



**FAIRCHILD AFB DESIGN GUIDE**  
**DATA SHEETS**

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**When developing design/construction documents (UFGS specifications, drawings, submittals, etc.) use the following Design Guide data developed by the 92d Civil Engineer Squadron Engineering Flight.**

## **SECTION 033000 – CAST-IN-PLACE CONCRETE**

### **A. GREEN PROCUREMENT PROGRAM**

1. Fairchild Air Force Base has adopted the Green Procurement Program Plan regarding recycling and conserving resources. The Plan requires that some construction materials be composed of a minimum percentage of recycled products. See FAIRCHILD AIR FORCE BASE GUIDE SPECIFICATION Section 016000, Product Requirements, for details.

### **B. AIR CONTENT**

1. Exterior concrete slabs shall have a minimum air content of 6 percent.

### **C. COMPRESSIVE STRENGTH**

1. Exterior concrete slabs shall have a minimum 28 day compressive strength of 4000 psi.

### **D. CURING COMPOUNDS**

1. Except for use on airfield, no liquid curing compounds shall be allowed for Portland Cement Concrete.

### **E. CONCRETE TEMPERATURE**

1. Temperature of fresh concrete shall be maintained between 50 and 90 degrees Fahrenheit. Concrete must be protected from freezing during the curing period.

### **F. HOT WEATHER REQUIREMENTS**

1. The Contractor shall prepare a plan which describes the methods and materials which shall be used to protect concrete under hot weather conditions. See ACI 305R, Hot Weather Concreting, for recommended methods and materials. The Contracting Officer Representative will review and approve (or reject) the proposed plan. In addition to the incorporation of this plan, the Contractor shall:

a. Sprinkle forms and underlying material with water immediately before placing the concrete and the concrete shall be placed at the coolest temperature practicable when hot weather concreting procedures are likely to apply.

b. Cease all placement of concrete when the temperature of the fresh concrete exceeds 90 degrees F.

2. Hot weather conditions shall be assumed to prevail when the surface evaporation rate exceeds 0.15 pounds per square foot per hour as determined by using ACI 305R Figure 2.1.5.

### **G. COLD WEATHER REQUIREMENTS**

1. ACI 306R, Cold Weather Concreting, shall be referenced as a specification.

2. The procedures of Section 1.5 of ACI 306R shall be required and submitted to the Contracting Officer representative. The Contracting Officer Representative will review and approve (or reject) the procedures.

3. Concrete damaged by freezing shall be removed and replaced.

**SECTION 042000 – UNIT MASONRY****A. GREEN PROCUREMENT PROGRAM**

1. Fairchild Air Force Base has adopted the Green Procurement Program Plan regarding recycling and conserving resources. The plan requires that some construction materials be composed of a minimum percentage of recycled products. See FAIRCHILD AIR FORCE BASE GUIDE SPECIFICATION Section 016000, Product Requirements, for details.

**B. GENERAL**

1. Brick and block shall be tested for limited efflorescence.
2. Upon completion UNIT MASONRY walls shall be cleaned and sealed.
3. Brick face and panel systems shall be cleaned at the end of the one year warranty period.

**C. COLOR**

1. Face Brick and Brick Panel System
  - a. Brown Varitone Wire Cut as previously manufactured by Interpace Industries Inc.,
  - b. Imperial Red Mission as previously manufactured by Interpace Industries Inc., or
  - c. As approved by the Base.
2. Concrete UNIT MASONRY Unit
  - a. Color requirement:
    - i. Split faced, normal weight block color to be standard gray color.
    - ii. Paint to match as approved by the Government.
3. Mockup

Provide 4 ft. by 8 ft. sample panels of UNIT MASONRY construction for evaluation and establishing workmanship expectations. Panel shall be used to evaluate subsequent UNIT MASONRY work for the specific project. Panel shall be removed upon direction of the Government.

**SECTION 050000 – METALS****A. GREEN PROCUREMENT PROGRAM**

1. Fairchild Air Force Base has adopted the Green Procurement Program Plan regarding recycling and conserving resources. The Plan requires that some construction materials be composed of a minimum percentage of recycled products. See FAIRCHILD AIR FORCE BASE GUIDE SPECIFICATION Section 016000, Product Requirements, for details.

**B. COLD-FORMED METAL FRAMING**

1. Structural metal studs and joists shall be used for all non-residential construction.
2. All exposed metal framing shall be painted to match adjacent finish.
3. See Section 090000, Paragraph C for non-structural wall requirements.

**C. STEEL DECK**

1. All new steel deck shall be a minimum of 20 gauge.

**D. Metal Roofing**

1. See FAIRCHILD AIR FORCE BASE GUIDE SPECIFICATION Section 07 – Moisture and thermal protection.

**SECTION 060000 – WOOD, PLASTICS, AND COMPOSITES****A. GREEN PROCUREMENT PROGRAM**

1. Fairchild Air Force Base has adopted the Green Procurement Program Plan regarding recycling and conserving resources. The Plan requires that some construction materials be composed of a minimum percentage of recycled products. See FAIRCHILD AIR FORCE BASE GUIDE SPECIFICATION Section 016000, Product Requirements, for details.

**B. COMPLIANCE**

1. Comply with the specified provisions of the Architectural Woodwork Institute AWI P-208, Quality Standards Illustrated as follows:
  2. Wood Casework: AWI Section 400, Premium Grade.
  3. Plastic Laminate Casework: AWI Section 400, Custom Grade.
  4. Wood Paneling: AWI Sections 200 and 500, Premium Grade.
  5. Shop Finishing: AWI Section 1500, Premium Grade.
  6. Installation: AWI Section 1700, Premium Grade.

**SECTION 080000 – OPENINGS****A. DOORS**

1. All facilities that serve the public shall have automatic hardware at entry doors along the accessible route of travel.

2. “Balance” doors (with offset pivot hinges) shall be allowed, but only when such doors are 48" in width or wider.

3. Automatic closure of vehicle doors is preferred over manual closure, to ensure that doors are not left open, and for user convenience. Automatic closure shall be accomplished using buried loop detectors and automatic timers, except at restricted area access entry points. Time interval shall be adjustable. Manual operation of vehicle doors shall still be possible in case of emergency or malfunction. At restricted area access points, provide Automated Entry Control Systems. Coordination and approval must occur with Security Forces prior to procurement of any Automated Entry Control Systems.

4. Hangar doors shall have detectors that disable the heat while the doors are open. Maximum gaps of a few inches are allowable to account for poor fit between door panels. The heating disable function shall be capable of being overridden by the base EMCS system.

5. Exterior roll-up doors shall have a minimum R-value of R-4.75.

B. WINDOWS

1. Window glass shall be of high quality, performance glazing with dark bronze tint.

2. Window frames shall be anodized aluminum with dark bronze finish, or to match adjacent. Direction will be given by CE.

3. Window systems shall have a maximum U-factor of 0.30.

C. DOOR HARDWARE

1. When developing specifications for this section, use the Fairchild Base Design Guide sectional information developed by the 92d Civil Engineer Squadron Engineering Flight.

D. TRANSLUCENT WALL AND ROOF ASSEMBLIES

1. Exterior face sheet shall be crystal in color.

2. Interior face sheet shall be white in color.

## SECTION 087100 – DOOR HARDWARE

A. IN-HOUSE AND CORPS OF ENGINEER PROJECTS

1. Locksets, Latchsets, and Deadbolts

a. The designer shall write the specifications to include the following:

i. Locksets, latchsets and deadlocks shall be heavy duty weight. To the maximum extent possible, all locksets, latchsets and deadlocks shall be from the same manufacturer, and of matching style, finish, color, etc. All key operated locks shall be compatible with the Best Lock Corporation "BEST" interchangeable cores."

ii. The keying schedule shall be developed by the designer and be included in either the project specifications or project drawings.

2. Lock cores shall be specified as follows:

a. For Base Contracted Projects:

i. The contractor shall provide seven pin "BEST" "TB" keyway cores (no substitutes) keyed to the Base Best Grandmaster Key controlled system. Final "pinned" cores and keys shall be purchased from "BEST" by the contractor and shipped to the base locksmith so that they are received prior to Substantial Completion. The base will install the final cores and return the construction cores to the manufacturer.

b. For Corps of Engineers (CoE) Contracted Projects:

i. Construction cores shall be provided by the contractor and delivered to the government prior Substantial Completion. The keying schedule shall still be prepared by the designer and included in the either the specifications or drawings, however, it will be annotated with a note that says "Final cores to be provided by the contractor".

3. Door hardware. For guidance see FAIRCHILD AIR FORCE BASE GUIDE SPECIFICATION Section 087100 Guidelines, Attachment 1.

## **SECTION 090000 – FINISHES**

### **A. DESIGN GUIDES**

1. All interior and exterior finishes are in various AMC Design Guides and the Fairchild AFB Architectural Compatibility Plan. Copies of these documents can be checked out by hand receipt from the Engineering Flight, 92 CES/CEN.

### **B. GREEN PROCUREMENT PROGRAM**

1. Fairchild Air Force Base has adopted the AF Sustainable Procurement Program regarding procurement of items that use recycled materials and conserve resources. The program requires that some construction materials be composed of a minimum percentage of recycled products. See FAIRCHILD AIR FORCE BASE GUIDE SPECIFICATION Section 016000, *Product Requirements*, for details.

### **C. NON-STRUCTURAL METAL FRAMING**

1. Metal studs shall be used for all non-residential construction.
2. All exposed metal framing shall be painted to match adjacent finish.
3. See FAIRCHILD AIR FORCE BASE GUIDE SPECIFICATION Section 05, Section 05000 for load bearing wall requirements.

### **D. CERAMIC TILE**

1. When developing specifications for this section, use the Fairchild Base Design Guide sectional information developed by the 92d Civil Engineer Squadron Engineering Flight.

### **E. CARPET**

1. When developing specifications for this section, use the Fairchild Base Design Guide sectional information developed by the 92d Civil Engineer Squadron Engineering Flight.
2. For projects which are solely for carpet replacement, refer to the current Installation Facilities Standards (IFS) to obtain information on USAF Carpet Program, and the Mandatory Source Selection Contract AFCA (10 August 2018).

### **F. SUSPENDED CEILINGS**

1. Ceiling grid shall be 2' x 2' accepting tiles with "tangular" type reveal edges. Drop-out ceilings (foam-grid panels) are not permitted. Ceiling grids shall be seismically braced per the current International building Code.

### **G. EXTERIOR PAINTING**

1. Applies to all base facilities including commercial/industrial buildings, flightline facilities, and administration complexes.
2. Follow AMC Design Guides and the Base Architectural Compatibility Plan.
3. Specific Guidance
  - a. Exterior colors shall match:
    - i. Walls: "FAFB Cool Sierra Tan" #CR-133-10 (Sherwin-Williams' color: "Sierra Tan" #SW8258).
    - ii. Doors and Frames: Sherwin-Williams' color: "Spanish Moss" #SW2070.
    - iii. Roof Panels: AEP Span – Dura Tech 5000 finish color "Cool Weathered Copper" (SRI 34).

- iv. Wall Panels: Citadel Architectural Products – Kynar 500 metal finish color: “Bone White”.
- v. Paint codes for Sherwin-Williams “Spanish Moss” and “FAFB Cool Sierra Tan” are provided below.
- vi.

EXTERIOR		ARCHITECTURAL							
SUPER PAINT		LATEX							
SATIN		IFC 8112NP							
<b>2070 SPANISH MOSS</b>									
SHER-COLOR FORMULA									
CCE*COLORANT	0Z	32	64	128					
W1-White	-	38	-	1					
B1-Black	4	60	1	1					
R2-Maroon	-	24	-	-					
Y3-Deep gold	4	4	1	-					
<b>ONE GALLON</b>		ULTRADEEP							
A89T00154		640392379							
<b>EXTERIOR</b>		<b>ARCHITECTURAL</b>							
<b>SUPER PAINT</b>		<b>LATEX</b>							
<b>SATIN</b>		<b>IFC 8112NP</b>							
<b>2070 SPANISH MOSS</b>									
SHER-COLOR FORMULA									
CCE*COLORANT	0Z	32	64	128					
W1-White	4	63	-	1					
B1-Black	28	47	1	1					
R2-Maroon	2	56	-	-					
Y3-Deep gold	20	22	1	-					
<b>FIVE GALLON</b>		ULTRADEEP							
A89T00154		640392387							

EXTERIOR		ARCHITECTURAL							
SUPER PAINT		LATEX							
SATIN		IFC 8112N							
<b>CR-133-10 FAFB COOL SIERRA TAN</b>									
CUSTOM MANUAL MATCH									
CCE*COLORANT	0Z	32	64	128					
W1-White	2	19	1	1					
B1-Black	4	53	1	-					
R2-Maroon	-	4	-	-					
Y3-Deep gold	-	9	-	1					
G2-New Green	-	2	-	-					
<b>ONE GALLON</b>		ULTRADEEP							
A89W00153		640392346							
<b>EXTERIOR</b>		<b>ARCHITECTURAL</b>							
<b>SUPER PAINT</b>		<b>LATEX</b>							
<b>SATIN</b>		<b>IFC 8112NP</b>							
<b>CR-133-10 FAFB COOL SIERRA TAN</b>									
CUSTOM MANUAL MATCH									
CCE*COLORANT	0Z	32	64	128					
W1-White	12	34	1	1					
B1-Black	28	11	1	-					
R2-Maroon	-	20	-	-					
Y3-Deep gold	-	46	-	1					
G2-New Green	-	10	-	-					
<b>FIVE GALLON</b>		ULTRADEEP							
A89W00153		640392353							

- b. Metal roofing shall match AEP Span – Dura Tech 5000 metal finish color “Cool Weathered Copper”; gutters, fascia and trim shall match “Spanish Moss”.
- c. Downspouts shall be “open-face” type with both exterior and interior surfaces (exposed to view) colored to match adjacent facility surface color.
- d. Personnel doors, all door trim and window trim shall be “Spanish Moss” or painted to match the body of the facility, as approved by the Contracting Officer. Roll-up doors shall match the

- building body color if building is painted, and shall match "Spanish Moss" if building is mostly brick.
- e. Bollards shall be "Spanish Moss" with 4" white reflective (Scotchlite or approved equal) band with its top edge 4" below top of bollard.
  - f. Exterior paint type (latex, acrylic, etc.) and paint finish (flat, semi-gloss, gloss) shall be determined by the Design Guides and approved by the government.
  - g. The use of markings, symbols, or signs on buildings is prohibited unless they are part of the approved building paint scheme. No super graphics are authorized on and in facilities.
  - h. Miscellaneous.
    - i. Exterior HVAC and electrical equipment, ducts, pipes, and architectural features on or near facilities shall be made "invisible" by painting them to match the adjacent facility surface color. If not near the facility (as determined by the Government), items shall be painted "Spanish Moss". Landscaping shall also be used when appropriate to reduce visibility of these items.
    - ii. Exterior handrails for administrative facilities shall be brushed aluminum or dark bronze anodized aluminum, and shall not be painted steel. Handrails in industrial areas shall be steel, painted "Spanish Moss."
    - iii. All trash dumpsters are to be painted "Spanish Moss." Utility cabinets, HVAC equipment, trash dumpsters shall be screened in accordance with the Architectural Compatibility Plan.

#### H. INTERIOR PAINTING

1. Compatibility: Interior design compatibility at Fairchild AFB shall be a cohesive approach to coordination of interior materials, construction details, finish colors and furnishings.
2. Color: Follow AMC Design Guides and the Architectural Compatibility Plan.
  - a. For interior "cool" white match: Sherwin-Williams "Sleek White" #SW1018
  - b. For interior "warm" white match: Sherwin-Williams "FAFB Off White" #CR-2546-07
3. Specify Class 5 drywall finish for all walls with semi-gloss paint, Class 4 drywall finish for other paints.
4. Specify special sealer for all gypsum wallboard composed of recycled products.
5. All exposed surfaces, including (but not limited to) ductwork, conduit, grilles, diffusers, piping (sprinkler, water service, drainage, etc.), and equipment (access panels, etc.) shall be painted to match color, texture and finish of adjacent surfaces, unless factory finish is suitable (as determined by Government) or specific exceptions are called out in the specifications. Fire alarm devices are not to be painted. All conduit related to fire protection shall be "red", and prefinished from the factory. Field painting is prohibited.
6. Painted CMU is not acceptable as an interior finish except inside utility rooms, such as storage, mechanical, electrical, communications, etc.

### SECTION 093010 – CERAMIC, QUARRY, AND GLASS TILING

#### A. PURPOSE

1. Provide technical and functional/aesthetic criteria for the selection, installation, and maintenance of ceramic tile. Ceramic tiles include glazed, unglazed, porcelain, quarry, mosaics and pavers. These standards do not apply to other hard surface products such as stone, resin, conglomerates, etc.

#### B. GLOSSARY OF TERMS

1. Breaking Strength – In order to determine the strength and durability of ceramic tile, a standard test method (ASTM C648) is used to evaluate the tile. A force is applied to an unsupported portion of the tile specimen until breakage occurs. The ultimate breaking strength is then recorded in pounds. The ANSI standard requires an average breaking strength of 250 lbs for floor tile.
2. Ceramic Mosaic Tile – Tile formed by either the dust-pressed or plastic method, usually  $\frac{1}{4}$  to  $\frac{3}{8}$  inch thick, having a facial area of less than six square inches. May be of either porcelain or natural clay composition and they may be either plain or with an abrasive mixture throughout.
3. Coefficient of Friction – This is a term used in physics to describe the amount of force required to cause an object to start moving across a surface. Tiles are tested for coefficient of friction in accordance with ASTM C-1028. A quantitative value can be determined to generally express the relative degree of slip resistance. A higher coefficient indicates increased resistance. Although there is no current ANSI requirement, a minimum coefficient of friction of 0.50 (wet and dry) is the recognized industry standard for a slip-resistant flooring surface. The Occupational Safety and Health Administration (OSHA) also recommends this same standard for walking surfaces. The Americans with Disabilities Act (ADA) recommends a minimum coefficient of friction of 0.60 (wet and dry) for accessible routes and 0.80 for ramps.
4. Durability Classification (Abrasion Resistance) – Glazed ceramic and porcelain tile normally carry a durability class rating. Although there are no official industry standards, most manufacturers give their tile a rating number from I to IV+, according to the results of the Porcelain Enamel Institute (PEI) abrasion test. The Porcelain Enamel Institute rating is not a measurement of quality. It is a scale that clearly indicates the areas of use each manufacturer recommends and has designed their tile to fit.

Rating	Traffic	Recommended Applications
Class I	No Foot Traffic	interior residential and commercial wall
Class II	Light Traffic	interior residential and commercial wall; residential bathroom floor
Class III	Light/Moderate	residential floor and wall
Class IV	Moderate/ Heavy Traffic	residential, medium commercial and light institutional floor and wall
Class IV+	Heavy/Extra Heavy Traffic	residential, commercial and institutional floor and wall; subjected to heavy/extrah heavy traffic

5. Glazed Tile – Tile with fused impervious facial finish composed of ceramic material, fused to the body of the tile that may be non-vitreous, semi-vitreous, vitreous or impervious.
6. Paver Tile – Glazed or unglazed porcelain or natural clay tile formed by the dust-pressed method having a facial area of six square inches or more.
7. Porcelain Tile – A ceramic mosaic or paver tile that is generally made by the dust-pressed method of composition resulting in a tile that is dense, impervious and fine grained.
8. Quarry Tile – Glazed or unglazed tile, made by the extrusion process from natural clay or shale usually having a facial area of six square inches.
9. Scratch Hardness (MOH's Hardness) – The relative hardness of glazed tile is an important issue that should be addressed when selecting tile. Scratch resistance of glazes is measured by scratching the surface of the tile with different minerals and assigning a "MOH's Scale Hardness" number to the glaze, the softest mineral used is talc (a rating of 1) and the hardest is a diamond (a rating of 10 if no scratch). Most glazes used on ceramic tile fall in the five to six range, which is also slightly harder than most steels. Case-hardened steel, such as what is used in drill bits, is

approximately six and will scratch most glazes. Quartz, number 7 on the MOH's scale, will scratch most glazes (sand is a common example of natural quartz).

10. Tile – A ceramic surfacing unit, usually relatively thin in relationship to facial area, made from clay or a mixture of clay and other ceramic materials, called the body of the tile, having either a glazed or unglazed face and fired above red heat in the course of manufacturing to a temperature sufficiently high to produce specific physical properties and characteristics.
11. Unglazed Tile – A hard, dense tile of uniform composition throughout, deriving color and texture from the materials of which the body is made.
12. Water Absorption – ASTM C-373 is the test method for classifying ceramic tile by the percent of its water absorption. Individual tiles are weighed, saturated with water, and then weighed again. The percent difference between the two conditions is referred to as the water absorption. Although this test is used to evaluate water absorption of glazed and unglazed product, it can also be a good indicator to predict the stain resistance of the unglazed tiles. Generally for unglazed tiles, the lower the water absorption, the greater the stain resistance.
  - a. Impervious - Tiles exhibiting 0.5% or less
  - b. Vitreous - Tiles exhibiting more than 0.5% but not more than 3.0%
  - c. Semi-Vitreous - Tiles exhibiting more than 3.0% but not more than 7.0%
  - d. Non-Vitreous - Tiles exhibiting more than 7.0%

#### C. LOCATION

1. Tile is appropriate for all areas which may be subject to high foot traffic, wetness, and require the need for increased durability, e.g., dining facilities, kitchens, break rooms, restrooms, entry lobbies, floors and or walls, etc.

#### D. SELECTION

1. Technical criteria: Select tile based on the performance criteria appropriate for the functional use of the space. There are five properties of ceramic tile to consider: Coefficient of Friction, Durability Classification or PEI, Scratch Hardness, Breaking Strength and Water Absorption. Select tiles with the following properties:
  - a. Coefficient of Friction: Floor tile shall have a minimum coefficient of friction of 0.60 (wet and dry) or higher in accordance with ASTM C-1028. Standing water and other contaminants create slippery conditions for any hard surface floor material. Floor applications with exposure to these conditions require extra caution in the tile selection. Use abrasive grains or raised textured tile for greater traction in areas with the possibility of standing water or grease build up.
  - b. Durability Classification: Floor tile shall be Class IV—Heavy Traffic, durability classification as rated by the manufacturer when tested in accordance with ASTM C-1027 for abrasion resistance as related to foot traffic. Class III can be considered for residential installations.
  - c. Scratch Hardness: Glazed floor tile shall have a scratch hardness of 6.0 or higher. Do not use glazed tile in areas of high abuse where possible tile breakage may occur. Avoid high gloss or polished tiles for areas with high traffic; use only as accents in floor patterns.
  - d. Breaking Strength: Tile shall be impact resistant with a minimum breaking strength of 250 lbs in accordance with ASTM C-648.
  - e. Water absorption: Use only vitreous or impervious tile for most applications in accordance with ASTM C-373.
2. Functional/Aesthetic Criteria: Some products work better in certain functional areas than others. The pattern, texture, and color or combination of colors will greatly influence the overall appearance of tile. Consider the amount of cleaning and maintenance required when selecting particular tiles and grouts.

- a. Slip resistance: This is a major factor in the selection of tiles for kitchens and entrance lobbies. There are numerous products that have slip-resisting features for lobbies. Unglazed quarry tile works best for commercial kitchen floor installations. Because of the possibility of water and grease spillage, unglazed tile must be sealed in kitchens.
- b. Color: Recommend tile with through-color, that is, color the entire thickness of the tile body. Avoid solid color tiles unless they are designed into a pattern. Avoid light-colored quarry tile in commercial kitchens. Colors and patterns shall be approved by the Government.
- c. Texture: Tiles with a textured surface and an interesting variation of colors will tend to show less surface soiling.
- d. Grout: Select medium to dark pigmented grouts. Light grouts tend to change color and trap soil over a period of time. Minimize the visibility of grout by using larger-sized tile.
- e. Base: Use a matching tile base in commercial kitchens and other areas subject to excessive water. In other locations, wood or vinyl base may be appropriate. Ensure that there is an aesthetical transition between tile/wood bases and vinyl bases as you progress from one area to another.

## E. INSTALLATION

- 1. Tile: Install tile in accordance with the appropriate ANSI A108/ANSI A118/136-1999 Specifications for the Installation of Ceramic Tile as per manufacturer's instructions.
  - a. Provide transition strips wherever the tile meets another floor material to avoid damage to the tile edges and ensure that there are no accessibility issues.
  - b. Provide trim tile like bull nose at wall edge transitions.
  - c. Mockup: Provide 4 ft. by 8 ft. sample panels of tile construction (floor and wall) for evaluation and establishing workmanship expectations. Panels shall be used for evaluation of subsequent tile work for the specific project. Panels shall be removed upon direction of the Government.
- 2. Grout: Ceramic tile grout shall be prepared and installed in accordance with ANSI A108.10. Follow grout manufacturer's recommendations as to grouting procedures and precautions.
  - a. Take special care, especially when grouting with dark pigmented colors, to clean all of the grout from the tile during installation. A grout release is recommended to prevent finely powdered pigments from lodging in the pores of the tile surface. Epoxy grouts are recommended for kitchens, showers and rest rooms.
- 3. Sealant: Some tiles and grouts do not require sealant, but others require multiple coats of sealant at the time of installation. Do not apply sealant to glazed tile, but unglazed tile must be sealed.
  - a. Apply sealant to the tile and grout in accordance with manufacturer's instructions. Perform acceptance tests per manufacturer's recommendations before accepting the completed installation. Some sealants may also require reapplication several times a year. Application of silicone sealer may be required for maximum protection.
  - b. Obtain the tile manufacturer's guidelines for recommended cleaning agents. Ensure that the occupant receives the care information in the form of an Operations & Maintenance Manual. Include information regarding requirements for reapplication of sealants.

## F. CARE AND MAINTENANCE

- 1. Clean and maintain floor tile according to the manufacturer's recommendations without being excessive. Obtain specific information on the product used from the tile distributor, contractor or installer. Provide Operations Engineering Service Contracts Element (92 CES/CEO) with appropriate cleaning and care instructions so this information can be incorporated into base custodial contracts.

2. Cleaning: Establish a regular schedule for routine cleaning of tile floors to remove day-to-day dust and other “normal” accumulations (food crumbs, boot and shoe marks, etc.). This includes (but is not limited to) sweeping, dusting, light vacuuming and washing.
  - a. Identify and remove stains and spillage immediately. Under normal situations, most tile can be easily cleaned using clear water with a manufacturer’s recommended tile cleaner. Always follow up with a rinse of clean water.
  - b. Do not use undiluted bleach or harsh/abrasive cleaning agents as they can scratch the surface of the tile or degrade the finish surface of either tile or grout. Do not combine ammonia with any bleach as this creates a toxic substance.
  - c. Tile with coarse or abrasive type surfaces requires more frequent performance of cleaning and/or maintenance. More vigorous agitation with more frequent changes of water is necessary.
3. Maintenance: Maintain the tile on a regular and frequent basis to prevent buildup of soil, grease, residue, soap, detergents, sealers, dampness, liquids, etc., which may reduce the static coefficient of friction, and reduce the aesthetic appearance of the tile.
  - a. Do not apply waxes or floor polish to ceramic tile floors unless specifically recommended by the manufacturer. Wax cleaner, oil-based detergents and sealants may decrease the slip resistance of ceramic tile. They also have the tendency to attract and trap dirt when not completely removed during the cleaning process.
  - b. In cases where waxing is recommended, ensure that old wax is stripped according to manufacturer’s recommendations before new wax is applied.
  - c. Follow manufacturer’s directions when buffing is recommended as a maintenance procedure. Do not buff excessively, or use coarse buffering pads, as this may cause a permanent burn to the surface of the tiles.
  - d. Use protective padding to prevent damage when moving any heavy equipment or sharp-edged items over the tile (e.g., moving furniture into a building, bringing in carts of musical instruments for a performance at a club, etc.). This is especially important when tile is used as stair treads.

## **SECTION 100000 – SPECIALTIES**

### **A. GREEN PROCUREMENT PROGRAM**

1. Fairchild Air Force Base has adopted the AF Sustainable Procurement Program regarding procurement of items that use recycled materials and conserve resources. The program requires that some construction materials be composed of a minimum percentage of recycled products. See FAIRCHILD AIR FORCE BASE GUIDE SPECIFICATION Section 016000, *Product Requirements*, for details.

### **B. SIGNAGE**

1. When developing specifications for this section, use the Fairchild Base Design Guide sectional information developed by the 92d Civil Engineer Squadron Engineering Flight.

### **C. PAPER TOWEL AND TOILET PAPER DISPENSERS**

1. In restrooms, all paper towel and toilet paper dispenser cabinet locks shall be tool operated. Keyed locks shall not be permitted.
2. Any restroom design shall require locating, furnishing, and installing backing for the specific dispensers needed by the Government’s custodial contract, but shall not be installed by the Government’s Custodial Contractor. Dispensers shall meet the paper product and soap specifications outlined below.

- a. Toilet Tissue Dispensers shall be a high-capacity standard 3-roll type and come complete with a tamper-resistant lock. If a role is used, simply turn the dial to advance to the next role. Where limited space is an issue, the use of a standard 2-role side-by-side type dispenser is acceptable, where one role is covered, while one is in use. Toilet tissue paper product specifications: 3.25 inch x 4 inch double ply, 865 sheets per role.
- b. Hand Towel Dispensers shall be a high-capacity design and come complete with a tamper-resistant lock. The dispenser shall require the user to only touch the paper product reducing cross-contamination and shall cut the rolled paper product in pre-measured 11-inch lengths. Dispenser shall hold 1 high-capacity role. Hand towel paper product specifications: 8-inch roll, 800 feet per roll. Multi-fold towels & dispensers are no longer used on the installation.
- c. Hand Soap Dispensers shall be a high-capacity cartridge style. Dispenser shall accept a 1 liter replaceable cartridges and come complete with a tamper-resistant lock. The use of refillable liquid containers is no longer supported on the installation.

## SECTION 101400 – SIGNAGE

### A. OVERVIEW

1. When developing specifications for signage, use [UFC 3-120-01, Design: Sign Standards](#) as amended/clarified by this data sheet.
2. Hierarchy:
  - a. This data sheet. This data sheet incorporates standards set forth in [AMC Exterior Sign Standards](#) and [AMC Services Signage Policy Supplement](#).
  - b. [UFC 3-120-01, Design: Sign Standards](#).
3. Design proposals for all signs (other than the types mentioned in this data sheet) shall be submitted to Base Civil Engineer's Architectural Compatibility Review Board (ACRB) for approval prior to implementation. Allow a minimum of 30 days in the design process for ACRB review.

### B. REFERENCES

1. [AMC Exterior Sign Standards](#)
2. [AMC Services Signage Policy Supplement](#)
3. [ASTM D4956, Standard Specification for Retroreflective Sheeting for Traffic Control](#),  
<http://www.astm.org/Standards/D4956.htm>
4. [Fairchild Air Force Base Installation Facilities Standards](#)
5. [Manual on Uniform Traffic Control Devices \(MUTCD\)](#), Federal Highway Administration  
<http://mutcd.fhwa.dot.gov/>
6. [UFC 3-120-01, Design: Sign Standards](#)  
[http://www.wbdg.org/ccb/DOD/UFC/ufc\\_3\\_120\\_01.pdf](http://www.wbdg.org/ccb/DOD/UFC/ufc_3_120_01.pdf)

### C. TYPOGRAPHY, GRAPHICS, AND SIGN PLACEMENT

#### 1. Graphics

- a. For exterior signs, where a shield or emblem is referenced, use the AMC shield for units under AMC. Tenant units, such as AETC, JPRA, DRMO, ANG, and Army, may use their respective shield or emblems. When using adhesive backed stickers for these shields or emblems, trim to the outline of the shield or emblem only.

