SELFRIDGE DESIGN STANDARDS

1917—2017 CENTENNIAL EDITION

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Introduction

These standards contain building and infrastructure design guidelines for Selfridge as part of the Base Renovation Plan.

The recommendations contained herein include references to applicable military and industry standards and codes.

Scope of Standards

The scope for these Design Standards includes the following items:

Architectural Design: Standards for architectural themes, materials, and colors. Also includes exterior and interior signage, furnishings, and lock systems.

Historic Facilities Treatment: Standards for preserving or repairing architecture that has historical significance at Selfridge.

Landscape Design: Site design and restoration guidelines for grading and seeding and landscape palette.

Civil Engineering: Standards for base infrastructure (water, sanitary sewer, storm drainage, airfield and roadway pavements.) This section also includes general drawing submittal and design requirements for infrastructure designs.

Mechanical Systems: Mechanical standards for heating, air conditioning, and ventilation (HVAC), and controls.

Electrical Systems: Standards for electrical distribution and building systems, including power, switching, and interior, exterior, and airfield lighting.

Communication Systems: Standards for cable, fiber optics, and local area network (LAN) systems and utility systems alarms.

Environmental Standards: Standards for environmental compliance requirements.

Energy Monitoring and Control System (EMCS): Standards for controlling energy, alarms, and metering through a central control system. The base system standard is Automated Logic Corporation (ALC).

Department of Defense Antiterrorism Construction Standards: Mandatory DOD antiterrorism construction standards to mitigate vulnerabilities and terrorist threats.

Use of Standards

The manual should be used in conjunction with the most current revisions of the ANG Design Policy and the Design Objectives and Procedures.

The intent of this manual is to be a dynamic adaptable document that clearly conveys the base's design philosophy and allows for creativity and design expression within a general framework.

Note that all real property on Selfridge Air National Guard Base belongs to the United States Government and is not to be "personalized."

Requirements and Responsibilities

- The Base Civil Engineer's (BCE's) office is the responsible agency for all utility and infrastructure construction improvements. The BCE will provide the staff for coordination with all other Selfridge Air National Guard Base (SANGB) units and will provide the single point of contact for third party design consultants, regardless of which unit is eventually responsible for operation and maintenance of the facility being designed and constructed.

- All plans and documents stipulating construction requirements or soils reports and similar documents generated for specific project designs shall be stamped and signed by a registered professional architect or engineer licensed to practice by the State of Michigan. This certification shall signify that the documents were prepared by the architect

or engineer or under his/her direct supervision and in accordance with the laws of the State of Michigan governing such practice.

- The designer shall file permit applications for construction that encroaches on adjacent municipal, township, county, or state maintained property.

- The designer shall file permit applications with the Michigan Department of Environmental Quality and/or the Army Corps of Engineers for construction that encroaches upon designated wetlands.

- The designer shall file permit applications with the Michigan Department of Public Health for water system projects.

- The designer and/or contractor shall file permit applications for soil erosion and sediment control actions with Macomb County Soil Erosion Control Office. Plans/drawing required to accompany permit applications have specific requirements need for approval. (See Requirements for Soil Erosion Plans.)

- Designer shall conduct a records search for hazardous materials within the project limits and report on those findings.

- Designer shall include language in all contract documents requiring construction contractors to prepare and implement a Hazardous Material Action Plan and comply with federal Occupational Health and Safety (OSHA) and State of Michigan (MIOSHA) requirements.

- All building systems shall be designed to meet or exceed minimum quality, performance, and energy efficiency standards in accordance with Air National Guard Design Policy as well as Air National Guard and Air Force Engineering Technical Letters (ETLs) as appropriate to the element or particular systems.

- All MILCON vertical new construction and major renovations projects require Guiding Principles Compliance third party certification.

- All other MILCON projects will incorporate sustainable principles to the maximum extent possible and achieve the benchmark levels indicated in the Air Force Sustainable Design and Development (SDD) Policy memorandum.

- Each project shall be reviewed in its entirety by the Program Manager to ensure the A/E's overall design functions holistically, verify the best systems were selected for the project, and that long-term maintenance and energy efficiency are addressed. A building energy analysis shall be accomplished for each new building and submitted to the program manager for review and approval.

Conflicting criteria will be resolved in the following order: (a) adhering to the project's Statement of Work (SOW), (b) adhering to the appropriate Air Force standards manuals previously cited, historic considerations where applicable and (c) selecting the criteria that are shown to provide the maximum energy efficiency with the highest Savings-to-Investment Ratio (SIR) as applied to the specifics of the project.

Prior to the acceptance of a construction improvement, the design professional shall submit to the BCE a hard copy and an Auto CAD disk showing all changes made during construction, labeled "Record Drawings" and signed by the contractor who performed the work.

Drawings

Standard drawing sheet size shall be 24 inches by 36 inches. Each sheet shall be drawn on a title block as specified by SANGB, showing the project

title, SANGB project number, sheet number such as 1 of 1 and/or drawing number if used, revision number and date, and location for the design professional's stamp.

Each sheet shall include:

1. The design professional's firm name, address, and telephone number.
2. Date of the drawing.
3. Scale of the drawing.

All drawings (not already in electronic format) shall be suitable for scanning into electronic format.

Each drawing set shall include a map of the area showing locations of existing facilities and the proposed improvements.

All drawings shall depict scales in both English and metric units and both by description (i.e., 1-inch = 50 feet) and bar scale. Metric dimensions shall be based on soft metric conversions.

Design work shall be tied and referenced to the Michigan State Plane.

Coordinate System. Vertical datum shall be based on USGS.

Drawings should be in either of the latest two versions of AutoCAD with each drawing sheet as a separate file.

All Computer Aided Design (CAD) work shall comply with the most current versions of the Architectural Engineering Construction Computer Aided Design ("A/E/C/CAD) Standard" created by the CAD/GIS (Geographic Information System) Technology Center and the "United States National CAD Standard" currently available from NIBS (National Institute of Building Sciences).

Government Inspections

- The contract documents shall advise the contractor that certain activity driven inspections will be accomplished during the construction life of the project. The first is a rough inspection of all systems prior to sealing off a wall, pipe chase, suspended ceiling system etc. These systems include, but are not limited to: domestic and heating, water lines, communication and electric runs, all insulation material to be covered by other material (gyp board, wood panel, etc.), duct runs, ceiling suspension systems, raised flooring, fire detection and protection etc. A second or finish inspection will be conducted after these items are "hidden" to ensure the quality of the finished project. The designer may also include other functional disciplines if it is determined that this level of inspection may be beneficial. The designer shall call out in various specification sections what inspections are required.
- The finish inspection does not constitute the final project inspection accomplished as project completion. The construction documents are to require that time for these inspections, to be conducted by government personnel, is included as a line item in the job progress schedule. The contractor shall request that these inspections, thru the Contracting Officer (C.O.) at least 5 days prior to the desired inspection date.

Reference: UFC3-101-01 Chapter 5 Pre Design, Design, and Post Design Services.

Architectural Design

Architectural Design Standards are established for facilities at Selfridge ANG Base (Selfridge) to accomplish two objectives:

1. Establish guidelines ensuring that buildings, their interiors, and their surroundings are harmonious and consistent throughout major areas of the

base, strengthening and unifying the identity of the base.

2. Promote an understanding of the level of excellence expected for all construction projects.

These standards should be used as a basis for realizing facilities on Selfridge ANG Base. Following GPC design criteria may override established design standards to meet the needs required to attain the Guiding Principles Compliance third party certification. Examples of these are siting, landscaping, parking areas, building materials, etc. The incorporation of Renewable Energy shall be considered for each facility. Ensure that all roofing infrastructure is constructed to support installation of photovoltaics. Conduits are to be put into place from roof to electrical room and chase ways for later additions etc.

ANGETL 15-01-00, (available from Selfridge ANG Base Engineering), provides the basic criteria applicable to all ANG facility design projects.

Selfridge ANG Base also includes units from numerous agencies. Most of these agencies have their own established guidelines and standards that apply to architectural design. The standards described herein do not replace or supersede standards required by ANG or other agencies, but provide unique guidelines tailored to Selfridge. These standards apply to all facilities at Selfridge in addition to any other applicable standards.

These design standards apply to new facility construction, revitalization of existing buildings, and additions and alterations made to existing facilities. Selfridge Architectural Design Standards are intended to guide architects and engineers in developing innovative, attractive, appropriate, and cost effective buildings that will serve the Selfridge mission and promote a base wide standard of excellence in design.

The designer will insure that the equipment fits the area in which it is to be installed and the installation is in accordance with all safety and clearance codes. As equipment (mechanical, electrical, other) cannot, for the most part, be specified as sole source, the size of the supplied item may differ from the preferred item. In the past this has created safety, operational, and maintenance clearance problems. The area to house this equipment must be sized to accommodate the largest piece of equipment that can reasonably be expected to be provided to meet the specification.

Codes and References

Applicable codes, standards and references that apply in addition to these standards are listed in the Architectural References at the end of this section. *All* buildings must comply with applicable requirements.

Building Siting

Site buildings to develop appropriate relationships with other buildings and site work by respecting existing development patterns. Design new buildings to “fit” with existing facilities and to conform with setbacks, orientation, and other established siting standards for similar facilities in the vicinity.

Consider the relationship of buildings with open space, access to and from the site by pedestrians, visitor parking, personnel parking, and service vehicles. Use building siting to define entry sequence and site circulation, including service and parking access, and to buffer noisy or unattractive functions, such as trash pickup. Develop service yard and parking lot layouts to minimize the amount of paved surfaces.

Energy use and the location of existing infrastructure should be a consideration in new site selection. Consider reusing facilities or collocation whenever possible. Use site planning that maximizes solar energy, utilizes natural light and minimizes storm water runoff. Utilize facility energy modeling to drive the orientation of buildings whenever possible. Use planting to assist the building in blocking wind and sun in compliance with base standards. Every type of

tree, shrub and ground cover affects the thermal response of a building.

Buildings 50, 140, 160 and the Dining Hall have special siting requirements to ensure their frontal facades are maintained as open and visible to the public.

Reference: UFC 3-101-01 Building Orientation.

Orientation and Setbacks

Match orientation of existing buildings. Buildings that digress from established patterns without justification detract from the overall harmony of development and give those buildings special significance that may be unwarranted.

Set buildings back from corners at major street intersections to maximize visibility. Use consistent setbacks along streets and Aircraft parking aprons.

For new buildings, respect the setbacks and orientation set by nearby historic facilities unless approved otherwise by the Base Engineer.

Parking

Relate buildings to parking for visitors, staff, service vehicles, and handicapped stalls.

Provide sufficient parking, including stalls for barrier–free access for visitors and staff at each accessible building. Provide parking lots adequate to serve the occupants of the respective building during a Unit Training Assembly (UTA) period. Develop service yard and parking lot layouts to minimize the amount of paved surfaces.

Landscape and screen large parking areas to diminish the impact of extensive paved areas. (Refer to the Landscape Plan in the landscape design standards here in.)

Image

The public receives their first impressions of Selfridge at four distinct locations: the north (main entry) and south vehicle entry gates; providing shared recreational amenities, open space, and attractive views (Figure 1.) Facility improvements in buildings along the Base Operations Building 50, where transient aircraft park and distinguished guests are welcomed; and at the eastern shore of the base, from which the numerous passengers of leisure craft on Lake St. Clair can observe Selfridge.

FIGURE 1: VIEW FROM LAKE ST. CLAIR

The gates and Base Operations are symbols of Selfridge to the public. Facility improvements at these locations should project an impression of professionalism, quality, and service.

Lake St. Clair provides recreational opportunities for both the base and the public. The Selfridge lakefront is an asset, providing shared recreational amenities, open space, and attractive views. (Figure 1.) Facility improvements in buildings along the lakeshore should enhance Selfridge's contribution to the lakefront and reinforce positive public perceptions of the installation.

In addition, Selfridge has numerous buildings that have historic significance as determined by the Michigan State Historic Preservation Officer. These facilities should be viewed as assets and treated in accordance with both the Selfridge Architectural Design Standards and the Historic Facilities Treatment guidelines described herein.

The Main Base Area contains a number of red brick, federal style buildings that together convey the image of a unified campus. The impression of the historic campus area should be strengthened and enhanced wherever possible.

Building Form

Building massing and forms should be compatible with existing structures, evolving from program functions, internal relationships, and environmental factors.

Align buildings with adjacent structures along aircraft parking aprons or street fronts. Design new buildings of scale appropriate to neighboring buildings; i.e., use two–story structures among existing two–story buildings.

Most existing buildings use pitched roofs gabled or hip roof structures (see Figures 2 and 3). Design new roofs to be pitched at 4:12 slope or steeper to relate to other buildings and to deflect rain and snow. (see Figure 16 New Construction) Buildings should be sited utilizing facility energy modeling while taking the surrounding building aesthetics into consideration.

Roof structures shall be designed to accommodate the support of future PV physical loading. Include a design for a utility chase and/or conduits that run from roof to electrical room for future PV installation.

Use small canopies at building entrances to relate to existing buildings, define and protect entrances, provide smaller scale elements against larger building masses and provide transitions between building interior and exterior.

Use forms such as gabled dormers to reduce the scale of large, commercial or industrial building complexes near smaller scaled facilities.

FIGURE 2 – ROOF FORMS

FIGURE 3 – ROOF FORMS

Screen noisy or less attractive functions such as transformers, refuse containers, or service entries and loading areas from incompatible functions or other buildings by using the building forms or walls.

Architectural Themes and General Guidelines

The following general guidelines apply to buildings throughout the base. Additional guidelines applicable to specific areas of the base follow.

To maintain consistency in each area of the base, specific exterior material/color requirements are addressed for respective areas. Common colors and themes are proposed over the base as a whole. This approach maintains the identity of each area while promoting a base wide design standard.

For buildings located outside of the specific areas noted, follow the requirements deemed most applicable by the Base Engineer.

General Guidelines

Selfridge's building inventory includes many structures identified by the Michigan State Historic Preservation Officer as historic structures. (Building 140 is shown in Figure 4). Several complexes of buildings, referred to herein as the Northwest, North, and Southwest Areas, and the original Main Base Area reflect construction associated with various missions established during the past 80 years.

Reference: UFC 3-101-01 2-4.2 Historic Architecture.

FIGURE 4 - HISTORIC FACILITY

This sporadic history of construction resulted in diverse architecture while enhancing the overall historic significance of Selfridge ANGB. (For more information, refer to the Selfridge Cultural Landscape Evaluation.)

Many of the base's original buildings, located in the Main Base Area, are designed in the federal style. Later facilities in the Main Base Area were designed with a modern, functional character rather than in a specific architecturally–defined style.

- Maintain or modify historic buildings in a manner consistent with their original construction, this includes signage and screening. Design of historic facilities should also comply with the Historic Facilities Treatment section of these Standards.

- Use new materials matching the original materials as nearly as possible for historically significant facilities in *all* areas. Where alterations are made to historic buildings, salvage removed brick for reuse or future use.

- Select colors for historic building materials that match the existing color scheme. Where color is integral to the material (such as brick or slate), match the existing material possible. Use the paint

colors designated in “Color Palette” for specific areas of the base.

- Where two or more existing buildings are connected, match the connecting construction to one or both of the existing structures. Where a precise match is not possible, use different, but appropriate, material for the building linkage. (See Figure 16 – Building 124.)
- Design new buildings to harmonize with adjacent and nearby buildings in style, massing, materials, detailing, and layout concepts. Style and overall design image should be consistent with that used on base and appropriate for the geographic location of Selfridge ANG Base. (See Figure 16.)

New facilities in each area of the base should follow the guidelines established herein for those specific areas.

Sheds, relocatable and temporary facilities are not permitted unless specifically approved by the Base Civil Engineer. In accordance with AFI-1021 and DoD 4165.65 use of these types of facilities are authorized for limited uses as follows: interim use pending construction (not to exceed three years), incident to MILCON, transitory/peak mission, contingency operations, deployments and disaster relief. Design, use and location of this type of facility must be approved by Civil Engineering prior to purchase or leasing. Facilities are to be neat in appearance, functional yet austere and readily removable; there shall be no appearance of permanence.
Design renovations and additions that are architecturally compatible with the existing structure. Minimize exterior alterations to historic buildings; necessary alterations should match the original construction as nearly as possible.

Color Palette
A limited range of colors are designated for the current color palette. Select from these colors for new materials and for painting of existing materials. Color numbers designated herein refer to Sherwin Williams, “Color Answers” system and are used for reference only. Unique areas such as; the Coast Guard complex and Army waterfront block facilities may deviate from this color palette with CE concurrence. Colors should be selected to harmonize with adjacent buildings.

Color Standards:

SW 2010 Taupe Tint

SW 2012 Warmshadow

SW 2013 Manor House
#181 Slate Gray

SW 2007 Nightscape
#154 Dark Bronze

SW 2301 Farmhouse
#156 Colonial Red

SW 2294 Carriage Door

For the exterior colors listed above, it is strongly recommended to obtain a paint color sample from the Staff Architect.

Materials and Colors
Apply the following materials and colors to designs for buildings in each respective area of the base:

Main Base Area—Historic Brick Buildings
Brick: Perform a brick and mortar analysis before specifying a brick type or mortar. Refer to the Selfridge ANGB Conceptual Report – “Analyze Historic Brick” for guidance regarding replacing and/or repairing brick.

Stone*:* precast concrete or limestone sills, lintels, belt course, keystone, capitals, and copings (match existing concrete or stone).

Roofing: slate roofs (repair/maintain); standing seam (repair/maintain) replacement roofing for low–slope membranes: modified bitumen.

Trim/fascia: Wood, painted white. Porch railing: Carriage Door SW 2294.

Sheet metalwork (flashing, gutters, downspouts): copper.

Doors: painted wood panel doors (match original.)

Windows: white vinyl–clad single–hung, double- hung or swing-in wood, multi light replacement windows (match original style).

Louvers and exposed mechanical equipment: baked enamel finish, match adjacent wall material color.

Main Base Area—Other Existing and New Buildings

Brick: Perform a brick and mortar analysis before specifying a brick type or mortar. Refer to the Selfridge ANGB Conceptual Report – "Analyze Historic Brick" for guidance regarding replacing and/or repairing brick.

Stone: Precast concrete or limestone Sills, lintels, belt courses, keystones, capitals, copings.

Pitched roofs: standing seam metal roofing: (Petersen Aluminum or Centria), slate grey.

Low–slope roofs*:* Fiberglass reinforced SBS modified bitumen system, a fully adhered PVC membrane system, or EPDM shall be used.

Non-visible low-slopes shall be white in color and be classified as a "Cool-Roof material".

Trim, fascia, sheet metalwork (flashing, gutters, and downspouts): New - Kynar–coated sheet metal, color to match metal roofing or siding. Paint existing to match Warmshadow SW2012.

Siding: prefinished embossed steel or aluminum (Petersen Aluminum or Centria) flat panels, selected from standard colors: slate grey, or colonial red (small areas/buildings only); paint existing to match Taupe Tint SW2010.

