

# **WMD Design Manual and Standard Specifications**



# WASHINGTON STATE MILITARY DEPARTMENT

## DESIGN MANUAL AND STANDARD SPECIFICATIONS

May 2011

TABLE OF CONTENTS

Title	No. of Pages
<b>DESIGN MANUAL</b>	
Basis for Design Manual .....	1
Greater Campus Guidelines .....	7
Historic District Guidelines .....	3
<b>DIVISION 1 - GENERAL REQUIREMENTS</b>	
Section 01 00 00 General Requirements .....	1
Section 01 81 13 Sustainable Design Requirements.....	1
<b>DIVISION 2 - SITE WORK</b>	
Section 02 41 16 Demolition .....	1
<b>DIVISION 3 - CONCRETE</b> Not Used.	
<b>DIVISION 4 - UNIT MASONRY SYSTEM</b>	
Section 04 05 03 Masonry Mortar and Grout .....	1
Section 04 20 00 Unit Masonry .....	1
<b>DIVISION 5 - METALS</b>	
Section 05 50 00 Metal Fabrications.....	1
<b>DIVISION 6 - WOOD AND PLASTIC</b>	
Section 06 10 00 Rough Carpentry .....	1
<b>DIVISION 7 - THERMAL AND MOISTURE PROTECTION</b>	
Section 07 46 00 Siding .....	1
Section 07 61 00 Sheet Metal Roof .....	1
Section 07 62 00 Sheet Metal Flashing and Trim .....	1
<b>DIVISION 8 - DOORS AND WINDOWS</b>	
Section 08 11 13 Hollow Metal Doors and Frames.....	2
Section 08 14 00 Wood Doors .....	1
Section 08 31 13 Access Panels and Doors .....	1
Section 08 41 13 Aluminum Entrances and Storefronts .....	2
Section 08 51 13 Aluminum Windows.....	2
Section 08 71 00 Hardware.....	2

**DIVISION 9 - FINISHES**

Section 09 51 13	Acoustical Ceiling Grid System.....	1
Section 09 65 00	Resilient Flooring .....	1
Section 09 68 13	Carpet Tiles.....	1
Section 09 90 00	Paint and Coatings.....	1

**DIVISION 10 – SPECIALTIES**

Section 10 21 13	Toilet Partitions .....	1
Section 10 28 00	Toilet and Bath Accessories .....	1
Section 10 44 00	Fire Protection Specialties .....	1

**DIVISION 11 - EQUIPMENT**

Not Used.

**DIVISION 12 - FURNISHINGS**

Section 12 21 13	Horizontal Louvered Blinds.....	1
Section 12 48 13	Entrance Floor Mats and Frames.....	1

**DIVISION 13 - SPECIAL CONSTRUCTION**

Not Used.

**DIVISION 14 - CONVEYING SYSTEMS**

Not Used.

**DIVISION 21 – FIRE SUPPRESSION**

Section 21 00 00	Basic Fire Suppression Requirements.....	1
------------------	--	---

**DIVISION 22 – MECHANICAL PLUMBING**

Section 22 00 00	Basic Plumbing Requirements.....	1
Section 22 05 19	Advanced Meters for Plumbing Requirements.....	13
Section 22 11 16	Water Piping Systems.....	1
Section 22 33 00	Electric Water Heaters .....	2
Section 22 34 36	Gas-Fired Water Heaters .....	2
Section 22 40 00	Plumbing Fixtures .....	2

**DIVISION 23 – MECHANICAL HVAC**

Section 23 00 00	Basic HVAC Requirements.....	3
Section 23 05 19	Advanced Meters for HVAC Requirements.....	7
Section 23 09 23	Direct Digital Control System .....	2
Section 23 25 00	HVAC Water Treatment .....	1
Section 23 35 00	Special Exhaust Systems.....	1
Section 23 40 00	Air Filtration .....	1
Section 23 81 23	Computer Room Air Conditioners .....	2

**DIVISION 25 – INTEGRATED AUTOMATION**  
**Not Used**

**DIVISION 26 - ELECTRICAL**

Section 26 01 26	Maintenance Testing for Electrical Systems .....	1
Section 26 05 00	Common Work Results for Electrical Systems.....	1
Section 26 05 19	Low Voltage Electrical Power Conductors and Cables .....	1
Section 26 05 26	Grounding .....	1
Section 26 08 00	Commissioning.....	1
Section 26 09 13	Advanced Electrical Power Monitoring Requirements .....	3
Section 26 22 00	Low Voltage Transformers .....	1
Section 26 24 13	Electrical Switchboards .....	1
Section 26 24 16	Panelboards .....	1
Section 26 24 19	Motor Control Centers.....	1
Section 26 27 26	Wiring Devices .....	1
Section 26 32 00	Generators .....	1
Section 26 50 00	Lighting .....	3

**DIVISION 27 – COMMUNICATIONS**

Section 27	WA Army National Guard Telecommunications Planning Guide .....	16
------------	--	----

**DIVISION 28 – ELECTRONIC SAFETY AND SECURITY**

Section 28 31 00	Fire Alarm Mass Notification System .....	1
------------------	---	---

**END OF TABLE OF CONTENTS**

## **BASIS FOR DESIGN MANUAL**

### **History of Camp Murray**

The First instructional encampment or summer camp on the site of Camp Murray was in the summer of 1890. The state of Washington purchased 220 acres at a cost of \$6,600 in 1903. When Camp Lewis was constructed in 1918 12 acres were transferred to Pierce County to become part of the cantonment area of what is now Ft. Lewis. In 1921 another 11.215 acres were purchased and in 1932 Barlow Island was acquired through condemnation.

In 1915 the parcel was fenced and the first building “The Arsenal” was built to prevent tentage and other equipment from being hauled back and forth from Seattle each year. The name is derived from the railroad station erected about 1890. The railroad used the name because it was alongside Murray Creek, which was named after a pioneer family in the area.

### **Philosophy of Design Guidelines**

The Camp Murray site houses several different organizations with diverse uses and program requirements. This has resulted in a wide variety of building designs and site elements. It is the intent of this design guidelines manual to create a cohesive standard of design and visual elements as the campus continues to grow and mature. This manual was created to give basic design guidelines and standards for Camp Murray to present a more unified and cohesive visual palette moving forward.

The campus has two distinct areas: The historic district and the greater Camp Murray campus. Each has its own set of unique design requirements, style and finish considerations.

This manual provides a guideline for future building construction at Camp Murray. Deviations from the requirements of this manual will be considered on a case by case basis.

## GREATER CAMPUS GUIDELINES

The historic area encompasses the area highlighted in yellow on the map below. The area outside of the yellow area represents the greater campus area.

It is the intent of the greater campus to create a more cohesive and easily navigated campus. This will be achieved through site design and building design, both new and remodel work that adheres to the following guidelines. A consistent building vocabulary is desired to create a strong sense of place on the Camp Murray campus. The buildings most representative of the character to be emulated are Building No. 91 and the Addition to Building No. 32. These represent the style of architecture and the types of finishes that should be contemplated in the greater campus area.

### Campus Map



Yellow area denotes Historic District



**Building No. 91**



**West end of Building No. 32**

Building No. 91 and the building addition to the west end of Building No. 32 reflect the palate of materials and colors to be used for future buildings outside of the historic district at Camp Murray.

**Building Elements:**

Exterior Facade:

Several building materials are used in the greater campus but the materials to be contemplated for future buildings should be limited to the following:

- Stucco finish
- Concrete Block – Split Faced Integral Color
- Wood Siding - Horizontal Lap Siding, color to be off-white or beige
- Metal Panels

Windows:

- Aluminum, must meet force protection standards
- Color: Silver

Doors:

- Hollow metal or Aluminum, must meet force protection standards
- Color: Brown or silver

Roofing:

- Roof slopes to be 3:12 minimum
- Type: Standing seam metal roofs
- Color: Brown
- Gutter type – No internal gutters

**Site Elements:**

Landscaping:

- Landscaping must be designed to meet force protection standards

Pedestrian Paths:

- Pedestrian paths need to provide connectivity between all buildings
- Pedestrian paths are to be built with pervious materials where not subject to vehicle traffic



Pedestal pedestrian lighting fixtures to match fixture at left. Larger pedestrian areas may use lighting similar to parking lot lighting fixture.

Pedestrian Lighting:

Memorials: Camp Murray has established a respectful manner to memorialize individuals on campus. A flowering cherry tree is planted with an engraved block mounted at grade. This simple memorial will be the model for future memorials at Camp Murray.



The memorial at left illustrates the style to be followed for future memorials on Camp Murray.

Parking Lot Lighting:



Parking lot lighting

Parking lot lighting and area lighting to use  
Fixtures similar to the one at left.



Special Area Lighting

Under special circumstances the fixture at  
left may be used. These circumstances  
include projects that do not have readily  
accessible power sources.

Traffic Barriers:



The traffic barriers at left represent the standard style and colors to be used on Camp Murray.



Site Furnishings:



Picnic Tables

Picnic tables to be concrete bases with plastic tops and benches. Tables to have an overhang on one end for ADA access.



Smoking Shelter

Pre-manufactured aluminum and glass smoking shelter.

Storage Yard Fencing:



Sight obscuring fencing

Use vision obscuring slats where storage yards are visually prominent.



Typical secure fencing

Typical secure fencing includes 6' high chain link fencing with three rows of barbed wire and one strand of razor wire.

Perimeter Fencing:



Decorative Perimeter Fencing



Standard Perimeter Fencing

## HISTORIC DISTRICT GUIDELINES

The historic district encompasses the area highlighted in yellow on the map below.

It is the intent of the historic district to support and enhance the historic buildings and to foster a connection to the time this area was constructed. This will be achieved through site design, building design, both new and remodel work that adheres to the following guidelines. The buildings most representative of the historic district are Building No. 1 and Building No. 2. These represent the style of architecture and scale of buildings that should be contemplated in the historic district.

### Campus Map



Yellow area denotes Historic District



**Building No. 1**



**Building No. 2**

### **Historic District Buildings:**

New buildings in the district must be designed to be compatible with the existing building in the district. Building No.1 and No. 2 reflect the style and materials desired in the historic district.

Existing facility alterations must consult with JFESD Cultural Resources who will coordinate with State of Washington representative in Olympia.

### **Historic District Building Elements:**

In the historic district all finishes should be selected to closely match the palate of materials on the adjacent existing buildings.

#### **Exterior Facade:**

The exterior façade material in the historic district is primarily stucco. Corrugated metal siding was also used on the warehouse buildings. Walls are off-white to tan in color.

#### **Windows:**

Wood windows were used on the original buildings within this district. Force protection standards may dictate aluminum windows but profiles should be selected to most closely match the window styles present in the historic district.

#### **Doors:**

Wood doors were primarily used on the original buildings within this district. Force protection requirements may lead to the use of steel doors trimmed out to match the wood style.

#### **Roofing:**

Roof with slopes of at least 3:12 are predominant in this district. Red roofing is also predominant with clay tiles and compositions shingles.

**Site Elements:**

**Pedestrian Paths:**

Pedestrian Paths within the Historic District will be constructed as concrete sidewalks with tooled control joints at 5' o.c. or brick pavers.

**Streets:**

Streets within the historic district will be placed towards the perimeter of the district to create a pedestrian friendly core in the historic district.

**Parking:**

New parking within the historic district will be placed towards the perimeter of the district to create a pedestrian friendly core in the historic district.



Pedestrian Lighting

Pedestrian Lighting in the historic district should reflect the lighting from the style from the original construction period. The fixture at left is the style that future pedestrian lighting in the historic district will match.

**Part 1 – General Information**

- Design Information
  1. Substitutions
    - a. Manufacturer's must have full supporting literature and details, specifications and technical support to be considered equal to the specified product.
    - b. Designers must pre-approve substitutions with Joint Facilities & Environmental Services Division.
  
- Force Protection
  1. Designs will utilize the Unified Facilities Criteria 4-010-01, DoD Antiterrorism Standards for Buildings.
  2. All design decisions involving security and anti-terrorism requirements will require coordination among the design stakeholders including land planners, landscape architects, architects, intelligence personnel, security personnel, Force Protection Officer, facility users, and engineers.
  3. The designers must work to resolve conflicts and balance force protection requirements with all other requirements that impact design and development. These include the **Americans with Disabilities Act Accessibility Guidelines (ADAAG)**, the **Uniform Federal Accessibility Standards (UFAS)**, **National Fire Protection Codes (NFPA)**, and all applicable local building codes and ordinances.
  4. The design team will also consult security personnel to determine whether portions of the design documents are subject to access limitations.
  
- Sustainable Design Requirements
  1. Projects required to meet LEED shall provide the data needed to obtain the rating required for state projects.
  
- CADD Drawing Conventions
  1. Consultants and Contractor's preparing drawings will be required to utilize the **Washington State Military Department CADD Standards** dated January 9, 2007
  
- Submittal Information
  1. As required by individual sections and as design team

**Part 1 – General Information**

- It is Camp Murray’s intent to provide sustainable design to the maximum extent possible within the prescribed budget on all projects whether the project is required to meet a LEED standard or not.
  1. To that end, all projects should review LEED standards for sustainable design whether required to meet a specific standard or not.
  2. The LEED checklist will be used on all projects to confirm that sustainable design concepts have been identified, investigated, reviewed and where possible implemented.
  
- Sustainable Design Requirements
  1. All State projects over 5,000 s.f. are required to meet the LEED Silver standard
  2. All MILCON projects are required to meet the LEED Silver standard
  
- Building Requirements: All buildings shall meet or exceed an energy efficiency of at least 30% better energy efficiency than ASHRA 90.1-2004 minimum standards.

**Part 1 – General Information**

- Design Information
  1. Register for demolition permit through responsible agency (Puget Sound Clean Air Agency)
  2. Hazardous materials assessment and testing by a qualified company.
  3. Owner to identify any items to be salvaged and reused.

**Part 2 – Product Information – Not used.**

**NOT USED**

**Part 1 – General Information**

- Design Information
  1. Joints Above Grade: Concave
  2. Joints Below Grade: Flush
  
- Submittal Information
  1. Maintenance and Care Instructions
  2. Warranty
  3. Call-back Contact Information

**Part 2 – Product Information**

- Sealant
  1. Fabrishield 653, Fabrikem or as recommended by mortar or grout manufacturer.

**Part 1 – General Information**

- Design Information
  1. Visible masonry, veneer or load bearing
    - a. Split face
    - b. 8"x16"x depth (depth dependant on application)
    - c. Color to match surrounding buildings or as directed by the project manager.
    - d. Veneer cavities to use a poly-ethylene mesh product to keep weeps clear.
    - e. Weeps minimum 4'-0" o.c.
    - f. Mortar Joints: concave
  2. Non-visible masonry, load bearing (foundation walls)
    - a. smooth face
    - b. 8"x16"x12"
    - c. bituminous dampproofing applied to all below grade installations
    - d. Mortar Joints: flush
  3. Control Joints
    - a. Per Masonry Institute Standards
  4. Reinforcing steel
    - a. Horizontal and vertical
    - b. Type and size by structural engineer
  
- Submittal Information
  1. Maintenance and Care Instructions
  2. Warranty
  3. Call-back Contact Information

**Part 2 – Product Information**

- Manufacturer
  1. Mutual Materials
  2. Pre-approved matching all characteristics of Mutual Materials
  
- Accessories
  1. Wall ties: Slotted Rap-Tie by Ferro Corp. or as recommended by block manufacturer.
  2. Sealer: Fabrishield 653, Fabrikem or as recommended by block manufacturer.
  3. Dampproofing: Bituminous
  4. Mortar net
  5. Reinforcing steel

**Part 1 – General Information**

- Design Information
  1. Handrails and guard rails:
    - Steel Pipe: 1-1/2 inch, Grade B, Schedule 40 minimum.
    - Handrail Fittings: Elbows, T-shapes, wall brackets, escutcheons cast steel.
    - All welds to be ground smooth
    - Lateral force per the current edition of the IBC.
  2. Bollards
    - 6 inch tube steel, Grade B, Schedule 40 minimum
    - Filled with concrete
    - Footing sufficient for height.
    - Provide for protection of buildings at garage doors or where vehicles abut buildings without benefit of sidewalk, curb or wheel stops
- Submittal Information
  1. Shop drawings
  2. Call-back Contact Information

**Part 2 – Product Information – Not Used**

**Part 1 – General Information**

- Design Information
  1. Roofs:
    - Minimum 5/8 inch roof sheathing thickness
  2. Counters at sinks
    - Marine grade plywood

**Part 2 – Product Information – Not used.**

**Part 1 – General Information**

- Design Information
  1. Siding Materials
    - a. Exterior Grade Plywood, rough sawn with 1inch x 2 inch battens.
    - b. Fiber Cement Board with wood grain pattern
    - c. Cedar horizontal lap
  2. Soffits
    - a. Exterior Grade Plywood, medium density overlay
    - b. Preformed, pre-finished galvanized steel.
    - c. Fiber Cement Board
  3. Accessories (same as siding material)
    - a. Soffit vents: Galvanized or pre-painted metal or aluminum
    - b. Facias
    - c. Starter strips
    - d. Trim
    - e. Corner beads
  
- Submittal Information
  1. Maintenance and Care Instructions
  2. Warranty
  3. Call-back Contact Information

**Part 2 – Product Information – Not used**

**Part 1 – General Information**

- Design Information
  1. Concealed fastener standing seam only.
  2. Face of panel shall have surface variation (no flat panels).
  3. Color: Weathered Copper
  
- Submittal Information
  1. Product Data
    - a. Technical product data and installation instructions and shop drawings for flashings.
    - b. Manufacturer's standard color samples
    - c. 12" wide panel showing shape and color
    - d. Shop Drawings: Show panel layout, trim and flashing and panel attachment.
  2. Warranty
    - a. Manufacturer: Minimum of 10 years experience supplying metal roofing and siding where work is to be done.
    - b. Installer: Minimum 5 years experience in installation of panes and accessories and must be approved by panel manufacturer.
  3. Maintenance and Care Instructions
  4. Call-back Contact Information

**Part 2 – Product Information – Not used.**

**Part 1 – General Information**

- Design Information
  1. Gutters:
    - No internal gutters
    - Color to match metal roofing
  2. Downspouts
    - Color to match building
    - Straps: 4'-0" o.c.
  3. Roof Flashing:
    - Valleys: Ice and Water Shield
    - Eaves:
      1. Face: Per current SMACNA Manual
      2. Return under roof: Per current SMACNA manual or Roofing Manufacturer's recommendation whichever is most stringent
    - Rakes:
      1. Face: Per current SMACNA Manual
      2. Return under roof: Per current SMACNA manual or Roofing Manufacturer's recommendation whichever is most stringent
    - Drip Edges: Hemmed 1/4 inch
  4. Sealants and caulk:
    - Polyurethane only (no silicone)
    - Check for compatibility of materials

**Part 2 – Product Information – Not used.**

### Part 1 - General Information

- Design Information  
Hollow metal frames are used throughout the facility.  
Hollow metal frames and doors prepared for future electric locking devices.  
Exterior man doors: Hollow metal throughout the facility.  
Interior applications: Verify with facilities manager.  
Relites:  
Interior office and conference room doors to have minimum vision panel 4"x25"  
Exterior doors: High traffic areas to have a minimum vision panel 4"x25"  
Adjacent to door frames, minimum 12" away from frame to allow for light switches and sensors.  
Steel Door Institute Guidelines
- Submittal Information  
Maintenance and Care Instructions  
Warranty  
Call-back Contact Information

### Part 2 – Product Information

- Manufacturer:
  1. Curries, Republic, Kewanee
  2. Steel Door Institute member
- Exterior Hollow Metal Doors:
  1. Seamless
  2. Gage: 16
  3. Thickness: 1-3/4 inch.
  4. Vertical Edges: Continuous weld.
  5. Top and Bottom Edges: Closed with 18 gage continuous recessed channel.
  6. Core: Insulating Foam.
  7. U-Value: .61
  8. Fire Rated: As dictated by International Building Code, labeled.
  9. Finish: Primed or if exposed galvanized
- Exterior Hollow Metal Frames:
  1. Gage: 16
  2. Floor Anchors: 14 gage welded to frame
  3. Jamb Anchors: 18 gage welded to frame
  4. Finish: Primed or if exposed galvanized
- Interior Hollow Metal Doors:
  1. Seamless
  2. Gage: 20
  3. Thickness: 1-3/4 inch.