### D. THE AMERICANS WITH DISABILITIES ACT

**1. Parking Stalls**

- a. All parking lot striping shall be white. Do not provide handicapped symbols or wording to the parking surface of parking stalls.
- b. Handicapped parking access aisles will be striped white by diagonal stripes.

**E. EXTERIOR IDENTIFICATION SIGNS****1. Military Identification Signs:**

- a. **Military (Building) Identification Sign**
  - i. All building identification signs shall be free standing.
  - ii. Signs shall be Charleston Industries, Inc., Architectural Signage Systems, Series 325 Post and Panel System, Standard Design.
  - iii. Signs will be double-faced and oriented perpendicular to the roadway to permit reading by traffic moving in both directions.
  - iv. Provide full street address below the unit name.
  - v. Provide address lettering heights equal to the name of the organization.
  - vi. Sign colors shall be white letters on “National Park Service Brown” background. Background, sign back, and post color shall match.
  - vii. Posts shall be 2-1/2" x 3-1/4" with 3' buried in a 12" diameter by 3'-6" deep concrete footing.
  - viii. Existing SERE School building identification signs are installed on brick bases. All future signs shall match main base (installed on posts).
- b. **Building Number Sign Type**
  - i. Only show the building number without displaying “Building Number” wordage.
  - ii. Locate sign on side elevation at approximately 5'-4" above ground. Adjust the placement of the sign to fit within the brick or block coursing where possible. Use only one sign per building.
  - iii. Sign colors shall be white letters on “National Park Service Brown” Pantone, PMS469c color background.

**2. Community Identification Signs:**

- a. Use Military (Building) Identification Sign when identifying community facilities as opposed to the Community Facilities Signs.
- b. **Facilities with Services Activities (per AMC Services Signage Policy Supplement):**
  - i. Facilities that house more than one Services activity will have all collocated activities listed on the exterior sign.
  - ii. Illuminated entrance signage is limited to one exterior illuminated sign per facility, located at or near the main entrance to the facility/operation.
  - iii. Entrance door signage is limited to facility name and hours of operation.
- c. ACRB approval is required for all community and services activity identification signs.

**F. DIRECTION SIGNS**

1. Do not attach additional signs, such as the “H” for “Hospital” or “Tree City USA” to posts supporting another sign.
2. Direction Signs

- a. Sign colors shall be white letters, arrows, rules and borders (reflectivity mandatory) on "National Park Service Brown" background.
3. Street Name Sign
  - a. Provide one street name sign (for each street) at each street intersection.
  - b. Sign locations shall be consistent with other intersections in area and installed above traffic control signs. Mount both street name signs on single post.
  - c. Sign panel material shall be aluminum with a minimum thickness of 0.100".
  - d. All street name signs are to include a 4" AMC shield to the left of the street name.
  - e. Sign colors and materials shall be as specified in the MUTCD.
4. Direction Signs Type
  - a. Vehicular directional and way finding signs shall be as detailed in the MUTCD.
  - b. Pedestrian directional signs shall follow UFC 3-120-01.

## G. REGULATORY SIGNS

1. Traffic Control Signs
  - a. Traffic control sign face layout and colors shall be in accordance with the *MUTCD*.
  - b. Sign back and post color shall be painted to match Sherwin Williams SW #2070 "Spanish Moss."
  - c. Reflective sheeting shall be warranted to meet or exceed *MUTCD Table 2A-3 Minimum Maintained Retro-reflectivity Levels* for ten years. Black is non-reflective.
  - d. If *MUTCD* sign size is inconsistent with other signs of the same type on base, obtain ACRB approval.
  - e. Sign panel material shall be aluminum with minimum thickness:

Horizontal width less than 20"	0.063"
Horizontal width between 20" and 36" inclusive	0.080"
Horizontal width over 36"	0.125"
- Notes:
  - 1 - The side dimension for a diamond shaped warning sign is considered to be the maximum horizontal dimension.
  - 2 - Freestanding signs on the flightline (within the controlled area) shall be 0.100" minimum thickness.
- f. Either non-perforated 2-1/2" square or 2-3/8" outside diameter round metal posts may be used. Round posts require special mounting brackets to maintain orientation of sign panels, bolting through round post is not permitted.
2. Handicapped Parking Signs:
  - a. Handicapped Parking Signs shall be freestanding unless approved by the Architectural Compatibility Review Board (ACRB).
  - b. Use Parking Regulation Sign for designation of handicapped parking stalls.
  - c. Do not display any "Fines" wordage or panels to handicapped signs.
  - d. Sign face colors shall be white symbol, letters, and border on "National Park Service Brown" background.

- e. Sign back and post color shall be painted to match Sherwin Williams SW #2070 "Spanish Moss."
  - f. For van accessible spaces, provide the same, but substitute the wording "Van Accessible" for "Reserved Parking."
  - g. Signs shall be pole mounted. Use the clear height of 5'-0" to the bottom of the panel unless safety dictates use of the 7'-0" height. When handicapped parking spaces are adjacent to reserved parking spaces, install handicapped parking signs at same height as reserved parking signs.
  - h. Handicapped parking sign posts shall be non-perforated 2" square metal tubing.
3. Reserved Parking Signs:
- a. Reserved Parking Signs shall be freestanding unless approved by the ACRB.
  - b. Curb markings shall not be used.
  - c. Use Parking Regulation Sign for designation of reserved parking stalls.
  - d. Sign face colors shall be white letters and border on "National Park Service Brown" background.
  - e. Sign back and post color shall be painted to match Sherwin Williams SW #2070 "Spanish Moss."
  - f. Signs shall be pole mounted. Curb markings shall not be used.
  - g. Reserved parking sign posts shall be non-perforated 2" square metal tubing.
  - h. The following reserved parking locations are authorized:
    - i. Squadron-level facilities may have one reserved parking sign for each of the following positions: Squadron Commander, Deputy (Ops Officer), First Sergeant, and Chief Master Sergeants.
    - ii. Wing Commander: Reserved parking signs for the wing commander are authorized at Wing Headquarters, Command Post, Fitness Center, Officer/Enlisted Club, Commissary, and Base Exchange.
    - iii. Limited customer service or visitor spaces and government-owned vehicle spaces are authorized: Number and location(s) shall be approved by the ACRB.
    - iv. Honor Guard: One spot at the Shoppette and one spot at the Base Exchange.
    - v. Car-Pool: Use requires approval by the ACRB.

#### H. MOTIVATION SIGNS

- 1. Exterior signs displaying unit emblems, mottoes, or personal names are not permitted.
- 2. Use of motivation signs shall be approved by the ACRB.

#### I. WALL MOUNTED SIGNS

- 1. Use of wall mounted signs is discouraged.
- 2. Except for the Building Number Sign or required hazard placards, use of wall mounted signs shall be approved by the ACRB.

#### J. SPECIFICATIONS AND DETAILS

- 1. Submit shop drawing of each sign and post/base for approval by 92 CES/CENM prior to manufacture.
- 2. Do not mix metals. For example, use aluminum bolts with aluminum stock.
- 3. Assembly bolts and brackets shall match the surface color where attached.

4. Exterior Signs shall be designed for nighttime visibility.
  - a. All sign background, legend, symbol, and border colors shall be retroreflective except for black which shall be opaque.
  - b. Reflective sheeting shall meet ASTM D4956 Type I.
5. For exterior signs not specified elsewhere in this data sheet, the minimum aluminum panel thickness shall be 0.063".
6. Sign Posts/Bases:
  - a. Use concrete footings.
  - b. The use of wood posts is not permitted.
  - c. Steel posts, when used, shall be galvanized.
  - d. Posts shall not be perforated.

## SECTION 110000 – EQUIPMENT

### A. PERMITTING REQUIREMENTS

1. Refer to Section A.3, *Environmental*, to determine permitting requirements for equipment that includes, but is not limited to: paint booths, sawdust collectors, bag houses, and cyclones.

### B. Equipment Installation requirements

1. All equipment mounting brackets shall be secure using finish screws that are color-coded to match the mounting brackets.
2. Any damage to the walls and ceilings during installation of any equipment shall be professionally repaired to match the same texture and color of the surrounding area. Damaged ceiling tiles shall be replaced with matching tiles.
3. Interior conduit shall be run inside walls, above ceilings or in crawl spaces/basement areas. Cable/wires run in ceilings that are used for return air plenums shall be run in rigid conduit or are "plenum-rated". Flush mounted cut in boxes shall be used for all new power/data points. Surface mounted conduit and boxes are prohibited except in utility rooms.
4. All power cords and data lines shall exit walls and ceilings at a point as close to the equipment as possible. All data lines shall enter walls in boxes with color coded faceplates that match the type originally installed in the facility.
5. No conduit, wires, cable, etc. are allowed to be attached to the exterior walls or roofs of buildings except in extreme circumstances. Building penetrations shall be below grade whenever possible. If it is not possible to enter buildings below grade, conduit shall enter the building as close to grade as practical. All exposed exterior conduit shall be painted to match the exterior of the facility.
6. All equipment installations that require supporting electrical work or other facility modifications must be approved by 92CES on an AF Form 332 PRIOR to purchasing the equipment. A drawing/sketch shall be attached to the AF Form 332 that shows the location of all equipment that is proposed to be installed and depicts the location of any new electrical or communication requirements. All electrical work that is provided as part of the equipment installation shall conform to the National Electrical Code.
7. Any equipment installation requiring penetration of fire walls shall be protected with a material or system of the same hourly rating that is listed by UL, FM, or a NRTL.

**SECTION 140000 – CONVEYING EQUIPMENT****A. ELEVATORS**

1. Specifications shall require contractors installing elevators to include a 1-year service and maintenance agreement included in the construction contract for all new elevators. (This is in addition to the standard, one-year construction warranty).

**SECTION 210000 – FIRE SUPPRESSION****A. GENERAL DESIGN REQUIREMENTS**

1. Design for all new construction and major projects shall comply with, but not limited to:
  - a. UFC 3-600-01, *Fire Protection Engineering for Facilities*
  - b. All applicable Tri-Service Fire Protection Engineering Working Group (TSFPEWG) Guides
  - c. All Applicable NFPA standards, except where modified by UFC 3-600-01
  - d. All applicable Fairchild specific requirements
  - e. **The Designer shall confirm that this guidance has not been superseded by any subsequent DoD directives.**
2. Entire facility has automatic fire detection and/or sprinkler fire suppression system.

**B. KITCHEN EQUIPMENT**

1. All suppression systems used for the protection of commercial cooking operations shall be wet chemical systems IAW NFPA 17A and shall be designed as “overlapping” type.

**C. WET-PIPE SYSTEMS**

1. An electronic water flow switch (vane paddle type) shall be installed for the purpose of indicating a fire condition and be adjustable to delay the signal to the fire alarm panel up to at least one minute.
2. Water flow pressure switches and retard switches are not required.

**D. DRY-PIPE SYSTEMS**

1. The air system side shall be maintained by an Air Pump: Supervisor Air Panel, Model F112, UL Listed 892A, the pump being a Vacuum-Pressure, Model # 400-1901, manufactured by Barnat Co., Berrington, IL 60010, or equal.

**E. PREACTION SYSTEMS**

1. The chamber, valves and assembly shall be a Gem Multimatic, Model A-4; a Grinnell Duomatic, or approved equivalent.
2. No water flow pressure switches or retard switches on the system.

**F. FIRE HYDRANTS**

1. Fire hydrants shall be Dry barrel and suitable for winter conditions. 5 inch Storz adapters must be attached to the largest diameter opening of all new fire hydrant installations.
2. Fire hydrants shall be identified by color, based upon NFPA 291.

**G. KEYS**

1. All fire equipment cabinets on Fairchild AFB shall be keyed alike.

**H. MISCELLANEOUS REQUIREMENTS**

1. The Inspectors Test Valve, if not located with riser, must not be hidden and remain accessible to maintenance personnel.
2. All fire sprinkler systems shall have a PIV shut off valve.
3. All hydraulic and general information placards will be metal and information shall be permanently stamped
4. Fire suppression systems shall have an external electric bell to indicate water flow by the fire riser room.
5. All tamper switch arms on OS&Y valve stems shall be in the grove of the valve stem for proper alignment.
6. All rooms containing Fire Suppression equipment shall be labeled at the door.

## **SECTION 220000 – PLUMBING, GENERAL PURPOSE**

### **A. BACKFLOW PREVENTION**

1. Backflow assemblies are required at the water service entrance to buildings. Internal backflow assemblies are required at boiler make-up connections and any other location where the source of potential contamination through cross-connections is present. Specify the appropriate level of protection for the level of hazard.
2. All backflow prevention assemblies shall be manufactured by Febco or Wilkins and shall, at time of installation, reside on the current publication of Washington State Department of Health – Division of Environmental Health – Office of Drinking Water's Publication 331-137, *Backflow Prevention Assemblies Approved for Installation in Washington State*.

### **B. CATHODIC PROTECTION**

1. See FAIRCHILD AIR FORCE BASE DESIGN GUIDE Section 264200 for cathodic protection Requirements.

### **C. WELDING**

1. See FAIRCHILD AIR FORCE BASE GUIDE SPECIFICATION Section 013520, Paragraph B.2 for welding requirements.

### **D. PIPING**

1. Do not specify grooved pipe and fittings for domestic water systems.
2. If copper piping is specified on hot or cold domestic water lines, Type L copper piping shall be used.
3. Isolation valves shall be provided for each domestic water line serving, or returning from, each bathroom in a facility and each individual dormitory style rooms; or the lines serving, or returning from, a common bathroom/kitchen in dormitory style housing.
4. Domestic water line isolation valves 2" and under shall be full port ball valves.

### **E. WATERLESS URINALS**

1. When specifying waterless urinals, require cartridge-less models. Basis of design shall be wall-hung, vitreous china, manufactured by ZeroFlush Inc. or approved equal.

### **F. AUTOMATED FLUSH VALVES**

1. Hard wired automatic flush valves shall be installed on all urinals and water closets in restrooms in customer service, administrative and other high-use public areas. Flush valves shall be SLOAN 186-1-ES-S Optima Flush Valve for urinals", SLOAN Model 111-ES-S Optima Flush Valve for water closets, or equal. Connect the number of flush valves to transformer per

manufacturer's recommendations (typically up to 10 flush valves). Chrome finish is required on all installed automatic flush valves. No battery operated automatic flush valves shall be used.

#### G. AUTOMATED FAUCETS

1. Hard wired automatic faucets shall be installed on all sinks in restrooms in customer service, administrative and other high-use public areas. The required finish for all faucets is chrome. No battery operated automatic faucets shall be used.

#### H. SHOWER MIXING VALVES

1. All shower mixing valves shall have stops.

#### I. PRESSURE WATER COOLERS

1. Pressure water coolers shall be wall-mounted type, complete with a bottle filler. The bubbler shall be located on the cabinet deck, and shall have an adjustable stream regulator. The control for the bubbler shall be a front push-button. The bottle filler shall have touchless control. The unit shall have a minimum 3000 gallon filtration system, complete with an LED Visual Filter Monitor to indicate when filter replacement is required. The unit shall also have a "Green Ticker" displaying the count of plastic bottles saved from waste.

#### J. CLEANOUTS

1. Install sanitary sewer cleanouts on each urinal, water closet and lavatory during new construction and when renovation work involves plumbing. All other cleanouts as required by UPC.

#### K. SEWER LINE MAINTENANCE AND INSPECTION

1. Clean all sanitary sewer laterals from the construction areas to the sanitary sewer main after all remodels and new construction involving installation of or repairs to sanitary sewer lines and connected appliances. Provide video recordings of the laterals showing condition of the laterals after cleaning. Lines shown not fully clean shall be re-cleaned. Damaged or incorrectly installed lines and connections shall be repaired. Re-accomplish the video recording after re-cleaning or additional repairs are completed.

#### L. LEAD CONTENT IN DRINKING WATER PLUMBING:

1. To comply with amended Section 42 USC 300g-6 of the Safe Drinking Water Act, the allowable lead content of potable water pipes, plumbing fittings, and fixtures shall be no greater than 0.25 percent. Faucets and other end-use devices must meet ANSI-NSF Standard.

#### M. FLOOR DRAINS

1. All restrooms shall have a minimum of one (1) floor drain.

### **SECTION 230000 – HEATING, VENTILATING, AND AIR CONDITIONING**

#### A. SECTIONAL INFORMATION

1. Mechanical fire protection features for air handling, heating, ventilation, and exhaust systems must comply with the requirements of NFPA 90A, except as modified by UFC 3-600-01.

#### B. ENERGY MANAGEMENT AND CONTROL SYSTEM

1. Provide mechanical systems with electronic direct digital control (DDC) by interfacing with the existing Fairchild AFB central Energy Management and Control System (EMCS). See FAIRCHILD AIR FORCE BASE GUIDE SPECIFICATION Section 230900.

#### C. LOAD PROFILE

1. Designs shall include a 24-hour heat/cooling load profile for the facility together with a profile of energy consumption requirements. Energy consumption requirements shall include annual

energy and annual energy per square foot for space heating, space cooling, domestic hot water, and process loads.

#### D. LIFE CYCLE COST ANALYSIS

1. For new construction and major renovation where a large portion of HVAC equipment is being replaced, equipment shall be analyzed for life cycle cost effectiveness, as applicable but not limited to the following: ground source heat pumps, water source heat pumps on a hydronic loop, hydronic boilers, variable speed drives on pumps and fans, demand based ventilation, infrared radiant heat, evaporative heat with and without heat exchange, dedicated outdoor air systems, and heat recovery units.

#### E. NATURAL GAS

1. Natural gas is supplied by Avista Utilities under firm regulated rate schedules. Base gas lines are owned and maintained by Avista Utilities and Honeywell Corp. All natural gas line distribution work must be coordinated through the respective system owner. The on-base distribution system operates at 55 psig. The system is a combination of steel and polyethylene lines buried at a depth of approximately 30 inches. It is recommended that any connections to the steel lines be investigated to check for corrosion prior to final design or any construction. Future major additions to the system shall be sized and planned to provide a natural gas grid system for the base.

#### F. METERS

1. Provide meters (when determined cost effective by 92 CEN) for water, irrigation, natural gas, and power; and ensure compatibility and connection with the base EMCS. See FAIRCHILD AIR FORCE BASE GUIDE SPECIFICATION Section 230900, FAIRCHILD AIR FORCE BASE DESIGN GUIDE SPECIFICATION Section's 262713 and 330000.

#### G. HEATING SYSTEMS

1. Heat Sources: Fairchild AFB currently uses a combination of gas fired steam boilers, hot water boilers, unit heaters, and radiant heat located in each facility. All new facility and heating system renovation projects shall evaluate natural gas fired hydronic boilers, gas-fired infrared radiant heaters, ground source heat pumps, and/or water source heat pumps on a hydronic loop (as appropriate) based on lowest life cycle cost analysis. **Gas fired stand-alone, or gas fired instantaneous and/or solar domestic hot water is preferred over electric.** Where boilers are used, maximize the burner turndown ratio as allowed by minimum life cycle cost. For new heating system projects, there shall be a full system design, which utilizes high-efficiency boilers.
2. Boiler Piping: Heating hot water set points shall be capable of being reset based on outside air temperature. Exterior and underground piping may not be of PVC, or have glued joints.
3. Gas-fired infrared radiant heaters shall have ten (10) foot tube lengths with couplings to allow for ease of replacement. The first ten foot section attached at the burner shall be made of stainless steel.
4. Direct-fired gas units shall not be acceptable.
5. Steam boilers shall not be acceptable.

#### H. COOLING SYSTEMS

1. Air-cooled chillers, and air-cooled condensing units shall be considered (as a minimum and as appropriate) on the basis of lowest life cycle cost analysis. **Only Trane chillers shall be used. There will be no substitutions.**
2. For chillers that utilize a flow switch for proving chill water flow, do not employ Variable Frequency Drives (VFD) on the chill water pumps. If a designer would like to propose another control method, which may include VFDs, then that method must be detailed in the chillers sequence of operation portion of the design documents for Fairchild AFB's evaluation and approval.

3. Evaporative cooling, cooling towers, and variable refrigerant systems shall not be approved cooling systems. Chilled water cooling and DX cooling shall be acceptable.
4. All new equipment shall employ HFC refrigerants - Class II ODS refrigerants are not acceptable.
5. Chiller Piping: Exterior and underground piping may not be of PVC, or have glued joints.

#### I. MECHANICAL SYSTEM SITING AND ROOM LAYOUT

1. All mechanical equipment shall be sited within the mechanical room or on-grade outside the facility - rooftop installations are not acceptable. When located outside, pad-mounted heat exchangers and compressors shall be screened in accordance with the Fairchild AFB *Architectural Compatibility Plan* and Division 32, Section 320000, Paragraph D. Equipment located outside shall have an enclosure with at least one 120V, 20 amp duplex electrical outlet mounted on/near the equipment.
2. Mechanical rooms shall be designed to provide maintenance personnel the space necessary to service the installed equipment and perform major system overhauls efficiently. Maintenance platforms shall be provided as necessary.
3. A source of clean water shall be available in the mechanical room. A connection, hose bib fitting with cap and lanyard, to the domestic water line is preferred.
4. Free space shall be provided to allow easy removal of fan shafts from air handling units, tube bundles from steam converters, changing of air filters, and other large items without removal of another system component.
5. For hydronic systems, removal of a component of equipment shall not require the removal of other equipment items or more than two fittings.
6. Do not mount electrical disconnects, VFDs, or similar devices where they will impede access to equipment. This includes mounting devices directly to the equipment when that location will impede access.
7. VFDs shall be installed at eye level in mechanical rooms. If distance to the mechanical room, available space in the mechanical room, or building type/design prevent the specified installation then the contractor must walk/talk a government representative through the proposed installation locations, and receive that representative's approval prior to installation.
8. All mechanical equipment (not floor mounted) shall be accessible by stairs, platforms, or catwalks with a staging area to allow for maintenance, repair, and replacement of the largest component. In instances where access via stairs, platforms, or catwalks is not reasonably achievable, then access via a lift will need to be maintained; this includes taking into account the placement of the equipment in relation to other existing systems (e.g. fire suppression, lighting, etc.). Unless specifically stated in the SOW, it will be the expectation of Fairchild AFB that the use of stairs, platforms, or catwalks is reasonably achievable and desired.
9. Pumps shall be less than 4 feet off the ground and accessible for maintenance/replacement.
10. Floor slab for mechanical rooms shall have minimum slope of 1% and be provided with appropriate floor drainage connected to the sanitary sewer system. Provide housekeeping pads for pumps, boilers and floor mounted electrical equipment. Pads for other mechanical room equipment will be evaluated on a case by case basis.
11. All thermometers and other gauges shall be mounted to provide unobstructed view of dial face.
12. Condensate overflows and pressure relief piping shall be installed full-size from the point of equipment connection with minimal piping and elbows and routed to within two (2) inches of the floor and directed to allow any flows to dispose properly without creating excess liquid ponding.
13. Glycol system overflows and pressure reliefs shall be piped back to the glycol feed tank. If the new design or existing system does not include a glycol feed tank then overflows and pressure reliefs shall be piped to a suitable container that is accessible for emptying its contents.

14. A copy of the mechanical and HVAC schematics shall be provided in booklet form and placed in the mechanical room.
15. All conduit and/or piping shall be fed to equipment from overhead.
16. The ventilation for HVAC systems serving conference rooms, training rooms and other spaces with variable occupancy shall be controlled using dual technology occupancy sensors.

#### J. DISTRIBUTION SYSTEM

1. Do not specify grooved pipe and fittings for heating and cooling systems.
2. Provide full port ball valves for isolation. All hydronic piping lines leaving the mechanical room, as well as any main line branches, shall have isolation valves installed – isolation valves shall be located in the mechanical room where possible. ALL equipment to isolate it for maintenance/repair, except expansion tanks.
3. Propylene glycol (30 percent) shall be used over nitrates for heating and cooling systems; except for dry-cool systems, which shall be 40% propylene glycol. Glycol shall be DOWFROST HD Heat Transfer Fluid – Dyed.
4. Diaphragm type expansion tanks are preferred over the bladder or compression type expansion tanks.
5. Spiro-vent air/dirt separators with flanged cleanout are preferred.
6. Bell and Gossett pumps are preferred.
7. Provide reheat coils on all VAVs. Do not specify fan-powered VAVs. Reheat coils shall have a minimum of 2 rows.
8. Provide water softeners on the water supply for all humidifiers.
9. All air handling units shall be installed inside in a mechanical room. All ductwork shall be inside the facility. Packaged units with air handling included shall not be specified or installed.
10. Provide sealed bearings for all fractional horsepower motors.
11. Compare systems using variable flow through coils at constant temperature via variable speed drives to systems with variable temperature at constant flow. Specify the system with the lowest life cycle cost. If flow control valves are used to balance a variable flow system, specify manual balancing valves.
12. Do not specify equipment that requires special software to operate, maintain, or troubleshoot. Do not install equipment that requires a separate connection to the Fairchild network
13. Boilers and chillers shall be monitored and enabled by EMCS but shall be controlled by the individual equipment package controls. Equipment alarm inputs to the EMCS controller and supply temperature resets from the EMCS system controller will be utilized to the greatest extent possible.
14. Special consideration shall be given to ease of service of distributed equipment, where possible, filters shall be of a commonly available size for ease of replacement. Filters and other routine service items shall be located in the most accessible locations. Mezzanine floor access is preferred over locations above ceilings, and locations above ceilings in hallways are preferred over locations inside individual or group office areas. At least 4 feet of free space shall be adjacent to any side of equipment that requires access for maintenance.
15. For air handlers with bearings that require greasing, grease fittings shall be extended with copper tube back to the access panel/door if the fittings are not within an arm's length of the access panel/door.
16. For VAV systems, a three way valve at the end of each loop and two way valves for the other VAV boxes are preferred over a three way valve at each VAV box.

17. For glycol filled systems that employ a glycol makeup tank, do not include a connection to makeup water and do not include a bypass feeder.
18. For hydronic systems a filtration system shall be employed – located upstream of the system's pumps unless otherwise dictated by the filtration system manufacturer.
19. All mechanical openings shall follow the shutoff damper and associated ductwork insulation requirements of the IECC (section C403) and the WSEC (section C403), regardless of equipment process (manufacturing, industrial, commercial).

#### K. REFRIGERANTS

1. The Contractor shall reclaim refrigerants and return them to the government.

#### L. TESTING

1. Provide for testing, adjusting, and balancing of air and water systems. The work shall be performed by an independent testing and balancing agency other than the mechanical contractor. The testing and balancing agency shall be a subcontractor directly to the general contractor.
2. Provide for commissioning/acceptance testing of all building systems. Commissioning/acceptance testing shall be done by an independent, certified testing agency subcontracted directly to the general contractor. The testing agency shall have a minimum of five years of experience conducting acceptance procedure testing of mechanical systems or in the commissioning of buildings.

#### M. OPERATIONS AND MAINTENANCE MANUALS

1. Operations and maintenance manuals shall be furnished for all mechanical systems (as part of the overall O&M manual requirement.)

#### N. TRAINING

1. Training and instruction will include adjustment, operation, and maintenance, including pertinent safety requirements of the equipment and systems specified. Orient the training specifically to the system installed. For EMCS, a minimum of 4 hours of on-site training for up to 12 HVAC/Controls personnel is required. In addition, a minimum of 8 hours training for EMCS operators and controls technicians will be provided. Instructors shall be thoroughly familiar with the subject matter they are to teach. Training manuals shall be provided which describe in detail the data included in each training program. The manuals shall also include an agenda and defined objectives for each lesson. At a minimum, the training manuals shall include a mechanical systems diagram and control system schematic. Training and manuals shall be provided no later than 10 days prior to the scheduled training. Training presentations will be mandatory. Unplanned, impromptu sessions do not constitute an acceptable training program.

### SECTION 230900 – INSTRUMENTATION AND CONTROL FOR HVAC

#### A. ENERGY MANAGEMENT AND CONTROL SYSTEM (EMCS)

##### 1. General

- a. Sequences of operations guidance shall be provided and are required on all systems.
- b. All installations shall communicate with the central EMCS office and be stand-alone operable for all programmed functions in the case of communications loss with the central computer. Override control of functions shall be possible from the central EMCS computer center. Communications shall therefore include alarm reporting, override control when necessary, and the capability of gathering trending summaries on system points.
- c. EMCS shall use native BACnet architecture as referenced by the latest version of ANSI/ASHRAE Standard 135. The communication between application controllers shall be BACnet MS/TP.

- d. Provide EMCS control of all systems on the basis of distributed controls using intelligent direct digital controllers (DDC). The existing approved EMCS is the Alerton System.
  - e. The contractor shall return all removed/demolished electronic HVAC controls to the government.
  - f. All fans, including exhaust fans, shall be integrated into the single point EMCS shelter-in-place shutdown switch located in the main fire department control room. When the switch is activated, all fans affecting occupied areas shall be shutdown. This includes fan powered VAV boxes. Essentially, if it has a fan and moves air, then it shall shutdown when the shelter-in-place switch is activated
2. Facility Environmental System Control
- a. Facility environmental system control shall be accomplished via the EMCS installation programming and hardware. Do not specify a traditional pneumatic control system installation with an additional requirement for EMCS interface. Controls shall be electronic; sequences shall be executed by the EMCS DDC equipment using electric motor operated actuators. Pneumatic actuators may be specified based upon application requirements or economic justification with 92 Civil Engineer Squadron Engineering Flight approval.
3. Set points
- a. Specifications shall require that all set points and similar control parameters be capable of being changed or altered from the EMCS central computer to facilitate troubleshooting. Do not install set point values in permanent memory that require a site visit by maintenance personnel for alteration.
4. Graphics
- a. All graphics shall display real time readings. Web based access using Internet Explorer from any computer located on the Fairchild CE VLAN is required.
  - b. Provide a graphic that shows the floor plan of the building. The floor plan graphic shall be the home page for each building and shall display the temperature and set point for each control zone. There shall be a link to the appropriate equipment page from each temperature/set point display on the floor plan. There shall also be a link to all other mechanical equipment graphics from the home page. There shall be a link from all graphics back to the home page. The home page will have a link to the EMCS home page. The outside air temperature shall be displayed on the building home page.
  - c. VAV graphics will have a link to the AHU that supplies air to the VAV. Provide a VAV status page that displays all VAV temperatures, set points, flow set points, flow, discharge air temperature, and re-heat valve position. Each VAV page shall link to the VAV status page. The VAV status page shall also have links to each VAV page.
  - d. Provide graphics that shows a quick view of selected equipment for the entire EMCS system. Provide a separate graphic for AHU status, hot water pumps status, hot water supply temps, chilled water pumps status, chilled water supply temps, domestic hot water pumps status, domestic hot water temps, freeze stats status, flood alarm sensors status, Honeywell owned boiler alarms status, Honeywell owned boilers steam pressure and Fairchild owned boiler alarms status. Animators can be used but are not required. A simple status indication is acceptable. The quick view status pages shall be linked to the EMCS home page and there shall be links between all of the quick view status pages.
  - e. All mechanical equipment graphics will show an accurate representation of the equipment and will have real time readings of all hardware points and set points. Equipment actuators will show the position in a 0-100% format and may also show the actual analog output value. The actuator spring range and normal default position will also be annotated. EMCS operators shall have the ability to change set points and schedules and over-ride all hardware points from the graphical interface.

