SECTION 013216

NETWORK ANALYSIS SCHEDULES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. References.

B. Quality assurance.

C. Format.

D. Schedules.

E. Submittals.

F. Review and evaluation.

G. Updating schedules.

H. Distribution.

1.2 REFERENCES

A. The Use of CPM in Construction - A Manual for General Contractors and the Construction Industry, Washington, D.C., The Associated General Contractors of America (AGC).

1.3 QUALITY ASSURANCE

A. Scheduler: Contractor's personnel specializing in CPM scheduling with 2 years minimum experience in scheduling construction work of complexity comparable to this Project, and having use of computer facilities capable of delivering detailed graphic printout within 48 hours of request.

B. Contractor's Administrative Personnel: 2 years minimum experience in using and monitoring CPM schedules on comparable projects.

1.4 FORMAT

A. Listings: Reading from left to right, in ascending order for each activity. Identify each activity with applicable specification section number.

B. Diagram Sheet Size: 24 inches high x 36 inches wide.

C. Scale and Spacing: To allow for notations and revisions.

1.5 SCHEDULES

A. Prepare network analysis diagrams and supporting mathematical analyses using Critical Path Method, under concepts and methods outlined in AGC's "The Use of CPM in Construction - A Manual for General Contractors and the Construction Industry".

B. Illustrate order and interdependence of activities and sequence of work; how start of given activity depends on completion of preceding activities, and how completion of activity may restrain start of subsequent activities.

C. Illustrate complete sequence of construction by activity, identifying work of separate stages. Indicate dates for submittals and return of submittals; dates for procurement and delivery of critical products; and dates for installation and provision for testing. Include legend for symbols and abbreviations used.

D. Mathematical Analysis: Tabulate each activity of detailed network diagrams, using calendar dates, and identify for each activity:
1. Preceding and following event numbers.
2. Activity description.
3. Estimated duration of activity, in maximum 15 day intervals.
4. Earliest start date.
5. Earliest finish date.
6. Actual start date.
7. Actual finish date.
8. Latest start date.
9. Latest finish date.
10. Total and free float; accrue float time to Owner and to Owner's benefit.
11. Monetary value of activity, keyed to Schedule of Values.
12. Percentage of activity completed.
13. Responsibility.

E. Analysis Program: Capable of compiling monetary value of completed and partially completed activities, of accepting revised completion dates, and recomputation of scheduled dates and float.

F. Required Sorts: List activities in sorts or groups:
1. By preceding work item or event number from lowest to highest.
2. By longest float, then in order of early start.
3. By responsibility in order of earliest possible start date.
4. In order of latest allowable start dates.
5. In order of latest allowable finish dates.
6. Contractor's periodic payment request sorted by [Schedule of Values listings] [specifications sections].
7. Listing of basic input data generating report.
8. Listing of activities on critical path.

G. Prepare sub-schedules for each stage of Work identified in Section 011000 - Summary.

H. Coordinate contents with schedule of values in Section 013300 - Submittal Procedures.

1.6 SUBMITTALS

A. Within 10 days after date established in Notice to Proceed, submit proposed preliminary network diagram defining planned operations for first 60 days of Work, with general outline for remainder of Work.

B. Participate in review of preliminary and complete network diagrams jointly with Architect/Engineer.

C. Within 20 days after joint review of proposed preliminary network diagram, submit draft of proposed complete network diagram for review. Include written certification that Subcontractors have reviewed and accepted proposed schedule.

D. Within 10 days after joint review, submit complete network analysis consisting of network diagrams and mathematical analysis.

E. Submit updated network schedules with each Application for Payment.

F. Submit number of opaque reproductions Contractor requires, plus 2 copies Architect/Engineer will retain.

G. Submit under transmittal letter form specified in Section 013300 - Submittal Procedures.

1.7 REVIEW AND EVALUATION

A. Participate in joint review and evaluation of network diagrams and analysis with Architect/Engineer at each submittal.

B. Evaluate project status to determine work behind schedule and work ahead of schedule.

C. After review, revise network diagrams and analysis incorporating results of review, and resubmit within 10 days.

1.8 UPDATING SCHEDULES

A. Maintain schedules to record actual start and finish dates of completed activities.

B. Indicate progress of each activity to date of revision, with projected completion date of each activity. Update diagrams to graphically depict current status of Work.

C. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.

D. Indicate changes required to maintain Date of Substantial Completion.

E. Submit sorts required to support recommended changes.

F. Prepare narrative report to define problem areas, anticipated delays, and impact on schedule. Report corrective action taken or proposed and its effect including effects of changes on schedules of separate contractors.

1.9 DISTRIBUTION

A. Following joint review, distribute copies of updated schedules to Contractor's project site file, to Subcontractors, suppliers, Architect/Engineer, and the Owner.

B. Instruct recipients to promptly report, in writing, problems anticipated by projections shown in schedules.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 013300

SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Submittal procedures.

B. Construction progress schedules.

C. Proposed products list.

D. Product data.

E. Shop drawings.

F. Samples.

G. Design data.

H. Test reports.

I. Certificates.

J. Manufacturer's instructions.

K. Manufacturer's field reports.

L. Erection drawings.

1.2 SUBMITTAL PROCEDURES

A. Transmit each submittal with Architect/Engineer accepted form.

B. Sequentially number transmittal forms. Mark revised submittals with original number and sequential alphabetic suffix.

C. Identify Project, Contractor, subcontractor, and supplier; pertinent drawing and detail number, and specification section number, appropriate to submittal.

D. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with requirements of the Work and Contract Documents.

E. Schedule submittals to expedite Project and deliver to Architect/Engineer at business address. Coordinate submission of related items.

F. For each submittal for review, allow 15 days excluding delivery time to and from Contractor.

G. Identify variations from Contract Documents and product or system limitations which may be detrimental to successful performance of completed Work.

H. Allow space on submittals for Contractor and Architect/Engineer review stamps.

I. When revised for resubmission, identify changes made since previous submission.

J. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report inability to comply with requirements.

K. Submittals not requested will not be recognized or processed.

1.3 CONSTRUCTION PROGRESS SCHEDULES

A. Submit initial schedules within 20 days after date established in Notice to Proceed. After review, resubmit required revised data within 10 days.

B. Submit revised Progress Schedules with each Application for Payment.

C. Distribute copies of reviewed schedules to Project site file, subcontractors, suppliers, and other concerned parties.

D. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.

E. Submit computer generated chart with separate line for each major portion of Work or operation, identifying first work day of each week.

F. Show complete sequence of construction by activity, identifying Work of separate stages and other logically grouped activities. Indicate early and late start, early and late finish, float dates, and duration.

G. Indicate estimated percentage of completion for each item of Work at each submission.

H. Submit separate schedule of submittal dates for shop drawings, product data, and samples, including [products identified under Allowances], and dates reviewed submittals will be required from Architect/Engineer. Indicate decision dates for selection of finishes.

I. Indicate delivery dates for [products identified under Allowances].

J. Revisions To Schedules:

1. Indicate progress of each activity to date of submittal and projected completion date of each activity.

2. Identify activities modified since previous submittal, major changes in scope, and other identifiable changes.

3. Prepare narrative report to define problem areas, anticipated delays, and impact on Schedule. Report corrective action taken, or proposed, and its effect including effect of changes on schedules of separate contractors.

1.4 PROPOSED PRODUCTS LIST

A. Within 15 days after date of Notice to Proceed, submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.

B. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

1.5 PRODUCT DATA

A. Product Data: Submit to Architect/Engineer for review for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents.

B. Submit number of copies Contractor requires, plus 2 copies Architect/Engineer will retain.

C. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

D. Indicate product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

E. After review, produce copies and distribute in accordance with SUBMITTAL PROCEDURES article and for record documents described in Section 017000 - Execution Requirements.

1.6 SHOP DRAWINGS

A. Shop Drawings: Submit to Architect/Engineer for review for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents.

B. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

C. When required by individual specification sections, provide shop drawings signed and sealed by professional engineer responsible for designing components shown on shop drawings.

1. Include signed and sealed calculations to support design.

2. Submit drawings and calculations in form suitable for submission to and approval by authorities having jurisdiction.

3. Make revisions and provide additional information when required by authorities having jurisdiction.

D. Submit number of opaque reproductions Contractor requires, plus 2 copies Architect/Engineer will retain.

E. After review, produce copies and distribute in accordance with SUBMITTAL PROCEDURES article and for record documents described in Section 017000 - Execution Requirements.

1.7 SAMPLES

A. Samples: Submit to Architect/Engineer for review for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents.

B. Samples For Selection as Specified in Product Sections:

1. Submit to Architect/Engineer for aesthetic, color, or finish selection.

C. Submit samples to illustrate functional and aesthetic characteristics of Products, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.

