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**I. Military Guide and References Materials**

- A Army National Guard DG-415-1 Readiness Center Design Guidelines (01 June 2011)

**ARMY NATIONAL GUARD  
DG 415-1  
READINESS CENTERS  
DESIGN GUIDE**



**NATIONAL GUARD BUREAU  
INSTALLATIONS DIVISION  
111 SOUTH GEORGE MASON DRIVE  
ARLINGTON, VA 22204-1382**

## FOREWORD

This Readiness Centers Design Guide (DG 415-1) was published by the National Guard Bureau, Army Installations Division (ARNG-ILI). DG 415-1 applies to all projects for new construction (including additions) as well as alterations to and rehabilitation and conversion of existing facilities. It is intended to assist the States, Territories, the District of Columbia and design professionals in gaining an understanding of the functions and the unique environmental considerations to address in the construction documents development. This design guide does not contain criteria but refers readers to sources of criteria in other publications that relate directly to the specific technical design requirements.

This Readiness Centers Design Guide should be used in conjunction with the General Facilities Information Design Guide (DG 415-5) to develop the final project design.

Distribution is limited. However, authorized users of the NGB Guard Knowledge Online (GKO), can obtain an electronic copy at <https://gkoportal.ngb.army.mil/sites/ARI-HQ/default.aspx>, Design, Guide Library site. All users are encouraged to submit comments and suggestions to improve this document by completing DA Form 2028, "Recommended Changes to Publications and Blank Forms," and sending it directly to:

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## CHAPTER 1

### GENERAL INFORMATION

#### 1-1 PURPOSE: PERFORMANCE DESIGN GUIDE

This Readiness Centers Design Guide (DG 415-1) contains design and functional planning guidance information for the design architect-engineer (A-E) to use in developing the design and the construction contract documents for Army National Guard (ARNG) readiness centers projects that qualify for support, totally or in part, from Federal funds. Readiness centers projects include Readiness Centers (Armory), Civil Support Team/Weapons of Mass Destruction (CST-WMD)-Ready Buildings, and joint-use Armed Forces Reserve Centers (AFRC). This design guide is applicable to all construction projects, including new construction, major alterations, rehabilitation and adaptive reuse of existing facilities. All ARNG facilities must be designed and constructed using the principles and practices of sustainable design and development using the latest version of the U.S. Green Building Council Leadership in Environmental and Energy Design (LEED) Green Building Rating System to achieve a “Silver” rating.

DG 415-1 addresses the unique functional design requirements for specific types of buildings. It should be used in conjunction with the General Facilities Information Design Guide (DG 415-5), which contains technical design guidance common to all Army National Guard building types. Together, the two design guides provide the functional performance information necessary to assist in developing the facility design.

To aid the reader in using this design guide, the following are included:

- Appendix A, Unique References, lists reference documents that pertain specifically to this building type; other references cited in this design guide are included in the References in DG 415-5.
- Appendix B, Glossary, defines the acronyms and abbreviations used in this design guide as well as specialized terms that are unique to this design guide.
- Appendix C contains several tables of requirements.
- Appendix D contains the figures that illustrate the explanations in the text.

#### 1-2 FUNCTIONS AND OPERATIONS OF READINESS CENTERS

A readiness center is defined as a facility that houses one or more units of the State Army National Guard.

### **1-2.1 Primary Function**

Readiness centers provide administrative, training, and material storage areas for the assigned military unit(s). Generally, full-time operations are limited to those personnel required to provide continuous support in unit administration plus preparation and planning for unit training, supply, administration, and recruiting. The administrative sector of the building should be designed to allow independent operational shutdown when other functions remain active.

### **1-2.2 Secondary Function**

Readiness centers are also utilized to support State functions such as disaster relief and policing actions in case of civil disturbance.

### **1-2.3 Tertiary Functions**

In addition, readiness centers provide for military and public social functions (the latter generally on a rental basis), and shelters during emergency or natural disasters. Public access to functional spaces is normally limited to the assembly hall, indoor firing range (used by authorized local organizations), lobby, toilet, classroom, and food preparation and scullery areas. The functional layout should appropriately compartmentalize all areas to support these uses.

### **1-2.4 Part-Time Functions**

Part-time functions are unit training assemblies, meetings, and special training classes, described below.

#### **1-2.4.1 Part-Time Unit Training Assemblies**

Unit training assemblies are normally conducted on one weekend per month per unit. Several units may train on the same weekend. The number of weekends on which these assemblies take place depends on individual unit situations and scheduling; however, common practice is to alternate weekends. All unit personnel, both part time and full time, normally attend such assemblies.

#### **1-2.4.2 Part-Time Meetings**

Administration and training meetings may be conducted on one or more nights per month.

#### **1-2.4.3 Part-Time Special Training Classes**

Classes may be conducted at night during the week or on a weekend, as circumstances dictate.

## CHAPTER 2

### READINESS CENTER FUNCTIONAL DESIGN GUIDANCE

#### 2-1 ARRANGEMENT AND ACCOMMODATION OF BASIC SITE COMPONENTS

The primary purpose of every readiness center is to provide an environment for administering the assigned unit or units, training for their mobilization mission, and storing the immediate equipment that they would take to their mobilization station. In addition to the functional space that is authorized every unit for this purpose, space for certain special units and activities not present at every readiness center may be authorized in accordance with guidance in NG PAM 415-12. For this reason, a careful study of the space authorizations in the DD Form 1390/91 approved program documents is essential to understanding how best to arrange the various functional groups in any given case. A further complication arises from the fact that certain functional spaces are set aside as common-use areas for all personnel in multi-unit readiness centers, whereas other functional areas are dedicated to sole use by a single unit, even at multi-unit readiness centers.

The main readiness center building should be located to maximize its visual presence in the community and to facilitate accessibility from the public thoroughfare, subject to any constraints imposed by antiterrorism/force protection (UFC 4-010-01/02), soil conditions and topography of the site. The military vehicle storage compound and supporting structures, such as the unheated unit storage building, should be located at the rear to minimize visual impact. Functional areas within the complex that have the greatest potential for expansion shall be placed with adequate site space to grow. Future expansion of the building and parking should be shown on the plans and considered in the layout to eliminate the need to remove and relocate paved areas and utilities. (See Figure 1, Basic Site Components.)

#### 2-2 FUNDAMENTAL PLANNING FOR THE BASIC READINESS CENTER

To provide the design A-E with an understanding of important planning relationships within a readiness center, several diagrams in Appendix D address the fundamental activities and functional dependencies that have a significant impact on the building design. In addition, Table 1 in Appendix C addresses proximity requirements between each program function listed in NG PAM 415-12, Chapter 2, Readiness Centers.

##### 2-2.1 Basic Components

Basic program components, which may consist of several individual dependent spaces and their fundamental interrelationships, are illustrated in Appendix D, Figures 1- 5.

All the basic functional relationships for individual program spaces to support one unit accommodating 250 to 300 troops are shown in Figure 3. This arrangement demonstrates one of many configurations possible to satisfy basic requirements. It is

provided to illustrate the many important interdependencies between the program spaces within a typical Readiness Center. One of the main planning goals is to maximize the flexibility of use of the assembly hall.

### **2-2.2 Varying Operational Requirements**

Figure 4, Accommodation of Unit Deployment, in Appendix D illustrates those essential functions that actively support unit deployment and those that can be locked down. Figure 5, Accommodation of Community Functions, in Appendix D indicates those functions supporting a typical community activity. When allowing access to the public, some of the challenges of the facility design are maintaining the security of unit and basic National Guard functions and providing emergency egress for large groups. Another very important element of the design is effective and efficient zoning of internal environmental systems to accommodate flexibility of use.

### **2-2.3 Accommodating Incompatible Functions**

Two functions that are included in a typical readiness center but are incompatible with most of the other functions because of noise and vibration are the maintenance area and the indoor firing range. Figure 6, Acoustic and Vibration Buffers, in Appendix D, illustrates one solution that provides neutral spaces between the noise- and vibration-sensitive areas of the building. In this case, it is suggested to use storage components and the break room to provide the buffer.

### **2-2.4 Plan for Potential Growth**

In the future, it is possible for additional units to be housed at the readiness center. Therefore, the initial design should provide for orderly expansion related to both the facility site plan and the arrangement of functions within the building. Figure 7, Additional Units Expansion, in Appendix D, shows the incremental growth to accommodate requirements for new units assigned to the readiness center, which include storage of equipment and supplies plus administrative support. With the incorporation of additional units at a facility, incremental growth of the major readiness center support program spaces should also be expected to occur.

## **2-3 DESIGN GUIDANCE FOR PROGRAM SPACES**

### **2-3.1 Assembly Hall**

The primary function of the assembly hall is to provide space for troop formations, inspections, dining, and large group assemblies for training. The assembly hall also serves the neighboring community as a place of public assembly and as a refuge in case of natural disaster. The assembly hall must accommodate direct access for loading and off-loading supplies and equipment from unit vehicles. Therefore, a loading dock is required adjacent to this space. The food service must also be adjacent to this space because food service will be provided for both the unit and local civic and private functions using the assembly hall. Heated unit storage must be in very close proximity to the assembly hall to allow efficient organization of equipment for deployment.

### 2-3.1.1 Flexibility of Use

Flexibility is the key design issue related to the assembly hall. To accommodate the various uses planned for this space, the most versatile approach is division by flexible partitions that are appropriately detailed at the top and bottom plus panel composition to provide maximum acoustic separation. Acoustical treatment should be also provided above the ceiling to the underside of the roof deck or at the floor under folding partitions to attain a proper sound transmission coefficient (STC) rating within each subdivided space.

Multiple entry points should be aligned with each space compartment when all flexible partitions are fully deployed. This arrangement allows most of the support storage to be located outside of the assembly hall and the stored materials to be easily taken around the perimeter to any one of the compartmentalized areas. (See Figure 8, Assembly Hall and Adjacent Support Functions, in Appendix D.)

### 2-3.1.2 Placement within the Facility

Placement of the assembly hall should allow the public direct access off the main lobby. Important support functions that should be located in close proximity include storage for chairs, tables, and audio/visual (AV) equipment plus toilet facilities of adequate size to support the largest group activities anticipated. In addition, food preparation and serving facilities should be located immediately adjacent to the assembly hall. The feasibility of locating the food serving area off the corridor adjacent to the assembly hall, with adequate queuing space, should be considered because of the acoustical isolation provided from the activities in the hall space. (See Figure 9, Food Service/Transfer of Equipment in Relationship to Assembly Hall, in Appendix D.)

### 2-3.1.3 Support for Presentations

An adequate power supply for all anticipated functions is critical to flexible use. Connections to the Internet and other data systems should be provided at multiple locations and aligned with the maximum subdivision arrangements. A ceiling-mounted projection system may be beneficial for large group meetings.

### 2-3.1.4 Direct Vehicle Access

The assembly hall should be located for direct access to unit support vehicles that carry supplies and equipment. This can be accomplished by providing a loading dock with overhead coiling doors adjacent to the perimeter of the space. (The vehicles do not come into the assembly hall.) The loading dock should also accommodate food service supplies. See Figure 9, Food Service/Transfer of Equipment in Relationship with Assembly Hall, in Appendix D.

### 2-3.1.5 Air Conditioning Policy

The Assembly Hall maybe environmental controlled with a mechanical air conditioning system to maintain 78 degrees F and 50% RH. The space must be heated and ventilated by a central station air handling unit (AHU) with an 85% efficiency filter bank base on ASHRAE Standard 52.1-1992 Atmospheric Dust-Spot Efficiency rating.

## 2-3.2 Classrooms

The classroom area is subdivided as described below.

### **2-3.2.1 Classrooms/Meeting Rooms**

Classrooms are used for instructional training of unit personnel and for unit meetings. They may also be used by the public. The classrooms/meeting rooms and their related support components are illustrated in Figure 10, Classrooms/Meeting Room Spaces, in Appendix D. If classrooms are to be provided independently of the assembly hall, the following applies:

- The space authorized in the approved program documents should be used for the design.
- Classrooms that are 900 ft<sup>2</sup> or larger may be provided with an accordion or folding partition to divide the classroom area into two smaller rooms.
- Acoustical treatment should be provided above the ceiling to the underside of the roof deck or at the floor under the acoustically insulated folding partition(s) to attain an STC of 40.
- Lighting controls for each individual classroom and subdivision should be located at a point convenient to the speaker and at the door.
- Fixed speaker's platforms, chalkboards or marker boards with map rails, and electrical outlets for AV equipment should be provided.
- A portion of the authorized classroom space may be designed as an auditorium with an inclined floor and installed seats plus a raised platform at the front.

### **2-3.2.2 Library/Classroom**

The library/classroom accommodates a reading area with training publications and other reading material. This space may be combined with the learning center. A chalkboard with map rails as well as electrical convenience outlets should be provided.

### **2-3.2.3 Learning Center**

The learning center should be adjacent to, or combined with, the library/classroom. This space should be equipped with individual pre-wired study carrels for military occupational skills (MOS) training. The learning center should have built-in shelving or racks and a chalkboard as well as electrical outlets to accommodate AV equipment in the study carrels.

### **2-3.2.4 Distance Learning Center**

The distance learning center provides space for delivery of remote training and educational resources. It requires accommodation of voice and data links.

### **2-3.2.5 Audio/Visual and Training Aid Storage**

Storage rooms for AV equipment and training aids should be adjacent to, and preferably have direct access to, the library/classroom and the learning center. The storage rooms should be designed to maximize wall space. Each room should have built-in shelving or racks, or both.

### **2-3.3 Indoor Firing Range**

The indoor firing range is used for marksmanship practice and qualification. Spatial requirements include a storage room and a small toilet. (See Figure 11, Plan of Indoor Firing Range Components, in Appendix D.)

#### **2-3.3.1 Design Guidance**

The environment of the actual range area is unique both in the construction materials and the ventilation requirements. Materials used in the exposed construction, including baffled elements, must be able to deflect projectiles toward the target with no possibility of ricochet in the shooter's direction. The materials must also be substantial enough to prevent any rounds fired from any location or direction from escaping the immediate environment.

Horizontal safety ceilings, ceiling baffles, deflectors, and shields (sheathing) provide safe ballistic conditions above the firing line and down range of the shooters. All non-bullet-proof walls and ceilings down range must be either sheathed with round-absorbing material or baffled to divert stray bullets back into the range. Ceiling or sidewall-supported deflection baffles should be located close to the bullet trap to redirect stray rounds to the primary impact plates of the bullet trap.

Bullet traps and baffles must extend the full width and height of the back wall of the range and have a profile that directs all bullets into the deceleration chamber of the bullet trap.

Air ventilation pressure in the range area must always be negative with regard to the direction of the bullet trap to avoid contamination by bullet backspatter.

Supply air should be filtered at 35% efficiency and 60 degrees F minimum through a perforated wall at the face of the air plenum behind the firing line. Exhaust air final filter be HEPA Type w/85% efficiency pre-filter or as required by the U.S. Environmental Protection Agency.

For the design criteria, refer to UFC 4-160-01, AR 210–21, ER 210-3-2, and the American Conference of Governmental Industrial Hygienists (ACGIH) Industrial Ventilation Manual and U S Navy Environmental Health Center TM 6290.99-10. (See Range Detail Diagrams, in Appendix D, Figures 11, 12, 13 & 14.)

#### **2-3.3.2 Independent Access**

A means of access that is independent from the remainder of the facility functions should be provided to allow community shooting groups and law enforcement agencies to utilize the range.

#### **2-3.3.3 Ventilation Testing**

The contract documents should stipulate that the construction contractor is to hire a qualified independent testing firm to evaluate the ventilation system in the completed range. The evaluation should ensure that the air flow at the firing line is uniformly distributed over the room cross section to achieve 75 FPM minimum velocity with laminar flow down range.

### **2-3.4 Exterior Space Requirements**

The facility should have a garbage can wash area that includes a source of hot and cold water and a drain with a grease separator. Garbage can storage should be adjacent to the building and screened from sight.

### **2-3.5 Break Room and Vending Area**

For the size requirements for the break room and vending area, refer to NG PAM 415-12, Chapter 2; and for design guidance, refer to the discussion of common facility functional areas in DG 415-5, Chapter 5, Common Functional Planning and Building Design Guidelines.

### **2-3.6 Toilets and Showers**

The majority of the toilets should be concentrated with, but separated from, the shower facilities that accommodate cleanup after unit training activities. Toilets should also be easily accessible to those attending public functions. Refer to the general design guidance included in DG 415-5, Chapter 5. For size requirements, refer to NG PAM 415-12, Chapter 2.

### **2-3.7 Table/Chair Storage**

Areas for table and chair storage should be located on the perimeter of the assembly hall. They should be accessible from both the assembly hall and the corridor to promote optimum flexibility in the use and configuration of the assembly hall space. (See Figure 8, Assembly Hall and Adjacent Support Functions, in Appendix D.)

### **2-3.8 Physical Fitness Area**

For design guidance regarding the physical fitness area, refer to DG 415-5, Chapter 5; and for size requirements, refer to NG PAM 415-12, Chapter 2.

### **2-3.9 Nursing Mothers Room**

**Any ARNG facility that include an Administrative Area is authorized a net area of 80-square feet enclosed room with complete environmental systems and one cabinet/counter mounted 16"x16" sink to support this effort.**

## **2-4 EXCLUSIVE USE AREAS**

### **2-4.1 Unit Administration**

The allocated net square footage for each administrative component is determined from NG PAM 415-12 and specifically indicated in the approved program documents for the project. The actual number of administrative personnel and their office or workstation requirements as well as assigned equipment such as file cabinets, desks, chairs, and personal computers should be determined at the pre-design conference. At a minimum, the unit commander, executive officer, and a senior non-commissioned officer should have private offices.

The layout of the unit administrative space must take into account the need to locate full-time administrative personnel adjacent to the main entrance and lobby for visitor control. A viewing window should be provided in an adjacent lobby so that the entrance can be kept under observation from both a standing and seated position at the reception area. Office furniture consisting of modularly dimensioned components

should be a strong consideration when laying out the open administrative areas because modular furniture allows flexibility for rearrangement in the future.

#### **2-4.2 Heated Unit Storage**

Heated and ventilated unit storage is authorized for each assigned unit to provide a secure area for storing, issuing, and returning organizational equipment and clothing. The H/V Unit serving this area must be provided with a 35% efficiency filter bank. The walls of the authorized heated storage space for each unit should extend from the floor to the bottom of the roof deck or floor structure above. Supply and return air diffusers and grilles should be security type. A Dutch door could be used in place of a standard door if desired by the unit. The active leaf of the Dutch door should be solid, allowing the best functional use of the door and optimal performance of the magnetic switches. A double-door arrangement should be provided so that heavy or bulky equipment can be moved directly between the storage area, the assembly hall, or the transporter. Physical security standards should be as stipulated in AR 190-51 Security Of Unclassified Army Property. This area should have direct access from the loading docks. (See Appendix D Figure 15 for Vault and Unit Storage)

#### **2-4.3 Vault**

The vault should be immediately adjacent to the unit storage area. Design guidance Vaults construction, and intrusion detection systems can be found in AR 190-11 Physical Security of Arms, Ammunition And Explosives. Vault design criteria must be as indicated in NG PAM 415-12. (See Figure 15, Vault and Unit Storage, in Appendix D of this document)

#### **2-4.4 Locker Rooms**

The locker room is intended for storage of individual equipment. The total authorization of the size, type, and number of lockers for each readiness center is identified by the State construction and facilities management officer (CFMO) or obtained from the approved program documents.

#### **2-4.5 Recruiting/Retention Office**

The recruiting/retention office should be located as near to the main entrance as possible, preferably adjacent to the lobby. It should have a viewing/pass-through window or some other appropriate means of emphasizing public accessibility.

#### **2-4.6 Family Readiness Office**

The ARNG Family Readiness Program supports the soldier's family members well being through communication, involvement, support, recognition and assistance during deployments and other times of needs.

#### **2-4.7 Rapids Office**

Real-Time Automated Personnel Identification System requires general office space for supporting unit human resource and administration matters.

#### **2-4.8 Communications Security Areas**

Communications security (COMSEC) areas contain the communication gear and Army cryptography (crypto) devices for command and control operations. These areas should not be located adjacent to an exterior wall. The following are design

requirements for storage of the communication gear and the crypto devices and for work space to service and repair them:

#### **2-4.8.1 Storage Areas**

Storage areas for the crypto equipment should be identified as "Restricted Areas" and should have walls extending from the floor to the underside of the floor above or to the roof structure. The walls and door should have a 1-hour fire rating. When organizational maintenance is to be performed on the equipment, no visibility from the outside of the COMSEC room can be tolerated.

#### **2-4.8.2 Training Device/Simulation Center**

The training area is dedicated to continual specialized use for tactical fire direction (TACFIRE) systems. The construction of the center should follow the same procedures as for the crypto equipment storage areas except that, during non-use periods, the crypto keys should be secured in the unit crypto security containers. The door to the center should be equipped with both three-position tumbler and cipher locks for non-duty and duty hour control. Simulation Device Vendor Data must be provided to the designer.

#### **2-4.8.3 Secret Internet Protocol Router Network Room**

The room is needed to securely house the Secret Internet Protocol Router Network (SIPRNET) equipment and those individuals operating the equipment where required.

#### **2-4.9 Maintenance/Training Area**

The operations and space requirements to support unit-level maintenance and training include the components described below (see Figure 16, Maintenance Training Area, in Appendix D).

##### **2-4.9.1 Supervisor's Office**

The supervisor oversees the operations of the shop in performing organizational-level maintenance.

##### **2-4.9.2 Supply and Tool Rooms**

The supply and tool room technician is responsible for requisitioning and issuing repair parts, supplies, and special tools. The supply and tool rooms should be adjacent to or contiguous with each other for convenient operation.

##### **2-4.9.3 Battery Room**

Battery room is not authorized for Maintenance/Training Area.

##### **2-4.9.4 Bulk POL Storage**

This area is used to store bulk POL products such as grease and oils that will transport these products to delivery reels located adjacent to the general purpose and special purpose work bays. This area should be heated to a minimum of 50 degrees Fahrenheit to maintain fluid viscosity. This area should have exterior door access that will accommodate forklift or pallet jacks for moving POL containers into or out from the area.

#### **2-4.9.5 Inspection and Library Area**

The inspection and library area is an office used by a mechanic responsible for inspecting work done on all table of organization and equipment (TOE) maintained in the maintenance training work bays. The mechanic inspector also maintains a library that includes technical manuals, technical bulletins, and work order modifications used by the inspector and other mechanics.

#### **2-4.9.6 Maintenance/Training Work Bays**

When authorized, the facility may have a General Purpose Training Bay (GPTB) IAW NG PAM 415-12, Table 2-2, Item L and associated note 19.. The GPTBs are used to train mechanics for field-level maintenance. These work bays are used for activities such as training in removal and replacement of equipment components such as engines and transmissions. Readiness Centers with authorized A validated and approved GPTB (as outlined in NG PAM 415-12) may be used for vehicle maintenance and minor repairs. All work bays and the associated equipment must comply with applicable OSHA and EPA requirements. The work bay will be designed to have a vehicle tailpipe exhaust system, emergency eyewash, and a trench/floor drain connected to an oil-water separator. Additionally, the followings items should be included in the GPTB air compressor; electrical and IT Ports. Associated with the MTWB are a supervisor's office, inspection and library, waste oil/hazardous materials storage area, tool room, and supply room.

#### **2-4.10 Special-Purpose Areas**

The special-purpose areas that could be required at a readiness center, listed under Schedule I of the program documents, include those described below.

##### **2-4.10.1 Headquarters Functions**

The headquarters functions could be State, division, brigade, battalion, or other headquarters components. A mix of full-time and inactive duty training personnel will occupy the authorized space to perform the administrative-type work associated with operation of the headquarters.

##### **2-4.10.2 Army Advisor's Office**

The Army advisor's office is administrative space that is occupied full time.

##### **2-4.10.3 Band Facilities**

Band training facilities shall be designed and constructed in accordance with UFC 4-171-04AN, Band Training Facilities. When a band is authorized at the readiness center, allowances listed under Schedule II of the program documents should be used for BTF space allowance.

### **2-5 BASIC FACILITY FUNCTIONS**

#### **2-5.1 Facility Maintenance Storage**

The facility maintenance storage space accommodates the storage of supplies and equipment used in the day-to-day operation and maintenance of the facility.

#### **2-5.2 Mechanical, Electrical, and Telecommunications Rooms**

Refer to DG 415-5, Chapter 5.

### **2-5.3 Facility Maintenance and Custodial Area**

Refer to DG 415-5, Chapter 5.

### **2-5.4 Flammable Materials Storage Building**

Refer to DG 415-5, Chapter 4, Common Functional Site Design Guidelines.

### **2-5.5 Controlled Waste Handling**

Refer to DG 415-5, Chapter 4.

### **2-5.6 Wash Platforms for Vehicles and Equipment**

Refer to DG 415-5, Chapter 4.

### **2-5.7 Fuel Storage and Dispensing System**

Refer to DG 415-5, Chapter 4.

### **2-5.8 Exterior Lubrication and Inspection Rack**

The exterior and inspection rack should be designed for the maximum anticipated vehicle weights and tread widths. It should include a suitable walkway (platform) with safety railings and steps to grade, allowing the vehicle operator to dismount safely after positioning the vehicle on the rack. The rack should generally be located within or adjacent to the military vehicle parking area and allow for easy access without conflicting with traffic flow. Inspection rack should be located in close proximity to reduce cost of common utility runs.

### **2-5.9 Recycling Area**

This area should be adjacent to the shipping/receiving area where recyclables from the building can be consolidated and stored for pickup.

## CHAPTER 3

### FOOD SERVICE AREA:

#### 3-1 PURPOSE

The primary purpose of this chapter is to provide information about the Food Service Area and updates. Currently, there are two kitchen layouts for the readiness center; small and large kitchen with 1,300 square feet and 1,875 square feet, respectively. There will be only one kitchen layout for every readiness center at 2200 square feet. The kitchen layout and equipment has been included in this chapter instead of Appendix D of DG 415-5. Also, on the equipment list, there is no longer item 51 Condensation Hood (at Kettle & Ovens).

#### 3-2 FOOD SERVICE AREA

The food service area should be adjacent to the assembly hall and have direct access to the building exterior service area for deliveries and for trash and garbage removal.

##### 3-2.1 Kitchen

The contract documents for the kitchen area should include the following:

- Kitchen design in accordance with the latest published criteria from the U.S. Army Quartermaster Center and School (USAQMC&S)
- Federal government-furnished, contractor-installed equipment
- Contractor-furnished equipment
- Required utilities

Additional guidance concerning the spaces in the kitchen area is as follows:

##### 3-2.2 Food Storage Area

The food storage area is intended for storing food items in a dry, refrigerated, or frozen state. Mobile storage cabinets should be provided for dry bulk staple food items. Individual mobile cabinets should be assigned to, and under control of, the various military units at the readiness center. Refrigerator and freezer units must be provided for storing refrigerated and frozen foods.

##### 3-2.3 Food Preparation Area

The food preparation area is the central function within the kitchen. It requires all utilities, plumbing, counter space, and shelving at a scale to meet the needs of authorized troop capacity within the readiness center.

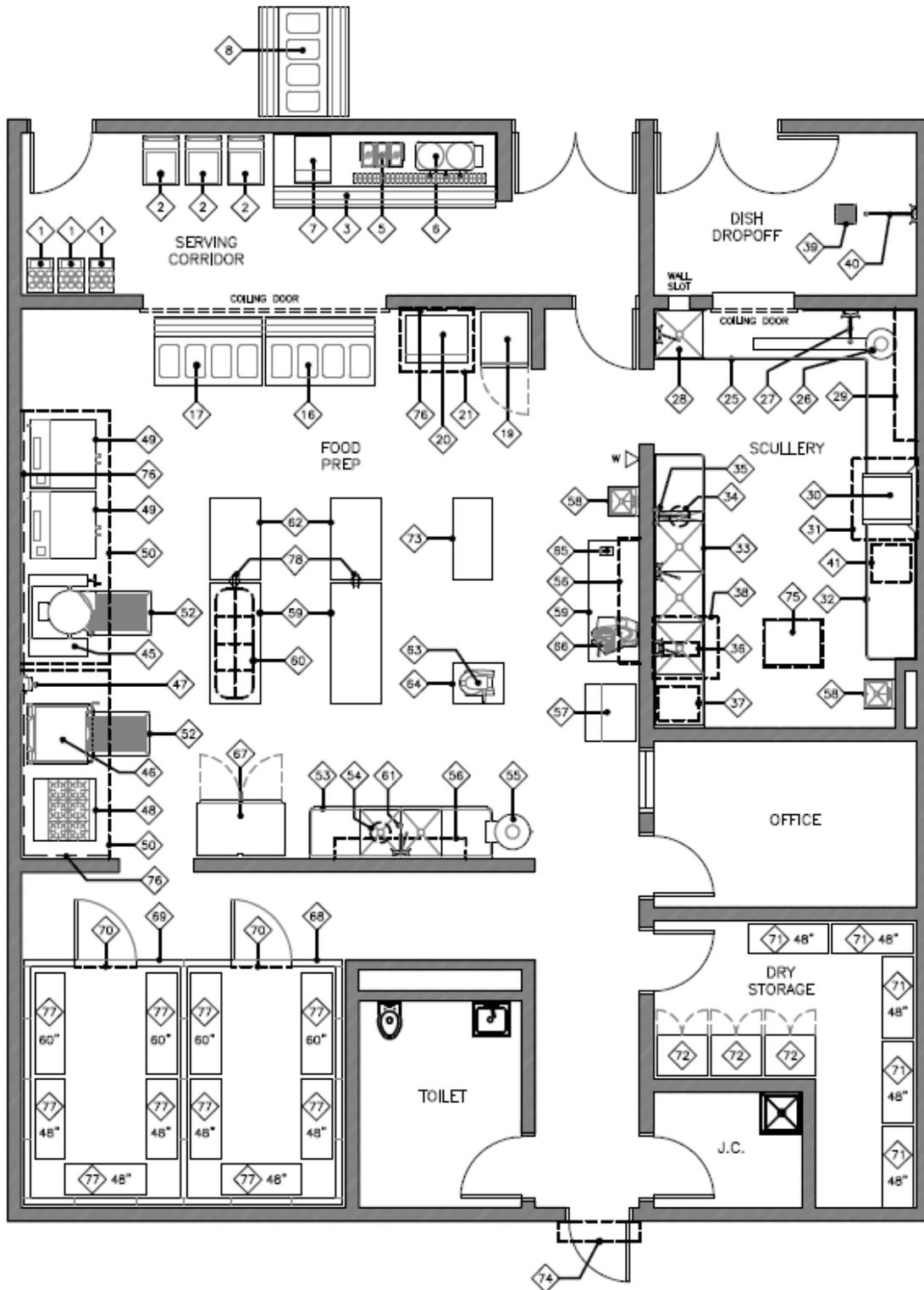
##### 3-2.4 Serving Area

The serving area is intended for dispensing drinks, dishes, and eating utensils as well as facilitating the orderly movement of diners.

### **3-2.5 Scullery**

The scullery area is used for cleaning all food preparation pots and pans as well as dining utensils.

### KITCHEN LAYOUT AND EQUIPMENT LIST



ARMY NATIONAL GUARD KITCHEN EQUIPMENT LAYOUT  
(NOT TO SCALE)

## ARMY NATIONAL GUARD KITCHEN EQUIPMENT SCHEDULE

ITEM NO	QTY	ITEM NAME	GF/CI	CF/CI
1	3	Tray Dispenser w/ Silverware Holder		
2	3	Tableware Dispenser		
3	1	Beverage Counter		
4		Open Number		
5	1	Juice Dispenser		
6	1	Coffee Um		
7	1	Ice/Water Dispenser		
8	1	Cold Food Counter		
9		Open Number		
10		Open Number		
11		Open Number		
12		Open Number		
13		Open Number		
14		Open Number		
15		Open Number		
16	1	Mobile Cold Food Counter		
17	1	Mobile Hot Food Counter		
18		Open Number		
19	1	Food Warming Cabinet		
20	1	Griddle		
21	1	Exhaust Hood (at Griddle)		
22		Open Number		
23		Open Number		
24		Open Number		
25	1	Soiled Dish Table		
26	1	Garbage Disposal		
27	1	Spray Assembly		
28	1	Silver Soak Sink		
29	1	Wall-Mounted Shelf		
30	1	Dishwasher		
31	1	Condensate Hood (at Dishwasher)		
32	1	Clean Dish Table		
33	1	Pot and Pan Sink		
34	1	Garbage Disposal		
35	1	Spray Assembly		
36	1	Sink Heater/Sanitizer		
37	1	Booster Heater (for Final Rinse Faucet)		
38	1	Condensate Hood (at Final Rinse Compartment)		
39	1	Floor Trough		

ITEM NO	QTY	ITEM NAME	GF/CI	CF/CI
40	1	Spray Assembly		
41	1	Booster Heater (for Dishwasher)		
42		Open Number		
43		Open Number		
44		Open Number		
45	1	Tilting Kettle		
46	1	Tilting Skillet		
47	1	Pot Filler		
48	1	Range		
49	2	Convection Oven		
50		Open Number		
51	1	Condensate Hood (at Kettle & Ovens)- See Note 1		
52	2	Floor Trough (at Skillet & Kettle)- See Note 2		
53	1	Vegetable Prep Sink		
54	1	Garbage Disposal		
55	1	Vegetable Peeler		
56	2	Wall-Mounted Shelf		
57	1	Ice Maker		
58	2	Hand Sink		
59	3	Worktable		
60	1	Utensil Rack		
61	1	Spray Assembly		
62	2	Mobile Worktable		
63	1	Mixer		
64	1	Mixer Stand		
65	1	Can Opener		
66	1	Meat Slicer		
67	1	Reach-In Freezer		
68	1	Walk-In Refrigerator (Dairy)		
69	1	Walk-In Refrigerator (Vegetables)		
70	2	Plastic Strip Curtain		
71	5	Mobile Shelving (Dry Storage) - See Note 3		
72	3	Security Unit		
73	1	Dolly Truck		
74	1	Air Curtain		
75	1	Grease Interceptor		
76	2	Stainless Steel Wall Covering		
77	10	Mobile Shelving (Walk-In Refrig.) - See Note 3		
78	2	Cord Drop Receptacle		

Note 1: The condensate hood at the Tilting Kettle and ovens may be eliminated if these pieces of equipment are located adjacent to the Tilting Skillet and Range and the Grease Exhaust Hood extends over all equipment.

Note 2: Contractor to verify exact final location and orientation of the Floor Trough; coordinate with the pour path of the specific model of Tilting Skillet and Tilting Kettle provided.

Note 3: The number and length of Mobile Shelving units may vary with the Kitchen layout. Maximize the amount of shelving to the extent feasible. Verify final quantities and sizes with Owner.

GF/CI = Government Furnished/Contractor Installed  
CF/CI = Contractor Furnished/Contractor Installed

26 August 2010

## CHAPTER 4

### UNIQUE ANTITERRORISM FORCE PROTECTION REQUIREMENTS

RE: DG 415-5 General Facilities Information Design Guide, Chapter 2. (UFC 4-010-01;  
UFC 4-010-02; UFC 4-021-01; UFC 4-023-03)

**CHAPTER 5  
UNIQUE ARCHITECTURAL AND ENGINEERING  
SUBMISSION REQUIREMENTS CHECKLIST**

(To Be Determined and Developed As Required)

**CONCEPT SUBMISSION (10%)**

**CIVIL, SITE, AND LANDSCAPE DESIGN**

Item #1

---

Item #2

---

Item #3

---

**STRUCTURAL ENGINEERING DESIGN**

**ARCHITECTURAL DESIGN**

**MECHANICAL AND PLUMBING SYSTEMS DESIGN** N/A

---

**ELECTRICAL AND COMMUNICATION SYSTEMS DESIGN** N/A

---

**PRELIMINARY DESIGN SUBMISSION (35% & 65%)**

**CIVIL, SITE, AND LANDSCAPE DESIGN**

**STRUCTURAL ENGINEERING DESIGN**

**ARCHITECTURAL DESIGN**

**MECHANICAL AND PLUMBING SYSTEMS DESIGN**

**ELECTRICAL AND COMMUNICATION SYSTEMS DESIGN**

**FINAL DESIGN SUBMISSION (95% & 100%)**

**CIVIL, SITE, AND LANDSCAPE DESIGN**

**STRUCTURAL ENGINEERING DESIGN**

**ARCHITECTURAL DESIGN**

**MECHANICAL AND PLUMBING SYSTEMS DESIGN**

**ELECTRICAL AND COMMUNICATION SYSTEMS DESIGN**

*(This Submission Requirements Checklist will be expanded to cover all unique review requirements.)*

**CHAPTER 6**

**UNIQUE ARCHITECTURAL AND ENGINEERING  
DESIGN DIRECTIVE REVIEW CHECKLIST**

*(To Be Determined and Developed As Required)*

<u>REQUIREMENT</u>	SUBMISSIONS				
	10%	30%	60%	95%	100%
<b>SECTION 1: CIVIL, SITE, AND LANDSCAPE DESIGN</b>					
<b>DIVISION 1: GENERAL REQUIREMENTS</b>					
Item #1					
Item #2					
Item #3					
<b>DIVISION 2: SITE CONSTRUCTION</b>					
Item #1					
Item #2					
Item #3					
<b>DIVISION 10: SPECIALTIES</b>					
Item #1					
Item #2					
Item #3					
<b>SECTION 2: STRUCTURAL ENGINEERING DESIGN</b>					
<b>DIVISION 1: GENERAL REQUIREMENTS</b>					
Item #1					
Item #2					
Item #3					
<b>DIVISION 3: CONCRETE</b>					
Item #1					
Item #2					
Item #3					

*(This Design Review Checklist will be expanded to cover all unique review requirements.)*

## APPENDIX A

### UNIQUE REFERENCES

The following lists criteria in the form of regulations and industry standards that are to be used to design ARNG readiness centers and are not included in the References in DG 415-5. The design A-E should use the current applicable edition of all references.

#### GOVERNMENT PUBLICATIONS:

1. Department of Defense
  - UFC 3-120-10 Interior Design.
  - UFC 4-451-10N Design: Hazardous Waste Storage.
  - UFC 4-160-01 Unified Facilities Criteria Design and Maintenance, Small Arms Range Facilities.
  - UFC 4-171-04AN, Design Guide, Band Training Facilities
  - UFC 4-610-01 Administration Facilities
2. Department of the Navy
  - TM 6290.99-10, Indoor Firing Ranges Industrial Hygiene Technical Guide
3. Department of Justice
  - 2010 ADA Standard for Accessible Design

#### NON-GOVERNMENT INDUSTRY STANDARD PUBLICATIONS:

- |  |   |
|--|---|
| American Society of Heating, Refrigeration<br>Air conditioning Engineers, Inc. | Handbook, Fundamentals; HVAC<br>Application/Systems |
| American Conference of Governmental<br>Industrial Hygienist (ACGIH)            | Industrial Ventilation Latest Edition               |
| National Fire Protection Association   | Codes and Standards.                                |

## APPENDIX B

### GLOSSARY

#### B-1 ACRONYMS AND ABBREVIATIONS

ACGIH	American Conference of Governmental Industrial Hygienists
A-E	Architect-Engineer
ARNG	Army National Guard
AV	Audio/Visual
BTF	Band Training Facilities
CFMO	Construction and Facilities Management Officer
COMSEC	Communications Security
Crypto	Cryptography
CST-WMD	Civil Support Teams for Weapons of Mass Destruction
DG	design guide
ft	foot/feet
FTP	File Transfer Protocol
HVAC	Heating, Ventilation, and Air Conditioning
MOS	Military Occupational Skills
N/A	not applicable
NFPA	National Fire Protection Association
NGB-ARI	National Guard Bureau, Army Installations Division
PAM	Pamphlet
RAPIDS	Real-Time Automated Personnel Identification System
STC	Sound Transmission Coefficient
TACFIRE	tactical fire direction

TI	Technical Instructions
TM	Technical Manual
TOE	Table of Organization and Equipment
UFC	Unified Facilities Criteria
USAQMC&S	U.S. Army Quartermaster Center and School

**B-2      UNIQUE SPECIALIZED TERMS**

Armed Forces Reserve Center	A readiness center that is constructed as a joint-use facility with another reserve component from the Army, Navy, Marine, or Air National Guard
Communications Security (COMSEC)	Measures and controls taken to deny unauthorized persons information derived from telecommunications and to ensure the authenticity of such telecommunications.
Readiness Center	A facility that houses one or more units of the State Army National Guard; an armory

**APPENDIX C**

**TABLES**

- Table 1. Architectural Interior Finishes
- Table 2. Doors, Hardware, Storage, and Shelving
- Table 3. Mechanical Requirements – Part 1
- Table 4. Mechanical Requirements – Part 2
- Table 5. Electrical Requirements
- Table 6. Special Equipment and Ceiling Height

**Table 1. Architectural Interior Finishes**

	<b>FUNCTIONAL AREA</b>	<b>FLOOR</b>	<b>BASE</b>	<b>WAINSCOT</b>	<b>WALLS</b>	<b>CEILING*</b>
1	Assembly Hall	CONC/H	---	Epoxy (Note 3)	CMU/P	EXP/P
2	Classrooms	VCT	RB	Epoxy	GWB/P	ACST
3	Library/Classroom	CPT	RB	Epoxy	GWB/P	ACST
4	Learning Center	VCT	RB	Epoxy	GWB/P	ACST
5	Distance Learning Center	VCT	RB	Epoxy	GWB/P	ACST
6	Indoor Firing Range	CONC/H				
7	Training Device/Simulation Center	CONC/H	RB	Epoxy	GWB/P	ACST
8	Training Aid Storage	VCT	RB			
9	Kitchen	QT	QT	QT	GWB/P	GWB/P
10	Break Room	VCT	RB	Epoxy	GWB/P	ACST
11	Vending Area	VCT	RB	Epoxy	GWB/P	ACST
12	Toilets/Shower	CT	CT	N/A	CT (Note 1)	GWB/P
13	Flammable Materials Storage	CONC/H		Epoxy	CMU/P	EXP/P
14	Family Readiness Office	CPT	RB	Epoxy	GWB/P	ACST
15	RAPIDS Office	CPT	RB	Epoxy	GWB/P	ACST
16	Recruiting/Retention Office	CPT	RB	Epoxy	GWB/P	ACST
17	Audio/Visual Storage	VCT	RB	Epoxy	GWB/P	ACST
18	Table/Chair Storage	CONC/H	RB	(Note 4)	GWB/P	ACST
19	Physical Fitness	(Note 1)	RB	Epoxy	GWB/P	ACST/ GWB/P
20	Controlled Waste Handling Facility	(Note 2)		Epoxy	CMU/P	EXP/P
21	Unit Administration	CPT	RB	Epoxy	GWB/P	ACST
22	Unit Storage (Heated)	CONC/H	---	---	CMU/P	EXP/P
23	Locker Rooms	VCT		Epoxy	CMU/P	GWP/P
24	Maintenance Training Workbays	CONC/H	---	---	CMU/P	EXP/P
25	Supervisor's Office	CONC/H	---	---	CMU/P	ACST
26	Inspection and Library	CONC/H	---	---	CMU/P	ACST
27	Tool Room	CONC/H	---	---	CMU/P	EXP/P
28	Supply Room	CONC/H	---	---	CMU/P	EXP/P
29	Vault	CONC/H	CONC	---	CONC/P	CONC/P
30	SIPRNET Room	VCT	RB	---	GWB/P	GWP/P

\*Ceiling heights are indicated in Table 6.

**TABLE 1 – ABBREVIATIONS**

ACST	acoustical suspended tile, 2 ft by 4 ft or 2 ft by 2 ft grid
CONC/H	clear liquid hardener/sealer finish over exposed concrete floor
CMU	concrete masonry units
CPT	carpet – A 26- to 28-oz. (face weight) permanent, static-free (2.5 kV or less), cut or loop pile nylon or acrylic commercial-grade (direct glue-down without cushion) carpet is authorized. (Carpet tile is preferred over rolled stock.)
CT	ceramic tile (thick or thin set) and ceramic or marble threshold
EXP/P	exposed construction, painted (using enamel, latex, or paint of an equivalent cost)
GWB/P	gypsum wallboard, painted (using enamel, latex, or paint of an equivalent cost)
QT	quarry tile
RB	resilient base
VCT	vinyl composition tile – VCT with a thickness of 3/16 in. or less on monolithic concrete finish and with a final wax coat, if recommended by the tile manufacturer, is authorized.

**TABLE 1 – NOTES**

1. The shower should be provided with ceramic tile on the walls to the ceiling.
2. Surrounded by a 4-in.-high liquid-tight curb.
3. Epoxy is the base paint. The coating should not exceed two-application system.
4. If the walls are faced with gypsum board, painted plywood up to wainscot height or a protective bumper system should be installed.

**Table 2. Doors, Hardware, Storage, and Shelving**

	<b>FUNCTIONAL AREA</b>	<b>DOORS</b>	<b>HARDWARE</b>	<b>STORAGE/SHELVING</b>
1	Assembly Hall	hollow metal	commercial/keyed (exterior)	---
2	Classrooms	solid core wood	commercial/keyed	shelving & cabinets
3	Library/Classroom	solid core wood	commercial/keyed	shelving & cabinets
4	Learning Center	solid core wood	commercial/keyed	shelving & cabinets
5	Distance Learning Center	solid core wood	commercial/keyed	shelving & cabinets
6	Indoor Firing Range	hollow metal	commercial/keyed	---
7	Training Device/ Simulation Center	solid core wood	commercial/keyed	---
8	Training Aid Storage	solid core wood	commercial/keyed	shelving & cabinets
9	Kitchen	hollow metal	commercial/keyed	shelving & cabinets
10	Break Room	---	---	cabinets
11	Vending Area	---	---	---
12	Toilets/Shower	hollow metal	---	---
13	Flammable Materials Storage	hollow metal	commercial/keyed	shelving
14	Family Readiness Office	hollow metal	commercial/keyed	shelving
15	RAPIDS Office	hollow metal	commercial/keyed	shelving
16	Recruiting/Retention Office	hollow metal	commercial/keyed	shelving
17	Audio/Visual Storage	hollow metal	commercial/keyed	shelving
18	Table/Chair Storage	hollow metal	---	---
19	Physical Fitness	hollow metal	---	
20	Controlled Waste Handling Facility	hollow metal	commercial/keyed	shelving
21	Unit Administration	hollow metal	commercial/keyed	---
22	Unit Storage (Heated)	hollow metal	commercial/keyed	shelving cabinets & countertops
23	Locker Rooms	hollow metal	---	---
24	Maintenance Training Workbays	hollow metal	---	shelving & cabinets
25	Supervisor's Office	hollow metal	commercial/keyed	---
26	Inspection and Library	hollow metal	commercial/keyed	shelving & cabinets
27	Tool Room	hollow metal	commercial/keyed	shelving & cabinets
28	Supply Room	hollow metal	commercial/keyed	shelving & cabinets
29	Vault	Special	Series 86	---
30	SIPRNET Room	hollow metal	FF-L-2740A	shelving & cabinets

**Table 3. Mechanical Requirements – Part 1**

	FUNCTIONAL AREA	H/O	H/U	C/O	C/U	OA VENTILATION	NCB
1	Assembly Hall	68	55	78	85	10 cfm/person	<45
2	Classrooms	68	55	78	85	10 cfm/person	<35
3	Library/Classroom	68	55	78	85	10 cfm/person	<35
4	Learning Center	68	55	78	85	10 cfm/person	<35
5	Distance Learning Center	68	55	78	85	10 cfm/person	<35
6	Indoor Firing Range	68	55	-	-	Ref: ACGIH Manual	
7	Training Device/Simulation	68	55	78	85	10 cfm/person	<35
8	Training Aid Storage	68	55	78	85	0.25 cfm/ft <sup>2</sup>	-
9	Kitchen	68	55	78	85	1.0 cfm/ft <sup>2</sup> , w/Hoods Ref: ACGIH Manual	45
10	Break Room	68	55	78	85	10 cfm/person	<40
11	Vending Area	68	55	78	85	10 cfm/person	<40
12	Toilets/Shower	68	55	78	85	50 cfm/WC & UR or 1.0 cfm/ft <sup>2</sup>	<45
13	Flammable Materials Storage	55	55	-	-	3.0 AC/hr	
14	Family Readiness Office	68	55	78	85	10 cfm/person	<35
15	RAPIDS Office	68	55	78	85	10 cfm/person	<35
16	Recruiting/Retention Office	68	55	78	85	10 cfm/person	<35
17	Audio/Visual Storage	68	55	78	85	0.25 cfm/ft <sup>2</sup>	-
18	Table/Chair Storage	55	55	-	-	0.25 cfm/ft <sup>2</sup>	-
19	Physical Fitness	68	55	78	85	20 cfm/person	<45
20	Controlled Waste Handling Facility	45	-	-	-	3.0 AC/hr	-
21	Unit Administration	68	55	78	85	10 cfm/person	<35
22	Unit Storage (Heated)	55	55	-	-	3.0 AC/hr	
23	Locker Rooms	68	55	78	85	0.5 cfm/ft <sup>2</sup>	<45
24	Maintenance Training Workbays	60	55	-	-	1.5 cfm/ft <sup>2</sup> VEH EXH System	<45
25	Supervisor's Office	68	55	78	85	10 cfm/person	<35
26	Inspection and Library	68	55	78	85	10 cfm/person	<35
27	Tool Room	55	55	-	-	3.0 AC/hr	<45
28	Supply Room	68	55	78	85	1.0 AC/hr	<45
29	Vault	55	-	78	-	0.25 cfm/ft <sup>2</sup>	-
30	SIPRNET Room	68	55	78	85	10 cfm/person	35

**TABLE 3 – ABBREVIATIONS**

AC/hr	air changes per hour
cfm	cubic feet per minute
C/O	Cooling Occupied
C/U	Cooling Unoccupied
H/O	Heating Occupied
H/U	Heating Unoccupied
NCB	Noise Coefficient Balanced (Reference ANSI Standard S12.2)
OA	outside air
UR	urinal
WC	water closet

**TABLE 3. – NOTES**

1. Outside Air Ventilation rates are based on ANSI/ASHRAE Standard 62.1-2007 where the supply and return air distribution devices are ceiling mounted. If the distribution devices are located in the occupied zone reduce the air quantity by 50%. Regardless of where the air distribution devices are located the outside air quantity must be at least 15% of the total air circulated within the HVAC controlled spaces.
2. Exhaust Systems for special work processes that require an exhaust hood to capture particles being transported by the air stream must be designed in accordance with the American Conference of Governmental Industrial Hygienists (ACGIH) Industrial Ventilation Manual and ASHRAE Handbooks of Fundamentals and HVAC Applications.
3. Assembly Hall HVAC System: This space requires a Central Station AHU with an 85% efficiency filter bank based on ASHRAE Standard 52.1-1992 Atmospheric Dust-Spot Efficiency rating to provide continuous HVAC system control for a year-around operation. Recommend a carbon Dioxide (CO<sub>2</sub>) system be installed to increase the outside air volume if the CO<sub>2</sub> levels exceed 530 ppm above the outside air levels.

**Table 4. Mechanical Requirements – Part 2**

	<b>FUNCTIONAL AREA</b>	<b>PIPED SERVICE</b>	<b>PLUMBING</b>	<b>OTHER</b>
1	Assembly Hall	CW/HW/ CA	EDF/HB/EW/FD	
2	Classrooms			
3	Library/Classroom			
4	Learning Center			
5	Distance Learning Center			
6	Indoor Firing Range	CW/CWT	EDF/EW/FD	
7	Training Device/Simulation Center			REF:NOTE 1
8	Training Aid Storage			
9	Kitchen	DG 415-5	DG 415-5	
10	Break Room	CW/HW	SK/EDF	
11	Vending Area	FD/CW	FD	
12	Toilets/Shower			Baby Changing Stations
13	Flammable Materials Storage			
14	Family Readiness Office			
15	RAPIDS Office			
16	Recruiting/Retention Office			
17	Audio/Visual Storage			
18	Table/Chair Storage			
19	Physical Fitness Area	CW/FD	EDF	
20	Controlled Waste Handling Facility	CW		
21	Unit Administration			
22	Unit Storage (Heated)	HW/CW	SK	
23	Locker Rooms			
24	Maintenance Training Workbays	CA/HW/ CWT	ES/SK/EDFHB/TD	VEH EXH/OWS 7.5 Ton Crane
25	Supervisor's Office			
26	Inspection and Library			
27	Tool Room			
28	Supply Room			
29	Vault			Dehumidifier
30	SIPRNET Room			

**TABLE 4 – ABBREVIATIONS**

CA	compressed air
CW	cold water
CWT	Cold Water Tempered (ES/EW)
EDF	Electric Drinking Fountain
ES	emergency shower
EW	eyewash station
FD	floor drain
HB	hose bibb
HW	hot water
OWS	Oil/Water Separator
SK	sink
TD	Trench Drain
VEH EXH	Vehicle Exhaust System

NOTE 1: Training Device/Simulation Center: Utilities for this area may vary depending on equipment provided designer must have vender data prior to design activity.

**Table 5. Electrical Requirements**

	<b>FUNCTIONAL AREA</b>	<b>LIGHTING</b>	<b>OUTLETS</b>	<b>NOTES</b>
<b>1</b>	Assembly Hall	50 FC	1 duplex per 10 LF of wall	
<b>2</b>	Classrooms	70 FC	1 duplex per 10 LF of wall	
<b>3</b>	Library/Classroom	70 FC	1 duplex per 10 LF of wall	
<b>4</b>	Learning Center	70 FC	1 duplex per workstation	3
<b>5</b>	Distance Learning Center	70 FC	1 duplex per workstation	3
<b>6</b>	Indoor Firing Range	-	2 duplex	1
<b>7</b>	Training Device/Simulation Center	50 FC	REF: Vender Data	2
<b>8</b>	Training Aid Storage	20 FC	1 duplex per 20 LF of wall	
<b>9</b>	Kitchen	50 FC	minimum of 1 duplex per 10 LF of wall	
<b>10</b>	Break Room	50 FC	1 duplex per 10 LF of wall	
<b>11</b>	Vending Area	30 FC	1 duplex per 10 LF of wall	2
<b>12</b>	Toilets/Shower	30 FC	1 duplex GFCI per 2 sinks	
<b>13</b>	Flammable Materials Storage	30 FC	1 duplex XP	
<b>14</b>	Family Readiness Office	50 FC	1 duplex per wall	
<b>15</b>	RAPIDS Office	50 FC	1 duplex per wall	
<b>16</b>	Recruiting/Retention	50 FC	1 duplex per wall	
<b>17</b>	Audio/Visual Storage	35 FC	1 duplex per 20 LF of wall	
<b>18</b>	Table/Chair Storage	20 FC	1 duplex per 20 LF of wall	
<b>19</b>	Physical Fitness	50 FC	2 duplex per 8 LF of wall	2
<b>20</b>	Controlled Waste Handling Facility	30 FC	1 duplex per 20 LF of wall	
<b>21</b>	Unit Administration	50 FC	2 duplex per 50 ft <sup>2</sup>	
<b>22</b>	Unit Storage (Heated)	30 FC	1 duplex per 20 LF of wall	
<b>23</b>	Locker Room Space	30 FC	1 duplex GFCI	
<b>24</b>	Maintenance Training Workbays	50 FC	1 duplex per 10 LF of wall	2
<b>25</b>	Supervisor's Office	50 FC	1 duplex per wall	
<b>26</b>	Inspection and Library	50 FC	1 duplex per 10 LF of wall	
<b>27</b>	Tool Room	30 FC	1 duplex per 20 LF of wall	
<b>28</b>	Supply Room	30 FC	1 duplex per 20 LF of wall	
<b>29</b>	Vault	30 FC	1 duplex	
<b>30</b>	SIPRNET Room	50 FC	1 duplex per wall	2

**TABLE 5 – ABBREVIATIONS**

FC	foot-candles
GFCI	ground fault circuit interrupter
LF	linear feet
XP	explosion proof

**TABLE 5 – NOTES**

All Electrical Power Systems/Service outlets in spaces must be designed and constructed in accordance with NFPA 70, National Electrical Code to accommodate the actual equipment layout. All Classified areas must be explosion proof construction to include lighting and power.

Lighting Systems must be designed in accordance with IESNA Lighting Handbook. The Lighting Power Densities in Watts/ST input must be in accordance with ANSI/ASHRAE/IESNA Standard 90.1-2004, Energy Standard for Buildings Except Low-Rise Residential Buildings. General Administrative and support areas lighting fixtures should be T-8 fluorescent lamps and high efficiency electronic ballasts to achieve a 0.85 Watts/SF lighting power density.

1. INDOOR FIRING RANGE LIGHTING FC REQUIREMENTS:  
General lighting Behind Shooter 50 FC; Task Lighting @ Firing Line 60 FC; Direct/Indirect Lighting onTargets 100 FC.
2. Additional power for programmed equipment should be provided.
3. Multi-level switching or dimming should be provided.

**Table 6. Special Equipment and Ceiling Height**

	<b>FUNCTIONAL AREA</b>	<b>SPECIAL EQUIPMENT</b>	<b>CEILING HEIGHT<sup>* MAX</sup></b>
1	Assembly Hall		24 ft
2	Classrooms		10 ft
3	Library/Classroom		10 ft
4	Learning Center		10 ft
5	Distance Learning Center		10 ft
6	Indoor Firing Range		9 ft
7	Training Device/Simulation Center		14 ft; Ref: Vender requirements
8	Training Aid Storage		10 ft
9	Kitchen		10 ft
10	Break Room		10 ft
11	Vending Area		10 ft
12	Toilets/Shower		8 ft
13	Flammable Materials Storage		8 ft
14	Family Readiness Office		9 ft
15	RAPIDS Office		9 ft
16	Recruiting/Retention Office		9 ft
17	Audio/Visual Storage		10 ft
18	Table/Chair Storage		10 ft
19	Physical Fitness		10 ft
20	Controlled Waste Handling		8 ft
21	Unit Administration		9 ft
22	Unit Storage (Heated)		10 ft
23	Locker Rooms		9 ft
24	Maintenance Training Workbays		24 ft
25	Supervisor's Office		9 ft
26	Inspection and Library		9 ft
27	Tool Room		9 ft
28	Supply Room		9 ft
29	Vault		8 ft
30	SIPRNET Room	Secure Network	9 ft

**Or clearance to underside of structure.**

## APPENDIX D

### FIGURES

- Figure 1. Basic Site Components
- Figure 2. Basic Program Components
- Figure 3. Basic Program Functional Relationships
- Figure 4. Accommodation of Unit Deployment
- Figure 5. Accommodation of Community Functions
- Figure 6. Acoustic and Vibration Buffers
- Figure 7. Additional Units Expansion
- Figure 8. Assembly Hall and Adjacent Support Functions
- Figure 9. Food Service/Transfer of Equipment – Relationship With Assembly Hall
- Figure 10. Classrooms/Meeting Room Spaces
- Figure 11. Plan of Indoor Firing Range Components
- Figure 12. Range Detail Diagram
- Figure 13. Range Detail Diagram
- Figure 14. Range Detail Diagrams
- Figure 15. Vault and Unit Storage
- Figure 16. Maintenance Training Area

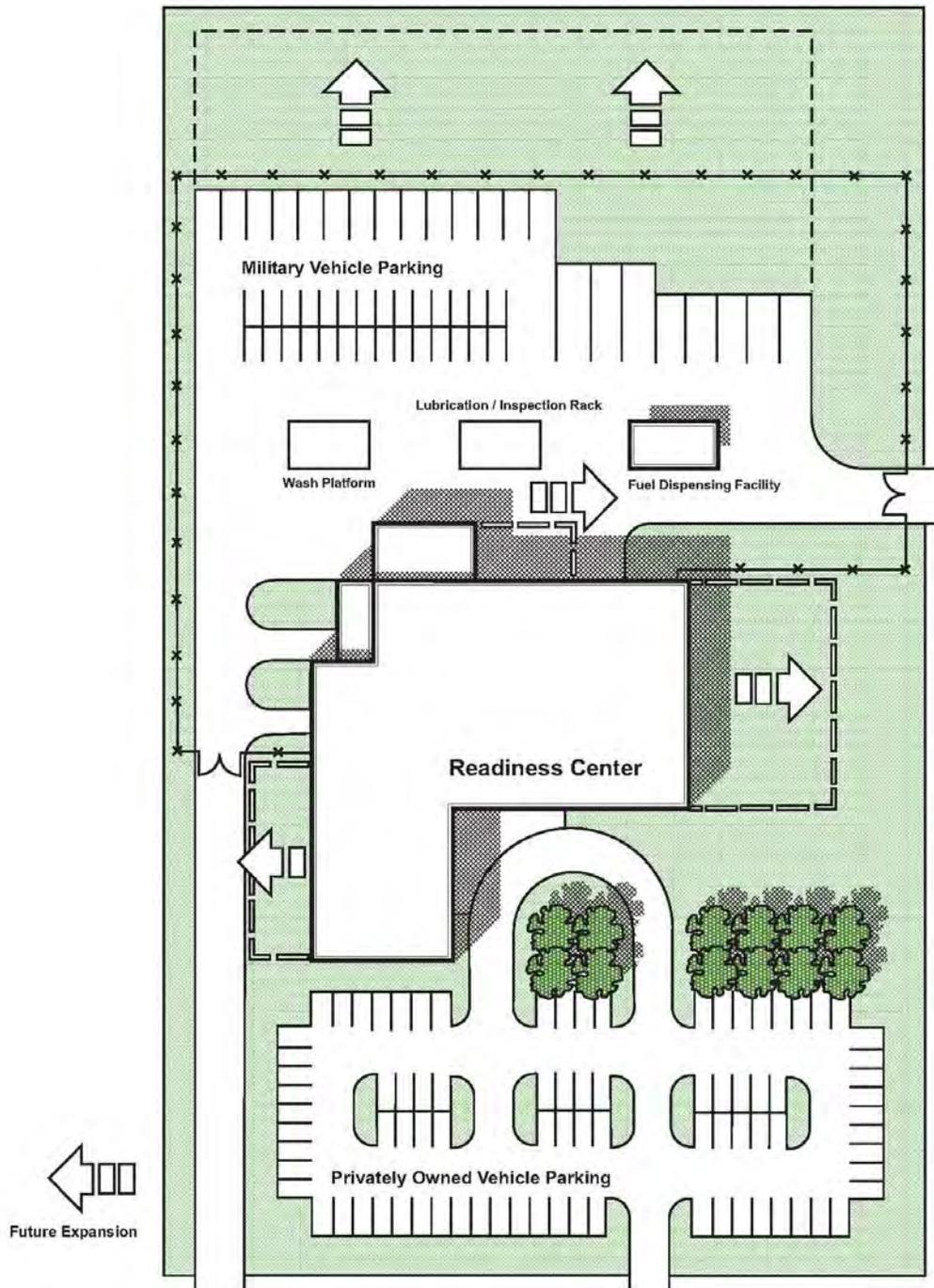


Figure 1. Basic Site Components

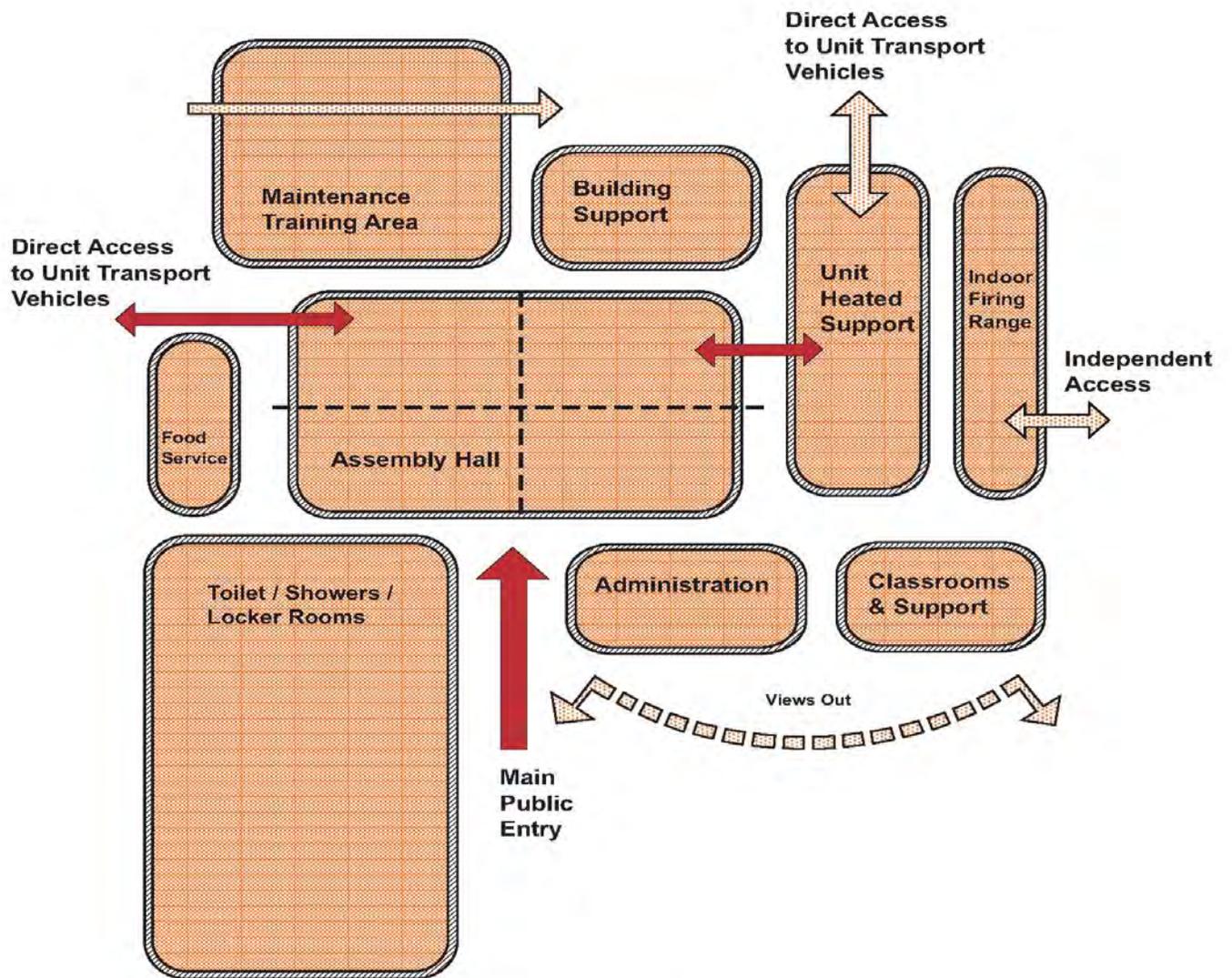


Figure 2. Basic Program Components

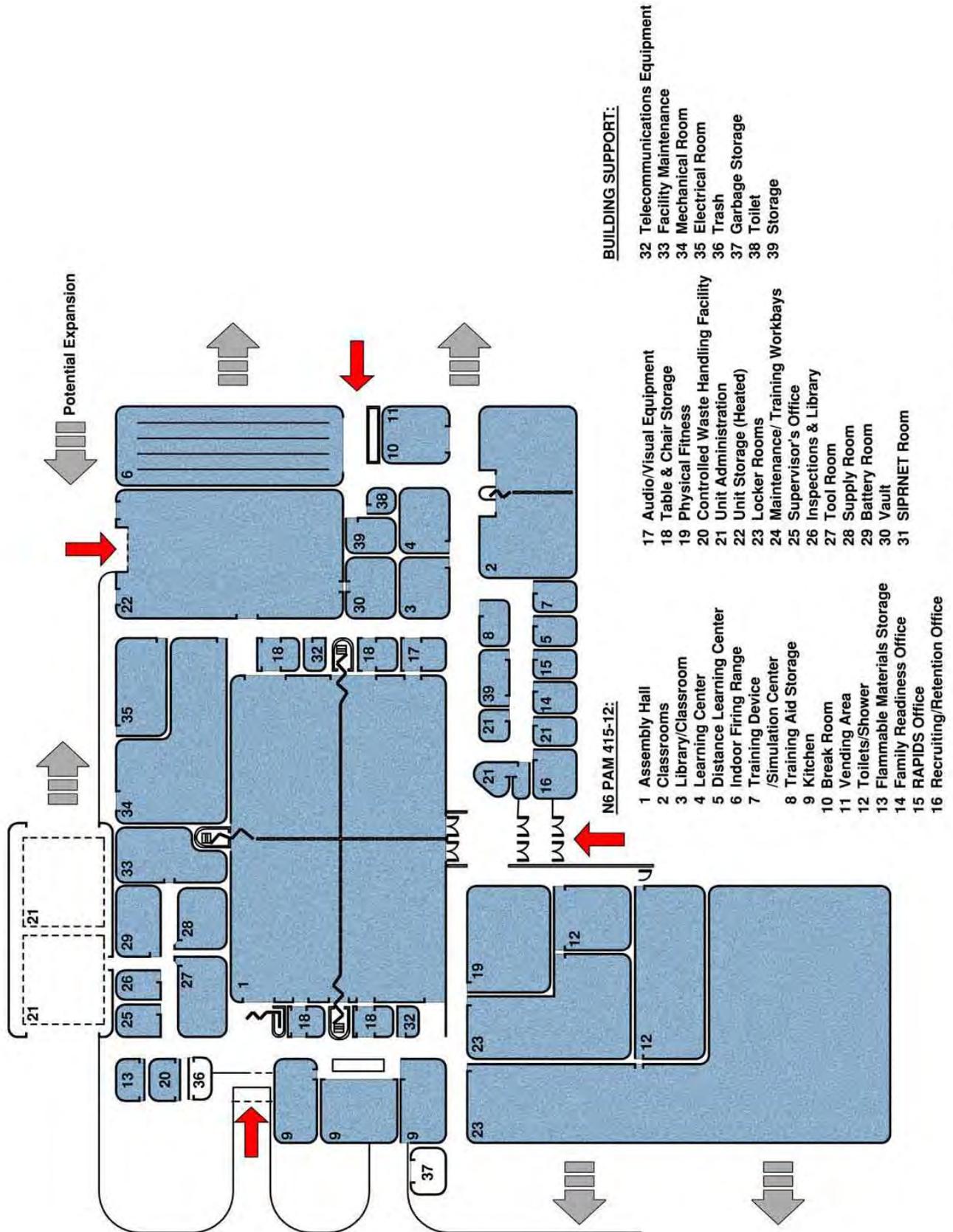


Figure 3. Basic Program Functional Relationships

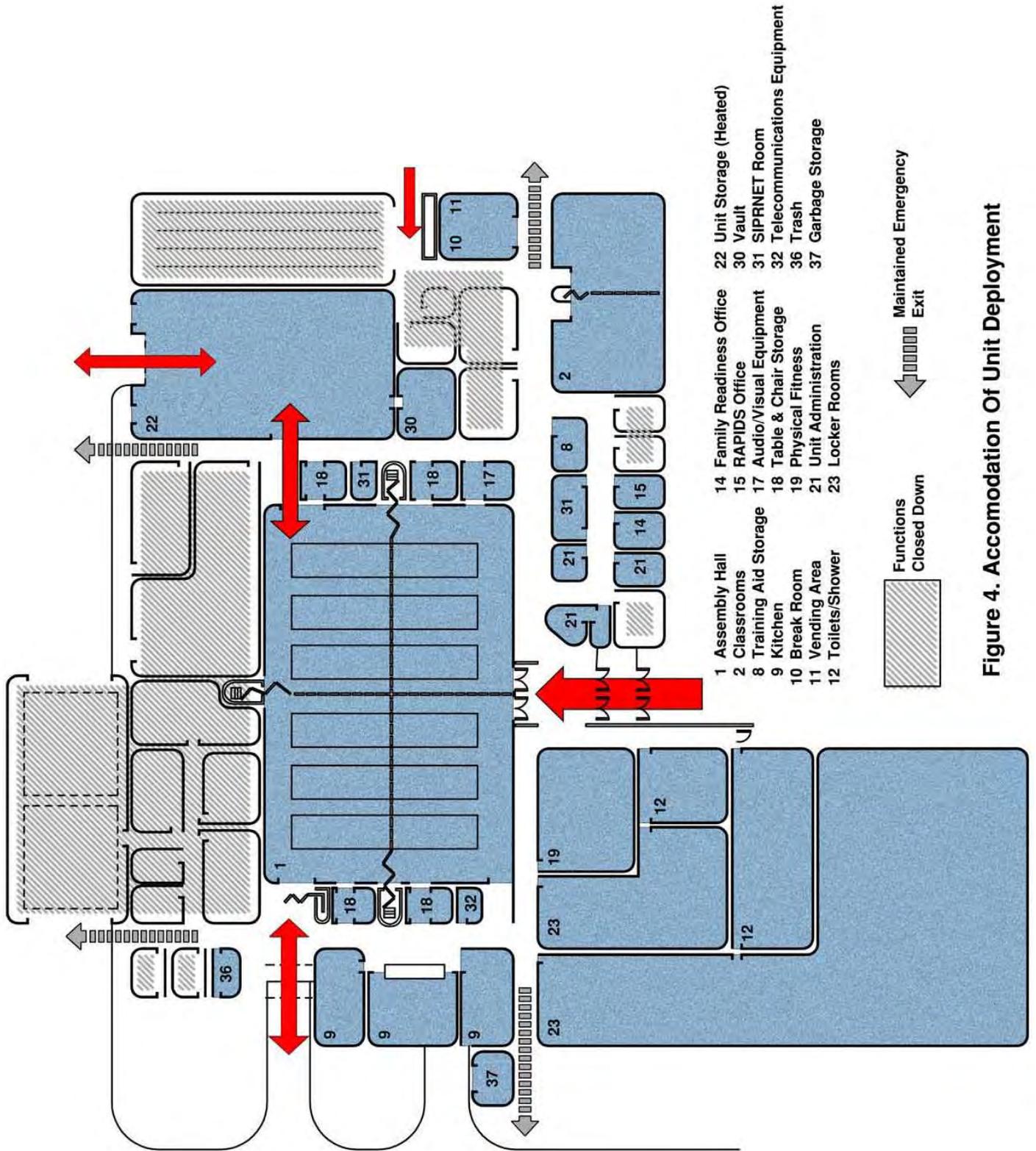


Figure 4. Accomodation Of Unit Deployment

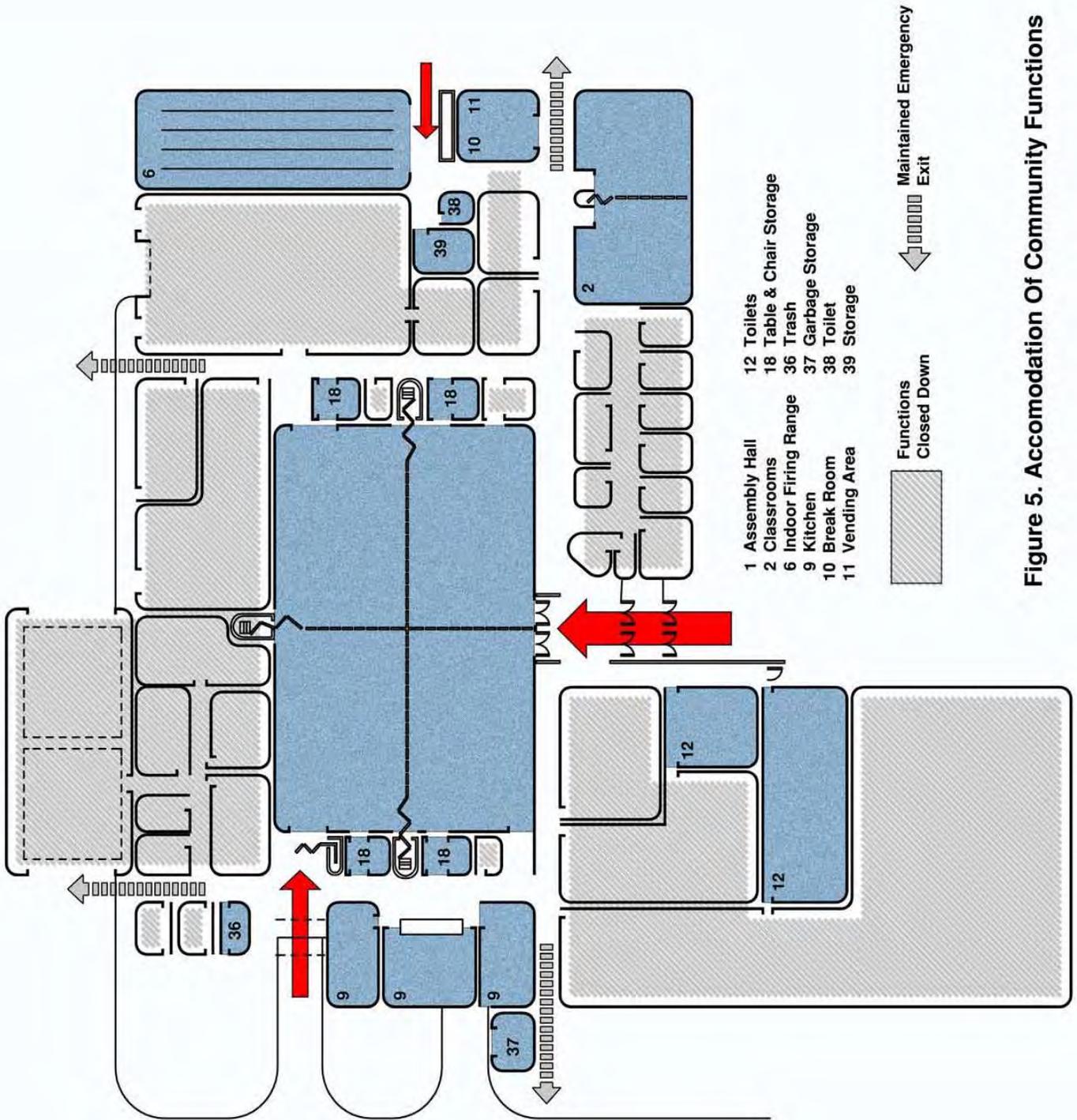


Figure 5. Accomodation Of Community Functions

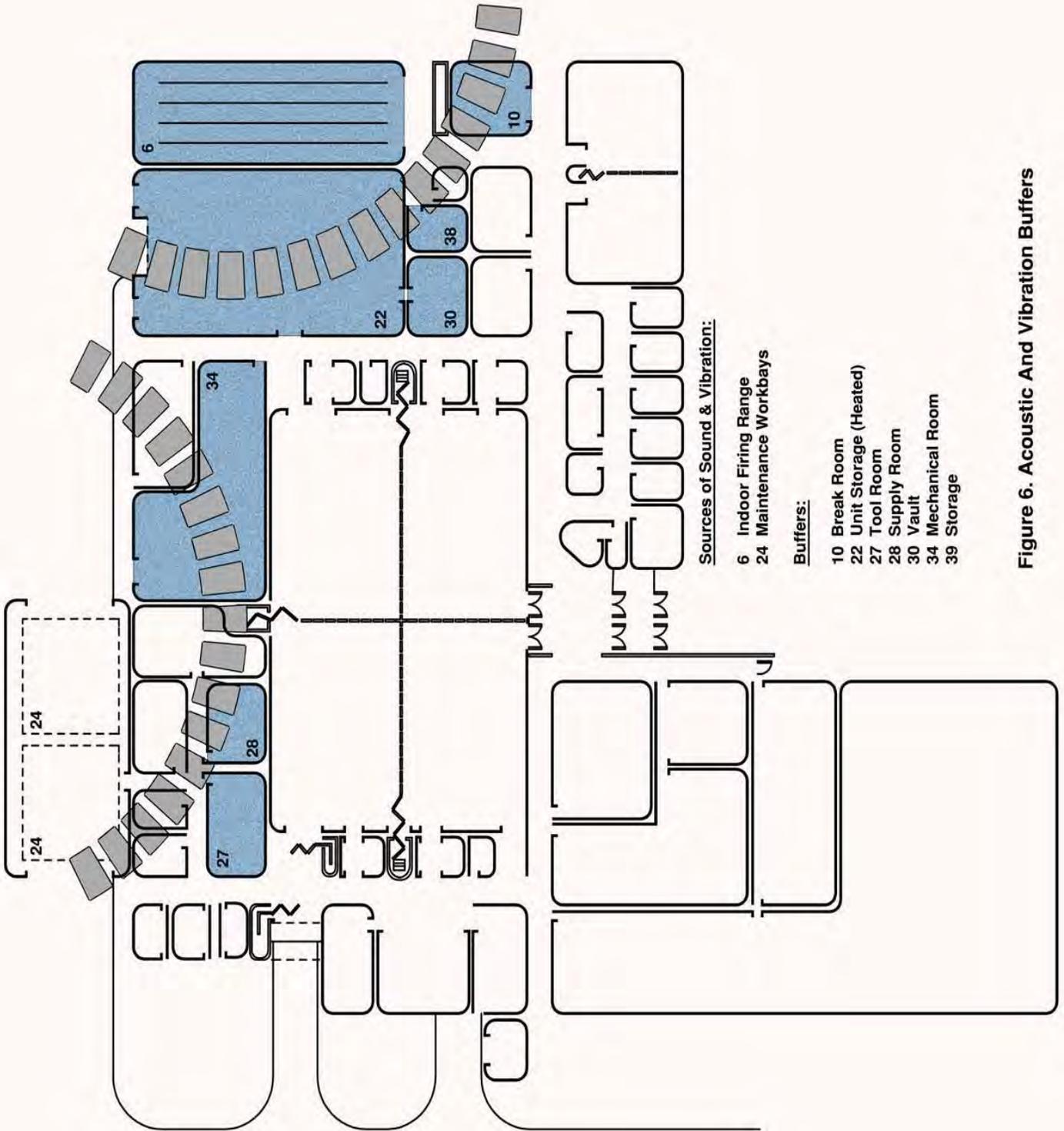


Figure 6. Acoustic And Vibration Buffers

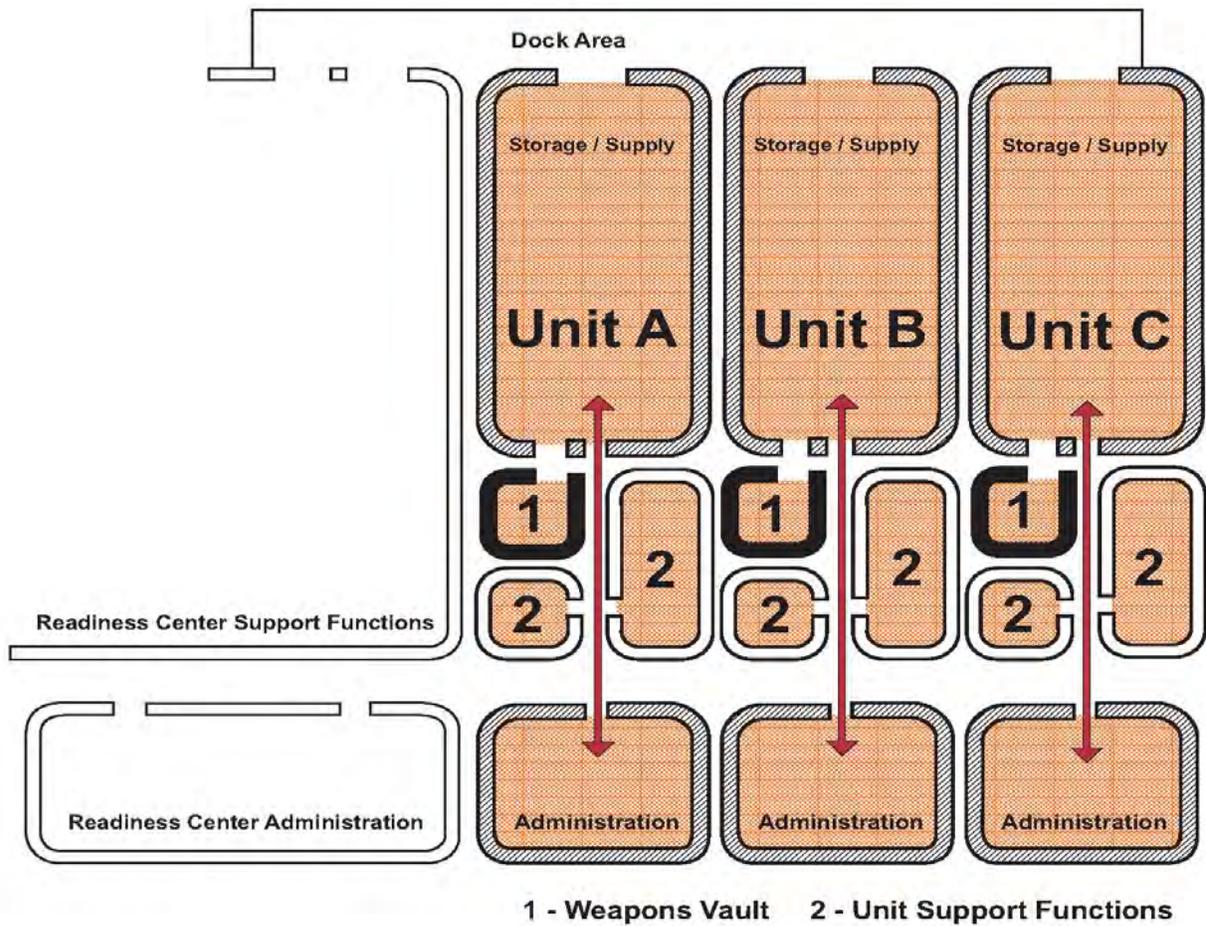


Figure 7. Additional Units Expansion

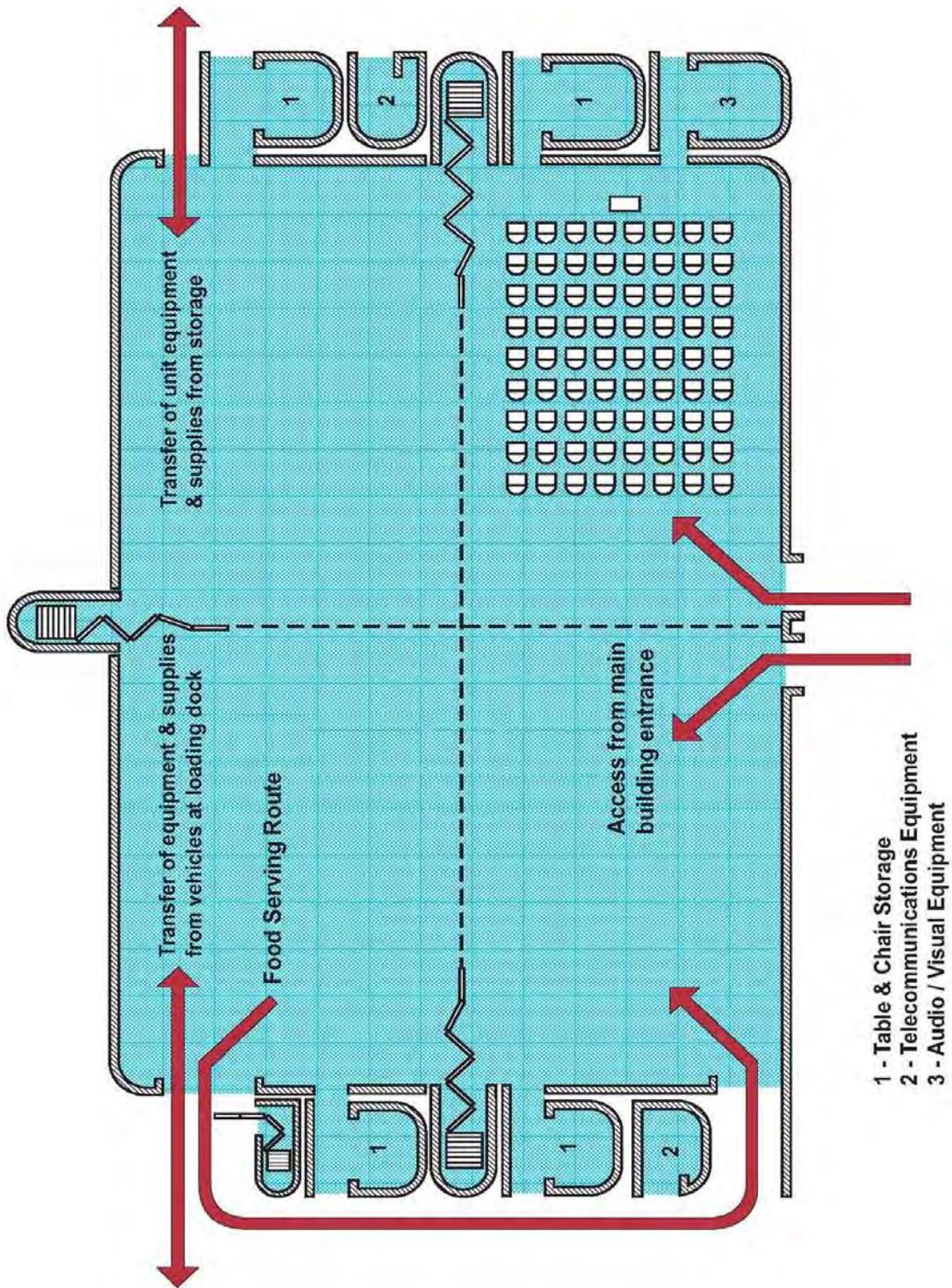
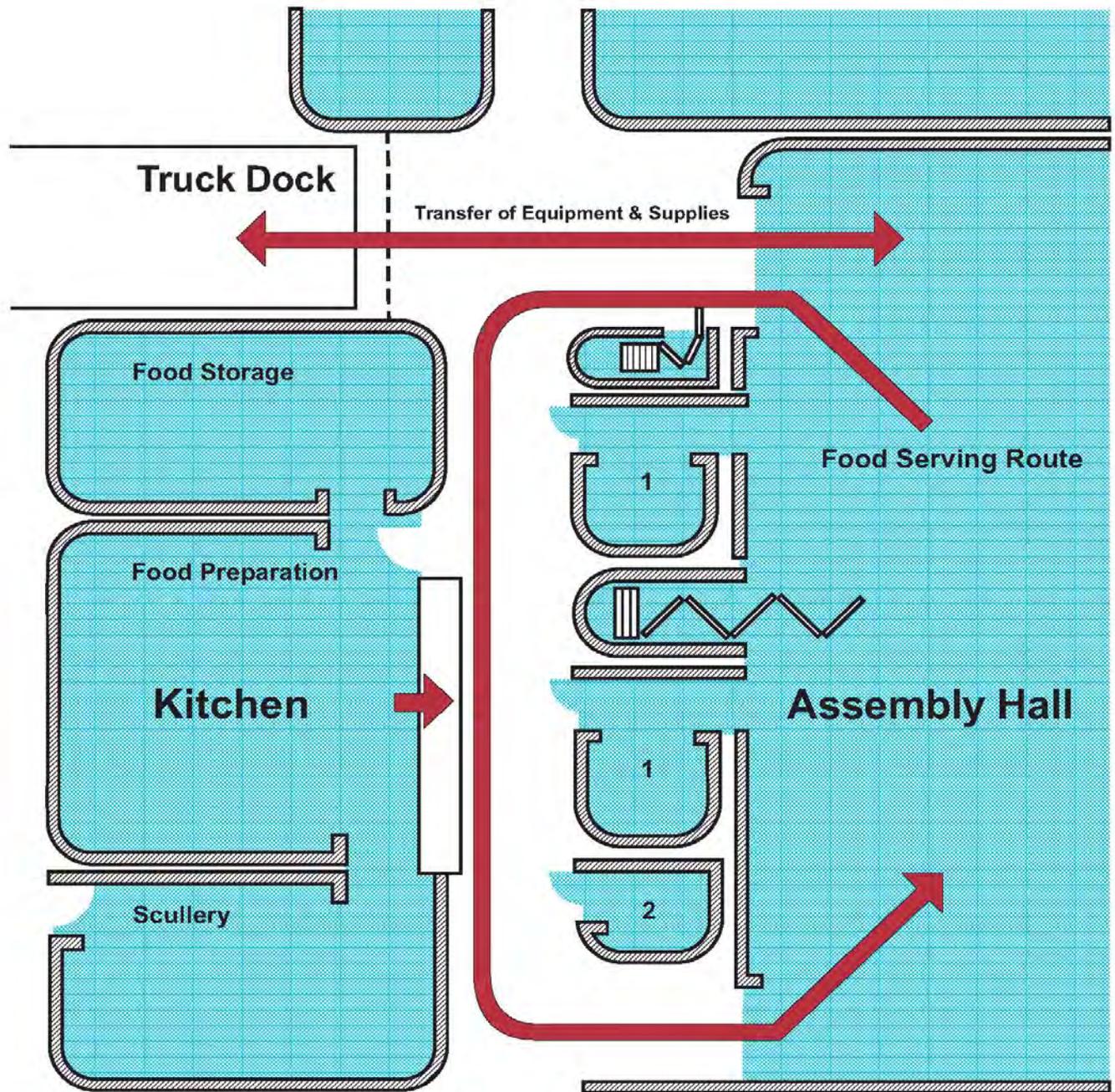


Figure 8. Assembly Hall and Adjacent Support Functions



1 - Table & Chair Storage 2 - Telecommunications Equipment

Figure 9. Food Service/Transfer of Equipment -  
Relationship with Assembly Halls

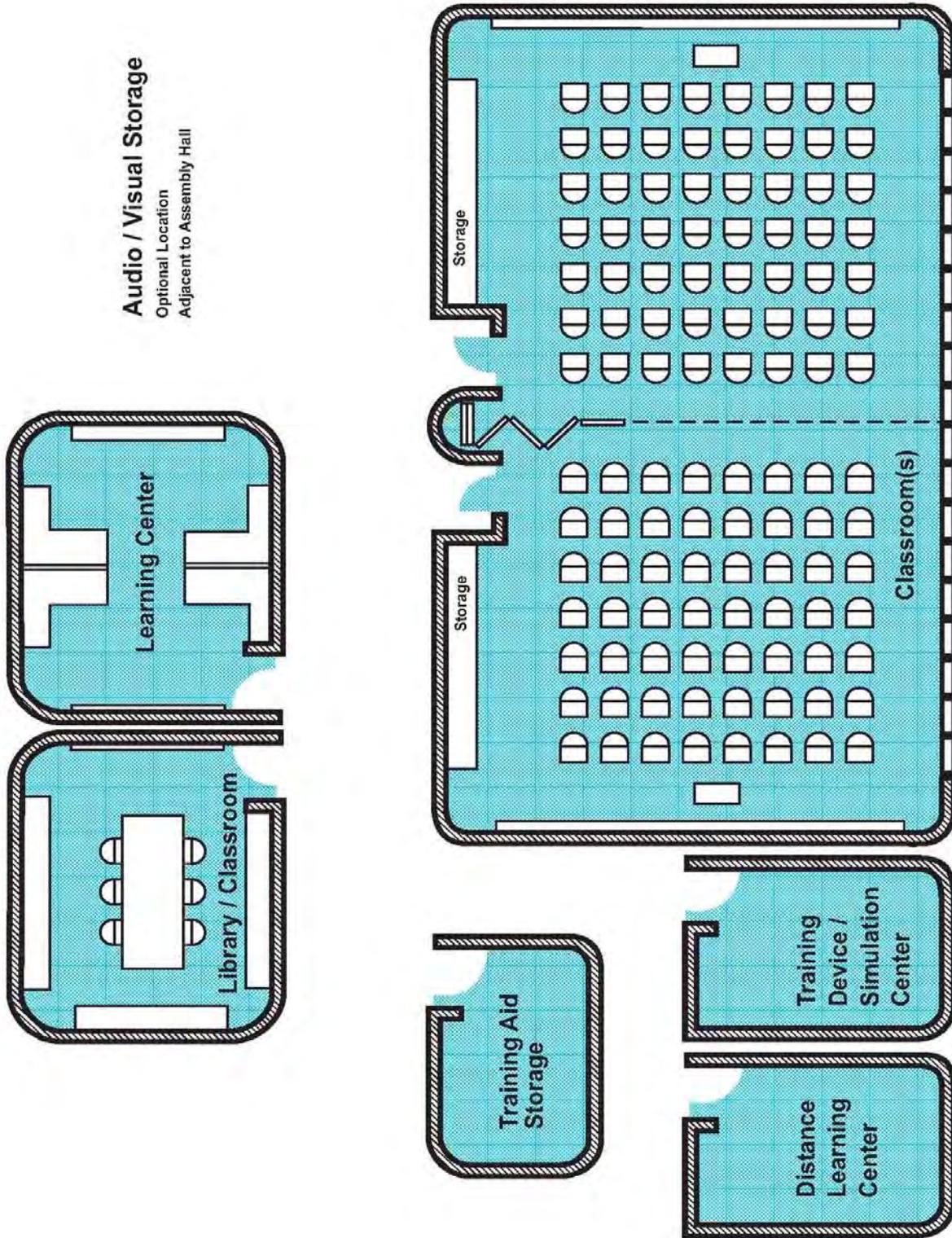


Figure 10. Classrooms/Meeting Rooms Spaces

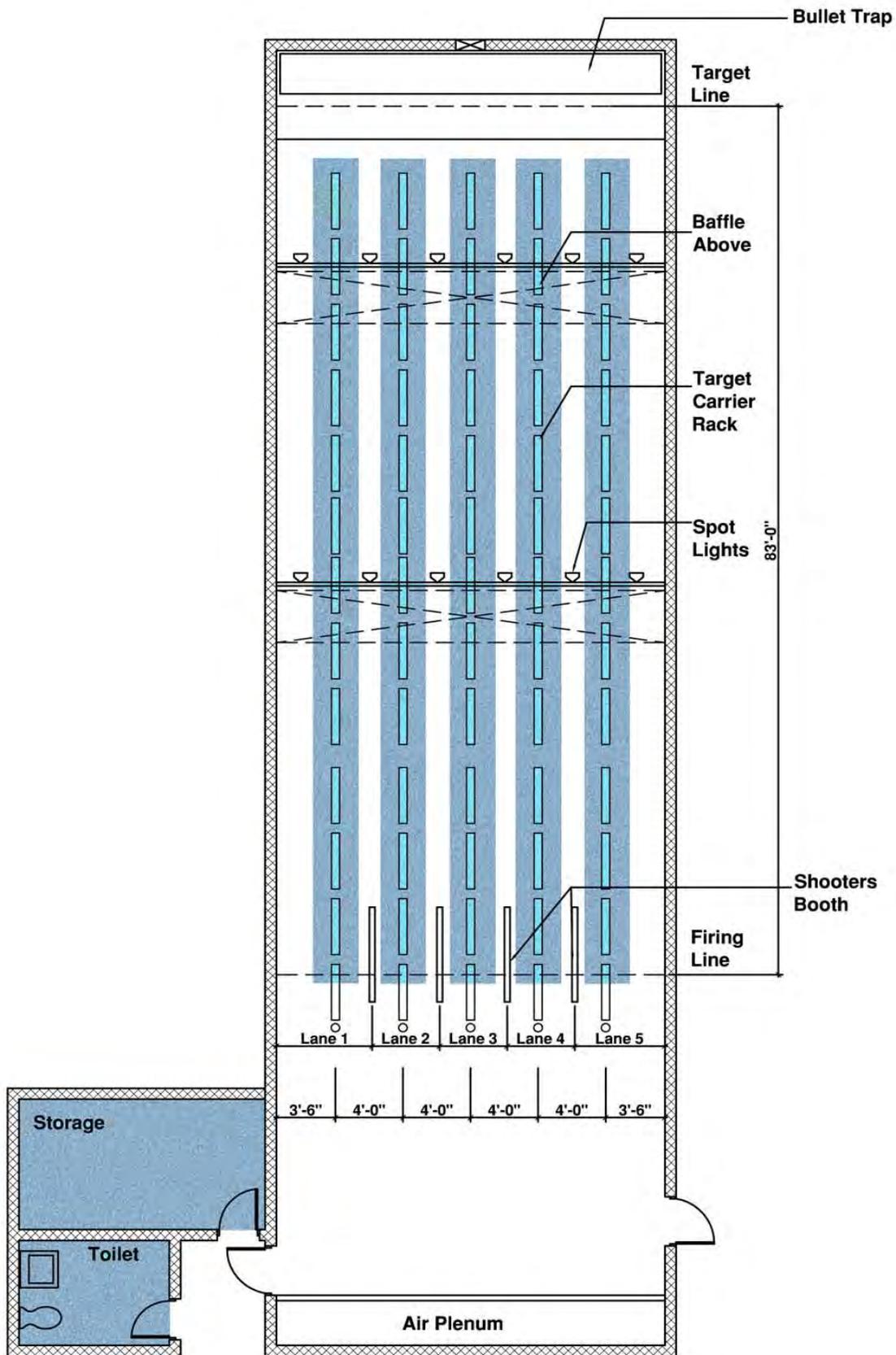


Figure 11. Plan of Indoor Firing Range Components

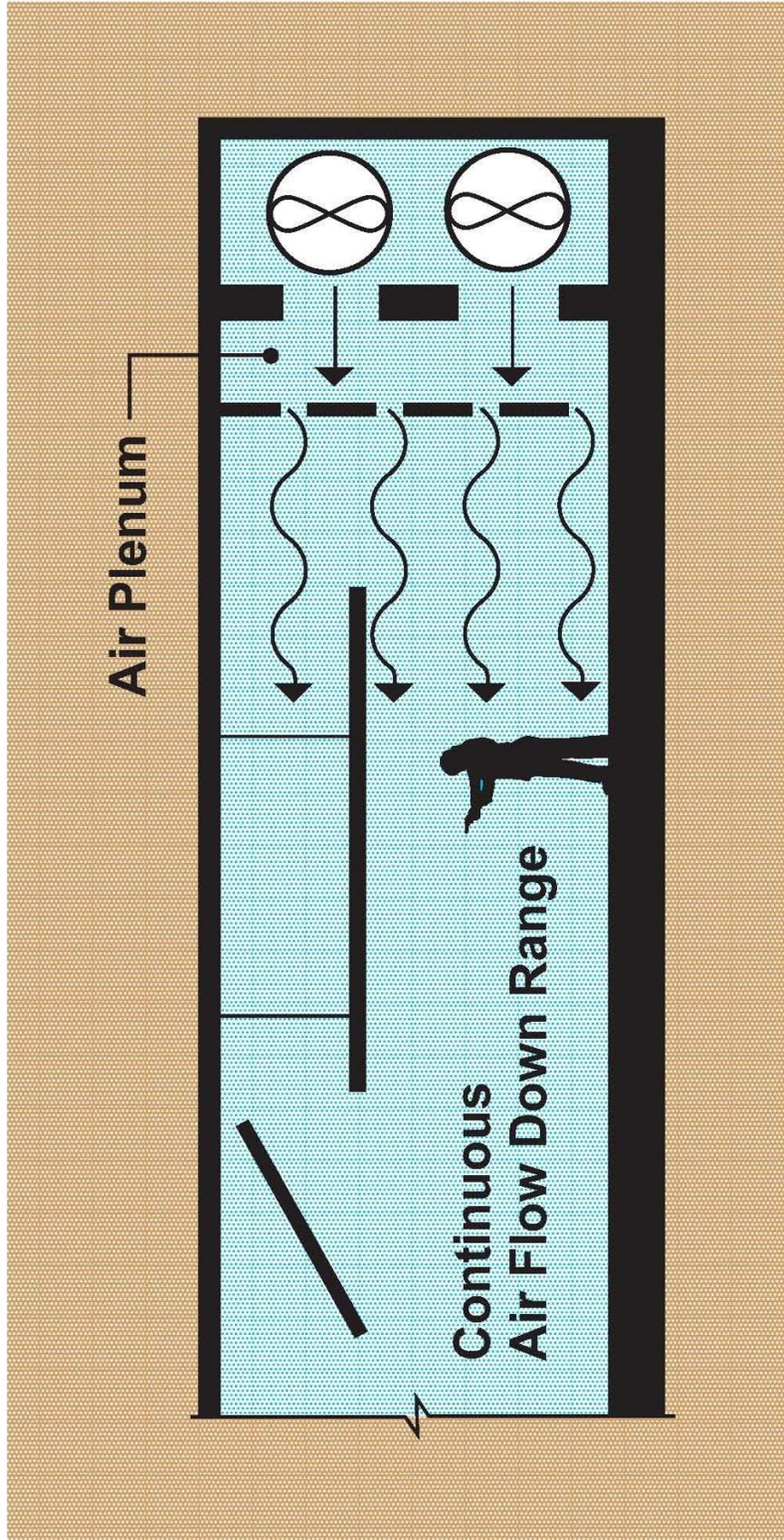


Figure 12. Range Detail Diagrams

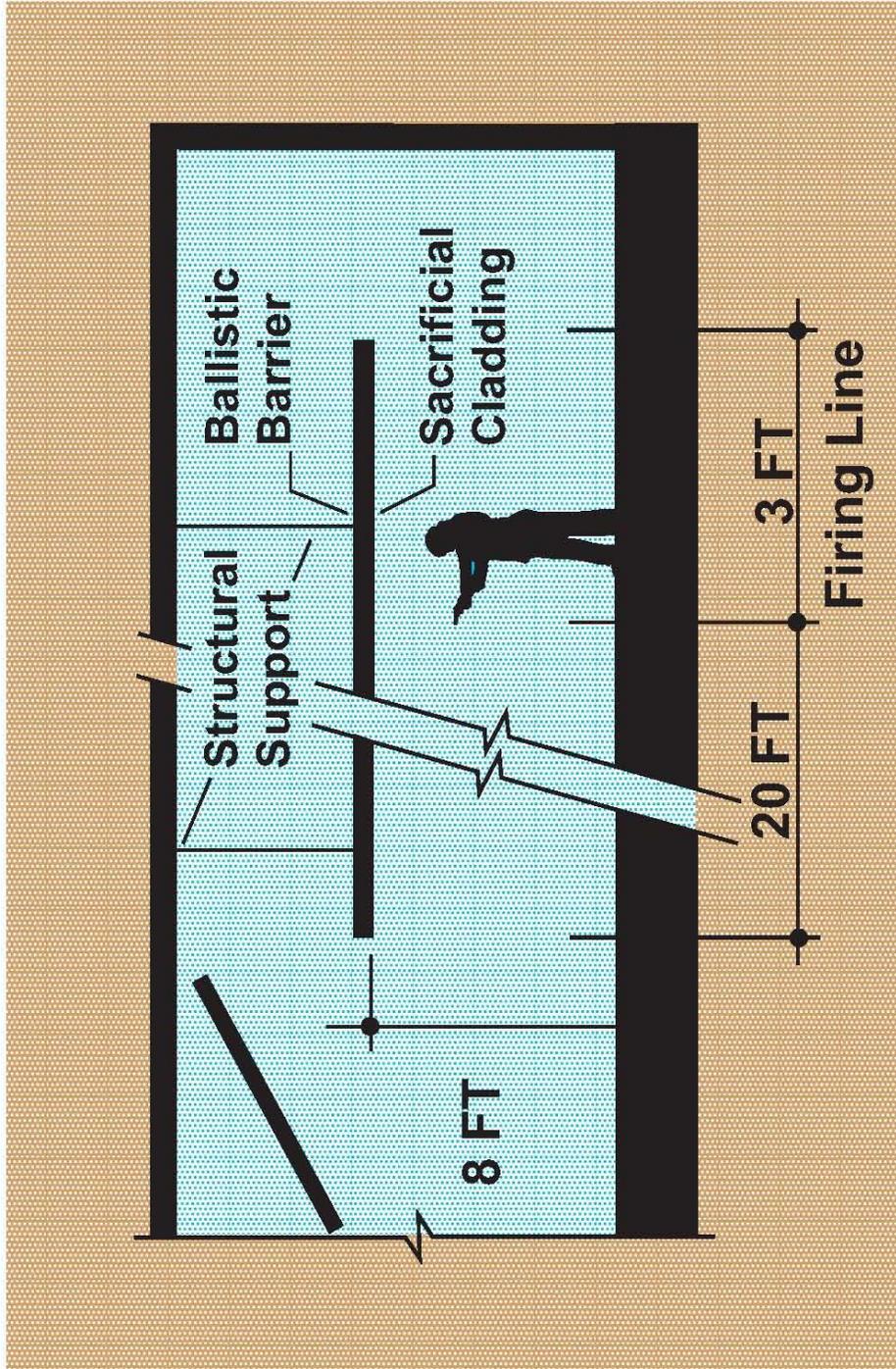


Figure 13. Range Detail Diagrams

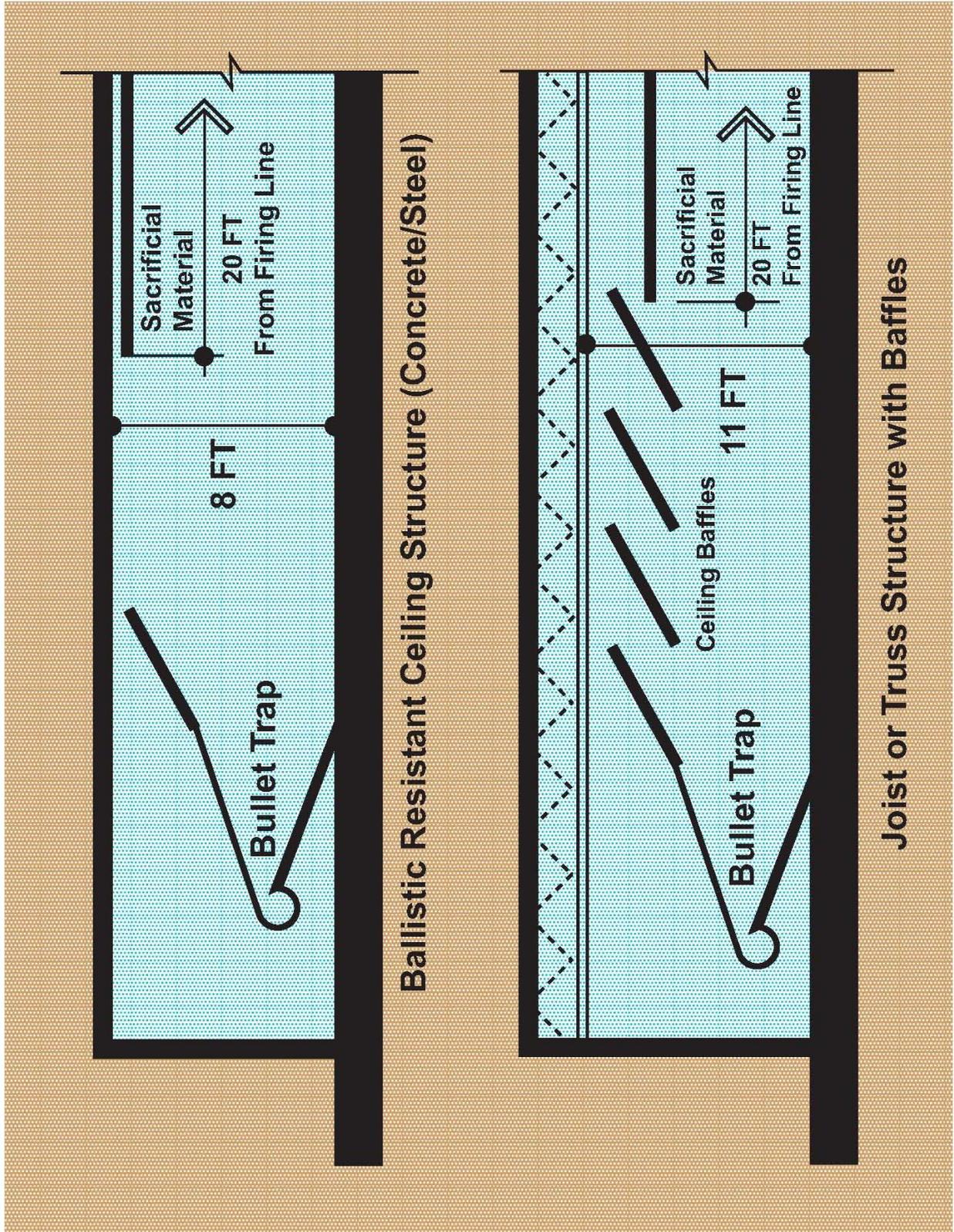


Figure 14. Range Detail Diagrams

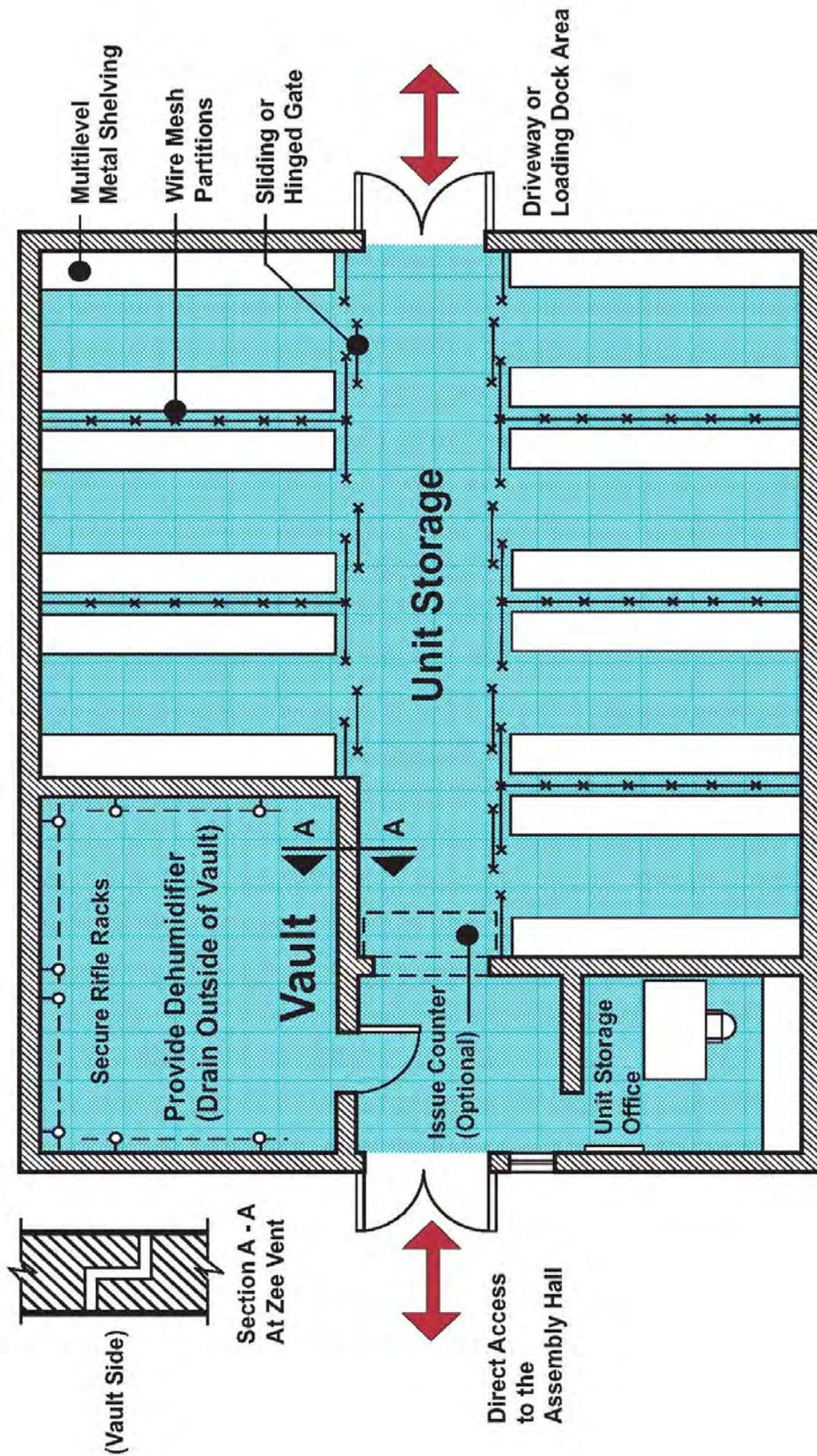
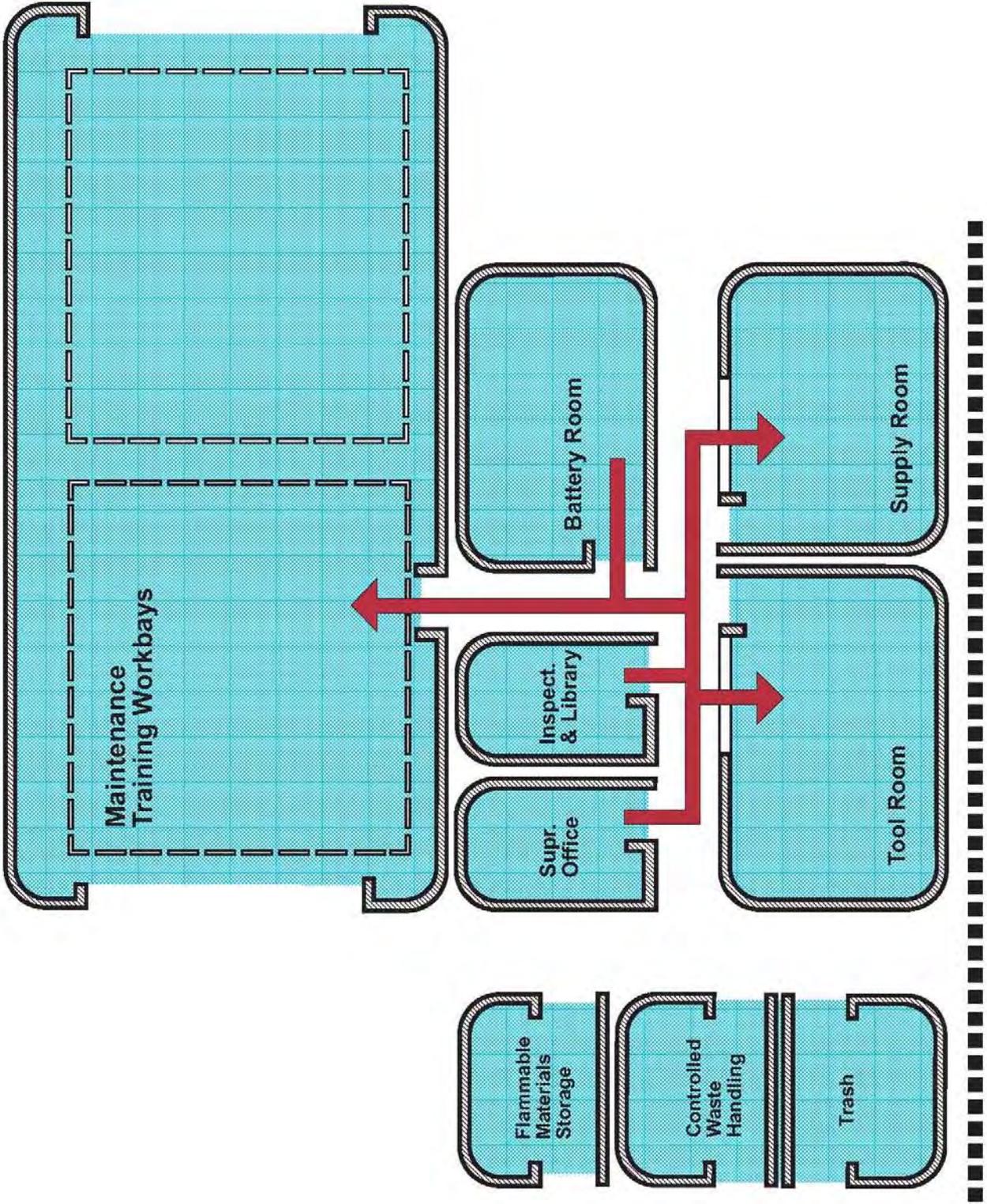


Figure 15. Vault and Unit Storage



Probable fire separation requirement

Figure 16. Maintenance Training Area

**I. Military Guide and References Materials**

B National Guard Bureau NG 415-12 Chapter 2 ARNG  
Facilities Allowances (25 Jan 2015)

**National Guard Pamphlet 415-12**

**Construction**

# **Army National Guard Facilities Allowances**

**National Guard Bureau  
Arlington, VA 22204  
25 January 2015**

**UNCLASSIFIED**

# ***SUMMARY of CHANGE***

NG Pam 415-12  
ARMY NATIONAL GUARD FACILITIES ALLOWANCES

o This revision, dated 25 January 2015 has been extensively revised and must be reviewed entirely.

Construction

ARMY NATIONAL GUARD FACILITIES ALLOWANCES

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By Order of the Secretary of the Army:

JUDD H. LYONS  
Major General, GS  
Acting Director, Army National Guard

Official:   
Charles P. Baldwin  
Deputy Chief of Staff

---

**History.** All Common Supporting Items have been included in Chapter 1. This revision also includes technical corrections to the 1 June 2011 version which is hereby superseded.

**Summary.** This pamphlet establishes allowances and provides guidance to the States for building space and supporting items used for programming the construction of Army National Guard facilities.

**Applicability.** These standards apply to all federally funded Army National Guard construction.

**Proponent and exception authority.** The proponent of this pamphlet is the Chief of Installations, National Guard Bureau, Army Installations Division (ARNG-ILI). Exceptions to criteria will be reviewed by the ARNG staff proponents for recommendations of concurrence or non-concurrence. The Chief of Installations has the sole authority to approve exceptions to the criteria presented in this document that are consistent with applicable laws and regulations. This authority may not be delegated.

**Management Control Process.** The proponent of this pamphlet is the ARNG-ILI. Exceptions to criteria will be reviewed by the ARNG staff proponents for recommendations of concurrence or non-concurrence. The Chief of Installations has the sole authority to approve exceptions to the criteria presented in this document that are consistent with applicable laws and regulations. This authority may not be delegated.

**Supplementation.** Supplementation of this regulation requires the approval of the Army National Guard, Installations Division, ARNG-ILI, 111 South George Mason Drive, Arlington, VA 22204.

**Suggested Improvements.** Users of this pamphlet are invited to send comments and suggested improvements on DA Form 2028 (Recommended Changes to Publications and Blank Forms) to the National Guard Bureau, Army Installations Division, ARNG-ILI, 111 South George Mason Drive, Arlington, VA 22204.

**Distribution.** B.

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\* This pamphlet supersedes NG Pam 415-12, 1 June 2011.

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## Chapter 1

### General

#### 1-1. Purpose

This pamphlet identifies the allowable space criteria for facilities supported by Federal contributions to the State, either totally or in part. It gives information on general construction standards, materials, space allowances, building circulation, and other requirements directly related to programming military construction projects. As such, it is the major reference document required for preparing DD Forms 1390/1391.

#### 1-2. References

Required and related publications are listed in Appendix A.

#### 1-3. Explanation of Abbreviations and Terms

Abbreviations and special terms used in this pamphlet are explained in the glossary.

#### 1-4. Applicability

The formats, processes and tables of this pamphlet are designed to cover most circumstances commonly met during preparation of military construction programming documents. However, unusual project circumstances may dictate that the State justify and request an exception to criteria (ETC). Exceptions to criteria are recommended by ARNG proponent and approved by ARNG-ILI.

#### 1-5. Common Standards

States shall incorporate into programming documents the construction standards identified in special DoD publications, such as Unified Facility Criteria (UFC) for antiterrorism/force protection, and all environmental protection and safety measures required by Federal, State, and local codes and regulations.

#### 1-6. General Construction of Buildings

- a. Buildings shall be constructed of materials rated as non-combustible. The exterior walls may be brick with concrete masonry unit backup or other suitable systems. In certain instances pre-fabricated metal buildings may be used where allowed by codes and it is economically feasible. In those cases, exterior walls may be veneered with brick when co-located with a readiness center or when justified by environmental and aesthetic considerations of the surrounding facilities and communities.
- b. Roof systems, either of low slope or hip/gable type construction, normally consist of lightweight joists, non-combustible decking, and insulation above the decking. If the roof is a low slope type, the final layer shall be built-up bituminous material, a single ply membrane, or standing seam metal. However, if the roof is hip or gable type construction, it shall be a standing seam metal roof, or covered with asphalt, or fiberglass shingles.
- c. Walls and partitions may be drywall, CMU block, or other economically suitable material that will provide a durable structure.
- d. Floors are normally constructed with concrete.
- e. Design shall incorporate the use of space saving, energy-saving, alternative energy options (i.e., Geothermal, Radiant Heat, Solar Electric), as well as other sustainable design features wherever justified by Life-Cycle Cost Analysis (LCCA). ARNG MILCON projects are required to achieve, at a minimum, a certification of silver based on the latest edition of US Green Building Council's Leadership in Energy and Environmental Design (LEED) standards and the Sustainable Design and Development Policy Update 13 December 2014.
- f. Mechanical ventilation shall be provided for administrative, surface equipment maintenance, aviation maintenance, billeting, latrine, dining, and training facilities in accordance with UFC 1-200-02.
- g. Air conditioning requirements for comfort cooling will be evaluated and approved by the Adjutant General based on local conditions. The Adjutant General's justification (based on Unified Facilities Criteria (UFC) 3-400-02, Design: Engineering Weather Data) shall be enclosed with the DD Forms 1390/1391. As a general rule, and for planning and programming purposes, the tonnage of air conditioning required to cool an authorized space may be estimated by dividing the total floor area (in square feet) of the space by 300.
- h. Sustainability/Energy Measures. Sustainable design and construction features mandated since September 2011 are authorized for the primary facility. For programming purposes, enter a separate line on the DD Form 1391 and compute the requirement at 2% of the cost of the primary facility.
- i. Emergency power generator pad and house connection/hook-up:

(1) National Guard Readiness centers, aviation maintenance facilities, and USPFO administrative offices (as per AR 420-1 (4-67)) are authorized stand-by power generator sets and pertinent functional components, such as an automatic transfer switch, fuel storage tank, and associated conduit and wiring to electrical power circuits, to ensure continuous operation. These are to support environmental, health, and safety equipment requirements essential to Army National Guard (ARNG) missions during a prolonged (four hours duration) power outage. Power generator sets and pertinent functional components may be acquired with funds from the military construction appropriation. The generator may be installed inside the mechanical room or outside with factory design housing. Generator sets are authorized to power up to 35% of the facility's electricity load requirements. Generator sets to power higher than 35% of the facility's electricity load requirements must be approved as an ETC. Generator sets should be added as a line item in primary facilities of Block 9 of the DD Form 1391. The priority for emergency power generator supply shall be as follows in descending order:

- (a). Fire protection and detection
- (b). Access control
- (c). Communications and Automation Operations (G6), IT DEMARK Rooms, and Range Control Operations Building
- (d). Lighting (up to 20% of the facility lighting)
- (e). Elevators (Maximum of one elevator at each entrance)
- (f). Administrative Offices (office equipment), including Post Headquarters Facilities at the Training Centers
- (g). Heating, ventilation and air conditioning (HVAC)

(2) For all other facilities, only a 150SY emergency power ridged generator pad and house connections/hook-up are authorized. This requirement is limited to a 6-inch thick concrete mounting pad with a house connection/hook-up outlet necessary to provide temporary mission but essential electricity during emergency operation of the facility. The emergency generator itself is considered portable equipment and must be obtained with funds other than from the military construction appropriation.

### **1-7. Flexibility**

The space allowance for any functional area (except the readiness center assembly hall, maintenance training work bays, indoor rifle range (if approved by ETC), training device/simulations center, general purpose and special purpose maintenance work bays, unheated storage, and hangar floor) may be increased by up to 15 percent, provided that the total allowable functional net area is not increased as a result. In order to provide the necessary off-setting reduction for these space increases, any functional space (except a work bay, indoor rifle range, training device/simulations center, unheated unit storage area, or hangar floor) may be reduced by a maximum of 15 percent. Functional areas may be completely removed from a facility if they are not needed. However, in that case, the total allowable net space must be reduced by a like amount.

### **1-8. Restrictions to Support by Federal Funding**

- a. Real estate. Sites for the construction of ARNG facilities shall generally be owned or leased by the State and procured without federal reimbursement. This does not, however, preclude the construction of new ARNG facilities or the rehabilitation of existing buildings on federally owned land licensed to the State for ARNG facility use.
- b. Prewired work stations. Prewired workstations are not authorized to be funded through the military construction appropriation. They are not to be classified as installed building equipment and are to be included in the programming documents as equipment associated with the project that will be provided from other appropriations.
- c. Future improvements. Designing in capacities for future improvements to a specific project is prohibited unless fully justified as an exception to criteria and clearly described in the narrative portion of the programming documents (DD Form 1391). Providing additional capacity for utilities adjacent to contiguous unheated storage with the intent to provide heating and/or cooling of that unheated space in the future is strictly prohibited without exception.

### **1-9. Common Supporting Items, Features, and Allowances for All ARNG Facilities**

In planning the functional arrangement of facilities, the State shall give appropriate consideration to the existing site conditions, layout, and materials of construction in order to achieve maximum operating efficiency, cost effectiveness, and flexibility. The support items include:

- a. Site preparation. The work of clearing, grubbing, stripping, and stockpiling topsoil, excavating embankment, and rough grading required to develop the project site to sub grade levels and elevations for proper siting and drainage of facilities (including culverts, head walls, retaining walls, retention ponds etc.). The State must use its own funds for the special handling/remediation/disposal of contaminated soil excavated from a non-federally owned or leased project site.

(1) Rock excavation and correction of unsatisfactory soil conditions is authorized only if the state has submitted adequate supporting documentation such as an economic or master planning analysis that demonstrates that the positive impacts on readiness strongly outweigh the increased construction costs at that site.

(2) Culverts, retaining walls (installed in lieu of sloping the ground to achieve grade differentials), drainage systems, or other similar construction required for controlling surface water runoff will be approved on an individual site basis if the State justifies these items. The State, however, must consider the cost of these items during the site selection process and submit an exception to criteria for approval.

(3) A storm water pollution prevention plan must be implemented during construction to prevent soil erosion. The plan must be written and implemented in accordance with federal, state, and local regulations.

b. Fine grading and seeding.

(1) The state may program for fine grading and seeding to provide proper site drainage and control of erosion on those parts of the project site where the previously existing surface cover has been destroyed or buried beneath redistributed soil.

(2) Sodding or sprigging is authorized for critical areas subject to erosion.

(3) Importing topsoil is authorized if the natural topsoil on the site, stockpiled at the beginning of construction, is inadequate to provide a finished depth of approximately four inches.

c. Landscaping. This shall be included as an integral part of the planning of the project to produce an aesthetically pleasing final site that consists of natural (native) species or non-native varieties which are non invasive to the surrounding landscape.

(1) The state may program up to three percent of the basic building cost for planting trees, shrubs, and vines (exclusive of grading and seeding or sprigging and sodding for erosion control). In those locations that are considered to have an arid climate, the state may program up to four percent of the basic building cost and may use xeriscaping.

(2) Additional planting for energy conserving landscaping may be authorized if the state justifies it on a life cycle cost basis.

(3) An installed watering system (sprinkler) is authorized. The sprinkler must be designed in accordance with Federal Water Efficiency Requirements. Refer to ARNG DG 415-5 Chapter 3, 3-2.2 - Water Efficiency, and Chapter 6, Section 2 - Exterior Improvements for guidance on Irrigation Systems.

d. Parking: All parking areas must be designed in accordance with the requirements of UFC 4-010-01, DoD Minimum Antiterrorism Standards for Buildings and UFC 4-010-02, DoD Minimum Antiterrorism Standoff Distances for Buildings.

(1) Military Vehicle Parking (MVP) (Organizational Vehicle Parking, Paved CATCODE 85210). Rigid concrete or gravel is authorized for paving those areas designated for the parking of military vehicles. For programming purposes the concrete shall be eight inches in depth. Actual depth should be determined during design based on soil conditions and loading requirements.

(i) Parking is authorized for all vehicles, trailers, equipment, etc (including GSA and other Non-Tactical Vehicles (NTV)), that are permanently stationed at each facility type. This includes equipment hand receipted from units exclusively for facility operating requirements.

(ii) Parking is also authorized at a Combined Support Maintenance Shop (CSMS), Maneuver Area Training Equipment Site (MATES), Unit Training and Equipment Site (UTES), and Field Maintenance Shop (FMS) for 10 percent of the vehicles, trailers, equipment, etc., authorized to receive maintenance at that facility but not permanently stationed at the facility and for prepositioned equipment at Training Centers.

(iii) See Military Vehicle Parking allowances shown in Table 1-1. This area includes an allowance for circulation lanes within the parking area in addition to any required access roads.

**Table 1-1. Military Vehicle Parking**

Type of Equipment	Per Vehicle Allowance
Wheeled Vehicles/Trailers/Other Wheeled/Towed Equipment <30' in length	50 SY
Equipment > 30' in length, including PLS Trailer	75 SY
Tracked Vehicles, Engineer Vehicles	75 SY
Fuel Trucks	175 SY
HETs	275 SY

(iv) For other unique equipment that must be stored within the military vehicle parking area, such as skid-mounted generators, snowmobiles, and transportable containers organic to the assigned units, the State may program an appropriate amount of space as an exception to criteria. Documentation to support this request must be provided along with the project programming documents.

(v) Unheated Enclosed or Shed-Type Vehicle Storage Space

a. Federal support for enclosed or shed-type storage is authorized IAW NGR 415-10. This vehicle storage space may be constructed as a 'pole barn-type' structure with a shed roof and open sides or it may be constructed with enclosed sides and fitted with vehicle access doors. When storing more than five vehicles, the space must be designed to conform with all applicable codes, standards and dry pipe sprinkler system (reference NFPA standards) protected.

b. When enclosed or shed-type storage is provided, the amount of open air paved area authorized for parking of military vehicles at the site shall be reduced by the area of the covered/enclosed space.. (Refer to paragraph 3-4.). Vehicle storage space shall be unheated and shall not exceed 66% of the normally authorized open-air military parking area. The remaining paved area is to be used for circulation and access to and from the covered or enclosed storage structure; as well as for the parking remaining vehicles. For example, if a SEMF is authorized 100,000 SY for open air military vehicle parking and the NGR 415-10 requirements are met for enclosed or shed-type vehicle storage, then up to 66,667 SY could be used for enclosed parking. The remaining 33,333 SY would then be authorized for the circulation and access to and from the parking structure and parking remaining vehicles.

c. Vehicle spacing must be tightly controlled. Vehicles should be parked nose to tail with only the minimum space required for personnel to maneuver between the vehicles to access operator or driver access doors on the vehicles. There would not be any 'drive-through' vehicle lanes.

d. Overhead or rollup doors at approximately 25 feet on centers are authorized on two sides of enclosed structures at the rate of one for each 1800 square feet of floor area to provide for mass parking of vehicles without the need for internal circulation lanes.

e. A 60 foot deep concrete apron is authorized for each side of the facility with vehicle entrances.

(2) POV Parking (Non-organizational Vehicle Parking, Paved CATCODE 85215)

(i) This area includes an allowance for circulation lanes within the parking areas (Note: this does not include the access road). For programming purposes, flexible pavement (or concrete if supported by an Economic Analysis) shall consist of six inches of bituminous material placed over an installed, appropriate aggregate base. Rigid concrete or flexible pavement curbs may be installed along pavement edges to comply with the site's approved storm water management plan or to preclude soil erosion.

(ii) See POV Parking allowances shown in Table 1-2:

**Table 1-2. POV Parking\***

Facility Type	Allowance
Readiness Center	35 SY times 90% of the authorized strength of the assigned units required to train simultaneously. The 90% ratio of authorized strength depends on the adequacy of public transportation serving the site (TBD by Design).
Logistics Facility	35 SY per required full-time staff of the facility, including contract personnel.
Aviation Facility	35 SY times the required full-time staff of the facility, including contract personnel, or, if larger, 35 square yards times 90% of the authorized strength of the non co-located units required to train simultaneously.
Training Facility	35 SY times the sum of the full-time staff (including permanently assigned Federally reimbursed State employees) and 50 % of the billeting capacity of the training center.
Educational Facility	35 SY times the sum of the ARNG-TR validated maximum student load and the full-time staff (including instructors).

Notes:

1/ 35 SY is factored on a 10 FT by 20 FT parking space with a 10 FT by 12 FT circulation aisle included.

(3) Visitor/Customer Parking (Nonorganizational Vehicle Parking, Paved CATCD 85215)

(i) Visitor/customer parking spaces are authorized as indicated in Table 1-3- Visitor/Customer Parking based on the number of required full time employees including permanently assigned federally reimbursed State employees. The allowance includes circulation lanes, required access roads are an additional allowance.

(ii) In addition to the number of spaces shown below, for every 50 (or fraction thereof) authorized spaces, an additional 60 square yards is authorized for a handicapped parking space.

(iii) For programming purposes, flexible pavement or concrete (if supported by an Economic Analysis) shall consist of six inches of bituminous material placed over an installed, appropriate aggregate base. Rigid concrete, granite or flexible pavement curbs may be installed around pavement edges if required to control storm water per the site's approved storm water management plan.

**Table 1-3. Visitor/Customer Parking**

Facility Type	Allowance	# of Employees	# of Parking Spaces
Readiness Center	35 SY	N/A	To be designed by the A-E for specific location and approved by ARNG-ILI
Logistics Facility	35 SY	5-15	4
		16-25	7
		26 & over	9 (plus one additional parking space for every 10 employees or major fraction thereof > 26)
Aviation Facility	35 SY	N/A	12
Training Center Facility	35 SY	5-15	4
		16-25	7
		26 & over	9 (plus one additional parking space for every 10 employees or major fraction thereof > 26)
Educational Facility	35 SY	5-15	4
		16-25	7
		26 & over	9 (plus one additional parking space for every 10 employees or major fraction thereof > 26)

(4) Fuel Truck Containment Area. In addition to the parking allowances above, a minimum of 75 square yards of rigid concrete is authorized to construct a containment area for each fuel truck or trailer that stores POL on board. In accordance with applicable environmental, safety and fire protection regulations, each containment area is to be designed and sized so that it is capable of capturing and retaining 110% of the POL volume stored in

or on the fuel storage truck/trailer/tank positioned within that area along with sufficient freeboard to contain precipitation. A roof type cover will be provided, and designed in accordance with UFC 3-110-03 if required by local code or local climatic conditions (e.g., excessive heat or snow), to prevent overheating of fuel and/or to preclude the introduction of storm water runoff into the sump of the containment area. The local climatic condition can be determined by contacting the National Climatic Data Center, or from historical data presented in US Army TM 5-785 Facility Design and Planning, Engineering Weather Data.

e. Loading Dock. For facilities that receive/ship products in large bulk (e.g. USPFO warehouse, CIF, etc.), a four foot high, covered loading dock fitted with a dock leveler for each truck docking space shall be provided in the receiving and shipping areas. A basic length of 22 feet to accommodate one truck plus 10 feet for each additional truck space is authorized. Thus, a loading dock to accommodate three trucks would be 42 feet in length. Docks should be 15 feet in width from face of building to edge of loading dock. The dock shall also have an access ramp 10 feet wide (not to exceed a 12 degree incline) to provide forklift access.

(1) Logistics facilities, including Basic Issue Item (BII) warehouses located at MATES/UTES, are authorized loading docks that accommodate a maximum of three trucks simultaneously.

(2) Aviation facilities are authorized loading docks that accommodate a minimum of two trucks simultaneously.

(3) Any other loading dock requirements will be addressed as exceptions to criteria.

(4) Final design plans will dictate the actual loading dock length.

f. Military Vehicle Loading Ramps. Military vehicle loading ramps may be constructed to assist in loading and off-loading military vehicles (wheel and track) from equipment transporters that do not have loading ramps as an integral part of the vehicle trailer. A multi-level loading ramp not to exceed a footprint of 160 SY is authorized. The maximum ramp incline will not exceed 12 degrees. Sufficient area should be allocated to accommodate the vehicle turning radius for loading/off loading equipment.

g. Turn Pads. For facilities supporting tracked vehicles, rigid concrete turn pads are authorized where frequent turning of tracked vehicles is required on flexible pavement. The facility design shall limit the number of pads to the minimum required to preclude damaging flexible pavement. Pads should each be 30 feet by 30 feet (100 square yards). Three hundred square yards of concrete (three turn pads) shall be used for programming purposes. However, the exact number of turn pads will be determined during the design review based on an economical and practical facility site layout.

h. Service and Access Aprons. Rigid concrete paving may be provided for access to each dumpster, controlled waste handling facility, and any other facility requiring outside access by forklifts or large, heavy vehicles. Allowances for service and access aprons are indicated by an "X", "N/A" means aprons are not authorized for that function – See Service and Access Apron allowances shown in Table 1-4:

**Table 1-4. Service and Access Aprons**

Apron/Access	Allowance	Readiness Center	Logistics Facility	Aviation Facility	Training Facility	Educational Facility
Firefinder Radar	150 SY	X	X	N/A	N/A	N/A
Refuse Coll Fac	150 SY	X	X	X	X	X
Controlled Waste	150 SY	X	X	X	X	X
Loading Dock	150 SY	X	X	X	X	N/A
Military Veh Loading Ramp	250 SY	X	X	X	X	X
Fuel Storage & Dispensing System	250 SY	X	X	X	X	X
Wash Platform	250 SY	X	X	X	X	N/A
Assembly hall	500 SY	X				
Maintenance & Training Bay Doors	60' deep <u>1</u> /	X	X	X	N/A	N/A
USPFO Warehouse Service Apron	60' deep x loading dock length	N/A	X	N/A	N/A	N/A
Aviation Hangars	100' Deep(120' for CH47) x hanger door width	N/A	N/A	X	N/A	N/A

Notes:

1/ A 60 foot deep, as measured from the maintenance bay doors, concrete apron may be installed to provide a paved access to general, special purpose, and maintenance training work bays. Where work bays are adjacent to each other, the aprons should be contiguous.

i. Access road and entrance throat. The primary entrances and access roads are authorized a width of 32 feet. More than one entrance may be authorized based on a demonstrated requirement to separate military and civilian vehicle traffic and to satisfy access requirements for fire and emergency vehicles. For programming purposes, the access road shall consist of 5000 square yards of flexible or rigid pavement, unless a greater amount is justified by a detailed site plan. However, the exact amount and type of pavement will be determined at the concept/preliminary design review based on an economical and practical site facility layout and code considerations.

j. Curbs. Rigid concrete, cut stone, or flexible pavement may be used for curbing along the edges of the roads and parking areas to comply with code, to control traffic, or to control storm water per the site's approved storm water management plan.

k. Security Fencing. Security fencing shall be constructed IAW guidance in Army Techniques Publication (ATP) 3-39.32. For planning purposes, a fence consisting of a six foot high chain-link-type metal fabric, with a barbed wire top guard facing upward and outward at a 45 degree angle extending the fence height by at least one foot, shall enclose the military vehicle parking, service and access areas, and ancillary facilities. Fencing shall include vehicle and personnel gates, which may be electronically controlled. The fencing shall be located IAW Army security regulations and Anti-Terrorism/Force Protection (AT/FP) requirements. The area between the edge of pavement and the fence may be seeded with grass, or a well-designed non vegetative cover (not to exceed four inches of rigid pavement) may be substituted. For aviation facilities, the following applies:

(1) Additional fencing may be authorized at stand-alone facilities when approved as an exception by ARNG Aviation and Safety Division (ARNG-AV).

(2) The fence shall be located so as to enclose the aircraft parking area and shall be equipped with gates of sufficient width to permit ingress/egress from the area to existing runways, taxiways, etc., at the airport. Air safety must be considered in the design of both fencing and security lighting.

(3) Where feasible the fence shall connect to the existing airport boundary security fence, if the boundary fence meets NGB requirements.

l. Site AT/FP Measures. A separate fence, wall, passive vehicle barrier, landform, or line of vegetation shall be applied along the exterior perimeter of the site to create a protective standoff and obscure vision, hinder personnel access, and hinder or prevent unauthorized vehicle access. In addition, a guard house/access control facility not to exceed 550 square feet is authorized when determined to be appropriate following completion of an AR 190-51 security risk assessment. Such a facility may be equipped with an environmental control system, electric service, latrine, and voice, video, and data communication links. The requirements of Unified Facilities Criteria (UFC) 4-010-01 must be met.

m. Sidewalks. For programming purposes, sidewalks shall be 15% of the building footprint. However, the exact amount of sidewalk area will be determined at the concept design review based on an economical and practical site layout of the facilities.

n. Flagpoles: ARNG facilities are authorized flagpoles per Table 1-5.

**Table 1-5. Flagpoles 1/**

Facility Type	Allowance
Readiness Center	Two ground-set flagpoles (three for general officer commands) with illumination.
Logistics Facilities	Two ground-set flagpoles with illumination, unless the facility is collocated with a readiness center or another ARNG facility with flagpoles or is on a military installation that already has or will have flagpoles
Aviation Facilities	
Training Center Facilities	
Educational Facilities	The educational complex is authorized two ground-set flagpoles with illumination, but only if the installation on which it is located does not already have one.

Notes:

1/There shall only be 1 American flag per site, if one exists already on site, then the authorized number will be reduced by 1

o. Exterior Fire Protection. Consideration shall be given to the size of the structure, the type of construction, and the exposure to fire hazard that it creates for or receives from nearby buildings. Except in cases of conflict with state requirements, exterior fire protection should be in conformance with National Fire Protection Association requirements. Extension of water mains for fire protection is limited to that needed to ensure that an adequate number of fire hydrants can be located between 50 and 400 feet of any building. No more than 300 linear feet of pipe per water line required by code may be outside the property line.

p. Detached Facilities Sign/Static Display. In addition to the authorized building-mounted facilities sign, a free-standing sign is authorized identifying the facility name and type, street name, the State, and Army National Guard/Joint Facility Identity. Lighting to illuminate the sign continuously during hours of darkness may be provided. Provisions may also be made at this facility for a static display, including a concrete slab or mounting pedestal.

q. Outside Security Lighting. Security lighting of military vehicle/equipment storage and other outside area lighting should be in keeping with minimum needs for personnel safety and security or as required by physical security regulations. Lighting of fuel islands is authorized. A security lighting system is authorized that permits ample lighting to conduct safe after hour training and is designed to illuminate continuously during the hours of darkness or equipped with sensors which when activated by movement within the designated area will cause the lights to illuminate. After discontinuance of movement within the designated area, the lights should remain lit for a time determined to be appropriate for the specific situation by the security manager. Vandal resistant lenses should be provided where appropriate. Wherever possible, security lighting shall be provided from building-mounted fixtures. Pole-mounted fixtures may be used to supplement the building-mounted fixtures and where building-mounted fixtures are inadequate.

r. Interior Space Lighting. Along with day lighting techniques, the use of innovative, energy conserving interior lighting concepts, such as low-voltage; high lumen output fixtures, LED lamps and high bay; fluorescent illumination is encouraged whenever a cost-benefit analysis indicates that it is prudent based upon a comparison of the savings derived when the estimated installation cost plus the cost of maintenance over the expected life-span of the product are compared with like costs for a more conventional lighting technique.

s. Fuel Storage and Dispensing Systems are authorized provided that:

(1) The State's surface vehicle fuel management plan justifies the use of a fuel storage and dispensing system at this location because of a lack of nearby military facilities, an agreement with other state facilities, or local private sources (using credit/debit cards).

(2) The facility is not located within a mile of a surface maintenance facility with fuel storage and dispensing capability,

(3) There are at least 15 vehicles using each type of fuel assigned to the facility,

(4) The storage facilities shall be built to nationally recognized environmental standards and IAW local ordinances,

(5) A roof type cover will be provided, and designed in accordance with UFC 3-110-03 if required by local code or local climatic conditions (e.g., excessive heat or snow), to prevent overheating of fuel and/or to preclude the introduction of storm water runoff into the sump of the containment area. Local climatic condition can be determined by contacting the National Climatic Data Center, or from historical data presented in US Army TM 5-785 - Facility Design and Planning, Engineering Weather Data.

(6) For Readiness Centers, Logistics Facilities, and Educational Facilities, the system capacity shall not exceed the quantities in Table 1-6 below:

**Table 1-6. Fuel Storage and Dispensing Systems**

No. of Vehicles Using Type of Fuel	Capacity Per Type of Fuel
0 – 14	N/A
15 – 39	3,000 Gallons
40 – 69	5,000 Gallons
70 – 100	7,000 Gallons
101 – 250	10,000 Gallons
Over 250	20,000 Gallons

(7) Aviation Facilities: Aircraft fuel storage and dispensing system is authorized in accordance with UFC 3-460-01 16 August 2010, with direct fuel truck access to the aircraft parking apron.

(8) Training Sites: Fuel storage and dispensing systems are authorized at an amount not to exceed a 15 day supply based on the largest 15 day requirement during the training year.

t. Wash Platforms for all facilities are authorized as follows:

(1) Unless otherwise noted below, one concrete wash platform, not to exceed 115 SY, is authorized when 10 or more motor vehicles are authorized to be physically located at the facility and if the facility will not be located within a mile of a surface equipment maintenance facility with vehicle washing capability.

(2) A roof type cover will be provided if required by local code to prevent storm water from draining into the sanitary or storm water sewer system. This structure shall be listed as a separate primary facility line item in block 9 of the DD Form 1391.

(3) An exterior wash platform may be enclosed by a heated shed-type structure and a heated aviation wash-rack may be constructed when the heating design temperature, as designated in UFC 3-400-02, is minus (-) 10 degrees Fahrenheit or lower, or the annual snowfall exceeds 30 inches. This structure shall be listed as a separate primary facility line item in Block 9 of the DD Form 1391.

(4) SEMF:

(i) One wash platform, not to exceed 115 SY, is authorized at each SEMF.

(ii) Additional wash platforms are authorized for each 100 vehicles, or major fraction thereof, in excess of the initial 100 vehicles authorized to receive maintenance at the facility.

(iii) An interior wash bay as authorized in Table 3-4 shall count as one wash platform.

(iv) When it can be justified, a centralized wash facility (birdbath type) may be authorized as an exception to criteria at a UTES or MATES. The use of a closed-loop water circulation system with replenishment to make-up any water lost through evaporation is preferred as environmentally prudent.

(5) Aviation Facility:

(i) In addition to the vehicle wash platform authorized above, one aircraft wash area (washing apron), category code 11370, is authorized at each aviation facility to be constructed of rigid concrete according to UFC 3-260-1.

(ii) Maximum allowance is 118 feet by 74 feet (140 feet by 110 feet for CH-47s).

(6) Training Facilities:

(i) The number of wash platforms authorized at a training center is in addition to those authorized for a MATES located on the training center but does not include any wash platforms at other DoD component facilities on the training center that are available for ARNG use.

(ii) Size and design of wash facilities shall be IAW TM 5-814-9.

(iii) Other environmental measures required by federal, state and local codes shall be included.

Central birdbath wash facilities must be justified on a case-by-case basis.

(iv) An exterior wash rack may be enclosed by a heated shed-type structure when the heating design temperature, as designated in UFC 3-400-02, is minus (-) 10 degrees Fahrenheit or lower, or the annual snowfall exceeds 30 inches.

u. Utilities: All building utility service connections shall be underground. The length of service for each utility is limited to the distance of the shortest run from the building to the property line adjacent to the public right-of-way providing ingress and egress for the site plus up to an additional 300 linear feet for connection to the existing utility system. The state is responsible for any additional utilities beyond the 300 FT. Direct-burial of

cable for telephone, data, and electric service connections is authorized. This includes conduit where the service connection(s) must pass under a paved area.

(1) Construction of an on-site water well, a cistern with a chlorination system, a sanitary waste water treatment system, or tanks for the storage of heating fuels, such as liquid petroleum gas or number two oil, as well as delivery piping is authorized if like public services are not available. Such systems must conform to the requirements of the local approval authority and all applicable federal, state, and local environmental laws and regulations.

(2) The installation of any renewable energy system, either active or passive, to provide supplemental space heating or electric service is authorized when it can be demonstrated that the projected conventional energy cost savings will equal or exceed the installation costs during the projected service life of the alternative energy system. All projects that use alternative energy sources are required to conduct a cost benefits economic analysis in BLCC regardless of cost. Line will show as follows:

- (i) Heating Plant, Geothermal: FCC 82187, U/M: EA, Quantity: Number of well farms.
- (ii) Heating Plant, Solar: FCC 82182, U/M: EA, Quantity: Number of Solar Arrays
- (iii) Wind Turbine: FCC 81146, U/M: EA, Quantity: Number of Wind Farms.
- (iv) Electric Power, Photovoltaic: FCC 81122, , U/M: EA, Quantity: Number of Solar Arrays

When an alternative energy source is used, each type will be a separate primary facility line item. As of FY16, every project is required to have an analysis conducted on weather renewable energy sources are cost beneficial or not. Life cycle cost effectiveness as defined in 10 CFR 433.2, applies to this entire document unless otherwise stated. All Life Cycle Cost Analyses (LCCA) performed must be prepared in accordance with 10 CFR Part 436, Subpart A and NIST Handbook 135 “Life-Cycle Costing Manual for the Federal Energy Management Program”. LCCA must be prepared using the Building Life Cycle Costing (BLCC) program, available from the National Institute of Standards and Technology (<http://www.nist.gov/el/buildeconomic.cfm>). A link to BLCC may also be found at the Department of Energy’s building energy tools web site, [http://www1.eere.energy.gov/femp/information/download\\_blcc.html](http://www1.eere.energy.gov/femp/information/download_blcc.html). When needed, use weather data obtained from UFC 3-400-02.

(3) Energy Policy Act 2005 (EPA 2005): Section 103 of EPA 2005 requires that “all Federal buildings shall, for the purposes of efficient use of energy and reduction in the cost of electricity used in such buildings be metered to the maximum extent practicable.” Therefore, the installation and use of individual meters or advanced metering devices and smart metering that provide data at least daily and that measure at least hourly consumption of electricity should be examined or evaluated.

v. Storm Water Drainage: The State may program up to three percent of the basic building cost for retention ponds as part of a storm water pollution prevention program. The storm water pollution prevention program and retention ponds must be implemented and constructed in accordance with federal, state, and local regulations. These ponds may include bio-retention capabilities if required by local codes and/or best management practices.

w. Facility Support Space. All facilities are authorized support space allowances as shown in Table 1-7:

**Table 1-7. Facility Support Space Allowances**

Facility Maintenance and Storage Space(s)	3% of the Total Net Area
Mechanical/Electrical Room (s)	5% of the Total Net Area <u>1/</u> <u>2/</u> <u>3/</u>
Telecommunications/Information Technology	1% of the Total Net Area <u>1/</u>

Notes:

1/ Mechanical/Electrical and Telecommunications/Information Technology rooms may be increased or decreased based on actual design requirements or to provide sufficient space for required secure information technology systems.

2/ Mechanical space includes pipe and duct shafts and perimeter heating units. Additional mechanical equipment space is authorized for multiple story facilities to accommodate vertical duct requirements. This space is understood to include space for computerized controls and equipment for all facility related systems. The percentage indicated is intended as a planning guide. Final determination will be approved during the design review process.

3/ Exclusive of facility maintenance and storage space allocation

x. Inter-functional Circulation Space. Facilities are authorized space for inter-functional circulation as shown in Table 1-8:

**Table 1-8. Inter-functional Circulation**

Facility Type	Allowance
Readiness Center	15 % (22 % for multiple-story facilities) of the total net floor area (excluding unheated unit storage, unless it is incorporated within the readiness center) <u>1/</u>
<b>Logistics Facility</b> USPFO Admin Offices USPFO Warehouse Office/Shop Areas in SEMF Unheated Vehicle Storage BII Warehouse Firefinder Radar Facility Controlled Humidity Preservation (CHP)	15% (22% for multiple-story facilities) <u>1/</u> None (already included in base allocation) 15% (22% for multiple-story facilities) <u>1/ 2/</u> None None Based on A-E design and ARNG-ILI/ILS Approval. None
Aviation Facility	15% (22% for multiple-story facilities) of the total net floor area (excluding unheated unit storage, unless it is incorporated within aviation facility) <u>1/ 3/</u>
Training Center Facility	15% (22% for multiple-story facilities) of the total net floor area (excluding unheated unit storage, unless it is incorporated within heated buildings) <u>1/ 4/</u>
Educational Facility	22% (29% for multiple-story facilities) of the total net floor area (excluding unheated unit storage, unless it is incorporated within heated buildings) <u>1/ 4/ 5/</u>

Notes:

1/ This allowance includes corridors, staircases, entrances, and a lobby. This percentage is a planning figure, and final determination will be approved during the design review process based upon what is required for a well planned functional layout.

2/ This allowance does not include egress for maintenance bay areas (see paragraph 3-3.d. (5)).

3/ Inter-functional circulation for unheated aircraft storage hangars does not fall under this authorization.

The total floor area may be increased by 15% for unheated aircraft storage hangars to provide for egress, interior aisles, hangar doors, walls and interior partition walls

(if required). The 15% figure is intended as a planning guide. Final determination will be made during the design review process.

4/ Circulation is 22% (27% for multiple story buildings) for billeting facilities.

5/ Circulation is 29% (36% for multiple story buildings) for billeting facilities.

y. Walls. Facility allowances for wall space are as shown in Table 1-9:

**Table 1-9. Walls**

Walls	10 percent of total net floor area, including circulation <u>1/ 2/ 3/</u>
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Notes:

1/ The total floor area may be increased by 10 percent to provide for interior and exterior walls and partitions. The 10 percent figure is intended as a planning guide. Final determination will be approved during the design review process.

2/ For Aviation Facilities, the total floor area may be increased by 10 percent (15 percent for stand-alone fixed wing facilities) to provide for interior and exterior walls and partitions. The 10 percent (15 percent for stand-alone fixed wing facilities) is intended as a planning guide. Final determination will be made during the design review process.

3/ For Aviation Facilities, the total floor area may be increased by 15 percent for unheated aircraft storage hangars to provide for egress, interior aisles, hangar doors, walls and interior partition walls (if required). The 15 percent figure is intended as a planning guide. Final determination will be made during the design review process.

z. Controlled Waste Handling Facility (CWHF).

(1) A prefabricated metal or concrete masonry building with a concrete floor or building of equivalent or less cost of a size shown in Table 1-10 below is authorized for all facilities. The basic allowance is the gross area including intracirculation. Intercirculation space has to be justified as an exception to criteria.

(2) The building shall be designed to allow wastes to be conveniently stored inside each cell in drums, metal boxes, on pallets, and easily loaded/unloaded using a forklift or manual means. Partitioning of individual storage cells shall be designed to provide secondary spill containment within each cell.

(3) 150 square yards of rigid concrete access paving may be provided for access. All Facilities are authorized space for a CWHF as shown in Table 1-10:

**Table 1-10. Controlled Waste Handling Facilities**

Facility	Barrels stored	Basic Allowance <u>1/</u>
Readiness Centers <u>1/</u>	1-40	300
USPFO <u>2/</u>		
SEMF <u>2/</u>		
Aviation Facilities <u>3/</u>	41 & Over	500
Training Center		
Facilities		
Educational Facilities		

Notes:

1/ At its option the State may include this authorized space within the readiness center or another adjacent facility.

2/ At its option the State may include this authorized space within the logistics facility or another adjacent facility. It is additive to any allowances authorized for Surface Equipment Maintenance Facilities (SEMF).

3/ At its option the State may include this authorized space within the aviation facility or another adjacent facility.

## Chapter 2

### Readiness Centers

#### 2-1. General

Readiness Centers are facilities constructed to support individual and collective training, administrative, automation and communications, and logistical requirements for the ARNG. Functional areas included in this building are assembly space, classrooms, distance learning centers, locker rooms, physical fitness area, kitchen, weapons and protective masks storage, other storage, enclosed areas to support training with simulation, operator-level maintenance shop for assigned equipment, and use of NBC equipment.

#### 2-2. Standards

This chapter establishes the space allowances for National Guard Readiness Centers (CATCD 17180), National Guard/Reserve Centers (CATCD 17142) which includes Joint Force Headquarters (JFHQ), sole use ARNG space in Armed Forces Reserve Centers (AFRC) (CATCD 17141), and Civil Support Team (CST) Ready Buildings (CATCD 14132). Below are the descriptions of the facilities reference above:

- (1) A National Guard Readiness Center is a readiness center facility constructed for sole-use of ARNG.
- (2) A National Guard/Reserve Center is a readiness center constructed as a joint-use facility with another reserve component element (including the Air National Guard) where the ARNG is the lead agency (Host). A National Guard/Reserve Center must provide space for at least 20 members from each of one or more reserve component units in addition to the ARNG.

- (3) A JFHQ is specific type of National Guard/Reserve Center constructed as a joint-use facility for ARNG and ANG federal elements of the Joint Force Headquarters-State and associated State elements as allowed by State statute. There is only one JFHQ per State/Territory/District of Columbia (54 total).
- (4) An AFRC is a reserve center constructed as a joint-use facility with the US Army Reserve where the USAR is the lead agency (Host) and where the ARNG is a tenant of the facility.
- (5) A Ready Building is a building used by a CST Team. The building provides billeting and/or operational areas for civil support teams, missile site crews, units on standby for rapid deployment, or security forces not permanently stationed at the site

### **2-3. Standard Space Allowances**

- (1) Refer to Table 2-1 for standard space allowances.
- (2) Refer to Table 2-2 for unit specific space allowances.
- (3) Refer to Table 2-4 for Civil Support Team facility allowances.
- (4) Refer to Table 1-5 for allowances for Flagpoles.
- (5) Refer to Table 1-7 for Facility Support Space allowances.
- (6) Refer to Table 1-8 for Circulation allowances.
- (7) Refer to Table 1-9 for Walls allowance.
- (8) Refer to Table 1-10 for Space allowances for Controlled Waste Handling Facilities (CWHF)
- (9) All other space requirements not specifically indicated in the referenced tables will be treated as exceptions to criteria. The State must fully justify such requests and the NGB proponent must concur with them before ARNG-ILI will approve including them in the programming documents and the final design of the project.

### **2-4. Non-Standard Supporting Items**

In planning the functional arrangement of facilities, the State shall give appropriate consideration to the existing site conditions, layout, and materials of construction in order to achieve maximum operating efficiency, cost effectiveness, and flexibility. The following exterior Non-Standard Supporting Items are authorized for Federal reimbursement in readiness center projects:

- (1) Parking pad for Mobile Conduct of Fire Trainer (MCOFT) and similar simulators.

Federal support is authorized for construction of a 60 x 60 square feet rigid concrete parking pad, with electrical power and telephone service, at each Army Training Division (ARNG-TR) approved MCOFT or similar simulation device site. A roof-type cover may be provided if required by local climatic conditions (e.g., excessive heat, snow, rain).

- (2) Helipad.

Federal support is authorized for construction of a helipad at the Joint Force Headquarters (JFHQ) or at a readiness center that has a Colonel or higher level command. Constructed of reinforced concrete, the limited use pad shall be 100 x 100 square feet with 25 foot wide shoulders of flexible pavement. Lighting and markings shall conform to the requirements of TM 5-811-5.

### **2-5. Unheated Enclosed or Shed-Type Vehicle Storage Space**

Refer to section 1-9b.

### **2-6. Civil Support Team Facilities**

These facilities are classified as ready buildings and the space allowances are authorized as shown in Table 2-4. Critical to these teams are the operations center/crew room and vehicle storage/ready bays for the loading and pre-staging of sensitive equipment on the unit's primary vehicles.

### **2-7. Sensitive Compartmented Information Facilities (SCIFs)**

SCIFs are only authorized by an Exception to Criteria (ETC). The State must request authorization for a SCIF from the ARNG-G2. The ARNG-G2 will determine if the State has a valid requirement for a SCIF and, if so, will define the authorized space according to the mission. The State will then provide the ARNG-G2 approval documents to ARNG-ILI-R as supporting documentation with the request for ETC. Contact ARNG-ILI-C for specific construction issues and sample SCIF design layouts. Refer to UFC 4-010-05, Sensitive Compartmented Information Facilities Planning, Design, and Construction for more information.

**Table 2-1. Schedule I, Readiness Center Space Allowances**

Allowances Based on Readiness Center Capacity (Allowance in net square feet, exclusive of interior and exterior walls)							
(Required Strength) <u>1/</u>							
Functional Areas <u>2/</u>	55-99	100-175	176-350	351-650	651-950	951-1,200	
1 Assembly Hall	5,400	5,400	5,400	6,300	6,300	6,300	
2 Classrooms <u>3/</u>	800	1,000	1,500	2,400	2,700	3,000	
3 Learning Center <u>4/</u>	500	500	500	700	700	700	
4 Multipurpose Training Area <u>5/</u>	1,500	1,500	1,500	1,500	1,500	1,500	
5 Kitchen <u>6/</u>	1,500	1,500	2,200	2,200	2,200	2,200	
6 Break/ Vending	<u>7/</u>						
7 Toilets/Shower <u>8/</u>	1,220	1,300	1,400	1,620	1,860	2,060	
8 Flam Mats. Storage	100	100	200	200	350	400	
9 Lactation Area/Room	80	80	80	80	120	160	
10 Family Readiness Office	250	250	250	400	400	400	
11 RAPIDS Office <u>9/</u>	150	150	150	150	150	150	
12 Retention Office <u>10/</u>	110	110	110	110	110	110	
13 Table/Chair Storage	300	300	300	550	550	550	
14 Physical Fitness <u>11/</u>	600	700	800	1,000	1,225	1,600	
15 Controlled Waste Handling Facility (CWHF)	<u>12/</u>						

Notes:

1/ The required strength of a Readiness Center is the sum of the authorized strengths of all assigned units. Units with required strength(s) of fewer than 55 are not authorized a separate facility and must be programmed as part of a multiple-unit readiness center, unless approved as an exception to criteria. Multiple-unit readiness centers do not require a single unit with a required strength of 55, rather a combined total required strength of 55. Exclusive use space for such units will be according to Table 2-2.

2/ All functional areas listed in Table 2-1 are for the common use of all the units assigned to the Readiness Center.

3/ Classroom space is authorized using the formula 10 square feet per person based on the combined required strengths of the assigned unit(s) (including units with a strength less than 55) that are required to train simultaneously, plus the basic space from the table. An auditorium with inclined floor and installed seats is authorized for battalion or higher level headquarters. Auditorium space is subtracted from the authorized classroom space. All audio/visual equipment will be stored in this area

4/ The Learning Center is a combined space consisting of the library, learning center, and Distance Learning Center (DLC). If a DLC is validated and approved by the ARNG-TR-, it will be installed within this space. No additional space will be authorized for the DLC. Learning Center space is in addition to any classroom space otherwise authorized.

5/ Space authorization will accommodate marksmanship trainers, combative rooms, and any other special trainers required by unit(s). This space will also accommodate all training aid storage requirements for the facility.

6/ Units that do not have a cook section will be allowed to build an 800 SF serving/catering kitchen. A 150 SY concrete pad located in the vicinity of the kitchen is authorized for a Mobile Kitchen Trailer (MKT). NGB DG 415-1, Appendix B lists approved layout drawings and equipment.

7/ Break and Vending areas are now combined spaces with a minimum allowance of 300 square feet for up to 8 full-time support personnel and 400 SF for support personnel of 9 and above. Break and vending areas can be disbursed through the facility.

8/ In addition to the basic toilet area, shower space is also authorized. Shower area shall be determined using the largest number of soldiers required to train simultaneously at the readiness center. This number shall be divided by 15 and the result multiplied by 40 square feet. This figure should then be added to the basic allowance in Table 2-1. The toilet/shower allowance is to be split into appropriate facilities to support both males and females. The split should account for both minimum code requirements and anticipated building usage. The basic allowance may be increased by ten percent (10%), if the facility has two or more floors, in order to allow a toilet area to be installed on each floor.

9/ Space authorized only if Real-Time Automated Personnel Identification System (RAPIDS) office assigned to the

readiness center. Only one RAPIDS office is authorized per campus/training site.

10/ Retention office SF is based on a AR 405-70 category P5 at 110 SQFT is authorized at one per facility, plus an additional 110 SQFT office per unit over 55.

11/ Physical Fitness area in not authorized if a campus/training site physical fitness facility exists and a Memorandum of Agreement (MOA) between the installation commanders and unit exist.

12/ See Table 1-9 - CWHF.

**Table 2-2. Schedule II, Unit and Special Space Allowances 1/  
(Allowance in net square feet, exclusive of interior and exterior walls)**

**1. Administrative Office Space: 2/**

<b>Functional Area</b>	<b>Allowance</b>
a. Basic Allowance	
(1) Unit with strength of 75 and less	400
(2) Unit with strength over 75	800
b. Office Allowance <u>3/</u>	
c. Special Administrative Allowances: <u>4/</u>	
(1) Division Headquarters	5,850
(2) Brigade Headquarters	3,300
(3) Echelons above Brigade Units	2,850
(4) Special Operation Groups	1,950
(6) Battalion Headquarters and Headquarters Company (HHC or HHD)	1,500
(7) State Headquarters (Army National Guard)	<u>5/</u>
Under 4,000 Strength	2,970
4,000 to 7,500 Strength	3,570
7,500 to 10,000 Strength	4,020
10,000 to 15,000 Strength	4,470
15,000 to 20,000 Strength	4,920
Over 20,000 Strength	5,670
(8) Troop Command	
54 or Less Strength	1,950
55 to 99	2,850
100 and Over	3,300
(9) Army Advisor's office for advisors (officers and enlisted) authorized to specific units)	130 each
(10) Personnel Services Companies/Sections	<u>6/</u>
(11) State Headquarters military record archives	<u>7/</u>
(12) Training Support Brigade (TSB) personnel authorized to specific units	130 each

**2. Unit Storage Space (minus Arms Vault) 8.1.a/**

<b>Functional Area</b>	<b>Allowance</b>
a. Arms Vaults	<u>8.1.b/</u>
b. Battalion Headquarters with Organic Subunits (Per Table of Organization and equipment (TOE) <u>9/</u>	1,000
c. Supply and Transportation Battalion (Division) <u>9/</u>	1,000
d. Support Battalion (Separate Brigade) <u>9/</u>	1,000

**3. Locker Room Space 10/**

Functional Area	Allowance
a. Basic Space (one per readiness center)	200
b. Space per each individual authorized in the readiness center	18

**4. Special Functions:**

Functional Area	Allowance
a. JFHQ Joint Operations Center (JOC)	1,200
b. JFHQ Secure Video Conference Center	500
c. Ready Bay for JFHQ Secure Communications Vehicle	1,500
d. Public Affairs Detachment (Specialized functions are allowed space for workroom, recording studio, edit studio, broadcasting studio, finishing room, print room, negative room (dark room), etc.)	1,020
e. JFHQ Photographic Studio <u>11/</u>	500
f. JFHQ Media Room <u>12/</u>	820
g. Medical Section within a Headquarters unit	400
h. Physical Exam/Flight Surgeon Space for 10-160 Exams per Year <u>13/</u>	500
i. Communications Security (COMSEC) Material	<u>14/</u>
j. Information Technology (IT) Support Activities	<u>14/</u>
k. General Purpose Training Bay (GPTB)	<u>15/</u>
l. Air/Army National Guard Weather Flight <u>16/</u>	1,500
m. Band	<u>17/</u>
(1) Main Rehearsal Studio <u>18/</u>	1,700
(2) Large Group Rehearsal Studio <u>19/</u>	700
(3) Small Rehearsal Studio <u>20/</u>	350
(4) Music Library	500
(5) Individual Instrument Storage <u>21/</u>	520
(6) Recording Studio <u>22/</u>	250
(7) Bulky Instrument Storage/Instrument Cleaning and Repair <u>23/</u>	1,200
(8) Individual Practice Rooms <u>24/</u> , <u>25/</u>	870

Notes:

1/ The appropriate space for each unit is to be selected from below and subtotaled by unit per each function. Space for headquarters, special units, or other elements having special requirements not specifically established in this schedule may be submitted to ARNG-ILI for approval as an exception to criteria if supported by a clearly stated justification that is backed up by actual data (if appropriate). The word unit, when not further modified, is intended to represent MTOE units, Table of Distribution and Allowances (TDA) units, split units, and detachments.

2/ The State uses the sum of total of all administrative space authorized for the units and lays out the work areas according to accepted guidelines.

3/ Refer to Army Regulation (AR) 405-70, Table D-1 and D-2 for private and open office space allowances.

4/ Special administrative allowances include a secure planning/briefing room, conference/meeting rooms, operations center, files/supplies storage, etc.

5/ The allowance shown in the table for JFHQ space already includes the following: 100 square feet for COMSEC supplies/equipment; 120 square feet for a terminal room for the Worldwide Military Command and Control System (WWMCCS); and 200 square feet for the terminal room for on-line secure interactive system support.

6/ For a records storage area, you are authorized in square feet the total required strength for all assigned units divided by 20.

7/ For military records archives storage area, you are authorized in square feet the total required strength for all assigned units in the state divided by 4.

8/ Unit storage space shall be computed based on authorized strength of, and cubage of the equipment (excluding

vehicles/equipment provided space under military equipment parking, other items normally stored outside and provided space elsewhere, and individual clothing and equipment) authorized to the unit(s) assigned to the facility.

- a. Each unit or detachment with a required strength of 55 or more is authorized:
  - (1a) Heated storage space. A net area of 2,700 square feet within the readiness center facility is authorized for an equipment cubage of 0 to 4,000 cubic feet.
  - (1b) Arms Vaults. One vault (600 square feet) for every unit greater than 12.
  - (2) Unheated storage space. If total equipment cubage exceeds 4,000 cubic feet, a detached building or an equivalent area incorporated within the readiness center facility is authorized based on one of the following applicable categories:

Total Cubage In Cubic Feet	Net Square Feet (NSF) Authorized
4,001 to 8,000 NSF	= 0.6 x (Total Cubage minus 4,000)
Exceeds 8,000 NSF	= 2,400 + [0.2 x (Total Cubage minus 8,000)]

- b. Each unit or detachment with a required strength of less than 55 but greater than 10 is authorized:
  - (1) Heated storage space. A net area (minimum of 1,300 square feet) within the readiness center facility for an equipment cubage of 0 to 4,000 cubic feet as determined by the formula listed below.

$$\text{Heated Storage} = 0.6 \times \text{Total Cubage}$$

- (2) Unheated storage space. If total cubage exceeds 4,000 cubic feet, use the appropriate applicable category referenced above in Note 8a (2).

9/ This 1,000 square feet authorized for the battalion supply area is intended for a temporary storage area of supplies in transit to and from organic subunits. Shelving for this area is authorized. Vaults or improved office space are not authorized. However, a wire cage partition may be erected to give security to more sensitive supplies. For the Supply and Transport Battalion (Divisional) and the Support Battalion (Separate Brigade) this 1,000 square feet is only authorized for units that have a fulltime functioning supply support activity (SSA) and is intended for a temporary storage area of supplies in transit to and from organic units within the Division or Separate Brigade.

10/ Space may be divided, provided that the total of the separate space allocated to men and women is within the total space authorized. Also, a part or the total area may be used as unit storage space.

11/ A photographic studio (20' x 25' with an approximate 10 foot ceiling height) is authorized in JFHQ readiness centers that do not have a collocated Public Affairs Detachment with a video mission.

12/ In addition to the basic allowance, an additional 60 square feet is authorized for each statewide media outlet in excess of 12. In addition, the JFHQ assembly hall is authorized additional electrical, phone, and data outlets, air conditioning, and special acoustical treatment to make it conducive for use as a media room in case a briefing exceeds the size of the regular media room.

13/ Not more than one examination facility shall be authorized in a single readiness center.

14/ This item refers to communications security and other information technology items (e.g., computer hardware) unique to specific units. IT space allowance to be determined in coordination with State J-6 and the Army National Guard Information Technology Plans, Policy, and Resource Division, Governance and Policy Branch (ARNG-IMG-G) prior to the submission of programming documents. Joint Force Headquarters are authorized 175 square feet for a vault to store cryptographic, encryption, tape backups, and other secure J-6 materials. Joint Force Headquarters also require sufficient space to run the communications hub for the State, a help desk for the State, and to do IT repair. For planning purposes this will probably be at least 7,000 square feet, but the exact amount must be coordinated between the State J-6 and ARNG-IMG-G prior to the completion of the DD Forms 1390/1391 during the charrette process.

15/ Readiness Centers: For Readiness Centers that are not in a Complex or are located more than a mile radius to a Surface Equipment Maintenance Facility (SEMF), such as Field Maintenance Facility (FMS), the RC projects are authorized one General Purpose Training Bay (GPTB). The GPTB is configured the same as a SEMF General Purpose Work Bay (GPWB) plus egress aisles. Paragraph 3-3.d. describes a GPWB. Paragraph 3-3.d. (5) describes egress aisles. For Readiness Centers located within a Complex or within a distance less than 1 mile radius to a SEMF, the adjoining SEMF will be modified to add an (attached or unattached) GPTB.

The GPTB designated for a Readiness Centers that supporting units with a MTOE maintenance section or personnel is authorized the following if validated and approved by ARNG-ILI:

- o Compressed air delivery system
- o Vehicle exhausts evacuation system
- o Electrical and IT Ports
- o A trench/floor drain connected to an oil-water separator

- Waste oil/hazardous materials storage as required but not to exceed 100 sf.
- Required safety and/or hygiene equipment (i.e. emergency eyewash stations, hand wash facility, etc.)
- A 15-ton traveling bridge crane may be authorized based on unit mission.
- In addition, each unit with a MTOE maintenance section or maintenance personnel of 4 or greater stationed at the Readiness Center in ASIP are authorized:
  - Supervisor's office: 100 square feet.
  - Inspections and library: 110 square feet.
  - Tool room: 300 square feet.
  - Supply room: 300 square feet.
- Any other areas required by the unit's mission must be justified as exceptions to criteria.

16/ Add 200 square feet for: a Representative Weather Observation Station (RWOS). See UFC 3-260-01.

17/ All spaces are required in the dimensions shown. If any spaces are omitted, corresponding adjustments to other spaces will be required to accommodate personnel and equipment required for mission capability.

18/ Average ceiling height of 20 feet to 30 feet is recommended, with 18 feet as a minimum. Minimum wall length is 30 feet.

19/ Average ceiling height of 18 feet recommended, with 15 feet as a minimum. Room should not be square.

20/ Minimum wall length is 15 feet, to allow for work space and storage.

21/ Requires 65 feet of linear storage for: instrument lockers. If this space is omitted, main rehearsal studio must be increased in size by 520 net square feet.

22/ Minimum width is 10 feet. The recording studio must have visual contact by means of soundproof glass or video camera with the main rehearsal studio. Visual contact with the large group rehearsal studio is highly desired.

23/ This area may be combined with individual instrument storage.

24/ In combination of large (80-125 net square feet) and small (55-65 net square feet) individual soundproofed rooms.

25/ Commercially available soundproofed prefabricated modules may be used, particularly in cases of renovation/renewals.

**Table 2-3. Schedule II, Physical Exam/Flight Surgeon Space Allowances**

**(Allowance in net square feet, exclusive of interior and exterior walls) Functional Area 1/**

Functional Area	161-320	321-640	641-1280
1. Reception, Waiting and Form writing	210	280	350
2. Doctor's Office <u>2/</u>	80	80	160
3. Exam Room <u>3/</u>	220	330	550
4. History Station	70	70	105
5. Height & Weight	70	70	70
6. Blood Pressure and Pulse Station	70	70	70
7. Electronic Consult System	<u>4/</u>	110	110
8. Lab	70	70	70
9. Blood Specimen Collection	70	70	70
10. Specimen Toilet	36	36	60
11. Vision Test <u>5/</u>	70	70	70
12. Hearing Test	90	150	210
13. Dental Check <u>6/</u>	100	100	200

Notes:

1/ These functional areas are based on exams per year. These facilities shall not be authorized unless establishment of examination facilities has been approved by the Office of Chief Surgeon (ARNG-CSG). (See UFC 4-510-01) Not more than one examination facility shall be authorized in a single readiness center. Sizes are based on operation of the facility at least 15 days per year.

2/ 80 square feet for each doctor.

3/ 110 square foot room minimum. One room may be used for consulting, review of completed physical examination paperwork, weight control counseling or similar purposes.

4/ Electronic Consult System (ECS) and Tonometry Station will be in the Exam Room when under 320 exams per year

5/ An additional 140 square feet is authorized to accommodate eye examinations if the facility is authorized to conduct flight physical examinations. The circulation space should then be increased by 20 square feet because of the additional 140 square feet for the eye examinations.

6/ 100 square feet minimum per area.

**Table 2-4. Civil Support Team Facility Allowances  
(Allowance in net square feet, exclusive of interior and exterior walls)**

<b>Functional Area</b>	<b>Allowances</b>
1. Classrooms/Library <u>2/ 3/</u>	1,050
2. Training Aid Storage <u>2/</u>	80
3. Break Room (Area) <u>2/ 3/</u>	662
4. Vending Area <u>2/ 3/</u>	75
5. Toilets/Shower <u>1/</u>	600
6. Flammable Materials Storage <u>2/</u>	100
7. Table/Chair Storage <u>2/</u>	80
8. Physical Fitness <u>2/ 3/ 4/</u>	600
9. Ready Bays	6,200
10. Ops Center <u>2/</u>	680
11. Admin Space General <u>2/</u>	<u>5/</u>
12. Admin Space Special <u>2/</u>	650
13. COMSEC <u>2/</u>	420
14. Storage <u>2/</u>	2,400
15. Lockers <u>2/</u>	992
16. Laundry <u>2/</u>	120
17. Medical Support/Storage <u>2/</u>	200
18. Equipment Maintenance <u>2/</u>	1,000
19. DECON Room <u>2/</u>	100

Notes:

1/The toilet/shower allowance is to be split into appropriate facilities to support both males and females. The split should account for both minimum code requirements and anticipated building usage. The basic allowance may be increased by 10%, if the facility has two or more floors, in order to allow a toilet area to be installed on each floor.

2/All equipment, furniture and pre-wired workstations must be obtained with other than Federal construction funds.

3/ If CST is collocated with a Readiness Center, the Classroom, Library, Break Room, Vending Area, and Physical Fitness will not be included as part of the CST portion of the building, but rather will be located in the readiness center.

4/ Physical Fitness area is not authorized if a campus/training site physical fitness facility exists and a Memorandum of Agreement (MOA) between the installation commanders and unit exist.

5/ Refer to Army Regulation (AR) 405-70, Table D-1 and D-2 for Private and Open office space allowances. All 22 members of the CST DO NOT each get 130 SF office space.

### **Chapter 3 Logistical Facilities**

#### **3-1. General**

a. Standards. This chapter establishes the space allowances for all ARNG Logistical Facilities construction projects, including the United States Property and Fiscal Office (USPFO).

b. Space allowances.

(1) Logistical Facilities space allowances are based on the authorized strength(s), the numbers, occupational specialties, and job descriptions of full-time personnel, the numbers and types of equipment authorized, and special requirements of the supported units.

(2) Refer to Table 3-1 for USPFO Administrative Space Allowances

(3) Refer to Table 3-2 for Lifting Devices/Cranes

(4) Refer to Table 3-3 for Schedule I, Office, Work, and Personnel Space allowances in Surface Equipment Maintenance Facilities (SEMF)

(5) Refer to Table 3-4 for Schedule II, Work Bay Space allowances in Surface Equipment Maintenance Facilities (SEMF)

- (6) Refer to Table 3-5 for Warm Up Bay allowances
- (7) Refer to Table 1-5 for Flagpole allowances
- (8) Refer to Table 1-7 for Facility Support Space allowances.
- (9) Refer to Table 1-8 for Circulation allowances.
- (10) Refer to Table 1-9 for Walls allowance.
- (11) Refer to Table 1-10 for Controlled Waste Handling Facilities (CWHF) space allowances.
- (12) All other space requirements not specifically indicated in the referenced tables will be treated as exceptions to criteria. The State must fully justify such requests and the NGB proponent must concur with them before ARNG-ILI will approve including them in the programming documents and the final design of the project.

**3-2. USPFO Administrative Offices, Warehouses, and Central Issue Facilities (CIF)**

a. A United States Property and Fiscal Officer (USPFO) is assigned to each State and Territory for which a federally recognized National Guard has been established. Each USPFO requires a support staff and certain facilities in order to perform his/her primary mission of being responsible for all federal funds and property. These include administrative and office space, warehouse space, a CIF, areas for the temporary storage of military vehicles and equipment prior to issue or turn-in, and parking for employee and visitor POVs.

b. Administrative Area.

(1) The criteria for determining the area(s) authorized to support administrative staff activities for the USPFO are predicated upon a presumption that these areas will be located within the same structure that provides administrative space for the Joint Force Headquarters (JFHQ). This may be accomplished by incorporating the USPFO administrative staffing requirements, as delineated in the JFHQ Table of Distribution and Allowances into the construction plans for the new JFHQ complex or addition to the existing JFHQ structure. However, when the number of full-time administrative employees required by the USPFO exceeds 25 and the operational complexities within a particular State make collocation impractical or impossible to achieve, the State may seek authorization to construct a separate, freestanding USPFO administrative structure. In such a case, the CFMO shall provide substantive documentation to ARNG-ILI in order to validate why collocation is not feasible.

(2) The allowance for the USPFO administrative area is based upon the number of full-time administrative employees, other than those whose duties are directly related to Information Technology (IT) or the receipt, storage, transportation and warehousing of military vehicles, clothing and equipment. Job titles such as IT Specialist, IT Equipment Operator, Supply Technician, Motor Vehicle Operator or Materials Handler exemplify those that would not be classified as administrative. Table 3-1 indicates how this space is to be calculated.

(3) State employees and/or contractors who are hired by the state to provide liaison between the State and the USPFO are not considered to be USPFO staff. Thus, they are neither added to nor subtracted from the number of full-time administrative positions required by the particular USPFO staffing document.

(4) Administrative space includes all functional areas needed for the performance of administrative functions and those areas required to support the personnel performing those activities. These spaces include administrative offices, record storage areas, a single classroom and briefing area (if the administrative area for the USPFO is not within the same structure or collocated with the JFHQ, additional space is authorized), a conference room, an employee break room, latrine/shower/locker rooms, mechanical/electrical/telephone/IT spaces, custodial storage, and intra-office circulation.

(5) Wherever possible, construction of private offices and areas enclosed by walls should be kept to a minimum consistent with operational needs for privacy of communication and/or security. The use of individual and collective work spaces is to be maximized.

**Table 3-1. USPFO Administrative Space Allowances**

Staffing Level	Basic Allowance	PLUS Additional Space (SF) of:			
1-25	5,000 SF	N/A	N/A	N/A	N/A
26-60	5,000 SF	200/person>25	N/A	N/A	N/A
61-100	5,000 SF	7,000	175/person>60	N/A	N/A
101-200	5,000 SF	7,000	7,000	165/person>100	N/A

201-300	5,000 SF	7,000	7,000	16,500	155/person>200
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c. Information Technology and Secure Telecommunications Areas. An area of no more than 2,000 square feet is authorized to support IT activities directly related to USPFO operations. This space includes:

- (1) A 150 SF office for the IT manager,
- (2) A 150 SF server room,
- (3) A 150 SF SIPRNET room, and
- (4) One or more storage rooms or areas not to exceed 150 SF total.
- (5) Other IT personnel working area.

d. Warehouse and Loading Dock. Every effort shall be made to incorporate the USPFO warehouse into the same structure as that providing the USPFO administrative space. If this cannot be accomplished, the two shall be placed at minimum practical distance from each other and connected by an enclosed passageway where feasible.

(1) The allowance for net warehousing space for the USPFO, exclusive of the CIF, is a basic allowance of 5,500 square feet for authorized troop strength of 1,000 or less. For an authorized troop strength exceeding 1,000, the basic allowance is 5,500 SF plus 5 square feet for each ARNG Soldier exceeding 1,000 authorized to the State or Territory for the federal fiscal year projected to be the year of construction.

(2) Although the space authorized for the storage of flammable material is included in the overall allowance for USPFO warehouse space, it may not exceed four percent of the total net warehouse space calculated.

(3) The allocation of space for vaults, latrine/shower/locker rooms, a warehouse manager's office, and an employee break room shall be determined based upon Table 3-3. This space, if utilized, shall be deducted from the total net area calculated for the USPFO warehouse.

e. Class VII Storage Areas. An open area not to exceed 90,000 square feet (10,000 square yards) and enclosed by a security fence may be set aside for the temporary storage of vehicles and equipment prior to its disposal or pick-up by the unit to which it is being issued. This area may be paved according to climate force structure, or environmental considerations

(1) This space is in addition to any other areas of pavement authorized for the parking of POV, commercial-type USPFO transport and/or delivery vehicles, etc.

(2) Where a need for additional secure storage area can be documented, such space may be authorized as an exception to criteria.

f. Physical Fitness Room. If the administrative area for the USPFO is not within the same structure or collocated with the JFHQ, additional space is authorized to provide an enclosed and properly ventilated area for the placement of physical fitness equipment for use by all members of the full-time USPFO staff. When there are five or more full-time technicians authorized on the manning document for the USPFO section, a net area of 600 square feet is authorized. For each additional approved full-time technician, that space may be increased by 30 square feet, up to a maximum of 1650 square feet for the entire room. However, when the USPFO offices are collocated within the same structure as the JFHQ, the number of USPFO staff members should be included in the total number of personnel used to determine the size of the physical fitness room within that structure.

g. Central Issue Facility (CIF). The CIF and the USPFO Warehouse should be located within the same structure whenever feasible in order to facilitate the use of a single loading dock. In this case, the CIF shall be constructed as a separate section of the USPFO warehouse separated by CMU blocks or other permanent wall type and must have its own entrance. Alternatively, the CIF may be constructed as a separate or stand-alone building.

(1) Additional space for a CIF is authorized on the basis of 2.2 SF times the number of Soldiers on the ARNG force structure document for the state or territory/DC for the federal fiscal year that is projected to be the year of construction.

(2) A designated clear space, not to exceed 1000 square feet, may be set aside within the CIF for use as a Unit-level show down and layout area. This space comes out of the net area authorized for the CIF.

(3) An area, not to exceed 100 square feet, is authorized to accommodate up to five private dressing rooms of 20 square feet each. Each dressing room shall be provided with lighting but heating, cooling and mechanical ventilation beyond that provided to the general CIF space is not required. This space comes out of the net area authorized for the CIF

(4) An area of 150 square feet may be set aside for the construction of an office for the CIF manager. This space may be increased to a total of 250 square feet if it will be occupied by two individuals. This space comes out of the net area authorized for the CIF.

### 3-3. Surface Equipment Maintenance Facilities (SEMF)

a. The criteria presented in this paragraph are applicable to all new construction and existing structures intended to function as SEMF.

- (1) Refer to Table 3-3 for office, work, and personnel allowances (Schedule I items).

(2) See Table 3-4 for work bay authorizations (Schedule II items).

b. Tables 3-3 and 3-4 differentiate between field maintenance and sustainment maintenance facilities.

(1) Field maintenance refers to work that is generally performed at a Field Maintenance Shop (FMS), a Unit Training and Equipment Site (UTES), and a Maneuver Area Training Equipment Site (MATES) without Support.

(2) Sustainment maintenance refers to work that is generally only performed at a Combined Support Maintenance Shop (CSMS) or MATES with Support.

(3) Normally, Special Purpose Work Bays (SPWB) will only be incorporated into the design of sustainment maintenance facilities. However, in order to better distribute workload/workforce, a State may elect to tailor an FMS to perform sustainment level maintenance functions. One or more special purpose work bays/areas may be incorporated into the design. The State shall provide the Maintenance Support Plan, manning document, and equipment densities to ARNG-ILI, through ARNG-ILS during the DD Forms 1390/1391 review process to substantiate that those functions will not duplicate similar work performed at an existing or planned sustainment maintenance facility.

c. Office, Personnel, and Work Areas.

(1) The net area in square feet allowed for each functional area is listed in Table 3-3, Schedule I, in the columns under each type of maintenance facility. The office and personnel areas are defined as the CORE area.

(2) If the function is designated NA, that area is not authorized for the facility unless approved as an Exception To Criteria (ETC). All ETCs require final approval of ARNG-ILI.

(3) Some areas sizes are calculated as the sum of the amount in the basic allowance plus the amount listed under the specific facility type or footnote from the appropriate table.

(4) The sizes of some areas are determined by an amount of square feet times a factor, such as the number of general purpose work bays authorized for the shop, federal technicians/Soldiers/employees required to perform the function at the shop, total troop strength supported by the shop, or the number of combat vehicles authorized at the shop.

d. Work Bays.

(1) SEMF work bays are either general purpose or special purpose.

(a) General Purpose Work Bays (GPWB) are those in which mechanics repair, replace, or adjust the operational mechanisms of vehicles and equipment.

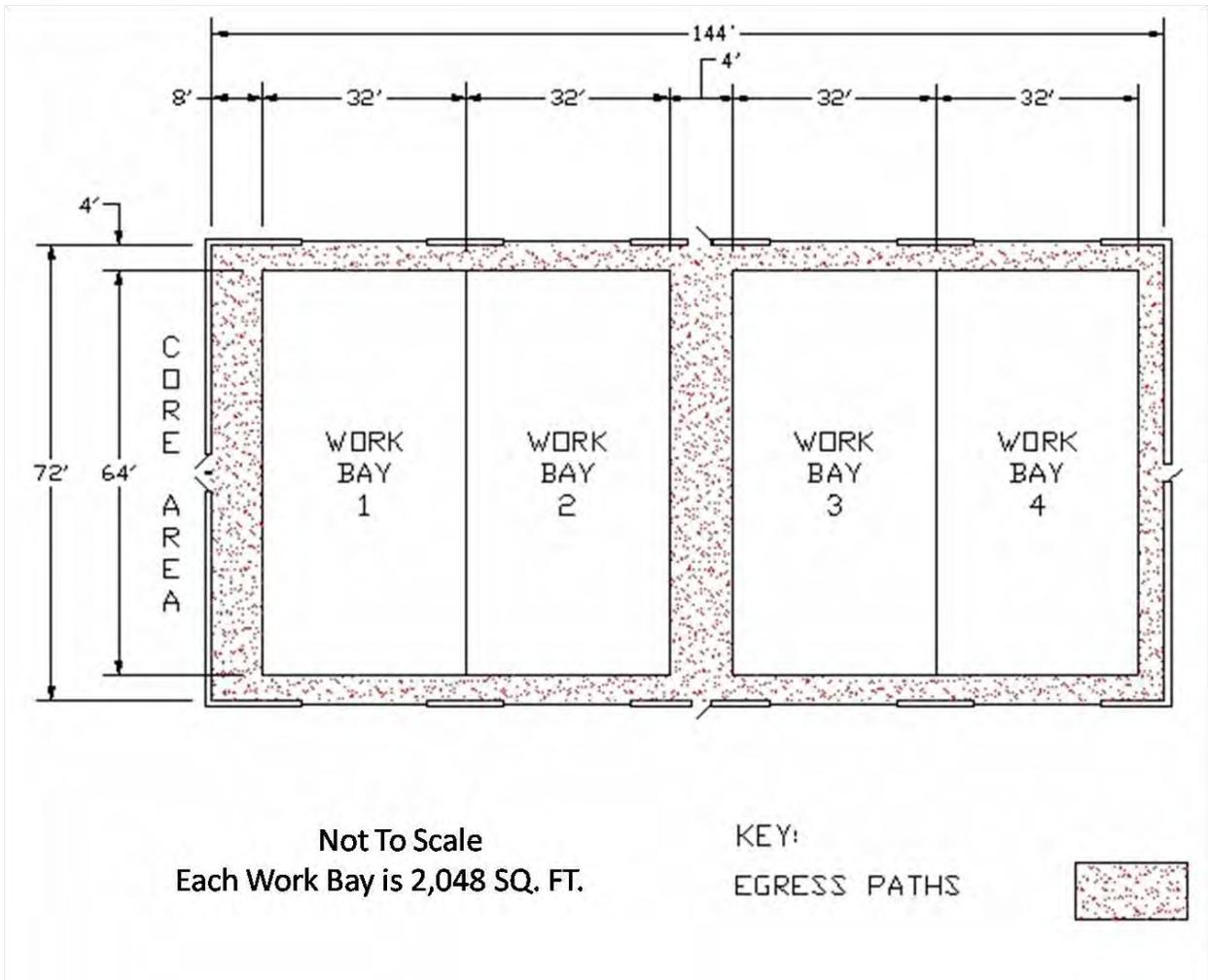
(b) Special Purpose Work Bays (SPWB) (see Table 3-4) are those that support a specialized functional area, such as, welding, painting, etc, not general vehicular maintenance.

(2) All work bays at a facility shall be the same size to facilitate design and construction while minimizing construction costs. The bay size shall be 32 feet wide by 64 feet long. This does not include routes of egress. Egress walkways shall not bisect the longitudinal axis of work bays.

(3) The authorized number of GPWB is determined by the number of mechanics required for the facility based upon the surface equipment density. Mechanics are defined as non-supervisory personnel who work primarily in GPWB. The personnel who work in special purpose work areas are not to be used in determining the number of GPWB. The number of authorized GPWB will be determined on the basis of one work bay for every six field or sustainment level maintenance mechanics required. Any fraction of a work bay resulting from this calculation authorizes an additional bay.

(4) No SEMF shall be constructed unless the number of required mechanics justifies two GPWBs. Thus, the construction of a SEMF requires at least seven mechanics, that is one GPWB per six mechanics plus a fraction of a GPWB (approximated to be one GPWB).

(5) A safety walkway (route of egress) shall be provided along the perimeter of each set of two work bays. It shall be four feet wide, except at the interface of the administrative core area and the first work bay adjacent to that core area, where the walkway shall be eight feet wide. Each safety walkway running parallel to the major axis of the work bays shall have a personnel door at either end to provide exit out of the building. The safety walkways that are perpendicular to the major axis of the work bays shall be free of any obstruction caused by a structural member or equipment support column. As detailed in Figure 3-1, safety walkways shall not bisect work bays. This space is not a component of the allowance authorized for circulation, as presented in Table 1-8, and shall not be construed as such.



**Figure 3-1. Egress & Work Bay Dimensions 1**

e. Lifting Devices. When the operation performed in a general purpose or special purpose work bay requires the extraction or lifting of equipment or materials exceeding 50 pounds in weight, appropriate lifting devices are authorized as installed building equipment in the following areas:

**Table 3-2. Lifting Devices/Cranes**

<b>Work Area</b>	<b>Min. Crane Capacity</b>	<b>Min. Hook Height</b>	<b>Qty</b>	<b>Remarks</b>
GPWB	15 Ton	17 feet	1	Per each 5 work bays or fraction thereof (e.g. 4 work bays are authorized 1 crane, 6 work bays are authorized 2 cranes, etc.). Lifting device(s) should be installed to service 100% of all authorized GPWB areas.
Armament Bay <u>1/</u>	30 Ton	22 feet	1	SEMF supporting M1 Family of Vehicles (FOV) only. Authorized one work bay (preferably an end bay). Should traverse the bay's length to perform maintenance on these vehicles.
Welding Bay <u>1/</u>	7.5 Ton	17 feet	1	
Body Bay <u>1/</u>	7.5 Ton	17 feet	1	If design places Welding and Body Bays adjacent to each other, the state should make every attempt to employ the same device to support both functional areas.
Engine Test Cell <u>1/</u>	5 Ton	14 feet	1	
Transmission Test Cell <u>1/</u>	3.5 Ton	14 feet	1	
Machine Shop <u>1/</u>	1 Ton	10 feet	1	
Radiator Test & Repair <u>1/</u>	0.5 Ton	10 feet	1	
Fuel & Electric Repair <u>1/</u>	0.5 Ton	10 feet	1	
Canvas Shop <u>1/</u>	0.5 Ton	14 feet	1	

Lifting Devices Note:

1/ If shop/area is authorized

f. Other Installed Equipment. NG Pam 415-5, Chapter 4, contains a comprehensive, but not all inclusive listing of equipment by type that may be installed or built into SEMF. States should contact Army Environmental Programs Division (ARNG-ILE) if considering permanently installed pollution prevention equipment.

g. Outside Support Items. Supporting items or specialty areas that may be provided at SEMF are as follows:

(1) Cannibalization Area. An area of rigid pavement equal to the greater of 1,000 square yards or 10% of the area authorized for military vehicle parking and enclosed with a security fence and illuminated by security lights is authorized at CSMS and MATES with Support. If this enclosure is not adjacent to other paved areas, a 20 foot wide rigid paved access road is authorized. For programming purposes, rigid pavement shall be eight inches of concrete. Actual design will be determined by structural calculations.

(2) Vehicle Issue/Turn-in Area. A vehicle issue/turn-in area equivalent to 10% of authorized collocated military vehicle parking is authorized at an UTES or MATES. Area should be level-graded and have an aggregate surface. This area should have suitable security lighting and fencing.

### **3-4. Unheated Enclosed or Shed-Type Vehicle Storage Space**

Refer to section 1-9d(1)v.

### **3-5. Firefinder Radar (AN/TPQ36, AN/TPQ37, and AN/TPQ47) Facility**

- a. Space criteria. Each set is authorized a 20 foot by 40 foot net floor area as a special purpose bay.
- b. Location. This facility may be located either at a surface equipment maintenance facility or at a readiness center, whichever is the most cost effective and practical, but not at both. It should generally be located within a military vehicle parking area or adjacent to some other paved area.
- c. All other space requirements not specifically indicated in this Chapter will be treated as exceptions to criteria. The State must fully justify such requests and the NGB proponent must concur with them before ARNG-ILI will approve including them in the programming documents and the final design of the project.
- d. Facility design. For detailed design guidance, refer to NGB DG 415-2.

### **3-6. Unheated Controlled Humidity Preservation (CHP) Shelters**

- a. Federal support for CHP Shelters is managed by ARNG-ILS-M IAW Memorandum, ARNG-Z of 19 September 2007, and subject: National Guard Bureau Controlled Humidity Preservation Program Policy.
- b. Equipment for preservation will be approved by the ARNG-ILS-M CHP Program Manager (PM) IAW ARNG-ILZ-A approved equipment preservation priorities.
- c. CHP Shelter space shall be unheated and shall be calculated based on the operational shipping configuration of each approved piece of equipment plus one foot in all directions for circulation space.
- d. When enclosed CHP space is provided, the amount of paved area (authorized for parking of military vehicles at the site) shall be reduced by the area of the preservation space.
- e. CHP shelters shall be pre-engineered, un-insulated, unheated, and unlighted metal shelters of a design to accommodate a relative humidity (RH) of less than 50% RH at all times, and less than 40% RH 90% of the time; subject to conditions caused by an act of nature.
- f. CHP Shelters shall not be provided with fresh water or sewer facilities and shall not be used for any purpose other than Controlled Humidity Preservation unless specifically approved by the ARNG-ILZ-A.
- g. CHP Shelters shall be provided with a moisture vapor barrier and concrete floor designed for the heaviest type vehicle to be preserved (eight inches for track vehicles; six inches for wheel vehicles).
- h. Manually operated overhead or rollup doors at each end of the CHP shelter are authorized as follows:
  - (1) Two doors for each 5,000 Square Foot (SF) or 10,000 SF shelter
  - (2) Four doors for each of 15,000 SF; 20,000 SF; 25,000 SF; or 30,000 SF shelters.
- i. A 20 foot deep concrete apron is authorized in front of each vehicle entrance.
- j. Final shelter design shall be as accepted from the contractor by the CHP PM in ARNG-ILS-M and approved by ARNG-ILI.

**Table 3-3. Schedule I, Office, Work, and Personnel Space Allowances in SEMF  
(Allowance in net square feet, exclusive of interior and exterior walls)**

Functional Area	Basic Allowance <u>1/</u>	Field Maintenance	Sustainment Maintenance
<b>1. Office Area</b>			
a. General Supervisor	200	<u>2/</u>	<u>2/</u>
b. Supervisor	150	<u>2/ 3/</u>	<u>2/ 3/</u>
c. Production Controller	150	<u>2/ 3/</u>	<u>2/ 3/</u>
d. Inspection & Library	200	<u>4/</u>	<u>4/</u>
e. Administrative Assistant/Secretary	200	<u>2/ 4/</u>	<u>2/ 4/</u>
f. Common IT Space	NA	<u>5/</u>	<u>5/</u>
g. IT Support Activities (Server Room)	NA	<u>6/</u>	<u>6/</u>
h. Classroom	500	10 per Tech <u>7/</u>	10 per Tech <u>7/</u>
i. Conference Room	NA	<u>8/</u>	<u>8/</u>
<b>2. Personnel Area</b>			
a. Latrine/Shower	250	<u>2/</u>	<u>2/</u>
b. Locker Room	125	<u>2/</u>	<u>2/</u>
c. Break Area	400	<u>3/</u>	<u>3/</u>
d. Physical Fitness Area	600	<u>4/</u>	<u>4/</u>

Office Area Notes:

1/ The basic allowance column applies to all surface equipment maintenance facilities. It is additive to any allowances authorized in the columns for field maintenance or sustainment maintenance.

2/ If position or specialty is authorized.

3/ Add 150 square feet for each required position greater than one.

4/ Plus 60 square feet per required position over one.

5/ Each TDA authorized Standard Army Management Information System (STAMIS) terminal supporting maintenance related programs (e.g. SAMS-E, etc.) is authorized 30 square feet and each printer 10 square feet. A copy of the Information Management Plan authorizing equipment should be included with the initial submission of the programming documents (DD Forms

1390/1391). Desktop computers and other pieces of single user information technology equipment are not eligible for additional floor space because they are considered part of the work area for the individual position.

6/ Size to be determined by coordination between State J-6 and ARNG-IMG-G prior to submission of programming documents. Recommend using a planning factor of 150 square feet.

7/ Total classroom size may not exceed 2,000 square feet.

8/ Authorized 400 square feet for facilities with four or more supervisors. None if less than four Supervisors

Personnel Area Notes:

1/ The basic allowance column applies to all surface equipment maintenance facilities. It is additive to any allowances authorized in the columns for field maintenance or sustainment maintenance.

2/ The total space authorized for the men's and women's shower and latrine areas is based on an allocation of 10 square feet for each authorized person plus the basic allowance as stated in the table. The total space allocated for men's and women's locker room is 12 square feet for each authorized person plus the basic allowance as stated in the table. These allowances are to be split into separate areas for men and women that are appropriately sized and configured to meet both local code requirements and anticipated building usage.

3/ The basic authorization is 400 square feet for up to eight full-time support personnel, with an additional 20 square feet per individual for 9 to 20 full-time support personnel requirements, 12 square feet per individual for 21 to 40 full-time support personnel, and eight square feet per individual for full-time support personnel exceeding 40. This space may be a single consolidated area or several smaller break rooms. Refrigerators, microwaves, etc. may be installed in this area, but ranges are not authorized.

4/ The basic allowance is authorized only when there are eight or more full-time technicians required at the SEMF based on equipment density. For each additional required full-time technician over eight, the allowance increases by 30 square feet to a maximum of 1650 square feet.

**Schedule I: Table 3-3. Cont.**

Functional Area	Basic Allowance <u>1/</u>	Field Maintenance	Sustainment Maintenance
<b>3. Work Area</b>			
a. Tool Room	600	50 per GPWB <u>3/</u>	50 per GPWB <u>3/</u>
b. Supply Room	500	100 per GPWB <u>4/</u>	100 per GPWB <u>4/</u>
c. Battery Room	200	25 per GPWB <u>5/</u>	25 per GPWB <u>5/</u>
d. Comm/Electronic Shop	100	100 per Tech <u>2/</u>	100 per Tech <u>2/</u>
e. Instrument Repair Shop	350	100 per Tech <u>2/</u>	100 per Tech <u>2/</u>
f. Small Arms Repair Shop	125	100 per Tech <u>2/</u>	100 per Tech <u>2/</u>
g. Small Arms Test Room	440	N/A	<u>2/ 6/</u>
h. Vault (Small Arms)	150	<u>2/ 7/</u>	<u>2/ 7/</u>
i. Vault (Combat Vehicle Arms)	130	<u>2/ 8/</u>	<u>2/ 8/</u>
j. Injector Test Room	300	N/A	<u>2/</u>
k. Fuel and Electric Repair Shop	525	N/A	<u>2/</u>
l. BII Storage/Issue	<u>N/A</u>	<u>2/ 9/</u>	<u>2/ 9/</u>
m. Machine Shop	1,600	N/A	<u>2/</u>
n. Carpenter Shop	1,500	N/A	<u>2/</u>
o. Lumber Storage Area	500	N/A	<u>2/</u>
p. Canvas Shop	800	N/A	<u>2/ 10/ 11/</u>
q. Missile Repair Shop	400	N/A	<u>2/ 12/</u>
r. Vault (Missile)	<u>N/A</u>	<u>2/ 13/</u>	<u>2/ 13/</u>
s. Calibration Room	400	N/A	<u>2/</u>
t. Calibration Storage	400	N/A	20 per 1000 Troops <u>2/</u>
u. Glass Repair Room	200	N/A	15 per GPWB>13 <u>2/</u>
v. Radiator Test & Repair Room	660	N/A	<u>2/</u>
w. COMSEC Repair Room	250	N/A	<u>2/</u>
x. Radiation Calibration Room	300	N/A	<u>2/</u>
y. Bulk POL Storage for Lube Sys			
2 to 6 GPWB	80		
7 to 10 GPWB	176		
11 & Over GPWB	272		
z. Bulk POL Storage	200	50 per GPWB>2 <u>14/</u>	50 per GPWB>2 <u>14/</u>
aa. CWHF	<u>15/</u>	<u>15/</u>	<u>15/</u>
ab. Bulky Equipment Storage	200 per GPWB	<u>16/</u>	<u>16/</u>
ac. Flammable Materials Storage	3% of net area	<u>17/</u>	<u>17/</u>
ad. Enclosed unheated storage	250 per WB	150 per WB> 4 <u>18/</u>	150 per WB > 4 <u>18/</u>
ae. Washer Dryer Utility Space	100	<u>19/</u>	<u>19/</u>
af. DSESTS/Fire Control Shop	N/A	N/A	200 per set

Work Area Notes:

1/ The basic allowance column applies to all surface equipment maintenance facilities except as indicated by an NA. It is additive to any allowances authorized in the columns for field maintenance or sustainment maintenance.

2/ If position or specialty is authorized.

3/ This additional tool room space is authorized for each authorized and programmed work bay greater than four.

- 4/ 100 square feet for the first full-time support individual and 60 square feet for each additional full-time support individual assigned as a supply assistant and/or equipment maintenance clerk may be partitioned off as office space. This office may not increase supply room authorization. A covered dock (if justified) or an apron is authorized.
- 5/ Total not to exceed 500 square feet.
- 6/ The net area of the Small Arms Test Room is comprised of a firing area four feet by eight feet, a firing lane tunnel four feet by 82 feet, and a bullet stop area four feet by 20 feet for a total of 440 square feet.
- 7/ The Small Arms Vault should be sized at 20 square feet for each 1,000 troops supported, but not less than 150 square feet.
- 8/ This vault is authorized only at a UTES or MATES. In addition to the basic allowance, an additional 2.5 square feet is authorized for each combat vehicle up to 460, then 1.75 square feet for each combat vehicle over 460, and an additional 0.5 square feet for each authorized M2/M3 (Infantry/Cavalry Fighting Vehicle). Double-leaf vault doors are authorized if materials handling equipment is used.
- 9/ BII not applicable for CSMS. Authorized 21.5 square feet per tracked vehicle and 4.0 square feet per wheeled vehicle. The combat vehicles or wheeled vehicles to be used in computing the total BII space allowance are vehicles authorized to be permanently assigned to the UTES or MATES. The BII storage may be a separate structure and the inside area may be subdivided by wire mesh partitions to segregate by unit level. A 20 foot wide concrete apron with a cover overhead may be installed on one side of the warehouse to load BII with forklifts. The length of the apron shall not exceed the minimum lateral building dimension. A 20 foot by 20 foot covered loading dock is authorized for the BII storage.
- 10/ A pit (approximately six feet square by three feet deep) may be provided in the Canvas Shop to allow the sewing machine to be installed level with the floor. The pit should be enclosed by a removable protective railing.
- 11/ An additional 200 square feet is authorized for each canvas repairman over one.
- 12/ The missile shop area authorization is based only on the largest unit supported, not on the sum of subordinate units supported. If the shop supports a brigade, it receives an additional 200 square feet; if it supports a division, it receives an additional 400 square feet.
- 13/ Vault size is six square feet per supported missile system as documented on equipment density listing. Vault should normally be collocated with the missile repair area.
- 14/ Storage may be freestanding or incorporated into the facility.
- 15/ See Table 1-10 - CWHF.
- 16/ This space is authorized to accommodate bulky maintenance equipment such as tire changers, floor jacks, portable lifts, equipment stands, and welding equipment. This space can stand alone or be incorporated into the GPWB.
- 17/ A detached prefabricated metal or masonry building of equivalent size may be used if this area is not incorporated into the facility. The allowance is 3% of total net area but no less than 100 square feet and no more than 600 square feet.
- 18/ Enclosed unheated storage. Detached buildings may be used, or an equivalent area may be incorporated within the facility to store major end items, items awaiting repair/direct exchange, and Class IX parts that are susceptible to damage from the outside elements. 150 SY of rigid concrete may be provided for access paving to the storage building. The storage area is determined based on the number of authorized field and sustainment maintenance work bays.
- 19/ This space, if utilized, shall be deducted from the facility maintenance and storage authorization in Table 1-7.

#### **Legend for Schedule I**

- CV** - Combat vehicles
- CWHF** - Controlled Waste Handling Facility
- N/A** - Not authorized
- Tech** - Full time employee in technician status assigned to the function
- TR** - Authorized aggregate supported troop strength
- GPWB** - General purpose work bay
- SPWB** - Special purpose work bay
- WB** - General purpose and special purpose work bays

**Schedule II: Table 3-4**

**Table 3-4. Schedule II, Work Bay Authorizations for Surface Equipment Maintenance Facilities**

Use	Field Maintenance	Sustainment Maintenance
1. General Purpose Work Bay	<u>1/</u>	<u>1/</u>
2. Special Purpose Work Bay	<u>2/</u>	<u>2/</u>
a. Warm-up Bay	<u>3/</u>	<u>3/</u>
b. Welding Bay	<u>1/4/</u>	<u>1/ 4/</u>
c. Body Shop	N/A	<u>1/ 4/</u>
d. Optional Wash Bay	<u>1/ 5/</u>	<u>1/ 5/</u>
e. Paint Stripping Bay	N/A	<u>1/ 4/ 6/</u>
f. Paint Preparation Bay	N/A	<u>1/ 4/</u>
g. Paint Bay	N/A	<u>1/ 4/ 7/</u>
h. Engine/Transmission Test Cell	N/A	<u>1/ 8/</u>
i. Armament Bay	<u>1/4/ 9/</u>	<u>1/ 4/ 9/</u>
j. Inspection Bay	<u>1/ 4/</u>	<u>1/ 4/</u>

Schedule II Notes:

1/ See paragraph 3-3.d. for work bay determination of allowance.

2/ Special Purpose work bays shall be the same size as the general purpose work bays.

3/ Warm-up bays are authorized IAW Table 3-5.

4/ One bay authorized if specialty technicians are authorized to the facility.

5/ A wash bay is optional, but if constructed, it will be in lieu of one exterior wash platform (CATCD 14955).

6/ The net bay size is to be 32 feet by 64 feet (exclusive of safety walkways). The blasting equipment may be programmed from the military construction appropriation. The bay requires its own, adjacent mechanical room of approximately 500 square feet, which is in addition to the mechanical space authorized in Table 1-7. The type of paint stripping equipment must be approved in writing by ARNG-ILI prior to initiating design. The design of this space must be reviewed and approved in writing by NGB Industrial Hygiene (ARNG-CSG-P). Their review will include such aspects as the equipment installed, the methods employed for ensuring adequate air flows, and worker safety in general.

7/ The net bay size is to be 32 feet by 64 feet (exclusive of mechanical equipment). The paint booth may be programmed from the military construction appropriation and should be designed to fit within the bay, incorporating all local codes and regulations. The bay requires its own adjacent mechanical room of approximately 500 square feet, which is in addition to the mechanical space authorized in Table 1-7. In addition to the bay and the mechanical room, a paint kitchen and a personnel hygiene/equipment maintenance area of 180 and 200 square feet respectively are authorized. The design of this space must be reviewed and approved in writing by NGB Industrial Hygiene (ARNG-CSG-P). Their review will include such aspects as the equipment installed, the methods employed for ensuring adequate air flows, and worker safety in general.

8/ Authorized only where justified as a valid mission requirement submitted in writing to and approved by ARNG-ILS-M. If authorized, a total of 2500 square feet are authorized to house a transmission dynamometer test cell, an engine dynamometer test cell, and a control room for each to perform the diagnosis of transmissions and engines. The control rooms may be collocated or separate areas. Additional mechanical space may be provided if required and justified. Dynamometers are authorized for procurement with military construction funds as installed building equipment.

9/ Authorized only for facilities supporting M1 series tanks.

**Table 3-5. Warm Up Bays <sup>1/</sup>**

Number of GPWB	Number of Warm Up Bays
1 – 6	1
7 – 11	2
12 – 16	3
17 or more	4

Notes:

<sup>1/</sup> Warm-up bays are authorized for geographic areas where the outside winter design temperature is 12 degrees Fahrenheit dry bulb or less as designated in the Unified Facilities Criteria 3-400-02.

### **3-7. Bollards**

Bollards are authorized to protect maintenance facilities IAW ARNG Design Guide.

## **Chapter 4 Aviation Facilities**

### **4-1. General**

a. Standards. This chapter establishes the space allowances for ARNG aviation facility construction projects.

b. Space allowances. All allowances are in net square feet, exclusive of interior and exterior walls. All Chapter 4 tables except 4-4 apply to facilities supporting either rotary wing aircraft or rotary and fixed wing aircraft. Only Tables 4-4 apply to stand-alone fixed wing facilities.

- (1) Refer to Table 4-1 for Space allowances for hangar floor areas.
- (2) Refer to Table 4-2: for Space allowances for specialized work areas.
- (3) Refer to Table 4-3: for Space allowances for personnel support areas.
- (4) Refer to Table 4-4 for Space allowances for fixed wing facilities.
- (5) Refer to Table 4-5 for Space allowances for unheated aircraft storage.
- (6) Refer to Table 1-5 for allowances for Flagpoles
- (7) Refer to Table 1-7 for Facility Support Space allowances.
- (8) Refer to Table 1-8 for Circulation allowances.
- (9) Refer to Table 1-9 for Walls allowance.
- (10) Refer to Table 1-10 for Space allowances for Controlled Waste Handling Facilities (CWHF)
- (11) All other space requirements not specifically indicated in the referenced tables will be treated as exceptions to criteria. The State must fully justify such requests and the NGB proponent must concur with them before ARNG-ILI will approve including them in the programming documents and the final design of the project.

### **4-2. Non standard Supporting Items**

a. Aircraft parking apron. Outside parking and tiedown spaces are authorized for 50 percent of the authorized aircraft plus one parking/tie down space for transient aircraft (size to be based on CH-47). The layout and dimensions of the aircraft parking and hoverlane/taxilane area shall be according to UFC 3-260-01. Parking and hoverlane/taxilane facilities for aircraft shall consist of rigid concrete. A 20 foot wide access road of rigid concrete is authorized to connect the aircraft parking area to other vehicular pavement and the hangar apron on the site. States should coordinate parking apron layout with ARNG-AV prior to submission of programming documents, especially if they are requesting parking for more than 50% of authorized aircraft.

b. Taxiways. Taxiways of flexible pavement, 40 feet wide, are authorized. They shall be the minimum length required for a practical and economical site layout among hangar ramps, loading area, wash area, parking area, and the nearest exit point connecting to any other existing taxiway or runway system.

c. Shoulders. Aircraft parking ramp and taxiway shoulders of flexible pavement, where authorized in UFC 3-260-01, should be constructed in accordance with NGB DG 415-3.

d. Aircraft wash area.

(1) One aircraft washing apron, category code 11370, is authorized at each aviation facility, to be constructed of rigid concrete according to UFC 3-260-1. Authorized maximum allowance is 118 feet by 74 feet (140 feet by 110 feet if CH-47s). A roof type cover may be provided if required by local code to prevent storm water from draining into the sanitary sewer system.

(2) An exterior wash rack may be enclosed by a heated shed-type structure when the heating design temperature, designated in UFC 3-400-02, is minus (-) 10 degrees Fahrenheit or lower, or the annual snowfall exceeds 30 inches.

#### **4-3. Special Aviation Items**

Supporting items or facilities that may be provided at aviation facilities, when individually justified to and approved by ARNG-AV, include the following:

a. Aircraft Rescue and Firefighting Facility (ARFF).

(1) One station capable of accommodating assigned/approved apparatus and personnel is authorized when justified as an exception to criteria. This functional area may be located in a separate building or included in the layout of the main building, but is to be readily accessible to the flight line and aircraft parking area.

(2) A basic allowance of 800 square feet net area is allowed for the associated administrative and storage functions. An additional allowance of 800 square feet net area is authorized for each type ARFF vehicle authorized.

b. Ground support equipment (GSE) storage/maintenance area.

(1) Unheated enclosed or shed-type storage is authorized for GSE. A basic allowance of 1200 square feet net area is allowed for 16 or less authorized aircraft. For more than 16 authorized aircraft, an allowance computed at 20 square feet per aircraft over 16 is authorized in addition to the basic allowance.

(2) A heated area of 320 square feet (within the total allowance) may be provided for maintenance of GSE when the heating design temperature at the site is as designated in UFC 3-400-02, is minus (-) 10 degrees Fahrenheit or lower, or the annual snowfall exceeds 30 inches.

c. Airfield lighting. Pavement marking lights for runways, taxiways, hoverlanes/taxilanes, and aircraft tiedown area shall conform to requirements of TM 5-811-5 (except that, in cases of conflict with Federal Aviation Administration (FAA) guidance, the latter shall govern where the facility is located at a commercial airfield). At the parking ramps and aircraft tiedown areas, perimeter lights must be provided in accordance with TM 5-811-5.

d. Miscellaneous. Additional special aviation items must be justified on an individual basis as essential features, necessary for complete and safe operation of the aviation facility.

e. Special requirements for airfields. Runways, taxiways, aprons, navigational and approach aids, airfield lighting, and other related airfield requirements for aviation facilities non-located with active airfields shall be coordinated with and approved by ARNG-AV prior to submission of programming documents. Refer to UFC 3-260-01 for possible requirements.

f. Aviation Combined Arms Tactical Trainer (AVCATT) Parking Pads. A 35 foot by 70 foot rigid concrete parking pad with electrical power, telephone, and water service is authorized at each NGB approved site permitted an AVCATT location.

#### **4-4. Unheated Enclosed or Shed-Type Storage Space**

a. Federal support is authorized for enclosed or shed type storage of military aircraft authorized at an Army Aviation Support Facility (AASF). Refer to Table 4-5 for appropriate allowances. The number of military aircraft for which enclosed storage may be provided shall not exceed allowances provided by the applicable TOE/TDA, less those located elsewhere and those aircraft used to determine main hangar floor sizing. Allowances in this paragraph are in addition to the allowances for aircraft parking as stated in paragraph 4-2a.

b. Unheated enclosed storage is authorized for security and preservation of aircraft and mission accessory equipment per Table 4-2.

c. Federal support for enclosed or shed-type storage is authorized for wheeled vehicles and equipment.

d. Vehicle storage space shall be unheated and shall not exceed 66% of the normally authorized open-air military parking area. When enclosed or shed-type storage is provided, the amount of paved area (authorized for parking of military vehicles at the site) shall be reduced by the area of the covered space. The remaining paved area is to be used for circulation and access to and from the covered/enclosed storage structure.

e. Vehicle doors at approximately 25 feet on centers are authorized at the rate of one for each 1800 square feet of floor area to provide for mass parking of vehicles without the need for internal circulation lanes.

f. A 60 foot long (from the front of the building) concrete apron is authorized the length of each side of the facility with vehicle entrances.

#### 4-5. Security

Aviation facilities are mandated to comply with the requirements of AR 190-51 and DA PAM 190-51 concerning the protection of aviation resources. Reference to these regulations is required to determine appropriate security measures.

**Table 4-1. Space Allowances for Hangar Floor Areas 1/**

Aircraft Type	Hangar Bay Factor	Hangar Envelope (Per Authorized Bay)		
		Length (FT) 2/	Width (FT) 2/	Allowance (SQFT) 3/
C-12, C-26, C-35	1	70	62	4,340
AH-64, UH-60, UH-72	0.5	70	60	4,200
CH-47	0.5	105	66	6,963

Notes:

1/ Hangar floor size in feet and square feet.

a. The hangar floor net area shall be calculated by first multiplying the number of each type aircraft times the hangar factor (average of aircraft expected to be in the hangar for maintenance at a given time) for each aircraft type, rounded up to the next whole number. This will determine the required number of hangar envelopes for each type aircraft to be provided for within the hangar area. Actual square footage of the hangar will be based on logical layout of the aircraft envelopes with appropriate circulation.

b. The actual dimensions of the hangar floor will be based on the smallest rectangular area required to enclose the envelopes of the various type aircraft (with the envelopes arranged for movement of the aircraft in the same direction). In addition, the dimensions of the hangar floor

shall include a perimeter wall and door clearance of 5 feet from the rotary wing aircraft envelopes and 10 feet from the fixed wing aircraft envelopes. A single-line drawing of the floor plans shall be drawn to scale on a DD Form 1391C and submitted with the programming documents.

2/ Hangar envelope dimensions include aircraft dimensions plus a minimum 5 foot working clearance and egress clearance required between aircraft. Envelope length for rotary wing aircraft (except CH-47) is based on UH-60 length plus 5-foot working clearance.

3/ Allowance in net square feet, exclusive of interior and exterior walls and perimeter circulation.