4. Vertical Edges: Continuous weld.
  5. Top and Bottom Edges: Closed with 18 gage continuous recessed channel.
  6. Core: Polyurethane foam
  7. Fire Rated: As dictated by International Building Code, labeled.
  8. Finish: Primed.
- Interior Hollow Metal Door Frame:
    1. Metal: 18 gage
    2. Construction: Welded units with integral stop and trim
    3. Floor Anchors: 18 gage welded inside jambs
    4. Jamb Anchors: 18 gage welded inside jambs
  - Interior Relite Frame:
    1. Metal: 18 gage
    2. Construction: Welded units with integral stop and trim
    3. Sill Anchors: 18 gage welded inside jambs
    4. Jamb Anchors: 18 gage welded inside jambs
  - Exterior Door Relite Frame:
    1. Gage: 18
    2. Welded
    3. Glazing Stops: Security screws.
  - Interior Door Relite Frame:
    1. Gage: 20
    2. Welded or knocked-down with integral top and trim.
    3. Loose Glazing Stops: 20 gage
  - Oversize Doors
    1. Doors 3'-6" or larger
    2. Gage: 16 gage
    3. Extra reinforcement
  - Hardware Preparation
    1. Doors and Frames prepared for cylindrical 2 3/4 Inch back-set
    2. Obtain templates from hardware manufacturer/supplier.
  - Accessories:
    1. Bituminous Coating: Fibered asphalt emulsion.
    2. Primer: ANSI A250.10 rust inhibitive type, zinc chromate.

**Part 1 – General Information**

- Design Information
  1. Interior applications only: Verify with facilities manager.
  2. Relites: Interior office and conference room doors to have minimum vision panel 4"x25",
- Submittal Information
  1. Shop Drawings
    - a. Indicate size
    - b. Relite size and locations within door panel.
    - c. Handing
    - d. Fire rating
  2. Maintenance and Care Instructions
  3. Warranty
  4. Call-back Contact Information

**Part 2 – Product Information**

- Manufacturer
  1. Marshfield Door
  2. Weyerhaeuser Door
  3. Vancouver Door
  4. Pre-approved substitutions: Permitted.
- Characteristics
  1. Core: Solid
  2. Flush Door Facing: Wood Veneer: NWWDA Grade 1 - Premium Fir or Birch species wood, plain sliced with match grain, for paint or stain finish.
  3. Fire Rated: As required by current edition of the IBC, with permanent label.
  4. Fabricate doors in accordance with NWWDA I.S.1 requirements.
  5. Fabricate doors with hardware reinforcement blocking in place.
  6. Factory machine doors for finish hardware.
  7. Factory fit doors for frame opening dimensions identified on shop drawings.
  8. Install doors in accordance with NWWDA I.S.1 requirements.

**Part 1 – General Information**

- Design Information
  1. Finishes
    - a. Paintable steel
    - b. Stainless steel at bathrooms and wet locations
  2. Lockable, coordinate with finish hardware.
  3. Size: As needed for type of access.

**Part 2 – Product Information**

- Manufacturer
  1. None specified

**Part 1 – General Information**

- Design Information
  1. Blast Resistant Assemblies as outlined in Force Protection Standards.
  2. Blast Resistant Glazing Units
  3. Locations as outlined in Force Protection Standards.
  4. Color: Bronze
  5. Safety glazing where required by building code.
  6. Door stiles: 6 inches wide to accommodate cypher locks
  7. Door bottom rail: 6 inches high
  8. Storefront sills to be a minimum 6 inches high.
  
- Submittal Information
  1. Maintenance and Care Instructions
  2. Warranty – Minimum 5 year and will cover:
    - a. Complete watertight and airtight system installation
    - b. Completed installation will remain free from rattles, wind whistles and noise due to thermal movement and wind pressure.
    - c. Glass and glazing gaskets will not break or “pop” from frames due to design wind load pressure, expansion or contraction movement or structural loading.
    - d. Glazing sealants and gaskets will remain free from abnormal deterioration or dislocation due to sunlight, weather or oxidation.
  3. Thermal Break Structural Integrity Warranty: Provide 10-year manufacturer’s warranty against failure resulting from longitudinal or transverse shrinkage, cracking or loss of adhesion or prescribed pressure on the glazed material.
  4. Call-back Contact Information

**Part 2 – Product Information**

- Manufacturer
  1. No preference
  
- Characteristics
  1. Frame:
    - a. Minimum 2 inch deep profile
    - b. Thermally broken, Interior portion of frame insulated from exterior portion
    - c. Aluminum extrusion .062” thick, 6063-T5 aluminum
    - d. Flush glass stops, screw fastened type.
  
- Insulated Glass Unit
  1. 1 inch overall thickness
    - a. Exterior Glass: 1/4” glass, blast resistant lamination, tempered where required by code, made up of (2) 1/8 inch layers bonded together with a minim of .75mm .030 inch polyvinyl-butyl (PVB) interlayer.

- b. Interior Glass: 1/4 inch consisting of two nominal 1/8 inch glass panes bonded together with a minimum of .030 inch polyvinyl-butyl (PVB) interlayer.
  - c. U Value: per WSEC
  - d. SHGC: per WSEC
- Accessories
  - 1. Anchors: Concealed type, provide a minimum of 3 per jamb, total number of anchors and spacing shall be determined by Structural Testing or Structural Calculations.
  - 2. Sealant: Silicon only
  - 3. Bituminous paint: apply one coat to concealed aluminum and steel surfaces in contact with cementitious materials.

**Part 1 – General Information**

- Design Information
  1. Blast Resistant Assemblies as outlined in Force Protection Standards.
  2. Blast Resistant Glazing Units
  3. Locations as outlined in Force Protection Standards.
  4. Horizontal slider
  5. Colors: White or Bronze
  6. Safety glazing where required by building code.
  
- Submittal Information
  1. Maintenance and Care Instructions
  2. Warranty – Minimum 5 year and will cover:
    - a. Integrity of gas seal.
    - b. Complete watertight and airtight system installation
    - c. Completed installation will remain free from rattles, wind whistles and noise due to thermal movement and wind pressure.
    - d. Glass and glazing gaskets will not break or “pop” from frames due to design wind load pressure, expansion or contraction movement or structural loading.
    - e. Glazing sealants and gaskets will remain free from abnormal deterioration or dislocation due to sunlight, weather or oxidation.
  3. Thermal Break Structural Integrity Warranty: Provide 10-year manufacturer’s warranty against failure resulting from longitudinal or transverse shrinkage, cracking or loss of adhesion or prescribed pressure on the glazed material.
  4. Call-back Contact Information

**Part 2 – Product Information**

- Manufacturer
  1. Traco
  2. Pre-approved substitution: Permitted.
  
- Characteristics
  1. Frame:
    - a. Minimum 2 inch deep profile
    - b. Thermally broken, Interior portion of frame insulated from exterior portion
    - c. Aluminum extrusion .062” thick, 6063-T5 aluminum
    - d. Flush glass stops, screw fastened type.
    - e. Air Infiltration: Limited to .015 cfm/s.f.
  
- Insulated Glass Unit
  1. 1 inch overall thickness
    - a. Exterior Glass: 1/4” glass, blast resistant lamination, tempered where required by code, made up of (2) 1/8 inch layers bonded together with a minimum of .75mm .030 inch polyvinyl-butyl (PVB) interlayer.
    - b. Interior Glass: 1/4 inch consisting of two nominal 1/8 inch glass panes bonded together with a minimum of .030 inch polyvinyl-butyl (PVB) interlayer.

- c. U Value: per WSEC
- d. SHGC: per WSEC
- Accessories
  1. Anchors: Concealed type, provide a minimum of 3 per jamb, total number of anchors and spacing shall be determined by Structural Testing or Structural Calculations.
  2. Sealant: Silicon only
  3. Bituminous paint: apply one coat to concealed aluminum and steel surfaces in contact with cementitious materials.

**Part 1 – General Information**

- Design Information
  1. Finishes
    - a. Brushed Chrome, US26, 26D, 626
    - b. No bronze or brass
  2. Cores:
    - a. No substitutions
    - b. Construction cores and keys to be used during construction phase
    - c. Permanent cores and keys contact state locksmith at (253) 512-8701.
    - d. Cores and Keys will be ordered from Best Access Systems in Kent, WA (425) 253-6001.
  3. Keying
    - a. Two (2) keys for every door
    - b. No master keys
    - c. No control keys
    - d. Construction keys to be used during construction phase
  4. Locks:
    - a. Cylinder only, no mortise
    - b. Electronic stand alone
    - c. Unacceptable: Marks and Falcon
  5. Exit Devices
    - a. No substitutes
    - b. No exterior or interior vertical rod latches
  6. Removable Mullion
    - a. No substitutes
    - b. Must use Best IC A2 lock system
  7. Hinges
    - a. Minimum 3 per door less than 48 inches wide
    - b. Minimum 4 per door 48 inches and wider
  8. Latches
    - a. Lever
  9. Deviations must be approved in writing by the Security Manager for State Military Department, Camp Murray, WA
- Submittal Information
  1. Maintenance and Care Instructions
  2. Warranty

3. Call-back Contact Information

**Part 2 – Product Information**

- Manufacturer
  - 1. Locks
    - a. Best
    - b. USCAN
    - c. Arrow
    - d. Sergeant
    - e. Schlage
  - 2. Cores
    - a. Best A2 System, NO SUBSTITUTIONS
  - 3. Closers
    - a. LCN
    - b. Norton
    - c. Corbin Russwin
    - d. USCAN
  - 4. Electronic Closers
    - a. LCN
    - b. Keene Monroe
  - 5. Exit Devices
    - a. Von Duprin 98/99 with 499F strike
    - b. Von Duprin EL98/EL99, Electric, 24V
  - 6. Stand alone Electronic Locks
    - a. OMNI, OM 300 Cylindrical Locks, QA 300 with Von Duprin adapter plate, IC core, interior or weatherized must be specified.
    - b. Trilogy: DL2000, 300 and PDL 300, cylindrical locks, ETDL 3000S1G/26Dv99, ETPDL 3000S1G/26DV99 with adapter kits for Best A2 system
  - 7. Removable Mullion
    - a. Von Duprin, with key removable cam

### **Part 1 – General Information**

- Design Information
  1. Non-fire rated and fire rated dependant on conditions.
  2. Offices, Conference Rooms, Non-rated Corridors: standard 2'x4' grid and tile system.
  3. Spaces of significance or stature: 2'x2' may be allowed.
  
- Submittal Information
  1. Maintenance and Care Instructions
  2. Warranty
  3. Call-back Contact Information

### **Part 2 – Product Information**

- Manufacturer
  1. Armstrong
  2. Pre-approved substitutions: Permitted.
  
- Standard Grid Characteristics
  1. Donn XL
  2. Color: White.
  
- Standard Tile Characteristics
  3. Minaboard Cortega
  4. Size 24" x 48" x 5/8"
  5. NRC Range: .50 - .60
  6. STC Range: 39 – 39
  7. Flame Spread: 0-25, Class A
  8. Exposed Edges: Square
  9. Color: White.

**Part 1 – General Information**

- Design Information
  1. Sheet goods for all wet and damp areas.
  2. VCT allowed for corridors and areas not considered wet or damp.
  3. Bathrooms: cove base
  4. Accessories:
    - a. Cove backer
    - b. Aluminum edge at vertical transition.
    - c. Transition strips
    - d. Solid color vinyl rod for welding seams.
  
- Submittal Information
  1. Maintenance and Care Instructions
  2. Warranty
  3. Call-back Contact Information

**Part 2 – Product Information**

- Manufacturer
  1. Sheet materials
    - a. Armstrong World Industries, Style: Perspectives
    - b. Pre-approved substitutions
  2. Stair Treads, Risers and Landing Tiles
    - a. Burke, Style: Endura, Pattern: Round
    - b. Pre-approved substitutions
  
- Characteristics
  1. Sheet materials
    - a. Vinyl
    - b. Total Thickness: .080 “ thick.
    - c. Sheet Width: 6.5’ wide
    - d. Color: to be selected from full color line
  2. Adhesive: As recommended by Manufacturer.
  3. Stair Treads, Risers, Skirting and Landing Tiles
    - a. Tread:
      - Square Profile
      - Pattern: Round
      - 1/8 inch
      - Color: to be selected by Owner
    - b. Risers: Color to match treads
    - c. Tiles: Pattern and color to match treads
    - d. Skirting: Color to match treads.

**Part 1 - General Information**

- Design Information  
Carpet tile is used throughout the facility.
- Submittal Information  
Maintenance and Care Instructions  
Warranty  
Call-back Contact Information

**Part 2 – Product Information**

- Manufacturer:
  1. Lees Carpet
  2. Substitutions: No
- Product Name: Workforce DV183
- Color: Cloud Glow, #408.
- Size: 26"x26" Carpet Tiles
- Details:
  1. Construction: Tufted
  2. Surface Texture: Level Loop
  3. Gauge: 5/64"
  4. Stitches per Inch: 8.4
  5. Finished Pile Thickness: .094 average
  6. Dye Method: Yarn Dyed
  7. Backing Material: ICT – Fiberglass Reinforced Thermoplastic Composition Tile
  8. Face Yarn: Antron Legacy Nylon 6.6 with Dura Tech Soil Protection by DuPont.
  9. Fiber Technology: Duracolor by LEES Stain Resistant system. Passes GSA requirements for permanent stain resistant carpet.
  10. Face Weight: 22 oz/yd<sup>2</sup>
  11. Installation Method: Monolithic
- Accessories:
  1. Contact Adhesive: Recommended by Carpet Manufacturer
  2. Base: Roppe, Burke
    - a. Coved
    - b. Height: 4 or 6 inches, confirm with facilities manager for condition
  3. Sub-floor Filler: Suitable to floor material
  4. Moldings, Edgings and Transition Strips
    - a. Aluminum, rubber or vinyl.

**Part 1 – General Information**

- Design Information
  1. Standard Colors
    - a. Interior Walls: White Shadow, Kelly Moore
    - b. Interior Trim: Per project
    - c. Exterior Wall: Navaho White, Kelly Moore
    - d. Exterior Trim: Match Weathered Copper metal color
  2. Master Painters Institute Architectural Painting Manual
    - a. Follow recommendation for surfaces and locations
  
- Submittal Information
  1. Maintenance and Care Instructions
  2. Warranty
  3. Call-back Contact Information

**Part 2 – Product Information**

- Manufacturer
  1. Non-specified
    - a. Colors to match Kelly Moore
  
- Characteristics
  1. As recommended for surface, location and finish outlined in the MPI Architectural Painting Manual.

**Part 1 – General Information**

- Design Information
  1. Phenolic core, or better
  2. Overhead braced
  3. Floor Mounted
  4. Accessories to be thru-bolted
  5. Heavy duty grade
  
- Submittal Information
  1. Maintenance and Care Instructions
  2. Warranty
  3. Call-back Contact Information

**Part 2 – Product Information – Not used.**

### **Part 1 – General Information**

- Design Information
  1. Large Restrooms
    - a. Automatic hand dryers for large restrooms
    - b. Paper towel dispenser one for each large restroom
  2. Single User Restrooms
    - a. Paper towel dispenser only
  3. Blocking for all wall mounted accessories
  4. Finish: Stainless steel
  5. All restrooms to be planned with space for a free-standing 20 gallon trash receptacle

### **Part 2 – Product Information**

- Typical Accessories provided by owner's vendors
  1. Paper towel dispenser
  2. Soap dispenser
- Typical Accessories provided in contract
  1. Automatic hand dryers: Dyson Airblade or as approved by project manager.
  2. Toilet paper dispenser: Surface-mounted, double-roll toilet paper holder, heavy-duty cast aluminum, satin matte silver-gray finish with no waste rocking action spindles
  3. Toilet seat cover dispenser at each toilet: stainless steel
  4. Coat hook at each toilet stall or on back of door for single user restroom
  5. Grab bars at each accessible toilet
  6. Sanitary products dispenser at each women's restroom
  7. Sanitary products receptacle at each toilet in each women's restrooms
  8. Mirror with shelf over each sink, minimum size 24" x 36"

**Part 1 – General Information**

- Design Information
  1. Portable Fire Extinguishers
    - a. Surface mounted only
- Submittal Information
  1. Maintenance and Care Instructions
  2. Warranty
  3. Call-back Contact Information

**Part 2 – Product Information – not used.**

**NOT USED**

**Part 1 – General Information**

- Design Information
  1. Slat: 1”, unperforated
  2. Standard Colors
  3. Fabricate blinds to cover window frames and openings completely.
  4. At openings requiring multiple blind units, fabricate separate blind assemblies with space of 1/2 inch between assemblies, occurring at the center of window mullions.
  
- Submittal Information
  1. Maintenance and Care Instructions
  2. Warranty
  3. Call-back Contact Information

**Part 2 – Product Information**

- Manufacturer
  1. None specified
  
- Characteristics
  1. Components:
    - a. U-shaped Headrail.
    - b. Tilter Mechanism.
    - c. Transparent Tilt Wand.
    - d. Crash Proof Cord Lock.
    - e. Drum and Cradle: for each ladder.
    - f. Tilt Rod.
    - g. End Braces.
    - h. Installation Brackets: accommodate overhead, side or face mounting.
    - i. Intermediate Brackets: blinds over 60 inches.
    - j. Ladders: slat supports of braided, dyed polyester yarn, maximum distance not to exceed 23”.
    - k. Slats: 5000 series magnesium aluminum alloy. One-inch width, baked on coating, unperforated.
    - l. Bottom Rail.
    - m. Lift Cord.
    - n. Color: Selected from 190 Riviera standard colors by owner after bid award.
    - o. Restrictive Cam Tilter.
    - p. Top-loc cord Lock and Ring Pull.
    - q. Valance.
    - r. Definition Edging.
    - s. Hold-down Brackets.

**Part 1 – General Information**

- Design Information
  1. Exterior applications
    - a. Only where covered by a porch or roof overhang.
    - b. Metal frames and grids shall have a non-skid finish.
- Submittal Information
  1. Maintenance and Care Instructions
  2. Warranty
  3. Call-back Contact Information

**Part 2 – Product Information – Not used.**

**NOT USED**

**NOT USED**

**Part 1 – General Information**

- Design Information
  - Fire sprinkler protection shall be provided as required by the IBC and IFC
  - Establish fire sprinkler design criteria (hazard classification) including fire flow information
  - Fire sprinkler design shall be provided by Contractor in accordance with NFPA 13
  - Fire suppression in Server Room shall be FM200
  - Establish FDC, Post Indicator Valve and backflow protection device locations
  
- Submittal Information
  - Contractor Qualifications
  - Fire sprinkler design, calculations, product data and shop drawings
  - Permit submittal and approval by the Authorities Having Jurisdiction  
(Authorities Having Jurisdiction dependent upon project location)
  - Interface with fire alarm system
  - Maintenance and Care Instructions
  - Spare parts and materials per NFPA 13
  - Warranty
  - Call-back Contact Information
  
- CAD Standards
  - Consultants and Contractor's preparing drawings will be required to utilize the Washington State Military Department (WSMD) CAD Standards dated January 9, 2007

**Part 2 – Product Information**

- Manufacturers
  - To be specified by Design Consultant
  
- Characteristics
  - Products to be UL listed or FM approved for fire protection system service
  
- Contractor Qualifications
  - Fire Protection Engineer/Designer qualifications in compliance with WAC 212-80
  - Installer qualifications in compliance with WAC 212-80

## **Part 1 – General Information**

- Section includes:
  - CAD Standards
  - Force Protection Requirements
  - General Plumbing Design Information
  
- CAD Standards
  - Consultants and Contractor's preparing drawings will be required to utilize the Washington State Military Department (WSMD) CAD Standards dated January 9, 2007 – confirm latest edition
  
- Force Protection Design Information
  - UFC 4-010-01 DoD Minimum Antiterrorism Standards for Buildings
    - 1-6.6 Washington State Military Department Buildings: Any Washington State Military Department building that uses Federal funding for new construction, renovations, modifications, repairs, restorations, or leasing and that meets the applicability provisions of the standards, will comply with these standards.
    - Appendix B DoD Antiterrorism Standards for New and Existing Buildings
      - B4.4 Utility Distribution and Installation
        - Utility Routing
          - For all new inhabited buildings, route critical or fragile utilities so that they are not on exterior walls or on walls shared with mail rooms.
          - This requirement is recommended, but not mandatory, for existing buildings.
        - Redundant Utilities
          - Where redundant utilities are required in accordance with other requirements or criteria, ensure that the redundant utilities are not collocated or do not run in the same chases.
        - Emergency Backup Systems
          - Where emergency backup systems are required in accordance with other requirements or criteria, ensure that they are located away from the system components for which they provide backup.
      - B4.5 Equipment Bracing:
        - Comply with requirements for equipment support and bracing.
  