D. Include identification on each sample, with full Project information.

E. Submit number of samples specified in individual specification sections; Architect/Engineer will retain 1 sample.

F. Reviewed samples which may be used in the Work are indicated in individual specification sections.

G. Samples will not be used for testing purposes unless specifically stated in specification section.

H. After review, produce duplicates and distribute in accordance with SUBMITTAL PROCEDURES article and for record documents purposes described in Section 017000 - Execution Requirements.

1.8 DESIGN DATA

A. Submit for Architect/Engineer's knowledge as contract administrator or for Owner.

B. Submit for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.

1.9 TEST REPORTS

A. Submit for Architect/Engineer's knowledge as contract administrator or for Owner.

B. Submit test reports for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.

1.10 CERTIFICATES

A. When specified in individual specification sections, submit certification by manufacturer, installation/application subcontractor, or Contractor to Architect/Engineer, in quantities specified for Product Data.

B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

C. Certificates may be recent or previous test results on material or Product, but must be acceptable to Architect/Engineer.

1.11 MANUFACTURER'S INSTRUCTIONS

A. When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, adjusting, and finishing, to Architect/Engineer for delivery to Owner in quantities specified for Product Data.

B. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

1.12 MANUFACTURER'S FIELD REPORTS

A. Submit reports for Architect/Engineer's benefit as contract administrator or for Owner.

B. Submit report within 5 days of observation to Architect/Engineer for information.

C. Submit for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.

1.13 ERECTION DRAWINGS

A. Submit drawings for Architect/Engineer's benefit as contract administrator or for Owner.

B. Submit for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.

C. Data indicating inappropriate or unacceptable Work may be subject to action by Architect/Engineer or Owner.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 014000

QUALITY REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Quality control and control of installation.

B. Tolerances.

C. References.

D. Labeling.

E. Testing and inspection services.

F. Manufacturers' field services.

G. Examination.

H. Preparation.

1.2 QUALITY CONTROL AND CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. When manufacturers' instructions conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.

D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Perform Work by persons qualified to produce required and specified quality.

F. Verify field measurements are as indicated on Shop Drawings or as instructed by manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

1.3 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. When manufacturers' tolerances conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

1.4 REFERENCES

A. For products or workmanship specified by association, trade, or other consensus standards, comply with requirements of standard, except when more rigid requirements are specified or are required by applicable codes.

B. Conform to reference standard by date of issue current on date of Contract Documents except where specific date is established by code.

C. Obtain copies of standards where required by product specification sections.

D. When specified reference standards conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.

E. Neither contractual relationships, duties, nor responsibilities of parties in Contract nor those of Architect/Engineer shall be altered from Contract Documents by mention or inference otherwise in reference documents.

1.5 LABELING

A. Attach label from agency approved by authority having jurisdiction for products, assemblies, and systems required to be labeled by applicable code.

B. Label Information: Include manufacturer's or fabricator's identification, approved agency identification, and the following information, as applicable, on each label.
   1. Model number.
   2. Serial number.
   3. Performance characteristics.

1.6 TESTING AND INSPECTION SERVICES

A. Owner will employ and pay for specified services of an independent firm to perform testing and inspection.

B. The independent firm will perform tests, inspections, and other services specified in individual specification sections and as required by Architect/Engineer.
   1. Laboratory: Authorized to operate in the Commonwealth of Virginia.

2. Laboratory Staff: Maintain full time registered Engineer on staff to review services.
3. Testing Equipment: Calibrated at reasonable intervals with devices of an accuracy traceable to National Bureau of Standards or accepted values of natural physical constants.

C. Testing, inspections, and source quality control may occur on or off project site. Perform off-site testing as required by Architect/Engineer or Owner.

D. Reports will be submitted by independent firm to Architect/Engineer, Contractor, and authority having jurisdiction, in duplicate, indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents.
1. Submit final report indicating correction of Work previously reported as non-compliant.

E. Cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage, safe access, and assistance by incidental labor as requested.
1. Notify Architect/Engineer and independent firm a minimum of 24 hours prior to expected time for operations requiring services.
2. Make arrangements with independent firm and pay for additional samples and tests required for Contractor's use.

F. Testing and employment of testing agency or laboratory shall not relieve Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

G. Re-testing or re-inspection required because of non-conformance to specified requirements shall be performed by same independent firm on instructions by Architect/Engineer. Payment for re-testing or re-inspection will be charged to Contractor by deducting testing charges from Contract Sum/Price.

H. Agency Responsibilities:
1. Test samples of mixes submitted by Contractor.
2. Provide qualified personnel at site. Cooperate with Architect/Engineer and Contractor in performance of services.
3. Perform specified sampling and testing of products in accordance with specified standards.
4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
5. Promptly notify Architect/Engineer and Contractor of observed irregularities or non-conformance of Work or products.
6. Perform additional tests required by Architect/Engineer.
7. Attend preconstruction meetings and progress meetings.

I. Agency Reports: After each test, promptly submit 2 copies of report to Architect/Engineer, Contractor, and authority having jurisdiction. When requested by Architect/Engineer, provide interpretation of test results. Include the following:
1. Date issued.

2. Project title and number.
3. Name of inspector.
4. Date and time of sampling or inspection.
5. Identification of product and specifications section.
6. Location in Project.
7. Type of inspection or test.
8. Date of test.
9. Results of tests.
10. Conformance with Contract Documents.

J. Limits On Testing Authority:
1. Agency or laboratory may not release, revoke, alter, or enlarge on requirements of Contract Documents.
2. Agency or laboratory may not approve or accept any portion of the Work.
3. Agency or laboratory may not assume duties of Contractor.
4. Agency or laboratory has no authority to stop the Work.

1.7 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, and test, adjust and balance of equipment as applicable, and to initiate instructions when necessary.

B. Submit qualifications of observer to Architect/Engineer 30 days in advance of required observations. Observer subject to approval of Architect/Engineer.

C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

D. Refer to Section 013300 - Submittal Procedures, MANUFACTURERS' FIELD REPORTS article.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.

B. Verify existing substrate is capable of structural support or attachment of new Work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.

D. Verify utility services are available, of correct characteristics, and in correct locations.

3.2 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying new material or substance in contact or bond.

END OF SECTION

SECTION 015000

TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Temporary Utilities:
1. Temporary electricity.
2. Temporary lighting for construction purposes.
3. Temporary ventilation.
4. Telephone service.
5. Facsimile service.
6. Temporary water service.
7. Temporary sanitary facilities.

B. Construction Facilities:
1. Field offices and sheds.
2. Vehicular access.
3. Parking.
4. Progress cleaning and waste removal.
5. Project identification.
6. Traffic regulation.
7. Fire prevention facilities.

C. Temporary Controls:
1. Barriers.
2. Enclosures and fencing.
3. Security.
4. Water control.
5. Dust control.
6. Erosion and sediment control.
7. Pollution control.
8. Rodent control.

D. Removal of utilities, facilities, and controls.

1.2 TEMPORARY ELECTRICITY

A. Provide and pay for power service required from utility source, as needed for construction operation. Utilize Owner’s existing power service, provide separate metering and reimburse Owner for cost of energy used.

B. Provide temporary electric feeder from electrical service at location as directed by Architect/Engineer. Do not disrupt Owner's use of service.

C. Complement existing power service capacity and characteristics as required for construction operations.

D. Provide power outlets, with branch wiring and distribution boxes located as required for construction operations. Provide flexible power cords as required for portable construction tools and equipment.

E. Provide main service disconnect and over-current protection at convenient location.

1.3 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

A. Provide and maintain lighting for construction operations to achieve minimum lighting level of 2 watt/sq ft.

B. Provide and maintain 1 watt/sq ft lighting to exterior staging and storage areas after dark for security purposes.

C. Provide and maintain 1/4 watt/sq ft HID lighting to interior work areas after dark for security purposes.

D. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps for specified lighting levels.

E. Maintain lighting and provide routine repairs.

F. Permanent building lighting may [not] be utilized during construction.

1.4 TEMPORARY VENTILATION

A. Ventilate enclosed areas to achieve curing of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

1.5 TELEPHONE SERVICE

A. Provide, maintain, and pay for telephone service to field office at time of project mobilization.

1.6 FACSIMILE SERVICE

A. Provide, maintain, and pay for facsimile service to field at time of project mobilization.

1.7 TEMPORARY WATER SERVICE

A. Provide and pay for suitable quality water service as needed to maintain specified conditions for construction operations.

1.8 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Existing facility use is not permitted. Provide facilities at time of project mobilization.

1.9 FIELD OFFICES AND SHEDS

A. Office: Weather tight, with lighting, electrical outlets, heating, cooling, and ventilating equipment, and equipped with sturdy furniture, drawing rack, and drawing display table.