**Table 4-2. Space Allowances for Specialized Work Areas 1/**

Functional Areas	Basic Allowance	UH-72	AH-64 UH-60	CH-47
<b>1 Drive Train Allied Shops</b>				
a. Propeller/ Rotor 2/	750	NA	NA	NA
b. Engine Inspection/Repair 3/ 4/	600	NA	5/	6/
c. Pneudraulics 3/ 4/	NA	200	300	300
d. Component Cleaning Area	100	40	40	40
<b>2 Airframe and Structural Shops</b>				
a. Airframe /Welding /Structural 3/	1650	NA	NA	NA
b. Composite Materials 10/	200	NA	NA	NA
c. Paint 3/ 7/	540	NA	NA	NA
d. Non-Destructive Inspection	400	NA	NA	NA
<b>3 Electronic and Avionics Allied Shops</b>				
a. Avionics/Instrument 4/8/	600	NA	NA	NA
b. COMSEC Storage 9/	140	NA	NA	NA
c. Electrical 3/4/	100	200	250	250
d. Night Vision Device/ASE shop	200	NA	NA	NA
e. Arms Vault and Armament Subsystem 3/ 11/14/	600	NA	NA	NA

<b>4</b>	<b>Tech Supply</b>				
	a. Special Tools Room <u>12/</u>	300	100	200	200
	b. Repair Parts Room <u>12/</u>	400	100	200	200
	c. Accessory Equipment TOE/TDA Storage <u>13/</u>	NA	60	100	120
	d. Shipping and Receiving/ recycling	400	NA	NA	NA
<b>5</b>	<b>Contractor Shop/Storage <u>17/</u></b>	NA	NA	NA	NA
<b>6</b>	<b>Bulk Material Storage</b>				
	a. Bulk POL Storage <u>15/ 16/</u>	150	NA	NA	NA
	b. Flammable/Combustible Storage	<u>15/</u>	NA	NA	NA
	c. Controlled Waste Handling Facility	<u>18/</u>	NA	NA	NA
<b>7</b>	<b>Unheated Storage <u>19/</u></b>	1000	80	150	250

Notes:

- 1/ Allowances are in net square feet, exclusive of interior and exterior walls. The amount of the basic allowance is added to the amount for the type of aircraft supported at the facility. If there is more than one type of aircraft supported, sum the allowances for each type of aircraft authorized to be supported at the site.
- 2/ Room size (15 feet by 50 feet) is based upon largest rotor blade authorized. A 1000 pound electric hoist on a monorail with trolley assembly extending across the length or width of the room is authorized.
- 3/ Not Authorized for Limited Army Aviation Support Facility (LAASF).
- 4/ Requires a minimum of two aircraft for space to be authorized. The aircraft assigned to any LAASF are to be included in computing the allowance for the supporting AASF.
- 5/ 150 square feet authorized for each increment of 8 aircraft authorized at the site of the construction project.
- 6/ 200 square feet authorized for each increment of 6 aircraft authorized at the site of the construction project.
- 7/ The paint room is authorized for painting component parts, not complete aircraft. A prefabricated paint booth (approximately 8 foot by 12 foot with an opening for exhaust) is authorized to be installed in the paint room for painting of small parts and aircraft components.
- 8/ Basic allowance is for 1 to 30 aircraft. 15 square feet is authorized for each additional aircraft over 30 (up to a maximum of 2,400 square feet). The LAASF avionics/instrument shop and avionics float equipment is authorized a combined total of 300 square feet.
- 9/ Basic allowance is for 1 to 16 aircraft. An additional allowance of 3 square feet is authorized per aircraft for each aircraft over 16.
- 10/ Composite materials work space shall have a down draft work table filtered and vented to the exterior above the roof line.
- 11/ Applies only if AH-64 type aircraft are authorized to be supported at the site.
- 12/ Actual allowance is the basic allowance plus the allowance for each aircraft type. Even though there is only one column for AH-64, UH-60, etc., each listed aircraft is considered a separate type. Office space must come out of the existing allowance.
- 13/ Figure shown represents only the per authorized aircraft figure and base on Cubage for TDA.  

$$\text{Heated Storage} = 0.6 \times \text{Total Cubage}$$
- 14/ Additional space may be authorized on an individual basis. A single-line drawing of the floor plan and wall elevations showing the proposed lay-out of the authorized weapons systems, without mounts, shall be drawn to scale on DD Form 1391C and submitted with programming documents. Security of arms vaults and supply rooms must include an intrusion detection system, be in accordance with AR 190-11, and be approved by ARNG-ILI-F. Proponent for approval of additional space is ARNG-AV.
- 15/ A detached prefabricated building of equivalent size may be used if this area is not incorporated into the facility. The allowance is 3% of total net area but no less than 100 square feet and no more than 600 square feet.
- 16/ Increase the allowance 5 square feet for each aircraft authorized to be supported at the site.
- 17/ Per contractor, when authorized contract maintenance. Size: to be determined in coordination with ARNG-AV prior to submission of programming documents.
- 18/ See Table 1-9 CWHF.
- 19/ An unheated storage building for mission and aircraft accessory equipment with area authorized on a per aircraft basis. At its option the State may include this authorized space within the aviation facility or another adjacent facility.

**Table 4-3. Space Allowances for Personnel Support Areas**

Functional Areas	Allowance <u>1/</u>	
<b>1. Administrative and Training Area</b>		
a. Security/Entry Lobby	<u>2/</u>	
b. Supervisory Aircraft Pilot	250	
c. Secretary	200	
d. Supervisory Instructor Pilot	2 0 0	
e. Flight Instructor (Safety) <u>3/ 20/</u>	175	
f. Flight Instructors (Aircraft) <u>3/20/</u>	175 each	
g. Administrative Support Area	220	
h. Library/Classroom	400	
i. Learning Center <u>4/20/</u>	300	
j. Simulation Devices <u>20/</u>	<u>5/</u>	
k. Flight Surgeon Administration/Examination Area <u>20/</u>	200	
<b>2. Operations</b>		
a. Operations area <u>6/</u>	1400	
b. Flight Operations Specialist <u>7/</u>	150	
c. Tactical Operations Secure Area <u>8/</u>	240	
d. Safety, Briefing and Examination Room <u>9/</u>	400	
e. Flight Planning	600	
f. Passenger Waiting/Briefing Area <u>10/ 20/</u>	240	
g. Aviation Emergency Operations Center (AEOC) <u>20/</u>	<u>11/</u>	
<b>3. Aviation Life Support Equipment (ALSE) Shop</b>		
a. ALSE Administration Area	150	
b. ALSE Maintenance Support	500 LAASF	1000 AASF
c. ALSE Storage	<u>12/</u>	
<b>4. Maintenance Administrative Area</b>		
a. Flight Engineers (SI/FI)	175 each	
b. Supervisory Maintenance Test Pilot	200	
c. Aircraft Maintenance Supervisors	150 each	
d. Production Controller <u>7/</u>	150	
e. Aircraft Automation Clerk/Clerk Typist	100	
f. Supervisory Supply Technician	150	
g. Maintenance Test Pilots	150 each	
h. Aircraft Inspectors (or Quality Assurance Supervisor and Technical Inspectors)	125 each	
i. Crew Chief Log Area <u>13/</u>	400	
j. Common IT Space	<u>14/</u>	
k. IT Support Activities	<u>15/</u>	
<b>5. Information Technology Space</b>		
a. Common IT Space	<u>14/</u>	
b. IT Support Activities	<u>15/</u>	
<b>6. Locker Rooms <u>16/</u></b>	400	
<b>7. Break/Assembly Area <u>17/</u></b>	400	
<b>8. Toilets/Showers <u>18/</u></b>	500	
<b>9. Physical Fitness Area <u>20/</u></b>	<u>19/</u>	

Notes:

1/ Allowance is in net square feet, exclusive of interior and exterior walls.

2/ A Security Entry/Lobby (up to 400 square feet) may be provided within the base facility in lieu of a guard house/access control facility.

3/ Basic allowance is for full-time support personnel. An additional 150 square feet is authorized for every two MTOE/TDA instructor pilot authorizations required to drill simultaneously.

4/ Basic allowance is for up to 50 crew members. An additional allowance of 4 square feet for each crew member above 50 is authorized.

5/ 100 SQFT is authorized for each training device. AVCATT facilities should be requested as an exception to criteria and approval by ARNG-AV.

6/ Allowance is based on 6 or more authorized aircraft. Decrease allowance to 800 square feet when fewer than 6 aircraft are authorized.

7/ An additional 100 square feet is authorized for every authorized position over one.

8/ This includes tactical operations secure storage, Secure Internet Protocol Router Network (SIPRNET), and Aircraft Survivability Equipment Trainer (ASET) areas.

9/ Authorized an additional 12 square feet per authorized crewmember greater than 20 for the authorized crewmember strength of the largest single aviation element supported. This allowance may be split into separate areas as required to accommodate the listed functions.

10/ If the facility is one story, the passenger waiting and briefing area shall be included with or adjacent to the operations area. If the facility is two stories and the operations area is on the second floor, the passenger waiting and briefing area shall be included on the first floor.

11/ An Aviation Emergency Operations Center (AEOC) of approximately 1200 to 1400 square feet. may be requested primarily for use in emergency situations and for training of battle captains and staff, tactical operations officers, and flight operations personnel. The request must be justified by the state and approved by ARNG-AV. No more than one AEOC per State will be approved. Approval will be contingent upon regional threat potential. The AEOC will require secure construction to accommodate secure communication equipment and flight-related data.

12/ Space authorized for ALSE storage for the particular facility in question is computed using the guidelines below. However, this is a maximum authorization. Actual authorization must be established for each case based on anticipated usage (i.e., how many of these are items actually to be stored, inspected, and repaired at the facility in question).

a. Storage of helmet, vest and gloves: 4 square feet per crewmember in addition to the 10 square feet per person authorized for a locker room for storage of personal flight gear.

b. Storage of individual life preservers: 8 square feet for every 8 individuals (crew members and passengers) who can be accommodated on board the authorized aircraft. Storage should be in conventional wall lockers at least 5 feet high.

c. Storage of Individual Overwater Survival Kits: 8 square feet for every 8 individuals (crew members and passengers) who can be accommodated on board the authorized aircraft at a location where flight of 30 minutes or more over water might be required. This is generally applicable to facilities located along the East, West and Gulf Coasts, Alaska, Hawaii, Puerto Rico, and the Virgin Islands. Storage should be in conventional wall lockers at least 5 feet high.

d. Storage of Individual Hot Climate Survival Kits: 8 square feet for every 8 individuals (crew members and passengers) who can be accommodated on board the authorized aircraft at locations in the southwestern U.S., Hawaii, Puerto Rico, and the Virgin Islands. Storage shall be in conventional wall lockers at least 5 feet high.

e. Storage of Individual Cold Climate Survival Kits: 8 square feet for every 8 individuals (crew members and passengers) who can be accommodated on board the authorized aircraft at locations in Alaska and the northern tier of States. Storage should be in conventional wall lockers at least 5 feet high.

f. Storage of 7-Man Life Rafts: To be determined on an individual basis, depending on the equipment actually on hand for utility and cargo aircraft assigned to facilities along the East, West, and Gulf Coasts, Alaska, Hawaii, Puerto Rico, and the Virgin Islands. Four cubic feet of storage volume is required for each raft.

g. Storage of Group Survival Kits: To be determined on an individual basis depending on the equipment actually on hand at a given site.

13/ For each aircraft greater than 16 authorized to be supported at the site, an additional 10 square feet is authorized. This space includes publications and Unit Level Logistics System- Aviation (ULLS-A) log book work areas.

14/ Each common use terminal is authorized 30 square feet and each printer 10 square feet. A copy of the Information Management Plan authorizing equipment should be included with the initial submission of the programming documents (DD Forms 1390/1391). Desktop computers and other pieces of single user information technology equipment are not eligible for additional floor space because they are considered part of the work area for the individual position.

15/ Size to be determined by coordination with ARNG-ILI prior to submission of programming documents.

16/ Aviation facility locker space is above and beyond readiness center locker space. In addition to the basic allowance in the table, facility is 12 square feet per individual based on the sum of the total authorized number of crew members and authorized full-time support personnel who are not crew members. This allowance is to be split into appropriate facilities to support both men and women. The split should account for both minimum code requirements and anticipated building usage.

17/ An additional 20 square feet per person is authorized for 9 to 20 full-time support personnel, an additional 12 square feet per person is authorized for 21 to 40 full-time support personnel, and an additional 8 square feet per person is authorized for full-time support personnel exceeding 40.

18/ In addition to the basic allowance, you are authorized 10 square feet per person for whichever is greater: the largest contingent of authorized crew members training simultaneously, or the sum of the authorized full-time support and contract personnel. This allowance is to be split into appropriate facilities to support both men and women. The split should account for both minimum code requirements and anticipated building usage.

19/ An additional net area of 600 square feet is authorized for physical fitness equipment when there are 5 or more approved full-time technicians authorized on the TDA. For each additional approved full-time technician, the allowance increases 30 square feet to a maximum of 1,650 square feet. This allowance may be applied within the aviation facility or added to an existing physical fitness facility on the installation.

20/ Limited use facilities (LAASF) do not receive this item unless an exception to criteria is authorized by ARNG-AV.

**Table 4-4. Space Allowances for Fixed Wing Facilities**

Functional Area	Basic Allowance <u>1/</u>
1. Hangar Floor <u>2/</u>	5950
2. Contractor Shop/Storage <u>3/</u>	800
3. Common IT Space	<u>4/</u>
4. IT Support Activities	<u>5/</u>
5. Aircraft Pilot/Contracting Officer's Representative (COR) <u>6/</u>	175
6. Aircraft Pilot <u>7/</u>	150
7. Flight Operations Specialist	200
8. Passenger Waiting Area <u>8/</u>	400
9. Break/Assembly Area	<u>9/</u>
10. ALSE Storage	<u>10/</u>
11. Locker Room <u>11/</u>	200
12. Toilets/Showers <u>12/</u>	250

Notes:

1/ Allowances are in net square feet, exclusive of interior and exterior walls.

2/ Actual square footage will be layout specific. However, minimum allowance is based on a maintenance area of 60' by 75' plus a 10' safety clearance area between the aircraft and walls. This allowance is only for a single aircraft in a standalone facility. If you desire space for multiple fixed wing aircraft, or if you are combining rotary wing and fixed wing aircraft into a common aviation facility, you must coordinate the applicability of these space allowances with ARNG-AV in advance of submitting your programming documents.

3/ Per contractor, when authorized contract maintenance. Locations with multiple aircraft of the same type shall be authorized 125 square feet per each additional authorized aircraft over 1.

4/ Each common use terminal is authorized 30 square feet and each printer 10 square feet. A copy of the Information Management Plan authorizing equipment should be included with the initial submission of the programming documents (DD Forms 1390/1391). Desktop computers, typewriters, and other pieces of single user information technology equipment are not eligible for additional floor space because they are considered part of the work area for the individual position.

5/ Size to be determined by coordination with state J-6 and ARNG-ILI prior to submission of programming documents.

6/ COR for aircraft maintenance contractor.

7/ Per each authorized full-time support personnel position for the facility.

8/ Authorized for standalone operational aircraft facilities only; space for other aviation facilities shall be derived from authorized circulation space.

9/ 20 square feet per authorized full-time support and contract personnel position, but not less than 200 square feet.

10/ Refer to ALSE Storage, Table 4-3, Note 12, for space allowance.

11/ In addition to the basic allowance in the table, facility is authorized 12 square feet per individual based on the sum of the total authorized number of crew members and authorized full-time support personnel who are not crew members. This allowance is to be split into appropriate facilities to support both men and women. The split should account for both minimum code requirements and anticipated building usage.

12/ In addition to the basic allowance, facility is authorized 10 square feet per person for whichever is greater: the largest contingent of authorized crew members training simultaneously, or the sum of the authorized full-time support and contract personnel. This allowance is to be split into appropriate facilities to support both men and women. The split should account for both minimum code requirements and anticipated building usage.

**Table 4-5. Unheated Aircraft Storage Allowances**

Type Aircraft	Length	Width	Allowance
C-12D/F/R	50	58	2900
C-12J	64	58	3712
C-26	66	60	3960
AH-64, UH-60, UH-72	70	60	4200
CH-47	105	66	6930

Notes:

1. Allowances are net and exclude all walls. The above dimensions include six feet additional length and six feet additional width, which provide for handling safety clearance zones between each individual aircraft.
2. Facility is authorized an additional three foot wide perimeter egress aisle at the back and left and right side walls surrounding the aircraft modules.
3. Facility is authorized a two foot wall and door thickness around the aircraft modules and egress aisle area.
4. For programming purposes and in lieu of paragraphs b and c above, you may calculate your egress, aisle, wall, and door areas by adding 15% to the total area authorized.
5. Egress, aisle, wall, and door authorizations will be adjusted during design review to reflect actual requirements.

**4-6. ARNG Facilities Allowances for TUAS/UAS Ready Buildings (General Information)**

4-6.1 Operating Facility:

- a. Standard Design or Sites Adaptable Plan.
- b. Maintenance, Training and Operations Functions c. Landing Strip

4-6.2 Training Facilities:

Design Criteria with Facility designed to meet Local Requirements and Conditions, and Use Existing Facilities. Unmanned Aerial Vehicles (UAVs) are remotely piloted or self-piloted aircraft that can carry cameras, sensors, communications equipment or other payloads.

The Tactical UAS (TUAS) – the “SHADOW”

Shadow is typically operated and supported by a platoon of 27 Soldiers. One system includes:

- Four (4) Unmanned Aircraft
- Ground Control System:
- Two (2) HMMWV GCSs
- Two (2) Ground Data Terminals
- Two (2) Base HMMWV for GCS support
- Two (2) Equipment Trailers with 10-kw generators
- Launcher
- Two (2) HMMWV with AVT and two (2) hydraulic launchers
- One (1) HMMWV AVT support vehicle with one (1) Equipment trailer
- One (1) HMMWV Maintenance Section Multifunctional (MSM) with Equipment Trailer

The maintenance storage facility will be laid out to accommodate 3 Shadow 200 airframes and 2 LMTV Ground Control Stations and the Air Vehicle Transport.

Shadow 200 Specifications

- Wingspan: 22 ft.
- Length: 11.8 ft.
- Maximum gross weight: 460 lb.

Tactical Control Station (TCS): The Tactical Control Station is the software and communications links required to control the TUAV, MAE-UAV, and other future tactical UAV's. It also provides connectivity to other C4I systems.

Unmanned Aircraft Systems (UAS) Ready/Building: The larger class UAS (Class III & IV) require obstruction clearances similar to manned aircraft and are generally located at Army Airfields/Heliports. The smaller class UAS are co-located with the parent brigade organization closer to the training complex thereby maximizing “on-station” time for training productivity. *Threshold*: At a minimum, all Class I (manpack) and Class II (generally, 12’ wing span/rotor disk or smaller) shall be stored and maintained with the battalion-sized unit they are assigned to. *Objective*: For BCTs, sighting the UAS facility in immediate proximity or direct access to the training area will include the capability to launch and recover UAS from the tank trail or range road whenever land use and obstruction clearances allow.

**4-7. ARNG Facilities Allowances for TUAS/UAS Ready Buildings (Design Considerations)**

The TUAS/UAS Ready Buildings may be a separate permanent or pre-engineered building, or contiguous with a general warehouse. Design hanger door height to accommodate LMTVs. Plan for a wingspan of 22 feet and length of 11.8 feet.

Aircraft launcher must be at least 100 feet from “occupied areas”. Provide a launching pad that can launch in any direction. Size should be approximately 40 feet by 40 feet.

Provide vehicle staging area approximately 100 feet wide by 40 feet long. Comply with FAA 1:7 height restrictions near the runway. Surface in the parking/maintenance bays needs to be the same surface in a light color. Explore usage of swamp coolers in maintenance bay. Design drives to be 24-feet wide. Final design shall be approved by the State Construction and Facilities Management Officer (CFMO).

**Table 4-6. ARNG TUAS Facility Allowances (OPTIMUM)**

<b>Functional Area</b>	<b>Basic Allowance</b>
No. of Unit Clerks	1
No. of Training Devices	1
No of UAS Airframe	4
1 Administrative Area	700
a. Entry/Security Lobby	200
b. Platoon Leader	120
c. Platoon Sergeant (one per unit)	80
d. Standardization Pilot (one per unit)	80
e. Flight Operations Specialist/Unit clerk (one per unit)	80
f. Administrative Support Area (one per unit)	80
g. Audio/Visual Storage (one per unit)	60
2 Operations Area	1,700
a. Mission/Flight Planning (one per unit)	400
b. Library/Classroom/Briefing/Operator Work Area (one per unit)	600
c. Tactical Operations (Imagery) Secure Area/SIPRNET (one per unit)	100
d. Simulation Training Area (Shadow Crew Trainer) (one per unit)	600
3 Maintenance Area	3,840
a. Contractor office	120
b. Contractor Storage Area / Parts Room (one per unit)	160
c. QC/Prod Control Office/Tech Pubs.	460
d. General repair shop / Tool storage area (one per unit)	400
e. Ground Vehicle parking (140 sq ft / HMMWV) (one per unit)	700
f. Ground Equipment storage (GCS/GDT/launcher) (one per unit)	400

g. UAS parking/maintenance bays (400 SQFT per Airframe)	1600
4 Break/Assembly Area	400
5 Toilets/Showers (one per unit)	400
6 Locker Rooms (one per unit)	686
7 Physical Training Area	600
8 Storage (one per unit)	600
Total TUAS Facility Net Area	8,180
Maintenance and Storage (3% of Net Area)	245
Mechanical/Electrical Room (5% of Net Area)	409
Telecom/IT (1% of Net Area)	82
Circulation Allowance (15% of Net Area/22% for Multi-story)	1227
Structural Allowance (10% of Net Area)	946
Total TUAS Facility Gross Area	11,089

## Chapter 5 Training Center Facilities

### 5-1. General

a. Standards: This chapter establishes the space allowances at ARNG Training Centers, exclusive of space associated with educational facilities. Allowances are based on the ARNG-TR classification of the Training Center method IAW NGR 5-3, which uses measured operational capability for individual/collective live fire ranges, maneuver land, and transient training billeting capacity. The Training Center classification will be one of the following:

(1) **Close In Training Area (CITA)**. A site with no live fire capability, but supports requirements at the individual and/or small unit level at or near home station. No full-time support, range and support facilities, or cantonment facilities are authorized.

(2) **Local Training Area - LTA (Level VI)**. A local training site that supports requirements at the individual and/or small unit level at or near home station. No full-time support or cantonment facilities are authorized.

(3) **Local Training Center - LTC / Intermediate Training Center - ITC (Level V)**. A training site that supports individual and collective training up to company level. Full-time support and limited cantonment facilities are authorized.

(4) **Collective Training Center - CTC (Level IV)**. A training site/installation designed to support individual and collective training up to battalion level. Full-time support and cantonment facilities are authorized.

(5) **Maneuver Training Center-Light - MTC-L (Level III)**. A training site/installation designed to support individual and collective training for multiple battalions. Full-time support and cantonment facilities are authorized.

(6) **Maneuver Training Center-Heavy - MTC-H (Level II)**. A training site/installation designed to support individual and collective training for a brigade level. Full-time support and cantonment facilities are authorized.

(7) **Mobilization Force Generation Installation - MFGI / Enhanced MTC-H (Level I)**. A training site/installation designed to support individual and collective training for multiple brigades. Full-time support and cantonment facilities are authorized.

b. Space allowances.

(1) Training center facility space allowances are based on the classification of the center as verified and set by ARNG-TR (NGR 5-3). The classification drives the number and mix of facilities, which in and of themselves are of standard size. A project may consolidate some or all facilities into a single complex.

(2) Prior to submittal of the DD Forms 1390/91 for a training center project, States should contact ARNG-TR to verify the current classification of the training center, any requested ranges, and any requested deviations from the standard training center package. All such deviations must be processed as exceptions to criteria.

(3) Refer to Table 5-1 for the Type and Number of Unit Transient Training Cantonment Facilities.

(4) Use Table 5-2 to determine Unit Transient Training Cantonment Facility and Parking Allowances.

(5) Table 5-3 provides the space allowances for Training Center Billeting.

(6) See Table 5-4 for Troop Medical Clinic Allowances.

- (7) Refer to Table 5-5 for Physical Exam Allowances.
- (8) Refer to Table 5-6 for Chapel Allowances.
- (9) Refer to Table 5-7 for Range Facilities Allowances.
- (10) Refer to Table 5-8 for Training Center Headquarters Allowances.
- (11) Refer to Table 5-9 for Range Operations and Maintenance Allowances.
- (12) Refer to Table 5-10 for ID Processing Center Allowances.
- (13) Refer to Table 5-11 for Department of Public Works Allowances.
- (14) Refer to Table 5-12 for Police Station Allowances.
- (15) Refer to Table 5-13 for Fire Station Allowances.
- (16) Refer to Table 5-14 for Recycle Center Allowances.
- (17) Refer to Table 1-5 for Space allowances for Flagpoles
- (18) Refer to Table 1-7 for Facility Support Space allowances.
- (19) Refer to Table 1-8 for Circulation allowances.
- (20) Refer to Table 1-9 for Walls allowance.
- (21) Refer to Table 1-10 for Space allowances for Controlled Waste Handling Facilities (CWHF).
- (22) All other space requirements not specifically indicated in the referenced tables will be treated as exceptions to criteria. The State must fully justify such requests and the NGB proponent must concur with them before ARNG-ILI will approve including them in the programming documents and the final design of the project.
- (23) For detailed design guidance, refer to NGB DG 415-4.

## 5-2. Non standard Supporting Items

In planning the functional arrangement of facilities, the State shall give appropriate consideration to the existing site conditions, layout, and materials of construction in order to achieve maximum operating efficiency, cost effectiveness, and flexibility. The following exterior items are authorized Federal reimbursement for training center projects:

a. Roads: The allowance for roads shall be as indicated on the approved State Real Property Development Plan (RPDP) and as specified below.

(1) Cantonment area. Main roads shall be 32 feet wide. Construction shall be flexible pavement unless rigid concrete is justified by an economic analysis. In addition, a 6 foot wide sidewalk is authorized for one side of each cantonment area road.

(2) Tank trails. Main tank trails shall be 30 feet wide, and secondary tank trails shall be 20 feet wide. Construction may be stabilized hardstand.

(3) Training Area Roads. Roads shall be 30 feet wide if tracked vehicles are authorized and 24 feet wide otherwise. Construction shall be improved gravel surface.

(4) Other roads. Flexible pavement or rigid concrete (if supported by an economic analysis) surface on other roads will be justified on an individual basis.

(5) NGB-ILI will determine the exact amount and type of pavement at the preliminary design review, based on an economical and practical site facility layout.

(6) If project is to be conducted as part of a Mater Planning phasing, the first project must contain the necessary roads for the follow on phases.

b. Vehicle wash platforms:

(1) The number of wash platforms authorized at a training center is in addition to those authorized for a MATES or UTES located on the training center but does include any wash platforms at other DoD component facilities on the training center that are available for ARNG use.

(2) The size and design of wash facilities shall be IAW TM 5-814-9.

(3) Other environmental features required by Federal, State and local codes will be included. Central birdbath wash facilities must be justified on a case-by-case basis.

(4) An exterior wash rack may be enclosed by a heated shed-type structure when the heating design temperature, as designated in UFC 3-400-02, is minus (-) 10 degrees Fahrenheit or lower, or the annual snowfall exceeds 30 inches and the Training Center is operational during the months when the conditions prevail. If enclosed, the structure is to be annotated in Block 9 of the DD1391 as a separate primary facility line item.

## 5-3. Training Center Facilities

These facilities fall into three major categories: those facilities that are issued to training units, ranges and training areas used by training units, and facilities utilized primarily by the training center support staff to maintain the training center.

a. Facilities issued to training units (Tables 5-1 through 5-6):

(1) Authorizations will be based on the classification of the training center. Space allowances are authorized in accordance with the approved RPDP, which includes the training center's Site Development Plan (SDP). Facilities not listed on the plan may be authorized when individually justified as an exception to criteria. See Tables 5-1 through 5-6.

(2) Aviation facilities.

(i) Helipads (rigid concrete and unlighted according to UFC 3-260-01) are authorized at training sites that are used more than 30 days per year to support annual training for aviation units and/or flight training areas for aviation units.

(ii) Tie-down pad layout and dimensions of aircraft parking and maneuver area shall be according to UFC 3-260-01. Parking facilities shall be rigid concrete. Pads will be authorized when justified by usage for a minimum of 30 days per year or two annual training cycles. Unlighted reflective hover-lane markers and lighted wind socks are authorized in conjunction with the pads.

(iii) An aircraft maintenance area may be provided in conjunction with the tie-down pads. It shall be rigid paving, 75 feet by 75 feet or sized to accommodate CH-47 aircraft.

(iv) Hardstand for vehicular access to the maintenance area and for maneuvering of refueling and service vehicles may be provided in conjunction with the tie-down pads/maintenance area. A 15 foot by 45 foot covered curbed rigid concrete pad is authorized for parking of each refueling vehicle.

(v) A grounding connection should be provided at each refueling pad.

(vi) Construction of new fixed wing, hard surfaced runways and associated facilities will be handled as exceptions to criteria. Sustainment, Restoration and Modernization (SRM) of existing facilities is authorized.

b. Ranges and training areas used by training units (Table 5-7).

Ranges are authorized at training centers when validated with a Range Complex Master Plan (RCMP) and approved by ARNG-TR. In addition ARNG-AV must validate the surface danger zone (SDZ). Range development projects require careful, deliberate planning by a team of trainers, engineers, safety specialists, environmental specialists, and resource managers. Ranges are authorized at training centers to support the annual weapons qualification/familiarization requirements for the Army (AR) and Army National Guard (ARNG) units habitually using the training center in accordance with DA Pam 350-38. Requirements must be documented in the State Range Development Plan.

(1) For each established aerial gunnery range, four firing/harmonization points are authorized. They shall be constructed of rigid paving, 40 feet by 40 feet – Ref. Training Circular No. 25-8 (TC 25-8).

(2) For each established aerial gunnery range rearming/refueling points are authorized as required. They shall be rigid paving, 75 feet by 75 feet, Ref. TC 25-8, Hot refueling and approved by ARNG-AV. A hardstand service road may be provided for access by ammunition and fuel trucks.

(3) The supporting facilities at a range shall be based on the type and size of range authorized, and the space allowance will normally be limited to those in Table 5-7. The requirements of TC 25-8 shall take precedence over authorizations in this table. Table 5-7 authorizations are for gross area, including walls and circulation.

(4) Authorizations are for standard small arms ranges. Ranges that have lower usage rates should have the number of firing lanes and support facilities scaled down or eliminated so that only those facilities necessary to render a complete and usable range are included in the project.

c. Facilities utilized by the training center support staff to maintain the training center (Tables 5-8 through 5-14).

In addition to those facilities identified in Table 5-8 through Table 5-14, training centers are authorized the following spaces:

(1) Mail Room. A 600 sq ft mailroom is authorized to conduct mail room operations at training centers. Location and construction shall take force protection requirements into consideration.

(2) Access Control Facilities. A training center is authorized facilities housing operations for the regulation of access and/or egress to designated areas or facilities as in compliance with UFC 4-022-01. Primary uses of these facilities are to provide entrance control, guard posts, and watchtowers. Such facilities offer observation and control of incoming and outgoing traffic, protection of security personnel from the elements, and an area to conduct personnel identification and visitor control.

(3) Land Mobile Radio System Tower: The quantity of land mobile system towers is based on the training center mission, size (acreage/square miles), number of ranges, and number of mobile radios in operation. Users include range operations, facilities, equipment, and vehicle maintenance, fire and emergency services, medical response, and air and ground evacuation.

(4) Soldier Readiness Processing (SRP) Facilities. As authorized by ARNG-TR, those training centers designated as a Level I or those training centers with a requirement to deploy units to the mobilization station once SRP is completed are authorized an SRP facility. Primary tasks supported by this facility (or facilities) are administrative (records review, legal document preparation, finance review) and medical (vaccinations, dental, physical exams).

Ideally, all SRP facilities should be co-located to facilitate command and control of the units being supported. Waiting areas should be designated to support company sized units and to conduct required briefings and group instructions. There are normally two waiting areas required, one for units beginning in-processing and one used as a holding area for processing Soldiers.

(5) Training Aids Support Center (TASC)/ Multiple Integrated Laser Engagement System (MILES) Warehouse). Authorizations are for TASC items issued to the training center to support the units that habitually train there. To determine the authorized size, multiply the required storage space times 2 (for intrafunctional circulation) and add 130 square feet per assigned employee and 200 square feet for a device testing and repair center. TASC equipment has specific limitations on how many storage containers can be stacked on one another. To calculate the storage space for each separate type of item multiply the numbers of containers times the size in square feet of the container and then divide by the authorized number of containers in a stack.

(6) Museums. Museums are authorized if they are recognized by the Center for Military History. Museums are authorized Federal support for construction, sustainment, restoration, modernization, and facilities operating costs if they are specifically recognized and approved in writing by Office of the National Guard Historian (NGB-PAH) and approved for DOD support by ARNG-ILI-E.

(7) Ammunition Supply Point (ASP). An ASP is authorized at training sites, when justified and approved by the Department of Defense Explosive Safety Board (DDESB).

(i) Ammunition related projects and projects within the quantity distance arc (QDA) of ASP facilities will not receive approval to go beyond conceptual design until the State receives DDESB approval of the preliminary site plan. Such plans must comply with AR 385-10, DA Pam 385-64, U.S. Army Technical Center for Explosives Safety (USATCESP) Publication 385-02, and other appropriate publications.

(ii) Storage shall be according to AR 385-10, DA Pam 385-64, and other appropriate DA and DoD publications. US Army Corps of Engineers (USACE) standard drawings should be used as the standard design for earth covered steel arch magazines. A limited or small quantity of ammunition may be stored in above ground structures or reinforced above ground magazines (RMAG), if approved by DDESB.

(iii) In addition to meeting all safety and structural requirements, ammunition storage projects shall include fencing, security lighting and intrusion detection systems as required by AR 190-11 and approved by ARNG-ILI

(iv) A covered loading dock fitted with a dock leveler is authorized.

(v) ASP administrative offices, where no ammunition operations are conducted, should be located at Inhabited Building Distance (IBD) from ammunition storage or operations.

(vi) A surveillance/operation building is authorized at all ASPs.

(vii) A residue building is authorized at all ASPs.

(viii) A vehicle marshalling/inspection area large enough to hold all the ammunition vehicles of the ASP's largest customer is authorized near the entrance of the ASP.

(8) TISA. A TISA is authorized only at locations where commercial supplies are not available within a reasonable distance. Prior to submitting DD Forms 1390/1391 programming documentation for the establishment and construction of a TISA, States shall contact ARNG-ILS to determine if a facility is authorized and to obtain guidance on justification and space allowances. Any requested TISA shall be considered an exception to criteria.

(9) Storage facilities. Warehouses, hazardous materials (HAZMAT) storage, enclosed vehicle storage, enclosed equipment storage, etc., are authorized, when appropriate and justified, to store and manage the materials, supplies and equipment required by the training center to support the units/personnel utilizing the training center. Space allowances are calculated based on cubic feet, stack height, personnel authorized, and intra-functional circulation required. Allowances vary between training centers based upon the mission and may include but are not limited to storage for:

- (i) Linens
- (ii) Billeting furniture
- (iii) Office furniture
- (iv) Kitchen equipment
- (v) Mission specific supplies/equipment
- (vi) Morale, Welfare, and Recreation (MWR) supplies
- (vii) Medical supplies
- (viii) Miscellaneous Class II supplies
- (ix) Prepositioned unit equipment
- (x) Training Unit Class IV/V (replicated) storage

(10) Environmental Facilities. The facilities in this area vary from training center to training center. These facilities are authorized based upon the support mission of this section, the number of required employees (Active

Guard/Reserves (AGRs), military technicians, federally reimbursed State employees, and contractors), and the amount and type of equipment required.

(11) Parade Field. Training centers are authorized an area that provides open space for military ceremonies, outdoor training, and conduct of physical exercise. The parade field should include permanent or portable bleachers, a 600 square foot covered reviewing stand and, electricity to power a portable public address system.

(12) Running track/multipurpose athletic field. Training centers are authorized a facility to conform to the standards established in FM 7-22. The track and athletic field is only authorized for individual preparation for and conduct of the Army Physical Fitness Test (APFT).

(13) Potable water point(s). Potable water points shall be strategically located in order to fully support training units.

(14) Training Center Communications. Facilities to support the telecommunications hub(s) are authorized as required to support the training center in coordination with the State's J-6.

#### 5-4. Local Training Areas General

Facilities may be of a type consistent with training in a field environment.

a. Field kitchens. Construction of field kitchens shall consist of a concrete floor and lightweight wood or metal roof structure, with 4 foot high siding and screens above. Wood shutters may be provided to cover the screens.

b. Mess shelter. Construction of mess shelters shall consist of a concrete floor and lightweight wood or metal roof structure. Screening or siding may be authorized if justified.

c. Latrines. Latrines shall consist of a concrete floor, lightweight wood or metal roof structure and wood, metal, or concrete block walls. Ventilation openings shall be screened and shuttered. No windows are authorized. Unless an existing sanitary system is available at the site, concrete holding tanks/pits shall be provided in accordance with applicable Federal, State, and local environmental laws and regulations.

d. Vehicle wash platform.

A wash platform may be authorized, if justified.

e. Others.

All other facility requirements not specifically indicated shall require approval of an exception to criteria.

**Table 5-1. Type and Number of Unit Transient Training Cantonment Facilities**

Facility <u>1/</u>	Level V	Level IV	Level III	Level II	Level I
1 Billets <u>2/</u>	640 spaces	1,040 spaces	2,280 spaces	4,560 spaces	9,120 spaces
2 Dining Facility	200 person, <u>3/</u>	200 person, <u>3/</u> (1) 400	<u>3/</u>	<u>3/</u>	<u>3/</u>
3 Bde. Headquarters TT	NA	NA	1	2	3
5 Bde Support Fac.	NA	NA	0	1	2
6 Bn Headquarters TT	NA	1	3	6	12
7 Co. Supply/Admin	3	6, <u>4/</u>	12, <u>4/</u>	24, <u>4/</u>	48, <u>4/</u>
8 Physical Fitness Area	<u>1/</u> <u>5/</u>	<u>1/</u> <u>5/</u>	<u>1/</u> <u>5/</u>	<u>1/</u> <u>5/</u>	<u>1/</u> <u>5/</u>
9 Bn Sup/Rat Breakdown	NA	1	3	6	12
10 Cleaning/Maint Bldg <u>6/</u>	2,700 sq. ft.	5,400 sq. ft.	16,200 sq. ft.	32,400 sq. ft.	32,400 sq. ft.
11 Battalion Maint Shelter	NA	1	3	6	12
12 Troop Medical Clinic	NA	1	1	1	1
13 Physical Exam Center	1, <u>7/</u>	1, <u>7/</u>	1, <u>7/</u>	1, <u>7/</u>	1, <u>7/</u>
14 Training Device/ Simulation Center	<u>8/</u>	<u>8/</u>	<u>8/</u>	<u>8/</u>	<u>8/</u>
15 Distance Learning	<u>9/</u>	<u>9/</u>	<u>9/</u>	<u>9/</u>	<u>9/</u>

16	General Instruction	1,500, <u>10/</u>	1,500, <u>10/</u>	2,400, <u>10/</u>	2,700, <u>10/</u>	3,000, <u>10/</u> Buildings Base
17	Chapel	1, <u>11/</u>				

Notes:

1/ Authorizations will be based on the classification of the training center.

2/ The numbers depicted are maximum authorizations.

3/ Dining hall allowances equal authorized billeting spaces. Up to one-half of the allowance may be 200 persons sized dining facilities; the remainder should be served by 400 or 800 persons sized dining facilities.

4/ Plus one building per battalion for a support element headquarters. For unheated storage, detached buildings may be used, or an equivalent area may be incorporated within the facility.

5/ TI 800-01, Appendix H. The space criteria for physical fitness centers are shown in the table below. Generally these facilities include gear issue control, gymnasium, locker rooms, offices, exercise room(s), spectator area, storage, and toilet facilities. This type of facility is intended to be capable of supporting basic physical fitness skill training requirements. New physical fitness facilities shall be designed in accordance with technical criteria for U.S. Army Physical Fitness Facilities.

Space Criteria for Physical Fitness Facilities		
Military Population	Area (sf)	Area (square meters)
251 to 1,000	27,771	2580
1,001 to 3,000	44,347	4120

Military population is defined as all personnel (AGR, technician and Federally reimbursed State employees) assigned to the training center, plus 10% of total billets space. At training centers where the population is less than or equal to 250, refer to Table 5-2 to obtain the space authorization for a Physical Fitness Facility.

6/ This allowance is for buildings in which units clean and maintain small arms weapons and basic initial issue equipment. For each Level I-III, there shall normally be one per authorized battalion headquarters. For the Level V, there shall normally be one per authorized company supply/admin building. For the Level IV, the State may choose between one consolidated building or one per authorized company supply/admin building.

7/ Space is authorized if validated and approved by ARNG-CSG. See Table 5-5 for space allowances. Total patients supported across the entire state training centers cannot exceed the total state strength.

8/ Training centers are authorized any facility listed in DA Pam 415-28 with a facility category code beginning with 172 and 179 so long as these facilities are required by habitual users of the training center and are approved by ARNG-TR

9/ Space is authorized if validated and approved by ARNG-ILS-L. This space is in addition to any classroom space otherwise authorized.

10/ Classroom space is authorized using the formula of 10 square feet per person based on the capacities of authorized billeting spaces, plus the basic space from the table. An auditorium with inclined floor and installed seats is authorized for training centers Level IV and higher. Auditorium space is subtracted from the authorized classroom space.

11/ For chapel space allowances, see Table 5-6.

**Table 5-2. Unit Transient Training Cantonment Facility and Parking Allowances**

Standard Facility <u>1/</u>	Net Square Feet	Admin. Vehicles Parking (sq yd)
1. Brigade Headquarters TT	7,120	600
2. Battalion Headquarters TT	5,196	400
3. Battalion Supply/Ration Breakdown	2,409	400
4. Company Supply and Administration TT	2,980	200
5. Dining Facilities		
a. 200 Person	4,500	200
b. 400 Person	8,400	300
c. 800 Person	14,800	400
6. Troop Medical Clinic	<u>2/</u>	500
7. Battalion Maintenance Shelter <u>3/</u>	7,204	
8. Physical Fitness Area <u>4/</u>	2,050	400
9. Motor Pool (per battalion/sep company size element) <u>5/</u>		8,000
10. Ranges		
a. Admin/Basic		150
b. Wheeled Vehicles		# firing lanes x 50 divided by 2
c. Tracked Vehicles		Estimated number of tracked vehicles to be on range times <sup>75</sup>
11. Bde Support Facility		
a. Heated Storage	2,690	400
b. Covered Storage	10,000	
c. Open Storage (Fenced)	6,000 Sq Yds	

Notes:

1/ Allowance is per facility/area as authorized in Table 5-1

2/ The Troop Medical Clinic shall provide a scope of care directed by Health Services Command to eligible military personnel. Sizing shall be based on Table 5-4.

3/ The shelter should be an open-shed type enclosed on three sides with 6-inch rigid concrete floor and up to 400 square feet may be enclosed for an office and latrine. The shelter may be enclosed on four sides and heated if located geographically where the outside design temperature is 15 degrees Fahrenheit dry bulb or less designated in UFC 3-400-02 or the annual snowfall exceeds 30-inches as designated in UFC 3-400-02; and where the shelter is required to be used for winter annual training/Inactive Duty Training (IDT). Maintenance bays for oversized vehicles will be addressed as exceptions to criteria.

4/ An additional 22 square feet per TDA full time position is authorized for shower/locker/latrine space; 450 square feet of the basic allowance is also for this purpose. This portion of the allowance is to be split into appropriate facilities to support both men and women. The split should account for both minimum code requirements and anticipated building usage. If there are readiness centers, educational facilities, logistics facilities, and aviation facilities located on the training center, they are not authorized a separate physical fitness area. Instead, the TDA full-time authorizations for all activities on the training center should be combined and multiplied by 22 to get the additional allowance for shower/locker/latrine space.

5/ Where more than one motor pool is to be constructed, they should be contiguous to accommodate varying sizes of battalions/separate companies. This area may be fenced.

**Table 5-3. Training Center Billeting Allowances 1/**

Pay Grade	Open Bay <u>2/</u>	1 + 1 <u>3/</u>	Private <u>4/</u>
E4 and below	90 SF/person	90 SF/person	NA
E5 and E6	90 SF/person	135 SF/person	NA
E7 through E9	NA	250 SF/person	250 SF
W01, CW2, 01, 02	NA	NA	250 SF
CW3-CW5, O3-O6	NA	NA	250 SF
General Officer	NA	NA	430 SF
Lounge/ Vending	12 SF/person	12 SF/person	12 SF/person
Laundry	144 SF/20 billeting spaces	144 SF/20 billeting paces	144 SF/20 billeting

Notes:

1/ Allowances are in net square feet, exclusive of interior and exterior walls and of a 20 square foot closet in each 1+1 and private room. States must justify the split among the three configurations of rooms and the number/location of separate buildings. HVAC is authorized.

2/ No more than 20 persons per room with an additional allowance of 10 square feet per person for a latrine (including showers).

3/ One individual per room sharing bath/service area of 100 square feet (not included in the allowance shown above).

4/ One individual per room with a private bath/service area of 100 square feet (not included in the allowance shown above).

**Table 5-4. Troop Medical Clinic Allowances\_1/**

Functional Area	SF	Notes
1. Clinic Entrance	50	Plus 50 SF covered entrance
2. Entrance Lobby	200	
3. Public Toilet	380	
4. Information Desk	60	
5. Radiology	360	
6. Clinic Pharmacy	240	
7. Advise Nurse Area	100	Plus 60 SF/nurse
8. Appointment Clerk	130	
9. Central waiting		3 seats/provider, 16 SF/seat, except that 5% of seats are 25 SF for handicapped/litter patients
10. Reception control	140	
11. Screening, weights, & measures		80 SF each, 1 room per 4 providers or fraction thereof
12. Provider exam rooms		120 SF each, 2 exams rooms/provider
13. Isolation exam	140	
14. Dedicated isolation toilet	60	
15. Patient toilets	220	
16. Administrative Office	400	Plus 130 SF/admin person assigned
17. Provider's office		130 SF each
18. Nurse manager	130	1 per 10 nurses
19. Nurse's workroom	130	Plus 40 SF per nurse above 4
20. NCOIC/LCPO/LPO Office	130	One per provider team
21. Clean utility room	120	less than or = 15 exam rooms
	150	16 to 30 exam rooms
	160	>30 exam rooms
22. Soiled utility room	90	less than or = 15 exam rooms
	120	16 to 30 exam rooms
	150	>30 exam rooms
23. Scope wash room	120	
24. Equipment storage	100	
25. Team conference room	250	Per provider team of 6-8 persons
26. Litter/wheelchair storage	60	
27. Staff lounge	140	
28. Staff lockers	282	
29. Staff toilets	380	
30. Janitorial closet	60	
31. Treatment room - GP	175	1 per 6 providers

32. Holding room	175	
33. Treatment room, 2 station	340	
34. Immunization Waiting Area		16 SF per space. 12 spaces per injection station
35. Immunization Room	215	One per primary care clinic; one station. Multiple stations may be authorized for more than 12
36. Immunization Holding area	100	One per immunization room
37. Orthopedic Appliance Mod, Prep, & Cast Room	140	
38. Laboratory (Mini Lab)	60	

Note: 1/ Based on DoD Space Planning Criteria for Health Facilities

**Table 5-5. Physical Exam Allowances 1/**

Functional Areas	Allowances		
	Exams per Year		
	161-320	321-640	641-1280 <u>2/</u>
1. Reception, Waiting and Form Writing	210 SF	280 SF	350 SF
2. Doctor's Office (80 sf each)	80 SF	80 SF	160 SF
3. Exam Room (110 sf each) <u>3/</u>	220 SF	330 SF	550 SF
4. History Station	70 SF	70 SF	105 SF
5. Height & Weight Station	70 SF	70 SF	70 SF
6. Blood Pressure and Pulse Station	70 SF	70 SF	70 SF
7. Electronic Consult System (ECS) and Tonometry Station	in exam room	110 SF	110 SF
8. Lab	70 SF	70 SF	70 SF
9. Blood Specimen Collection	70 SF	70 SF	70 SF
10. Specimen Toilet	36 SF	36 SF	60 SF
11. Vision Test	70 SF <u>4/</u>	70 SF <u>4/</u>	70 SF <u>4/</u>
12. Hearing Test	90 SF	150 SF	210 SF
13. Dental Check (100 sf ea)	100 SF	100 SF	200 SF
14. Circulation	345 SF <u>4/</u>	485 SF <u>4/</u>	675 SF <u>4/</u>

**Notes:**

1/ Authorized where physical examinations are conducted at the training center. On those training centers that are required both a Troop Medical Clinic (TMC) and Physical Exam Station, these facilities should be co-located to take advantage of like-type equipment and space.

2/ For over 1280 exams/year, use the space data for 641-1280 and increase the number of days per year that the facility is operated.

3/ One room may be used for consulting, review of completed physical examination paperwork, weight control counseling or similar purposes.

4/ An additional 140 square feet is authorized to accommodate eye examinations if the facility is authorized to conduct flight physical examinations. The circulation space should then be increased by 20 square feet because of the additional 140 square feet for the eye examinations.

**Table 5-6. Chapel Allowances**

1. Chapel	10.5 sq. ft/seat (minimum 335 sq. ft) <u>1/</u>
2. Altar	100 sq. ft
3. Storage	100 sq. ft
4. Chancel	100 sq. ft
5. Chaplain's Office	140 sq. ft plus 120 sq. ft for each additional chaplain
6. Chaplain Assistant and Waiting	120 sq. ft
7. NCOIC	120 sq. ft
8. Chaplain Trainee	100 sq. ft plus 60 sq. ft for each additional trainee
9. Counseling Room	140 sq. ft (1 per every 3 Chaplains – minimum 1)
10. Rest Rooms	3 sq. ft/seat

Note:

1/ Determined by the State Chaplain, based on the habitual training unit historical worship service requirements. (Reference Army Standard Design Requirements for the Small Compact Chapel Facility Type)

**Table 5-7. Range Facilities Allowances**

For Table 5-7, reference TC 25-8, Appendix D, which lists authorized range operation support facilities associated to each range.

**Table 5-8a. Training Center Headquarters Allowances**

Functional Areas <u>2/</u>	55-99	100-175	176-up
1 Assembly Hall	5,400	5,400	5,400
2 Classrooms <u>3/</u>	800	1,000	1,500
3 Learning Center <u>4/</u>	500	500	500
4 Multipurpose Training Area <u>5/</u>	1,500	1,500	1,500
5 Kitchen <u>6/</u>	0	0	0
6 Break/ Vending	<u>7/</u>	<u>7/</u>	<u>7/</u>
7 Toilets/Shower <u>8/</u>	1,220	1,300	1,400
8 Flam Mats. Storage	100	100	200
9 Lactation Area/Room	80	80	80
10 Family Readiness Office	250	250	250
11 RAPIDS Office <u>9/</u>	150	150	150
12 Retention Office <u>10/</u>	110	110	110
13 Table/Chair Storage	300	300	300
14 Physical Fitness <u>11/</u>	0	0	0
15 Controlled Waste Handling Facility (CWHF)	<u>12/</u>	<u>12/</u>	<u>12/</u>

Notes:

1/ Training Center Headquarters can be combined with the National Guard Readiness Center function.

2/ All functional areas listed in Table 5-8a are for the common use for the training center TDA.

3/ Refer to Table 2-1. Note 3

4/ Refer to Table 2-1. Note 4

5/ Refer to Table 2-1. Note 5

6/ Training center headquarters are not authorized a kitchen, since the unit has use of the training center assets.

7/ Refer to Table 2-1. Note 7

8/ Refer to Table 2-1. Note 8

9/ Only one RAPIDS office is authorized per campus/training site.

10/ Retention office SF is based on a AR 405-70 category P5 at 110 SQFT is authorized at one per facility, plus an additional 110 SQFT office per unit over 55.

11/ Physical Fitness area is not authorized if a campus/training site physical fitness facility exists..

12/ See Table 1-9 - CWHF.

**Table 5-8b. Schedule II, Unit and Special Space Allowances 1/  
(Allowance in net square feet, exclusive of interior and exterior walls)**

**1. Administrative Office Space: 2/**

Functional Area	Allowance
a. Basic Allowance	
(3) Unit with strength of 75 and less	400
(4) Unit with strength over 75	800
b. Office Allowance <u>3/</u>	
c. Special Administrative Allowances: <u>4/</u>	
(6) Battalion Headquarters and Headquarters Company (HHC or HHD)	1,500

**2. Unit Storage Space (minus Arms Vault) 8.1.a/**

Functional Area	Allowance
a. Arms Vaults	<u>5.1.b/</u>

**3. Locker Room Space 6/**

Functional Area	Allowance
a. Basic Space (one per readiness center)	200
b. Space per each individual authorized in the readiness center	18

Notes:

1/ Refer to Table 2-2. Note 1

2/ Refer to Table 2-2. Note 2

3/ Refer to Table 2-2. Note 3

4/ Refer to Table 2-2. Note 4

5/ Unit storage space shall be computed based on authorized strength of, and cubage of the equipment (excluding vehicles/equipment provided space under military equipment parking, other items normally stored outside and provided space elsewhere, and individual clothing and equipment) authorized to the unit(s) assigned to the facility.

a. Each unit or detachment with a required strength of 55 or more is authorized:

(1a) Heated storage space. A net area of 2,700 square feet within the readiness center facility is authorized for an equipment cubage of 0 to 4,000 cubic feet.

(1b) Arms Vaults. One vault (600 square feet) for every unit greater than 12.

(2) Unheated storage space. If total equipment cubage exceeds 4,000 cubic feet, a detached building or an equivalent area incorporated within the readiness center facility is authorized based on one of the following applicable categories:

Total Cubage In Cubic Feet	Net Square Feet (NSF) Authorized
4,001 to 8,000 NSF	= 0.6 x (Total Cubage minus 4,000)
Exceeds 8,000 NSF	= 2,400 + [0.2 x (Total Cubage minus 8,000)]

b. Each unit or detachment with a required strength of less than 55 but greater than 10 is authorized:

(1) Heated storage space. A net area (minimum of 1,300 square feet) within the readiness center facility for an equipment cubage of 0 to 4,000 cubic feet as determined by the formula listed below.

$$\text{Heated Storage} = 0.6 \times \text{Total Cubage}$$

(2) Unheated storage space. If total cubage exceeds 4,000 cubic feet, use the appropriate applicable category referenced above in Note 5a (2).

6/ Space may be divided, provided that the total of the separate space allocated to men and women is within the total space authorized. Also, a part or the total area may be used as unit storage space.

**Table 5-9. Range Operations and Maintenance Allowances**

Functional Area	SF	Notes
a. Admin Space	130	Per authorized position
b. Break Room/Area		<u>1/</u>
c. Toilet and Shower	250	Plus 10 SF per auth position
d. Locker Room	125	Plus 12 SF per auth position
1. Range Administration		
a. Reception Area	175	
b. Conference/Classroom		As required
c. Record Storage	150	
2. Range Operations		
a. Map Storage/Library	400	
b. Radio Room	250	
c. Scheduling Area	200	
d. Safety Briefing Room		As required
3. Target Systems		
a. Electrical Shop/Bay		As required
b. Storage Room (electrical)		As required
c. Battery Room		As required
4. Supply/Support		
a. Carpenter/Target Maintenance Shop		As required
b. Untreated Lumber Storage (Unheated)		As required
c. Tool Room Storage		As required
d. Target Storage (unheated)		As required
e. Treated Lumber Storage (unheated)		As required
f. Ground Maintenance Equipment Storage (unheated)		As required
g. Paint Storage		As required
h. Fire Truck Ready Bay/Water Tanker	1024	Per assigned vehicle

**Notes:**

1/ Basic authorizations are 200 square feet for up to 4 full-time support personnel. It is 400 square feet for staffing levels between 5 and 8 full-time support personnel, with an additional 20 square feet per individual for 9 to 20 full-time support personnel, 12 square feet per individual for 21 to 40 full-time support personnel, and 8 square feet per individual for full-time support personnel exceeding 40.

**Table 5-10. ID Processing Center Allowances**

1. Work station allowance	130 sf / workstation
2. File storage	50 square feet / workstation
3. Personnel holding space/photo processing	65 square feet / workstation
4. User specific display area	30 square feet / workstation
5. Waiting room/Reception Area	150 square feet / workstation
6. Break Room/Area	<u>1/</u>
7. Toilet and Shower	250 square feet plus 10 square feet per auth position
8. Locker Room	125 square feet plus 12 square feet per auth position

**Note:**

1/ Basic authorizations are 200 square feet for up to 4 full-time support personnel. It is 400 square feet for staffing levels between 5 and 8 full-time support personnel, with an additional 20 square feet per individual for 9 to 20 full-time support personnel, 12 square feet per individual for 21 to 40 full-time support personnel, and 8 square feet per individual for full-time support personnel exceeding 40.

**Table 5-11. Department of Public Works Allowances 1/**

**1. Administration**

a. Conference/Classroom	500 SF + 10 SF per person based on authorized strength
b. Record / Archive Storage	
c. Drafting Office	130 SF/ auth pos plus automation
d. Drafting Table	100 SF/ table
e. Geographic Information Systems (GIS) Operator	130 SF/ auth pos plus automation
f. Learning/Library Center	250 SF
g. Drafting Supply Storage Area	100 SF
h. Surveying Equipment Storage Area	
i. Break Room/Area	<u>2/</u>
j. Toilet and Shower	250 square feet plus 10 square feet per auth position
k. Locker Room	125 square feet plus 12 square feet per auth position

**2. Facilities Maintenance Section 1/**

a. Carpenter's Shop	
b. Electrical Shop	
c. Plumbing Shop	
d. Machine Shop	
e. HVAC Shop	
f. Glass Repair Shop	
g. Locksmith Shop	
h. Sign Shop	
i. Paint Shop w/heated storage	
j. Telecom Shop	
k. Tool Room	
l. Tool Issue Office	
m. Supply Warehouse	
n. Supply Yard	

**3. Roads and Grounds Shop 1/**

a. Grounds Maintenance Shop	
b. Operator Repair Work bay (32x64)	
c. Tool Room	
d. Welding Shop	
e. Ground Maintenance Equipment Storage	
f. Equipment Storage Compound	
g. Loading Ramp	

**Notes:**

1/ The facilities in this area vary at each separate training center. These facilities are authorized based upon the support mission of this section, the number of required employees (AGRs, military technicians, and Federally reimbursed State employees), and the amount and type of equipment required. The information in this table should be used as a planning tool for areas to consider while designing this facility.

2/ Basic authorizations are 200 square feet for up to 4 full-time support personnel. It is 400 square feet for staffing levels between 5 and 8 full-time support personnel, with an additional 20 square feet per individual for 9 to 20 full-time support personnel, 12 square feet per individual for 21 to 40 full-time support personnel, and 8 square feet per individual for full-time support personnel exceeding 40.

**Table 5-12. Police Station Allowances 1/**

1. Holding Cell, 2 each @ 72sf	144 SF
2. Arms Vault	300 SF
3. Dispatch Office	130 SF/person
4. Evidence Room	150 SF
5. Training Aid Storage	50 SF
6. Parking	POV 35 sy/ea Organizational 50 sy/ea Visitor 300 sy
7. Break Room/Area	2/
8. Toilet and Shower	250 square feet plus 10 square feet per auth position
9. Locker Room	125 square feet plus 12 square feet per auth position

**Notes:**

1/ A building that houses the operations of a provost marshal and the services and operations of the military police. The provost marshal is responsible for physical security, traffic, supervision of gate personnel, and law enforcement on the training center.

2/ Basic authorizations are 200 square feet for up to 4 full-time support personnel It is 400 square feet for staffing levels between 5 and 8 full-time support personnel, with an additional 20 square feet per individual for 9 to 20 full-time support personnel, 12 square feet per individual for 21 to 40 full-time support personnel, and 8 square feet per individual for full-time support personnel exceeding 40.

**Table 5-13. Fire Station Allowances 1/**

1. Administration/Training Area	1777 SF
2. Apparatus/Equipment Area	2197 SF
3. Billeting	675 SF
4. Latrines/Showers/Locker Rooms/Laundry/etc.	375 SF plus 22 SF per employee
5. POV/Civ Parking	35sy ea
6. TOE/TDA Equip Parking	50sy ea/75sy for ea over 30' long
7. Helipads	Sized IAW MEDEVAC Requirements

**Note:**

1/ Authorizations are per engine company. A fire station is a building that houses firefighting vehicles and equipment as well as the operating personnel of fire-fighting companies. Also included are facilities housing fire and emergency rescue equipment and personnel at any heliport or airfield on the training center. Space for drying hoses is included. Also report this facility with unit of measure vehicles (VE). Data should be available from the training center fire chief. If not, conduct a physical count of stalls and survey building area. Each firefighting/rescue vehicle stall provided at the facility counts as one VE. (Ref: UFC 4-730-10, Fire Stations).

**Table 5-14. Recycle Center Allowances 1/**

1. Office/Admin Space	130 SF/employee
2. Break Area	120 SF
3. Latrines/Shower	400 SF
4. Horizontal Bailer Area	1800 SF plus 800 SF for each additional bailer
5. Paper Shredding Area	1000 SF
6. Brass Deformer/Shredder Area	800 SF
7. Conveyor Area	1600 SF
8. Glass Processing Area	800 SF per color of glass
9. Storage Area	As Required
10. Receiving Area	1600 SF
11. Sorting Area	1200 SF
12. Shipping Area	1600 SF
13. Intra-functional	2000 SF

14. Battery Charging Area	400 SF for each piece of electric material handling equipment
15. Trash Transfer Point	1000 SF per outside container
16. Scrap Metal Storage Area	1000 SF per outside container
17. Pallet Processing Area	1800 SF
18. Truck Scales Area	2800 SF

Note:

1/ The facilities in this area vary from training center to training center. These facilities are authorized based upon the volume of recyclable materials, the number of required employees (AGRs, military technicians, and Federally reimbursed State employees), and the amount and type of equipment. The information in this table should be used as a planning tool for areas to consider while designing this facility.

## Chapter 6 Educational Facilities

### 6-1. General

- a. Standards. This chapter establishes the space allowances for ARNG educational facilities (and educational support facilities) that are part of the Army School System (TASS).
- b. Space allowances.
  - (1) TASS facility space allowances are based on the Army Training Requirements and Resources System (ATRRS) student load as verified and set by ARNG-TR, the authorized strength(s) of the staff as documented on the TDA, and other manning documents showing full-time personnel, the numbers and types of equipment authorized, and special requirements of the supported units.
  - (2) Prior to submittal of DD Forms 1390/91 for an educational facility, States should contact ARNG-TR to determine if an educational facility is authorized and to obtain sizing guidance for space allowances.
  - (3) Refer to Table 6-1 for Space allowances based on student load.
  - (4) Refer to Table 6-2 for Space allowance for educational facility billeting.
  - (5) Refer to Table 1-5 for Flagpoles allowances
  - (6) Refer to Table 1-7 for Facility Support Space allowances.
  - (7) Refer to Table 1-8 for Circulation allowances.
  - (8) Refer to Table 1-9 for Walls allowance.
  - (9) Refer to Table 1-10 for Space allowances for Controlled Waste Handling Facilities (CWHF)
  - (10) All other space requirements not specifically indicated in the referenced tables will be treated as exceptions to criteria. The State must fully justify such requests and the NGB proponent must concur with them before ARNG-ILI will approve including them in the programming documents and the final design of the project.
  - (11) If there are any conflicts between the criteria in this pamphlet and those of Training and Doctrine Command (TRADOC) for an educational facility teaching the same Program of Instruction (POI), the TRADOC criteria shall take precedence. However, the State must include documentation of the TRADOC requirement(s) criteria as part of its request for exception to criteria.
  - (12) For detailed design guidance, refer to NGB DG 415-4.

### 6-2. Non standard Supporting Items

Parking pad for MCOFT and similar simulators. Federal support is authorized for a 60 foot square rigid concrete parking pad, with electrical power and telephone service, at each ARNG-TR approved site authorized to have an MCOFT or similar simulation device.

### 6-3. Joint Use

Inclusion of other educational and training functions within the GIB facility can greatly increase Army efficiencies through the use of shared resources. ACES generally operate after hours, allowing dual use of classrooms and support facilities. Inclusion of Applied Instruction that is directly related to the GIB aids communication and logistic operations by having students and staff perform both types of training concurrently. NCO training can share many of the same support functions with GIB. A GIB/ACES facility will include a combination of the classroom subtypes depending on the type of general instruction required.

**Table 6-1. Educational Facility Allowances 1/**

**1 Administration**

a. Instructor Offices (FTE)	130 SF
b. Instructor Offices (MDAY)	As per AR 405-70 tables D-1 and D-2
c. Information/ Reception	10 SF per visitor IAW AR 405-70 for Commanders, heads of directorates, offices, bureaus, agencies, and comparable positions in Grades O7-O10, SES, are authorized reception areas of visitors in a single meeting.
d. Conference/ Counseling Rooms	1 Conf room per 15 FTE <u>12/</u>
e. Work/ Copy Space	3 SF/ FTE, but not less than 100 SF
f. Student Records Storage	3 SF/ FTE
g. Staff Break Area	4 SF/FTE, but not less than 120 SF

**2 Support Facilities**

a. Office Supply	4 SF/ FTE																																			
b. Central Storage	4 SF per peak habitual student load																																			
c. Unit Storage	<u>2/</u>																																			
d. Computer Maintenance <u>14/</u>	3 SF per peak habitual student load																																			
e. Network Ops Center/ Digital Training repository <u>15/</u>	1 SF per peak habitual student load																																			
	<b>Student Peak Training Load</b>																																			
	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;"></th> <th style="width: 12.5%;">Basic Allowance</th> <th style="width: 12.5%;">Below 100</th> <th style="width: 12.5%;">Basic Allowance</th> <th style="width: 12.5%;">Below 100</th> </tr> </thead> <tbody> <tr> <td>f. Medical/Aid Station</td> <td>NA</td> <td>400</td> <td>400</td> <td>400</td> </tr> <tr> <td>g. Publication Storage</td> <td>5 SF/student</td> <td>500</td> <td>500</td> <td>500</td> </tr> <tr> <td>h. Mail Center</td> <td>NA</td> <td>400</td> <td>500</td> <td>600</td> </tr> <tr> <td>i. Showers/Lockers <u>3/</u></td> <td>22 SF/TDA position</td> <td>300</td> <td>300</td> <td>300</td> </tr> <tr> <td>j. Toilets <u>18/</u></td> <td>3 SF/student</td> <td>300</td> <td>400</td> <td>500</td> </tr> <tr> <td>k. Physical Fitness Area <u>17/</u></td> <td>NA</td> <td>1000</td> <td>1225</td> <td>1600</td> </tr> </tbody> </table>		Basic Allowance	Below 100	Basic Allowance	Below 100	f. Medical/Aid Station	NA	400	400	400	g. Publication Storage	5 SF/student	500	500	500	h. Mail Center	NA	400	500	600	i. Showers/Lockers <u>3/</u>	22 SF/TDA position	300	300	300	j. Toilets <u>18/</u>	3 SF/student	300	400	500	k. Physical Fitness Area <u>17/</u>	NA	1000	1225	1600
	Basic Allowance	Below 100	Basic Allowance	Below 100																																
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j. Toilets <u>18/</u>	3 SF/student	300	400	500																																
k. Physical Fitness Area <u>17/</u>	NA	1000	1225	1600																																

**3 Education/ Classrooms 5/**

	<b>Student load by Class Size</b>					
	Under 16	Under 25	16 to 31	32 to 48	49 to 71	72 to 150
a. Large Group Lectures <u>6/</u>	NA	NA	NA	NA	NA	25 SF/student
b. General Purpose <u>7/</u>	25 SF/student	25 SF/student	25 SF/student	25 SF/student	25 SF/student	25 SF/student
c. Small Group Seminar <u>8/</u>	NA	40 <u>9/</u> SF/student	NA	NA	NA	NA
d. Lab or applied Instruction						
e. General Purpose Training Bay <u>10/</u>	1 per every six maintenance students					
f. Lab Allowance	<u>11/</u>					
g. Resources Center <u>13/</u>	30 SF*20% of peak habitual student load					
	<b>Student Peak Training Load</b>					
	<b>Basic Allowance</b>	<b>Below 100</b>	<b>Basic Allowance</b>	<b>Below 100</b>		
h. Multi-Purpose Training Area	NA	5400	5800	6300		

i. Auditorium	NA	2000	2500	3000
j. Library	NA	600	600	600
k. Learning Center	NA	300	550	800
l. Distance Learning Center	NA	<u>5/</u>	<u>5/</u>	<u>5/</u>
m. Training Device/ Simulation Center	NA	<u>16/</u>	<u>16/</u>	<u>16/</u>
n. Training Aid Storage	NA	300	600	900
o. Audio Visual Storage	NA	300	600	900
p. Test Control Storage	NA	100	100	100

#### 4 Dining Facility

a. Dining Area & Kitchen <u>19/</u>	NA	4100	4100	4100
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Notes:

1/ All allowances are in net square feet exclusive of interior and exterior walls. Total allowance for an item is the sum of the basic allowance and the allowance for the student load the educational facility is authorized. Per student in the basic allowance refers to the maximum number of students authorized to be at the TASS complex at any point during a training year.

2/ A net area of 2,700 square feet within the facility is authorized for an equipment cubage of 0 to 4,000 cubic feet.

2a/ Arms Vaults. One vault (600 square feet) if mission dictates and in a climate controlled area.

2b/ Unheated storage space. If total equipment cubage exceeds 4,000 cubic feet, a detached building or an equivalent area incorporated within the facility is authorized based on one of the following applicable categories:

Total Cubage In Cubic Feet	Net Square Feet (NSF) Authorized
4,001 to 8,000 NSF	= 0.6 x (Total Cubage minus 4,000)
Exceeds 8,000 NSF	= 2,400 + [0.2 x (Total Cubage minus 8,000)]

2c/ Heated storage space. A net area (minimum of 1,300 square feet) within the facility for an equipment cubage of 0 to 4,000 cubic feet as determined by the formula listed below.

$$\text{Heated Storage} = 0.6 \times \text{Total Cubage}$$

3/ This allowance is to be split into appropriate facilities to support both men and women. The split should account for both minimum code requirements and anticipated building usage.

4/ If there are any conflicts between the criteria in this pamphlet and those of TRADOC for an educational facility teaching the same POI, the TRADOC criteria shall take precedence.

5/ Class size is determined by the supported class size as depicted in ATTRS, based on the class maximum.

5/ Space is authorized if validated and approved by ARNG-TR. This space is in addition to any classroom space otherwise authorized.

6/ These classrooms are intended for large group lectures IAW the POI up to 150 students. Since these are less frequently used than smaller classrooms in the conduct of the course, it is highly encouraged to provide separability (eg operable partitions) to break up the space into smaller classrooms where the larger proportion of academic instruction often takes place. (E.g.; a 72PN classroom can be subdivided into two 32 PN classrooms.)

7/ These classrooms are intended for general lecture accommodating up to 72 students using moveable tables and chairs permitting flexibility to adapt to different teaching modes, and providing for laptop use. The most common size for these classrooms is from 24 to 32 students. Like the larger group lecture classrooms, these classrooms can be further partitioned in order to increase overall utilization; e.g., a 72 PN classroom can be divided by an operable partition to accommodate two concurrent classes of 24 to 32 students each.

8/ These classrooms are small group discussion based and reflect the ALM 2015 and Industry trends for high engagement and "Instructor-facilitated" learning. These classrooms have furniture configured in a conference style or a tight "U"-shape. For courses that require accommodation of training aides or demonstration devices in the classrooms, adjust the Student station size accordingly. An additional allowance of 81 square feet for courses which require a visitor table or 2nd instructor.

9/ Add the net square foot area for the training devices simulators to be used for this category.

10/ General Purpose Training Bay (GPTB). The GPTB is configured the same as a SEMF General Purpose Work Bay (GPWB) plus egress aisles. Paragraph 3-3.d. describes a GPWB. Paragraph 3-3.d. (5) describes egress aisles.

11/ Lab must be justified through the school proponent. Determination must be made at the proponent level the suitable allocation of space.

12/ Conference and Counseling rooms support the POI requirement for student formal and informal counseling, evaluations, etc, as well as supporting the internal meeting needs of staff and instructors. 2/3 of these should be for Small of 8 to 10 (375 sqft), and Medium of 1/3 for 5 to 7 (150 sqft). Facility may consider one large 20 to 30 PN at 500 sqft in lieu of a Small or Medium. The Large may be sub dividable.

13/ Provide the student support spaces. These include resource centers, which are a study-related space that can accommodate bound print material, computers, and other resources to support student research. Resource centers provide quiet study areas with sufficient resources to support academic study in the program of instruction. Industry standard allowance is based on peak habitual student load.

14/ This space supports the ongoing and periodic refresh, repair, and maintenance of school IM/IS assets.

15/ This space supports the digital educational infrastructure accommodating only the school-owned assets such as servers and network switches. Outside plant and telecommunications closets to support the building are not included here but in the net-to-gross factor.

16/ Space is authorized if validated and approved by ARNG-TR.

17/ All equipment must be obtained with other than Federal construction funds.

18/ This allowance is to be split into appropriate facilities to support both men and women. The split should account for both minimum code requirements and anticipated building usage.

19/ Based on 200 person standard design to include all supporting functional areas. Dining facility authorized only if adequate dining facility is not otherwise available on the training center. Requires exception to criteria and ARNG-TR approval.

**Table 6-2. Space Allowances for Educational Facility Billeting 1/**

Pay Grade	Open Bay 2/	2+2 3/	1 + 1 3/	Private
E4 and below	90 SF/person	90 SF/person	90 SF/person	NA
E5 and E6	90 SF/person	135 SF/person	135 SF/person	NA
E7 through E9	NA	250 SF/person	250 SF/person	250
W01, CW2, 01, 02	NA	NA	250 SF/person	250
CW3-CW5, O3-O6	NA	NA	NA	250
Lounge/ Vending	12 SF/person	12 SF/person	12 SF/person	12 SF/person
Laundry	144 SF/20 billeting spaces			

Notes:

1/ Allowance is in net square feet, exclusive of: interior and exterior walls; necessary circulation space; a 20 square foot closet (2 closets in the 2+2 rooms). An educational complex is authorized to billet as many people as are shown on the approved student load plus the authorized TDA positions, including any authorized instructors not on the TASS TDA. States must justify the split among the three configurations of rooms and the construction of more than a single building containing billets. Billeting facilities are to comply with TRADOC Regulation 350-6 dated 7 Nov 2013 and DoD 4165.63-M, October 28, 2010.

2/ No more than ten persons per room/bay, all sharing a latrine of 500 square feet (not included in the allowance shown above).

3/ Two individuals per room sharing private bath/service area of 100 square feet (not included in the allowance shown above).

## **Appendix A References**

### **AR 190-11**

Physical Security of Arms, Ammunition, and Explosives (Cited in Table 4-2 (Note 14) and para 5-3c(7)(iii))

### **AR 190-51**

Security of Unclassified Army Property (Sensitive and Non-Sensitive) (Cited in paras 1-91 and 4-5)

### **AR 385-10**

The Army Safety Program (Cited in paras 5-3c(7)(i) and 5-3c(7)(ii))

### **AR 405-70**

Utilization of Real Property (Cited in Table 2-1 (Note 10), Table 2-2 (Note 3), Table 2-4 (Note 5), and Table 6-1 (1b))

### **AR 420-1**

Army Facilities Management (Cited in para 1-6i(1))

### **Army National Guard DG 415-1**

Readiness Centers Design Guide (Cited in Table 2-1 (Note 6) and Table 5-8 (Note 4))

### **Army National Guard DG 415-2**

Logistics Facilities Design Guide (Cited in Para 3-5d)

### **Army National Guard DG 415-3**

Aviation Facilities Design Guide (Cited in Para 4-2c)

### **Army National Guard DG 415-4**

Training Site Facilities Design Guide (Cited in paras 5-1b(23) and 6-1b(12))

### **Army National Guard DG 415-5**

General Facilities Information Design Guide (Cited in para 1-9c(3))

### **DA Pam 190-51**

Risk Analysis for Army Property (Cited in para)

### **DA Pam 350-38**

Standards in Training Commission (Cited in para 5-3b)

### **DA Pam 385-64**

Ammunition and Explosives Safety Standards (Cited in paras 5-3c(7)(i) and 5-3c(7)(ii))

### **DA Pam 415-28**

Guide to Army Real Property Category Codes (Cited in Table 5-1 (Note 8))

**DoD Space Planning Criteria for Health Facilities** (Cited in Table 5-4 (Note 1))

### **FM 7-22**

Army Physical Readiness Training (Cited in para 5-3c(12))

### **NGR 5-3**

Army National Guard Training Centers (Cited in para 5-1a and 5-1b(1))

**NG Pam 415-5**

Army National Guard Military Construction Program Execution (Cited in para 3-3f)

**NGR 415-10**

Army National Guard Facilities Construction (Cited in paras 1-9d(v)a. and 1-9d(v)b.)

**TC 25-8**

Training Ranges (Cited in paras 5-3b(1), 5-3b(2), 5-3b(3) and Table 5-7)

**TI 800-01**

Design Criteria (Cited in Table 5-1 (Note 5))

**TM 5-811-5**

Army Aviation Lighting (Cited in paras 2-4(2) and 4-3c.)

**TM 5-814-9**

Central Vehicle Wash Facilities (Cited in paras 1-9t(6)(ii) and 5-2b(2))

**UFC 1-200-02**

High Performance and Sustainable Building Requirements (Cited in para 1-6f)

**UFC 3-260-01**

Airfield and Heliport Planning and Design (Cited in Table 2-2 (Note 16) and paras 4-2a, 4-2c and 4-2e)

**UFC 3-400-02**

Design: Engineering Weather Data (Cited in paras 1-9t(3), 1-9t(6)(iv), 1-9u(2), 4-2d(2), 5-2b(4) and Table 5-2 (Note 3))

**UFC 4-010-01**

DoD Minimum Antiterrorism Standards for Buildings (Cited in para 1-9d)

**UFC 4-010-02**

DoD Minimum Antiterrorism Standoff Distances for Buildings (Cited in para 1-9d)

**UFC 4-010-05**

Sensitive Compartmented Information Facilities Planning, Design, and Construction (Cited in para 2-7)

**UFC 4-510-01**

Military Medical Facilities (Cited in Table 2-3, Note 1)

**UFC 4-730-10**

Fire Stations (Cited in Table 5-13 (Note 1))

**USATCESP 385-02**

Explosives Safety Site Plan Developers Guide (Cited in para 5-3c(7)(i))

**Section II****Related Publications**

A related publication is a source of additional information. The reader does not have to read it to understand this publication.

**AR 25-1**

Army Information Technology

**AR 40-5**

Preventive Medicine

**AR 55-80**

DoD Transportation Engineering Program

**AR 190-13**

The Army Physical Security Program

**AR 200-1**

Environmental Protection and Enhancement

**AR 385-63**

Range Safety

**29 CFR Part 1900 et seq**

Occupational Safety and Health Administration, Department of Labor

**36 CFR Part 800**

Protection of Historic Properties

**DoD 6055.09-M, Volume 1**

DoD Ammunition and Explosives Safety Standards: General Explosives Safety Information and Requirements

**DoDD 1225.07**

Reserve Component Facilities Programs and Unit Stationing

**DoDD 4270.5**

Military Construction

**DoDD 6055.9E**

Explosives Safety Management and the DoD Explosives Safety Board

**DoDI 1225.8**

Programs and Procedures for Reserve Component Facilities Programs and Unit Stationing

**Executive Order 11988**

Floodplain Management

**Executive Order 11990**

Protection of Wetlands

**Executive Order 12856**

Federal Compliance with Right-to-Know Laws and Pollution Prevention Requirements

**Executive Order 12873**

Federal Acquisition, Recycling, and Waste Prevention

**Executive Order 13007**

Indian Sacred Sites

**Executive Order 13045**

Protection of Children from Environmental Health Risks and Safety Risks

**MIL-STD-3007**

Standard Practice For Unified Facilities Criteria And Unified Facilities Guide Specifications

**NG Pam 210-20**

Real Property Development Planning Procedures for The Army National Guard

**NGR (AR) 200-3**

State and Federal Environmental Responsibilities

**NGR 350-1**

Army National Guard Training

**NGR 415-5**

Army National Guard Military Construction Program Development and Execution

**TM 5-683**

Electrical Interior Facilities

**TM 5-684**

Electrical Exterior Facilities

**TM 5-803-14**

Site Planning and Design

**UFC 3-340-02**

Structures to Resist the Effects of Accidental Explosions

**UFC 4-020-01**

DoD Security Engineering Facilities Planning Manual

**Other Unified Facilities Criteria as appropriate**

**Uniform Building Code**

**10 U.S.C. §172**

Ammunition Storage Board

**10 U.S.C. Chapter 159**

Real Property

**10 U.S.C. Chapter 169**

Military Construction and Military Family Housing

**10 U.S.C. Chapter 1803**

Facilities for Reserve Components

**15 U.S.C. §§2601-2692**

Toxic Substances Control Act

**16 U.S.C. § 470 et. seq.**

National Historic Preservation

**16 U.S.C. §§1271-1287**

Wild and Scenic Rivers Act

**16 U.S.C. §§1531-1544**

Endangered Species Act.

**18 U.S.C §1001**

Fraud and False Statements

**33 U.S.C. §1251 et. seq.**

Clean Water Act

**40 U.S.C. §1101 et seq**  
Selection of Architects and Engineers

**42 U.S.C. §300f et. seq.**  
Safe Drinking Water Act

**42 U.S.C. §1996**  
American Indian Religious Freedom Act

**42 U.S.C. §§4151-4157**  
Architectural Barriers Act of 1968

**42 U.S.C. §§4321-4370a**  
National Environmental Policy Act

**42 U.S.C. §§6901-6992**  
Resource Conservation and Recovery Act

**42 U.S.C. §§7401-7661**  
Clean Air Act

**42 U.S.C. §§9601-9657**  
Comprehensive Environmental Response, Compensation and Liability Act

**32 CFR Part 651**  
Environmental Analysis of Army Actions

**Section III**  
**Prescribed Forms**  
This section contains no entries.

**Section IV**  
**Referenced Forms**

**DD Form 1390**  
Military Construction Program

**DD Form 1391**  
Military Construction Project Data

## **Glossary**

### **Section I Abbreviations**

**AASF**

Army Aviation Support Facility

**AEOC**

Aviation Emergency Operations Center

**AGR**

Active Guard/Reserve

**ALSE**

Aviation Life Support Equipment

**APFT**

Army Physical Fitness Test

**AR**

Army Regulation

**ARFF**

Aircraft Rescue and Firefighting Facility

**ARNG**

Army National Guard

**ARNG-AV**

Army National Guard Aviation & Safety Division

**ARNG-CSG-P**

Army National Guard Industrial Hygiene

**ARNG-FM**

Army National Guard Force Management Division

**ARNG-ILI**

Army National Guard Installations Division

**ARNG-IMG-G**

Army National Guard Governance and Policy Branch

**ARNG-TR**

Army National Guard Training Division

**ARTEP**

Army Training and Evaluation Program

**ASET**

Aircraft Survivability Equipment Trainer

**ASP**

Ammunition Supply Point

**AT**

Annual Training

**AT/FP**

Anti-Terrorism/Force Protection

**ATS**

Automated Target System

**Auth**

Authorized

**AVCATT**

Aviation Combined Army Tactical Trainer

**Bde**

Brigade

**BEQ**

Bachelor Enlisted Quarters

**BII**

Basic Issue Items

**Bn**

Battalion

**BOQ**

Bachelor Officer's Quarters

**CFMO**

Construction and Facilities Management Officer

**CHS**

Common Hardware Software

**Civ**

Civilian

**CMDSA**

COMSEC Material Direct Support Activities

**Co**

Company

**COMSEC**

Communication security

**COR**

Contracting Officer's Representative

**CRC**

Component Repair Company

**CSMS**

Combined Support Maintenance Shop

**CSSAMO**

Combat Service Support Automation Management Office

**CTA**  
Common Table of Allowances

**CTC**  
Collective Training Center

**CTF**  
Concurrent Training Facility

**CV**  
Combat vehicles

**CWHF**  
Controlled Waste Handling Facility

**DA**  
Department of the Army

**DARNG**  
Director of Army National Guard

**DD**  
Department of Defense

**DDESB**  
Department of Defense Explosives Safety Board

**DG**  
Design Guide

**Div**  
Division

**DoD**  
Department of Defense

**DoDD**  
Department of Defense Directive

**DoDI**  
Department of Defense Instruction

**DS4**  
Direct Support Unit Standard Supply System

**DSU**  
Direct Support Unit

**ECS**  
Electronic Consult System

**EMCS**  
Energy Management Control System

**EST**  
Engagement Skills Trainer

**FAA**  
Federal Aviation Administration

**FISP**  
Federal Inventory and Support Plan

**FM**  
Field Manual

**FMS**  
Field Maintenance Shop

**GIB**  
General Instruction Building

**GIS**  
Geographic Information Systems

**GPM**  
Gallons per Minute

**GPTB**  
General Purpose Training Bay

**GPWB**  
General Purpose Work Bay

**GSA**  
General Services Administration

**GSE**  
Ground support equipment

**GSU**  
General Support Unit

**HAZMAT**  
Hazardous Materials

**HEMTT**  
Heavy Expanded Mobility Tactical Truck

**HET**  
Heavy Equipment Transporter

**HHC**  
Headquarters and Headquarters Company

**HHD**  
Headquarters and Headquarters Detachment

**IAW**  
In Accordance With

**IBD**  
Inhabited Building Distance

**IDT**

Inactive Duty Training

**IT**

Information Technology

**ITC**

Intermediate Training Center

**JFHQ**

Joint Force Headquarters

**JOC**

Joint Operations Center

**KD**

Known Distance

**LAASF**

Limited Army Aviation Support Facility

**LTA**

Local Training Area

**LTC**

Local Training Center

**LUH**

Light Utility Helicopter

**MAINT**

Maintenance

**MATES**

Maneuver Area Training Equipment Site

**MCNG**

The Army National Guard Military Construction appropriation

**MCOFT**

Mobile Conduct of Fire Trainer

**MEDEVAC**

Medical evacuation

**MEVA**

Mission Essential Vulnerability Area

**MILES**

Multiple Integrated Laser Engagement System

**MOUT**

Military Operations on Urbanized Terrain

**MTC-H**

Maneuver Training Center - Heavy

**MTC-L**

Maneuver Training Center - Light

**MWR**

Morale, Welfare, and Recreation

**MTOE**

Modified Table of Organization and Equipment

**NA**

Not Authorized

**NG**

National Guard

**NGB**

National Guard Bureau

**NGR**

National Guard Regulation

**NSF**

Net Square Feet

**Pam**

Pamphlet

**PLS**

Palletized Load System

**POI**

Program of Instruction

**POL**

Petroleum Oil Lubricants

**POV**

Privately owned vehicle

**QDA**

Quantity Distance Arc

**RAOC**

Rear Area Operations Center

**RAPIDS**

Real-Time Automated Personnel Identification System

**Rat**

Ration

**RMAG**

Reinforced Above Ground Magazines

**RPDP**

Real Property Development Plan

**RWOS**

Representative Weather Observation Station

**RXA**

Repair/Direct Exchange

**SAMS**

Standard Army Maintenance System

**SB**

Supply Bulletin

**SDP**

Site Development Plan

**SDZ**

Surface Danger Zone

**SEMF**

Surface Equipment Maintenance Facility

**SF**

Square Feet

**SIPRNET**

Secure Internet Protocol Router Network

**SP**

Self-propelled

**SPWB**

Special Purpose Work Bay

**SQ YD**

Square Yard

**SRM**

Sustainment, Restoration, and Modernization

**SRP**

Soldier Readiness Processing

**SSA**

Supply Support Activity

**STAMIS**

Standard Army Management Information System

**Sup**

Supply

**SY**

Square Yard(s)

**TADSS**

Training Aids, Devices, and Simulations Systems

**TASC**

Training Aids Support Center

**TASS**

The Army School System

**TC**

Training Circular

**TDA**

Table of Distribution and Allowances

**Tech**

Military Technician

**TI**

Technical Instruction

**TISA**

Troop Issue Subsistence Activity

**TM**

Technical Manual

**TMC**

Troop Medical Clinic

**TOE**

Table of Organization and Equipment

**TRADOC**

U.S. Army Training and Doctrine Command

**TSB**

Training Support Brigade

**UFC**

Unified Facilities Criteria

**ULLS-A**

Unit Level Logistics System – Aviation

**USATCESP**

U.S. Army Technical Center for Explosives Safety Publication

**U.S.C.**

United States Code

**USPFO**

United States Property and Fiscal Office

**UTES**

Unit Training and Equipment Site

**UXO**

Unexploded Ordnance

**WB**

Work Bay (General Purpose, Special Purpose Work Bay, and or Maintenance Training Work Bay)

**WWMCCS**

Worldwide Military Command and Control System

## **Section II Terms**

### **Collocated Facilities**

ARNG facilities are considered to be collocated if they have at least one adjacent land-use area boundary in common or are separated only by the width of the vehicle thoroughfare.

### **Combat Vehicle**

For the purpose of this regulation, the term combat vehicles includes tanks, armored personnel carriers, tracked command and reconnaissance vehicles, combat engineer vehicles, self-propelled artillery, tank retrievers and other like type vehicles.

### **Construction**

The erection, installation, or assembly of a new facility; the relocation of a facility; the complete replacement of an existing facility; or the addition, expansion, extension, alteration, or conversion (to a new type use) of an existing facility. This includes installed building equipment and related site preparation, excavation, filling and landscaping or other land improvements. It also includes increases in components of facilities for functional reasons when a facility is not being repaired and the components are not required to meet current standards, and it includes the extension of utilities to areas not previously served. Construction is an activity that may be a part of either the restoration or modernization program.

### **Construction Specifications Institute (CSI)**

A non-profit organization dedicated to the advancement of construction technology through communication, education, research and service. CSI serves the interest of architects, engineers, contractors, product manufacturers and others in the construction industry.

### **Facility**

A separate and individual building, structure, utility system, or other real property improvement. It includes supporting elements for structures, such as sidewalks, fire hydrants, gasoline and diesel fuel dispensing systems, flammable materials buildings, roads, fencing, and hard stand.

### **Federal Funds**

The terms "Federal funds" or "Federal costs" refers to funds appropriated for the Army National Guard Military Construction (MCNG) program. It does not include appropriations funding the non-construction aspects of the project. However, in the case of a joint use facility, it may include construction appropriation funds contributed by the other reserve component(s). Also, in the case of projects that fall within the statutory limits of operations and maintenance construction, it refers to the Operations and Maintenance National Guard appropriation (but only that portion supporting the construction aspects of the project).

### **Floodplain**

Floodplains are the lowland and relatively flat areas next to inland and coastal waters including flood prone areas of offshore islands. This includes, at a minimum, that area with a one percent or greater chance of flooding in any given year (the "100 year flood"). For critical facilities where evacuation would be difficult, such as hazardous chemical storage or hospitals, the floodplain will be that area subject to a 0.2 percent or greater chance of flooding in any given year (the "500 year flood").

### **Green Building**

Green Building or High Performance/Sustainable Building (HPSB) is constructed using the Guiding Principles, an integrated synergistic approach. For more information refer to NG Design Guide 415-5

### **Hardstand**

This is an area constructed of crushed stone, gravel, slag, shale, or similar materials. These materials are shaped and compacted into position without the addition of any binder materials.

### **Installation**

An aggregation of contiguous or near contiguous, common mission-supporting real property holdings under the jurisdiction of the State, the District of Columbia, territory, or commonwealth controlled by and at which an ARNG unit or activity is permanently assigned. For the purpose of Installation Status Report reporting and the calculation of programming inventory, each State shall be considered a separate installation. However, for real property inventory reporting, each entity with a FISP installation number shall be reported as an installation.

### **Building Life-Cycle Cost Analysis (BLCCA)**

An economic assessment of an item, system, feature, or facility by considering all significant costs of ownership over an economic life, expressed in terms of equivalent costs. Such an analysis of economic results in a determination as to whether any increase in initial construction cost due to inclusion of the feature or system would be recouped during its lifetime by decreases in operating and/or maintenance costs, when calculated in discounted dollars and using documentable current local fuel cost and escalation forecasts as prepared by the Office of the Secretary of Defense.

### **MATES with Support**

An SEMF that performs both field and sustainment level maintenance missions. A MATE with Support is typically not collocated with a CSMS since the CSMS performs the same sustainment maintenance mission as a MATES with Support.

### **MATES without Support**

This SEMF performs only field level maintenance missions. The MATES without Support is typically collocated with a CSMS.

### **Military Vehicles**

Any motorized or towed-vehicles, wheeled or track, authorized to units by TOE, MTOE, or TDA.

### **Motor Vehicle**

Motor vehicles are self-propelled military equipment, including amphibious equipment, classed as 1/4-ton or over in size.

### **Pre-Wired Workstations**

A workstation which should include posts, panels, partitions, wiring for electricity and communications, task lighting, and partition-hung components to support individual and group efforts. Both panel-to-panel and post-to-panel systems are acceptable. Additional system components are ambient lighting and partition supported files. A pre-wired workstation should, at a minimum, provide for the following functions: (1) An acoustically treated enclosure defining the limits of an individual or a shared use workstation. (2) Adequate work surfaces to accommodate the individual's equipment, writing, and work layout needs. (3) Storage space for individual files and supplies. (4) Task lighting and electrical and communications outlets to support the individual's equipment. Pre-wired workstations do not include movable furniture and furnishings such as chairs, stand alone file cabinets, coat hooks or racks, name tags, in and out file trays, and other similar accouterments.

### **Peak Habitual Training Load**

The peak habitual training load is the training population used in calculating an RTI, by identifying the courses projected student load for all course are taught simultaneously. The number is generated from the reported Class Maximum number in ATTRS by class and school code. The compiled number does not include multiple phases of the same course or multiple sessions of the same course, rather will only capture the higher of the multiple class sizes.

### **Replacement**

Reconstruction of a real property facility destroyed or damaged beyond the point at which it may be economically repaired. Complete replacement is classified as construction.

### **Site Preparation**

Clearing; grubbing; demolition of existing structures; removing existing utilities, excavation and

embankment earth work, drainage channels or systems, and retaining walls; the grading/compaction of site soils to proposed subgrade elevations; and necessary environmental compliance actions.

**Surface Danger Zone (SDZ)**

The statistical area in which a particular round fired from a particular weapon at a particular point toward a particular target will impact if there are no physical barriers to impede its path.

**Sustainable Design and Development**

The systematic consideration of current and future impacts of an activity, product, or decision on the environment, energy use, natural resources, the economy, and quality of life. In terms of military construction, it is also the design, construction, operation, and reuse/removal of the built environment (infrastructure and buildings) in an environmentally and energy efficient manner.

**UTES**

This SEMF performs field level maintenance on the vehicles and equipment stored at the facility to support training activities at a nearby ARNG training center or active duty post.

**Wetlands**

Wetlands are those areas flooded or inundated by surface or ground waters often enough to support aquatic life or vegetation. Wetlands generally include swamps, marshes, bogs, and similar areas, such as sloughs, open or wet meadows, river outflows, mud flats, natural ponds, wet forests, potholes, and riparian areas. They may or may not be located in flood plains.

**Section III**

**Special Abbreviations and Terms**

This section contains no entries.

## **I. Military Guide and References Materials**

C DD – 1390 Area

# Richland

## Functional Space Details - Actual/ English

### 171R: ARNG - Readiness Center Memo

	Authorized	Requested	Memo
	28,812	28,812	
	Yes	Yes	
ARNG - Readiness Center	No	No	
Readiness Center:	No	No	
Joint Forces Headquarters:	No	No	
Civil Support Team Ready Building:	No	No	
RAPIDS Office Assigned:	No	No	
Existing Physical Fitness Facility:	No	No	
Detached General Purpose Training Bay:	No	No	
Detached Controlled Waste Handling:	Yes	Yes	
Detached Unit Unheated Storage:	Yes	Yes	
Detached Flammable Materials Storage:	Yes	Yes	
No. of Firefinder Radar Facilities:	0	0	
No. of Controlled Waste Barrels:	3	3	
No. of Arms Vaults:	1	2	
No. of Fed Reimbursed Admin State Employees:	0	0	
No. of Statewide Media Outlets for JFHQ Media Rm:	0	0	
A. Schedule 1 – Common Use Areas	14,890	14,890	
1. Assembly Hall	5,400	5,400	
2a. Auditorium	0	0	
2b. Classrooms	2,510	2,510	
0 Library/Classroom (Removed)	0	0	
3. Learning Center	500	500	
0 Distance Learning Center (Removed)	0	0	
0 Indoor Firing Range (Removed)	0	0	
4. MultiPurpose Training Area	1,500	1,500	
0 Training Aid Storage (Removed)	0	0	

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**171R: ARNG - Readiness Center**  
 Authorized Requested Memo

5. Kitchen	1,500	1,500	
6. Break / Vending	300	300	
0 Vending Area (Removed)	0	0	
7. Toilets/Shower	1,740	1,740	
a. Toilets	1,300	1,300	
b. Showers	440	440	
8. Flammable Materials Storage	0	0	
9. Lactation Area	80	80	
10. Family Readiness Office	250	250	
11. RAPIDS Office	0	0	
12. Retention Office	110	110	
0 Audion/Visual Storage (Removed)	0	0	
13. Table/Chair Storage	300	300	
14. Physical Fitness	700	700	
15. Controlled Waste Handling Facility (CWHF)	0	0	
<b>B. Schedule II -- Unit and Special Space Allowances</b>	<b>13,922</b>	<b>13,922</b>	
1. Administrative Office Space	3,410	3,410	
a. Basic Space	1,200	1,200	
b. Office Allowance	2,210	2,210	
c. Special Administrative Allowances	0	0	
(1) Division Headquarters	0	0	
0 Armored Cavalry Regiment HQ (Removed)	0	0	
(2) Brigade and Division Artillery Headquarters	0	0	
(3) Echelons above Brigade Units	0	0	
(4) Special Operations Groups	0	0	
(5) Battalion Headquarters and Headquarters (HHC or HHD)	0	0	

*Disposal*

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**171R: ARNG - Readiness Center**

	Authorized	Requested	Memo
0 Rear Area Operations Center (RAOC) (Removed)	0	0	0
0 Division Support Command (Removed)	0	0	0
0 Supply and Transport BN (Division) (Removed)	0	0	0
0 Support JFHQ (Separate BDE) (Removed)	0	0	0
(6) State Headquarters (ARNG)	0	0	0
(7) Troop Command	0	0	0
(8) Army Advisors Office	0	0	0
(9) Personnel Services Companies/Sections	0	0	0
(10) State Headquarters military record archive	0	0	0
(11) Training Support Brigade (TSB)	0	0	0
0 WMD - CST Mission (Removed)	0	0	0
0 CBRN and Explosive Team Facility (Removed)	0	0	0
2. Unit Storage Space (Including Arms Vault)	5,200	5,200	
a. Arms Vaults	1,200	1,200	
b. Battalion Headquarters with Organic Subunits (per TOE)	0	0	
c. Supply and Transportation Battalion (Division)	0	0	
d. Support Battalion (Separate Brigade)	0	0	
e. Heated Storage Space	4,000	4,000	
(1) Units with Required Strength >= 55	2,700	2,700	
(2) Units with Required Strength 10 - 55	1,300	1,300	
f. Unheated storage space	0	0	
3. Locker Room Space	2,144	2,144	
a. Basic Space (One per readiness center)	200	200	
b. Space per Authorized Position	1,944	1,944	
4. Special Functions	3,168	3,168	
a. JFHQ Joint Operations Center (JOC)	0	0	

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171R: ARNG - Readiness Center			
	Authorized	Requested	Memo
b. JFHQ Secure Conference Center	0	0	0
c. JFHQ Secure Commo Vehicle Ready Bay	0	0	0
d. Public Affairs Detachment	0	0	0
e. JFHQ Photographic Studio	0	0	0
f. JFHQ Media Room	0	0	0
g. Medical Section within a Headquarters Unit	0	0	0
h. Physical Exam Space.	0	0	0
i. Flight Eye Physical Exam Space	0	0	0
j. COMSEC Material Direct Support Activities (CMDSA)	0	0	0
k. Information Technology (IT) Support Activities	0	0	0
l. General Purpose Training Bay (GPTB)	3,168	3,168	3,168
(1) Workbays	3,168	3,168	3,168
(2) Office Space	0	0	0
m. Air/Army National Guard Weather Flight	0	0	0
n. Band	0	0	0
5. Firefinder Radar Readiness Bay	0	0	0
6. Secure Area	0	0	0
7. Civil Support Team Ready Building	0	0	0
a. Classrooms/Library	0	0	0
b. Training Aid Storage	0	0	0
c. Break Room (Area)	0	0	0
d. Vending Area	0	0	0
e. Toilets/Shower	0	0	0
f. Flammable Materials Storage	0	0	0
g. Table/Chair Storage	0	0	0
h. Physical Fitness	0	0	0

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**171R: ARNG - Readiness Center**

	Authorized	Requested	Memo
i. Ready Bays	0	0	
j. Operations Center	0	0	
k. Admin Space General	0	0	
l. Admin Space Special	0	0	
m. COMSEC	0	0	
n. Storage	0	0	
o. Lockers	0	0	
p. Laundry	0	0	
q. Medical Support/Storage	0	0	
r. Equipment Maintenance	0	0	
s. DECON Room	0	0	
8. Other Special Facilities	0	0	
a.	0	0	
b.	0	0	
c.	0	0	
d.	0	0	
e.	0	0	
Total Net Readiness Center Space	28,812	28,812	
Maintenance and Storage (3% of Total Net Area)	865	865	
Mechanical/Electrical Room (5% of Total Net Area)	1,441	1,441	
Telecom/IT (1% of Total Net Area)	289	289	
Circulation Allowance (15% or 22% of Total Net Area)	4,712	4,712	
Structural Allowance (10% of Total Net Area)	3,612	3,612	
Total Gross Readiness Center Space	39,731	39,731	
- Other Gross Readiness Center Space	0	0	
Total Readiness Center Space	39,731	39,731	

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**171R: ARNG - Readiness Center**  
 Authorized Requested Memo

Detached General Purpose Training Bay (GPTB)	0	0	0
1. Workbays	0	0	0
2. Office Space	0	0	0
Total Net GPTB Space	0	0	0
Maintenance and Storage (3% of Total Net Area)	0	0	0
Mechanical/Electrical Room (5% of Total Net Area)	0	0	0
Telecom/IT (1% of Total Net Area)	0	0	0
Office Space Circulation (15% of Office Totals)	0	0	0
Workbay Circulation (10% of Workbay Totals)	0	0	0
Structural Allowance (10% of Total Net Area)	0	0	0
Total Gross GPTB Space	0	0	0
—			
Detached Controlled Waste Handling	300	300	300
Circulation Allowance (15% of Net)	0	0	0
Structural Allowance (10% of Net Space)	30	30	30
Total Gross Controlled Waste Handling Space	330	330	330
Detached Unheated Storage Space	484	484	484
Circulation Allowance (15% of Net)	0	0	0
Structural Allowance (10% of Net Space)	49	49	49
Total Gross Unheated Storage Space	533	533	533
Detached Flammable Materials Storage	100	100	100
Circulation Allowance (15% of Net)	0	0	0
Structural Allowance (10% of Net Space)	10	10	10

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**171R: ARNG - Readiness Center**  
Authorized Requested Memo  
110 110

Total Gross Flammable Materials Space

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**ARNG - Common Supporting Items**

Authorized Requested Existing Memo

	Authorized	Requested	Existing	Memo
ARNG - Common Supporting Items				
Unheated Vehicle Strg Shed Needed:	No	No	0	
Wash Platform Required:	Yes	Yes	0	
Loading Ramp Required:	No	No	0	
MCOFT Type Simulator Required:	No	No	0	
Rigid Paving for Access Road:	No	No	0	
Access Road Length (LF)	0	0	0	
No. of Controlled Waste Access Facilities:	1	1	0	
No. of Fuel Trucks/Trlr to be Parked with Fuel:	0	0	0	
No. of Trucks Simultaneously at Loading Dock:	0	0	0	
No. of Turning Pads:	0	0	0	
No. of Refuse Collection/Dumpster Sites:	1	1	0	
No. of Other Access Apron Service Sites:	0	0	0	
No. of Generator Pads	1	1	0	
Fuel Storage and Dispensing Systems (EA)				
A. Total Vehicles Requiring Support	0	0	0	
1. Vehicles Requiring MOGAS (EA)	0	0	0	
2. Vehicles Requiring Diesel Fuel (EA)	0	0	0	
3. Vehicles Requiring AVGAS (EA)	0	0	0	
4. Vehicles Requiring Other Fuel (EA)	0	0	0	
B. Organizational Vehicle Parking				
1. Other Functional Activities				
a. Authorized based on Vehicle Inventory	950	950	0	
1) Wheeled vhcl and trlr/towed equip (SY)	950	950	0	
2) Tracked/lengr vehicle, and equip > 30 (SY)	0	0	0	
3) Fuel Truck (SY)	0	0	0	

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**ARNG - Common Supporting Items**

	Authorized	Requested	Existing	Memo
4) HET vehicle (SY)	0	0	0	0
2. Unheated Enclosed Vehicle Storage Shed (SF)	0	0	0	0
3. Total Exterior Organizational Vehicle Parking (SY)	950	950	0	0
<b>C. Loading Docks</b>				
1. Readiness Center Loading Dock (LS)	No	No	0	0
<b>D. Wash Platform (EA)</b>	1	1	0	0
<b>E. Military Vehicle Loading Ramp (EA)</b>	0	0	0	0
<b>F. Rigid Pavement Other Than Parking (SY)</b>	1,329	1,479	0	0
1. Structures and Pads Supporting Operations (SY)	150	300	0	0
a. Fuel Truck Containment Area (SY)	0	0	0	0
b. Miltry Vhcl Loading Ramp Sprt (SY)	0	0	0	0
c. Turn Pads (SY)	0	0	0	0
d. Helipads (SY)	0	0	0	0
e. Parking Pad for MCOFT Type Simulators (SY)	0	0	0	0
f. Generator Pad with Electrical Hookup (SY)	150	150	0	0
g. Mobile Kitchen Trailer (MKT) Parking Pad (SY)	0	150	0	0
2. Service and Access Aprons (SY)	1,179	1,179	0	0
a. Military Vehicle Loading Ramp (SY)	0	0	0	0
b. Wash Platform Pad (SY)	115	115	0	0
c. Wash Platform Access (SY)	250	250	0	0
d. Refuse Collection/Dumpster Pad (SY)	150	150	0	0
e. Controlled Waste Handling (SY)	150	150	0	0
f. Fuel Pump Island (SY)	0	0	0	0
g. Fuel Pump Access (SY)	0	0	0	0
h. Loading Dock Access (SY)	0	0	0	0
i. Firefinder Radar Readiness Bay Access	0	0	0	0

Project Number : 531201  
 Project Title : 531201  
 Date: Feb 17, 2017

**ARNG - Common Supporting Items**

	Authorized	Requested	Existing	Memo
j. Other Service Area (SY)	0	0	0	
k. Readiness Center Workbay Access Apron (SY)	214	214	0	
l. Vehicle Storage Shed Apron (SY)	0	0	0	
m. Drill Hall Door Access Apron (SY)	300	300	0	
3. Access Road and Entrance Throat (SY)	0	0	0	
G. Flexible Pavement (SY)	9,760	9,760	0	
1. Privately owned vehicle (POV) parking (SY)	4,760	4,760	0	
2. Visitor/Customer Parking (SY)	0	0	0	
3. Access Road and Entrance Throat (SY)	5,000	5,000	0	
4. Helipad Clearance Area (SY)	0	0	0	
H. Sidewalks (SY)	676	682	0	
I. Curbs (LF)	1,325	1,336	0	
J. Security Fencing (LF)	730	754	0	
K. Flagpole(s) (EA)	2	2	0	
L. Exterior Fire Protection (LS)	Yes	Yes	0	
M. Detached Facilities Sign/Static Display (EA)	1	1	0	
N. Outside Security Lighting (LS)	Yes	Yes	0	
O. Utilities (LS)				
1. Gas (LS)	Yes	Yes	0	
2. Electric (LS)	Yes	Yes	0	
3. Chilled/Heated Water Dist System (LS)	No	No	0	
4. Water (LS)	Yes	Yes	0	
5. Waste Water/Sewer (LS)	Yes	Yes	0	
P. Storm Water Drainage (LS)	Yes	Yes	0	
Q. Installed Equipment (EA)				
1. Stand-by Generator (prioritize for top 35% of load)	2	2	0	
	1	1	0	

Project Number : 531201  
 Project Title : 531201  
 Date: Feb 17, 2017

**ARNG - Common Supporting Items**

	Authorized	Requested	Existing	Memo
2. Refuse Collection Facilities	1	1	0	
3. Other Installed Equipment (LS)	0	0	0	
a.	No	No	0	
b.	No	No	0	
c.	No	No	0	
d.	No	No	0	
e.	No	No	0	
R. Fuel Storage and Dispensing Systems (EA)	0	0	0	
1. 3000 Gallons	0	0	0	
2. 5000 Gallons	0	0	0	
3. 7000 Gallons	0	0	0	
4. 10000 Gallons	0	0	0	
5. 20000 Gallons	0	0	0	
S. AC Tonnage (Total)	133	133	0	
1. AC Tonnage (Readiness Center)	133	133	0	

Project Number : 531201  
 Project Title : 531201  
 Date: Feb 17, 2017

**INFO: ARNG - Information Systems Worksheet**  
 Authorized Requested Memo

1 ISCE Inputs:		Authorized	Requested	Memo
<b>A. Square Footage Tab</b>				
1	Admin	40,615	41,013	
2	Intermediate	4,854	5,902	
3	Barracks	456	456	
4	Warehouse/Storage	0	0	
5	Clinic/Medical	11,513	11,860	
6	Class Rooms	0	0	
7	Others	6,598	6,598	
		17,194	15,799	
<b>B. New Services Tab</b>				
1	Single Line Phone	23	23	
2	ISDN Sets	23	23	
3	Multi-Line Phones	3	3	
4	Weatherproof Phones	1	1	
5	Explosive Environment Phones	2	2	
6	LAN Ports	106	106	
7	Wall/Payphone Outlet w/telephone set (additional)	2	3	
8	Fiber Optic Outlets (2RJ-45 wDual SC)	0	0	
9	SIPRNET	0	0	
10	TV Outlets – All Services	8	8	
<b>C. Cabling, Switching, and Building Tab</b>				
1	No. Persons to Use Facility Initially	151	151	
2	No. Ducts into Bldg: 2, 4, 6, 9, 12-way	2	2	
3	Maximum Occupant Capacity	99	99	
4	Proposed Bldg Entry Duct/Sys Length - Underground	0	0	
5	Type of Building	7	7	

Project Number : 531201  
Project Title : 531201  
Date: Feb 17, 2017

**INFO: ARNG - Information Systems Worksheet**  
Authorized Requested Memo

II ISCE Results:

A. Construction Primary Funded (\$000)	308	308
B. Construction Support Funded (\$000)	87	87
C. ISC Equipment (OPA \$000)	138	138
D. ISCE Proponent (OMNG \$000)	12	12

## **I. Military Guide and References Materials**

- D UFC 4.010.01- DOD Minimum Anti-terrorism Standards for Buildings (12 Dec 2018)

# UNIFIED FACILITIES CRITERIA (UFC)

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## DoD MINIMUM ANTITERRORISM STANDARDS FOR BUILDINGS



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U.S. ARMY CORPS OF ENGINEERS (Preparing Activity)

NAVAL FACILITIES ENGINEERING COMMAND

AIR FORCE CIVIL ENGINEER CENTER

Record of Changes (changes are indicated by \1\ ... /1/)

<b>Change No.</b>	<b>Date</b>	<b>Location</b>

---

**This UFC supersedes UFC 4-010-01 Change 1, dated October 2013.**

## FOREWORD

The Unified Facilities Criteria (UFC) system is prescribed by MIL-STD 3007 and provides planning, design, construction, sustainment, restoration, and modernization criteria, and applies to the Military Departments, the Defense Agencies, and the DoD Field Activities in accordance with [USD \(AT&L\) Memorandum](#) dated 29 May 2002. UFC will be used for all DoD projects and work for other customers where appropriate. All construction outside of the United States is also governed by Status of Forces Agreements (SOFA), Host Nation Funded Construction Agreements (HNFA), and in some instances, Bilateral Infrastructure Agreements (BIA). Therefore, the acquisition team must ensure compliance with the most stringent of the UFC, the SOFA, the HNFA, and the BIA, as applicable.

UFC are living documents and will be periodically reviewed, updated, and made available to users as part of the Services' responsibility for providing technical criteria for military construction. Headquarters, U.S. Army Corps of Engineers (HQUSACE), Naval Facilities Engineering Command (NAVFAC), and Air Force Civil Engineer Center (AFCEC) are responsible for administration of the UFC system. Defense agencies should contact the preparing service for document interpretation and improvements. Technical content of UFC is the responsibility of the cognizant DoD working group. Recommended changes with supporting rationale may be sent to the respective DoD working group by submitting a Criteria Change Request (CCR) via the Internet site listed below.

UFC are effective upon issuance and are distributed only in electronic media from the following source:

- Whole Building Design Guide web site <http://www.wbdg.org/ffc/dod>.

Refer to UFC 1-200-01, *DoD Building Code (General Building Requirements)*, for implementation of new issuances on projects.

### AUTHORIZED BY:



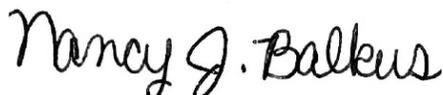
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Deputy Assistant Secretary of Defense  
(Facilities Investment and Management)  
Office of the Assistant Secretary of Defense  
(Energy, Installations, and Environment)

**UNIFIED FACILITIES CRITERIA (UFC)  
REVISION SUMMARY SHEET**

**Document:** UFC 4-010-01, *DoD Minimum Antiterrorism Standards for Buildings*

**Superseding:** UFC 4-010-01 Change 1, dated October 2013 and cancels UFC 4-010-02.

**Description:** The purpose of this criteria is to establish minimum engineering standards for DoD projects that incorporate antiterrorism (AT) based mitigating measures not associated with an identified threat or level of protection. The intent of these standards is to reduce collateral damage and the scope and severity of mass casualties in buildings or portions of buildings owned, leased, privatized, or otherwise occupied, managed, or controlled by or for DoD in the event of a terrorist attack. This document applies to all DoD Components and to all DoD inhabited buildings as defined in the applicability section of this UFC.

Information in Chapter 4 and Appendix B will be removed when UFC 4-027-01, Design to Mitigate Terrorist Attacks in Expeditionary Environments and UFC 4-020-02: Security Engineering Facilities Design Manual are published.

**Reasons for Document:**

- This UFC establishes the minimum engineering standards that incorporate antiterrorism based mitigating measures not associated with an identified threat against DoD personnel and assets. This document has been updated to remove mitigation measure tied to a specific explosive weight.

**Impact:**

- This revision will likely reduce the cost of construction for facilities that do not require a higher level of protection, and will promote efficiencies in land use and installation comprehensive planning.

**Unification Issues**

- There are no unification issues.

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## CHAPTER 1 INTRODUCTION

### 1-1 BACKGROUND.

One of the findings in the 1996 Downing Commission report on the Khobar Towers bombing in Dhahran, Saudi Arabia was that there were no standards for force protection in fixed DoD facilities. In partial response to that finding, the initial version of this document was published as an interim standard in December 1999. It applied to Military Construction (MILCON) funded new construction and major renovations of DoD buildings beginning with the Fiscal Year 2002 program. It was transmitted by a memorandum dated 20 September 2002 from the Undersecretary of Defense for Acquisition, Technology and Logistics (USD (AT&L)) and was referenced as a requirement by DoD Instruction 2000.16.

### 1-2 PURPOSE AND SCOPE.

The purpose of this standard is to establish minimum engineering standards that incorporate antiterrorism (AT) based mitigating measures where no identified threat or level of protection has been determined in accordance with UFC 4-020-01.

### 1-3 INTENT.

The intent of these standards is to reduce collateral damage and the scope and severity of mass casualties in the event of a terrorist attack. These standards provide cost effective, implementable, and enforceable construction standards to protect personnel against terrorist attacks. While complete protection against all potential threats for every inhabited building is cost prohibitive, the intent of these standards can be achieved through prudent master planning, real estate acquisition, and design and construction practices.

### 1-4 IMPLIMENTATION.

Implement in accordance with the Implementation, Administration, and Enforcement paragraph in UFC 1-200-01. These standards apply to projects funded under host-nation agreements after the implementation date of these standards or as soon as negotiations with the foreign governments can be completed.

Due to major changes between these standards and previous editions, projects currently under design and beyond 35% completion may consider complying with these standards where possible.

### 1-5 APPLICABILITY.

These standards apply to all DoD Components, to all DoD inhabited buildings and high occupancy family housing, to all inhabited tenant buildings on DoD installations, and to all DoD expeditionary structures.

**1-5.1 New Construction.**

Implementation of these standards is mandatory for all new construction regardless of funding source.

**1-5.2 Existing Buildings.**

Implementation of these standards is mandatory to existing buildings when triggered as specified below, regardless of funding source.

**1-5.2.1 Major Investments.**

Implementation of these standards to bring entire inhabited buildings into compliance is mandatory for all DoD building renovations, modifications, repairs, revitalizations, and restorations where project costs exceed 50% of the replacement cost of the existing building in accordance with UFC 3-701-01 except as otherwise stated in these standards. The 50% cost is exclusive of the costs identified to meet these standards.

Where costs do not exceed the 50% threshold, compliance with these standards is recommended, but not required.

**1-5.2.2 Change of Occupancy Level.**

Implementation of these standards is mandatory when any building or portion of a building is converted from low occupancy to inhabited occupancy. Examples would include a warehouse (low occupancy) being converted to administrative (inhabited) use.

**1-5.2.3 Window, Skylight, Glazing, and Door Replacement Projects.**

Because of the significance of glazing hazards in a blast environment, implementation of all provisions of Standard 10 is mandatory for existing inhabited buildings any time a window, skylight, or glazing is being replaced. This also applies to installation of supplemental windows behind existing windows (inside face) and to installations of windows in new openings.

Because of the significance of door hazards in a blast environment, implementation of all provisions of Standard 12 is mandatory for existing inhabited buildings any time doors are being replaced.

**1-5.2.4 Heating, Ventilating, and Air Conditioning (HVAC) Systems and Associated Controls.**

Whenever HVAC systems featuring outside air intakes or control systems associated with HVAC systems including outside air intakes are being replaced or modified, apply provisions of Standard 18. Modifications include, but are not limited to modifications such as complete air handling unit replacement, outside air control damper replacement, major ductwork reconfiguration, control system replacement, and control system reprogramming. Modifications do not include replacement of or repair of components such as coils and fans and do not include control system software updates

or reprogramming in support of additional equipment added to an existing control system.

### **1-5.3 Building Additions.**

Inhabited additions to existing buildings must comply with the minimum standards for new buildings. If the addition is 50% or more of the gross area of the existing building, the existing building will comply with the minimum standards for existing buildings in Chapter 3. Cost of building additions will not be included in calculating the 50% trigger for major investments.

Throughout these standards references to new construction will be considered to be inclusive of additions to existing buildings.

### **1-5.4 Leased Buildings.**

In accordance with DoD Instruction 2000.12, the security standards established by the Interagency Security Committee (ISC) in Physical Security Criteria for Federal Facilities must apply to all off-installation leased space managed by DoD and all DoD occupied space in buildings owned or operated by the U.S. General Services Administration (GSA). The ISC standards apply to leased space in the U.S. and in foreign countries. Current tenants and tenants who initiated lease requests prior to 7 December 2012 must apply the ISC standards in accordance with existing lease agreements to the extent practicable.

### **1-5.5 Privatized Buildings.**

Privatized inhabited buildings and high occupancy family housing that meet the applicability provisions above, will comply with these standards.

### **1-5.6 DoD Purchases of Existing Buildings.**

Existing inhabited buildings purchased for use by DoD will comply with the minimum standards for existing buildings. Those buildings will meet the requirements before they can be occupied by DoD personnel.

### **1-5.7 Non-DoD Tenant Buildings on DoD Installations.**

Tenant buildings on DoD installations other than those that meet one of the exemptions below are required to comply with these standards because it is assumed that the tenant buildings are likely to be turned over to DoD sometime during their design life and that they will then be occupied by DoD personnel. For the purposes of these standards, occupancies for non-DoD tenant-built building will be calculated assuming that building occupants are DoD personnel.

### **1-5.8 National Guard Buildings.**

National Guard buildings that use Federal funding for new construction, renovations, modifications, repairs, or restorations that meet the applicability provisions above, will comply with these standards.

### **1-5.9 Expeditionary Structures.**

Implementation of these minimum standards is mandatory for all expeditionary structures that meet the occupancy criteria for inhabited buildings. See Chapter 4 for structure types that meet the expeditionary structures criteria. Many expeditionary structures are in forward operating locations where there is a conventional and/or terrorist threat more severe than those addressed in these standards. In those situations, more detailed planning and additional measures are needed for providing protection. Refer to the GTA 90-01-011, Joint Forward Operations Base (JFOB) Survivability and Protective Construction Handbook.

#### **1-5.9.1 New Structures.**

These standards apply to all new expeditionary structures effective as of the implementation date of these standards.

#### **1-5.9.2 Existing Structures.**

These standards will apply to all existing expeditionary structures as they undergo major modifications or renovations as of the implementation date of these standards.

### **1-6 EXCEPTIONS.**

The following buildings are exempt from all provisions of these standards. Compliance with these standards for those buildings is recommended where possible. In addition, there are some exemptions to individual standards that are included in the text of those standards in CHAPTER 3.

#### **1-6.1 Low Occupancy Buildings.**

Buildings whose occupancies do not meet the occupancy levels of inhabited buildings.

#### **1-6.2 Low Occupancy Family Housing.**

Family housing with 12 units or fewer per building.

The exemption of family housing with 12 units or fewer in a single building acknowledges that the density of such units is generally low, reducing the likelihood of mass casualties. It also acknowledges the fact that low-density housing has rarely been directly targeted by terrorists.

**1-6.3 Fisher Houses.**

Fisher houses with 24 units or fewer.

**1-6.4 Town Centers.**

Town Center buildings that include retail, health, or community services space on the first floor and not more than 12 units of family housing above that space.

This exception does not apply where the buildings contain any occupancy other than retail, health, community services, and family housing or where the retail space is more than half of the total area of the family housing.

**1-6.5 Enhanced Use Leases.**

Facilities associated with enhanced use leases on DoD installations, unless a facility warrants additional force protection due to its specific purpose and/or location per title 10 U.S.C. section 2667(b)(8). Application of these standards must be justified on a case-by-case basis.

**1-6.6 Transitional and Temporary Structures and Spaces.**

Buildings, structures, and spaces that are required for limited durations to maintain operations during construction, for other temporary mission requirements, or for administering construction contracts.

Lightweight buildings or trailers are frequently provided for these structures, and those kinds of structures are commonly not commercially available with construction such as laminated glass windows that will meet these standards. Enforcing the standards on those structures, therefore, would be of questionable economic feasibility for the short duration for which they are anticipated to be used.

**1-6.6.1 Transitional Structures and Spaces.**

Buildings and structures, including buildings and structures leased to provide transitional spaces during the life of the construction or renovation contract for which the transitional buildings and structures are being provided, but no longer than 5 years.

**1-6.6.2 Temporary and Relocatable Buildings.**

Temporary and relocatable buildings that are intended for use for less than 5 years in non-expeditionary environments are exempt from all provisions of these standards.

**1-6.7 Military Protective Construction.**

Facilities designed to the North Atlantic Treaty Organization (NATO) (or equivalent) standards for collaterally protected, semi-hardened, protected, and hardened facilities are exempt from all provisions of these standards. (Refer to Supreme Headquarters Allied Power Europe (SHAPE) document 6160/SHLOFA-059-82.)

These facilities are exempted because the military conventional and nuclear weapons threats to which they are designed are much more stringent than those included in these standards due to their purpose of protecting critical military functions. Facilities designed to protective construction standards will provide higher levels of protection for facility occupants than those required by these standards.

#### **1-6.8 Parking Structures.**

Parking structures are exempt from these standards except where there are areas built into the structures that meet the definition of inhabited buildings. People accessing their vehicles do not need to be included in any calculation of population or population density.

### **1-7 OCCUPANCY CALCULATION.**

The starting point for applying the Standards is based on buildings or portions of buildings being routinely occupied by 11 or more DoD personnel and with a population density of greater than one person per 430 gross square feet (40 gross square meters). The determination of occupancy is usually straightforward but in some cases there are questions on how to calculate occupancies. The following are examples of how to determine occupancy.

#### **1-7.1 Gas Stations and Car Care Centers.**

Where DoD or non-DoD visitors to Gas Stations and Car Care Centers routinely increase the occupancy of those buildings to levels meeting the definition of inhabited buildings, those buildings will comply with these standards.

#### **1-7.2 Visitor Centers and Museums.**

Where DoD or non-DoD visitors to visitor centers, museums, and similar buildings on DoD property routinely increase the occupancy of those buildings to levels meeting the definition of inhabited buildings, those buildings will comply with these standards.

#### **1-7.3 Visitor Control Centers at Entry Control Facilities / Access Control Points.**

Where DoD personnel and the average daily peak occupancy of visitors routinely increase the occupancy of those buildings to levels meeting the definition of inhabited buildings, those buildings will comply with these standards. See UFC 4-022-01 for average daily occupancy calculation.

### **1-8 REGULATORY AUTHORITIES.**

The following regulatory authorities may establish antiterrorism related requirements in addition to the Standards in this UFC.

### **1-8.1 DoD and Heads of DoD Components.**

DoD and heads of DoD Components may establish additional guidance or standards for facilities under their authority or to account for any component related special circumstances.

### **1-8.2 Geographic Combatant Commanders.**

Geographic Combatant Commanders (GCC) may establish additional guidance or standards within their areas of operations. Such guidance is typically included in Antiterrorism Operations Orders (OPORD).

### **1-8.3 Installation Specific Requirements.**

As required by DoD Instruction O-2000.16 and service directives, each installation must have an Antiterrorism Plan. The plan provides procedures and recommendations for reducing risk and vulnerability of DoD personnel, their family members, facilities, and assets from acts of terrorism. Installation Antiterrorism Plans may define a Design Basis Threat for the installation; however, UFC 4-020-01 must be used to validate the Design Basis Threat and level of protection for individual projects.

## **1-9 EXPLOSIVE SAFETY STANDARDS.**

These antiterrorism standards establish criteria to minimize mass casualties and progressive collapse of buildings from terrorist attacks. DoD 6055.09-M, DoD Ammunition and Explosives Safety Standards as implemented by Service component explosive safety standards, establish acceptable levels of protection for accidental explosions of DoD-titled munitions. The explosive safety and antiterrorism standards address hazards associated with unique events; therefore, they specify different levels of protection. Compliance with both standards is required where applicable. Where conflicts arise, the more stringent criteria will govern.

## **1-10 GENERAL BUILDING REQUIREMENTS.**

Comply with UFC 1-200-01, *DoD Building Code (General Building Requirements)*. UFC 1-200-01 provides applicability of model building codes and government unique criteria for typical design disciplines and building systems, as well as for accessibility, antiterrorism, security, high performance and sustainability requirements, and safety. Use this UFC in addition to UFC 1-200-01 and the UFCs and government criteria referenced therein.

It is assumed that the provisions of these standards will be coordinated with all other applicable DoD building and design criteria and policies. Nothing in these standards should be interpreted to supersede the provisions of any other applicable building or design criteria. Where other criteria mandate more stringent requirements, the most stringent is applicable.

**1-11 PROJECT PLANNING AND DESIGN CRITERIA.**

The standards contained within this document do not establish the Design Basis Threat or Level of Protection for DoD buildings. Use UFC 4-020-01 to establish the Design Basis Threat and Level of Protection for individual projects.

**1-12 HISTORIC PRESERVATION COMPLIANCE.**

**1-12.1 Security and Stewardship.**

The Department of Defense remains the lead federal agency in balancing security threats with the protection of historic properties. The Department of Defense abides by federal legislation on protecting cultural resources, and issues its own complementary policies for stewardship.

**1-12.2 Compliance with Laws.**

Implementation of these standards will not supersede DoD's obligation to comply with federal laws regarding cultural resources to include the National Historic Preservation Act (NHPA) and the Archaeological Resources Protection Act (ARPA). Installation personnel must determine possible adverse effects to historic structures and/or archaeological resources during project development and consult accordingly. Personnel at installations outside the United States should coordinate with the applicable host nation regarding possible adverse effects to cultural resources.

**1-12.3 Compliance with DoD Standards.**

Conversely, historic preservation compliance does not negate the requirement to implement other Department of Defense policy. Federal agencies are always the decision-maker in the Section 106 process of the National Historic Preservation Act. An agency should seek to avoid prolonged consultations that conflict with the eminent need to implement security requirements. Preservation considerations and antiterrorism standards are not mutually exclusive, and any compliance conflicts should be quickly and effectively resolved in consultation with appropriate stakeholders.

**1-13 GLOSSARY.**

APPENDIX D contains acronyms, abbreviations, and definitions of terms.

**1-14 REFERENCES.**

APPENDIX E contains a list of references used in this document. The publication date of the code or standard is not included in this document. Unless otherwise specified, the most recent edition of the referenced publication applies.

**1-15 PLANNING AND INTEGRATION.**

When the best procedures, proper training, and appropriate equipment fail to deter terrorist attacks, adherence to these standards goes toward mitigating the possibility of

mass casualties from terrorist attacks against DoD personnel in the buildings in which they work and live. Although predicting the specific threat is not possible, proper planning and integration of those plans provide a solid foundation for preventing, and if necessary reacting, when terrorist incidents or other emergencies unfold.

### **1-15.1 Threat-Specific Requirements.**

Determining the Design Basis Threat is an installation function requiring programmers, antiterrorism officers, and members of the threat working group. Determining the facility Design Basis Threat is the first step in planning antiterrorism requirements. However, without a defined level of protection, only the minimum standards apply. The Design Basis Threat and level of protection are unique for each individual facility and are based on the threat likelihoods and the values of the assets in the building. Use UFC 4-020-01 to determine the Design Basis Threat and level of protection for individual projects. The process outlined in UFC 4-020-01 will determine if the minimum AT standards are adequate or if additional protective measures are required.

### **1-15.2 Effective Planning.**

An effective planning process facilitates the necessary decision making, clarifies roles and responsibilities, and ensures support actions generally go as planned. A team consisting of the chain of command and key personnel from all appropriate functional areas who have an interest in the building and its operation executes this planning process. The team should include, as a minimum, antiterrorism/force protection, intelligence, security, and facility engineering personnel. This team is responsible for identifying requirements for the project, facilitating the development of supporting operational procedures, obtaining adequate resources, and properly supporting all other efforts needed to prudently enhance protection of the occupants of every inhabited DoD building. For further information on planning and integration, refer to UFC 4-020-01.

### **1-15.3 Critical Facilities.**

Buildings that must remain mission operational during periods of national crisis and may be subjected to terrorist attack may warrant design to higher levels of protection than those provided by these standards. Ensure detailed risk and threat assessments are executed using UFC 4-020-01 for buildings containing critical assets.

## **1-16 MASTER PLANS.**

Installation master plans must include roadmaps for new and existing facilities. Master plans should consider threats and levels of protection for facilities. For site planning this may include standoff from parking, base perimeters, and entry control facilities / access control points, but it can also include utilities, vantage points, and the location of high value assets.

## **1-17 SECURITY ENGINEERING UFC SERIES.**

This UFC is one of a series of security engineering unified facilities criteria documents that cover minimum standards, planning, preliminary design, and detailed design for security and antiterrorism. The manuals in this series are designed to be used sequentially by a diverse audience to facilitate development of projects throughout the design cycle. The manuals in this series include the following:

### **1-17.1 DoD Minimum Antiterrorism Standards for Buildings.**

This UFC establishes standards that provide minimum protection against terrorist attacks for the occupants of all DoD inhabited buildings. This UFC is intended to be used by security and antiterrorism personnel and design teams to identify the minimum requirements that must be incorporated into the design of all new construction and major renovations of inhabited DoD buildings and inhabited tenant buildings on DoD installations. They also include recommendations that should be, but are not required to be incorporated into all such buildings.

### **1-17.2 Security Engineering Facilities Planning Manual.**

UFC 4-020-01 presents processes for developing the design criteria necessary to incorporate security and antiterrorism into DoD facilities and for identifying the cost implications of applying those design criteria. Those design criteria may be limited to the requirements of the minimum standards, or they may include protection of assets other than those addressed in the minimum standards (people), aggressor tactics that are not addressed in the minimum standards, or levels of protection beyond those required by the minimum standards. The cost implications for security and antiterrorism are addressed as cost increases over conventional construction for common construction types. The changes in construction represented by those cost increases are tabulated for reference, but they represent only representative construction that will meet the requirements of the design criteria. The manual also addresses the tradeoffs between cost and risk. The Security Engineering Facilities Planning Manual is intended to be used by planners as well as security and antiterrorism personnel with support from planning team members.

### **1-17.3 Security Engineering Facilities Design Manual.**

UFC 4-020-02FA provides interdisciplinary design guidance for developing preliminary systems of protective measures to implement the design criteria established using UFC 4-020-01. Those protective measures include building and site elements, equipment, and the supporting manpower and procedures necessary to make them all work as a system. The information in UFC 4-020-02FA is in sufficient detail to support concept level project development, and as such can provide a good basis for a more detailed design. The primary audience for the Security Engineering Design Manual is the design team, but it can also be used by security and antiterrorism personnel.

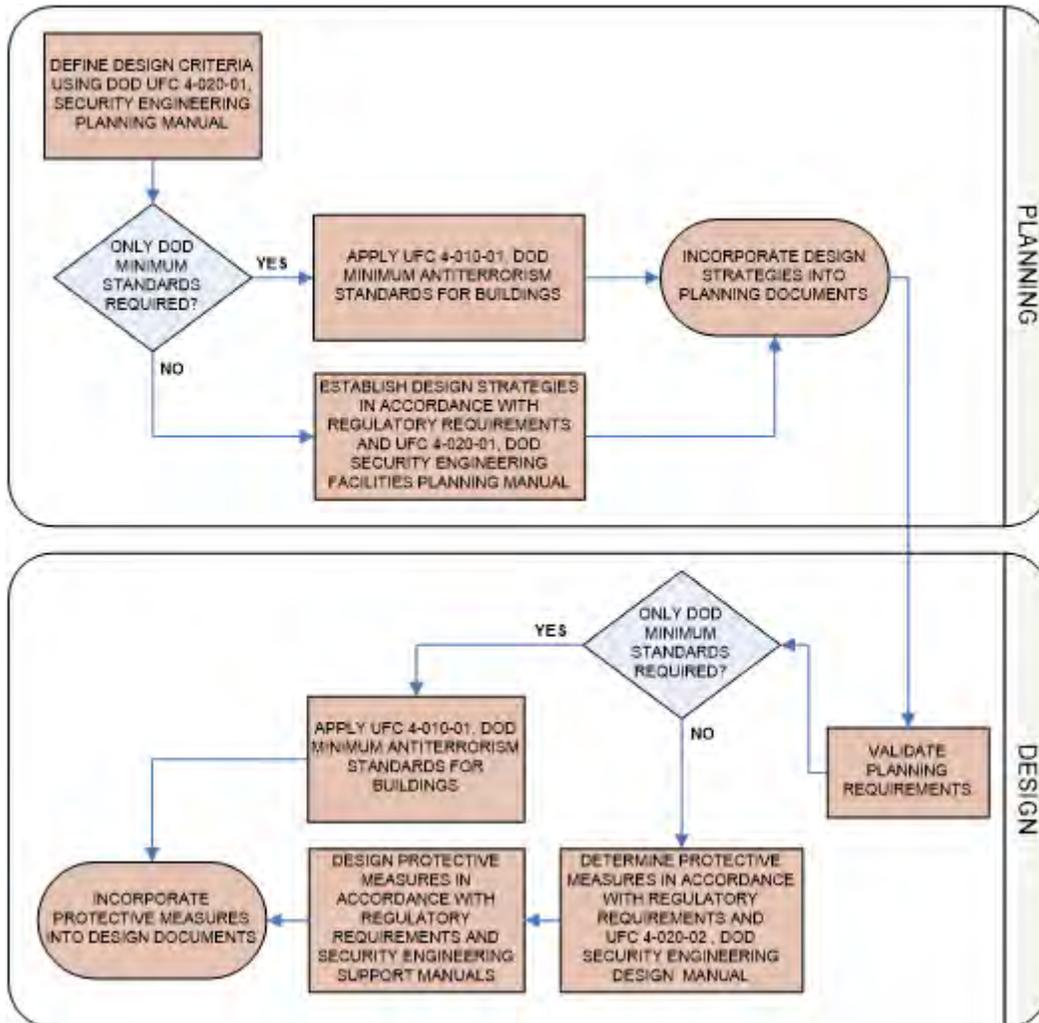
#### **1-17.4 Security Engineering Support Manuals.**

In addition to the standards, planning, and design UFCs mentioned above, there is a series of additional UFCs that provide detailed design guidance for developing final designs based on the preliminary designs developed using UFC 4-020-02. These support manuals provide specialized, discipline specific design guidance. Some address specific tactics such as direct fire weapons, forced entry, or airborne contamination. Others address limited aspects of design such as resistance to progressive collapse or design of portions of buildings such as mail rooms. Still others address details of designs for specific protective measures such as vehicle barriers or fences. The Security Engineering Support Manuals are intended to be used by the design team during the development of final design packages.

#### **1-17.5 Security Engineering UFC Application.**

The application of the security engineering series of UFCs is illustrated in Figure 1-1. UFC 4-020-01 is intended to be the starting point for any project that is likely to have security or antiterrorism requirements. By beginning with UFC 4-020-01, the design criteria will be developed that establishes which of the other UFCs in the series will need to be applied. The design criteria may indicate that only the minimum standards need to be incorporated, or it may include additional requirements, resulting in the need for application of additional UFCs. Applying this series of UFCs in the manner illustrated in Figure 1-1 will result in the most efficient use of resources for protecting assets against security and antiterrorism related threats.

Figure 1-1 Security Engineering UFC Applicability



**1-18 STANDARDS AND RECOMMENDATIONS.**

Mandatory DoD minimum antiterrorism standards for new and existing inhabited buildings are contained in Chapter 3. Mandatory DoD minimum antiterrorism standards for expeditionary structures are contained in Chapter 4. Where specific Design Basis Threat and level of protection are identified, additional guidance is included in APPENDIX B.

Additional recommended measures for new and existing inhabited buildings are included in APPENDIX A. The standards and recommendations in this document include a combination of performance and prescriptive requirements. In many cases where there are minimum prescriptive requirements, those requirements are based on performance standards and there are generally provisions to allow those performances to be provided through alternate means where those means will provide the required levels of protection.

## CHAPTER 2 PHILOSOPHY, DESIGN STRATEGIES, AND ASSUMPTIONS

### 2-1 GENERAL.

The purpose of this chapter is to clarify the philosophies on which these standards are based, the design strategies that are their foundation, and the assumptions inherent in their provisions. The further purpose of this chapter is to provide background and rationale for the requirements in Chapter 1 and Chapter 3; therefore, nothing in this chapter should be construed to establish a requirement. Effective implementation of these standards depends on a reasonable understanding of the rationale for them. With this understanding, engineers and security and antiterrorism personnel can maximize the efficiency of their solutions for complying with these standards while considering site-specific threat and mission related issues and constraints that might dictate measures beyond these minimums.

### 2-2 PHILOSOPHY.

The overarching philosophy upon which this document is based is that comprehensive protection for every inhabited facility against the range of possible threats is cost prohibitive, but that appropriate protective measures can be provided for all DoD personnel at a reasonable cost. Those protective measures are engineering solutions intended to lessen the risk of mass casualties resulting from terrorist attacks. Implementation of these standards will provide some protection against a wide range of threats and will reduce injuries and fatalities. The costs associated with these standards are assumed to be less than the physical and intangible costs associated with incurring mass casualties.

Furthermore, all DoD decision makers must commit to making smarter investments with the scarce resources available and stop investing money in inadequate buildings that DoD personnel will have to occupy for decades, regardless of the threat environment. There are two key elements of this philosophy that influence the implementation of these standards.

#### 2-2.1 Time.

Protective measures must be in place prior to the initiation of a terrorist attack. Incorporating those measures into DoD buildings and inhabited tenant buildings on DoD installations is least expensive at the time those buildings are being constructed, are undergoing major renovation, repair, restoration, or modernization, or when existing buildings are being purchased. Because of that investment strategy, it is recognized that it may take significant time before all DoD buildings and inhabited tenant buildings on DoD installations comply with these standards.

#### 2-2.2 Design Practices.

The philosophy of these standards is to build a baseline level of resistance to terrorist attack into all DoD inhabited buildings. That philosophy affects the general practice of designing inhabited buildings. While these standards are not based on an identified threat or level of protection, they are engineering solutions intended to provide the

easiest and most economical methods to minimize injuries and fatalities in the event of a terrorist attack. The primary methods to achieve this outcome are to construct superstructures to avoid progressive collapse, minimize hazardous flying debris, provide effective building layout, limit airborne contamination, and provide building mass notification. These and related design issues are intended to be incorporated into standard design practice.

## **2-3 DESIGN STRATEGIES.**

There are several major design strategies that are applied throughout these standards. They do not account for all of the measures considered in these standards, but they are the most effective and economical in protecting DoD personnel from terrorist attacks. These strategies are summarized below.

### **2-3.1 Prevent Building Collapse.**

Provisions for preventing building collapse are essential to minimizing mass casualties of building occupants. Those provisions apply regardless of standoff distance or the ability of buildings to resist blast effects since structural systems that provide greater continuity and redundancy among structural components will help limit collapse for any extreme loading events.

### **2-3.2 Minimize Hazardous Flying Debris.**

In past explosive events where there was no building collapse, a high number of injuries resulted from flying glass fragments and debris from walls, ceilings, and fixtures (non-structural features). Flying debris can be minimized through building design and avoidance of certain building materials and construction techniques. The glass used in most windows breaks at very low blast pressures, resulting in hazardous, dagger-like fragments. Minimizing those hazards through reduction in window numbers and sizes and through enhanced window construction has a major effect on limiting mass casualties. Hazardous fragments may also include secondary debris from such sources as barriers and site furnishings.

### **2-3.3 Provide Effective Building Layout.**

Effective design of building layout and orientation can significantly reduce opportunities for terrorists to target building occupants or injure large numbers of people.

### **2-3.4 Limit Airborne Contamination.**

Effective design of heating, ventilation, and air conditioning (HVAC) systems can significantly reduce the potential for chemical, biological, and radiological agents being distributed throughout buildings.

### **2-3.5 Provide Building Mass Notification.**

Providing a timely means to notify building occupants of threats and what should be done in response to those threats reduces the risk of mass casualties. Effective designs will include means for both local and remote origination of information.

## **2-4 ASSUMPTIONS.**

This section includes assumptions that form the foundation of these standards and assumptions and philosophies behind some of the provisions of these standards.

### **2-4.1 Baseline Antiterrorism Protective Measures.**

The location, severity, and nature of terrorist threats are unpredictable. It would be cost prohibitive to provide protection against the worst-case scenario in every building. These standards provide a reasonable baseline of antiterrorism protective measures for inhabited DoD buildings and inhabited tenant buildings on DoD installations. Designing to these standards will provide general collateral protection and will establish a foundation upon which to build additional measures where justified by higher threats or when the threat environment increases in the future.

The terrorist threats addressed in these standards are further assumed to be directed against DoD personnel. Threats to other assets and critical infrastructure and specific threats to facilities are beyond the scope of these standards, but they are addressed in UFC 4-020-01. The following are the terrorist tactics upon which these standards are based:

#### **2-4.1.1 External Explosive Threats.**

These minimum standards are not based on a specific Design Basis Threat identified against the facility being designed. These minimum standards provide collateral damage protection for threats directed against other nearby facilities.

#### **2-4.1.2 Mail Bombs.**

Explosives in packages delivered through the mail can cause significant localized damage, injuries, and fatalities if they detonate inside a building. No assumption as to the size of such explosives is made in these standards. Provisions for mail bombs are limited to specifying locations of mail rooms so that they can be more efficiently hardened if a specific threat of a mail bomb is identified in the future.

#### **2-4.1.3 Chemical, Biological, and Radiological Weapons.**

For the purposes of these standards, these weapons are assumed to be improvised weapons containing airborne agents employed by terrorists. These standards do not assume comprehensive protection against this threat. They provide means to reduce the potential for widespread dissemination of such agents throughout buildings in the event of an attack either outside buildings or in mail rooms.

**2-4.2 Policies and Procedures.**

It is assumed that policies and procedures will be developed to support these standards and other related issues and that those policies and procedures will be incorporated into antiterrorism plans, training, and exercises. It is assumed for the purposes of these standards that policies and procedures will be developed by physical security personnel at individual installations or buildings based on their local capabilities and situations.

**2-4.3 Training.**

It is assumed that key security and facility personnel will receive training in security engineering, antiterrorism, physical security, and related areas. It is further assumed that all DoD personnel have been trained in basic antiterrorism awareness in accordance with DoD Instruction O-2000.16, that they are able to recognize potential threats, and that they know the proper courses of action should they detect a potential threat.

## CHAPTER 3 STANDARDS

### 3-1 INTRODUCTION.

The purpose of this chapter is to establish standards to provide appropriate protective measures for the protection of DoD personnel at a reasonable cost. These standards represent engineering solutions intended to lessen the risk of mass casualties and collateral damage resulting from terrorist attacks. Implementation of these standards will provide some protection against a wide range of threats and should reduce injuries and fatalities.

The standards in this chapter provide the minimum protective measures for DoD inhabited buildings. Engineers, security and antiterrorism personnel must consider site-specific threats, mission related issues and constraints that might dictate measures beyond these minimums. Use UFC 4-020-01 to establish project requirements and determine if these minimum standards are adequate or if additional mitigation measures are required. The engineering risk analysis conducted as part of UFC 4-020-01 should be consistent with the terrorism risk analysis conducted by the installation security/AT staff.

### 3-2 STANDARD 1. STANDOFF DISTANCE.

The previous version of Standard 1 established standoff distances to parking, roadways, and controlled perimeters that were based on building construction and occupancy. In this revision of Standard 1, standoff distances only apply to distances to installation perimeters for new construction and additions to existing buildings that are required to comply with these standards.

Exception: Existing buildings within an installation perimeter are exempt from this standard.

#### 3-2.1 Minimum Standoff.

The minimum standoff distance for new construction and additions to existing buildings to the installation perimeter is 20 ft. (6 m). Where there is no clear zone outside the perimeter, the minimum standoff distance is 50 ft. (15 m).

For buildings that are outside an installation perimeter, use UFC 4-020-01 to establish the Design Basis Threat, level of protection and resulting standoff.

##### 3-2.1.1 Clear Zone.

Standoff distances to installation perimeters are based on clear zone requirements. Clear zones are areas established around the perimeters to provide unobstructed views to enhance detection and assessment. Typically, clear zones are free of all obstacles, topographical features, and vegetation exceeding 8 in. (152 mm) in height that could impede observation or provide cover and concealment of an aggressor. Provide a minimum aggregate clear zone of 50 feet (15 m) inclusive of the clear zones outside and inside the installation perimeter. For example, if an outer clear zone is 20 ft. (6 m)

wide, the standoff distance to the installation perimeter must be 30 ft. (10 m) wide. Clear zones only provide unobstructed views and do not require access control. Some installations and high security areas may have higher clear zone requirements. Consult with local antiterrorism and security personnel to determine if higher clear zones are required. See Figure 3-1 and Figure 3-2.

Figure 3-1 Installation Perimeter with Outer Clear Zone

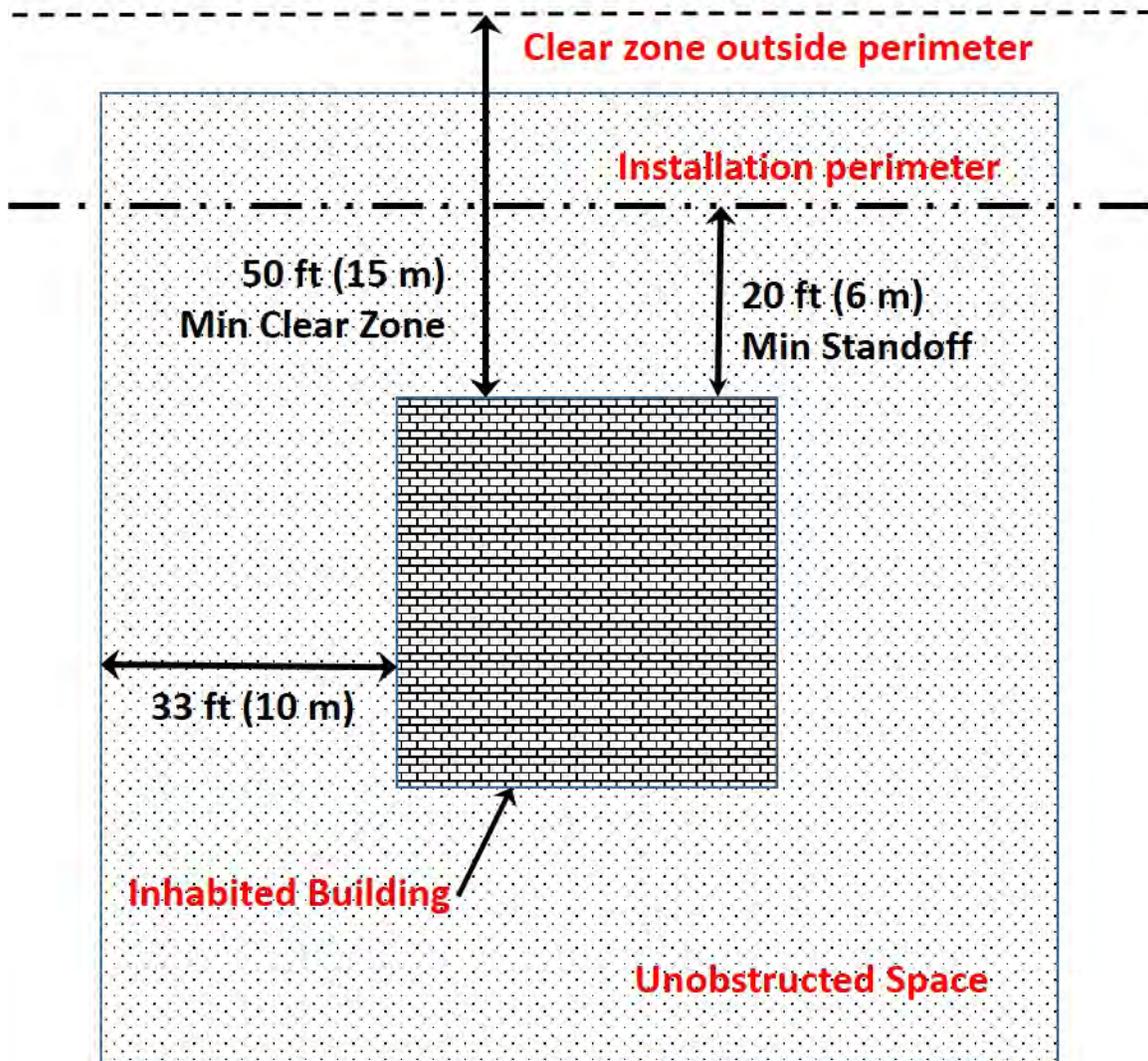
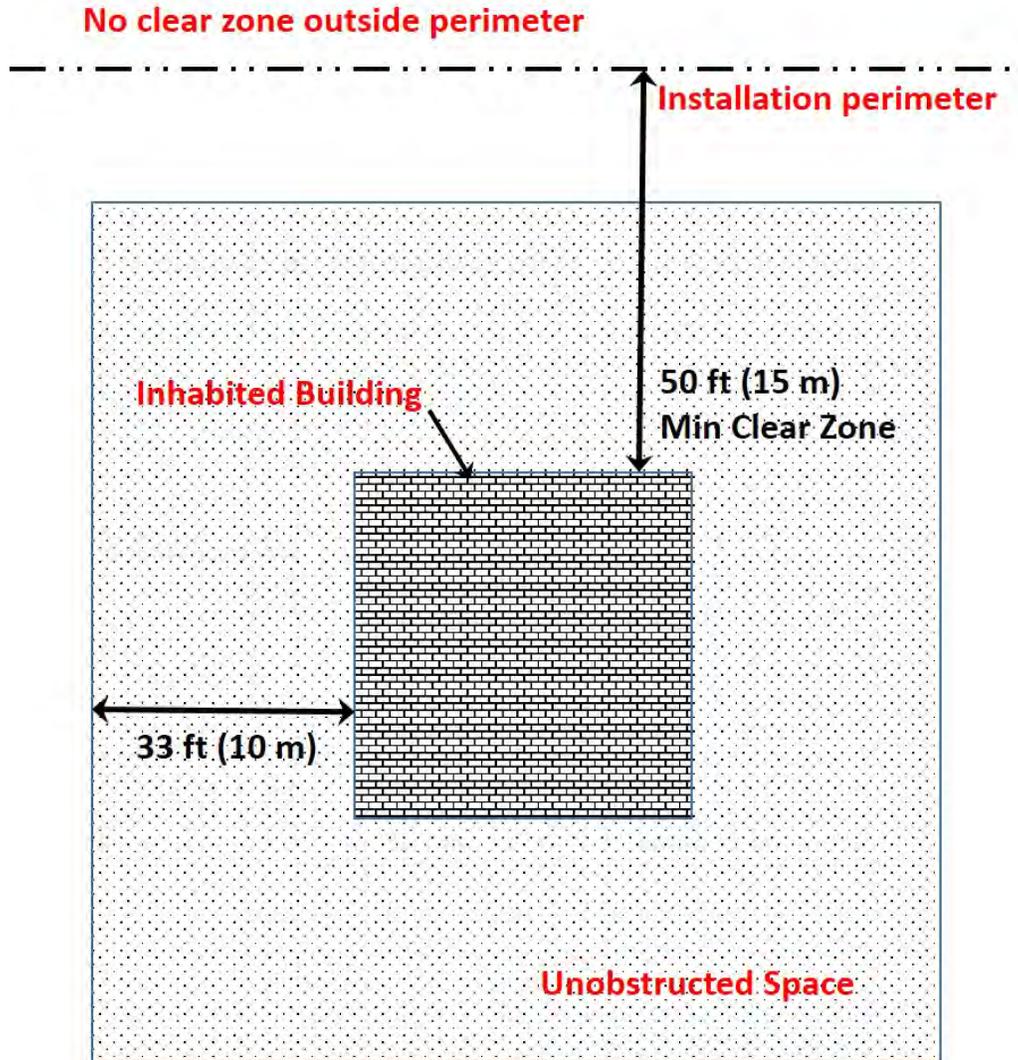


Figure 3-2 Installation Perimeter without Outer Clear Zone



**3-3 STANDARD 2. UNOBSTRUCTED SPACE.**

Where buildings are required to meet these standards, the unobstructed space must extend 33 ft. (10 m) out from the building, or to the installation perimeter as established by Standard 1. When the unobstructed space overlaps an established clear zone, the more stringent clear zone requirement will govern.

It is assumed that aggressors will not attempt to place explosive devices in areas near buildings where those explosive devices could be visually detected by building occupants. Ensure there are unobstructed spaces in which there are no obstructions or building features that might allow for concealment from observation of explosive devices with dimensions of no less than a 6 in. (150 mm) cube around buildings and underneath building overhangs or breezeways. This does not preclude the placement of site

furnishings or plantings around buildings. It only requires conditions such that any explosive devices placed in the unobstructed spaces would be observable by building occupants or passers by either from within the buildings or as they walk into or around it. For trees or shrubs ensure that no foliage extends lower than 3 ft. (1 m) above the grounds to improve observation of objects underneath them.

Exception:

- Stand-alone franchised fast food operations, commercial, bank, and pharmacy facilities.
- Stand Alone Shoppettes, Mini Marts, and Commissaries with areas of less than 15,000 square feet (1394 square meters).

### **3-3.1 Concealment.**

The requirements for the unobstructed space are based on eliminating opportunities to conceal objects indicated above. The key to determining what may be located in unobstructed spaces is whether or not a person could see the objects. Obstructions such as mechanical equipment, electrical equipment, trash containers, or landscaping features may be permissible if the devices could be seen from at least one direction. Concealment establishes the basis for the requirement for above ground objects or obstructions. When applicable, evaluate indentations in landscapes such as ditches with respect to concealment.

Evaluate the capacity to conceal objects underneath and inside equipment. If there are voids into which explosives could be inserted or space underneath equipment large enough to conceal objects, that equipment will need to be secured if it is within the unobstructed space. The test should be whether or not something could be concealed behind the equipment or trash container. If walls or other screening devices are two sided it is assumed that people could see something out of place by observation.

### **3-3.2 Trash Containers.**

Trash containers are not allowed within the unobstructed space unless the containers are secured to preclude concealment of explosives as described above or if they are enclosed in accordance with 3-3.5.

### **3-3.3 Electrical and Mechanical Equipment.**

Electrical and mechanical equipment may be located within unobstructed spaces if they do not provide opportunities for concealment of explosives as described above or if they are enclosed in accordance with 3-3.5.

### **3-3.4 Fuel Tanks.**

Fuel tanks may be located within unobstructed spaces if they do not provide opportunities for concealment of explosives as described above or if they are enclosed in accordance with 3-3.5. Distances between buildings and fuel tanks are based on

flammability (not explosive equivalence); therefore, they should be determined using NFPA 30.

**3-3.5 Enclosures.**

When trash containers, fuel tanks or electrical or mechanical equipment within the unobstructed space provide the opportunity for concealment, they must be enclosed. Enclosures must have four sides and a top. Openings in screening materials and gaps between the ground and screens or walls making up an enclosure will not be 6 in. (150 mm) or greater. Secure any surfaces of the enclosures that can be opened so that unauthorized personnel cannot gain access. Where opaque top enclosures are provided, they will have a pitch of at least 1 vertical to 2 horizontal to increase visibility of objects thrown onto them and to increase the likelihood that the objects will slide off. Alternatively, if the vertical surfaces of the enclosures are transparent and at least 7 ft. (2.1 m) high, a top enclosure is not required.

**3-3.6 Walls and Screens.**

If walls or other screening devices with more than two sides are placed around trash containers, fuel tanks or electrical or mechanical equipment within the unobstructed space, provide enclosure in accordance with 3-3.5.

**3-3.7 Parking Within Unobstructed Spaces.**

Parking is allowed within the unobstructed space. Parking may be temporarily eliminated within the unobstructed space at a higher Force Protection Condition (FPCON).

**3-3.8 Adjacent Existing Buildings.**

Where projects for new and existing buildings designed in accordance with these standards are located within 33 ft. (10 m) of existing inhabited buildings that are not required to meet these standards, ensure that the unobstructed spaces for buildings that must comply with the standards are maintained between those buildings and other existing buildings. If there are opportunities for concealment in the spaces around the other existing buildings those spaces should be modified to ensure fully compliant unobstructed spaces around the buildings that must comply.

**3-4 STANDARD 3. DRIVE-UP/DROP-OFF AREAS.**

This standard has been removed and no longer applies.

**3-5 STANDARD 4. ACCESS ROADS.**

This standard has been removed and no longer applies.

**3-6 STANDARD 5. PARKING BENEATH BUILDINGS OR ON ROOFTOPS.**

Avoid parking beneath buildings or on rooftops of buildings required to comply with these standards. Where very limited real estate makes such parking unavoidable, the following measures must be incorporated into the design for new construction.

Ensure that access control measures are implemented to prohibit unauthorized personnel and vehicles from entering underground or rooftop parking areas. Because situations vary from location to location, the development of one standardized “one-size-fits-all” access control package (measures, procedures, and equipment) is not possible and is beyond the scope of these standards. Access control is the responsibility of installation security personnel.

**3-7 STANDARD 6. PROGRESSIVE COLLAPSE RESISTANCE.**

For new construction of three stories or more required to comply with these standards, provide progressive collapse resistance designed in accordance with UFC 4-023-03. This standard also applies to new construction with parking beneath or multi-level parking above inhabited space.

Progressive collapse is considered to be a significant risk for buildings of three or more stories. Basements and penthouses will be considered stories if there is space designed for human occupancy and equipped with means of egress, lighting, and ventilation that meet the local building code requirements as detailed in UFC 4-023-03.

**3-7.1 Progressive Collapse Design.**

Follow the design guidance in UFC 4-023-03 for new construction to reduce the potential for progressive collapse due to localized structural damage. Apply the requirements for risk category II or higher. UFC 3-301-01 defines risk categories for numbers of occupants and different types of occupancies. The design requirements in UFC 4-023-03 are related to those risk categories. Evaluate interior columns and/or walls in parking areas beneath or above inhabited areas for progressive collapse in accordance with UFC 4-023-03.

**3-8 STANDARD 7. STRUCTURAL ISOLATION.**

Structural isolation minimizes the possibility that collapse of one part of a building will affect the stability of the remainder of the building.

**3-8.1 Building Additions.**

Design building additions that are required to comply with these standards to be structurally independent from the adjacent existing buildings. Alternatively, verify through analysis that collapse of either the addition or the existing building will not result in collapse of the remainder of the building. Structural isolation is not necessary if the existing buildings have been designed in accordance with these standards (including previous versions).

### **3-8.2 Portions of Buildings.**

Design low occupancy portions of inhabited buildings required to comply with these standards to ensure their superstructures are structurally independent from the inhabited portions of the buildings. Alternatively, verify through analysis that collapse of low occupancy portions of buildings will not result in collapse of any portion of buildings covered by these standards. This standard is not mandatory for existing structures, but it should be implemented where possible.

### **3-9 STANDARD 8. BUILDING OVERHANGS AND BREEZEWAYS.**

For new construction required to comply with these standards, avoid building overhangs and breezeways with inhabited spaces above them where people could gain access to the areas underneath the overhangs. Where such overhangs or breezeways must be used, incorporate the following measures

#### **3-9.1 Building Elements.**

Ensure the areas underneath the overhangs or breezeways comply with the provisions of the unobstructed space requirements of Standard 2. The areas underneath the overhangs or breezeways can be considered to be extensions of the surrounding unobstructed spaces.

### **3-10 STANDARD 9. EXTERIOR MASONRY WALLS.**

Unreinforced masonry walls are prohibited for the exterior walls of new construction required to comply with these standards. Exterior masonry walls must have vertical and horizontal reinforcement distributed throughout the wall section. The vertical reinforcement ratio must be at least 0.05%, spaced no more than 4 ft. (1200 mm) on center with reinforcement within 1.3 ft. (410 mm) of the ends of walls. The horizontal reinforcement ratio must be at least 0.025%, consisting of either joint reinforcement spaced no more than 1.3 ft. (410 mm) on center, or bond beam reinforcement spaced no more than 4 ft. (1200 mm) on center, with reinforcement within 1.3 ft. (410 mm) of the top and bottom of the wall. For conventional cavity wall construction reinforcement only needs to be in the inner wall unless other reinforcement is required by other criteria.

Wood or metal studs with brick veneer that meet the analysis assumptions of Table C-5 may be considered to meet the provisions of this standard when used in conjunction with an otherwise unreinforced masonry wall. European masonry walls that are within the range of parameters in Table C-5 and PDC Technical Report 10-01 may be considered to meet the requirements of this standard.

### **3-11 STANDARD 10. GLAZING.**

Glazing that is in compliance with this standard is not required to be designed or constructed for blast resistance. It is intended to minimize hazardous glazing fragments.

Apply the following provisions for exterior glazing for new construction or existing buildings that are required to comply with these standards.

### **3-11.1 Glazing.**

For glazing in exterior building elements such as storefronts, doors, windows, curtain walls, clerestories, and skylights provide no less than 1/4 in. (6 mm) nominal polycarbonate or laminated glass. The 1/4 in. (6 mm) laminated glass consists of two nominal 1/8 in. (3 mm) glass panes bonded together with a minimum of a 0.030 in. (0.75 mm) interlayer of a material designed for blast resistance. For insulated glass units (IGU), use the polycarbonate or laminated glass for the innermost pane as a minimum. For laminated glass, provide a glazing frame bite in accordance with ASTM F 2248. For polycarbonate, provide a glazing frame bite of no less than 1.5 times the polycarbonate thickness.

Monolithic glass or monolithic acrylic used as a single pane or as the inner pane of a multi-pane system is not allowed for the purposes of complying with this standard. Spandrel glass when backed by a structural wall or spandrel beam, translucent fiberglass panels, other lightweight translucent plastics, and glass unit masonry are not required to comply with this standard. Spandrel glass that is open to occupied space must be designed in accordance with this standard.

### **3-11.2 Exterior Stairwells, Vestibules, and Covered or Enclosed Walkways.**

Glazing in stairwells, vestibules, and covered or enclosed walkways that are exterior to buildings required to comply with these standards must meet the provisions of this standard. In addition, any windows, inner doors, sidelights, and transoms that are interior to the exterior stairwells, vestibules, or covered or enclosed walkways must meet the requirements of this standard.

### **3-11.3 Replacement with Wall or Roof Systems.**

When windows or skylights are being replaced by filling in the openings with wall or roof material fill in the openings with the same or similar construction as the adjacent wall or roof construction. Alternatively install lightweight translucent fiberglass or plastic panels in the openings.

### **3-11.4 Alternative Window Treatments.**

Window retrofits incorporating alternative window treatments such as fragment retention films and blast curtains are not acceptable alternatives for new buildings or existing buildings that are required to comply with these standards.

The primary reason for that is the fact that such solutions commonly have much shorter design lives than laminated glazing, which requires their replacement multiple times as compared to laminated glazing. Laminated glazing, while more expensive initially, is less expensive over its life cycle. In the case of blast curtains, there needs to be operational procedures to ensure that they remain closed at all times for them to be

effective. Fragment retention films and blast curtains are good interim solutions where compliance with these standards is not required.

### **3-12 STANDARD 11 BUILDING ENTRANCE LAYOUT.**

The areas outside of installation perimeters are commonly not under the direct control of installations. Where the main entrances to buildings face installation perimeters, people entering and exiting the buildings are vulnerable to being fired upon from vantage points outside those perimeters. Obscuration or screening that minimizes targeting opportunities and mass notification are assumed to be the primary means of protecting DoD personnel from direct fire weapons. Hardening to resist direct fire effects represents a higher level of protection than required by these standards. To mitigate those vulnerabilities, apply the following measures for buildings required to comply with these standards:

#### **3-12.1 New Construction.**

For new construction, ensure that the main entrance to the building does not face uncontrolled vantage points with direct lines of sight or provide means to block the lines of sight using mitigation such as walls, privacy fencing, or vegetation.

#### **3-12.2 Existing Buildings.**

For existing buildings where the main entrance faces uncontrolled vantage points, either use a different entrance as the main entrance or screen that entrance to limit the ability of potential aggressors to target people entering and leaving the building using mitigation such as walls, privacy fencing, or vegetation.

### **3-13 STANDARD 12. EXTERIOR DOORS.**

For all new and existing buildings covered by these standards, ensure that all exterior doors into inhabited areas open outwards. By doing so, the doors will seat into the door frames in response to an explosive blast, increasing the likelihood that the doors will not enter the buildings as hazardous debris. Alternatively, position doors such that they will not be propelled into inhabited spaces or provide other means to ensure they do not become hazards to building occupants.

#### **3-13.1 Glazed Doors.**

Glazing in and around doors must comply with Standard 10.

#### **3-13.2 Sliding Glass doors and Revolving Doors.**

Sliding glass doors and revolving doors do not have to open outwards.

#### **3-13.3 Overhead Doors.**

Because of the nature of overhead door failures due to blast loads there are no antiterrorism requirements for overhead doors.

### **3-14            STANDARD 13. MAIL ROOMS AND LOADING DOCKS.**

The following measures address the location of rooms to which mail or supplies are delivered or in which mail or supplies are handled in new buildings required to comply with these standards. This standard is not required for existing buildings, but it is recommended to be applied when possible. These standards need not be applied to mail rooms or loading docks to which mail or supplies that were initially delivered to a central mail or supplies handling facility. These standards should be applied to such mail rooms or loading docks where possible to account for potential changes in mail or supplies handling procedures over the life of the building. The measures in this standard involve limiting collateral damage and injuries and facilitating future upgrades to enhance protection should it become necessary. This standard does not require the hardening of mail rooms or loading docks because the mail and supplies bomb threats are beyond the scope of these standards.

#### **3-14.1            Location.**

Where new construction is required to comply with these standards, locate the mail rooms or loading docks on the perimeter of the building. By locating the mail rooms or loading docks on the building perimeters there are opportunities to modify them in the future if a mail or supplies bomb threat is identified. Where mail rooms or loading docks are located in the interiors of buildings, few retrofit options are available for mitigating the mail and supplies bomb threats. Having mail rooms and loading docks on the building perimeter avoids situations where contaminated packages would be transported through the buildings.

##### **3-14.1.1        Proximity.**

Locate mail rooms and loading docks as far from heavily populated areas of buildings and from critical infrastructure as possible. This measure will minimize injuries and damage if a mail or supplies bombs detonate in mail rooms or loading docks. Further, it will reduce the potential for wider dissemination of hazardous debris. This applies where mail rooms or loading docks are not specifically designed to resist those threats.

### **3-15            STANDARD 14. ROOF ACCESS.**

For buildings required to comply with these standards, control access to roofs to minimize the possibility of aggressors placing explosives or chemical, biological, or radiological agents there or otherwise threatening building occupants or critical infrastructure.

#### **3-15.1            New Construction.**

For new construction eliminate all external roof access by providing access from internal stairways or ladders, such as in mechanical rooms.

**3-15.2 Existing Buildings.**

For existing buildings, eliminate external access where possible or secure external ladders or stairways with locked cages or similar mechanisms.

**3-16 STANDARD 15. OVERHEAD MOUNTED ARCHITECTURAL FEATURES.**

For new construction and existing buildings required to comply with these standards, ensure that overhead mounted features weighing 31 pounds (14 kilograms) or more (excluding distributed systems such as suspended ceilings that collectively exceed that weight) are mounted using either rigid or flexible systems to minimize the likelihood that they will fall and injure building occupants. Mount all such systems so that they resist forces of 0.5 times the component weight in any horizontal direction and 1.5 times the component weight in the downward direction. This standard does not preclude the need to design architectural feature mountings for forces required by other criteria such as seismic standards.

**3-17 STANDARD 16. AIR INTAKES.**

Air intakes to heating, ventilating, and air conditioning (HVAC) systems at ground level that are designed to move air throughout a building provide an opportunity for aggressors to easily place contaminants where they could be drawn into buildings. The following measures will be applied to minimize those opportunities.

Exception: Air intakes within enclosures that meet the requirements of paragraph 3-3.5 and are a minimum of 10 ft. (3 m) from the enclosure perimeter.

**3-17.1 New Construction.**

For new construction required to comply with these standards locate all air intakes at least 10 ft. (3 m) above the ground.

**3-17.2 Existing Buildings.**

For existing buildings required to comply with these standards locate all air intakes at least 10 ft. (3 m) above the ground or provide means such as exterior chimneys to extend the elevations of air intakes to at least 10 ft. (3 m).

**3-18 STANDARD 17. MAIL ROOM AND LOADING DOCK VENTILATION.**

For new construction required to comply with these standards, provide separate, dedicated HVAC systems for mail rooms and loading docks whose purpose is to receive initial delivery of mail or supplies. This is to ensure airborne chemical, biological, and radiological agents introduced into mail rooms and loading docks do not migrate into other areas of buildings in which the mail rooms and loading docks are located,

### **3-18.1 Other Heating and Cooling Systems.**

Building heating and cooling systems such as steam, hot water, chilled water, and refrigerant may serve mail rooms as long as the airflow systems for the mail rooms and loading docks and other areas of the buildings in which they are located remain separate.

### **3-18.2 Dedicated Exhaust Systems.**

Provide dedicated exhaust systems within mail rooms and loading docks to maintain slight negative air pressures (minimum of 0.05 in. of water [12.5 Pa]) with respect to the remainder of the buildings in which the mail rooms and loading docks are located so that the flow of air is into and contained in the mail rooms and loading docks. Though the airflow into the mail rooms and loading docks will not eliminate the potential spread of contamination by personnel leaving the mail room or the loading dock, it will limit the migration of airborne contaminants through openings and open doorways.

### **3-18.3 Outside Intakes, Relief, and Exhausts.**

Provide mail room and loading dock ventilation system outside air intakes, relief air, and exhausts with low leakage isolation dampers that can be automatically closed to isolate the mail rooms and loading docks. The low leakage dampers will have maximum leakage rates of 3 cfm/square foot (15 liters/second/square meter) with a differential pressure of one inch of water gage (250 Pa) across the damper.

### **3-18.4 Isolation Controls.**

Provide separate switches or methods of control to isolate mail rooms in the event of a suspected or actual chemical, biological, or radiological release in the mail room.

### **3-18.5 Walls and Sealing Joints and Doors.**

Mail room and loading dock walls will extend from true floor to true ceiling and all joints will be sealed. Doors between mail rooms and loading docks and inhabited areas of buildings will have gaskets or weather stripping to minimize leakage around the doors.

## **3-19 STANDARD 18. EMERGENCY AIR DISTRIBUTION SHUTOFF.**

For all new construction and existing buildings required to comply with these standards, provide an emergency shutoff switch in the HVAC control system. The switch will initiate a response in HVAC systems and low leakage dampers leading to the outside regardless of hand/off/auto (HOA) position within 30 seconds of switch activation subject to the guidance below.

- Switch activation may, but is not required to shut down HVAC systems that do not draw air from the outside and do not serve mail rooms.
- Switch activation will not shutdown HVAC systems, but will close dampers leading to the outside for systems whose continued operation assists in

preventing the spread of airborne contaminants and that do not serve mail rooms.

- Switch activation will not shutdown HVAC systems, but will close dampers leading to the outside for systems whose continued operation provides safety of egress pathways.

Locate the shutoff switch (or switches) to be easily accessible by building occupants by locating them similarly to building mass notification system (MNS) local operating consoles (LOC) (see UFC 4-021-01 for additional information on MNS LOCS) so that the travel distance to the nearest shutoff switch will not be in excess of 200 ft. (61 m). Ensure that the shutoff switches are well labeled, and of a different color than fire alarm pull stations.

### **3-19.1 Outside Air Intakes, Relief Air, and Exhausts.**

Provide outside air intakes, relief air, and exhaust openings with low leakage dampers that are automatically closed when the emergency air distribution shutoff switch is activated. The low leakage dampers will have maximum leakage rates of 3 cfm/square foot (15 liters/second/square meter) with a differential pressure of one inch of water gage (250 Pa) across the damper. Low leakage dampers will be located at the building envelope or as close as possible to the building envelope. If shutting down an exhaust system will violate building or fire codes or create an unsafe condition, then the exhaust system may continue to operate. For example, the installation of dampers in kitchen exhaust ductwork, where the dampers can become laden with grease, may be a violation of fire codes. Also, kitchen hood exhaust fans may have to continue to operate to avoid potential fire hazards.

### **3-19.2 Critical Areas.**

Switch activation will not shut down HVAC systems, but will close dampers leading to the outside for systems that serve critical areas where cooling, heating, and / or airflow requirements must be maintained to prevent mission failure, or loss of data, or unsafe conditions such as computer rooms.

Switch activation will not shutdown HVAC systems and will not close dampers leading to the outside for critical systems whose continued operation is required by code or other safety protocols such as bio containment laboratories, radio isotope spaces, or other hazardous material or explosive hazard spaces.

### **3-19.3 Unoccupied Areas.**

Switch activation may, but is not required to shutdown HVAC systems and may, but is not required to close dampers leading to the outside for systems that serve one or more normally unoccupied spaces whose access is directly to the outside such as electrical, mechanical, and fire pump rooms.

**3-19.4 Fan Coil Units and Air Conditioners.**

All new buildings required to comply with these standards must have a system that allows fan coil units to be shut off in an emergency. Fan coil units and air conditioners do not require low leakage dampers.

For existing inhabited buildings required to comply with these standards, emergency shutoffs for fan coil unit heaters and air conditioners are recommended.

**3-20 STANDARD 19. EQUIPMENT BRACING.**

For new construction and existing buildings required to comply with these standards mount all overhead utilities and other fixtures weighing 31 pounds (14 kilograms) or more (excluding distributed systems such as piping networks that collectively exceed that weight) using either rigid or flexible systems to minimize the likelihood that they will fall and injure building occupants. Design all equipment mountings to resist forces of 0.5 times the equipment weight in any horizontal direction and 1.5 times the equipment weight in the downward direction. This standard does not preclude the need to design equipment mountings for forces required by other criteria such as seismic standards.

**3-21 STANDARD 20. UNDER BUILDING ACCESS.**

To limit opportunities for aggressors placing explosives underneath buildings, ensure that access to crawl spaces, utility tunnels, and other means of under building access is controlled in all buildings required to comply with these standards.

**3-22 STANDARD 21. MASS NOTIFICATION.**

All buildings required to comply with these standards must have a timely means to notify occupants of threats and instruct them what to do in response to those threats. To achieve that goal, provide the following:

Buildings must have a capability to provide real-time information to building occupants or personnel in the immediate vicinity of the building during emergency situations. The information relayed must be specific enough to determine the appropriate response actions. The information must be capable of being originated both locally at the building and from a remote location. Design building MNS in accordance with UFC 4-021-01.

## CHAPTER 4 STANDARDS FOR EXPEDITIONARY STRUCTURES

### 4-1 GENERAL.

Implementation of these minimum standards is mandatory for all expeditionary structures that meet the occupancy criteria for inhabited buildings. Many expeditionary structures are in forward operating locations where there is a conventional and/or terrorist threat more severe than those addressed in these standards. In those situations, more detailed planning and additional measures are needed for providing protection. Refer to the GTA 90-01-011, Joint Forward Operations Base (JFOB) Survivability and Protective Construction Handbook.

- New buildings built in expeditionary environments or existing buildings used by DoD in those environments will comply with all of the standards in Chapter 3.
- New expeditionary structures built in expeditionary environments will comply with the provisions of this chapter.

### 4-2 SITE PLANNING STANDARDS.

All the standards that are unique to expeditionary structures pertain to site planning. Integrate operational, logistic, and security requirements into the overall configuration of structures, equipment, landscaping, parking, roads, and other features during planning for expeditionary construction. The most cost-effective solution for mitigating explosive effects on expeditionary structures is to keep explosives as far away from them as possible. This is especially critical for these types of structures because hardening may not be possible or may be prohibitively expensive. Dispersed layouts reduce risks from a variety of threats by taking full advantage of terrain and site conditions; therefore, nothing in these standards is intended to discourage dispersal. Costs and requirements for expeditionary structure hardening are addressed in UFC 4-020-01.

#### 4-2.1 Standard 1. Standoff Distances.

The previous version of Standard 1 established standoff distances to parking, roadways, and controlled perimeters that were based on building construction and occupancy. In this revision of Standard 1 standoff distances only apply to distances to installation perimeters for new construction and additions to existing buildings required to comply with these standards.

Exception: Existing buildings are exempt from this standard.

#### 4-2.2 Minimum Standoff.

The minimum standoff distance for new construction and additions to existing buildings to the installation perimeter is 20 ft. (6 m). In the cases where there is no clear zone outside the perimeter, the minimum standoff distance is 50 ft. (15 m).

#### **4-2.2.1 Clear Zone.**

Standoff distances to installation perimeters are based on clear zone requirements. Clear zones are areas established around the perimeters to provide unobstructed views to enhance detection and assessment. Typically, clear zones are free of all obstacles, topographical features, and vegetation exceeding 8 in. (152 mm) in height that could impede observation or provide cover and concealment of an aggressor. Provide a minimum aggregate clear zone of 50 feet (15 m) inclusive of the clear zones outside and inside the installation perimeter. For example, if an outer clear zone is 20 ft. (6 m) wide, the standoff distance to the installation perimeter must be 30 ft. (10 m) wide. Clear zones only provide unobstructed views and do not require access control. Some forward operating locations and high security areas may have higher clear zone requirements. Consult with local antiterrorism and security personnel to determine if higher clear zones are required. See Figure 3-1 and Figure 3-2.

#### **4-2.3 Standard 2. Structure Separation.**

Structure separation requirements are established to minimize the possibility that an attack on one structure causes injuries or fatalities in adjacent structures. The separation distance is predicated on the potential use of indirect fire weapons. Structure separation also limits the ability of fire to spread from structure to structure, which is especially important in many of the types of construction used in expeditionary environments. Provide separation between structures in accordance with Figure 4-1.

#### **4-2.4 Standard 3. Unobstructed Space.**

Keep areas within 33 ft. (10 m) of all expeditionary structures free of items other than those that are part of the utilities and other supporting infrastructure. Do not allow roadways and trash containers within unobstructed spaces. Allowing parking within unobstructed spaces will be determined by security personnel.

### **4-3 ADDITIONAL STANDARDS.**

In addition to the specific standards detailed in this chapter, apply the standards from Chapter 3 to expeditionary structures as follows:

#### **4-3.1 Container Structures and Pre-engineered Buildings.**

For these structures, all standards in Chapter 3 apply.

#### **4-3.2 Fabric Covered, Trailers, Modular Structures, and other Expeditionary Structures.**

Apply the following standards from Chapter 3 to these structures:

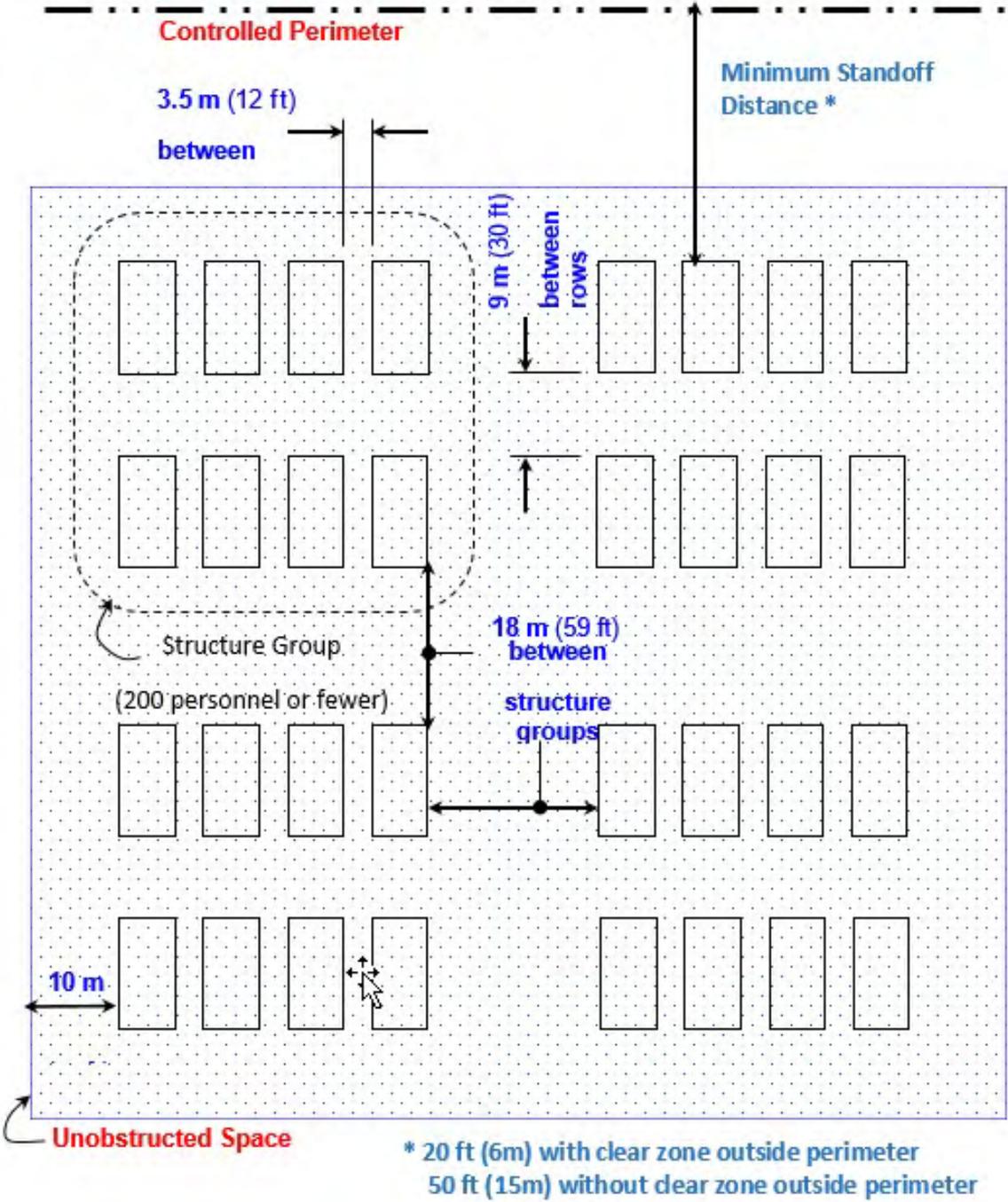
- Standard 10. Glazing
- Standard 11. Building Entrance Layout
- Standard 12. Exterior Doors

- Standard 15. Overhead Mounted Architectural Features
- Standard 19. Equipment Bracing
- Standard 21 Mass Notification

**4-4 ANTITERRORISM RECOMMENDATIONS.**

Apply all recommendations except for Recommendation 7 (Access control for family housing), Recommendation 8 (Standoff for family housing), and /recommendation 9 (Building Separation) from APPENDIX A to all expeditionary structures.

Figure 4-1 Standoff and Separation Distances for Expeditionary Construction



## **APPENDIX A RECOMMENDED ANTITERRORISM MEASURES FOR NEW AND EXISTING BUILDINGS**

### **A-1 INTRODUCTION.**

The following additional measures, if implemented, will significantly enhance building occupants' safety and security with little increase in cost and should be considered for all new and existing buildings required to comply with these standards.

### **A-2 RECOMMENDATION 1. VEHICLE ACCESS POINTS.**

The number of access points should be kept to the minimum necessary for security and operational purposes. This will limit the number of points at which access has to be controlled at increased Force Protection Conditions or if the threat increases in the future.

### **A-3 RECOMMENDATION 2. HIGH-SPEED VEHICLE APPROACHES.**

The energy of a moving vehicle increases with the square of its velocity; therefore, minimizing a vehicle's speed enables the vehicle barriers used to be lighter and less expensive. To facilitate vehicle speed reduction, avoid unobstructed vehicle approaches that create direct paths to buildings.

### **A-4 RECOMMENDATION 3. DRIVE-UP/DROP-OFF AREAS.**

Drive-up and drop-off areas should be located away from large glazed areas of buildings to minimize the potential for hazardous flying glass fragments in the event of an explosion. Consider locating the lanes at outside corners of buildings or otherwise away from main entrances or minimizing glazing in the proximity of drive-up and drop-off areas. Building geometries such as reentrant corners in the vicinity of drive-up and drop-off areas should be laid out to minimize the possibility that explosive blast forces could be increased due to being trapped or otherwise concentrated.

### **A-5 RECOMMENDATION 4. BUILDING LOCATION.**

Activities with large visitor populations provide opportunities for potential aggressors to get near buildings with minimal controls and limit opportunities for early detection of aggressor activity. To limit opportunities for aggressors, separation distances should be maximized between buildings required to comply with these standards and areas with large visitor populations.

### **A-6 RECOMMENDATION 5. RAILROAD LOCATION.**

For new construction avoid sites for buildings that are close to railroads. For existing buildings, procedures should be in place to prohibit trains from stopping in the vicinity of those buildings.

**A-7 RECOMMENDATION 6. ACCESS CONTROL FOR FAMILY HOUSING.**

For new family housing areas, allocate space at the perimeter of the housing area for an entry control facility/access control point designed in accordance with UFC 4-022-01 may be established if the need arises.

**A-8 RECOMMENDATION 7. STANDOFF FOR FAMILY HOUSING.**

For new low occupancy family housing construction, standoff distances should be maintained in accordance with the Standard 1.

**A-9 RECOMMENDATION 8. BUILDING SEPARATION.**

For all new construction, buildings should be separated from adjacent buildings by at least 33 feet (10 meters).

This recommendation applies to new buildings and is established to minimize the possibility that an attack on one building causes injuries or fatalities in adjacent buildings.

**A-10 RECOMMENDATION 9. VISITOR CONTROL.**

Controlling visitor access maximizes the possibility of detecting potential threatening activities. Locations in buildings where visitor access is controlled should be kept away from sensitive or critical areas, areas where high-risk or mission-critical personnel are located, or other areas with large population densities of DoD personnel.

**A-11 RECOMMENDATION 10. ASSET LOCATION.**

To minimize exposure to direct blast effects and potential impacts from hazardous glass fragments and other potential debris, critical assets and mission-critical or high-risk personnel should be located away from the building exterior.

**A-12 RECOMMENDATION 11. ROOM LAYOUT.**

In rooms adjacent to the exterior of the building, personnel and critical equipment should be positioned to minimize exposure to direct blast effects and potential impacts from hazardous glass fragments and other potential debris.

**A-13 RECOMMENDATION 12. EXTERNAL HALLWAYS.**

Because doors can become hazardous debris during explosive blast events and designing them to resist blast effects is expensive, avoid building configurations that have large numbers of exterior doors leading into inhabited areas in buildings required to comply with these standards. A common example is a barracks/dormitory with exterior doors into each room or suite. Internal hallways with interior entrances to rooms or suites are preferable.

## APPENDIX B BEST PRACTICES

### B-1 INTRODUCTION.

The contents in this appendix are not required. The contents in this appendix are taken from the previous publication of this UFC to retain until publication of UFC 4-020-02. The information contained within may be used when a specific threat has been identified for the location or project based on UFC 4-020-01 or Service, Agency, or Geographic Combatant Command guidance.

This appendix presents a best practices strategy for site planning and designing facilities to protect against stationary vehicle bombs and hand delivered devices.

### B-2 SITE PLANNING FOR STATIONARY VEHICLE BOMBS AND HAND DELIVERED DEVICES.

Protective measures associated with site planning are established to address vehicle borne and hand placed explosive threats. The most cost-effective solution for mitigating explosive effects on buildings is to keep explosives as far as possible from them. Standoff distance should be coupled with appropriate building hardening to provide the necessary level of protection to DoD personnel as described in Table B-1.

Where conventional construction standoff distances cannot be achieved because land is unavailable, these best practices allow for building hardening to mitigate the blast effects. Planning level costs and requirements for building hardening are addressed in UFC 4-020-01. None of these best practices address physical barriers that are capable of stopping moving vehicles to prevent vehicles from accessing areas within the standoff distances established below. Measures using landscaping features, curbing, or pavement marking should meet the best practices for establishing standoff below. Those features address what is called the Stationary Vehicle Bomb Tactic in which the aggressor is assumed not to attempt to enter into areas where he or she would be noticed. Considerations for the Moving Vehicle Bomb Tactic where in the aggressor may be suicidal would include barriers that are capable of stopping the kinetic energy of the threat vehicle. For further discussion on both tactics, refer to UFC 4-020-01.

#### B-2.1 Standoff Distances.

Provide standoff distances between buildings and controlled perimeters, parking areas, roadways, and trash containers. The standoff distances are presented in Appendix C and illustrated in Figure B-1 and Figure B-2 for new buildings and Figure B-3 and Figure B-4 for existing buildings. For planning purposes, standoff distance is measured to the closest point on the building exterior. Vehicle barriers are not required to maintain these standoff distances unless threat analysis justifies them.

##### B-2.1.1 Standoff Analysis.

Where the standoff distances in the “Conventional Construction Standoff Distance” (CCSD) columns of Table C-1 through Table C-4 can be met, conventional construction for the applicable building walls may be used for the buildings without a specific analysis

of blast effects. Roofs do not need to be analyzed where the standoff distances for roofs in Table C-1 through Table C-4 are met and where they are within the ranges of one of the roof construction types in Table C-5. Types of construction not shown in Table C-5 may be permissible subject to validation by the designer of record. While the Appendix C tables address windows, the standoff distances shown should only be used for planning purposes as indicators of standoff distances at which conventionally constructed windows can be used. Standoff Distances for expeditionary structures are found in Table C-6.

Where conventional construction standoff distances are not available, lesser standoff distances may be validated through analysis that verifies the applicable level of protection is met, but none may be closer than the minimum standoff distance distances described in paragraph B-2.1.3 except as allowed for existing buildings. Allowable building damage and door and window hazards for the various levels of protection are described in Table B-1. Note that regardless of standoff distance, where buildings are three stories or more, the progressive collapse provisions of Standard 6 should be applied.

Figure B-1 Standoff Distances – With Controlled Perimeter

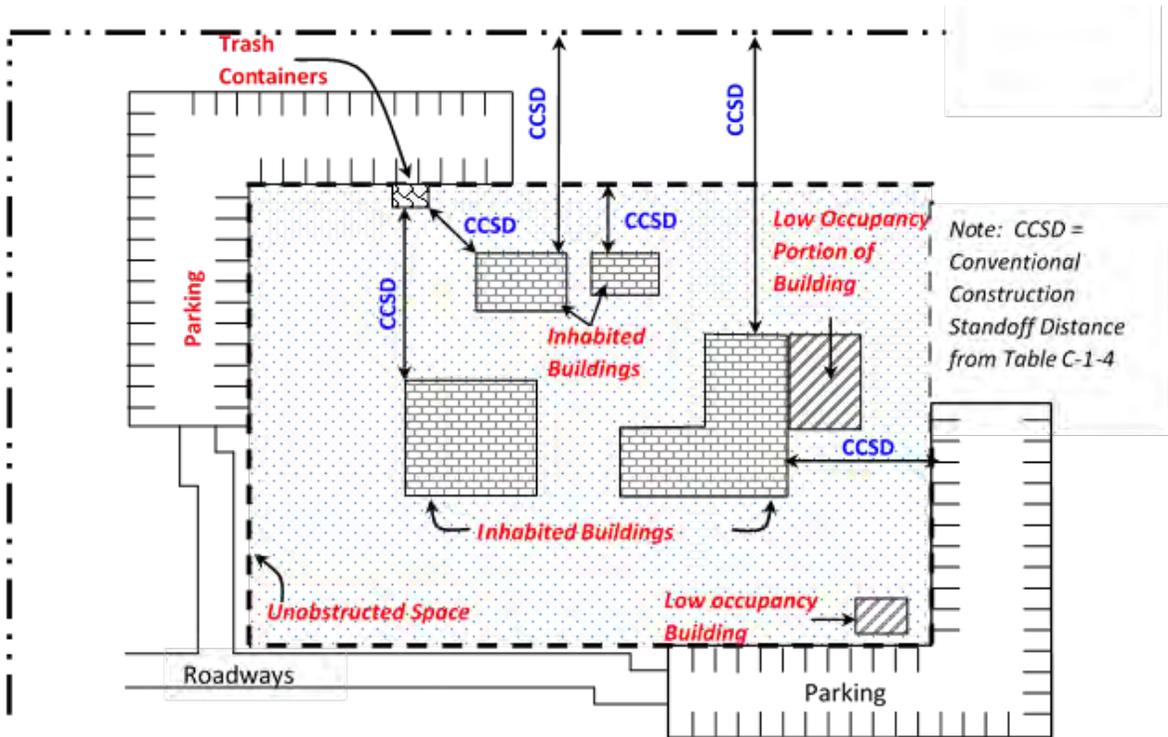


Figure B-2 Standoff Distances – No Controlled Perimeter

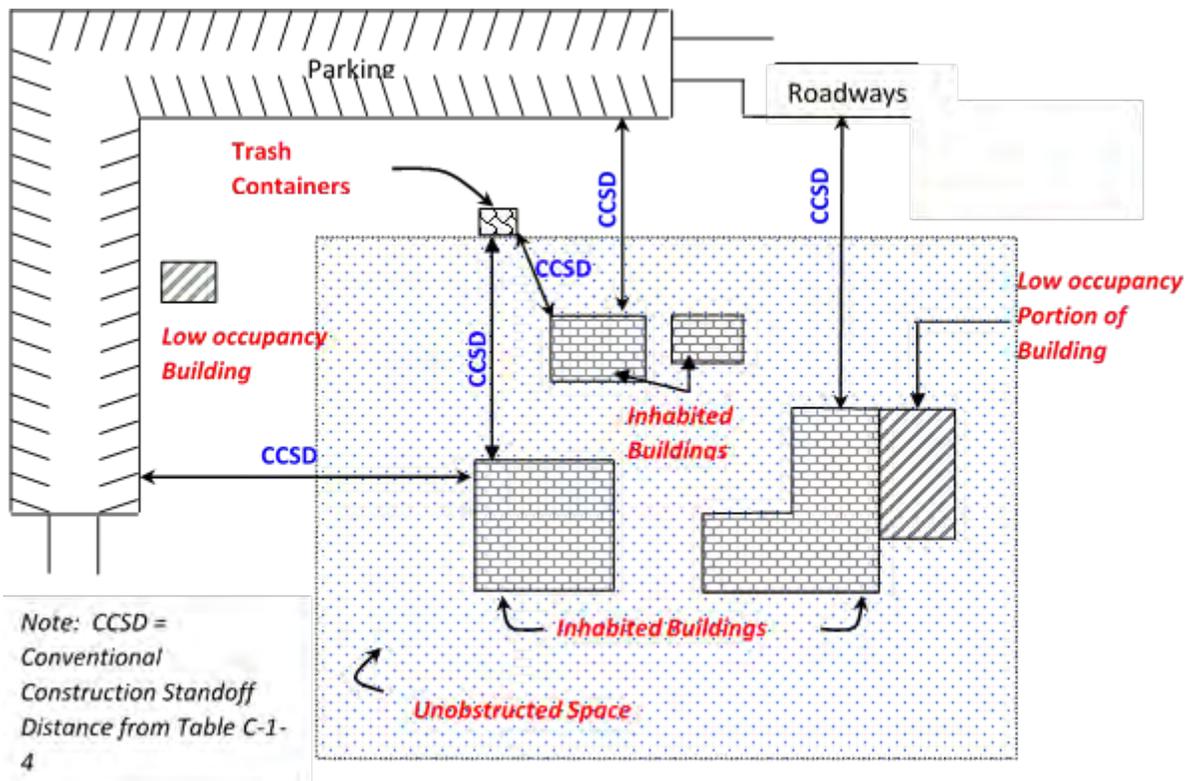


Figure B-3 Parking and Roadway Control for Existing Buildings – Controlled Perimeter

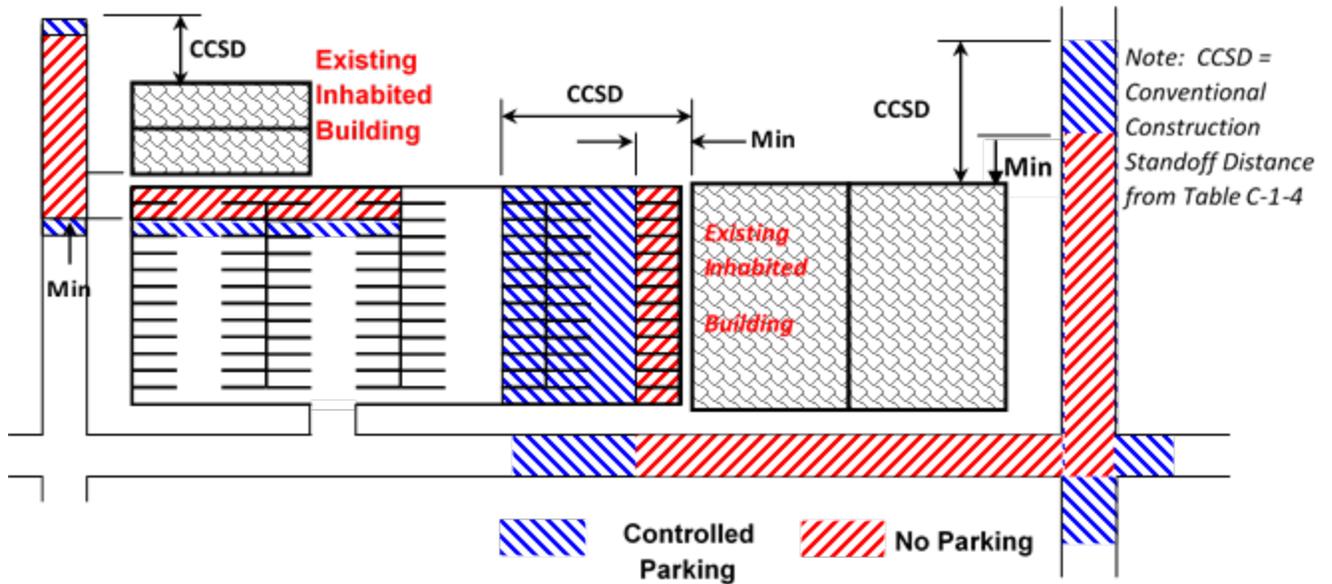
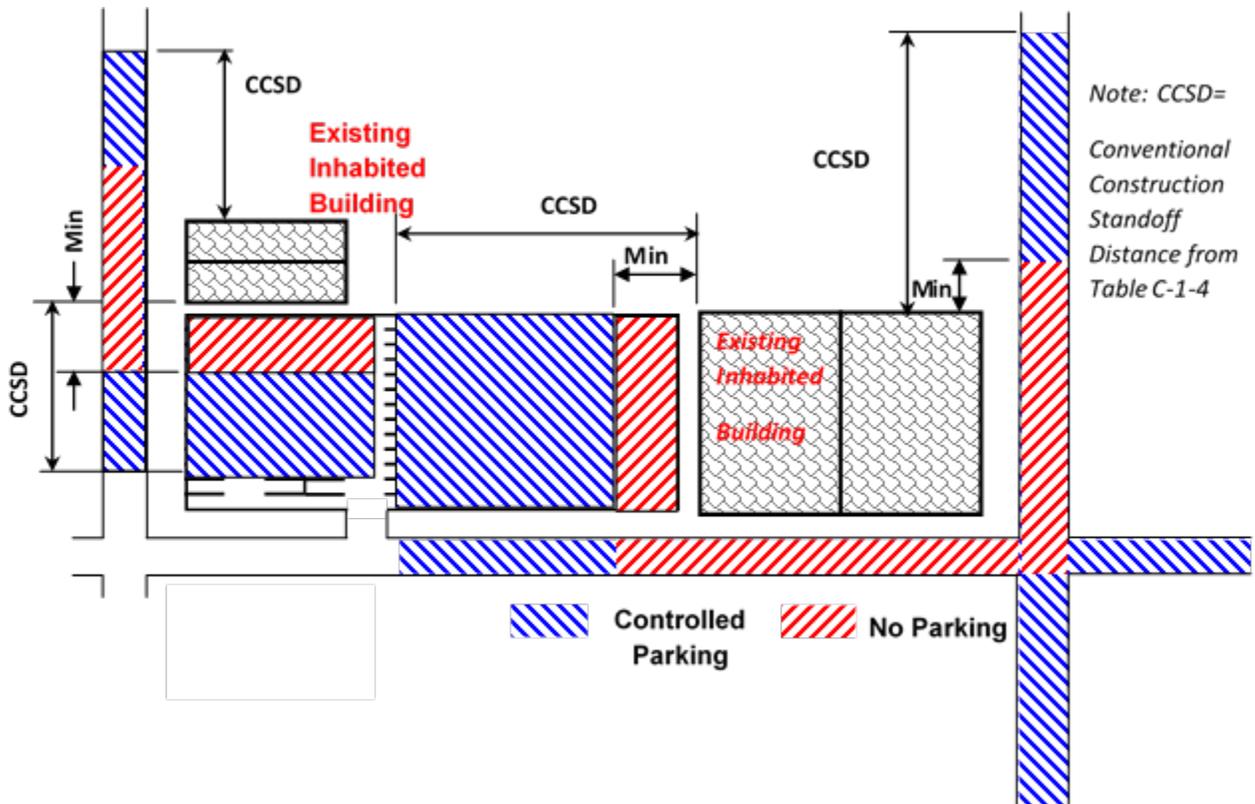


Figure B-4 Parking and Roadway Control for Existing Buildings – No Controlled Perimeter



### **B-2.1.2 Conventional Construction Standoff Distance.**

Standoff distances for buildings vary based on the specific construction of the walls, on whether they are load bearing or non-load bearing, by level of protection, and by explosive weight. The specific construction types upon which the standoff distances are based are indicated in Table C-1 through Table C-4 and detailed descriptions of their design parameters are tabulated in Table C-5. The separate conventional construction standoff distances columns in Table C-1 through Table C-4 for load bearing and non-load bearing wall construction reflect the fact that the damage allowed to load bearing construction is less than that allowed to non-load bearing construction for the same level of protection as explained in PDC Technical Report 06-08. Specific standoff distances are tabulated for different construction types. Note that the conventional construction standoff distance columns in Table C-1 through Table C-4 are primarily related to walls because the walls in that table always controlled the conventional construction standoff distance over any of the roofs indicated in Table C-5. Walls and roofs of construction other than those included in Table C-5 should be designed to provide the applicable response described in Table B-1 and detailed in PDC Technical Report 06-08. Standoff distances for windows in Table C-1 through Table C-4 are for conventional windows. When standoff distances are closer than those standoff distances windows will commonly be much heavier and more expensive than conventional windows.

Conventional construction standoff distances do not apply to doors; refer to B-3.2. Planners and designers will have to analyze tradeoffs between wall standoff and window and door construction. Standoff distances for expeditionary structures are based on structure types as indicated in Table C-6.

### **B-2.1.3 Minimum Standoff Distance.**

Minimum standoff distance is the smallest permissible standoff distance allowed for buildings regardless of any analysis results or hardening of buildings that would allow for closer standoff distances, except as established below for existing buildings. Note that achieving the minimum standoff distance generally requires a significant degree of building component hardening; therefore, where only the minimum standoff distance is provided there should be analysis results that show it can be achieved while still providing the applicable level of protection. Minimum standoff distance  $R_M$  is determined as a scaled range of 3 by the following equations:

$$\text{For Feet: } R_M = 3\sqrt[3]{W}$$

$$\text{For Meters: } R_M = 1.19\sqrt[3]{W}$$

Where:

$W$  is the threat explosive weight in pounds for feet or kilograms for meters.  
 $R_M$  is the minimum standoff distance in feet or meters.

**Table B-1 Levels of Protection – New and Existing Buildings**

Level of Protection	Potential Building Damage/Performance <sup>2</sup>	Potential Door and Glazing Hazards <sup>3,4</sup>	Potential Injury
Below AT standards <sup>1</sup>	Severe damage. Progressive collapse likely. Space in and around damaged area will be unusable.	* Windows will fail catastrophically and result in lethal hazards. ( <i>High hazard rating</i> ) * Doors will be thrown into rooms. ( <i>Category V</i> )	Majority of personnel in collapse region suffer fatalities. Potential fatalities in areas outside of collapsed area likely.
Very Low	Heavy damage - Onset of structural collapse, but progressive collapse is unlikely. Space in and around damaged area will be unusable.	* Glazing will fracture, come out of the frame, and is likely to be propelled into the building, with potential to cause serious injuries. ( <i>Low hazard rating</i> ) * Doors will become dislodged from the structure but will not create a flying debris hazard. ( <i>Category IV</i> )	Majority of personnel in damaged area suffer serious injuries with a potential for fatalities. Personnel in areas outside damaged area will experience minor to moderate injuries.
Low	Moderate damage – Building damage will not be economically repairable. Progressive collapse will not occur. Space in and around damaged area will be unusable.	* Glazing will fracture, potentially come out of the frame, but at reduced velocity, does not present a significant injury hazard. ( <i>Very low hazard rating</i> ) * Doors will experience non-catastrophic failure, but will have permanent deformation and may be inoperable. ( <i>Category III</i> )	Majority of personnel in damaged area suffer minor to moderate injuries with the potential for a few serious injuries, but fatalities are unlikely. Personnel in areas outside damaged areas will potentially experience minor to moderate injuries.
Medium	Minor damage – Building damage will be economically repairable. Space in and around damaged area can be used and will be fully functional after cleanup and repairs.	* Glazing will fracture, remain in the frame and results in a minimal hazard consisting of glass dust and slivers. ( <i>Minimal hazard and No Hazard ratings</i> ) * Doors will be operable but will have permanent deformation. ( <i>Category II</i> )	Personnel in damaged area potentially suffer minor to moderate injuries, but fatalities are unlikely. Personnel in areas outside damaged areas will potentially experience superficial injuries.
High	Minimal damage. No permanent deformations. The facility will be immediately operable.	* Innermost surface of glazing will not break. ( <i>No Break hazard rating</i> ) * Doors will be substantially unchanged and fully operable. ( <i>Category I</i> )	Only superficial injuries are likely.
<ol style="list-style-type: none"> <li>1. This is not a level of protection and should never be a design goal. It only defines a realm of more severe structural response, and may provide useful information in some cases.</li> <li>2. For damage / performance descriptions for primary, secondary, and non-structural members, refer to PDC Technical Report 06-08.</li> <li>3. Glazing hazard ratings are from ASTM F 2912.</li> <li>4. Door damage level categories are from ASTM F 2247 and F 2927.</li> </ol>			

For new buildings, standoff distances of less than a scaled range of 3 should not be allowed. For existing buildings, the minimum standoff distances should be provided except where doing so is not possible. In those cases, lesser standoff distances may be allowed where the applicable level of protection can be shown to be achieved through analysis or can be achieved through building hardening or other mitigating construction or retrofit as described in these standards

#### **B-2.1.4 Distances Between Conventional and Minimum Standoff Distances**

Where the conventional construction standoff distances are not available, an engineer experienced in blast-resistant design should analyze the building and apply building hardening as necessary to mitigate the effects of the applicable explosives at the achievable standoff distance to the appropriate level of protection. The appropriate levels of protection are described in Table B-1 and in UFC 4-020-01. Detailed design parameters for meeting the levels of protection are in PDC Technical Report 06-08. Buildings should be designed for fully reflected blast pressures except where it can be proven that a wall could never be exposed to reflected pressures.

#### **B-2.1.5 Parking and Roadways Standoff Distances.**

Measure the standoff distance from the closest edge of parking areas, driving lanes within parking areas, and roadways to the closest point on the building exterior or inhabited portion of the building or to specific building components. In addition, the following apply:

##### **B-2.1.5.1 New Buildings.**

The minimum standoff distance for all new buildings regardless of hardening or analysis is that associated with a scaled range of 3 for both parking areas and roadways, whether parking is allowed on the roadways or not.

##### **B-2.1.5.2 Existing Buildings.**

Where possible, move parking and roadways away from existing buildings in accordance with the standoff distances in Table C-1 through Table C-4 for the threat explosive weight and the applicable level of protection. It is recognized that moving existing parking areas and roadways or applying structural retrofits may be impractical in some cases; therefore, the following operational options are provided for existing buildings.

##### **a. Controlled Parking Areas.**

Controlled parking associated with existing buildings may be allowed to be as close as the minimum standoff distance without hardening or analysis if access control (see definition in glossary) to the parking area is established at the applicable conventional construction standoff distance for parking. In cases where the applicable level of protection can be provided (based on hardening or analysis) with a standoff distance between the conventional construction standoff distance and the minimum standoff distance, uncontrolled parking may be allowed at the standoff distance at which the

level of protection can be achieved subject to the requirements below, but not closer than the minimum standoff distance.

To mitigate the introduction of hand delivered explosives into the controlled parking areas in violation of the unobstructed space standard (Standard 2), controlled parking areas should have some means to control pedestrian access as well as vehicular access, such as fencing or walls.

**b. Driving Lanes within Parking Areas.**

Where limited space necessitates, driving lanes within parking areas may be closer to existing buildings than parking spaces located at the applicable standoff distances, but vehicles should not be left unattended in those driving lanes. Standoff distance in these cases should be to the nearest parking space. This should not be allowed for new buildings.

**c. Alternate Situations.**

Parking may be closer to existing buildings than the minimum standoff distance where it is impractical to achieve that distance and where it can be shown through analysis that the applicable level of protection can be provided at the lesser standoff distance or if it can be provided through building hardening or other mitigating measures or retrofits designed for those standoff distances. Allowing any parking closer than the distances established in the paragraphs above should be avoided wherever possible.

**d. Parking on Existing Roadways.**

Parking along roadways is subject to similar standoff considerations as to other parking. Where there are existing roads adjacent to existing inhabited buildings, ensure there is no parking on those roadways closer than the conventional construction standoff distance unless the applicable level of protection can be provided (based on hardening or analysis) with a standoff distance between the conventional construction standoff distance and the minimum standoff distance. Parking along those roadways should not be closer than the minimum standoff distance under any circumstance. (Refer to Figure B-3 and Figure B-4). Where parking along existing roadways adjacent to existing buildings can be controlled, parking may be allowed to be as close as the minimum standoff distance without hardening or analysis.

**e. Parking for Existing High Occupancy Family Housing.**

For existing high occupancy family housing within a controlled perimeter or where there is access control to the parking area, parking within the required standoff distances may be allowed where designated parking spaces are assigned for specific residents or residences. Do not label assigned parking spaces with names or ranks of the residents. Where the existing standoff distances are less than the required standoff distances do not encroach upon those existing standoff distances with any additional parking. Avoid parking closer than the minimum standoff distance.

**B-2.1.5.3 Adjacent Underground Parking.**

Where underground parking is provided adjacent to (not underneath) buildings, parking may be allowed as close to the buildings as the construction of the building superstructure will allow based on the applicable level of protection and explosive weight. Analysis should show that the soil-structure interaction and any venting into the building will not cause progressive collapse of the building or damage to inhabited areas of the building beyond the applicable level of protection. Also, ensure there is no venting into inhabited areas of buildings that could result in occupant injuries.

#### **B-2.1.5.4 Government Vehicle Parking.**

Limitations on parking near buildings apply to all vehicles, including official and tactical vehicles, except for mobile ground tactical platforms, emergency vehicles, and operations support vehicles that are never driven out of restricted access areas, as established in these best practices. Government vehicles other than those vehicles are included in the parking limitations in these best practices because it is assumed that when they are out of restricted access areas they may be out of the immediate control of their operators, which could make them susceptible to having explosives placed on or inside of them.

#### **B-2.1.5.5 Parking of Emergency, Command, and Operations Support Vehicles.**

Emergency and command vehicles, as well as operations support vehicles may be parked closer to buildings than allowed in Table C-1 through Table C-4 without hardening or analysis if access to the vehicles is continuously controlled or as long as they are never removed from a restricted access area. Command and operations support vehicles should not be parked closer than the applicable minimum standoff distance. In addition, where standard operation of buildings includes parking emergency vehicles inside them, such as in fire stations, those emergency vehicles may be parked inside the buildings.

Emergency vehicles and command vehicles are exempted from parking restrictions because they are assumed to be under strict control while they are both in and away from their usual parking spaces. Operational support vehicles are exempted because they are assumed to always operate within restricted access areas such as airfields.

#### **B-2.1.5.6 Parking of Vehicles Undergoing Maintenance.**

Vehicles undergoing maintenance may be parked inside maintenance buildings close to inhabited areas of those buildings while they are undergoing repair without providing any hardening or analysis of the buildings. Vehicles stored outside awaiting maintenance are subject to the parking limitations in these best practices.

#### **B-2.1.5.7 Parking of Mobile Ground Tactical Platforms.**

Where operational requirements require parking mobile ground tactical platforms containing non-removable sensitive compartmented information systems adjacent to buildings, ensure those parking areas are surrounded by a 7 foot (2 meter) chain link security fence topped by a single outrigger with three-strands of barbed wire and that

access to those parking areas is controlled so that the vehicles cannot be accessed without being detected.

Mobile ground tactical platforms are exempted because they are provided strict security and access control due the sensitive nature of their missions and because they must be parked adjacent to buildings to support their connectivity for electronic system updates.

#### **B-2.1.5.8 Parking for Handicapped Personnel.**

Parking for handicapped personnel should not be located closer than the standoff distances necessary to meet the applicable levels of protection. Handicapped parking is only required to be the closest parking available. There is no set distance associated with it.

#### **B-2.1.5.9 Parking and Roadway Projects.**

Where practical, all roadway and parking area projects not associated with a building renovation, modification, repair, or restoration should comply with the applicable conventional construction standoff distances from existing inhabited buildings. Where parking areas that are within the applicable standoff distances from such existing buildings are being constructed, expanded, or relocated, those parking areas should not encroach on the existing standoff distances of any existing inhabited building unless it can be shown that the building can provide the appropriate level of protection that would apply if the building were required to meet a standoff distance. Parking and roadway projects should not be located closer than the applicable minimum standoff distances.

If roadway projects include road widening or encroachment on existing standoff distances is otherwise unavoidable, ensure there are operational procedures in place to prohibit parking on the roadways within those standoff distances as described in paragraph B-2.1.5.2. Driving lanes within parking areas may be allowed to be closer to existing buildings than the closest parking spaces where limited space necessitates, but vehicles may not be left unattended in those driving lanes.

#### **B-2.1.5.10 Standoff to Entry Control Facilities/Access Control Points.**

For stationary vehicle bomb threats standoff distances from buildings to Entry Control Facilities/Access Control Points should be measured from the identification check area to the closest point on the building exterior or inhabited portion of the building or to specific building components. For moving vehicle bomb threats standoff distances should be measured to the nearest final denial active vehicle barrier.

**B-2.1.5.11 Location of Trash Containers.**

Provide standoff distances from the nearest points of trash containers or trash container enclosures to the closest points on building exteriors, inhabited portions of buildings, or to specific building components in accordance with the conventional construction standoff distance for the threat hand carried explosive. Where the applicable conventional construction standoff distance is not available, analyze the building and apply building hardening as necessary to mitigate the effects of the applicable explosives for trash containers at the achievable standoff distance to the appropriate level of protection.

Alternatively, harden trash enclosures to mitigate the direct blast effects and secondary fragment effects of the explosive on the building if the applicable level of protection can be proven by analysis or testing. As an additional alternative, if trash containers or enclosures are secured to preclude introduction of objects 6-in. (150 mm) or greater in height or width into them by unauthorized personnel, they may be located closer to the building as long as they do not violate the unobstructed space provisions of paragraph B-2.2. Openings in screening materials and gaps between the ground and screens or walls making up an enclosure should not be greater than 6 in. (150 mm).

**B-2.1.5.12 Adjacent Existing Buildings.**

Where projects for new and existing buildings include locating parking, roadways, or trash containers near existing inhabited buildings, the standoff distances from parking, roadways, and trash containers to those buildings should comply with the applicable standoff distances in Table C-1 through Table C-4.

Where those standoff distances are not available, do not allow parking and roadways to encroach on existing standoff distances to parking and roadways associated with those existing buildings unless it can be shown that the building can provide the appropriate level of protection that would apply if the building were required to comply with the minimum standards in this UFC. The encroachment provision above applies only to parking and roadways. Do not allow trash containers associated with new or existing buildings to be located closer to existing inhabited buildings than the applicable standoff distances in Table C-1 through Table C-4.

**B-2.1.5.13 Parking Structures.**

Standoff distances between parking structures and inhabited buildings should be measured to actual parking spaces within the parking structures, including spaces on all floors of the parking structures.

**B-2.2 Unobstructed Space.**

Standard 2 covers unobstructed space requirements to meet the minimum standards, however, fully mitigating the effects of a hand placed explosive requires determining a standoff distance based on the building construction, threat explosive weight, and applicable level of protection. To achieve that mitigation, do the following in addition to what is required by Standard 2. The unobstructed space should extend out to the

applicable conventional construction standoff distance to walls for parking and roadways in accordance with Table C-1 through Table C-4, but not less than the minimum standoff distance. If the standoff distance required to provide the applicable performance of windows or doors is greater than the conventional construction standoff distance, the unobstructed space should extend to the applicable window or door distance. Unobstructed space for expeditionary structures should be determined using Table C-6.

Alternatively, for distances between the conventional construction standoff distance and the minimum standoff distance, standoff distances may be validated through analysis. That analysis verifies the applicable level of protection is met based on mitigating the effects of the threat hand carried explosive at the distance between the location of the explosive and the area of the building being protected. For existing buildings where the standoff distances for parking and roadways have been established at less than the minimum standoff distance, the unobstructed space may be reduced to be equivalent to those distances.

#### **B-2.2.1      Controlled Parking.**

Where controlled parking associated with existing buildings is allowed, the unobstructed space should be considered to extend to the limits of those parking areas where access is controlled. To mitigate the introduction of hand delivered explosives into the controlled parking areas, those areas should have some means to control pedestrian access as well as vehicular access, such as fencing or walls. Security fences or walls should be a minimum of 7 ft. (2 m) high. Specific fence, wall, and access control requirements should be coordinated with physical security and antiterrorism personnel.

#### **B-2.2.2      Parking Within Unobstructed Spaces.**

When an explosive threat has been identified, parking should not be allowed within unobstructed spaces except for parking of emergency, command, and operations support vehicles and mobile ground tactical platforms.

#### **B-2.2.3      Adjacent Uncontrolled Public Space.**

Where there is a defined explosive threat and there are spaces with uncontrolled public access below, above or beside building areas that are occupied by DoD, it should be considered that the threat explosives may be located in those spaces and the spaces occupied by DoD should be designed to ensure that they meet the applicable level of protection

#### **B-2.3          Drive-Up/Drop-Off Areas.**

Some facilities require access to areas within the required standoff distances for dropping off or picking up people or loading or unloading packages and other objects. Examples that may require drive-ups or drop-offs include, but are not limited to, medical facilities, exchanges and commissaries, schools, and child care centers. In these cases, standoff distances should be measured to the nearest legal parking spaces, not the drive-ups or drop-offs. No building hardening should be required to compensate for

the closer standoff distances associated with the drive-ups or drop-offs. This also applies to drive-through lanes such as those at stand-alone franchised food operations.

**B-2.3.1      Marking.**

Where operational or safety considerations require drive-up or drop-off areas or drive-through lanes near, ensure those areas or lanes are clearly defined and marked in accordance with the Manual on Uniform Traffic Control Devices and that their intended use is clear to prevent parking of vehicles in those areas.

**B-2.3.2      Unattended Vehicles.**

Do not allow unattended vehicles in drive-up or drop-off areas or drive-through lanes. Prohibit unattended vehicles within conventional construction standoff distances in accordance with Table C-1 through Table C-4 or ensure through analysis that buildings can provide the appropriate level of protection at lesser standoff distances. Unattended vehicles should never be allowed closer than the minimum standoff distance.

**B-2.3.3      Location.**

Do not allow drive-through lanes or drive-up/drop-off areas to be located under any inhabited portion of any new building. For existing buildings that have drive-through lanes or drive-up areas, either eliminate them or design the buildings to provide the applicable level of protection for the applicable explosive weight located underneath the portion of the building accessed by the drive-through or drop-off.

**B-2.4          Access Roads.**

Where access roads are necessary for the operation of buildings (including those required for emergency access and/or security operations), ensure that access control measures are implemented to prohibit unauthorized vehicles from using access roads within the applicable standoff distances. Because situations at various buildings and installations are different, the development of specific access control measures and procedures is beyond the scope of these standards. That is left to local physical security personnel.

**B-2.5          Parking Beneath Buildings or on Rooftops.**

Standard 5 in Chapter 3 establishes the minimum measures required for addressing this situation. To mitigate the effects of an explosive event underneath or on top of a building, ensure that there is no general collapse of more than one single bay of floor beneath or floors/roof above inhabited areas and that all other adjacent supporting structural elements will not fail from the detonation in the parking area of the threat explosive. Unless it can be shown that a greater standoff distance can be justified, evaluate structural elements in parking areas at a standoff distance of 4 ft. (1.2 m) horizontally or 30 in. (76 cm) above the elements. Failure should be evaluated based on the applicable level of protection in accordance with PDC Technical Report 06-08. Also, ensure there is no venting into inhabited areas of buildings that could result in

occupant injuries. In addition, see Standard 6 of the minimum standards for progressive collapse avoidance requirements.

### **B-3 ARCHITECTURAL AND STRUCTURAL DESIGN.**

Chapter 3 establishes minimum requirements for glazing and doors. Those requirements do not address mitigation of blast effects on structures. Where an explosive threat has been identified to a facility, the following apply.

#### **B-3.1 Windows and Skylights.**

To minimize hazards from flying debris from windows and skylights, apply the following provisions for glazing, framing, connections, and supporting structural elements for all new and existing buildings for which there is an identified explosive threat. These provisions apply to window systems at all standoff distances, even those that meet or exceed the wall conventional construction standoff distances. The specific requirements below will result in window and skylight systems that provide for effective hazard mitigation. These provisions allow for design by dynamic analysis, testing, or the ASTM F 2248 design approach as described in the paragraphs below. Use strength design with load factors of 1.0 and strength reduction factors of 1.0 for all methods of analysis referenced herein for flexure and use typical strength reduction factors for other modes of failure. Windows will be inclusive of storefronts, clerestories, and similar glazed construction. For glazed doors refer to paragraph B-3.2.2.

Monolithic glass or monolithic acrylic used as a single pane or as the inner pane of a multi-pane system should not be allowed as glazing when there is an identified explosive threat. Spandrel glass when backed by a structural wall or spandrel beam, translucent fiberglass panels, other lightweight translucent plastics, and glass unit masonry should meet the performance requirements of Table B-1. That performance needs to be proven through testing or analysis. Engineered glass block window systems and spandrel glass that is open to occupied space should be designed in accordance with the following guidance.