Doors: painted hollow metal, Warmshadow SW2012

Windows: Kynar–finished to match Warmshadow SW2012.

Glazing—hangar doors: insulated translucent panels (Kalwall), reverse shoji pattern.

Louvers, exposed mechanical equipment: baked enamel finish, match adjacent wall material color or paint dark bronze.

Accent color: Farmhouse SW2031 (limited application such as entry canopies, small contrast elements.)

Examples of new facilities that establish acceptable stylistic standards for the Main Base Area include the Joint Dining Facility – Building 194, Joint Medical Training Facility – Building 825, CE Building 124, and the Visitors Center – Building 901.

Northwest Area

Hangars: prefinished metal panel siding (Petersen Aluminum) sandstone and standing seam metal roofing (Petersen Aluminum or Centria), slate grey.

Existing siding materials: paint to match Taupe Tint SW2010.

Other facility walls: integrally colored, split face concrete masonry units, colors to match SW2010.

New roofing: standing seam metal roofing (Petersen Aluminum or Centria), slate grey.

Pitched roofs: standing seam metal roofing (Petersen Aluminum or Centria), slate grey.

Low–slope roofs: Fiberglass reinforced SBS modified bitumen system, a fully adhered PVC membrane system, or EPDM shall be used.

Non-visible low-slopes shall be white in color and be classified as a "Cool-Roof material".

Existing Metal Roofs; Spray applied cold process roofing system. Recommend sources are Thermo Manufacturing and Topcoat. Match color to slate gray.

Trim, fascia, sheet metalwork (flashing, gutters, and downspouts): new- Kynar–coated sheet metal, color to match new roof or siding. Paint existing to match Warmshadow SW2012.

Doors: painted hollow metal, Warmshadow SW2012.

Windows: Kynar- finished to match Warmshadow SW2012, clear glazing or match existing. Treatment for areas requiring security will be determined on an individual basis.

Glazing; hangar doors: insulated translucent panels (Kalwall), reverse shoji pattern.

Glazing—large areas, masonry buildings: glass block; for privacy where applicable.

Louvers, exposed mechanical equipment: baked enamel finish, match adjacent wall color.

Accent color: Farmhouse SW2031 (limited application such as entry canopies, small contrast elements.) See Figure 6 Exterior Materials.

North Area

Metal buildings: Prefinished metal flat panels siding (Petersen Aluminum sandstone) and standing seam metal roofing (Petersen Aluminum or Centria), slate gray.

Existing siding materials: paint to match Taupe Tint SW2010.

Other facility walls*:* concrete masonry units, paint to match Taupe Tint SW2010. See Figure 6 Exterior Materials.

Pitched roofing: standing seam metal roofing: (Petersen Aluminum or Centria), slate gray.

Low–slope roofing: Tapered**,** Fiberglass reinforced SBS modified bitumen system, a fully adhered PVC membrane system, or EPDM shall be used.

Non-visible low-slopes shall be white in color and be classified as a "Cool-Roof material".

Trim, fascia, sheet metalwork (flashing, gutters, and downspouts): New - Kynar–coated sheet metal, color to match roof. Paint existing to match Warmshadow SW2012.

Doors: painted hollow metal, select color adjacent to siding color on palette chart.

Windows: Kynar-finished to match Warmshadow SW2011, clear glazing.

Glazing—large areas: insulated translucent panels (Kalwall), reverse shoji pattern, bronze exterior face sheet, and dark bronze finish.

Louvers, exposed mechanical equipment: baked enamel finish, match adjacent wall material color or paint dark bronze.

Accent color: Farmhouse SW2031 (limited application such as entry canopies, small contrast elements.)

Southwest (1500) Area

Walls: Warm shadow SW1012.

Pitched roofing: standing seam metal roofing (Petersen Aluminum or Centria), slate grey or charcoal grey shingles

Low–slope roofing: Fiberglass reinforced SBS modified bitumen system, a fully adhered PVC membrane system, or EPDM shall be used.

Non-visible low-slopes shall be white in color and be classified as a "Cool-Roof material".

Trim, fascia, sheet metalwork (flashing, gutters, and downspouts): New - Kynar–coated sheet metal to match roof, Paint existing Manor House SW2013.

Doors: painted hollow metal, Manor House SW2013.

Windows: Kynar finished to match Manor House SW2013 windows, clear glazing.

Glazing—large areas: insulated translucent panels (Kalwall), reverse shoji pattern, bronze exterior face sheet, and dark bronze finish.

Louvers, exposed mechanical equipment: baked enamel finish, match wall color.

Accent color*:* Farmhouse SW2031 (limited application such as entry canopies, small contrast elements.)

Construction Materials

Minimize the amount of energy required during construction and operation by using resource

efficient construction techniques, building systems (including HVAC, electrical, water, lighting, heat-pumps and boilers), insulation, fixtures, appliances, and controls. Minimize waste, spillage, pilferage, spoil and misuse of building materials.

Use materials free of formaldehyde, lead, PCBs, Ozone Depleting Compounds, or other hazardous materials. Select materials with low–VOC adhesives, coatings and/or binders. Halon use is banned.

Use recycled materials whenever possible or mandated by Affirmative Procurement.

Schedule time to allow for the "off gassing" of construction materials such as paint, carpets, and furnishings prior to building occupancy. Install these materials at least 2 weeks before building occupancy whenever possible. Complete "off gassing per LEED Commissioning requirements

Exterior Materials

This section describes the standards for materials listed above.

The materials noted herein are not intended to supersede requirements for landmarks designated by the Michigan State Historic Preservation Officer. Refer to the Historic Facilities Treatment section for additional information.

Items designated as "prefinished" shall include either anodized or Kynar–coatings unless specifically stated differently. Consider the use of special coatings which meet or exceed the durability of Kynar coatings while enhancing the energy performance of a building.

The Building Envelope

The envelope of a building is one of the primary factors in minimizing a building's energy use. Building designs shall focus on minimizing losses first in order to maximize gains. Designs shall ensure an efficient building envelope which includes high R-Value insulation, airtight construction, and energy efficient windows and doors.

Reference: UFC3-101-01, Chapter 3 – Building Envelope Requirements.

High R-Value Insulation

Use high R-value insulation that provides a continuous, unbroken layer around the building envelope. Attic areas, roofing systems, and walls should be tightly sealed and strive to exceed ASHRAE 90.1 Standards by 50% whenever economically feasible. Insulate foundations and under the slabs. Seal all holes, cracks, and penetrations through the floor, walls, and ceiling to unconditioned spaces to prevent thermal bridging.

Airtight Construction

Ensure that all windows and doors are tight and have seals which eliminate air-leakage. The roof and/or ceiling needs special attention, as do the kitchen and bathrooms, to make sure they have adequate ventilation but still maintain energy efficiency.

Roofs and Roofing Systems

Building roof types existing on base currently include low slope roofs with and without parapets; steep slope roofs such as hip roofs, gables, sheds and dormers.

Use pitched roofs with slopes similar to those of surrounding structures wherever possible. Do not use mansard or shed roof structures. Do not use Coal Tar Pitch roofing material in new applications. Lay out buildings to allow for use of pitched roof structures rather than to require extensive, flat roof fields. All roofing systems must meet applicable with the long axis aligned east-west to maximize solar exposure, rather than extensive flat roof fields. Roofing systems shall be designed to support future PV systems, and material must meet "Cool Roof" criteria. Strive to integrate cool roof systems with historic building requirements. Consideration should be given to using a vegetated roofing system where appropriate. All roofing systems must meet applicable codes and regulations and have FM I–90 and UL Class A rating.

Snow guards for standing seam steel roofs must be a type that will clamp to the rib of the roof panel, either flag or rail type fence, no "stick-on" type 2. Gutter system must be independent of the drip edge with adequate pitch to prevent ice damming. All roofing work must be in accordance with appropriate UFC.

Reference: Refer to UFC 3-101-01 4-7 Fire Rated Assemblies UFC 3-110-03.

Steep–slope roofing systems: Use one of the following roofing systems for steep slopes, as appropriate:

- ***Historic administrative buildings***: where slate roofs exist, repair or replace damaged roofing to maintain the roof's integrity and remain consistent with the original building design. Use copper flashings, gutters, and downspouts to match existing systems.
- ***Other administrative buildings:*** Use Kynar–finished metal standing seam roofing systems over ice and water shield membrane. Match the flashings, gutters, downspouts, and other exposed trim to the roofing panels. Provide snow-guards over entrances. Use only true standing seam systems with folded seams anchored by "floating" clips anchored to roof decks. Petersen Aluminum or Centria establish the quality standard for this material, but other products of demonstrated equal or better quality may be specified.
- ***Residential facilities***: Use asphalt shingle roofing systems. Use Kynar–finished aluminum gutters, downspouts, and flashing materials.
- ***New industrial facilities***: Use Kynar–finished standing seam metal roofing systems, such as systems manufactured by Centria or Petersen Aluminum, over ice and water shield membrane. Either steel or aluminum systems may be used; materials selection considerations include system weight and associated structural requirements, current market cost of materials, and corrosive atmosphere within and around the buildings. Use only true standing seam systems with folded seams anchored by "floating" clips anchored to roof deck. Petersen Aluminum or Centria establish the quality standard for this material, but other products of demonstrated equal or better quality may be specified.

Permanently installed fall protection shall be incorporated into the design and construction of steep roof systems with a slope greater than 3:12.

Low–slope roofing systems: For low-slope applications, use a fiberglass reinforced styrene-butadiene-styrene (SBS) modified bitumen system or a fully adhered PVC membrane system. Siplast Paradiene 20/30 FR system establishes the quality standard for the SBS modified bitumen application. Other products of demonstrated equal or better quality may be specified. If a PVC system is used it shall be fully adhered with a minimum of a 72 Mil membrane thickness. Also, the PVC system shall incorporate a cover board directly below the roof membrane and it should be made of glass mat silicon-modified gypsum board.

Install low–slope membranes over Perlite, fiberglass, or polyisocyanurate insulation. Use tapered insulation on flat roof decks (less than 1/4–inch per foot slope). Tapered insulation shall provide a minimum of ½" per foot slope.Use prefinished aluminum flashings, gutter, downspouts, and trim.

Fascia and copings: Use prefabricated, prefinished sheet metal systems for fascia and copings. Detail or select sheet metalwork to allow for thermal expansion, provide hemmed drip edges, and to use concealed fasteners that allow for movement of materials without buckling.

Refer to the specific building type listed under the Construction Materials section for color standard.

Exterior Wall Systems

All exterior wall systems shall use insulation levels which meet or exceed current ANG and State code standards. Facility modeling should

drive the insulation requirement. In the event of a conflict use the standard which provides the highest level of insulation.

Reference: UFC 3-101-01 -4-3 Paint Selection and 4.4 Masonry.

Brick cavity wall systems*:* Construct exterior brick wall systems 4–inch brick veneer over concrete masonry unit interior wall, with insulated wall cavities. Interior walls should be either reinforced for bearing, or nonbearing as most economically feasible. Design the masonry wall thickness for structural requirements and to comply with the applicable building code. Do not fill cores of the interior masonry wythe with insulation inserts and fill materials. Detail brick per Brick Institute of America Technical Notes. Include weep holes and flashing to provide an exit for moisture from cavity.

Metal siding systems*:* Use embossed Kynar–finished aluminum or steel flat, panels, minimum 12" width. Vertical panel systems may be used on existing hangar gables. Vertical panels shall be used elsewhere. Panels shall be insulated with reflective vapor barrier on warm side of wall system. Petersen Aluminum or Centria establish the quality standard for this material, but other products of demonstrated equal or better quality may be specified.

Exterior concrete masonry walls: Use 4-inch units over 2-inch insulated cavity over minimum 8-inch standard concrete masonry unit interior wythe. Do not fill cores of interior masonry wythe with insulation inserts and fill materials. Provide weep holes and flashing to allow moisture to exit cavity.

Other masonry walls: Single wythe walls or masonry unit cell–type insulation materials are not permitted.

Historic Brick Masonry Facilities: Analyze existing mortar, masonry units, and techniques originally used in striking the joints when doing any repair work or repointing.

Replacement brick is to match the properties of the existing brick as closely as possible.

Mortar shall have:

- A compressive strength that is less than the existing masonry units and equal to or less than the original mortar.
- A color and texture matching the original mortar.

Mechanical cleaning is not to be used as a brick cleaning method. Do not use a water method to clean brick during cold weather. When choosing a cleaning process, the negative environmental impact is to be considered. The preferred masonry cleaning method is water and a bristle brush.

Nonhistoric coatings, such as water repellents, are not to be used.

Exterior Doors and Windows

Exterior Doors

Specify appropriate quality, energy-efficient doors. Where wood exterior doors are provided, use *solid* wood (no veneers) stile and rail construction. Install wood doors in wood or metal frames. Use wood frames only where appropriate to the architectural style of existing facilities.

Provide insulated exterior metal doors in buildings where required. Use panel style doors where appropriate to the architectural style of existing facilities. For other metal doors, use flush type doors in fully-welded insulated hollow metal thermal break frames.

Fiberglass doors and frames may also be used for flight line buildings or facilities with corrosion problems. Where exposed to high winds, provide bollards with neoprene bumpers behind doors to limit door swing.

Overhead Doors

Hangar doors which shall be fabric and coiled overhead service doors should be selected to provide maximum R-value and minimum air infiltration whenever possible.

Exterior Windows

Specify appropriate quality, energy-efficient windows. Select double-glazed low-E window exterior aluminum or vinyl–clad wood windows where appropriate to the architectural style of existing facilities. Specify commercial–quality aluminum windows with thermal break construction, with Kynar-coating or anodic finish. Roof overhangs, window size and placement, and overall building shape should be designed to maximize energy performance for building end user.

Flight line facilities may require special window systems to meet interior Acoustics and Noise Control criteria listed hereinafter.

Glazing Systems

Use low – E, 1– inch – thick clear insulating thermal glazing systems for exterior windows.

For large areas of glazing in hangars and similar open–bay buildings, use Kalwall insulating translucent panels. Due to differences in panel materials and construction, use proprietary specifications for Kalwall panels. Provide coordinated aluminum windows and louvers as part of the translucent panel systems to minimize wall penetrations.

For large areas of glazing in masonry buildings, use clear glass block panels.
Where security or privacy is *required*, use the appropriate level of translucency to meet the task requirement.

Stoops

Stoops are to have foundations which extend to the frost depth and attach to the building foundation.

FIGURE 5- EXTERIOR MATERIALS

Building 50

- Existing historical brick building constructed in 1931.
- Slate roof.

Main Gate

Visitor's Center and Main Gate

- New brick construction reflective of Main Base Area architecture.
- Standing Seam Metal Roof

Visitor's Center

s

FIGURE 6 - EXTERIOR MATERIALS

Building 124

"The LINK"

- Aluminum metal panels and a glass spandrel wall used to link two historic buildings which were built of different types and colors of brick.

- Painted Concrete Masonry
- Farmhouse Red Canopy
- Color of Louvers match wall color.

- Metal siding system - Sandstone color
- Farmhouse red door indicating Main Entry

Interior Building Systems

Choose interior architectural elements and finishes that provide coordinated, professional, comfortable environments to facilitate the mission of building occupants.

Avoid using materials that require regular maintenance such as painting, waxing, or buffing. Use light interior wall, and ceiling colors to maximize light reflectance.

Use "open planning" organizational concept throughout offices, using systems furniture to maximize efficient space planning. Refer to specific requirements in the ANGETL 15-01-00 and *Furnishing (in this section)* for system furniture requirements and responsibilities.

Maintain primary circulation paths and exit corridors along the main building axis. Clearly develop and define vertical and horizontal circulation paths.

Locate important spaces or shared facilities such as conference rooms or restrooms near public areas of buildings to minimize circulation through semiprivate offices or other spaces.

Designate spaces for break areas, vending machines, and recycled materials bins. Consider service requirements for these areas when selecting locations for these functions.

The location of rooms within a building should be determined with consideration given to the amount of heat generated by activities or lost because of the room's location. Spaces which are not occupied a great deal of the time, such as corridors, wall closets, mechanical equipment rooms, laundries and garages, can be kept at lower temperatures, and placed on the north wall of the building where feasible.

Comply with applicable industry standards and building code requirements in selecting finishes and equipment.

Interior Color Palette

Select color for permanent interior materials from the Selfridge Interior Design and Color Standards List. Use light colors for ceilings and walls. Use medium–range hues for carpeting, wall coverings, and furnishings to brighten interiors and provide visual relief from the neutral tones.

Accent Colors

An accent color can be used:

1. On one wall in an office
2. As a solid colored border for a floor carpet (carpet tile) in a commander's office or conference room.

Table 1 – Interior Color Standards

Selfridge Interior Design and Color Standards	
Sherwin Williams Pro Mar 200 Latex	
Walls	
Color	**SW #**
Dover White	SW 6385
Extra White	SW 7006
Snowfall	SW 6000
Aesthetic White	SW 7035
Take Five	SW 6513
Trim	
Color	**SW #**
Tony Taupe	SW 7038
Accent Color	
Burgundy	SW6300
Dark Green - Shamrock	SW6454
Dark Blue – Loyal Blue	SW6510

Interior Design

In accordance with Air Force Design, include Comprehensive Interior Design (CID) for all extensive remodeling or new construction

projects. Include materials and color selections for all applicable interior finishes, equipment, interior signs, and systems furniture in the CID package. Avoid trendy or dated finishes and design features. Interiors should be creative but not extreme, reflect quality, and be capable of updating without requiring major changes to materials, spaces, and functions.

Acoustics and Noise Control

Apply the following acoustical design criteria for ANG facilities at Selfridge:
Administrative areas: 65 dBA maximum.
Industrial: 80 dBA maximum.
Clinics: 50 dBA maximum.
Audiogram booths in separate rooms: 40 dBA maximum.
Acoustical privacy: conference rooms, counseling facilities.
Designers note: flight line facilities pose special challenges for acoustical design, which must be considered early in design and selection of construction systems to meet the above criteria.

Reference: UFC 3-101-01, 3-7 Acoustics, 4-8 Interior Acoustics, and 5-3.3.11 Architectural Acoustics.

Floor Finishes and Systems

Provide carpeting for all but high traffic areas, industrial facilities, and sanitary areas such as restrooms. Choose carpet that complies with the U.S. Air Force Carpet Selection Handbook-Engineering Technical Letter (ETL) 07-4. Carpeting shall be bold tweed or randomly patterned, commercial quality carpeting. Carpet tiles may be used in areas requiring frequent alterations. The carpeting is to be uniform throughout the facility. Solid colored carpeting is to only be used for general officer's or wing/base commander's suites. A solid border may be used for office and conference rooms of squadron commanders and above. Use only burgundy, dark blue, or dark green as an accent color. Refer to Table 1, Selfridge Interior Design and Color Standards. Use only low–VOC adhesives for carpet materials.

Use concrete floors painted with white or light gray two part epoxy coating in industrial work areas. In areas where lubricants, chemicals, or solvents are used, apply urethane flooring materials with appropriate resistance to the chemicals being used within the area. Use hardeners on concrete where heavy equipment is used. Refer to the most current version of ANGETL 15-01-00.