B. Provide space for Project meetings, with table and chairs to accommodate 8 persons.

C. Do not use permanent facilities for field offices or for storage.

D. Construction: Portable or mobile buildings, or buildings constructed with floors raised above ground, securely fixed to foundations with steps and landings at entrance doors.
   1. Construction: Structurally sound, secure, weather tight enclosures for office and storage spaces. Maintain during progress of Work; remove at completion of Work.
   2. Temperature Transmission Resistance of Floors, Walls, and Ceilings: Compatible with occupancy and storage requirements.
   3. Exterior Materials: Weather resistant, finished in 1 color.
   4. Interior Materials in Offices: Sheet type materials for walls and ceilings, pre-finished or painted; resilient floors and bases.
   5. Lighting for Offices: 50 ft C at desk top height, exterior lighting at entrance doors.
   6. Interior Materials in Storage Sheds: As required to provide specified conditions for storage of products.

E. Environmental Control:
   1. Heating, Cooling, and Ventilating for Offices: Automatic equipment to maintain comfortable conditions 68 degrees F heating and 76 degrees F cooling.
   2. Storage Spaces: Heating and ventilation as needed to maintain products in accordance with Contract Documents; lighting for maintenance and inspection of products.

F. Storage Areas And Sheds: Size to storage requirements for products of individual Sections, allowing for access and orderly provision for maintenance and for inspection of products to requirements of Section 016000 - Product Requirements.

G. Preparation: Fill and grade sites for temporary structures sloped for drainage away from buildings.

H. Installation:
   1. Install office spaces ready for occupancy 15 days after date fixed in Notice to Proceed.
   2. Employee Residential Occupancy: Not allowed on Owner's property.

I. Maintenance And Cleaning:
   1. Weekly janitorial services for offices; periodic cleaning and maintenance for office and storage areas.
   2. Maintain approach walks free of mud, water, and snow.

J. Removal: At completion of Work remove buildings, foundations, utility services, and debris. Restore areas.

1.10 VEHICULAR ACCESS

A. Construct temporary all-weather access roads from public thoroughfares to serve construction area, of width and load bearing capacity to accommodate unimpeded traffic for construction purposes.

B. Construct temporary bridges and culverts to span low areas and allow unimpeded drainage.

C. Extend and relocate vehicular access as Work progress requires, provide detours as necessary for unimpeded traffic flow.

D. Location as approved by Owner.

E. Provide unimpeded access for emergency vehicles. Maintain 20 feet wide driveways with turning space between and around combustible materials.

F. Provide and maintain access to fire hydrants and control valves free of obstructions.

G. Provide means of removing mud from vehicle wheels before entering streets.

H. Use existing on-site roads for construction traffic.

1.11 PARKING

A. Provide temporary gravel surface parking areas to accommodate construction personnel.

B. Locate as approved by Owner.

C. When site space is not adequate, provide additional off-site parking.

D. Use of designated existing on-site streets and driveways used for construction traffic is permitted. Tracked vehicles not allowed on paved areas.

E. Use of designated areas of existing parking facilities used by construction personnel is permitted.

F. Do not allow heavy vehicles or construction equipment in parking areas.

G. Do not allow vehicle parking on existing pavement.

H. Permanent Pavements And Parking Facilities:
1. Bases for permanent roads and parking areas may be used for construction traffic.
2. Avoid traffic loading beyond paving design capacity. Tracked vehicles not allowed.

I. Maintenance:
1. Maintain traffic and parking areas in sound condition free of excavated material, construction equipment, products, mud, snow, and ice.
2. Maintain existing and permanent paved areas used for construction; promptly repair breaks, potholes, low areas, standing water, and other deficiencies, to maintain paving and drainage in original, or specified, condition.

J. Removal, Repair:
1. Remove temporary materials and construction when permanent paving is usable.
2. Remove underground work and compacted materials to depth of 2 feet; fill and grade site as specified.
3. Repair existing facilities damaged by use, to original condition.

K. Mud From Site Vehicles: Provide means of removing mud from vehicle wheels before entering streets.

1.12 PROGRESS CLEANING AND WASTE REMOVAL

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing spaces.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and rubbish from site periodically and dispose off-site.

E. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.13 PROJECT IDENTIFICATION

A. Project Identification Sign:
1. One painted sign, 32 sq ft area, bottom 6 feet above ground.
2. Content:
a. Project title, logo, and name of Owner as indicated on Contract Documents.

b. Names and titles of authorities.
c. Names and titles of Architect/Engineer and Consultants.
d. Name of Prime Contractor [and major Subcontractors].

3. Graphic Design, Colors, Style of Lettering: Designated by Architect/Engineer.

B. Project Informational Signs:
1. Painted informational signs of same colors and lettering as Project Identification sign, or standard products; size lettering for legibility at 100 feet distance.
2. No other signs are allowed without Owner permission except those required by law.

C. Design sign and structure to withstand 60 miles/hr wind velocity.

D. Sign Painter: Experienced as professional sign painter for minimum 3 years.

E. Finishes, Painting: Adequate to withstand weathering, fading, and chipping for duration of construction.

F. Show content, layout, lettering, and color.

G. Sign Materials:
1. Structure and Framing: New, wood, structurally adequate.
2. Sign Surfaces: Exterior grade plywood with medium density overlay, minimum 3/4 inches thick, standard large sizes to minimize joints.
3. Rough Hardware: Galvanized.
4. Paint and Primers: Exterior quality, 2 coats; sign background of color as selected.
5. Lettering: Exterior quality paint, contrasting colors as selected.

H. Installation:
1. Install project identification sign within 15 days after date fixed by Notice to Proceed.
2. Erect at location of high public visibility adjacent to main entrance to site.
3. Erect supports and framing on secure foundation, rigidly braced and framed to resist wind loadings.
4. Install sign surface plumb and level, with butt joints. Anchor securely.
5. Paint exposed surfaces of sign, supports, and framing.

I. Maintenance: Maintain signs and supports clean, repair deterioration and damage.

J. Removal: Remove signs, framing, supports, and foundations at completion of Project and restore area.

1.14 TRAFFIC REGULATION

A. Signs, Signals, And Devices:
1. Post Mounted and Wall Mounted Traffic Control and Informational Signs: As approved by authority having jurisdiction.
2. Traffic Control Signals: As approved by local jurisdictions.

3. Traffic Cones and Drums, Flares and Lights: As approved by authority having jurisdiction.
4. Flagperson Equipment: As required by authority having jurisdiction.

B. Flag Persons: Provide trained and equipped flag persons to regulate traffic when construction operations or traffic encroach on public traffic lanes.

C. Flares And Lights: Use flares and lights during hours of low visibility to delineate traffic lanes and to guide traffic.

D. Haul Routes:
1. Consult with authority having jurisdiction, establish public thoroughfares to be used for haul routes and site access.

E. Traffic Signs And Signals:
1. Provide signs at approaches to site and on site, at crossroads, detours, parking areas, and elsewhere as needed to direct construction and affected public traffic.
2. Provide, operate, and maintain traffic control signals to direct and maintain orderly flow of traffic in areas under Contractor's control, and areas affected by Contractor's operations.
3. Relocate as Work progresses, to maintain effective traffic control.

F. Removal:
1. Remove equipment and devices when no longer required.
2. Repair damage caused by installation.
3. Remove post settings to depth of 2 feet.

1.15 FIRE PREVENTION FACILITIES

A. Prohibit smoking with buildings under construction. Designate area on site where smoking is permitted. Provide approved ashtrays in designated smoking areas.

B. Establish fire watch for cutting and welding and other hazardous operations capable of starting fires. Maintain fire watch before, during, and after hazardous operations until threat of fire does not exist.

C. Portable Fire Extinguishers: NFPA 10; 10 pound capacity, 4A-60B: C UL rating.
1. Provide minimum 1 fire extinguisher in every construction trailer and storage shed.

1.16 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations.

B. Provide barricades and covered walkways required by authorities having jurisdiction for public rights-of-way.

C. Provide protection for plants designated to remain. Replace damaged plants.

D. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.17 ENCLOSURES AND FENCING

A. Construction: Commercial grade chain link fence.

B. Provide 6 feet high fence around construction site; equip with vehicular gates with locks.

C. Exterior Enclosures:
1. Provide temporary weather tight closure of exterior openings to accommodate acceptable working conditions and protection for products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

1.18 SECURITY

A. Security Program:
1. Protect Work existing premises from theft, vandalism, and unauthorized entry.
2. Initiate program at project mobilization.
3. Maintain program throughout construction period until Owner acceptance precludes need for Contractor security.

B. Entry Control:
1. Restrict entrance of persons and vehicles into Project site.
2. Allow entrance only to authorized persons with proper identification.
3. Maintain log of workers and visitors, make available to Owner on request.

