DESIGN & CONSTRUCTION STANDARDS
STATE OF OHIO, ADJUTANT GENERALS DEPARTMENT
This document shall provide specific guidelines to architects, engineers, design consultants, and contractors for all construction and maintenance activities. These Standards are intended to summarize information that is unique to the Adjutant General's Department due to the specialized nature of the agency. Exceptions to this Standard may be considered by filling out the Variance Request Form (Appendix H). This form shall be submitted to the Adjutant General's Department for review and approval prior to proceeding with any deviation from the Standards.

These Standards do not replace professional design analyses and may not be used directly as contract Specifications. A/E’s, Contractor’s, and Consultants shall conduct independent evaluations to support design and construction requirements, discuss alternatives, and make recommendations with the appropriate Adjutant General’s Department personnel.

The Design and Construction Standards consists of three major sections:
1. Consultant Requirements contain procedures and processes for accomplishing the design work.
2. Design and Construction Standards contain the requirements for building systems and construction. This section has been organized using the UniFormat system, as developed by the Construction Specifications Institute.
3. Appendices that contain additional specific information.

Architects, Engineers, Design Consultants and Contractors are required to provide a signed letter (APPENDIX I) Design and Construction Standards Letter of Receipt) certifying that the Adjutant General’s Department’s Design and Construction Standards have been incorporated into the bidding documents.

As part of Basic Services, all Architects, Engineers, Design Consultants and Contractors shall become familiar with and follow the requirements detailed herein.

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Section 1 - GENERAL

1.1 GENERAL

1.1.1 Section 1 Standards are in accordance with State of Ohio Contracting Procedures, if Federal Contracting Procedures are used, make changes to requirements and submissions in accordance with NG Pam 415-5 and FAR Regulations.

1.1.2 Ownership and Rights. All design product/s, investigative studies, and associated deliverables are the Property of the Government (Adjutant General’s Department).

1.1.3 These Design and Construction Standards are in accordance with the Unified Facilities Criteria (UFC) system prescribed by MIL-STD 3007 and provides planning, design, construction, sustainment, restoration, and modernization criteria. UFC’s are effective upon issuance and are distributed only in electronic media from the following source:

1.1.3.1 Whole Building Design Guide web site http://dod.wbdg.org/

1.1.4 A/E and Consultants shall include UFGS (Unified Facilities Guide Specifications) in their Design Submissions.

1.1.5 Specifications section numbers shall be consistent to CSI Masterformat classification (i.e. 08 70 00 Door Hardware) in accordance with UFC 1-300-02, Unified Facilities Guide Specifications (UFGS) Format Standard.

1.1.6 The Adjutant General’s Department maintains a strong commitment to the environment and conserving natural resources. All facility assessments, programming and design shall assess sustainable strategies that are applicable to a project. Identified features shall be included in the project where feasible. Refer to the Department of the Army’s Sustainable Design and Development Policy (Environmental and Energy Performance).

1.1.7 The Designers and Contractors involved in any project for the Adjutant General’s Department shall meet or exceed the written standards of quality as established by appropriate construction, military, and industry organizations. When similar standards vary from another, the Designer and the Contractor shall meet the more stringent criteria for quality.

1.1.8 All Designers involved in any project shall be aware of and design facilities to meet and comply with the minimum requirements of all applicable federal, state, local, environmental and building codes, ordinances and standards, at all levels of jurisdiction. All Contractors involved in any project shall perform construction work to meet or exceed the minimum requirements of all applicable federal, state, local, environmental and building codes, ordinances and standards. If a conflict arises between program requirements and codes, regulations and ordinances, such conflict must be resolved to the satisfaction of all interested parties prior to completion of the Design Development phase by the A/E or be addressed in an RFI by the Contractor.

1.1.9 No A/E, Contractor or Consultant will correspond with any regulatory agency on behalf of the Adjutant General’s Department without approval of the Adjutant General’s Department. The Adjutant General’s Department will review and approve all correspondence.

1.1.10 Throughout the Design and Construction Standards, many elements of the Work have been indicated “shall be” provided. If a product or element has been specifically requested, provide that specific element. For brevity, language such as “without prior approval” has been omitted from the Standard. Items which have not been indicated in the Design and Construction Standards, are not approved.

1.1.11 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor.

1.1.12 The Contractor shall provide all labor and materials necessary for the entire completion of the Work described in the Contract Documents and to produce the intended results. All labor and materials shall include a minimum one (1) year warranty.
1.1.13 The A/E must give appropriate consideration to products of Ohio manufacturers wherever possible and in accordance with ORC 153.012.

1.1.14 The A/E must specify the use of steel products made in the United States in accordance with ORC 153.011.

1.1.15 Materials specified must be institutional grade, of the highest quality within available funds and suitable for their intended purpose.

1.1.16 A/E must specify Energy Star products when available.

1.1.17 In addition to aesthetic considerations, on remodeling projects, the A/E must strive to standardize and match the existing materials and building components. The A/E may obtain, from the Owner, a list of commonly used finish materials, hardware, equipment and other stocked items regularly utilized by the Owner. When specifying components, the A/E must make an effort to minimize the type of items that the Owner must maintain in stock.

1.1.18 The A/E must verify the scope of the work on remodeling projects. If asbestos-containing materials or other hazardous materials are expected to be encountered, and design of abatement is not included in the A/E’s Agreement, the A/E must recommend to the Adjutant General’s Department that a Design Consultant which specializes in the removal of the hazardous material to meet Occupational Safety and Health Administration (“OSHA”) and Ohio Environmental Protection Agency (“OEPA”) guidelines be retained.

1.1.19 Any documents, drawings or other information provided by Adjutant General’s Department shall be field verified by the A/E, Consultant and/or Contractor, whichever is applicable.

1.1.20 Thorough, accurate, professional and effective communication of information is an essential part of every aspect of a project. Open and frequent communication is expected.

1.1.21 The Adjutant General’s Department shall issue specific written authorization to the A/E, Consultant, or Contractor in the form of an Amendment or Change Order for additional services. Performing work without aforementioned written authorization is at the sole risk of the A/E, Consultant, or Contractor.

1.1.22 The A/E, Consultant and Contractor shall obtain the latest version of the Adjutant General’s Department Standard forms and documents to be utilized from the outset of the Project.

1.1.23 Industry Standards such as ANSI, ASTM or other similar in accordance with shall be based upon the latest revision of the Standard.

1.1.24 Design review and comment by the Adjutant General’s Department shall not be construed as “quality control/quality assurance” for the A/E. The responsibility for the completeness, coordination of each submission and the Bidding Documents is the responsibility of the A/E.

1.1.25 Review and approval by, the Adjutant General’s Department shall not relieve the A/E from providing design solutions and documentation which are both Building Code and Design and Construction Standards compliant.

1.1.26 The A/E is the responsible entity when it comes to understanding the building and its systems. Commissioning agents, inspectors, the Owner, testing agencies, contractors, construction managers, cannot assume nor usurp the A/E’s role in the delivery of a fully functional and well-coordinated facility.

1.1.27 The A/E, the Adjutant General’s Department and Contractor (as appropriate) shall develop a workable schedule to meet agreed upon delivery dates and milestones.

1.1.28 If Adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated, and had an adverse effect on the scheduled construction.

1.1.29 The Adjutant General’s Department insists on a balanced design. All components and systems should be of similar levels of quality, performance and life expectancy, for example, an HVAC system with a 50 year life expectancy is not appropriate for a building with a 10 year life expectancy.
1.1.30 The A/E shall not place information in specifications that will not actually be used or enforced.

1.1.31 The following words or phrases shall not be used in the Construction or Design Documents.
   1.1.31.1 By others
   1.1.31.2 Should
   1.1.31.3 Incidental To
   1.1.31.4 And/or
   1.1.31.5 Must

1.1.32 Words and phrases that cannot be measured (and shall not be used in Construction or Design Documents):
   1.1.32.1 Clean
   1.1.32.2 Smooth
   1.1.32.3 Properly fitted or assembled
   1.1.32.4 Good Working Order
   1.1.32.5 Neatly Finished
   1.1.32.6 Of an Approved type
   1.1.32.7 Suitable Housed
   1.1.32.8 When or Where Required

1.1.33 One word to use with extreme caution:
   1.1.33.1 Delete

1.1.34 The relationship between drawings and specifications
   1.1.34.1 Drawings shall be a graphic portrayal of the various elements
   1.1.34.2 Specifications shall describe the quality of materials, processes, and workmanship.
   1.1.34.3 There should be no duplication between these two documents; instead, they should be complementary.
   1.1.34.4 To improve coordination between drawings and specifications, there shall be standardization of the information appearing in them.
   1.1.34.5 In the event of inconsistency or conflict within the Contract Documents, the Contractor shall provide the better quality or greater quantity of Work, and comply with the stricter requirement.

1.1.35 All fees and permits required for the construction of the project are the responsibility of the Contractor(s).

1.1.36 The specifications shall clearly identify each contractor’s responsibility for providing continuous utility services until date of final acceptance or beneficial occupancy (whichever comes first) including operation of permanent equipment and services.

1.1.37 The organization of the Specifications in divisions, sections, and articles, and the arrangement of Drawings shall not restrict the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

1.1.38 Unless otherwise defined in the Contract Documents, words that have well-known technical or construction industry meanings are used in accordance with those recognized meanings.

1.1.39 The Sections of Division 01 – “General Requirements” govern the performance of the Work of all Sections of the Specifications.
1.1.40 Refer to Appendix A – General Notes for standard construction notes to be added to drawings as appropriate.

1.2 SPECIALTY CONSULTANTS

1.2.1 If required by the Project, Specialty Consultants may be engaged and added to the Project Delivery Team. The Project Delivery Team shall jointly develop the list and roles of specialty consultants appropriate for the project. The Adjutant General’s Department and A/E may agree to procure the services of these Specialty Consultants as part of the A/E’s services.

1.2.2 The A/E shall communicate with the various Specialty Consultants and the Adjutant General’s Department such that all parties are fully informed and the documents of all consultants are fully and completely coordinated.

1.2.3 The A/E shall coordinate and integrate the recommendations of the Specialty Consultant with the work of the A/E so that each is complementary to, and is not at variance with, the other. The A/E shall get all recommendations and comments of Specialty Consultants incorporated into the bid documents as to not delay the project schedule.

1.3 OWNER’S PROGRAM

1.3.1 Program of Requirements:

1.3.1.1 In cases where the Adjutant General’s Department provides a Program of Requirements (POR), the A/E shall maintain a current and easily understood comparative spreadsheet. The spreadsheet shall describe the actual spaces as shown on the drawing with their respective net areas, plus a tabulation of gross area. The A/E shall prepare a table which compares actual and programmed areas side-by-side and a computation of the difference. This program verification chart is required with the submittal of Schematic Design, (Two parts - Preliminary Concept Design, and Final Concept Design), Design Development, and Construction Documents. Deviations or modifications to the Owner’s original program shall be readily discernible and shall be approved by the Adjutant General’s Department, before further development of the design documents may proceed.

1.3.1.2 For projects of limited scope, where no detailed Program of Requirements (POR) has been prepared prior to the commencement of the Schematic Design Phase, the approved Schematic Design Drawing shall establish the approved project Program of Requirements.

1.3.1.3 For projects that are not readily defined in terms of areas and spaces, the A/E shall provide a written description of the scope and nature of the project that defines the program of work. This task is typical for systems renovations and certain engineering projects.

1.3.2 Visual Management System: Visual Management is a concept that emphasizes putting critical information at the point of need. Visual devices remain clearly visible, readily understood, and consistently adhered to. Visual Management Requirements will be identified in required sections. Below is sample of the type of information that may be requested.

1.3.2.1 Posted Operating Instructions: Print or engrave operating instructions and frame under glass. Post instructions where directed. For operating instructions exposed to the weather, provide weather-resistant materials or weatherproof enclosures. Ensure operating instructions do not fade when exposed to sunlight. Secure instructions to prevent easy removal or peeling. Install in locations close to Equipment/systems.

.1 Startup procedures
.2 Equipment or system break-in procedures
.3 Routine and normal operating instructions
.4 Regulation and control procedures
.5 Instructions on stopping
.6 Normal shutdown instructions
.7 Required sequences for electric or electronic systems
.8 Special operating instructions and procedures.
.9 Systems and Equipment Controls:
.10 Sequence of operation and diagram controls as installed
.11 Piped Systems:
   • Diagram piping as installed, identify color coding where required for identification.
.12 Highlight important safety issues
   • Content:
      o Type of emergency
      o Emergency instructions
      o Emergency procedures
   • Type of Emergency:
      o Fire
      o Flood
      o Gas leak
      o Water leak
      o Power outage
      o System, subsystem or equipment failure
      o Chemical release or spill (Post MSDS)
   • Emergency Instructions:
      o Describe and explain warnings, trouble indications, error messages, and similar codes and signals.
      o Post operating personnel responsibilities for notification of Installer, supplier, and manufacturer to maintain warranties.

1.3.2.2 Prepare a single, directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to the desired information. Print or engrave directory and frame under glass. Post directory where directed. For directory exposed to the weather, provide weather-resistant materials or weatherproof enclosures. Ensure directory does not fade when exposed to sunlight. Secure directory to prevent easy removal or peeling. Include in directory a section for each of the following.

.1 List of documents
.2 List of systems
.3 List of equipment
.4 Location

1.3.2.3 Determine operating principles for the major equipment types

1.4 SOLE SOURCE ITEMS

1.4.1 The Adjutant General’s Department has written the Design and Construction Standards to allow for competition in bidding and support the needs of maintenance and operations for facilities. Where a sole-source product has been included in the Standards, that product is to be considered basis of design. However, products of equal specification will be considered. Sole Source specifications have been included in the Design and Construction Standards for:

   1.4.1.1 Door Hardware: Refer to Appendix C
   1.4.1.2 Security and Access Control Systems: Refer to Appendix C

1.4.2 In all other items, the A/E shall specify items for which three (3) or more acceptable/equal products are available.
1.4.3 Should the A/E recommend additional Sole Source items, the A/E shall seek written approval from the Adjutant General’s Department and provide written justification and documentation as to why a particular item(s) shall be sole source.

1.5 REVIEW, APPROVAL AND DISTRIBUTION OF DOCUMENTS

1.5.1 Refer to Design Deliverables for additional information.

1.5.2 Documents required for approvals by the Adjutant General’s Department, as well as documents required by the A/E’s consultants shall be provided by the A/E.

1.5.3 A Schedule of Services Document (see Appendix J) shall be completed by the A/E.

1.5.4 The A/E shall submit documents for review to the Adjutant General’s Department (as directed) at the completion of each of the following Phases:

- **1.5.4.1 Schematic Design**
  1. Preliminary Concept Design
  2. Final Concept Design
- **1.5.4.2 Design Development**
- **1.5.4.3 Construction Documents**
- **1.5.4.4 Conformance Documents (incorporate addenda and negotiated changes)**
- **1.5.4.5 Record Documents (incorporate “As-Built” Documents)**

1.5.5 The A/E shall submit a minimum of 2 weeks prior to each design submission review meeting all required specifications and drawings.

1.5.6 The Adjutant General’s Department designated project manager will inform the A/E of any items which are deficient or not deemed to be in compliance with our requirements, using the “Design Review Comments Spread Sheet”. A/E shall then respond by completing the “Design Review Comment Sheet.

**DESIGN REVIEW COMMENT SPREAD SHEET**

<table>
<thead>
<tr>
<th>PIN</th>
<th>ADJ #</th>
<th>Facility Name</th>
<th>Design Submission</th>
<th>Reviewer</th>
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Documents Reviewed:

State Contact:

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<th>Comment No.</th>
<th>Drawing No./Document</th>
<th>Comment</th>
<th>A/E Response</th>
<th>Open or Closed</th>
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1.5.7 A/E shall correct deficiencies and non-compliance items. The documents will be reviewed during the design submission review meeting with the project team-Project Manager, Contracting Representative, Environmental Representative, Planning and Programming Representative.

1.5.8 The documents will be evaluated, approved or rejected, with the submission of the Design Service Acceptance Form.

1.6 DESIGN SUBMISSIONS

Although the Adjutant General’s Department may provide comments on the overall submission, the responsibility for compliance with the Design and Construction Standards lies with the A/E. In certain circumstances, the Adjutant General’s Department may retain additional consultants outside of the Project Delivery Team to ensure that the technical portions of the Design and Construction Standards have been adhered to. The inclusion of these additional Consultants does not relieve the A/E from the performance of the duties stipulated within the Agreement for the Work. A/E shall submit documents as directed by the Adjutant General’s Department suitable for review. The A/E shall submit, at a minimum, Two (2) CD’s and Two (2) hard copy sets of documents (drawing size shall be ARCH D – 24 x 36) suitable for review, and Power Point Presentation slides for each submission as follows:

1.6.1 Schematic Design – The Schematic Design stage is the portion of Design in which the Program of Requirements (POR) is first expressed in graphic form. The Stage begins after completion of the Program Verification and ends with the Adjutant General’s Department approval of the submission of the Design Service Acceptance form for this phase.

1.6.1.1 Preliminary Concept Design (Concept): The Preliminary concept deliverables must be appropriate to the project scope. Preliminary concept deliverables include, at a minimum, the following:

1. Concept Drawing/s
2. Cost Estimate
3. Design Submission could also include:
   - Site plans
   - Floor plans
   - Elevations
   - Preliminary scheme evaluations

1.6.1.2 Final Concept Design (Preliminary): At the conclusion of the Preliminary Concept portion, a final concept is selected for further development. Final concept deliverables must be appropriate to the project scope. Final concept deliverables include, at a minimum, the following:

1. Approved Concept Drawings
2. Cost Estimate
3. Summary
4. Design Submission could also include:
   - Site drawings – Show adjacent buildings, existing and proposed elevation contours, existing and new site utilities, vehicular and pedestrian flow, parking, service access and special construction required.
   - Floor plans – illustrate proposed structural bays with room layouts that include door swings, program room numbers, names and areas. Identify mechanical, electrical and equipment rooms with fire walls, stairs and elevators. Show roof plans and proposed screen and parapet walls. Partial plans will include key plans.
   - Fire Resistance Floor Plans – Illustrate all fire walls and means of egress for all phases of construction. Each phase of construction will comply with life safety and means of egress during the construction period. The Drawings must illustrate
temporary measures for means of egress during any sequence or phase of construction.

- Elevations – Develop all elevations and exterior canopies. Define anticipated grade, floor and bearing elevations.
- Building Sections – develop a section through the entire building illustrating relationships of architectural and structural features and elements. Show all anticipated floor, ceiling, roof and exterior grade elevations.
- Equipment and Furniture – Illustrate furniture and equipment defined in the Program.
- Massing studies – Study models and computer generated graphics of the building, illustrating mass relationships and entrances of the facility.
- Survey

1.6.2 Design Development (Final) – The Design Development Stage is the portion of Design in which the project is transformed from ideas, concepts, and broad-brush thoughts to specific materials, details and contractual instructions to implement the competitive bidding and construction of physical facilities. This stage begins after the completion of the Schematic Design stage and ends with the Adjutant General’s Departments approval of and the submission of the Design Service acceptance form for this Stage. Based on the approved Schematic Design Documents, the updated Program, approved Statement of Probable Construction Cost and the approved Project Schedule, the A/E must prepare Design Development Documents appropriate to the scope of the project. Design Development Documents deliverables include, at a minimum, the following:

1.6.2.1 Drawings
1.6.2.2 Specifications
   .1 Specifications require the inclusion of the Submittal Register

<table>
<thead>
<tr>
<th>SCHEDULE OF MATERIAL SUBMITTALS</th>
<th>PROJECT NUMBER</th>
<th>PROJECT NAME</th>
<th>REQUEST/CONTRACT NUMBER</th>
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<td>TO BE COMPLETED BY PROJECT MANAGER</td>
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<td>Note: 3 copies required per submittal. Government will retain all submittals.</td>
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<th>DESIGN</th>
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<tr>
<td>SCHEMATIC</td>
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<tr>
<td>Concept Drawings</td>
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<td>Cost Estimate</td>
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<td>Cost Estimate</td>
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<td>Summary Sheet</td>
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<tr>
<th>DESIGN DOCUMENTS</th>
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<tbody>
<tr>
<td>Drawings</td>
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<td>Specifications</td>
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<td>Design Analysis</td>
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<td>Cost Estimate</td>
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<tr>
<td>Project Summary</td>
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<td>SWP/EFM Control Plan (If Required)</td>
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<tr>
<td>Draft 1354 (If Required)</td>
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<tr>
<td>Geotechnical Data/Tests (If Required)</td>
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<td>CONSTRUCTION DOCUMENTS</td>
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<td>Cost Estimate</td>
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1.6.2.3 Design Analysis
1.6.2.4 Cost Estimate
1.6.2.5 Project Summary
1.6.2.6 Life Cycle Cost Analysis (If Required)
1.6.2.7 SWP3/Erosion Control Plan (If Required)
1.6.2.8 Draft 1354 (If Required)
1.6.2.9 Geotechnical Data/Tests (If Required)
1.6.2.10 Deliverables: Design Documents information shall include, as required, the following:

.1 Drawing Cover Sheet:
- Name, address of Owner, Construction Manager (if applicable), Architect, Consultants, Project Number, and ADJ Number.
- Vicinity map
- Location map
- Index to all drawings
- Code analysis information such as: Fire resistance plans and building code construction type and occupancy information.
- Architect/Engineer Stamp

.2 Site Plan(s)
- A certified plot plan, (sealed by an Ohio licensed Land Surveyor) if requested.
- A grading plan 1'-0" or 2'-0" increments with appropriate sections.
- Sedimentation control and Storm Water Management Plans and profiles
- Local governing utility standards included in all utility details
- Standard details must be modified to suit project conditions. All non-applicable information must be deleted.
- Existing and proposed electrical, gas, sewer, water, storm drainage, telephone and TV cable utilities must be identified.
- Utility designs must show plan, profile and all fittings and details required by code and local government standards.

.3 Landscape:
- An overall site plan showing plantings, irrigation and drainage system, site lighting and all site development features.
- Details and sections of all site development features, sidewalks, curbs, paving stones, bollards, ramps, exterior stairs, lawn areas showing seeding methods, etc.
- All landscape conditions should be thoroughly detailed.
- A symbol glossary
- Planting schedule
- Seeding schedule
- Modify standard details to suit project conditions. Delete all non-applicable information.

.4 Architectural:
- A basic floor plan of the entire facility showing minimal detail with a grid or column in accordance with system showing overall building layout dimensions, core spaces, Adjutant General’s Departments numbered or named rooms, room square footage, floor opening penetrations, etc. Fire ratings of all partitions, fire doors, etc. should be clearly denoted.
- A dimensioned floor plan locating all interior partitions and exterior wall partitions from the grid or column in accordance with system. Floor plan should include room and workstation designations, interior and exterior door and window designations.
• A dimensioned floor plan showing wire management system with openings located for voice, data, video and electrical and outlet locations.
• Room wall elevations for all non-typical walls.
• Casework floor plan complete with schedule, details and elevations
• Interior and exterior window, door and frame schedule, complete with elevations and details for all head, jamb and sill conditions.
• Interior and exterior finish and color schedule (exposed finished mechanical and electrical items will be clearly addressed)
• A reflected ceiling plan showing all grid, access doors, drapery tracks, light fixtures, grills, diffusers, sprinkler heads, security devices, fire alarm devices, intercom system, exit devices and acoustic treatment, Ceiling heights and type should be indicated on the reflected ceiling plan.
• Details to illustrate transitions between finish material and construction types. Major building sections in at least two directions. A sufficient number of details to clearly indicate the method of construction for all building components and include, but not be limited to: walls, floors, roofing assemblies, waterproofing systems, insulating systems, interior and exterior finishes, architectural details, interior stairs and elevators.
• Interior signage locations must be shown on the floor plan complete with details and schedules
• Final locations must be shown on the floor plan with associated floor loadings being shown on the structural drawings.
• Partition type schedule and section details for all interior, exterior and floor wall conditions.
• Roof plan showing all roofing material, roof drains, overflows, access hatches, roof walk pads, roof drainage slopes and elevations, scuppers, skylights and mechanical and plumbing penetrations. Details must be provided for all edge, parapet and flashing conditions.
• All exterior building elevations showing finish materials, exterior door and window openings and designations, lights, louvers, grilles, signage, speakers and other devices.
• All structural members included in, or enclosed by the architectural details must be closely coordinated with the size verified by the structural engineer. Details must indicate the framing and furring method wherever possible.
• All mechanical/electrical elements included in, or enclosed by the architectural details must be closely coordinated with the size verified by the design engineer. Details must indicate the framing and furring method wherever appropriate.

.5 Structural:
• A dimensioned foundation plan showing and locating in plan and in elevation all footing, foundations, foundation piers, caissons, grade beams, reinforcement with all layouts for masonry and anchor bolts.
• A dimensioned floor plan for each floor, showing all beams, beam sizes, duct and piping penetrations, construction joints, expansion joints, edge conditions, imbedded anchors and frames thickened slabs, recessed slabs stair penetrations, elevator shafts, floor loading, top of structure elevation and reinforcement.
• Footing, column, grade beam, caissons, piers, reinforcement, and beam schedules
• Dimensioned to scale details showing all conditions, connections, and structural sizes
• Shear walls clearly shown on plan and schedule if symbol code is used
• Abbreviation and symbol glossary
• Fastener/connection schedule
• Elevations of all footings, elevations to top of all beams, columns, recesses and floors
• Roof beam plan, elevator hoist beams

.6 Mechanical

• Abbreviation and symbol glossary
• Mechanical equipment schedule
• Exterior louver schedule, as coordinated with architectural louvers
• Floor plans indicating ductwork with sizes, ductwork mechanical devices, beams for floor above with ductwork penetrations
• Reflected ceiling plan showing final location of all ceiling mounted mechanical devices which include but are not limited to; diffusers, return air grilles and thermostats
• Floor plan indicating the sprinkler and standpipe riser systems including all required pumps and control devices
• Fire damper schedule and location of dampers on each floor
• Ductwork sound attenuation schedule
• Vibration isolation schedule
• Terminal control box schedule, with electrical and air volume requirements
• Chilled water, condenser, refrigerant, fuel oil, steam and gas riser piping floor plans and riser diagrams and schematics including pipe sizes. Piping schematics must be in large enough scale to clearly indicate all control devices, valves, unions and miscellaneous appurtenances.
• Areas of concentrated mechanical equipment must be enlarged from the basic floor plan to not less than ¼"=1'0" illustrating detailed ductwork and equipment within the mechanical room in both plan and section views; coil access and filter access are to be shown to scale as verification of clearance.
• Access doors both wall and ceiling, must be called out at each applicable location as coordinated with the architectural drawings (rated where applicable).
• Floor plans should indicate housekeeping pads and weight of concentrated loads.
• Duct/piping penetrations of all walls, floors, roofs, beams, columns and foundations must be coordinated with and verified by the structural engineer. Code complying fire stopping must be detailed for penetrations through fire rated assemblies.
• Locate on the floor plans all controls system equipment and provide a panel and device schedule, indicator and panel graphics complete with sequence of operation and control system program diagram.

.7 Plumbing

• Fixture/connection schedule
• Abbreviations/symbol glossary
• Floor plans indicating domestic hot and cold water, waste, vent and gas piping plans, including all valves, unions, fixtures, pipe sizes, and riser diagrams, etc.
• Piping and insulation jacket dimensions are to be coordinated with architectural finishes and casework; all exposed piping is to be verified with the Architect.
• Plan drawing of all water and sanitary branch piping for installation of interior equipment and fixtures.
• Typical piping riser schematics for all gravity flow piping systems
• Areas of concentrated plumbing equipment (hot water heaters, circulating pumps, etc.) must be enlarged from the basic floor plan to not less than ¼"=1'0" detail in both plan and section views.
• Access panels, doors and provisions in both walls and ceilings are to be shown on floor plans for all valves, cleanouts and caps, etc.
• Connections to existing and new building utilities must be clearly shown. Requirements of governing utilities must be determined and clearly detailed and shown. Connection details and elevations must be checked and coordinated with applicable civil drawings.
• Design details
• Piping penetrations of all walls, floors, roofs, beams, columns and foundations must be coordinated with and verified by the structural engineer. Code complying fire stopping must be detailed for penetrations through fire rated assemblies.

.8 Electrical:
• Lighting fixture schedule
• Lighting control schedule, switches, emergency lighting
• Power riser diagram for interior lighting systems
• Abbreviations and symbol glossary
• Panel schedules with panel locations shown on the floor plan
• Fan/motor control schedule/diagram
• Floor plan showing location of all fire alarm device/panel schedule, indicator graphics, riser diagram including activated hardware and pull stations. Confirm activated hardware with hardware schedule.
• Floor plan showing location of all intercom devices, panel schedule and location and program riser diagram
• Floor plan showing location of all security devices, panel schedule and locations and riser diagram
• Floor plan showing location of all intercom and TV outlets and devices
• Power riser diagram and main distribution panel layout in large enough scale so each run can be clearly seen.
• Telephone board schedule and riser diagram coordinated to equipment size requirements and connection provisions with governing telephone utility and Adjutant General’s Departments requirements.
• TV Terminal/splitter and riser diagram coordinated as to equipment size requirements and connection provisions to antenna and cable TV system.
• Floor plan indication wire management wiring for power, receptacles, voice, video and data communications including circuiting, and connections to systems furniture, etc.
• Separate plans for power, voice and data must be provided.
• Floor plan indicating power connections to all mechanical equipment
• Reflected ceiling plan indicating above ceiling wiring and circuits for lighting/electrical switches, security, fire alarm, emergency exit lighting and intercom controls, etc.
• Main service entrance connection diagram as verified and coordinated with the governing power utility; locations of services entrances and transformers must be verified with the Architect.
• Areas of concentrated electrical equipment, and electric vault rooms in particular, must be enlarged from the basic floor plan to not less than ¼”=1’0” and must be shown in plan and elevation.
• Sheet notes must be applicable to each sheet. Standard notes and details must be modified to specified conditions.
• Access to systems must be verified. Doors, panels or other provisions must be called out in all wall and ceiling locations for junction boxes, controls or any other device requiring access.
• Raceway penetrations of all walls, floors, roofs, beams, columns and foundations must be coordinated with and verified by the structural engineer. Code complying fire-stopping must be detailed for penetrations through fire rated assemblies.

1.6.2.11 Provide a report which indicates any item within the contract documents and/or agreements which is not in compliance with the Design and Construction Standards. This report shall be included in each submission beginning with Design Development Phase. If any element of the Work is not in compliance with the Design and Construction Standards, the A/E shall submit a written request for Variance and receive written approval from the Adjutant General’s Department, in accordance with the requirements noted in Appendix H.

1.6.2.12 Spreadsheets (Submittal Log) for the following management tasks shall be included in each submission beginning with the Design Development Phase and included in the Specifications:

1. Expected Submittals
2. Special Testing Requirements
3. Recommended Attic Stock
4. Warranties/Guarantees
5. Adjutant General’s Department Training Requirements
6. Maintenance & Operations Manuals

1.6.2.13 Reports/calculations (Design Analysis) for the following design tasks shall be included in each submission beginning with Design Development Phase:

1. Annual projected energy and utility consumption and utilization/occupancy diversity assumptions for each utility required by the Project.
2. Air exchange rates and codes/standards applied for each space,
3. Structural loads, lateral forces, geotechnical report, geotechnical report interpretation, and seismic considerations and design calculations for each comparison structural system that was evaluated,
4. Rain drainage system calculations including gutters/downspouts, internal roof drains, emergency overflow devices or similar systems,
5. Lighting calculations and photometric data for each type of space (interior and exterior) and all spaces that contain an occupancy above 49 persons,
6. Life Cycle Cost Analysis (LCCA)
7. Acoustical narrative for assembly spaces, sleeping units, individual offices and administrative suites,
8. Site plans which show fire truck and emergency vehicle access and building plans which indicate critical fire protection assembly rationale and primary service/equipment locations, and
10. All Building and Installed Building Equipment calculations.
11. Other reports/calculations as deemed necessary during the course of the Work, as determined by the A/E or the Project Manager.

1.6.3 Construction Documents (Bid Final): The Construction Documents stage is the portion of Design, which provides the stamped documents that have been revised and amended based on the Design Development review. The Stage begins after completion of the Design Development stage and ends with the Adjutant General’s Departments approval of, and the A/E’s submission of the Design Service Acceptance form for this Stage.
1.6.4 Conformed Documents: Drawings and specifications that contain all pre-award and accepted addenda are known as conformed bid documents.

1.6.4.1 Drawings:

.1 Annotated with revision symbols (see below) to identify accepted changes made by addenda. Also the revision block for all drawings, whether changed or not changed by addenda, shall contain words “CONFORMED BID DRAWING”.

.2 “CONFORMED BID DRAWING” may be stamped on a paper copy of the unchanged original solicitation drawings.

.3 Add “CONFORMED BID DRAWING” in large letters on the first drawing. All changed drawings shall be replotted, signed, and sealed by the A/E.

1.6.4.2 Specifications:

.1 Add “CONFORMED BID SPECIFICATION” as a footer centered at the bottom of all specification pages and in large letters on the specification cover sheet.
1.6.5 Record Documents

1.6.5.1 Provide (2) sets of the Record Documents in both paper and electronic copies (CD), at the conclusion of the Project. (See attached electronic deliverables, Appendix G)

1.6.5.2 The final drawing set within the Record Documents shall be labeled “Record Documents” in the issued-for section of the Title Block and shall not include “clouds” or other indications of the changes during the project process.

1.6.5.3 The A/E shall complete the Record Documents (As Built, etc.) using the Red-line Drawings from the Contractor. The A/E shall specify that the Red-line Drawings are received from the Contractor within one (1) month of Substantial Completion of the Project.

1.6.5.4 The A/E shall provide one (1) set of the Record Documents within three (1) months of Substantial Completion of the Project.

1.6.5.5 Record Drawings shall be provided in both CAD in current release AutoCAD drawing and PDF format.

1.6.5.6 Record Specifications shall be provided in both .PDF and Microsoft Word, Electronic (CD) format, using the most-recent version of Microsoft Word available at the Substantial Completion of the Project. The A/E shall specify that the Contractor provide an electronic set of all documented modifications to the contract documents shall accompany the Record Documents including but not limited to:

.1 Change Orders
.2 Construction Change Directives
.3 RFI’s
.4 Test Reports
.5 Field Observation Reports
.6 Submittals
  - Provide a binder which includes actual samples of all of the interior finishes.
  - Maintenance & Operations Manuals, to be provided by the Contractor during Project Closeout shall be provided in both paper and electronic copy, similar to the Record Documents. The A/E shall specify this requirement in the Contract Documents.
Section 2 - FOUNDATION

2.1 GENERAL

2.1.1 In accordance with UFC 3-220-01 Geotechnical Engineering (Engineering procedures for Foundation Design of buildings and Structures)

2.1.2 Foundation systems are to be recommended by a Geotechnical Engineer in consultation with a Structural Engineer.

2.1.3 The Structural Engineer must submit a letter to Project Manager certifying that the Structural Engineer has read the geotechnical report and consulted with the Geotechnical Engineer regarding the foundation system.

2.1.4 The A/E shall submit to the Project Manager a written statement of the design rationale for the foundation system chosen.

2.2 CONCRETE

2.2.1 Concrete mix designs shall be submitted by the Contractor to the Structural Engineer for approval so as not to delay construction. The minimum standard concrete mix shall be 3,000 P.S.I.

2.2.2 Proper transporting, conveying, depositing, and curing methods for concrete shall be clearly specified by the A/E.

2.2.3 Hot and cold weather requirements shall be defined clearly.

2.2.4 The A/E shall submit to Project Manager a written statement of the design rationale for any admixtures that are specified.

2.2.5 Calcium chloride or admixtures containing chlorides shall not be used.

2.2.6 An approved air-entraining admixture shall be used for all concrete exposed to weather. When used, the concrete must be tested at the site immediately prior to placement to verify the proper amount of air-entrainment is present.

2.2.7 Aluminum conduits and pipes shall not be embedded in any concrete.

2.3 TESTING AND LABORATORY ANALYSIS

2.3.1 All testing and laboratory analyses shall be performed by a qualified independent laboratory (conforming to American Society for Testing and Materials standards) selected and paid for by the Contractor. The A/E shall define the scope of work for testing.

2.3.2 In addition to the sample cylinders required by applicable building codes, the A/E shall specify that sufficient cylinders be made to allow for additional 7 day and 14 day compression tests.

2.3.3 The Contractor shall notify Project Manager when testing is to be performed and must report the results of testing immediately to Project Manager.

2.4 SLAB ON GRADE

2.4.1 Control joints, isolation joints, and construction joints shall be designed, located, and otherwise clearly defined by the A/E.

2.4.2 Control joints shall be coordinated with interior partition walls to the fullest extent possible.

2.4.3 Control joints shall be spaced no wider than 30 times the slab thickness.

2.4.4 Control joints are to be a depth of 1/3 the slab thickness.

2.4.5 If joints are to be saw cut, they must be sawed within 12 hours of concrete being poured if the overnight temperature is expected to be greater than 70° F, and within 24 hours in all other cases.
2.5 RETAINING WALLS

2.5.1 Retaining walls are to be constructed with vertical drainage system behind the wall with an outlet pipe connected to the storm drainage system, or with a direct outlet to a drainage channel.

2.5.2 Drainage pipe shall include wrapping the pipe with filter fabric sock and careful bedding of the pipe with appropriate fill material.

2.5.3 Weep holes as a means of drainage for retaining wall systems are not to be used without prior approval.
3.1 GENERAL

3.1.1 Basement drainage systems must be drawn and detailed to show the path of water from its source into some existing drainage structure. Drainage systems shall be coordinated with the civil drawings. Drainage systems shall not rely on pumps or other mechanical means to remove water; instead a positive gravity outfall situation shall be created. Wall drainage perforated piping shall include wrapping the pipe with a filter fabric sock and careful bedding of the pipe with the appropriate fill material.

3.1.2 If equipment is housed in the basement, there must be a way to access, service, and remove all equipment without making alterations to the building.

3.1.3 Shoring and/or sheet piling for basement excavation shall be designed by a Professional Engineer registered in the State of Ohio.

3.1.4 Provide block or board insulating materials recommended by manufacturer for the indicated application.

3.2 WATERPROOFING

3.2.1 All projects which include waterproofing in the scope of work to be performed, shall have a waterproofing consultant review drawings and specifications throughout the design process.

3.2.2 For below grade waterproofing, use a composite self-adhering bitumen sheet membrane waterproofing system.

3.2.3 All sheet waterproofing shall be protected by protection board/drainage mat assemblies.

3.2.4 Waterproofing shall be terminated with a termination bar at footings below grade and with counter flashings in the cavity wall assembly above grade.

3.2.5 All waterproofing membranes must be installed to a minimum of 8” above the height of exterior finish grade.

3.2.6 Wall joints below grade shall include a water stop.
**DESIGN & CONSTRUCTION STANDARDS**

**Note:** Component Functions

a.) Provides continuity between upper building envelope weather shield & below grade waterproofing.

b.) Directs building face sheet runoff & roof gutter overflow away from below grade waterproofing and drainage system.

c/d) Reduces/prevents liquid water buildup against wall, serves as a flow path to drain pipe.

e.) Protects Membrane and protection board from construction & thermal shock while in service. Provides thermal resistance.

f.) Protects membrane from construction damage.

g.) Prevents moisture (waterproofing) and vapor (dampproofing) transmission through wall and into the building.

h.) Protects soil from contaminating "clogging" drainage layer.

i.) Provides a flow path for water to enter into and exit through drain pipe.

j.) Provides a channelled flow to the discharge system.

k.) Prevents moisture migration through cold joint @ wall/slab.

l.) Prevents soil vapors and gases migrating into building.

m.) Prevents cold ground from cooling slab and possibly causing condensation.

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**FOUNDATION WALL - TYPICAL SYSTEM**
Notes: Component Functions

a.) Resists earth loads transfers bldg loads to footer
b.) Conveys fluids to occupied space
c.) Reduces stress concentration for membrane flashing
d.) Protects joint/wall against water leakage.
e.) Remove vagrant water to subdrain system.

STIFF MIX CRYSTALLINE BASED WATER PROOFING (E.G. XYZ)

BENTONITE ROD

URETHANE CRACK INJECTION FOAM (DeNeF)

XYPEX SEALANT

L-M = LIQUID MEMBRANE

NOTE: IT IS PREFERABLE TO SEAL THE MEMBRANE DIRECTLY TO THE PIPE UNLESS THE PIPE WILL UNDERGO LARGE TEMPERATURE CHANGES, IN WHICH CASE USE THIS DETAIL (MODERATE MOVEMENT) OR PERHAPS A PREFORMED NEOPRENE OR OTHER TYPE OF ELASTOMERIC BOOT (LARGE MOVEMENT)

TYPICAL

FOUNDATION WALL - PIPE PENETRATION DETAIL WITH SLEEVE

CONCEPTUAL - NOT FOR CONSTRUCTION
Section 4 - SUPERSTRUCTURE

4.1 GENERAL

4.1.1 In accordance with UFC 3-301-01 Structural Engineering

4.1.2 Design the structure to allow for reprogramming in the future without the need for structural strengthening.

4.1.3 The structural design engineer shall clearly define and approve testing methods and frequency for both shop and field work.

4.1.4 The location of building expansion joints shall be coordinated between all trades including but not limited to structural, mechanical, electrical, architectural, and interior finishes.

4.2 CONCRETE

4.2.1 No lightweight structural concrete is to be used without prior approval. No lightweight insulating concrete shall be used in roof assemblies.

4.2.2 Hot and cold weather requirements shall be defined clearly.

4.2.3 Calcium chloride or admixtures containing chlorides shall not be used.

4.2.4 An approved air-entraining admixture shall be used for all concrete exposed to weather. When used, the concrete must be tested at the site immediately prior to placement to verify the proper amount of air-entrainment.

4.2.5 Before any admixture is specified, the A/E must submit a written rationale for the use of the admixture with regard to the specific project.

4.2.6 Isolation joints and construction joints shall be designed, located, and otherwise clearly defined by the A/E with appropriate details. Construction documents must include a comprehensive joint layout and detail drawing.

4.2.7 Reinforcing coverage in concrete must meet the requirements of the most current version of American Concrete Institute (ACI) 318.

4.3 STRUCTURAL STEEL

4.3.1 Clearly define limits and type of paint for metal elements including primers. Shop painting is preferred. Preparation methods prior to applications of primers and paints shall be described in the specifications.

4.3.2 All welded connections shall be made by an American Welding Society (AWS) certified welder. The use of "pre-qualified welds" is encouraged.

4.3.3 In order to achieve the Fire Rating as required by the Building Code, structural steel and steel decking shall be protected with gypsum board sheathing, rather than sprayed fireproofing systems unless previously approved. Where spray-on fireproofing must be used, follow the manufacturer’s guidelines relative to the preparation, priming, and painting the steel.

4.3.4 All structural steel in exterior locations (such as cornices, parapets, hand rails, guard rails, or canopies) shall be hot dip galvanized.
5.1 GENERAL

5.1.1 In accordance with UFC 3-101-01 Architecture

5.1.2 All materials that compose the exterior building envelope are subject to review and approval by the Architect and the Project Manager. Renderings or images depicting the exterior of the facility shall be approved by the Project Manager.

5.2 EXTERIOR WALLS

5.2.1 General

5.2.1.1 All exterior material selections shall be submitted to the Project Manager at each design phase and reviewed and approved in writing before commencing with the following design phase.

5.2.1.2 Provide final material selections for the building envelope, including physical samples, at the Design Development submission. After review and approval by the Project Manager, material selections shall be specifically documented in the Design Submission. Terms such as "to be selected from the manufacturers’ standard range of colors" are not acceptable.

5.2.1.3 A building envelope assembly mockup panel shall be detailed by the A/E, in the Construction Documents. The mockup panel shall constructed by the appropriate contractor(s) for approval of workmanship and final building envelope material approval and shall be built on site after the beginning of construction and prior to beginning the building envelope work. The materials used shall be provided by the project suppliers and shall represent the final product in all aspects. The panel shall be protected from construction operations, but shall remain in place and exposed to the elements until all building envelope work has been approved.

5.2.1.4 Exterior envelope systems shall be selected with low maintenance and longevity as the primary considerations. Exterior Insulation and Finishing System (EIFS) and single-Wythe uncoated concrete masonry unit walls are not acceptable.

5.2.1.5 The A/E shall provide calculations indicating compliance with the Ohio basic building code.

5.2.2 Masonry

5.2.2.1 Several brick/block types and bond patterns are evident in various locations around the OHARNG Sites. When proposing a new structure, or a significant addition to an existing structure, the A/E shall consider using the same brick/block types and bond patterns as used on the surrounding buildings.

5.2.2.2 A minimum of three brick/block samples, with a variety of mortar selections, from different suppliers shall be recommended during the Design Development phase by viewing samples on site and comparing them to the buildings in the surrounding area. After written approval of these selections, these three selections will be specified in the Contract Documents.

5.2.2.3 Special shapes shall be inspected by the A/E for uniformity of size and color against the approved sample panel prior to installation.

5.2.2.4 The A/E shall specify the minimum brick/block cut allowed at corners and jambs.

5.2.2.5 Masonry cavity wall assemblies shall be designed to allow water that may enter the cavity to pass from the outer face of the inner Wythe, through the outer Wythe and weep to the exterior. The interior Wythe and structural framing shall be designed to disallow the passage of water/vapor from the exterior to the interior – in effect the assembly shall be waterproof. Clean and clear cavity spaces, high-quality waterproofing membranes, and appropriately sized and spaced weeps are particularly important to the success of the waterproof assembly of the masonry cavity wall.
**5.2.2.6** Design and detail masonry buildings to control efflorescence.

**5.2.2.7** Design and detail masonry expansion joints so that un-controlled cracking does not occur.

**5.2.3 Mortar**

**5.2.3.1** Provide tooled concave mortar joints.

**5.2.3.2** There shall be no site mixing of mortar colors. Bags shall come from the manufacturer with premixed colors with only sand and water added at the site. Sand shall be added in consistent amounts through the use of a measured box rather than shovel counts.

**5.2.4 Architectural Precast Concrete**

**5.2.4.1** Architectural precast concrete must be fabricated using the wet cast method.

**5.2.4.2** The Contract Documents shall note that the Contractor is responsible for protecting the work during construction. Stained, vandalized or otherwise damaged work is not acceptable.

**5.2.5** Provide rigid board insulation in the masonry cavity.

**5.2.6 Waterproofing**

**5.2.6.1** Use silicone sealants at exterior joints.

**5.2.6.2** Provide the following sealant types at these exterior conditions:

1. Masonry-to-masonry or Masonry-to-stone
   - Dow Corning
DESIGN & CONSTRUCTION STANDARDS

- Tremco

.2 Metal-to-metal or Metal-to-masonry
  - Dow Corning
  - Tremco

.3 Stone-to-stone or Metal-to-stone
  - Dow

.4 CMU-to-CMU or CMU-to-concrete
  - Sonneborn
  - Dymeric

.5 Masonry flashing splice
  - Dow Corning
  - Tremco

5.2.6.3 Masonry cavity wall construction is preferred. If cavity wall construction utilizing light gauge framing and Dens Glass Gold sheathing board is provided, seal joints between sheathing boards and apply 2” fiberglass mesh tape fully embedded in sealant, before damp proofing is applied.

5.2.6.4 Through wall flashing assemblies shall consist of a stainless steel “base” pan and a 40-mil asphalt-modified waterproofing membrane.

.1 The membrane shall be terminated on the stainless steel base flashing 1” back from the exterior face of the masonry veneer.

.2 Termination of the membrane at the damp proofed backup wall shall be a minimum of 8” above the drainage medium, approximately 16” above the shelf angle/horizontal projection.

.3 Provide a continuous stainless steel termination bar at the top of the membrane flashing. Stainless steel base flashing shall be 26 gauge, T304 alloy with 2D (dull) finish.

.4 Flashing splice shall be at least four inches in length and covered with a third piece of stainless steel base flashing, fully-bedded in sealant. The hemmed edge of the base flashing shall extend beyond the face of the masonry veneer.

.5 Provide end dams at vertical terminations and dissimilar systems.

5.2.6.5 Provide flashing at all necessary locations; including window and door headers, shelf angles, parapets, roofing transitions and where masonry walls rest on a slab on grade.

5.2.6.6 Provide emulsion-based cavity wall damp proofing.

.1 All damp proofing systems must be water-based and they must be applied pinhole free.

.2 The outer face of the inner Wythe, or the entire face of the sheathing board shall be coated with damp proofing.

.3 Sealants behind the veneer wall (adjacent to damp proofing) shall be polyurethane.

5.2.6.7 Provide full-height weep vents in the vertical joint.

5.2.6.8 The A/E shall submit a diagrammatical representation of the path of travel of water from the sky across the exterior building envelope to an appropriate drainage outlet.

5.2.7 Masonry Restoration and Cleaning: Because of the many variables involved, the A/E planning to clean a masonry building shall carefully identify the facade materials, investigate the physical properties of each and understand their reactions to various pollutants and cleaners. Selection of the gentlest means possible consistent with accomplishing the desired result is recommended. Sandblasting or acid are not acceptable. Each surface shall be treated separately and protected from cleaning compounds and procedures intended for its neighbor. To determine the condition of the masonry surface and its reaction to cleaning, the A/E shall test-clean sections of the building that exhibit a typical range of problems.
5.3 EXTERIOR WINDOWS

5.3.1 In accordance with UFC 4-010-01 DOD Minimum Antiterrorism Standards for Buildings and UFC 3-101-01, Architecture.

5.3.2 Window materials shall be chosen to minimize maintenance. The finish shall be provided with a 20-year warranty.

5.3.3 The percentage of glazing to solid areas shall be analyzed and designed to fit the intended purpose and if possible to blend into the surrounding buildings.

5.3.4 Energy conservation must be given prime consideration when incorporating fenestration into building design. Shading, orientation, low emissivity glass, insulating glass, and thermally broken frames shall be given consideration as potential energy conservation methods. When insulating glass is used, it shall be hermetically sealed to prevent condensation between the two layers of glass and shall have a 10-year warranty.

5.3.5 Window frames shall be aluminum and of weather-tight design.

5.3.6 Window sills shall be masonry, stone or architectural precast concrete.

5.3.7 Provision shall be made to allow for interior cleaning of all windows with minimum inconvenience and hazard. For example, double-hung windows which open into building.

5.3.8 If required by code, provide tempered or laminated safety glass. Intumescent fire-glass is preferred over wire glass.