##### **B-3.1.1 Dynamic Analysis.**

Any of the glazing, framing members, connections, and supporting structural elements may be designed using dynamic analysis to prove the window or skylight systems will provide performance equivalent to or better than the hazard rating associated with the applicable level of protection established in the project requirements and described in Table B-1. Dynamic analysis guidance is presented in PDC TR 10-02. The design loadings for dynamic analyses should be the appropriate pressures and impulses from the applicable explosive weights at the actual standoff distances at which the windows are sited. The design loading should be applied over the areas tributary to the element being analyzed. The allowable response limits of structural elements for all of the levels of protection are provided in PDC-TR 06-08. Response limits for steel and aluminum window frame members are provided in PDC-TR-10-02. Window frames constructed from materials other than aluminum or steel should be tested in accordance with paragraph B-3.1.2 or proven by analysis to demonstrate performance equivalent to or

better than the hazard rating associated with the applicable level of protection as indicated in Table B-1.

### **B-3.1.2 Testing.**

Window and skylight systems may be dynamically tested to demonstrate performance equivalent to or better than the hazard rating associated with the applicable level of protection as indicated in Table B-1. Testing should include the entire window or skylight system, including connections, and should be in accordance with ASTM F 1642 with hazard ratings in accordance with ASTM F 2912.

The structural supporting material used in the test for fastener attachment should be representative of the fielded application. Any deviations in field application of the connections or the connected elements from the test should be demonstrated by calculation to provide the applicable level of protection for the specific application. The design loading for a dynamic test should be the appropriate pressure and impulse from the applicable explosive weight at the actual standoff distance at which the window is sited.

### **B-3.1.3 ASTM F 2248 Design Approach for Laminated Glass Glazing Systems.**

Windows and skylights fabricated using laminated glass may be designed using ASTM F 2248 and ASTM E 1300 in accordance with the requirements below. The application of ASTM F 2248 and ASTM E 1300 results in a medium level of protection as reflected in Table B-1.

#### **B-3.1.3.1 Glazing.**

Provide laminated glass with a minimum interlayer thickness of 0.030 in. (0.75mm) and a load resistance determined from ASTM E 1300 greater or equal to the 3-second duration equivalent design load determined from ASTM F 2248.

Note that ASTM F 2248 can be used for a limited range of charge weights and standoffs, including those covered by this standard. For charge weights and standoffs outside of the range of ASTM F 2248, for conditions outside the range of ASTM E 1300, and for glazing alternatives to laminated glass that provide equivalent levels of protection, refer to PDC Technical Report 10-02.

#### **B-3.1.3.2 Frames.**

Provide window and skylight frames, mullions and sashes of aluminum or steel designed in accordance with ASTM F 2248. Window frames constructed from materials other than aluminum or steel should be tested in accordance with paragraph B-3.1.2 or proven by analysis to demonstrate performance equivalent to or better than the hazard rating associated with the applicable level of protection as indicated in Table B-1.

In the case of a punched or ribbon window, the supported edge length should be taken as equal to the longest span of a single pane of glass, regardless of any intermediate

support connections. For storefront and curtain wall systems, primary mullions that span between points of structural support should be considered supporting frame members and may be designed dynamically in accordance with paragraph B-3.1.1 or statically. If designed by the static method the moment and shear capacities of framing members should be designed to resist two (2) times the glazing resistance applied to the framing members only from the tributary area of the window, and deflection should be limited to 1/60 of the members' span lengths between points of structural support. Intermediate mullions should be checked for deflection with the supported edge length taken as equal to the longest span of a single glass panel and the deflection should be calculated based on simple support conditions for that length.

#### **B-3.1.3.3 Glazing Frame Bite.**

Glazing frame bite requirements for structurally or non-structurally glazed windows or skylights should be in accordance with ASTM F 2248. Apply structural silicone bead or glazing tape to both sides of the glass panel for single pane glazing but only to the inboard side for insulating glass units.

#### **B-3.1.3.4 Connection Design.**

Connections of window and skylight frames to surrounding walls or roofs, of hardware and associated connections, of glazing stop connections, and of other elements in shear should be designed for the connection design load determined in accordance with ASTM F 2248 and should account for the geometry of the particular frame and the connection configuration being used when calculating bending, shear, bearing, and pull out loads for the connections.

#### **B-3.1.4 Design of Supporting Structural Elements.**

Supporting structural elements (i.e. those structural elements that frame the rough opening) for window and skylight systems of any glazing material can be designed statically to account for the increase in tributary areas to the adjacent supporting elements due to windows or skylights. Building elements that have only glazing framed into them, such as curtain walls and storefronts, should be designed as frame members in accordance with paragraph B-3.1.3.2. For window and skylight systems in buildings situated at less than the wall conventional construction standoff distance, the surrounding wall and roof elements should be designed dynamically in accordance with paragraph B-3.1.1.

##### **B-3.1.4.1 Static Design of Wall and Roof Elements.**

For window and skylight systems in buildings situated at or beyond the wall conventional construction standoff distance for the wall material to which it is attached, the surrounding wall and roof elements and their connections to the rest of the structure should be designed as described below. The supporting structural elements adjacent to windows should be designed to account for their increased tributary areas. These areas represent the tributary areas of windows or skylights, and the walls or roof area above and below them, whose loads should be laterally supported by those elements. Those

increases in tributary areas should be accounted for by applying a tributary area increase factor (C) to the moment and shear capacities of the walls. The tributary area increase factor is the ratio of the tributary area that accounts for the windows or skylights and the walls or roofs above and below them to the tributary area upon which typical conventional wall sections or elements are designed. See PDC Technical Report 10-02 for an illustration. The tributary area increase factor is shown in Equation 1 and should not be taken as less than 1.

$$C = \frac{a_{trib}}{a_{wall}} \geq 1$$

Equation 1

a wall = tributary area for typical conventional wall section or element

a trib = combined tributary area for supported window or skylight and wall or roof section or element

Design the supporting structural elements to have moment and shear capacities equal to or greater than the calculated conventional wall capacities multiplied by the applicable tributary area increase factor as shown in Equation 2 and Equation 3. Connection loads for the supporting structural element should be determined based on the increase in member shear capacity.

$$M_{SSE} \geq C \cdot M_{CW} \quad \text{Equation 2}$$

$$V_{SSE} \geq C \cdot V_{CW} \quad \text{Equation 3}$$

MSSE and VSSE are moment and shear capacities of supporting structural element.

MCW and VCW are moment and shear capacities of conventional wall section.

#### **B-3.1.4.2 Reactions for Static Design.**

The reactions from the supporting structural element analysis normally do not have to be carried through the horizontal and lateral bracing systems of buildings to the foundations. The main concern is that these loads are transferred into horizontal floor and roof systems without failing those connections or the attached elements, as the building mass dissipates those loads before they are transferred to the foundation. It is left to the structural engineer to assess the adequacy of these connections, the attaching elements, and the need for further analysis.

#### **B-3.1.5 Skylights.**

Because glazing fragment hazards are increased when glazing falls from the elevations of skylights, skylight glazing should be designed as a minimum to break, but remain in the frame, which is equivalent to the minimal hazard rating in ASTM F 2912 (medium level of protection in Table B-1). Use the appropriate blast load for the applicable angle of incidence to design or test the skylight.

### **B-3.1.6 Window and Skylight Replacement Projects.**

Whenever windows and skylights are being replaced in existing buildings that have an identified explosive threat, design glazing, frames, connections, and supporting structural elements to meet all of the requirements of the following. Base the window designs on either the standoff distances to existing parking and roadways or to the planned locations for future parking and roadways in accordance with the installation or facility master plan. These provisions also apply to new windows installed in new wall openings.

Provide no less than 1/4 in. (6 mm) nominal polycarbonate or laminated glass for exterior windows or skylights. The 1/4 in. (6 mm) laminated glass consists of two nominal 1/8 in. (3 mm) glass panes bonded together with a minimum of a 0.030 in. (0.75 mm) interlayer of a material designed and tested for bomb blast resistance. For insulating glass units (IGU), use the polycarbonate or laminated glass for the innermost pane as a minimum. For laminated glass provide a glazing frame bite in accordance with ASTM F 2248. For polycarbonate provide a glazing frame bite of no less than 1.5 times the polycarbonate thickness.

### **B-3.1.7 Replacement with Wall or Roof Systems.**

When windows or skylights are being replaced by filling in the openings with wall or roof material the openings should be filled with the same or similar construction as the adjacent wall or roof construction. Lightweight translucent fiberglass or plastic panels or other construction dissimilar to the existing adjacent construction may also be used. Regardless of the infill construction used, it must provide the applicable level of protection.

### **B-3.1.8 Alternative Window Treatments.**

For existing buildings in which windows are not being replaced, window retrofits incorporating alternative window treatments are viable and economical solutions to mitigating the effects of explosive attacks, but will be evaluated prior to installation so that reduction in glass hazards may be validated.

### **B-3.1.9 Exterior Stairwells and Covered or Enclosed Walkways.**

Glazing in stairwells and covered or enclosed walkways that are exterior to buildings does not need to comply with the provisions of these best practices because exterior stairwells and walkways generally are not considered to be routinely occupied. Building components behind the exterior stairwell glazing should be capable of mitigating any hazards resulting from the stairwell or enclosed walkway glazing failure in response to a blast event in accordance with the applicable levels of protection described in Table B-1. To provide that debris resistance, any windows, inner doors, sidelights, and transoms that are interior to the exterior stairwells or enclosed walkways should meet the windborne debris resistance requirements of ASTM E 1996 (missiles A and D in Table 2) All building components behind stairwells and covered or enclosed walkways should also be designed as if the stairwells or walkways were not present.

## **B-3.2 Exterior Doors.**

For new and existing buildings for which there is an identified explosive threat provide exterior doors into inhabited areas in accordance with the provisions below

### **B-3.2.1 Unglazed Doors**

Provide unglazed doors that are tested to achieve the applicable damage level category in Table B-1 in accordance with ASTM F 2247, with ASTM F 2927, or that meet the provisions of the Alternative Designs paragraph below.

- The fasteners and anchorage methods used to attach the tested door assembly should be representative of the actual door installation. Any deviations in actual installation of the connections or the connected elements from those tested should be demonstrated by calculation to provide the applicable level of protection for the specific application.
- The design air blast loading for the test should be the appropriate pressure and impulse from the applicable explosive weight at the actual standoff distance at which the door is sited.

### **B-3.2.2 Glazed Doors.**

Provide glazed doors that are tested to achieve the applicable door damage level category and glazing hazard rating in Table B-1 in accordance with ASTM F 2927 or ASTM F 2247 that meet the provisions of the “Alternative Designs” paragraph below. Unless included as part of the tested assembly, glazed sidelights and transoms around doors should meet the window design requirements above.

The fasteners and anchorage methods used to attach the tested door assembly should be representative of the actual door installation. Any deviations in actual installation of the connections or the connected elements from those tested should be demonstrated by calculation to provide the applicable level of protection for the specific application. The design air blast loading for the test should be the appropriate pressure and impulse from the applicable explosive weight at the actual standoff distance between the location of the doors and potential locations for explosives.

### **B-3.2.3 Alternative Designs.**

As an alternative to the above testing provisions for glazed and unglazed doors, position doors such that they will not be propelled into inhabited areas if they fail in response to a blast or provide other means to ensure they are intercepted by a surface with sufficient strength to keep the doors from translating into inhabited areas if they fail or otherwise ensure they do not become hazards to building occupants. The glazing in glazed doors should still meet the glazing and frame bite provisions of Standard 10 if this alternative is exercised to reduce the glazing hazard. The framing, connection, and supporting structure provisions above do not have to be applied for this alternative. Where it is not possible to design surfaces to safely intercept doors, the doors should be designed to remain in the door frames.

#### **B-3.2.4 Vestibules or Foyers.**

In vestibules, foyers, or similar entry configurations into inhabited areas where there are inner and outer doors the vestibules, foyers, or similar entries are considered not to be routinely occupied spaces. The inner doors should meet the provisions of this appendix and any other glazing associated with inner door entries such as sidelights and transoms should meet the requirements above. The inner doors and glazing should be capable of mitigating any hazards resulting from the enclosed vestibule or foyer outer doors and glazing failure in response to the design blast event. This is to account for the fact that at the levels of protection associated with these best practices the outer doors and glazing may fail, which would subject the inner doors and glazing to significant blast loads. To provide that debris resistance, the inner doors, sidelights, and transoms should meet the windborne debris resistance requirements of ASTM E 1996 (missiles A and D in Table 2).

Alternatively, exterior doors and glazed surfaces of the exteriors of vestibules or foyers can be designed to a minimum of a medium level of protection. Designing to that level will ensure that blast effects do not breach outer layers of vestibules or foyers, protecting inner doors and associated glazing from blast effects. Those inner doors and glazed surfaces could then be designed of conventional construction.

#### **B-3.2.5 Overhead Doors.**

Because it is impractical to design conventional overhead doors to meet the required performance in Table B-1, ensure overhead doors do not open into inhabited spaces or ensure that if they fail that they are intercepted by walls or tether systems that are designed with sufficient strength to keep the overhead doors from translating into areas that meet the definition of inhabited spaces.

## **APPENDIX C REPRESENTATIVE STANDOFF DISTANCES FOR CONVENTIONAL CONSTRUCTION AND EXPEDITIONARY STRUCTURES**

### **C-1 INTRODUCTION.**

The purpose of this appendix is to provide representative standoff distances for a number of conventionally constructed walls, roofs, and windows that fall within the parameters of Table C-5. The materials that were selected are for systems that are commonly used in DoD construction. These standoff distances should only be used for project planning and not used as a basis for final design. Even if the final structural elements fall within the parameters of Table C-5 they should be validated during design. The contents in this appendix will be included in UFC 4-020-02 when published. The information contained within may be used when a specific threat has been identified for the location or project based on UFC 4-020-01 or Service, Agency, or Geographic Combatant Command guidance.

### **C-2 USING THIS APPENDIX.**

Each of Table C-1 through Table C-4 corresponds to specific levels of protection from very low to high. Within those columns there are standoff distances for each of the construction types in the leftmost column. Instructions for walls, roofs, and windows follow.

### **C-3 WALLS.**

For each wall type there are two entries for each threat severity level. There is one for load bearing walls (LB) and one for non-load bearing (NLB). Either select a wall material based on available standoff distance or select a standoff distance based on a desired wall material. Note that where wall types include multiple cladding systems such as brick half way up the wall and EIFS above that, use the greater of the two applicable standoff distances for the two wall materials. Note that the walls in Table C-5 have specific ranges of spans and material properties. Table C-1 through Table C-4 are only valid within those ranges of properties. Users must not extrapolate outside of the tables.

### **C-4 ROOFS.**

Roofs seldom control the designs of buildings with respect to blast resistance, but standoff distances for common concrete and metal roofs are tabulated for reference. Other roof types will have to be analyzed separately.

### **C-5 WINDOWS.**

The standoff distances for windows are for conventional laminated glass windows with glazing consistent with the minimum glazing in Paragraph B-3.1.3.1. These windows can be considered conventional windows. Any standoff distances less than those in Table C-1 through Table C-4 for windows will require heavier and more costly blast resistant window systems.

**C-6 EXPEDITIONARY STRUCTURES.**

Standoff distances to expeditionary structures are based on structure types as indicated in Table C-6. Standoffs are based on blast testing of actual structures of the types indicated. Note that there are some entries that have NDA instead of distances. Those entries reflect instances where there was no data available to make a determination of standoff distance. Note that there are no entries for windows. If there are windows in expeditionary structures, use the window entries from Tables C-1 through C-4. For more information on standoff distances for expeditionary structures refer to the retrofit and Overpressure Design of Shelters (RODS) After Initiative Report.

Table C-1 Representative Standoff Distances for Very Low Level of Protection <sup>7</sup>

Construction <sup>1</sup>	Explosive Weight (TNT)											
	55 lbs (25 kg)		220 lbs (100 kg)		550 lbs (250 kg)		1,100 lbs (500 kg)		4,400 lbs (2,000 kg)		19,800 lbs (9,000 kg)	
	LB <sup>2</sup>	NLB <sup>3</sup>	LB <sup>2</sup>	NLB <sup>3</sup>	LB <sup>2</sup>	NLB <sup>3</sup>	LB <sup>2</sup>	NLB <sup>3</sup>	LB <sup>2</sup>	NLB <sup>3</sup>	LB <sup>2</sup>	NLB <sup>3</sup>
Metal Stud with Lightweight Sheathing <sup>4</sup>	150 ft (46 m)	67 ft (20 m)	376 ft (115 m)	162 ft (49 m)	661 ft (201 m)	290 ft (88 m)	971 ft (296 m)	445 ft (136 m)	1642 ft (500 m)	988 ft (301 m)	2656 ft (809 m)	2417 ft (737 m)
Metal Stud with Brick Veneer <sup>4</sup>	74 ft (22 m)	31 ft (9 m)	186 ft (57 m)	84 ft (26 m)	341 ft (104 m)	152 ft (46 m)	538 ft (164 m)	235 ft (72 m)	1303 ft (397 m)	571 ft (174 m)	2545 ft (776 m)	1416 ft (431 m)
Wood Stud with Lightweight Sheathing <sup>4</sup>	85 ft (26 m)	55 ft (17 m)	211 ft (64 m)	139 ft (42 m)	386 ft (118 m)	253 ft (77 m)	601 ft (183 m)	395 ft (120 m)	1441 ft (439 m)	958 ft (292 m)	2645 ft (806 m)	2304 ft (702 m)
Wood Stud with Brick Veneer <sup>4</sup>	36 ft (11 m)	17 ft (5 m)	103 ft (31 m)	64 ft (20 m)	193 ft (59 m)	127 ft (39 m)	303 ft (92 m)	203 ft (62 m)	761 ft (232 m)	498 ft (152 m)	2010 ft (613 m)	1307 ft (398 m)
Pre-engineered Building (Girt and Metal Panel) <sup>4</sup>	104 ft (32 m)	39 ft (12 m)	336 ft (102 m)	108 ft (33 m)	684 ft (209 m)	213 ft (65 m)	1132 ft (345 m)	345 ft (105 m)	1668 ft (508 m)	851 ft (259 m)	2780 ft (847 m)	2418 ft (737 m)
Unreinforced Concrete Masonry <sup>4</sup>	80 ft (24 m)	15 ft (4 m)	262 ft (80 m)	34 ft (10 m)	535 ft (163 m)	71 ft (22 m)	906 ft (276 m)	162 ft (49 m)	1893 ft (577 m)	538 ft (164 m)	2780 ft (847 m)	1651 ft (503 m)
Unreinforced European Clay Masonry <sup>4</sup>	38 ft (11 m)	15 ft (5 m)	163 ft (50 m)	29 ft (9 m)	398 ft (121 m)	51 ft (16 m)	748 ft (228 m)	84 ft (26 m)	1614 ft (492 m)	302 ft (92 m)	N/A	1304 ft (398 m)
Reinforced Masonry <sup>4</sup>	28 ft (9 m)	13 ft (4 m)	85 ft (26 m)	20 ft (6 m)	166 ft (51 m)	38 ft (12 m)	273 ft (83 m)	78 ft (24 m)	736 ft (224 m)	221 ft (67 m)	2212 ft (674 m)	644 ft (196 m)
Reinforced Concrete <sup>4</sup>	22 ft (7 m)	13 ft (4 m)	104 ft (32 m)	23 ft (7 m)	234 ft (71 m)	42 ft (13 m)	424 ft (129 m)	90 ft (27 m)	1255 ft (383 m)	341 ft (104 m)	2504 ft (763 m)	1231 ft (375 m)
Concrete roofs and Metal Roofs with concrete topping <sup>5</sup>	13 ft (4 m)		18 ft (5 m)		25 ft (8 m)		47 ft (14 m)		155 ft (47 m)		560 ft (171 m)	
Windows <sup>6</sup>	40 ft (12 m)		93 ft (28 m)		155 ft (47 m)		230 ft (70 m)		504 ft (154 m)		1070 ft (326 m)	
Minimum Standoff Distance <sup>8</sup>	13 ft (4 m)		20 ft (6 m)		26 ft (8 m)		33 ft (10 m)		50 ft (15 m)		82 ft (25 m)	

1. Refer to Table B-5 for details on the analysis assumptions and material properties for these wall and roof types.
2. Load bearing construction.
3. Non-load bearing construction.
4. Where wall types include multiple cladding systems such as brick half way up the wall and EIFS above that, use the greater of the two applicable standoff distances. For additional information on Steel Studs see PDC TR 15-01, Minimum Standoff Distances for Non-Load Bearing Steel Stud In-Fill Walls.
5. Roof construction seldom controls standoff distances. Standoffs of at least those in this row will commonly be adequate for those roof types. Other roof types will have to be analyzed separately
6. At distances closer than these standoff distances windows will commonly be much heavier and more expensive than conventional windows.
7. Note that these standoff distances are for planning purposes only. All building components should be designed for blast loading and conventional loading.
8. See Paragraph B-2.1.3.

**Table C-2 Representative Standoff Distances for Low Level of Protection <sup>7</sup>**

Construction <sup>1</sup>	Explosive Weight (TNT)											
	55 lbs (25 kg)		220 lbs (100 kg)		550 lbs (250 kg)		1,100 lbs (500 kg)		4,400 lbs (2,000 kg)		19,800 lbs (9,000 kg)	
	LB <sup>2</sup>	NLB <sup>3</sup>	LB <sup>2</sup>	NLB <sup>3</sup>	LB <sup>2</sup>	NLB <sup>3</sup>	LB <sup>2</sup>	NLB <sup>3</sup>	LB <sup>2</sup>	NLB <sup>3</sup>	LB <sup>2</sup>	NLB <sup>3</sup>
Metal Stud with Lightweight Sheathing <sup>4</sup>	150 ft (46 m)	84 ft (26 m)	376 ft (115 m)	206 ft (63 m)	661 ft (201 m)	372 ft (113 m)	971 ft (296 m)	566 ft (173 m)	1642 ft (500 m)	1279 ft (390 m)	2656 ft (809 m)	2910 ft (887 m)
Metal Stud with Brick Veneer <sup>4</sup>	74 ft (22 m)	42 ft (13 m)	186 ft (57 m)	107 ft (33 m)	341 ft (104 m)	191 ft (58 m)	538 ft (164 m)	300 ft (91 m)	1303 ft (397 m)	730 ft (223 m)	2545 ft (776 m)	1779 ft (542 m)
Wood Stud with Lightweight Sheathing <sup>4</sup>	85 ft (26 m)	65 ft (20 m)	211 ft (64 m)	163 ft (50 m)	386 ft (118 m)	299 ft (91 m)	601 ft (183 m)	465 ft (142 m)	1441 ft (439 m)	1134 ft (346 m)	2645 ft (806 m)	2625 ft (800 m)
Wood Stud with Brick Veneer <sup>4</sup>	36 ft (11 m)	22 ft (7 m)	103 ft (31 m)	78 ft (24 m)	193 ft (59 m)	150 ft (46 m)	303 ft (92 m)	238 ft (73 m)	761 ft (232 m)	589 ft (179 m)	2010 ft (613 m)	1546 ft (471 m)
Pre-engineered Building (Girt and Metal Panel <sup>4</sup> )	104 ft (32 m)	54 ft (17 m)	336 ft (102 m)	151 ft (46 m)	684 ft (209 m)	287 ft (88 m)	1132 ft (345 m)	458 ft (140 m)	1668 ft (508 m)	1294 ft (394 m)	2780 ft (847 m)	2985 ft (910 m)
Unreinforced Concrete Masonry <sup>4</sup>	80 ft (24 m)	26 ft (8 m)	262 ft (80 m)	124 ft (38 m)	535 ft (163 m)	276 ft (84 m)	906 ft (276 m)	484 ft (148 m)	1893 ft (577 m)	1393 ft (425 m)	2780 ft (847 m)	2940 ft (896 m)
Unreinforced European Clay Masonry <sup>4</sup>	38 ft (11 m)	22 ft (7 m)	163 ft (50 m)	59 ft (18 m)	398 ft (121 m)	148 ft (45 m)	748 ft (228 m)	314 ft (96 m)	1614 ft (492 m)	1146 ft (349 m)	N/A	2688 ft (819 m)
Reinforced Masonry <sup>4</sup>	28 ft (9 m)	13 ft (4 m)	85 ft (26 m)	30 ft (9 m)	166 ft (51 m)	72 ft (22 m)	273 ft (83 m)	120 ft (37 m)	736 ft (224 m)	326 ft (99 m)	2212 ft (674 m)	945 ft (288 m)
Reinforced Concrete <sup>4</sup>	22 ft (7 m)	14 ft (4 m)	104 ft (32 m)	35 ft (11 m)	234 ft (71 m)	105 ft (32 m)	424 ft (129 m)	200 ft (61 m)	1255 ft (383 m)	663 ft (202 m)	2504 ft (763 m)	2122 ft (647 m)
Concrete roofs and Metal Roofs w/ concrete topping <sup>5</sup>	13 ft (4 m)		23 ft (7 m)		50 ft (15 m)		92 ft (28 m)		270 ft (82 m)		737 ft (225 m)	
Windows <sup>6</sup>	51 ft (15 m)		123 ft (37 m)		197 ft (60 m)		269 ft (82 m)		545 ft (166 m)		1092 ft (333 m)	
Minimum Standoff Distance <sup>8</sup>	13 ft (4 m)		20 ft (6 m)		26 ft (8 m)		33 ft (10 m)		50 ft (15 m)		82 ft (25 m)	

1. Refer to Table B-5 for details on the analysis assumptions and material properties for these wall and roof types.
2. Load bearing construction.
3. Non-load bearing construction.
4. Where wall types include multiple cladding systems such as brick half way up the wall and EIFS above that, use the greater of the two applicable standoff distances. For additional information on Steel Studs see PDC TR 15-01, Minimum Standoff Distances for Non-Load Bearing Steel Stud In-Fill Walls.
5. Roof construction seldom controls standoff distances. Standoffs of at least those in this row will commonly be adequate for those roof types. Other roof types will have to be analyzed separately
6. At distances closer than these standoff distances windows will commonly be much heavier and more expensive than conventional windows.
7. Note that these standoff distances are for planning purposes only. All building components should be designed for blast loading and conventional loading.
8. See Paragraph B-2.1.3.

**Table C-3 Representative Standoff Distances for Medium Level of Protection <sup>7</sup>**

Construction <sup>1</sup>	Explosive Weights (TNT)											
	55 lbs (25 kg)		220 lbs (100 kg)		550 lbs (250 kg)		1,100 lbs (500 kg)		4,400 lbs (2,000 kg)		19,800 lbs (9,000 kg)	
	LB <sup>2</sup>	NLB <sup>3</sup>	LB <sup>2</sup>	NLB <sup>3</sup>	LB <sup>2</sup>	NLB <sup>3</sup>	LB <sup>2</sup>	NLB <sup>3</sup>	LB <sup>2</sup>	NLB <sup>3</sup>	LB <sup>2</sup>	NLB <sup>3</sup>
Metal Stud with Lightweight Sheathing <sup>4</sup>	311 ft (95 m)	150 ft (46 m)	701 ft (214 m)	376 ft (115 m)	844 ft (257 m)	661 ft (201 m)	1004 ft (306 m)	971 ft (296 m)	1504 ft (459 m)	1642 ft (500 m)	2567 ft (783 m)	2656 ft (809 m)
Metal Stud with Brick Veneer <sup>4</sup>	148 ft (45 m)	74 ft (22 m)	380 ft (116 m)	186 ft (57 m)	710 ft (216 m)	341 ft (104 m)	1145 ft (349 m)	538 ft (164 m)	1679 ft (512 m)	1303 ft (397 m)	2745 ft (837 m)	2545 ft (776 m)
Wood Stud with Lightweight Sheathing <sup>4</sup>	151 ft (46 m)	85 ft (26 m)	390 ft (119 m)	211 ft (64 m)	714 ft (218 m)	386 ft (118 m)	1076 ft (328 m)	601 ft (183 m)	1553 ft (473 m)	1441 ft (439 m)	2726 ft (831 m)	2645 ft (806 m)
Wood Stud with Brick Veneer <sup>4</sup>	67 ft (21 m)	36 ft (11 m)	186 ft (57 m)	103 ft (31 m)	345 ft (105 m)	193 ft (59 m)	554 ft (169 m)	303 ft (92 m)	1402 ft (427 m)	761 ft (232 m)	2642 ft (805 m)	2010 ft (613 m)
Pre-engineered Building (Girt and Metal Panel <sup>4</sup> )	269 ft (82 m)	104 ft (32 m)	633 ft (193 m)	336 ft (102 m)	818 ft (249 m)	684 ft (209 m)	1096 ft (334 m)	1132 ft (345 m)	1682 ft (513 m)	1668 ft (508 m)	2505 ft (764 m)	2780 ft (847 m)
Unreinforced Concrete Masonry <sup>4</sup>	365 ft (111 m)	80 ft (24 m)	567 ft (173 m)	262 ft (80 m)	808 ft (246 m)	535 ft (163 m)	1033 ft (315 m)	906 ft (276 m)	1512 ft (461 m)	1893 ft (577 m)	2515 ft (767 m)	2780 ft (847 m)
Unreinforced European Clay Masonry <sup>4</sup>	N/A	38 ft (11 m)	N/A	163 ft (50 m)	N/A	398 ft (121 m)	N/A	748 ft (228 m)	N/A	1614 ft (492 m)	N/A	N/A
Reinforced Masonry <sup>4</sup>	224 ft (68 m)	28 ft (9 m)	563 ft (171 m)	85 ft (26 m)	768 ft (234 m)	166 ft (51 m)	1010 ft (308 m)	273 ft (83 m)	1598 ft (487 m)	736 ft (224 m)	2691 ft (820 m)	2212 ft (674 m)
Reinforced Concrete <sup>4</sup>	276 ft (84 m)	22 ft (7 m)	489 ft (149 m)	104 ft (32 m)	822 ft (251 m)	234 ft (71 m)	918 ft (280 m)	424 ft (129 m)	1433 ft (437 m)	1255 ft (383 m)	2672 ft (814 m)	2504 ft (763 m)
Concrete roofs and Metal Roofs w/ concrete topping <sup>5</sup>	15 ft (5 m)		43 ft (15 m)		101 ft (31 m)		171 ft (52 m)		443 ft (166 m)		1086 ft (333 m)	
Windows <sup>6</sup>	51 ft (15 m)		123 ft (37 m)		197 ft (60 m)		269 ft (82 m)		545 ft (166 m)		1092 ft (333 m)	
Minimum Standoff Distance <sup>8</sup>	13 ft (4 m)		20 ft (6 m)		26 ft (8 m)		33 ft (10 m)		50 ft (15 m)		82 ft (25 m)	

1. Refer to Table B-5 for details on the analysis assumptions and material properties for these wall and roof types.  
2. Load bearing construction.  
3. Non-load bearing construction.  
4. Where wall types include multiple cladding systems such as brick half way up the wall and EIFS above that, use the greater of the two applicable standoff distances. For additional information on Steel Studs see PDC TR 15-01, Minimum Standoff Distances for Non-Load Bearing Steel Stud In-Fill Walls.  
5. Roof construction seldom controls standoff distances. Standoffs of at least those in this row will commonly be adequate for those roof types. Other roof types will have to be analyzed separately  
6. At distances closer than these standoff distances windows will commonly be much heavier and more expensive than conventional windows.  
7. Note that these standoff distances are for planning purposes only. All building components should be designed for blast loading and conventional loading.  
8. See Paragraph B-2.1.3.

**Table C-4 Representative Standoff Distances for High Level of Protection <sup>7</sup>**

Construction <sup>1</sup>	Explosive Weights (TNT)											
	55 lbs (25 kg)		220 lbs (100 kg)		550 lbs (250 kg)		1,100 lbs (500 kg)		4,400 lbs (2,000 kg)		19,800 lbs (9,000 kg)	
	LB <sup>2</sup>	NLB <sup>3</sup>	LB <sup>2</sup>	NLB <sup>3</sup>	LB <sup>2</sup>	NLB <sup>3</sup>	LB <sup>2</sup>	NLB <sup>3</sup>	LB <sup>2</sup>	NLB <sup>3</sup>	LB <sup>2</sup>	NLB <sup>3</sup>
Metal Stud with Lightweight Sheathing <sup>4</sup>	311 ft (95 m)	311 ft (95 m)	701 ft (214 m)	701 ft (214 m)	844 ft (257 m)	844 ft (257 m)	1004 ft (306 m)	1004 ft (306 m)	1504 ft (459 m)	1504 ft (459 m)	2567 ft (783 m)	2567 ft (783 m)
Metal Stud with Brick Veneer <sup>4</sup>	148 ft (45 m)	148 ft (45 m)	380 ft (116 m)	380 ft (116 m)	710 ft (216 m)	710 ft (216 m)	1145 ft (349 m)	1145 ft (349 m)	1679 ft (512 m)	1679 ft (512 m)	2745 ft (837 m)	2745 ft (837 m)
Wood Stud with Lightweight Sheathing <sup>4</sup>	151 ft (46 m)	151 ft (46 m)	390 ft (119 m)	390 ft (119 m)	714 ft (218 m)	714 ft (218 m)	1076 ft (328 m)	1076 ft (328 m)	1553 ft (473 m)	1553 ft (473 m)	2726 ft (831 m)	2726 ft (831 m)
Wood Stud with Brick Veneer <sup>4</sup>	67 ft (21 m)	67 ft (21 m)	186 ft (57 m)	186 ft (57 m)	345 ft (105 m)	345 ft (105 m)	554 ft (169 m)	554 ft (169 m)	1402 ft (427 m)	1402 ft (427 m)	2642 ft (805 m)	2642 ft (805 m)
Pre-engineered Building (Girt and Metal Panel) <sup>4</sup>	269 ft (82 m)	269 ft (82 m)	633 ft (193 m)	633 ft (193 m)	818 ft (249 m)	818 ft (249 m)	1096 ft (334 m)	1096 ft (334 m)	1682 ft (513 m)	1682 ft (513 m)	2505 ft (764 m)	2505 ft (764 m)
Unreinforced Concrete Masonry	365 ft (111 m)	365 ft (111 m)	567 ft (173 m)	567 ft (173 m)	808 ft (246 m)	808 ft (246 m)	1033 ft (315 m)	1033 ft (315 m)	1512 ft (461 m)	1512 ft (461 m)	2515 ft (767 m)	2515 ft (767 m)
Unreinforced European Clay Masonry <sup>4</sup>	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Reinforced Masonry <sup>4</sup>	224 ft (68 m)	224 ft (68 m)	563 ft (171 m)	563 ft (171 m)	768 ft (234 m)	768 ft (234 m)	1010 ft (308 m)	1010 ft (308 m)	1598 ft (487 m)	1598 ft (487 m)	2691 ft (820 m)	2691 ft (820 m)
Reinforced Concrete <sup>4</sup>	276 ft (84 m)	276 ft (84 m)	489 ft (149 m)	489 ft (149 m)	822 ft (251 m)	822 ft (251 m)	918 ft (280 m)	918 ft (280 m)	1433 ft (437 m)	1433 ft (437 m)	2672 ft (814 m)	2672 ft (814 m)
Concrete roofs and Metal Roofs w/ concrete topping <sup>5</sup>	208 ft (63 m)		381 ft (116 m)		542 ft (184 m)		699 ft (213 m)		1137 ft (347 m)		2135 ft (651 m)	
Windows <sup>6</sup>	189 ft (58 m)		392 ft (119 m)		602 ft (184 m)		805 ft (245 m)		1412 ft (430 m)		2147 ft (654 m)	
Minimum Standoff Distance <sup>8</sup>	13 ft (4 m)		20 ft (6 m)		26 ft (8 m)		33 ft (10 m)		50 ft (15 m)		82 ft (25 m)	

1. Refer to Table B-5 for details on the analysis assumptions and material properties for these wall and roof types.
2. Load bearing construction.
3. Non-load bearing construction.
4. Where wall types include multiple cladding systems such as brick half way up the wall and EIFS above that, use the greater of the two applicable standoff distances. For additional information on Steel Studs see PDC TR 15-01, Minimum Standoff Distances for Non-Load Bearing Steel Stud In-Fill Walls.
5. Roof construction seldom controls standoff distances. Standoffs of at least those in this row will commonly be adequate for those roof types. Other roof types will have to be analyzed separately.
6. At distances closer than these standoff distances windows will commonly be much heavier and more expensive than conventional windows.
7. Note that these standoff distances are for planning purposes only. All building components should be designed for blast loading and conventional loading.
8. See Paragraph B-2.1.3.

**Table C-5 Conventional Construction Parameters**

Wall or Roof Type <sup>(1)</sup>	Analysis Assumptions <sup>(2, 10)</sup>						
	Sections	Span	Spacing	Support Condition	Supported Weight <sup>(5)</sup>	Reinforcement Ratio	Min. Static Material Strength
Wood Studs – Brick Veneer	2x4 & 2x6 in (50x100 & 50x150 mm)	8 – 10 ft (2.4 - 3 m)	16 - 24 in (400 – 600 mm)	S-S	44 psf (215 kg/m <sup>2</sup> )	N/A	875 psi (6 MPa)
Wood Studs – EIFS	2x4 & 2x6 in (50x100 & 50x150 mm)	8 – 10 ft (2.4 – 3 m)	16 -24 in (400 -600 mm)	S-S	10 psf (49 kg/m <sup>2</sup> )	N/A	875 psi (6 MPa)
Steel Studs – Brick Veneer <sup>(3)</sup>	600S162-43 600S162-54 600S162-68	8 – 12 ft (2.4 – 3.7 m)	16 - 24 in (400 – 600 mm)	S-S	44 psf (215 kg/m <sup>2</sup> )	N/A	50,000 psi (345 MPa)
Steel Studs – EIFS <sup>(3)</sup>	600S162-43 600S162-54 600S162-68	8 – 12 ft (2.4 – 3.7 m)	16 - 24 in (400 – 600 mm)	S-S	10 psf (49 kg/m <sup>2</sup> )	N/A	50,000 psi (345 MPa)
Metal Panels <sup>(6)</sup> (in wall or roof construction)	1.5 – 3 in (38 - 76 mm) 22, 20, & 18 ga	4 – 8 ft (1.2 - 2.4 m)	N/A	S-S	10 psf (49 kg/m <sup>2</sup> )	N/A	33,000 psi (228 MPa)
Girts <sup>(6)</sup> (in wall or roof construction)	8Z3 & 10Z3 16, 14, & 12 ga	20 – 25 ft (6 – 7.6 m)	6 – 8 ft (1.8 – 2.4 m)	S-S	5 psf (24 kg/m <sup>2</sup> )	N/A	50,000 psi (345 MPa)
Reinforced Concrete <sup>(7)</sup>	≥ 6 in (≥ 150 mm)	12 – 20 ft (3.7- 6 m)	N/A	S-S, One way flexure	10 psf (49 kg/m <sup>2</sup> )	≥ 0.0015	3,000 psi (21 MPa)
Unreinforced Concrete Masonry <sup>(4, 8)</sup>	6 – 12 in (150 – 300 mm)	8 – 12 ft (2.4 – 3.7 m)	N/A	S-S, One way flexure	10 psf (49 kg/m <sup>2</sup> )	0	1,500 psi (10 MPa)
Reinforced Concrete Masonry <sup>(7, 8)</sup>	8 – 12 in (200 - 300 mm)	10 – 14 ft (3 – 4.3 m)	N/A	S-S, One way flexure	10 psf (49 kg/m <sup>2</sup> )	0.0005 - 0.0030	1,500 psi (10 MPa)

Wall or Roof Type <sup>(1)</sup>	Analysis Assumptions <sup>(2, 10)</sup>						
	Sections	Span	Spacing	Support Condition	Supported Weight <sup>(5)</sup>	Reinforcement Ratio	Min. Static Material Strength
European Clay Block Masonry <sup>(4, 9)</sup>	6 – 8 in (150 – 200 mm)	10 – 12 ft (3 – 3.7 m)	N/A	S-S, Brittle Flexure	10 psf (49 kg/m <sup>2</sup> )	0	1,800 psi (12 MPa)
Concrete Roofs <sup>(7)</sup>	4 – 12 in (100 - 300 mm)	6 ft (1.8 m)	N/A	F-S	15 psf (73 kg/m <sup>2</sup> )	0.0015 - 0.005	3,000 psi (21 MPa)
Metal Roofs	K and LH joists with Metal Deck and/or 3.5 - 5.5 in (90 - 140 mm) Concrete Topping	30 ft (9.1m)	4 – 8 ft (1.2 – 2.4 m)	S-S	15 – 90 psf (73 – 439 kg/m <sup>2</sup> )	N/A	50,000 psi (345 MPa)

1. Other types of construction other than that shown in this table may be permissible subject to validation by the designer of record.
2. See PDC Technical Report 10-01 for details on the analysis assumptions and material properties.
3. Steel studs are assumed to be connected top and bottom for load bearing walls. For non-load bearing walls steel studs are assumed to have a slip-track connection at the top. For additional information on Steel Studs see PDC TR 15-01, Minimum Standoff Distances for Non-Load Bearing Steel Stud In-Fill Walls.
4. Unreinforced masonry must have adequate lateral support at the top and bottom.
5. Weight supported by the wall that moves through the same deflection as the wall, not including self-weight of the component.
6. For walls or roofs built using metal panels and girts; use the greater of the standoffs for the metal panel and the girt.
7. Reinforcing steel is 60,000 psi (414 MPa) tensile strength.
8. Concrete Masonry Units (excluding European block) are medium weight (120 pcf / 1922 kg/m<sup>3</sup>)
9. European clay block masonry complies with DIN: 105 Teil 1 + 2/HLz B
10. Shear will need to be checked when using higher than minimum material strengths.

S-S = Simple - Simple Supports

F-S = Fixed - Simple Supports

**Table C-6 Standoff Distances for Expeditionary Structures**

Explosive Weight	LOP	Expeditionary Structure Type			
		TEMPER and GP Tents	Small Shelter System	SEA Hut	Retrofitted SEA Hut
55 lbs (25 kg)	VL	33 ft (10 m)	33 ft (10 m)	75 ft (23 m)	NDA*
	L	46 ft (14 m)	46 ft (14 m)	105 ft (32 m)	45 ft (14m)
	M	67 ft (20 m)	59 ft (18 m)	135 ft (41 m)	65 ft (20 m)
	H	157 ft (48 m)	NDA	190 ft (58 m)	90 ft (27 m)
220 lbs (25 kg)	VL	79 ft (24 m)	79 ft (24 m)	154 ft (47 m)	NDA
	L	115 ft (35 m)	105 ft (32 m)	177 ft (54 m)	94 ft (29 m)
	M	145 ft (44 m)	145 ft (44 m)	256 ft (78 m)	123 ft (38 m)
	H	355 ft (108 m)	NDA	375 ft (114 m)	184 ft (56 m)
550 lbs (250 kg)	VL	NDA	NDA	NDA	NDA
	L	176 ft (54 m)	180 ft (55 m)	269 ft (82 m)	133 ft (41 m)
	M	220 ft (67 m)	249 ft (76 m)	387 ft (117 m)	178 ft (54 m)
	H	540 ft (165 m)	NDA	558 ft (170 m)	275 ft (84 m)
1100 lbs (550 kg)	VL	NDA	NDA	NDA	NDA
	L	243 ft (74 m)	262 ft (80 m)	355 ft (108 m)	174 ft (53 m)
	M	299 ft (91 m)	355 ft (108 m)	515 ft (157 m)	237 ft (72 m)
	H	705 ft (215 m)	NDA	760 ft (232 m)	355 ft (108 m)
4400 lbs (2000 kg)	VL	NDA	NDA	NDA	NDA
	L	447 ft (145 m)	490 ft (149 m)	576 ft (176 m)	288 ft (88 m)
	M	507 ft (155 m)	640 ft (195 m)	820 ft (250 m)	395 ft (120 m)
	H	1216 ft (371 m)	NDA	1285 ft (392 m)	593 ft (181 m)
19,800 lbs	VL	NDA	NDA	NDA	NDA
	L	755 ft (230 m)	924 ft (282 m)	NDA	NDA
	M	870 ft (265 m)	1285 ft (392 m)	1370 ft (418 m)	646 ft (197 m)
	H	2089 ft (637 m)	NDA	NDA	NDA

\* NDA stands for No Data Available

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## APPENDIX D GLOSSARY

<b>D-1</b>	<b>ABBREVIATIONS AND ACRONYMS.</b>
<b>ACHP</b>	Advisory Council on Historic Preservation
<b>ANSI</b>	American National Standards Institute
<b>ARPA</b>	Archaeological Resources Protection Act
<b>ASTM</b>	Not an Abbreviation (Formerly American Society of Testing and Materials, now ASTM International)
<b>AT</b>	Antiterrorism
<b>BIA</b>	Bilateral Infrastructure Agreements
<b>BOMA</b>	Building Owners and Managers Association
<b>C</b>	Tributary width increase factor
<b>CCSD</b>	Conventional Construction Standoff Distance
<b>CFM</b>	Cubic Feet per Minute
<b>cm</b>	Centimeter
<b>CONEX</b>	Container Express
<b>DIN</b>	Deutsches Institut für Normung (German Institute for Standardization)
<b>DBT</b>	Design Basis Threat
<b>DoD</b>	Department of Defense
<b>EIFS</b>	Exterior Insulation and Finish System
<b>ESC</b>	Expandable Shelter Containers
<b>FCU</b>	Fan Coil Unit
<b>FPCON</b>	Force Protection Condition
<b>FSTFS</b>	Frame-Supported Tensioned Fabric Structures
<b>ft.</b>	Feet
<b>GCC</b>	Geographic Combatant Commander
<b>GP</b>	General Purpose

<b>GSA</b>	General Services Administration (U.S.)
<b>HNFA</b>	Host Nation Funded Construction Agreement
<b>HOA</b>	Hand/Off/Auto
<b>HQUSACE</b>	Headquarters, US Army Corps of Engineers
<b>HVAC</b>	Heating, Ventilating, and Air Conditioning
<b>IGU</b>	Insulating Glass Units
<b>in.</b>	Inches
<b>ISC</b>	Interagency Security Committee
<b>JFOB</b>	Joint Forward Operations Base
<b>Kg/m<sup>2</sup></b>	Kilograms per square meter
<b>Kg/m<sup>3</sup></b>	Kilograms per cubic meter
<b>LB</b>	Load Bearing
<b>LOC</b>	Local Operating Console
<b>m</b>	Meters
<b>MILCON</b>	Military Construction
<b>mm</b>	Millimeters
<b>MNS</b>	Mass Notification Systems
<b>MPa</b>	MegaPascals
<b>MSS</b>	Medium Shelter Systems
<b>M<sub>cw</sub></b>	Moment, conventional wall
<b>M<sub>sSE</sub></b>	Moment, Supporting Structural Element
<b>NATO</b>	North Atlantic Treaty Organization
<b>NAVFAC</b>	Naval Facilities Engineering Command
<b>NCR</b>	National Capital Region
<b>NFPA</b>	National Fire Protection Association
<b>NHPA</b>	National Historic Preservation Act

<b>NLB</b>	Non-Load Bearing
<b>OPORD</b>	Operations Orders
<b>OSD</b>	Office of the Secretary of Defense
<b>Pa</b>	Pascals
<b>PCF</b>	Pounds per cubic foot
<b>PDC</b>	Protective Design Center
<b>PSF</b>	Pounds per square foot
<b>PSI</b>	Pounds per square inch
<b>RFP</b>	Request for Proposal
<b>R<sub>M</sub></b>	Minimum Standoff Distance
<b>SHAPE</b>	Supreme Headquarters Allied Powers Europe
<b>SOFA</b>	Status of Forces Agreement
<b>SSS</b>	Small Shelter System
<b>TEMPER</b>	Tent, Extendable, Modular, Personnel
<b>TNT</b>	Trinitrotoluene
<b>UFC</b>	Unified Facilities Criteria
<b>USD (AT&amp;L)</b>	Undersecretary of Defense for Acquisition, Technology, and Logistics
<b>V<sub>CW</sub></b>	Shear, conventional wall
<b>V<sub>SSE</sub></b>	Shear, Supporting Structural Element

## D-2 DEFINITIONS OF TERMS.

**Access control.** For the purposes of these standards, any combination of barriers, gates, electronic security equipment, and/or guards that can limit entry or parking of unauthorized personnel or vehicles.

**Access road.** Any roadway such as a maintenance, delivery, service, emergency, or other special limited use road that is necessary for the operation of a building or structure.

**Analysis.** For the purposes of evaluating compliance with standoff distance and supporting structure requirements of these standards, evaluation of structural components using commonly accepted analysis methodologies such as single degree of freedom or finite element analysis.

**Breezeway.** A covered passage that passes between two buildings or portions of buildings or covered areas underneath or attached to buildings.

**Building.** A structure, usually enclosed by walls and a roof, constructed to provide support or shelter for an intended occupancy. Note that other structures, such as canopies or gazebos, are not considered buildings for the purposes of these standards.

**Building hardening.** Enhanced conventional construction that mitigates threat hazards where standoff distance is limited. Building hardening may also be considered to include the prohibition of certain building materials and construction techniques.

**Building occupancy.** For the purposes of these standards, the planned occupancy of a building or the allowable occupancy calculated in accordance with life safety codes where the occupancy is not known.

**Building overhangs.** Any structural configuration in which the outer walls or columns of the ground floor are set back from the outer walls or column lines of floors above.

**Building separation.** The distance between closest points on the exterior walls of adjacent buildings or structures.

**Clear Zone.** Areas commonly associated with perimeters that are free of all obstacles, topographical features, and vegetation exceeding 8 in. (152 mm) in height that could impede observation or provide cover and concealment of an aggressor.

**Collateral damage.** Injury to personnel or damage to buildings that are not the primary targets of attacks.

**Command vehicles.** Government owned or leased vehicles operated by installation or senior mission commanders, exclusive of privately owned vehicles

**Commercial facilities.** Facilities that are not DoD owned or operated and that support commercial activities other than food service and retail activities such as banks.

**Container structures.** Structures built using shipping containers that are designed to withstand structural loadings associated with shipping, including Container Express (CONEX) and International Organization for Standardization (ISO) containers. Testing has shown that these structures behave similarly to buildings for the purposes of these standards.

**Controlled parking.** For the purposes of these standards, parking that is limited to authorized vehicles that is enforced through physical security measures such as card operated gates, identification or vehicle checks by personnel or similar measures that are acceptable to physical security personnel.

**Controlled perimeter.** For the purposes of these standards, a physical boundary at which vehicle access is controlled with sufficient means to channel vehicles to the access control points. At a minimum, access control at a controlled perimeter requires the demonstrated capability to search for and detect explosives. Where the controlled perimeter includes a shoreline and there is no defined perimeter beyond the shoreline, the boundary for measuring standoff distances will be at the mean high water mark or the elevation associated with top of bank (associated with a flood recurrence interval of 1.2 years).

**Conventional construction.** Building construction that is not specifically designed to resist weapons or explosives effects. Conventional construction is designed only to resist common loadings and environmental effects such as wind, seismic, and snow loads. Note that for the purposes of these standards, conventional construction may still require special windows, structural reinforcement around windows, and progressive collapse resistant construction.

**Conventional construction standoff distance.** The standoff distances at which conventional construction may be used for building components other than doors and windows without a specific analysis of blast effects, except as otherwise required in these standards.

**Change of occupancy.** Change of occupancy level as defined in these standards. It does not relate to conversions of facility category code. Examples include occupancy changing from low occupancy to inhabited.

**Design basis threat.** The threat (aggressors, tactics, and associated weapons, tools or explosives) against which assets within a building must be protected and upon which the security engineering design of the building is based.

**DoD building.** Any building or portion of a building (permanent, temporary, or expeditionary) owned, leased, privatized, or otherwise occupied, managed, or controlled by or for DoD. DoD buildings other than leased buildings are categorized within these standards as low occupancy, inhabited, and high occupancy family housing.

**DoD components.** The Office of the Secretary of Defense (OSD); the Military Departments (including their National Guard and Reserve Components); the Chairman, Joint Chiefs of Staff and Joint Staff; the Combatant Commands; the Office of the

Inspector General of the Department of Defense; the Defense Agencies; the DoD Field Activities; and all other organizational entities within DoD.

**DoD Installation.** A base, camp, post, yard, center, homeport facility for any ship, or other activity under the jurisdiction of the Department of Defense

**DoD personnel.** Any U.S. military, DoD civilian or family member thereof, host-nation employees working for DoD, or contractors occupying DoD buildings. For the purposes of these standards, non-DoD visitors to DoD owned or controlled visitor centers, visitor control centers, museums, and similar facilities will be included in DoD personnel populations of those facilities. Visitor counts will be based on routine visitor levels.

**Door.** A building component for opening or closing an opening in a wall that allows normal access and passage.

**Emergency vehicles.** Vehicles such as fire trucks and ambulances and other vehicles that are critical to emergency response and for which close proximity to inhabited buildings or containment therein is essential.

**Enhanced use lease.** Out leases of non-excess DoD land or facilities to a public or private entities for development under the authority of 10 US Code Section 2667.

**Equivalent level of protection.** Performance of building components that results in building damage or door and glazing hazards similar to that required for the required level of protection as described in Table B-1 or as specified in PDC Technical Report 06-08.

**Expeditionary structures.** Structures that are erected in forward operating locations and that are intended to be occupied only during the period of operations. This group of structures typically includes but is not limited to tents, Small and Medium Shelter Systems, Expandable Shelter Containers (ESC), ISO and CONEX containers, General Purpose (GP) Medium tents and GP Large tents, trailers, and modular and light wood framed structures.

**Fabric covered structures.** A construction type that can be identified by wood or metal (usually aluminum) posts or load-bearing frames with some type of fabric (such as canvas) stretched or pulled over the posts or frames. Examples of the types of structures that should be considered under this classification of structures include Frame-Supported Tensioned Fabric Structures (FSTFS); Tent, Extendable, Modular, Personnel (TEMPER Tents); and Small and Medium Shelter Systems (SSS and MSS); General Purpose (GP) Medium tents and GP Large tents; and air supported fabric structures. Testing has shown that for these fabric structures, the posts and frames are what cause hazards.

**Family housing.** DoD buildings used as quarters for DoD personnel and their dependents. For the purposes of these standards, family housing will be considered to include Morale, Welfare, and Recreation housing (cottages) and temporary family lodging of similar occupancies.

**Fan Coil Unit (FCU).** A device consisting of a heating and / or cooling heat exchanger (coil) and a fan.

**Final denial active vehicle barrier.** Vehicle barriers that can be raised and lowered or otherwise moved to block traffic lanes to stop the motion of threat vehicles. In Entry Control Facilities / Access Control Points they are located at the end of the response zone (see UFC 4-022-01).

**Fisher Houses.** Houses constructed by the Fisher House Foundation at military medical centers for lodging families of military personnel while the military personnel are hospitalized.

**Force Protection Condition (FPCON).** A DoD-approved system that standardizes the Departments' identification and recommended preventive actions and responses to terrorist threats against U.S. personnel and facilities. This system is the principle means for a commander to apply an operational decision on how to protect against terrorism and facilitates inter-Service coordination and support for antiterrorism activities.

**Glazing.** The part of a window, skylight, or door assembly that is transparent or translucent and transmits light, but not air.

**High occupancy family housing.** Family housing with 13 or more units per building.

**Identification check point.** The location in an Entry Control Facility / Access Control Point at which driver identification is checked to control access into controlled perimeters

**Inhabited building.** Buildings or portions of buildings routinely occupied by 11 or more DoD personnel and with a population density of greater than one person per 430 gross square feet (40 gross square meters). This density generally excludes industrial, maintenance, and storage facilities, except for more densely populated portions of those buildings such as administrative areas. The inhabited building designation also applies to expeditionary structures with similar population densities. In a building that meets the criterion of having 11 or more personnel with low occupancy portions that do not have sufficient population densities to qualify as inhabited buildings, those portions that have sufficient population densities will be considered inhabited buildings while the remainder of the building may be considered low occupancy, subject to provisions of these standards. An example would be a hangar, warehouse, or maintenance facility with an administrative area within it. The administrative area would be treated as an inhabited building while the remainder of the facility could be treated as low occupancy. External stairwells and covered or enclosed walkways are not part of the inhabited space of a building. (Note: This definition differs significantly from the definition for inhabited building used by DoD 6055.09-M and is not to be construed as authorization to deviate from criteria of DoD 6055.09-M.)

**Installation:** For the purposes of these standards, the installation is an area or locality subject to the custody, jurisdiction, or administration of the Secretary of a Military

Department or the Secretary of Defense, in the case of an activity in a foreign country, under the operational control of the Secretary of a Military Department or the Secretary of Defense. This term includes but not limited to, military reservations, bases, posts, camps, stations, or arsenals.

**Installation Perimeter:** For the purposes of these standards, the installation perimeter is defined as any demarcation identifying the limit of DoD property and directly or indirectly indicating that unauthorized access is prohibited. The landside perimeter may be established with fences, walls, signage, natural barriers or other means. The waterside perimeter will be at the mean high water mark or the elevation associated with top of bank (associated with a flood) recurrence interval of 1.2 years) or be established with channel markers, buoys, float lines, signage, or boat barriers.

**Laminated glass.** Multiple sheets of glass bonded together by a bonding interlayer.

**Level of protection.** The degree to which an asset (person, equipment, object, etc.) is protected against injury or damage from an attack.

**Low occupancy building.** Any building or portion of a building routinely occupied by fewer than 11 DoD personnel or with a population density of less than one person per 430 gross square feet (40 gross square meters).

**Low occupancy family housing.** Family housing with 12 or fewer units per building.

**Mail room.** A facility operated by or for the Department of Defense for the receipt and delivery of mail for military units or other authorized organizations and agencies by entities outside the DoD. This does not include mail rooms that receive mail distribution that was initially received at a central DoD mail handling facility.

**Mass notification.** Capability to provide real-time information to all building occupants or personnel in the immediate vicinity of a building during emergency situations.

**Military protective construction.** Military facilities designed to resist military conventional and nuclear weapons to the NATO (or equivalent) standards of hardened, protected, semi-hardened, collaterally protected, or splinter protected.

**Minimum standoff distance.** The smallest permissible standoff distance regardless of any analysis results or hardening of the building.

**Mobile ground tactical platforms.** Vehicle mounted tactical ground station for posting, processing, and distributing real-time intelligence, surveillance, and reconnaissance information.

**Operations support vehicles.** Vehicles such as airfield support equipment or material handling equipment whose purpose is direct support to operations and which are operated only within a restricted access area.

**Parking areas.** Designated areas where vehicles may be left unattended, including parking lots, designated parking areas along roadways, and roadways within or accessing parking areas.

**Progressive collapse.** The spread of an initial local failure from building element to building element, eventually resulting in the collapse of an entire structure or a disproportionately large part of it.

**Punched window.** A window installed as a punched opening surrounded by cladding, as opposed to being arranged in vertical or horizontal strips.

**Relocatable building.** Personal property used as a structure designed to be readily moved, erected, disassembled, stored, and reused and whose sum of building disassembly, repackaging, and non-recoverable building components, including typical foundation costs does not exceed 20% of the purchase cost of the relocatable building. Personal property is managed as equipment as opposed to real property.

**Replacement Cost.** The cost to design and construct a facility to current standards and building codes to replace an existing facility at the same location calculated in accordance with UFC 3-701-01.

**Ribbon window.** Windows installed in vertical or horizontal strips with no building wall elements between them but surrounded by cladding around the overall opening perimeter.

**Roadways.** Any surface intended for routine motorized vehicle traffic, including driving lanes of parking areas.

**Routinely occupied.** For the purposes of these standards, an established or predictable pattern of activity within a building that terrorists could recognize and exploit.

**Scaled Range.** A relationship based on cube-root scaling that allows comparisons to be made among blast wave properties created by detonations of different explosive quantities.

**Security engineering.** The process of identifying practical, risk managed short and long-term solutions to reduce and/or mitigate dynamic manmade hazards by integrating multiple factors, including construction, equipment, manpower, and procedures.

**Skylight.** Sloped or horizontal application of a fenestration product that allows for natural day lighting and that may be either fixed (non-operable) or venting (operable).

**Spandrel Glass.** Glass used in non-vision areas of building exteriors

**Specific threat.** Known or postulated aggressor activity focused on targeting a particular asset.

**Standoff distance.** A distance maintained between a building or portion thereof and the potential location for an explosive detonation.

**Structural glazed window systems.** Window systems in which glazing is bonded to both sides of the window frame using an adhesive such as a high-strength, high-performance structural silicone.

**Superstructure.** The supporting elements of a building above the foundation.

**Supporting structural elements.** Structural elements that support windows and that are not in direct contact with the glass, such as walls.

**Temporary buildings.** For the purposes of these standards, those buildings, other than expeditionary structures, that are real property facilities and are designed and constructed with a life expectancy of five years or less.

**Testing.** For the purposes of these standards, experiments performed in accordance with standardized procedures that prove that building components meet the performance required to meet a specific level of protection.

**Town Centers.** Mixed use small scale retail, health, or community services and family housing facilities in the same buildings.

**TNT equivalent weight.** The weight of TNT (trinitrotoluene) that has an equivalent energetic output to that of a different weight of another explosive compound.

**Transitional structures and spaces.** Structures or spaces within buildings that are used to temporarily relocate DoD occupants of buildings while those buildings or other buildings to which they will relocate undergo renovations, modifications, repairs, or restorations or are being constructed. (Also known as swing space.)

**Uncontrolled Public Access.** Spaces within and beneath buildings where there is insufficient positive access control to preclude unauthorized access. For the purposes of these standards, positive access control will be considered to include (but not be limited to) electronic access control on all exterior doors or providing personnel to control visitors.

**Unobstructed space.** Space around inhabited buildings in which there are no opportunities for concealment from observation of explosive devices of no less than a 6 in. (150 mm) cube.

**Window or Skylight Replacement.** The removal of an existing window or skylight assembly and replacement with a new window assembly. For the purposes of this definition a "window assembly" is considered to be the entire system of glazing, framing and anchorage components that fill in and fit within the opening in the wall or roof structure.

## APPENDIX E REFERENCES

### ADVISORY COUNCIL ON HISTORIC PRESERVATION

<http://www.achp.gov/>

36 CFR Part 800, *Protection of Historic Properties*

### ASTM INTERNATIONAL

<http://www.astm.org>

ASTM E1300, *Standard Practice for Determining Load Resistance of Glass in Buildings*

ASTM E1996, *Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes*

ASTM F1642, *Standard Test Method for Glazing and Glazing Systems Subject to Airblast Loadings*

ASTM F2247, *Standard Test Method for Metal Doors Used in Blast Resistant Applications (Equivalent Static Method)*

ASTM F2248, *Standard Practice for Specifying an Equivalent 3-Second Duration Design Loading for Blast Resistant Glazing Fabricated with Laminated Glass*

ASTM F2912, *Standard Specification for Glazing and Glazing Systems Subject to Airblast Loadings*

ASTM F2927, *Standard Test Method for Door Systems Subject to Airblast Loadings*

### DEPARTMENT OF DEFENSE

<http://www.dtic.mil/whs/directives/index.html>

DoD 6055.09-M, *DoD Ammunition and Explosive Safety Standards*

DoD Instruction 2000.12, *DoD Antiterrorism (AT) Program*

DoD Instruction O-2000.16, *DoD Antiterrorism (AT) Program Implementation (Volumes 1 and 2)*

GTA 90-01-011, *Joint Forward Operations Base (JFOB) Survivability and Protective Construction Handbook (For Official Use Only [FOUO])*

The Deputy Secretary of Defense, 7 December 2012, *Memorandum, Subject: Antiterrorism Building Standards for Leased Space*

**DEPARTMENT OF DEFENSE, UNIFIED FACILITIES CRITERIA PROGRAM**

<http://dod.wbdg.org/>

Military Standard (MIL-STD) 3007, *Department Of Defense Standard Practice Standard Practice For Unified Facilities Criteria and Unified Facilities Guide Specifications*

UFC 1-200-01, *DoD Building Code (General Building Requirements)*

UFC 4-020-01, *DoD Security Engineering Facilities Planning Manual*

UFC 4-020-02FA, *DoD Security Engineering Facilities Design Manual*

UFC 4-021-01, *Design and O&M: Mass Notification Systems*

UFC 4-022-01, *Security Engineering: Entry Control Facilities/Access Control Points*

UFC 4-023-03, *Design of Buildings to Resist Progressive Collapse*

UFC 4-023-07, *Design to Resist Direct Fire Weapons Effects*

UFC 3-701-01, *DoD Facilities Pricing Guide for FY2011, March 2011, with Change 1*

UFC 3-301-01, *Structural Engineering*

**DEPARTMENT OF HOMELAND SECURITY**

<http://www.dhs.gov/interagency-security-committee>

*Interagency Security Committee Standards*

**FEDERAL HIGHWAY ADMINISTRATION**

<http://mutcd.fhwa.dot.gov/>

*Manual on Uniform Traffic Control Devices*

**NATIONAL FIRE PROTECTION ASSOCIATION**

<http://www.nfpa.org>

NFPA 30, *Flammable and Combustible Liquids Code*

**SUPREME HEADQUARTERS ALLIED POWERS EUROPE**

SHAPE Document 6160/SHLOFA-059/82, *NATO Approved Criteria and Standards for Tactical and Transport Airfields (6th Addition) (NATO Restricted)*

**UNITED STATES ARMY**

<https://pdc.usace.army.mil>

PDC Technical Report 06-08, *Single Degree of Freedom Structural Response Limits for Antiterrorism Design*

PDC Technical Report 10-01, *Conventional Construction Standoff Distances for the Low and Very Low Levels of Protection*

PDC Technical Report 10-02, *Blast Resistant Design Methodologies for Window Systems Designed Statically and Dynamically*

PDC Technical Report 15-01, *Minimum Standoff Distances for Non-Load-Bearing Steel Stud In-Fill Walls*

**UNITED STATES AIR FORCE**

After Initiative Report, Retrofit and Overpressure Design of Shelters (RODS)

**I. Military Guide and References Materials**

- E Army National Guard DG 415-5 – General Facilities Guide (01 June 2011)

**ARMY NATIONAL GUARD  
DG 415-5  
GENERAL FACILITIES INFORMATION  
DESIGN GUIDE**



**NATIONAL GUARD BUREAU  
INSTALLATIONS DIVISION  
111 SOUTH GEORGE MASON DRIVE  
ARLINGTON, VA 22204-1382**

## FOREWORD

This General Facilities Information Design Guide (DG 415-5) was published by the National Guard Bureau, Army Installations Division (ARNG-ILI). DG 415-5 applies to all projects for new construction (including additions) as well as alterations to and rehabilitation and conversion of existing facilities. It is intended to assist the States, Possessions, design agencies, and design architect-engineer in gaining an understanding of the general functions and environmental considerations to address in the design and construction documents for the Army National Guard (ARNG) facilities that qualify for support from Federal funds. This design guide does not contain criteria but refers readers to sources of criteria in other publications that relate directly to the specific technical design requirements.

DG 415-5 contains functional and technical information common to all ARNG facilities. It should be used in conjunction with the design guide developed for the specific facility type to assist in the design process.

Distribution is limited. However, authorized users of the NGB Guard Knowledge Online (GKO), can obtain an electronic copy at ([gkoportal.ngb.army.mil/sites/ARI\\_HQ/default.aspx](http://gkoportal.ngb.army.mil/sites/ARI_HQ/default.aspx)), Design, Guide Library site. All users are encouraged to submit comments and suggestions to improve this document by completing a DA Form 2028, "Recommended Changes to Publications and Blank Forms," and sending it directly to:

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## CHAPTER 1

### GENERAL INFORMATION

#### 1-1 PURPOSE: PERFORMANCE DESIGN GUIDELINES

This General Facilities Information Design Guide (DG 415-5), along with the facility-type design guides (DGs 415-1 Readiness Centers, 415-2 Logistics Facilities, 415-3 Aviation Facilities and 415-4 Training Site Facilities), sets forth functional and technical design and planning guidance to use in the development of military construction (MILCON) projects.

##### 1-1.1 Audience

These design guides are written for the design architect-engineer (A-E) who will be preparing design and construction documents as well as for construction and facilities management officers (CFMOs) and other Army National Guard (ARNG) personnel who will be planning, reviewing, and approving the facility design. It is the intent of the National Guard Bureau, Army Installations Division (ARNG-ILI) to encourage the design A-E to design high-quality, user-friendly, functional, energy-efficient, and sustainable facilities using the latest engineering and construction industry standards.

To aid the reader, DG 415-5 includes the following:

- Appendix A, References, contains a detailed list of reference documents.
- Appendix B, Glossary, defines all abbreviations and acronyms used in this design guide as well as specialized terms that are used in this design guide.

##### 1-1.2 Master Plan Compliance

Before project initiation, the CFMO should provide the design A-E with an approved working or preliminary master plan for the proposed facility site. The State Military Department should provide special instructions for any deviations from the master plan. The design A-E should consider sustainable material types and construction industry standards indicated in these design guidelines to establish the minimum project quality.

#### 1-2 ROLE OF THE FEDERAL GOVERNMENT

Title 10 of the United States Code (U.S.C.) authorizes contributions of Federal funds to the States and possessions to provide facilities for the training and administration of Reserve components of the Armed Forces. NG PAM 415-12 establishes facilities allowances, and these design guides provide the design and construction performance recommendations governing such contributions from Federal funds that the NGB Chief administers. Each such contribution is subject to the terms of a Military Construction Cooperative Agreement executed specifically for providing designated facilities. These

agreements are executed under authority granted in Title 10, United States Code, Chapter 1803, which states that all work “shall be done according to the laws of that jurisdiction and under the supervision of its officials, subject to inspection and approval of the Secretary of Defense.” The United States Property and Fiscal Officers (USPFO) are responsible for disbursement of Federal funds contributed toward the construction of State ARNG facilities projects.

### **1-3 NATIONAL GUARD BUREAU POLICY**

ARNG-ILI has specific policy regarding the types of buildings and installed equipment eligible for Federal support in ARNG facilities, as outlined in the following paragraphs.

#### **1-3.1 Technical Instructions Criteria**

Where specified guidelines are not set forth herein or in the program documents, design criteria in NGR 415-10, NG PAM 415-12, Unified Facilities Guide Specifications and MIL-STD 3007F apply for all MILCON projects.

#### **1-3.2 Construction and Equipment Materials Criteria**

The materials and equipment allowances are to be considered the maximum allowable using Federal contributions toward construction costs. Use of the full maximum allowances is permissible rather than mandatory because local conditions may justify the actual facility constructed.

A project's DD Form 1390/91 documents the approved scope and Federal share for each component of the project, and the CFMO may not design or construct beyond this level without receiving ARNG-ILI approval or an amended funding document.

#### **1-3.3 Federal Support**

In order for an ARNG facilities project to qualify for Federal support, the materials and equipment incorporated, built-in, or installed shall be submitted and approved by ARNG-ILI at or prior to Final Design (95%).

#### **1-3.4 Non-Federal Funds**

These design guides do not preclude the use of non-Federal funds to provide materials, equipment, or features of higher quality than suggested, provided that the Federal share of the operating and maintenance cost does not increase. The cost of such improvements, however, must be clearly determinable as separate bid items or specified as a contractor's option. If the amount of higher-quality features, equipment, materials, and space not Federally supportable is unusually large and makes separate bidding impractical, the State and the Federal Government must negotiate an agreement to establish the limitations of the Federal share of the overall project construction costs. This is usually expressed as a percentage of the total construction cost.

### **1-3.5 Equipment Not in Contract**

Portable furniture and equipment may not be supported by Federal construction funds. Examples are desks, chairs, tables, stools, map cases, unattached shelving, fire extinguishers, coats of arms, State seals, memorial plaques, entrance door mats, and waste receptacles.

### **1-3.6 Performance Focus**

ARNG-ILI encourages the use of contractor's options and performance-type specifications as a means of ensuring procurement of the most economical system or component. The materials and methods of construction proposed for use on a given facility must have been used on a sufficient number of State facilities to establish a documented record of performance.

For functional area flexibility, the design A-E may increase or decrease individual functional areas by exchanging a percentage of the area between functions as per NG PAM 415-12, Chapter 1-7. However the total net functional area may not exceed that authorized for the facility unless it is funded with other than Federal funds.

### **1-3.7 Accessibility**

All ARNG facilities shall be designed and constructed in accordance with Public Law 90-480, the Architectural Barriers Act (ABA) of 1968, as amended. The document that sets standards as a result of this law is the Uniform Federal Accessibility Standards (UFAS). These standards primarily address projects in the Federal sector or projects built and leased with Federal funds. Currently, UFAS applies to all ARNG projects.

After the Americans with Disabilities Act (ADA) of 1990 were enacted, the U.S. Access Board under the Department of Justice has regularly updated the ADA Accessibility Guidelines (ADAAG). These guidelines address projects in the private sector (places of commercial accommodation and commercial facilities) and the public sector (State and local government facilities). Currently, ADAAG applies to all ARNG projects.

New guidelines, which combine UFAS and ADAAG into one unified standard, were published in the *Federal Register* in July 2004 and became effective on September 21, 2004. This unified standard, the Americans with Disabilities Act and Architectural Barriers Act Accessibility Guidelines, was created under 36 CFR, Parts 1190 and 1191. This rule contains a separate scoping document for ADA facilities, a scoping document for ABA facilities, and a joint technical section referenced by each scoping section. Refer to the summary of the new guidelines in the July 23, 2004, *Federal Register*, which contains a detailed description and background information. The latest version of this standard is 2010 ADA Standard for Accessible Design (by the Department of Justice). ARNG intends to apply this standard in lieu of the separate ADAAG and UFAS.

As noted in the preamble to the UFAS, the basis for the first accessibility standards adopted by the Federal government and most State governments was ANSI 117.1, Accessible and Usable Buildings and Facilities. This code has been recognized by the private sector and the Council of American Building Officials, and is the accessibility code referenced in the International Building Code (IBC). Because ARNG projects follow a statewide building code in many instances, this code may apply when referenced by the adopted model statewide building code. The design A-E is directed to compare the accessibility codes and use the more stringent one. The new, unified Americans with Disabilities Act and Architectural Barriers Act Accessibility Guidelines may reduce the potential for conflicts with other regulations developed by State agencies.

### **1-3.8 Hazardous Materials Abatement**

The design A-E will need to comply with all U.S. Environmental Protection Agency (EPA) reference documents. The design A-E shall also consult with the CFMO to determine any special State and local requirements.

#### **1-3.8.1 Asbestos Removal**

Before facility buildings are programmed or planned for alteration, rehabilitation, and addition, a survey should be undertaken to establish the amount, location, and estimated cost of asbestos removal. A letter should be sent from the CFMO to ARNG-ILI to indicate that there is an asbestos problem and that authorization to do an asbestos survey and design for removal is urgently needed because asbestos has to be removed prior to any construction.

The cost of asbestos removal should be included as an item in the program and funding documents. The cost of the survey and asbestos removal is 100 percent supportable by Federal funds for all functional areas authorized in the Federal project requirements.

If only a portion of an existing building requires alteration or rehabilitation, all the asbestos in the building must be removed before beginning the alteration or rehabilitation phase of the project. If emergency repairs (such as re-insulating a boiler) are needed after asbestos removal, the asbestos removal portion of the project should include the repair cost.

### **1-3.9 Value Engineering Studies and Life Cycle Cost Analysis**

The State is encouraged to acquire the services of a Certified Value Specialist (CVS) to lead the value engineering study (VES) to ensure that design solutions are cost effective. The VES also serves as a means of identifying opportunities for substitutions during the design process, should the project exceed budget requirements, while still maintaining the level of quality performance expected.

The VES should be accomplished early in project development once the design concept and the building systems have been initially defined. Each item in the VES should be clearly defined by narrative and drawing, and the cost savings should be

shown with related calculations. The specific, formally documented VES recommendations should be incorporated in the Preliminary (35-50%) Design milestone design review submission to NGB-ARI. Before proceeding with project development beyond the Preliminary milestone, all VES decisions should be made regarding which recommendations to implement immediately and which to consider contingent items to incorporate if costs continue to exceed budget. The VES should be a 3-day limited workshop since the site has been selected by the State prior to the design phase. The VES Workshop should adhere to the 5-step methodology and approach prescribed by the Society of American Value Engineers (SAVE) International.

An integral part of the VES process is life cycle cost analysis (LCCA), which is a systematic means of evaluating the entire building initial, energy, operation and maintenance cost over an extended period of time. A formal LCCA should be used to compare system alternatives. This process requires caution because the recommended system may increase the facility initial cost above the approved programmed funding amount.

### **1-3.10 Signage and Graphic Standards**

All signage and graphics at a facility should comply with requirements of the State Military Department; General Services design standards or industry standards. If the proposed facility is located on a U. S. Armed Forces military installation, local signage standards should be followed.

### **1-3.11 Project Scheduling Requirements**

*(ARNG ILI will provide form)*

### **1-3.12 Warranty Requirements**

ARNG-ILI requires that products and systems have warranty provisions according to industry standards. The following list identifies the majority of these elements under the Unified Facilities Guide Specification (UFGS)/CSI 2004 MasterFormat that may occur in ARNG facilities.

#### **DIVISION 02 – EXTERIOR IMPROVEMENT**

- Water Distribution System
- Packaged Sewage Pumping Station
- Irrigation Systems
- Seeding, Sodding, Plants, and Planting

#### **DIVISION 03 – CONCRETE**

- Concrete Surface Sealer
- Glass Fiber-Reinforced Concrete

DIVISION 04 – MASONRY

Brick Masonry

DIVISION 05 – METALS

Shop Applied Metal Finishes

DIVISION 06 – WOOD, PLASTICS AND COMPOSITES

Laminated Wood Construction

Polymer Surfacing Materials

DIVISION 07 – THERMAL AND MOISTURE PROTECTION

Waterproofing

Water Repellent Coatings

Cementitious Damp proofing

Exterior Insulation Finish System

Fireproofing

Roofing

Metal Siding and Wall Panels

Fluid Applied Deck Coatings

Flashing and Sheet Metal

Roof Hatches

Joint Sealants

DIVISION 08 – OPENINGS

Steel Doors and Frames

Wood Doors

Glass Door Assemblies

Aluminum Storefront and Windows

Wood Windows

Skylight Systems

Finish Door Hardware

Glass and Glazing

Curtain Wall Systems

DIVISION 09 – FINISHES

Exterior Stud wall System

- Ceramic and Quarry Tile
- Terrazzo
- Acoustical and Other Specialty Plaster Finishes
- Wood Flooring
- Resilient Flooring
- Carpet and Carpet Tile
- Fluid-Applied Seamless Flooring
- Wall Coverings
- DIVISION 10 – SPECIALTIES**
  - Markerboards and Tackboards
  - Toilet Partitions
  - Access Flooring Systems
  - Demountable Partitions
  - Toilet and Bath Accessories
- DIVISION 11 – EQUIPMENT**
  - Window Washing System Equipment
  - Dock Levelers and Lifts
  - Food Service Equipment
  - Detention Equipment
  - Shooting Range Equipment
- DIVISION 12 – FURNISHINGS**
  - Architectural Casework
  - Window Shades
  - Entrance Mats
- DIVISION 13 – SPECIAL CONSTRUCTION**
  - Prefabricated Wall and Partition Systems
  - Prefabricated Radio Frequency Shielding Enclosure
  - Pre-Engineered Buildings
- DIVISION 14 – CONVEYING SYSTEMS**
  - Elevators

DIVISION 21 – FIRE SUPPRESSION SYSTEMS

DIVISION 22 – PLUMBING

Plumbing Fixtures and Pumps

Gas and Vacuum Systems

Fuel Oil Systems

DIVISION 23 – HEATING, VENTILATING & AIR CONDITIONING

Chillers

Cooling Towers

Steam Generators

Unit Heaters

Packaged Air-Handling Units

Exhaust Fans

Fiberglass Reinforced Plastic Ductwork

DIVISION 25 – INTEGRATED AUTOMATION

Energy Management and Control System

Utility Monitoring and Control System

DIVISION 26 – ELECTRICAL

Wiring Devices

Lighting Fixtures

Uninterruptible Power Supply Systems

Standby Power Generator Systems

Battery Powered Systems

DIVISION 27 – COMMUNICATIONS

Administrative Telephone Equipment

DIVISION 28 – ELECTRONIC SAFETY AND SECURITY

Electronic Security System

Closed Circuit Television Systems

Fire Alarm and Detection System

Mass Notification System

### 1-3.13 Performance Specifications

The Unified Facilities Guide Specifications (UFGS) with technical notes is available to the A-E design team via the Whole Building Design Guide website at ([www.wbdg.org/ccb/browse\\_org](http://www.wbdg.org/ccb/browse_org)). However, the A-E is encouraged to suggest areas where a creative solution could be better managed through a performance-based specification for that particular element. Given the dual role of many ARNG facilities, the need for flexibility could become a driver for a creative solution using this method. Such a method could be considered in the following situations:

- Where the desired systems have not evolved to standardized configurations or solutions from manufacturer to manufacturer, or where no alternatives are similar enough that a prescriptive method could be used without inadvertently excluding all other variations of the system desired. Examples are a new integrated system for automated vehicle wash racks, a specialized type of paint removal system, or even a large-scale paint spray system or other industrial-based process.
- Where it is desirable, because of complexity or for other reasons, to delegate the responsibility for designing and integrating a particular system to an industry specialist. An example of this is crane systems.

Careful coordination is required to define the performance-based requirements, criteria, and tests for a particular attribute or system.

The design standards for finishes in ARNG facilities favor a more flexible set of recommendations and parameters for finish performance. The design A-E should continue this flexible approach in the design process, working from a palette of finishes that meet these requirements and criteria. This flexible approach may be extended to the specifications process for finishes, where the requirements and criteria can be well defined.

### 1-3.14 Operation and Maintenance Design Priorities

Important aspects of the design of all Army National Guard facilities are the selection of maintainable finishes and the provision of access or placement of building equipment and other fixed elements. The following are ways to address concerns in the design process:

- Select finishes based on the durability requirements related to the use of the space.
- Specify slip-resistant floor materials and finishes where water can be tracked in.
- Position heating, ventilation, and air conditioning (HVAC) and other mechanical and electrical components that are located above the ceiling and require servicing within easy reach from below to avoid the need for a service lift and major ceiling disassembly.

- Allocate adequate clearances for the servicing and replacement of large pieces of building mechanical and electrical equipment.
- Provide for ready access to wells and containment systems for inspection.
- Consider the use of a low-power traction elevator system that is competitive in cost with hydraulic units, and consider a machine room that can fit inside the hoistway.
- The designer should specify Total Building Commissioning when programmed in the DD Form 1390/91 funding document at 1% primary building cost.

### **1-3.15 Applicable Codes and Standards**

The references list in Appendix A pertains to national standards, the International Building Code (IBC) will be considered as the minimum acceptable standard for ARNG Design Guides. The CFMO should provide in writing for the design A-E all categories of State regulations that exceed national standards.

### **1-3.16 Fire Protection**

Fire protection guidelines are as follow:

- Incorporate efficient and cost-effective fire protection and detection systems in all ARNG facility designs.
- Comply with the requirements for all building space types presented in the International Building Code and National Fire Protection Association (NFPA) standards and with criteria presented in UFC 3-600-01 Fire Protection Engineering for Facilities. Also address State and local requirements that are more stringent than these sources.
- Ensure that the municipal water supply pressure and capacity or independent means (including storage tanks) comply with the water source requirements of the fire suppression systems.
- Provide adequate water source, sprinkler, emergency generator, and alarms systems capacity to accommodate limited building expansion on site.
- Include the means of egress, with all related calculations. Maintain the proper dimensions of all means of egress during detailed design.
- Identify all rated separations, and ensure that all building systems components at these separations support the rating.
- Coordinate smoke evacuation systems with the HVAC design.
- Adequately isolate and vent areas with highly combustible products, including the petroleum, oils, and lubricants (POL) storage.

- Ensure that the antiterrorism/force protection (AT/FP) standoff barrier components include access for fire-fighting apparatus.
- Telecommunication/Information Technology spaces must comply with the above codes for a primary system, a secondary Halon alternative clean agent fire extinguishing system maybe used.

### **1-3.17 Occupational Health and Safety**

#### **1-3.17.1 General Information**

The U.S. Department of Labor, Occupational Safety & Health Administration (OSHA) Standards for General Industry in 29 CFR Part 1910 and DA PAM 40-503, Industrial Hygiene Program, requires that ARNG provide a safe and healthy workplace for its employees. All Readiness Centers with Indoor Firing Ranges, Logistics and Aviation Maintenance facilities must have an Industrial Hygiene / Chief Surgeon's Office (ARNG-CSG-P) technical review prior to construction. Personal protective equipment (PPE) and administrative procedures are only interim measures for controlling occupational hazards. The following paragraphs address other measures.

#### **1-3.17.2 Noise and Vibration Reduction**

Noise-induced hearing loss is one of the most common occupational hazards. Currently, ARNG uses PPE as the main means of preventing hearing loss; however, engineering controls would be more effective. Mechanical equipment rooms contribute most of the high noise and vibration levels in buildings. The design A-E should take great care when locating these spaces to avoid adjacencies with incompatible noise tolerances. Mechanical equipment mounted rigidly to the supporting structure produces excessive vibration levels. The design A-E shall select vibration isolation methods to eliminate these problems. For equipment applications the designer should reference ASHRAE Handbook of Fundamentals.

#### **1-3.17.3 Indoor Air Quality**

The design of the building HVAC and exhaust systems must include indoor air quality features to ensure a safe environment. The design A-E should follow American National Standards Institute/American Society of Heating, Refrigerating and Air-Conditioning Engineers (ANSI/ASHRAE) Standard 62.1-2007, which recommends the minimum outdoor air rates for buildings, and the American Conference of Governmental Industrial Hygienists (ACGIH) Industrial Ventilation Manual for recommended practices related to specific exhaust and ventilation systems design.

A combination ventilation and exhaust system needs to be designed for the specific occupancy and process within each area to meet the indoor air quality standards. The design A-E should establish temperature, humidity, and ventilation criteria for each space and should design special exhaust hoods where necessary. Although specific humidity criteria may not be published for many areas, all conditioned spaces should be designed to maintain not higher than 50 percent relative humidity (RH).

Consideration must be given to air quality in storage rooms and similar spaces. Although these areas are not normally occupied, they may require ventilation, temperature, and/or humidity control to prevent damage to stored material and provide an acceptable environment for personnel using the room.

Air-handling unit (AHU) design should minimize mold and mildew growth inside the units. AHUs should have a filter bank (pre-filters @ 30% and final filter @ 85% efficient) base on *ASHRAE Standard 52.1-1992 Atmospheric Dust-Spot Efficiency* rating to prevent dust collection on coils, and drain pans should be properly sloped and provided with condensate traps to eliminate standing water in the units. AHUs should not be operated during construction without proper filters in place, and all filters should be replaced at turnover to the ARNG.

#### **1-3.17.4 Location of Air Exhaust and Intake**

Exhaust air discharges and vents must be located at a proper distance from intakes to prevent cross-contamination and must be in a location which does not expose people or other buildings to hazardous discharge. Outside air intakes must also be located to minimize induction of vehicle exhaust and other site contaminants; in addition, they must be located and protected as prescribed by antiterrorism requirements. The design A-E should follow the recommended guidelines of ACGIH and local building codes.

#### **1-3.18 Energy Efficiency**

It is important to emphasize building envelope, mechanical and electrical systems efficiency as referenced in *UFC 3-400-01, Design: Energy Conservation*. An LCCA is to be performed to evaluate at least two proposed mechanical systems. The Energy Policy Act of 2005 (EPAAct-05) amended in 2007 published guidelines to design/construct buildings 30% more efficient than ANSI/ASHRAE/IESNA Standard 90.1-2007, if life cycle cost effective. The building envelope, mechanical and electrical systems must be designed in accordance with ANSI/ASHRAE/IESNA 90.1-2007 or the State energy codes. The use of air-side or water-side heat recovery systems should be considered where they can be applied effectively.

ARNG buildings are frequently occupied on irregular schedules, with many areas used only on weekends and/or at night. Therefore, the mechanical systems should be zoned so that heating, cooling, and ventilation can be reduced in portions of the building when they are unoccupied.

#### **1-3.19 HVAC System Quality**

When selecting mechanical equipment and designing systems, the A-E should strive for a system that will provide low maintenance and long life while providing a quality indoor environment. The use of rooftop packaged AHUs should be minimized because of their relatively short life and the inconvenience of servicing them. Double-wall AHUs are generally more robust and more easily maintained. Stainless steel condensate drip pans and cooling coil casings extend the life of an AHU and provide a cleaner surface,

which reduces growth of mold and mildew. The designer should use ASHRAE Handbooks of Fundamentals, HVAC Applications and HVAC Systems and Equipment as guidance.

On larger installations, hydronic cooling utilizing a central chiller plant should be investigated in lieu of packaged direct expansion (DX) cooling, which typically is more maintenance intensive. The design A-E should avoid using steam for heat distribution as the boiler and piping system are more difficult to maintain than hot water. Direct-fired warm air furnaces and unit heaters typically require more maintenance and have a shorter life than hydronic systems; they should be used only in small installations where a central system is not practical.

### **1-3.20 Geotechnical Investigation**

Site selection and Federal support shall conform to NGR 415-5, Chapter 4. Based on a visual observation of the site and knowledge of the local area, an appropriate number of soil borings should be made to determine the nature and consistency of subsurface soil conditions. Additional borings are warranted if the results are inconclusive or insufficient for the foundation and pavement design. The Site Survey Report, to be prepared in accordance with NGR 415-5, must include the results of the investigation of the selected site. The CFMO and NGB-ARI use the completed Soil Bearing Capacity Declaration (NG PAM 415-5, Appendix G) to gauge the adequacy of the site and thus determine whether to grant Federal funds for construction of the facility at that particular location. This declaration should include the actual allowable design soil bearing capacity.

### **1-3.21 Bid Format Information**

Two types of formats may be used for bidding:

**All Bid Formats are located in NG PAM 415-5, Appendix L.**

Separate bids must also be obtained for the Intrusion Detection Systems and Interior Intrusion Detection System equipment-in-place, maintenance repair, and other support items to identify the funding support when provided from different accounts or to identify varying proportions of Federal/State cost sharing. Although the bids may be lump sum for each item, the quantity and unit of measure for each should be included, where practical, showing the magnitude of work required.

The bids of all authorized items (including site preparation and the IDS) are to be totaled before listing additive and/or alternative items that are to be supported with other than Federal funds. A written description of each bid is also to be provided to define the scope of work associated with the bid amount.

In addition, unit price bids should be obtained for the various types of work that may have to be increased or decreased during the period of construction, or when the unit cost of work must be utilized to determine the cost of work in excess of authorized amounts (such as excess foundation walls, exterior walls, and interior partitions).

### 1-3.22 Commissioning Buildings and Systems

Total building (enhanced) commissioning is recommended for all ARNG MILCON projects for new construction and major renovation. Fundamental Commissioning of Building Energy Systems is a prerequisite for LEED-NC and Enhanced Commissioning is a one (1) point credit.

*The total cost allowed for this activity will be 1% of the Primary Facility Cost. A line item cost of 0.6% for the construction phase will be indicated on the DD Form 1390/91 Funding Document. The design phase allowance of 0.4% will be funded with P&D funds. This cost allowance includes the services of an Independent Commissioning Agent. The CFMO should provide the design Architect-Engineer and the Commissioning Agent a copy of the ARNG COMMISSIONING RFP/SOW prior to design startup.*

Commissioning Defined:

- The National Conference on Building Commissioning has established an official definition of Total Building Commissioning as “The systematic process of assuring by verification and documentation, from the design phase to a minimum of one after construction, that all facility systems perform interactively in accordance with the design documentation and intent and in accordance with the owner’s operational needs, including preparation of operation personnel”.

Commissioning with respect to the U. S. Green Building Council Leadership in Energy and Environmental Design for New Construction and Major Renovations (LEED-NC), Energy & Atmosphere;

- EA Prerequisite 1: Fundamental Commissioning of the Building Energy Systems are required for all ARNG MILCON projects. The intent is to verify that the building’s energy related systems (Mechanical/HVAC/Electrical) are installed, calibrated and perform according to the owner’s project requirements, basis of design and construction documents.
- EA Credit 3: Enhanced Commissioning, this commissioning process begins early during the design process and execute additional activities after systems performance verification is completed.

## CHAPTER 2

### ANTITERRORISM/FORCE PROTECTION

#### 2-1 GENERAL INFORMATION

Any building or portions of buildings routinely occupied by 11 or more DoD personnel with a population density greater than one person per 430 ft<sup>2</sup> requires the minimum antiterrorism/force protection measures. Compliance with the U.S. Department of Defense (DoD) Minimum Antiterrorist Standards for Buildings (UFC 4-010-01) is not an option. However, the individual State's AT/FP officer's recommendations to the adjutant general determine the level of protection required (the degree to which assets are protected against injury or damage from an attack) at the specific site.

These standards may be supplemented where specific terrorist threats are identified, where more stringent local standards apply, or where local commanders dictate additional measures. The individual State Antiterrorism/Force Protection Officer recommendations to the Adjutant General assist in determining the level of protection required (the degree to which assets are protected against injury or damage from an attack) at the specific site. At a minimum, the level of protection identified in UFC 4-010-01 for Inhabited Buildings, Primary Gathering Facilities, Billeting, and High Occupancy Family Housing will be incorporated into the design.

During the design process, the design A-E shall conduct all protection analysis as described in DA PAM 190-51, DOD Security Engineering Publications UFC 4-020-01FA, UFC 4-020-02FA, UF 4-020-03FA and UF 4-020-04FA. For some protective strategies, the design process may include identification of multiple scenarios or alternatives for achieving the required level of protection. All alternatives should undergo a suitability analysis, which takes into account factors that may limit the feasibility of the concepts. Potential future expansion of the new facilities should be considered in the analysis. Factors limiting effective AT/FP strategies may consist of physical, resource, and political constraints such as land area restrictions.

#### 2-2 DESIGN PHILOSOPHY

The security engineering requirements identified in UFC 4-010-01 Minimum Antiterrorism Standards for Buildings, UFC 4-010-02 Minimum Standoff Distances for Buildings (FOUO), and UFC 4-023-03 Progressive Collapse provide the framework for incorporating major design strategies (Civil, Structural, Architectural, Mechanical, and Electrical) that are the most effective and economical in protecting DoD personnel from terrorist attacks.

**Baseline Threat:** The location, size, and nature of terrorist threats are unpredictable. The standards identified in UFC 4-010-01 are based on a specific range of assumed threats that provide a reasonable baseline for the design of all inhabited DoD buildings. Designing to resist baseline threats will provide general protection today and will establish a foundation upon which to build additional measures where justified by higher threats or where the threat environment increases in the future. While those baseline threats are less than some of the terrorist attacks that have been directed against U.S. personnel in the past, they represent more severe threats than a significant majority of historical attacks. It would be cost prohibitive to provide protection against the worst-case scenario in every building. The terrorist threats addressed in the UFC 4-010-01 standards are further assumed to be directed against DoD personnel. Threats to other assets and critical infrastructure are beyond the scope of the DoD required Minimum Antiterrorism Standards, but they are addressed in UFC 4-020-01

**Level of Protection:** The standards in UFC 4-010-01 afford a Low level of protection for billeting, high occupancy family housing, and primary gathering buildings and a Very Low level of protection for other inhabited buildings. Greater protection is provided for primary gathering buildings, billeting, and high occupancy family housing because of the higher concentration of personnel and the more attractive nature of the target.

**2-2.1 Standoff Zone:** The primary design strategy is to keep aggressors as far away from inhabited DoD buildings as possible. The easiest and least costly opportunity for achieving the appropriate levels of protection against terrorist threats is to incorporate sufficient standoff distance into project designs. While sufficient real estate is not always available to provide the standoff distances required for conventional construction, maximizing the available standoff distance always results in the most cost-effective solution. Maximizing standoff distance also ensures that there is opportunity in the future to upgrade buildings to meet increased threats or to accommodate higher levels of protection.

**2-2.2 Building Structural Design.** Provisions relating to preventing building collapse and building component failure are essential to effectively protecting building occupants. Those provisions apply regardless of standoff distance or the ability of a building to resist blast effects. Designing those provisions into buildings during new construction or retrofitting during major renovations, repairs, restorations, or modifications of existing buildings is the most cost effective time to do that. In addition, structural systems that provide greater continuity and redundancy among structural components will help limit collapse in the event of severe structural damage from unpredictable terrorist acts.

**2-2.3 Hazardous Flying Debris.** In past explosive events where there was no building collapse, a high number of injuries resulted from flying glass fragments and debris from walls, ceilings, and fixtures (non-structural features). Flying debris can be minimized through building design and avoidance of certain building materials and construction techniques. The glass used in most windows breaks at very low blast pressures,

resulting in hazardous, dagger-like shards. Minimizing those hazards through reduction in window numbers and sizes and through enhanced window construction has a major effect on limiting mass casualties. Window and door designs must treat glazing, frames, connections, and the structural components to which they are attached as an integrated system. Hazardous fragments may also include secondary debris such as those from barriers and site furnishings.

**2-2.4 Building Layout.** Effective design of building layout and orientation can significantly reduce opportunities for terrorists to target building occupants or injure large numbers of people..

**2-2.5 Airborne Contamination.** Effective design of heating, ventilation, and air conditioning (HVAC) systems can significantly reduce the potential for chemical, biological, and radiological agents being distributed throughout buildings.

**2-2.6 Mass Notification.** Providing a timely means to notify building occupants of threats and what should be done in response to those threats reduces the risk of mass casualties. Refer to UFC 4-021-01 Mass Notification Systems.

**2-2.7 Future Upgrades.** Many of the provisions of these standards facilitate opportunities to upgrade building protective measures in the future if the threat environment changes.

## **2-3 DESIGN ELEMENTS**

**2-3.1 Standoff Distances.** The primary impact on project scope for sitework will be the establishment and maintenance of standoff distance. That standoff will have to be provided to any location that is accessible to vehicles. For the stationary vehicle bomb tactic those locations may be limited to those that have legitimate vehicle access such as parking areas and roadways. The key to understanding the planning implications of the standoff distance is in knowing the type of vehicle and the explosive weight associated with the threat and determining where access of those vehicles will be controlled. The approach, therefore, is to establish a standoff distance based on the largest applicable explosive weight based on the applicable threat severity level and require access procedures for entry past that perimeter to be applied to all vehicles at that standoff distance.

The conventional construction standoff distances identified in UFC 4-010-01 Tables B-1 and D-1 were developed by the U.S. Army Corps of Engineers to provide survivable structures for a wide range of conventionally constructed buildings and expeditionary/temporary structures. These buildings range from tents and wood framed buildings to reinforced concrete buildings. The pressures resulting from explosive blasts can be very high, but they decrease rapidly with distance. That suggests that where land is available the least expensive way to provide protection against explosives is to maximize the standoff distance. The general design strategy, therefore, is to provide as

much standoff distance between protected facilities and potential locations for vehicles, such as parking areas, roadways, and other locations that could be accessible by vehicles.

### **2-3.2 Facility Arrangement**

When possible, facilities that are functionally compatible and have similar threat levels should be clustered. This reduces the required perimeter area to be protected, limits access points to serve multiple facilities, and promotes compact security areas. However, the practical benefits of clustering facilities must be balanced against the survivability benefits of resource dispersal in the event of an attack. The arrangement of buildings into complexes that have strongly delineated boundaries and are oriented to enhance the surveillance opportunities creates a “defensible space” that can be protected more efficiently than scattered buildings.

### **2-3.3 Vehicular Access and Circulation**

Limiting the opportunities for aggressors to get close to buildings with vehicles is the first line of defense. Ways to achieve the minimum standoff distance from vehicle circulation or parking include creating a buffer zone using design features such as landscape elements and bollards. However, the design must address site access and circulation for fire department apparatus and other emergency vehicles. The site circulation should be designed to prevent high-speed approaches by vehicles. The vehicle entrances should be offset from the major areas of high-risk concentration, and higher-risk resources should be in a location that is remote from primary roads.

### **2-3.4 Site Perimeter Vehicle Inspection**

At facilities requiring vehicle inspection or controlled access, the design considerations are as follows:

- Provide space for inspection and waiting in line at the site access point, with adequate protection from inclement weather.
- Incorporate design features that are appropriate with regard to the threat assessment (see paragraph 4-1.2) and prevent vehicles from breaching the perimeter before being inspected.
- Whenever possible, accommodate commercial, service, and delivery vehicles by providing a separate, designated entry that preferably is distant from higher-risk resources.

Locate drive-up or drop-off areas away from large glazed areas of the building to minimize the effects of an explosive blast

### **2-3.5 Site Lighting**

Effective, uniform site lighting levels should be provided at a minimum of 0.50 foot-candle (FC) across the site and supplemented with additional focused lighting at vehicle and pedestrian entrances. Site lighting should be evaluated and designed in accordance with IES-NA. The lighting design should be coordinated with the closed-circuit television (CCTV) system, motion detection (NGB-ARI Delite System) and other means of surveillance to optimize their effectiveness.

### **2-3.6 Site Signage**

Confusion over site circulation, parking, and entrance locations can weaken site security. Therefore, signs should be provided to properly orient all who are coming to the site. Signage should include on-site directional information, parking, and cautionary signs for visitors, employees, service vehicles, and pedestrians.

### **2-3.7 Landscaping**

Landscaping design can enhance or be a detriment to the security design. Such elements as earth berms and trees can provide barriers, but all landscape features should be carefully designed to coordinate with site surveillance when the plants are fully grown. Landscape plantings can be used to conceal above-ground utility systems, but utilities should be installed underground when possible.

### **2-3.8 Architectural and Engineering Building Systems Design**

The specific requirements for AT/FP are described in detail in UFC 4-010-01 and UFC 4-023-03, Design of Buildings to Resist Progressive Collapse.

## CHAPTER 3

### SUSTAINABLE DESIGN AND DEVELOPMENT

#### 3-1 GENERAL INFORMATION

Sustainable Design and Development (SD&D) includes the design, construction, and operation of buildings to reduce negative impacts on the environment, improve the health and comfort of the building occupants, and reduce operating costs while improving building performance. SD&D requires a multi-disciplinary approach that incorporates a wide range of strategies and objectives set in Executive Order, (EO) 13423, Strengthening Federal Environmental, Energy and Transportation Management into the design and construction process. The Energy Independence and Security Act of 2007 (EISA 2007) increased federal energy reduction goals. The National Guard Bureau Army Installations Division sustainable design and development goal for all MILCON projects is a U. S. Green Building Council Leadership in Energy and Environmental Design-New Construction & Major Renovations Version 3 (LEED-NC™ v3) Silver Certification. **Starting with FY13 military construction program and FY13 Sustainment, Restoration , and Modernization (SRM) program** must be registered with the Green Building Certification Institute (GBCI) @ [www.gbci.org](http://www.gbci.org). For a Link to SDD use: *Ahttp://www.asaie.army.mil/Public/IE/doc/Sustainable%20Design%20and%20Dev%20Policy%20Update.pdf*

#### 3-2 GREEN BUILDING RATING SYSTEM

The design Architect-Engineer must use the Green Building Rating System LEED-NC™ 3, developed by the U.S. Green Building Council (USGBC). The LEED-NC™ version 3 rating system is based on compliance with a series of prerequisites and credits to obtain a score within categories of recognition. Five principal categories of sustainable design, which also support other Federal goals in energy and environmental initiatives, have been identified using LEED-NC as a central organizing system:

- Sustainable site design
- Protection and conservation of water
- Design for energy efficiency and consideration of alternative sources of energy
- Optimization of the environmental life cycle of materials
- Enhancement of indoor environmental quality

The following outlines the major objectives and sample strategies for each of these sustainable design categories:

### 3-2.1 Sustainable Sites

*Objectives:*

- Promote natural areas.
- Minimize impacts on the site and surroundings.

*Sample Strategies:*

- Encourage alternative means of transportation.
- Protect from wind and water erosion.
- Use highly reflective paving and roofing materials.
- Use a vegetative roof surface for stormwater management.
- Restore damaged habitat.
- Brownfield Redevelopment (Urban) to conserve Greenfields.
- Manage Stormwater with Low Impact Development per EISA Section 438.
- Consult EPA technical guidance for implementing EISA Section 438, EPA 841-B-09-001 @ [www.epa.gov](http://www.epa.gov).

### 3-2.2 Water Efficiency

*Objectives:*

1. Reduce the municipal water supply and treatment burden by designing in accordance with Federal Water Efficiency Requirements:

- [Executive Order \(EO\) 13514](#)
- [Energy Independence and Security Act of 2007 \(EISA 2007\)](#)
- [EO 13423](#)
- [Federal Leadership in High Performance and Sustainable Buildings Memorandum of Understanding \(MOU\)](#)

2. Allow water to return to the water table.

Sample Strategies can be obtained by using the 14 Best Management Practices (BMPs) as recommended by the [Federal Energy Management Program](#):

[BMP #1](#) - Water Management Planning

[BMP #2](#) - Information and Education Programs

[BMP #3](#) - Distribution System Audits, Leak Detection and Repair

[BMP #4](#) - Water-Efficient Landscaping

[BMP #5](#) - Water-Efficient Irrigation

[BMP #6](#) - Toilets and Urinal

[BMP #7](#) - Faucets and Showerheads

[BMP #8](#) - Boiler/Steam Systems

[BMP #9](#) - Single-Pass Cooling Systems

[BMP #10](#) - Cooling Tower Systems

[BMP #11](#) - Commercial Kitchen Equipment

[BMP #12](#) - Laboratory/Medical Equipment

[BMP #13](#) - Other Water Use

[BMP #14](#) - Alternate Water Sources

### 3-2.3 Energy Efficiency

*Objectives:*

- Optimize energy efficiency per ASHRAE Standard 189.1-2009, Design of High-Performance Green Buildings.
- Total Building Commissioning and Enhanced Building Energy Systems.
- Encourage renewable and alternative energy sources.
- Support international ozone protection protocols.

*Sample Strategies:*

- Orient the building appropriately.
- Use a highly reflective Energy Star roof.
- Explore Green/Vegetated roof systems
- Specify highly efficient HVAC equipment without the use of chloro-fluorocarbons (CFC) or hydro-chloro-fluorocarbons (HCFC) chemicals.
- Provide occupant controls for all spaces.
- Use photovoltaics and renewable energy sources.

### 3-2.4 Material Selection

*Objectives:*

- Use materials with minimum environmental impact.
- Reduce, recycle and manage waste.

*Sample Strategies:*

- Conduct on-site recycling.
- Implement a construction waste management plan.

- Minimize toxins in materials.
- Specify certified wood and bio-based materials.
- Use biological wastewater treatment systems.
- Specify recycled content.

### **3-2.5 Indoor Environmental Quality**

*Objectives:*

- Eliminate the sources of indoor pollution.
- Provide for thermal comfort of occupants.
- Provide for occupant connection to outdoors.

*Sample Strategies:*

- Conduct on-site recycling.
- Limit indoor air pollutants.
- Specify low-emitting materials.
- Incorporate lighting controls.
- Create a natural indoor environment.

## **3-3 FEDERAL GOALS**

### **3-3.1 Energy Policy**

The sustainable design and development should adhere to the efficient energy management goals and objectives stated in Executive Order (EO) 13423. Building energy efficiency goals must exceed ASHRAE Standard **189.1** - Standard for Green Buildings Except Low-Rise Residential Buildings.. The Energy Independence and Security Act of 2007 (EISA 2007), Section 431 increased the federal energy reduction goal from 2%/year to 3%/year by fiscal year 2015. All MILCON projects must install Advanced Utility Meters for electrical, natural gas, water and steam applications.

- The Energy Policy Act of 2005 required all federal facilities to be metered with advanced meters to the maximum extent practicable. Suspense to complete electric meter installations is 1 October 2012.
- OSD guidance established \$35,000 annual utility consumption as threshold for being considered “practicable.” Base on Army energy use index, this translated to buildings greater than or equal to 29,000 square feet (29 KSF).
- The Energy Independence and Security Act of 2007 (EISA 2007) established a FY16 deadline for metering of all utilities (including natural gas, and steam) serving federal facilities.

### **3-3.2 Environmental Initiatives**

The sustainable design must meet or exceed the waste prevention, recycling, and Federal acquisition goals and objectives stated in with guidance in UFC 1-900-01, Selection of methods for the Reduction, Reuse, and Recycling of Demolition Waste and Unified Facilities Guide Specification Sections, UFGS-01355, Environmental Protection; UFGS-01572, Construction and Demolition Waste Management; UFGS-02220, Demolition. Apply where possible the *Guiding Principles for Federal Leadership in High Performance and Sustainable Buildings*.

### **3-3.3 Environmentally Preferred Products**

Environmentally preferred products (EPPs) reduce effects on human health and the environment. Products are designated as EPPs after a product assessment based on their raw materials source, production, manufacturing, packaging, distribution, disposal, and recyclability. All selected materials are also required to meet industry standards for durability and cost effectiveness based on an LCCA. The comprehensive guidelines can be obtained at (epa.gov) website.

### **3-3.4 Facility Equipment**

All facility equipment, materials, and operating systems should be based on consideration of the lowest life cycle cost analysis (LCCA) and AR 11-27, the State's energy code, ETL 1110-3-491, and the latest energy and environmental industry standards.

## **3-4 SPECIFIC APPLICATIONS**

### **3-4.1 General Goals**

All facility equipment, materials, and operating systems should be based on the lowest life cycle cost considerations, AR 11-27, the State's energy code, UFC 3-400-01 Energy Conservation and the latest referenced energy and environmental industry standards.

### **3-4.2 Passive Solar Energy Conservation**

The design and orientation of functional areas should in new construction and where feasible in major additions/renovations, make use of the principles of passive solar energy design. Specific passive solar features, however, must be justified on a life cycle cost basis, demonstrating a payback in 20 years or less in order to obtain Federal support. Buildings should be located to best utilize the winter sun day-lighting and warmth, prevailing winds for ventilation, and natural landscape. Refer to *UFC 3-440-03N, Passive Solar Buildings* for design guidance.

### **3-4.3 Plantings**

Landscaping and planting should be integrated appropriately into the design to provide shade from summer sun and to block winter winds. All landscape features should be

adequately described for cost estimating proposes. All plant selections must coordinate with all antiterrorism force protection (AT/FP) goals of the site.

Landscaping can reduce direct sun from striking and heating up building surfaces. It can reduce reflected light carrying heat into a building from the ground or other surfaces. The shade created by trees, along with the effect of grass and shrubs can also reduce air temperatures adjoining the building and provide evaporative cooling. The landscape design should also incorporate water conservation principles.

### **3-4.4 Building Envelope**

The building envelope consists of all architectural elements that define the exterior shell of the building. All heated and cooled building roof assembly must have a calculated *U-factor (1/Rt) of 0.025 and wall assembly must be 0.038 Btu/h/SF/F*. Features include the following:

#### **3-4.4.1 Wall and Roof Insulation**

The design of the exterior envelope should optimally promote energy-efficient performance guidance in the 2005 Edition ASHRAE Handbook of Fundamentals. In doing this, the design should show that it satisfies the mechanical/HVAC calculations for envelope values submitted at the 65 percent level of design completion. The design professional should specify Cool Roof™ Systems certified by the Cool Roof Rating Council where possible.

#### **3-4.4.2 Doors and Windows**

Openings should be sized and located to balance energy conservation and the need for natural daylight. High-performance windows with efficient insulated glazing should be considered (*RE: Efficient Windows Collaborative @ [www.Efficientwindows.org](http://www.Efficientwindows.org)*) yet carefully matched to the wall thermal performance level based on HVAC heat load calculations for envelope values, including solar gain. Air infiltration should be carefully analyzed and reduced wherever possible.

#### **3-4.4.3 Vestibules**

Air locks or vestibules should be provided at the main entrance and at all corridor exits leading to privately owned vehicle (POV) parking if the facility is located in a climatic zone with a winter design temperature less than 20 °F db and summer temperature greater than 75 F wb.

#### **3-4.4.4 Earth Embankments and Berms**

Embankments and berms may be used where appropriate, provided such usage does not involve an excessive amount of retaining wall type of construction. Federal support is not authorized for retaining wall construction at the toe of the embankment (for example, where the toe of the berm is above the adjacent finished grade).

#### **3-4.4.5 Weather Stripping and Caulking**

Weather stripping and caulking shall be used to reduce air infiltration.

#### **3-4.4.6 Building Configuration and Mass**

To reduce heating and cooling costs, the building shape should result in as low an exterior surface and mass as practical and economical.

#### **3-4.4.7 Selection of HVAC Equipment**

Interior environmental equipment should be selected based on energy efficiency, including fuel sources. The use of variable air volume (VAV) system, ground source heat-pump systems, in-floor radiant heating and central heating/cooling plants for multiple facilities must meet the lowest life cycle cost for owning and operating.

#### **3-4.4.8 Standard Building System Features**

- A Utility Monitoring and Control System (UMCS) per UFGS-13801) or programmable timer with the capability to preset the appropriate temperature level for occupied and unoccupied usage of the various zones.
- Adhere to the Advanced Metering Program to meter at all buildings for water, steam, natural gas, and electric in accordance with the Energy Policy Act of 2005 and DOE/EE -0312 Guidance for Electric Metering in Federal Building ([www.eere.energy.gov/femp](http://www.eere.energy.gov/femp)).
- A temperature sensor to automatically shut off the heating system when the outside temperature reaches 65 °F for more than three consecutive hours.
- Door closers, where justified, on exterior and interior doors
- Operable (manual) windows
- Low-leakage dampers
- Vestibules options Entry in extreme climates.

#### **3-4.4.9 Optional System Features**

HVAC system features to consider, if economical, include the following:

- Multiple boilers
- De-stratification fans in Assembly Halls and maintenance Work Bays/Hangers areas
- Exhaust hoods that supply 80% untempered makeup air through an outer jacket of the kitchen exhaust hood (to exhaust only a limited amount of heated room air)

#### **3-4.4.10 Domestic Hot Water**

Domestic hot water heating plants should use natural gas, electric and supplemental solar panels where feasible. Other features should provide the following:

- Flow restrictors in shower heads
- Low-flow aerators in kitchen and lavatory faucets
- Separate water heaters for kitchen and small toilet areas serving full-time occupancy
- Outdoor temperature reset control for the water-heating systems may vary water temperature inversely with outdoor temperature.
- Solar water heating panels should be used where economically feasible in accordance with EISA 2007, Section 523.

## CHAPTER 4

### COMMON FUNCTIONAL SITE DESIGN GUIDELINES

#### 4-1 SITE ANALYSIS EVALUATION

##### 4-1.1 Area Suitable for Building Construction

The geotechnical investigation, the facility master plan development, and the conceptual-level site analysis process with regard to sustainable site goals should provide information clearly delineating the extent of the site area that is suitable for building construction in the initial phase of development and potential future expansion.

##### 4-1.2 Compliance with Threat Assessment Criteria

All building complex designs should clearly indicate, to scale, the configurations of the exclusive and nonexclusive standoff perimeters on designated site plan drawings. Areas of potential building expansion should be considered when establishing standoff perimeters.

##### 4-1.3 Urban Brownfield Redevelopment Site Selection

Select Urban Brownfield sites early in the master planning and site selection process for MILCON projects in the State/Adjutant Generals Long-Range Construction Plan (LRCP) to allow time for remediation. The U. S. Environmental Protection Agency (EPA) supports the States Brownfield and Voluntary Response Programs and their Voluntary Cleanup Programs (VCP) that promote cleanup and reuse. To review each State VCP reference EPA Brownfield State and Voluntary Response Programs at ([www.epa.gov/cgi-bin/epaprintonly.cgi](http://www.epa.gov/cgi-bin/epaprintonly.cgi)).

#### 4-2 STORMWATER POLLUTION PREVENTION

##### 4-2.1 Storm water Management Practices

The best management practices currently used in stormwater quality control includes Green Roofs/vegetative, wet and dry ponds, infiltration trenches, porous paving, and oil-grit separators. These practices have certain limitations and drawbacks. Therefore, the design A-E should carefully analyze their functional benefit and cost impact before incorporating them into the project.

Design goals are to minimize stormwater runoff by maximizing the infiltration of rainwater into groundwater and to reduce the concentration of undesirable chemicals in both groundwater and surface waters. The key to these efforts is to minimize the nonporous surface areas, which is consistent with sustainable goals for reducing the heat sink effect on site.

## **4-2.2 Bio-retention Ponds**

Bioretention ponds may be used at most ARNG facilities. These small, inexpensive, and somewhat isolated improvements combine the absence of paving (which allows ponding and eventual infiltration of water) with the uptake and chemical conversion of some pollutants by bacteria adsorbed onto the roots of selected plant species. Often, these bacteria are the best method to reduce the concentration of nitrogenous chemical species and phosphates in surface water.

### **4-2.2.1 Standard Reference for Small Watersheds**

The standard reference, TR-55, Urban Hydrology for Small Watersheds, contains technical calculations for bioretention ponds. TR-55 serves to determine the amount of storage required to mitigate the impact of urbanization, including parking lots.

## **4-3 REQUIRED PAVED AREAS**

Three Army National Guard facilities require large expanses of paved areas:

- Mobilization and training equipment sites (MATES)
- Combined support maintenance shops (CSMS)
- Army aviation support facilities (AASF)

Rigid concrete pavement and or Resin Modified Pavement™ are authorized for all parking surfaces. However one option is to maximize the use of crushed stone or hardstand in lieu of pavement at maintenance facilities for ground vehicles. This material permits rainwater infiltration and recharge into the groundwater. Its usefulness decreases to the extent that the ground is compacted prior to emplacement, because the compacting reduces porosity and therefore permeability to rainwater. At AASF facilities, however, crushed stone is not an option, given the justified concern over rotor and prop wash kicking small particulates such as stones or dust into aircraft engines. For AASF Aircraft parking a Resin Modified Pavement™ or rigid concrete material must be specified.

## **4-4 FUEL STORAGE AND DISPENSING SYSTEM**

Any fuel storage or dispensing facility must be designed in accordance with guidance in MIL-HDBK-1022A and with the State's Department of Environmental Quality, EPA, and local regulations. Fuel storage may be either above or below ground. Above-ground storage tanks should be concrete encased. Placement of tanks in proximity to buildings should take into account fire protection codes, including NFPA 30, or should be fire-rate tanks accordingly. Fuel-dispensing units for the direct fueling of ground vehicles should be in accordance with standard MIL-848-2 and should have an output capacity no greater than 26 gpm. The pump should be located in the dispensing unit rather than the dispensing tank. Special approval is required for high-speed, large-capacity units involving multiple dispensing systems and a pump located in the tank. The pump should be located in the dispensing unit rather than in the dispensing tank. In addition to fueling individual vehicles, the system must be equipped for bottom-loading tank

trucks and trailers. The system should meet all Federal, State, and environmental regulatory requirements.

In accordance with *Army Regulation (AR) 70-12 Fuels and Lubricants Standardization Policy for Equipment Design, Operation, and Logistic Support*, all plans for new construction, modification, or upgrading of petroleum facilities containing fuel purchased with federal funds must be submitted prior to bidding for review and technical assistance to:

U.S. ARMY PETROLEUM CENTER (APC)  
Facilities and Operations Division  
8725 John J. Kingman Road, Stop 6421  
Fort Belvoir, VA 22060-6241

Questions related to fuel-dispensing systems can be answered by calling the APC at:

- (703) 767-0646 or DSN 427-0646
- (703) 767-0648 or DSN 427-0648

#### **4-5 CONTROLLED WASTE-HANDLING FACILITY**

The controlled waste-handling facility should be a separate building constructed of noncombustible materials. It should be in close proximity with flammable/combustible storage and bulk POL storage. As a hazard, it should be located at the appropriate distance from other buildings in accordance with fire safety and building codes applicable for the State, such as NFPA 30 and the IBC. The facility should be within a secured compound and located to minimize the impact of contamination by accidental surface runoff. A prefabricated structure may be used. A 6-ft-high chain link fence or permanent partition should be designed within the enclosure to separate the various types of controlled waste. The latest Federal and State environmental agency waste management requirements for controlling waste should be followed.

A single-point grounding system shall be used to ground flammable materials in metal containers. It should be wired in series to the ground point, with an anchor bolt installed in the concrete floor for each separate, segregated area within the enclosure. Fire protection systems, explosion relief construction, air conditioning, and heating are not authorized unless required by the type of waste stored. Adequate ventilation should be provided at the edge of the concrete slab and the walls to prevent spontaneous combustion of escape fumes from material storage containers. If the roof is flat or nearly flat, a continuous ridge vent or other roof-top ventilation should be provided.

The controlled waste-handling facility should have one personnel door, one 6-ft-wide by 10-ft-high overhead coiling door for forklifts, and one 6-ft-wide by 8-ft-high overhead coiling door for non-forklift operations. The floor should be constructed of reinforced concrete and must have a chemical and moisture-resistant seal (such as an epoxy-based system) with liquid-tight, chemical-resistant joint sealants at any floor joints. It should have a spill/leak containment raised edge. The slab reinforcement design must

resist cracking to prevent leaks in the floor containment membrane and to support the loads from stored materials. The design A-E must comply with environmental regulations regarding containment sump capacity.

#### **4-6 COVERED (ENCLOSED), UNHEATED VEHICLE AND PARTS STORAGE**

Covered, unheated vehicle storage and parts spaces should be sized according to the program documents. The facility should have one personnel door, one 6-ft-wide by 10-ft-high overhead coiling door for forklifts, and at least one overhead coiling door for vehicular operations, with additional vehicle doors as the size of the facility dictates. Doors must be sized for vehicle access according to vehicle clearance requirements, and protection for door edges should be provided.

#### **4-7 COVERED STORAGE AREA**

Covered storage areas should be sized according to the program documents. Vertical maneuvering clearance should be 14 ft clear height, measured at the one-third point of the underside of the lowest sloping roof structural elements. The covered area may be enclosed when indicated in the program documents. The design should incorporate a super-flat reinforced concrete slab suitable for high-stack forklift traffic and load support.

#### **4-8 WASH PLATFORMS FOR VEHICLES/EQUIPMENT**

Wash platform sizes depend on the type of vehicles to be washed. Generally, the minimum standard-sized platform is 25 ft by 40 ft. Wash platforms should be equipped with settling basins prior to discharge to trap grit, and with an oil and grease interceptor in accordance with all environmental requirements in Federal, State, and local codes. The water supply should be sufficient to provide a flow of 40 gpm at 40 psi at each hydrant.

#### **4-9 BULK POL STORAGE**

Consolidated above-ground, liquid bulk storage of new petroleum, oils and lubricants generally requires temperature and ventilation control. It should be next to the Controlled Waste Handling areas and close to the Flammable/Combustible Storage area; but isolated from all other shops and storage rooms.

#### **4-10 FLAMMABLE MATERIALS STORAGE**

Consolidated storage of bulk solid flammable materials (not fuels). It is generally unheated, and requires ventilation. It should be next to the Controlled Waste Handling areas and close to Bulk POL Storage, but isolated from other shops and storage rooms.

The flammable materials storage (FMS) building may be a separate prefabricated metal building or constructed of concrete masonry units (CMU) or the same material as the main building as long as the design meets all Federal, State, and local codes, regulations, and ordinances. If designed as part of the main building, the FMS should have an exterior door and may have an interior automatic self-closing noncombustible fire door, and the entire storage area must be surrounded by a liquid-tight 4 in. high curb. A roof- or wall-mounted exhaust fan and a wall or door louver near the floor should be provided to prevent hazardous vapor from accumulating within the area. If

the FMS is located in a separate building it is generally not heated and is considered a Class 1, Division 1 hazardous location for electrical work. The net floor area can be obtained from the approved program documents. The FMS may be equipped with metal shelves. No floor drain is to be provided. If the interior area is to be separated for item or organizational control, an industrial wire mesh partition may be provided.

## CHAPTER 5

### COMMON FUNCTIONAL PLANNING AND BUILDING DESIGN GUIDELINES

#### 5-1 FUNCTIONAL PLANNING RELATIONSHIPS

All functional site and building design components should respect fundamental planning relationships that optimize efficient operations at Army National Guard facilities.

Each facility-type design guide, used in combination with this document, includes specific information related to the topics discussed in the following paragraphs.

##### 5-1.1 Proximity

All program functions listed in NG PAM 415-12 for each facility type have priorities of functional proximity to one another. Some should be adjacent because of functional co-dependence, and others isolated because of incompatibility.

Each facility-type design guide includes adjacency matrices related to all functions to be located in the facility. In addition, functional relationship diagrams, which delineate each function in proportional scale, are included to assist the design A-E. These diagrams are not intended to establish conceptual design direction but to assist in the functional comprehension process.

##### 5-1.2 Expandability

The location of those functions with the greatest potential for future expansion warrants careful consideration. Such functions should be placed either at the building perimeter, allowing incremental growth in a new addition, or adjacent to flexible use areas that can be converted into additional dedicated functional space. Facility expansion should be considered in establishing AT/FP standoff zones. All designs should accommodate 25% expansion without affecting the initial AT/FP standoff zones.

##### 5-1.3 Special Environmental Requirements

Unique space environmental factors to consider during the space planning process include:

- Height requirements
- Noise and vibration isolation
- Requirements for utility support
- Public versus secure spaces
- Code-required fire separations

#### **5-1.4 Access to Natural Light**

The location of classrooms and open administrative areas should maximize exposure to natural light.

#### **5-1.5 Service Efficiency**

Common service functions, including toilet facilities and mechanical and electrical rooms should be grouped horizontally and vertically. The design should provide adequate space for servicing and replacing mechanical and electrical equipment. Where possible in new construction and major renovation locate mechanical/electrical rooms on outside walls to allow unrestricted equipment service and replacement activities.

### **5-2 GENERAL BUILDING CIRCULATION**

The circulation area authorization in the program documents is for inter-functional use only. The individual functional space allowances include intra-functional circulation. The designer should layout the building spaces in the most efficient manner with the smallest ratio of circulation space/occupied space.

#### **5-2.1 Direct Routes**

Circulation areas should provide direct access to functional spaces without the use of offsets or elaborate circulation patterns.

#### **5-2.2 Corridor Width**

Corridor width should be based on the anticipated use but should not exceed 6 ft, unless required by the calculated exit width as determined by building codes (or NFPA 101). The minimum clear width is governed by means of egress sections of these codes.

#### **5-2.3 Lobby Requirements**

The building should have only one lobby that is easily observed from the adjacent functions.

#### **5-2.4 Vertical Circulation**

Stairways should be strategically located adjacent to corridors. Elevators are authorized for all two-story facilities to allow access and freight handling between floors. Stair placement must be evaluated as part of the means of egress travel distance limits, dead-end limitations, and exit discharge requirements in the codes.

### **5-3 APPROPRIATE BUILDING MATERIALS**

The Army National Guard has extensive experience resulting in lessons learned relative to the durability of both interior and exterior building materials. Exterior building materials should comply with the performance guidelines presented in Chapter 6, Common Architecture and Engineering Technical Guidelines. Each facility-specific

design guide contains tables of generic architectural interior finish materials. These represent performance level expectations; alternatives with the same characteristics may be considered for use.

#### **5-4 HVAC, ELECTRICAL, AND TELECOMMUNICATIONS SYSTEMS**

During the entire development of the building design, it is important to maintain a focus on the design intent related to fundamental environmental, electrical, and communications systems. Emphasis should be on indoor air quality, energy, efficiency, flexibility of needs, and adaptability for future technological advancement. The size of the mechanical, electrical, and telecommunication room(s) depends on the geographic location as well as the amount and size of the actual equipment needed to provide the heating, ventilation, and air conditioning (HVAC), electrical, and telecommunications support for the entire building. The floor plan layout, drawn to scale and showing the required equipment, should justify the actual floor space required. The building mechanical, electrical, and telecommunications equipment should be housed in separate rooms with direct outside access where possible. The telecommunications room should be environmentally controlled to protect the equipment from overheating.

#### **5-5 FACILITY MAINTENANCE AND CUSTODIAL AREA**

The facility maintenance and custodial area should be located on an outside wall to allow direct access for taking equipment and supplies in and out for maintenance and upkeep. The design may include wood or metal shelving attached to the floor and installed along one wall. One custodial room may be provided per floor. Each should have one mop sink, shelving on the wall, and a wall-mounted broom and mop rack.

#### **5-6 REGIONAL CONSIDERATIONS**

ARNG facilities are constructed in very diverse climates. The design A-E must research the proposed materials and systems in detail to verify their appropriateness, particularly related to the building envelope. Consideration should include durability to the elements and availabilities, particularly in remote locations. Reference *UFC 3-440-05N, Tropical Engineering for ARNG Tropical Regions* for (Southern Florida, Hawaii, Guam, Virgin Islands and Puerto Rica) planning, design and construction. Reference *UFC 3-130-07 Arctic and Subarctic Construction for Buildings for ARNG Cold Regions* facilities.

##### **5-6.1 Mechanical Systems**

In tropical and semi-tropical climates, mechanical cooling should be considered in storage areas as well as occupied portions of the building. Regions that experience long periods of high humidity may require dehumidification, not only for human comfort but also to avoid damage to stored equipment and supplies. Analysis should be performed before airside economizers are selected, as they are frequently not cost effective in hot, humid climates. Intense sun may justify external sun shades on windows. Mechanical system protection from tropical storms should be considered.

In extremely cold climates, heating is required in almost all building areas. Special attention must be given to the potential freezing of pipes located in outside walls, stairways, or any unoccupied area. Outside air intakes and exhaust outlets must be protected from snow accumulation. Intakes ducts and coils must be designed to avoid ice accumulation and to dispose of water resulting from melting ice. Glycol solution should be used in preheat coils to avoid coil freeze-up, and special care must be exercised to ensure proper mixing of outside and return air at AHU inlets. Some form of perimeter heating, such as baseboard radiation, should be considered. Standby boilers, pumps, and other equipment should be provided to prevent building freeze-up in the event of major equipment failure.

### **5-6.2 Architectural Considerations**

Observation and recognition of the reasons for certain materials being favored locally assists the design A-E in evaluating materials that are intended to reflect this knowledge. The design A-E is encouraged to adopt the same practical approach to selecting materials that reflect the community environment. The design A-E is cautioned to avoid introducing materials inappropriate to a climatic region.

The following are some examples of impacts on design resulting from environmental and climatic extremes:

- Ground moisture content, which may have an impact on slab design and elements below grade
- Dew point/condensation management in extremely cold climates or in spaces that change from conditioned to unconditioned based on use (and thermal breaks in insulated window units to prevent condensation/frost in cold climates)
- The position and type of the air retarder, vapor retarder, waterproofing, and dam-proofing in exterior walls and roofs in climatic extremes
- Perimeter below-grade insulation in extremely cold climates
- Piled (plowed) snow and ice against the perimeter of the building, and de-icing chemicals and water/slush ice tracked inside
- Fenestration and other shading considerations in very hot climates
- Alkaline content of soils, which may have an impact on concrete and reinforcement
- The effect of extreme temperature differentials on movement isolation and movement control joints, particularly masonry
- Drifting snow against edges of the building in cold climates, along with snow loads on the roof related to structural design

### **5-6.3 Areas of Seismic Extremes**

Structural engineering design requirements for areas of seismic extremes are provided in the International Building Code, Structural Design and UFC 3-310-04 Seismic Design for Buildings. In addition, the design A-E should ensure that ceilings and ceiling-hung/structurally supported elements are braced, particularly in assembly areas, and that elevator hoist-ways have proper tolerances.

### **5-6.4 Areas of Wind Extremes**

In areas subject to extreme wind conditions, structural design should be based on the most stringent requirements of the IBC or local building codes and regulations. The design A-E should consider persistent wind effects in cold climates on door entries, door closer operation, and glazing unit design.

## **5-7 COMMON FACILITY FUNCTIONAL AREAS**

The following functions have the same design guidance for inclusion in all facility types.

### **5-7.1 Break Room (Area)**

The break room space should be conveniently located for the majority of the building occupants and contain a vending area. The location needs to be acoustically isolated or remote from areas needing a quiet environment. It should include vending machines plus tables and chairs in the amount appropriate to the size of the facility.

### **5-7.2 Toilets and Showers**

The approved program documents should indicate the number of designated males and females in order to proportion the authorized space appropriately. The appropriate plumbing code should be used to determine the specific number of each type of plumbing fixtures.

### **5-7.3 Physical Fitness Area**

The physical fitness area is used on a daily or weekly basis for physical training and requires construction to withstand the impact of furnished exercise equipment. The area should be located at an appropriate distance from administrative and classroom functions for acoustical reasons. The physical fitness machines and equipment are classified as portable equipment to be purchased through standard supply channels, not with Federal construction funds.

### **5-7.4 Mail Room**

Mail room is a facility operated by or for the National Guard/Department of Defense (DOD) for the receipt and delivery of mail for military units or other authorized organizations and agencies by entities outside the National Guard/DoD. This does not include mail rooms that receive mail distribution that was initially received at a central DOD mail handling facility.

Mail rooms in inhabited facilities should comply with the minimum design standards as addressed in the Unified Facility Criteria (UFC) 4-0101-01. The following are some of the minimum anti-terrorism design standards for mail rooms addressed in the UFC 4-010-01:

- Locate mail rooms on the perimeter of the building.
- Locate mail rooms as far from heavily populated areas of the building and critical infrastructure as possible.
- Ensure that mail rooms are well sealed between their envelopes and other portions of the buildings in which they are located to limit migration into buildings of airborne chemical, biological, and radiological agents introduced into mail rooms.
- Provide separate, dedicated air ventilation systems for mailrooms to ensure airborne chemical, biological, and radiological agents introduced into mailrooms do not migrate into other areas of buildings in which the mailrooms are located.
- Provide dedicated exhaust systems within mailrooms to maintain slight negative air pressures with respect to the remainder of the buildings in which the mailrooms are located so that the flow of air is into and contained in the mailrooms.

#### **5-7.5 Nursing Mothers Room**

All ARNG facilities that include Administrative Areas are authorized a net area of 80-square feet enclosed room with complete environmental systems and one cabinet/counter mounted 16"x16" stainless steel service sink to support this effort. For information on State Breastfeeding Laws or Civil Codes refer to the National Conference of State Legislatures website: ([ncsl.org/programs/health/breast50.htm](http://ncsl.org/programs/health/breast50.htm)).

## CHAPTER 6

# COMMON ARCHITECTURE AND ENGINEERING

## TECHNICAL GUIDELINES

ORGANIZED BY Construction Criteria Base, (CSI MasterFormat™ 2004 Edition) Unified Facilities Guide Specifications (UFGS) (USACE, NAVFAC, AFCEA & NASA) Whole Building Design Guide: ([www.wbdg.org/ccb/browse\\_org.php](http://www.wbdg.org/ccb/browse_org.php).)

### SECTION 1 CIVIL, SITE, AND LANDSCAPE DESIGN

#### DIVISION 01 GENERAL REQUIREMENTS

##### **Sustainable Site Development Goals**

The major site development objective is to preserve the character of the site by retaining natural features such as ground slopes, drainage patterns, trees, and other natural vegetation to the greatest extent possible. The design A-E should analyze the site to locate and orient the building and other structures so they are compatible with natural site features, sun orientation, and prevailing winds. The overall site design should conserve energy, allow easy access to public roads and utilities, and support the most efficient operation. Careful consideration should be given to future expansion of the facility during development of the initial design.

##### **Site Preparation**

Site preparation should include the work for demolition and clearing, grubbing, stripping, stockpiling topsoil, excavation, and rough grading. It should not include the excavation and backfilling required for foundation walls and footings nor the finish shaping and proof rolling of the subgrade under pavements and floor slab construction. The subgrade should be such that the cut and fill are roughly balanced to provide the most economical site preparation. If required, demolition should include removal of all surface features in conflict with the new construction as well as underground utility lines and structures. The design A-E shall prepare a suitable stormwater pollution prevention plan (SWPPP) and obtain the National Pollution Discharge Elimination System (NPDES) permit during the construction and post-construction phases in accordance with local requirements.

Environmental Protection - UFGS 01 57 20.00 10:

Storm Water Pollution Prevention Measures - UFGS 01 57 23:

Construction and Demolition Waste Management - UFGS 01 74 19:

Recycle/Recovered Materials - UFGS 01 62 35:

Demolition - UFGS 02 41 00:

Removal and Salvage of Historic Building Material - UFGS 02 42 91:

Clearing and Grubbing - UFGS 31 11 00:

Earthwork - UFGS 31 00 00:

Excavation and Backfill - UFGS 31 23 00:

Subsurface Drilling, Sampling, and Testing - UFGS 02 32 00:

### **Soil Surface Erosion Control - UFG 31 32 11:**

During the construction phase, the appropriate control measures (such as straw bales silt fence, sediment traps, sediment basin, and other approved practices) shall be employed to minimize erosion in order to comply with the latest environmental and State requirements.

### **Utilities - General Information**

All building utility service lines should be underground where possible. The design A-E should verify that all utility services will be available at the site when the intent is to connect with or extend an existing municipal system. The design A-E shall comply with and obtain approval with respect to all municipal requirements. The contract documents should stipulate that the contractor is to coordinate with local utility companies on the division of work to the extent necessary to ensure that when the facility is complete, all utility services will be connected and operational without further cost. The Federal share of the total cost of all utility service connections must not exceed 15 percent of the Federal share of the building cost. Exposed utility components and light standards may have bumper guards or posts if a location outside the vehicle traffic area is not feasible. Emergency power may be provided when sewage lift stations are necessary. The length of the service line for each utility is limited to the distance of the shortest run from the point 5 ft outside of the building to the property line adjacent to the public right-of-way.

### **Potable Water**

#### **Water Distribution - UFGS 33 11 00**

Ductile-Iron pipe and fittings, PVC, Type K copper for a line size of 2 in. or less in diameter or an equivalent pipe should be used for the service connection, unless specific circumstances require the use of some more expensive material. If a public water system is not available in the general area, a well may be utilized if consistent with the requirements of the local authority having jurisdiction. Line extensions 6 in. or more in diameter should be ductile iron or plastic.

### **Fire Protection**

The design A-E should consider the size of the structure, type of construction, and exposure to fire hazard that the structure creates or receives from nearby buildings. The fire apparatus access requirements should be considered as well as the exterior

fire rating of nearby buildings on site and the building being designed. Except in cases of conflict with State requirements, exterior fire protection should be in conformance with NFPA and UFC 3-600-01 Fire Protection Engineering for Facilities.

### **Sanitary Sewage Systems - UFGS 33 30 00**

Piping should be vitrified clay, concrete, corrugated metal, PVC, or of equivalent quality and cost, unless special circumstances require the use of a more expensive material. The sewer should be gravity type. If a municipal system is not available in the general area, a packaged sanitary treatment system or septic system may be utilized.

### **Natural Gas Distribution - UFGS 33 51 15**

Normally, natural gas is the fuel of choice if available at the site. Piping material should be vinyl clad Schedule 40 black steel or thermoplastic gas pressure pipe and fittings conforming to American Society for Testing and Materials (ASTM) D2513.

### **Stormwater Retention Basin Design**

The design should separate normal stormwater sheet flows (from roofs or other areas) from possible contaminated stormwater sheet flows (occurring at military and POV parking areas). Non-contaminated flows should be designed to run off downstream from contaminated sheet flows. Contaminated sheet flow management (including retention basins, grit interceptions, and oil-water separators) is authorized for Federal support if required by the approved SWPPP and the NPDES permit (based on 1-hr rainfall during a 10-year event and on the local limitations thresholds imposed on such effluents). Designers should reference EPA 841-B-09-001 Technical Guidance on Implementing Stormwater Runoff Requirements and UFC 3-210-10 Low Impact Development Manual.

### **Privately Owned Vehicle Parking - UFGS 01 50 00**

The authorized amount of paved area for circulation and parking is based on 35 yd<sup>2</sup> per parking space. If on-street parking is available, the area allocation may be reduced to the size of the parking space meeting local zoning ordinances. Paint striping may be used to define individual parking stalls, but stalls shall not have identification marking except for the physically disabled if a competitive employee position is authorized. Concrete curbs may be used around the pavement edges. Designers should reference UFC 3-210-10.

### **Additional Paved Area Requirements - UFGS 32 13 13.06**

The designer should incorporate additional areas of pavement for vehicular access to a wash platform or fuel-dispensing facility, or both, if authorized, in the military parking or storage area. A security fence should enclose these additional areas of pavement along with the platform or fuel facility, or both.

Bituminous Concrete Pavement - UFGS 32 10 00

Resin Modified Pavement™ Surfacing Material - UFGS 32 12 18

### **Access Roads and Entrance Roads - UFGS 32 13 13**

The design A-E should consult the approved program documents for the authorized amount of paved area. The number of square yards of pavement stated in the approved program documents is only approximate; the actual amount will be as needed to provide the shortest runs possible when considering site conditions and economical locations of the building, dock(s), parking, and existing roads. The primary access or entrance road may be 24 ft wide, with rigid or bituminous concrete curbs, provided that an underground drainage system is avoidable. Secondary access roads, service drives, and circulation lanes in parking areas are limited to a width of 20 ft.

The design should provide an adequate turning radius based on the types of equipment driven or towed. Secondary access roads and service drives should not have curbs unless dictated by the most economical storm drainage solution. The authorization of paving for the parking areas includes paving for circulation lanes.

### **Pavement Standards - UFGS 32 10 00**

A rigid pavement section should consist of a 6-in. or 8-in. concrete slab with shrinkage or temperature-welded wire mesh steel. The 6-in. thickness applies to wheeled vehicles, and the 8-in. thickness applies to tracked vehicles. Generally, concrete should be placed directly on a compacted subgrade, unless existing soil conditions dictate an aggregate base (a thickness of 6 in. maximum). An alternative to the rigid pavement section is to use roller-compacted resin modified pavement. If the design A-E determines that local soil conditions necessitate a more costly paving section, special justification is required before Federal support can be obtained for the additional paving cost.

### **02751 Military Vehicle Parking Pavement Requirements**

The designer should consult NG PAM 415-12 for the area and type of paving to provide for military vehicle parking. The area includes space for parking the vehicles and circulation. The paving should consist of Portland cement concrete, and the design should be based on soil conditions and on the maximum loads anticipated but should in no case be less than a 4,000-lb wheel load and 40-psi tire pressure.

### **02761 Fuel Truck Parking**

Fuel truck parking containment is required and overhead protection is allowed. When more than one fuel truck is authorized, a spacing of 10 ft should be maintained between vehicles when parked.

### **02754 Trash Container Pad**

A concrete pad may be provided at an appropriate location for storage of a truck-operated trash container. The selected location may take into account the ease of access by building users, visibility, and access for dumping and removal (the location

generally is not inside the fenced compound). Screening may consist of walls or plantings.

## **SECTION 2 EXTERIOR IMPROVEMENTS**

### **Concrete Sidewalks (Porous Asphalt) - UFGS 32 16 13**

Walks connecting the primary and secondary building entrances to the parking area(s) and to the main vehicular access points should be porous asphalt. The maximum width may be 6 ft, except at the main entrance/flagpole location, where it may be 10 to 15 ft. The total area should not exceed the amount authorized in the program documents without prior approval from the Military Department or the CFMO. The designer should reference UFC 3-210-10 for permeable pavement design.

### **High Security Chain Link Fences and Gates - UFGS 32 31 13.53**

The security-type fence must be a six (6) feet high, nine gauge, chain-link metal fabric with a twelve inch high, three strand four point barbed wire 45 degree anti-climbers to enclose the secured areas. Vehicle gate(s) may be swinging or rolling type. The following areas should be provided with security fencing: military vehicle parking; fuel storage and dispensing system; service and access aprons; aircraft parking; wash platform; lubrication and inspection rack; covered, unheated storage; cannibalization area; and loading ramp. Fencing should be located no more than 5 ft from the edge of the paved areas unless safety or security demands a greater distance.

### **Irrigation Systems - UFGS 32 84 24**

If an irrigation system is proposed, it should be in the landscape budget. The designer should select an efficient landscape to reduce potable water consumption by using native or adapted plants, captured rainwater or grey water systems.

### **Fine Grading and Seeding - UFGS 32 92 19**

The area within the limits of construction should be fine graded and seeded to provide proper site drainage and erosion control. The limits of construction should be clearly indicated on the project plans, and any damaged surface cover outside of this limit must be restored to its previous condition. The bottoms of drainage swales or ditches and embankment slopes steeper than 1 ft vertical to 4 ft horizontal should have sod instead of seeding. Banks steeper than 1 ft vertical to 3 ft horizontal should be stabilized with ground cover plants or with 3 in. of crushed aggregate. Steep slopes should be held to the absolute minimum and selected only when most economical. Importation of topsoil is authorized if the existing topsoil is insufficient to provide adequate cover.

### **Exterior Plants - UFGS 32 93 00**

Plantings should include the furnishing and planting of new trees, shrubs, ground cover (other than sodding or seeding), irrigation systems, fertilizing, mulching, staking, erection of temporary barriers, watering, and general maintenance operation required to establish healthy growth after transplanting.

## **Landscaping - UFGS 32 05 33**

The designer should include plantings as an integral part of the project planning and should clearly indicate the location, size, and quantity on the plans for bidding purposes. The planting design shall be simple and orderly, using a minimum of plant types and materials for framing and background aesthetics of the building and the screening of service areas, parking areas, and other objectionable views. Solar orientation, plantings, and berms should all be considered during early stages of design. Plant and tree selection should provide permanent low-maintenance vegetation appropriate to the location. Selected plant material shall be of local, hardy species that are tolerant of site-specific conditions. The design A-E should consider adjacent structures to prevent adverse impact. Trees should be carefully selected and located to prevent clogged gutters and drains from leaves and seeds and blocked sewer lines from root infiltration. Topsoil should be 4 in. thick unless there is a surplus from on-site project excavation grading.

In addition to aesthetic values, landscaping provides an opportunity to enhance the energy efficiency of the facility. Refer to Chapter 3, Sustainable Design.

## **SECTION 3 STRUCTURAL ENGINEERING DESIGN**

### **GENERAL REQUIREMENTS**

#### **General Information**

The structural system of the building should consist of noncombustible materials or heavy timber-type construction. The construction should generally be of open-web steel joists or prefabricated light-gage steel trusses supported on masonry bearing walls, tilt-up concrete, or steel wide-flange beams or joist girders and columns. Pre-engineered metal buildings are acceptable where economically feasible.

#### **Structure Height**

The designer should keep the building heights to a minimum to reduce construction and operating cost. The interior height from the finished floor to the bottom of the roof structure system (or upper floor structure) should not exceed the limitations stated in each facility-type design guide (plus or minus 4 in. to accommodate masonry courses). Where the roof structure is sloping, the clearance is to be measured at the lower end of the one-third point of the triangle formed by the sloping roof arrangement. Care shall be taken to maintain the maximum authorized clearance at the one-third point. To accomplish this when longer spans are required, the design A-E can reduce the slope. The limit of the slope reduction is the minimum that the manufacturer recommends in order to achieve a roofing system that is warranted for 15 to 20 years.

#### **Seismic Design Considerations**

The design and construction of all new buildings located in areas of high probability of seismic activity must be in accordance with the International Building Code Section

1910, Seismic Design Provisions. The designer must reference UFC 3-310-04 Seismic Design for Buildings.

### **Division 03 CONCRETE**

#### **03200 Concrete Strength**

Compressive strength should generally be 2,500 to 3,500 psi at 28 days after placement, unless a stronger concrete is justified by the unique technical requirements for a building type and identified in the facility-type design guide. All concrete related work must be in accordance with the latest recommendations of the American Concrete Institute. For extreme conditions such as cold climates, deicing chemicals and sulfate-containing solutions refer to the International Building Code Chapter 19.

#### **31 60 00 Foundations**

Bearing wall foundations may be CMU (with the core filled and grouted) or reinforced concrete foundation walls on continuous concrete spread footings as a standard. (The standard for columns is spread footings.) Special foundations include wood, steel, or concrete piles; concrete grade beams may be used if required by the soil investigation survey and justified by a Declaration of Uniformity of Area Soil Conditions. The top of the interior bearing wall and column footings should generally be 6 to 8 in. below the bottom of the floor slab. The bottom of the exterior bearing wall and column footings should be just below the maximum frost depth or 1 ft 6 in. below the outside finished grade, whichever governs. Footings should be lower where required for plumbing and other underground utilities, including risers at the column footings. For entrances in cold climates, the designer may consider the use of foundations or grade walls under concrete stoops (which are almost flush with the bottom of the doors) to prevent door interference due to upward displacement of the stoop by frost action.

#### **03000 Slabs on Grade**

The slab should be poured in a single layer, with non-galvanized shrinkage and temperature steel placed at mid-point of the slab thickness on no more than 6 in. of granular base, and surfaced with a standard troweled finish. Generally, a 4 in. slab thickness and temperature-welded steel wire mesh are adequate except for special areas and uses indicated in the individual facility-type design guides. Instead of welded wire mesh, the design A-E may consider fibrous concrete. A steel angle or other type of protection may be used to protect the concrete edge of a vehicle access door threshold.

## **SECTION 4 ARCHITECTURAL DESIGNS**

### **GENERAL INFORMATION**

WHERE DESCRIBED IN THESE DESIGN GUIDES AND REFERENCE PUBLICATIONS, THE STANDARDS FOR MATERIAL QUALITY AND CONSTRUCTION ARE THE MINIMUM REQUIRED TO SUPPORT FEDERAL FUNDING FOR A PROJECT. THE USE OF CONTRACTOR OPTIONS AND

PERFORMANCE-TYPE SPECIFICATIONS IS ENCOURAGED. THE BUILDING MUST BE OF NONCOMBUSTIBLE CONSTRUCTION, AND ALL MATERIALS MUST HAVE A FLAME SPREAD RATING OF 25 OR LESS IN ACCORDANCE WITH ASTM E84. REFER TO AR 190-51, APPENDIX D, FOR THE PHYSICAL SECURITY REQUIREMENTS FOR FUNCTIONAL AREAS STORING OR HAVING SPECIAL TOOLS, EQUIPMENT, OR REPAIR PARTS.

## **DIVISION 04 MASONRY**

### **Parapet Walls - UFGS 04 20 00**

Parapet walls, up to a maximum height of 18 in., are authorized. Where parapet walls are constructed of CMU, they should have a one-piece truss-type (industry standard) horizontal reinforcing element every second or third course. Vertical reinforcing should be used in seismic zones to comply with the applicable building code. The design A-E should pay special attention to eliminate differential expansion compared with walls below as indicated by movement in control joints.

### **Exterior Walls - UFGS 04 20 00**

Where masonry is used in exterior walls the material may be face or common brick with CMU backup forming a bearing wall. A concrete tilt slab or other suitable system can be provided if the cost is equal or less. For non-cavity wall construction with CMUs at the exterior, the design A-E should consider whether a moisture-resistant film or other barrier would assist in moisture control (with a non-bond-breaker type of barrier) and whether to permit or reduce moisture movement.

## **DIVISION 05 METALS**

### **Miscellaneous Metals - UFGS 05 50 13**

Lintels may be steel angles, masonry, or precast masonry units. The concrete edge of vehicular door openings shall have a steel angle or a similar type of protection.

### **Corrosion Resistance**

The design must prevent corrosion and electro-galvanic activity under all dissimilar metal-to-metal and metal-to-alkaline material conditions.

## **DIVISION 06 WOODS AND PLASTICS**

### **Wood Roof Support - UFGS 06 10 00**

The roof system should normally consist of a lightweight, noncombustible type of construction. As an alternate, the structural system may be of heavy timber-type construction (defined as a minimum of 2-in.-thick decking and 6-in. by 8-in. minimum-size joists, purlins, and beams) when proven to be more economical than steel construction and where permitted by the building code.

## **DIVISION 07 THERMAL AND MOISTURE PROTECTION**

### **Insulation**

The exterior walls, penetrations, and roof should be insulated to reduce the heat transmission U-factor and energy cost in accordance with the State Energy Code or ANSI/ASHRAE/IESNA Standard 90.1-2007.

#### **Slab Perimeter Insulation - UFGS 07 21 13**

Perimeter insulation should be provided for slab-on-grade floors to reduce the U-Factor to the same as that of the exterior wall insulation. The insulation should be arranged to prevent an uninsulated gap at the wall and floor juncture.

#### **Mineral Fiber Blanket Insulation - UFGS 07 21 16**

The installation of batt insulation above suspended ceilings is not recommended due to the likelihood of creating a condensation problem. However, the roof insulation may be installed below the roof deck if this does not create a potential condensation problem.

#### **Roofing Systems - UFGS 07 22 00**

The roof system should normally consist of a lightweight, noncombustible type of construction. The roof construction may be any of the following:

- A composite built-up roof (3-ply minimum and 4-ply maximum glass fiber felts)
- A single-ply membrane roof (ethylene propylene diene monomer [EPDM], ballasted, partially or fully adhered, or mechanically fastened)
- A standing seam metal roof

All roofing systems should be of a quality to have a twenty (20) year warranty. Proposals to use other roofing systems or slopes exceeding 3 in. per foot must be justified by an economic analysis. Walking treads may be provided if required to maintain roof-mounted equipment. Drainage should be toward the perimeter of the roof, with a minimum slope of ¼ in. per foot, into scuppers and downspouts discharging onto grade. Calculations of roof slope should allow for roof-supporting member sag to reduce ponding. Refer to the National Roofing Contractors Association [NRCA] Roofing and Waterproofing Manual.

#### **Bituminous Roofing - UFGS 07 52 00**

Where selected, built-up bituminous roof systems should be applied over rigid insulation for heated buildings. Metal decking with the appropriate corrosion protection on both sides may be used as the supporting substrate for insulated and uninsulated roof applications. The appropriate base sheets recommended by the manufacturer must be used for insulated roof applications. Condensation and the location of the dew point (such as at soffits) must be considered to prevent occurrence at the decking or

the bitumen bond. Two-in. wood decking may be used as an alternate for such special conditions.

### **Elastomeric Membrane Roofing - UF-07530**

The same recommendations apply as for built-up bituminous roofing.

### **Sheet Metal Roofing - UFGS 07 61 14.00 20**

If standing seam metal roofing is selected, the authorization generally is for the less costly system using a galvanized or aluminized, painted metal roofing supported by metal purlins. The appropriate thickness of fiberglass batt insulation should be placed under the metal roofing and over the top of the purlin.

### **Roof Restraint Protection**

Protection for service staff on the roof should consist of either an extension of the parapet, guardrails, or a tie-off system. The local OSHA office can provide the ruling on the appropriate method. Refer to OSHA standards regarding walking-working surfaces in 29 CFR 1910.21–1910.23 and regarding fall protection in 29 CFR 1910.23(c)(1)(c)(3) and 29 CFR 1910.132(a).

## **DIVISION 08 OPENINGS**

### **Exterior Doors - UFGS 08 11 13**

All exterior doors, including rollup doors entering into heated or air-conditioned areas, should be insulated. Exterior doors providing access to storage rooms for tool and repair parts and to supply rooms should be hollow metal with fixed pin hinges of suitable weight on a hollow metal frame. Main entrance doors and those connecting directly to POV parking areas may be incorporated into a vestibule, particularly in areas of climatic extremes. If the entrance doors lead to a major administrative area, they may consist of commercial-grade aluminum and glass store front systems. Secondary doors, which are generally for emergency egress only, should not be fitted with glass panels, transom glass, or sidelights for security reasons. Where required by code, panic hardware should be installed on all exterior exit doors. Only main entrance doors may have concealed door closers; all other frequently used doors should have surface-mounted closers. Ball bearing hinges should be used only for high-frequency usage doors or where fire safety governs. Kick and push plates may be installed on frequently used doors.

### **Wood Interior Doors - UFGS 08 11 00**

Interior doors and frames should generally be hollow metal for durability. Kick and push plates may be installed on frequently used doors. Solid-core wood doors with a standard finish may also be used. Interior doors providing access to storage rooms for tool and repair parts and to supply rooms should be hollow metal with fixed pin hinges of suitable weight on a hollow metal frame. The use of wood doors is not encouraged in heavy traffic areas because wood is less durable than metal. Interior doors may be

recessed when the occupant load, as identified by the building code, requires a door to swing outward into the direction of egress. Doors may have surface-mounted door closers. Closers are required by code at fire-rated doors.

### **Motor-Operated Doors**

Motor operation is authorized for vehicle maintenance workbay doors, warmup bays, hangar doors, and the most frequently used United States Property and Fiscal Office (USPFO) warehouse overhead supply doors. Motor-operated overhead doors are not authorized for vehicle storage buildings, but chain-operated overhead doors may be used.

### **Door Sizes**

Personnel doors may be 3 feet wide X 7 feet high. Double-leaf doors should generally have an astragal. The maintenance workbay/hangar door size is 28 feet high X 18 feet wide. Workbay/Hangar doors may be constructed of insulated panels or fabric type.

Logistics Maintenance/ Aviation Hangar Doors Steel sliding of vertical lift fabric doors may be used. - UFGS 08 34 16.10/20

### **Skylights and Clerestories - UFGS 08 62 00**

The design A-E should consider a limited amount of skylights in a day-lighting scheme. Where high walls exist, clerestory windows shall be used instead of skylights to provide adequate natural light. Lobbies, warehouses, and interior windowless areas may have skylights.

### **Door Hardware - UFGS 08 71 00**

Door locks should be heavy-duty mortise type, except that doors to rooms containing an arms vault shall have Government Series 86 (ANSI A115.1) dead bolt locks (Federal Specification FF-H-105). Offices and other non-security-type areas should have standard commercial passageway locks. For safety reasons, lock sets and locks normally should not be installed on interior stairways or toilet room doors. The needs for life safety, force protection, and access control should be coordinated in the selection of hardware. In locations where doors potentially can be used as a means of egress for assembly use groups, the design A-E should avoid inadvertently controlling doors in the direction of egress with delayed-release locking devices.

### **Glazing Types (Blast Resistant Tempered) - UFGS 08 56 53**

Generally, windows should be manually operated. Glazed openings susceptible to accidental human impact should be designed in accordance with the applicable IBC, Consumer Product Safety Commission (CPSC), or similar code safety requirements in model building codes. In considering the use of high-performance glazing, the designer should carefully match the solar gain/heat loss values and thermal performance levels including solar gain. Force protection issues must also be considered in the glazing

design at locations where exposure to threat is indicated. Such glazing units and restraint systems in insulated units are a significant cost issue. The needs for natural daylight, thermal efficiency, value, and security should be balanced. Security window sash and bars may be used only at ground floor locations of supply and repair parts rooms and warehouses.

## **DIVISION 09 FINISHES**

### **Basic Interior Finishes**

All facility-type design guides include tables for generic interior finishes appropriate for use within each room or space.

Acoustical Ceilings - UFGS 09 51 00

Resilient Flooring - UFGS 09 65 00

Carpet - UFGS 09 68 00

### **Exterior Painting and Coatings - UFGS 09 90 00**

The painting of exterior galvanized metal surfaces (gutters, downspouts, and flashing) is authorized where such surfaces are exposed to view from the ground. All exterior aluminum doors, window frames, and trim may be anodized (clear or bronze). Wood windows, doors, and trim, as well as non-galvanized or unfinished steel windows and doors, may be painted. Baked-on colors are authorized instead of anodized finish on aluminum or steel commercial-grade doors and windows.

## **DIVISION 10 SPECIALTIES**

### **Bulletin and Tack Boards - UFGS 10 10 00**

A standard manufactured bulletin or tackboard with a cork surface laminated to a backing board and a clear anodized aluminum frame (flush mounted) is authorized. The board should be permanently affixed to the wall with vandal-proof fasteners.

### **Marker Boards - UFGS 10 10 00**

A marker board with a standard color, appropriate finish, clear anodized aluminum tray, and frame (flush mounted) may be provided. The board should be permanently affixed to the wall with vandal-proof fasteners.

### **Exterior Signage (Free-standing or Building Mounted) - UFGS 10 14 01**

Building identification signs are authorized for all projects. The sign may be free-standing building mounted or independent letters may be mounted directly on the exterior building surface. It should be located in direct view of the public, facing a main thoroughfare or public street. The facility name letters should be a maximum of 12 in. high, and the State name followed by "ARMY NATIONAL GUARD" should be a maximum of 8-in.-high letters.

**Interior Signage - UFGS 10 14 02**

Room signs may be made of aluminum or plastic material. Letters or numbers should be no larger than 1 in. in height. Preference should be given to pre-manufactured systems that have interchangeable components. Signs may be made of aluminum, steel, plastic, or other appropriate materials of equivalent cost.

**Toilet Partitions - UFGS 10 21 13**

Toilet partitions should be of steel, with a baked enamel finish or plastic laminate, for durability. Partitions should be anchored to solid reinforcement in the walls, and should be supported overhead and secured to the floor (including miscellaneous metal bracing above the ceiling.)

**Toilet Accessories - UFGS 10 28 13**

Toilet partitions should be of steel, with a baked enamel finish or plastic laminate, for durability. Partitions should be anchored to solid reinforcement in the walls, and should be supported overhead and secured to the floor (including miscellaneous metal bracing above the ceiling.)

**Metal Lockers - UFGS 10 51 13**

Lockers should be raised on a base above the floor. A full-length wood bench, anchored to the floor, should be placed between each parallel group of lockers. In selecting hardware, the design A-E should coordinate the needs for access control. Lockers should be deep enough, tall enough (single tier), and wide enough for required equipment and clothing to be stored. Lockers are to be secured with padlocks furnished separately.

**DIVISION 11: EQUIPMENT**

**Service Equipment Schedule**

**Refrigerated and Frozen Food Storage Equipment - UFGS 11 41 11**

**Food Preparation Equipment - UFGS 11 42 00**

**Food Cooking Equipment - UFGS 11 44 00**

**Food Dispensing Equipment - UFGS 11 46 00**

**Ice Machines - UFGS 11 47 00**

**Cleaning and Disposal Equipment - UFGS 11 48 00**

**Vaults (Armory)**

The area of the vault can be obtained from the approved program documents. Generally, no vaults should be designed with less than 300 square feet of space. Vaults should be designed and constructed in accordance with AR 190-11. Conduit for the intrusion detection, telephones, and electrical systems should be provided by the

design A-E. If a modular vault constructed of precast panels meets or exceeds the security requirements in AR 190-11, it may be bid as an additive alternate to the constructed-in-place vault and the less expensive vault should be selected. A vault should not be placed on an exterior wall.

### **Vault Wall Construction**

Vault walls shall, at a minimum, consist of 8-in.-thick reinforced concrete. The wall will be reinforced with No. 4 reinforcing bars at 9 inches on center in each direction in each face of the wall.. Reinforcement in the 2 faces of the wall will be staggered on each face to form a projected grid approximately 4–1/2 inches square. Reinforcement in the walls will be tied into floors and ceilings in accordance with American Concrete Institute standards. In addition, Anchor rings should be installed along the inside walls to facilitate the securing of arms racks. As an alternate, a 3/8-in.-thick by 2-in.-wide hardened steel bar located continuously around the inside wall, with anchor rings welded to the bar, may be used to facilitate the securing of arms racks.

### **Vault Floor Construction**

The vault floor should consist of a 6-in. reinforced concrete slab construction reinforced with 6 inches by 6 inches, W4 by W4 welded wire fabric or equivalent steel reinforcing bars (based on area of steel per square foot).. If the floor is the ceiling for a room or area below, the slab shall be a minimum of 8 in. thick. Where equivalent steel reinforcing bars are used, bar spacing will form a grid so that the area of any opening does not exceed 96 square inches.

### **. Doors and door frames**

**The vault door threshold must be level with the adjoining floor to allow easy movement of pallet jacks and other wheeled items. The door will be GSA approved Class V armory door per GSA Fed Spec AA–D–600D. Door frames will be per Fed Spec AA–D–600D.**

### **Vault Ceiling**

Ceilings and roofs will be of reinforced concrete construction. The thinnest portion may not be less than 6 inches. reinforcing bar spacing will form a grid so that the area of any opening does not exceed 96 square inches using No. 4 bars or larger. If the ceiling is the floor for a room above, the slab should be a minimum of 8 in. thick.

### **Vault HVAC**

The vault should be provided with a (Z-type) vent for emergency ventilation. The design A-E should provide for a minimum of four air changes per hour of supply air from a central HVAC unit into the vault, and the air should exhaust directly to the outside. The design A-E should also specify a packaged dehumidifier. The dehumidifier condensate floor drain should be located outside of the vault. Canvas-type flexible duct connections should be used to eliminate vibration, and ducts should terminate with security grilles and registers at the interior surfaces. Windows are not authorized.

Ducts, vents, and other openings of 96 square inches or more with the least dimension greater than 6 inches will be secured in accordance with 1 of the following methods and otherwise limited to the minimum number and size that are essential

- (1) Sealed with material comparable to that forming the adjacent walls.
- (2) Fitted with any of the barriers below with bars or steel mesh securely embedded in the structure of the building or welded to a steel frame that will be securely attached to the wall with fastenings inaccessible from the exterior of arms storage facility.
  - (a) Three-eighth inch or larger hardened steel bars with vertical bars not more than 4 inches apart and with horizontal bars welded to the vertical bars so that the openings do not exceed 32 square inches.
  - (b) A minimum of 8-gauge high carbon manganese steel mesh with 2-inch diamond grid.
  - (c) A 6-gauge cold drawn steel wire mesh with 2-inch diamond grid when 8-gauge mesh above is not available.

### **Modular/Portable Arms Vault**

Modular/portable arms vaults may be used for service in lieu of concrete constructed in place units where they can be located in a secure environment meeting AR 190-11 and DOD NSWC 3046-93-2 Standards. These pre-engineered vaults must meet all the above requirements of the constructed in place units.

### **Security Safe**

A security safe that is permanently installed (mechanically secured to the floor or wall) may be provided within the vault to store weapon parts and other highly sensitive items.

### **Loading Docks - UFGS 11 31 10**

In addition to the docks authorized for the data and parts vans and trailers, a loading dock should be provided in the receiving and shipping area of the Class IX operation. The dock should be of sufficient length to provide space for a minimum of three trucks simultaneously loading or off-loading supplies. The dock should be 15 ft deep to provide the required space for forklift operations, approximately 4 ft high, and covered with a roof. Each of the truck docking spaces should be equipped with a mechanical self-leveling dock leveler. One of the truck loading and off-loading dock spaces should have an enclosure equipped with an air seal to close the gap between the enclosure and truck body. If operational requirements make it necessary (that is, if the outside heating design temperature is 15°F or cooler), a heated air curtain should be provided at one or two doors (but not at the door with the enclosure). Rubber, neoprene, or wood dock bumper blocks should be included. Stairs to the dock(s) should be provided

as required. The dock(s) should have an access ramp no wider than 10 ft to provide forklift access to the dock. The lighting illumination level on the dock should be 30 FC.

## **DIVISION 12 FURNISHINGS**

### **Window Blinds - UFGS 12 21 00**

Operable blinds or shades may be provided in administrative and shop areas except workbays. Blackout shades and blinds should be installed in any functional areas where training or briefings may occur, including the break and assembly or safety briefing areas.

### **Furniture Systems (Workstations) - UFGS 12 50 00**

This specification establishes the minimum requirements for the acquisition and installation of a complete and usable system of modular workstations, freestanding work surfaces, electrical wiring and communication access requirements. A comprehensive interior design with furniture/equipment layout drawings and cost estimate construction documents must be provided. For complete interior design guidance reference UFC 3-120-10. Design funds for Military Construction Program Planning and Design must be used for all interior design construction documents preparation.

## **Interior Design and Administration**

### **GENERAL INFORMATION**

Interior Design is required on new building construction and renovation projects regardless of funding source or type of project. Planning furniture cannot occur too early for a project. Furniture, fixtures, and equipment should be identified in the programming phase by the designer. Currently the furniture plan is afterthought and is not included in the construction documents.

### **PURPOSE**

A Comprehensive Interior Design (CID) will provide, unless otherwise directed, and includes the Structural Interior Design (SID) and the Furniture, Fixtures, and Equipment (FF & E) Design. The CID provides a formal method for establishing the standard and requirements for all furniture, fixtures, equipment & sometime millwork. The Structural Interior Design includes building related design elements and components generally part of the building itself, such as walls, ceilings, floor coverings, and built in casework. The Furniture, Fixtures, and Equipment is the selection, layout, specification and documentation of workstations, seating, storage, filing, visual display items, accessories, window treatments, and artwork including contract documentation to facilitate pricing, procurement, and installation. The designer shall refer to UFC 3-120-10 Interior Design and UFC 4-610-10 Administration Facilities for additional information and requirements.

## PROFESSIONAL

The primary benefit to employing the Interior Designer directly is having an independent and objective advocate whose only focus is the function and aesthetics of the interior space. The main benefit of having an Interior Designer under contract to the Architect is enhanced communication and closer project coordination. In either case, the Interior Designer will have direct communication and coordination with both parties.

The Interior Designer's scope of services may include space planning; development of the furniture program and budget; design of custom millwork & furniture; selections of interior finish material and design motif; interior signage design and specification and specification of furniture and shelving. It should include several meetings to discuss functions of the interior spaces and furniture requirements. The layouts, selections of specific items, and presentation boards of colors and finish materials should be presented to the client as the phases are completed.

## PROCUREMENT

Refer to UFC 3-120-10 Interior Design for procurement methods for the CID.

## TIMELINE

During the programming phase, FF& E should be included. With early input, the space planner can accommodate the required furniture. It can also assure that a realistic budget is developed. Begin with a list all furniture items to be place in the facilities, included preferred dimensions, quantity, equipment to be housed and any electrical and data requirements. Existing furniture reused should be listed as refurbish. Below is an example of a spreadsheet that would assist in the preliminary furniture list may be used.

ITEM	ITEM NAME	#	LOCATION	EX/NEW	DESCRIPTION	FINISH	NOTES
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During the design phase, selection of furniture and budget should be done. Specification and drawings should be included in the construction document phase. The electrical and data coordination are also required early in the project.

## PERFORMANCE STANDARD

There are many points to consider when selecting furniture, functionality and durability are the primary. Performance standards should be reviewed prior to making any furniture decision. The Business and Institutional Furniture Manufacturer's Association (BIFMA) provides a listing of available standards. It currently lists the American National Standard for Office Furnishings (ANSI) standards for the following products: General Purpose Office Chairs, Lateral Files, Vertical Files, Desk Products, Panel Systems, and the BIFMA Ergonomics Guideline for VDT (Visual Display Terminal) Furniture.

## **BUDGET**

Cost Engineering (CE) will be an integral part of the design process. Apply the CE principles and practices in the pre-design and programming development stage relative to establishing costs. Initiate more CE cost relative to the scope and requirements at the concept design on program documents and use throughout the design and construction of projects. Based design decisions on life-cycle cost considerations to determine an economical design for facilities. Take into account not only the initial construction costs but also the operating and maintenance costs of buildings, the associated impacts on productivity and missions performed within the facility over their anticipated life. Designers must design within current cost criteria and requirements of each project's programming documents and Form DD 1391. Once the furniture itemized list and FF& E plan have been prepared, a preliminary budget can be estimated. It is important to use realistic costs rather than general cost per square foot. Allowances should included freight, delivery, installation relocation and sales tax. Contingency amount is for unforeseen items and unanticipated price increase. Allowances and contingency should be included in the budget. The budget should be update often as the CID is updated. Life-Cycle Costing is sometime factor in the budget and specifying furniture. It includes elements other than acquisition cost to determine the actual cost over time. The initial cost includes discounts, shipping, delivery, handling assembly, storage, installation, personnel, training, etc. Other elements to consider about the initial cost are service life of product; recurring operational costs and maintenance cost. Life Cycle Costing adds another dimension to the budgeting process and provides additional quality control by analyzing the cost of the product over its lifespan, with the added potential for operational and maintenance cost savings.

## **CRITERIA**

Besides the functionality and cost, appropriateness to the over-all design concept is one of the first criterions used in selecting furniture finish materials. Careful attention should be paid to matching materials and stain colors and sample submittals for all products should be examined and compared. Durability and longevity is another important criterion in selecting materials. If a material won't stand up to heavy use and wear or can't be easily repaired, then it probably shouldn't be used. To minimize static electricity generation in sensitive computer areas, wood or other nonconductive materials should be used rather than plastic coated or metal furniture. Vinyl upholstery can also contribute to the problem. Wool or wool nylon blends would be a better choice. Ergonomically should be taken into consideration. It is designed to adjust to the user's body such as the mechanisms ranging from simple seat height to multitude of adjustments.

## **MAINTENANCE ISSUES**

All furniture materials must be maintained. Maintenance instructions should be requested from each manufacturer and kept together for reference. Often the life of a material is determined by the care it receives. Correct cleaning procedures will help

preserve the furniture. Follow cleaning instruction and maintenance instruction per the manufacturer.

## **DIVISION 13 SPECIAL CONSTRUCTIONS**

### **A. Intrusion Detection System (IDS) General Information**

The Electronic Security Program Office (ARNG-ILI-F) has selected three (3) IDS for protection of Federal assets and arms, ammunitions, and explosives (Ademco Vista 128 Panel; FBI XL4 Panel; IST/EUROPLEX 2064NG Panel). IDS shall be installed in each facility containing an arms and/or ammunition vault. The system shall consist of a Commercial IDS furnished by the Federal government and installed by the contractor or State. The IDS shall include the following:

#### **Vault Pre-Entry Area**

The space providing access to a vault should have the following:

- One ultrasonic motion sensor directed at the vault door
- An ultrasonic motion processor
- Balanced magnetic switches on all doors and operable windows
- A time delay device with timer and duress capability.

#### **Arms Vault Protection/Commercial IDS**

The arms vaults should have the following controls and related equipment:

- A balanced magnetic switch on the door
- Passive ultrasonic sensors throughout (vibration sensors where ultrasonic noise levels prevent the use of passive ultrasonic sensors)
- A passive ultrasonic processor
- A data transmission system located in the control unit connected to a dedicated telephone line for monitoring

### **B Pre-Engineered Structures - UFGS 13 34 19**

Pre-engineered structures may be used for the following if they meet functional requirements:

- Controlled waste-handling facility
- Covered (enclosed), unheated vehicle and parts storage
- Covered storage areas

If required, shelving and access metal ramps affixed to the structure may be purchased as part of the unit. These structures are to be attached to a concrete slab, and the electrical power line is to be hardwired to the electrical control panel of the structure.

The same electrical and mechanical service requirements need to be met as in conventional construction.

## **C Sensitive Compartmented Information Facility (SCIF).**

**Ref:** UNIFIED FACILITIES CRITERIA (UFC) 4-021-02NF. Security Engineering: Design of Electronic Security Systems (ESS). ESS is the integrated electronic system that encompasses the Access Control Systems (ACS), interior and exterior Intrusion Detection System (IDS), Closed Circuit Television Systems (CCTV systems) for assessment of alarm conditions, the Data Transmission Media (DTM), alarm reporting systems for monitor, control, and display, and the policies, procedures, and response times that ensure that all elements of the ESS work effectively.

SCIF can be an enclosed area within a building (a room), a trailer enclosed in special panels to prevent information from leaking and where jamming is used to prevent surveillance or a facility capable of storing Sensitive Compartmented Information (SCI) materials. Requirements for these facilities are defined in Intelligence Community Directive (ICD) 705 or latest and Intelligence Community Standard (ICS) 705.1 – Guidance on SCIF Construction.

### **Design Considerations and Guidance**

1. **Introduction**
  - All new and renovated SCIFs in the ARNG must be designed to the requirements of UFC 4-021-02NF and 705.1 – Guidance on SCIF Construction.. The design will be sent to ARNG-ILI before construction for review and approval..
2. **Entries and Exits**

SCIFs are limited to only one entrance unless approved by the Cognizant Security Authority. Use of external door hardware is prohibited on SCIFs (with the exception of the SCIF entrance)..

Per DoD Directive 8190.3, the CAC should be “the principal card enabling physical access to SCIFs. Other supplementary security systems (such as badging systems) that are considered necessary to provide an additional level of security not presently afforded by the CAC may be used.
3. **INTRUSION DETECTION SYSTEM (IDS).** Reference: Chapter 5 of UFC 4-021-02NF. The principal elements of IDS include interior sensors, exterior sensors, Central Processing Unit (CPU) or local controllers, communications and interfaces with ACS, CCTV and the Dispatch Center. Do not use dual-tech devices in SCIFs. Dual-technology sensors can only be used in a SCIF, vault, or secure room if the technologies operate in an “OR” configuration (either the microwave or PIR sense an intruder). Therefore dual technology sensors are not recommended for this application.
4. **PCU - SCIFs must have a PCU installed** Per the DCID 6/9 definition a PCU is a (CPU). See Figure 3 on Page 132, at the end of this document. A PCU receives signals from all associated sensors in the SCIF’s alarmed zone and establishes

the alarm status. The alarm status is immediately transmitted to the monitoring station within the monitoring station, a dedicated alarm-monitoring panel (or central processor) monitors incoming PCU signals. On receiving an alarm signal, a monitoring station's enunciator generates an audible or visual alarm for the monitoring personnel

5. **CCTV Installation** CCTV cameras should not be installed in areas that may compromise classified material (such as SCIFs).
6. The computer running within this facility must operate under rules set forth in ICD 503. Computer and telecommunication equipment within must fall within the TEMPEST emanations specification as directed by a Certified TEMPEST Technical Authority (CTTA).
7. **Backup Power Battery Backup** - The minimum requirement for battery backup for an IDS and its monitoring station is eight hours. If primary power is subject to being out for longer periods, increase backup capacity accordingly. The requirement for battery backup for a SCIF and its monitoring station is 24 hours. The battery backup requirement for a SCIF can be reduced if the system is on a generator. Monitoring stations must have visible and audible indicators to inform system operators of failure of a power source, a change in power source, and the location of the failure or change. Any metallic conduit that leaves an area that processes classified information such as a SCIF must be decoupled (insert of nonmetallic conduit) when existing the area.

## SECTION 5 MECHANICAL AND PLUMBING SYSTEMS DESIGN

### DIVISION 14 CONVEYING SYSTEMS

#### Hydraulic Elevators - UFGS-14 24 00

The majority of ARNG facilities are not more than three stories in height; therefore, hydraulic elevators should be used in compliance with TI 810-90

### DIVISION 21: FIRE SUPPRESSION

#### Fire Protection Systems - UFGS 21 13 00

An automatic sprinkler system with a fire alarm signaling system should be designed and installed. The system shall meet the requirements of the IBC, UFC 3-600-01 Fire Protection Engineering for Facilities and NFPA 13 and NFPA 72 of the National Fire Codes. Buildings must be of noncombustible construction meeting IBC or Uniform Building Code (UBC) Type I and II. Regardless of the construction type, any facility meeting any of the following criteria should be provided with an appropriate fire protection system:

- The area exceeds 15,000 ft<sup>2</sup>.
- Operational impairment would reduce the operational readiness and responsiveness of the strategic or tactical defensive and offensive capability.

- The contents include direct war-fighting assets (combat aircraft or tactical vehicles).
- The facility and contents housing critical equipment requiring a long lead time to replace that have a high monetary value with a replacement cost or value exceeding \$5.0 million.

### **Fire Protection System (AFFF) - UFGS 21 13 24**

Aqueous Film-Forming Foam should be used for Army Aviation Support Facilities helicopter maintenance hangars.

Wet Pipe Sprinkler System - UFGS 21 13 13.00

Dry Pipe Sprinkler System - UFGS 21 13 17.00

Foam Fire Extinguishing for Aviation Facility - UFGS 21 13 20.00

Foam Fire Extinguishing for Haz/Flam Materials - UFGS 21 13 22.00

## **DIVISION 22 PLUMBING SYSTEMS**

### **System Sizing**

Plumbing systems should be designed and installed in accordance with the International Plumbing Code, American Society of Plumbing Engineers (ASPE) Data Book and the State/Local Plumbing Codes.

### **Piping Insulation - UFGS 22 07 19**

Heating, cooling, and plumbing piping should be insulated in accordance with ASHRAE Standard 90.1-2007 or the State Energy Code. Waste and drainage piping should be insulated with a sealed vapor barrier where condensation may occur. Insulation type should be as indicated in related ASTM standards. Insulation application should be in accordance with MICA Standards.

### **Piping Systems Support - UFGS 22 05-48**

The materials for piping supports should be in accordance with Manufacturers Standardization Society (MSS) SP-58, SP-69, and SP-89. The design A-E should provide a pipe flow diagram showing all sizes, flow rates, valves, coils, vessels, and pumps. Typical piping details for coils, vessels, and pumps should be part of the contract drawings to support the test and balance contractor and maintenance staff.

### **Pipe Labeling**

Piping systems should be labeled for identification purposes. Where painting is authorized, the pipe exposed to view may be painted to match adjacent surfaces. Piping should be labeled to indicate the fluid and direction of flow.

### **Piping Specialties - UFGS 22 00 00**

The following should be provided:

- Thermometers at the inlet and outlet of hot water boilers, heat exchangers, and major AHU coils
- Thermometers at the outlet of domestic water heaters
- Pressure gauges at the inlet and outlet of HVAC pumps and at hydronic system water makeup points
- Strainers at the inlet of pumps

### **Domestic Water Piping - UFGS 22 00 00**

Domestic water piping should be insulated Type M copper for hot and cold service, with heat-free solder.

### **Sanitary Waste and Vent Piping - UFGS 22 00 00**

Sanitary waste lines for above-grade and venting service should be cast iron soil pipe Schedule 40 PVC or copper alloy drain, waste, or vent (DWV) tubing. All below-grade sanitary waste lines under the building should be cast iron soil pipe.

### **Storm Drainage Piping - UFGS 22 00 00**

Storm drain pipes shall be Schedule 40 PVC for conductors and cast iron soil pipe for below-grade service. Interior roof drains discharging onto grade are authorized for large roof areas but must be coordinated with the civil storm drains and regulations. Interior roof drains discharging into underground piping systems are authorized in areas where the heating design temperature, as determined from the 97.5 percent column in UFC-3-400-02, is (+) 10°F dry bulb or less. Federal support is also authorized for the underground piping system in these areas. The design A-E should provide roof relief scuppers in accordance with the plumbing code where parapets surround the drainage area.

### **Fuel Piping - UFGS 22 00 00**

Gas and fuel oil piping should be Schedule 40 black steel or Type L copper tubing. (Steel fuel oil piping should have welded joints.) Fuel-dispensing output capacity should not exceed 26 gpm. Special approval is needed for high-speed, large-capacity units involving multiple dispensing systems and a pump located in the tank.

### **Plumbing Fixtures - UFGS 22 00 00**

Water closets should have self-closing valves, flushometers, and low-flow-type fittings for water conservation. The number provided should be based on the International Plumbing Code (IPC) or the State plumbing code, whichever is most stringent. Floor-mounted or wall-hung tank-type fixtures of vitreous china shall be specified where water pressure is a factor. Flush valve fixtures may be used where the required water pressure is available.

**Lavatories - UFGS 22 00 00**

Countertop lavatories should be provided in female toilet rooms, and either countertop or wall-hung units should be provided in male toilet rooms.

**Showers - UFGS 22 00 00**

The amount of showers should meet the requirements of the IPC, the State code, or NG PAM 415-12, whichever is more stringent.

**Mop Sink - UFGS 22 00 00**

Each occupied building should have a minimum of one janitorial closet with a mop sink per floor.

**Water Coolers UFGS 22 00 00**

Water cooler drinking fountains are authorized in barracks, educational facilities, medical clinics, dining facilities, training site headquarters, all unit headquarters buildings, and any other location where required by an applicable code. They should not be recessed unless they would cause a safety hazard or unless recessing is required to meet Federal, State, and/or local codes.

**Eye Wash and Deluge Shower - UFGS 22 00 00**

An eye wash and deluge shower, equipped with an audible alarm that is activated when they are operated, should be installed in any area where personnel could be accidentally exposed to harmful wastes in accordance with ANSI Standard Z358.1-2004. The alarm should be located where workers outside of the immediate area can hear it and respond. The location of the eye wash and deluge shower should allow easy access from any point in the facility (10 second walk). Floor drains are not recommended. Tempered water is required to be between 70-95 degrees F.

**Exterior Wall Hydrants - UFGS 22 00 00**

Freezeless anti-siphon wall hydrants should be provided no closer than 100 ft apart on the exterior walls of a building.

**Hot Water Heaters - UFGS 22 00 00**

Separate point-of-use water heaters, instead of circulating pumps and piping, may be provided for remotely located toilet areas.

**DIVISION 23 HEATING, VENTILATING, AIR CONDITIONING**

**General Information**

Mechanical systems should be designed in accordance with the latest recommendations of ASHRAE Handbooks and Standards and the ACGIH Industrial Ventilation Manual. Ductwork for heating, cooling, and exhaust should generally be overhead instead of underground, and should be minimized to the shortest runs

possible. All ductwork should be of sheet metal, and designed and constructed in accordance with handbooks and standards by ASHRAE and the Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).

### **HVAC System Sizing**

The system components should be selected to maintain an inside winter design temperature of 68 °F during the heating season except in storage rooms, maintenance training work bays, and the weapons vault, where the design temperature should be 55 °F. Summer inside Design Temperatures should be 78 degrees F and 50% RH maximum and 30% RH minimum. To the greatest extent possible, the areas designated for part-time occupancy should be on separate zones from those having full-time occupancy. Exterior design conditions must be in accordance with UFC-3-400-02, Engineer Weather Data and ASHRAE Handbook of Fundamentals.

### **Seismic Bracing - UFGS 23 05 48**

In all regions where the building design must comply with seismic force resistance, the design A-E should provide bracing and anchoring of interior and exterior mechanical piping and equipment for protection from damage. Bracing and anchoring should be designed and installed in accordance with UFC 3-310-03A, Seismic Design for Buildings and ASHRAE Application Handbook.

### **Ductwork Insulation - UFGS 23 07 00**

All heating and cooling system supply and return air ductwork should be externally insulated following the latest recommendations of the Midwest Insulation Contractors Association (MICA) National Commercial & Industrial Insulation Standards and ASHRAE Standard 90.1-2007. Internal insulation should be used only on exhaust ducts. Return and exhaust ducts do not require insulation within conditioned areas. Direct lining should not be used in supply ducts.

### **Heating Systems - UFGS 23 54 19**

An LCCA must be performed. It should address the initial construction cost and annual operating and maintenance cost, calculated in discounted dollars, for each proposed system. The analysis should clearly indicate which system has been selected, and if it is not the lowest-cost option, a justification should be presented.

### **Heat Pumps Water/Ground Source - UFGS 23 81 47**

Water source heat pumps may be used if justified by the LCCA. Heat pumps provide efficient operation, especially where electric resistance heating is the only other viable option. Heat pumps permit zoned temperature control and allow temperature to be set back on a room-by-room basis when spaces are unoccupied.

### **Infrared Radiant Heaters - UFGS 23 54 16**

Infrared radiant heaters using oil or natural gas for fuel may be used for vehicle workbays and for shipping and receiving areas of warehouses.

### **Energy Sources**

The selection of the energy source for the heating system is part of the LCCA process which establishes the most cost-effective alternative available in accordance with the provisions of AR 420-49. The viable alternatives include:

- Fuel oil
- Natural gas
- LPG
- Electricity
- Solar
- Geothermal

If fuel oil is the primary source, an above-ground storage tank or an underground storage tank (with double-wall containment and monitoring wells) may be installed. If natural gas is the primary fuel, the boiler may be equipped with dual fuel burners and an interior pipe line to the exterior building wall (but not a storage tank) to facilitate possible future conversion to the use of fuel oil as the energy source availability and economics dictate.

### **Pollution Control - UFGS 23 51 43**

Heating systems are subject to Federal, State, and local air pollution control regulations. Generally, heating systems are regulated based on the fuel source and design heat input in British thermal units (Btu) per hour. If the heat input exceeds a regulated limit, an air permit may be required for construction.

### **Boilers Heating Systems - UFGS 23 52 00**

If a boiler is chosen as the most economical system, a hot water unit is more economical to operate than a steam unit. Boilers may use coal, natural gas, or oil, to be determined based on the appropriate fuel selection procedures. Two heating boilers may be selected, provided that the output capacity of each boiler would not exceed two-thirds of the design heating load. Hot water heating systems generally are economical in cold weather climates and should not be considered for warmer climates unless an LCCA proves them to be the most cost effective. Chemical treatment of water should be used where analysis indicates it is necessary.

## **Mechanical/Industrial Ventilation Systems - UFGS 23 35 19**

Mechanical ventilation systems for summer operation of non-air-conditioned areas should provide a minimum of four air changes per hour. The minimum air changes per hour for interior heat control should be based on the internal heat gain. The minimum air change per hour for dilution ventilation and exhaust should be as recommended by the ASHRAE handbooks, the ACGIH Industrial Ventilation Manual, and OSHA Standards for General Industry. Special exhaust systems are required as identified in each facility-type design guide. Mechanical ventilation should be provided in all climates during the summer and winter seasons.

## **Air Conditioning Systems and Evaporative Cooling**

Mechanical air conditioning or evaporative cooling for personnel comfort shall be in accordance with AR 420-49, Chapter 7, Air Conditioning and Refrigeration. Spaces to be air conditioned should be consolidated to the maximum extent feasible and efficiently zoned within the system design. Central station air handling or packaged units with 35% efficiency filter banks should be used to the maximum extent possible. Independent units of the appropriate size should serve small, remotely located spaces. HVAC equipment should be located in indoor mechanical equipment rooms wherever possible to facilitate maintenance and extend equipment life.

## **System Sizing HVAC**

The system components should be sized to maintain a summer indoor design temperature of 78 °F with a maximum RH of 50 percent and a winter indoor design temperature of 68 °F and 35% RH based on an outside design temperature as designated in ASHRAE Fundamental Handbook and UFC-3-400-02 Design Engineering Weather Data for the project location.

Desiccant Dehumidification Equipment - UFGS 23 84 16

Energy Recovery Systems - UFGS 23 72 00

Filters-HVAC Systems - UFGS 23 41 13

## **System Controls - Direct Digital - UFGS 23 09 23**

A system of direct digital controls should be used to maintain the interior temperature at the design level during periods of occupancy and at lower temperatures (40 to 50 °F) as appropriate when unoccupied. Pneumatically operated systems may be used as an extension of an existing system.

## **DIVISION 25: INTEGRATED AUTOMATION**

### **Energy Management & Control System - UFGS 2510 10**

Utility monitoring and control systems should be used to conserve energy by providing a capability to preset the appropriate temperature levels for unoccupied periods. An outdoor temperature-sensing control located near the mechanical room should be

provided to automatically shut off the heating system when the outdoor temperature reaches or exceeds 65 °F for more than 24 hours. The outdoor temperature-sensing control should have a convenient manual override.

## **SECTION 6 ELECTRICAL AND COMMUNICATION SYSTEMS DESIGN**

The electrical and communication systems design should consist of safe and economical power distribution, lighting, communication, and fire alarm and signaling systems meeting present requirements and anticipated future growth. The design should meet requirements of NFPA, applicable codes, and Unified Facilities Criteria.

### **DIVISION 26: ELECTRICAL**

#### **General Information**

##### **Exterior Electrical Design**

Direct burial cable marked with above-ground indicators at appropriate intervals should be used to the maximum practical extent. Conduit should be limited to those sections passing under paved areas unless the local electric company policy is to install all underground service in conduit. Lighting and power loads should be served at the highest voltage practicable. The design A-E should specify primary power at three-phase, 480Y/277 volts and use a dry-type transformer to obtain 208Y/120 volts where required.

##### **Service Line**

The secondary power supply line should be sized adequately to accommodate any future projected demand. The electrical power to such items as fuel-dispensing systems and lubrication and inspection racks is included under this item. Extension of the primary power supply line, substations, and transformers should be the financial responsibility of the locality or State, except when a proposed building is located on Federal property. **Generators must be provided for Readiness Centers, Aviation Support Facilities, USPFO/Warehouse, Barracks and Dining Facilities.** The designer must provide the necessary auxiliary equipment.

- A quick power disconnect
- An automatic transfer switch (manual w/o generator provided)
- Fuel oil and diesel piping from the storage tank
- An 8-ft by 16-ft by 6-in. reinforced concrete pad near the main power service

##### **Interior Electrical Design**

The design for the electrical systems should include provisions for safe and economical electrical distribution, lighting, communications, and signaling systems that meet present requirements and anticipated future growth. The electrical power distribution system should be designed to meet all requirements of UFC 3-520-01 and NFPA 70.

## **Seismic Bracing**

The design A-E should provide bracing and anchoring of electrical conduit, cable trays, and equipment to protect them from damage due to seismic forces where the regional requirements dictate. Refer to UFC 3-310-03A, Seismic Design for Buildings and the International Building Code for guidelines regarding seismic bracing requirements.

### **Wiring – UFGS 26 05 19**

Wiring (including conduit for future communications), junction boxes, and plug-in receptacles may be selected for use in a grid arrangement above the suspended ceilings in large open administrative areas. This is to be used in conjunction with "telephone power pole" systems or conventional wall and/or floor pedestal outlets. Wiring and conduit may be labeled or tagged for circuit identification but should not be painted. Electrical metallic tubing or rigid conduit should be used where required by code. The administrative areas, corridors, lobby, toilets, classrooms and library, learning center, food preparation and scullery area, and physical fitness area should have concealed conduit, which may also be used throughout the facility.

To reduce overheating of the neutral conductor due to harmonic currents caused by switch mode power supplies in computer equipment, the neutral of multi-wire branch circuits should be sized at 175 percent of the phase conductors. The oversized neutral will occur at multi-wire branch circuits, which may have computer equipment connected. Using the oversized neutral has two benefits over separate circuits: 1) reduced cost because of decreased wire and conduit quantities; 2) reduced voltage drop because a three-phase voltage drop is less than a single-phase voltage drop and the oversized neutral has less voltage than the code minimum neutral.

## **Electrical Receptacles**

Electrical receptacles should be provided in accordance with tables included in the appendices of each facility-type design guide. Emergency power receptacles shall be red in color.

## **Electrical Power**

The interior electrical system should be designed for the most efficient and economical distribution of power, using the highest voltage consistent with the load served. A three-phase, 208Y/120-volt system should generally be the minimum, with consideration given to the use of a 480Y/277-volt system where loads are sufficient to justify it.

## **Primary Electrical Service**

Primary electric service shall be provided underground from the nearest pole to pad-mounted, three-phase transformers located near the exterior of the mechanical equipment room or load center.

## **Secondary Electrical Service**

Secondary electric service from transformers to the building shall also be underground. If metering is required, the electric meter should be placed on the secondary service side rather than the primary service side. Digital Meters should be provided to each building.

Emergency Generators/Automatic Transfer Switch - UFGS 26 32 15/26 28 21

Generators should be placed away from areas averse to noise and fumes, to include fresh air intake louvers. Reference NFPA 110, Standard for Emergency and Standby Power Systems. An Emergency Power Generator and Automatic Transfer Switch must be provided for every Readiness Center, Army Aviation Support Facility, Barracks, Dining Facility and USPFO/Warehouse.

## **Ground Fault Protection**

Ground fault provisions should be in accordance with NFPA 70. Ground fault protection may be used for all receptacles where power tools will be used.

## **Service Distribution**

Service and distribution equipment exceeding 600 volts should be metal enclosed and manually operated, with fusible load-interrupter switches or power circuit breakers. Low-voltage services should have power circuit breakers or fusible disconnect switches.

**Interior Distribution** - UFGS 26 20 00

The electrical system design should include the most efficient and economical distribution of power, using the highest voltage consistent with the loads served. A three-phase, 208Y/120-volt system is generally the minimum, with consideration given to the use of a 480Y/277-volt system where loads are sufficient to justify it.

**Lightning and Surge Protection** - UFGS 26 41 00 n

The design A-E should specify a lightning protection system for any building located in an area with a high lightning probability using the risk assessment calculation specified in *NFPA 780, Standard for the Installation of Lightning Protection Systems, Appendix H*. Power line surge protection equipment should be specified at the main service panel, mid-building panel, and any dedicated electronic or computer equipment service panel.

**Power Panels** - UFGS 26 24 16

Power panels, telecommunications equipment, and electrical equipment should be located in secure areas free from environmental extremes of temperature, dust, and humidity. Power panels may not be placed in storage rooms or janitor closets.

### **Interior Lighting Systems - UFGS 26 51 00**

The lighting system design objectives are to economically provide lighting levels for efficient working conditions and effective nighttime vision for security and safety. The lighting system should be designed according to the Illuminating Engineering Society of North America (IESNA) Lighting Handbook and NFPA 70 National Electric Code.

### **Interior Fixture Types - UFGS 26 51 00**

Except in high bay maintenance and classified areas, standard energy-efficient fluorescent light fixtures should be used. Fluorescent lighting may be used in high bay maintenance areas to supplement the metal halide lamps. Parabolic louver fixtures or indirect lighting should be provided in room areas with computer or monitor screens. The design A-E should take the maintenance and inventory cost of lamps and ballasts into consideration when selecting fixture types. T-8 fluorescent lamps and high-efficiency electronic ballasts should be used to achieve a 0.85 Watts/SF lighting power density.

### **Interior Lighting Intensity Level - UFGS 26 51 00**

Lighting levels should conform to the foot-candle levels established for the individual functional areas as specified in the facility-type design guides. If required, portable lighting equipment purchased through standard supply channels should provide special supplementary localized lighting of higher intensity. All interior lighting should be designed in accordance with ANSI/ASHRAE/IESNA Standard 90.1-2007.

### **Exterior Lighting Systems - UFGS 26 56 00**

Lighting should be provided on site at the following locations:

- At entrances to the site and building(s)
- Along sidewalks from parking areas to building entrances
- At military vehicle and POV parking
- Around the entire building perimeter
- At other areas as required for safety and security
- At flag poles

Lighting fixture types should be selected and placed to minimize intensity off site. The lighting for military vehicle parking should illuminate 30 to 40 ft of the area outside the fenced area where M-1 tanks are stored, if that area is within the facility property line.

### **Exterior Fixture Types - U FGS 26 56 00**

High-pressure sodium vapor or metal halide vandal-resistant lenses should be specified. When motion detectors are used in conjunction with security lighting, lights should have the capability to activate instantly. After movement within the area discontinues, the lights should remain on for 15 minutes.

### **Exterior Lighting Intensity Level - UFGS 26 56 00**

A minimum illumination intensity of 0.50 FC should be provided over the entire site. Existing street lighting should be taken into account in the design computations. The design A-E should make sure that the entire exterior of the facility is adequately illuminated for safety and security without undue glare falling on neighboring properties or landing aircraft. Lighting of fuel-dispensing facilities is authorized at an intensity of 20 FC at 3 to 4 ft above finished grade.

### **Explosion-Proof Fixtures**

Lighting fixtures and electrical service located in classified areas (Class I, Division 1 and 2) should be designed and constructed to meet the requirements of the National Electrical Code (NEC), Article 500.

### **Emergency Egress Lighting - UFGS 26 52 00.00 40**

Dual-purpose fluorescent fixtures with internal battery backup at appropriate locations including corridors, hallways, stairs, and fire exit egress should be considered as an alternative to dedicated emergency battery units (EBUs). Such fixtures generally would be the most economical alternative and would not require any special circuitry. Dual-purpose fixtures incorporate battery backup units and continue to function during power outages. If only EBUs are used, they shall be hardwired rather than the plug-in type.

### **Exit Signs - UFGS 26 53 00**

Either illuminated or non-illuminated exit signs should be provided in accordance with applicable codes. Exit signs shall be the light-emitting diode (LED) type.

### **Lighting for Infrared Scanning**

Designated lighting should be equipped with a sensor that illuminates the fixture(s) when the infrared scanning device detects motion. The lighting system may be equipped with an override switch that activates all perimeter lights on demand.

## **DIVISION 27 COMMUNICATIONS**

### **Communication Systems**

Conduit and cable should be provided for all components determined by the State DOIM.

## Telecommunications and Cable Requirements

At the programming stage of the project, the CFMO should coordinate with the State Director of Information Management (DOIM) to determine the entire telephone and data communications system to be installed. Telecommunications cabling includes voice, video, and data in a single integrated plant. The cabling should be installed in accordance with *Interim Guidance from U S Army Information Systems Engineering Command, Technical Guide for Installation Information Infrastructure Architecture Technical Guide for 13A, UFC 3-580-01 Telecommunications Building Cabling Systems Planning and Design*; and the Telecommunications Industry Association (TIA)/Electronic Industries Alliance (EIA) 568A and 569-A Standard. Service at the facility should consist of a buried cable with sufficient pairs of wires to accommodate present and future requirements. In the construction drawings and specifications, the design A-E should specify the following as “contractor furnished and installed”:

- The system's outside trenching, plastic conduit, and cable to the terminal board, which is located in or near the mechanical or electrical room
- The cable trays
- Outlet boxes
- Wiring, including associated fittings, connectors, terminal strips, and similar devices needed to install the cable
- The cabinet mounting board

### Fiber Optic Cable - UFGS 27 21 10

The DOIM should consider a fiber optic outside cable even though the telephone company's primary cable is not a fiber optic cable. The fiber optic cable would still allow for connection to a conventional telephone system inside the building.

### Telephone Outlets

A maximum of one CAT- 6 telephone outlet should be provided at each of the following locations:

- Independent offices
- Approximately 70 ft<sup>2</sup> of open administrative area
- Each supply and repair area
- Outside the vault door to facilitate Commercial IDS testing
- Technical library, Classrooms and Training Areas
- Lobby (public telephone)

### **Power for Microprocessors**

As long as an adequate number of electrical outlets are provided in areas where microprocessors are to be used, and the circuitry is properly designed to accommodate the anticipated loading, there should be no need for special dedicated circuit wiring for computer use. An exception is the Read Clear All Scalars (RCAS) server and printer location.

### **Antenna Base and Lead-In**

Where one or more of the functional areas at the facility are authorized, a ground-mounted antenna system (either through the terrestrial directional antenna or other sources) with a concrete base and a conduit (with pull wire) leading into the building should be provided. If an antenna mast is roof mounted, a roof-mounted base, mounting brackets, guy cable tie-down, and conduit may be provided as part of the construction. Detailed coordination between the design A-E, the Military Department, and the user are necessary to identify the exact requirements.

### **Public Address System - FGS 27 51 16**

Conduit, wiring, and equipment may be installed for the public address system as part of program requirements. This system should be audible throughout the buildings of the complex and at a reasonable distance outside in order to contact personnel whose exact location is not known. Generally, the unstaffed outbuildings do not require this system; if they do, NGB-ARI requires an approved justification.

## **DIVISION 28: ELECTRONIC SAFETY AND SECURITY**

### **Carbon Monoxide Detectors - UFGS 28 31 49**

Carbon monoxide detectors must be placed in all vehicle and aircraft maintenance Work Bays to create an alarm condition to activate second stage exhaust/ventilation system.

### **Fire Alarm/Detection and Mass Notification System -UFGS 28 31 76**

An automatic fire alarm and detection system must be designed and installed in accordance with NFPA-72 and UFC 3-600-01, with a connection to the supporting fire-fighting unit. However, combined smoke and heat detectors (UL approved, with both smoke- and heat-detecting capability) should be installed in all billeting areas, including corridors. The smoke-detecting component should sound a local alarm confined to the fire-affected room(s), while the heat-detecting component should be connected to the building alarm system. Detectors should be spaced at not more than 30 ft on center and 15 ft maximum between a door and a detector. A Mass Notification System is required in any inhabited facility in conjunction to the Fire Alarm and Detection System. The system must be UL listed and Factory Mutual approved for the intended use.

## **SECTION 7: UTILITIES FUEL STORAGE**

### **DIVISION 33: UTILITIES**

#### **Above-Ground Storage Tanks - UFGS 33 56 10**

Above-ground storage tanks may be either single-walled steel or doubled-walled fiberglass-reinforced plastic. The tanks should be designed and installed in accordance with the American Petroleum Institute standards and NFPA 30, Section 2. If it is possible for the liquid contents to flow onto adjacent property or into a public waterway, tanks exceeding 500 gallons in size should be surrounded by a liquid-tight dike equipped with a drain sump, drain pipe, locked-type gate valve, and minimum of two tank grounds. All vegetation should be cleared from within the dike area. The dike area may be made liquid tight by lining the dike with neoprene, rubber, clay (such as bentonite), concrete, or some other impermeable material, whichever is cost effective.

#### **Underground Storage Tanks - UFGS 33 56 10**

Underground storage tanks (USTs) (with a concrete hold-down pad and anchor straps, if required by wet soil conditions) shall be designed and installed in accordance with 40 CFR Parts 280 and 281; NFPA 30, Section 2; and/or State and local codes, whichever is more stringent. The USTs should be double-wall construction of either steel or fiberglass reinforced plastic, whichever is the least costly. (The steel tank is the standard; the fiberglass tank may be bid as an additive alternate.) Steel tanks should be coated with either a coal tar or epoxy and should be cathodically protected or coated with glass fiber-reinforced polyester resin. The USTs should be monitored between the outer and inner shells by means of a leak detection system with an audible alarm and indicator lights.

Underground piping should be of steel or nonmetallic materials. Steel piping shall be cathodically protected. Steel piping and fittings should be primed and protected with pressure-sensitive organic plastic tape or coated with the same material as used to coat the tank. Double-wall piping may be used.

#### **Fuel Storage Tanks (Compresses Gases) - UFGS 33 56 10**

When fuel oil or liquefied petroleum gas (LPG) is selected, a 30-day supply is authorized for the capacity of the storage tank. Fuel storage facilities shall conform to all applicable Federal, State, and local vapor emission and water pollution control (spill planning) regulations. Either above- or underground fuel tanks are authorized.

## **SECTION 8 MATERIAL HANDLING**

### **DIVISION 41 MATERIAL PROCESSING AND HANDLING EQUIPMENT**

#### **Top-Running Overhead Cranes - UFGS 41 22 13.14**

*(Reference DG-415-2 and DG 415-3 requirements)*

**CHAPTER 7**  
**SUPPLEMENTAL SUBMISSION REQUIREMENTS**

*(To be determined and developed As Required)*

## CHAPTER 8

### FUNCTIONAL QUALITY ASSURANCE

#### 8-1 MILESTONE COMPLIANCE ASSURANCE

To verify that all functional and performance goals are being accomplished in the project development process, the design review directives checklists in **Appendix C, TABLE 6-1** should be used in the review exercise performed at the 10 percent, 35 percent, and 95 percent design and documentation submission milestones for each facility type (refer to the facility-type design guide for additional, unique design review directives). These reviews are not intended to be an all-inclusive technical analysis related to design criteria. That responsibility belongs to the State and should be accomplished prior to submission of the documents to NGB-ARI at the milestones. The main focus of the NGB-ARI review shall be on effective incorporation of functional requirements that are both general and unique to the different types of facilities.

#### 8-2 DESIGN REVIEW DIRECTIVES FORMAT

The design review directives are arranged to address the following:

- General project coordination issues
- General issues pertaining to each discipline
- Specific functional issues pertaining to each discipline

Many of the checklist items refer directly to the related technical guidance information in Chapter 6, Common Architecture and Engineering Technical Guidelines, by indication in the left margin. Others make reference to SPiRiT/LEED-NC compliance and related industry standards.

#### 8-3 REVIEW TASKS

Each review task is written in the form of a directive. This format describes the task to be accomplished to ensure compliance with the functional design intent and adequacy of the information related to the requirements of the milestone submission.

## APPENDIX A

### REFERENCES

The following lists criteria in the form of regulations and industry standards to use in designing ARNG facilities in addition to the references listed in the facility-type design guides. The design A-E should use the current applicable edition of all references.

#### GOVERNMENT PUBLICATIONS:

1. Executive Office
  - EO 13423, Strengthening Federal Environmental, Energy and Transportation Management.
  - Energy Independence and Security Act of 2007 (EISA 2007)
  
2. U.S. Army Corps of Engineers (USACE)
  - ETL 1110-1-177, Use of Resin modified Pavement.
  - ETL 1110-3-481, Containment and Disposal AFFF Solution.
  - ETL 1110-3-484, Aircraft Hangar Fire Protection Systems.
  - ETL 1110-3-485, Fire Protection for Helicopter Hangars.
  - ETL 1110-3-491, Sustainable Design for Military Facilities.
  - General Instruction Building and Army Continuing Education System Standard Design Criteria.
  - TI 810-90, Technical Instructions – Elevator Systems.
  - Technical Instructions – Structural Design Criteria for Buildings.
  - TI 800-01, Design Criteria.
  - TI 809-04, Seismic Design for Buildings.
  - TI 810-90, Elevator Systems.

Training Centers – ARNG/USAR Facilities  
Standards Booklet.

3. U.S. Green Building Council  
USGBC Green Building Rating System  
LEED-NC
4. Army National Guard (ARNG)  
NGR 415-5, Army National Guard Military  
Construction Program Development and  
Execution.  
NGR (AR) 415-10, Army National Guard  
Facilities Construction.  
NG PAM 415-12, Army National Guard  
Facilities Allowances.  
NGR 5-3, Army National Guard Training  
Centers (Management).
5. U.S. Department of Agriculture,  
Natural Resources Conservation  
Service (formerly the Soil  
Conservation Service)  
TR-55, Urban Hydrology for Small  
Watersheds.  
<http://www.wcc.nrcs.usda.gov/water/quality/cost.html>
6. Department of the Army  
AR 11-27, Army Energy Program.  
AR 190-11, Physical Security of Arms,  
Ammunition and Explosives.  
AR 190-13, The Army Physical Security  
Program.  
AR 190-51, Security of Unclassified Army  
Property (Sensitive and Nonsensitive),  
Appendix D.  
AR 415-15, Army Military Construction  
Program Development and Execution.  
AR 420-1, Army Facilities Management.  
Army Regulation (AR) 425-15.  
DA Form 2028, Recommended Changes to  
Publications and Blank Forms.  
DA PAM 190-51, Risk Analysis for Army  
Property.

TM 5-853-1, Security Engineering Project Development.

TM 5-853-2, Security Engineering Concept Design.

7. Department of Defense (DOD)
  - MIL-HDBK-1022A, Petroleum Fuel Facilities.
  - UFC 3-600-01, Fire Protection Engineering for Facilities.
  - UFC 4-010-01, DOD Minimum Antiterrorism Standards for Buildings.
  - UFC 3-110-03 Roofing
  - UFC 3-120-10, Interior Design
  - UFC 3-400-01, Design: Energy Conservation.
  - UFC 3-400-02, Engineering Weather Data
  - UFC 3-440-05N, Tropical Engineering
  - UFC 3-520-01, Interior Electrical System.
  - UFC 3-570-2A, Cathodic Protection
  - UFC 3-580-01, Telecommunications Building Cabling Systems Planning and Design.
  - UFC 4-610-01, Administration Facilities
  - UFC 4-722-01, Dining Facilities
  
8. Department of Energy, Federal Energy Management Program (FEMP)
  - Business Case for Sustainable Design in Federal Facilities.
  
9. U.S. Department of Health and Human Services, National Institute for Occupational Safety and Health (NIOSH)
  - Publication No. 2002-139, Guidance for Protecting Building Environments from Airborne Chemical, Biological, or Radiological Attacks.

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| 10. U.S. Department of Labor,<br>Occupational Safety & Health<br>Administration (OSHA) | 29 CFR Part 1910, Occupational Safety and<br>Health Standards.<br>OSHA Standards for General Industry,<br>Walking – Working Surfaces, 1910.21–<br>1910.23.<br><br>Fall Protection in General Industry, 29 CFR<br>1910.   |
| 11. Department of Justice  | 2010 ADA Standard for Accessible Design  |
| 12. Department of Energy (DOE)   | FEMP (Business Case for Sustainable Design<br>Construction in Facilities; Interagency<br>Working Group).   |
| 13. U.S. Environmental Protection<br>Agency (EPA)                                      | Comprehensive Procurement Guidelines,<br><a href="http://www.epa.gov">www.epa.gov</a><br><br>EPA 832-R-92-005, Storm Water<br>Management for Construction Activities:<br>Developing Pollution Prevention Plans and<br>Best Management Practices.<br>40 CFR Part 280, Technical Standards and<br>Corrective Action Requirements for Owners<br>and Operators of Underground Storage Tanks<br>(UST) and Part 281, Approval of State<br>Underground Storage Tank Programs. |
| 14. U.S. Department of the Navy  | TM 6290.99-1, Indoor Firing Range Industrial<br>Hygiene Technical Guide.<br><br>UG-2030-SUR, User’s Guide on Security<br>Glazing Applications.<br><br>TR-2111-SHR, Planning and Design<br>Considerations for Incorporating Blast<br>Mitigation in Mailrooms, Loading Docks, and<br>Entrances.<br><br>TDS-2079-SHR, Planning and Design<br>Considerations for Incorporating Blast<br>Mitigation in Mailrooms.   |

15. -----

Federal Specification AA-D-600B, Door, Vault,  
Security.

16. -----

Specification FF-H-105.

**NON-GOVERNMENT INDUSTRY STANDARD PUBLICATIONS:**

1. American Concrete Institute (ACI)  
American Society of Mechanical Engineers (ASCE), and  
The Masonry Society (TMS) ACI 530/ASCE 5/TMS 402-92,  
Building Code Requirements for  
Masonry Structures and Commentary.  
ACI 318-02, Building Code  
Requirements for Structural Concrete  
and Commentary.
2. Air Conditioning and Refrigeration Institute Standards.
3. American Institute of Steel Construction  
(AISC) Specification for Structural Steel  
Buildings (Allowable Stress Design  
and Plastic Design).  
Load and Resistance Factor Design  
(LRFD) Specification for Structural  
Steel Buildings.
4. American Boiler Manufacturers Association  
(ABMA) Handbooks and standards.
5. American Iron and Steel Institute (AISI) North American Specification for the  
Design of Cold-Formed Steel  
Structural Members and Commentary.  
Standard for Cold-Formed Steel  
Framing – Truss Design.
6. American Conference of Governmental  
Industrial Hygienists (ACGIH) Industrial Ventilation Manual.
7. American Institute of Architects (AIA) Handbooks and standards.
8. American National Standards  
Institute (ANSI) ANSI A115.1, Steel Door and Steel  
Frame Preparation for Mortise Locks  
for 1-3/8 In and 1-3/4 In Doors

	Standard Specification. ANSI A120.1, Safety Requirements for Powered Platforms for Building Maintenance. ANSI B31, Code for Pressure Piping. ANSI/ASHRAE Standard 62.1-2007, Ventilation for Acceptable Indoor Air Quality.
American National Standards Institute/ Builders Hardware Manufacturers Association (ANSI/BHMA)	Handbooks and standards.
9. American Petroleum Institute	Standards.
10. American Society for Testing of Materials (ASTM)	ASTM D2513, Standard Specification for Thermoplastic Gas Pressure Pipe, Tubing, and Fittings. ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.
11. American Society of Civil Engineers (ASCE)	Handbooks and standards.
12. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE)	Standard 90.1-2007, Energy Standard for Buildings Except Low-Rise Residential Buildings. Standard 62.1-2007: Ventilation for Acceptable Indoor Air Quality Standard 55-2004: Thermal Environmental Conditions for Human Occupancy Handbooks of: Fundamentals; HVAC Applications; HVAC Systems and Equipment; Refrigeration

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|---|---|
| 13. American Society of Mechanical Engineers (ASME)           | Boiler and Pressure Vessel Code.                                    |
| 14. American Society of Plumbing Engineers (ASPE)             | Handbooks and standards.  |
| 15. Associated Air Balance Council (AABC)                     | Handbooks and standards.  |
| 16. Consumer Product Safety Commission (CPSC)                 | Window Glazing Standard   |
| 17. Illuminating Engineering Society of North America (IESNA) | Lighting Standards.   |
| 18. Institute of Electrical and Electronic Engineers (IEEE)   | Handbooks and standards.  |
| 20. International Fuel Gas Council                            | International Fuel Gas Code (IFGC).<br><br>Handbooks and standards. |
| 21. Manufacturers Standardization Society (MSS)               | SP-58, SP-69, SP-89, Pipe Hangers and Supports.                     |
| 22. Midwest Insulation Contractors Association (MICA)         | National Commercial & Industrial Insulation Standards.              |

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|--|--|
| 23. National Fire Protection Association (NFPA)                                | National Fire Protection Handbooks.<br>NFPA 10, Fire Extinguishers.<br>NFPA 13, Installation of Sprinkler Systems.<br>NFPA 30, Flammable and Combustible Liquids Code.<br>NFPA 70, National Electric Code.<br>NFPA 72, National Fire Alarm Code.<br>NFPA 78, Lightning Protection Code.<br>NFPA 90A-02/90 B-02, Installation of Air Conditioning, Ventilation and Warm Air Heating Systems.<br>NFPA 101, Life Safety Code. |
| 24. National Roofing Contractors Association (NRCA)                            | Roofing and Waterproofing Manual ( <a href="http://www.nrca.net/technical/manual/default.asp">http://www.nrca.net/technical/manual/default.asp</a> )   |
| 25. Sheet Metal and Air Conditioning Contractors National Association (SMACNA) | Handbooks and standards (duct construction).   |
| 26. International Plumbing Code  | Building Code  |
| 27. Sheet Metal and Air Conditioning Contractors National Association (SMACNA) | Handbooks and standards (duct construction).   |
| 28. Steel Deck Institute (SDI)   | Specifications and Commentary Diaphragm Design Manual.   |
| 29. Steel Joist Institute (SJI) Standard                                       | Specification and Load Tables  |

- 30. Telecommunications Industry Association (TIA)/Electronic Industries Alliance (EIA)
- 31. U.S. Green Building Council

568A Standard.

Leadership in Energy and Environmental Design (LEED™) Building Rating System.

**APPENDIX B**

**GLOSSARY**

**B-1 ACRONYMS AND ABBREVIATIONS**

AABC	Associated Air Balance Council
AASF	Army Aviation Support Facilities
ABA	Architectural Barriers Act
ABMA	American Boiler Manufacturers Association
ACGIH	American Conference of Governmental Industrial Hygienists
ACI	American Concrete Institute
ADA	Americans with Disabilities Act
ADAAG	ADA Accessibility Guidelines
A-E	Architect-Engineer
AFFF	Aqueous Film Forming Foam
AHU	Air Handling Unit
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
ANSI	American National Standards Institute
AR	Department of Army Regulation
ARNG	Army National Guard
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASPE	American Society of Plumbing Engineers
ASTM	American Society for Testing and Materials
AT/FP	antiterrorism/force protection

AWI	Architectural Woodwork Institute
BHMA	Builders Hardware Manufacturers Association
Btu	British thermal unit(s)
CBR	California bearing ratio
CCTV	closed-circuit television
CFC	chloro-fluorocarbons
CFMO	construction and facilities management officer
CFR	Code of Federal Regulations
CPSC	Consumer Product Safety Commission
CSI	Construction Specifications Institute
CSMS	Combined Support Maintenance Shops
DA	Department of the Army
DG	Design Guide
DoD	(U.S.) Department of Defense
DOE	(U.S.) Department of Energy
DOIM	Director of Information Management
DWV	drain, waste, or vent
DX	direct expansion
EBU	emergency battery unit
EIA	Electronic Industries Alliance
EO	Executive Order
EPA	(U.S.) Environmental Protection Agency
EPDM	ethylene propylene diene monomer
EPP	environmentally preferred product
ETL	Engineer Technical Letter
F	Fahrenheit
FC	foot-candle(s)
FEMP	Federal Energy Management Program
ft	foot or feet
FTP	file transfer protocol
gpm	gallons per minute

HCFC	hydro-chloro-fluorocarbons
hr	hour(s)
HVAC	heating, ventilation, and air conditioning
IAQ	indoor air quality
IBC	International Building Code
ICBO	International Conference of Building Officials
ICC	International Code Council
IDS	Intrusion Detection System
IEEE	Institute of Electrical and Electronic Engineers
IEQ	indoor environmental quality
IESNA	Illuminating Engineering Society of North America
IFGC	International Fuel Gas Code
IMA	(U.S. Army) Installation Management Agency
in.	inch(es)
J-SIIDS	Joint Services Interior Intrusion Detection System
lb	pound(s)
LCCA	life cycle cost analysis
LED	light-emitting diode
LF	linear foot/feet
LPG	liquefied petroleum gas
MATES	mobilization and training equipment sites
MICA	Midwest Insulation Contractors Association
MILCON	military construction
MIL-HDBK	Military Handbook
MSS	Manufacturers Standardization Society
NCRA	National Roofing Contractors Association
NEC	National Electrical Code
NFPA	National Fire Protection Association
NGB-ARI	National Guard Bureau, Installations Division
NG PAM	(Army) National Guard Pamphlet
NGR	National Guard Regulation

NIOSH	National Institute for Occupational Safety and Health
NPDES	National Pollutant Discharge Elimination System
NRCA	National Roofing Contractors Association
OSHA	Occupational Safety & Health Administration
PAM	Pamphlet
POL	petroleum, oils, and lubricants
POV	privately owned vehicle
PPE	personal protective equipment
psi	pounds per square inch
PVC	polyvinyl chloride
RCAS	Read Clear All Scalars
RH	relative humidity
SDI	Steel Deck Institute
SJI	Steel Joist Institute
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association
SPIRiT	Sustainable Project Rating Tool
SWPPP	stormwater pollution prevention plan
TI	Technical Instruction
TIA	Telecommunications Industry Association
TM	Technical Manual
TMS	The Masonry Society
TR	Technical Release
UBC	Uniform Building Code
UFAS	Uniform Federal Accessibility Standards
UFC	Unified Facilities Criteria
UL	Underwriters Laboratories
USACE	U.S. Army Corps of Engineers
U.S.C.	United States Code
USPFO	U.S. Property and Fiscal Office
UST	underground storage tank

VE	value engineering
VOC	volatile organic compound
yd	yard(s)

**B-2 SPECIALIZED TERMS**

exclusive standoff zone	the controlled area surrounding a structure, into which only service and delivery vehicles are allowed
level of protection	the degree to which assets are protected against injury or damage from an attack by an aggressor
Life Cycle Cost Analysis (LCCA)	a systematic means of evaluating the building energy and conditioned space systems for practicality by measuring initial cost against beneficial use over an extended period of time
nonexclusive standoff zone	the controlled area that is used in conjunction with an exclusive standoff zone but provides less restrictive land use

**APPENDIX C  
DESIGN REVIEW CHECKLISTS  
FOR  
DESIGN BID BUILT (D/B/B)**

**NOTE:**

**For DESIGN BUILD (D/B)**

**IF CONTRACT IS DESIGN BUILD D/B USE MILCON EXECUTION SLIDE GUIDE  
ON PAGE 132 OF THIS DESIGN GUIDE TO INTERPOLATE DESIGN REVIEW  
CHECKLIST**

**Table 6-1. Design Review Directives**

GENERAL COORDINATION ISSUES		SUBMISSION				
		SUBMITTALS (10%)	CONCEPT (30%)	PRELIMS (60%)	FINAL (90%)	BFI (100%)
<b>SITE DEVELOPMENT</b>						
	A complete site survey report has been provided. Before project initiation, the CFMO should provide the design A-E with an approved working or preliminary master plan for the proposed facility site. The State Military Department should provide special instructions for any deviations from the master plan.					
1-3.20	Soil Bearing Capacity Declaration and Declaration of Uniformity of Soil Conditions (if applicable ) have been provided for the current development and areas of future expansion.					
4-2.0	Storm water permit and pollution prevention plan have been obtained/approved.					
	ARNG Environmental Checklist and Record of Consideration have been reviewed, and a record is included in the narrative.					
	An Environmental Impact Statement has been completed and approved by the governing agencies.					
<b>FUEL-DISPENSING SYSTEMS</b>						
	Size of concrete pad and slab design comply with standards.					
	Utility connections meet capacity required based on check of criteria.					
	Spill containment provisions are adequate to meet requirements.					
	Capacity of fuel tanks meets authorized requirement.					
<b>WASH PLATFORM</b>						
4-8.0	Size of concrete pad and slab design comply with standards.					
	Water drainage and effluent disposal meet environmental requirements.					
	Water service is adequate based on check of calculations.					
<b>MAINTENANCE</b>						
	Vehicular maintenance areas and equipment comply with environmental criteria and OSHA requirements.					

**Table 6-1. Design Review Directives**

GENERAL COORDINATION ISSUES	SUBMISSION				
	SUBMITTALS (10%)	CONCEPT (30%)	PRELIMS (60%)	FINAL (90%)	BFI (100%)
1-3.17.1 Safety provisions for the building equipment maintenance area comply with OSHA requirements, including roof perimeter restraints when rooftop equipment is part of the mechanical, electrical, and communications systems.					
Site and building construction materials and details meet the project specific levels of antiterrorism and force protection.					
The U.S. Department of Labor, Occupational Safety & Health Administration (OSHA) Standards for General Industry in 29 CFR Part 1910 and DA PAM 40-503, Industrial Hygiene Program, requires that ARNG provide a safe and healthy workplace for its employees. All Readiness Centers with Indoor Firing Ranges, Logistics and Aviation Maintenance facilities must have an Industrial Hygiene / Chief Surgeon's Office (ARNG-CSG-P) technical review prior to construction.					

Table 6-1. Design Review Directives						
ACCESSIBILITY REQUIREMENTS		SUBMISSION				
		SUBMITTALS (10%)	CONCEPT (30%)	PRELIMS (60%)	FINAL (90%)	BFI (100%)
1-3.7	The site and building design comply with accessibility requirements for the following conditions based on check of the plans and the narrative.					
	Path of travel to the building, including drop-off areas					
	Building entrances including doors and vestibules					
	Horizontal circulation throughout the building, excluding maintenance areas					
	Emergency egress routes					
	Toilet, shower, and locker facilities					
	Drinking fountains					
	Public telephones					

Table 6-1. Design Review Directives					
SITE AND CIVIL ENGINEERING	SUBMISSION				
	SUBMITTALS (10%)	CONCEPT (30%)	PRELIMS (60%)	FINAL (90%)	BFI (100%)
<b>SITE / CIVIL - SUPPORTING DOCUMENTATION</b>					
Based on review, the site survey information includes all existing vegetation, topography, floodplains, rights-of-way, and utility connections at the site perimeter, and all dimensioning is complete.					
Based on review of the Geotechnical Report, adequate soil testing has been done within the proximity of the building construction, including potential areas of expansion.					
Declaration of Soil Bearing Capacity and Decalaration of Uniformity of Soil Conditions have been signed and included with the Geotechnical Report.					
State code and environmental regulations have been identified and are being followed as described in the narrative and code analysis					
The Environmental Impact Statement requirements are being followed in the design.					
<b>SITE / CIVIL - GENERAL</b>					
Calculation confirms that the authorized amount of parking is being provided.					
Review of the site plan indicates antiterrorism standoff areas are in compliance with the project-specific threat assessment and allow for potential future expansion by review of the site plan.					
Check of the site plan indicates security perimeters are clearly defined and have no breaches					
<b>SITE / CIVIL - SUSTAINABILITY</b>					
<b>LEED</b> Review of the narrative confirms that all site design sustaniable goals have been clearly defined and are realistic within the project budget. (Support documentation for the SPIRiT program is being developed and included in documentation at each milestone as the project progresses.)					