1.19 WATER CONTROL

A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

B. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

1.20 DUST CONTROL

A. Execute Work by methods to minimize raising dust from construction operations.

B. Provide positive means to prevent air-borne dust from dispersing into atmosphere.

1.21 EROSION AND SEDIMENT CONTROL

A. Plan and execute construction by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.

B. Minimize surface area of bare soil exposed at 1 time.

C. Provide temporary measures including berms, dikes, and drains, and other devices to prevent water flow.

D. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.

E. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

1.22 POLLUTION CONTROL

A. Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations.

B. Comply with pollution and environmental control requirements of authorities having jurisdiction.

1.23 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, materials, prior Final Application for Payment inspection.

B. Remove underground installations to minimum depth of 2 feet.

C. Clean and repair damage caused by installation or use of temporary work.

D. Restore existing facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 016000

PRODUCT REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Products.

B. Product delivery requirements.

C. Product storage and handling requirements.

D. Product options.

E. Product substitution procedures.

1.2 PRODUCTS

A. Furnish products of qualified manufacturers suitable for intended use. Furnish products of each type by single manufacturer unless specified otherwise.

1.3 PRODUCT DELIVERY REQUIREMENTS

A. Transport and handle products in accordance with manufacturer's instructions.

B. Promptly inspect shipments to ensure products comply with requirements, quantities are correct, and products are undamaged.

C. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

1.4 PRODUCT STORAGE AND HANDLING REQUIREMENTS

A. Store and protect products in accordance with manufacturers' instructions.

B. Store with seals and labels intact and legible.

C. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.

D. For exterior storage of fabricated products, place on sloped supports above ground.

E. Provide off-site storage and protection when site does not permit on-site storage or protection.

F. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

G. Store loose granular materials on solid flat surfaces in well-drained area. Prevent mixing with foreign matter.

H. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

I. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

1.5 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Any product meeting those standards or description.

B. Products Specified by Naming 1 or More Manufacturers: Products of 1 of manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming 1 or More Manufacturers with Provision for Substitutions: Submit request for substitution for any manufacturer not named in accordance with the following article.

1.6 PRODUCT SUBSTITUTION PROCEDURES

A. Architect/Engineer will consider requests for Substitutions only within 30 days after date established in Notice to Proceed.

B. Substitutions may be considered when a product becomes unavailable through no fault of Contractor.

C. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.

D. A request constitutes a representation that Contractor:
1. Has investigated proposed product and determined that it meets or exceeds quality level of specified product.
2. Will provide same warranty for Substitution as for specified product.
3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.
4. Waives claims for additional costs or time extension which may subsequently become apparent.
5. Will reimburse Owner and Architect/Engineer for review or redesign services associated with re-approval by authorities having jurisdiction.

E. Substitutions will not be considered when they are indicated or implied on Shop Drawing or Product Data submittals, without separate written request, or when acceptance will require revision to Contract Documents.

F. Substitution Submittal Procedure:

1. Submit 5 copies of request for Substitution for consideration. Limit each request to 1 proposed Substitution.
2. Submit Shop Drawings, Product Data, and certified test results attesting to proposed product equivalence. Burden of proof is on proposer.
3. Architect/Engineer will notify Contractor in writing of decision to accept or reject request.

PART 2 PRODUCTS – Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 017000

EXECUTION REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Closeout procedures.

B. Final cleaning.

C. Starting of systems.

D. Demonstration and instructions.

E. Protecting installed construction.

F. Project record documents.

G. Operation and maintenance data.

H. Manual for materials and finishes.

I. Manual for equipment and systems.

J. Spare parts and maintenance products.

K. Product warranties and product bonds.

L. Maintenance service.

1.2 CLOSEOUT PROCEDURES

A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Architect/Engineer's review.

B. Provide submittals to Owner required by authorities having jurisdiction.

C. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.

1.3 FINAL CLEANING

A. Execute final cleaning prior to final project assessment.

B. Clean interior and exterior surfaces exposed to view; remove temporary labels, stains, and foreign substances.

C. Clean equipment to sanitary condition with cleaning materials appropriate to surface and material being cleaned.

D. Clean debris from roofs and drainage systems.

E. Clean site; sweep paved areas, rake clean landscaped surfaces.

F. Remove waste and surplus materials, rubbish, and construction facilities from site.

1.4 STARTING OF SYSTEMS

A. Coordinate schedule for start-up of various equipment and systems.

B. Notify Owner 7 days prior to start-up of each item.

C. Verify tests, meter readings, and specified electrical characteristics agree with those required by equipment or system manufacturer.

D. Verify wiring and support components for equipment are complete and tested.

E. Execute start-up under supervision of applicable manufacturer's representative in accordance with manufacturers' instructions.

F. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

G. Submit a written report in accordance with Section 013300 - Submittal Procedures that equipment or system has been properly installed and is functioning correctly.

1.5 DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate operation and maintenance of products to Owner's personnel 2 weeks prior to date of final inspection.

B. Demonstrate Project equipment and instructed by manufacturer's representative who is knowledgeable about the Project.

C. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.

D. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at agreed time, at equipment location.

E. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

F. Required instruction time for each item of equipment and system is specified in individual sections.

1.6 PROTECTING INSTALLED CONSTRUCTION

A. Protect installed Work and provide special protection where specified in individual specification sections.

B. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

C. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

D. Protect floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

E. Prohibit traffic or storage upon waterproofed surfaces. When traffic or activity is necessary, obtain recommendations for protection from waterproofing manufacturer.

F. Prohibit traffic from landscaped areas.

1.7 PROJECT RECORD DOCUMENTS

A. Maintain on site 1 set of the following record documents; record actual revisions to the Work:
1. Drawings.
2. Specifications.
3. Addenda.
4. Change Orders and other modifications to the Contract.
5. Reviewed Shop Drawings, Product Data, and Samples.
6. Manufacturer's instruction for assembly, installation, and adjusting.

B. Ensure entries are complete and accurate, enabling future reference by Owner.

C. Store record documents separate from documents used for construction.

D. Record information concurrent with construction progress, not less than weekly.

E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
1. Manufacturer's name and product model and number.
2. Product substitutions or alternates utilized.
3. Changes made by Addenda and modifications.

F. Record Drawings and Approved Shop Drawings: Legibly mark each item to record actual construction including:
1. Measured depths of foundations in relation to finish first floor datum.
2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.

3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
4. Field changes of dimension and detail.
5. Details not on original Contract drawings.

G. Submit documents to Architect/Engineer with claim for final Application for Payment.

1.8 OPERATION AND MAINTENANCE DATA

A. Submit data bound in 8-1/2 x 11 inch (A4) text pages, 3 D side ring binders with durable plastic covers.

B. Prepare binder cover with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS", title of project.

C. Internally subdivide binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.

D. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

E. Contents: Prepare Table of Contents for each volume, with each product or system description identified, typed on white paper, in 3 parts as follows:
1. Part 1: Directory, listing names, addresses, and telephone numbers of Architect/Engineer, Contractor, Subcontractors, and major equipment suppliers.
2. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
    a. Significant design criteria.
    b. List of equipment.
    c. Parts list for each component.
    d. Operating instructions.
    e. Maintenance instructions for equipment and systems.
    f. Maintenance instructions for special finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
3. Part 3: Project documents and certificates, including the following:
    a. Shop drawings and product data.
    b. Air and water balance reports.
    c. Certificates.
    d. Originals of warranties and bonds.

1.9 MANUAL FOR MATERIALS AND FINISHES

A. Submit 2 copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect/Engineer will review draft and return 1 copy with comments.

B. For equipment, or component parts of equipment, put into service during construction and operated by Owner, submit documents within 10 days after acceptance.

C. Submit 1 copy of completed volumes 15 days prior to final inspection. Draft copy be reviewed and returned after final inspection, with Architect/Engineer comments. Revise content of document sets as required prior to final submission.

D. Submit 2 sets of revised final volumes in final form within 10 days after final inspection.

E. Building Products, Applied Materials, and Finishes: Include product data, with catalog number, size, composition, and color and texture designations. Include information for re-ordering custom manufactured products.

F. Instructions for Care and Maintenance: Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

G. Moisture Protection and Weather Exposed Products: Include product data listing applicable reference standards, chemical composition, and details of installation. Include recommendations for inspections, maintenance, and repair.

H. Additional Requirements: As specified in individual product specification sections.

I. Include listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.

1.10 MANUAL FOR EQUIPMENT AND SYSTEMS

A. Submit 2 copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect/Engineer will review draft and return 1 copy with comments.

B. For equipment, or component parts of equipment, put into service during construction and operated by Owner, submit documents within 10 days after acceptance.