For lobbies, break rooms in shop areas, and entrances, use quarry tile on depressed slabs. Provide unglazed quarry tile flooring with 1-1/2-inch mortar setting bed. Grout and tile colors shall be dark neutral colors.

Provide removable, slip–resistant, recessed rubber or metal floor grates at building entrance areas to collect soil and moisture.

Provide ceramic tile floors that comply with The Americans with Disabilities Act for restroom, locker rooms and shower room floors.

Install ceramic or quarry tile flooring with a matching coved, 6–inch bull nose base except at tile wainscots, wall tile, or glazed concrete masonry walls. Install tile in accordance with the applicable guidelines of the Tile Council of America.

Use vinyl composition tile or welded vinyl sheet flooring for corridors, general purpose spaces, small single–occupant latrines, and high traffic areas. Provide 4 –inch high, 1/8–inch–thick vinyl or rubber coved wall base.

Provide access flooring in computer rooms and spaces with intensive communications requirements. Provide plastic laminate finish. Use accessible aircraft parking aprons to provide transitions between raised access panels and existing building floors.

Install carpeting in all areas of visitor quarters except kitchens, bathrooms, laundry areas, and vestibules. Use ceramic tile in bathrooms and resilient sheet flooring in all other areas.

Wall Finishes

Where masonry cavity wall construction is used in industrial areas, use glazed or painted concrete masonry units for the wall finish. Areas with more stringent sanitation or maintenance requirements may employ glazed ceramic wall tile. Use ceramic wall tile in restrooms, locker rooms, and shower rooms.

Use heavy–duty liner panels, painted concrete masonry units, or glazed concrete masonry units for interior surfaces of exterior walls in metal industrial type buildings, pole buildings, or hangars.

Use chemical resistant, washable, gloss paint where painted concrete masonry units are provided. (See recommended systems in "Paint".)

Use heavy duty, Type II, washable, textured vinyl wall coverings in high traffic areas such as corridors, spaces with special maintenance requirements such as break rooms, and on accent walls for administrative buildings.

Provide textile wall coverings for executive offices and conference rooms and visitor reception areas. Use washable, decorative paint finishes applied to gypsum wallboard for other wall surfaces.

Interior Doors

Provide interior doors and frames appropriate to the style and function of each facility:

***Historic administration buildings*:** painted or stained, solid wood raised panel doors in wood frames.

New administration buildings: stained, solid core birch veneer flush doors in prefinished aluminum or painted hollow metal or wood frames.

New/existing industrial buildings: hollow metal doors/frames. Fiberglass doors and frames may also be used for flight line buildings or facilities with corrosion problems.

Ceiling Systems

Provide acoustical tile ceiling (ATC) systems for administrative facilities. Use 24-inch by 24–inch fine-textured, fissured, tegular edged, recessed lay–in ATC panels in metal grid. Provide decorative acoustical tile ceiling systems in administrative spaces for senior officers; lounges, break areas, conference, training, and other assembly spaces; clinics; and in reception areas and lobbies.

Use compatible, recessed fixtures and other appurtenances for all lighting, mechanical, and fire protection systems used with ATC systems, to provide a complete system.

Window Treatments

Provide 1–inch mini blinds for small to medium windows in offices and other administrative areas. Blinds shall be metal in off–white or light neutral color compatible with the building palette. Select vertical blinds with perforated holes for large windows. All blinds for a single building shall be of the same color. Window treatments are to be purchased by the using organization.

Paint Systems

Provide chemical–resistant coatings suitable for industrial applications, including hazardous materials storage, hazardous wastes storage, and shop storage shelving. Use washable, abrasion resistant, nonhazardous paint materials free of lead and ozone depleting compounds (ODCs), with low–VOC ratings.

Select coatings resistant to applicable exposure, such as acids, solvents, bases/caustic, and POL substances.

Paint finishes are to be approved by BCE.

Door Hardware and Lock Systems

General Requirements

Comply with ADAAG, IBC International l Building Code, ANSI/BHMA standards, and NFPA 80 Fire Doors & Windows.

Provide hardware finishes US26D Satin Chrome or US28 Clear Anodized Aluminum.

Where manufacturers names are listed for hardware components, use proprietary specifications to match existing systems.

Locks

Provide interchangeable core lever–handled cylindrical locks, Series 93K (heavy duty) by Best Lock for exterior doors.

Surface mounted, single point latch, exit devices are preferred (Von Duprin 33, 98, or 99) for example). Use devices in conjunction with removable mullions rather than vertical rod devices for double doors. This is because vertical rod devices constantly require adjustment and repair. Avoid the use of concealed vertical rod devices.

- Cylindrical locksets are preferred over mortise locks. Mortise locks typically require more repairs and are more costly. The use of mortise locks is acceptable when there is a need for a combination of functions and also a requirement for a deadbolt.
- Handed door closers are preferred over the non-handed variety. For example the use of LCN 4110 series is preferred over LCN 4040 series. High traffic areas need to have heavy duty closers-medium duty closers will not last.
- SANG Base is equipped to service only KABA SIMPLEX brand stand-alone push button locks. Use the following series: 1000, L1000, LP1000 (exit device), or 5000 (includes exit devices.) If other brands are used training will be required.
- Keys and cores are to be BEST brand only.

Keying

Provide a master key system "Best Lock" for each building keyed to a base–wide grand–master key system. There are currently 5 Grandmaster keys to the base. All locks within all buildings unless otherwise approved by the Base Civil Engineer or required for special secure installations shall be able to be operated by one of the five grandmaster keys. The building master key shall operate all locks within a specific building only. Operating keys operate only locks for designated rooms or series of rooms within a building.

Building facility managers will receive master keys. Building occupants will receive operating keys only. The grandmaster keys will be available only to the Wing Commander, Base Civil Engineer, Base Fire Department, and Civil Engineer locksmith.

Key control is the responsibility of the local commander of the occupying unit and is normally delegated to either the security manager or facility manager. This person is to work with the locksmith to design a suitable keying system and then receives the keys. He or she then has each person sign for the new keys in the key register. The hardware supplier is responsible for insuring that the correct number of keys and cores are shipped from BEST to the locksmith allowing ample time to design and build the system prior to occupation.

Provide a key control cabinet located inside the building in a location designated by the applicable facility manager for storage of operating key copies.

Fire Entry

Currently, the base uses multiple keyways, with several grandmaster keys. There are also facilities or portions of facilities accessed by cipher locks or card entry systems. One exterior door will have a push button lock with a key override to allow entry by the Fire Department in case of an emergency.

Electronic Access

Electronic access control should be accomplished via readers compatible with DOD CAC. They should be fail secure with key bypass. They should have full audit trail capability. Systems should not be proprietary and replacement and repair parts should be

easily attainable at reasonable cost. Computer based systems must be approved by Communications and it cannot be assumed that any system will be allowed to reside on the NIPR Net without official DOD approval.

Exit Devices

Provide surface–mounted exit devices by Von Duprin. Exit devices shall comply with applicable code requirements. At double–leaf door exits from any occupied space; provide exit devices on both leaves. Two–point latches or bolts are prohibited.

Closers

Provide LCN "Smoothee" surface mounted door closers, models 4010 or 4110 with extra duty cushion stop arm, and hold open feature where applicable.

Stops

Provide doorstops for all doors. Use interior floor stops only where wall stops are inappropriate and where stops will not be a tripping hazard.

Table 2 – Door Hardware

1

DOOR HARDWARE			
Description	Manufacturer	Model/Series	Finish
Hanging Devices			
Continuous Hinge	Stanley	661HD/662HD (Geared Type)	628
	Alternate: Hager/Roton	780-112hd/780-224HD	628
Mortise Hinge	Stanley	FBB/CB199 x NRP (Heavy use exterior)	626
		FBB/CB191 x NRP (Standard use exterior)	626
		FBB/CB168 (Heavy use interior)	652
		FBB/CB179 (Standard use interior)	652
		*NRP at out swinging doors	
Securing Devices			
Mortise Lock Set	Best	Mortise – 45H Series, Verify trim design	630
Cylindrical Lock Set	Best	Cylindrical -93K-S3 Series, Verify trim design	626
	Lock Function	Room Type	
	45H-A (93K-AB)	Office Function – Faculty, Administration	
	45H-AT (93K-AB)	Office Function	
	45-R (93K-R)	Classroom Function – Classroom's	
	45H-D (93K-D)	Storeroom Function – Janitor, Storage, Boiler rooms	
	45H-N (93K-N)	Passage Function	
	45H-L (93K-L)	Privacy Function – Single Student Bathroom	
	No Substitution		
Auxiliary Dead Locks	Best	Mortise – 48H (function as required)	626
		Tubular – 83T (function as required)	626
	No Substitution		
Padlocks	Best	21B722L x XSPL – 1 ½" shackle height	630
	No Substitution		
Keying	Best	Existing "Standard Interchangeable Core	626
	No Substitution		
Exit Device	Von Duprin	CD35A-NL-OP X Pull (narrow door exterior)	626
		CD98NL (single door, exterior)	630
		CD98NL – OP x Pull X CD98EO XKR4954 (pair, ext)	630
		CD3547A-NL-OP x Pull X CD3547-EO (narrow pr, ext)	626
		CD987NL-OPxPullXCD9847EOxPull (Pr, ext)	630

Table 3 – Door Hardware

DOOR HARDWARE			
Description	Manufacturer	Model/Series	Finish
		98L-F (rated single door interior)	630
		9827L-F X LBR X 9827EO-F X LBR (pr, interior)	630
		350 Series Dummy Bar (interior vestibule)	630
		• All non-rated exit devices to have hex key dogging	
		• Vandal Resistant Lever	
		• SNB	
		•Offset wire pulls as required.	
Coordinator	Rockwood	1600 Series x Filler Bar x 2/1601C	600
	Alternate: Trimco	3094 Series x Filler Bar x 2/3095 or 2/3096	600
Automatic Flush Bolts	Rockwood	1842/1845 (Automatic) (metal doors)	626
		1942/1945 (Automatic) (wood doors)	626
	Alternate: Trimco	3810 x 3810 (Automatic) (metal doors)	626
		3815L x 3815L (Automatic) (wood doors)	626
Manual Flush Bolts	Rockwood	555 (Manual (metal doors)	626
		557 (Manual) (wood doors)	626
	Alternate:Trimco	3917 (Manual) (metal doors)	626
		3913 (Manual) (wood doors)	626
Closing Device			
Surface Closer	LCN	4110 EDA (exterior out swinging)	689
		4110 EDA, 4041 REG (interior)	689
		• All door frames to be reinforced	
		•Hold-open arms HSCNS or H-EDA as required	
		•Auxiliary stops recommended	
	No substitution		
Stops & Holders			
Overhead Door Holder	ABH	1000 Series (Overhead Concealed-Heavy Duty)	630
		9000 Series (Overhead Surface – Heavy Duty)	630
	Alternate: Glynn Johnson	100 Series (Overhead Concealed-Heavy Duty)	630
		900 Series (Overhead Surface-Heavy duty)	630
Door Stop	Rockwood	403/409 Wall Stop (Interior)	626
		441/443 (Interior Floor)	626
		480 (Interior/Exterior Floor)	
		•Allow for maximum swing of doors	
		•Backing required at wall stops	
		•Avoid floor stops where possible	
	Alternate: Trimco	1270CVCP (Wall Stop)	626
		1211 (Interior Floor)	626
		1214 (Interior/Exterior Floor)	626
		• Allow for maximum swing of doors	
		• Backing required at wall stops	
		•Avoid floor stops where possible	
Accessories			
Push/Pull Plate	Rockwood	70C x 106-6" x 70C 4x 16 (CFC where required)	630
	Alternate: Trimco	1001-3 x 1013B 4 x 16 (CFC where required)	
Kick Plate	Rockwood	K1050 10" x 2" LDW x .050 x CSK (Single	630

Table 4 – Door Hardware

DOOR HARDWARE			
Description	Manufacturer	Model/Series	Finish
		Doors)	
		K1050 10" x 1" LDW x .050 x CSK (Pair Doors)	630
	Alternate: Trimco	KO050 10" x 2" LDW x .050 x CSK (Single Doors)	630
		KO050 10" x 1" LDW x .050 x CSK (Pair Doors)	630
Mop Plate	Rockwood	K1050 4" x 1" LDW x .050 x CSK (Single Doors)	630
		K1050 4" x 1"LDW x .050 x CSK (Pair Doors)	630
	Alternate: Trimco	KM050 4" x 1" LDW x .050 x CSK (Single Doors)	630
		KM050 4" x 1" LDW x .050 x CSK (Pair doors)	630
Door Silencer	Rockwood	608 (Metal Frames)	Gray
		609 (Wood Frames)	Gray
		1229A (Metal Frames)	Gray
		1229B (Wood Frames)	Gray
Thresholds	Reese	S205A (verify per details)	
	Alternate: Pemko	171 (verify per details)	
	Alternate: National Guard	425 (Verify per Details)	
Gasketing	Reese	797B (at head and jambs)	
	Alternate: Pemko	S88D (at head and jambs)	
	Alternate: National Guard	5050B (at head and jambs)	
Weather Seal	Reese	678A (at head and jambs-surface mount)	
		323A (at sill on door – surface mount)	
		•Applications may vary	
	Alternate: Pemko	303AS (at head and jambs-surface mount)	
		315CN (at sill on door-surface mount)	
		•Applications may vary	
	Alternate: National Guard	161 SA (at head and jambs- surface mount)	
		200SA (at sill on door-surface mount)	
		•Applications may vary	
Astragal	Reese	276C x 588D (Wood Doors) (Where required buy fire code.)	
		•Astragal by door manufacturer at HM door.	
	Alternate: Pemko	355CS x HS1000 (Wood Doors) (Where required by fire code)	
		• Astragal by door manufacturer at HM door.	
	Alternate: National Guard	15N8A x 9800C (Wood doors) (Where required by fire code)	
		• Astragal by door manufacturer at HM door.	
Sound Seal	Reese	DS78A (at head and jambs)	

Table 5 – Door Hardware

DOOR HARDWARE			
Description	Manufacturer	Model/Series	Finish
		370A (at sill on door-mortise)	
		•Applications may vary	
	Alternate: Pemko	312CR (at head and jambs)	
		411ASL (at sill on door – mortise)	
		•Applications may vary	
	Alternate: National Guard	130NA (at head and jambs)	
		225N (at sill on door-mortise)	
		•Applications may vary	
Drip Cap	Reese	R201A (4" wider than door width)	
	Alternate: Pemko	346C (4" wider than door width)	
	Alternate: National Guard	16A (4" wider than door width)	
CIPHER LOCKS			
Below are the types of cipher locks used at Selfridge ANGB. These are a few choices which will need to be made based upon the application. All locks should be 26D finish with "Best" or SFIC key bypass. Where electronic versions are required please use the KABA E-PLEX series locks.			
Description	Manufacturer	Model/Series	Finish
Panic/Exit devices on exit doors use the following			
	KABA	SI5010B-WL-26D-41	
	Simplex	LRP1020B-26D-RH (Right Hand Doors)	
	Simplex	Model: LRP1020B-26D-LH (Left Hand Doors)	
For standard interior doors where there is currently a knob or lever lock use the following:			
	KABA	5021 BWL-26D	
Where there are mortise locks or when needed use the following cover plate kit (1 kit per door):			
	Don Jo	DJ-RPK109-630-32D	
The CE lock shop purchases most parts from the following vendor: Accredited Lock Supply 800-652-2835			
We have found this company to be the most reliable and cost effective for our needs. If you use a different company please make sure that you are not sold different parts. We would like to keep the different brands and lock types to a minimum in order to insure our ability to provide timely service.			

Furnishings

Requirements and Responsibilities:

- BCE Responsibilities: Review all requests for systems furniture, including acquiring or installing new wall panel sections, and moving or rearranging existing systems furniture configurations. Approval by the BCE or his/her appointed representative is required prior to any action.

- User Responsibilities: The user is responsible for the accountability, maintenance, custody, care and safekeeping of systems furniture items.

Systems furniture shall be used for all open office planning over 1000 square feet, in all new facilities in accordance with ANGETL 15-01-00 and ANGETL 92-3.

Select the following finishes for systems furniture: baked enamel on steel with plastic laminate work surfaces. Consider ergonometric, flexibility, and specific functions supported in each facility when developing furniture layouts. System wall height shall be no higher than 66" without special approval.

Integrate lighting, communications, and wire management systems with systems furnishings. Use under–carpet flat wire system as necessary to avoid posts or floor monuments for electrical service. Where floor outlets are required, top shall be flush with finish floor surface. Refer to illumination level requirements in the Electrical Design Standards.

All new systems furniture shall be provisioned with ERP (Extended raceway panels) for routing Data and Communication Cabling, Open Frame Access Panels for all systems adjacent to or abutting walls.

Coordination shall be done with the base communications office on the number of phone lines and data lines, required in the systems furniture area office.

Use ergonomic, fully adjustable seating with stable, "5–star" bases.
Comply with IBC International Building Code and ADAAG requirements for furnishings.

Use modular, movable shelving/storage systems to optimize space use. Design for appropriate live loads wherever storage systems are used.

Ensure that furniture does not block heat exchange surfaces like radiators and supply and return vents.

The Contractor must investigate the applicability of procuring these items with recycled-content as outlined in the Green Procurement portion of the standards. If the Contractor is unable to provide the product with the recommended percentage of recycled-content, proper justification must be submitted.

Radiation Exposure

161–9, 10 CFR 1700, NRC, and 29 CFR 1910 requirements for radiation shielding. Shield adjacent spaces from exposure to potential sources of Radio Frequency and Electromagnetic Radiation (RF/EMR.) Where Video Display Terminals (VDTs) are used with systems furnishings, ensure that VDTs are shielded to protect users from radiation emitted at sides or rear of units, or locate VDT workstations to prevent exposure.
Integrate measures to prevent radiation exposure into space planning and overall facility design concepts. Orient work-flow patterns and processes to prevent exposure and minimize the effects shielding on adjacent work areas.

FIGURE 7: MAIN ENTRANCE SIGN

Building Sign Standards

The objective of Selfridge sign standards is to develop a uniform signing approach that will direct first–time visitors to their destinations and provide information about specific buildings or spaces. An effective sign system provides a hierarchy of information at appropriate decision points, without overwhelming travelers.
Use uniform signage to promote clear, concise, and consistent sources of information and to enhance the installation image. All permanent building signs shall conform to the standards identified below and as shown in Figure 7 and 12.

General

Apply UFC 3-120-01 Sign Standards where applicable. Size messages and graphics on signs according to functional viewing distance. The rule of thumb for sign readability is 1–inch of letter height per 25 feet of viewing distance. Figures 9 - 11 includes examples of typical base signs with dimensions and proportions for use in developing a Base Sign Master Plan.
Signs shall not be internally illuminated. Where visibility requires illumination, use unobtrusive external spot or flood lights or concealed down lights to illuminate the sign surface. The only exceptions are Exit Lights that must be illuminated to comply with building code requirements. Use LED Lighting in all exit signs. Building sign lighting shall comply with UFC 3-530-01 Interior and Exterior Lighting Systems and Controls.