<b>Table 6-1. Design Review Directives</b>						
<b>SITE AND CIVIL ENGINEERING</b>		<b>SUBMISSION</b>				
		<b>SUBMITTALS (10%)</b>	<b>CONCEPT (30%)</b>	<b>PRELIMS (60%)</b>	<b>FINAL (90%)</b>	<b>BFI (100%)</b>
<b>SITE / CIVIL - BASIC DESIGN</b>						
2200	Cut and fill calculations have been provided; based on review, they reflect balance, or the amount of off-site material required or on-site material removed has been determined.					
2200	General review of proposed final design grading reflects no extremes in topography, and retaining walls are indicated as necessary.					
2370	Based on check of the specifications, erosion control has been adequately addressed.					
2500	Based on review of the narrative and indications on the perimeter of the site survey, all available utilities have been identified; they are of adequate size to support the new project based on appropriate calculations.					
2500	Based on review of related details, adequate protection of utility elements on grade is provided.					
2500	Based on review of the site plan, utility lines from connection at the site perimeter to the building(s) are the shortest practical distance.					
2501	The fire protection water loop is provided with hydrants placed as required by the local jurisdiction, and is confirmed in writing.					
2630	Based on review of the drawings and narrative, storm drainage design includes a retention basin with support calculations or a stormwater permit for off site drainage.					
2750	Pavement standards have been incorporated into the specifications and cover all conditions for drives, parking, walkways, and site structures.					
<b>SITE / CIVIL - LANDSCAPING</b>						
2810	Irrigation and landscape plans are coordinated for adequate sprinkler coverage based on plan overlay.					
2890	Facility signage meets standard and is adequate for all site entry points based on check of the site plan and specifications					
2930	Landscape species are appropriate for the local environment based on related information included in the design narrative					

Table 6-1. Design Review Directives					
SITE AND CIVIL ENGINEERING	SUBMISSION				
	SUBMITTALS (10%)	CONCEPT (30%)	PRELIMS (60%)	FINAL (90%)	BFI (100%)
<b>SITE / CIVIL - COST ESTIMATING</b>  Based on review of the cost estimate, all of the items in the following categories required in the project design have been adequately addressed:  Site preparation and demolition Site improvements and landscaping Site utilities Connecting tunnels and bridges Other site systems					

<b>Table 6-1. Design Review Directives</b>						
<b>STRUCTURAL ENGINEERING</b>		<b>SUBMISSION</b>				
		<b>SUBMITTALS (10%)</b>	<b>CONCEPT (30%)</b>	<b>PRELIMS (60%)</b>	<b>FINAL (90%)</b>	<b>BFI (100%)</b>
<b>SEISMIC DESIGN CONSIDERATIONS</b>						
1102	An evaluation of the building configuration (plan and massing) related to transfer of seismic loads has been done and is included in calculations and narrative.					
	Building expansion joints and/or seismic joints are shown on floor plans.					
<b>FOUNDATIONS</b>						
3051	Any development restrictions or other recommendations of the geological investigation have been followed to including building size and location on site.					
3051	The foundation system is in compliance with the Geotechnical Report and takes into account expansive soils, corrosive soils, and any other special characteristics.					
<b>SLAB ON GRADE</b>						
	Floor slabs on grade are being designed based on the recommendations of the Geotechnical Report as described in the narrative.					
<b>GENERAL REQUIREMENTS</b>						
	Live loads have been selected to suit any special requirements of the project based on review of the calculations and narrative.					
	Review of the narrative indicates that equipment having excessive noise and/or vibration has been identified, and proper structural isolation is incorporated into the design					
	Blast and progressive collapse studies have been included and explained in the narrative.					
	Provision of floating slabs to mitigate equipment noise and vibration isolation requirements are identified.					
	The design includes compliance with regard to accommodating maintenance equipment, and when the building is 40 ft or					

Table 6-1. Design Review Directives						
STRUCTURAL ENGINEERING		SUBMISSION				
		SUBMITTALS (10%)	CONCEPT (30%)	PRELIMS (60%)	FINAL (90%)	BFI (100%)
LEED	higher, details at the building perimeter are provided for service equipment supports.					
	Structural systems have been coordinated with fire resistance requirements and protection is identified in the narrative.					
	Specifications call for recyclable products in concrete and cement mixes to the maximum extent allowable, and to the maximum available in structural steel.					
	Structural design has incorporated support for crane systems in maintenance areas.					
	The cost estimate has been checked for inclusion of all structural system components					

Table 6-1. Design Review Directives						
ARCHITECTURAL DESIGN		SUBMISSION				
		SUBMITTALS (10%)	CONCEPT (30%)	PRELIMS (60%)	FINAL (90%)	BFI (100%)
<b>GENERAL DESIGN CONSIDERATIONS</b>						
	Based on review of the space program and floor plan layouts, all program requirements are incorporated with optimal functional relationships.					
	Areas with incompatible noise and/or vibration tolerances are remote from one another or are segregated by neutral building elements.					
LEED	The building orientation is in accordance with the site analysis and energy modeling.					
LEED	The building massing configuration and envelop design are in accordance with the related architectural characteristics in the energy analysis model that is used to set the annual energy budget.					
	Building entry and circulation routes are in accordance with security assessment requirements					
	Functional expansion capabilities have been thoroughly analyzed.					
	Custodial and designated facility storage areas have been sized and located appropriately, including direct loading dock access.					
	Dimensions are adequate for vehicular circulation at all service dock areas based on check of the accommodation of the largest vehicles anticipated.					
LEED	Open office areas are not isolated from exposure to natural light by continuous perimeter enclosed functions.					
	A formal vertical transportation study has been performed by a specialist, and the results are reflected in the narrative and the building design.					
	Appropriate methods of access to the roof for servicing equipment are provided and approved in writing by facilities management.					
OSHA	Provisions are included for the method of compliance with OSHA Standard 29 in CFR 19.66 and ANSI A120.1 for accommodating maintenance equipment servicing when a building is 40 ft or higher.					

**Table 6-1. Design Review Directives**

ARCHITECTURAL DESIGN		SUBMISSION				
		SUBMITTALS (10%)	CONCEPT (30%)	PRELIMS (60%)	FINAL (90%)	BFI (100%)
	All acoustic performance requirements are met, and the method of achieving them is described in the narrative.				■	
	Expansion joints needed due to the length of the building and configuration are determined by a structural engineer and indicated on the architectural plans.			■	■	
8500	All interior pollutant-generating sources (copy rooms, janitor closets, chemical storage areas, etc.) are isolated with separate outside exhaust and slab-to-slab partitions.				■	
	All exterior finishes have been defined in the narrative, details, and cost estimates.			■	■	
LEED	Based on calculations and the narrative, glazing systems are designed as low conductive thermal barriers.		■	■	■	■
	All interior finishes have been defined in detail in the finish schedules.				■	
8710	All required hardware types are identified in the schedule				■	
LEED	Power, data, and telecommunications connectivity at workstations and in meeting areas meet capacity and flexibility requirements.			■	■	
	Building fire protection standpipe system is included on the drawings.				■	
	Blast-resistant materials, systems, and details are integrated into the building perimeter with regard to the project-specific threat assessment.				■	■
	Review of details and specifications indicate that buildings in areas with severe weather conditions have entry mats integrated with grills or grates and drainage systems in vestibules.				■	
	Dock levelers or scissor lifts are provided to accommodate various truck bed heights in the drawings and specifications.			■	■	

Table 6-1. Design Review Directives						
ARCHITECTURAL DESIGN		SUBMISSION				
		SUBMITTALS (10%)	CONCEPT (30%)	PRELIMS (60%)	FINAL (90%)	BFI (100%)
LEED	Performance requirements for testing thermal resistance of the building envelop construction (thermal graphic imaging) have been incorporated into the specifications.					
10440	Review of details and specifications indicate that a comprehensive signage and graphics program has been developed based on a thorough review of paths of travel including all interior conditions, and meets standards.					
LEED	Forrest Stewardship Council principles and criteria are met for specified wood products.					
LEED	Paints and coatings comply with Green Seal standard based on review of specifications.					
LEED	Adhesives and sealants comply with VOC content limits described in LEED guidelines.					
NCRA	Roofing design and penetrations follow standards based on specifications and detail references.					
SMACNA	Flashing details follow standards					
	The architect has confirmed, based on diagrams, that servicing and parts replacements can be accomplished within the dimensional limits of equipment rooms.					
	Based on the narrative, a minimum roof slope of 1/50 is provided and that the architect has coordinated this requirement with the structural engineer.					
	Based on review of details and specifications, dock areas are protected from extreme climatic conditions by overhead rolling doors and dock seals where appropriate.					
	Based on check of the specifications, overhead-supported toilet partitions are being used throughout the facilities.					
AWI	Based on specification requirements, all architectural woodwork is designed according to the AWI Quality Certification Program.					
	Suspended ceiling bracing is incorporated where seismic zones dictates and related details are included in the drawings.					

Table 6-1. Design Review Directives						
ARCHITECTURAL DESIGN		SUBMISSION				
		SUBMITTALS (10%)	CONCEPT (30%)	PRELIMS (60%)	FINAL (90%)	BFI (100%)
LEED	Based on specification, carpet systems meet or exceed the <u>Carpet and Rug Institute Green Label Indoor Quality Test</u> .				■	■
	Based on review of reflected ceiling and equipment plans, ceiling access to equipment above is through lay-in ceiling systems to the maximum extent possible.				■	
	Cost estimate includes all architectural components.			■	■	■
10100 10670	All requirements for specialties including markerboards, tackboards, and shelving are included in the documents.				■	■

Table 6-1. Design Review Directives						
MECHANICAL ENGINEERING		SUBMISSION				
		SUBMITTALS (10%)	CONCEPT (30%)	PRELIMS (60%)	FINAL (90%)	BFI (100%)
<b>GENERAL DESIGN CONSIDERATIONS</b>						
LEED	The design target for annual energy budget has been determined and the mechanical design is in accordance with related modeling of the architectural design.					
	Utility service availability has been determined and outlined in the narrative.					
	The narrative identifies acoustic and/or vibration isolation needs for spaces near HVAC equipment.					
	The extent of sub-metering required has been determined in writing.					
LEED	LEED sustainability and energy conservation goals have been defined and continually reviewed for compliance.					
	Functional layouts of architectural plans have been assessed to optimize efficient air handler zones, and zones are aligned separately between fully occupied areas and partially occupied areas.					
	Equipment will be located above the 100-year floodplain.					
LEED	The building automation system will follow LEED recommendations.					
	Based on calculated service clearances and pathway dimensions, adequate room is provided for major equipment replacement.					
	Based on confirmation in writing, the facilitates engineering staff has the training and expertise to maintain and operate the proposed HVAC systems and controls.					
	High maintenance equipment for every system has been described in the narrative.					
	Based on description in the narrative, optimum flexibility is designed into the systems for classrooms, meeting spaces, and assembly halls.					
	HVAC equipment will not be visable from the exterior of the building.					
LEED	Effective methods for providing off-hour HVAC operation have been defined and are included in the narrative					

Table 6-1. Design Review Directives						
MECHANICAL ENGINEERING		SUBMISSION				
		SUBMITTALS (10%)	CONCEPT (30%)	PRELIMS (60%)	FINAL (90%)	BFI (100%)
	Based on Life Cycle Cost Analysis, HVAC alternatives have been considered			■	■	
	The limits imposed by value engineering decisions are clearly identified in writing.				■	
	An air flow balance for off-hours of operation has been calculated..				■	■
	The level of plant equipment redundancy has been established by the A-E and facility maintenance staff and is reflected in the preliminary equipment schedule and the narrative.				■	■
LEED	A detailed preliminary Commissioning Plan, including requirements for implementation strategy, has been incorporated into the narrative and specification language.		■	■	■	■
LEED	Economic viability of all LEED credits is checked and updated at each phase.	■	■	■	■	■
	Description in the narrative indicates compliance with all seismic zone requirements for stabilizing equipment will be done.	■	■			
	Provision is made for appropriate access to service equipment that cannot be maintained from ground floor level.			■	■	
	Based on placement on the site plan drawings, underground or above-ground mounted storage tanks will not be located close to buildings, railroad trackss, or roads.		■	■	■	
	Service agreements and appropriate durations are incorporated into the specifications, and a list of all necessary provisions is included in the narrative.				■	■
	Specifications call for all necessary training and a thorough spare parts list under each related category, and indicate the extent of the requirements provided as a list in the narrative.			■	■	
	An analysis has been performed to verify the need of water treatment for boilers, humidifiers, and cooling towers; and if required, it is addressed in the specification is addressed in the specifications.				■	■
1-3.12	All warranty requirements for mechanical equipment are included in the respective specification sections, and all the specfic warranties are listed in the narrative.				■	■

Table 6-1. Design Review Directives					
MECHANICAL ENGINEERING	SUBMISSION				
	SUBMITTALS (10%)	CONCEPT (30%)	PRELIMS (60%)	FINAL (90%)	BFI (100%)
LEED					
Based on listing in the narrative, building automation system control and monitoring points meet minimum requirements.					
Specifications contain instructions to bidders for documentation and product literature necessary to support the LEED goals.					
Cost estimate includes all mechanical system components.					

Table 6-1. Design Review Directives						
PLUMBING ENGINEERING		SUBMISSION				
		SUBMITTALS (10%)	CONCEPT (30%)	PRELIMS (60%)	FINAL (90%)	BFI (100%)
LEED	The potential for gray water use is described in the narrative.			■	■	
	A metering strategy to effectively monitor water consumption from an overall efficiency standpoint is used and described in the narrative.		■	■	■	
	Water service, sanitary drainage, and storm drainage calculations are completed and summarized in the narrative.				■	■
	Domestic water heating approach (storage, instantaneous, circulated, points-of-use) has been determined and included in the narrative.			■	■	■
	Preliminary water pressure has been determined, and the narrative describes whether pumping will be necessary.	■	■	■	■	
	Requirements for sewage ejectors and/or sump pumps are identified in the narrative.			■	■	
	Pipe and insulation materials have been identified in the specifications.			■	■	
	The intent to meet or exceed water conservation standards is economically viable based on cost analysis.		■	■	■	
	Toilet fixture count is adequate for occupancy and accessible accommodation is being provided by standard as indicated in the narrative.			■	■	
	Geotechnical Report has been reviewed, and provision is included for foundation and/or underslab drainage system as indicated in the narrative and specifications.	■	■	■		
	Specifications provide for grease interception and/or recovery for kitchen fixtures and drains.			■	■	
	Based on check of specifications, fuel storage tanks are provided with leak detection and alarm.				■	■
	Natural gas meter and service pressure regulator are protected from vehicular damage, foundation settlement, and vibration				■	■
	Cost estimate includes all plumbing components.		■	■	■	■
Pipe sizes are coordinated with utility connections by check of the site survey information.			■	■		

Table 6-1. Design Review Directives						
ELECTRICAL		SUBMISSION				
		SUBMITTALS (10%)	CONCEPT (30%)	PRELIMS (60%)	FINAL (90%)	BFI (100%)
LEED	Commitments to energy management have been established including lighting controls and energy monitoring systems, and are indicated in detail in the narrative.					
	Based on analysis in the narrative, all existing building electrical systems and power source(s) are adequate for expansion or renovation loads.					
	Requirements for cathodic protection have been determined from the Geotechnical Report, and if needed are defined in the narrative.					
	All special equipment power requirements are identified by listing in the narrative.					
	Utility rebate programs have been investigated for availability and applicability.					
	The narrative indicates that adequate service and expansion space has been provided at major equipment locations.					
	The electrical system is being designed with adequate spare capacity by listing in the narrative.					
	Statement in the narrative indicates that all electrical equipment is located above the floodplain.					
	All lighting control conditions are defined in the narrative					
	The site lighting design minimizes lighting intensity off site by incorporating directional fixtures at the perimeter.					
	UPS is provided in the electrical requirements for critical service items listed in the narrative.					
	Lightning protection requirements have been defined in the narrative.					
	A separate green, insulated equipment ground conductor has been incorporated into all feeder and branch circuits by					
	LEED	Mercury-free transformers and lamps are being specified.				

**Table 6-1. Design Review Directives**

<b>ELECTRICAL</b>		<b>SUBMISSION</b>				
		<b>SUBMITTALS (10%)</b>	<b>CONCEPT (30%)</b>	<b>PRELIMS (60%)</b>	<b>FINAL (90%)</b>	<b>BFI (100%)</b>
	Emergency generators have adequate ventilation and are located away from HVAC air intakes; and sound and/or vibration isolation is provided.			■	■	
	Based on check of schedules, panels have at least one circuit breaker per 200 ft2 of coverage in office areas.				■	
	Based on check of schedules, panelboards have adequate spaces and spares.				■	
LEED	Daylighting sensors are called for on the building perimeter and included in the specifications.			■	■	
	The building automation system includes the requirements and has the capacity to monitor normal, emergency, and uninterruptible power; mechanical systems and controls; fire detection and suppression; security systems; lighting; communication equipment; gas; and exhaust..			■	■	
	Receptacles placed for cleaning are located in all open spaces and corridors.				■	
	Based on check of diagrams and floor plans, electrical service has been provided for all related site elements including lighting and security systems.				■	
	One emergency receptacle has been placed in each electrical closet, communications equipment room, mechanical room, and electrical equipment room.				■	
	Cost estimate includes all electrical system components	■	■	■	■	■
	Lighting power budget calculations have been provided if required by the energy code.			■	■	
	Door schedule indicates special items, including fire alarm hold open, security devices, and power-operated doors.				■	
	There is clear indication of division of work between building contractor and utility company.				■	
	Battery-powered lights have been provided in the generator and switchgear rooms.				■	
LEED	A minimum of 10% spare breakers in panelboards have been provided.				■	

Table 6-1. Design Review Directives					
ELECTRICAL	SUBMISSION				
	SUBMITTALS (10%)	CONCEPT (30%)	PRELIMS (60%)	FINAL (90%)	BFI (100%)
All quantities of outlets, spacing, and type meet program requirements.					
Based on review, lighting calculations meet energy code.					
Based on check of drawings, location of structural foundations and electrical ductbanks are not in conflict.					
By check of schedules, all lighting type and space illumination levels meet program requirements					
By check of schedules and code requirements, all emergency lighting requirements are met.					

Table 6-1. Design Review Directives					
FIRE PROTECTION	SUBMISSION				
	SUBMITTALS (10%)	CONCEPT (30%)	PRELIMS (60%)	FINAL (90%)	BFI (100%)
All Federal, state, and local codes and amendments are included in the narrative.	■	■			
The local water supply has sufficient capacity for future expansion of the fire protection system.	■	■			
Fire access roads are not in conflict with future building plans on the proposed site, and access is provided 24 hours a day when the roads are behind security barriers.		■			
The emergency generator has been specified with extra capacity for future loads as described in the narrative.				■	■
Water tank sizes have extra capacity for future expansion as described in the narrative.			■	■	
UL assembly numbers, compartmentalization, rated walls, and penetration conditons are indicated on the drawings.				■	
Based on check of the specifications, the fire alarm system includes capacity for future expansion.				■	
Dimensional check shows that the location of major fire protection equipment, to include fire pumps is accessible for service.				■	
Fire extinguishers and/or cabinets are located on the plans.				■	■

**APPENDIX D  
FIGURES LIST**

Figure 1. Small Kitchen Equipment Layout

Figure 2. Large Kitchen Equipment Layout

FOOD SERVICE EQUIPMENT LIST

FIGURE 3 PCU IN A SCIF

MILCON EXECUTION SLIDE GUIDE

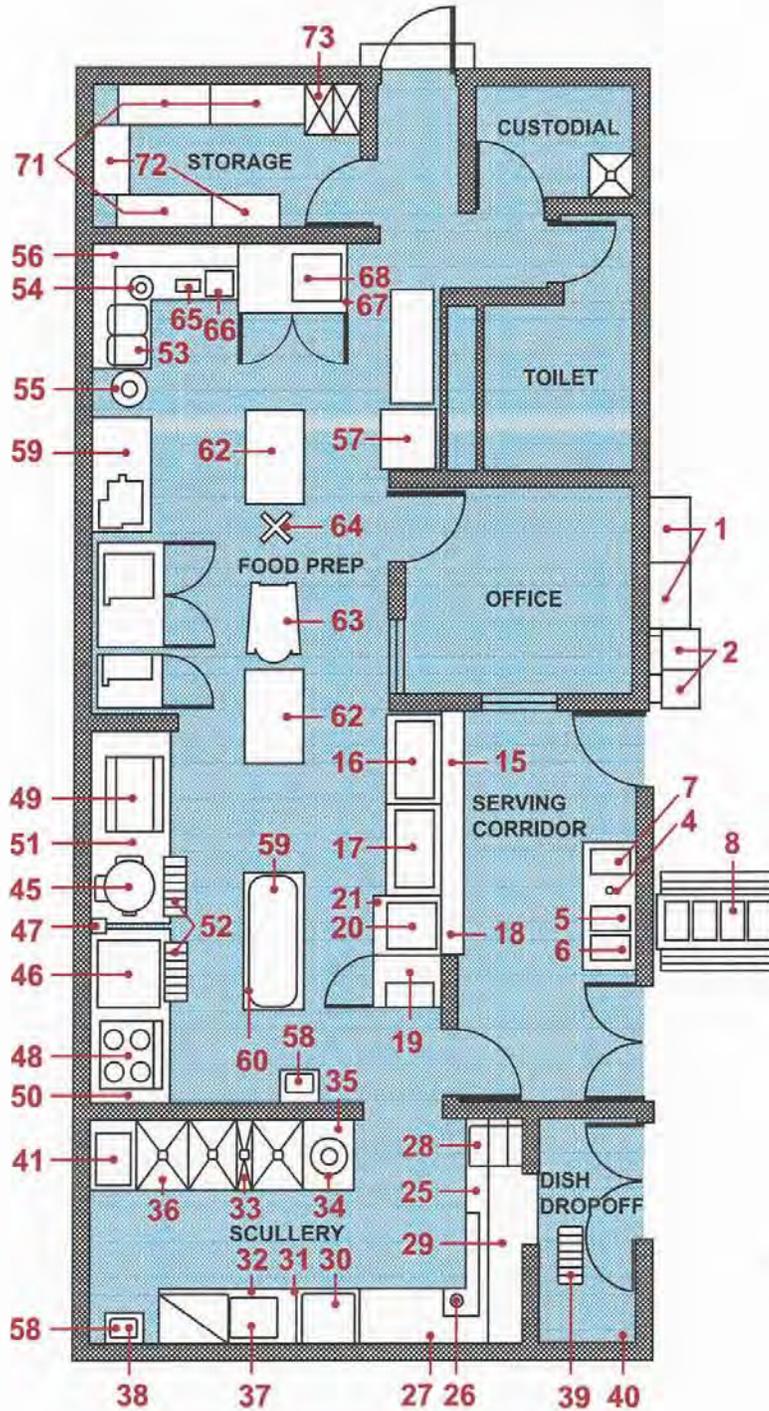


Figure 1. Small Kitchen Equipment Layout

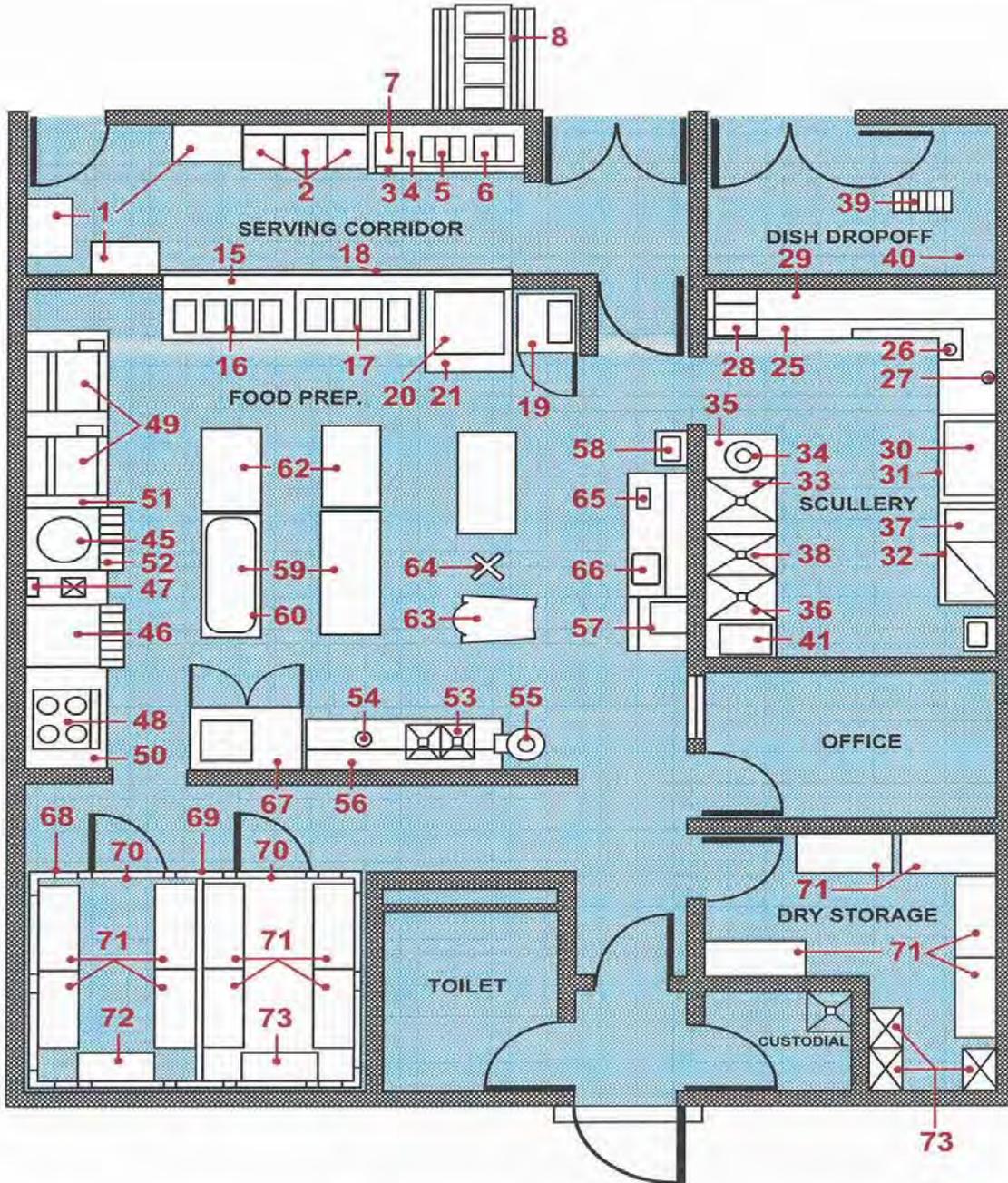


Figure 2. Large Kitchen Equipment Layout

**Self-Serve, Beverage, Salad, and Dessert Areas:**

- 1 Dispenser Regular -Service Tray and Silverware
- 2 Dispensers - Tableware
- 3 Stand - Drinks
- 4 Water Cooler
- 5 Dispenser - Juice
- 6 Urn - Coffee
- 7 Ice Dispenser
- 8 Cold Food Counter
- 9 to 14 Not Used

**Serving Line Area:**

- 15 Serving Counter
- 16 Cold Pan (Drop-in)
- 17 Hot Food Table (Drop-In)
- 18 Tray Slide
- 19 Food Warming Cabinet
- 20 Griddle
- 21 Exhaust Hood
- 22 to 24 Not Used

**Scullery Area:**

- 25 Soiled Dish Table
- 26 Garbage Disposal
- 27 Spray Assembly
- 28 Soaking Sink
- 29 Wall-Mounted Shelf
- 30 Dishwashing Machine
- 31 Exhaust Hood - Dishwasher
- 32 Dish Table
- 33 Pot and Pan Sink
- 34 Garbage Disposal
- 35 Spray Assembly
- 36 Water Heater - Under Sink
- 37 Water Heater
- 38 Exhaust Hood - Over Sink
- 39 Floor Trough
- 40 Spray Assembly
- 41 Water Heater
- 42 to 44 Not Used

**Kitchen, Storage, and Refrigeration Areas**

- 45 Steam Kettle - Jacketed
- 46 Frying and Braising Pan
- 47 Water Meter
- 48 Heavy Duty Range
- 49 Baking and Roasting Oven
- 50 Exhaust Hood
- 51 Exhaust Hood
- 52 Floor Trough
- 53 Vegetable Preparation Sink
- 54 Garbage Disposal
- 55 Vegetable Peeling Machine
- 56 Wall-Mounted Shelf
- 57 Ice Machine
- 58 Hand Sink
- 59 Food Preparation Table
- 60 Kitceh Utensils Rack
- 61 Not Used
- 62 Food Preparation Table
- 63 Food Mixing Machine
- 64 Mixer Stand
- 65 Can Opener
- 66 Meat Slicing Machine
- 67 Frozen Food Cabinet
- 68 Refrigerator
- 69 Refrigerator (Not in Small Kitchen)
- 70 Plastic Strip Doorway Closure  
(Not in Small Kitchen)
- 71 Shelving
- 72 Wall Lockers
- 73 Hand Shelf Truck
- 74 Air Curtain Machine (Fly Control)

**Food Service Equipment List**

**ARMY NATIONAL GUARD FOOD SERVICE EQUIPMENT SCHEDULES**

ITEM NO.	ITEM DESCRIPTION	LOG Class	MILCON	OMARNG	NATIONAL STOCK NUMBER	SPECIFICATION	REMARKS	UTILITIES
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**SELF-SERVE, BEVERAGE, SALAD AND DESSERT AREAS:**

1	DISPENSER, RECTANGULAR, Service Service Tray, Automatic W/Silverware Holder, Stainless Steel	C		X	7320-01-009-2867	COMMERCIAL	8 Silverware Holders, For Dispensing Trays	
2	DISPENSERS, Tableware, Self-Leveling, Cups, Bowls Tumbler, Stainless Steel	C		X	7320-00-738-8404	COMMERCIAL	(Cups, Bowls And Tumblers, Unheated) (Cantilevered, Carrier ), Size (20"x20"Racks (Mobile Casters) ,	
3	STAND, Drink, (Hot/Counter) Stainless Steel	A	X		NNSN	BUILT TO ORDER AS PER PLAN	Mariner Edge Top, W/Tray Slide, Drain Trough and Drain Line	2" Drain Line
4	GLASS FILTER WATER COOLER	A	X				Mounted on the Stand, Drink (Hot) Counter, Stainless Steel	
5	DISPENSER, Juice, Mechanically Refrigerated, Electric, Triple	C		X	7310	COMMERCIAL	(Dispenser W/Agitation System But W/O Aeration System), For Pulpy Fruit Juice, and other Beverages not suitable for Aeration, (Triple Bowl), (capacity of 5 to 6 gallons per bowl) 15-18 gallons total capacity inclusive, Counter-Mounted Separate Toggle Switch Req'd For Independent Bowl) Operation	Electric, 115 V, 60HZ 1PH, 1/5HP, ncm 5-15 Plug
6	URN, Coffee, Twin, Automatic, 6 Gallon Capacity, Electric  OR  URN, Coffee, TWIN, Automatic, 6-Gallon Capacity Gas	A	X		7310	COMMERCIAL	(Counter or Stand Mounted, Twin or Single URN) (3-Gallon Capacity Each Compartment), (Electric Heated), Use with Item #3.	Electric, 208V, 60HZ, 3PH, 12KW, ½" CW Inlet
			X		7310	COMMERCIAL	(Counter or Stand Mounted, Twin or Single URN) (3-Gallon Capacity Each Compartment), (Gas Heated, Not applicable to Single Unit), Use with	Gas, 45,000 BTU Electric, 115V, 60HZ, 1PH, ½" CW Inlet

**ARMY NATIONAL GUARD FOOD SERVICE EQUIPMENT SCHEDULES**

ITEM NO.	ITEM DESCRIPTION	LOG Class	MILCON	OMARNG	NATIONAL STOCK NUMBER	SPECIFICATION COMMERCIAL	REMARKS	UTILITIES
7	ICE DISPENSER, Load, W/Automatic Dispensing Head, 150 LBS Storage Capacity	A	X		NNSN	COMMERCIAL	Item #3, Furnished To Operate on Natural Gas Stainless Steel Exterior, Stainless Steel Evaporator, Manual Fill Access Door	Electric, 115V, 60HZ, 1PH, 15 AMPS, 1/4HP
8	COLD FOOD COUNTER, Mechanically Refrigerated Mobile, Self Contained, Electric, 4 Compartment	C		X	7310-01-077-6502	COMMERCIAL	(4 Food Storage Pan Capacity W/Bumpers & Casters Sneeze Guard W/Tray Rail On Both Sides	Electric, 110V, 60HZ, 1PH, 1/2" Drain

**ITEM NUMBERS 9-14 NOT USED**

**SERVING LINE AREA**

15	COUNTER, Serving, W/8 Opening SEE DETAIL DRAWINGS AND PLAN 4.03, 4.04, 4.04A AND 3.04 W/Sneeze Guard and Pastry Display	A	X		NNSN	BUILT TO ORDER	Stainless Steel, Used to Support Items 16 & 17, Sneeze Guard and Double Deck Pastry Display	Nona
16	COLD PAN, Drop-In, Mechanically Refrigerated, 1 Piece Construction Typical Producer: Atlas Metal Industries, 4 Compartment w/pastry display	A	X		NNSN	COMMERCIAL	Condensing Unit Located Below Cold Pan, On/Off Switch, W/Adapter Bars, 3 Opening Capacity, Stainless Steel	Electric 115V, 60HZ, 1/4HP, 6AMPS
17	TABLE, Hot Food, Drop-In, Electric Stainless Steel, W/Drain, Size 4, (4 Compartment) 15 Watts, Per Opening, Typical Producer: Atlas Metal Industries	A	X		NNSN	COMMERCIAL	(3 Food Storage Compartment), 12 Inch Pans X 20 inch Food Storage Pans, (With Drain), 1500 Watts Per Opening	Electric, 220V, 60HZ, 3HP, 9KW
18	TRAY SLIDE, Stainless Steel, mounted on wall (see detail drawing and plan 4-04)	A	X		NNSN	CUSTOM BUILT	Mounted on Top o Concrete /Block wall, Tray Slide To Accomodate 14"W X 18" L Tray, Use with Items 15, 16, and 17	NONE
19	CABINET, Food Warming, Reach-In Electric	A	X		7310-01-086-2867	COMMERCIAL	Modified Commercial 2 Compartment Each Compartment	Electric, 208V 60HZ, 1PH

ARMY NATIONAL GUARD FOOD SERVICE EQUIPMENT SCHEDULES

ITEM NO.	ITEM DESCRIPTION	LOG Class	MILCON	OMARNG	NATIONAL STOCK NUMBER	SPECIFICATION COMMERCIAL	REMARKS	UTILITIES
							Shall Hold Ten or More 12"X20" X 4" Pans, and A Minimum of Thirteen 18"X 26" Bun Pans, or Trays of 12: X 20"X 2" Food Service Fans	
20	GRIDDLE, Self-Heating, Electric W/Griddle Stand(38"W,34"D,26"H) OR	A	X		7310	COMMERCIAL	Open Frame, Griddle Stand Leg Mounted, with support brackets	Electric,208/230V 60HZ, 3PH, 14KW
	GRIDDLE, Self Heating, Gas Fired, W/Griddle Stand, (36"W,34"D, 26"H)	A	X		7320-01-295-4308		Griddle Stand, Stationary, (Leg mounted), W/Quick Gas, Disconnect, (Furnished to Operable On Natural Gas)	Gas, 81,000 BTU 115V, 60HZ, 1PH Power Control
21	HOOD, EXHAUST, W/Grease Automatic Wash down system, Stainless Steel	A	X		NSN	BUILT TO ORDER AS PER PLAN	W/Vapor Proof Fluorescent Lights, W/Enclosure Panels, (Ends Closed), W/Fire Suppression system, (Chemical or Water), fire/fuel delay Timer included NFPA 13 & 96.	Electric Motor Water

ITEM NUMBER 22-24 NOT USED

SCULLARY AREA

25	DISH TABLE, Soiled, W/Scrap Trough Pre wash Sink, (W/Faucet And Drain Lever. Build slot in wall to allow silverware to be dropped in sink.	A	X			BUILT TO ORDER AS PER PLAN	Constructed Of 14 Gauge Stainless Steel, With 6" Back splash, W/Scrap Trough	
26	GARRAGE DISPOSAL MACHINE Typical Producer: Salvajor 5 HP II Model 500	A	X		4540	COMMERCIAL	5HP Stainless Steel, Control Center, Circuit Breaker, Automatic Reversing, Positive Flush, 6-8" Diameter Throat Cut-out, Used with Item #25 Dish washing Area.	Electric, 208V, 60HZ,3HP, 1/2" CW
27	SPRAY ASSEMBLY, Pre-rinse, Wall mounted	A	X		NNSN	COMMERCIAL	W/Wall Bracket, (Horizontal) Water Supply, Spray W/Water Mixing Control Valve, (7 1/4" to 8 1/4" on center) Self Closing Spray Valve	1/2" HW & CW IPS Female Inlet

**ARMY NATIONAL GUARD FOOD SERVICE EQUIPMENT SCHEDULES**

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ITEM NO.	ITEM DESCRIPTION	LOG Class	MILCON	OMABNG	NATIONAL STOCK NUMBER	SPECIFICATION	REMARKS	UTILITIES
28	SINK, Silver, Soak, Stainless Steel, 34 Deep, Mobile, W/Lever Drain Valve, Part of Item #25 Built in W/Removable Basket	A	X		7320-01-295-4308	COMMERCIAL	Stainless Steel, Sink Built Into Soil Dish table, W/Stainless Steel, Wall Slot From the Drop Off Corridor Wall (Drop Off Window)	NONE
29	SELF, Wall Mounted	A	X		7310-NNSN	BUILT TO ORDER AS PER PLAN	Constructed Of One inch Stainless Steel Tubing With Stainless Brackets Supports, 16 Gauge SS, 2" back splash Rounded Corners, All Edges, Turned Up 1 1/2", To be Used W/D-3-3.	
30	DISHWASHING MACHINE Commercial Stationary, Electric, (50 Racks Per Hour)	A	X		7320-01-028-3787	COMMERCIAL	Size 50-20, (20" X 20"), Racks, (Straight Feed) 50 Racks Per Hour (Notes: An Exception to Specification, (W/O Detergent Meter)	Electric, 208V 60HZ, 3PH, 1HP, 50KW, Heating Element, 18KW Booster, 1/2" Inlet, 2" Drain
31	HOOD, Exhaust, Dishwasher, Condensate	A	X			BUILT TO ORDER AS PER PLAN	Used W/Item #30	
32	DISH TABLE, Clean, Stainless Steel W/Lower Storage Shelf	A	X		NNSN	BUILT TO ORDER AS PER PLAN	Used W/Item #30	NONE
33	SINK, Pot and Pan, Stainless Steel, 14 Gauge No 3 or 4 Finish, 3 Compartments, W/Drain Boards, ASTI 300 Series, W/Swing Faucets	A	X		NNSN	COMMERCIAL	W/Swing Faucets and Mechanical Lever Drains Sink Compartments Will be 30"W X 28" D X 16"H W/Adjustable Bullet Feet, W/9" Back splash, Covered Corners Single Faucet For Third Sink 180 Degrees Water	1/2" EW & CW 1 1/2" Drain
34	GARBAGE DISPOSAL MACHINE, Electric 5HP	A	X		NNSN	COMMERCIAL	5HP, Control Center, Circuit Breaker, Automatic Reversing, Positive Flush, 6-8" Diameter Throat Cut Out	Electric, 208V, 60HZ, 3PH, 1/2" CW, 2" Waste Drain

ARMY NATIONAL GUARD FOOD SERVICE EQUIPMENT SCHEDULES

ITEM NO.	ITEM DESCRIPTION	LOG Class	MILCON	OMARNG	NATIONAL STOCK NUMBER	SPECIFICATION	REMARKS	UTILITIES
35	SPRAY ASSEMBLY, Pre-rinse, Wall Mounted	A	X		NNSN	COMMERCIAL	W/Wall Bracket, (Horizontal Water Supply), Spray Unit, W/Water Mixing Control Valve, (7 1/4" To 8 1/4" on center), Self-Closing Spray Valve	1/2" HW & CW IPS Female Inlet
36	HEATER, Sink, Hot Water Booster, Electric Sanitizing	A	X		4520-01-041-2184	COMMERCIAL	9 KW, 180 Degree Hot Water Booster, For Final, Rinse Compartment Of the Pot and Pan Sink, Item #33	Electric, 208 V, 60HZ, 1PH, 9KW, 1/2" Inlet
37	HEATER, Hot Water, Booster Electric	A	X		4520-01-042-0409	COMMERCIAL	This item is designed, To Heat And Recirculate Only, Not to Heat the Water inside the Rinse Compartment.	Electric, 208V, 60HZ, 3PH 15KW
38	HOOD, Exhaust, Sink, Stainless Steel, SEE DETAIL DRAWING AND PLAN 5.07	A	X		MMSN	CUSTOM BUILT		Electric Motor
39	FLOOR TROUGH, W/Grate	A	X			COMMERCIAL		
40	SPRAY ASSEMBLY, Pre-rinse, Wall Mounted	A	X		NNSN	COMMERCIAL	W/Water Mixing Control Valve, (7 1/4" To 8 1/4" On Center) Self-Closing Spray Valve.	1/2" HW & CW IPS Female Inlet
41	HEATER, Hot water, Booster, Electric	A	X			COMMERCIAL	15KW, 180 Degrees Hot Water For The Dish washing Machine	208 V, 60HZ, 3PH 15KW

ITEM NUMBERS 42-44 NOT USED

KITCHEN, STORAGE, REFRIGERATION AREAS

45	KETTLE, Steam Jacketed, (Stainless Steel), 20 Gallon Electrically Heated	A	X		7310-00-355-8343	COMMERCIAL	(Floor Model), (20 Gallon Capacity), Cover, 3" Tangent Draw-Off Assembly	Electric, 208V, 60HZ, 3PH, 15KW, 1/2" Inlet
	OR							
	KETTLE, Steam Jacketed, (Stainless Steel) 20 Gallon Gas Heated	A	X			COMMERCIAL	(20 Gallon Capacity), Leg Mounted, W/3" Tangent Draw-Off Assembly, Hinged Cover Swing Spout, (Furnished To	Gas, 110,000 BTU, 115V, 60HZ, 1PH, 1/2" Inlet

ARMY NATIONAL GUARD FOOD SERVICE EQUIPMENT SCHEDULES

ITEM NO.	ITEM DESCRIPTION	LOG Class	MILCON	OMARNG	NATIONAL STOCK NUMBER	SPECIFICATION	REMARKS	UTILITIES
46	PAN, Frying and Braising, Electric, Tilting Type, Stainless Steel, 7" Deep 30 Gallon Capacity	A	X		7310	COMMERCIAL	Operate On Natural Gas), Quick Gas Disconnect Required  (W/O Extension Frames and Trays), (Non-Insulated Pan Side walls), (Floor Mounted), Size (40"L X 23"D X 7"H Pan Depth), (W/O Casters), With Tilting Mechanism, W/Hinged Cover, Terminal Block For Permanent Connect	Electric, 208V, 60HZ, 3PH, 15KW Drain Trough Required.
	OR							
	PAN, Frying and Braising, Gas Heated, Tilting Type Stainless Steel 7" Deep 30 Gallon Capacity	A	X		7310	COMMERCIAL	(W/O Extension Frames and Trays), (Non-Insulated Pan Side walls), (Floor Mounted), (40"L X 23"D X 7"H Pan Depth), (W/O Casters), With Tilting Mechanism, W/Hinged Cover, Burner Indicator Lights Are Required, (Furnished To Operate On Natural Gas), Quick Gas Disconnect is Req'd	Gas, 70,000 BTU, 115V, 60HZ, 1PH, Controls, Drain Trough Required
47	METERS, Water, Automatic, Industrial, Accuracy + - %, Dispense 12 Gallons per minute	A	X		NNSN		With Hot and Cold Water Mixing Valve, Temperature Controls, Capacity, 70 LBS/Minute, W/Mounting Brackets, 100/200/400 LBS, W/Standard Dial Setting	Electric, 120V, 60HZ, 1PH, 1/2"HW & CW
	TYPICAL PRODUCER: Gemini Bakery Equipment, Model AWM Or Equal		X					
48	RANGE, Heavy Duty, Electric, Commercial, w/3 Hot Plates, (Hot Top)	A	X		7310-01-034-6169		W/Oven, (3 Hot Plates, (Minimum Size 12" X 24")Stainless steel Front and Sides, W/6" Legs (Adjustable)	Electric, 208V, 60HZ, 3PH, 24KW
	OR							
	RANGE, Heavy Duty, Gas, Commercial, Open Top, W/4	A	X		7310-00-823-7379	COMMERCIAL	W/Oven, W/4 Open Top Burners, Stainless Steel Front and sides	Gas, 162,000 115V, 60HZ, 1PH,

ARMY NATIONAL GUARD FOOD SERVICE EQUIPMENT SCHEDULES

ITEM NO.	ITEM DESCRIPTION	LOG Class	MILCON	OMARNG	NATIONAL STOCK NUMBER	SPECIFICATION	REMARKS	UTILITIES
	Open Burns							
49	OVEN, Baking and Roasting (Stainless Steel) Forced Convection, Electric, 2 Compartments  OR For Gas Oven See Item 49 On Small Food Service Kitchen Equipment Schedule	A	X		7310-00-353-5633	COMMERCIAL	W/6" Legs (Adjustable), Furnished To Operate On Natural Gas  (Two Oven Compartment), (Standard Oven Cavity), W/2 Speed Blower Motor Stainless Steel Interior, Stainless Steel exterior, Both Doors Will Have Heat Resisting Safety Viewing Glass	Controls  Electric, 208V, 60HZ, 3PH, 1 1/2 HP. 3TKW
50	HOOD, Exhaust, W/Grease Automatic Wash down System, Stainless Steel, Fire Suppression System W/Clean Access Door For Clean Out	A	X		NNSN	COMMERCIAL	W/Vapor Proof Fluorescent Lights, W/Enclosed Panels (Ends Closed), W/Baffles, NFPA 13 & 96 (Fire Extinguishing System, Water or Dry Chemicals	Electric, Water
51	HOOD, Exhaust, Condensate, Stainless Steel	A	X		NNSN	COMMERCIAL	W/Vapor Fluorescent Lights, W/Enclosed Panels (End Closed)	Electric, Water
52	FLOOR THROUGH, W/Grate	A	X		NNSN	COMMERCIAL	Used W/Items # 45 & 46	NONE
53	SINK, Vegetable Preparation Stainless Steel No3 or 4 Finish, Covered Corners, ASTM Series W/SS Counter	A	X		NNSN	COMMERCIAL	2-Compartments, W/Drain Boards, W/Swing Faucets and Mechanical Lever Drain, Sink compartment Will Be 24"W X 28" X 14" H, With One 3/4" Wire Mesh Basket 20"W X 20"D X 12"H, Stainless Steel	1/2" CW & HW Swing Water Spouts, 1-1/2" Drain Line
54	GARBAGE DISPOSAL MACHINE, Electric, Commercial, 3HP	A	X		NNSN	COMMERCIAL	3HP, Control Center, Circuit Breaker Automatic Reversing, Positive Flush 6"-8" Diameter Throat Cut-Out.	Electric, 208V, 60HZ, 3PH, 3HP, 3/4" Water Inlet, 2" Waste Outlet
55	VEGETABLE PEELING MACHINE, Electric, 30 Pounds Capacity, W/Garbage Disposal (Optional)	A	X		7320	COMMERCIAL	(Floor-Mounted), 30 Pounds Of Potatoes, Per Charge) Complete W/Disposal, Waste & Disposal Motor) 1/2HP included Steel Base, & Abrasive Or Ribbed Wall Cylinder	Electric, 115 V, 60HZ, 1PH, 1 1/4"HP Disposal Motor) 1/2HP included 3/4" CW, 2 1/2" Drain
56	SHELF, Wall Mounted,	A	X		7310-NNSN	BUILT TO ORDER	Constructed of One Inch	

ARMY NATIONAL GUARD FOOD SERVICE EQUIPMENT SCHEDULES

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ITEM NO.	ITEM DESCRIPTION	LOG Class	MILCON	OMARNG	NATIONAL STOCK NUMBER	SPECIFICATION	REMARKS	UTILITIES
	Stainless Steel					AS PER PLAN	Stainless Steel Tubing With Stainless Steel Brackets, Supports, 16 Gauge SS, 2" Back splash, Rounded Corners, All Edges Turned Up 1 1/2", To Be Used W/D-3-3	
57	ICE MAKING MACHINE, Cube Automatic Mechanical, Refrigerated, Self Contained Electric	A	X		4110	COMMERCIAL	(Air Cooled Condenser), 400 Pounds, Capacity, (Stainless Steel Cabinets, 300 Series Only)	Electric, 208V, 60HZ, 1PH, 2PH 1 1/2" drain line
58	SINK, Hand Lavatory, Stainless Steel, Typical Producer: SECO Products Model HS-11-2A ADVANCE MODEL 7-PS-32 METAL MASTER MODEL HSAJ-10-FL	A	X		MNSN	COMMERCIAL	No.3 or 4 Finish, Cited Dimensions, W/Soap/Towel Dispenser, Wrist Off/On Lever	1/2 HW & CW, 1 1/2" Drain
59	TABLE, Food Preparation, (Stainless Steel)	A	X		7320-00	COMMERCIAL	(Rolled Rim Top) (72" X 30" X 36") W/Under shelf, A (Stainless Steel Top, Frame & Fixed In Place W/Electric Outlets	Electric, 110V, 60HZ, 1PH
60	RACK, Table, Kitchen Utensils (Stainless Steel) For Mounting On Food Preparation Table, W/Sliding Hooks, Three Bars, Uprights, Table Mounted	A	X		7320-00-893-4728	COMMERCIAL	Detail Drawing 1.18 (Contractor will Provide) Use with Item 59	NONE
61	OPEN NUMBER							
62	TABLE, Food Preparation, Mobile, Stainless Steel, Rolled Rim Top	C		X	7320-00-008-7635	COMMERCIAL	(Rolled Rim Top, ) (48"L X 30"W X 36" H) (With Under shelf), (Stainless Steel), (With Casters)	NONE
63	MIXING MACHINE, Food Electric (Vertical), (Commercial Type), 20 QT Capacity	C		X	2726	COMMERCIAL	Size 20(20 W Bowl Capacity) Bench Mounted With Vegetable Cutting, Slicing Attachments	Electric, 120V, 60HZ, 1PH
64	STAND, Mixer, W/Attachment Meat Rack	C		X	7320	COMMERCIAL	For Use With 20 QT Mixer, W/Under shelf	

ARMY NATIONAL GUARD FOOD SERVICE EQUIPMENT SCHEDULES

ITEM NO.	ITEM DESCRIPTION	LOG Class	MILCON	OMARNG	NATIONAL STOCK NUMBER	SPECIFICATION	REMARKS	UTILITIES
65	OPENER, Can, Heavy Duty Electric	C		X	7330-00-272-2590	COMMERCIAL	Portable, W/Lid Lifter Use W/Item 59	Electric, 115V, 60HZ, 1PH
66	MEAT SLICING MACHINE, Automatic, Electric	C		X	7320-00-355-8389	COMMERCIAL	80 Slices Per Minute, Size 1, Bench Required.	Electric, 115V, 60HZ, 1PH, 1/3HP
67	FROZEN FOOD CABINET, Mechanically, Refrigerated, Stainless steel, 45 Cu Ft, Reach-in	A	X		4110-01-024-8990	COMMERCIAL	Reach-In 4 doors, Air Cooled Hemetically sealed condenser, with shelves	Electric, 208 V 60HZ, 3PH, 34HP
68	REFRIGERATOR, Prefabricated Mechanical cooled, Commercial Walk-in Dairy	A	X		MNSN	COMMERCIAL	Type I (Refrigerator) Style A (Flooders Design), Remote and Air Cooled Refrigeration system	Electric, 208V, 60HZ, 3PH,
69	REFRIGERATOR, Prefabricated Mechanically Cooled Commercial Walk in Vegetables	A	X		MNSN	COMMERCIAL	Type I (Refrigerator) Style A (Flooders Design), Remote and Air Cooled Refrigeration System	Electric, 120V, 60HZ, 3PH, 3HP
70	Doorway Closures, Plastic Strips Typical Procedures W. B McGuire Co, Inc Model SF 300 or Kelly Co Model 303 or equal	A 2	X		MNSN	COMMERCIAL	Transparent, Overlapping Strip Rounded edge constructed Designed for low and Standard Temperature, (300X to 1500X F) Used W/R 2 Series Item (10A/ 10B/10C, Max Thickness .125 Inches	NONE
71	SHELVING, Stainless Steel Mobile, Food Service	C		X	7125	COMMERCIAL	Type II Style I (Mobile), (Wire Construction), W/5 Adjustable Shelves, W/5-Inch Casters, W/Bumper Guards	NONE
72	LOCKERS, Wall, Metal, Tier OR SECURITY UNITS	A	X		7125-NNSN	COMMERCIAL	One Door, W/5 Shelves, W/Legs, To Be Used To Store, Containers of Condiments, Local Purchase and Authorized Security Unit W/Casters	
73	TRUCK, Hand Shelf, Pot and Pan Rack, Stainless Steel	C		X	3920-00-171-9306	COMMERCIAL	(4 Shelves, 2 Fixed & 2 Adjustable), 800 Pounds Capacity, W/Bumpers & Casters	NONE

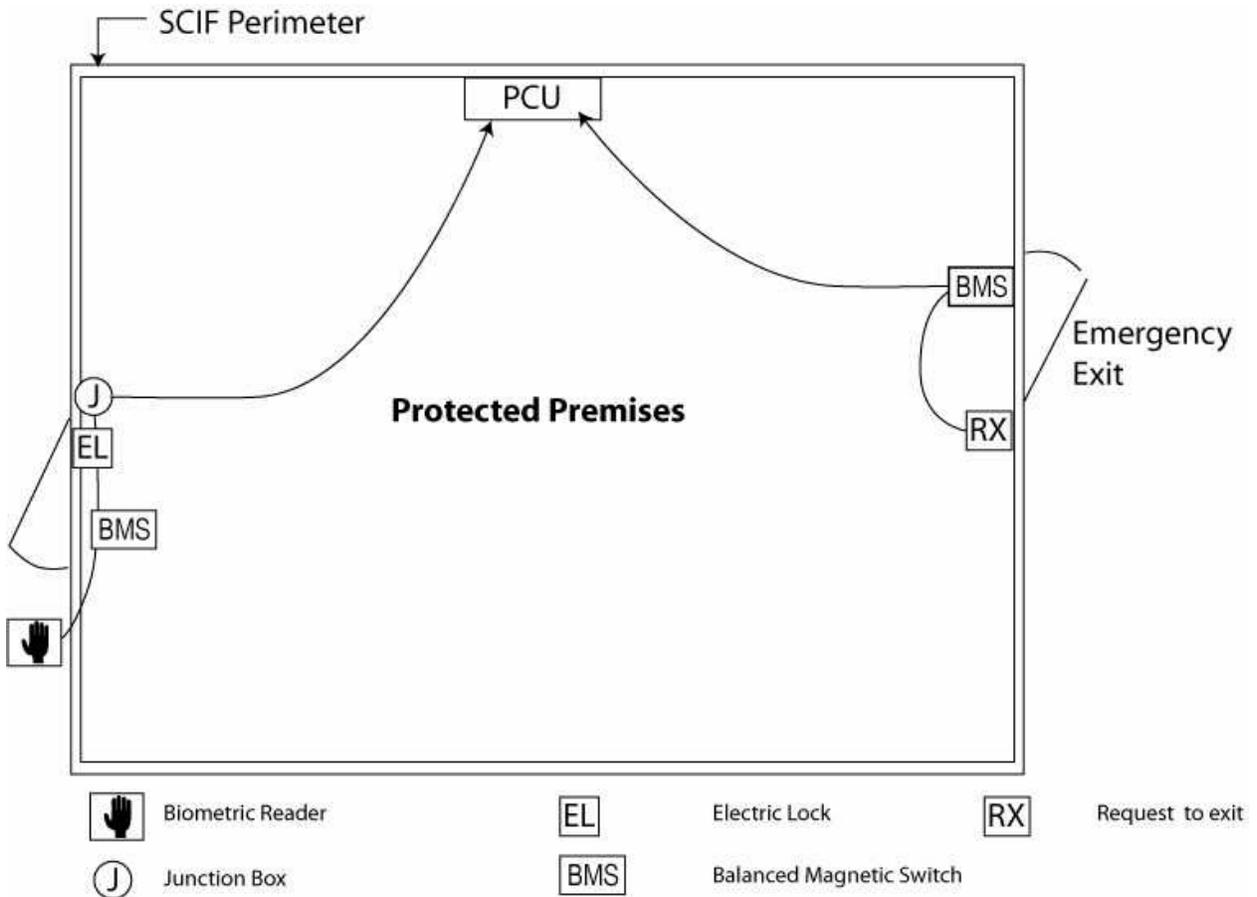
ARMY NATIONAL GUARD FOOD SERVICE EQUIPMENT SCHEDULES

ITEM NO.	ITEM DESCRIPTION	LOG Class	MILCON	OMARNG	NATIONAL STOCK NUMBER	SPECIFICATION	REMARKS	UTILITIES
74	AIR CURTAIN FLY CONTROL MACHINE	A	X			COMMERCIAL	Air Velocity , Measured Three Feet Above The Floor Will Be 600 FPM For Personnel Entrance Ways, and Receiving Doors, Micro switch For Automatic, On/Off Air Curtains Must Cover Complete Width Of, The Door, Machine Must Be Installed Above The Exterior Of The Door.	Electric, 208V, 60 HZ, 1PH, 1/2HP

NOTES:

- Point of Contact is as follows:  
 Army Center of Excellence Subsistence  
 U.S. Army Quartermaster Center and School  
 ATSM-CES-OE, 1201 22<sup>nd</sup> Street  
 Building P-5000  
 Fort Lee, VA 23801-1601  
 Tele. No. DSN 687-3450 Comm. (804) 734-3450  
 FAX. DSN 687-5108 Comm. (804) 734-5108  
 ATTN: Mr. Goldie M. Bailey
- LOG CLASSIFICATIONS:  
 A: Equipment authorized to be installed (i.e. attached to the floor and or permanently connected to the building structure or utility system) as part of the construction contract.  
 C: Portable equipment which will be provided through supply channels and owner installed (and which should not be included in the construction contract) and for which no utility hook-ups are required (but which should be considered in the Space layout and operational plan).

- For Food Service Equipment Layout Sketch  
 See Design Guide (DG) 415-5, Appendix D,  
 Figure-1: Small Kitchen Equipment Layout,  
 Figure-2: Large Kitchen Equipment Layout
- FUNDING CLASSIFICATIONS:  
 MILCON: Military Construction  
 OMARNG: Operation & Maintenance Army National Guard



**FIGURE 3 PCU IN A SCIF**

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**01 JUNE 2011**



## **II. Exhibit Materials**

### **A Request for Qualifications**



May 4, 2020



## DESIGN-BUILD REQUEST FOR QUALIFICATIONS

TRI-CITIES READINESS CENTER  
PROJECT NO. 18-586  
RICHLAND, WA

BY DEPARTMENT OF ENTERPRISE SERVICES AND WASHINGTON MILITARY DEPARTMENT

STATEMENT OF QUALIFICATIONS DEADLINE:  
MAY 19, 2020

TRI-CITIES READINESS CENTER  
REQUEST FOR QUALIFICATIONS

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TRI-CITIES READINESS CENTER REQUEST FOR QUALIFICATIONS

STATE OF WASHINGTON  
DESIGN-BUILD REQUEST FOR QUALIFICATIONS

DEPARTMENT OF ENTERPRISE  
SERVICES OLYMPIA, WASHINGTON

NOTICE TO GENERAL CONTRACTORS, ARCHITECTS & ENGINEERS

Design-Build team services are required for Project No. 18-586  
Tri-Cities Readiness Center - Richland, WA

The proposed project will provide a modern regional training center that meets the multi-level training and operational requirements for the assigned Army National Guard units and the Washington State Military Department.

Maximum allowable design and construction cost for the Project is \$13,150,900 including Washington State Sales Tax.

To immediately obtain a copy of the "Request for Qualifications" please access web site  
<https://www.des.wa.gov/services/facilities-leasing/public-works-design-construction/architecture-engineering-design-consultants>

A virtual pre-submittal informational meeting will be held on Wed., May 12<sup>th</sup> at 10:00 a.m.

**Please join my meeting from your computer, tablet or smartphone.**  
<https://global.gotomeeting.com/join/861092613>

**You can also dial in using your phone.**  
United States: +1 (872) 240-3212

**Access Code: 861-092-613**

RFQ holders interested in receiving potential amendments to the RFQ document and answers to questions from other teams should register by emailing [david.hickman@des.wa.gov](mailto:david.hickman@des.wa.gov)

If a firm does not have access to the Internet, a copy of the information will be mailed after calling David Hickman at (360) 407-7950 or email [david.hickman@des.wa.gov](mailto:david.hickman@des.wa.gov)

To qualify for review, submittals are required to be delivered to Olympia and date/time stamped by E&AS prior to 1:00 PM PDT, Tuesday, May 19, 2020.

Prevailing wages apply for Benton County.

The Owner has Federal Funding or other special requirements for this project. The Bidder will be required to comply with the "SECTION 00 74 10 FEDERAL SPECIAL CONDITIONS" section in the specifications. Please direct questions regarding this subject to the office of the Consultant.

The State of Washington is an affirmative action employer. This is not a request for a proposal. All submittals become the property of the State.

# **REQUEST FOR QUALIFICATIONS**

## 1.0 Introduction

On behalf of Washington State Military Department (Owner), the Department of Enterprise Services (DES) (jointly referred to as Owner/DES) is soliciting Statements of Qualifications (SOQ) from qualified Design-Build teams, which may include joint ventures, to design and construct the Tri-Cities Readiness Center. The Tri-Cities Readiness Center will be located in Richland, Washington.

In accordance with RCW 39.10.300, et seq., the Owner/DES will utilize a Design-Build (Design-Build) approach for the procurement and delivery of the project meaning that the Design-Builder will be selected based on qualification and the criteria in the Request for Qualifications (RFQ) and Request for Proposals (RFP) issued pursuant to this procurement.

Owner/DES are using the Design-Build alternative public works contracting procedure authorized under RCW 39.10. This project delivery method is considered appropriate for this project because

1. The Design-Build approach is critical in developing a creative and complex construction methodology required for this project.
2. The Design-Build approach creates a streamlined, efficient project delivery method, which reduces project delivery time and brings the new facility on line sooner than traditional delivery methods.

The primary mission of this project is to provide a cost-effective and operationally efficient specialized training facility for the assigned units of the Washington Army National Guard and its personnel located in the Washington Military Department's Tri-Cities area. The successful proposer will deliver an innovative, highly- efficient design that includes survivability and fitness for use in the event of a natural or man-made emergency. Additionally, the final building solution must:

1. be designed to comply with all pertinent Department of Defense, Department of the Army, and National Guard Bureau Standards and Regulations;
2. have internal security zones to facilitate public use both as a rental facility and an emergency shelter;
3. be constructed to meet facility standards and comply with all pertinent Department of Defense anti-terrorism/force protection (AT/PF) standards, including UFC 4-010-01; and
4. be designed and constructed to successfully achieve LEED Silver certification

DES is a certified public body using the design-build alternative public works contracting procedures authorized under Chapter 39.10 RCW and the Washington State Capital Projects Advisory Review Board's Project Review Committee. DES expects a collaborative, creative, and productive design-build process involving the design-builder, DES staff, Washington Military department staff, and DES consultants.

A two-step competitive selection process will ultimately determine the most qualified, price-competitive and creative design solution. Interested firms must submit SOQs in the form detailed below prior to the designated submittal date and time. The most highly qualified responders to this RFQ will be invited to submit detailed design and cost proposals based on a detailed architectural program and performance criteria, per "Basis of Design" documents issued in a separate Request for Proposals (RFP).

## 2.0 Background Information

### A. Project Description

The Tri-Cities Readiness Center will be located in Richland on an approximately 40-acre site bounded by 1st Street on the north, by Parkway on the east and by smaller parcels on the west.

1. Size: Authorized 39,731 gross square feet (gsf). Work will also include associated site development and other minor support facilities.
2. Budget: The maximum allowable design and construction cost (MADCC) for the Project, which cost is inclusive of the design and all other services to be performed under the design-build contract, is \$13,150,900 including Washington State Sales Tax.
3. Schedule: See Section 2.D.
4. Performance: The project will comply with National Guard Bureau (NGB) standards and achieve LEED Silver certification.
5. Area Summary:

#### Schedule 1 - Common Use Areas

<u>Area</u>	<u>SF EA</u>	<u>Total SF</u>
Assembly Hall (1)	5,400	5,400
Lg Classroom (1)	1,650	1,650
Sm Classroom (1)	860	860
Learning Center (1)	500	500
Multi-Purpose Training Area (1)	1,500	1,500
Kitchen (1)	1,500	1,500
Break / Vending (1)	300	300
Toilet / Shower	varies	1,740
Lactation Area (1)	80	80
Family Readiness Office (1)	250	250
Retention Office (1)	110	110
Table / Chair Storage (1)	300	300
Physical Fitness (1)	700	700

#### Schedule 2 - Units and Special Space Allowances

Basic Space (1)	1,200	1,200
- Commander Office (1)	120	120
- Executive Officer's Space (1)	120	120
- First Sergeant (1)	110	110
- JSS Office (1)	110	110
- Platoon Office (4)	110	440
- Supply Office (1)	230	230
- Training NCQ (1)	110	110
- Readiness NCQ (1)	110	110
- Open Office (1)	860	860

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Arms Vault - Large (1)	900	900
Arms Vault - Small (1)	300	300
Heated Storage Space (1)	4,000	4,000
TA50 Locker Space (1)	2,144	2,144
General Purpose Training Bay (1)	3,168	3,168
- Office (1)	0	0
- Storage (1)	0	0

**Schedule 3 - General Building Spaces**

Maintenance and Storage (1)	865	865
Mechanical (1)	1,141	1,141
Electrical (1)	300	300
Telecom/IT (1)	289	289
Circulation Allowance (1)	4,712	4,712
Structural Allowance (1)	3,612	<u>3,612</u>

**Gross Readiness Center Space** **39,731**

**Schedule 4 - Detached Spaces Total Gross Controlled Waste**

Handling Space	330
Unheated Storage Space	533
Detached Flammable Materials Storage	110

Paved Areas:

1. Privately Owned Vehicles: 132 Spaces
2. Military Equipment Parking: 1,325 SY
3. Circulation to Dock, Military Parking, Exterior Building Pedestrian Circulation

**Special Requirements**

1. Emergency Generator
2. Photovoltaic Power
3. Geothermal Heat Pump System

*B. Owner Consultants/Technical Support Not Eligible to Participate*

A previously-selected team of consultants led by ALSC Architects, Coffman Engineers and Design Balance LEED Consultant have prepared Basis of Design and requirements set forth in the Request for Proposal including a detailed architectural program, performance requirements, and contract. These team members are not eligible to serve on design-build teams. The Basis of Design documents will be made available to short-listed competitors, known as Finalists. Proposers are prohibited from contacting or communicating with any of these consultants to solicit technical, legal, financial, contractual, or any other type of advice or information relative to the Project.

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Additional detail regarding proposal evaluation including relative weighting of Project priorities will be given to the Finalists with the issuance of the RFP.

### *C. Description of the Procurement Process*

The Project will be designed and constructed using design-build, as specified in Chapter 39.10 RCW and as defined in enabling legislation.

This RFQ is the first step in a two-step proposal process for the selection of a design-builder for the Project. SOQ's will be evaluated by the Evaluation Committee appointed pursuant to Section 2.D below and scored in accordance with the terms of this RFQ. The evaluation process is intended to identify those Proposers who, in the opinion of the Owner and DES, in the opinion of the Owner and DES, are best qualified to execute successfully the design and construction of the Project based on the criteria identified in this RFQ.

Three Finalists will be invited to proceed to the second step of the procurement process, which will include a detailed Request for Proposal requiring the submission of a design solution and other supporting data.

Up to three proprietary meetings are planned with each Finalist where proposers are given time with DES, the Owner, and DES consultants to review design concepts and address specific questions. Details of proprietary meetings will be given to the Finalists.

The contract form contemplated at this time (to be included in the RFP) is a lump sum contract.

An honorarium will be paid to the non-successful Finalists submitting responsive proposals in accordance with the Request for Proposal. The honorarium sum is \$100,000 per Finalist.

Award of the design-build contract will be made to the Finalist deemed to provide the best value to the Owner and DES, in accordance with the processes and requirements set forth in the Request for Proposal. Additional detail regarding proposal evaluation including relative weighting of Project priorities will be given to the Finalists with the issuance of the RFP.

### *D. Project Milestone Schedule*

The Owner and DES currently anticipate conducting the procurement of the Project in accordance with the following list of milestones leading to award of a design- build contract. This schedule is subject to revision and the Owner / DES reserve the right to modify this schedule as either finds necessary, in its sole discretion.

#### **Request for Qualifications**

Advertise RFQ	May 4, 2020
Virtual Pre-Submittal Informational Meeting	May 12, 2020, 10:00 AM
Last Day/Time for Questions	May 13, 2020, 5:00 PM
Last Addendum Issued (If Necessary)	May 14, 2020
SOQ's Due	May 19, 2020, 1:00 PM

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Notification of Shortlisted Teams	May 26, 2020
<b><u>Request for Proposals</u></b>	
Earliest RFP Release Date	May 29, 2020
Initial Proprietary Meetings	June 12, 2020
Second Proprietary Meetings	July 3, 2020
Third Proprietary Meetings (if required)	July 17, 2020
Last Day for Questions	July 27, 2020
Design and Price Proposals Due	August 7, 2020
Presentation By D/B Teams	August 20-21, 2020
Announce Successful D/B Team	August 24, 2020
Debrief of Unsuccessful Finalists (if requested)	August 26-28, 2020

**Contracting**

Negotiation of Final Lump Sum Price	September. 1-14, 2020
Review / Approval (NGB)	September 1-14, 2020

**Contract Award/NTP** September 14, 2020

**Substantial Completion** 460 Calendar Days

Final Completion 60 Calendar Days

\*Dates are dependent on federal funding approval

*E. DES Point of Contact*

DES' sole point of contact for this Project shall be David Hickman, Project Manager ("Point of Contact"). Mr. Hickman is the only individual authorized to discuss this RFQ with any interested parties, including Proposers. All communications with Mr. Hickman about the Project or this RFQ shall be via email.

David Hickman  
Email: david.hickman@des.wa.gov

*F. Evaluation Committee*

The Statements of Qualification will be evaluated by a committee ("Evaluation Committee") comprised of David Hickman and one other DES Project Manager, Washington Military Department representatives, ALSC Architects - Architect representative in a (non- voting) advisory role, and one public representative. Other technical, legal, and financial consultants, and/ or DES staff with expertise in fields such as capital project management, operations and maintenance, engineering, design, construction, may serve as advisors to the Evaluation Committee.

*G. Site Visit*

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1. No formal site visit will be held. The site may be visited at any time by potential proposers.
2. Directions:  
From the East: I-90 to US 395 to WA 240 West in Richland. Take Exit 4 from I-82 West. Continue on WA 240 West to Kingsgate Way to 1st Street.  
From the West I-90 East to the I-82 East at Exit 110. At Exit 96, take WA 224 East (Webber Canyon Road). Continue on WA 224 East (Twin Bridges Road) to WA 240 East. Turn North at Kingsgate Road, then turn East to 1st Street.



### **3.0 Minimum Proposer Qualifications**

The evaluation process established by this RFQ is intended to enable Proposers to demonstrate their qualifications to perform the Project. At a minimum, Proposers are to have the following qualifications:

1. Completed at least one similar project valued at \$15,000,000 or greater in the past ten (10) years.
2. The designer-of-record will be required to have an active office located within the State of Washington during the duration of the Project. This office will have responsibility for the design work associated with the Project. All design associated with the Project, including that design work within the responsibility of Specialty Subconsultants, shall be accomplished or reviewed and approved by design professionals registered to practice in the particular professional field involved in the State of Washington.
3. Proposer, the lead contractor and the designer- of-record shall be legally qualified to do business in the State of Washington and shall provide registration or license numbers as required by this RFQ.
4. Proposer, the lead contractor and the designer- of-record shall not have filed for bankruptcy protection within the past five (5) years, nor shall such organizations have been reorganized under a new company name, or the current name, after filing bankruptcy in the past five (5) years.
5. Proposers, individually or as a team, must have the capacity to obtain performance and payment bonds, in accordance with the terms of this RFQ, for the full value of the design-build contract, in an amount not less than the MADCC.
6. Proposers shall comply with additional minimum qualification requirements set forth in Section 4 of this RFQ.

### **4.0 Statement of Qualification and Proposal Requirements**

4.1 This section describes specific information that must be included in the SOQ. The format for the presentation of such information is described in Section 6.

DES reserves the right to conduct an independent investigation of any information, including prior experience, identified in a SOQ by contacting project references, accessing public information, contacting independent parties, or any other means.

#### *A. Letter of Submittal*

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Provide a Letter of Submittal on the Proposer's letterhead identifying the official representative and point of contact for the Proposer. The letter shall identify such representative's title, address, phone, and e-mail addresses.

An authorized representative of the Proposer's organization shall sign the letter. If the Proposer is not yet a legal entity or is a joint venture, all major participants or joint venture members shall sign the letter. All signatures shall be original and signed in ink.

### *B. Proposed Team*

Describe the proposed project team; include resumes for all key staff outlining employment history, education, relevant experience, personal references and other relevant information.

Provide an organizational chart showing the "chain of command" with lines identifying participants who are responsible for major functions to be performed, and their reporting relationships in managing, designing and constructing the Project, and post-completion services during the performance guarantee and warranty periods. This chart should include design subconsultants, Specialty Subconsultants and major Subcontractors (if selected).

Provide a matrix of proposed staff identifying the team's common projects, and relevant project experience as detailed in Section 4.C of this RFQ.

Clearly identify the following key staff:

1. Design-Build Project Director – The individual primarily responsible for the overall project design, construction quality management, contract administration and DES' primary point of contact for the Project.
2. Lead Designer – The individual acting as the architect-of-record.
3. Specialty and Engineering consultant leaders including those responsible for building electrical and mechanical systems.
4. Project Management, Superintendent and Engineering – The individuals responsible for planning and executing day-to-day pre- construction and construction activities.
5. Energy performance and Sustainable design specialist(s).
- 6 Other key designer and builder staff members.

Identify where the Proposer intends to maintain its project office(s) and where a majority of the design work will be performed.

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Identify any Washington State employees or former State employees employed or on the Proposer's governing board as of the date of the SOQ submission. Include their position and responsibilities within the Proposer's organization.

### *C. Relevant Experience*

Provide up to six individual project profiles demonstrating the proposed team's relevant experience and history of working together on either design-build or other delivery methods. Relevant experience may include National Guard readiness centers with attention given to anti-terrorism/force protection AT/FP features, other Department of Defense facilities, sustainable buildings, design-build projects and buildings of similar program. Demonstrate your team's understanding and experience with modern training and workplace environments, managing the design-build process and delivering high-performance buildings.

For each project profile identify:

1. The name of the project and the owner's contract or project number.
2. Owner's name, address, contact person, and current telephone number and email address.
3. Dates of design, construction.
4. Description of the work or services provided.
5. Initial construction price and final construction contract price, including the quantity and dollar value of contract modifications and claims, and an explanation of the causes of the differences.
6. Total cost per square foot, less site costs, but including all soft costs.
7. Occupied EUI in kBtu/sf-yr and number of occupants.
8. Level of LEED Certification, e.g. Silver.
9. Relevance to the Tri-Cities Readiness Center project.
10. Which proposed project team members delivered services for the project.
11. The delivery method used with reference to Chapter 39.10 RCW.

General Team Experience:

1. Outline your experience in life cycle operating costs and energy efficiency

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measures.

2. Provide an explanation of the history and business relationship, if any, between the Proposer's lead contractor and designer-of-record.

### *D. Project Approach*

Describe your overall approach to delivering the project, maximizing the value of design-build delivery and building a highly collaborative and effective project team including:

1. Your design process to meet WMD goals for the Tri-Cities Readiness Center Project within the budget and schedule planned.
2. Your approach to addressing the detailed needs of WMD and individual tenants within project funding constraints.
3. How you engage with building tenants in support of modern training and workplace design to optimize space and energy efficiency while enabling them to complete their mission.
4. Your high performance design approach that demonstrates low life cycle costs and balances the constraints of limited first cost funding.
5. Your approach to overall project management that promotes effective decision making, effective communications, risk management and predictable outcomes.
6. Your approach to overall quality control including day to day review, reporting and follow up to assure quality construction.
7. Your recommendations regarding building commissioning, measurement and verification on building performance post-occupancy.
8. Your approach and recommendations to:
  - a. Proposed energy, life cycle and energy use index goals.
  - b. The operations of the building during the first year of occupancy.
9. Describe your approach and past performance in successfully employing small and disadvantaged business enterprises.

### *E. Safety*

Provide sufficient information to enable the Owner and DES to understand and evaluate the capability of the Proposer to provide a safe working environment for all individuals associated or affected by the Project. At a minimum, each SOQ shall respond to the following requirements:

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1. Provide the safety record of the Proposer and its lead contractor for the past five (5) years.
2. Provide the workers' compensation modifiers for the past five (5) years for Proposer and its lead contractor, listed by state where the Proposer or such contractor has performed work.
3. Provide a list of all OSHA, WISHA, or other state safety agency citations and their dispositions for the past five (5) years against Proposer and its lead contractor and subcontractors with contract amounts over 10% of the contract amount.
4. Provide a summary of the Proposer's safety and accident prevention program for the Project.

### *F. Financial Capacity*

Provide sufficient information to enable the Owner and DES to understand and evaluate the capability of the Proposer to remain viable for the duration of the Project, that it can be contractually bound to and abide by its contractual obligations to DES, and that it can meet the required financial commitments associated with the Project. At a minimum, each SOQ shall respond to the following requirements:

1. Provide an explanation of the legal structure of the Proposer and its design- build team. If the Proposer is a limited liability company, joint venture or any form of partnership, provide complete copies of the organizational documents that allow, or would allow by the time of contract award, the Proposer to do business in the state of Washington.
2. List the State of Washington design and construction licenses and registrations held by the Proposer, the lead contractor, designer-of- record and specialty subconsultants.
3. Provide evidence from a surety or insurance company (with a Rating of A minus and VIII or better by A.M. Best Co.) stating that the Proposer is capable of obtaining a performance and payment bond in amounts not less than the MADCC, which bonds will cover the Project and any warranty periods. If the Proposer is a limited liability company, joint venture or any form of partnership, specifically identify how bonds will be obtained and which member(s) and/or partner(s) will be providing such bonds.
4. Describe any project that Proposer, lead contractor or designer-of-record were involved in within the past five (5) years that resulted in:
  - a. The assessment of liquidated damages against one of such parties;
  - b. Claims being submitted by or against one of such parties that involved the project;

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- c. One of such parties having received a notice to cure a default due to the party's non- performance or poor performance of the underlying contract;  
or
- d. One of such parties being terminated for cause.

For each such situation, explain the circumstances and identify the project's representative and its current telephone number.

- 5. Disclose past or current bankruptcies, convictions, debarments, or suspensions involving Proposer, the lead contractor, or the designer-of- record.
- 6. Debarment and Suspension prohibits the Washington Military Department from contracting with persons, organizations, or companies who have been excluded from participating in federal contracts or grants. As evidence of compliance with this requirement, Proposer shall complete and submit to Owner Attachment A - "Debarment, Suspension, Ineligibility or Voluntary Exclusion Certification" with Statement of Qualifications.

### 4.2 Proposal Requirements:

The information provided in response to the Evaluation Section of the RFP will be scored based on the following:

- a. The Proposed Design-Build Team's understanding of the delivery method;
- b. The degree to which the Proposed Design-Build Team understands the Owner's/DES' goals and objectives with respect to the Project; and
- c. The strength of the Proposed Design-Build Team's management plan for the Project, including not only the specific topics and specialized components outlined in the RFP or discussed in the Interactive Meeting but also any other component or element that the Proposed Design-Build Team deems essential to the success of the Project.

The evaluation factors are listed below.

- 1. Proposal and Design Solution 30 points  
How well does the proposal and design solution meet the program and technical approach to the Design solution? How well does the design solution demonstrate long term value and low life cycle costs to the State of Washington, DES, and the WMD?
- 2. Overall Management Approach; Ability to Meet Time and Budget Requirements 10 points  
Describe the Finalist's overall management approach to the Project. In responding to this evaluation factor, Finalists shall identify three

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- (3) key issues, risks, and challenges to the Project, and, for each issue or challenge identified, describe how to mitigate its potential negative impacts (i.e., risk mitigation strategy) and any unique approaches or strengths the Finalist may have to implement such mitigation strategies. Cost or price related factors may include operating costs.
3. Operations, Maintenance, Energy Performance, Sustainability 20 points  
How well does the proposed design solution demonstrate sustainable design strategies, operations / maintenance / energy efficiency, and innovation?
4. Ability of Professional Personnel: 20 points  
a) How well does the proposed design and construction team demonstrate the skills and competence in high-performance design and construction and its understanding of DES's overall goals for the project?  
b) Confirm that the Proposed Design-Build Team and Key Team Members are available to perform the Project. To verify this availability, provide the following information in the form of a table:  
Recent, current and projected workloads of Proposed Design-Build Team Members;  
Recent, current and projected workloads of Key Team Members;  
Location of home office of Proposed Design-Build Team Members and whether they have an office in the Tri-Cities area; and Home office location of Key Team Members and proposed location during the performance of the Project.
5. Past Performance on Similar Projects 20 points
6. Financial Capacity – Bonding and Insurance Statements: Pass/Fail  
Ability to provide a performance and payment bond for the project. Submit one copy of bonding and insurance statements (none of which are included in the page count), in a sealed envelope marked “Confidential Financial Material in Response to the RFQ.” This financial information will not be copied or distributed except as needed in the financial review process and will not be provided for other firms to review, except as required by law
7. Total Possible Score 100 points  
Each evaluation criterion has an assigned maximum number of points that demonstrates its relative importance. Each Evaluation Committee Member scores all Proposals. All Evaluation Committee Members’ scoring will be totaled for each Proposal for a combined

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summary score. The selection of the Finalist will be made on the basis of which Proposal has the highest combined score.

**Diverse Business Inclusion Plan** **Not Scored**  
 Provide Diverse Business Plan per Section 10.0D

**5.0 Evaluation Process for Design-Build Team Selection**

In the evaluation and scoring of Proposers and Finalists, the Owner/DES will consider the information submitted in the SOQ, the Technical and Price Proposal, and Confidential Proprietary Meetings with respect to the evaluation criteria set forth in the RFQ and RFP. The result of the evaluation will be a comparative scoring of Proposers.

The relative weights of the Evaluation Criteria for the SOQ are as follows:

CRITERIA	WEIGHTING (Max points)
Proposed Team	35 points
Relevant Experience	35 points
Project Approach	25 points
Safety	5 points
Financial Capacity	PASS/FAIL

The relative weights of the Evaluation Criteria for the Proposal are as follows:

CRITERIA	WEIGHTING (Max points)
Proposal and Design Solution	30 points
Overall Management Approach, Ability to Meet Time & Budget	10 points
Operations, Maintenance Energy Performance Sustainability	20 points
Ability of Professional Personnel	20 points
Past Performance on Similar Projects	20 points
Ability to provide performance and payment bond for the project	Pass / Fail
Diverse Business Inclusion Plan	Not Scored
 Total Proposal Scores	 100 points

Relative weights of the Evaluation criteria for the entire procurement are as follows:

CRITERIA	WEIGHTING (Max points)
SOQ	15 points
Proposal	40 points
Proprietary Meetings/Interview	35 points
Contract Amount	10 points

## TRI-CITIES READINESS CENTER REQUEST FOR QUALIFICATIONS

Total

100 Points

In evaluating each of the criteria, the Selection Panel will identify significant and minor strengths and weaknesses from the submissions. The Selection Panel will then use the following guidelines to evaluate the submissions and determine the number of points for each Evaluative Criteria based on the percentages assigned in the RFQ, the RFP and any addenda. In the description below, the term “Proposer” includes both Proposers in the SOQ phase as well as Finalists in the RFP phase of the procurement.

### 1. Definition of “strength” and “weakness”:

- a. The term “strength” ultimately represents a benefit to the Project and is expected to increase the Proposer’s ability to meet or exceed the Project Goals and/or meet the definition of Design Excellence. A minor strength has a slight positive influence and a significant strength has a considerable positive influence on the Proposer’s ability to exceed the Project Goals and meet the definition of Design Excellence.
- b. The term “weakness” detracts from the Proposer’s ability to meet the Project Goals or the definition of Design Excellence and may result in inefficient or ineffective performance. A minor weakness has a slight negative influence and a significant weakness has a considerable negative influence on the Proposer’s ability to exceed the Project Goals and meet the definition of Design Excellence.

### 2. Scoring:

- a. **Excellent** (81-100 percent): The Evaluative Criteria demonstrates an approach that is considered to exceed the Project Goals and the RFQ or RFP requirements and provide a consistently outstanding level of quality. For the Evaluative Criteria to be considered *Excellent*, it must be determined to have significant strengths and/or a number of minor strengths and few or no appreciable weaknesses. The minimum allocation of points for *Excellent* is 81 percent of the maximum points available for a given evaluation criterion. The greater the significance of the strengths and/or the number of strengths will result in a higher percentage, up to a maximum of 100 percent. An Evaluative Criteria that is evaluated as Excellent is considered to present virtually no risk that the Proposer would be unsuccessful in delivering the Project to the Owner's/DES satisfaction and would most likely exceed all Project Goals and meet the definition of Design Excellence.
- b. **Good** (61-80 percent): The Evaluative Criteria demonstrates an approach that is considered to meet the RFQ or RFP requirements in a beneficial way (providing advantages, benefits, or added value to the Project) and offers quality. For the Evaluative Criteria to be considered *Good*, it must be determined to have strengths and few, if any, significant weaknesses. Minor weaknesses are offset by strengths. The minimum allocation of points for *Good* is 61 percent of the maximum points available for a given evaluation criterion. The greater the significance of the strengths

and/or the number of strengths, and the fewer the minor weaknesses will result in a higher percentage, up to a maximum of 80 percent. There is little risk that the Proposer would be unsuccessful in delivering the Project to the Owner's/DES' satisfaction and would most likely meet all Project Goals and may meet the definition of Design Excellence.

- c. **Fair** (41-60 percent): The Evaluative Criteria demonstrates an approach that contains minor and/or significant weaknesses and limited appreciable strengths. The minimum allocation of points for *Fair* is 41 percent of the maximum points available for a given evaluation criterion. The greater the significance of the strengths and/or the number of strengths, and the fewer the minor or significant weaknesses will result in a higher percentage, up to a maximum of 60 percent. There is some risk that the Proposer would be unsuccessful in delivering the Project to the Owner's/DES' satisfaction and meeting the Project Goals or the definition of Design Excellence.
- d. **Deficient** (0-40 percent): The Evaluative Criteria demonstrates an approach that contains significant weaknesses and no appreciable strengths. The minimum allocation of points for *Deficient* is 0 percent. The greater the significance of the strengths and/or the number of strengths, and the fewer the minor or significant weaknesses will result in a higher percentage, up to a maximum of 40 percent of the maximum points available for a given evaluation criterion. It is expected that the Proposer would not be able to deliver the Project to the Owner's/DES' satisfaction and meet the Project Goals or the definition of Design Excellence. The Owner/DES, at its sole discretion, may reject any Proposal deemed *Deficient* in fulfilling the requirements of the RFQ or RFP requirements.
- e. **Non-Responsive**: Does not meet the Minimum Qualifications required for evaluation. In addition, the Owner/DES, at its sole discretion, may reject any Evaluative Criteria deemed non-responsive to any of the requirements of the RFQ or RFP.

No more than three Finalists will be invited to provide Proposals in accordance with a Request for Proposals. Proposers who are not selected as Finalists will be eliminated from further participation in the procurement process and will not be eligible to submit Proposals.

## 6.0 Statement of Qualifications Submittal Requirements

This section describes the requirements that all Proposers must satisfy in submitting SOQ's. Failure of any Proposer to submit its SOQ in accordance with this RFQ may result in rejection of its SOQ.

### **Due Date, Time and Location:**

The SOQ must be delivered to, and date/time stamped by E&AS prior to date/time indicated

## TRI-CITIES READINESS CENTER REQUEST FOR QUALIFICATIONS

in Section 2.D. If you have delivery questions, please contact David Hickman at 360.407.7950.

Address submittals to:

Engineering & Architectural Services 1500 Jefferson Street SE  
Olympia, WA 98501 Attn: Selection Administrator

or:

Engineering & Architectural Services  
P.O. Box 41476  
Olympia, WA 98504-14176  
Attn: Selection Administrator

Neither fax nor email submissions will be accepted. Proposers are responsible for effecting delivery by the deadline above, and late submissions will be rejected without opening, consideration, or evaluation, and will be returned unopened to the sender.

Any addenda issued for this RFQ and RFP will be published at the following website address: <https://des.wa.gov/services/facilities-leasing/public-works-design-construction/architecture-engineering-design-consultants/current-projects-advertised-consultant-selection>. Proposers are responsible for checking the website for any addenda prior to submission of qualifications and proposals. If you are unable to download the addenda, you may contact the individual noted at the end of this RFQ. Attachments to this RFQ will also be posted at the above website.

DES accepts no responsibility for misdirected or lost proposals.

Format:

The SOQ shall follow the requirements and format prescribed below. Submittals that do not follow the format prescribed below may be considered non-responsive and may be eliminated from further consideration.

The SOQ must not exceed thirty (30) sheets, printed front and back. Except for charts, exhibits and other illustrative and graphical information, all information shall be prepared on 8.5" x 11" white paper.

Charts, exhibits and other illustrative and graphical information may be on 11" x 17" paper, but must be folded to 8.5" X 11" and will be counted as one page. All printing, except for the front cover of the SOQ and any appendices, must be a font of no less than 10-point. In addition to the above, a complete copy of the Proposer's SOQ must be submitted on a high density flash drives in Adobe PDF format.

Each section shall be separated by numbered tabs, with the following sections corresponding to the order set forth in Section 4, namely (1) Letter of Submittal; (2) Proposed Team; (3) Relevant Experience; (4) Project Approach; (5) Safety; (6) Financial

and Legal.

Provide eight (8) copies in three-ring binders, and one flash drive. Each copy must be identified on its front cover, in the upper right-hand corner, as "Copy of 8 Copies."

## 7.0 Questions and Clarifications

All questions and requests for clarification regarding this RFQ shall be submitted to DES in writing to the Point of Contact. No requests for additional information, clarification or any other communication should be directed to any other individual.

Questions or clarifications requested after date/time indicated in Section 2.D will not be answered, unless DES elects, in its sole discretion, to do so.

DES' responses to questions or requests for clarification shall be in writing, and will be accomplished by an Addendum to this RFQ. DES will not be bound by any oral communications, or written interpretations or clarifications that are not set forth in an Addendum.

DES, at its sole discretion, shall have the right to seek clarifications from any Proposer to fully understand information contained in the SOQ necessary to help evaluate and rank the Proposers.

## 8.0 Rights and Obligations of the DES

### *9.0 Reservation of Rights*

In connection with this procurement, DES reserves to itself all rights (which rights shall be exercisable by DES in its sole discretion) available to it under applicable law, including without limitation, the following, with or without cause and with or without notice:

1. The rights to cancel, withdraw, modify postpone or extend this RFQ or the subsequent Request for Proposals in whole or in part at any time prior to the execution by DES of a design-build contract, without incurring any obligations or liabilities.
2. The right to reject any and all submittals, responses and proposals received at any time.
3. The right to terminate evaluations of responses received at any time.
4. The right to suspend and terminate the procurement process for the Project, at any time.
5. The right to issue addenda, supplements, and modifications to this RFQ, including but not limited to modifications of evaluation criteria or methodology and weighting

## TRI-CITIES READINESS CENTER REQUEST FOR QUALIFICATIONS

of evaluation criteria.

6. The right to hold meetings and conduct discussions and correspondence with one or more of the Proposers responding to this RFQ to seek an understanding of the responses to this RFQ.
7. The right to seek or obtain data from any source that has the potential to improve the understanding and enable evaluation of the responses to the RFQ, including the right to seek clarifications from Proposers.
8. The right to appoint and change members of the Evaluation Committee.
9. The right to use assistance of outside technical and legal experts and consultants in the evaluation process.
10. The right to waive minor deficiencies, informalities and irregularities in an SOQ, accept and review a non-conforming SOQ or seek clarifications or supplements to an SOQ.
11. The right to disqualify any Proposer that changes its submittal without DES approval.

### *B. DES and Owner Not Obligated for Costs of Proposing*

DES and the Owner assume no obligations, responsibilities, or liabilities, fiscal or otherwise, to reimburse all or part of the costs incurred or alleged to have been incurred by parties considering a response to and/or responding to this RFQ, or the subsequent Request for Proposals. All of such costs shall be borne solely by each Proposer and its team members.

### *C. DES and Owner Obligations*

Except as set forth in the following paragraph, in no event shall DES or the Owner be bound by, or liable for, any obligations with respect to the Project until such time (if at all) a design-build contract, in form and substance satisfactory to DES, has been executed and authorized by the DES and, then, only to the extent set forth therein.

Notwithstanding the preceding paragraph, the Owner will provide the Finalists who submit a responsive Proposal, but are not awarded the design-build contract, an honorarium in the amount of \$100,000. The terms for attaining such honorarium payment will be specified in the Request for Proposals.

## **9.0 Protests**

### *A. General*

## TRI-CITIES READINESS CENTER REQUEST FOR QUALIFICATIONS

This Section sets forth the exclusive protest remedies available with respect to this RFQ. Each Proposer, by submitting its SOQ, expressly recognizes and agrees to the limitation on its rights to protest contained herein, expressly waives all other rights and remedies and agrees that the decision on any protest, as provided herein, shall be final and conclusive unless wholly arbitrary. These provisions are included in this RFQ expressly in consideration for such waiver and agreement by the Proposers.

Such waiver and agreement by each Proposer are also consideration to each other Proposer for making the same waiver and agreement.

### *B. Protests Prior to Submission of SOQ*

A Proposer may protest the terms of this RFQ prior to the time for submission of SOQ's on the grounds that:

1. A material provision in this RFQ is ambiguous to the extent that it hinders the Proposer's ability to accurately respond;
2. Any aspect of the procurement process described herein is contrary to legal requirements applicable to this procurement; or
3. This RFQ in whole or in part exceeds the authority of DES.

Protests regarding this RFQ shall be filed only after the Proposer has informally discussed the nature and basis of the protest with the Point of Contact in an effort to remove the grounds for protest.

Protests regarding this RFQ shall completely and succinctly state the grounds for protest and shall include all factual and legal documentation in sufficient detail to establish the merits of the protest. Evidentiary statements, if any, shall be submitted as signed, certified declarations under penalty of perjury.

Protests regarding this RFQ shall be filed by hand delivery or courier to the Point of Contact. The time for filing a protest is as soon as the basis for protest is known to the Proposer, but in any event it must be actually received no later than ten (10) days before the SOQ submittal due date. Protests regarding an Addendum to the RFQ shall be filed and actually received no later than five (5) business days after the Addendum to the RFQ is issued.

DES will distribute copies of the protest to the other Proposers and may, at its sole discretion: (1) request that other Proposers submit statements or arguments regarding the protest, and (2) discuss the protest with the protesting Proposer. If other Proposers are requested to submit statements or arguments, they may file a statement in support of or in opposition to the protest within seven (7) calendar days of the request.

The protesting Proposer shall have the burden of proving its protest by clear and convincing evidence. No hearing will be held on the protest. The DES Assistant Director of Facilities shall decide the protest on the basis of the written submissions. The DES Assistant Director of Facilities shall issue the decision in writing to each Proposer. The decision shall be final and conclusive. If necessary to address the issues raised in the protest, DES will make appropriate revisions to this RFQ by issuing

## TRI-CITIES READINESS CENTER REQUEST FOR QUALIFICATIONS

Addenda. DES may extend the SOQ due date, if necessary, to address any protest issues.

The failure of a Proposer to protest a particular ground prior to submission of the SOQ shall preclude consideration of that ground in any protest after submission of the SOQ. However, this preclusion does not apply if such ground was not and could not have been known to the Proposer prior to the final date to protest after submission of the SOQ.

### *C. Protests Regarding Responsiveness and Finalist Selection Process after Submission of SOQ's*

A Proposer may protest the results of the evaluation and finalist selection process by filing a notice of protest by hand delivery or courier to the Point of Contact.

The protesting Proposer shall concurrently provide a copy of its notice of protest to the other Proposers. The notice of protest shall specifically state the grounds of the protest.

Notice of protest of any decision to accept or disqualify a SOQ on responsiveness grounds must be filed within four (4) business days after the earliest of: notification of non-responsiveness, the scheduled date for oral meetings and presentations (if any), or the public announcement of the Finalists. Notice of protest of the decision on the finalist selection process must be filed and actually received by DES within four (4) business days after the public announcement of the Finalists.

Within seven (7) calendar days of the notice of protest, the protesting Proposer must file with the Point of Contact a detailed statement of the grounds, legal authorities and facts, including all documents and evidentiary statements, in support of the protest. The protesting Proposer shall concurrently deliver a copy of the detailed statement to all other Proposers. Evidentiary statements, if any, shall be submitted as signed certified declarations under penalty of perjury. The protesting Proposer shall have the burden of proving its protest by clear and convincing evidence.

Failure to file a notice of protest or a detailed statement within the applicable period shall constitute an unconditional waiver of the right to protest the evaluation or finalist selection process and decisions thereunder, other than any protest based on facts not reasonably ascertainable as of such date.

Other Proposers may file by hand delivery to the Point of Contact a statement in support of or in opposition to the protest. Such statement must be filed within seven (7) calendar days after the protesting Proposer files its detailed statement of protest. DES will promptly forward copies of any such statements to the protesting Proposer.

No evidentiary hearing or oral argument shall be provided, except, in the sole and absolute discretion of the DES Assistant Director of Facilities, a hearing or oral

argument may be permitted if deemed useful in rendering a decision. The DES Assistant Director of Facilities shall issue a written decision regarding the protest within thirty (30) calendar days after DES receives the detailed statement of protest, unless notice is given to the protesting Proposer that additional time is needed.

Such decision shall be final and conclusive. DES shall deliver the written decision to the protesting Proposer and copies to the other Proposers. Unless necessary for the successful completion of the Project, as determined at the sole discretion of the DES Assistant Director of Facilities, the Request for Proposals shall not be issued to the Finalists until DES issues its written decision on the protest.

If the DES Assistant Director of Facilities concludes that the Proposer filing the protest has established a basis for protest, the DES Assistant Director of Facilities will determine what remedial steps, if any, are necessary or appropriate to address the issues raised in the protest. Such steps may include, without limitation, withdrawing or revising the decisions, issuing a new RFQ or taking other appropriate actions.

## 10.0 Miscellaneous

### A. *Public Records Act*

1. Confidential Records. As used herein, "confidential records" includes any trade secrets, proprietary information or confidential content the Proposer submits to DES.
2. Public Records Requests for Confidential Records. DES will respond to any requests for confidential records consistent with 42.56 RCW and in particular with 39.10.470 RCW which provides for the protection of trade secrets as follows: *"Trade secrets, as defined in RCW 19.108.010, or other proprietary information submitted by a bidder, offeror, or contractor in connection with an alternative public works transaction under this chapter shall not be subject to chapter 42.56 RCW if the bidder, offeror, or contractor specifically states in writing the reasons why protection is necessary, and identifies the data or materials to be protected."* 39.10.470(2)
3. In the event that Proposer does not comply with the 39.10.470 RCW requirements above, DES will respond to any Public Records request for Proposer's confidential records by (i) notifying Proposer of the request and (ii) of DES' intent to disclose Proposer's confidential records on a date certain unless Proposer obtains a court order directing DES to withhold such records pursuant to 42.56.540 ("Court Protection of Public Records").

### B. *Conflict of interest*

DES may, in its sole discretion, disqualify any Proposer from further consideration for the award of the design-build contract if it is found after due notice and examination

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by DES that there is a violation of the Ethics in Public Service Act, Chapter 42.52 RCW, or any similar statute involving the Proposer in the procurement of the design-build contract.

### *C. Requirement to Keep Team Intact*

The team proposed by Proposer, including but not limited to the lead contractor, the designer-of-record, key personnel, and other individuals identified pursuant to Section 4.B hereof, shall remain on Proposer's team for the duration of the procurement process and, if the Proposer is awarded the design-build contract, the duration of the design-build contract. If extraordinary circumstances require a team member change, the proposed change must be submitted in writing to DES's Point of Contact. DES, at its sole discretion, will determine whether to authorize a change. Unauthorized changes to the Proposer's team at any time during the procurement process may result in the elimination of the Proposer from further consideration.

Notwithstanding the above, DES will consider providing the Finalists with a limited opportunity to add or remove consultants, subcontractors and/or key personnel to address deficiencies identified by DES in the Proposal. This opportunity will only be allowed in writing during the Proposal process.

### *D. Diverse Business Participation*

In accordance with [RCW 39.19.010](#), the state of Washington encourages participation in all of its contracts by OMWBE certified firms.

In accordance with [RCW 43.60A.200](#) and [RCW 39.26.240](#), the state of Washington encourages participation in contracts that are exempt from competitive bidding under RCW 39.26.125 by firms certified by Department Of Veteran Affairs.

In accordance with [RCW 39.26.005](#), the state of Washington encourages participation in all of its contracts by Washington small businesses.

DES is committed to providing the maximum practicable opportunity for participation by Diverse Businesses through direct contracts with DES, subcontracts, sub-consulting, and supplier participation.

#### *1. Definitions.*

- a) Diverse Business includes Washington small business, micro-business, and mini-business as defined in RCW 39.26.010, Minority and Women Business Enterprises (M/WBEs) as defined in RCW 39.39.19 and WAC 326-20, and Veteran-owned businesses as defined in RCW 43.60A.010. If the proposed subcontractors are self-identified diverse businesses, the Proposer will encourage and support state efforts for their certification with the appropriate Washington state agencies.
- b) Subcontracting means direct performance of commercially useful work through

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subcontracting as part of the proposed project team.

2. *Participation Goals.* The aspirational diversity goals for DES contracts are:
  - ✓ 10% Minority Owned Business (MBE) certified by the Washington State Office of Minority and Women Business Enterprises
  - ✓ 6%, Women Owned Business (WBE) certified by the Washington State Office of Minority and Women Business Enterprises
  - ✓ 5% Veteran Owned Business (VOB) certified by the Washington State Department of Veterans Affairs
  - ✓ 5% Washington Small Businesses self-identified in the Washington Electronic Business Solution  
<http://www.des.wa.gov/services/ContractingPurchasing/Business/Pages/WEBSRegistration.aspx> (WEBS).

Participation goals for this project are 10% for MBEs, 6% for WBEs, 5% VOB, and 5% for Washington Small Businesses.
  
3. *Inclusion Plan.* To be considered responsive, Finalists must submit a Diverse Business Inclusion Plan (Attachment 10) as part of their proposal. The Proposer must prepare and provide a “Diverse Business Inclusion Plan” and may use the template below as guidance. The Proposer’s goals are voluntary. No preference will be included in the evaluation of proposals, no minimum level of MWBE or Veteran Owned or Washington Small Business participation will be required as a condition for receiving an award and proposals will not be rejected or considered non-responsive on that basis (unless a zero (0) goal amount is submitted).

<b>Public Works Inclusion Plan Template</b>		
<b>Voluntary goals for certified diverse business participation:</b> <i>(Of the total contract work, what is the percentage of diverse business participation proposed for this project, including the prime and subcontracting/joint venturing on this project?)</i>		
<b>1. Anticipated Certified Diverse Business Participation (Goals)</b>		
<b>State certification category</b>	<b>Washington State / DES Goals</b>	<b>Anticipated Percent of Contract Amount (Goals)</b>
<b>Minority-owned business</b>	<b>10%</b>	
<b>Women-owned business</b>	<b>6%</b>	
<b>Veteran-owned business</b>	<b>5%</b>	
<b>Small/mini/micro business</b>	<b>5%</b>	
<b>2. Describe your firm’s efforts to identify diverse business subcontractors for this proposal?</b>		
<b>3. Planned efforts by the firm to meet or exceed the voluntary inclusion goals. To include, but not limited to the following:</b>		
<b>a. General description;</b>		
<b>b. Mentoring, training and capacity building programs;</b>		
<b>c. Prompt payment, retainage and dispute resolution</b>		
<b>4. A description of firm’s planned efforts at outreach to the diverse business community</b>		
<b>5. A description of firm’s process for ensuring diverse businesses have enough time and information to provide your firm with bids/quotes:</b>		

<b>6. An explanation of how firm ensures diverse businesses understand the bid and specifications and are able to learn ways to improve if they are not selected (i.e. pre-bid meetings, debriefing, etc.);</b>
<b>7. A description of how firm considers diverse businesses in the development of bid packages</b>
<b>8. Does the firm have and the name of any “Diversity Inclusion Expert”?</b>
<b>9. A list of projects (5 max.) with diverse business participation in the last five (5) years</b>
<b>10. Statement of firm’s awareness and commitment to reach out to diverse businesses and helping Washington State reduce the disparity of participation by minority and women owned businesses in state contracts</b>
<b>11. Description of proposer’s educational and training programs to communicate the firm’s expected employee behaviors and performance relative to implementing the Diverse Business Inclusion Plan</b>
<b>12. Any additional information the firm would like to include as a part of their plan.</b>

The Design Builder commits to a genuine effort to achieve the proposed subcontract amounts with diverse business subcontractors by working with the Agency to develop a comprehensive “Outreach Strategy.”

4. *Contact Information.* For information on certified firms, prime Proposers may contact:  
 OMWBE at <http://www.omwbe.wa.gov/> or (360) 664-9750  
 DVA at <http://www.dva.wa.gov/BusinessRegistry/Search.aspx> or (360) 725-2200.  
 DES Public Works Diverse Business Manager, Charles Wilson  
[charles.wilson@des.wa.gov](mailto:charles.wilson@des.wa.gov) or (360) 407-8455 for a list of self-certified Washington Small Businesses that downloaded this solicitation and selected to allow their contact information to be shared.
  
5. *DES Diversity Compliance Program.* The successful Proposer is required to register and create an account in the DES Diversity Compliance Program (B2Gnow) at <https://des.diversitycompliance.com>. Every month for the duration of your contract, and while your contract is active in the B2Gnow system, submit and accurately maintain the following payment information through B2Gnow:
  1. Payments received by the prime contractor from the Agency
  2. Payments paid to each subcontractor
  3. Payments paid to each supplier
  
6. *Maintenance of Records.* Design-Builder shall maintain, for at least six (6) years after Final Acceptance, relevant records and information necessary to document the level of utilization of Diverse Businesses and other businesses as Subcontractors on this Project, as well as any efforts Design-Builder made to increase the participation of Diverse Businesses. The Design-Builder shall also maintain, for at least six (6) years after Final Completion, a record of all quotes, bids, estimates, or proposals submitted to Design-Builder by all businesses seeking to participate as Subcontractors on this Project. Owner/DES shall have the right to inspect and copy such records. If this Contract involves federal funds, Design-Builder shall comply

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with all record keeping requirements set forth in any federal Governmental Rules referenced in the Contract Documents.

7. *Advertisements.* Design-Builder shall advertise opportunities for Subcontractors in a manner reasonably designed to provide Diverse Businesses capable of performing the work with timely notice of such opportunities, and all advertisements shall include a provision encouraging participation by Diverse Businesses. Advertising may be done through general advertisements (e.g. newspapers, journals, etc.) or by soliciting bids directly from Diverse Businesses. The Design-Builder shall provide Diverse Businesses that express interest with adequate and timely information about plans, specifications, and requirements of the Project.
8. *Non-Discrimination.* The Design-Builder shall not create barriers to open and fair opportunities for all businesses, including Diverse Businesses, to participate in all state contracts and to obtain or compete for contracts and subcontracts as sources of supplies, equipment, construction and services. In considering offers from and doing business with subcontractors and suppliers, the Design-Builder shall not discriminate on the basis of race, color, creed, religion, sex, age, nationality, marital status, or the presence of any mental or physical disability in an otherwise qualified disabled person.
9. *Violations.* Any violation of the mandatory requirements of this part of the Contract shall be a material breach of the Contract for which the Design-Builder may be subject to a requirement of specific performance, or damages and sanctions provided by contract, by RCW 39.19.090, or by other applicable laws.

### *E. Apprenticeship Participation*

#### APPRENTICE UTILIZATION REQUIREMENTS

The apprentice labor hours required for this project are 15% of the total labor hours. The Design-Builder signing the Proposal agrees to utilize this level of apprentice participation. A monetary incentive of \$1,000 will be paid to the Design-Builder meeting the apprentice utilization requirement. A monetary penalty will be applied to the Design-Builder failing to meet the utilization requirement and failing to demonstrate a Good Faith Effort. The penalty will be applied to every hour of short-fall of the minimum number of required apprentice hours using the applicable published wage of a Step 1 apprentice laborer. The penalty will not exceed five percent (5%) of the total Contract Sum. The cost value associated with meeting the apprentice utilization requirement is included in the Proposal Price.

Mandatory apprentice utilization of at least fifteen percent (15%) of the total construction labor hours worked on the Contract is required. Apprentices must be registered as apprentices with the State Apprenticeship and Training Council. Design-Builder shall comply with the requirements of the Contract documents and with statutory requirements in accordance with Chapters 39.04 and 49.04 RCW. related to apprenticeship. Proposers may contact the Department of Labor & Industries, Apprenticeship Program at

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360-902-5320 to obtain information on apprenticeship programs.

A. In accordance with [RCW 39.04.320](#), for all public works estimated to cost one million dollars or more, the State of Washington requires no less than **15% of the labor hours be performed by apprentices**. The design-builder or subcontractor may not be required to exceed the 15% requirement. This is an applicable project and the minimum required percentage of apprentice labor hours compared to the total labor hours.

1. **Incentives** - The Design-Builder who meets or exceeds this utilization requirement on eligible contracts, will be awarded a monetary incentive described in the Apprentice Utilization Requirements section above.
2. **Penalties** - The Design-Builder who fails to meet the utilization requirement and fails to demonstrate a Good Faith Effort, as outlined below, is subject to penalties described in the Apprentice Utilization Requirements section above. Design-Builder will receive an invoice payable to the Owner within 30 days of determination.
3. **Cost Value** - The expected cost value associated with meeting the goal is included in the Proposal Amount as described above.
4. **Utilization Plan** - The Design-Builder shall provide an **Apprentice Utilization Plan** (Plan) demonstrating how and when they intend to achieve the Apprenticeship Utilization Requirement. The Plan shall have enough information to track the Design-Builder's progress in meeting the utilization requirement. The Design-Builder shall submit the Plan on the Apprentice Utilization Plan template (on the DES Public Works Forms website) **within 30 days of Notice to Proceed of the Construction portion of the contract and prior to submitting the first construction invoice**. The Design-Builder shall provide an updated Plan during the course of construction when there are significant changes to the Plan which may affect their ability to meet the requirement.
  - (a) The Plan shall be uploaded to the Department of Labor & Industries' (L&I) ***Prevailing Wage Intents and Affidavit (PWIA) system on L&I's website.***
  - (b) The Plan is not submitted for approval.
  - (c) It is expected that the Design-Builder will actively seek out opportunities to meet the Apprentice Utilization Requirement during construction even if the Plan indicates a shortfall in meeting the requirement.
  - (d) If the Plan indicates that the Design-Builder will not attain the Apprentice Utilization Requirement, then Design-Builder must submit "Good Faith Effort" (GFE) documentation with their Plan to L&I's PWIA system.

5. **Good Faith Effort (GFE)**

- (a) Good Faith Effort (GFE) documentation shall describe in detail why the Design-Builder is not or was not able to attain the Apprentice Utilization Requirement.
  - 1. The Design-Builder may submit Good Faith Effort (GFE) documentation at any time during the construction.
  - 2. All GFE documentation must be submitted no later than 30 days before substantial completion.
- (b) Good Faith Effort (GFE) documentation must be in signed letter format uploaded to the PWIA system and include:
  - 1. The contract number, title and the apprentice utilization requirements,
  - 2. The amount of apprentice labor hours the contract can or did attain along with the percentage of labor hours,
  - 3. Design-Builder may receive a GFE credit for graduated Apprentice hours through the end of the calendar year for all projects worked on as long as the Apprentice remains continuously employed with the same Design-Builder they were working for when they graduated. If an Apprentice graduates during employment on a project of significant duration, they may be counted towards a GFE credit for up to one year after their graduation or until the end of the project (whichever comes first). Determination of whether or not Contract requirements were met in good faith will be made by subtracting the hours from the journeyman total reported hours for the project and adding them to the apprentice hour total. If the new utilization percentage meets the Contract requirement, the Design-Builder will be reported as meeting the requirement in good faith,
  - 4. Anticipated or actual shortfall (in apprentice labor hours and percentage) and the reason(s) for not attaining the required apprentice labor hours,
  - 5. Information from one or more of the following areas:
    - (a) Names of any State-Approved Apprentice Training Programs contacted with the name(s) of person(s) contacted and dates of contacts, and a copy of each response from the Training Program(s),
    - (b) Reference Contract Specifications or documents that affected the Design-Builder's ability to attain apprentice utilization,

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- (c) Discuss efforts the Design-Builder has taken to require Subcontractors to solicit and employ apprentices,

6. Backup documentation to the letter consisting of the following:

Letters, emails, phone logs including names dates and outcomes, posters, photos, payrolls, timecards, schedules, copies or references to other contract specifications or documents.

**Additional Resource Information**

- (a) For questions regarding how to complete the Apprentice Utilization Plan template or Good Faith Effort documentation, please contact the Project Manager listed in the RFQ.
- (b) Step-by-step instructions on how to access and navigate the L&I's PWIA system, including uploading required documents can be found on the L&I website.
- (c) Additional information about apprentice utilization on Public Works Project can be found on the L&I website.

### **11.0 Attachments**

- A. Federal Debarment, Suspension, Ineligibility and Voluntary Exclusion Form

Washington Military Department Contract Number: \_\_\_\_\_

**Debarment, Suspension, Ineligibility or Voluntary Exclusion Certification Form**

NAME		Doing business as (DBA)	
ADDRESS	Applicable Procurement or Solicitation #, if any:	WA Uniform Business Identifier (UBI)	Federal Employer Tax Identification #:
This certification is submitted as part of a request to contract.			

**Instructions For Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion--Lower Tier Covered Transactions**

**READ CAREFULLY BEFORE SIGNING THE CERTIFICATION.** Federal regulations require contractors and bidders to sign and abide by the terms of this certification, without modification, in order to participate in certain transactions directly or indirectly involving federal funds.

1. By signing and submitting this proposal, the prospective lower tier participant is providing the certification set out below.
2. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.
3. The prospective lower tier participant shall provide immediate written notice to the department, institution or office to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous when submitted or had become erroneous by reason of changed circumstances.
4. The terms covered transaction, debarred, suspended, ineligible, lower tier covered transaction, participant, person, primary covered transaction, principal, proposal, and voluntarily excluded, as used in this clause, have the meaning set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations.
5. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is proposed for debarment under the applicable CFR, debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.
6. The prospective lower tier participant further agrees by submitting this proposal that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.
7. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that it is not proposed for debarment under applicable CFR, debarred, suspended, ineligible, or voluntarily excluded from covered transactions, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the List of Parties Excluded from Federal Procurement and Non-procurement Programs.
8. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of a participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business activity.
9. Except for transactions authorized under paragraph 5 of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is proposed for debarment under applicable CFR, suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

**Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion--Lower Tier Covered Transactions**

**The prospective lower tier participant certifies, by submission of this proposal or contract, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this form.**

Bidder or Contractor Signature: \_\_\_\_\_

Date: \_\_\_\_\_

Print Name and Title: \_\_\_\_\_

## FEDERAL DEBARMENT, SUSPENSION INELIGIBILITY and VOLUNTARY EXCLUSION

### (FREQUENTLY ASKED QUESTIONS)

#### **What is “Debarment, Suspension, Ineligibility, and Voluntary Exclusion”?**

These terms refer to the status of a person or company that cannot contract with or receive grants from a federal agency

In order to be debarred, suspended, ineligible, or voluntarily excluded, you must have:

- had a contract or grant with a federal agency, and
- gone through some process where the federal agency notified or attempted to notify you that you could not contract with the federal agency.
- Generally, this process occurs where you, the contractor, are not qualified or are not adequately performing under a contract, or have violated a regulation or law pertaining to the contract.

#### **Why am I required to sign this certification?**

You are requesting a contract or grant with the Washington Military Department. Federal law (Executive Order 12549) requires Washington Military Department ensure that persons or companies that contract with Washington Military Department are not prohibited from having federal contracts.

#### **What is Executive Order 12549?**

Executive Order 12549 refers to Federal Executive Order Number 12549. The executive order was signed by the President and directed federal agencies to ensure that federal agencies, and any state or other agency receiving federal funds were not contracting or awarding grants to persons, organizations, or companies who have been excluded from participating in federal contracts or grants. Federal agencies have codified this requirement in their individual agency Code of Federal Regulations (CFRs).

#### **What is the purpose of this certification?**

The purpose of the certification is for you to tell Washington Military Department in writing that you have not been prohibited by federal agencies from entering into a federal contract.

#### **What does the word “proposal” mean when referred to in this certification?**

Proposal means a solicited or unsolicited bid, application, request, invitation to consider or similar communication from you to Washington Military Department.

#### **What or who is a “lower tier participant”?**

Lower tier participants means a person or organization that submits a proposal, enters into contracts with, or receives a grant from Washington Military Department, OR any subcontractor of a contract with Washington Military Department. If you hire subcontractors, you should require them to sign a certification and keep it with your subcontract.

#### **What is a covered transaction when referred to in this certification?**

Covered Transaction means a contract, oral or written agreement, grant, or any other arrangement where you contract with or receive money from Washington Military Department. Covered Transaction does not include mandatory entitlements and individual benefits.

### **Sample Debarment, Suspension, Ineligibility, Voluntary Exclusion Contract Provision**

**Debarment Certification.** The Contractor certifies that the Contractor is not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in this Contract by any Federal department or agency. If requested by Washington Military Department, the Contractor shall complete a Certification Regarding Debarment, Suspension, Ineligibility, and Voluntary Exclusion form. Any such form completed by the Contractor for this Contract shall be incorporated into this Contract by reference.

## **II. Exhibit Materials**

### **B Geotechnical Report**



Engineering +  
Environmental

# Geotechnical Engineering Report

Washington State Army National Guard  
Richland Army National Guard Building  
Richland, Washington

Prepared for:

Washington State Army National Guard  
Attn: Mr. Ron Cross  
Camp Murray Building 36  
Tacoma, Washington 98430

October 18, 2016  
Project No. 64395.000

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Richland Army National Guard Building  
Richland, Washington**

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Prepared for:  
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Attn: Mr. Ron Cross  
Camp Murray Building 36  
Tacoma, Washington 98430

Prepared by:



10/18/2016

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## 1.0 INTRODUCTION

### 1.1 General

This report presents the results of the PBS Engineering and Environmental Inc. (PBS) geotechnical engineering services for the proposed design and construction of the Richland Army National Guard Readiness Center in Richland, Washington. The site location is shown on the Vicinity Map, Figure 1. The approximate exploration locations in relation to existing site features are shown on the Site Plan, Figure 2.

### 1.2 Purpose and Scope

The purpose of PBS' services was to evaluate the subsurface conditions at the site and provide general geotechnical information needed to develop recommendations for use in design and construction of the proposed structure. This was accomplished by performing the following scope of services:

#### 1.2.1 Literature and Records Review

PBS reviewed various relevant published geologic maps of the area for information regarding geologic conditions. We also reviewed previously completed reports for the project site provided by you and the design team, or that were available in our files.

#### 1.2.2 Subsurface Explorations

PBS completed 3 borings (B-1 through B-3) and 10 test pits (TP-1 through TP-10) within the proposed site development area. The borings were explored to depths between 50.1 and 51.5 feet below the existing ground surface (bgs). The test pits were excavated to depths between 8 and 17 feet bgs. The borings and test pits were logged and representative soil samples collected by a PBS geotechnical engineer.

#### 1.2.3 Infiltration Testing

PBS completed infiltration testing in TP-3 and TP-8. Open-hole, falling head infiltration testing was completed at a depth of approximately 8 and 6 feet bgs, respectively.

#### 1.2.4 Soils Testing

Collected soil samples were transported to our laboratory for testing that included natural moisture contents and grain-size analyses (refer, Appendix B – Laboratory Testing).

#### 1.2.5 Geotechnical Engineering Analysis

Data collected during the subsurface explorations, literature research, and laboratory testing were used to develop specific geotechnical design and construction recommendations.

#### 1.2.6 Seismic Site Hazard Study

Using geologic maps and geologic hazard maps in conjunction with the results from the site-specific subsurface explorations, this report provides the following: discussion of the geologic profile, regional geologic, tectonic, and seismic settings, seismic source recommendations, discussion of ground response including amplification effects, evaluation of site-specific hazards including earthquake-induced landslides, liquefaction settlement, fault rupture, and seiche.

#### 1.2.7 Report Preparation

This Geotechnical Engineering Report summarizes the results of our explorations, testing, and analyses, including information relating to the following:

- Exploration logs and site plan showing approximate exploration locations
- Laboratory test results
- Infiltration test results
- Earthwork and grading, cut, and fill recommendations:
  - structural fill materials and preparation
  - utility trench excavation and backfill requirements
  - slab and pavement subgrade preparation
  - wet weather considerations
- Shallow foundation recommendations:
  - minimum embedment
  - allowable bearing pressure
  - estimated settlement
  - sliding coefficient
- Lateral earth pressures for retaining wall design, including:
  - active, passive, and at-rest earth pressures
  - seismic lateral force
  - allowable bearing pressure
  - sliding coefficient
  - groundwater and drainage considerations
- Seismic design criteria in accordance with the 2015 International Building Code (IBC) including State of Washington amendments
- Recommended AC pavement section thicknesses

### 1.3 Project Understanding

PBS understands the Richland Army National Guard proposes to build a 40,000 square foot, single-story Readiness Center and training area with associated parking on a 40-acre portion of Benton County Parcel 121084000006003 near the intersection of 1st Street and Polar Way in Richland, Washington. Conceptual plans of the site design and building placement were not available at the time this report was prepared, and the building type, configuration, and location at the site have not yet been finalized. Our recommendations were developed based on loads of less than 200 kips for columns, 7.5 kips per linear foot for walls, and slab loads of less than 200 pounds per square foot (psf).

## 2.0 SITE CONDITIONS

### 2.1 Surface Description

The proposed Richland Army National Guard Readiness Center property is located in an area previously used for agriculture in the Horn Rapids area of Richland, Washington. The site is bounded by 1st Street to the north, Polar Way to the east, commercial properties to the west, and partially bounded to the south by Logan Street and other formerly agricultural land (refer, Figure 1), creating a nearly square parcel. The site sits on a gentle to moderate slope that descends to the east. The elevation across the site varies from approximately 426 feet above mean sea level (amsl) in the southwest corner of the site to approximately 383 feet amsl near the northeast corner.

## 2.2 Geologic Setting

### 2.2.1 Regional Geology

The proposed Richland Army National Guard Readiness Center site is located within the Pasco Basin, a structural and topographical low area that lies in the Columbia River Plateau physiographic province in southeast Washington and northeast Oregon. This province consists of a series of flood basalt flows of the Columbia River Basalt Group (CRBG) of the Miocene Epoch and early Pliocene Epoch (between 17 and 6 million years ago) age, forming an extensive volcanic plateau. The thick basalt of the CRBG forms the bedrock of the region.

The Pasco Basin lies within a tectonic subdivision of the Columbia River physiographic province known as the Yakima Fold Belt (Riedel et al., 1991). Deformation of the basalt flows has since occurred, which is generally attributed to regional north-south compression and associated folding, strike-slip faulting, and thrusting. This deformation of the basalt has generally led to a series of northwest-trending anticlinal ridges and synclinal valleys. The Pasco Basin is a large syncline on the easterly side of the Yakima Fold Belt.

### 2.2.2 Local Geology

According to published geologic mapping of the area (Rockwell International, 1979), the surficial geology overlying the basalt consists of the stabilized sand dune deposits (Qds). The sand is a surficial Holocene deposit from within the most recent 13,000 years.

### 2.2.3 Faults

The Wallula fault zone (No. 846) and the Rattlesnake Hills fault zone (No. 565) are mapped approximately 2.5 to 5 miles southwest of the proposed site (Personius, 2002). Although data about the fault system are limited, the USGS and DOGAMI classify it as active with most recent deformation of less than 1.6 million years ago.

## 2.3 Subsurface Conditions

### 2.3.1 Discussion

Subsurface conditions at the site were explored by advancing three borings, designated as B-1 through B-3, and by excavating ten test pits, designated as TP-1 through TP-10. The borings were advanced to depths between 50.1 and 51.5 feet bgs, on September 14, 2016, by Haz-Tech Drilling of Meridian, Idaho. The test pits were explored to depths of 8 to 17 feet bgs, on September 20, 2016, by Mahaffey Enterprises, Inc., of Kennewick, Washington.

### 2.3.2 Soils

PBS has summarized the subsurface units as follows:

**SAND** SAND (SP) was encountered in all borings and test pits from the surface to depths between 40 and 50 feet bgs. The relative density ranged from medium dense to dense with Standard penetration test (SPT) and Dynamic Cone Penetrometer (DCP) blow counts generally between 10 to over 40, with the exception of loose sand within the top 5-feet of the soil layer. The sand was generally medium to fine-grained with variable amounts of silt and gravel, and had moisture contents of generally less than 10 percent.

**GRAVEL** GRAVEL (GP) with sand and silt was encountered at depths between 40 and 50 feet bgs. The relative density was very dense

with Standard penetration test (SPT) blow counts of over 50. The gravel was generally coarse and rounded, and the sand was generally medium to fine-grained with silt content less than 10 percent. The gravel felt dry to the touch.

### 2.3.3 Groundwater

Groundwater was not observed during the subsurface explorations on the dates completed. Existing information regarding the groundwater depths in the project area were obtained from the Washington State Department of Ecology well log database. The data were recorded in 2013. Based on the nearby well logs, groundwater underlying the site is below approximately 50 feet bgs.

Perched groundwater may be encountered at the project site and may fluctuate due to variations in rainfall, agricultural irrigation, and the season.

### 2.3.4 Infiltration Testing

PBS completed two infiltration tests, one each in TP-3 and TP-8, at a depth of approximately 8.0 and 6.0 feet bgs, respectively. The tests were completed in general accordance with the procedures outlined in the Stormwater Management Manual for Eastern Washington. The test pit was advanced to the test depth and then filled with to an initial head of approximately 3 feet of water, saturating the surrounding soils. The water was then allowed to drain and the water depth was recorded at regular, timed intervals. From initial saturation to the end of testing, the test durations were 64 and 46 minutes for TP-3 and TP-8, respectively.

The following Table 1 presents test depth, the field-measured infiltration rate, and soil classification.

**Table 1. Infiltration and Laboratory Test Results**

Test Pit	Depth of Infiltration Test (feet bgs)	Infiltration Rate <sup>1</sup> (inches/hour)	Soil Classification
TP-3	8	15.6	SAND (SP-SM) with silt and gravel
TP-8	6	9.3	SAND (SP-SM) with silt and gravel

<sup>1</sup> Field-measured infiltration rate.

The infiltration rates listed in Table 1 are not permeability or hydraulic conductivity rates, but field-measured rates, and do not include correction factors related to long-term infiltration rates. The design engineer should determine the appropriate correction factors to account for the planned level of pre-treatment, maintenance, vegetation, siltation, etc. Field-measured infiltration rates are typically reduced by a factor of two to four for use in design.

## 3.0 CONCLUSIONS AND RECOMMENDATIONS

### 3.1 Geotechnical Design Considerations

The subsurface conditions at the site consist primarily of medium to fine-grained sand alluvium. Based on our observations and analyses, conventional foundation supported on shallow spread footings is feasible for the proposed construction, and excavation with conventional equipment

is feasible for the site. Final grading plans for the project have not been completed for this site. We have not evaluated the impacts of site grading on the stability of the existing slopes and have estimated settlement of the underlying soils based on the estimated loads.

Depending on the future (proposed) location of the building, additional field exploration may be required to better evaluate the subsurface conditions beneath the proposed building footprint and to refine our recommendations, as needed.

### **3.2 Shallow Foundations**

Shallow spread footings bearing on native medium dense sand and silt may be used to support loads associated with the proposed construction, provided the recommendations in this report are followed. Footings should be supported on firm native soils or properly compacted structural fill.

#### **3.2.1 Footing Preparation**

Excavations for footings should be carefully prepared to a medium dense/compact state. A representative from PBS should confirm suitable bearing conditions and evaluate all exposed footing subgrades. Observations should also confirm that loose materials have been removed or compacted to a dense condition within the new footing excavations, concrete slab-on-grade areas, and pavement areas. In the event that loose, wet, or deleterious materials are encountered, PBS may require localized deepening of the footing excavations.

We recommend a layer of compacted, crushed rock be placed over the footing subgrades to help protect them from disturbance due to foot traffic and the elements. Placement of this rock is the prerogative of the contractor; regardless, the footing subgrade should be in a dense or stiff condition prior to pouring concrete. Based on our experience in the area, approximately 4-inches of compacted crushed rock will be suitable beneath the footings.

#### **3.2.2 Footing Embedment Depths**

We recommend that all footings be founded a minimum of 24 inches below the lowest adjacent grade. The footings should be founded below an imaginary line projecting upward at a 1H:1V (horizontal to vertical) slope from the base of any adjacent, parallel utility trenches or deeper excavations.

#### **3.2.3 Minimum Footing Widths / Design**

Continuous wall and isolated spread footings should be at least 18 and 24 inches wide, respectively. Footings should be sized using a maximum allowable bearing pressure of 2,500 pounds per square foot (psf). This is a net bearing pressure and the weight of the footing and overlying backfill can be disregarded in calculating footing sizes. The recommended allowable bearing pressure applies to the total of dead plus long-term-live loads. Allowable bearing pressures may be increased by one-third for seismic and wind loads.

#### **3.2.4 Foundation Static Settlement**

Footings will settle in response to column and wall loads. Based on our evaluation of the subsurface conditions and our analysis, we estimate post-construction settlement will be less than one inch for the column and perimeter foundation loads. Differential settlement will be on the order of one-half of the total settlement.

### 3.2.5 Lateral Resistance

Lateral loads can be resisted by passive earth pressure on the sides of and by friction at the base of the footings. A passive earth pressure of 300 pounds per cubic foot (pcf) may be used for footings confined by native soils and new structural fills. The allowable passive pressure has been reduced by one-half to account for the large amount of deformation required to mobilize full passive resistance. Adjacent floor slabs, pavements, or the upper 12-inch depth of adjacent unpaved areas should not be considered when calculating passive resistance. For footings supported on native soils or new structural fills, use a coefficient of friction equal to 0.4 when calculating resistance to sliding. These values do not include a factor of safety (FS).

### 3.3 Retaining Walls

The proposed building may include retaining walls as part of the general site grading design. The following recommendations are based on the assumption of flat conditions in front of and behind the wall and fully drained backfill. For unrestrained walls allowed to rotate at least  $0.005H$  about the base, where  $H$  is the height of the wall, we recommend using an active earth pressure of 35 psf. Where walls are constrained against rotation, we recommend using an “at-rest” earth pressure equal to 55 psf. We recommend any retaining walls founded on native soil or compacted structural fill be provided with adequate drainage and backfilled with clean, angular, crushed rock fill, in accordance with the recommendations provided in Section 4.6.

For seismic loading, we recommend using an inverted triangular distribution (seismic surcharge) with a maximum magnitude of  $6H$  psf. Walls should be designed by applying the active earth pressure plus the seismic loading, or at-rest earth pressures, whichever is greater. If vertical surcharge loads,  $q$ , are present within  $0.5H$  of the wall, a lateral surcharge of  $0.3q$  (for walls allowed to rotate) and  $0.5q$  (for restrained walls) should be applied as a uniform horizontal surcharge active over the full height of the wall. These values assume that the wall is vertical and the backfill behind the wall is horizontal. Seismic lateral earth pressures were computed using the Mononobe-Okabe equation. Recommended lateral earth pressure distributions are shown on Figure 3, Retaining Wall Earth Pressure Diagram. Additional lateral pressures due to surcharge loads can be estimated using the guidelines shown on Figure 4, Lateral Surcharge Detail.

Lateral loads can also be resisted by a passive resistance of 300 psf acting against embedded walls and foundations, and by friction acting on the base of spread footings or mats using a friction coefficient of 0.4.

### 3.4 Seismic Design Criteria

Subsurface conditions encountered to the depths explored consist primarily of medium dense sand and sand with variable amounts of silt and gravel. Well logs and geologic cross-sections from this area indicate that soil below the depth of our explorations consists of sand and gravel. The soil profile in the top 100 feet at this site conforms to a seismic design Site Class D for a “stiff soil” profile.

The seismic design parameters, in accordance with the 2015 IBC, are summarized in Table 2 as follows:

**Table 2. 2015 IBC Seismic Design Parameters**

Parameter	Short Period	1 Second
Maximum Credible Earthquake Spectral Acceleration	$S_s = 0.41 \text{ g}$	$S_1 = 0.16 \text{ g}$
Site Class	D	
Site Coefficient	$F_a = 1.20$	$F_v = 1.64$
Adjusted Spectral Acceleration	$S_{MS} = 0.60 \text{ g}$	$S_{M1} = 0.34 \text{ g}$
Design Spectral Response Acceleration Parameters	$S_{DS} = 0.40 \text{ g}$	$S_{D1} = 0.23 \text{ g}$
<b>Design Spectral Peak Ground Acceleration</b>	<b>0.17 g</b>	

g – Acceleration due to gravity

Seismic hazards considered include earthquake-induced landslides, fault rupture, and earthquake shaking. Based on the topography and geology at the site, we consider the risk from earthquake-induced landslides to be low. Strong earthquake ground shaking may occur during a design-level seismic event on the Wallula fault zone and the Rattlesnake Hill zone. These faults are shown approximately 2.5 to 5 miles southwest of the proposed site according to the Washington State Department of Natural Resources, but are not included in the US Geological Survey (USGS) Quaternary Faults and Folds database. Based on our current understanding of the project, our opinion is that effects of earthquake ground motions can be accounted for by using code-based design procedures.

### 3.5 Floor Slabs

Satisfactory subgrade support for building floor slabs can be obtained from the native sand subgrade prepared in accordance with our recommendations presented in the Site Preparation, Subgrade Protection in Wet Conditions, and Select Borrow sections of this report. A minimum six-inch-thick layer of imported granular material should be placed and compacted over the prepared/compacted subgrade or structural fill. Imported granular material should be composed of crushed rock or crushed gravel that is relatively well graded between coarse and fine, contains no deleterious materials, has a maximum particle size of 1½-inch, and has less than five percent by dry weight passing the US Standard No. 200 Sieve.

Floor slabs supported on a compacted subgrade and base course prepared in accordance with the preceding recommendations may be designed using a modulus of subgrade reaction (k) of 150 pounds per cubic inch (pci).

### 3.6 Pavement Section Suggestions

PBS understands that the parking areas at the site will consist of AC pavement limited to car and light truck traffic. We assume the access drive for the facility may receive limited heavy truck traffic. The AC pavement was evaluated using a pavement design life of 20 years and an assumed truck factor of 2.0 equivalent single-axle loads (ESAL) per truck. Based on the anticipated 5 trucks per day, we have estimated total ESALs for a 20-year design life. The native subgrade under AC pavement areas should be prepared by scarifying, moisture conditioning, and recompacting a minimum of 12 inches below the bottom of the base course. Our AC pavement design recommendations are based on the following design parameters:

- A resilient modulus of 4,500 pounds per square inch (psi) (equivalent to a California Bearing Ratio [CBR] value of three) was used for the medium dense sand with silt that has been recompacted to a depth of 12 inches bgs
- A resilient modulus of 28,000 psi was assumed for the aggregate base rock
- Initial and terminal serviceability index of 4.2 and 2.5, respectively
- Reliability and standard deviation of 90 percent and 0.45, respectively
- Structural coefficient of 0.43 and 0.13 for the asphalt and aggregate base rock, respectively
- Pavement suggestions were evaluated using the American Association of State Highway and Transportation Officials (AASHTO) design methods

**Table 3. Minimum AC Pavement Sections**

Traffic Loading	AC (inches)	Base Rock (inches)	Subgrade
Pull-in Car Parking Areas	3.0	9.0	Medium dense sand subgrade compacted to 92% of ASTM D 1557
Drive Lanes and Access Roads	5.0	10.0	

The AC binder should be performance graded according to the WSDOT SS 9-02.1(4) – Performance Graded Asphalt Binder. The AC should consist of ½-inch, hot mix asphalt (HMA). The maximum lift thickness should be 3.0 inches. The AC should conform to WSDOT SS 5-04.3(7)A – Mix Design, WSDOT SS 9-03.8(2) – HMA Test Requirements, and WSDOT SS 9-03.8(6) – HMA Proportions of Materials. The AC should be compacted to 91 percent of the maximum theoretical density (Rice value) of the mix, as determined in accordance with the ASTM D 2041, following the guidelines set in WSDOT SS 5-04.3(10) – Compaction.

Heavy construction traffic on new pavements or partial pavement sections (such as base course over the prepared subgrade) will likely exceed the design loads and could potentially damage or shorten the pavement life. Therefore, we recommend construction traffic not be allowed on new pavements, or that the contractor take appropriate precautions to protect the subgrade and pavement during construction.

## 4.0 CONSTRUCTION RECOMMENDATIONS

### 4.1 Site Preparation

Construction of the proposed building will involve clearing and grubbing of the existing vegetation and recompaction of the exposed subgrade. The expected depth of site clearing and grubbing of surface vegetation and roots measuring a minimum of one inch in diameter is approximately one foot.

### 4.2 Proofrolling/Subgrade Verification

Following site preparation and prior to placing aggregate base for the shallow foundations, building pad, or pavement sections, the exposed subgrade should be evaluated either by proofrolling or another method of subgrade verification. The subgrade should be proofrolled with a fully loaded dump truck or similar heavy, rubber-tire construction equipment to identify unsuitable areas. If evaluation of the subgrades occur during wet conditions, or if proofrolling the

subgrades will result in disturbance, they should be evaluated by a member of the PBS engineering staff using a steel foundation probe. We recommend that PBS be retained to observe the proofrolling and perform the subgrade verifications. Unsuitable areas identified during the field evaluation should be compacted to a firm condition or be excavated and replaced with compacted structural fill.

#### **4.3 Subgrade Protection in Wet Conditions**

Protection of the subgrade is the responsibility of the contractor. Track-mounted excavating equipment may be required during wet weather. The thickness of the haul roads to access the site for excavation and staging areas will depend on the amount and type of construction traffic. The material used for haul roads or site access drives should be stabilization material described below. A 12- to 18-inch-thick mat of stabilization material should be sufficient for light staging areas. The stabilization material for haul roads and areas with repeated heavy construction traffic typically needs to be increased to between 18 to 24 inches. The actual thickness of haul roads and staging areas should be based on the contractor's approach to site work and the amount and type of construction traffic, and is the contractor's responsibility. The stabilization material should be placed in one lift over the prepared, undisturbed subgrade and compacted using a smooth-drum, non-vibratory roller. Additionally, a geotextile fabric should be placed as a barrier between the subgrade and stabilization material. The geotextile should meet specifications and be installed in conformance with WSDOT SS Section 2-12.3.

#### **4.4 Excavation**

The near-surface soils at the site can be excavated with conventional earthwork equipment. Sloughing and caving should be anticipated. All excavations should be made in accordance with applicable Occupational Safety and Health Administration (OSHA) and State regulations. The contractor is solely responsible for adherence to the OSHA requirements. Trench cuts may stand relatively vertical to a depth of approximately four feet bgs. Open excavation techniques may be used in the sand provided the excavation is configured in accordance with the OSHA requirements and with the understanding that some sloughing and caving will likely occur. The trenches should be flattened if sloughing occurs. If vertical walls are desired for cuts deeper than four feet bgs, use of a trench shield or other approved temporary shoring is highly recommended.

#### **4.5 Slopes**

If the project will include slopes or open excavation, temporary and permanent cut slopes up to 10 feet high may be inclined at 1.5H:1V and 2H:1V, respectively. Access roads and pavements should be located at least five feet from the top of temporary slopes. Surface water runoff should be collected and directed away from slopes to prevent water from running down the face.

#### **4.6 Structural Fill**

The extent of site grading is currently unknown; however, we estimate cuts and fills will be limited in depth/thickness of approximately five feet. Structural fill, including base rock, should be placed over subgrades that have been prepared in conformance with Section 4.3, Subgrade Protection in Wet Conditions. Structural fill material should consist of relatively well-graded soil, or an approved rock product that is free of organic material and debris, and contains particles not greater than 3-inches nominal dimension.

If fill and excavated material will be placed on slopes steeper than 5H:1V, these must be keyed/benched into the existing slopes and installed in horizontal lifts. Vertical steps between benches should be approximately two feet.

#### 4.6.1 On-Site Soil

On-site soils encountered in our explorations are generally suitable for placement as structural fill during moderate, dry weather when moisture content can be maintained by air drying and/or addition of water. The fine-grained fraction of the site soils are moisture sensitive, and during wet weather, may become unworkable because of excess moisture content. In order to reduce moisture content, some aerating and drying of fine-grained soils may be required. The material should be placed in lifts with a maximum uncompacted thickness of approximately 8 inches and compacted to at least 92 percent of the maximum dry density, as determined by ASTM D 1557 (modified Proctor).

#### 4.6.2 Gravel Borrow

Borrow material for general structural fill construction should meet the requirements set forth in WSDOT SS 9-03.14(1) – Gravel Borrow. When used as structural fill, borrow material should be placed in lifts with a maximum uncompacted thickness of approximately 8 inches and compacted to not less than 92 percent of the maximum dry density, as determined by ASTM D 1557.

#### 4.6.3 Select Borrow

Selected granular backfill used during periods of wet weather for structural fill construction should meet the specifications provided in WSDOT SS 9-03.14(2) – Select Borrow. The imported granular material should be uniformly moisture conditioned to within about 2 percent of the optimum moisture content and compacted in relatively thin lifts using suitable mechanical compaction equipment. Selected granular backfill should be placed in lifts with a maximum uncompacted thickness of 8 to 12 inches and be compacted to not less than 95 percent of the maximum dry density, as determined by ASTM D 1557.

#### 4.6.4 Crushed Aggregate Base

Crushed aggregate base course below floor slabs, spread footings, and asphalt concrete pavements should be clean, crushed rock or crushed gravel that contains no deleterious materials and meets the specifications provided in WSDOT SS 9-03.9(3) – Crushed Surfacing, and have less than 7.5 percent by dry weight passing the US Standard No. 200 Sieve. The crushed aggregate base course should be compacted to at least 95 percent of the maximum dry density, as determined by ASTM D 1557.

#### 4.6.5 Utility Trench Backfill

Trench backfill in structural areas should be composed of suitable granular soils such as sand, gravel, and crushed rock. Pipe bedding placed to uniformly support and surround the barrel of pipe should meet specifications provided in WSDOT SS 9-03.12(3) – Gravel Fill for Pipe Zone Bedding. The pipe zone extends at least 6 inches above and below utility lines. The pipe zone backfill material should be compacted to at least 90 percent of the maximum dry density, as determined by ASTM D 1557, or as required by the pipe manufacturer.

The remainder of the trench backfill should consist of well-graded granular material with less than 10 percent by dry weight passing the US Standard No. 200 Sieve, and should meet standards prescribed by WSDOT SS 9-03.19 – Bank Run Material for Trench Backfill. This material should be compacted to at least 92 percent of the maximum dry density, as determined by ASTM D 1557, or as required by the pipe manufacturer. The upper 2 feet of the trench backfill should be compacted to at least 95 percent of the maximum dry density,

as determined by ASTM D 1557. Controlled low-strength material (CLSM), WSDOT SS 2-09.3(1)E – Backfilling, can be used as an alternative.

#### **4.6.6 Stabilization Material**

Stabilization rock should consist of pit- or quarry-run rock that is well-graded, angular, crushed rock consisting of 4- or 6-inch-minus material with less than 5 percent passing the US Standard No. 4 Sieve. The material should be free of organic matter and other deleterious material. WSDOT SS 2-03.3(14)A – Rock Embankment Construction can be used as a general specification for this material and construction methods, with the stipulation of limiting the maximum size to 6 inches.

### **5.0 ADDITIONAL SERVICES AND CONSTRUCTION OBSERVATIONS**

In most cases, other services beyond completion of a geotechnical engineering report are necessary or desirable to complete the project. Occasionally, conditions or circumstances arise that require the performance of additional work that was not anticipated when the geotechnical report was written. PBS offers a range of environmental, geological, geotechnical, and construction services to suit the varying needs of our Clients.

PBS should be retained to review the plans and specifications for this project before they are finalized. Such a review allows us to verify that our recommendations and concerns have been adequately addressed in the design.

Satisfactory earthwork performance depends on the quality of construction. Sufficient observation of the contractor's activities is a key part of determining that the work is completed in accordance with the construction drawings and specifications. We recommend that PBS be retained to observe general excavation, stripping, fill placement, and footing and pavement subgrades. Subsurface conditions observed during construction should be compared with those encountered during the subsurface explorations. Recognition of changed conditions requires experience; therefore, qualified personnel should visit the site with sufficient frequency to detect whether subsurface conditions change significantly from those anticipated.

### **6.0 LIMITATIONS**

This report has been prepared for the exclusive use of the addressee, and their architects and engineers, for aiding in the design and construction of the proposed building and is not to be relied upon by other parties. It is not to be photographed, photocopied, or similarly reproduced, in total or in part, without express written consent of the Client and PBS. It is the addressee's responsibility to provide this report to the appropriate design professionals, building officials, and contractors to ensure correct implementation of the recommendations.

The opinions, comments, and conclusions presented in this report are based upon information derived from our literature review, field explorations, laboratory testing, and engineering analyses. It is possible that soil, rock, or groundwater conditions could vary between or beyond the points explored. If soil, rock, or groundwater conditions are encountered during construction that differ from those described herein, the Client is responsible for ensuring that PBS is notified immediately so that we may reevaluate the recommendations of this report.

Unanticipated fill, soil and rock conditions, and seasonal soil moisture and groundwater variations are commonly encountered and cannot be fully determined by merely taking soil samples from borings and test pits. Such variations may result in changes to our recommendations and may

require additional funds for expenses to attain a properly constructed project. Therefore, we recommend a contingency fund to accommodate such potential extra costs.

The scope of services for this subsurface exploration and geotechnical report did not include environmental assessments or evaluations regarding the presence or absence of wetlands or hazardous substances in the soil, surface water, or groundwater at this site.

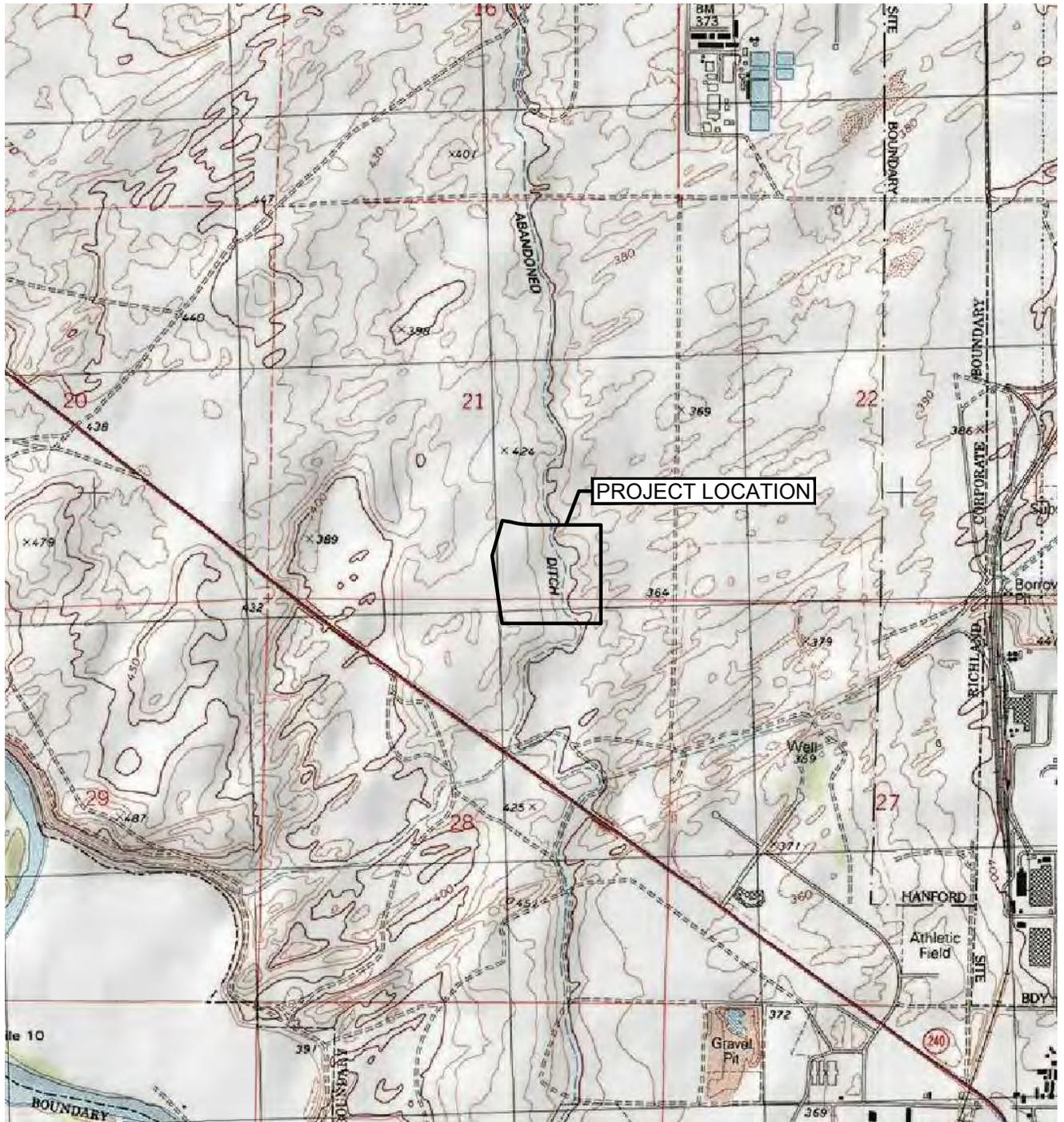
If there is a substantial lapse of time between the submission of this report and the start of work at the site, if conditions have changed due to natural causes or construction operations at or adjacent to the site, or if the basic project scheme is significantly modified from that assumed, this report should be reviewed to determine the applicability of the conclusions and recommendations presented herein. Land use, site conditions (both on and off site), or other factors may change over time and could materially affect our findings. Therefore, this report should not be relied upon after three years from its issue, or in the event that the site conditions change.

## 7.0 REFERENCES

- IBC. (2015). *International Building Code*. Country Club Hills, IL: International Code Council, Inc. Washington State Amendments to the International Building Code.
- Personius, S. F., compiler, 2002, *Fault number 565, Rattlesnake Hills Fault Zone, in Quaternary fault and fold database of the United States*: U.S. Geological Survey website, <http://earthquakes.usgs.gov/hazards/qfaults>
- Personius, S.F., compiler, 2002, *Fault number 846, Wallula Fault Zone, in Quaternary fault and fold database of the United States*: U.S. Geological Survey website, <http://earthquakes.usgs.gov/hazards/qfaults>
- Riedel, Stephen, et al. (1991). *Field Trip Guide to the Geology of the Pasco Basin and Surrounding Area, South-Central Washington*, Washington State University.
- Rockwell International, (1979). *Compilation Geologic Map of the Pasco Basin, South Central Washington*. RHO-BWI-ST-4, Rockwell Hanford Operations Energy Systems Group.
- WSDOT SS (2016). *Standard Specifications for Road, Bridge, and Municipal Construction, M 41-10* Olympia, WA: Washington State Department of Transportation.
- Washington State Department of Ecology, (2004), *Stormwater Management Manual for Eastern Washington*, publication number 04-10-076

## **FIGURES**

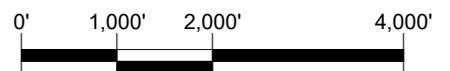
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SOURCE: USGS RICHLAND WA QUADRANGLE 1992, PHOTO REVISED 1990.



WASHINGTON



SCALE: 1" = 2,000'

PREPARED FOR: WASHINGTON STATE ARMY NATIONAL GUARD



PROJECT #  
64395.000

DATE  
OCT 2016

VICINITY MAP  
WASHINGTON ARMY NATIONAL GUARD BUILDING  
RICHLAND, WASHINGTON

FIGURE

1



SOURCE: © 2016 GOOGLE EARTH PRO.

**LEGEND**

- TP-1 TEST PIT NUMBER AND LOCATION
- B-1 BORING NUMBER AND LOCATION



SCALE: 1" = 300'

PREPARED FOR: WASHINGTON STATE ARMY NATIONAL GUARD

L:\Projects\64000\64300-64399\64395\_CFM\DWG\64395.000\_FIG 1-2.dwg Oct 10, 2016 03:53pm jim



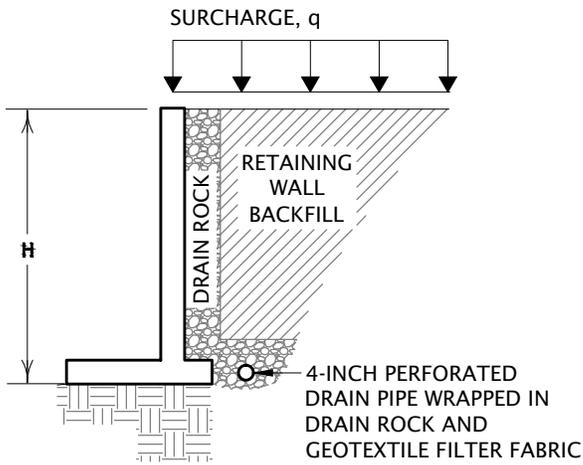
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OCT 2016

**SITE PLAN**  
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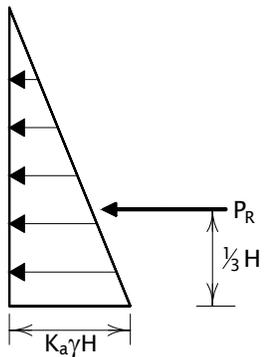
FIGURE

**2**



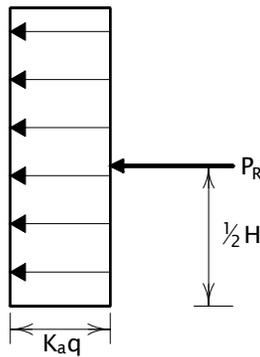
PARAMETER	VALUE
$K_a$	0.3
$K_o$	0.4
$\Delta K_{ae}$	0.2
$\gamma$	110 pcf

ACTIVE EARTH PRESSURE



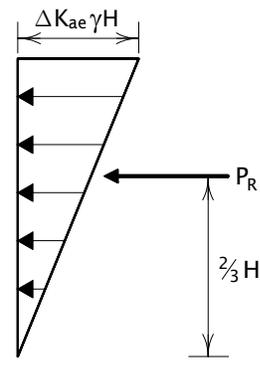
$$P_R = K_a \gamma \frac{H^2}{2}$$

SURCHARGE PRESSURE (ACTIVE)



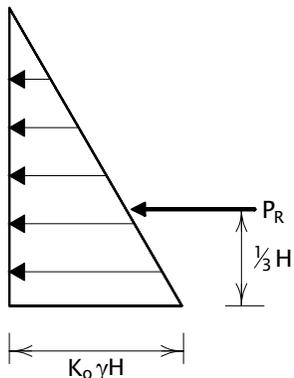
$$P_R = K_a q H$$

SEISMIC SURCHARGE PRESSURE



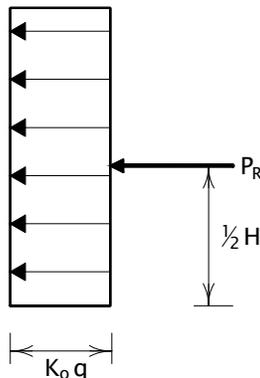
$$P_R = \Delta K_{ae} \gamma \frac{H^2}{2}$$

AT-REST EARTH PRESSURE



$$P_R = K_o \gamma \frac{H^2}{2}$$

SURCHARGE PRESSURE (AT-REST)



$$P_R = K_o q H$$

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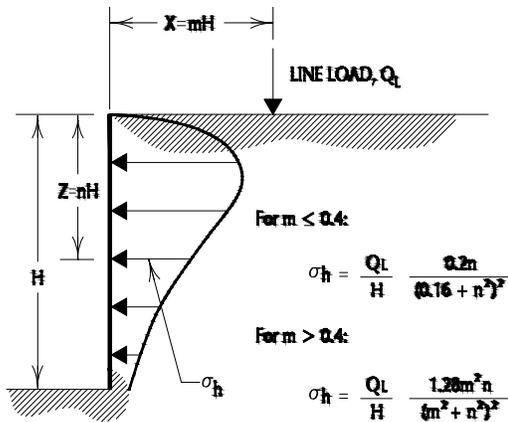
DATE  
OCT 2016

## RETAINING WALL EARTH PRESSURE DIAGRAM

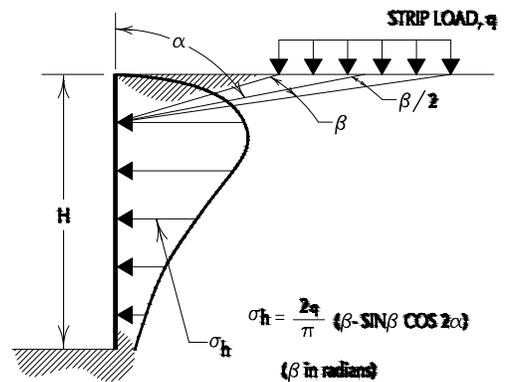
WASHINGTON ARMY NATIONAL GUARD BUILDING  
RICHLAND, WASHINGTON

FIGURE

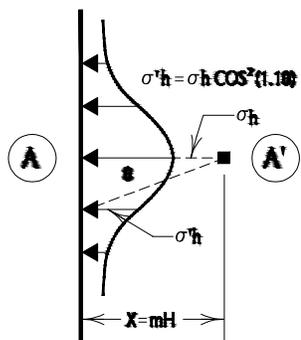
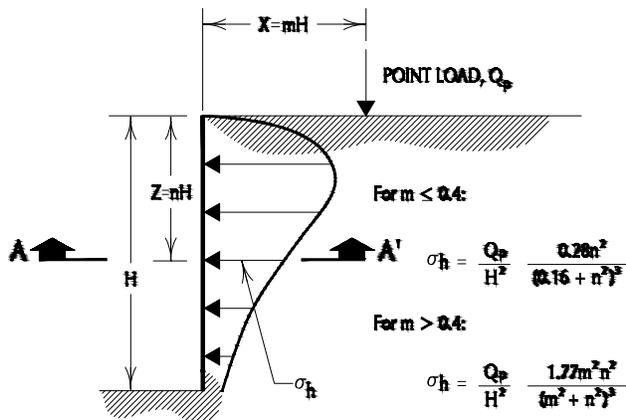
3



LINE LOAD PARALLEL TO WALL



STRIP LOAD PARALLEL TO WALL



DISTRIBUTION OF HORIZONTAL PRESSURES

VERTICAL POINT LOAD

NOTES:

1. THESE GUIDELINES APPLY TO RIGID WALLS WITH POISSON'S RATIO ASSUMED TO BE 0.5 FOR BACKFILL MATERIALS.
2. LATERAL PRESSURES FROM ANY COMBINATION OF ABOVE LOADS MAY BE DETERMINED BY THE PRINCIPLE OF SUPERPOSITION.

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LATERAL SURCHARGE DETAIL

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FIGURE  
4

## **APPENDIX A**

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Field Explorations

## APPENDIX A – FIELD EXPLORATIONS

### A1.0 GENERAL

PBS explored the subsurface conditions at the project site by advancing three borings on September 14, 2016, and by excavating ten test pits on September 20, 2016. The approximate locations of the explorations are shown on Figure 2, Site Plan. The procedures and techniques used to excavate the borings and test pits, collect samples, and other field techniques, are described in detail in the following paragraphs. Unless otherwise noted, all soil sampling and classification procedures followed local engineering practices that are in general accordance with relevant ASTM procedures. “General accordance” means that certain local and common excavation and descriptive practices and methodologies have been followed.

### A2.0 BORINGS

#### A2.1 Excavation and Sampling

The borings were advanced to depths up to 51.5 feet bgs with a CME CB-75 truck-mounted drill rig, using hollow-stem auger drilling techniques. The drill rig was provided and operated by Haz-Tech Drilling of Meridian, Idaho. The borings were observed by a PBS engineer, who located the general areas for exploration and maintained a detailed log of the subsurface conditions and materials encountered during the course of the work.

#### A2.2 Sampling

Disturbed soil samples were taken in the borings at selected depth intervals. The samples were obtained using a standard 2-inch outside diameter (OD), split-spoon sampler following procedure prescribed for the Standard Penetration Test (SPT). Using the SPT, the sampler is driven 18 inches into the soil using a 140-pound hammer dropped 30 inches. The number of blows required to drive the sampler the last 12 inches is defined as the standard penetration resistance, or N-value. The N-value provides a measure of the relative density of granular soils such as sands and gravels, and the consistency of cohesive soils such as clays and plastic silts. The disturbed soil samples were examined by the PBS engineer and then sealed in plastic bags for further examination and physical testing in our laboratory.

#### A2.3 Boring Logs

The logs show the various types of materials that were encountered in the borings and the depths where the materials or soil characteristics changed, although the changes may be gradual. Where material types and descriptions changed between samples, the contacts were interpreted. The types of samples taken during drilling, along with their sample identification number, are shown to the right of the classification of materials. Standard penetration resistances (N-values) and natural water (moisture) readings are plotted in the column to the right. Groundwater was not encountered in the borings at the time of exploration.

### A3.0 TEST PITS

#### A2.1 Excavation

Test pits were excavated with a track-mounted CAT 320C excavator with a 36-inch toothed-bucket operated by Mahaffey Enterprises, Inc., of Kennewick, Washington. The test pits were observed by a PBS engineer, who maintained a detailed log of the subsurface conditions and materials encountered during the course of the work.

#### A2.2 Sampling

Disturbed soil samples were taken in the test pits to determine the variation of the subsurface profile across the site. The samples were obtained from the floor or sidewalls of the test pit or

from the bucket for samples taken below 4 feet bgs. The disturbed soil samples were examined by a PBS engineer, and then sealed in plastic bags for further examination and physical testing in our laboratory.

### **A2.3 Dynamic Cone Penetration (DCP) Testing**

DCP testing was completed at specific depths in the test pit explorations. DCP testing uses a standardized cone driven into the subgrade soils with a 15-pound weight dropped 20 inches. The blow counts recorded for 1 $\frac{3}{4}$ -inches of penetration is roughly equivalent to a Standard Penetration Test resistance (SPT blow count, i.e., N-value). DCP test results are shown on the test pit logs presented in Appendix A.

### **A2.3 Test Pit Logs**

Test pit logs describe the subsurface conditions and types of materials encountered in the test pits and the depths where the materials or conditions changed, although the changes may be gradual. Each test pit log shows the locations of the samples obtained. Groundwater was not observed during test pit excavation.

## **A4.0 MATERIAL DESCRIPTION**

Initially, soil samples were classified visually in the field. Consistency, color, relative moisture, degree of plasticity, and other distinguishing characteristics of the soil samples were noted. Afterward, the samples were reexamined in the PBS laboratory, various standard classification tests were conducted, and the field classifications were modified where necessary. The terminology used in the soil classifications and other modifiers are defined in Appendix A, Table A-1, Terminology Used to Describe Soil.



**Soil Descriptions**

Soils exist in mixtures with varying proportions of components. The predominant soil, i.e., greater than 50 percent based upon total dry weight, is the primary soil type and is capitalized in our log descriptions, e.g., SAND, GRAVEL, SILT or CLAY. Lesser percentages of other constituents in the soil mixture are indicated by use of modifier words in general accordance with the Visual-Manual Procedure (ASTM D2488-06). "General Accordance" means that certain local and common descriptive practices have been followed. In accordance with ASTM D2488-06, group symbols (such as GP or CH) are applied on that portion of the soil passing the 3-inch (75mm) sieve based upon visual examination. The following describes the use of soil names and modifying terms used to describe fine- and coarse-grained soils.

**Fine - Grained Soils (More than 50% fines passing 0.075 mm, #200 sieve)**

The primary soil type, i.e. SILT or CLAY is designated through visual – manual procedures to evaluate soil toughness, dilatancy, dry strength, and plasticity. The following describes the terminology used to describe fine - grained soils, and varies from ASTM 2488 terminology in the use of some common terms.

Primary soil NAME, adjective and symbols			Plasticity Description	Plasticity Index (PI)
SILT ML & MH	CLAY CL & CH	ORGANIC SILT & CLAY OL & OH		
SILT		Organic SILT	Non-plastic	0 - 3
SILT		Organic SILT	Low plasticity	4 - 10
SILT / Elastic SILT	Lean CLAY	Organic clayey SILT	Medium Plasticity	10 – 20
Elastic SILT	Lean/Fat CLAY	Organic silty CLAY	High Plasticity	20 – 40
Elastic SILT	Fat CLAY	Organic CLAY	Very Plastic	>40

Modifying terms describing secondary constituents, estimated to 5 percent increments, are applied as follows:

Description	% Composition
<b>With sand; with gravel</b> (combined total greater than 15% but less than 30%, modifier is whichever is greater)	15% to 30%
<b>Sandy; or gravelly</b> (combined total greater than 30% but less than 50%, modifier is whichever is greater)	30% to 50%

**Borderline Symbols**, for example CH/MH, are used where soils are not distinctly in one category or where variable soil units contain more than one soil type. **Dual Symbols**, for example CL-ML, are used where two symbols are required in accordance with ASTM D2488.

**Soil Consistency.** Consistency terms are applied to fine-grained, plastic soils (i.e.,  $PI \geq 7$ ). Descriptive terms are based on direct measure or correlation to the Standard Penetration Test N-value as determined by ASTM D1586-84, as follows. Note, SILT soils with low to non-plastic behavior (i.e.  $PI < 7$ ) are classified using relative density.

Consistency Term	SPT N-value	Unconfined Compressive Strength tsf	Unconfined Compressive Strength kPa
<b>Very soft</b>	Less than 2	Less than 0.25	Less than 24
<b>Soft</b>	2 – 4	0.25 - 0.5	24 - 48
<b>Medium stiff</b>	5 – 8	0.5 - 1.0	48 – 96
<b>Stiff</b>	9 – 15	1.0 - 2.0	96 – 192
<b>Very stiff</b>	16 – 30	2.0 - 4.0	192 – 383
<b>Hard</b>	Over 30	Over 4.0	Over 383

**Soil Descriptions**

**Coarse - Grained Soils (less than 50% fines)**

Coarse-grained soil descriptions, i.e., SAND or GRAVEL, are based on that portion of materials passing a 3-inch (75mm) sieve. Coarse-grained soil group symbols are applied in accordance with ASTM D2488-06 based upon the degree of grading, or distribution of grain sizes of the soil. For example, well graded sand containing a wide range of grain sizes is designated SW; poorly graded gravel, GP, contains high percentages of only certain grain sizes. Terms applied to grain sizes follow.

Material	Particle Diameter	
	Inches	Millimeters
<b>Sand (S)</b>	0.003 - 0.19	0.075 - 4.8
<b>Gravel (G)</b>	0.19 - 3.0	4.8 - 75
	Additional Constituents	
<b>Cobble</b>	3.0 - 12	75 - 300
<b>Boulder</b>	12 - 120	300 - 3050

The primary soil type is capitalized, and the amount of fines in the soil are described as indicated by the following examples. Other soil mixtures will provide similar descriptive names.

**Example: Coarse-Grained Soil Descriptions with Fines**

5% to less than 15% fines (Dual Symbols)	15% to less than 50% fines
GRAVEL with silt, GW-GM	Silty GRAVEL: GM
SAND with clay, SP-SC	Silty SAND: SM

Additional descriptive terminology applied to coarse-grained soils follow.

**Example: Coarse-Grained Soil Descriptions with Other Coarse-Grained Constituents**

Coarse-Grained Soil Containing Secondary Constituents	
<b>With sand or with gravel</b>	> 15% sand or gravel
<b>With cobbles; with boulders</b>	Any amount of cobbles or boulders.

Cobble and boulder deposits may include a description of the matrix soils, as defined above.

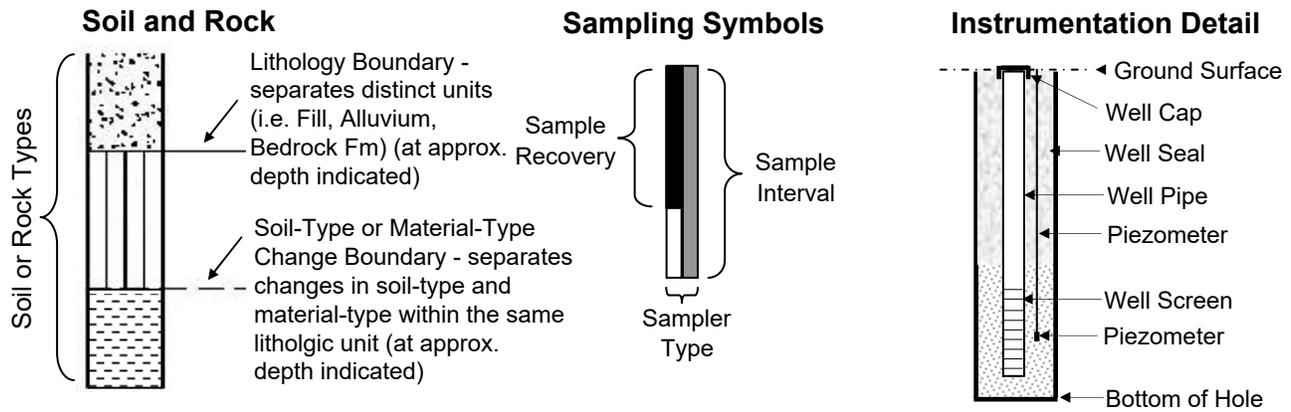
**Relative Density** terms are applied to granular, non-plastic soils based on direct measure or correlation to the Standard Penetration Test N-value as determined by ASTM D1586-84.

Relative Density Term	SPT N-value
<b>Very loose</b>	0 - 4
<b>Loose</b>	5 - 10
<b>Medium dense</b>	11 - 30
<b>Dense</b>	31 - 50
<b>Very dense</b>	> 50

**SAMPLING DESCRIPTIONS<sup>1</sup>**

	SPT Drive Sampler Standard Penetration Test ASTM D 1586	Shelby Tube Push Sampler ASTM D 1587	Specialized Drive Samplers (Details Noted on Logs)	Specialized Drill or Push Sampler (Details Noted on Logs)	Grab Sample	Rock Coring Interval	Screen (Water or Air Sampling)	Water Level During Drilling/Excavation	Water Level After Drilling/Excavation
									

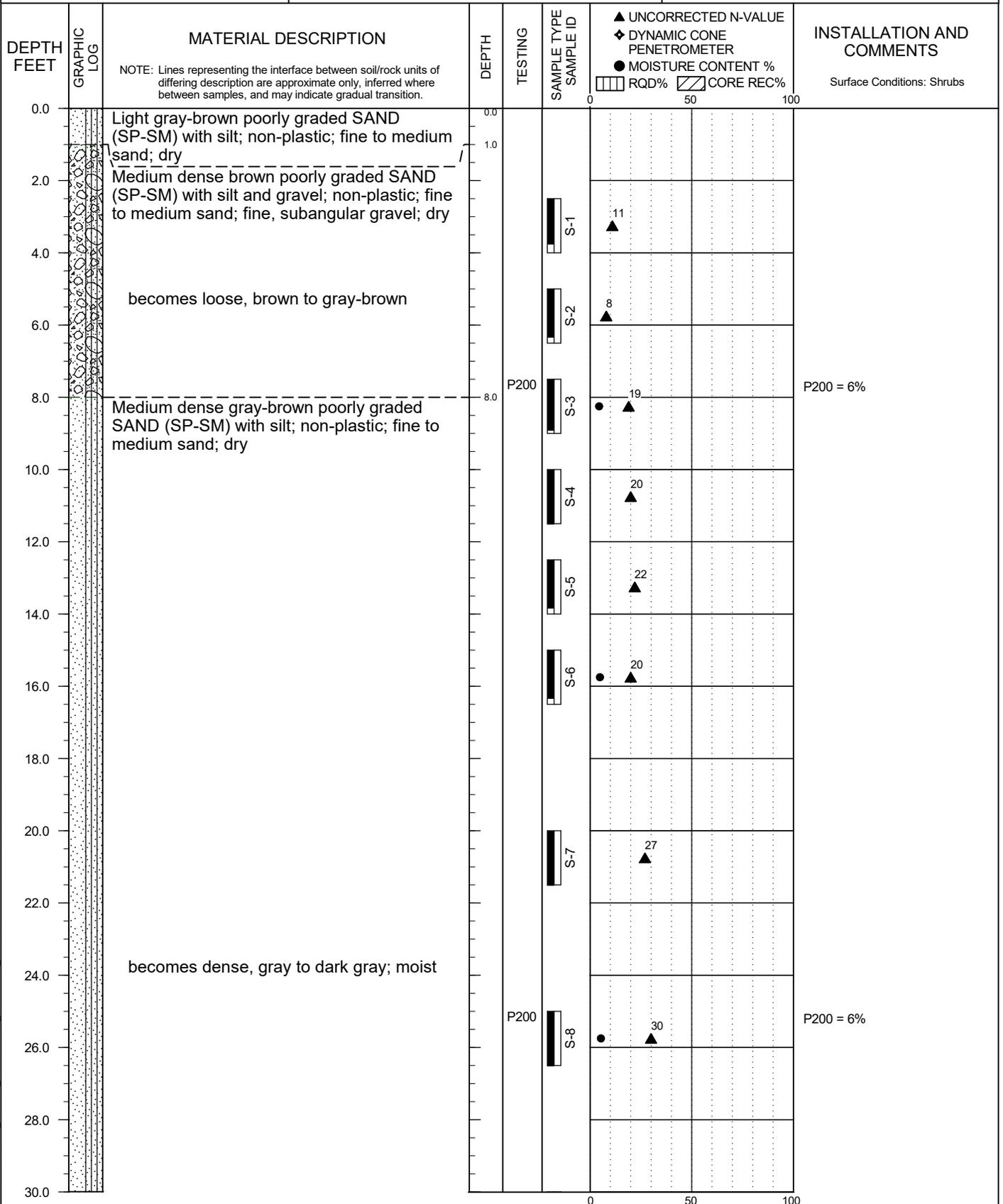
**LOG GRAPHICS**



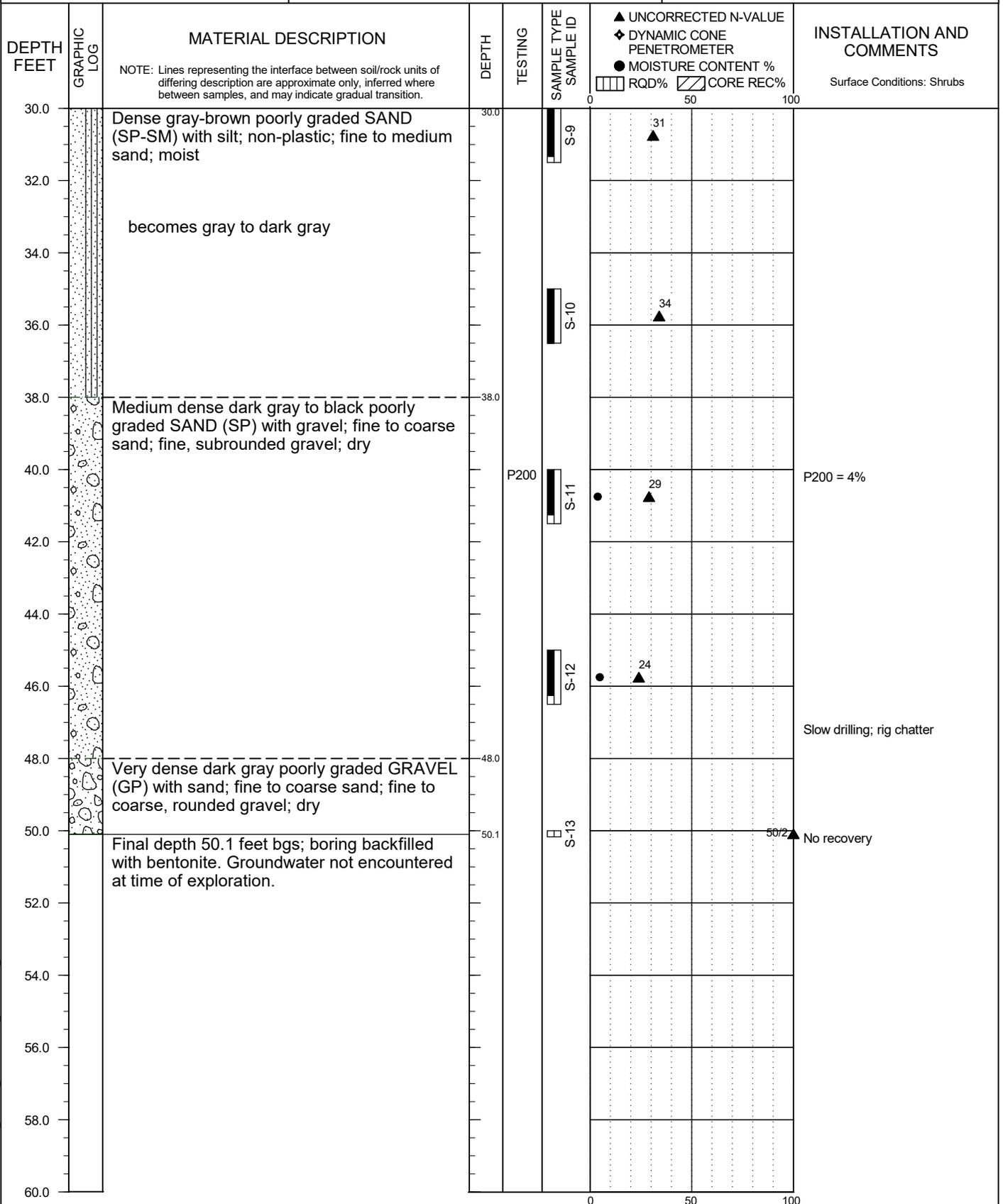
**Geotechnical Testing/Acronym Explanations**

PP	Pocket Penetrometer	LL	Liquid Limit
DD	Dry Density	ATT	Atterberg Limits
DCP	Dynamic Cone Penetrometer	SIEV	Sieve Gradation
TOR	Torvane	CBR	California Bearing Ratio
CON	Consolidation	OC	Organic Content
DS	Direct Shear	RES	Resilient Modulus
P200	Percent Passing U.S. Standard No. 200 Sieve	VS	Vane Shear
UC	Unconfined Compressive Strength	HYD	Hydrometer Gradation
PL	Plasticity Limit	bgs	Below ground surface
PI	Plasticity Index	MSL	Mean Sea Level

<sup>1</sup>Note: Details of soil and rock classification systems are available on request.



BORING LOG 64395.000\_10.10.16 RG.GPJ\_PBS\_DATATMPL\_GEO.GDT\_PRINT DATE: 10/12/16/RPG



BORING LOG 64395.000 - 10.10.16 RG.GPJ\_PBS\_DATATMPL\_GEO.GDT - PRINT DATE: 10/12/16/RPG



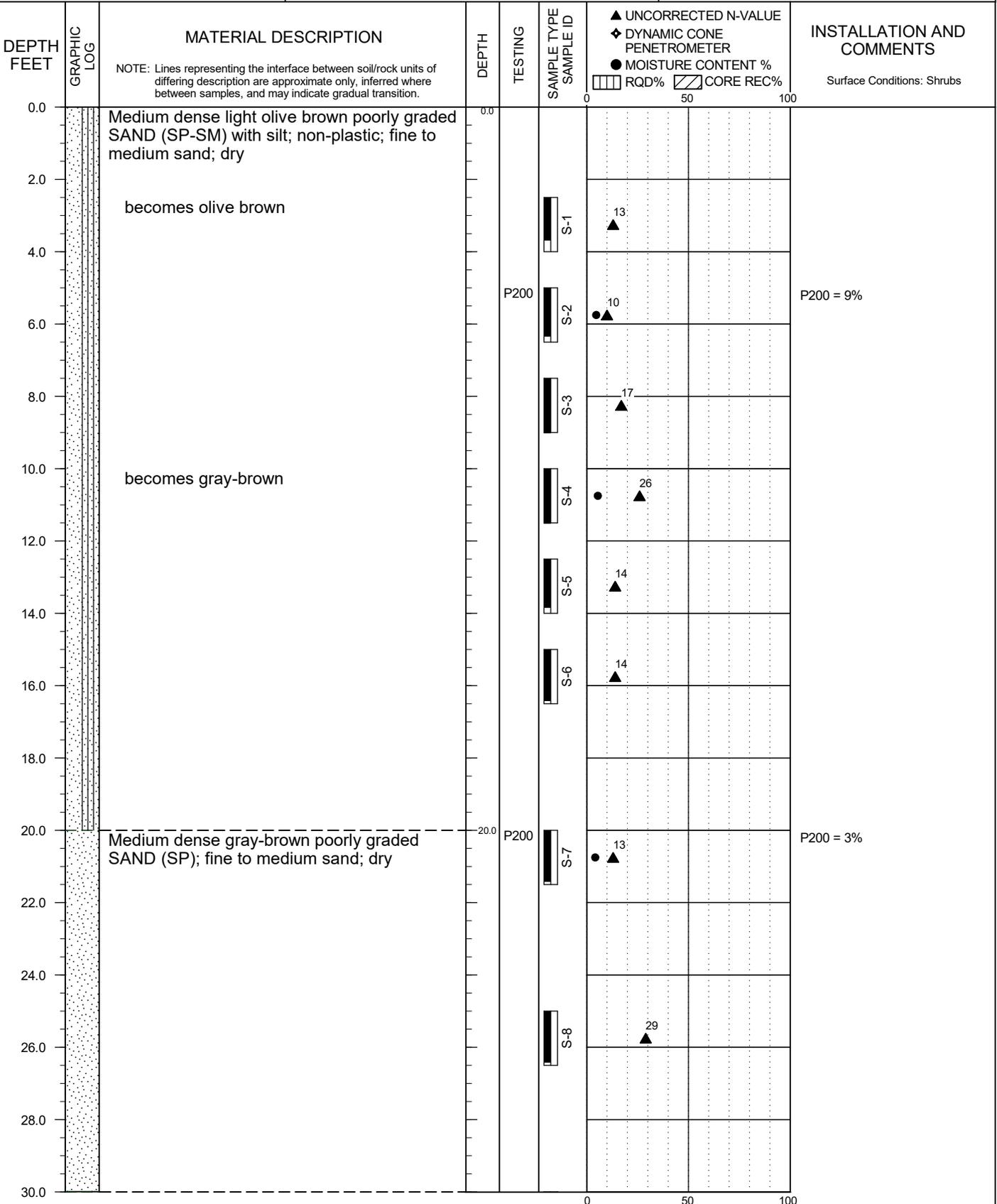
400 Bradley Boulevard  
Suite 300  
Richland, WA 99352  
Phone: 509.942.1600  
Fax: 866.727.0140

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RICHLAND, WASHINGTON

**BORING B-2**

PBS PROJECT NUMBER:  
64395.000

APPROX. BORING B-2 LOCATION:  
Lat. 46.33137, Long. -119.31186



BORING LOG 64395.000\_10.10.16 RG.GPJ\_PBS\_DATATMPL\_GEO.GDT\_PRINT DATE: 10/12/16/RPG

DRILLING METHOD: Hollow-Stem Auger  
DRILLED BY: Haztech Drilling  
LOGGED BY: A. Swenson

BIT DIAMETER: 6 inches  
HAMMER EFFICIENCY PERCENT: 85  
LOGGING COMPLETED: 9/14/16

**FIGURE A2**  
Page 1 of 2



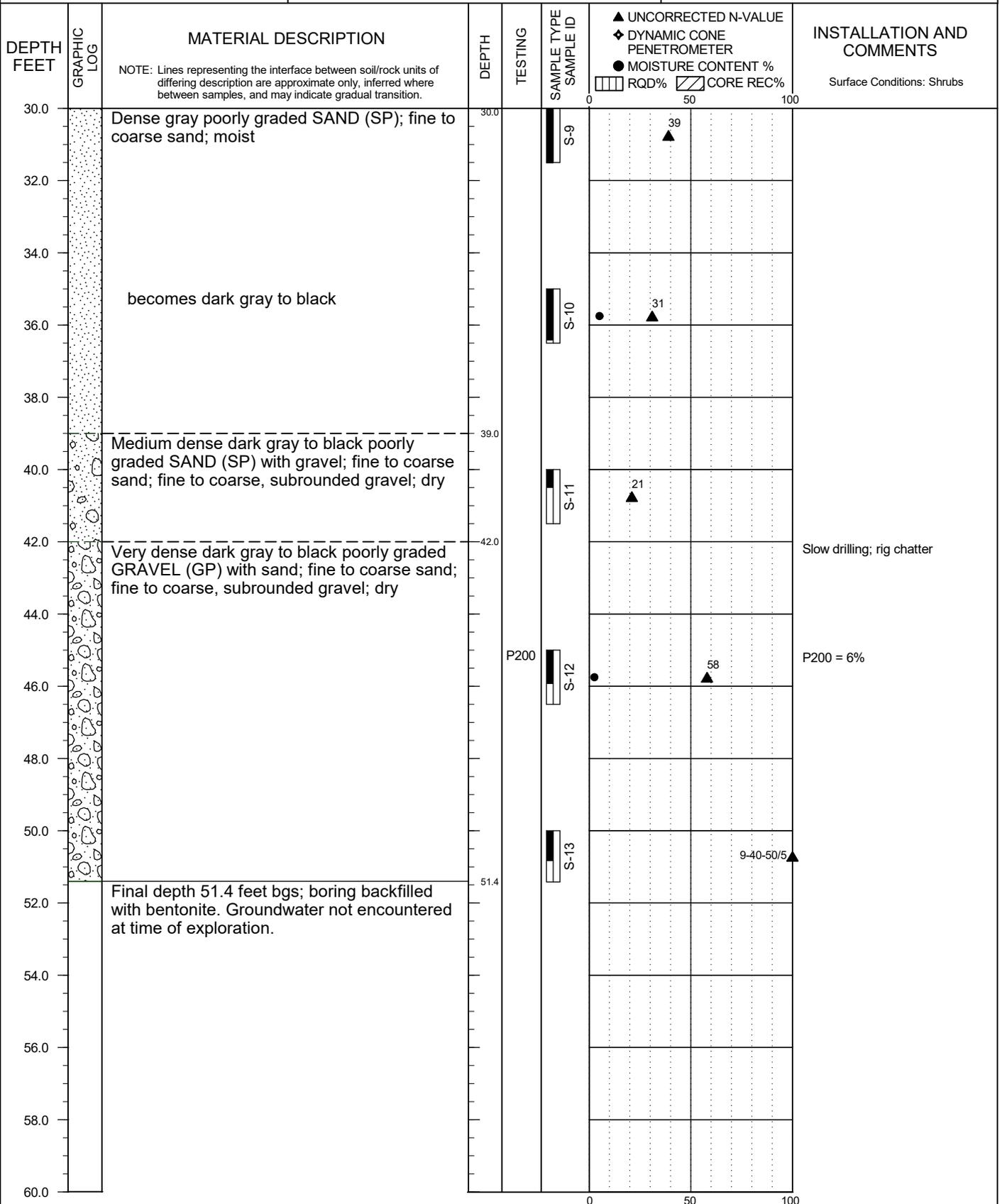
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**BORING B-2**  
(continued)

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DRILLING METHOD: Hollow-Stem Auger  
DRILLED BY: Haztech Drilling  
LOGGED BY: A. Swenson

BIT DIAMETER: 6 inches  
HAMMER EFFICIENCY PERCENT: 85  
LOGGING COMPLETED: 9/14/16



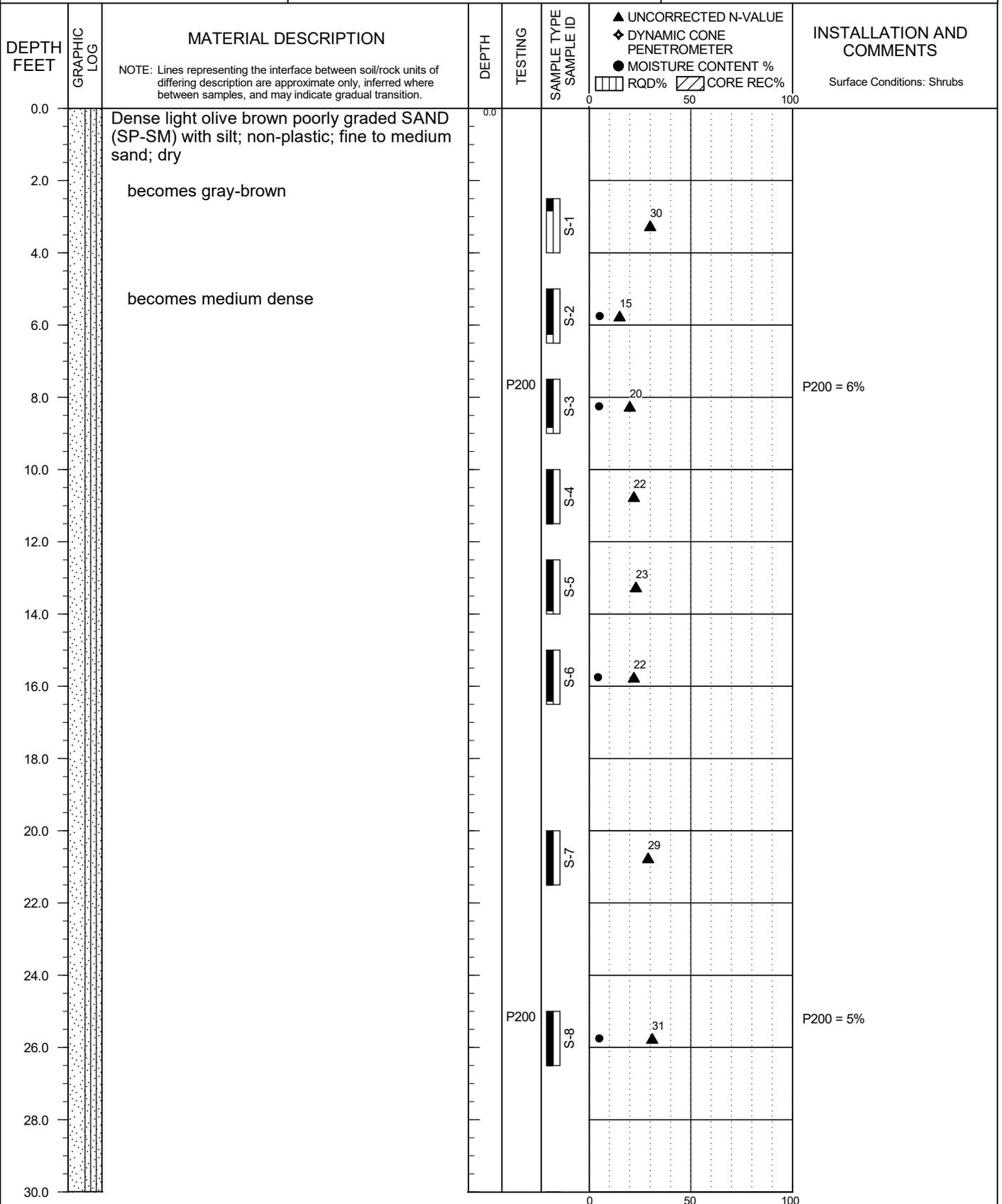
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Suite 300  
Richland, WA 99352  
Phone: 509.942.1600  
Fax: 866.727.0140

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RICHLAND, WASHINGTON

**BORING B-3**

PBS PROJECT NUMBER:  
64395.000

APPROX. BORING B-3 LOCATION:  
Lat. 46.33195, Long. -119.31360



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DRILLING METHOD: Hollow-Stem Auger  
DRILLED BY: Haztech Drilling  
LOGGED BY: A. Swenson

BIT DIAMETER: 6 inches  
HAMMER EFFICIENCY PERCENT: 85  
LOGGING COMPLETED: 9/14/16



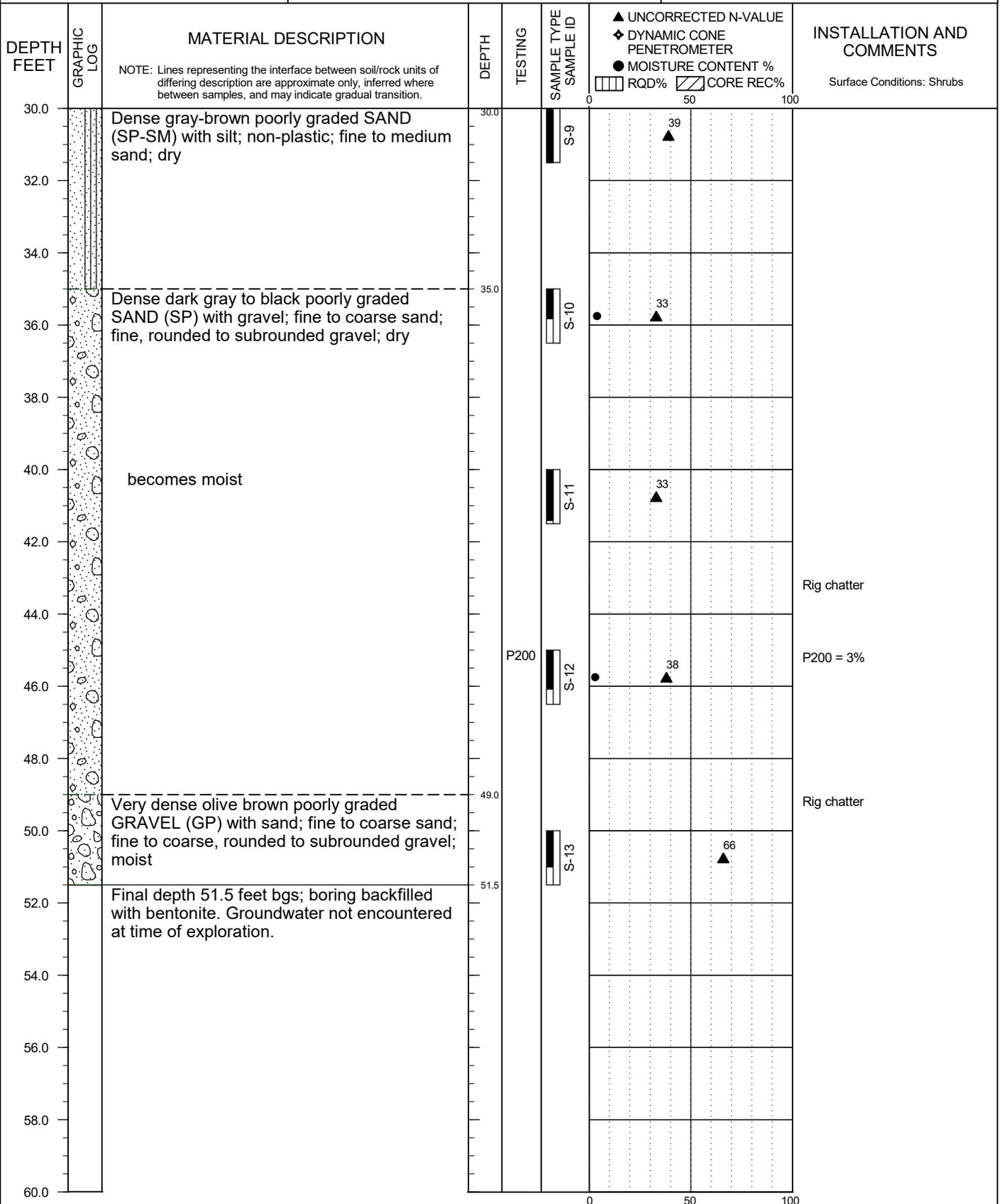
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**BORING B-3**  
(continued)

PBS PROJECT NUMBER:  
64395.000

APPROX. BORING B-3 LOCATION:  
Lat. 46.33195, Long. -119.31360



BORING LOG 64395.000 - 10.10.16 RG.GPJ\_PBS\_DATATMPL\_GEO.GDT - PRINT DATE: 10/12/16RPG

DRILLING METHOD: Hollow-Stem Auger  
DRILLED BY: Haztech Drilling  
LOGGED BY: A. Swenson

BIT DIAMETER: 6 inches  
HAMMER EFFICIENCY PERCENT: 85  
LOGGING COMPLETED: 9/14/16



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Phone: 509.942.1600  
Fax: 866.727.0140

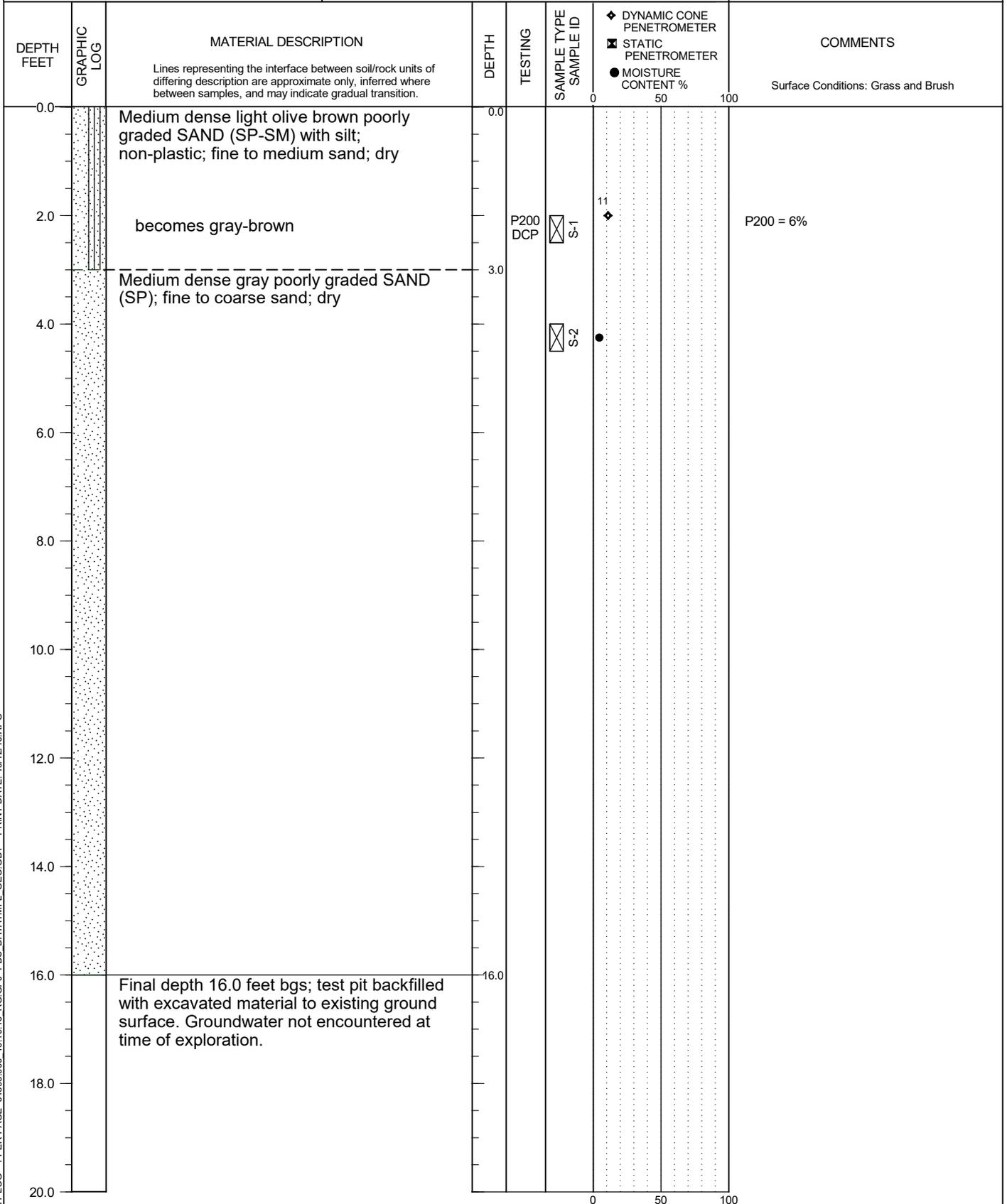
WASHINGTON ARMY NATIONAL GUARD BUILDING  
RICHLAND, WASHINGTON

**TEST PIT TP-1**

PBS PROJECT NUMBER:  
64395.000

APPROX. TEST PIT TP-1 LOCATION:  
(See Site Plan)

Lat: 46.33012 Long: -119.31310



TEST PIT LOG - 1 PER PAGE 64395.000\_10.10.16 RG.GPJ\_PBS DATATMPL GEO.GDT PRINT DATE: 10/12/16.RPG

LOGGED BY: A. Swenson  
COMPLETED: 9/20/16

EXCAVATED BY: Mahaffey Enterprises, Inc.  
EXCAVATION METHOD: CAT 320C with 36" Bucket

**FIGURE A4**  
Page 1 of 1



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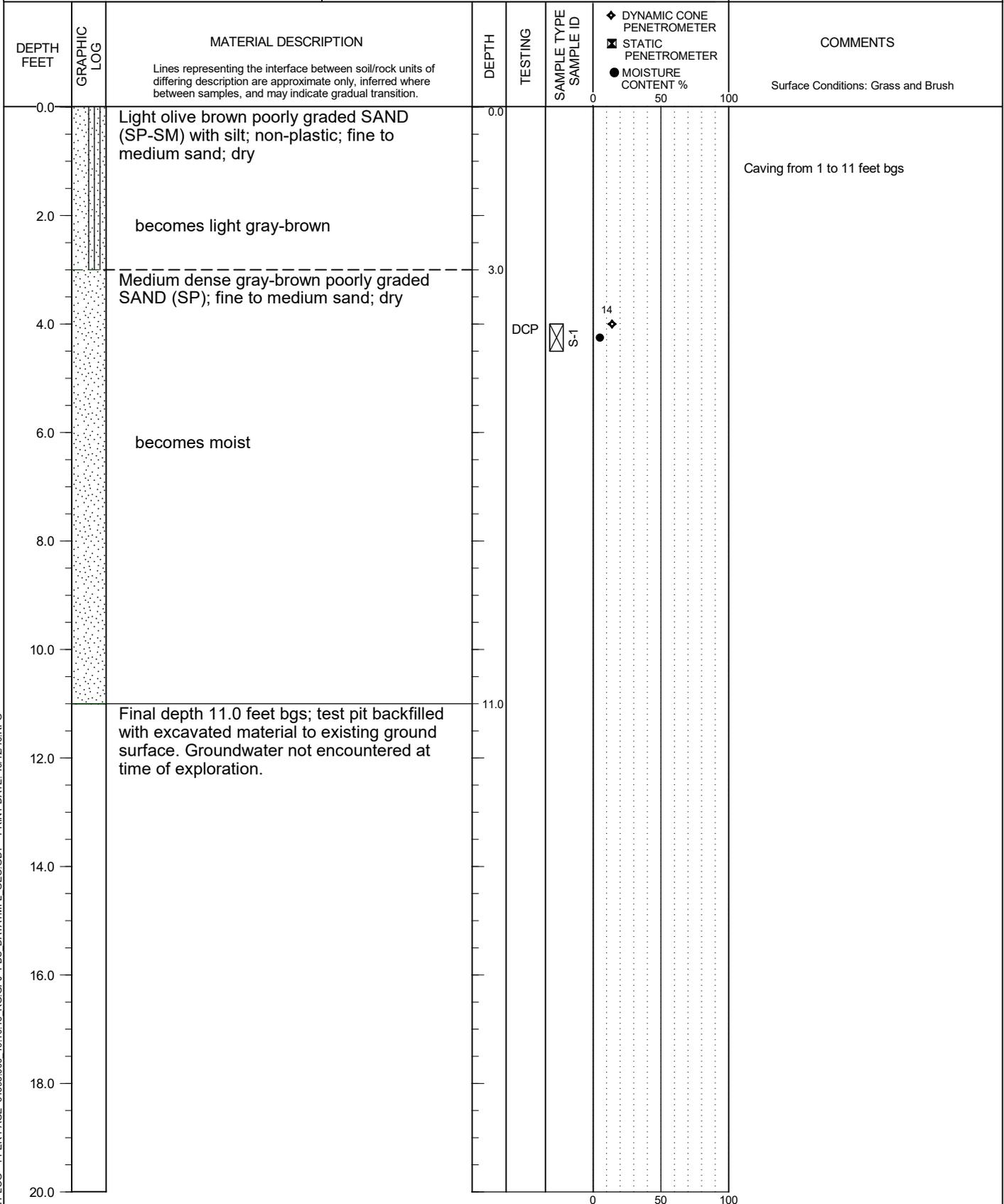
WASHINGTON ARMY NATIONAL GUARD BUILDING  
RICHLAND, WASHINGTON

**TEST PIT TP-2**

PBS PROJECT NUMBER:  
64395.000

APPROX. TEST PIT TP-2 LOCATION:  
(See Site Plan)

Lat: 46.33017 Long: -119.31200



TEST PIT LOG - 1 PER PAGE 64395.000 - 10.10.16 RG.GPJ PBS DATATMPL GEO.GDT PRINT DATE: 10/12/16.RPG

LOGGED BY: A. Swenson  
COMPLETED: 9/20/16

EXCAVATED BY: Mahaffey Enterprises, Inc.  
EXCAVATION METHOD: CAT 320C with 36" Bucket

**FIGURE A5**  
Page 1 of 1



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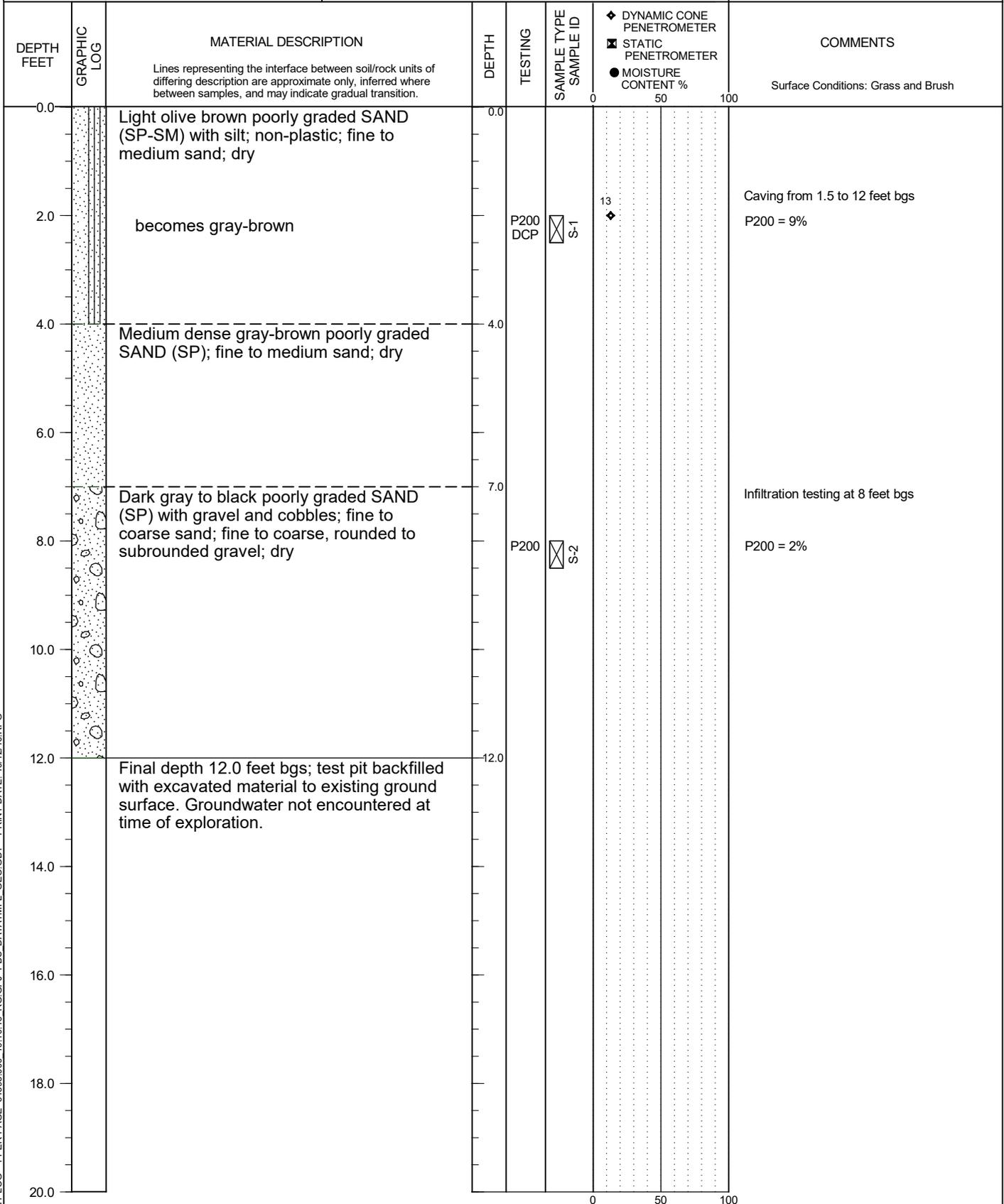
WASHINGTON ARMY NATIONAL GUARD BUILDING  
RICHLAND, WASHINGTON

**TEST PIT TP-3**

PBS PROJECT NUMBER:  
64395.000

APPROX. TEST PIT TP-3 LOCATION:  
(See Site Plan)

Lat: 46.33053 Long: -119.30938



TEST PIT LOG - 1 PER PAGE 64395.000 - 10.10.16 RG.GPJ\_PBS DATATMPL GEO.GDT PRINT DATE: 10/12/16.RPG

LOGGED BY: A. Swenson  
COMPLETED: 9/20/16

EXCAVATED BY: Mahaffey Enterprises, Inc.  
EXCAVATION METHOD: CAT 320C with 36" Bucket

**FIGURE A6**  
Page 1 of 1





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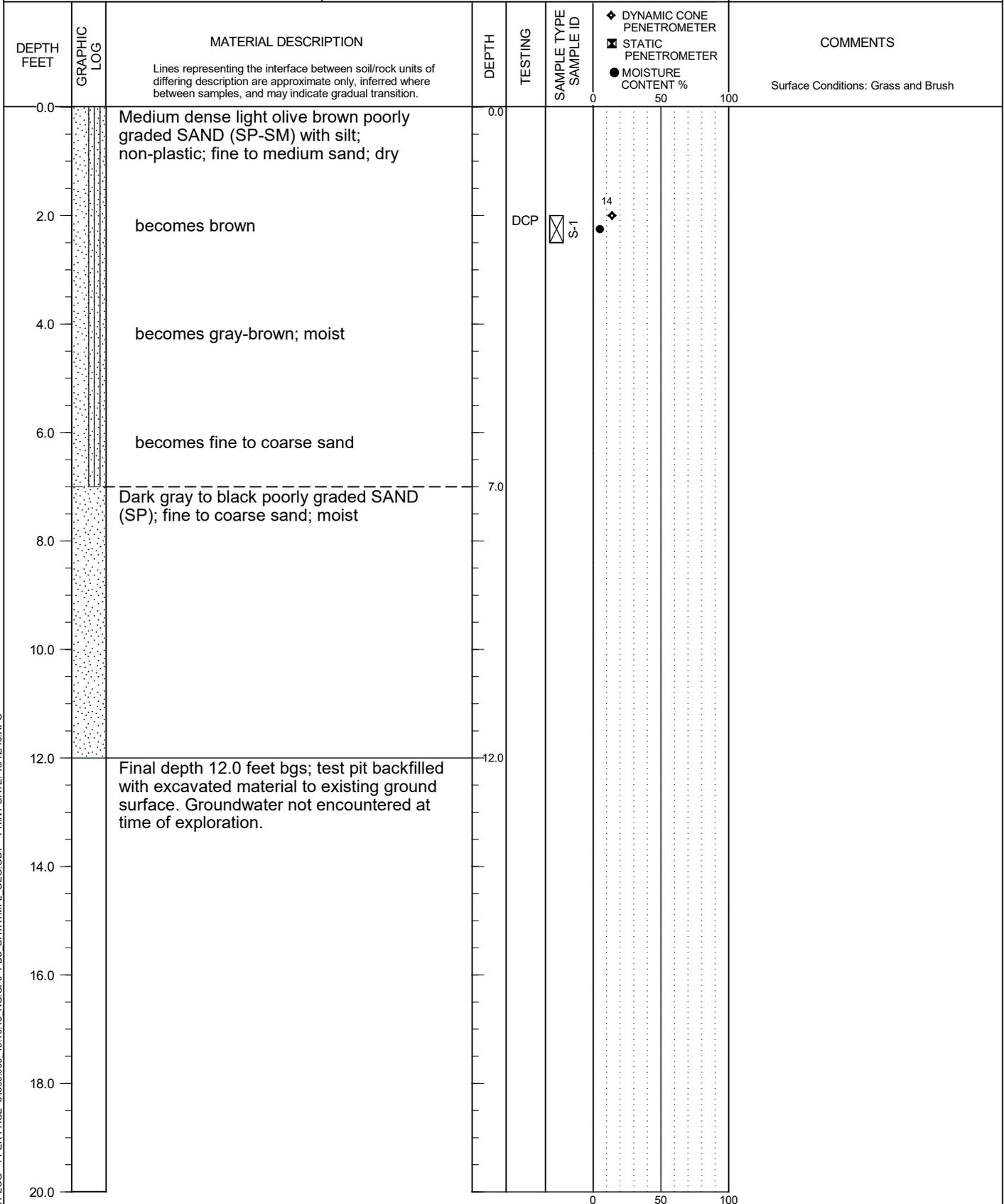
WASHINGTON ARMY NATIONAL GUARD BUILDING  
RICHLAND, WASHINGTON

PBS PROJECT NUMBER:  
64395.000

**TEST PIT TP-5**

APPROX. TEST PIT TP-5 LOCATION:  
(See Site Plan)

Lat: 46.33130 Long: -119.31069



TEST PIT LOG - 1 PER PAGE 64395.000 - 10.10.16 RG.GPJ PBS DATATMPL GEO.GDT PRINT DATE: 10/12/16.RPG

LOGGED BY: A. Swenson  
COMPLETED: 9/20/16

EXCAVATED BY: Mahaffey Enterprises, Inc.  
EXCAVATION METHOD: CAT 320C with 36" Bucket

**FIGURE A8**  
Page 1 of 1



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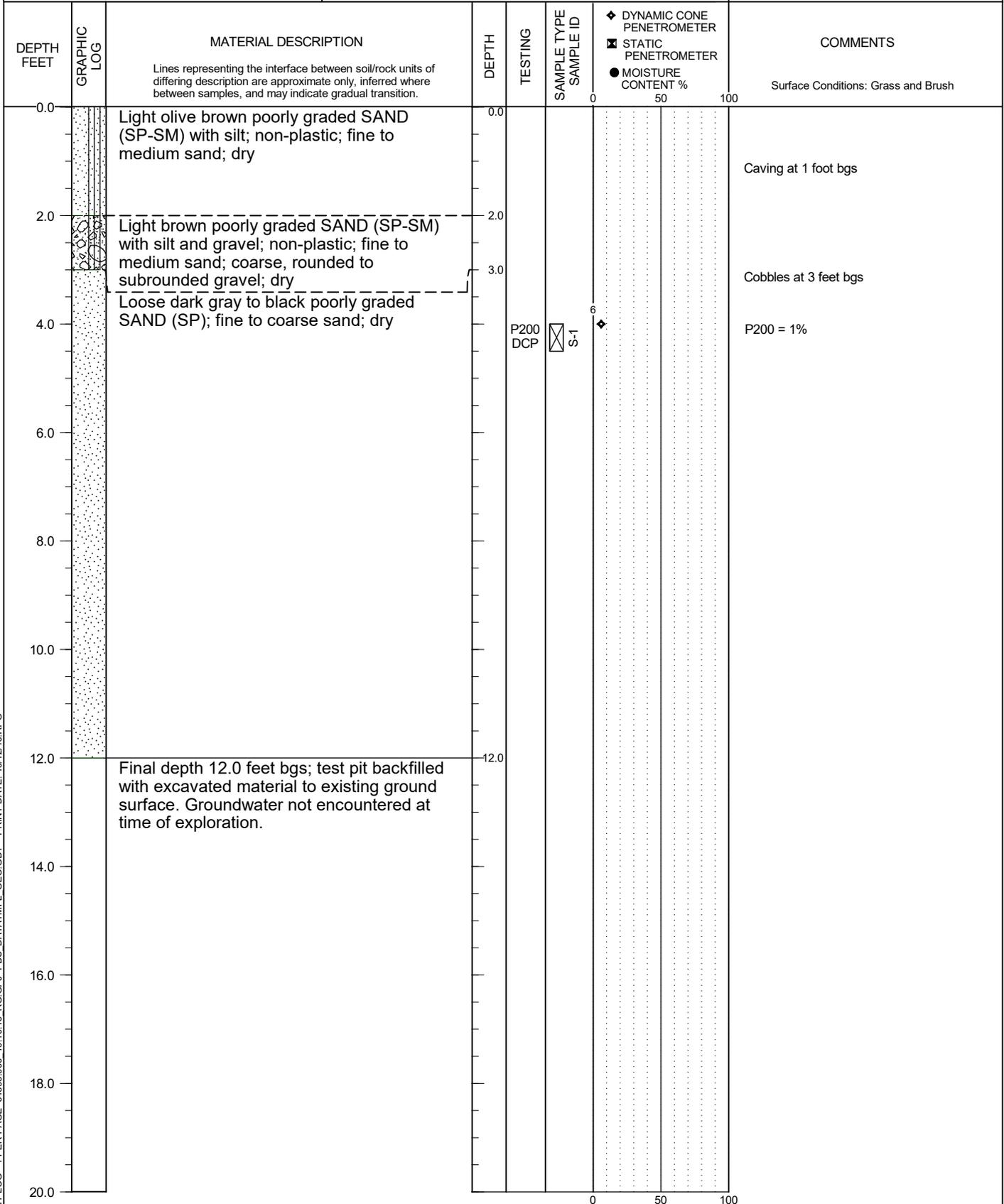
WASHINGTON ARMY NATIONAL GUARD BUILDING  
RICHLAND, WASHINGTON

**TEST PIT TP-6**

PBS PROJECT NUMBER:  
64395.000

APPROX. TEST PIT TP-6 LOCATION:  
(See Site Plan)

Lat: 46.33079 Long: -119.31253



TEST PIT LOG - 1 PER PAGE 64395.000\_10.10.16 RG.GPJ\_PBS DATATMPL GEO.GDT PRINT DATE: 10/12/16/RPG

LOGGED BY: A. Swenson  
COMPLETED: 9/20/16

EXCAVATED BY: Mahaffey Enterprises, Inc.  
EXCAVATION METHOD: CAT 320C with 36" Bucket

**FIGURE A9**  
Page 1 of 1



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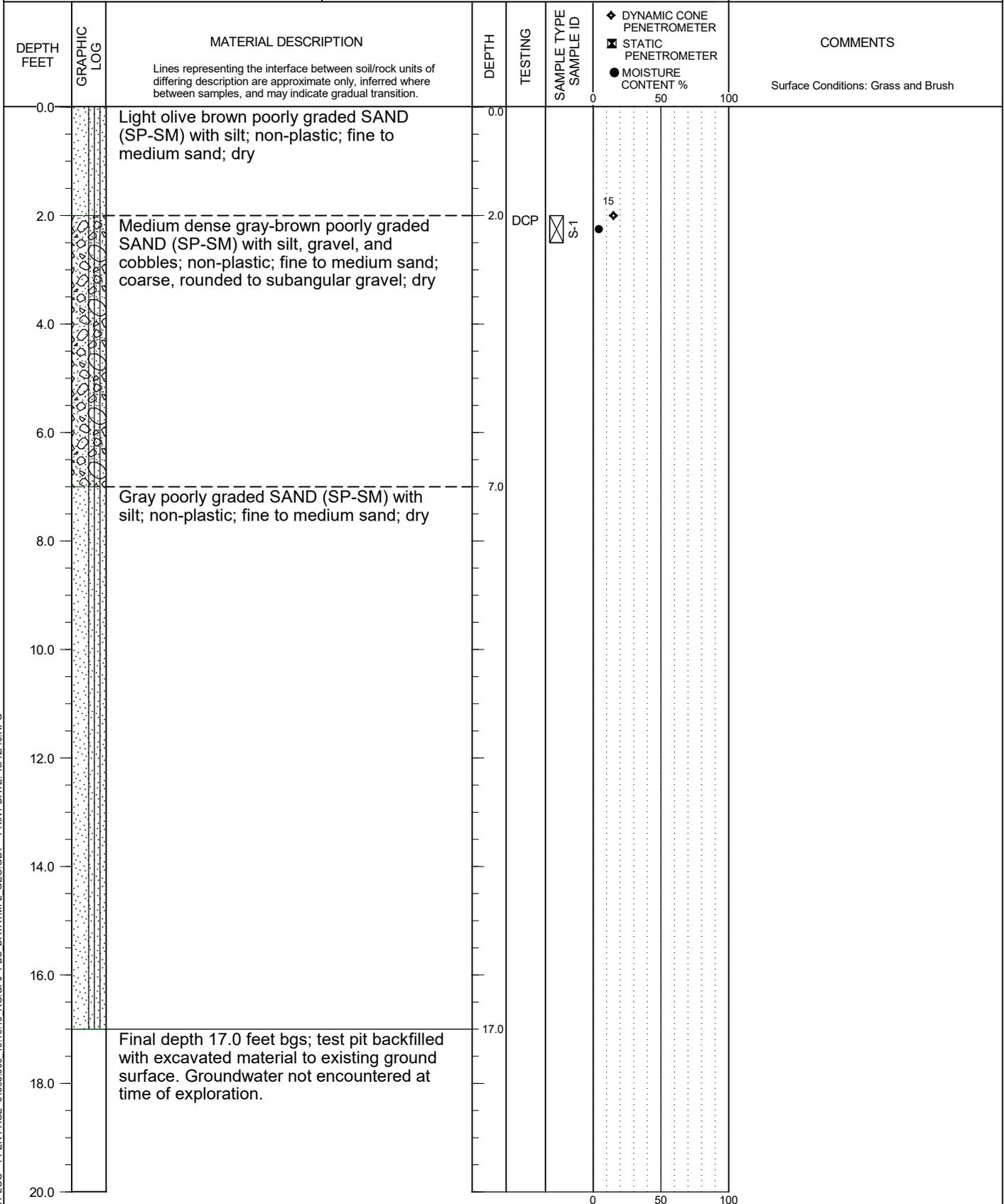
WASHINGTON ARMY NATIONAL GUARD BUILDING  
RICHLAND, WASHINGTON

**TEST PIT TP-7**

PBS PROJECT NUMBER:  
64395.000

APPROX. TEST PIT TP-7 LOCATION:  
(See Site Plan)

Lat: 46.33117 Long: -119.31398



TEST PIT LOG - 1 PER PAGE 64395.000\_10.10.16 RG.GPJ\_PBS DATATMPL GEO.GDT PRINT DATE: 10/12/16/RPG

LOGGED BY: A. Swenson  
COMPLETED: 9/20/16

EXCAVATED BY: Mahaffey Enterprises, Inc.  
EXCAVATION METHOD: CAT 320C with 36" Bucket

**FIGURE A10**  
Page 1 of 1



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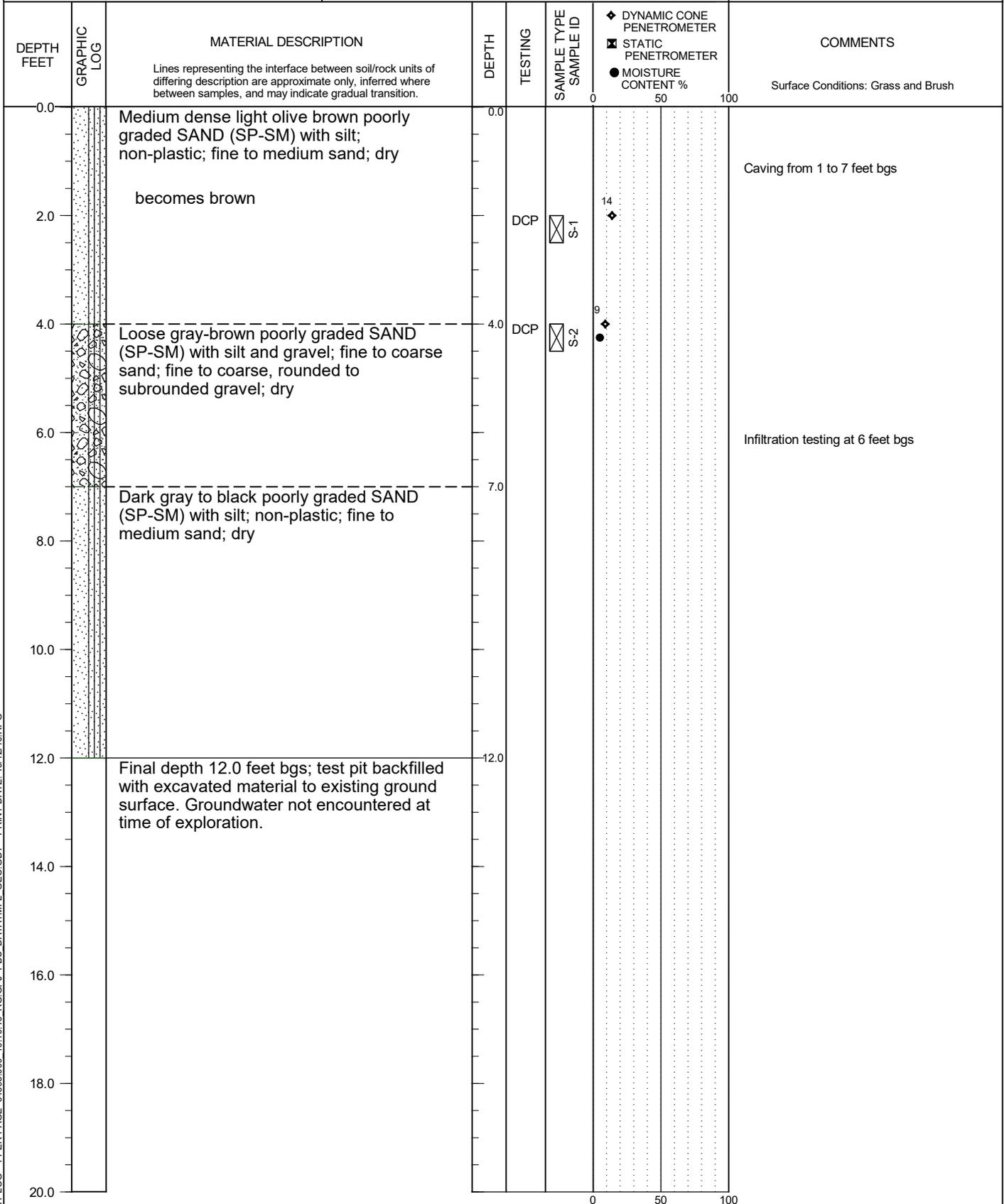
WASHINGTON ARMY NATIONAL GUARD BUILDING  
RICHLAND, WASHINGTON

**TEST PIT TP-8**

PBS PROJECT NUMBER:  
64395.000

APPROX. TEST PIT TP-8 LOCATION:  
(See Site Plan)

Lat: 46.33247 Long: -119.31290



TEST PIT LOG - 1 PER PAGE 64395.000 - 10.10.16 RG.GPJ PBS DATATMPL GEO.GDT PRINT DATE: 10/12/16.RPG

LOGGED BY: A. Swenson  
COMPLETED: 9/20/16

EXCAVATED BY: Mahaffey Enterprises, Inc.  
EXCAVATION METHOD: CAT 320C with 36" Bucket

**FIGURE A11**  
Page 1 of 1



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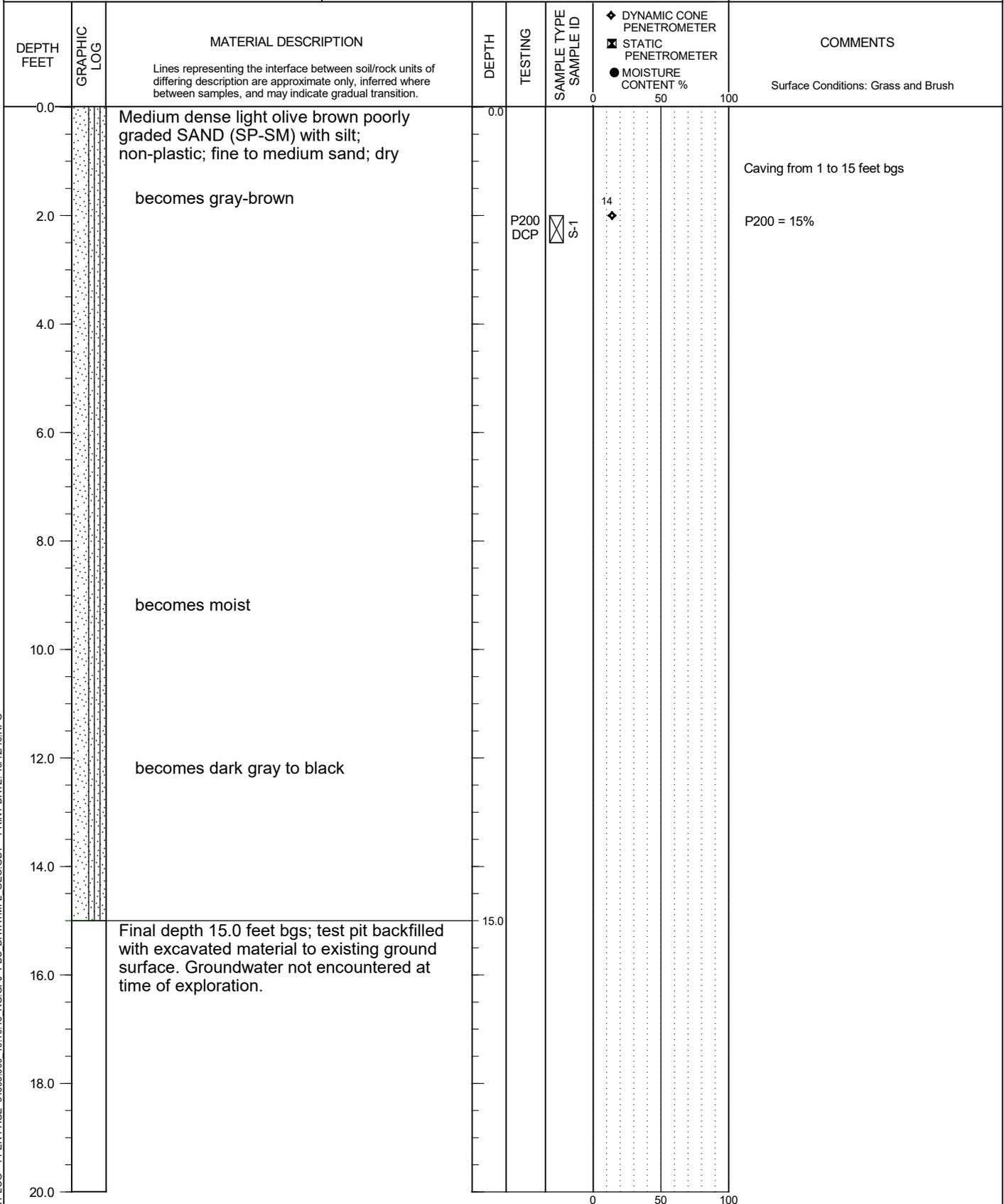
WASHINGTON ARMY NATIONAL GUARD BUILDING  
RICHLAND, WASHINGTON

**TEST PIT TP-9**

PBS PROJECT NUMBER:  
64395.000

APPROX. TEST PIT TP-9 LOCATION:  
(See Site Plan)

Lat: 46.33236 Long: -119.31144



TEST PIT LOG - 1 PER PAGE 64395.000 - 10.10.16 RG.GPJ\_PBS DATATMPL GEO.GDT PRINT DATE: 10/12/16.RPG

LOGGED BY: A. Swenson  
COMPLETED: 9/20/16

EXCAVATED BY: Mahaffey Enterprises, Inc.  
EXCAVATION METHOD: CAT 320C with 36" Bucket

**FIGURE A12**  
Page 1 of 1



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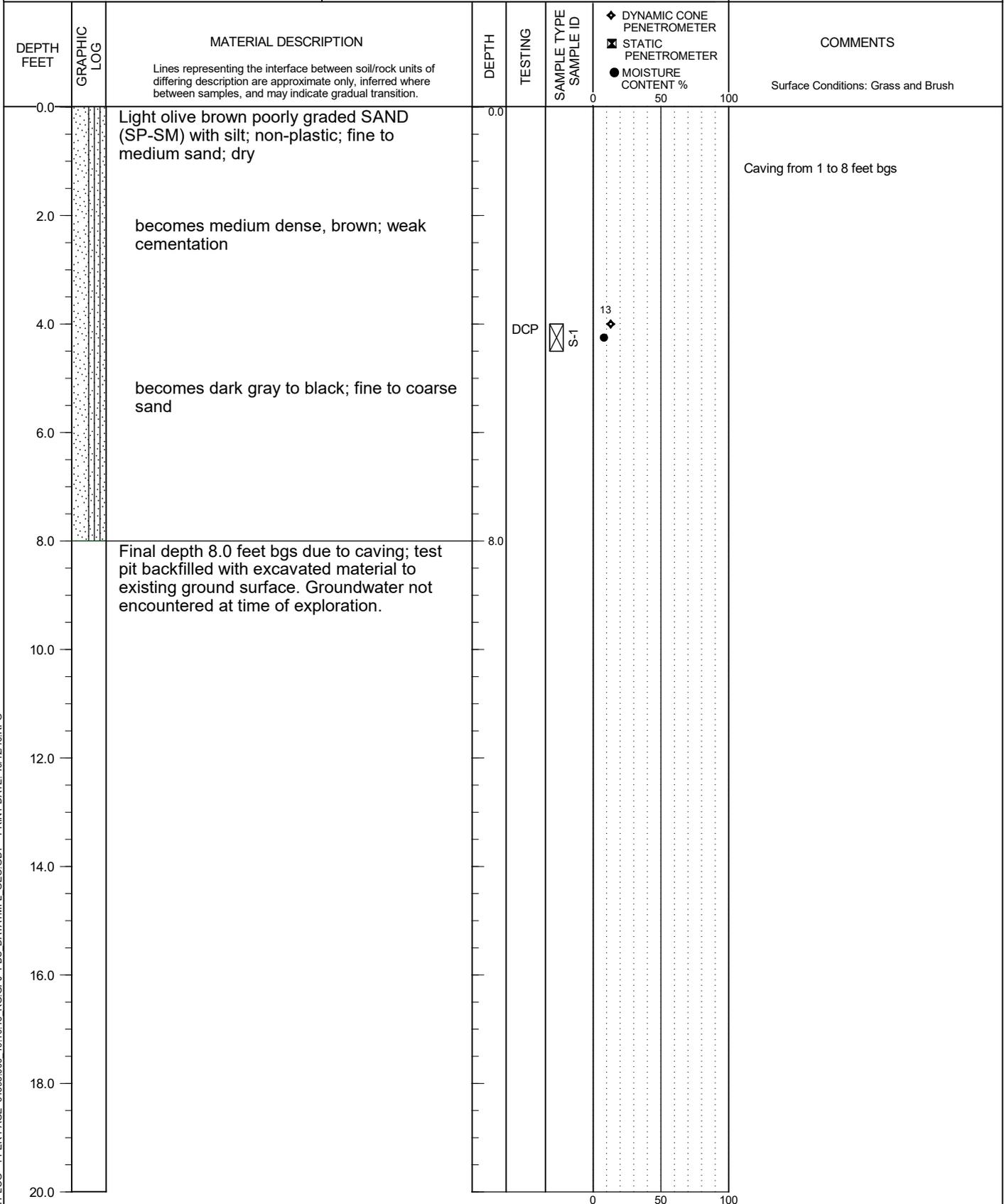
WASHINGTON ARMY NATIONAL GUARD BUILDING  
RICHLAND, WASHINGTON

**TEST PIT TP-10**

PBS PROJECT NUMBER:  
64395.000

APPROX. TEST PIT TP-10 LOCATION:  
(See Site Plan)

Lat: 46.33230 Long: -119.31008



TEST PIT LOG - 1 PER PAGE 64395.000 - 10.10.16 RG.GPJ PBS DATATMPL GEO.GDT PRINT DATE: 10/12/16.RPG

LOGGED BY: A. Swenson  
COMPLETED: 9/20/16

EXCAVATED BY: Mahaffey Enterprises, Inc.  
EXCAVATION METHOD: CAT 320C with 36" Bucket

**FIGURE A13**  
Page 1 of 1

## **APPENDIX B**

---

Laboratory Testing

## APPENDIX B – LABORATORY TESTING

### B1.0 GENERAL

Samples obtained during the field explorations were examined in the PBS laboratory. The physical characteristics of the samples were noted and the field classifications were modified where necessary. The testing procedures are presented in the following paragraphs. Unless noted otherwise, all test procedures are in general accordance with applicable ASTM standards. “General accordance” means that certain local and common descriptive practices and methodologies have been followed.