C. Submit 1 copy of completed volumes 15 days prior to final inspection. Draft copy to be reviewed and returned after final inspection, with Architect/Engineer comments. Revise content of document sets as required prior to final submission.

D. Submit 2 sets of revised final volumes in final form within 10 days after final inspection.

E. Each Item of Equipment and Each System: Include description of unit or system, and component parts. Identify function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and model number of replaceable parts.

F. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.

G. Include color coded wiring diagrams as installed.

H. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and special operating instructions.

I. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and adjusting and checking instructions.

J. Include manufacturer's printed operation and maintenance instructions.

K. Include sequence of operation by controls manufacturer.

L. Include original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

M. Include control diagrams by controls manufacturer as installed.

N. Include Contractor's coordination drawings, with color coded piping diagrams as installed.

O. Include test and balancing reports as specified in Section 014000 - Quality Requirements.

P. Additional Requirements: As specified in individual product specification sections.

Q. Include listing in Table of Contents for design data, with tabbed dividers and space for insertion of data.

1.11 SPARE PARTS AND MAINTENANCE PRODUCTS

A. Furnish spare parts, maintenance, and extra products in quantities specified in individual specification sections.

B. Deliver to Project site; obtain receipt prior to final payment.

1.12 PRODUCT WARRANTIES AND PRODUCT BONDS

A. Obtain warranties and bonds executed in duplicate by responsible subcontractors, suppliers, and manufacturers, within 10 days after completion of applicable item of work.

B. Execute and assemble transferable warranty documents and bonds from subcontractors, suppliers, and manufacturers.

C. Verify documents are in proper form, contain full information, and are notarized.

D. Co-execute submittals when required.

E. Include Table of Contents and assemble in 3 D side ring binder with durable plastic cover.

F. Submit prior to final Application for Payment.

G. Time Of Submittals:
1. For equipment, or component parts of equipment, put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing date of acceptance as beginning of warranty or bond period.

1.13 MAINTENANCE SERVICE

A. Furnish service and maintenance of components indicated in specification sections during warranty period.

B. Examine system components at frequency consistent with reliable operation. Clean and adjust as required.

C. Include systematic examination and adjustment of components. Repair or replace parts whenever required. Use parts produced by manufacturer of original component.

D. Do not assign or transfer maintenance service to agent or Subcontractor without prior written consent of Owner.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 033000

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Formwork.
2. Reinforcement.
3. Accessories.
4. Cast-in-place concrete.
5. Finishing and curing.

1.2 SYSTEM DESCRIPTION

A. Design, engineer and construct formwork, shoring, and bracing in accordance with ACI 301, ACI 318, and ACI 347 to conform to design and applicable code requirements to achieve concrete shape, line, and dimension as indicated on Drawings.

B. Vapor Retarder Permeance: Maximum 1 perm when tested in accordance with ASTM E96 Procedure A.

1.3 SUBMITTALS

A. Shop Drawings:
1. Indicate pertinent dimensioning, form materials, arrangement of joints and ties, location of bracing and temporary supports, schedule of erection, and stripping.
2. Indicate reinforcement sizes, spacings, locations and quantities, bending and cutting schedules, and supporting and spacing devices.
3. Indicate slabs-on-grade.

B. Product Data: Indicate admixtures and anchors.

C. Design Data: Submit mix designs.

1.4 QUALITY ASSURANCE

A. Construct and erect concrete formwork in accordance with ACI 301, ACI 318, and ACI 347.

B. Perform concrete reinforcing work in accordance with ACI 318 and CRSI Manual of Practice.

C. Perform cast-in-place concrete work in accordance with ACI 318.

D. Perform Work in accordance with Commonwealth of Virginia standards.

E. Maintain 1 copy of each document on site.

F. Design Work under direct supervision of Professional Engineer experienced in design of this Work and licensed in the Commonwealth of Virginia.

PART 2 PRODUCTS

2.1 FORM MATERIALS AND ACCESSORIES

A. Form Materials: At discretion of Contractor.

B. Form Ties: Snap-off metal type of fixed length cone type, leaving no metal closer than 1 inch from formed surface of concrete.

C. Dovetail Anchor Slots: Galvanized steel, non-filled, release tape sealed slots; bend tab anchors.

D. Form Release Agent: Colorless mineral oil not capable of staining concrete or impairing natural bonding characteristics of coating intended for use on concrete.

E. Formed Construction Joints for Slab-on-Grade: Galvanized steel, tongue and groove type profile, knockout holes to receive doweling.

F. Slab Edge Joint Filler: ASTM D1751, Premolded asphaltic board, 1/2 inch thick.

G. Vapor Retarder: ASTM E1745 Class C; 6 mil thick clear polyethylene film type recommended for below grade application. Furnish joint tape recommended by manufacturer.

2.2 REINFORCEMENT MATERIALS

A. Reinforcing Steel: ASTM A615/A615M, 60 ksi yield grade deformed billet bars, uncoated finish.

B. Welded Plain Wire Fabric: ASTM A185 in flat sheets unfinished. Provide epoxy coated finished as alternate.

C. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for support of reinforcing; plastic tipped or non-corroding for supports in slabs forming finished ceilings or where supports are exposed to weather.

D. Fabricate concrete reinforcement in accordance with CRSI Manual of Practice and ACI 318.

E. Weld reinforcement in accordance with AWS D1.4.

F. Epoxy Coated Finish for Steel Bars: ASTM A775/A775M as alternate.

G. Epoxy Coated Finish for Steel Wire: ASTM A884/A884M; Class A using ASTM A775/A775M as alternate.

H. Epoxy Coating Patching Material: Type as recommended by coating manufacturer.

2.3 CONCRETE MATERIALS

A. Cement: ASTM C150, Normal-Type I and/or II Portland type.

B. Fine and Coarse Aggregates: ASTM C33.

C. Water: Clean and not detrimental to concrete complying with ASTM C94.

D. Air Entrainment Admixture: ASTM C260.

E. Bonding Agent: Polymer resin emulsion.

F. Non-shrink Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.

2.4 COMPOUNDS, HARDENERS AND SEALERS

A. Curing Compound: ASTM C309, Type 1, Class B, acrylic type; clear.

2.5 CONCRETE MIX

A. Mix and deliver concrete in accordance with ASTM C94.

B. Furnish concrete of the following strength for beams, slabs, and columns:
1. Compressive strength 5,000 psi (28 day).
2. Slump 3 to 5 inches.
3. Maximum water-cement ratio: .40.

C. Furnish concrete of the following strength for footings:
1. Compressive strength 3,000 psi (28 day).
2. Slump 3 to 5 inches.
3. Maximum water-cement ratio: .50.

D. Select admixture proportions for normal weight concrete in accordance with ACI 318.

E. Add air entraining agent to concrete mix for concrete work exposed to exterior.

PART 3 EXECUTION

3.1 FORMWORK ERECTION

A. Erect formwork, shoring, and bracing to achieve design requirements.

B. Camber slabs and framing to achieve ACI 301 tolerances.

C. Provide bracing to ensure stability of formwork.

D. Form external corners of beams and columns with 3/4 inch chamfer.

E. Apply form release agent to formwork prior to placing form accessories and reinforcement.

F. Do not apply form release agent where concrete surfaces will receive applied coverings affected by agent.

G. Clean forms as erection proceeds, to remove foreign matter.

3.2 INSERTS, EMBEDDED COMPONENTS, AND OPENINGS

A. Provide formed openings where required for work to be embedded in and passing through concrete members.

B. Coordinate work of other sections in forming and setting openings, slots, recesses, chases, sleeves, bolts, anchors, and other inserts.

C. Install concrete accessories straight, level, and plumb.

D. Install water stops continuous without displacing reinforcement.

E. Place formed construction joint device in slab-on-grade as indicated on the Drawings.

F. Place joint filler at perimeter of floor slab, penetrations, and isolation joints.

3.3 REINFORCEMENT PLACEMENT

A. Place reinforcement, supported and secured against displacement.

B. Ensure reinforcing is clean, free of loose scale, dirt, or other foreign coatings.

C. Weld reinforcement in accordance with AWS D1.4.
1. Do not weld crossing reinforcement bars for assembly except as permitted by Architect/Engineer.

D. Space reinforcement bars with minimum clear spacing in accordance with ACI 318.
1. Where bars are indicated in multiple layers, place upper bars directly above lower bars.

E. Maintain concrete cover around reinforcement in accordance with ACI 318 and as indicated on the Drawings.

3.4 PLACING CONCRETE

A. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent.

B. Install vapor retarder under interior slabs-on-grade in accordance with ASTM E1643. Lap joints minimum 6 inch and seal watertight.

C. Repair damaged vapor retarder with vapor retarder material, lap over damaged areas minimum 6 inch and seal watertight.