5.3.9 Punched window openings can utilize pre-manufactured window waterproofing systems provided they meet the following minimum criteria:

5.3.9.1 Have flange for secondary water control.

5.3.9.2 Minimum air filtration of .06 cfm/sq. ft. when tested at 6.24 psf.

5.3.9.3 No water penetration when tested at 10 psf.

5.3.10 Field Testing is required on mockup assemblies for all new construction projects. The testing shall meet a minimum standard of AAMA 501.2-03 criteria. Testing shall be performed by a qualified testing firm.

5.3.11 Do not fasten window heads up through shelf angles.

5.4 EXTERIOR DOORS

5.4.1 In accordance with UFC 4-010-01 DOD Minimum Antiterrorism Standards for Buildings.

5.4.2 Materials shall be chosen to minimize maintenance.

5.4.3 Entrance doors must be able to handle the ingress/egress demands of the building. Follow ANSI A250.8—Recommended Specifications for Standard Steel Doors and Frames, and ANSI A250.4—Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frame Anchors and Hardware Reinforcing’s, for Level A, Extra Heavy Duty.

5.4.4 Doors shall have a sealing system incorporated into the edge/threshold of the door by the licensed manufacturer. Meeting edges of pairs shall require an astragal with a sealing system.

5.4.5 Steel doors depend on an applied coating for corrosion resistance. Coating systems shall include a galvanic protection primer (e.g. zinc-rich paint, hot dipped galvanizing) in combination with a barrier coat of paint.

5.4.6 Glass, if installed, must be reinforced to prevent access to locks.

5.4.7 Outside hinge-pins must be non-removable.

5.4.8 Doors must fit securely into the door jam.

5.4.9 Doors must be strong enough so that no portion of the door can be pushed in to allow unauthorized entry.
5.4.10 Door frames must be solid core or filled with concrete.
5.4.11 Doors shall have a maximum height of 8'-0" and a minimum height of 6'-8".
5.4.12 All doors shall have a minimum width of 3' 0".
5.4.13 Doors shall be standard 3’x 7’ where possible.
5.4.14 Exterior doors shall be aluminum or 16-gauge metal construction.
5.4.15 All exterior door frames shall be aluminum or galvanized 14-gauge steel.
5.4.16 Frame shall be welded and ground smooth. Knock down or un-welded frames are not acceptable.
6.1 GENERAL

6.1.1 In accordance with UFC 3-110-03 Roofing

6.1.2 The A/E shall consider the context of the project and recommend systems which support and sustain the image and character of the site and the area of site. There are areas of site where one or more appearances are prevalent, such as shingles, or metal roofing assemblies. Establish with the Project Manager what appearance options are acceptable and preferred.

6.1.3 When determining the roof pitch and general design of roofs for new buildings consideration shall be given to coordinating the design with the surrounding buildings.

6.1.4 The A/E’s design of new buildings are encouraged to seek simpler roof forms with fewer and more consistent details. A/E’s designing retrofit or roof replacement projects are encouraged to look at areas for improvement to the existing condition, not to simply replace old material with new.

6.1.5 Pitched roofs are strongly preferred over low slope roofs. Low slope roofs are only acceptable when the building expanse is too great for a pitched roof to be practical or when there is an addition to an existing building with a low slope roof.

6.1.6 Low slope roofs are those roofs whose slope is between ½:12 and 2:12. Roofing assemblies with a slope greater than 2:12 are considered to be pitched roofs.

6.1.7 Built-in gutters and systems which bring roof water into the envelope of the building shall be avoided.

6.1.8 The A/E shall specify that the roofing manufacturer submit a certification of intent to warrant pending proper installation and the contractor shall be approved to install the chosen roofing system.

6.1.9 Exposed fasteners are not acceptable on metal roofing assemblies, unless specifically approved in writing by the Project Manager.

6.1.10 For each roof, furnish in plastic and framed for interior display at roof access point, or a photoengraved 0.032 inch thick aluminum card for exterior display. Card shall be 8 ½ by 11 inches minimum. Information card shall identify facility name and number; location; contract number; approximate roof area; detailed roof system description, including deck type, membrane, number of plies, method of thickness; presence of tapered insulation for primary drainage, presence of vapor retarder; date of completion; installing Contractor identification and contact information; membrane manufacturer warranty expiration, warranty reference number, and contact information. Install card at roof top or access location as directed by the Project Manager.

6.1.11 Insert the following in General Notes on Drawings involving roofing of existing structures:

“The Contractor shall be responsible for all repairs of water damage to the building, including furnishings, occurring during the construction phase of the project. The A/E shall survey, in the presence of the Project Manager and contractor, any existing water damage prior to construction and prepare a written and photographic record of this survey with copies distributed to both the Project Manager and contractor.”

6.2 ROOFS

6.2.1 Roofing drawings shall include complete plan sets and elevations. Include abundant details reflecting full compliance with NRCA construction and details or similar criteria for roofing type. Symmetrically locate all penetrations on the roof and include detail for each penetration. All roofing systems require gutter and controlled drainage and these requirements shall be fully detailed.

6.2.2 Water shedding (pitch of roof) systems are preferred and must be considered over low sloped, waterproof systems. Water shedding systems are those systems with a minimum slope of 3 inches per foot. Use standing seam roofs wherever feasible with rail snow and ice guards around entire perimeter of roof.
6.2.3 Minimum warranty for standing seam roof is 20 years.

6.2.4 During the concept design stage roofing manufacturers should be readily available to provide input for avoiding problem conditions such as inside corners, valleys, dormers or cascading water (water falling from one roof surface to another), where problem conditions cannot be avoided, they will provide special details.

6.2.5 Ensure the system to be specified is manufactured by firms having the experience, background and financial resources necessary to meet the warranty provisions.

6.2.6 All roofs must meet underwriters; laboratories UL 790 class A requirements for fire resistance and as a minimum factor mutual I-90 or underwriters laboratories 580, class 90 requirements for wind uplift resistance. Design for higher wind uplift resistance when required based on the most recent version of ASCE 7. For uplift resistance greater that I-90 and for attachment at corners and perimeters, design the system to meet ASCE 7 requirements with a factor of safety of 2 applied. Design details shall be sufficient to fully define the work (including fastener or clip density at corners, perimeter and field of the roof, edge nailers: roof drains; curbs and penetrations)

6.2.7 All roofs shall be designed as a “Cool Roof”.

6.2.8 Exterior drainage systems: Design a gutters highest vertical section at least 1 inch below roof height. Provide overflow scuppers in parapets at a maximum height of 2 inches above the primary roof drains.

6.2.9 Use 100-year storm criteria from either the international plumbing code or factory mutual loss prevention data sheet 1-54, roof loads for new construction.

6.2.10 Penetrations: do not locate antennas, air conditioners, air cooled condensing units, cooling towers and ductwork on roofs. Require that all necessary penetrations be trade coordinated. All penetrations for standing metal roofing systems shall be centered on the roofing deck between structural members and roofing panel seams.

6.3 LOW-SLOPE ROOFS

6.3.1 When low-slope roofs are approved for use, they shall be provided with a minimum slope of ½ inch per foot and shall be fully-adhered, heat welded, white single ply thermoplastic membrane.

6.3.2 Acceptable low-slope roofing manufacturers include:
   
   6.3.2.1 Manufacturers as recommended by the A/E and approved by the Project Manager.

6.3.3 All low-slope roofs must carry a 20 year, no dollar limit warranty.

6.3.4 The manufacturer of the roofing must submit a letter to the Project Manager certifying that the entire roofing assembly is compatible.

6.3.5 Secondary slope to roof drains shall be provided within two feet of the primary roof drain. Roof drains shall be kept protected from debris.

6.3.6 Prior to final inspection, the contractor shall conduct a flood test if appropriate (follow NRCA requirements) of the roof in the presence of the A/E and the Project Manager to verify drainage.

6.4 PITCHED ROOFS

6.4.1 Metal roofing is preferred.

6.4.2 The SSSRS shall be designed by the Manufacturer as a complete system. Members and connections not indicated on the drawings shall be the responsibility of the Contractor. All components of the system shall be supplied or specified by the same manufacturer.

6.4.3 Design Loads shall be in accordance with MBMA.

   6.4.3.1 Dead Loads
.1 The dead load shall be the weight of the SSSRS. Collateral Loads shall be as shown on the contract drawings. Collateral Loads shall not be applied to the roof panels. [Specifier Note: Collateral Loads consist of Sprinklers, Mechanical and Electrical Systems, and Ceilings, and shall not be attached to the roof panels.]

6.4.3.2 Live Loads
.1 The panels and concealed anchor clips shall be capable of supporting a minimum uniform live load of 20psf.

6.4.3.3 Snow Loads
.1 The design ground snow loads shall be as defined on the contract drawings.

6.4.3.4 Wind Loads
.1 The design wind speed for the metal roofing system shall be as defined on the contract documents.

6.4.3.5 Thermal Effects
.1 Roof panels shall be free to move in response to the expansion and contraction forces resulting from temperature variation, as specified in the MBMA Metal Roofing Systems Design Manual.

6.4.3.6 Rainfall Intensity
.1 All exterior gutters and downspouts shall be designed for rainfall intensity based upon a 5-year recurrence interval for a five-minute duration. All interior gutters, valleys and downspouts shall be designed for rainfall intensity based upon a 25-year recurrence interval based on a five-minute duration. Rainfall intensity can be found in the Metal Roofing Systems Design Manual.

6.4.3.7 Framing Members Supporting the SSSRS
.1 Any additions/revisions to framing members supporting the SSSRS to accommodate the manufacturer/fabricator's design shall be the Contractor's responsibility, and shall be submitted for review and approval by the Engineer of Record. Deflection requirements shall be in accordance with the applicable building code, or as a minimum, the provisions of the AISC Steel Guide Series 3 – Serviceability Design Considerations for Steel Buildings, 2nd Edition.

6.4.3.8 Roof Panels
.1 Steel panels shall be designed in accordance with AISI S100.

- Aluminum panels shall be designed in accordance with the Aluminum Design Manual.
- Deflection requirements shall be in accordance with the applicable building code, or as a minimum, L/180 for roof snow load (but not less than 20psf).

6.4.3.9 Accessories and Their Fasteners
- Accessories and their fasteners shall be capable of resisting the specified design wind uplift forces and shall allow for thermal movement of the roof panel system. Exposed fasteners shall not restrict free movement of the roof panel system resulting from thermal forces, except at designed points of roof panel fixity.

6.4.4 If shingles are used, Asphalt shingles installed over an ice and water shield is the preferred roofing assembly. Shingles shall be dimensional architectural shingle with a 35 year warranty from the shingle manufacturer.

6.4.5 Acceptable Asphalt shingle manufacturers include:

- 6.4.5.1 GAF
- 6.4.5.2 Owens Corning
- 6.4.5.3 Additional manufacturers as recommended by the A/E and approved by the Project Manager.

6.5 ROOF OPENINGS

6.5.1 If the lowest point of the roof is not consistently accessible within 24 feet of the ground, a rooftop hatch or door shall be provided to facilitate access for roofing maintenance.
6.5.2 Roof access shall be as safe as possible. Ladders inside closets are not acceptable for roofs with equipment that requires maintenance. Permanent stairs shall be built into the structure for roof access. Consideration shall also be given to accessing different roof levels.

6.5.3 If provided, roof hatches shall be oriented and located to facilitate the safe access of personnel needing access to the roof. Roof hatches must be no closer than 12 feet from the roof edge. Orient the hatch and ladder to facilitate access in the safest manner practical.

6.5.4 The A/E shall incorporate built in personnel tie-off points into the roof design for the purposes of construction and maintenance. Use dark bronze in color or other similar color to blend with the roof color. Tie-off points shall be provided within and immediately outside the roof hatch.

6.5.5 Roof top equipment shall be located as far from the roof edge as practical and never closer than 16 feet. If any equipment is located within 12 feet of the roof edge, fall-protective railings shall be provided.

6.5.6 Stair doors opening onto roofs or into mechanical penthouses shall be equipped with a self-locking lockset having free lever on the roof or mechanical area side with access by key only, and a closer mounted on the interior face of the door.

6.5.7 The A/E shall complete a risk assessment and present the findings and recommendations to the Project Manager.

6.5.8 When lightning protection is required it shall be coordinated and detailed to minimize roof penetrations and potential roof leaks.
Section 7 - INTERIOR CONSTRUCTION

7.1 GENERAL

7.1.1 In accordance with UFC 3-101-01 Architecture

7.1.2 Plans shall provide detailed architectural elevations of all views (including hidden views if any). Architectural elevations shall show all exterior items such as mechanical and electrical equipment and materials, communications equipment, dumpsters, cargo or storage items, courtyards and screening walls and reflect their impact on overall architecture. The architectural elevations shall clearly show finish grade line. For presentation purposes (at concept and final stages) provide color versions in proposed finish palettes.

7.1.3 Architectural drawings shall also provide a table or schedule showing total specified U-values for walls, roofs, ceilings, floors, doors and windows on all typical exterior sections.

7.1.4 Finish schedules shall be developed and shown in table format in the architectural drawings for finish and color of all facility exterior construction. Include all wall and roof mounted items. It shall also include all mechanical, electrical and communication items; all site equipment, piping, conduit boxes, etc.

7.1.5 Finish schedules shall be developed in table format in the architectural drawings for finish and color of all facility interior surfaces and materials.

7.1.6 Acoustic sound transmission schedules for various rooms and wall types shall be shown on the architectural drawings. Maximum noise criteria for each space shall be indicated and a requirement for contractor acoustic testing of each space to verify conformance with sound transmission and noise criteria shall be included in the specifications.

7.1.7 Select and specify finishes and surfaces that are durable and require minimal maintenance.

7.1.8 Design and construct to handicap accessibility laws and standards.

7.1.9 Provide designs that avoid construction of nooks, ledges and alcoves or points of egress that would encourage nesting or congregation of local wildlife.

7.1.10 Finishes for concrete shall be appropriate to the area and intended use. Concrete points shall be pre-formed with tooled edge in building or site construction where the concrete surface will be exposed to view or subject to vehicle or pedestrian traffic. Sawed concrete joints are permitted elsewhere but must be provided with appropriate joint sealant. Joints shall be tooled or sawn to the minimum 1/3 of slab thickness in all cases. Fully detail all concrete jointing on the contract plans. Excessively large expanses of concrete without joints are prohibited (10 ft. by 10 ft.). Jointing plans shall avoid creation of sections that are unusually narrow and/or that taper to a point.

7.1.11 Facility and utility protection: Provide steel edge guards at all vehicle and equipment access doors into facilities. Also, provide galvanized schedule 40 steel bollards that are concrete filled at appropriate equipment and vehicle access points into facilities, at exposed above grade utilities, within dumpster enclosures and all other locations requiring protection from accidental vehicle damage. Also, provide hot dipped galvanized steel edge integrally into the slab for all horizontal edges or corners such as loading docks, vehicle entrances into facilities and other similar use areas.

7.1.12 Open office planning is required for all facilities. Pre-wired workstation systems shall be accommodated by all new facilities and major renovations that are constructed with a minimum of 1000 square feet.

7.1.13 The A/E shall develop facility designs, using generic workstation layouts to insure floor area is adequately sized to accept pre-wired work stations. The final vendor specific design and installation of the pre-wired workstations will be separate procurement.

7.1.14 Special care shall be taken to design and specify the proper materials for sound control in facilities. Interior spaces shall also be provided with room to room acoustical insulation for walls and ceilings. Areas include break rooms, conference rooms, training rooms, restrooms, offices, auditoriums and mechanical rooms. Additional areas would include separating industrial functions such as shops, form administrative
functions. Provide acoustically improved partitions for division of conference and training rooms into smaller use areas.

7.1.15 Finish protection: Provide full and adequate protection systems for interior finishes. These protection systems include stainless steel corner guards for circulation space wall corners, bumpers and stops at walls and doors for control of equipment, custodial service items, dollies, moving equipment and other items. Provide floor mounted door stops for all interior doors that do not have automatic closure mechanisms with travel limit adjustment. Provide door push plates and base kick plates as appropriate for the interior use and of the proper finish.

7.1.16 Primary facility entrances shall include double door entrances into a suitably sized air lock type vestibule prior to entering into the main building lobby. Provide recess door mat and high quality slip resistant tile or other suitable floor finish within the entrance area and lobby. Ceilings in the entry, vestibule and lobby area shall generally be higher and use drywall. Provide picture mounting rails, lighted wood and glass display cabinetry, case work and building directory.

7.2 PARTITIONS

7.2.1 Provide 5/8" gypsum board on minimum 3-5/8" 20-gauge metal studs, at 16" on-center, with snap-in 1 5/8" cold rolled channel stiffeners through studs at mid-span to facilitate future rewiring. Brace studs to structure for additional stiffness as needed.

7.2.2 Provide fire-retardant treated wood blocking to facilitate installation of grab bars, wall stops, similar accessories or other built-in work. Provide details on the drawings to accommodate built-in elements of varying weight.

7.2.3 Gypsum board shall not touch the floor, provide ½" clearance.

7.2.4 Provide fiberglass mat (moisture resistant) gypsum board in areas where water is present, such as bathrooms, and kitchens.

Coated Fiberglass Mat
7.2.5 Extend partitions through ceiling and anchor to structure above. Do not terminate partitions at ceiling grid without prior approval. If approved, trim top edge of gypsum board partition with ceiling system “L” trim, white finish.

7.2.6 Extend all corridor partitions and finish to structure. Enclose all mechanical and electrical rooms with at least one hour rated walls or more as required by current building codes.

7.2.7 Provide gypsum board on steel stud partitions with approximately 12” x 12” inspection/access panel for all under stair areas (usually the lowest level). Where the design professional feels that this is not appropriate (such as lobby) please request a variance from the Project Manager.

7.2.8 General overall layout of rooms, corridors and facilities shall be functional and logical, and meet current codes. Within the building, attention shall be given to providing a floor plan that provides accessibility for waste removal and ease of transportation to the service dock area.

7.2.9 Acoustics shall be considered in appropriate areas for comfort, presentations, and privacy. Provide for sound control around offices, conference rooms, restrooms and other sensitive areas.

7.2.10 Provide corner guards in high traffic and utility corridors. Provide 4’ - 0” high stainless steel corner guards.

7.2.11 Provide a Level 5 finish, as defined by the Gypsum Association’s publication Recommended Levels of Gypsum Board Finish (GA-214-96) in areas specified to receive dark, semi-gloss or gloss paint applications of any color, areas that are subject to direct natural and artificial light, high traffic areas such as lobbies, corridors and stairwells and other special-finish areas as determined by the A/E.
### LEVELS OF FINISH

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LEVEL 0</strong></td>
<td>No taping, finishing or corner beads are required</td>
</tr>
<tr>
<td><strong>LEVEL 1</strong></td>
<td>All joints and interior angles shall have tape embedded in joint compound. Surface shall be free of excess joint compound. Tool marks and ridges shall be acceptable</td>
</tr>
<tr>
<td><strong>LEVEL 2</strong></td>
<td>All joints and interior angles shall have tape embedded in joint compound and shall be immediately wiped with a joint knife or trowel leaving a thin coating of joint compound over all joints and interior angles. Fastener heads and accessories shall be covered with a coat of joint compound. Surface shall be free of excess joint compound. Tool marks and ridges are acceptable. Joint compound applied over the body of the tape at the time of tape embedment shall be considered a separate coat of joint compound and shall satisfy the conditions of this level.</td>
</tr>
<tr>
<td><strong>LEVEL 3</strong></td>
<td>All joints and interior angles shall have tape embedded in joint compound and shall be immediately wiped with a joint knife or trowel leaving a thin coating of joint compound over all joints and interior angles. Fastener heads and accessories shall be covered with two separate coats of joint compound. All joint compounds shall be smooth and free of tool marks and ridges. The prepared surface shall be covered with a drywall primer prior to the application of the final decoration.</td>
</tr>
<tr>
<td><strong>LEVEL 4</strong></td>
<td>All joints and interior angles shall have tape embedded in joint compound and shall be immediately wiped with a joint knife or trowel leaving a thin coating of joint compound over all joints and interior angles. Two separate coats of joint compound shall be applied over all flat joints. One separate coat of joint compound shall be applied over interior angles. Fastener heads and accessories shall be covered with three separate coats of joint compound. All joint compounds shall be smooth and free of tool marks and ridges. The prepared surface shall be covered with a drywall primer prior to the application of the final decoration.</td>
</tr>
<tr>
<td><strong>LEVEL 5</strong></td>
<td>All joints and interior angles shall have tape embedded in joint compound and shall be immediately wiped with a joint knife or trowel leaving a thin coating of joint compound over all joints and interior angles. Two separate coats of joint compound shall be applied over all flat joints. One separate coat of joint compound shall be applied over interior angles. Fastener heads and accessories shall be covered with three separate coats of joint compound. A thin skim coat of joint compound shall be trowel applied to the entire surface. Excess compound is immediately sheared off, leaving a film of skim coating compound completely covering the paper. As an alternate to skim coat, a material manufactured especially for this purpose shall be applied. The surface shall be smooth and free of tool marks and ridges.</td>
</tr>
</tbody>
</table>

### 7.3 INTERIOR DOORS

7.3.1 Provide steel doors, except that existing adjacent door types shall be matched in remodeling projects.

7.3.2 Provide welded and formed 16 gauge steel hollow metal interior door frames.

7.3.3 Doors taller than eight (8) feet shall be approved by the Project Manager.

7.3.4 Refer to Appendix L - Security, Access Control & Door Hardware, for door hardware.
7.4 SPECIALTIES

7.4.1 Toilet Partitions

7.4.1.1 High-Density Polyethylene (HDPE) Solid Polymer with Smooth Edges are required and shall be floor mounted, overhead braced. Provide heavy duty stainless steel trim and hardware with self-closing door hinges. Latches that do not depend on precision alignment of door and wall to operate are preferred.

Floor Mounted Overhead Braced

7.4.2 Toilet Compartments

7.4.2.1 Stall width minimum (inside clear) – 36”
7.4.2.2 Stall depth minimum (inside clear) – 60”
7.4.2.3 Minimum 18 inches clearance in front.

7.4.3 Toilet Accessories

7.4.3.1 All towel holders, toilet paper dispensers, and soap dispensers shall be provided by Contractor.
7.4.3.2 Large roll toilet paper dispensers are to be mounted approximately six (6) to eight (8) inches above the toilet compartment hand rail.
7.4.3.3 All Toilet accessories to be installed in accordance with ADAAG requirements.

7.4.4 Postal

7.4.4.1 All mail rooms shall meet ATFP requirements.

7.4.5 Attic Space

7.4.5.1 Provide mechanical ventilation in attic spaces
7.5 SIGNAGE

7.5.1 General

7.5.1.1 The A/E shall provide all interior and exterior signage, including room signage; way-finding and directories. Signage shall be designed so that occupants are easily directed to destinations in the new building or area. The A/E shall work with the Project Manager to ensure that exact wording is correct and all key components are identified.

7.5.1.2 Provide a location for dedication plaques, if requested by the Project Manager.

7.5.2 Exterior Signage

7.5.2.1 Provide exterior signage as indicated in this Standard and appropriate for the project.

7.5.2.2 Provide a location for building name signage, if requested by the Project Manager. If requested, bronze anodized cast aluminum letters, Helvetica font shall be provided.

7.5.3 Interior Signage

7.5.3.1 Interior Signage shall match existing within the building, or shall match the Standard. The Project Manager will determine the signage type to be utilized on the project.

7.5.3.2 The A/E shall provide the Egress Plans and drawing files for use in the fabrication of interior signage. Egress plans shall be installed at each stairwell at each level, at each elevator landing, and at each building entrance immediately inside the building. Provide interior signage for all assigned spaces, life safety requirements, exit stair/keep door closed, inside stair landing, path to exit, exit door, public toilets, ADA compliant toilets, mechanical, service rooms and essential directional signs. Identify service rooms as Custodial, Electrical and Telecommunications where applicable.

7.5.3.3 Mechanically fasten signage on four corners with tamper-proof fasteners.

7.5.3.4 Provide signage with Grade 2 Braille, in accordance with ADA requirements. Maintain the required spacing of the Braille text from the raised print text. A representative sign sample must be submitted prior to the full production run to demonstrate Americans with Disability Act Accessibility Guidelines (ADAAG) compliance.

7.6 ROOM NUMBERING

7.6.1 Room numbering shall be determined by the Design Development Phase of the project.

7.6.2 Final room numbering shall be provided by the Project Manager, based upon the final room layout.

7.7 CUSTODIAL CLOSETS

7.7.1 Custodial Closets shall not be located at the dead end of a corridor, on a stair landing, inside another room, under stairways, or in narrow spaces.

7.7.2 Corridors, Mechanical Equipment Rooms, or similar spaces shall not serve as a Custodial Closet. Elevator controls, electrical panels, telephone equipment, roof access hatches or similar equipment shall not be located in a Custodian Closet.

7.7.3 Each Custodian Closet shall be provided with:

7.7.3.1 Floor drain.
7.7.3.2 Positive ventilation.
7.7.3.3 Space for a 6’ step ladder.
7.7.3.4 Pegs for storage of rotary brushes.
7.7.3.5 Hangers for wet mops over floor receptors.
7.7.3.6 Hangers for dust mops and brooms furnished by the owner.
7.7.3.7 Hard surface walls and 10’ high ceilings.
7.7.3.8 Adjustable shelves for supplies.
7.7.3.9 A 36” door that swings out, not into the room.
7.7.3.10 Hot and cold water. Faucet shall be threaded for a hose connection, mounted 36” above the floor and provided with a vacuum breaker before the threaded portion.
7.7.3.11 Ceramic or quarry tile 36” x 36” minimum mop receptor with 4” front curb and 6” side curbs located in one corner on the wall beside the entrance door. The remainder of the floor area in the closet may be trowel finished, sealed concrete with a ceramic tile base. A waterproof membrane shall be provided under the entire floor, and the floor shall be pitched to receptor or a drain.
7.7.3.12 A grounded duplex receptacle in "open" wall.
7.7.3.13 Floor space for large floor finishing machine.
7.7.3.14 Space for 40” H x 26” W 48”L trash cart.
7.7.3.15 Adequate lighting; but no light fixtures or sprinkler heads located above mop receptor.

7.8 MECHANICAL/ELECTRICAL ROOMS
7.8.1 No ceilings are to be installed in mechanical rooms.
7.8.2 Primary mechanical/electrical equipment rooms shall be located with access to the building exterior and allow for convenient service vehicle access and equipment removal. These spaces shall not be combined with custodian closets.

7.9 LOCKER AREAS/TOILET ROOMS
7.9.1 Provide all restroom/locker areas with slip resistant floor tile and as a minimum tile wainscot with painted surface and hard ceiling above. Sink areas, counters and other wet surfaces, shall be constructed of solid surface materials. Fixtures such as urinals and water closets shall be wall mounted vitreous china. Partitions shall be High-Density Polyethylene (HDPE) Solid Polymer with Smooth Edges and shall be floor mounted, overhead braced. Provide heavy duty stainless steel trim and hardware with self-closing door hinges. Latches that do not depend on precision alignment of door and wall to operate are preferred.
7.9.2 All bathroom and locker areas shall be provided with floor drains with primer. Provide stainless steel accessories. Provide coat and hat rack as well as stainless steel shelving for Temporary storage of items while using facility. Locker rooms shall generally be located with restroom areas and shall cross circulation with the restroom as well as independent entrances. Lockers shall be secured to the wall and shall be mounted on a raised base approximately 6 inches above floor level. Lockers shall have louvers and slant metal top. Locker shall be full height 6 foot with integral shelf and clothes hanger. Provide built-in bench seating in all locker areas. Avoid creating dead spaces or unused corners with locker system layouts. Area lighting shall use motion sensors.
7.9.3 Shower compartment min. 900 square inches – 30 inch min.
7.9.4 Provide a unisex toilet room within the building core on each floor. This single restroom may be included within the plumbing calculations.
7.9.5 Signage shall be clearly labeled “unisex.”
Section 8 - INTERIOR FINISHES

8.1 GENERAL

8.1.1 In accordance with UFC 3-101-01 Architecture and UFC 3-120-10 Interior Design

8.1.2 All finishes shall be selected for durability, ease of maintenance, quality, and aesthetics. Where appropriate, finish selections should be uniform throughout each building.

8.1.3 All interior finishes shall be in accordance with the most current flammability and life safety codes.

8.1.4 Interior Finishes recommendations shall be presented to the Project Manager for approval.

8.1.5 An Interior Finishes Schedule shall be submitted to the Project Manager for final approval during the Design Development and Construction Documents Phases. Submittals shall be approved in writing by the Project Manager prior to installation. The following interior finishes and accessories shall be reviewed and approved by the Project Manager:

- 8.1.5.1 Architectural Woodwork/Casework/Trim/Work Surfaces
- 8.1.5.2 Door Hardware
- 8.1.5.3 Paint
- 8.1.5.4 Wall Coverings
- 8.1.5.5 Acoustical Wall Panels
- 8.1.5.6 Vinyl Composition Tile (VCT)
- 8.1.5.7 Ceramic or other hard tile flooring
- 8.1.5.8 Carpet/Rugs
- 8.1.5.9 Vinyl/Resilient Flooring
- 8.1.5.10 Ceiling Tile
- 8.1.5.11 Decorative Materials
- 8.1.5.12 Artwork
- 8.1.5.13 Accessories for any of the above finishes
- 8.1.5.14 Additional interior finishes, as determined by the specific project.

8.1.6 Attic Stock for each color, type and pattern of the following interior finishes shall be provided. Each is to be packaged, protected, identified and stored by the Contractor at a location to be indicated in the Construction Documents.

- 8.1.6.1 Flooring – 5% of installed amount
- 8.1.6.2 Paint – 1 gallon of each type and color
- 8.1.6.3 Wall Covering – 5 linear yards
- 8.1.6.4 Tile – 3% of installed amount
- 8.1.6.5 Provide two unopened cartons of each type of ceiling tile
- 8.1.6.6 Accessory Materials (grout, sealant) – 3% of installed amount
- 8.1.6.7 Review the total recommended square footage and materials for Attic Stock with the Project Manager prior to the completion of the Construction Documents.

8.1.7 During the Closeout Phase of each project, physical samples and a schedule of interior finishes shall be incorporated into the Operations & Maintenance Manuals. In addition to the O&M Manuals, a color photocopy of each physical sample and a schedule of interior finishes shall be provided to the Project Manager.
8.2 WALLS

8.2.1 Unless otherwise approved by the Project Manager, provide the following interior finishes for walls in the locations indicated:

8.2.1.1 Corridors and stairwells – Gypsum wallboard with a Level 5 finish and semi-gloss enamel paint.

8.2.1.2 Offices and conference rooms – Gypsum wallboard with a Level 4 finish and low luster or eggshell latex paint.

8.2.1.3 Toilet Rooms and Showers – Fiberglass mat wallboard and ceramic or other hard tile full height on wet walls.

8.2.1.4 Kitchens, Foodservice Venues and Break Rooms – Fiberglass mat wallboard and porcelain or quarry tile or epoxy paint on CMU. Painted gypsum wallboard is unacceptable.

8.2.1.5 Mechanical Rooms, Electrical Rooms, Elevator Control/Machine Rooms, Custodial Rooms and I/T Rooms - Epoxy paint on CMU is preferred. If gypsum wallboard is provided, a Level 4 finish and epoxy paint shall be provided.

8.2.1.6 Special Rooms – Some spaces are too specialized to list in the Design Standard. In the event that a particular space is included within a project, the A/E shall recommend the appropriate finishes for approval by the Project Manager.

8.2.1.7 Exposed metal studs without a finish is not acceptable.

8.2.2 Paint

8.2.2.1 Flat wall paint is unacceptable, except at ceilings

8.2.2.2 Provide paint products by one of the following manufacturers:

 .1 Sherwin Williams
 .2 Benjamin Moore
 .3 Devoe/Glidden

8.2.3 Wall Coverings

8.2.3.1 If vinyl wall coverings are specified, Type II mold and mildew resistant products with micro-perforations shall be provided.

8.2.3.2 If fabric wall coverings are specified, Type II mold and mildew resistant products with micro-perforations shall be provided.

8.2.3.3 If acoustical panels are specified, panels shall meet Class A flammability standards.

 .1 If digital images printed on acoustical panels are specified, images shall be approved by the Project Manager.
 .2 Panels shall meet or exceed NRC of 0.80.

8.3 FLOORING

8.3.1 Unless otherwise approved by the Project Manager, provide the following interior finishes for flooring at the locations indicated:

8.3.1.1 Building entrances shall have a built-in water walk off mat with a minimum length of 7 feet. In new construction, the walk off mat shall be recessed into the structure. Renovations shall provide for a removable mat to lie on the finished floor.

8.3.1.2 Flooring shall be durable and easy to maintain. Hard flooring, such as VCT, luxury vinyl flooring, ceramic or other hard tile shall meet Building Code requirements for slip resistance and durability. If carpet is specified, it shall be commercial-grade, high-density with low pile height. Base shall be 4” resilient, tile base as appropriate to the flooring type and project design.
8.3.1.3 Toilet Rooms and Showers - ceramic or other hard tile, or sealed concrete on the floor with 6” minimum cove base. Provide at least one floor drain in each room.

8.3.1.4 Kitchens, Foodservice Venues and Break Rooms - ceramic or quarry tile or sealed concrete with 6” minimum cove base. Provide at least one floor drain in each room.

8.3.1.5 Closets, Storerooms and File rooms - VCT with 4” resilient base or sealed concrete.

8.3.1.6 Offices and Conference Rooms, – Commercial-grade high-density carpet with low pile height and 4” resilient base.

8.3.1.7 Mechanical Rooms, Electrical Rooms, Custodial Rooms and IT Rooms – sealed concrete with 4” resilient base.

8.3.1.8 Special Rooms – Some spaces are too specialized to list in the Design Standard. In the event that a particular space is included within a project, the A/E shall recommend the appropriate finishes for approval by the Project Manager.

8.3.1.9 Server rooms – In new construction, provide removable raised-flooring panels supported on interconnecting grids and pedestals providing an under-floor plenum for air distribution and utilities. Specify a clear concrete sealer on concrete floors under access floors that is compatible with the flooring adhesive. In renovations, VCT shall be provided.

8.3.2 All hard surface flooring shall be sealed in accordance with the manufacturer’s written instructions.

8.3.3 If specified, resilient wall base shall be continuous roll 4” cove base. Outside and inside corners shall be formed by using the continuous roll base. Do not provide sections of base that are less than 6’ in length.

8.3.4 VCT flooring shall be scrubbed to remove factory finish and then waxed with 4 coats of wax. Wax specification to be coordinated by Project Manager.

8.3.5 Newly waxed VCT flooring shall be burnished with a hog’s hair pad by a high speed burnisher at 1500-2000 rpm.

8.3.6 Broadloom Carpet Products:

- 8.3.6.1 Rated for heavy traffic with soil, stain protection, red dye stain resistant
- 8.3.6.2 22-34 ounce face weight.
- 8.3.6.3 Nylon fiber type 6 or 6-6
- 8.3.6.4 Level loop or multi-level loop
- 8.3.6.5 When padding is used it shall be integral with carpet
- 8.3.6.6 Solution dyed yarns are preferred
- 8.3.6.7 Carpet shall contain pre-consumer and post-consumer recycled content. Carpets containing pre-industrial and post-industrial recycled content are preferred.
- 8.3.6.8 Install using a direct-glue method, in accordance with manufacturer’s written instructions.

8.3.7 Carpet Tile Products:

- 8.3.7.1 Rated for heavy traffic with soil, stain protection, red dye stain resistant
- 8.3.7.2 22-34 ounce face weight.
- 8.3.7.3 Nylon fiber type 6 or 6-6
- 8.3.7.4 Use cushion back tiles as circumstances require, such as in an area where acoustics are important.
- 8.3.7.5 Carpet shall contain pre-consumer and post-consumer recycled content. Carpets containing pre-industrial and post-industrial recycled content are preferred.
8.3.7.6 Install using a “releasable” glue system, “peel and stick”, or tackable dots, in accordance with manufacturer’s written instructions. Direct-glue method is unacceptable.

8.3.8 Vinyl Composition Tile:
   8.3.8.1 3.8.1. 12 in. x 12 in.
   8.3.8.2 1/8 in. thick
   8.3.8.3 Static Load limit of 125 psi
   8.3.8.4 Fire test data to equal:
   8.3.8.5 ASTM E 648 Critical Radiant Flux - .045 watts/cm2
   8.3.8.6 ASTM E 662 Smoke – 450 or less
   8.3.8.7 Provide a five year warranty.
   8.3.8.8 Provide waterproof setting materials for flooring applied to below grade floor slabs and other assemblies as recommended by the A/E.

8.3.9 Ceramic/porcelain hard tile:
   8.3.9.1 All specified tiles must meet or exceed industry standards
   8.3.9.2 Static Coefficient of Friction (COF) Slip resistance of tile
   ASTM C1028-06
   8.3.9.3 Abrasion resistance data to equal:
   .1 ASTM C1027-99 Class Four or Class Five
   .2 Scratch hardness: value of 7 or greater
   .3 Water absorption data to equal:
   ASTM C373-88
   8.3.9.4 Breaking strength data to equal:
   ASTM C648-04
   8.3.9.5 Chemical resistance data to equal:
   ASTM C650-04
   8.3.9.6 Porcelain tile is recommended over ceramic tile, minimum size 12X12.
   8.3.9.7 Dark grout is preferred

8.3.10 Luxury vinyl flooring:
   8.3.10.1 All specified products shall meet or exceed industry standards set by ASTM F 1700 Class III Solid Vinyl Tile
   8.3.10.2 As a minimum, product should meet the following:
   .1 .030” high density wear layer
   .2 Overall gauge of .120” (3mm) nominal
   .3 20 Year commercial warranty

8.4 CEILINGS

8.4.1 Ceilings shall be accessible. If hard ceilings, such as gypsum ceiling board are specified, access panels shall be specified, detailed and located on the Construction Documents to coordinate with above-ceiling systems which require accessibility and maintenance.

8.4.2 Acoustical Panel Ceilings:
   8.4.2.1 Suspension system shall be 2 ft. x 4 ft., 15/16" wide intermediate-duty, hot-dip galvanized with standard white finish. Suspension systems in high-
humidity/unconditioned spaces, kitchens, foodservice venues or other specialized spaces shall be aluminum, unless otherwise recommended by the A/E.

8.4.2.2 Ceiling tile shall be 2 ft. x 4 ft., 3/4" thick, white (Armstrong). Ceiling tile in high-humidity/unconditioned spaces, kitchens, foodservice venues or other specialized spaces shall be Armstrong Fine Fissured Ceramaguard with hold down clips, unless otherwise recommended by the A/E. In renovation projects, match the existing tile if available.

8.4.2.3 Suspend ceiling system from structure only.

8.4.2.4 Acoustical ceiling tile shall not be installed until all work above ceilings has been completed, inspected, approved by the Project Manager and temperature and humidity are consistently maintained as indicated for final occupancy.

8.5 STAIRS

8.5.1 Stairs, including fire exit stairs, shall be finished with premium grade rubber treads. Compatible sheet rubber flooring may be used on landings. Risers may be painted. Premium grade rubber treads do not include products with wax and low rubber content.

8.5.2 Stair nosing to be extruded aluminum alloy base with an abrasive filler locked into extruded channels of the base.

8.5.3 Magnetic hold-open doors that close automatically when the fire alarm is activated are desirable for enclosed stairwells.

8.5.4 Natural light in stairwells is considered desirable.
8.5.5 Vertical pickets for stair railing are required in lieu of horizontal.

8.5.6 Staircases shall meet all applicable building codes; where two codes are in conflict the most strenuous requirements shall be used.

8.5.7 Place electrical outlets on each stairwell landing. Provide (1) 20 amp convenience duplex outlet per landing.
Section 9 - ELEVATOR

9.1 GENERAL

9.1.1 Warranty period and maintenance period to be one year and coincide with General Contractor’s warranty.

9.1.2 Elevators to comply with ANSI A17.1 and ADA.

9.1.3 Comply with Ohio laws that regulate elevators. A/E shall specify that the Contractor is to pay all fees and to coordinate the inspection of the elevator system with the State Elevator Inspector.

9.1.4 Elevator rooms shall be sprinkled and equipped with shunt trip devices located outside of the elevator equipment room.

9.1.5 To keep the elevator equipment in peak running environment, all new and renovated elevators shall have air conditioning and humidity controls in the control cabinets or equipment rooms. Shaft ways exposed to exterior environment (i.e. parking garages) shall be provided with humidity control to prevent water condensation on rails and operating mechanisms. The spaces shall maintain a temperature range between 68 to 84 degrees Fahrenheit year round.

9.1.6 For passenger elevators, the elevator speed shall be no less than 150 FPM. For freight elevators, the speed is to be determined according to project needs.

9.1.7 Provide Automatic Fireman’s Recall System; in general, operation shall comply with attached Elevator Recall/Shutdown Matrix for sprinklered and non-sprinklered buildings.

9.1.8 Provide directional lanterns in the cab jambs, both sides of the entrance columns and provide the car position indicator in the main floor of egress hall station, minimum 2” in height.

9.1.9 Elevator cab lighting shall be LED light fixtures.

9.1.10 Provide all special diagnostic equipment, meters or monitors manuals needed to trouble shoot or repair elevators to the Project Manager. Proprietary equipment, computer hardware and software, shall not be used. Provide all user and service codes for all diagnostic equipment with instructions.

9.1.11 Two service and repair manuals for all elevators must be submitted. Service manual must include all diagnostic information. An owner’s manual must be provided to the Project Manager. One of the three sets of wiring diagrams must be laminated. All items must be turned over to the Project Manager upon completion. After the one year warranty period, all service records, manuals and diagnostic equipment must be turned over to and signed by the Project Manager.

9.1.12 Provide key locks for independent service, fire service inspection, and lighting & fan. (Four keys for each lock) The emergency stop switch shall be a Double D Core.

9.1.13 Access to elevator equipment rooms shall be restricted.

9.1.14 Provide three copies of the “Certificate of Operation” to the Project Manager – one to be posted in the elevator cab, one for the Project Manager, & one for the Operations and Maintenance.

9.1.15 All elevator controls shall be of a non-proprietary type.

9.1.16 All elevator controls to be microprocessor logic type. Provide in the service manual a ladder diagram or other source code, relay wiring diagram, showing all relays, devices and switches. The drawing set shall include electrical schematic diagrams and input/output schedules.

9.1.17 Elevator control logic for electric traction elevators to be independent or component control logic.

9.1.18 Hydraulic elevators to be equipped with a sealed PVC cylinder sleeve.

9.1.19 Elevator machine and control rooms shall not be located near sound sensitive areas.
9.1.20 Elevator Permits

9.1.20.1 Permit shall be paid for by Contractor.
9.1.20.2 Permits shall be applied for in advance of completion to avoid any unnecessary delays in the permitting process.

9.1.21 No floor drains are permitted in any elevator mechanical room.

9.1.22 All elevator pits shall be sealed and watertight, with minor slope to the sump pit. Sump to be located in a rear wall corner. Sump pit must be a minimum of 2' x 2' x 2' with a galvanized steel grate cover.

9.1.23 Provide an oil cooler as needed.

9.1.24 A/E shall review the requirements of these and other design guidelines and confirm compliance with current code.
Section 10 - PLUMBING

10.1 PIPING (REFERENCE UFC 3-420-01)

10.1.1 General

10.1.1.1 Tracer wire is required for all underground utilities.
10.1.1.2 Building piping main runs shall be located above corridors unless otherwise approved by Project Manager.
10.1.1.3 No compression fittings; soldered joint connections or threaded joint required for copper piping.
10.1.1.4 Copper piping in plumbing systems less than 2 inches shall be soldered using 95/5 tin/antimony solder. Copper piping in plumbing systems 2 inches and larger shall be brazed using 6 percent silver alloy with a 1000 degree F minimum and comparable to J.W. Harris Co., Dynaflow.
10.1.1.5 Threaded ball valves on all lines up to 2 inches (no sweat valves). 2 ½ inches and higher flanged ball valves on all lines up to 8 inches. Bronze valves with copper piping. Carbon Steel valves with steel piping.
10.1.1.6 Isolation Valves (show on drawings)
   .1 Provide isolation of each independent item of equipment and fixture
   .2 Provide isolation of each floor or section of a floor, provide isolation for each bathroom; provide isolation of each mechanical room.
   .3 Provide shutoff valve on the water supply line (interior) on every exterior hose bib.
   .4 Access shall be provided to all isolation/shutoff valves.
10.1.1.7 Contractor provides all meter/s for installation.
10.1.1.8 Backflow Preventers
   .1 Domestic and Fire water: Install in mechanical room. If reduced pressure type, provide drain funnel and pipe to floor drain.
   .2 Irrigation water: Install in pit in yard with separate water meter.
10.1.1.9 Piping Insulation
   .1 End joints of pipe insulation shall be sealed to pipe.
   .2 A pre-installation conference shall be specified to ensure that proper techniques are followed.
   .3 Insulation shall be as listed below for service piping:
      • Domestic Cold Water Piping: Fiberglass – Minimum Thicknesses – 1 inch
      • Domestic Hot Water Piping: Fiberglass - Minimum Thicknesses – 1 ½ inch
10.1.1.10 The A/E shall minimize quantity of dielectric unions. When used, unions shall be located in accessible locations for ease of maintenance. Engineer shall provide a drawing indicating location of all dielectric unions. Provide ball valves on each side of union to allow for repair of union.
10.1.1.11 Floor Sleeves shall be cast-in-place schedule 40 steel pipe, 2” above floor, flush with bottom of slab.

10.1.2 Gravity

10.1.2.1 Sanitary Waste and Vent Piping
   .1 Waste and Vent Piping above grade: Cast iron no-hub with four band mechanical clamps.
   .2 Waste and Vent Piping below grade: Cast iron hub and spigot.
   .3 Indirect Drains: Copper type ‘M’ for 1” and smaller, type ‘DWV’ for 1 ¼” and larger with sweat joints.
10.1.2.2 Storm Drainage Piping Above/Below Grade
   .1 Above Grade: Cast iron no-hub with four band mechanical clamps.
   .2 Below Grade: Cast iron hub and spigot
10.1.2.3 Floor Drains
.1 Provide floor drains in Water Closets and Mechanical rooms.
.2 Provide floor drains for all emergency/drench showers.
.3 Provide trap primers for all floor drains and floor sinks. All trap primers shall have isolation valves. Access doors shall be provided if located behind a wall or above a ceiling.

10.1.2.4 Cleanouts are to be accessible. Locate to the side of the Water Closets with a minimum clearance of 6” from the rough-in of the Water Closets. Preferred location is in ADA stall to allow for additional access.

10.1.2.5 Pressure
.1 Domestic Water Piping
   • Non-Potable Water: Copper type 'L', hard drawn, with soldered joints.
   • Potable Water: Copper type 'L', hard drawn, with soldered joints.

10.1.2.6 Fuel Piping
.1 Liquid Petroleum (LP) Gas Piping:
   • Above grade: Black steel, schedule 40
   • Below grade: High density polyethylene (HDPE) with electro/heat fusion joints. Pipe shall be installed per 49CFR Part 192 by a certified installer.

10.1.2.7 Natural Gas Piping:
.1 Above grade: Black steel, schedule 40
.2 Below grade: High density polyethylene (HDPE) with electro/heat fusion joints. Pipe shall be installed per 49CFR Part 192, by a certified installer.

10.2 PLUMBING FIXTURES

10.2.1 Water Closets

10.2.1.1 Water Closet to be vitreous china, wall hung with chair carrier.

CHAIR CARRIER

10.2.1.2 Water closets shall be vitreous china, elongated bowl, siphon jet style, water saving type with white open face toilet lid. Closet shall be wall mount type (Kohler). Flush valve shall be lever action style or may be electronic (no battery) IR (infrared) type with individual shut off (Sloan). Valve finish shall match faucets. They shall not be set closer than 15 inches from its center to any sidewall, partition, vanity or other obstruction or closer than 30 inches center to center between toilets or adjacent fixture.
10.2.1.3 Water Closet passage to be a minimum diameter of 2.25" trap-way
10.2.1.4 Water Closet flush valve shall be a low flow design of 1.2 or 1.6 gallons per flush with selectable dual flush handle. Flush valves to be dual filtered bypass (minimum), ADA compliant handle.
10.2.1.5 Water Closet seats to be solid plastic with stainless steel self-sustaining check hinges.
10.2.1.6 Water Closet water supply connection shall be top spud type with a minimum inlet diameter of 1".

10.2.2 Urinals

10.2.2.1 Urinals to be vitreous china, wall hung with floor mounted carrier, low flow design sensor type with 1 pint per flush.

FLOOR MOUNTED CARRIER

10.2.2.2 Urinal passageway shall be a minimum diameter of 2".
10.2.2.3 Urinal water supply connection shall be a top spud type with a minimum inlet diameter of 3/4".
10.2.2.4 Trough urinals shall be prohibited (4101:3-4-01, 401.2).
10.2.3 Lavatories/Sinks

10.2.3.1 Lavatories to be either vitreous china, wall hung and shall be provided with concealed arm carrier, or if countertop is required, provide HDPE surface countertop with vitreous China Lavatory sink.

HDPE Surface Countertop with Vitreous China Lavatory Sink

10.2.3.2 If no ceramic tile is included on walls, provide 4” backstop.
10.2.3.3 24” by 36” mirror with stainless steel shelf at Bottom.
10.2.3.4 Go-Jo or equivalent soap dispensers

10.2.4 Service/ shop sinks to be 18 gauge stainless steel.

10.2.4.1 Sink faucets to be ¼ turn ceramic disk cartridge type with 4” minimum length wrist blade handles.
10.2.4.2 P-traps to be 17 gauge brass with integral cleanout.
10.2.4.3 Exposed waste assemblies and all other supplies located beneath handicapped Plumbing Fixtures shall be protected with pre-molded insulation protectors made especially for that purpose.

10.2.4.4 Fixtures shall not contain plastic components.

10.2.4.5 Traps shall have mechanical connection (not soldered) at wall connection to allow for removal and use as a cleanout.

**FIXTURE CLEARANCE**

10.2.5 Janitor Room Basins

10.2.5.1 Mop service basins shall be floor/wall assemblies.

10.2.5.2 Basin shall be a one-piece terrazzo construction.

10.2.5.3 Basin shall be equipped with aluminum bumper guards.

10.2.5.4 Basin shall be equipped with a mop hanger bracket.

10.2.5.5 Basin shall be equipped with a service faucet complete with vacuum breaker, integral check valves, integral stops, an adjustable wall brace, a pail hook, and a 3/4" hose thread on spout.