### B2.0 CLASSIFICATION TESTS

#### B2.1 Visual Classification

The soils were classified in accordance with the Unified Soil Classification System with certain other terminology, such as the relative density or consistency of the soil deposits, in general accordance with engineering practice. In determining the soil type (that is, gravel, sand, silt, or clay) the term that best described the major portion of the sample is used. Modifying terminology to further describe the samples is defined in Terminology Used to Describe Soil in Appendix A.

#### B2.2 Moisture (Water) Contents

Natural moisture content determinations were made on samples. The natural moisture content is defined as the ratio of the weight of water to dry weight of soil, expressed as a percentage. The results of the moisture content determinations are presented on Figure B1, Summary of Laboratory Data, and on the exploration logs in Appendix A.

#### B2.4 Grain-Size Analyses (P200 Wash)

No. 200 wash (P200) analyses were completed on samples to determine the portion of soil samples passing the No. 200 Sieve (i.e., silt and clay). The results of the P200 test results are presented on Figure B1 and on the exploration logs in Appendix A.



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### SUMMARY OF LABORATORY DATA

WASHINGTON ARMY NATIONAL GUARD BUILDING  
RICHLAND, WASHINGTON

PBS PROJECT NUMBER:  
64395.000

SAMPLE INFORMATION				MOISTURE CONTENT (PERCENT)	DRY DENSITY (PCF)	SIEVE			ATTERBERG LIMITS		
EXPLORATION NUMBER	SAMPLE NUMBER	SAMPLE DEPTH (FEET)	ELEVATION (FEET)			GRAVEL (PERCENT)	SAND (PERCENT)	P200 (PERCENT)	LIQUID LIMIT (PERCENT)	PLASTIC LIMIT (PERCENT)	PLASTICITY INDEX (PERCENT)
B-1	S-3	7.5		4.4			6				
B-1	S-6	15		4.8							
B-1	S-8	25		5.3			6				
B-1	S-11	40		3.7			4				
B-1	S-12	45		4.7							
B-2	S-2	5		4.6			9				
B-2	S-4	10		5.4							
B-2	S-7	20		4.1			3				
B-2	S-10	35		5.0							
B-2	S-12	45		2.5			6				
B-3	S-2	5		5.1							
B-3	S-3	7.5		4.8			6				
B-3	S-6	15		4.3							
B-3	S-8	25		4.9			5				
B-3	S-10	35		3.8							
B-3	S-12	45		2.9			3				
TP-1	S-1	2		2.7			6				
TP-1	S-2	4		4.5							
TP-2	S-1	4		5.0							
TP-3	S-1	2		3.8			9				
TP-3	S-2	8		3.6			2				
TP-4	S-1	4		4.3							
TP-4	S-2	7		79.4			69				
TP-5	S-1	2		5.0							
TP-6	S-1	4		3.7			1				
TP-7	S-1	2		4.2							
TP-8	S-2	4		5.0							
TP-9	S-1	2		5.1			15				

**FIGURE B1**  
Page 1 of 2



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 Fax: 866.727.0140

**SUMMARY OF LABORATORY DATA**  
 (continued)

WASHINGTON ARMY NATIONAL GUARD BUILDING  
 RICHLAND, WASHINGTON

PBS PROJECT NUMBER:  
 64395.000

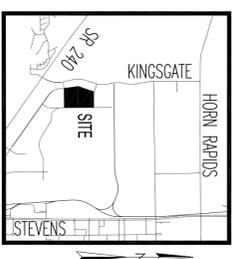
SAMPLE INFORMATION				MOISTURE CONTENT (PERCENT)	DRY DENSITY (PCF)	SIEVE			ATTERBERG LIMITS		
EXPLORATION NUMBER	SAMPLE NUMBER	SAMPLE DEPTH (FEET)	ELEVATION (FEET)			GRAVEL (PERCENT)	SAND (PERCENT)	P200 (PERCENT)	LIQUID LIMIT (PERCENT)	PLASTIC LIMIT (PERCENT)	PLASTICITY INDEX (PERCENT)
TP-10	S-1	4		8.0							

## **II. Exhibit Materials**

### **C Survey Report**

# TOPOGRAPHICAL SURVEY

PORTIONS OF THE SE 1/4 OF SECTION 21 &  
TOWNSHIP 10 NORTH, RANGE 28 EAST, WILLAMETTE MERIDIAN,  
CITY OF RICHLAND, BENTON COUNTY, WASHINGTON



VICINITY MAP

## DESCRIPTION: LOT 1 RGS 4852

THAT PORTION OF THE SOUTHEAST QUARTER OF SECTION 21 AND THE NORTHEAST QUARTER OF SECTION 28 TOWNSHIP 10 NORTH, RANGE 28 EAST, WILLAMETTE MERIDIAN, BENTON COUNTY, WASHINGTON, MORE PARTICULARLY DESCRIBED AS FOLLOWS:  
COMMENCING AT THE SOUTHWEST CORNER OF SAID SECTION 21; THENCE SOUTH 89°22'08" WEST ALONG THE SOUTH LINE THEREOF 2535.21 FEET TO THE EAST LINE OF TRACT 2 AS DERIVED ON THAT RECORD OF SURVEY RECORDED IN VOLUME 1 OF SURVEYS, PAGE 2515, RECORDS OF SAID COUNTY AND STATE AND THE TRUE POINT OF BEGINNING;  
THENCE NORTH 00°32'07" WEST ALONG THE EAST LINE THEREOF 1156.92 FEET; THENCE CONTINUING ALONG SAID EAST LINE NORTH 22°28'15" WEST 241.54 FEET TO THE SOUTH RIGHT-OF-WAY MARGIN RECORDED UNDER AUDITOR'S FILE NUMBER 2015-008673, RECORDS OF SAID COUNTY AND STATE, THENCE SOUTH 65°43'44" EAST ALONG SAID SOUTH RIGHT-OF-WAY MARGIN 9.96 FEET; THENCE ALONG A CURVE TO THE LEFT THROUGH A CENTRAL ANGLE OF 24°47'08" HAVING A RADIUS OF 80.00 FEET AND AN ARC LENGTH OF 35.841 FEET; THENCE NORTH 89°29'05" EAST 89.99 FEET TO THE WEST RIGHT-OF-WAY MARGIN OF A PUBLIC ROAD KNOWN AS POLAR WAY AS DEDICATED BY SAID CITY OF RICHLAND TOWNSHIP OF 15 FEET; THENCE SOUTH 00°31'11" WEST ALONG SAID WEST RIGHT-OF-WAY MARGIN 108.09 FEET; THENCE SOUTH 89°22'08" WEST 1079.00 FEET; THENCE SOUTH 00°24'46" EAST 108.09 FEET; THENCE SOUTH 89°28'40" WEST 240.50 FEET; THENCE ALONG A CURVE TO THE LEFT THROUGH A CENTRAL ANGLE OF 02°44'54" HAVING A RADIUS OF 1768.65 FEET AND AN ARC LENGTH OF 19.65 FEET TO THE TRUE POINT OF BEGINNING.  
CONTAINS 39.93 ACRES.

## SURVEYOR'S NOTES

- DATE OF SURVEY/MONUMENTS VISITED: MAY 2019
- BASE OF BEARING: NAB83(1) WASHINGTON STATE PLANE COORDINATE SYSTEM, SOUTH ZONE.
- UNITS OF MEASURE: SURVEY FEET GROUND DISTANCES, MULTIPLY GROUND DISTANCES BY A COMBINED SCALE FACTOR OF 1.000089616 TO ACHIEVE GROUND DISTANCES. LEGAL DESCRIPTION, REFERENCE SURVEY AND SQUARE FOOTING ARE GROUND DISTANCES. MULTIPLY GROUND DISTANCES BY A COMBINED SCALE FACTOR OF 0.999910392 TO ACHIEVE SURVEYED GROUND DISTANCES.
- (XXXXXX) GROUND DISTANCE.
- EQUIPMENT/PROCEDURES: TOPCON GR3 GNSS, RIK METHOD, LINEAR CLOSURES MEET OR EXCEED STANDARDS CONTAINED IN WAC 332-130-090.
- FOUND MONUMENT AS NOTED.
- FOUND 5/8" BRASS & COP "TERRIT" SURVEY PLS 45774". UNLESS OTHERWISE NOTED.
- CALCULATED POINT, NOT FOUND OR SET.
- PRIMARY CONTROL POINT: POINT 1031 AND 1080 CITY OF RICHLAND SURVEY CONTROL NETWORK.
- CONTOUR INTERVAL: 1 FOOT.
- UNDERGROUND UTILITIES SHOWN PER LOCATE MARKINGS, CITY GIS DATA AND BY CONNECTING VISIBLE STRUCTURES.

## MONUMENT NOTES

- FOUND 2.5" BRASS CAP IN MONUMENT CASE
- FOUND RAILROAD SPIKE
- FOUND 2.5" BRASS CAP IN MONUMENT CASE \*45774\*

## LEGEND

- J-BOX
- STREET LIGHT
- SIGN
- FIRE HYDRANT
- WATER VALVE
- WATER
- UNDERGROUND POWER
- SEWER
- SANITARY SEWER MANHOLE

## SURVEYOR'S CERTIFICATION

I, KYLE D. GAZDA, A PROFESSIONAL LAND SURVEYOR REGISTERED IN THE STATE OF WASHINGTON, HEREBY CERTIFY THAT THE INFORMATION AND BELIEF THAT THIS MAP IS THE RESULT OF AN ACTUAL FIELD SURVEY CONDUCTED BY ME OR UNDER MY DIRECTION AND THAT ALL INFORMATION SHOWN HEREON IS TRUE AND ACCURATELY SHOWN.



CURVE	LENGTH	RADIUS	DELTA	CHORD BEARING	CHORD
C1	346.58 (346.10)	800.00 (800.00)	214.55	144.3	144.3 (144.1)
C2	346.58 (346.41)	800.00 (800.00)	214.55	144.3	144.3 (144.1)
C3	28.54 (28.52)	50.00 (50.00)	85.9241"	145.21 (145.18)	145.21 (145.18)
C4	84.73 (84.72)	1768.65 (1768.65)	2°44'54"	84.72 (84.73)	84.72 (84.73)

## UTILITY CONTACT INFO:

CITY OF RICHLAND- PUBLIC SERVICES (WATER/SEWER)  
JASON RINHERBERG  
(509) 942-7743  
E-MAIL: JASR@CITYOFRICHLAND.WA.GOV

CASCADE NATURAL GAS  
78113 W GRANDROCK BLVD.  
(888) 522-1130

CITY OF RICHLAND- ELECTRICAL SERVICES  
KEITH D. HILL, PE  
DANIEL L. STANLEY  
CITY OF RICHLAND  
(509) 942-7416  
E-MAIL: KDHILL@CITYOFRICHLAND.WA.GOV

FRONTIER COMMUNICATIONS: FIBER/CABLE  
4916 W CLEARWATER AVE.  
SPOKANE, WA 99233  
(509) 735-3700



NO.	DATE	DESCRIPTION
0	05/28/19	ORIGINAL SUBMITTAL
1	05/30/19	UPDATED UTILITY CONTACT INFO

**BERMIT SURVEYING INC.**  
2245 Robertson Drive  
Richland, Washington 99354  
OFFICE 509-975-4123  
FAX 509-971-0999

**ALSC ARCHITECTS, PS**  
203 N WASHINGTON, SUITE 400  
SPOKANE, WASHINGTON

PROJECT NO. 19049  
DRAWN BY: AOC  
CHECKED BY: CCA  
SCALE: 1" = 100'  
REVISION 0  
SHEET 1 OF 1  
SV1

November 1, 2019

Mr. Ron Cross  
Washington State Army National Guard  
Camp Murray Building 36  
Tacoma, Washington 98430

Via email: Ron.Cross@MIL.wa.gov

Regarding: Declaration of Bearing Capacity  
Richland Army National Guard Building  
Richland, Washington  
PBS Project 64395.000

Dear Mr. Cross:

PBS Engineering and Environmental Inc. (PBS) completed a geotechnical engineering evaluation for the Richland Army National Guard building in Richland, Washington, and presented the results in a geotechnical engineering report (GER) dated October 18, 2016.<sup>1</sup> This letter should be considered an addendum to and used only in conjunction with the full GER for the project.

Based on PBS' subsurface exploration and on generally accepted practices and procedures of the geotechnical engineering profession, our current, professional opinion is that shallow foundations can be designed using a maximum allowable bearing pressure of 2,500 pounds per square foot (psf) for the existing soil conditions at the site, provided the recommendations in the project GER are followed.



11/1/2019

Ryan White, PE, GE (OR)  
Principal/Geotechnical Engineering Group Manager  
PBS Engineering and Environmental Inc.

RW:rg

---

<sup>1</sup> PBS Engineering and Environmental Inc. (October 18, 2016). Geotechnical Engineering Report, Washington State Army National Guard, Richland Army National Guard Building, Richland, Washington. Prepared for Washington State Army National Guard. PBS Project 64395.000.

## **II. Exhibit Materials**

### **D ARNG Environmental Checklist**

Enviro Tracking #:	<b>ARNG ENVIRONMENTAL CHECKLIST</b>	State ARNG
Enter information in the yellow shaded areas.		
<b>PART A - PROJECT INFORMATION</b>		
1. PROJECT NAME: <div style="background-color: yellow; height: 40px;"></div>		
2. PROJECT NUMBER: (MILCON if applicable)	3. DATE PREPARED:	
4. DESCRIPTION AND LOCATION OF THE PROJECT/PROPOSED ACTION:		
a. Location (Include a detailed map, if applicable): <div style="background-color: yellow; height: 40px;"></div>		
b. Description: <div style="background-color: yellow; height: 80px;"></div>		
c. The proposed action will involve (check all that apply): <input type="checkbox"/> Training activities/areas <input type="checkbox"/> Construction <input type="checkbox"/> Natural resource management <input type="checkbox"/> Maintenance/repair/rehabilitation <input type="checkbox"/> Real estate action <input type="checkbox"/> Environmental plans/surveys <input type="checkbox"/> Innovative readiness training project <input type="checkbox"/> Other (Explain): <div style="background-color: yellow; width: 200px; display: inline-block;"></div>		
d. Project size (acres): (if applicable)	Acres of new surface disturbance (proposed):	(if applicable)
5. START DATE of PROPOSED ACTION (dd-mmm-yy):		Note: This must be a future date.
6. PROGRAMMED FISCAL YEAR (if applicable):		
7. END DATE (if applicable):		
<b>PART B - DECISION ANALYSIS GUIDE</b>		
To use a categorical exclusion, the project must satisfy the following three screening criteria: no segmentation, no exceptional circumstances and a qualifying categorical exclusion that covers the project. The following decision tree will guide the application and documentation of these three screening criteria. The criteria were extracted from 32 CFR Section 651.29 and represent the most common screening conditions experienced in the ARNG. NOTE: Each question in Part B must have an applicable block checked for concurrence with REC.		
1. Is this action segmented (the scope of the action must include the consideration of connected, cumulative, and similar actions)? <input type="checkbox"/> YES (go to #30) <input type="checkbox"/> NO (go to #2)		
2. Is there reasonable likelihood of significant environmental effects (direct, indirect, and cumulative)? If action meets screening criteria but is assessed in an existing EA or EIS, check NO and proceed to the next question. <input type="checkbox"/> YES (go to #30) <input type="checkbox"/> NO (go to #3)		
3. Is there a reasonable likelihood of significant effects on public health, safety or the environment? If action meets screening criteria but is assessed in an existing EA or EIS, check NO and proceed to the next question. <input type="checkbox"/> YES (go to #30) <input type="checkbox"/> NO (go to #4)		
4. Is there an imposition of uncertain or unique environmental risks? If action meets screening criteria but is assessed in an existing EA or EIS, check NO and proceed to the next question. <input type="checkbox"/> YES (go to #30) <input type="checkbox"/> NO (go to #5)		
5. Is the project of greater scope or size than is normal for the category of action? If action meets screening criteria but is assessed in an existing EA or EIS, check NO and proceed to the next question. <input type="checkbox"/> YES (go to #30) <input type="checkbox"/> NO (go to #6)		
6. Does the project introduce or employ unproven technology? If action meets screening criteria but is assessed in an existing EA or EIS, check NO and proceed to the next question. <input type="checkbox"/> YES (go to #30) <input type="checkbox"/> NO (go to #7)		

**PART B - DECISION ANALYSIS (continued)**

7. Will there be reportable releases of hazardous or toxic substances as specified in 40 CFR Part 302? If action meets screening criteria but is assessed in an existing EA or EIS, check NO and proceed to the next question.

- YES (go to #30)       NO (go to #8)

8. If proposed action is in a non-attainment or maintenance area, will air emissions exceed de minimus levels or otherwise require a formal Clean Air Act (CAA) conformity determination? If action meets screening criteria but is assessed in an existing EA or EIS, check NO and proceed to the next question.

- YES (go to #30)       NO (go to #9)      NA (go to #9)

9. Will the project have effects on the quality of the environment that are likely to be highly controversial? If action meets screening criteria but is assessed in an existing EA or EIS, check NO and proceed to the next question.

- YES (go to #30)       NO (go to #10)

10. Will the project establish a precedent (or make decisions in principle) for future or subsequent actions that are reasonably likely to have future significant effects? If action meets screening criteria but is assessed in an existing EA or EIS, check NO and proceed to the next question.

- YES (go to #30)       NO (go to #11)

11. Has federal funding been secured for the Innovative Readiness Training (IRT) project?

- N/A (go to #13)       YES (go to #13)       NO (go to #12)

12. NOTE: IRT projects not currently funded can secure approved NEPA documentation. However, once funding is secured State ARNG is required to coordinate with ARNG-ILE-T to complete natural and cultural surveys via proponent funding.

- CONFIRMED (go to #27)

13. Do you have a species list from the U.S. Fish and Wildlife Service that is less than 90 days old?

- YES (go to #14)      **Date of List:** \_\_\_\_\_       NO (update species list return to #13)

14. In reviewing the species list, what determination was made by the State ARNG?

- No species present (go to #16)  
 No affect (go to #16)  
 May affect but not likely to adversely affect (go to #15)      **Date of USFWS concurrence:** \_\_\_\_\_  
 May affect likely to adversely affect (go to #15)

15. Does an existing Biological Opinion cover the action?

- YES (go to #16)      **Date of BO:** \_\_\_\_\_       NO (go to #30)

16. Have the Endangered Species Act, Section 7 requirements completed?

- YES (go to #17)      **Date of Documentation:** \_\_\_\_\_       NO (complete documentation, return to #16)

17. Does the project involve an undertaking to a building or structure that is 50 years of age or older?

- YES (go to #18)       NO (go to #20)

18. Has the building or structure been surveyed for the National Register of Historic Places?

- YES (go to #19)       NO (complete inventory, return to #18)

19. Is the building or structure eligible for or listed on the National Register of Historic Places?

- YES (go to #20)       NO (go to #20)

20. Does the action involve ground disturbing activities?

- YES (go to #21)       NO (go to #22)

21. Has an archaeological inventory or research been completed to determine if there are any archeological resources present?

- YES (go to #22)       NO (complete inventory or conduct research, return to #21)

22. In reviewing the undertaking, under the National Historic Preservation Act (NHPA) (for both above and below ground resources), what determination was made by the State ARNG?

- No 106 undertaking; no additional consultation required under NHPA (go to question #27)  
 No properties affected (go to #24)      **Date of SHPO Concurrence:** \_\_\_\_\_  
 No adverse effect (go to #24)      **Date of SHPO Concurrence:** \_\_\_\_\_  
 Adverse effect (go to #23)

23. Has the State ARNG addressed the adverse effect?

- YES (place date of MOA or existing PA and explanation of mitigation in box below, go to #24)       NO (go to #30)

23a.

**PART B - DECISION ANALYSIS (continued)**

24. Per DoDI 4710.02 did the state ARNG determine that tribal consultation was necessary for this project?

- YES (go to #25)  
 NO (Provide reason in this block 24a, go to #27)

24a.

25. Did the Tribes express an interest or respond with concerns about the project?

- YES (go to #26)       NO (go to #27)      Date of Documentation:

26. Has the State ARNG addressed the Tribal concerns?

- YES (place date of MOU or explanation of how State ARNG addressed tribal concerns in box below, go to #27)  
 NO (address concerns, return to #26)

Complete only if additional documentation is required in question #26

26a.

27. Does the project involve an unresolved effect on areas having special designation or recognition such as those listed below? For any yes responses go to #30 otherwise go to #28. If any No response is a result of negotiated and/or previously resolved effects please describe resolution in box 27a below.

TYPE	Unresolved Effects?	TYPE	Unresolved Effects?
a. Prime/Unique Farmland		e. Wild/Scenic River	
b. Wilderness Area/National Park		f. Coastal Zones	
c. Sole-Source Aquifer		g. 100-year Floodplains	
d. Wetlands		h. National Wildlife Refuges	

27a.

28. Is this project addressed in a separate EA or EIS review?

- YES (complete table below; go to Part C, Determination)       NO (go to #29)

Document Title:	
Lead Agency:	
Date of Decision Document:	

29. Does the project meet at least one of the categorical exclusions listed in 32 CFR 651 App B?

- YES (complete table below; go to Part C, Determination)       NO (go to #30)

List primary CAT EX code	
Describe why CAT EX applies	

30. At this time your project has not met all the qualifications for using a categorical exclusion under 32 CFR 651. Unless the scope of the project is changed, it will require an Environmental Assessment or possibly an Environmental Impact Statement. If you feel this is in error, please call your NEPA Regional Manager to discuss. If needed, go to Part C Determination.

Additional Information (if needed):

**PART C - DETERMINATION**

**On the basis of this initial evaluation, the following is appropriate:**

- IAW 32 CFR 651 Appendix B, the proposed action qualifies for a Categorical Exclusion (CX) that does not require a Record of Environmental Consideration.
- A Record of Environmental Consideration (REC).
- An Environmental Assessment (EA).
- A Notice of Intent (NOI) to prepare an Environmental Impact Statement (EIS).

\_\_\_\_\_

Signature of Proponent (Requester)

\_\_\_\_\_

Environmental Program Manager

\_\_\_\_\_

Printed Name of Proponent (Requester)

\_\_\_\_\_

Printed Name of Env. Program Manager

\_\_\_\_\_

Date Signed

\_\_\_\_\_

Date Signed

**Other concurrence (as needed):**

\_\_\_\_\_

Signature

\_\_\_\_\_

Signature

\_\_\_\_\_

Printed Name

\_\_\_\_\_

Printed Name

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Date Signed

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Printed Name

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Printed Name

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Date Signed

\_\_\_\_\_

Date Signed

Enviro Tracking #:	<b>ARNG Record of Environmental Consideration</b>		<b>State ARNG</b>
Enter information in the yellow shaded areas.			
1. PROJECT NAME:			
2. PROJECT NUMBER: (MILCON if applicable)		3. DATE PREPARED:	
4. START DATE of PROPOSED ACTION (dd-mmm-yy):		Note: This must be a future date	
5. PROGRAMMED FISCAL YEAR:			
6. END DATE (if applicable):			
7. DESCRIPTION AND LOCATION OF THE PROPOSED ACTION:			
a. Location (Include a detailed map, if applicable):			
b. Description:			
8. CHOOSE <b>ONE</b> OF THE FOLLOWING:			
<input type="checkbox"/> An existing environmental assessment* adequately covers the scope of this project. Attach FNSI if EA was completed by another federal agency (non-ARNG).			
EA Date (dd-mmm-yy):		Lead Agency:	
<input type="checkbox"/> An existing environmental impact statement* adequately covers the scope of this project.			
EIS Date (dd-mmm-yy):		Lead Agency:	
<input type="checkbox"/> After reviewing the screening criteria and completing the ARNG environmental checklist, this project qualifies for a			
Categorical Exclusion Code:			
See 32 CFR 651 App. B			
Categorical Exclusion Code:			
<b>See 32 CFR 651 App. B</b>			
Categorical Exclusion Code:			
<b>See 32 CFR 651 App. B</b>			
<input type="checkbox"/> This project is exempt from NEPA requirements under the provisions of:			
Cite superseding law:			
*Copies of the referenced EA or EIS can be found in the ARNG Environmental Office within each state.			
9. REMARKS:			
Signature of Proponent (Requester)		Environmental Program Manager	
Printed Name of Proponent (Requester)		Printed Name of Env. Program Manager	
Date Signed		Date Signed	
Proponent Information:			
10. Proponent:			
11. Address:			
12. POC:			
13. Comm. Voice:			
14. Proponent POC e-mail:			

## **II. Exhibit Materials**

E Archaeological Survey

1) Letter of Determination Assessment



Allyson Brooks Ph.D., Director  
State Historic Preservation Officer

August 29, 2017

Ms. Elizabeth Murphy  
36 Quartermaster Road  
Washington Military Department  
Camp Murray, Washington 98430-0500

Re: Richland Readiness Center Project  
Log No.: 2017-08-06164-MIL

Dear Ms. Murphy:

Thank you for contacting our department. We have reviewed the professional archaeological survey report you provided for the proposed Tri-Cities aka Richland Readiness Center Project at 2675 1<sup>st</sup> Street, Richland, Benton County, Washington.

We concur with your Determination of No Historic Properties Affected. Please keep us apprised as your project is actually designed and implemented.

We would also request receiving any correspondence or comments from concerned tribes or other parties that you receive as you consult under the requirements of 36CFR800.4(a)(4).

In the event that archaeological or historic materials are discovered during project activities, work in the immediate vicinity must stop, the area secured, and the concerned tribes and this department notified

These comments are based on the information available at the time of this review and on behalf of the State Historic Preservation Officer in compliance with the Section 106 of the National Historic Preservation Act, as amended, and its implementing regulations 36CFR800.4. ). Should additional information become available, our assessment may be revised. Thank you for the opportunity to comment.

Sincerely,

Robert G. Whitlam, Ph.D.  
State Archaeologist  
(360) 890-2615  
email: [rob.whitlam@dahp.wa.gov](mailto:rob.whitlam@dahp.wa.gov)



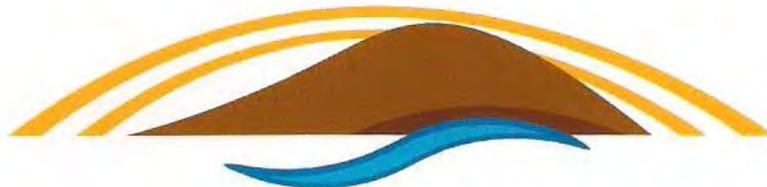
**Archaeological Assessment of the 40-Acre Parcel  
Being Considered for the Proposed Army National  
Guard Readiness Center, Richland, Benton County,  
Washington**

Prepared for:

Army National Guard  
Environmental Programs,  
Camp Murray, WA

Prepared by:

James Knobbs, RPA and Darby C. Stapp, PhD, RPA  
Northwest Anthropology LLC  
P.O. Box 1721  
Richland, WA 99352  
March 31, 2017



NORTHWEST ANTHROPOLOGY

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## **Executive Summary**

Northwest Anthropology LLC conducted an archaeological assessment of a 40-acre parcel in Richland, Washington, which is being considered by the Army National Guard for a readiness center. Historical research and field investigations were conducted to assess the probability that significant cultural resources are located on the property. No evidence of human occupation was found. The surface survey located no significant historic resources and no pre-contact evidence. The subsurface investigation, while minimal, produced no artifacts. The results indicate that it is unlikely any significant archaeological resources are located on the parcel.

Additional research was conducted to identify any other cultural resource-related issues that might arise should the project move forward. Native American cemeteries are not typically found in locations such as this and therefore the probability that one is located here is remote. While single burials can be found almost anywhere, we believe it unlikely that one is located on the parcel. Consideration was also given to the potential that there is a Native American traditional cultural property or property of religious and cultural significance associated with the parcel; while that determination can only be made through consultation with area tribes, preliminary indications are that the probability is low.

If the land is purchased and planning for construction of the facility begins, the Army National Guard will consult with the Washington Department of Archaeology and Historic Preservation and area Tribes as part of its compliance with the National Environmental Policy Act and National Historic Preservation Act. This assessment will assist the parties in determining whether additional cultural resource investigation is needed.

# **Archaeological Assessment of the 40-Acre Parcel Being Considered for the Proposed Army National Guard Readiness Center Project, Richland, Benton County, Washington**

## **Introduction**

This archaeological assessment was prepared by Northwest Anthropology LLC, under contract to PBS Engineering and Environmental, to advise the Army National Guard on potential archaeological and other cultural issues associated with purchasing a 40-acre parcel located in Richland, Washington. The assessment incorporated historical research, previous cultural work in the immediate area, and survey of the parcel. In addition, a small number of shovel test pits were excavated to gain some subsurface information about the areas where buildings and parking lot are being considered. If the National Guard proceeds with the purchase of the parcel and construction of the facility, this assessment will provide the basic information needed to begin cultural resources-related consultations associated with National Environmental Policy Act (NEPA) and National Historic Preservation Act compliance.

## **Location**

The 40-acre parcel is located on City of Richland land, between the Columbia and Yakima rivers, in northwest Richland, Benton County, Washington (Figure 1). The parcel is located in the SW quarter of the SE quarter of Township 10 N, Range 28 E, Section 21, Willamette Meridian (Richland 7.5' USGS quadrangle, 1992). Specifically, the parcel is located in a rapidly expanding industrial section, just off Highway 240 and Kingsgate Way, between Logan Road to the south, 1<sup>st</sup> Avenue to the north, and Polar Way to the east; it is bordered by an RV park on the south, and several private parcels of land on the west (Figure 2). The parcel has been plowed and planted in wheat and corn for decades; the parcel has laid fallow during the past few years (Figure 3).

## **Previous Cultural Resources Investigations**

The Department of Archaeology and Historic Preservation (DAHP) Washington Information System for Architectural and Archaeological Records Data WISAARD was used to identify the previous investigations and sites recorded within one mile of the 40-acre parcel. Two sites associated with the Richland Irrigation Canal (45-BN-1172), eight early twentieth century refuse scatters, and one pre-contact ground stone tool fragment have been recorded during the eleven cultural resources investigations conducted. (Appendix A). Two of the investigations conducted focused on new roads located adjacent to the parcel (Arthur 2009 a, b). Both surveys were conducted when visibility of the plowed fields was high; neither investigation conducted any subsurface sampling. The results of both investigations were negative, and no additional work was recommended.

Large areas to the north have been surveyed over the years, the Hanford Land Conveyance being a recent example (Morton, Civay, and Payne 2012). Early twentieth century farming sites have been the dominant resource encountered, along with a few pre-contact lithic scatters and numerous isolated lithic finds.



Figure 1. Map showing the project location, in northwest Richland, Washington, Benton County. The parcel is located in Section 21, 10 N, 28E. Orange arrow points to parcel.



Figure 2. Google Earth oblique view showing the 40-acre parcel (outlined in red) location for the proposed readiness center. Note the Horn Rapids RV Resort in the foreground, and the agricultural and industrial development to the north.



Figure 3. 2009 aerial photograph showing that the 40-acre parcel (red outline) was located within an irrigated crop circle. (Google Earth image)

## Environmental Description

The 40-acre parcel lies within the semi-arid shrub-steppe Pasco Basin of the Columbia Plateau region (Duncan 2007). Average annual precipitation is less than 7 inches annually. Winds are from the west, southwest. Average temperatures range from 31 degrees F in January to 76 degrees F in July.

Weather between the post-glacial climate, 13,000 to 9,000 years before present (B.P.), to c.a. 2,500 B.P., underwent a series of fluctuations from cooler and moister to warm and dry and back to cool and wet again. After 9,000 B.P. and following the post-glacial climate, the environment warmed and became drier until ca. 4,400 to 2,500 B.P. when it became cool and wet again. From 2,500 B.P. to the present, climate conditions are thought to reflect those occurring today (Chatters 1998).

## Geology

The overall surface geology of the property area includes ridges formed from stabilized sand dunes that consist of medium to fine grained aeolian sediments (Reidel and Chamness 2007). The underlying geology is associated with Miocene basalt flows, glacial flood activities, and Mio-Pliocene fluvial/lacustrine sedimentary deposits). One sedimentary deposit, unconsolidated aeolian dune sand and loess was identified within the parcel using the Washington State Department of Natural Resources Washington State Geologic Information Portal electronic database. This surface geological formation is identified as Quaternary dune sand (Qds) which characterizes Holocene dune sand, in stabilized dunes.

The Hanford formation (13,000-3.4 million years ago) underlies the Qds formation in the property area, and is made up of Pleistocene-age cataclysmic flood deposits from floodwaters including Glacial Lake Missoula, pluvial Lake Bonneville, and ice-margin lakes (Fecht et al. 2004). Unconsolidated Holocene-age, aeolian and alluvial sediments overlay the Hanford formation. These deposits consist of aeolian silts, fine-grained sands and gravels that cover most of the Hanford Site and associated areas such as the 40-acre parcel (Reidel 2004). Sand dunes have been formed from these sediments as a result of prevailing winds and sparse vegetation in the area.

## Soils

The west to east trending stabilized sand dune that comprises the 40-acre parcel are the product of the strong westerly winds that dominate the landscape in this area (Duncan 2007). These landforms constrain the movement of people on foot: it is much easier to follow the contours and walk along the ridges or troughs of the dunes than to walk across them. The soils comprising these dunes, while very fruitful for many of the botanical resources valued by Native Americans, was recognized as relatively poor quality for agricultural purposes without irrigation (Kocher 1919).

The soils of the area are primarily Quincy sand (QuD). This type of soil is of relatively poor quality for agriculture, not well adapted to dry farming, being a medium to fine sand with good drainage and low amounts of organic matter, and prone to deflation through wind action (Kocher 1919). Additionally there is a smaller area of Burbank (BdB) sandy loam. Burbank

sandy loam contains very little (<1%) organic matter as well, and like the other soil type present in the property area, is excessively drained, making it poor for dry farming (NRCS 2014).

## Hydrology

There is no surface water on the 40-acre parcel. Groundwater is at a depth of approximately 116 m (Hartman et al. 2007). A feeder canal from the Richland Irrigation canal constructed along the eastern end of the parcel in the early twentieth century, and later irrigation circle during recent decades may have altered the hydrologic character of the parcel.

## Ecology

While the greater Hanford area supports a biologically diverse shrub-steppe plant community that has been relatively protected from disturbance (Duncan 2007), all of the 40-acre parcel has been disturbed by modern agricultural efforts. Prior to farming, the stabilized sand dunes provided good habitat for a wide variety of plants and animal species. Sackschewsky *et al.* 1992 provides a thorough description of plants species found in habitats that existed prior to development.

No plant species of rare, threatened or endangered status have been documented in the parcel area. Invasives such as *Bromus tectorum* (cheatgrass), *Salsola tragus* (tumbleweed), *Lactuca serriola* (prickly lettuce), *Erodium cicutarium* (restem filaree), *Sisymbrium altissimum* (tumblemustard), and *Centaurea* spp. (knapweeds) now dominate the landscape, with only a handful of native *Ericameria nauseosus* (Gray rabbitbrush) observed.

Animal species that would have been common prior to development include coyote (*Canis latrans*), mule deer (*Odocoileus hemionus*), long-billed curlew (*Numenius americanus*), pygmy short-horned lizard (*Phrynosoma douglasii*), sagebrush lizard (*Sceloporus graciosus*), eastern racer snake (*Coluber constrictor*), night snake (*Hypsiglena torquata*), and western rattlesnake (*Crotalus viridis*) (Sackschewsky *et al.* 1992).

## Cultural Context

The parcel has not been previously investigated for cultural resources, however, a substantial amount of work has been accomplished to the north and east. The cultural resources in this area can be assigned to one of three cultural landscapes—the Native American Cultural Landscape, the Early Settlers and Farming Landscape, and the Manhattan Project and Cold War Era Cultural Landscape.

The Native American Cultural Landscape includes a rich record of archaeological sites associated with pre-contact and ethnographic use of the site. Native Americans have lived in and around the present-day Hanford Site for thousands of years. More than 8,000 years of pre-contact human activity have left extensive archaeological deposits along the Columbia River and, to a lesser degree, the off-river interior (Table 1). Sacred and ceremonial areas such as mountains and rivers where food and medicinal plants are gathered are dispersed across the landscape. Native American descendants of the area's original inhabitants continue to use this landscape to access traditional resources and places. These descendants include members of the Wanapum, Yakama

Nation, Nez Perce Tribe, Confederated Tribes of the Umatilla Indian Reservation, and the Confederated Tribes of the Colville Reservation.

The first non Native American outsiders came to the region as explorers, ca. 1800. The Corps of Discovery, also known as the Lewis and Clark Expedition passed through to the south in 1805-06. By 1810, a fur trade post was established approximately 20 miles to the south at the mouth of the Walla Walla River (Stern 1993). Missionaries were in the region by the 1830s, the best known being the Whitman Mission in the Walla Walla valley. As the western migration of settlers began in the 1940s. In 1855, the U.S. Government established treaties with local tribes.

The project area was surveyed by the General Land Office in 1865, paving the way for organized settlement. Homesteaders and ranchers began moving into the lower Yakima Valley and Hanford plains in the 1870s. The project area became part of Yakima County in 1865. Settlement in the Richland area did not take off until the Newlands Act was passed in 1902 providing funds for the irrigation canals. The area became part of Benton County in 1905. The Richland canal was built in 1906, a segment of which is located close to the project area (Kubik 1994).

Richland was organized in the early 1900s to service the many irrigated farms that sprung up as the Richland Irrigation Canal and other irrigation systems began operation. The early settlers' history at the Hanford Site came to an abrupt end in 1943, when the federal government condemned the land for the war effort. Farming residents were given only 30 days to vacate the land on which many had lived for decades.

Scattered remains of the North Richland farms have been located in the vicinity, characterized by farm sites, irrigation features, and small isolated trash piles. Early Benton County maps (Metzker 1934, 1943) show the Richland Irrigation Canal (45BN1125; Prendergast-Kennedy 2004) to the east of the 40-acre parcel, and no farm properties on the parcel. To the south of the parcel, approximately 1 mile, the remains of farmsteads in undeveloped portions of the 1100 Area were located, documented, and determined to be not eligible for listing in the National Register (Hale 1998; Cadoret 1999).

The project area was condemned in 1943, along with the Richland, Hanford, and White Bluffs communities. In all, 640 square miles was condemned for the Hanford Engineering Works, a part of the Manhattan Project, which constructed facilities to produce plutonium for the Manhattan Project (DOE 1996). The Manhattan Project and Cold War Era Landscape rapidly transformed the Hanford Site from an isolated agricultural region to a military industrial complex dedicated to the production of plutonium, which was later used in the first atomic bombs (DOE 1996). The U.S. Department of Energy (DOE) identified a National Register-eligible Hanford Site Manhattan Project and Cold War Era Historic District that serves to organize and delineate the evaluation and mitigation of Hanford's plutonium-production built environment. While the lands where the 40-acre parcel were located were condemned and obtained by the U.S. Government for the Hanford Engineer works, there is no documentation that any related activities occurred at this location.

In 1958, the condemned lands in Richland and surrounding area were released from the federal government to the local population. The subject parcel was assigned to the City of Richland, which has continued to own it to the present.

**Table 1.** Pre-Contact Cultural Sequence at the Hanford Site <sup>a</sup> (Morton, Civay, and Payne 2014)

<b>Period/Phase</b>	<b>Years (BP)</b>	<b>Subsistence</b>	<b>Architecture</b>	<b>Site Types</b>
Windust Phase	1100-8000	Large/small game, fish. Tool production: Windust, Clovis, Folsom, Scottsbluff type-projectile points, other stemmed and lanceolate projectile points, cobble tools.	Open habitation, rock shelters, caves	Open habitation, rock shelters, caves, lithic material reduction and isolated lithic tool sites.
Cascade/Vantage Phase	8000-4500	Continued large and small mammal hunting; seed, fish, and mussel foraging. Tool production: Cascade and stemmed projectile points, microblades, hammerstones, core tools, scrapers, ovate knives.	Open habitation, rock shelters, caves	Temporary camps, lithic material scatters, quarry sites, food and other resource processing sites.
Frenchman Springs Period	4500-2500	Continued small mammal hunting and increased seed, fish, mussel, root foraging; Tool production with wider tool variety: contracting stemmed, corner notch, and stemmed projectile points, knives, scrapers, graters, ground stone and cobble tools such as mortars, pestles.	House dwellings, semi-subterranean	Lithic material scatters, quarry sites, food/other resource processing sites, seasonal camp sites, habitation sites.
Cayuse Phase I	2500-1200	Increased reliance on fish, mussels, and other riverine-based resources, roots. Tool production: corner- and basal-notched projectile points, continued wide variety of tools such as ground stone, net sinkers, cobble tools, drills, scrapers, lanceolate and pentagonal knives.	Pithouses including wall benches	Spiritual/ideological sites, lithic material scatters, quarry sites, food/resource processing sites, seasonal camp sites, habitation sites.

**Table 1. Pre-Contact Cultural Sequence at the Hanford Site (continued)**

Cayuse Phase II	1200-900	Same as above	Pithouses no longer with wall benches	Same as above
Cayuse Phase III	900-250	Same as above with increased mobility from horse introduction. Tool production: corner- (decreased), stemmed, side-notched projectile points, pressure flake tools, trade goods.	Pit longhouses/villages	Same as above with increased large habitation (villages) sites and seasonal camp sites.

<sup>a</sup>This table was synthesized from various regional studies Benson et al 1989; Galm et al 1981; Green 1975; Morgan et al 2001; Nelson 1969; Rice 1980; Sharpe and Marceau 2001; Swanson 1962; Thoms et al 1983a; Walker 1998.

This review of the cultural contexts and the results of cultural resource surveys conducted in the immediate area indicate that pre-contact archaeological remains are possible but unlikely to be found within the parcel, that significant farming features are unlikely to be found within the parcel, and that significant Manhattan Project/Cold War features are unlikely to be found.

## Research Design

The following research design was developed based upon the archaeological settlement models for the area, the historic land use models, and the geomorphological context. The research design identifies the research questions presented from the background research and aids in the development of the data sources and methods that will be used. Research questions fall into two categories: Native American land use from arrival to the present and nineteenth and twentieth century land use associated with farming and Hanford-era plutonium production.

### Native American Land Use

Our understanding of Native American land use in this region through all time periods indicate that primary habitations and associated cemeteries would be located adjacent to major waterways, such as the Columbia and Yakima Rivers. Secondary habitations would occur near areas used for gathering/hunting resources, which would be located many miles from the primary habitations. Because this area is about 2.5 miles from the Columbia where major settlements were located, this area could have been frequented on a regular basis to provide daily resources for the populations. The project area is over a mile away from the Yakima River, and farther from areas where major sites on the Yakima River are located, but a similar principle applies. People may have travelled through the area using trails, for example to get to and from the fishing camp at Horn Rapids, located at the horn of the Yakima River approximately 6 miles away. Given these assumptions, and the fact that there is no water source in or near the parcel, we would anticipate no evidence of major habitation sites or lithic scatters, but would expect isolated lithic artifacts associated with hunting or possible plant gathering.

### Nineteenth and Twentieth Century Land Use

The parcel is located in an area that became agricultural in the early twentieth century. Adjacent to a major irrigation canal, we would think it likely that evidence of farming activities could be found. However, period maps indicate no farms were located there. No evidence of any roads is shown on maps. Therefore, if Euroamerican evidence is found, we would expect it to be associated with early ranching activities, or hunting before and after Hanford. There is no documentation of Hanford-era authorized use of the area. Because the parcel is several miles from the closest Hanford facilities, and there is no road to the parcel, therefore, no Hanford-era material is anticipated.

## Methods for Identifying Resources

To determine the probability that significant resources are located on the 40-acre parcel being considered for purchase, the following activities were conducted:

- preliminary details concerning the proposed locations of facilities to be constructed was obtained.

- the Washington State Department of Archaeology and Historic Preservation (DAHP) predictive model was consulted.
- DAHP's Washington Information System for Architectural and Archaeological Records Data (WISAARD) was consulted to identify previous investigations and known archaeological sites.
- Historic maps and aerial photography were examined for evidence of past land use and ownership.
- Knowledge of traditional cultural interest was obtained from the Confederated Tribes of the Umatilla Indian Reservation and the Wanapum Band.
- An archaeological pedestrian survey was designed using a 10-meter survey interval. This is a standard transect width for projects of this nature.
- A shovel test pit strategy was developed to gain insight to the subsurface; neither of the other cultural reviews in this area involved any subsurface testing. Forty shovel test pits were planned for excavation at locations selected by the field supervisor to obtain subsurface information from various microenvironments.

## Results of Investigations

### **Information Concerning Proposed Facilities**

The details concerning the proposed readiness facility have not been developed. However, preliminary thoughts on where the parking lot and main building location could be located were obtained from the Army National Guard (Vo 2016). The building location would be located on the high ground to the west, and the parking lot on the low flat to the east (Figure 4).

### **DAHP Predictive Model**

The Washington State Department of Archaeology and Historic Preservation (DAHP) cultural predictive model rates the project area as “Moderate Risk.”

### **DAHP WISAARD Results**

The WISAARD identified nine archaeological sites were identified, all historic, mostly dating to early decades of the 20<sup>th</sup> century. One isolated artifact was identified; a ground stone item of Native American origin. The results from the WISAARD search are provided in Appendix A.

### **Historic Maps and Records Analysis**

The following historic maps were located and reviewed for evidence of historic land use:

- The General Land Office map from 1865 for Township 10 N, Range 28 E, Section 21, Willamette Meridian shows nothing in the 40-acre parcel area, but does show a trail running along the Yakima Rive to the west (Figure 4).
- The 1917 USGS Pasco Quadrangle showed no activity in the parcel.
- 1934 and 1943 Benton County Metzker maps indicated no development on the parcel, which was owned by Benton County (Figure 5).

- The 1943 Hanford Real Estate Map showed that the parcel was part of lands owned by Benton County, identified as J-633, which was purchased by the U.S. Government for Hanford.

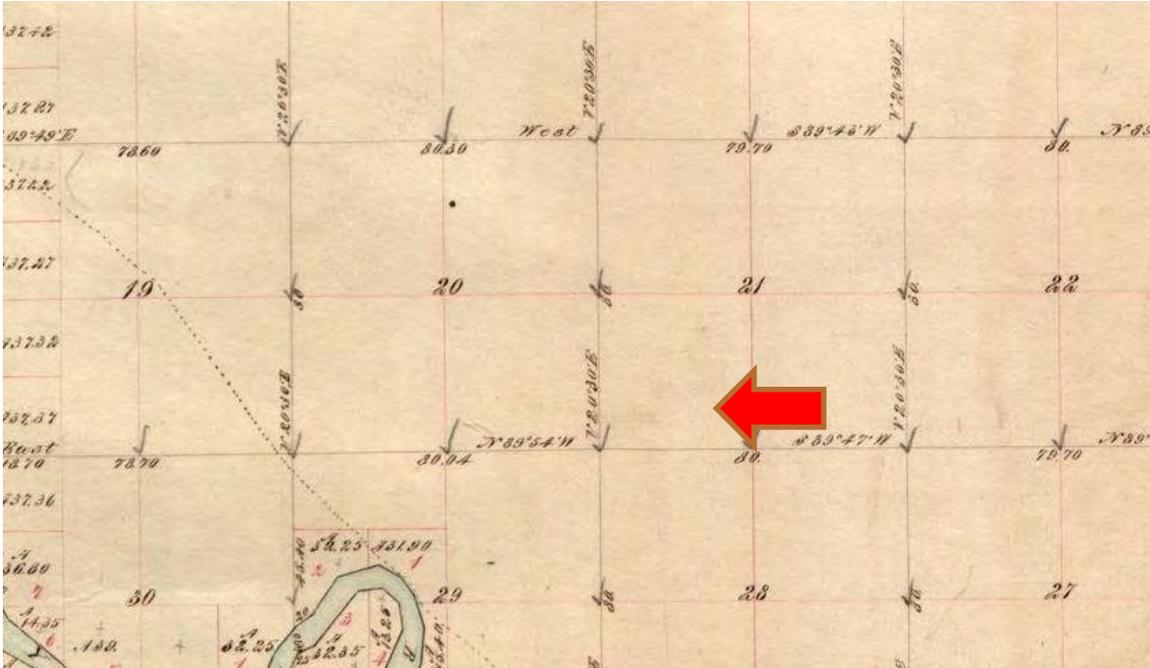


Figure 4. Segment of the 1865 General Land Office map showing location of 40-acres parcel.

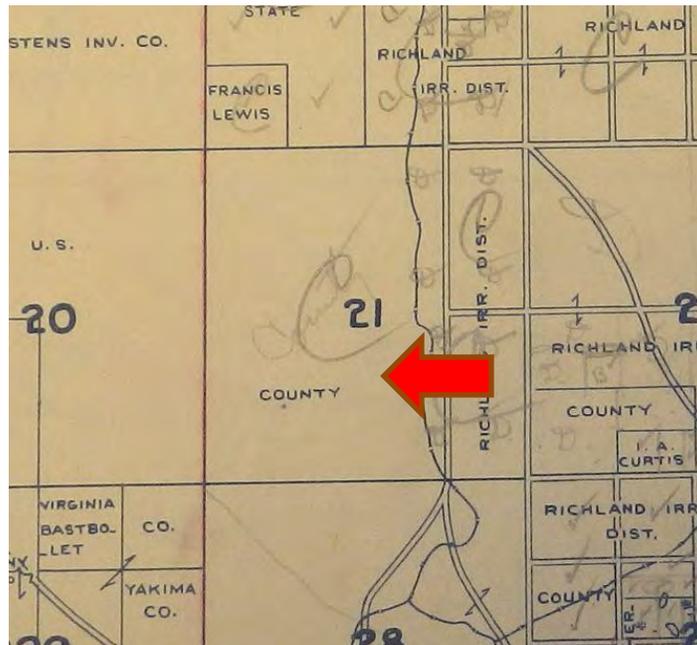


Figure 5. Segment of the 1943 Benton County map showing location of 40-acre parcel.

## Knowledge of Tribal Traditional Resources

The Confederated Tribes of the Umatilla Indian Tribes (CTUIR) was contacted about possible traditional uses of the 40-acre parcel. The response indicated that there was a Historic Property of Religious or Cultural Significance within one mile, but potential impacts would need to wait until more specifics were available (Shea 2016).

Northwest Anthropology LLC (NWA) has been working with the Wanapum of Priest Rapids for several years to identify traditional cultural places (TCP). Although we did not talk to Wanapum specifically about this parcel, we know there is nothing in the documentary record to suggest any Wanapum TCP at this location. Because the native habitat was altered when the area was farmed, traditional plant resources no longer exist on the parcel. There is a good viewscape of Rattlesnake Mountain (*Laalik*) to the west (Figure 6). When consultation with tribes occurs as the project moves forward, there could be concern about impacts to this viewscape.



Figure 6. View of 40-acre parcel, looking northwest at the snow-shrouded, sacred Rattlesnake Mountain.

## Archaeological Survey Results

Following DAHP guidelines on locations classified as Moderate Risk, a ten-meter pedestrian survey was conducted. NWA staff members Amanda Cervantes, Tyus Squeochs, and field supervisor James Knobbs assembled at the corner of 1<sup>st</sup> Street and Polar Way in Richland, WA at 9:30 am on February 22, 2017. The weather was dry and clear. Representatives from the City of Richland Public Works, in response to an 811 utility inquiry, advised NWA to operate at least 40 feet from any extant road in the survey and shovel testing areas. Three NWA staff spread out along the northern edge of the property 40 feet south of 1<sup>st</sup> Street spaced 10 meters apart, and starting from 40 feet plus 5 meters west from Polar Way. NWA staff surveyed in north-south transects using a Silva model 420 magnetic compass set with declination of 14°, 53' E to maintain direction. Survey transects are shown in Figure 7.

Each surveyor scanned the ground approximately 5 meters on either side of their path. Surveyors walked as straight as the ground cover would allow while maintaining a 10 meter spacing. Knobbs, the center surveyor on each set of transects, was charged with maintaining direction. Towards the center of the site, there appeared to be some sort of electromagnetic interference, as the compass showed wide variance with the actual cardinal directions (as determined by map).

Ground visibility is very poor (Figure 8). Approximately 95% of the area is heavily covered with invasive species of plants, primarily cheat grass (*Bromus tectorum*), and Russian thistle (*Salsola tragus*). There are many “blowouts” where no plants are presently growing, which were found to be areas where geotechnical exploration occurred in the recent past.

The entire property was surveyed in this method, with the results presented below.

Only two cultural features were observed during the survey: the pivot platform from the modern crop circle (Figure 9), and a small cairn of modern debris and natural rock in the northwest quarter of the property (Figure 10). Surveyors found a lot of modern garbage scattered across the property, most likely blown in from the Horn Rapids RV resort on the southwest border and the nearby high traffic on Kingsgate Way.

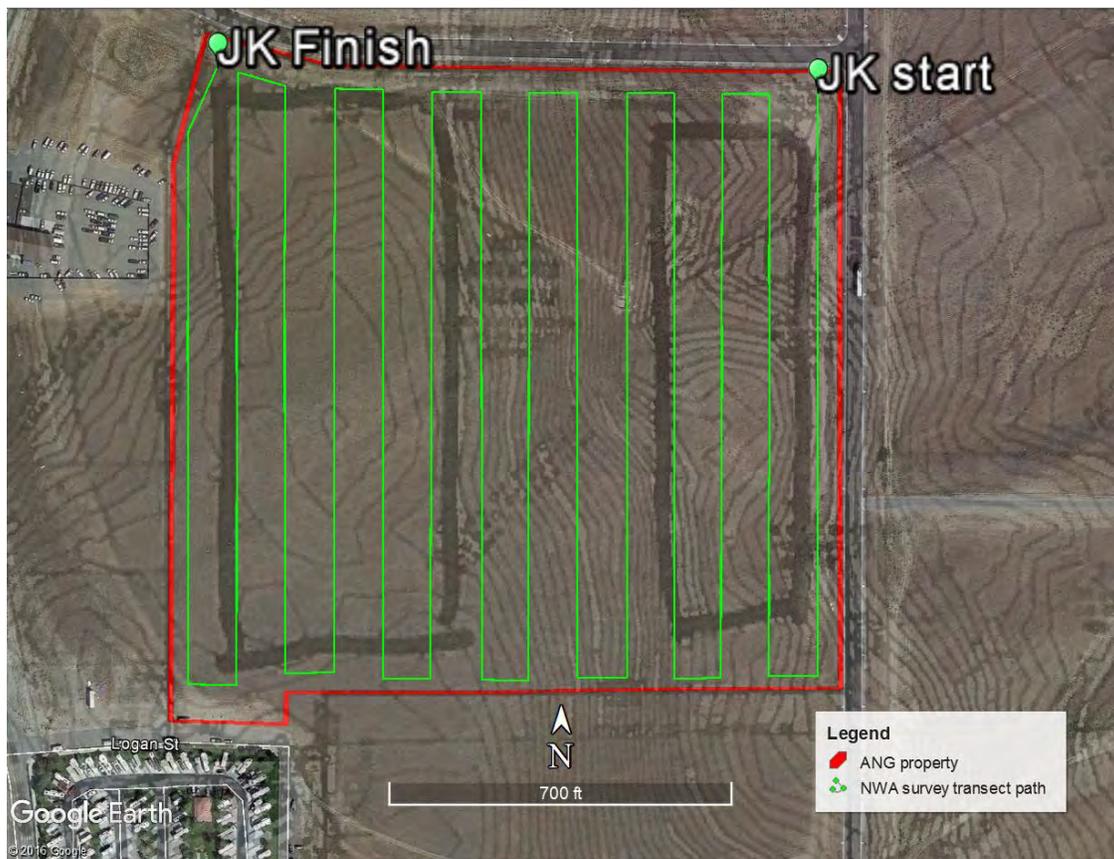


Figure 7. Map of the 40-acre parcel (outlined in red) showing survey transects. The green line is James Knobbs (JK) survey path on 30 meter centers (one surveyor on either side).



Figure 8. Common density of cheatgrass encountered on the survey property. Swiss Army knife used for scale.

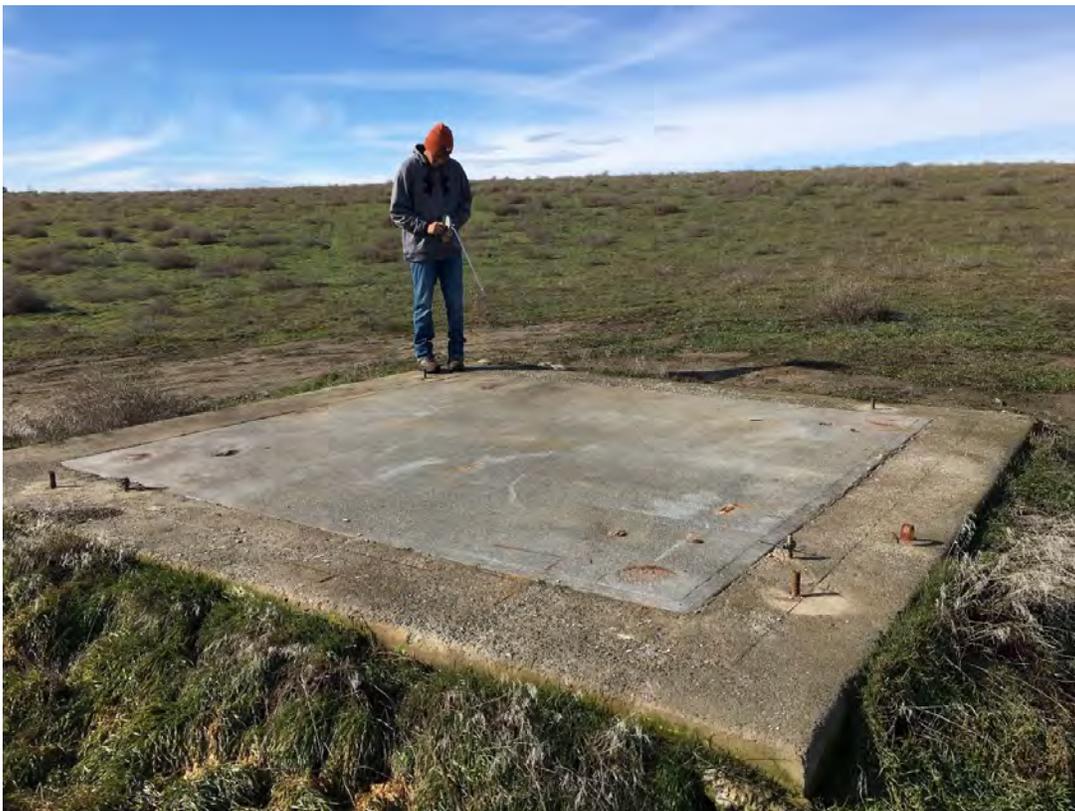


Figure 9. Concrete pivot foundation in the 40-acre parcel property.



Figure 10. Cairn made up of modern debris (concrete, slate, brick and asphalt), and native rocks (basalt, and calcium carbonate crusted cobbles). NWA staff member Tyus Squeochs for scale.

### Subsurface Results

NWA placed 40 shovel test probes in order to assess the subsurface conditions in the project area below the plow-zone. The shovel tests were spaced based on the judgement of NWA field supervisor James Knobbs with the intent to sample a variety of microenvironments. The micro-landforms included small rises, saddles, gullies, and slopes, the micro-biomes included high and low density *Salsola tragus* areas, high and low density *Bromus tectorum* areas, and sandy blowout areas, which turned out to be areas where geotechnical drilling had recently occurred.

The procedures and standards used in the shovel testing are listed below:

1. Sample locations for the two areas slated for construction are shown in Figure 11.
2. Using a Trimble Outdoors mapping app on an iPhone 6s, the UTM coordinates of the sample location were recorded in the app, on a shovel test form, and on a photo-documentation board.
3. A 1/4" shaker screen was set up on a tarp to capture sediment and staffed by an NWA employee in close proximity to the sample location.

4. Using a round nosed shovel, an NWA staff member would dig an approximately 35 cm diameter hole in arbitrary 10 cm levels, either putting the sediment directly into the shaker screen, a bucket, or a 1/8" hand screen (Figure 12).
5. The sediment was sifted through the 1/4 or 1/8 inch mesh screen, with cultural material being pursued both visually and tactilely.
6. Upon termination of the hole, either by depth of 1 meter or more, or obstruction, the hole was photo-documented (Figure 13), documented on the STP form, measured for changes in stratigraphy, soil conditions and color, and examined for cultural material in the side-walls.
7. The hole was then back-filled with the sediment remaining on the tarp, a new STP location was selected, and the process was repeated.

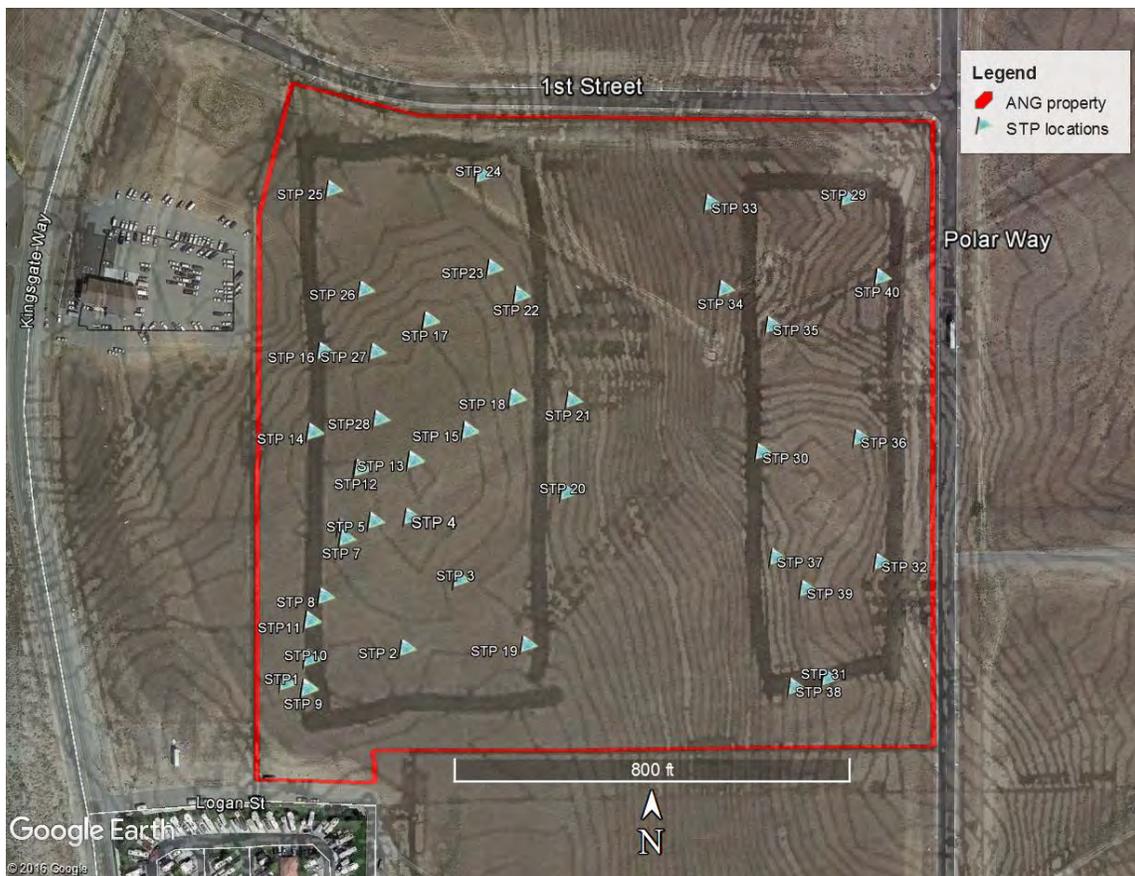


Figure 11. Topographic map showing the location of the 40-acre-parcel and the shovel test pits excavated. The possible location of the readiness center area is outlined in black on the left; the parking lot area outlined in black on the right. Note the relatively steep slope in between the two areas.



Figure 12. NWA Crew beginning STP 21 in an area that turned out to be the location of a recent geotechnical exploration test.



Figure 13. STP 21 photo-documentation: photo on left showing the documentation recorded on the photo-documentation board, photo on the right showing the basic stratigraphy of the STP. Note the bentonite fragments in the bottom of the STP.

Of the 40 shovel tests completed, only two contained cultural material. The first, STP 17, was terminated at 90 cm after encountering an unidentified concrete structure whose size and nature could not be determined in the context of a shovel test, though it appeared to be a modern drain pipe. This was located very near the modern cairn, but association could not be established.

The other positive shovel test (STP 21) encountered wet clay fragments below 50 cm, which were interpreted to be Bentonite clay, a common filler used to plug geotechnical drilling holes. All other STPs were negative for cultural materials, the results are tabulated in Tables 2 and 3.

Three types of soil horizons were observed in the shovel tests, and these were coded A, B, and C. The A soil horizon was typically measured from the surface down to between 15 and 40 cm. The A horizon is characterized as root laden, medium brown fine to medium sand, typically with < 1% small rounded to sub-angular gravels. The color of this horizon was measured using a Munsell chart as 2.5Y5/2, but all samples were damp, so color may change as the area dries out. A typical soil column is illustrated in Figure 14.

The B soil horizon was typically measured from the surface down to between 15 and 40 cm. The A horizon is characterized as sterile, grayish medium sand, typically with < 1% small rounded to sub-angular gravels. The color of this horizon was measured using a Munsell chart as 10YR6/4, but all samples were damp, so color may change as the area dries out.

The C soil horizon was only observed in STP 40 below a depth of 72 cm. The C horizon is characterized as sterile, brownish medium-fine sand, with < 1% small rounded to sub-angular gravels. The color of this horizon was measured using a Munsell chart as 10YR4/4, but all samples were damp, so color may change as the area dries out. This was the only STP that showed evidence of vertebrate life, in the form of a small rodent femur.

**Table 2.** Shovel Test Locations Selected for Sampling, Cultural Material Occurrence, and Rationale for Selection

STP # <sup>a</sup>	11T Easting (meters) <sup>b</sup>	Northing (meters) <sup>b</sup>	P or N <sup>c</sup>	Depth (cm) <sup>d</sup>	Soil Change <sup>e</sup>	Test Rationale (landform/surface veg)
1	0321883	5133301	N	100	40	Gully/cheatgrass
2	0321957	5133320	N	100	16, 53	Gully/sandy
3	0321991	5133361	N	100	38	Saddle/cheatgrass
4	0321962	5133400	N	100	32	Rise/cheatgrass
5	0321940	5133398	N	100	34	Gully/cheatgrass
6	0321921	5133395	N	100	30	Slope/ cheatgrass
7	0321922	5133388	N	100	25	Rise/cheatgrass
8	0321908	5133353	N	100	35	Saddle, sparse veg
9	0321896	5133297	N	100	27	Rise/cheatgrass
10	0321898	5133315	N	100	28	Rise/tumbleweed
11	0321899	5133338	N	100	30	Slope/cheatgrass
12	0321932	5133430	N	100	30	Saddle/cheatgrass

13	0321965	5133434	N	100	22	Bench/sparse veg
14	0321904	5133453	N	100	28	Slope/tumbleweed
15	0321911	5133502	N	100	28	Saddle/tumbleweed
16	0321999	5133451	N	100	34	Gully/sparse veg
17	0321977	5133519	P	90	31	Rise/tumbleweed/cairn
18	0322028	5133470	N	110	26	Rise/tumbleweed
19	0322031	5133320	N	110	13, 42	Slope/sandy
20	0322058	5133412	N	110	36	Slope/cheatgrass
21	0322063	5133468	P	110	10, 40	Slope/sandy
22	0322033	5133533	N	100	27	Slope/cheatgrass
23	0322017	5133550	N	100	24	Rise/cheatgrass
24	0322012	5133607	N	100	34	Gully/cheatgrass
25	0321920	5133601	N	100	36	Gully/cheatgrass
26	0321938	5133539	N	100	34	Slope/tumbleweed
27	0321944	5133501	N	100	30	Slope/tumbleweed
28	0321945	5133460	N	100	32	Bench/tumbleweed
29	0322237	5133588	N	100	23	Slope/tumbleweed
30	0322179	5133433	N	106	26	Bench/cheatgrass
31	0322216	5133293	N	100	35	Bench/sparse veg
32	0322251	5133363	N	100	30	Gully/sparse veg
33	0322152	5133578	N	100	35	Slope/tumbleweed
34	0322159	5133534	N	102	22	Slope/cheatgrass
35	0322188	5133511	N	111	26	Gully/sandy
36	0322240	5133440	N	106	29	Bench/cheatgrass
37	0322186	5133368	N	100	32	Slope/cheatgrass
38	0322195	5133288	N	109	36	Slope/sparse veg
39	0322204	5133348	N	102	45	Bench/cheatgrass
40	0322257	5133539	N	108	23, 72	Gully/sparse veg

<sup>a</sup>STP = shovel test pit number; <sup>b</sup>UTM locations; <sup>c</sup>P = positive for cultural material; N = negative for cultural material; <sup>d</sup> depth where change occurs from A to B or A to B to C in cm.

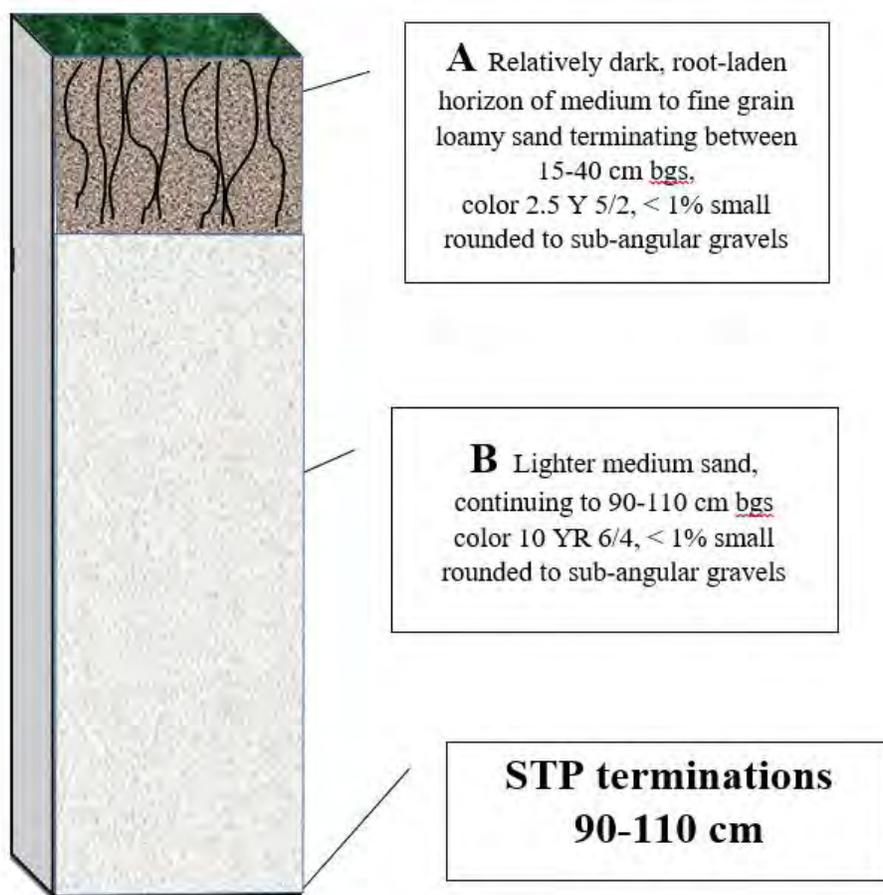


Figure 14. Typical soil column observed in shovel testing at 40-acre parcel.

## Assessment

Based upon the forgoing analyses, our assessment is that there is a low probability that significant archaeological resources are located on the parcel. In the event resources are discovered, assuming proper consultations are completed prior to construction, resolution should be straightforward. The location does not fit models for major village locations or major cemetery locations, two scenarios that could result in complex mitigation.

As the land purchase and plans for construction move forward, the Army National Guard will begin National Environmental Policy Act and National Historic Preservation Act consultations with the Washington Department of Archaeology and Historic Preservation and area Tribes. This report will assist in providing information concerning the known cultural resources and the potential for unknown resources to be discovered. The parties may believe that additional investigation is needed or that there should be monitoring during construction. It is the recommendation of NWA LLC that the potential to encounter National Register-eligible archaeological resources within the 40-acre parcel is remote.

**Table 3.** Cultural Resources observed during pedestrian survey and shovel testing.

<b>STP or Photo #</b>	<b>Length</b>	<b>Width</b>	<b>Height</b>	<b>Description</b>
<b>IMG_4106</b> (Figure 9)	4m	4m	15cm	Pivot foundation. Appears modern, 1954 aerial photo shows no pivot farming in the area. Most of the development of pivot irrigation occurred after 1970 (Muckleston, Highsmith 1978), leading NWA to infer that this pivot does not meet federal standards for historic properties.
<b>IMG_4107</b> (Figure 10)	2.5m	2.5m	.5m	Cairn made up of modern debris (concrete, slate, brick and asphalt), and native rocks (basalt, and calcium carbonate crusted cobbles). NWA interprets the cairn to be modern based on the inclusion of clearly modern debris in the form of some concrete curbing, and slate as well as carbonate crusted cobbles that most likely came from off-site.
<b>STP 17</b>	Unknown			Unknown concrete structure, probably a modern drain pipe. NWA was not able to make a definitive determination due to the depth of the concrete and limitations of shovel excavation. Observed at 90 cm bgs at the termination of the STP.
<b>STP 21</b>	Unknown			Clay, most likely bentonite fill from a recent geotechnical investigation of the area. Observed from 50 cm bgs to the termination of the STP.

## References

Arthus, Ed.

2009a Cultural Resources Survey for the First Street Construction, Kingsgate Way to Logston Boulevard, Richland, WA. Tech Memo 0811C-2. Cultural Resource Consultants. Bainbridge Island, WA.

2009b Cultural Resources Survey for the Robertson Drive Extension, Richland, WA. Tech Memo 0811J-2. Cultural Resource Consultants. Bainbridge Island, WA.

Benson, J.R., J.V. Jermann, and D.E. Lewarch

1989 *Cultural Resources Inventory of the Proposed Yakima Firing Center Expansion Area East-Central Washington*. URS Corporation, Sacramento, California. Department of Energy.

Chatters, James C.

1998 Environment. In *Plateau*, edited by DE Walker, Jr., pp. 29-48. Volume 12. Handbook of North American Indians, edited by WC Sturtevant. Smithsonian Institution. Washington, D.C.

Duncan, J. P. (editor)

2007 Hanford Site National Environmental Policy Act (NEPA) Characterization. Prepared for the U.S. Department of Energy by Pacific Northwest National Laboratory. PNNL, Richland, WA 99352.

Fiege, Mark

1999 *Irrigated Eden : The Making of an Agricultural Landscape in the American West*. University of Washington Press: Seattle.

Galm, Jerry R., Glen D. Hartman, R. A. Mastern, and G. O. Stephenson

1981 *A Cultural Resources Overview of the Bonneville Power Administration's Mid-Columbia Project, Central Washington*. Eastern Washington University, Cheney, WA

Green, G. S.

1975 *Prehistoric Utilization in the Channeled Scablands of Eastern Washington*. Washington State University, Pullman.

Hanford Site

2003 *Hanford Site, Summary of the Hanford Site Environmental Report, for Calendar Year 2002*. Prepared for the U.S. Department of Energy by Pacific Northwest National Laboratory. PNNL, Richland, WA 99352.

Kocher, A. E.

1919 *Soil Survey of Benton County, Washington*. U.S. Department of Agriculture, Washington Government Printing Office. Accessed online at [http://www.nrcs.usda.gov/Internet/FSE\\_MANUSCRIPTS/washington/bentonWA1919/bentonWA1919.pdf](http://www.nrcs.usda.gov/Internet/FSE_MANUSCRIPTS/washington/bentonWA1919/bentonWA1919.pdf) on 2/21/2014.

Kubik, Barbara J.

1994 Richland: Celebrating its Heritage. City of Richland, Richland, WA.

Marceau, T. E., D. W. Harvey, D. C. Stapp, S. D. Cannon, C. A. Conway, D. H.

Deford, B. J. Freer, M. S. Gerber, J. K. Keating, C. F. Noonan, and G. Weisskopf

2003 *Hanford Site Historic District, History of the Plutonium Production Facilities 1943-1990*. Battelle Memorial Institute, Battelle Press, Richland, Washington.

- Mendez, K. M., H. Hay, and K. Clark  
 2012 *Cultural Resource Review for the City of Richland 300 Area Electrical Service Project, Hanford Site, Richland, Washington* (HCR#2012-300-009). September 2012. Benton County, Richland, Washington.
- Morgan, V., R. Bruce, J. Creighton, and S. Emerson  
 2001 *A Cultural Resources Overview for the Priest Rapids Hydroelectric Generation Project* (FERC Project No. 2011). Grant, Chelan, Douglas, Kittitas, and Yakima Counties, Washington, Ephrata, Washington.
- Morton Ashley M., Gregory Civay, and James Payne  
 2014 *Historic Property Assessment for the TRIDEC Land Conveyance of the Hanford Site 600 Area Benton County, Washington*. Report prepared for U.S. Department of Energy, Richland Operations. Fort Walla Walla Museum, Heritage Research Services. Walla Walla, WA 99362
- Muckleston, Keith W., Highsmith, Richard M.  
 1978. *CENTER PIVOT IRRIGATION IN THE COLUMBIA BASIN OF WASHINGTON AND OREGON: DYNAMICS AND IMPLICATIONS*. JAWRA Journal of the American Water Resources Association. Blackwell Publishing Ltd.
- Nelson, C. M.  
 1969 *The Sunset Creek Site (45-KT-28) and Its Place in Plateau Prehistory*. Report of Investigations No. 47. Laboratory of Anthropology, Washington State University, Pullman, Washington.
- NRCS  
 2014 *USDA Natural Resources Conservation Service Official Soil Series Descriptions: Burbank*. Online resource accessed at [https://soilseries.sc.egov.usda.gov/OSD\\_Docs/B/BURBANK.html](https://soilseries.sc.egov.usda.gov/OSD_Docs/B/BURBANK.html) on 2/21/2014.
- Rediel, S. P.  
 2004 *The Geologic Development of the Pasco Basin, South-Central Washington*. Northwest Geological Society. Society Field Trips in Pacific Northwest Geology. October: 16-17.
- Reidel, S.P. and M.A. Chamness  
 2007 *Geology Data Package for the Single-Sehll Tank Waste Management Area at the Hanford Site*. PNNL-15955. Pacific Northwest National Laboratory, Richland, Washington.
- Rice, D.G.  
 1980 *Overview of Cultural Resources on the Hanford Reservation in South Central Washington State*. Report Submitted to the U.S. Department of Energy, Richland Operations Office, Richland, Washington.
- Sackschewsky, M. R., D. S. Landeen, J. L. Downs, W. H. Rickard, G. I. Baird.  
 1992 *Vascular Plants of the Hanford Site*. WHC-EP-0554. Westinghouse Hanford Company. Richland, WA.

Sharpe, J. J., and T. E. Marceau

2001 *Archaeological Excavation Report for Extraction Well C3662 in Support of the 100-KR-4 Pump and Treat Project*. BHI-01645. U.S. Department of Energy, Richland, Operations, Richland, Washington.

Shea, Holly

2017 Email from Holly Shea (CTUIR) to Justine Kmiecik (MIL) concerning WA Militart Dept Richland Site. February 1, 2017.

Solimano, Paul

2012. *Archaeological Test Excavations at 45-BN-1573, Benton County, Washington Final Report*. WillametteCRA Report Number 12-05 Willametter Cultural Resources Associates, Ltd.

Stern, Theodore

1993 *Chief & Traders: Indian Relations at Fort Nez Perces, 1818–1855*. Oregon State University Press, Corvallis.

Swanson, E. H.

1962 *The Emergence of Plateau Culture*. Occasional Papers of the Idaho State College Museum No. 8. Idaho State College Museum, Pocatello, Idaho.

Thoms, A. V., S. J. Bobalick, K. Bohm, T. R. Metzger, D. Olson, and S. R. Samuels

1983 *Archaeological Investigations in Upper McNary Reservoir: 1981–1982 (HCRL# 702a)*. Laboratory of Archaeology and History, Washington State University, Pullman, Washington.

Vo, Minh H

2016 Email to Darby Stapp, Secember 28, 2016.

Walker, Deward, Jr. (editor)

1998 *Handbook of North American Indians: In Plateau*, Vol. 12. Smithsonian Institution Press, Washington, D.C.

## **Appendix A**

### **Results of WISAARD Search**

Archaeology Comments	Date Recorded	Smithsonian Number	Listing Status	Archaeology ID	Field Temporary Number(s)	Resource ID	Site Type Name	Site Name
HISTORIC REFUSE SCATTER, 1935-1945, 90 X 20M	11/24/1998 12:00:00 AM	BN01110	Potentially Eligible	1320	BN01110	631581	Historic Debris Scatter/Concentr	
HISTORIC FARMSTEAD, 37 X 18M, EARLY 1900'S	11/24/1998 12:00:00 AM	BN01111	Potentially Eligible	1321	BN01111	631582	Historic Agriculture; Historic Homestead	
HISTORIC REFUSE DUMP, 40 X 15M, EARLY 1900'S	11/24/1998 12:00:00 AM	BN01113	Potentially Eligible	1323	BN01113	631583	Historic Debris Scatter/Concentr	
HISTORIC REFUSE SCATTER, 3 X 3M, EARLY 1900'S	4/4/1998 12:00:00 AM	BN01114	Potentially Eligible	1324	BN01114	631584	Historic Debris Scatter/Concentr	
HISTORIC REFUSE SCATTER, 80 X 30M, EARLY 1900'S	2/28/1997 12:00:00 AM	BN01122	Potentially Eligible	1332	BN01122	631592	Historic Debris Scatter/Concentr	
RICHLAND IRRIGATION CANAL, HISTORIC CANAL, REFUSE SCATTER, CA 1902-1909, SEGMENTS 15 X 1400M, 165 X 40M, 60 X 180M	9/27/1994 12:00:00 AM	BN01125	Determined Eligible	1335	BN01125	631595	Historic Agriculture; Historic Debris Scatter/Concentr	
HISTORIC REFUSE SCATTER, 10 X 10M	3/26/1998 12:00:00 AM	BN01419	Survey/Inventor	1613	BN01419	631873	Historic Debris Scatter/Concentr	

Comments	Date Recorded	Smithsonian Number	Listing Status	Archaeology ID	Field Temporary Number(s)	Resource ID	Site Type Name	Site Name
HISTORIC REFUSE SCATTER, BOTTLES, CANS, CAR PARTS, 1917-1930'S, 15 X 10M	3/25/1998 12:00:00 AM	BN01420	Potentially Eligible	1614	BN01420	631874	Historic Debris Scatter/Concentration Historic Object(s)	
PRE-CONTACT LITHIC MATERIAL, GROUND STONE ISOLATE.	2/29/2008 12:00:00 AM	BN01475	Survey/Inventor	1669	BN01475	631927	Pre Contact Isolate; Pre Contact Lithic Material	
HISTORIC REFUSE, CULVERTS, CONCRETE BOX, IRRIGATION DITCH, 1000 X 150M, CA. 1948	3/23/1998 12:00:00 AM	BN01681	Potentially Eligible	27270	BN01681	657114	Historic Agriculture; Historic Debris Scatter/Concentration	

## Property

Property ID	Has Image(s)?	Resource ID	County	Common Name	Address	Historic Name
573892	No	521169	Benton		2898 RIVERBEND DR, RICHLAND, WA 99354	
574459	No	521736	Benton		2947 CROSSWATER LOOP, RICHLAND, WA 99354	

## Cultural Survey

Author	County	Title	NADB	Report Date	Document Type
Chatters, James C.	Benton	Letter to Gene Post Regarding Preliminary Report on the Cultural Resources File Search and Survey of the Precision Cast Parts Property	1342318	2/6/1997 12:00:00 AM	Survey Report
Sharley, Ann	Benton	Cultural Resources Survey for the Washington State Department of Transportation's SR 240, Beloit Road to Kingsgate Way Project	1350517	9/1/2007 12:00:00 AM	Survey Report
Miller, Carey L.	Benton	Archaeological Survey for the Proposed Babe Ruth Baseball Complex, Richland	1351107	3/24/2008 12:00:00 AM	Survey Report
Chobot, Katherine	Benton	Cultural Resources Assessment and Monitoring for the Port of Benton Transload Facility Project	1351223	4/1/2008 12:00:00 AM	Survey Report
Arthur, Ed	Benton	Cultural Resources Survey for the Horn Rapids Stormwater Retrofit, Richland	1352449	2/4/2009 12:00:00 AM	Survey Report
Arthur, Ed	Benton	Cultural Resource Survey for the Horn Rapids .75 Mgal Reservoir, Richland	1352450	7/10/2009 12:00:00 AM	Survey Report
Dampf, Steven	Benton	Cultural Resources Assessment of AREVA NP Richland Fuel Fabrication Facility	1352543	3/1/2009 12:00:00 AM	Survey Report
Arthur, Ed	Benton	Cultural Resources Survey for the Robertson Drive Extension, Richland	1353206	7/10/2009 12:00:00 AM	Survey Report
Arthur, Ed	Benton	Cultural Resources Survey for the Logston Boulevard Extension, Richland	1353207	7/10/2009 12:00:00 AM	Survey Report

Author	County	Title	NADB	Report Date	Document Type
Arthur, Ed	Benton	Cultural Resources Survey for the First Street Construction, Kingsgate Way to Logston Boulevard, Richland	1353208	7/10/2009 12:00:00 AM	Survey Report
Mishkar, Larry	Benton	Aggregate Quarry Cultural Resources Assessment, Richland	1681170	11/1/2010 12:00:00 AM	Survey Report

## **II. Exhibit Materials**

F Clean Air RONA

**RECORD OF NON-APPLICABILITY (RONA) FOR GENERAL CONFORMITY**

NAME OF PROJECT: Richland (Tri-Cities) Readiness Center Construction and Operation,  
Benton County, WA

PROJECT ID NUMBER: MILCON #531201

POINT OF CONTACT: LTC Adam Iwaszuk

PHONE/E-MAIL: 253-512-8702/Adam.M.Iwaszuk.mil@mail.mil

START DATE: FY 2020

General Conformity under the *Clean Air Act, Section 1.76* has been evaluated for the project described above according to the requirements of *40 CFR 93 Subpart B*. The requirements of this rule are not applicable to this project/action because:

The project/action qualifies as an exempt action. The applicable exemption citation is 40 CFR 93.153:

Total direct and indirect emissions from this project/action have been estimated at (only include information for applicable pollutants):

1.6749 Tons per year of CO

0.10931 Tons per year of PM<sub>2.5</sub>

These levels are below the conformity threshold values established at 40 CFR 93.153(b)--NO<sub>x</sub>, PM<sub>2.5</sub>, CO, SO<sub>2</sub>: 100 tons per year, **AND** this project/action is not considered regionally significant under 40 CFR 93.153(i).

Supporting documentation and emission estimates are:

Attached

Appear in NEPA documentation -- \_\_\_\_\_ (cite reference)

Other \_\_\_\_\_ (cite reference)



ROWENA VALENCIA-GICA, Ph.D., Environmental Programs Supervisor

10/6/2017

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ENVIRONMENTAL COORDINATOR (title and signature)

DATE

Emissions Calculation for Construction Projects

Nonroad Equipment								
Equipment	Equipment Population (a)	Operations (Days) (a)	CO Emission Factor (tons/day) (b)	PM <sub>2.5</sub> Emission Factor (tons/day) (b)	PM <sub>10</sub> Emission Factor (tons/day)	CO Emissions (TPY)	PM <sub>2.5</sub> Emissions (TPY)	PM <sub>10</sub> Emissions (TPY)
Paver	1	5	0.000346	0.000076	0.000078	0.001730	0.000380	0.000392
Rollers	1	40	0.000322	0.00007	0.000072	0.012880	0.002800	0.002887
Scrapers			0.000447	0.0001	0.000103	0.000000	0.000000	0.000000
Paving equipment			0.000286	0.00006	0.000062	0.000000	0.000000	0.000000
Surfacing equipment	1	20	0.000273	0.000054	0.000056	0.005460	0.001080	0.001113
Signal boards/light plants	2	120	0.000052	0.00008	0.000082	0.012480	0.019200	0.019794
Trenchers			0.000288	0.000059	0.000061	0.000000	0.000000	0.000000
Bore/drill rigs			0.000179	0.000036	0.000037	0.000000	0.000000	0.000000
Cranes	1	40	0.000224	0.000055	0.000057	0.008960	0.002200	0.002268
Graders	1	20	0.000408	0.000092	0.000095	0.008160	0.001840	0.001897
Off-highway trucks			0.000787	0.000188	0.000194	0.000000	0.000000	0.000000
Tractors/loaders/backhoes	2	300	0.000413	0.000071	0.000073	0.247800	0.042600	0.043918
Crawler tractors/dozers	1	30	0.000386	0.000087	0.000090	0.011580	0.002610	0.002691
Dumpers/tenders			0.000179	0.000037	0.000038	0.000000	0.000000	0.000000
Other construction equipment	2	300	0.000297	0.000061	0.000063	0.178200	0.036600	0.037732
<b>TOTAL</b>						<b>0.48725</b>	<b>0.10931</b>	<b>0.112691</b>

(a) This number may change from project to project

(b) EPA Nonroad Emissions Model, Version 2005 1.0, June 2006

Record of Non-Applicability (RONA)

October 6, 2017

Page 3 of 3

<b>Onroad Vehicles</b>							
<b>Equipment</b>	<b>Total Days<sup>(a)</sup></b>	<b>Average trips/day<sup>(a)</sup></b>	<b>Average miles/trip<sup>(a)</sup></b>	<b>Total miles</b>	<b>CO Emission Factor (gram/mile)<sup>(b)</sup></b>	<b>Conversion Factor (lb/gram)<sup>(b)</sup></b>	<b>CO Emissions (TPY)</b>
Heavy duty diesel vehicle	300	11	30	99000	9.520000	0.0022	1.0367
Light duty diesel vehicle	500	6	30	90000	1.524000	0.0022	0.1509
Heavy duty gasoline vehicle				0	4.136000	0.0022	0.0000
<b>TOTAL</b>							<b>1.1876</b>

<sup>(a)</sup>This number may change from project to project

<sup>(b)</sup>EPA Nonroad Emissions Model, Version 2005 1.0, June 2006

<b>Total CO Emissions (TPY)</b>	<b>1.6749</b>
<b>Total PM<sub>2.5</sub> Emissions (TPY)</b>	<b>0.1093</b>
<b>Total PM<sub>10</sub> Emissions (TPY)</b>	<b>1</b>
<b>Total PM<sub>10</sub> Emissions (TPY)</b>	<b>0.1126</b>
<b>Total PM<sub>10</sub> Emissions (TPY)</b>	<b>91</b>

**NOTE:** These emissions estimates were based on a similar MILCON project (Pierce County Readiness Center) project. Calculations will be revised, if needed, when the RRC project design details are available and/or if there would be any changes in the regulatory requirement at the national and/or local level.

## **II. Exhibit Materials**

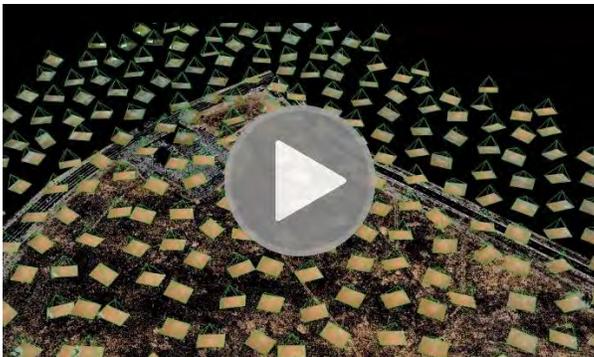
G Biological Survey Report

# Biological Survey Report

Tri-Cities Readiness Center  
Richland, Washington

Prepared for:  
State of Washington Military Department  
Building 36 Quartermaster Road  
Camp Murray, WA 98430-5050

June 26, 2017  
PBS Project No. 64395.000



[Click for video content. \(Web connection required.\)](#)



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## SUPPORTING DATA

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- Table 1. Plant species observed on the project site
- Table 2. Priority Plant Species in Benton County, WA
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- Figure 1. Project Location
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- Figure 3. National Wetlands Inventory Map
- Figure 4. WDFW Priority Habitat Species Map

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#### FIGURES

#### SITE PHOTOGRAPHS

#### CORRESPONDENCE

## 1 INTRODUCTION

The Washington Military Department, Army National Guard proposes to construct a 40,000 square foot, single story readiness center with parking areas, training areas, access driveways, and utilities on a site near the intersection of 1st Street and Polar Way in Richland, Benton County, Washington.

A field investigation of the subject property was conducted to map vegetation communities, assess habitat conditions, note wildlife signs (including migratory birds), and describe general site conditions. Invasive vegetative species presence was also noted. This report on the vegetation, habitat and wildlife assessment was conducted to determine potential future permitting requirements for development of the project.

## 2 PROPERTY DESCRIPTION

### 2.1 Location

The project site is located on 40 acres of a 193-acre parcel of former agricultural land owned by the City of Richland, between the Columbia and Yakima rivers, in northwest Richland, Benton County, Washington (Figure 1). The parcel is located in the SW quarter of the SE quarter of Township 10 N, Range 28 E, Section 21, Willamette Meridian (Richland 7.5' USGS quadrangle, 1992). The project is located on a portion of Benton County Parcel 121084000006003. Specifically, the area of survey is focused on a subset of the land bounded by 1st Street to the north, Polar Way to the east, Logan Street to the south, and a cluster of tax parcels along Kingsgate Way to the west in a rapidly expanding industrial section, just off Highway 240 and Kingsgate Way. The site is bordered by an RV park on the south, and several private parcels of land on the west (Figure 2).

### 2.2 Site Information

The site lies within the semi-arid shrub-steppe region Pasco Basin of the Columbia Plateaus Physiographic Province. This region is primarily a mixture of grazing land and cropland (USDA 1971). The proposed Readiness Center property is located in an area previously used for agriculture in the Horn Rapids area of Richland, Washington (NWA 2017). The site sits on a gentle to moderate slope that descends to the east. The western portion of the project area is very slightly rounded, sloping to east and west, but then falls off towards the east, with a slight swale to the northeast. The elevation across the site varies from approximately 426 feet above mean sea level (amsl) in the southwest corner of the site to approximately 383 feet amsl near the northeast corner (NRCS 2017).

Field observations identified one concrete block near the center of the site; this was center of the pivot irrigation system used during active agriculture operations. A shallow swale led from slightly south of the concrete block generally towards the northeast corner. New roads to the north and east have been recently constructed.

The National Wetlands Inventory maps one stream on the site. The feature is classified as a riverine wetland with an unknown hydrology permanence and an unknown type of bottom substrate (USFWS 2017, Richland 2017). No wetlands, ditches or streams were observed on the site (Figure 3). One roadside ditch was observed along the east edge of the parcel that was located within the Polar Way right-of-way. The area was investigated for wetland characteristics; the soil was reported to be somewhat moist but the area did not satisfy wetland characteristics. A west to east trending stabilized sand dune is located within the 40-acre parcel; it is the product of the strong westerly winds that dominate the landscape in this area (NWA 2017).

### 2.3 Disturbance History

The entire parcel has been disturbed by modern agricultural efforts and has been plowed and planted in wheat and corn for decades. Prior to farming, the stabilized sand dunes provided good habitat for a wide variety of plants and animal species. The parcel has laid fallow during the past few years (NWA 2017).

## 3 METHODOLOGY

PBS has prepared this report based on the following information:

- **Site Visit:** Katharine Lee, a Senior Scientist for PBS, conducted a site visit on June 7, 2017. The site visit consisted of walking the property and identifying vegetation communities, plant species, and wildlife sign, as well as making general observations on habitat conditions and site disturbance.
- **Wildlife Habitat Evaluation:** Kimberly Degutis, a Project Manager with PBS, provided an analysis of habitat conditions.
- **WDFW Priority Habitats and Species:** The WDFW on-line habitat and species website was consulted for information on priority habitats and species at or in close proximity to the property.
- **Literature Review:** Information on species identification and habitat requirements was obtained from multiple sources on the internet.
- **Aerial Photographs and Maps:** A number of mapping sources were consulted for historic aerials, topography, soils, habitat use, and other information.
- **Consultation with WDFW and USFWS local biologist:** Michael Ritter, a Washington State Department of Fish & Wildlife (WDFW) Area Habitat Biologist in Pasco, WA, was consulted to determine if any State of Washington sensitive plant or animal species had been or are located on the project site. Ryan McReynolds, a US Fish and Wildlife Service (USFWS) Consultation & Conservation officer in Lacey, WA was consulted regarding potential priority species use at the property or in the immediate vicinity.

## 4 NATURAL RESOURCE INVENTORY

### 4.1 Vegetation Communities

The parcel is located in a region that previously supported a semi-arid shrub-steppe community type (USDA 1971). Shrub-steppe is defined as a vegetation community consisting of one or more layers of perennial grass with a discontinuous overstory layer of shrubs. In the Mid-Columbia Region, intact shrub-steppe is dominated by perennial grasses that include bluebunch wheatgrass, Sandberg's bluegrass, Idaho fescue, needle and thread grass, and Thurber's needlegrass (WHNIS 2012). Big sagebrush is the dominant shrub with lesser amounts of rabbitbrush, hopsage, bitterbrush and buckwheat (USDA 1971). Much of the original shrub-steppe in the Tri-Cities area has been converted to agriculture or development. Grazing and other disturbance on the remaining shrub-steppe in the region has resulted in a dramatic reduction in perennial bunchgrasses and native forbs with a corresponding increase in the non-native annual cheatgrass.

The shrub-steppe community on this property was replaced with agricultural fields decades ago (NWA 2017). When agriculture was discontinued two years ago, the site was taken over by the introduced annual cheat grass. Cheat grass has over 90 percent cover across nearly the entire site except for the relatively newly graded side slopes for the roads to the north and east, where there were still areas of bare soil. Old corn stalks were present throughout the site, though mostly deteriorated. Only a few native plants are present and these include scattered individuals of big sagebrush, a few rabbitbrush, and possibly a few native grasses. Other species identified on site include tumbleweed, tall tumbled mustard, burning brush, and prickly lettuce, all of which are introduced species that colonize disturbed areas.

**Table 1 – Plant species observed on the project site**

Scientific Name	Common Name	Native or Introduced
<i>Bromus tectorum</i>	Cheatgrass	I
<i>Calamagrostis sp.</i>	Reed grass	?
<i>Ericameria nauseosa</i>	Gray or rubber rabbitbrush	N
<i>Kochia scoparia</i>	Burning brush	I
<i>Lactuca serriola</i>	Prickly lettuce	I
<i>Artemesia tridentata</i>	Big sagebrush	N
<i>Salsola tragus</i>	Tumbleweed	I
<i>Sisymbrium altissimum</i>	Tall tumbledustard	I

Burning brush is listed on both the Washington State and Benton County Class B Noxious Weed lists. Class B noxious weeds are nonnative species whose distribution is limited to portions of Washington State (WAC 16-750-011, Richland 2013). In regions where a Class B species is already abundant, control is decided at the local level. Containment of these weeds is the primary goal so that they do not spread into un-infested regions. Class B noxious weeds can be designated for mandatory control.

#### 4.1.1 Priority Plant Species

The Washington Natural Heritage Information System lists 27 rare plants known to occur within the vicinity of the project area (WHNIS 2017). Suitable habitat is not present on the site for any these species.

**Table 2 – Priority Plant Species in Benton County, WA**

Common Name	Scientific Name	Federal Status	State Status	Potentially Occurring on the Project Site?
Great Basin gilia	<i>Aliciella leptomeria</i>	--	Threatened	N
grand redstem	<i>Ammannia robusta</i>	--	Threatened	N
Columbia milk-vetch	<i>Astragalus columbianus</i>	--	Sensitive	N
pauper milk-vetch	<i>Astragalus misellus var. pauper</i>	--	Sensitive	N
rosy pussypaws	<i>Calyptridium roseum</i>	--	Threatened	N
gray cryptantha	<i>Cryptantha leucophaea</i>	--	Sensitive	N
miner's candle	<i>Cryptantha scoparia</i>	--	Sensitive	N
Snake River cryptantha	<i>Cryptantha spiculifera</i>	--	Sensitive	N
desert dodder	<i>Cuscuta denticulata</i>	--	Threatened	N
small-flower evening-primrose	<i>Eremothera minor</i>	--	Sensitive	N
dwarf evening-primrose	<i>Eremothera pygmaea</i>	--	Sensitive	N
Piper's daisy	<i>Erigeron piperianus</i>	--	Sensitive	N
Umtanum desert buckwheat	<i>Eriogonum codium</i>	Threatened	Endangered	N
Suksdorf's monkeyflower	<i>Erythranthe suksdorfii</i>	--	Sensitive	N

Common Name	Scientific Name	Federal Status	State Status	Potentially Occurring on the Project Site?
Canadian St. John's-wort	<i>Hypericum majus</i>	--	Sensitive	N
halfchaff awned sedge	<i>Lipocarpha aristulata</i>	--	Threatened	N
spreading pygmyleaf	<i>Loeflingia squarrosa</i>	--	Threatened	N
Hoover's desert-parsley	<i>Lomatium tuberosum</i>	--	Sensitive	N
red poverty-weed	<i>Micromonolepis pusilla</i>	--	Threatened	N
Nuttall's sandwort	<i>Minuartia nuttallii</i> var. <i>fragilis</i>	--	Threatened	N
mousetail	<i>Myosurus clavicaulis</i>	--	Sensitive	N
coyote tobacco	<i>Nicotiana attenuata</i>	--	Sensitive	N
cespitose evening-primrose	<i>Oenothera cespitosa</i> ssp. <i>cespitosa</i>	--	Sensitive	N
persistentsepal yellowcress	<i>Rorippa columbiae</i>	--	Threatened	N
lowland toothcup	<i>Rotala ramosior</i>	--	Threatened	N
woven-spore lichen	<i>Texosporium sancti-jacobi</i>	--	Threatened	N

Both the WDFW and the USFWS were contacted by the Washington Military Department to determine the likelihood of any of the above species occurring on the project site. See Appendix: Correspondence for a copy of the communication.

- Michael Ritter, the WDFW Habitat Biologist for the Pasco area, confirmed that no sensitive plant species are mapped on the project site (personal communication, April 4, 2017).
- Ryan McReynolds, the USFWS Consultation and Conservation Planner, confirmed that no sensitive plant species are mapped on the project site (personal communication, February 3, 2017)

None of the above listed species occur on or have suitable habitat on the project site; it is unlikely that any of these species would be affected by development of the proposed Readiness Center.

#### 4.2 Wildlife and Wildlife Habitat

The project site is located within an area that was formerly farmed and the land constantly disturbed. While the greater Hanford area supports a biologically diverse shrub-steppe plant community that has been relatively protected from disturbance, the entire 40-acre project site has been disturbed by modern agricultural efforts (NWA 2017). Prior to farming, the stabilized sand dunes provided good habitat for a wide variety of animal species. The historic wildlife population was small. There are few pockets of undisturbed habitat that contain shrubs or trees on or near the parcel; however, the project site itself is highly disturbed and generally clear of native vegetation.

Some of the major wildlife species in this area include coyote, hawks, eagles, prairie falcon, pheasant, gray partridge, chukar, California quail, and burrowing owl (USDA 2006). Good numbers of waterfowl, deer, sage grouse, and furbearers were to be found only along streams and around springs and potholes (USDA, 1971). Because of the degraded plant communities and the proximity to developed areas, wildlife that use the area tend to be more generalist species and those more tolerant of human activity.

Field survey of the project site identified a few small burrows, mostly along the north and east edges of the parcel in the disturbed road banks, but also a few burrows in the center of the site in areas where there is bare soil and a few other plants (tumbleweed or tumble mustard). The burrow entrances and immediate areas were inspected for signs of burrowing owls (e.g. – small bones); no evidence of owl activity was observed. The only wildlife observed were some swallows that likely originated from a nesting area off site.

#### 4.2.1 Priority Wildlife and Wildlife Habitat

WDFW’s Priority Habitat Species mapper indicates one species with the potential occurrence on the site (Ferruginous hawk) and another species within close vicinity of the project site (burrowing owls) (WDFW 2017) (Figure 4). Table 3 summarizes the priority wildlife species and habitat requirements for each species (USFWS 2013). Two species, burrowing owl and Ferruginous hawk, have the potential to occur on the project site.

**Table 3 – Priority wildlife species potentially on the project site**

Scientific Name	Common Name	Federal Status	State Status	Habitat	Habitat Present?	Potential to Occur
<i>Athene cunicularia</i>	Burrowing owl	Concern	Candidate	Shrub steppe areas with low ground cover, small animal burrows for nesting	Y	Y
<i>Coccyzus americanus</i>	Yellow billed cuckoo	Threatened	N/A	Large continuous riparian zones and open lowland deciduous woodlands with clearings and shrubby vegetation, especially those near rivers and streams	N	N
<i>Canis lupus</i>	Gray wolf	Endangered	Endangered	Forested areas with relatively flat, open spaces such as river valleys and basins; areas with limited human contact	N	N
<i>Brachylagus idahoensis</i>	Columbia Basin pygmy rabbit	Endangered	Endangered	Areas of deep loamy soils with sagebrush dominant vegetation	N	N
<i>Salvelinus confluentus</i>	Bull trout	Threatened	Candidate	Cold, clean, complex and connected streams (headwater regions)	N	N
<i>Buteo regalis</i>	Ferruginous hawk	Concern	Threatened	Wide open undisturbed landscapes with native bunchgrasses; not tolerant of development; winter in agricultural areas	Y	Y

##### 4.2.1.1 Burrowing Owls

Burrowing Owls (Fed Species of Concern, WA State Candidate species) have been found in locations throughout the Tri-Cities and are reported to be in the vicinity of the project site. WDFW does not show presence on the 40-acre project (WDFW 2017). The owls prefer open areas with low ground cover and feed off large insects and small mammals such as moles and mice. The burrowing owl will use the burrows of ground squirrels, gophers and other ground dwelling species as well as other natural and man-made cavities for nesting. Few small mammal burrows were observed on the project site, so potential burrow sites could be limiting. Nesting season begins in late March or April (Lewis, 2015) and lasts approximately 3 months (Ehrlich et al 1988).

#### 4.2.1.2 *Ferruginous Hawks*

Ferruginous Hawk is the only state threatened wildlife species with a potential presence on the project site. WDFW reports potential breeding habitat and occurrences for the Ferruginous Hawk in the general area (at the township level). Ferruginous hawks prefer wide open, undisturbed landscapes and are not very tolerant of urban or suburban development (WDFW 2012). The primary prey species for the Ferruginous hawk include jackrabbits and gophers. Site observations noted few small burrows within the 40-acre parcel, with none the size of suitable for jackrabbits or gophers. In addition, WDFW notes that the proliferation of cheatgrass in disturbed areas has contributed to overall declines in the jackrabbit population (WDFW 2012). Significant loss of hares in Washington State and dietary shifts to insects and smaller mammals suggest that the hawks may prefer more undisturbed hunting grounds. The project site, as currently used, provides poor hunting opportunities for hawks. Ferruginous hawks are known to travel five or ten miles in search of prey. Larger agricultural parcels within 5 to ten miles distance provide a more robust source of prey, making it unlikely that the project site is utilized as a hunting ground for Ferruginous hawks.

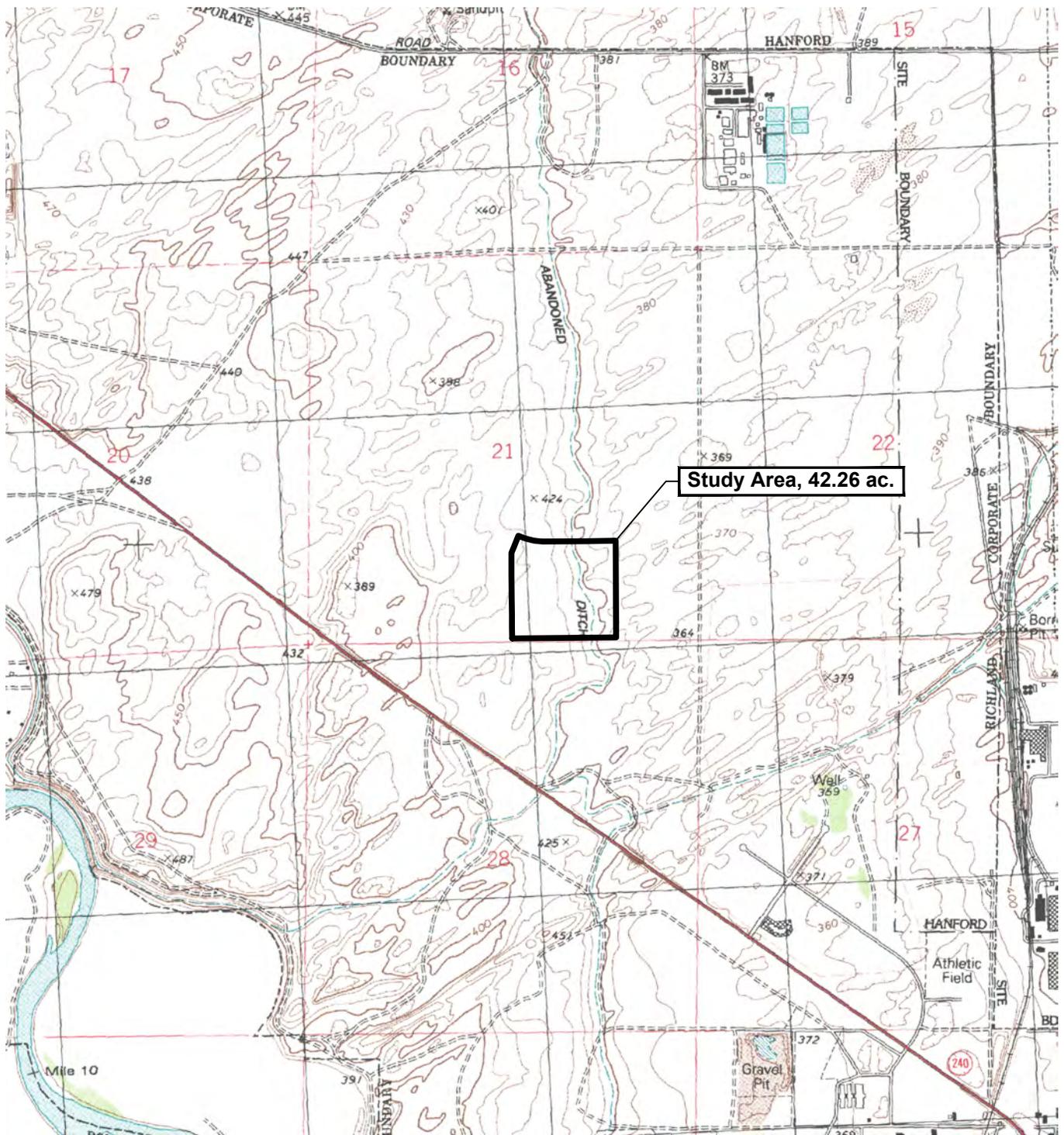
None of the above listed species are known to occur on the project site and there is no suitable habitat present due to the past agricultural activities; it is unlikely that any of these species would be affected by development of the proposed Readiness Center.

## 5 REFERENCES

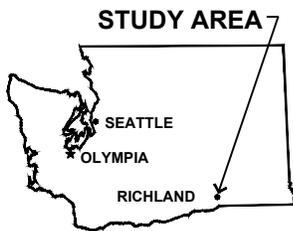
- City of Richland (Richland). 2017. Geographic Information Systems mapping for Geologic Sensitive Locations. Accessed June 2017. Accessed online at <https://www.ci.richland.wa.us/residents/maps>
- City of Richland Municipal Code (Richland). 2013. Accessed June 2017. Accessed online at: <http://www.codepublishing.com/wa/richland/>
- Ehrlich, P., Dobkin, D., and Wheye, D. (1988). *The Birders Handbook: A Field Guide to the Natural History of North American Birds*. New York: Simon and Schuster Inc.
- Lewis, Deane. 2015. *The Owl Pages: Burrowing Owls*. Accessed online June 2017. Access online at <http://www.owlpages.com/owls/species.php?s=2250>
- Natural Resource Conservation Service (NRCS) 2017 WEBS Online interactive soil survey <http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx>
- Northwest Anthropology LLC (NWA). 2017. *Archaeological Assessment of the 40-Acre Parcel Being Considered for the Proposed Army National Guard Readiness Center, Richland, Benton County, Washington*. 33pp
- United States Department of Agriculture (USDA) 1971. *Natural Resources Conservation Service, Soil Survey report of Benton County Area*. 58pp
- USDA, 2006. *Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin: Custom Report for MLRA Explorer: Northwestern Wheat and Range Region: Columbia Basin Area*. Created June 2017.
- US Fish and Wildlife Service (USFWS). 2017. *National Wetlands Inventory Wetlands Mapper*. Accessed June 2017. Accessed online at <https://www.fws.gov/wetlands/data/Mapper.html>
- USFWS. 2013. *List of threatened and endangered species for Benton County, Washington*. Accessed June 2017. Accessed online at <http://www.fws.gov/endangered/>
- Washington Department of Fish and Wildlife (WDFW). 2017. *Priority Habitats and Species Report for Tri-Cities Readiness Center site*.
- WDFW. 2012. *Annual Report on Threatened Species: Ferruginous Hawk*. Accessed June 2017. Accessed online at [http://wdfw.wa.gov/conservation/endangered/species/ferruginous\\_hawk.pdf](http://wdfw.wa.gov/conservation/endangered/species/ferruginous_hawk.pdf)
- Washington National Heritage Information System (WHNIS). 2012. *Known High-Quality or Rare Plant Communities and Wetland Ecosystems of Washington. Benton County*.
- WHNIS. 2017. *List of rare plants and nonvasculars in Benton County, Washington*. Accessed June 12, 2017. Accessed online: [http://file.dnr.wa.gov/publications/amp\\_nh\\_county\\_plants.pdf](http://file.dnr.wa.gov/publications/amp_nh_county_plants.pdf)

## **FIGURES**

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SOURCE: USGS RICHLAND, WASH. 7.5 MINUTE QUADRANGLES 1992.



WASHINGTON



Scale 1" = 2000'



PREPARED FOR: STATE OF WASHINGTON MILITARY DEPT.



# LOCATION MAP

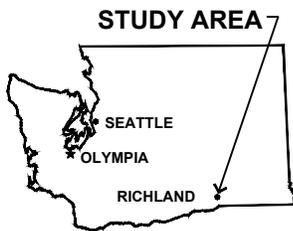
Tri-Cities Readiness Center  
Richland, Washington

JUN 2017  
64395.000

FIGURE

1

Study Area, 42.26 ac.



WASHINGTON

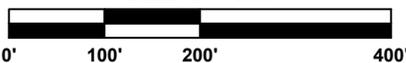
**Legend**

-  *Bromus tectorum* dominated grassland
-  Areas disturbed during road construction
-  Photo Points

SOURCE: AERIAL PHOTOGRAPHY FROM PBS UAS FLIGHT.



Scale 1" = 200'

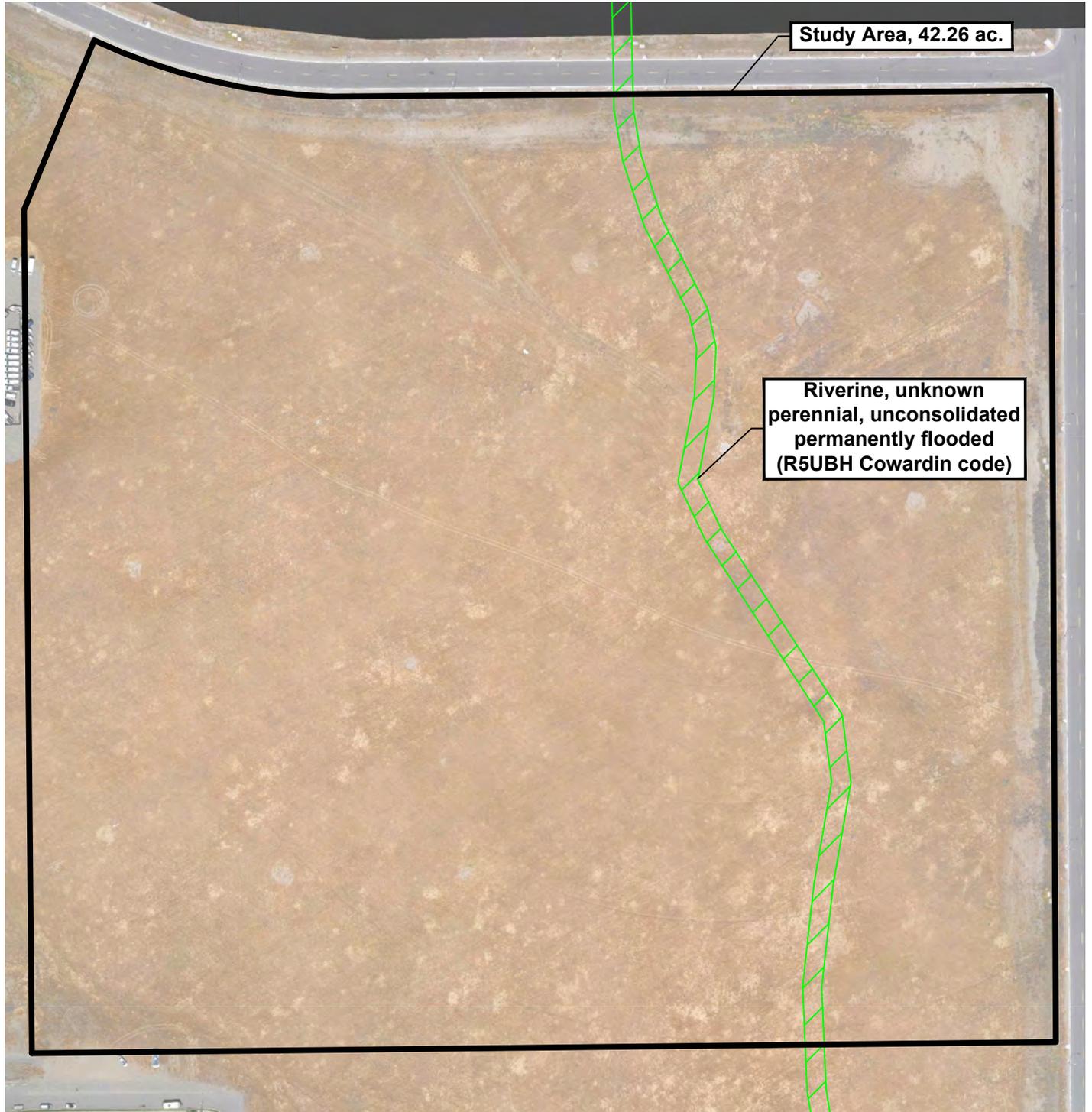


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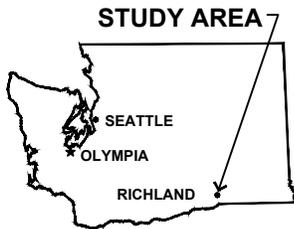


**VEGETATION MAP**  
Tri-Cities Readiness Center  
Richland, Washington

JUN 2017  
64395.000  
FIGURE  
**2**



SOURCE: SOURCE: NWI POLYGONS FROM US FISH AND WILDLIFE SERVICE. AERIAL PHOTOGRAPHY FROM PBS UAS FLIGHT.



WASHINGTON



Scale 1" = 200'



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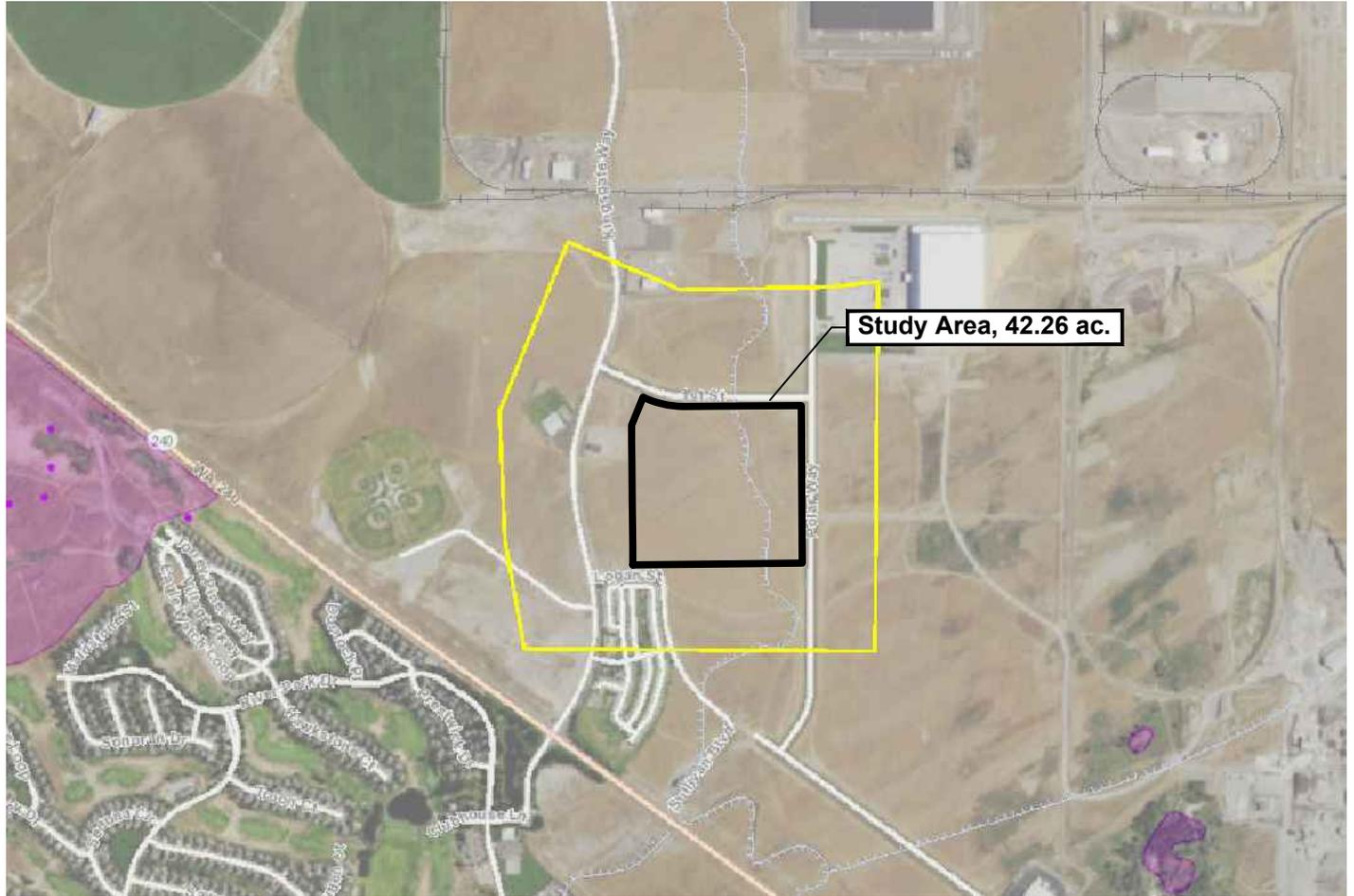
# NATIONAL WETLAND INVENTORY

Tri-Cities Readiness Center  
Richland, Washington

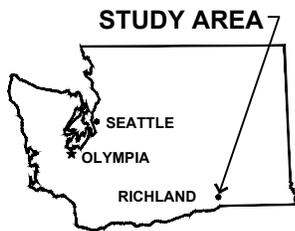
JUN 2017  
64395.000

FIGURE

3



SOURCE: PRIORITY HABITATS FROM WDFW. AERIAL PHOTOGRAPHY FROM PBS UAS FLIGHT.



WASHINGTON



Scale 1" = 1,500'



PREPARED FOR: STATE OF WASHINGTON MILITARY DEPT.



# PRIORITY HABITATS AND SPECIES

Tri-Cities Readiness Center  
Richland, Washington

JUN 2017  
64395.000

FIGURE

4

## **SITE PHOTOGRAPHS**

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Photo 1. View to south from north edge in western portion of property. Greenish and yellowish vegetation is mostly tall tumbled mustard.



Photo 2. View to north from center of site showing near complete dominance by cheat grass.



Photo 3. View to west from near the center of the site



Photo 4. View to northeast of slight swale in northeast portion of property. A couple of young sagebrush present in this area.



Photo 5. Ditch along Polar Way showing higher concentrations of tall tumbled mustard, tumbleweed and prickly lettuce.



Photo 6. Cheat grass with old cornstalks



Photo 7. View to north of ditch area along Polar Way with areas of bare soil and tumbleweed in the ditch.



Photo 8. Burning bush plants are scattered across site.



Photo 9. Representative burrow found along road cut on north edge.



Photo 10. View to east along north edge showing roadside ditch



Photo 11. Representative burrow found along road cut on east edge.



Photo 12. Cluster of burrows in area of sparse vegetation.

## **CORRESPONDENCE**

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**From:** [Ritter, Michael W \(DFW\)](#)  
**To:** [Valencia-Gica, Rowena B \(MIL\)](#)  
**Subject:** RE: Richland Property for WAARNG Readiness Center  
**Date:** Tuesday, April 4, 2017 2:46:27 PM

---

Rowena,

Thank you for the brief phone conversation. The proposed project site is currently operated as irrigated farmland located at 1<sup>st</sup> St. and Polar Way, Richland, WA.

I reviewed the project location within our PHS (Priority Habitats and Species) data base to determine if any State of Washington sensitive plant or animal species had been or are located within the project. My review did not reveal any PHS data points or polygons.

Based on this information, the Washington Department of Fish and Wildlife has no further comment on the proposed project.

Sincerely,

Michael Ritter  
Area Habitat Biologist  
Washington Department of Fish and Wildlife  
2620 N. Commercial Ave  
Pasco, WA 99301  
509-543-3319 (office)  
509-380-3028 (cell)

---

**From:** Valencia-Gica, Rowena B (MIL)  
**Sent:** Tuesday, April 04, 2017 2:25 PM  
**To:** Ritter, Michael W (DFW)  
**Subject:** Richland Property for WAARNG Readiness Center

Hi Mike,

Greatly appreciate you giving me a call and talking to me about our land acquisition project in Richland WA. Your email about your response to my consult would also be greatly appreciated.

Sincerely,  
Rowena

Rowena Valencia-Gica, Ph.D.  
Environmental Programs Supervisor  
WMD/WAARNG  
36 Quartermaster Road  
Camp Murray WA 98430

WAARNG's Land Acquisition and Proposed Richland Readiness Center Project USFWS Concurrence No Effect

From: McReynolds, Ryan <ryan\_mcreynolds@fws.gov>  
Sent: Friday, February 3, 2017 12:39 PM  
To: Valencia-Gica, Rowena B (MIL)  
Cc: Ryan McReynolds  
Subject: Re: WAARNG's Land Acquisition and Proposed Richland Readiness Center Project

Thank you Rowena for your emails and call.

Thank you also for providing information to help address your questions.

I agree with your assessment of the issue.

The species list identifies only a few listed species for this portion of Benton County ... I see no obvious reason why a proposed Readiness Center at this location would raise any significant issues related to yellow-billed cuckoo, gray wolf, northern wormwood, umtatum desert buckwheat, Columbia basin pygmy rabbit, or bull trout.

I agree, that in most, and perhaps each case it may be possible to document "no effect" ESA determinations; technically, a determination for bull trout would depend on some specifics, including stormwater management. But, I imagine that it should be pretty easy to design an effective stormwater management strategy for this site, and thereby avoid any significant impacts to the Yakima River.

My cursory review of this location identifies no significant ESA issues. I think you can have pretty good confidence about that.

Does that meet your needs right now?

Thanks - Ryan -

Ryan McReynolds  
U.S. Fish and Wildlife Service, Lacey WA  
Consultation & Conservation Planning Division

WAARNG's Land Acquisition and Proposed Richland Readiness Center Project USFWS Concurrence No Effect  
ryan\_mcreynolds@fws.gov  
360.753.6047

On Fri, Jan 27, 2017 at 9:08 AM, Valencia-Gica, Rowena B (MIL) <Rowena.Valencia-Gica@mil.wa.gov> wrote:

Good morning Ryan,

Hope this email finds you well. I'm contacting you to discuss about the WAARNG's proposed Richland Readiness Center on a parcel of land (~40 ac) owned by the City of Richland located on 1st St. and Polar Way (see attached pdf map). We are dangerously close to finalizing the Purchase Sale Agreement but before reaching that point, we would like to make sure that the site does not have any potential project-stopping concerns. The site has been used as farmland for many years now (see attached map).

In September 2016, I obtained an official species list covering a larger area than the parcel for acquisition (see attached pdf). The list showed 4 potential species and no habitat present; of these 4 species, I am confident to say that two of them certainly are not found in our proposed site (bull trout and gray wolf). Our initial site assessment also showed that the other two species (yellow-billed cuckoo and Northern wormwood) also do not exist nor have habitats present on this site.

When we prepare the EA later for the construction/operation phase (still waiting for funding), my plan is to discuss any potential impacts under Biological Resources. My determination is that there is no need to prepare a Biological Evaluation for this site due to the very low potential of finding any T&E species. We'd like to make sure though that there are no serious roadblocks before we dive deeper into the purchase process.

I'd greatly appreciate your guidance.

Sincerely,  
Rowena

Rowena Valencia-Gica, Ph.D.  
Environmental Programs Supervisor  
WMD/WAARNG  
36 Quartermaster Road  
Camp Murray WA 98430  
DSN 323-8704  
Desk 253-512-8704

## **II. Exhibit Materials**

- J Kitchen Equipment Schedule, Plan & Products Information



STATE OF WASHINGTON  
MILITARY DEPARTMENT  
Camp Murray, WA 98430-5000

**MEMORANDUM FOR THE RECORD**

October 6, 2017

TO: CPT Wilford Griego  
NEPA Program Manager  
ARNG-IEZ-IER

*Rowena Valencia-Gica*  
FROM: Rowena Valencia-Gica, Ph.D.  
Environmental Programs Supervisor  
WMD/WAARNG

SUBJECT: Construction and Operation of WAARNG Richland (Tri-Cities) Readiness Center in Benton County, WA: Determination of No Effects under ESA Consultation and No Properties Affected under SHPO Consultation

1. The WAARNG proposes to construct a 39,731-square foot, one story National Guard Readiness Center, with associated parking areas and detached storage buildings. The facility will be sited on 11.9 acres of a 39.93-acre parcel bought by the WAARNG from the City of Richland in Benton County, Washington (MFR Attachment A). The facility will also house training classrooms, unit administration, storage and supply space, restrooms, an Assembly Hall, and a kitchen. Common areas will be available for use by the public under the established rental policy. The facilities will include LEED planning and construction factors.
2. The Readiness Center will be used by an estimated 150 WAARNG soldiers on their monthly drill weekends and an estimated 5 Active Guard Reserve (AGR) Soldier as a permanent duty location. This fulfills a stationing need that was created when the lease on the Bellingham Armory expired, resulting in a reorganization of statewide units. A Readiness Center in Richland will maximize the use of statewide resources, while serving southeastern Washington.
3. In compliance with Section 106 of the National Historic Preservation Act (NHPA), the WAARNG started with database search, informal consults with Tribes, and review of the secure database (WISAARD) of the Washington State Department of Archaeology and Historic Resources (DAHP)/State Historic Preservation Office (SHPO) in January 2017. No archaeological sites had been found in the project site, but CTUIR suggested to contact DAHP regarding a historic property of cultural significance to the Tribe within one mile

of the project site. To further support the initial search results, the WAARNG contracted with Northwest Anthropology LLC to conduct an archaeological survey (completed on March 31, 2017; REC/Checklist Attachment 1) which yielded the same findings as the WAARNG's initial review. The WAARNG also consulted with the WA State Historic Preservation Officer (SHPO) and concerned Tribes (Confederated Tribes of the Umatilla Indian Reservation or CTUIR, Colville, Nez Perce, Wanapum, and Yakama Nation) to seek their concurrence on the archaeological survey findings of No Historic Properties Affected. SHPO concurrence was received on August 29, 2017 (MFR Attachment B). The CTUIR e-mail response requested the WAARNG to prepare a plan for inadvertent discovery. No response has been received from all the other Tribes as of the date of this MFR. Follow-up emails and phone calls will be made to these Tribes.

4. As part of NEPA review, the WAARNG consulted with USFWS and WDFW in April 2017 and obtained their concurrence on No Species Present determination (MFR Attachment C). The WAARNG also retained the services of PBS Engineering to conduct a Biological Survey for the site that was completed on June 26, 2017 (REC/Checklist Attachment 2). The WAARNG again reviewed the list of threatened and endangered species for the Richland (Tri-Cities) Readiness Center project site on September 28, 2017 (MFR Attachment C). Based on our review of the lists and the survey work, no endangered, threatened, candidate, or species of concern is present inside the proposed project site, and none of these species will be impacted by the construction and activities inside the proposed Richland Readiness Center.
5. A Geotechnical exploration for the site was completed on October 18, 2016 (REC/Checklist Attachment 3) along with Pesticide and Metals contamination survey (completed on October 20, 2016) and results indicated no soil contamination present (REC/Checklist Attachment 4).
6. The WAARNG reviewed the Maintenance Areas published by the WA Department of Ecology ([http://www.ecy.wa.gov/programs/air/sips/designations/maintenance\\_areas.htm](http://www.ecy.wa.gov/programs/air/sips/designations/maintenance_areas.htm)). Benton County is a maintenance area. Based on the estimated emissions calculated for this proposed construction project, emissions would be *de minimus* and a Record of Non-Applicability (RONA) was the applicable documentation (REC/Checklist Attachment 5).
7. The WAARNG has not identified any unresolved effects or controversy involved nor effect on endangered species or cultural resources. Although the project involves ground disturbance in an area over 5 acres, the site has been previously heavily disturbed by agricultural activities since the early twentieth century. Therefore, our determination is that the project qualifies for a Categorical Exclusion. Because of this, the WAARNG will not prepare an Environmental Assessment or Environmental Impact Statement and this REC/Checklist and supporting documentations will fulfill NEPA requirements.
8. If the ARNG Program Manager disagrees with our determination, the WAARNG will plan for and prepare the next level of NEPA documentation.

**MFR ATTACHMENT A**  
**Aerial view of the proposed new site for the Richland Readiness Center in Benton**  
**County, WA.**



**MFR ATTACHMENT B**  
**SHPO and Tribal Consult Letters**



STATE OF WASHINGTON  
MILITARY DEPARTMENT  
Camp Murray, WA 98430-5000

August 24, 2017

Dr. Robert Whitlam  
Department of Archaeology & Historic Preservation  
P.O. Box 48343  
Olympia, WA 98504-8343

**Re: Cultural Resources Assessment for the Richland Readiness Center, Benton County, WA**

Dear Dr. Whitlam,

A cultural resources assessment has been completed for the proposed site of the Washington Army National Guard (WAARNG) Tri-Cities Readiness Center in Richland, Washington. The WAARNG proposes to build the Tri-Cities Readiness Center within the 40-acre property purchased by the WAARNG from the City of Richland. The property comprises part of the 193-acre Benton County parcel no. 121084000006003, located in the SW quarter of the SE quarter of Township 10 N, Range 28 E, Section 21, Willamette Meridian with physical address of 2675 1<sup>st</sup> Street, Richland, WA 99354. The project area is bounded by 1<sup>st</sup> Street to the north, Polar Way to the east, Logan Street to the south, and several tax parcels along Kingsgate Way to the west (Figure 1).

Preliminary project planning is underway for the construction anticipated to commence in FY20. The 40,000-square foot Readiness Center, associated parking lot, and 1,000 square feet of detached accessory buildings are projected to disturb a 12-acre footprint. Current planning places the construction in the northwest corner of the 40-acre parcel, which we have identified as the Area of Potential Effect (Figure 2).

In preparation for the cultural resources survey, Environmental Specialist Justine Kmiecik contacted you by email and phone in January 2017. Informal consultation with your office and an initial search of the Secure WISAARD database indicated that no archeological sites are known on the property. A predictive model run by the unsecured WISAARD database indicated "Moderate Risk: Survey Recommended". Ms. Kmiecik also contacted the Confederated Tribes of the Umatilla Indian Reservation (CTUIR), the Confederated Tribes and Bands of the Yakama Nation, the Wanapum Tribe, and the Nez Perce Tribe to request input on the proposed project. Holly Shea of the CTUIR noted the existence of a Historic Property of Religious or Cultural Significance within 1 mile of the parcel in question and recommended a cultural resources survey. Based on this consultation with DAHP and the tribes, a cultural resources assessment was conducted for the proposed project site.

October 6, 2017

Page 5 of 40

A copy of the cultural resource assessment report dated March 31, 2017 is attached for your review and has also been sent to the concerned tribes. As stated in the report, no previously identified archaeological sites are located within the project boundary. The assessment, which included pedestrian survey, did not identify any cultural or archaeological resources that could potentially be affected by this project.

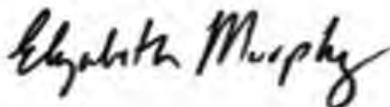
In accordance with 36 CFR Part 800, Section 106 of the National Historic Preservation Act (NHPA), we request your further review of the project and the cultural resources assessment report to provide further guidance for the above work to proceed. We also request your concurrence on our determination of "No Historic Properties Affected" based on the results of this assessment.

Any comments related to the cultural resource assessment may be sent to:

Washington Military Department  
Attn: Elizabeth Murphy, Environmental Specialist  
Building 36 Quartermaster Road  
Camp Murray, WA 98430  
Email: [elizabeth.murphy@mil.wa.gov](mailto:elizabeth.murphy@mil.wa.gov)  
Tel.: (253)512-8704

If we do not receive a response within 30 days, the WAARNG will proceed in implementing the proposed project in accordance with the provisions of 36 CFR 800.(c)(4), 800.5(c)(1), and 800.5(d). In the event that cultural and/or archaeological resources are found or identified during construction activities, the work would stop and individuals would follow standard operating procedures for inadvertent archaeological discoveries as outlined in the WAARNG ICRMP (2007). The WAARNG would then contact the SHPO to seek further guidance. Thank you for you review.

Sincerely,

A handwritten signature in black ink that reads "Elizabeth Murphy". The signature is written in a cursive style with a large, stylized "E" and "M".

Elizabeth Murphy

Natural and Cultural Resources  
Washington Military Department

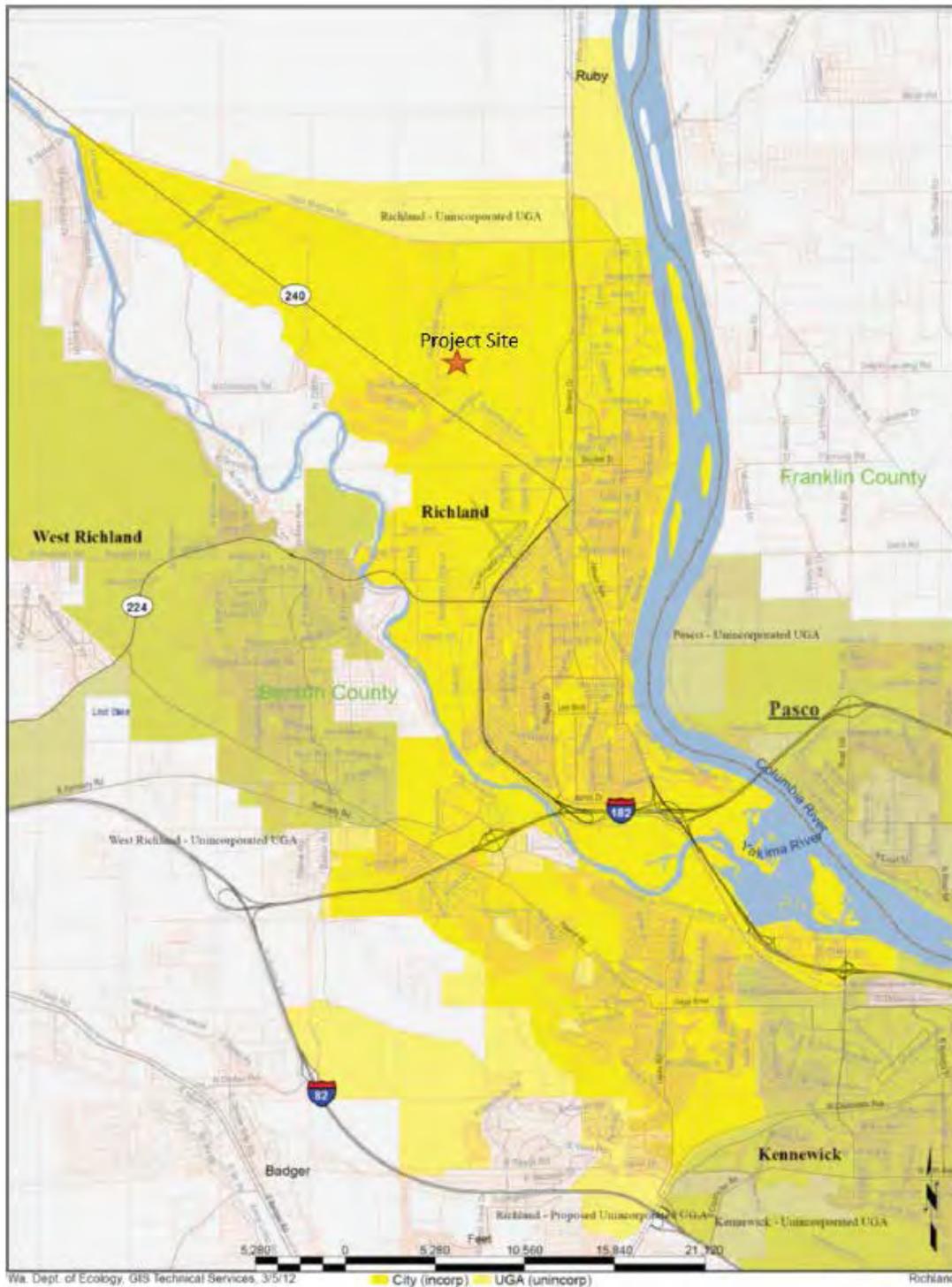


Figure 1. Project location for the proposed Tri-Cities Readiness Center at 2675 1<sup>st</sup> Street, Richland, WA 99354 in Benton County.



Figure 2. Area of potential effect for the proposed Tri-Cities Readiness Center, the 40-acre parcel owned by the Washington Military Department and located in the SW quarter of the SE quarter of Township 10 N, Range 28 E, Section 21, Willamette Meridian.



Alyson Brooks Ph.D., Director  
State Historic Preservation Officer

August 29, 2017

Ms. Elizabeth Murphy  
36 Quartermaster Road  
Washington Military Department  
Camp Murray, Washington 98430-0500

Re: Richland Readiness Center Project  
Log No.: 2017-08-06164-MIL

Dear Ms. Murphy:

Thank you for contacting our department. We have reviewed the professional archaeological survey report you provided for the proposed Tri-Cities aka Richland Readiness Center Project at 2675 1<sup>st</sup> Street, Richland, Benton County, Washington.

We concur with your Determination of No Historic Properties Affected. Please keep us apprised as your project is actually designed and implemented.

We would also request receiving any correspondence or comments from concerned tribes or other parties that you receive as you consult under the requirements of 36CFR800.4(a)(4).

In the event that archaeological or historic materials are discovered during project activities, work in the immediate vicinity must stop, the area secured, and the concerned tribes and this department notified.

These comments are based on the information available at the time of this review and on behalf of the State Historic Preservation Officer in compliance with the Section 106 of the National Historic Preservation Act, as amended, and its implementing regulations 36CFR800.4. Should additional information become available, our assessment may be revised. Thank you for the opportunity to comment.

Sincerely,

A handwritten signature in blue ink, appearing to read 'Rob Whitlam', is written over a horizontal line.

Robert G. Whitlam, Ph.D.  
State Archaeologist  
(360) 890-2615  
email: [rob.whitlam@dahp.wa.gov](mailto:rob.whitlam@dahp.wa.gov)





STATE OF WASHINGTON  
**MILITARY DEPARTMENT**  
Camp Murray, WA 98430-5000

August 24, 2017

Holly Shea Barrick, Senior Archaeologist  
46411 Timine Way  
Pendleton, OR 97801

**Re: Cultural Resources Assessment for the Richland Readiness Center, Benton County, WA**

Dear Ms. Shea,

A cultural resources assessment has been completed for the proposed site of the Washington Army National Guard (WAARNG) Tri-Cities Readiness Center in Richland, Washington. The WAARNG proposes to build the Tri-Cities Readiness Center within the 40-acre property purchased by the WAARNG from the City of Richland. The property comprises part of the 193-acre Benton County parcel no. 121084000006003, located in the SW quarter of the SE quarter of Township 10 N, Range 28 E, Section 21, Willamette Meridian with physical address of 2675 1<sup>st</sup> Street, Richland, WA 99354. The project area is bounded by 1<sup>st</sup> Street to the north, Polar Way to the east, Logan Street to the south, and several tax parcels along Kingsgate Way to the west (Figure 1).

Preliminary project planning is underway for the construction anticipated to commence in FY20. The 40,000-square foot Readiness Center, associated parking lot, and 1,000 square feet of detached accessory buildings are projected to disturb a 12-acre footprint. Current planning places the construction in the northwest corner of the 40-acre parcel, which we have identified as the Area of Potential Effect (Figure 2).

In preparation for the cultural resources survey, Environmental Specialist Justine Kmiecik informally contacted yourself at the Confederated Tribes of the Umatilla Indian Reservation (CTUIR), as well as the Wanapum Tribe, the Nez Perce Tribe, and the Confederated Tribes and Bands of the Yakama Nation to request input on the proposed project. At the time, you noted the existence of a Historic Property of Religious or Cultural Significance within 1 mile of the parcel in question and recommended a cultural resources survey. Dr. Robert Whitlam of the Department of Archaeology and Historic Preservation was also contacted by email and phone in January 2017. This informal consultation and an initial search of the Secure WISAARD database indicated that no archeological sites are known on the property. A predictive model run by the unsecured WISAARD database indicated "Moderate Risk: Survey Recommended". Based on this consultation with DAHP and the tribes, a cultural resources assessment was conducted for the proposed project site.

A copy of the cultural resource assessment report dated March 31, 2017 is attached for your review and has also been sent to the concerned tribes. As stated in the report, no previously identified archaeological

October 6, 2017

Page 10 of 40

sites are located within the project boundary. The assessment, which included pedestrian survey, did not identify any cultural or archaeological resources that could potentially be affected by this project.

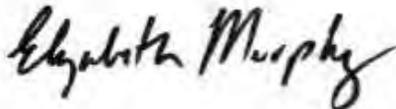
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Camp Murray, WA 98430  
Email: [elizabeth.murphy@mil.wa.gov](mailto:elizabeth.murphy@mil.wa.gov)  
Tel.: (253)512-8704

If we do not receive a response within 30 days, the WAARNG will proceed in implementing the proposed project in accordance with the provisions of 36 CFR 800.(c)(4), 800.5(c)(1), and 800.5(d). In the event that cultural and/or archaeological resources are found or identified during construction activities, the work would stop and individuals would follow standard operating procedures for inadvertent archaeological discoveries as outlined in the WAARNG ICRMP (2007). The WAARNG would then further contact the SHPO and concerned tribes to seek further guidance. Thank you for your review.

Sincerely,

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Elizabeth Murphy

Natural and Cultural Resources  
Washington Military Department

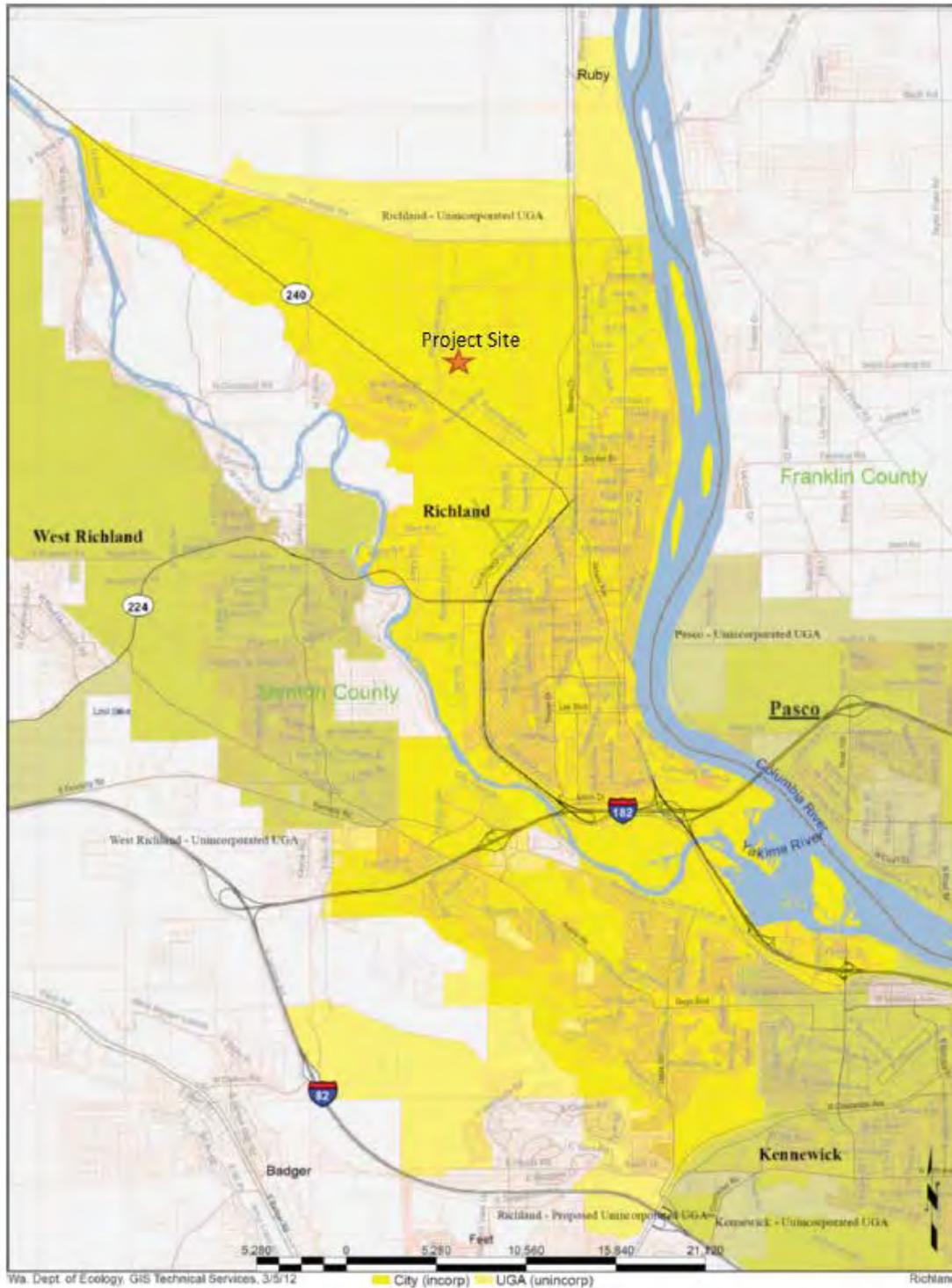


Figure 1. Project location for the proposed Tri-Cities Readiness Center at 2675 1<sup>st</sup> Street, Richland, WA 99354 in Benton County.



Figure 2. Area of potential effect for the proposed Tri-Cities Readiness Center, the 40-acre parcel owned by the Washington Military Department and located in the SW quarter of the SE quarter of Township 10 N, Range 28 E, Section 21, Willamette Meridian.



STATE OF WASHINGTON  
MILITARY DEPARTMENT  
Camp Murray, WA 98430-5000

August 24, 2017

Guy Moura, THPO  
Colville Confederated Tribes  
PO Box 150  
Nespelem, WA 99155

**Re: Cultural Resources Assessment for the Richland Readiness Center, Benton County, WA**

Dear Mr. Moura,

A cultural resources assessment has been completed for the proposed site of the Washington Army National Guard (WAARNG) Tri-Cities Readiness Center in Richland, Washington. The WAARNG proposes to build the Tri-Cities Readiness Center within the 40-acre property purchased by the WAARNG from the City of Richland. The property comprises part of the 193-acre Benton County parcel no. 121084000006003, located in the SW quarter of the SE quarter of Township 10 N, Range 28 E, Section 21, Willamette Meridian with physical address of 2675 1<sup>st</sup> Street, Richland, WA 99354. The project area is bounded by 1<sup>st</sup> Street to the north, Polar Way to the east, Logan Street to the south, and several tax parcels along Kingsgate Way to the west (Figure 1).

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October 6, 2017

Page 14 of 40

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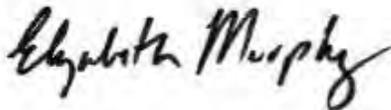
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Elizabeth Murphy

Natural and Cultural Resources  
Washington Military Department

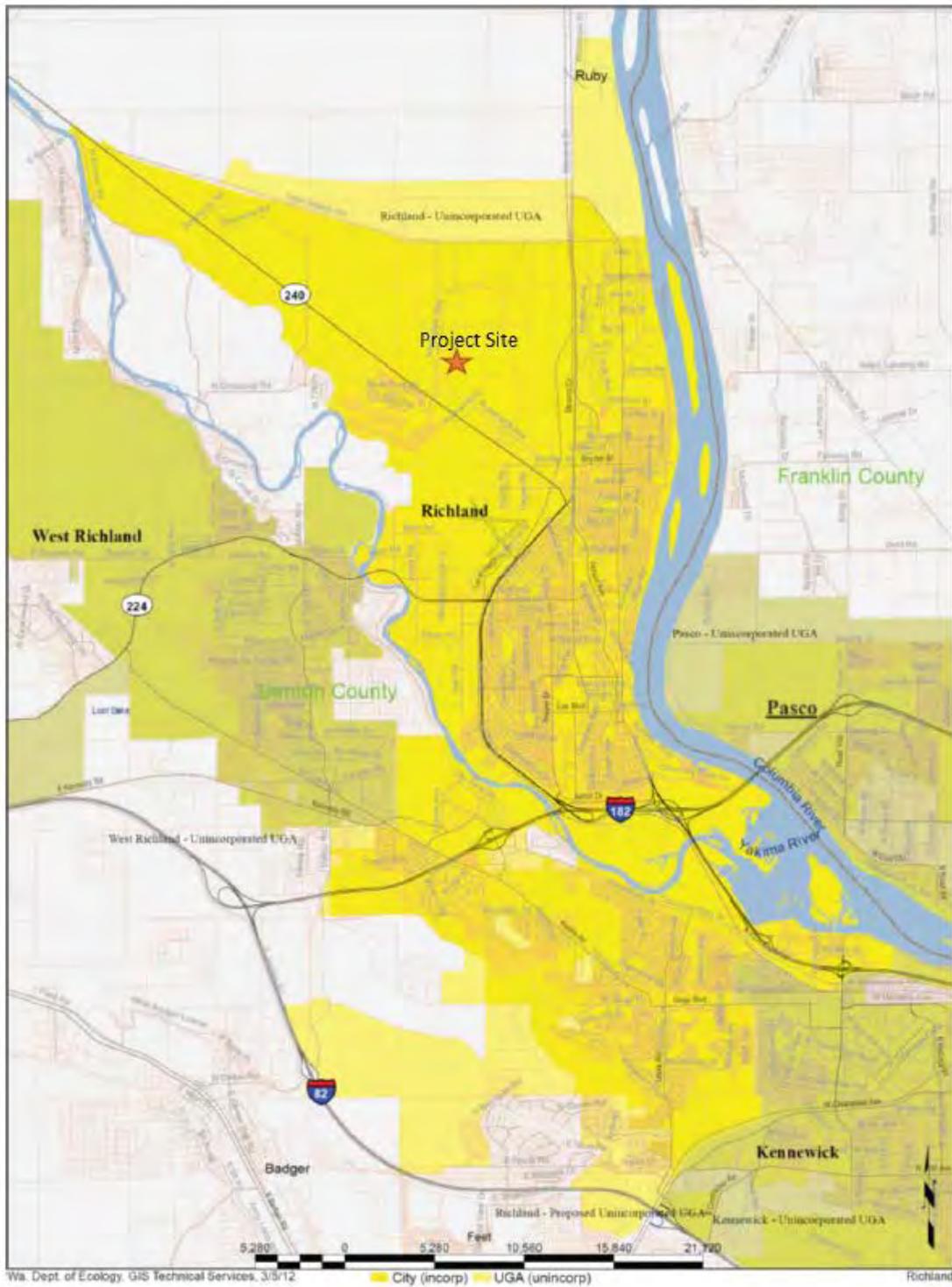


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STATE OF WASHINGTON  
**MILITARY DEPARTMENT**  
Camp Murray, WA 98430-5000

August 24, 2017

Aaron Miles, Sr. Acting Director Cultural Resources Program  
Nez Perce Tribe  
PO Box 365  
Lapwai, ID 83540

**Re: Cultural Resources Assessment for the Richland Readiness Center, Benton County, WA**

Dear Mr. Miles,

A cultural resources assessment has been completed for the proposed site of the Washington Army National Guard (WAARNG) Tri-Cities Readiness Center in Richland, Washington. The WAARNG proposes to build the Tri-Cities Readiness Center within the 40-acre property purchased by the WAARNG from the City of Richland. The property comprises part of the 193-acre Benton County parcel no. 121084000006003, located in the SW quarter of the SE quarter of Township 10 N, Range 28 E, Section 21, Willamette Meridian with physical address of 2675 1<sup>st</sup> Street, Richland, WA 99354. The project area is bounded by 1<sup>st</sup> Street to the north, Polar Way to the east, Logan Street to the south, and several tax parcels along Kingsgate Way to the west (Figure 1).

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A copy of the cultural resource assessment report dated March 31, 2017 is attached for your review and has also been sent to the concerned tribes. As stated in the report, no previously identified archaeological sites are located within the project boundary. The assessment, which included pedestrian survey, did not identify any cultural or archaeological resources that could potentially be affected by this project.

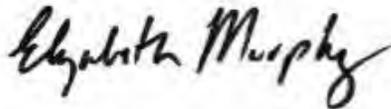
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Any comments related to the cultural resource assessment may be sent to:

Washington Military Department  
Attn: Elizabeth Murphy, Environmental Specialist  
Building 36 Quartermaster Road  
Camp Murray, WA 98430  
Email: [elizabeth.murphy@mil.wa.gov](mailto:elizabeth.murphy@mil.wa.gov)  
Tel.: (253)512-8704

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Sincerely,

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Elizabeth Murphy

Natural and Cultural Resources  
Washington Military Department

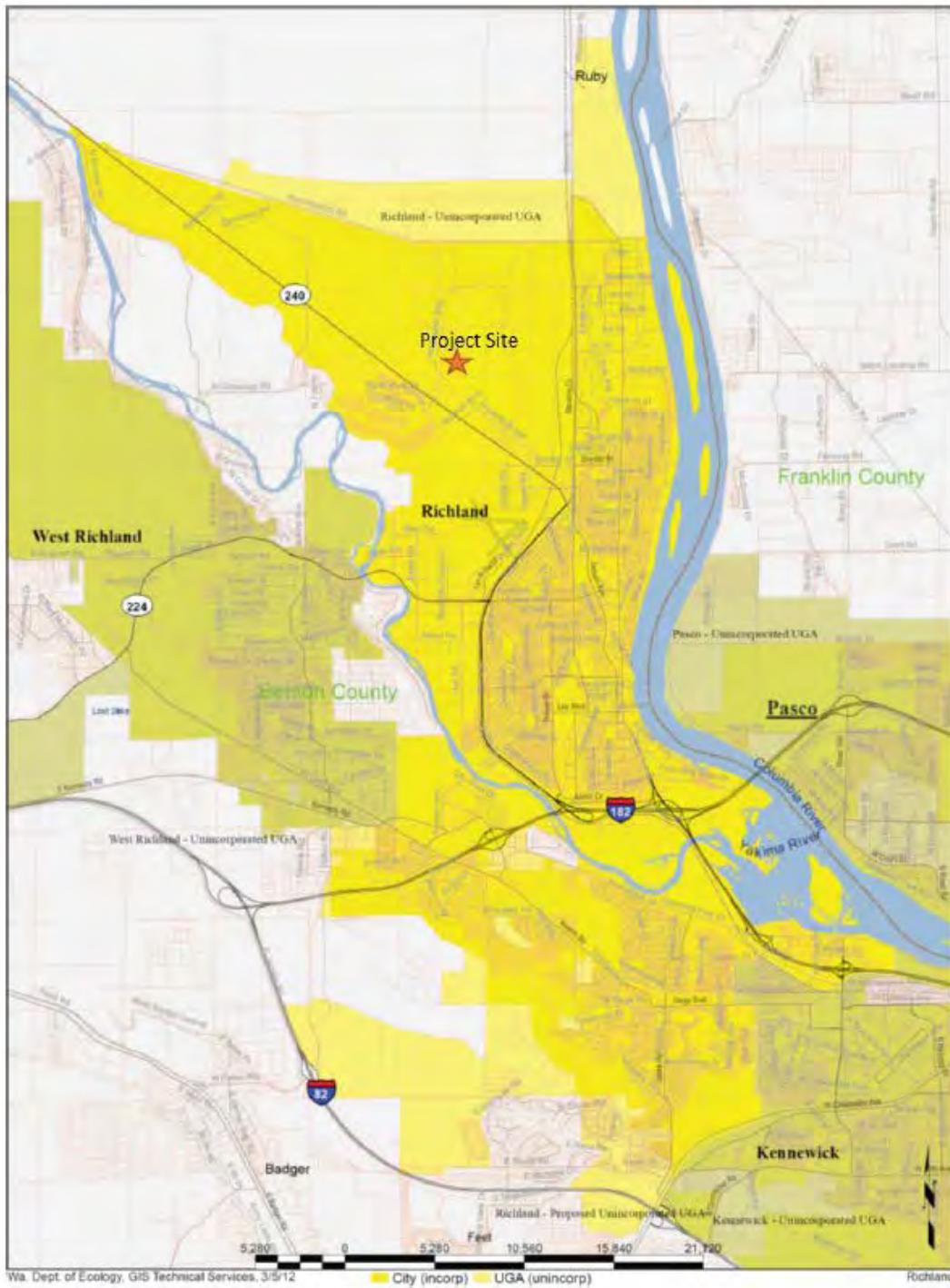


Figure 1. Project location for the proposed Tri-Cities Readiness Center at 2675 1<sup>st</sup> Street, Richland, WA 99354 in Benton County.



Figure 2. Area of potential effect for the proposed Tri-Cities Readiness Center, the 40-acre parcel owned by the Washington Military Department and located in the SW quarter of the SE quarter of Township 10 N, Range 28 E, Section 21, Willamette Meridian.



STATE OF WASHINGTON  
**MILITARY DEPARTMENT**  
Camp Murray, WA 98430-5000

August 24, 2017

Rex Buck, Jr., Chair  
Wanapum Tribe  
PO Box 275 Beverly, WA 99321-0164

**Re: Cultural Resources Assessment for the Richland Readiness Center, Benton County, WA**

Dear Mr. Buck,

A cultural resources assessment has been completed for the proposed site of the Washington Army National Guard (WAARNG) Tri-Cities Readiness Center in Richland, Washington. The WAARNG proposes to build the Tri-Cities Readiness Center within the 40-acre property purchased by the WAARNG from the City of Richland. The property comprises part of the 193-acre Benton County parcel no. 121084000006003, located in the SW quarter of the SE quarter of Township 10 N, Range 28 E, Section 21, Willamette Meridian with physical address of 2675 1<sup>st</sup> Street, Richland, WA 99354. The project area is bounded by 1<sup>st</sup> Street to the north, Polar Way to the east, Logan Street to the south, and several tax parcels along Kingsgate Way to the west (Figure 1).

Preliminary project planning is underway for the construction anticipated to commence in FY20. The 40,000-square foot Readiness Center, associated parking lot, and 1,000 square feet of detached accessory buildings are projected to disturb a 12-acre footprint. Current planning places the construction in the northwest corner of the 40-acre parcel, which we have identified as the Area of Potential Effect (Figure 2).

In preparation for the cultural resources survey, Environmental Specialist Justine Kmiecik informally contacted yourself at the Wanapum Tribe, as well as the Confederated Tribes of the Umatilla Indian Reservation (CTUIR), the Confederated Tribes and Bands of the Yakama Nation, and the Nez Perce Tribe to request input on the proposed project. Holly Shea of the CTUIR noted the existence of a Historic Property of Religious or Cultural Significance within 1 mile of the parcel in question and recommended a cultural resources survey. Dr. Robert Whitlam of the Department of Archaeology and Historic Preservation was also contacted by email and phone in January 2017. This informal consultation and an initial search of the Secure WISAARD database indicated that no archeological sites are known on the property. A predictive model run by the unsecured WISAARD database indicated "Moderate Risk: Survey Recommended". Based on this consultation with DAHP and the tribes, a cultural resources assessment was conducted for the proposed project site.

A copy of the cultural resource assessment report dated March 31, 2017 is attached for your review and has also been sent to the concerned tribes. As stated in the report, no previously identified archaeological

sites are located within the project boundary. The assessment, which included pedestrian survey, did not identify any cultural or archaeological resources that could potentially be affected by this project.

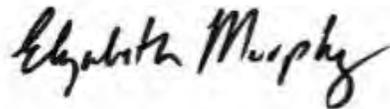
In accordance with 36 CFR Part 800, Section 106 of the National Historic Preservation Act (NHPA), we request your further review of the project and the cultural resources assessment report to provide further guidance for the above work to proceed. We also request your concurrence on our determination of "No Historic Properties Affected" based on the results of this assessment.

Any comments related to the cultural resource assessment may be sent to:

Washington Military Department  
Attn: Elizabeth Murphy, Environmental Specialist  
Building 36 Quartermaster Road  
Camp Murray, WA 98430  
Email: [elizabeth.murphy@mil.wa.gov](mailto:elizabeth.murphy@mil.wa.gov)  
Tel.: (253)512-8704

If we do not receive a response within 30 days, the WAARNG will proceed in implementing the proposed project in accordance with the provisions of 36 CFR 800.(c)(4), 800.5(c)(1), and 800.5(d). In the event that cultural and/or archaeological resources are found or identified during construction activities, the work would stop and individuals would follow standard operating procedures for inadvertent archaeological discoveries as outlined in the WAARNG ICRMP (2007). The WAARNG would then further contact the SHPO and concerned tribes to seek further guidance. Thank you for your review.

Sincerely,



Elizabeth Murphy

Natural and Cultural Resources  
Washington Military Department

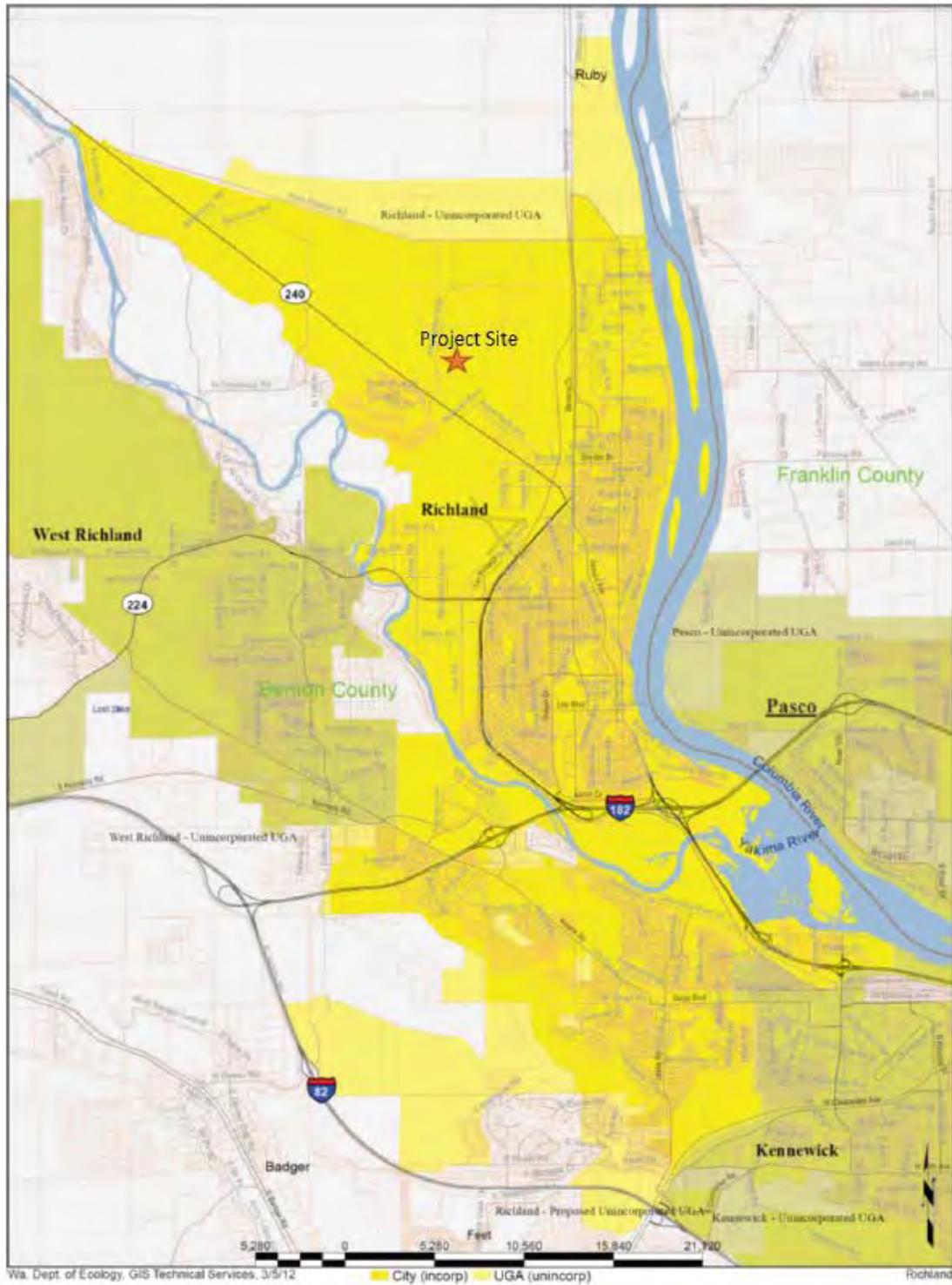


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Figure 2. Area of potential effect for the proposed Tri-Cities Readiness Center, the 40-acre parcel owned by the Washington Military Department and located in the SW quarter of the SE quarter of Township 10 N, Range 28 E, Section 21, Willamette Meridian.



STATE OF WASHINGTON  
**MILITARY DEPARTMENT**  
Camp Murray, WA 98430-5000

August 24, 2017

Kate Valdez, THPO  
Confederated Tribes and Bands of the Yakama Nation  
PO Box 151  
Toppenish, WA 98948

**Re: Cultural Resources Assessment for the Richland Readiness Center, Benton County, WA**

Dear Ms. Valdez,

A cultural resources assessment has been completed for the proposed site of the Washington Army National Guard (WAARNG) Tri-Cities Readiness Center in Richland, Washington. The WAARNG proposes to build the Tri-Cities Readiness Center within the 40-acre property purchased by the WAARNG from the City of Richland. The property comprises part of the 193-acre Benton County parcel no. 121084000006003, located in the SW quarter of the SE quarter of Township 10 N, Range 28 E, Section 21, Willamette Meridian with physical address of 2675 1<sup>st</sup> Street, Richland, WA 99354. The project area is bounded by 1<sup>st</sup> Street to the north, Polar Way to the east, Logan Street to the south, and several tax parcels along Kingsgate Way to the west (Figure 1).

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October 6, 2017

Page 26 of 40

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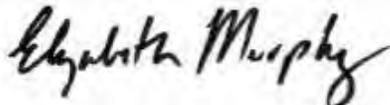
In accordance with 36 CFR Part 800, Section 106 of the National Historic Preservation Act (NHPA), we request your further review of the project and the cultural resources assessment report to provide further guidance for the above work to proceed. We also request your concurrence on our determination of "No Historic Properties Affected" based on the results of this assessment.

Any comments related to the cultural resource assessment may be sent to:

Washington Military Department  
Attn: Elizabeth Murphy, Environmental Specialist  
Building 36 Quartermaster Road  
Camp Murray, WA 98430  
Email: [elizabeth.murphy@mil.wa.gov](mailto:elizabeth.murphy@mil.wa.gov)  
Tel.: (253)512-8704

If we do not receive a response within 30 days, the WAARNG will proceed in implementing the proposed project in accordance with the provisions of 36 CFR 800.(c)(4), 800.5(c)(1), and 800.5(d). In the event that cultural and/or archaeological resources are found or identified during construction activities, the work would stop and individuals would follow standard operating procedures for inadvertent archaeological discoveries as outlined in the WAARNG ICRMP (2007). The WAARNG would then further contact the SHPO and concerned tribes to seek further guidance. Thank you for your review.

Sincerely,



Elizabeth Murphy

Natural and Cultural Resources  
Washington Military Department

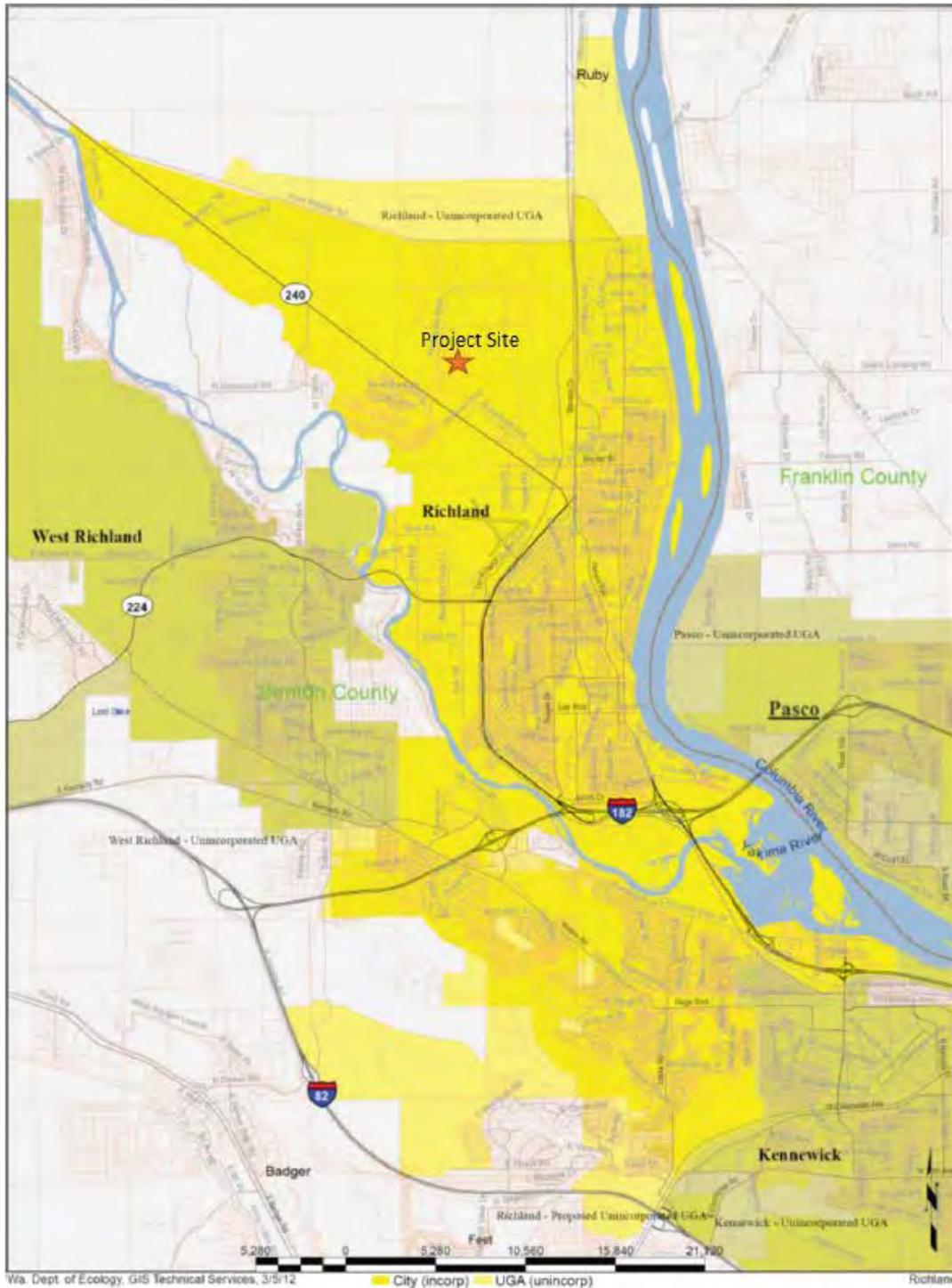


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Figure 2. Area of potential effect for the proposed Tri-Cities Readiness Center, the 40-acre parcel owned by the Washington Military Department and located in the SW quarter of the SE quarter of Township 10 N, Range 28 E, Section 21, Willamette Meridian.



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**From:** Holly Shea Barrick [mailto:HollySheaBarrick@ctuir.org]  
**Sent:** Thursday, September 21, 2017 3:10 PM  
**To:** Murphy, Elizabeth C (MIL) <Elizabeth.Murphy@mil.wa.gov>

**Subject:** RE: Tri-Cities Readiness Center CR Assessment Consultation

Good afternoon,

Thank you for notifying us of the project and sending us the cultural resources report for review. While the survey did not locate any archaeological resources within the APE, there are several historic properties of religious and cultural significance located along the waterways surrounding the proposed readiness center. We therefore request that an inadvertent discovery plan for cultural resources and human remains be in place prior to the start of construction. I would like to review the plan before it is finalized.

I have two further comments. The cultural resource report indicates that the surveyors found evidence of recent geotechnical testing with the APE. Was any consultation and/or cultural resource review carried out prior to the geotechnical testing? Due to the ground disturbance required, geotechnical testing qualifies as an undertaking that has the potential to cause effects on historic properties per 36CFR §800.3. Therefore, Section 106 of the NHPA should have been followed prior to the testing being carried out. Perhaps you can shed some light on why it was not.

I also wanted to make sure I understand something correctly: The WAARNG purchased and will only be using 40 acres of Benton County parcel no. 121084000006003, correct? I just want to ensure that no further cultural resource surveys are warranted.

Thank you,

Holly Shea

Archaeologist

Cultural Resources Protection Program

Confederated Tribes of the Umatilla Indian Reservation

46411 Timine Way, Pendleton, OR. 97801

Direct Line/Fax: (541)429-7204

Main Office: (541)276-3447



ESA/NHPA MFR for Richland Readiness Center

October 6, 2017

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**From:** Murphy, Elizabeth C (MIL) [<mailto:Elizabeth.Murphy@mil.wa.gov>]  
**Sent:** Thursday, August 24, 2017 5:29 PM  
**To:** Holly Shea Barrick  
**Subject:** Tri-Cities Readiness Center CR Assessment Consultation

Dear Ms. Shea,

Good afternoon. My name is Elizabeth Murphy, and I work for the Washington Military Department.

We are in the preliminary planning stage for construction of a new Tri-Cities Readiness Center near Richland, WA. I believe Justine Kmiecik talked with you last fall about this proposed project.

Following this, WMD contracted a cultural resources assessment for the proposed project area.

I am attaching the resulting cultural resources assessment report, along with a letter requesting your comment and review.

If you have any questions or concerns, please don't hesitate to reach me at 253-512-8704.

Best regards,

Elizabeth

Elizabeth Murphy  
*Natural and Cultural Resources*  
WA Military Department  
Camp Murray, Bldg 36  
253-512-8704  
[Elizabeth.murphy@mil.wa.gov](mailto:Elizabeth.murphy@mil.wa.gov)

The opinions expressed by the author are his or her own and are not necessarily those of the Confederated Tribes of the Umatilla Indian Reservation. The information, contents and attachments in this email are Confidential and Private.

**Kmiecik, Justine C (MIL)**

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**From:** Holly Shea Barrick <HollySheaBarrick@ctuir.org>  
**Sent:** Wednesday, February 1, 2017 4:34 PM  
**To:** Kmiecik, Justine C (MIL)  
**Subject:** RE: WA Military Dept Richland site

**Follow Up Flag:** Follow up  
**Flag Status:** Flagged

Hi Justine,

There is a Historic Property of Religious or Cultural Significance to the CTUIR within one mile of the parcel in question. I doubt it would be adversely effected by the project, but I would need more specifics about project plans to assess that. We will cross that bridge when we come to it! The project area will require a cultural resource survey before any ground disturbance happens.

I would suggest you contact the Washington Department of Archaeology and Historic Preservation. They can advise you on any known cultural resources in the project area as well as ensuring you are in compliance with state and federal laws. I am fairly sure that a land purchase is considered an undertaking as defined in Section 106 of the National Historic Preservation Act.

I hope this helps. We appreciate you contacting us early on in the process, as this is a very sensitive cultural area to the CTUIR.

Warm regards,

Holly Shea  
Senior Archaeologist  
Cultural Resources Protection Program  
Confederated Tribes of the Umatilla Indian Reservation  
46411 Timine Way, Pendleton, OR. 97801  
Direct Line/Fax: (541)429-7204  
Main Office: (541)276-3447



**MFR ATTACHMENT C**  
**Threatened and Endangered Species Review**

**a) USFWS and WDFW Consults**

**a) WDFW Consult**

From: Valencia-Gica, Rowena B (MIL)  
Sent: Thursday, March 30, 2017 10:18 AM  
To: Team Yakima (DFW)  
Subject: RE: WAARNG's Land Acquisition and Proposed Richland Readiness Center Project  
Attachments: Aerial view of the parcel for the proposed WAARNG.docx;  
Official\_Species\_List\_WA FISH AND WLDLFE OFC\_19\_Sep\_2016.pdf;  
Official\_Species\_List\_WA FISH AND WLDLFE OFC\_27Feb2017.pdf

Importance: High

Dear Sir/Madam

This is just to follow-up on the status of my consult regarding the proposed Richland Readiness Center project site. I believe that your office covers Benton County under which this property is located. I'd greatly appreciate if you could please send at least an email reply regarding your thoughts about this property.

If you are not the correct contact for this consult, kindly provide me with the correct contact information.

Sincerely,  
Rowena

Rowena Valencia-Gica, Ph.D.  
Environmental Programs Supervisor  
WMD/WAARNG  
36 Quartermaster Road  
Camp Murray WA 98430  
DSN 323-8466  
Desk 253-512-8466

From: Valencia-Gica, Rowena B (MIL)  
Sent: Monday, February 27, 2017 12:24 PM  
To: Team Yakima (DFW) <teamyakima@dfw.wa.gov>  
Subject: WAARNG's Land Acquisition and Proposed Richland Readiness Center Project

Dear Mr. Livingston,

Hope this email finds you well. I'm contacting you to discuss about the WAARNG's proposed Richland Readiness Center on a parcel of land (~40 ac) owned by the City of Richland located on 1st St. and Polar Way. We are dangerously close to finalizing the Purchase Sale Agreement but before reaching that point, we would like to make sure that the site does not have any potential project-stopping concerns.

The site has been used as farmland for many years now (see attached map).

In September 2016, I obtained an official species list covering a larger area than the parcel for acquisition (see attached pdf). The list showed 4 potential species and no habitat present; of these 4 species, I am confident to say that two of them certainly are not found in our proposed site (bull trout and gray wolf). Our initial site assessment also showed that the other two species (yellow-billed cuckoo and Northern wormwood) also do not exist nor have habitats present on this site. Today, I obtained an updated species list for the project site and Northern wormwood is no longer included in the list (see attached pdf). My determination remains the same.

When we prepare the EA later for the construction/operation phase (still waiting for funding), my plan is to discuss any potential impacts under Biological Resources. My determination is that there is no need to prepare a Biological Evaluation for this site due to the very low potential of finding any T&E species. We'd like to make sure though that there are no serious roadblocks before we dive deeper into the purchase process.

I'd greatly appreciate your guidance.

Sincerely,  
Rowena

Rowena Valencia-Gica, Ph.D.  
Environmental Programs Supervisor  
WMD/WAARNG  
36 Quartermaster Road  
Camp Murray WA 98430  
DSN 323-8704  
Desk 253-512-8704

ESA/NHPA MFR for Richland Readiness Center

October 6, 2017

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From: Valencia-Gica, Rowena B (MIL)  
Sent: Thursday, March 30, 2017 10:18 AM  
To: Team Yakima (DFW)  
Subject: RE: WAARNG's Land Acquisition and Proposed Richland Readiness Center Project  
Attachments: Aerial view of the parcel for the proposed WAARNG.docx;  
Official\_Species\_List\_WA FISH AND WLDLFE OFC\_19\_Sep\_2016.pdf;  
Official\_Species\_List\_WA FISH AND WLDLFE OFC\_27Feb2017.pdf

Importance: High

Dear Sir/Madam

This is just to follow-up on the status of my consult regarding the proposed Richland Readiness Center project site. I believe that your office covers Benton County under which this property is located. I'd greatly appreciate if you could please send at least an email reply regarding your thoughts about this property.

If you are not the correct contact for this consult, kindly provide me with the correct contact information.

Sincerely,  
Rowena

Rowena Valencia-Gica, Ph.D.  
Environmental Programs Supervisor  
WMD/WAARNG  
36 Quartermaster Road  
Camp Murray WA 98430  
DSN 323-8466  
Desk 253-512-8466

October 6, 2017

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**b) USFWS Consult**

From: Valencia-Gica, Rowena B (MIL)  
Sent: Friday, January 27, 2017 9:08 AM  
To: 'McReynolds, Ryan'  
Subject: WAARNG's Land Acquisition and Proposed Richland Readiness Center Project  
Attachments: Aerial view of the parcel for the proposed WAARNG.docx;  
Official\_Species\_List\_WA FISH AND WLDLFE OFC\_19\_Sep\_2016.pdf;  
Proposed\_Richland\_Property.pdf

Good morning Ryan,

Hope this email finds you well. I'm contacting you to discuss about the WAARNG's proposed Richland Readiness Center on a parcel of land (~40 ac) owned by the City of Richland located on 1st St. and Polar Way (see attached pdf map). We are dangerously close to finalizing the Purchase Sale Agreement but before reaching that point, we would like to make sure that the site does not have any potential project-stopping concerns. The site has been used as farmland for many years now (see attached map).

In September 2016, I obtained an official species list covering a larger area than the parcel for acquisition (see attached pdf). The list showed 4 potential species and no habitat present; of these 4 species, I am confident to say that two of them certainly are not found in our proposed site (bull trout and gray wolf). Our initial site assessment also showed that the other two species (yellow-billed cuckoo and Northern wormwood) also do not exist nor have habitats present on this site.

When we prepare the EA later for the construction/operation phase (still waiting for funding), my plan is to discuss any potential impacts under Biological Resources. My determination is that there is no need to prepare a Biological Evaluation for this site due to the very low potential of finding any T&E species. We'd like to make sure though that there are no serious roadblocks before we dive deeper into the purchase process.

I'd greatly appreciate your guidance.

Sincerely,  
Rowena

Rowena Valencia-Gica, Ph.D.  
Environmental Programs Supervisor  
WMD/WAARNG  
36 Quartermaster Road  
Camp Murray WA 98430  
DSN 323-8704  
Desk 253-512-8704

ESA/NHPA MFR for Richland Readiness Center

October 6, 2017

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From: McReynolds, Ryan <ryan\_mcreynolds@fws.gov>  
Sent: Friday, February 3, 2017 12:39 PM  
To: Valencia-Gica, Rowena B (MIL)  
Cc: Ryan McReynolds  
Subject: Re: WAARNG's Land Acquisition and Proposed Richland Readiness Center Project

Thank you Rowena for your emails and call.

Thank you also for providing information to help address your questions.

I agree with your assessment of the issue.

The species list identifies only a few listed species for this portion of Benton County ... I see no obvious reason why a proposed Readiness Center at this location would raise any significant issues related to yellow-billed cuckoo, gray wolf, northern wormwood, umtanum desert buckwheat, Columbia basin pygmy rabbit, or bull trout.

I agree, that in most, and perhaps each case it may be possible to document "no effect" ESA determinations; technically, a determination for bull trout would depend on some specifics, including stormwater management. But, I imagine that it should be pretty easy to design an effective stormwater management strategy for this site, and thereby avoid any significant impacts to the Yakima River.

My cursory review of this location identifies no significant ESA issues. I think you can have pretty good confidence about that.

Does that meet your needs right now?

Thanks - Ryan -

Ryan McReynolds  
U.S. Fish and Wildlife Service, Lacey WA  
Consultation & Conservation Planning Division  
ryan\_mcreynolds@fws.gov  
360.753.6047

**b) Latest T&E Species List**

**List of threatened and endangered animals and plants for Richland Readiness Center.**

09/28/2017

Event Code: 01EWFWD-2017-E-03013

**Official Species List**

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

**Washington Fish And Wildlife Office**  
510 Desmond Drive Se, Suite 102  
Lacey, WA 98503-1263  
(360) 753-9440

09/29/2017

Event Code: 01EWF00-2017-E-03013

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## Project Summary

Consultation Code: 01EWF00-2017-SLI-1601

Event Code: 01EWF00-2017-E-03013

Project Name: Richland Readiness Center

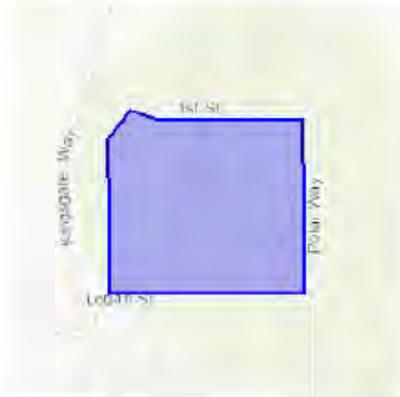
Project Type: DEVELOPMENT

Project Description: The WAARNG proposes to construct a 39,731-square foot, one story National Guard Readiness Center, with associated parking areas and detached storage buildings. The facility will be sited on Benton County parcel no. 121084000006005 located in the SW quarter of the SE quarter of Township 10 N, Range 28 E, Section 21, Willamette Meridian with physical address of 2675 1st Street, Richland, WA 99354

### Project Location:

Approximate location of the project can be viewed in Google Maps:

<https://www.google.com/maps/place/46.331232067057584N119.3119165840549W>



Counties: Benton, WA

## Endangered Species Act Species

There is a total of 3 threatened, endangered, or candidate species on this species list. Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

### Mammals

NAME	STATUS
<p>Gray Wolf <i>Canis lupus</i></p> <p>Population: U.S.A.: All of AL, AR, CA, CO, CT, DE, FL, GA, IA, IN, IL, KS, KY, LA, MA, MD, ME, MI, MO, MS, NC, ND, NE, NH, NJ, NV, NY, OH, OK, PA, RI, SC, SD, TN, TX, VA, VT, WI, and WV; and portions of AZ, NM, OR, UT, and WA. Mexico.</p> <p>There is <b>final designated</b> critical habitat for this species. The location of the critical habitat is not available.</p> <p>Species profile: <a href="https://ecos.fws.gov/ecp/species/4488">https://ecos.fws.gov/ecp/species/4488</a></p>	<p>Endangered</p>

### Birds

NAME	STATUS
<p>Yellow-billed Cuckoo <i>Coccyzus americanus</i></p> <p>Population: Western U.S. DPS</p> <p>There is <b>proposed</b> critical habitat for this species. Your location is outside the critical habitat.</p> <p>Species profile: <a href="https://ecos.fws.gov/ecp/species/3911">https://ecos.fws.gov/ecp/species/3911</a></p>	<p>Threatened</p>

### Fishes

NAME	STATUS
<p>Bull Trout <i>Salvelinus confluentus</i></p> <p>Population: U.S.A., conterminous, lower 48 states</p> <p>There is <b>final designated</b> critical habitat for this species. Your location is outside the critical habitat.</p> <p>Species profile: <a href="https://ecos.fws.gov/ecp/species/8212">https://ecos.fws.gov/ecp/species/8212</a></p>	<p>Threatened</p>

### Critical habitats

There are no critical habitats within your project area under this office's jurisdiction.

---

## **II. Exhibit Materials**

### **I Soil Sampling for Contamination**



Engineering +  
Environmental

October 20, 2016

Ron Cross  
Washington State Military Department  
Army National Guard  
Camp Murray Bldg 36  
Tacoma, Washington 98340

Re: Limited Environmental Site Assessment  
Benton County Parcel 121084000006003  
1st Street, Richland, Washington  
PBS Project No.64395.000

Dear Mr. Cross:

PBS Engineering and Environmental Inc. (PBS) is providing this letter to address soil sampling conducted at the above-referenced parcel located in Richland, Washington (Figure 1). The sampling was conducted to assess potential presence of pesticides in shallow soil related to historical agricultural use.

Sampling was conducted in conjunction with the excavation of test pits for a geotechnical engineering evaluation.

### **Field Sampling**

The scope of work consisted of collecting discrete soil samples from the upper foot of soil at ten test pit locations (TP-1 through TP-10) at the site. The test pits were advanced for the primary purpose of collecting geotechnical information, and their locations are shown on Figure 2 (samples were not collected at soil boring locations labeled with B-1, etc).

Samples were collected directly from the excavator bucket. All samples were placed in sterile laboratory-provided containers, sealed with Teflon lids, and stored on ice for the duration of fieldwork and for transportation to the laboratory under chain-of-custody.

### **Investigation Derived Waste**

Soil sampling residuals were returned to the test pits. Disposable gloves were disposed of as solid waste.

### **Laboratory Analysis and Findings**

Ten soil samples were analyzed for seventeen agricultural metals by Environmental Protection Agency (EPA) Methods 6010 and 7471, pesticides by EPA Methods 8081 and 8141, and chlorinated acid herbicides by EPA Method 8151.

Table 1 summarizes the soil analytical results for compounds detected in one or more soil samples. No detectable levels of pesticides and herbicides were found in the soil samples. Arsenic, barium,

beryllium chromium, cobalt, copper, lead, nickel, vanadium, and zinc were detected in soil samples. Analytical results were compared to Washington State Department of Ecology's (Ecology) Model Toxics Control Act (MTCA) Method A cleanup values and Table 1 of Ecology's Natural Background Soil Metals Concentrations in Washington State (Publication No. 94-115, October 1994 document). The laboratory report is provided as an attachment. The levels of arsenic, beryllium, chromium, copper, lead, nickel, and zinc detected were below both the MTCA Method A cleanup values (if established) and applicable state background levels. Although there is not a MTCA Method A cleanup level or a state background level for the remaining detected metals (barium, cobalt, and vanadium, the low concentrations of these metals are not indicative of levels associated with pesticide application and do not appear to present a concern.

### **Conclusions and Recommendations**

Based on the results of this investigation, it is PBS' opinion that no evidence of soil contamination related to historical agricultural activities is present in near surface soil at the site. Further evaluation with regards to historical agricultural pesticide use is not recommended at this time.

### **Limitations**

PBS has prepared this report for use by Army National Guard (Client). This report is for the exclusive use of the Client and is not to be relied upon by other parties. It is not to be photographed, photocopied, or similarly reproduced, in total or in part, without the expressed written consent of the Client and PBS.

This study was limited to the tests, locations, and depths as indicated to determine the absence or presence of certain contaminants. The site as a whole may have other contamination that was not characterized by this study. The findings and conclusions of this report are not scientific certainties, but probabilities based on professional judgment concerning the significance of the data gathered during the course of this investigation. PBS is not able to represent that the site or adjoining land contain no hazardous waste, oil or other latent conditions beyond that detected or observed by PBS.

Please contact Dennis Terzian at 503.417.7601 if you have any questions regarding this assessment. Other questions regarding this site should be directed to Adam Swenson at 509.375.7844.

Sincerely,  
PBS Engineering and Environmental Inc.

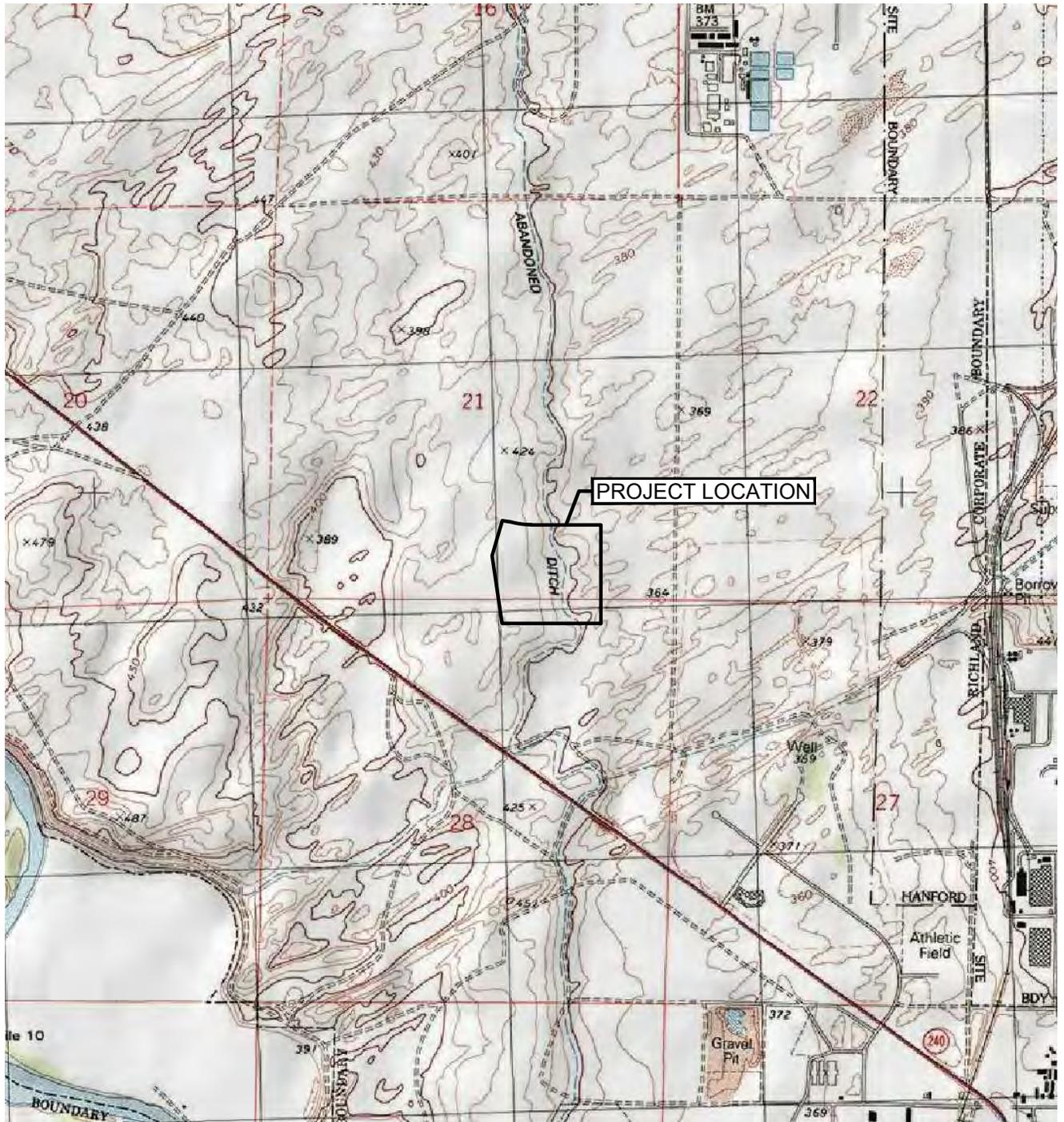


Dennis M. Terzian, LG  
Senior Geologist

Attachments: Figure 1 – Vicinity Map  
Figure 2 – Site Plan  
Table 1 – Soil Analytical Results  
Laboratory Report and Sample Chain-of-Custody Forms

## **FIGURES**

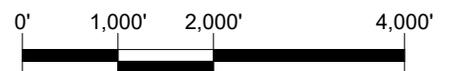
---



SOURCE: USGS RICHLAND WA QUADRANGLE 1992, PHOTO REVISED 1990.



WASHINGTON



SCALE: 1" = 2,000'

PREPARED FOR: WASHINGTON STATE ARMY NATIONAL GUARD



PROJECT #  
64395.000

DATE  
OCT 2016

VICINITY MAP  
WASHINGTON ARMY NATIONAL GUARD BUILDING  
RICHLAND, WASHINGTON

FIGURE

1



SOURCE: © 2016 GOOGLE EARTH PRO.

**LEGEND**

- TP-1 TEST PIT NUMBER AND LOCATION
- B-1 BORING NUMBER AND LOCATION



SCALE: 1" = 300'

PREPARED FOR: WASHINGTON STATE ARMY NATIONAL GUARD

L:\Projects\64\000\64300-64399\64395\_CFM\DWG\64395.000\_FIG 1-2.dwg Oct 10, 2016 03:53pm jim



PROJECT #  
64395.000

DATE  
OCT 2016

**SITE PLAN**  
WASHINGTON ARMY NATIONAL GUARD BUILDING  
RICHLAND, WASHINGTON

FIGURE

**2**

**TABLE**

---

**Table 1: Soil Analytical Results  
 Richland Army National Guard Building  
 Richland, Washington**

Sample ID	Sampling Date	Metals (limited to detections)									
		Arsenic	Barium	Beryllium	Chromium <sup>6</sup>	Cobalt	Copper	Lead	Nickel	Vanadium	Zinc
TP-1	10/10/2016	3.01	87.3	0.395	9.86	11.8	10.9	5.92	10.8	53.7	66.6
TP-2	10/10/2016	2.3	75.3	0.332	7.85	10.1	8.39	4.73	10.1	46.6	58.8
TP-3	10/10/2016	<2.02	72.2	0.297	7.17	8.79	8.95	5.52	8.06	31.7	72.2
TP-4	10/4/2016	2.8	81.4	0.334	8.39	11	8.5	5.18	10.2	52	58.5
TP-5	10/4/2016	2.84	71.6	0.368	10.6	11.9	10.4	5.15	11.4	60.8	65.6
TP-6	10/4/2016	2.24	85.4	0.396	11.5	12.3	9.1	5.86	11.3	60.2	64.2
TP-7	10/4/2016	2.45	86.3	0.384	10.5	12.3	9.79	5.06	10.4	63	58.7
TP-8	10/4/2016	2.31	82.1	0.382	10.5	12	9.25	5.3	10.4	60.3	60.4
TP-9	10/4/2016	2.79	82.7	0.389	11.9	12.1	7.99	5.53	11.2	59.8	61
TP-10	10/4/2016	2.63	72.5	0.352	9.8	11.4	8.87	5.2	10.6	55.9	54.1
MTCA Methods A (Unrestricted Land Use)		20	NE	NE	2,000	NE	NE	250	NE	NE	NE
Washington Background Concentration <sup>1</sup>		7	NE	2	42	NE	36	17	38	NE	86

See laboratory report for full list of analytes

MTCA = Model Toxics Control Act

NE = not established

All analyses measured total metals (no valence states)  
 Concentrations in milligrams per kilograms (mg/kg)

<sup>1</sup> Washington Department of Ecology, Natural Background Soil Metals Concentrations in Washington State, October 1994, Table 1

<sup>2</sup> Using cleanup value for chromium III



## **LABORTORY REPORT AND CHAIN OF CUSTODY**

---

## PBS Engineering & Env.- WA

Sample Delivery Group: L864107  
Samples Received: 10/05/2016  
Project Number: 64395.000  
Description: Richland Army National Guard Building

Report To: Adam Swenson  
400 Bradley Blvd  
Suite 300  
Richland, WA 99352

Entire Report Reviewed By:



Brian Ford  
Technical Service Representative

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by ESC is performed per guidance provided in laboratory standard operating procedures: 060302, 060303, and 060304.