- f. All point trends shall be accessible through links on the page that is displaying that value.
5. Required Specifications
- a. The following specifications for EMCS equipment shall be employed for all designs.
  - b. All new controls shall be the Alerton system. The existing Fairchild AFB Energy Management Control System is used to monitor, schedule, alarm (routed to all workstations and via paging system), program, and trouble-shoot over 120 buildings. An existing server-client network supports technicians in the field for this work.
  - c. Communications over the Fairchild AFB metropolitan area network using a T1 connection at 1.5 Mbps up to and including 100 Mbps shall be required. Twisted-Pair 10Base-T cabling systems shall be supported. Field access to area controllers and application specific controllers using existing laptops shall be required; to include full access to the entire installed programming.
  - d. The Network Communications Module that provides Ethernet connectivity for the Global Level Controller must be a dedicated device, specifically manufactured for that purpose. A category 5 rated Ethernet compatible network cable shall be run from the installed building networking equipment to the EMCS DDC Global Controller. The cable shall be terminated and plugged into the equipment at both ends. Materials and installation provided by Division 27.
  - e. Existing Server-Client-Paging System: The EMCS shall fully and seamlessly support the existing EMCS System Server and Operator Workstation software that is residing on the Fairchild Server-Client-paging Network. EMCS Systems requiring additional operator's terminals, gateways, or routers shall not be acceptable.
  - f. The EMCS shall be able to send automated alpha-numeric alarm pages from a single paging unit located in the telephone switch room next to the EMCS office in building 2451. The system shall have the ability to send a single alarm message to multiple pagers using the Fairchild paging system and/or email paging protocols.
  - g. System I/O Points: The EMCS operators shall be able to read/write to all points and programming in the area and applications specific equipment remotely from the system server in the EMCS office. The EMCS operators shall have the ability to access, modify all program/point parameters, and install the modified programs in the controllers.
6. Field Hardware
- a. Outside Air Temperature (OAT) sensors: OAT sensors shall be installed with a sun shade. Mount the sensor in the shade on the north wall of the building, approximately 10 feet above the ground level. These sensors are to be sensing actual outside air, not air inside the entrance of a section of ductwork.
  - b. Current Transducers (CT): All status inputs on motors shall be through adjustable CTs. Do not install Differential Pressure sensors for status inputs. CTs on belt driven fans shall have the ability to recognize a broken belt as an off condition.
  - c. Variable Frequency Drives (VFD): Install VFDs with BACnet interface cards in lieu of mechanical vanes. The interface cards will communicate on the MS/TP communication trunk at a minimum of 38.4 kbs. Fairchild prefers ABB variable frequency drives.
  - d. Meters: Meters are required at for all utility system renovations exceeding \$200K, new MILCON, major renovation, Energy Conservation Investment Program projects, and Energy Saving Performance Contract projects. EMCS controls contractor shall provide meters to insure compatibility. Totalizing capability shall reside at the meter for electric meters or at the metering controller for gas and water meters so that consumption is tracked even if connectivity to EMCS is lost. Electric meters will have a BACnet communication interface and will be installed as a BACnet controller on the MS/TP loop. Fairchild prefers Veris power meters with a BACnet interface board.

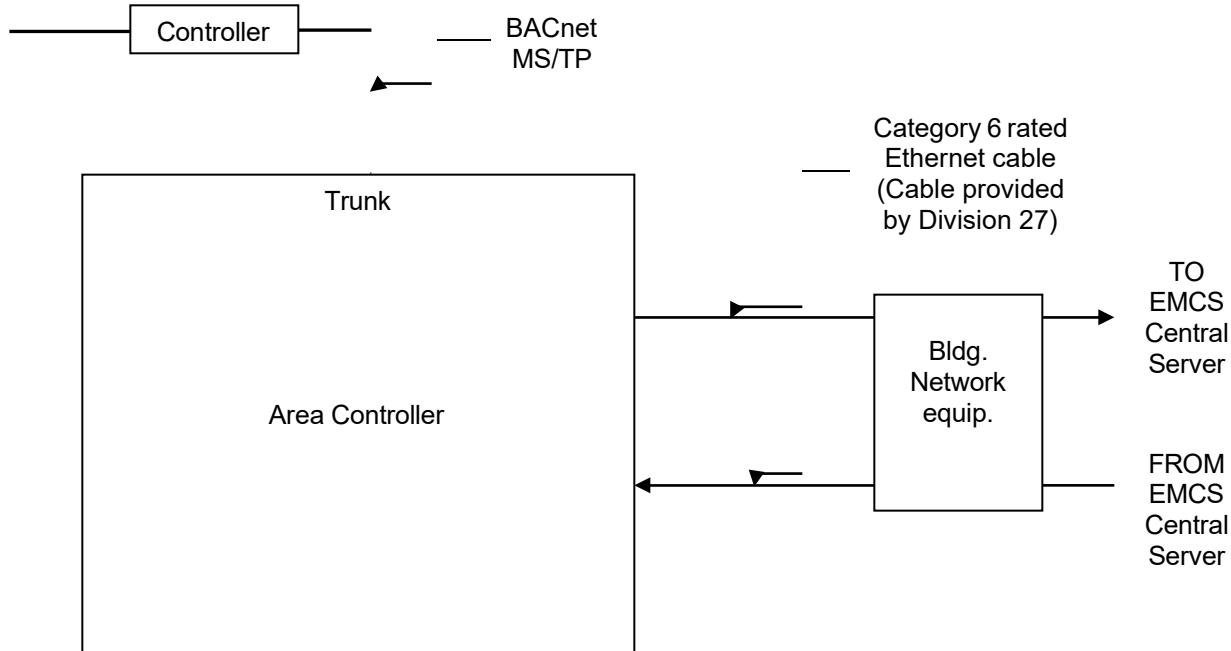
- e. Freezestats are required on air handling units with heating coils and outside air sources. Freezestats shall be hard wired to shutdown fan motors and have alarm inputs to EMCS.
  - f. Emergency air distribution shutoff buttons are required in all facilities to shut down the air distribution and exhaust systems throughout the building and close all dampers leading to the outside. The button(s) shall be wired as an input to an EMCS DDC controller. The EMCS system will shut down all fans (air handlers, exhaust, heaters, VAV fans, etc.) affecting occupied areas when the push button(s) are activated. The button(s) will be push-pull type with a cover and labeled. The buttons shall be mounted in a common area accessible to all personnel. A single button is acceptable to shut down all equipment. Multiple buttons can be used if needed due to the layout of the building.
  - g. Provide a status input from the building fire alarm panel. HVAC equipment supplying air to occupied areas will be shut down when the fire alarm panel is in alarm.
  - h. Air quality sensors are preferred for ventilation control in vehicle bays.
  - i. VAV Wall Sensors: Wall sensors shall have occupant set point control ability for possible future use. Zone temperature set points shall be set in software. Wall sensors shall have an override button to place the system in occupied mode.
  - j. VAV's will have discharge air sensors installed.
  - k. System actuators will be 2-10 VDC analog. This includes VAV dampers and reheat valves. Floating point actuators shall not be used.
  - l. Variable flow systems shall have flow measurement of total actual flow through the system, corresponding to temperature measurement so as to facilitate energy balances as a diagnostic tool. For example, VAV systems shall have flow measurement at the air handling unit discharge and corresponding to discharge temperature measured, as well as at the VAV boxes; and hydronic systems with variable speed drives shall have flow measurement corresponding to system supply or system return temperature measurements.
  - m. Boilers shall operate on their own manufacturer installed controls. Boilers shall have the ability to receive a remote enable command and analog input signal to reset the boiler controller hot water set point from the building EMCS DDC controller. Boilers shall have an alarm point that is sent to the DDC controller. These signals shall be hard wired to the DDC controller.
  - n. Chillers shall operate on their own manufacturer installed controls. Chillers shall have the ability to receive a remote enable command and analog input signal to reset the chiller controller chilled water set point from the building EMCS DDC controller. Chillers shall have an alarm point that is sent to the DDC controller. These signals shall be hard wired to the DDC controller. All new chillers will be Trane.
7. Submittals
- a. Coordinate with Fairchild AFB 92 Civil Engineer Squadron Engineering Flight (CENM) during design process.
  - b. As-built and Operations and Maintenance (O&M) Manual information must be available to the EMCS shop through the Contracting Officer at final acceptance. This stage is crucial to the orderly opening of a new facility.
8. O&M Manual Minimum Content Requirements for EMCS
- a. Flow charts of control sequences shall be provided as a part of the O&M submittal. Each point shall be indexed to show association with the control sequences.
  - b. As-built drawings shall show controller location, terminal numbers in the EMCS controller, and any equipment such as motor starters, air conditioning compressors, etc.
  - c. Catalog cuts included in the O&M Manual shall be marked with indicating arrows to show the specific installed item.

- d. Service and calibration information for all installed equipment.
  - e. A detailed contents and format instruction for O&M Manuals is available on request.
  - f. Commissioning report to include verification that all inputs and outputs operate and read accurately on a laptop at the building controller.
  - g. Provide valve and actuator schedules with operating ranges and default positions.
  - h. Provide two (2) 11" X 17" hardcopies and one (1) electronic copy of the control drawings. One hardcopy for the building control cabinet and one hard and one electronic copy for the EMCS Operators. All hard copies shall be in 8-1/2" x 11" 3-ring binders.
9. Installation
- a. Place all equipment in service accessible area such as a locked cabinet in mechanical room. Coordinate placement of cabinets with other crafts requirements.
  - b. Remotely located equipment must be readily accessible.
  - c. Provide for at least 25% spare point connections in controllers located in Mechanical Rooms.
  - d. Vendor must provide exchange and repair service for all components.
  - e. Install latest version of system software on the EMCS computer(s).
  - f. Vendor must tune all MS/TP LAN trunks in accordance with Alerton System documentation, using an oscilloscope and 80 to 120 ohm terminating resistors.
10. Commissioning
- a. The contractor shall field verify that all physical points are working properly and that the software routines are operating the controlled equipment according to design. Provide documentation showing that all hardware points have been tested. Testing shall include starting and stopping all binary output points, verify correct change of state of all binary input points, modulating the full range of all analog output points and calibrating all analog input points.
  - b. The contractor shall provide printouts documenting the waveforms of MS/TP LAN Trunks.

END OF DATA SHEET

**SECTION 230900 – INSTRUMENTATION AND CONTROL FOR HVAC EMCS**

DETAIL: EMCS BLOCK DIAGRAM

**SECTION 235200 – HEATING BOILERS****A. BOILERS**

1. Hydronic boilers shall be specified - steam boilers are not acceptable. Any non-emergent replacement of a steam boiler will require that all steam related system components/equipment also be replaced; converted to a hydronic system or to another means of heating (e.g. gas fired infrared heaters). Cast iron sectional boilers shall be avoided. Fire-tube boilers with external burners are preferred.
2. When practical, multiple boilers are preferred over one large single boiler. Where common venting of two or more boilers is used, spectacle flanges or other devices shall be employed to allow complete maintenance and inspection of one boiler while one or more boilers are operating under pressure.
  - a. Where redundancy (multiple boilers) is utilized, each boiler shall be sized to accommodate a minimum of 60% of the designed capacity of the boiler system, unless stated otherwise in the specific project contract.
3. For new heating system projects, there shall be a full system design, which utilizes high-efficiency boilers.

**SECTION 260000 – ELECTRICAL****A. GENERAL**

1. The design shall be in accordance with NFPA 70, *National Electrical Code®*, WAC 296-46B, *Electrical Safety Standards, Administration, and Installation*, national and state codes, and Air Force regulations.
2. All work shall be performed in accordance with NECA 1-2010, *Good Workmanship in Electrical Contracting*.
3. Coordinate with Base Electrical Engineering for the best way to connect into the base electrical distribution system. Include connection to the distribution system as part of the project.
4. Exposed conduit shall be allowed only in utility spaces. It shall not be allowed in finished spaces.

**B. REFERENCES**

1. National Fire Protection Association (NFPA) <http://www.nfpa.org>
  - a. NFPA 70, *National Electrical Code®*, latest edition
2. Unified Facilities Criteria (UFC)
  - a. UFC 3-501-01, *Electrical Engineering*; latest edition
  - b. UFC 3-520-01, *Interior Electrical Systems*; latest edition

**C. METERS**

1. Electrical meters shall be provided for all new facilities and all major remodels. Meters shall measure kilowatt-hours and demand. The meter multiplier shall be clearly marked on the inside of the meter. Calculations showing how the multiplier was obtained shall be submitted by the Contractor to the Contracting Officer for approval. Insure electrical meters are connected with the EMCS.

**D. MECHANICAL AND ELECTRICAL ROOMS**

1. Outlets: Electrical and mechanical rooms shall be provided with convenience outlets every 12 feet.
2. Telephone Jack: One RJ-45 telephone jack shall be provided in each electrical and mechanical room.

**E. GENERATORS:** Reference Section 263213 for generator requirements.**F. PANELS AND BREAKERS**

1. Breakers shall be provided whenever possible for overcurrent protection. Breakers for new panels shall be of the bolt-on breaker type. In your specifications specifically state that series rated breakers shall not be used. Provide 25% spare breakers on all new panels. Provide load calculations in the Design Analysis. Spare breakers shall be 20A.
2. All circuits shall be marked at the panel identifying what each circuit goes to.

**G. COMPUTER CIRCUITS**

1. Computers shall have dedicated circuits and full sized dedicated neutrals. Shared neutrals shall not be used. Where appropriate, dedicated panels shall also be provided.

**H. COLOR CODING**

1. Color coding for all three-phase circuits shall be in accordance with the following:

	480V	208V
Phase A	Brown	Black
Phase B	Orange	Red
Phase C	Yellow	Blue
Neutral	White	White
Ground	Green	Green

**I. CONDUCTORS**

1. All conductors shall be copper.

**J. MOTORS AND CONTROLLERS**

1. Motors: Motors shall be high efficiency type and use de-rated values for supply voltages. All motors shall have a disconnect switch as required by NFPA 70, National Electrical Code® (NEC). Motors over 10 HP shall have under-voltage, phase loss, and phase reversal protection.
2. Variable Speed Drives: When provided, variable frequency drive (VFD) controllers shall be enclosed in a ventilated enclosure with separate conduit for input and output power. Basis-of-Design shall be ABB (Asea Brown Boveri) brand VFD's.

**K. LIGHTING**

1. Design: Illuminating Engineering Society of North America's (IESNA) HB-9, *IESNA Lighting Handbook*, and UFC3-530-01 shall be referenced for lighting design.
2. Exit Lights: Exit lights shall be provided in accordance with NFPA 101. Exit lights shall be hardwired, "self-diagnostic" type with LED indicators (no bulb-type) and with replaceable emergency battery capabilities.
3. Emergency Lighting: Emergency lighting shall be provided in accordance with NFPA 101. Lights shall be "self-diagnostic" type with replaceable emergency battery capabilities. Down lighting built into EXIT lights is acceptable if it meets the foot-candle illumination requirements as a means of egress. Wall mounted battery/lamp type units are preferred.
4. Parking and Recreational Lighting: This type of lighting is provided by fixtures mounted at an average height of between 30 and 50 feet and is used in recreational areas and parking areas. Provide rectangular (shoe box) luminaires equal to Holophane Somerset (<http://www.holophane.com>, keyword: Somerset) with a bronze powder coat finish or approved equal. Physical profile of the luminaire shall have a height to width ratio between 1:2 and 1:3, with the depth dictated by the required fixture size. Fixtures shall be LED with equivalent wattage to provide the foot-candle levels recommended in the IESNA Lighting Handbook and in accordance with industry standard practice. Provide square, non-tapered pole (or match existing poles in the vicinity, if different from standard) with bronze powder coat finish. Provide unpainted concrete bases set with the top 30 inches above grade. Lighting must be controlled to automatically reduce lighting power by a minimum of 30%, during any period when no activity has been detected for a time of no longer than 15 minutes. Lights must also automatically turn off when sufficient daylight is available.
5. Roadway Lighting: This type of lighting is provided by fixtures mounted at average heights of between 30 and 50 feet and of the type typically used in roadway applications. Provide standard highway luminaire Cobra-head with full cutoff flat lens style or approved equal. Provide LED fixtures with equivalent wattage to provide the foot-candles recommended in the IESNA Lighting Handbook and in accordance with industry standard practice. A good guide is to provide wattage similar to the other streetlights in the immediate area. Provide round tapered brushed aluminum breakaway poles. Unpainted concrete bases shall be set with the top 3 inches above grade. Lighting must be controlled to automatically reduce lighting power by a minimum of 30%, during

any period when no activity has been detected for a time of no longer than 15 minutes. Lights must also automatically turn off when sufficient daylight is available.

6. Interior Lighting: Fixtures shall be LED with equivalent wattage to provide the foot-candle levels recommended in the IESNA Lighting Handbook, and in accordance with industry-standard practice. Controls should be manual upon the occupant entering the room. Control general lighting in daylighted areas separately through multilevel photocontrols (step dimming or continuous dimming), to reduce light output when daylight is available. There shall be at least one control step between 50% and 70% of design lighting power, and one control step that is greater than 35% (including "off") of design lighting power. Automatically turn off within 15 minutes of no occupant activity.
7. Color Temperature: Fixture lamps shall be 4100K temperature.

#### L. QUALIFICATIONS OF WORKERS

1. The contract shall require all electricians or high voltage linemen to be licensed by the state for the trade in which they are working. All Federal and Washington State labor laws shall be followed.

### **SECTION 262000 – 15 KV ELECTRICAL DISTRIBUTION**

#### A. GENERAL

1. The base electrical distribution system is rated 13.2 KV phase to phase and 7620 volts phase to ground. The system is 3 wire with concentric neutral, 60 Hertz, 3 phase, grounded wye. The area north of the runway is fed by an underground distribution system. The area south of the runway is fed by a combination underground/overhead system.
2. The existing distribution system is a loop system. All additions to the underground distribution system shall be designed as loop systems unless specifically authorized to do otherwise by 92 CES/CENM. Provide fused switches whenever conductors are being powered from the distribution system main trunk lines.

#### B. REFERENCES

1. Institute of Electrical and Electronic Engineers (IEEE) <http://www.ieee.org>
  - a. C2, *National Electrical Safety Code®*
2. National Fire Protection Association (NFPA) <http://www.nfpa.org>
  - a. NFPA 70, *National Electrical Code®*, latest edition
3. *The Lineman's and Cableman's Handbook*, latest edition. (Published by McGraw-Hill)
4. Unified Facilities Criteria (UFC)
  - a. UFC 3-501-01, *Electrical Engineering*; latest edition
  - b. UFC 3-550-01, *Exterior Electrical Power Distribution*; latest edition

#### C. UNDERGROUND DISTRIBUTION SYSTEM

1. 15KV Cable shall be copper conductors, 15 KV, URD construction, 133% EPR insulation, 1/3 concentric neutral 3 phase circuits, full concentric neutral for single phase circuits, full PVC or polyurethane jacket over the concentric neutral, 250 MCM conductor for main trunk line feeders, #2 AWG conductor for loop feeders.
2. Corona / Tape shields shall not be used as neutrals. All extensions of the base distribution system shall be color coded to identify the phasing of the conductors. Color notation for phases is left to right, Brown-Orange-Yellow for 13.2 KV. Ground all neutrals, lock all cabinets with Exterior Shop locks, label all lines, where they originate and terminate.

3. 15 KV underground cable shall be installed in concrete encased duct banks. Provide 5 inch Schedule 80 PVC or EB conduit. Provide spare conduit with pull wire for future use. Place duct bank 36 inches below grade. Provide rigid galvanized steel elbows wrapped in corrosion inhibiting tape at all transformers, junction cabinets, and short bends. Encase elbows in concrete. Secure conduit in position before placing concrete. Provide plastic warning tape with metallic wire above all duct runs.
4. All exterior equipment shall be painted according to the standard colors identified in FAIRCHILD AIR FORCE BASE GUIDE SPECIFICATION Section 09, Section 090000.
5. 15 KV splices and terminations shall be rated for the full ampacity of the cables being connected. All 15KV cable shall be Very Low Frequency (VLF) tested before energization. "T" type splices shall not be used. Dead break or Load break elbows shall not be installed in manholes. DC Hi-Pot testing shall not be allowed.
6. Transformers for the underground distribution system shall be oil filled, pad mounted, dead front construction, loop feed capable with six 200 amp load break integral bushings. Three phase transformer primary windings shall be rated 13.2 KV phase to phase, Delta connected primary (3 phase), grounded wye secondary. If used in a radial application – 15KV M.O.V.E. lighting arrestors shall be installed. Single phase transformers shall be rated 7620 volts phase to ground, grounded secondary. If used in a radial application – 10KV M.O.V.E. lighting arrestors shall be installed. All transformers shall be provided with 95 BIL, gang operated load break switch are not allowed, provide three individual switches (two switches for the loop H1A & H1B and one switch for the Secondary), primary bayonet fusing, taps + 2-2 1/2 %, de-energized tap changer switch, high voltage parking stand, penta-head locking bolt, 200 amp load break integral bushings, pressure relief valves, separate primary and secondary compartments. Provide minimum 10-foot clearance on operable sides for "hot stick" work and 4' clearance on all other sides when installing block/brick walls around pad mounted transformers. All transformer feeder cabling (high and low voltage) shall be fed from below grade, through the concrete pad and ground sleeve assembly. Above ground / side access will NOT be permitted. See Section 320000, Paragraph D. 5. for screening wall requirements.
7. 15 KV Junction Cabinet (Sectionalizing Terminals) shall be 12-gauge steel, with stainless steel hardware, one-piece construction, top-hinged, removable door, recessed lock pocket with padlock, hasp and penta-head silicon bronze door bolt, door stop, hinge retainer, hold down cleats, one parking stand per phase, ground clamp nuts welded in place (one per phase). Junction points shall be rated 15 KV, 200 amps (load break) for #2AWG cable. Equipment shall be pad-mounted type. Provide minimum 8' 10-foot clearance on operable sides for "hot stick" work and 4' clearance on all other sides when installing block/brick walls around pad mounted junction cabinets. See Section 320000, Paragraph D. 5. for screening wall requirements.
8. All 15 KV switches shall be pad-mounted oil switches (Cooper MOST-9B brand preferred). Key interlocks are not allowed. All "Dead-front" type switches shall have windows in them, to provide visual verification of the blades being in contact with each other, or having a visual "open" between them.
9. All pad-mounted equipment (transformers, switches and junction enclosures) shall be mounted on a reinforced concrete pad (or approved equal) with ground sleeve installed. A grounding ring of 4/0 bare copper shall encircle the pad and be buried 24 inches below grade. Provide four ground rods (one at each corner of the pad). Provide a 4/0 copper cable from the ground ring to inside the equipment enclosure for grounding in accordance with Institute of Electrical and Electronic Engineers' C2, *National Electrical Safety Code®* and National Fire Protection Association's NFPA 70, *National Electrical Code®*. All connections between the ground rods and the 4/0 cable shall be exothermic type equal to Cadweld brand.
10. Electrical distribution manholes shall be concrete, rated H20, have round manhole covers (spring loaded lids are preferred), minimum size 6 ft long, 4 ft wide, 6 ft high. Shall come complete with pulling irons, ground rods, and cable racks.

#### D. OVERHEAD DISTRIBUTION SYSTEM

1. Primary lines shall be copper hard/semi-hard drawn cable. Strain insulators shall not be used. Stirrups shall be placed at all distribution taps. CSP transformers shall not be used. External taps for transformers shall have two primary bushings. Provide transformer-rated lightning surge arrestors and fused disconnects on all transformer Primary Connections. Provide riser-class lightning surge arrestors and fused disconnects on all aerial/underground pole transitions.
2. Secondary lines and service drops shall be copper, duplex, triplex, or quadraplex. Weatherheads shall be used. Dead end with wedge clamps and insulators. Use compression connectors for secondary distribution, split-bolts shall not be used.
3. Service laterals shall be copper and installed in conduit. Conduit shall be PVC (preferred) or rigid galvanized steel wrapped in corrosion inhibiting tape.

## **SECTION 263213 – ENGINE GENERATORS**

### **A. PERMITTING REQUIREMENTS**

1. Refer to Section A.3, *Environmental*, to determine permitting requirements for equipment that includes, but is not limited to generators and other combustion-style engines.

### **B. AIR FORCE PROGRAMMING AND DESIGN REQUIREMENTS**

1. All RPIE generator designs must be approved in writing by AFCEC/CO or designee prior to finalizing project purchase and/or programming and/or design. Submit the generator authorization request during project initiation (programming) and design approval request at the 65 percent design milestone. If electrical design changes are made after the 65 percent design submittal, another design approval request is required.
2. All generators shall be specified with a factory installed Exhaust Gas Temperature (EGT) probe.
3. For generator installations sized 250 kW and higher, the design must include provision for portable load bank/generator connection at the ATS or distribution equipment (not at the generator). Size the connection at a minimum of the generator kW rating.
4. Generator fuel tanks shall be provided. The size of the fuel tank will have a minimum 72-hour local capacity tank based on the full-load fuel consumption rate of the engine. UFC 3-540-07 paragraph 8-6.5.5.
5. The sizing of all generators shall be in accordance with UFC 3-540-07 paragraph 8-3.2.2.2. Generators will be sized to a minimum of 50% of rated capacity.
6. Exterior generators, fuel tanks and ATS shall be painted to match “Sierra Tan” colored facilities paint to match as directed by the Government.
7. All generators shall be BACnet compatible and connected to EMCS for remote monitoring and control.
8. All generators shall be compatible with InPower software.

### **C. AUTOMATIC TRANSFER SWITCHES (ATS) REQUIREMENTS**

1. All ATS shall be specified to be four pole units.
2. Four pole requirement: Any project replacing a generator that is connected to a 3 pole ATS shall replace the 3 pole ATS with a 4 pole ATS. The electrical wiring shall be modified to allow the correct function of the 4 pole ATS.
3. All new ATS switches shall be specified four pole.
4. All new ATS will include an on-board battery charger properly sized to charge the generators batteries.

5. Bypass switches: All ATS switches shall be specified/designed to allow bypass of the ATS to allow maintenance and testing of the ATS without interrupting power to the facility. The bypass function shall be accomplished using a combination of manual disconnect switches. The disconnect switches shall be immediately adjacent to the ATS. Variances to these requirements due to space limitations will be considered on a case by case basis and require Base Civil Engineering approval. Existing auto transfer switches are Cummins and Asco.
6. All ATS switches shall be BACnet compatible and connected to EMCS for remote monitoring and control.
7. All ATS switches shall be compatible with InPower software.
8. All ATS switches shall have a manual disconnect between the commercial power and the ATS.

#### D. GENERATOR ROOMS

1. Emergency Generator Rooms: Where generator rooms are being provided, provide generator rooms with automatic louvers and exhaust fans for ventilation. Provide overhead and side lighting to minimize shadows. Provide water outlet, bay or double doors to allow replacement of generator, minimum 30 inches (800 mm) working clearance all sides. Provide sound dampers. Auto-transfer switches and start panels shall be located in the generator room.
2. If a generator room is not being provided, the generator needs to be in an insulated enclosure with a minimum 30 inches (800 mm) working clearance on all sides between the generator and the enclosure. Provide generator enclosures with automatic louvers and exhaust fans for ventilation.

### SECTION 264200 – CATHODIC PROTECTION

#### A. REFERENCES

1. National Association of Corrosion Engineers (NACE) International (<http://www.nace.org>)
  - a. Corrosion Specialist Certification
  - b. Cathodic Protection Specialist Certification

#### B. LOCATIONS REQUIRING PROTECTION

1. Cathodic protection shall be provided for all metallic underground utility lines, storage tanks, and structures in contact with the earth associated with the following systems:
  - a. Petroleum, Oils, and Lubricants (POL) systems
  - b. Fuel storage systems
  - c. Natural Gas piping
  - d. Water tanks (interior and exterior surfaces)
  - e. Steam piping

#### C. EXISTING PROTECTION

1. Existing utility systems are protected by:
  - a. The POL system is protected by coatings, sacrificial anodes, and five overlapping impressed current systems. No additions to this system will be allowed without an additional impressed current system.
  - b. Underground steel piping associated with POL, fuels, and natural gas are protected by coatings and cathodic protection.

- c. Natural gas lines are protected by coatings and three overlapping impressed current systems. There are **only two cathodic systems for natural gas lines which is maintained by Avista Utilities.**
- d. All water tanks are protected by coatings and cathodic protection.
- e. Fire protection systems receive water from base mains with no special measures to control corrosion unless underground steel piping is used. If steel piping is used, sacrificial anodes are installed. If the main and service are of dissimilar materials then an insulated coupling shall be installed between them.
- f. Sewer systems shall require no corrosion control.

#### D. DESIGN

- 1. Soil resistivity varies widely across the base. All cathodic protection design calculations shall be based upon actual soil resistivity measurements taken at the project site. Soil resistivity tests shall be taken by a certified NACE Corrosion Specialist.
- 2. All cathodic protection designs provided by the A-E shall be designed by a NACE certified Corrosion Specialist or NACE certified Cathodic Protection Specialist and be coordinated with the Base Cathodic Protection Engineer or Technician.
- 3. The preferred method of protection is impressed current; however, sacrificial anodes may be used as design conditions dictate.
- 4. All cathodic protection designs will consider the effect of interference upon existing cathodic protection systems and the structures they protect.
- 5. Design calculations shall be submitted for approval to the Contracting Officer.

#### E. INSTALLATION

- 1. A NACE International certified Corrosion Specialist shall supervise the installation and adjustments of all cathodic protection systems.

### SECTION 275116 – MASS NOTIFICATION SYSTEM

#### A. GENERAL DESIGN REQUIREMENTS

- 1. Design for all Mass Notification Installations shall comply with, but not limited to.
  - a. UFC 4-021-01, *Design and O&M: Mass Notification Systems*
  - b. UFC 3-600-01, *Fire Protection Engineering for Facilities*
  - c. All applicable Tri-Service Fire Protection Engineering Working Group (TSFPEWG) Guides
  - d. All Applicable NFPA standards, except where modified by UFC 3-600-01
  - e. All applicable Fairchild specific requirements
  - f. The Designer shall confirm that this guidance has not been superseded by any subsequent DoD directives

#### B. DESIGN

- 1. The system shall be designed under the supervision of a registered fire protection engineer, by a registered professional engineer having at least four years of current experience in the design of fire protection and detection systems, or by an engineering technologist qualified at NICET Level IV in fire alarm systems. Intelligibility modeling shall be performed. The Architect of Record shall be included in this process.

#### C. EQUIPMENT

1. Only Mass Notification Systems recommended by the fire alarm systems manufacturer shall be used and installed IAW the latest edition of UFC 4-010-01 and UFC 4-021-01.
2. The acceptable manufacturer for the Mass Notification System shall be listed and "UFC 4-021-01 Compliant"
3. All batteries necessary to maintain the fire alarm control panel, transmitter, and/or accessories shall be gel-type.
4. Provide surge protection in accordance with UFC 3-520-01
5. All system equipment or components that are keyed are to be keyed the same as the fire alarm panel; # C415A key or Cat 45 Key shall be acceptable.
6. All Local Operating Consoles (LOC) are to be accessible at all times to the occupants, but must be protected from tampering by the use of a thumb-lock device.
7. All LOC shall have a microphone for building wide announcements.
8. All Local Operating Consoles shall have signage on the outside of the enclosure that state "Mass Notification" and if HVAC shutdown is provided "HVAC Emergency Shutdown"
9. All programming codes or passwords required to access, update, modify, and maintain the system shall be provided to the DOD installation no later than the date of final system acceptance.

#### D. ALERT MESSAGES

1. The system shall be capable of a minimum of 8 pre-recorded messages. The following pre-recorded messages shall be programmed into and clearly labeled on all LOC's:

Note: For single-story Facilities, delete "or exit stairway. Do not use the elevators" from the voice message.