- Design Information
  - Access Doors for concealed valves and trap primers shall be standardized throughout project and shall be keyed – specified under Section 083100 – Access Doors
  - Preferred restroom design is to provide floor mount water closets. See Section 224000 Plumbing Fixtures
  - Locate plumbing equipment (water heaters, building water supply risers) in mechanical rooms whenever possible.
  - Provide plumbing equipment from manufacturers with local vendors for support services.

### Part 1 – General Information

- Design Information  
Remote Metering Requirements – AR 420-1 Army Facilities Management (28 March 2009), Chapter 22-15 Advanced Metering
- Advanced Meters are those that have the capability to measure and record interval data and communicate the data to a remote location in a format that can be easily integrated into an advanced metering system.
- Water and Gas meters shall be provided for all new construction projects regardless of programmed cost or for renovation or energy projects with a programmed cost of \$ 200,000 or more that include natural gas or water components with remote metering output transmitted through the DDC System of Section 23 0923
- Advanced Metering Data Management System – See Section 26 09 13 – Advanced Electrical Power Monitoring for data transmittal, storage and display requirements.

#### NOTES:

1. Where gas service is provided by a gas utility (e.g., Puget Sound Energy), the gas meters shall be provided by the gas utility. Contract requirements shall include coordination with the gas utility to provide a pulse output device which can provide an output to the DDC System.
2. The Washington State Military Department does not currently have a data monitoring system which assembles the transmitted utility information. AR 420-1 requirements to provide metering are mandatory but a data management system has not yet been defined. Commissioning of meters shall include confirmation that meters are installed and are interfaced with the DDC system to transmit the data and that data is properly scaled to match the required output and accuracy.

### Part 2 – Product Information

- General specifications for all water meters

Quantities Measured:

Gallons of Water

Measurement Configuration:

Water Supply to a building. For buildings that already have a water meter with a pulse output, ensure that the pulse output is connected to a data gathering device (i.e. electric meter). For buildings where a water meter already exists but does not have a pulse output, add a pulse kit to the existing meter and tie the output into a data gathering device. If the existing meter will not accept a pulse kit or if no meter exists, a new water meter will be installed, also requiring a pulse output to a data gathering device.

Operating Temperatures:	32 degrees F to 120 degrees F. When exterior mounting is required, consider the local ambient temperature extremes and protect from freezing with insulated, moisture proof enclosures and heat tracing as required.
Humidity Operating Range:	5% to 90% RH (non-condensing)
Accuracy:	1.5% of scale.
Frequency:	Not less than one pulse per revolution. Meter pulser shall be coupled to the meter dial to provide a pulse rate of not less than one pulse per gallon of water.

For non-LonWorks meter applications

Digital Output Only:	Pulse Output
----------------------	--------------

For LonWorks meter applications

Digital Output Only:	Pulse Output
----------------------	--------------

- Water Meters shall be the turbine, propeller, or displacement type with pulse output chosen to meet the specific application (pipe size, flow, pressure, etc.).



- Turbine Type Meters  
Turbine type meters shall conform to AWWA C701 Class I or Class II depending on the application. The main casing shall be bronze or cast iron protected by corrosion resistant coating with stainless steel external fasteners. Registers shall be straight-reading type, shall be permanently sealed and shall read in U.S. gallons. Connections shall be suitable to the type of pipe and conditions encountered. Register type shall be a direct reading remote register designed in accordance with AWWA C706 or an encoder type remote register designed in accordance with AWWA C707 but must be compatible with the local Utility Monitoring and Control System. Meters shall comply with the accuracy and capacity requirements of AWWA C701.



- Propeller Type Meters  
Propeller type meters shall conform to AWWA C704. Registers shall be straight-reading type, shall be permanently sealed and shall read in U.S. gallons. Connections shall be suitable to the type of pipe and conditions encountered. Register type shall be a direct-reading remote register designed in accordance with AWWA C706 or an encoder-type remote register designed in accordance with AWWA C707 but must be compatible with the local Utility Monitoring and Control System. Meters shall comply with the accuracy and capacity requirements of AWWA C703.



- Displacement Type Meters  
Displacement type meters shall conform to AWWA C700. Registers shall be straight-reading and shall read in U.S. gallons. Meters in sizes 1/2 through 1 shall be frost-protection design as required by the local environmental conditions. Connections shall be suitable to the type of pipe and conditions encountered. Register type shall be a direct reading remote register designed in accordance with AWWA C706 or an encoder type remote register designed in accordance with AWWA C707 but must be compatible with the local Utility Monitoring and Control System. Meters shall comply with the accuracy and capacity requirements of AWWA C700.



- **Compound Type Meters**  
Compound type meters shall conform to AWWA C702 and shall be furnished with strainers. The main casing shall be bronze or cast iron protected by corrosion resistant coating with stainless steel external fasteners. The main casing shall be tapped for field testing purposes. Registers shall be straight-reading type, shall be permanently sealed and shall read in U.S. gallons. The meter shall be equipped with a coordinating register. Connections shall be suitable to the type of pipe and conditions encountered. Register type shall be a direct reading remote register designed in accordance with AWWA C706 or an encoder type remote register designed in accordance with AWWA C707 but must be compatible with the local Utility Monitoring and Control System. Meters shall comply with the accuracy and capacity requirements of AWWA C702.



- **Fire Service Type Meters**  
Provide Fire Service Type Meters as required by the Installation. Fire service type meters shall be proportional type or turbine type conforming to AWWA C703 and shall be furnished with strainers. The main casing shall be bronze or cast iron protected by corrosion resistant coating with stainless steel external fasteners. Any isolation valves installed as part of the meter assembly shall either have tamper switches or be position indicating valves in accordance with NFPA. Registers shall be straight-reading type, shall be permanently sealed and shall read in U.S. gallons. The meter shall be equipped with a coordinating register. Connections shall be

suitable to the type of pipe and conditions encountered. Register type shall be a direct reading remote register designed in accordance with AWWA C706 or an encoder type remote register designed in accordance with AWWA C707 but must be compatible with the local Utility Monitoring and Control System. Meters shall comply with the accuracy and capacity requirements of AWWA C703. When turbine type main line meters are used, the meter shall be supplied with a separate check valve, as a unit.



- **Meter Boxes**  
Meter boxes shall be of cast iron, concrete, or plastic. The boxes shall be of sufficient size to completely enclose the meter and shutoff valve or service stop. Meter boxes set in paved areas subject to vehicular traffic shall be cast iron, or concrete with cast iron lid and cast iron meter reader lid suitable for vehicle wheel loads. Boxes set in sidewalks, not subject to vehicular traffic, shall be concrete with cast iron lid and cast iron meter reader lid. Plastic boxes and lids can be used in unpaved areas or grass areas not subject to vehicular traffic. Box height shall extend from invert of the meter to final grade at the meter location. The lid shall have the word "WATER" cast in it.



- **Dielectric Fittings**  
Dielectric fittings shall be installed between threaded ferrous and nonferrous metallic pipe, fittings and valves, except where corporation stops join mains. Dielectric fittings shall prevent metal-to-metal contact of dissimilar metallic piping elements and shall be suitable for the required working pressure.
- **Gate Valves Smaller than 3 Inch in Size**

Gate valves smaller than 3 inch size shall meet requirements of AWWA C500 or AWWA C509, Class 150, solid wedge, nonrising stem. Valves shall have flanged or threaded end connections, with a union on one side of the valve. Provide handwheel operators. Valves shall open by counterclockwise rotation of the valve stem.

- Gate Valves 3 Inch Size and Larger  
Gate valves 3 inch size and larger shall meet AWWA C500 or UL 262 and be of one manufacturer. Valves shall be AWWA C500, nonrising stem type with double-disc gates or UL 262, inside-screw type with operating nut, split wedge or double disc type gate, and designed for a hydraulic working pressure of 175 psi. Valves shall open by counterclockwise rotation of the valve stem.
- General requirements for all gas meters

Quantity Measured:	Cubic Feet of Natural Gas
Measurement Configuration:	Natural Gas service to a building. For buildings that already have a gas meter with a pulse output, ensure that the pulse output is connected to a data gathering device (i.e. electric meter). For buildings where a natural gas meter already exists but does not have a pulse output, add a pulse kit to the existing meter and tie the output to a data gathering device. If the existing gas meter will not accept a pulse kit or if no meter exists a new natural gas meter will be installed, also requiring a pulse output to a data gathering device. Ensure the pulse frequency and electronic characteristics are compatible with the existing data gathering device, if any.
Operating Temperatures:	-40 degrees F to +150 degrees F.
Humidity Operating Range:	5% to 90% RH (non-condensing)
Accuracy:	$\pm$ 1% of scale.
Pulse Frequency:	Not less than two pulses per revolution. Meter pulser shall be coupled to the meter dial to provide a pulse rate of not less than one pulse for every 100 cubic feet of gas.

For non-LonWorks meter applications

Digital Output Only:	Pulse Output
----------------------	--------------

For LonWorks meter applications

Digital Output Only:	Pulse Output
----------------------	--------------

**NOTE:** Gases are more difficult to measure than liquids, as measured volumes are highly affected by temperature and pressure. Gas meters measure a defined volume, regardless of the pressurized quantity or quality of the gas flowing through the meter. Temperature, pressure and heating value compensation must be made to measure actual amount and value of gas moving through a meter.



- Natural Gas Meters shall be the Diaphragm, Rotary, or for high volume applications Turbine type with pulse output chosen to meet the specific application.



DIAPHRAGM



ROTARY



TURBINE

- METERS  
Provide gas meters for the natural gas service line to the building. Diaphragm Gas Meters with flow rates less than 500 cubic feet per hour shall conform to AGA B109.1. Diaphragm Gas Meters with flow rates of 500 cubic feet per hour and higher shall conform to AGA B109.2. Rotary Type Gas Meters shall conform to AGA B109.3. Turbine Type Gas Meters shall conform to ASME MFC-4M. Meters shall be pipe or pedestal mounted and be provided with a strainer immediately upstream. Meters shall be provided with over-pressure protection as specified in ASME B31.8. Include tamper-proof protection, frost protection and fungus-proof protection as

applicable. Meters shall be suitable for accurately measuring and handling gas at pressures, temperatures, and flow rates present. Meters shall have a pulse switch initiator capable of operating up to speeds of 500 pulses per minute with no false pulses and shall require no field adjustments or calibration. Initiators shall provide the maximum number of pulses up to 500 per minute that is obtainable from the manufacturer. The minimum pulse rate shall not be less than one pulse per 100 cubic feet of gas.

- Gas valves and pressure regulators are necessary at all points where pressure reduction or regulation is required by the user. Install a shut-off valve upstream of the regulator and both upstream and downstream of the meter. Provide a gas meter bypass line with a lockable valve for buildings with critical service.
  - **GAS VALVES**  
Valves shall be suitable for shutoff or isolation service and shall conform to the following: Steel valves 1-1/2 inches and smaller installed aboveground shall conform to ASME B16.34, carbon steel, socket weld or threaded ends with handwheel or wrench operator. Steel valves 2 inches and larger installed aboveground shall conform to API Spec 6D, carbon steel, butt weld or flanged ends, with handwheel or wrench operator.
  - **GAS SERVICE LINE REGULATORS**  
Pressure regulators for individual service lines shall have ferrous bodies. Regulator shall be capable of reducing distribution line pressure to pressures required for users. Regulators shall be provided where gas will be distributed at pressures in excess of 10 inches of water column. Pressure relief shall be set at a lower pressure than would cause unsafe operation of any connected user. Regulator shall have single port with orifice diameter no greater than that recommended by the manufacturer for the maximum gas pressure at the regulator inlet. Regulator valve vent shall be of resilient materials designed to withstand flow conditions when pressed against the valve port. Regulator shall be capable of regulating downstream pressure within limits of accuracy and shall be capable of limiting the buildup of pressure under no-flow conditions to 50 percent or less of the discharge pressure maintained under flow conditions. Regulator shall have a self contained service regulator. Regulator pipe connections shall not exceed 2 inch size.
  - **EARTHQUAKE ACTUATED AUTOMATIC GAS SHUTOFF SYSTEM**  
Include earthquake actuated automatic gas shutoff system if the facility is either essential or hazardous. The designer will determine the classification of the facility and provide a detail on the drawings showing this system. ASCE 25-97 EARTHQUAKE ACTUATED AUTOMATIC GAS SHUTOFF DEVICES, includes a test procedure to verify that the valve will activate during strong ground shaking but will not activate for minor ground shaking or accidental bumping by a pedestrian or vehicle. The State of California, Division of the State Architect/Real Estate Services Division maintains a list of devices that have been tested and conform to the ASCE Standard; inquiries can be directed to telephone no. 916-445-2600. Show the earthquake actuated automatic gas shutoff on the drawings when required in the project. Earthquake Actuated Automatic Gas Shutoff devices shall conform to requirements furnished by the Contracting Officer, and shall be listed by the State of California, Division of the State Architect as being tested and in conformance with specified requirements. The system shall safely interrupt the flow of gas to the building due to strong ground shaking of an earthquake.

### Part 3 – Execution

- **Water Meter Installation**

- **Connections to Publicly or Privately Operated Water Utility Lines**  
Contractor shall provide materials for the connections to the existing water lines. Final connections and the turning on of water shall be made by the utility. The Contractor shall notify the Contracting Officer, in writing, 10 days before final connections and turning on of water lines. The Contractor shall make necessary arrangements with the Utility for tie in and activation of new water lines. Only the Operating Agency/Utility Company may reactivate the system after tie in. The Contractor shall furnish a certification by the Operating Agency/Utility Company that all Utility work has been satisfactorily completed.
- **Connection to Government Owned/Operated Water Lines**  
Provide the name and location of the utility or operating agency of the existing water lines. Show on the drawings, the location of valves to be operated for existing system deactivation. The Contractor shall provide connections to the existing water lines in accordance with approved procedures. The Contractor's Connection Plan shall be submitted and approved prior to making any connections to existing water lines. This plan shall include the Operating Agency's required procedures which may be obtained from the Contracting Officer. The Contractor shall notify the Contracting Officer, in writing, 10 days before connections to existing lines are to be made. Reactivation of any existing water lines will only be done by the Government.
- **Location of Meters**  
The location of meters and meter boxes shall be shown on the drawings. The meters shall be centered in the boxes to allow for reading and ease of removal or maintenance.
- **Disinfection**  
Prior to disinfection, obtain Contracting Officer approval of the proposed method for disposal of waste water from disinfection procedures. Disinfect existing water piping affected by Contractor's operations in accordance with AWWA C651. Fill piping systems with solution containing minimum of 50 parts per million of available chlorine and allow solution to stand for minimum of 24 hours. Flush solution from the systems with domestic water until maximum residual chlorine content is within the range of 0.2 and 0.5 parts per million, or the residual chlorine content of domestic water supply. Obtain at least two consecutive satisfactory bacteriological samples from new water piping, analyze by a certified laboratory, and submit the results prior to the new water piping being placed into service. Disinfection of systems supplying nonpotable water is not required.  
Chlorinating materials shall conform to the following:  
Chlorine, Liquid: AWWA B301.  
Hypochlorite, Calcium and Sodium: AWWA B300.
- **Field Tests and Inspections**  
Prior to hydrostatic testing, obtain Contracting Officer approval of the proposed method for disposal of waste water from hydrostatic testing. The Contracting Officer will conduct field inspections and witness field tests. The Contractor shall perform field tests, and provide labor, equipment, and incidentals required for testing, except that water and electric power needed for field tests will be furnished. The Contractor shall produce evidence, when required, that any item of work has been constructed in accordance with the approved Statement of Work.

- **Testing Procedure**  
Test water service lines in accordance with applicable requirements of AWWA C600 for hydrostatic testing. No leakage will be allowed at copper pipe joints, copper tubing joints (soldered, compression type, brazed), plastic pipe joints, flanged joints and screwed joints.

Prior to the pressure test, fill that portion of the pipeline being tested with water for a soaking period of not less than 24 hours. For pressure test, use a hydrostatic pressure 50 psi greater than the maximum working pressure of the system. Hold this pressure for not less than 2 hours. For leakage test, use a hydrostatic pressure not less than the maximum working pressure of the system. Leakage test may be performed at the same time and at the same test pressure as the pressure test.

- **CLEANUP**  
Upon completion of the installation of water meters, all debris and surplus materials resulting from the work shall be removed.
- **Gas Meter Installation**
  - A shutoff valve, meter set assembly, and service regulator shall be installed on the service line outside the building, 18 inches above the ground on the riser. An insulating joint (dielectric connection) shall be installed on the inlet side of the meter set assembly and service regulator and shall be constructed to prevent flow of electrical current. A 3/8 inch tapped fitting equipped with a plug shall be provided on both sides of the service regulator for installation of pressure gauges for adjusting the regulator. All service regulator vents and relief vents shall terminate in the outside air in rain and insect resistant fittings. The open end of the vent shall be located where gas can escape freely into the atmosphere, away from any openings into the building and above areas subject to flooding.
  - Meters shall be installed in accordance with ASME B31.8. Permanent gas meters shall be installed with provisions for isolation and removal for calibration and maintenance, and shall be suitable for operation in conjunction with an energy monitoring and control system.
  - **Connections to Publicly or Privately Operated Gas Utility Lines**  
Contractor shall provide materials for the connections to the existing gas lines. Final connections and the turning on of gas shall be made by the utility. The Contractor shall notify the Contracting Officer, in writing, 10 days before final connections and turning on of gas lines. The Contractor shall make necessary arrangements with the Utility for tie in and activation of new gas lines. Only the Operating Agency/Utility Company may reactivate the system after tie in. The Contractor shall furnish a certification by the Operating Agency/Utility Company that all Utility work has been satisfactorily completed.
  - **Connection to Government Owned/Operated Gas Lines**  
Provide the name and location of the utility or operating agency of the existing gas lines. Show on the drawings, the location of valves to be operated for existing system deactivation. The Contractor shall provide connections to the existing gas lines in accordance with approved procedures. Reactivation of any existing gas lines will only be done by the Government. The Contractor's Connection Plan shall be submitted and

approved prior to making any connections to existing gas lines. This plan shall include the Operating Agency's required procedures which may be obtained from the Contracting Officer. The Contractor shall notify the Contracting Officer, in writing, 10 days before connections to existing lines are to be made.

- **Pressure and Leak Tests**  
Prior to returning the gas line back to service it shall be tested in accordance with ASME B31.8. Test pressures should recognize the weakest component of each system tested for the actual pressure, the maximum allowable operating pressure, and the gas supplier's maximum operating pressure. The test pressure will be 150 percent of the maximum operating pressure or 50 psig, whichever is greater. However, the maximum test pressure must not be more than three times the design pressure of the pipe.

The service lines shall be tested after modifications and before being placed in service using air as the test medium. Prior to testing the system, the interior shall be blown out, cleaned and cleared of all foreign materials. All meters, regulators, and controls shall be removed before blowing out and cleaning and reinstalled after clearing of all foreign materials.

Testing of gas service lines shall be done with due regard for the safety of employees and the public during the test. Persons not working on the test operations shall be kept out of the testing area while testing is proceeding. The test shall be made on the system as a whole or on sections that can be isolated. The test shall continue for at least 24 hours from the time of the initial readings to the final readings of pressure and temperature. The initial test readings of the instrument shall not be made for at least 1 hour after the pipe has been subjected to the full test pressure, and neither the initial nor final readings shall be made at times of rapid changes in atmospheric conditions. The temperatures shall be representative of the actual trench conditions. There shall be no indication of reduction of pressure during the test after corrections have been made for changes in atmospheric conditions in conformity with the relationship  $T(1)P(2)=T(2)P(1)$ , in which T and P denote absolute temperature and pressure, respectively, and the numbers denote initial and final readings. During the test, the entire system shall be completely isolated from all compressors and other sources of air pressure. Each joint shall be tested by means of soap and water or an equivalent nonflammable solution prior to backfilling or concealing any work. The testing instruments shall be approved by the Contracting Officer. All labor, materials and equipment for conducting the tests shall be furnished by the Contractor and shall be subject to inspection at all times during the tests. The Contractor shall maintain safety precautions for air pressure testing at all times during the tests.

Gas distribution equipment shall be installed in accordance with all applicable federal, state and local codes and regulations. Gas distribution equipment shall be installed in conformance with the manufacturer's recommendations and applicable sections of ASME B31.8, AGA XR0104 and 49 CFR 192. Gas distribution equipment installed in areas where they will be subject to damage will be protected by appropriate physical barriers (i.e. bollards). The Contractor shall provide installation details including catalog cuts and installation drawings for each gas service to be modified for approval by the Contracting Officer or the Contracting Officer's Representative.