<b><sup>1</sup>Cp: Cover Page</b>	<b>1</b>
<b><sup>2</sup>Tc: Table of Contents</b>	<b>2</b>
<b><sup>3</sup>Ss: Sample Summary</b>	<b>3</b>
<b><sup>4</sup>Cn: Case Narrative</b>	<b>6</b>
<b><sup>5</sup>Sr: Sample Results</b>	<b>7</b>
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TP-2 L864107-02	9
TP-3 L864107-03	11
TP-4 L864107-04	13
TP-5 L864107-05	15
TP-6 L864107-06	17
TP-7 L864107-07	19
TP-8 L864107-08	21
TP-9 L864107-09	23
TP-10 L864107-10	25
<b><sup>6</sup>Qc: Quality Control Summary</b>	<b>27</b>
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OP Pesticides by Method 8141	34
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<b><sup>8</sup>Al: Accreditations &amp; Locations</b>	<b>40</b>
<b><sup>9</sup>Sc: Chain of Custody</b>	<b>41</b>



# SAMPLE SUMMARY



## TP-1 L864107-01 Solid

Collected by  
Adam Swenson  
Collected date/time  
10/04/16 07:53  
Received date/time  
10/05/16 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Chlorinated Acid Herbicides (GC) by Method 8151	WG915615	1	10/10/16 09:20	10/12/16 01:19	KLM
Mercury by Method 7471A	WG914418	1	10/05/16 20:34	10/07/16 10:45	NJB
Metals (ICP) by Method 6010C	WG915060	1	10/07/16 15:53	10/10/16 11:11	LTB
Metals (ICP) by Method 6010C	WG916216	1	10/11/16 18:20	10/12/16 12:06	LTB
OP Pesticides by Method 8141	WG916127	1	10/11/16 17:46	10/12/16 14:15	ADF
Pesticides (GC) by Method 8081	WG915301	1	10/08/16 01:51	10/10/16 12:03	VKS
Total Solids by Method 2540 G-2011	WG914939	1	10/07/16 09:54	10/07/16 10:02	MEL

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

## TP-2 L864107-02 Solid

Collected by  
Adam Swenson  
Collected date/time  
10/04/16 08:03  
Received date/time  
10/05/16 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Chlorinated Acid Herbicides (GC) by Method 8151	WG915615	1	10/10/16 09:20	10/12/16 02:01	KLM
Mercury by Method 7471A	WG914418	1	10/05/16 20:34	10/07/16 11:14	NJB
Metals (ICP) by Method 6010C	WG915060	1	10/07/16 15:53	10/10/16 11:19	LTB
Metals (ICP) by Method 6010C	WG916216	1	10/11/16 18:20	10/12/16 12:09	LTB
OP Pesticides by Method 8141	WG916127	1	10/11/16 17:46	10/12/16 14:47	ADF
Pesticides (GC) by Method 8081	WG915301	1	10/08/16 01:51	10/10/16 12:43	VKS
Total Solids by Method 2540 G-2011	WG914939	1	10/07/16 09:54	10/07/16 10:02	MEL

## TP-3 L864107-03 Solid

Collected by  
Adam Swenson  
Collected date/time  
10/04/16 08:27  
Received date/time  
10/05/16 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Chlorinated Acid Herbicides (GC) by Method 8151	WG915615	1	10/10/16 09:20	10/12/16 02:15	KLM
Mercury by Method 7471A	WG914418	1	10/05/16 20:34	10/07/16 11:17	NJB
Metals (ICP) by Method 6010C	WG915060	1	10/07/16 15:53	10/10/16 11:21	LTB
Metals (ICP) by Method 6010C	WG916216	1	10/11/16 18:20	10/12/16 12:18	LTB
OP Pesticides by Method 8141	WG916127	1	10/11/16 17:46	10/12/16 15:19	ADF
Pesticides (GC) by Method 8081	WG915301	1	10/08/16 01:51	10/10/16 12:56	VKS
Total Solids by Method 2540 G-2011	WG914939	1	10/07/16 09:54	10/07/16 10:02	MEL

## TP-4 L864107-04 Solid

Collected by  
Adam Swenson  
Collected date/time  
10/04/16 08:51  
Received date/time  
10/05/16 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Chlorinated Acid Herbicides (GC) by Method 8151	WG915615	1	10/10/16 09:20	10/12/16 02:28	KLM
Mercury by Method 7471A	WG914418	1	10/05/16 20:34	10/07/16 11:20	NJB
Metals (ICP) by Method 6010C	WG915060	1	10/07/16 15:53	10/10/16 11:24	LTB
Metals (ICP) by Method 6010C	WG916216	1	10/11/16 18:20	10/12/16 12:21	LTB
OP Pesticides by Method 8141	WG916127	1	10/11/16 17:46	10/12/16 15:50	ADF
Pesticides (GC) by Method 8081	WG915301	1	10/08/16 01:51	10/10/16 13:09	VKS
Total Solids by Method 2540 G-2011	WG914939	1	10/07/16 09:54	10/07/16 10:02	MEL

## TP-5 L864107-05 Solid

Collected by  
Adam Swenson  
Collected date/time  
10/04/16 09:00  
Received date/time  
10/05/16 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Chlorinated Acid Herbicides (GC) by Method 8151	WG915615	1	10/10/16 09:20	10/12/16 02:42	KLM
Mercury by Method 7471A	WG914418	1	10/05/16 20:34	10/07/16 11:23	NJB
Metals (ICP) by Method 6010C	WG915060	1	10/07/16 15:53	10/10/16 11:27	LTB

# SAMPLE SUMMARY



## TP-5 L864107-05 Solid

Collected by  
Adam Swenson  
Collected date/time  
10/04/16 09:00  
Received date/time  
10/05/16 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Metals (ICP) by Method 6010C	WG916216	1	10/11/16 18:20	10/12/16 12:24	LTB
OP Pesticides by Method 8141	WG916127	1	10/11/16 17:46	10/12/16 16:22	ADF
Pesticides (GC) by Method 8081	WG915301	1	10/08/16 01:51	10/10/16 13:22	VKS
Total Solids by Method 2540 G-2011	WG914939	1	10/07/16 09:54	10/07/16 10:02	MEL

1  
Cp

2  
Tc

3  
Ss

4  
Cn

5  
Sr

6  
Qc

7  
Gl

8  
Al

9  
Sc

## TP-6 L864107-06 Solid

Collected by  
Adam Swenson  
Collected date/time  
10/04/16 10:14  
Received date/time  
10/05/16 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Chlorinated Acid Herbicides (GC) by Method 8151	WG915615	1	10/10/16 09:20	10/12/16 02:56	KLM
Mercury by Method 7471A	WG914418	1	10/05/16 20:34	10/07/16 11:26	NJB
Metals (ICP) by Method 6010C	WG915060	1	10/07/16 15:53	10/10/16 11:29	LTB
Metals (ICP) by Method 6010C	WG916216	1	10/11/16 18:20	10/12/16 12:27	LTB
OP Pesticides by Method 8141	WG916127	1	10/11/16 17:46	10/12/16 16:53	ADF
Pesticides (GC) by Method 8081	WG915301	1	10/08/16 01:51	10/10/16 13:35	VKS
Total Solids by Method 2540 G-2011	WG914939	1	10/07/16 09:54	10/07/16 10:02	MEL

## TP-7 L864107-07 Solid

Collected by  
Adam Swenson  
Collected date/time  
10/04/16 10:07  
Received date/time  
10/05/16 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Chlorinated Acid Herbicides (GC) by Method 8151	WG915615	1	10/10/16 09:20	10/12/16 03:10	KLM
Mercury by Method 7471A	WG914418	1	10/05/16 20:34	10/07/16 11:29	NJB
Metals (ICP) by Method 6010C	WG915060	1	10/07/16 15:53	10/10/16 11:32	LTB
Metals (ICP) by Method 6010C	WG916216	1	10/11/16 18:20	10/12/16 12:30	LTB
OP Pesticides by Method 8141	WG916127	1	10/11/16 17:46	10/12/16 17:25	ADF
Pesticides (GC) by Method 8081	WG915301	1	10/08/16 01:51	10/10/16 13:48	VKS
Total Solids by Method 2540 G-2011	WG914939	1	10/07/16 09:54	10/07/16 10:02	MEL

## TP-8 L864107-08 Solid

Collected by  
Adam Swenson  
Collected date/time  
10/04/16 09:56  
Received date/time  
10/05/16 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Chlorinated Acid Herbicides (GC) by Method 8151	WG915615	1	10/10/16 09:20	10/12/16 03:24	KLM
Mercury by Method 7471A	WG914418	1	10/05/16 20:34	10/07/16 11:32	NJB
Metals (ICP) by Method 6010C	WG915060	1	10/07/16 15:53	10/10/16 11:34	LTB
Metals (ICP) by Method 6010C	WG916216	1	10/11/16 18:20	10/12/16 12:33	LTB
OP Pesticides by Method 8141	WG916127	1	10/11/16 17:46	10/12/16 19:00	ADF
Pesticides (GC) by Method 8081	WG915301	1	10/08/16 01:51	10/10/16 14:02	VKS
Total Solids by Method 2540 G-2011	WG914939	1	10/07/16 09:54	10/07/16 10:02	MEL

## TP-9 L864107-09 Solid

Collected by  
Adam Swenson  
Collected date/time  
10/04/16 09:09  
Received date/time  
10/05/16 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Chlorinated Acid Herbicides (GC) by Method 8151	WG915615	1	10/10/16 09:20	10/12/16 03:37	KLM
Mercury by Method 7471A	WG914418	1	10/05/16 20:34	10/07/16 11:35	NJB
Metals (ICP) by Method 6010C	WG915060	1	10/07/16 15:53	10/10/16 11:37	LTB
Metals (ICP) by Method 6010C	WG916216	1	10/11/16 18:20	10/12/16 12:36	LTB
OP Pesticides by Method 8141	WG916127	1	10/11/16 17:46	10/12/16 19:31	ADF
Pesticides (GC) by Method 8081	WG915301	1	10/08/16 01:51	10/10/16 14:15	VKS
Total Solids by Method 2540 G-2011	WG914939	1	10/07/16 09:54	10/07/16 10:02	MEL

# SAMPLE SUMMARY



TP-10 L864107-10 Solid

Collected by Adam Swenson  
 Collected date/time 10/04/16 09:22  
 Received date/time 10/05/16 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Chlorinated Acid Herbicides (GC) by Method 8151	WG915615	1	10/10/16 09:20	10/12/16 03:51	KLM
Mercury by Method 7471A	WG914418	1	10/05/16 20:34	10/07/16 11:38	NJB
Metals (ICP) by Method 6010C	WG915060	1	10/07/16 15:53	10/10/16 11:40	LTB
Metals (ICP) by Method 6010C	WG916216	1	10/11/16 18:20	10/12/16 12:39	LTB
OP Pesticides by Method 8141	WG916127	1	10/11/16 17:46	10/12/16 20:03	ADF
Pesticides (GC) by Method 8081	WG915301	1	10/08/16 01:51	10/10/16 14:28	VKS
Total Solids by Method 2540 G-2011	WG914939	1	10/07/16 09:54	10/07/16 10:02	MEL

- <sup>1</sup>Cp
- <sup>2</sup>Tc
- <sup>3</sup>Ss
- <sup>4</sup>Cn
- <sup>5</sup>Sr
- <sup>6</sup>Qc
- <sup>7</sup>Gl
- <sup>8</sup>Al
- <sup>9</sup>Sc



All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times. All MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Brian Ford  
Technical Service Representative

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Collected date/time: 10/04/16 07:53

L864107

Total Solids by Method 2540 G-2011

Analyte	Result	Qualifier	Dilution	Analysis	Batch
	%			date / time	
Total Solids	98.8		1	10/07/2016 10:02	<a href="#">WG914939</a>

1 Cp

2 Tc

Mercury by Method 7471A

Analyte	Result (dry)	Qualifier	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg		date / time	
Mercury	ND		0.0202	1	10/07/2016 10:45	<a href="#">WG914418</a>

3 Ss

4 Cn

Metals (ICP) by Method 6010C

Analyte	Result (dry)	Qualifier	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg		date / time	
Antimony	ND		2.02	1	10/10/2016 11:11	<a href="#">WG915060</a>
Arsenic	3.01		2.02	1	10/10/2016 11:11	<a href="#">WG915060</a>
Barium	87.3		0.506	1	10/10/2016 11:11	<a href="#">WG915060</a>
Beryllium	0.395		0.202	1	10/10/2016 11:11	<a href="#">WG915060</a>
Cadmium	ND		0.506	1	10/10/2016 11:11	<a href="#">WG915060</a>
Chromium	9.86		1.01	1	10/10/2016 11:11	<a href="#">WG915060</a>
Cobalt	11.8		1.01	1	10/10/2016 11:11	<a href="#">WG915060</a>
Copper	10.9		2.02	1	10/10/2016 11:11	<a href="#">WG915060</a>
Lead	5.92		0.506	1	10/10/2016 11:11	<a href="#">WG915060</a>
Molybdenum	ND		0.506	1	10/10/2016 11:11	<a href="#">WG915060</a>
Nickel	10.8		2.02	1	10/10/2016 11:11	<a href="#">WG915060</a>
Selenium	ND		2.02	1	10/10/2016 11:11	<a href="#">WG915060</a>
Silver	ND		1.01	1	10/10/2016 11:11	<a href="#">WG915060</a>
Thallium	ND		2.02	1	10/10/2016 11:11	<a href="#">WG915060</a>
Vanadium	53.7		2.02	1	10/10/2016 11:11	<a href="#">WG915060</a>
Zinc	66.6		5.06	1	10/12/2016 12:06	<a href="#">WG916216</a>

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

Chlorinated Acid Herbicides (GC) by Method 8151

Analyte	Result (dry)	Qualifier	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg		date / time	
2,4-D	ND	<a href="#">J5</a>	0.0708	1	10/12/2016 01:19	<a href="#">WG915615</a>
Dalapon	ND		0.0708	1	10/12/2016 01:19	<a href="#">WG915615</a>
2,4-DB	ND	<a href="#">J4 J5</a>	0.0708	1	10/12/2016 01:19	<a href="#">WG915615</a>
Dicamba	ND		0.0708	1	10/12/2016 01:19	<a href="#">WG915615</a>
Dichloroprop	ND		0.0708	1	10/12/2016 01:19	<a href="#">WG915615</a>
Dinoseb	ND		0.0708	1	10/12/2016 01:19	<a href="#">WG915615</a>
MCPA	ND		6.58	1	10/12/2016 01:19	<a href="#">WG915615</a>
MCPP	ND	<a href="#">J5</a>	6.58	1	10/12/2016 01:19	<a href="#">WG915615</a>
2,4,5-T	ND		0.0708	1	10/12/2016 01:19	<a href="#">WG915615</a>
2,4,5-TP (Silvex)	ND		0.0708	1	10/12/2016 01:19	<a href="#">WG915615</a>
(S) 2,4-Dichlorophenyl Acetic Acid	100		15.0-122		10/12/2016 01:19	<a href="#">WG915615</a>

OP Pesticides by Method 8141

Analyte	Result (dry)	Qualifier	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg		date / time	
Azinphos-Methyl	ND		0.101	1	10/12/2016 14:15	<a href="#">WG916127</a>
Bolstar (Sulprofos)	ND		0.101	1	10/12/2016 14:15	<a href="#">WG916127</a>
Chlorpyrifos	ND		0.101	1	10/12/2016 14:15	<a href="#">WG916127</a>
Coumaphos	ND		0.101	1	10/12/2016 14:15	<a href="#">WG916127</a>
Demeton,-O and -S	ND		0.0708	1	10/12/2016 14:15	<a href="#">WG916127</a>
Diazinon	ND	<a href="#">J3</a>	0.101	1	10/12/2016 14:15	<a href="#">WG916127</a>
Dichlorvos	ND		0.101	1	10/12/2016 14:15	<a href="#">WG916127</a>
Dimethoate	ND		0.101	1	10/12/2016 14:15	<a href="#">WG916127</a>
Disulfoton	ND		0.101	1	10/12/2016 14:15	<a href="#">WG916127</a>



Collected date/time: 10/04/16 07:53

L864107

OP Pesticides by Method 8141

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
EPN	ND		0.101	1	10/12/2016 14:15	<a href="#">WG916127</a>
Ethoprop	ND		0.101	1	10/12/2016 14:15	<a href="#">WG916127</a>
Ethyl Parathion	ND		0.101	1	10/12/2016 14:15	<a href="#">WG916127</a>
Fensulfothion	ND	J3	0.101	1	10/12/2016 14:15	<a href="#">WG916127</a>
Fenthion	ND		0.101	1	10/12/2016 14:15	<a href="#">WG916127</a>
Malathion	ND		0.101	1	10/12/2016 14:15	<a href="#">WG916127</a>
Merphos	ND		0.101	1	10/12/2016 14:15	<a href="#">WG916127</a>
Methyl parathion	ND		0.101	1	10/12/2016 14:15	<a href="#">WG916127</a>
Mevinphos	ND		0.101	1	10/12/2016 14:15	<a href="#">WG916127</a>
Naled	ND	J3	0.101	1	10/12/2016 14:15	<a href="#">WG916127</a>
Phorate	ND		0.101	1	10/12/2016 14:15	<a href="#">WG916127</a>
Ronnel	ND		0.101	1	10/12/2016 14:15	<a href="#">WG916127</a>
Stirophos	ND		0.101	1	10/12/2016 14:15	<a href="#">WG916127</a>
Sulfotep	ND		0.101	1	10/12/2016 14:15	<a href="#">WG916127</a>
TEPP	ND	J3	1.01	1	10/12/2016 14:15	<a href="#">WG916127</a>
Tokuthion (Prothothiofos)	ND		0.101	1	10/12/2016 14:15	<a href="#">WG916127</a>
Trichloronate	ND		0.101	1	10/12/2016 14:15	<a href="#">WG916127</a>
(S) Triphenyl Phosphate	91.8		40.0-120		10/12/2016 14:15	<a href="#">WG916127</a>

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

Pesticides (GC) by Method 8081

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Aldrin	ND		0.0202	1	10/10/2016 12:03	<a href="#">WG915301</a>
Alpha BHC	ND		0.0202	1	10/10/2016 12:03	<a href="#">WG915301</a>
Beta BHC	ND		0.0202	1	10/10/2016 12:03	<a href="#">WG915301</a>
Delta BHC	ND		0.0202	1	10/10/2016 12:03	<a href="#">WG915301</a>
Gamma BHC	ND		0.0202	1	10/10/2016 12:03	<a href="#">WG915301</a>
Chlordane	ND		0.202	1	10/10/2016 12:03	<a href="#">WG915301</a>
4,4-DDD	ND		0.0202	1	10/10/2016 12:03	<a href="#">WG915301</a>
4,4-DDE	ND		0.0202	1	10/10/2016 12:03	<a href="#">WG915301</a>
4,4-DDT	ND		0.0202	1	10/10/2016 12:03	<a href="#">WG915301</a>
Dieldrin	ND		0.0202	1	10/10/2016 12:03	<a href="#">WG915301</a>
Endosulfan I	ND		0.0202	1	10/10/2016 12:03	<a href="#">WG915301</a>
Endosulfan II	ND		0.0202	1	10/10/2016 12:03	<a href="#">WG915301</a>
Endosulfan sulfate	ND		0.0202	1	10/10/2016 12:03	<a href="#">WG915301</a>
Endrin	ND		0.0202	1	10/10/2016 12:03	<a href="#">WG915301</a>
Endrin aldehyde	ND		0.0202	1	10/10/2016 12:03	<a href="#">WG915301</a>
Endrin ketone	ND		0.0202	1	10/10/2016 12:03	<a href="#">WG915301</a>
Hexachlorobenzene	ND		0.0202	1	10/10/2016 12:03	<a href="#">WG915301</a>
Heptachlor	ND		0.0202	1	10/10/2016 12:03	<a href="#">WG915301</a>
Heptachlor epoxide	ND		0.0202	1	10/10/2016 12:03	<a href="#">WG915301</a>
Methoxychlor	ND		0.0202	1	10/10/2016 12:03	<a href="#">WG915301</a>
Toxaphene	ND		0.405	1	10/10/2016 12:03	<a href="#">WG915301</a>
(S) Decachlorobiphenyl	84.0		10.0-143		10/10/2016 12:03	<a href="#">WG915301</a>
(S) Tetrachloro-m-xylene	78.4		29.2-144		10/10/2016 12:03	<a href="#">WG915301</a>



Collected date/time: 10/04/16 08:03

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Total Solids by Method 2540 G-2011

Analyte	Result	Qualifier	Dilution	Analysis date / time	Batch
Total Solids	99.2		1	10/07/2016 10:02	<a href="#">WG914939</a>

Mercury by Method 7471A

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Mercury	ND		0.0202	1	10/07/2016 11:14	<a href="#">WG914418</a>

Metals (ICP) by Method 6010C

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Antimony	ND		2.02	1	10/10/2016 11:19	<a href="#">WG915060</a>
Arsenic	2.30		2.02	1	10/10/2016 11:19	<a href="#">WG915060</a>
Barium	75.3		0.504	1	10/10/2016 11:19	<a href="#">WG915060</a>
Beryllium	0.332		0.202	1	10/10/2016 11:19	<a href="#">WG915060</a>
Cadmium	ND		0.504	1	10/10/2016 11:19	<a href="#">WG915060</a>
Chromium	7.85		1.01	1	10/10/2016 11:19	<a href="#">WG915060</a>
Cobalt	10.1		1.01	1	10/10/2016 11:19	<a href="#">WG915060</a>
Copper	8.39		2.02	1	10/10/2016 11:19	<a href="#">WG915060</a>
Lead	4.73		0.504	1	10/10/2016 11:19	<a href="#">WG915060</a>
Molybdenum	ND		0.504	1	10/10/2016 11:19	<a href="#">WG915060</a>
Nickel	10.1		2.02	1	10/10/2016 11:19	<a href="#">WG915060</a>
Selenium	ND		2.02	1	10/10/2016 11:19	<a href="#">WG915060</a>
Silver	ND		1.01	1	10/10/2016 11:19	<a href="#">WG915060</a>
Thallium	ND		2.02	1	10/10/2016 11:19	<a href="#">WG915060</a>
Vanadium	46.6		2.02	1	10/10/2016 11:19	<a href="#">WG915060</a>
Zinc	58.8		5.04	1	10/12/2016 12:09	<a href="#">WG916216</a>

Chlorinated Acid Herbicides (GC) by Method 8151

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
2,4-D	ND		0.0706	1	10/12/2016 02:01	<a href="#">WG915615</a>
Dalapon	ND		0.0706	1	10/12/2016 02:01	<a href="#">WG915615</a>
2,4-DB	ND	<u>J4</u>	0.0706	1	10/12/2016 02:01	<a href="#">WG915615</a>
Dicamba	ND		0.0706	1	10/12/2016 02:01	<a href="#">WG915615</a>
Dichloroprop	ND		0.0706	1	10/12/2016 02:01	<a href="#">WG915615</a>
Dinoseb	ND		0.0706	1	10/12/2016 02:01	<a href="#">WG915615</a>
MCPA	ND		6.55	1	10/12/2016 02:01	<a href="#">WG915615</a>
MCPP	ND		6.55	1	10/12/2016 02:01	<a href="#">WG915615</a>
2,4,5-T	ND		0.0706	1	10/12/2016 02:01	<a href="#">WG915615</a>
2,4,5-TP (Silvex)	ND		0.0706	1	10/12/2016 02:01	<a href="#">WG915615</a>
(S) 2,4-Dichlorophenyl Acetic Acid	109		15.0-122		10/12/2016 02:01	<a href="#">WG915615</a>

OP Pesticides by Method 8141

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Azinphos-Methyl	ND		0.101	1	10/12/2016 14:47	<a href="#">WG916127</a>
Bolstar (Sulprofos)	ND		0.101	1	10/12/2016 14:47	<a href="#">WG916127</a>
Chlorpyrifos	ND		0.101	1	10/12/2016 14:47	<a href="#">WG916127</a>
Coumaphos	ND		0.101	1	10/12/2016 14:47	<a href="#">WG916127</a>
Demeton,-O and -S	ND		0.0706	1	10/12/2016 14:47	<a href="#">WG916127</a>
Diazinon	ND	<u>J3</u>	0.101	1	10/12/2016 14:47	<a href="#">WG916127</a>
Dichlorvos	ND		0.101	1	10/12/2016 14:47	<a href="#">WG916127</a>
Dimethoate	ND		0.101	1	10/12/2016 14:47	<a href="#">WG916127</a>
Disulfoton	ND		0.101	1	10/12/2016 14:47	<a href="#">WG916127</a>

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc



Collected date/time: 10/04/16 08:03

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OP Pesticides by Method 8141

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
EPN	ND		0.101	1	10/12/2016 14:47	<a href="#">WG916127</a>
Ethoprop	ND		0.101	1	10/12/2016 14:47	<a href="#">WG916127</a>
Ethyl Parathion	ND		0.101	1	10/12/2016 14:47	<a href="#">WG916127</a>
Fensulfothion	ND	J3	0.101	1	10/12/2016 14:47	<a href="#">WG916127</a>
Fenthion	ND		0.101	1	10/12/2016 14:47	<a href="#">WG916127</a>
Malathion	ND		0.101	1	10/12/2016 14:47	<a href="#">WG916127</a>
Merphos	ND		0.101	1	10/12/2016 14:47	<a href="#">WG916127</a>
Methyl parathion	ND		0.101	1	10/12/2016 14:47	<a href="#">WG916127</a>
Mevinphos	ND		0.101	1	10/12/2016 14:47	<a href="#">WG916127</a>
Naled	ND	J3	0.101	1	10/12/2016 14:47	<a href="#">WG916127</a>
Phorate	ND		0.101	1	10/12/2016 14:47	<a href="#">WG916127</a>
Ronnel	ND		0.101	1	10/12/2016 14:47	<a href="#">WG916127</a>
Stirophos	ND		0.101	1	10/12/2016 14:47	<a href="#">WG916127</a>
Sulfotep	ND		0.101	1	10/12/2016 14:47	<a href="#">WG916127</a>
TEPP	ND	J3	1.01	1	10/12/2016 14:47	<a href="#">WG916127</a>
Tokuthion (Prothothiofos)	ND		0.101	1	10/12/2016 14:47	<a href="#">WG916127</a>
Trichloronate	ND		0.101	1	10/12/2016 14:47	<a href="#">WG916127</a>
(S) Triphenyl Phosphate	86.2		40.0-120		10/12/2016 14:47	<a href="#">WG916127</a>

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc

Pesticides (GC) by Method 8081

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Aldrin	ND		0.0202	1	10/10/2016 12:43	<a href="#">WG915301</a>
Alpha BHC	ND		0.0202	1	10/10/2016 12:43	<a href="#">WG915301</a>
Beta BHC	ND		0.0202	1	10/10/2016 12:43	<a href="#">WG915301</a>
Delta BHC	ND		0.0202	1	10/10/2016 12:43	<a href="#">WG915301</a>
Gamma BHC	ND		0.0202	1	10/10/2016 12:43	<a href="#">WG915301</a>
Chlordane	ND		0.202	1	10/10/2016 12:43	<a href="#">WG915301</a>
4,4-DDD	ND		0.0202	1	10/10/2016 12:43	<a href="#">WG915301</a>
4,4-DDE	ND		0.0202	1	10/10/2016 12:43	<a href="#">WG915301</a>
4,4-DDT	ND		0.0202	1	10/10/2016 12:43	<a href="#">WG915301</a>
Dieldrin	ND		0.0202	1	10/10/2016 12:43	<a href="#">WG915301</a>
Endosulfan I	ND		0.0202	1	10/10/2016 12:43	<a href="#">WG915301</a>
Endosulfan II	ND		0.0202	1	10/10/2016 12:43	<a href="#">WG915301</a>
Endosulfan sulfate	ND		0.0202	1	10/10/2016 12:43	<a href="#">WG915301</a>
Endrin	ND		0.0202	1	10/10/2016 12:43	<a href="#">WG915301</a>
Endrin aldehyde	ND		0.0202	1	10/10/2016 12:43	<a href="#">WG915301</a>
Endrin ketone	ND		0.0202	1	10/10/2016 12:43	<a href="#">WG915301</a>
Hexachlorobenzene	ND		0.0202	1	10/10/2016 12:43	<a href="#">WG915301</a>
Heptachlor	ND		0.0202	1	10/10/2016 12:43	<a href="#">WG915301</a>
Heptachlor epoxide	ND		0.0202	1	10/10/2016 12:43	<a href="#">WG915301</a>
Methoxychlor	ND		0.0202	1	10/10/2016 12:43	<a href="#">WG915301</a>
Toxaphene	ND		0.403	1	10/10/2016 12:43	<a href="#">WG915301</a>
(S) Decachlorobiphenyl	84.9		10.0-143		10/10/2016 12:43	<a href="#">WG915301</a>
(S) Tetrachloro-m-xylene	80.1		29.2-144		10/10/2016 12:43	<a href="#">WG915301</a>



Total Solids by Method 2540 G-2011

Analyte	Result	Qualifier	Dilution	Analysis	Batch
	%			date / time	
Total Solids	99.0		1	10/07/2016 10:02	<a href="#">WG914939</a>

Mercury by Method 7471A

Analyte	Result (dry)	Qualifier	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg		date / time	
Mercury	ND		0.0202	1	10/07/2016 11:17	<a href="#">WG914418</a>

Metals (ICP) by Method 6010C

Analyte	Result (dry)	Qualifier	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg		date / time	
Antimony	ND		2.02	1	10/10/2016 11:21	<a href="#">WG915060</a>
Arsenic	ND		2.02	1	10/10/2016 11:21	<a href="#">WG915060</a>
Barium	72.2		0.505	1	10/10/2016 11:21	<a href="#">WG915060</a>
Beryllium	0.297		0.202	1	10/10/2016 11:21	<a href="#">WG915060</a>
Cadmium	ND		0.505	1	10/10/2016 11:21	<a href="#">WG915060</a>
Chromium	7.17		1.01	1	10/10/2016 11:21	<a href="#">WG915060</a>
Cobalt	8.79		1.01	1	10/10/2016 11:21	<a href="#">WG915060</a>
Copper	8.95		2.02	1	10/10/2016 11:21	<a href="#">WG915060</a>
Lead	5.52		0.505	1	10/10/2016 11:21	<a href="#">WG915060</a>
Molybdenum	ND		0.505	1	10/10/2016 11:21	<a href="#">WG915060</a>
Nickel	8.06		2.02	1	10/10/2016 11:21	<a href="#">WG915060</a>
Selenium	ND		2.02	1	10/10/2016 11:21	<a href="#">WG915060</a>
Silver	ND		1.01	1	10/10/2016 11:21	<a href="#">WG915060</a>
Thallium	ND		2.02	1	10/10/2016 11:21	<a href="#">WG915060</a>
Vanadium	31.7		2.02	1	10/10/2016 11:21	<a href="#">WG915060</a>
Zinc	72.2		5.05	1	10/12/2016 12:18	<a href="#">WG916216</a>

Chlorinated Acid Herbicides (GC) by Method 8151

Analyte	Result (dry)	Qualifier	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg		date / time	
2,4-D	ND		0.0707	1	10/12/2016 02:15	<a href="#">WG915615</a>
Dalapon	ND		0.0707	1	10/12/2016 02:15	<a href="#">WG915615</a>
2,4-DB	ND	<u>J4</u>	0.0707	1	10/12/2016 02:15	<a href="#">WG915615</a>
Dicamba	ND		0.0707	1	10/12/2016 02:15	<a href="#">WG915615</a>
Dichloroprop	ND		0.0707	1	10/12/2016 02:15	<a href="#">WG915615</a>
Dinoseb	ND		0.0707	1	10/12/2016 02:15	<a href="#">WG915615</a>
MCPA	ND		6.56	1	10/12/2016 02:15	<a href="#">WG915615</a>
MCPP	ND		6.56	1	10/12/2016 02:15	<a href="#">WG915615</a>
2,4,5-T	ND		0.0707	1	10/12/2016 02:15	<a href="#">WG915615</a>
2,4,5-TP (Silvex)	ND		0.0707	1	10/12/2016 02:15	<a href="#">WG915615</a>
(S) 2,4-Dichlorophenyl Acetic Acid	111		15.0-122		10/12/2016 02:15	<a href="#">WG915615</a>

OP Pesticides by Method 8141

Analyte	Result (dry)	Qualifier	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg		date / time	
Azinphos-Methyl	ND		0.101	1	10/12/2016 15:19	<a href="#">WG916127</a>
Bolstar (Sulprofos)	ND		0.101	1	10/12/2016 15:19	<a href="#">WG916127</a>
Chlorpyrifos	ND		0.101	1	10/12/2016 15:19	<a href="#">WG916127</a>
Coumaphos	ND		0.101	1	10/12/2016 15:19	<a href="#">WG916127</a>
Demeton,-O and -S	ND		0.0707	1	10/12/2016 15:19	<a href="#">WG916127</a>
Diazinon	ND	<u>J3</u>	0.101	1	10/12/2016 15:19	<a href="#">WG916127</a>
Dichlorvos	ND		0.101	1	10/12/2016 15:19	<a href="#">WG916127</a>
Dimethoate	ND		0.101	1	10/12/2016 15:19	<a href="#">WG916127</a>
Disulfoton	ND		0.101	1	10/12/2016 15:19	<a href="#">WG916127</a>

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc



Collected date/time: 10/04/16 08:27

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OP Pesticides by Method 8141

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
EPN	ND		0.101	1	10/12/2016 15:19	<a href="#">WG916127</a>
Ethoprop	ND		0.101	1	10/12/2016 15:19	<a href="#">WG916127</a>
Ethyl Parathion	ND		0.101	1	10/12/2016 15:19	<a href="#">WG916127</a>
Fensulfothion	ND	<u>J3</u>	0.101	1	10/12/2016 15:19	<a href="#">WG916127</a>
Fenthion	ND		0.101	1	10/12/2016 15:19	<a href="#">WG916127</a>
Malathion	ND		0.101	1	10/12/2016 15:19	<a href="#">WG916127</a>
Merphos	ND		0.101	1	10/12/2016 15:19	<a href="#">WG916127</a>
Methyl parathion	ND		0.101	1	10/12/2016 15:19	<a href="#">WG916127</a>
Mevinphos	ND		0.101	1	10/12/2016 15:19	<a href="#">WG916127</a>
Naled	ND	<u>J3</u>	0.101	1	10/12/2016 15:19	<a href="#">WG916127</a>
Phorate	ND		0.101	1	10/12/2016 15:19	<a href="#">WG916127</a>
Ronnel	ND		0.101	1	10/12/2016 15:19	<a href="#">WG916127</a>
Stirophos	ND		0.101	1	10/12/2016 15:19	<a href="#">WG916127</a>
Sulfotep	ND		0.101	1	10/12/2016 15:19	<a href="#">WG916127</a>
TEPP	ND	<u>J3</u>	1.01	1	10/12/2016 15:19	<a href="#">WG916127</a>
Tokuthion (Prothothiofos)	ND		0.101	1	10/12/2016 15:19	<a href="#">WG916127</a>
Trichloronate	ND		0.101	1	10/12/2016 15:19	<a href="#">WG916127</a>
<i>(S) Triphenyl Phosphate</i>	90.3		40.0-120		10/12/2016 15:19	<a href="#">WG916127</a>

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc

Pesticides (GC) by Method 8081

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Aldrin	ND		0.0202	1	10/10/2016 12:56	<a href="#">WG915301</a>
Alpha BHC	ND		0.0202	1	10/10/2016 12:56	<a href="#">WG915301</a>
Beta BHC	ND		0.0202	1	10/10/2016 12:56	<a href="#">WG915301</a>
Delta BHC	ND		0.0202	1	10/10/2016 12:56	<a href="#">WG915301</a>
Gamma BHC	ND		0.0202	1	10/10/2016 12:56	<a href="#">WG915301</a>
Chlordane	ND		0.202	1	10/10/2016 12:56	<a href="#">WG915301</a>
4,4-DDD	ND		0.0202	1	10/10/2016 12:56	<a href="#">WG915301</a>
4,4-DDE	ND		0.0202	1	10/10/2016 12:56	<a href="#">WG915301</a>
4,4-DDT	ND		0.0202	1	10/10/2016 12:56	<a href="#">WG915301</a>
Dieldrin	ND		0.0202	1	10/10/2016 12:56	<a href="#">WG915301</a>
Endosulfan I	ND		0.0202	1	10/10/2016 12:56	<a href="#">WG915301</a>
Endosulfan II	ND		0.0202	1	10/10/2016 12:56	<a href="#">WG915301</a>
Endosulfan sulfate	ND		0.0202	1	10/10/2016 12:56	<a href="#">WG915301</a>
Endrin	ND		0.0202	1	10/10/2016 12:56	<a href="#">WG915301</a>
Endrin aldehyde	ND		0.0202	1	10/10/2016 12:56	<a href="#">WG915301</a>
Endrin ketone	ND		0.0202	1	10/10/2016 12:56	<a href="#">WG915301</a>
Hexachlorobenzene	ND		0.0202	1	10/10/2016 12:56	<a href="#">WG915301</a>
Heptachlor	ND		0.0202	1	10/10/2016 12:56	<a href="#">WG915301</a>
Heptachlor epoxide	ND		0.0202	1	10/10/2016 12:56	<a href="#">WG915301</a>
Methoxychlor	ND		0.0202	1	10/10/2016 12:56	<a href="#">WG915301</a>
Toxaphene	ND		0.404	1	10/10/2016 12:56	<a href="#">WG915301</a>
<i>(S) Decachlorobiphenyl</i>	85.2		10.0-143		10/10/2016 12:56	<a href="#">WG915301</a>
<i>(S) Tetrachloro-m-xylene</i>	76.8		29.2-144		10/10/2016 12:56	<a href="#">WG915301</a>



Collected date/time: 10/04/16 08:51

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Total Solids by Method 2540 G-2011

Analyte	Result	Qualifier	Dilution	Analysis date / time	Batch
Total Solids	99.3		1	10/07/2016 10:02	<a href="#">WG914939</a>

Mercury by Method 7471A

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Mercury	ND		0.0201	1	10/07/2016 11:20	<a href="#">WG914418</a>

Metals (ICP) by Method 6010C

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Antimony	ND		2.01	1	10/10/2016 11:24	<a href="#">WG915060</a>
Arsenic	2.80		2.01	1	10/10/2016 11:24	<a href="#">WG915060</a>
Barium	81.4		0.504	1	10/10/2016 11:24	<a href="#">WG915060</a>
Beryllium	0.334		0.201	1	10/10/2016 11:24	<a href="#">WG915060</a>
Cadmium	ND		0.504	1	10/10/2016 11:24	<a href="#">WG915060</a>
Chromium	8.39		1.01	1	10/10/2016 11:24	<a href="#">WG915060</a>
Cobalt	11.0		1.01	1	10/10/2016 11:24	<a href="#">WG915060</a>
Copper	8.50		2.01	1	10/10/2016 11:24	<a href="#">WG915060</a>
Lead	5.18		0.504	1	10/10/2016 11:24	<a href="#">WG915060</a>
Molybdenum	ND		0.504	1	10/10/2016 11:24	<a href="#">WG915060</a>
Nickel	10.2		2.01	1	10/10/2016 11:24	<a href="#">WG915060</a>
Selenium	ND		2.01	1	10/10/2016 11:24	<a href="#">WG915060</a>
Silver	ND		1.01	1	10/10/2016 11:24	<a href="#">WG915060</a>
Thallium	ND		2.01	1	10/10/2016 11:24	<a href="#">WG915060</a>
Vanadium	52.0		2.01	1	10/10/2016 11:24	<a href="#">WG915060</a>
Zinc	58.5		5.04	1	10/12/2016 12:21	<a href="#">WG916216</a>

Chlorinated Acid Herbicides (GC) by Method 8151

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
2,4-D	ND		0.0705	1	10/12/2016 02:28	<a href="#">WG915615</a>
Dalapon	ND		0.0705	1	10/12/2016 02:28	<a href="#">WG915615</a>
2,4-DB	ND	<u>J4</u>	0.0705	1	10/12/2016 02:28	<a href="#">WG915615</a>
Dicamba	ND		0.0705	1	10/12/2016 02:28	<a href="#">WG915615</a>
Dichloroprop	ND		0.0705	1	10/12/2016 02:28	<a href="#">WG915615</a>
Dinoseb	ND		0.0705	1	10/12/2016 02:28	<a href="#">WG915615</a>
MCPA	ND		6.55	1	10/12/2016 02:28	<a href="#">WG915615</a>
MCPP	ND		6.55	1	10/12/2016 02:28	<a href="#">WG915615</a>
2,4,5-T	ND		0.0705	1	10/12/2016 02:28	<a href="#">WG915615</a>
2,4,5-TP (Silvex)	ND		0.0705	1	10/12/2016 02:28	<a href="#">WG915615</a>
(S) 2,4-Dichlorophenyl Acetic Acid	108		15.0-122		10/12/2016 02:28	<a href="#">WG915615</a>

OP Pesticides by Method 8141

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Azinphos-Methyl	ND		0.101	1	10/12/2016 15:50	<a href="#">WG916127</a>
Bolstar (Sulprofos)	ND		0.101	1	10/12/2016 15:50	<a href="#">WG916127</a>
Chlorpyrifos	ND		0.101	1	10/12/2016 15:50	<a href="#">WG916127</a>
Coumaphos	ND		0.101	1	10/12/2016 15:50	<a href="#">WG916127</a>
Demeton,-O and -S	ND		0.0705	1	10/12/2016 15:50	<a href="#">WG916127</a>
Diazinon	ND	<u>J3</u>	0.101	1	10/12/2016 15:50	<a href="#">WG916127</a>
Dichlorvos	ND		0.101	1	10/12/2016 15:50	<a href="#">WG916127</a>
Dimethoate	ND		0.101	1	10/12/2016 15:50	<a href="#">WG916127</a>
Disulfoton	ND		0.101	1	10/12/2016 15:50	<a href="#">WG916127</a>

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc



Collected date/time: 10/04/16 08:51

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OP Pesticides by Method 8141

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
EPN	ND		0.101	1	10/12/2016 15:50	<a href="#">WG916127</a>
Ethoprop	ND		0.101	1	10/12/2016 15:50	<a href="#">WG916127</a>
Ethyl Parathion	ND		0.101	1	10/12/2016 15:50	<a href="#">WG916127</a>
Fensulfothion	ND	J3	0.101	1	10/12/2016 15:50	<a href="#">WG916127</a>
Fenthion	ND		0.101	1	10/12/2016 15:50	<a href="#">WG916127</a>
Malathion	ND		0.101	1	10/12/2016 15:50	<a href="#">WG916127</a>
Merphos	ND		0.101	1	10/12/2016 15:50	<a href="#">WG916127</a>
Methyl parathion	ND		0.101	1	10/12/2016 15:50	<a href="#">WG916127</a>
Mevinphos	ND		0.101	1	10/12/2016 15:50	<a href="#">WG916127</a>
Naled	ND	J3	0.101	1	10/12/2016 15:50	<a href="#">WG916127</a>
Phorate	ND		0.101	1	10/12/2016 15:50	<a href="#">WG916127</a>
Ronnel	ND		0.101	1	10/12/2016 15:50	<a href="#">WG916127</a>
Stirophos	ND		0.101	1	10/12/2016 15:50	<a href="#">WG916127</a>
Sulfotep	ND		0.101	1	10/12/2016 15:50	<a href="#">WG916127</a>
TEPP	ND	J3	1.01	1	10/12/2016 15:50	<a href="#">WG916127</a>
Tokuthion (Prothothiofos)	ND		0.101	1	10/12/2016 15:50	<a href="#">WG916127</a>
Trichloronate	ND		0.101	1	10/12/2016 15:50	<a href="#">WG916127</a>
(S) Triphenyl Phosphate	84.1		40.0-120		10/12/2016 15:50	<a href="#">WG916127</a>

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc

Pesticides (GC) by Method 8081

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Aldrin	ND		0.0201	1	10/10/2016 13:09	<a href="#">WG915301</a>
Alpha BHC	ND		0.0201	1	10/10/2016 13:09	<a href="#">WG915301</a>
Beta BHC	ND		0.0201	1	10/10/2016 13:09	<a href="#">WG915301</a>
Delta BHC	ND		0.0201	1	10/10/2016 13:09	<a href="#">WG915301</a>
Gamma BHC	ND		0.0201	1	10/10/2016 13:09	<a href="#">WG915301</a>
Chlordane	ND		0.201	1	10/10/2016 13:09	<a href="#">WG915301</a>
4,4-DDD	ND		0.0201	1	10/10/2016 13:09	<a href="#">WG915301</a>
4,4-DDE	ND		0.0201	1	10/10/2016 13:09	<a href="#">WG915301</a>
4,4-DDT	ND		0.0201	1	10/10/2016 13:09	<a href="#">WG915301</a>
Dieldrin	ND		0.0201	1	10/10/2016 13:09	<a href="#">WG915301</a>
Endosulfan I	ND		0.0201	1	10/10/2016 13:09	<a href="#">WG915301</a>
Endosulfan II	ND		0.0201	1	10/10/2016 13:09	<a href="#">WG915301</a>
Endosulfan sulfate	ND		0.0201	1	10/10/2016 13:09	<a href="#">WG915301</a>
Endrin	ND		0.0201	1	10/10/2016 13:09	<a href="#">WG915301</a>
Endrin aldehyde	ND		0.0201	1	10/10/2016 13:09	<a href="#">WG915301</a>
Endrin ketone	ND		0.0201	1	10/10/2016 13:09	<a href="#">WG915301</a>
Hexachlorobenzene	ND		0.0201	1	10/10/2016 13:09	<a href="#">WG915301</a>
Heptachlor	ND		0.0201	1	10/10/2016 13:09	<a href="#">WG915301</a>
Heptachlor epoxide	ND		0.0201	1	10/10/2016 13:09	<a href="#">WG915301</a>
Methoxychlor	ND		0.0201	1	10/10/2016 13:09	<a href="#">WG915301</a>
Toxaphene	ND		0.403	1	10/10/2016 13:09	<a href="#">WG915301</a>
(S) Decachlorobiphenyl	85.7		10.0-143		10/10/2016 13:09	<a href="#">WG915301</a>
(S) Tetrachloro-m-xylene	80.5		29.2-144		10/10/2016 13:09	<a href="#">WG915301</a>



Collected date/time: 10/04/16 09:00

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Total Solids by Method 2540 G-2011

Analyte	Result	Qualifier	Dilution	Analysis	Batch
	%			date / time	
Total Solids	99.3		1	10/07/2016 10:02	<a href="#">WG914939</a>

Mercury by Method 7471A

Analyte	Result (dry)	Qualifier	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg		date / time	
Mercury	ND		0.0201	1	10/07/2016 11:23	<a href="#">WG914418</a>

Metals (ICP) by Method 6010C

Analyte	Result (dry)	Qualifier	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg		date / time	
Antimony	ND		2.01	1	10/10/2016 11:27	<a href="#">WG915060</a>
Arsenic	2.84		2.01	1	10/10/2016 11:27	<a href="#">WG915060</a>
Barium	71.6		0.503	1	10/10/2016 11:27	<a href="#">WG915060</a>
Beryllium	0.368		0.201	1	10/10/2016 11:27	<a href="#">WG915060</a>
Cadmium	ND		0.503	1	10/10/2016 11:27	<a href="#">WG915060</a>
Chromium	10.6		1.01	1	10/10/2016 11:27	<a href="#">WG915060</a>
Cobalt	11.9		1.01	1	10/10/2016 11:27	<a href="#">WG915060</a>
Copper	10.4		2.01	1	10/10/2016 11:27	<a href="#">WG915060</a>
Lead	5.15		0.503	1	10/10/2016 11:27	<a href="#">WG915060</a>
Molybdenum	ND		0.503	1	10/10/2016 11:27	<a href="#">WG915060</a>
Nickel	11.4		2.01	1	10/10/2016 11:27	<a href="#">WG915060</a>
Selenium	ND		2.01	1	10/10/2016 11:27	<a href="#">WG915060</a>
Silver	ND		1.01	1	10/10/2016 11:27	<a href="#">WG915060</a>
Thallium	ND		2.01	1	10/10/2016 11:27	<a href="#">WG915060</a>
Vanadium	60.8		2.01	1	10/10/2016 11:27	<a href="#">WG915060</a>
Zinc	65.6		5.03	1	10/12/2016 12:24	<a href="#">WG916216</a>

Chlorinated Acid Herbicides (GC) by Method 8151

Analyte	Result (dry)	Qualifier	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg		date / time	
2,4-D	ND		0.0705	1	10/12/2016 02:42	<a href="#">WG915615</a>
Dalapon	ND		0.0705	1	10/12/2016 02:42	<a href="#">WG915615</a>
2,4-DB	ND	<u>J4</u>	0.0705	1	10/12/2016 02:42	<a href="#">WG915615</a>
Dicamba	ND		0.0705	1	10/12/2016 02:42	<a href="#">WG915615</a>
Dichloroprop	ND		0.0705	1	10/12/2016 02:42	<a href="#">WG915615</a>
Dinoseb	ND		0.0705	1	10/12/2016 02:42	<a href="#">WG915615</a>
MCPA	ND		6.54	1	10/12/2016 02:42	<a href="#">WG915615</a>
MCPP	ND		6.54	1	10/12/2016 02:42	<a href="#">WG915615</a>
2,4,5-T	ND		0.0705	1	10/12/2016 02:42	<a href="#">WG915615</a>
2,4,5-TP (Silvex)	ND		0.0705	1	10/12/2016 02:42	<a href="#">WG915615</a>
(S) 2,4-Dichlorophenyl Acetic Acid	117		15.0-122		10/12/2016 02:42	<a href="#">WG915615</a>

OP Pesticides by Method 8141

Analyte	Result (dry)	Qualifier	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg		date / time	
Azinphos-Methyl	ND		0.101	1	10/12/2016 16:22	<a href="#">WG916127</a>
Bolstar (Sulprofos)	ND		0.101	1	10/12/2016 16:22	<a href="#">WG916127</a>
Chlorpyrifos	ND		0.101	1	10/12/2016 16:22	<a href="#">WG916127</a>
Coumaphos	ND		0.101	1	10/12/2016 16:22	<a href="#">WG916127</a>
Demeton,-O and -S	ND		0.0705	1	10/12/2016 16:22	<a href="#">WG916127</a>
Diazinon	ND	<u>J3</u>	0.101	1	10/12/2016 16:22	<a href="#">WG916127</a>
Dichlorvos	ND		0.101	1	10/12/2016 16:22	<a href="#">WG916127</a>
Dimethoate	ND		0.101	1	10/12/2016 16:22	<a href="#">WG916127</a>
Disulfoton	ND		0.101	1	10/12/2016 16:22	<a href="#">WG916127</a>

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc



Collected date/time: 10/04/16 09:00

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OP Pesticides by Method 8141

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
EPN	ND		0.101	1	10/12/2016 16:22	<a href="#">WG916127</a>
Ethoprop	ND		0.101	1	10/12/2016 16:22	<a href="#">WG916127</a>
Ethyl Parathion	ND		0.101	1	10/12/2016 16:22	<a href="#">WG916127</a>
Fensulfothion	ND	J3	0.101	1	10/12/2016 16:22	<a href="#">WG916127</a>
Fenthion	ND		0.101	1	10/12/2016 16:22	<a href="#">WG916127</a>
Malathion	ND		0.101	1	10/12/2016 16:22	<a href="#">WG916127</a>
Merphos	ND		0.101	1	10/12/2016 16:22	<a href="#">WG916127</a>
Methyl parathion	ND		0.101	1	10/12/2016 16:22	<a href="#">WG916127</a>
Mevinphos	ND		0.101	1	10/12/2016 16:22	<a href="#">WG916127</a>
Naled	ND	J3	0.101	1	10/12/2016 16:22	<a href="#">WG916127</a>
Phorate	ND		0.101	1	10/12/2016 16:22	<a href="#">WG916127</a>
Ronnel	ND		0.101	1	10/12/2016 16:22	<a href="#">WG916127</a>
Stirophos	ND		0.101	1	10/12/2016 16:22	<a href="#">WG916127</a>
Sulfotep	ND		0.101	1	10/12/2016 16:22	<a href="#">WG916127</a>
TEPP	ND	J3	1.01	1	10/12/2016 16:22	<a href="#">WG916127</a>
Tokuthion (Prothothiofos)	ND		0.101	1	10/12/2016 16:22	<a href="#">WG916127</a>
Trichloronate	ND		0.101	1	10/12/2016 16:22	<a href="#">WG916127</a>
(S) Triphenyl Phosphate	85.2		40.0-120		10/12/2016 16:22	<a href="#">WG916127</a>

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc

Pesticides (GC) by Method 8081

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Aldrin	ND		0.0201	1	10/10/2016 13:22	<a href="#">WG915301</a>
Alpha BHC	ND		0.0201	1	10/10/2016 13:22	<a href="#">WG915301</a>
Beta BHC	ND		0.0201	1	10/10/2016 13:22	<a href="#">WG915301</a>
Delta BHC	ND		0.0201	1	10/10/2016 13:22	<a href="#">WG915301</a>
Gamma BHC	ND		0.0201	1	10/10/2016 13:22	<a href="#">WG915301</a>
Chlordane	ND		0.201	1	10/10/2016 13:22	<a href="#">WG915301</a>
4,4-DDD	ND		0.0201	1	10/10/2016 13:22	<a href="#">WG915301</a>
4,4-DDE	ND		0.0201	1	10/10/2016 13:22	<a href="#">WG915301</a>
4,4-DDT	ND		0.0201	1	10/10/2016 13:22	<a href="#">WG915301</a>
Dieldrin	ND		0.0201	1	10/10/2016 13:22	<a href="#">WG915301</a>
Endosulfan I	ND		0.0201	1	10/10/2016 13:22	<a href="#">WG915301</a>
Endosulfan II	ND		0.0201	1	10/10/2016 13:22	<a href="#">WG915301</a>
Endosulfan sulfate	ND		0.0201	1	10/10/2016 13:22	<a href="#">WG915301</a>
Endrin	ND		0.0201	1	10/10/2016 13:22	<a href="#">WG915301</a>
Endrin aldehyde	ND		0.0201	1	10/10/2016 13:22	<a href="#">WG915301</a>
Endrin ketone	ND		0.0201	1	10/10/2016 13:22	<a href="#">WG915301</a>
Hexachlorobenzene	ND		0.0201	1	10/10/2016 13:22	<a href="#">WG915301</a>
Heptachlor	ND		0.0201	1	10/10/2016 13:22	<a href="#">WG915301</a>
Heptachlor epoxide	ND		0.0201	1	10/10/2016 13:22	<a href="#">WG915301</a>
Methoxychlor	ND		0.0201	1	10/10/2016 13:22	<a href="#">WG915301</a>
Toxaphene	ND		0.403	1	10/10/2016 13:22	<a href="#">WG915301</a>
(S) Decachlorobiphenyl	78.7		10.0-143		10/10/2016 13:22	<a href="#">WG915301</a>
(S) Tetrachloro-m-xylene	71.5		29.2-144		10/10/2016 13:22	<a href="#">WG915301</a>



Total Solids by Method 2540 G-2011

Analyte	Result	Qualifier	Dilution	Analysis	Batch
	%			date / time	
Total Solids	99.4		1	10/07/2016 10:02	<a href="#">WG914939</a>

Mercury by Method 7471A

Analyte	Result (dry)	Qualifier	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg		date / time	
Mercury	ND		0.0201	1	10/07/2016 11:26	<a href="#">WG914418</a>

Metals (ICP) by Method 6010C

Analyte	Result (dry)	Qualifier	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg		date / time	
Antimony	ND		2.01	1	10/10/2016 11:29	<a href="#">WG915060</a>
Arsenic	2.24		2.01	1	10/10/2016 11:29	<a href="#">WG915060</a>
Barium	85.4		0.503	1	10/10/2016 11:29	<a href="#">WG915060</a>
Beryllium	0.396		0.201	1	10/10/2016 11:29	<a href="#">WG915060</a>
Cadmium	ND		0.503	1	10/10/2016 11:29	<a href="#">WG915060</a>
Chromium	11.5		1.01	1	10/10/2016 11:29	<a href="#">WG915060</a>
Cobalt	12.3		1.01	1	10/10/2016 11:29	<a href="#">WG915060</a>
Copper	9.10		2.01	1	10/10/2016 11:29	<a href="#">WG915060</a>
Lead	5.86		0.503	1	10/10/2016 11:29	<a href="#">WG915060</a>
Molybdenum	ND		0.503	1	10/10/2016 11:29	<a href="#">WG915060</a>
Nickel	11.3		2.01	1	10/10/2016 11:29	<a href="#">WG915060</a>
Selenium	ND		2.01	1	10/10/2016 11:29	<a href="#">WG915060</a>
Silver	ND		1.01	1	10/10/2016 11:29	<a href="#">WG915060</a>
Thallium	ND		2.01	1	10/10/2016 11:29	<a href="#">WG915060</a>
Vanadium	60.2		2.01	1	10/10/2016 11:29	<a href="#">WG915060</a>
Zinc	64.2		5.03	1	10/12/2016 12:27	<a href="#">WG916216</a>

Chlorinated Acid Herbicides (GC) by Method 8151

Analyte	Result (dry)	Qualifier	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg		date / time	
2,4-D	ND		0.0704	1	10/12/2016 02:56	<a href="#">WG915615</a>
Dalapon	ND		0.0704	1	10/12/2016 02:56	<a href="#">WG915615</a>
2,4-DB	ND	<u>J4</u>	0.0704	1	10/12/2016 02:56	<a href="#">WG915615</a>
Dicamba	ND		0.0704	1	10/12/2016 02:56	<a href="#">WG915615</a>
Dichloroprop	ND		0.0704	1	10/12/2016 02:56	<a href="#">WG915615</a>
Dinoseb	ND		0.0704	1	10/12/2016 02:56	<a href="#">WG915615</a>
MCPA	ND		6.54	1	10/12/2016 02:56	<a href="#">WG915615</a>
MCPP	ND		6.54	1	10/12/2016 02:56	<a href="#">WG915615</a>
2,4,5-T	ND		0.0704	1	10/12/2016 02:56	<a href="#">WG915615</a>
2,4,5-TP (Silvex)	ND		0.0704	1	10/12/2016 02:56	<a href="#">WG915615</a>
(S) 2,4-Dichlorophenyl Acetic Acid	113		15.0-122		10/12/2016 02:56	<a href="#">WG915615</a>

OP Pesticides by Method 8141

Analyte	Result (dry)	Qualifier	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg		date / time	
Azinphos-Methyl	ND		0.101	1	10/12/2016 16:53	<a href="#">WG916127</a>
Bolstar (Sulprofos)	ND		0.101	1	10/12/2016 16:53	<a href="#">WG916127</a>
Chlorpyrifos	ND		0.101	1	10/12/2016 16:53	<a href="#">WG916127</a>
Coumaphos	ND		0.101	1	10/12/2016 16:53	<a href="#">WG916127</a>
Demeton,-O and -S	ND		0.0704	1	10/12/2016 16:53	<a href="#">WG916127</a>
Diazinon	ND	<u>J3</u>	0.101	1	10/12/2016 16:53	<a href="#">WG916127</a>
Dichlorvos	ND		0.101	1	10/12/2016 16:53	<a href="#">WG916127</a>
Dimethoate	ND		0.101	1	10/12/2016 16:53	<a href="#">WG916127</a>
Disulfoton	ND		0.101	1	10/12/2016 16:53	<a href="#">WG916127</a>

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc



Collected date/time: 10/04/16 10:14

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OP Pesticides by Method 8141

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
EPN	ND		0.101	1	10/12/2016 16:53	<a href="#">WG916127</a>
Ethoprop	ND		0.101	1	10/12/2016 16:53	<a href="#">WG916127</a>
Ethyl Parathion	ND		0.101	1	10/12/2016 16:53	<a href="#">WG916127</a>
Fensulfothion	ND	J3	0.101	1	10/12/2016 16:53	<a href="#">WG916127</a>
Fenthion	ND		0.101	1	10/12/2016 16:53	<a href="#">WG916127</a>
Malathion	ND		0.101	1	10/12/2016 16:53	<a href="#">WG916127</a>
Merphos	ND		0.101	1	10/12/2016 16:53	<a href="#">WG916127</a>
Methyl parathion	ND		0.101	1	10/12/2016 16:53	<a href="#">WG916127</a>
Mevinphos	ND		0.101	1	10/12/2016 16:53	<a href="#">WG916127</a>
Naled	ND	J3	0.101	1	10/12/2016 16:53	<a href="#">WG916127</a>
Phorate	ND		0.101	1	10/12/2016 16:53	<a href="#">WG916127</a>
Ronnel	ND		0.101	1	10/12/2016 16:53	<a href="#">WG916127</a>
Stirophos	ND		0.101	1	10/12/2016 16:53	<a href="#">WG916127</a>
Sulfotep	ND		0.101	1	10/12/2016 16:53	<a href="#">WG916127</a>
TEPP	ND	J3	1.01	1	10/12/2016 16:53	<a href="#">WG916127</a>
Tokuthion (Prothothiofos)	ND		0.101	1	10/12/2016 16:53	<a href="#">WG916127</a>
Trichloronate	ND		0.101	1	10/12/2016 16:53	<a href="#">WG916127</a>
(S) Triphenyl Phosphate	88.4		40.0-120		10/12/2016 16:53	<a href="#">WG916127</a>

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc

Pesticides (GC) by Method 8081

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Aldrin	ND		0.0201	1	10/10/2016 13:35	<a href="#">WG915301</a>
Alpha BHC	ND		0.0201	1	10/10/2016 13:35	<a href="#">WG915301</a>
Beta BHC	ND		0.0201	1	10/10/2016 13:35	<a href="#">WG915301</a>
Delta BHC	ND		0.0201	1	10/10/2016 13:35	<a href="#">WG915301</a>
Gamma BHC	ND		0.0201	1	10/10/2016 13:35	<a href="#">WG915301</a>
Chlordane	ND		0.201	1	10/10/2016 13:35	<a href="#">WG915301</a>
4,4-DDD	ND		0.0201	1	10/10/2016 13:35	<a href="#">WG915301</a>
4,4-DDE	ND		0.0201	1	10/10/2016 13:35	<a href="#">WG915301</a>
4,4-DDT	ND		0.0201	1	10/10/2016 13:35	<a href="#">WG915301</a>
Dieldrin	ND		0.0201	1	10/10/2016 13:35	<a href="#">WG915301</a>
Endosulfan I	ND		0.0201	1	10/10/2016 13:35	<a href="#">WG915301</a>
Endosulfan II	ND		0.0201	1	10/10/2016 13:35	<a href="#">WG915301</a>
Endosulfan sulfate	ND		0.0201	1	10/10/2016 13:35	<a href="#">WG915301</a>
Endrin	ND		0.0201	1	10/10/2016 13:35	<a href="#">WG915301</a>
Endrin aldehyde	ND		0.0201	1	10/10/2016 13:35	<a href="#">WG915301</a>
Endrin ketone	ND		0.0201	1	10/10/2016 13:35	<a href="#">WG915301</a>
Hexachlorobenzene	ND		0.0201	1	10/10/2016 13:35	<a href="#">WG915301</a>
Heptachlor	ND		0.0201	1	10/10/2016 13:35	<a href="#">WG915301</a>
Heptachlor epoxide	ND		0.0201	1	10/10/2016 13:35	<a href="#">WG915301</a>
Methoxychlor	ND		0.0201	1	10/10/2016 13:35	<a href="#">WG915301</a>
Toxaphene	ND		0.402	1	10/10/2016 13:35	<a href="#">WG915301</a>
(S) Decachlorobiphenyl	80.0		10.0-143		10/10/2016 13:35	<a href="#">WG915301</a>
(S) Tetrachloro-m-xylene	74.6		29.2-144		10/10/2016 13:35	<a href="#">WG915301</a>



Collected date/time: 10/04/16 10:07

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Total Solids by Method 2540 G-2011

Analyte	Result	Qualifier	Dilution	Analysis date / time	Batch
Total Solids	99.2		1	10/07/2016 10:02	<a href="#">WG914939</a>

Mercury by Method 7471A

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Mercury	ND		0.0202	1	10/07/2016 11:29	<a href="#">WG914418</a>

Metals (ICP) by Method 6010C

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Antimony	ND		2.02	1	10/10/2016 11:32	<a href="#">WG915060</a>
Arsenic	2.45		2.02	1	10/10/2016 11:32	<a href="#">WG915060</a>
Barium	86.3		0.504	1	10/10/2016 11:32	<a href="#">WG915060</a>
Beryllium	0.384		0.202	1	10/10/2016 11:32	<a href="#">WG915060</a>
Cadmium	ND		0.504	1	10/10/2016 11:32	<a href="#">WG915060</a>
Chromium	10.5		1.01	1	10/10/2016 11:32	<a href="#">WG915060</a>
Cobalt	12.3		1.01	1	10/10/2016 11:32	<a href="#">WG915060</a>
Copper	9.79		2.02	1	10/10/2016 11:32	<a href="#">WG915060</a>
Lead	5.06		0.504	1	10/10/2016 11:32	<a href="#">WG915060</a>
Molybdenum	ND		0.504	1	10/10/2016 11:32	<a href="#">WG915060</a>
Nickel	10.4		2.02	1	10/10/2016 11:32	<a href="#">WG915060</a>
Selenium	ND		2.02	1	10/10/2016 11:32	<a href="#">WG915060</a>
Silver	ND		1.01	1	10/10/2016 11:32	<a href="#">WG915060</a>
Thallium	ND		2.02	1	10/10/2016 11:32	<a href="#">WG915060</a>
Vanadium	63.0		2.02	1	10/10/2016 11:32	<a href="#">WG915060</a>
Zinc	58.7		5.04	1	10/12/2016 12:30	<a href="#">WG916216</a>

Chlorinated Acid Herbicides (GC) by Method 8151

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
2,4-D	ND		0.0706	1	10/12/2016 03:10	<a href="#">WG915615</a>
Dalapon	ND		0.0706	1	10/12/2016 03:10	<a href="#">WG915615</a>
2,4-DB	ND	<u>J4</u>	0.0706	1	10/12/2016 03:10	<a href="#">WG915615</a>
Dicamba	ND		0.0706	1	10/12/2016 03:10	<a href="#">WG915615</a>
Dichloroprop	ND		0.0706	1	10/12/2016 03:10	<a href="#">WG915615</a>
Dinoseb	ND		0.0706	1	10/12/2016 03:10	<a href="#">WG915615</a>
MCPA	ND		6.55	1	10/12/2016 03:10	<a href="#">WG915615</a>
MCPP	ND		6.55	1	10/12/2016 03:10	<a href="#">WG915615</a>
2,4,5-T	ND		0.0706	1	10/12/2016 03:10	<a href="#">WG915615</a>
2,4,5-TP (Silvex)	ND		0.0706	1	10/12/2016 03:10	<a href="#">WG915615</a>
(S) 2,4-Dichlorophenyl Acetic Acid	100		15.0-122		10/12/2016 03:10	<a href="#">WG915615</a>

OP Pesticides by Method 8141

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Azinphos-Methyl	ND		0.101	1	10/12/2016 17:25	<a href="#">WG916127</a>
Bolstar (Sulprofos)	ND		0.101	1	10/12/2016 17:25	<a href="#">WG916127</a>
Chlorpyrifos	ND		0.101	1	10/12/2016 17:25	<a href="#">WG916127</a>
Coumaphos	ND		0.101	1	10/12/2016 17:25	<a href="#">WG916127</a>
Demeton,-O and -S	ND		0.0706	1	10/12/2016 17:25	<a href="#">WG916127</a>
Diazinon	ND	<u>J6</u>	0.101	1	10/12/2016 17:25	<a href="#">WG916127</a>
Dichlorvos	ND		0.101	1	10/12/2016 17:25	<a href="#">WG916127</a>
Dimethoate	ND	<u>J3</u>	0.101	1	10/12/2016 17:25	<a href="#">WG916127</a>
Disulfoton	ND		0.101	1	10/12/2016 17:25	<a href="#">WG916127</a>

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Collected date/time: 10/04/16 10:07

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OP Pesticides by Method 8141

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
EPN	ND		0.101	1	10/12/2016 17:25	<a href="#">WG916127</a>
Ethoprop	ND		0.101	1	10/12/2016 17:25	<a href="#">WG916127</a>
Ethyl Parathion	ND		0.101	1	10/12/2016 17:25	<a href="#">WG916127</a>
Fensulfothion	ND	J3	0.101	1	10/12/2016 17:25	<a href="#">WG916127</a>
Fenthion	ND		0.101	1	10/12/2016 17:25	<a href="#">WG916127</a>
Malathion	ND		0.101	1	10/12/2016 17:25	<a href="#">WG916127</a>
Merphos	ND		0.101	1	10/12/2016 17:25	<a href="#">WG916127</a>
Methyl parathion	ND		0.101	1	10/12/2016 17:25	<a href="#">WG916127</a>
Mevinphos	ND		0.101	1	10/12/2016 17:25	<a href="#">WG916127</a>
Naled	ND		0.101	1	10/12/2016 17:25	<a href="#">WG916127</a>
Phorate	ND		0.101	1	10/12/2016 17:25	<a href="#">WG916127</a>
Ronnel	ND		0.101	1	10/12/2016 17:25	<a href="#">WG916127</a>
Stirophos	ND		0.101	1	10/12/2016 17:25	<a href="#">WG916127</a>
Sulfotep	ND		0.101	1	10/12/2016 17:25	<a href="#">WG916127</a>
TEPP	ND	J6	1.01	1	10/12/2016 17:25	<a href="#">WG916127</a>
Tokuthion (Prothothiofos)	ND		0.101	1	10/12/2016 17:25	<a href="#">WG916127</a>
Trichloronate	ND		0.101	1	10/12/2016 17:25	<a href="#">WG916127</a>
(S) Triphenyl Phosphate	84.9		40.0-120		10/12/2016 17:25	<a href="#">WG916127</a>

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc

Pesticides (GC) by Method 8081

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Aldrin	ND		0.0202	1	10/10/2016 13:48	<a href="#">WG915301</a>
Alpha BHC	ND		0.0202	1	10/10/2016 13:48	<a href="#">WG915301</a>
Beta BHC	ND		0.0202	1	10/10/2016 13:48	<a href="#">WG915301</a>
Delta BHC	ND		0.0202	1	10/10/2016 13:48	<a href="#">WG915301</a>
Gamma BHC	ND		0.0202	1	10/10/2016 13:48	<a href="#">WG915301</a>
Chlordane	ND		0.202	1	10/10/2016 13:48	<a href="#">WG915301</a>
4,4-DDD	ND		0.0202	1	10/10/2016 13:48	<a href="#">WG915301</a>
4,4-DDE	ND		0.0202	1	10/10/2016 13:48	<a href="#">WG915301</a>
4,4-DDT	ND		0.0202	1	10/10/2016 13:48	<a href="#">WG915301</a>
Dieldrin	ND		0.0202	1	10/10/2016 13:48	<a href="#">WG915301</a>
Endosulfan I	ND		0.0202	1	10/10/2016 13:48	<a href="#">WG915301</a>
Endosulfan II	ND		0.0202	1	10/10/2016 13:48	<a href="#">WG915301</a>
Endosulfan sulfate	ND		0.0202	1	10/10/2016 13:48	<a href="#">WG915301</a>
Endrin	ND		0.0202	1	10/10/2016 13:48	<a href="#">WG915301</a>
Endrin aldehyde	ND		0.0202	1	10/10/2016 13:48	<a href="#">WG915301</a>
Endrin ketone	ND		0.0202	1	10/10/2016 13:48	<a href="#">WG915301</a>
Hexachlorobenzene	ND		0.0202	1	10/10/2016 13:48	<a href="#">WG915301</a>
Heptachlor	ND		0.0202	1	10/10/2016 13:48	<a href="#">WG915301</a>
Heptachlor epoxide	ND		0.0202	1	10/10/2016 13:48	<a href="#">WG915301</a>
Methoxychlor	ND		0.0202	1	10/10/2016 13:48	<a href="#">WG915301</a>
Toxaphene	ND		0.403	1	10/10/2016 13:48	<a href="#">WG915301</a>
(S) Decachlorobiphenyl	86.4		10.0-143		10/10/2016 13:48	<a href="#">WG915301</a>
(S) Tetrachloro-m-xylene	78.4		29.2-144		10/10/2016 13:48	<a href="#">WG915301</a>



Collected date/time: 10/04/16 09:56

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Total Solids by Method 2540 G-2011

Analyte	Result	Qualifier	Dilution	Analysis	Batch
	%			date / time	
Total Solids	99.1		1	10/07/2016 10:02	<a href="#">WG914939</a>

Mercury by Method 7471A

Analyte	Result (dry)	Qualifier	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg		date / time	
Mercury	ND		0.0202	1	10/07/2016 11:32	<a href="#">WG914418</a>

Metals (ICP) by Method 6010C

Analyte	Result (dry)	Qualifier	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg		date / time	
Antimony	ND		2.02	1	10/10/2016 11:34	<a href="#">WG915060</a>
Arsenic	2.31		2.02	1	10/10/2016 11:34	<a href="#">WG915060</a>
Barium	82.1		0.504	1	10/10/2016 11:34	<a href="#">WG915060</a>
Beryllium	0.382		0.202	1	10/10/2016 11:34	<a href="#">WG915060</a>
Cadmium	ND		0.504	1	10/10/2016 11:34	<a href="#">WG915060</a>
Chromium	10.5		1.01	1	10/10/2016 11:34	<a href="#">WG915060</a>
Cobalt	12.0		1.01	1	10/10/2016 11:34	<a href="#">WG915060</a>
Copper	9.25		2.02	1	10/10/2016 11:34	<a href="#">WG915060</a>
Lead	5.30		0.504	1	10/10/2016 11:34	<a href="#">WG915060</a>
Molybdenum	ND		0.504	1	10/10/2016 11:34	<a href="#">WG915060</a>
Nickel	10.4		2.02	1	10/10/2016 11:34	<a href="#">WG915060</a>
Selenium	ND		2.02	1	10/10/2016 11:34	<a href="#">WG915060</a>
Silver	ND		1.01	1	10/10/2016 11:34	<a href="#">WG915060</a>
Thallium	ND		2.02	1	10/10/2016 11:34	<a href="#">WG915060</a>
Vanadium	60.3		2.02	1	10/10/2016 11:34	<a href="#">WG915060</a>
Zinc	60.4		5.04	1	10/12/2016 12:33	<a href="#">WG916216</a>

Chlorinated Acid Herbicides (GC) by Method 8151

Analyte	Result (dry)	Qualifier	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg		date / time	
2,4-D	ND		0.0706	1	10/12/2016 03:24	<a href="#">WG915615</a>
Dalapon	ND		0.0706	1	10/12/2016 03:24	<a href="#">WG915615</a>
2,4-DB	ND	<u>J4</u>	0.0706	1	10/12/2016 03:24	<a href="#">WG915615</a>
Dicamba	ND		0.0706	1	10/12/2016 03:24	<a href="#">WG915615</a>
Dichloroprop	ND		0.0706	1	10/12/2016 03:24	<a href="#">WG915615</a>
Dinoseb	ND		0.0706	1	10/12/2016 03:24	<a href="#">WG915615</a>
MCPA	ND		6.56	1	10/12/2016 03:24	<a href="#">WG915615</a>
MCPP	ND		6.56	1	10/12/2016 03:24	<a href="#">WG915615</a>
2,4,5-T	ND		0.0706	1	10/12/2016 03:24	<a href="#">WG915615</a>
2,4,5-TP (Silvex)	ND		0.0706	1	10/12/2016 03:24	<a href="#">WG915615</a>
(S) 2,4-Dichlorophenyl Acetic Acid	104		15.0-122		10/12/2016 03:24	<a href="#">WG915615</a>

OP Pesticides by Method 8141

Analyte	Result (dry)	Qualifier	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg		date / time	
Azinphos-Methyl	ND		0.101	1	10/12/2016 19:00	<a href="#">WG916127</a>
Bolstar (Sulprofos)	ND		0.101	1	10/12/2016 19:00	<a href="#">WG916127</a>
Chlorpyrifos	ND		0.101	1	10/12/2016 19:00	<a href="#">WG916127</a>
Coumaphos	ND		0.101	1	10/12/2016 19:00	<a href="#">WG916127</a>
Demeton,-O and -S	ND		0.0706	1	10/12/2016 19:00	<a href="#">WG916127</a>
Diazinon	ND	<u>J3</u>	0.101	1	10/12/2016 19:00	<a href="#">WG916127</a>
Dichlorvos	ND		0.101	1	10/12/2016 19:00	<a href="#">WG916127</a>
Dimethoate	ND		0.101	1	10/12/2016 19:00	<a href="#">WG916127</a>
Disulfoton	ND		0.101	1	10/12/2016 19:00	<a href="#">WG916127</a>

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc



Collected date/time: 10/04/16 09:56

L864107

OP Pesticides by Method 8141

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
EPN	ND		0.101	1	10/12/2016 19:00	<a href="#">WG916127</a>
Ethoprop	ND		0.101	1	10/12/2016 19:00	<a href="#">WG916127</a>
Ethyl Parathion	ND		0.101	1	10/12/2016 19:00	<a href="#">WG916127</a>
Fensulfothion	ND	J3	0.101	1	10/12/2016 19:00	<a href="#">WG916127</a>
Fenthion	ND		0.101	1	10/12/2016 19:00	<a href="#">WG916127</a>
Malathion	ND		0.101	1	10/12/2016 19:00	<a href="#">WG916127</a>
Merphos	ND		0.101	1	10/12/2016 19:00	<a href="#">WG916127</a>
Methyl parathion	ND		0.101	1	10/12/2016 19:00	<a href="#">WG916127</a>
Mevinphos	ND		0.101	1	10/12/2016 19:00	<a href="#">WG916127</a>
Naled	ND	J3	0.101	1	10/12/2016 19:00	<a href="#">WG916127</a>
Phorate	ND		0.101	1	10/12/2016 19:00	<a href="#">WG916127</a>
Ronnel	ND		0.101	1	10/12/2016 19:00	<a href="#">WG916127</a>
Stirophos	ND		0.101	1	10/12/2016 19:00	<a href="#">WG916127</a>
Sulfotep	ND		0.101	1	10/12/2016 19:00	<a href="#">WG916127</a>
TEPP	ND	J3	1.01	1	10/12/2016 19:00	<a href="#">WG916127</a>
Tokuthion (Prothothiofos)	ND		0.101	1	10/12/2016 19:00	<a href="#">WG916127</a>
Trichloronate	ND		0.101	1	10/12/2016 19:00	<a href="#">WG916127</a>
(S) Triphenyl Phosphate	92.9		40.0-120		10/12/2016 19:00	<a href="#">WG916127</a>

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc

Pesticides (GC) by Method 8081

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Aldrin	ND		0.0202	1	10/10/2016 14:02	<a href="#">WG915301</a>
Alpha BHC	ND		0.0202	1	10/10/2016 14:02	<a href="#">WG915301</a>
Beta BHC	ND		0.0202	1	10/10/2016 14:02	<a href="#">WG915301</a>
Delta BHC	ND		0.0202	1	10/10/2016 14:02	<a href="#">WG915301</a>
Gamma BHC	ND		0.0202	1	10/10/2016 14:02	<a href="#">WG915301</a>
Chlordane	ND		0.202	1	10/10/2016 14:02	<a href="#">WG915301</a>
4,4-DDD	ND		0.0202	1	10/10/2016 14:02	<a href="#">WG915301</a>
4,4-DDE	ND		0.0202	1	10/10/2016 14:02	<a href="#">WG915301</a>
4,4-DDT	ND		0.0202	1	10/10/2016 14:02	<a href="#">WG915301</a>
Dieldrin	ND		0.0202	1	10/10/2016 14:02	<a href="#">WG915301</a>
Endosulfan I	ND		0.0202	1	10/10/2016 14:02	<a href="#">WG915301</a>
Endosulfan II	ND		0.0202	1	10/10/2016 14:02	<a href="#">WG915301</a>
Endosulfan sulfate	ND		0.0202	1	10/10/2016 14:02	<a href="#">WG915301</a>
Endrin	ND		0.0202	1	10/10/2016 14:02	<a href="#">WG915301</a>
Endrin aldehyde	ND		0.0202	1	10/10/2016 14:02	<a href="#">WG915301</a>
Endrin ketone	ND		0.0202	1	10/10/2016 14:02	<a href="#">WG915301</a>
Hexachlorobenzene	ND		0.0202	1	10/10/2016 14:02	<a href="#">WG915301</a>
Heptachlor	ND		0.0202	1	10/10/2016 14:02	<a href="#">WG915301</a>
Heptachlor epoxide	ND		0.0202	1	10/10/2016 14:02	<a href="#">WG915301</a>
Methoxychlor	ND		0.0202	1	10/10/2016 14:02	<a href="#">WG915301</a>
Toxaphene	ND		0.403	1	10/10/2016 14:02	<a href="#">WG915301</a>
(S) Decachlorobiphenyl	86.2		10.0-143		10/10/2016 14:02	<a href="#">WG915301</a>
(S) Tetrachloro-m-xylene	81.5		29.2-144		10/10/2016 14:02	<a href="#">WG915301</a>



Collected date/time: 10/04/16 09:09

L864107

Total Solids by Method 2540 G-2011

Analyte	Result	Qualifier	Dilution	Analysis	Batch
	%			date / time	
Total Solids	99.1		1	10/07/2016 10:02	<a href="#">WG914939</a>

Mercury by Method 7471A

Analyte	Result (dry)	Qualifier	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg		date / time	
Mercury	ND		0.0202	1	10/07/2016 11:35	<a href="#">WG914418</a>

Metals (ICP) by Method 6010C

Analyte	Result (dry)	Qualifier	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg		date / time	
Antimony	ND		2.02	1	10/10/2016 11:37	<a href="#">WG915060</a>
Arsenic	2.79		2.02	1	10/10/2016 11:37	<a href="#">WG915060</a>
Barium	82.7		0.505	1	10/10/2016 11:37	<a href="#">WG915060</a>
Beryllium	0.389		0.202	1	10/10/2016 11:37	<a href="#">WG915060</a>
Cadmium	ND		0.505	1	10/10/2016 11:37	<a href="#">WG915060</a>
Chromium	11.9		1.01	1	10/10/2016 11:37	<a href="#">WG915060</a>
Cobalt	12.1		1.01	1	10/10/2016 11:37	<a href="#">WG915060</a>
Copper	7.99		2.02	1	10/10/2016 11:37	<a href="#">WG915060</a>
Lead	5.53		0.505	1	10/10/2016 11:37	<a href="#">WG915060</a>
Molybdenum	ND		0.505	1	10/10/2016 11:37	<a href="#">WG915060</a>
Nickel	11.2		2.02	1	10/10/2016 11:37	<a href="#">WG915060</a>
Selenium	ND		2.02	1	10/10/2016 11:37	<a href="#">WG915060</a>
Silver	ND		1.01	1	10/10/2016 11:37	<a href="#">WG915060</a>
Thallium	ND		2.02	1	10/10/2016 11:37	<a href="#">WG915060</a>
Vanadium	59.8		2.02	1	10/10/2016 11:37	<a href="#">WG915060</a>
Zinc	61.0		5.05	1	10/12/2016 12:36	<a href="#">WG916216</a>

Chlorinated Acid Herbicides (GC) by Method 8151

Analyte	Result (dry)	Qualifier	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg		date / time	
2,4-D	ND		0.0707	1	10/12/2016 03:37	<a href="#">WG915615</a>
Dalapon	ND		0.0707	1	10/12/2016 03:37	<a href="#">WG915615</a>
2,4-DB	ND	<a href="#">J4</a>	0.0707	1	10/12/2016 03:37	<a href="#">WG915615</a>
Dicamba	ND		0.0707	1	10/12/2016 03:37	<a href="#">WG915615</a>
Dichloroprop	ND		0.0707	1	10/12/2016 03:37	<a href="#">WG915615</a>
Dinoseb	ND		0.0707	1	10/12/2016 03:37	<a href="#">WG915615</a>
MCPA	ND		6.56	1	10/12/2016 03:37	<a href="#">WG915615</a>
MCPP	ND		6.56	1	10/12/2016 03:37	<a href="#">WG915615</a>
2,4,5-T	ND		0.0707	1	10/12/2016 03:37	<a href="#">WG915615</a>
2,4,5-TP (Silvex)	ND		0.0707	1	10/12/2016 03:37	<a href="#">WG915615</a>
(S) 2,4-Dichlorophenyl Acetic Acid	102		15.0-122		10/12/2016 03:37	<a href="#">WG915615</a>

OP Pesticides by Method 8141

Analyte	Result (dry)	Qualifier	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg		date / time	
Azinphos-Methyl	ND		0.101	1	10/12/2016 19:31	<a href="#">WG916127</a>
Bolstar (Sulprofos)	ND		0.101	1	10/12/2016 19:31	<a href="#">WG916127</a>
Chlorpyrifos	ND		0.101	1	10/12/2016 19:31	<a href="#">WG916127</a>
Coumaphos	ND		0.101	1	10/12/2016 19:31	<a href="#">WG916127</a>
Demeton,-O and -S	ND		0.0707	1	10/12/2016 19:31	<a href="#">WG916127</a>
Diazinon	ND	<a href="#">J3</a>	0.101	1	10/12/2016 19:31	<a href="#">WG916127</a>
Dichlorvos	ND		0.101	1	10/12/2016 19:31	<a href="#">WG916127</a>
Dimethoate	ND		0.101	1	10/12/2016 19:31	<a href="#">WG916127</a>
Disulfoton	ND		0.101	1	10/12/2016 19:31	<a href="#">WG916127</a>

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc



Collected date/time: 10/04/16 09:09

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OP Pesticides by Method 8141

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
EPN	ND		0.101	1	10/12/2016 19:31	<a href="#">WG916127</a>
Ethoprop	ND		0.101	1	10/12/2016 19:31	<a href="#">WG916127</a>
Ethyl Parathion	ND		0.101	1	10/12/2016 19:31	<a href="#">WG916127</a>
Fensulfothion	ND	J3	0.101	1	10/12/2016 19:31	<a href="#">WG916127</a>
Fenthion	ND		0.101	1	10/12/2016 19:31	<a href="#">WG916127</a>
Malathion	ND		0.101	1	10/12/2016 19:31	<a href="#">WG916127</a>
Merphos	ND		0.101	1	10/12/2016 19:31	<a href="#">WG916127</a>
Methyl parathion	ND		0.101	1	10/12/2016 19:31	<a href="#">WG916127</a>
Mevinphos	ND		0.101	1	10/12/2016 19:31	<a href="#">WG916127</a>
Naled	ND	J3	0.101	1	10/12/2016 19:31	<a href="#">WG916127</a>
Phorate	ND		0.101	1	10/12/2016 19:31	<a href="#">WG916127</a>
Ronnel	ND		0.101	1	10/12/2016 19:31	<a href="#">WG916127</a>
Stirophos	ND		0.101	1	10/12/2016 19:31	<a href="#">WG916127</a>
Sulfotep	ND		0.101	1	10/12/2016 19:31	<a href="#">WG916127</a>
TEPP	ND	J3	1.01	1	10/12/2016 19:31	<a href="#">WG916127</a>
Tokuthion (Prothothiofos)	ND		0.101	1	10/12/2016 19:31	<a href="#">WG916127</a>
Trichloronate	ND		0.101	1	10/12/2016 19:31	<a href="#">WG916127</a>
(S) Triphenyl Phosphate	88.6		40.0-120		10/12/2016 19:31	<a href="#">WG916127</a>

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc

Pesticides (GC) by Method 8081

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Aldrin	ND		0.0202	1	10/10/2016 14:15	<a href="#">WG915301</a>
Alpha BHC	ND		0.0202	1	10/10/2016 14:15	<a href="#">WG915301</a>
Beta BHC	ND		0.0202	1	10/10/2016 14:15	<a href="#">WG915301</a>
Delta BHC	ND		0.0202	1	10/10/2016 14:15	<a href="#">WG915301</a>
Gamma BHC	ND		0.0202	1	10/10/2016 14:15	<a href="#">WG915301</a>
Chlordane	ND		0.202	1	10/10/2016 14:15	<a href="#">WG915301</a>
4,4-DDD	ND		0.0202	1	10/10/2016 14:15	<a href="#">WG915301</a>
4,4-DDE	ND		0.0202	1	10/10/2016 14:15	<a href="#">WG915301</a>
4,4-DDT	ND		0.0202	1	10/10/2016 14:15	<a href="#">WG915301</a>
Dieldrin	ND		0.0202	1	10/10/2016 14:15	<a href="#">WG915301</a>
Endosulfan I	ND		0.0202	1	10/10/2016 14:15	<a href="#">WG915301</a>
Endosulfan II	ND		0.0202	1	10/10/2016 14:15	<a href="#">WG915301</a>
Endosulfan sulfate	ND		0.0202	1	10/10/2016 14:15	<a href="#">WG915301</a>
Endrin	ND		0.0202	1	10/10/2016 14:15	<a href="#">WG915301</a>
Endrin aldehyde	ND		0.0202	1	10/10/2016 14:15	<a href="#">WG915301</a>
Endrin ketone	ND		0.0202	1	10/10/2016 14:15	<a href="#">WG915301</a>
Hexachlorobenzene	ND		0.0202	1	10/10/2016 14:15	<a href="#">WG915301</a>
Heptachlor	ND		0.0202	1	10/10/2016 14:15	<a href="#">WG915301</a>
Heptachlor epoxide	ND		0.0202	1	10/10/2016 14:15	<a href="#">WG915301</a>
Methoxychlor	ND		0.0202	1	10/10/2016 14:15	<a href="#">WG915301</a>
Toxaphene	ND		0.404	1	10/10/2016 14:15	<a href="#">WG915301</a>
(S) Decachlorobiphenyl	79.9		10.0-143		10/10/2016 14:15	<a href="#">WG915301</a>
(S) Tetrachloro-m-xylene	74.7		29.2-144		10/10/2016 14:15	<a href="#">WG915301</a>



Total Solids by Method 2540 G-2011

Analyte	Result	Qualifier	Dilution	Analysis	Batch
	%			date / time	
Total Solids	99.4		1	10/07/2016 10:02	<a href="#">WG914939</a>

Mercury by Method 7471A

Analyte	Result (dry)	Qualifier	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg		date / time	
Mercury	ND		0.0201	1	10/07/2016 11:38	<a href="#">WG914418</a>

Metals (ICP) by Method 6010C

Analyte	Result (dry)	Qualifier	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg		date / time	
Antimony	ND		2.01	1	10/10/2016 11:40	<a href="#">WG915060</a>
Arsenic	2.63		2.01	1	10/10/2016 11:40	<a href="#">WG915060</a>
Barium	72.5		0.503	1	10/10/2016 11:40	<a href="#">WG915060</a>
Beryllium	0.352		0.201	1	10/10/2016 11:40	<a href="#">WG915060</a>
Cadmium	ND		0.503	1	10/10/2016 11:40	<a href="#">WG915060</a>
Chromium	9.80		1.01	1	10/10/2016 11:40	<a href="#">WG915060</a>
Cobalt	11.4		1.01	1	10/10/2016 11:40	<a href="#">WG915060</a>
Copper	8.87		2.01	1	10/10/2016 11:40	<a href="#">WG915060</a>
Lead	5.20		0.503	1	10/10/2016 11:40	<a href="#">WG915060</a>
Molybdenum	ND		0.503	1	10/10/2016 11:40	<a href="#">WG915060</a>
Nickel	10.6		2.01	1	10/10/2016 11:40	<a href="#">WG915060</a>
Selenium	ND		2.01	1	10/10/2016 11:40	<a href="#">WG915060</a>
Silver	ND		1.01	1	10/10/2016 11:40	<a href="#">WG915060</a>
Thallium	ND		2.01	1	10/10/2016 11:40	<a href="#">WG915060</a>
Vanadium	55.9		2.01	1	10/10/2016 11:40	<a href="#">WG915060</a>
Zinc	54.1		5.03	1	10/12/2016 12:39	<a href="#">WG916216</a>

Chlorinated Acid Herbicides (GC) by Method 8151

Analyte	Result (dry)	Qualifier	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg		date / time	
2,4-D	ND		0.0704	1	10/12/2016 03:51	<a href="#">WG915615</a>
Dalapon	ND		0.0704	1	10/12/2016 03:51	<a href="#">WG915615</a>
2,4-DB	ND	<u>J4</u>	0.0704	1	10/12/2016 03:51	<a href="#">WG915615</a>
Dicamba	ND		0.0704	1	10/12/2016 03:51	<a href="#">WG915615</a>
Dichloroprop	ND		0.0704	1	10/12/2016 03:51	<a href="#">WG915615</a>
Dinoseb	ND		0.0704	1	10/12/2016 03:51	<a href="#">WG915615</a>
MCPA	ND		6.54	1	10/12/2016 03:51	<a href="#">WG915615</a>
MCPP	ND		6.54	1	10/12/2016 03:51	<a href="#">WG915615</a>
2,4,5-T	ND		0.0704	1	10/12/2016 03:51	<a href="#">WG915615</a>
2,4,5-TP (Silvex)	ND		0.0704	1	10/12/2016 03:51	<a href="#">WG915615</a>
(S) 2,4-Dichlorophenyl Acetic Acid	105		15.0-122		10/12/2016 03:51	<a href="#">WG915615</a>

OP Pesticides by Method 8141

Analyte	Result (dry)	Qualifier	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg		date / time	
Azinphos-Methyl	ND		0.101	1	10/12/2016 20:03	<a href="#">WG916127</a>
Bolstar (Sulprofos)	ND		0.101	1	10/12/2016 20:03	<a href="#">WG916127</a>
Chlorpyrifos	ND		0.101	1	10/12/2016 20:03	<a href="#">WG916127</a>
Coumaphos	ND		0.101	1	10/12/2016 20:03	<a href="#">WG916127</a>
Demeton,-O and -S	ND		0.0704	1	10/12/2016 20:03	<a href="#">WG916127</a>
Diazinon	ND	<u>J3</u>	0.101	1	10/12/2016 20:03	<a href="#">WG916127</a>
Dichlorvos	ND		0.101	1	10/12/2016 20:03	<a href="#">WG916127</a>
Dimethoate	ND		0.101	1	10/12/2016 20:03	<a href="#">WG916127</a>
Disulfoton	ND		0.101	1	10/12/2016 20:03	<a href="#">WG916127</a>

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc



Collected date/time: 10/04/16 09:22

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OP Pesticides by Method 8141

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
EPN	ND		0.101	1	10/12/2016 20:03	<a href="#">WG916127</a>
Ethoprop	ND		0.101	1	10/12/2016 20:03	<a href="#">WG916127</a>
Ethyl Parathion	ND		0.101	1	10/12/2016 20:03	<a href="#">WG916127</a>
Fensulfothion	ND	J3	0.101	1	10/12/2016 20:03	<a href="#">WG916127</a>
Fenthion	ND		0.101	1	10/12/2016 20:03	<a href="#">WG916127</a>
Malathion	ND		0.101	1	10/12/2016 20:03	<a href="#">WG916127</a>
Merphos	ND		0.101	1	10/12/2016 20:03	<a href="#">WG916127</a>
Methyl parathion	ND		0.101	1	10/12/2016 20:03	<a href="#">WG916127</a>
Mevinphos	ND		0.101	1	10/12/2016 20:03	<a href="#">WG916127</a>
Naled	ND	J3	0.101	1	10/12/2016 20:03	<a href="#">WG916127</a>
Phorate	ND		0.101	1	10/12/2016 20:03	<a href="#">WG916127</a>
Ronnel	ND		0.101	1	10/12/2016 20:03	<a href="#">WG916127</a>
Stirophos	ND		0.101	1	10/12/2016 20:03	<a href="#">WG916127</a>
Sulfotep	ND		0.101	1	10/12/2016 20:03	<a href="#">WG916127</a>
TEPP	ND	J3	1.01	1	10/12/2016 20:03	<a href="#">WG916127</a>
Tokuthion (Prothothiofos)	ND		0.101	1	10/12/2016 20:03	<a href="#">WG916127</a>
Trichloronate	ND		0.101	1	10/12/2016 20:03	<a href="#">WG916127</a>
(S) Triphenyl Phosphate	92.6		40.0-120		10/12/2016 20:03	<a href="#">WG916127</a>

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

Pesticides (GC) by Method 8081

Analyte	Result (dry) mg/kg	Qualifier	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Aldrin	ND		0.0201	1	10/10/2016 14:28	<a href="#">WG915301</a>
Alpha BHC	ND		0.0201	1	10/10/2016 14:28	<a href="#">WG915301</a>
Beta BHC	ND		0.0201	1	10/10/2016 14:28	<a href="#">WG915301</a>
Delta BHC	ND		0.0201	1	10/10/2016 14:28	<a href="#">WG915301</a>
Gamma BHC	ND		0.0201	1	10/10/2016 14:28	<a href="#">WG915301</a>
Chlordane	ND		0.201	1	10/10/2016 14:28	<a href="#">WG915301</a>
4,4-DDD	ND		0.0201	1	10/10/2016 14:28	<a href="#">WG915301</a>
4,4-DDE	ND		0.0201	1	10/10/2016 14:28	<a href="#">WG915301</a>
4,4-DDT	ND		0.0201	1	10/10/2016 14:28	<a href="#">WG915301</a>
Dieldrin	ND		0.0201	1	10/10/2016 14:28	<a href="#">WG915301</a>
Endosulfan I	ND		0.0201	1	10/10/2016 14:28	<a href="#">WG915301</a>
Endosulfan II	ND		0.0201	1	10/10/2016 14:28	<a href="#">WG915301</a>
Endosulfan sulfate	ND		0.0201	1	10/10/2016 14:28	<a href="#">WG915301</a>
Endrin	ND		0.0201	1	10/10/2016 14:28	<a href="#">WG915301</a>
Endrin aldehyde	ND		0.0201	1	10/10/2016 14:28	<a href="#">WG915301</a>
Endrin ketone	ND		0.0201	1	10/10/2016 14:28	<a href="#">WG915301</a>
Hexachlorobenzene	ND		0.0201	1	10/10/2016 14:28	<a href="#">WG915301</a>
Heptachlor	ND		0.0201	1	10/10/2016 14:28	<a href="#">WG915301</a>
Heptachlor epoxide	ND		0.0201	1	10/10/2016 14:28	<a href="#">WG915301</a>
Methoxychlor	ND		0.0201	1	10/10/2016 14:28	<a href="#">WG915301</a>
Toxaphene	ND		0.403	1	10/10/2016 14:28	<a href="#">WG915301</a>
(S) Decachlorobiphenyl	84.9		10.0-143		10/10/2016 14:28	<a href="#">WG915301</a>
(S) Tetrachloro-m-xylene	81.2		29.2-144		10/10/2016 14:28	<a href="#">WG915301</a>



Method Blank (MB)

(MB) R3169075-1 10/07/16 10:02

Analyte	MB Result %	<u>MB Qualifier</u>	MB MDL %	MB RDL %
Total Solids	0.000400			

L864107-01 Original Sample (OS) • Duplicate (DUP)

(OS) L864107-01 10/07/16 10:02 • (DUP) R3169075-3 10/07/16 10:02

Analyte	Original Result %	DUP Result %	Dilution	DUP RPD %	<u>DUP Qualifier</u>	DUP RPD Limits %
Total Solids	98.8	98.7	1	0.0582		5

Laboratory Control Sample (LCS)

(LCS) R3169075-2 10/07/16 10:02

Analyte	Spike Amount %	LCS Result %	LCS Rec. %	Rec. Limits %	<u>LCS Qualifier</u>
Total Solids	50.0	50.0	100	85.0-115	

1 Cp	2 Tc	3 Ss	4 Cn	5 Sr	6 Qc	7 Gl	8 Al	9 Sc
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Method Blank (MB)

(MB) R3168958-1 10/07/16 10:36

Analyte	MB Result mg/kg	<u>MB Qualifier</u>	MB MDL mg/kg	MB RD L mg/kg
Mercury	U	0.0028	0.0200	

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3168958-2 10/07/16 10:39 • (LCSD) R3168958-3 10/07/16 10:42

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCSD Result mg/kg	LCS Rec. %	LCSD Rec. %	Rec. Limits %	<u>LCS Qualifier</u>	<u>LCSD Qualifier</u>	RPD %	RPD Limits %
Mercury	0.300	0.248	0.283	83	94	80-120			13	20

L864107-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L864107-01 10/07/16 10:45 • (MS) R3168958-4 10/07/16 10:48 • (MSD) R3168958-5 10/07/16 10:51

Analyte	Spike Amount (dry) mg/kg	Original Result (dry) mg/kg	MS Result (dry) mg/kg	MSD Result (dry) mg/kg	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	<u>MS Qualifier</u>	<u>MSD Qualifier</u>	RPD %	RPD Limits %
Mercury	0.304	ND	0.268	0.262	88	86	1	75-125		2		20



Method Blank (MB)

(MB) R3169375-1 10/10/16 10:29

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Antimony	U		0.75	2.00
Arsenic	U		0.65	2.00
Barium	U		0.17	0.500
Beryllium	U		0.07	0.200
Cadmium	U		0.07	0.500
Chromium	U		0.14	1.00
Cobalt	U		0.23	1.00
Copper	U		0.53	2.00
Lead	U		0.19	0.500
Molybdenum	U		0.16	0.500
Nickel	0.695	J	0.49	2.00
Selenium	U		0.74	2.00
Silver	U		0.28	1.00
Thallium	U		0.65	2.00
Vanadium	U		0.24	2.00

**1** Cp

**2** Tc

**3** Ss

**4** Cn

**5** Sr

**6** Qc

**7** Gl

**8** Al

**9** Sc

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3169375-2 10/10/16 10:32 • (LCSD) R3169375-3 10/10/16 10:34

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCSD Result mg/kg	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD Limits %
Antimony	100	88.2	93.6	88	94	80-120		6	20
Arsenic	100	93.9	99.5	94	99	80-120		6	20
Barium	100	90.7	96.0	91	96	80-120		6	20
Beryllium	100	94.7	99.4	95	99	80-120		5	20
Cadmium	100	94.0	99.9	94	100	80-120		6	20
Chromium	100	90.6	96.4	91	96	80-120		6	20
Cobalt	100	91.2	97.0	91	97	80-120		6	20
Copper	100	94.2	100	94	100	80-120		6	20
Lead	100	88.6	94.6	89	95	80-120		7	20
Molybdenum	100	97.9	104	98	104	80-120		6	20
Nickel	100	93.2	99.3	93	99	80-120		6	20
Selenium	100	97.3	103	97	103	80-120		6	20
Silver	100	91.4	97.4	91	97	80-120		6	20
Thallium	100	84.4	89.7	84	90	80-120		6	20
Vanadium	100	92.1	97.0	92	97	80-120		5	20



L864001-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L864001-01 10/10/16 10:37 • (MS) R3169375-6 10/10/16 10:50 • (MSD) R3169375-7 10/10/16 10:52

Analyte	Spike Amount (dry)		Original Result (dry)		MS Result (dry)		MSD Result (dry)		MS Rec.	MSD Rec.	Dilution	Rec. Limits %	MS Qualifier		MSD Qualifier		RPD Limits %
	mg/kg	U	mg/kg	U	mg/kg	U	mg/kg	U					%	U	%	U	
Antimony	107	U	55.6	U	60.4	U	52	U	57	U	1	75-125	J6	J6	8	20	
Arsenic	107	U	95.7	U	102	U	90	U	96	U	1	75-125			6	20	
Barium	107	115	236	115	239	113	113	116	116	1	75-125			1	20		
Beryllium	107	1.18	97.4	1.18	103	90	90	96	96	1	75-125			6	20		
Cadmium	107	U	98.3	U	104	92	92	98	98	1	75-125			6	20		
Chromium	107	29.1	132	29.1	137	97	97	101	101	1	75-125			4	20		
Cobalt	107	17.5	127	17.5	130	102	102	106	106	1	75-125			3	20		
Copper	107	1.19	102	1.19	108	94	94	100	100	1	75-125			6	20		
Lead	107	11.9	114	11.9	119	96	96	100	100	1	75-125			4	20		
Molybdenum	107	U	93.2	U	99	88	88	93	93	1	75-125			6	20		
Nickel	107	28.1	143	28.1	148	107	107	112	112	1	75-125			4	20		
Selenium	107	U	100	U	106	94	94	100	100	1	75-125			6	20		
Silver	107	U	98.3	U	105	92	92	98	98	1	75-125			6	20		
Thallium	107	U	91.9	U	96.7	86	86	91	91	1	75-125			5	20		
Vanadium	107	40.3	141	40.3	148	95	95	101	101	1	75-125			5	20		

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Method Blank (MB)

(MB) R3170022-1 10/12/16 11:44

Analyte	MB Result mg/kg	<u>MB Qualifier</u>	MB MDL mg/kg	MB RD L mg/kg
Zinc	0.971	J	0.59	5.00

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3170022-2 10/12/16 11:46 • (LCSD) R3170022-3 10/12/16 11:48

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCSD Result mg/kg	LCS Rec. %	LCSD Rec. %	Rec. Limits %	<u>LCS Qualifier</u>	<u>LCSD Qualifier</u>	RPD %	RPD Limits %
Zinc	100	102	103	102	103	80-120			1	20

L864844-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L864844-01 10/12/16 11:51 • (MS) R3170022-6 10/12/16 12:00 • (MSD) R3170022-7 10/12/16 12:03

Analyte	Spike Amount (dry) mg/kg	Original Result (dry) mg/kg	MS Result (dry) mg/kg	MSD Result (dry) mg/kg	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	<u>MS Qualifier</u>	<u>MSD Qualifier</u>	RPD %	RPD Limits %
Zinc	140	29.5	160	165	94	97	1	75-125		3		20

Method Blank (MB)

(MB) R3170140-1 10/12/16 00:38

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RD L mg/kg
2,4-D	U		0.0110	0.0700
Dalapon	U		0.0110	0.0700
2,4-DB	U		0.0110	0.0700
Dicamba	U		0.0110	0.0700
Dichloroprop	U		0.0110	0.0700
Dinoseb	U		0.0110	0.0700
MCPA	U		1.22	6.50
MCPP	U		1.22	6.50
2,4,5-T	U		0.0110	0.0700
2,4,5-TP (Silvex)	U		0.0110	0.0700
(S) 2,4-Dichlorophenyl Acetic Acid 110				15.0-122

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 GI

8 AI

9 SC

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3170140-2 10/12/16 00:52 • (LCSD) R3170140-3 10/12/16 01:05

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCSD Result mg/kg	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
2,4-D	0.167	0.181	0.199	109	119	22.0-120			9.28	40
Dalapon	0.167	0.146	0.151	87.3	90.5	25.0-120			3.56	40
2,4-DB	0.167	0.218	0.239	131	143	26.0-120	J4	J4	8.99	40
Dicamba	0.167	0.140	0.166	83.8	99.5	34.0-121			17.1	39
Dichloroprop	0.167	0.161	0.179	96.4	107	17.0-120			10.8	40
Dinoseb	0.167	0.126	0.140	75.9	83.9	10.0-120			10.0	40
MCPA	16.7	14.8	16.6	88.6	99.9	17.0-120			12.0	40
MCPP	16.7	17.0	19.3	102	116	19.0-124			12.4	40
2,4,5-T	0.167	0.170	0.180	102	108	29.0-120			6.04	40
2,4,5-TP (Silvex)	0.167	0.150	0.157	89.7	94.4	31.0-120			5.17	40
(S) 2,4-Dichlorophenyl Acetic Acid				101	109	15.0-122				

L864107-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L864107-01 10/12/16 01:19 • (MS) R3170140-4 10/12/16 01:33 • (MSD) R3170140-5 10/12/16 01:47

Analyte	Spike Amount (dry) mg/kg	Original Result (dry) mg/kg	MS Result (dry) mg/kg	MSD Result (dry) mg/kg	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
2,4-D	0.169	ND	0.400	0.438	237	259	1	10.0-138	E J5	E J5	9.03	35
Dalapon	0.169	ND	0.181	0.169	107	100	1	12.0-120			6.92	36
2,4-DB	0.169	ND	0.440	0.404	261	239	1	10.0-146	E J5	E J5	8.61	40



L864107-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L864107-01 10/12/16 01:19 • (MS) R3170140-4 10/12/16 01:33 • (MSD) R3170140-5 10/12/16 01:47

Analyte	Spike Amount (dry)		Original Result (dry)		MS Result (dry)		MSD Result (dry)		MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%	%								
Dicamba	0.169	ND	0.137	0.119	0.137	0.119	81.4	70.7	1	16.0-135	14.0	36				
Dichloroprop	0.169	ND	0.152	0.136	0.152	0.136	89.9	80.8	1	10.0-120	10.7	34				
Dinoseb	0.169	ND	0.138	0.126	0.138	0.126	81.9	74.6	1	10.0-122	9.25	40				
MCPA	16.9	ND	21.7	21.0	21.7	21.0	129	125	1	10.0-134	3.34	40				
MCPA	16.9	ND	38.6	34.1	38.6	34.1	229	202	1	10.0-140	EJ5	40				
2,4,5-T	0.169	ND	0.178	0.169	0.178	0.169	105	99.9	1	17.0-120	5.39	32				
2,4,5-TP (Silvex)	0.169	ND	0.153	0.144	0.153	0.144	91.0	85.6	1	15.0-120	6.13	35				
(S) 2,4-Dichlorophenyl Acetic Acid							121	110		15.0-122						

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 GI

8 AI

9 Sc



Method Blank (MB)

(MB) R3170299-1 10/12/16 12:41

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RD L mg/kg
Azinphos-Methyl	U		0.00378	0:100
Bolstar (Sulprofos)	U		0.00554	0:100
Chlorpyrifos	U		0.00923	0:100
Coumaphos	U		0.00680	0:100
Demeton,-O and -S	U		0.00339	0:0700
Diazinon	U		0.00447	0:100
Dichlorvos	U		0.00969	0:100
Dimethoate	U		0.0198	0:100
Disulfoton	U		0.00498	0:100
EPN	U		0.00512	0:100
Ethoprop	U		0.00465	0:100
Ethyl Parathion	U		0.00571	0:100
Fensulfothion	U		0.0169	0:100
Fenthion	U		0.00608	0:100
Malathion	U		0.00700	0:100
Merphos	U		0.00539	0:100
Methyl parathion	U		0.00669	0:100
Mevinphos	U		0.0102	0:100
Naled	U		0.00418	0:100
Phorate	U		0.00471	0:100
Ronnel	U		0.00437	0:100
Stirophos	U		0.00537	0:100
Sulfotep	U		0.00386	0:100
TEPP	U		0.157	1:00
Tokuthion (Prothiofos)	U		0.00604	0:100
Trichloronate	U		0.00664	0:100
(S) Triphenyl Phosphate	86.4			40.0-120

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3170299-2 10/12/16 13:12 • (LCSD) R3170299-3 10/12/16 13:44

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCSD Result mg/kg	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Azinphos-Methyl	0.334	0.389	0.325	117	97.6	54.0-124			17.8	20
Bolstar (Sulprofos)	0.334	0.368	0.316	110	94.9	65.0-120			15.0	20
Chlorpyrifos	0.334	0.363	0.321	109	96.2	69.0-120			12.3	20
Coumaphos	0.334	0.341	0.284	102	85.2	58.0-122			18.3	20
Demeton,-O and -S	0.167	0.194	0.160	117	95.9	61.0-120			19.5	20
Diazinon	0.334	0.354	0.285	106	85.3	58.0-120		J3	21.8	20

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3170299-2 10/12/16 13:12 • (LCSD) R3170299-3 10/12/16 13:44

Analyte	Spike Amount		LCS Result		LCSD Result		LCS Rec.		LCSD Rec.		Rec. Limits		LCS Qualifier		LCSD Qualifier		RPD		RPD Limits	
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Dichlorvos	0.334	0.336	0.336	0.336	0.284	0.284	101	85.3	37.0-120			16.6	16.6	20			20			
Dimethoate	0.334	0.388	0.388	0.318	0.318	0.318	116	95.2	48.0-120			20.0	20.0	20			20			
Disulfoton	0.334	0.378	0.378	0.322	0.322	0.322	113	96.5	67.0-120			15.9	15.9	20			20			
EPN	0.334	0.334	0.334	0.281	0.281	0.281	100	84.1	50.0-122			17.2	17.2	20			20			
Ethoprop	0.334	0.358	0.358	0.316	0.316	0.316	107	94.6	68.0-120			12.6	12.6	20			20			
Ethyl Parathion	0.334	0.329	0.329	0.277	0.277	0.277	98.7	83.1	63.0-120			17.2	17.2	20			20			
Fensulfothion	0.334	0.401	0.401	0.321	0.321	0.321	120	96.3	43.0-121		<u>J3</u>	22.1	22.1	21			21			
Fenthion	0.334	0.393	0.393	0.339	0.339	0.339	118	102	64.0-120			14.7	14.7	20			20			
Malathion	0.334	0.348	0.348	0.294	0.294	0.294	104	88.1	67.0-120			16.8	16.8	20			20			
Merphos	0.334	0.336	0.336	0.295	0.295	0.295	101	88.5	60.0-120			12.9	12.9	20			20			
Methyl parathion	0.334	0.357	0.357	0.302	0.302	0.302	107	90.5	63.0-120			16.8	16.8	20			20			
Mevinphos	0.334	0.358	0.358	0.299	0.299	0.299	107	89.8	49.0-120			17.9	17.9	20			20			
Naled	0.334	0.333	0.333	0.247	0.247	0.247	99.9	74.1	10.0-129		<u>J3</u>	29.7	29.7	26			26			
Phorate	0.334	0.341	0.341	0.306	0.306	0.306	102	91.6	65.0-120			11.0	11.0	20			20			
Ronnel	0.334	0.369	0.369	0.328	0.328	0.328	111	98.4	67.0-120			11.9	11.9	20			20			
Stirophos	0.334	0.376	0.376	0.316	0.316	0.316	113	94.9	63.0-120			17.1	17.1	20			20			
Sulfotep	0.334	0.355	0.355	0.310	0.310	0.310	106	93.1	70.0-120			13.4	13.4	20			20			
TEPP	3.34	3.90	3.90	1.60	1.60	1.60	117	47.9	1.00-120		<u>J3</u>	83.8	83.8	40			40			
Tokuthion (Prothiofos)	0.334	0.369	0.369	0.321	0.321	0.321	111	96.2	67.0-120			14.0	14.0	20			20			
Trichloronate	0.334	0.367	0.367	0.331	0.331	0.331	110	99.1	68.0-120			10.4	10.4	20			20			
(S) Triphenyl Phosphate				108			108	90.6	40.0-120											

L864107-07 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L864107-07 10/12/16 17:25 • (MS) R3170299-4 10/12/16 17:57 • (MSD) R3170299-5 10/12/16 18:28

Analyte	Spike Amount		Original Result		MS Result		MSD Result		MSD Rec.		MS Rec.		MSD Rec.		Dilution		Rec. Limits		MS Qualifier		MSD Qualifier		RPD		RPD Limits	
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	
Azinphos-Methyl	0.336	ND	ND	0.297	0.297	0.272	0.272	88.3	81.0	50.0-124			8.55	8.55	20			20								
Bolstar (Sulprofos)	0.336	ND	ND	0.309	0.309	0.269	0.269	91.8	80.0	56.0-120			13.7	13.7	20			20								
Chlorpyrifos	0.336	ND	ND	0.306	0.306	0.272	0.272	91.0	80.8	61.0-120			11.8	11.8	20			20								
Coumaphos	0.336	ND	ND	0.262	0.262	0.223	0.223	77.8	66.2	44.0-128			16.1	16.1	20			20								
Demeton,-O and -S	0.168	ND	ND	0.138	0.138	0.126	0.126	82.1	75.1	53.0-120			8.92	8.92	20			20								
Diazinon	0.336	ND	ND	0.176	0.176	0.155	0.155	52.3	46.1	61.0-120		<u>J6</u>	12.6	12.6	20			20								
Dichlorvos	0.336	ND	ND	0.310	0.310	0.276	0.276	92.2	82.0	43.0-145			11.7	11.7	23			23								
Dimethoate	0.336	ND	ND	0.156	0.156	0.208	0.208	46.4	61.8	42.0-120		<u>J3</u>	28.4	28.4	26			26								
Disulfoton	0.336	ND	ND	0.311	0.311	0.271	0.271	92.4	80.6	56.0-120			13.5	13.5	20			20								
EPN	0.336	ND	ND	0.295	0.295	0.256	0.256	87.6	76.2	43.0-120			14.0	14.0	20			20								
Ethoprop	0.336	ND	ND	0.301	0.301	0.263	0.263	89.6	78.3	62.0-120			13.5	13.5	20			20								
Ethyl Parathion	0.336	ND	ND	0.287	0.287	0.246	0.246	85.3	73.2	58.0-120			15.3	15.3	20			20								



L864107-07 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L864107-07 10/12/16 17:25 • (MS) R3170299-4 10/12/16 17:57 • (MSD) R3170299-5 10/12/16 18:28

Analyte	Spike Amount (dry) mg/kg	Original Result (dry) mg/kg	MS Result (dry) mg/kg	MSD Result (dry) mg/kg	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier		RPD Limits	
									MS Qualifier	MSD Qualifier	RPD %	RPD %
Fensulfothion	0.336	ND	0.175	0.221	52.1	65.6	1	40.0-120		J3	23.1	23
Fenthion	0.336	ND	0.315	0.278	93.7	82.8	1	56.0-120			12.4	20
Malathion	0.336	ND	0.282	0.240	84.0	71.3	1	61.0-120			16.4	20
Merphos	0.336	ND	0.247	0.213	73.6	63.3	1	45.0-120			15.0	23
Methyl parathion	0.336	ND	0.308	0.267	91.6	79.4	1	59.0-120			14.3	20
Mevinphos	0.336	ND	0.186	0.188	55.3	55.9	1	48.0-120			1.17	20
Naled	0.336	ND	0.136	0.0992	40.4	29.5	1	10.0-127			31.3	40
Phorate	0.336	ND	0.309	0.273	92.0	81.3	1	62.0-120			12.4	20
Ronnel	0.336	ND	0.310	0.277	92.1	82.3	1	60.0-120			11.2	20
Stirophos	0.336	ND	0.303	0.263	90.2	78.2	1	54.0-120			14.3	20
Sulfotep	0.336	ND	0.301	0.257	89.4	76.3	1	64.0-120			15.8	20
TEPP	3.36	ND	ND	ND	0.000	0.000	1	1.00-144	J6	J6	0.000	39
Tokuthion (Prothothiofos)	0.336	ND	0.313	0.278	93.2	82.7	1	59.0-120			12.0	20
Trichloronate	0.336	ND	0.317	0.286	94.3	85.0	1	60.0-120			10.3	20
(S) Triphenyl Phosphate					85.3	74.3		40.0-120				



Method Blank (MB)

(MB) R3169394-3 10/10/16 11:24

Analyte	MB Result mg/kg	<u>MB Qualifier</u>	MB MDL mg/kg	MB RD L mg/kg
Aldrin	U		0.00135	0.0200
Alpha BHC	U		0.00136	0.0200
Beta BHC	U		0.00160	0.0200
Delta BHC	U		0.00143	0.0200
Gamma BHC	U		0.00145	0.0200
4,4-DDD	U		0.00156	0.0200
4,4-DDE	U		0.00154	0.0200
4,4-DDT	U		0.00200	0.0200
Dieldrin	U		0.00152	0.0200
Endosulfan I	U		0.00149	0.0200
Endosulfan II	U		0.00160	0.0200
Endosulfan Sulfate	U		0.00151	0.0200
Endrin	U		0.00157	0.0200
Endrin aldehyde	U		0.00129	0.0200
Endrin ketone	U		0.00165	0.0200
Heptachlor	U		0.00154	0.0200
Heptachlor epoxide	U		0.00161	0.0200
Hexachlorobenzene	U		0.00124	0.0200
Methoxychlor	U		0.00178	0.0200
Chlordane	U		0.0390	0.200
Toxaphene	U		0.0360	0.400
(S) Decachlorobiphenyl	84.3		10.0-143	
(S) Tetrachloro-m-xylene	78.7		29.2-144	

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3169394-1 10/10/16 10:58 • (LCSD) R3169394-2 10/10/16 11:11

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCSD Result mg/kg	LCS Rec. %	LCSD Rec. %	Rec. Limits %	<u>LCS Qualifier</u>	<u>LCSD Qualifier</u>	RPD %	RPD Limits %
Aldrin	0.0667	0.0623	0.0634	93.4	95.1	65.8-124			1.81	20
Alpha BHC	0.0667	0.0607	0.0616	91.1	92.4	65.7-126			1.42	20
Beta BHC	0.0667	0.0622	0.0634	93.2	95.1	57.6-137			1.94	20
Delta BHC	0.0667	0.0618	0.0629	92.6	94.3	65.7-124			1.81	20
Gamma BHC	0.0667	0.0608	0.0613	91.2	92.0	64.5-121			0.860	20
4,4-DDD	0.0667	0.0633	0.0629	94.9	94.4	65.6-122			0.580	20
4,4-DDE	0.0667	0.0599	0.0605	89.9	90.7	61.9-132			0.960	20
4,4-DDT	0.0667	0.0649	0.0636	97.3	95.3	57.6-125			2.11	20
Dieldrin	0.0667	0.0636	0.0639	95.3	95.8	64.1-122			0.560	20
Endosulfan I	0.0667	0.0621	0.0629	93.0	94.3	62.0-121			1.33	20



Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3169394-1 10/10/16 10:58 • (LCSD) R3169394-2 10/10/16 11:11

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCSD Result mg/kg	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Endosulfan II	0.0667	0.0639	0.0637	95.8	95.5	64.2-117			0.280	20
Endosulfan sulfate	0.0667	0.0611	0.0615	91.5	92.2	58.3-128			0.720	20
Endrin	0.0667	0.0635	0.0624	95.2	93.5	53.6-127			1.81	20
Endrin aldehyde	0.0667	0.0548	0.0559	82.1	83.8	37.4-130			2.04	20
Endrin ketone	0.0667	0.0617	0.0619	92.4	92.8	63.0-121			0.430	20
Heptachlor	0.0667	0.0629	0.0634	94.4	95.1	66.4-118			0.750	20
Heptachlor epoxide	0.0667	0.0613	0.0623	91.9	93.4	60.6-132			1.59	20
Hexachlorobenzene	0.0667	0.0590	0.0593	88.4	89.0	57.6-131			0.620	20
Methoxychlor	0.0667	0.0615	0.0604	92.3	90.6	54.8-131			1.83	20
(S) Decachlorobiphenyl				91.1	90.1	10.0-143				
(S) Tetrachloro-m-xylene				84.4	84.2	29.2-144				

L864107-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L864107-01 10/10/16 12:03 • (MS) R3169394-4 10/10/16 12:17 • (MSD) R3169394-5 10/10/16 12:30

Analyte	Spike Amount (dry) mg/kg	Original Result (dry) mg/kg	MS Result (dry) mg/kg	MSD Result (dry) mg/kg	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Aldrin	0.0675	ND	0.0590	0.0568	87.5	84.1	1	20.2-150			3.92	20
Alpha BHC	0.0675	ND	0.0584	0.0563	86.6	83.4	1	35.3-155			3.76	20
Beta BHC	0.0675	ND	0.0592	0.0572	87.7	84.8	1	30.4-160			3.40	20
Delta BHC	0.0675	ND	0.0594	0.0574	87.9	85.0	1	27.8-160			3.43	20
Gamma BHC	0.0675	ND	0.0583	0.0562	86.3	83.3	1	32.6-149			3.56	20
4,4-DDD	0.0675	ND	0.0606	0.0557	89.7	82.6	1	33.0-145			8.31	20
4,4-DDE	0.0675	ND	0.0569	0.0544	84.2	80.6	1	26.3-151			4.36	20
4,4-DDT	0.0675	ND	0.0562	0.0539	83.3	79.8	1	11.8-145			4.31	23.8
Dieldrin	0.0675	ND	0.0609	0.0587	90.2	87.0	1	24.8-149			3.63	20
Endosulfan I	0.0675	ND	0.0600	0.0577	88.8	85.5	1	20.7-152			3.78	20
Endosulfan II	0.0675	ND	0.0620	0.0582	91.9	86.2	1	22.1-150			6.41	20
Endosulfan sulfate	0.0675	ND	0.0557	0.0550	82.5	81.5	1	24.6-151			1.21	21.5
Endrin	0.0675	ND	0.0601	0.0565	89.1	83.7	1	27.3-149			6.22	21.2
Endrin aldehyde	0.0675	ND	0.0540	0.0530	80.0	78.5	1	11.0-157			1.89	20
Endrin ketone	0.0675	ND	0.0561	0.0545	83.1	80.8	1	28.5-148			2.85	20
Heptachlor	0.0675	ND	0.0591	0.0568	87.5	84.2	1	26.7-144			3.92	20
Heptachlor epoxide	0.0675	ND	0.0594	0.0573	88.0	84.8	1	25.2-155			3.71	20
Hexachlorobenzene	0.0675	ND	0.0564	0.0538	83.5	79.7	1	19.0-156			4.71	20
Methoxychlor	0.0675	ND	0.0526	0.0514	77.9	76.1	1	10.0-165			2.30	25.4
(S) Decachlorobiphenyl					80.3	76.9		10.0-143				
(S) Tetrachloro-m-xylene					77.0	72.8		29.2-144				



Abbreviations and Definitions

SDG	Sample Delivery Group.
MDL	Method Detection Limit.
RDL	Reported Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
U	Not detected at the Reporting Limit (or MDL where applicable).
RPD	Relative Percent Difference.
(dry)	Results are reported based on the dry weight of the sample. [this will only be present on a dry report basis for soils].
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
(S)	Surrogate (Surrogate Standard) - Analytes added to every blank, sample, Laboratory Control Sample/Duplicate and Matrix Spike/Duplicate; used to evaluate analytical efficiency by measuring recovery. Surrogates are not expected to be detected in all environmental media.
Rec.	Recovery.

Qualifier	Description
E	The analyte concentration exceeds the upper limit of the calibration range of the instrument established by the initial calibration (ICAL).
J	The identification of the analyte is acceptable; the reported value is an estimate.
J3	The associated batch QC was outside the established quality control range for precision.
J4	The associated batch QC was outside the established quality control range for accuracy.
J5	The sample matrix interfered with the ability to make any accurate determination; spike value is high.
J6	The sample matrix interfered with the ability to make any accurate determination; spike value is low.

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Company Name/Address:

**PBS Engineering & Environme**  
 400 Bradley Blvd. Ste 300  
 Richland, WA 99352

Billing Information:

**PBS Engineering & Environmental**  
 400 Bradley Blvd. Ste 300  
 Richland, WA 99352

Report to:

**Adam Swenson**

Email To:

adam.swenson@pbsenv.com

Project

**Richland Army National Guard Building**

City/State Collected: **Richland, WA**

Phone: **509-375-7844**

Client Project # **64395.000**

Lab Project # *Normal JAT*

Fax:

Collected by (print): **Adam Swenson**

P.O. #

Collected by (signature):

**Rush?** (Lab MUST Be Notified)  
 \_\_\_ Same Day .....200%  
 \_\_\_ Next Day .....100%  
 \_\_\_ Two Day .....50%  
 \_\_\_ Three Day .....25%

Immediately Packed on ice N \_\_\_ Y

Date Results Needed *Normal JAT*

Email? \_\_\_ No  Yes  
 FAX? \_\_\_ No \_\_\_ Yes

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	Shipped Via:	
							Rem./Contaminant	Sample # (lab only)
TP-1	Grab	SS	1	10/4/16	7:53	2		-01
TP-2	Grab	SS	1	10/4/16	8:03	3		-02
TP-3	Grab	SS	1	10/4/16	8:27	3		-03
TP-4	Grab	SS	1	10/4/16	8:51	3		-04
TP-5	Grab	SS	1	10/4/16	9:00	3		-05
TP-6	Grab	SS	1	10/4/16	10:14	3		-06
TP-7	Grab	SS	1	10/4/16	10:07	3		-07
TP-8	Grab	SS	1	10/4/16	9:56	3		-08
TP-9	Grab	SS	1	10/4/16	9:09	3		-09
TP-10	Grab	SS	1	10/4/16	9:22	3		-10

Pesticides, OP Pesticides, CI Acid Herbicides  
 Solid Soils, California title, 22 metals list

Chain of Custody Page 1 of 1

**YOUR LAB OF CHOICE**  
 12065 Lebanon Rd  
 Mount Juliet, TN 37122  
 Phone: 615-758-5858  
 Phone: 800-767-5859  
 Fax: 615-758-5859

L # **1864107**  
**G227**

Acctnum:  
 Template:  
 Prelogin:  
 TSR:  
 PB:

pH \_\_\_\_\_ Temp \_\_\_\_\_  
 Flow \_\_\_\_\_ Other \_\_\_\_\_

Samples returned via:  UPS  
 FedEx  Courier

Temp: **2.6** °C Bottles Received: **29**  
 Date: **10/5/16** Time: **0900**

Hold # \_\_\_\_\_  
 Condition: (lab use only) **JW7**  
 COC Seal Intact: Y \_\_\_ N \_\_\_  
 pH Checked:  NCF:

\* Matrix: **SS** - Soil **GW** - Groundwater **WW** - WasteWater **DW** - Drinking Water **OT** - Other

Remarks:

Relinquished by: (Signature) *ASW* Date: **10/4/16** Time: **14:45**  
 Relinquished by: (Signature) *ASW* Date: \_\_\_\_\_ Time: \_\_\_\_\_  
 Relinquished by: (Signature) *ASW* Date: \_\_\_\_\_ Time: \_\_\_\_\_

Received by: (Signature) \_\_\_\_\_ Time: \_\_\_\_\_  
 Received by: (Signature) \_\_\_\_\_ Time: \_\_\_\_\_  
 Received for lab by: (Signature) *ASW* Time: \_\_\_\_\_



L.A.B S.C.I.E.N.C.E.S

YOUR LAB OF CHOICE

### Cooler Receipt Form

Client: PBS ENG RWA      SDG# 1864107  
Cooler Received/Opened On: 10/05/16      Temperature Upon Receipt: 2.6 °C

Received By: Jeremy Watkins

Signature: *Jeremy Watkins*

#### Receipt Check List

	Yes	No	N/A
Were custody seals on outside of cooler and intact?			<input checked="" type="checkbox"/>
Were custody papers properly filled out?			
Did all bottles arrive in good condition?	<input checked="" type="checkbox"/>		
Were correct bottles used for the analyses requested?	<input checked="" type="checkbox"/>		
Was sufficient amount of sample sent in each bottle?	<input checked="" type="checkbox"/>		
Were all applicable sample containers correctly preserved and checked for preservation? (Any not in accepted range noted on COC)			<input checked="" type="checkbox"/>
If applicable, was an observable VOA headspace present?			
Non Conformance Generated. (If yes see attached NCF)			<input checked="" type="checkbox"/>

## **II. Exhibit Materials**

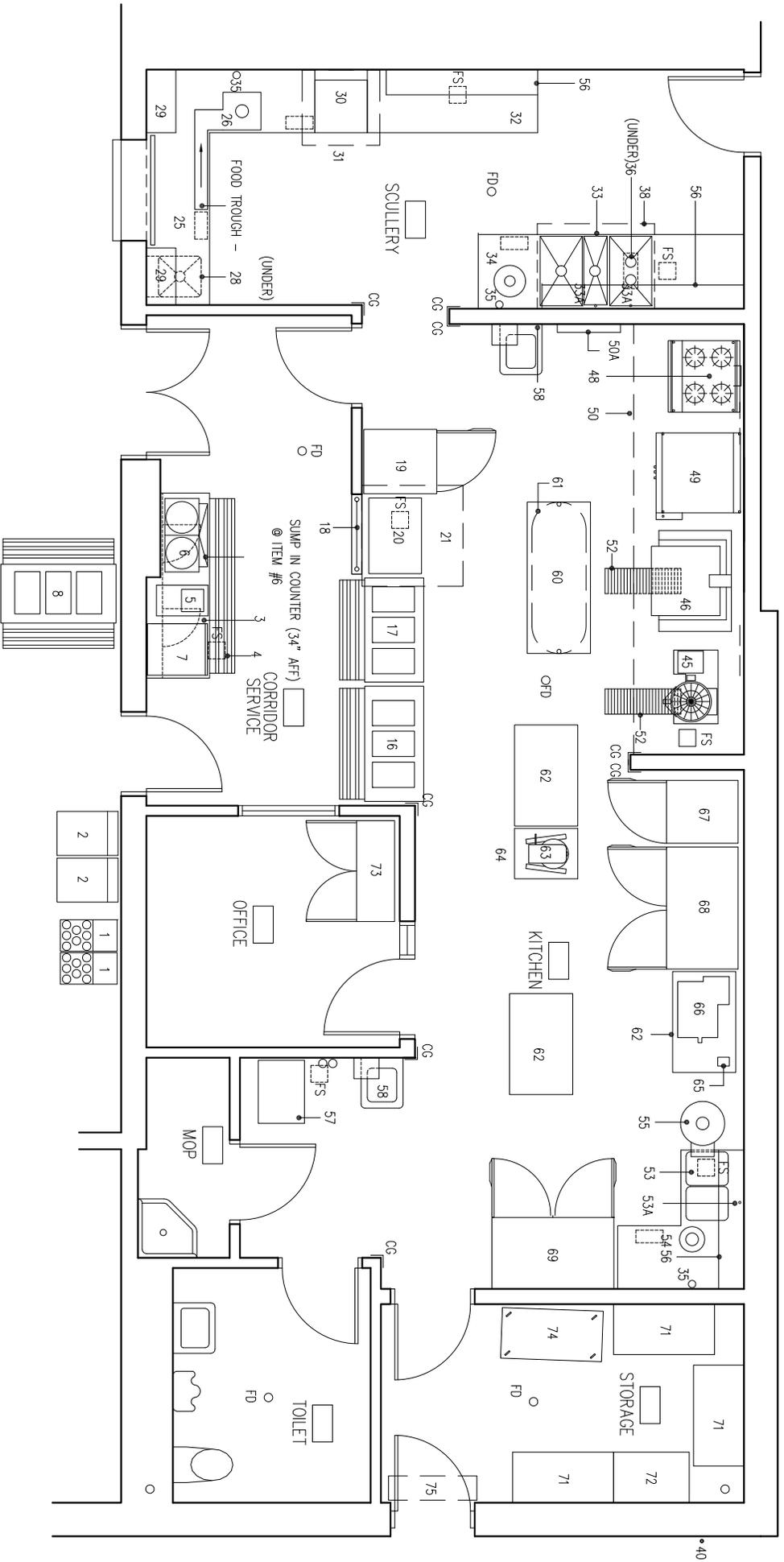
- J Kitchen Equipment Schedule, Plan & Products Information

KITCHEN EQUIPMENT SCHEDULE

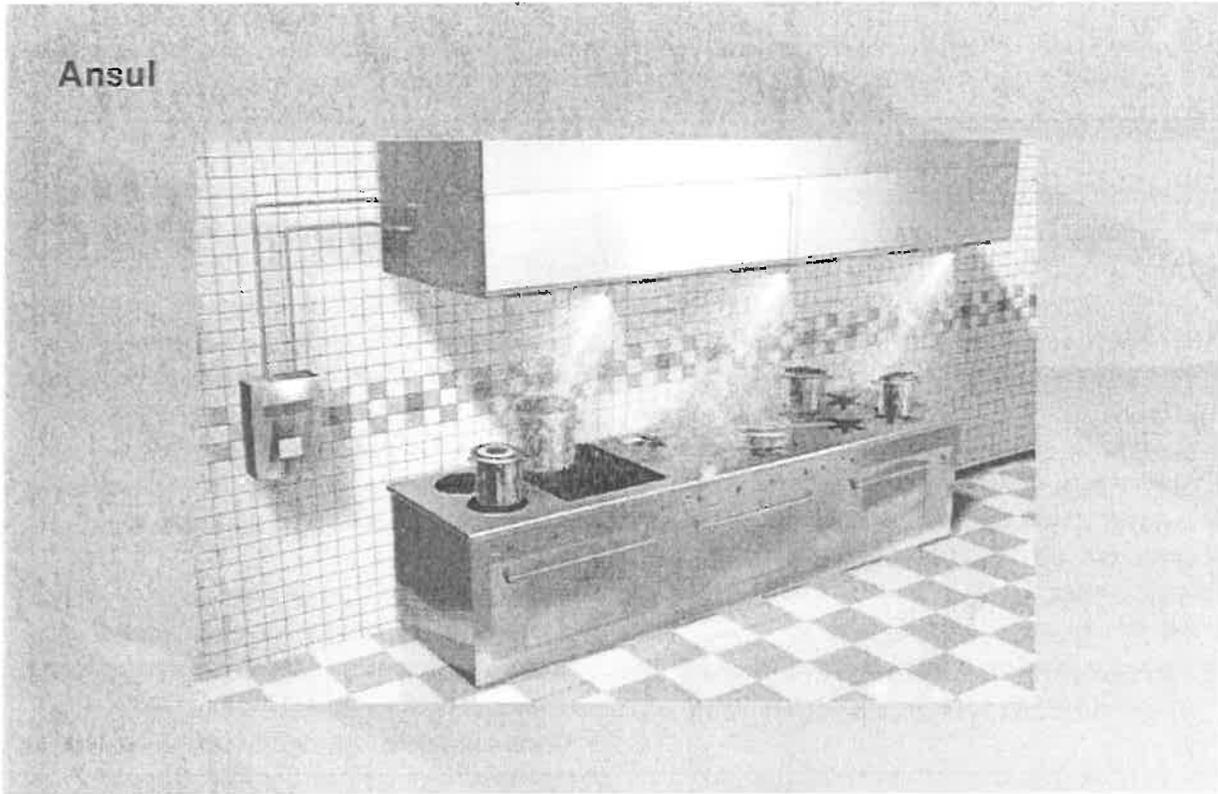
ITEM	QTY	DESCRIPTION	IN CONTRACT (CF - CI)	NOT IN CONTRACT (GF - GI)
1		TRAY / SILVER DISPENSER		
2		GLASS / CUP / BOWL DISPENSER		
3		DRINK STAND		
4		N/A		
5		JUICE DISPENSER (DOUBLE)		
6		COFFEE URN (TRIM)		
7		ICE DISPENSER W/ STORAGE BIN		
8		MOBILE FOOD COUNTER		
9-14		N/A		
15		STAINLESS STEEL COUNTER		
16		COLD FOOD PAN UNIT (DROP IN)		
17		HOT FOOD PAN UNIT (DROP IN)		
18		SOLID RIBBED TRAY SLIDE		
19		FOOD WARMING CABINET		
20		GRIDDLE		
21		VENTILATION HOOD (GREASE)		
22		N/A		
23		N/A		
24		N/A		
25		DISH TABLE (SOILED)		
26		GARBAGE DISPOSER		
27		PRE-RINSE SPRAY		
28		SILVERWARE SOAK SINK		
29		SLANTED WALL SHELF		
30		DISHWASHER		
31		VENTILATION HOOD (CONDENSATE)		
32		DISH TABLE (CLEAN)		
33		SINK POT & PAN (3 COMPARTMENT)		
34		GARBAGE DISPOSAL		
35		PRE-RINSE SPRAY		
36		BOOSTER HEATER (9 kw)		
37		HOT WATER BOOSTER HEATER		
38		VENTILATION HOOD (CONDENSATE)		
39		TROUGH DRAIN W/ GRATE		
40		CAN WASH / RINSE		

41	HOT WATER BOOSTER HEATER (DW)		
42	TOASTER		
43	N/A		
44	N/A		
45	STEAMED JACKET KETTLE		
46	PAN FRYING & BRASING (TILT TOP)		
47	WATER FILLER		
48	RANGE W/ OVEN		
49	STACK OVEN FORCED CONVECTION		
50	VENTILATION HOOD (GREASE)		
51	VENTILATION HOOD (CONDENSATE)		
52	TROUGH DRAIN W/ GRATE		
53	VEGETABLE PREP. COUNTER W/ SINK		
54	GARBAGE DISPOSER		
55	POTATO PEELER		
56	WALL SHELF		
57	ICE MAKER W/ STORAGE BIN		
58	HAND SINK		
59	FIXED WORK TABLE		
60	UTENSIL RACK		
61	N/A		
62	MOBILE TABLE		
63	MIXER		
64	MIXING MACHINE TABLE W/ ACCESSORY RACK		
65	CAN OPENER		
66	SLICER		
67	FREEZER		
68	VEGETABLE REFRIGERATOR		
69	DAIRY REFRIGERATOR		
70	N/A		
71	FOOD RACK		
72	FOOD RACK		
73	CONDIMENT LOCKERS		
74	POT AND PAN CART		
75	AIR CURTAIN FLY CONTROL (AS REQ'D)		
76	UNDER COUNTER SHELF		
77	N/A		

PIERCE COUNTY READINESS CENTER  
1300 SQFT "SMALL KITCHEN"



**Ansul**



60/ANSUL/250/010/EN

### **Equipment supplied**

The restaurant fire suppression system is a pre-engineered; wet chemical, cartridge-operated,

regulated pressure type with a fixed nozzle agent distribution network. It is listed with Underwriters Laboratories, Inc. (UL).

### **Operation instructions**

The system provides automatic actuation; or it can be actuated manually through a remote pull station. The gas or electrical supply to all protected appliances will be immediately shut off upon actuation of the system, using appropriate gas shut-off or electrical shutdown devices (if fitted, by others).

The R-102 system suppresses fire by spraying the plenum area; the filters, cooking surfaces, and the exhaust duct system with a predetermined flow rate of ANSULEX Low pH Liquid Fire Suppressant. When the liquid agent is discharged onto a cooking appliance fire, it cools the grease surface, and reacts with the hot grease (saponification) forming a layer of soap-like foam on the surface of the fat. This layer acts as insulation between the hot grease and the atmosphere, thus helping to prevent the escape of combustible vapours.

Exhaust fans in the ventilating systems should be left on. The forced draft of these fans assists the movement of the liquid agent through the ventilation system, thus aiding in the fire suppression process. These fans also provide a cooling effect in the plenum and duct after the fire suppression system has been discharged.

It is also recommended that make-up or supply-air fans be shut down upon system actuation. Shutdown of fuel and power to all appliances located under protected ventilating equipment is required upon system actuation (if fitted, by others).

For continued fire protection, the R-102 fire suppression system must be re-charged by an authorized Ansul distributor immediately after a system discharge.

## Maintenance instructions

Never use corrosive cleaning solutions on the fusible link or cables.

Check to make certain there is no corrosion to any of the detection system components. Certain high alkaline cleaners could cause corrosion.

Ensure that metal fusible links are replaced at least annually.

Deterioration of these links could cause the system to be actuated or to malfunction in case of a fire.

Make certain the releasing unit has not been tampered with, and that visual inspection seals are not broken or missing.

At daily intervals check your system for loose pipes and missing or grease covered nozzle caps. Make certain nozzle caps are in place over the ends of each nozzle.

Temporarily remove cap, check to make certain it is not brittle, and snap back on nozzle.

Check each metal blow-off cap and make certain the cap can be turned freely on the nozzle.

Periodically check your visual indicator on the releasing unit to make certain the system is cocked.

Have your system inspected by Halton Vent Master

at a maximum of 6-month intervals and immediately after major hood and duct cleaning. Often fusible links are wired shut during the cleaning process to prevent accidental activation. This will prevent the system from operating automatically. It's also possible that your system might have been disconnected, damaged, or has accumulated excessive deposits of grease causing your system to become inoperative.

Check that the manual pull station is not obstructed, has not been tampered with, and is ready for operation.

Make certain that each tank and releasing unit is mounted in an area with a temperature range of 32°. Under certain circumstances hood and duct cleaning operations may render the fire suppression system ineffective due to a coating of cleaning chemical left on the detection equipment or mishandling of the system by cleaning service personnel.

Therefore, it is strongly recommended that the R-102 system be completely inspected and serviced by an authorized Ansul distributor immediately following any such cleaning operations.

# Technical Performance data and cash sheets: R-102™ Restaurant Fire Suppression Systems

UG/ANSUL/250/010C/EN

## Features

- Low pH Agent
- Proven Design
- Reliable Cartridge Operated
- Aesthetically Appealing
- UL Listed – Meets Requirements of UL 300

## Application

The Ansul R-102 Restaurant Fire Suppression System is an automatic, pre-engineered, fire suppression system designed to protect the following areas associated with cooking equipment; ventilating equipment including hoods, ducts, plenums, and filters; fryers; griddles and range tops; upright, natural charcoal, or chain-type broilers; electric, lava rock, mesquite or gas-radiant charbroilers and woks. The system is ideally suitable for use in restaurants, hospitals, nursing homes, hotels, schools, airports,

and other similar facilities.

Use of the R-102 system is limited to interior applications only. The regulated release and tank assemblies must be mounted in an area where the air temperature will not fall below 32 °F (0 °C) or exceed 130 °F (54 °C). The system must be designed and installed within the guidelines of the UL Listed Design, Installation, Recharge, and Maintenance Manual.

## System description

The restaurant fire suppression system is a pre-engineered, wet chemical, cartridge-operated, regulated pressure type with a fixed nozzle agent distribution network. It is listed with Underwriters Laboratories, Inc. (UL).

A system owner's guide is available containing basic information pertaining to system operation and maintenance. A detailed technical manual is also available including system description, design, installation, recharge, and maintenance procedures, plus additional equipment installation and resetting instructions.

The system is installed and serviced by authorized distributors that are trained by the manufacturer. The basic system consists of an ANSUL AUTOMAN regulated release assembly which includes a regulated release mechanism and a wet chemical storage tank housed within a single enclosure. Nozzle blow-off caps, detectors, cartridges, agent, fusible links, and pulley elbows are supplied in separate packages in

the quantities needed for fire suppression system arrangements.

Additional equipment includes remote manual pull station, mechanical and electrical gas valves, pressure switches, and electrical switches for automatic equipment and gas line shut-off. Accessories can be added such as alarms, warning lights, etc., to installations where required.

Tanks can be used in multiple arrangements to allow for larger hazard coverage. Each tank is limited to a listed maximum amount of flow numbers.

The system is capable of automatic detection and actuation and/or remote manual actuation. Additional equipment is available for mechanical or electrical as line shut-off applications.

The detection portion of the fire suppression system allows for automatic detection by means of specific alloy rated fusible links, which, when the temperature exceeds the rating of the link, the link separates, allowing the regulated release to actuate.

## Component description

**Wet Chemical Agent** — The extinguishing agent is a mixture of organic salts designed for rapid flame knockdown and foam securement of grease related fires. It is available in plastic containers with instructions for wet chemical handling and usage.

**Agent Tank** — The agent tank is installed in a stainless steel enclosure or wall bracket. The tank is constructed of stainless steel.

Tanks are available in two sizes: 1.5 gallon (5.7 L) and 3.0 gallon (11.4 L). The tanks have a working pressure of 100 psi (6.9 bar), a test pressure of 300 psi (20.7 bar), and a minimum burst pressure of 600 psi (41.4 bar).

The tank includes an adaptor/cube assembly. The adaptor is chrome-plated steel with a 1/4 in. NPT female gas inlet and a 3/8 in. NPT female agent outlet. The adaptor also contains a bursting disc seal which prevents the siphoning of agent up the pipe during extreme temperature variations.

**Regulated Release Mechanism** — The regulated release mechanism is a spring-loaded, mechanical/pneumatic type capable of providing the expellant gas supply to one or two agent tanks, depending on the capacity of the gas cartridge used. It contains a factory installed regulator deadset at 100 psi (6.9 bar) with an internal relief of approximately 145 psi (10.0 bar). It has automatic actuation capabilities by a fusible link detection system and remote manual actuation by a mechanical pull station.

The regulated release mechanism contains a release assembly, regulator, expellant gas hose, and agent

storage tank housed in a stainless steel enclosure with cover. The enclosure contains knockouts for 1/2 in. conduit. The cover contains an opening for a visual status indicator.

It is compatible with mechanical gas shut-off devices; or, when equipped with a field or factory-installed switch, it is compatible with electric gas line or appliance shut-off devices.

**Regulated Actuator Assembly** — When more than two agent tanks are required, the regulated actuator is available to provide expellant gas for additional tanks. It is connected to the cartridge receiver outlet of the regulated release mechanism providing simultaneous agent discharge. It contains a regulated actuator deadset at 100 psi (6.9 bar) with an internal relief of approximately 145 psi (10.0 bar). It has automatic actuation capabilities by a fusible link detection system and remote manual actuation by a mechanical pull station.

The regulated actuator assembly contains a regulated actuator, regulator, expellant gas hose, and agent tank housed in a stainless steel enclosure with cover. The enclosure contains knockouts to permit installation of the expellant gas line.

**Discharge Nozzles** — Each discharge nozzle is tested and listed with the R-102 system for a specific application. Nozzle tips are stamped with the flow number designation (1/2, 1, 2, and 3). Each nozzle must have a metal or rubber blow-off cap to keep the nozzle tip orifice free of cooking grease build-up.

## Approvals

Applicable Standards: ULI listed under EX-3470; ULC listed under CEX-747; meets requirements of NFPA 96 (Standard for the Installation of Equipment for the

Removal of Smoke and Grease-Laden Vapours from Commercial Cooking Equipment); NFPA 17A (Standard on Wet Chemical Extinguishing Systems).

## Ordering information

Order all system components through your local authorized Ansul Distributor.

## Specifications

An Ansul R-102 Fire Suppression System shall be furnished. The system shall be capable of protecting all hazard areas associated with cooking equipment.

**1.0 General**

**1.1 References**

- 1.1.1 Underwriters Laboratories, Inc. (UL)
  - 1.1.1.1 UL Standard 1254
  - 1.1.1.2 UL Standard 300
- 1.1.2 National Fire Protection Association (NFPA)
  - 1.1.2.1 NFPA 96
  - 1.1.2.2 NFPA 17A

**1.2 Submittals**

- 1.2.1 Submit two sets of manufacturer's data sheets
- 1.2.2 Submit two sets of piping design drawings

**1.3 System Description**

- 1.3.1 The system shall be an automatic fire suppression system using a wet chemical agent for grease related fires.
- 1.3.2 The system shall be capable of suppressing fires in the following areas associated with cooking equipment: ventilating equipment including hoods, ducts, plenums, and filters; fryers; griddles and range tops; upright, natural charcoal, or chain-type broilers; electric, lava rock, mesquite or gas-radiant char-broilers.
- 1.3.3 The system shall be the pre-engineered type having minimum and maximum guidelines established by the manufacturer and listed by Underwriters Laboratories, Inc. (UL).
- 1.3.4 The system shall be installed and serviced by personnel trained by the manufacturer.
- 1.3.5 The system shall be capable of protecting cooking appliances by utilizing either dedicated appliance protection and/or overlapping appliance protection.

**1.4 Quality Control**

- 1.4.1 Manufacturer: The R-102 Restaurant Fire Suppression System shall be manufactured by a company with at least thirty years experience in the design and manufacture of preengineered fire suppression systems. The manufacturer shall be ISO 9001 registered.
- 1.4.2 Certificates: The wet agent shall be a specially formulated, aqueous solution of organic salts with a pH range between 7.8 - 8.2, designed for flame

knockdown and foam securement of grease- related fires.

**1.5 Warranty, Disclaimer, and Limitations**

1.5.1 The pre-engineered restaurant fire suppression system components shall be warranted for five years from date of delivery against defects in workmanship and mate.

**1.6 Delivery**

1.6.1 Packaging: All system components shall be securely packaged to provide protection during shipment.

**1.7 Environmental Conditions**

1.7.1 The R-102 system shall be capable of operating in a temperature range of 32 °F to 130 °F (0 °C to 54 °C).

**2.0 product**

**2.1 Manufacturer**

2.1.1 Ansul Fire Protection, One Stanton Street, Marinette, Wisconsin 54143-2542, Telephone (715) 735-7411.

**2.2 Components**

- 2.2.1 The basic system shall consist of an ANSUL AUTOMAN regulated release assembly which includes a regulated release mechanism and a wet chemical storage tank housed within a single enclosure. Nozzles, blow-off caps, detectors, cartridges, agent, fusible links, and pulley elbows shall be supplied in separate packages in the quantities needed for fire suppression system arrangements. Additional equipment shall include remote manual pull station, mechanical and electrical gas valves, pressure switches, and electrical switches for automatic equipment and gas line shut-off.
- 2.2.2 Wet Chemical Agent: The extinguishing agent shall be a specially formulated, aqueous solution of organic salts with a pH range between 7.8 – 8.2, designed for flame knockdown and foam securement of grease related fires.
- 2.2.3 Agent Tank: The agent tank shall be installed in a

stainless steel enclosure or wall bracket. The tank shall be constructed of stainless steel. Tanks shall be available in two sizes; 1.5 gallon (5.7 L) and 3.0 gallon (11.4 L). The tanks shall have a working pressure of 100 psi (6.9 bar), a test pressure of 300 psi (20.7 bar), and a minimum burst pressure of 600 psi (41.4 bar). The tank shall include an adaptor/tube assembly containing a burst disc union.

**2.2.4 Regulated Release Mechanism:** The regulated release mechanism shall be a spring-loaded, mechanical/pneumatic type capable of providing the expellant gas supply to one or two agent tanks depending on the capacity of the gas cartridge used. It shall contain a factory installed regulator deadset at 100 psi (6.9 bar) with an internal relief of approximately 145 psi (10.0 bar).

It shall have the following actuation capabilities: automatic actuation by a fusible link detection system and remote manual actuation by a mechanical pull station.

The regulated release mechanism shall contain a release assembly, regulator, expellant gas hose, and agent storage tank housed in a stainless steel enclosure with cover. The enclosure shall contain knock-outs for 1/2 in. conduit. The cover shall contain an opening for a visual status indicator.

It shall be compatible with mechanical gas shut-off devices; or, when equipped with a field or factory-installed switch, it shall be compatible with electric gas line or appliance shut-off devices.

**2.2.5 Regulated Actuator Assembly:** When more than two agent tanks are required, the regulated actuator shall be available to provide expellant gas for additional tanks. It shall be connected to the cartridge receiver outlet of the regulated release mechanism providing simultaneous agent discharge.

The regulator shall be deadset at 100 psi (6.9 bar) with an internal relief of approximately 145 psi (10.0 bar). The regulated actuator assembly shall contain a regulated actuator, regulator, expellant gas hose, and agent tank housed in a stainless steel enclosure with cover. The enclosure shall contain knockouts to permit installation of the expellant gas line.

**2.2.6 Discharge Nozzles:** Each discharge nozzle shall be tested and listed with the R-102 system for a specific application. Nozzle tips shall be stamped with the flow number designation (1/2, 1, 2, and 3). Each nozzle shall have a metal or rubber blow-off cap to keep the nozzle tip orifice free of cooking grease build-up.

**2.2.7 Distribution Piping:** Distribution piping shall be Schedule 40 black iron, chrome-plated, or stainless steel pipe conforming to ASTM A120, A53, or A106.

**2.2.8. Detectors:** The detectors shall be the fusible link style designed to separate at a specific temperature.

**2.2.9. Cartridges:** The cartridge shall be a sealed steel pressure vessel containing either carbon dioxide or nitrogen gas. The cartridge seal shall be designed to be punctured by the releasing device supplying the required pressure to expel wet chemical agent from the storage tank.

### **3.0 implementation**

#### **3.1 Installation**

**3.1.1** The R-102 fire suppression system shall be designed, installed, inspected, maintained, and recharged in accordance with the manufacturer's listed instruction manual.

#### **3.2 Training**

**3.2.1** Training shall be conducted by representatives of the manufacturer.

**R-102 FLUSHING CONCENTRATE MATERIAL SAFETY DATA SHEET ACCORDING TO 91/155/EEC**  
**ANSUL INCORPORATED MARINETTE, WI 54143-2542**

30/ANSUL/25/0106/EN

**I. Identification of the Substance / Preparation and of the Company**

I.1 Trade Name: R-102 Flushing Concentrate  
 I.2 Manufacturer/ Supplier: ANSUL INCORPORATED  
 Address: One Stanton Street, Marinette, WI 54143-2542  
 Prepared by: Health and Safety Department  
 Internet /Home Page Address: <http://www.ansul.com>  
 I.3 Emergency Phone Number: CHEMTREC 300-424-9300 or (703) 527-3887

**II. Composition / Information on Ingredients**

II.1 Chemical Formula: N/A CAS No.: N/A  
 Chemical Name: N/A This is a mixture Chemical Family: Mixture

**II.2 Substances with Exposure Limits:**

Component(s) (chemical and common name(s))	Wt. %	CAS No.	Acute Toxicity Data
Potassium Carbonate	30-35	584-08-7	Oral LD50(rat)1370 mg/kg
Potassium Acetate	18	127-08-2	Oral LD2(rat)3250 mg/kg
Yellow Food Colour	344 ppm	N/E	NDA
Water	Approx 50	7732-18-5	NDA

**III. Hazards Identification**

III.1 For Humans:  
 Threshold Limit Value: None Established  
 Routes of Entry:  
 Eye Contact: Irritant. Prolonged contact can cause chemical burns  
 Skin Contact: Irritant. Prolonged contact can cause chemical burns  
 Inhalation: Not an expected route  
 Ingestion: Irritating to mucous membrane of entry.  
 Signs and Symptoms: Acute Overexposure; Due to alkaline nature, Material irritates skin, eyes and mucous membrane. Prolonged contact may cause skin burns.  
 Chronic Exposure: None Known  
 Medical Conditions Generally: None Known  
 Chemical Listed as: National Toxicology Program: I.A.R.C. Monographs:  
 OSHA:  
 Carcinogen or Potential:  Yes  No  Yes  No  Yes  No

**IV First Aid Measures**

IV.1 Inhalation: Fresh air if symptoms occur. Seek Medical attention if irritation persists  
 IV.2 Eye Contact: Flush and irrigate with water for 15 minutes while holding eyelids open. If irritation persists, seek Medical attention  
 IV.3 Skin Contact: Wash thoroughly with soap and water. If irritation persists, seek medical attention  
 IV.4 Ingestion: Dilute by drinking large quantities of water

**V. Fire-Fighting Measures**

Special Fire Fighting Procedures: None  
 Unusual Fire and Explosion Hazards: None

**VI. Accidental Release Measures**

VI.1 Personal Precautions:  
 Protective Gloves: Rubber gloves for spill/leak  
 Eye Protection: Chemical goggles recommended during flushing procedures  
 VI.2 Environmental Precautions:  
 Steps to be taken in Case: Stop leaks. Contain Spill. Remove as much as possible. Place in closed container for proper disposal. Wash spill area with large amounts of water to remove traces and neutralize.  
 Material is released or spilled:  
 VI.3 Clean-Up Methods: Dispose of in compliance with local, state and federal regulations

**R-102 FLUSHING CONCENTRATE MATERIAL SAFETY DATA SHEET ACCORDING TO 91/155/EEC**  
**ANSUL INCORPORATED MARINETTE, WI 54143-2542**

60/AN-SUL/250/0107/FEN

**VII Storage and Handling**

VII.1 Precautions to be taken in Handling and Storage: Store in original container. Keep tightly closed. Keep separate from acid.

**VIII Exposure Controls / Personal Protection**

VIII.1 Breath Protection: N/A

VIII.2 Hand Protection: Protective Gloves: Rubber gloves for spill/leak

VIII.3 Eye Protection: Chemical goggles recommended during flushing procedures

VIII.4 Body Protection: Other Protected Clothing or Equipment: Eye wash and safety showers are good safe practices

**IX Physical and Chemical Properties**

IX.1 Appearance and Odour: Yellow coloured liquid, mild odour

IX.2 Boiling Point: 113° C Specific Gravity (H<sub>2</sub>O)=1): 1.53

IX.3 Vapour Pressure (mm Hg): Not Determined Percent Volatile by Volume(%): 50

IX.4 Vapour Density (Air =1): 1.03 Evaporation Rate ( Butyl Acetate = 1):  
Approx 0.005

IX.5 Solubility in Water: 100% Reactivity in Water: Mild exothermic

IX.6 Flash point: None to boiling Flammable Limits in Air % by Vol: N/A

**X Stability and Reactivity**

X.1 Conditions to Avoid: Stability: Unstable [ ] Conditions to Avoid: N/A  
Stable [ x ]

X.2 Hazardous Polymerisation: May Occur [ ]  
Will Not Occur [ x ]

X.3 Materials to Avoid: Incompatibility (Materials to Avoid): Reactive metals, ClF<sub>3</sub>, electrically energized equipment,  
Any material reactive with water  
Hazardous Decomposition Products: Not established, acrid fumes

**XI Ecological Information**

XI.1 Degradability: Not Determined, materials not considered to be aquatic pollutant

XI.2 Environmental Impact Rating: Not Determined, materials not considered to be aquatic pollutant

XI.3 Acute Aquatic Toxicity: Not Determined, materials not considered to be aquatic pollutant

XI.4 Other Indications: Not Determined, materials not considered to be aquatic pollutant

**XII Other Information**

XII.1 Further Information: Contact Ansul Incorporated

**ANSULEX LOW pH MATERIAL SAFETY DATA SHEET ACCORDING TO 91/155/EEC**  
**ANSUL INCORPORATED MARINETTE, WI 54143-2542**

6C/ANSUL/250/010C/EN

**I. Identification of the Substance / Preparation and of the Company**

I.1 Trade Name: ANSULEX Low pH Liquid Fire Suppressant  
 I.2 Manufacturer/ Supplier: ANSUL INCORPORATED  
 Address: One Stanton Street, Marinette, WI 54143-2542  
 Prepared by: Health and Safety Department  
 Internet /Home Page Address: <http://www.ansul.com>  
 I.3 Emergency Phone Number: CHEMTREC 800-424-9300 or (703) 527-3887

**II. Composition / Information on Ingredients**

II.1 Chemical Formula: N/A CAS No.: N/A  
 Chemical Name: N/A This is a mixture Chemical Family: Mixture

**II.2 Substances with Exposure Limits:**

Component(s) (chemical and common name(s))	Wt.%	CAS No.	Acute Toxicity Data
Proprietary mixture of organic and inorganic salts and water			NDA
Phosphoric Acid	0.2	7664-38-2	
EDTA	0.65	64-02-8	
Yellow – Green Fluorescent Dye	0.011	518-47-3	Oral LD50 (rat)6800 mg/kg

**III. Hazards Identification**

III.1 For Humans:  
 Threshold Limit Value: None Established  
 Routes of Entry:  
 Eye Contact: Irritant  
 Skin Contact: Irritant  
 Inhalation: Not an expected route  
 Ingestion: Irritating to mucous membrane of entry.  
 Signs and Symptoms: Acute Overexposure; Material irritates skin, eyes and mucous membrane  
 Chronic Exposure: None Known  
 Medical Conditions Generally: None Known  
 Chemical Listed as: National Toxicology Program: I.A.R.C. Monographs: OSHA:  
 Carcinogen or Potential:  Yes  No  Yes  No  Yes  No

**IV. First Aid Measures**

IV.1 Inhalation: Fresh air if symptoms occur. Seek Medical attention if irritation persists  
 IV.2 Eye Contact: Flush and irrigate with water for 15 minutes while holding eyelids open. If irritation persists, seek Medical attention  
 IV.3 Skin Contact: Wash thoroughly with soap and water. If irritation persists, seek medical attention  
 IV.4 Ingestion: Dilute by drinking large quantities of water

**V. Fire-Fighting Measures**

Special Fire Fighting Procedures: NONE-THIS IS AN EXTINGUISHING AGENT  
 Unusual Fire and Explosion Hazards: None

**VI. Accidental Release Measures**

VI.1 Personal Precautions:  
 Protective Gloves: Rubber gloves for spill/leak  
 Eye Protection: Chemical goggles recommended during spill/leak procedures  
 VI.2 Environmental Precautions:  
 Steps to be taken in Case Material is released or spilled: Stop leaks. Contain Spill. Remove as much as possible. Place in closed container for proper disposal. Wash spill area with large amounts of water to remove traces and neutralize.  
 VI.3 Clean-Up Methods: Dispose of in compliance with local, state and federal regulations

**ANSULEX LOW Ph MATERIAL SAFETY DATA SHEET ACCORDING TO 91/155/EEC**

**ANSUL INCORPORATED MARINETTE, WI 54143-2542**

60/ANSUL/25701007/EN

**VII Storage and Handling**

VII.1 Precautions to be taken: Store in original container. Keep tightly closed. Keep separate  
In Handling and Storage: from acid.

**VIII Exposure Controls / Personal Protection**

VIII.1 Breath Protection: N/A  
VIII.2 Hand Protection:  
Protective Gloves: Rubber gloves for spill/leak  
VIII.3 Eye Protection: Chemical goggles recommended during spill/leak procedures  
VIII.4 Body Protection: Other Protected Clothing or Equipment: Eye wash and safety showers  
are good safe practices

**IX Physical and Chemical Properties**

IX.1 Appearance and Odour: Fluorescent Yellow coloured liquid, mild odour  
IX.2 Boiling Point: 113° C Specific Gravity (H2O)=1): 1.33  
IX.3 Vapour Pressure (mm Hg): Not Determined Percent Volatile by Volume(%): 50  
IX.4 Vapour Density (Air =1): 1.03 Evaporation Rate ( =1): 0.13  
IX.5 Solubility in Water: 100% Reactivity in Water: Mild exothermic  
IX.6 Flash point: None to boiling Flammable Limits in Air % by Voi: N/A

**X Stability and Reactivity**

X.1 Conditions to Avoid: Stability: Unstable [ ] Conditions to Avoid: N/A  
Stable [ x ]  
X.2 Hazardous Polymerisation May Occur [ ]  
Will Not Occur [ x ]

**X.3 Materials to Avoid:**

Incompatibility (Materials to Avoid): Reactive metals, ClF3, electrically energized equipment,  
Any material reactive with water  
Hazardous Decomposition Products: Not established, acrid fumes

**XI Toxicology Information**

XI.1 Toxicology Information: LC50> 5000 mg/kg oral rat.

**XII Ecological Information**

XII.1 Degradability: Not Determined, materials not considered to be aquatic pollutant  
XII.2 Environmental Impact Rating: Not Determined, materials not considered to be aquatic pollutant  
XII.3 Acute Aquatic Toxicity: Not Determined, materials not considered to be aquatic pollutant  
XII.4 Other Indications: Not Determined, materials not considered to be aquatic pollutant

**XIII Other Information**

XIII.1 Further Information: Contact Ansul Incorporated

**NITROGEN MATERIAL SAFETY DATA SHEET ACCORDING TO 91/155/EEC****ANSUL INCORPORATED MARINETTE, WI 54143-2542**

80/ANSUL/250/010C/EN

**I. Identification of the Substance / Preparation and of the Company**

- I.1 Trade Name: NITROGEN
- I.2 Manufacturer/ Supplier: ANSUL INCORPORATED  
 Address: One Stanton Street, Marinette, WI 54143-2542  
 Prepared by: Health and Safety Department  
 Internet /Home Page Address: <http://www.ansul.com>
- I.3 Emergency Phone Number: CHEMTREC 800-424-9300 or (703) 527-3887

**II. Composition / Information on Ingredients**

- II.1 Chemical Formula: N<sub>2</sub> CAS No.: 7727-37-9  
 Chemical Name: Nitrogen Chemical Family: Gas

**II.2 Substances with Exposure Limits:**

Component(s) (chemical and common name(s))	Wt. %	CAS No.	Acute Toxicity Data
Nitrogen	100	7727-37-9	NDA

**III. Hazards Identification**

- III.1 For Humans:  
 Threshold Limit Value: None Listed  
 Routes of Entry:  
 Eye Contact: Avoid contact with liquefied form of N<sub>2</sub>. Can produce chilling sensation and discomfort, also frostbite.  
 Skin Contact: Evaporation of liquid from the skin can cause a chilling sensation. Frostbite can occur. Avoid N<sub>2</sub> liquid.  
 Inhalation: In high concentrations, it is a simple asphyxiant – dizziness, shortness of breath, unconsciousness, or suffocation may occur  
 Ingestion: Ingestion is not likely to occur since this material is gas at room temperature  
 Signs and Symptoms: Acute Overexposure; Dizziness, headaches, tinnitus, difficulty breathing  
 Drowsiness, depending on length of exposure and concentrations  
 Chronic Exposure; Compressed air illness  
 Medical Conditions Generally: None Known  
 Chemical Listed as: National Toxicology Program: I.A.R.C. Monographs: OSHA:  
 Carcinogen or Potential: [ ] Yes [ x ] No [ ] Yes [ x ] No [ ] Yes [ x ] No

**IV. First Aid Measures**

- IV.1 Inhalation: Fresh air if symptoms occur. If cough or other respiratory symptoms occur, consult medical personnel. If not breathing, give artificial respiration, preferably mouth-to-mouth. If breathing is difficult, give oxygen. Consult medical personnel
- IV.2 Eye Contact: Flush and irrigate with water for 15 minutes while holding eyelids open. If redness, itching or burning sensation develops, get Medical attention. Treat for frostbite if necessary
- IV.3 Skin Contact: Wash the material off the skin with copious amounts of soap and water for at least 15 minutes. If redness, itching or burning sensation develops get Medical attention. Treat for frostbite if necessary
- IV.4 Ingestion: Ingestion is not likely to occur as material is gas at room temperature

**V. Fire-Fighting Measures**

- Special Fire Fighting Procedures: Though gas cylinders are equipped with pressure and temperature relief devices, they should be removed from high temperatures or fire to avoid risk of rupture
- Unusual Fire and Explosion Hazards: None

**NITROGEN MATERIAL SAFETY DATA SHEET ACCORDING TO 91/155/EEC**

**ANSUL INCORPORATED MARINETTE, WI 54143-2542**

60/ANSUL/2E010000/EN

<b>VI.</b>	<b>Accidental Release Measures</b>		
VI.1	Personal Precautions:		
	Protective Gloves:		Protective gloves for contact with liquid
	Eye Protection:		Chemical goggles recommended when handling liquid. Full face shield if splashing is possible
VI.2	Steps to be taken in Case Material is released or spilled:		Ventilate to outside
VI.3	Waste Disposal Method:		Dispose of in compliance with local, state and federal regulations
<b>VII</b>	<b>Storage and Handling</b>		
VII.1	Precautions to be taken In Handling and Storage:		Store containers in a clean, dry well-ventilated area, away from heat above 125°F. Store as a compressed gas in DOT approved vessels. If cylinder is not attached to a system, it must be safely capped to protect against violent vessel movement or force of escaping gas if valve is actuated or seal is accidentally puncture
<b>VIII</b>	<b>Exposure Controls / Personal Protection</b>		
VIII.1	Breath Protection:		N/A
VIII.2	Hand Protection:		
	Protective Gloves:		Rubber gloves for contact with liquid
VIII.3	Eye Protection:		Chemical goggles recommended during handling. Full face shield if splashing is possible
VIII.4	Body Protection:		
	Other Protected Clothing or Equipment:		Protective clothing for contact with liquid
<b>IX</b>	<b>Physical and Chemical Properties</b>		
IX.1	Appearance and Odour:		Colourless gas with no odour
IX.2	Boiling Point:	-195.8° C	Specific Gravity (H <sub>2</sub> O)=1):N/A
IX.3	Vapour Pressure (mm Hg):	Not Determined	Percent Volatile by Volume(%): 100
IX.4	Vapour Density (Air =1):	0.98	Evaporation Rate ( =1): N/A
IX.5	Solubility in Water:	Slight	Reactivity in Water: Slight-forms N <sup>2</sup> CO <sup>3</sup>
IX.6	Flash point:	None	Flammable Limits in Air % by Vol: N/A
<b>X</b>	<b>Stability and Reactivity</b>		
X.1	Conditions to Avoid:	Stability:	Unstable [ ]      Conditions to Avoid: N/A Stable [ x ]
X.2	Hazardous Polymerisation		May Occur [ ] Will Not Occur [ x ]
X.3	Materials to Avoid:		
	Incompatibility (Materials to Avoid):		Can react violently with Li, Nd, Ti under proper conditions Hazardous Decomposition Products: None
<b>XI</b>	<b>Toxicology Information</b>		
XI.1	Toxicology Information:		LC50> 5000 mg/kg oral rat.
<b>XII</b>	<b>Ecological Information</b>		
XII.1	Degradability:		Not Determined, materials not considered to be aquatic pollutant
XII.2	Environmental Impact Rating:		Not Determined, materials not considered to be aquatic pollutant
XII.3	Acute Aquatic Toxicity:		Not Determined, materials not considered to be aquatic pollutant
XII.4	Other Indications:		Not Determined, materials not considered to be aquatic pollutant
<b>XIII</b>	<b>Other Information</b>		
XIII.1	Further Information:		Contact Ansul Incorporated



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Project Name: \_\_\_\_\_

A/A #

Location: \_\_\_\_\_

S/S #

Item #: \_\_\_\_\_ Qty: \_\_\_\_\_

Model #: \_\_\_\_\_

Model:  
**GDM-19T**

**Glass Door Merchandiser:**  
*Swing Door Refrigerator*



**GDM-19T**

- ▶ The world's #1 manufacturer of glass door merchandisers.
- ▶ Oversized, factory balanced, refrigeration system holds 33°F to 38°F (5°C to 3.3°C).
- ▶ Exterior - non-peel or chip white laminated vinyl; durable and permanent.
- ▶ Interior - attractive, NSF approved, white aluminum interior liner with stainless steel floor.
- ▶ Self closing door. Positive seal, torsion type closure system.
- ▶ "Low-E", double pane thermal insulated glass door assembly with extruded aluminum frame. The latest in energy efficient technology.
- ▶ Patented integrated door light (IDL) system for brighter, shadow free illumination.
- ▶ Entire cabinet structure is foamed-in-place using Ecomate. A high density, polyurethane insulation that has zero ozone depletion potential (ODP) and zero global warming potential (GWP).

**Bottom mounted units feature**

- ▶ "No stoop" lower shelf to maximize product visibility.
- ▶ Storage on top of cabinet.
- ▶ Easily accessible condenser coil for cleaning.



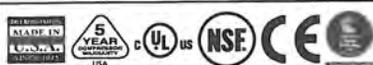
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**ROUGH-IN DATA**

Specifications subject to change without notice.  
Chart dimensions rounded up to the nearest 1/8" (millimeters rounded up to next whole number).

Model	Doors	Shelves	Cabinet Dimensions (inches) (mm)			HP	Voltage	Amps	NEMA Config.	Cord Length (total ft.) (total m)	Crated Weight (lbs.) (kg)
			L	D†	H						
GDM-19T	1	4	27	24 7/8	78 3/8	1/3	115/60/1	8.1	5-15P	9	275
			686	632	1998	1/3	230-240/50/1	2.8	▲	2.74	125

▲ Plug type varies by country.



APPROVALS:

AVAILABLE AT:

Model:  
**GDM-19T**

**Glass Door Merchandiser:**  
*Swing Door Refrigerator*



**STANDARD FEATURES**

**DESIGN**

- True's commitment to using the highest quality materials and oversized refrigeration systems provides the user with colder product temperatures, and lower utility costs in an attractive merchandiser that brilliantly displays packaged food and beverages.

**REFRIGERATION SYSTEM**

- Factory engineered, self-contained, capillary tube system using environmentally friendly (CFC free) 134A refrigerant.
- Extra large evaporator coil balanced with higher horsepower compressor and large condenser; maintains cabinet temperatures of 33°F to 38°F (5°C to 3.3°C).
- Sealed, cast iron, self-lubricating evaporator fan motor(s) and larger fan blades give True merchandisers a more efficient low velocity, high volume airflow design. This unique design ensures faster temperature pull down of warm product, colder holding temperatures and faster recovery in high use situations.
- Bottom mounted condensing unit positioned for easy maintenance. "No stoop" lower shelf maximizes visibility by raising merchandised product to higher level.

**CABINET CONSTRUCTION**

- Exterior - non-peel or chip white laminated vinyl; durable and permanent.
- Interior - attractive, NSF approved, white aluminum liner with stainless steel floor.
- Insulation - entire cabinet structure is foamed-in-place using Ecomate. A high density, polyurethane insulation that has zero ozone depletion potential (ODP) and zero global warming potential (GWP).
- Welded, heavy duty steel frame rail, black powder coated for corrosion protection.

- Frame rail fitted with leg levelers.
- Illuminated exterior sign panel. Variety of sign options available.

**DOOR**

- "Low-E", double pane thermal insulated glass door assembly with extruded aluminum frame. The latest in energy efficient technology.
- Door fitted with 12" (305 mm) long integrated handle.
- Self closing door. Positive seal, torsion type closure system.
- Magnetic door gasket of one piece construction, removable without tools for ease of cleaning.

**SHELVING**

- Four (4) adjustable, heavy duty PVC coated wire shelves 22 5/16" L x 18 1/4" D (574 mm x 464 mm). Four (4) chrome plated shelf clips included per shelf.
- Shelf support pilasters made of same material as cabinet interior; shelves are adjustable on 1/2" (13 mm) increments.

**LIGHTING**

- Safety shielded fluorescent interior lighting. Door(s) utilize(s) full-length, patented, integrated doors light (IDL) system.
- Cabinet lighting utilizes electronic ballast and T-8 bulbs for brighter illumination, longer bulb life and increased energy efficiency.

**MODEL FEATURES**

- Evaporator is epoxy coated to eliminate the potential of corrosion.
- See our website [www.truemfg.com](http://www.truemfg.com) for latest color and sign offerings.
- Convenient clean-out drain built in cabinet floor.
- Listed under NSF-7 for the storage and/or display of packaged or bottled product.

**ELECTRICAL**

- Unit completely pre-wired at factory and ready for final connection to a 115/60/1 phase, 15 amp dedicated outlet. Cord and plug set included.

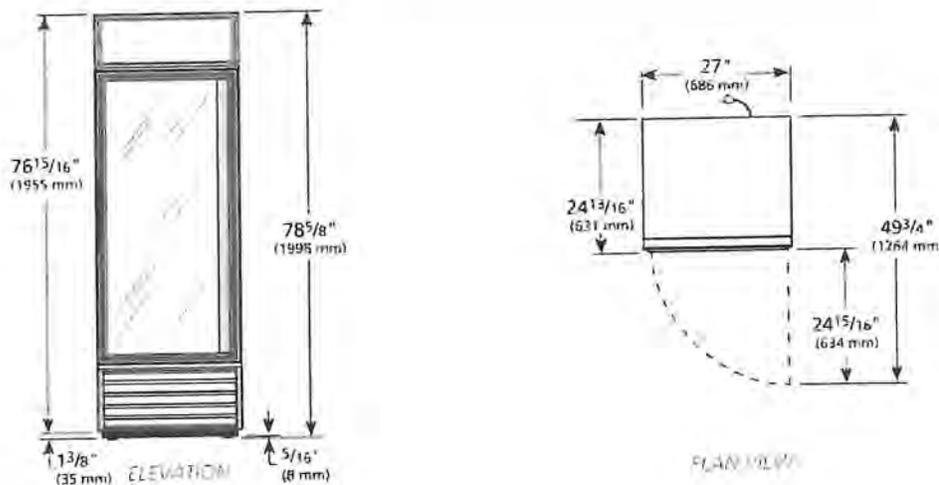


115/60/1  
NEMA-5-15R

**OPTIONAL FEATURES/ACCESSORIES**  
Upcharge and lead times may apply.

- 230 - 240V / 50 Hz.
- Black exterior.
- Stainless steel exterior.
- Black aluminum interior liner with black shelving.
- Stainless steel interior liner.
- 6" (153 mm) standard legs.
- 6" (153 mm) seismic/flanged legs.
- 2 1/2" (64 mm) diameter castors.
- 4" (102 mm) diameter castors.
- LED Lighting.
- Red wine thermostat.
- White wine thermostat.
- Chocolate thermostat.
- Barrel lock (factory installed).
- Additional shelves.
- TrueFlex gravity feed organizers.
- Pricing strips.
- Remote cabinets (condensing unit supplied by others; system comes standard with 404A expansion valve and requires R404A refrigerant). Consult factory technical service department for BTU information. All remote units must be hard wired during installation.

**PLAN VIEW**



**WARRANTY**  
Three year warranty on all parts and labor and an additional 2 year warranty on compressor. (U.S.A. only)

METRIC DIMENSIONS ROUNDED UP TO THE NEAREST WHOLE MILLIMETER

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

Model	Elevation	Right	Plan	3D	Back
GDM-19T	TFAY119E	TFAY119S	TFAY19P	TFAY1193	

**TRUE FOOD SERVICE EQUIPMENT**

2001 East Terra Lane • O'Fallon, Missouri 63366 • (636)240-2400 • Fax (636)272-2408 • (800)325-6152 • Intl. Fax# (001)636-272-7546 • [www.truemfg.com](http://www.truemfg.com)

# PIPER DISPENSERS

# Tray & Silverware Dispensers

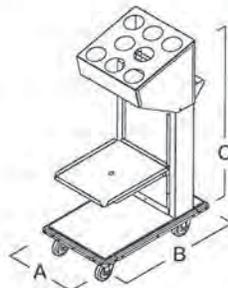


ATCA-ST-OSW8-1014

### CANTILEVER STYLE, MOBILE ADJUSTABLE

CAPACITY-Approx. 100 to 150 trays and 35-40 pieces of silverware in each cylinder.

Dispenser shown with optional silverware cylinders and wrap-around bumper.



JOB \_\_\_\_\_ ITEM # \_\_\_\_\_ QTY # \_\_\_\_\_

- ATCA-ST-OSW8-1014
- ATCA-ST-OSW8-1216
- ATCA-ST-OSW8-1418
- ATCA-ST-OSW8-1520
- ATCA-ST-OSW8-1622
- 2ATCA-ST-OSW8-1014
- 2ATCA-ST-OSW8-1216
- 2ATCA-ST-OSW8-1418
- 2ATCA-ST-OSW8-1520
- 2ATCA-ST-OSW8-1622

### MODELS / DIMENSIONS

Model #	Max Tray Size	A	B	C
<input type="checkbox"/> ATCA-ST-OSW8-1014	10 x 14	13"	24"	50"
<input type="checkbox"/> ATCA-ST-OSW8-1216	12-1/4 x 16-1/2	14 1/2"	25 1/2"	50"
<input type="checkbox"/> ATCA-ST-OSW8-1418	14 x 18	16"	27 1/2"	50"
<input type="checkbox"/> ATCA-ST-OSW8-1520	15-1/4 x 20-1/2	17"	30 1/2"	50"
<input type="checkbox"/> ATCA-ST-OSW8-1622	16 x 22	18 1/2"	32"	50"
<input type="checkbox"/> 2ATCA-ST-OSW8-1014	10 x 14	25 1/2"	24"	50"
<input type="checkbox"/> 2ATCA-ST-OSW8-1216	12-1/4 x 16-1/2	29 1/2"	26"	50"
<input type="checkbox"/> 2ATCA-ST-OSW8-1418	14 x 18	32 1/2"	27 1/2"	50"
<input type="checkbox"/> 2ATCA-ST-OSW8-1520	15-1/4 x 20-1/2	39"	30-1/2"	50"
<input type="checkbox"/> 2ATCA-ST-OSW8-1622	16 x 22	37 1/2"	32"	50"

### SPECIFICATIONS

Model ATCA-ST-OSW8 cantilever style, mobile tray and silverware dispenser.

### FRAME AND BODY:

The unit is constructed of all welded heavy gauge stainless steel. The body is stainless steel on all sides and top. The front panel is removable for adjustment access. The top is fitted with a stainless steel sloped overhead-type silverware dispenser, enclosed on all four sides and provided with eight openings for insertion of round silverware cylinders.

### DISPENSING MECHANISM

The tray carrier, constructed of all welded 16 ga. stainless steel, is raised by a series of coil springs attached to the frame. Ball bearing guides and a single stainless steel aircraft type cable keep the carrier level in all directions, even with an unbalanced load. The cable runs over pre-lubricated plated steel pulleys.

### ADJUSTMENT

Adjustment for various tray weights is easily accomplished by removing the front panel, then engaging or disengaging individual springs as required.

### CASTERS

The unit is mounted on four 4" diameter, heavy duty, swivel, casters with non-marking rubber tires.

**LIMITED WARRANTY:** PIPER PRODUCTS warrants to the original purchaser parts and labor for a period of twelve (12) months from the date of purchase. See manufacturer's complete warranty for details.

It is our policy to build equipment which is design certified by companies that have been accredited at the Federal Level by the Occupational Safety and Health Agency (OSHA) and ANSI as a National Recognized Testing Laboratory. These companies include CSA International, Underwriters Laboratories, and the National Sanitation Foundation. However, a continuing program of product improvement makes it necessary to submit new models to the agencies as they are developed. Consequently, all models may not bear the appropriate labels at all times.

We reserve the right to change specifications and product design without notice. Such revisions do not entitle buyer to corresponding changes, improvements, additions or replacements for previously purchased equipment. Information is not for design purposes.

### OPTIONS

Part #	Description
<input checked="" type="checkbox"/> WB	Two locking casters
<input type="checkbox"/> PB	Perimeter bumper
<input checked="" type="checkbox"/> B	Corner bumper
<input checked="" type="checkbox"/> Y4	Polyurethane 4" casters (set of 4)
<input type="checkbox"/> Y5	Polyurethane 5" casters (set of 4)
<input type="checkbox"/> 159-2701	Silverware Cylinder, plastic (each, 8 required)
<input checked="" type="checkbox"/> 011-3842	Silverware Cylinder, stainless steel (each, 8 required)
<input type="checkbox"/> 341-3483	Napkin Dispenser, folded napkin 3-1/2" x 7"
<input type="checkbox"/> I (for carts)	Silverware, identity labels (knives, forks, t-spoons)

Shipping weight: 175 lbs

**SPEC E-12**

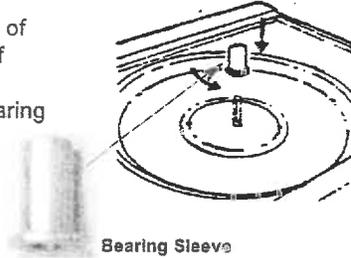
**PIPER PRODUCTS**  
**BUILT TO LAST**  
[www.piperonline.net](http://www.piperonline.net)

300 S. 84th Avenue  
 Wausau, WI 54401  
 Phone: 800-544-3057  
 Fax: 715-842-3125

**Assembly**

**1 PLACE BEARING SLEEVE ON GUIDE PIN**

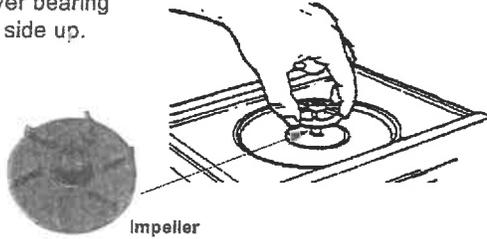
Note flat sides on outside of guide pin and on inside of bearing sleeve.  
Line flat sides up until bearing sleeve slides down over guide pin and rests on the cooling plate.



Bearing Sleeve

**2 PLACE IMPELLER OVER BEARING SLEEVE.**

Put impeller over bearing sleeve with fin side up.

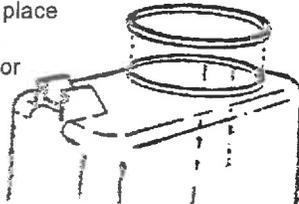


Impeller

**3 PLACE BOWL GASKET ON BOWL**

Turn bowl upside down and place bowl gasket over the neck of the bowl. Moisten gasket with water or thin film of lubricant.

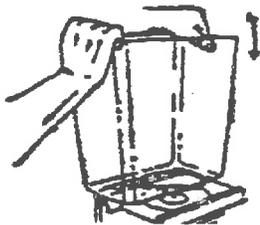
NOTE: On D112 units place bowl gasket around cooling dome.



**4 PUT BOWL ON BASE**

Place the neck of the bowl over center of the cooling plate and with a back and forth downward motion, push bowl down into place.

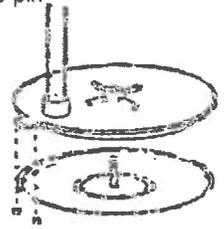
NOTE: On D112 units, place bowl over the gasket and cooling dome with the neck of the bowl centered on the cooling dome.



**5 PLACE PUMP COVER OVER GUIDE PIN**

Place the pump cover over the guide pin with the spray tube toward the front. Note that the tab on the front of the pump cover fits between the 2 locator buttons or ridges on the bowl. Mini units - bent part of spray tube faces front of bowl.

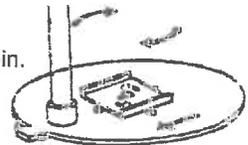
NOTE: Use agitator cover in place of pump cover and spray tube for fresh juice, drinks that foam (iced tea or dairy products), or heavy viscous drinks.



**6 INSTALL LOCKDOWN WASHER OR CLAMPS**

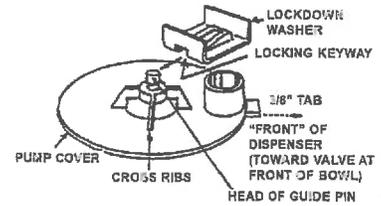
**Standard Units:**

- Place lockdown washer over guide pin.
- Push lockdown washer down and into locking keyway.
- Turn lockdown washer clockwise to lock into place.



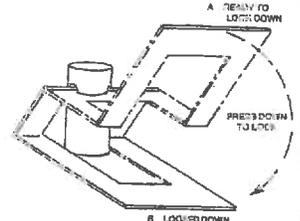
**Mini Units:**

- Place lockdown washer over guide pin.
- Push lockdown washer down and into locking keyway.
- Slide into locked position.



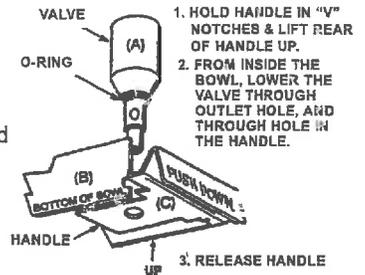
**D112 Superbowl Units:**

- Insert each lockdown clamp in a lockdown pin and snap down into place. (Lock down 2 clamps closest to the front of the bowl first.)



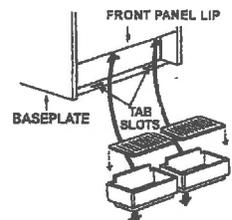
**7 ASSEMBLE VALVE AND HANDLE**

Place handle (C) in the two V-cuts in the front of the handle bracket (B) and push handle back. From inside bowl, lower the valve (A) through the outlet hole, and through the hole in the handle. Release handle.



**8 REPLACE DRIP PAN(S)**

Place cover/grid on drip pan. Place top edge of drip pan up under lip on front panel. Lower each drip pan so that the tab goes down into the tab slot and locks pan in place.

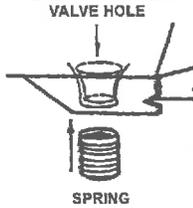


Regular units proceed to step 15.  
Whipper units proceed to step 9.

## Assembly (cont.)

**9**

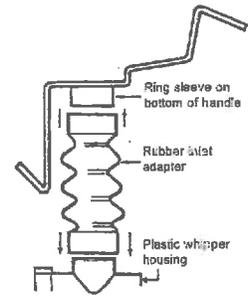
**(WHIPPER UNITS ONLY)**  
PRESS SPRING UP INTO PLACE AGAINST THE BOTTOM OF THE BOWL.



**14**

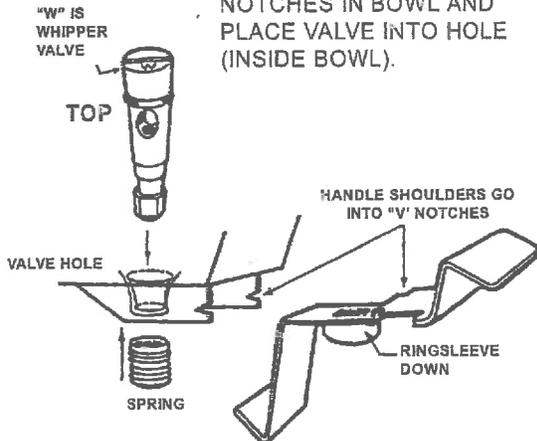
**(WHIPPER UNITS ONLY)**  
**ASSEMBLE THE RUBBER INLET ADAPTER**

Assemble white rubber inlet adapter by stretching one end over the large tubular inlet on top of the whipper housing. Attach the other end over the ring sleeve on the underside of the handle.



**10**

**(WHIPPER UNITS ONLY)**  
INSERT HANDLE INTO "V" NOTCHES IN BOWL AND PLACE VALVE INTO HOLE (INSIDE BOWL).



**15**

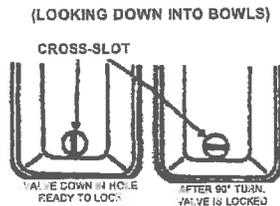
FILL BOWL(S) WITH PRODUCT and place lid(s) on bowl(s). Turn spray switch on first then refrigeration.



**IMPORTANT: NEVER RUN REFRIGERATION UNLESS SPRAY OR AGITATE IS ON.**

**11**

**(WHIPPER UNITS ONLY)**  
TURN VALVE 90° TO LOCK. Cross slot (located on top of valve) should run left to right across the bowl when locked.



**12**

**(WHIPPER UNITS ONLY)**  
PUSH WHIPPER BLADE INTO PLACE. Replace the whipper blade by lining up the flat inside the blade with the flat side of the motor shaft. Push blade firmly into place.



**13**

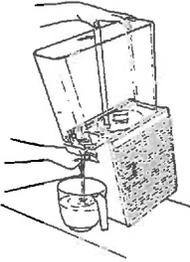
**(WHIPPER UNITS ONLY)**  
REPLACE WHIPPER CHAMBER. Replace whipper chamber by positioning the medium-sized opening up and tilting 1/8 turn to the right. Put whipper chamber over whipper blade and turn to the left until it locks into place.



## DISASSEMBLY

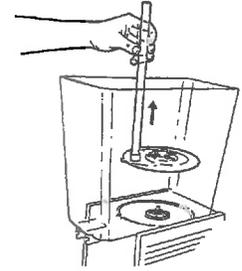
### 1 DRAIN ALL BEVERAGE FROM BOWLS

- A. Remove bowl lid(s) and drip tray(s)
- B. Drain through valve then
- C. Tip unit forward, gently press spray tube back a short distance to lift the edge of the pump cover to allow remaining beverage in well to be drained through valve.



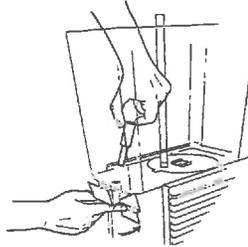
### 4 REMOVE PUMP COVER

Remove pump cover by lifting up on spray tube.



### 2a.

**STANDARD & MINI UNITS:**  
REMOVE VALVE AND HANDLE  
Lift valve. Handle drops into operator's other hand.

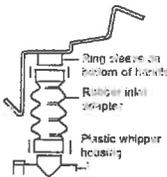


### 2b.

**WHIPPER UNITS:**

#### • DISASSEMBLE THE RUBBER INLET ADAPTER

Remove one end from the large tubular inlet on top of the whipper housing and the other end from the ring sleeve on the underside of the handle.



#### • REMOVE WHIPPER CHAMBER

Turn whipper chamber to the right until it releases and you can pull it off of the whipper blade.



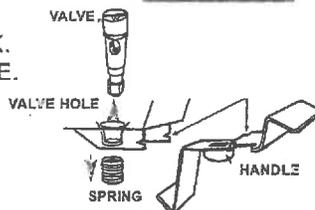
#### • REMOVE WHIPPER BLADE

Pull whipper blade off of the motor shaft.



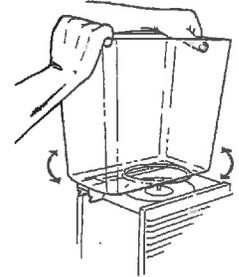
#### • TURN VALVE 90° TO UNLOCK. REMOVE HANDLE AND VALVE.

#### • REMOVE SPRING FROM BOTTOM OF BOWL.



### 5 REMOVE BOWL AND BOWL GASKET

Twist bowl back and forth while lifting up. Bowl gasket will be around bottom of bowl.

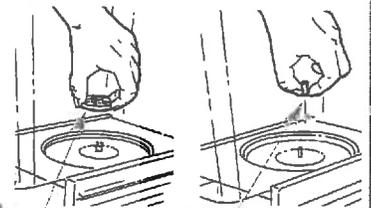


**NOTE:** On D112 units, bowl gasket will be around cooling dome.

### 6 REMOVE IMPELLER AND BEARING SLEEVE

Remove impeller and bearing sleeve by lifting them straight up.

**NOTE:** Check impeller and bearing sleeves for wear. See page 5.



Impeller



Bearing Sleeve

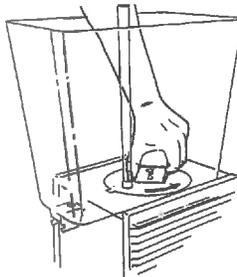
**7 THOROUGHLY CLEAN ALL PARTS IN WARM WATER USING A MILD NON-ABRASIVE DETERGENT AND RINSE THOROUGHLY.**  
**CAUTION:** ABRASIVES WILL SCRATCH PLASTIC PARTS. WASH BOWL LIDS IN COOL OR LUKEWARM WATER TO AVOID LEAKS DUE TO SEALED SURFACE BEING DAMAGED.

### 3 REMOVE LOCKDOWN WASHER(S)

**Standard Unit:** Twist lockdown washer counterclockwise, slide to release keyway. Then lift out.

**Mini Unit:** Slide to release keyway, then lift out.

**D112 Unit:** Release each clamp.



### SANITIZE

Immerse parts in sanitizing solution for 1-2 minutes. Remove parts from sanitizing solution and drain. **DO NOT RINSE.** Place parts on a clean surface to air dry. Wipe the machine, condensate tray and cooling plate depression with a cloth wetted with sanitizer solution.

**IMPORTANT:** Never pour dry powder, crystals, or concentrate into a dry bowl. Premixing beverage in separate container is recommended. If mixing in bowl, always add water first.

## ROUTINE MAINTENANCE: For all Models

### Cleaning Your Dispenser

To optimize performance or when using dairy products, clean unit daily.

Regular cleaning of bowl components will result in maximum pumping efficiency, proper seating and sealing, and prevention of leaks at the valve O-Ring and bowl gasket by removing dried-on beverage solids and pulp from moving sealed parts.

1. Wash all bowl components regularly. Follow all local health codes.

\* Refer to Disassembly, Cleaning, and Assembly instructions on pages 1-3.

### Sanitizing Your Dispenser

\* Refer to Disassembly and Assembly instructions on pages 1-3.

1. In the bowl, mix one gallon of Oxford Chemical's Disinfectant/Sanitizer Formula C or its equivalent.
2. Turn on spray motor(s) and allow sanitizer to spray around inside of bowl for a period of time as recommended by the sanitizer manufacturer. Formula C is satisfactory for this purpose when mixed in a solution of 1 liquid ounce of cleaner to 4 gallons of water. Run spray motor(s) for 60 seconds. In areas with extreme hard water, consult the local health authority.
3. Drain sanitizer **completely** and **thoroughly** during each step of the cleaning process (wash, rinse, and sanitize). Refer to tips on draining in Disassembly Guide on page 3.

## HELPFUL HINTS

1. **Noisy Impeller:** Do not run impeller dry. The impeller will make a chattering sound in an empty bowl. Remove the impeller and run a small amount of water in the bowl.
2. **Valve and O-Ring:** On the first installation, if there is an after-drip, place your hand on the valve and with a slight downward pressure turn it slightly. This will help seat the o-ring so that it is properly aligned with the valve seat. If an o-ring becomes cut or worn it should be replaced. If you are pumping a product which has excessive pulp, a separate valve weight may be purchased to add extra weight so the o-ring will press down against the pulp and guarantee a positive shut-off.
3. **Valve Cap Use:** The Valve Cap (Part # 2039) insures that a tight valve seal will occur with products containing heavy pulp. The Valve Cap can be installed by placing it on top of the Valve after the Valve has been assembled into the bowl. See Figure A.
4. **High Water Marks on Bowl:** When you agitate, you may get "high water marks" as the beverage level drops. Keep the bowl as full as possible. Frosted bowls are available which are helpful in reducing the appearance of water marks.
5. **To Spray or Not to Spray:** Most beverages can be sprayed. It is best not to spray iced tea, iced coffee, natural juices, or beverages that foam (whipped drinks). A special agitator plate is used in place of a pump cover and spray tube to promote circulation.
6. **Proper Cooling:** Always keep spray switch on when refrigeration switch is on. A unit must spray or agitate to cool. Failure to do this will cause impeller to lock-up. The dispenser is designed to run 24 hours a day. Keep both spray and agitate on when beverage is in the bowls.
7. **Condensation:** Condensation on the bowls and lids is natural, cool, and refreshing. The amount of condensation is affected by humidity. Condensation will run down the front panel into the drip tray. Remember to occasionally empty the drip trays.
8. **Single Bowl Operation:** if you find it necessary to run your dispenser with only one bowl containing beverage, put one half (1/2) cup of water in the unused cooling plate depression(s) for best one-bowl operation and efficiency.

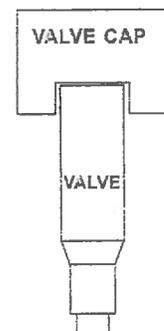


Figure A

# PREVENTATIVE MAINTENANCE

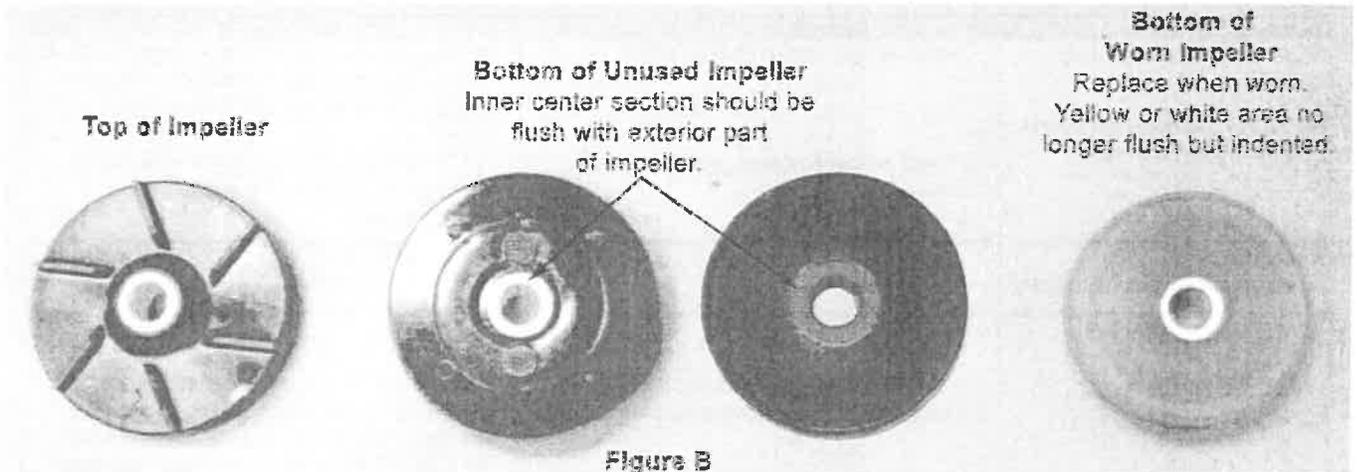


Figure B

- 1) Wash all bowl components regularly.
- 2) Wash impeller and bearing sleeve individually and check for wear.
  - a) Check for wear on bearing sleeve (flange should be 1.77mm thick - thickness of penny or quarter). (Figure C)
  - b) Check for wear on impeller (inner white center section should be flush with colored part of impeller). (Figure B)
  - c) If bearing sleeve or impeller do not spin freely or are worn - replace them. (Figure F)
  - d) Worn parts can cause personal injury, impair cooling and can damage machine. (Figure D & E)
- 3) Check valve o-rings and bowl gaskets for wear or damage - replace every 6 months or as needed.
- 4) Every 6 months or more often if needed: unplug unit, remove panels, clean condenser and interior. (Remove dust and lint from fins with a soft brush and vacuum.)
- 5) For further information, visit [www.grindmaster.com](http://www.grindmaster.com) or call (800) 695-4500.

Figure C New bearing sleeve  
flange (approx. 1.77mm - thickness of penny or quarter)

Figure D Worn bearing sleeve (replace when worn to approx. 1mm or 1/2 thickness of penny or quarter).  
worn flange

Figure E Bearing sleeve with flange missing is extremely worn. Discard immediately.  
**CAUTION:** Handle with care. Sharp edges may cause personal injury or damage to machine.

Figure F Bearing sleeve and impeller should spin freely when held like this. If parts do not spin freely or are worn, unit will not cool properly and worn parts may damage machine.

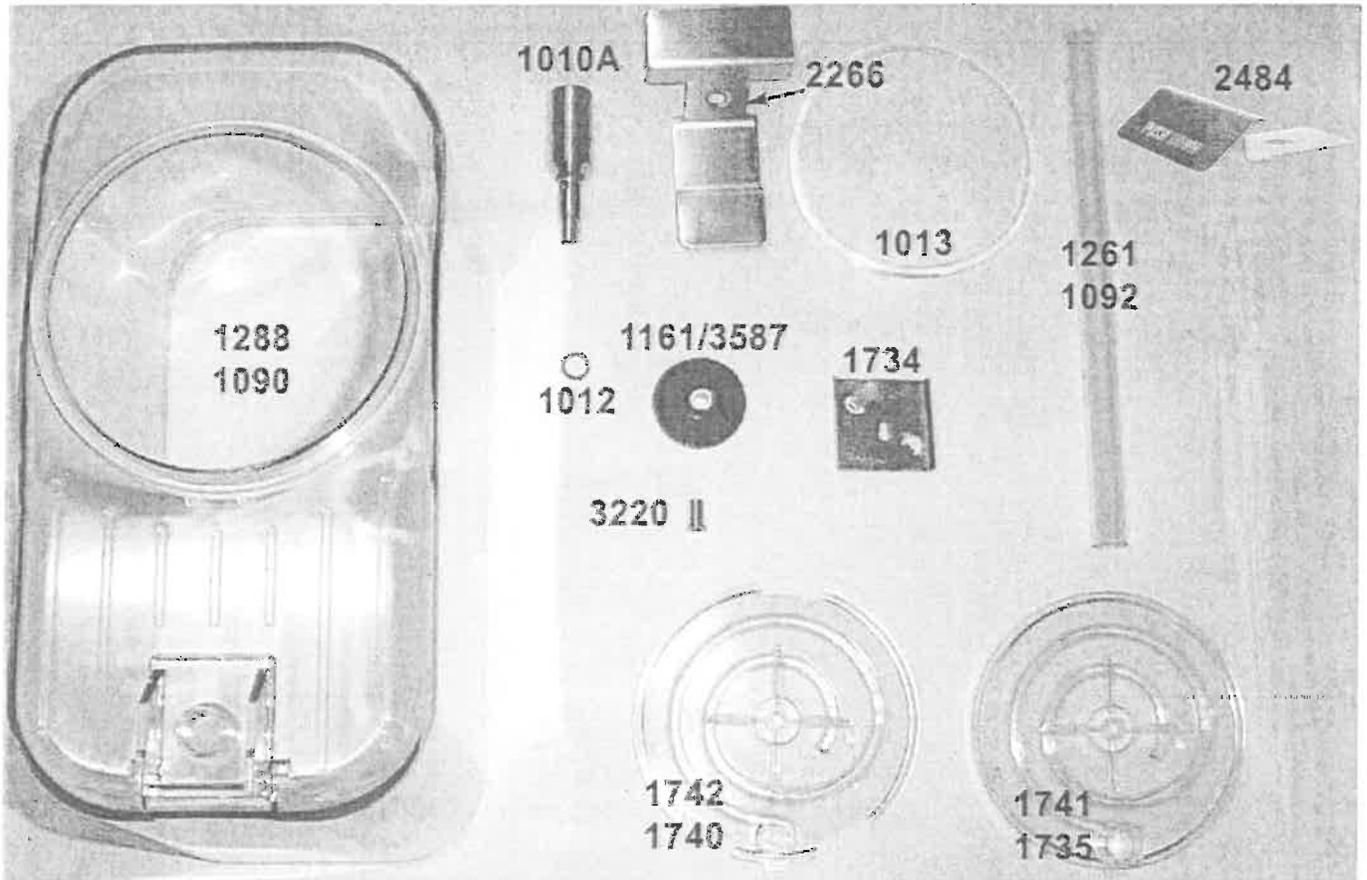
Part #s for Preventative Maintenance	
Description	Part #
Bearing Sleeves (all units except D112)	3220
Large Blue Impeller (D & WD model)	1161
Small Red Impeller (E model)	1008
Universal Impeller (all models)	3587
Valve O-ring	1012
Bowl Gasket - for D, WD models 5 gallon (or 3 gallon) bowl	1013
Bowl Gasket for E model and/or 9 liter bowl	2010
Bowl Gasket for 12 gallon SuperBowls (D112)	1150
Bearing Sleeve for 12 gallon Super Bowl (D112)	1983



Universal Impeller (Part # 3587)

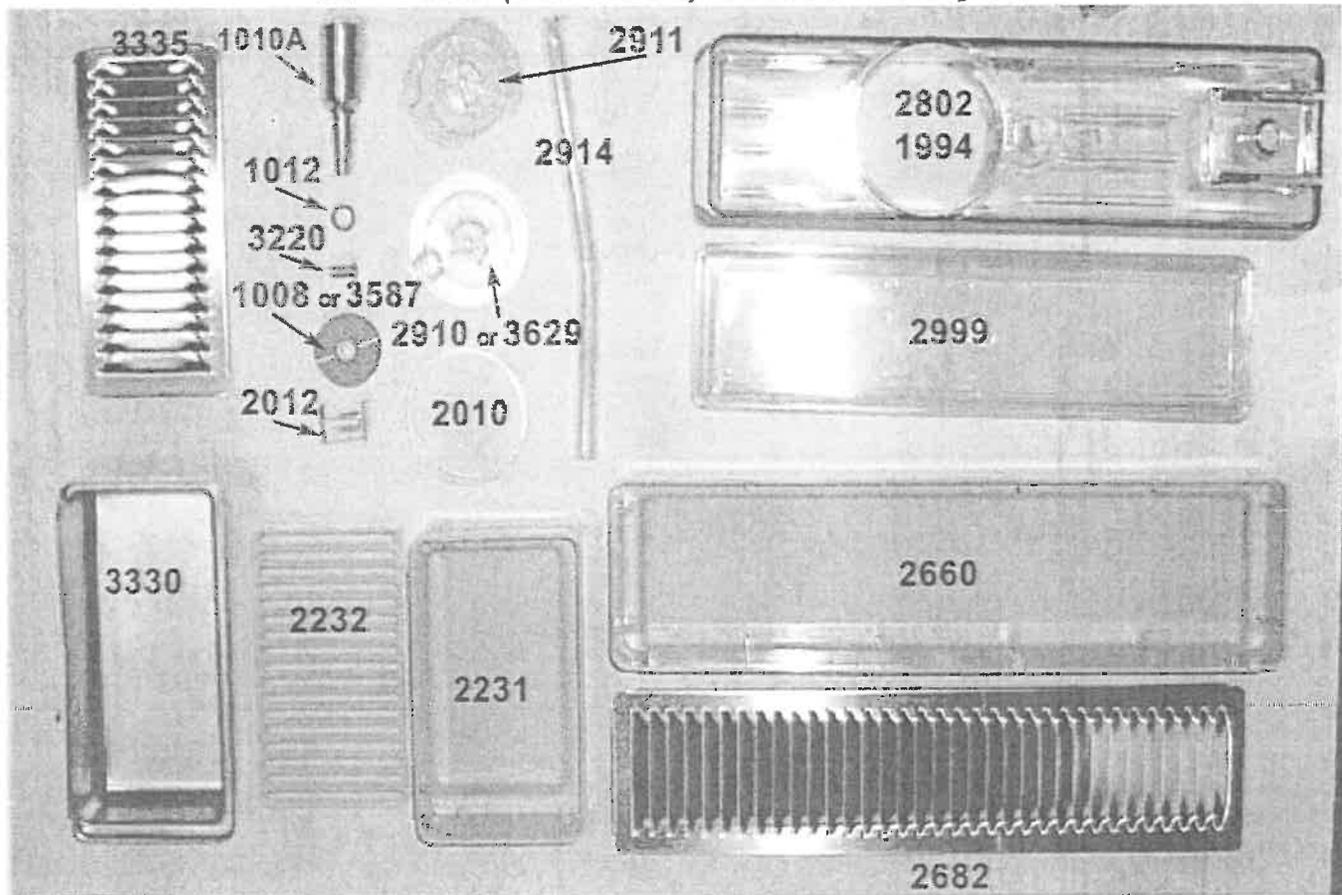


## STANDARD BOWL ASSEMBLY PARTS



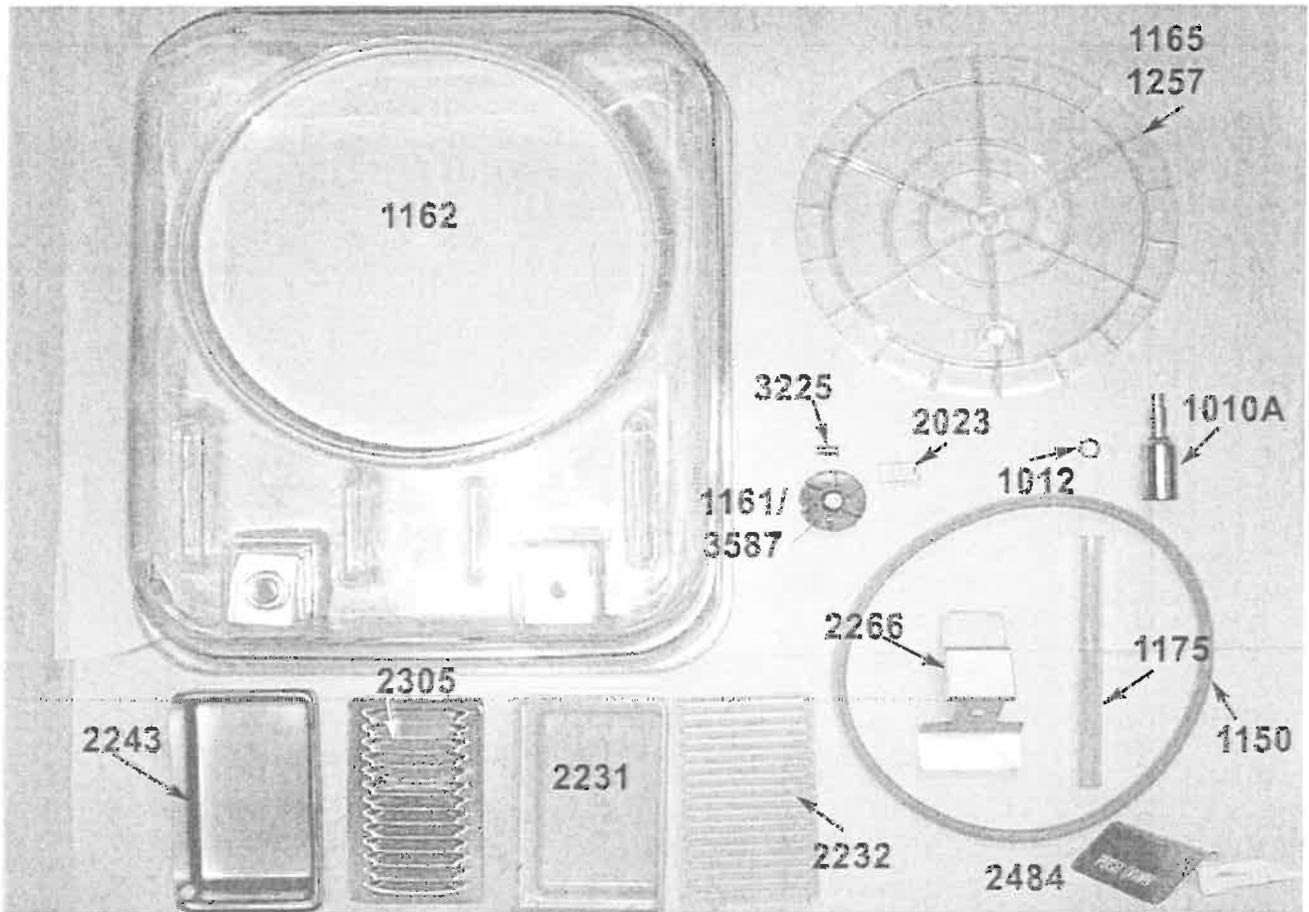
Part #	Description	Models Used On
1010A	Dispense Valve w/ O-ring	All standard (non-whipper)
1012	O-ring for Dispense Valve	All
1013	Standard Bowl Gasket	All D15, D25, D35, HD and WD models (for 5 & 3 gallon bowls)
1090	3 Gal. Bowl	All D15, D25, D35, HD and WD models
1092	3 Gal. Bowl Spray Tube	All D15, D25, D35, HD and WD models w/ 3 gal. bowls
1161	Standard Bowl Impeller (blue)	All D, HD and WD models
3587	Universal Impeller (black)	All models
1261	5 Gal. Bowl Spray Tube	All D15, D25, D35, HD and WD models w/ 5 gal. bowls
1238	5 Gal. Bowl	All D15, D25, D35, HD and WD models
1734	Washer, Lockdown	All D15, D25, D35, HD and WD models
1735	Standard Bowl Pump Cover for Red (p/n 1008) or Black (p/n 3587) Impeller (use with spray tube)	All D15, D25, D35, HD and WD models
1740	Agitator for use with Red (p/n 1008) or Black (p/n 3587) Impeller	All D15, D25, D35, HD and WD models
1741	Standard Bowl Pump Cover for Blue Impeller (use with spray tube)	All D15, D25, D35, HD and WD models
1742	Standard Bowl Agitator for Blue Impeller (for iced tea, viscous products, or orange juice)	All D15, D25, D35, HD and WD models
2231	Plastic Drip Tray	D15-4, D25-4, D35-4, E27-4, D112-4, HD & WD models
2232	Plastic Drip Tray Grid	D15-4, D25-4, D35-4, E27-4, D112-4, HD & WD models
2240	Standard Bowl Lid	All D15, D25, D35 and WD models (Do not use on HD models)
1116	Bowl Lid for Heated Units	HD (heated models)
2243	Stainless Steel Drip Tray	D15-3, D25-3, D35-3, D112-3 and HD-3 models
2266	Dispense Valve Handle	All standard (non-whipper)
2484	Non-Contact Handle	All standard (non-whipper)
2305	Stainless Steel Drip Tray Grid	D15-3, D25-3, D35-3, D112-3 and HD-3 models
3220	Bearing Sleeve	All

## Mini Bowl (E27 & E47) Bowl Assembly Parts



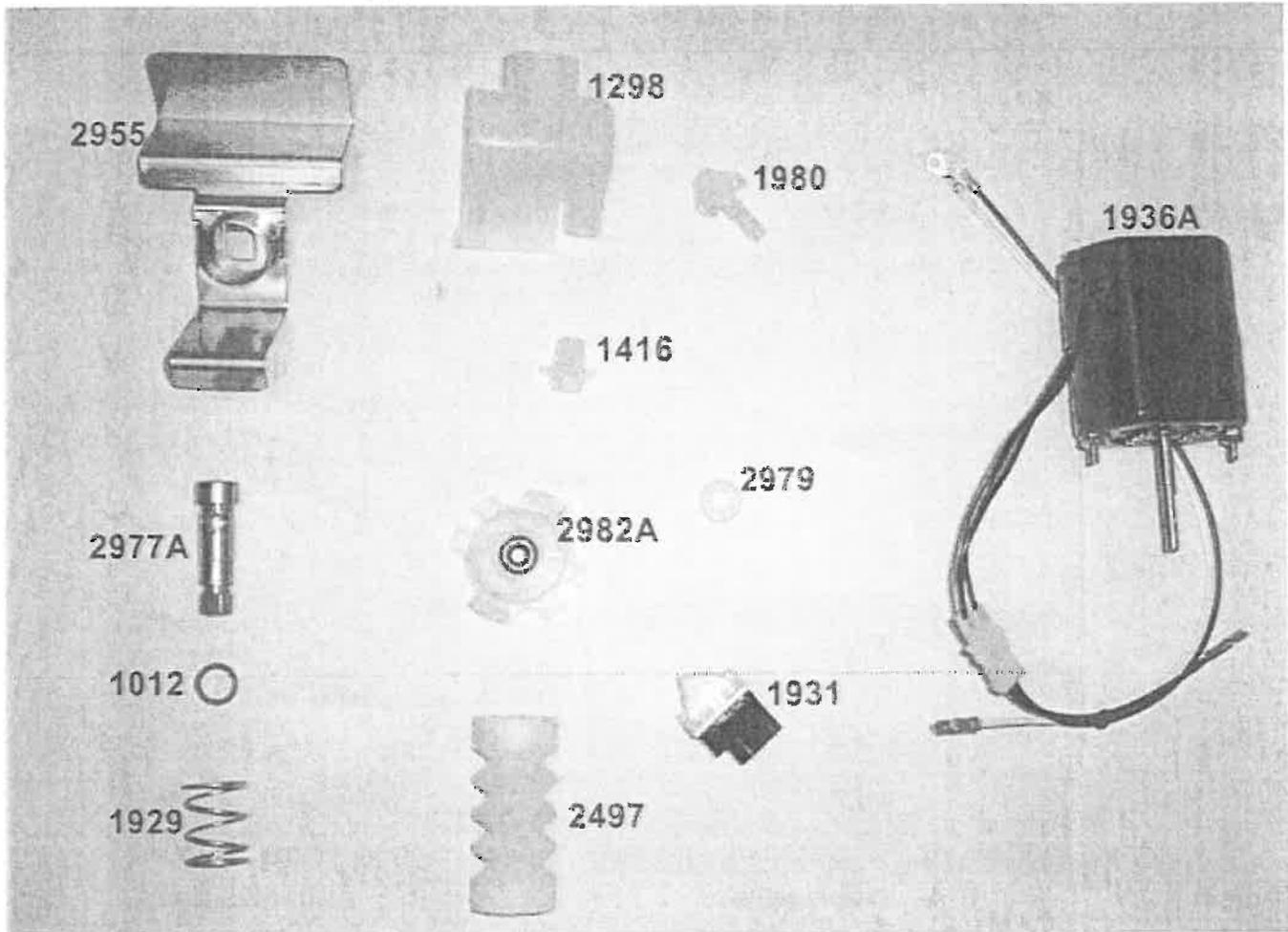
Part #	Description
1008	Mini Bowl Impeller (red)
1010A	Dispense Valve w/ O-ring
1012	Dispense Valve O-ring
1994	7 Liter Bowl
2010	Mini Bowl Gasket
2012	Mini Bowl Lock Washer
2231	Mini Twin Plastic Drip Tray
2232	Mini Twin Plastic Drip Tray Grid
2266	Dispense Valve Handle (pictured w/ std bowl assembly photo)
2484	Non-Contact Handle (pictured w/ std bowl assembly photo)
2660	Mini Quad Drip Tray (Plastic)
2682	Mini Quad Drip Tray Grid
2802	Standard 9 Liter Bowl
2910	Mini Bowl Pump Cover (use w/ spray tube) use w/ red impeller (p/n 1008)
2911	Mini Bowl Agitator (use with iced tea, orange juice, and viscous products)
2914	9 Ltr. Mini Bowl Spray Tube
2999	Cover for 9L Bowl
3220	Bearing Sleeve
3330	Stainless Steel Drip Tray, E27, E47
3335	Stainless Steel Drip Tray Grid, E27, E47
3587	Universal Impeller (black)
3629	Mini Bowl Pump Cover - use with black impeller (p/n 3587)

## Super Bowl (D112) Bowl Assembly Parts



Part #	Description	Models Used On
1010A	Dispense Valve w/ O-ring	All Standard (non-whip)
1012	O-ring for Dispense Valve	All
1150	Bowl Gasket	D112
1155	Super Bowl Lid	D112
1161	Impeller (blue)	All D, HD, and WD models
1162	Super Bowl (12 gal) w/ hardware	D112
1165	Super Bowl Pump Cover (use with spray tube)	D112
1175	Super Bowl Spray Tube	D112
1257	Agitator (use in place of pump cover and spray tube for iced tea, orange juice, and viscous products)	D112
2023	Lockdown Cam	D112
2231	Plastic Drip Tray	D15, D25, D35, E27, D112, HD15, and all WD models
2232	Plastic Drip Tray Grid	"
2243	Stainless Steel Drip Tray	All D, HD, and WD models
2266	Dispense Valve Handle	All Standard (non-whipper)
2484	Non-Contact Handle	All Standard (non-whipper)
2305	Stainless Steel Drip Tray Grid	D15, D25, D35, D112, HD15, and all WD models
3225	Bearing Sleeve	D112
3587	Universal Impeller (black)	All models

## Whipper Unit Parts (Different from Standard)



Part #	Description
1012	Dispense Valve O-ring
1298	Whipper Housing Chamber
1416	Whipper Assy Restrictor Valve
1929	Whipper Assembly Spring
1931	Whipper Activation Switch
1936A	Whipper Motor w/ Harness
1980	Whipper Blade
2497	Inlet Whipper Adapter
2955	Whipper Dispense Valve Handle
2977A	Whipper Dispense Valve w/ O-ring
2979	Slinger Washer
2982A	Whipper Base

# MCX Mag-Drive™ Impeller

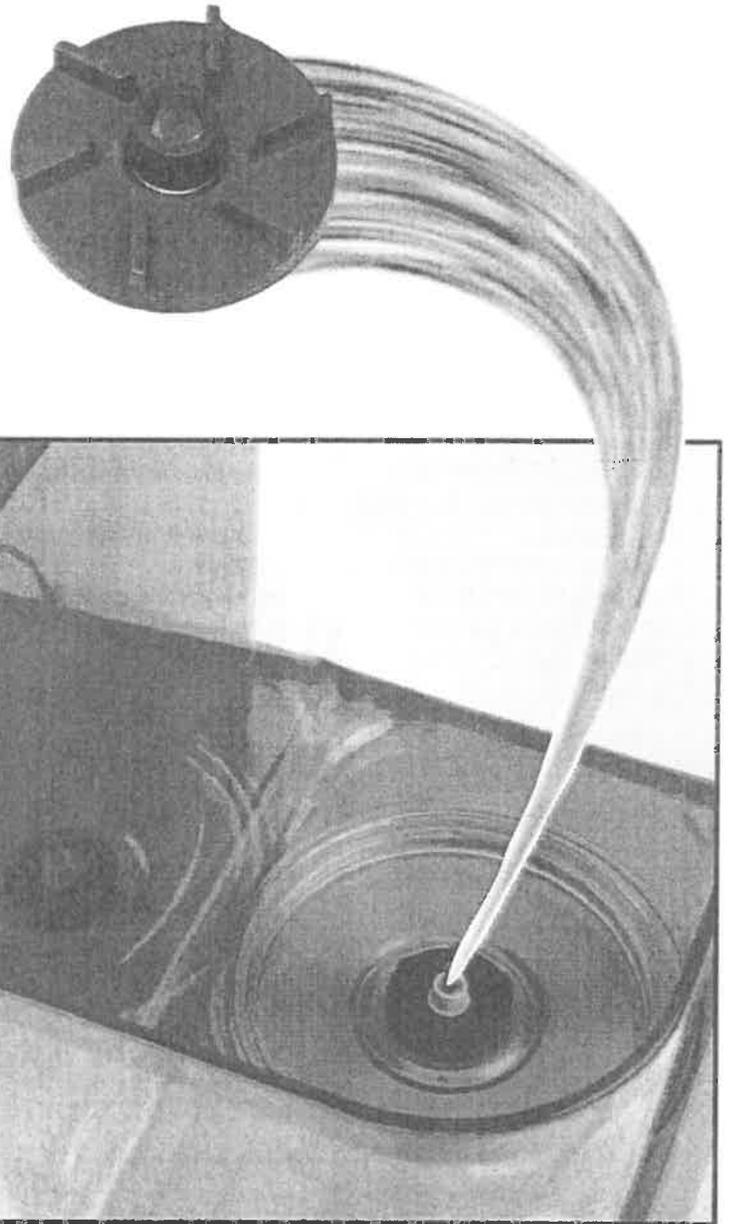
by Crathco®

## Purely the Best

### Features:

Proprietary one-piece design using advanced, magnetic compound material...

- Smooth surfaces assure complete sanitizing
- High performance nylon bearing - harder material for longer life
- More powerful and efficient action
- One size fits all - use in all types of beverages and all models
- Common parts for lower inventory
- Crathco Bubblers™ -
  - \* Built simple
  - \* Built stronger
  - \* Built to last



### Specifications and Use:

- Part #: 3587
- Recommended for use in all models (standard, mini, and super)

Bowl size	Recommended Pump Cover (when spraying)	Recommended Agitator (when not spraying)
9L - 2.4 gal. (or 7L)	part # 2910	part # 2911
18L - 5 gal. (or 3 gal.)	part # 1735 (1741 may also be used on 60 Hz units)	part # 1740 (1742 may also be used on 60 Hz units)

# SET-UP

## UNPACKING

Your dispenser is packed in 2 cartons: base pack and bowl pack. Unpack base by opening bottom flaps. See Figure G.

### IMPORTANT NOTES:

1. Do not leave base upside down as this can damage refrigeration system.
2. Check that all 4 rubber feet are attached to legs after removing from base pad. Check base pad or carton for missing feet and replace on legs.
3. Never lift from louvres/ventilation slots. Instead, place fingers under base plate.

## INSTALLATION

1. Place base on counter.
2. For heated units (HD15/WHD15) units only:  
Install Safety Arms  
Tools required: Phillips Head Screwdriver
  - a) Place unit on its side so you have access to the bottom of the unit.
  - b) Line up arm holes so they line up to the holes on the bottom of the unit; arms will extend forward as shown in illustration. See Figure H.
  - c) Attach arms with screws provided.
3. Leave sufficient air space (6" (15cm)) on sides (also rear of D35 triple) for proper airflow and efficient operation. See Figure I.  
**IMPORTANT:** Failure to provide required airspace can damage unit.
4. Plug into properly grounded, 3 prong outlet.
5. Assemble bowl parts and drain trays. See Assembly instructions (pgs 1-2). See Figure J.

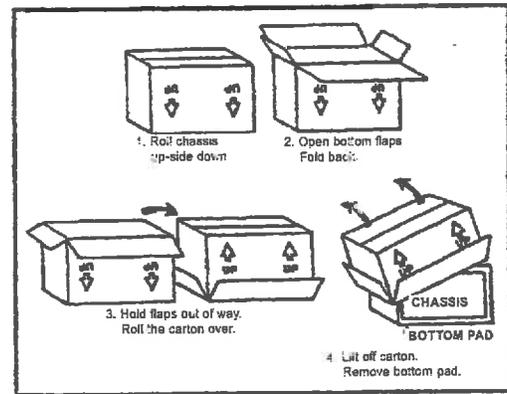


Figure G



Figure H

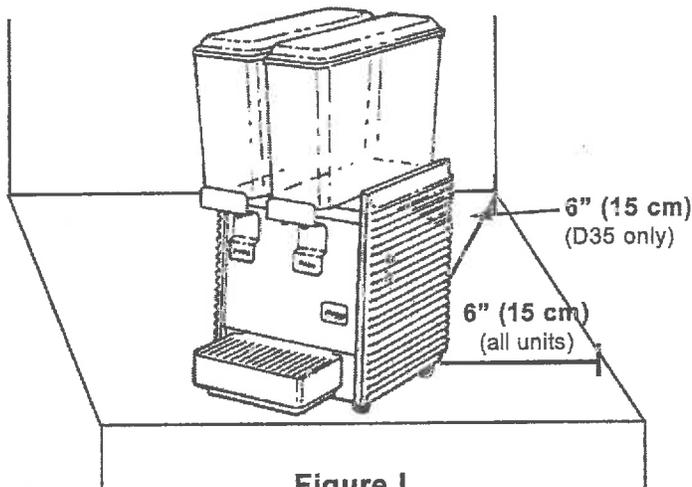


Figure I

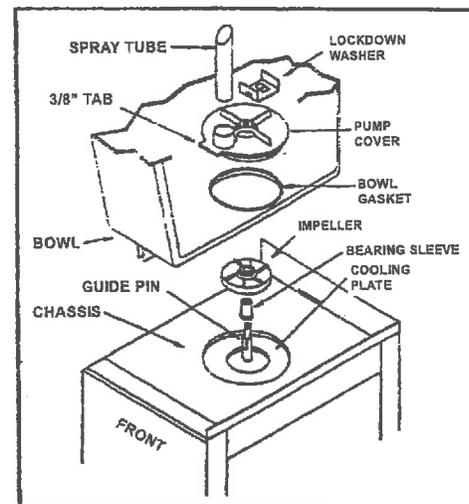


Figure J



**GRINDMASTER**  
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**GRINDMASTER™**  
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Item # \_\_\_\_\_

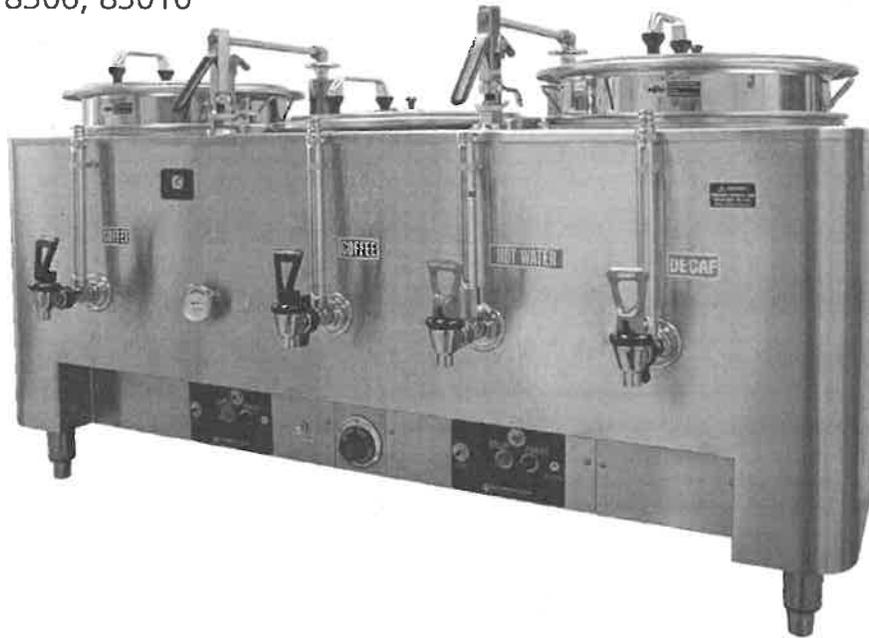
Project \_\_\_\_\_

Date \_\_\_\_\_

# Triple Space Saver Urn

## Dual Wall Insulated Pump Type Brewing System

Models 8303, 8306, 83010  
Electric



### Features:

- **Pump Style Brewing Systems**  
Water is heated in large water compartment and is sprayed over the grounds by two independently controlled water pumps.
- **Electropolished Liners**  
Smooth surface on coffee liners for easy cleaning
- **Dual wall urn body with fiberglass insulation**  
Energy Savings minimizes heat loss, saves air-conditioning costs.
- **Dual Spray Arms**  
Two independent brewing systems with two spray arms allows for simultaneously brewing of regular and decaffeinated coffee.
- **Durable Construction**  
All A.I.S.I. type 304, 18-8 stainless steel
- **Constant Brew Temperature**  
Brew temperature varies less than 5°F (3°C) throughout spray over
- **Automatic Coffee Agitation**  
Thoroughly mixes brewed coffee immediately after spray over is completed
- **Automatic refill of water compartment**  
Water compartment automatically refills and reheats as needed.
- **Low water cutoff System**  
Protects heating elements from burn out, at start-up or in operation.
- **Velvet Smooth Spray Arm**  
Teflon® coating on spray arm piston prevents liming and insures smooth operation. Positive "stops" on spray arm for operator ease.