  - a. **ALTERNATE EGRESS** (Female Voice): (Temporal 3 Alert Tone)  
"Attention all personnel. An emergency has occurred in the building. Please evacuate the building by alternate means." <Provide a 2 second pause> "May I have your attention please..." (Repeat the message).
  - b. **FORCE PROTECTION** (Male Voice): (Male Voice): (Alert Sound – Hi-Lo - 780 to 600 hz alternately, 0.52 each (repeat 2 cycles))  
"Attention all personnel. The Force Protection Condition has been changed. All personnel are to immediately implement prescribed actions." <Provide a 2 second pause.> "May I have your attention please..." (Repeat the message).
  - c. **BOMB THREAT** (Male Voice): (Alert Sound – Hi-Lo - 780 to 600 hz alternately, 0.52 each (repeat 2 cycles))  
"Attention all personnel, a bomb threat has been issued for this building. Please leave the building by the nearest exit or exit stairway. Do not use the elevators. This is not a drill." <Provide a 2 second pause> "Attention all personnel..." (Repeat the message).
  - d. **HOSTILE THREAT** (Male Voice): (Alert Sound – Hi-Lo - 780 to 600 hz alternately, 0.52 each (repeat 2 cycles))  
"Attention all personnel, a hostile threat has been reported. Please take appropriate actions. This is not a drill." <Provide a 2 second pause> "Attention all personnel..." (Repeat the message).
  - e. **SHELTER IN PLACE** (Male Voice): (Alert Sound – Hi-Lo - 780 to 600 hz alternately, 0.52 each (repeat 2 cycles))

"Attention all personnel, please proceed to your designated shelter-in-place location immediately and wait for further instruction. This is not a drill.." <Provide a 2 second pause>  
 " Attention all personnel..." (Repeat the message).

- f. **WEATHER WARNING** (Male Voice): (Alert Sound – Hi-Lo - 780 to 600 hz alternately, 0.52 each (repeat 2 cycles)
- "Attention all personnel, a severe weather warning has been issued. Take appropriate action and tune in to the local radio or television stations for the latest updates. This is not a drill." <Provide a 2 second pause> "Attention all personnel..." (Repeat the message).

- g. **ALL CLEAR** (Male Voice): (Alert Sound – Hi-Lo - 780 to 600 hz alternately, 0.52 each (repeat 2 cycles)
- "Attention all personnel, the emergency has now ended. Please resume normal operations. Thank you for your cooperation. <Provide a 2 second pause> "Attention all personnel..." (Repeat the message).
- h. **MNS TEST** (Male Voice): (Alert Sound – Hi-Lo - 780 to 600 hz alternately, 0.52 each (repeat 2 cycles)
- "Attention all personnel, this is a test of the Mass Notification system. This is only a test. <Provide a 2 second pause> "Attention all personnel..." (Repeat the message).

2. All MNS messages shall temporarily override fire alarm audible messages and visual signals, and to provide intelligible voice commands during simultaneous fire and terrorist events. All other features of the fire alarm system, including the transmission of signals to the fire department, shall function properly. MNS messages shall take priority and continue to override fire alarm audible messages until the MNS message is either manually or automatically ended. If not manually ended, the MNS message shall automatically end after 10 minutes.
3. When not overriding fire alarm messages, all MNS messages shall remain activated until manually reset.

#### E. MESSAGE PRIORITY

1. The live-voice and pre-programmed messages shall be prioritized as follows:
  - a. Live Voice announcement
  - b. **HOSTILE THREAT**
  - c. **SHELTER IN PLACE**
  - d. **ALTERNATE EGRESS**
  - e. **BOMB THREAT**
  - f. **FORCE PROTECTION**
  - g. **WEATHER WARNING**
  - h. **ALL CLEAR**
  - i. **TEST**
2. Only messages prioritized (a-e) shall be allowed to temporarily override fire alarm audible messages and visual signals, and to provide intelligible voice commands during simultaneous fire and terrorist events. All other features of the fire alarm system, including the transmission of signals to the fire department, shall function properly. The MNS message shall continue to override fire alarm audible messages until the MNS message is either manually terminated or automatically end after 10 minutes.
3. Provide a supervisory signal if the MNS is used to override fire alarm audible messages and visible signals during simultaneous fire and terrorist events. The supervisory signal shall be annunciated at the FACP and any remote fire alarm annunciators and be transmitted to the fire

department. The visual annunciation of the separate supervisory signal shall be distinctly labeled or otherwise clearly identified.

## F. TESTING AND ACCEPTANCE

1. All Acceptance testing shall be conducted IAW applicable standards and scheduled with and witnessed by the Base Fire Prevention Office.

## SECTION 275400 – KLAXON AND NAOC ALARM SYSTEMS

### A. ALERT KLAXONS AND NAOC ALARMS

1. The klaxon is the primary alerting system. The normal klaxon pattern is a 30-second blast, followed by a 15-second pause, for three soundings.
2. Certain facilities on base require alert klaxon and National Airborne Operation Center (NAOC) alarm systems. Designers shall retain existing alarm systems whenever a structure is remodeled. Designers shall specifically ask for direction from the base project manager if alert klaxon and NAOC alarm systems are required for new facilities.

### B. KLAXON AND NAOC SYSTEMS

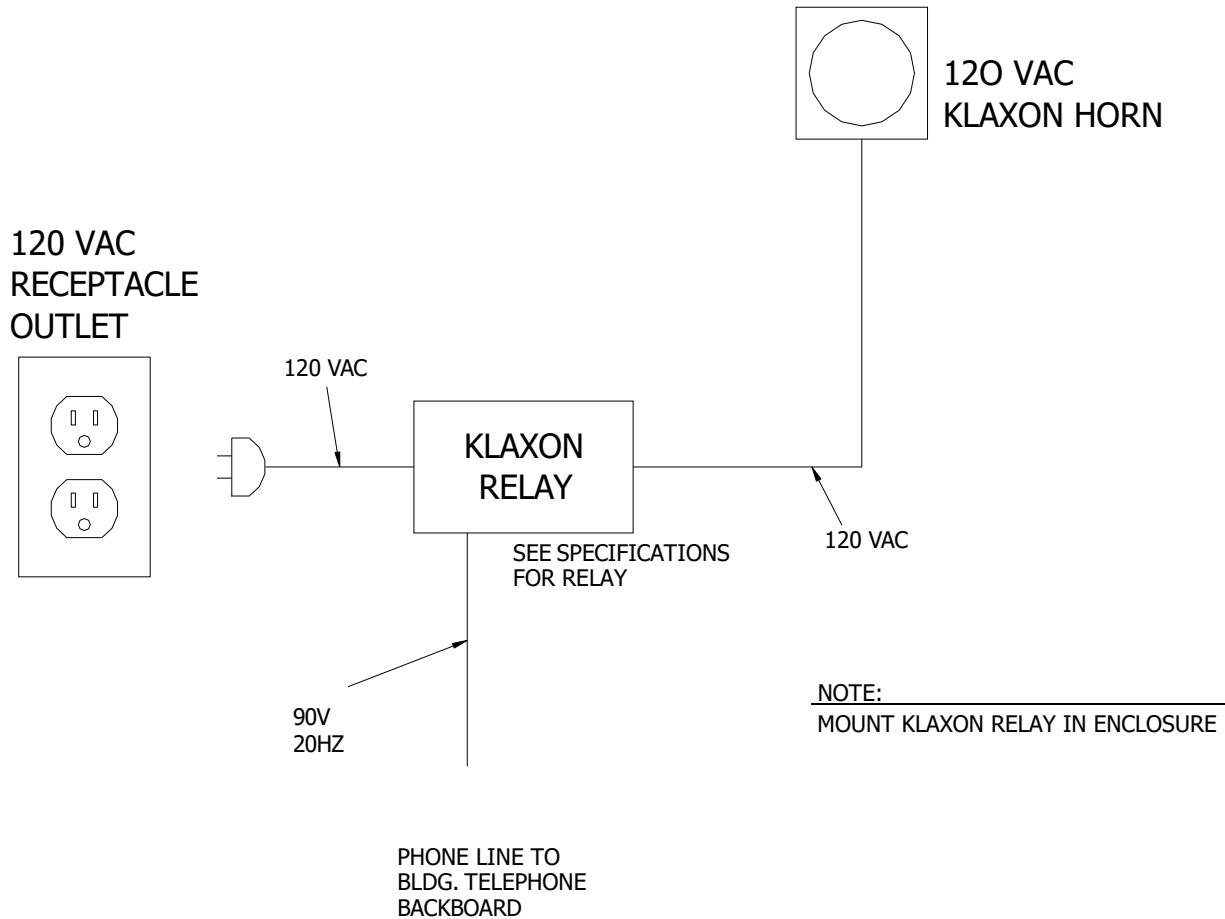
1. Both these systems are audio devices located to notify aircrews of the need to return to their aircraft. The audio alarms are located in specific buildings and some outdoor areas.
2. KLAXON SYSTEM: The klaxon system is for Fairchild aircrews. The command post initiates the alarm by sending a 90 volt 20 Hz signal through the phone system to the location of the klaxon horn. The 90 volts activates a relay that controls 120 volt power to the klaxon horn.
3. NAOC SYSTEM: The NAOC system is for aircrews of special visiting aircraft. A crewmember of the visiting aircraft initiates the alarm from the aircraft via a phone line plugged into the aircraft. A switch is thrown in the plane that completes a 48 volt DC circuit from the command post. The circuit activates a relay (located at the Command Post). That relay sends a 90 volt 20 Hz signal over a phone line to a relay. The relay controls 120 volt power to a 120AC/12VDC transformer rectifier. The 12 Volt DC powers the NAOC horn. The NAOC horn is a yelping sounding horn different from the KLAXON horn.

### C. EQUIPMENT TO BE USED INSIDE A BUILDING

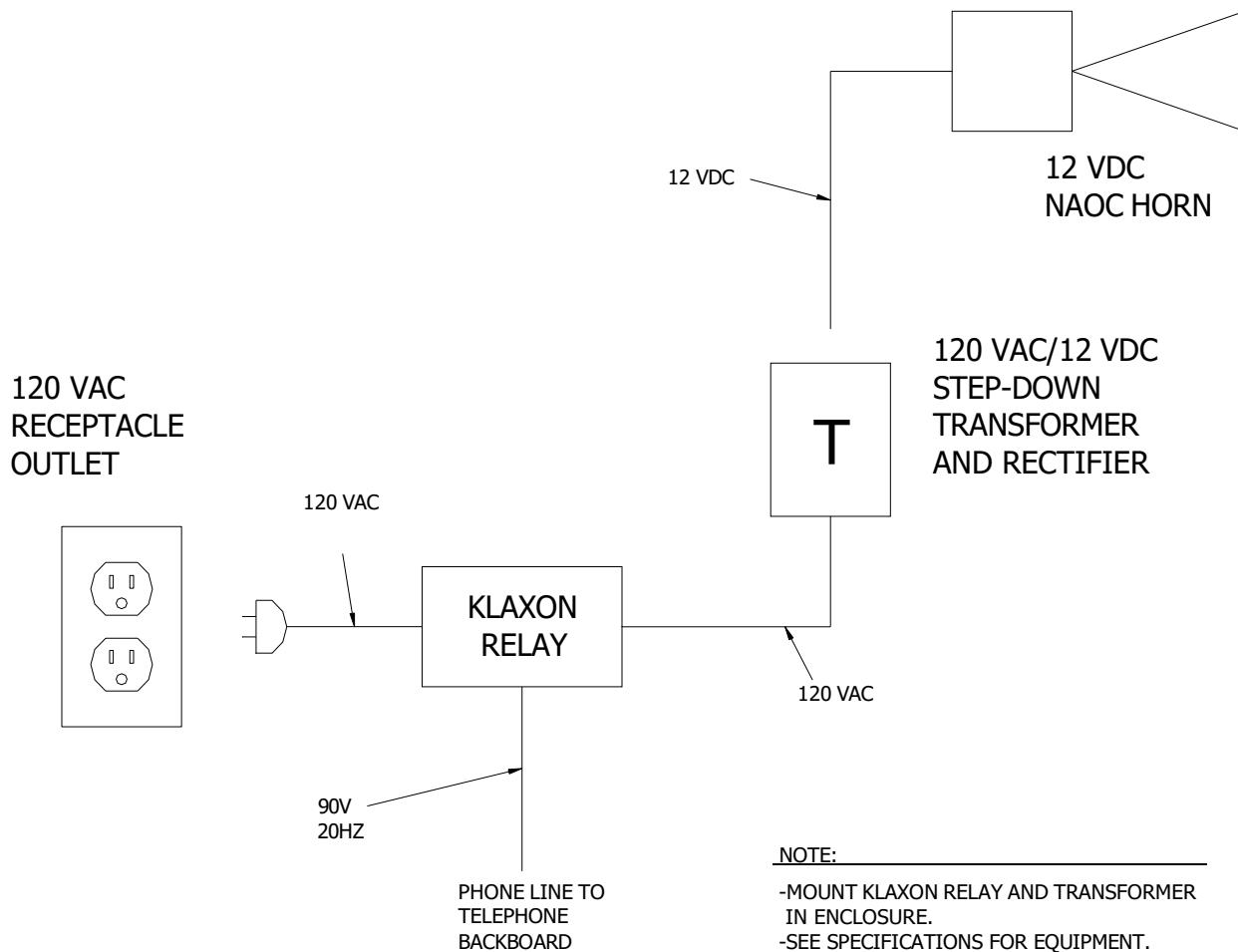
1. KLAXON and NAOC Relay: The relay used for both systems is a CRT-T-40, manufactured by Wheelock Signals Inc. (<http://www.wheelockinc.com>). The relay coil is rated 90 volts, 20 Hz. The contacts are rated 5 amp, 60 HZ 115 volt.
2. NAOC Horn: Yelping sound. The horn used for the system is 12 volt DC, Moose Model # MPI-37 (<http://www.gesecurity.com>, keyword MPI-37). This horn was last purchased through CARR Sales of Spokane Washington.
3. KLAXON Horn: Adaptahorn manufactured by Edwards Signaling & Security Systems, part of GE Security (<http://www.edwards-signals.com>). Draws 0.13 amps. For indoor locations use part number 874-N5. Provide mounting box. For outdoor locations use part number 876-N5. For hazardous areas use part number 878-N5.
4. NAOC POWER SUPPLY: Magnetek (<http://www.magnetektelecom.com>) Model WDU 12-1200. Input is 120VAC, 60 Hz, 24 watt. Output is 12 VDC, 1.2 amp, class 2 transformer.

### D. WIRING DIAGRAMS

1. The details at the end of this section show how the NAOC and KLAXON system components are wired together in the buildings.

**DETAIL 1 – KLAXON SYSTEM AT FACILITY**

## DETAIL 2 – NAOC SYSTEM AT FACILITY



NOT TO SCALE

**SECTION 284611 – CARBON MONOXIDE DETECTION AND ALARM****A. CARBON MONOXIDE**

1. Detectors
  - a. Carbon Monoxide (CO) detectors shall be specified for installation at all new construction and/or renovation projects. Permanent hard-wired CO detectors with a detection element service life of not less than five (5) years shall be used.
  - b. Detectors shall be listed by Underwriters Laboratories UL 2034, *Single and Multiple Station Carbon Monoxide Alarms*.
2. Locations
  - a. Install CO detectors in all Air Force-owned and -leased housing units with natural gas-, oil- or LPG-fired systems. Recommend one CO detector per housing unit near the sleeping areas; units with multiple floors shall install one CO detector per floor.
  - b. Install CO detectors in facilities housing natural gas-, oil- or LPG-fired equipment or appliances.
  - c. CO detectors in boiler rooms shall be located directly above gas-fired equipment.
3. Instructions
  - a. Contractor shall include the manufacturer's instructions regarding operation and proper maintenance of the detectors in the Operations and Maintenance Manuals.

**SECTION 284620 – FIRE-ALARM SYSTEM****A. GENERAL DESIGN REQUIREMENTS**

1. Design for all new construction and major projects shall comply with, but not limited to:
  - a. UFC 3-600-01, *Fire Protection Engineering for Facilities*
  - b. UFC 4-010-01, *Design and O&M: Mass Notification Systems*
  - c. All applicable Tri-Service Fire Protection Engineering Working Group (TSFPEWG) Guides
  - d. All Applicable NFPA standards, except where modified by UFC 3-600-01
  - e. All applicable Fairchild specific requirements
  - f. The Designer shall confirm that this guidance has not been superseded by any subsequent DoD directives

**B. MANUAL STATIONS**

1. Devices shall be of the internal toggle switch type (not push button) with a key lock for reset and testing WITH NO GLASS RODS OR BREAK GLASS DEVICES.

**C. BATTERIES**

1. All batteries necessary to maintain the fire alarm control panel, transmitter, and/or accessories shall be gel-type of sealed lead acid type.

**D. FIRE ALARM/MASS NOTIFICATION SYSTEM CONTROL PANEL**

1. All zones shall be marked at the panel identifying locations. The labeling of all device addresses at the panel shall be approved by the Base Fire Prevention office before being programmed.
2. Reset control panel passwords to the default passwords.
3. Submit manufacturer's documents including operators, users, and programming manuals. These documents shall be submitted through the contracting officer to 92 CES/CEOE.

4. Panel shall be accessible to the fire department when the building is not occupied.
5. The complete Fire Alarm System shall be the product of only one manufacturer and shall be capable of communicating with the Monaco D-21 System.
6. There shall not be any relays between Fire Alarm panel(s) and Radio Transmitter, hardwired in only.
7. Fire alarm panel shall have Point to Point capability through the Monaco D-21 System.
8. Only Mass Notification Systems recommended by the fire alarm systems manufacture shall be used and installed IAW the latest edition of UFC 4-010-01 and UFC 4-021-01.
9. Smoke detector over fire alarm panel shall be no higher than 5 ft.
10. All wires shall be clearly identified for bell circuit and/or speaker/audio for MNS.
11. The AHJ shall be notified after conduit is installed for visual inspection. No panels shall be installed without coordination or location(s).
12. The last device installed must have an engraved sign stating the value and location of the end of line resistor.
13. On all false ceiling grids the cross "T"s shall be marked with a RED dot indicating the location of fire 'J' boxes.
14. Post a laminated 11 x 17 schematic drawing next to the fire alarm systems and MNS panels and clearly mark on the drawing the location of all fire 'J' boxes. (Hand written marking and/or labels is not acceptable).
15. Post a laminated 11 x 17 Floor Plan drawing next to the fire alarm systems and MNS panels and clearly mark on the drawing the room numbers, the location of all fire Pull Boxes and Detection devices. (Hand written marking and/or labels is not acceptable).

#### E. TRANSCEIVER (TRANSMITTER)

1. The transceiver shall be a Monaco Radio Alarm System Transceiver and be capable of transmitting a Zone Identification (ZID) to the Monaco D-21 VHF Radio Alarm System located in the fire stations (FM frequency 138.925 MHz).
2. With the following applicable hardware:
  - a. Antenna, ground plane, fixed station, cut to frequency.
  - b. Antenna Bracket (depending on preferred mounting):
    - (1) Lightning arrester kit.
    - (2) Rain tight enclosure for lightning arrestor.
    - (3) Coaxial cables with connectors, Type I (from lightning arrestor to transceiver):
    - (4) Coaxial cable with two PL-259 connectors, Type 2 (from antenna to lightning arrestor).
3. Lightning Protection: All antennas shall be provided with coaxial lightning arrestors located outside of the building and connected to the antenna grounding system. Lightning protection shall be installed in accordance with NFPA 70. Transceivers shall not exhibit mis-operation or failure when electrical transient per IEEE Standard 587 Category B are applied to the AC power line.
4. Location: Radio transceivers shall be installed in locations easily accessible for maintenance.
5. Programming: Radio transceiver shall provide a means for programming zone and transceiver identification in the field. Transceivers shall be designed to allow complete interchangeability and reprogramming of transceiver identification in the field without additional parts or equipment.

**F. KEYS**

1. All fire panels, associated panels, fire pull stations are to be keyed the same; # C415A key or Cat 45 Key shall be acceptable.

**G. SUPERVISION**

1. Tamper switches shall be provided for all post indicator and OS&Y valves to indicate a trouble condition in the event the valves or tamper switch covers are shut off or removed.

**H. TESTING AND ACCEPTANCE**

1. All Acceptance testing shall be scheduled with and witnessed by the Base Fire Prevention Office.

**I. KNOX BOXES**

1. The transceiver shall be a Monaco Radio Alarm System Transceiver and be capable of transmitting a Zone Identification (ZID) to the Monaco D-21 VHF Radio Alarm System located in the fire stations (FM frequency 138.925 MHz).
  - a. For new construction, boxes shall be recessed mount type.
  - b. For existing construction, surface mount type is acceptable.
2. "Knox Boxes" conforming to the fire departments key plan shall be used. Contact the base Fire Prevention office for key code information.
3. All "Knox Boxes" shall be tied into the facilities Fire Alarm Control Panel.
4. All "Knox Boxes" shall be located per directional and approval of the FAFB Fire Prevention Office.

**J. GENERAL REQUIREMENTS**

1. Tamper switches required for all post indicator and OS&Y valves to indicate trouble
2. Panel shall be accessible to the fire department when the building is not occupied.
3. Provide transmitter zone schedule. A minimum of 16 Zones shall be supplied with the capability to expand to 32 or 64 depending on the size of the facility being built.
4. The complete Fire Alarm System shall be the product of only one manufacturer. And shall be capable of communicating with the Monaco D-21 System.
5. There shall not be any relays between Fire Alarm panel(s) and Radio Transmitter, hardwired in only.
6. Fire alarm panel shall have Point to Point capability through the Monaco D-21 System.

Only Mass Notification Systems recommended by the fire alarm systems manufacture shall be used and installed IAW the latest edition of UFC 4-010-01 and UFC 4-021-01

Smoke detector over fire alarm panel shall be no higher than 5 ft.

All wires shall be clearly identified for bell circuit and/or speaker/audio for MNS.

The AHJ shall be notified after conduit is installed for visual inspection. No panels shall be installed without coordination or location(s).

The last device installed must have an engraved sign stating the value and location of the end of line resistor.

On all false ceiling grids the cross "T"s will be marked with a RED dot indicating the location of fire 'J' boxes.

**SECTION 312000 – EARTH MOVING****A. TOPSOIL AND FILL**

1. No topsoil or fill is available on Fairchild AFB.

**B. EXCAVATED MATERIAL**

1. Excavated material shall be hauled off base to a certified landfill site approved by the Contracting Officer. Copies of all dump receipts shall be submitted to the Contracting Officer, including quantities intended for recycling purposes.

**C. PETROLEUM-CONTAMINATED SOIL**

1. Refer to FAIRCHILD AIR FORCE BASE DESIGN GUIDE Section013543, Paragraph 1.09.

**SECTION 320000 – EXTERIOR IMPROVEMENTS****A. GREEN PROCUREMENT PROGRAM**

1. Fairchild Air Force Base has adopted the *Green Procurement Program Plan* regarding recycling and conserving resources. The Plan requires that some construction materials be composed of a minimum percentage of recycled products. See FAIRCHILD AIR FORCE BASE DESIGN GUIDE Section016000, *Product Requirements*, for details.

**B. AIRFIELD PAVEMENTS**

1. The United States Air Force has very stringent and specific requirements for airfield pavements. Consult the Air Force project manager to obtain a copy of the latest guide specifications/handbooks for any airfield pavement projects.

**C. BASE ROADS AND PARKING LOTS**

1. Base roads and parking lots shall be designed for the appropriate level of vehicle traffic. Parking lots shall be located away from the front of the building. Parking lot designs shall allow for removal of snow and ice. Provide integral, rolled Portland Cement Concrete curb and gutter for both roads and parking lots.
2. Street/road and parking lot repairs shall be completed within 48 hours of demolition operations. If repair is scheduled for more than 48 hours after demolition operations, then a cold mix shall be used as a temporary installation until the hot mix becomes available.
3. Base roads/streets are composed of asphalt concrete (AC) pavement, while some overlay existing Portland cement concrete (PCC) roadway. Road/street lane widths range from 10 feet (3.0 meters) to 15 feet (4.6 meters). All new pavement lane widths shall be 12 feet (3.7 meters) where possible, measured to the edge of the asphalt.
4. All projects calling for the installation of new paved roads or the resurfacing of existing paved roads, designer shall specify the installation of two Schedule 80, 4"-diameter conduits, concrete-encased sleeves under the road to be paved for the accommodation of future power and communication lines. Two such sleeves shall be installed beneath each branch of each intersection and also beneath the roadway at reasonable intervals between intersections.
5. If recycled PCC is to be used for base course, designer shall specify that appropriate conditions shall exist (e.g., documented resistance to sulfate attack), as well as, compliance with WSDOT or USACE specifications.

**D. SCREENING WALLS**

1. Site utility elements such as transformers, electrical switch gear, gas regulators, back flow assemblies, mechanical units, dumpsters, and the like shall be provided with screening elements

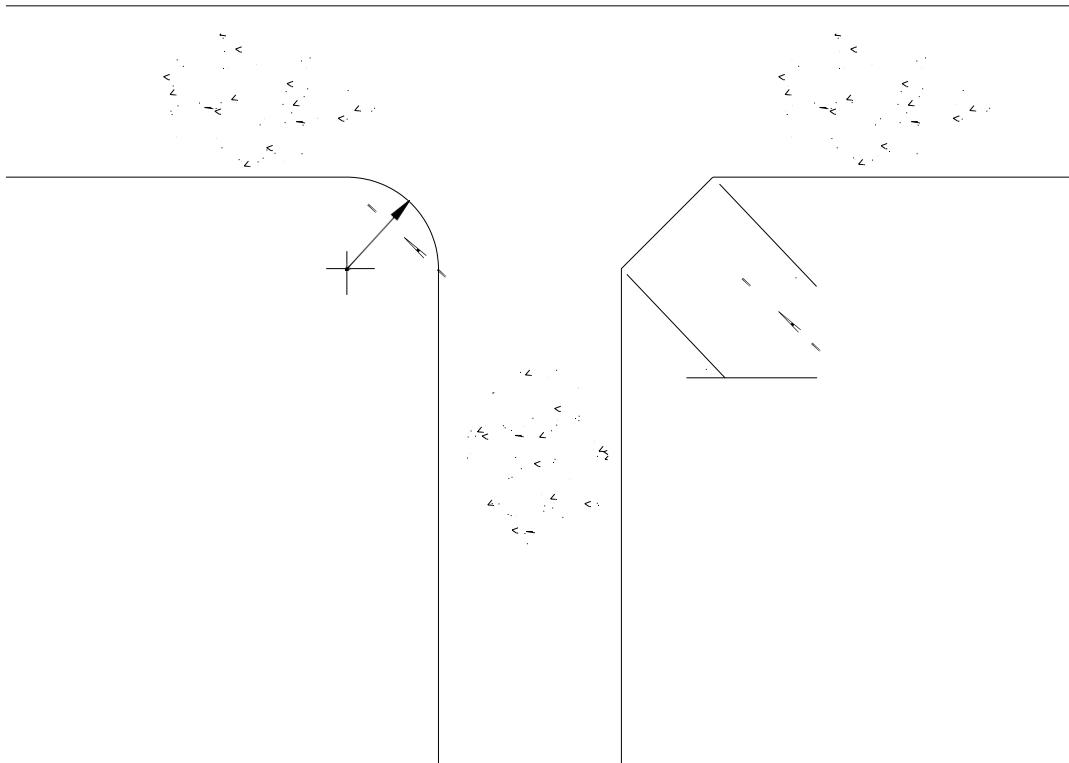
to minimize their negative visual impact while not compromising necessary accessibility considerations.

2. Screen walls constructed of concrete or UNIT MASONRY materials compatible with the surrounding architecture are frequently utilized on base and their use is encouraged. (See FAIRCHILD AIR FORCE BASE DESIGN GUIDE Section 323100).
3. Planted materials may be considered as well; however, hard wall screens shall be provided for all major mechanical air handling equipment and all dumpsters. Views from inside of the building as well as outside shall be considered.
4. Split block/brick fence shall be installed to protect/shield all gas regulators, transformers, exterior HVAC, back flow assemblies, mechanical units, dumpsters, etc. from vehicle damage and as a vision screen.
5. Screening walls shall be provided for all dumpsters, exterior electrical/ mechanical equipment, etc. Ensure sufficient clearance for maintenance access. Electrical equipment (e.g., transformers and junction cabinets), requires 8' minimum clearance on operable sides for "hot stick" work. Provide 4' minimum clearance on all other sides of electrical equipment.
6. There are three types of screening walls found on Fairchild AFB.
  - a. Walls located next to block facilities shall be constructed of blocks per Detail 1 and Detail 2, FAIRCHILD AIR FORCE BASE DESIGN GUIDE Section 323100.
  - b. Screening walls located next to bricked facilities shall be bricked per Detail 3, FAIRCHILD AIR FORCE BASE DESIGN GUIDE Section 323100.
  - c. Walls located next to facilities that are "Sierra Tan" in color but not of brick or block construction shall be constructed per Allen Block Corporation's mortar-less concrete block wall system. Plans and specifications can be obtained by contacting the Allen Block Corporation at 1-800-899-5309.
  - d. Block shall be standard gray color to be painted with color as approved and selected by Government.
7. See Section 042000, *Unit UNIT MASONRY*, for Fairchild AFB standard colors.
8. See *Architectural Compatibility Plan* section "Screens and Enclosures."