Do not paint signs on sidewalks or curbs, except where parking striping or similar street markings are required. Reserved parking signs are limited to unit commanders 0-6 and above, handicap, visitors, and military vehicles.
The Contractor must investigate the applicability of procuring these items with recycled-content as outlined in the Green Procurement portion of the standards. If the Contractor is unable to provide the product with the recommended percentage of recycled-content, proper justification must be submitted.

Additional information regarding exterior signage standards such as parking signs and street signs can be found in the SANGB Instruction 32-8 Exterior Signs and Markings.

Exterior Signs

Display only a single emblem for each sign. A flag–bearing unit that is the only occupant of a facility may include its unit emblem on the sign. Signs for joint use facilities should display the "Team Selfridge" emblem only.

Building Signs

Building signs comprise part of the Base Sign Master Plan and should provide building specific information. Limit the amount of information for readability and identity. Normally, building signs include a single unit name and emblem only. Refer to UFC 3-120-01 for applicable guidelines. Refer to Figures 9 -11 for sign design and color scheme.
Layout each exterior building sign to include one emblem for either the flag–bearing unit occupant or the Team Selfridge emblem, building number; building street address; and primary unit name.
At historic buildings in the Main Base Area, provide granite base (Dakota Mahogany) mounted signs.
Signs shall be mounted to face oncoming traffic.

Hangar Signs

In addition to the building signs described above, provide individual hangar bay numbers

mounted on the aircraft parking apron side gables of East Aircraft parking apron hangars (For example, street side sign for Building 3 will include the number 3; the aircraft parking apron side of the building will have numbers 3 and 4 mounted on the gables of the respective hangars).
Hangar bay numbers shall be individual cast aluminum numbers painted to match SW2301 Farmhouse and centered in the gable area above the hangar door.

FIGURE 8: SIGN

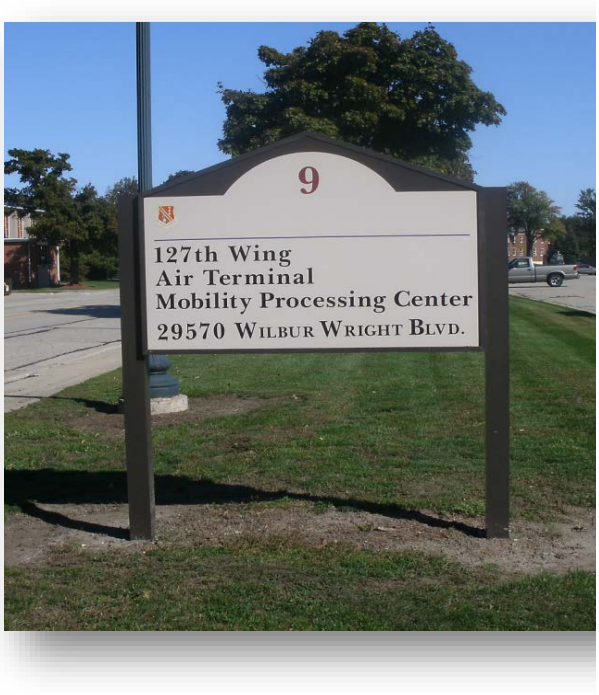


FIGURE 9 - SIGN

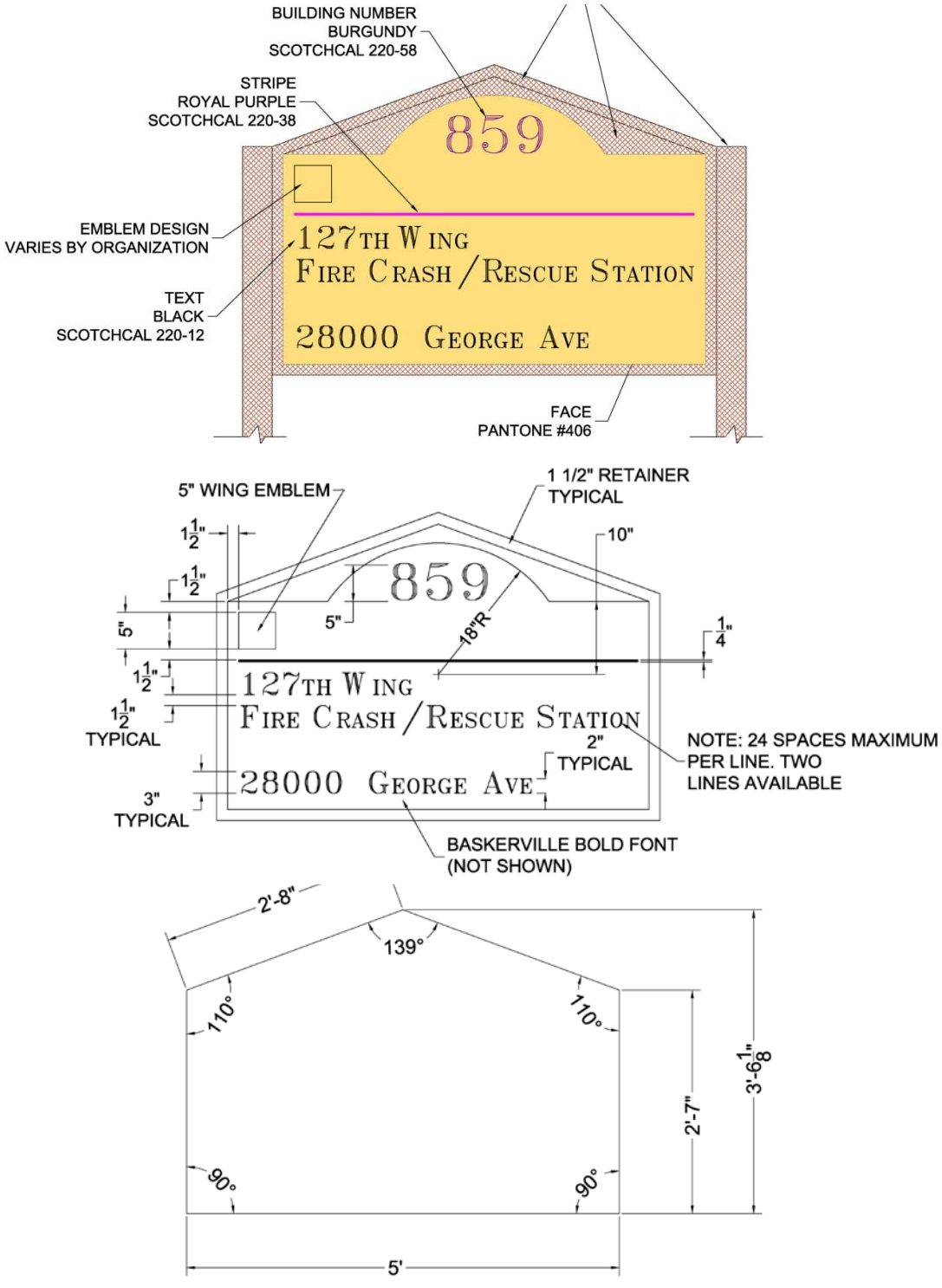


FIGURE 10 - SIGN

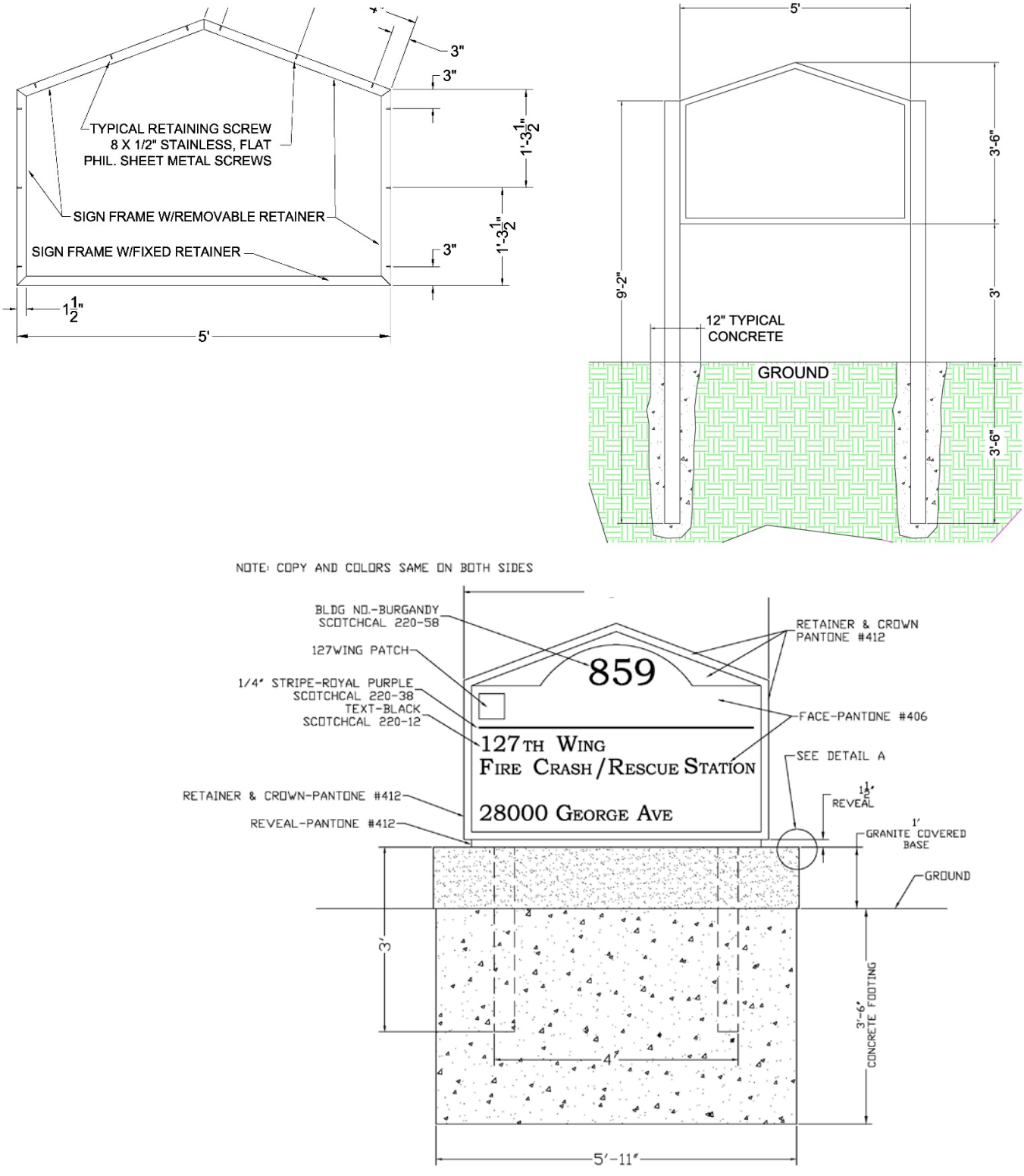


FIGURE 111: BUILDING SIGN WITH GRANITE BASE

Facility Directory Signs

At groups of similar buildings, such as the 301–305 complex, provide one Facility Directory sign located in the parking lot. Facility Directory signs are pylon-mounted signs, 6 feet high. Select locations for Facility Directory signs so as to minimize the visual impact of signs, but to provide a convenient location for visitors in vehicles and on foot.

Interior Signs

Use interior signs to designate door numbers, building occupants, and functions or to provide other information useful to visitors. Provide a complete interior signage package, identifying locations, messages, and graphics with each facility renovation and new construction project.

Interior signage system for use at Selfridge is UNICOR 2/90 Sign Systems.

These standards cannot anticipate every possible sign; where additional signs are required, design signs similar to those shown herein. The sign system must comply with applicable codes and regulations, including ADAAG requirements.

Coordinate interior signage system with Comprehensive Interior Design based on sign standards described herein. Figure 13 displays requirements for typical interior signs.

System 2/90 Sign Systems General Requirements

Room Numbers shall be raised a minimum on 1/32" to comply with ADA requirements.

Braille shall be a photo polymer tactile Grade 2 Braille, do not tip black.

Colors: All interior signs except Regulatory signs will be a standard color throughout the facility. The colors will match the colors from Sherwin Williams Co. The background will be SW21010 Taupe Tint (System 2/90 LN, Light Neutral) Rails and End Caps will be SW2013 Manor House (System 2/90 MG, Medium Gray) and Numbers will be SW2301 Farmhouse (System 2/90 C-BU, Burgundy.) Lettering color to be Matte Black GSP220 Scotchcal Premium film. The 1/16" design line will be Royal Purple vinyl, GSP 220 Scothcal Premium film.

Mounting Options: Mounting shall be based on type of surface sign is to be applied to. Pressure sensitive is intended for smooth, hard surfaces. It is not intended for vinyl wall covering. Magnetic tape strip shall be used for application to steel surfaces. Screw-on is used for rough surfaces where pressure sensitive is not recommended. Hook is clear plastic which "hooks over" the top of a panel.

Room Number and Office Identification Signs

Room Number/Office signs will primarily be used throughout the building. Typical measurements are 4"x9" and use two 2" inserts. The first insert will have ¾" ADA number that will be Helvetic Bold style. Accompanied with the number will be a photo polymer tactile Grade 2 Braille. A 1/16" design line will underscore the room number with ½" index on both ends. The second insert will have the office or title name on it. This insert will use ½". Helvetica Bold style lettering that will be cut vinyl and be placed on the surface side of the colored ABS material

Desk Plaques

Desk plaques will be used for individual identification. Plaques measure 2”x9” and comes with a clear bent plastic stand or they can be hung near a desk area without a stand.

Toilet and Locker Room Signs

Provide signs for women’s and men’s toilets and locker rooms. Signs should include universal symbols to indicate “men” or “women” and whether barrier–free access is provided. Coordinate signs with complete interior sign system.

Barrier–free Access Signs

Provide signs at building entrances, toilet and locker rooms, and other facilities designated by ADAAG to indicate accessibility. Signs should include universal symbol for barrier–free access (see Figure 13.) Coordinate signs with complete interior sign system.

Building Directory and Map

Buildings with multiple offices or occupant spaces are required to display a directory inside the main building entrance. Provide building directories similar to those shown in Figure 13 with replaceable modular inserts on which to list occupants. Each building directory sign shall include a plan of the building for reference to room numbers. The sign is a combination of 1”x12” inserts, 8”x24” clear plastic viewing area for a building map and a 3”x24” area for a heading. Informational signs are not required to have tactile or Braille lettering.

Building Evacuation Maps

Every building is required to display one or more graphic building evacuation map sign indicating exits, evacuation routes, gathering location outside of building, room numbers and locations, and other significant building features. Display building maps in accordance with NFPA guidelines. Provide full color 8-inch by 10-inch minimum size signs with graphic maps as manufactured by Fire Safety Display Company (800 854 FIRE.)

Bulletin Boards

All information bulletins, circulars, or other changing and periodically distributed information should be neatly displayed on bulletin boards in prominent locations. Appropriate locations include break areas, vending rooms, lobbies, and main building corridors. Use bulletin boards with self–healing, fabric–covered, tackable surfaces with prefinished metal frames.

Fire Protection Signs

Identify fire extinguishers, standpipe cabinets, and fire alarm pull stations using wall–mounted international symbols. Mount symbols at right angles to the wall where appropriate for visibility, especially in high or moderate hazard areas. Provide emergency and exit signs in accordance with the local building code.

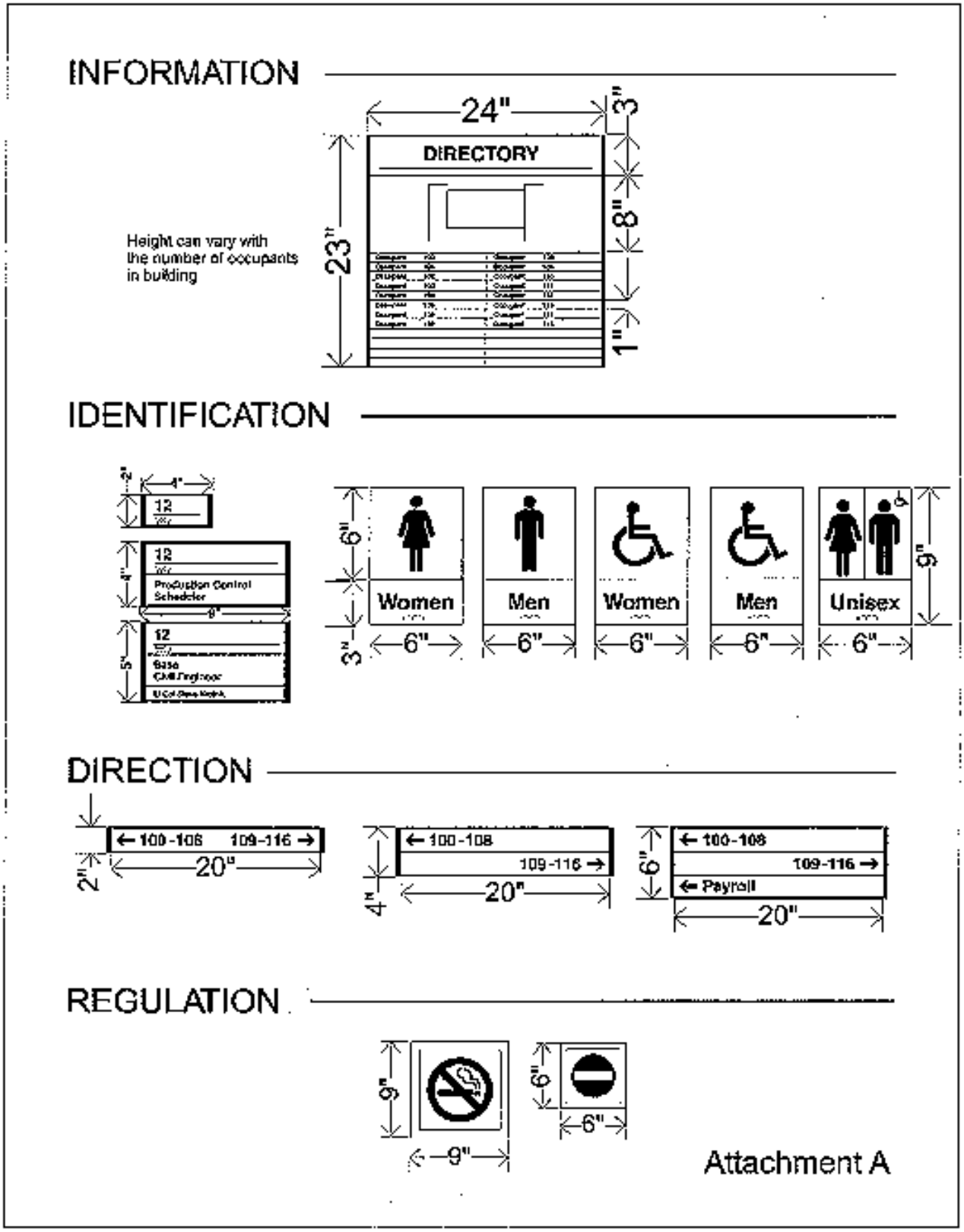


FIGURE 12: INTERIOR SIGNAGE

Architectural Design References

Building Codes, Standards and Regulations:

The following building codes and regulations shall apply to facilities designed for Selfridge ANG Base:

1. Americans with Disabilities Act (ADA), Title 1; ADA Accessibility Guidelines (ADAAG); and other applicable publications of the U.S. Architectural and Transportation Barriers Compliance Board Guidelines. Follow these to the maximum extent required by law. Where not otherwise required, it shall be the Base's policy to comply with these guidelines to the extent that is technically and economically feasible and proportionate to the revitalization of existing facilities.