### Easy to operate:

- **Fully Automatic – Push Button Operation**  
Simply load brew basket with coffee, align spray arm over basket lid hole and press brew start button.
- **Easy Adjustment of spray over rate**  
Simple screwdriver adjustment. No awkward changing of parts.
- **Adjustable Bypass valve on spray arm**  
Enables proper coffee extraction even with variable water conditions
- **Dial Thermometer with color-marked brew zone.**
- **Thermostat adjustable from front**  
Knob on thermostat has four marked positions: Brew, Hold, Night Standby and Off.

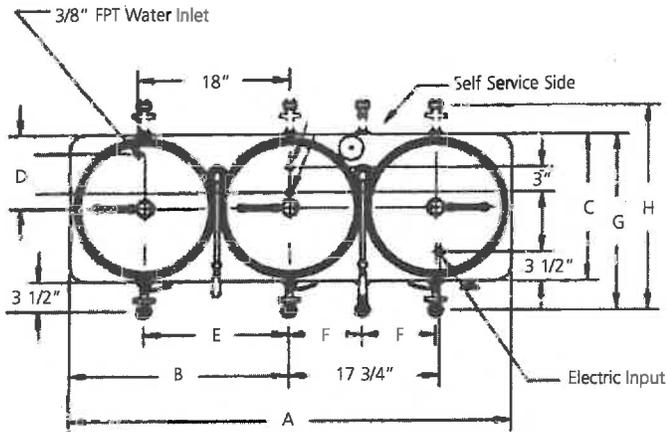
### Serviceable:

- **Drain valve in bottom**
- **Control drawer with all electrical components is accessible from the front**

# Triple Space Saver Urn

## Dual Wall Insulated

### Pump Type Brewing System



Note:  
Faucets On Self Service  
Only When Specified

Model No.	8303	8306	83010
Coffee Capacity (each liner)	3 gal.	6 gal.	10 gal.
Actual Brew Time Per Liner	6 minutes	9 minutes	14 minutes
Brews Per Hour	12	8	5
Gallons Per Hour	36	48	50
Number of 5 oz. Cups Per Hour	920	1230	1280

Brew Basket Selection Chart					
Brews	3 Gal.	6 Gal.	10 Gal.	1/2 Batch on 6 Gal.	1/2 Batch on 10 Gal.
Part No.	BB3	BB6	BB810	BB3-1.5	BB810-6

NOTE: All SS Permanent Filter Brew Basket with SS woven wire cloth bottom is available. Filter paper is available from our stock. See price list. Two stainless steel baskets included.

#### Design Specification (Fill in the blanks)

Coffee urn, fully automatic triple \_\_\_\_\_ gallons each. Pump style brewing system. Electric service. All controls to be located in recessed base of urn and operate on 120VAC. Dual wall fiberglass insulated. All AISI 304, 18-8 stainless steel construction. To include: positive low water cutoff system, automatic refill, automatic air agitation with top coffee gage fittings, bypass on spray arm, variable brew volume, electropolished liners and two all stainless steel brew baskets for paper filters. Two year parts, one year labor warranty included. U.L. listed, NSF approved.

Model Number	A	B	C	D	E	F	G	H	Work Height	Overall Height
8303	47"	23-1/2"	16-1/4"	8-1/8"	15-1/2"	7-3/4"	19-3/4"	23-1/4"	22"	27-1/2"
8306	52-1/4"	26-1/8"	17-3/4"	8-7/8"	17-1/4"	8-5/8"	21-1/4"	24-3/4"	28"	33-1/2"
83010	52-1/4"	26-1/8"	17-3/4"	8-7/8"	17-1/4"	8-5/8"	21-1/4"	24-3/4"	30"	37"

#### Fast Fill Options

- Opt. 56 Jug Fill Funnel and Chain
- Opt. 57 Gravity Jug Fill Hose Assembly
- Opt. 70T1 High Speed Jug Fill - Coffee Only
- Opt. 70T2 High Speed Jug Fill - Coffee and Washer (110 Cord and Plug Required)
- Opt. 70T3 High Speed Jug Fill - Coffee and Decaf (110 Cord and Plug Required)
- Opt. 70T4 High Speed Jug Fill - Coffee/Water/Decaf (110 Cord and Plug Required)

Model No.	8303		8306		83010	
Heater Size - KW	12 KW	11.5 KW	15 KW	15 KW	15 KW	15 KW
Heater Voltage	240V	208V	240V	208V	240V	208V
Amperes Drawn - 1Ph	50	54	63	72	63	72
Amperes Drawn - 3Ph	29	31	36	42	36	42

For 480-3Ph Supply - divide amperes for 240V-3Ph by 2.  
3 Phase 3 wire requires separate 120V supply for controls (7 Amp.)

#### Electric Services Available

Note: A ground wire must be provided in addition to the wire service shown.

#### Neutral Wire Required

- 120/208V - Single Phase - 3 Wire
- 120/208V - Three Phase - 4 Wire
- 120/240V - Single Phase - 3 Wire

#### We Supply 3 Wire Cord & Plug for separate 120 VAC

- 208V - Single Phase - 2 Wire
- 208V - Three Phase - 3 Wire
- 240V - Single Phase - 2 Wire
- 240V - Three Phase - 3 Wire
- 480V - Three Phase - 3 Wire - Extra Cost

All services include terminal block connection.



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P.O. Box 35020 • Louisville, KY 40232 • USA

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# American Metal Ware® Midline & Space Saver Urns

## Operation and Instruction Manual

For

### 7000, 8000, 9000 and Chinese Tea Urn Series

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American Metal Ware Midline and Space Saver Models: 7000, 8000, 9000, and Chinese Tea Urn Series.

- Electric heated models have suffix (E).
- Steam heated models have suffix (S).
- Heat exchange urns start in 74, 80, 81, 84, 91 or 99, all without suffix (P).
- Pump models begin in 72, 73, 77, 82, 83, 87, 93, CH, or Models 81 and/or 91 with the second suffix (P).

Your model number is found on the nameplate of the urn below the controls.

**Prior authorization must be obtained from Grindmaster Corporation for all warranty claims.**



## Installation

### **WARNING! ELECTRIC SHOCK HAZARD!**

**INSTALLATION OF THIS APPLIANCE SHOULD BE PERFORMED BY QUALIFIED SERVICE PERSONNEL ONLY. IMPROPER INSTALLATION COULD CAUSE ELECTRIC SHOCK.**

See the rough-in drawings for this model for dimensions and locations of electric, steam, and water input.

## Positioning

- 1) Position urn so that the faucets drip into a drip trough or drain receptacle of some type.
- 2) Level urn both front to back and left to right. The feet are adjustable for this purpose.

### IMPORTANT:

THE PERSON INSTALLING THIS COFFEE URN IS RESPONSIBLE FOR ENSURING THAT THE ELECTRIC AND WATER CONNECTIONS MEET THE REQUIREMENTS OF THE NATIONAL ELECTRIC CODE, THE NATIONAL PLUMBING CODE, AND ANY LOCAL ORDINANCES.

DO NOT RUN TUBING, PIPES, CONDUIT OR CABLE UNDER CENTER PORTION OF SPACE SAVER URN. THIS AREA MUST BE KEPT CLEAR FOR SERVICING URN CONTROLS.

## Water

- 1) Cold or hot water (160 degrees F. maximum) may be used. Heat input capacity is ample for the coldest water, and cold water should be used for best brewing results.
- 2) Provide shut-off valve and union in supply line near urn.
- 3) Minimum operating pressure at urn should be 30 PSI.
- 4) Maximum pressure recommended at urn is 70 PSI.
- 5) Copper tubing should be used for flexibility.
- 6) To insure pressure at the urn of at least 30 PSI, use 3/8" OD tubing for short runs, 1/2" OD tubing for longer runs, and larger size tubing for unusually long runs. Be sure other appliances will not reduce water pressure excessively.
- 7) Turn on the water supply line and check for leaks.

# Heat Input

## Electric Heated Urns, Models with suffix (E):

- 1) Check rating marking on urn nameplate to be sure electric lines match voltage, phase, and amperage requirements of urn. Select the proper cord and cord grip for electrical rating of the urn. The cord must be an oil resistant type such as SO, SOO, STO, STOO, SEO, SJO, SJOO, SJTO, SJTOO, SJEO, HSO, HSOO, HSJO, or HSJOO. Alternatively, flexible metal conduit and type THHN wires may be used.
- 2) The terminal block and ground screw are located behind a cover plate on the front, right side of the urn, or inside the control box mounted on right hand side of mid line equipment.
- 3) A neutral wire is normally required on all single phase and on 208 Volt, 3 phase power supplies to operate 120 VAC control circuit. In the case of single phase, 2 wire service (no neutral), or 3 phase 3 wire service (no neutral), a separate 120 VAC cord and plug (NEMA 5-15P) supplies 120 VAC power to the control circuit (or for use of transformer on heat exchange urns). This cord must be ordered separately.

### **WARNING:**

**NEVER USE THE GROUND CONDUCTOR AS A NEUTRAL. THIS COULD CAUSE ELECTROCUTION.**

- 4) A fused disconnect switch should be installed near urn.
- 5) Urn body **MUST** be grounded. A grounding terminal is provided for this purpose.
- 7) Use only copper wire to connect this urn.

## Steam Heated Urns, Models with suffix (S):

- 1) Steam supply line should have a shut-off valve ahead of the urn. (A strainer and control valve are located in the urn's control compartment.)
- 2) Steam return lines should be connected to a high-quality steam trap. Also, we recommend including a bypass and test valve to check trap operation while in service.
- 3) Use unions and/or copper tubing on both the supply and return connections to avoid strain on the urn.
- 4) A cord and plug (NEMA-5-15P), are attached for electrical control power. Plug cord into a nearby 115 volt, 15 amp, grounded wall outlet, only after the water line is turned on.

## Operation and Start-Up

- 1) Open water supply line valve to urn.
- 2) Turn on or plug in the power supply to the urn. Water compartment will begin to fill automatically. Do not power up the urn when the water line is off.
- 3) Pump urns have a fast fill feature. Pump urns have model numbers beginning in 72, 73, 77, 82, 83, 87, 93, and CH with any suffix, or may be any model with second suffix (P). To fill the urn in only ten minutes on these models:
  - a) Disconnect power to the urn.
  - b) Remove the control drawer in the center, underneath the urn. On triple urns, remove the left drawer. On Midline and Chinese Tea Urns, remove the cover on the side of the control box. Leave the drawer sitting under the urn, making certain no uninsulated live parts are touching the urn body.
  - c) Locate the FAST FILL VALVE which is a labeled screw type valve on the water inlet assembly - left side facing the urn.
  - d) Open the valve completely.
  - e) Leave the control drawer disconnected and restore power. The urn should fill in about ten minutes.
  - f) Disconnect power.
  - g) Close the valve until it is snug. There is no need to tighten.
  - h) Reattach the control drawer to the urn. Restore power.
- 4) Turn the thermostat knob in front of housing to BREW position. Pilot light on top of thermostat bezel will illuminate. Water in urn will heat up, and thermometer pointer will rise to high end of BREW zone on thermometer dial. It will take approximately 45 minutes to heat water, depending on inlet water temperature, and urn heater wattage. Pilot light on top of thermostat bezel will go out when water in urn is at brew temperature.
- 5) Brew and discard at least one batch of water into each liner. Check that the level is correct. See the adjustments section if changes are needed.

## How to Brew in an Automatic Urn

- 1) Place filter paper in brew basket with designated amount of coffee grounds. Coffee experts recommend from 6.4 to 8 ounces of coffee per gallon of water. Make certain you have a level bed of coffee. Consult your coffee supplier for exact brewing specifications. Filter paper sizes are:

<u>Liner size</u>	<u>Filter size</u>	<u>American Part #</u>
1.5 gallon	13 x 5	BB1.5WP
3 gallon	18 x 6	BB3WP
6 gallon	21 x 9	BB6WP
10 gallon	25 x 11	BB810WP

- 2) Replace cover. Lift and rotate the spray arm to position the nozzle in the hole on the basket cover.
- 3) Set the batch size toggle for a full or half batch. Press the start button on timer.
- 4) The brew cycle takes from 2 to 15 minutes depending on the size of the urn. When the brew is finished, allow one to two minutes for the coffee to drip from the basket.
- 5) When the drip period is complete, center the spray arm and remove the basket to throw away the grounds. Replace the liner cover to keep the coffee hot.
- 6) Coffee is ready to serve.
- 7) Hold brewed coffee at 185 to 190 degrees F by turning to the HOLD setting on thermostat knob.

## Urn Adjustments

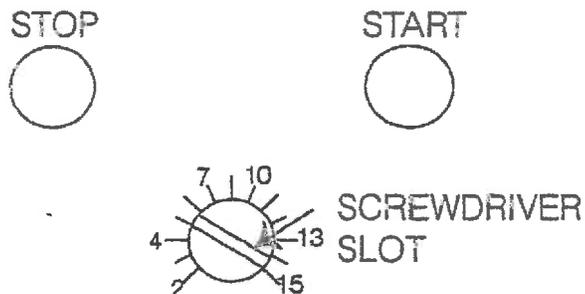
### Brew Volume: Sprayover Time and Rate

Timer and sprayover rate are factory set. If other volumes of water or a faster or slower sprayover rate is desired, see following instructions:

Urn should be up to temperature before making adjustments of the brew system.

### Timer Adjustment

The brew timer's full batch may be adjusted. The adjustment screw is located behind the plug under the start and stop buttons. See the figure at right. Since the sprayover rate is constant, the length of brew time sets the brew volume. The half batch is exactly 1/2 of the full batch.



## Urn Adjustments (con't.)

### Sprayover Rate Adjustment

**Pump Urns:** models starting in 72, 73, 77, 82, 83, 87, 93, CH, or suffix (P).

A fixed orifice is located in top of spray arm swivel post. The only way to adjust the rate of flow from the spray arm is to drill a larger hole for more sprayover water or replace the existing orifice with a smaller hole size for less sprayover water.

**Heat Exchange Urns:** models beginning in 74, 80, 81, 84, 91, 99, without suffix (P).

Heat exchange urns have a regulator which adjusts the sprayover rate. The adjustment screw is located under urn in the back of the control drawer on the left side, or inside the control box on the Midline Urns. Loosen, CCW, the screw to decrease flow and tighten, CW, the screw to increase the flow. The spray pattern should touch the weld line near the top of the liner.

To set the sprayover rate, follow these steps:

- 1) Divide the desired brew size by the desired brew time. This is your sprayover rate in gallons per minute.
- 2) Operate the brew timer for one minute and measure the amount of water. If the volume is higher than your sprayover rate from step 1, decrease the flow. Increase the flow if the volume is too low.
- 3) Continue the adjustment until the desired rate is achieved.

### Bypass Adjustment (Refer to Figure A)

The bypass adjustment controls the amount of water which bypasses the coffee during the brew. This water dilutes the final brew. If bypass is desired, open red handle on bypass valve. This opening will bypass up to about 40% of total sprayover water. Each complete turn is approximately equal to 5% bypass.

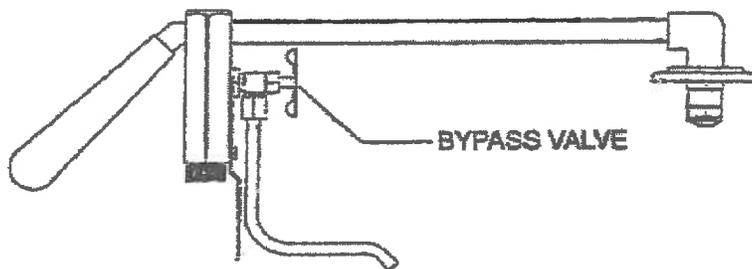


FIGURE A

### Thermostat Adjustment

The thermostat is factory set so that the maximum temperature is about 204 degrees F in heat exchange urns and 195 degrees F in pump urns. This is the high end of brew range on the thermometer and corresponds to the BREW position on the thermostat. The HOLD position is the low end of the brew range on the thermometer, or 185 degrees F.

Water should never boil in the urn. If you need to adjust the maximum setting of the thermostat, do the following:

- 1) Remove the thermostat knob.
- 2) Insert small screwdriver into the center of the shaft. Turn the screw slightly clockwise to decrease the temperature.
- 3) Check the setting by adding cold water to make sure the temperature reaches the high end of the BREW range.

## Care and Cleaning of Coffee Urns

**WARNING: THE URN SURFACES AND WATER INSIDE ARE VERY HOT. USE CAUTION WHEN CLEANING THIS URN.**

**NEVER USE CHLORINE BASED CLEANERS SUCH AS BLEACH TO CLEAN STAINLESS STEEL. DO NOT USE SCOURING CLEANERS ON THE URN'S SURFACES.**

### After Each Brew

- 1) Discard grounds and rinse brew basket.

### Every Day

- 1) Clean liners by rinsing and scrubbing with large, plastic bristle brush.
- 2) Wipe outside surfaces of the urn with a damp cloth.
- 3) Clean the brew basket. Remove wire basket insert if needed.
- 4) Wipe clean the liner covers.
- 5) Fill the liners with about one gallon of water to prevent coffee oil burn-in.

### Weekly or Bi-Weekly Depending on Use

- 1) Fill the urn liners with about one gallon of hot water. Leave the thermostat on BREW.
- 2) Pour into the liner the recommended concentration of urn cleaner. Excessive amounts of cleaner will attack the stainless steel.

Urn cleaners which have been used successfully:  
DIP-IT manufactured by Economics Laboratories, Inc.  
4 Corporate Park Drive, White Plains, NY 10604

OXYLITE manufactured by Avril, Inc., Syndet Division  
601 N. Third Street, Reading, PA 19601

- 3) Scrub the liner interior with a large plastic bristle brush. Drain the liner.
- 4) Clean the gauge glasses with a long narrow brush. Rinse.
- 5) With the liners empty, remove the coffee faucets by unscrewing the large plastic wing-nuts which fasten the faucets. Scrub from the opening into the center of the urn with a long brush.

**WARNING: THE HOT WATER FAUCET SHOULD NOT BE REMOVED FOR CLEANING. HOT WATER WILL EMPTY FROM JACKET, CAUSING BURNS. TO CLEAN WATER GAUGE, CLOSE SHUT-OFF VALVE AT BASE OF GAUGE ASSEMBLY.**

- 6) Unscrew the top of the faucet from its body. Scrub faucet body. Clean the silicone seat cup with a soft cloth and soapy water.
- 7) Reassemble faucets. Fill the liners with hot water and drain until the liner and all parts are completely rinsed.

# Liquid Level Control System

Dual Level Control: What it Does (Refer to Figure B):

- A) AUTO REFILL of the water compartment to keep the tank filled with water. When the water is used, the fill valve opens automatically to let in more water. The fill valve closes when the water level reaches full.
- B) LOW WATER CUTOFF to prevent burnout of the electric immersion heater when there is not enough water to cover it. When low water occurs, the heat automatically switches off. The heat stays off until more water is added.

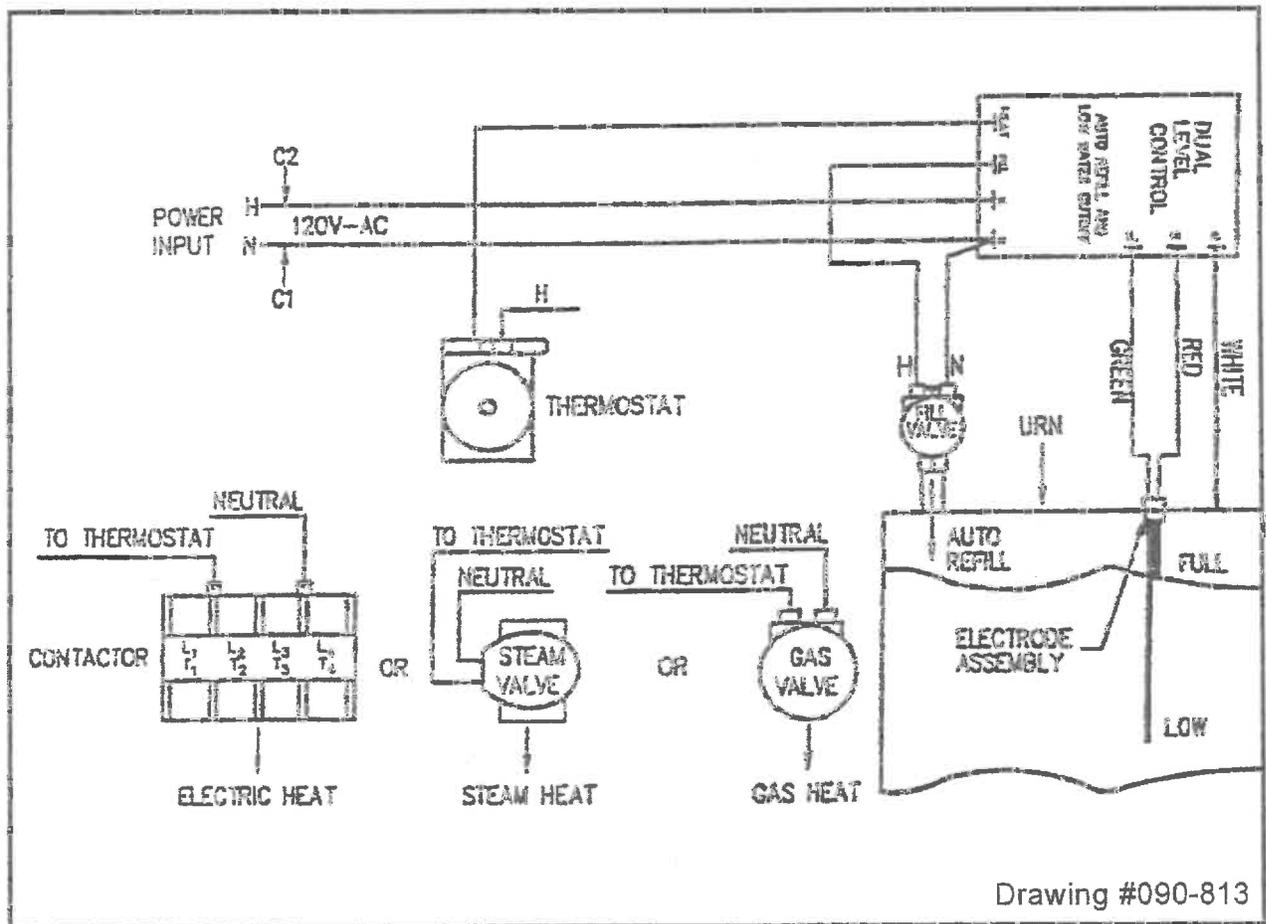


Figure B

## Quick Service Check of Liquid Level Control System:

- 1) All wires secure and properly connected.
- 2) Clean the electrodes. Lime (mineral scale) build-up can interfere with operation of any liquid control system.

## Service (cont.)

### To replace a heater (drain the urn first):

- 1) Remove the control drawer as described above. (Refer to page 9)
- 2) Locate the heater terminals under the urn, or on the side for Midline equipment.
- 3) Remove the heater liner which is closest to the terminals.
- 4) Loosen the heater connection and remove heater.
- 5) Place the copper sealing washer on the new heater with the split toward the element.
- 6) Position the new heater in the urn and tighten the nut.
- 7) Be sure the electrical connections are tight. Close the gap terminal with pliers if it is too loose. Replace the wires if they are damaged.

### To replace the thermostat (drain the urn first):

- 1) Remove the control drawer as described above. (Refer to page 9)
- 2) Locate the fitting on the bottom surface of the urn which the thermostat capillary passes through.
- 3) Remove the coffee liner closest to this fitting.
- 4) Locate the thermostat bulb and remember its location. Some urns have two thermostats. Be sure to find the right one.
- 5) Unwrap the wire holding the bulb.
- 6) Unscrew the thermostat from the fitting on the bottom of the urn.
- 7) Disconnect the wires and remove the thermostat.
- 8) Attach the new thermostat and tighten the capillary tube fitting.
- 9) Use the wire to attach the bulb to the same location in the urn as the old thermostat.
- 10) Reattach the liner, as described above, close up the urn, allow the urn to heat to check the temperature setting.
- 11) On Midline or Chinese Tea Urns, the thermostat is mounted on the control box on the side of the urn.

### To convert between single and three phase (on urns with three heaters only, 208-240V only):

Refer to the heater wiring diagram #091-227 at the end of the manual.  
Use extra caution in ensuring that all wires are correctly and securely connected.

### To replace a sprayover pump on pump urns:

- 1) Disconnect power from urn.
- 2) Remove the cover over the controls.
- 3) Locate the hose clamp in the control panel.
- 4) Clamp off intake hose to pump from water jacket.
- 5) Disconnect wires from pump to timer (label wires).
- 6) Disconnect ground wires.
- 7) Slip hoses off of pump.
- 8) Loosen screws which hold pump in place and remove pump.
- 9) Retain fitting and bracket for use with replacement.
- 10) Replace pump, connect wiring and tubing, and pump should be level.
- 11) Restore power to the urn.

## Troubleshooting: Filling, Heating, and Brewing

Problems	Possible Cause	Service Check	Remedy
<b>Filling Problems</b>			
<b>Over filling water tank even when the power is off.</b>	• Fill valve not sealing properly.	• Water entering tank continuously, usually slow.	• Disassemble valve and clean out dirt. Valve may need new plunger if seal is worn.
	• Fill valve installed backwards.	• Look for direction of arrow on valve body.	• If arrow on valve is pointing toward water inlet, remove valve and install correctly.
<b>Over filling water tank only when power is on.</b>	• High electrode coated in lime or faulty.	• Jumper HI terminal on level control to metal enclosure stops fill.	• Remove electrode assembly and clean both probes. If this does not work, replace assembly.
	• Missing or faulty connection of C terminal on level control to metal enclosure.	• Jumper from C terminal to metal body stops fill.	• Make secure connection of C to metal body.
	• Fill valve connected to heat terminal on level control.	• Check connections.	• Connect black lead for valve to FILL on level control.
	• Liquid Level Control is faulty.	• Jumper from HI to C or metal enclosure does not stop fill.	• Replace level control.
<b>Tank does not refill.</b>	• No power at equipment.	• Nothing operates.	• Check main switch or circuit breaker, urn's circuit breaker or power switch if provided.
	• No water at equipment.	• Crack water inlet fitting.	• Make sure all water supply line valves are open.
	• Water strainer clogged.	• Water pressure before strainer but not after.	• Remove and clean or replace strainer's mesh.
	• No power to level control.	• Check for 120V AC across H and N terminals on level control.	• If no voltage, check for loose or broken wires.
	• Level control faulty.	• Disconnect probe wire to HI terminal on level control. Check for 120V at FILL terminal.	• If no 120V at FILL terminal, replace level control.
	• Electrodes faulty.	• Tank fills only when probe wire is disconnected from HI terminal on level control.	• Replace electrodes. If no remedy, check for improper wiring or level probe tip touching metal.
	• Fill valve faulty.	• 120V is across FILL and N on level control, but no fill.	• Disassemble valve and clean or replace plunger if frozen. If plunger is OK, coil may need replacement.

## Troubleshooting: Filling, Heating, and Brewing (con't.)

Problems	Possible Cause	Service Check	Remedy
<b>Heating Problems</b>			
<b>Tank does not heat.</b>	• Low electrode faulty or covered with lime.	• Jumper from XL terminal on level control to metal body allows heating.	• Clean electrode, check wiring. If no remedy, replace electrodes.
	• Level control faulty.	• Check for 120V between H and N terminals on level control. If OK, jumper between XL and metal body and check for 120V between HEAT and N terminals	• If 120V is not at HEAT, replace level control.
	• Thermostat faulty or out of calibration.	• Make sure thermostat is turned on. Jumper across thermostat allows heating.	• Recalibrate thermostat. If no remedy or thermostat does not cycle, replace thermostat.
	• Heater contactor coil faulty. (electric heat)	• Check for 120V across contactor coil.	• If correct voltage, but contactor not closing, replace contactor.
	• Heater contactor contacts faulty.	• Check for heater voltage between each heater pole on contactor and a different terminal pole.	• If no continuity across contactor when it is closed, replace contactor.
	• Heater faulty.	• Check resistance across elements with wires disconnected.	• If resistance is much different than 10 to 15 ohms, replace heater.
<b>Recovery time is very long.</b>	• Heater faulty.	• See above.	• See above.

## Troubleshooting: Filling, Heating, and Brewing (con't.)

Problems	Possible Cause	Service Check	Remedy
<b>Brewing Problems</b>			
<b>Brew volume too large or small.</b>	• Timer out of adjustment.	• Compare timer setting to factory setting chart.	• Adjust timer.
	• Flow rate is incorrect.	• Brew batch for one minute and measure volume. Compare to factory setting chart.	• Adjust flow rate. If flow rate cannot be adjusted, check for lime in spray arm, or spray arm post. Water regulator on heat exchange urns may be faulty or need adjustment.
	• Pressure not adequate at urn.	• Water line must be 3/8" ID and pressure at least 30 PSI.	• Increase water line size. Plumb line so other equipment does not interfere with pressure.
	• Lime build-up in heat exchange coil. (heat exchange models only)	• Brew rate regulator opened completely, pressure OK at urn, but flow is still slow.	• De-lime heat exchange coil.
	• Timer faulty.	• Brew time does not match timer setting. Timer not adjustable.	• Replace timer.
<b>Brew volume erratic. (There are always some small variations from batch to batch).</b>	• Pump cavitation (pump models only)	• Water temperature above 195 degrees F.	• Recalibrate thermostat to about 195 degrees F.
	• Timer faulty.	• Measure brew time for inconsistencies.	• If time is different from batch to batch, replace timer.
	• Pressure fluctuations at urn.	• Check pressure at urn inlet.	• Plumb water line so its pressure is not influenced by other appliances.
			• On Heat Exchange Urns, adjust, repair, or replace regulators.

## Troubleshooting: Filling, Heating, and Brewing (con't.)

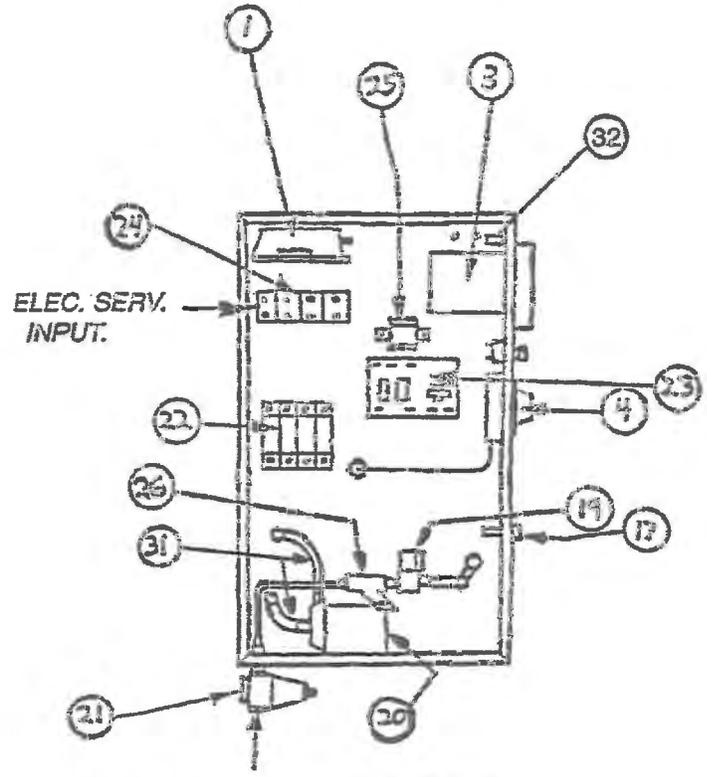
Problems	Possible Cause	Service Check	Remedy
<b>Brewing Problems (con't.)</b>			
<b>Brew will not start.</b>	• Timer faulty.	• Check for 120V between H and N on timer. If OK, check for 120V between BREW and N on timer after pressing start.	• If no 120V BREW output from timer, replace timer.
	• Pump faulty (pump urns only)	• 120V between BREW and N on timer, but pump does not operate.	• Check for lime in pump impeller. Clean or replace impeller. If no remedy, replace pump.
	• Spray arm clogged with lime.	• Cannot blow through spray arm.	• Clean lime out of spray nozzle.
	• Coil on Heat Exchange Urns clogged.	• Brew valve opens but no water enters coil.	• Delime or replace coil.
<b>Agitation does not automatically start after brew.</b>	• Timer faulty.	• Pressing manual agitation button starts air pump.	• Replace timer.
	• Air pump faulty.	• Pressing manual agitation button does not start air pump. Also check for 120V between AGITATE terminals on timer.	• Replace air pump.
<b>Agitation pump starts, but does not stir coffee.</b>	• Silicone tube at top of gauge glass broken.	• Visual.	• Replace tubing.

If you still need help, call our Service Department at (800) 695-4500 (USA or Canada) (Monday through Friday, 8 am - 6 pm EST), +1-502-425-4775 or an authorized service center in your area. Please have the model and serial numbers ready so that accurate information may be given.

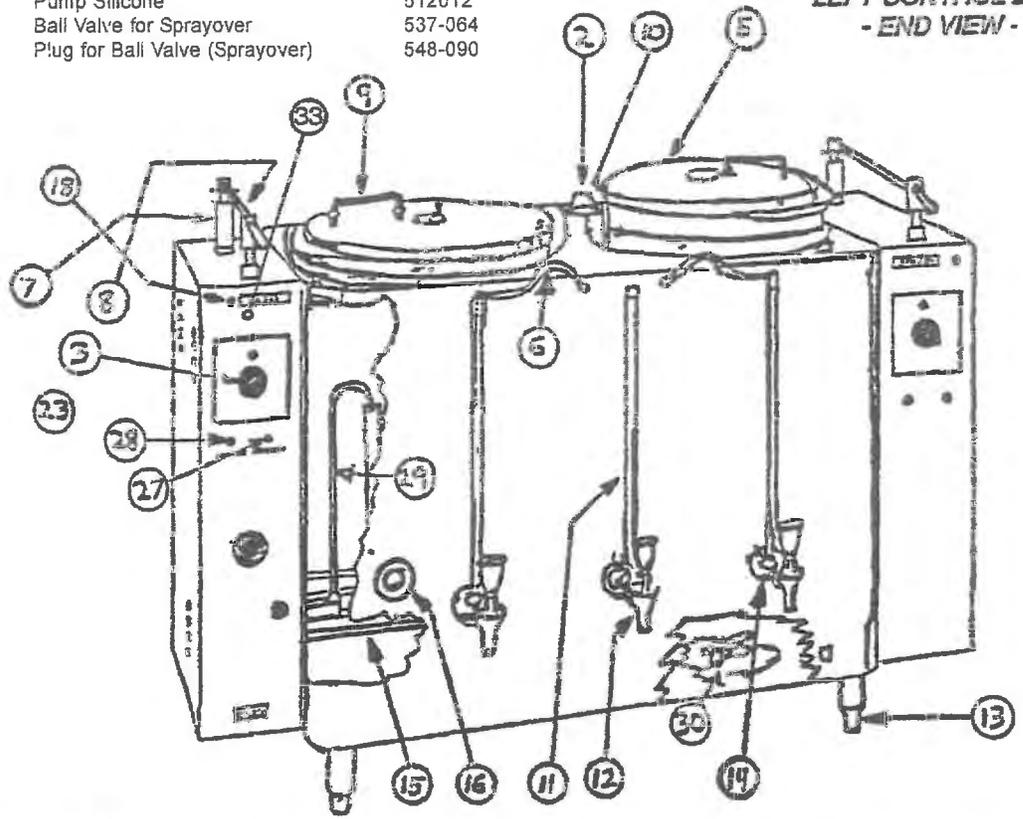
Prior authorization must be obtained from Grindmaster Corporation's Technical Services Department for all warranty claims.

# Parts Illustration for High Volume Urns (Model 87710)

	DESCRIPTION	PART NO.
1.	Dual Air Pump	508004
2.	Electrode Assembly	712-017
3.	Timer	530-007
4.	Thermostat	504001
5.	Cover	800007
6.	Air Agitation Tubing	512011
7.	Vent Tube	A581B
8.	Spray Arm Assembly	1214028
9.	Cover Handle	513001
10.	Brew Basket	BB810
11.	Gauge Glass Assembly	Coffee 718-036 Water 718-046
12.	Faucet	522094
13.	ADI Foot	510012
14.	Shank w/Wing Coupling Nut	Coffee 1211016 Water 1211015
15.	Electric Immersion Water Heater	535-040
16.	Thermometer	506001
17.	Circuit Breaker	515072
18.	Manual Agitation Switch	515001
19.	Fill Solenoid Valve	537-060
20.	Sprayover Pump	533-012
21.	Water Pressure Regulator	505019
22.	Heater Contactor	514005
23.	Liquid Level Control - Dual	549-006
24.	Power Input Terminal Block	531-035
25.	Solid State Relay - Automatic Air Agitation	531-024
26.	Water Strainer	532064
27.	Start Push Button	515001
28.	Stop Push Button	515002
29.	Refill Water Inlet Standpipe	418-005
30.	Boiler Drain Valve	532097
31.	Pump Silicone	512012
32.	Ball Valve for Sprayover	537-064
33.	Plug for Ball Valve (Sprayover)	548-090

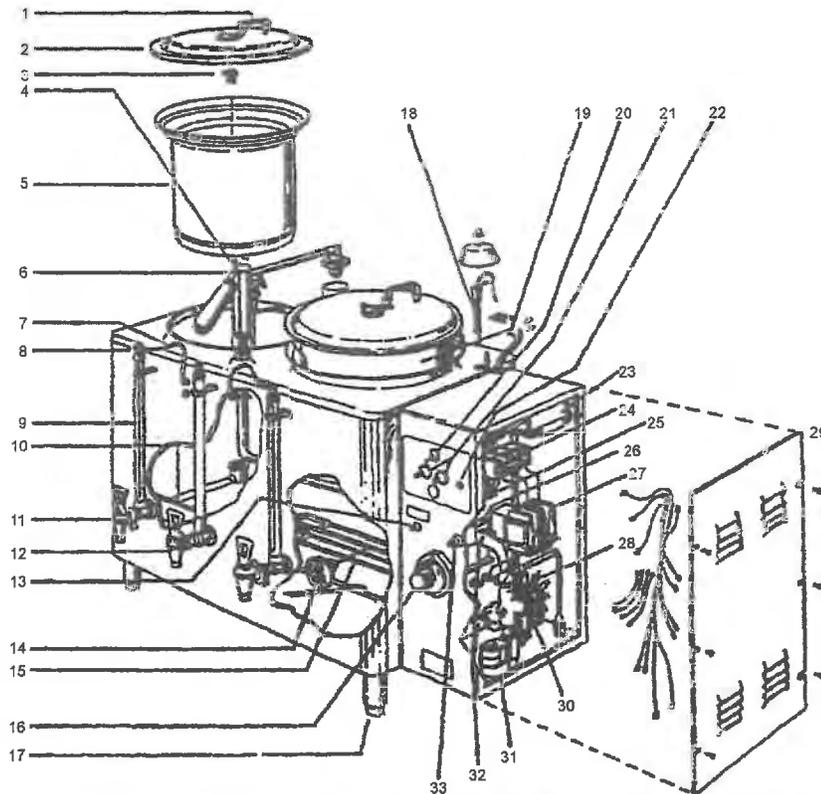


LEFT CONTROL BOX  
- END VIEW -



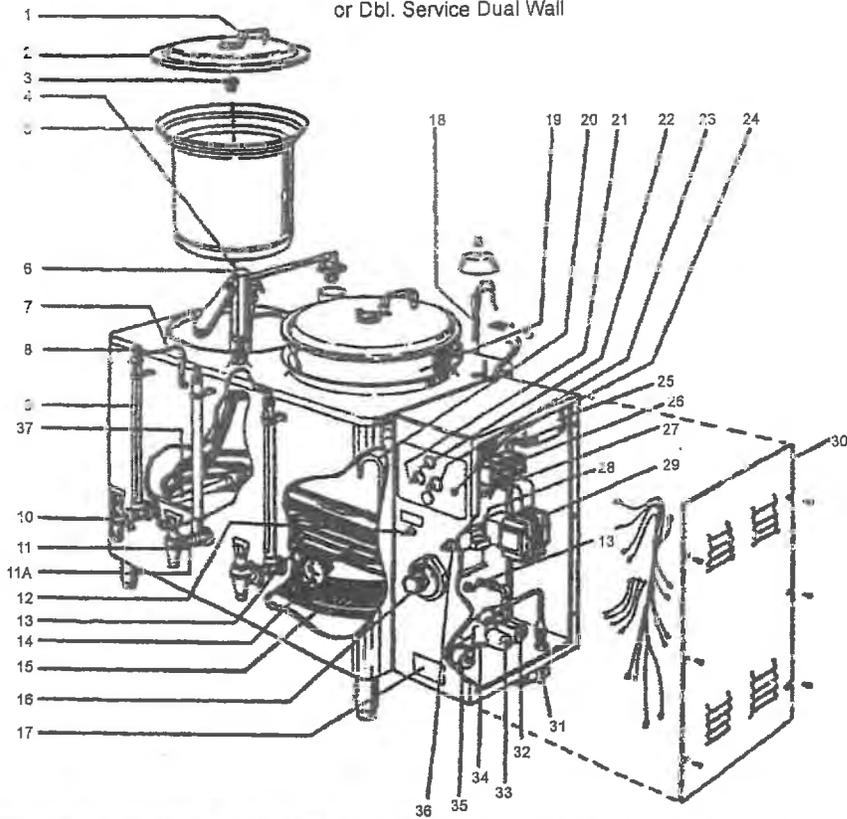
# Parts Illustration for 7700 Urns

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>URN SIZE</u>	<u>PART NO.</u>
1	Cover Handle Kit	All	513001
2	Cover	Specify Model #	8000XX
3	Liner Nut	All	1200002
4	Liner Washer	All	520001
5	Coffee Liner	Specify Model #	10190XX
6	Spray Arm Ass'y	Specify Model #	12140XX
7	Air Agitation Tubing	All	512011
8	Plug in Cleanout Cap for Air Mix	All	A-689
9	Gauge Assy	Specify Model #	718-OXX
10	Coffee Delivery Tube	Specify Size and Single or Double Service Dualwall	12100XX
11	Upper Faucet Ass'y	All	537-048
12	Faucet	All	522094
13	Agitation Switch	All	515001
14	Thermometer	All	50600;
15	Heater	Specify Model Ser.	535-OXX
16	Thermostat	All	504001
17	Bullet Foot	All	510012
18	Electrode Assy	Specify Model #	712-OXX
19	Brew Basket	Specify Model #	BBXX
20	Full/Half Batch Selector Switch	All	531-012
21	Start/Stop Switches (Part of Brew Timer)	All	530-007
22	Brew Pilot Light	All	515016
23	Dual Air Pump	All	508004
24	Terminal Block	All	505003
25	Timer	All	530-007
26	Dual Liquid Level Control	All	549-000
27	Heat Contactor	Specify Model #	5140XX
23	Water Strainer	All	532064
29	Control Box Door	Specify Model #	313-XXX
30	Sprayover Pump	All	553-012
31	Fill Solenoid Valve	All	537-060
32	Pump Silicone Tubing	All	512012
33	Circuit Breaker	All	515072

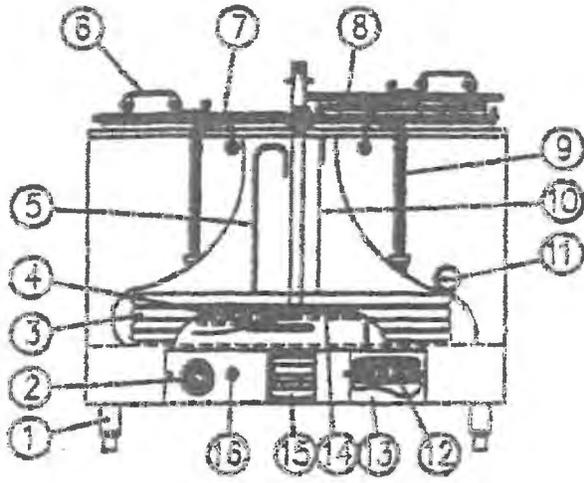


# Parts Illustration for 7400 Urns

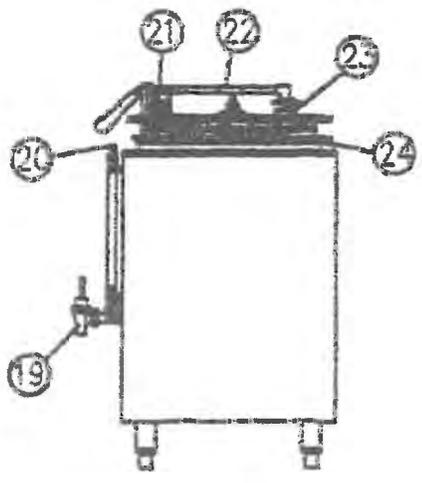
ITEM NO.	DESCRIPTION	URN SIZE	PART NO.
1	Cover Handle Kit	All	510001
2	Urn Cover Complete	Specify Model #	8000XX
3	Liner Nut	All	1200002
4	Liner Washer	All	520001
5	Coffee Liner	Specify Model #	10190XX
6	Spray Arm Ass'y	Specify Model #	12140XX
7	Silicone Tubing For Air Mix	All	512011
8	Plug in Gauge Cap For Air	All	A-889
9	Gauge Shield Ass'y	Specify Model #	718-OXX
10	Upper Faucet Ass'y	All	537-048
11	Faucet	All	522094
11A	Shank Ass'y for Faucet	Specify Coffee or Water	12110XX
12	Manual Agitation Switch	All	515001
13	Heater & Serial #	Specify Model #	535-OXX
14	Thermometer	All	50600;
15	Heat Exchange Coil	Specify Model #	2030XX
16	Thermostat	All	50400;
17	Bullet Foot	All	510012
18	Electrode Ass'y	Specify Model #	712-OXX
19	Brew Basket	Specify Model #	BBXX
20	Refill Water Inlet	All	718-XXX
21	Stop Switch	All	515002
22	Full/Half Batch Selector Switch	All	521-012
23	Start Switch	All	515001
24	Amber Brew Pilot Light	All	515016
25	Dual Air Pump	All	508004
26	Terminal Block	All	505003
27	Timer	All	530-007
28	Liquid Level Control	All	505002
29	Heat Contactor	Specify Model #	5140XX
30	Control Panel Door	Specify Model #	313-XXX
31	Outside 3/8" Water Regulator	All	505019
32	Brew Solenoid Valve	All	537-060
33	Inside 1/4" Water Regulator	All	505021
34	Water Strainer	All	532064
35	Fill Solenoid Valve	All	537-060
36	Circuit Breaker	All	515072
37	Coffee Delivery Tube	Specify Size & Single or Dbl. Service Dual Wall	12100XX



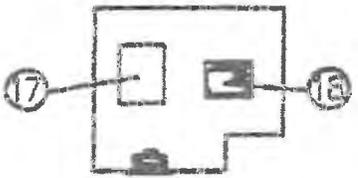
# Parts Illustration for 8000 Urns



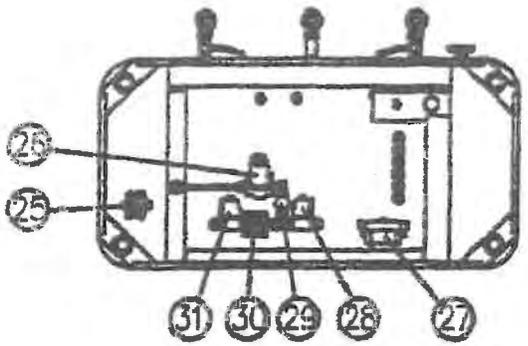
**FRONT VIEW**



**SIDE VIEW**



**CONTROL PANEL TOP VIEW**



**BOTTOM VIEW**

	<u>DESCRIPTION</u>	<u>PART NO.</u>
1.	Adjustable Leg	510012
2.	Thermostat W/Pilot Light	504001
3.	Heat Exchange Coil	203XXX
4.	Thermostat Capillary Bulb	Part of 504001
5.	Refill Water Inlet Standpipe	418-XXX
6.	Cover Handle	513001
7.	Air Agitation Tubing	512011
8.	Coffee Liner Cover	300XXX
9.	Gauge Glass Assembly	718-XXX
10.	Electrode Assembly	712-XXX
11.	Thermometer	506001
12.	Terminal Block	531-035
13.	Terminal Block Cover	A1037
14.	Electric Immersion Heating Element (s) (Electric heat only)	535-XXX
15.	Solid State Timer	530-007
16.	Control Section Circuit Breaker	515072
17.	Dual Output Air Pump	508004
18.	Liquid Level Control	549-006
19.	Faucet	522094
20.	Top Gauge Cleanout Fitting for Air Agitation	A-889
21.	Bypass Valve	1214034
22.	Spray Arm Assembly	1214XXX
23.	Vent Tube	A581B
24.	Brew Basket	BBX
25.	Drain	532097
26.	Primary Water Inlet Regulator	505019
27.	Heater Contactor (Electric heat only)	514005
28.	Water Inlet Fill Solenoid Valve	537-060
29.	Inlet Water Strainer	532064
30.	Secondary Sprayover Water Regulator	505021
31.	Sprayover Solenoid Valve	537-060

# Rough In Specifications for High Speed Brew Urns (Model 87710E)

## UTILITY DATA

1. Must be connected to hot (140 degrees F) water supply, 3/8" NPT, 2.5 GPM flow rate min.

### 2. Steam Heat

- A. Standard pressure = 10-25 PSIG
- B. Max. steam demand = 70 lbs. per hour
- C. Boiler horse power = 2.3
- D. Requires connection to 120V AC, 3 wire, 15 amp circuit; 6 foot cord with plug supplied

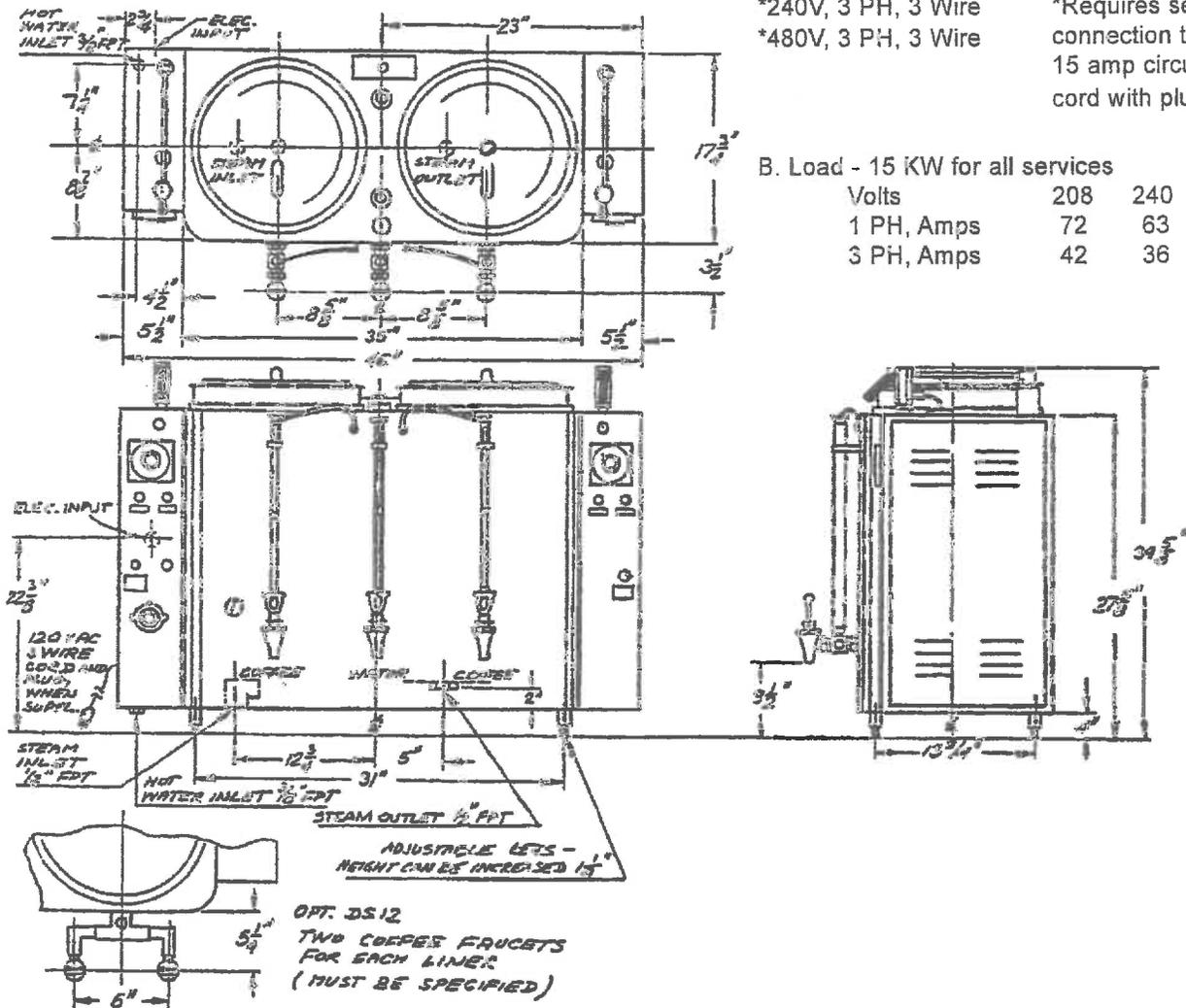
### 3. Electric Heat

#### A. Specify service

120/208V, 1 PH, 3 Wire	*208V, 1 PH, 2 Wire
120/208V, 3 PH, 4 Wire	*208V, 3 PH, 3 Wire
120/240V, 1 PH, 3 Wire	*240V, 1 PH, 2 Wire
*240V, 3 PH, 3 Wire	*Requires separate connection to 120V AC 15 amp circuit; 6 foot cord with plug supplied.
*480V, 3 PH, 3 Wire	

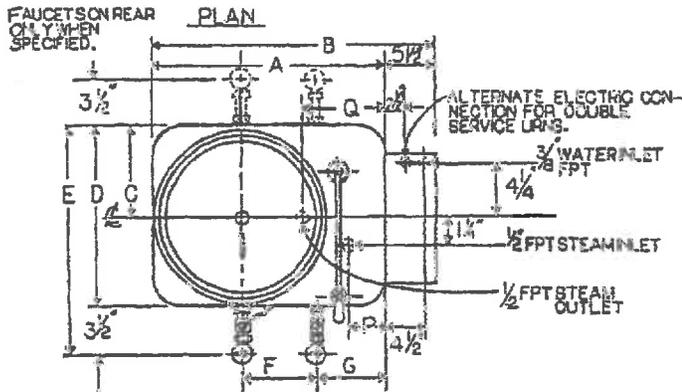
#### B. Load - 15 KW for all services

Volts	208	240	480
1 PH, Amps	72	63	-
3 PH, Amps	42	36	18

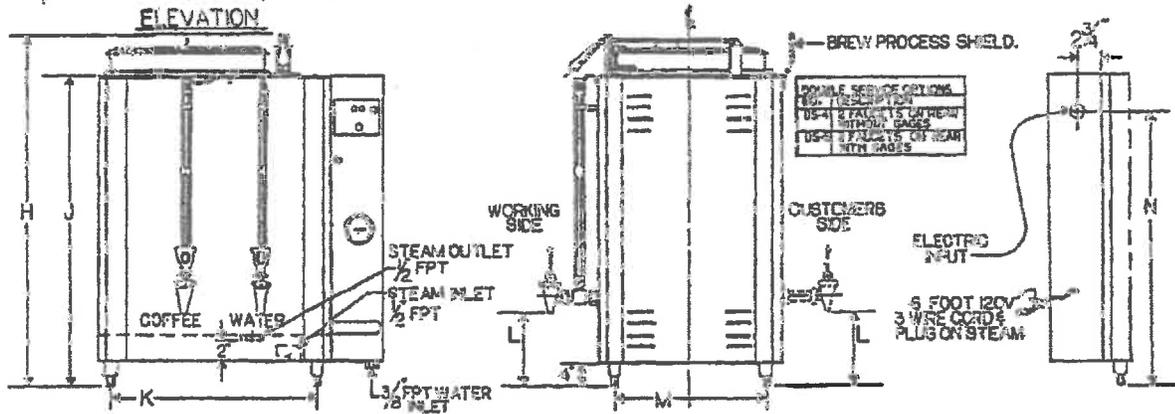


Drawing #090-999

# Rough In Specifications for Single Auto Urns (7700, 7400, or Chinese Tea Urns)



MODEL	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q
8413 E.S	13	24 1/2	8	16	19 1/2	5 1/2	5 1/2	27 1/2	21 1/2	15	8 1/2	12	18	1 1/2	3 1/2
8416 E.S	22	27 1/2	8 1/2	17 1/2	21 1/2	7 1/2	5 1/2	33 1/2	27 1/2	18	9 1/2	13 1/2	22 1/2	1 1/2	8 1/2
84110 E.S	22	27 1/2	8 1/2	17 1/2	21 1/2	7 1/2	5 1/2	34 1/2	27 1/2	18	9 1/2	13 1/2	22 1/2	1 1/2	8 1/2
9413 E.S	18	23 1/2	7 1/2	15	18 1/2	5 1/2	5	27 1/2	21 1/2	15	3 1/2	12	18	1 1/2	8
9416 E.S	21	26 1/2	3 1/2	16 1/2	20 1/2	7 1/2	5	33 1/2	27 1/2	18	9 1/2	13 1/2	22 1/2	1 1/2	8
94110 E.S	21	26 1/2	8 1/2	16 1/2	20 1/2	7 1/2	5	34 1/2	27 1/2	18	9 1/2	13 1/2	22 1/2	1 1/2	8
7413 E.S	18	23 1/2	7 1/2	15	18 1/2	5 1/2	5	27 1/2	21 1/2	15	8 1/2	12	18	1 1/2	8
7416 E.S	21	23 1/2	8	16 1/2	20 1/2	7 1/2	5	33 1/2	27 1/2	18	9 1/2	13 1/2	22 1/2	1 1/2	8
74110 E.S	21	26 1/2	8 1/2	16 1/2	20 1/2	7 1/2	5	34 1/2	27 1/2	13	9 1/2	13 1/2	22 1/2	1 1/2	8
7700 E.S	Same as 7400 Model Series														

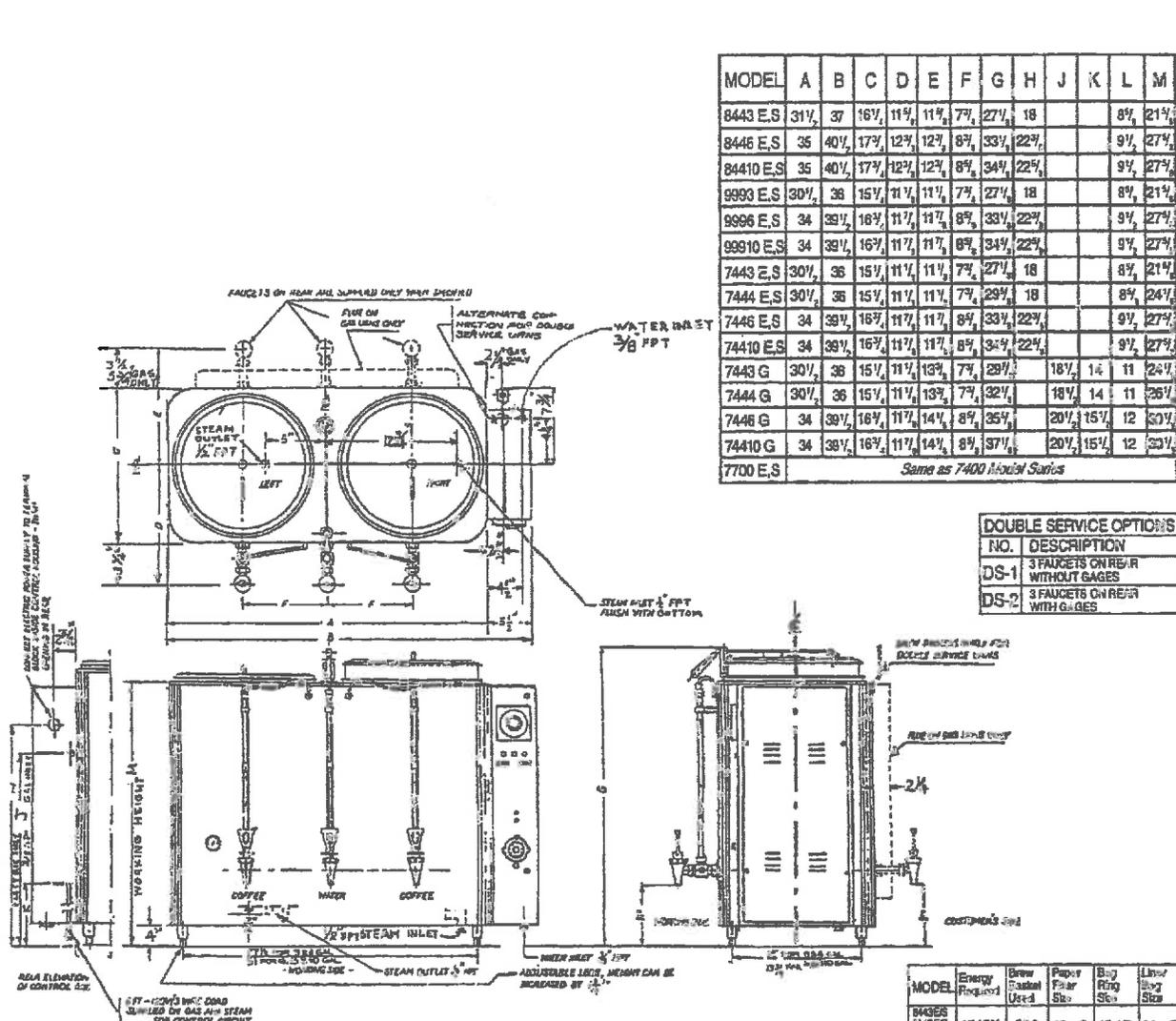


IF 120V SERVICE NOT AVAILABLE SPECIFY OPT. 22 CONTROL CIRCUIT TRANSFORMER

MODEL	Brew Liver Volume	Brew Basket Used	Paper Filter Size	Bag Ring Size	Liver Bag Size	STEAM HEAT Model No. Suffix (S) • Specify steam pressure. • Standard is 10 to 25 PSIG, other pressures extra cost. • 6 ft. - 120V/3 wire cord and plug supplied for controls (1 amp).	ELECTRIC HEAT Model No. Suffix (E) Specify service.										
							MODEL	8413 8413	8416 8416	84110 84110	7413	7416	LOAD	13W	AMP	KW	AMP
8413ES 8416ES 7413E	3 GAL	BB3	18 x 6	12 1/2	14 x 9	• Standard is 10 to 25 PSIG, other pressures extra cost. • 6 ft. - 120V/3 wire cord and plug supplied for controls (1 amp).	120/208V - 1PH - 3 WIRE	3	39	11.5	54	15	72	5.5	25	8.5	41
8416ES 8416ES 7416E	6 GAL	BB6	21 x 9	14	17 x 9	• Standard is 10 to 25 PSIG, other pressures extra cost. • 6 ft. - 120V/3 wire cord and plug supplied for controls (1 amp).	120/240V - 1PH - 3 WIRE	10.5	44	12	50	15	63	7	29	11.5	48
84110ES 84110ES	10 GAL	BB10	25 x 11	15	17 x 9	Maximum steam demand, lbs. per hr.	120/208V - 3PH - 4 WIRE	8	22	11.5	31	15	42	8	22	11.5	31
							240V - 3PH - 3 WIRE	10.5	25	12	29	15	36	10.5	25	12	29
							480V - 3PH - 3 WIRE	12	14	12	14	15	18	12	14	12	14

Drawing #A-1184

# Rough In Specifications for Twin Auto Urns (7700, 7400, or Chinese Tea Urns)



MODEL	A	B	C	D	E	F	G	H	J	K	L	M
8443 E.S.	31 1/2	37	16 1/2	11 1/2	11 1/2	7 1/2	27 1/2	18			8 1/2	21 1/2
8446 E.S.	35	40 1/2	17 1/2	12 1/2	12 1/2	8 1/2	33 1/2	22 1/2			9 1/2	27 1/2
84410 E.S.	35	40 1/2	17 1/2	12 1/2	12 1/2	8 1/2	34 1/2	22 1/2			9 1/2	27 1/2
9993 E.S.	30 1/2	36	15 1/2	11 1/2	11 1/2	7 1/2	27 1/2	18			8 1/2	21 1/2
9996 E.S.	34	39 1/2	16 1/2	11 1/2	11 1/2	8 1/2	33 1/2	22 1/2			9 1/2	27 1/2
99910 E.S.	34	39 1/2	16 1/2	11 1/2	11 1/2	8 1/2	34 1/2	22 1/2			9 1/2	27 1/2
7443 E.S.	30 1/2	36	15 1/2	11 1/2	11 1/2	7 1/2	27 1/2	18			8 1/2	21 1/2
7444 E.S.	30 1/2	36	15 1/2	11 1/2	11 1/2	7 1/2	29 1/2	18			8 1/2	24 1/2
7446 E.S.	34	39 1/2	16 1/2	11 1/2	11 1/2	8 1/2	33 1/2	22 1/2			9 1/2	27 1/2
74410 E.S.	34	39 1/2	16 1/2	11 1/2	11 1/2	8 1/2	34 1/2	22 1/2			9 1/2	27 1/2
7443 G	30 1/2	36	15 1/2	11 1/2	13 1/2	7 1/2	29 1/2		18 1/2	1 1/2	11	24 1/2
7444 G	30 1/2	36	15 1/2	11 1/2	13 1/2	7 1/2	32 1/2		18 1/2	1 1/2	11	26 1/2
7446 G	34	39 1/2	16 1/2	11 1/2	14 1/2	8 1/2	35 1/2		20 1/2	1 1/2	12	30 1/2
74410 G	34	39 1/2	16 1/2	11 1/2	14 1/2	8 1/2	37 1/2		20 1/2	1 1/2	12	33 1/2
7700 E.S.	Same as 7400 Model Series											

DOUBLE SERVICE OPTIONS	
NO.	DESCRIPTION
DS-1	3 FAUCETS ON REAR WITHOUT GAGES
DS-2	3 FAUCETS ON REAR WITH GAGES

MODEL	Energy Required	Brew Basket Used	Paper Filter Size	Brg Ring Size	Line Size
8443ES 8446ES 7444ES	12 KW	BB3	18 x 6	12 1/2	14 x 9
8446ES 9996ES	15 KW	BB6	21 x 9	14	17 x 9
8410ES 99910ES 74410ES	15 KW	BB10	25 x 11	15	17 x 9
7446ES	20/22/24/26 KW	BB3	18 x 6	12 1/2	14 x 9
7446ES	24/26/28/30 KW	BB6	21 x 9	14	17 x 9
7443G	25 000 BTU/hr	BB3	18 x 6	12 1/2	14 x 9
7444G	35 000 BTU/hr	BB3	18 x 6	12 1/2	14 x 9
7446G	35 000 BTU/hr	BB3	21 x 9	14	17 x 9
74410G	35 000 BTU/hr	BB10	25 x 11	15	17 x 9

ALL HEIGHTS INCREASED BY OPT. 58 WHEN SPECIFIED

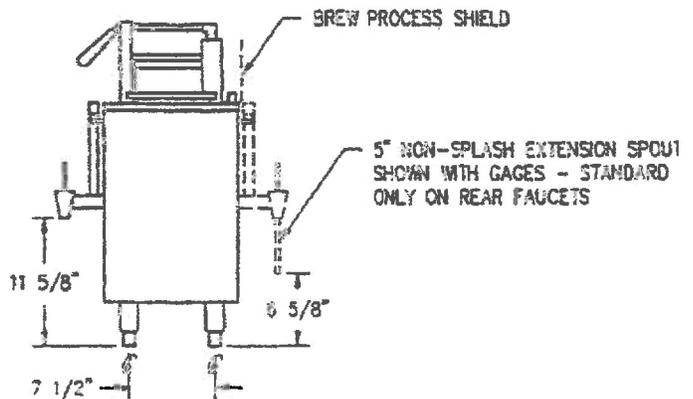
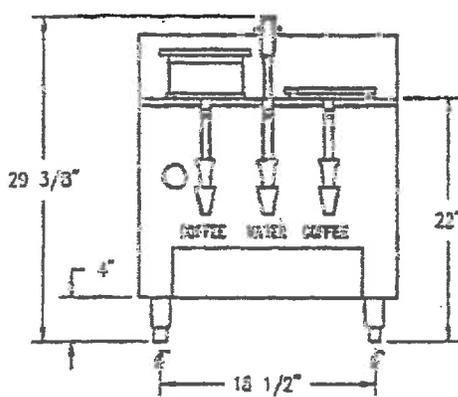
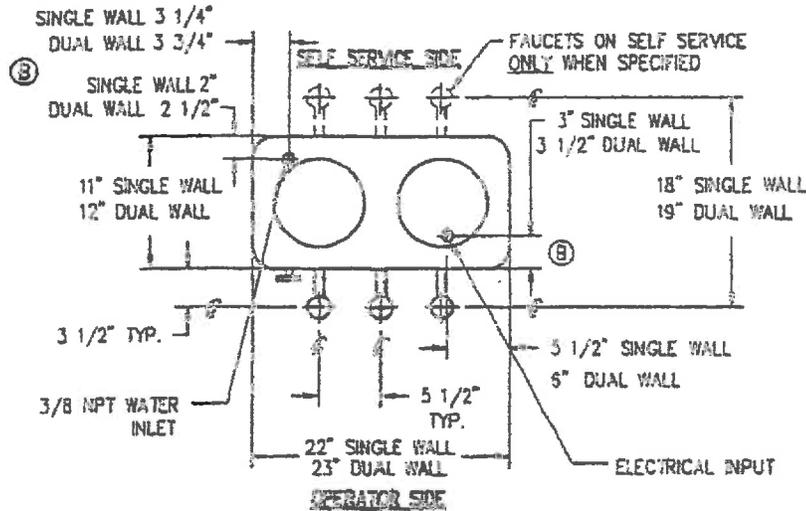
<b>ELECTRIC HEAT - SPECIFY ELECTRIC SERVICE</b> 120/208V-3 WIRE-SINGLE PHASE 120/208V-4 WIRE-THREE PHASE 120/240V-3 WIRE-SINGLE PHASE 240V-3 WIRE-THREE PHASE (EXTRA COST) 480V-3 WIRE-THREE PHASE (EXTRA COST)	<b>STEAM HEAT - SPECIFY STEAM PRESSURE</b> OPERATING PRESSURE STANDARD IS 10 TO 25 PSIG. OTHER PRESSURES EXTRA COST. ALL REQUIRE 120V AC POWER FOR CONTROL CIRCUIT, 1 AMP.	<b>GAS HEAT - SPECIFY TYPE OF GAS</b> NATURAL (SUPPLIED WITH REGULATOR - 3 1/2" W.C.) LP GAS (SUPPLIED WITH REGULATOR - 10" W.C.) ALL REQUIRE 120V AC POWER FOR CONTROL CIRCUIT, 1 AMP.
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Drawing #A-890

# Rough In Specifications for Twin 1.5 Gallon Automatic Brew Urn

**(A) ELECTRIC HEAT: SPECIFY ELECTRIC SERVICE**

MODEL 7215E (SINGLE WALL): 4400W,120/240V,18AMP,1PH,3 WIRE OR  
 3300W,120/208V,16AMP,1PH,3 WIRE  
 MODEL 8215E (DUAL WALL): 6600W,120/240V,28AMP,1PH,3 WIRE OR  
 5000W,120/208V,24AMP,1PH,3 WIRE



Drawing #090-749

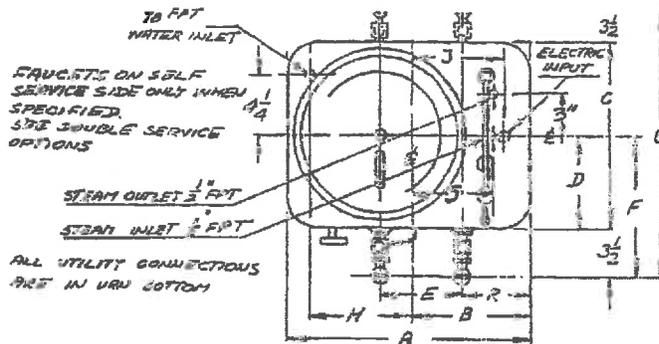
# Rough in Specifications for 8000 Single Space Saver Urn

MODEL	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	S	T
8113	19	9 1/2	16 1/4	3 1/8	5 1/2	11 5/8	23 1/4	6	8	15	12	23 1/2	29	13 1/8	5 1/2	6 1/2	8 1/2
8116	22	11	17 3/4	3 7/8	7 5/8	12 3/8	24 3/4	7 1/2	9 1/2	18	13 3/4	29 1/2	35	13 1/2	5 1/2	8	8 1/2
80110	22	11	17 3/4	8 7/8	7 5/8	12 3/8	24 3/4	7 1/2	9 1/2	18	13 3/4	31 1/2	38 1/2	13 1/2	5 1/2	8	8 1/2
9113	18	9	15 1/4	7 5/8	5 1/2	11 1/8	22 1/4	6	8	15	12	23 1/2	29	13 1/8	5	6 1/2	8 1/8
9116	21	10 1/2	16 3/4	3 3/8	7 5/8	11 7/8	23 3/4	7 1/2	9 1/2	18	13 3/4	29 1/2	35	13 1/2	5	8	8 1/2
90110	21	10 1/2	16 3/4	3 3/8	7 5/8	11 7/8	23 3/4	7 1/2	9 1/2	18	13 3/4	31 1/2	38 1/2	13 1/2	5	8	8 1/2

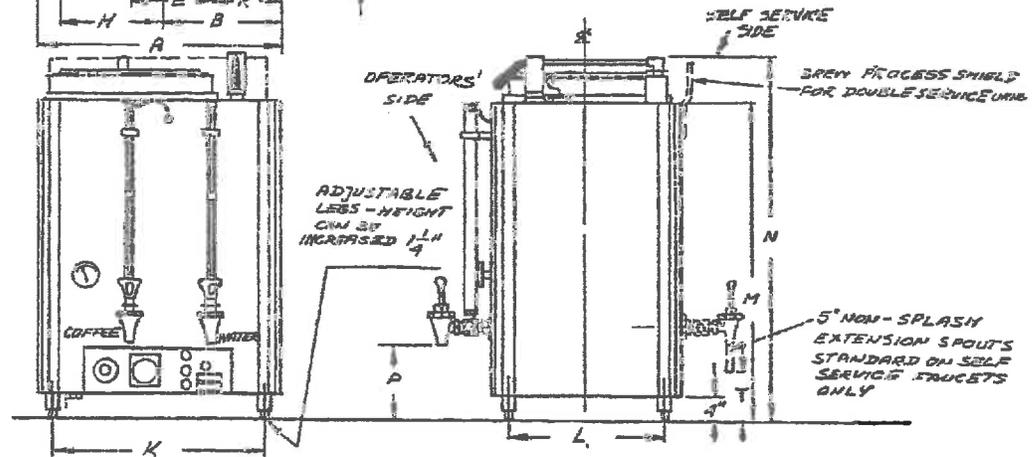
DOUBLE SERVICE OPTIONS	
NO.	DESCRIPTION
DS-4	2 FAUCETS ON SELF SERVICE, NO GAGES
DS-5	2 FAUCETS ON SELF SERVICE, WITH GAGES

STEAM HEAT MODEL NO. SUFFIX (S)  
 SPECIFY STEAM PRESSURE. STANDARD IS 10 TO 25 PSIG. OTHER PRESSURE EXTRA COST. 6'-120V/3 WIRE CORD PLUG SUPPLIED FOR CONTROLS (1 AMP).

MAXIMUM STEAM DEMAND, LBS. PER HR.	8113	8116, 10
	5113	9116, 10
	30	70



ELECTRIC HEAT MODEL NO. SUFFIX (S) SPECIFY SERVICE	8113		8106, 10		8106, 10	
	KW	AMP	KW	AMP	KW	AMP
120/208V-1 PH-3 WIRE	8	33	11.5	54	15	72
120/208V-3 PH-4 WIRE	8	22	11.5	31	15	42
120/240V-1 PH-3 WIRE	10.5	44	12	50	15	63
240V-3 PH-3 WIRE	10.5	25	12	29	15	36
480V-3 PH-3 WIRE	12	14	12	14	15	18



IF 120V SERVICE NOT AVAILABLE SPECIFY OPT. 22 CONTROL CIRCUIT TRANSFORMER.

MODEL	BREW LINER VOL. (GAL.)	TOTAL WATER VOL. (GAL.)	BREW BASKET USED	PAPER FILTER SIZE	BAG RING SIZE	LINER BAG SIZE
8113, 9113	3	3	BB3	18 X 6	12 1/2	14 X 9
8116, 9116	6	20	BB6	21 X 9	14	17 X 9
81110, 91110	10	24	BB10	25 X 11	15	17 X 9

Drawing #090-305

# Rough In Specifications for 8000 Twin Space Saver Urn

MODEL	A	B	C	D	E	F	G	K	L	M	P	R
8103	31 1/2	15 3/4	16 1/4	8 1/8	7 3/4	11 5/8	23 1/4	27 1/2	12	27 1/2	11 5/8	6 5/8
8106	35	17 1/2	17 3/4	9 7/8	8 5/8	12 3/8	24 3/4	31	13 3/4	33 1/2	12	7
81010	35	17 1/2	17 3/4	8 7/8	8 5/8	12 3/8	24 3/4	31	13 3/4	37	12	7
9103	30 1/2	15 1/4	15 1/4	7 5/8	7 3/4	11 1/8	22 1/4	27 1/2	12	27 1/2	11 5/8	6 5/8
9106	34	17	16 3/4	9 3/8	8 5/8	11 7/8	23 3/4	31	13 3/4	33 1/2	12	7
91010	34	17	16 3/4	8 3/8	8 5/8	11 7/8	23 3/4	31	13 3/4	37	12	7

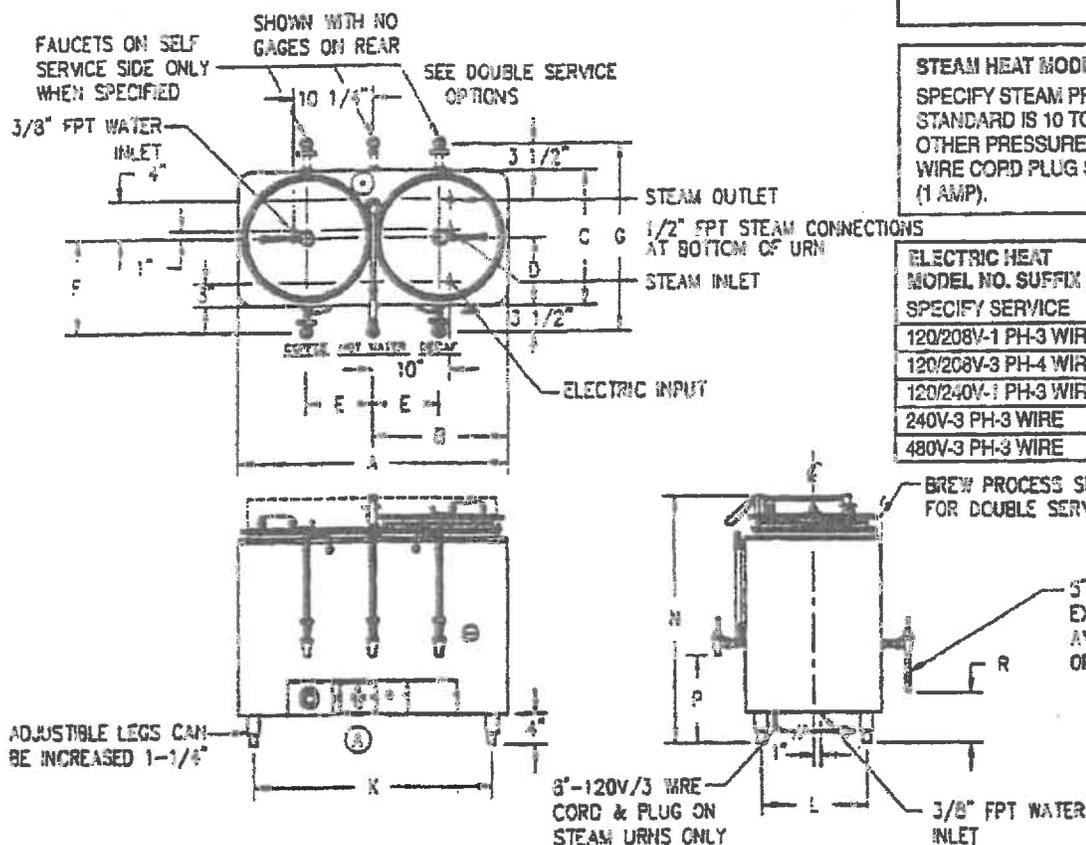
### DOUBLE SERVICE OPTIONS

OPT. NO.	DESCRIPTION
DS-1	3 FAUCETS REAR, NO GAUGES
DS-2	3 FAUCETS REAR WITH GAUGES

### STEAM HEAT MODEL NO. SUFFIX (S)

SPECIFY STEAM PRESSURE.  
STANDARD IS 10 TO 25 PSIG.  
OTHER PRESSURE EXTRA COST. 6-120V/3  
WIRE CORD PLUG SUPPLIED FOR CONTROLS  
(1 AMP).

ELECTRIC HEAT MODEL NO. SUFFIX (E)	8103 9103		8106, 10 9106, 10	
	KW	AMP	KW	AMP
120/208V-1 PH-3 WIRE	11.5	54	15	72
120/208V-3 PH-4 WIRE	11.5	31	15	42
120/240V-1 PH-3 WIRE	12	50	15	63
240V-3 PH-3 WIRE	12	29	15	36
480V-3 PH-3 WIRE	12	14	15	18

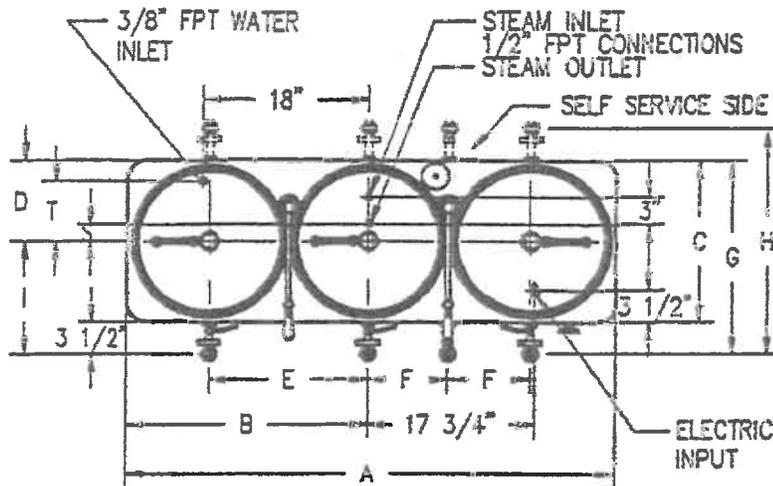


MODEL	BREW LINER VOL (GAL.)	TOTAL WATER VOL (GAL.)	BREW BASKET USED	PAPER FILTER SIZE	BAG RING SIZE	LINER BAG SIZE
8103, 9103	3	3	BB3	18 X 6	12 1/2	14 X 9
8106, 9106	6	20	BB6	21 X 9	14	17 X 9
81010, 91010	10	24	BB10	25 X 11	15	17 X 9

Drawing #090-779

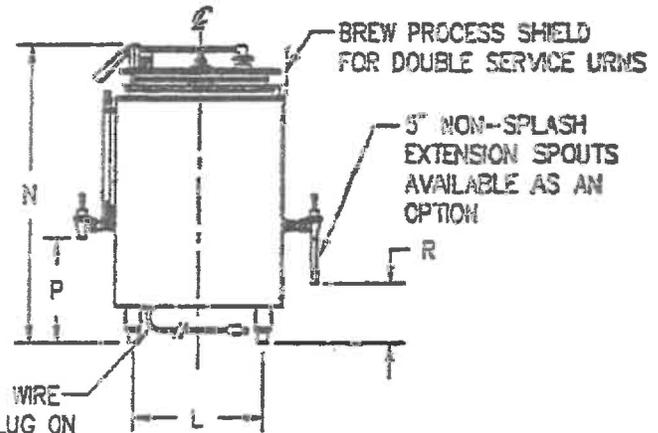
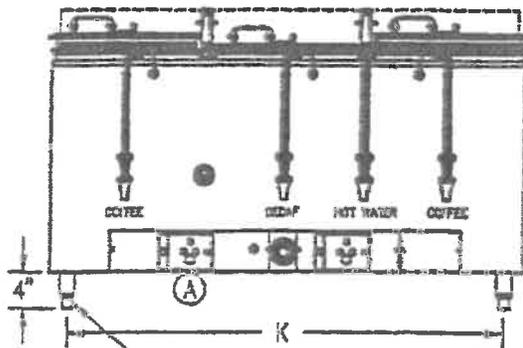
# Rough In Specifications for 8000 Triple Space Saver Urn

MODEL	A	B	C	D	E	F	G	H	I	K	L	N	P	R	S	T
7303	46	23	15 1/4	7 5/8	15 1/2	7 3/4	19 3/4	22 1/4	11 1/8	42	12	27 1/2	11 5/8	6 5/8	1	5 3/4
7306	51 1/4	25 5/8	16 3/4	8 3/8	17 1/4	8 5/8	20 1/4	23 3/4	11 7/8	47 1/4	13 3/4	33 1/2	12	7	1 7/8	6 5/8
73010	51 1/4	25 5/8	16 3/4	8 3/8	17 1/4	8 5/8	20 1/4	23 3/4	11 7/8	47 1/4	13 3/4	37	12	7	1 7/8	6 5/8
8303	47	23 1/2	16 1/4	8 1/8	15 1/2	7 3/4	19 3/4	23 1/4	11 5/8	42	12	27 1/2	11 5/8	6 5/8	1	5 3/4
8306	52 1/4	26 1/8	17 3/4	8 7/8	17 1/4	8 5/8	21 1/4	24 3/4	12 3/8	47 1/4	13 3/4	33 1/2	12	7	1 7/8	6 5/8
83010	52 1/4	26 1/8	17 3/4	8 7/8	17 1/4	8 5/8	21 1/4	24 3/4	12 3/8	47 1/4	13 3/4	37	12	7	1 7/8	6 5/8



**STEAM HEAT MODEL NO. SUFFIX (S)**  
 SPECIFY STEAM PRESSURE.  
 STANDARD IS 10 TO 25 PSIG.  
 OTHER PRESSURE EXTRA COST. 6-120V/3  
 WIRE CORD PLUG SUPPLIED FOR CONTROLS  
 (1 AMP).

**NOTE:**  
 FAUCETS ON SELF SERVICE ONLY WHEN  
 SPECIFIED



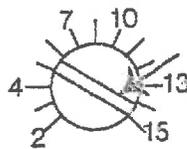
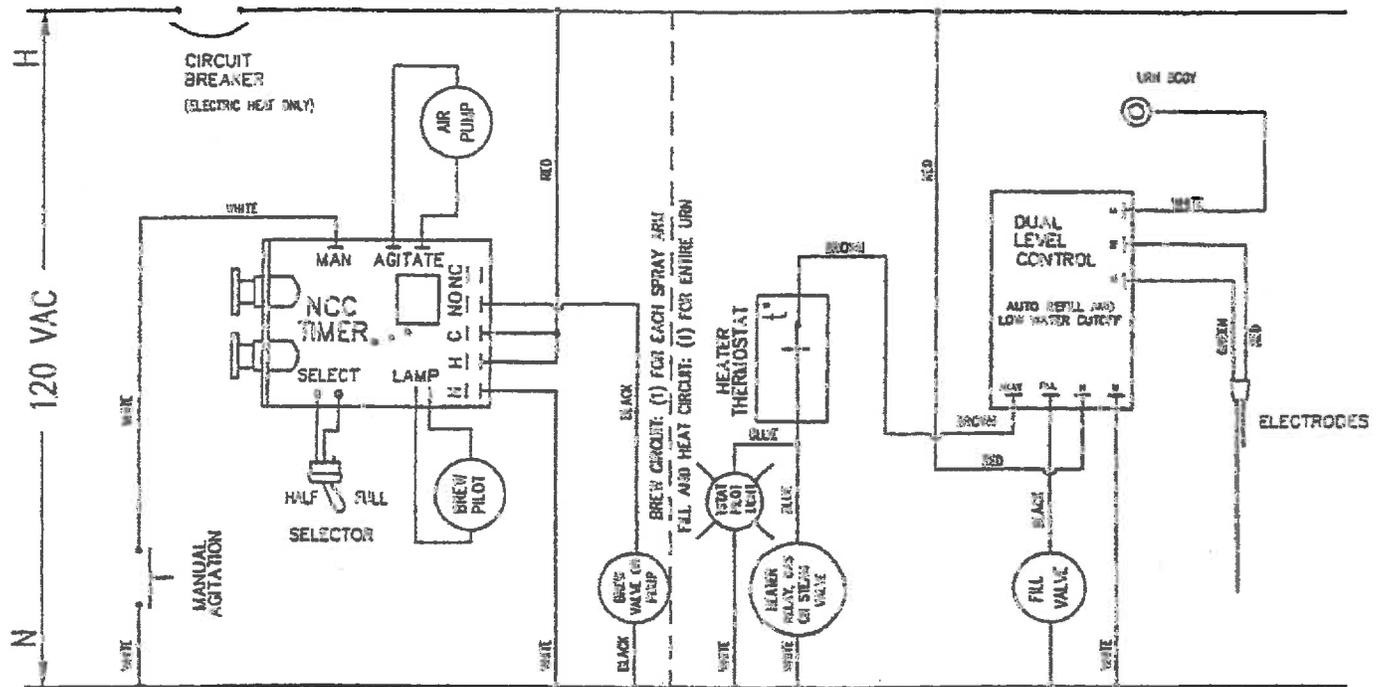
ADJUSTIBLE LEGS CAN  
 BE INCREASED 1-1/4"  
 6'-120V/3 WIRE  
 CORD & PLUG ON  
 STEAM URNS ONLY

ELECTRIC HEAT MODEL NO. SUFFIX (E)	7303		7306		73010		8303		8306		83010	
	KW	AMP	KW	AMP	KW	AMP	KW	AMP	KW	AMP	KW	AMP
120/208V-1 PH-3 WIRE	6	29	8.5	41	15	72	11.5	54	15	72	15	72
120/208V-3 PH-4 WIRE	8	22	11.5	31	15	42	11.5	31	16	42	15	42
120/240V-1 PH-3 WIRE	8	34	11.5	48	15	63	12	50	15	63	15	63
*240V-3 PH-3 WIRE	10.5	25	12	29	15	36	12	29	15	36	15	36
*480V-3 PH-3 WIRE	12	14	12	14	15	18	12	14	15	18	15	18

\*Requires Separate 120V Supply For Controls (7 Amp)

Drawing #090-780

# Wiring Diagram for all Series Urns with Air Agitation (Does not apply to Pourover Urns)



SCREWDRIVER  
SLOT

TIMER ADJUSTMENT UNDER SNAP  
PLUG ON CONTROL PANEL FACE

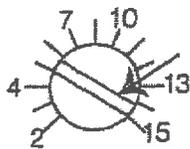
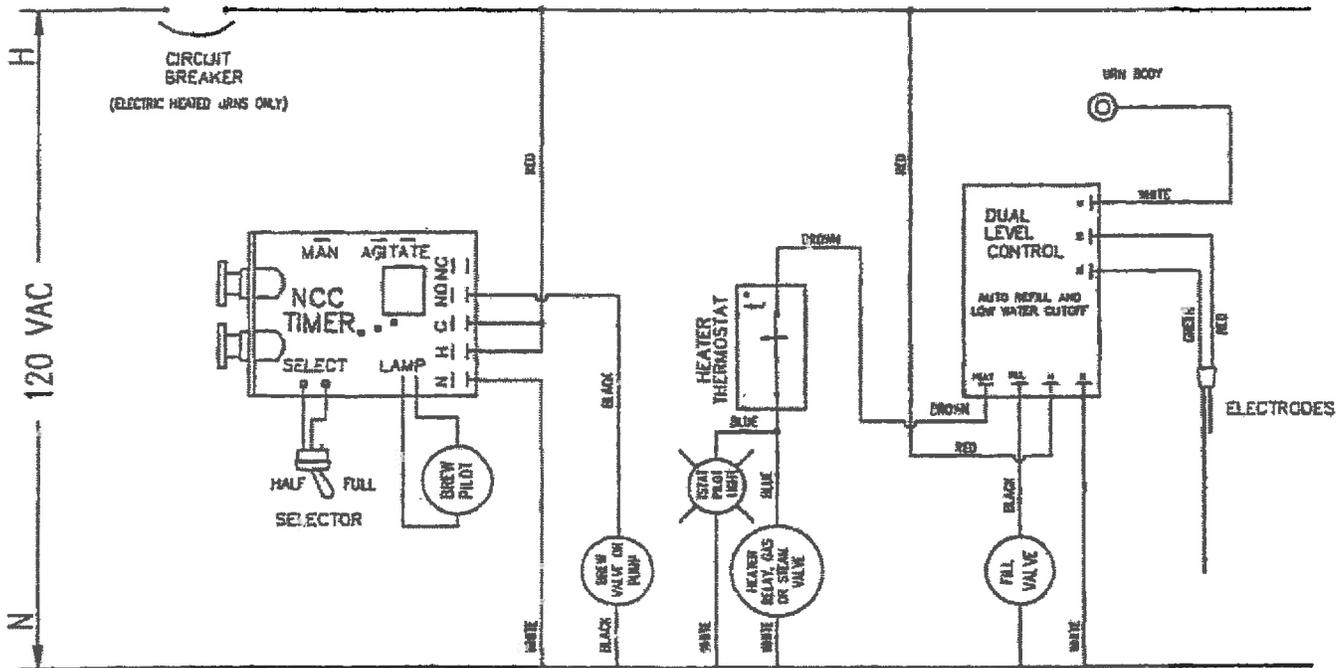
**NOTES:**

- 1) GAS ONLY AVAILABLE ON 7400 AND 7700 SERIES.
- 2) STEAM VALVE LEADS ARE BLACK OR RED.

Drawing #091-537



# Wiring Diagram for all Series Urns with No Air Agitation (Does not apply to Pourover Urns)



SCREWDRIVER  
SLOT

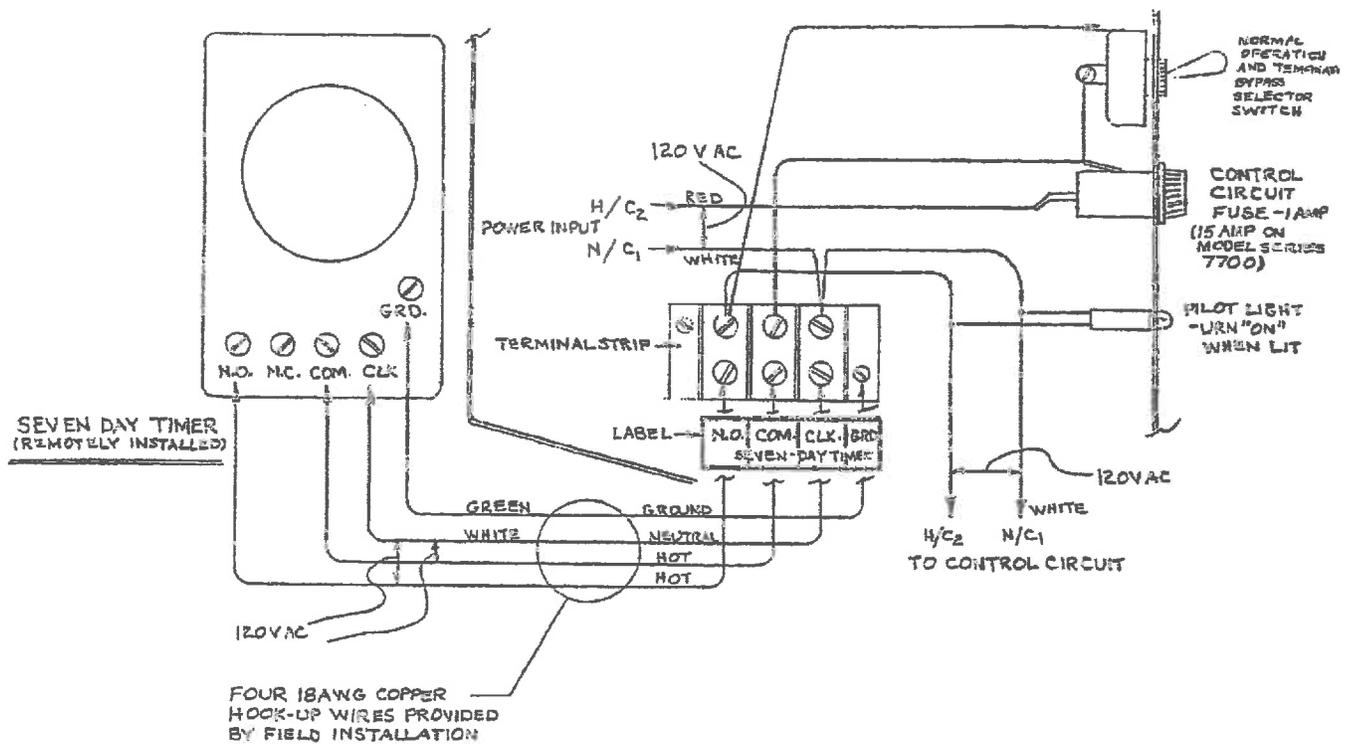
TIMER ADJUSTMENT UNDER SNAP  
PLUG ON CONTROL PANEL FACE

**NOTES:**

- 1) GAS ONLY AVAILABLE ON 7400 AND 7700 SERIES.
- 2) STEAM VALVE LEADS ARE BLACK OR RED.
- 3) USE THIS DIAGRAM FOR MODELS: 8215, OR CH SERIES, AND OTHER SINGLE OR TWIN URNS WITHOUT AGITATION.

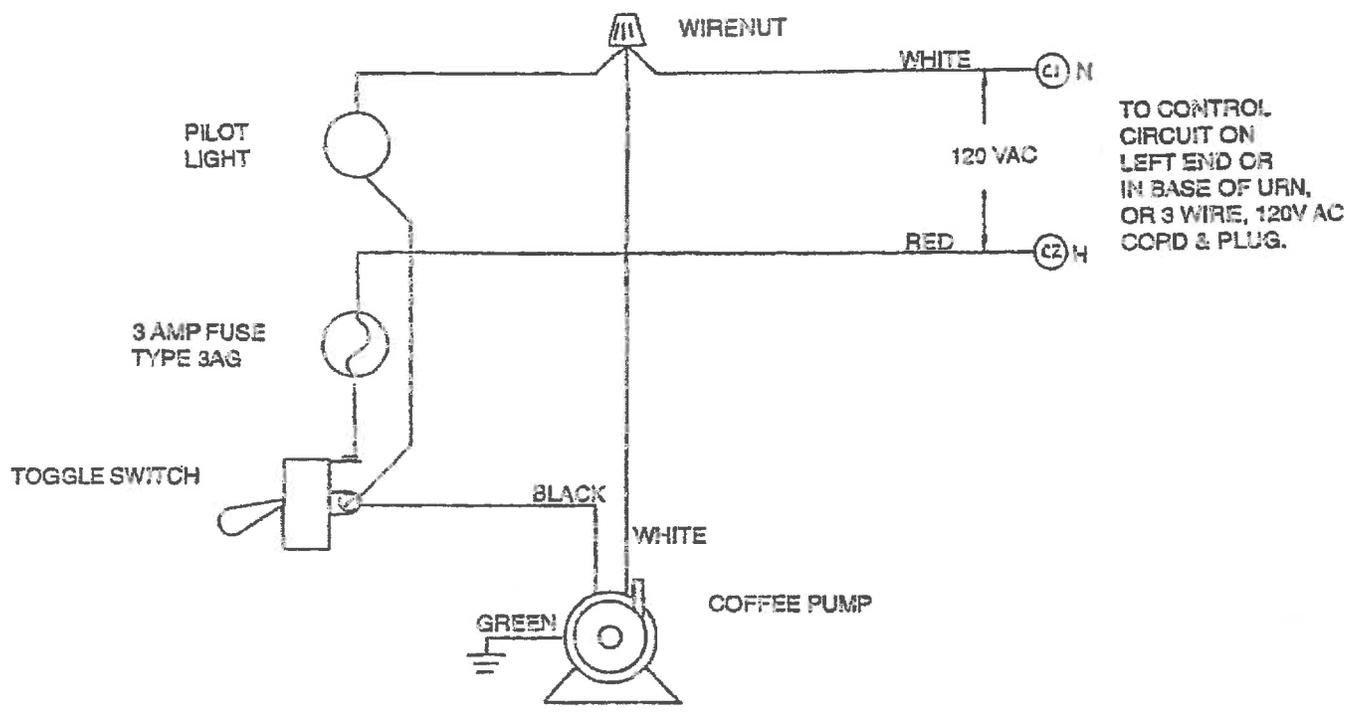
Drawing #091-541

# Wiring Diagram for Optional Seven Day Timer



NOTE: MAY HAVE CIRCUIT BREAKER INSTEAD OF FUSE.

# Wiring Diagram for Optional High Speed Fill Jug



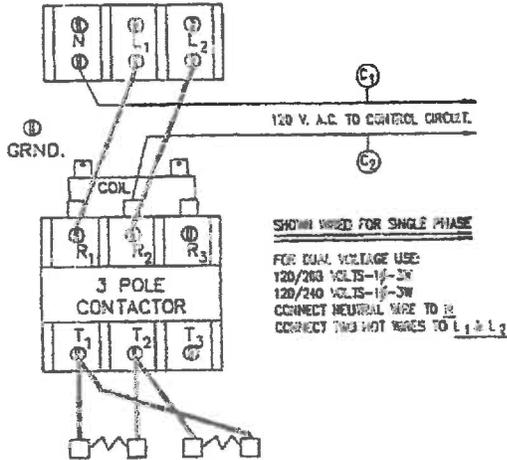
TO CONTROL  
CIRCUIT ON  
LEFT END OR  
IN BASE OF URN,  
OR 3 WIRE, 120V AC  
CORD & PLUG.

Drawing #A-1001

# Wiring Diagram for 208V-240V 2 or 3 Heating Element Wiring (All Urns)

## SINGLE PHASE ONLY

CONNECT POWER HERE



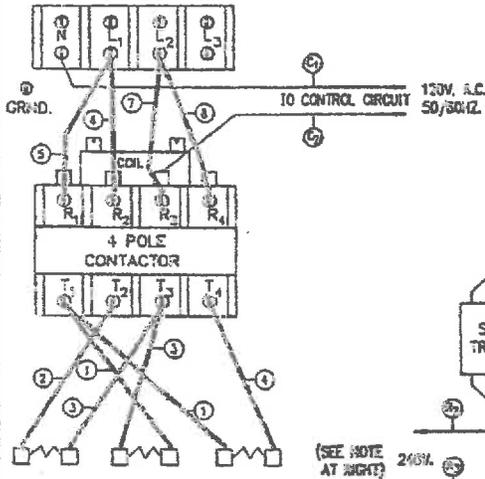
SHOWN WIRED FOR SINGLE PHASE

FOR DUAL VOLTAGE USE:  
 120/208 VOLTS - 1/2-3W  
 120/240 VOLTS - 1/2-3W  
 CONNECT NEUTRAL WIRE TO N  
 CONNECT TWO HOT WIRES TO L<sub>1</sub> & L<sub>2</sub>

2 HEATING ELEMENTS - SINGLE PHASE ONLY  
 DO NOT USE 2 ELEMENTS 3 PHASE  
 NOTE: A 2 POLE CONTACTOR MAY BE USED ON MODELS  
 HAVING A LOW WATTAGE HEATER

ELECTRIC SERVICE	STANDARD PARTS
120/208/3/1 WIRE	REQUIRES CIRCUIT BREAKER FOR CONTROL CIRCUIT PROTECTION. NEUTRAL TERMINAL BLOCK PROVIDED.
120/208/1/3 WIRE	
120/240/1/3 WIRE	
208/1/2 WIRE	NO NEUTRAL TERMINAL BLOCK SUPPLIED. HIGH PUMP TYPE URNS INCLUDE STEPDOWN TRANSFORMER OR SEPARATE 120V CORD FOR CONTROL CIRCUIT. PUMP TYPE AND REMOTE DISPENSING URNS HAVE SEPARATE 120V CORD FOR CONTROL CIRCUIT.
240/1/2 WIRE	
240/3/3 WIRE	
208/3/3 WIRE	

CONNECT POWER HERE

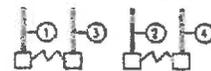


SEE ELECTRICAL MANIPULATE FOR PROPER VOLTAGE, PHASE AND NUMBER OF WIRES AND AMPERE LOAD.

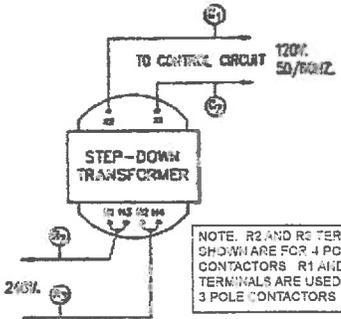
SINGLE PHASE WIRING SHOWN TO CONVERT TO THREE PHASE A  
 1) MOVE WIRE (5) FROM L<sub>1</sub> TO L<sub>3</sub>  
 2) MOVE WIRE (6) FROM T<sub>4</sub> TO T<sub>2</sub>

(SEE NOTE AT RIGHT)

3 HEATING ELEMENTS



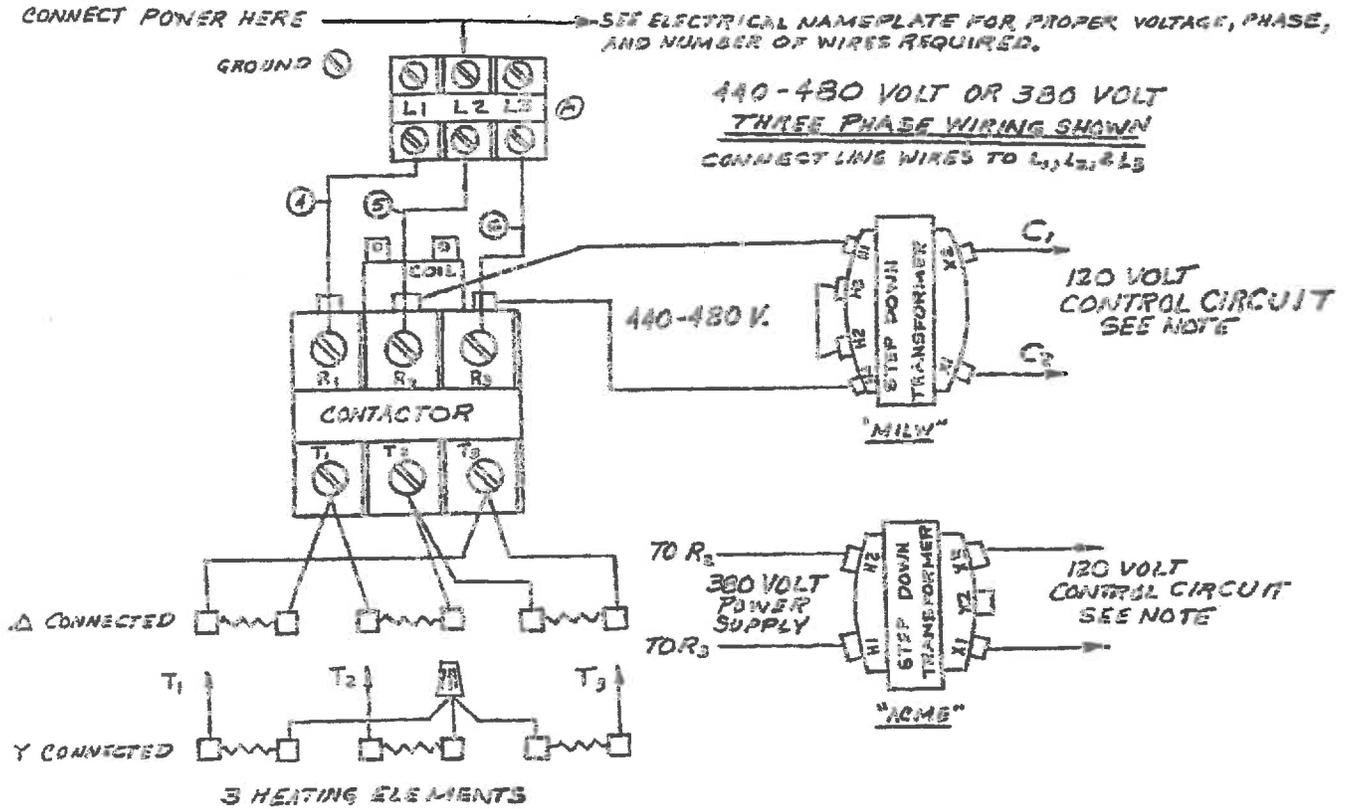
2 HEATING ELEMENTS - SINGLE PHASE ONLY  
 DO NOT USE 2 ELEMENTS 3 PHASE



NOTE: R2 AND R3 TERMINALS SHOWN ARE FOR 4 POLE CONTACTORS. R1 AND R3 TERMINALS ARE USED FOR 3 POLE CONTACTORS

NEUTRAL TERMINAL BLOCK NOT SUPPLIED WITH TRANSFORMER

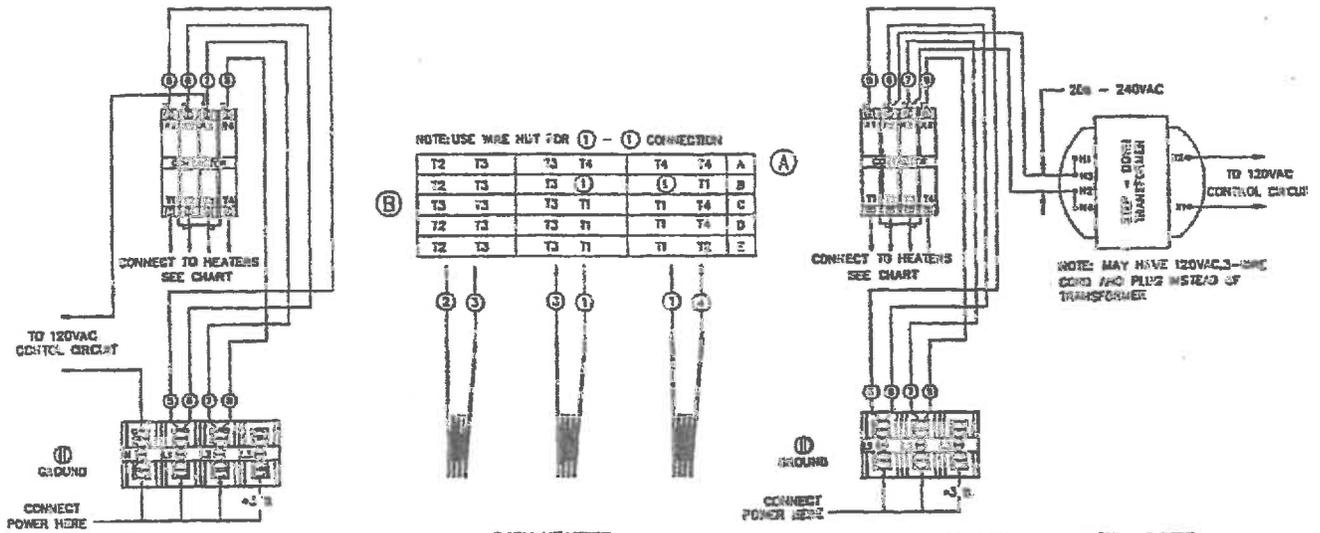
# Wiring Diagram for 380V-480V 3PH, 3 Element Wiring (All Urns)



NOTE: PUMP URNS AND REMOTE DISPENSING URNS HAVE A SEPARATE CORD AND PLUG FOR CONTROL CIRCUIT.

Drawing #091-027

# Wiring Diagram for 208V-240V Alternate Low Water Heater



NOTE: USE WIRE NUT FOR (1) - (1) CONNECTION

T2	T3	T3	T4	T4	T4	A
T2	T3	T3	(1)	(1)	T1	B
T3	T3	T3	T1	T1	T4	C
T2	T3	T3	T1	T1	T4	D
T2	T3	T3	T1	T1	T4	E

## 240V HEATERS

EACH NTR. SIZE	208V SERVICE							
	A		B		C		D	
	KW	AMPS	KW	AMPS	KW	AMPS	KW	AMPS
1.0 KW	2.5	13	3.0	15	3.7	20	4.5	23
1.5 KW	3.8	19	4.5	22	5.5	29	6.8	35
2.0 KW	5.0	26	6.0	30	7.3	38	8.8	45
2.5 KW	6.3	32	7.5	37	9.1	47	11.0	56
3.0 KW	7.5	38	9.0	44	10.9	56	13.1	67
3.5 KW	8.8	45	10.5	52	12.6	65	15.3	78
4.0 KW	10.0	50	12.0	58	14.4	75	17.5	89
4.5 KW	11.3	57	13.5	66	16.2	84	19.7	100
5.0 KW	12.5	63	15.0	74	18.0	94	21.9	111
5.5 KW	13.8	69	16.5	81	19.8	104	24.1	122
6.0 KW	15.0	75	18.0	88	21.6	113	26.3	133
6.5 KW	16.3	81	19.5	95	23.4	123	28.5	144
7.0 KW	17.5	87	21.0	102	25.2	133	30.7	155
7.5 KW	18.8	93	22.5	109	27.0	143	32.9	166
8.0 KW	20.0	100	24.0	116	28.8	152	35.1	177
8.5 KW	21.3	106	25.5	123	30.6	162	37.3	188
9.0 KW	22.5	112	27.0	130	32.4	171	39.5	199
9.5 KW	23.8	118	28.5	137	34.2	181	41.7	210
10.0 KW	25.0	125	30.0	144	36.0	190	43.9	221
10.5 KW	26.3	131	31.5	151	37.8	199	46.1	232
11.0 KW	27.5	137	33.0	158	39.6	208	48.3	243
11.5 KW	28.8	143	34.5	165	41.4	217	50.5	254
12.0 KW	30.0	150	36.0	172	43.2	226	52.7	265
12.5 KW	31.3	156	37.5	179	45.0	235	54.9	276
13.0 KW	32.5	162	39.0	186	46.8	244	57.1	287
13.5 KW	33.8	168	40.5	193	48.6	253	59.3	298
14.0 KW	35.0	175	42.0	200	50.4	262	61.5	309
14.5 KW	36.3	181	43.5	207	52.2	271	63.7	320
15.0 KW	37.5	187	45.0	214	54.0	280	65.9	331
15.5 KW	38.8	193	46.5	221	55.8	289	68.1	342
16.0 KW	40.0	200	48.0	228	57.6	298	70.3	353
16.5 KW	41.3	206	49.5	235	59.4	307	72.5	364
17.0 KW	42.5	212	51.0	242	61.2	316	74.7	375
17.5 KW	43.8	218	52.5	249	63.0	325	76.9	386
18.0 KW	45.0	225	54.0	256	64.8	334	79.1	397
18.5 KW	46.3	231	55.5	263	66.6	343	81.3	408
19.0 KW	47.5	237	57.0	270	68.4	352	83.5	419
19.5 KW	48.8	243	58.5	277	70.2	361	85.7	430
20.0 KW	50.0	250	60.0	284	72.0	370	87.9	441
20.5 KW	51.3	256	61.5	291	73.8	379	90.1	452
21.0 KW	52.5	262	63.0	298	75.6	388	92.3	463
21.5 KW	53.8	268	64.5	305	77.4	397	94.5	474
22.0 KW	55.0	275	66.0	312	79.2	406	96.7	485
22.5 KW	56.3	281	67.5	319	81.0	415	98.9	496
23.0 KW	57.5	287	69.0	326	82.8	424	101.1	507
23.5 KW	58.8	293	70.5	333	84.6	433	103.3	518
24.0 KW	60.0	300	72.0	340	86.4	442	105.5	529
24.5 KW	61.3	306	73.5	347	88.2	451	107.7	540
25.0 KW	62.5	312	75.0	354	90.0	460	109.9	551
25.5 KW	63.8	318	76.5	361	91.8	469	112.1	562
26.0 KW	65.0	325	78.0	368	93.6	478	114.3	573
26.5 KW	66.3	331	79.5	375	95.4	487	116.5	584
27.0 KW	67.5	337	81.0	382	97.2	496	118.7	595
27.5 KW	68.8	343	82.5	389	99.0	505	120.9	606
28.0 KW	70.0	350	84.0	396	100.8	514	123.1	617
28.5 KW	71.3	356	85.5	403	102.6	523	125.3	628
29.0 KW	72.5	362	87.0	410	104.4	532	127.5	639
29.5 KW	73.8	368	88.5	417	106.2	541	129.7	650
30.0 KW	75.0	375	90.0	424	108.0	550	131.9	661
30.5 KW	76.3	381	91.5	431	109.8	559	134.1	672
31.0 KW	77.5	387	93.0	438	111.6	568	136.3	683
31.5 KW	78.8	393	94.5	445	113.4	577	138.5	694
32.0 KW	80.0	400	96.0	452	115.2	586	140.7	705
32.5 KW	81.3	406	97.5	459	117.0	595	142.9	716
33.0 KW	82.5	412	99.0	466	118.8	604	145.1	727
33.5 KW	83.8	418	100.5	473	120.6	613	147.3	738
34.0 KW	85.0	425	102.0	480	122.4	622	149.5	749
34.5 KW	86.3	431	103.5	487	124.2	631	151.7	760
35.0 KW	87.5	437	105.0	494	126.0	640	153.9	771
35.5 KW	88.8	443	106.5	501	127.8	649	156.1	782
36.0 KW	90.0	450	108.0	508	129.6	658	158.3	793
36.5 KW	91.3	456	109.5	515	131.4	667	160.5	804
37.0 KW	92.5	462	111.0	522	133.2	676	162.7	815
37.5 KW	93.8	468	112.5	529	135.0	685	164.9	826
38.0 KW	95.0	475	114.0	536	136.8	694	167.1	837
38.5 KW	96.3	481	115.5	543	138.6	703	169.3	848
39.0 KW	97.5	487	117.0	550	140.4	712	171.5	859
39.5 KW	98.8	493	118.5	557	142.2	721	173.7	870
40.0 KW	100.0	500	120.0	564	144.0	730	175.9	881
40.5 KW	101.3	506	121.5	571	145.8	739	178.1	892
41.0 KW	102.5	512	123.0	578	147.6	748	180.3	903
41.5 KW	103.8	518	124.5	585	149.4	757	182.5	914
42.0 KW	105.0	525	126.0	592	151.2	766	184.7	925
42.5 KW	106.3	531	127.5	599	153.0	775	186.9	936
43.0 KW	107.5	537	129.0	606	154.8	784	189.1	947
43.5 KW	108.8	543	130.5	613	156.6	793	191.3	958
44.0 KW	110.0	550	132.0	620	158.4	802	193.5	969
44.5 KW	111.3	556	133.5	627	160.2	811	195.7	980
45.0 KW	112.5	562	135.0	634	162.0	820	197.9	991
45.5 KW	113.8	568	136.5	641	163.8	829	200.1	1002
46.0 KW	115.0	575	138.0	648	165.6	838	202.3	1013
46.5 KW	116.3	581	139.5	655	167.4	847	204.5	1024
47.0 KW	117.5	587	141.0	662	169.2	856	206.7	1035
47.5 KW	118.8	593	142.5	669	171.0	865	208.9	1046
48.0 KW	120.0	600	144.0	676	172.8	874	211.1	1057
48.5 KW	121.3	606	145.5	683	174.6	883	213.3	1068
49.0 KW	122.5	612	147.0	690	176.4	892	215.5	1079
49.5 KW	123.8	618	148.5	697	178.2	901	217.7	1090
50.0 KW	125.0	625	150.0	704	180.0	910	219.9	1101
50.5 KW	126.3	631	151.5	711	181.8	919	222.1	1112
51.0 KW	127.5	637	153.0	718	183.6	928	224.3	1123
51.5 KW	128.8	643	154.5	725	185.4	937	226.5	1134
52.0 KW	130.0	650	156.0	732	187.2	946	228.7	1145
52.5 KW	131.3	656	157.5	739	189.0	955	230.9	1156
53.0 KW	132.5	662	159.0	746	190.8	964	233.1	1167
53.5 KW	133.8	668	160.5	753	192.6	973	235.3	1178
54.0 KW	135.0	675	162.0	760	194.4	982	237.5	1189
54.5 KW	136.3	681	163.5	767	196.2	991	239.7	1200
55.0 KW	137.5	687	165.0	774	198.0	1000	241.9	1211
55.5 KW	138.8	693	166.5	781	199.8	1009	244.1	1222
56.0 KW	140.0	700	168.0	788	201.6	1018	246.3	1233
56.5 KW	141.3	706	169.5	795	203.4	1027	248.5	1244
57.0 KW	142.5	712	171.0	802	205.2	1036	250.7	1255
57.5 KW	143.8	718	172.5	809	207.0	1045	252.9	1266
58.0 KW	145.0	725	174.0	816	208.8	1054	255.1	1277
58.5 KW	146.3	731	175.5	823	210.6	1063	257.3	1288
59.0 KW	147.5	737	177.0	830	212.4	1072	259.5	1299
59.5 KW	148.8	743	178.5	837	214.2	1081	261.7	1310
60.0 KW	150.0	750	180.0	844	216.0	1090	263.9	1321
60.5 KW	151.3	756	181.5	851	217.8			

# Midline and Space Saver Urn Series WARRANTY

For Models 7000, 8000, 9000, Chinese Tea Urn Series

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EFFECTIVE DECEMBER 1, 1995

## GENERAL WARRANTY INFORMATION

Grindmaster Corporation maintains the highest standard of quality control in the manufacturing of American Metal Ware products. We use the finest components and materials, and employ quality engineering standards and tests. All American Metal Ware brewers and dispensers, except the Space Saver Model automatic coffee urns, will be warranted for a period of one year from the date of shipment. This warranty will include parts and labor but will not cover transportation and shipping charges and will be limited to equipment sold to commercial purchasers and installed in the continental U.S.A., Hawaii, Alaska and Canada.

## EXCLUSIVE

Grindmaster Corporation features a two year service warranty to include parts and labor but not transportation and shipping charges on its American Metal Ware Space Saver (800 Series Model) automatic coffee urns. The warranty is limited to equipment sold to commercial purchasers and installed in the continental U.S.A., Hawaii, Alaska and Canada.

## EXCEPTIONS

Coverage is not included for labor needed or caused by:

- Adjustments of temperature or flow rates or timers. These adjustments are covered in the technical manual provided and subject to user preferences.
- This warranty does not cover maintenance consumable parts such as o-rings, seat cups, washers. These are subject to NORMAL wear of everyday usage and are a responsibility of the user.
- Accident
- Improper installation
- Neglect or abuse
- Excessive lime/mineral content of water used
- Cleaning of any category. Cleaning is a user's responsibility.
- All warranties are null and void if muriatic or any other form of hydraulic acid is used for cleaning or deliming our equipment.

**NOTE: THIS WARRANTY SUPERSEDES ANY OTHER WARRANTY. ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE OR USE, ARE HEREBY EXCLUDED AND DISCLAIMED.**

## HOW TO OBTAIN WARRANTY SERVICES

Call Grindmaster Corporation Service Department toll free at 1-800-695-4500 or +1-502-425-4776, press selection three (3) for technical services or write to : Grindmaster Corporation Factory Service Center, P.O. Box 35020, Louisville, KY 40232. In order to receive warranty service, you must provide the serial number of the machine requiring service along with a description of the problem. Service will be arranged through a factory authorization center. Transportation is the user's responsibility. Should it become necessary to transport your machine to a service center, make sure it is properly packaged to avoid in-transit damage, which is not covered by this warranty.

*No field, outside or service station work is covered by this warranty without prior authorization by Grindmaster Corporation Service Dept.*



# GRINDMASTER™

C O R P O R A T I O N

---

Grindmaster® Coffee Grinders and Brewers • Espresso® Espresso Machines • Crathco® Hot Beverage Dispensers  
Crathco® Cold and Frozen Beverage Dispensers • American Metal Ware® Coffee and Tea Systems  
Tel (502) 425-4776 • Fax (502) 425-4664 • 1-800-695-4500  
P.O. Box 35020 • Louisville, KY 40232 • USA  
www.grindmaster.com • email: info@grindmaster.com

# Midline and Space Saver Urn Series WARRANTY

For Models 7000, 8000, 9000, Chinese Tea Urn Series

EFFECTIVE DECEMBER 1, 1995

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- Accident
- Improper installation
- Neglect or abuse
- Excessive lime/mineral content of water used
- Cleaning of any category. Cleaning is a user's responsibility.
- All warranties are null and void if muriatic or any other form of hydraulic acid is used for cleaning or deliming our equipment.

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# GRINDMASTER™

C O R P O R A T I O N

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Grindmaster® Coffee Grinders and Brewers • Espresso® Espresso Machines • Crathco® Hot Beverage Dispensers  
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www.grindmaster.com • email: info@grindmaster.com



RN-400 Tubular Nugget Ice Machine

# RN-400 Tubular Nugget Ice Machine

## Models

RN-0408A



RN-0408A Nugget Ice Machine on Servend SV-250 Dispenser

RN-0408A Nugget Ice Machine on B-420 Bin

## Standard Features

- Up to 385 lbs. (175 kgs) daily ice production.
- Only 22" (55.9 cm) wide.
- Perfect for beverage applications, dispensing and cold therapy.
- Evaporator is designed for maximum quality and operating life.
- 90% ice to water ratio and longer pieces makes tubular nugget ideal for dispensing without congealing.
- Great for blended drinks with less wear on blender and smoother texture.
- Optional 9" discharge tube ships in carton for dispense applications.



## Specifications

BTU Per Hour: 5,000  
 Compressor:  
 Nominal rating: 1/2 HP  
 Refrigerant: R404A

Operating Limits:

- Ambient Temperature Range: 50°-100°F (10.0°C-37.8°C)
- Water Temperature Range: 45°-90°F (7.2°-32.2°C)
- Water Pressure Ice Maker Water In:  
 Min. 20 psi (137.9 kPa)  
 Max. 70 psi (483 kPa)

## Ice Machine Electric

115/60/1 ice machines are factory pre-wired with a 7' (2m) power cord and NEMA 5-20 right angle plug configuration.

Total Amps: 11 amps

Maximum fuse size: 20 amps

## Ice Shape

- Tubular Nugget Ice provides a softer, chewable texture while still providing maximum cooling effect.
- 5/8" (1.59 cm) diameter cylindrical-shaped nugget with average length of approximately 1" (2.54 cm).



2110 South 26th Street  
 PO Box 1720  
 Manitowoc, WI 54221-1720 USA

Tel: 1.920.682.0161  
 Fax: 1.920.683.7589

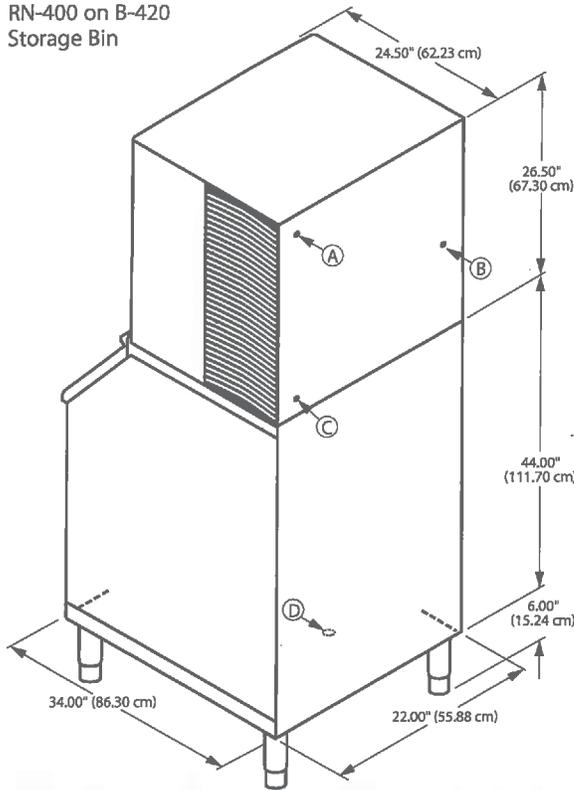
www.manitowocice.com





# RN-400 Tubular Nugget Ice Machine

RN-400 on B-420 Storage Bin



- (A) 3/8" F.P.T. Ice Making Water Inlet
- (B) Electrical Entrance
- (C) 3/4" M.P.T. Ice Making Water Drain
- (D) 3/4" Bin Drain

**Installation Note -**

Minimum installation clearance: Top/sides: 8" (20.32 cm), back: 5" (12.7 cm).

**Dispenser Note -**

Verify with the dispenser manufacturer that the correct agitator and deflector kit for nugget ice dispensing is included with your dispenser purchase.

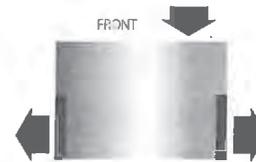
## Space Saving Designs



	RN-400 E-320	RN-400 B-420
Height	64.50" 168.83 cm	76.50" 194.3 cm
Width	22.00" 55.88 cm	22.00" 55.88 cm
Depth	34.00" 86.30 cm	34.00" 86.30 cm
Bin Storage	210 lbs. 95 kgs	310 lbs. 141 kgs

Height includes adjustable bin legs 6.00" to 7.00", (15.24 to 17.78 cm) set at 6.0" (15.24 cm).

## Air Flow Top View



## Specifications

	Model	Ice Shape	Ice Production 24 Hours		Power Usage kWh/100 lbs.@90°Air/70°F	Potable Water Usage/ 100 lbs. 45.4 kgs of Ice
			70°Air/ 50°F Water	90°Air/ 70°F Water		12.6 Gal. 47.7 L
AIR-COOLED	RN-0408A	Nugget	385 lbs.	294 lbs.	6.38	47.7 L
			175 kgs	133 kgs		

Order ice storage bin separately. \*A\* following model number indicates "Air" condensing unit. Will not accept AuC's accessory.

4735A ©2011 Manitowoc 7/11. Continuing product improvement may necessitate change of specifications without notice.

# CAMBRO

## Food Bars

### Ultra

Models 6UBR - 6 ft. (182 cm), 5UBR - 5 ft. (162 cm)  
4UBR - 4 ft. (130 cm)



#### Features & Benefits

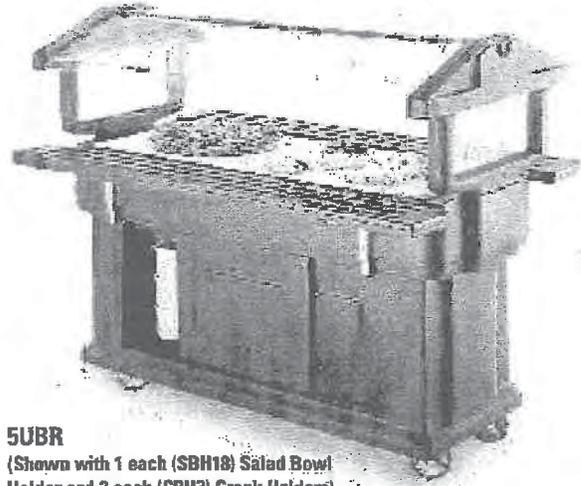
- Versatility, style and durability for self-service breakfast, lunch or dinner. Accommodates GN 1/1 Full or Fractional Size Food Pans up to 6" (15 cm) deep with Divider Bars.
- Quick access sliding doors on both sides offer convenient storage.
- Double-wall polyethylene construction provides extra strength, durability and reliability. Scratch-resistant textured exterior. Simple to clean - just wipe off.
- Thick foamed-in-place polyurethane insulation maintains food temperatures and holds ice cold for hours. Provides added structural strength.
- NSF listed threaded faucet drain with a standard hose hook-up provides quick draining and cleaning.
- Four each 5" (12,7 cm) swivel casters w/ brakes ensure easy maneuvering.
- Standard accessories include protective Sneeze Guard panel made from NSF listed material.
- Optional accessories include Tray Rails, End Tables, Divider Bars, Crock Holder, and Salad Bowl Holders.
- Non-electrical.
- Easy to assemble.
- Available in 15 colors.

Item No. \_\_\_\_\_

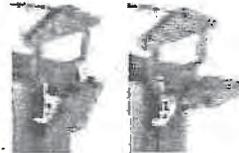
Specifier Identification No. \_\_\_\_\_

Model No. \_\_\_\_\_

Quantity \_\_\_\_\_



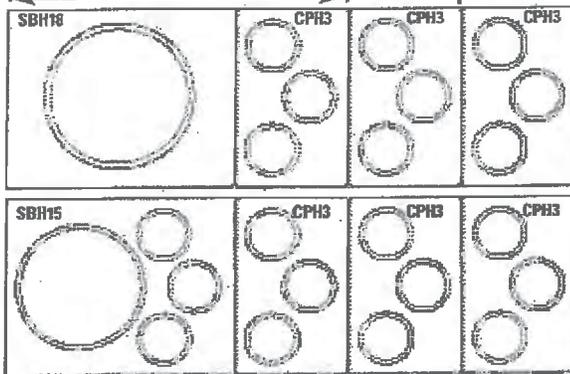
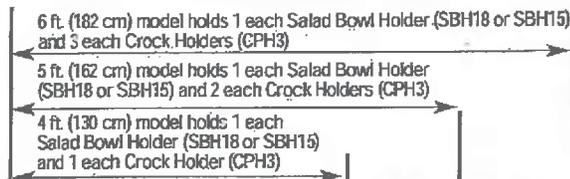
**5UBR**  
(Shown with 1 each (SBH18) Salad Bowl Holder and 2 each (CPH3) Crock Holders)



Optional End Table FBRTBL

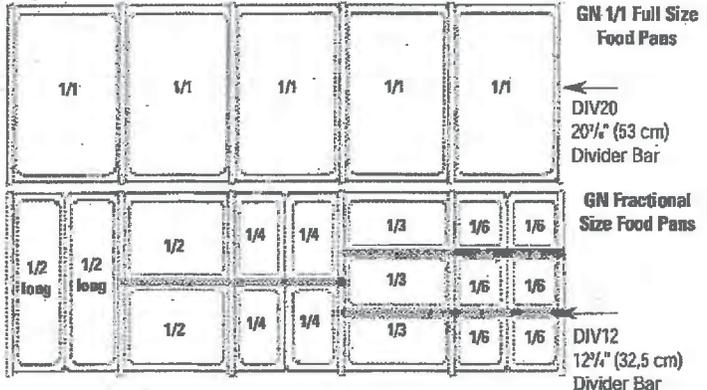
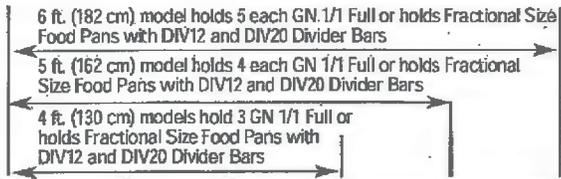
### Set Up Guide for Ultra Food Bars

#### Salad Bowls and Cocks



SBH18 - Holds 1 each 18" (45,7 cm) Salad Bowl  
SBH15 - Holds 1 each 15" (38 cm) Salad Bowl & 3 each 1.5 qt. (1,4 L) or 2.7 qt. (2,4 L) Cocks  
CPH3 - Holds 3 each 1.5 qt. (1,4 L) or 2.7 qt. (2,4 L) Cocks

#### Food Pans



### Approvals

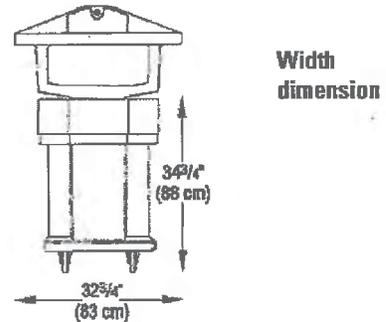
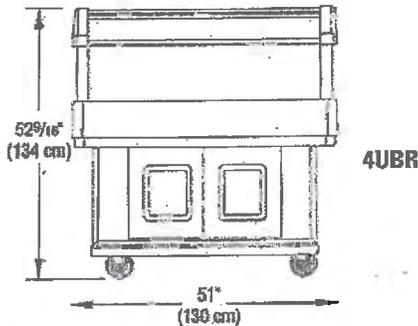
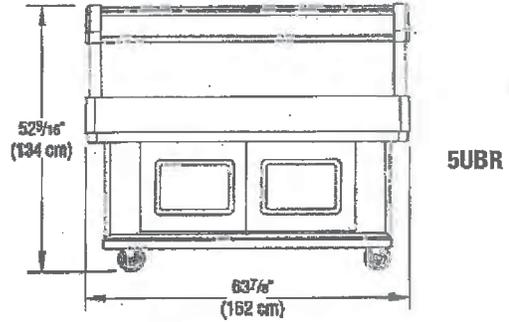
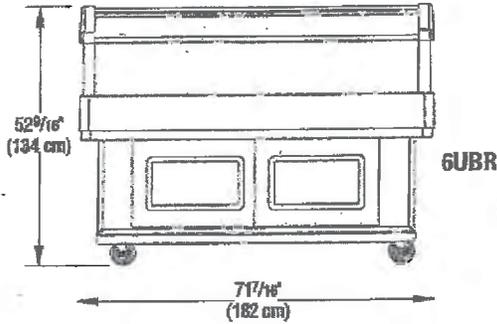


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Telephone (1)714 848 1555 Toll Free 800 854 7631 Customer Service Hot Line 800 833 3003  
LIT FCST-0102-75

# Food Bars

## Ultra

Models 6UBR - 6 ft. (182 cm), 5UBR - 5 ft. (162 cm)  
4UBR - 4 ft. (130 cm)



Item No. \_\_\_\_\_

Specifier Identification No. \_\_\_\_\_

Model No. \_\_\_\_\_

Quantity \_\_\_\_\_

### Specifications

Dimension Tolerance: +/- 1/8" (0.64 cm)

Code	Description	GN 1/1 Full Size Food Pan Capacity	Exterior Dimensions L x W x H	Case lbs./cube Kg/m <sup>3</sup>
6UBR	6 ft. (182 cm) Ultra Food Bar	5	71 7/8" x 32 3/4" x 52 9/16" (182 x 83 x 134 cm)	170 (44.36) 77 (1.2)
5UBR	5 ft. (162 cm) Ultra Food Bar	4	63 3/8" x 32 3/4" x 52 9/16" (162 x 83 x 134 cm)	161 (39.50) 73 (1.1)
4UBR	4 ft. (130 cm) Ultra Food Bar	3	51" x 32 3/4" x 52 9/16" (130 x 83 x 134 cm)	143 (39.50) 65 (1.1)

### Optional Accessories

- Tray Rails**
- FBR6P (6 ft.) (182 cm)
  - FBR5R (5 ft.) (162 cm)
  - FBR4R (4 ft.) (130 cm)
- End Table**
- FBRTBL
- 3-Crock Holder**
- CPH3 (holds 1.5 qt. (1.4 L) and 2.7 qt. (2.4 L) crocks)
- Salad Bowl Holders**
- SBH15 (holds one 15" (38 cm) bowl, 3 crocks)
  - SBH18 (holds one 18" (46 cm) bowl)
- Divider Bars**
- DIV12  DIV20

### Standard Colors

- Black (110)
- Coffee Beige (157)
- Navy Blue (186)
- Green (519)
- Granite Green (192)
- Slate Blue (401)
- Dark Brown (131)
- Dusty Rose (400)
- Hot Red (158)
- Granite Red (193)
- Brick Red (402)
- Cold Blue (159)
- Gray (180)
- Granite Gray (191)
- Granite Sand (194)

### Divider Bar:

- White (148)
- Clear (035)

### Crock Holder and Salad Bowl Holder:

- White (148)

### Architect Specs

The non-electrical portable foodservice food bar shall be a Floor Model Ultra Food Bar, Model..., manufactured by Cambro Mfg. Co., Huntington Beach, CA 92648 U.S.A. It shall be made of double-wall polyethylene and foam-injected polyurethane insulation. It shall have sliding doors on both sides for convenient storage. It shall have 4 each, 5" (12.7 cm) swivel casters w/ brakes. It shall hold optional accessories such as the Cambro Salad Bowl Holders (SBH18 and SBH15) and Crock Holder (CPH3) or a selection of GN Full or Fractional Size Food Pans with Divider Bars. The depth of the interior food

wells shall be 6 1/2" (16.5 cm). It shall be available with optional end tables and side tray rails. It shall include a sneeze guard and protective end panels. It shall have an NSF Listed threaded faucet drain with a standard hose hook up. It shall be available in 15 colors.

### Approvals



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Telephone (1)714 848 1555 Toll Free 800 854 7631 Customer Service Hot Line 800 833 3003  
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[WEBstaurantStore.com](#) > [Restaurant Equipment](#) > [Food Holding Equipment and Food Warming](#) > [Hot / Cold Food Wells and Soup Wells](#) > [Dual Temperature Food Wells](#) > **APW Wyott CHDT-3 3 Pan Cold / Hot Dual Temp Well**

## APW Wyott CHDT-3 3 Pan Cold / Hot Dual Temp Well



*Requires Base & Sneeze Guard*

**FREE SHIPPING!** 

Each Only

**~~\$4,534.50~~/Eac**

To see our price  
**Add this item to your cart.**  
*(You can remove it at any time.)*

 Why do we do this?

- ✓ 1" drain and screen
- ✓ Hot operation: 208/240V, 3000/4000W Cold operation: 120V, 1/3 HP
- ✓ UL and NSF Listed

### Companion Items



**2 1/2" Deep, Full Size Standard Weight Stainless Steel Steam**  
**\$11.49/Each**



**6" Deep, Full Size Standard Weight Stainless Steel Steam**  
**\$18.99/Each**

**Item:** 135CHDT3  
208/240

**Units:** Each

**Ship...** Usually Ships in 2-3 Business Days

**MFR...** CHDT-3

**Details**

*White Glove Delivery*

Perfect for buffet lines, salad bars, or catered events, this versatile APW Wyott CHDT-3 3 pan cold / hot dual temp well is equipped to keep either hot or cold food at safe temperatures! If the occasion calls for you to serve soup, sauce, or other hot foods, the unit uses an immersion heating system to warm your food. If a cold well is what you need for salad, fruit cocktail, or other chilled goods, this dual temp well's powerful compressor will start pumping refrigerant to keep your food cold. Switching from hot to cold takes nothing more than the flip of a switch!

The APW Wyott CHDT-3 3 pan cold / hot dual temp well has easily accessible temperature controls for both hot and cold operation. The heated system is controlled by a manual dial while the refrigerated system is digitally controlled with an LCD readout. Built with your convenience in mind, this dual temp well is made of heavy duty stainless steel for long-lasting performance, and can even be easily mounted into metal or wooden countertops for space

**SPECS**

Width	46 3/4 Inches
Depth	27 1/8 Inches
Height	24.325 Inches
Amps	7.0 - 16.7 Amps
Hertz	60
Phase	1
Voltage	120 Volts
Voltage	208/240
Wattage	3000 - 4000 Watts
Control Type	Dial
Installation Type	Drop In
Insulated	No
Material	Stainless Steel
Pan Capacity	3 Pans
Power Type	Electric
Style	Top Mount
Water Pan Required	No

- AVAILABLE -

[What is White Glove service?](#)



[View all APW Wyott Dual Temperature Food Wells](#)

**Downloads**



[Specsh](#) [Manual](#) [Warrant](#)

A PDF viewer is required to view this product's information. [Download Adobe Acrobat software](#)

**Warranty Info**

**RESIDENTIAL USERS:** APW Wyott assumes no liability for parts or labor coverage for component failure or other damages resulting from installation in non-commercial or residential applications.

saving efficiency.

The warmer for the APW Wyott CHDT-3 3 pan cold/hot dual temp well requires a 208/240V electrical connection, while the refrigeration system requires a 120V connection. The unit's 1/3 HP motor uses R404A refrigerant. It is UL and NSF Listed.

### **Overall Dimensions**

Width: 46 3/4"

Depth: 27 1/8"

Height: 24 3/8"

*Also known as CHDT3 and CHDT 3.*

**This Item Ships via Common Carrier.** For more information and tips to help your delivery go smoothly, click [here](#).

Because this item is not stocked in our warehouse, processing and transit times will vary. If you need your items by a certain date, please note this in the comment section while checking out! Please feel free to log on to our Live Chat should you have any questions before placing your order. After your order is placed, we will update you via email to let you know how this will be shipping to you.

### **Certifications**



### **Related Items**



"Your Solutions Partner"

# Specifications

F.O.B. Sedalia, Missouri 65301



E303

### OPTIONS:

- 3-phase wiring
- 1000 watt elements
- Stainless steel heat compartment liner - **FMOD-SS-LINER**
- Stainless steel cutting board in lieu of poly
- Hardwood cutting board in lieu of poly
- Drop type brackets for cutting board
- Casters - **EPxxx**
- Stainless steel feet - **SS-FEET**
- Serving shelves - **656-xS/656-460-xS/956-xS/956-460-xS**
- Glass display shelves - **98x**
- Shelves/Carving boards - **441-xS/442-xS/445-xS**
- Buffet shelves - **63x/73xFL/73xBL/73xHT/83x/93xFL/83xBL/93xHT**
- Adapter plates - **31, 32, 33**
- Insets/Inset Covers - **521, 522, 523**
- Telescope covers - **546, 548**
- Tubular tray slides - **3BTS-FX-x/HD-x**
- Spillage pans - **576, 676**

### AGENCY LISTINGS:



**DUKE MANUFACTURING CO.**  
2305 N. Broadway  
St. Louis, MO 63102

800.735.3853 Toll Free  
314.231.1130 In Missouri  
314.231.5074 Fax  
www.dukemfg.com

### Approval Stamp(s):

### PROJECT INFORMATION:

PROJECT: \_\_\_\_\_  
ITEM: \_\_\_\_\_  
QUANTITY: \_\_\_\_\_

### MODEL:

## Aerohot Steamtables Hot Food Units - Electric

- E302** 2 top openings
- E303** 3 top openings
- E304** 4 top openings
- E305** 5 top openings

### TOP:

- 20 gauge, 300 Series stainless steel
- Die-stamped openings - 12" x 20"
- Poly carving board - 7"W x 1/2" thick with 18 gauge stainless steel support base and die-stamped brackets

### HEAT COMPARTMENTS:

- Each with die-formed 8" deep galvanized liner
- Insulated with 1" thick fiberglass or equal, all four sides and bottom
- Single phase standard

### BODY, UNDERSHELF AND LEGS:

- 20 gauge, 430 Series stainless steel body
- 18 gauge, 430 Series stainless steel undershelf
- 430 Series stainless steel tubular legs with adjustable plastic feet

### ELECTRICAL INFORMATION:

- 500 or 750 watt dome-type element for each compartment
- Wired to operate on 120, 208 or 240 volt
- Single or three phase
- AC current
- Each section with infinite switch
- Permanently wired, 6' long cord with plug provided

### SHORT FORM SPECIFICATIONS:

**Duke Aerohot Steamtables - Hot Food - Electric.** Top shall be 20 gauge, 300 Series stainless steel, with body, undershelf and legs formed of heavy gauge 430 Series stainless steel. Top to have die-stamped openings measuring 12-1/16" x 20-1/16", with 8" deep galvanized liner. Each compartment to be insulated on all four sides and bottom with 1" thick fiberglass or equal, having thermal conductivity of 0.27 or less, with single phase standard. Each compartment to have 500 or 750 watt dome-type element fitted inside, above warming compartment. Wired to operate on 120, 208 or 240 volt, single or 3-phase. AC current, as ordered. Each section to be controlled by infinite switch. Permanently wired, 6' long cord with plug provided. Units to be furnished with poly carbonate carving board measuring 7" x 1/2" thick with 18 gauge stainless steel support base and die-stamped brackets. Portable units to have NSF listed casters, 5" diameter, rubber, swivel-type, two with locks, all non-marking tires, with 9"L pusher bar attached to end panel on operator's right.

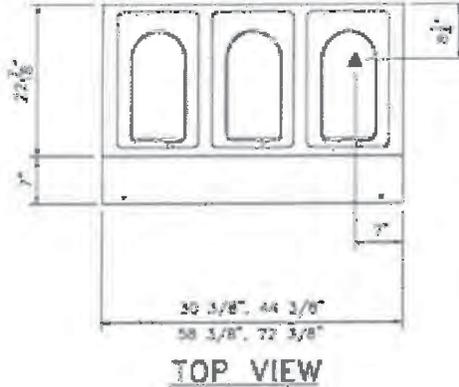
"P" - prefix on model number denotes portable unit.



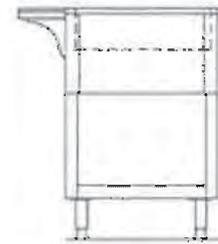
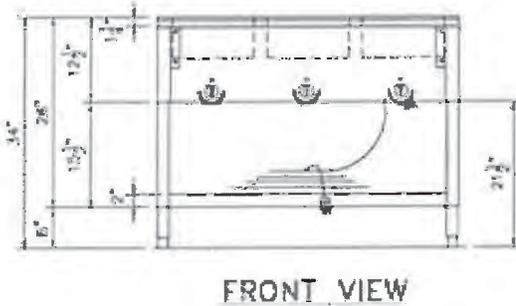
# Aerohot

## AEROHOT STEAMTABLES HOT FOOD UNITS - ELECTRIC

- E302** 2 top openings
- E303** 3 top openings
- E304** 4 top openings
- E305** 5 top openings



LEGEND	
▲	ELECTRICAL CONNECTION
"P" = prefix on model number denotes portable unit	



### DIMENSIONS:

Freight Class: 85

Model	Length		Width		Height		Top Openings	Cube ft. crated	Weight	
	in.	cm	in.	cm	in.	cm			lbs.	kg
<b>E302/EP302</b>	30-3/8	77.2	22-7/16	57.1	34	86.4	2	23.4	81/90	36.8/40.9
<b>E303/EP303</b>	44-3/8	112.8	22-7/16	57.1	34	86.4	3	32.5	107/114	48.6/51.8
<b>E304/EP304</b>	58-3/8	148.3	22-7/16	57.1	34	86.4	4	41.5	138/144	62.7/65.5
<b>E305/EP305</b>	72-3/8	183.9	22-7/16	57.1	34	86.4	5	50.5	165/172	75.0/78.2

### ELECTRICAL SPECIFICATIONS:

Model	120 Volt - 500 watt elements			208 Volt - 750 watt elements			240 Volt - 750 watt elements		
	Watts	Amps	NEMA	Watts	Amps	NEMA	Watts	Amps	NEMA
<b>E302/EP302</b>	1000	8.3	5-15	1500	7.2	6-20	1500	6.3	6-20
<b>E303/EP303</b>	1500	12.5	5-15	2250	10.8	6-20	2250	9.4	6-20
<b>E304/EP304</b>	2000	16.7	L5-30	3000	14.4	6-20	3000	12.5	6-20
<b>E305/EP305</b>	2500	20.8	L5-30	3750	18.0	L6-30	3750	15.6	6-20

Cord and NEMA plug included.



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01/07

Specifications subject to change

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JOB \_\_\_\_\_ ITEM # \_\_\_\_\_ QTY # \_\_\_\_\_



934-H

915-H



### PIPER'S SUPERIOR

#### FOUNDATION

Featured on our toughest racks: Two 14 gauge aluminized steel reinforcing channels support our .125" thick aluminum bottom panel. The edges are formed and rolled to create a built-in bumper and heavy duty plate casters make this the strongest foundation in the industry.

### MODEL NUMBER

- 915-H
- 934-H
- 934-H-LD
- 1034-LD
- 1015 (Insulated)
- 1034 (Insulated)

### DIMENSIONS

- ◆ 915-H - 40-3/4"H x 21-1/2"W x 31"D
- ◆ 934-H - 68-3/4"H x 25W x 31"D
- ◆ 934-H-LD - 68-3/4"H x 21-1/2"W x 31"D
- ◆ 1034-LD - 68-3/4"H x 21-1/2"W x 31"D
- ◆ 1015 (Insulated) - 40-3/4"H x 21-1/2"W x 31"D
- ◆ 1034 (Insulated) - 68-3/4"H x 21-1/2"W x 31"D

Piper's aluminum Heated Cabinets /Proofers are designed with features to make your operation efficient. Controls can be easily accessed at the front of the Cabinet without opening the doors and the entire heater unit can be removed for cleaning and maintenance.

### STANDARD FEATURES

- ◆ Base is a solid bottom constructed of .125" aluminum, rolled edge base acts as a built-in bumper
- ◆ Two 14-gauge aluminized steel reinforcing channels attach the casters and support the bottom panel
- ◆ Frame consist of four extruded channels 1-1/2" x 5/8" x .094" aluminum. Corners have .190 channel supports for reinforcement
- ◆ Double pan top constructed of two .080" thick aluminum panels, fully welded corners
- ◆ Glides are channels spaced on 1-1/2" centers with 5/8" ledge, .090 thick extruded aluminum continuously welded to the frame
- ◆ Door panel is .125" PVC coated aluminum attached to cabinet with bakery hinges, 270 degree door swing with card clip
- ◆ Back panel is .080" aluminum fully welded with removable multiple louvered vent stack
- ◆ 1/2" extruded aluminum tie bar keeps cabinet square
- ◆ 16-gauge stainless steel positive gravity latch is provided to keep door closed during transport
- ◆ Stainless steel side door latch holds door open
- ◆ One inch insulation surround the cabinet (Insulated models only)
- ◆ Card clip, easy identification of cabinet content when door is closed

### HEAT SYSTEM

- ◆ Individual heat and food moisture controls
- ◆ Digital read-out for accuracy
- ◆ Stainless steel 1 gallon water pan
- ◆ Unit removable for easy cleaning & maintenance
- ◆ 60 minute timer
- ◆ 120 volt, 12.5 AMP, 1500 Watts

### HEAVY-DUTY CASTERS

- ◆ 5" diameter x 1/1/4" wide swivel sealed wheels, two with brakes
- ◆ 350 lb. capacity
- ◆ Maximum resistance to chemicals, acids, bases, alcohol, water and steam
- ◆ Maximum low temperature flexibility or superior performance even in freezing temperatures

### COMMON OPTIONS

- ◆ Lexan full-view door
- ◆ Push handle
- ◆ Dutch doors
- ◆ Personalized embossment
- ◆ See reverse side for additional options

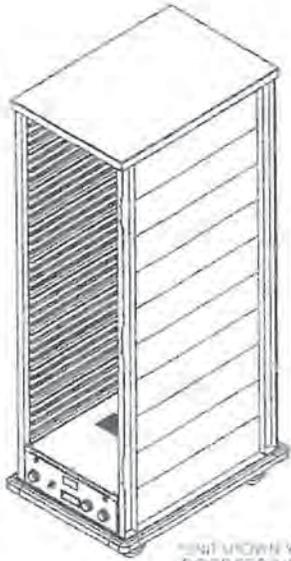
### WARRANTY

- ◆ One year parts and labor. Warranty is detailed on inside front cover of the price list.

**SPEC J-6**

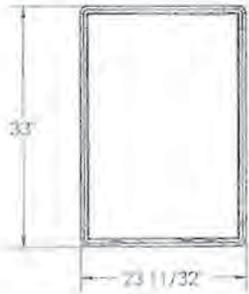
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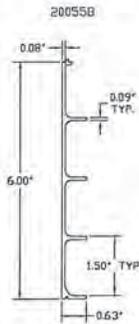


RIGHT SHOWN WITHOUT DOOR FOR INTERIOR DETAILS

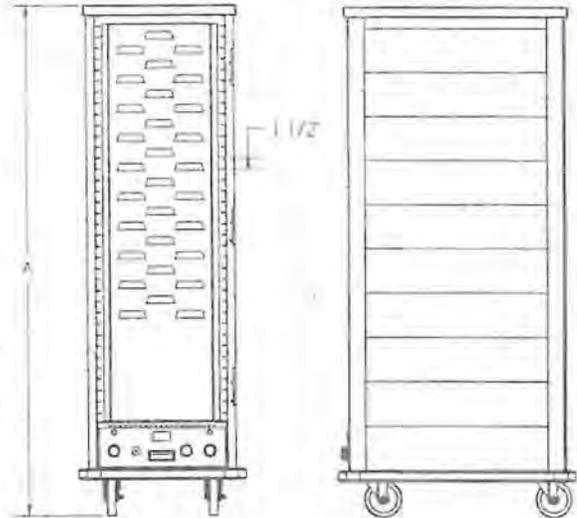
Glides are channels spaced on 1-1/2" centers with 5/8" ledge



Shown with optional Bumper



Glides



Model #	Description	(A) Height	Width	Depth	Channel Spacing	18x26 Pan Capacity	Ship Wt.(lbs)	Shipping Class
<b>NON-INSULATED</b>								
915-H	half size	40-3/4"	21-1/2"	31"	1-1/2"	15	140	100
934-H	full size	68-3/4"	21-1/2"	31"	1-1/2"	34	190	100
<b>INSULATED</b>								
1015	half size	40-3/4"	21-1/2"	31"	1-1/2"	15	160	100
1034	full size	68-3/4"	21-1/2"	31"	1-1/2"	34	260	100

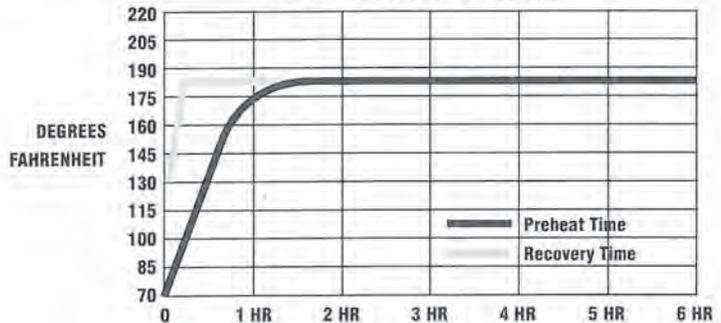
All models 120 volt, 12.5 APM, 1500 watts

### OPTIONS / ACCESSORIES

- (LD) Lexan full-view door
- (DD) Dutch door, only available on 941 units
- (CH) Chest handles, set of 2
- (EMB) Personalized embossment, 12 letters per line
- (PH) Push handle
- (I) Insulating transport cabinet
- (B) Set of 4 non-marking rubber corner bumpers
- (PB) Full perimeter non-marking bumper (Add 2" to overall width and depth)
- (WB) Wheel brakes, set of 2
- (5x2) Heavy-duty casters, set of 4
- (CP) Correctional package, includes welded casters and hole in door latch for paddlelock

- (CHT-2) Canned Heat Tray Insert
- (Y4) Polyurethane 4" casters (set of 4)
- (Y5) Polyurethane 5" casters (set of 4)
- (FL) Floor Lock

### TEMPERATURE PROFILE



### J-6 SPEC

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Wausau, WI 54401  
Phone: 800-544-3057  
Fax: 715-842-3125

**LIMITED WARRANTY:** PIPER PRODUCTS warrants to the original purchaser parts and labor for a period of twelve (12) months from the date of purchase. See manufacturer's complete warranty for details.

It is our policy to build equipment which is design certified by companies that have been accredited at the Federal Level by the Occupational Safety and Health Agency (OSHA) and ANSI as a National Recognized Testing Laboratory. These companies include CSA International, Underwriters Laboratories, and the National Sanitation Foundation. However, a continuing program of product improvement makes it necessary to submit new models to the agencies as they are developed. Consequently, all models may not bear the appropriate labels at all times.

We reserve the right to change specifications and product design without notice. Such revisions do not entitle buyer to corresponding changes, improvements, additions or replacements for previously purchased equipment. Information is not for design purposes.



Star Manufacturing International, Inc.



## ULTRA-MAX<sup>®</sup> THROTTLING THERMOSTAT GAS GRIDDLES

**Models 824T, 836T, 848T, 860T & 872T**

### Features/Benefits:

- ★ Thermostatically controlled with a throttling thermostat control from 150° to 450°F provides accurate temperature control of +/- 20 degrees of set point.
- ★ Unique internal plate sensor accurately measures the temperature of the griddle plate 3/16" from the cooking surface for instant response to surface temperature change and fast recovery.
- ★ Available in 24", 36", 48", 60" and 72" widths to meet your space and volume requirements.
- ★ Ultra-Max high capacity 24" deep cooking surface is ideal for high volume operations.
- ★ Highly polished 1" thick steel plate for superior heat distribution, fast recovery and energy efficient operation.
- ★ Custom designed steel 30,000 BTU burner every 12" of cooking surface provides superior cooking performance.
- ★ Heavy-duty construction with all-weld body construction and stainless steel front, side panels, bull nose and splash guard.
- ★ "Euro-style" design with stylishly curved, ergonomically advanced front panel providing easy access and viewing of controls.
- ★ Standing pilot light for consistent performance.
- ★ Spatula wide 3-1/2" front grease trough and grease chute for easier cleaning.
- ★ Large 6 quart stainless steel grease drawer (2 drawers on 50" and 72" models).
- ★ Extra-heavy 4" adjustable legs to fit your countertop needs.
- ★ Floor model stands available for free standing unit. Optional casters available.

### Applications:

Ultra-Max Throttling Thermostat gas Griddles will exceed your food service operations expectations. Designed for high performance and reliability. Ultra-Max griddles will provide years of trouble free operations.

### Construction:

Ultra-Max thermostatically controlled griddles feature 1" thick highly polished steel griddle plate with 5" tapered stainless steel splash guard and 3-1/2" wide front access grease trough with 6 quart grease drawer capacity. Includes a 30,000 BTU aluminized burner every 12" of width controlled by throttling control valve with standing pilot light, 3/4" N.P.T. male gas connection with convertible pressure regulator, and 4" adjustable legs.

### Warranty:

Ultra-Max gas griddles are covered by Star's one year parts and labor warranty.



848T



836T  
Shown with Optional Floor Stand



Ultra-Max<sup>®</sup> Throttling Thermostat Gas Griddles

Star Manufacturing International Inc. - 10 Sunnen Drive - P.O. Box 430129 - St. Louis, MO 63143-3800  
Phone: (800) 264-7827 - FAX: (800) 264-6666 - www.star-mfg.com

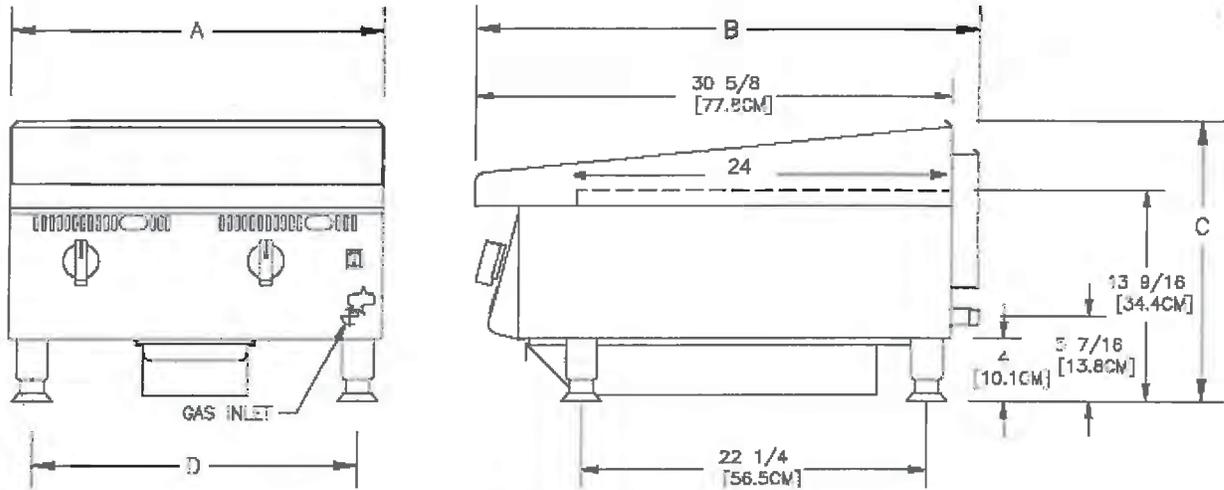
S203/1041



Star Manufacturing International, Inc.

## ULTRA-MAX<sup>®</sup> THROTTLING THERMOSTAT GAS GRIDDLES

Models 824T, 836T, 848T, 860T & 872T



### Specifications

Model No.	Dimensions				No. Controls	BTU	Grid Area	Plate Thickness	Approximate Weight	
	(A) Width Inches	(B) Depth Inches	(C) Height Inches	(D) Leg Width Inches					Installed	Shipping
824T	24" (61 cm)	32-3/8" (82.2 cm)	18" (45.7 cm)	21" (53.34)	2	60,000	573 sq. in. (3,697sq cm)	1" (2.54 cm)	220 lbs. (99.7 kg)	246 lbs. (111.5 kg)
836T	36" (91.4 cm)	32-3/8" (82.2 cm)	18" (45.7 cm)	33" (83.8)	3	90,000	860 sq. in. (5,545 sq cm)	1" (2.54 cm)	330 lbs. (149.5 kg)	369 lbs. (167.2 kg)
848T	48" (121.9cm)	32-3/8" (82.2 cm)	18" (45.7 cm)	45" (114.3)	4	120,000	1146 sq. in. (7,394 sq cm)	1" (2.54 cm)	440 lbs. (199.4 kg)	492 lbs. (222.9 kg)
860T	60" (152.4 cm)	32-3/8" (82.2 cm)	18" (45.7 cm)	57" (144.78)	5	150,000	1433 sq. in. (9,242 sq cm)	1" (2.54 cm)	550 lbs. (249.2 kg)	615 lbs. (278.7 kg)
872T	72" (182.9 cm)	32-3/8" (82.2 cm)	18" (45.7 cm)	69" (175.3)	6	180,000	1719 sq. in. (11,091 sq cm)	1" (2.54 cm)	660 lbs. (299.0 kg)	738 lbs. (334.4 kg)

### Typical Specifications

Gas griddles are constructed of stainless steel, valve knobs are protected by a stainless steel bull nose front. Griddle plate is 1" (2.54 cm) thick highly polished steel plate with a 5" (12.7 cm) high tapered wrap-around stainless steel splash guard. Unit has a 3-1/2" (8.3 cm) wide front grease trough with with grease chute and a 6 qt. (5.68L) capacity stainless steel grease drawer. Models 860T and 872T house two each 6 quart grease drawers. Units are equipped with a 30,000 BTU aluminized steel burner for every 12" (30.5 cm) of width and are controlled by a throttling control valve with standing pilot light, 3/4" N.P.T. male gas connection with convertible pressure regulator. Griddles are supplied with 4" (10.2 cm) high stainless steel legs that have a 1-5/8" (4.5cm) adjustment. Units are approved for installation within 6" (15.2 cm) of combustible surfaces and are UL Gas Fired Listed for U.S. and Canada and UL classified to NSF Standard 4 Sanitation. Printed in the U.S.A.

Due to periodic changes in designs, methods, procedures, policies and regulations, the specifications contained in this sheet are subject to change without notice. While Star Manufacturing exercises good faith efforts to provide information that is accurate, we are not responsible for errors or omissions in information provided or conclusions reached as a result of using the specifications. By using the information provided, the user assumes all risks in connection with such use.

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Phone: (800) 264-7827 - FAX: (800) 264-6666 - www.star-mfg.com

Ultra-Max<sup>®</sup> Throttling Thermostat Gas Griddles

# 3 H.P. Model 300



JOB: \_\_\_\_\_

Item No.: \_\_\_\_\_



## FOOD WASTE DISPOSER SPECIFICATIONS

### CORROSION RESISTANT BODY

Permanent molded from heat treated aluminum alloy.

### TEFLON LIP WATER SEAL

Protects the motor from damage by water.

### TAPERED ROLLER BEARING

Provides longer motor life, quiet operation and shock absorbing.

### WATER COOLED MOTOR

Provides maximum efficiency and longer life.

### QUIET OPERATION

Extra thick rubber mounting adaptor and drain outlet isolates sound and eliminates vibration.

### WASTE MIXING CHAMBER

Extra large to ensure proper mixture of water to waste.

## NEMA 4 Watertight Controls



MSS



MRSS

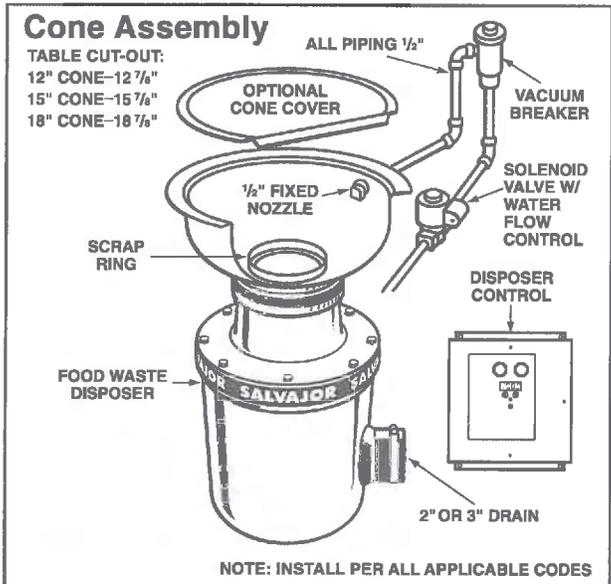


ARSS-2



ARSS

Optional Line Disconnect (LD) available on MSS, MRSS, & ARSS



## FULL LOAD AMPS

<input type="checkbox"/>	208 Volts	3 Phase	8.8 Amps
<input type="checkbox"/>	230 Volts	3 Phase	8.0 Amps
<input type="checkbox"/>	460 Volts	3 Phase	4.0 Amps

◆ SPECIFY EXACT OPERATING VOLTAGE ◆

# Salvajor Model 300

Food Waste Disposer 3HP – 3 Phase

D E T A I L S   A N D   D I M E N S I O N S

## SPECIFICATIONS:

**MOUNTING** – Rubber adaptor above grind chamber and rubber drain outlet isolates sound and eliminates vibration. No metal to metal contact.

**EXTERIOR HOUSING** – Permanent molded from heat treated, corrosion resistant aluminum alloy then computer machined to a smooth polished finish. Paint free.

**SHREDDER** – 9 inch diameter, machined high strength, wear resistant hardened carbide alloy.

**ROTOR** – 9 inch diameter with 4 cutter bars, machined high strength, wear resistant hardened carbide alloy.

**MOTOR** – 3 HP totally enclosed. Fan cooled and water cooled for efficiency and longer life. Built-in manual reset thermal overload protection. Available in 208-230/460 volts, 60 cycle, 3 phase.

**BEARINGS** – Tapered roller (top)  
Sealed ball (bottom)

**SEAL** – Teflon Lip Water Seal.

**WATER REQUIREMENT** – 8 gallons of cold water per minute.

**WASTE OUTLET** – Rubber drain accepts 2" piping or 3" piping by removing drain insert.

**DUAL DIRECTION GRINDING** – Designed to operate in either direction. Direction of rotation can be controlled when installed with automatic reversing controls. *Reversing rotation can double cutting teeth life.*

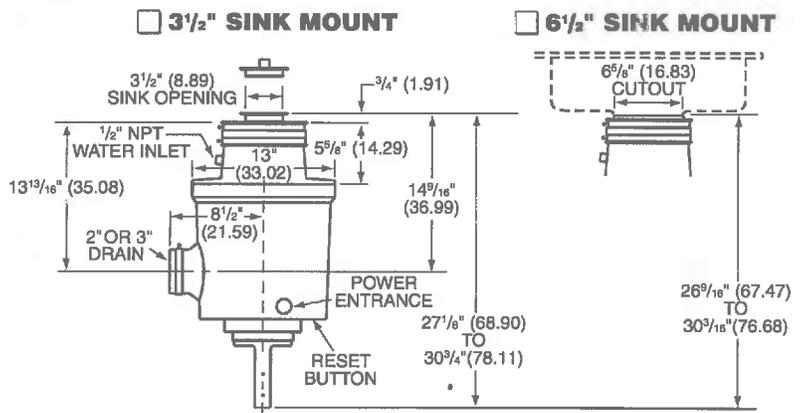
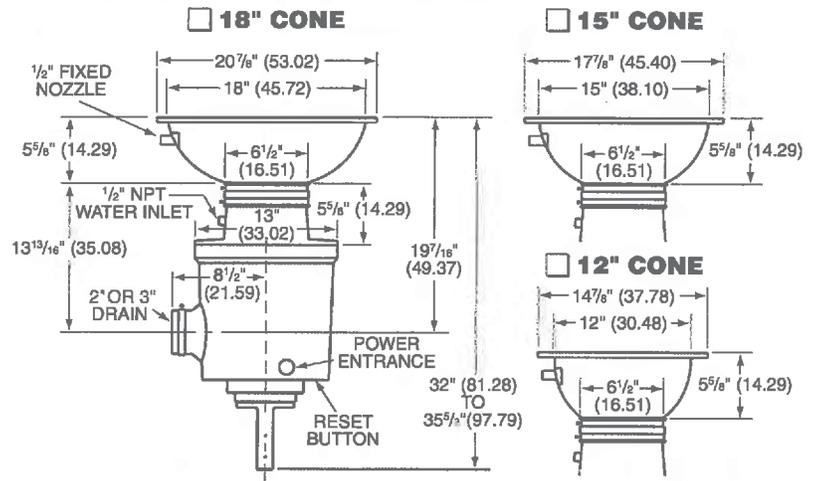
**LEG SUPPORT** – Single leg, adjustable.

**ASSEMBLIES:** (See Specification Sheet)

- CA – Cone Assembly with 12", 15" or 18" Cone
- SA – Sink Assembly with 3½" or 6½" Sink Collar

**DISPOSER CONTROLS:** (See Specification Sheet)

- MSS: (Non Reversing)
- MRSS: (Manual Reversing)
- ARSS-2: (Automatic Reversing)
- ARSS: (Automatic Reversing)



NOTE: Dimensions in parenthesis are in centimeters  
(Specifications subject to change without notice)  
Current specification details may be found online at [www.salvajor.com](http://www.salvajor.com)

SAMPLE SPECIFICATION			
300-CA-18	ARSS	(230/60/3)	
Model	Cone Size	Disposer Control	Electrical Specs.
Assembly			
◆ SPECIFY EXACT OPERATING VOLTAGE ◆			



**The Salvajor Company** 4530 East 75th Terrace Kansas City, Missouri 64132-2081, USA

1-800-SALVAJOR  
[www.salvajor.com](http://www.salvajor.com)

(816) 363-1030  
Email: [sales@salvajor.com](mailto:sales@salvajor.com)

FAX: 1-800-832-9373  
[service@salvajor.com](mailto:service@salvajor.com)

Manufacturers of Commercial Food Waste Disposing Systems since 1944

# Champion<sup>®</sup>

The Dishwashing Machine Specialists

Project \_\_\_\_\_

Item No. \_\_\_\_\_

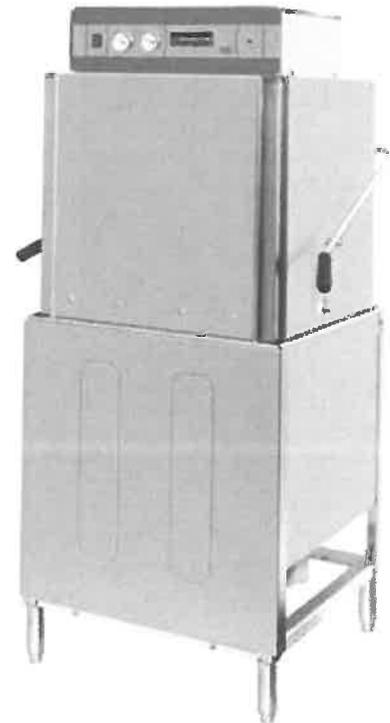
Quantity \_\_\_\_\_

## STANDARD FEATURES

- **ENERGY STAR<sup>®</sup> Qualified**
- **NEW Exclusive** Built-in booster configured for both 40° and 70° Rise
- **NEW Exclusive** Field convertible to single or three phase, 208 or 240 volt, corner or straight through operation
- Rinse Sentry – ensures 180°F final rinse
- Auto start – starts unit when doors are closed
- High temperature
- Single point connection
- High efficiency 1 HP pump
- 55 racks per hour
- Self draining pump
- Automatic tank fill
- Detergent/chemical connections
- Interchangeable upper and lower arm
- Top mounted splash proof controls
- Automatic drain valve
- Vent fan control
- Pressure regulating valve
- Low water tank heat protection

## VERSA-CLEAN

DH2000 High Temperature  
Door-type  
Dishwashing Machine



VERSA-CLEAN DOOR-TYPE

## OPTIONS & ACCESSORIES

- Drain Tempering Kit
- Side Panels



## SPECIFIER STATEMENT

Specified unit will be Champion model Versa-Clean, DH2000 high temperature door-type dishwashing machine.

Features top mounted splash proof controls, Rinse Sentry, Auto start, interchangeable stainless steel wash and rinse arms, 55 racks/hr., .90 US gals/rack.

1 year parts and labor warranty.

Champion Industries, Inc.  
3765 Champion Blvd, Winston-Salem, NC 27105  
Tel: 336/661-1556 Fax: 336/661-1979  
[www.championindustries.com](http://www.championindustries.com)

# VERSA-CLEAN

DH2000 High Temperature  
Door-type  
Dishwashing Machine

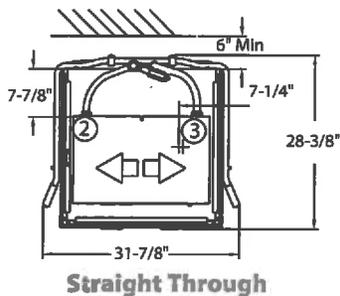
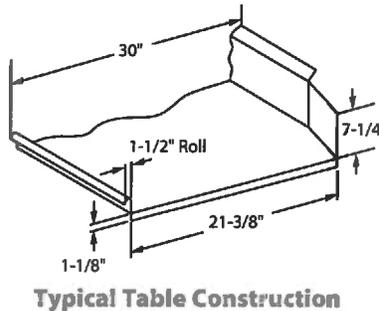
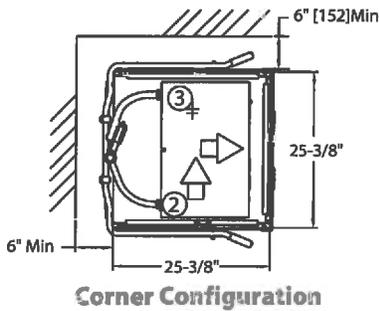
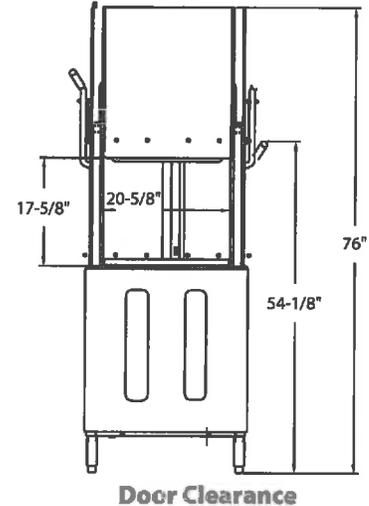
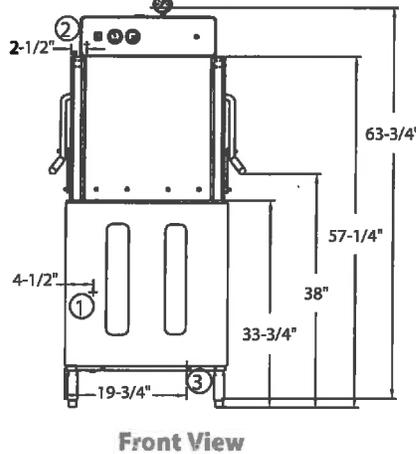
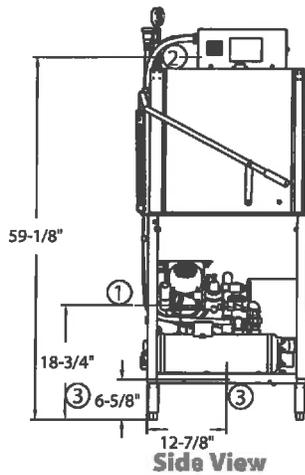


# Champion®

The Dishwashing Machine Specialists

Shipping weight crated: 300 lbs.

Dimensions shown in inches



SPECIFICATIONS	
<b>Capacities</b>	
Racks per hr. (NSF rated)	55
Wash tank (gal.)	9.5
<b>Motor horsepower</b>	
	1 HP
<b>Water consumption</b>	
Gal. per hr. (max. use)	49.5
Gal. per rack	0.9
<b>Temperature °F</b>	
Wash	150
Rinse	180
<b>Heating</b>	
Tank heat, electric	5.2 kW
Electric Booster	7.5 kW
<b>Time cycle in seconds</b>	
Wash	40
Dwell	1
Rinse	12
Sanitary Dwell	7
Total cycle	60

Utilities	
<b>1</b>	<b>Water</b> 3/4" NPT Flow pressure 20-25 PSI Hot water 140°F (82°C)
<b>2</b>	<b>Electrical 40°/70° Booster</b> A. 208-220/60/1 (See Box) B. 208-220/60/3 (See Box)
<b>3</b>	<b>Drain</b> A. 2" OD Connection Gravity flow, 15 GRM max flow

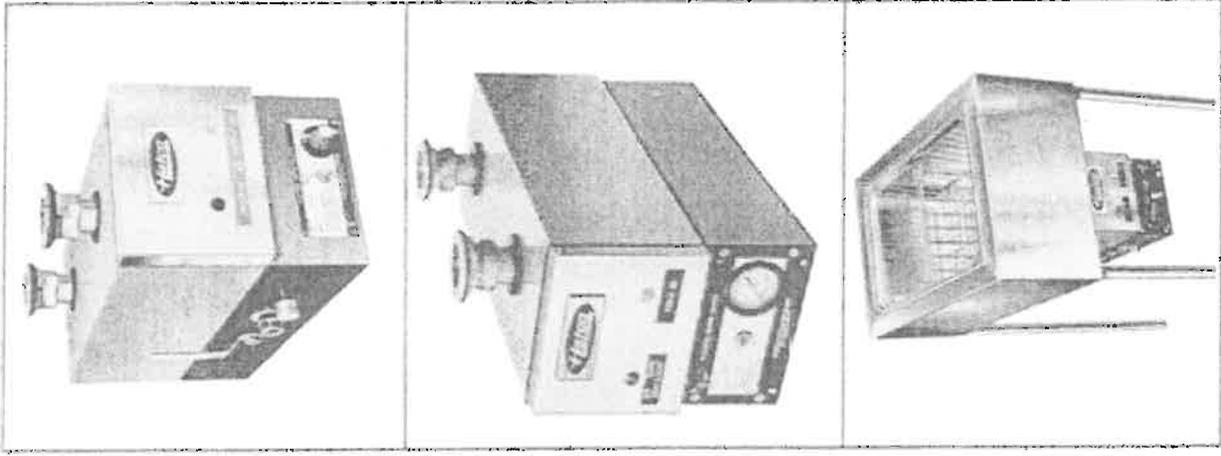
Electric 40°/70° Rise Booster			
Voltage	Rated Amps	Minimum Supply Ckt. Conductor Ampacity	Maximum Overcurrent Protective Device
208/60/1	65	80	80
240/60/1	75	80	80
208/60/3	40	50	50
240/60/3	45	50	50

**Warning:** Plumbing, electrical connections should be made by qualified personnel who will observe all the applicable plumbing, sanitary and safety codes and the National Electrical Code.



# 3CS, FR and Therma-Corn Installation and Operating Manual

I & W #07.05.004.00



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## GENERAL

Hatco FR and 3CS heaters are designed to supply temperature controlled water to a holding vessel (sink or tank) above the heater. Water flows from the holding vessel into the heater directly into the first reservoir. This first reservoir acts as a soft collection sump. Debris that could affect the heating element settles out in the sump to be drained away later. The debris free water flows into the second reservoir in which the heating elements are mounted. The water is heated and returned to the holding vessel above.

This manual provides the installation and operation instructions for Hatco FR and 3CS heaters and Thermo-Corn models FRC-1 and FRC-2.

We recommend all installation and operating instructions and safety precautions appearing in this manual be read prior to installation and operation.

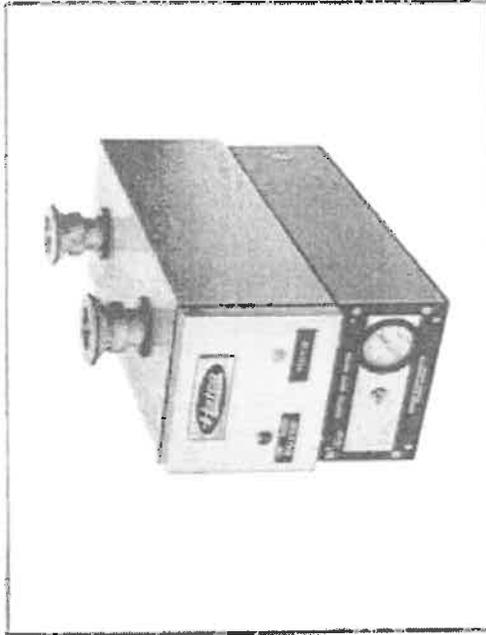


Figure 1. 3CS Heater

Safety precautions provided in this manual by the words **WARNING** or **CAUTION** printed in bold face are important. Warning means there is the possibility of personal

injury to yourself or others. Caution means there is the possibility of damage to the unit.

## MODEL DESCRIPTION



Figure 2. FR Heater

## 3CS

The Hatco 3CS model heaters are specifically designed for use with any manual dishwashing operation. The 3CS heater maintains sanitizing rinse water of 183° F.

## FR

The Hatco FR model heaters are designed to be used with a Dish-Mare or food reconstituter, such as the Hatco Thermo-Corn, to heat or hold foods at temperatures between 143° F and 193° F. Holding temperature is controlled by an adjustable thermostat.

## THERMA-CORN, FRC-1, and FRC-2

The Hatco Thermo-Corn, models FRC-1 and FRC-2 use a Hatco FR-3 heater, which is supplied with an electrical cord and plug.

# SPECIFICATIONS DIMENSIONS 3CS AND FR

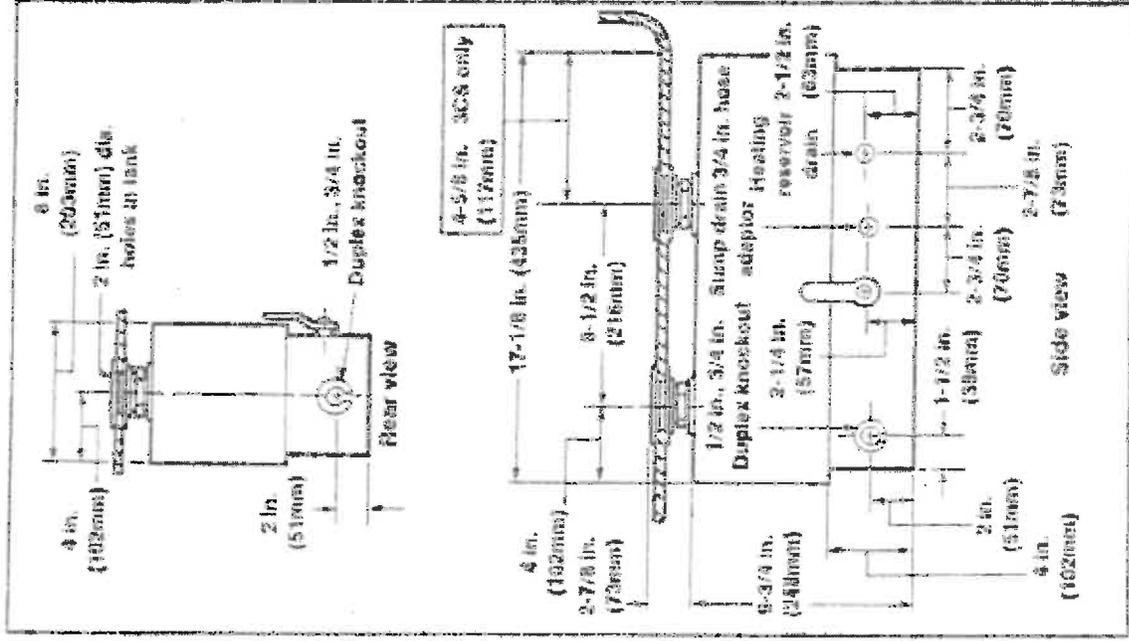


Figure 4. Three Element Style (Balanced 3 Phase)

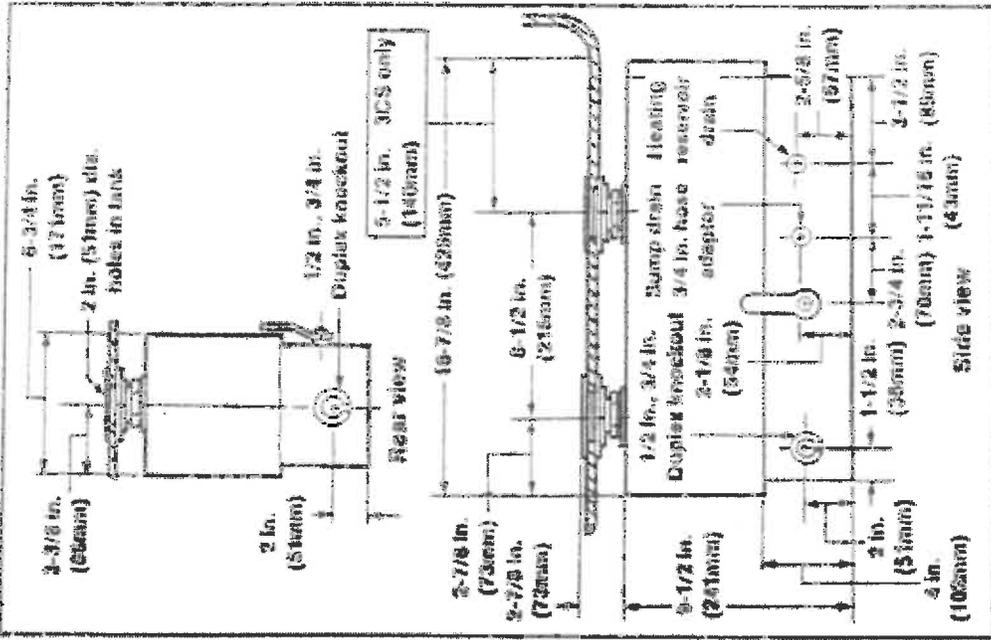


Figure 5. One and Two Element Style

## FR SIZING INFORMATION

For a Ban-Matic or steam table:

750 watts per square foot of vessel top.

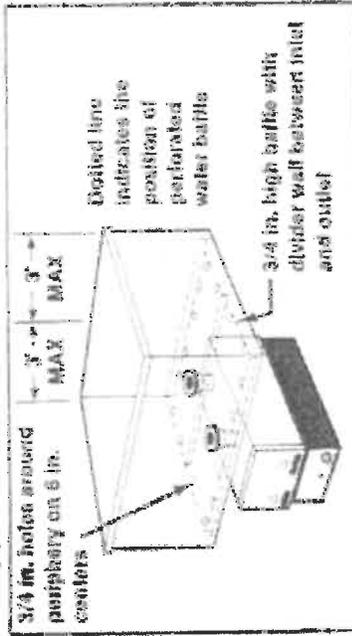
For a food reconstitutor:

2000 watts per square foot of vessel top.

### NOTE

Use one FR for a Ban-Matic up to 6 feet long. Gear 6 feet, a maximum of two FR heaters are required.

See Figure 5. The FR should be positioned with no more than 3 feet on either side when mounted in holding vessel. A perforated water baffle must be used. (Not supplied by factory.)



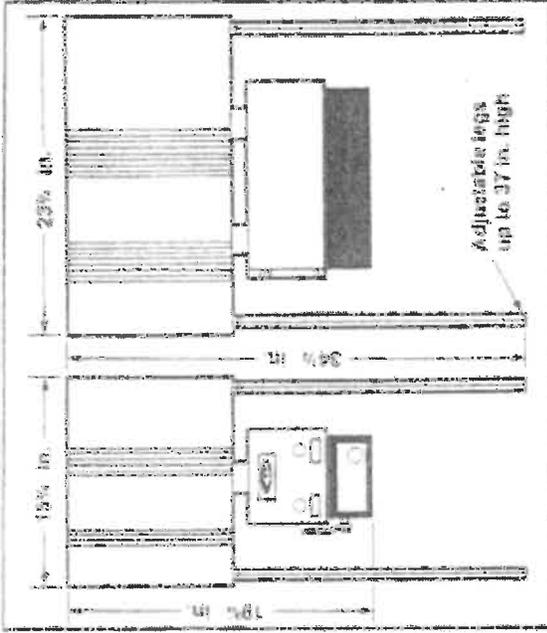
**Figure 5. FR With Water Baffle**  
**THERMA-CORN**

The Therma-Corn is completely assembled and prewired at the factory. The Therma-Corn may be mounted to an accessory stand or inserted into a counter top.

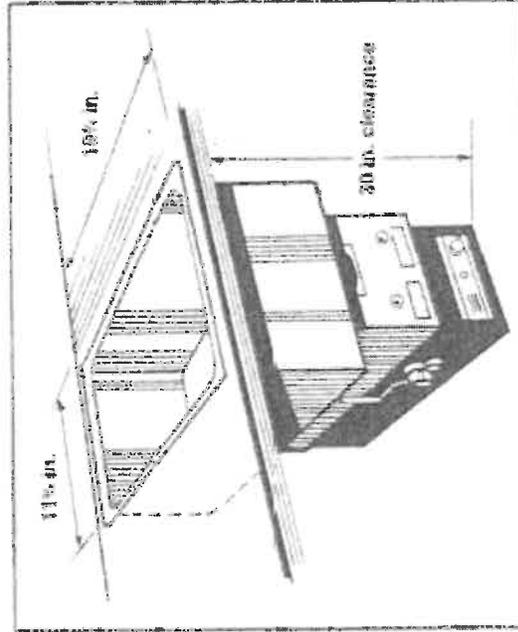
See Figure 6. Adjustments may be made to the accessory stand by using the thumb screws for leveling and adjusting height.

See Figure 7. When installing the Therma-Corn into a counter top the opening must be 1-3/4 in wide by 19-3/4 in. deep.

There must be at least a 30 in. clearance below the counter top to accommodate the tank, burner and drain assembly.



**Figure 6. Therma-Corn Model FRC-II**



**Figure 7. Therma-Corn Model FRC-I**

# CIRCUIT BREAKER AND FUSE SIZING CHART 3CS HEATERS

208 Volts					Fuse or
KW Rating	Phase	Size Amps	Wire Size	Circuit Breaker	
3	1	14.5	12	20	
4.5	1	22	10	30	
6	1	29	8	40	
6	3*	25	10	40	
6.8	3(Bal.)	16.0	10	30	
9.0	1	43	4	60	
9.0	3*	37	6	50	
9.0	3(Bal.)	25	10	40	

240 Volts					Fuse or
KW Rating	Phase	Size Amps	Wire Size	Circuit Breaker	
3	1	12.5	12	20	
4.5	1	18	10	30	
6	1	25	10	40	
6	3*	22	10	30	
6.0	3(Bal.)	14.4	12	20	
9.0	1	38	6	50	
9.0	3*	33	8	40	
9.0	3(Bal.)	22	10	30	

480 Volts					Fuse or
KW Rating	Phase	Size Amps	Wire Size	Circuit Breaker	
3	1	6.3	14	15	
4.5	1	9.4	14	15	
6	1	12.5	12	20	
6	3*	10.8	14	15	
6.0	3(Bal.)	7.2	14	15	
9.0	1	15.8	10	30	
9.0	3*	16.2	12	20	
9.0	3(Bal.)	10.8	14	15	

\*Open Delta—standard construction (Amperage higher than Balanced 3 phase)

Install a fused disconnect switch or circuit breaker sized according to the table. The wiring from the switch to the Halo 3CS sink heater should be in accordance with local electrical requirements.

## FR HEATERS

208 Volts					Fuse or
KW Rating	Phase	Size Amps	Wire Size AWG	Circuit Breaker	
3.3	1	16	12	20	
4.8	1	23	10	30	
6.3	1	30	8	40	
6.3	3*	25	8	40	
7.1	3(Bal.)	19.7	10	30	
9.3	1	45	4	60	
9.3	3*	36	6	50	
9.3	3(Bal.)	26.4	10	40	

240 Volts					Fuse or
KW Rating	Phase	Size Amps	Wire Size AWG	Circuit Breaker	
3.3	1	14	12	20	
4.8	1	20	10	30	
6.3	1	26	8	40	
6.3	3*	22	10	30	
6.3	3(Bal.)	16.6			
9.3	1	39	6	50	
9.3	3*	33	8	40	
9.3	3(Bal.)	23	10	30	

\*Open Delta—standard construction (Amperage higher than Balanced 3 phase)

Install a fused disconnect switch or circuit breaker sized according to the above table. The wiring from the switch to the Halo FR should be in accordance with local electrical requirements.

## PLUMBING

A paper template with adhesive backing is shipped with the heater. The template is used for locating the position.

of the holes needed for the sink strainers. The heater mounts to the sink strainers.

1. Expose the adhesive portion of the template. Stick the template to the bottom of the holding vessel with the notation "Front Cover" against the front inside wall of the holding vessel.
2. Center punch and drill a 3/4 in. pilot hole at each of the 2 center marks on the template.

**NOTE**

The pilot holes are for cutting larger holes with Greenlee cutters.

3. Remove template and cut a 2 in. diameter hole at each pilot hole using a standard #AV1755 Greenlee cutter.

**NOTE**

If #AV1755 Greenlee cutter is not available, use a standard Greenlee 1-1/2 in. conduit cutter #500-6974 which is slightly under 2 in. diameter. File or ream holes as necessary to 2 in. diameter required for mounting sink strainers.

4. See Figure 8. In both of the 2 in. holes, install a male threaded sink strainer with a thin gasket between the strainer flange and the bottom of the holding vessel.
5. On the under side of the holding vessel at each strainer, install a thick gasket, then a thin metal or fiber washer and nut. Tighten nuts finger tight only at this time.
6. Attach the heater to the strainers using unions with 1-3/4 in. diameter rubber gaskets inside the connecting union nuts.

**NOTE**

Be sure gaskets do not crimp.

7. Tighten unions securely.
8. Tighten nuts on strainers securely.
9. Fill the holding vessel with water and check for installation leaks.

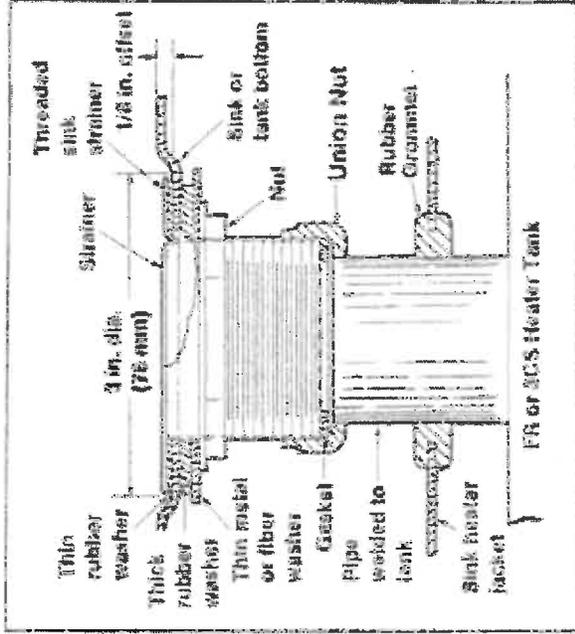


Figure 8. Installation Sink Strainer

**CAUTION**

Do not overtighten unions or nuts. Overtightening may cause leaks.

**NOTE**

A 3/4 in. hose or pipe may be connected to the heater dump drain and run to an open sight drain. The dump drain should not be permanently connected to the sanitary drain system. Check local plumbing code for proper drain installation.

**ELECTRICAL**

**CAUTION**

Do not turn on electrical current to the heater until the tank has been filled with water. Heating elements will burn out quickly if energized dry.

Conductors from a properly sized fused disconnect switch or circuit breaker must be wired to the Hitec ACS or FR heater in accordance with local electrical codes.

Model FR-3 and FR-4 heaters may be supplied with an electrical cord and plug. These heaters must be plugged into an approved receptacle. For FR-3, NEMA 6-20R, for FR-4 NEMA 6-30R.

#### WARNING

For proper electrical installation, conforming to local electrical codes, consult a licensed electrical contractor.

#### NOTE

See *Circuit Breaker and Fuse Sizing Chart for wiring recommendations. Refer to the specification plate on the front of the heater for voltage requirements.*

## OPERATING PROCEDURE START-UP

#### CAUTION

Do not turn on electrical current to the heater until the tank has been filled with water.

#### 3CS Models

#### See Figure 9

1. Check that small pipe cap to the heating chamber drain is in place.
2. Close sump valve by operating the drain handle on the side of the heater.

#### NOTE

See Figure 9. Sump valve is closed when handle is vertical.

3. Fill the holding vessel with hot tap water to normal operating level.
4. Check that the fused disconnect switch or circuit breaker is on.

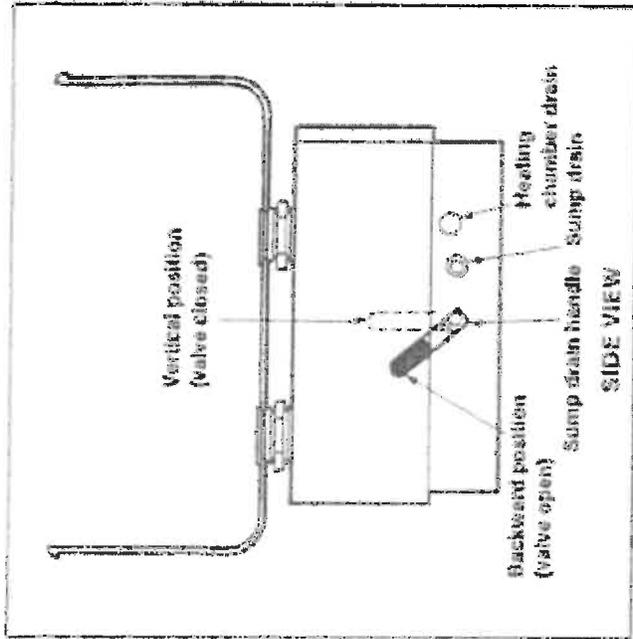


Figure 9. Heater Drain Controls

5. Turn power switch to "ON" position.
6. An optional amber light or indicating diode thermometer indicates when sanitizing temperature is reached.

#### NOTE

All Hitec heaters have an Energy Cut-Off switch (ECO) that will shut "OFF" the power if the unit should overheat. If the Energy Cut-Off switch has activated a low water level may be the cause.

To reset ACS heaters, fill to the proper water level. Turn the "OFF-ON" switch to "OFF" then "ON".

#### CAUTION

The ECO does not protect the heater when both reservoirs are drained.

**FR Models  
Bain-Marie Application**

**WATER TEMPERATURE CHART 750 WATTS PER SQUARE FOOT**

6 INCH DEEP WATER	Temperature Water Heated To														
	70	80	80	100	110	120	130	140	150	160	170	180			
	8	15	23	31	40	48	57	67	77	90	108	140			
80	8	16	24	33	40	49	59	70	83	100	133				
90	8	16	25	33	41	51	62	75	92	125					
100	8	17	23	33	43	54	67	84	117						
110	8	17	25	35	45	59	76	109							
120	8	17	27	37	44	68	100								
130	9	19	29	42	60	92									
140	10	21	34	51	84										
150	11	24	41	74											
160	13	31	63												
170	17	50	33												

Minutes to Heat

Temperature Water at Start

**FR Models  
Bain-Marie Application**

**WATER TEMPERATURE CHART 750 WATTS PER SQUARE FOOT**

9 INCH DEEP WATER	Temperature Water Heated To												
	70	80	90	100	110	120	130	140	150	160	170	180	
60	12	23	35	47	60	72	85	100	116	138	182	211	
70		12	24	36	49	61	74	89	105	125	151	200	
80			12	24	37	48	62	77	93	113	139	188	
						<b>Minutes to Heat</b>							
90				12	25	34	50	65	81	101	127	176	
100					13	25	38	53	69	89	115	164	
110						12	25	40	56	66	102	151	
120							13	28	44	64	80	139	
130								15	31	51	77	126	
140									16	36	62	111	
150										20	46	95	
160											26	75	
170												49	

## FR Models See Figure 9

1. Check that small pipe cap to the heating chamber drain is in place.
2. Close sump valve by operating the drain handle on the side of the heater.

### NOTE

See Figure 9. Sump valve is closed when the handle is vertical.

3. Fill the holding vessel with hot tap water to normal operating level.

### NOTE

For FR heaters rated 750 watts per square foot of tank area see WATER TEMPERATURE CHART for minutes to heat.

4. Check that the power supply cord is plugged into a proper receptacle (20 AMP for FR-3, 30 AMP for FR-4). Turn the toggle switch to the "On" position. The power "On" light will glow indicating power is supplied.
5. Set the water temperature control dial to the desired temperature. The "Water at Temperature" light will glow when water is at the control temperature.

### NOTE

All Haico heaters have an Energy Cut-Off switch (ECO) that will shut "OFF" the power if the unit should overheat.

If the Energy Cut-Off switch has activated, a low water level may be the cause.

To reset, fill to the proper water level. Push the reset button on the front of the heater.

### NOTE

The ECO does not protect the heater when both reservoirs are drained. The optional Low-Water Cut-Off (LWCO) Relay disconnects power if water is drained.

## Therma-Corn Models See Figure 9

1. Check that small pipe cap to the heating chamber drain is in place.
2. Close sump valve by operating the drain handle on the side of the heater.

### NOTE

See Figure 9. Sump valve is closed when the handle is vertical.

3. Fill the holding vessel with hot tap water to normal operating level.
4. Check that the power supply cord is plugged into a proper 20 AMP receptacle. Turn the toggle switch to the "On" position. The power "On" light will glow indicating power is supplied.

5. Set the water temperature control dial to the desired temperature. The "Water at Temperature" light will glow when water is at the control temperature.

### NOTE

All Haico heaters have an Energy Cut-Off switch (ECO) that will shut "OFF" the power if the unit should overheat.

If the Energy Cut-Off switch has activated, a low water level may be the cause.

To reset, fill to the proper water level. Push the reset button on top of the heater above the front cover.

### NOTE

The ECO does not protect the heater when both reservoirs are drained. The optional Low-Water Cut-Off (LWCO) Relay disconnects power to the heating elements if the heater is energized without water in the reservoirs.

Filling the vessel with water will reset the LWCO.

6. Fill the baskets with frozen corn and place in the preheated Therma-Corn.

Baskets have a capacity of up to 40 (3-1/2 in. cut) ears of corn each.

**NOTE**

*Heat up time for 80 ears of corn is approximately 25 minutes. The thermostat should be set to hold the water at 150°F.*

If cobs are removed too soon, corn will not have fully reconstituted and the kernels will be soft or mushy.

After emptying a basket, refill with frozen corn and place the basket in the rear of the Thermo-Corn. This is important because the water flow in the Thermo-Corn is from front to back.

### **DRAINING 3CS and FR**

*The holding vessel should be drained through its own drain valve to discharge debris and water that remains in the heater. The sump must be drained after each use by placing the sump drain handle in the backward position.*

**NOTE**

**CAUTION**

**Do not drain holding vessel with power on.**

1. Turn toggle switch to "Off" position.
2. Drain holding vessel. The sump drain handle on the side of the heater opens the sump valve and contents of the sump and the vessel above will be drained. The waste should lead to an open sight drain in a manner according to local plumbing code.

**CAUTION**

**Periodic inspection should be made for flue buildup in tanks. Excessive amounts can affect unit performance.** If the heater is to be stored or shipped in freezing temperatures, completely drain the reservoirs to prevent damage to the unit. See **DRAINING HEATER FOR SERVICE OR PROTECTION FROM FREEZING TEMPERATURES.**

### **Thermo-Corn**

The Metro Thermo-Corn must be drained and cleaned daily.

**CAUTION**

**Do not drain heater with the power on. Unless the heater is equipped with a Low-Water Cut-Off Relay, element burn out will occur.**

1. See Figure 9. Turn power switch to "Off" and drain heater by placing the sump drain handle in the backward position.
2. Wipe visible deposits from the tank and false bottom. Close the drain valve by operating the drain handle.
3. Dissolve 3 tablespoons of Stera-Sheen (green label) in 1 gallon of hot water and pour into the holding vessel.
4. Refill the tank with hot water to one half inch above the false bottom and soak for at least 15 minutes.
5. Open the valve and drain the tank.
6. Remove the false bottom and rinse in clear water.
7. Place the rubber stopper in the rear opening and the special hose adaptor in the front opening of the tank. Flush with clear water for approximately 1 minute, then close the valve and replace the false bottom in the tank.

**NOTE**

*The false bottom is shipped "BACK" for correct installation in the tank.*

**CAUTION**

**To protect the heater from damage, if the Thermo-Corn is to be shipped or stored in freezing temperatures, or if it is necessary to drain the heater for servicing, follow the draining procedure under **DRAINING HEATER FOR SERVICE OR PROTECTION FROM FREEZING.****

## SAFETY PRECAUTIONS

Do not turn on electrical current to the heater until the holding vessel has been filled with water. Unless the heater is equipped with a Low-Water Cut-Off, element burn out will occur.

For proper electrical installation, conforming to local electrical codes, consult a licensed electrical contractor.

Heaters supplied with an electrical cord and plug must be plugged into a 20 amp receptacle.

Drain holding vessel with power "Off" or element burn out could occur.

To prevent electrical shock never service the heater without first turning off the power at the fused disconnect switch, the circuit breaker, or by unplugging the power cord.

## DRAINING HEATER FOR SERVICE OR PROTECTION FROM FREEZING TEMPERATURES SEE FIGURE 9

### WARNING

To prevent electrical shock never service the heater without turning off the power at the fused disconnect switch or circuit breaker or by unplugging the power cord.

1. Turn toggle switch to "OFF" position.
2. Turn off the electrical power supply to the heater at the fused disconnect switch, the circuit breaker or by unplugging the power cord.
3. Drain the holding vessel and the sump by placing the sump drain handle on the side of the heater in a backward position.
4. With a catch pan ready, unscrew the pipe cap on the side of the heater to drain the heating element chamber.

### NOTE

Heating element chamber bolts from 2-1/2 up to 4-1/2 quarts of water, depending upon model.

## OPTIONAL ACCESSORIES

### 3CS TEMPERATURE MONITOR

This indicating dial thermometer indicates when sanitizing temperature is reached.

### 3CS TEMPERATURE LIGHT

When water temperature is raised to the desired temperature an amber light glows to indicate water is at temperature.

### FR/CC LOW-WATER CUT-OFF

The Low-Water Cut-Off relay is available to prevent element burn out in the event the unit is turned on without adequate water in the heater.



P O BOX 340500  
MILWAUKEE WI 53234-0500 USA  
(800) 558-0607 (414) 671-6350  
Fax (800) 543-7521 (414) 671-8976

Jun. 1984  
Printed in U.S.A.  
P/N 07.04.114.00

# QCSe3 SERIES CONVEYOR TOASTERS WITH ELECTRONIC CONTROLS

**Models QCSe3-950H, QCSe3-1000 & QCSe3-1300**

**QCSe Features/Benefits:**

- ★ Holman's easy to use electronic control panel takes the guesswork out of temperature and speed control settings for your bread products. The electronic control is pre-programmed from the factory with 4 channel settings for toast, bagels, English muffins and other. Change products on the go with the touch of a button any time during the operation.
- ★ Single order feature allows darker or lighter for one time product orders without the need to change program settings.
- ★ Super energy efficiencies with programmable feature allowing the operator to set stand by feature automatically from 1/2 hour to 8 hours. This feature will automatically reduce power by as much as 100% (power reduction can be reduced in 10% increments) if toaster is not in use after a preprogrammed set time.
- ★ Customize your settings for your specific product needs with our easy programmable electronic control. Once the control is programmed the setting will automatically default to the last saved setting.
- ★ Large LED display provides for easier reading of settings.
- ★ Holman's forced convection keeps the toaster cool to the touch and extends the life of critical components. The forced convection increases productivity by re-circulating pre-heated air into the toasting chamber.
- ★ Quartz infrared heaters provide faster, more consistent heating than traditional heating elements and responds quickly to the electronic control.
- ★ High Performance -  
 QCSe3-950H with a 3" high opening produces up to 950 slices per hour  
 QCSe3-1000 produces up to 1000 slices per hour.  
 QCSe3-1300 produces up to 1300 slices per hour.
- ★ High volume compact toaster - requires only 18-5/8" of counter space and the forced convection system allows the unit to be placed against a wall. Other toasters have louvers requiring additional counter space.
- ★ Extended conveyor belt for easy loading and large warming area for higher production.
- ★ Heated holding area to keep toast at the perfect temperature.
- ★ 24 hours 7 days a week technical support by Star technicians.



**Model QCSe3-1000**



**Applications:**

Holman's new QCSe3 is the ultimate in conveyor toasters with touch pad electronic controls for consistent toasting and easy operation. This state of the art toaster is designed for a variety of bread products such as bagels, English muffins, toast, buns and more. Electronic controls are perfect for foodservice operations and restaurants. The innovative energy saving feature can significant reduce cost and extend component life with a simple touch of a button.

**Quality Construction:**

Star designs every toaster to stand up to the most rigorous foodservice demands. Stainless steel construction for long lasting durability. Heavy-duty motor, drive chain and conveyor speed control for superior reliability. Conveyor belt tension system for smooth and quiet operation. High performance quartz infrared heaters for superior toasting performance and reliability. Units are easy to disassemble with one-piece cover for cleaning and service. Toasters are furnished with 1" adjustable legs and 4' cord.

**Warranty:**

Holman's conveyor toasters are covered by a one-year parts and labor warranty.



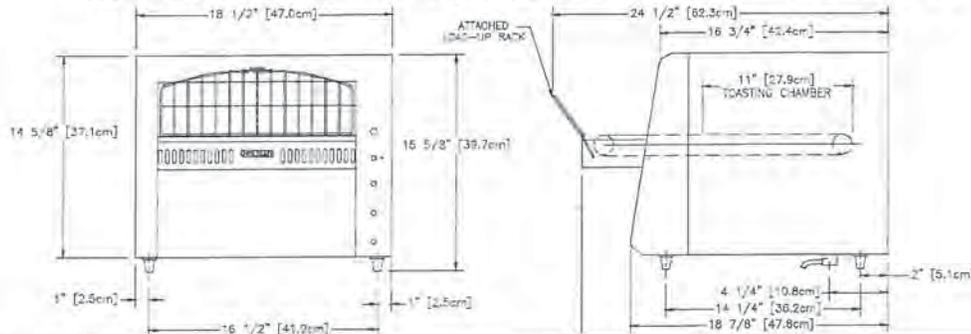
QCSe3 Series  
Electronic Controls



Star Manufacturing International, Inc.

## QCSe3 SERIES CONVEYOR TOASTERS WITH ELECTRONIC CONTROLS

Models QCSe3-950H, QCSe3-1000 & QCSe3-1300



### Performance Data

Model No.	Production Capacity	Product Opening
QCSe3-950H	up to 950 slices or bun halves per hour	3"
QCSe3-1000	up to 1000 slices or bun halves per hour	1-1/2"
QCSe3-1300	up to 1300 slices or bun halves per hour	1-1/2"

### Specifications

Model No.	Dimensions			Shipping Weight lbs (kg)	Shipping Carton		
	Width Inches (cm)	Depth Inches (cm)	Height Inches (cm)		Width Inches (cm)	Depth Inches (cm)	Height Inches (cm)
QCSe3-950H	18-5/8 (47.3)	22-5/8 (57.5)	15-5/8 (39.7)	68 (149.6)	23 (58.4)	20-1/2 (52)	26 (66)
QCSe3-1000	18-5/8 (47.3)	22-5/8 (57.5)	15-5/8 (39.7)	68 (149.6)	23 (58.4)	20-1/2 (52)	26 (66)
QCSe3-1300	18-5/8 (47.3)	22-5/8 (57.5)	15-5/8 (39.7)	68 (149.6)	23 (58.4)	20-1/2 (52)	26 (66)

### Electrical Data

Model No.	Volts	HZ	1 Phase	Ampos	Watts	Heating Elements <sup>1</sup>		NEMA
						Above Belt	Below Belt	
QCSe3-950H	208		60	15.3	3200	2	2	6-20P
	240		60	13.3	3200	2	2	6-20P
	220		50	14.5	3200	2	2	Not Supplied with plug
QCSe3-1000	208		60	15.3	3200	2	2	6-20P
	240		60	13.3	3200	2	2	6-20P
	220		50	14.5	3200	2	2	Not Supplied with plug
QCSe3-1300	208		60	17.3	3600	3	3	6-30P
	240		60	15.0	3600	3	3	6-30P
	220		50	16.3	3600	3	3	Not Supplied with plug

<sup>1</sup>Can be supplied with metal sheathed heaters (no additional charge), however production will be reduced.

### Typical Specifications

Conveyor toasters are constructed of corrosion resistant stainless steel. Supplied with heavy-duty motor, drive chain and fast heat up quartz infrared heaters. A conveyor belt tension system is supplied for a smooth, quiet operation. Units are supplied with electronic control designed with four pre-set channels, variable speed control, top and bottom heat control and power saver feature. Extended conveyor belt, crumb tray, heated holding area and full width burn guard are standard. Unit has a one-piece cover for easy access with 1" adjustable legs and a 4' cord. Units are listed with UL, CUL and are UL certified to NSF4. Patent number D459,140. Printed in the U.S.A.

Due to periodic changes in designs, methods, procedures, policies and regulations, the specifications contained in this sheet are subject to change without notice. While Star Manufacturing exercises good faith efforts to provide information that is accurate, we are not responsible for errors or omissions in information provided or conclusions reached as a result of using the specifications. By using the information provided, the user assumes all risks in connection with such use.

Star Manufacturing International Inc. - 10 Sunnen Drive - P.O. Box 430129 - St. Louis, MO 63143-3800

Phone: (800) 264-7827 - FAX: (800) 264-6666 - www.star-mfg.com

QCSe3 Conveyor Toasters with Electronic Controls



<b>13</b>	ITEM TYPE: STEAM KETTLE, 40 GALLON	LOGICAL CLASS: B
	DESCRIPTION: Let Type Jacketed Steam Kettle	MODEL NUMBER: Cleveland KGL-40

**SPECIFICATIONS:**

- leg type, gas fired steam kettle
- stationary, 2./3 steam jacketed
- 140M BTU's on 40 gallon models
- Standard Voltage is 115 volts, 60 Hz, single-phase supplied with cord and plug
- Hot and Cold WATER Faucet with Swing Spout (DPK)

ROOM LOCATION	QUANTITY
Kitchen [101A]	<b>1</b>
	<b>1</b>



PHOTO / SAMPLE



**BASIS OF DESIGN:**  
Cleveland Gas Kettles



<b>14</b>	ITEM TYPE: Tilt Braising Pan, 40 Gallon	LOGICAL CLASS: B
	DESCRIPTION: 46" Wide Tilt Braising Pan	MODEL NUMBER: Vulcon - VG40

**SPECIFICATIONS:**

- Modular gas tilting braising pan, Vulcan-Hart Model No. (VG30) (VG40). 36"/46" wide open base. Stainless steel front, sides and 12" legs with adjustable flanged feet. Stainless steel back. Front hinged polished stainless steel pan body with covered interior corners and embossed gallon markings. Stainless steel cooking surface bonded to steel plate. Full width 4" return flange with formed pouring lip and removable strainer. Stainless steel spring assist cover with wrap around handle and condensate lip. Faucet mounting bracket (non-enclosed) field reversible "L" bracket either side. Drop away food pan receiving support mounts under pouring lip. Manually operated pan tilting mechanism with folding swing away handle. Pan can be fully tilted to empty completely with approximately 30 crank revolutions.

One 30,000 BTU/hr. burner for each 12" pan width. Burners shut off when pan is tilted 5°. Electronic ignition system for automatic burner light. Solid state temperature controls. Water tight controls and enclosures. Requires a 120/60/1 electrical power supply, 3.0 amps total draw. 3/4" rear gas connection and gas pressure regulator.

ROOM LOCATION	QUANTITY
Kitchen [101A]	1
	1



PHOTO / SAMPLE



Shown with enclosed faucet bracket

**BASIS OF DESIGN:**  
Vulcon Braising Pans

## RESTAURANT RANGES

**VULCAN****ENDURANCE GAS RESTAURANT RANGE  
6 OPEN BURNERS  
36" WIDE GAS RANGE****Model 36S-6B-N**

(shown with optional casters)

**Connect-a-Range shipped in multiple cartons**

- 36S-6B-N** 1 Standard Oven / Natural Gas
- 36S-6B-P** 1 Standard Oven / Propane
- 36C-6B-N** 1 Convection Oven / Natural Gas
- 36C-6B-P** 1 Convection Oven / Propane

**STANDARD FEATURES**

- Fully MIG welded frame
- Stainless steel front, sides, backriser, lift-off high shelf
- 6" stainless steel adjustable legs
- Six open top burners, each burner is 30,000 BTU/hr. with lift-off burner heads
- Shrouded flash tube pilot system (one pilot per two burners)
- Heavy duty cast grates, easy lift-off 12" x 12½" in front and 12" x 14½" in the rear
- Extra deep pull out crumb tray with welded corners
- 35,000 BTU/hr. baker's depth standard oven cavity. Full size sheet pans fit side-to-side or front-to-back.
- Oven thermostat adjusts from 250°F to 500°F
- Two oven racks and four rack positions
- 35,000 BTU/hr. convection oven in place of standard oven, 24"d x 26¾"w x 13⅞"h (115v - 1 phase blower motor 4 amp, 6' cord and plug), includes three oven racks. Full size sheet pans only fit side-to-side in convection oven. Convection oven motor requires field attachment.
- One year limited parts and labor warranty

**SPECIFICATIONS**

36" wide gas restaurant range, Vulcan Model No. 36S-6B-N. Fully MIG welded aluminized steel frame for added durability. Stainless steel front, sides, backriser, highshelf and 6" adjustable legs. Extra deep crumb tray with welded corners. Six 30,000 BTU/hr. open top burners with lift-off burner heads. Energy saving flashtube open burner ignition system (one pilot for every two burners) shrouded for reliability. Heavy duty cast grates, easy lift-off 12" x 12½" in the front and 12" x 14½" in the back to better accommodate stock pots or large pans. Grates have a built in aeration bowl for greater efficiency. Burner knobs are cool to the touch, high temperature material. One oven: 35,000 BTU/hr. standard bakers depth ovens with porcelain oven bottom and door panel, measures 27"d x 26¾"w x 14"h. Oven thermostat adjusts from 250°F to 500°F with a low setting. Oven is supplied with two racks, two rack guide sets, and four rack positions. Oven door is heavy duty with an integrated door hinge/spring mechanism requiring no adjustment. ¾" rear gas connection and pressure regulator. Total input 215,000 BTU/hr.