## SECTION 320000 – MISCELLANEOUS DETAILS

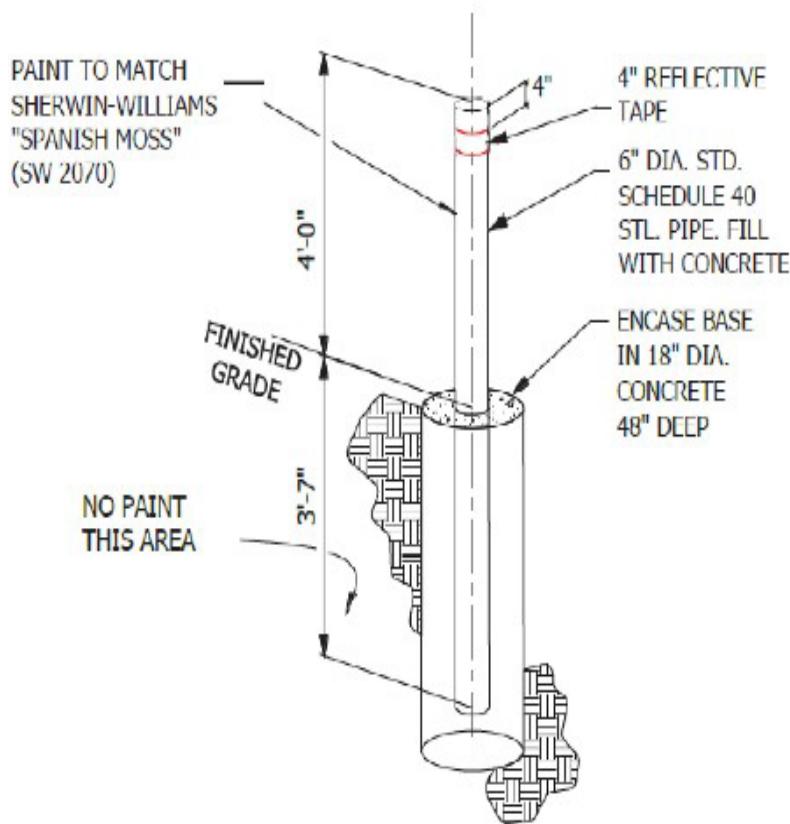
### A. DETAILS

1. Sidewalk Intersection
2. Bollards
3. Bike Rack
4. Outdoor Bench

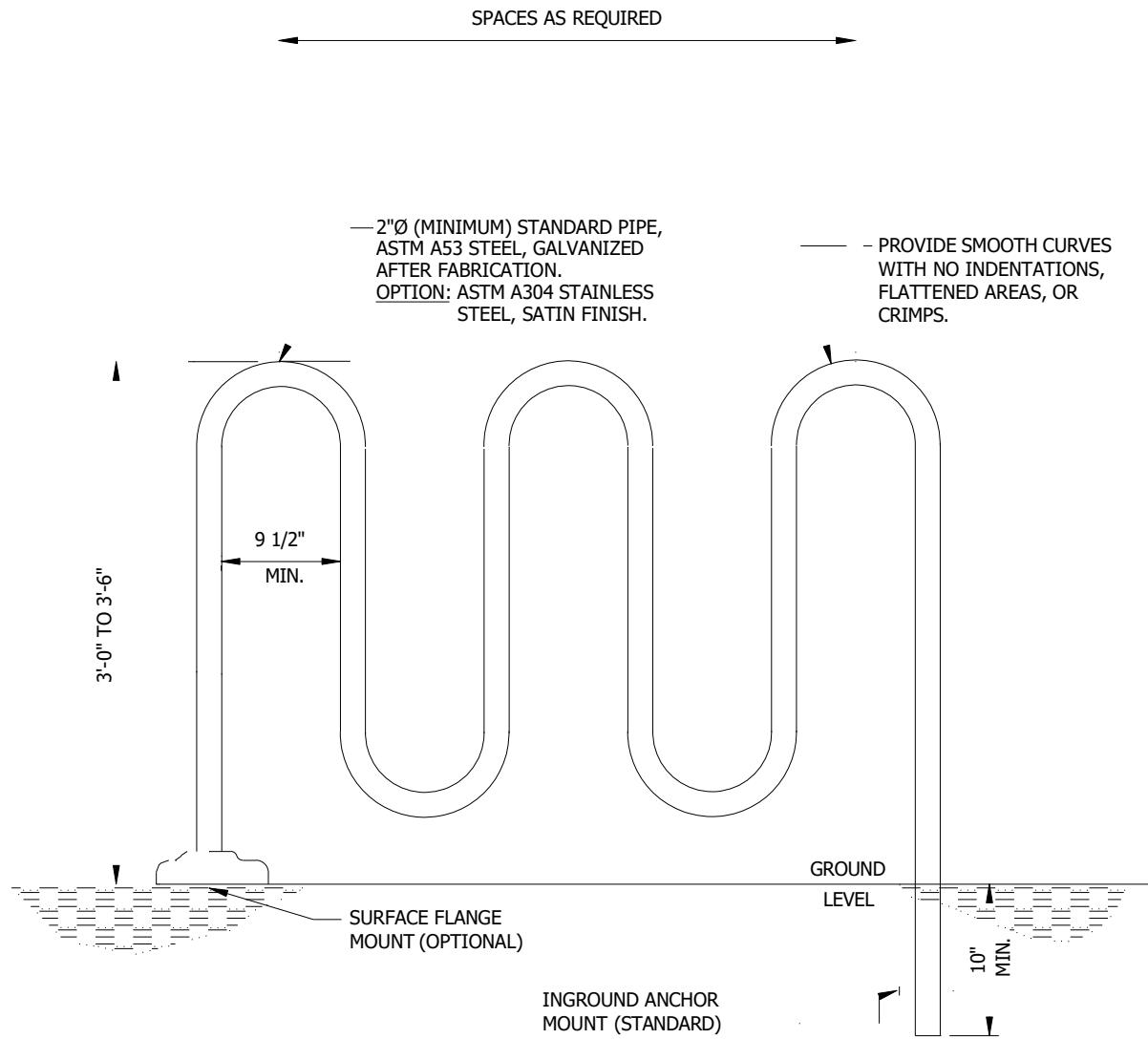
**DETAIL 1 – SIDEWALK INTERSECTION**

"A" = 3'-0" MINIMUM

SCALE: NONE

**DETAIL 2 – BOLLARDS**

SCALE: NONE

**DETAIL 3 – BIKE RACK**

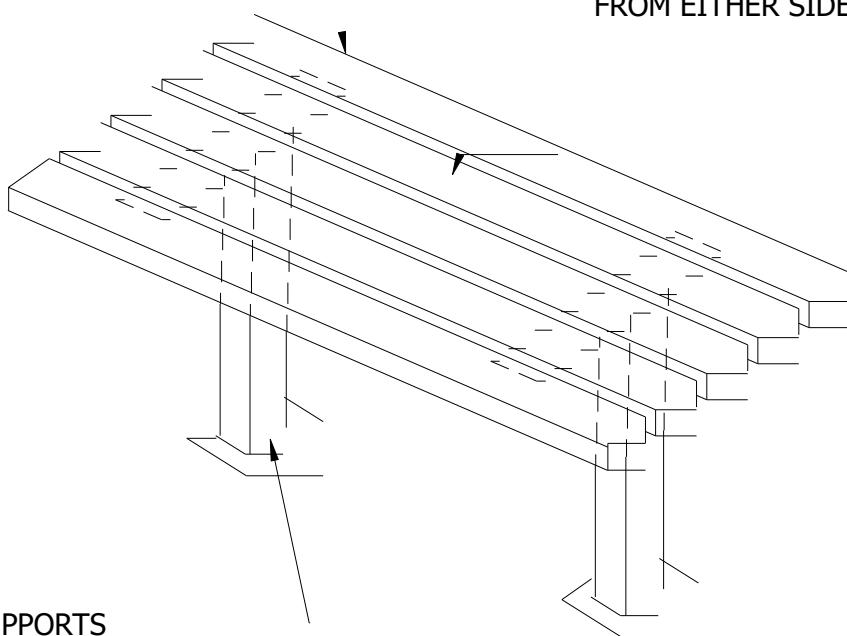
## DETAIL 4 – OUTDOOR BENCH

(TYPICAL)

WEATHER RESISTANT  
WOOD BENCH SEAT

- PROVIDE FLAT BENCH SURFACE WITH NO BACK TO AFFORD SEATING FROM EITHER SIDE

METAL SUPPORTS  
PAINTED. (CONCRETE  
MAY BE CONSIDERED  
ON AN INDIVIDUAL  
BASIS)



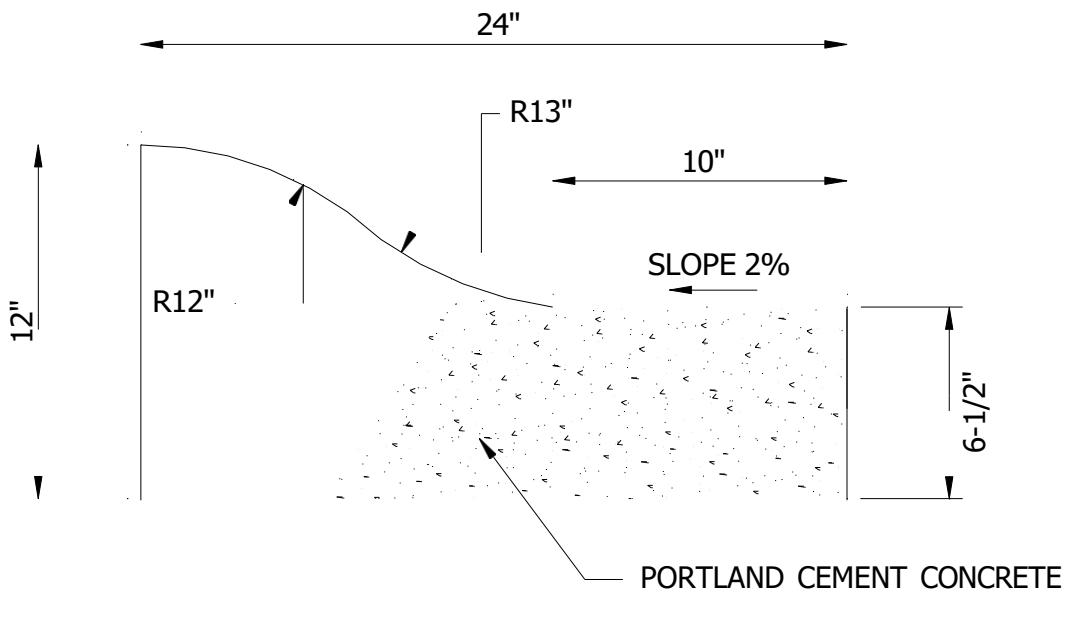
NOTE:

CONFIGURATIONS MAY VARY, BUT  
COMPONENTS MATERIAL SHALL  
MATCH THOSE INDICATED.

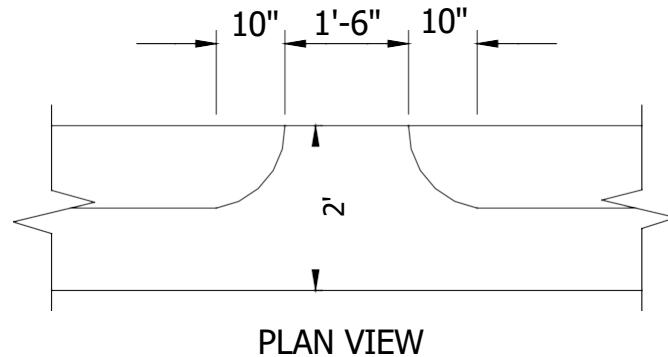
SCALE: NONE

**SECTION 321600 – CURBS AND GUTTERS****A. CURB DETAILS**

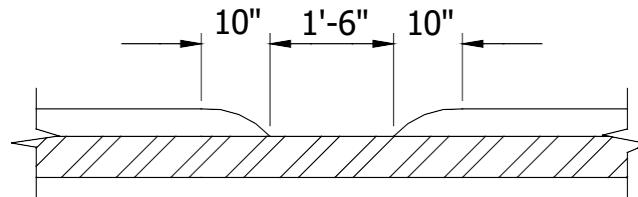
1. Typical Curb and Gutter
2. Typical Curb Cut
3. Asphalt Curb Backing
4. Earthen Curb Backing

**DETAIL 1 – TYPICAL CURB AND GUTTER**

SCALE: NONE

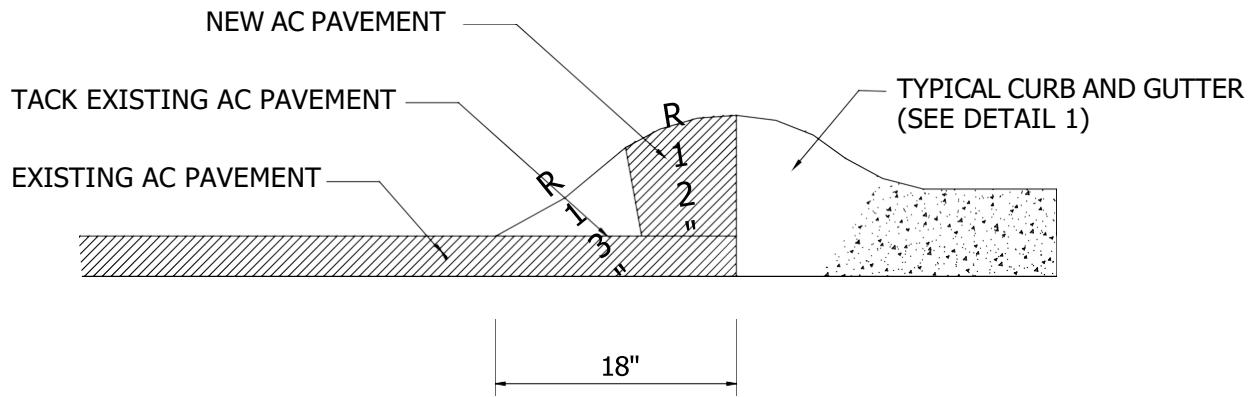
**DETAIL 2 – TYPICAL CURB CUT**

PLAN VIEW

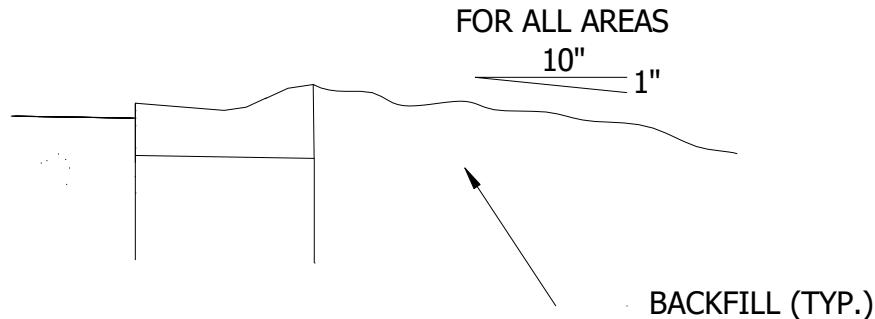


ELEVATION

SCALE: NONE

**DETAIL 3 – ASPHALT CURB BACKING**

SCALE: NONE

**DETAIL 4 – EARTHEN CURB BACKING**

SCALE: NONE

END OF DETAILS

**SECTION 323100 – FENCES AND GATES****A. GENERAL**

1. Requirements for fencing by type of installation and application are stated in AFMAN 31 series for restricted areas, AFI 31-101 for controlled areas, and DoD 5100.76-M for base defense. Details on installation of Type A fencing are found in USACE Specification, which guides Air Force construction.
2. The standard at Fairchild AFB for installation perimeter, restricted area and controlled area fence and gates is Type A fencing.

**B. REFERENCES**

1. Department of Defense, <http://www.wbdg.org>
  - a. AFMAN 32-1084, *Facility Requirements*
  - b. UFC 4-022-01, *Security Engineering: Entry Control Facilities / Access Control Points*
  - c. UFC 4-022-02, *Selection and Application of Vehicle Barriers*
  - d. UFC 4-022-03, *Security Fences and Gates*
  - e. AFI 31-101,
2. Air Force Instruction (AFI)
  - a. AFI 31-101, *Integrated Defense*

b. AMC Supplement 1 to AFI 31-101, *Integrated Defense*

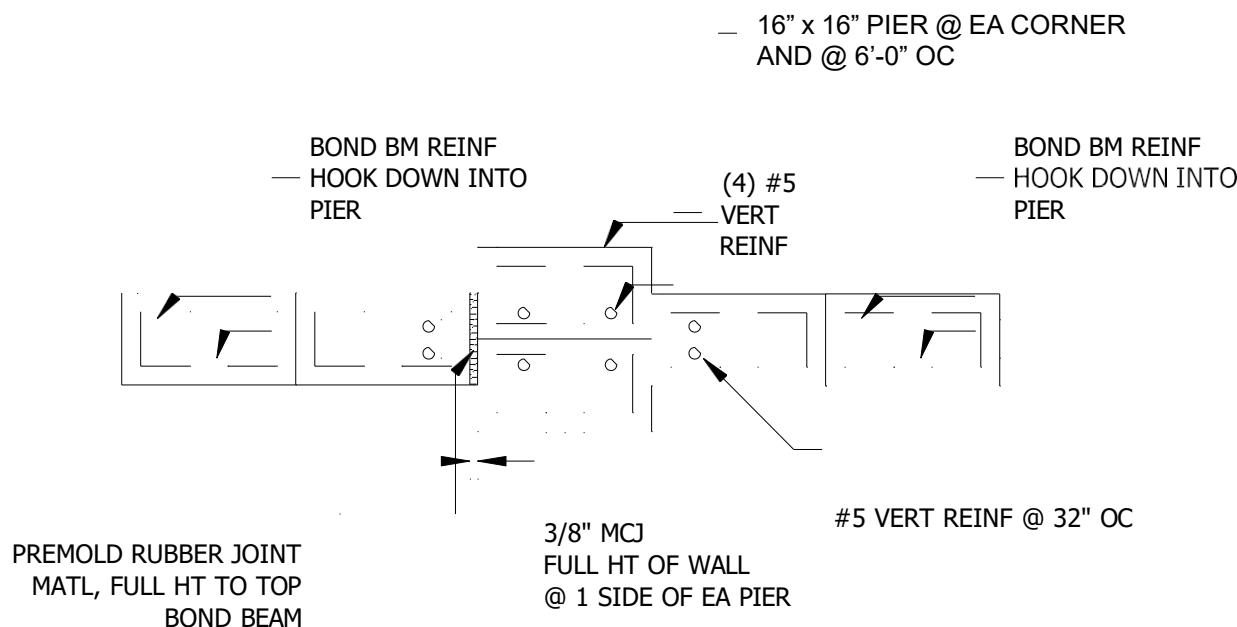
## SECTION 323100 – FENCES AND GATES

### C. SCREENING WALL DETAILS

1. Wall Column
2. Screen Wall
3. Wall Screen or Enclosure

## DETAIL 1 – WALL COLUMN

(TYPICAL PLAN VIEW)

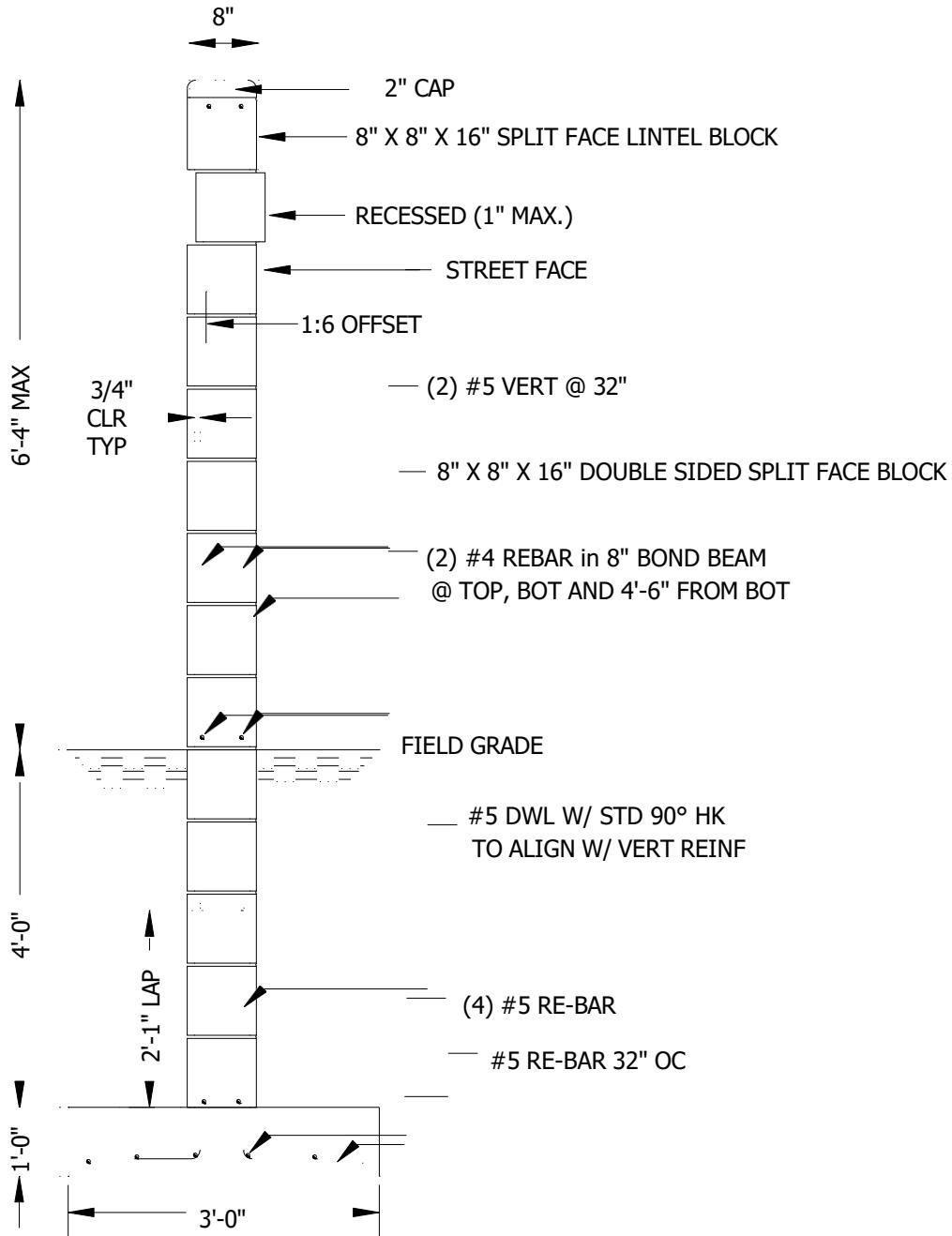


NOTE: BOND BEAM REINF SHALL BE TERMINATED  
EA SIDE OF MCJ EXCEPT BOND BEAM AT TOP  
OF WALL WHICH SHALL BE CONTINUOUS

SCALE: NONE

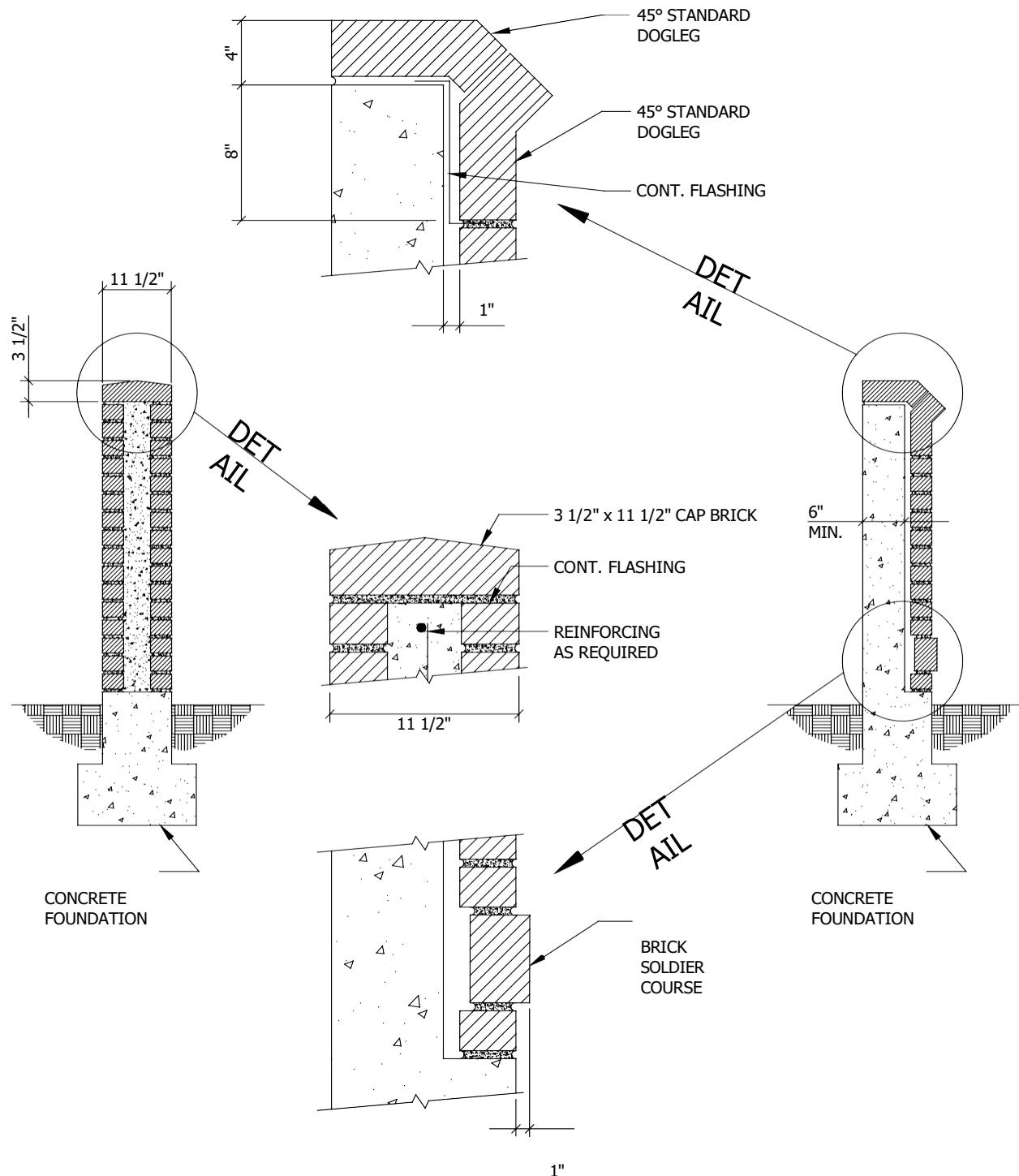
**DETAIL 2 – SCREEN WALL**

(TYPICAL DIMENSIONS)



\*This footing design is acceptable for walls up to 6'4" high. Taller walls require validation of the footing design.

SCALE: NONE

**DETAIL 3 – WALL SCREEN OR ENCLOSURE**

SCALE: NONE

END OF DETAILS

## SECTION 328400 – PLANTING IRRIGATION

### A. MAINTENANCE ISSUES

1. Irrigation and Building Walls: Overspray of irrigation water onto building walls stains, may damage, and causes efflorescence on walls. Due to persistent wind conditions at the Base, it is impractical to irrigate turf areas adjacent to buildings without spraying the walls.
  - a. There shall be no turf irrigation within 10 feet of building walls, and the first row of turf heads nearest the building shall be directed away from building face.
  - b. When irrigating turf areas near buildings with large radius heads, use low angle nozzles when available.
  - c. Drip and/or bubbler irrigation shall be used for all shrub, groundcover, and flower beds.
2. Generally, it is recommended that a 10' strip along building foundations be maintained in 1"-2" washed river gravel over weed fabric, and/or groundcover plantings, such as low ground hugging junipers, sedums, or drought-tolerant perennials irrigated by drip and/or bubbler irrigation. Where vandalism is a concern, gravel shall not be specified.
3. Water Efficient Irrigation: The irrigation design specifications shall require that the irrigation contractor provide the owner and maintenance contractor proper training to learn the operation and maintenance of the irrigation system and that the irrigation system shall be maintained to operate at optimum efficiency.

### B. IRRIGATION SYSTEMS

1. General
  - a. Fairchild AFB is located in a semi-arid to arid environment and is subject to persistent winds in the range of 10 to 25 mph. Adequate recognition of these factors is essential to the design of irrigation systems for Base facilities to avoid poor performance and resulting dry spots.
  - b. Planting design and irrigation design should be integrated to establish a water budgeting scheme. For example, zones of landscape/irrigation intensity should be developed to provide plantings and irrigation according to areas of importance in terms of appearance, image, and use. Visually less important areas should be developed with less planting and only minimal to no irrigation. The zones shall be determined by function as follows: (See Exhibits 1-3 at end of FAIRCHILD AIR FORCE BASE DESIGN GUIDE Section329000)
    - Public Landscape Zone – High visibility areas where both military and civilian personnel and guests will be present, such as entry features, community facilities, recreation centers, etc.
    - General Landscape Zone – Moderately visible areas where predominantly base personnel are present, such as residential dormitories, staff administration facilities, classroom facilities, etc.
    - Industrial Landscape Zone – Low visible areas where the industrial, utilitarian functions predominate to serve the operation and function of the Base, such as aircraft areas and hangers, military training facilities, public works facilities, etc.
  - c. System components (piping, valves, etc.) shall be sized to accommodate future modifications to the system including a 25% increase in water flow in excess of the immediate need. Where future projects are planned for a given area, adequate provisions shall be made to extend the system into the planned development or to share appropriate system components. Refer to Details for irrigation system component details.
  - d. System components selected shall be appropriate for their use and location. In turf areas, the head chosen for any given area shall have the largest radius which can be accommodated within the most intricate section of that area to be irrigated. However, care

must be exercised in the vicinity of buildings to avoid irrigation spray from being carried by the wind onto building walls and windows. Low angle nozzles shall be used whenever available. Where sandy soils predominate, heads with stainless steel shafts shall be specified. Shrub, groundcover, and flower beds shall be irrigated with drip and/or bubbler irrigation systems.

- e. Shrub areas and lawn areas shall be placed on separate irrigation circuits. However, where low-height shrub areas lie in the middle of large open lawn areas, large radius lawn heads may be used to irrigate the lawn and shrub areas together, provided all heads are located sufficient distances from the shrubs such that no blockage of the irrigation stream occurs immediately, and in the future when plants have reached mature size.
  - f. Shrub/groundcover beds shall be grouped on separate irrigation zones based on sun exposure, soil characteristics, plant type, moisture requirements, etc.
  - g. The system shall be designed such that one full cycle, operating all circuits, can be completed between 2100 hours and 0600 hours. If drip circuits are included, they will be wired to the last station on the controller and can be operable outside the time frame specified above. The time required for each station will be dependent upon the type of irrigation head used. The system shall be designed to provide at least 1-1/2 in. of precipitation per week. This is normally provided by applying 1/2 in. of precipitation three times per week (or every other day), although other schedules can be used. If the above criteria can not be met with one controller, another controller shall be added and the system supply line and main lines shall be upsized. Where more than one controller is used to operate the system, main-line piping shall be sized based upon the assumption that one station from each controller may be operating simultaneously.
  - h. All irrigation system components specified and/or used shall be of commercial quality. Residential grade materials are not acceptable. No products shall be specified and/or used for which replacements, spare parts, or services are not readily available within the Spokane area.
  - i. Shop drawings for irrigation system components shall be included with the contractor as-built.
2. Head Types
- a. Irrigation systems at the Base shall be designed and engineered based on the performance specifications of the following products:
    - (1) Small (up to 15-ft radius)
      - (a) Hunter MPR40 Rotator 1000 Series (12-ft to 15-ft)
      - (b) Hunter MPR40 Rotator Corner Series (10.5-ft to 15-ft)
      - (c) Hunter Pro Spray and Institutional Spray Series (5-ft to 17-ft)
      - (d) Rain Bird 1800 Series (plastic nozzles), (Rotary Nozzles)
      - (e) Toro 570Z Series (plastic nozzles)
    - (2) Mid-range (15-ft to 30-ft radius)
      - (a) Hunter MPR40 Rotator 2000 Series (16-ft to 21-ft)
      - (b) Hunter MPR40 Rotator 3000 Series (25-ft to 30-ft)
      - (c) Hunter I-10/I-20 Ultra (18-ft to 25-ft)
      - (d) Hunter PGJ Series Stream Rotor
      - (e) Toro Mini 8 Series Stream Rotor (20 ft to 35 ft)
      - (f) Toro 340 Series Stream Rotor (16 ft to 30')
      - (g) Rainbird 3500 Series & 5500 Short Radius.