10.2.5.6 Basin shall be equipped with a hose and hose bracket.

10.2.5.7 Basin shall be equipped with stainless steel wall guards.

10.2.5.8 Basin and wall guards shall be sealed water tight to the wall and floor.

10.3 PLUMBING PUMPS

10.3.1 Package booster pumping station to be duplex type, utilize variable speed drive pumps when applicable.

10.3.2 Sewage ejectors to be used with prior approval from Project Manager.
Section 11 - HVAC

11.1 GENERAL (IN ACCORDANCE WITH UFC 3-410-01 and UFC 3-410-02)

11.1.1 Approved Manufacturers

11.1.1.1 Chillers
.1 Carrier
.2 Trane
.3 York

11.1.1.2 Air Handling Units
.1 Carrier
.2 Trane
.3 York

11.1.1.3 Variable Frequency Drives
.1 Allen Bradley
.2 Baldor

11.1.2 System Decisions

11.1.2.1 The 2012 ASHRAE Handbook HVAC Systems and Equipment states, "The design engineer is responsible for considering and recommending various systems and recommending one or two that will meet the project goals and perform as desired." Defining the desire of the client is part of the engineering process. The system selection criteria includes such considerations as capacity based on local climate, building design and use, redundancy, space requirements, security concerns, first cost, operational costs, maintenance costs, reliability, life-cycle costs, sustainability, acoustical considerations, and others based on project specific demands.

11.1.2.2 HVAC systems shall be designed in accordance with the following maintainability principles:
.1 Systems shall be selected with minimal mechanical components requiring service and maintenance.
.2 System components requiring frequent service and maintenance shall be located in equipment rooms or service areas, and not above ceilings or in occupied spaces.
.3 Clear and safe access shall be provided for servicing, removal, and replacement of equipment.
.4 Sufficient instrumentation shall be specified for measuring, indicating, monitoring, and operating at part load as well as full load.
.5 All equipment mounted on a roof must be detailed by a structural engineer.
.6 Equipment shall be selected for long-term durability, reliability, maintainability, and serviceability.

11.1.2.3 Instrumentation and test ports shall be provided for measuring temperatures and pressures at each piece of HVAC equipment.

11.1.2.4 Engineers shall provide multiple units of heating equipment for a few reasons. One is for efficiency of operation, and another is for standby and redundancy depending on the critical nature of the building systems, based on the occupancy type and climate conditions at the location.

11.1.2.5 The HVAC design analysis for new facilities or renovation of existing facilities must include a psychrometric analysis documenting that the system meets design criteria. The analysis must provide calculations of system cooling load, energy/mass transfer through conditioning equipment and fans, and a system schematic indication state point dry bulb and wet bulb temperatures (or humidity ratios) of outside air, mixed air, supply air, and return air flow streams. The system must provide the capability to condition ventilation air and maintain space relative humidity over the full range of cooling load.
11.1.2.6 Heating and cooling system design loads must be determined in accordance with the calculation procedures described in the ANSI/ASHRAE/ACCA Standard 183 unless sizing to account for morning warm-up.

11.1.3 SYSTEM MANUAL

11.1.3.1 It is critically important that the installation Contractor and Design Engineer contracts include provisions to deliver a System Manual.

11.1.3.2 System Manual is over and above the standard equipment manufacturer’s O&M manuals. This document should include:

1. As-built construction drawings identifying the locations of all components potentially needing maintenance or repair, all isolation valves and dampers, all ductwork and piping distribution systems, and all DDC panels
2. Schematic diagrams of each system, with all individual components shown graphically and tabulated in an equipment list with manufacturer and model number data
3. Control system sequences of operation
4. DDC system architecture
5. User interface and navigation of the BAS front end
6. Special instructions for critical manual operations not accomplished automatically by the DDC system, e.g., seasonal switchovers, occupied mode changes, shift changes.

11.2 CODES, STANDARDS AND REGULATORY REQUIREMENTS

11.2.1 A/E shall ensure that construction documents are in accordance with the latest edition of all codes and standards.

11.2.2 Required Permits shall be acquired and paid for by the contractor prior to installation. This includes boilers, pressure vessels, etc.

11.2.3 The MEP energy related design for all buildings shall be 30% below ASHRAE Standard 90.1.

11.2.4 Design Temperatures:

   **Indoor design conditions.**
   - Winter 70°F DB
   - Summer – Cooling 75°F DB / 50% RH
   - Max Space Humidity 50% RH

11.2.5 Mechanical Sound and Vibration Control shall be designed in accordance with the latest edition of the ASHRAE Applications Handbook.

11.3 ACCESS

11.3.1 Mechanical rooms shall have exterior doors to grade level, at least one light on emergency power, fire alarm strobe, and pull station at the exit.

11.3.2 Service Access. Space shall be provided around all HVAC system equipment as recommended by the manufacturer and in compliance with local code requirements for routine maintenance. Access doors or panels should be provided in ventilation equipment, ductwork and plenums as required for in-site inspection and cleaning. Equipment access doors or panels should be readily operable and sized to allow full access. Large central equipment shall be situated to facilitate its replacement. The HVAC design engineer should be cognizant of the necessity to provide for the replacement of major equipment over the life of the building and should insure that provisions are made to remove and replace, without damage to the structure, the largest and heaviest component that cannot be further broken down.

11.3.3 Mechanical rooms shall be configured with clear circulation aisles and adequate access to all equipment. The arrangement shall consider the future removal and replacement of all equipment. The mechanical rooms shall have adequate doorways or areaways and staging areas to permit the replacement and removal of equipment without the need to demolish walls or relocate other equipment. Sufficient space areas (noted by outlining manufacturer’s recommendations) for maintenance and removal of coils, filters, motors, and similar devices shall be provided. Chillers shall be placed to permit
pulling of tubes from all units. The clearance shall equal the length of the tubes plus 600 mm (2 feet). Air-handling units require a minimum clearance of 750 mm (2 feet 6 inches) on all sides, except the side where filters and coils are accessed. The clearance on that side should equal the length of the coils plus 600 mm (2 feet). Provide access panels for all devices (Dampers, actuators, etc.)

11.3.4 Vertical Clearances. Main mechanical equipment rooms generally shall have clear ceiling heights of not less than 3.6 m (12 feet). Catwalks shall be provided for all equipment that cannot be maintained from floor level. Where maintenance requires the lifting of heavy parts [45 kg (100 pounds) or more], hoists and hatchways shall be installed.

11.3.5 VAV terminals, controllers, actuators, dampers, and valves shall be easily accessible and located in hallways or at the space entry with a minimum 2’ X 2’ opening.

11.3.6 No serviceable devices to be located above a hard ceiling.

11.3.7 Access door/panel shall be provided upstream and downstream of re-heat coils.

11.3.8 Outside air intake louvers should have access doors for cleaning bird screen.

11.3.9 Housekeeping Pads. Housekeeping pads shall be at least 150 mm (6 inches) wider on all sides than the equipment they support and shall be 150 mm (6 inches) thick.

11.4 MOTORS

11.4.1 Motor Starters, Control Panels, & Variable Frequency Drives shall be mounted on wall at accessible height standing from floor. Equipment mounted or Uni-strut type frame mounting is not acceptable.

11.4.2 Motors for equipment served by variable speed drives shall be Inverter-rated motors conforming to NEMA MG-1, Part 3, 1.15 service factor and class “F” insulation.

11.4.3 Maximum Motor RPM: 1750 without prior approval.

11.4.4 All motors 5 hp or larger shall have VFD.

11.5 Variable Frequency Drives

11.5.1 Variable frequency drives shall be equipped with a serial interface to allow bi-directional communication with the existing controls system. At a minimum, the following points shall be made available to the controls system: Set Point, Drive Speed (RPM), Frequency (Hz), Current (A), Power (KW), Energy (KWH), Last Fault Number, OK/Faulted Status, Stop/Run Status, and Hand/Off/Auto Status.

11.5.2 No bypass required.

11.5.3 Drives shall be installed in accordance with NEC requirements.

11.5.4 NEMA 12 enclosure.

11.5.4.1 With integrated disconnect switch.

11.5.5 The preferred drive manufacturer shall be Danfoss or approved equal.
11.6 PIPING

11.6.1 Joining Materials: The heating hot water and chilled water systems pipe joining materials shall include the following:

11.6.1.1 Solder filler metals: 95-5 Tin-Antimony
11.6.1.2 Brazing filler metals: Classification BAg-1 (silver)
11.6.1.3 Welding Materials: Comply, with ASME Boiler and Pressure Vessel Code for welding materials appropriate for the wall thickness and Chemical analysis of the pipe being welded.

11.6.2 Grooved Mechanical Couplings are not permitted.

11.6.3 Below Grade

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<td>Hot Water</td>
<td>Copper, Type L or Stainless Steel</td>
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11.6.4 Above Grade

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<td>Make-up Water</td>
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</table>

11.6.5 Locate main piping runs above corridors when possible.

11.6.6 Mechanically formed (pulled) T’s are acceptable for ½” and ¾” piping connections to 2” or larger pipe.

Mechanically formed extruded outlet

11.6.7 Minimize quantity of dielectric unions. Unions shall be located in accessible locations for ease of maintenance. Engineer shall provide a drawing indicating location of all dielectric unions. Provide ball valves on each side of union to allow for repair of union.
11.6.8 Floor sleeves shall be cast-in-place schedule 40 steel pipe, 2" above floor, flush with bottom of slab. Sheet metal sleeves are not acceptable.

11.6.9 Thrust blocks shall be formed and poured in place.

11.7 VALVES

11.7.1 Provide isolation of each independent item of equipment.

11.7.2 Provide isolation at each branch takeoff.

11.7.3 Provide isolation valves to shut down each floor or sections of a floor.

11.7.4 Locate isolation valves outside the coil pull line to allow coil removal without disruption of hydronic service to other equipment and to keep piping disassembly to a minimum.

11.7.5 Valves located on Primary water supply and return shall be offset butterfly type with metal seats.

11.8 VALVE TAGS

11.8.1 Valve Tags: Stamped Tags, 1-1/2" dia. round brass, see below attachment for example of naming convention and numbering.

11.8.2 Fasteners: beaded chain

11.8.3 Valve Schedules: For each piping system, on 8-1/2-by-11-inch paper in enclosed picture frame. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

11.8.4 Valve-tag schedule shall be included in operation and maintenance data.

11.9 Condensing Units

11.9.1 Provide condensing units with full-face coil louvers (stamped louver panels, Hail guards) for aesthetics and hail protection.
11.9.2 Cabinet:

11.9.2.1 Galvanized steel with powder coat paint finish. The powder coat paint finish is high gloss, durable and capable of withstanding a 1000 hour salt spray test per ASTM B117.

11.10 AIR DISTRIBUTION

11.10.1 Ductwork

11.10.1.1 Match the fan to the system pressure losses

11.10.1.2 Designate the pressure class for construction of each duct system and duct segment and clearly identify these in the contract documents

11.10.1.3 Evaluate the leakage potential for ducts conforming to SMACNA standards and Guidelines and supplement with deletions and additions that may be prudent and economical for this specific project. Check the location of all ducts, type of service, connections to other equipment dampers and accessories in the system, tolerances on air balance, and the performance objectives. Account for leakage in equipment such as fans, coils, and volume regulating boxes, in addition to all duct leakage.

11.10.1.4 Specify the amount and manner of leakage testing, if testing is required, and clearly indicate the acceptance criteria.

11.10.1.5 Reconcile all significant inconsistencies between performance specifications and prescription specifications before releasing contract documents for construction.

11.10.1.6 Comply with SMACNA’s "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class.

11.10.1.7 Avoid ambiguity created by, in accordance with, and to non-specific editions of SMACNA or other documents specified. At a minimum, the full title and edition of all in accordance with documents should be noted.

11.10.1.8 The duct designer needs to understand that a “single line” duct drawing does not provide sufficient information to describe the complexity of today’s duct systems. Unusual fittings to avoid structural components or ducts located in highly congested ceiling spaces must be detailed on the drawings.

11.10.1.9 Make the contract documents reflect a clear scope of work that is known to conform to applicable codes and regulations, including those addressing energy conservation.
11.10.1.10 Require adequate submittals and record keeping, while making sure all work in progress conforms to the contract documents in a timely manner.

11.10.1.11 Fibrous Glass Ducts: Fibrous glass duct or (duct board) are not acceptable.

11.10.1.12 Flexible Ducts: Flexible duct runouts to diffusers shall be limited to 3 feet. Takeoffs for flexible ducts shall be installed at main duct branch.

11.10.1.13 Specialty ductwork materials (i.e. stainless steel, aluminum, etc.) shall be clearly noted on the plans.

11.10.1.14 Underground ductwork is not acceptable.

11.10.1.15 Requirements for pressure tests shall be specified for all duct work.

11.10.1.16 Fume hood and kitchen exhaust ducts to be continuously welded, water tight. Welded longitudinal joints to be facing up.

11.10.1.17 During construction all open ducts shall be sealed.

11.10.1.18 Diffusers/Registers/Grilles

.1 Shall be of corrosion resistant construction of aluminum or stainless steel.

.2 All items visible through return air grilles shall be painted flat black.

11.10.2 QUALITY ASSURANCE

11.10.2.1 The listed standards are in accordance with for the contractor to follow for the construction of ductwork items not specifically addressed in this specific section. This specification takes precedence over the in accordance with standards.

11.10.2.2 Standards:

.1 American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE), Sheet Metal and Air Conditioning Contractors National Association (SMACNA), National Fire Protection Association (NFPA), and Underwriters' Laboratories (UL).

.2 SMACNA’s "HVAC Duct Construction Standards - Metal and Flexible" latest edition. These are absolute minimum standards of construction; duct construction shall comply with all requirements of this specification and meet or exceed the latest SMACNA standards. Note: Duct constructions compliant with other editions of the SMACNA standards that do not meet or exceed the latest SMACNA standard are unacceptable.

.3 SMACNA’s "Round and Rectangular Industrial Duct Construction Standards." This is to be used for return duct subject to negative pressures greater than 4 inches W.G. These are absolute minimum standards of construction; duct construction shall comply with all requirements of this specification and meet or exceed the SMACNA standards.


11.10.2.3 Welding Qualifications: Qualify procedures and personnel according to the following:


11.10.3 PERFORMANCE REQUIREMENTS

11.10.3.1 Duct construction, including sheet metal thickness, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA’s "HVAC Duct Construction Standards – Metal and Flexible" and performance requirements and design criteria indicated.

.1 Static-Pressure Classes:

- Supply Ducts (except in Mechanical Rooms): 1 inch W.G.
- Supply Ducts (downstream from Air Terminal Units): 1 inch W.G.
- Return Ducts (negative pressure): 1 inch W.G.
- Exhaust Ducts (negative pressure): 1 inch W.G.
.2 Leakage Class:
  - Rectangular Supply Ducts: 6 cfm/100 sq. ft. at 1 inch W.G.

11.10.4 DUCT DIMENSIONS

11.10.4.1 Dimensions given are the inside clear dimensions of the ductwork.
11.10.4.2 Contractor shall allow for shop-lined or exterior insulation thickness as required and indicate this on the ductwork layout shop drawings.

11.10.5 PRODUCTS

11.10.5.1 LOW PRESSURE DUCTWORK

.1 General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
.2 Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-4, "Transverse (Girth) Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
.3 Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-5, "Longitudinal Seams - Rectangular Ducts," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
.4 Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible." Rectangular elbows shall be radius, 1.5 times duct width, or square throat with vanes. For duct taps off of main ductwork to diffusers, grilles, registers, or chilled beams, 90° taps shall be used. For all other taps, 45° taps shall be used.
.5 Provide sweep elbows at all changes of direction or offsets in supply, exhaust, and return ductwork. Field mitered duct such as shown below shall not be allowed:

Field Mitered Duct (NOT ALLOWED)

11.10.5.2 SINGLE-WALL ROUND DUCTS AND FITTINGS

.1 General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.
.2 Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Transverse Joints - Round Duct," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
.3 Longitudinal Seams: All round ducts shall be spiral lock seam conforming to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Seams - Round Duct and Fittings," for...
static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

Spiral Lockseam Duct

.4 Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," "90 Degree Tees and Laterals," and "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible." For duct taps off of main ductwork to diffusers, grilles, registers, or chilled beams, 90° taps shall be used. For all other taps, 45° taps shall be used.

.5 Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible." Round elbows shall be radius type, with a centerline radius of 1.5 times the duct diameter, of stamped, pleated, or three-piece segmented construction.

11.10.6 SHEET METAL MATERIALS

.1 General Material Requirements: Comply with SMACNA’s “HVAC Duct Construction Standards - Metal and Flexible” for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

.2 Galvanized Sheet Steel: Comply with ASTM A 653 and A-924.

.3 Galvanized Coating Designation: G90.

.4 Finishes for Surfaces Exposed to View: Mill phosphatized.

.5 Rectangular Ductwork

- Cross-break, bead and reinforce flat surfaces of all fittings the same as straight duct sections.
- Transverse joints shall not be considered as duct reinforcement unless specifically stated and listed in the SMACNA standards.
- Rectangular elbows shall be radius type, 1.5 times the duct width, or square throat with vanes.
- All duct fittings shall conform to the gauge and reinforcement requirements indicated for the largest connected straight duct section.
- Volume dampers shall be opposed multi-blade.

11.10.7 EXPOSED DUCTWORK

.1 Provide all exposed ductwork in conditioned spaces with a paint-grip galvanized finish or similar mill surface etch treatment for painting.
.2 Prime exposed ductwork
.3 Provide pleated elbows on round ductwork.
.4 Provide tapered wedge (ramp) joint or gasketed fittings on round ducts.
.5 Minimize the use of duct sealants and apply at joints only in a neat manner.

11.10.8 DUCT SEALS
.1 Liquid seal for joints and seams. Clean surfaces of substances interfering with bonding of the sealant such as oil, dust, dirt, etc. Where metal clearances exceed 1/16 inch, the following are required:
   - McGill AirSeal Corporation, “United Duct Sealer – Water Based”
   - Hard cast “Duct-Seal 321”
   - Products with documented VOC-emission rates meeting LEED guidelines by Dow Corning, Miracle Adhesives, or Surebond, Inc.

.2 Low Pressure Ductwork: All duct transverse joints and longitudinal seams seals to meet SMACNA Seal Class B for 2 inches of static pressure (positive or negative), also ensuring that leakage rates do not exceed those stated in other sections of this specification.

.3 High Pressure Ductwork: All duct transverse joints and longitudinal seams seals to meet SMACNA Seal Class A for 10 inches of static pressure.

.4 Soft elastomer butyl gasket with adhesive backing shall be used to seal flanged joints.

11.10.9 FLANGE CONNECTORS

11.10.9.1 Provide galvanized steel.
11.10.9.2 The gauge and shape shall match connecting ductwork.
11.10.9.3 Add-on factory-fabricated, slide-on transverse flange connectors, gaskets, and components.
11.10.9.4 Acceptable Manufacturers are: Ductmate Industries Inc., Nexus PDQ, Ward Industries Inc.

11.10.10 TURNING VANES

11.10.10.1 Turning vanes shall be double wall with every sixth vane welded to the runner.
11.10.10.2 Curved blades of galvanized sheet steel. Support with bars perpendicular to blades set. Set into vane runners suitable for duct mounting.

11.10.10.3 Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

11.10.10.4 Comply with SMACNA’s “HVAC Duct Construction Standards – Metal and Flexible”; “Vanes and Vane Runners,” and “Vane Support in Elbows.”

11.10.10.5 Vane construction to be single wall for ducts up to 48 inches wide and double wall for larger dimensions.

11.10.10.6 Acceptable Manufacturers are: Ductmate Industries Inc., Duro Dyne Inc., METALAIRE Inc., SEMCO Inc., and Ward Industries Inc.

11.10.10.7 HANGERS AND SUPPORTS

11.10.10.8 Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

11.10.10.9 Strap and Rod Sizes: Comply with SMACNA’s "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1, "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct."

11.10.10.10 Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

11.10.10.11 Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

11.10.10.12 Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

11.10.10.13 Trapeze and Riser Supports:

11.11 DUCT INSTALLATION

11.11.1 All duct installations and duct construction shall comply with all requirements of this specification and meet or exceed SMACNA standards and recommendations for construction and installation.

11.11.2 Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.

11.11.3 Install ducts vertically and horizontally, and parallel and perpendicular to building lines unless indicated otherwise.

11.11.4 Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.

11.11.5 Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.

11.11.6 Protect duct interiors from moisture, construction debris and dust, and other foreign materials.

11.11.7 Provide turning vanes or sweep elbows at all changes of direction in supply, exhaust, and return ductwork.

11.11.8 Seal all duct seams, joints, connections and penetrations.
11.10.11.9 Install a minimum 6 inch flexible connection where ductwork connects to motor-driven equipment. Do not bulge or install on a bind.

11.10.11.10 Provide duct access doors at all fire dampers, smoke dampers, combination fire/smoke dampers, and motor-operated control dampers. Provide ceiling access panels in drywall or other inaccessible ceiling systems such that all dampers are serviceable. Coordinate locations with the Electrical Contractor.

11.10.11.11 Keep all ductwork tight to underside of structure. Maintain at least 7 inches clear between duct and ceiling construction.

11.10.11.12 Install all dampers and provide blank-off plate to seal frames airtight.

11.10.11.13 Provide volume dampers at each branch to balance system to air flows indicated on the drawings.

11.10.11.14 Secure all insulation and vapor barriers on factory-fabricated flexible ducts with a separate draw band, independent of any used the connection of the flexible duct to the duct collar.

11.10.11.15 Repair galvanizing damaged by welding, scratches, etc., by using cold galvanizing compound.

11.10.12 TESTING

11.10.13 The sum of the measured leakage rates from all sections of a duct system shall not exceed 2% of the total system design airflow capacity.

11.10.14 Document all duct testing and submit testing results as part of the “As-Built” documents. Furnish copies of all completed duct testing documentation upon request of the Architect, Engineer, or Owner.

11.10.15 Low Pressure Ductwork

11.10.15.1 Leak-test all ductwork in conformance with the SMACNA “HVAC Air Duct Leakage Test Manual.” Pressurize ductwork to 110% of design pressure. Air leakage in any tested section of rectangular ductwork shall not exceed that of SMACNA Leakage Class 24. Air leakage in any tested section of round or flat oval ductwork shall not exceed that of SMACNA Leakage class 12.

11.10.16 Inspect all turning vanes for proper and secure installation.

11.10.17 SEAM AND JOINT SEALING

11.10.17.1 Seal duct seams and joints for duct static-pressure and leakage classes specified in "Performance Requirements" Article, according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 1-2, "Standard Duct Sealing Requirements," unless otherwise indicated.

1. For static-pressure classes 1 inch W.G., comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Seal Class A, except as follows:
   - Systems for residential occupancy.
   - Ducts that are located directly in zones they serve.
   - Ducts that have short runs from volume-control boxes to diffusers.

11.10.18 HANGER AND SUPPORT INSTALLATION

11.10.18.1 Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Hangers and Supports."

11.10.18.2 Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Where practical, install concrete inserts before placing concrete.
2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
.4 Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.

11.10.18.3 C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1 (Table 4-1M), "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.

11.10.18.4 Hangers Exposed to View: Threaded rod and angle or channel supports.

11.10.18.5 Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.

11.10.18.6 F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

11.10.19 CONNECTIONS

11.10.19.1 Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

11.10.20 PAINTING

11.10.20.1 Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer.

11.10.21 FIELD QUALITY CONTROL

11.10.21.1 Perform tests and inspections.

11.10.21.2 Duct System Cleanliness Tests:
   .1 Visually inspect duct system to ensure that no visible contaminants are present.
   .2 Test sections of metal duct system, chosen randomly by Owner, for cleanliness according to "Vacuum Test" in NADCA ACR, "Assessment, Cleaning and Restoration of HVAC Systems."
     • Acceptable Cleanliness Level: Net weight of debris collected on the filter media shall not exceed 0.75 mg/100 sq. cm.
   .3 Duct system will be considered defective if it does not pass tests and inspections.
   .4 Prepare test and inspection reports.

11.10.22 DUCT CLEANING

11.10.22.1 Clean and blow out new duct system before final connections are made. Inspect ductwork for debris before starting any fans.

11.10.22.2 Clean new duct system(s) before testing, adjusting, and balancing.

11.10.22.3 Use service openings for entry and inspection.
   .1 Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Division 23 Section "Air Duct Accessories" for access panels and doors.
   .2 Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
   .3 Remove and reinstall ceiling to gain access during the cleaning process.

11.10.22.4 Clean the following components by removing surface contaminants and deposits:
   .1 Air outlets and inlets (registers, grilles and diffusers).
11.10.22 Mechanical Cleaning Methodology:
.1 Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
.2 Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
.3 Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
.4 Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
.5 Provide drainage and cleanup for wash-down procedures.
.6 Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents according to manufacturer's written instructions after removal of surface deposits and debris.

11.10.23 DUCT SCHEDULE
11.10.23.1 Fabricate ducts with galvanized sheet steel:
11.10.23.2 Intermediate Reinforcement:
11.10.23.3 Galvanized-Steel Ducts:
11.10.23.4 Elbow Configuration:
   .1 Radius elbow with minimum 1.5 radius-to-diameter ratio.
   .2  Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," "Vanes and Vane Runners," and "Vane Support in Elbows."

11.10.24 Branch Configuration:
   .1 Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," and "Branch Connections."
   .2 Rectangular Main to Rectangular Branch: 45-degree entry.
   .3 Rectangular Main to Round Branch: Spin in.
   .4 Round: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," "90 Degree Tees and Laterals," and "Conical Tees."
      • Velocity 1000 fpm or Lower: 90-degree tap.
      • Velocity 1000 to 1500 fpm: Conical tap.
      • Velocity 1500 fpm or Higher: 45-degree lateral.
   .5 E. Install turning vanes at all changes or direction in supply and return ductwork.

11.11 EQUIPMENT
11.11.1 POSTED OPERATION INSTRUCTIONS
11.11.1.1 Specifications shall be very comprehensive concerning the requirements for posted operation instructions. Standardize posted instruction format and requirements among project specifications. Instructions shall be required to be completed with professionally prepared graphics, printed on full size sheets and shall be in color.
11.11.1.2 Posted instructions shall be prepared for all mechanical systems and shall include all components.
11.11.1.3 Comprehensive schematics for air distributing and handling systems
11.11.1.4 Facility floor plans showing location of all equipment with coordinated identification
11.11.1.5 Piping diagrams (hot, cold, heating, chilled water, compressed air, fire, etc.)
11.11.1.6 System diagrams, including isometrics of equipment and systems (boiler, pumps, chillers, AHU’s, VAV’s and exhaust system)
11.11.1.7 Valve charts
11.11.1.8 Equipment schedules
11.11.1.9 Instructions shall be framed in extruded metal frames, mounted under glass. Instructions shall be permanently mounted in the clear wall area reserved in each mechanical room.

11.11.2 HVAC Equipment (AHU’s, Pumps, etc.) shall be located on a housekeeping pad.

11.11.3 Air Handling Units

11.11.3.1 VAV systems with reheat.
11.11.3.2 Units shall be double wall construction.
11.11.3.3 Drain pans shall be constructed of stainless steel.
11.11.3.4 Air handling units shall not be located above a ceiling without prior written approval by the Project Manager.
11.11.3.5 Install Auxiliary drain pans with water sensor on all units above ceilings. Sensor shall be connected to the existing control system.
11.11.3.6 Intermediate drain pans shall be installed on multiple coil sections.
   .1 Custom air handlers shall not be specified without prior written approval by the Project Manager.
   .2 Pressure gauges and thermometers to be provided on supply and return of all AHU coils.
   .3 Pressure gauges to be provided with gauge valve.
   .4 Thermometers to be provided with thermometer well.
   .5 P-T Plugs (Pete’s Plugs) shall be provided adjacent to all control sensors for testing and verification.
   .6 Use of fan coil units is discouraged and shall be used in limited scope. Fan coil units shall not be located above a ceiling without prior written approval by the Project Manager.

11.11.3.7 Locate all maintenance parts (belts, motors, bearings, etc.) outside of contaminated air stream.
11.11.3.8 For any fan that exhausts hazardous materials or fumes, locate all maintenance items out of the air stream. Fans shall have an up blast discharge if possible.
11.11.3.9 Pumps
   .1 Heating and Cooling: Base mounted vertical centrifugal. Provide and install two 100% capacity pumps for redundancy. Horizontal split case pumps are acceptable for larger capacity requirements.
   .2 Steam Condensate: Duplex receiver type

11.11.3.10 Boilers and Pressure Vessels
   .1 Boilers and pressure vessels shall be designed, constructed, installed, operated, maintained, and inspected in accordance with Ohio Department of Commerce, Industrial Compliance.
   .2 Permits for boilers and pressure vessels, new or relocated, shall be included in project costs. Permits shall be obtained and maintained by contractor throughout warranty period.
   .3 Provide emergency shutdown button switch for each boiler. Switch shall be maintained and tested, mushroom type at mechanical room entrance.
11.12 BOILERS

11.12.1 Modular boilers shall be installed in lieu of traditional larger boilers. This following list explaining the reasoning for installing modular boilers is not all-inclusive, and engineers and facility owners may have other features/benefits they consider important for their specific applications.

11.12.1.1 Less installation space
11.12.1.2 Lower-temperature flue gas that can be exhausted directly out a sidewall
11.12.1.3 Less flue gas piping of smaller size
11.12.1.4 Less flue gas pipe heat loss
11.12.1.5 More efficient operations
11.12.1.6 Greater turndown ratios to better match building part-load demands
11.12.1.7 Easier maintenance and parts replacement
11.12.1.8 Smaller and lighter product for easier installation through standard doors
11.12.1.9 Generally lower total installed cost than larger boilers
11.12.1.10 Greater redundancy opportunity when properly sized based on building load demands
11.12.1.11 Flexibility and greater adaptability for future building retrofits
11.12.1.12 Maintenance: one of the biggest benefits to modular boilers is the simplicity of the product for maintenance. When it comes to product selection criteria, maintainability is one factor that engineers discuss with end users. More and more, maintenance staff budgets are being cut, and that has a bearing on the level of expertise within a maintenance staff. Modular boiler designs have nearly come to a plug-and-play status when it comes to parts replacement and ease of maintenance and self-diagnostic controls.

11.12.2 Boilers shall be gas or oil fired forced draft water tube type. The water tube shall be flexible type.

11.12.3 Boilers shall have a minimum efficiency of 85%.

11.12.4 Boilers vent system shall be stainless steel inner liner with stainless or galvanized steel outer jacket (type B) and shall meet AGA criteria. Roof penetrations shall be per NRCA detail. Roof portion of vent shall match roof in color.

11.12.5 The boiler shall bear ASME stamps.

11.12.6 Gas burners and controls shall be modulating type, UL approved.

11.12.7 Multiple boilers shall be manifoded together with manufacturer provided manifold kits. Provide minimum two 60% boilers for building heating.

11.12.8 Boilers shall be mounted on 4 inch chamfer edge house pads.

11.12.9 Units shall be capable of installation into and removal from the mechanical space after all walls and ceiling structures are in place.

11.12.10 Upon completion of the assembly and installation of boilers and pressure vessels, acceptance tests shall be conducted in accordance with the requirements of the “ASME Boiler and Pressure Vessel Code”. Where field assembly of pressure vessels or boilers is required, a copy of the completed U-1 Manufacturer’s Data Report required by the “ASME Boiler and Pressure Vessel Code” shall be submitted to the Project Manager.
11.13 INSULATION

11.13.1 Ducts

11.13.1.1 No internal duct liner allowed.
11.13.1.2 Provide externally wrapped fiberglass insulation or factory fabricated double wall duct with perforated metal liner.
11.13.1.3 All duct work with the possibility of condensation shall be insulated.
11.13.1.4 All change of direction shall be accomplished with radius fabrication.
11.13.1.5 Duct insulation support pins shall be welded to ductwork. Glue-on/stick-on pins are not acceptable.

11.13.2 Piping

11.13.2.1 End joints of pipe insulation shall be sealed to pipe.
11.13.2.2 A pre-installation conference shall be specified to ensure that proper techniques are followed.
11.13.2.3 All elbows and fittings to be fully insulated.
11.13.2.4 Insulation shall be as listed below for service piping:
   11.13.2.5 Chilled Water Piping: Cellular glass.
   11.13.2.6 Underground Pre-insulated Pipe Conduit: Polyurethane or cellular glass.
   11.13.2.7 Steam and Condensate Piping: Fiberglass
   11.13.2.8 Hot Water Piping: Fiberglass

11.14 STARTUP

11.14.1 All equipment shall be field inspected and tested by the manufacturer or a factory trained authorized representative for installation in compliance with the manufacturer’s installation instructions and recommendations prior to start-up. The manufacturer or a factory trained authorized representative shall do, or be present at, the start-up. Start-up documentation certifying proper installation and start-up shall be submitted to Project Manager at that time and shall also be included in the O&M manuals.

11.14.2 HVAC systems shall not be started until cleaning, flushing and pre-treatment has been performed to the satisfaction of the Project Manager.

11.14.3 Heating hot water systems shall be cycled through heat up and cool down and checked for leaks prior to substantial completion.

11.14.4 Following start-up procedures, adjust equipment for proper operation within manufacturer’s published guidelines and tolerances. Demonstrate proper operation of equipment and systems to designated Project Manager and the Commissioning Agent.

11.15 CONTROLS

11.15.1 All control systems must be capable of full communication with this system.
11.15.2 Must be a way to locally adjust controls in all auditoriums.
11.15.3 Temperature sensors shall be nickel construction.
11.15.4 Control relays shall be installed in control panels, starters, or variable speed drive.
11.15.5 Control thermostat/sensor boxes in walls shall be sealed/ caulked to prevent airflow through the device.

11.15.6 The following shall be included under “BAS Manufacturer’s Field Services”:

   11.15.6.1 “Contractors shall be responsible for the initial controls testing prior to commissioning. All aspects of the system shall be correct in functionality before commencement of commissioning.”
11.16 TEST & BALANCE

11.16.1 Test and balance of an HVAC system shall be performed for any equipment replacement and/or system modifications.

11.16.2 Test and balance shall be performed by an Associated Air Balance Council (AABC) or National Environmental Balancing Bureau (NEBB) certified T&B contractor that shall be a different company than the mechanical contractor and approved by the Project Manager.

11.16.3 Testing and balancing of HVAC systems shall be performed, at minimum, in accordance with AABC or NEBB National Standards.

11.16.4 Final T&B report shall include design and actual readings with explanation and recommendation for remediation for readings that could not be balanced.
12.1 GENERAL

12.1.1 In accordance with UFC 3-600-01 Fire Protection Engineering for Facilities

12.1.2 New facilities or substantially renovated facilities, as defined by the IBC, must include automatic fire sprinkler systems and fire alarm/mass notification systems. Exceptions must be approved in writing by the Project Manager.

12.1.3 Safeguards during building construction, alteration, and/or demolition shall be in compliance with the most current version of NFPA 241 and shall be prescribed and reviewed by the A/E of Record.

12.1.4 Existing fire hydrants shall be accessible to fire apparatus during construction, alteration and/or demolition.

12.1.5 Before renovation, alteration, or demolition, the contractor shall contact the Project Manager and arrange to have all existing fire extinguishers delivered to an acceptable storage facility to be reused in OHARNG facilities.

12.1.6 Fire protection water supplies and the location of fire hydrants shall be installed to comply with the most currently adopted International Fire Code. Water lines supplying fire hydrants shall be a minimum of 6 inches.

12.1.7 Fire apparatus access roads shall be included in the design to comply with the most currently adopted International Fire Code requirements.

12.1.8 Evac-Tracs shall be provided on every floor at each egress stair. Maintain required egress widths.

12.2 DOCUMENTATION

12.2.1 Fire Protection drawings shall include but not be limited to design intent, narrative, metrics, and descriptions of:

12.2.1.1 Applicable codes standards used
12.2.1.2 Distribution and spacing of fire hydrants
12.2.1.3 Building required fire flow calculation
12.2.1.4 Building sprinkler layout
12.2.1.5 Fire apparatus access
12.2.1.6 Life Safety Plan with room occupant loads
12.2.1.7 Fire extinguisher locations
12.2.1.8 Fire pull station locations
12.2.1.9 Fire department connections
12.2.1.10 Command center locations (if applicable)
12.2.1.11 Areas of refuge

12.2.2 All fire sprinkler system design drawings must be sealed by an Ohio registered professional engineer.

12.2.3 Contract documents shall require the fire protection contractor to submit final approved sprinkler shop drawings and hydraulic calculations to the Project Manager.

12.2.4 Submittals

12.2.4.1 Two weeks prior to final inspection the Contractor shall deliver two (2) hard copies and two (2) CD’s of the final up-dated operating and maintenance manual to the Project Manager.

12.2.4.2 The manual shall be up-dated to include any information necessary by shop drawing approval. The manual should include any information for testing, repair, trouble
12.2.4.3 Two (2) copies of “as-built” drawings and two (2) sets of CD discs, containing software back up and CAD based drawings, shall be submitted two weeks prior to final inspection.

12.2.4.4 The drawings shall include complete wiring diagrams showing connections between devices and equipment, both factory and field wired.

12.2.4.5 Include a riser diagram and drawings showing the as-built location of devices and equipment.

12.2.4.6 The drawings shall show the system as installed, including deviations from both the project drawings and the approved shop drawings.

12.3 INSPECTIONS AND APPROVALS

12.3.1 All fire-stopping systems shall be installed in accordance with the applicable Underwriters Laboratories Fire Resistant Directory. All fire-stop applications shall be labeled to depict which UL system used and all UL fire-stop system installation instructions shall be made available to the Project Manager at the time of fire-stop inspection.

12.3.2 Final design submittals and shop drawings shall be provided to the Project Manager for review and approval.

12.4 FIRE ALARM/MASS NOTIFICATION SYSTEMS

12.4.1 In accordance with UFC 4-021-01 Design and O&M Mass Notification Systems and UFC 3-600-01 for Fire Protection Engineering for Facilities.

12.4.2 Basis of design is Simplex Grinnell. Other acceptable manufacturers shall be approved by the Project Manager.

12.4.3 Equipment

12.4.3.1 Fire alarm system shall be networkable, addressable type, voice capable type and incorporate Mass Notification/Emergency Communication.

12.4.3.2 Strobes shall be combination fire/alert visible notification appliances. Single assembly areas should have dual strobes; Amber marked “Alert”, and clear marked “Fire”.

12.4.3.3 Weather resistant outdoor speakers should be installed at entrances and other gathering points near building.

12.4.3.4 Visual text displays shall be coordinated through the Project Manager. Consideration should be given to placement in elevator lobbies, large assembly areas, and main paths of egress.

12.4.4 Materials & Methods

12.4.4.1 Fire alarm control panel shall be located in electrical room.

12.4.4.2 Fire alarm control panel shall include buttons for activating pre-programmed messages locally at building.

12.4.4.3 Fire alarm system conduit, fittings, junction boxes and covers shall be painted red.

12.4.4.4 Provide terminal strips for all connections. No wire nuts are allowed.

12.4.4.5 On multi-story buildings fire alarm riser shall have fire alarm terminal cabinet on each floor.

12.4.4.6 A pull station is required within 5 feet of exterior doors and at the exit of every mechanical room.
12.4.4.7 All buildings shall have speaker layout designed to ensure intelligibility and audibility. System shall be tested and a report submitted as part of closeout documents.

12.4.4.8 All Fire Alarm/Mass Notification systems must be integrated with the command center determined by the Project Manager.

12.4.4.9 All Fire Alarm/Mass Notification systems must have the ability to activate no less than 12 pre-programmed and manual evacuation messages as well as live public address (site wide or building only).

12.4.4.10 No copper wire shall be used underground to interface a fire alarm control panel in one building to peripherals or remote panels/transponders in an outlying building. In these instances, connection of fire alarm equipment in the outlying building will be connected to the main control panel via single-mode fiber.

12.4.4.11 All underground conductors to post indicator valves or sprinkler valve vaults shall be installed in PVC conduits and all outdoor sprinkler equipment shall be grounded using the manufacturer provided ground terminals.

12.4.4.12 A 120 volt AC electrical outlet shall be installed in close proximity to the main fire alarm control panel, for use by computers or test equipment.

12.4.4.13 A power switch shall be installed inside the fire alarm control panel when the circuit breaker, which services the panel, is not located in the same room.

12.4.4.14 As built drawings will be turned into the Project Manager immediately upon completion of the final inspection.

12.4.4.15 No surge suppressors will be installed above ceilings or in areas difficult to access by maintenance personnel.

12.5 FIRE SUPPRESSION

12.5.1 Provide fire sprinkler system in accordance with NFPA 13.

12.5.2 Piping

12.5.2.1 Below Grade piping shall be cement lined ductile iron with mechanical joints.

12.5.2.2 Above Grade

- 2” and smaller: Black steel schedule 40 with screwed joints.
- 2.5” and larger: Black steel schedule 10 with grooved mechanical joints (Victaulic).

12.5.2.3 Saddle taps for interior piping are not acceptable.

12.5.3 Valves

12.5.3.1 All sprinkler system control valves shall be equipped with tamper switches and locks and chains.

12.5.3.2 Provide hydrostatic calculation plate for each individual dry valve.

12.5.3.3 Fire Department locks and chains shall be provided in front of each system riser.

12.6 FIRE EXTINGUISHERS

12.6.1 Fire extinguishers shall be in accordance with the most currently adopted International Fire Code and National Fire Protection Association requirements. Where these codes are in conflict the most stringent will apply. Location and installation of fire extinguishers shall be reviewed and approved by Project Manager and Fire Safety Program Manager.

12.6.2 All facilities shall be provided with 10 lb. ABC multi-purpose dry chemical portable fire extinguishers along with other types and sizes as required.

12.6.3 Extinguishers in public areas shall be mounted in recessed or semi-recessed cabinets capable of holding the extinguisher without the use of hooks or brackets. Locked cabinets with means of emergency access (striker, etc.) shall be provided in areas especially susceptible to malicious use.
12.6.4 All portable extinguishers shall be in visible locations and free from obstructions.

12.6.5 Signage shall be provided to indicate the extinguisher location where visual obstructions cannot be avoided.
### Section 13 - ELECTRICAL

#### 13.1 GENERAL

**13.1.1** In accordance with UFC 3-520-01 Interior Electrical Systems and UFC 3-550-01 Exterior Electrical Power Distribution

**13.1.1.1** Conductors and Conduit

- **Conductor/Cable** to be the following as applicable:
  - Cu (Copper) THHN
  - Cu THHW
  - Cu XHHW
  - Minimum wire size to be #12AWG
  - #12AWG/#10AWG to be solid
  - #8AWG/larger stranded
  - Service Entrance to be Cu XHHW

**13.1.1.2** Voltage System Color Code:

<table>
<thead>
<tr>
<th>Function</th>
<th>Color Code (for 120/208/240 V)</th>
<th>Color Code (for 277/480 V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Three Phase Line (L1)</td>
<td><img src="image" alt="Black" /></td>
<td><img src="image" alt="Brown" /></td>
</tr>
<tr>
<td>Three Phase Line (L2)</td>
<td><img src="image" alt="Red" /></td>
<td><img src="image" alt="Orange" /></td>
</tr>
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<td>Three Phase Line (L3)</td>
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<tr>
<td>Neutral (N)</td>
<td><img src="image" alt="White" /></td>
<td><img src="image" alt="Gray" /></td>
</tr>
<tr>
<td>Protective Earth or Ground (PG)</td>
<td><img src="image" alt="Green" /></td>
<td><img src="image" alt="Green" /></td>
</tr>
<tr>
<td>Single Phase Line</td>
<td><img src="image" alt="Black" /></td>
<td><img src="image" alt="Brown" /> (for 2nd hot)</td>
</tr>
</tbody>
</table>

**13.1.1.3** Minimum conduit to be ¾”.

**13.1.2** Rigid Metal Conduit to be used (indoors/outdoors) above grade where exposed to direct physical damage; Electrical Metallic Tubing may be used (indoors only) in concealed/protected areas not subject to physical damage; liquid tight flexible metal conduit to be used for final connection to fan/pump motors or vibrating loads.
13.1.3 PVC or Galvanized Rigid Steel shall be used below grade. If PVC is used, it shall be incased in concrete unless otherwise approved by Project Manager. The transition from PVC to metal conduit shall be made at a minimum of 12 inches below final grade. Minimum depth of bury shall be three feet. Galvanized Rigid Steel (GRS) or PVC Schedule 80 shall be used for direct burial. When PVC is used a tracer shall be pulled for future locating.

13.1.4 Outdoor enclosures to be NEMA 3R or NEMA 4; indoor enclosures may be NEMA 1 in dry areas, but shall be NEMA 12 in areas exposed to moisture; floor-mount electrical equipment to have individual 4-inch high concrete housekeeping pad extending 6 inches out from base of equipment (at front and both sides); outdoor receptacles to be ground-fault-current-interrupt with weatherproof covers; outdoor light fixtures and wall switches to be suitable for wet/damp locations.

13.1.5 The use of “Wiremold” is not allowed.

13.1.6 Electrical Equipment

13.1.6.1 Secondary power distribution equipment approved manufacturers are:

.1 Square D
.2 General Electric
.3 Siemens
.4 Cutler-Hammer

13.1.7 Non-specialty general lighting fixtures approved manufacturers are:

.1 Lithonia
.2 Cooper
.3 Hubbell

13.1.8 Receptacles and Wall plates

13.1.8.1 NEMA 5-20R

13.1.8.2 Duplex: Construction Series Gray Hubbell 5352AG with stainless steel Hubbell SS8 wall plate or approved equal.

13.1.8.3 GFCI: Commercial Spec-Grade Gray Hubbell GFR5362GYA with stainless steel Hubbell S26 wall plate or approved equal.

13.1.8.4 External Receptacles: Hubbell Pro-Series GFR5362GY with weather proof cover Hubbell WP8H or approved equal.

13.1.9 Wall Switches

13.1.9.1 20A, 120V-277V Side-Wire only.

13.1.9.2 1-Pole/Toggle Construction Grade Gray Hubbell 1221GY or approved equal.

13.1.9.3 3-Way Toggle/Maintain Gray Hubbell 1223GY or approved equal.

13.1.9.4 4-Way Toggle/Maintain Hubbell 1224GY or approved equal.

13.1.9.5 Stainless steel Hubbell SS1 wall plate or approved equal.

13.1.10 Provide panelboard schedules in spreadsheet form.

13.1.11 Electrical boxes and covers to be color coded as follows:

13.1.11.1 120/208 systems shall be Silver (Unpainted)

13.1.11.2 277/480 systems shall be Yellow

13.1.11.3 Emergency Power shall be Orange

13.1.11.4 Fire Alarm System shall be Red

13.1.11.5 Telecommunications shall be Blue

13.1.11.6 Security (Access Control) shall be White
13.1.12 All junction boxes shall be permanently labeled indicating the panel, circuit(s), and voltage.

13.1.13 Exposed Conduit: Conduit to be concealed in all public areas (walls, ceiling, floor surfaces); conduit shall not be exposed except in mechanical, electrical, and telecom rooms or other locations approved by Project Manager.

13.1.14 Electrical rooms: In new facilities, electrical rooms shall be vertically-stacked (with sufficient overlap) to permit straight/vertical route of busway and cable raceway between multiple levels; Electrical Rooms to provide sufficient physical space for present/future needs; Electrical Rooms to be centrally-located (minimal cable lengths) to reduce costs & voltage drop. All new electrical rooms shall have safe area lines painted on floor based on arc flash rating for each electrical panel and switch gear. All electrical panels 480 volts or higher shall have an arc flash rating label applied.

13.1.15 Each mechanical/electrical room shall have at least one light and power outlet on an emergency circuit, when an emergency generator is installed.

13.1.16 Telecom rooms shall have two 20-amp 120-volt NEMA duplex power outlets on separate circuit breakers located near the top of the backboard on each wall under the cable tray (typically at 84 to 90 inches AFF). These power outlets/circuits should be on an emergency circuit when an emergency generator is installed.

13.1.17 Telecom rooms shall have a 100 amp panel.

13.1.18 Location of all exterior electrical equipment shall be approved by the Project Manager.

13.1.19 General Lighting

13.1.19.1 T12 fluorescent and incandescent bulbs shall not be used.

13.1.19.2 Provide lighting calculations to Project Manager for review prior to 100% design review.


13.1.19.4 Diagonally opposite corners of recessed fixtures shall be securely supported from and directly attached to building structure so as to comply with luminaire mounting requirements in NEC Article 410 independent of any support provided from suspended
ceiling grid. All fixtures (recessed and other) shall be directly attached to building structure using reusable bolt/screw-type hardware.

13.1.20 Provide occupancy sensor lighting controls. Standards are:

<table>
<thead>
<tr>
<th>Application</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classrooms, Conference rooms, Offices, Break Areas</td>
<td>Multi-technology Ceiling Mount</td>
</tr>
<tr>
<td>Restrooms, Hallways</td>
<td>Ultrasonic Ceiling Mount</td>
</tr>
<tr>
<td>Janitor Closets, Small Rooms</td>
<td>Passive Infrared Wall Switch</td>
</tr>
</tbody>
</table>

13.1.21 Generator:

13.1.21.1 Generator shall be subjected to minimum 4-hour test run at full load; load bank to be quoted (as add alternate to generator/automatic-transfer-switch bid) to permit 4-hour test of generator at 100% rated kW load.

13.1.22 Breakers to be bolt-in type; plug-in/snap-in type not permitted.

13.1.23 Grounding rods to be CADWELD type; mechanical connections are not permitted.

13.1.24 Exterior lighting:

13.1.24.1 Utilize photoelectric (PE) controls. Timers are not acceptable.

13.1.24.2 Minimum Acceptable Lighting Levels:

| .1 High Pedestrian Activity, High Volume Parking Lots: .75 FC (8 LUX) |
| .2 Primary Walkways, POC Parking: .50 FC (5 LUX)                     |
| .3 Secondary Walkways, ORG Parking: .25 FC                          |

13.1.25 All wiring shall be in conduit with the exception of telecommunications wiring where cable trays or hooks/rings are provided above suspended ceilings.

13.1.26 Sleeves to be rigid conduit with bushings.

13.1.27 Duct bank

13.1.27.1 Required for underground electrical and telecommunications.

13.1.27.2 Concrete encased PVC pipe.

13.1.27.3 Refer to Telecommunication Pathways.

13.1.28 Use of Type MC Cable is not permitted except for light fixture whips.

13.1.29 Use of Type NM (Romex) Cable is not permitted.

13.1.30 Cable Tray

13.1.30.1 Shall be provided for telecommunications.

13.1.30.2 No power shall be run in cable tray.

13.1.31 For fire alarm information see Fire Protection.

13.1.32 Auditorium Lighting – Particular care to be exercised when laying out lights in tiered auditoriums in accordance with maintenance & lamp replacement. Occupants shall not have to walk through dark auditorium to turn on lights. Aisle lights shall be “on” at all times.

13.2 GROUNDING

13.2.1 Proper grounding of the electrical systems is one of the most critical concerns for the Adjutant General’s Department. At a minimum Article 250 of the NEC is to be followed.