D. Separate slabs-on-grade from vertical surfaces with 1/2 inch thick joint filler, extended from bottom of slab to within 1/4 inch of finished slab surface.

E. Place concrete continuously between predetermined expansion, control, and construction joints. Do not break or interrupt successive pours creating cold joints.

F. Place floor slabs in saw cut pattern indicated.

G. Where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack with non-shrink grout.

3.5 FORM REMOVAL

A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.

B. Remove formwork progressively and in accordance with code requirements.

3.6 FLOOR FINISHING

A. Finish concrete floor surfaces in accordance with ACI 301 and ACI 302.1.

B. Uniformly spread, screed, and float concrete.

C. Apply light broom finish to surfaces remaining exposed to view in finished construction.

D. Maintain surface flatness, with maximum variation of 1/4 inch in 10 feet.

3.7 CURING AND PROTECTION

A. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
   1. Protect concrete footings from freezing for minimum of 7 days.

B. Apply sealer on floor surfaces.

C. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete for not less than 7 days.

3.8 FORMED SURFACES

A. Provide concrete surfaces to be left exposed such as concrete columns and beams with smooth rubbed finish.

3.9 ERECTION TOLERANCES

A. Install reinforcement within tolerances required by ACI 318.

3.10 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with ACI 318.

B. Reinforcement Inspection:
   1. Inspect for correct materials, fabrication, sizes, locations, spacing, concrete cover, and splicing.

C. Strength Test Samples:
   1. Sample concrete and make 1 set of 5 cylinders for every 27 cu yds or less of each class of concrete placed each day and for every 1,000 sf of surface area for slabs.

D. Field Testing:
   1. Measure slump and temperature for each concrete truck.
   2. Measure air content in air entrained concrete for each concrete truck.

E. Cylinder Compressive Strength Testing:
   1. Test Method: ASTM C39.
   2. Test Acceptance: In accordance with ACI 318.
   3. Test 2 cylinders at 28 days.
   4. Test 1 cylinder at 7 days.
   5. Retain 2 cylinders for testing when requested by Architect/Engineer.
   6. Dispose remaining cylinders when testing is not required.

3.11 DEFECTIVE CONCRETE

A. Modify or replace concrete not conforming to required lines, details, and elevations, as directed by Architect/Engineer.

END OF SECTION

SECTION 040503

MASONRY MORTARING AND GROUTING

PART 1 GENERAL

1.1 SUMMARY

A. Section includes mortar and grout for masonry.

B. Related Sections
1. Section 042016 – Reinforced Unit Masonry: Installation of Mortar and Grout

1.2 SUBMITTALS

A. None Required.

1.3 QUALITY ASSURANCE

A. Perform Work in accordance with TMS 402/602 Building Code Requirements and Specifications for Masonry Structures.

1.4 ENVIRONMENTAL REQUIREMENTS

A. Cold Weather Requirements: In accordance with TMS 402/602 when ambient temperature or temperature of masonry units is less than 40 degrees F (4 degrees C).

B. Hot Weather Requirements: In accordance with TMS 402/602 when ambient temperature is greater than 100 degrees F (38 degrees C) or ambient temperature is greater than 90 degrees F (32 degrees C) with wind velocity greater than 8 mph (13 km/h).

PART 2 PRODUCTS

2.1 MORTAR AND MASONRY GROUT

The following list of manufacturers shall be completed by the owner's architectural/ engineering firm. Jurisdictions should solicit at a minimum 3 vendors/manufacturers. The following is a template to help with the procurement process:

A. Manufacturers:
1. _____ Corporation. Model: _____
2. _____ Company. Model: _____
3. _____ Incorporated. Model: _____
4. Or an Approved Equal.

2.2 COMPONENTS

A. Portland Cement: ASTM C150, Type I or II, natural color or white.

B. Refractory Mortar: Medium duty, ground fireclay or alumina refractory mortar as determined by ASTM C199.

C. Mortar Aggregate: ASTM C144, standard masonry type.

D. Hydrated Lime: ASTM C206, Type S.

E. Grout Aggregate: ASTM C404.

F. Water: Clean and potable.

G. Calcium chloride is not permitted.

2.3 MIXES

A. Mortar Mixes:
1. Mortar for Structural and Non-Structural Masonry: ASTM C270, Type N using Proportion specification.

2. Pointing Mortar: ASTM C270, Type N, using Proportion specification.

3. Mortar For Firebrick Masonry: Fireclay type.

B. Mortar Mixing:
1. Thoroughly mix mortar ingredients in accordance with ASTM C270 in quantities needed for immediate use.

C. Grout Mixes:
1. Bond Beams and Lintels: 3,000 psi (21 MPa) strength at 28 days; 8 to 10 inches (200-250 mm) slump mixed in accordance with ASTM C476 [Fine] [Course] grout].

D. Grout Mixing:

1. Thoroughly mix grout ingredients in quantities needed for immediate use in accordance with ASTM C476.
2. Do not use anti-freeze compounds to lower freezing point of grout.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install mortar and grout in accordance with TMS 402/602.

3.2 FIELD QUALITY CONTROL

A. Testing Frequency: 1 set of specified tests for every 2,500 sf (232 sq m) of completed wall area.

B. Testing of Mortar Mix: In accordance with ASTM C780.

C. Testing of Grout Mix: In accordance with ASTM C1019.

END OF SECTION

SECTION 042016

REINFORCED UNIT MASONRY

PART 1 GENERAL

1.1 SUMMARY

A. Section includes concrete masonry units, firebrick, reinforcement, anchorage, and accessories.

B. Related Sections:
1. Section 040503 - Masonry Mortaring and Grouting: Mortar and grout.
2. Section 055000 - Metal Fabrications: Product requirements for fabricated steel items for placement by this section.
3. Section 079000 - Joint Protection: Rod and sealant at control joints.

1.2 REFERENCES

A. American Concrete Institute:
1. TMS 402/602 - Building Code Requirements and Specifications for Masonry Structures.

B. ASTM International:
1. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
2. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
3. ASTM A580/A580M - Standard Specification for Stainless Steel Wire.
4. ASTM A615/A615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
5. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
6. ASTM B695 - Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel.
7. ASTM C27 - Standard Classification of Fireclay and High-Alumina Refractory Brick.
8. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units.
9. ASTM C140 - Standard Test Methods of Sampling and Testing Concrete Masonry Units.
10. ASTM C744 - Standard Specification for Prefaced Concrete and Calcium Silicate Masonry Units.
11. ASTM C1261 - Standard Specification for Firebox Brick for Residential Fireplaces.
12. ASTM C1283 - Standard Practice for Installing Clay Flue Lining.

13. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.
14. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.

1.3 PERFORMANCE REQUIREMENTS

A. Concrete Masonry Assemblies Compressive Strength (f'm): 1,500 psi; determined by prism test method.
   1. Concrete Masonry Units: 1,950 psi minimum net area compressive strength.

1.4 SUBMITTALS

A. Section 013300 - Submittal Procedures: Submittal requirements.

B. Shop Drawings: Indicate bars sizes, spacings, locations, reinforcement quantities, bending and cutting schedules, supporting and spacing devices for reinforcement, and accessories.

C. Product Data:
   1. Submit data for concrete masonry units.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with TMS 402/602.

B. Maintain 1 copy of each document on site.

1.6 QUALIFICATIONS

A. Installer: Company specializing in performing Work of this section with minimum 3 years experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Section 016000 - Product Requirements: Product storage and handling requirements.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Section 016000 - Product Requirements.

B. Cold Weather Requirements: In accordance with TMS 402/602 when ambient temperature or temperature of masonry units is less than 40 degrees F.

C. Hot Weather Requirements: In accordance with TMS 402/602 when ambient temperature is greater than 100 degrees F or ambient temperature is greater than 90 degrees F with wind velocity greater than 8 mph.

1.9 COORDINATION

A. Section 013000 - Administrative Requirements: Coordination and project conditions.

B. Coordinate masonry work with installation of window shutter and door anchors.

PART 2 PRODUCTS

2.1 REINFORCED UNIT MASONRY ASSEMBLIES

The following list of manufacturers shall be completed by the owner's architectural/ engineering firm. Jurisdictions should solicit at a minimum 3 vendors/manufacturers. The following is a template to help with the procurement process:

A. Manufacturers:
1. _____ Corporation. Model: _____
2. _____ Company. Model: _____
3. _____ Incorporated. Model: _____
4. Or an Approved Equal.