**Exterior Dimensions:**

34"d x 36"w x 58"h on 6" adjustable legs

**ACCESSORIES (Packaged & Sold Separately)**

- Extra oven rack with rack guides
- Casters (set of four)
- Leveling casters (set of four)
- Flanged feet (set of four)
- 10" stainless steel stub back
- Reinforced high shelf for mounting salamander broiler

**VULCAN**

a division of ITW Food Equipment Group LLC

P.O. Box 696 ■ Louisville, KY 40201 ■ Toll-free: 1-800-814-2028 ■ Local: 502-778-2791 ■ Quote &amp; Order Fax: 1-800-444-0602



# ENDURANCE GAS RESTAURANT RANGE

## 6 OPEN BURNERS

### 36" WIDE GAS RANGE

#### INSTALLATION INSTRUCTIONS

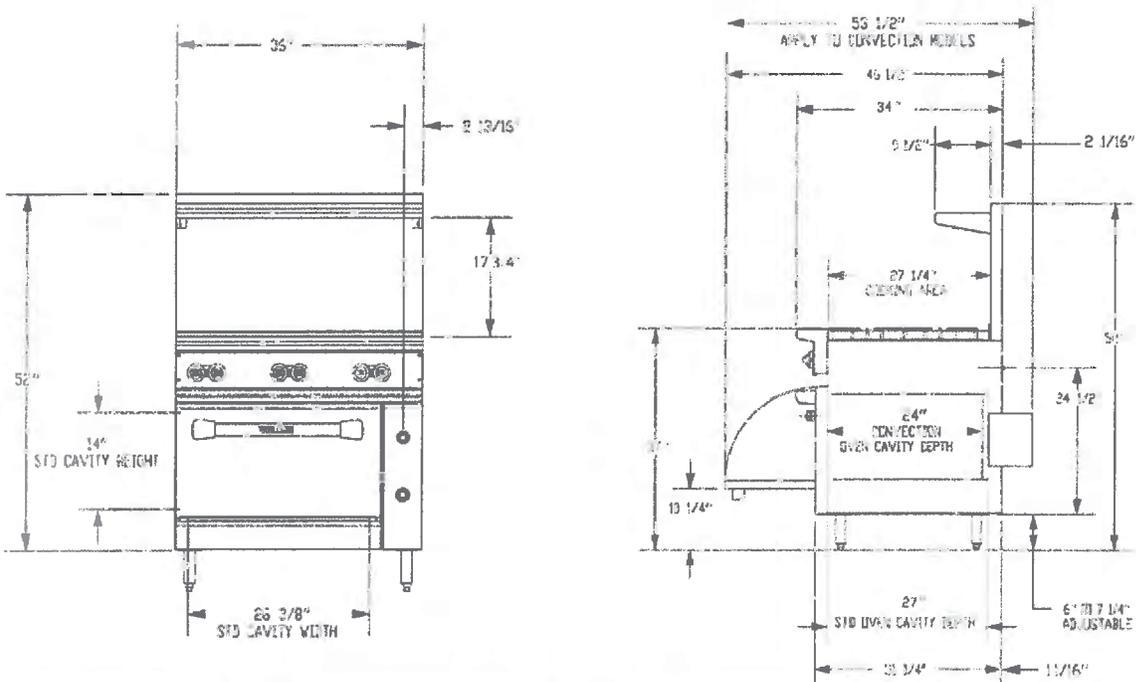
1. A pressure regulator sized for this unit is included. Natural gas 5.0" W.C., propane gas 10.0" W.C.
2. Gas line connecting to range must be 3/4" or larger. If flexible connectors are used, the inside diameter must be 3/4" or larger.
3. An adequate ventilation system is required for commercial cooking equipment. Information may be obtained by writing to the National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02269, www.NFPA.org. When writing, refer to NFPA No. 96.
4. These units are manufactured for installation in accordance with ANSZ223.1A (latest edition), National Fuel Gas Code. Copies may be obtained from The American Gas Association, 400 N Capitol St. NW, Washington, DC 20001, www.AGA.org.

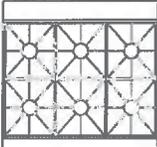
- |                                 |             |              |
|---------------------------------|-------------|--------------|
| 5. <b>Clearances</b>            | <b>Rear</b> | <b>Sides</b> |
| Combustible                     | 6"          | 10"          |
| Standard Oven Non-combustible   | 0"          | 0"           |
| Convection Oven Non-combustible | Min. 4"     | 0"           |

6. For proper combustion, install equipment on adjustable legs or casters provided with unit.

**NOTE:** In line with its policy to continually improve its product, Vulcan reserves the right to change materials and specifications without notice.

**Specify type of gas when ordering.  
Specify altitude when above 2,000 feet.**



TOP CONFIGURATION	MODEL NUMBER	DESCRIPTION	TOTAL INPUT BTU / HR	SHIPPING WEIGHT LBS / KG
	36S-6B-N	1 Standard Oven / 6 Burners / Natural Gas	215,000	520 / 236
	36S-6B-P	1 Standard Oven / 6 Burners / Propane	215,000	520 / 236
	36C-6B-N	1 Convection Oven / 6 Burners / Natural Gas	215,000	580 / 263
	36C-6B-P	1 Convection Oven / 6 Burners / Propane	215,000	580 / 263

This appliance is manufactured for commercial use only and is not intended for home use.

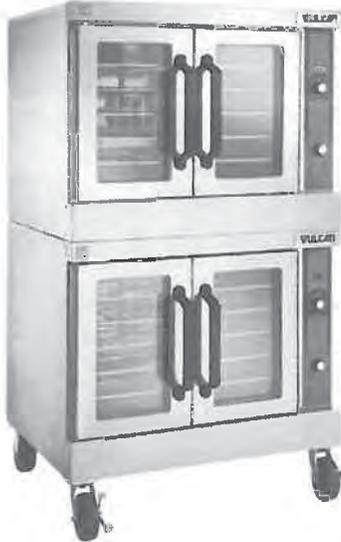


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**NOTE:** In line with its policy to continually improve its products, Vulcan reserves the right to change materials and specifications without notice.

## OVENS

**VULCAN****VC66G SERIES  
DOUBLE DECK, DEEP DEPTH  
GAS CONVECTION OVENS**

**Model VC66GD**  
shown with optional casters

**SPECIFICATIONS**

Double section, deep depth gas convection oven, Vulcan-Hart Model No. (VC66GD) (VC66GC). Stainless steel front, sides, top and legs. Independently operated stainless steel doors with double pane windows. Non-sag insulation applied to the top, rear, sides, bottom and doors. Porcelain enamel on steel oven interiors measures 29"w x 26 $\frac{1}{8}$ "d x 20"h. Two interior oven lights per section. Five nickel plated oven racks per section measure 28 $\frac{1}{4}$ " x 24 $\frac{1}{2}$ ". Eleven position nickel plated rack guides with positive rack stops. One 44,000 BTU/hr. burner per section. 88,000 BTU/hr. total input. Electronic spark igniters. Furnished with a two speed  $\frac{1}{2}$  H.P. oven blower-motor per section. Oven cool switch for rapid cool down. 120 volt, 60 Hz, 1 ph power supply required. 6' cord and plug. 8 amps total draw per section.

**Exterior Dimensions:**

40 $\frac{1}{4}$ "w x 45 $\frac{1}{8}$ "d (includes motor & door handles) 41 $\frac{3}{4}$ "d (includes motor only) x 70"h on 8" legs.

CSA design certified. NSF listed.

**SPECIFY TYPE OF GAS WHEN ORDERING.  
SPECIFY ALTITUDE WHEN ABOVE 2,000 FT.**

- VC66GD** Solid state temperature controls adjust from 150° to 500°F. 60 minute timer with audible alarm.
- VC66GC** Computer controls with digital time and temperature readouts. 99-hour timer with audible alarm. Roast and Hold cycle. One hundred programmable menu selections. Shelf I.D. programming.

**STANDARD FEATURES**

- Stainless steel front, sides, top and legs.
- Independently operated stainless steel doors with double pane windows.
- 44,000 BTU/hr. burner per section. 88,000 BTU/hr. total input.
- Electronic spark igniters.
- $\frac{1}{2}$  H.P. two speed oven blower-motor. 120/60/1 with 6' cord and plug. 8 amps per section. 16 amps total draw.
- Oven cool switch for rapid cool down.
- Porcelain enamel on steel oven interiors.
- Five nickel plated oven racks with eleven rack positions per section.
- $\frac{3}{4}$ " rear gas connection with combination gas pressure regulator and safety solenoid system.
- One year limited parts and labor warranty.

**OPTIONS**

- Complete prison package.
  - Security screws only.
- 208V or 240V, 60 Hz, 1 ph, two speed,  $\frac{1}{2}$  H.P. blower motor.
- Casters.
- Simultaneous chain driven doors.
- Stainless steel rear enclosure.
- Second year extended limited parts and labor warranty.

**ACCESSORIES**

- Extra oven rack(s).
- Rack hanger(s).
- Stainless steel drip pan.
- Flexible gas hose with quick disconnect and restraining device. Consult price book for available sizes.
- Down draft flue diverter for direct vent connection.

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OVENS

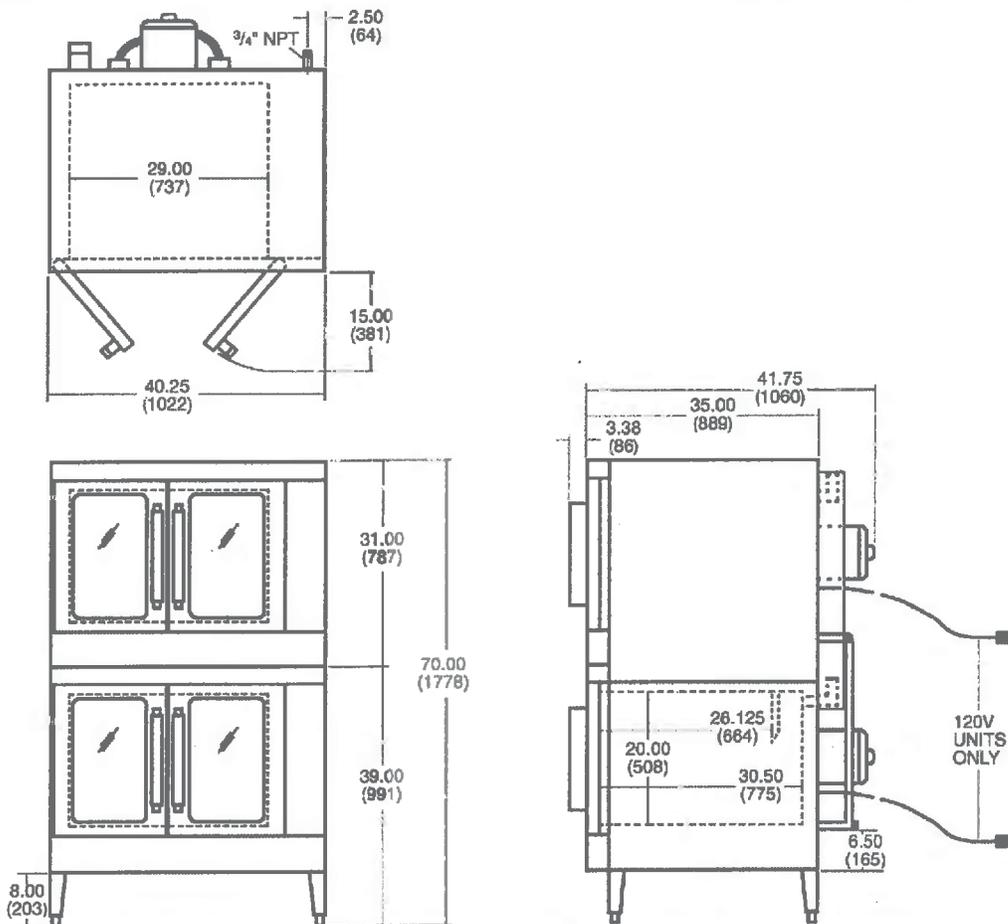


**VC66G SERIES**  
**DOUBLE DECK, DEEP DEPTH**  
**GAS CONVECTION OVENS**

**INSTALLATION INSTRUCTIONS**

1. A combination gas pressure regulator and safety solenoid system is included in this unit. Natural gas is 3.5" W.C., Propane gas is 10.0" W.C.
2. An adequate ventilation system is required for commercial cooking equipment. Information may be obtained by writing to the National Fire Protection Association, Batterymarch Park, Quincy, MA 02289. When writing, refer to NFPA No. 96.
3. These units are manufactured for installation in accordance with ANSZ223.1 (latest edition), National Fuel Gas Code. Copies may be obtained from American Gas Association Inc., Accredited Standards Committee Z223, 400 N. Capitol St. NW, Washington, DC 20001 or the Secretary Standards Council, NFPA, 1 Batterymarch Park, Quincy, MA 02169-7471.
4. Clearances:
 

	Combustible	Non-combustible
Rear	2"	2"
Right Side	4"	4"
Left Side	1"	0"
5. This appliance is manufactured for commercial installation only and is not intended for home use.



MODEL NO.	WIDTH	DEPTH (INCLUDES HANDLES)	HEIGHT	BTU/HR. PER OVEN	TOTAL BTU/HR.	ELECTRICAL	WEIGHT			
							WITH SKIDS & PACKAGING		WITHOUT SKIDS & PACKAGING	
							LBS.	KG	LBS.	KG
VC66G	40 1/4"	45 1/8"	70"	44,000	88,000	120/60/1	984	446	866	392



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# INSTRUCTIONS

## MODEL 6430, 6430T, 6460 & 6460T POTATO PEELER

### MODEL

ML-19628 6430  
ML-19629 6430T

ML-19630 6460  
ML-19631 6460T



701 S. RIDGE AVENUE  
TROY, OHIO 45374-0001

# Installation, Operation and Care of MODEL 6430, 6430T, 6460 & 6460T PEELERS

SAVE THESE INSTRUCTIONS

## GENERAL

Models 6430 and 6430T Peelers are designed to peel 30 to 33 lbs (13.5 to 15.0 kg) of product in 1 to 3 minutes using a  $\frac{3}{4}$  HP, single- or three-phase electric motor. The 6430T includes a synchronous timer and is available for single-phase electrical service ONLY.

Models 6460 and 6460T Peelers are designed to peel 50 to 60 lbs (22.5 to 27.0 kg) of product in 1 to 3 minutes using a 1 HP, single- or three-phase electric motor. The 6460T includes a synchronous timer and is available for single-phase electrical service ONLY.

All models incorporate a reinforced peeling disc with the abrasive permanently bonded to its surface and a Lexan Liner for the inside of the hopper. The switch or timer is mounted on the right side of the discharge chute as standard but can be ordered on the left or changed in the field. The bottom of the peeler unit is cushioned with a rubber trim molding which also provides a seal.

Optional accessories include a peel trap or disposer stand.

## INSTALLATION

**NOTE:** Immediately after unpacking, machine should be checked for possible shipping damage. If the machine is found to be damaged after unpacking, save the packaging material and contact the shipper.

This machine **MUST** be cleaned after installation and before being put into service. Refer to MAINTENANCE for instructions.

### PEELER UNIT (FIG. 1)

1. Remove the peeler from its shipping carton and remove the hopper top.
2. Remove the fill tube and bracket assembly from the peeler housing and the cloth bag containing the fill tube gasket and acorn nuts.
3. Do NOT remove the rubber molding on bottom of peeler.
4. Lay the peeler on its side. Slightly loosen the clamp that attaches the drain hose and pull the drain hose down so that it extends approximately  $\frac{7}{8}$ " below the bottom of peeler housing. Tighten the clamp.

On units that will NOT use a peel trap or disposer stand, attach the bottom cover plate using the bolts and washers supplied with the unit.

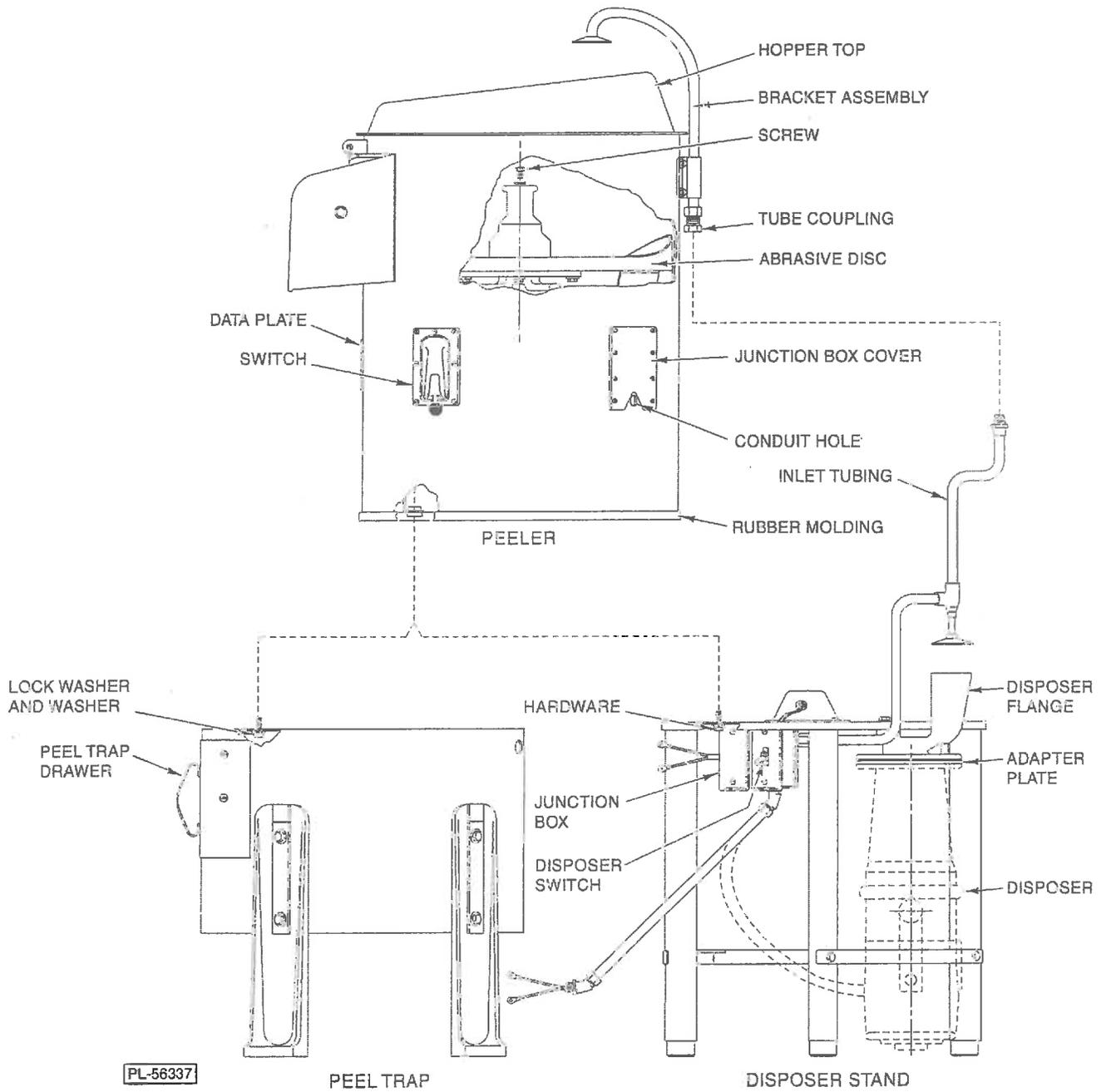


Fig. 1

## LEXAN LINER

1. Slide the liner (Fig. 2) into the hopper, ensure the liner is under retaining brackets (Fig. 2) and resting on the top of the lip (Fig. 2) on the bottom of the hopper chamber.

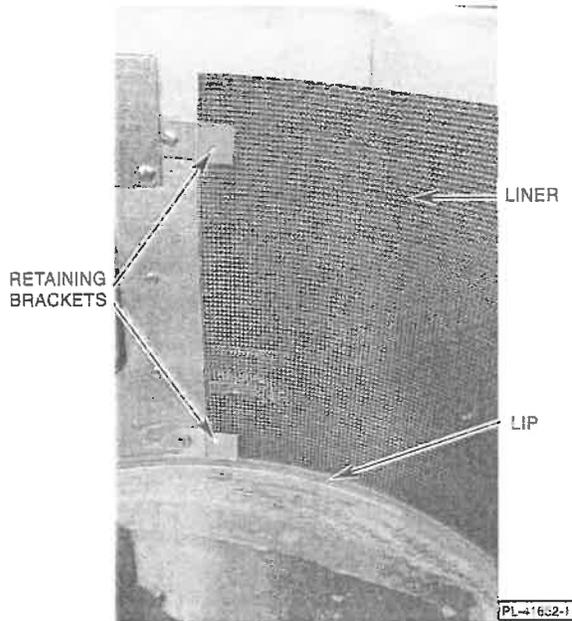


Fig. 2



Fig. 3

2. Push the liner keeper into the hole (Fig. 3) provided.
3. Secure the keeper using the exterior latch.

## PEEL TRAP

If a peel trap is to be used, unpack the trap from its shipping carton. Remove the legs and cloth bag from inside the peel trap. The cloth bag contains hardware for attaching the legs.

### Legs

It will be necessary to remove the peel trap drawer (Fig. 1) to allow enough room for attaching the legs.

Assemble the legs as follows (Fig. 4):

1. Lay the peel trap on its side.
2. Assemble one of the rubber gaskets to one of the curved leg clamp bolts.
3. Assemble the bolt and gasket from the inside, through one of the leg bolt holes in the peeler housing.
4. Assemble a leg and a leg slot cover on the leg clamp bolt.
5. Place a stainless steel washer and acorn nut onto the clamp bolt and partially tightened, set unit upright.
6. Each leg has an upper and lower leg clamp bolt assembly. When all are assembled and partially tightened, set unit upright.
7. Adjust each leg to a suitable height such that the unit is level, and tighten the acorn nuts.

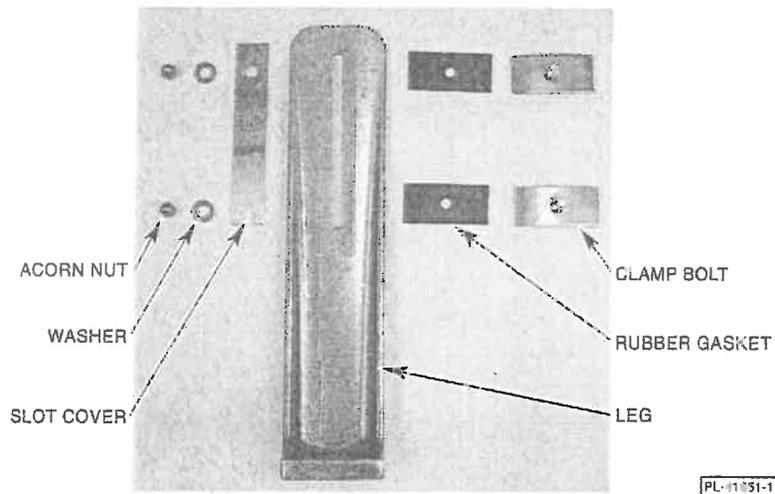


Fig. 4

### Peelers

The peeler may be positioned on the peel trap in one of four positions. Each of the positions will cause the peel trap drawer to be located in a different position relative to the discharge chute.

The peel trap drawer may be directly beneath the discharge chute, to the right, left or rear (see Fig. 5).

After selecting the most convenient position for the peel trap drawer, remove the cover disc from the appropriate hole in the peel trap top and position the peeler on top of the peel trap, with the peeler drain hose extending through selected hole (Fig. 5).

The cloth bag shipped in peel trap drawer contains the capscrews, lockwashers and washers (Fig. 1) necessary for fastening the peeler to peel trap.

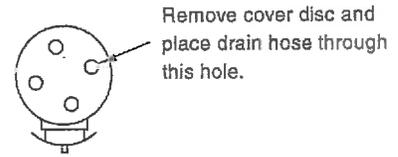
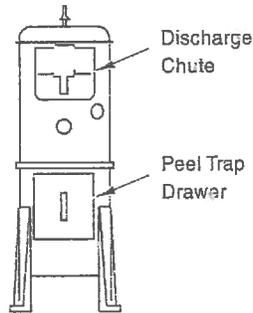
**CAUTION: Excessive tightening of screws may distort housing.**

If desired, the peel trap legs may be bolted to the floor.

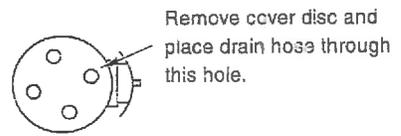
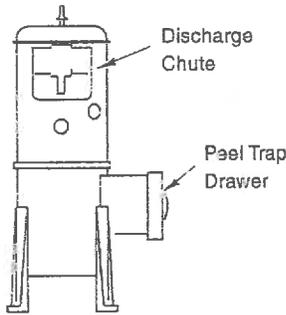
RELATIONSHIP OF PEELER WITH TRAP

VIEW OF TOP OF PEEL TRAP

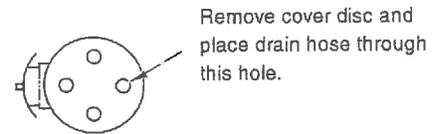
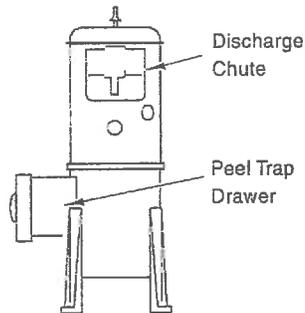
To position peel trap drawer BENEATH the discharge chute:



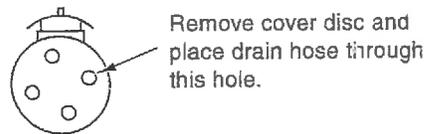
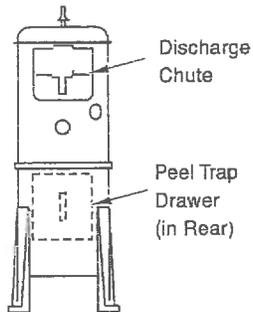
To position peel trap drawer to the RIGHT of discharge chute:



To position peel trap drawer to the LEFT of discharge chute:



To position peel trap drawer to the REAR of discharge chute:



PL-56327

Fig. 5

## **DISPOSER STAND**

If a disposer stand is to be used, unpack the stand from its shipping carton. The feet may be threaded in or out as necessary to level the disposer stand.

The disposer flange, adapter plate, gaskets and all hardware required for mounting the disposer are assembled and packed in a separate container. Refer to the disposer manual shipped with the disposer and follow the recommendations contained in it. Remove the three mounting bolts and lockwashers from the disposer flange.

Attach the disposer flange (Fig. 1) and if necessary, the adapter plate (Fig. 1) to the disposer.

**NOTE:** If a Hobart disposer is used, remove and discard the adapter plate and the smaller of the two gaskets.

Using the three mounting bolts and lockwashers (previously removed from disposer flange), mount the disposer and flange assembly to the disposer stand.

### **Peeler**

Position the peeler on top of the disposer stand. Place the peeler drain hose in the hole above the disposer. Fasten the peeler to the stand using hardware (Fig. 1) shipped in the bag tied to the disposer stand.

If desired, the disposer stand feet may be bolted to the floor.

## **PLUMBING**

**WARNING:** PLUMBING CONNECTIONS MUST COMPLY WITH APPLICABLE SANITARY, SAFETY AND PLUMBING CODES.

### **Peeler Unit Without Disposer**

Using the supplied acorn nuts and gasket, attach the fill tube and bracket assembly (Fig. 1) to the peeler.

Connect a cold water supply to the 1/2" fill tube coupling (Fig. 1).

**NOTE:** A globe valve for controlling water supply should be installed in the water supply line at a location convenient to the operator.

### **Peeler Unit With Disposer**

Using the supplied acorn nuts and gasket, attach the fill tube and bracket assembly (Fig. 1) to the peeler.

Connect the water inlet tubing (Fig. 1) to the 1/2" fill tube coupling (Fig. 1). Connect the other end of the water inlet tubing to the fill valve, which is mounted on the disposer stand.

Connect a cold water supply line to the fill valve, which has a 3/8"-18 N.P.S. female connection.

## ELECTRICAL CONNECTIONS

Before making electrical connections, check the specifications on peeler data plate (Fig 1), as well as those of the disposer (where applicable), to assure they agree with those of your electrical service.

**WARNING:** ELECTRICAL AND GROUNDING CONNECTIONS MUST COMPLY WITH THE APPLICABLE PORTIONS OF THE NATIONAL ELECTRICAL CODE AND/OR OTHER LOCAL ELECTRICAL CODES.

**WARNING:** DISCONNECT ELECTRICAL POWER SUPPLY AND PLACE A TAG AT THE DISCONNECT SWITCH TO INDICATE CIRCUIT IS BEING WORKED ON.

If it is desired to move the switch (Fig. 1) or timer to the opposite side of the discharge chute, simply remove the screws that attach the switch or timer and cover plates. Interchange the switch or timer and cover plates and fasten each with the screws.

A  $\frac{7}{8}$ " conduit hole (Fig. 1) is provided in the peeler housing for  $\frac{1}{2}$ " trade size electrical conduit. Remove the junction box cover (Fig. 1), make electrical connections and replace the cover.

A separate junction box (Fig. 1) is provided for making disposer connections.

**NOTE:** The following information is compiled in accordance with the National Electrical Code, latest edition.

### BRANCH CIRCUIT SIZE AND PROTECTION

DUAL ELEMENT TIME-DELAY FUSE						
Volts	Phase	Minimum Circuit Ampacity		Maximum Fuse Size		60°C Copper Wire Size
		6430	6460	6430	6460	
115	1	25	25	25	25	10
200-230	1	15	15	15	15	14
200-230	3	15	15	6	10	14
460	3	15	15	3	6	14

INVERSE TIME CIRCUIT BREAKER						
Volts	Phase	Minimum Circuit Ampacity		Maximum Circuit Breaker Size		60°C Copper Wire Size
		6430	6460	6430	6460	
115	1	25	30	25	30	10
200-230	1	20	20	20	20	12
200-230	3	15	15	10	10	14
460	3	15	15	6	6	14

# OPERATION

Using the lugs on the hopper top as locators, position the hopper top on the housing and turn it clockwise into place.

Close and latch the discharge chute door.

Pour the product into the hopper. There should be room in the hopper for the product to move around while peeling. Do NOT overload the peeler; peeler capacities are 30 to 33 lbs (13.5 to 15.0 kg) maximum for the 6430/6430T and 50 to 60 lbs (22.5 to 27.0 kg) for the 6460/6460T.

Turn on the water supply. On units with a disposer, turn on the disposer switch (Fig. 1). This will open the valve.

Turn on the peeler. On units equipped with a timer, set the timer at the desired time.

Peeling times will vary depending on the type and condition of product. When the desired degree of peeling has been reached, turn off the water (or disposer where applicable). Place a container to catch the product under the discharge chute door.

**NOTE:** On units equipped with a timer, if the timer has expired, it will be necessary to reset the timer to allow enough time for the product to be discharged.

After the product has been completely discharged, turn off the peeler and it is ready for a repeat operation.

If the peeler is equipped with a peel trap, it will be necessary to empty the peel trap drawer occasionally (after a few batches).

**WARNING:** DISCONNECT ELECTRICAL POWER SUPPLY AND REPLACE A TAG AT THE DISCONNECT SWITCH, INDICATING CIRCUIT IS BEING WORKED ON BEFORE BEGINNING ANY MAINTENANCE PROCEDURE.

## CLEANING

The peeler should be cleaned after the peeling operation has been completed.

As soon as the peeling operation has been completed and BEFORE the hopper has had time to dry, turn on the water or disposer, if equipped, and flush the interior of the hopper. Turn off the water (or disposer).

Rotate the hopper top COUNTERCLOCKWISE and lift to remove. Clean the hopper top in a sink.

Lift out the abrasive disc (Fig. 1), which is NOT fastened to the shaft and scrub it with a brush and mild soap. Clean the housing beneath the abrasive disc with mild soap and water.

**NOTE:** If the abrasive disc should stick and is NOT easily removed, it may be loosened by removing the hex head screw (Fig. 1) on top of the hub and threading a longer screw (such as  $\frac{5}{16}$ "-18 x 1- $\frac{1}{2}$ ") in until disc loosens.

To remove the lexan liner, unlatch the exterior latch on the outside of the hopper and push the keeper out of the hole (Fig. 3). Slide the liner out from under the retaining brackets. Take to the sink and scrub with a nonabrasive brush, using soap and water to clean. Allow to air dry before installing into the hopper.

Turn on the water or disposer, if equipped, and thoroughly clean the interior of the hopper using a mild soap and brush. Turn off the water or disposer.

If the drawer is equipped with a peel trap, remove the peel trap drawer and thoroughly clean the drawer, as well as the peel trap interior.

The discharge chute **MUST** be left open when the unit is **NOT** in use in order to prolong the life of the door seal.

## MOTOR

This machine is equipped with a manual-reset overload protection switch. If during operation, the motor should overheat and trip this switch, turn the peeler switch or timer off and allow the motor to cool for several minutes. To reset the switch, remove the top screw from the round cover plate (Fig. 6), rotate the cover plate and push the red button (Fig. 6). Install round cover plate and screw onto potato peeler.

If the overload switch persists in tripping, contact your local Hobart Service Office.

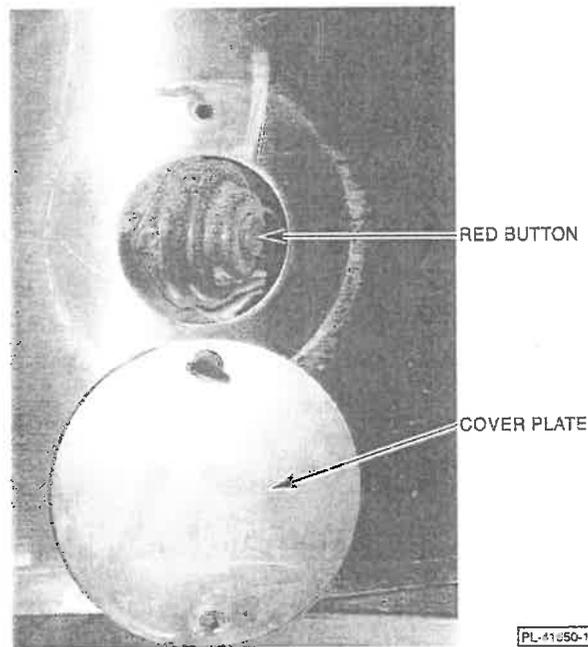


Fig. 6

## MAINTENANCE

### LUBRICATION

The peeler uses sealed ball bearings and therefore, requires no lubrication maintenance.

## TROUBLESHOOTING

SYMPTOM	POSSIBLE CAUSE
Peeler won't operate.	Electrical power not connected.
	Circuit breaker tripped or fuse blown.
Excessive foaming.	Too much water in the hopper.

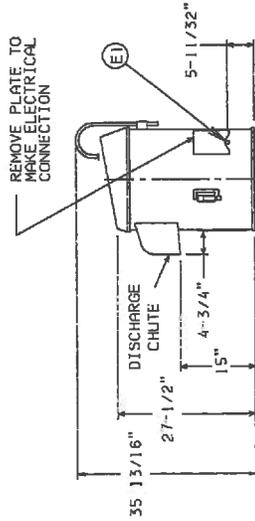
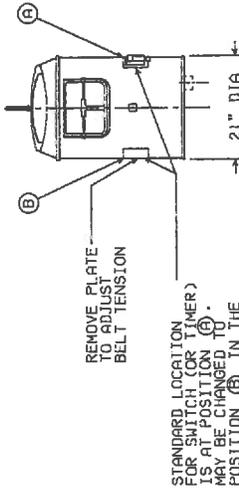
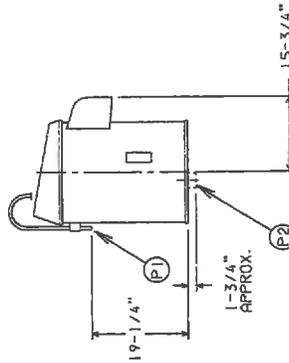
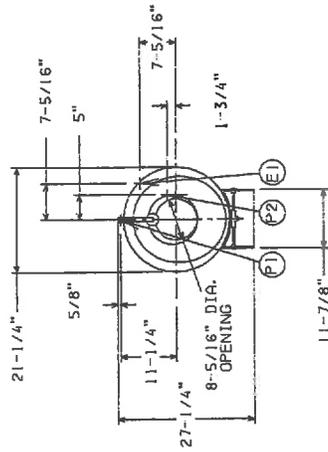
If the above suggestions do not remedy the situation, contact Hobart Service Office.

### SERVICE

Contact your local Hobart-authorized Service Office for any repairs or adjustments needed on this equipment.

**LEGEND**

- E1-ELECTRICAL CONN.: 7/8" DIA. HOLE (FOR 1/2" CONDUIT)
- P1-WATER CONNECTION: ST.D. 1/2" FEMALE PIPE THREAD
- P2-DRAIN HOSE: 2-3/8" I.D. X 2-3/4" O.D.



**WARNING**  
ELECTRICAL AND GROUNDING CONNECTIONS MUST COMPLY WITH THE APPLICABLE PORTIONS OF THE NATIONAL ELECTRICAL CODE AND/OR OTHER LOCAL ELECTRICAL CODES.  
PLUMBING CONNECTIONS MUST COMPLY WITH APPLICABLE SANITARY, SAFETY AND PLUMBING CODES IN FORCE.

**NOTE:**

NET WEIGHT OF PEELER - 142 LBS.  
DOMESTIC SHIPPING WEIGHT OF PEELER - 147 LBS.

REMOVE PLATE TO ADJUST TO BELT TENSION

STANDARD LOCATION FOR SWITCH (OR TIMER) IS AT POSITION (A). MAY BE CHANGED TO POSITION (B) IN THE FIELD.

MODEL 6430 & 6430-T  
PEELER (WITHOUT TRAP)  
D-272008  
REV. C

PL-56334

MODEL / ELEC. CODE	ELECTRICAL SPECIFICATION	AMPS	DUAL ELEMENT TIME DELAY FUSE STYLE	INVERSE TIME BREAKER STYLE	MINIMUM CIRCUIT BREAKING CAPACITY			
6430/J	200-230/60/3	3.2	15	6	14	15	10	14
6430/H	460/60/3	1.6	15	3	14	15	6	14
6430T/A	115/60/1	13.0	25	10	25	25	10	10
6430T/E	200-230/60/1	6.5	15	14	20	20	20	12

**INSTALLATION DIAGRAM (WITHOUT TRAP)**

**LEGEND:**

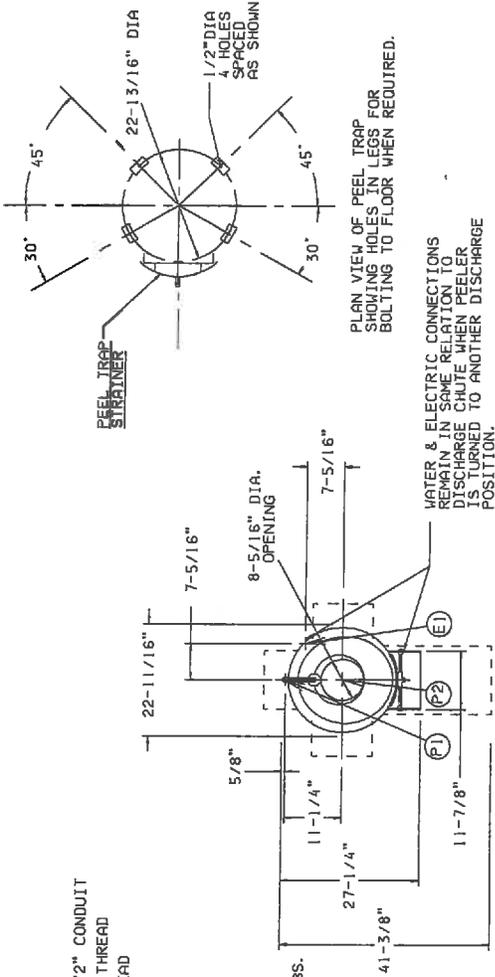
- E1-ELECTRICAL CONNECTION: 7/8" DIA. HOLE FOR 1/2" CONDUIT
- P1-WATER CONNECTION: STANDARD 1/2" FEMALE PIPE THREAD
- P2-DRAIN CONNECTION: STANDARD 2" MALE PIPE THREAD

**NOTES:**

- ALL DIMENSIONS TAKEN FROM FLOOR LINE MAY BE INCREASED AS MUCH AS 13/16" BY LEG ADJUSTMENT.
- APPROXIMATE SHIPPING WEIGHT OF PEELER AND PEEL TRAP UNIT: 201 LBS.
- APPROXIMATE SHIPPING WEIGHT OF PEELER LESS PEEL TRAP UNIT: 147 LBS.
- NET WEIGHT OF PEELER AND PEEL TRAP UNIT: 190 LBS.

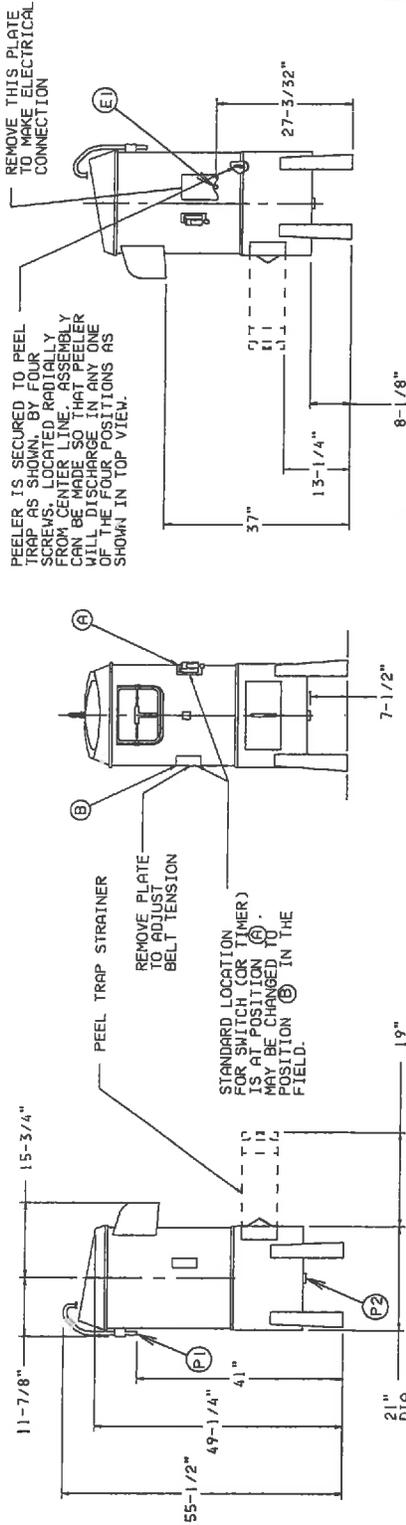
**WARNING**

ELECTRICAL AND GROUNDING CONNECTIONS MUST COMPLY WITH THE APPLICABLE PORTIONS OF THE NATIONAL ELECTRICAL CODE AND/OR OTHER LOCAL ELECTRICAL CODES.  
 PLUMBING CONNECTIONS MUST COMPLY WITH APPLICABLE SANITARY, SAFETY AND PLUMBING CODES IN FORCE.



PLAN VIEW OF PEEL TRAP SHOWING HOLES IN LEGS FOR BOLTING TO FLOOR WHEN REQUIRED.

WATER & ELECTRIC CONNECTIONS REMAIN IN SAME RELATION TO DISCHARGE CHUTE WHEN PEELER IS TURNED TO ANOTHER DISCHARGE POSITION.



REMOVE THIS PLATE TO MAKE ELECTRICAL CONNECTION

PEELER IS SECURED TO PEEL TRAP AS SHOWN, BY FOUR SCREWS, LOCATED RADIALLY FROM CENTER LINE. ASSEMBLY CAN BE MADE SO THAT PEELER WILL DISCHARGE IN ANY ONE OF THE FOUR POSITIONS AS SHOWN IN TOP VIEW.

REMOVE PLATE TO ADJUST BELT TENSION

STANDARD LOCATION FOR SWITCH (OR TIMER) IS AT POSITION (A). POSITION (B) IN THE FIELD.

SPACE REQ'D FOR REMOVAL OF PEEL TRAP STRAINER

MODEL / ELEC. CODE	ELECTRICAL SPECIFICATION	AMPS	DUAL ELEMENT TYPE	MINIMUM CIRCUIT CAPACITY	MAXIMUM WIRE SIZE	MINIMUM WIRE SIZE	INVERSE TIME CIRCUIT BREAKER STYLE	MINIMUM CIRCUIT BREAKER	COPPER WIRE SIZE
6430T/J	200-230/60/3	3.2	15	6	14	15	10	14	14
6430T/H	460/60/3	1.6	15	3	14	15	6	14	14
6430T/A	115/60/1	13.0	25	10	25	25	10	25	10
6430T/E	200-230/60/1	6.5	15	15	14	20	20	12	12

MODEL 6430 & 6430-T  
 PEELER (WITH PEEL TRAP)  
 D-271985  
 REV. B

PL-56333

INSTALLATION DIAGRAM (WITH TRAP)





Indigo™ Series 1400 Ice Cube Machine

# Indigo™ Series 1400 Ice Cube Machine

Model:  ID-1402A     ID-1403W     ID-1492N  
 IY-1404A     IY-1405W     IY-1494N



Indigo Series I-1400 Ice Machine on B-970 Bin

Designed for operators who know that ice is critical to their business, the Indigo™ Series ice machine's preventative diagnostics continually monitor itself for reliable ice production. Improvements in cleanability and programmability make your ice machine easy to own and less expensive to operate.

- **Space-Saving Design** – Up to 1,550 lbs. (705 kgs.) daily ice production and only 48" (121.92 cm) wide.
- **Intelligent Diagnostics** – provide 24 hour preventative maintenance and diagnostic feedback for trouble free operation.
- **Acoustical Ice Sensing Probe** – for reliable operation in challenging water conditions.
- **EasyRead Display** – communicates operating status, cleaning reminders, and asset information through a blue illuminated display.
- **Programmable Ice Production** – by On/Off Time, Ice Volume or Bin Level (with accessory bin level control) further improves energy efficiency and savings.
- **Easy to Clean Foodzone** – Hinged front door swings out for easy access. Removable water-trough, distribution tube, curtain, and sensing probes for fast and efficient cleaning. Select components made with AlphaSan® antimicrobial.
- **DuraTech™ Exterior** – provides superior corrosion resistance. Stainless finish with innovative clear-coat resists fingerprints and dirt.
- Available **LuminIce™ Growth Inhibitor** controls the growth of bacteria and yeast within the foodzone.

## Ice Machine Electric

208-230/60/1 standard  
(208-230/60/3 and 230/50/1 also available.)

### Minimum circuit ampacity:

Air-cooled:	18.3 1ph	13.2 3ph
Water-cooled:	16.9 1ph	11.8 3ph
Remote-cooled:	17.9 1ph	12.8 3ph

### Maximum fuse size:

Air-cooled:	30 1ph	20 3ph
Water-cooled:	30 1ph	20 3ph
Remote-cooled:	30 1ph	20 3ph

## Specifications

### BTU Per Hour:

23,500 (average)  
27,000 (peak)

### Refrigerant:

R-404A CFC-free

### Operating Limits:

- Ambient Temperature Range: 35° to 110°F (1.7° to 43.3°C)  
Water Temperature Range: 35° to 90°F (1.7° to 32.2°C)
- Water Pressure Ice Maker Water In: Min. 20 psi (137.9 kPa)  
Max. 80 psi (551.1 kPa)



## Ice Shape

	<b>Half Dice</b> 3/8" x 1 1/8" x 7/8" (.95 x 2.86 x 2.22 cm)		<b>Dice</b> 7/8" x 7/8" x 7/8" (2.22 x 2.22 x 2.22 cm)
--	--	--	--



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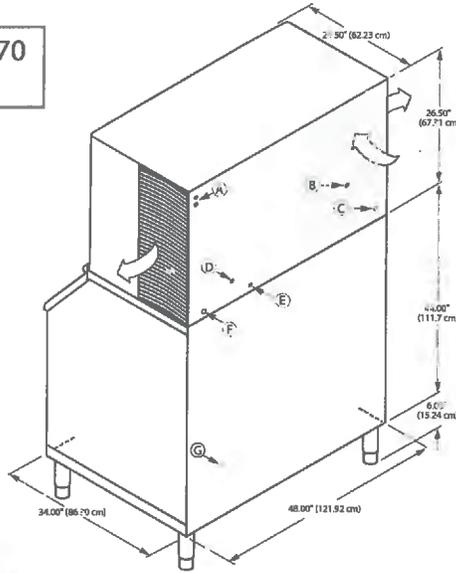
**Indigo™ Series 1400 Ice Cube Machine**

**i-1400 on B-970 Storage Bin**

**Installation Note**

**Air Cooled clearance:**  
 Top: 24" (61.0 cm)  
 Sides: 24" (61.0 cm)  
 Back: 5" (12.7 cm)

**Water Cooled clearance:**  
 Top/Sides: 8" (20.3 cm)  
 Back: 5" (12.7 cm)



- Ⓐ Electrical Entrance (2 Options)
- Ⓑ 1/2" (1.27 cm) F.P.T. Water Condenser Outlet (water-cooled units)
- Ⓒ 3/4" (0.95 cm) F.P.T. Water Condenser Inlet (water-cooled units)
- Ⓓ 3/8" (0.95 cm) F.P.T. Ice Making Water Inlet
- Ⓔ 1/2" (1.27 cm) F.P.T. Ice Making Water Drain
- Ⓕ 1/2" (1.27 cm) Auxiliary Base Drain Socket
- Ⓖ 3/8" (1.91 cm) Bin Drain
- Ⓗ Air filter for air circulation

**Space-Saving Designs**



**i-1400  
B-970**

Height 76.50"  
194.31 cm

Width 48.00"  
121.92 cm

Depth 34.00"  
86.30 cm

Bin Storage 710 lbs.  
322.2 kgs.

Height includes adjustable bin legs 6.00" to 8.00", (15.24 to 20.32 cm) set at 6.00" (15.24 cm).

**Specifications**

	Model	Ice Shape	Ice Production 24 Hours		Power Usage kWh/100 lbs. @90°Air/70°F		Water Usage/ 100 lbs. 45.4 kgs. of Ice	ENERGY STAR®
			70°Air/ 50°F Water	90°Air/ 70°F Water	1 Ph	3 Ph	Potable Water	
<b>AIR-COOLED</b>	ID-1402A	dice	1,500 lbs.	1,155 lbs.	4.86	4.86	23.5 gal.	
			582 kgs.	525 kgs.			89 L	
	IY-1404A	half-dice	1,550 lbs.	1,180 lbs.	4.88	4.88	23.5 gal.	
			705 kgs.	536 kgs.			89 L	
<b>WATER-COOLED</b>	ID-1403W	dice	1,515 lbs.	1,275 lbs.	3.85	3.85	23.5 gal.	NA
			689 kgs.	580 kgs.			89 L	
	IY-1405W	half-dice	1,565 lbs.	1,290 lbs.	3.86	3.86	23.5 gal.	NA
			711 kgs.	586 kgs.			89 L	
* Water-cooled Condenser Water Usage / 100 lbs. /45.4 kgs. Of Ice: 154 gal. / 583 L. * Water-cooled models are excluded from ENERGY STAR qualification.								
<b>REMOTE-COOLED</b>	ID-1492N	dice	1,430 lbs.	1,220 lbs.	4.52	4.52	23.5 gal.	
			650 kgs.	555 kgs.			89 L	
	IY-1494N	half-dice	1,480 lbs.	1,230 lbs.	4.53	4.53	23.5 gal.	
			673 kgs.	559 kgs.			89 L	

Order ice machine separately. To order 1 ph or 3 ph, add 100 to model # (e.g. ID-1402A-1).

**Accessories**

**LuminIce™ Growth Inhibitor** reduces yeast and bacteria growth for a cleaner ice machine.



**Bin Level Control** Allows ice bin level to be automatically set. Built-in LED light illuminates bin.



**Arctic Pure® Water Filters** Reduces sediment and chlorine odors for better tasting ice.



**AuCS®** schedules and performs routine ice machine cleaning automatically.



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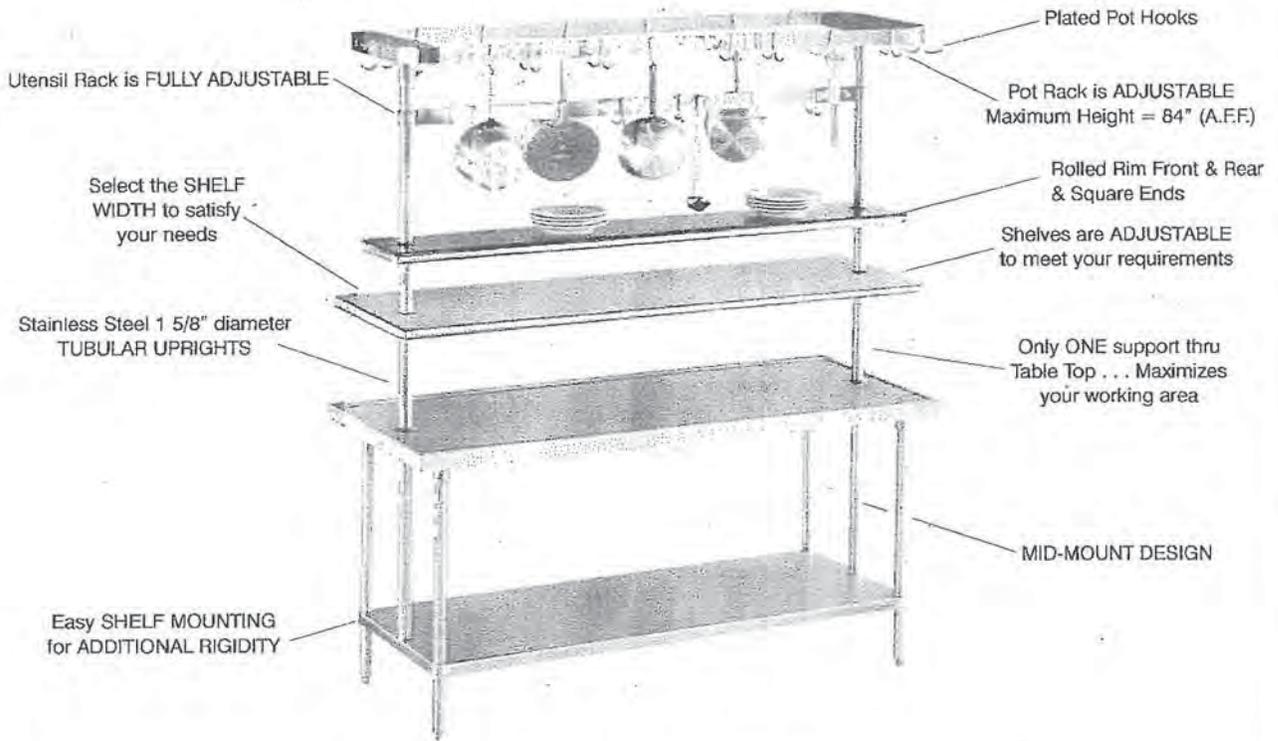




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STAINLESS STEEL  
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*Maximize Your Work Area!*

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**The Adjustable Solution . . . . . components are adjustable. You set the height to meet your demanding requirements.**

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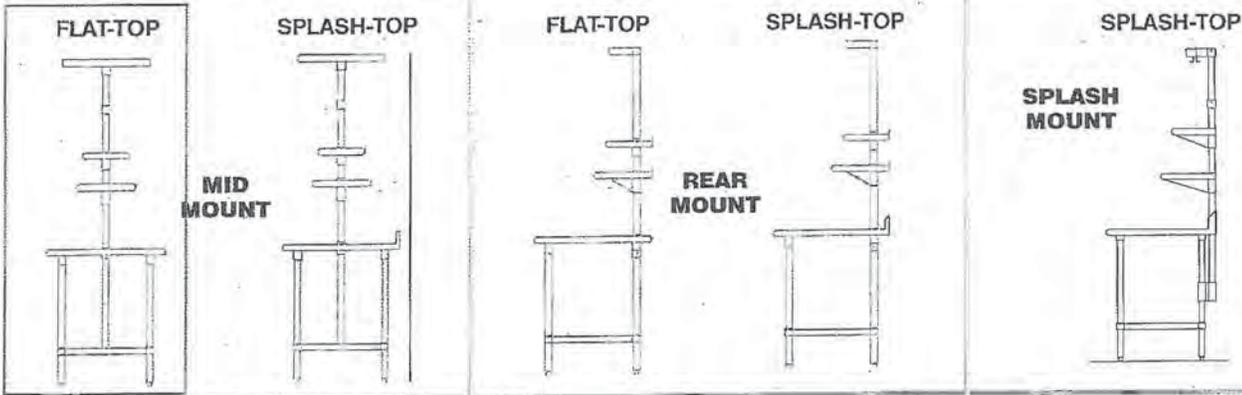
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**DESIGNED & CONSTRUCTED so as to be a Self-Contained Unit**

Possible: **ADJUSTABLE** Standard 11 Standard 12 Standard 13 Standard 14 Standard 15 Standard 16 Standard 17 Standard 18 Standard 19 Standard 20 Standard 21 Standard 22 Standard 23 Standard 24 Standard 25 Standard 26 Standard 27 Standard 28 Standard 29 Standard 30 Standard 31 Standard 32 Standard 33 Standard 34 Standard 35 Standard 36 Standard 37 Standard 38 Standard 39 Standard 40 Standard 41 Standard 42 Standard 43 Standard 44 Standard 45 Standard 46 Standard 47 Standard 48 Standard 49 Standard 50 Standard 51 Standard 52 Standard 53 Standard 54 Standard 55 Standard 56 Standard 57 Standard 58 Standard 59 Standard 60 Standard 61 Standard 62 Standard 63 Standard 64 Standard 65 Standard 66 Standard 67 Standard 68 Standard 69 Standard 70 Standard 71 Standard 72 Standard 73 Standard 74 Standard 75 Standard 76 Standard 77 Standard 78 Standard 79 Standard 80 Standard 81 Standard 82 Standard 83 Standard 84 Standard 85 Standard 86 Standard 87 Standard 88 Standard 89 Standard 90 Standard 91 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Also . . . . Adaptable to ALL ADVANCE TABCO Open - Base (less undershelf) Units.

**SHELF SPECIFICATIONS:**

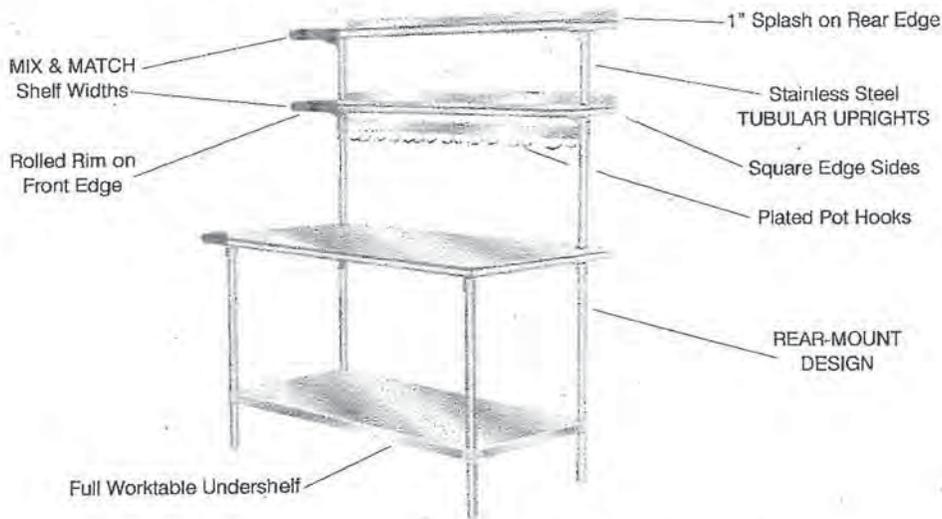
**REAR MOUNT & SPLASH MOUNT DESIGN:**  
Shelves feature a 1 1/2" splash on rear edge. Front edge has a rolled rim and square sides.

**MID MOUNT DESIGN:**  
Shelves feature a rolled rim on front and rear & square sides.

TUBULAR UPRIGHT DIMENSIONS	
furnished with units requiring pot racks, shelves and utensil rack. (Dim. A.F.F.)	84"
furnished with units requiring ONLY shelving. (Dim. A.F.F.)	60"
furnished with units requiring field retrofit to include pot rack. Model TA-225 (ext. assembly)	24"

A.F.F. = Above Finished Floor.

**TABLE with OVERHEAD SHELVES**



ADVANCE TABCO is constantly engaged in a program of improving our products. Therefore, we reserve the right to change specifications without prior notice.



# STAINLESS STEEL WORK TABLES STANDARD Series - Flat Top - UNDERSHELF Style



Item #: \_\_\_\_\_ Qty #: \_\_\_\_\_  
 Model #: \_\_\_\_\_  
 Project #: \_\_\_\_\_



**NEW**  
 Rolled Rim Edges on  
 Front & Back and  
 Square Side Edges



Featuring as Standard:  
**"THE PROVEN"**  
 ORIGINAL ADVANCE TABCO  
**Adjustable Undershelf**  
 with Die Cast Leg Clamp

### FEATURES:

Top is furnished with 1-5/8" sanitary rolled rim edges on front & back and square side edges.

To reinforce and maintain a level working surface, 24" wide tables are supplied with TWO hat channels and 30" and 36" wide tables are supplied with THREE hat channels.

Pre-engineered welded angle adapters insure ease of future drawer installation.

Aluminum die cast "leg-to-shelf" clamp secures shelf to leg eliminating unsightly nuts & bolts. Undershelf is adjustable.

### CONSTRUCTION:

All TIG welded. Exposed weld areas polished to match adjacent surfaces.

Entire top mechanically polished to a satin finish.

Top is sound deadened.

Roll formed embossed galvanized hat channels are secured to top by means of structural adhesive and weld studs.

Gussets welded to support hat sections.

### MATERIAL:

#### MS-SERIES: Stainless Steel Legs & Undershelf

**TOP:** 16 gauge stainless steel type "304" series.

**SHELF:** 18 gauge stainless steel.

**LEGS:** 1 5/8" diameter tubular stainless steel.  
 1" adjustable stainless steel bullet feet.  
 Stainless steel gussets.

#### MG-SERIES: Galvanized Legs & Undershelf

**TOP:** 16 gauge stainless steel type "304" series.

**SHELF:** 18 gauge galvanized steel.

**LEGS:** 1 5/8" diameter tubular galvanized steel.  
 1" adjustable plastic feet.  
 Galvanized steel gussets.

**MS-Series:**  
**Stainless Steel Legs & Undershelf**

L	24" Wide	30" Wide	36" Wide
30"	MS-240	MS-300	
24"	MS-242	MS-302	
36"	MS-243	MS-303	MS-363
48"	MS-244	MS-304	MS-364
60"	MS-245	MS-305	MS-365
72"	MS-246	MS-306	MS-366
84"	MS-247	MS-307	MS-367
96"	MS-248	MS-308	MS-368
108"	MS-249	MS-309	MS-369
120"	MS-2410	MS-3010	MS-3610
132"	MS-2411	MS-3011	MS-3611
144"	MS-2412	MS-3012	MS-3612



**MG-Series:**  
**Galvanized Steel Legs & Undershelf**

L	24" Wide	30" Wide	36" Wide
30"	MG-240	MG-300	
24"	MG-242	MG-302	
36"	MG-243	MG-303	MG-363
48"	MG-244	MG-304	MG-364
60"	MG-245	MG-305	MG-365
72"	MG-246	MG-306	MG-366
84"	MG-247	MG-307	MG-367
96"	MG-248	MG-308	MG-368
108"	MG-249	MG-309	MG-369
120"	MG-2410	MG-3010	MG-3610
132"	MG-2411	MG-3011	MG-3611
144"	MG-2412	MG-3012	MG-3612

Create Your Own Efficient Workstation with the Available Standard Accessories (Visit Section K)



Customer Service Available To Assist You **1-800-645-3166** 8:30 am - 8:00 pm E.S.T.

Email Orders To: [customer@advancetabco.com](mailto:customer@advancetabco.com). For Smart Fabrication™ Quotes, Email To: [smartfab@advancetabco.com](mailto:smartfab@advancetabco.com) or Fax To: 631-586-2833

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**TEXAS**  
 Fax: (972) 932-4795

**NEVADA**  
 Fax: (775) 972-1578

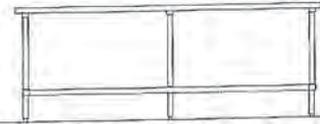
# DIMENSIONS and SPECIFICATIONS

ALL DIMENSIONS ARE TYPICAL TOL ± .500"

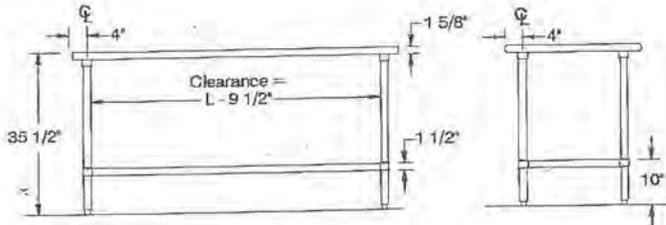
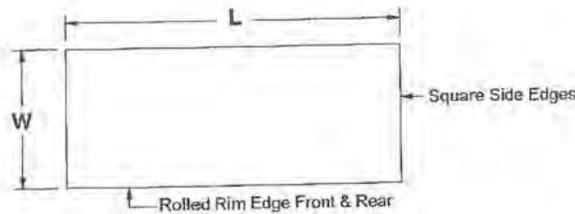
All Units Shipped Unassembled (KD) for Reduced Shipping Costs.

## MS & MG Series UNDERSHELF Style FLAT TOP

Finished size of undershelf = Length minus 5 3/4"  
Width minus 5 3/4"



Units 8 ft. and larger are furnished with six (6) legs



### MS-Series: Stainless Steel Legs & Undershelf

L	24" Wide	Wt.	30" Wide	Wt.	36" Wide	Wt.
30"	MS-240	49 lbs.	MS-300	65 lbs.		
24"	MS-242	31 lbs.	MS-302	55 lbs.		
36"	MS-243	64 lbs.	MS-303	72 lbs.	MS-363	88 lbs.
48"	MS-244	79 lbs.	MS-304	89 lbs.	MS-364	98 lbs.
60"	MS-245	92 lbs.	MS-305	107 lbs.	MS-365	118 lbs.
72"	MS-246	109 lbs.	MS-306	125 lbs.	MS-366	138 lbs.
84"	MS-247	130 lbs.	MS-307	148 lbs.	MS-367	164 lbs.
96"	MS-248	145 lbs.	MS-308	166 lbs.	MS-368	184 lbs.
108"	MS-249	161 lbs.	MS-309	176 lbs.	MS-369	190 lbs.
120"	MS-2410	261 lbs.	MS-3010	287 lbs.	MS-3610	308 lbs.
132"	MS-2411	293 lbs.	MS-3011	324 lbs.	MS-3611	358 lbs.
144"	MS-2412	308 lbs.	MS-3012	339 lbs.	MS-3612	373 lbs.

### MG-Series: Galvanized Steel Legs & Undershelf

L	24" Wide	Wt.	30" Wide	Wt.	36" Wide	Wt.
30"	MG-240	49 lbs.	MG-300	65 lbs.		
24"	MG-242	31 lbs.	MG-302	55 lbs.		
36"	MG-243	64 lbs.	MG-303	72 lbs.	MG-363	88 lbs.
48"	MG-244	79 lbs.	MG-304	89 lbs.	MG-364	98 lbs.
60"	MG-245	92 lbs.	MG-305	107 lbs.	MG-365	118 lbs.
72"	MG-246	109 lbs.	MG-306	125 lbs.	MG-366	138 lbs.
84"	MG-247	130 lbs.	MG-307	148 lbs.	MG-367	164 lbs.
96"	MG-248	145 lbs.	MG-308	166 lbs.	MG-368	184 lbs.
108"	MG-249	161 lbs.	MG-309	176 lbs.	MG-369	190 lbs.
120"	MG-2410	261 lbs.	MG-3010	287 lbs.	MG-3610	308 lbs.
132"	MG-2411	293 lbs.	MG-3011	324 lbs.	MG-3611	358 lbs.
144"	MG-2412	308 lbs.	MG-3012	339 lbs.	MG-3612	373 lbs.



ADVANCE TABCO is constantly engaged in a program of improving our products. Therefore, we reserve the right to change specifications without prior notice.



Model SP20



*precisely.*

Model #: \_\_\_\_\_

Serial #: \_\_\_\_\_



**Instruction Manual for Globe Mixers**  
**Models SP10, SP20, SP25, SP30, SP30P,**  
**SP40, SP60, SP62P and SP80PL**

**For Service on Your Mixer:**

1. Visit our website at [www.globeslicers.com](http://www.globeslicers.com)  
 (select the Support / Parts drop down).
2. Or call the Globe service department at 937-297-7247 and ask for contact  
 information for your local service company.

Visit our website for information on additional products available from Globe.

**[www.globeslicers.com](http://www.globeslicers.com)**

***Slicers, Mixers, Vegetable Cutters, Meat Choppers and Scales***

**- IMPORTANT SAFETY NOTICE -**

This manual contains important safety instructions which  
 must be strictly followed when using this equipment.

## Attention Owners and Operators

Globe's equipment is designed to provide safe and productive processing of food products as long as the equipment is used in accordance with the instructions in this manual and is properly maintained. Unless the operator is adequately trained and supervised there is a possibility of serious injury. Owners of this equipment bear the responsibility to make certain that this equipment is used properly and safely, strictly follow all the instructions contained in this manual and the requirements of local, state or federal law.

Owners should not permit anyone to touch this equipment unless they are over 18 years old, are adequately trained and supervised, and have read and understood this manual. Owners should also ensure that no customers, visitors or other unauthorized personnel come in contact with this equipment. Please remember that Globe cannot anticipate every circumstance or environment in which its equipment will be operated. It is the responsibility of the owner and the operator to remain alert to any hazards posed by the function of this equipment. If you are ever uncertain about a particular task or the proper method of operating this equipment, ask your supervisor.

This manual contains a number of precautions to follow to help promote safe use of this equipment. Throughout the manual you will see additional warnings to help alert you to potential hazards.

Warnings affecting your personal safety are indicated by:



or



Warnings related to possible damage to the equipment are indicated by:



Globe has put several warning labels in the English language on its mixers. French labels are also available and can replace the English labels at the owner's discretion. If the warning labels or this manual are misplaced, damaged, or illegible, or if you require additional copies, please contact your nearest representative or Globe directly for these items at no charge.

Please remember that this manual or the warning labels do not replace the need to be alert, to properly train and supervise operators, and to use common sense when using this equipment.

# Installation

## UNPACKING

Unpack the mixer immediately after receipt. If the machine is found to be damaged, save the packaging material and contact the carrier within fifteen (15) days of delivery. Immediately contact your source of the equipment. You have no recourse to damage after fifteen (15) days.

## **▲ WARNING**

### TO AVOID SERIOUS PERSONAL INJURY:

- ALWAYS install equipment in work area with adequate light and space.
- ONLY operate the mixer on a solid, LEVEL, non-skid surface that is nonflammable.
- NEVER bypass, alter, or modify this equipment in any way from its original condition. Doing so may create hazards and will void warranty.
- NEVER operate the mixer without all warnings attached to it.
- DO NOT attempt to lift the mixer alone.

## INSTALLATION

1. Read this manual thoroughly before installation and operation. DO NOT proceed with installation and operation if you have any questions or do not understand anything in this manual. Contact your local representative or Globe first.
2. Remove the corrugated box from the skid by removing the bands on the box. NOTE: The SP62P and SP80PL are shipped in a wooden crate. Only the bolts at the bottom of the crate (all four sides) need to be removed.
3. Carefully unbolt the mixer from the skid using an 11/16" or 3/4" wrench.
4. Select a location for the mixer keeping these points in mind:
  - Floor or counter must be level.
  - Easy access for maintenance and service.
  - Clearance for operating controls, installing and removing agitators, bowl, or attachments.
  - Sufficient space for adding ingredients during mixing periods.
  - Ensure rear ventilation outlet of mixer is not blocked.
5. Use at least two other people to tilt the unit and install the rubber feet.
6. A bolt down template and bolts are available for the SP10, SP20, or SP25. Contact Globe if this is needed.
7. Inspect the mixer to ensure all parts have been provided (i.e. bowl, beater, whip, and dough hook). The SP62P only has a bowl and dough hook.
8. Read the electrical information found on the data plate located at the rear of the machine. The incoming power should match the rating on the data plate.

## CONNECTING TO ELECTRICAL POWER **▲ WARNING**

**Cord Connected Units:** This machine is provided with a three-prong grounding plug. The outlet that this plug is connected to must be properly grounded. If the receptacle is not the proper grounding type contact an electrician. Do not under any circumstances cut or remove the third ground prong from the power cord or use any adapter plug. Never use an extension cord. Low amp supply could damage the mixer or cause a fire.

# Operating Instructions

2. To rotate the bowl guard to its open position, grasp the separated handles on the bowl guard and move them, together as one, clockwise to open/rotate the bowl guard. To close the bowl guard, grasp the separated handles and move them together as one, counterclockwise to close/rotate the bowl guard back into a locked position.

## Removing and Attaching the Bowl Guard:

NOTE: Before removing or attaching the bowl guard, make sure the bowl is in the down/ lowered position and the agitator tool is off the shaft.

1. To remove the bowl guard for cleaning, push the lower part of the separated handle out (clockwise) dividing the handle and releasing the guard from the rotation ring. (see fig. 7-1)
2. Once separated, take hold of the lower separated handle and continue turning the guard clockwise until the bowl guard releases from the ring catch on the mixer. (see fig. 7-2)
3. To reattach the bowl guard, line up the ring catch on the left of the mixer; lift guard gently into place and rotate the guard's lower handle counterclockwise until it snaps back into place with the upper part of the handle.

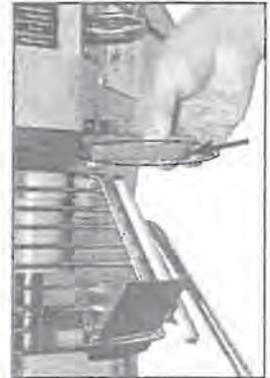


fig. 7-1

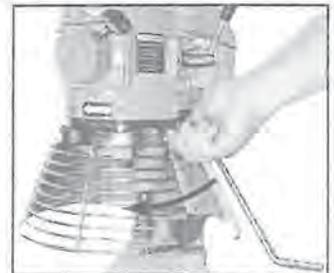


fig. 7-2

## ATTACHING THE BOWL TO THE MIXER

NOTE: Install the bowl BEFORE attaching the agitators.

1. Lower the bowl by pulling the bowl lift lever forward and down to its resting position. For models SP40 and SP60 rotate the bowl lift wheel counterclockwise until it stops. For the SP62P and SP80PL press the down arrow (blue button) to lower the bowl until it stops.
2. Lift the bowl by the bowl handles and
  - a. slowly position the locking pin (located on the rear of the bowl) into the hole in the middle rear of the cradle (see fig 7-3).
  - b. lower the bowl onto the pins located on either side of the bowl cradle.
3. Once the bowl is positioned on the cradle, secure the bowl by pulling each bowl clamp forward until the bowl is locked tight (see fig 7-4).



fig. 7-3



fig. 7-4

## Operating Instructions

5. Select the appropriate speed setting by lifting or lowering the speed control lever. Three fixed speeds are available for use: first (1), second (2), and third (3). NOTE: The SP62P has two speeds and the SP80PL has four fixed speeds.

<u>Gear Speed</u>	<u>Product Type/Ingredient</u>
1 (low)	Heavy: mixing pizza, bread, pasta and donut doughs, waffle/cake batter, mashing potatoes
2 (medium)	Medium: 2nd stage of mixing for donut dough, etc.
3 (high)	Light: whipping cream, egg whites, meringue

**IMPORTANT:** When mixing product always follow the recommended agitator and speed setting according to the capacity chart located on page 13 of this manual.

6. Press the green start button located on the middle of the control panel.

**CAUTION** Always STOP the mixer BEFORE changing speeds! Failure to do so may damage the gears or other parts and WILL void the warranty!

7. To change the speed while mixing
  - a. press the red stop button
  - b. change the speed by raising or lowering the speed control lever
  - c. press the green start button to restart the mixer.

NOTE: The SP62P and SP80PL will automatically shut off if the speed is changed while the mixer is in operation.

NOTE: The mixer is equipped with a motor overload protection. If the mixer shuts off during operation reduce the batch size and

- a. SP25 and smaller models: Press the stop button then press the overload reset button.
- b. Larger models: Wait two minutes. Press the stop button then press the start button.

NOTE: 2nd speed should never be used on 50% AR or lower with the exception of the SP60. The SP60 requires a 50% reduction in batch size to mix in speed 2 with 50% AR doughs.

NOTE: Reduce batch size by 10% if chilled flour, water below 70°F, ice, or high gluten flour is being used.

**IMPORTANT:** For heavier loads, the mixer should not run longer than fifteen minutes without pausing for a cool down period of at least fifteen minutes or more before resuming mixing. For lighter loads the mixer should not run longer than thirty minutes without pausing for a cool down period of at least thirty minutes or more before resuming mixing.

8. When the ingredients have been thoroughly mixed, press the red stop button to stop the mixer.  
NOTE: If the timer was used the mixer will automatically stop when the time has expired.

9. Lower the bowl by pulling the bowl lift lever forward and down to its resting position. For models SP40 and SP60, rotate the bowl lift wheel counterclockwise until it stops. For models SP62P and SP80PL press the down arrow (blue button) until the bowl stops.

10. Rotate the bowl guard to the left so it is in the open position.

11. Remove the agitator from the planetary shaft by lifting it upwards then rotating it counterclockwise until it is unlocked. Lower the agitator and remove from planetary shaft.

# Cleaning Instructions

## ⚠ CAUTION

- Dilute detergent per supplier's instruction.
- DO NOT hose down or pressure wash any part of the mixer.
- NEVER use a scrubber pad, steel wool, or abrasive material to clean the mixer.
- NEVER use bleach (sodium hypochlorite) or bleach based cleaner.
- ALWAYS remove the agitator after each batch. If not, the agitator can become stuck on the shaft and difficult to remove.



The entire mixer, including removable parts, must be thoroughly cleaned and sanitized using the procedures identified by your local health department and the ServSafe Essentials published by the National Restaurant Association Educational Foundation (NRAEF). Visit [www.servsafe.com](http://www.servsafe.com) for more details.



It is extremely important to sanitize the mixer and to follow the instructions on the quaternary sanitizer container to ensure proper sanitation is achieved.



**ALWAYS DISCONNECT OR UNPLUG THE ELECTRICAL POWER FROM THE MIXER BEFORE CLEANING.**

### RECOMMENDED CLEANING

PART	REQUIRED ACTION	FREQUENCY
Agitators	Hand-wash using mild soap and water, rinse, dry and sanitize.	Clean after each use.
Removable Bowl Guard	Hand-wash using mild soap and water, rinse, dry and sanitize or place in dishwasher.	Clean after each use.
Bowl	Using a sponge or cloth, mild soap and water, apply pressure to ensure the bowl is clean, rinse, dry, and sanitize. The bowl can also be placed in a dishwasher.	Clean after each use.
Rear Splash Guard	Hand-wash using mild soap and water, rinse, dry and sanitize.	Clean after each use.
Bowl Cradle	Hand-wash using mild soap and water, rinse, dry and sanitize.	Daily
Planetary Shaft	Wipe with clean damp cloth, dry and sanitize. Apply a light quantity of Globe oil (mineral oil) to the planetary shaft after cleaning.	Clean after each use.
Exterior	Hand-wash using mild soap and water, rinse, dry, and sanitize. DO NOT use a water hose!	Daily
Hub Interior	Wipe with clean damp cloth, dry, and sanitize.	Daily

# Capacity Chart

The following maximum capacities are intended as a guideline only. Varying factors such as the type of flour used, temperature of water used and other conditions may require the batch to be reduced.

Product	Agitator and Speed	SP5	SP8	SP10	SP20	SP25	SP30/ SP30P	SP40	SP60	SP62P	SP80PL
Waffle or Hotcake Batter	Flat Beater	2 qts.	3 qts.	5 qts.	8 qts.	10 qts.	12 qts.	16 qts.	24 qts.	---	30 qts.
Whipped Cream	Wire Whip	2 qts.	2 qts.	2 qts.	4 qts.	5 qts.	6 qts.	9 qts.	12 qts.	---	16 qts.
Mashed Potatoes	Flat Beater	4 lbs.	4 lbs.	8 lbs.	15 lbs.	18 lbs.	23 lbs.	30 lbs.	40 lbs.	---	50 lbs.
Egg Whites	Wire Whip	¾ pts.	¾ pts.	1 pt.	1 qt.	1¼ qts.	1½ qts.	1¾ qts.	2 qts.	---	2 qts.
Meringue (Qty. of Water)	Wire Whip	¾ pts.	½ pts.	¾ pts.	1½ pts.	1¾ pts.	1 qt.	1¼ qts.	1¾ qts.	---	3 qts.
Raised Donut Dough (65% AR) *◆	Dough Hook 1st and 2nd	2 lbs.	2 lbs.	4½ lbs.	9 lbs.	12 lbs.	15 lbs./ 20 lbs.	25 lbs.	60 lbs.	75 lbs.	80 lbs.
Heavy Bread Dough (55% AR) *◆	Dough Hook 1st only	4 lbs.	3 lbs.	7½ lbs.	15 lbs.	20 lbs.	30 lbs./ 35 lbs.	40 lbs.	70 lbs.	75 lbs.	80 lbs.
Bread and Roll Dough (60% AR) *◆	Dough Hook 1st only	5 lbs.	5 lbs.	12½ lbs.	25 lbs.	25 lbs.	45 lbs.	60 lbs.	80 lbs.	90 lbs.	90 lbs.
Pizza Dough, Thin (40% AR) *✕◆□	Dough Hook 1st only	3 lbs.	2 lbs.	5 lbs.	9 lbs.	12 lbs.	16 lbs./ 25 lbs.	30 lbs.	40 lbs. (1st)	50 lbs. 35 lbs. (2nd)	50 lbs.
Pizza Dough, Medium (50% AR) *◆□	Dough Hook 1st only	4 lbs.	4 lbs.	5 lbs.	10 lbs.	15 lbs.	25 lbs./ 36 lbs.	40 lbs.	70 lbs. (1st) 35 lbs. (2nd)	80 lbs. (1st) 60 lbs. (2nd)	90 lbs.
Pizza Dough, Thick (60% AR) *◆	Dough Hook 1st only	5 lbs.	5 lbs.	10 lbs.	20 lbs.	25 lbs.	40 lbs./ 45 lbs.	50 lbs.	70 lbs.	90 lbs.	100 lbs.
Fondant Icing	Flat Beater	4 lbs.	3 lbs.	6 lbs.	12 lbs.	15 lbs.	18 lbs.	25 lbs.	36 lbs.	---	60 lbs.
Cake	Flat Beater	5 lbs.	5 lbs.	10 lbs.	20 lbs.	25 lbs.	30 lbs.	40 lbs.	60 lbs.	---	90 lbs.
Pie Dough	Flat Beater	5 lbs.	4 lbs.	10 lbs.	18 lbs.	22 lbs.	27 lbs.	35 lbs.	50 lbs.	60 lbs.	70 lbs.
Pasta, Basic Egg Noodle	Dough Hook	1 lb.	2 lbs.	3 lbs.	5 lbs.	6 lbs.	8 lbs./ 15 lbs.	17 lbs.	35 lbs.	40 lbs.	50 lbs.

- \* NOTE: The mixer capacity depends on the moisture content of the dough. When mixing doughs (pizza, bread, or bagels) check your AR%! %AR (% Absorption Ratio) = Water weight divided by flour weight. The capacities listed above are based on flour at room temperature and 70°F water temperature. (1 gallon of water weighs 8.33 lbs.)
- ✕ Maximum Mixing Time - 7 Minutes
- ◆ If high gluten flour is used, reduce the batch size by 10%.
- ◆ If using chilled flour, water below 70°F, or ice, reduce batch size by 10%.
- 2nd speed should never be used on 50% AR or lower with the exception of the SP60. The SP60 requires a 50% reduction in batch size to mix in speed 2 with 50% AR doughs.

**Do not use attachments on hub while mixing!**

## Troubleshooting

Problem	Possible Causes	Action Required
Mixing time is too long.	Three-phase mixer is wired wrong.	Agitators should rotate clockwise around bowl. If not, electrician must rewire.
	Batch size too small.	Increase batch size <u>or</u> use smaller bowl adapter kit. ( <i>Contact dealer for purchase</i> )
	Incorrect recipe portions <u>or</u> temperatures.	Follow portions and temperatures per recipe instructions.
Bowl raise sticking or not operational.	Lack of lubrication on bowl slides.	Lubricate bowl slides with mineral oil or food quality grease. If still sticking, technician must clean bowl raise mechanism.
One or more gears not working.	Broken belt.	Technician to replace belt.
	Damaged or broken gear.	Technician to replace gear. <b><i>Always stop mixer before shifting gears!</i></b>
Mixer will not mix medium or heavy loads.	Incorrect or low voltage.	Contact electrician.
	Belt slipping.	Technician to replace belt.
Residue leaking from hub.	Contaminated hub due to build-up of meat and/or vegetable juices (especially tomatoes).	Technician to remove hub and clean interior. To avoid problem, always wipe hub and dry after each use. <i>*Note: Acid from tomato juices will corrode/contaminate interior parts! Don't mix tomatoes in meat grinder!</i>
Agitators touching bottom or sides of bowl.	Defective or dented bowl.	Remove dents or replace bowl.
	Defective agitator.	Replace agitator.
Broken whip wires.	Batch size too large for mixer. Items too firm, speed too high.	Reduce batch size. ( <i>See Capacity Chart</i> ) Adjust recipe. Reduce speed.
	Hand utensil dropped into bowl while mixing.	Stop mixer before working on mixture.
Broken flat beater.	Ingredients too cold or too large (e.g. frozen butter, cream cheese cut in chunks).	Wait for ingredients to reach room temperature before mixing. Reduce chunk size.
Broken dough hook.	Batch size too large for mixer.	Reduce batch size. ( <i>See Capacity Chart</i> ) Adjust recipe.
	Ingredients too cold or too large.	Wait for ingredients to reach room temperature before mixing. Reduce chunk size.
Mixture climbs up dough hook.	Three-phase mixer is wired incorrectly.	Electrician to rewire.
Discoloration of mixed product.	Bowl has not been thoroughly cleaned.	Clean bowl again (refer to page 11).



# STAINLESS STEEL MIXER TABLES



(Optional Casters Shown)



Item #: \_\_\_\_\_ Qty #: \_\_\_\_\_  
 Model #: \_\_\_\_\_  
 Project #: \_\_\_\_\_

## UTENSIL RACK & UNDERSHELF

Width x Length	S/S Base	Galv. Base	Weight
24" x 24"	MX-SS-242	MX-GL-242	53 lbs.
30" x 24"	MX-SS-302	MX-GL-302	63 lbs.
30" x 30"	MX-SS-300	MX-GL-300	77 lbs.
30" x 36"	MX-SS-303	MX-GL-303	77 lbs.
36" x 36"	MX-SS-363	MX-GL-363	85 lbs.

### FEATURES:

TOP is furnished with a 2" x 1" square die embossed NO-DRIP countertop offset edge with a 1/2" return on 4 sides.  
 Aluminum die cast "leg-to-shelf" clamp secures shelf to leg eliminating unsightly nuts and bolts. Undersheff is adjustable.

### MATERIAL:

**MX-SS & MT-SS SERIES - Stainless Steel Base**  
 TOP is 14 gauge stainless steel type "304" series with galvanized understructure.  
 UNDERSHELF is 18 gauge stainless steel.  
 LEGS are 1 5/8" diameter tubular stainless steel with stainless steel bullet feet & gussets.  
 UTENSIL RACK on MX-SS Series is 1 5/8" dia. stainless steel tubing with stainless steel hooks.

### MX-GL & MT-GL Series - Galvanized Steel Base

TOP is 14 gauge stainless steel type "304" series with galvanized understructure.  
 UNDERSHELF is galvanized steel.  
 LEGS are 1 5/8" diameter, tubular galvanized steel. Gussets are galvanized steel with 1" adjustable plastic bullet feet.  
 UTENSIL RACK on MX-SS Series is 1 5/8" diameter galvanized steel tubing with stainless steel hooks.

### SAG-MT & AG-MT Budget Series

TOP is heavy gauge stainless steel type "430" series with galvanized understructure.  
 SAG-MT Series UNDERSHELF is 18 gauge stainless steel.  
 AG-MT Series UNDERSHELF is galvanized steel.  
 SAG-MT Series LEGS are 1 5/8" diameter, tubular stainless steel. Gussets are stainless steel. 1" adjustable stainless steel bullet feet.  
 AG-MT Series LEGS are 1 5/8" diameter, tubular galvanized steel. Gussets are galvanized steel. 1" adjustable plastic bullet feet.

## WITH UNDERSHELF

Width x Length	S/S Base	Galv. Base	Weight
24" x 24"	MT-SS-242	MT-GL-242	53 lbs.
30" x 24"	MT-SS-302	MT-GL-302	63 lbs.
30" x 30"	MT-SS-300	MT-GL-300	77 lbs.
30" x 36"	MT-SS-303	MT-GL-303	77 lbs.
36" x 36"	MT-SS-363	MT-GL-363	85 lbs.

## BUDGET SERIES WITH UNDERSHELF

Width x Length	S/S Base	Galv. Base	Weight
24" x 24"	SAG-MT-242	AG-MT-242	53 lbs.
30" x 24"	SAG-MT-302	AG-MT-302	63 lbs.
30" x 30"	SAG-MT-300	AG-MT-300	77 lbs.
30" x 36"	SAG-MT-303	AG-MT-303	77 lbs.
36" x 36"	SAG-MT-363	AG-MT-363	85 lbs.

### CONSTRUCTION:

All TIG welded. Exposed weld areas polished to match adjacent surface.  
 Entire Top is mechanically polished to a satin finish and is sound deadened. Countertop edge polished to a MIRROR FINISH.  
 Roll formed embossed galvanized hat channels are secured to top by means of structural adhesive and weld studs.  
 Gussets welded to support hat channels.



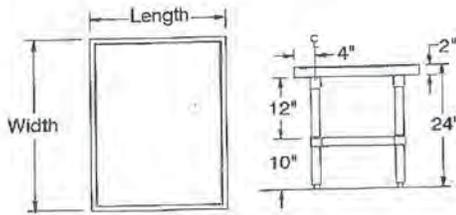
Customer Service Available To Assist You **1-800-645-3166** 8:30 am - 8:00 pm E.S.T.  
 Email Orders To: [customer@advancetabco.com](mailto:customer@advancetabco.com). For Smart Fabrication™ Quotes, Email To: [smartfab@advancetabco.com](mailto:smartfab@advancetabco.com) or Fax To: 631-586-2933

**NEW YORK** Fax: (631) 242-6900  
**GEORGIA** Fax: (770) 775-5625  
**TEXAS** Fax: (972) 932-4795  
**NEVADA** Fax: (775) 972-1578

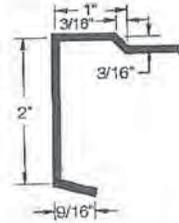
# DETAILS and SPECIFICATIONS

ALL DIMENSIONS ARE TYPICAL

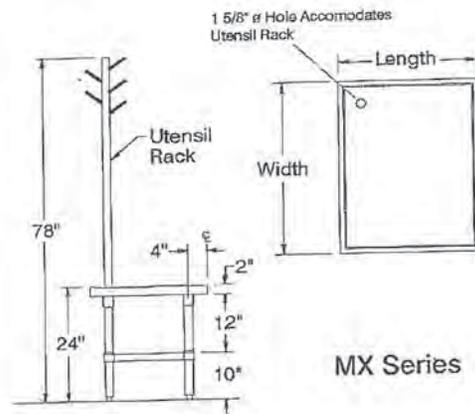
TOL  $\pm$  .500"



MT, SAG & AG Series



Countertop Edge Detail



MX Series



ADVANCE TABCO is constantly engaged in a program of improving our products. Therefore, we reserve the right to change specifications without prior notice.

© ADVANCE TABCO, SEPTEMBER 2005

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---	---

**HOBART**

**STANDARD FEATURES**

- Variable Six-Speed Automatic Carriage with Front Mounted Controls
- Home Position Start
- Close To Stop
- Gauge Plate Interlock
- Carriage System Interlock
- No Volt Release
- Exclusive Tilting, Removable Carriage System
- CleanCut™ Knife
- Top Mounted Borazon Stone Sharpener
- Hobart Poly V-Belt Drive System
- Sanitary Anodized Aluminum Base
- Double-Action Indexing Cam
- Permanently Mounted Ring Guard
- Heavy Gauge Stainless Steel Knife Cover
- Lift Lever
- Removable Rear Deflector
- ½ H.P. Knife Drive Motor
- Nylon Carriage Roller
- Electroless Nickel Plated Single Slide Rod with Reservoir Wick
- Stainless Steel Carriage
- Ergonomic Style Handle
- Low Fence

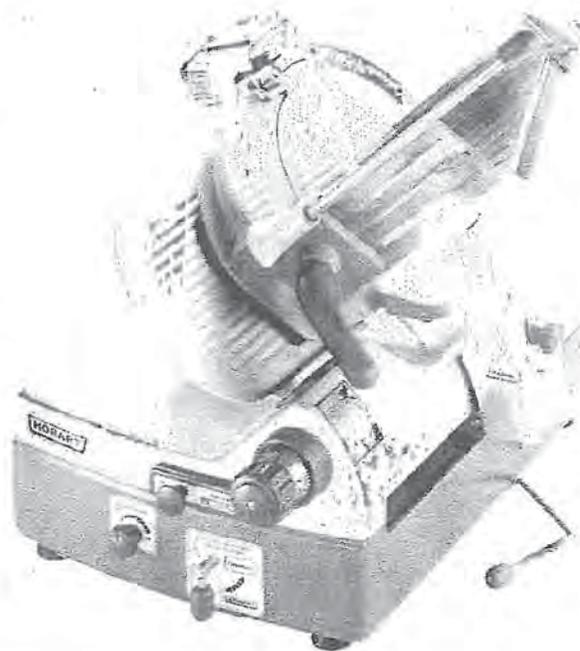
**MODEL**

- 2912 – Smart Feature Automatic Slicer

**ACCESSORIES**

- Low Fence
- High Fence
- Food Chute
- Heavy Meat Grip
- Tall Legs
- Product Tray

Specifications, Details and Dimensions on Inside and Back.



**2912 SLICER**

# 2912 SLICER

**HOBART**

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## SOLUTIONS / BENEFITS

### Variable Six-Speed Automatic Carriage with Front Mounted Controls

- Improved yield, labor savings
- Greater flexibility for all slicing needs
- Six speed choices for 28, 33, 38, 42, 47, and 52 strokes per minute

### Home Start Position

- Maximizes yield
- Carriage must be in "home position" before the slicer will start

### Close To Stop

- Convenience, labor savings, energy savings
- Closing of gauge plate turns off the slicer

### Gauge Plate Interlock

- Supports use of proper cleaning procedures, easier to clean
- Gauge plate must be closed to remove carriage for cleaning and cannot be opened when removed

### Carriage System Interlock

- Will not tilt away or remove if gauge plate indicator is not closed

### No Volt Release

- Protects against unintentional starting of slicer
- Slicer must be restarted if power fails or slicer is unplugged

### Exclusive Tilting, Removable Carriage System

- Reduces labor, improves sanitation
- Tilt design allows for ease of midday cleaning
- Removable for complete cleaning and sanitation procedures

### CleanCut™ Knife

- Reduced cost of ownership, improved yield
- Thin edge design improves yield
- Super alloy edge lasts longer
- Fewer and shorter sharpenings required

### Top Mounted Borazon Stone Sharpener

- Ease of use, improved sanitation, reduced costs
- Single action sharpens and hones in just five seconds
- Removable and submersible for easy cleaning and sanitation
- Lifetime guaranteed Borazon sharpening stones provide maximum performance with reduced maintenance costs

### Poly V-Belt Drive System

- Performance, durability, reduced maintenance
- Patented design extends belt life while producing optimum slicing results
- Quieter operating slicer

### Sanitary Anodized Aluminum Base

- Improved sanitation, labor savings
- One piece base protects against possible growth of bacteria
- No cracks/crevices or bolt holes where product can lodge and bacteria may grow
- Easy cleanup and durable finish

### Double-Action Indexing Cam

- Increases reliability, easier to use, increased yield
- The first full revolution of the indexing knob provides precise control for shaving, chipping and thin slicing
- The second revolution opens the gauge plate quickly for thicker slicing
- Gauge plate holds position for consistent, precision slicing

### Permanently Mounted Ring Guard

- Protection
- Protects knife during operation and cleaning

### Heavy Gauge Stainless Steel Knife Cover

- Durability, ease of use, sanitation
- Twelve-gauge stainless steel maintains shape to ensure consistent fit
- Spring loaded knob for quick removal and easy cleanup
- One piece design for simplistic usage

### Lift Lever

- Improved sanitation, ease of use
- Props machine for easy cleaning underneath slicer

### Removable Rear Deflector

- Improved sanitation, ease of use
- Allows access for thorough cleaning
- No tools required means easy removal during cleaning

### ½ H.P. Knife Drive Motor

- Durability, performance
- Reserve power runs at 400 rpm for optimum results

### Nylon Carriage Roller

- Performance
- Easy movement for manual operation

### Electroless Nickel Plated Single Slide Rod with Reservoir Wick

- Performance, durability, lower maintenance
- Smooth operation with continuous lubrication of carriage rod
- Resistant to rust

### Stainless Steel Carriage

- Improved sanitation, durability
- Maximum sanitation with minimum cleanup time
- Corrosion resistant, impact resistant

### Ergonomic Style Handle

- Operator satisfaction
- Comfortable manual operation

### Meat Grip Options

- Multiple choices for improved yield and consistency
- Front meat grip standard
- Heavy front meat grip available

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SLICER**

## SPECIFICATIONS

**VARIABLE SIX-SPEED AUTOMATIC CARRIAGE WITH FRONT MOUNTED CONTROLS:** Choice of six speeds - 28, 33, 38, 42, 47, 52 strokes per minute. Carriage can be disengaged from power drive whether slicer is in operation or not. Automatic engagement and speed selector controls located in front of machine. Speed can be changed with slicer motor on or off. Carriage driven by DC gear-reduction motor and 4 bar synchronous linkage.

**HOME POSITION START:** Home-start ensures carriage is in a convenient position before starting the slicer.

**CLOSE TO STOP:** After slicing, a quick turn of the index knob to the closed position turns off the slicer.

**GAUGE PLATE INTERLOCK:** Gauge plate interlock protects knife edge when indicator is at zero.

**CARRIAGE SYSTEM INTERLOCK:** Carriage will not tilt away or remove if gauge plate indicator is not closed.

**NO VOLT RELEASE:** In the event of power loss, slicer must be restarted before operation can continue.

**TILTING REMOVABLE CARRIAGE SYSTEM:** Positive angle carriage design enables operator to slice without manual feed. The stainless steel carriage system tilts back easily for midday cleaning and is removable for thorough cleaning and sanitation procedures. The carriage has 12½" manual travel.

**CLEANCUT™ KNIFE:** Another Hobart exclusive, the knife is constructed of 304L stainless steel and high performance super alloy. Knife is protected by a permanently mounted ring guard with integrated product deflector. The stainless steel knife cover provides easy access for cleaning. Gauge plate protects knife edge when indicator is closed. Knife cover is quickly removed with a quarter turn of the spring loaded locking knob.

**TOP MOUNTED BORAZON STONE SHARPENER:** One lever operation utilizing two Borazon stones to sharpen and hone in five seconds. Removable and top mounted. When sharpener is removed for cleaning, knife edge is shielded. Borazon stones have lifetime guarantee.

**HOBART POLY V-BELT DRIVE SYSTEM:** Knife is driven by a Hobart Poly V belt and runs at 400 rpm for optimal performance.

**SANITARY ANODIZED ALUMINUM BASE:** One-piece base protects against possible growth of bacteria. All surfaces are durable and smooth, presenting no holes or crevices in which food can lodge.

**DOUBLE-ACTION INDEXING CAM:** First revolution of index cam for precision slicing; second revolution for thicker slicing selection. Indexing cam holds true to setting during slicing operation.

**PERMANENTLY MOUNTED RING GUARD:** Permanently mounted ring guard with integrated product deflector protects knife.

**HEAVY GAUGE STAINLESS STEEL KNIFE COVER:** One piece design made of 12 gauge stainless steel, durable to maintain shape and ensure consistent fit. Spring loaded for quick removal and replacement.

**LIFT LEVER:** Lift lever facilitates raising slicer to tilted position for cleaning beneath the machine.

**REMOVABLE REAR DEFLECTOR:** No tools are required for removal of the deflector for thorough cleaning of the slicer.

**KNIFE MOTOR:** ½ H.P., permanently lubricated ball bearings. Single phase capacitor-start, induction run.

**ELECTROLESS NICKEL PLATED SINGLE SLIDE ROD WITH RESERVOIR WICK:** Transport slide rod is E-Nickel electroless plated. Slide rod bearings feature an oil reservoir/oil wick.

**FINISH:** Stainless steel carriage, gauge plate and knife cover. Anodized aluminum base.

**ERGONOMIC STYLE HANDLE:** Specially designed for ease of use during manual operation.

**MEAT GRIP:** Front mounted grip is high strength thermoplastic. Swings out of way when not in use.

**ELECTRICAL SPECIFICATIONS:** 120/60/1 - U L Listed. Also available in 100/50/60/1, 240/60/1 (3 amps) and 230/50/1 (3 amps) - not submitted for U L Listing.

**SWITCH:** Moisture protected toggle type, operated by a push-pull rod.

**CORD & PLUG:** 6-foot, three-wire power supply cord and plug. Plug not furnished on export models.

**CAPACITY:** The carriage will take food up to 12" in width or 7½" in diameter.

**GAUGE PLATE:** Gauge plate is a heavy aluminum casting with ribbed laminated stainless steel face for smooth feeding. Adjustable to cut any thickness of slice up to 1".

**WARRANTY:** All parts and service coverage for one year including knife. Lifetime guarantee on Borazon stones in the sharpening system.

**WEIGHTS FOR THE FOLLOWING ITEMS:** Tubular Chute 9.1 lbs.; Swing Arm .61 lbs.; Heavy Front Meat Grip 2.76 lbs.; Heavy Handle 2.7 lbs.; Standard Meat Grip 2.34 lbs.

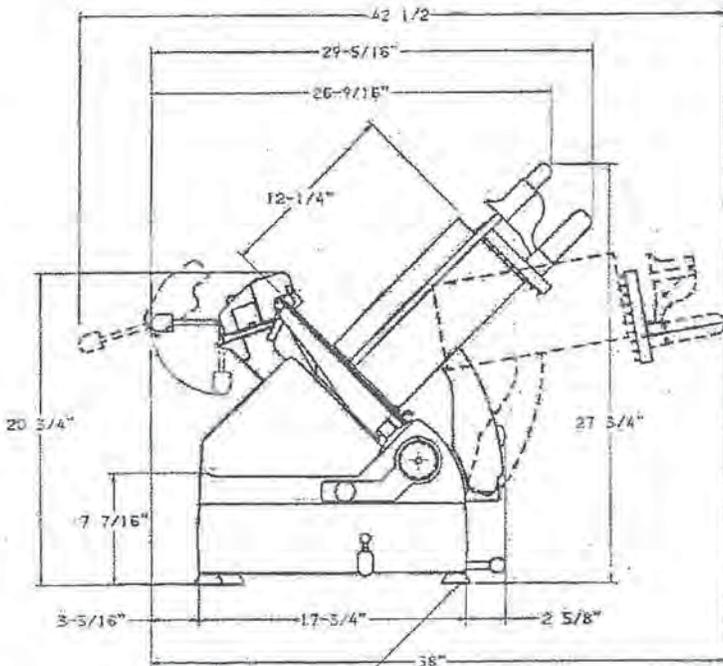
**WEIGHT:** Shipping 182 lbs., Net 140 lbs.

# 2912 SLICER

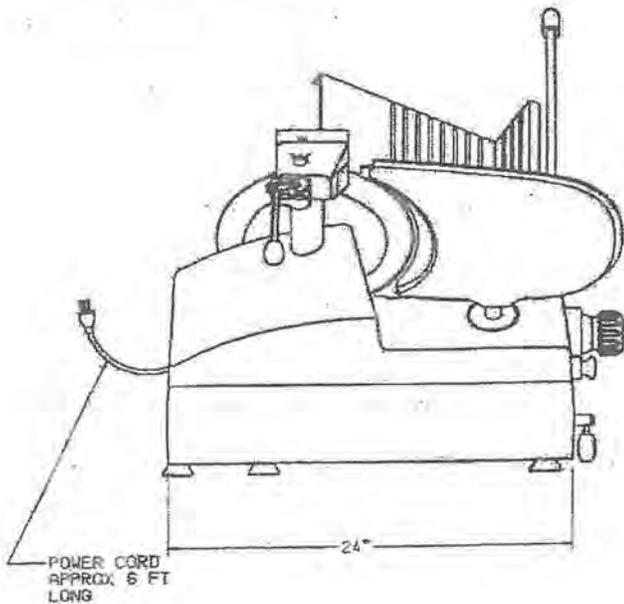
## HOBART

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### DETAILS AND DIMENSIONS



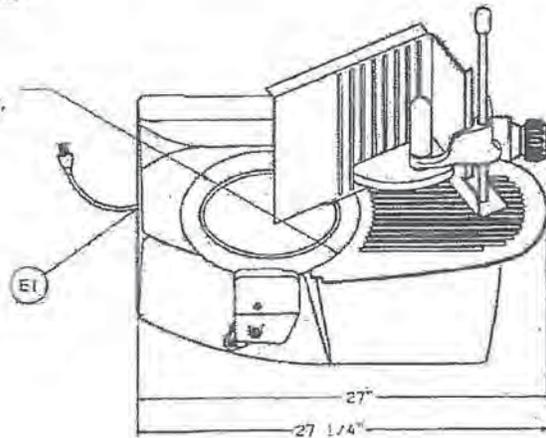
WHEN IN CLEANING POSITION  
LEG 5" OFF GROUND  
PIVOTED BY OTHER LEG



### WARNING

ELECTRICAL AND GROUNDING CONNECTIONS  
MUST COMPLY WITH THE APPLICABLE PORTIONS  
OF THE NATIONAL ELECTRICAL CODE AND/OR  
OTHER LOCAL ELECTRICAL CODES.

11-3/4"  
KNIFE DIA.



### LEGEND

E1-ELECTRICAL CONNECTION,  
APPROX 6 1/2" ABOVE  
COUNTER TOP

As continued product improvement is a policy of Hobart, specifications are subject to change without notice.



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Solid Door -10°F Freezers

Solid Door 0°F Freezers

Glass Door -10°F Freezers

Solid Half Door -10°F Freezers

Slide Door Refrigerators

Dual Temperature

Heated Cabinets

TS Series

Specification Series

Food Prep Tables

Undercounters

Worktops

Chef Bases

T-19FZ

True's solid door reach-in's are designed with enduring quality that protects your long term investment.

Designed using the highest quality materials and components to provide the user with colder product temperatures, lower utility costs, exceptional food safety and the best value in today's food service marketplace.

Extra large evaporator coil balanced with higher horsepower compressor and large condenser maintains 0°F (-18°C)

[Read More](#)

T-19FZ



[Click Here for Spec Sheet](#)  
[Click Here for CAD Drawing](#)

Doors	Shelves	Cabinet Dimensions (inches)			HP	Voltage	Amps	Crated Weight (lbs.)
		L	D	H				
1	3	27	24-1/2	75-1/4	1/3	115/60/1	6.8	250



T-19FZ

Results Found: 1

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T Series

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Half-Door Refrigerators

Solid Door -10°F Freezers

Solid Door 0°F Freezers

Glass Door -10°F Freezers

Solid Half Door -10°F Freezers

Slide Door Refrigerators

Dual Temperature

Heated Cabinets

TS Series

Specification Series

Food Prep Tables

Undercounters

Worktops

Chef Bases

T-35

True's solid door reach-in's are designed with enduring quality that protects your long term investment.

Designed using the highest quality materials and components to provide the user with colder product temperatures, lower utility costs, exceptional food safety and the best value in today's food service marketplace.

Oversized, factory balanced, refrigeration system holds 33°F to 38°F (1.5°C to 3.3°C) for the best in food preservation.

[Read More](#)



[Click Here for Spec Sheet](#)  
[Click Here for CAD Drawing](#)

Doors	Shelves	Cabinet Dimensions (inches)			HP	Voltage	Amps	Crated Weight (lbs.)
		L	D	H				
2	6	39-1/2	29-1/2	78-3/8	1/3	115/60/1	7.3	370

Results Found: 7

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10.01A

Job \_\_\_\_\_



**SUPER ADJUSTABLE™ SUPER ERECTA SHELF® WIRE SHELVING**

**Dimensions**

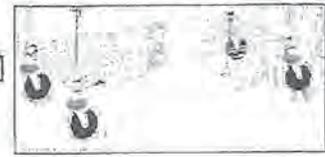
**Super Adjustable™ Super Erecta Wire Shelving**

Model No. Chrome	Model No. Metroseal 3	Model No. Stainless	Shelf Width/Length (in.) (mm)		Approx. Pkd. Wt. (lbs.) (kg)
A1424NC	A1424NK3	A1424NS	14x24	355x610	6 2.7
A1430NC	A1430NK3	A1430NS	14x30	355x760	7 3.2
A1436NC	A1436NK3	A1436NS	14x36	355x914	8 3.6
A1442NC	A1442NK3	A1442NS	14x42	355x1066	9 1/2 4.3
A1448NC	A1448NK3	A1448NS	14x48	355x1219	10 1/2 4.7
A1460NC	A1460NK3	A1460NS	14x60	355x1524	14 6.3
A1472NC	A1472NK3	A1472NS	14x72	355x1829	17 7.7
A1824NC	A1824NK3	A1824NS	18x24	457x610	7 3.2
A1830NC	A1830NK3	A1830NS	18x30	457x760	8 3.6
A1836NC	A1836NK3	A1836NS	18x36	457x914	9 1/2 4.3
A1842NC	A1842NK3	A1842NS	18x42	457x1066	11 5.0
A1848NC	A1848NK3	A1848NS	18x48	457x1219	12 5.4
A1854NC	A1854NK3	A1854NS	18x54	457x1370	14 1/2 6.6
A1860NC	A1860NK3	A1860NS	18x60	457x1524	17 7.7
A1872NC	A1872NK3	A1872NS	18x72	457x1829	20 9.1
A2124NC	A2124NK3	A2124NS	21x24	530x610	8 3.6
A2130NC	A2130NK3	A2130NS	21x30	530x760	9 4.1
A2136NC	A2136NK3	A2136NS	21x36	530x914	11 5.0
A2142NC	A2142NK3	A2142NS	21x42	530x1066	12 5.4
A2148NC	A2148NK3	A2148NS	21x48	530x1219	14 6.4
A2154NC	A2154NK3	A2154NS	21x54	530x1370	16 7.3
A2160NC	A2160NK3	A2160NS	21x60	530x1524	18 8.2
A2172NC	A2172NK3	A2172NS	21x72	530x1829	24 10.9
A2424NC	A2424NK3	A2424NS	24x24	610x610	9 4.1
A2430NC	A2430NK3	A2430NS	24x30	610x760	11 5.0
A2436NC	A2436NK3	A2436NS	24x36	610x914	13 5.9
A2442NC	A2442NK3	A2442NS	24x42	610x1066	15 6.8
A2448NC	A2448NK3	A2448NS	24x48	610x1219	16 7.3
A2454NC	A2454NK3	A2454NS	24x54	610x1370	18 8.6
A2460NC	A2460NK3	A2460NS	24x60	610x1524	21 9.5
A2472NC	A2472NK3	A2472NS	24x72	610x1829	26 11.8
A3036NC		A3036NS	30x36	760x914	15 6.8
A3048NC		A3048NS	30x48	760x1219	21 9.5
A3060NC		A3060NS	30x60	760x1524	26 1/2 11.8
A3072NC		A3072NS	30x72	760x1829	31 14.0
A3636NC		A3636NS	36x36	914x914	18 8.2
A3648NC		A3648NS	36x48	914x1219	23 10.4
A3660NC		A3660NS	36x60	914x1524	29 13.1
A3672NC		A3672NS	36x72	914x1829	34 1/2 15.4



All Environments —  
Metroseal 3™ with  
\*Microban® Antimicrobial  
Product Protection

**Mobile Options**



Stem Casters



Dolly Trucks

NOTE: MICROBAN® protects the Metroseal 3 coating from bacteria, mold, mildew and fungi that cause odors, stains and product degradation. For Metroseal 3 shelving information see sheet #10.10A.



**Replacement Parts**  
Each kit includes components for one original Super Adjustable or Super Adjustable shelf; (4) wedges, (4) sleeves, (4) shelf releases.  
**Model No. SAKITA2**

**SiteSelect™ Posts**

STATIONARY				MOBILE				Approx. Pkd. Wt. (lbs.) (kg)
Actual Height* (in.) (mm)	Model No. Plated	Model No. Metroseal 3	Model No. Stainless	Actual Height* (in.) (mm)	Model No. Plated	Model No. Metroseal 3	Model No. Stainless	
7 3/8 187	7P	7PK3	7PS	6 3/4 171	7UP	7UPK3	7UPS	1/2 0.3
14 3/8 365	13P	13PK3	13PS	13 3/4 349	13UP	13UPK3	13UPS	1 0.5
28 3/8 720	27P	27PK3	27PS	27 3/4 704	27UP	27UPK3	27UPS	1 3/4 0.75
34 3/8 873	33P	33PK3	33PS	33 3/4 857	33UP	33UPK3	33UPS	2 0.9
54 7/16 1382	54P	54PK3	54PS	53 13/16 1366	54UP	54UPK3	54UPS	3 1.4
62 7/16 1585	63P	63PK3	63PS	61 13/16 1570	63UP	63UPK3	63UPS	3 1/2 1.6
				69 3/4 1771	70UP			3 3/4 1.7
74 1/2 1892	74P	74PK3	74PS	73 7/8 1876	74UP	74UPK3	74UPS	4 1.8
86 1/2 2197	86P	86PK3	86PS	85 7/8 2181	86UP	86UPK3	86UPS	4 1/2 2.0
96 1/2 2450	**96P	96PK3	96PS					5 1/2 2.5

\*Actual height for the stationary post includes the post cap and the leveling bolt completely tightened.

**Important:** When ordering by components remember that for maximum stability, units should be kept as wide and low as possible.

All Metro Catalog Sheets are available on our Web Site: [www.metro.com](http://www.metro.com)



**InterMetro Industries Corporation**  
North Washington Street, Wilkes-Barre, PA 18705  
Phone: 570-825-2741 • Fax: 570-825-2852  
For Product Information:  
U.S. and Canada: 1-800-992-1776  
Outside U.S. and Canada: [www.metro.com/contactus](http://www.metro.com/contactus)

Printed in U.S.A. Rev. 4/11  
Information and specifications are subject to change without notice. Please confirm at time of order.

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SUPER ADJUSTABLE™ SUPER ERECTA SHELF®  
**Adjustable Wire Shelving**





Item # \_\_\_\_\_

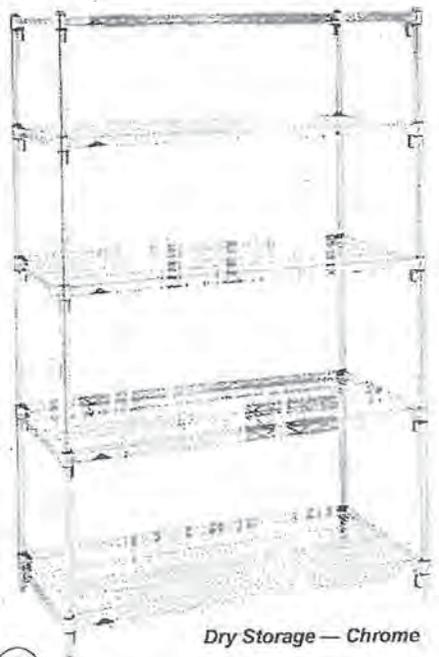
Job \_\_\_\_\_

METRO  
SUPER ADJUSTABLE™ SUPER ERECTA SHELF®  
Adjustable Wire Shelving

## SUPER ADJUSTABLE™ SUPER ERECTA SHELF® WIRE SHELVING

Super Adjustable™ Super Erecta Wire Shelving is the most advanced and innovative wire storage system available.

- **Maximum Space Utilization:** The Corner Release System encourages repositioning of shelves during initial assembly to reclaim wasted vertical space. In some cases, reclaimed vertical space will allow an extra shelving tier to be added to the storage unit resulting in a 25% increase in storage capacity!
- **Easily Assembled:** The unique Corner Release System enables quick and easy repositioning of shelves during the initial set up to accommodate different package or container sizes. "Total Assembly" is complete only after the shelves are properly spaced to maximize storage. SiteSelect™ Posts, with the double-groove visual guide feature, have circular grooves at 1" (25mm) increments and are numbered at 2" (51mm) intervals to easily identify proper shelf locations.
- **Easily Adjustable:** The unique shelf design and SiteSelect™ Posts enable "tool-free", quick adjustment at 1" (25mm) increments along the entire height of the post.
- **Improved Rigidity:** An enhanced Corner Release System has made Super Adjustable™ the most rigid, easily adjustable shelving system ever.
- **Strong:** Super Adjustable™ shelves hold as much weight as traditional Super Erecta wire shelving. Stationary units hold a maximum of 2,000 lb. (910kg). Maximum weight capacity per shelf (48" [1219mm] or shorter = 800 lb. [364kg]; longer than 48" [1219mm] = 600 lb. [273kg])
- **Choice of Finishes:** Super Adjustable™ Super Erecta shelving is available in a variety of finishes: chrome-plated for dry storage; Metroseal 3™ with antimicrobial product protection and Type 304 stainless steel for corrosive environments.
- **Accessories:** Compatible with the entire system of Super Erecta shelves and accessories. See Catalog Sheets 10.04, 10.05, 10.06 for more information.



Corner Release System

### Super Adjustable™ Advantage ...



- Easy "no tool" shelf adjustment
- 1" 25mm spacing minimizes dead space
- Efficient use of space allows more storage levels to be added.
- Storage efficiency can increase by 25% or more!



\*MICROBAN® and the MICROBAN® symbol are registered trademarks of the Microban Products Company, Huntersville, NC.



InterMetro Industries Corporation  
North Washington Street  
Wilkes-Barre, PA 18705  
www.metro.com



10.01A

## SHELVING KITS

Shelving kits specifically designed for each Kold Locker™ walk-in configuration are offered as an optional extra. These kits are shipped with the Kold Locker™ walk-in and Capsule Pak™ refrigeration system so that all necessary components are at your location promptly when you need them. The shelving sets are coded to correspond to the Kold Locker™ walk-in configuration ordered and are offered in either three or four tier.

### TWO TYPES OF SHELVING SYSTEMS ARE AVAILABLE FROM NOR-LAKE.

**A. Green Kote™ Shelving:** Electrostatically applied green baked epoxy over zinc steel and brite basic wire. Thickness: 2-3 mill. 15 year guarantee against corrosion.

**B. Nor-Lake Standard Chrome Kote™ Shelving:** Plated quality wire and steel. Surface nickel chrome plated.

Select the shelving FINISH of your choice. Shelving posts are engineered for maximum strength. Shelves are adjustable on 2" centers. All shelves are NSF listed and are zinc coated with a heavy layer of Protoxy for a maximum life span under humid storage conditions. Special clips are utilized to gain the maximum square footage of storage space for each Kold Locker™ model. 14", 18" and 24" wide shelves are used as required for maximum storage capacity in each set. This wire shelving is ideal for storage of all refrigerated or frozen products.

### SHELVES:

Shelves to have #9 (.148") gauge crosswires spaced 3/4" on centers with crossbraces 1/4" (.192") minimum of 4-3/4" on center.

### Shelf Frames

Channel to be 9/16" x 1" x .075" thick.

### Shelf Collars

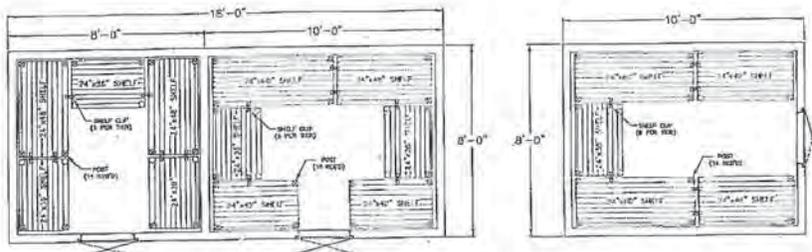
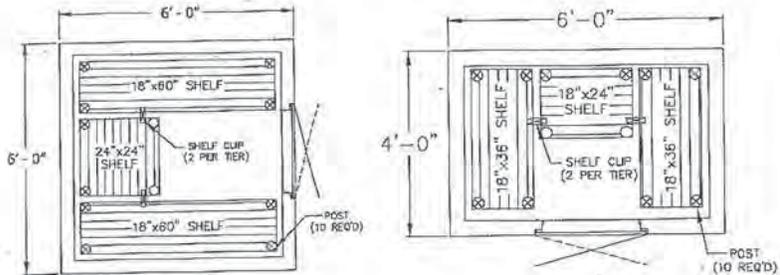
A round tapered 1-5/16" high steel collar to be welded at each corner.

### POSTS

Posts to be .062" thick 1" O.D. round tubing notched every 2" on each corner of the post.

### POST LEVELERS

Installed on the bottom of each post is nylon housing for a steel leveler 3/8"-16 x 1-3/4".



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## **II. Exhibit Materials**

K Specification Section: 23 09 00 Instrumentation and Control for HVAC

## **SECTION 23 09 00 INSTRUMENTATION AND CONTROL FOR HVAC**

### **PART 1 GENERAL**

#### **1.01 RELATED DOCUMENTS**

- A. General: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.
- B. Other Requirements: See Section 23 05 00 "Common Work Results for HVAC" for additional requirements for this section, including but not limited to providing non-equipment-mounted VFDs.
- C. Other Controls: See Section 23 81 29 "Variable Refrigerant Flow (VRF) Systems"

#### **1.02 SUMMARY**

- A. This section includes control equipment for HVAC systems and components, including control components for terminal heating and cooling units not supplied with factory-wired controls.

#### **1.03 DEFINITIONS**

- A. DDC: Direct digital control.
- B. I/O: Input/output.
- C. BACnet: Control network technology platforms for designing and implementing interoperable control devices and networks.
- D. MS/TP: Master slave/token passing.
- E. PC: Personal computer.
- F. PID: Proportional plus integral plus derivative.
- G. RTD: Resistance temperature detector.

#### **1.04 WORK BY OTHERS**

- A. General: Mechanical Contractor installs control valves, taps, and dampers furnished by BAS manufacturer.
- B. Electrical Contractor Provides:
  - 1. Power: 120 V power to BAS and/or temperature control panels. Power is to be connected to the building emergency power system.
  - 2. Wiring: Wiring of power feeds through disconnect starters to electrical motor.
  - 3. Stop/Start Switches: Wiring of remote stop/start switches and manual or automatic motor speed control devices not furnished by BAS manufacturer.
  - 4. Sub-Metering: Wiring of electrical sub-metering devices furnished by BAS manufacturer.

#### **1.05 SYSTEM PERFORMANCE**

- A. Comply with the following performance requirements:
  - 1. Graphic Display: Display graphic with minimum 20 dynamic points with current data within 10 seconds.
  - 2. Graphic Refresh: Update graphic with minimum 20 dynamic points with current data within 8 seconds.
  - 3. Object Command: Reaction time of less than two seconds between operator command of a binary object and device reaction.
  - 4. Object Scan: Transmit change of state and change of analog values to control units or workstation within 6 seconds.
  - 5. Alarm Response Time: Annunciate alarm at workstation within 45 seconds. Multiple workstations must receive alarms within 5 seconds of each other.
  - 6. Program Execution Frequency: Run capability of applications as often as 5 seconds, but selected consistent with mechanical process under control.
  - 7. Performance: Programmable controllers shall execute DDC PID control loops and scan and update process values and outputs at least once per second.
  - 8. Reporting Accuracy and Stability of Control: Report values and maintain measured variables within tolerances as follows:
    - a. Water Temperature: Plus or minus 1 degrees F.
    - b. Water Flow: Plus or minus 5 percent of full scale.
    - c. Water Pressure: Plus or minus 2 percent of full scale.
    - d. Space Temperature: Plus or minus 1 degrees F.

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- e. Ducted Air Temperature: Plus or minus 1 degrees F.
- f. Outside Air Temperature: Plus or minus 2 degrees F.
- g. Dew Point Temperature: Plus or minus 3 degrees F.
- h. Temperature Differential: Plus or minus 0.25 degrees F.
- i. Relative Humidity: Plus or minus 5 percent.
- j. Airflow (Pressurized Spaces): Plus or minus 3 percent of full scale.
- k. Airflow (Measuring Stations): Plus or minus 5 percent of full scale.
- l. Airflow (Terminal): Plus or minus 10 percent of full scale.
- m. Air Pressure (Space): Plus or minus 0.01-inch w.g.
- n. Air Pressure (Ducts): Plus or minus 0.1-inch w.g.
- o. Carbon Monoxide: Plus or minus 5 percent of reading.
- p. Carbon Dioxide: Plus or minus 50 ppm.
- q. Electrical: Plus or minus 5 percent of reading.

### 1.06 SEQUENCE OF OPERATION

- A. General: See Drawings for control sequences.

### 1.07 ACTION SUBMITTALS

- A. Product Data: Include manufacturer's technical literature for each control device. Indicate dimensions, capacities, performance characteristics, electrical characteristics, finishes for materials, and installation and startup instructions for each type of product indicated.
  - 1. DDC System Hardware: Bill of materials of equipment indicating quantity, manufacturer, and model number. Include technical data for operator workstation equipment, interface equipment, control units, transducers/transmitters, sensors, actuators, valves, relays/switches, control panels, and operator interface equipment.
  - 2. Control System Software: Include technical data for operating system software, operator interface, color graphics, and other third-party applications.
  - 3. Controlled Systems: Instrumentation list with element name, type of device, manufacturer, model number, and product data. Include written description of sequence of operation including schematic diagram.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  - 1. Bill of materials of equipment indicating quantity, manufacturer, and model number.
  - 2. Schematic flow diagrams showing fans, pumps, coils, dampers, valves, and control devices.
  - 3. Wiring Diagrams: Power, signal, and control wiring.
  - 4. Details of control panel faces, including controls, instruments, and labeling.
  - 5. Written description of sequence of operation.
  - 6. Schedule of dampers including size, leakage, and flow characteristics.
  - 7. Schedule of valves including flow characteristics.
  - 8. DDC System Hardware:
    - a. Wiring diagrams for control units with termination numbers.
    - b. Schematic diagrams and floor plans for field sensors and control hardware.
    - c. Schematic diagrams for control, communication, and power wiring, showing trunk data conductors and wiring between operator workstation and control unit locations.
  - 9. Controlled Systems:
    - a. Schematic diagrams of each controlled system with control points labeled and control elements graphically shown, with wiring.
    - b. Scaled drawings showing mounting, routing, and wiring of elements including bases and special construction.
    - c. Written description of sequence of operation including schematic diagram.
    - d. Points list.
- C. Samples for Initial Selection: For each color required, of each type of thermostat or sensor cover with factory-applied color finishes.
- D. Samples for Verification: For each color required, of each type of thermostat or sensor cover.

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### 1.08 INFORMATIONAL SUBMITTALS

- A. Data Communications Protocol Certificates: Certify that each proposed DDC system component complies with ASHRAE 135.
- B. Data Communications Protocol Certificates: Certify that each proposed DDC system component complies with LonWorks.
- C. Qualification Data: For Installer and manufacturer.
- D. Software Upgrade Kit: For Owner to use in modifying software to suit future systems revisions or monitoring and control revisions.
- E. Field quality control test reports: Provide.

### 1.09 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For HVAC instrumentation and control system to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 01 78 23 "Operation and Maintenance Data," include the following:
  - 1. Maintenance instructions and lists of spare parts for each type of control device and compressed air station.
  - 2. Interconnection wiring diagrams with identified and numbered system components and devices.
  - 3. Keyboard illustrations and step-by-step procedures indexed for each operator function.
  - 4. Inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.
  - 5. Calibration records and list of setpoints.
- B. Software and Firmware Operational Documentation: Include the following:
  - 1. Software operating and upgrade manuals.
  - 2. Program Software Backup: On compact disc or electronically, complete with data files.
  - 3. Device address list.
  - 4. Printout of software application.
  - 5. Software license required by and installed for DDC workstations and control systems.

### 1.10 QUALITY ASSURANCE

- A. Installer Qualifications: Automatic control system manufacturer's authorized representative who is trained and approved for installation of system components required for this Project.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with ASHRAE 135 for DDC system components.

### 1.11 DELIVERY, STORAGE, AND HANDLING

- A. Factory-Mounted Components: Where control devices specified in this section are indicated to be factory-mounted on equipment, arrange for shipping of control devices to equipment manufacturer.
- B. System Software: Update to latest version of software at Project completion.

### 1.12 COORDINATION

- A. Coordinate location of thermostats, humidistats, and other exposed control sensors with plans and room details before installation.
- B. Coordinate controls with Section 23 81 29 "Variable Refrigerant Flow (VRF) Systems" to provide VRF DDC interface.
- C. Coordinate equipment with Section 28 13 00 "Access Control and Security Systems" to achieve compatibility with equipment that interfaces with that system.
- D. Coordinate equipment with Section 26 09 23 "Lighting Control Devices" to achieve compatibility with equipment that interfaces with that system.
- E. Coordinate equipment with Section 28 31 10 "Fire Detection and Alarm Systems" achieve compatibility with equipment that interfaces with that system.
- F. Coordinate supply of conditioned electrical branch circuits for control units and operator workstation.
- G. Coordinate equipment with Section 26 24 16 "Panelboards" to achieve compatibility with starter coils and annunciation devices.

## PART 2 PRODUCTS

### 2.01 ACCEPTABLE MANUFACTURERS

- A. Basis-of-Design BAS Software Manufacturers: System software graphics and programming design is based on software manufactured by Delta Connects BACnet (provided by local Delta Connects office). Provide software manufactured by the basis-of-design manufacturer, or comparable products by the following:
  - 1. Tridium Inc. ([www.tridium.com](http://www.tridium.com))
- B. Basis-of-Design BAS Hardware Manufacturers: System component design, except where specified otherwise, is based on hardware manufactured by Delta Connects (provided by local Delta Connects office). Provide hardware manufactured by the basis-of-design manufacturer, or comparable products by the following:
  - 1. Tridium Inc. ([www.tridium.com](http://www.tridium.com))
- C. System Requirements: System components shall be, to greatest extent possible, manufactured by a single manufacturer. Local branch (or company) engineers and technicians shall directly supervise installation and point-to-point checkout of installing subcontractor. This local branch (or company) shall maintain a service organization that stocks, and has direct factory access to, manufacturer's standard parts and shall be capable of system inspection, troubleshooting, maintenance, and service.

### 2.02 SYSTEM DESCRIPTION

- A. General:
  - 1. Distributed Logic BAS: Provide complete with software and hardware functions. This system shall control mechanical equipment including unitary equipment such as heat pumps, fan coils, AC units, makeup air units, fans, and DOAS units as detailed in this Specification.
  - 2. BAS: Provide a fully distributed processing, online, real-time, direct digital control building controls subsystem as an integral part of BAS, in compliance with applicable codes and as reviewed by authorities having jurisdiction at Project site. Communication between nodes shall be digital only.
  - 3. Auto Communications: Network shall support internet access via Owner's internet provider for e-mailed alarm access.
  - 4. Software: Provide software on owner workstations connected to DDC network.
  - 5. Open Architecture at field controller levels: Network shall utilize an open architecture capable of one or more of following:
    - a. Connectivity via BACnet as per ANSI/ASHRAE Standard 135.
  - 6. Additional Requirements: BAS shall interact with equipment such as VRF systems, or local controllers that are provided by other trades. BAS Contractor shall provide equipment and connections to integrate these devices.
- B. BAS Software BACnet: Operator's workstation software shall be Microsoft Windows, most current version supported by BAS manufacturer. Software shall include password protection, alarming, logging of historical data, graphics including animation, suite of field engineering tools including graphical programming, and applications.
  - 1. Building Controllers: Include complete energy management software, including scheduling building control strategies and logging routines. Energy management software and firmware shall be resident in field hardware and shall not be dependent on operator's terminal. Operator's terminal software shall be used for access to field-based energy management function only. Provide zone-by-zone direct digital logic control of space temperature, scheduling, run-time accumulation, equipment alarm reporting, and override timers for after-hours usage.
  - 2. Application Controllers: Provide for every terminal unit, air handler, central plant equipment, and other programmable controlled equipment. Application controllers shall be mounted next to controlled equipment and communicate with building controller via LAN.

### 2.03 NETWORK

- A. First Tier Communications: First tier network shall provide communications between operator workstations and first tier network controllers. It shall be based on PC industry standard Ethernet TC/IP and shall use BACnet as first tier network communication protocol. First tier network shall operate at a minimum communication speed of 10 Base-T or 100 Base-TX, with full peer-to-peer network communication. Workstation and network controller LAN cards shall be standard "off-the-shelf" products available through normal PC vendor channels.
- B. First Tier Network: First tier network shall be provided its own dedicated cable as a private network, unless otherwise noted on Drawings, Specifications, or by prior review. BAS network shall support both copper and optical fiber communication media to comply with applicable codes, ordinances, and regulations and authorities having jurisdiction. It shall be color coded and labeled with BAS manufacturer's name.

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- C. Interconnecting Devices: Provide gateways, routers, repeaters, transceivers, hubs, and other devices to interconnect operator workstations and network controllers. Equipment shall comply with IEEE 802.3 or Ethernet Version 2 (V2.0) specifications.
- D. Telephone Lines: Owner shall provide private and public telephone lines, ISDN lines, and Internet Service Provider connections for Contractor to complete BAS work as specified, at Owner's cost. Contractor shall identify specific BAS requirements in a Shop Drawing submittal.
- E. IT Interface Equipment: Provide IT interfacing equipment and coordinate on configuration and interfacing arrangements with Data Cabling System Contractor.
- F. Second Tier Networks: Second tier networks shall provide either peer-to-peer, master-slave, or supervised token passing communications, and shall operate at a minimum communication speed of 9.6 to 76.8 Kbps. Application-specific controllers shall reside on second tier. Communication protocol can be BACnet or LonTalk.
- G. Third Party Interface:
  - 1. BAS Contractor:
    - a. Shall integrate real-time data from building systems and databases originating from others.
    - b. Shall not be responsible for execution of scheduling of Work of other trades.
  - 2. Contractors Supplying other Associated Systems and Equipment: Contractors shall provide hardware and software and cooperate fully with BAS Contractor at their cost to ensure complete data integration.
  - 3. BAS: BAS hardware equipment and software shall allow data communications between BAS building systems supplied by others, utilizing standard protocols of LonWorks, BACnet, and/or Modbus. See sequence of operation for details.
  - 4. Integration: Third-party interfaces shall extend to operator's workstation software, which shall support user interaction with all control system components. Methods of integration shall include industry standard protocols such as BACnet, LonMark/LonTalk, OLE for Process Control (OPC), Modbus, or integrator interfaces between cooperating manufacturer's systems.

### 2.04 INTERFACE

- A. BAS supplier shall provide graphical interface that allows users to access real-time BAS data, configure data, archive data, monitor, command, commission, edit, and perform system diagnostics via local network from owner's designated workstations. Provide workstation software, which shall support user interaction with all control system components. Allow unlimited simultaneous users to access DDC system network, with ability to expand system to accommodate additional users.
- B. Remote Communications: Provide functions that allow remote communications via modem to off-site locations. Include one modem along with cabling for system installation. It shall be possible to use onboard modem or a separate modem connected via PTP/RS-232 connection.
  - 1. Building Controller:
    - a. Shall have capability to call out alarm conditions automatically. If desired, controller shall also send encoded message to digital pager. If an alphanumeric pager is in use by operator, building controller shall be capable of sending a text or numeric string of alarm description. Building controllers connected to local LAN shall be capable of calling out alarm messages through one or more shared modems connected to one or more building controllers on local LAN.
    - b. Shall have capability to call a minimum of 20 different phone numbers. Numbers called shall be controlled by type of alarm or time schedule.
  - 2. Phone Line: Owner shall provide standard voice-grade phone line for remote communication function if required.
  - 3. Baud Rates: Universal network controller and internal modem shall be capable of modem-to-modem baud rates of 33.6 Kbps minimum over standard voice-grade phone lines. Lower baud rates shall be selectable for areas where local phone company conditions require them.
  - 4. Wireless Ethernet Docking Station: At locations where Universal Network controllers are provided, provide a wireless Ethernet docking station (minimum one station per mechanical/fan room). Station shall be capable of supporting laptop computer interface capability.

### 2.05 BUILDING CONTROLLER

- A. General: Building controller shall be capable of providing building-wide network control strategies for system based on information from a system object regardless of whether object is directly monitored by controller or by another controller. Program that implements these strategies shall be completely flexible and user definable. Systems utilizing factory pre-programmed strategies

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that cannot be modified by field personnel on site or downloaded via remote communications are not acceptable. Changing Building Controller strategies via firmware changes is also unacceptable.

- B. Programming: Programming shall be object-oriented using control function blocks, supporting DDC functions, with analog and binary values to accomplish sequences. Flowcharts shall be generated and automatically downloaded to controller. Programming tool shall be resident on workstation. Contractor shall provide programming tools for controllers.
- C. Graphical View: Provide means to graphically view inputs and outputs to each program block in real time as program is executing. This function shall be performed via operator's workstation or field computer.
- D. Real Time: Building controller shall provide battery backup real-time (hardware) clock functions.
- E. Memory: Controller shall have memory needed to ensure high performance and data reliability. Battery shall retain static RAM memory for a minimum of 1.5 years, cumulative. Battery backup shall provide real time clock functions for a minimum of 72 hours.
- F. Control Functions: Global control algorithms and automated control functions shall execute via a 64-bit processor.
- G. Battery: Controller installation shall include memory-free gel-cell battery providing ongoing power conditioning and noise filtering for operation data integrity. It shall provide a minimum of five minutes of powerless operation.
- H. Schedules: Each building controller shall support schedule and calendar objects for number of zones of control connected to building controller.
- I. Logging Capabilities:
  - 1. Trend Logs: Each building controller shall log points (real or calculated) located in building controller. Objects in system (real or calculated) shall be logged. Sample time interval shall be adjustable at operator's workstation.
  - 2. Points: Points, physical or calculated, may be designated for trending. Trending may be triggered on a defined time interval, upon a change in value, or when a value exceeds a range.
  - 3. Remote Locations: Logs shall be viewed either on site or off site via remote communication.
  - 4. Building Controller: Controller shall periodically upload trended data to networked operator's workstation for long-term archiving if desired.
  - 5. Archived Data: Data stored in database format shall be available for use in third-party spreadsheet or database programs.
- J. Alarm Generation:
  - 1. Alarms:
    - a. Alarms shall be generated within system for object change of value or state, either real or calculated. This includes things such as analog object value changes, binary object state changes, and various controller communication failures.
    - b. Each alarm shall be distributed via text, phone, or e-mail as noted above.
  - 2. Alarm Log: Provide for alarm viewing. Log shall be viewed on site at operator's terminal or off-site via remote communications.
  - 3. Alarm Messages: In addition to point's descriptor and time and date, user shall be able to print, display, or store a minimum 65-character alarm message to more fully describe alarm condition or direct operator response. Each standalone building controller shall be capable of storing a library of alarm messages sufficient for number of alarm points in building controller. Each message may be assignable to number of points in panel.

### 2.06 AIR HANDLER APPLICATION CONTROLLERS

- A. General: Provide one controller for each air handler and for central plant control that covers objects listed in object list. Controllers shall include input, output, and self-contained logic program needed for complete control of units. Controllers shall be fully programmable. Programming tool shall be resident on operator workstation.
- B. Application Controllers: Application controllers shall include analog and binary inputs with 10-bit resolution that accepts 3K or 10K thermistors, 1,000 Ohm RTD temperature elements, NI, SI, PT, 0 to 10 VDC, 0 to 5 VDC, 4 to 20 mA, and dry contact signals. Controller shall include binary and analog outputs on board. Analog outputs shall be either 0 to 10 VDC or 0 to 20 mA. Software shall include scaling features for analog outputs. Include 24 VDC voltage supply for use as power supply to external sensors.
- C. Programming Sequences: Program sequences shall be stored on board application controller in flash RAM. No batteries shall be needed to retain logic program during normal operations. Programming of application controller shall be completely modifiable in field over provided LANs or remotely via modem interface. Application controller shall be programmed using programming tools as described in operator's terminal section.

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- D. Base Unit: Base unit of controller shall host expansion modules with various I/O combinations. These inputs and outputs shall include several combinations of binary inputs and outputs and analog inputs and outputs. Inputs shall support thermistors, dry contacts, or pulse inputs directly.
- E. Time Clock: Each controller shall support its own real-time operating system. Provide a time clock with battery backup to allow standalone operation and ensure protection during power outages. Clock operation shall be overridden by Universal Network controller time clock to ensure network continuity.
- F. Storage: Databases and programs shall be stored in non-volatile flash RAM or a minimum of 100-hour battery backup shall be provided. Upon transfer from normal to emergency power and back to normal power, DDC controlled setpoints, proportional bands, control algorithms, and other programmable parameters shall be maintained such that a normal power failure does not necessitate reprogramming or rebooting of controller and control functions shall proceed as if no interruption of normal power occurred. Programs shall be field-customized to meet user's exact control strategy requirements.
- G. Certifications: Controller shall be listed for UL 916 and UL 864 UUKL for smoke control.
- H. Manual Overrides:
  - 1. Manual Override Switches: Provide for binary outputs. Switches shall be mounted within system controller key accessed enclosure or adjacent local control panel.
  - 2. Switches for Analog Outputs: Switches shall be rotary gradual position, providing full analog signal range of associated analog output, and shall be operable whether panel processor is operational or not.
- I. Local LCD Display Capability: Provide local LCD display for each application controller. LCD shall have a minimum of four lines of text with 20 characters per line. Display shall have a built-in status and adjust panel interface to allow for local adjustment of setpoints, temporary override of input or output points, and status of points in alarm. LCD display shall include a password system that allows access to system controller.

### 2.07 TERMINAL UNIT APPLICATION CONTROLLERS (HEAT PUMPS, AC UNITS, FAN COILS)

- A. General: Provide one unitary controller for each piece of unitary mechanical equipment that covers objects listed in object list for unit. Controllers shall interface to building controller via LAN. Controllers shall include input, output, and self-contained logic program as needed for complete control of unit. Each unitary controller shall operate as a standalone controller capable of performing its specified control responsibilities independently of other controllers in network. Each unitary controller shall be a microprocessor based, multi-tasking, real-time digital control processor.
- B. Unitary Controllers: Unitary controllers shall include analog and binary inputs that accept 3K or 10K thermistors, 1,000 Ohm RTD temperature elements NI, SI, or PT, 0 to 10 VDC, 0 to 5 VDC, 4 to 20 mA, and dry contact signals. Controller shall include binary and analog outputs onboard as needed. Analog outputs shall be either 0 to 10 VDC or 0 to 20 mA. Software shall include scaling features for analog outputs. Provide 24 VDC voltage supply for use as power supply to external sensors.
- C. Storage: Program sequences shall be stored on board controller in flash RAM. No batteries shall be needed to retain logic program.
- D. Power Fail Protection: System setpoints, proportional bands, control algorithms, and other programmable parameters shall be stored such that a power failure does not necessitate reprogramming controller. Programming of application controller shall be completely modifiable in field over provided LANs or remotely via modem interface. Unitary controllers shall directly support temporary use of a portable service terminal that can be connected via zone temperature sensor or directly at controller. Vendor-specific programming tools shall be provided as part of system (other than a standard laptop).
- E. Certifications: UL 916, UL 864 UUKL for smoke control.

### 2.08 VAV BOX CONTROLLERS – SINGLE DUCT

- A. General: Provide one VAV controller for each VAV box that covers objects listed in object list for unit. Controllers shall interface to building controller via LAN. Controllers shall include on-board CFM flow sensor, inputs, outputs, and a programmable, self-contained logic program for control of units.
- B. Configurations: VAV terminal unit controllers shall support, but not be limited to, control of following configurations of VAV boxes to address current requirements described in Execution portion of this Specification and for future expansion:
  - 1. Single Duct Only: Cooling or cooling with reheat.
  - 2. Fan Powered: Parallel or series.
  - 3. Supply/Exhaust: Provide.

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- C. Outputs: VAV terminal unit controllers shall support following types of point outputs:
  - 1. Cooling Outputs: Proportional cooling outputs.
  - 2. Heating Outputs: Proportional or 1 to 3 stages.
  - 3. Fan Control Output: On/off or proportional fan logic.
- D. Valves: VAV box zone reheat valves shall be proportional control (0 to 10 VDC or 4 to 20 mA only).
- E. Features: VAV terminal unit controllers shall have following features:
  - 1. Controller: A configurable digital controller with differential pressure transducer and damper actuator.
  - 2. Damper Actuator: A fast response motor capable of stroking 90 degrees in 30 seconds for quick damper positioning.
  - 3. Airflow Measurement: Determine airflow by dynamic pressure measurement using an integral differential pressure transducer. Transducer shall be maintenance free and shall not require air filters.
  - 4. Calibration: Automatically calibrate flow sensor to eliminate pressure transducer offset error due to ambient temperature/humidity effects.
  - 5. Control Loops: Utilize a proportional plus integral (PI) algorithm for space temperature control loops.
  - 6. Controller Function: Utilize self-tuning PI loops or field-tune loops to reduce actuator duty cycle and prevent system hunting.
  - 7. Communications: Download and upload configuration files, both locally and via communications network. Controllers shall be able to be loaded individually or as a group using a zone schedule generated spreadsheet of controller parameters.
  - 8. Setpoint Changes: Control setpoint changes initiated over network shall be written to non-volatile memory to prevent loss of setpoint changes and to provide consistent operation in event of communication failure.
  - 9. Firmware: Flash upgradeable.
  - 10. Loss of Signal: Provide fail-safe operation if airflow signal becomes unreliable by automatically reverting to a pressure dependent control mode.
  - 11. Diagnostics: Detects system error conditions to assist in managing VAV zones. Error conditions shall consist of:
    - a. Unreliable space temperature sensor.
    - b. Unreliable differential pressure sensor.
    - c. Starved box.
    - d. Insufficient cooling.
    - e. Insufficient heating.
  - 12. Alarm Management: Each VAV terminal unit controller shall perform its own limit and status monitoring and analysis to maximize network performance by reducing unnecessary communications.
  - 13. Enclosure: Provide enclosure with UL 94-5B plenum flammability rating designed for duct installation. FCC Part 15, Subpart B.
  - 14. Certification: VAV terminal unit controller shall be listed for UL 916 and UL 864 UUKL for smoke control.
- F. Temperature Sensor: Provide duct temperature sensor at discharge of each VAV box with reheat that is connected to controller for reporting back to operator workstation.

### 2.09 FIELD DEVICES

- A. Temperature Sensors:
  - 1. General:
    - a. Fan coil from temperature sensors are provided by VRF system manufacturer. See Section 23 81 29.
    - b. Room temperature sensors shall be provided where indicated on Drawings. Temperature sensors shall be solid-state electronic, factory calibrated. Sensor accuracy shall be 0.36 degrees F over range of 40 to 100 degrees F. Mount centerline of sensor 48.00 inches above finished floor unless otherwise indicated on Architectural room elevations.
    - c. Duct sensors shall be rigid or flexible probe. Sensors in mixed air stream shall be averaging type with sensor element length for complete duct coverage (provide at least 1.00 feet of element length per 2.00 square feet of duct cross sectional area) arranged to cover entire duct area evenly. Sensor accuracy shall be 0.5 degrees F over range of 40 to 180 degrees F.
    - d. Control Contractor shall provide immersion sensors to Mechanical Contractor. Mechanical Contractor shall provide immersion sensors in wells filled with thermal compound before installation of immersion sensors. Sensor accuracy shall be 0.5 degrees F over range of 40 to 200 degrees F.
    - e. Outside air sensors shall be provided away from exhaust or relief vents, not in an outside air intake and in location that is in shade most of day. Provide outside air temperature sensors with watertight inlet fitting and sunlight shield. Sensor accuracy shall be 0.5 degrees F over range of minus 40 to 120 degrees F.

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2. Intelligent Room Sensor with LCD Readout:
    - a. Sensor shall contain a backlit LCD digital display and user function keys along with temperature sensor. Controller shall function as room control unit, shall allow occupant to raise and lower setpoint, and activate terminal unit for override use – all within limits as programmed by building operator. Sensor shall also allow service technician access to hidden functions as described in Sequence of Operation.
    - b. Sensor shall display room temperature. Unit shall be programmable. Unit shall have capability to show temperatures in Fahrenheit or Centigrade.
    - c. Override time shall be set and viewed. Override time countdown shall be automatic, but shall be reset to zero from sensor by occupant.
    - d. Allow fan speed selection based upon fan operation allowed by controller.
    - e. See Sequence of Operation for specific operation of LCD displays and function keys in field service mode and in normal occupant mode.
    - f. Field service mode shall be customizable to fit different applications.
  3. Wall Sensor with Adjustable Setpoint: Standard wall sensor shall use solid-state sensor identical to intelligent room sensor and shall be packaged in aesthetically pleasing enclosure. Sensor shall provide override function, warmer/cooler lever for setpoint adjustment, and port for plug-in of laptop or field service tool for field adjustments. Override time shall be stored and be adjustable on a zone-by-zone basis. Adjustment range for warmer/cooler lever shall also be stored in non-volatile RAM on controller. Programmable variables shall be available to field service tool or laptop through wall sensor port (RJ-11 jack).
  4. Wall Sensor with Nonadjustable Setpoint: Room sensors shall be architecturally pleasing with blank cover, sense temperature, and allow tenant to override system. Setpoints shall be adjustable from operator workstation, laptop, or field service tool.
  5. Guards: Heavy-duty plastic coated metal type with secure backing plate, removable with a Phillips screwdriver. Provide protective metal guards on room sensors located in public lobbies, corridors, or where sensors are subject to damage.
- B. Humidity Sensors:
1. General: Relative humidity (RH) sensors shall use bulk polymer or thin film capacitive type non-saturating sensing elements capable of withstanding a saturated condition without permanently affecting calibration or sustaining damage. Sensors shall include removable protective membrane filters. Sensors shall have an accuracy of plus or minus 2 percent of full scale with a temperature dependence of less than plus or minus 2 percent from 20 to 100 degrees F. A transmitter located at sensor shall be provided to convert sensor output to a linear 4 to 20 mA DC output corresponding to humidity span. Transmitter shall include non-interacting zero and span adjustments. Sensor and transmitter shall be wall mount or duct mount type as indicated on Contract Drawings. Where required for exterior installation, sensors shall be capable of surviving below freezing temperatures and direct contact with salt laden air without affecting sensor calibration.
  2. Space Humidistat: Humidistat shall have positive ON-OFF settings to allow manual operation of controlled equipment. Device shall have an impact-resistant, molded plastic cover and shall be capable of being mounted on wall. Full enclosed SPDT; snap acting switch shall be rated for 2 amps at 24 VDC. Sensing element shall consist of a thin, moisture-sensitive nylon ribbon that provides operation even when ambient temperature conditions change.
- C. Electric Damper Actuators:
1. General: Damper actuators shall be Brushless DC Motor Technology with stall protection, bi-directional, fail-safe spring return. Provide spring return actuators where damper is in direct contact with outside air and where applicable for spring return. Damper actuators shall have metal housing, manual override (on actuators except VAV boxes) with independently adjustable dual auxiliary switch.
  2. Electric Control Actuation: Direct coupled actuators shall be utilized for electric control actuation. Delta Controls.
  3. Assembly: Actuator assembly shall include hardware for mounting and connection to a standard 0.50-inch-diameter shaft or damper blade. Actuators shall be designed for mounting directly to damper shaft without need for connecting linkages.
  4. Self-Centering Capability: Actuators having more than 100-lb-in torque output shall have a self-centering damper shaft clamp that guarantees concentric alignment of actuator's output coupling with damper shaft. Self-centering clamp shall have a pair of opposed "V" shaped toothed cradles, each having two rows of teeth to maximize holding strength. A single clamping bolt shall simultaneously drive both cradles into contact with damper shaft.
  5. Shaft Size: Actuators having more than a 100-lb-in torque output shall accept a 1.00-inch-diameter shaft directly, without need for auxiliary adapters.
  6. Certifications: Actuators shall be designed and manufactured using ISO 9000 registered procedures, and shall be listed under Standards UL 873 and CSA C22.2 No. 24-93 1.
  7. Failure: Unless otherwise required or indicated by control sequence, damper actuator shall fail in place.

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### D. Automatic Control Dampers (ACD):

1. **General:** Individual damper blades shall be a maximum of 6.00 inches wide and/or 4.00 feet long. Edge seals for 0 to 180 degrees F operating temperatures. Blade linkages shall be attached at midpoint of blade length. Provide actuators for application. Provide one actuator for every 20.00 square feet of damper. Actuators shall utilize spring return on outside air applications. Provide positioning relays on pneumatic actuators to stroke damper(s) properly (i.e., sufficient power, sequencing, repeatability, or speed of response). Standard dampers shall be Ruskin CD36, butterfly dampers shall be Ruskin CDRS25, and low-leakage dampers shall be Vent Products 5900, or reviewed products provided by Vent Products, Air Balance, Johnson Controls, or Honeywell. Actuators shall be manufactured by Delta Controls.
2. **ACD – Standard Modulating Type:** Opposed blade type unless indicated otherwise. Blades and internally braced frames shall be constructed of 16 gauge-galvanized steel. Blades shall be equipped with 0.50-inch minimum thickness axles, molded synthetic bearings, EDPM or vinyl edge seals, and a flexible aluminum or stainless steel compression type jamb seal. Leakage shall not be greater than 7 CFM per square foot at 1.00-inch static pressure difference, regardless of damper size. Damper shall have a maximum operating static pressure differential of 2.00 inches. Unless indicated otherwise, dampers shall be sized for a maximum pressure drop of 0.10 inches at maximum design airflow.
3. **ACD – Standard Two-Position Type:** Parallel blade type with construction and performance same as specified for modulating type. Unless indicated otherwise, dampers shall be same size as duct. Where dampers are not provided in a duct, dampers shall be sized for a maximum pressure drop of 0.05 inches at maximum design airflow.
4. **ACD – Butterfly Two-Position Type:** Single round butterfly blade consisting of two layers of galvanized steel with a neoprene edge seal sandwiched between them. Frame shall be constructed of 20-gauge galvanized sheet steel and have a smooth interior air stream surface with no projections. Frames shall have rolled stiffener beads to facilitate sealing of a slip on a duct connection. Blade shall be equipped with a 0.50-inch minimum diameter axle with stainless steel sleeves for bearings. Leakage shall not be greater than 0.15 CFM per inch of blade circumference at 4.00-inch static pressure difference. Unless indicated otherwise, dampers shall be same size as duct. Where dampers are not provided in a duct, dampers shall be sized for a maximum pressure drop of 0.05 inches at maximum design airflow.
5. **ACD – Low-Leakage Modulating Type:** Opposed blade type unless indicated otherwise. Internally braced frames shall be constructed of 16-gauge galvanized steel. Airfoil blades shall be equipped with 0.50-inch minimum thickness axles, stainless steel or bronze sleeve bearings, field replaceable EDPM or vinyl edge seals, and a flexible aluminum or stainless steel compression type jamb seal. Leakage shall not be greater than 10.5 CFM per sq ft at 4.00-inch static pressure difference, regardless of damper size. Damper shall have a maximum operating static pressure differential of 6.00 inches and be capable of operating with face velocities up to 3,000 fpm. Unless indicated otherwise, dampers shall be sized for a maximum pressure drop of 0.10 inches at maximum design airflow.
6. **ACD – Low-Leakage Two-Position Type:** Parallel blade type with construction and performance same as specified for low-leakage modulating type. Unless otherwise indicated, dampers shall be same size as duct; where dampers are not provided in a duct, dampers shall be sized for a maximum pressure drop of 0.05 inches at maximum design airflow.
7. **Damper End Switches:** Damper end switches shall be momentary type limit switches for monitoring motion of damper at a prescribed arc of rotation. Switch shall be hermetically sealed mercury contacts that operate by way of a trip lever. Switch shall be mounted on exterior of duct so that trip lever is aligned with damper vane. Mechanical adjustments in switch case shall permit lever action for tripping mercury switch contacts. Switch shall have a SPDT contact arrangement that exceeds load requirements for both voltage and current.

### E. Pressure Sensors:

1. **Air Differential Pressure Switches:** Diaphragm actuated switch with adjustable setpoint fixed differential, automatic reset, and angle tipped static pressure probes. Range of switch to accommodate operating range of system being monitored plus and minus 20 percent, 12.00-inch maximum operating differential.
2. **Filter Differential Pressure Sensors:** Provide a differential pressure sensor that shall sense a change in differential pressure drop as airflow across filter changes. Provide adjustable software setpoint for alarm.
3. **Pressure Safety Switches:** Provide static pressure high limit and low limit switches as required by sequence of operation to sense duct over-pressure or under-pressure condition. Provide with adjustable setpoint. Provide with spare contacts for monitoring by control system. Provide switch for duct mounting. Dwyer or Ashcroft.
4. **Building Differential Pressure Transmitters:**
  - a. Building differential pressure transmitters shall be of industrial quality and transmit a linear, 4 to 20 mA output in response to variation of differential pressure or air pressuring sensing points. Differential pressure transmitter shall have non-interactive zero and span adjustments that are adjustable from outside cover and meet following performance specifications:
    - 1) Minus 1.00 to plus 1.00 w.c. input differential pressure ranges. (Select range for system application.)

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- 2) 4 to 20 mA output.
      - 3) Maintain accuracy up to 20 to 1 ratio turndown.
      - 4) Reference Accuracy: Plus or minus 0.25 percent of full span.
    - b. Manufacturer: Veris or Setra.
  5. Duct Differential Pressure Transmitters:
    - a. Duct differential pressure transmitters shall be of industrial quality and transmit a linear, 4 to 20 mA output in response to variation of differential pressure or air pressure sensing points. Differential pressure transmitter shall have non-interactive zero and span adjustments that are adjustable from outside cover and meet following performance specifications:
      - 1) 1.00 inch to 5.00 inches w.c. input differential pressure ranges. (Select range for system application.)
      - 2) 4 to 20 mA output.
      - 3) Maintain accuracy up to 20 to 1 ratio turndown.
      - 4) Reference Accuracy: Plus or minus 0.25 percent of full span.
    - b. Manufacturer: Veris or Setra.
  6. Velocity Sensors: Velocity sensor shall be used to measure differential pressure to determine air velocity for calculating airflow in VAV terminal units. Sensor shall measure differential pressure and generate a proportional voltage signal. Voltage signal shall be read by VAV controller and converted to airflow in cubic feet per minute (CFM). Calibration shall be performed within controller. Pressure range 0 to 1.50 inches w.c. maximum overpressure limit 15.00 inches w.c. Accuracy linearity 1.0 percent full span maximum. Repeatability/ hysteresis 0.05 percent full span maximum. UL 916 listed.
  7. Pressure Electric (PE) Switches: Provide with adjustable setpoint and differential range.
  8. Liquid Flow Switch:
    - a. Paddle type, 150 psig maximum working pressure, and flow actuation sensitivity for application.
    - b. Manufacturer: Delta Controls.
- F. Gas Sensors:
1. CO2 Sensors: Provide an electronic sensor to monitor amount of CO2 in air in range of 0 to 2,000 parts per million (ppm) for duct or wall mounting. Measuring principal shall be based on infrared spectroscopy or non-dispersive CO2 sensing technology. Internal electronics shall require a 24 VAC power supply and shall calculate CO2 concentration in return air or space. Provide 0 to 10 VDC or 4 to 20 mA output signal, which corresponds linearly to 0 to 2,000 ppm of CO2 for use in optimization of mixing dampers and economizer control. Provide activation of an adjustable contact closure relay when user defined CO2 levels are reached for alarm. CO2 sensors shall be certified by manufacturer to have an accuracy of no less than 75 ppm, factory calibrated or calibrated at startup, and certified by manufacturer to require calibration no more frequently than once every five years.
  2. Air Quality Sensors:
    - a. Provide full spectrum air quality sensors with filters utilizing hot wire element based on Taguchi principle. Sensors monitor a wide range of gaseous organic materials, which are common components of indoor air contaminants. These gaseous materials include paints and solvents, cooking and cigarette smoke, and car exhaust.
    - b. Sensors shall compensate for temperature and humidity, have span and calibration potentiometers, operate on 24 VDC power with output of 0 to 10 VDC, and operate between 32 and 140 degrees F and 5 to 95 percent RH. Provide isolation power supply for each sensor.
  3. Oxygen Depletion Sensor: Oxygen sensor shall monitor oxygen levels and report alarm in event of oxygen depletion due to a refrigerant leak. Provide 4 to 20 mA or minus 10 VDC output and an SPDT relay output to ATCS. Range 0 to 25 percent oxygen, 12-second response time.
  4. Refrigerant Leak Detection System:
    - a. Leak detection system shall consist of control panels, refrigerant detectors, audible and visual alarms, emergency shut-off switch, relays, control wiring, and auxiliary devices to provide a complete and working system. Detection and control system shall employ direct digital control but shall be independent from building temperature control system. Leak detection system shall control chiller room exhaust system. System shall alarm at levels required by code. Refrigerant detector shall be designed to sense specific type of refrigerant utilized in equipment to be provided. System shall provide continuous protection. Sensors and control components shall be long life, solid-state construction. Panel shall have visible indicators showing alarm status, fan status, and alarm zones. Control panel shall have a built-in time delay to minimize false alarms and have a test button for both audible and visual alarms. Sensors and control components shall have an operating range of minus 5 to 120 degrees F with a maximum response time of 30 seconds.

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- b. Detector design and construction shall be compatible with temperature, humidity, barometric pressure, and voltage fluctuations at operating area. Monitor shall have an adjustable sensitivity such that it can detect refrigerant at or above 3 ppm. Monitor shall be supplied factory calibrated for refrigerant. Monitor shall be provided with an alarm relay output that shall energize when detector detects a refrigerant level at or above TWA/TLV (or toxicity measurement consistent therewith) for refrigerant in use. Monitor's relay shall be capable of initiating corresponding alarms and ventilation systems as indicated on contract drawings. Monitor shall be provided with a failure relay output that energizes when monitor detects a fault in its operation. Monitor shall provide a 4 to 20 mA DC output signal indicating refrigerant level detected and alarm relay outputs to facility's site control and monitoring system BAS. Sensors shall have a minimum life of two years. Components shall be UL listed and comply with requirements of International Fire Code.
      - c. Manufacturer: Vulcain, (Honeywell Analytics).
    1. Power Metering:
      - a. Provide electric utility meter 3-phase monitoring, diagnostics, and energy reports of consumption, demand, and power quality.
      - b. Meter shall include input primary voltage of 120 to 480 VAC, Single and 3-phase monitoring, maximum primary current of 2,400 amps per phase, split core current transformer, and accuracy of IEC 62053-22 Class 0.5S, ANSI C12.20 0.5%.
      - c. Power monitoring data shall include:
        - 1) kWh consumption.
        - 2) kW demand.
        - 3) VAR reactive power.
        - 4) VA apparent power.
        - 5) Power factor.
        - 6) Average, minimum, and maximum demand.
        - 7) Voltage, line-to-line and line-to-neutral.
        - 8) Amps, average current.
        - 9) kW demand (each phase).
        - 10) Power factor (each phase).
        - 11) Voltage (each phase).
        - 12) Amps (each phase).
      - d. The power meter shall communicate using the BACnet MS/TP protocol at speeds from 9600 to 76,800 baud (no parity). The meter shall provide a BACnet Device object, a set of writable Analog\_Value objects for remote configuration, a set of Analog\_Input objects to provide access to scaled 32-bit measurement values and their unit types, and a set of Binary\_Input objects for indicating individual alarm conditions.
      - e. The meter shall be UL/CUL listed to the latest applicable safety standards.
      - f. The power meter shall accept either 0 to 0.333VAC or 0 to 1VAC input from up to three current transducers to 5,000 amps.
      - g. The power meter shall be configurable for operation on Single Phase (AN or AB), Split Phase (ABN), Delta (ABC), and Wye (ABCN) systems.
      - h. Products
        - 1) Veris E50 Series
        - 2) Setra Power Patrol
        - 3) Or Reviewed
  2. Current Sensing Relay: Provide 100 percent solid state with adjustable range (plus or minus 1 percent of range) trip setpoint to monitor AC current. Provide with contact transfer with no calibration drift, complete with LED status indicator. Limit off state leakage to 2 mA or less. Rating (200-ampere minimum) shall exceed equipment being monitored.
  3. Current Sensors: Sensors shall vary output voltage proportional to change in sensed current. Multiple range units shall be provided to allow for varying site conditions. Low range units shall offer ranges of 10, 20, and 50 amps. High range units shall offer ranges of 50, 100, and 200 amps. Provide actual analog current indication for status of motors 1 horsepower and larger. Provide switch points to determine motor status in software.
  4. Occupancy Sensors: Provide ceiling- or wall-mounted passive infrared occupancy sensor as shown on Drawings. Provide isolated relay for input to BAS, user adjustable time delay (30 seconds to 30 minutes), user adjustable sensitivity,

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- 360-degree coverage up to 1,200 square feet, and red LED to indicate occupancy detection. Include power supply, power packs, relays, and enclosures.
5. Photo Sensor: Provide photo sensor to indicate presence or absence of light at sensor location. Provide with 4 to 20 mA transmitter for input to BAS. Include weatherproof enclosure, power supply, and accessories.
  6. Natural Gas Meter Monitoring: Provide hardware, software, and wiring for interfacing with gas company building natural gas meter.
  7. Electromagnetic Flow Meter:
    - a. General: Sensor shall be an electromagnetic flow meter that utilizes Faraday's Law to measure volumetric fluid flow through a pipe.
    - b. Flow meter shall consist of two elements, sensor and electronics. Sensor shall generate a measuring signal proportional to flow velocity in pipe. Electronics shall convert an EMF into a standard current output.
    - c. Manufacturer and Model Number: Siemens Model MAG 3100 electromagnetic meter with Model MAG 5000 electronic transmitter and display.
  8. Pitot Tube Flow Sensor: Provide pitot tube type flow sensor with accuracy of plus or minus 1 percent over a 10 to 1 turndown. Dieterich Standard Annubar Flow Sensor Models DNT and DCR with eagle eye gpm gauge.
- G. Airflow Measuring Unit:
1. General: Airflow and temperature measuring unit (AMU) indicated on plans shall be capable of monitoring airflow at each measurement location. System shall be factory tested prior to shipment and shall not require calibration or adjustment over life of equipment when provided in accordance with manufacturer's guidelines. Each sensor probe shall be provided with a UL plenum-rated connecting cable. Connecting cable shall be a minimum of 10.00 feet in length for each probe. No additional devices or transducers shall be required to interface with host controls.
  2. Sensors: Sensors shall be calibrated to NIST-traceable standards for airflow. Each sensing point shall independently measure airflow prior to averaging. Provided accuracy shall be percent of reading and demonstrated at both maximum and minimum airflow rates for each measurement location.
  3. Transmitter and Electronics Enclosure: Transmitter shall operate on 24 VAC. Transmitter shall have a minimum 16-character alphanumeric LCD display for airflow and system diagnostics. Analog output signals shall be user selectable (0 to 10 VDC or 2 to 20 mA). When required, a serial RS-485 interface shall be made available with network protocols of either N2 or Modbus RTU, as required by DDC control equipment. Inputs and outputs shall be fused, protected, and internally isolated from 24 VAC power supply. Transmitter shall have a non-drifting adjustment for output signal offset/gain. Transmitter display shall be capable of being configured in either I.P. or S.I. units. Transmitter shall accept a user-defined area to display volumetric flow rates in CFM or LPS. Enclosure shall be aluminum alloy for indoor use and capable of operating over a temperature range of 30 to 120 degrees F. Where electronics are provided in locations subject to weather or high humidity (above 75 percent), provide in a NEMA 4 enclosure.
  4. Duct- and Plenum-Mounted Sensor Probes:
    - a. Sensor probes shall be constructed of anodized aluminum alloy tube with stainless steel mounting brackets. Probes shall be constructed to provide insertion, internal, or standoff mounting, depending on applications and field installation requirements.
    - b. Sensor accuracy for airflow shall be no more than plus or minus 2 percent of reading over sensor probe operating ranges. Provided total accuracy for airflow shall be better than plus or minus 3 percent of reading over sensor probe operating ranges when provided in accordance with manufacturer's guidelines. Sensor accuracy for temperature shall be better than plus or minus 0.15 degrees F over entire operating range. Each sensing point shall independently measure airflow and temperature prior to averaging.

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- c. Number of independent sensing points shall be distributed per duct face area, at a minimum quantity as indicated below:

Area (sq ft)	Area (sq m)	Sensors
≤ 1	≤ 0.093	2
> 1 to < 4	> 0.093 to < 0.372	4
4 to < 8	0.372 to < 0.743	6
8 to < 12	0.743 to < 1.115	8
12 to < 16	1.115 to < 1.486	12
≥ 16	≥ 1.486	16

- d. Probe Operating Ranges:

1) Airflow: 0 to 5,000 fpm.

5. Fan Inlet Velocity Sensors: Sensors shall be totally constructed from non-corrosive materials, with stainless steel sensor bodies, stainless steel mounting brackets, and adjustable cadmium-plated mounting rods.
- a. Fan Inlet Performance Requirements: Individual sensor accuracy for airflow shall be better than plus or minus 3 percent of reading over sensor probe operating ranges when provided in accordance with manufacturer's guidelines. Provided accuracy for temperature shall be better than plus or minus 0.15 degrees F over entire operating range.
- b. Fan Inlet Sensor Operating Ranges:
- 1) Airflow: 0 to 10,000 fpm.
6. Dynamic Pressure "Bleed Flow" Sensors: Each sensing point shall independently measure bleed airflow rates and direction, or dynamic differential pressure, plus temperature.
- a. DP Sensor Performance Requirements: Provided total accuracy for airflow shall be better than plus or minus 2 percent of reading and plus or minus 4 percent of reading for pressure over sensor operating range when provided in accordance with manufacturer's guidelines. Provided accuracy for temperature shall be better than plus or minus 0.15 degrees F over entire operating ranges. Sensors shall be calibrated to NIST-traceable standards for airflow and temperature.
- b. DP Sensor Operating Ranges:
- 1) Bleed Airflow: Minus 2,000 fpm to plus 2,000 fpm.
- 2) Differential Pressure: Minus 0.25-inch w.g. to plus 0.25-inch w.g.
7. Manufacturers and Equipment:
- a. EBTRON Gold Series probes, combination airflow/temperature sensors plus associated transmitters.
- b. Tek-Air Model Vortek, vortex shedding probes and matching electronics with display, mated with conforming multi-point temperature sensors.
- c. Air Monitor VoluProbe, supplied with Veltron II (0.1 percent FS) transmitters and mated with conforming multi-point temperature sensors.
- H. Air Static Pressure Sensing Probe: Provide full width duct traverse, extruded aluminum probe, with multiple sensing ports. Air Monitor Model Stat-Probe/1. Outside air static pressure sensing probe shall consist of two circular, parallel, 10-gauge anodized aluminum plates with a 2.00-inch FPT connection. Sensor shall be accurate to within 2 percent of actual ambient pressure when subject to radial wind velocities up to 80 miles per hour with approach angles up to 30 degrees to horizontal. Air Monitor model S.O.A.P.
- I. Damper Position Indicator Switch: Designed for use with a control damper, smoke damper, or fire/smoke damper to remotely indicate blade position of a two-position damper (open or closed). Switch shall positively communicate position of damper blades when interfaced with an associated device, control point, or operating equipment. Ruskin Model SP100.
- J. Miscellaneous Devices:
1. Bypass Timer: 0- to 6-hour dial type electromechanical timed switch. Intermatic.
2. Duct Smoke Detector: Standalone, sampling photoelectric type for sensing of products of combustion within air stream of ducted fan systems. Devices shall include sampling tube extensions and sensitivity adjustments for detecting products of combustion across width of duct. Device shall function uniformly in air velocities of 400 fpm through 3,000 fpm. Voltage shall

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- be 24 VDC or 120 VAC. Include two sets of auxiliary contacts rated for 12 amps resistive with manual reset. Visual indication of normal and alarm/trouble conditions shall be incorporated into exposed surface of device.
3. Control Power Transformers:
    - a. BAS Contractor shall be responsible for providing control power sources and wiring for specified sequence of operation.
    - b. Transformers shall be UL listed, provided with primary and secondary overcurrent protection, and sized in accordance with NEC Article 725. Control power transformers shall be sized to accommodate an additional 25 percent load (minimum) for future devices.
    - c. Where packaged mechanical equipment is specified to be provided with a control power transformer, this power source shall not be utilized for devices added under this scope of work unless prior review, in writing, is obtained from Owner's Representative.
    - d. Provide each transformer with a resettable circuit breaker. Circuit breakers shall be trip-free.
  4. Control Relays: Rated for application with a minimum of two sets of Form C contacts enclosed in a dustproof enclosure. Relays shall be rated for a minimum life of one million operations. Operating time shall be 20 milliseconds or less, with release time of 10 milliseconds or less. Relays shall be equipped with coil transient suppression devices to limit transients to 150 percent of rated coil voltage.
  5. Control Panels and Enclosures:
    - a. Control panels for controls and instruments shall be UL listed NEMA enclosure rate for application, surface or flush-mounted panel as indicated, with key locked continuous-hinge door. Panel assemblies shall be UL 508 listed.
    - b. Provide enclosures for auxiliary control devices such as relays, transformers, solenoid valves, etc. Enclosures shall be hinged and key locked.
    - c. Keys shall be same keys used for other panels and enclosures on Project. Manufacturer's standard baked enamel finish.
  6. Electronic/Pneumatic Transducers:
    - a. Provide electronic to pneumatic pressure transducers to convert digital analog signal to variable-to-variable pneumatic air pressure signal. Units to have following characteristics:
      - 1) Output: 3 to 15 psig.
      - 2) Input: 4 to 20 mA or 0 to 10 VDC.
      - 3) Manual output adjustment knob.
      - 4) Pressure gauge.
      - 5) External replaceable supply air filter.
  7. Horns: Horns shall be electromechanical vibration of diaphragm type. Diaphragm material shall be stainless steel. Area audible alarm shall provide at least 85 dB at 10.00 feet from device. Provide exterior devices for area classification where they are located. Minimum enclosure shall be watertight/dust tight. Horn shall be operated with 120 VAC power supply.
  8. Warning Lights: Visual warning devices shall be incandescent indicating lights of at least 123 candlepower. Exterior devices shall be designed for wet locations or rated weatherproof unless indicated otherwise. Warning lights shall be operated with 120 VAC power supply. Lens shall be yellow.

## PART 3 EXECUTION

### 3.01 PROJECT MANAGEMENT

- A. General: Provide a designated Project Manager who shall be responsible for following:
  1. Schedule: Construct and maintain Project schedule.
  2. Onsite Coordination: Coordinate with trades, subcontractors, and other integration vendors authorized to accept and execute orders or instructions from Owner's Representative.
  3. Project Meetings: Attend Project meetings to avoid conflicts and delays.
  4. Field Work: Make field decisions relating to this scope of work.
  5. Contact Person: Provide coordination/single point of contact.

### 3.02 SEQUENCE OF OPERATION

- A. General: Provide a complete and operational temperature control and building automation system based on points list and sequence of operations shown on Drawings. System shall have complete sequences and standard control practices. Point list is minimum amount of points that are to be provided. If additional points are required to meet sequence of operation, they shall be provided.

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- B. Sequence of Operations: See sequence of operations on Drawings.

### 3.03 STARTUP AND COMMISSIONING

- A. General: When installation of system is complete, calibrate equipment and verify transmission media operation before system is placed online. Testing, calibrating, adjusting, and final field tests shall be completed by manufacturer. Verify that systems are operable from local controls in specified failure mode upon panel failure or loss of power.
- B. System Modifications: Provide recommendation for system modification in writing to Owner. Do not make system modification, including operating parameters and control settings, without prior review of Owner.
- C. Commissioning of Integrated System Segments: After manufacturer has completed system start-up and commissioning, joint commissioning of integrated system segments shall be completed.

### 3.04 ELECTRICAL WIRING AND MATERIALS

- A. General: System shall be provided in a neat and competent manner by experienced and trained technicians either in direct employ of system manufacturer or under manufacturer's direct supervision. Provided system shall be delivered to Owner completed and fully operational.
1. Manufacturer's Instructions: Provide equipment in accordance with manufacturer's instructions and published application literature.
  2. Electrical Power Wiring: Electrical power wiring provisions for BAS shall be provided to locations indicated on electrical plans by electrical sections of this Project Specification. BAS supplier shall provide additional power requirements for BAS components that are not indicated on electrical plans. Provide control power circuits from electrical panels. Provide additional circuit breakers rated and labeled for service. Unless reviewed by Electrical Engineer, spare breakers shall not be used. Coordinate with Electrical Contractor.
  3. Other Electrical Work: All other electrical work for BAS, including power wiring that is not shown on electrical plans, shall be responsibility of this BAS supplier, including interlock wiring described in Sequence of Operation. Control wiring, conduit for control wiring, and miscellaneous accessory equipment for control wiring systems shall be provided by BAS supplier as part of control system. Conform to electrical sections of this Project Specification, NEC, NFPA 70, and local code requirements.
- B. Electrical Installation Methods:
1. Wiring: Wiring in or through mechanical rooms, finished spaces, on roofs, in walls, below grade, inside equipment, above accessible ceilings, and other concealed accessible locations shall be provided in conduit and properly supported, unless indicated otherwise. Label wire groups to match corresponding wiring diagrams. Wiring within control panels may be provided separate from raceway.
  2. Raceways: Raceways shall be run parallel or perpendicular to building structure, ceiling, and floor, and shall be secured and supported. Raceways connected to equipment mounted to or on vibrating machinery (such as fans, ducts, pumps, or pipes) shall be isolated by use of short (1.00 inch or less) pieces of flexible "greenfield" conduit, unless duct or pipe itself is sufficiently vibration isolated to eliminate transmission.
  3. Instrumentation and Communication Cable: Cables shall not be run together in same conduit or raceway as power wiring.
  4. Communication Cable: Provide communication wiring panels between operator workstation and standalone DDC panels and between standalone DDC panels and application-specific controllers such as AHU, unitary, or VAV digital controllers. Communication cable shall be checked for continuity, grounding, and shielding. Local area network communication wiring between operator workstations and global controllers shall be in conduit.
  5. Ethernet: Connect BAS to Owner's Ethernet network. Provide Ethernet fiber, hub, and hub connections.
  6. Control and Alarm Wiring: Provide wiring between thermostats, and control and alarm devices.
  7. Conduit and Signal Wiring: Provide conduit and signal wiring between motor starters in motor control centers and high and/or low temperature relay contacts and remotes relays in BMS panels located in vicinity of motor control centers.
  8. Other Conduit and Wiring: Provide conduit and wiring between PC workstation, electrical panels, metering instrumentation, indicating devices, miscellaneous alarm points, remotely operated contactors, and BMS panels, as shown on Drawings or as specified.
  9. Wall-Mounted Devices: Provide electrical wall box and conduit sleeve for wall-mounted devices. Room CO2 sensors shall be provided at same elevation as room thermostat. Confirm location with Architectural elevations.
  10. Ceiling Plenum: Provide conduit between wall-mounted wall box and ceiling plenum. Provide 90-degree elbow into ceiling plenum.

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11. Interface Control Wiring: Provide interface control wiring for equipment with remote sensors, panels, limits, and components to serve specified control functions. Materials, wiring, and termination shall be provided in accordance with manufacturer's instructions. Provide interface control wiring of following equipment:
    - a. Kitchen Hood: Temperature sensors, filter switches, remote control panel, exhaust fans, and makeup air units.
    - b. Indoor/Outdoor Split Unit: Evaporation/condenser sections.
  12. Grounding: Ground controllers to a good earth ground. Grounding of green AC ground wire at breaker panel alone is not adequate. Run metal conduit from controller panels to building grounds. Ground sensor drain wire shields at controller end. Associated ground loop problems shall be corrected.
- C. Surge Protection:
1. General: Provide surge and transient protection consisting of devices provided externally to operator workstations.
  2. Power Line Surge Protection: Surge suppressors external to workstation shall be provided on incoming AC power. Surge suppressor shall be rated by UL 1449 and have clamping voltage ratings below following levels:
    - a. Normal Mode (Line to Neutral): 350 V.
    - b. Common Mode (Line to Ground): 350 V.
  3. Telephone and Communication Line Surge Protection: Metal oxide varistor (MOV) protection or equivalent, rated for application, shall be provided at equipment. Additional protection (gas tubes rated for application) shall be provided within 3.00 feet of building cable entrance or within 3.00 feet of telephone company's network interface.
  4. Sensor and Control Wiring Surge Protection: Controllers shall have sensor and control wiring surge protection with optical isolation, MOV, or silicon avalanche devices. Fuses are not permitted for surge protection.
- D. Electrical Cabling Materials:
1. AC Control Wiring:
    - a. Control wiring for 24 V circuits shall be insulated copper 18 AWG minimum and shall be rated for 300 VAC service. Low-voltage control wiring and 24 VAC can be run in same conduit.
    - b. Control wiring shall be in accordance with National Electrical Code and Local Electrical Codes.
    - c. Wiring for 120 VAC shall be 14 AWG minimum and shall be rated for 600 VAC service. Power wiring 120 VAC and greater shall be in a separate conduit. Minimum control wiring conduit size is 0.75 inches EMT.
  2. Analog Input, Analog Output, Binary Input, Binary Output, 24 VAC, and General Purpose Cabling:
    - a. Cable shall consist of copper conductors not less than No. 18 AWG stranded.
    - b. Cable shall be 2- or 3-conductor twisted cable with a drain wire.
    - c. Cable shall have a 100 percent overall shield.
    - d. Cable shall be UL Listed and plenum-rated.
    - e. Cable shall meet NEC voltage rating of 300 V.
    - f. Cable shall be NEC type CMP.
    - g. Cable shall meet or exceed UL temperature rating of plus 60 degrees C.
    - h. Cable shall be labeled at panel entry with BAS manufacturer's name and type of signal carried within cable, i.e., Analog Input, Analog Output, Binary Input, Binary Output, 24 VAC.
    - i. Each cable type specified shall be of a different color coding for easy identification and troubleshooting.
      - 1) Analog Input Cable.
      - 2) Analog Output Cable.
      - 3) Binary Input Cable.
      - 4) Binary Output Cable.
- E. Primary and Secondary Communications Network Cabling:
1. Cable: Cable shall be of type recommended by BAS manufacturer.
  2. Shielding: 10BaseT cable shall be shielded.
  3. First Tier Network Cable: First tier network cable shall be provided in conduit.
  4. Cable Rating: Cable shall meet or exceed NEC voltage rating of 150 V.
  5. Cable Temperature Rating: Cable shall meet or exceed UL temperature rating of 140 degrees F.
  6. Labeling: Cable shall be labeled at a minimum of every 18.00 inches with BAS manufacturer's name, system name, and communications network name.
  7. Plenum-Rated: Cable shall be plenum-rated.
  8. Color Coding: Each cable type shall be of a different color coding for easy identification and troubleshooting.
  9. Cabling shall be run continuous, splicing is not allowed.

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- F. Room Sensor Cabling:
  - 1. Cable: Cable shall consist of copper conductors not less than No. 24 AWG.
  - 2. Twisted Cable: Twisted cable shall be multi-paired (at least two pairs).
  - 3. Shielding: Cable shall have a 100 percent overall shield.
  - 4. Plenum-Rated: Cable shall be UL Listed and plenum-rated.
  - 5. Cable Rating: Cable shall meet or exceed NEC voltage rating of 300 V.
  - 6. Cable Type: Cable shall be NEC Type Article 800-CMP.
  - 7. Cable Temperature Rating: Cable shall meet or exceed UL temperature rating of 165 degrees F.
- G. Identification Standards:
  - 1. Controllers and Local Control Panels: Identify by fastening a plastic engraved nameplate to outside of enclosure.
  - 2. Field Devices: Identify by attaching an engraved or stamped (not handwritten) tag label.
  - 3. Panel Devices: Identify by fastening an engraved or stamped label to backplane of local control panel.
- H. Raceway Identification: Covers to junction and pull boxes of control system raceways shall be painted blue or have identification labels stating "Control System Wiring" affixed to covers. Labels shall be engraved or stamped, not handwritten.
- I. Emergency Power: BAS controllers requiring emergency power shall be connected to emergency power panel circuits. Provide 120 V, single phase, 60-hertz emergency power to every BMS DDC controller panel, HVAC/mechanical equipment controller, PC console power supply, transformer, annunciator, modems, printers, and other devices. Power supplies shall be extended in conduit and wire from emergency circuit breakers.

### 3.05 PERFORMANCE

- A. General: Unless stated otherwise, control temperatures within plus or minus 2 degrees F humidity within plus or minus 3 percent of setpoint and static pressure within 10 percent of setpoint.

### 3.06 TEST AND BALANCE REPORT

- A. General: The Controls Contractor shall coordinate with and provide on-site support to the test and balance (TAB) personnel specified under Section 23 05 93 Testing, Adjusting, and Balancing. This support shall include:
  - 1. On-site operation and manipulation of control systems during the testing and balancing.
  - 2. Control setpoint adjustments for balancing all relevant mechanical systems, including VAV boxes.
  - 3. Tuning control loops with setpoints and adjustments determined by TAB personnel.

### 3.07 COMMISSIONING, TESTING, AND ACCEPTANCE

- A. General: Perform a 3-phase commissioning procedure consisting of field I/O calibration and commissioning, system commissioning, and integrated system program commissioning. Document commissioning information on commissioning data sheets, which shall be submitted prior to acceptance testing. Commissioning work that requires shutdown of system or deviation from normal function shall be performed when operation of system is not required. Commissioning shall be coordinated with Owner and Construction Manager to ensure systems are available when needed. Notify operating personnel in writing of testing schedule so that authorized personnel from Owner and Construction Manager are present throughout commissioning procedure.
  - 1. Prior to System Commissioning: Verify that each control panel has been provided according to plans, Specifications, and reviewed Shop Drawings. Test, calibrate, and bring online each control sensor and device. Commissioning shall include, but not be limited to:
    - a. Sensor accuracy at 10, 50, and 90 percent of range.
    - b. Sensor range.
    - c. Verify analog limit and binary alarm reporting.
    - d. Point value reporting.
    - e. Binary alarm and switch settings.
    - f. Actuator ranges.
    - g. Fail-safe operation on loss of control signal, electric power, and network communications.
- B. Operational System Demonstration: After control devices have been commissioned (i.e., calibrated, tested, and signed off), each BAS program shall be put on line and commissioned. Contractor shall, in presence of Owner and Construction Manager, demonstrate each programmed sequence of operation and compare results in writing. In addition, each control loop shall be tested to verify response and stable control, within specified accuracies. System program test results shall be recorded on commissioning data sheets and submitted for record. Discrepancies between Specification and actual performance shall be immediately rectified and retested.

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- C. System Performance Verification: After BAS programs have been commissioned, Contractor shall verify overall system performance as specified. Provide detailed report of tests performed and results, including initial failures and corrective action taken. Tests shall include, but not be limited to:
  - 1. Data Communication: Both normal and failure modes, confirm and demonstrate.
  - 2. Fully Loaded System Response Time: Verify; provide written report.
  - 3. Impact of Component Failures: On system performance and system operation, provide written report.
  - 4. Time/Date Changes: Confirm and demonstrate.
  - 5. End of Month/End of Year Operation: Confirm and demonstrate.
  - 6. Season Changeover: Confirm and demonstrate.
  - 7. Global Application Programs and Point Sharing: Confirm and demonstrate.
  - 8. System Backup and Reloading: Confirm and demonstrate.
  - 9. System Status Displays: Confirm and provide printout.
  - 10. Diagnostic Functions: Confirm and provide printout.
  - 11. Power Failure Routines: Confirm normal to emergency and back to normal; demonstrate.
  - 12. Battery Backup: Confirm continuation, complete operation, and return to normal power; demonstrate.
  - 13. Testing of Electrical and HVAC Systems with Other Divisions of Work: Confirm and provide written report.
- D. Acceptance Test Procedure: Submit for review a detailed acceptance test procedure designed to demonstrate compliance with contractual requirements. This acceptance test procedure shall take place after commissioning procedures but before final acceptance, to verify that sensors and control devices maintain specified accuracies and system performance does not degrade over time. This contractor to include labor to support the formal commissioning team.
- E. Performance Period: After above tests are complete and system is demonstrated to be functioning as specified, a 30-day performance test period shall begin. If system performs as specified throughout test period, requiring only routine maintenance, system shall be accepted. If system fails during test and cannot be fully corrected within eight hours, Owner may request that performance tests be repeated.

### 3.08 TRAINING

- A. Instructor: Manufacturer shall provide factory-trained instructor to give full instruction to designated personnel in operation of system provided. Instructors shall be thoroughly familiar with subject matter they are to teach. Manufacturer shall provide each student with a student binder containing product-specific training modules for system provided. Training shall be held during normal working hours of 8:00 a.m. to 4:30 p.m. weekdays.
- B. Duration: Provide 40 hours of training for up to (10) of Owner's designated operating personnel. Training shall include:
  - 1. General: Explanation of Drawings, O & M Manuals.
  - 2. Walk-Through: Walk-through of job to locate control components, operator workstation software and interface, and peripherals.
  - 3. Control: DDC controller and ASC operation/function.
  - 4. Operator Control Functions: Including graphic generation and field panel programming.
  - 5. Portable Terminal: Operation of portable operator's terminal.
  - 6. Control Technical Support: Explanation of adjustment, calibration, and replacement procedures.
  - 7. Training Material: Student binder with training modules:
    - a. System log-on procedures.
    - b. Review of sequence of operations.
    - c. System troubleshooting.
    - d. Emergency service interface.
    - e. Fire alarm interface.
    - f. System restart after power failure.
    - g. System backup and restoration procedures.
    - h. Replacement procedures of each system component.
    - i. Calibration and initialization procedures.
  - 8. Startup Procedures: Regeneration procedures on provided programming at operator's control stations.
  - 9. Maintenance Programs: Operation of maintenance services programs.
  - 10. Additional Training: Since Owner may require personnel to have more comprehensive understanding of hardware and software, additional training shall be available from manufacturer. If such training is required by Owner, it shall be contracted separately at a later date.

**3.09 POINT SCHEDULE MATRIX – I/O SCHEDULE**

- A. General: Following points, as defined for each piece of equipment, are designated as follows:
1. Digital Out (DO): Defined as two-state output (i.e., start/stop, enable/disable).
  2. Digital In (DI): Defined as two-state input (i.e., alarm, status).
  3. Analog In (AI): Defined as variable input (i.e., temperature, position).
  4. Analog Out (AO): Defined as electrical variable output. 0 to 20 mA, 4 to 20 mA, and 0 to 10 VDC are only acceptable analog outputs. Driver for analog outputs shall come from both hardware and software resident in controllers. Transducers shall not be acceptable.
- B. Points List: See I/O points list on Drawings.

**END OF SECTION**

### **III. Proposal Forms**

#### **A Release of Liability for Use of CAD Drawings**

### **RELEASE OF LIABILITY FOR USE OF CAD DRAWINGS**

Owner and its Consultants have provided Computer Aided Drafting (CAD) files of the RFP drawings for use by the prequalified Design-Build proposal teams ("Design-Builder") during their preparation of Proposals. Design-Builder's execution of this Release of Liability is a condition precedent to use of the CAD Files.

1. Owner and its Consultants make no representation or warranty as to the compatibility of the CAD Files with any hardware or software, or from the modification or conversion of the CAD Files into another format.
2. Because the information set forth on the CAD Files can be modified unintentionally or otherwise, Owner and its Consultants reserve the right to remove all indicia of ownership and/or involvement from each electronic display. The CAD Files and the media on which they are provided should not be considered certified documents.
3. All information on the CAD Files is considered instruments of service of the Owner and its Consultants, and shall not be used for other projects, for additions to this project, or completion of this project by others. The CAD Files shall at all times remain the property of the Owner and its Consultants, and in no case shall the transfer of the CAD Files be considered a sale or other transfer of ownership rights.
4. To the fullest extent allowed by law, Owner and its Consultants make no representation or warranty regarding the accuracy, title, non-infringement, completeness, or permanence of CAD Files, nor for their merchantability or fitness for a particular purpose. The Design-Builder acknowledges that it has not relied on any representation or warranty other than those expressly set forth herein in signing this Release of Liability. The CAD Files shall not be considered to be Contract Documents.
5. Design-Builder's use of the CAD Files shall not in any way obviate Design-Builder's responsibility for meeting the required criteria as set forth in the RFP, including, but not limited to, the proper checking and coordination of space sizes and adjacencies.
6. Design-Builder shall, to the fullest extent permitted by law, indemnify, defend and hold harmless Owner and its Consultants from all claims, damages, losses, expenses, penalties, and liabilities of any kind, including attorneys' fees, arising out of or resulting from the use of the CAD Files by Design-Builder, or by third party recipients of the CAD Files from the Design-Builder.
7. Owner and its Consultants believes that no licensing or copyright fees are due to others on account of the transfer of the CAD Files, but to the extent any are, Design-Builder will pay the appropriate fees and hold Owner and its Consultants harmless from such claims.

### **AUTHORIZED ACCEPTANCE**

\_\_\_\_\_  
Design-Build Entity

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Print Name and Title

\_\_\_\_\_  
Date

### **III. Proposal Forms**

#### **B Acknowledgment of Receipt of RFP and/or Addendum**



Washington Military Department

TRI-CITIES READINESS CENTER

Request For Proposal

XXXXX

**ACKNOWLEDGMENT OF RECEIPT OF RFP AND/OR ADDENDUM**

We hereby acknowledge our receipt of:

*[Proposer to circle and insert as applicable]*

RFP dated \_\_\_\_\_, XXXX

Addendum No. \_\_\_\_\_ dated \_\_\_\_\_, XXXX

for the Request for Proposal for the Design-Build project for the Tri-Cities Readiness Center at Richland, WA. We also acknowledge that the individual listed below is our single point of contact and that no communications regarding this solicitation or Project are allowed between any other individual, consultant or subcontractor and any Owner staff member or its designated representatives, other than as specifically allowed by the RFP. We understand that a breach of this condition may be grounds for disqualification of our Request for Proposal.

Signature: \_\_\_\_\_

Printed Name: \_\_\_\_\_

Date: \_\_\_\_\_

Title: \_\_\_\_\_

Representing: \_\_\_\_\_

Address: \_\_\_\_\_

Phone Number: \_\_\_\_\_

Fax: \_\_\_\_\_

Email: \_\_\_\_\_

Please scan this document and email immediately upon receipt to the attention of:

Dave Hickman Project Manager, SPSCC Building #1, [Dave.Hickman@DES.wa.gov](mailto:Dave.Hickman@DES.wa.gov)

### **III. Proposal Forms**

#### **C Energy Life Cycle Cost Spreadsheet**

# ENERGY LIFE CYCLE COST SPREADSHEET

ELCCA2005.xls

-----PROJECT DATA-----

PROJECT: Facility Name (Firm Name)  
 ALT. No.: Description (Analyst's Name)

-----DISCOUNT & ESCALATION Real Rates as of November 2004-----

Enter 1 or 0 for each fuel type:	Years:	Rate:
1 = Yes	Real Discount Rate (i) . . . . . 2005 - 2,040 . . . . .	2.0%
0 = No	Electricity . . . . . 2005 - 2,015 . . . . .	ERR
IOU Electricity Source*	ERR Pick One Ownership Mode 2,016 - 2,025 . . . . .	ERR
POU Electricity Source**	2,026 - 2,040 . . . . .	ERR
Natural Gas Fuel?	None . . . . . 2005 - 2,015 . . . . .	0.0%
Propane Fuel?	And other fossil fuels 2,016 - 2,025 . . . . .	0.0%
Oil Fuel?	2,026 - 2,040 . . . . .	0.0%
	Maintenance . . . . . 2005 - 2,040 . . . . .	2.0%
	Inflation (Nominal , not used) . . . . . 2005 - 2,040 . . . . .	3.0%

\* IOU = Investor Owned Utility  
 \*\* POU = Publicly Owned Utility

**#VALUE!** =30-year LCC

-----ANNUAL REAL CASH FLOWS-----

(Begin) Year	First & Replace. Costs	Annual Maint. Costs	Annual None Costs	Annual Electric Costs	Total Annual Costs	Present Worth Factor (1+i) <sup>-n</sup>	Present Worth of Annual Costs	Present Worth of Cumulative Costs
2,005	\$0	--	--	--	\$0	1.00	\$0	\$0
2,006	0	0	0	#VALUE!	#VALUE!	0.98	#VALUE!	#VALUE!
2,007	0	0	0	#VALUE!	#VALUE!	0.96	#VALUE!	#VALUE!
2,008	0	0	0	#VALUE!	#VALUE!	0.94	#VALUE!	#VALUE!
2,009	0	0	0	#VALUE!	#VALUE!	0.92	#VALUE!	#VALUE!
2,010	0	0	0	#VALUE!	#VALUE!	0.91	#VALUE!	#VALUE!
2,011	0	0	0	#VALUE!	#VALUE!	0.89	#VALUE!	#VALUE!
2,012	0	0	0	#VALUE!	#VALUE!	0.87	#VALUE!	#VALUE!
2,013	0	0	0	#VALUE!	#VALUE!	0.85	#VALUE!	#VALUE!
2,014	0	0	0	#VALUE!	#VALUE!	0.84	#VALUE!	#VALUE!
2,015		0	0	#VALUE!	#VALUE!	0.82	#VALUE!	#VALUE!
2,016	0	0	0	#VALUE!	#VALUE!	0.80	#VALUE!	#VALUE!
2,017	0	0	0	#VALUE!	#VALUE!	0.79	#VALUE!	#VALUE!
2,018	0	0	0	#VALUE!	#VALUE!	0.77	#VALUE!	#VALUE!
2,019	0	0	0	#VALUE!	#VALUE!	0.76	#VALUE!	#VALUE!
2,020	0	0	0	#VALUE!	#VALUE!	0.74	#VALUE!	#VALUE!
2,021	0	0	0	#VALUE!	#VALUE!	0.73	#VALUE!	#VALUE!
2,022	0	0	0	#VALUE!	#VALUE!	0.71	#VALUE!	#VALUE!
2,023	0	0	0	#VALUE!	#VALUE!	0.70	#VALUE!	#VALUE!
2,024	0	0	0	#VALUE!	#VALUE!	0.69	#VALUE!	#VALUE!
2,025		0	0	#VALUE!	#VALUE!	0.67	#VALUE!	#VALUE!
2,026	0	0	0	#VALUE!	#VALUE!	0.66	#VALUE!	#VALUE!
2,027	0	0	0	#VALUE!	#VALUE!	0.65	#VALUE!	#VALUE!
2,028	0	0	0	#VALUE!	#VALUE!	0.63	#VALUE!	#VALUE!
2,029	0	0	0	#VALUE!	#VALUE!	0.62	#VALUE!	#VALUE!
2,030	0	0	0	#VALUE!	#VALUE!	0.61	#VALUE!	#VALUE!
2,031	0	0	0	#VALUE!	#VALUE!	0.60	#VALUE!	#VALUE!
2,032	0	0	0	#VALUE!	#VALUE!	0.59	#VALUE!	#VALUE!
2,033	0	0	0	#VALUE!	#VALUE!	0.57	#VALUE!	#VALUE!
2,034	0	0	0	#VALUE!	#VALUE!	0.56	#VALUE!	#VALUE!
2,035	0	0	0	#VALUE!	#VALUE!	0.55	#VALUE!	#VALUE!

Totals: \$0 \$0 \$0 #VALUE! #VALUE! #VALUE! =30-year LCC  
 1st+Repl Maint Fuel Elec Total Annual

FUEL PRICE ESCALATION INFORMATION:

Select value and key in above as decimal fraction.

	Years:		
Electricity (Investor-Owned)	2005 - 2,015 . . .	1.0%	0.010
	2,016 - 2,025 . . .	2.0%	0.020
	2,026 - 2,040 . . .	2.0%	0.020
Electricity (Public Owned)	2005 - 2,015 . . .	2.0%	0.020
	2,016 - 2,025 . . .	2.0%	0.020
	2,026 - 2,040 . . .	2.0%	0.020
Natural Gas	2005 - 2,015 . . .	1.0%	0.010
	2,016 - 2,025 . . .	1.0%	0.010
	2,026 - 2,040 . . .	1.0%	0.010
Oil	2005 - 2,015 . . .	1.0%	0.010
	2,016 - 2,025 . . .	1.0%	0.010
	2,026 - 2,040 . . .	1.0%	0.010
Propane	2005 - 2,015 . . .	Assume same as natural gas	
	2,016 - 2,025 . . .		
	2,026 - 2,040 . . .		

**Instructions:**

1. C14..C18 plug in 1 if true, 0 if false  
C14 : If electric utility is privately owned enter 1  
C15 : If electric utility is publicly owned (e.g. PUD, municipality, rural electric) enter 1  
C16 : If natural gas escalation factors are desired enter 1  
C17 : If propane fuel is used enter 1  
C18 : If oil fuel is used enter 1
2. A29: Enter first analysis year
3. B29: Estimated construction cost would be the differential cost between the subject systems.  
(Including overhead & profit, tax, design fees, etc.)  
(If this was the least cost baseline system, the construction cost would be zero.)
4. C29: "Annual Maint Cost" includes boiler water and cooling tower water treatment, air filter changes, lubrication, spot replacement of lamps and ballasts, luminaire cleaning, boiler tune up, condenser cleaning, controls calibration, and other routine maintenance.  
e.g. 2% of lighting system construction cost.
5. D29: "Annual Gas Costs" (or other heating fuel).  
Apply current utility rate structure to monthly consumption from the building computer model.  
Enter first year dollar total in this cell.
6. E29: "Annual Electric Costs"  
Apply current utility rate structure to monthly consumption (kWh) and demand (kW) figures from the building computer model.  
Enter first year dollar total in this cell.
7. B31..B60: Replacement Costs include planned periodic maintenance such as heat pump compressor replacements, cooling tower and chiller replacements, boiler and burner replacements, boiler and condenser retubing, group relamping and reballasting, and other major refurbishing.

**Definitions:**

Present Worth Factor is  $1/((i+1)^n)$   
where "n" is the period in years  
and "i" is the discount rate

Real rate: Over and above general inflation.

Nominal rate: Includes general inflation.

General Inflation: Assumed to be 3.5% from 2005 through 2,040

To convert between real and nominal escalation or discount rates:

Nominal = Real + Discount + (Real \* Discount)

Escalation rates based on current Northwest Power Planning Council data.

**Print range:**

A1..J62

### **III. Proposal Forms**

#### **D Base Contract Price Proposal Form**





### **III. Proposal Forms**

#### **E Price Proposal Cost Estimate**

Proposer: \_\_\_\_\_  
 Date: \_\_\_\_\_

Appendix 3 E

**Price Proposal Cost Estimate**

	Qty	Unit	Labor including burden	Materials	Equipment	Purchase Order / Subcontract	Total
<b>A. Substructure</b>							
<b>A10 Foundations</b>							
A1010 Standard Foundations							-
A1020 Special Foundations							-
A1030 Slab on Grade							-
<b>A20 Basement Construction</b>							
A2010 Basement Excavation							-
A2020 Basement Walls							-
<b>B. Shell</b>							
<b>B10 Superstructure</b>							
B1010 Floor Construction							-
B1020 Roof Construction							-
<b>B20 Exterior Enclosure</b>							
B2010 Exterior Walls							-
B2020 Exterior Windows							-
B2030 Exterior Doors							-
<b>B30 Roofing</b>							
B3010 Roof Covering							-
B3020 Roof Openings							-
<b>C. Interiors</b>							
<b>C10 Interior Construction</b>							
C1010 Partitions							-
C1020 Interior Doors							-
C1030 Fittings							-
<b>C20 Stairs</b>							
C2010 Stair Construction							-
C2020 Stair Finishes							-
<b>C30 Interior Finishes</b>							
C3010 Wall Finishes							-
C3020 Floor Finishes							-
C3030 Ceiling Finishes							-
<b>D. Services</b>							
<b>D10 Conveying Systems</b>							
D1010 Elevators & Lifts							-
<b>D20 Plumbing</b>							
D2010 Plumbing Fixtures							-
D2020 Domestic Water Distribution							-
D2030 Sanitary Waste							-
D2040 Rain Water Drainage							-
D2090 Rain Water Harvesting Systems							-
D2090 Other Plumbing Systems							-
<b>D30 HVAC</b>							
D3010 Energy Supply							-
D3015 Geothermal Systems							-
D3020 Heat Generating Systems							-
D3030 Cooling Generating Systems							-
D3040 Distribution Systems							-
D3050 Terminal & Package Units							-
D3060 Controls & Instrumentation							-
D3070 Systems Testing & Balancing							-
D3090 Other HVAC Systems & Equipment							-

Proposer: \_\_\_\_\_

Appendix 3 E

Date: \_\_\_\_\_

**Price Proposal Cost Estimate**

	Qty	Unit	Labor including burden	Materials	Equipment	Purchase Order / Subcontract	Total
<b>D40 Fire Protection</b>							
D4010 Sprinklers							-
D4010 Fire pump							-
D4020 Standpipes							-
D4030 Fire Protection Specialties							-
D4040 Other Fire Protection Systems							-
<b>D50 Electrical</b>							
D5010 Electrical Service & Distribution							-
D5020 Lighting & Branch Wiring							-
D5030 Communication & Security Systems							-
D5031 Public Address & Music Systems							-
D5032 Intercom & Paging Systems							-
D5033 Telephone Systems							-
D5034 Call Systems							-
D5035 Televisions Systems							-
D5036 Clock & Program Systems							-
D5037 Fire Alarm Systems							-
D5038 Security & Detection Systems							-
D5039 Local Area Networks							-
D5040 Distributed Antenna Systems							-
D5041 Audio-Visual Systems							-
Owner Provided AV Allowance							-
D5090 Other Electrical Systems							-
D5091 Grounding							-
D5092 Emergency Power Systems (emerg ltg to be included in D5020)							-
D5092 UPS Systems							-
<b>E. Equipment &amp; Furnishings</b>							
<b>E10 Equipment</b>							
E1010 Commercial Equipment							-
E1020 Institutional Equipment							-
E1030 Vehicular Equipment							-
E1040 Other Equipment							-
<b>E20 Fixed Furnishings</b>							
E2012 Fixed Casework							-
E2013 Blinds and Other Window Treatment							-
<b>F. Special Construction &amp; Demolition</b>							
<b>F10 Special Construction</b>							
<b>G. Building Sitework</b>							
<b>G10 Site Preparation</b>							
G1010 Site Clearing							-
G1020 Site Demolition & Relocation							-
G1030 Site Earthwork							-
G1040 Hazardous Waste Remediation							-
<b>G20 Site Improvements</b>							
G2010 Roadways							-
G2020 Parking Lots							-
G2030 Pedestrian Paving							-
G2040 Site Development							-
G2050 Landscaping							-
<b>G30 Site Civil/Mechanical Utilities</b>							
G3010 Water Supply							-
G3020 Sanitary Sewer							-
G3030 Storm Sewer							-
G3040 Heating Distribution							-
G3050 Cooling Distribution							-

Proposer: \_\_\_\_\_  
 Date: \_\_\_\_\_

**Price Proposal Cost Estimate**

	Qty	Unit	Labor including burden	Materials	Equipment	Purchase Order / Subcontract	Total
G3060 Fuel Distribution							-
G3090 Other Site Mechanical Utilities							-
<b>G40 Site Electrical Utilities</b>							
G4010 Electrical Distribution							-
G4020 Site Lighting							-
G4030 Site Communications & Security							-
G4040 Other Site Electrical Utilities							-
<b>Direct Construction Cost Subtotal</b>							-
<b>Z10 General Requirements</b>							
Z1010 Administrative & Quality Requirements (General conditions/Project Management and Coordination)							-
Z1010 BIM							-
Z1030 Temporary facilities and temporary controls							-
Z1030 Mock-ups							-
Z1030 Hoisting							-
Z1040 Closeout							-
Z1050 Permits, Insurances & Bonds							-
Permits							-
Use							-
Building (paid by owner)							-
Trade							-
Insurances							-
General liability/Professional Liability							-
Builder's risk/All risk							-
Bonds							-
General contract P&P							-
Subcontractors P&P							-
Z1060 Fee							-
Z1070 Business & Occupation Tax							-
<b>Z20 Contingencies</b>							
Z2010 Contingency							-
Z2020 Escalation							-
<b>Indirect Construction Cost Subtotal</b>							-
<b>Z30 Professional Fees</b>							
Z3010 Preconstruction Services							-
Z3020 Design Professionals, Basic Services							-
Pre-design							-
Design							-
Construction Administration							-
Z3030 Design Professionals, Extra Services							-
Pre-design							-
Design							-
Construction Administration							-
Z3040 Five year performance guarantee							-
<b>Professional Fees Subtotal</b>							-
<b>Z90 Taxes</b>							
Z9010 Washington State Sales Tax							EXCLUDED
<b>Taxes Subtotal</b>							-
<b>Proposed Guaranteed Maximum Price</b>							-

Proposer: \_\_\_\_\_  
 Date: \_\_\_\_\_

Appendix 3 E

**Price Proposal Cost Estimate**

	Qty	Unit	Labor including burden	Materials	Equipment	Purchase Order / Subcontract	Total
<b>List All Percentage Mark-Ups within Proposed GMP</b>			<b>Comments</b>				
Labor Burden / Taxes		%					
Fee		%					
Small Tools		%					
B & O / Excise Taxes		%					
Insurance		%					
Bonding		%					
List all percentages not shown above							
<b>Additional Budget / Pricing Information Requested:</b>							
Design Builder to provide a sample Change Order form indicating all mark-ups, percent add ons to direct costs and subcontractor costs. Outline the methodology for change order pricing							
Design Builder to provide a hourly rate sheet that distinguishes between construction labor, subcontracting labor and design consulting labor indicating markups, labor taxes and any fees.							

### **III. Proposal Forms**

F Alternates Price Proposal Cost Estimate

Proposer: \_\_\_\_\_  
 Date: \_\_\_\_\_

**Alternates Price Proposal Cost Estimate**

	Alternates	Scope Description	Qty	Unit	Labor including burden	Materials	Equipment	Purchase Order / Subcontract	Total
1.0									-
2.0									-
3.0									-
4.0									-
5.0									-
6.0									-
7.0									-

### **III. Proposal Forms**

#### **G Exceptions/Qualifications to RFP Scope**



### **III. Proposal Forms**

H Proposal Stage Memorandum of Understanding  
(Honorary Agreement)

**Proposal Stage Memorandum of Understanding**

This Proposal Stage Memorandum of Understanding is between the State of Washington Department of Enterprise Services (hereinafter "DES") and the design-build competition finalist named \_\_\_\_\_ (hereinafter "Candidate").

Having previously reviewed qualifications presented by the Candidate, DES hereby agrees to review and consider the Candidate's future proposal to design and build the new Tri-Cities Readiness Center at Richland, WA, so long as that proposal is presented in accordance with the requirements listed in the Request for Proposal (RFP) document prepared by DES and already now reviewed by the Candidate.

The Candidate hereby attests that it has had ample opportunity to review DES's RFP document and the Candidate is now committed to fully and completely respond to it by the deadline time and date stated in that RFP.

It is mutually agreed by DES and the Candidate that the deadline date for DES receipt of design-builder proposals will not be changed unless by mutual consent.

Except in the instance of cancellation of the project by DES, in return for a proposal from the Candidate that fully satisfies the requirements of the RFP, if the Candidate is not awarded the design-build services contract, DES promises to pay the Candidate the lump sum honorarium amount of \$50,000.00. Any such honorarium payment will be made after the design-builder selection process has been completed and after a contract for design-build services has been fully executed with the winning proposer.

If for any reason DES should cancel the Pierce County Readiness Center project before a contract for design-build services has been executed, DES agrees to reimburse the Candidate for reasonable and actual expenses incurred toward the preparation of the herein authorized design-builder proposal, up to a maximum reimbursement of \$50,000.00.

In exchange for DES payment to the Candidate for proposal work performed, Candidate agrees to relinquish all proposal work product to DES for DES to review, copy, distribute, and potentially use for its Tri-Cities Readiness Center project, even though the Candidate may not become signatory to a design-build services contract with DES, so long as the work product is not patented or otherwise protected as a uniquely proprietary work product.

Mutually agreed this date of \_\_\_\_\_ by:

\_\_\_\_\_  
(Design Build Candidate)

State of Washington,  
Department of Enterprise Services

\_\_\_\_\_  
(Signature, Authorized Candidate representative)

\_\_\_\_\_  
(Signature, Authorized DES Representative)

\_\_\_\_\_  
(Print name and title, Authorized Candidate rep)

Dave Hickman, Program Manager  
(Authorized DES Representative)

### **III. Proposal Forms**

#### **I Design Builder/ Owner Responsibility Matrix**

## Design-Builder Owner Responsibility Matrix

Item	By Design Builder By Owner / DFS By Owner / Tenant			Remarks
<b>Site Investigation</b>				
Existing Neighborhood Conditions Survey		X		
Geotechnical Soils Report		X		Provided in RFP Exhibits
Potholing Investigation & Reports	X			
Asbestos & Hazardous Material Report & Survey		X		Provided in RFP Exhibits
Survey and locates of existing utilities	X			
<b>Design &amp; Consulting Fees (Including Construction Administration)</b>				
Architectural Design Fees	X			
Structural Engineering Fees	X			
Structural Engineering for Construction Equipment	X			Design of crane foundation
Shoring Design	X			Ground Support
Civil Engineering & Existing Conditions Survey	X			
Landscaping & Irrigation	X			
Acoustical Consultant	X			
Elevator Consultant	X			
Mechanical Design	X			
Mechanical Design Assist & Engineering	X			
Mechanical Design-Build Engineering	X			
Energy / Life cycle costing	X			
Curtainwall Design Concept	X			
Curtainwall Final Design & Engineering	X			by bidder designed - engineered
Utility rebate Coordination	X			
Electrical Design	X			
Electrical Design Assist & Engineering	X			
Street Lighting & Signalization	X			
Temporary Power Design	X			Temp power design fees are included.
Waterproofing & Roofing Consultant	X			
Document reproduction	X			
Graphics design (signage design)	X			
Tel/comm consultant	X			
Security consultant	X			
Lab consultant	X			
Door/hardware consultant	X			
Indoor air quality consultant	X			
Interior design	X			
Food service consultant	X			
Renderings, presentations, models, etc	X			
Record drawings	X			
Testing & balancing	X			
Traffic Consultant		X		
Sustainability Documentation & Registration Fees	X			LEED, Energy Star etc.
<b>Permit Cost</b>				
Development or mitigation fees		X		
Clear and Grading Permit Fees	X			
General Building Permit Fees		X		
Shoring Permit Fees	X			
Street Use Permits & Use Fees	X			
Shoring Bond	X			
Mechanical Plan Check & Permit Fees	X			
Fire Protection Plan Check & Permit Fees	X			
Puget Sound Air Quality Plan Check and Permit Fees	X			
Electrical Plan Check & Permit Fees	X			
<b>Testing and Inspection</b>				
Geotechnical Inspection		X		
Hazardous Waste		X		for site soils hazardous removal, asbestos abatement by DB Contractor
Noise & Vibration Monitoring		X		
Structural Inspection - concrete, steel & fireproofing		X		
Curtainwall Performance Test		X		
On site Curtainwall Testing Fees		X		Cost for third party inspection
Curtainwall "u" value Testing	X			Assumes system is already NFRC tested; to be done thru D-B Curtainwall sub
Air Barrier / Envelope Leakage Testing		X		
Functional and start up testing	X			
Inspector overtime		X		
Commissioning Agent		X		Third party commissioning agent; requirements for Cx to be reviewed with MEP/Systems subcontractors to determine fianl scope of Owner Cx Consultant

## Design-Builder Owner Responsibility Matrix

Item	By Design Builder By Owner / DFS By Owner / Tenant			Remarks
<b>Utility Connection Fees</b>				
Electrical Design & Installation - Building Service	X			Cost for engineering, Vista switch, vaults, transformers, ductbanks, medium voltage cable, terminations, connection, and coordination
Design & Installation - Temp Power	X			Temporary power connection costs and distribution
Temporary Power Monthly Usage Fees (Power Bills)	X			
Street Lighting	X			
Water Department - Fees and connection		X		Utility hook-up/service thru meter by Owner; estimate includes connection from meter to building
Steam Connection				Not required
Telephone Connections	X			Extensions from provider vaults into building
Telephone Equipment		X	X	Pathways to be provided by DB Contractor
Data & Telephone Cabling	X			Raceways, grounding and sleeves and cabling are included in the DB Scope
<b>FF&amp;E</b>				
Security System, rough-in	X			Pathway, systems and equipment as required for base building systems. Specialty systems located within TI spaces are by Owner
Security System, cabling and devices	X		X	See note above.....base building systems by DB Contractor, tenant specific by owner
Audio visual, rough-in	X			Pathways, Power and Network cabling / connections by DB contractor
Audio visual, cabling and equipment		X	X	Equipment, Install and equipment cabling by Owner
Public address, rough-in				system not required
Public address, cabling and equipment				system not required
Cable television, rough-in	X			Pathways, Power and Network cabling / connections by DB contractor
Cable television, cabling and equipment		X		Equipment, Install and equipment cabling by Owner
DAS, rough-in	X			Pathway, systems and equipment as required for base building systems. Specialty systems located within TI spaces are by Owner
DAS, cabling and equipment	X		X	See note above.....base building systems by DB Contractor, tenant specific by owner
Clock & program, rough-in				system not required
Clock & program, cabling and equipment				system not required
Building Signage	X			
Window Blinds	X			
Parking Equipment	X			not required for base proposal. See Alternate 1.C
Furnishings		X		Non-user group areas
Furnishings			X	User group areas
Site Furniture	X			
Trash Compactor/Recycling Equipment				Not required
<b>Post Occupancy</b>				
Post Occupancy Permits		X		Operating permits by Owner
Elevator Subcontractors Warranty Maintenance		X		Amounts will be assigned to Owner
Maintenance of Building Systems		X		
Contractor's Warranty	X			
Licensed Surveyor - As Built's		X		Established property corners, ALTA Survey.
<b>Scope of Work</b>				
Off site improvements	X			Limited to typical minimum City requirements
Traffic Signalization	X			
Asbestos Abatement / Hazardous Material Remediation	X			Asbestos Report and Survey included in RFP exhibits
Site Work Hazardous Waste / Contaminated Soil Removal & Disposal		X		
Licensed Surveyor - Shoring Monitoring		X		
Monthly Electrical Usage Costs	X			Including temporary power bills during construction
Project office Job Office / Site Laydown Area	X			See RFP exhibits for GA building temp office location and GA site laydown location. Costs (noted in Exhibit) are to be included in DB Contractor scope if use of these areas from State are to be used
Progress Photos	X			DB Scope includes monthly aerial photos
Final Cleaning	X			
Final Window Cleaning	X			
Printing Contract Documents & Approved Shop Drawings	X			
Moving/Relocation expenses			X	

### Design-Builder Owner Responsibility Matrix

Item	Responsibility			Remarks
	By Design Builder	By Owner / DFS	By Owner / Tenant	
<b>Insurance, Bonds, &amp; Taxes</b>				
Washington State Sales Tax	X			
Builder's Risk Insurance	X			
Change Order Contingency		X		
Payment & Performance Bond - General Contractor	X			
Payment & Performance Subcontractors	X			<i>Requirements for subcontractor bonding to be discussed further between Owner/Contractor to determine appropriate course</i>
All insurance required per contract including E & O Insurance Premiums	X			

### AUTHORIZED ACCEPTANCE

\_\_\_\_\_  
Design-Builder Entity

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Print Name and Title

\_\_\_\_\_  
Date

### **III. Proposal Forms**

#### **J Diverse Business Inclusion Plan**



## Diverse Business Inclusion Plan

To be considered responsive, the Proposer must submit the Diverse Business Inclusion Plan Supplement, as part of their proposal that will be incorporated into their contract, if awarded. The responses should reflect good faith efforts for diverse business inclusion. Zero is not a goal; however a range of 1% to 3% contribution to the agency goal would be a low result for the expected good faith effort, a 4% to 6% contribution to the agency goal would be a better result for the expected good faith effort, and a 7% to 10% or greater contribution to the agency goal would be a best result for the expected good faith effort. The Diverse Business definition – includes Washington small business, microbusiness, and minibusiness as defined in RCW 39.26.010, and Veteran-owned businesses as defined in RCW 43.60A.010. If the proposed subcontractors are self-identified diverse businesses, the DB will encourage and support state efforts for their certification with the appropriate Washington state agencies.

The Proposer must include an anticipated list of diverse subcontractors or suppliers who may provide services or otherwise assist the Proposer in fulfilling its obligations for the project. The Proposer must provide the following information regarding their plans for including diverse team members.

Identify any subcontractors who are certified by the Washington State Office of Minority and Women's Business Enterprises (OMWBE) or the Washington State Department of Veterans Affairs (DVA).

In accordance with [Chapter 39.19 RCW](#), the state of Washington encourages participation in all of its contracts by OMWBE certified firms.

In accordance with Chapter 43.60A.200, the state of Washington encourages participation in all of its contracts from firms certified by DVA certified firms.

In accordance with Chapter 39.26.005, the state of Washington encourages participation in all of its contracts from Washington small businesses.

**With respect to agency spend the agency aspirational goals are:**

- ✓ 10% Minority Owned Business certified by the Washington State Office of Minority and Women Business Enterprises
- ✓ 6%, Women Owned Business certified by the Washington State Office of Minority and Women Business Enterprises
- ✓ 5% Veteran Owned Business certified by the Washington State Department of Veterans Affairs
- ✓ 5% Washington Small Businesses self-identified in the Washington Electronic Business Solution <http://www.des.wa.gov/services/ContractingPurchasing/Business/Pages/WEBSRegistration.aspx> (WEBS).

These goals are voluntary. No preference will be included in the evaluation of bids, no minimum level of MWBE or Veteran Owned or Washington Small Business participation will be required as a condition for receiving an award and proposals will not be rejected or considered non-responsive on that basis.

For information on certified firms, prime Proposers may contact:

OMWBE at <http://www.omwbe.wa.gov/> or (360) 753-9693

DVA at <http://www.dva.wa.gov/BusinessRegistry/Search.aspx> or (360) 725-2200.



DES Business Diversity and Outreach Manager Servando Patlan [Servando.patlan@des.wa.gov](mailto:Servando.patlan@des.wa.gov) or (360) 407-9390 for a list of self-certified Washington Small Businesses that downloaded this solicitation and selected to allow their contact information to be shared.

Please complete this **Diverse Business Inclusion Plan Supplement** for this Proposal.

Scopes where the Diverse Businesses is not yet determined or committed	When do you anticipate making a selection ?	Y/N					Anticipated sub-contract \$ amount
		Do you anticipate using a State Certified Women Business?	Do you anticipate using a State Certified Minority Business?	Do you anticipate using a State Certified Veteran Business?	Do you anticipate using a Washington State Small Business?	Can only a Sole Sourced Business do the work?	
							\$
							\$
							\$
							\$
							\$
<b>Total Amount Not Yet Committed to a Sub/Supplier:</b>							\$

Contractor commits to a good faith effort to achieve the proposed subcontract amounts with diverse business subcontractors by at least hosting 3 supplier outreach events for businesses registered with the state of Washington in the Washington State Electronic Business Solution, WEBS; including those registered as state certified minority businesses, women businesses, veteran businesses, and businesses self-certified as Washington Small Businesses in WEBS. The state will assist in coordinating event invitations to these businesses.

**Subcontracting**

Subcontracting means direct performance of commercially useful work through subcontracting as part of the proposed project team.

**DIVERSE Expert**

Identify the person within your team to manage your DIVERSE inclusion responsibility.

DIVERSE Expert Name: \_\_\_\_\_

DIVERSE Expert Firm: \_\_\_\_\_

DIVERSE Expert Contact Information: \_\_\_\_\_

DIVERSE Expert responsibilities would typically include, but are not limited to:



Outreach to qualified DIVERSE firms.  
Submit and discuss updates on a regular basis to the state project manager, to indicate DIVERSE utilization and discuss progress.  
Ongoing outreach to DIVERSE firms for work the contract may require, including any new scopes.  
Assist DIVERSE firms to perform successfully.

A qualified DIVERSE Expert brings knowledge of the identity, capabilities and capacities of DIVERSE subcontractors and suppliers; experience recruiting and working with DIVERSE firms for construction; and assisting DIVERSE firms to develop working relationships with contracts.

**Strategies**

Describe the strategies and selection processes you intend to use to achieve meaningful DIVERSE utilization in the contract. Describe your strategies, the scopes of work that have greatest DIVERSE opportunities and how you would balance those scopes that have less DIVERSE opportunity.

**Mentoring Program**

If any of the DIVERSE subcontractors listed above are participating in a mentoring or capacity building program with your company, please identify which and describe your program.

The Owner/Department of Enterprise Services will review the submitted inclusion plan for good faith effort and the maximum opportunity to contribute toward the Owner/Department of Enterprise Services' aspirational goal.