13.2.2 Electrical systems are grounded to limit and stabilize voltages to ground, Unintentional line surges, lighting strikes, or contact with higher voltage lines may result in voltages being placed on the electrical system that could damage or destroy electrical components and equipment.
13.2.3 Ground rods should be installed in grade mounted boxed (ground wells) which allows for testing of the grounding system.

13.2.4 All grounding systems shall be designed and tested to insure a proper grounding system. Test results shall be documented and provided to the Project Manager before final completion of the Project.

13.2.5 Below is examples of Grounding Electrode System.

Each AC electrical system that is required to be grounded shall be connected to a GES per 250, Part C

13.3 TELECOMMUNICATIONS

13.3.1 Installation shall be based on the latest edition of the “Technical Criteria for Installation Information Infrastructure Architecture”.

13.3.2 An acceptable building cabling system encompasses: copper and fiber optic entrance cable, termination equipment, copper and fiber backbone cable, copper and fiber horizontal distribution cable,
workstation outlets, racks, cable management, patch panels, cable tray, cable ladder, grounding, and labeling.

13.3.3 All Contractors must be BICSI certified.

13.3.4 IT Room

13.3.4.1 Data Cabinets: In the primary communications room of a Facility use floor standing racks in the intermediary communication room use a wall mounted 36 inch rack.
   .1 Great Lakes case and cabinet
   .2 Wall mounted: WM series – GL36WM w/72 Fan assembly and w/7219 6 position power strip w/circuit breaker.
   .3 Floor Mounted: (GL720E-2436 SERIES) GL720E-2436F w/7215-S 16 position power strip w/surge suppressor.

13.3.5 All wall mounted racks will be mounted to no less than ½” plywood attached to the wall at the studs.

13.3.6 Data Cable Trays:

13.3.6.1 Data cable trays should be placed in all new facilities.

13.3.7 Voice/Data Cable:

13.3.7.1 Category 6 data cable should be used in all new installations. Plenum rated or standard riser will be used dependent on the local code and method of air circulation at the Facility.

13.3.8 Termination of Voice/Data Cabling:

13.3.8.1 The user end of all voice/data cabling will be terminated using CAT6 jacks with T568B standard. Orange jacks will be used and faceplates can be a color suitable to the wall color. All data/voice jacks will be labeled according to room, one up in each room, i.e. 101-1, 101-2, etc. with the number before the dash being the room number the jack is located in. If two jacks are in a single box they will be identified as a & b, i.e. 101-1b. The same concept would apply if there are more than two jacks in a single box.

13.3.8.2 The COMM Room end of a cable is to be terminated on a data termination panel using the T568B standard. Termination panels will be located in the data cabinet underneath the fiber termination panel.

13.3.9 Fiber Optic Cable:

13.3.9.1 Single mode fiber optic cable will be used between all buildings. Fiber optic cable used between COMM rooms within a building will be decided based upon the requirements of that facility.

13.3.10 Termination of Fiber Optic Cable:

13.3.10.1 All Fiber Optic cable will be terminated using fused SC ends. The Termination will be done in a fiber optic termination panel and placed inside the data cabinet at the top.

13.3.11 Copper Cable:

13.3.11.1 A 25-pair copper cable will be installed between all intermediary COMM rooms and the primary COMM room of a building. The installation of copper cable between buildings will be decided on an as needed basis dependent on the building overall requirements for copper.

13.3.12 Data Boxes:

13.3.12.1 Place at a height of 18 to 24 inches above the floor surface. The data box will be stubbed out above the ceiling height using 1 inch conduit and pull string placed in the conduit to facilitate the cable placement.
13.3.13 Termination of Data/Cable:

13.3.13.1 Terminate cables in the data box after the walls are finished. This will preclude finishing materials in or on the CAT 6 RJ45 Jack.

13.3.14 Hardware Requirements:

13.3.14.1 No specific standard can be given due to the fact that a facility or buildings requirements can vary and as a result change the hardware we would place within a building to support its infrastructure.

13.3.15 Cable runs between buildings:

13.3.15.1 Runs will be placed in 4 inch conduit. A separate run of conduit will be used for fiber optics and copper. Both will not be run in the same conduit. When a turn is required, a 45 degree sweeping turn or 90 degree sweeping turn will be made.

13.3.16 Size (number of strands) of fiber optics:

13.3.16.1 Size of each run will be decided based on the requirements of the facility/building/COMM room being serviced. A minimum of 9 strands will be used in any internal fiber optic cable run. A minimum of 16 strands will be used in any building fiber optic cable run.

13.3.17 Due to the installation of Voice Over IP Services on our network, the use of plain old telephone service will be at a minimum and the requirements for other than VoIP Telecommunication Requirements will be made uniquely for each facility/building.

13.4 ACCESS CONTROL SYSTEM

13.5 LIGHTING PROTECTION

13.5.1 If lightning protection system is required, as assessed by the A/E, it shall be of the passive type.

13.5.2 UL Master Label or LPI System Certificate shall be provided; lightning protection system to be installed by qualified UL or LPI installer; lightning protection system specification shall be provided and installed system to comply with NFPA 780, UL96, and UL96A.
Section 14 - EQUIPMENT

14.1 General

14.1.1 Capital improvement project equipment is in one of two categories:

14.1.1.1 Fixed (built-in) Equipment is defined as equipment that will become an integral part of the project by the fact that the equipment will require connections with the structural, mechanical, plumbing or electrical systems. The connections are provided through the construction contracts and are in the project budget. This includes items such as: shelving, food service equipment, unit kitchens, cabinets, laboratory work benches, fume hoods and fixed seating. The specifications shall clearly define which contractors have responsibilities relative to equipment receiving, inventory and installation (including utility hook-ups).

14.1.1.2 Moveable Equipment is defined as equipment that is not permanently attached to the building's systems. This equipment will be purchased by the Adjutant Generals Department directly and is not part of any construction contract. Most of the items will be purchased by the Adjutant General’s Purchasing Department and, therefore, are governed by state purchasing regulations (i.e., competition is required on large or numerous items and a specific brand or model might not be obtained due to the bid process).

The Adjutant Generals Department may be asked to help develop the final moveable equipment list. It is generally the intent of the Adjutant Generals Department to install the moveable equipment after most of the construction is complete. Some of the equipment may require connections to the project structure or utilities; therefore provision for connections shall be made in the project design (power, water, waste, etc.). Both specifications and drawings shall clearly define who is responsible for receiving, installing and connecting the equipment.

14.1.2 A list of all equipment installed in the building shall be given to the Project Manager as part of project closeout.

14.1.3 All local exhaust ventilation (LEV) systems shall meet the requirements of the American Conference of Governmental Industrial Hygienists (ACGIH) Industrial Ventilation: A Manual of Recommended Practice; and ANSI/AIHA Z9.2-2006 Fundamentals Governing the Design and Operation of Local Exhaust Ventilation Systems.

14.2 SERVICEABILITY AND ACCESSIBILITY

14.2.1 Equipment must be safely and comfortably accessible by service personnel without causing disruption to site activities.

14.2.2 Gauges, meters, thermometers, etc., shall be accessible and readable from floor level.

14.2.3 Door and window openings shall be sized to allow replacement of equipment without structural modifications.

14.2.4 Design drawings shall include a 1/4" scale or larger drawing showing the layout of all equipment in primary mechanical rooms and shall indicate path of travel for removal and replacement of largest piece of equipment located in mechanical rooms.

14.2.5 It is necessary that occupants' equipment and controls be located so that the occupants will not have to enter mechanical equipment rooms for routine operation of equipment. This includes fuses, circuit breakers, switches, valves, etc., that might serve departmental equipment.

14.3 VENDING EQUIPMENT

14.3.1 Project Manager will coordinate vending area requirements to be included in the design.
14.3.2 Connection requirements of equipment (power, water, etc.) shall be provided to the A/E and included in the design. Equipment shall be provided by the OHARNG or vending companies having contracts with the OHARNG. Requirements for a typical vending area are as follows:

14.3.2.1 Drink and snack machines each require a 20 amp duplex receptacle.

14.3.2.2 All water and electrical outlets around vending equipment shall be 18 inches above finished floor level.

14.3.2.3 Floor finishes around vending equipment shall be hard surface (ceramic tile, etc.).

14.3.2.4 If vending machines contain condensate drains, a floor drain should be provided.

14.3.2.5 No vending machines allowed above the ground floor.

14.3.2.6 Place vending machines in a convenient location to serve the building occupants such as an alcove, break room, vending room or other area as deemed appropriate by the building’s user requirements.
Section 15 - FURNISHINGS

15.1 GENERAL

15.1.1 All furnishing selections shall be coordinated with and approved by the Adjutant General’s Department.

15.1.2 All data and electrical outlets shall be considered in furniture layout.

15.1.3 All furnishings shall meet ANSI (American National Standards Institute) standards as determined by the Project Manager.

15.1.4 All furnishings shall have a minimum warranty of 10 years.

15.1.5 Glides and casters on seating products must be specified for the flooring type that they will be used on.

15.1.6 Finishes for new furnishings shall be consistent throughout new or renovated buildings.

15.2 FURNITURE

15.2.1 Horizontal Surfaces shall be high pressure laminate (HPL). Surfaces shall be medium density fiber board (MDF), particle board, or wheat board and must have a minimum density of 45 lb. per cubic ft. All horizontal surfaces shall be constructed to be dimensionally stable and shall be a minimum 1 1/16” thick.

15.2.2 Vertical exposed veneer surfaces shall be select grade hardwood veneer, selected, and matched to assure proper balance and consistency.

15.2.3 Joints and chassis must be fastened by screws, glue, and heavy duty metal fasteners. All fasteners shall be concealed.

15.2.4 All drawer fronts must be a minimum three ply construction. Drawer Slides must be full extension with steel ball bearing file drawer suspension.

15.2.5 Box drawers shall hold a minimum of 50 lbs. File drawers shall hold a minimum of 100 lbs. for 24-30” deep drawers, and 130 lbs. for 36” deep drawers.

15.2.6 All desks must have the option to include grommets for wire management.

15.2.7 All desks must have ¾ or full modesty panels.

15.2.8 Glides shall be countersunk into hardwood edge at bottom of desk panel and consist of countersunk threaded metal sleeve and adjustable threaded metal glide.

15.2.9 Coordination Storage:

15.2.10 Storage cabinets and lateral files shall have capability of being keyed-alike

15.2.11 Master keys shall be provided

15.2.12 Vertical filing cabinets shall not be used

15.2.13 Lateral Files

15.2.13.1 Width shall be 30”, 36” or 42”

15.2.13.2 Depths shall be 18”, 20” or 24”

15.2.13.3 Maximum height shall be 4 drawers

15.2.13.4 Dual sided metal locking system that shall lock all drawers simultaneously

15.2.13.5 Drawer slides shall be of steel construction with carburized steel ball-bearings

15.3 TASK SEATING

15.3.1 The minimum requirements are as follows:

15.3.1.1 Adjustable height arms

15.3.1.2 Pneumatic adjustable height seat
15.3.1.3 Adjustable seat depth
15.3.1.4 High-density foam seat cushion
15.3.1.5 Seat fabric shall be Crypton, Nanotex, or approved equal. Minimum 75,000 double rubs using Wyzenbeek method
15.3.1.6 Mesh or upholstered back
15.3.1.7 Adjustable lumbar support
15.3.1.8 Tilt lock mechanism
15.3.1.9 Hard and soft casters shall be available
15.3.1.10 Five star base with dual wheel casters

15.4 SIDE CHAIRS
15.4.1 Wood or steel frame.
15.4.2 Shall have option for padded seat and/or back
15.4.3 Shall have minimum 300 pound capacity
15.4.4 Chair glides shall be specified according to type of floor

15.5 TASK SEATING
15.5.1 Tables
15.5.1.1 Horizontal Surfaces shall be high pressure laminate (HPL). Surface substrate shall be medium density fiber board (MDF), particle board, or wheat board and must have a minimum density of 45 lb. per cubic ft. All horizontal surfaces shall be constructed to be dimensionally stable and shall be a minimum 1 1/4” thick.
15.5.1.2 Flat PVC or vinyl edge
15.5.1.3 Minimum 18” deep, maximum 30” deep
15.5.1.4 Height shall be 29-30”
15.5.1.5 For 60” wide tables, maximum seating capacity is 2; for 84” wide tables, maximum seating capacity is 3.
15.5.1.6 Steel base
15.5.1.7 Glides or locking casters.

15.5.2 Chairs
15.5.2.1 High density stackers or flip/nest.
15.5.2.2 Weight capacity minimum of 300 lbs.
15.5.2.3 Any high density stacking chairs must have polypropylene back and seat and tubular steel frame.
15.5.2.4 Chair glides shall be specified according to type of floor.

15.6 CLASSROOM FURNISHINGS
15.6.1 Tables and Desks
15.6.1.1 Horizontal Surfaces shall be high pressure laminate (HPL). Surface substrate shall be medium density fiber board (MDF), particle board, or wheat board and must have a minimum density of 45 lb. per cubic ft. All horizontal surfaces shall be constructed to be dimensionally stable and shall be a minimum 1 1/4” thick.
15.6.1.2 Flat PVC or vinyl edge
15.6.1.3 Minimum 18” deep, maximum 30” deep
15.6.1.4 Height shall be 29-30”
15.6.1.5 For 60” wide tables, maximum seating capacity is 2; for 84” wide tables, maximum seating capacity is 3
15.6.1.6 Steel base
15.6.1.7 Glides or locking casters

15.6.2 Seating
15.6.2.1 High density stackers, sled base, four-legged, flip/nest, task seating
15.6.2.2 Weight capacity minimum of 300 lbs.
15.6.2.3 No arms
15.6.2.4 Casters shall be specified according to type of floor

15.6.3 Tablet Arm Chairs
15.6.3.1 Must adequately fit a 13”-16” laptop computer
15.6.3.2 Must be available right and left-handed
15.6.3.3 HPL or vinyl clad top
15.6.3.4 Vinyl edge
15.6.3.5 Tablet arm classroom chair manufacturer is KI or approved equal

15.7 CONFERENCE SEATING
15.7.1 Conference Seating
15.7.1.1 Weight capacity minimum of 300 lbs.
15.7.1.2 Minimum seat width shall be 22”
15.7.1.3 Pneumatic height adjustable
15.7.1.4 5-star swivel base with dual wheel casters
15.7.1.5 Base understructure shall be steel
15.7.1.6 Upholstered seat with high density foam
15.7.1.7 Chairs shall have either fully upholstered or mesh back

15.8 MEETING ROOMS
15.8.1 Meeting Tables:
15.8.1.1 HPL tops
15.8.1.2 Wood, flat PVC or vinyl edge, minimum 1.25” overall thickness
15.8.1.3 Height shall be 29-30”
15.8.1.4 Power/data capabilities shall be an option with grommets and wire managers.

15.8.2 Meeting Room Seating
15.8.2.1 Weight capacity minimum of 300 lbs.
15.8.2.2 Minimum seat width shall be 22”
15.8.2.3 Base understructure shall be steel
15.8.2.4 Upholstered seat

15.9 BREAK ROOM
15.9.1 Tables
15.9.1.1 HPL or metal tops
15.9.1.2 Flat PVC or vinyl edge, minimum 1.25” overall thickness
15.9.1.3 Minimum 30” deep/diameter
15.9.1.4 Height shall be 29-42"
15.9.1.5 Rectangular tables
  .1 60” wide rectangular tables, maximum seating capacity is 2 per side
  .2 84” wide rectangular tables, maximum seating capacity is 3 per side
15.9.1.6 Circular tables
  .1 36” diameter tables, maximum seating capacity is 4
  .2 48” diameter tables, maximum seating capacity is 5
  .3 60” diameter tables, maximum seating capacity is 6
15.9.1.7 Square tables are 30” or 36” square tables, maximum capacity is 4
15.9.1.8 Steel base

15.9.2 Seating
  15.9.2.1 Stackable
  15.9.2.2 Polypropylene back and seat
  15.9.2.3 Tubular steel frame
  15.9.2.4 Chairs with flex back option are acceptable
  15.9.2.5 Chair glides shall be specified according to type of floor (i.e. poly glides for VCT)

15.10 STEEL STORAGE
  15.10.1 Minimum 22 gauge steel finished in baked enamel
  15.10.2 Storage cabinets and lateral files shall have the capability of being keyed-alike
  15.10.3 Master keys shall be provided
  15.10.4 Vertical filing cabinets shall not be used
  15.10.5 Lateral Files:
    15.10.5.1 Widths shall be 30”, 36” or 42”
    15.10.5.2 Depths shall be 18”
    15.10.5.3 Maximum height shall be 5 drawers
    15.10.5.4 Dual sided metal locking system that shall lock all drawers simultaneously
    15.10.5.5 Drawer slides shall be of steel construction with carburized steel ball-bearings
  15.10.6 Storage Cabinets
    15.10.6.1 Widths shall be 30”, 36” or 42”
    15.10.6.2 Depths shall be 18” or 24”
    15.10.6.3 Heights shall be 28” to 84”
    15.10.6.4 Dual sided metal locking system that shall lock all drawers/doors simultaneously
  15.10.7 Drawer Pedestals
    15.10.7.1 Depths shall be 20”-30”
    15.10.7.2 Metal locking system that shall lock all drawers simultaneously
    15.10.7.3 Shall have full-extension drawers

15.11 SYSTEM FURNITURE
  15.11.1 Panels
    15.11.1.1 The connection system shall be metal-to-metal
15.11.1.2 All panel connections shall be such that light passage and electrical wiring are concealed
15.11.1.3 The system must feature replaceable exterior surface skins or tiles that can be replaced in the field
15.11.1.4 Individual work station changes shall be capable of being made without disruption to adjoining workstations
15.11.1.5 The system shall allow for selective placement of surface finish options
15.11.1.6 Fabric surface panels shall be tackable
15.11.1.7 The system shall have wood veneer trim or painted metal top caps and end caps
15.11.1.8 Panels shall have the ability to stack up and/or down in the field

15.11.2 Electrical and Lighting
15.11.2.1 A minimum of three-circuit, eight-wire power system
15.11.2.2 Separate data and telecommunication raceways shall be provided
15.11.2.3 Raceway covers shall be securely hinged
15.11.2.4 Panel system shall be capable of adding or removing baseline or beltline power in the field without dismantling the system
15.11.2.5 Task light ballasts shall use rapid-start ballast and include one standard, cool white fluorescent lamp or LED
15.11.2.6 Task lights shall have a minimum 6-foot cord and an on/off rocker switch

15.11.3 Work Surface
15.11.3.1 Maximum unsupported length of work surface shall be 5’
15.11.3.2 A 7/8”-1” gap at the back of the freestanding or wall supported work surface or provide grommets or cutouts to allow electrical cords to drop through to cable management components
15.11.3.3 Panel mounted surfaces shall have a capacity of 31.5 psf
15.11.3.4 Access to work surface wire management should run the entire length of the back edge of all work surfaces regardless if it is panel mounted, wall mounted, or freestanding

15.11.4 Pedestals; refer to Steel Storage

15.11.5 Overhead Storage
15.11.5.1 Shall attach to either the panels or the walls (using wall track system)
15.11.5.2 Minimum 22 gauge steel construction
15.11.5.3 Provide an anti-dislodgment mechanism on all overhead units
15.11.5.4 The overhead doors shall open up and over
15.11.5.5 The load limit for any overhead storage unit or shelf shall be 150 pounds
15.11.5.6 Shall be lockable and have the ability to be keyed alike
15.11.5.7 All overheads shall be capable of incorporating a task light with enclosed vertical cord manager

15.11.6 Keyboard Trays
15.11.6.1 Fully articulating with palm rest
15.11.6.2 Shall include reversible mouse support and include wrist support

15.11.7 Window Treatments
15.11.7.1 All exterior windows shall have window treatments limited to horizontal metal blinds or specialty shades

15.11.8 Installation

15.11.8.1 Provide installation drawings color coded to indicate furniture dealer.

15.11.8.2 The following general note shall be added to the plans: The Contractor shall pay for, when installing panel systems, a licensed electrician to wire the panel system base feed to building power.
Section 16 - FACILITY REMEDIATION

16.1 HAZARDOUS MATERIALS ABATEMENT

16.1.1 Possible hazardous materials include, but not limited to the following items:

16.1.1.1 Asbestos
16.1.1.2 Lead
16.1.1.3 Mercury
16.1.1.4 Mercury Thermostats
16.1.1.5 Mercury (sink traps)
16.1.1.6 PCBs
16.1.1.7 Formaldehyde
16.1.1.8 VOCs
16.1.1.9 Fluorescent Lamps and Tubes
16.1.1.10 Lamp Ballasts (PCB and non-PCB types)
16.1.1.11 Perchlorate Salts
16.1.1.12 High intensity discharge (HID) lamps
16.1.1.13 Lead-acid battery electrolytes,
16.1.1.14 Fluorocarbons
16.1.1.15 Equipment coolant
16.1.1.16 Hydraulic fluids
16.1.1.17 Petroleum products

16.1.2 The Project Manager shall provide available information on identified hazardous material within any building on site. The A/E and/or Contractor shall report any questionable material which may contain hazardous material to the Project Manager for further direction.

16.1.3 Contractor is responsible for providing a Monitoring Professional.

16.1.4 Documentation shall be required for the monitoring of hazmat presence, contractor qualifications, removal procedures, and worker protections and exposure. In addition all other legally required abatement documents shall be the responsibility of the contracted monitoring professional. Copies of all documents issued by the monitoring professionals during the course of abatement shall be delivered to the Project Manager.

16.1.5 As each material type is fully abated, the monitoring professional shall certify to that fact.

16.1.6 The Monitoring Professional shall issue a final report document that summarizes the location, type, amounts and final disposal of the hazardous materials.

16.1.7 No dry cutting of concrete within a building or confined spaces is allowed.
Section 17 - SITE PREPARATION

17.1 SITE SURVEYING

17.1.1 In accordance with UFC 3-220-01 Geotechnical Engineering

17.1.2 All new project site plans shall be developed from a new topographical map developed specifically for that project; not from "as-built" information or previous project grading plans. Accurate information is essential and "special" conditions such as asbestos, lead paint, underground tank leaks, etc. shall be addressed.

17.1.3 Survey must be performed by a land surveyor with a current professional registration in the State of Ohio.

17.1.4 Surveyor is to allow Project Manager to review and comment on survey before final plots.

17.1.5 Surveys and design drawings must in accordance with this coordinate system (in accordance with Appendix G). If design firm needs to create its drawings of measurement other than decimal units (such as architectural), a base point of 0, 0 shall be used when rescaling the drawing. The rescaling occurs due to a change in units of measurement and is a scale factor of 12. Any scaling, rotation or change in units shall be noted in writing, on the CAD drawing, outside the plotting limits.

17.1.6 A checklist enumerating detailed and site specific requirements will be included in the request for proposal to perform the topographic survey.

17.1.7 For new facilities, the A/E shall evaluate the need for an archeological survey.

17.1.8 When surveying tree locations, the surveyor shall take three ground shots at the base of the tree trunk and three ground shots at the drip line of the tree.

17.1.9 When surveying trees, the drip line shall be depicted on the survey.

17.2 SUBSURFACE EXPLORATION

17.2.1 Contractor will contract directly with geotechnical consultants to perform subsurface investigations. The consultant retained for such services must be a professional engineer with current registration in the State of Ohio.

17.2.2 The A/E shall coordinate with Project Manager to develop the necessary testing locations, frequencies, depths, etc. that will be included in the request for proposal of such services.

17.2.3 The contract documents shall show all boring locations, cross sections and soil reports, all existing conduits, drains, utility lines, sewers, tunnels, cables, trees, paving, walks, foundations, and other objects or obstructions, whether in use or abandoned. Property boundaries shall be clearly indicated.

17.3 SITE CLEARING

17.3.1 Prior to any site clearing involving earthwork operations the A/E shall demonstrate to the Project Manager that the SWAPP has been completed.

17.3.2 Debris resulting from stripping and clearing operations shall be promptly removed from the site.

17.3.3 Removal of trees and shrubs shall include the removal of stumps and roots to the extent that no root greater than 3 inches in diameter remains within 5 feet of either underground structure, utility line, under footings, or paved areas. Grubbing in open areas shall include removal of stumps and 3 inch or greater roots to 6 feet below finish grade elevations.

17.4 BACKFILL AND TOPSOIL REUSE

17.4.1 The A/E shall coordinate with the Project Manager regarding potential reuse of onsite material.
17.4.2 Specify that soils be compacted to the following minimum densities determined unless special conditions override (Percentages listed are percentage of Standard Proctor):

<table>
<thead>
<tr>
<th>Standard Proctor Density</th>
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<td>90%</td>
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1. Under Road Beds, Parking Lots, and paved pedestrian walks
   a. Up to 12" below subgrade
   b. Upper 12" below subgrade

2. Under non-structural slabs on grade with normal loading inside the structure

3. Under structural slabs, foundations, isolated pads, and footings

4. Under planting beds and lawns, upper 2 feet of soil below finish grade at 75-80% with remainder being:
   a. if depth is less than 10 feet
   b. if depth is more than 10 feet

5. Around manholes and other underground structures
   a. if depth is less than 10 feet
   b. if depth is more than 10 feet

17.4.3 Extreme care shall be taken to obtain proper compaction in areas which abut walls, curbs, adjacent slabs, and other structures where use of mechanical compactors is difficult.

17.4.4 Field compaction tests and related laboratory analyses shall be performed by a qualified independent laboratory (conforming to American Society for Testing and Materials standards), under the supervision of a registered professional engineer specializing in soils engineering. All testing documentation shall be submitted to the Project Manager when they occur. Soils proposed for fill, backfill, and embankments shall be analyzed by the soils engineer to determine acceptability; no soil shall be placed until it is approved by the soils engineer. A representative of the testing laboratory shall provide continuous inspection during placement and compaction operations.
17.5 TREE AND PLANT PROTECTION

17.5.1 A tree protection plan shall be provided for each project as determined by Project Manager. Tree protection shall be shown on the Erosion and Sediment Control Plan and Site Development Plan. The Project Manager shall identify specifically those trees to be saved and those which must be removed.

17.5.2 All remaining trees shall have protective barriers which shall be the larger of:

17.5.2.1 The drip line of the tree

17.5.2.2 Diameter at breast height (in inches) x 1.5 (feet per inch)
17.5.3 A substantial barrier shall be installed prior to any construction and shall remain until construction and site cleanup is complete.

17.5.4 No construction material, debris or excavated material shall be stored within the barricaded area. No vehicles, trailers, etc. shall be parked inside the barricaded area.

17.5.5 Where trenching for utilities is required within the drip line, tunnel under or around roots by hand digging. Do not cut main lateral or tap roots. Cut smaller roots which interfere with a sharp pruning tool; do not chop or break.

17.5.6 Do not allow exposed roots to dry out before backfill is placed; provide temporary earth or moist burlap cover.
17.5.7 Any tree to remain that has had excavation within the drip line shall be pruned by a professional arborist according to the National Arborist Association Standards Class IV - Cutting Back or Drop Crotch Pruning.

17.5.8 Cutting back or drop crotch pruning shall consist of the reduction of tops, sides, under branches or individual limbs. This practice is to be undertaken only in cases of utility line interference, or where certain portions of the roots or root systems have been severed or severely damaged.

17.5.9 The following specifications shall apply:

17.5.9.1 All cuts shall be made sufficiently close to the trunk or parent limb, without cutting into the branch collar or leaving a protruding stub, so that closure can readily start under normal conditions. All cuts shall be clean. It is necessary to precut branches too heavy to handle to prevent splitting or peeling the bark. Where necessary, to prevent tree or property damage, branches shall be lowered to the ground by proper ropes or equipment.

17.5.9.2 Remove the weaker, least desirable, crossed or rubbed branches. Such removal shall not leave holes in the general outline of the tree.

17.5.9.3 Generally, in reducing size (cutting back) not more than one-third of the total area shall be reduced at a single operation. When cutting back, only drop crotch as much as necessary. Where practical, avoid cutting back to small suckers. All effort shall be made to cut back to a lateral, one-third the diameter of the cut being made. In reducing overall size, attention is to be given to the symmetrical appearance. Top is to be higher and sides reduced in order to maintain a tree-like form. When cutting back trees, one shall have in mind to make them shapely and typical of their species.

17.5.9.4 On thin bark trees, just enough limbs shall be removed to get the effect wanted without admitting too much sunlight to the trunk of the tree or the top of large branches. Care shall be taken with the following species: lindens, maples, beeches, apples, oaks, and other trees susceptible to sunscald, growing in different geographical areas. The damage may be minimized by doing work on susceptible species during the dormant season.

17.5.9.5 In lifting the lower bottom branches of trees for under clearance, care shall be given to symmetrical appearance, and cuts shall not be made so large that they will prevent normal sap flow.

Annual drop crotching or cutting back of silver maples, poplars, and other trees with brittle and soft wood is an established practice and has proven beneficial in maintaining the safety of these trees over long periods of growth. Other trees with soft and brittle wood growing in different geographic areas may be specifically named when it is common practice to control growth by cut-back. An alternate method in some situations for maintaining the safety of these trees would be cabling and bracing.

17.5.9.6 Maintain existing grade outside drip line of trees, unless otherwise indicated on plan. Do not leave open excavations in the vicinity of protected trees for longer than 2 days to prevent soil moisture reduction.

17.5.10 Fertilization

17.5.10.1 Where tree roots within the drip line will be covered with asphalt or concrete, feeders shall be installed as recommended by the National Arborist Association Standards.

17.5.11 Install extended feeders where construction of wells or retaining walls is required within the drip line.

17.5.12 The specifications shall define proper fertilization and the contractor shall fertilize affected trees during construction.
17.6 GRADING

17.6.1 Finish grade slopes shall be shallow enough to allow mowing (generally 1:3 or less); steeper slopes will be permitted only in areas where maintenance-free erosion control (groundcover planting, rip-rap, etc.) is provided.

17.6.2 All areas disturbed by construction operations and not covered by building, paving, etc. shall be fine graded and temporarily seeded. Sod is to be used for permanent lawns.

17.7 SITE REMEDIATION

17.7.1 Hazardous materials survey and remediation are assumed to be separate from building design unless otherwise requested by the Project Manager and/or Risk Management and Safety.

17.7.2 Contractor will contract directly with environmental consultants to perform the necessary assessments and remediation, if applicable. The consultant retained for such services must be a professional engineer with current registration in the in addition to any certifications required by local, state, and federal regulatory agencies.

17.8 EROSION CONTROL

17.8.1 General (In accordance with NRCS Rainwater and Land Development Manual)

17.8.1.1 Erosion and Sediment Control Process Narrative

.1 This document is to provide a clearer picture of how the overall plan to reduce erosion and its resulting sedimentation issues on site is to be applied. The following are shown in sequential order.

.2 Selected design Engineer shall be familiar with the Design and Construction Standard.

.3 For land disturbances less than 0.25 Acres, the design engineer may request a variance from the requirements of the Design and Construction standard and be allowed to incorporate Erosion and Sedimentation Control (ESC) in a more simplistic manner.

.4 Engineer uses ESC Standards to Design Project.

.5 Design to include 3 phase ESC plan (1. Pre-Construction, 2. Construction and 3. Post Construction) including tree protection.

.6 Engineer Incorporates necessary unit pricing for possible additional ESC measures throughout project life.

.7 Project goes to bid and only approved contactors, familiar with construction standard are permitted to bid.

.8 Contractor responsible for installing Erosion and Sedimentation Control (ESC), Best Management Practices (BMPs).

.9 Contractor acquires necessary NPDES permit, must present copy of application to Environmental Department.

.10 Land Disturbing Authorization requested by Contractor.

.11 Land Disturbing Authorization granted by Project Manager with the approval of Design Engineer and OHARNG Environmental Department.

.12 Contractor responsible for necessary OHIO EPA inspections.

.13 Contractor to stock basic ESC materials for emergency response situations.

.14 Contractor will contract with the engineer of record to conduct its own inspections monthly, before forecasted rain events, and within 48 hrs. after Rain Wave flagged 0.5 inches or greater event.

.15 Contractor shall test storm water run-off for turbidity at all outfalls on the site or that collects run-off from the site. The test shall be performed at minimum once monthly, and within 24 hours after any storm event greater than 0.5 inches.

.16 Contractor will contract with the engineer of record to monitor the turbidity of the runoff from each site once monthly, or after any storm event greater than 0.5 inches. The rainfall depth of an event will be determined using Rain Wave.

.17 As stipulated in General Notes, Contractor to pay any incurred OHIO EPA fines.

.18 Contractor to Coordinate with Project Manager regarding ESC removal.
17.8.1.2 The methods of erosion and sediment control outlined in this document are not intended to limit engineer creativity and innovation. The listed methods are intended to create a uniform set of standards for A/E’s and contractors to use, to ensure a maximum level of erosion and sediment control is achieved. Any desire to deviate from the standards should be presented to the Project Manager.

17.8.1.3 All design and construction activity must be performed in compliance with all local, state, and federal regulatory requirements.

17.8.1.4 Construction Standards are more stringent and shall to be used to supplement the Ohio EPA requirements regarding construction site storm water runoff.

17.8.1.5 All construction sites, regardless of size, will be subject to the design requirements here-in. Project Manager reserves the right to waive the requirements of this document should the Project Manager deem it appropriate.

17.8.1.6 All Ohio EPA and National Pollutant Discharge Eliminations Systems (NPDES) permitting and sampling documentation must be prepared by the civil engineering consultant. The civil engineering consultant must be a registered professional engineer as well as meeting any other requirements of a certifying professional as set forth by the State of Ohio. Additionally, the civil engineering consultant shall be familiar with OHARNG Environmental Department’s additional erosion and sediment control standards located here-in:

1. For projects that disturb one (1) or more acres of ground (or otherwise meet the Ohio EPA criteria for permit coverage), the Architect and Engineer (A&E) will complete a draft Notice of Intent (NOI) for coverage under the Ohio EPA General National Pollutant Discharge Elimination System (NPDES) Permit for Storm Water Discharges Associated with the Construction Activity on behalf of the Adjutant General’s Department. The General Contractor is responsible for preparing the draft NOI in the absence of an A&E. The NOI will be filled out with the Ohio Army National Guard - Location” (such as Camp Ravenna or Camp Perry, etc.) as the owner and the specific project identified as the Facility Name (such as Camp Ravenna Barracks III). The General Contractor will finalize the NOI for submission to the Ohio EPA on behalf of the Adjutant General’s Department. The NOI must be reviewed and approved by the local OHARNG Environmental Office prior to submission and signed by an authorized OHARNG employee. The General Contractor will submit the approved NOI and pay the associated fee. After the Ohio EPA issues an authorization letter and permit number to the OHARNG, the General Contractor and applicable sub-contractors will Complete and submit Co-Permittee NOI’s and will obtain coverage as co-permittees under the OHARNG permit. The General Contractor will utilize the information on the OHARNG approved NOI and Ohio EPA permit when completing the Co-Permittee NOI. The contractor will sign and submit the OHARNG approved Co-Permittee NOI.

When an Ohio EPA Construction Storm Water Permit is needed, the A&E will develop an initial draft Storm Water Pollution Prevention Plan (SWP3) in accordance with the requirements contained in the Ohio EPA General NPDES Permit for Storm Water Discharges Associated with Construction Activity. The SWP3 will be developed using the standards outlined in the latest version of the Ohio Department of Natural Resources publication titled "Rainwater and Land Development - Ohio’s Standards for Storm water Management and Land Development and Urban Stream Protection". The General Contractor will finalize the SWP3 developed by the A&E. The revised draft SWP3 will be provided to the local OHARNG Environmental Office for review and approval. Once Approved by the Environmental Office, the SWP3 will be provided to the local Soil and Water Conservation District (SWCD) and local County Engineer (if required by County or other regulations) for their review and approval. The A&E will make corrections to the SWP3 based upon OHARNG, SWCD and Engineer comments. The SWP3 will be signed by the local OHARNG Environmental Office and the A&E. The final copy of the SWP3 will be in a three ring binder and a signed copy of the SWP3 will be given to the local OHARNG Environmental Office and a copy will remain at the work.
site during project execution. In the absence of an A&E the General Contractor will be entirely responsible for the development, revision, and submission of the SWP3.

The General Contractor will implement the SWP3 and conduct all inspections and maintain storm water/erosion controls in accordance with the SWP3. The Contractor will use the inspection checklist for storm water controls in the SWP3 and shall complete and maintain signed inspections on site in the SWP3 binder. Copies of weekly/post storm event inspections will be provided to the local OHARNG Environmental Office monthly. The contractor will notify the local OHARNG Environmental Office immediately if there is a storm water control failure and off site discharge from the project area.

Any proposed changes to the SWPPP developed by the A&E and approved by the OHARNG must be submitted in writing by the Contractor for review and approval.

The General Contractor will notify the local OHARNG Environmental Office within 45 days of final site stabilization. The local OHARNG Environmental Office will inspect the site and will submit a Notice of Termination (NOT) if the site stabilization is approved. If required, the contractor is responsible for submitting the NOT(s) for termination of their co-permittee coverage after the OHARNG has terminated the permit. The site is considered to have reached final stabilization when the terms identified in the Ohio EPA Permit are met.”

17.8.1.7 The Contractor shall be responsible for all monitoring, inspections, etc. to assure the Project Manager that the site is at all times in accordance with Ohio EPA Rules and Regulations.

17.8.1.8 Contractor will contract with the engineer of record to conduct inspections monthly, after each ½” rain event, and prior to any substantial predicted storm event to ensure the contractor is properly maintaining erosion and sediment control. OHIO EPA is to be notified if any sites are found to be non-compliant during these inspections.

17.8.1.9 Contractor will contract with the engineer of record to sample and record turbidity during site inspection throughout the life of the project to determine whether the civil engineer and contractor have properly designed and installed the Erosion and Sediment Control Measures.

17.8.1.10 The contractor will be responsible for any incurred regulatory fines throughout the course of construction.

17.8.1.11 Project Manager reserves the right to withhold retainage for all but not limited to the following: Failure to maintain erosion & sediment control measures, the inability to meet Environmental turbidity sampling requirements, services rendered by Project Manager in the event that a contractor is unresponsive to directives to modify erosion and sedimentation control measures. Adjutant General’s Department also requires the A/E of Record to incorporate site specific Erosion and Sedimentation Control measures as unit prices in the bid package. These unit prices will be implemented in the event the site requires additional protection or if the contractor is nonresponsive to Erosion and Sedimentation problems that occur. These unit prices can also be implemented negatively if the contractor has not met his contractual obligations. Thus allowing the Adjutant General’s Department to have the BMP’s installed by other means.

17.8.1.12 There shall be in ALL Construction drawing sets requiring an Erosion and Sediment Control Plan, a sheet of general notes for erosion and sediment control.

17.8.1.13 Following each phase of the Erosion and Sediment Control Plan there shall be a sheet of project applicable details that correspond to the erosion and sediment control best management practices. These details are to be obtained from the Adjutant General’s Department.

17.8.1.14 It will be imperative that sediment laden runoff not be allowed to enter any pervious pavement areas. These areas shall be protected, at minimum, using a silt fence located up slope of diversion wales.
17.8.1.15 Project Manager strongly encourages A/E’s and contractors to consider the use of processed demolished building debris for appropriate erosion and sediment control measures such as check dams, construction exit pad, temporary roads, ditch lining, outlet protection, and inlet protection.

17.8.1.16 Erosion and Sediment Control Plan

17.8.1.17 The Erosion and Sediment Control Plan is a set of drawings which provides the necessary measures to reduce erosion on construction sites and minimize the impacts of sediment, turbidity and hydrologic changes off-site throughout the life of the project and beyond. It is to ensure that erosion and sediment control is appropriate for the planned use of the site.

17.8.1.18 The Erosion and Sedimentation Control Plan shall follow the Ohio EPA’s requirements for Construction Sites and must be reviewed and approved by Environmental Office.

17.8.1.19 Required content of the Erosion and Sediment Control Plan

.1 Site Map Drawing
- This Sheet to resemble the drawing required by OHIO EPA for NPDES permitting.
- Receiving waters labeled
- Site discharge points indicated
- Point of entry into receiving waters indicated

.2 Pre-Construction Site Plan Drawing
- Note: This plan to show necessary erosion sediment control measures to be installed before land disturbance authorization is granted. Only grading specifically identified as intended for erosion and sediment control shall be permitted prior to land disturbance authorization.
- Contours, existing and proposed
- Placement of necessary erosion & sediment control BMPs
- Tree protection
- Discharge points
- Expected pre & post-construction flow discharges for 25 year-24 hr. event (in table format)
- Site specific notes
- Note referencing the full sheet of general notes
- Erosion and sediment control details

.3 Construction Site Plan Drawing
- Phasing of changes to erosion and sediment control BMPs
- Contours, existing and proposed
- Placement of erosion & sediment control BMPs
- Tree protection
- Site specific notes
- Note referencing the full sheet of general notes
- Erosion and sediment control details

.4 Post-Construction Site Plan Drawing
- Note: This plan to show necessary Erosion Sediment Control Measures to be installed before substantial completion to be awarded.
- Contours, existing and proposed
- Changes to erosion and sediment control BMPs
- Site specific notes
- Note referencing the full sheet of general notes
Erosion and sediment control details

17.8.2 Erosion and sediment control BMPs, (In accordance with ODNR’s Erosion and Storm water Control Manual – Rainwater and Land Development – Ohio’s Standards for Storm water Management and Land Development) details:

17.8.2.1 This section outlines the design requirements and appropriate applications for Erosion and Sediment Control Practices on Site. The acronym in parentheses, following the practice or device, corresponds to the associated detail.

17.8.2.2 Site Preparation

.1 Construction Exit Pad (CEP)

- Practice Description
- Construction exit pads are used to prevent sediment from leaving the site by means of the wheels of construction vehicles exiting the construction site.
- Stone shall be ODOT No. 1 (1” to 3” inch stone)
- Pad shall be 6 inches thick.
- Pad shall be a minimum of 50 feet long and 20 feet wide.
- If stone alone does not sufficiently remove sediment, vehicle tires should be washed before exiting site with sediment-laden runoff draining into an on-site sediment trap or basin.
- Geotextile selection shall be in accordance with AASHTO M288.
- Should the construction exit pad cease to effectively remove tire born sediment, the top 3 inches of stone shall be removed and replaced.

![Construction Exit Pad (CEP)](image-url)
.2 Land Grading

- The practice of modifying existing topography for desired land uses.
- Grading plans should be designed to protect existing vegetation where possible.
- Grading should be scheduled to minimize the amount of time disturbed areas are left exposed to erosion elements.
- The grade of slopes (excluding channel side slopes) on site should, as a general practice, be no greater than 3 horizontal feet to 1 vertical foot (3:1).
- Retaining walls should be incorporated into the design where site conditions require grades of steeper than 3:1.
- Top soil from areas to be graded shall be removed and stockpiled for reapplication upon completion of grading operations. A stockpile location should be suggested by the engineer. Stockpiled vegetation should be protected from erosion by temporary vegetation.
- Slope lengths on site should be minimized by the use of diversion channels.
- Recommendations for diversion placement are given in the table below.

<table>
<thead>
<tr>
<th>Slope</th>
<th>Spacing (Ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>33-50%</td>
<td>20</td>
</tr>
<tr>
<td>25-33%</td>
<td>40</td>
</tr>
<tr>
<td>15-25%</td>
<td>60</td>
</tr>
<tr>
<td>10-15%</td>
<td>80</td>
</tr>
<tr>
<td>6-10%</td>
<td>120</td>
</tr>
<tr>
<td>3-6%</td>
<td>200</td>
</tr>
<tr>
<td>&lt;3%</td>
<td>300</td>
</tr>
</tbody>
</table>

- Where practical, storm water run-on from adjacent undisturbed sites should be diverted around the construction area to minimize on-site erosion.

.3 Top Soiling (TSG)

- The removal of soil surface useful for establishing vegetation. This practice is applied to areas to be disturbed by excavation, compaction, and general grading operations. Top soil is generally darker than subsoil due to increased levels of organic matter. This soil, upon distribution over the disturbed site is advantageous for establishing vegetation to minimize erosion.
- Topsoil shall be relatively free of debris and shall give evidence as a suitable soil for growing vegetation prior to stripping.
- PH should be in the range of 6.0-7.0. Any pH below 6.0, shall result in the addition of lime in accordance with a soil test report.
- Soluble salts levels shall be below 500 ppm.
- Depth of material placed on site meeting the above requirements should be 4 inches.

.4 Tree Protection (TP)

- Protection of the trees is an extremely important consideration of any design. The Adjutant Generals Department greatly values the trees on site and will seek monetary reparations for any unnecessary damage incurred. Tree protection entails the clear marking and barricading of protection zones around all trees in a project area that are to remain untouched.
.5 Erosion Control Blanket (ECB.A)

- A protective cover for exposed slopes used to aid in establishment of permanent vegetation. Erosion control blankets are utilized on steep slopes or in environments that might not be conducive to expedited establishment of vegetation. Blankets are typically comprised of plant fibers, plastic, or nylon. Erosion control blankets are also used for protecting soil in concentrated flow areas.

- Design Criteria
  - Slopes steeper than 5:1 (20%) shall be protected with an ECB.
  - ECBs shall have evenly distributed organic material.
  - ECBs shall be a minimum of 48” in width.
  - ECBs are to be installed with the fall of the slope, never across the slope.
  - Regarding staking, install ECBs in accordance with ECB detail.
  - Due to the excessive amount of erosion control blankets available, specific discussion of each type of blanket will not be described in this manual. Manufacturer’s guidelines should be followed when selecting the appropriate ECB.
  - Refer to the Ohio EPA for the material requirements for various applications.

.6 Soil Guard (ECB.B)

- Soil guard bonded fiber matrix is an acceptable alternative to erosion control blankets. Soil guard is hydraulically applied, conforming to contours of the slope before hardening into a fiber matrix which holds seed and soil in place. As seeds germinate the biodegradable matrix breaks down. Soil Guard is to be used for protecting slopes and sedimentation/retention basins from rainfall and wind erosion.

- Follow manufacturer and certified applicator guidelines for design mix and proper application.
  - Typical drying time is 12-24 hours.
  - Expected application life is 9 months.
  - Typical application rate 3000-4000 pounds/acre.
  - Soil Guard is not for use in concentrated flows.
  - After installation, soil guard protected slopes shall be kept free of foot and vehicle traffic until after seed germination.

.7 Hydro-Seeding

- The planting process which utilizes a liquid mixture of seed and mulch. This “slurry” is sprayed on the desired area to produce a vegetative cover. The slurry also can include fertilizers, green dyes, and tackifiers for improved vegetative yields.

- Manufacturer recommendations and soil test reports should be utilized when determining an appropriate hydro-seeding mixture.

.8 Mulching (MU)

- The application of plant material over the soil surface to reduce overland flow velocity of storm water runoff and to reduce the eroding effects of raindrop impact. It is also used to protect seed and establish plant cover. Mulching can be applied by hand or with a mulch blower.

- See Hydro-seeding for alternative to mulching.

- Mulching should be applied after grading and seeding.

- Use hay, straw, or wood chips on site.

- Apply until 80% ground cover is achieved.

- All straw shall be crimped (anchored) to hold mulch in place.

.9 Permanent Seeding (PS)

- Vegetation is the best long term method for preventing erosion.

- Vegetation selection should be coordinated with the Environmental Requirements.
• A ground cover of 95% must be achieved before final completion will be awarded.

.10 Rip Rap
• Rip Rap is typically used at pipe outlets, channel linings, and for steep slopes. Rip Rap shall be used permanently, only as outlet protection and channel lining for Project.
• The purpose of Rip Rap is to provide slope erosion protection from swift moving water. Rip Rap should be used for channels with a full flowing velocity between sand 10 ft./s for a 25 yr., 24 hr. storm event or for stabilizing cut and fill slopes.
• Use ODOT specifications to select the proper geotextile material to install between Rip Rap and the soil base.
• Rip Rap should be sized for channels at full bank flow.
• Do not place Rip Rap on slopes steeper than 1.5 ft./ft.
• Thickness of Rip Rap linings should be 1 to 1.5 times the maximum size stone in the gradation.
• Special consideration should be given to the use of processed demolished building debris for appropriate erosion and sediment control measures such as check dams, construction exit pad, temporary roads, ditch lining, outlet protection, and inlet protection.
• Filter stone is for placement on the upstream face of rock filter dams.
• Graded Rip Rap stone for channel lining and outlet protection.

.11 Sodding (SOD)
• The installation of transplanted vegetative cover. The intent is to provide immediate erosion control for disturbed soils. Areas benefiting from the use of sodding are diversions, adjacent to storm drain inlets and outlets, and disturbed slopes.
• A soil test should be performed to determine any necessary soil amendments to facilitate growth. Soil tests are to be conducted by the Contractor at a Soil Testing Laboratory.
• Before installation, the soil should be cleared of debris and clods larger than 2” in diameter.
• Low spots are to be removed to prevent ponding.
• Prepare soil by diskimg and rolling.
• Limit the use of heavy equipment to avoid over-compacting the soil and creating a root barrier.

17.8.2.3 Runoff Conveyance
.1 Hay Bale/Waddle Check Dam (HBCD)
• A row of straw bales or waddle (silt sock) entrenched in a storm water conveyance channel with the purpose of removing sediment from the construction site’s storm water runoff.
• The low flow rate of straw bales often leads to ponding and overtopping of bales. Be aware of ponding water concerns when including straw bales in an erosion control plan.
• Bale dimensions should be 14” x 18” x 36”.
• Bales should be embedded 4” into the soil and staked, using 2, 2” x 2” hardwood stakes.
• Hay bale check dams should be spaced at the horizontal distance that corresponds to one vertical foot of elevation change.
• Typical useful life of a straw bale is 3 months.
• Waddles with a 10” diameter, are acceptable alternatives to hay bales.
• Hay or coconut fiber waddles should be staked along both sides of the length of the waddle with a spacing of four feet.
• Stakes should be angled away from the waddle to resist upward force applied to the waddle by the flow of water.
.2 Diversion Channel (DV)
   • A temporary or permanent excavated channel designed to collect storm water and divert it away from the disturbed site to prevent erosion damage. Diversions can be used to intercept storm water running onto a site and eliminate the need for sediment removal for a potentially substantial volume of water. Rapid establishment of vegetation is crucial to proper diversion function.
   • Temporary storm water diversions shall be capable of carrying a 25yr, 24hr storm event with a 0.3 foot freeboard.
   • Permanent storm water diversions shall be capable of carrying a 50yr, 24hr storm event.
   • Refer to the Ohio EPA for guidance regarding further information on storm water diversion design.

.3 Inlet Protection (IP)
   • Inlet protection is intended to reduce the amount of sediment entering a pipe such as a culvert. Inlet protection is achieved using the hay bale check dam.