- (3) Large (25-ft to 50-ft radius)
    - (a) Hunter PGP
    - (b) Hunter I-20
    - (c) Rain Bird 5000 Series, & 5500 Series
    - (d) Toro XP-300
    - (e) Toro T5, Super 800 Series, & TR50 Series
  - (4) Maximum (40-ft radius and above)
    - (a) Hunter I-25, I-35 SIERRA
    - (b) Hunter I-40, I-40, & I-60
    - (c) Rain Bird 8005 Series
    - (d) Toro T7 Series, TR70P Series, TR70XTP Series, 2001 Series, TS90 Series, & Toro 640 Series,
  - (5) Strips
    - (a) Hunter MPR40 Rotator Strip Nozzles
    - (b) Hunter Pro Spray & Institutional Spray Strip Nozzles.
    - (c) Rain Bird 1800 Series Strip Nozzles
    - (d) Toro 570z Strip Nozzles
  - (6) Bubblers & Stream Spray
    - (a) Hunter Bubbler & Multi-Stream Bubbler Nozzles.
    - (b) Hunter Stream Spray Nozzles.
    - (c) Hunter RZWS Root Zone Watering System.
    - (d) Rain Bird RWS Root Watering Series
- b. The manufacturers listed represent the bulk of systems currently in use on the Base. They also represent the extent of commercial grade systems readily available in the Spokane area. Should other product lines become established in this area, their use will be considered by the Base on a project-by-project basis.
- c. Water conserving features, such as factory installed drain check valves, low angle trajectory for wind resistance, stream rotor features as opposed to spray, adjustable arc and radius adjustment to control overspray onto hardscape areas, lower precipitation rate nozzles, etc. should be specified as appropriate for the particular application and site.
3. Head Spacing
- a. Irrigation systems at the Base shall be controlled by "Smart" weather based controllers that have the capability of integrating with a Central Controller system. The Central Controller system will be capable of stopping the irrigation based on a preset maximum wind speed.
  - b. The maximum head spacing, when triangular spacing is used, shall be "head to head" spacing. The maximum row spacing, when triangular spacing is used, shall be 89% of the head spacing (this creates an equilateral triangle layout). If square spacing is used, the maximum head and row spacing shall be 90% of the "head to head" spacing. This compensates for the weak spots inherent in square spacing.
4. Electric Remote Control Valves
- a. Irrigation systems at the Base shall be designed and engineered based on the performance specifications of the following products:

- (1) Hunter PGV Series, & ICV Series
  - (2) HunterICV Series & ICV Filter Sentry Series for non-potable, reclaimed water use.
  - (3) Rain Bird PEB Series, & PGA Series
  - (4) Rain Bird PESB-R Series for non-potable, reclaimed water use.
  - (5) Toro 252 Series
  - (6) Toro P-220 Series for pressure regulation.
  - (7) Toro P-220S Series for non potable, reclaimed water use.
- b. Refer to Detail 3.
- c. Valves should have the pressure regulating option specified for control of pressure fluctuations.
5. Quick Coupler Valves
- a. Quick coupler valves shall be provided at the point of connection to the domestic water supply system (for winterization) and elsewhere along the irrigation system main line where access to the irrigation water supply is desired.
  - b. The quick coupler valve shall consist of a two-piece assembly of heavy duty brass construction with a rubber cover. Two operating keys with hose swivels shall be provided. (See Detail 4)
6. Manual Drain Valves
- a. A manual drain valve shall be provided at the point of connection immediately downstream from the backflow preventer.
  - b. The drain valve shall consist of a manual angle valve of heavy duty brass construction with a cross handle designed for key or hand operation.
7. Automatic Drain Valves
- a. Automatic drain valves shall be installed at all low points on the irrigation lines.
8. Isolation Valves
- a. Isolation valves in combination with quick coupler valves shall be used to divide the main line of large systems into sections to facilitate maintenance and to assist in the winterization of loop mains.
  - b. Isolation valves shall consist of 150 psi WOG gate valves of heavy duty brass construction with a non-rising stem designed for key or hand operation.
9. Valve Sizing
- a. Valves shall be sized to accommodate future modifications to the circuit which might result in an increase of up to 25% in the water flow. Performance characteristics vary from model to model, but the following guidelines would generally apply:

<u>Valve Size (inches)</u>	<u>Maximum Flow (gpm)</u>
1	22.5
1-1/2	55
2	100
3	225

- b. Many areas of the Base are characterized by low water pressure. The Designer is responsible for verifying water pressure during the design of the irrigation system. As a general rule, water pressure on Base is approximately 40 psi, however, it varies based on the point of connection to the main water line.

#### 10. Valve Adjustment for Windy Conditions

- a. The contractor shall be instructed to adjust the flow control on all valves such that the heads produce the largest water droplets possible while still maintaining head-to-head coverage.

#### 11. Backflow Preventers

- a. A backflow preventer shall be provided at each point of connection to the domestic water supply system. The backflow preventer shall consist of a double check valve assembly with resilient seated shutoff valves and test cocks, and shall be of heavy duty bronze construction (up to 2 in. size) or epoxy-coated cast iron (2-1/2 in. and above). Backflow preventer shall be installed below ground level (Refer to Detail 6). The design specifications shall contain the requirement that all backflow preventers shall be tested by a Washington State certified inspector prior to connecting the irrigation system to the potable water system. A certified test report shall be a submittal item and shall be approved prior to activation of the irrigation system.
- b. All backflow prevention assemblies shall be manufactured by Febco or Wilkins and shall, at time of installation, reside on the current publication of Washington State Department of Health – Division of Environmental Health – Office of Drinking Water's Publication 331-137, *Backflow Prevention Assemblies Approved for Installation in Washington State*.
- c. Backflow Preventer Sizing
- (1) Backflow preventers shall be sized to accommodate future modifications which may result in an increase of up to 25% in the water flow. Performance characteristics vary from model to model, but the following guidelines would generally apply:

<u>Double Check Valve Size (inches)</u>	<u>Maximum Flow (up to gpm)</u>
1	38
1-1/2	75
2	125
Two 1/2	150
Two 2	250

#### 12. Automatic Controllers

- a. For general purposes, irrigation systems at the Base shall be controlled by means of electronic irrigation timers, and shall operate on 120 volts a.c. building power, providing 24 volts a.c. power to the valves. The controller shall also provide for manual and semi-automatic operation, have an internal transformer and a lockable weatherproof cabinet. Electronic controllers shall be provided with surge protection and a battery backup to protect station programming during power outages. All controllers shall be "Smart" Weather-Based and have central controller compatibility, and after such time that the Base installs central irrigation controls, all future controllers shall be compatible with it.
- b. For interior installations, an external transformer and non-weatherproof, non-locking cabinet are acceptable.
- (1) Irrigation systems at the Base shall be designed and engineered based on the performance specifications of the following products:
- (a) Rain Bird ESP-LX Modular, ESP-MC, ESP-LXD & ESP-SMT.
- (b) Hunter PRO-C, ICC, & ACC.

- (c) Toro Custom Command Series Toro Intel-Sense Series, TDC Series, & TMC-424 Series.
- (d) Baseline System Basestation 3200 controller.
- (e) Calsense ET2000e controller.
- c. Battery-operated or solar-powered controllers may be considered in special cases only, and only for temporary use. The Energy Manager and Resource Efficiency Manager (92 CES/CENP) shall be consulted when solar-powered type controllers are being considered. Solenoids designed for use with direct currents must be used on valves operated by battery powered controllers. Water conserving features shall be a part of any battery or solar powered controller.
- d. The irrigation system controller (timer) shall be located in the building mechanical/electrical room or in an inaccessible exterior location, such as a mechanical/electrical equipment enclosure. However, if a controller cannot be placed in a building or other enclosure, an outdoor weather-proof cabinet shall be installed to contain the controller. The standard of quality for the weather-proof cabinet and/or pedestal shall be steel, NEMA 3R/outdoor rated box, painted, and commercial grade.
- e. Water Budgeting – During drought periods and when Base water storage reaches low levels, the irrigation system shall have the capability of automatically shutting down. Furthermore, controller schedules and timing shall automatically adjust to provide minimal irrigation during low level water periods to provide just enough water to keep plants alive. The Base central controller shall be wired directly to the water storage tanks, and have a preset water level that will signal the controller to shut the irrigation system down and go to a deficit watering cycle until water levels return to normal.

### 13. Master Valve

- a. A Master Valve shall be included at all points of connection to the Base main water line and wired to the controller to allow automatic control of the water supply.

### 14. Flow Sensor

- a. A Flow Sensor shall be included at all points of connection to the Base main water line and wired to the controller to allow data gathering on flow and automatic control of the water supply and flow to the irrigation system.

### 15. Valve Boxes

- a. Valve boxes shall be provided for all remote control valves, backflow preventers, and similar equipment located out in the field. Valve boxes shall be of sufficient size to facilitate easy removal and/or maintenance of equipment.
- b. In landscape areas, utilize products meeting the general specifications of Carson or Ametek standard structural plastic valve box and cover with a lock bolt. In paved areas, precast concrete valve boxes with cast iron covers shall be specified.

### 16. Pipe and Fittings

- a. Main line piping shall be as follows:
  - (1) Pipe under 3" diameter shall be PVC Class 200 solvent weld with PVC Schedule 40 socket-type solvent weld fittings. Concrete thrust blocks shall be installed at all tees and changes in direction.
  - (2) Pipe 3" and larger diameter shall be PVC Class 200 gasketed bell-joint with gasketed ductile iron fittings with joint restraints (knuckles on the end of all fittings).

Lateral line piping shall be PVC Class 200 with PVC Schedule 40 socket-type solvent weld fittings.

- b. Pipes passing under walks and drives and through walls, etc. shall be placed in pipe sleeves. The pipe sleeve shall be at least twice the diameter of the pressure or circuit pipe it serves. Under walks and light duty driving surfaces, pipe sleeves shall be constructed of PVC plastic pipe, Class 200. Under heavy traffic driving surfaces, pipe sleeves shall be constructed of PVC Schedule 40 pipe for sizes 4" in diameter and less, and PVC Class 200 for sizes 6" in diameter and larger.. Pipe sleeves shall be buried 12 in. minimum under walks and 18 in. minimum under drives.
- c. Each point of connection to the domestic water supply system shall include the following items:
- (1) 3/4-in. minimum manual drain valve.
  - (2) Backflow preventer (double check valve assembly).
  - (3) 3/4- or 1-in. quick coupler valve (for winterization).
- d. When the point of connection occurs within a building, all piping inside the building and the first 5 ft of piping outside the building shall be Type K copper water tube with soldered fittings. The quick coupler valve may be located just outside the building wall to facilitate access.
- e. When the point of connection occurs in a large precast concrete utility vault, all piping inside the vault and for the first 5 ft outside the vault shall be galvanized steel pipe, Schedule 40, with malleable iron threaded fittings.
- f. In other situations, PVC plastic pipe may be used, except that for systems requiring a 2-1/2- or 3-in. main line, galvanized steel pipe shall be used until 5 ft beyond the quick coupler valve. On systems requiring a 4-in. main line, galvanized steel pipe shall be used until 10 ft beyond the quick coupler valve. Where a loop main line 2 in. or larger is utilized, all piping between the point of connection and the loop shall be galvanized steel.
- g. Manual drain valves and vacuum relief valves shall be installed at suitable locations in very large systems to facilitate draining of the main line.

## 17. Pipe Sizing

- a. Pipe shall be sized such that water velocity does not exceed 5 ft/s. Main lines must be sized to accommodate the maximum water flow for all circuits which might be operating simultaneously and incorporate a 25% allowance for increases in water flow due to future system modifications. The following guidelines are for PVC plastic pipe, Class 200:

<u>Pipe Size (inches)</u>	<u>Maximum Flow (up to gpm)</u>
3/4	10
1	16
1-1/4	26
1-1/2	35
2	55
2-1/2	80
3	120
4	200
6	425

- b. Where low working pressure at heads is a concern or where long pipe runs are involved, pipe sizes should be increased to reduce pressure losses.

**18. Pipe Burial**

- a. Provide a minimum main line burial of 18 in. and a minimum lateral line burial of 12 in. On very large systems, where main line size exceeds 4 in., a main line burial depth of 30 in. and a lateral line burial depth of 18 in. shall be specified.
- b. Where existing soils contain numerous rocks or coarse gravel, piping shall be bedded in clean sand, 2 in. below and on the sides of the pipe, and 4 in. above.

**19. Wiring**

- a. The wire from the controller to the remote control valves shall be Type UF, solid copper, UL rated for direct burial and sized according to Rain Bird wire sizing recommendations with No. 14 AWG minimum size. Wire shall be continuous without splices except at control valves and splice boxes. Splices shall be made with 3M Scotch-Lok, Rain Bird Pen-Tite, or an equivalent waterproof device. Tape wires together and run in the trench along the main line pipe. Provide expansion curls at each valve and elsewhere at 100-ft intervals. Run at least one spare wire from the controller to all valve locations, looping the spare wire at each valve.
- b. Color code wires as follows:
  - (1) Hot wire: red or black
  - (2) Common wire: white
  - (3) Spare wire: orange
- c. Two-Wire Decoder system replaces the conventional wiring method described above and is available with newer controllers by some manufacturers. This method allows an easy way to add zones to an existing irrigation system by the wiring method connecting a new control valve to an existing controller.

**20. System Installation**

- a. All turf irrigation heads shall be pop-up heads. Shrub beds shall only be irrigated by drip and/or bubbler systems. If bubblers are used, they shall be on their own zone and placed on fixed risers.
- b. Design specifications shall impose the following requirements on the contractor:
  - (1) Main lines shall be pressure tested to a minimum of 100 psi prior to backfilling.
  - (2) Lines shall be flushed with clean water to remove debris prior to installing irrigation heads.
  - (3) All heads shall be mounted on swing joints. (See Detail 7.) As a minimum, the swing joint shall include two Marlex street ells, a standard threaded ell, a 6-in. horizontal nipple and a vertical nipple as required up to the base of the irrigation head (see detail). Quick coupler valves shall be mounted on swing joints constructed of galvanized steel pipe and malleable iron fittings.
  - (4) Shrub bubbler heads shall be mounted 1/2 in. to 1 in. above the level of bark mulch. Turf heads shall be mounted slightly above the thatch line in sod areas and approximately 1/2 in. above the soil line in seed areas. Sod thickness tends to build up over time.
  - (5) Control wires located within buildings shall be placed in conduits.
  - (6) Following installation, the contractor shall bring all heads to proper grade and shall adjust system components as needed to provide uniform coverage, to eliminate overspray on non-irrigated surfaces, and otherwise to optimize system performance.
  - (7) The contractor shall be responsible for initial programming of the controllers.

- (8) The contractor shall be required to record initial settings and affix the recording to the inside of the controller. A description of each station shall also be affixed to the inside of the controller.
- (9) Irrigation systems at the Base shall be designed to accommodate winterization by blowing out the piping system with compressed air.
- (10) The contractor shall be required to provide as-built drawings for the irrigation systems, and the as-builts shall be incorporated into the project as-builts. Furthermore, the contractor shall modify the as-built sheet index to show the added sheets for the irrigation system drawings.

## 21. Drip Systems

- a. Drip irrigation systems shall always be specified for shrub and groundcover beds for water conservation, and to direct moisture directly to the roots of the plant material. Also, for short-term use in the establishment of dryland plantings, drip type systems and/or temporary above-ground systems shall be provided. However, the designer shall consult with the Air Force Project manager to determine whether temporary systems will be required for turf establishment.

## 22. System Training

- a. Irrigation designers shall include, as part of the irrigation design specifications, that the contractor is responsible for training Base maintenance personnel, and/or Base maintenance contractors in the operation and maintenance of the irrigation system prior to final acceptance.

## 23. Warranty Periods

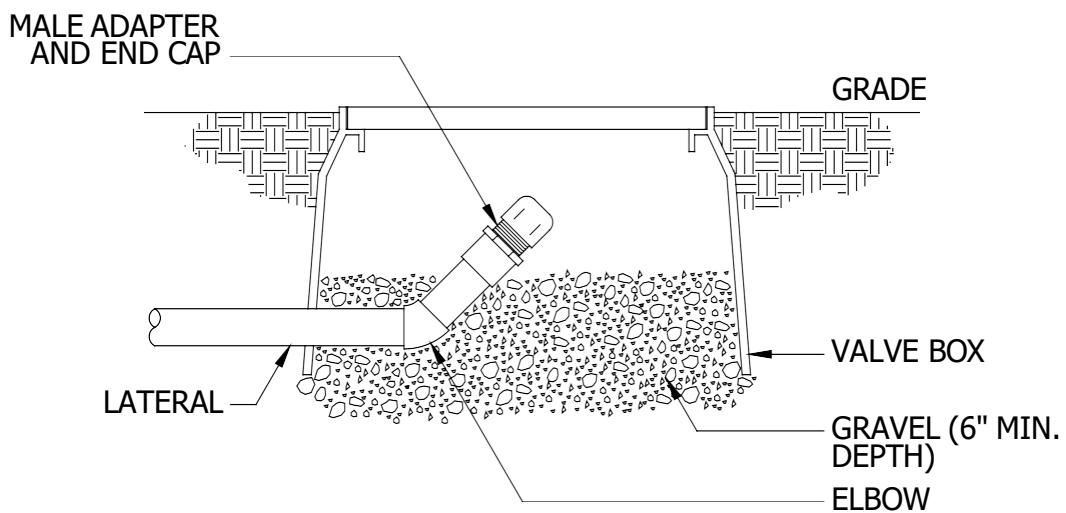
- a. Contract documents shall require the installer of the system to warranty the complete installation (parts and labor) for one full year.
- b. Any extended warranties or guarantees provided by the manufacturer shall be provided to the Base.

## 24. Maintenance Periods

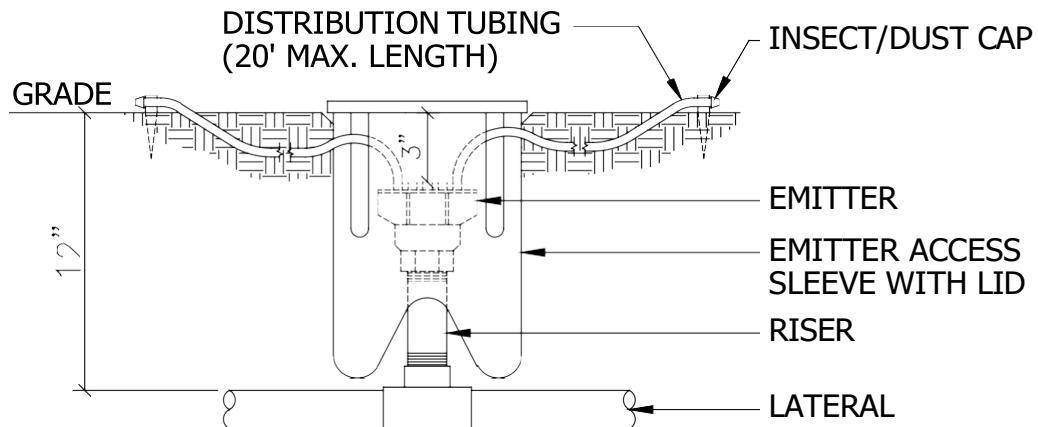
- a. System specifications shall require that the first year's winterization and spring start-up are the responsibility of the system installer. This will eliminate the possibility of any kind of dispute regarding whether the winterization was properly performed, with respect to the warranty. This also provides an opportunity for the installer to instruct those who will be maintaining the system in proper winterization and start-up procedures.

**SECTION 328400 – PLANTING AND IRRIGATION****D. DETAILS**

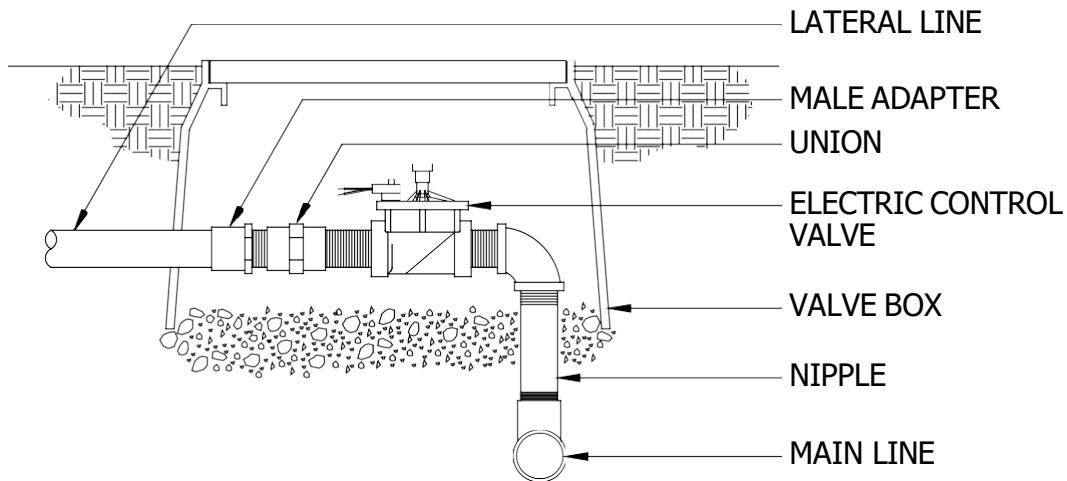
1. Flush Point
2. Emitter
3. Electric Control Valve
4. Quick Coupler Valve
5. Auto Drain Valve
6. Backflow Preventer
7. Swing Joint

**DETAIL 1 – FLUSH POINT**

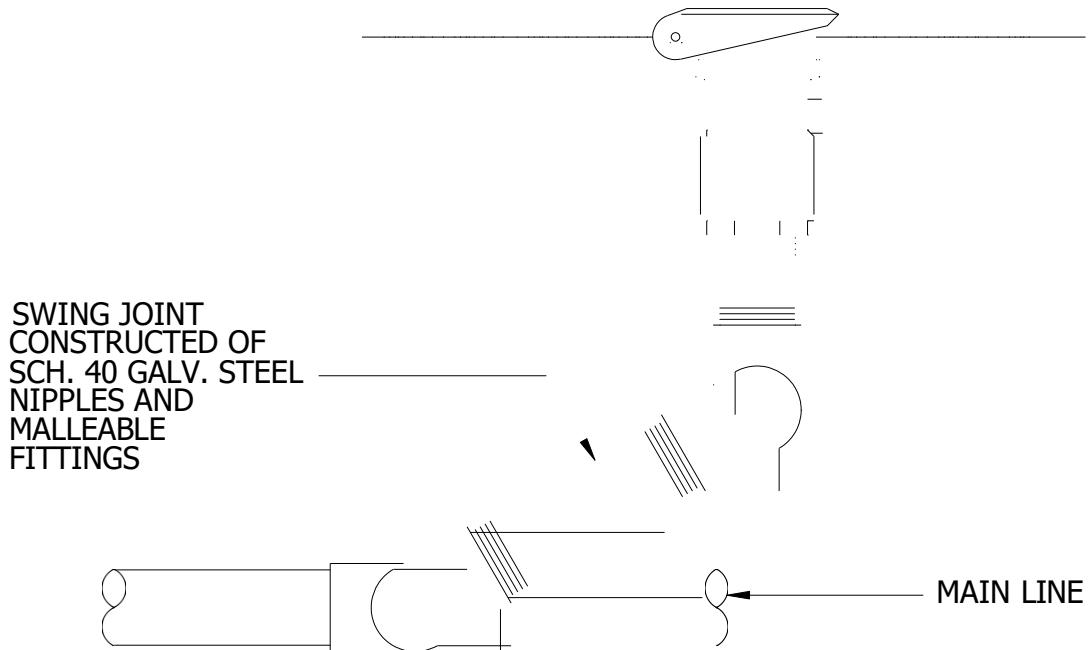
SCALE: NONE

**DETAIL 2 – Emitter**

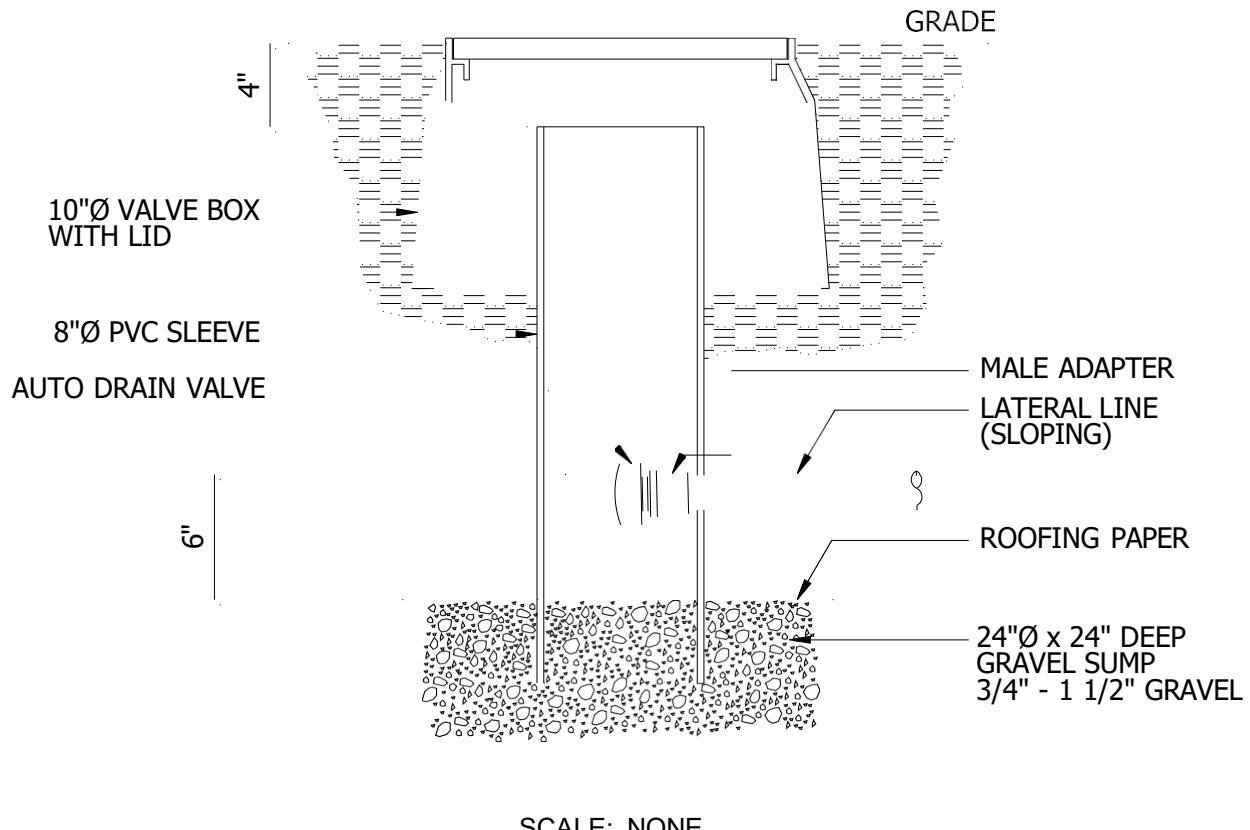
SCALE: NONE

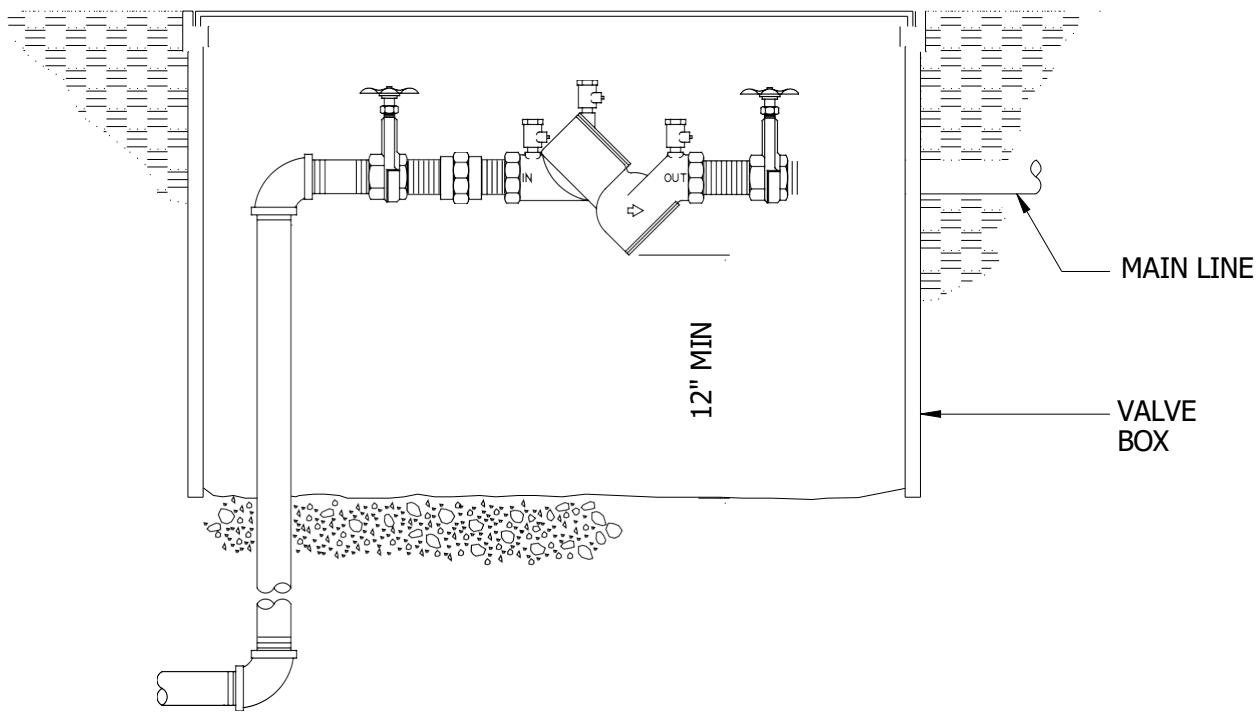
**DETAIL 3 – ELECTRIC CONTROL VALVE**

SCALE: NONE

**DETAIL 4 – QUICK COUPLER VALVE**

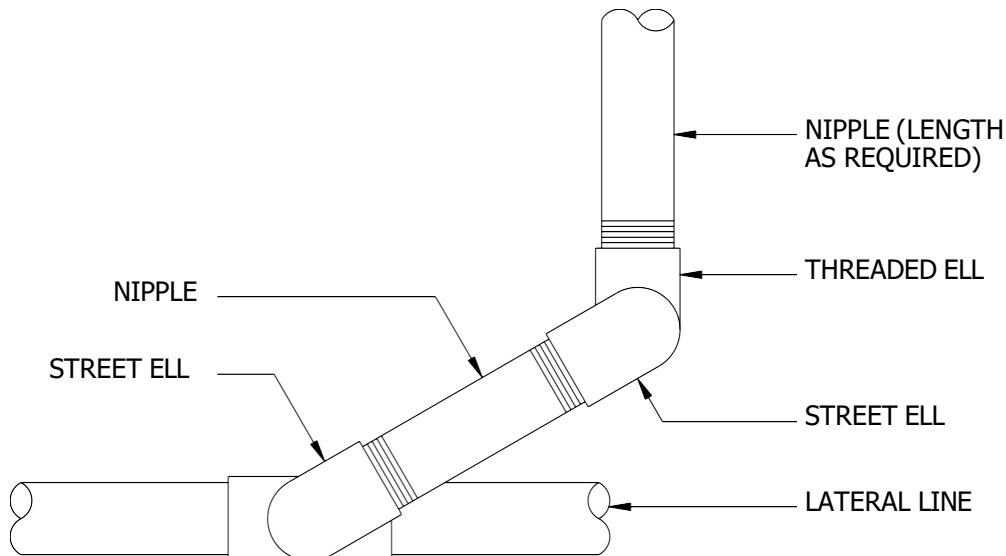
SCALE: NONE

**DETAIL 5 – AUTO DRAIN VALVE**

**DETAIL 6 – BACKFLOW PREVENTER**

SCALE: NONE

## DETAIL 7 – SWING JOINT



SCALE: NONE

END OF DETAILS

### SECTION 329000 – PLANTING

#### A. OVERVIEW

1. This section supplements requirements set forth in UFC 3-201-02, *Landscape Architecture*.
2. The Base's landscaping policy is to provide an attractive, low-maintenance landscaping environment that promotes the appearance of the Base. The landscaping policy also requires that water conservation be a major part of the design criteria. Shade and sun tolerance of the plants, as well as insect, disease, and drought resistance have been taken into consideration in these guidelines. The planning and design of all landscaping shall assume that the planting will receive little or no maintenance after a one to two year establishment period.

#### B. GENERAL DESIGN GUIDELINES

1. Planting Restrictions
  - a. No trees, shrubs, flower beds shall be planted around facilities in the Munitions and Operations and Maintenance districts. Dryland grass is acceptable along with xeriscaping.

Any loose rock used, shall be contained by curbing to keep it from traveling onto operational airfield pavements.