2. ASHRAE/IES Standard 90.1, Energy Efficient Design of New Buildings.

3. ASTM C: Test Methods of Sampling and Testing Brick and Structural Clay Tile

4. ASTM C 5-79: Specification for Quicklime for Structural Purposes

5. ASTM C 62-92C: Specification for Building Brick (Solid Masonry Units Made from Clay or Shale)

6. ASTM C 144-93: Specification for Aggregate for Masonry Mortar

7. ASTM C114-94: Test Methods for Chemical Analysis of Hydraulic Cement

8. ASTM C 150-95: Specification for Portland Cement

9. ASTM C 207-91: Specification for Hydrated Lime for Masonry Purposes

10. ASTM C 270-94: Specification for Mortar for Unit Masonry

11. Building Owners and Code Administrators (IBC), International Building Code, Current Edition.

12. Code of Federal Regulations

13. Code of Federal Regulations, 10 CFR 1700 and 29 CFR 1910 ("OSHA Standards".)

14. Code of Federal Regulations, 10 CFR 435, Federal Energy Conservation Standards

15. National Fire Protection Association (NFPA), Life Safety Code Handbook.

16. United Facilities Criteria (UFC) 3-101-01, Architecture

17. UFC 3-110-03, Roofing

ANG Engineering Technical Letters (ANGETLs) and Recurring Publications (RPs)

1. AF ETL 07-4: Air Force Carpet Standard

2. ANG Design Policy ANGETL 15-01 Series.

3. ANGETL 11-12: Compliance with Handicapped Accessibility Standards.

4. "2016 Guidance Principles for Sustainable Federal Buildings"

Other Reference Documents

1. Affirmative Procurement Plan encompasses the substantive requirements within Executive Order 13101 applicable to all Federal procurements. A copy can be requested through 127WG/CEV.

2. Department of Defense Antiterrorism Construction Standards, Current Edition.

3. Programmatic Agreement among The National Guard Bureau, 127th Wing, Michigan Air National Guard, The Advisory Council on Historic Preservation, and The Michigan State Historic Preservation Office Regarding the Operation and Maintenance of the Selfridge Air National Guard Base, Harrison Township, Macomb County, Michigan.

4. Selfridge ANGB Conceptual Report - "Analyze Historic Brick"

5. Selfridge ANGB Base, Cultural Resource Management Plan.

6. The Secretary of Interior Standards

7. SANGB Instruction 32-8 Exterior Signs and Markings.

Trade Associations

Trade associations are valuable sources of product information and construction industry standards. The associations listed below publish reference publications accepted as industry standards. This listing is not intended to be comprehensive, but rather to provide a list of resources that may be useful in applying the Selfridge Architectural Design Standards. In the absence of other available standards, designers may consult the following sources for recommendations, industry standards, and product–specific installation guidelines:

Aluminum Association (AA)

American Concrete Institute (ACI)

American Institute of Timber Construction (AITC)

American Petroleum Institute

American Society for Testing and Materials (ASTM)

American Wood Preservers Institute (AWPI)

American Woodwork Institute (AWI)

Asphalt Roofing Manufacturers Association (ARMA)

Associated General Contractors of America (AGCA)

Brick Masonry Institute of America (BIA), Brick Technical Notes

Builder's Hardware Manufacturers Association (BHMA)

Building Research Advisory Board
Carpet and Rug Institute (CRI)

Construction Specifications Institute (CSI)

Door and Hardware Institute (DHI)

Expanded Shale, Clay, and Slate Institute

Flat Glass Marketing Association (FGMA)

Forest Products Laboratory (FPL)

Gypsum Association

Hardwood Plywood Manufacturers Association (HPMA)

Indiana Limestone Institute of America, Inc. (ILIA)

International Building Code (IBC)

International Masonry Institute-
www.imiweb.org

Marble Institute of America (MIA)

Metal Lath/Steel Framing Association

Mineral Insulation Manufacturers Association

National Association of Architectural Metals Manufacturers (NAAMM)

National Bureau of Standards (NBS)

National Concrete Masonry Association (NCMA)

National Fire Protection Association (NFPA or NFPA)

National Forest Products Association (NFPA)

National Kitchen Cabinet Association (NKCA)

National Paint and Coatings Association (NPCA)

National Roofing Contractors Association (NRCA), Roofing and Waterproofing Manual

Perlite Institute, Inc. (PI)

Plywood Research Foundation

Porcelain Enamel Institute (PEI)

Portland Cement Association (PCA)

Precast Concrete Institute (PCI)

Resilient Floor Covering Institute (RFCI)

Sheet Metal and Air Conditioning Contractors National Association (SMACCNA) Architectural Sheet Metal Guide

Steel Deck Institute (SDI)

Steel Door Institute (SDI)

Steel Joist Institute (SJI)

Steel Manufacturers Association (SMA)

Steel Structures Painting Council (SSPC)

Steel Tank Institute

Steel Window Institute (SWI)

Superintendents of Documents, United States Government Printing Office

Sweet's General Building and Renovation Catalog Files

Tile Contractors Institute (TCI)

Tile Council of America (TCA)

Underwriter's Laboratories

USACE Cold Regions Research Laboratories (CRRL)

USACE Construction Engineering Research Institute (CERL)

Reference Standards:

Brick Institute of America Technical Notes www.gobrick.com

American Society for Testing and Materials 40CFR, Part 261-95: Identification and Listing of Hazardous Waste RCRA (Environmental Protection Agency)

Historic Facilities Treatment

Procedures and guidelines for treatment of historic properties will adhere to the Secretary of the Interior's Standards for the Treatment of Historic Properties and The Guidelines for the Treatment of Historic Properties. All project actions affecting facilities of historical relevance must follow the Programmatic Agreement established between the Air National Guard Readiness Center, 127th Wing, Michigan Air National Guard, the Advisory Council on Historic Preservation, and the Michigan State Historic Preservation Officer (SHPO) regarding the Operation and Maintenance of Selfridge Air National Guard Base, Harrison Township, Macomb County, Michigan.

Exterior Treatment

Consider the original exterior architecture of the building (see Figure 14.) The intent of these standards is to maintain the historical fabric to the maximum extent feasible within the cost, functional, and code constraints applicable to applicable projects.
Evaluate the extent of alterations required to restore the building to its original appearance and determine the extent of alterations appropriate to the project requirements.
Maintain or modify historic buildings in a manner consistent with the original construction.
Remove inappropriate construction, repair deteriorated systems, and maintain existing systems to preserve their integrity (see Figure 15.)

Standards for Interior Treatment

Consider the original interior design of the building. The intent of these standards is to maintain the historical fabric to the maximum extent feasible within the cost, functional, and code constraints applicable to applicable projects.

Most of the historically significant buildings at Selfridge have been substantially altered internally. The previous interior alterations do not typically represent the original construction. When comprehensive repairs and alterations are made to a building, make new alterations that are appropriate to the original building architecture, using materials and construction that restore original proportions and evoke the character of the building style.

FIGURE 13: HISTORIC BUILDING 140

Remove inappropriate construction, repair deteriorated systems, and maintain original remaining construction to preserve the architectural integrity of the building overall.

FIGURE 14: EXTERIOR RENOVATIONS

Building 304

Building 160

Building 118

FIGURE 15: NEW CONSTRUCTION

Building 901

Building 900

Building 859

Building 859

Building 124

Building 164

Landscape Design

A harmonious base wide landscape program can be successfully executed by using the landscape design standards as your guide. Plant materials shall be selected from those native to the region unless otherwise specified in this design standard. The location and species planted shall take into consideration Bird Air Strike Hazards (BASH) attraction, antiterrorist force protection, location of current infrastructure, and manpower required for necessary maintenance.

Landscaping plans not consistent with the design standard shall be submitted to Civil Engineering Work Control for review by CE Operations, Pest Management, Ground and Flight Safety, Security Forces, Communications, and Environmental Management as necessary.

For any species proposed for planting on the installation not listed in the design standard supporting documentation to include the following will be required as supporting documentation along with landscaping plan under consideration: common and scientific name, native status, morphology, physiology, growth requirements, reproduction, and wildlife attractants pertaining to vegetative species being submitted for consideration. Such information is readily available electronically by the United States Department of Agriculture on-line.

Plant Schedule Tables

Plant schedule tables are at the conclusion of this section.

Typical Plantings

Details for typical shrub and tree plantings are shown in figures 17 through 19 in this section.

Maintenance

Maintenance of any landscape design is as important as the design of the landscape. Maintenance requirements are key factors in the selection of plant materials:

- Watering/irrigation when planning your design consider the location of your water source.
- Pruning
- Exfoliation
- Fruits
- Disease and insect control
- Ease of snow removal and lawn mowing (minimum mowing clearance is 6')
- Ease of maintenance

Consider each of these factors when selecting specific plant materials. For example, street trees, parking areas, and screening necessitate minimum maintenance plantings. Plazas, major buildings, and monument location plantings would require more extensive maintenance. Generally, maintain the plants in a healthy, growing condition by watering, cultivation, and controlling weeds for a period of 1 year.

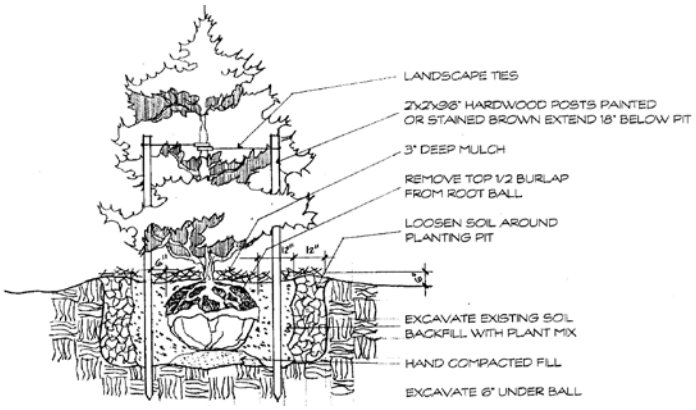
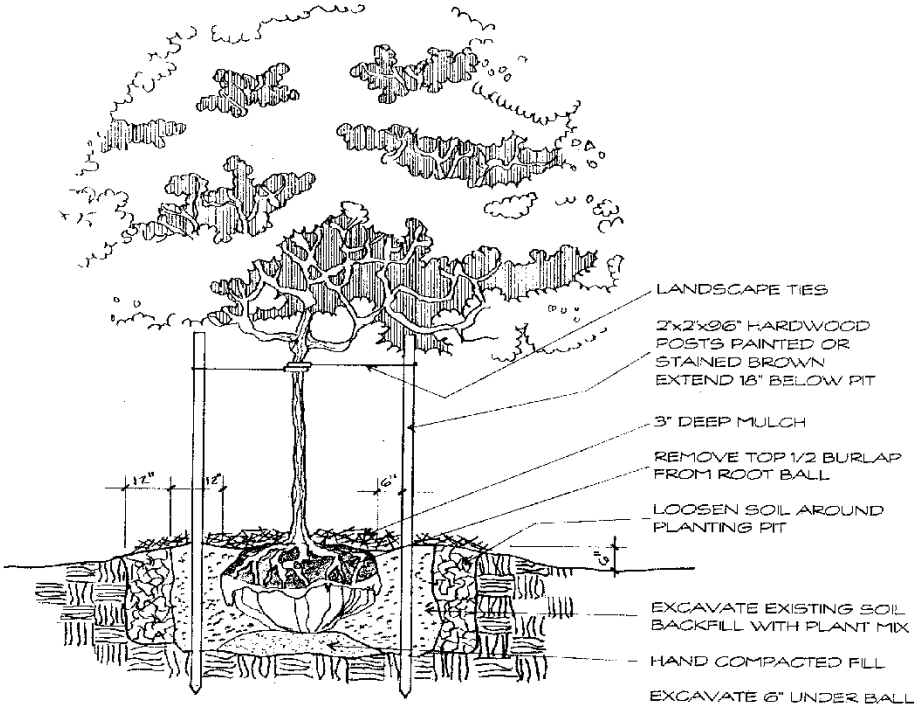


FIGURE 17: EVERGREEN TREE

FIGURE 18: DECIDUOUS TREE PLANTING



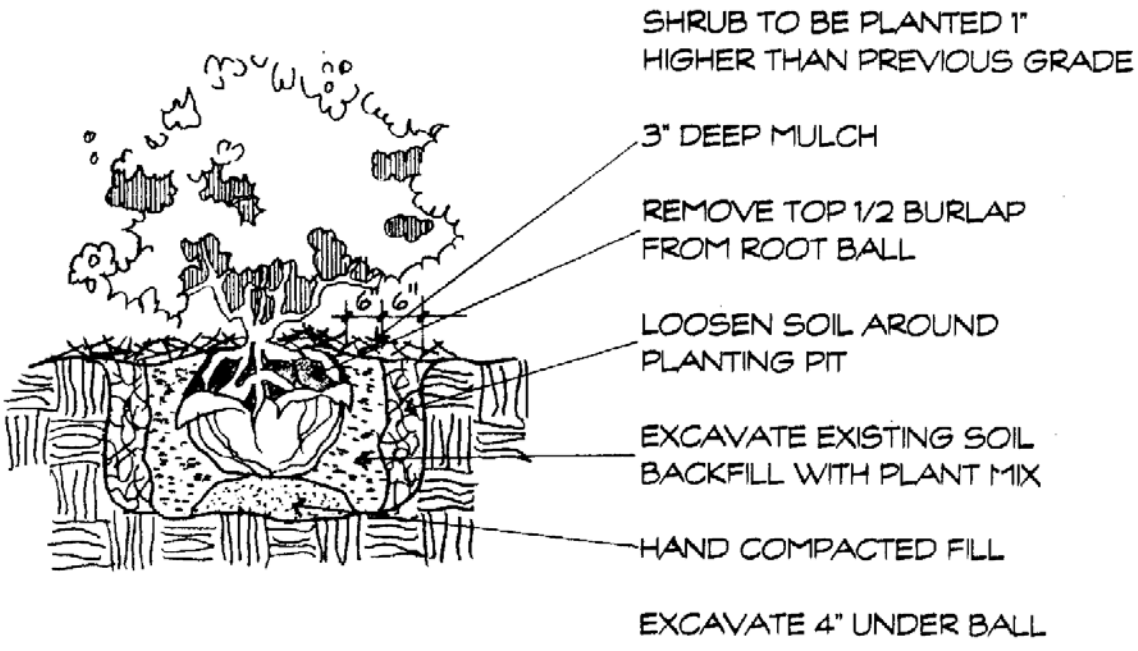


FIGURE 19: SHRUB PLANTING

Implementation Guidelines

Streets

General Guidelines

The streets at Selfridge ANG Base define vehicular movement patterns and visual corridors and establish physical patterns on the land. They are oriented north-south and east-west in a grid pattern that orients travelers and gives directional clues for persons moving about the base. A number of efforts have been made to create a hierarchy of streets and roads to assign various levels of importance to each. These various classifications are "primary and secondary"

Presently the streets identified as primary are:

- Jefferson Avenue between North Main Gate and Wilbur Wright Boulevard
- Wilbur Wright Boulevard between
- Jefferson Avenue and George Avenue
- George Avenue between Jefferson Avenue and General George Andrews Avenue
- General George Andrews Avenue between George Avenue and the South Golf Gate
- North Perimeter Road
- South Perimeter Road
- Joy Boulevard
- Range Road
- Ammo Road

Secondary streets are:

- Lake Street
- Oak Street
- Maple Street
- Walnut Street
- Birch Street
- Wagner Street
- Plattsburg
- Carswell
- Schilling Avenue
- Castle

Planting Street Trees

Street trees should be planted only by Civil Engineering or approved contractor through Civil Engineering.

General Guidelines

Refer to the planting schedule matrix for approved street tree species

Specific Guidelines

Trees shall be planted in straight lines along the roadway with a consistent set–back. Make sure that large trees are not planted beneath utility wires. Small ornamental trees (15 to 20 feet tall) may generally be used below overhead wires. Where possible, locate trees between roadway and overhead wires. Tree spacing will depend on the location of utilities, light fixtures, drive openings, and existing trees, and on the proposed tree species. Exact spacing is generally not possible in existing conditions. Do not plant trees of a species whose root system is known to cause damage to roadways or other utilities closer than 12 feet to a road–way or utility unless the root system is completely contained within a permanent barrier.

The recommended desirable minimum setbacks from street curb to the centerline of the tree are given is at least 15 feet.

Particular existing conditions may require adjustments to the setback distance.

Maintain clear sight lines at all intersections by keeping trees 50 feet from street corner. Use a variety of species, from the

plant schedule table, for street trees throughout the base to prevent the creation of a monoculture. A stand of trees with a predominance of one tree type is more susceptible to pest and disease damage than a stand of mixed species. (Street Trees shown in Figure 20)

Parking Areas

General Guidelines

Lay out future parking areas considering efficiency, aesthetics, and the environment. In relatively unconstrained sites a 90 degree system works best. For aesthetic and environmental reasons, buffer strips and planting islands are important. However, such areas shall not hinder snow removal. Planting islands and buffer strips can provide shade, define parking areas, and visually break up large expanses of paving if thoughtfully designed.

Specific Guidelines

New parking areas shall be buffered from streets, housing areas, and administrative facilities. Medians separating parking areas from streets and roads shall be at least 20 feet wide to allow for adequate space to incorporate effective street tree
plantings based on the street hierarchy.
At the end of each parking bay there shall be a planting strip at least 8 feet wide to separate parked cars from moving vehicles within a parking area.

A relatively low planting strip will facilitate effective vehicular maneuverability. Care should be taken to ensure the ease of
A relatively low planting strip will facilitate effective vehicular maneuverability. Care should be taken to ensure the ease of maintaining such strip.

Landscaping shall be incorporated within an efficient parking lot layout. Provide 1 tree per 50 parking spaces in or around the parking lot. Sidewalks may also be designed into the parking lot area.

Design parking facilities to maximize the efficiency of paving, circulation and ease of snow removal. A 90-degree parking space pattern seems to be most effective.

Parking lots shall designate spaces for the handicapped in accordance with the Americans with Disabilities Act Accessibility Guidelines (ADAAG). Such spaces shall be located to provide the shortest possible route from the parking area to an accessible building entrance. Handicapped-accessible parking spaces shall be dispersed among the building's accessible entrances.

Do not designate "Reserved Parking" spaces except for Wing and Group Commanders.