**End of Specification**

**Part 1 - General Information**

- Section includes:
  - Domestic water piping and fittings.
  - Non-potable water piping and fittings.
  - Under-building slab domestic water piping and fittings connected to domestic water service piping.
  - Specialty valves.
- Design Information
  - Provide valves for zone isolation, allowing zone repair without disabling entire building.
    - Separate isolation for kitchen/staff areas
    - Separate isolation for exterior hose bibs (individually or grouped)
    - Separate isolation for each restroom area (combined men's and women's where piped back to back)
    - Separate isolation on return water systems in addition to hot water isolation
  - Central hot water distribution is preferred over individual area water heating and point-of-use water heaters.
  - Minimize extent of water piping under building
- Design Standards
  - Uniform Plumbing Code
  - Washington State Energy Code
  - WAC 246-290-490 Cross Connection Control

**Part 2 – Product Information**

- Piping Materials
  - Above grade potable and non-potable water piping:
    - Type L copper with solder or pressure-seal fittings.
  - Below grade potable and non-potable water piping:
    - Type K soft copper tube with brazed fittings. Piping shall have no joints underground except at connection to exterior potable water service piping or piping shall be ductile iron pipe with restrained mechanical joints or Schedule 80 PVC with solvent cement joints and tracer wire.
- Specialty Valves
  - Balancing Valves for domestic hot water circulation with test flow fittings
  - Backflow Preventers in compliance with UPC and WAC 246-290-490

### Part 1 – General Information

- Section includes
  - Electric water heaters
  - Thermostatic Mixing Valves
  - Expansion Tanks
  - Thermometers
  - Domestic Water Circulating Pumps
  
- Design Information
  - Central tank-type water heaters with hot water distribution is preferred over tank-less point of use water heaters. For larger capacity water heating applications, gas fired water heating is preferred – see Section 22 3436 – Gas-Fired Water Heaters
  - Water Heaters will not be allowed in attic spaces or above ceilings except where located in accessible equipment spaces in attics (ladder or stair access). Preferred location shall be in mechanical rooms.
  - Instantaneous, point-of-use water heaters, where necessary, shall be provided with in-line filters on the makeup water supply.
  - Water heaters shall be designed for 140 °F with thermostatic mixing valves to reduce temperature to 120 °F distribution.
  - Expansion tanks shall be provided for each water heating system.
  - Circulating pumps shall be provided for central water heating systems with distribution. Thermostatic control of circulating system shall be provided under Section 230923 – DDC System.
  
- Submittal Information
  - Product Data: For each type and size of domestic-water heater indicated.
    - Water heater tank capacity
    - Electrical data: Power (KW), voltage, and phase.
    - Operation and maintenance data.
    - Warranty –Manufacturer’s extended warranty on commercial water heaters.
    - Call-back contact information

### Part 2 – Product Information

- Water Heater Manufacturers
  - To be determined by design consultant
- Characteristics
  - Storage Tank Construction: Steel
  - Pressure Rating: 150 psig
  - Interior Finish: Glass lined
  - Factory-Installed Storage Tank Appurtenances:
    - Anode Rod
    - Drain Valve
    - Insulation complying with ASHRAE 90.1
    - Replaceable Heating Elements
    - Adjustable Temperature Control
    - Safety Controls: High temperature limit cutoff switch

- ASME Combination Temperature-and-Pressure Relief Valve.
- Expansion Tanks
  - ASME Rated
- Thermostatic Mixing Valves
  - ANSI/ASSE 1017
- Thermometers
  - On outlet of water heater
  - On outlet of thermostatic mixing valve
- Circulating Pumps
  - All bronze construction

## Part 1 – General Information

- Section includes
  - Gas-fired, high-efficiency, storage, domestic-water heaters.
  - Thermostatic Mixing Valves
  - Expansion Tanks
  - Thermometers
  - Domestic Water Circulating Pumps
- Design Information
  - Central tank-type high efficiency gas-fired water heaters with distribution is preferred over electric water heaters for larger capacity systems. For smaller capacity systems, see Section 223300 – Electric
  - Gas-fired water heaters shall be located in mechanical equipment rooms.
  - Water heaters shall be designed for 140 °F with thermostatic mixing valves to reduce temperature to 120 °F distribution
  - Expansion tanks shall be provided for each water heating system.
  - Circulating pumps shall be provided for central water heating systems with distribution.
  - Thermostatic control of circulating pumps shall be provided under Section 230923 – DDC System.
- Submittal Information
  - Product Data: For each type and size of domestic-water heater indicated.
  - Shop Drawings: Combustion air and venting arrangement
  - Wiring Diagrams: For power, signal, and control wiring.
  - Product certificates.
  - Operation and maintenance data.
  - Warranty – Manufacturer’s extended warranty on commercial water heaters.
  - Call-back contact information
- **Part 2 – Product Information**
- Manufacturers
  - To be determined by design consultant
- Characteristics
  - Storage-Tank Construction: ASME-code steel with 150-psig minimum working-pressure rating.
  - Factory-Installed Storage-Tank Appurtenances:
    - Anode Rod: Replaceable.
    - Drain Valve
    - Insulation: Comply with ASHRAE/IESNA 90.1.
    - Gas-fired, high-efficiency burner, 95% minimum combustion efficiency
    - Temperature Control: Adjustable thermostat.
    - Safety Controls: Automatic, high-temperature-limit and low-water cutoff devices or systems.
    - ASME Combination Temperature-and-Pressure Relief Valves.
    - CSA or UL design certified
- Expansion Tanks
  - ASME Rated

- Thermostatic Mixing Valves  
ANSI/ASSE 1017
- Thermometers
  - On outlet of water heater
  - On outlet of thermostatic mixing valve
- Circulating Pumps
  - All bronze construction

## Part 1 – General Information

- Section includes
  - General Plumbing Fixture Information
- Design Information
  - Water Closets – Preferred type is floor mount, if wall hung water closets are necessary, provide with 750 pound minimum carriers.
  - Sensor faucets are preferred for lavatories and urinals, shall be battery type, not AC powered with transformers.
  - Flush valves for water closet shall be manual type, not sensor controlled.
  - Waterless urinals shall not be used
- Submittal Information
  - Product Data: For each type of product indicated.
  - Operation and maintenance data
  - Warranty – Manufacturer’s extended warranties beyond normal 1 year warranty
  - Call-back contact information

## Part 2 – Product Information

- Manufacturers
  - To be determined by design consultant
- Characteristics
  - Water Closets – Floor Mount Preferred
    - Vitreous china, elongated bowl, 1.6 gpf.
    - Flush Valve: Manual dual flush flushometer, Down 1.6 gpf, Up 1.1 gpf.
    - Seat: White open front seat with anti-microbial agent.
    - Carrier: Where wall hung water closets are necessary, provide with 750 pound carriers.
  - Wall hung urinal
    - Vitreous china, ultra low-consumption system, 1-pint flush
    - Flush Valve: Sensor operated (battery type) or manual flush
    - Carrier: as required to support fixture.
  - Lavatories
    - Vitreous china
    - Style/type to be determined
    - Faucet: Electronic sensor faucet with manual override, 0.5 gpm flow control.
    - Plumbing Brass: 17- gauge seamless chrome plated P-trap with 2-inch minimum trap seal, chrome plate, loose key stops with flexible risers.
    - Carrier: as required to support fixture where wall hung lavatories are provided.
  - Showers
    - Style/type to be determined
    - Shower valves: Pressure balanced thermostatic type with spring check stops
  - Sinks
    - Sink: Stainless steel, self rimming, 18 gauge.

Style/type to be determined

Plumbing brass: 17 gauge seamless chrome plated P-trap with 2" minimum trap seal, chrome plated, loose key stops with flexible risers.

Bi-Level water cooler

Style/type to be determined

Antimicrobial components to prevent mold and mildew

Pushbar activation

Cooler shall meet ADA guidelines for frontal or parallel approach.

Lead-free design

Floor Mount Utility sink 32"x32x12" sink molded stone neo-corner service basin are required in all buildings.

Wall guards: Stainless steel

Threshold: Stainless steel

Mop bracket: 23" long x 3" wide

Strainer: Flat stainless steel, 3" drain

Faucet: Wall mounted service faucet. With vacuum breaker, integral stops with check valves and adjustable wall brace.

Exterior hose bibbs

Non-freeze wall hydrant, anti-siphon, automatic drain

Ice machine/refrigerator water supply

Ice Maker Outlet Box with Water Hammer Arrestor

Floor drains

6" round polished bronze strainer with trap primer connection.

Trap Seal Protection: Sure Seal

## **Part 1 – General Information**

- Section includes:
  - CAD Standards
  - Force Protection Requirements
  - General HVAC Design Information
  
- CAD Standards  
Consultants and Contractor's preparing drawings will be required to utilize the Washington State Military Department (WSMD) CAD Standards dated January 9, 2007 – confirm latest edition
  
- Force Protection Design Information
  - UFC 4-010-01 DoD Minimum Antiterrorism Standards for Buildings
    - 1-6.6 National Guard Buildings: Any National Guard building that uses Federal funding for new construction, renovations, modifications, repairs, restorations, or leasing and that meets the applicability provisions of the standards, will comply with these standards.
  - Appendix B DoD Antiterrorism Standards for New and Existing Buildings
    - B-1.2.1 Electrical and Mechanical Equipment.  
The preferred location of electrical and mechanical equipment such as transformers, air-cooled condensers, and packaged chillers is outside the unobstructed space or on the roof. However this standard does not preclude placement within the unobstructed space as long as the equipment provides no opportunity for concealment of explosive devices.
  - B-4 Electrical and Mechanical Design
    - B4.1 Air Intakes.  
New Buildings. For all new inhabited buildings covered by this UFC locate all outside air intakes that distribute air throughout the building at least 3 meters (10 feet) above the ground.  
Existing Buildings. The above requirement is recommended, but not mandatory, for existing inhabited buildings covered by these standards.
    - B4.2 Mail Room Ventilation  
Provide separate, dedicated air ventilation systems for all mail rooms with:
      - Dedicated exhaust systems
      - Outside, Intakes, Reliefs and Exhaust openings provided with automatic low leakage isolation dampers
      - Isolation controlsMail rooms shall be located on building perimeter
    - B4.3 Emergency Air Distribution Shutoff  
For all new and existing inhabited buildings, provide an emergency shutoff switch in the HVAC control system that can immediately shut down the air distribution system throughout the building except where interior pressure and airflow control would more efficiently prevent the spread of airborne contaminants and/or ensure the safety of egress pathways. Locate the switch (or switches) to be easily accessible by building occupants. Coordinate with Mass Notification System.

Provide all 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.

Critical Areas

Local air handling units serving critical areas where cooling and/or heating must be maintained to prevent mission failure, loss of data or unsafe conditions can continue to recirculated air, but outside air, relief air and exhaust must be closed with low leakage isolation dampers.

B4.4 Utility Distribution and Installation

Utility Routing

For all new inhabited buildings, route critical or fragile utilities so that they are not on exterior walls or on walls shared with mail rooms. This requirement is recommended, but not mandatory, for existing buildings.

Redundant Utilities

Where redundant utilities are required in accordance with other requirements or criteria, ensure that the redundant utilities are not collocated or do not run in the same chases.

Emergency Backup Systems

Where emergency backup systems are required in accordance with other requirements or criteria, ensure that they are located away from the system components for which they provide backup.

B4.5 Equipment Bracing:

Comply with requirements for equipment support and bracing.

▪ General Design Information

Equipment Servicability:

Equipment shall be located for ease of service, show equipment service clearance requirements on contract drawings.

Provide NEC required clearance for electrical components, show clearance requirements on contract drawings.

Avoid above ceiling locations which require removal of ceiling tiles for access.

Locate air handling equipment in mechanical rooms or on roofs, do not suspend above ceilings.

Specify equipment with local vendor service available.

Fuel Source: (For facilities with hydronic heating systems)

Natural Gas preferred, LPG where natural gas is not available.

For critical facilities, provide dual fuel source:

Natural gas (interruptible service) and LPG which will require redundant equipment.

Where available through Lewis-McChord, air injected LPG shall be utilized as backup fuel source which eliminates the need for redundant equipment.

Conform to Lewis-McChord standards.

Do not use fuel oil.

**Part 2 – Product Information**

- **Manufacturer**  
Refer to individual specification sections
  
- **Characteristics**  
Refer to individual specification sections

## Part 1 – General Information

- Design Information  
Remote Metering Requirements – AR 420-1 Army Facilities Management (28 March 2009), Chapter 22-15 Advanced Metering
- Advanced Meters are those that have the capability to measure and record interval data and communicate the data to a remote location in a format that can be easily integrated into an advanced metering system.
- Steam meters shall be provided for all new construction projects regardless of programmed cost or for renovation or energy projects with a programmed cost of \$ 200,000 or more that include natural gas or water components with remote metering output transmitted through the DDC System of Section 23 0923
- Advanced Metering Data Management System – See Section 26 09 13 – Advanced Electrical Power Monitoring for data transmittal, storage and display requirements.

### NOTES:

1. Where steam is generated on-site through a metered gas or electrical service, additional steam metering is not required. The intent of steam metering is for facilities which acquire their steam from utility steam distribution systems.

## Part 2 – Product Information

- **General specifications for all meters**

Quantities Measured: Pounds of Steam

Measurement Configuration: Steam Supply to a building. For buildings that already have a steam meter with a pulse output, ensure that the pulse output is connected to a data gathering device (i.e. electric meter). For buildings where a steam meter already exists but does not have a pulse output, add a pulse kit to the existing meter and tie the output into a data gathering device. If the existing meter will not accept a pulse kit or if no meter exists, a new steam meter will be installed, also requiring a pulse output to a data gathering device.

Operating Pressures & Temperatures:-40 degrees F to +140 F ambient. When exterior mounting is required, consider the local ambient temperature extremes and moisture proof enclosures. Meter shall be rated for steam working pressure and temperature.

Humidity Operating Range:	5% to 90% RH (non-condensing)
Accuracy:	2.0% of scale.
Frequency:	Not less than one pulse per revolution. Meter pulser shall be coupled to the meter dial to provide a pulse rate of not less than one pulse per pound of steam.

**For non-LonWorks meter applications**

Digital Output Only:	Pulse Output
----------------------	--------------

**For LonWorks meter applications**

Digital Output Only:	Pulse Output
----------------------	--------------

Steam flow is measured with several types of flow meters: Differential pressure-based (orifice plates, flow nozzles, venturi tubes, and averaging pitot tubes), vortex, Coriolis, and ultrasonic.

Based on the advantages and disadvantages shown in the Steam Flow Meter Comparison Chart below, the vortex type meter is highly recommended and the orifice plate type meter is also recommended. The other meter types are considered acceptable as required by the specific application. Ensure that the flow meter selected meets the requirements for the specific application based on steam type (wet, saturated or superheated), flow rate, and operating conditions.

▪ **Steam Flow Meters - General**

Design pressure and temperature ratings of system components shall be for working pressure of 150 psig steam at 366 degrees F. Meter shall be for minimum working pressure of ASME Class 150 with steel pressure chambers or ASME Class 250 with cast-iron pressure chambers. Provide meter in horizontal pipe between two ASME B16.5 welding neck flanges. Provide a six-dial counter with an electrical contactor to transmit signal to a data gathering device (data terminal cabinet (DTC)) for indicating steam flow in pounds. Provide pressure compensated six-dial counter to automatically and continuously correct steam flow meter readings for steam pressure variations. For steam pipe main sizes 4 inches and smaller, provide meter directly in the steam piping. For steam pipe main sizes larger than 4 inches, provide meter in shunt bypass. Shunt bypass piping size shall be coordinated with the meter manufacturer. In the shunt bypass piping, provide two flanged gate valves calibrated by the meter manufacturer.

▪ **Vortex Meters**

Provide a Vortex Meter with sensors to measure the vortices created by a bluff body placed in a flow stream. The frequency of these vortices shall be directly proportional to the fluid velocity and exact volumetric flow rate computed with the internal cross sectional area. Each vortex meter shall be tested to determine the relationship between velocity/flow rate and vortex frequency, which results in a meter K-factor. This volumetric relationship shall be converted to relative engineering units in pounds of steam, which the flow meter converter will then retransmit via a conditioned pulse.

- **Orifice Plate Meters**

Provide a differential producing type orifice plate with a circular hole for insertion into the steam piping between two ASME B16.5 Class 300 welding neck orifice flanges. Orifice plate shall be Type 304 stainless steel. Furnish a dimensional report and flow versus differential curve with accuracy of plus or minus one percent over a 5 to 1 flow range. Orifice flanges shall have at least two radially-drilled and tapped holes for metering and two jack screws.

- **Output**

Pulse output is required with an isolated (500 volts minimum) ac or dc switch closure rated at 50 volts dc or 40 volts RMS ac, one ampere minimum capacity. Duration of closure shall be not less than 0.04 second or more than 0.06 second.

**Steam Flow Meter Comparison Chart**

<b>Type</b>	<b>Advantages</b>	<b>Disadvantages</b>
<b><i>Vortex</i></b>	Easy to install. Low maintenance. Moderate installed cost. Good accuracy. Good turndown accuracy.	Sensitivity to vibration and inlet flow.
<b><i>Orifice plate</i></b>	Lowest cost. Easily installed and/or replaced. Inexpensive installation. Well established coefficient of discharge. Will not wiredraw or wear in service. Sharp edge will not foul up with scale. No moving parts.	High pressure loss. Suspended matter may build up at the inlet. Requires pipe line flanges. Low capacity. Flow conditioning (decreased accuracy at low flow).
<b><i>Flow nozzle</i></b>	Moderate price (costs less than venturi tubes). Can be used where no pipe line flanges exist.	Higher Cost than orifice plate. Same head loss as orifice for same capacity. Difficult installation. Difficult cleaning.
<b><i>Venturi tube</i></b>	Low pressure drop Simple upstream requirements. Has integral pressure connections. Will not obstruct flow of suspended matter. Can be used where no pipe line flanges exist. Well established coefficient of discharge.	Highest cost. Limited capacity. Awkward size (greatest weight and largest size for a given size line).
<b><i>Averaging pitot tube</i></b>	Accuracy does not degrade with use. Low pressure drop.	Not suited for low flow rates. High cost.
<b><i>Coriolis</i></b>	High accuracy. No flow conditioning.	High initial cost.
<b><i>Ultrasonic</i></b>	Non-intrusive. No pressure drop. Works in large pipe diameters.	High initial cost.

- **Vortex Meter**

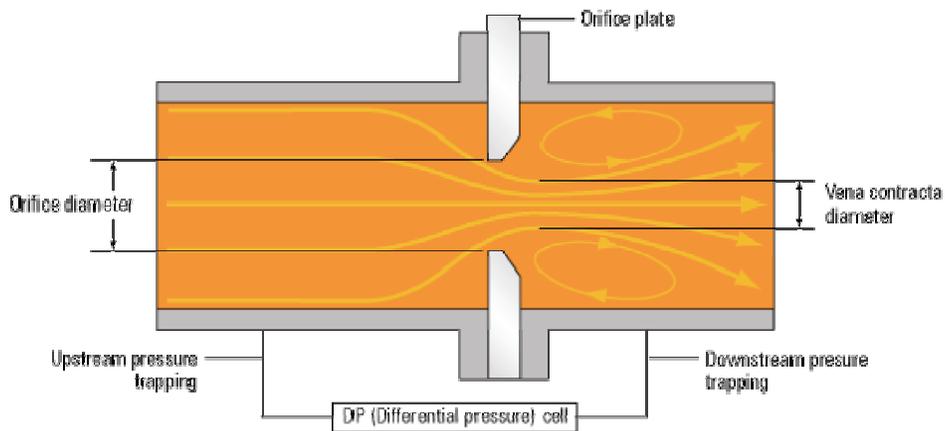
Vortex flow meters are flow sensors that detect the frequency of vortices shed by a bluff body placed in a flow stream. The frequency of the vortices is proportional to the flow velocity.