.4 Outlet Protection (OP)
   • Practice applied whenever a high velocity discharge must be released onto an erodible soil, typically at the outlet of a channel or conduit. Protection is achieved by means of a Rip Rap lined apron, concrete baffles, and concrete flumes.
   • The outlet protection should be designed to handle the peak storm water runoff from a 25 yr., 24hr storm.
   • The Ohio EPA provides precise design requirements for outlet protection.

17.8.2.4 Sediment Control

.1 Flocculants
   • Floc-logs are a semi-hydrated polyacrylamide blended block that when placed within turbid water flows will remove fine particles and reduce NTU values.
   • Soil Tests are required in order for the manufacturer to select the proper Floc Log mixture.
   • Placement of Floc Logs should be as close to the source of particle suspension as possible.
   • Floc Logs can be placed in the invert of drop structures to begin treating sediment-laden water immediately upon entering the collection system. This application is only acceptable if the collection system in which the Floc Log is placed flows into a temporary sedimentation basin.
   • Floc Logs can be placed in the invert of open ditches directly behind check dams and well upstream from the sedimentation basin. This application is only acceptable if the
The collection system in which the Floc Log is placed flows into a temporary sedimentation basin.

- The use of Floc Logs should be considered in any application in which storm water is detained at a sediment trap before entering the storm water collection network. These traps include excavated drop inlet protection, hay bale check dams, rock filter check dams, and sedimentation basins.
- The typical flow treated by one Floc Log is 60-75 GPM.

.2 Floccin Bags

- A manufactured bag filled with the Floccin Flocculating Agent that when placed within turbid water flows, causes suspended soil particles to coagulate and drop from solution, therefore reducing NTU values.
- Always follow manufacturer’s dosing recommendations.
- Place Floccin Bags as far upstream from the sedimentation basin as feasible to allow more time for mixing and sediment deposition.
- Floccin Bags are typically staked to the ground in the invert of the ditch immediately following a check dam.
- The use of Floccin Bags should be considered in any application in which storm water is detained at a sediment trap before entering the storm water collection network. These traps include excavated drop inlet protection, hay bale check dams, rock filter check dams, and sedimentation basins.

.3 Flocculant Covered Fabric at Check Dams

- A practice similar to the use of Floc Logs. Polyacrylamide in the form of an emulsified powder is applied to a moist coir fabric attached to the downstream side of check dams in open channels and is used to facilitate sediment deposition and reduction of the NTU value of discharged storm water.
- The powder form of polyacrylamide should be applied to a secured, moist fabric, typically 700-900 g/m² Coir, on downstream face of Check Dam, either Rock or Hay.
- Follow manufacturer guidelines for dosing.
.4 Grate Inlet Protection in Pavement
- A sediment barrier formed from filter fabric, gravel, hay or coconut waddles, and sand bags used to minimize the amount of sediment entering an inlet. This method can be used in paved inlets. This method is for protecting inlets with no bypass (inlets in a sag). It can also be used for inlets in disturbed area, but fabric drop inlet protection is preferred.
  - Drainage area should be less than 1 acre.
  - The approach slope to the inlet should be less than 1%.
  - Used for inlets in sag, with no bypass.
  - Height of gravel should be 0.5’ high.
  - Gravel should have a 2:1 side slope or flatter.
  - #57 washed stone is recommended for the gravel.

.5 Curb Inlet Protection (CIP)
- Type “S” Curb inlets located in paved areas within the same drainage basin as the construction site require protection from sediment laden storm water flowing along the curb and gutter. Type “S” curb inlets constructed prior to paving that are in disturbed areas require either fabric drop inlet protection or block and gravel protection. Curb inlet protection can potentially lead to flooding of roadways. Should unsafe driving water conditions be created due to water standing in roadways remove the inlet protection immediately.
  - Use 10” diameter hay or coconut fiber waddles.
  - Waddles are to be held in place by weighting with sand bags or bags of stone.
  - Place waddles in gutter and at a minimum of 1 foot from the inlet throat.
  - This allows overflow and prevents flooding.
  - Alternatively, the practice of wrapping 8” concrete blocks with silt fence material is also an acceptable form of inlet protection.

.6 Fabric Drop Inlet Protection (FIP.1 and FIP.2)
- New and existing drop (grate) inlets in disturbed areas (do not use in paved areas) must be protected in order to minimize the amount of sediment laden water from entering the storm water collection network. This can be achieved through manufactured products or constructed on site. This method can be combined with the excavated drop inlet protection (XDIP) for even better results.
  - Design Criteria-Silt Fence with Wood Supported Frame
  - Use only in locations with a drainage basin slope of 5% or less.
  - This method is not applicable to inlets receiving concentrated flows.
  - Silt fence type A shall be used for this application.
  - When sediment has accumulated to ½ the height of the structure, it should be removed and properly disposed.

.7 Design Criteria- Frame and Filter Fabric (FIP.2)
- Use only in locations with an approach slope of 2% or less.
- Drainage area should be less than 1 acre per inlet.
- Frame shall be constructed of high density polyethylene copolymer (HDPE).
- Frame may be round or square base.
- The filter fabric shall have a weight on no less than 2.5 ounces per square yard.
- The filter fabric shall have a tensile strength of no less than 70 psi with an elongation at break of no less than forty percent (40%).
- The filter fabric shall have a minimum U.V. rating of no less than 65% at 500 hrs.
7.8 Excavated Drop Inlet Protection (XDIP)

- The excavated drop inlet is the preferred method of sediment control for grate inlets and open throat inlets placed in unpaved areas. The excavated drop inlet method of protection is the creation of a small sediment basin around a drop inlet in an unpaved area that is allowed to dewater through weep holes cored in the sides of the inlet structure. The sediment laden water is filtered through stone and filter fabric before entering the structure. The detention time allows for sediment deposition. Should the weep holes become fouled, the structure will overtop and allow water to enter through grating or the open throat.
- The excavated basin shall have a maximum depth between 1 and 2 feet.
- Minimum diameter of the excavated sediment trap, at rim elevation, shall be 12 feet at minimum.
- The sediment trap shall be sized to hold 67 cubic yds. per disturbed acre.
- Side slopes for the basin shall be 2:1 or flatter.
- The inlet structure shall at the level of the bottom of the sediment trap, have 4, 2” holes (16 total) cored into each side of the structure.
- Type A silt fence shall be wrapped around the structure with the weep holes covered by no less than 1 foot in any direction.
- Install washed No. 57 stone around the structure to provide protection for the silt fence. The minimum width of the stone filter around the structure shall be 2 feet.
- If inlet drains more than 1 acre use fabric drop inlet protection in conjunction with the excavated drop inlet protection.
- Remove sediment when accumulation reaches one half the depth of the excavation.

7.9 Rock Check Dam (RCD)

- The check dam shall be constructed of 4-8 inch diameter stone, placed so that it completely covers the width of the channel. ODOT type D stone is acceptable, but should be underlain with a gravel filter consisting of ODOT No. 3 or 4 or suitable filter fabric.
- Maximum height of check dam shall not exceed 3.0 feet.
- The midpoint of the rock check dam shall be a minimum of 6 inches lower than the sides in order to direct across the center and away from the channel sides.
- The base of the check dam shall be entrenched approximately 6 inches.
- Spacing of check dams shall be in a manner such that the toe of the upstream dam is at the same elevation as the top of the downstream dam.
- A splash Apron shall be constructed where check dams are expected to be in use for an extended period of time, a stone apron shall be constructed immediately down-stream of the check dam to prevent flows from undercutting the structure. The apron should be 6 inches thick and its length two times the height of the dam.
- Stone placement shall be performed either by hand or mechanically as long as the center of check dam is lower than the sides and extends across entire channel.
- Side slopes shall be a minimum of 2:1.
0.10 Sediment Basin (SBN)

- Sediment basins are typically employed for large disturbed areas or when the use of smaller localized sediment traps would not provide adequate protection.
- Sediment basins are earthen embankments used to detain sediment laden storm water in order to provide adequate time for soil particles to settle out of suspension. Water at the surface of the pond is the most treated and least turbid. Therefore the storm water is dewatered from the top of the pond by utilizing a skimmer (floating weir). The process is made more efficient through the use of a flocculant to improve sedimentation and baffles for dechannelizing the flow within the pond. Sediment ponds are often converted to storm water detention or retention ponds after the construction phase is complete in order to manage post-construction storm water runoff.
- The Ohio EPA provides detailed guidelines for the design and construction of sediment basins.
- Minimum basin width shall be 10 feet (toe of slope to toe of slope).
- Preferred length to width ratio is 3:1. When site constraints do not permit a 3:1 ratio, an absolute minimum length to width ratio of 2:1 may be used.
- The minimum depth of the basin shall be 4 feet.
- Basin side slopes shall be 2:1 or flatter.
- The basin shall hold and store at minimum 3600 cubic feet/acre of drainage.
- Sediment ponds shall be designed to treat storm water run-off of a 25 year, 24 hr. storm.
- Basin and skimmer should be designed to store and dewater a 25 year storm event over 3 days.
- Floating skimmers shall be the primary method for dewatering the sedimentation basin. Perforated riser designs will not be accepted.
- The emergency spillway shall be sized for storm water run-off flows from a 50 year, 24 hr. storm.
- The emergency spillway may be designed as an overflow channel lined with Rip Rap or a self-cleaning drop inlet structure.
- PAM shall be used to increase the soil particle deposition rate in the sedimentation basin. Preferred methods include the use of fixed “floc logs” or “Floccin bags” at the inlet of the basin, or placement of PAM emulsions or powders on the first baffle of the basin.
.11 Dewatering-Dirt Bag (DB)
- For temporary dewatering operations the use of a “DIRTBAG” may be employed. The sediment laden water is filtered as it is forced through the porous geotextile fabric of the bag. Filter socks are not acceptable alternatives to dirt bags.
- Composition shall be polypropylene nonwoven geotextile
- Spout shall be capable of receiving a 4” discharge hose
- Place dirt bag on slopes no greater than 2%.
- Orient the inlet of the bag facing up-slope.
- Place bag on 6 inch thick bed of gravel or bed of wooden pallets to allow more rapid dewatering.

.Dewatering Dirt Bag

.12 Silt Fence (SF)
- Silt fences are used to prevent sediment carried by sheet flow from leaving the construction site by slowing storm water runoff and allowing settlement of soil particles. Areas directly upstream of silt fences are often prone to flooding due to the reduced flow rate through the silt fence, therefore special consideration should be given to fence placement. Silt fence shall not be installed in areas of concentrated flow such as swales or streams.
- All silt fence shall be installed in 2 parallel rows, 2 feet apart.
- The 2 foot zone between silt fence rows shall be covered in 6 inches of loose straw.
• Sediment buildup at silt fences shall be removed when sediment reaches one-half of the height of the fabric.
• Fence posts shall be “T” shaped with minimum weight of 1.3 lbs. /ft.
• Silt fence- type A
• Type A is used in locations of high flow and is supported by wire reinforcement.
• Type A silt fence is reinforced with either galvanized steel:
  o 12 gauge “hog wire” with small openings oriented at the base of the silt fence.
  o 14 gauge 4”x4” wire mesh size, W1.4/1.4

17.9 CONSTRUCTION COMPACTION REMEDIATION

17.9.1 Prior to distributing any topsoil and/or beginning installation of any landscape materials (plantings, trees, shrubs, sod, seed, etc.), the installer shall visit the site and

17.9.1.1 Perform percolation (perk) tests. Installer should never assume good soil drainage. The soil should not be excessively dry or saturated when this test is performed. With a shovel or posthole digger, dig hole(s) 18” to 24” deep and a minimum of 4” wide. The diameter of the hole should be uniform from top to bottom. Fill with water and let stand for at least one hour to pre-wet the soil. Refill the hole to within an inch of the top without overflowing the hole. Place a stick or board across the top of the hole and use a ruler or measuring tape to record periodic drops in water level. Monitor water in the hole every 15 minutes. Allow the hole to drain for at least one hour. A longer period of time (2 to 3 hours will give a more accurate reading of average percolation rates. Water in hole should drain at a rate of 1” or more per hour.

17.9.1.2 Perform deep preparation work if soil does not pass the perk test. Turn existing soil over to a depth of 2'-3' or to a depth that results in drainage meeting the perk test minimum using forks on a skid-steer tractor, mini-excavator, or other equipment deemed appropriate. Take extreme care around utilities. Smooth soil and confirm adequacy of preparatory work with additional perk tests prior to adding topsoil. The topsoil should not be placed wet or on a wet subgrade, as this will add to the compaction problem. Once the topsoil is placed, all construction traffic should be kept off of the area.

17.9.1.3 Verify surface drainage patterns per plans.

17.9.1.4 Soil under large trees to remain should not require remediation if proper tree protection measures have been followed. If, however, the soil under large trees has been compacted by construction activities, landscape installer is required to de-compact the soil using an air-spade and employ other remedial measures based on the recommendations of the Project Manager.
Section 18 - SITE IMPROVEMENTS

18.1 ROADWAYS/PARKING AREAS

18.1.1 In accordance with UFC 3-201-01, Civil Engineering and UFC 3-250-01FA, Pavement Design for Roads, Streets, Walks, and Open Storage Areas

18.1.2 Roadways, parking areas/lots, service courts, including subgrade and related work, shall be designed by a Professional Engineer licensed in Ohio

18.1.3 Provide Ohio Department of Transportation (ODOT) standard pavement material specifications designed for specific soil conditions and anticipated loading.

18.1.4 Rigid pavements or composite pavements with a rigid overlay are required for the following areas:

18.1.4.1 Vehicle Maintenance Areas.

18.1.4.2 Pavements for All Vehicles with Non-pneumatic tires.

18.1.4.3 Open Storage Areas with Materials Having Non-pneumatic Loadings in Excess of 200 psi.

18.1.4.4 Covered Storage Areas.

18.1.4.5 Organizational Vehicle Parking Areas.

18.1.4.6 Pavements Supporting Tracked Vehicles.

18.1.4.7 Vehicle Wash Racks.

18.1.4.8 Vehicle Fueling Pads.

18.1.5 Except for architectural or special operational requirements, all other pavements will be designed based upon life-cycle cost analysis.

18.1.6 Street and parking lot layouts shall comply with Manual on Uniform Traffic Control Devices (MUTCD).

18.1.7 Routes to ADA accessible locations (i.e. handicapped parking, drop off locations, building entrances, etc.) shall be maintained or alternate routes shall be provided

18.1.8 Depressions and Abutments to existing pavement shall be prepared by cutting out the pavement to below the base layer. The base shall be repaired and compacted. Tack the edges of asphalt to join the new pavement with the old.

18.1.9 All parking bump blocks must be pinned each end 5/8 inches minimum steel pins.

18.1.10 Locate all utilities on drawings.

18.1.11 Contract documents shall specify contractor to mark all utilities on site before any excavation.

18.1.12 Coordinate all pavement marking colors.

18.1.13 Provide a concrete collar/apron: minimum 3 feet from edge of casting. Concrete shall be a minimum of 4 inches thick, 5000 psi, with epoxy coated rebar.

EPOXY COATED REBAR
18.1.14 Catch basin shall be minimum 4 square feet drainage opening.

18.1.15 All drainage grating should be AASHTO H-20 rated. Bicycle proof grates are required.

18.1.16 Parking area surfaces should have a minimum slope of 2 percent (2’ per 100’). They should be constructed so water does not accumulate at the pavement edge. An underdrain system may be required to carry water away from the pavement structure.

18.1.17 Seal coating requires 2 coat minimum, first coat to be squeegee. Proven sustainable seal coating is preferred.

18.1.18 All pavement joints shall be detailed on civil drawings.

18.1.19 No asphalt curbs or sidewalks.

18.1.20 Parking spaces shall be permanently marked with striping in accordance with all federal, and state Standards. As a minimum, lines shall be located along the sides and, unless curbing is present, at the head of parking stalls. Lines shall be four (4) inches wide and should extend the full length of the space.

18.1.21 Handicap Parking Space Markings shall be painted Blue with white lettering.
18.1.22 "YIELD" markings shall be painted in yellow letters a minimum of 36" high at the end of each parking row as it intersects either a drive lane or another parking row that has priority flow for traffic.

YIELD MARKINGS AND YELLOW STRIPING

18.1.23 Striping

18.1.23.1 Striping shall be one consistent color, semi-permanent, reflective traffic paint with reflective glass beads to enhance visibility.

18.1.23.2 Parking spaces will be striped white except at the end of each row of parking or at handicapped accessible aisles. These lines will be painted yellow. All cross walks, no parking areas and access walks will be striped in yellow.

18.1.23.3 Parking spaces are a minimum of 10’ wide from center of stripe to center of stripe, by a minimum 20’ deep. All lines must be 4” wide.

18.2 WALKS

18.2.1 In accordance with UFC 3-250-01FA, Pavement Design for Roads, Streets, Walks, and Open Storage Areas

18.2.2 Typical width shall be 6 feet for minor walks and 8 feet for major walks

18.2.3 Concrete Walks

18.2.3.1 Minimum of six (6) inches thick with welded wire fabric over 4 inches of compacted gravel base over a compacted soil sub-base

18.2.3.2 Subgrade conditions must be considered during design of walks

18.2.3.3 Light broom finish perpendicular to traffic flow

18.2.3.4 Joints shall be tooled. No saw cut joints allowed

18.2.3.5 No fibrous mesh

18.2.3.6 No stamped or patterned concrete
18.2.3.7 Where required by ADA, Tactile paving (also called truncated domes, detectable warnings, Tactile Ground Surface Indicators, detectable warning surfaces) is a system of textured ground surface indicator found on footpaths, stairs, and curb ramps to assist pedestrians who are blind or visually impaired shall meet the following requirements:

**Tactile Warning System**

18.3 TRASH AND RECYCLING DUMPSTERS

18.3.1 A standard outdoor service area consists of at least two trash dumpsters.

18.3.2 Dumpster enclosures shall be located as required by DoD Minimum Antiterrorism Standards for Buildings. Paved access for staff to deposit waste and vehicle access by a minimum 20 cubic yard front load refuse truck (or service vehicle determined by the Project Manager) shall be considered in the location. Provide turn around route or access without creating a traffic hazard. Allow for overhead clearance of 25 feet at the loading point. Locations shall reduce the visual impact of the dumpster. Masonry screening shall be provided for each location. Lockable Gates are required.

18.3.3 Front end load dumpsters shall be used where space permits. A minimum of (dumpster width plus 6’) x 15’ shall be allotted for each front end load dumpster. No less than 3’ shall be provided in front of any trash or recycle container.

18.3.4 Provide heavy duty grade paving for the route that the refuse truck will take to service the dumpster. A reinforced concrete pad shall be installed under and in front of each container to prevent damage from the front wheels of the vehicle.

18.3.5 Provide signage and striping as required to ensure adequate access to waste and recycling area.
18.4 LANDSCAPING (See Appendix E - Supplement Environmental Conditions)

18.4.1 Landscaping and plant materials shall be warranted for one year unless otherwise specified.
18.4.2 Sod shall be warranted for six months after final acceptance of landscaping.
18.4.3 Landscape design shall strive to minimize the visual impact of transformers, switches, panels, traffic signal cabinets, dumpsters, and other exterior equipment.
18.4.4 Landscape A/E shall coordinate plant placement, particularly trees, with lighting pole placement and security cameras (existing and future).
18.4.5 Retaining walls shall be poured in place unless site conditions require other methods be used.
18.4.6 Landscaping and irrigation plans shall be reviewed and approved by the Project Manager.
18.4.7 Landscaping and irrigation plans shall be included in design package and any estimate for the project.
18.4.8 Designs shall provide for irrigation water service taps, including meter and backflow preventer, installed upstream of building domestic water meter. The meter shall be provided by the Contractor.
18.4.9 Plant material selections must be made from stock indigenous to the specific locations where it will be placed. Plant lists shall contain both common and technical names, quantities, and plant delivery method (B&B, bare roots, etc.).

18.4.10 Lawns (See Appendix E - Supplement Environmental Conditions)

18.4.10.1 Permanent lawns shall be sodded. Seeding is allowed only for temporary purposes.
18.4.10.2 The areas to be grassed shall be held down 4” below finished grade prior to sodding.
18.4.10.3 Fertilizer shall be a commercial fertilizer delivered in unopened original containers each bearing the manufacturer's guaranteed analysis. Any fertilizer which comes caked or otherwise damaged shall not be accepted. Fertilizer selection and application rate shall be determined by soil analysis. Lime shall be granulated agricultural limestone applied at a rate according to soil sample analysis. Apply fertilizer uniformly at specified rate with an approved distributor prior to seeding. Fertilizer shall be worked into the top three to four inches of the soil.
18.4.10.4 Mulch for seeded areas shall be weed-free grain straw. Quantity shall be 3,300 pounds per acre (approximately 75 pounds per 1000 square feet) or 65 bales per acre (1-1/2 bales per 1000 square feet).
18.4.10.5 Cultivation average shall be a 4” deep layer of topsoil after scarification to a depth of 6” minimum. Pulverize the soil with a roller type pulverizer with 4” tines. Hand rake the soil to level and remove loose stones and other debris leaving a smooth friable condition suitable for sodding.
18.4.10.6 All seeding shall be conducted with moist but not wet soil and broadcasted by means which will ensure uniform distribution and thorough coverage of the entire area. Areas which do not show a prompt "catch" or have been washed shall be reseeded for thorough coverage.

18.4.11 Maintenance

18.4.11.1 Installed landscaping shall be maintained until final acceptance of the landscaping.
18.4.11.2 Sodded areas shall be sufficiently irrigated to maintain a continually moist condition.
18.4.11.3 Mowing operations shall be conducted to keep the lawn in a neat and well-groomed appearance. The lawn shall only be cut when grass and soil are dry. Not more
than 1/3 of the total leaf surface is to be removed at one mowing. It is not necessary to remove clippings if grass is mowed according to these specifications.

18.4.11.4 General maintenance by the Owner, after final acceptance, shall not void the warranty.

18.4.11.5 Soil analysis, seed and fertilizer data, and instructions for planting and care of the lawn shall be submitted to the Project Manager.

18.5 SIGNAGE (In accordance with UFC 3-120-01) AND PAVEMENT MARKINGS

18.5.1 Permanent and temporary traffic regulatory signage and pavement markings shall meet the requirements of MUTCD.

18.5.2 Wayfinding and information signage shall comply with the OHARNG’s Requirements.

18.5.3 Temporary signage must have label affixed to the rear of the sign as follows:

Contractor:__________________________________________ Phone:____________________________
Project:_____________________________________________________________________________
Date Installed:________________________________________________________________________

Date to be Removed:____________________________________________________________________

18.5.4 Pavement markings shall be as follows:

<table>
<thead>
<tr>
<th></th>
<th>Non-Reflective Traffic Rated Paint</th>
<th>Reflective Traffic Rated Paint</th>
<th>Reflective Thermo-Plastic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major Roads</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Minor Roads</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Parking Lots</td>
<td></td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>
18.5.5 Project Identification Signage:

All construction projects require the Contractor to display an official construction sign on the site, in a prominent location, prior to initiating work. Sign must be maintained throughout the life of the project. Upon completion of the project, remove the sign from the site. Construction signs must conform to the following:

18.5.5.1 The sign shall be constructed of a durable, weather resistant material, properly and securely framed and mounted.

18.5.5.2 Signs shall be white with black lettering.

18.5.5.3 Signs shall be mounted at least four (4) feet above the ground.

18.5.5.4 Signs shall include the name of the architect and general contractor and shall contain an artist’s rendering or photograph of the model of the building(s)/site under construction.

18.5.5.5 Signs at a Sustainment, Restoration and/or Modernization project shall include the name of the architect and/or engineers for the major systems work (i.e. structural, mechanical, electrical), if appropriate. In addition, the sign shall include the name of the general contractor.

18.5.6 Rendering

18.5.6.1 Provide the project rendering in accordance with the following:

.1 Preliminary One Line Drawings: Provide three different views of the facility in a preliminary single line drawing (black and white), format. These three views will represent the best angles at which to view the proposed facility and the three dimensional character of the facility.

.2 Provide a photographic copy (8 by 10 inches minimum size) of the final rendering for approval of color, landscaping, and foreground/background development prior to final submittal.
18.5.6.2 Provide final full color rendering of the proposed facility (minimum 36 by 48 inches). Below is a sample.

18.5.7 Facility Recognition Plaque

18.5.7.1 Submit full size drawing of Facility Recognition Plaque for approval. Contractor shall confirm the content (message), location and mounting with the Project Manager prior to fabrication. The names on the plaque shall be determined at the end of the project duration to assure that current participants can be identified and recognized on the plaque.

18.6 FENCING

18.6.1 Fencing shall conform to UFC 4-022-03 Security Fences and Gates

18.6.2 CHAIN-LINK FABRIC

18.6.2.1 Steel Chain Link Fabric:

.1 Fabric shall be Class 1, with 1.2 ounces of zinc coating per square meter foot.

.2 Fabricate fence fabric of 9 gauge wire woven in 2 inch mesh conforming to ASTM A116.

.3 Fabric height at a minimum must be 6 feet for controlled areas and 7 feet for restricted areas.

.4 Fabric shall be twisted and barbed on the top selvage and knuckled on the bottom selvage.
.5 Secure fabric to posts using stretcher bars or ties spaced 15 inches on center, or by integrally weaving to integral fastening loops of end, corner, pull, and gate posts for full length of each post.

.6 Install fabric on opposite side of posts from area being secured.

### 18.6.2.2 STEEL FENCE FRAMEWORK

<table>
<thead>
<tr>
<th>USE AND SECTION</th>
<th>STEEL POST SCHEDULE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>FABRIC WIDTH 72&quot; OR LESS</td>
</tr>
<tr>
<td>CORNER, END &amp; PULL POSTS</td>
<td></td>
</tr>
<tr>
<td>TUBULAR - ROUND</td>
<td>2.375&quot; O.D.</td>
</tr>
<tr>
<td>TUBULAR - SQUARE</td>
<td>2.00&quot; SQ.</td>
</tr>
<tr>
<td>C-SECTION (ROLL-FORMED)</td>
<td>3.50&quot; X 3.50&quot;</td>
</tr>
<tr>
<td>LINE POSTS</td>
<td></td>
</tr>
<tr>
<td>TUBULAR - ROUND</td>
<td>1.80&quot; O.D.</td>
</tr>
<tr>
<td>H-SECTION</td>
<td>2.25&quot; X 1.70&quot;</td>
</tr>
<tr>
<td>C-SECTION (ROLL-FORMED)</td>
<td>1.875&quot; X 1.625&quot;</td>
</tr>
<tr>
<td>TOP, BOTTOM &amp; BRACE RAILS</td>
<td></td>
</tr>
<tr>
<td>TUBULAR - ROUND</td>
<td>1.66&quot; O.D.</td>
</tr>
<tr>
<td>TUBULAR - SQUARE</td>
<td>1.50&quot; SQ.</td>
</tr>
<tr>
<td>H-SECTION</td>
<td>1.625&quot; X 1.50&quot;</td>
</tr>
<tr>
<td>C-SECTION (ROLL-FORMED)</td>
<td>1.625&quot; X 1.25&quot;</td>
</tr>
</tbody>
</table>

### 18.6.3 BRACES AND RAILS

Note: Top rails shall not be specified, top tension wire shall be used. Bottom tension wire shall be specified for fence in controlled areas, and a bottom rail shall be specified for high security fence (restricted area).

Note: Use a single diagonal truss rod for fences less than 12 feet high.

### 18.6.4 TENSION WIRE

18.6.4.1 Metallic Coated Steel Marcelled Tension Wire: 7 gauge marcelled wire.

18.6.4.2 Type II Zinc-Coated Class 5 – 2.0 oz. /ft2

18.6.4.3 Class 2a, extruded and adhered

### 18.6.5 BARBED WIRE

18.6.5.1 Metallic Coated Steel Barbed Wire: Double 12-1/2 gauge twisted strand wire, with 4 point 14 gauge round barbs spaced 5 inches on center.

18.6.5.2 Coating type Z – Zinc-coated: Strand wire coating Type Z, Class 3, 0.80 oz. /ft2, barb coating 0.70 oz. /ft2.

18.6.5.3 Class 2 – 2.0 oz. /ft2

18.6.5.4 Class 2a extruded and adhered

18.6.5.5 Fabric selvage: Standard fabric selvage for 2 inch mesh 72 inch high and over is knuckle finish at one end, twist at the other, K&T. Fabric less than 72 inch knuckle finish top and bottom.

### 18.6.6 FITTINGS

18.6.6.1 Tension and Brace Bands: Galvanized pressed steel, minimum steel thickness of 12 gauge, minimum width of ¾ inch and minimum zinc coating of 1.20 oz./ft2. Bands supplied with 5/16 inch or 3/8 inch galvanized steel carriage bolts.

18.6.6.2 Terminal Post Caps, Line Post Loop tops, Rail and Brace Ends, boulevard Clamps, Rail Sleeves: Pressed steel galvanized after fabrication having a minimum zinc coating of 1.20 oz./ft2.
18.6.3 Truss Rod Assembly: 3/8 inch diameter steel truss rod with a pressed tighten’er, minimum zinc coating of 1.2 oz./ft², assembly capable of withstanding a tension of 2,000 lbs.

18.6.4 Tension Bars: galvanized steel one-piece length 2 inch less than the fabric height. Minimum zinc coating 1.2 oz./ft².

18.6.5 Bars for 2 in. and 1 ¾ inch mesh shall have a minimum cross section of 3/16 inch.

18.6.6 Bars for 1 inch mesh shall have a cross section of ¼ inch by 3/16 inch.

18.6.7 Bars for small mesh 3/8 inch, ½ inch, and 5/8 inch shall be attached (sandwiched) to the terminal post using a galvanized steel strap having a minimum cross section of 2 inch by 3/16 inch with holes spaced 15 inch on center to accommodate 5/16 inch carriage bolts which are to be thru bolted thru the strap the mesh and thru the terminal post.

18.6.8 Barbed Wire Arms: In compliance with ASTM F626, pressed steel galvanized after fabrication, minimum zinc coating of 1.20 oz./ft², capable of supporting a vertical 250 lb. load. Type I – three strand 45 degree arm Polymer Coated Color Fittings: Polymer coating minimum thickness 0.006 inches fused and adhered to zinc coated fittings and match color to fence system.

18.6.7 4.7 TIE WIRE AND HOG RINGS

18.6.7.1 Tie Wire and Hog Rings: Galvanized minimum zinc coating 1.20 oz./ft² 9 gauge steel wire. Polymer coated; match the coating, class and color to that of the chain link fabric.

18.6.8 4.8 SWING GATES

18.6.8.1 Swing Gates: Galvanized steel welded fabrication. Gate frame member’s 1.900 inch OD (choice one) Group IA F1083 schedule 40 pipe or Group IC pipe. Frame members spaced no greater than 8 feet apart vertically and horizontally. Welded joints protected by applying zinc-rich paint. Positive locking gate latch fabricated of 4/16 inch thick by 1 ¾ inch pressed steel galvanized after fabrication. Galvanized malleable iron or heavy gauge pressed steel post and frame hinges. Match gate fabric to that of the fence system. Polymer coated gate frames and gateposts; match the coating type and color to that specified for the fence framework. Moveable parts such as hinges, latches and drop rods may be field coated using a liquid polymer touch up.
SWING GATE

PLAN - DOUBLE SWING GATE

SCALE: 1" = 1'-0"

1/8" THREADED ROD
BRAKE RAILS

TOP HINGE OR TENSION WIRE
POST CAP

GATE HINGE WITH
OPPOSING HINGE PINS

FRAME (TOP CAP)

CHAIN LINK RACING (TYPICAL)

GATE HINGE WITH
OPPOSING HINGE PINS

BRAKE WIRE AS REQUIRED.
SEE SHEET 195-01 FOR
DETAILS

LIVE POST

TYPICAL DOUBLE SWING GATE ELEVATION
**DETAIL: DROP BAR**

*NOT TO SCALE*

<table>
<thead>
<tr>
<th>SINGLE OR DOUBLE LEAF GATES</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOM HEIGHT (H)</td>
</tr>
<tr>
<td>NOM HT INCLUDING BRIEDED WIRE</td>
</tr>
<tr>
<td>8'-0&quot; [2438MM]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SINGLE LEAF GATES</th>
</tr>
</thead>
<tbody>
<tr>
<td>OPENING</td>
</tr>
<tr>
<td>FACE TO FACE</td>
</tr>
<tr>
<td>3'-0&quot; [914MM] THROUGH 6'-0&quot; [1829MM]</td>
</tr>
<tr>
<td>6'-0&quot; [1829MM] THROUGH 12'-0&quot; [3657MM]</td>
</tr>
<tr>
<td>19'-0&quot; [5790MM] THROUGH 23'-0&quot; [7010MM]</td>
</tr>
</tbody>
</table>

**GATE POSTS & FOUNDATIONS:** GATE POST SIZE AND ASSOCIATED FOOTING DIAMETER TO BE DETERMINED BY MANUFACTURER BASED ON LEAF WEIGHT & DIMENSION, BUT NOT LESS THAN DIAMETER SHOWN ON THESE DRAWINGS. MINIMUM FOOTING DIAMETERS (TO BE FILLED W/4000 PSI CONC): 40" Ø FOR 8" POST; 36" Ø FOR 6" POST; 24" Ø FOR 4" POST. OTHER SIZES TO BE DESIGNED BY MFR OR KT. NO FOOTING WIDTH SHALL BE LESS THAN 4X THE POST WIDTH.

**NOTE:** IF GATE HINGES ARE NOT OPPOSING (AS SHOWN ABOVE) OR LEAF IS NOT LOCKED MECHANICALLY TO THE HINGES, WELD AN ANGLE, PLATE, OR BLOCK ABOVE HINGE TO RESTRICT LEAF FROM BEING REMOVED OR LIFTED OFF. RESTRICTION SHALL NOT HINDER OPERATION OF GATE.
18.6.9 HORIZONTAL SLIDE GATES

18.6.9.1 4.9.1 Overhead Slide Gates: Gate framing to be of welded construction, minimum 1.900 inch OD pipe members. (chose one) Group IA ASTM F 1083 Schedule 40 pipe or Group IC pipe. Framing members to be spaced no more than 8 feet apart horizontally and vertically. Welded joints are to be protected by applying zinc-rich paint in accordance with ASTM Practice A780. Positive locking latch, 5/16 inch thick by 1 ¾ inch pressed steel, galvanized after fabrication. Galvanized steel drop bars to be provided with double gates. Chain link fabric to match the fence system. Manufacturer's standard overhead beam/structure, track, rollers and accessories design to support the load of the gate panel taking into consideration wind load and possible icing. The support beam/structure to be galvanized or receive proper corrosion protection.

18.6.9.2 4.9.1.1 Cantilever Slide Gates: In compliance with ASTM F1184 Type II.

18.6.9.3 4.9.1.2 Class 1-External Roller Design: Horizontal top and bottom steel pipe “track” members to be 2.375 inch OD, vertical and internal members 1.900 inch O.D. in compliance with Group IA 1083 Schedule 40 pipe. Gate frame to be fabricated by welding, vertical and horizontal members located no greater than 8 feet apart. The length of back frame support section shall be a minimum of 40% of the opening. Welded joints are to be protected by applying zinc-rich paint in accordance with ASTM Practice A780. Gates designed to open or close by applying an initial pull force no greater 40 lbs. Match chain link fabric to that of the fence system. Positive locking latch fabricated galvanized pressed steel. Galvanized steel drop bars provided with double gates. Gateposts, 4.000 inch OD Group IA Schedule 40 pipe. Provide safety protective guards for the top and bottom external rollers.

18.6.9.4 4.9.1.3 Class 2-Internal Roller Design: Select material: (chose one) aluminum alloy extrusion or Group IA, Schedule 40 pipe, or Group IC pipe. Gate frame fabricated by welding, vertical and horizontal members located no greater than 8 feet apart. The length of back frame support section shall be minimum of 40% of the opening. Class cantilever slide gates to comply with the performance deflection criteria. Gates designed to open or close by applying an initial pull force no greater than 40 lbs. Internal truck assemblies designed to handle the forces required for gate size opening and height. Match chain link fabric to that of the fence system. Gateposts, 4.000 inch OD (chose one) Group IA schedule 40 pipe or Group IC pipe.
DESIGN & CONSTRUCTION STANDARDS

TYPICAL SINGLE CANTILEVERED SLIDING GATE ELEVATION- (4) BAYS SHOWN

<table>
<thead>
<tr>
<th>OPENING (F/T)</th>
<th>NOMINAL HEIGHT (H)</th>
<th>LENGTH (L)</th>
<th>GATE POSTS (G)</th>
<th>BAYS / OVERHANG</th>
</tr>
</thead>
<tbody>
<tr>
<td>30'-0&quot;</td>
<td>8'-0&quot;</td>
<td>42'-3&quot;</td>
<td>12'-0&quot;</td>
<td>4 (FABRIC) / 2 (W/O)</td>
</tr>
<tr>
<td>24'-0&quot;</td>
<td>8'-0&quot;</td>
<td>36'-3&quot;</td>
<td>12'-0&quot;</td>
<td>3 (FABRIC) / 2 (W/O)</td>
</tr>
</tbody>
</table>
18.6.10 CONCRETE

18.6.10.1 Concrete for post footings shall meet ASTM C94/C94M, using ¾ inch maximum size aggregate, and having a minimum compressive strength of 3000 psi at 28 days. Grout shall consist of one part Portland cement to three parts clean, well-graded sand and the minimum amount of water to produce a workable mix.
ROUND POST

9-GAGE STEEL TIE WIRE (15" O.C. MAX. AND WITHIN 4" FROM TOP AND BOTTOM OF FABRIC)

GROUNDING DETAIL

TENSION BAND (15" O.C. MAX. AND WITHIN 4" FROM TOP AND BOTTOM OF FABRIC)

TENSION BAR TO ENGAGE EACH FABRIC LINK

END OR GATE POST DETAIL

BARBED WIRE OR TENSION WIRE

TENSION BAND DETAIL
18.7 LOADING RAMP
ANCHOR LAYOUT FOR FRONT EMBEDDED ANGLE

ANGLE 3" X 3" X 1/4" X "0"

SURFACE MUST BE FLAT WITHIN 1/8" AFTER WELDING.

45°
TYP

1/8" DIA. X 6" L.G
HEADED STUDS

STUD DETAIL

GALVANIZED STEEL 1 1/2" DIA. RAIL & POST
EMBED RAIL POSTS 4" MIN. (TYP.)

FOUR 3/4" BOLT SET IN CONCRETE (TYP.)

CONTRACTOR SHALL FURNISH AND INSTALL INDEPENDENT CHAIN WITH HOOKS AND FASTENERS AT THE END OF EACH RAMP.

INSTALL 8 LAMINATED DOCK BUMPERS AT LOCATIONS AS SPECIFIED PER MANUFACTURER'S RECOMMENDATION (3 PER DOCK POSITION)

CONCRETE LOADING RAMP DETAIL
Section 19 - LIQUID AND GAS SITE UTILITIES

19.1 GENERAL

19.1.1 In accordance with UFC 3-430-05FA Gas Distribution

19.1.2 Utility infrastructure connections shall be coordinated with the Project Manager.

19.1.3 Above ground utility appurtenances located in planting beds shall be one inch (1") above the landscaped surface. Above ground utility appurtenances located in lawn areas shall be flush to one inch (1") below the landscaped surface.

19.1.4 Tracer wire is required for all underground utilities.

19.1.5 Do not backfill utility trenches until approved by the Project Manager.

19.1.6 Survey grade as-builts shall be provided by the contractor including boring coordinates of trenchless installed utilities.

19.1.7 Buried Piping

19.1.7.1 Provide a minimum of 18" vertical and horizontal clearance between utilities.

19.1.8 Utility Trench Bedding and Backfill

19.1.8.1 See Natural Gas Backfill Section of this document for backfill requirements for gas lines.

19.1.8.2 The following requirements apply to potable water, fire, sanitary sewer, and storm sewer lines.

.1 Bedding Materials:
.2 Where trenches are excavated in soil, bedding material shall be #57 stone to a depth of approximately 4" under barrel of pipe.
.3 Where trenches are excavated in rock, bedding material shall be #57 stone, placed and compacted to a depth of approximately 6" under barrel of pipe.

19.1.8.3 Backfill Materials

.1 Where trenches are excavated in soil, backfill material shall be #57 stone to ½ the diameter of the pipe, then the remainder shall be placed and compacted in suitable soil.
.2 #57 stone shall be used for backfill in the following trenched locations:
   • In rock to a depth of 12 inches above the top of the pipe
   • Under paved areas
   • Beneath footings and slabs
   • At utility crossings to a depth of 12” above the highest pipe.

19.1.9 General Utility Testing Requirements

19.1.9.1 The Project Manager shall be notified a minimum of 48 hours prior to any testing.

19.1.9.2 The contractor is solely responsible for safety during any and all testing.

19.1.9.3 The results of all tests shall be provided to the A/E and the Project Manager.

19.2 POTABLE WATER DISTRIBUTION SYSTEM

19.2.1 Materials

19.2.1.1 Piping and Fittings

.1 All piping 3" and smaller shall be Copper.
.2 All piping 4" and larger shall be ductile iron.
.3 Copper pipe 1" or smaller shall be soft annealed type K.
.4 Copper pipe 1-1/2" or larger shall be rigid type K.
.5 Couplings for copper pipe shall be crimping type rings Rigid Pro-Press system or approved equal, solid brass conductive union couplings Mueller 110 series or silver brazed, or approved equal.

.6 Ductile iron pipe and fittings shall be cement mortar lined per ANSI/AWWA A21.4/C104. Ductile iron pipe shall also be furnished with outside asphaltic coating of 1 mil thickness per ANSI/AWWA A21.51/C151.

.7 All ductile iron pipe and fittings shall have a minimum pressure class rating of 350.

.8 Joints for ductile iron pipe to be installed underground shall be “Push-on” joint pipe per ANSI/AWWA A21.11-07/C111.

.9 Gaskets for “Push-on” joint pipe shall be Styrene Butadiene Rubber locking type with high strength stainless steel wedges equally spaced around the gasket for full restraint per ANSI/AWWA A21.11-06/C111.

.10 Joints for ductile iron pipe to be installed above ground shall be “Flanged” joint per ANSI/AWWA A21.10-08, A21.15-05/C110, and C115.

.11 Gaskets for “Flanged” joint pipe shall be Styrene Butadiene Rubber per ANSI/AWWA A21.11-06/C111.

.12 Hardware for “Flanged” joint pipe shall be hexagonal type per ASTM A307-10, Grade B.

.13 All below grade ductile iron fittings and valves shall be restrained by use of bolted restraint device.

.14 All mechanical joint fittings requiring thrust blocks shall be wrapped in plastic prior to installation of concrete.

.15 All new water mains shall include underground warning tape placed 1’ above pipe during pipe backfill operations. Warning tape shall be non-conductive Poly 3” wide with 1” lettering 4 mils thick. Warning tape shall conform to APWA uniform color codes and shall read "BURIED WATER LINE".

19.2.1.2 Valves

.1 All gate valves shall have a minimum pressure class rating of 250 with iron- body, bronze mounted, inside-screw, resilient seat, and non-rising stem and equipped with rubber O-ring seals at the top of the stems.

.2 Gate valve bodies shall have mechanical joints for use below grade or flanged joints for above grade applications. 2” gate valves installed in vaults shall be standard threaded NPT connections.

.3 Mechanical joint gate valves shall be manufactured per AWWA C515

.4 Flanged joint gate valves shall be manufactured per ANSI A21.15

.5 Valves 2” and larger installed below grade shall have a 2” square valve operating nut and turn left or counter-clockwise to open.

.6 All valves and valve extensions shall terminate within 2’ of finished grade.

.7 A valve jar shall be provided from valve housing to finish grade.

.8 Valves installed above grade shall have hand wheels.

.9 Automatic air release valves shall be combination type, single body, double orifice with large orifice having a diameter of 2” and small orifice having a diameter of 3/32”. Valve body and cover shall be cast iron per ASTM A48, Class 30. Float shall be stainless steel per ASTM A240. Air release valves shall be installed in a precast concrete manhole with a standard cover.

.10 Backflow prevention devices shall be reduced pressure zone type per AWWA C511-92. Watts Water Technologies model 909 or approved equal for ¾” to 10” devices.

.11 Backflow prevention devices shall be installed in mechanical rooms or other above grade locations. If an above grade option does not exist, provide double check backflow preventer in compliance with AWWA C510. Watts Water Technologies model 007 for devices ½” to 3” and model 709 for devices 4” to 10” or approved equal. See Appendix A for details.

.12 Enclosures for Reduced Pressure Zone backflow preventers installed above grade shall be heated.
13 Double check backflow preventers should be installed below grade in a meter box or vault.

19.2.1.3 Valve Boxes

1 Valve boxes shall be two piece adjustable screw type asphalt coated with an inside diameter of 5 1/4”.

2 Valve box lid shall be cast iron drop in non-locking type imprinted with “Water” on the top.

3 The following general note shall be added to plans that include installation of a valve box. Valve box risers shall be cast iron and shall conform to that of valve box top section and shall be used in appropriate heights to adapt to changing landscapes.

4 Valve Boxes shall have a pre-cast concrete collar in landscaped areas and poured-in-place concrete collars in paved areas.

5 Pre-cast concrete collars shall be 4000 psi with 24” outside diameter with a 10” inside diameter center hole.

6 Poured-in-place concrete collars shall be 4000 psi 24”x 24” square with inside hole sized to fit valve box.

19.2.1.4 Hydrants

1 Hydrants shall be 3 nozzle type in compliance with AWWA C502.

2 All fire hydrant assemblies shall include isolation valves.

3 The following general note shall be added to plans that include installation of a hydrant. Fire hydrant extensions shall be used to bring hydrants up to grade.

4 Extensions shall be by the same manufacturer as the hydrant. No more than 1 extension riser per hydrant set.

5 Hydrant anchoring system is to be designed by the engineer.

6 Anchoring shall be accomplished by one of the following methods:
   - EBBA Iron MEGA LUG series for ductile iron or approved equal
   - Roding via the use of stainless steel all-thread rod. At a minimum, all-thread rod shall be 3/4” diameter, 18-8 stainless steel.

7 Concrete braces shall be used in all new fire hydrant sets.

8 Concrete braces shall not block hydrant weep holes.

19.2.1.5 Meters

1 All meters shall be provided by Contractor.

2 Provide a strainer and bypass piping system sufficient to sustain water service during meter outage.

3 Meter boxes for 1 1/2” and smaller meters shall be high density reinforced concrete meter box with non-settling shoulders with a high-density, RF transparent, plastic lid.

4 Meter vaults for 2” and larger meters shall be pre-cast or poured-in-place vaults which house meter assemblies and backflow prevention valves centered about the vault. Vaults shall have a locking aluminum traffic rated lid.

19.2.2 General Location/Installation Requirements

19.2.2.1 Valves
.1 All service lines off the main shall have an isolation valve.
.2 All 2" or larger service lines must include a tri-valve arrangement.

19.2.2.2 Hydrants
.1 Location and quantity of hydrants for individual projects shall be coordinated with Project Manager.
.2 Fire hydrant shall be no more than 100 feet from fire department connection.
.3 Fire hydrants shall be installed plumb and such that nozzles are approximately 18" above finished grade.

19.2.2.3 Meters
.1 All new service lines on site shall have a water meter.
.2 All meters shall be located in mechanical rooms with lockable bypasses.
.3 A minimum 2' horizontal and 2' vertical clearance is required around all meters installed inside mechanical rooms.

19.2.2.4 Backflow Devices
.1 All backflow prevention devices shall be located in mechanical rooms with lockable bypasses.
.2 A minimum 2' horizontal and 2' vertical clearance is required around all backflow devices installed inside mechanical rooms.

19.2.2.5 Post Indicator Valves are required on all fire service lines and shall be no less than 40 feet from the building.

19.2.3 Design Requirements

19.2.3.1 Piping
.1 Utilize acceptable pipe deflection as the preferred method for making vertical and horizontal bends in pipeline segments. The use of bends shall be limited as to not constrict water flow.
.2 Provide 4" minimum ductile iron pipe, valves, and fittings.
.3 No potable water main or fire main shall have any structure, temporary or permanent, built over the top of it unless approved by Project Manager.
.4 All domestic and fire lines shall be to be flushed, chlorinated and tested.
.5 Pre-construction fire flow testing shall be performed.

19.2.3.2 Valves
.1 Provide automatic air release valves directly over water mains in precast concrete manholes.
.2 Tap sleeve and valve connections shall be two sizes larger than the line to be added. Tapping sleeves for line sizes 4" to 24" shall be bolted split type having gaskets extending the entire length of the sleeves. Tapping sleeves shall be ductile iron conforming to the requirements of ANSI/AWWA A21.10/C110. Tap valves shall be Mueller model H-615 or approved equal.
.3 Service tap connections for lines 2 1/2" and smaller shall be ductile iron pipe service saddles with positively confined "O-Ring" type sealing gaskets conforming to the requirements of ANSI/AWWA A21.11/C111.
.4 The following general note shall be added to all plans which include a tap connection to the existing potable water system: The Contractor shall return all tap coupons to the Project Manager.

19.2.3.3 Fire Hydrants
.1 Review geotechnical report for the presence of impervious soils in the project area. In the event impervious soils are present a drainage pit 2' in diameter and 2' deep shall be excavated below each hydrant and filled compactly with coarse gravel or crushed stone under and around the hydrant foot and to a level 6" above hydrant weep holes.
.2 Provide isolation valves no more than 5' from fire hydrant.

19.2.3.4 Contractor shall provide water meter for installation by the contractor.
19.3 SANITARY SEWER SYSTEM (IN ACCORDANCE WITH UFC 3-240-08FA)

19.3.1 Tracer wire is required for all underground utilities.

19.3.2 Materials

19.3.2.1 Manholes

.1 Precast reinforced concrete manholes shall meet the requirements of ASTM C-478. Concrete shall have a minimum compressive strength of 4,000psi at 28 days. Cement shall be Type II with C3A content of 6.5% or less. Manhole connections for sewer piping smaller than 24” shall be accomplished through the use of flexible connectors, connections for sewer piping 24” or larger should be accomplished using mortar comprised of 1 part Portland Type II cement and 2 parts sand by volume.

.2 Manholes shall have interior surfaces coating of high-build glass-flake cementitious epoxy to dry film thickness of not less than 20 mils. Cementitious epoxy coating shall be PCS-9043 Type II, Permite Coatings, Coal Tar Epoxy coating or approved equal, to dry film thickness of not less than 30 mils or be impregnated with a concrete waterproofing cementitious crystalline admixture.

.3 Manhole base and riser sections shall be equipped with non-penetrating lifting inserts, Press-Seal Gasket Corporation or approved equal, and adhere to the following thicknesses:

- Floor Slab – Minimum 6-inch thick
- Walls – Minimum 4-inch thick

.4 Manhole cone section shall be eccentric type, equipped with non-penetrating lifting inserts, Press-Seal Gasket Corporation or approved equal, and be suitable for mounting cast iron manhole frames and covers as described below.