2.2 COMPONENTS

A. Firebrick: ASTM C155 Classification C-26 Minimum.

B. Brick Size and Shape: Nominal size of 7 5/8 x 3 5/8 x 2 1/7 inches.

C. Hollow Concrete Masonry Units (CMU): ASTM C90; normal weight.

D. Solid Concrete Masonry Units (CMU): ASTM C90; normal weight.

E. Concrete Masonry Unit Size and Shape: Nominal modular size of 8 x 8 x 16 inches. Furnish special units for 90 degree corners, bond beams, lintels, and bullnosed corners.

2.3 ACCESSORIES

A. Single Wythe Joint Reinforcement: Do not provide horizontal joint reinforcement in CMU walls.

B. Vertical Reinforcing Steel: ASTM A615/A615M, 60 ksi yield grade, deformed billet bars, uncoated finish.

C. Dovetail Anchors: Bent steel strap, 1 x 5 1/2 inch size x 12 gauge thick; ASTM A153/A153M hot dip galvanized.

D. Masonry Mortaring and Grouting: As specified in Section 040503.

E. Weeps: Preformed plastic tubes, hollow.

F. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 013000 - Administrative Requirements: Coordination and project conditions.

B. Verify field conditions are acceptable and are ready to receive work.

C. Verify items provided by other sections of work are properly sized and located.

D. Verify built-in items are in proper location and ready for roughing into masonry work.

3.2 PREPARATION

A. Direct and coordinate placement of metal anchors supplied to other Sections.

B. Furnish temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent support.

3.3 INSTALLATION

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form bed and head joints of uniform thickness.

C. Coursing of Concrete Masonry Units:
1. Bond: Running.
2. Coursing: 1 unit and 1 mortar joint to equal 8 inches.
3. Mortar Joints: Concave.

D. Placing And Bonding:
1. Lay solid masonry units in full bed of mortar, with full head joints.
2. Lay hollow masonry units with face shell bedding on head and bed joints.
3. Buttering corners of joints or excessive furrowing of mortar joints are not permitted.
4. Remove excess mortar as Work progresses.
5. Interlock intersections and external corners.
6. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment is required, remove mortar and replace.
7. Perform job site cutting of masonry units with proper tools to assure straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
8. Isolate masonry from vertical structural framing members with movement joint as indicated on Drawings.

9. Isolate top of masonry from horizontal structural framing members and slabs or decks as indicated on Drawings.

E. Weeps and Vents: Furnish weeps and vents in outer wythe at 32 inches oc horizontally at bottom of walls.

F. Cavity Wall: Do not permit mortar to drop or accumulated into cavity air space or to plug weeps.

G. Anchorage:
1. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.
2. Embed anchors embedded in concrete. Embed anchorages in every second block joint.

H. Lintels:
1. Install reinforced unit masonry lintels over openings.
2. Openings: Place 2, No. 4 reinforcing bars 1 inch from bottom web and 2, No. 4 reinforcing bars 1 1/2 inches from top of block.
3. Do not splice reinforcing bars.
4. Support and secure reinforcing bars from displacement.
5. Place and consolidate grout fill without displacing reinforcing.
6. Allow masonry lintels to attain specified strength before removing temporary supports.
7. Maintain minimum 8 inch bearing on each side of opening.

I. Reinforced Masonry:
1. Lay masonry units with cells vertically aligned and cavities between wythes clear of mortar and unobstructed.
2. Place reinforcing, reinforcement bars, and grout as indicated on Drawings.
3. Splice reinforcement in accordance with Section 033000.
4. Support and secure reinforcement from displacement.
5. Place and consolidate grout fill without displacing reinforcing.
6. Place grout in accordance with TMS 402/602.

J. Expansion Joints:
1. Install expansion joints as indicated on Drawings.
2. Size expansion joint in accordance with Section 079000 – Joint Protection for sealant performance.

K. Built-In Work:
1. As work progresses, install built-in work items furnished by other sections.
2. Install built-in items plumb and level.
3. Do not build in materials subject to deterioration.

L. Cutting And Fitting:

1. Cut and fit for conduit. Coordinate with other sections of work to provide correct size, shape, and location.
2. Obtain Architect/Engineer's approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.4 ERECTION TOLERANCES

A. Section 014000 - Quality Requirements: Tolerances.

B. Maximum Variation From Alignment of Columns: 1/4 inch.

C. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.

D. Maximum Variation from Plane of Wall: 1/4 inch in 10 feet and 1/2 inch in 20 feet or more.

E. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in 2 stories or more.

F. Maximum Variation from Level Coursing: 1/8 inch in 3 feet and 1/4 inch in 10 feet; 1/2 inch in 30 feet.

G. Maximum Variation of Joint Thickness: 1/8 inch in 3 feet.

H. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

I. Maximum Variation for Steel Reinforcement:
1. Install reinforcement within the tolerances specified in TMS 402/602 for foundation walls.
2. Plus or minus 1/2 inch when distance from centerline of steel to opposite face of masonry is 8 inches or less.
3. Plus or minus 2 inches (50 mm) from location along face of wall.

3.5 FIELD QUALITY CONTROL

A. Section 014000 - Quality Requirements, 017000 - Execution Requirements: Field inspecting, testing, adjusting, and balancing.

B. Concrete Masonry Units: Test each type in accordance with ASTM C140.

3.6 CLEANING

A. Section 017000 - Execution Requirements: Final cleaning.

B. Remove excess mortar and mortar smears as work progresses.

C. Replace defective mortar. Match adjacent work.

D. Clean soiled surfaces with cleaning solution.

E. Use non-metallic tools in cleaning operations.

3.7 PROTECTION OF FINISHED WORK

A. Section 017000 - Execution Requirements: Requirements for protecting finished Work.

B. Protect exposed external corners subject to damage.

C. Protect base of walls from mud and mortar splatter.

D. Protect masonry and other items built into masonry walls from mortar droppings and staining caused by mortar.

E. Protect tops of masonry work with waterproof coverings secured in place without damaging masonry. Provide coverings where masonry is exposed to weather when work is not in progress.

END OF SECTION

SECTION 055000

METAL FABRICATIONS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Shop fabricated ferrous metal items, galvanized and prime painted.
2. Steel stair frame of structural sections and landings.
3. Balusters and handrailing.
4. Miscellaneous steel items.
5. Steel plate window shutters.
6. Steel plate doors.

1.2 SYSTEM DESCRIPTION

A. Design stair assembly to support live load of 100 lb/sq ft with deflection of stringer or landing framing not to exceed 1/240 of span.

B. Design handrail, guardrail, and attachments to resist forces as required by VUSBC. Apply loads non-simultaneously to produce maximum stresses.
1. Guard Top Rail and Handrail Concentrated Load: 200 pounds applied at any point in any direction.
2. Guard Top Rail Uniform Load: 50 plf applied in any direction.
3. Intermediate Rails, Panels, and Baluster Concentrated Load: 50 pounds applied to 1 sf area.

1.3 SUBMITTALS

A. Product data for steel shapes and plates, steel grating and treads, paint products, and grout.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

C. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the “Quality Assurance” Article.

1.4 QUALITY ASSURANCE

A. Finish joints in accordance with NOMMA Guideline 1.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Accept metal fabrications on site in labeled shipments. Inspect for damage.

B. Protect metal fabrications from damage by exposure to weather.

1.6 FIELD MEASUREMENTS

A. Verify field measurements are as indicated on shop drawings.

PART 2 PRODUCTS

2.1 COMPONENTS

A. Steel Sections: ASTM A572/A572M; Grade 50.

B. Steel Plate: ASTM A36/A36M

C. Hollow Structural Sections: ASTM A500, Grade B.

D. Steel Pipe: ASTM A53/A53M, Grade B.

E. Sheet Steel: ASTM A653/A653M, Grade 33 Structural Quality with galvanized coating.

F. Bolts: ASTM A325; Type X.
1. Finish: Hot dipped galvanized.

G. Nuts: ASTM A563 heavy hex type.
1. Finish: Hot dipped galvanized.

H. Washers: ASTM F436; Type 1.
1. Finish: Hot dipped galvanized.

I. Handrail Fittings: Elbows, T-shapes, wall brackets, escutcheons; cast steel.

J. Anchor Rods: ASTM F1554; Grade 55, weldable.

2.2 ACCESSORIES

A. Welding Materials: AWS D1.1.

B. Shop Primer: SSPC Paint 15, Type 1, red oxide.

C. Touch-Up Primer: Match shop primer.

2.3 FABRICATION

A. General:
1. Fit and shop assemble items in largest practical sections, for delivery to site.

2. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
3. Exposed Mechanical Fastenings: Flush countersunk screws or bolts, consistent with design of component.
4. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication.
5. Accurately form components required for anchorage of stairs and landings and railings to each other and to building structure.
6. Exposed Welded Joints: NOMMA Guideline 1 Joint Finish 3.