- b. Cranes, bucket trucks, high lifts cannot be used on Fairchild AFB to include SERE side and the airfield unless it has been pre-approved by Airfield Management and Terminal Instrument Procedures (AMC/A3A TERPS). Cranes, bucket trucks, high lifts in use, but not previously approved by Airfield Management and TERPS, shall be immediately lowered until the information is submitted and approved. The following information needs to be submitted to the Airfield Manager.
  - Obstacle description
  - MSL height in NAVD88 & AGL to the nearest foot
  - WGS 84/NAD83 location in deg, min, & 100th sec
  - Survey accuracy per FAAO 8260.19.
  - EXAMPLE: Crane, 1100' AMSL (80 AGL'), N00° 00' 00.00" E123 ° 45' 56.00" (NAD83), 1A.

## 2. Design of Turf Areas

- a. When designing turf areas, keep in mind the requirements of mowing equipment. Most turf areas should be designed to accommodate large gang mowers or riding mowers.
- b. Avoid small turf areas, steep slopes, and turf areas delineated by complex or detailed edges containing numerous sharp corners which require hand mowing.
- c. Wherever possible integrate tree plantings into shrub planting areas. Trees in lawn areas represent an obstacle to mow around; "planting rings" tend to be ineffective and increase maintenance requirements. However, where trees are proposed in grass areas, they shall have a maintained mulched ring of at least 6' radius around the trunk to reduce competition for moisture and nutrients from grasses, and for tree protection from mower and/or weed eater damage. The mulched ring diameter shall be increased as the tree trunk expands to maintain at least 6' of mulched area around the trunk.
- d. There shall be no turf irrigation within 10 feet of building walls.

## 3. Shrub & Tree Plantings

- a. Use native and adapted non-native drought-tolerant plant materials and group native plantings according to natural plant communities. Natural plant communities have similar water, microclimate, and soil requirements.
- b. Combine shrubs and trees in planting beds to avoid individual tree plantings in turf areas, or spotty plantings. Utilize natural plant associations as much as possible.
- c. Where possible place plants requiring more water in natural, or man-made storm water collection areas, such as, inverted parking islands, depressions, and swales.
- d. Zones of landscape intensity should be developed to provide plantings according to areas of importance in terms of appearance, image, and use. Visually less important areas should be developed with less planting.

## 4. Existing Vegetation

- a. Save and protect existing desirable native vegetation (trees and shrubs) and incorporate into the overall landscape.
- b. Supplement existing vegetation with additional native plantings that already occur in the area.

## 5. Traffic Routes

- a. Designs at Fairchild AFB shall enhance and provide for the safe separation of bicycles, pedestrians, and motor vehicles. Clear vision lanes shall be maintained such that blind

corners are not created and high levels of safety are consistently maintained. The design of separation elements shall take into account the effects of planted materials at initial size as well as at maturity. Design of landscaping elements shall be coordinated with lighting plans and fixture locations to insure that safety is not diminished.

- b. Screening of parking areas incorporating berms, planted buffer zones, etc. shall take winter conditions into account. Snow removal involving plowing and potentially large snow pile accumulations require the designer to provide sufficient space and clear plowing lanes. Islands, berms, and perimeter screening elements shall not result in difficult or complex snow removal requirements.

## 6. Transition Zones

- a. For projects bordering an undeveloped area, provide a 20 ft minimum width transition zone in the design. Transition zone shall consist of dryland grass and individual tree or shrub plantings.
- b. All shrub and tree landscaping installed in transition zones, and dryland areas on the Base shall be provided with drip irrigation, and/or bubblers to facilitate plant establishment.

## 7. Wind Control

- a. Fairchild AFB is characterized by fairly consistent winds between 10 and 25 mph. Landscaping can play an important role in mitigating the effects of this condition. Plants perform better than fences or walls for windbreaks because they permit some degree of wind penetration, reducing turbulence on the leeward side of the screen.
- b. Mitigating prevailing persistent winds shall be considered in development of landscaping designs. It would be inappropriate to emphasize this design element to an excessive degree, resulting in an undesirable wind row or barricaded environment.

## 8. Maintenance Issues

- a. **Plant Selection:** Selected plant materials should provide an attractive landscape with minimal maintenance requirements. The following guidelines shall be followed:
  - (1) Plant selection shall be based on design intent, and compatibility with the specific site and microclimate conditions.
  - (2) Select plants with a uniform and compact habit of growth; avoid plants which get "leggy" or require routine pruning.
  - (3) Be cognizant of potential abuse areas. Select sturdy plants for high traffic areas such as parking lot islands. Restrict the use of more delicate plants to protected landscape sites such as near building walls, fences, etc.
  - (4) A mixture of evergreen and deciduous plants is desirable. Utilize deciduous trees on the South and West sides of facilities to provide summer shading.
  - (5) Plants shall be selected for drought tolerance utilizing native plants in groupings according to natural plant associations. Ornamentals and natives can be mixed in special landscaped areas at entry points, entry signage, pedestrian plazas, gathering areas, and other special site areas as appropriate that will be irrigated.
- b. **Fringe Areas:** Do not ignore the undeveloped areas adjacent to developed sites. The creation of a transition zone between maintained, landscaped areas and native, non-landscaped areas is to be incorporated. The transition zone should be seeded with dryland seed and planted with indigenous and/or drought tolerant plants such as pines, Common Chokecherry, Rocky Mountain Juniper, Ocean Spray, Snowberry, and Common Ninebark. Trees, shrubs, and ground covers installed in the transition zone shall be drip and/or bubbler irrigated to facilitate plant establishment.

- c. Irrigation and Building Walls: Overspray of irrigation water onto building walls stains, may damage, and causes efflorescence on walls. Due to persistent wind conditions at the Base, it is impractical to irrigate turf areas adjacent to buildings without spraying the walls.
  - (1) There shall be no turf irrigation within 10 feet of building walls.
  - (2) When irrigating turf areas near buildings with large radius heads, use low angle nozzles when available.
  - (3) When irrigating shrub areas along buildings, drip irrigation or bubblers shall be used. Eliminate the use of heads which throw water toward the building wall.
- d. For additional information, refer to the irrigation standards section of this document.
- e. Traffic and Wear: Be alert to potential or obvious pedestrian traffic patterns. Pedestrian traffic which traverses landscape areas results in damaged and dead plants. Where pedestrian traffic crosses landscaping, provide periodic sidewalks, stepping stones, or other hard surfacing to direct traffic patterns and protect landscaping. Landscaped traffic and parking islands which cross or interrupt pedestrian traffic routes shall be provided with stepping stones or walkways at a maximum spacing of 20 ft to discourage foot traffic across plantings. Do not use 90 degree corners at sidewalk intersections; provide a 3-ft minimum radius or short diagonal (45 degree) to minimize wear on turf or other landscape materials. (See Detail 2).

#### 9. Planting Period

- a. To the fullest extent possible design documents shall provide for planting of trees, shrubs, and ground cover to occur during the optimum planting period of April 1<sup>st</sup> through June 25th and August 25<sup>th</sup> through Oct. 1<sup>st</sup>, however these dates are only guidelines; weather patterns vary each year, and thus suitable planting times will also vary. When planting during optimum times is not possible, the A/E shall clearly specify any necessary measures to ensure proper establishment of planted materials.

#### 10. Maintenance Periods

- a. For trees, shrubs, ground covers, and sod, a minimum maintenance period of 30 days or until final project acceptance, whichever is later, shall be required from the date of planting completion.
- b. Maintenance period for irrigated turf grasses shall be through the third mowing and until turf establishment. It shall include one herbicide application to control broadleaf weeds after the third mowing. Each mowing shall be spaced a minimum of seven (7) days apart. Irrigated turf grass shall be considered established when plant density exceeds 150 plants per square foot with no bare spots exceeding 9 square inches in size. Required maintenance on dryland seed areas shall include one herbicide application one year after seeding. Dryland seed shall be provided temporary irrigation to establish dryland seed until it reaches specified plant density.

#### 11. Warranty Periods

- a. The warranty of newly planted trees and shrubs shall be one year from the date of planting completion. All plants not in a vigorous condition at that time shall be removed and replaced. Replacements are limited to one for each plant and are typically installed immediately following the end of the warranty period. Plants damaged by vandals or other circumstances beyond the control of the installer are normally not covered by the warranty. Turf areas shall be warranted through the required maintenance period.
- b. Design documents shall specify that final acceptance of landscape work will include consideration of the following limits:
  - (1) No evidence of disease.
  - (2) Normal growth rates observed.

## C. PLANT SELECTION

### 1. Plant Matrices

- a. The attached spreadsheet (FAFB\_ApprovedSpecies.xls) lists species which are drought tolerant and expected to perform well at Fairchild Air Force Base under average conditions. The matrices are included to provide the designer with maximum flexibility and as diverse a selection of plants as possible.

## D. PLANT SETBACKS AND PROTECTION

### 1. Setbacks

- a. No landscaping components that create a sight obstruction or a hazard to the traveling public shall be permitted within the area designated as the "clear view triangle." This area can be determined by measuring 110 ft from the center of two intersecting roadways along the centerline of the through street and 55 ft along the centerline of local access streets, then connecting the two points with a straight line forming the hypotenuse of the clear view triangle. (See Detail 1). Trees within the clear view triangle shall have their branches removed at the trunk from ground level to a minimum of 7 ft above ground level. Shrubs or other vegetation not constituting a sight obstruction within the clear view triangle shall have a mature height no greater than 3 ft above grade elevation of the centerline of the adjacent street. These provisions are adapted from current local municipality ordinances and have been revised to reflect relatively low speed limits throughout the Base. In cases in which the "clear view triangle" will not provide adequate sight distance, 92d Civil Engineer Squadron Engineering Flight shall determine the required area needed to reduce hazards to the traveling public.

### 2. Protection of Existing Plant Materials

- a. Landscaping plans must provide for protection of existing trees and shrubs to remain within project work limits and immediately adjacent to construction sites. These plants will be protected by placement of a chain-link fence (or other barrier sufficient in size and strength) to prevent damage. Barricades shall be located no closer to the plant(s) than the crown circumference as defined by the outer drip-line of the plant(s) crown. Construction contractor shall irrigate and maintain landscaping within pre construction irrigated areas affected by the construction project.

## E. TURF MATERIALS

### 1. Playfields/Recreation Areas

- a. The primary consideration for playfields/recreation areas is wear resistance. For Fairchild AFB the following mixture shall be used:

<u>Seed</u>	<u>Percent</u>
Audubon or Aruba Creeping Red Fescue	25
Sheeps Fescue	25
Hard Fescue	25
Chewings Fescue	25

- b. The seeding rate shall be 5.5 lbs/1000 sf (240 lbs/acre).

2. Dryland (Non-irrigated areas that shall be prepared and seeded in late summer or early spring for seed establishment during times when rain is more frequent.)

- a. Primary considerations for dryland areas are drought tolerance as well as minimal maintenance. At Fairchild AFB, the following mixture shall be used:

<u>Seed</u>	<u>Percent</u>
Hard Fescue – Minimus	14
Sheeps Fescue – Covar*	14
Kentucky Bluegrass – SPF30	14
Red Fescue – Boreal	8
Snake River Wheatgrass – Secar	36
Idaho Fescue – Nespur**	14
No noxious weeds	

\* or other approved cultivar

\*\* or other approved native cultivar

- b. The seeding rate shall be 0.3 lbs/1000 sf (12 lbs/acre).

### 3. Seed Application Methods

- a. The application of seed by means of mechanical seed drill is the preferred method. Drill to an average depth of 1/2 in.
- b. Broadcast seeding may be used for small Playfield/Recreation areas. Grass seeding shall be installed on a minimum 4-in. loose topsoil. If the seed is broadcast, it shall be lightly raked into the soil following application. Apply one-half of the seed in one direction. Apply the other half at a 90 degree angle to the first application. Designs shall specify that turf areas shall be maintained by the contractor through the first three cuttings. Grass shall be cut when it has attained a height of 2-1/2 in. and shall be cut to a height of 1-1/2 in.
- c. Hydroseeding is acceptable on sloping sites and on other areas where it can be shown to be economically advantageous. Increase the seeding rate by 100% for hydroseed application. The components and rates of application include:
  - (1) Seed (see type for rates of application).
  - (2) Wood cellulose fiber: Apply at 2,000 lbs/ac.
  - (3) Tacking agent: The contractor shall apply at the rate as recommended by the manufacturer.

### 4. Topsoil

- a. At Fairchild AFB, sandy loam is sufficient for most turf installation purposes. Sandy loam shall consist of not more than 80% sand and 1% gravel, shall have an organic content of not less than 1.25%, and shall have a pH between 5.5 and 7.5.
- b. Where there is a particular concern for water retention in the soil, Washington State Department of Transportation (WSDOT) Type "A" (Black Dirt) may be specified. Black Dirt shall consist of a mixture of sand, silt, and decayed plant fiber. The sand content shall not exceed 60% and 1% gravel, the organic content shall not be less than 4%, and the pH shall lie between 5.5 and 7.5.

## F. OTHER MATERIALS

### 1. Planting Mixture for Trees, Shrubs, and Ground Covers

- a. Planting mixtures provide a medium to enhance plant growth. At Fairchild AFB, the planting mixture shall be:
  - (1) 1/2 on-site soil

- (2) 1/4 compost
  - (3) 1/4 peat humus
  - b. Use of imported topsoil in planting mixtures shall be minimized. Maximum use of on-site soils will encourage root growth beyond the original planting excavation.
2. Mulch
- a. A coarse grade of shredded or ground bark shall be used as the mulching material in shrub and ground cover planting areas. A 3-in. minimum depth (or greater as determined by the A/E) shall be used to retard weed growth, and for moisture retention. Rock mulching materials shall be used only as specifically approved by the Base. Where approved, rock mulch to be 1½" to 3" washed river rock 4" deep. Design of perimeter elements around mulched areas shall take into consideration containment of these materials. Care will be exercised during design to avoid the use of bark mulches along drainage routes and in areas subject to ponding or flowing water.
3. Lawn Edging
- a. Lawn edging separates lawn areas from shrub planting areas. At Fairchild AFB, 2 x 6 fir/larch pressure treated with water-borne preservative for ground contact use, which complies with AWPB LP-22, shall be used as the lawn edging material in most situations. The edging shall be anchored with 1 x 2 stakes at least 18-in. long located 3 ft on center and driven 1 in. below the top of the edging. Two stakes, one on each side, shall be provided at the ends of each 2 x 6. Stakes shall be secured to the wood edging with two galvanized nails.
  - b. On high profile commercial, industrial, or administrative projects where appearance and durability are a high priority and where budgets permit, a 6-in. wide by 12-in. deep concrete "curb" edging, reinforced with #4 bars top and bottom shall be used.
4. Tree Staking and Wrap
- a. All deciduous trees, 1-1/2 in. in caliper and larger, and all conifer trees, 5 ft in height and taller, shall be staked. Guying of trees is generally not acceptable since the tree guys present a safety hazard.
  - b. Three stakes are required, spaced equidistant around the tree. Stakes shall be 2 x 2 or 2-in. round driven in a minimum of 2 ft of total embedment with no less than 1 ft into undisturbed soil and shall be stained dark brown with semi-transparent penetrating oil stain. Trees shall be tied to stakes with 2-strand twisted 12-gauge galvanized wire. Tree trunks shall be protected by feeding the wire through a suitable length of 1/2-in. diameter black rubber or plastic hose. "ChainLock" #5 1-in. wide rubber tree ties (or equivalent) may be used in lieu of twisted wire and hose. Prior to staking, wrap the trunks of deciduous trees with 4-in. wide tree-wrap tape designed to prevent borer and freeze damage. Tree-wrap tape shall consist of paper laminated with asphalt, and shall be crinkled to provide a stretch factor of approximately 30% to allow wrap to conform to irregular surfaces. Secure with twine. The trunks of deciduous trees planted in lawn areas shall be protected from damage by lawn mowers and weed trimmers by an expandable polyethylene trunk guard ("Tree Gard" or equivalent) located at the base of the trunk. Trees planted in full leaf should be sprayed with an emulsion type anti-desiccant to retard excessive moisture loss from the tree.
  - c. Specify that the contractor shall remove the tree stakes and tree wrap at the end of the one-year warranty period. (If this is not done, these materials tend to remain in place for years, frequently damaging to the tree, as well as detracting from the attractiveness of the landscaping.)

## G. FERTILIZATION

1. Utilize organic and non-chemical methods as much as possible for fertilizer applications, such as, a compost tea that can be sprayed onto turf areas and shrub areas.

2. The following represents the minimum recommendations for fertilization. Many fertilizer formulations are available. Adjust recommended application rates to suit the specific formulation used.

3. Wear Resistant Turf Grasses

a. Turf grasses shall be fertilized at the time of planting, with a water retention fertilizer, whether in sod or seed form, by mixing fertilizer into the top 2 in. of the prepared sod/seed bed.

b. Minimum Recommended Nutrient Analysis:

<u>Nutrient</u>	<u>Percent</u>
Nitrogen	20
Phosphorous	4
Potassium	4
Iron	2

c. Application Rate: 5 Lbs/1,000 ft<sup>2</sup>

d. At least 25% of nitrogen shall be in slow release form. Fertilizer shall be applied at the time of planting and three times per season through the establishment period and over the life of the stand of grass.

4. Dryland Grasses

a. Dryland grasses shall be fertilized at the time of planting by mixing fertilizer into the top 2 in. of the prepared seed bed or by mixing the fertilizer into the hydroseed slurry. Fertilizer should be applied at the time of seeding only.

b. Minimum Recommended Nutrient Analysis:

<u>Nutrient</u>	<u>Percent</u>
Nitrogen	21
Phosphorous	14
Potassium	14

c. Application Rate: 600 lbs/ac

d. At least 50% of nitrogen shall be in slow release form.

5. Trees, Shrubs, and Ground Covers

a. Trees, shrubs, and ground covers shall be fertilized at the time of planting by mixing fertilizer into the planting mix. Subsequent fertilizations are not generally required.

b. Minimum Recommended Nutrient Analysis:

<u>Nutrient</u>	<u>Percent</u>
Nitrogen	5
Phosphorous	10
Potassium	10

c. Application Rate: 5 lbs/cy

d. Slow release plant food tablets may be used in lieu of mixing fertilizer with planting mix. The application rate shall be that recommended by the tablet manufacturer.

## H. WEED CONTROL

1. Shrub Planting and Mulched Areas

a. The A/E shall specify the use of weed-barrier fabric for weed control in shrub planting and mulched areas. Herbicides are not to be specified. Landscape fabrics shall be spun-bonded,

woven, needle-punched, or a combination polypropylene fabric designed to permit air, water, and nutrients to penetrate to the soil below. Sheet plastic shall not be used.

Minimum Weight (for bark mulch)	1.9 oz/yd <sup>2</sup>
Minimum Weight (for rock mulch)	3.0 oz/yd <sup>2</sup>
Minimum Tensile Strength	70 lbs
Minimum Puncture Strength	20 lbs
Minimum Permeability	30 gpm/ft <sup>2</sup>

- b. Fabrics shall be anchored to the ground with 1 x 6 U-shaped 11-gauge staples located at 2 feet maximum on center at edges and overlaps and 4 feet on center otherwise. Fabric shall be overlapped a minimum of 4 inches at the seams.

## 2. Turf Areas

- a. A single application of herbicide to turf grass seeded areas by the installation contractor shall be specified after the third mowing to control broadleaf lawn weeds. The herbicide shall be applied by a licensed applicator following the manufacturer's recommendations. Following application, treated areas shall be posted as prescribed by all applicable Washington State Department of Agriculture regulations.

# I. PESTICIDES

## 1. Applicator Certification

- a. All contract personnel applying pesticides must be certified by the State of Washington in the categories for the pesticides that they are applying. Contractors are responsible for ensuring their employees are certified and carry a copy of certification with them whenever on Base. Project specifications shall require certification papers to be submitted to the Contracting Officer before individuals are allowed to begin pesticide application. The required documentation shall include the applicator's full name, certification expiration date, all categories certified in, and state certification number.

## 2. Application Record

- a. Specifications must also include documentation needed to fulfill MAJCOM requirements, including date application was performed, application site, building number or street site, operation type (baiting, residual, etc.), labor hours/survey hours, name of the applicator, name of pest, area treated/surveyed (square feet, acres, etc.), EPA registration number, amount of finished product applied, pesticide name, percent finished product or amount of concentrate used, and finished form. Use the *Contractor Pesticide Documentation Requirements* data sheet located at the end of this section for inclusion in specifications involving the use of pesticides. Provide a copy of data sheet to Grounds Contract QAE (92 CES/CEOES), 92 CES Pest Management Shop, and 92 CES/CEIE.

## 3. Chemical Handling

- a. Specify that Contractors shall not store or mix pesticides/adjuvants on Fairchild AFB and that Contractors shall not clean dispersal equipment and safety gear on Fairchild AFB.
- b. Specify that Contractors shall refill sprayers/dispersal equipment at site(s) designated by the Government. Ensure that water source(s) used for mixing have a functional, state-certified backflow prevention device installed.
- c. On improved or semi-improved grounds, specify that the Contractor shall post warning signs (in the areas to be treated) to the base populace to advise them that pesticides are being applied, in accordance with Washington agricultural requirements. The signs shall stay in place until the pesticide is dry, or longer if so required in the Material Safety Data Sheets or label(s) for the pesticide(s).

## 4. Pesticide Approval

- a. All pesticides and adjuvants used on Fairchild AFB must be approved by all of the following authorities:
  - (1) HQ AMC/ESOF, Air Mobility Command Entomologist
  - (2) 92d Medical Group/BSC (Chief, Military Public Health)
  - (3) 92d CES/CE (The Civil Engineer)
  - (4) 92d CES/CEI (Chief, Installation Management Flight)
  - (5) Contracting Officer or his/her authorized representative for the contract
  - (6) Approved Pesticide List
  - (7) For list of approved pesticides currently authorized for use on Fairchild AFB and tenant units, refer to AFPMB Standard Pesticide NSN Listing FY 2020.

#### J. MAINTENANCE

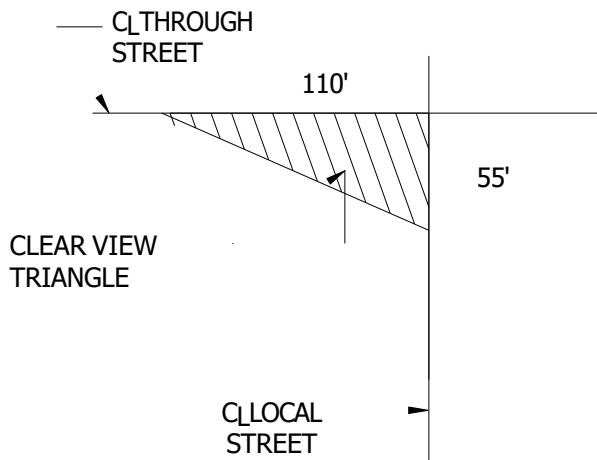
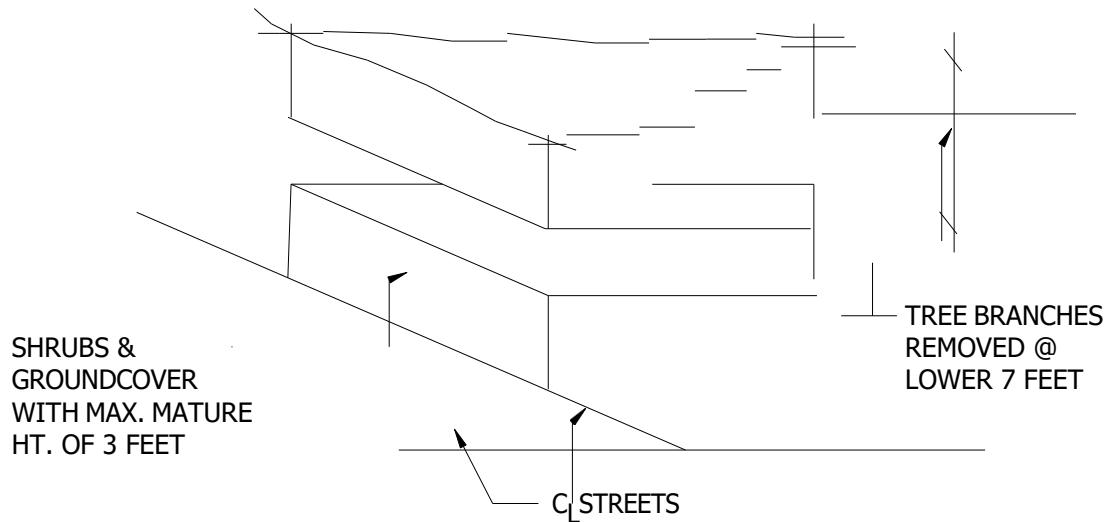
1. Landscape designers shall include, as part of the landscape design specifications, that the contractor is responsible for training Base maintenance personnel, and/or Base maintenance contractors in the proper maintenance of the landscape prior to final acceptance. The maintenance training shall include proper care of plants including any special care required for specific plant types, pruning, fertilizing, mulching, lawn care, watering, weed prevention, and winterization.

**CONTRACTOR PESTICIDE DOCUMENTATION REQUIREMENTS**

Date of Application	Application Site
Operation Type	Building Number/Suffix
Street Address/Area Applied	
Labor Hours/Survey Hours	Amount of Area Treated
Name of Pest	Amount of Finished Spray
Pesticide Registration Number	Percent or Ratio of Finished Spray
Pesticide Name	Amount of Concentrate Used
Pesticide Finished Formulation	
Name of Applicator	
Applicator's Certification Number	
Certification Expiration Date	
Categories Certified in	

**SECTION 329300 – PLANTS****A. DETAIL SHEETS**

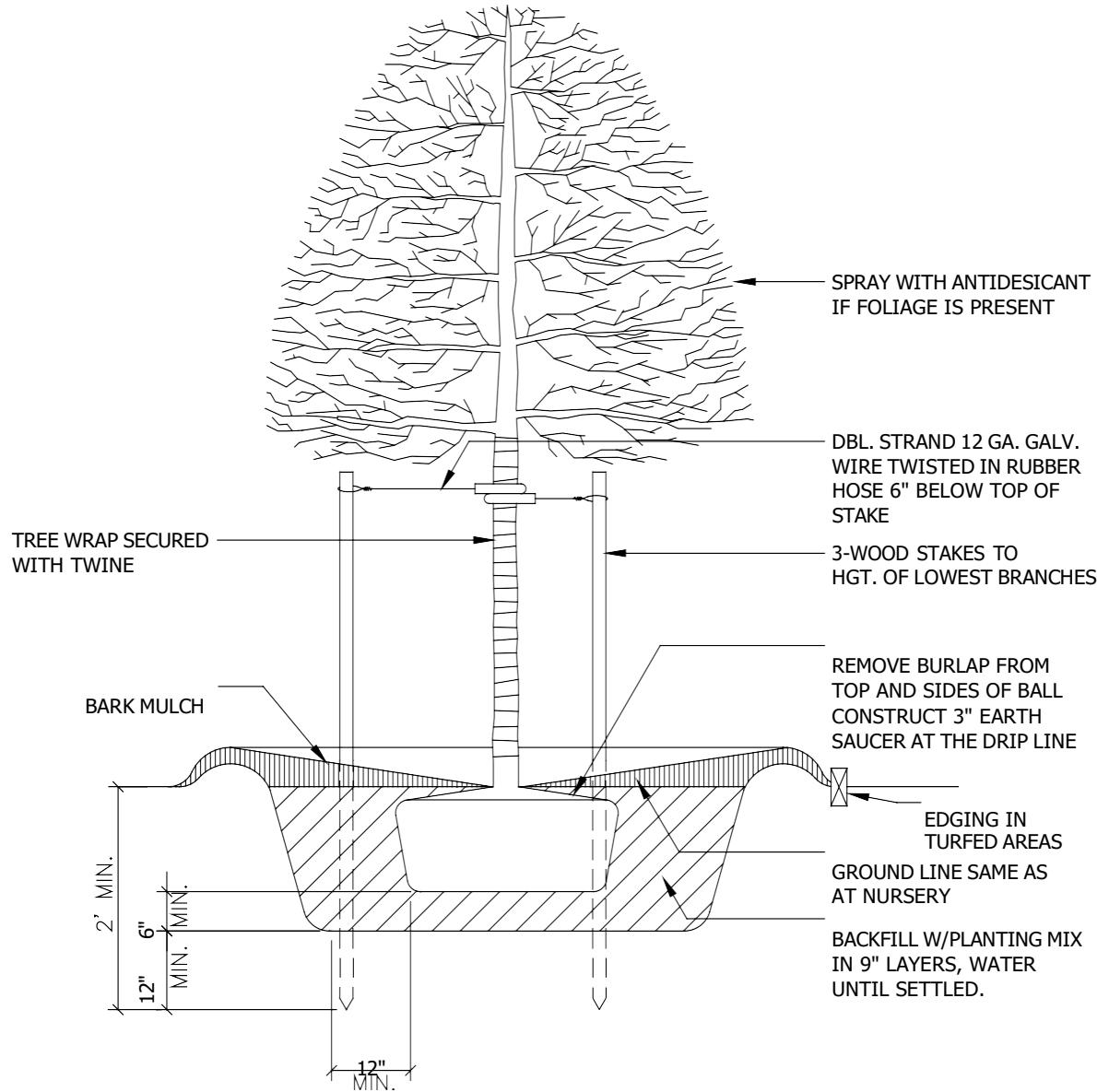
1. Clear View Triangle
2. Tree Planting (Conifers Similar)
3. Shrub Planting (Small Trees Similar)
4. Ground Cover Planting

**DETAIL 1 – CLEAR VIEW TRIANGLE**

SCALE: NONE

**DETAIL 2 – TREE PLANTING**

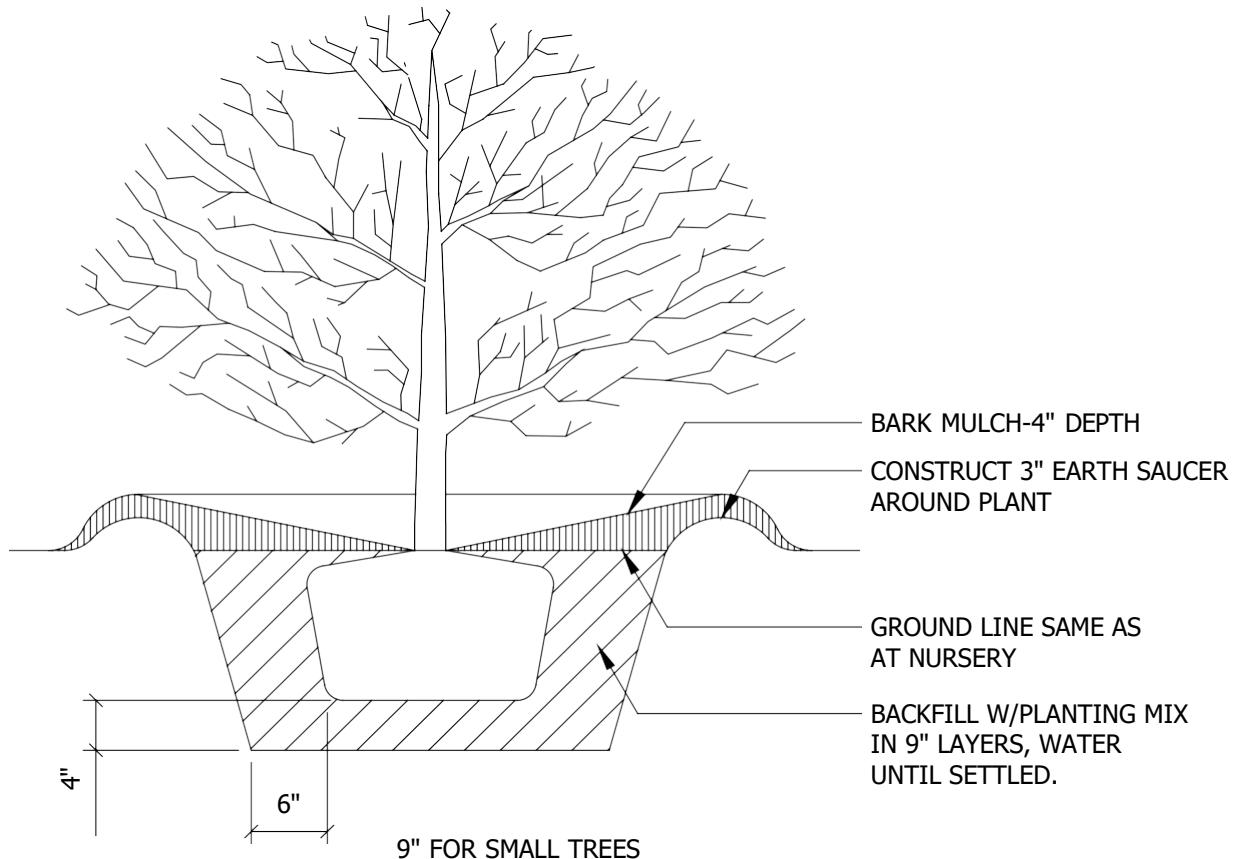
(Conifers Similar)