.5 Joints between manhole sections shall be offset tongue and groove type and shall utilize a pre-lubricated manhole gasket which meets the following requirements:

- Gasket shall consist of a compression section and a serrated mantel section which slides over the compression section as the manhole sections are placed together.
- Gasket shall meet the requirements of ASTM C 443.

.6 Manhole frames and covers shall be cast from gray iron meeting the requirements of ANSI A48-83, Class 30 or greater conforming to the following:

- All manhole covers shall be self-sealing type with non-penetrating pick holes.
- Frames and covers installed in open areas shall weigh not less than 290 lbs. Frames and covers subject to traffic shall be H 20 rated and shall weigh not less than 375 lbs.
- Covers shall be labeled “SANITARY SEWER”.

.7 Manhole steps shall conform to one of the following requirements:

- Gray Iron or Ductile Iron integrally cast into the manhole barrel, meeting the requirements of ANSI A48-83.
- Gray Iron or Ductile Iron equipped with inserts integrally cast into the manhole barrel having steps bolted on, meeting the requirements of ANSI A48-83.
- Copolymer polypropylene plastic, meeting the requirements of ASTM D 2146 reinforced with a ½” diameter deformed bar meeting the requirements of ASTM A 615.

.8 Manhole inverts shall be constructed of mortar comprised of 1 part Portland Type II cement and 2 parts sand by volume. Inverts should be hand troweled to a smooth finish. Top of invert shall be a minimum of 8” wide to allow crawler type camera accessibility. To accommodate for wider inverts manholes shall be designed and constructed utilizing 2 tenths of a foot (0.2’ or 2.4”) drop across each manhole or match crown at pipe size changes. In the event 2 tenths of a foot (0.2’ or 2.4”) drop across the manhole is not possible a 5’ diameter Type I base section shall be utilized and the top of the invert cannot be less than 8” wide.

.9 Turns in manholes that change the direction of flow shall not exceed ninety degrees.

.10 Incoming lines with inverts 24” or higher above the exiting invert shall have an exterior drop connection.
19.3.2.2 Piping and Fittings
.1 Ductile iron pipe and fittings shall be cement mortar lined with asphaltic seal coat in accordance with ANSI/AWWA A21.4/C104. Ductile iron pipe shall also be furnished with outside asphaltic coating of 1 mil thickness per ANSI/AWWA A21.51/C151. Pipe shall be installed such that the pipe bell is upstream of the pipe spigot.

19.3.3 Design Requirements

19.3.3.1 General
.1 Package Pumping/Lift Stations are not allowed.
.2 No sanitary sewer manhole, piping or fittings shall have any structure, temporary or permanent, built over the top of it.
.3 A/E shall provide verification that existing system capacity is compatible with the current proposed design.
.4 All new sanitary sewer lines shall be designed with the following minimum line sizes: Laterals 6” and Mains 8”.
.5 All new sanitary sewer lines shall be designed such that the velocity of the flow in the pipe shall not be less than 2 feet per second, nor exceed 10 feet per second.
.6 Sanitary sewer lines shall be a minimum of 18 inches below potable water lines.
.7 Sewer lines and manholes which are no longer in service shall be removed.

19.3.3.2 Sanitary Sewer Rehabilitation
.1 Acceptable rehabilitation methods include the following:
.2 Sanitary Sewer Lines: Cured-In-Place Pipe (CIPP) Lining Systems conforming to standards from the American Society for Testing and Materials, such as: ASTM F1216 (Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tubs), ASTM F1743 (Rehabilitation of Existing Pipelines and Conduits by Pulled-In-Place Installation of Cured-In-Place Thermosetting Resin Pipe (CIPP)), ASTM D5813 (Cured-In-Place Thermosetting Resin Sewer Pipe), ASTM D790 (Test Methods for Flexural Properties of Un-Reinforced and Reinforced Plastics and Electrical Insulating Materials), and D2990 (Tensile, Compressive, and Flexural Creep and Creep-Rupture of Plastics)
.3 Sanitary Sewer Manholes: Cementous Fiber-Reinforced Structural Monolithic Manhole Lining System.
NEW SANITARY SEWER MANHOLE

SOLID INDENTED COVER
NOTE: PROVIDE CONCEALED LIFTING HOLES IN COVER.

TO BE LETTERED "SANITARY SEWER"

MANHOLE FRAME & COVER
DIA. CLEAR OPENING 1'-9 1/2"
DIA. COVER 1'-11"

MANHOLE IN LANDSCAPED AREAS

MANHOLE STEPS

INTERIOR COATING

FILL SOLID WITH CONC. TO FORM BENCH, SLOPE BENCH 2" FROM INSIDE FACE OF CHANNEL

12" COMPACTED CRUSHED STONE BASE CHOKED WITH FINES, UNLESS OTHERWISE NOTED

SECTION

"O" RING GASKET

THIS STEP ONLY ON MANHOLES EXCEEDING 6'-0" IN DEPTH. 8" BELOW CONE SECTION

STANDARD PRE-CAST CONCRETE 48" DIA. MANHOLE SECTION & BASE

PRE-CAST FLEXIBLE GASKETED JOINT 4" THROUGH 20" PIPE SIZES
MANHOLE FRAME AND COVER

NOTE:
SANITARY SEWER MANHOLE COVERS SHOULD BE LABELED "SANITARY SEWER" AND STORM SEWER MANHOLE COVERS SHOULD BE LABELED "STORM SEWER"
19.4 STORM SEWER SYSTEM

19.4.1 Materials

19.4.1.1 Manholes

.1 Manholes shall be Precast Reinforced concrete only. No block or brick masonry. Precast Reinforced Concrete Manholes shall meet the requirements of ASTM C-478. Cement shall be Type II with C3A content of 6.5% or less. Manhole connections shall be accomplished through the use of flexible connectors or using mortar comprised of 1 part Portland Type II cement and 2 parts sand by volume.

.2 Manhole base, eccentric cone and riser section shall be equipped with non-penetrating lifting inserts, Press-Seal GASKET Corporation or approved equal.

.3 Manhole cone section shall be suitable for mounting cast iron manhole frames and covers as described below.
.4 Joints between manhole sections shall be offset tongue and groove type and shall utilize a pre-lubricated manhole gasket which meets the following requirements:

- Gasket shall consist of a compression section and a serrated mantel section which slides over the compression section as the manhole sections are placed together.
- Gasket shall meet the requirements of ASTM C 443

.5 Manhole frames and covers shall be cast from gray iron meeting the requirements of ASTM A48, Class 30 or greater conforming to the following:

- Minimum clear space opening for frames and covers is 21 7/8”.
- Non-drainage frames and covers installed in landscaped areas shall weigh not less than 290 lbs. Non-drainage frames and covers installed in hardscape areas and subject to traffic shall be H 20 rated and shall weigh not less than 375 lbs. Non-drainage frames and covers installed in Type-S inlets shall be Neenah Foundry R-6144 or approved equal. Drainage frames and covers installed in landscaped areas shall be Neenah Foundry R-2560-EA or approved equal. In the event a round cover is not practical use frame and cover of Neenah Foundry R-4346 or approved equal. Drainage frames and covers installed in hardscape areas and subject to traffic shall be H 20 rated and shall be Neenah Foundry R-3561 or approved equal. Frames and covers installed in pedestrian areas shall be rated for pedestrian service.
- Covers shall be labeled “STORM SEWER.”

.6 Manhole steps shall conform to one of the following requirements:

- Gray Iron or Ductile Iron integrally cast into the manhole barrel, meeting the requirements of ASTM A48.
- Gray Iron or Ductile Iron equipped with inserts integrally cast into the manhole barrel having steps bolted on, meeting the requirements of ASTM A48.
- Copolymer polypropylene plastic, meeting the requirements of ASTM D 2146 reinforced with a ½” diameter deformed bar meeting the requirements of ASTM A 615.

.7 Manhole inverts shall be constructed of mortar comprised of 1 part Portland Type II cement and 2 parts sand by volume. Inverts should be hand troweled to a smooth finish. Top of invert shall be a minimum of 8” wide to allow crawler type camera accessibility. To accommodate for wider inverts manholes shall be designed and constructed utilizing 0.2’ drop across each manhole or match crown at pipe size changes.

.8 Turns in manholes that change the direction of flow shall not exceed ninety degrees.

.9 Maximum spacing between storm sewer manholes shall be 400’.

.10 Manholes shall be installed on mains at any location where there is a change in grade, or direction of flow.

.11 All building drainage laterals shall connect to the storm sewer collection system at a manhole, junction box, or inlet box.

19.4.1.2 Piping and Fittings

.1 Storm sewer piping 12” and greater:

- Reinforced Concrete Pipe (RCP) conforming to the requirements of ASTM C76, Wall type B. Pipe class shall be determined by laying depth; Class III for cuts 0 to 10 feet, Class IV for cuts 10 to 20 feet, Class V for all cuts exceeding 20 feet. Pipe shall be installed such that the pipe bell is upstream of the pipe spigot.
- Pipe end treatment shall be bell and spigot manufactured in accordance with ASTM C76 with joint lengths no less than 8’ and no greater than 16’. Gaskets for bell and spigot joints shall be rubber O-ring gaskets manufactured in accordance with ASTM C361 and ASTM C433.
- RCP shall be manufactured wet cast, dry cast or centrifugally cast or by the re-densification method.
• All pipe lift holes are to be plugged with a mortar mix consisting of one part Portland cement, two parts sand by volume and water as required to produce a stiff workable mixture.

.2 Storm sewer piping smaller than 12” in diameter:
• Ductile iron pipe which shall be cement mortar lined in accordance with ANSI A21.4/AWWA C104; standard thickness, with asphaltic seal coat. Ductile iron pipe shall also be furnished with outside asphaltic coating of 1 mil thickness per ANSI A21.51/WWAC151. Pipe shall be installed such that the pipe bell is upstream of the pipe spigot.
• All ductile iron pipe and fittings shall have a minimum pressure class rating of 350.
• Joints for ductile iron pipe to be installed underground shall be “Push-on” joint pipe, in compliance with ANSI/AWWA A21.11-07/C111.
• Gaskets for “Push-on” joint pipe shall be Styrene Butadiene Rubber.

.3 All new storm sewer laterals and mains shall include underground warning tape placed 1’ above pipe during pipe backfill operations. Warning tape shall be non-conductive Poly 3” wide with 1” lettering 4 mils thick. Warning tape shall conform to APWA uniform color codes and shall read “BURIED SEWER LINE”.

.4 Provide combination cleanout plug/relief on first cleanout outside of building.
.5 Cleanouts shall be installed on laterals at any location where there is a change in grade, or direction in flow.
.6 All storm sewer wyes shall have a cleanout within 1’ of the upstream side of the wye.

19.4.2 Design Requirements

19.4.2.1 General
.1 If a project increases the impervious cover and affects the existing hydrology, determine the appropriate storm water Best Management Practices (BMPs) to offset the increase in storm water peak discharge rate and reduction in water quality.
.2 No storm sewer manhole, piping or fittings shall have any structure, temporary or permanent, built over the top of it.
.3 A/E shall confirm available capacity of existing storm system with Utility Provider to ensure system can accept new flow.
.4 Provide minimum 6” laterals and 12” mains.
.5 Minimum velocity 3.5 feet per second.
.6 Maximum velocity 15 feet per second.
.7 Remove existing sewer lines and manholes which are no longer in service.
.8 In stairwells, areaways and similar locations where leaf clogging of conventional drains would be expected provide scupper or cast iron dome type drains.
.9 Install removable bars or grills at open ends of culverts, drains and pipes 10” diameter and larger.
.10 Curb inlets along roadways and in parking lots shall be ODOT Type S self-cleaning inlets. Allowable spread for roadway applications is 6’ or 1/2 of travel lane width whichever is less. Refer to Appendix A for details.
.11 Gutter downspouts which connect to underground storm system shall utilize a cast iron downspout boot of McKinley type DS4 or approved equal to transition between downspout and drainage lateral.
.12 Inlet sizing and spacing shall be designed to allow no more than 6’ diameter spread around inlets during design rain event.
.13 No above ground detention ponds or weirs are allowed.
.14 All storm sewer junction boxes shall have an access.
.15 No conflict boxes will be allowed.
19.4.2.2 Underground Detention

.1 Post construction runoff must equal preconstruction runoff for the required design storm. Engineer shall design an underground storm water detention structure sized for the appropriate release rates. Underground detention structure shall meet the following minimum requirements:

- All underground detention structures should be constructed on precast concrete vaults, poured in place concrete structures or reinforced concrete pipe.
- Multiple barrels of reinforced concrete pipe shall have a manifold at one end with reinforced concrete pipe equal in diameter to the largest pipe barrel used in the detention system, or a junction box larger than the largest pipe barrel used in the detention system.
- A trash collection structure must be installed upstream of all underground detention structures.
- All underground detention structures must include an air release structure large enough to prevent air locking during a rain event.
- All underground detention structures shall have a minimum of 1 standard manhole access point including manhole steps.

19.5 NATURAL GAS

19.5.1 In accordance with UFC 3-430-09 Exterior Mechanical Utility Distribution and UFC 3-420-01 Plumbing Systems.

19.5.2 Materials

19.5.2.1 Piping and Fittings

.1 Polyethylene (PE) natural gas pipe and fittings shall be PE 2406 medium density polyethylene (MDPE) meeting cell classification 234363E per ASTM D3350.
.2 All pipe and fittings material shall be opaque, yellow in color, stabilized against ultraviolet deterioration and suitable for unprotected outdoor storage for at least 4 years.
.3 All new natural gas mains and laterals shall include underground warning tape placed 1’ above pipe during pipe backfill operations. Warning tape shall be non-conductive Poly 3” wide with 1” lettering 4 mils thick. Warning tape shall conform to APWA uniform color codes and shall read “BURIED GAS LINE”.
.4 All buried natural gas line shall have a #12 yellow sheathed solid copper wire installed 6” above pipe and brought above grade through a valve jar.
.5 Fittings shall be of the same diameter, type, and wall thickness of the pipeline being constructed. Fittings shall be manufactured and tested in accordance with ASTM D2513 and applicable Federal Department of Transportation regulations.
.6 Line tapping fittings shall be bypass type and of such design that flow through the pipeline being tapped will not be interrupted at any time during the tapping operation.
.7 Electrofusion fittings shall be PE 2406 medium density polyethylene material manufactured in accordance with ASTM F1055.
.8 Polyethylene gas pipe and fittings may be joined together to other materials by transition fittings or fully restrained mechanical couplings. These devices shall be designed for joining polyethylene gas piping to another material and shall be approved by the Federal Department of Transportation.
.9 Transitions between unlike wall thicknesses greater than 1 DR shall be made with a transition nipple or by mechanical means.

19.5.2.2 Valves

.1 Valves for service ½” through 12” shall be PE 2406 medium density polyethylene ball valves rated for service under working pressure of not less than 175 psi.
.2 Valve ends shall be either butt fusion or heat fusion welded.
.3 Valves 2” and larger installed below grade shall have a 2” square valve operating nut and turn left or counter-clockwise to open.
19.5.2.3 Valve Boxes
.1 Valve boxes shall be two piece adjustable screw type asphalt coated with an inside diameter of 5 1⁄2". Sigma Corporation model VB261-8 or equal.
.2 Valve box lid shall be cast iron drop in non-locking type imprinted with “Gas” on the top,
.3 Valve Boxes shall have a pre-cast concrete collar in landscaped areas and poured-in-place concrete collars in paved areas.
.4 Pre-cast concrete collars shall be 4000 psi with 24” outside diameter with a 10” inside diameter center hole.
.5 Poured-in-place concrete collars shall be 4000 psi 24”x 24” square with inside hole sized to fit valve box.

19.5.3 General Location/Installation Requirements

19.5.3.1 Natural Gas Pipe Bedding
.1 Pipe trenches excavated in earth (soils).
   • Where trenches are excavated in earth (soils), the bottom of the trench shall be evenly graded to an elevation approximately 2” below the pipe in order to accommodate the bedding material.
   • Bedding material of clay soil as described by CFR Title 49 Part 192, shall be placed across the entire width of the trench and shall be compacted to approximately 90% of Standard Proctor Density up to the level of the bottom of the pipe.
   • The trench shall be backfilled with clay soil as described by CFR Title 49 Part 192, from top of bedding to level 4” above the top of the pipe, and the material shall be compacted to approximately 95% of Standard Proctor Density.
   • The cross-sectional area of the trench from level 2” below bottom of pipe to level 4” above top of pipe and extending across entire width of trench constitutes the pipe zone where trenches are excavated in soils.

.2 Pipe trenches excavated in rock
   • Where trenches are excavated in rock the trench shall be excavated to depth 6” below the pipe and bedding material as specified herein above shall be placed and compacted to approximately 90% of Standard Proctor Density.
   • Backfill from top of bedding to level 1'-0” above top of pipe shall be same material as specified for bedding and shall be compacted to approximately 95% of Standard Proctor Density.
   • The cross-sectional area of the trench from level 6” below bottom of pipe to level 1'-0” above top of pipe and extending across entire width of trench constitutes the pipe zone when trenches are excavated in rock.
   • The remaining depths of the trenches, from the tops of the pipe zones shall be backfill.

19.5.3.2 Piping
.1 Butt, socket, and saddle fusion joints in polyethylene gas pipe shall be made using procedures that have been qualified and approved in accordance with CFR Title 49 Part 192.
.2 Installation of the gas transmission mains and other gas pipelines shall comply with ASME B31.8.
.3 Soft Poly Pigging of all new gas mains shall be performed before service installation.
.4 There shall be a minimum separation of 18” between natural gas lines and insulated utility lines.

19.5.3.3 Valves
.1 All service lines off the main shall have an isolation valve.
.2 All 2” or larger service lines must include a tri valve arrangement.
.3 Valves shall be located (tied) to two permanent benchmarks (X, Y, & Z coordinates) on as-built drawings.
.4 All valves installed below grade deeper than 4’ shall have a valve extension to terminate within 2’ of finished grade.
19.5.3.4 Natural Gas Meters and Regulators

.1 All new services lines are to include installation of a meter and regulator.
.2 Contractor shall provide all gas meters. Gas meters shall be installed by Contractor per piping details provided by A/E.
.3 Locate meters and regulators away from building fresh air intakes.
.4 All above grade black iron or steel gas pipe shall be painted to match meter and regulator with primer, intermediate, and finish coat of 6.5 – 9.5 mils DFT per coat.

19.5.4 Design Requirements

19.5.4.1 Piping

.1 Do not install temporary or permanent structures over natural gas mains and laterals.
.2 3” polyethylene natural gas main shall not be used.

19.5.4.2 Natural Gas Meters and Regulators

.1 Contractor provides all natural gas meters.
.2 A/E shall include, on drawings, pressure and flow rate requirements for the gas meter.
.3 A/E shall provide a layout drawing of the meter set including location of valve(s), regulator(s), and meter(s).
.4 Meter set to be installed by Contractor.
.5 The A/E shall consult the gas meter manufacturer and include the manufacturer’s recommended length of straight pipe runs to be installed, both before and after the meter.
.6 A/E shall notify the Contractor a minimum of 60 days before a meter is required to allow for ordering and delivery.

19.5.5 Polyethylene pipelines shall be tested in accordance with CFR 49, Part 192.
Section 20 - ELECTRICAL SITE IMPROVEMENTS

20.1 ELECTRICAL SERVICE

20.1.1 Electrical load estimates and voltage connection requirements should be provided to the Project Manager at the conclusion of the Design Development Phase

20.1.2 Tracer wire is required for all underground utilities.

20.1.3 The following general note shall be added to the plans: All connections and disconnections to electrical distribution system (low side) shall be coordinated through the Project Manager

20.1.4 Meters are required on all service connections

20.1.5 All meters shall be the responsibility of the contractor

20.2 ELECTRICAL TRANSFORMERS

20.2.1 All primary distribution transformers shall be the responsibility of the contractor

20.2.2 Transformer shall be specified by the Electrical Engineer

20.2.3 Final location of primary distribution transformer and service feeds must be approved by Project Manager

20.3 UNDERGROUND DUCTS

20.3.1 Duct banks shall be concrete encased PVC for primary and secondary power distribution.

20.3.2 Sufficient spare conduits are to be furnished in underground duct banks to allow for installation of one future/additional circuit of the same size/rating as those already provided with cable/conductor

20.3.3 Provide #12 AWG solid copper tracer wire in all non-metallic underground conduits.

20.3.4 All permanent electrical service is to be provided underground

20.4 LIGHTING POLES AND FIXTURES

20.4.1 A dispersed placement pattern of pathway lighting is preferred. Photometric study and catalog cut sheets shall be provided at the Design Development Phase

20.4.2 Parking lot Illuminance Recommendations

<table>
<thead>
<tr>
<th></th>
<th>Basic</th>
<th>Enhanced Security (ATFP)</th>
</tr>
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<tr>
<td>Minimum Horizontal Illuminance</td>
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<td>0.75 fc</td>
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<tr>
<td>Uniformity Ratio, Maximum to Minimum</td>
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<td>15:1</td>
</tr>
<tr>
<td>Minimum Vertical Illuminance</td>
<td>0.2 fc</td>
<td>0.25 fc</td>
</tr>
</tbody>
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20.4.3 All exterior lighting shall be controlled by a photoelectric cell. A single photocell may be provided for multiple fixtures

20.4.4 Pedestrian Lighting Fixture

20.4.4.1 Holophane ‘Granville’ LED Series or approved equal

20.4.4.2 3000 K

20.4.4.3 Dark bronze finish

20.4.4.4 Glass prismatic lens (acorn fixture)

20.4.4.5 Tapered cast aluminum hinged fluted pole with dark bronze finish
20.4.5 Parking Lot and Street Lighting Fixture

20.4.5.1 Evolve LED Series or approved equal
20.4.5.2 Dark bronze finish
20.4.5.3 Glass lens
20.4.5.4 Tapered cast aluminum pole with dark bronze finish

Evolve™ LED Area Light
Scalable Area Light (EASC)
20.4.6 No building mounted site lighting shall be used
21.1 DEMOLITION

21.1.1 A Pre-Demolition Environmental Hazard Assessment shall be required. The assessment shall be used to develop an Environmental Hazard Abatement Work Plan. This “Plan” shall be reviewed and approved by the OHARNG Environmental Department before demolition activities take place.

21.1.2 Record Documents shall indicate foundations to remain.

21.1.3 The project-specific Safety Plan shall indicate requirements for control of dust and noise mitigation.

21.1.4 Existing conditions of adjacent structures to remain shall be documented prior to demolition.

21.1.5 Blasting demolition shall be approved by the Project Manager.

21.1.6 Seismographic monitoring may be required on adjacent buildings.

21.1.7 Engineering Survey

21.1.7.1 Prior to starting all demolition operations, OSHA Standard 29 CFR 1926.850(a) requires that an engineering survey of the structure must be conducted by a competent person. The purpose of this survey is to determine the condition of the framing, floors, and walls so that measures can be taken, if necessary, to prevent the premature collapse of any portion of the structure. When indicated as advisable, any adjacent structure(s) or improvements should also be similarly checked. The demolition contractor must maintain a written copy of this survey. Photographing existing damage in neighboring structures is also advisable.

21.1.7.2 The engineering survey provides the demolition contractor with the opportunity to evaluate the job in its entirety. The contractor should plan for the wrecking of the structure, the equipment to do the work, manpower requirements, and the protection of the public. The safety of all workers on the job site should be a prime consideration. During the preparation of the engineering survey, the contractor should plan for potential hazards such as fires, cave-ins, and injuries.

21.1.7.3 If the structure to be demolished has been damaged by fire, flood, explosion, or some other cause, appropriate measures, including bracing and shoring of walls and floors, shall be taken to protect workers and any adjacent structures. It shall also be determined if any type of hazardous chemicals, gases, explosives, flammable material, or similar dangerous substances have been used or stored on the site. If the nature of a substance cannot be easily determined, samples should be taken and analyzed by a qualified person prior to demolition.

21.1.7.4 During the planning stage of the job, all safety equipment needs should be determined. The required number and type of respirators, lifelines, warning signs, safety nets, special face and eye protection, hearing protection, and other worker protection devices outlined should be determined during the preparation of the engineering survey. A comprehensive plan is necessary for any confined space entry.

21.1.8 Prepare a Demolition Plan including removal procedures for approval before work is started.

21.1.8.1 Include in the plan procedures for careful removal and disposition of materials specified to be salvaged, coordination with other work in progress, a disconnection schedule of utility services, detailed description of methods and equipment to be used for each operation and of the sequence of operations. Identify components and materials to be salvaged for reuse or recycling.

21.1.8.2 Append tracking forms for all removed materials indicating type, quantities, condition, destination, and end use.

21.1.8.3 Coordinate with Waste Management Plan. Include statements affirming Contractor inspection of the existing roof deck and its suitability to perform as a safe working platform or if inspection reveals a safety hazard to workers, state provisions for
securing the safety of the workers throughout the performance of the work. Provide procedures for safe conduct of the work in accordance with EM 385-1-1. Plan shall be approved by Structural PE, Project Manager and Environmental Personnel prior to work beginning.

21.1.9 Sequence of work includes:

21.1.9.1 Pre-Demolition Activities including:
- Utility abandonment procedures
- Completion of Structural Engineering Survey
- Identification of on-site competent person as well as level of authority established
- Development of drawings and calculations to substantiate work procedures, including temporary supports required to avoid catastrophic collapse of building.
- Fire safety procedures
- Debris Removal
- Load rating evaluation for existing roadways.
- Additional information – see Supplemental Environmental Conditions.

21.1.9.2 Detailed description of demolition process
- Measures to protect existing structures, facilities, utilities, etc.
- Demolition sequence
  - Isolation of Utilities
  - Abatement
  - Demolition of Silos
  - Demolition of low rise building additions
  - Demolition of high rise building section

21.1.9.3 Control Measures
- Entry and Exit Procedures
- Decontamination facilities
- Engineering Controls
- Radiological
- Dust Control
- Surface water runoff control methods

21.1.9.4 Rigging and Lifting
- A rigging plan will be drafted for all lifts, regardless of weight, in accordance with the scope of work.

21.1.9.5 Site Mobilization
- Contractor shall conduct a pre-demolition inspection and retain video/photographic documentation of the existing site conditions prior to commencement of any on-site work.

21.1.10 In accordance with

21.1.10.1 40 CFR 61 National Emission Standards for Hazardous Air Pollutants
21.1.10.2 40 CFR 82 Protection of Stratospheric Ozone
21.1.10.3 49 CFR 173.301 Shipment of Compressed Gases in Cylinders and Spherical Pressure Vessels
22.1 GENERAL NOTES


22.1.2 The erosion control measures shown are a required minimum. The contractor shall be responsible for the prevention of sediment transport from this property in accordance with all Federal, State and Local regulations during construction. The Contractor shall install additional devices and implement additional practices if warranted by field conditions. Prior to construction activities, the Contractor shall install all silt fencing, sediment traps, and sediment basins.

22.1.3 The Contractor shall inspect and maintain all erosion control devices and practices. Inspections shall be performed at least once every 7 calendar days and within 24 hours of the end of a rainfall event of ½” or greater.

22.1.4 The Contractor shall begin stabilization measures in portions of the disturbed area as soon as practicable. However, stabilization measures must be initiated within 10 calendar days on portions where construction activity has ceased.

22.1.5 This applies to soil stockpiles as well. All disturbed areas left mulched after 30 days shall be stabilized with temporary vegetation.

22.1.6 All disturbed areas not encompassed by structures, pavement or called out for other surface treatment shall be, at a minimum, top soiled, seeded and mulched in accordance with Design and Construction Standards.

22.1.7 The Contractor shall be responsible for the removal of all erosion control measures except channel lining and outlet protection after site stabilization. The Contractor shall dress all areas to the line and grade shown on these plains.

22.1.8 The Contractor shall be responsible for removing and/or flushing sediment from existing storm drains if an excessive amount is collected during construction activities.

22.1.9 The Contractor shall determine the exact location of all existing utilities before commencing work. The contractor agrees to be fully responsible for any and all damages which might be occasioned by his failure to exactly locate and preserve any and all underground utilities. The Contractor shall contact OUPS a minimum of 48 hours prior to excavation in order to give enough time to mark utilities. If no paint is visible, Contractor shall not perform excavation until verifying with Project Manager that work site is cleared for excavation.

22.1.10 Erosion Control Best Management Practices (BMP’s)

22.1.10.1 The Contractor shall utilize erosion control Best Management Practices (BMP’s) to prevent the discharge of sediment bearing water runoff or airborne dust from the project site in accordance with all Federal, State and Local regulations during construction.

22.1.10.2 The Contractor shall be responsible for obtaining an NPDES for storm water discharge from the construction site(s) for all work described in these specifications and shown on the drawings. It shall be the Contractor’s responsibility to meet all requirements and obligations of the permit. The Contractor shall be responsible for all costs associated with making application for the permit and for meeting the requirements of the permit.

22.1.10.3 The Contractor shall be responsible for the inspection and maintenance of all BMP’s in accordance with the requirements of the permitting authority.

22.1.10.4 The Contractor shall ensure that all down slope BMP’s are installed and functional before any land disturbing activity is commenced on any portion of the site.
22.1.10.5 The Contractor shall be responsible for the installation and maintenance of additional BMP’s if required by field conditions, the Architect/Engineer or a permitting authority having jurisdiction of the site.

22.1.10.6 After stabilization of the disturbed area has been achieved, the Contractor shall remove and dispose of all temporary BMP’s and dress out those areas to the proper line and grade.

22.1.11 Pre-Construction Phase – Erosion Control Notes

22.1.11.1 Prior to the land disturbing construction, the Contractor shall schedule a Pre-Construction meeting with the Project Manager, and Design Engineer.

22.1.11.2 The Contractor shall follow the project sequence shown on the plans. The Contractor shall maintain careful scheduling and performance to ensure that the land stripped of its natural cover is exposed only in small quantities.

22.1.11.3 No staging areas, material storage or concrete wash out areas shall be located within 500 feet of designated tree protection areas.

22.1.11.4 The escape of sediment from the site shall be prevented by the installation of erosion and sediment control measures and practices prior to land disturbing activities.

22.1.11.5 Prior to any other construction, a stabilization construction exit pad shall be constructed at each point of entry to or exit from the site or onto any public roadway.

22.1.11.6 The following initial erosion control measures shall be implemented prior to any other construction activity:

.1 Immediately after establishment of construction exit pad, all perimeter erosion control and storm water management devices shall be installed as shown on the Pre-Construction Phase Erosion Control Plan.

.2 Double Row Type “A” Silt Fence should be installed at the perimeter of the disturbed area as shown on the plan. The silt fence should be placed in accordance with the Design and Construction Standards. The silt fence should be kept erect at all times and repaired when requested by the site inspector or the Project Design Professional of Record. Silt should be removed when accumulation reaches one half the height of the barrier. The perimeter silt fence should be inspected daily for any failures. Any failures of said fencing should be repaired immediately.

.3 Inlet sediment protection measures shall be installed on all existing storm structures in project site or below site within the same drainage basin.

.4 Hay bale check dams or rock filter dams shall be installed in areas of concentrated flows as shown on the plan.

.5 Tree protection fencing should be installed prior to the start of any land disturbance activity and maintained until final landscape is installed. The tree protection fencing should be inspected daily. Any failures of said fencing should be repaired immediately.

.6 Sediment ponds and diversion swales shall be installed as shown on the Pre-Construction Plan.

22.1.11.7 After installation of initial erosion control measures, the Site Contractor shall schedule an inspection by the Design Engineer. No other construction activities shall occur until the Design Engineer and Project Manager approve installation of said erosion control measures and land disturbance authorization is granted. If unforeseen conditions exist in the field that warrant additional erosion control measures, the Contractor must construct any additional erosion control devices deemed necessary by the site inspection.

22.1.11.8 No burn or bury pits shall be permitted on the construction site.

22.1.11.9 Additional silt barriers must be placed as shown on the plan as access is obtained during clearing. No grading shall take place until silt barrier installation is constructed as shown on the Pre-Construction Phase Erosion Control Plan.

22.1.12 All erosion control measures shall meet the requirement of the Ohio EPA and the Design and Construction Standards.
22.1.13 Mulch or temporary grassing shall be applied to all exposed areas within 13 days of the ceasing of land disturbance activities.

22.1.14 Sediment and erosion control measures should be checked after each rain event. Each device is to be maintained or replaced if sediment accumulation has reached one half the capacity of the device. Additional devices must be installed if new channels have developed.

22.1.15 The construction exit shall be maintained in a condition which will prevent track or flow of mud onto public right-of-way. This may require periodic top dressing with 1” – 3” of stone, as conditions demand. All materials spilled, dropped, washed or tracked from vehicle onto public roadway or into storm drain must be removed immediately.

22.1.16 Contractor shall inspect control measures at the end of each working day to ensure measures are functioning properly.

22.1.17 Erosion control measures will be maintained at all times. If full implementation of the approved plan does not provide for effective erosion control, additional erosion and sediment control measures will be implemented to control or treat the sediment source as directed by the on-site inspector or the civil engineer.

22.1.18 Failure to install, operate or maintain all erosion control measures will result in all construction being stopped on the job until such measures are corrected back to the approved erosion control plans.

22.1.19 Construction Phase – Erosion Control Notes

22.1.19.1 During construction, the Contractor shall maintain careful scheduling and performance to ensure that land stripped of its natural ground cover is exposed only in small quantities and therefore limited durations, before permanent erosion protection is established.

22.1.19.2 The following erosion control measures shall be implemented in addition to the notes for Pre-Construction during the preliminary grading phase of construction.

22.1.19.3 Sediment shall not be washed into inlets. It shall be removed from the sediment traps and disposed of to prevent re-entry into inlets.

22.1.19.4 Erosion control devices shall be installed immediately after ground disturbance occurs. The location of some of the erosion control devices may have to be altered from that shown on the approved plans if drainage patterns during construction are different from the proposed drainage patterns. It is the Contractor’s responsibility to accomplish erosion control for all drainage patterns created at various stages during construction. Any difficulty in controlling erosion during any phase of construction shall be reported to the Design Engineer immediately.

22.1.19.5 The Contractor shall furnish and maintain all necessary barricades while roadway frontage improvements are being made.

22.1.19.6 Additional silt fence should be placed in accordance with the Design and Construction Standards. The silt fence shall be maintained until permanent ground cover is established. Silt shall be removed when accumulation reaches one half height of the barrier. Cut and fill slopes are not to exceed “2H: 1V.”

22.1.19.7 Hay bale check dams shall be installed in areas of concentrated flow. See detail for additional information.

22.1.19.8 Sediment and erosion control measures should be checked after each rain event. Each device is to be maintained or replaced if sediment accumulation has reached one half the capacity of the device. Additional devices must be installed if new channels have developed.

22.1.19.9 Soil stockpile area, if required, shall be located in a flat area away from any concentrated flow and surrounded by a single row of silt fence at the toe of each pile. Contractor shall inspect control measures at the end of each working day to ensure measures are functioning properly. Erosion control measures will be maintained at all times. If full implementation of the approved plan does not provide for effective erosion control, additional erosion control measures will be implemented to control or treat the sediment source as directed by the Design Engineer immediately.
control, additional erosion and sediment control measures shall be implemented to control or treat the sediment source as directed by the on-site inspection or the Design Engineer.

22.1.20 Post Construction Phase – Erosion Control Notes

22.1.20.1 In addition to the notes for Pre-Construction and Construction, the following erosion control measures shall be implemented during the Post Construction Erosion Control Phase of Construction

22.1.20.2 The contractor shall maintain all erosion control measures until 95% permanent ground cover is applied and established.

22.1.20.3 All roadway and parking shoulders disturbed should be applied with vegetation cover as soon as final grade is achieved.

22.1.20.4 Upon completion of the project and receipt of certificate of completion, the Contractor shall coordinate with landscaping services to remove all temporary erosion control measures and dispose of them unless noted on plans.
23.1 General Notes

23.1.1 Contractor to form continuous concrete inverts and benches between inlets and outlets with smooth long radius arcs in all storm manholes, junction boxes and inlets.

23.1.2 Project Manager shall be notified a minimum of 72 hours prior to any connection to the existing system. All connections to existing system shall be constructed under the observation of Project Manager. Contractor shall take precautions to prevent introduction of debris into new and existing sewer laterals and mains while making connections to the existing system.

23.1.3 Contractor shall perform a continuity test on all tracer wire in the presence of the Project Manager. If the tracer wire is found to be not continuous after testing, contractor shall repair or replace the failed segment of wire.

23.1.4 (Natural Gas) The following general note shall be added to plans that include installation of a valve box. Valve box risers shall be cast iron and shall conform to that of valve box top section and shall be used in appropriate heights to adapt to changing landscapes.

23.1.5 The following general note shall be added to plans that include installation of a connection to the existing distribution system: The Project Manager shall be notified a minimum of 48 hours prior to any connection to the existing system. All connections to existing system shall be constructed under the observation of the Project Manager. Contractor shall take precautions to prevent introduction of contaminated material into new and existing mains while making connections to the existing system. Contractor is solely responsible for operating any and all newly installed valves and appurtenances until new system has been approved and accepted for operation by the Project Manager.

23.1.6 All pipelines shall be quality control tested in accordance with procedures and practices applicable to the various types and kinds of pipe and to the various sizes of pipe.

23.1.7 The Contractor is solely responsible for safety during testing.

23.1.8 The Contractor is responsible for furnishing all equipment, transportation, labor, tools, gauges, piping, test instruments, electric power, fuel, water materials, supplies and supervision required and/or involved in the testing, repair (if required), retesting (if required) or for any incidental work required.

23.1.9 Should any pipe lines, or any section of the line, fail to meet the criteria established all deficiencies shall be remedied and the testing repeated until the specified test results have been achieved.

23.1.10 The Contractor shall clean and test each section of the gas pipelines.

23.1.11 Pipe line cleaning and purging will be accomplished by introducing compressed air into the mains and exhausting the air through suitable openings.

23.1.12 Volatile combustible liquids shall not be permitted to enter the pipelines and shall not be used for cleaning pipelines. Should interior surfaces of the pipe be found to be wetted with such liquids, or should it be known that such liquids have been used for cleaning interior surfaces of the pipelines, or should it be found that such liquids have been allowed to enter the pipelines, steaming of the facilities shall be employed until all combustible liquids have been evaporated and swept out of the main to be tested.

23.1.13 Natural Gas Piping Testing

23.1.13.1 Sections under test shall be isolated by valves or caps.

23.1.13.2 The Contractor shall furnish and install recording test gauges as required to determine pressure conditions in the section (or sections) under test.

23.1.13.3 After the pressure in the section (or sections) under test has stabilized the test pressure shall be set at 90 psi for a period of not less than 24 hours, and the line shall be walked for detection of any leaks.

23.1.13.4 Any drop in pressure shall be considered to be evidence of leakage, and a failed test. The Contractor shall locate and repair such leaks, and shall repeat the test until satisfactory results are obtained.
23.1.13.5 Satisfactory results shall be obtained for all sections of the pipelines before the project is accepted by the Owner.

23.1.13.6 The original and three copies of each test chart shall be furnished to the Owner.

23.1.13.7 Dated, times, identification of particular pipeline section and signatures of the witnesses shall be shown on each original chart.

23.1.13.8 After all testing has been satisfactorily completed all vents and pressure taps shall be closed with permanent caps. Caps shall be a maximum of 6” from the main.
Section 24 - COMMISSIONING GUIDE

24.1 GENERAL

24.1.1 These guidelines define the role of the Commissioning Authority, Construction Contractor, A/E, and Test and Balance Contractor

24.1.2 The Commissioning Authority will work for the Adjutant General’s Department and will not provide direction to the Contractor, except as forwarded through the Project Manager

24.1.3 Training shall be provided for the Adjutant General’s Department employees, designated by the Project Manager, for all equipment specified. This training shall include video recording of all required training

24.1.4 Commissioning must be completed prior to Substantial Completion

24.1.5 The Commissioning Authority shall be certified in Building Systems Commissioning by the National Environmental Balancing Bureau (NEBB)

24.1.6 Commissioning shall be performed in accordance with this document and the following Guidelines and Standards:

   24.1.6.2 ASHRAE Guideline 1.1-2007 HVAC&R Technical Requirements for the Commissioning Process
   24.1.6.3 ASHRAE Guideline 0-2005 the Commissioning Process

24.1.7 The Commissioning Team shall be made up of those parties that have been involved in the design and construction of the elements indicated in the Scope of Commissioning section, as established by the Project Manager

24.2 THE COMMISSIONING AUTHORITY (CXA) RESPONSIBILITIES

24.2.1 The CxA shall review the Basis of Design and Owner’s Project Requirements (OPR) provided by the A/E

24.2.2 The CxA shall review Design Documents to have full understanding of the project. The Commissioning Authority shall notify the PM of any found design discrepancy and coordinate resolution of these issues through the PM

24.2.3 The CxA shall review Construction Shop Drawing and Operation and Maintenance Manuals to observe and report that the systems and equipment identified on these documents are consistent with the design intent and performance criteria. The Commissioning Authority shall notify the PM of any discrepancy with the Design Documents and coordinate resolution of these issues through the PM

24.2.4 The CxA shall be responsible for developing the Commissioning Plan, Installation Verification checklists, Functional Performance Tests, Preventative Maintenance Program and Training plans. Acceptance of these items is subject to the approval of the Project Manager. The plan will be forwarded to the Contractor and/or CM for inclusion into the project schedule.

24.2.5 The required training will be performed primarily by the Contractor as provided for in the other specifications. The CxA will coordinate with the Contractor to provide a complete and orderly training effort, supplementing this effort as required to produce effective training sessions for the Adjutant General’s Department.

24.2.6 The CxA shall be responsible for performing and documenting each step of the commissioning process and for recommending acceptance or non-acceptance to the Adjutant General’s Department. Acceptance of these items is subject to the approval of the Project Manager. Equipment, tools, materials, and personnel required to complete the commissioning work shall be provided by the Commissioning Authority. Materials, tools, and equipment required shall remain the property of the CxA. Specialty tools and testing equipment shall be coordinated with the installing contractor
24.2.7 The CxA shall be responsible for developing a commissioning specification to be incorporated into the bid documents prepared by the A/E.

24.2.8 The CxA shall orchestrate a regularly scheduled meeting with the project delivery team to discuss project specific items.

24.2.9 The Commissioning Authority shall orchestrate and complete functional performance test records and reports. Site observation reports shall be distributed within three days of site visit.

24.2.10 The CxA shall provide a regularly scheduled progress report summarizing commissioning activities.

24.2.11 The CxA shall develop and submit to the Contractor a CxA’s activities schedule for incorporation into the Contractor’s Overall Project Schedule.

24.2.12 The CxA shall review the TAB Contractors report(s) for compliance with the contract documents and provide comments to the Project Manager.

24.3 DESIGN ARCHITECT/ENGINEER (A/E) RESPONSIBILITY

24.3.1 The A/E shall incorporate comments of the CxA reviews into the design documents at the direction of the Adjutant General’s Department.

24.3.2 The A/E shall incorporate the commissioning plan and specification into the bid documents. Should any discrepancies or conflicts be identified in the Design Documents, the Project Manager will determine what action will be required of the A/E for resolution.

24.4 THE CONSTRUCTION CONTRACTOR (CONTRACTOR)

24.4.1 The Contractor shall incorporate the Commissioning Plan into the Construction Schedule by determining when the start-up inspections, tests, or other elements of the Commissioning plan are required. The Contractor shall coordinate their efforts with the CxA and the Commissioning plan.

24.4.2 The Contractor shall coordinate scheduling of inspections, tests, system start-ups through the Project Manager and CxA.

24.4.2.1 The Contractor shall incorporate the CxA’s and TAB activities schedule into their Overall Project Schedule.

24.4.2.2 The Contractor shall advise the Project Manager when required work has been completed for each phase of the Commissioning plan.

24.4.2.3 The Contractor shall establish a date for inspections, testing, and startup required for that test and balance and/or commissioning phase. The date, time and location shall be coordinated through the Project Manager. Tests shall be repeated until results are approved and accepted by the Project Manager.

24.4.2.4 The Contractor shall advise subcontractors, manufacturer’s representatives, and other parties designated for any work related to the commissioning, of the date, time and location of inspections.

24.4.3 The Contractor shall be responsible for creating and maintaining as-built documents per the contract documents.

24.4.4 The Contractor shall assist the CxA in verification of Test, Adjust, Balance and commissioning of systems identified by the CxA.

24.4.5 The Contractor shall develop and submit Training Agenda to the Project Manager twenty one (21) calendar days prior to initial scheduled training session.
24.5 TEST AND BALANCE (TAB) CONTRACTOR

24.5.1 The TAB Contractor shall incorporate the Commissioning Plan into the Test and Balance Schedule by determining when the start-up, inspections, tests, or other elements of the Commissioning plan are required. The TAB Contractor shall coordinate their efforts with the CxA and the Commissioning Plan.

24.5.2 The TAB Contractor shall coordinate scheduling of inspections, tests, and system start-ups through the Project Manager and CxA.

24.5.3 The TAB Contractor shall advise the Project Manager when required work has been completed for each phase of the Commissioning Plan.

24.5.4 The date, time and location shall be coordinated through the Project Manager. Tests shall be repeated until results are approved and accepted by the Project Manager.

24.5.5 The TAB Contractor shall advise subcontractors, manufacturer’s representatives, and other parties designated for any work related to the test and balance, of the date, time and location.

24.5.6 The TAB Contractor shall support the CxA with TAB verification and provide a copy of report as each system is completed.

24.6 SCOPE OF COMMISSIONING

24.6.1 The commissioning process shall encompass and coordinate the traditionally separate functions of system documentation, equipment start-up, control system calibration, testing and balancing, performance testing, and training.

24.6.2 Systems required to be commissioned include:

- 24.6.2.1 HVAC Systems
  1. Terminal units serving office and common space areas shall be tested with a minimum of 10% sampling rate
  2. All other equipment types shall be tested with a 100% sampling rate
- 24.6.2.2 HVAC Building Automation Systems
- 24.6.2.3 Lighting and Lighting Controls
- 24.6.2.4 Domestic Hot Water Systems

24.6.3 Other systems that may be commissioned for specific projects (A/E shall consult with the Adjutant General’s Department to determine additional systems to be commissioned):

- 24.6.3.1 Fuel Alarm Systems
- 24.6.3.2 Fire Alarm Systems
- 24.6.3.3 Emergency Generator Systems
- 24.6.3.4 Electrical Systems
- 24.6.3.5 Life Safety Systems

24.6.4 Scope of commissioning shall include, but shall not be limited to, the following: (Many of these same items of work, and more, should be completed by the Contractor as part of completing the work within the Contract Documents, prior to verification by the CxA):

- 24.6.4.1 Attend design meetings to discuss with the A/E commissioning requirements and observe and report that design requirements are met
- 24.6.4.2 Review of design documents, shop drawings, as-built installation drawings, operations and maintenance manuals
- 24.6.4.3 Maintain an ongoing comment/resolution log for all items starting with drawing reviews and continuing through closeout for the project. Logs should be distributed to Project Team at following intervals:
  1. During design – at milestone reviews
  2. During construction – monthly or weekly as construction progresses
24.6.4.4 Witness and report HVAC equipment and system installation for conformity to design documents and Design & Construction Guidelines. Observe and report that installations are free of vibration, have proper alignment and rotation, proper size and rating of overload protection, proper location of thermometers, gauges and test plugs.

24.6.4.5 Review report of testing of HVAC piping and duct systems, as specified in the Contract Documents.

24.6.4.6 Review report of static testing of plumbing systems piping, including water, air, gas, and vacuum, as specified in the Contract Documents.

24.6.4.7 Observe and report that dampers, including fire and smoke dampers, are properly located and fully operational.

24.6.4.8 Observe and report proper electrical power wiring to HVAC equipment. Observe and report any direct control wiring (signals not initiated by the BAS such as fire alarm signals that wire directly to necessary HVAC controllers) and BAS control wiring to HVAC equipment controllers as compared to the operational requirements and control schematics.

24.6.4.9 Observe and report calibration of thermostats, humidistats, differential pressure sensors, damper settings, valve positions, and related controls in accordance with sampling rates defined above.

24.6.4.10 Observe and report monitoring and/or control input, output, and status points for the Building Automation System (BAS). Assistance from the BAS installation team shall be available to the Commissioning Authority.

24.6.4.11 Observe and report operation of system modes and Sequences of Operations shown in construction documents, including damper and valve operations, Humidification system, heating and cooling coil responses, fan and pump operations, and other automation system points required.

24.6.4.12 Observe and report system response to emergency operational modes, including fan interlocks.

24.6.4.13 Witness and report on TAB Contractor’s readings for 20% of all readings chosen at random by the CxA.

24.6.4.14 Observe and report that total HVAC system is performing to meet specified design intent under full load, part load, emergency, and seasonal conditions.

24.6.4.15 Observe and report performance of filtration devices, including pressure drop measurements and leak testing.

24.6.4.16 Witness and report leak testing of supply, return and exhaust duct systems.

24.6.4.17 Check and report as-built drawings match installation. This includes HVAC construction as well as controls drawings.

24.6.4.18 Review the Operations and Maintenance documents required by the Contract Documents to ensure compliance with the Contract Documents. Provide comments on deficiencies to the Owner.

24.6.4.19 Participate in the training efforts required by the Contractor within the Contract Documents.

24.6.4.20 Observe and report that equipment is installed in a manner in which it can be reasonably accessed for service and calibration.

24.6.5 Commissioning Tests:

24.6.5.1 Installation Verification Test. Each system shall be checked for proper installation, shall be adjusted and shall be calibrated to observe and report that it is ready to function as specified.
24.6.5.2 Pre-Functional Performance Test. Systems shall be inspected and approved for substantial completion and full operation prior to actual Functional Performance Testing

24.6.5.3 Functional Performance Test. The objective of these tests is to demonstrate that each system is operating and complying with specified performance requirements of the OPR and the Contract Documents through possible modes of operation.

24.7 PRE-CONSTRUCTION COMMISSIONING MEETING

24.7.1 Before construction begins, the CxA shall review the draft Commissioning Plan with members of the commissioning team.

24.7.2 This meeting shall be held at a time and place designated by the Project Manager.

24.7.3 The purpose of the meeting will be to familiarize parties with the requirements of the commissioning process, and to ensure that the responsibilities of each party are clearly understood.

24.8 SHOP DRAWING REVIEWS

24.8.1 The CxA shall review shop drawings for building systems that will be commissioned.

24.8.2 The review shall be summarized in a report and submitted within fourteen (14) calendar days of receipt of each submittal to the Owner.

24.8.3 The review shall be structured and reported to identify any discrepancies between the Design Documents and the shop drawing submittals that would affect the commissioning process.