Use existing islands for the planting of large deciduous canopy trees in existing parking areas. These areas offer immediate opportunities to provide shade and reduce heat build-up as well as improve the visual environment.

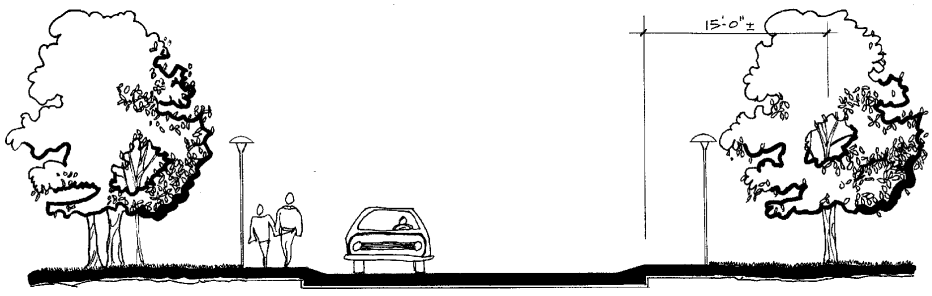


FIGURE 16: STREET TREES

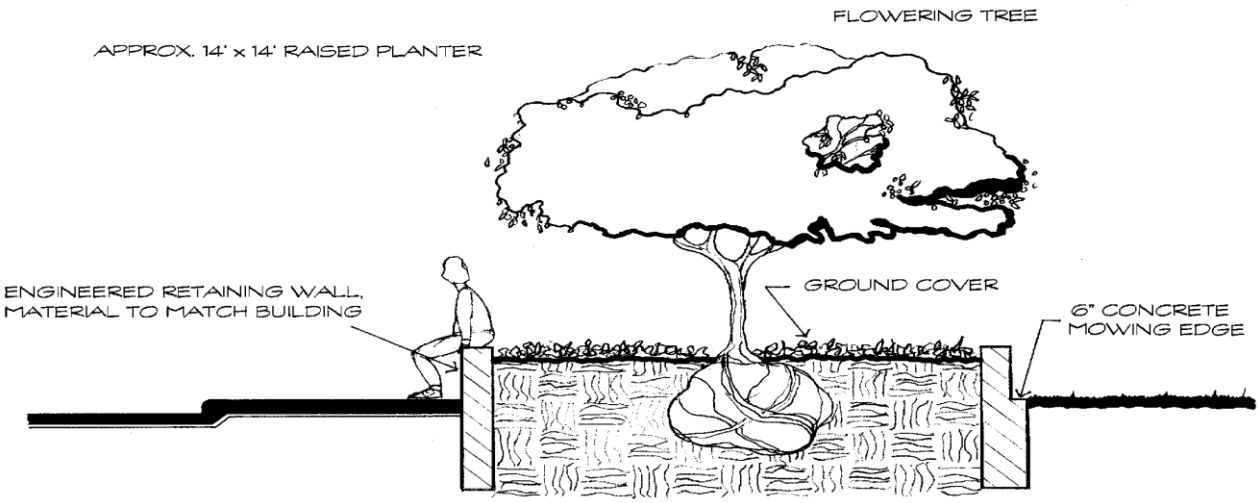


FIGURE 17: RAISED PLANTER

Parking spaces that are designated for use only during the Unit Training Assembly (UTA) shall be semi impervious surfaces. Such surfaces shall be similar to the Grasspave2 Porous Paving System, manufactured by Invisible Structures, Inc., 14704-D East 33rd Place, Aurora, CO. 80011. Tel.: 800-233-1510.

Plant Selection

Plantings for parking lots shall be selected from the plant schedule tables.
Lighting shall be provided in all parking areas and should not interfere with the plant materials.

Screening

General Guidelines

All screening shall comply with the Force Protection/Vulnerability assessment recommendations.

Plant materials can be used as a very effective way to screen most anything. There are several different ways to use plant materials as a screen:

- Visual barrier
- Physical barrier
- Wind barrier
- Security barrier

Ensure that the desired obscuring effect of screen plantings is created by implementing the proper spacing relationship between deciduous and evergreen plant materials. Consider the size of plant material, both juvenile and mature, to ensure that the optimal screening effect is accomplished. Refer to Figure 21 and 22 for typical screening effects using different plant materials.

Stagger plant materials that are placed in two or more rows.

In all screening situations in which plant materials are used, maintenance shall be an important consideration. Compliance with

Screening Trash Dumpsters

Trash Dumpsters shall be secured and in compliance with the UFC 4-010-01. Trash dumpsters shall be located outside of the buildings' conventional construction stand-off distance. When the conventional stand-off distance is not achievable, a harden enclosure which complies with UFC 4-010-01 and the Selfridge Design Standards can be utilized. Openings shall be oriented away from building entrances and main streets, whenever possible.

Harden Enclosures

Harden enclosures shall have an opaque top with a minimum pitch of 1 vertical to 2 horizontal.

Main Base Area Harden Dumpster Enclosure Construction:

Construct dumpster enclosures of poured reinforced concrete wall with a brick veneer exterior face. The brick shall be consistent with the color palette as recognized in the Architectural Design Standards for the Main Base Area.

Outside of the Main Base Area Harden Dumpster Enclosure Construction:

Harden enclosures shall consist of architectural concrete masonry walls or poured in place, reinforced concrete walls with simulated brick texture and color additive. The color additive shall complement the adjacent building color as described in the color palette in the Architectural Design Standards.

Translucent Fence Trash Dumpster Enclosure

A trash dumpster enclosure which is **l**ocated outside of the buildings' conventional construction stand-off distance. And has a 7'-0" high minimum translucent fence will not require a cover. The fence shall comply with the Selfridge Design Standards and UFC 4-010-01. It shall be a minimum of 7'-0" high and contain a 10'-0" x 10'-0" area. The fencing shall be consistent with the fencing in adjacent areas.

General

- Place a reinforced concrete slab under the dumpster and under the truck pick up area to provide a durable, level surface, curbed on three sides.
- Increasing the dimensions of the enclosure accordingly, can accommodate large and dual dumpsters. A nearby hose bib is advisable for cleaning purposes but is not essential at every location.

Screening Mechanical Equipment

Specific Guidelines

All screening will comply with the Force Protection/Vulnerability assessment recommendations.

- The preferred location for electrical and mechanical equipment such as transformers, air-cooled condensers, and packaged chillers is outside the unobstructed space or on the roof. Equipment may be placed within the unobstructed space as long the equipment provides no opportunity for concealment of explosive devices with heights of 6 inches (150 mm) or greater or the equipment is secured to prevent concealment of the devices.
- If walls or other screening devices with more than two sides are placed around electrical, mechanical, or other equipment within the unobstructed space, enclose equipment on all four sides and the top. Openings in screening materials and gaps between the ground and screens or walls making up an enclosure will not be greater than 6 inches (150 mm). Secure any surfaces of the enclosures that can be opened so that unauthorized personnel cannot gain access through them. Where opaque top enclosures are provided, they will have a pitch of at least 1 vertical to 2 horizontal to increase visibility of objects thrown onto them and to increase the likelihood that the objects will slide off. Alternatively, if the vertical surfaces of the enclosures are transparent and at least 7 feet (2.1 meters) high, a top enclosure is not required.

General Guidelines

- Locate mechanical equipment away from building fronts and other high visibility areas such as entrances. Where possible, locate mechanical equipment near or in association with loading and

service areas to the rear or at either end of the building.

- Allow three feet between unit and fencing. Landscape with stone or gravel, as grass cutting causes damage to units.

FIGURE 18 SCREEN

Screening Secure Areas

Secure areas are predominantly associated with the flight line, storage, emergency response areas, and the munitions area. Seven foot fabric, 9 gage, 2x2 hole twisted and barb topped with 3 strands of barb wire on a 45º outriggers for a total height of 8' fencing generally encloses them. The flight line area is most visible and should be screened for security and aesthetic reasons. Coordinate screening of all secure areas with Selfridge ANG Base Security.

Secure fencing shall comply with the Unified Facilities Guide Specifications UFGS-02821A and UFC 4-010-01.

In the Main Base Area use fencing consisting of masonry piers and ornamental iron fencing. Piers shall be consistent with the color palette in the Architectural Design Standards, and the fencing shall have a black powder coat finish. Iron fencing shall be similar to Classic Premier Industrial Ornamental fencing Security style as manufactured by Master-Halco Tel.: 800-883-8384.

Plant materials shall be used to create a buffer to the fence line, i.e., low shrub border, or informal tree planting. The selection of nursery stock shall be such that plants will not infringe on the integrity of the fence line.

Elsewhere on the Base, fencing shall meet design standards. Where streets penetrate the fence line, a 30-foot-long visual strip on either side of the gateway shall be maintained. Low evergreen shrubs of 12 inches to 15 inches in height will allow necessary security observation.

FIGURE 19 –ORNATE IRON FENCE

General Guidelines

- Plazas are important to the Base image in areas that are intensively used or have high visibility.

- Provide plantings, special pavements, attractive fencing, and a full complement of site furnishings and amenities to identify and distinguish these buildings as important structures and activity areas.

Specific Guidelines

- Lay out plant materials in a formal design.

- The anticipated level of maintenance should be considered in the design of this area.

Plazas

Plant Selection

Selections from all plant schedule tables may be used in these areas.

Buildings

General Guidelines

Use effective landscaping to emphasize important entrances and to reinforce the functional importance of major buildings. Use evergreen shrubs to treat the landscaping somewhat formally and to provide screening from wind where appropriate.

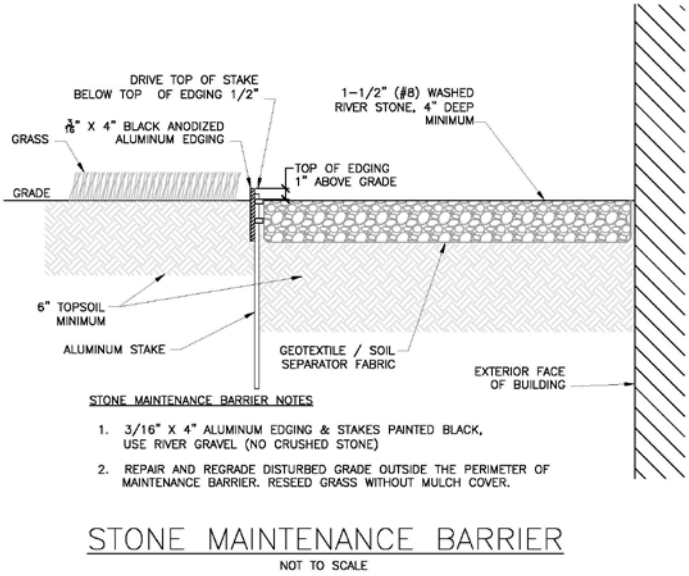


FIGURE 20: BUILDING BASE DETAIL

Tree and shrub foliage shall not extend below 3 feet above ground level. Plantings shall be 6" or less in width and height when planted around buildings and underneath overhangs or breezeways.

All landscape plans must be submitted to Civil Engineering for approval.

Every type of tree, shrub and ground cover affects the thermal response of a building. Use plantings to improve the energy performance of a building in compliance with base standards.

Building Managers that wish to plant flowerbeds, in flowerpots or shrub plantings must follow guidelines provided and assume responsibility for maintenance.

Plant Selection

Plantings for buildings shall be selected from the following plant schedule tables: Trees will be planted by Civil Engineering or an approved contractor.

- Evergreen Trees
- Large, Medium, and Small Shrubs
- Ground Cover

Open Areas

General Guidelines

Plantings adjacent to buildings should assist in defining the primary spaces relating to that building(s) and shall consider mix issues and concerns in the design.

Specific Guidelines

- Landscaping should be appropriate in scale to the particular building(s) and should help to provide identity and direction.

- Where buildings abut open space and the Back to Nature program efforts, there shall be an appropriate transitional lawn area of at least 50 feet.

- There is not to be any plantings around the perimeter of buildings. Provide a stone maintenance barrier by using 1 ½" washed river stone with 4" black anodized aluminum edging and Geotextile/ soil separator fabric. Refer to Figure 24.

- Landscape Materials. Landscape timbers that are installed flush with the ground, shall be used to contain

flowerbeds. Bark should be used as a cover to help maintain moisture and reduce weeds. New flowerbeds should use felt paper secured on top of the earth with holes cut for placement of plants.

- Decorative Flower Containers. Containers shall be made of terra cotta or terra cotta in color. Container design should be consistent at each location.

- Recreational - Basketball backboards/ hoops or horseshoe pits must be authorized prior to installation. The requester shall submit proposed location and justification to Civil Engineering.

Employee Break Areas

Users of buildings that have picnic tables, ash urns, pavilion shelter, trash receptacles, and benches shall be responsible for all maintenance and ensure that the placement does not detract from the building or grounds beautification.

Near Air Field Areas

Planting activities near the airfield must not infringe on clear, transition, or approach zones and should be consistent with the installation BASH plan, INRMP, and Urban Tree Management Plan.
Shrubs, ornamental trees, hedgerows, and vegetated noise suppression barriers are important planting on the installation. However, the airfield, clear zone, and transition areas are not areas for landscape planting. This type of planting can influence wildlife populations and their movement around the base. When planting vegetation, select those species that do not produce fruit, especially during winter.
The greatest number of species is found where vegetation types change from forest to brush, or brush to grass, which is called edge effect. To reduce wildlife problems, keep edge effects to a minimum, or as far from the active runway as possible.
Seed mix used in the airfield area must be consisted with that included in tables at the end of this section.

Tree Removal

Where possible trees should be kept until they become a public hazard or are required to be removed in for safety reason or in support of required construction or maintenance activities. Should a stand of trees contain birds protected by the Migratory Bird Treaty Act or the Bald and Golden Eagle Protection Act or any other species protected by the Endangered Species Act, the USFWS shall be contacted to determine whether an incidental-taking permit is required prior to any tree removal activities. Coordination of tree removals must be conducted well in advance of field activities where possible.

Per the Urban Tree Study and Action Plan replacement of Non-Native species should be accomplished with Native trees. The following table provides potential native replacement trees for those species. Consideration should still be taken concerning maintenance, location, safety concern when determining replacement options.

Reclaimed Areas

General Guidelines

Reclaimed areas are spaces where previous building(s) were located that have now been returned to the natural environment. Reclaimed area improvements will be accomplished through Civil Engineering.

Specific Guidelines

After the buildings that are designated to be demolished are removed from the site, the soils need to be stabilized to prevent soil erosion. Immediately use various ground covers to stabilize the site. Refer to Figures 21 and 26. Once the site has been stabilized, installation of plant materials can begin to correspond to the implementation guidelines at specific areas. If the site does not fulfill a particular guideline, it shall be returned to informal natural landscape. However, if the area is designated for redevelopment, then the plant materials installed should be of a temporary nature.

Plant Selection

Planting for reclaimed areas shall be selected from the following plant schedule tables:

- Trees
- Ground Covers

Design Reference:

UFC 3-201-02, Landscape Architecture

UFC 4-010-01, DoD Minimum Antiterrorism Standards for Buildings

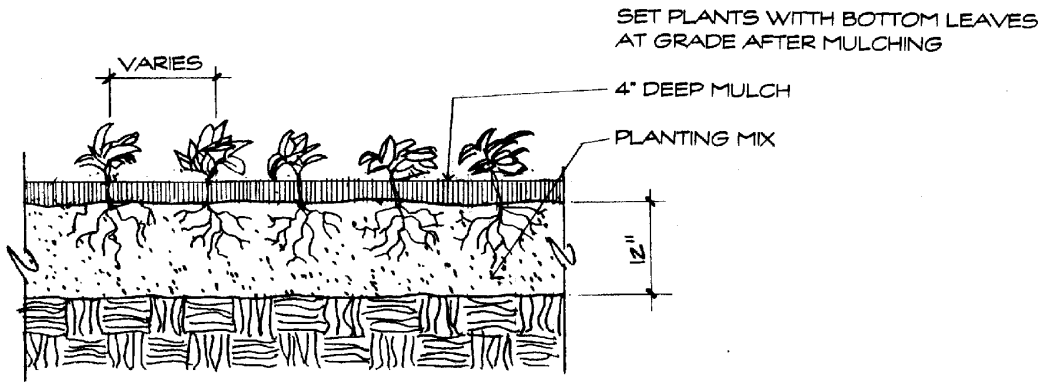


FIGURE 21:
GROUND COVER PLANTING

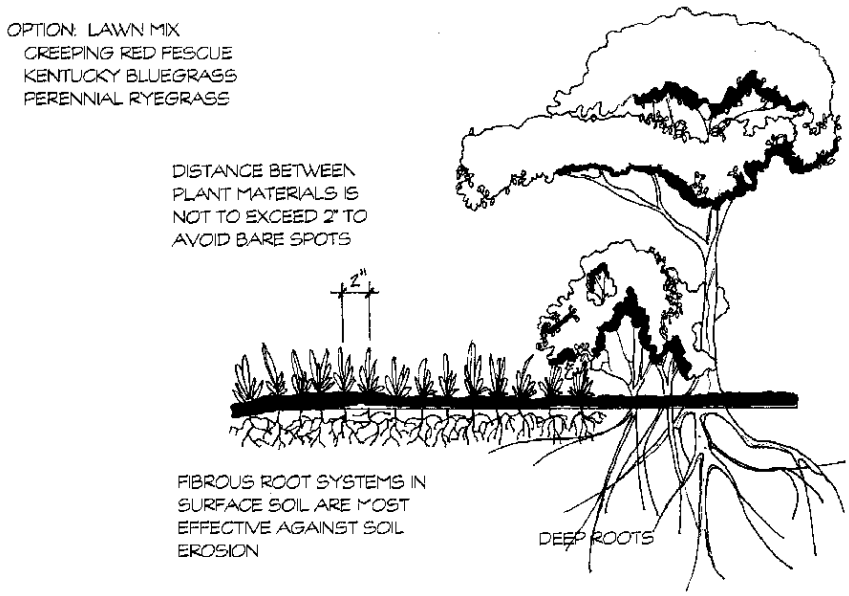


FIGURE 22: EROSION CONTROL

Table 6 Potential Native Tree Replacements

Existing non-native trees at the Selfridge ANGB, and potential native replacements, based on relative size, growth habit, habitat requirements, flowering and fruiting characteristics, and aesthetics.