**VORTEX FLOW METER**

- **Orifice Plate**

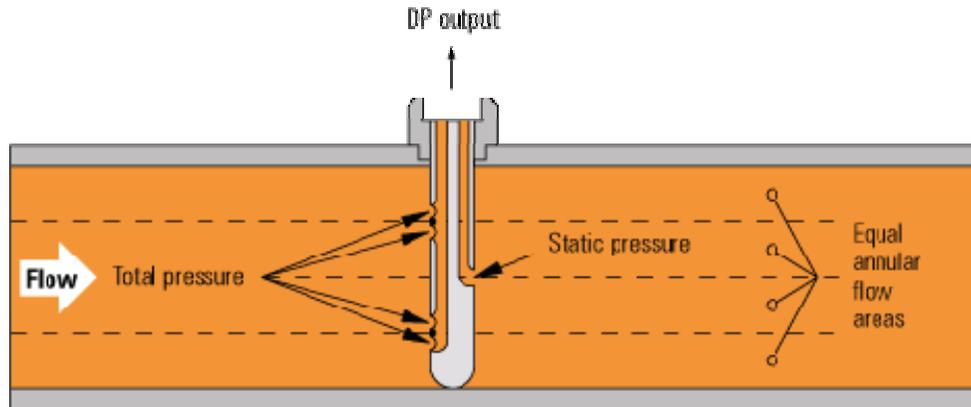
Orifice Plate flow meters are differential producing type orifice plate with a circular hole for insertion into the steam piping between two orifice flanges. Orifice flanges shall have at least two radially-drilled and tapped holes for metering and two jack screws.



**ORIFICE PLATE METER**

- **Pilot Tube Flowmeter**

The Pitot Static tube measures the total pressure (or impact pressure) at the nose of the Pitot tube and the static pressure of the gas stream at side ports. The difference of these pressures, i.e. the dynamic or velocity pressure varies with the square of the gas velocity.



**PITOT TUBE FLOWMETER**

**Part 3 - Execution:**

- **Connections to Publicly or Privately Operated Steam Utility Lines**

Contractor shall provide materials for the connections to the existing steam lines. Final connections and the turning on of steam supply shall be made by the utility. The Contractor shall notify the Contracting Officer, in writing, 10 days before final connections and turning on of steam supply lines. The Contractor shall make necessary arrangements with the Utility for tie in and activation of new steam lines. Only the Operating Agency/Utility Company may reactivate the system after tie in. The Contractor shall furnish a certification by the Operating Agency/Utility Company that all Utility work has been satisfactorily completed.

- **Connection to Government Owned/Operated Steam Lines**

Provide the name and location of the utility or operating agency of the existing steam lines. Show on the drawings, the location of valves to be operated for existing system deactivation. The Contractor shall provide connections to the existing steam lines in accordance with approved procedures. The Contractor's Connection Plan shall be submitted and approved prior to making any connections to existing steam lines. This plan shall include the Operating Agency's required procedures which may be obtained from the Contracting Officer. The Contractor shall notify the Contracting Officer, in writing, 10 days before connections to existing lines are to be made. Reactivation of any existing steam supply lines will only be done by the Government.

- **Demolition**

Remove materials so as not to damage materials which are to remain. Replace existing work damaged by the Contractor's operations with new work of the same construction.

▪ **Cleaning of Piping**

Keep the interior and ends of new piping and existing piping affected by the Contractor's operations, cleaned of water and foreign matter during installation by using plugs or other approved methods. When work is not in progress, securely close open ends of pipe and fittings to prevent entry of water and foreign matter. Inspect piping before placing into position.

▪ **Adjustments**

Upon completion of the work, furnish the services of a competent technician regularly employed by the manufacturer of the flow meter to make the necessary adjustments to place the steam flow meter in operation and to conduct performance tests which demonstrate that the flow measuring equipment is functioning. Install the steam flow meter in accordance with manufacturer's recommendations.

▪ **Piping Tests**

Provide piping modifications that facilitates acceptance testing such as piping which includes flanges at appropriate locations for flanged blanks to be installed for testing. Include requirements for how the modified piping shall be pressure tested and also specify which pipe sections or equipment that will be pressure tested in the shop if absolutely necessary.

Before final acceptance of the work, test each system as in service to demonstrate compliance with contract requirements. Before insulation is applied, hydrostatically test each piping system at not less than 225 psig in accordance with ASME B31.1, with no leakage or reduction in gage pressure for 2 hours. The Contractor shall flush and clean piping before placing into operation. Flush piping at a minimum velocity of 8 fps. Correct defects in work provided by Contractor and repeat tests until work is in compliance with contract requirements. Furnish potable water, electricity, instruments, connecting devices, and personnel required for the tests.

**End of Specification**

**Part 1 - General Information**

- DDC contractor responsibilities shall include the following:
  - Design, installation and component commissioning of the Direct Digital Control (DDC) type Building Automation System (BAS).
  - DDC programming to provide the sequence of operations indicated by the consulting engineer.
  - Coordination with HVAC equipment manufacturers for factory installation of DDC components on selected HVAC equipment.
  - Interface with fire alarm system.
  - Force Protection equipment and activation by DDC contractor.
  - Technical support for building commissioning.
  
- Design Information
  - Existing State-wide DDC system is Delta Controls "ORCA" and will be extended and connected to the new DDC system to be installed by ESC Automation Inc., contact Kim Kelley, 425.487.8613 for standard specification applicable to Washington State Military Department facilities.
  - Control Panels shall be located in secured locations within mechanical rooms or other locations approved by Owner.
  - DDC control system power shall be provided through the building UPS power or shall have their own dedicated UPS power to handle the lag between a power outage and the switch-over to generator power.
  
- Submittal Information
  - System architecture showing all digital devices, computers and network configuration.
  - Equipment lists of all proposed devices and equipment
  - Valve, damper, and well and tap schedules showing size, configuration, capacity and location of all equipment.
  - Schematic device wiring and piping interconnection diagrams including panel and device power and sources.
  - Software design data including flowchart of a typical DDC program showing interrelationship between inputs, PID functions, all other functions, outputs, etc.
  - Detailed description of system operation.
  - Product Data for each type of product indicated.
  - Operation and Maintenance Data.
  - Owner Training
  - Warranty
  - Call-back contact information
  
- Commissioning
  - The Work of this Section shall include the Contractor's labor and materials for participation in the Commissioning Activities (Cx) as a Commissioning Team Member (CxT) as required by Section 01900 –Commissioning.
  
- Gas, Water, Steam and Electric Metering are provided under Sections 22 05 19 ADVANCED METERS FOR PLUMBING (Gas & Water), 23 05 19 ADVANCED METERS FOR HVAC (Steam) and 26 09 13 ADVANCED ELECTRICAL POWER MONITORING (Electricity) to be collected and transmitted through the DDC system to the Advanced

Metering Data Management System – See Section 26 09 13 – Advanced Electrical Power Monitoring for data transmittal, storage and display requirements.

**Part 2 - Product Information**

- Manufacturers  
    Delta
- Control system consists of DDC controllers, sensors, indicators, actuators, final control elements, interface equipment, other apparatus, and accessories connected to controllers to operate mechanical systems according the sequences of operation indicated or specified as provided by the consulting engineer. The system shall include all interconnecting wiring and conduit as required for fully operational systems.
- System shall be remotely operational via dialup modem and Ethernet.
- Provide UPS for DDC
- Discuss version of software with Project Manager.

**Part 1 – General Information**

- Section includes
  - Water treatment chemicals for heat transfer fluid
  - Manual chemical feed equipment
  - Heat transfer fluid & anti-freeze solution
- Design Information
  - An HVAC Water Treatment Program shall include all necessary chemicals and testing procedures for maintaining consultant-prescribed levels of water treatment for the project closed hydronic systems including hot-water heating system loops and condenser water loops.
- Performance Requirements
  - Propylene glycol-based water treatment chemicals specially formulated, based on analysis of makeup water, to prevent accumulation of scale and corrosion and to prevent freezing of heat transfer fluids in piping and connected equipment.
- Submittal Information
  - Submit manufacturer's product data for propylene glycol and water treatment chemicals to be provided under the Work of this Section.
  - Include MSDS data sheets for all chemicals.
  - Water-Treatment Program: Written sequence of operation on an annual basis for the application equipment required to achieve water quality defined in the "Performance Requirements" Article above.
  - Water Analysis: Illustrate water quality available at Project site.

**Part 2 – Product Information**

- Water Treatment Chemicals for Heat Transfer Fluids
- Bypass Feeders
  - Steel, with corrosion-resistant exterior coating, minimum 3-1/2-inch fill opening in the top, and NPS 3/4 bottom inlet and top side outlet. Quarter turn or threaded fill cap with gasket seal and diaphragm to lock the top on the feeder when exposed to system pressure in the vessel.
  - Capacity: 5 gallons.
  - Minimum Working Pressure: 125 psig
- Heat Transfer Fluid & Anti-Freeze Solution

**Part 1 – General Information**

- Section includes
  - Vehicle exhaust systems
  - Diesel stack adaptors
  
- Design Information
  - Where vehicle exhaust systems are being provided, coordinate with Owner/Users to determine vehicle type, engine displacement, operating rpm and number of simultaneous operating vehicles.
  - Where vehicles include vertical stack exhausts, provide diesel stack adapters.
  - Exhaust levels shall be determined in compliance with guidelines of the “Industrial Ventilation – A Manual of Recommended Practice” published by the American Conference of Governmental Industrial Hygienists.
  
- Submittal Information
  - Product data: Manufacturer’s product data for each item included in the vehicle exhaust system
  - Shop drawings: Vehicle exhaust system duct and fan arrangement
  - Wiring Diagrams: For power and control wiring.
  - Maintenance and Care Instructions
  - Warranty – Manufacturer’s extended warranty on products supplied which are greater than 1-year
  - Call-back Contact Information

**Part 2 – Product Information**

- Manufacturer
  - To be determined by design consultant
  
- Characteristics
  - Tubing material
  - Diesel stack adaptor
  - Motorized hose reels
  - Hose reel re-wind control
  - Interlocks for fan control and makeup air

**Part 1 – General Information**

- Design Information
  - MERV 8 – 2” thick filters to be provided from list of standard sizes (Preferred)
  - Filter pressure drop monitoring is not required. Filters changed by Washington State Military Department Facilities on quarterly basis.
  - Where required for LEED certification, increased filter efficiency may be necessary

**Part 2 – Product Information**

- Available MERV 8 standard filter sizes utilized in WNG Facilities:

SIZE	1” MERV 8	2” MERV 8	4” MERV 8	
06 x 12				
10 x 48				
12 x 20		x		
12 x 24		x	x	
14 x 20		x		
14 x 25		x		
16 x 16				
16 x 20		x	x	
16 x 21				
16 x 24		x	x	
16 x 25		x	x	
20 x 20		x	x	
20 x 24		x	x	
20 x 25		x	x	
24 x 24		x	x	

## Part 1 – General Information

- Section includes the following:
  - Installation of split system direct expansion cooling units for air conditioning of I.T. Rooms.
  - Installation of computer room air conditioning systems for cooling of computer server and support equipment within Server Rooms.
  
- Design Information
  - I. T. Rooms
    - Split-system air conditioners with stand-alone controls. AC systems shall be on Generator Power when available.
  - Server Rooms
    - Split system computer server room air conditioning system with waterside economizer cooling and humidity control.
    - Humidification requirements shall include water filtration and treatment of minerals in the makeup water which occur at Washington National Guard facilities.
    - Obtain water quality analysis reports for makeup water from Owner specific to the project location
    - Server Room AC system shall be on Generator Power when available.
    - Interface with FM200 Fire Suppression System where provided.
    - Back-up ventilation cooling system to operate automatically upon temperature rise due to failure of air conditioning system to limit Server Rooms temperature to 85F (adjustable) with backup ventilation sized to maintain a maximum temperature of 100F at design conditions. Backup system shall also operate to provide economizer cooler during temperature band where waterside economizer is not sufficient.
    - Backup system shall be on Generator Power when available.
  
- Submittal Information
  - Product data on all products to be used.
    - Single-line diagrams
    - Dimensional, electrical and capacity data
    - Piping and electrical connection drawings
    - Manufacturer's Written Instructions:
      - Manufacturer's electrical connection diagram.
      - Manufacturer's piping connection diagram.
    - Shop Drawings: Including plans, elevations, sections, details and attachments to other work.
  
  - 1. Maintenance and Care Instructions.
  - 2. Warranty.
  - 3. Call-back Contact Information.

## Part 2 – Product Information

- Manufacturers
  - I.T. Room Split System Dx Equipment:
    - Mitsubishi
    - Fujitsu
    - Other manufacturers shall be reviewed by Washington State Military Department Facilities Group

Server Room Air Conditioning Equipment:

Liebert

Other manufacturers shall be reviewed by Washington State Military Department  
Facilities Group

**NOT USED**

**Part 1 – General Information**

- CAD Standards  
Consultants and Contractor's preparing drawings will be required to utilize the Washington State Military Department CAD Standards dated January 9, 2007.
- Design Information  
Electrical equipment testing shall follow National Electrical Testing Association (NETA) Standards.  
All new construction design shall include a coordination study of the electrical system with available Short Circuit Analysis, Circuit Breaker Trip Coordination and Arc Flash labeling.
- Submittal Information  
Testing agency qualifications  
Testing forms  
Test results

**Part 2 – Product Information**

- Not Applicable

**Part 1 – General Information**

- CAD Standards  
Consultants and Contractor's preparing drawings will be required to utilize the Washington State Military Department CAD Standards dated January 9, 2007.
- Design Information  
Labels shall be provided on all disconnects, combination motor starters, and junction boxes indicating the specific panel and branch circuit utilized.  
  
Junction boxes for telecom shall be painted blue.  
  
Fire alarm j-boxes shall be painted red.  
  
Specifications shall call for infrared scanning at the one year warranty walk through after construction.
- Designer to Identify:  
Scope of Work  
Temporary power requirements  
Codes and Regulations  
Permits and Fees  
O & M Manuals  
As-Built Drawing requirements  
Inspections  
Warrantees  
Equipment Substitution requirements  
Equipment Submittal requirements  
Equipment Label requirements

**Part 2 – Product Information**

- Not Applicable

**Part 1 – General Information**

- CAD Standards  
Consultants and Contractor's preparing drawings will be required to utilize the Washington Military Department CAD Standards dated January 9, 2007.
- Design Information  
Ground wires shall be provided in all conduits.  
All feeder neutrals shall be sized at 100 percent of feeder amperage  
MC cable is only allowed where authorized in writing by the project manager.  
Aluminum conductors are acceptable for feeder conductors. Aluminum conductors shall not be used for conductors sized #2 AWG or less.

**Part 2 – Product Information**

- Designer to specify wire and insulation types.

**Part 1 – General Information**

- CAD Standards  
Consultants and Contractor's preparing drawings will be required to utilize the Washington State Military Department CAD Standards dated January 9, 2007.
- Design Information  
Building service ground system shall be designed and certified as 10 ohms or less.

**Part 2 – Product Information**

- Designer to specify ground rods, connectors and conductors.

**Part 1 – General Information**

- **CAD Standards**  
Consultants and Contractor's preparing drawings will be required to utilize the Washington Military Department CAD Standards dated January 9, 2007.
- **Design Information**  
Electrical Systems to be commissioned;  
Exterior lighting  
Interior lighting  
Lighting controls such as low voltage controls, photocells, timeclock, occupancy sensors, day lighting controls, etc.  
Generators  
Transfer switches  
Owner metering systems  
Fire/Mass Notification Systems  
UPS Systems.

**Part 2 – Product Information**

- **Test Equipment**  
All test and verification equipment for electrical systems testing shall be provided by the contractor.  
The instrumentation and test equipment provided by the contractor shall meet the following requirements.
  - Be of necessary accuracy to test and measure system performance within the tolerances required to determine adequate performance.
  - Be calibrated on the manufacturer's recommended intervals with calibration tags affixed to the instrument. In absence of calibration tags, calibration documentation shall be submitted to the Owner 30 days prior to use. Documentation shall include description and serial number of instrument, calibration data and date.
  - Be maintained in good operating condition for the duration of the project.

### Part 1 – General Information

- Design Information  
Remote Metering Requirements – AR 420-1 Army Facilities Management (28 March 2009), Chapter 22-15 Advanced Metering
- Advanced Meters are those that have the capability to measure and record interval data and communicate the data to a remote location in a format that can be easily integrated into an advanced metering system.
- Electrical meters shall be provided for all new construction projects regardless of programmed cost or for renovation or energy projects with a programmed cost of \$ 200,000 or more that include natural gas or water components with remote metering output transmitted through the DDC System of Section 23 0923
- Electrical meters and instrument transformers shall meet or exceed the following minimum requirements:

Measure quantities	Electrical meter quantities measured are Power (kiloWatt), average demand over 15 minute intervals and Energy (kiloWatt-hours).
System Accuracy	System accuracy for the meter product devices including instrument transformers shall not exceed 1% as calculated using the Root Sum Square (RSS) method and assuming normal distribution.
Meter Accuracy:	For facilities with connected loads equal to or greater than one (1) mega volt-ampere (MVA), meter certification shall be NEMA/ANSI C12.20, Accuracy class 0.2%. For facilities with loads less than 1MVA, meter certification shall be IEEE/ANSI C12.16, Accuracy class 0.5%.
Communication Protocol.	Meters shall communicate via either Modbus RTU or ANSI/CEA-709.1b (LonTalk) protocols or as otherwise specified.
Auxiliary data ports	Unless otherwise specified, electrical meters shall have a minimum of two pulse inputs for incorporation and transmission of other external meter data.
Surge Protection.	IEEE/ANSI C37.90.1, Standard surge withstand capability (SWC) tests for relays and relay systems associated with electric power apparatus.

Current transformers (CTs)

Sized properly so that the meter secondary of the transformer shall output current to ensure at least a plus or minus 0.6% accuracy of current when measured between 10% and 90% of full amperage range.

CTs shall not exceed 5 amps on the secondary side.

Burden on CTs shall not exceed rated burden for the accuracy class.

CTs shall be provided in split core configuration.

CTs shall be provided in the appropriate ranges to meet the service entrance amperage requirements.

For facilities with a connected load equal to or greater than 1MVA, CT certification shall be IEC 185 or ANSI/IEEE C57.13 for 0.3% accuracy class or better.

For facilities with a connected load less than 1MVA, CTs shall revenue grade and certified per IEEE/ANSI C57.13 or IEC 185.

Current sensors shall be sized properly for the application and provide a voltage (normally 0-2 volts) to the meter that results in at least a plus or minus 0.6% accuracy of current when measured between 10% and 90% of full amperage range.

Voltage or Potential Transformers (PTs) sized properly so that the meter secondary of the transformer shall output voltage to ensure at least a plus or minus 0.6% accuracy of voltage when measured from zero to the IEEE/ANSI C57.13 or IEC 185 specified standard burden, at the specified standard burden power factor, and at any value from 90% to 110% of rated voltage.

For facilities with a connected load equal to or greater than 1MVA, PT certification shall be IEC 185 or IEEE/ANSI C57.13 for 0.3% accuracy class or better.

For facilities with a connected load less than 1MVA, PTs shall be revenue grade and certified per IEEE/ANSI C57.13 or IEC 185.

Burden on PTs shall not exceed rated burden for accuracy class.

Data Storage. Unless otherwise specified, the meter must be capable of providing and storing required interval data for a minimum of 30 days.

### Environmental Tolerances of Metering Devices

Meters shall be installed in indoors/interior locations and rated for operation and storage from 0° - 50° C or better and 5 to 90% relative humidity (non-condensing). Interior meters shall be provided with or installed within a NEMA 12 enclosure.

### Part 2 – Products

- Advanced Metering Data Management System front end computer requirements are:

Data encapsulation format:	Extensible Markup Language (XML) and Simple Object Access Protocol (SOAP) for future output to a remote centralized meter data management system.
Storage of metered data:	For at least 2 years.
Display:	Display of data upon request and selectable from 1 minute to 15 minutes for kW.  Final install of front end equipment shall, at minimum, display accurate data readings for each meter in a text format. Customization of the user interface is not required. Two hardcopies and two electric copies (DVD or CD) of detailed instructions shall be provided for customization and integration of additional display features that are not prepared at the time of final install.
Display capability:	Shall include multiple graphical formats such as data vs. time (minutes, hours, days, weeks, months, and year) comparison between metered data from two or more meters and other standard meter data.
System expansion capability:	50 times for incremental future growth of metered data to include water, gas and steam.
Data Transmission Media:	LAN, Radio Frequency, or Power Lines for interface of metered data to the Advanced Metering Data Management System, whichever is most economical for the site.

**End of Specification**

## SmartServer 2.0

The Smart Way to Save Energy and Lower Operating Costs



The SmartServer is a versatile smart energy manager that connects control devices to IP-based applications such as enterprise energy management, demand response programs, street light management systems, and high-value remote asset management programs.

The server not only allows you to access, control, and monitor electronic devices, but also lets you use data intelligently to save energy, improve operations, and lower maintenance costs. Easy to deploy and manage, and capable of both local and remote control, the SmartServer offers unparalleled flexibility. Use it as a standalone server, or integrate it with the control system of your choice. With built-in drivers for industry-standard protocols like Echelon's LONWORKS® technology, Web services SOAP/XML, Modbus, M-Bus, digital I/O, and pulsecount input, and custom driver support for everything else, the SmartServer offers unprecedented connectivity at no extra cost.