24.9 OPERATIONS AND MAINTENANCE FOR EQUIPMENT AND SYSTEMS

24.9.1 The mechanical systems and equipment manuals shall contain the following:

24.9.1.1 Itemized Equipment List: Include maintenance schedule and detailed work description of each commissioned maintenance item.

24.9.1.2 Each item of equipment and each system: Include description of unit or system, and components parts. Identify function, normal operating characteristics, and limiting conditions. Include complete nomenclature and commercial number of replaceable parts.

24.9.1.3 Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shutdown, and emergency instructions. Include summer, winter, and any special operation instruction.

24.9.1.4 Maintenance Requirements: Include routine procedures and guide for troubleshooting; disassembly, repair and reassembly instructions; and alignment, adjusting, balancing and checking instructions.

24.9.1.5 Provide servicing and lubrication schedule, and list of lubricants required.

24.9.1.6 Include manufacturer’s printed operation and maintenance instructions.

24.9.1.7 Include sequence of operation from BAS controls contractor.

24.9.1.8 Provide original manufacturer’s parts lists, illustrations, assembly drawings and diagrams required for maintenance.

24.9.1.9 Provide wiring diagrams and schematics.

24.9.1.10 Provide control diagram by controls contractor as installed.

24.9.1.11 Provide list of original manufacturer’s spare parts, current prices, and recommended quantities to be maintained in stock on-hand.

24.9.1.12 Operations and Maintenance manuals shall be provided in 3-ring binders for hardcopies and on CD’s for electronic PDF versions.
24.9.2 Schedule:

24.9.2.1 Construction Contractor shall furnish complete Operation and Maintenance Manuals to Commissioning Authority and Project Manager for review and assimilation, as defined by specific equipment and materials specifications, and as it applies to commissioning. Furnish within 60 calendar days before scheduled Functional Performance Test(s). Allow minimum fourteen (14) calendar days for review.

24.9.2.2 Construction Contractor shall furnish reviewed and corrected Operation and Maintenance Manuals to Commissioning Authority and Owner, fourteen (14) calendar days before scheduled Functional Performance test(s).

24.9.2.3 Final Operation and Maintenance Materials to be submitted to Project Manager within fourteen (14) calendar days following completion of Functional Performance Tests.

24.10 COMMISSIONING PROCEDURES

24.10.1 Test Procedure Development and Test Documentation

24.10.1.1 The CxA shall prepare and submit to the Project Manager for review the Commissioning Plan, detailed descriptions of test procedures that the CxA proposes for demonstration of conformance of completed systems to these Plans and Specifications.

.1 Each test procedure shall include the following information:

- Purpose of the test
- Required personnel, tools, instruments needed to perform the tests
- Design information pertinent to the equipment or system being tested
- Equipment description
- Detailed sequence of operation, including any operating set points.
- Scheduling requirements
- Special instructions or warnings
- Expected results (i.e. truth table)
- Sampling strategies

24.10.1.2 The CxA shall revise each test procedure as necessary to incorporate information specific and particular to the equipment/systems as shown on the Shop Drawings and Operations and Maintenance Manuals. Changes to test procedures, field corrections to equipment or system components, or other modifications that occur during testing must be documented.

24.10.1.3 As-Built Verification: The CxA shall review As-Built Documents for accuracy of commissioned items.

24.10.1.4 The review shall be structured and reported to identify any discrepancies between the As-Built Documents and the actual on-site operation and hardware. Observe and report that system documentation is current.

24.10.1.5 The review shall be summarized in a report and six (6) copies shall be submitted for approval to the Project Manager. Once approved, two (2) copies shall be forwarded to the Contractor from the Project Manager.

24.10.1.6 The Commissioning Authority shall coordinate and document the resolution of discrepancies identified in the As-Built Verification Report with the Construction Contractor through the Project Manager.

24.10.2 Documentation and Reports

24.10.2.1 The CxA shall record and maintain detailed witnessing, observation and testing data. The data record shall be comprehensive and concise.

24.10.2.2 Data shall be recorded as soon as possible during the course of the witnessing, observation and testing, changes to test procedures, field corrections to
equipment or system components, or other modifications that occur during testing must be documented.

24.10.2.3 Documentation shall have the date, time, weather conditions, and names of persons participating in the inspection and testing

24.10.2.4 Test instruments shall be documented for valid calibration

24.10.2.5 The documentation format for records must be approved by the Project Manager

24.10.3 Report

24.10.3.1 The Commissioning Authority shall prepare and submit to the Adjutant General’s Department the report in PDF format.

24.10.3.2 Submit draft report after completion of initial commissioning at substantial completion

24.10.3.3 Submit final report after completion of commissioning period.

24.10.3.4 Report shall document ALL Cx activities including reviews, checklists, issues log, tests performed, any modifications to tests, comparison to TAB and other agency tests, and verification of compliance with OPR.

24.10.4 Training Session Requirements

24.10.4.1 Training Sessions shall be conducted for the Adjutant General’s Department personnel in the Adjutant General’s Department Facilities, with hands-on-training at the project site.

24.10.4.2 Commissioning Authority shall identify personnel, including Construction Contractor, A/E and manufacturer’s representatives that shall participate in training sessions as required in the Construction Documents. Training time requirements shall be identified in a training matrix for inclusion in Commissioning Plan. The Commissioning Authority shall participate in vendor- provided training

24.10.4.3 Commissioning Authority will review the Training Agenda prepared by the Contractor and provide comments to the UPL

24.10.4.4 Training Session Topics to be included:

.1 Equipment and system descriptions including design intent
.2 Equipment start-up operation in normal and emergency modes, shutdown procedures, seasonal changeover, and manual/automatic control
.3 Operation and adjustment of dampers, valves and controls
.4 Preventative Maintenance Program: requirements and schedules for routine maintenance on equipment
.5 Special tools needed and a recommended spare parts inventory
.6 Relevant health and safety issues, including emergency procedures
.7 Warranties and guarantees
.8 Hands-on operation of the equipment and systems
.9 Common troubleshooting problems that might arise, with a description of possible causes and corrective measures
.10 Overview of information contained in the operating manuals and location of plans and manuals in the facility
.11 Video record training session for future training needs

24.10.4.5 Commissioning Authority shall review and comment on the Contractor-provided training materials

24.10.4.6 The Contractor shall provide professional video production services to record these training sessions. Provide three (3) hard copies of training manuals, contained in 3-ring binders, and one (1) electronic copy in PDF format which include necessary
documentation for system hardware operation and maintenance data. Provide three (3) copies of the training session video DVD format

24.11 GENERAL REQUIREMENTS

24.11.1 Operating equipment and systems shall be tested by the Commissioning Authority, to demonstrate compliance with specified requirements. Life safety tests shall be witnessed by persons identified by the Project Manager or the CxA.

24.11.2 Prior to installation, required control system components and sensors, as identified in the Commissioning Plan, shall have been bench calibrated

24.11.3 Prior to start-up, Installation Verification inspection checklists shall be complete. The Contractor shall coordinate with the CxA to develop this checklist

24.11.4 Before starting Functional Performance Tests, Installation Verification shall be completed and approved by the Owner

24.11.5 Per the Commissioning Plan, testing shall be conducted under specified design operating conditions, and in accordance with manufacturer’s instructions. BAS testing shall be assisted by personnel of the Contractor and the BAS Sub-Contractor. Manufacturer’s installation team shall assist in testing of other major equipment where applicable to the Commissioning Plan

24.11.6 Elements of systems shall be tested to demonstrate that total systems satisfy requirements of the Specifications. Testing shall be accomplished on hierarchical basis. Test each piece of equipment for proper operation, followed by each subsystem, followed by entire system, followed by any interfaces to other major systems

24.11.7 Special commissioning testing materials, tools and equipment shall be provided by and remain the property of the Commissioning Authority

24.11.8 Commissioning Authority shall provide (6) copies of test reports and records to the Project Manager within seven (7) days of test. The Project Manager will provide two (2) copies to the Contractor with requests for corrective action, if required

24.12 SYSTEM START-UP AND INSTALLATION VERIFICATION

24.12.1 Prior to HVAC system startup, the completed Utility Connection Checklist shall be reviewed by the Project Manager and forwarded to the CxA for inclusion in the Cx report

24.12.2 Contractor shall install temporary additional filters at return air devices to keep return air duct, plenums, and air handlers clean.

24.12.3 CxA shall inspect filters and air handlers to ensure that filters are properly maintained by Contractor

24.12.4 The CxA shall for purposes of installation verification, verify the following is performed by the Contractor:

24.12.4.1 Construction Contractor shall ensure that construction debris and dirt have been removed and that systems have been cleaned

24.12.4.2 Each system shall be checked for proper installation, shall be adjusted, and shall be calibrated to observe and report that it is ready to function as specified

24.12.4.3 System elements shall be checked to observe and report that they have been installed properly and that connections have been made correctly. Observe and report that each piece of equipment has been checked for proper lubrication, drive rotation, belt tension, control sequence or other conditions that may cause damage. Observe and report that control devices shall have been calibrated and control loops tuned

24.12.4.4 Observe and report that tests, meter readings and specific electrical characteristics agree with those required by equipment or system manufacturer
24.12.4.5 Discrete elements and sub-systems shall be adjusted and shall be checked for proper operation. Observe and report that wiring and support components for equipment are complete and tested

24.12.4.6 Installation Verifications shall be documented in a permanent record for each system/piece of equipment. Settings, readings and/or calibration points shall be listed on the record. Records shall be dated and initialed by the Construction Contractor and stamped by the Commissioning Authority

24.13 FUNCTIONAL PERFORMANCE TESTS

24.13.1 A Functional Performance Test shall be performed on each complete system after the Contractor has completed any tests specified in the individual specifications. Each function shall be demonstrated by the Commissioning Authority on a step-by-step basis as detailed in the written test procedure of the Commissioning Plan

24.13.2 Functional Performance Tests shall be documented in a permanent record for each system/piece of equipment. Settings, readings, and/or calibration points shall be listed on the record. Records shall be dated and initialed and stamped by the Commissioning Authority

24.13.3 The Construction Contractor shall make corrective measures of rejected systems and equipment as directed by the A/E and witnessed by the Commissioning Authority.

24.13.4 The Commissioning Authority shall coordinate re-testing of rejected systems/equipment through the PM after corrective measures have been performed

24.13.5 The Commissioning Authority shall identify and prepare a list of off-season systems that must be tested after the normal commissioning period to properly establish system performance. This second phase of testing shall take place within 10 months following construction and when weather conditions permit proper demonstration of systems under near-design conditions

24.13.6 The CxA shall perform a 10 month warranty review with the Project Manager to discuss ongoing issues and warranty items that need to be documented prior to end of warranty period

24.13.7 FAILURE: If, during functional performance testing phase the system or equipment fails to perform as required by the contract documents, that point/reading will be retested until it passes and five (5) additional pieces of the same type of equipment will be verified at no cost to Project Manager or the CxA

24.14 OWNERS DEMONSTRATION PHASE

24.14.1 The Contractor shall assist the CxA in demonstration of verification of randomly chosen test and balance readings, controls sequence of operations, and control system points. The following demonstrations shall be performed:

24.14.1.1 Demonstrate to Project Manager 10% of TAB readings to be chosen at random by Owner. This is in addition to the TAB readings verified by CxA

24.14.1.2 Demonstrate to Project Manager 15% of controls points of operation to be chosen at random by Owner

24.14.2 FAILURE: If, during owners demonstration phase of TAB readings and controls points readings, points do not perform as required, that point/reading will be retested until it passes and five (5) additional points/ readings will be verified at no cost to Owner.

24.14.3 The Owners Demonstration Phase shall be accounted for in overall construction schedule. Demonstration shall be performed after receipt and approval of Final Commissioning Report
DESIGN & CONSTRUCTION STANDARDS

Section 25 - ENVIRONMENTAL

25.1 ENVIRONMENTAL REQUIREMENTS FOR DEMOLITION, RENOVATION OR UTILITY UPGRADE

25.1.1 Demolition only: BUILDING CLEAN OUT - The building will be cleaned out of all chemical and chemical residues stored in the building.

25.1.2 LIGHT FIXTURES, TRANSFORMERS, AND LIGHT BULBS - Light fixtures, if they contain ballast with potential PCB will be separated and drummed for disposal per regulation. Building transformers will be tested for PCBs and appropriately disposed under TSCA. Fluorescent light bulbs will be collected and recycled.

25.1.3 All activities:

25.1.3.1 PAINTED SURFACES - Old paints commonly contain lead, may contain chrome, and other heavy metals. PCB's have rarely been used in paints. Determination of lead may be through use of XRF, unless demolition is required, then core samples will be necessary.

25.1.3.2 Sample paint surfaces for waste disposal with suspected hazardous components, run Toxic Characteristic Leaching Procedure (TCLP) analysis for metals. Sample should be of the paint surface and underlying strata (e.g., wood, brick, concrete). If knowledge of the material or paint is known which can tell it is not metal-based paint (e.g., latex paint on wallboard), no sampling is required for the specific surface.

.1 Sample all concrete, brick, etc., which are painted have the potential to be recycled.

.2 Sample all painted soft material such as wood which may be disposed.

25.1.3.3 ASBESTOS – Refer to Environmental Supplemental Conditions.

"The Contractor is required to collect a representative number of samples of suspect asbestos-containing materials (ACMs) following the National Emissions Standard for Hazardous Air Pollutants (NESHAPs) protocol for sample collection for a comprehensive demolition survey. Asbestos bulk samples shall be sampled using polarized light microscopy (PLM) in accordance with EPA's July 1993 method for the determination of asbestos in bulk building materials – EPA 600/R-93/116. The contractor shall properly track all samples on a chain-of-custody and use an accredited laboratory for analysis under the National Institute of Standards and Technology's National Voluntary Laboratory Accreditation Program (NVLAP) for determination of asbestos. Protocols to be used must be in accordance with applicable Federal, State, and local asbestos regulations. Results of the pre-demolition survey should be summarized in a comprehensive report that includes analytical results, regulatory requirements, conclusions and recommendations, tables with total amounts of each hazardous item, and photographs and maps/schematics of locations where hazards were identified."

25.1.3.4 SUBSLAB - if sub-slab of building has not been pre-cleaned by Environmental Planning Group (EPG) the following is required, (EPG personnel will aid PM on this portion of the project):

.1 The sewer line must be flushed to clean the line.

.2 The water used to flush the line may have to be captured and analyzed for full TCLP constituents and other constituents. This is based on the use of the building. If no indication that the material has potential environmental issues related to the sewer, the water may be allowed to be reintroduced into the sewer. At a minimum, all granular material or other components that could plug the sewer system must be filtered and removed. If the water has been sampled, local Publicly Owned Treatment Works (POTW) will be contacted for permission to dispose of the water back into the sanitary sewer. All of the analytical data collected in support of the discharge request will be transmitted to the POTW. If the analysis the water is classified as hazardous waste or does not meet POTW discharge requirements, it will be collected and disposed at an appropriate facility.

.3 During excavation, the soils surrounding the sewer line and floor drains must be observed for potential contamination (e.g., odor/staining). If contamination is observed, soil samples are required.
The stained soils, if excavated, shall be segregated so that they can be containerized and disposed of appropriately.

25.1.3.5 If sub-slab of building has been pre-cleared by EPG the following is required, (EPG personnel will aid PM on this portion of the project):

25.1.3.6 During excavation, the soil surrounding the sewer line and floor drains must be observed for potential contamination (e.g., odor/staining). If stained soils/contamination is observed, contaminated soils will be segregated and sampling will be required. Contact EPG for support in determining what analytical suite should be run. At a minimum, a full TCLP should be run.
Section 26 - APPENDIX A - GENERAL NOTES

26.1 General Notes

26.1.1 The following general note shall be added to plans: All costs for providing temporary Services shall be included in the Contractor’s bids. Specifications shall clearly identify each Contractor’s responsibility for installation of service lines and payment for services, whether services are furnished by the Utility Company or the Adjutant General’s Department.

26.1.2 Contractor shall follow OHARNG Environmental requirements.

26.1.3 Contractor is required to pay for all Testing.

26.1.4 Contractor shall meter and pay sewer-service use charges for usage by all entities for construction operations.

26.1.5 Contractor shall meter and pay electric-service use charges for usage by all entities for construction operations.

26.1.6 Contractor shall meter and pay water-service use charges for usage by all entities for construction operations.

26.1.7 Contractor shall meter and pay gas-service (propane/natural) use charges for usage by all entities for construction operations.

26.1.8 Contractor shall clean project site and work areas daily, including common areas.

26.1.9 Contractor shall be responsible for the removal of snow to gain access to project area, and from public access walkways and adjacent site walkways.

26.1.10 Sanitary Facilities: Contractor shall not use owner’s facilities. Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for the type, number, location, operation, and maintenance of fixtures and facilities.

26.1.11 Warranty Tags

26.1.11.1 At the time of installation, tag each warranted item with a durable, oil and water resistant tag approved by the Project Manager. Attach each tag with a copper wire and spray with a silicone waterproof coating. The date of acceptance and the QC signature must remain blank until the project is accepted for beneficial occupancy. Show the following information on the tag:

1. Type of product/material ____________________________________________
2. Model Number ____________________________________________________
3. Serial Number ____________________________________________________
4. Contract Number _________________________________________________
5. Warranty period __________ from __________ to __________
6. Inspector’s Name _________________________________________________
7. Construction Contractor ___________________________________________
8. Address __________________________________________________________
9. Phone Number ____________________________________________________
10. Warranty Contact _________________________________________________
11. Address __________________________________________________________
12. Phone Number ____________________________________________________
13. Warranty Response Time Priority Code ______________________________

26.1.12 Project Manager shall be notified a minimum of 72 hours prior to any connection to the existing Utility system. All connections to existing system shall be constructed under the observation of Project Manager. Contractor shall take precautions to prevent introduction of debris into new and existing sewer laterals and mains while making connections to the existing system.
### Section 27 - APPENDIX B - EQUIPMENT IDENTIFICATION

#### 27.1 Piping Identification Standard

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<th>Background Color</th>
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### 27.2 Valve Equipment Identification

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Section 28 - APPENDIX C - SECURITY, ACCESS CONTROL & DOOR HARDWARE

28.1 General

28.1.1 This Appendix does not provide a solution for every type of opening that may occur on the Project. The A/E shall become familiar with, and interpret this section of the Design and Construction Standards in accordance with the programmatic requirements of the Project. If variations are recommended, these shall be reviewed and approved by the Project Manager, prior to inclusion into the Bid Documents.

28.1.2 Although a Security Consultant may be retained, the scope of work shall be provided by the A/E.

28.1.3 Access Control and Security requirements for each project shall be evaluated and determined by the Project Delivery Team during the Schematic Design Phase.

28.1.4 Buildings shall be equipped with card access.

28.1.5 Card readers shall be provided in the following locations:

- 28.1.5.1 IT/Telecommunication Closets
- 28.1.5.2 Other such vital infrastructure spaces

28.1.6 All doors without card readers shall be monitored.

28.1.7 Card access control panel(s) for all access-controlled openings shall be located in a single IT/Telecommunications Room. This room may be located up to 250' from the opening.

28.1.8 Single-leaf door openings are preferred to double-leaf door openings. If double-leaf door openings are required by the project, a keyed removable mullion shall be provided.

28.1.9 Exterior doors shall be provided with Electrified Panic Hardware and shall be monitored by the Access Control System. An exterior opening which is not hinged, such as a large sliding, overhead coiling or similar opening shall be monitored.

28.1.10 If aluminum storefront systems are specified, only wide-stile doors are acceptable. Provide a 12” bottom rail on aluminum storefront doors.

28.1.11 All cable shall be in minimum 3/4" conduit from door to cable tray and from cable tray to head-end panels. Home run conduit from junction box to security panel shall be minimum 1” conduit. All conduit and cable shall be concealed.

28.1.12 All cable shall be shielded and plenum rated.

28.2 Security

28.2.1 General

28.2.1.1 This document provides internal policy, guidance and considerations for integrating physical security in all Adjutant General’s Department owned, managed, or occupied buildings. Security shall be an integral consideration in the selection and development of both new building sites and renovation projects. The guidelines in this Appendix set forth minimum security features and arrangements that are required for all site buildings and facilities.

28.2.1.2 Security design, including drawings and specifications, shall include, but not be limited to the physical, electrical and/or electronic, CCTV, and mechanical security design details. Bid Documents shall be signed and sealed by the Ohio Licensed Professional who prepared them.

28.2.1.3 Security infrastructure components shall not be located in Custodial Closets, Mechanical Rooms or Electrical Rooms. All equipment shall be located in the Telecommunications Closet.

28.2.1.4 The A/E shall develop the set of construction documents for a turn-key security package, including all scope items required to meet this Standard.
28.2.2 Definitions

28.2.2.1 CCTV Maintenance Agreement Vendor/Contractor – the entity responsible for the integration of the security system. This entity is referred to as the Integrator.

28.2.2.2 Contractor – the entity responsible for the installation of the security system. This entity is referred to as the Installer and may be a prime contractor, or a subcontractor.

28.2.2.3 Adjutant General’s Department - responsible for determination of the Threat Level of the project, evaluation of the Security Assessment and management of the systems and contract with CCTV Maintenance Vendor/Contractor.

28.2.2.4 Installation – the efforts required to install the security system in the project:
   .1 Devices shall be installed with credentials set to factory defaults.
   .2 Cameras shall be pointed, aimed, focused and flashed.
   .3 Switches shall accommodate 20% growth.
   .4 Switches shall be flashed.
   .5 Pathways, wiring and connections to each device within the project scope.
   .6 Provide server(s) for installation by Integrator.

28.2.2.5 Integration – the efforts required to connect the installed security system to the Project backbone:
   .1 Provide IP addresses for each device to the Installer.
   .2 Install software on the new server(s).
   .3 Program recording equipment.
   .4 Program alarm equipment.

28.2.2.6 Office of Information Technology (G6) – the office responsible for material, installation, cost estimate, and maintenance of the following components for the system:
   .1 Fiber connections within building from IT closet to IT closet
   .2 Fiber jumpers as required for CCTV installations
   .3 UPS for network switches in building required for CCTV installations
   .4 Space in IT closet switch racks for CCTV switches
   .5 Identification and marking of fiber cables

28.2.2.7 Security Assessment – a written document that describes the A/E’s response to the Threat Level that has been assigned to the project. The Security Assessment shall be included in the Schematic Design Submission, and updated as the project is developed.

28.2.2.8 Security Consultant – if retained by the A/E, this consultant may provide the Security Assessment, recommend the scope of work, review the design to ensure that recommended scope is adequately captured in the design/bid/construction documents and/or provide commissioning services for the security systems.

28.2.3 Facility Threat Level (TL) Designation

28.2.3.1 General
   .1 The level of security required will be dependent on the function of the facility and of specific space within the facility.

28.2.4 Security Hardware

28.2.4.1 Site Security:
   .1 Structural barriers such as bollards and fencing shall be installed at the primary and secondary entrances to new buildings to prevent vehicular approaches and intrusions.
   .2 Landscaping shall be selected and placed in such a manner that opportunities for concealment are minimized.
28.2.5 CCTV (Closed Circuit Television):
   28.2.5.1 CCTV equipment shall be compatible with existing video and access control security integration system.
   28.2.5.2 CCTV cameras shall have sufficient resolution and be located such that recognizable images of individuals are captured by the CCTV system.
   28.2.5.3 Provide dedicated electrical circuit(s) on emergency or back-up power system for the CCTV system.
   28.2.5.4 CCTV cameras shall either be “fixed” or “pan-tilt-zoom” type (PTZ). PTZ cameras shall have an alarm output, thereby allowing the camera to be viewed automatically when a signaling hardware element is annunciated, such as an emergency phone or access control door hardware.

28.2.6 Alarms:
   28.2.6.1 System shall be capable of integration with site security and access control systems.

28.2.7 Building Miscellaneous Security:
   28.2.7.1 Roof access hatches shall be locked at all times from the inside, and electronically monitored through the access control system.
   28.2.7.2 All windows within 6’ of the grade plane shall open 6”, maximum.

28.3 Door Hardware

   28.3.1 General
      28.3.1.1 Acceptable Manufacturers for door hardware are Ingersoll Rand or Best unless noted otherwise in this section.
      28.3.1.2 Finishes for door hardware shall match either US26D or US32D, consistently throughout the project. On renovation projects, other finishes may be submitted to the Project Manager for review, if matching the existing finishes is desired.
      28.3.1.3 Permanent cores shall be provided by the Contractor. Provide Best construction cores during the construction phase. Near the end of the project, Contractor will remove the construction cores, install the permanent cores. The Adjutant General’s Department shall develop the final keying schedule prior to purchasing and delivery of the permanent cores.

   28.3.2 Access Control Hardware
      28.3.2.1 Access Control hardware shall be provided by the following:
         .1 Best
         .2 Von Duprin
      28.3.2.2 Locksets shall accept Best 7-pin interchangeable cores and cylinders.
      28.3.2.3 Electrified panic hardware shall be Von Duprin 98/99 Series Rim Device with night latch (NL), electric latch retraction (EL) and request to exit (RX). Manual/key latching or cylinder dogging is not acceptable.
      28.3.2.4 Automatic door operators, if used, shall be LCN 4642 Series. Substitutions are not acceptable. If an automatic door operator is used on any card access door, the door shall have both card reader and proximity reader tied into the Access Control System.
      28.3.2.5 All doors and frames shall be prepped for EPT-10 (Electric Power Transfer) when electrified hardware is present.
28.3.3 Hinges

28.3.3.1 Hinges shall be provided by one of the following:

.1 Hager
.2 McKinney
.3 Stanley

28.3.3.2 Continuous gear-type hinges, manufactured of extruded 6063-T6 aluminum alloy/temper and consisting of three interlocking extrusions in a pin-less assembly applied to the full height of the door and frame, shall be provided at all exterior openings. Finish to match door.

28.3.3.3 Butt hinges shall be manufactured to template screw locations and be non-handed.

28.3.3.4 Thrust bearings shall carry the vertical loads and be completely concealed by the gear cap the full length of the hinge.

28.3.3.5 Hinges shall comply with ANSI A156, Grade 1.

28.3.4 Mechanical Locks and Latches

28.3.4.1 Locksets shall be provided by the following:

.1 Ingersoll Rand
.2 Best

28.3.4.2 Locksets shall accept Best 7-pin interchangeable cores and cylinders.

28.3.4.3 Plastic parts in locksets are not acceptable.

28.3.4.4 If specified, mortise-type locksets shall comply with ANSI A156, Grade 1, with 3/4 inch throw latch bolt. Inside trim shall include a turn lever to permit egress when door is locked. Mortise cylinders shall have a concealed internal set screw for securing the cylinder to the body. Best 45H Series shall be provided.

28.3.4.5 If specified, cylinder-type locksets shall comply with ANSI A156, Grade 1. Inside trim shall include a turn lever to permit egress when door is locked. Provide 2¾” backset on cylinder locksets. Best 9K Series shall be provided.

28.3.4.6 Deadbolts shall be constructed of hardened stainless steel and shall extend a minimum of 1” into the door casing, beyond the door strike. Levers shall be operated with a roller bearing spindle hub mechanism. The use of dead bolts shall be approved by Project Manager.

28.3.4.7 Latch bolts shall extend a minimum of 3/8” into the door casing, beyond the door strike.

28.3.4.8 Furnish locksets with sufficient curved strike lip to protect door trim.

28.3.4.9 Locksets to have self-aligning, thru-bolted trim.

28.3.4.10 Auxiliary dead latches shall be constructed of one piece hardened stainless steel, permanently lubricated.

28.3.4.11 Lever handles shall be forged of cast brass, bronze, or stainless steel and shall conform to ANSI A117.1. Hollow cavity levers are not acceptable.

28.3.5 Panic Hardware

28.3.5.1 Panic hardware shall be Von Duprin, 98/99 Series Rim Device.

28.3.5.2 Exterior doors shall be equipped with Electrified Panic Hardware.

28.3.5.3 Outside trim shall be pull without a movable handle. Vertical rod devices are not acceptable.

28.3.5.4 Panic hardware shall be UL listed for Accident Hazard.

28.3.5.5 Panic hardware in a fire-rated assembly shall bear factory installed UL listing for specified rating.
28.3.5.6 Panic hardware on doors with card readers shall also be keyed. Keys shall not be provided on exterior doors without card readers.

28.3.5.7 Panic hardware shall have a three-year warranty.

28.3.6 Door Closers

28.3.6.1 Closers shall be mounted on interior side of space/room. Closer shall be mounted in an inverted overhead position or in a parallel arm position.

28.3.6.2 Closers shall be equipped with “delayed-action” feature.

28.3.6.3 Closers shall be equipped with “back-check” feature.

28.3.6.4 Closers shall have a ten-year warranty.

28.3.7 Operating Trim

28.3.7.1 Door Operating Trim shall be provided by one of the following:

.1 Glynn-Johnson

.2 McKinney

.3 Rockwood

28.3.7.2 Flush and surface bolts shall comply with ANSI A156, Grade 1.

28.3.7.3 Coordinators shall comply with ANSI A156, Grade 1.

28.3.7.4 Where through-bolts are used to attach hardware to doors, spacer sleeves in doors shall be provided to prevent collapse of the door.

28.3.7.5 Thru-bolt fasteners shall be templated so as not to make contact with the frame assembly.

28.3.8 Architectural Trim

28.3.8.1 Metal protection plates shall comply with ANSI A156, Grade 1. Provide .050 stainless steel plate with four beveled edges, door leaf width, less 2” for a single door, less 1” for pairs of doors. Provide 8” height kick- and 34” for armor-plate.

28.3.8.2 Furnish screws to match finish.

28.3.9 Door Stops and Holders

28.3.9.1 Provide an overhead stop at exterior openings, similar to Glynn-Johnson 100.

28.3.9.2 Wall stops are preferred.

28.3.9.3 Floor stops are not desired, unless a wall stop cannot be provided.

28.3.10 Door Seals

28.3.10.1 Provide sound-rated seals at all classrooms, offices and sleeping units, and those spaces recommended by the A/E, or Acoustician.

28.3.10.2 Weather stripping shall be provided by the storefront manufacturer.

28.3.11 Thresholds

28.3.11.1 ADA-compliant thresholds at all exterior openings and those spaces recommended by the A/E.

28.4 Standard Openings Schedule

28.4.1 The list below is intended to provide the A/E with an understanding of the level of detail and quality that is expected for the documentation of openings that are most-often used at the Adjutant’s General’s Department. The final recommendation for each of these openings will be dependent on the project requirements. The A/E has the responsibility for the coordination of these products into the Construction Documents.
28.4.1.1 Single Exterior Door – Storefront
.1 Hinge, continuous
.2 Rim Cylinder
.3 Electrified Panic Hardware
.4 Power Transfer
.5 Power Supply Unit
.6 Card Reader (or Proximity Reader)
.7 Pull Bar
.8 Push Bar
.9 Closer (or Power Operator)
.10 Power Operator Pushbuttons
.11 Overhead Stop
.12 Weather-stripping
.13 Threshold
.14 Control post (if required)

28.4.1.2 Single Exterior Door
.1 Hinge, continuous
.2 Rim Cylinder
.3 Electrified Panic Hardware
.4 Power Transfer
.5 Power Supply Unit (if electrified hardware is specified)
.6 Card Reader (or Proximity Reader), if applicable
.7 Exit Device Outside Trim

28.4.1.3 Closer
.1 Overhead Stop
.2 Weather stripping
.3 Threshold
.4 Control post (if required)

28.4.1.4 Double Exterior Door – Storefront (note ADA leaf)
.1 (2) Hinges, continuous
.2 (2) Rim Cylinders
.3 Keyed Removable Mullion (with cylinder)
.4 (2) Electrified Panic Hardware
.5 (2) Power Transfers
.6 (2) Power Supply Units
.7 Card Reader (or Proximity Reader)
.8 (2) Pull Bars
.9 (2) Push Bars
.10 Coordinator (if required)
.11 (2) Closers (or Power Operator)
.12 Power Operator Pushbuttons
.13 (2) Overhead Stop
.14 Weather stripping
.15 Threshold
### Crushed Stone Sizes

<table>
<thead>
<tr>
<th>Number</th>
<th>Size</th>
<th>Common Use</th>
<th>Description / Approximate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 &amp; 2</td>
<td>2&quot;-4&quot;</td>
<td>Bases and filling in bad mud conditions</td>
<td>Size of baseball and softballs</td>
</tr>
<tr>
<td>4</td>
<td>2&quot;</td>
<td>Mass concrete, railroad ballast, filler stone</td>
<td>Size of acid balls</td>
</tr>
<tr>
<td>57</td>
<td>1/4&quot; - 1&quot;</td>
<td>Concrete, asphalt base, fill</td>
<td>Size of a walnut</td>
</tr>
<tr>
<td>67</td>
<td>3/4&quot;</td>
<td>Asphalt, parking lots</td>
<td>Size of a big marble</td>
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<tr>
<td>8</td>
<td>1/8&quot; - 1/2&quot;</td>
<td>Asphalt, pipe bedding, drainage, driveways</td>
<td>Size of a peanut</td>
</tr>
<tr>
<td>9</td>
<td>1/4&quot;</td>
<td>Top control, fillings, drainage</td>
<td>Size of a pencil eraser (pea)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Coving county and township roads</td>
<td></td>
</tr>
<tr>
<td>304.02</td>
<td>2&quot; down</td>
<td>Base for roads, parking lots and driveways</td>
<td>Golf ball size down to dust, will track until it hardens</td>
</tr>
<tr>
<td>411.02</td>
<td>1&quot; down</td>
<td>Road berms, topping for drives, parking lots</td>
<td>Walnut size down to dust, will track until it hardens</td>
</tr>
<tr>
<td>703.05</td>
<td>Sand</td>
<td>Sand for asphalt and concrete products</td>
<td>Sand to dust (screenings)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type A</td>
<td>24&quot; x 36&quot;</td>
<td>Rip-Rap material</td>
<td>Reservoirs, ponds, docks</td>
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<tr>
<td>Type B</td>
<td>12&quot; x 24&quot;</td>
<td>Rip-Rap material</td>
<td>The more water, the larger the stone should be</td>
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<tr>
<td>Type C</td>
<td>12&quot; x 18&quot;</td>
<td>Rip-Rap material</td>
<td></td>
</tr>
<tr>
<td>Type D</td>
<td>6&quot; x 12&quot;</td>
<td>Rip-Rap material</td>
<td></td>
</tr>
</tbody>
</table>

Type A, B, C, D dumped rock filling conforms with ODOT Specification 317.07, which reads as follows:

- **Type A**
  - 24" x 36" Rip-Rap material
  - At least 85% larger than 18" but less than 30"
  - At least 50% larger than 24"
  - Materials smaller than 18" consisting predominantly of rock spalls and fines and shall be free of soil

- **Type B**
  - 12" x 24" Rip-Rap material
  - At least 85% larger than 12" but less than 24"
  - At least 50% larger than 18"
  - Materials smaller than 12" consisting predominantly of rock spalls and fines and shall be free of soil

- **Type C**
  - 12" x 18" Rip-Rap material
  - At least 85% larger than 6" but less than 18"
  - At least 50% larger than 12"
  - Materials smaller than 6" consisting predominantly of rock spalls and fines and shall be free of soil

- **Type D**
  - 6" x 12" Rip-Rap material
  - At least 85% larger than 3" but less than 12"
  - At least 50% larger than 6"
  - Materials smaller than 3" consisting predominantly of rock spalls and fines and shall be free of soil

### Rule Of Thumb

- A cubic yard of anything clean (12, 4, 57, 8) 1.5 Tons
- A cubic yard of anything w/dust (304, 411, 703, and sands) 2 Tons
- A cubic yard of rip-rap (Type A, B, C, D) 1.9 Tons

### To Convert To Tons

<table>
<thead>
<tr>
<th>Table Inches To Feet (decimal)</th>
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<tbody>
<tr>
<td>1&quot; = .0833</td>
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<tr>
<td>2&quot; = .1667</td>
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<tr>
<td>3&quot; = .2500</td>
</tr>
<tr>
<td>4&quot; = .3333</td>
</tr>
<tr>
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</tr>
<tr>
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</tr>
<tr>
<td>7&quot; = .5833</td>
</tr>
<tr>
<td>8&quot; = .6666</td>
</tr>
<tr>
<td>9&quot; = .7500</td>
</tr>
<tr>
<td>10&quot; = .8333</td>
</tr>
<tr>
<td>11&quot; = .9166</td>
</tr>
<tr>
<td>12&quot; = 1</td>
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</table>

Savore feet = length x width
Take the length (in feet) and multiply that by the width (in feet)
To convert inches to feet see table of side
Take this answer and divide by 27
Then to figure tonnage multiply that answer by one of the following:

- #2, 4, 57, 8, 9 Multiply by 1.5
- 304, 411, 703 (sands) Multiply by 2.0
- A, B, C, D Multiply by 1.9
<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>TYPICAL COEFFICIENTS OF EXPANSION IN INCH PER INCH PER °F</th>
<th>EXPANSION IN 64hrs OF AN INCH PER 100° F TEMPERATURE RISE PER 10' LENGTH (APPROX.)</th>
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</thead>
<tbody>
<tr>
<td>STAINLESS STEEL</td>
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<tr>
<td>(300 Series)</td>
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<tr>
<td>110 SOFT COPPER</td>
<td>.0000094</td>
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<tr>
<td>110 COLD ROLLED COPPER</td>
<td>.0000098</td>
<td></td>
</tr>
<tr>
<td>TIN</td>
<td>.0000117</td>
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<tr>
<td>ALUMINUM 3003</td>
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<tr>
<td>LEAD</td>
<td>.0000150</td>
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<tr>
<td>ZINC, ROLLED</td>
<td>.0000174</td>
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<tr>
<td>ZINC ALLOY (With grain)</td>
<td>.0000130</td>
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<tr>
<td>ZINC ALLOY (Across grain)</td>
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<tr>
<td>MONEL</td>
<td>.0000078</td>
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<tr>
<td>GALVANIZED STEEL</td>
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<td>CONCRETE</td>
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**PANEL PROFILES AND CLIPS (ARCHITECTURAL)**

**POWER SEAMED, SINGLE STAGE, CLIPS REQUIRED**

1. Requires hand or power seamer.
2. A very secure tight seam.
3. Panels should have a fixed point.
4. Thermal movement requires floating clips in longer panels.
5. Low slope with sealant in seams is recommended.

**POWER SEAMED, DOUBLE STAGE, CLIPS REQUIRED**

1. Requires hand or power seamer.
2. The most secure, tight seam of the architectural panels.
3. Panels should have a fixed point.
4. Thermal movement requires floating clips in longer panels.
5. The best seam for low slopes.

**SNAP SEAM, CLIPS REQUIRED**

1. Seams snap together.
2. Panel seams and caps must be secured to prevent movement.
3. Seam is open to wind driven moisture, without sealants, plugs and closures.

**BATTEN SEAM OR BATTEN CAP**

1. Straight legs on panel uses a secured clip, to hold panel to substrate, it spaces panel for batten seam or cap, and holds the seam or cap.
2. Panel seams and caps must be secured to prevent movement.
4. Vinyl inserts or sealant in cap is recommended.
1. General

1.1. The Ohio Army National Guard (OHARNG) is committed to environmental stewardship at all of our facilities and within our communities as a whole. The Adjutant General’s Department maintains an Environmental Management System (EMS) in accordance with (IAW) ISO 14000 standards. Contractors performing work on behalf of the department are required to be familiar with the Adjutant General’s EMS Policy and to comply with this policy where applicable and practicable. If implemented accordingly, following the guidelines outlined in the following supplemental conditions will ensure Contractor compliance with the EMS policy.

1.2. The contractor must comply with all applicable local, state, and federal environmental requirements to include applicable Army and OHARNG regulations. This includes, but is not limited to, the proper characterization, management and disposal of wastes; proper storage, use and transportation of hazardous materials; spill prevention and clean up; obtaining proper permits and submitting proper notifications as applicable to the work being conducted; and protection of surface water and natural resources.

1.3. The contractor will not correspond with any regulatory agency on behalf of the OHARNG without approval of the OHARNG. This includes meetings, phone calls, emails, or other written or verbal communications. The OHARNG will review and approve all correspondence before it is sent to a regulatory agency to include but not limited to the federal or Ohio Environmental Protection Agency (EPA), the US Fish and Wildlife Service, the Ohio Historic Preservation Office, and the US Army Corps of Engineers.

1.4. The contractor is responsible for paying all fees and acquiring all applicable permits or regulatory approvals associated with the work they are performing. Depending upon the permit/notification, it may need to be issued in the OHARNG’s name. Coordination will be done with the OHARNG to determine this and the contractor will complete the application/notification for OHARNG signature and submit the application and associated fees. All permit submittals will be coordinated, reviewed and approved by the OHARNG regardless who signs the application.

1.5. The contractor will develop an environmental work plan that identifies the details of work to be performed and how it will be performed to ensure compliance with applicable environmental requirements (wetland permits, endangered species restrictions, erosion control, hazardous waste generation, etc.). Topics addressed within the environmental work plan will include as applicable: hazardous materials to be used; the qualified personnel responsible for waste management; waste to be generated (hazardous and non-hazardous waste); materials to be recycled; methods to be used to minimize hazardous waste generation; methods and laboratories to be used to characterize the waste; DRMO approved waste haulers and TSDF’s to be used; proposed on site waste storage locations; on site waste management and inspection procedures to be implemented to include maximum storage time/proposed waste pickup/transport date; emergency plan and emergency contact information; discharges from secondary containment and de-watering activities; and any other information pertinent to environmental compliance and the generation and management of waste during project implementation. The environmental work plan will be reviewed by the environmental office and edited by the contractor as necessary to correct deficiencies. Work may not begin until this work plan has been approved by the environmental office. A copy of the final work plan will be provided to the contracting office, the appropriate OHARNG environmental office, the OHARNG technical representative and one will be available at the project site at all times.

1.6. Executive Order (EO) 13693, Planning for Federal Sustainability in the Next Decade, establishes a federal integrated strategy toward sustainability including efforts to “eliminate waste, recycle, and prevent pollution.” Additionally, EO 13693 establishes targets to divert at least 50% of non-hazardous solid waste, including construction and demolition debris, from the waste stream. The Contractor will utilize the most current waste prevention, waste diversion (salvage, reuse, recycle), and waste minimization guidelines to ensure this target is met.
1.7. Burning of waste, brush, rubbish, and/or any other debris is not permitted. If brush or vegetation burning is desired, a request to do so must be submitted to the OHARNG for review. If the OHARNG concurs that burning is needed, the contractor is required to submit a burn permit to the Ohio EPA along with any associated fee. If the Ohio EPA approves the application and issues a permit, the contractor is required to comply with all conditions of the permit. Upon receipt of the Ohio EPA burn permit the contractor will obtain any additional permits required by the OHARNG and/or local fire departments/districts, if any.

2. Emergency Spill Response and Petroleum, Oil, and Lubricant (POL) Management

2.1. The contractor must implement the local OHARNG Spill Contingency Plan notification/reporting procedures upon discovery of a spill, leak or other release to the environment. The contractor is responsible for implementing spill response and clean up all spills/leaks within the project area immediately upon discovery. Clean up must be satisfactory to the OHARNG and/or the Ohio EPA or other regulatory agency. Wastes will be managed as described in the waste management section of these supplemental conditions. Any spill of petroleum products over 25 gallons, or a spill of any amount into a body of water, must be reported to the OHARNG Environmental Office immediately. All other spills will be reported in writing on the OHARNG Spill Report Form to the OHARNG within 24 hours. The contractor will be provided with a copy of the OHARNG Spill Report Form and a point of contact for submitting such reports/notifications.

2.2. The contractor is required to have a spill kit with appropriate absorbents, plastic bags, drums, shovels, and other supplies and equipment suitable to clean up any releases or spills from their activities.

2.3. Contractor fuel pods / fuel cans and other POL and liquid hazardous materials must be in/on secondary containment with storage capacity large enough to store the contents of the containers. Releases of rain water from secondary containment can only be initiated after approval from the OHARNG Environmental Office and after inspection and verification/absorption of all POL and/or other contaminants in the water by the contractor. Discharge of POL or other contaminants/pollutants from secondary containment is not permitted. At minimum, discharging through an oil only boom/filter or an oil absorption filter bag is required. If the contractor cannot show proof of lack of contaminants, the water will need to be sampled and characterize to determine the proper discharge/disposal method. The contractor will document all discharges/disposal from secondary containments to include name and signature of person conducting discharge/disposal, date of discharge/disposal, volume discharged/disposed, method of discharge/disposal, method of determining water was clean to discharge (analytical result if applicable), and a statement that any discharge did not contain POL or other contaminants. Discharges from secondary containment will be addressed in the environmental work plan.

3. Erosion Control, Storm Water and Other Surface Water Management

3.1. For all projects, regardless of the disturbance acreage, the contractor shall use all methods appropriate and required to prevent soil from leaving the project site either by wind, water, or on vehicles and equipment. Silt fence and other temporary run off soil detention methods will be used as needed. Spoil piles and disturbed areas will be managed in accordance with the stipulations in the Ohio EPA Storm Water Construction Permit and will be seeded with a temporary seed mix if left idle for the designated period of time. The project site will be closed out by preparing the soil as a seed bed and seeding and mulching with the appropriate seed mix. Temporary erosion control measures (silt fence) will be removed by the contractor once vegetation has been established and soil on the project area is stabilized.

3.2. Native seed mixes will be used where suitable and compatible with maintenance requirements. An appropriate turf grass mix will be used for high traffic and high maintenance areas. Annual ryegrass may be added to mixes to provide quick cover. For late season seeding, winter wheat/rye may be added to provide a quick cover. Contractors may use approved grass seed mixes provided by the OHARNG or may propose alternative seed mixes. The OHARNG Environmental Office must approve all seed mixes. The seed mixes should be included in the environmental work plan.

3.3. For projects that disturb one (1) or more acres of ground (or otherwise meet the Ohio EPA criteria for permit coverage), the contractor will complete a Notice of Intent (NOI) for coverage under the Ohio EPA General
DESIGN & CONSTRUCTION STANDARDS

National Pollutant Discharge Elimination System (NPDES) Permit for Storm Water Discharges Associated with Construction Activity. The NOI will be filled out with the Ohio Army National Guard – “Location” (such as Camp Ravenna or Camp Perry, etc.) as the owner and the specific project identified as the Facility Name (such as Camp Ravenna Barracks III). The NOI will be reviewed and approved by the local OHARNG Environmental Office and signed by an authorized OHARNG employee. The contractor will submit the approved NOI and pay the associated fee. After the Ohio EPA issues an authorization letter and permit number to the OHARNG, the contractor and applicable sub-contractors will complete and submit Co-Permittee NOI’s and will obtain coverage as co-permittees under the OHARNG permit. The contractor will utilize the information on the OHARNG approved NOI and Ohio EPA permit when completing the Co-Permittee NOI. The contractor will sign and submit the OHARNG approved Co-Permittee NOI.

3.4. When an Ohio EPA Construction Storm Water Permit is needed, the contractor will develop a Storm Water Pollution Prevention Plan (SWP3) in accordance with the requirements contained in the Ohio EPA General NPDES Permit for Storm Water Discharges Associated with Construction Activity. The SWP3 will be provided to the local OHARNG Environmental Office for review and approval and then to the local Soil and Water Conservation District (SWCD) and local County Engineer (if required by County or other regulations) for their review and approval. The contractor will make corrections to the SWP3 based upon OHARNG, SWCD and Engineer comments. The SWP3 will be signed by the local OHARNG Environmental Office and the Contractor. The final copy of the SWP3 will be in a three ring binder and a signed copy of the SWP3 will be given to the local OHARNG Environmental Office and a copy will remain at the work site during project execution.

3.5. The contractor will implement the SWP3 and conduct all inspections and maintain storm water/erosion controls in accordance with the SWP3. The contractor will use the inspection checklist for storm water controls in the SWP3 and shall complete and maintain signed inspections on site in the SWP3 binder. Copies of weekly/post storm event inspections will be provided to the local OHARNG Environmental Office monthly. The contractor will notify the local OHARNG Environmental Office immediately if there is a storm water control failure and off site discharge from the project area.

3.6. The contractor will notify the local OHARNG Environmental Office within 45 days of final site stabilization. The local OHARNG Environmental Office will inspect the site and will submit a Notice of Termination (NOT) if the site stabilization is approved. If required, the contractor is responsible for submitting the NOT(s) for termination of their co-permittee coverage after the OHARNG has terminated the permit. The site is considered to have reached final stabilization when the terms identified in the Ohio EPA Permit are met.

3.7. The contractor will use best management practices or whatever means necessary to prevent contamination of storm water due to runoff from wastes, debris piles, fuel tanks, materials and equipment, and other storage/materials on the project site.

3.8. The contractor is not permitted to disturb or fill any wetlands, streams, or other surface waters while performing tasks within this scope of work unless such disturbance or fill is specifically identified as a task in the scope and applicable permits and authorizations have been obtained. The contractor will maintain a 30 foot undisturbed buffer around wetlands and depressional areas that hold water and keep all equipment, materials, vehicles, debris, waste, and personnel out of this buffer and prevent discharges of any type (chemical or soil) from entering such areas.

3.9. The OHARNG Environmental Office must approve all dewatering activities. Dewatering will be addressed in the environmental work plan if applicable to the project. Standing water must be characterized to determine if it is regulated before dewatering procedures are implemented. Characterization may be possible by generator knowledge or may require sampling and analysis. For demolition projects the water may contain asbestos, lead, PCBs or other contaminants and will have to be sampled. Construction dewater would most likely only contain suspended solids but could contain contaminated groundwater depending upon where the project is located. At minimum, discharges must meet water quality standards identified in Ohio Administrative Code 3745-1. At locations with known contaminated groundwater the OHARNG Environmental Office will provide specific guidance on containerization, sampling, and disposal/discharge requirements. At minimum, water must be discharged through an oil absorption and/or an activated charcoal, and/or a sediment filter bag as appropriate, for the water being discharged. Discharge will be done in a vegetated upland area that drains away from the work site unless
otherwise specified in the scope of work or authorized by the OHARNG Environmental Office. Discharge will be done so as to allow the discharge to filter through dense groundcover vegetation. The discharge hose will be set on a piece of plywood or rubber mat to disperse the water and prevent a concentrated discharge that can cut and erode soil. Direct discharge to a stream, pond, wetland, ditch or other body of water or conveyance is not permitted.