SCALE: NONE

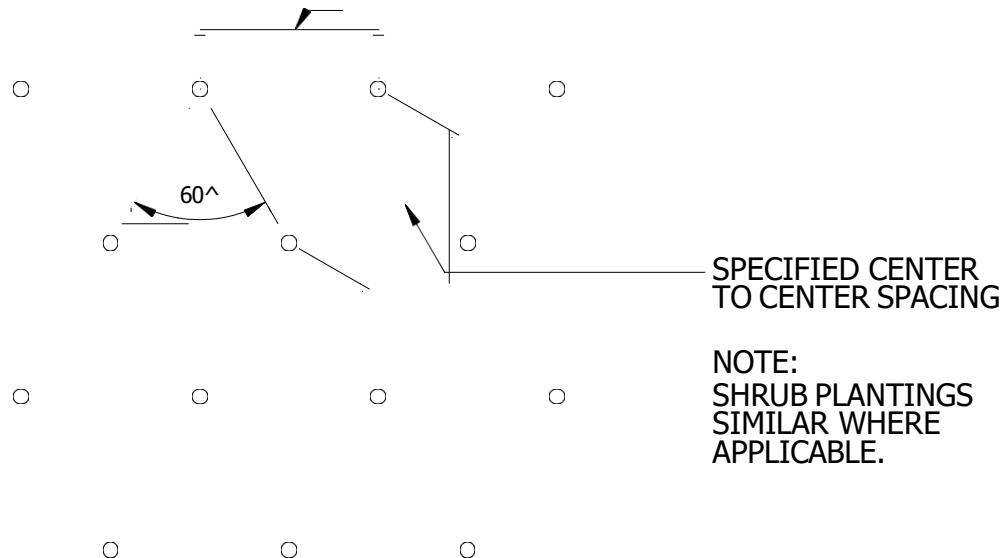
**DETAIL 3 – SHRUB PLANTING**

(Small Trees Similar)



SCALE: NONE

## DETAIL 4 – GROUND COVER PLANTING



SCALE: NONE

END OF DETAILS

## FAIRCHILD AIR FORCE BASE DESIGN GUIDE – DATA SHEETS

## Fairchild AFB Approved Species List

Type	Plant	Common Name	Ht/Width	Bloom	Sun/Shade	Hardiness Zone	Comments	Administrative	Community	Munitions	Operations and MX	Residential	Training
Grass	<i>Bouteloua dactyloides</i>	Buffalo grass	4-6"		Sun		stoloniferous perennial	Y	Y	N	N	Y	Y
Grass	<i>Elymus glaucus</i>	Blue wild rye	4-5'		Sun		utilitarian grass/ erosion control, wildlife and agroforestry	Y	Y	N	N	Y	Y
Grass	<i>elymus wawawaiensis</i>	Secar Snake River Wheatgrass	16-32"		Sun		area stabilization	Y	Y	N	N	Y	Y
Grass	<i>Sporobolus heterolepis</i>	Prairie dropseed	2-3'		Sun		fountain-like mound of foliage w/fine texture	Y	Y	N	N	Y	Y
Grass	<i>Festuca glauca</i>	Blue Fescue	10' x 18"	bluish-green	Sun		Drought tolerant, keeps color through winter	Y	Y	N	N	Y	Y
Grass	<i>Festuca idahoensis</i>	Idaho Fesue	18-24"x 12-18"	Bluish	Sun		Drought tolerant, grows taller in moist sites	Y	Y	N	N	Y	Y
Grass	<i>Panicum Virgatum</i>	Shenandoah' Switchgrass	3-5' x 3-5'		Sun		Desert garden or perennial border	Y	Y	N	N	Y	Y
Grass	<i>Schizachyrium scoparium</i>	Little Bluestem	2' x 18"		Sun		Changes color throughout season	Y	Y	N	N	Y	Y
Ground Cover	<i>Antennaria dioica 'rubra</i>	Pink Pussy-toes	4-6" x 10-12"	Deep pink	Sun		Perennial low mat of tiny silver-gray leaves and deep pink flowers in late Spring	Y	Y	N	N	Y	Y
Ground Cover	<i>Arabis blepharophylla</i>	Rock Cress	6-8" x 1'	Varies	Sun/pt shade		Herbaceous perennial. Border plant	Y	Y	N	N	Y	Y
Ground Cover	<i>Delosperma cooperi</i>	Pink Hardy Ice Plant	6" x 24"	Pink	Sun	5+	Succulent. Does not tolerate heavy snowpack or winter moisture	Y	Y	N	N	Y	Y
Ground Cover	<i>Delosperma nubigenum</i>	Hardy Yellow Ice Plant	1-3"x12-16"	Yellow	Sun	4+	Fast spreader, deer tolerant. No foot traffic or heavy snow	Y	Y	N	N	Y	Y
Ground Cover	<i>Deosperma cooperi</i>	Hardy Purple Ice Plant	3 x 18"	Fuchsia Purple/?	Sun	5+	Vigorous spreader, succulent	Y	Y	N	N	Y	Y
Ground Cover	<i>Sedum spurium</i>	Two-row stonecrop	3-6"x12-24"	Pink-rust	Sun/dapple	5+	Not dense enough to crowd out weeds but can overtake small plants	Y	Y	N	N	Y	Y
Ground Cover	<i>Thymus "Reiter Thyme"</i>	Reiter Creeping Thyme	3 x 30"	Lav./mid Sum.	Sun	4+	Thick foliage chokes out most weeds	Y	Y	N	N	Y	Y
Ground Cover	<i>Thymus lanuginosus</i>	Wooly Thyme	2 x 18"	Rarely	Sun	4+	Can take high traffic areas	Y	Y	N	N	Y	Y
Ground Cover	<i>Thymus pseudolanuginosus</i>	Wooly Thyme	1-2" x 18"	Pink/summer	Sun/shade	4+	Ground cover for rock gardens, between stepping stones	Y	Y	N	N	Y	Y
Perennial	<i>Achillea ageratifolia</i>	Greek Yarrow	4"-18"	White/lt sp	Sun	4+	Ground cover	Y	Y	N	N	Y	Y
Perennial	<i>Achillea f. "Moonshine"</i>	Moonshine Yarrow	18 x 24"	Yellow	Sun	3+	Silver foliage	Y	Y	N	N	Y	Y
Perennial	<i>Achillea serbica</i>	Serbian Yarrow	4 x 15"	White/late spring	Sun	4+	Slow growing. Tight mat of evergreen-gray foliage	Y	Y	N	N	Y	Y
Perennial	<i>Achillea x kelleri</i>	Keller's Yarrow	8" x 15"	White/sp-sum	Sun	5+	Silver foliage	Y	Y	N	N	Y	Y
Perennial	<i>Agastache canna</i>	Wild Hyssop	2-3' x 2'	Rose/purple	Sun	3+	Deer resistant, attracts butterflies	Y	Y	N	N	Y	Y
Perennial	<i>Alchemilla molis</i>	Lady's Mantle	12-18"x12-15"	Yellow-green	Dapple sun	4+	Needs more water in full sun. Prefers moist to somewhat dry	Y	Y	N	N	Y	Y
Perennial	<i>Alyssum saxatile</i>	Basket of Gold	9-12"x15"	Bright yellow	Sun	3 to 7	High maintenance	Y	Y	N	N	Y	Y
Perennial	<i>Anemone pulsatilla</i>	Pasque Flower	9-12"	Purpleish/ea Spr	Pt shade	5+	Seed clusters resemble feathery smoke-gray pomponns	Y	Y	N	N	Y	Y
Perennial	<i>Antennaria microphylla</i>	Rosy Pussytoes	4-12" x 8-12"	White/Pink/early sum	Sun	2+	Spreads & self-sows rapidly, good for ground cover. Very dry tolerant. Great pollinator	Y	Y	N	N	Y	Y
Perennial	<i>Asclepias tuberosa</i>	Butterfly Weed	12-18"x12-24"	Orange	Sun	3+	Attracts butterflies, especially swallowtails & monarchs	Y	Y	N	N	Y	Y
Perennial	<i>Bergenia cordifolia</i>	Heartleaf Bergenia	12" x 12-15"	Pink or white	Shade/pt sh	4+	Bold, glossy foliage. Moist to somewhat dry soil	Y	Y	N	N	Y	Y
Perennial	<i>Calytophus serrulatus</i>	Dwarf Sundrops	6" x 10"	Yellow/lt spring	Sun	4+	Heavy bloomer	Y	Y	N	N	Y	Y

## FAIRCHILD AIR FORCE BASE DESIGN GUIDE – DATA SHEETS

Type	Plant	Common Name	Ht/Width	Bloom	Sun/Shade	Hardiness Zone	Comments	Administrative	Community	Munitions	Operations and MX	Residential	Training
Perennial	Catananche caerulea	Cupids Dart	24" x 12"	Lav blue/summer	Sun	5+	Grass-like foliage with flowers on 8-12" stems	Y	Y	N	N	Y	Y
Perennial	Centaurea montana	Cornflower	2-3' x 2-3'	Blue	Sun	3 to 8	Sprawls in too much shade	Y	Y	N	N	Y	Y
Perennial	Cerastium tomentosum	Snow-in summer	4-8"x18"	Small white	Sun	3 to 7	Spreads rapidly-short lived due to rotting	Y	Y	N	N	Y	Y
Perennial	Cichorium intybus	Chicory	2 x 3' H	Blue	sun	4 to 8	Can be very aggressive	Y	Y	N	N	Y	Y
Perennial	Coreopsis 'Moonbeam' verticillata	Threadleaf	2-3'x2'	Yellow/gold	Sun	3 to 8	Seems to prefer more moisture. Divide every 2-3 years	Y	Y	N	N	Y	Y
Perennial	Coreopsis grandiflora	Sunray	24" x 18"	Gold/yellow	sun	3+	Blooms all summer. Spread by self-seeding	Y	Y	N	N	Y	Y
Perennial	Dianthus barbatus	Sweet William	10" – 20"	Pink, red, white	sun	3 to 9	Dense clusters, vigorous. Spicy sent	Y	Y	N	N	Y	Y
Perennial	Erigeron speciosus	Daisy ( Fleabane)	1 – 7' H	Violet	sun	2 to 8	Can be very aggressive. Great pollinator	Y	Y	N	N	Y	Y
Perennial	Eriogonum umbellatum	Sulphur Flower	6-12"x1-2"	Yellow/summer	Sun	3+	Needs pruning to keep compact. Very drought tolerant. Great pollinator	Y	Y	N	N	Y	Y
Perennial	Gaillardia aristata	Blanket flower	2-3' x 2-3'	Yellow w/red	Sun	3+	Reseeds. Deadheading required to prolong bloom season. Great pollinator	Y	Y	N	N	Y	Y
Perennial	Geranium sanguineum	Blood-red Cranesbill	12-18x24"	Purple to pale pk	Sun/pt sun	4+	Deeply lobed leaves turn red in fall	Y	Y	N	N	Y	Y
Perennial	Helianthemum nummularium	Sunrose	6-12"x12-18"	Multi	Sun	5 to 7	Good drainage-likes rocky dry alkaline conditions	Y	Y	N	N	Y	Y
Perennial	Hemerocallis species	Daylily	Varies	Varies	Sun	4+	Moderately drought tolerant. Beautiful display of flowers	Y	Y	N	N	Y	Y
Perennial	Hesperaloe pavilifera	Texas Red Yucca	5' x 36" w	Red flowers	Sun/prt s	5+	Very drought tolerant, once established	Y	Y	N	N	Y	Y
Perennial	Iris germanica	Bearded Iris	2-3' x 2'	purple/varies	Sun/pt sh	4+	best in full sun	Y	Y	N	N	Y	Y
Perennial	Iris pumila	Dwarf Iris	8-16"	purple/varies	Sun/pt sh	4+	best in full sun	Y	Y	N	N	Y	Y
Perennial	Lewisia	Bitterroot	4-8" x 5-10"	Various	Sun	4 to 7	Good rock garden plant	Y	Y	N	N	Y	Y
Perennial	Lewisia cotyledon	Siskiyou Lewisia	6"+x 1.5'	Various	Sun	4 to 7	Good rock garden plant	Y	Y	N	N	Y	Y
Perennial	Linum perenne "Lewisii"	Blue Flax	18" x 18"	Blue	Sun/pt sun	3+	Favorite of gardens & meadows. Reseeds	Y	Y	N	N	Y	Y
Perennial	Monarda fistulosa	Wild Bergamot	3-4'	Lilac to purple	Sun/pt sh	4+	Plants spread quickly	Y	Y	N	N	Y	Y
Perennial	Nepeta x "Six Hills Grant"	Giant Catmint	36" x 30"	Violet-blue/lt sp	Sun/pt sun	4+	Tough, long lived, reliable bloomer	Y	Y	N	N	Y	Y
Perennial	Nepeta x faassenii	Catmint	18" x 30"	Lav-blue/sum	Sun/pt sun	4+	Adapts to wet or dry soils. Fast growing	Y	Y	N	N	Y	Y
Perennial	Oenothera missouriensis	Missouri Evening Primrose	10" x 36"	Yellow	Sun	4+	Long blooming	Y	Y	N	N	Y	Y
Perennial	Oenothera speciosa "Rosea"	Showy Pink Evening Primrose	10" x 18"	Pink/summer	Sun	5+	Spreads rapidly	Y	Y	N	N	Y	Y
Perennial	Papaver orientale	Poppy	2-4"x2'	Red/or/pink/white	Sun	3 to 7	Long lived-top root challenge to transplanting	Y	Y	N	N	Y	Y
Perennial	Perovskia atriplicifolia "Filagran"	Cutleaf Russian sage	3' x 3'	Lav-blue/sum	Sun	4+	Spreads below ground	Y	Y	N	N	Y	Y
Perennial	Phlox subulata	Creeping phlox/Moss phlox	4-6"	Pink/blue/white	Sun	3 to 9	Spring color for rock gardens and edgings	Y	Y	N	N	Y	Y
Perennial	Polygonum affine	Himalayan Fleeceflower	6-10" x 30+"	Pink/lt summer	Sun/pt sh	4+	Use in rock gardens, ground cover, borders	Y	Y	N	N	Y	Y
Perennial	Rudbeckia spp	Gloriosa Daisy	Varies	Yellow/gold	Sun	2 to 6	Reliable bloomer-good seed heads in fall	Y	Y	N	N	Y	Y

## FAIRCHILD AIR FORCE BASE DESIGN GUIDE – DATA SHEETS

Type	Plant	Common Name	Ht/Width	Bloom	Sun/Shade	Hardiness Zone	Comments	Administrative	Community	Municipal	Operations and MX	Residential	Training
Perennial	<i>Salvia nemerosa</i>	Meadow sage	18 x 18"	Purple/lt sp	Sun	4+	Flowers from midsummer and onward	Y	Y	N	N	Y	Y
Perennial	<i>Salvia officinalis</i>	Garden sage	18-24"x12-18"	Violet-blue	Sun	4+	Several cultivars available	Y	Y	N	N	Y	Y
Perennial	<i>Salvia picheri "Grandiflora"</i>	Pitcher's Blue Sage	48" x 24"	Blue/violet	Sun	4+	Great butterfly plant	Y	Y	N	N	Y	Y
							Fine plant for matching with other late blooming						
Perennial	Sedum "Ruby Glow"	Rosy glow	8" x 15"	Ruby-red/lt sum	Sun	3+	plants	Y	Y	N	N	Y	Y
Perennial	Sedum spectabile	Showy stonecrop	18-24"x10-15"	Pink, red, white	Sun/pt sun	3+	Moderately drought tolerant	Y	Y	N	N	Y	Y
Perennial	<i>Sempervivum</i> species	Hens and Chicks	2-4" x 6-12"	Various	Sun/pt sun	4+	Container, rock gardens. Does best in gravelly soil	Y	Y	N	N	Y	Y
Perennial	<i>Sphaeralcea incana</i>	Orange Globe Mallow	3-4' x 24"	Orange/mid sum	Sun	4+	Will thrive in deep clay. Very drought tolerant	Y	Y	N	N	Y	Y
Perennial	<i>Thymus vulgaris</i>	English Culinary Thyme	12" x 15"	Lav-pk/ea sum	Sun	4+	Fragrant gray-green leaves. Easy grown	Y	Y	N	N	Y	Y
Perennial	<i>Thymus vulgaris</i> "orange balsam"	Culinary Thyme	6-8" x 15"	Pale pink	Sun	4+	Hint of citrus. Rambling orange tinged stems	Y	Y	N	N	Y	Y
							Aromatic; gnarled branches at maturity; good						
Shrub	<i>Artemesia tridentata</i>	Big Sage	4' x 3'		Sun	4+	wildlife plant	Y	Y	N	N	Y	Y
Shrub	<i>Atriplex canescens</i>	Four-wing Saltbush	1-6' x 4-8'	4-winged bract	Sun	2+	Extremely tolerant of all conditions	Y	Y	N	N	Y	Y
							Bright yellow pea-like bloom, 2" seedpods; Good						
Shrub	<i>Caragana arborescens</i>	Siberian Pea Shrub	7-20'	Yellow	Sun	2+	screen/windbreak	Y	Y	N	N	Y	Y
							Prune in Spring, blooms on new growth. Attracts						
Shrub	<i>Caryopteris</i> spp	Bluebeard	3-4' x 3-4'	Blue/lt sum	Sun	5+	bees	Y	Y	N	N	Y	Y
							Pink, silky plumed seed heads cover plant for						
Shrub	<i>Fallugia paradoxa</i>	Apache Plume	4' x 4'	White/late spring	Sun	4+	many months	Y	Y	N	N	Y	Y
							Profuse bloomer. ½ - 1 inch leaves. Upright						
Shrub	<i>Genista tinctoria</i>	Woadwaxen	3' x 12'	Yellow	Sun	5+	shrub	Y	Y	N	N	Y	Y
Shrub	<i>Penstemon</i> spp	Penstemon	varies	varies	Sun		Ground cover or rock garden plant.	Y	Y	N	N	Y	Y
							Newer varieties in other colors, flowers best in						
Shrub	<i>Potentilla fruticosa</i>	Shrubby Cinquefoil	1-4' x 2-4'	Yellow/summer	Sun/pt sun	2+	full sun	Y	Y	N	N	Y	Y
Shrub	<i>Rhus aromatica</i> "Gro-Low"	Fragrant Sumac	3' x 8'	Yellow/lt spring	Sun/pt sun	4+	Beautiful fall color, very tough ground cover	Y	Y	N	N	Y	Y
Tree	<i>Acer campestre</i>	Hedge Maple	30' x 30'	Green	Sun/Pt Shade	5+	Tolerates drought/compacted soil; slow growing	Y	Y	N	N	Y	Y

FAIRCHILD AIR FORCE BASE DESIGN GUIDE – DATA SHEETS

Type	Plant	Common Name	Ht/Width	Bloom	Sun/Shade	Hardiness Zone	Comments	Administrative	Community	Municipal	Operations and MX	Residential	Training
Tree	Acer ginnala	Amur Maple	15-20'	Yellow	Sun/Pt Shade	2+	Multi-trunked; fall color; adaptable	Y	Y	N	N	Y	Y
Tree	Acer glabrum	Rocky Mtn. Maple	20' x 15'	Green/yellow	Sun/Pt Shade	4+	Multi-trunked, best in moist, partly sunny areas	Y	Y	N	N	Y	Y
Tree	Cercis spp	Redbud	10-15'	Pink/early spring	Sun/Pt Shade	5+	Brilliant magenta blossoms, heart-shaped leaves	Y	Y	N	N	Y	Y
Tree	Pinus aristata	Bristlecone Pine	20-30' x 10-15'		Sun	2+	Very slow-growing; water during dry spells	Y	Y	N	N	Y	Y
Tree	Pinus mugo	Mugo Pine	3-10' x 10-15'		Sun/Pt Shade	2+	Sawfly and pine needle scale can be a problem; may need pruning	Y	Y	N	N	Y	Y
Tree	Pinus nigra	Austrian Pine	40-60' x 20'		Sun	4+	Good city/windbreak tree; Diplodia tip blight may be a problem	Y	Y	N	N	Y	Y
							Very drought tolerant, easy to propagate in poor soil. Not recommended as street tree; needs room						
Tree	Pinus ponderosa	Ponderosa Pine Tree	80-100' x 25-30'		Sun/Pt Shade	3+		Y	Y	N	N	Y	Y

End of Section

## SECTION 330000 – UTILITIES

### A. NATURAL GAS

1. Natural gas is supplied by Avista Utilities under firm regulated rate schedules. Base gas lines are owned and maintained by Avista Utilities and Honeywell Corp. All natural gas line distribution work must be coordinated through the respective system owner. The on-base distribution system operates at 55 psig. The system is a combination of steel and polyethylene lines buried at a depth of approximately 30 inches. It is recommended that any connections to the steel lines be investigated to check for corrosion prior to final design or any construction. Future major additions to the system shall be sized and planned to provide a natural gas grid system for the base.

### B. METERS

1. Provide meters for electric, water, natural gas, and irrigation, where determined cost effective by 92 CEN, and ensure connection with the EMCS.
2. Metering requirements are subject to changes mandated by higher levels of the Air Force in response to communication security issues. At the time of this revision, memory at the meter is not required for water or natural gas meters, but is required for electric meters at point of base electrical service entry and on buildings > 35,000 square feet. Memory at the electric meter shall be sufficient to accumulate 15 minute trended readings for at least 30 days. All meters are required to be open protocol, with BACnet preferred. Please check with 92 CES for any subsequent changes to these requirements.
3. See Division 26 for UFG spec 26 27 13.10 30, Electrical Metering, and edit the template specification as appropriate for the specific project. See Division 33 for UFG spec 33 12 33.00 30, Water Metering, and UFG spec 33 51 13.00 30, Natural Gas Metering, and edit the template specifications as appropriate for the specific project.

### C. CATHODIC PROTECTION

1. See Section 264200, *Cathodic Protection*.

#### D. UTILITY LOCATE

1. It shall be the responsibility of the designer to correctly locate existing utilities. During the design phase, all utilities shall be located using state-plane coordinates and marked on the utility site plan. (Refer to Attachment 1 at the end of this Section for Utility Verification Procedures). As-built drawings of facilities showing utilities shall be confirmed. Site plans showing utility locations shall also include the depth of the utility. Project utility site plan(s), with dimensioned, designer-verified existing utilities, shall be used in the approval of the FAFB Form 103, Base Civil Engineering Work Clearance Request.

#### E. UTILITIES

1. All utility lines provided shall have a plastic marker tape installed above line and 8-10 inches below grade. The plastic marker tape shall include a metallic wire for detection purposes and shall indicate the type of utility line buried below. Utility line monument markers shall be installed every 200 feet along straight runs and at each change of direction. Provide #12 AWG tracer wire along utility; and provide grounding point near each manhole, and terminate wire.
2. No gas regulators, transformers, exterior HVAC, fire hydrants, etc. shall be provided at entryways to facilities.
3. Exterior equipment such as bollards, gas regulators, transformers, exterior HVAC, etc. shall be painted to match Sherwin-Williams' color, #SW2070, "Spanish Moss" when located in open areas or adjacent to brick facilities. When located adjacent to "Sierra Tan" colored facilities paint to match as directed by the government.
4. All underground utilities shall be placed parallel to roads/streets within a 50-foot (15-meter) corridor. Service connections shall be installed perpendicular to mains and avoid crossing large developable spaces.
5. Where new utilities must cross under existing roads, base policy is to run them through existing duct banks, if possible. If new duct banks/lines are needed, they shall be horizontally bored/drilled under the road/pavement. Street cutting will be an exception justified only by the road already being in such bad shape that a patch is better than the existing road or the extent of the new utilities makes boring/drilling impossible. (Justification for any and all street cuts shall be included in the Design Analysis). In the event that street cutting and patching is permitted, the trench shall be backfilled with "flowable fill" (controlled density fill, CDF) to prevent rutting under traffic loads. Completely restore sites disturbed by boring/drilling operations.
6. All utilities shall be metered at the building, with all services marked.
7. Split block/brick fence shall be installed to protect/shield all gas regulators, transformers, exterior HVAC, back flow assemblies, etc. from vehicle damage and as a vision screen. See FAIRCHILD AIR FORCE BASE DESIGN GUIDE Section320000, Paragraph D.
8. All existing underground utility lines that are decommissioned shall be cut and capped at the mains; lines exiting building shall be terminated by cutting and capping at point of exit from the building and a minimum 5 feet out from the building foundation. The remainder of the line may be abandoned in place; both ends of any line abandoned in place shall be capped. All caps, valves, elbows, etc., shall be GPS located.
9. GPS coordinates for all utility line connections and changes in utility direction shall be included in the as-built drawings. Drawings shall also include GPS coordinates for all locations where utilities have been abandoned and capped.

#### F. POTABLE WATER PIPING

1. All new potable water piping mains shall be AWWA C900 or C905 PVC material. The base utilities shop does not have equipment to repair ductile iron (DI) or high-density polyethylene (HDPE) pipe.
2. All new potable water piping service lines to buildings shall be Type K Copper material.

**G. UTILITY OUTAGES IMPACTING FIRE SUPPRESSION OR FIRE ALARM SYSTEMS**

1. See Section 330000 UTILITY VERIFICATION PROCEDURES Attachments 1 BDG requirements and procedures for utility outages impacting fire suppression and fire alarm systems.

**H. THRUST BLOCKING**

1. Pre-cast thrust blocks shall not be used to support underground installed utilities.
2. All thrust blocks shall be constructed of formed concrete. The concrete thrust block shall have a thickness of one pipe diameter and a contact face area that shall be formed against the pipe. The back of the thrust block be placed against undisturbed soil. Backfill shall be placed on all sides of the thrust block and to the sides of the excavation.

## ATTACHMENT 1 – UTILITY VERIFICATION PROCEDURES

### A. PURPOSE

1. The designer is tasked with the responsibility for verifying the location of existing utilities within their project site. Through the verification process, better information is provided to contractors for bidding and construction; the number of unplanned utility outages is greatly reduced; and there is less redesign, fewer construction delays, and fewer modifications after contract award.

### B. PROCEDURES

1. Development of Project Limit Line (PLL): The designer determines the PLL at 35% design. The PLL must take into account perimeter fencing requirements and all utility corridors.
2. Initiating the FAFB Form 103, *Base Civil Engineering Work Clearance Request*: The designer is responsible for initiating the FAFB Form 103. See FAFBI 32-1001, *Preparing Base Civil Engineering Work Clearance Request* for instructions.
3. Designers shall use Ground Penetrating Radar (GPR) to verify the location of known and unknown utilities in areas of excavation on the project site. All GPR data will be incorporated into GEOBASE as built data.
4. Overlaying the Comprehensive Utility Plan (CUP): The designer draws the PLL on the CUP provided by the BCE.
5. Marking the PLL at the Project Site: The designer marks the PLL at the project site in accordance with the APWA Uniform Color Code standards and FAFBI 32-1001.
6. Requesting a FAFB Form 103: The designer clearly annotates on the CUP how the PLL was marked in the field (e.g., “The site was marked with white stakes at all corners”). The designer then attaches 2 copies of the annotated CUP to an FAFB Form 103 and provides it to the BCE PM for processing.
7. Processing the FAFB Form 103: The BCE PM or CM is responsible for processing the FAFB Form 103 within 10 business days.
8. Assigning a Tracking Number and Obtaining Signatures: The BCE PM/CM will submit the FAFB Form 103 through the Fairchild GeoBase Portal / Base Civil Engineering Work Clearance Request page. The permit tracking number will be assigned automatically. Signatures for all coordination blocks will be provided by the organizations responsible for utility markings.
9. Marking Existing Utilities at the Project Site: Utilities within the PLL will be marked on the ground by the responsible organization. All marking will be in accordance with the APWA Uniform Color Code standards. In some instances, the organization responsible for utility marking will annotate the FAFB Form 103 with words similar to “Call 48 hours prior to digging”. When this occurs, the Requestor is responsible for calling the organization to coordinate marking after the FAFB Form 103 has been returned.
10. Approval of the FAFB Form 103: The FAFB Form 103 is considered approved when the Chief Engineer signs the approval block. Upon approval, the BCE PM notifies the Requestor that the permit is ready for pick up. The BCE PM gives the original copy of the FAFB Form 103, with attachments, to the Requestor and keeps a copy, with attachments, for the BCE project file.
11. Maintenance of Utility Markings: Once utilities are marked, the Requestor is responsible for maintaining the marks for the duration of the project.
12. Coordinating Final Utility Markings: Upon receipt of the approved FAFB Form 103, the Requestor makes contact with any organizations that require 48 hours notice prior to marking utilities. If the Requestor has difficulties in getting AF personnel to physically mark the location of existing utilities, he/she will contact the BCE PM for assistance.

13. Verification of Existing Utilities: The designer is responsible for ensuring that all existing utilities are accurately shown on a Site Utility Plan and that all discrepancies in the CUP are brought to the attention of the BCE.
14. Questionable Utility Markings: If there is a question about the actual location of any utility, it is the responsibility of the designer to determine the actual location of the utility. This process includes, but is not limited to, investigating physical features at the project site (nearby manholes, curb stops, fire hydrants, steam pits, etc.); calling the appropriate agency, as shown on the FAFB Form 103, to verify its markings; and digging up the utility to determine its actual location.
15. Missing Utility Markings: If a utility line is shown on the CUP, but a corresponding mark is not on the ground at the project site, the designer is responsible for resolving the discrepancy. The procedures described in the previous paragraph are to be used in the verification process.
16. Creation of the Site Utility Plan: The designer is responsible for surveying the actual location of all utilities within the PLL and showing the information (including grid coordinates and depth where critical for utility tie-ins, utility crossings, etc.) on a Site Utility Plan for the project.
17. Notifying the BCE of Errors in the CUP: The designer is responsible for formally notifying the BCE PM of all discrepancies between the actual location of existing utilities and the location shown on the CUP within 14 days after the creation of the Site Utility Plan. The notification shall be in the form of an annotated CUP that shows the actual, verified location (including grid coordinates and depth) relative to the location shown on the CUP.
18. Updating the CUP: The BCE PM is responsible for formally notifying the Geobase Section, 92 CES/CENME, of discrepancies in the CUP within 14 days. CENM is responsible for updating the CUP, and related base maps, within 30 days.

END OF DATA SHEETS