## FEATURES

### Building Energy Management

- Building Energy Management (BEM) Edition provides a robust, highly reliable, and low-cost solution for monitoring energy usage from multiple energy meters and forwarding energy data to the SeriousEnergy Manager that collects and analyzes data from each meter and presents an energy dashboard Web-based interface.
- Templates available for all editions for easy connection to a wide variety of energy meters.

### Street Light System Support

- Power line (PL) editions have street light segment control built-in, with support for mesh repeating for street light controllers using both power line and RF segments, with RF segments created with the Echelon Street Light Bridge.

### User Interfaces

- Built-in Web pages for setup, network installation commissioning, scheduling, alarming, data logging, and network integration.
- The included i.LON Vision 2.0 Web Authoring Tool lets you create custom Web pages quickly and easily; or you

can create custom Web pages by editing simple Web page mark-up with any standard Web authoring tool.

- Serial and Telnet console interface for advanced configuration.

### Programmatic Interfaces

- Web services using SOAP/XML.
- Standard WSDL file suitable for .NET and Java Web services integration.
- LNS® Remote Network Interface (RNI) for local or remote connection to LNS or OpenLDV™ applications including the LonMaker® Integration Tool, supporting the following limits:
  - 32,768 address table entries
  - 255 outgoing transactions
  - 3,000 dynamic network variables
- HTTP and HTTPS interfaces for Web browser-based interfaces.
- SmartServer API for custom apps

### Network and Device Interfaces

- IP via built-in 10/100BaseT Ethernet interface, optional internal 56K V.90 analog modem, or external GSM/GPRS or 3G modem.
- TP/FT-10 free topology twisted pair or PL-20 C-band power line ISO/IEC

14908-1 (LONWORKS) with built-in LONWORKS transceiver.

- Modbus RTU with built-in RS-485 transceiver.
- Modbus TCP (Modbus TCP/IP) with built-in Ethernet interface, optional internal analog modem, or external GSM/GPRS modem.
- M-Bus with built-in RS-485 transceiver and optional M-Bus translator.
- Custom drivers using built-in Ethernet, RS-232, and RS-485 interfaces.

### Built-in SmartServer Apps

- Scheduling: time of day, day of week, date, and sunrise/sunset relative.
- Alarming: data point health and value monitoring; flexible reporting.
- Data logging with automatic transfers to historical data repositories
- Meter reading.
- Network integration with customizable data type translation, analog functions, and case logic for converting, splitting, and merging structured data points.
- Built-in Web pages for configuring and using all applications.

- Unified data model provides easy access to all your data regardless of manufacturer or communication protocol.
- Up to 1,000 data points can be defined for use by built-in and custom applications.
- Programmatic SOAP/XML interface for remote application access to all applications.

#### Windows PC Apps

- Rapid site deployment lets you quickly replicate and deploy a site design and configuration to a new site.
- Remote upgradability lets you easily update multiple remote sites to new SmartServer versions.
- Remote backup and restore features help you easily recover from hardware failures.
- Data log historian automatically receives and extracts data logs from multiple sites.
- LNS SOAP interface for seamless synchronization between a SmartServer and an LNS Server.
- BEM Edition includes wizards that configure and install SmartServers and supported BEM submeters, and automate connection to the SeriousEnergy Manager energy management platform.

#### Custom Apps

- Support for custom apps included with the Professional and BEM Editions and is available as an option for the Standard Edition.
- C/C++ programming environment.
- Eclipse IDE lets you quickly and easily develop and deploy SmartServer apps.
- Web page localization tool.
- Requires separate purchase of SmartServer 2.0 Programming Tools.

#### LONWORKS Network Installation

- Two LONWORKS network installation modes: LNS mode and Standalone mode.
- LNS mode provides seamless integration with the market-leading LNS Server, the operating system for LONWORKS networks.
- LNS mode works with LNS tools such as the LonMaker Integration Tool; standalone LNS Server for the SmartServer is available if an LNS tool is not available.

- Standalone network installation mode supports up to 200 devices and ensures field personnel can get a site up and running quickly, without additional installation tools.
- Automatic device discovery and installation reduces time spent installing, replacing, and upgrading devices.
- Configure, commission, test, upgrade, and replace devices.
- Read and write any network variable or configuration property.
- Create network connections in LNS mode.
- Launch plug-ins to configure devices in LNS mode.
- Built-in RNI supports remote OpenLDV and LNS applications.
- Built-in LonScanner™ interface supports the LonScanner Protocol Analyzer.

#### Visualization

- Create custom displays with i.LON Vision 2.0 (no other software required); or use the Web authoring tool of your choice.
- Built-in design elements (such as a slider, gauge, navigation tree, and menu) help you create displays quickly.
- Trend graphs for real-time and historical tracking of data point values.
- Trend graphs available on both built-in configuration pages and custom Web pages.
- Trend graphs can show both scalar and structured data such as a temperature value with an alarm condition.
- Browse built-in and custom Web pages with Internet Explorer or Firefox.

#### Hardware I/O

- 2 optically isolated digital inputs.
- 2 high-voltage, high-current SPST relay outputs.
- 2 SO impulse meter inputs for supervising electric, gas, and water impulse meters.
- Hardware inputs and outputs are exposed as standard data points.
- Hardware inputs and outputs can be scaled and converted to and from appropriate units.
- Hardware outputs can be triggered by network events.

#### IP-852 Routing

- ISO/IEC 14908-4 (IP-852) routing included with the Professional and BEM Editions, and available as an option for the Standard Edition.
- IP-852 lets you use any IP network as a backbone for a LONWORKS network.
- IP-852 channel can include an LNS Turbo Edition Server and up to 255 i.LON SmartServers with IP-852 routing, i.LON 600 servers, third-party IP-852 routers, and LNS Turbo Edition clients.
- IP-852 channel supports thousands of packets per second for high-performance monitoring and control.

#### Standards-based Protocols

- IP local and wide area networking protocols and Internet standards include TCP, IPv4, IPv6, PPP, CHAP, PAP, DHCP, DNS, FTP, ICMP, MD5, SMTP, SNMP, SNT, HTTP, HTTPS, and SSL.
- Additional IP application protocols: HTML, XML, SOAP, and DIME.
- Dynamic IP addresses supported using the dynamic DNS service from DynDNS.
- NAT is supported.
- ISO/IEC 14908-1 Control Network Protocol.
- ISO/IEC 14908-2 Free Topology Twisted Pair (FT versions).
- ISO/IEC 14908-3 Power Line (PL versions).
- ISO/IEC 14908-4 Control Network IP Tunneling Protocol (optional IP-852 routing).

## SPECIFICATIONS

#### PC Requirements

##### Minimum Requirements for the SmartServer 2.0

Pentium III @ 1.3GHz, 768MB RAM, DVD-ROM drive, 100MB of free disk space.

##### Minimum Requirements for Echelon Enterprise Services

Pentium IV @ 1.5GHz, 1GB RAM, DVD-ROM drive, 270MB of free disk space.

##### Minimum Requirements for the SmartServer Programming Tools

Pentium IV @ 1.5GHz, 1GB RAM, DVD-ROM drive, 250MB of free disk space.

#### Operating Systems

Windows 7 (64-bit\* and 32-bit versions), Windows Vista (32-bit version), or Windows XP; \*Note: the SmartServer

products can be configured, monitored, and controlled via Internet Explorer and Firefox on the supported 64-bit and 32-bit versions and of Windows, and can be accessed as a remote network interface for LNS applications and the LonMaker Turbo Integration Tool running on both 64-bit and 32-bit Windows; the Echelon Enterprise Services (EES) software can only be installed and used on 32-bit versions of Windows.

## **SmartServer Hardware**

### **Processor**

MIPS32™, 264MHz

### **Memory**

64MB flash memory; 64MB RAM (FT versions) or 128MB RAM (PL versions).

### **Channel Type**

TP/FT-10 free topology twisted pair (FT versions); PL-20N or PL-20C power line (PL versions).

### **LONWORKS Network Connector**

Screw terminals.

### **Operating Input Voltage**

100 - 240VAC (-6%/+10%), 50/60Hz.

### **Power Consumption**

<15 watts.

### **Controls**

Service button, Reset button.

### **Indicators**

Power On/Wink; Ethernet link, Ethernet activity, 10/100 Mbps; LonWORKS Service, BIU (PL only), PKD (PL only), Tx, Rx; 2 digital inputs; 2 relay outputs; 2 metering inputs; Remote Network Interface connection status.

### **Ethernet Port**

10/100BaseT, auto-selecting, auto polarity.

### **Ethernet Connector**

RJ-45, 8 conductor.

### **Serial Ports**

1 isolated RS-485 port; 1 EIA-232 port.

### **Serial Connectors**

Screw terminals.

### **Modem**

Optional V.90 internal analog modem (FT version only).

### **Modem Connector**

RJ-11, 6 conductor.

### **Supported External Modems**

Cinterion MC75, Cinterion MC63i,

ETM9300 1 3G, Janus Terminus GSM864Q, Multitech MTCBA-G-F1, Siemens 35 to 45 Series, Siemens MC55 3G, Siemens MC75 EDGE.

### **Console Port**

EIA-232

### **Console Connector**

DB-9

### **Digital Inputs**

2 optically isolated dry contact inputs, 30V AC/DC.

### **Digital Input Connector**

Screw terminals.

### **Relay Outputs**

2 SPST relays rated at 240VAC @ 10A or 24VDC @ 10A.

### **Relay Output Connector**

Screw terminals.

### **Impulse Meter Inputs**

DIN 43 864 (open terminal voltage ≤12VDC max; max current ≤ 27mA).

### **Impulse Meter Input Connector**

Screw terminals.

### **Operating Temperature**

FT Versions: 0 to +50°C; PL Versions: -40 to +60°C

### **Non-operating Temperature**

FT Versions: -40 to +85°C; PL Versions: -40 to +85°C

### **Operating Humidity (non-condensing)**

FT Versions: 10 to 90% RH @ 50°C; PL Versions: 10 to 90% RH @ 60°C

### **Non-operating Humidity (non-condensing)**

FT Models: 5 to 90% RH max @ 50°C; PL Models: 5 to 90% RH max @ 60°C

### **Dimensions**

3.51 in. (H) x 5.47 in. (W) x 2.60 in. (D); 8TE DIN, 8.9 cm (H) x 13.8 cm (W) x 6.6 cm (D)

### **EMC**

FCC Part 15 Class B, EN55022 Class B, EN55024, CISPR 22 Class B, VCCI Class B.

### **Agency Listings**

UL 60950, cUL C22.2 No. 60950-00, TÜV EN60950, CE, C-Tick.

### **Mounting**

DIN, Enclosure 8TE.

## **DOCUMENTATION**

*Echelon Enterprise Services 2.0 User's Guide*  
078-0423-01

*SmartServer 2.0 User's Guide*  
078-0345-01

*SmartServer 2.0 Hardware Guide*  
078-0346-01

*iSmartServer 2.0 Programmer's Reference*  
078-0347-01

*SmartServer 2.0 Power Line Repeating Network Management Guide*  
078-0348-01

*SmartServer 2.0 Programming Tool User's Guide*  
078-0349-01

*i.LON Vision 2.0 User's Guide*  
078-0422-01

*IP-852 Channel User's Guide*  
078-0312-01

*Rapid Deployment Example for EES*  
078-0426-01

## **ORDERING INFORMATION**

SmartServer 2.0 FT Standard SR2  
72101R-430

SmartServer 2.0 FT Professional SR2  
72101R-440

SmartServer 2.0 FT BEM Edition SR2  
72101R-455-BEM

SmartServer 2.0 FT Professional with Modem SR2  
72102R-440

SmartServer 2.0 PL Professional SR2  
72103R-440

SmartServer 2.0 PL Professional with External Coupling SR2  
72103R-460

SmartServer 2.0 SR2 Software License  
72110-440

SmartServer 2.0 Programming Tools DVD  
72111-439

LNS Server for SmartServer CD  
72130-320

SmartServer IP-852 Router Activation Key  
72160

SmartServer Programmability Activation Key  
72161

**Part 1 – General Information**

- **CAD Standards**  
Consultants and Contractor's preparing drawings will be required to utilize the Washington State Military Department CAD Standards dated January 9, 2007.
- **Design Information**  
The minimum general purpose receptacle rating shall be 20 amps.  
General purpose receptacles shall be limited to six (6) per 20 amp circuit to allow for expansion.  
Receptacles serving classrooms computer loads shall be limited to four (4) per 20 amp circuit to allow for expansion.  
All NEMA 3R receptacle/switch covers shall be rated for Nema 3R "In Use".

**Part 2 – Product Information**

- **Manufacturers**  
To be specified by Design Consultant.
- **Characteristics**  
Products to be UL Listed.  
Face plates shall be nylon.

### Part 1 – General Information

- CAD Standards  
Consultants and Contractor's preparing drawings will be required to utilize the Washington State Military Department CAD Standards dated January 9, 2007.
- Design Information  
Service voltage for buildings 40,000 square feet and greater shall be 480 V, 3 phase, 4 wire, where 480V, 3Ph, 4W is available serving utility.  
A main electrical room and branch electrical room(s) shall be provided for buildings greater than 40,000 square feet. The main electrical room shall be located on an exterior wall and have a door to the exterior of the building. Building Fire Alarm/mass notification equipment (not sprinkler system) may be co-located in main electrical room or branch electrical rooms.  
Design panels with 5% spare circuit breakers and 10% space and 15% spare for the addition of future loads.  
Use copper for transformer windings and switchboard bussing. Aluminum windings or bussing will not be considered without written authorization by the project manager when copper is not available or cost prohibitive.  
Transient voltage surge suppressors shall be provided on the main electrical switchboard.

**Part 1 – General Information**

- **CAD Standards**  
Consultants and Contractor's preparing drawings will be required to utilize the Washington State Military Department CAD Standards dated January 9, 2007.
- **Design Information**  
Power distribution and branch circuit panels shall have bolt on type circuit breakers. Adjustable trip circuit breakers may be used if specific design considerations warrant their application, such as in electrical coordination of over current devices.  
Design panels with 5% spare circuit breakers, 10% space, and 15% spare capacity for the addition of future loads.  
Load center panelboards shall not be used except in elevator machine rooms and information technology rooms.  
Transient voltage surge suppressors shall be provided on communications and mechanical branch panelboards.

**Part 2 – Product Information**

- **Manufacturers**  
To be specified by Design Consultant.
- **Characteristics**  
Products to be UL Listed.

**Part 1 – General Information**

- **CAD Standards**  
Consultants and Contractor's preparing drawings will be required to utilize the Washington State Military Department CAD Standards dated January 9, 2007.
- **Design Information**  
Combination motor starters/disconnects shall be specified by the electrical engineer and provided by the electrical contractor.  
VFD's and starters supplied with mechanical equipment shall be specified by mechanical engineer and supplied by mechanical contractor.

**Part 2 – Product Information**

- **Manufacturers**  
To be specified by Design Consultant.
- **Characteristics**  
Products to be UL Listed.

**Part 1 – General Information**

- **CAD Standards**  
Consultants and Contractor's preparing drawings will be required to utilize the Washington State Military Department CAD Standards dated January 9, 2007.
- **Design Information**  
The minimum general purpose receptacle rating shall be 20 amps.  
General purpose receptacles shall be limited to six (6) per 20 amp circuit to allow for expansion.  
Receptacles serving classrooms computer loads shall be limited to four (4) per 20 amp circuit to allow for expansion.  
All NEMA 3R receptacle/switch covers shall be rated for Nema 3R "In Use".

**Part 2 – Product Information**

- **Manufacturers**  
To be specified by Design Consultant.
- **Characteristics**  
Products to be UL Listed.

**Part 1 – General Information**

- **CAD Standards**  
Consultants and Contractor's preparing drawings will be required to utilize the Washington State Military Department CAD Standards dated January 9, 2007.
- **Design Information**
  1. Outdoor units shall be provided with a suitable NEMA 3R, sound attenuated enclosure and have provisions to ensure reliable starting capability in cold weather.
  2. Sound levels for generators shall not exceed 75 dBA at 23 feet.
  3. The initial voltage drop on generator output due to starting currents of loads must not exceed 15 percent.
  4. In order to reduce possible nuisance tripping of ground fault relays, automatic transfer switches serving 3-phase, 4-wire loads should have 4-pole contacts with an overlapping neutral. Automatic transfer switches shall include a bypass isolation switch that allows manual bypass of the normal or emergency source to ensure continued power to emergency circuits in the event of a switch failure or required maintenance.
  5. Fuel supply shall be diesel, integral to the unit with minimum capacity for 24 hours of operation at full load. Verify fuel capacity and generator run requirements with owner during design.
  6. A complete list of loads the generator will serve shall be discussed with owner personnel during design and finalized at Schematic Design.
  7. Submittals shall be provided prior to ordering generator for owner, engineers and local Agency Having Jurisdiction (AHJ) review and approval to ensure compliance with local AHJ requirements.

**Part 2 – Product Information**

- **Manufacturers**  
To be specified by Design Consultant.
- **Characteristics**  
Products to be UL Listed.

**Part 1 – General Information**

- CAD Standards  
Consultants and Contractor's preparing drawings will be required to utilize the Washington State Military Department CAD Standards dated January 9, 2007.
  
- Design Information  
Interior Lighting  
Light levels shall be per IES recommendations and lighting power density (w/sf) meeting the Washington State Non-Residential Energy Code.  
Minimize the quantity of different lamp types in the design to no greater than 10 unless approved by owner.  
Linear fluorescent lamps shall be T8; T5 or T5HO lamps may also be used. Lamps shall be 30,000 hour minimum life and low mercury content.  
Color rendering shall be 3500 K.  
Compact fluorescent lamp types  
Sylvania Dulux S                      CF9Ds/827  
Sylvania Dulux D/E                    CF13DD/E/835  
Sylvania Dulux D/E                    CF18DD/E/835/ECO  
Sylvania Dulux T/E IN                CF26DT/E/IN/835  
Sylvania Dulux T/E IN                CF32DT/E/IN/835  
Sylvania Dulux T/E IN                CF42DT/IN/835/ECO  
All fluorescent ballasts shall be specified with an extended 5 year warranty based on the ballast manufacturer's published lamp/ballast combinations.  
Fluorescent ballasts shall be electronic type with 10% or less total harmonic distortion.  
Where LED type lamps or light fixtures are used designer shall calculate total harmonic distortion on each branch circuit serving LED's on each panel serving LED's and on the building main service. This is not necessary if only the building exit lights are of the LED type.  
Exit signs shall be of the LED type and meet the requirements of NFPA 101.  
General office/administrative area lighting shall be designed with fluorescent lamp, 2 x 4 recessed direct/indirect fixtures. Multi-level switching occupancy sensors and daylight controls shall be provided for energy savings. Designer and owner shall evaluate the use of low voltage lighting controls for interior/exterior building lighting. The window (daylighting) zones shall be circuited and controlled separately from the remainder of the room by separate switches, daylight sensors and occupancy sensors.

T8 on/off ballasts shall not exceed the following input wattages.

Qty of Lamps	Input Wattage (4' lamps, 32 watt)
1	25
2	48
3	73
4	95

T8 and standard T5 dimmers ballast shall not exceed the following input wattages.

Qty of Lamps	Input Wattage	Input Wattage
	(4' lamps, T8, 32W)	(4' lamps, T5, 28W)
1	30	
2	59	64
3	87	
4	114	

T5 High Output ballasts shall not exceed the following input wattages.

Qty of Lamps	Input Wattage
	(4' lamps, T5, 54W)
1	62
2	120

Occupancy sensors shall be dual technology type, wall/ceiling. Regularly occupied rooms such as offices, classrooms, conference rooms, etc. shall be designed with occupancy sensors. Standard rooms shall utilize dual technology sensors, unless the room is equipped with paddle fans (or other regularly moving objects). The occupancy sensor shall be set to automatically turn the lights off after 15 minutes. Turning the lights on shall require manual activation at the light switch. All occupancy sensors shall be equipped with an auxiliary 24V output to allow connection by the building control system, for control of mechanical equipment.

Specifications shall require the contractor to commission the lighting system utilizing a factory authorized representative to make final field adjustments. Contractor shall indicate light levels and final device settings to be included in the Electrical O & M manuals.

Lighting designer shall indicate primary and secondary daylight zones on the plans with locations for daylight sensors controlling light fixtures in both zones.