Existing Non-Native Tree Species	Potential Native Tree Replacements
Bradford Pear (Pyrus calleryana)	Hawthorns (Crataegus spp.)
Crack Willow (Salix fragilis)	
Little Leaf Linden (Tilia cordata)	Persimmon (Diospyros virginiana); Hackberry (Celtis occidentalis)
London Plane (Platanus hybrida)	Bur Oak (Quercus macrocarpa)
Norway Maple (Acer platanoides)	Black Gum (Nyssa sylvatica); Red Maple (Acer rubrum); Sugar Maple (Acer saccharum); Honey Locust (Gleditsia triacanthos)
Norway Spruce (Picea abies)	White Spruce (Picea glauca); Black Spruce (Picea mariana); Blue Spruce (Picea pungens)
Sand Cherry (Prunus x cistena)	Paper Birch (Betula papyrifera); Gray Birch (Betula populifolia)
Sweet Cherry (Prunus avium)	Persimmon (Diospyros virginiana); Hackberry (Celtis occidentalis)
Tree of Heaven (Ailanthus altissima)	Black Walnut (Juglans nigra)
Weeping Cherry (Prunus subhirtella)	
Weeping Willow (Salix babylonica)	Bur Oak (Quercus macrocarpa);
White Willow (Salix alba)	

Table 7 - Landscape Design Guidelines

Selected Plant Material
Selfridge Air National Guard Base

Botanical Name	Common Name	Recommended Size	Root Treatment	Mature Size	Hardiness	Leaf Texture	Best Uses/ Form
Evergreens							
Picea pungens	Colorado Spruce	6'- 7'	B&B	40' -60'	Hardy	Medium	Mass Specimen
Abies Concolor	White Fir	6'- 7'	B&B	30'- 50'	Hardy	Medium	
Thuja Occidentalis	Northern White Cedar			40' -50' at 20 years			
Pinus Strobus	Red Pine			150' at 20 years			
Pinus Strobus	Eastern White Pine			100' at 20 years			
Picea Mariana	Black Spruce			100' at 20 years			
Picea glauca	White Spruce			100' at 20 years			
Flowering Trees							
Cornus x rutdan "Celestial"	Celestial Dogwood	7' to 8'.	B & B	20' - 25'	Hardy	Medium	Uniform spread, white flower
Cornus Florida	Flowering Dogwood			30; at 20 years			
Cornus Alternifolia	Alternate Leaf Dogwood			25' at 20 years			
Ground Covers							
Cornus Canadensis	Bunchberry	18pk Flat	Container	3"- 9"	Hardy, shade, moist soil	Medium, fine	Mass, large
Rough Lawn Grass Seed Mixture							
Creeping Red Fescue	Grass	40 %	Hydro-seed		Sun/Shade Mix		
Kentucky Bluegrass		30 %					
Perennial Ryegrass		30 %					
Formal Lawn Grass Seed Mixture							
Creeping Red Fescue		40 %			Sun Mix		
Nite Hawk Perennial Ryegrass		30 %					
Kentucky Bluegrass		18 %					
Merit Kentucky Bluegrass		6 %					

Botanical Name	Common Name	Recommended Size	Root Treatment	Mature Size	Hardiness	Leaf Texture	Best Uses/ Form
Newport Kentucky Bluegrass		6 %					
Airfield Grass Seed Mixture							
Endophytic fescue		100 %					
Deciduous Street Trees							
Quercus Rubra	Red Oak		B & B	65' -90'	Hardy		Shade/ street tree/ round
Quercus Macrocarpa	Burr Oak		Container	40'-80'	Hardy		Windbreak/ shelter belt/ round
Quercus Palustris	Pin Oak		B & B	60'-70'	Hardy		Shade/ Oval
Acer Rubrum	Red Maple	2' to 3" cal. 14' - 16'	B & B	40' -50'	Very Hardy	Medium, Coarse	Shade, Rounded
Acer Rubrum	Red Sunset	2 ½ "cal. 6' - 8'	B & B	40' -50'	Very Hardy	Medium, Coarse	Shade, Rounded
Gleditsia Triancanthos inermis	Shademaster Locust	1" to 2" cal. 10'-12'	B & B	40'	Very Hardy	Medium, Fine	Canopy
Gleditsia Triacanthos inermis Skyline"	Skyline Locust	1" to 2" cal. 10' -12'	B & B	40'	Very Hardy	Medium, Fine	Pyramidal
Deciduous Shrubs							
Deciduous Shrubs (2'-12' typical mature size)							
Euonymus Alatus "Compactus"	Dwarf Burning Bush	5 Gallon	Container	5' - 8'	Hardy	Medium	Rounded Hedge
Cotoneaster Divaricatus "Spreading Cotoneaster"	Spreading Cotoneaster	5 Gallon	Container	5'- 6'	Hardy	Fine	Rounded Border
Azalea "Northen Lights"	**Northern Lights**	**18"- 24"**	**Container**	**4'- 5'**	**Hardy**	**Medium, Fine**	**Accent, Mass Planting**

Civil Engineering

General Submittal Requirements

Drawings

- Drawing scales typically shall be 1-inch = 50 feet horizontal and 1-inch = 5 feet vertical. For small congested areas a scale of 1 inch = 20 feet may be used.

- Drawings shall include the following:

    1. General legends using symbols approved by the BCE.

    2. General notes that include reference to the horizontal and vertical datum and project and temporary bench marks applicable to the project, including a description, location, and elevation for each.

    3. Drainage boundary map (for projects involving sanitary sewer or storm sewers) depicting the drainage area boundary on a 1–inch = 500 feet scale key map.

    4. Plan and profile sheets as applicable. All existing and proposed utilities shall be depicted on both plan and profile views.

    5. Design detail drawings.

- Plan view information shall clearly show all existing features within 50 feet of the proposed construction, with identification by name of street, building number, etc., for those items not identified on the legend.

- The profile shall clearly show existing and proposed profiles of utility lines, main sizes for both existing and proposed pipelines, ground surface profiles based on maximum 50–foot intervals and pipe class, slope, length and invert elevation information. Basement elevations of existing and proposed structures shall be shown for sewer projects.

- Stationing on plans and profiles shall increase from left to right and shall be pipe centerline stationing where practical. Plans shall generally be arranged so that the north arrow is either pointed toward the top or the right edge of the sheet.

Design

Utilities shall generally be located as follows, with exceptions to be only when authorized by the BCE:

- Sanitary sewer 10 feet south or west of centerline
  Water 10 feet north or east of centerline

- Storm sewer on centerline
  Power south or west of curb line and maximum 10 feet outside of curb

- Communications north or east of curb line and maximum 10 feet outside of curb

- Minimum easement width for sanitary sewer, water, or storm sewer shall be 30 feet for one utility and 40 feet for two utilities in the same easement.

- Designs for utility systems to be abandoned shall be done so in a manner that removes their presence from the ground surface and that clearly indicates they have been abandoned. Wires shall be removed from conductor ducts. Pipes shall

have a minimum 2 foot length plugged with grout at structures. Structures shall be filled with sand, the casting shall be removed, and the top 2 feet of structure demolished. Final backfill shall then be placed and the surface construction completed.

Sanitary Sewer System

Sanitary sewer system components shall be designed in accordance with the *Recommended Standards for Sewage Works* published by the Great Lakes—Upper Mississippi River Board of State Sanitary Engineers, commonly referred to as the *10 State Standards*, most recent edition, the Water Pollution Control Federation (WPCF) Manual of Practice No.9, *Design and Construction of Sanitary and Storm Sewers*, and the current standards and specifications of the Harrison Township Water and Sewer Department. The more stringent of the requirements of these references and the issues identified below shall be used:

- Collection lines shall be designed for the estimated ultimate tributary population. The engineer shall submit copies of all pertinent computations of the design of the sewerage facilities, including expected population densities, acreage, and land use. New sewers shall be designed based on an average daily per capita flow of sewage of not less than 100 gallons per day. This figure is assumed to cover some amount of infiltration and inflow into the system. Allowance should be made for additional infiltration and inflow where conditions warrant. Sewers shall be designed based on peak flow using the ratio of peak to average daily flow.

- All sanitary sewer gravity collection system piping shall be minimum 8-inch diameter. Minimum depth of cover for gravity sewers shall be 3'-6".

- Force main piping shall be minimum 4–inch–diameter. Pressure sewers shall be designed and tested for hydrostatic pressures 50 psi above the surge rate for the pump feeding the line, or 150 psi, whichever is greater. Minimum depth of cover for force mains shall be 5 feet.

- Manholes shall be 4–foot–diameter, precast concrete units meeting ASTM C–478. Manhole steps shall be cast into the concrete at the point of manufacture. Manhole sections shall be made with O–ring joints. Pipe to manhole connections shall be sealed with Kor–N–Seal Boots, Link–Seal, or similar product approved by the BCE. Manholes less than 48 inches in inside depth shall have flat tops. Manholes 48 inches and greater in depth shall have eccentric top sections. Each manhole shall have at least one 4 inch adjusting ring. Manhole frames and covers shall be manufactured by East Jordan Iron Works or an equivalent supplier approved by the BCE.

- Maximum spacing between manholes shall be 300 feet.

- Cleanouts will not be allowed as substitutes for manholes.

- Sewer service connection piping may be ductile iron pipe with push–on joints, cast iron soil pipe with "no hub" joints, or polyvinyl chloride (PVC) with solvent welded joints. The service lateral shall be at least 4 inches in diameter. Larger sizes shall be used where conditions warrant. Minimum service slope for 4–inch diameter lateral is 2.0 percent.

- Onsite wastewater disposal systems shall be allowed only where an economic comparison to extending sanitary sewer has been performed and the onsite system is shown to be

advantageous. Onsite systems shall be designed in accordance with Michigan Department of Public Health rules and regulations.

- Abandonment of onsite wastewater treatment and disposal systems shall be performed in accordance with Uniform Plumbing Code (UPC) Appendix I and any state and local regulations.

- Sewage pump stations shall be submersible type stations designed in accordance with the latest editions of the Uniform Building Code (UBC), Uniform Mechanical Code (UMC), UPC, National Electrical Code (NEC), and the guidelines and recommendations included in the Submersible Wastewater Pump Association's Submersible Sewage Pumping Systems Handbook.

- Sewage pump stations shall be designed so that the top of the facility is at least 1 foot above the 100–year floodplain.

Water System

Water system components shall be designed in accordance with *the Recommended Standards for Water Works* published by the Great Lakes—Upper Mississippi River Board of State Sanitary Engineers, commonly referred to as the *10 State Standards*, most recent edition, and the current standards and specifications of the Harrison Township Water and Sewer Department. The more stringent of the requirements of those references and the issues identified below shall be used:

- Technical specifications shall be referenced to American Water Works Association (AWWA) and/or American National Standards Institute (ANSI) standards whenever applicable.

- State of Michigan Public Acts and Administrative Rules relating to supplying water to the public and Michigan Department of Public Health regulations and requirements relative to the design of water system components shall be adhered to.

- Water distribution system components shall be designed to provide fire flows at minimum residual pressures as recommended by the Insurance Services Office (ISO.) Piping shall be evaluated using a value of C = 100 for the Hazen–Williams equation. Estimating water requirements shall be in accordance with the UPC and sound civil engineering practice.

- The designer shall provide looped water distribution system piping wherever feasible. The BCE shall make the decision concerning feasibility.

- Water distribution system piping shall be Class 54, Ductile Iron Piping, and minimum 8–inch–diameter with double thickness cement mortar lining or equal. Minimum depth of cover shall be 5 feet. Installations with less than this require insulation. Joints for main line pipe runs shall be push–on or mechanical joint, and joints for connections to fittings shall be mechanical joints. All pipe and fittings shall be wrapped with one layer of 8-mil thick polyethylene encasement "baggies" conforming to ANSI/AWWA C105/A21.5. Installation of the baggies shall be in accordance with procedures recommended by the Ductile Iron Pipe Research Association (DIPRA.)

  PVC Piping that conforms to AWWA C900 Specifications can be considered for use.

- Water service connection piping shall be Type K seamless copper, minimum 1–inch in diameter. Minimum depth of cover for service lines shall be

5 feet. Connections to the main line shall be made with Mueller corporation stops, direct tapped into the main at 45 degree angle above the pipe spring line. Service saddles are not required. Curb stops shall be Mueller or equal. They shall be located 10 feet outside of building walls.

- Mains less than 24 inches in diameter shall utilize gate valves; mains 24 inches and larger shall utilize butterfly valves. Valves shall be of the same diameter as the mains to which they are installed. Valves shall be installed so that a maximum of 1,000 feet of main is taken out of service when the valves are operated. At least two valves shall be located at three–way intersections and three valves shall be located at four–way intersections.
- Any water main improvements should be geared toward ensuring or providing adequate supplies for fire protection - UFC 3-600-01.
- Fire hydrants shall be installed no more than 300 feet apart. Each hydrant lead shall include a gate valve.
- Water meters shall read in gallons and are to be shall be installed on each service line in accordance with the following table:

Table 8 - Water Meters

Meter Size (inches)	Maximum gpm Flow
1	50
1–1/2	100
2	160
3	320
4	500
6	1,000
8	1,600

Storm Sewer Standards

Storm sewer system components shall be designed in accordance with the latest edition of the Joint Committee of the American Society of Civil Engineers and the Water Pollution Control Federation, Manual of Practice No. 9, *Design and Construction of Sanitary and Storm Sewers* and the requirements of the Macomb County Public Works Commissioners Office. The latest edition of the *Standard Specifications for Construction, Michigan Department of Transportation*, shall be used for construction of all storm sewers. The more stringent of the requirements of those references and the issues identified below shall be used.

- Storm sewer pipe design calculations shall be submitted to the BCE for review.
- The storm water runoff shall be determined using the rational method and compared with the TR55 method.
- The design storm for the airfield shall be 25–year return frequency and checked for 50–year frequency. The design storm for all other areas shall be 10–year return frequency and checked for a 25–year frequency. A 100–year overflow should be provided to convey the flow not carried in the storm sewer. The 100–year overflow may be conveyed in the streets, parking lots or swales. The acreage used in the design formula shall be the watershed area tributary to the point under consideration, including tributary areas lying outside the base

not provided with storm water holding facilities.

- Rainfall–intensity–duration–frequency curves typical to the Detroit, Michigan, area shall be used. Duration time used in selecting a specific point on the curves shall be equal to the time of concentration. The minimum duration time shall be 15 minutes.

- All storm sewers shall be designed for full flow using Manning's Equation. For pressure pipe flow systems, the hydraulic and energy grade lines shall be plotted against the storm sewer profiles and corrective measures shall be used as needed.
- An initial inlet time of 10 minutes shall be used.

- The minimum mean flow velocity shall be 3 feet per second, and the maximum velocity shall not exceed 10 feet per second.

- The minimum pipe diameter shall be 12 inches. Only reinforced concrete pipe (RCP) or high density polyethylene (HDPE) pipe shall be used.

- Pipe underdrain shall be installed under roadway pavements that do not include storm sewers. Minimum diameter shall be 6 inches, and the pipe shall be wrapped.

- Maximum spacing of manholes is 300 feet.

- Catch basins shall be used for all open–field installations. Inlets shall be used for curb and gutter installations. Check inlet capacity using the Hydraulic Engineering Circular 12 by the Federal Highway Administration (FHWA.) Catch basin/inlet spacing shall be in sags, at crossroad intersections or at interception points from concentrated flows. Check water spread in gutter for inlet spacing. Preferable minimum longitudinal gutter slope shall be 0.5 percent, with an absolute minimum of 0.3 percent. In sag vertical curve locations, three inlets are desirable.

- All manhole, catch basin, and inlet types shall be designed in accordance with the standard details used by the Michigan Department of Transportation. All appurtenances shall be precast.

Roadways

Roadways shall be designed in accordance with the latest edition of the American Association of State Highway and Transportation Officials (AASHTO) *A Policy on Geometric Design of Highways and Streets*, design standards and guidelines prepared by the Michigan Department of Transportation and Macomb County Road Commission standards, where applicable. The more stringent of the requirements of those references and the issues identified below shall be used.

- *Air National Guard Design Policy, ANGETL 15-01-00 and ANGETL 15-01-07,* shall be used for determination of general pavement design criteria. Detailed roadway pavement design shall be in accordance with the latest edition of AASHTO *Interim Guide for Design of Pavement Structures*.

- The design and selection of traffic control devices (pavement marking, signing, etc.) shall be in accordance with the latest edition of the U.S. Department of Transportation publication *Manual on Uniform Traffic Control Devices for Streets and Highways* (MUTCD) and as supplemented by the Michigan Department of Transportation.

- The latest edition of the *Standard Specifications for Construction*,

Michigan Department of Transportation, shall be used for construction of all roadways.

- Final roadway design plans shall be submitted for review to the BCE. Any exceptions to standards shall be reviewed and approved by the BCE.
- Typical roadway sections shall consist of one travel–lane in each direction. Provisions for left turning lanes and intersection turning lanes will be determined based on a separate traffic study. The BCE shall approve the installation of parking lanes, curb and gutter, and divided roadways. Typically, curb and gutter should be installed within the Main Base Area.
- Access control (i.e., driveway locations) shall be reviewed and approved by the BCE.
- Both preliminary and final roadway design plans shall be prepared. Preliminary plans shall be reviewed by the BCE before preparation of final design plans.
- Maximum design speed shall be 30 mph.
- Minimum desirable longitudinal roadway grades should be 0.5 percent, absolute minimum grades shall be 0.3 percent.
- The minimum width of travel lanes in rural roadways (without curb and gutter) shall be 11 feet. Parking lanes shall be 8 feet wide. Shoulders shall be 6 feet wide. Parking lanes and shoulders shall be the same construction as travel lanes.
- Right and left turn lanes shall be 10 feet wide. Consideration should be given to paving 3 feet of each shoulder on curved roadways used by large trucks.
- Urban roadways with curb and gutter shall have 14–foot wide travel lanes, measured to the edge of the pavement. Gutter widths shall be a minimum of 2 feet, with a rolled curb face. Lateral clearances shall be 4 feet to face of curb.
- All roadways shall have edge drains.
- Ditches will be provided on roadways without curb and gutter. Ditch flowline shall be at least 1 foot below pavement subgrade.
- Pavement cross slope shall be 2 percent; parking and shoulder cross slopes shall be 4 percent.
- Maximum width of commercial drives shall be 36 feet, and minimum width of noncommercial driveways shall be 12 feet.
- Minimum radius for left turns at intersections shall be 75 feet or as determined by design vehicle turning template. Minimum left turn lane taper shall be 150 feet. Minimum radius for right turns shall be 10 feet to face of curb or 15 feet to edge of paved shoulder.
- Curb aircraft parking aprons will be provided as needed.
- The design for the type and thickness of pavement shall provide an economical structure that is consistent with the selected design period. Pavement thickness design shall be based on a computer-aided thickness design program called PCASE (Pavement-Transportation computer Assisted Structural Engineering) located at www.pcase.com
- A pavement type selection report shall be prepared for each roadway. The report shall contain design data, alternative comparisons (using a life cycle cost analysis or equivalent),

design calculations, and final recommendations based on a review by the BCE. The pavement surface shall be designed for a 20–year life using existing and projected traffic volumes (Equivalent Single–Axle Loads: ESALs). Generally, the roadway surface shall consist of a flexible type pavement. The sub base course will be considered part of the pavement structure and shall meet design standards specified by the Michigan Department of Transportation. The determination to meet design standards specified by the use a rigid pavement design shall be made by the BCE.