4. Hazardous Waste, Other Waste and Recycling

4.1. Hazardous waste generated by contractors working on OHARNG projects counts toward the OHARNG monthly generation total and is an OHARNG waste. The contractor is responsible for minimizing all waste generation from OHARNG projects and for properly managing all wastes generated from OHARNG projects in accordance with the Ohio Army National Guard Waste Management Guidelines. Waste generated from OHARNG projects conducted at Camp Ravenna must be managed in accordance with the Camp Ravenna Waste Management Guidelines. Waste will be managed in accordance with all applicable Federal, States, U.S. Army, NGB and OHARNG regulations and requirements. OHARNG sites may have specific hazardous waste information / management guidelines that must be followed to ensure compliance with applicable regulations and requirements. The contractor must include hazardous waste management in their environmental work plan and coordinate all hazardous waste generation and management activities with the OHARNG Environmental Office prior to beginning work.

4.2. The contractor is responsible for characterizing all waste generated from a project and notifying the OHARNG of all waste streams, management methodology, and disposal methods prior to beginning work. If an alternative practice is available that will eliminate or minimize hazardous waste generation, the contractor is required to implement such practice (e.g. using dry ice instead of sand to sand blast lead based paint and minimize lead waste).

4.3. The contractor is responsible for properly labeling, storing, and inspecting non-hazardous and hazardous waste stored at the project site pending disposal. All containers on the project site will be labeled as to the contents, whether waste or otherwise. All waste stored on site must be inspected weekly using the Ohio Army National Guard Weekly Non-Hazardous and Hazardous Waste Inspection/Inventory Sheet.

4.4. The Contractor is responsible for properly completing all waste profiles, waste manifests, and shipping documents (hazardous and non-hazardous waste). Such documents will be reviewed, approved, and signed by the OHARNG. No waste may leave the site until the shipping documents are reviewed, approved and signed by the OHARNG. The contractor is responsible for weighing and documenting all waste material (regulated, diverted, landfilled) leaving the site. The contractor will complete a Construction/Demolition Diversion and Waste Disposal Form and provide supporting documentation (weight tickets, manifests etc.) prior to final payment.

4.5. The Contractor must manage used lamps (incandescent, fluorescent, mercury vapor, neon, high pressure sodium and metal halide) and other applicable wastes as universal waste in accordance with Ohio Administrative Code 3745-273-13(D) and the Ohio Environmental Protection Agency’s August 2011 Universal Waste Guidelines. Fluorescent light ballasts containing PCBs only in an intact and non-leaking capacitor must be disposed of in accordance with 40 CFR Part 761.60(b)(2)(ii). Fluorescent light ballasts containing PCBs in the potting material must be disposed of in accordance with 40 CFR Part 761.62. Fluorescent light ballasts that are not marked specifically as “Non PCB Containing” must be treated as PCB containing ballasts. Disposition of used lamps and ballasts must be noted on the Construction/Demolition Diversion and Waste Disposal Form as noted in paragraph 4.4 above.

4.6. The Contractor is required to recycle materials when possible and practicable. Recycled materials must be tracked using the Construction/Demolition Diversion and Waste Disposal Form. Materials that cannot be recycled or repurposed must be properly disposed of as solid waste at an appropriate waste handling facility. Solid waste must also be tracked using the Construction/Demolition Diversion and Waste Disposal Form. Disposal tickets for any materials transported to a landfill or recycled locally must accompany the Construction/Demolition Diversion and Waste Disposal Form.
4.7. Contractors are required to utilize qualified Defense Logistics Agency (DLA) waste haulers and Treatment, Storage, and Disposal Facilities (TSDFs) for hazardous waste. The current qualified waste hauler and TSDF list can be viewed by following the “Qualified Facilities” and “Qualified Transporters” links found on the DLA Disposition Services' Hazardous Waste Disposal Homepage, http://www.dla.mil/DispositionServices/Offers/Disposal/HazardousWaste/HazWasteDisposal.aspx.

4.8. Gray water and other liquid wastes (to include extracted groundwater and water from dewatering) generated by the contractor shall be managed in accordance with the waste management guidance in this section and applicable federal, state, and local regulations. Liquid waste may not be discharged to the land surface, surface water, storm drain/ditch, or a sanitary sewer unless properly characterized and done in accordance with applicable laws and applicable permit conditions. Liquid waste will be characterized and proper management and disposal methods identified and implemented. Guidance on construction site dewatering is provided in the section on Erosion Control, Storm Water and Other Surface Water Management.

5. Asbestos

5.1. Asbestos Identification: The asbestos content of all building materials to be impacted or disturbed during renovation, demolition, or project activities must be determined. Asbestos content may be determined by the following methods: 1) The contractor may in accordance with an existing asbestos survey for the building if one that meets the Ohio Department of Health required Asbestos Hazard Emergency Response Act (AHERA) standards is available; or 2) If a building survey is not available, the contractor must collect bulk samples for asbestos in accordance with the AHERA 40 CFR Part 763.86 (OAC 3701-34-06(C)(9)) and prepare a detailed AHERA type report for each site where bulk samples are collected (OAC 3701-34-06(C)(10)).

5.2. Asbestos Work Activities: All asbestos activities, including any disturbance or removal, must be conducted in accordance with applicable Federal, State, and local regulations. Asbestos must be properly handled, removed, containerized, and disposed of in accordance with applicable Federal, State, and local regulations. Asbestos removal methods and disposal operations shall be detailed in an asbestos abatement plan to be reviewed and approved by the OHARNG environmental office prior to the start of work activities. All abatement activities shall be conducted by a licensed abatement contractor in accordance with applicable Federal, State, and local regulations and guidance. All asbestos wastes generated as part of the building renovation or demolition activities and/or abatement activities must be disposed of in a licensed asbestos landfill. Disposal manifests for all asbestos waste must also be signed and approved by an OHARNG environmental office representative prior to shipment from the project site or OHARNG facility. In accordance with the OHARNG Asbestos Management Plan, the Contractor must submit a completed Asbestos Abatement Management Checklist and an Asbestos Abatement Project Closeout Form to the local Environmental Office upon completion of work.

5.2.1. Building Renovation and Demolition – No ACM Present

The Contractor is required to submit a completed Ohio Environmental Protection Agency (EPA) Notification of Demolition and Renovation Form to the OHARNG for review and approval 30 days prior to commencement of demolition. The approved notification must be submitted to the Ohio EPA 10 business days prior to commencement of demolition. Under no circumstances is the Contractor to submit any correspondence to the Ohio EPA or any other regulatory agency without written approval from the OHARNG. Copies of any correspondence from the Ohio EPA or any other regulatory agency concerning the demolition of this facility must be submitted to the OHARNG Environmental Office upon receipt. If suspected ACM is discovered during the course of demolition, the Contractor must cease work immediately and notify the OHARNG POC.
5.2.2. Building Demolition – ACM Present

The Contractor is required to submit a completed Ohio Environmental Protection Agency (EPA) Notification of Demolition and Renovation Form and a completed Ohio Department of Health (ODH) Prior Notification of Asbestos Hazard Abatement Form to the OHARNG for review and approval 30 days prior to commencement of demolition. The approved notifications and associated notification fees must be submitted to the Ohio EPA and the ODH at least 10 business days prior to commencement of demolition. A copy of the asbestos survey must accompany the ODH notification. Under no circumstances is the Contractor to submit any correspondence to the Ohio EPA or any other regulatory agency without written approval from the OHARNG. Copies of any correspondence from the Ohio EPA or any other regulatory agency concerning the demolition of this facility must be submitted to the OHARNG POC upon receipt. Previously completed asbestos surveys must be kept on the job site until the demolition activities are completed. If suspected ACM not identified in the survey is discovered during the course of demolition, the Contractor must cease work immediately and notify the OHARNG POC.

The Contractor is required to develop and submit an asbestos abatement work plan to the OHARNG for review and approval prior to the commencement of work. The work plan will specify the procedures to be utilized by the contractor to ensure compliance with all applicable State and Federal asbestos regulations. The work plan will address the abatement techniques to be used, the safety precautions to be taken, and emergency procedures to be implemented in the event of inadvertent exposure. Proof/copies of proper and current contractor licensure must also be included in the work plan. The work plan will also address how the ACM waste is to be handled, stored, transported, and disposed of in accordance with all applicable regulations. Site clearance procedures must be addressed in the plan. The plan must contain a detailed description of the project activities, including the amount (indicated in linear or square feet) of ACM to be abated, the exact location and type of ACM, and whether or not a contained work site will be established as required by 29 CFR Part 1926.1101.

Asbestos contractors must be properly licensed in accordance with applicable local, State, and Federal regulations. Only licensed contractors approved and licensed through the ODH shall be utilized on OHARNG asbestos abatement projects. The contractor shall show proof of license and shall maintain appropriate paperwork on the work site at all times. Work is to be performed in accordance with the 29 CFR 1926.1101 (OSHA Asbestos Construction Standard) in addition to accepted industry work procedures and other applicable local, State, and Federal regulations. The On-site Superintendent must be a ‘competent person’ as defined in 29 CFR 1926.1101(b) and must be onsite full time during the project.

An asbestos hazard abatement air-monitoring technician, or asbestos hazard evaluation specialist certified by the ODH, or a certified industrial hygienist or industrial hygienist in training as certified by the American Board of Industrial Hygiene will clear the abatement job site using approved air sampling techniques. Air sampling to be analyzed by phase contrast microscopy (PCM) will be conducted in accordance with National Institute of Occupational Safety and Health (NIOSH) method 7400 entitled “Fibers” published in the NIOSH manual of analytical methods, 3rd edition, second supplement, August 1987. A minimum of three samples shall be taken. The samples must show that the concentration of fibers for each sample is less than or equal to a limit of concentration for PCM of 0.01 fibers/cm³ of air. Air sampling to be analyzed by transmission electron microscopy (TEM) must be conducted in accordance with the regulations established by the United State Environmental Protection Agency (U.S. EPA), 40 CFR Part 763, Subpart E, Appendix A. The Contractor will prepare a job-site clearance report that summarizes the air monitoring results. The report will include copies of the analytical results and the licenses/certifications of the individuals conducting the air-monitoring and the lab performing the PCM or TEM.

The Contractor is responsible for managing all asbestos waste generated during the demolition of the facility. Any asbestos removed from an OHARNG facility must be properly abated, containerized, managed, labeled and disposed of as an asbestos waste in accordance with applicable local, State, and Federal regulations. ACM waste must be properly transported to an approved, licensed asbestos disposal facility. Waste shipment records must be maintained during transport. A final copy of the waste shipment record will be forwarded to the OHARNG within 30 days for recordkeeping. A representative from the OHARNG Environmental Department, or a representative designated by the Environmental Department, shall review and sign all waste profiles and manifests generated as the result of any asbestos abatement activities prior to the shipment of the waste from an OHARNG facility to a disposal facility.
5.2.3. Building Renovation – ACM Present

If abatement of ACM is equal to or greater than 50 linear feet or 50 square feet of regulated asbestos containing material (RACM) the Contractor is required to submit a completed Ohio Department of Health (ODH) Prior Notification of Asbestos Hazard Abatement Form to the OHARNG for review and approval 30 days prior to commencement of demolition. If abatement of ACM is equal to or greater than 260 linear feet or 160 square feet the Contractor will also be required to submit a completed Ohio Environmental Protection Agency (EPA) Notification of Demolition and Renovation Form to the OHARNG for review and approval 30 days prior to commencement of demolition. Approved notifications and associated notification fees must be submitted to the Ohio EPA and the ODH at least 10 business days prior to commencement of demolition. Under no circumstances is the Contractor to submit any correspondence to the Ohio EPA or any other regulatory agency without written approval from the OHARNG. Copies of any correspondence from the Ohio EPA or any other regulatory agency concerning the demolition of this facility must be submitted to the OHARNG POC upon receipt. Previously conducted asbestos surveys must be kept on the job site until the renovation activities are completed. If suspected ACM not identified in the attached survey is discovered during the course of demolition, the Contractor must cease work immediately and notify the OHARNG POC.

The Contractor is required to develop and submit an asbestos abatement work plan to the OHARNG, regardless of the amount of ACM abated, for review and approval prior to the commencement of work. The work plan will specify the procedures to be utilized by the contractor to ensure compliance with all applicable State and Federal asbestos regulations. The work plan will address the abatement techniques to be used, the safety precautions to be taken, and emergency procedures to be implemented in the event of inadvertent exposure. Proof/copies of proper and current contractor licensure must also be included in the work plan. The work plan will also address how the ACM waste is to be handled, stored, transported, and disposed of in accordance with all applicable regulations. Site clearance procedures must be addressed in the plan. The plan must contain a detailed description of the project activities, including the amount (indicated in linear or square feet) of ACM to be abated, the exact location and type of ACM, and whether or not a contained work site will be established as required by 29 CFR Part 1926.1101.

Asbestos contractors must be properly licensed in accordance with applicable local, State, and Federal regulations. Only licensed contractors approved and licensed through the ODH shall be utilized on OHARNG asbestos abatement projects. The contractor shall show proof of license and shall maintain appropriate paperwork on the work site at all times. Work is to be performed in accordance with the 29 CFR 1926.1101 (OSHA Asbestos Construction Standard) in addition to accepted industry work procedures and other applicable local, State, and Federal regulations. The On-site Superintendent must be a ‘competent person’ as defined in 29 CFR 1926.1101(b) and must be onsite full time during the project.

An asbestos hazard abatement air-monitoring technician, or asbestos hazard evaluation specialist certified by the ODH, or a certified industrial hygienist or industrial hygienist in training as certified by the American Board of Industrial Hygiene will clear the abatement job site using approved air sampling techniques. Air sampling to be analyzed by phase contrast microscopy (PCM) will be conducted in accordance with National Institute of Occupational Safety and Health (NIOSH) method 7400 entitled “Fibers” published in the NIOSH manual of analytical methods, 3rd edition, second supplement, August 1987. A minimum of three samples shall be taken. The samples must show that the concentration of fibers for each sample is less than or equal to a limit of concentration for PCM of 0.01 fibers/cm³ of air. Air sampling to be analyzed by transmission electron microscopy (TEM) must be conducted in accordance with the regulations established by the United State Environmental Protection Agency (U.S. EPA), 40 CFR Part 763, Subpart E, Appendix A. The Contractor will prepare a job-site clearance report that summarizes the air monitoring results. The report will include copies of the analytical results and the licenses/certifications of the individuals conducting the air-monitoring and the lab performing the PCM or TEM.
The Contractor is responsible for managing all asbestos waste generated during the renovation of the facility. Any asbestos removed from an OHARNG facility must be properly abated, containerized, managed, labeled and disposed of as an asbestos waste in accordance with applicable local, State, and Federal regulations. ACM waste must be properly transported to an approved, licensed asbestos disposal facility. Waste shipment records must be maintained during transport. A final copy of the waste shipment record will be forwarded to the OHARNG within 30 days for recordkeeping. A representative from the OHARNG Environmental Department, or a representative designated by the Environmental Department, shall review and sign all waste profiles and manifests generated as the result of any asbestos abatement activities prior to the shipment of the waste from an OHARNG facility to a disposal facility.

6. Lead

6.1. The Contractor is required to conduct all work in accordance with OSHA’s Lead Standard for the Construction Industry, Title 29 Code of Federal Regulations 1926.62. Prior to any demolition or renovation activities, paint and other suspected lead containing materials must be properly analyzed in areas to be impacted or disturbed. Copies of the analytical results must be forwarded to Mr. Shane Mathey, the OHARNG Hazardous Waste Manager. Mr. Mathey can be reached at 614-336-7394 Monday through Friday from 7:00a.m.-3:00p.m. If lead levels exceed 1.0 mg/cm² or 0.5% lead by weight the Contractor is required to perform personal air sampling on their employees to ensure that they are not being exposed to lead above the Action Level (AL) and Permissible Exposure Limit (PEL). Contractor will compare results of sampling with the regulatory limits in an easy to read table.

6.2. Lead abatement and disposal operations shall be detailed in a lead abatement plan to be reviewed and approved by the OHARNG Environmental Office prior to the start of work activities. All abatement activities shall be conducted by a licensed abatement contractor in accordance with applicable Federal, State, and local regulations and guidance. Disposal manifests for all lead contaminated waste must also be signed and approved by an OHARNG Environmental Office representative prior to shipment from the project site or OHARNG facility.

6.3. All lead based paint surfaces to be impacted must be properly abated by a licensed lead abatement contractor in accordance with applicable Federal, State and local regulations. Any surfaces exposed to lead containing dust as part of the renovation or demolition must be decontaminated. Personnel performing the renovation, demolition and/or abatement work must wear the appropriate level of personal protective equipment (PPE). Every effort must be made to contain any lead contaminated dust to the work area and reduce inadvertent exposure of unprotected individuals to lead contaminated dust.

6.4. Lead containing paint chips, dust, and debris will generally be classified as hazardous waste. All removed lead-based paint and debris from demolition or renovation operations which may contain lead-based paint shall be properly handled, characterized, managed, and disposed in accordance with all applicable Federal, State and local regulations.

7. Natural Resources

7.1. Vegetation

7.1.1. The contractor is responsible for ensuring the establishment of vegetative cover and soil stabilization of the project area and must use all means available and necessary to accomplish this. Straw erosion mats, rip rap, geo-cell, or other applicable soil stabilization methods, when needed, will be proposed to the OHARNG and approved before implementation. The contractor will utilize native vegetation unless native vegetation is not appropriate for the required application and the OHARNG Environmental Office has reviewed and approved the use of non-native species. Vegetation to be used on a project will be identified in the environmental work plan.

7.1.2. The contractor is required to prepare an adequate seed bed prior to seeding. The seed bed must consist of clean, weed free top soil must be broken up and loose and suitable for seed germination. Fertilization will be required if the soil is poor and/or nutrient levels are low. Lime will be applied as necessary to adjust the soil pH to the recommended level for the seed being sown.
7.1.3. An appropriate turf grass mix will be used for high traffic and high maintenance areas. Native seed mixes will be utilized for areas that do not require regular mowing or do not receive frequent foot traffic. Annual ryegrass may be added to mixes to provide quick cover. For late season seeding, winter wheat/rye may be added to provide a quick cover. Contractors may use approved grass seed mixes provided by the OHARNG or may propose alternative seed mixes. The OHARNG Environmental Office must approve all seed mixes. Seeding must be mulched with at least 2 inches of straw mulch if broadcast seeded, an appropriate fiber matting, or an appropriate cover if hydro-seeded. Seed drilling usually does not require mulch.

7.2. Tree and Woody Vegetation Clearing

7.2.1. Tree and vegetation clearing has the potential to impact protected wildlife species and their habitat. There may be seasonal or other limitations imposed on vegetation and land clearing operations. More details on this are provided in the Wildlife Section. Any such limitations will be incorporated into the project specifications and must be identified in the project environmental work plan.

7.2.2. Then clearing trees the specification will identify if the trees must be removed and hauled off site by the contractor or will be salvaged by the government. The government will salvage trees when they have commercial value as saw timber or another commercial forest product.

7.2.3. When trees are salvaged as saw timber, all 8 foot and longer straight portions of the trees from an 18” stump height to a 10” diameter outside bark top that are felled will be limbed and neatly stacked in a location designated by the OHARNG. Limbing will consist of cutting limbs flush to the boll of the trees. Branch stubs are not permitted. Trees will be kept and stacked in as long of lengths as possible and under no circumstance less than 8’6” long. Pieces shorter than 8’6” are not suitable for saw timber salvage.

7.2.4. When trees are salvaged for firewood and/or biomass, all portions of the trees down to 4” in diameter will be cut into 4.5’ to 9’ lengths and neatly stacked in an area designated by the OHARNG. Firewood salvage will include saw timber sized trees that are too short to be saw timber and saw timber top wood.

7.2.5. Limbs, branches, brush and tree parts not salvaged shall be removed from the site and properly disposed of offsite. This material may be chipped prior to removal. If only a small amount of chips are generated and the work is not within a cantonment or other maintained area, the chips may be blown/scattered in adjacent unimproved areas/woodlands. Piles of chips are not permitted and chips may not be placed in wetlands.

7.3. Stumps

7.3.1. Stumps will be ground or excavated in accordance with contract specification requirements. Stumps that are or above 24” high may not be ground or removed between 1 April and 30 September. Grinding of all stumps (to include major roots) will be to a minimum depth of 6 inches below ground surface. Grindings will managed as directed by the project specifications. If left on site, they will be spread on site adjacent to the stump if in an upland area. Grindings may not be spread in wetlands. If the area is not being leveled and re-graded, stump holes must leveled and filled with clean fill dirt and top soil. Piles of grinding and chips may not be left on the project area or anywhere in a mowing zone.

7.3.2. The contractor shall not place chips or any parts of trees or brush or put any type of fill into any wetland including but not limited to ditches, streams, floodplain areas, wet spots or low areas. Stumps in wetlands may not be ground or excavated without a wetland permit and prior approval of the OHARNG Environmental Office.

7.3.3. If stumps are excavated, the contractor is required to remove and properly disposed of by the stumps off site or to dispose of them as otherwise specified within the project specifications. Surface disposal on OHARNG property is not permitted.
7.4. Threatened and Endangered Species

7.4.1. The Northern Long Eared Bat (NLEB) (a Federally Threatened species as of April 5, 2015) being recorded at Camp Perry, Camp Ravenna and Tarlton and potentially present at other OHARNG training sites. In addition, the Migratory Bird Treaty Act prohibits harm to nesting migratory birds (with the exception of introduced species). Based on these considerations, brush cutting, tree cutting (height equal to or greater than 24” above ground) and tree trimming of any branches and any other part of the tree that is at least three inches in diameter, can only occur between 1 October – 31 March. All projects involving brush or tree clearing must be cleared through the OHARNG Environmental Office. The OHARNG treats abandoned wood utility poles as trees in the sense that they can only be felled 1 October – 31 March.

7.4.2. The contractor is responsible for doing everything possible so as to not intentionally or unintentionally harm any federally listed or protected species at any OHARNG facility. Immediately prior to the action commencing, the contractor will perform a thorough inspection for nesting birds and inhabiting bats within the structure(s) undergoing exterior maintenance or demolition. This thorough search shall be to determine if any bats, birds, or other animals are present within the work area (under roof flashing, under siding, nesting in brush, etc.) The contractor will thoroughly look for birds, bats, nests, or any other sign of active presence of said species within the respective structure(s). If any animals are found, the contractor will immediately notify the project manager and the OHARNG Environmental Office.

8. Cultural Resources

8.1. The contractor is responsible for ensuring their activities are completed in accordance with the National Historic Preservation Act (NHPA) and other applicable historic preservation laws and regulations. The contractor may not conduct any ground disturbing activity, structure renovation, maintenance, modification, or demolition until assurance is received from the OHARNG Environmental Office that cultural resources requirements have been met and consultation with the Ohio Historic Preservation Office (OHPO) complete. The OHARNG will conduct consultation with the OHPO and other appropriate parties and will required specific project details to do so. The contractor must provide as much detail as possible in work plans including but not limited to maps, measured drawings, structure elevations, clear photographs of portions of structures requiring work, details regarding types of mortar, brick, paint color, caulking, chemical products, structural replacement parts, etc.

8.2. All work on historic structures that are eligible for or listed on the National Register of Historic Places (NRHP) is required to be consistent with The Secretary of Interior’s Guidelines for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring & Reconstructing Historic Buildings (https://www.nps.gov/tps/standards.htm). In addition, depending on the type of work being completed on the historic structure, the contractor is required to follow additional guidance found in the National Park Service Preservation Briefs (https://www.nps.gov/tps/how-to-preserve/briefs.htm).

8.3. If during a project, the contractor makes an inadvertent discovery of human remains, funerary items, animal remains, household artifacts or other artifacts, they will immediately stop work. All remains and artifacts will be left in place and measures taken to protect the site and artifacts from pilferage and damage will be implemented. The project manager, contracting office, and OHARNG Cultural Resources Manager will be notified immediately. In the event that human remains are identified, the on-site OHARNG security personnel or Range Control must be immediately contacted to allow them to contact the appropriate law enforcement agency.

9. Pesticide Management

9.1. The contractor is responsible for ensuring that any pesticide applications as defined by the Ohio Department of Agriculture (OAC Chapter 921.01) and pesticides approved by the Department of Defense in accordance with the Ohio Army National Guard Integrated pest Management Plan Section 10.4 are completed in accordance with Ohio Administrative Code Chapter 901, DoD Instruction 4150.7 DoD Pest Management Program 22 April 1996, AR 200-5 Pest Management 29 October 1999, and all other pertinent Federal, State and local laws. The application or disbursement of pesticides is strictly prohibited without expressed written consent in the contract and only those specific pesticides stipulated in the contract are to be applied. This is to include not only
restricted use pesticides as defined by OAC 921.11 but commercial pesticides that can be legally purchased without a license such as wasp or hornet spray as well. All commercial pesticide applications must be done in accordance with OAC 921.11 by properly trained and licensed applicators OAC 921.06. The contractor is responsible for all purchasing, storing, mixing and applying of such pesticides and no pesticides are to ever be left on Ohio Army National Guard property when not in use. The contractor is responsible for providing the licensed applicator with the necessary PPE as well as providing any necessary health and safety monitoring.

9.2. All contracted pesticide applications must adhere to the aforementioned laws and regulations as stated in 9.1 in addition to what is stipulated in the contract. Non-contracted pesticide applications, restricted use or otherwise, are strictly prohibited. Prior to conducting a contracted pesticide application, the vendor must submit copies of all valid certificates and licenses to the Ohio Army National Guard for their records and prior approval. The licenses must be in accordance with OAC 921 with special emphasis paid to OAC 921.06, OAC 921.08, OAC 921.11 and OAC 921.14. Copies of all the pesticide SDSs’ and labels must first be submitted to the Ohio Army National Guard for approval. Any substituted or additional pesticides that have not received prior approval in the proposal or stated in the contract require the notification and approval of the Ohio Army National Guard before being applied. Upon completion of any prescribed pesticide application, the contractor must fill out and submit the completed Daily Pest Control Summary Sheet within five business days of the application to the Ohio Army National Guard Pest Management Coordinator. No follow-up or touch-up applications are to be completed at a later date unless expressly stated in the contract.

10 Special Considerations for Demolition

10.1. In addition to complying with all of the above requirements during demolition projects the Contractor must also prepare an Environmental Work Plan to address environmental hazards identified in the Pre-demolition Environmental Hazards Assessment and other environmental requirements as applicable. A sample work plan is available upon request. The work plan will include detailed abatement/mitigation procedures with specifications which will identify methods of abatement/removal, management and disposal for all identified hazards. The work plan will be developed and designed in accordance with all applicable Federal, State and local regulations. At a minimum, the work plan shall contain the following Table of Contents:

1.0 Introduction
2.0 Site Description and History
3.0 Summary of Identified Environmental Hazards
4.0 Procedures for Environmental Hazards Abatement/Removal
   4.1 Asbestos
   4.2 Lead-containing Materials
   4.3 PCB-containing Materials
   4.4 Floor Sweep
   4.5 Mercury-containing Materials/Equipment
   4.6 Smoke Detectors
   4.7 Exit Signs
   4.8 Air Conditioners
   4.9 Other Environmental Hazards
5.0 Waste Management
6.0 Building Demolition Procedures/Methodology
   6.1 Pre-demolition Submittals and Notifications
   6.2 Pre-demolition Site Inspection
   6.3 Mobilization
   6.4 Demolition Methodology
      6.4.1 Structural Demolition
      6.4.2 Utility Decommissioning
      6.4.3 Stormwater Management
      6.4.4 Dewatering Procedures
      6.4.5 Protection of Environmental Resources
      6.4.6 Site Restoration
   6.5 Demobilization and Project Closeout
7.0 Appendices
Appendix A – Site Plan
The following is a description of the required copies and review cycles needed for the Work Plan:

- Two (2) hardcopies and two (2) electronic copy each of the draft version of the Work Plan shall be submitted to the OHARNG for review and approval. The draft report will have the word “Draft” in the title and at the top or across each page. In addition, lines will be numbered in draft reports to facilitate ease of comments.
- Two (2) hardcopies and two (2) electronic copies each of the final Work Plan will be required for the OHARNG. The OHARNG may review the final document to make sure all comments/revisions were incorporated into the document.

The Environmental Office will have 30 days to review the draft work plan and submit comments to the contractor. The contractor is responsible for resolving all comments and issuing a final work plan to be approved by the Camp Ravenna Environmental Office. NOTE: Not all sections of the work plan may be applicable. If the section is not applicable insert a Blank Page labeled “NOT APPLICABLE” but do not remove the section from the table of contents.
SUPPLEMENTARY CONDITIONS

Certifications

These Supplementary Conditions amend and supplement the General Conditions and other provisions of the Contract Documents as indicated below. All provisions which are not amended remain in full force and effect. The terms used in these Supplementary Conditions which are defined in the Contracting Definitions or in the General Conditions shall have the meanings assigned to them in those documents.

These Supplementary Conditions are authorized for use on Projects by the Adjutant General's Department

By: Richard Willinger
Date: 07/17/15

Richard Willinger
The Adjutant General's Department

1000 Statehouse Plaza
The Adjutant General's Department
Directorate of Installation Management and Resources
State Contracting Section
2825 Dublin Granville Rd., W.
Columbus, Ohio 43235
614-336-4525
614-336-7027

Institutional Designee

Melissa Anderson
State Contracting Officer

MODIFICATIONS TO GENERAL CONDITIONS

*Insert Article 15 with associated paragraphs and subparagraphs as follows in its entirety:*
ARTICLE 15 - MISCELLANEOUS SUPPLEMENTARY CONDITIONS

31.1 LOBBYING

31.1.1 The Contractor covenants and agrees that it will not expend any funds appropriated by Congress to pay any person for influencing or attempting to influence an officer or employee of any Federal agency, or a Member of Congress, in connection with any of the following covered Federal actions: the awarding of any Federal contract; the making of any Federal grant; the making of any Federal loan; the entering into of any cooperative agreement; and, the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

31.1.2 The Final Rule, New Restrictions on Lobbying, issued by the Office of Management and Budget and the Department of Defense (32 CFR Part 28) to implement the provisions of Section 319 of Public Law 101-121 (31 U.S.C. Section 1352) is incorporated by in accordance with and the CONTRACTOR/VENDOR covenants and agrees to comply with all the provisions thereof, including any amendments to the Interim Final Rule that may hereafter be issued.

31.2 ENVIRONMENTAL STANDARDS

31.2.1 The Contractor/Vendor agrees that its performance under this contract shall comply with all provisions of the Clean Air Act, Clean Water Act, Resources Conservation and Recovery Act (RCRA) and the Comprehensive Environmental Response, Compensation and Liabilities Act (CERCLA), and any applicable Federal, State or Local environmental regulation.

31.2.2 The Contractor/Vendor shall ensure that no facility used in its performance under this contract is listed on the Environmental Protection Agency (EPA) list of violating facilities pursuant to 40 CFR Part 15.5 without the concurrence of the Department and NGB. The Contractor/Vendor shall notify the Department of the receipt of any communication from EPA indicating that a facility to be or being used in its performance under this Agreement is under consideration for listing on the EPA list of violating facilities.

31.3 NATIONAL HISTORIC PRESERVATION:

31.3.1 The Contractor/Vendor agrees to identify to the awarding agency any property listed or eligible for listing on the National Register of Historic Places that will be affected by this award, and to provide any help the awarding agency may need, with respect to this award, to comply with Section 106 of the National Historic Preservation Act of 1966 (16 U.S.C. 470, et seq.), as implemented by the Advisory Council on Historic Preservation regulations at 36 CFR Part 800 and Executive Order 11593 (3 CFR, 1971-1975 Comp., p. 559).

31.4 DEBARMENT AND SUSPENSION

31.4.1 The Contractor/Vendor shall not make any award or permit any award (sub grant or contract) at any tier to any party which is debarred or suspended or is otherwise excluded from or ineligible for participation in Federal assistance programs under Executive Order 12549, "Debarment and Suspension."

31.4.2 The Final Rules, Government wide Debarment and Suspension (non-procurement) issued by the Office of Management and Budget and the Department of Defense (32 CFR Part 25) to implement the provisions of Executive Order 12549, "Debarment and Suspension" is incorporated by in accordance with and the Contractor/Vendor covenants and agrees to comply with all the provisions thereof, including any amendments that may hereafter be issued.

31.5 RELOCATION AND REAL PROPERTY ACQUISITION

31.5.1 The Contractor/Vendor covenants and agrees that it will comply with the provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (42 U.S.C. Section 4601 et seq.) and regulations issued there under (49 CFR Part 24).
31.6 COPELAN “ANTI-KICKBACK” ACT

31.6.1 The Contractor/Vendor agrees that it will comply with the Copeland "Anti-Kickback" Act (18 U.S.C. 874) as supplemented in Department of Labor regulations (29 CFR Part 3). As applied to this Agreement, the Copeland "Anti-Kickback" Act makes it unlawful to induce, by force, intimidation, threat or procuring dismissal from employment, or otherwise, any person employed in the construction or repair of public buildings or public works, financed in whole or in part by the United States, to give up any part of the compensation to which that person is entitled under a contract of employment.

31.7 CONTRACT WORK HOURS AND SAFETY STANDARDS ACT

31.7.1 The Contractor/Vendor covenants and agrees that it will comply with Sections 103 and 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. Sections 327-330) as supplemented by Department of Labor regulations (29 CFR Part 5). As applied to this Agreement, the Contract Work Hours and Safety Standards Act specifies that no laborer or mechanic doing any part of the work contemplated by this Agreement shall be required or permitted to work more than 40 hours in any workweek unless paid for all additional hours at not less than 1.5 times the basic rate of pay. This Act is applicable to any construction contract awarded in excess of $2,000, and in excess of $2,500 for other contracts which involve the employment of mechanics or laborers.

31.8 HATCH ACT

31.8.1 The Contractor/Vendor agrees to comply with the Hatch Act (5 U.S.C. 1501 - 1508 and 7324 - 7328), as implemented by the Office of Personnel Management at 5 CFR Part 151, which limits political activity of employees or officers of State or local governments whose employment is connected to an activity financed in whole or part with Federal funds.

31.9 CARGO PIN ACCORDANCE WITH

31.9.1 Travel supported by U.S. Government funds under this agreement shall use U.S.-flag air carriers (air carriers holding certificates under 49 U.S.C. 41102) for international air transportation of people and property to the extent that such service is available, in accordance with the International Air Transportation Fair Competitive Practices Act of 1974 (49 U.S.C. 40118) and the interpretative guidelines issued by the Comptroller General of the United States in the March 31, 1981, amendment to Comptroller General Decision B138942.

31.10 BUY AMERICAN ACT

31.10.1 The Contractor/Vendor agrees that it will not expend any funds appropriated by Congress without complying with The Buy American Act (41 U.S.C. 10). The Buy American Act gives pin accordance with to domestic end products and domestic construction material. In addition, the Memorandum of Understanding between the United States of America and the European Economic Community on Government Procurement, and the North American Free Trade Agreement (NAFTA), provide that EC and NAFTA end products and construction materials are exempted from application of the Buy American Act.

31.11 USE OF UNITED STATES FLAG CARRIERS

31.11.1 The Contractor covenants and agrees that travel supported by U.S. Government funds under this Agreement shall use U.S.-flag air carriers (air carriers holding certificates under 49 U.S.C. 41102) for international air transportation of people and property to the extent that such service is available, in accordance with the International Air Transportation Fair Competitive Practices Act of 1974 (49 U.S.C. 40118) and the inter-operative guidelines issued by the Comptroller General of the United States in the March 31, 1981, amendment to Comptroller General Decision B138942.

31.11.2 The Contractor agrees that it will comply with the Cargo Pin accordance with Act of 1954 (46 U.S.C. 1241), as implemented by Department of Transportation regulation at 46 CFR 381.7, and 46 CFR 381.7(b).
31.12 ISO 14001

31.12.1 The Ohio Army National Guard (OHARNG) maintains an Environmental Management System in accordance with International Standard ISO 14001:2004(E) Environmental management systems - Requirements with guidance for use. The OHARNG is committed to environmental stewardship at all of our facilities and within our communities as a whole. To view our Environmental Policy Statement and significant aspects visit http://ong.ohio.gov/ or contact the OHARNG Environmental Office at 614-336-7395 for more information.

31.13 HOMELAND SECURITY PRESIDENTIAL DIRECTIVE 12: POLICY FOR A COMMON IDENTIFICATION STANDARD FOR FEDERAL EMPLOYEES AND CONTRACTORS.


31.13.2 All contractors and subcontractors will be required to perform local law enforcement background checks on all employees performing work on an Adjutant General's Department project. Per the Presidential Directive dated August 27th, 2004 this is a Federal requirement and will be collected at the time of the notice to proceed from the selected bidder. The dissemination of background checks issued to the department are applicable to the Privacy Act (5 U.S.C. 552a) and other statutes protecting the rights of Americans. The costs for performing required background checks should be calculated into the contractor's proposed price at the time of bid submission. No requests for time or cost extensions will be accepted.

31.13.3 In accordance with:

31.13.3.2 AR 380-49, Industrial Security Program, 20 March 2013
31.13.3.3 FISPD-12, Homeland Security Presidential Directive #12, 27 August 2004
31.13.3.4 U.S. Department of Justice Order 556-73, 28 September 1999

31.13.4 All contractors and contracted employees performing work on Ohio National Guard properties must have individual background checks completed. The nature and scope of these background checks are to be determined by the type of work being completed.

31.13.5 The minimum level of check required will be a Local Agency Check (LAC). This should be completed by submitting a DD Form 369 to the local law enforcement agency.

31.13.6 Most projects will also require an FBI Identity History Summary Check. This can be obtained in one of two ways.

31.13.6.1 Requests can be submitted directly to the FBI by following instructions at the following URL: https://www.fbi.gov/about-us/cjis/identity-history-summarychecks/submitting-an-identity-history-summary-request-to-the-fbi

31.13.6.2 Requests can be submitted via an FBI-approved Channeler. This is usually the faster method, but individual Channelers will provide specific information on costs, processing times, and availability. A list of FBI-approved Channelers and their contact information can be found at the following URL: https://www.fbi.gov/about-us/cjis/identity-history-summary-checks/fbi-approvedchannelers

31.13.7 Once an approved background check has been submitted to and reviewed by the G2 office, an individual contracted employee may be approved for unescorted access to a given facility, as required. Access will be approved only for the scope of work outlined in the contract and only for the duration of the contracted project.

31.13.8 Some projects, such as those that involve areas containing classified or sensitive information, will require escorted access in addition to the background check requirements listed above.
SUBJECT: OHARNG Specifications for Facility Management Electronic Data Deliverables

1. Purpose: Define formats for electronic files being delivered as part of facility construction, rehabilitation, or maintenance projects or special studies in support of base, facility, or property management
2. Effective Date: Immediately
3. In accordance with:
   b. Federal Geographic Data Committee (FGDC), Content Standard for Digital Geospatial Metadata (CSDGM), version 2, FGDC-STD-001-1998
   c. Federal Geographic Data Committee (FGDC), Geospatial Positioning Accuracy Standards Part 4: Standards for Architecture, Engineering, Construction (A/E/C) and Facility Management FGDC-STD-007.4-2002
   d. DAIM-ZA, Data Standards for Geographic Information Systems (GIS) and Computer Aided Drafting and Design (CADD) and Related Technologies - 20 Apr 2005
   e. Maintenance of National Geospatial Data Repository (NGDR) of Army National Guard (ARNG) Installations – 10 Feb 2003
4. Point of Contact for this Information Paper is AGOH-FM, Dr. Joe Tack at (614) 336-7089, joseph.tack@us.army.mil

COL Michael Ore, AGOH-DIMR

Attachment:
Specifications for Facility Management Electronic Deliverables

Distribution:

Ohio Army National Guard

Information Paper

Specifications for Facility Management Electronic Deliverables

Contents
Section 1 Purpose and Objectives

This information paper specifies the format for electronic files being delivered as part of facility construction, rehabilitation, or maintenance projects or special studies in support of base, facility, environmental or property management. These paragraphs do not specify content or what electronic files should contain. The content represented, or specific data being collected should be specified separately in the scope of work. It is recommended that this document be made an attachment to all AE contracts.

Section 2 Data Specifications

2.1 Documents
Any maps, drawings, figures, sketches, databases, spreadsheets, or text files prepared shall be provided in both hard and digital formats. The hard copy deliverables and their distribution will be addressed in the scope of work.

2.2 Enterprise Software
Ohio Army National Guard uses standard enterprise software applications to create, edit, and manage electronic data. All electronic data deliverables created shall be delivered in a format compatible with the following applications:

<table>
<thead>
<tr>
<th>Application</th>
<th>Software</th>
</tr>
</thead>
<tbody>
<tr>
<td>Document Publishing</td>
<td>Adobe Acrobat 11.0</td>
</tr>
<tr>
<td>Office Productivity</td>
<td>Microsoft Office 2007</td>
</tr>
<tr>
<td>GIS</td>
<td>ESRI ArcView 10.2</td>
</tr>
<tr>
<td>CADD</td>
<td>AutoCAD 2013</td>
</tr>
<tr>
<td>BIM</td>
<td>Autodesk Revit 2013</td>
</tr>
</tbody>
</table>

2.3 Text and Spreadsheets
Text and spreadsheet documents, both draft and final versions, shall be provided in a Microsoft Word 2007 format and Adobe Portable Document Format (PDF) to facilitate government review and retention. Spreadsheet files shall be provided in Microsoft Excel 2007 format.

2.4 Relational Databases
Relational databases shall be provided in MS Access 2007 format, unless otherwise specified, as approved by the government. Prior to database development, the contractor shall provide the government with technical approach documents for approval, which describe the contractor’s technical approach to designing and developing the database. The technical approach document should detail table names and structures, relationships, and primary and foreign key fields in a graphical database map. Information regarding valid attribute values and formats shall be included as well.

2.5 Geographic Information Systems (GIS) Data Deliverable Standards
Geographic Information Systems data deliverables shall be specified in the scope or statement of work for projects that are generally not engineering design related such as real-estate, environmental studies, spatial analysis, or facility management.

2.5.1 Format
Digital geographic maps and the related data sets shall be delivered in either of the following formats: Personal Geodatabase format for ArcGIS 10.1 or ArcGIS Shapefile (.shp) format. PDF map versions shall also be developed to illustrate the data generated and analyses performed by the contractor.

2.5.2 Structure
GIS data shall be developed in a structure consistent with the “Spatial Data Standards for Facilities, Infrastructure, and Environment (SDSFIE) Version 2.6. Prior to developing GIS data, the contractor shall prepare a technical approach document detailing the required feature datasets, relationships, attribution, and in accordance with values.

Electronic copies of the SDSFIE can be obtained from the www.sdsfie.org website.

2.5.3 Minimum Content
GIS data should comply with minimum content standards established in the OHARNG GIS Quality Assurance Plans (QAPs). QAPs for each data layer are to be reviewed and incorporated into the data structure technical approach document.

2.5.4 Projection
All GIS data shall use the horizontal datum of NAD 83(86) UTM Zone 17N metric projection and the NAVD 88 metric vertical datum.

2.6 Computer Aided Drafting and Design (CADD) Data Deliverable Standards

CADD data deliverables should be specified in the scope or statement of work for engineering related projects such as building design, site work, and construction layout.

2.6.1 Format
Digital CADD drawings and maps shall be delivered in AutoCAD compatible DWG files and as PDF files. Drawing sheets may be combined into a single PDF file for ease of retention and organization. The contractor shall ensure that all digital files and data (e.g. model files, in accordance with files, and cell libraries) can be accessed directly by AutoCAD without translation, preprocessing, or post processing of the digital data files.

2.6.2 Structure
Data developed in a CADD format shall comply with the CAD BIM Technology Center A/E/C CAD Standard release 5.0. The A/E/C CAD Standard includes presentation graphics, level/layer assignments, electronic file naming, and standard symbology. Standard drawing size shall be ANSI E-Size, inch-pound working units, and the A/E/C CAD Standard file, sheet, model, and layer naming conventions shall be used.

The data standard can be downloaded from the Technology Center at their https://cadbim.usace.army.mil/CAD website.

2.6.3 Projection
All site CADD data shall use the Ohio State Plane Coordinate System NAD83 (86) projection for horizontal coordinates and NAVD 88 for vertical coordinates in U.S. Survey Feet. The appropriate state plane system will be based on the county the facility is in. The state plane system to be used by county is shown in figure below.
2.7 Building Information Modeling (BIM)

BIM data deliverables should be specified in the scope or statement of work for engineering related projects such as building design, site work, and construction layout. The BIM Models shall be supplemented with CADD content as necessary to produce a complete set of construction drawings.

2.7.1 Format
Digital BIM Models shall be delivered in Revit compatible formats. USACE BIM Center has templates to develop consistent models. Model templates can be downloaded from: https://cadbim.usace.army.mil/Default.aspx. The submittals shall be fully operable, compatible, and editable within the native BIM tools.

2.7.2 Output
Drawings derived from the model shall be compliant with the above mentioned CADD standards.

2.8 Metadata

All geospatial data regardless of format shall have FGDC compliant metadata as detailed in FGDC-STD-001-1998. The metadata shall have all FGDC required metadata fields populated in detail. At a minimum, information regarding the name and description of the data, the source of the data, related data quality information such as accuracy and time period of content, the coordinate system and projection, description of the equipment or instruments used in data collection, the type of the data coverage (point, line, polygon, etc.), the field names of all attribute data and a description of each field name, the definition of all codes used in the data fields, the ranges of numeric fields and the meaning of these numeric ranges, the creation date of the data, and the name and contact information of the creator.

The FGDC standards are downloadable from http://www.fgdc.gov.

2.9 Accuracy

Map or Drawing Scales and desired mapping accuracy shall be stated in the scope or statement of work and be in conformance of FGDC-STD-007.4-2002. Table A-3 of the FGDC standard states typical map scales for types of drawings and maps. Accuracy shall be stated in the metadata as specified in FGDC-STD-007.3-1998 using compiled to meet or tested accuracy statements for horizontal and if necessary vertical coordinates.

The FGDC standards are downloadable from http://www.fgdc.gov.

2.10 Deviations

The contractor shall submit a written request for approval of any deviations from the standards discussed in this information paper. No deviations from the government’s standards will be permitted unless prior written approval of such deviation has been received from the government.

2.11 Data Transfer

All electronic data submittals shall be delivered on DVD or CD with read-only disk format. Each disk shall contain an ASCII text file labeled README.txt. This file will contain a description of the disk's content (file names, data dictionary, file contents, etc.) and other information required by the government. The text file will clearly illustrate cross-in accordance with files used in CADD. The CD deliverables shall be permanently labeled and include at a minimum:

• The Contract Number (and Delivery Order Number if applicable)
• Review percentage
• Date
• Contractor contact information
• The name and version of software used for preparing the files
The sequence of the digital media and the total number of digital media

2.12 Data Review

Digital data shall be included for review of the draft and final contract submittals. The reviews shall be performed on government computer systems with standard software. Data shall be analyzed for subject content, system compatibility, and standards adherence. Prior to approval of the final submittal, the contractor shall incorporate review comments to data and text.

For GIS and database deliverables, the government shall review the data structure and may make recommendations on changes necessary to the structure prior to acceptance of data for subject content, system compatibility, and standards adherence. Prior to approval and acceptance of the final submittal, the contractor shall incorporate review comments to data and text. The contractor will incorporate the necessary changes to data until the data meets the appropriate standards of acceptability.

Section 3 Ownership

The government, for itself and such others as it deems appropriate, will have unlimited rights to all information and materials developed and furnished to the government and documentation thereof, reports, and listings, and all other items pertaining to the work and services pursuant to this agreement including any copyright. Unlimited rights are rights to use, duplicate, or disclose text, data, drawings, and information, in whole or in part in any manner and for any purpose whatsoever without compensation to, or approval from, the contractor. The government will at all reasonable times have the right to inspect the work and will have access to and the right to make copies of the above-mentioned items. All text, electronic digital files, data, and other products generated shall become the property of the government. By in accordance with, the following DFAR clauses are included in this information paper as a part of the requirements herein:

- DFAR 252.227-7017, “Identification and Assertion of Use, Release, or Disclosure Restrictions.”
- DFAR 252.227-7020, “Rights in Special Works.”
- DFAR 252.227-7028, “Technical Data or Computer Software Previously Delivered to the Government”
- DFAR 252.227-7037, “Validation of Restrictive Markings on Technical Data.”
VARIANCE REQUEST FORM

Project Location: ______________________________________________________________

Project Name: ________________________________________________________________

Project Number:  ______________________________________________________________

Firm: _______________________________________________________________________

Date: _____________________         A/E: _________________________________________

Current Standard for which Variance is requested: ___________________________________

Section Number: ______________________________________________________________

Paragraph Number: ____________________________________________________________

Requested Variance (If required attach additional sheets):

Reason or Justification for Variance Approval (Please attach supporting documentation)

Below this line to be completed by Adjutant General's Department.

Project Manager/Coordinator: ________________________________ Date: _______________

CFMO: __________________________________________________ Date: ________________

Assistant Quartermaster: ______________________________________ Date: ______________

Status: Rejected ___________Approved______________

Alternative design/construction approaches proposed as equivalencies to established criteria must be approved by the Adjutant General’s Department. Requests for approval must include written justification for the deviation from established criteria and demonstrate how the proposed alternative solution provides an equivalent level of quality. Requests must also include hazard analysis, compensatory features, comparative cost analyses (first cost and life cycle cost), criteria used, and other pertinent data. Lack of funds or cost savings is not considered sufficient justification for an equivalency to established criteria. Approved equivalencies and alternatives apply only to the specific Facility or project involved, and do not constitute blanket approval for similar cases.
DESIGN AND CONSTRUCTION STANDARDS LETTER OF RECEIPT

The Undersign acknowledges the receipt of the – Adjutant General’s Department Design and Construction Standards.

Architects, Engineers, Design Consultants and Contractors are required to sign this document certifying that the Adjutant General’s Department’s Design and Construction Standards have been received and incorporated into their bidding documents.

Exceptions to this Standard may be considered by filling out the “Variance Request Form”

Project: __________________________________________________________________________

Name of Firm: _______________________________________________________________________

Signature: __________________________________________________________________________

Date: ______________________________________________________________________________
Schedule of Services
The anticipated target dates for the Project are as follows:

<table>
<thead>
<tr>
<th>Services</th>
<th>Proposed:</th>
<th>Actual:</th>
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<tbody>
<tr>
<td>Selection of Consultant</td>
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<td></td>
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<tr>
<td>Fee Proposal to the State (by selected firm)</td>
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<tr>
<td>Signed Agreement</td>
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<tr>
<td>Schematic Design</td>
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<tr>
<td>Design Development Documents</td>
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<tr>
<td>Construction Design Documents</td>
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<tr>
<td>Completion of Construction</td>
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<td></td>
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<tr>
<td>Professional Services Completed</td>
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</tbody>
</table>

Project Manager Signature     Consultant Project Lead Signature

________________________     ______________________________
Signature                  Signature

________________________     ______________________________
Print                      Print

________________________     ______________________________
Date                       Date