Digital Timer Switches shall be used in storage rooms, mechanical/electrical rooms, and utility rooms. The digital timer switch shall be set to 1 hour. The switch shall be programmed to blink the lights on/off 5 minutes prior to turning the lights off, to allow occupants in the room to reset the timer.

Where low voltage control systems are approved by the owner, designers shall specify digital low voltage control systems only. Analog low voltage lighting control systems are not acceptable.

The low voltage control system manufacturer shall have local factory trained support service within a 100 mile radius of the project. Manufacturer's data of the low voltage lighting control system shall be sent to district personnel for review.

Designer shall provide on the drawings a room by room scheduled breakdown of type of controls, switching, and description of how the room shall operate.



# **WASHINGTON ARMY NATIONAL GUARD**



## **TELECOMMUNICATIONS PLANNING GUIDE**

### **VOLUME 3**

#### **Outside Plant (OSP)**

#### **PRODUCTS AND INSTALLATION**

**(July, 2013)**

## Introduction

This telecommunications planning guide was written by personnel in the Department of Information Management (DOIM) office in coordination with the Facilities Maintenance Office (FMO) of the Washington Army National Guard (WAARNG) who know and use industry accepted practices and standards. It is to be used as the reference tool for Washington National Guard employees as well as architects, facilities planners and general contractors.

The WAARNG is responsible for providing voice and data connectivity to the Washington Military Department to include the Air National Guard and the state government employees as well as other occupants of Washington Army National Guard facilities. Since the WAARNG DOIM assumes responsibility for providing the connectivity for these various agencies it is imperative that the standards set forth in this planning guide are followed.

This planning guide is based on the most recent standards as published by Building Industry Consulting Service International (BICSI), American National Standards Institute (ANSI) Telecommunications Industry Association (TIA), and the National Fire Protection Association (NFPA). The majority of the language and acronyms will be taken from the BICSI<sup>®</sup> Telecommunications Distribution Methods Manual (TDMM).

The WAARNG Telecommunications Planning Guide is a living document and will be periodically reviewed, updated, and made available to users as part of the Services' responsibility for providing technical criteria for WAARNG construction. The WAARNG DOIM is responsible for administration of the planning guide. Technical content of the planning guide is the responsibility of the WAARNG DOIM. If you have questions about the guidelines in this planning guide, please contact our office at 253-512-8999 or 253-512-8888

You may also contact the WAARNG DOIM Office via email at [robert.j.wherrett.NFG@mail.mil](mailto:robert.j.wherrett.NFG@mail.mil)

## Intended Audience

Volume 3 of the planning guide is primarily intended for contractors intending to bid on and perform installation of outside plant conduit and cabling system. Volume 1 of this planning guide is intended for architects, space planners, facilities managers or other design professionals responsible for planning new construction or major renovation projects for the Washington Army National Guard.

Others who may benefit from this planning guide include Information Technology (IT) professionals, mechanical and electrical engineers, general contractors and others including electrical, mechanical outside plant and structured cabling contractors.

## Material Covered

Material covered in this volume of the planning guide includes approved OSP cabling products for installation entering buildings including cable and connectivity components and installation requirements that support telecommunications services for new or major renovation projects.

## PART I - GENERAL

1. APPLICABLE PUBLICATIONS: The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. As publications are revised and reissued the latest version of these standards take precedence over older versions.

### **1.1 REFERENCES**

ANSI/TIA/EIA-526-7-B.1 Cable Plant	Measurement of Optical Power Loss of Installed Single-Mode Fiber
ANSI/TIA/EIA-568-B.1 General Requirements	Commercial Building Telecommunications Cabling Standard -
ANSI/TIA/EIA-568-B.2 Balanced Twisted Pair Cabling Components	Commercial Building Telecommunications Cabling Standard -
ANSI/TIA/EIA-568-B.3 Optical Fiber Cabling Components	Commercial Building Telecommunications Cabling Standard -
ANSI/TIA/EIA-569-A and Spaces	Commercial Building Standard for Telecommunications Pathways
ANSI/TIA/EIA-569-A-1 and Spaces - Perimeter Pathways	Commercial Building Standard for Telecommunications Pathways
ANSI/TIA/EIA-569-A-2 and Spaces - Furniture Pathways	Commercial Building Standard for Telecommunications Pathways
ANSI/TIA/EIA-569-A-3 and Spaces - Access Floors	Commercial Building Standard for Telecommunications Pathways
ANSI/TIA/EIA-569-A-4 and Spaces - Poke Thru Devices	Commercial Building Standard for Telecommunications Pathways
ANSI/TIA/EIA-569-A-5 and Spaces - In Floor Systems	Commercial Building Standard for Telecommunications Pathways
ANSI/TIA/EIA-569-A-6 and Spaces - Multi Tenant Pathways	Commercial Building Standard for Telecommunications Pathways
ANSI/TIA/EIA-569-A-7 and Spaces - Cable Tray & Wireways	Commercial Building Standard for Telecommunications Pathways
ANSI/TIA/EIA-598-A	Optical Fiber Cable Color Coding
ANSI/TIA/EIA-60 of Commercial Buildings	Administration Standard for the Telecommunications Infrastructure
ANSI/TIA/EIA-607 Telecommunications	Commercial Building Grounding & Bonding Requirement for
ANSI/TIA/EIA-758	Customer Owned Outside Plant

WAARNG Telecommunications Planning Guide Volume 3: OSP Products and Installation

INSTITUTE OF ELECTRONIC AND ELECTRICAL ENGINEERS

IEEE 802.XX SERIES

INSULATED CABLE ENGINEERS ASSOCIATION (ICEA)

ICEA S-83-596 Fiber Optic Premises Distribution Cable

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2002) National Electrical Code

UNDERWRITERS LABORATORIES (UL)

UL 50 (1995; Rev thru Nov 1999) Enclosures for Electrical Equipment

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI C62.61 (1993) Gas Tube Surge Arresters on Wire Line Telephone Circuits

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 2239 (1999) Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter

ELECTRONIC INDUSTRIES ALLIANCE (EIA)

ANSI/EIA-455-81A-91 (1992) FOTP-81 Compound Flow (Drip) Test for Filled Fiber Optic Cable

ANSI/EIA/TIA-455-30B (1991) FOTP-30 Frequency Domain Measurement of Multimode Optical Fiber Information Transmission Capacity

ANSI/EIA/TIA-455-53A (1990) FOTP-53 Attenuation by Substitution Measurement for Multimode Graded-Index Optical Fibers or Fiber Assemblies Used in Long Length Communications Systems

ANSI/EIA/TIA-455-B (1998) Test procedures for Fiber Optic Fibers, Cables, Transducers, Sensors, Connector and terminating devices, and other fiber optic components (ANSI)

ANSI/EIA/TIA-455-78A-98 (1990; R 1998) FOTP-78 Spectral Attenuation Cutback Measurement for Single Mode Optical Fibers

ANSI/TIA/EIA-568-B.1 (2001; Addendum 2001) Commercial Building Telecommunications Cabling Standard Part 1 - General Requirements

ANSI/TIA/EIA-568-B.3 (2000; Addendum 2002) Commercial Building Telecommunications Cabling Standard Part 3 - Optical Fiber Cabling Components Standard

ANSI/TIA/EIA-606 Administration Standard for Commercial Telecommunications Infrastructure

ANSI/TIA/EIA-607 (2002) Commercial Building Grounding and Bonding Requirements for Telecommunications

WAARNG Telecommunications Planning Guide Volume 3: OSP Products and Installation

ANSI/EIA/TIA-758 Standard and Addendum	(1999) Customer Owned Outside Plant Telecommunications Cabling
ANSI/EIA/TIA-598-B	(2001) Optical Fiber Cable Color Coding
INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)	
IEEE C2	(2002) National Electrical Safety Code
INSULATED CABLE ENGINEERS ASSOCIATION (ICEA)	
ICEA S-85-625	(1996) Air core, Polyolefin Insulated, Copper Conductor Telecommunications Cable
ICEA S-87-640	(1999) Fiber Optic Outside Plant Communications Cable
NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)	
NFPA 70	(2002) National Electrical Code
U.S. DEPARTMENT OF AGRICULTURE (USDA)	
RUS REA Bull 345-39	(2000) Telephone Section Protectors
RUS 345-50	(2000) Trunk Carrier Systems
RUS 345-65	(2000) Shield Bonding Connectors
RUS 345-72	(2000) Field Splice Closures
RUS REA Bull 345-151	(2000) Conduit and Manhole Construction, REA Form 515c
RUS Bull 1751F-635	(2000) Aerial Plant Construction
RUS Bull 1751F-643	(2000) Underground Plant Design
RUS Bull 1753F-201	Standard for Acceptance Tests and Measurements of Telecommunications Plant
RUS Bull 1753F-302	(2000) Outside Plant Housings and Serving Area Interface Systems
RUS Bull 1753F-401 (PC-2)	(2000) RUS Standard for Splicing Copper and Fiber Optic Cables
RUS IP 344-2	(2000) List of Materials Acceptable for Use on Telecommunications Systems of RUS Borrowers
RUS REA Bull 1751F-641	(2000) Construction of Buried Plant
RUS REA Bull 1753F-201	(2000) Acceptance Tests and Measurements of Telephone Plant
RUS REA Bull 1753F-205	(2000) REA Specification for Filled Telephone Cables
RUS REA Bull 1753F-207	(2000) Terminating (TIP) Cable
RUS REA Bull 1753F-208	(2000) Filled Telephone Cables with Expanded Insulation

\*All non-listed yet applicable and current RUS bulletins and publications must be adhered to.

#### UNDERWRITERS LABORATORIES (UL)

UL 497 (1995; Rev Oct 1999) Protectors for Paired Conductor  
Communication Circuits

UL 50 (1995; Rev thru Nov 1999) Enclosures for Electrical Equipment

### 2. GENERAL REQUIREMENTS:

2.1 Contractor Qualifications: The contractor providing services under this contract must be licensed with the Washington State Department of Labor and Industries (L&I) and must possess an Electrical Telecommunication 09 contractor license.

2.2 Rules: The installation shall conform to the requirements of NEC, NFPA 70 and ANSI C2.

2.3 Verification of Dimensions: The Contractor shall become familiar with details of the work, shall verify dimensions in the field, and shall advise the Contracting Officer of any discrepancy before performing any work.

2.4 Standard Products; Materials and equipment shall be new and the standard products of manufacturers regularly engaged in the manufacture of the products. Items of equipment shall essentially duplicate equipment that has been in satisfactory use for at least 2 years prior to bid opening. The system(s) shall be of the latest electronic designs in current production.

2.5 Cable: All underground cable shall be filled type PE-89 or PE-39 telephone cable. All aerial cable shall be air-core type telephone cable designed for aerial use. Cables entering buildings shall be plenum rating.

2.6 Workmanship: All materials and equipment shall be installed in accordance with recommendations of the NFPA and the manufacturer to conform to the contract documents. Journey telecommunication workman (with a minimum of three years at the journeyman level) skilled in this type of work shall be used to accomplish the installation.

2.7 Installation Requirements: Underground cables shall be installed in or on supporting structures. All work shall be scheduled in accordance with requirements of the Contracting Officer. The Contractor shall coordinate through the Contracting Officer with the local Directorate of Information Management (DOIM) Telecommunications Engineer (253) 512-8917 or others as designated by the WAARNG DOIM.

2.8 Assembly Details: The Contractor shall perform his work in accordance with the assembly details shown on the drawings and attached at the end of this section when available.

### 3. SUBMITTAL:

3.1 Shop Drawings: The Contractor shall submit, for approval, shop drawings for the items listed below and for any other items as directed by the Contracting Officer who will verify. Submittal shall be made in accordance with Contract requirements for providing submittals. Shop drawings shall be submitted for the following items:

- Cable
- Closures and Splice Cases

- Backboards
- Protected/Unprotected Terminals
- Gas Module Protectors
- Manholes
- Handholes
- Duct
- Jacks & outlets internal to the building
- Fiber Optic Distribution Panels
- Jumper management
- Equipment Racks
- Data patch panels

3.2 List of Contractor provided Equipment and Materials: A complete itemized listing of equipment and material proposed for incorporation into the work shall be submitted before installation of any item. Each such itemization shall include an item number, the quantity of items proposed, name of the manufacturer of each such item, and the manufacturer's descriptive and technical literature, catalog cuts, and installation instructions. The Contractor shall update the list at completion of the Contract to show the actual material used, prior to final payment.

3.3 Performance Test Reports: Upon completion and testing of the installed system, comprehensive test reports shall be submitted in a booklet form and on a CD in electronic format and shall show that all field tests confirm compliance with the specified performance criteria and paragraph 11 of this specification. Software to download test result shall be provided.

3.4 Qualifications of Cable Splicer(s): Before assigning any cable splicer(s) to do work, the Contractor shall: provide the Contracting Officer with the name(s) to be employed. Together with satisfactory proof that each splicer has had at least three years experience in splicing telephone cables and is experienced with the type and rating of the cables to be spliced. In addition, must be certified in the specific type of copper/fiber to be spliced. Each splicer may be required to make an approved dummy splice in the presence of the Contracting Officer or Contracting Officer Representative, in accordance with the manufacturer's instructions, before the splicer is approved to splice cable. The Contractor shall furnish all material for dummy splices.

3.5 Acceptance Test Plan: The Contractor shall submit to the Contracting Officer for approval a complete detailed acceptance test plan.

3.6 Cutover Plan: The Contractor shall develop a cutover plan. The cutover plan shall be submitted for the Contracting Officers approval 30 days prior to scheduled start. The cutover plan shall provide detailed procedures and schedules for splicing indicated telephone and network (copper and fiber) cables to the overall facility's telephone and network system without interrupting service to any active cable pairs or circuits.

3.7 Installation and Maintenance Tools: 30 days prior to scheduled start of acceptance tests, the Contractor shall provide to the Contracting Officer a list equipment that appears on the manufacturer's recommended list of installation, test and maintenance tools required for normal installation, electronic testing and servicing tools required to certify the installed equipment including category 6 cable system and shall include a Fluke DTX-1800-MS for the category 6 and fiber systems.. Contractor shall prepare a list of provided items and submit with bid documents. Tier 2 fiber testing must be done with a Fluke tester and results must be viewable with Fluke LinkWare.

3.8 As Built Drawings:  
The Contractor shall annotate three sets of telephone system drawings to show the as-built condition and provide them to the Contracting Officer for delivery of one copy to the Director of Public Works and two copies to the DOIM. This shall include, but not be limited to, all cable types, sizes, counts, composition, splice cases, terminal numbers, measured distances to all splices and terminals along with any other details and sketches necessary for preparation of accurate plant-in-place type record drawings. As-built drawings will include manhole base layout, manhole diagrams (butterfly), building diagrams and communication room layouts (central office included). As-built

WAARNG Telecommunications Planning Guide Volume 3: OSP Products and Installation drawings will show the physical layout of cables inside manholes, buildings and communication rooms (central office included). As-built drawings will identify outside plant cables, inside plant cables and termination equipment in communication room or central office. Multi media outlets will be identified by the outlet labeling sequence identified in this specification. Examples of drawings can be obtained from DOIM. As-built drawings shall be annotated utilizing red and yellow (red for additions and yellow for deletions). Red line drawings to be submitted in electronic format (Auto-CAD or ArcView and PDF) on a CD and are required in addition to "D" size paper copies.

## PART II PRODUCTS

4. MATERIALS AND COMPONENTS: Materials and components shall conform to the following requirements:

4.1 Telephone cable: Solid copper conductors, types as follows.

4.1.1 Aerial: PE-38 Air core self supporting cable

4.1.2 Underground: Filled telephone cable with expanded insulation, type PE-89.

4.2 Fiber Optic cable shall be at minimum, Twenty-four strands or more as specified, single-mode fiber optic cable and will be connected from nearest DOIM RSU building to communication room in each designated building. Fiber shall be one continuous cable without splices unless the designated DOIM representative has granted prior approval for each splice. Indoor/outdoor combination cables shall not be used without specific approval from the DOIM. DOIM approval shall be granted by a request through the contracting officer to the DOIM representative and back through the Contracting Officer.

4.2.1 Interior Fiber optic cable: four strands or greater, single-mode fiber optic cable to be installed to each identified multi media outlet, home run to an ST fiber optic patch panel in a central communication room location, as outlined on the drawings. Internal fiber optic cable shall not be jelly filled.

4.3 Hardware:

All ferrous hardware, screws, and associated miscellaneous items shall be galvanized or cadmium plated to prevent rust and corrosion.

4.4 Termination of wires/fibers:

66 type insulation displacement connecting blocks shall be utilized to terminate voice circuits on the backboard. Category 6, 110 type Patch panels shall be utilized to terminate and facilitate patching of the data portion of the LAN wiring. Fiber optic patch panels utilizing ST type connectors to be used to terminate all fiber optic cable. All fiber optic patch panels and Category 6, 110 type RJ-45 patch panels to be installed in contractor provided 19" equipment racks. Contractor is responsible to provide Racks and equipment sufficient for termination and expansion.

4.5 Miscellaneous material: All miscellaneous material provided shall be current standard models, series, or type regularly advertised as such on the approved list of materials acceptable for use on REA Borrower's System, REA Bulletin.

4.5.1. Manholes: Precast Concrete, Utility Vault Co model number 38Y 612-TCA or equal.

4.5.2 Duct: Plastic conduit, 4" or 5" Schedule 80 suited for underground burial or concrete encasement.

4.5.3. Inner duct: Fabric inner duct (MaxCell or equivalent) designed and manufactured for that purpose with a minimum of 9 individual pathways shall be used in one of every four 4" ducts installed in a duct system. Install 3 pulls of 3 inch 3 cell MaxCell fabric innerduct in one of every four 4" ducts installed to meet the 9 cell requirement. When larger duct sizes are being filled (such

WAARNG Telecommunications Planning Guide Volume 3: OSP Products and Installation as 5" ducts) the maximum recommended innerduct pulls shall be used. In new duct systems at least one shall have a copper trace wire sewn into the innerduct fabric. Proper installation procedures must be observed to prevent the innerduct from twisting and binding during installation. All Fabric innerduct shall be properly terminated according to Manufacturers instructions to prevent the innerduct from being pulled into the conduit during the cable pulling process or twisting and binding. Pulling compound solutions not specifically recommended by the manufacture of the fabric innerduct shall not be used.

Where existing duct system has less than 2 spare inner duct pathways upon completion of this contract, filling a four inch duct with fabric type innerduct is required.

## PART III - INSTALLATION

### 5. MANHOLE/HANDHOLE SYSTEM

5.1 General: the Contractor shall provide and install new Precast telephone manholes and Hand holes as shown on the assembly drawings. Manhole/ Handhole types shown on the assembly drawings have been determined to be the most desirable; however due to subsurface conditions, normal drainage, or other underground conditions, manhole/Handhole shall be approved by the Contracting Officer prior to installation. All new manholes/handholes shall be temporarily numbered for clarity. The Contractor shall acquire the permanent manhole/Handhole number from the Contracting Officer and all drawings shall be annotated showing the assigned number.

5.5.1 Manhole/Handhole Construction: Manholes shall be equipped for double racking. Each manhole shall have pulling irons installed in the wall opposite each duct line entrance. Each manhole shall have a sump with a cast iron grill-type frame and cover. Each manhole/Handhole shall be provided with a ground point. The ground rod hole shall be used and a ground rod shall be installed and cables grounded as specified. Each manhole/Handhole shall be provided with an entrance collar, frame, and cover.

5.1.2 Covers for Manhole/Handhole. Covers will utilize reducing entrance collars, as required, to provide for a contractor furnished and installed thirty (30) inch round Inside diameter manhole cover as described below , and shall be Engraved "**COMMUNICATIONS**" All existing manhole covers, touched as a part of this contract, shall be replaced to comply with the above standard. Locking Security manhole sub-lids (Referred to as dishpans) are required for each manhole and must fit under the standard communication manhole lid without preventing the lid from seating completely. Round clear opening 30"X6" manhole frame, tapered without bolt-down tabs; and shall be East Jordan Iron Works # V-1830-2 or equal. The dishpan to fit the standard manhole ring is LockDown-LockDry Part LD-30 from the Barton Southern Company, 2387 Kinmor Industrial Parkway, Conyers, GA 30012. POC is Mike Wiemann at 1-800-572-3119. More information at [www.LockDown-LockDry.com](http://www.LockDown-LockDry.com)

5.1.3 Manhole/Handhole Placement: In paved areas, the top of the manhole/Handhole covers shall be 1/4" above the finished surface of paving and shall be approved for vehicular loads. In unpaved areas, the top of the manhole/Handhole covers shall be approximately 1/2 inch above the finished grade. Sufficient riser rings shall be installed between the top of the manhole/Handhole and the manhole/Handhole frame to elevate the manhole/Handhole cover to the desired height of the finished grade. Ladder steps shall be installed in the risers of manholes. Manholes/hand holes shall be placed with a minimum of 36-inch cover above the primary manhole structure.