Airfield Pavements

Airfield pavements shall be designed in accordance with the current edition of Air National Guard Design Policy, ANGETL 15-01-00/ ANGETL 15-01-07

- Keyed joints are no longer authorized in PCC pavement supporting aircraft operations (Runways, taxiways, aircraft parking aircraft parking aprons etc.)
- Dowelled joints shall be used exclusively due to the inherent weaknesses in the key way.
- Pavement thickness design shall be based on a computer-aided thickness design program called PCASE (Pavement-Transportation computer Assisted Structural Engineering) located at www.pcase.com

Methane

Methane has been encountered in different locations on base as shallow as 5 ft. below the surface. If digging or excavating activities are to occur greater than 5 ft. below the ground surface, a Methane Safety Plan is required. The methane safety plan at a minimum shall discuss site monitoring, potential indicators of methane, and emergency response if methane is believed to have been discovered. As part of the emergency response both the Base Fire Department and 127th CES shall be notified. If and when confirmation of a methane hit has occurred, proper mitigation measures shall be put in place. Mitigation shall protect both life and infrastructure during and after construction.

Mechanical Systems

Applicable Codes

Provide the design in accordance with the latest version of the following codes unless otherwise stated:

- International Code Council's (ICC):
  - International Building Code
  - International Mechanical Code
  - International Plumbing Code
- Council of American Building Officials (CABO), Model Energy Code.
- National Fire Protection Association (NFPA)
- ASHRAE 62.1-2010, Ventilation for Acceptable Indoor Air Quality.
- ASHRAE 90.1-2008, Energy Efficient Design of New Buildings Except New Low Rise Residential Buildings.
- AFMAN48-155. Occupational and Environmental Health Exposure Controls.
- UFC 3-400 Series, Mechanical Code.
- UFC 4-010-01, DoD Minimum Anti-terrorism Standards for Buildings.

- Unified Facilities Guide Specifications (UFGS) 23 09 23.13 20 (April 2007.)
- ASME Boiler and Pressure Vessel Code
- NBIC National Boiler Inspection Code
- Other referenced standards herein

General

- Ladders will be installed to provide secured access to units, especially rooftops. Ladders shall be cage-style, preventing unauthorized access.
- Cooling Towers shall not be used in design due to microbial issues within this region.
- Design conditions for heating and cooling shall be in accordance with ASHRAE Fundamentals Handbook for both standard and critical facilities unless otherwise specified in ANGETL 15-01-04.
- Employ geothermal, solar thermal and other renewable energy sources where feasible based on Life Cycle Cost Analysis.
- Optimize building performance and system control strategies (e.g. use occupancy sensors and air quality alarms.)
- Combination heating and cooling systems shall be provided where feasible in buildings authorized for air conditioning.
- Mechanical equipment shall be selected with consideration for maintaining the overall noise within the occupied spaces of a building where the equipment is installed. Rooftop HVAC systems shall be allowed, when this is the best option, provided that concealed from plain view. Overall noise levels shall be in accordance AFOSH 48-19 CFR 1910.95 and shall not exceed the following:
  - Administration—65 dBA, maximum
  - Clinic—50 dBA, maximum
  - Industrial—80 dBA, maximum
- Design layout of HVAC systems shall allow for ease of equipment maintenance and replacement of components. Space between units, clear space for filter removal, etc. shall be in accordance with good design practice or manufacturer's recommendations.
- Provide at least 3 feet of clearance around all equipment for maintenance access (See Fig 27.) Elevated equipment should have service platforms provided where appropriate. Provide secure access (ladder, catwalk, etc.) to service platforms. The clearance requirement also applies to equipment located above the ceilings such as source heat pumps and VAV boxes.
- Isolation valves shall be provided on all branch lines of piping systems and all components of a piping system.
- Plumbing fixtures shall be specified to be in accordance with Americans with Disability Act.
- Provide utility (gas, power, and water) metering to monitor usage of all services to an individual building. Meters shall be able to provide output signal to the resident Energy Monitoring and Control System (EMCS.)

- All motors for pumps, fans, and within larger pieces of equipment shall be controlled by a Variable Frequency Drive (VFD) and meet or exceed 95% efficiency.

- Design conditions:

  Indoor design conditions: Zones conditioned for comfort cooling shall be designed to 76°F dry bulb and an indoor relative humidity of 50% regardless of the outdoor temperature and humidity, or percentage of outside air. Lower indoor humidity levels must be maintained when justified by project criteria.

  Outdoor design conditions: The 1% outdoor design cooling criterion for Selfridge is 86°F dry bulb and 72°F MCWB. The 99% outdoor design heating criterion is 6°F dry bulb and 5° MCWB.

- Condensing units shall be grade mounted, fin-tube style, air cooled units; hidden from plain view as much as possible. Refrigerant condensing units shall be provided for smaller, single air supply unit designs. Air cooled water chillers shall be provided in designs for larger loads and when diversity in cooling medium usage is required.

- Existing refrigerant equipment shall be replaced as needed and new equipment shall be provided with a commercially available refrigerant such as R410A refrigerant. All CFC and HCFC refrigerant types and R-22 shall not be used. Refrigerant shall not use any ozone depleting substances. All demolished equipment containing refrigerant shall have the refrigerant removed from the equipment using contractor furnished cylinders and then turned over to the 127 CES HVAC shop.

- In controlled environments (computer rooms or around-the-clock command centers) and areas affected by weekend or weekday operations, consideration shall be given to providing air conditioning equipment that is separate from the general building facility equipment when engineering cost analysis indicates an economical benefit.

- An air to air energy recovery systems shall be evaluated as an alternative for most all HVAC designs.

FIGURE 23:

MECHANICAL UNITS' BOUNDARIES DIAGRAM

Heating and Humidification

- Design conditions: Zones conditioned for comfort heating shall be designed to 68°F dry bulb. Where the indoor relative humidity for comfort heating is expected to fall below 20 percent for extended periods, humidification must be added to increase the indoor relative humidity to 30 percent. Other than mentioned above, humidification is not to be provided unless justified by special project criteria.

- Provide face and bypass dampers for freeze protection on makeup air units with hot water heating coils. Heating coils shall be direct fired gas units unless hot water heating service is available.

- Provide radiant heat in high bay and other applicable areas. Radiant heaters shall be placed outside of hazardous areas. Radiant heaters shall be tubular direct fired gas. Radiant heaters shall have outside combustion air intakes and direct venting to outside of buildings.

- Use electric ignition on all gas-fired burners.

- Ground Source Heat pumps shall be used for all facilities whenever economically feasible based on Life Cycle Cost Analysis.

- Provide boilers with 95 percent efficiency or better. Design shall include multiple boiler systems with start/stop-control of boilers based on return water temperature. Heating coils will be rated at 180ºF instead of 200ºF. Design shall include at least two boilers each sized at 75 percent of load. Each boiler in a multiple boiler set-up shall be able to be monitored and controlled by the DDC independently of any other boiler in the system. The boilers shall be set-up in a lead/lag fashion through the DDC system. Designer shall determine boiler air emissions permit requirements and limitations. When applicable, prepare and submit permit application to authority. Reference EPA 40 CFR Parts 53 thru 95 and Michigan Air Pollution Control Act 348.

- Water temperature drop across air supply unit coils shall be 20ºF for occupied areas. For shop air supply units the water temperature drop shall be 40ºF as long as the boiler is specified for a 40-degree (F) temperature differential. Operating temperature of boiler shall be controlled by an outdoor reset controller.

- Energy recovery systems and economizer systems shall be incorporated. High bay areas shall include hear recovery fans such as "pear fans" or "big ass fans." Air side economizers are preferred.

- Heat exchangers and glycol shall be provided where high amounts of outside air are introduced into occupied spaces and freeze protection is necessary. 40% glycol is the base standard when freeze protection is required.

- Primary, secondary pumping with pumps placed in parallel each sized for full flow. Pumping systems shall be designed around Bell & Gossett and Taco pumps. VFD technology shall be incorporated in the design. Chemical treatment auto-programmable feeders shall be provided at pumps for closed system treatment. Generally, ball valves shall be provided on pipes less than 4 inches in diameter and gate valves shall be provided on pipes more than 4 inches in diameter. Provide adequate number of globe type water balancing valves.

- Pumps shall be provided with expansion tanks and air separators. Expansion tanks shall be placed suction side of pumps."

- Water softeners shall be provided for water serving humidifiers. Electric water bottle vs. steam bar.

- Provide makeup water supply and reduced pressure backflow prevention devices in accordance with International Plumbing Code. Provide

adequate air openings to boiler rooms for combustion air to boilers. Backflow and Back siphonage Preventers that have overflow or pressure relief valves (of any kind) shall include an overflow drain directly connected to the preventer (with air gap, as required) routed outdoors, and shall also include a redundant floor drain. Both drain types shall be sized to handle continuous flow at "street pressure" in case of system malfunction with positive pressure.

Automatic Control Systems

- Provide run commands from individual pieces of equipment to a building direct digital control (DDC) panel. The DDC shall accumulate any and all HVAC alarms (unanswered run commands and duct smoke detection alarms) to send the output signal to the EMCS. Alarm lamps, on the face of the ECP, shall identify the alarm condition with an alarm horn and a manual reset horn switch.
- DDC and all DDC components shall be Automated Logic Corporation (ALC) and shall be designed and installed in accordance with the EMCS section of this specification.
- DDC Systems shall be routed via an ALC LAN Gate Router (LGR-250)
- Specify HVAC System Control Diagram drawing, wiring ladder diagrams, and separate Sequence of Operation Description summary to be provided with system. Drawing and summary shall be mounted and framed under Plexiglas for permanent posting in the mechanical room.
- Use electric powered damper actuators and positioners. Pneumatic actuators shall not be used unless specific requirements dictate. Provide actuator-controlled outside air dampers at air handling units on fan shutdown conditions for positive closure. Provide face and bypass dampers for freeze protection on makeup air units with heating coils.
- Final wiring diagrams shall be furnished to CE Operations.
- Thermostats shall be provided by DDC manufacturer. Provide automatic setback thermostats and/or time clocks with manual override where when DDC is not installed in the facility. Provide heating/cooling dead band thermostats where appropriate.
- Pump control systems shall be lead / lag control with alternation of lead pump for plumbing and heating water systems.

Mechanical Ventilation

- Provide outside air ventilation for occupied air-conditioned and heated spaces in accordance with ASHRAE Standard 62.1, Ventilation for Acceptable Indoor Air Quality. Air handlers shall be centrifugal or plug flow fan type. Provide differential pressure measurement across filter sections and water drain-offs for all air handlers.
- Provide permanent nylon electrostatic filters in air handling systems.
- Do not provide under-slab ducting for HVAC. Grilles and louvers shall have factory applied finish.
- Provide energy recovery when cost analysis shows a 10-year or less payback on installed equipment.
- Fiberglass ductwork shall not be allowed. Consider exposed ductwork in existing buildings having difficult-to-access spaces above ceilings.

Provide 6 to 8 feet flexible ductwork at all connections to Variable Air Volume (VAV) boxes and registers. Provide fire dampers in ductwork passes through fire rated walls. Duct work shall be hard sheet metal except as noted. Avoid the use of RA plenums where practical.

- All initial start-up readings, such as temperatures, pressures, flow rates etc., will be provided to the shop for Baseline reference.

- Industrial ventilation shall be provided in accordance with *Industrial Ventilation, A Manual of Recommended Practice,* latest edition, by the American Conference of Governmental Industrial Hygienists. Also refer to Air National Guard Design Policy for industrial exhaust ventilation standards.

HVAC Testing and Balancing

- HVAC systems shall be tested and balanced by a contractor supplied independent and certified testing and balancing subcontractor. Systems shall be successfully tested when the test results are within 10 percent of specified criteria. A Contracting Officer (KO), Contracting Officer's Representative (COR), or a Government employee designated by the KO or COR shall be present during the test and balance to verify results.

- Automatic Balancing Valves shall be used in the place of Static Balancing Valves. ABV's shall have an easy method for changing flow rates. Designer shall be responsible for providing a schedule of flow rates for the ABV's and the Contractor shall be responsible for changing orifices in order to provide a proper balance in accordance with the plans and specifications. As-builts shall reflect any of these changes.

- The Contractor shall install additional volume control dampers than those shown on the drawings if required to properly balance the system.

- Ceiling grid markers shall be required to identify the location of all above-ceiling devices.

- The testing and balancing subcontractor shall provide training to SANGB staff on maintenance testing and balancing to include providing the test equipment needed for the balancing.

Training

- All HVAC systems specifications shall include provisions for classroom or onsite type system training by a factory certified trainer. Training classes shall include at a minimum topics on proper operating and maintenance procedures, troubleshooting procedures, routine and overhaul maintenance, testing and balancing, and calibration.

- HVAC system designer shall negotiate with the Government (CE Operations) the minimum number of classroom or onsite training hours to be provided. This shall be done on a case by case basis, and considerations shall be made for the amount of Selfridge ANGB employees to be trained. Training may be provided off-site at a local factory location if necessary.

- The contractor shall submit a training plan prior to project start up, that provides the subjects to be covered and course descriptions.

O&M Manuals

O&M manuals shall be required for all equipment. Manuals shall be submitted at the 30 to 40 percent construction completion stage of a project. Final contractor's payment shall be tied to receipt and approval of final O&M manuals, schematic wiring diagrams, sequence of operation and satisfactory training.

Insulation

Insulation must comply with the latest version of ASHRAE 90.1. All insulation shall provide condensation prevention where condensation is deemed to be a potential issue. Pipe insulation shall have a minimum R-value of 6.9. All domestic hot water must be insulated. Above-grade exterior chilled water and heating water piping must be insulated and protected with an aluminum jacket. Buried exterior chilled water, heating water and dual service piping must be factory fabricated, pre-insulated piping. Refrigerant piping must be insulated. Insulation must be continuous through floors, walls, and studs. Insulation must be on the outside of ductwork. Internal insulation is not permitted. Exposed outdoor ductwork must be insulated and wrapped with a minimum of 27 gauge aluminum jacket. Adhesives and installation of all insulation must be in accordance with the manufacturer's recommendations.

Commissioning

- New builds shall have HVAC system commissioned by an independent third party and shall be in accordance with current ASHRAE Guidelines. The Commissioning Process and ASHRAE Applications Handbook – Chapter 42 HVAC Commissioning.
- For additions or renovations, the HVAC systems shall be (retro) commissioned if a significant amount of the HVAC system is impacted (as determined by Base Engineering.)
- Any commissioning, recommissioning, and/or retro commissioning performed shall be well documented and a detailed report shall be given to CE Operations. As a part of this report, a continuous commissioning plan shall be created and performance baselines shall be listed.
- Provide control diagrams, sequence of
- operations, and operating instruction on mechanical room wall.

Heating Ventilation Air Conditioning Design (HVAC) Standard

All future HVAC systems must meet the following required standards. Cited standards are provides as a reference, newer versions of cited references will supersede all older versions.

Temperature:
Winter: 68° F dry bulb.
Summer: 76° F dry bulb.

Humidity

40-60% RH Year-round

Ventilation

Make Up Air Requirements (Outdoor Air): The more stringent of either ASHRAE 62.1-2010 or International Mechanical Code.

Physical System Requirements

(ASHRAE 55-2010; ASHRAE 62.1-2010; ACGIH Industrial Ventilation, A Manual of Recommended Practices, 19th & 23rd Editions; International Mechanical Code)

1. Intake air locations must be a minimum of 10 feet above the ground. Intakes must be located away from vehicle parking areas, loading docks, cooling towers and chimneys or vents. (International Mechanical Code)

2. Duct runs must not have 90-degree turns with the maximum turn angle being 45 degrees. Round ducts are recommended for maximum airflow efficiency. (ACGIH Industrial Ventilation)

3. Air handling and fan coil units shall be easily accessible for inspection and preventive maintenance. (ASHRAE)

4. Relative humidity must be maintained at less than 65% throughout the system. (ASHRAE)

5. Laboratory areas must have separate exhaust points and must not recirculate exhausted air into the system to preclude contamination of adjacent areas and indoor air quality deterioration. Separate HVAC systems for laboratories are recommended.

6. Use ASHRAE 62.1-2010 to calculate system balancing and ratio of outdoor make up air to recirculated air. Equations for Class I and Class IV should be used when dealing with cleaned recirculated air.

7. To maintain adequate indoor air quality, recirculated air should never exceed 67-85% of the total air flow volume. (International Mechanical Code)

8. Ducting and plenums shall meet requirements in International Mechanical Code.

9. Living quarters HVAC systems shall be separate from industrial and/or vehicle storage areas (as in the fire department.) (International Mechanical Code, ASHRAE, ACGIH)

10. Exhausts for boilers, water heaters, and/or other combustion units will be located at least 10 feet away from air intakes, entry doors, and/or window.

Energy Monitoring and Control System (EMCS)

The EMCS base standard, Automated Logic Corporation (ALC), is connected to the base server through a dedicated virtual LAN connection.

- The EMCS provides monitoring and control for building heating, ventilating, and air conditioning (HVAC) systems. It can also be designed to monitor and control other systems including:

- Environmental systems
- Alarm management systems
- External and Internal
- Generator, chilled water, and boiler systems
- Utility use, such as gas and power metering
- High water (flood in Mechanical Rooms)
- Predictive maintenance
- Process equipment

EMCS Architecture

- Smart field panels, referred to as direct digital control (DDC) or field interface device (FID) units contain a microcomputer and supporting electronics. This is the preferred

installation for new or up-graded systems. All DDC must be ALC.

- A DDC panel shall be installed as a local "stand alone system" in a single facility without a central computer. The DDC unit shall include a minimum of two serial LAN ports to accommodate on site communication. The DDC unit shall have capability to communicate to the CCU.

- Older installed systems may include local pneumatic or electric units. While many function in a stable manner, these units should be included in system upgraded plans.

- Field input and out devices are sensors and transmitters with a hardware interface to the DDC or other local units.

EMCS Communication

Acceptable options for EMCS communication include fiber optics or dedicated VLAN.

Fiber Optics

- The EMCS communication network shall be separated from the base LAN via VLAN.

- At a minimum when using fiber optic communication, an eight-fiber cable should be used for all EMCS installation.

- Coordinate installation of data communication media with base communications officer.

Fiber Optic Characteristics

- Uses wideband properties of infrared light traveling through transparent fibers at extremely high data transmission rates.

- Reliable communications media suited for point-to-point high-speed data transmission.

- Immune to radio frequency electromagnetic interference.

Transient Protection and Grounding

- The EMCS must be protected from power transients.

- Communication links must have surge protection circuits installed at each end and must have triple electrode gas surge arrestors within 3 feet of the building cable entrance.

- Power circuits serving and control and sensor lines connected to EMCS equipment must be surge protected.

- Communication link equipment must have overvoltage protection for voltages up to 480 Vac rms, 60 Hz.
- Equipment protection shall meet the requirement of IEEE C62.41. Fuses are not be used for surge protection.

- The EMCS must be properly grounded.

- Communication and instrumentation ground conductors shall be routed to the Common ground grid through insulated ground conductors, grounded at a single point.

- Avoid signal grounding conductors running parallel, to within 36 inches, of high-voltage (above 600 Vac) power or lighting conductors.

- Floating signal grounding systems are not acceptable because of lack of operating stability and shock hazard.