### 6. CONDUIT SYSTEM:

6.1 General: The Contractor shall provide a new underground conduit system as shown on the drawings. The Contractor provided conduit shall be 4" schedule 40 plastic conduit/duct with at least one of the 4" ducts being filled with 9 way MAX-Cell type innerduct. Lengths of each duct run shall be determined from the assembly drawings and field verified before installation. In no case shall the length between manholes exceed 500 feet in length. Additional information on conduit placement and arrangement may be provided. If the number of conduits is not specified in

WAARNG Telecommunications Planning Guide Volume 3: OSP Products and Installation  
the drawings then place 6 four-inch conduits from site to nearest DOIM communication facility. Overbuild all existing duct systems, used by this project with less than two spare four-inch ducts remaining. A minimum of six 4" ducts is required from each building to the nearest manhole.

6.1.1 Conduit Placement: All conduit lines shall be laid to a minimum grade of 2-inches per 100-feet. The grade may be from one manhole or Handhole to the next or both ways from the high point between manholes or hand holes depending on the contour of the finished grade. Grade changes, bends and entrances into manholes/handholes shall be made using components and/or accessories recommended by the manufacturer of the conduit installed. All conduits shall be thoroughly cleaned before using or lying in trench. Particular care shall be taken to keep the conduit clean of dirt, concrete, and any other substance during installation. After the conduit has been installed, a flexible mandrel not less than 12-inches long, with a diameter approximately 1/4-inch less than the inside diameter of the duct shall be pulled through each duct. This is to make certain that no particles of earth, sand or gravel has been left in the duct and that the conduit has not been deformed during installation. Pneumatic Roding may be used to draw in the lead wire/cord. Conduit shall be stored to avoid warping, deterioration or direct rays of the sun. Conduit shall be placed with a minimum 36-inch cover and may be indicated on assembly drawings. Conduit must be installed in the bottom most holes in the manholes or hand holes. Conduit must be installed deep enough as to allow all manhole entrance ports (if used now or in the future) to have conduit future installed and maintain a minimum of 24 inch of cover over the uppermost conduit. Existing conduit runs to be utilized on all projects shall also be thoroughly cleaned of dirt and foreign debris before pulling in new cable and after removing old cable. Any conduit system that will be reduced to less than two vacant ducts must be over-built to allow for a minimum of two vacant restoration ducts/conduits after completion of this project. Conduits must run true between Manholes and will not be transposed. All vacant conduits shall have pull string and duct plugs installed.

6.1.2 Conduit cement encasement: Full strength 3000PSI or better Concrete shall completely encase conduit to protect it from being dug up. Metal ribbon shall be placed above the cap to provide for ease of conduit location. The ribbon must maintain electrical connectivity from the beginning to the end of each conduit job and be patched across the top of each manhole. Identification ribbon must be placed approximately 18" below finished grade and directly above communication duct or cable system.

6.1.3 Conduit Under Road, Streets and Driveways: The Contractor shall encase duct in full strength steel reinforced formed concrete under all drives, streets, roads..

## 7. CABLE SYSTEM

7.1 Cables shall be installed, terminated and spliced as indicated. The Contractor shall complete all splices, furnish all splicing material and associated hardware, tag all cables and stencil cables. Inside terminals and splices in manholes/handholes shall be grounded as specified in grounding requirements. Prior to commencement of construction the Contractor shall coordinate with the WAARNG DOIM through the Contracting Officer on all communications interfacing requirements as stated by this specification.

7.1.1 Testing Existing Cables: Prior to start of this project, the Contractor shall test all pairs in the cable to be spliced into under this project. The Contractor, in accordance with the Contracting Officer, shall prepare a list of the defective cable pairs under form "Cable Status Certificate" attached at the end of this section. This list will be known as the original list. After project is completed, all pairs shall be tested. The Contractor shall clear trouble on any pairs that were not defective on the original list.

7.2 Cable: All telephone cable furnished and installed under this specification shall have the number of insulated twisted pairs of copper conductors as required. Cables shall be specified to include # of pairs and conductor gage and be of filled core with polyethylene sheath and polyethylene insulated conductors.

7.2.1. Color Coding: The cable shall be fully color-coded. The basic industry standard color scheme shall be used to provide different colors of insulation for each pair of a 25 pair group.

7.2.2 Guaranteed Pairs: All pairs in each cable shall be certified as usable.

### 7.3 Splices:

7.3.1 General: Splicing of cable into one continuous length is required. All pairs shall be spliced, including those indicated as dead pairs. Unless otherwise noted. Splicing shall be in accordance with industry standards. The completed splices shall not cause the connected cable to fail to meet the same performance and mechanical specifications of a single similar cable of the same overall length. Single plastic insulated conductors shall be spliced using self-piercing electrical filled connectors, (Scotch locks and bean type connectors shall not be used.) Modular splicing techniques are required and shall be utilized on all mainline splices and splices exceeding 24 pair, using Thomas & Betts/ 3M Wire Mate 710 cutter/presser splice tool and connectors. All underground cable splices shall be watertight and enclosed in a sealed splice case (encapsulating compounds shall not be used). Cable sheaths shall be bonded together at all cable splices with bonding harness to maintain sheath continuity. Splices shall be grounded to the manhole/Handhole ground system. Deviation from the cable splicing arrangements shown on the project drawings will not be allowed except as specifically approved by the Contracting Officer.

7.3.2 Closures: As needed, type to be determined by WAARNG (OSP) Out Side Plant, personnel through the Contracting Officer.

7.3.2.1 Underground: All underground splice cases shall be Preformed stainless steel splice cases or equal and shall be flash tested using nitrogen gas to insure dry and air tight seals. Encapsulating compounds shall not be used. Flash test shall insure that the splice case with cable installed will hold positive pressure for a period of at least 30 minutes at 10 PSI, soaping of case and adjacent cables throughout the duration if the pressure test is required to identify leaks.

7.4 Cable Installation: Cables shall be handled and placed in such a manner as to avoid kinks and other sheath deformities. Minimum bending radius of all cables shall be twenty times the diameter of the cable. Cable that is kinked, rippled or flattened shall not be installed. Lead sleeves and/or duct splices shall not be permitted. Cable lubricant shall be used in the installation of underground cable. The quantity of lubricant used shall be as recommended by the manufacturer. Cable racks and hooks shall be installed in all manholes and used to support cables installed. An access manhole ladder shall be provided for each manhole installed. All outdoor connections shall be weather proof through the use of weather boots or other approved methods. All aerial cable entrances into buildings shall have a drip loop formed in the cable at point of ingress. All building entrance points shall be sealed and waterproof.

7.4.1 Duct Sealant: After cable has been placed, each lateral duct at the building, entrance and exit duct in each manhole / Handhole, and riser shall be sealed with 3M Scotchcast 4416T or equal sealant compound. Unused ducts shall be sealed in each building they enter. Duct seal shall be removable, glue type sealants shall be installed in a way as to prevent permanent adherence to the duct walls.

7.4.2 Cable Tags: Embossed cable tags shall be placed on all underground cables on each side of all splices, including stub cables and branch cables. Each tag shall be stamped or permanently marked to indicate the cable size, gauge, cable number, cable composition and number of first and last pair of each group of consecutive pairs which is in the main cable, stub cable or branch cable to which tag is attached. The number of dead pairs, if any shall also be designated. Fiber cables shall also have the building to and from. Cable identification numbers are assigned by DOIM.

7.4.3 Cable Bonding: Cable in manholes shall be bonded in accordance with Section 9 of this specification.

7.4.4 Cable Guard Protectors: All underground to overhead cable shall have cable guard protectors installed. The guard protectors shall be Cahne No. 6533 or equal.

7.5 Cable Terminal Installation: All cable terminals furnished and installed under this specification shall be complete and will include proper gas or electronic protection modules.

7.5.1 Terminal Number: A terminal number shall be obtained from the Contracting Officer for each terminal shown on the project drawings. The Contractor shall stencil the terminal number on each terminal and shall reline the appropriate drawings.

7.5.2 Cable Protector terminals: shall be EMERSON (FORMALLY MARCONI) R399AAxxx (xxx=Stub length) wire wrap front facing terminals (or DOIM approved equal) for CO/RSU frame mounting and for building demark locations use Emerson (Formally Marconi) BEP CG100CF type Building entrance protected terminals with integral sealed splicing chamber sized appropriately at each building. Match existing terminals and rack or frame types when adding to an existing frame or rack system. Each terminal shall be stenciled to indicate cable number and cable pairs, using black marking on a white designation strip. Frames and wall mounting brackets shall be provided as required to effectively secure the protected terminals. Grounding of each protected terminal with # 6 AWG is required to the nearest ground point. Electronic solid-state or Gas tube protection modules shall be provided to completely fill each protected terminal. Use Emerson (Formally Marconi) R3B1E Gas tube protectors or DOIM approved equal.

7.5.3 Patch panels 110 type RJ-45 category 6 TIA/EIA 568 patch panels shall be provided and installed by the contractor. The DATA LAN cable will be terminated on this panel and will be marked at both the multi media box and the 66 type RJ-45 category 6 patch panels for easy identification.

7.5.4 Bonding: All protected terminals installed shall be bonded to ground and shall exceed manufactures grounding requirements. (See Grounding requirements in Section 9 of this document)

## 7.6 CABLE INSTALLATION STANDARDS

### 7.6.1 Underground Cable:

7.6.1.1 Where existing ducts and conduit are identified for the installation of underground cable; the installation shall be coordinated with the local DOIM. Underground cable shall not be placed in the conduit, Manhole or duct with power wiring.

7.6.1.2 Cable size requirements: the minimum cable size allowed in any primary duct system is 50 pair. Placements of cable of smaller size may be placed in a primary duct system if approved by DOIM and placed in one cell of MaxCell inner-duct.

7.6.2.2 All underground cable shall be carefully pulled into conduit, using sheaves of the proper diameter and shoes or guides at all sharp edges. The cable shall be fed directly from the reel if possible, and shall be continuously inspected, as it is unreeled for physical damage. Cable pulling lubricant as recommended by the cable manufacturer shall be used to prevent exceeding the tensile strength rating of the cable.

7.6.2.3 All fiber optic cables shall have a 20' maintenance loop coiled in each manhole.

7.7 Work Description: The Contractor shall provide all material and labor for the installation and placement of a complete operational underground cable system.

7.7.1 Multi-Mode fiber optic cable shall not be installed without prior consent of the WAARNG DOIM.

7.7.1.1 Contractor is to provide and install (see contract drawings) single mode fiber optic as Specified.

8. General: The Contractor shall furnish and install all cabling and equipment as indicated

WAARNG Telecommunications Planning Guide Volume 3: OSP Products and Installation to provide a complete integrated telephone wiring system. All requirements shall be satisfied by commercially available equipment, which is compatible with and will interface with the existing equipment.

8.1 Instruments: None required unless specifically addressed in bid documents.

## 9. Grounding:

9.1 General: Except where specifically indicated otherwise, all exposed non-current carrying metallic parts of telephone equipment, cable sheaths, cable splices and terminals shall be grounded. All grounding shall be accomplished in such a manner that a maximum of 25 ohms to ground resistance is obtained. When it is necessary to place more than one ground rod to meet this requirement, the minimum separation between rods shall be six feet. Two or more ground rods shall be connected using No. 6 AWG solid copper wire. The connection of the No. 6 AWG solid copper wire to the ground rods shall be made either with compression sleeves or fusion weld connections.

9.1.1 Use of bullet bonds is required on all copper cables for the grounding and bonding of all shielded (armored) cables.

9.2 Terminals: Inside type protected terminals shall be grounded using a NO. 6 AWG insulated solid copper wire. The ground wire shall be continuous from the ground lug, or the grounding strip of the terminal, to driven ground rod or rods as required. When a ground rod (minimum diameter of 5/8 inch and a minimum length of 8 feet) is placed, it shall be a minimum distance of 12 inches from wall of building. It shall be driven to a depth that shall provide a minimum of 6 inches depth of cover between the top of the ground rod and ground level. If two or more rods are required they shall be spaced IAW NFPA 70. The ground wire shall be continuous from the terminal or the driven ground rod and shall be placed in conduit where exposed or attached to supporting surface using either staples or one-hole clamps placed at 18-inch intervals and protected. If a telephone ground busbar is provided it shall be used in place of ground rods if properly connected to ground.

9.3 New buildings installations shall provide a telecommunications main grounding busbar(TMGB) and telecommunications grounding bar(TGB) per. Sizing and installation requirements follow TIA/EIA 607

9.3.1 All telecommunications equipment is grounded directly to busbar.

9.4 Manholes: A Standard bonding ribbon shall be used to ground all installed splices to the manhole grounding system. Bonding ribbon shall be attached, by the contractor, to the upper side of all four manhole walls on 18-inch centers with bonding ribbon clamps where no ribbon exists or in new manholes.

9.4.1 Bonding Ribbon shall be placed, by the contractor, vertically behind existing led sleeves, metallic splice cases of rigid plastic splice closures, behind new metallic splice cases or rigid plastic closures. Where it is necessary to run to another wall contractor shall place ground ribbon vertically to the ceiling and then route to the required location.

9.4.2 A 1/2 inch folded projection shall be placed every 5 1/2 inches in the bonding. All metallic cable sheaths are to be bonded to manhole ribbon. All cable splice cases shall be metallic type and be capable of routing electrical continuity from the cable sheaths through the splice case to ground without the use of internal to external ground wire.

9.4.3 Bonding ribbon clamps shall be attached to walls using 1/4-inch X 1-inch hammer drive anchors.

9.5 Repair of existing work: All work shall be carefully laid out in advance. The Contractor shall be responsible for the repair of any damage resulting from the cutting, channeling and chasing necessary for the proper installation, support, or anchorage of the conduit or raceway, at

## 10. QUALITY CONTROL:

10.1 General: All work shall be in accordance with the following Provisions.

10.2 Installation Inspections:

10.2.1 Pre-operational Inspection: An Inspection shall be made by the Contractor and Contracting Officer of all equipment to be utilized in this project. All equipment shall be verified for proper conformance to the demands and expectations of the installation, as dictated by the specification. All cables shall be inspected for abrasions, breaks and deformities, utilizing those methods stated in the Government-approved acceptance test plan to determine the integrity of the cable. This inspection shall also insure the adequacy of site readiness, availability of installation materials, status of Contractor-Furnished Equipment, as well as leased equipment and transmission facilities, if needed.

10.2.2 In-Progress Inspections: In-progress inspections of the Contractors effort will be as required by the Contracting Officer and or DOIM representative and may encompass visual inspections of equipment condition, wiring, splicing, cabling, mounting and placement of equipment, miscellaneous hardware, system operational status, and adherence to safety procedures.

10.2.3 Final Inspection: The final inspection conducted by the Contracting Officer will encompass all phases of installed equipment. This inspection includes, but is not necessarily limited to, aerial, or underground cable runs and supports, splices, manholes, handholes, terminals, apparatus or miscellaneous equipment and all inside wiring and equipment.

10.3 Corrective Measure: The Contractor shall correct any areas of noncompliance that are revealed by inspection evaluation. Following correction completion, a re-examination of any of all areas of non-conformance may be conducted at the discretion of the Contracting Officer.

## 11. ACCEPTANCE TESTS:

11.1 General: All testing shall be performed in accordance with the Contractor-developed, approved acceptance test plan and as specified herein. Construction of test and inspections utilizing the approved acceptance plan shall demonstrate compliance with all requirements of the specification.

11.1.1 Test Witnessing: All tests shall be performed in the presence of the Contracting Officer or DOIM representative excluding in-progress cable testing. The Contractor shall record all test data, as witnessed by the Contracting Officer and provide a record copy to the Contracting Officer. The Contractor shall notify the Contracting Officer a minimum of seven (3) working days prior to conducting any equipment or acceptance tests.

11.2 Cable Tests: Project integrity shall be ensured through pre-installation cable tests, in-progress tests, and final acceptance test of the cable installed. Requirements for cable integrity, splicing insulation, and loop resistance, as well as provisions for handling materials in such a way as to prevent damage, shall be demonstrated. The Cable Status Certificate shall be used as a documenting log when performing this test.

11.2.1. Pre-Operational: As a minimum, all new cable lengths shall be serviceability tested by the Contractor prior to installation to avoid placing unserviceable cable. Verify the length, continuity and insulation resistance on the reel prior to installation. Ensure the cable is 100% trouble free before installing. (100% free of shorts, crosses, reverses, splits, transpositions, opens,

WAARNG Telecommunications Planning Guide Volume 3: OSP Products and Installation grounds, etc.) The certificate shall be annotated to indicate that the test was conducted on non-connected (dead) cable.

Deleted 11.2.1.1 through 11.2.1.6

11.2.2 In-progress: Cable shall be tested by the Contractor to reveal any faults in cable construction. Such standard tests for correct pair identification and termination shall be performed prior to and during the splicing operation. Correct pair termination constitutes proper continuity verification of the wires being spliced.

11.2.3 Final: A final test of the work performed shall be made by the Contractor in the presence of the Contracting Officer or DOIM representative to demonstrate the acceptability of the project as installed. Testing shall be performed in accordance with REA Bulletin as applicable. Final testing shall consist of, but will not necessarily be limited to the following cable tests:

11.2.3.1 Insulation Resistance

11.2.3.2 Shorts/Crosses

11.2.2.3 Grounds

11.2.3.4 Opens

11.2.3.5 Shield Continuity

11.2.3.6 Loop Resistance

11.2.3.7 Reversed Pairs

11.2.3.8 Split Pairs

11.2.3.9 Continuity Test

## 12. Data Cabling Acceptance Test

12.1 This test is to be performed after complete installation of cable infrastructure and labeling of all distribution panels and station ends. The cable test is performed with one individual at the distribution panel location and a person at each station end (wall jack). The person at the distribution panel will use a cable tester certified for the level of cable being tested (category 6) and the person at the station end plugs in the remote end. The cable tester shall be for category 6 cable and include the parameters of TIA/EIA 568-B.2-1. Summary and detailed test results are to be stored electronically in numerical sequential order, match installed multi media outlets and be a deliverable. The final cable capacity for all cables will be 100% error free.

## 13. Fiber Optic Cable Acceptance Test

13.1 Pre-Operational: Fiber cables shall be tested using an OTDR and shall comply with industry

WAARNG Telecommunications Planning Guide Volume 3: OSP Products and Installation standards. Verify the length and link loss of the fiber strands on reel prior to the installation. Ensure cable is 100% trouble free before installation. Free of opens, micro-bends and within the allotted attenuation loss per foot by TIA/EIA-568-B.1 specifications.

#### 13.2 Final Test (Attenuation Test)

13.3 End-to-end attenuation measurements shall be made on all fibers, in both directions, using a 1310 and 1550 nanometer light source at one end and the optical power meter on the other end to verify that the cable system attenuation requirements are met. The measurement method shall be in accordance with TIA/EIA-526-7.

13.4 Calculate Link attenuation loss (power budget) by the Attenuation Formula in TIA/EIA-568-B.1, Section 11.3.3.4

13.5 Link loss shall be within the parameters of the attenuation formula loss for final acceptance.

13.6 Fiber cable lengths shall be provided with final acceptance test results.

**Part 1 – General Information**

- CAD Standards  
Consultants and Contractor's preparing drawings will be required to utilize the Washington State Military Department CAD Standards dated January 9, 2007.
- Design Information
  1. Fire alarm systems shall be addressable.
  2. The remote annunciator shall be located in the administration area.
  3. Two business telephone lines shall be designed to each fire alarm system.
  4. Camp Murray has a mix of fire alarm systems with telephone dialers to a 24 hour facility and Federal buildings having Monico Radio Transmitters with response from Joint Base Lewis McChord. Preference is via telephone dialer to 24 hour response facility. Designer shall verify requirements with owner prior to start of design.
  5. Fire Alarm Equipment manufacturer's shall be limited to Silent Knight, Siemens and EST. For consideration of other fire alarm equipment manufacturer's designers shall request owner approval.  
Designs shall include Mass Notification System requirements. The Mass Notification system may be designed as stand alone or combined with the fire alarm system. The Mass Notification system shall have multiple pre-recorded messages for the owner to select as well as the ability to add custom messages.

**Part 2 – Product Information**

- Manufacturers  
To be specified by Design Consultant.
- Characteristics  
Products to be UL Listed.