B. Handrails:
1. Fit and shop assemble components in largest practical sizes, for delivery to site.
2. Grind exposed joints flush and smooth with adjacent finish surface.
3. Accurately form components to suit stairs and landings, to each other and to building structure.

2.4 FINISHES

A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

B. Galvanizing for Components: ASTM A123/A123M; minimum 2 oz/sq ft coating thickness; galvanize after fabrication.

C. Galvanizing for Fasteners, Connectors, and Anchors:
1. Hot-Dipped Galvanizing: ASTM A153/A153M.
2. Mechanical Galvanizing: ASTM B695; Class 50 minimum.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify field conditions are acceptable and are ready to receive Work.

3.2 PREPARATION

A. Make provisions for erection stresses. Install temporary bracing to maintain alignment, until permanent bracing and attachments are installed.

B. Supply items required to be cast into concrete or embedded in masonry with setting templates, to appropriate sections.

3.3 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Provide for erection loads and provide temporary bracing to maintain indicated alignment until completion of erection and installation of permanent attachments.

C. Field weld components indicated on shop drawings. Perform field welding in accordance with AWS D1.1.

D. Obtain approval prior to site cutting.

E. After erection, touch up welds, abrasions, and damaged finishes with prime paint or galvanizing repair paint to match shop finishes.

3.4 FIELD QUALITY CONTROL

A. Welding: Inspect welds in accordance with AWS D1.1.

END OF SECTION

SECTION 055100

METAL STAIRS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes steel stair frame of structural sections, with open risers; open grate stair treads and landings; and handrailing.

B. Related Sections:
1. Section 055000 - Metal Fabrications.
2. Section 055200 - Metal Railings: Handrails and balusters other than specified in this section.

1.2 REFERENCES

A. ASTM International:
1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
2. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
3. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
4. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
5. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
6. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
7. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts.
8. ASTM A572/A572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
9. ASTM B695 - Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel.
10. ASTM F436 - Standard Specification for Hardened Steel Washers.
11. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings.
12. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings.
13. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.

B. American Welding Society:
1. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
2. AWS D1.1 - Structural Welding Code - Steel.

C. National Association of Architectural Metal Manufacturers:
   1. NAAMM AMP 510 - Metal Stairs Manual.
   2. NAAMM MBG 531 - Metal Bar Grating Manual.

D. SSPC: The Society for Protective Coatings:
   1. SSPC - Steel Structures Painting Manual.
   2. SSPC SP 1 - Solvent Cleaning.
   3. SSPC SP 10 - Near-White Blast Cleaning.
   4. SSPC Paint 20 - Zinc-Rich Primers (Type I - Inorganic and Type II - Organic).

1.3 DESIGN REQUIREMENTS

A. Fabricate stair assembly to support uniform live load of 100 lb/sq ft and concentrated load of 300 lb/sq ft with deflection of stringer or landing framing not to exceed 1/240 of span.

B. Fabricate stair assembly to NAAMM AMP 510, Class Industrial.

1.4 SUBMITTALS

A. Section 013300 - Submittal Procedures: Submittal requirements.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.

C. Shop Drawings: Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

D. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within previous 12 months.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with ASTM E985 - Permanent Metal Railing Systems and Rails for Buildings.

B. Finish joints in accordance with NOMMA Guideline 1.

C. Maintain 1 copy of each document on site.

1.6 PRE-INSTALLATION MEETINGS

A. Section 013000 - Administrative Requirements: Pre-installation meeting.

B. Convene minimum 1 week prior to commencing work of this section.

1.7 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.1 COMPONENTS

A. Steel Sections: ASTM A572/A572M; Grade 50.

B. Steel Plate: ASTM A36/A36M.

C. Hollow Structural Sections: ASTM A500, Grade B.

D. Steel Pipe: ASTM A53/A53M, Grade B.

E. Bolts: ASTM A325; Type 1X.
1. Finish: Hot dipped galvanized.

F. Nuts: ASTM A563 heavy hex type.
1. Finish: Hot dipped galvanized.

G. Washers: ASTM F436; Type 1.
1. Finish: Hot dipped galvanized.

H. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; consistent with design of stair structure.

I. Welding Materials: AWS D1.1; type required for materials being welded.

J. Touch-Up Primer for Galvanized Surfaces: SSPC Paint 20 Type I Inorganic.
1. Anti-Corrosive Paints: Maximum volatile organic compound content in accordance with GC-03.

K. Gratings: As indicated on Drawings.

L. Stair Treads: As indicated on Drawings.

2.2 FABRICATION

A. Fit and shop assemble components in largest practical sections, for delivery to site.

B. Fabricate components with joints tightly fitted and secured.

C. Continuously seal joined pieces by continuous welds.

D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

F. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

G. Accurately form components required for anchorage of stairs and landing and railings to each other and to building structure.

2.3 FABRICATION - OPEN GRATING STAIRS AND LANDING

A. Fabricate treads 2 inch thick members as indicated on Drawings, bolted to supports; galvanized finish.

B. Form hollow stringers with rolled steel channels; galvanized finish.

C. Form landings 2 inch thick same as treads; galvanized finish.

2.4 SHOP FINISHING

A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

B. Galvanizing: ASTM A123/A123M; galvanize after fabrication.

C. Galvanizing for Fasteners, Connectors, and Anchors:
1. Hot-Dipped Galvanizing: ASTM A153/A153M.
2. Mechanical Galvanizing: ASTM B695; Class 50 minimum.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 013000 - Administrative Requirements: Coordination and project conditions.

B. Verify field conditions are acceptable and are ready to receive work.

C. Verify concealed blocking and reinforcement is installed and correctly located to receive wall mounted handrails.

3.2 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply items required to be cast into concrete with setting templates.

3.3 INSTALLATION

A. Install components plumb and level, accurately fitted, free from distortion or defects.

B. Install anchors required for connecting stairs to structure.

C. Allow for erection loads. Install sufficient temporary bracing to maintain framing safe, plumb, and in alignment.

D. Field weld components indicated on Drawings. Perform field welding in accordance with AWS D1.1.

E. Field bolt and weld to match shop bolting and welding. Conceal bolts and screws whenever possible.

F. Mechanically fasten joints butted tight, flush, and hairline. Grind welds smooth and flush.

G. Obtain approval of Architect/Engineer prior to site cutting or creating adjustments not scheduled.

H. After erection, prime welds, abrasions, and surfaces not galvanized, except surfaces to be in contact with concrete.

3.4 ERECTION TOLERANCES

A. Section 014000 - Quality Requirements: Tolerances.

3.5 FIELD QUALITY CONTROL

A. Welding: Inspect welds in accordance with AWS D1.1.

END OF SECTION

SECTION 055200

METAL RAILINGS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes steel pipe railings, fittings, and handrails.

B. Related Sections:
1. Section 033000 - Cast-In-Place Concrete: Execution requirements for placement of anchors specified in this section in concrete.
2. Section 042016 – Reinforced Unit Masonry: Execution requirements for placement of anchors specified in this section in masonry.
3. Section 055100 - Metal Stairs: Handrails other than those specified in this section.

1.2 REFERENCES

A. ASTM International:
1. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
2. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
3. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
4. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings.

B. National Ornamental & Miscellaneous Metals Association:
1. NOMMA Guideline 1 - Joint Finishes.

C. SSPC: The Society for Protective Coatings:
1. SSPC - Steel Structures Painting Manual.
2. SSPC Paint 20 - Zinc-Rich Primers (Type I - Inorganic and Type II - Organic).

1.3 DESIGN REQUIREMENTS

A. Design handrail, guardrail, and attachments to resist forces as required by applicable code. Apply loads non-simultaneously to produce maximum stresses.
1. Guard Top Rail and Handrail Concentrated Load: 200 pounds applied at any point in any direction.
2. Guard Top Rail Uniform Load: 50 plf applied in any direction.
3. Intermediate Rails Concentrated Load: 50 pounds applied to 1 sf area.

1.4 SUBMITTALS

A. Section 013300 - Submittal Procedures: Submittal requirements.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.

1.5 QUALITY ASSURANCE

A. Finish joints in accordance with NOMMA Guideline 1.

B. Maintain 1 copy of each document on site.

1.6 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.1 STEEL RAILING SYSTEM COMPONENTS

A. Pipe: ASTM A53/A53M, Grade B.

B. Rails and Posts: 1 1/2 inch diameter steel pipe; welded joints.

C. Fittings: Elbows, T-shapes, wall brackets, escutcheons; steel.

D. Mounting: brackets and flanges, with steel brackets for embedding in masonry.

E. Exposed Fasteners: Flush countersunk screws or bolts; consistent with design of railing.

F. Galvanizing: ASTM A123/A123M; minimum 2.0 oz/sq ft coating thickness; galvanize after fabrication.

G. Touch-Up Primer for Galvanized Surfaces: SSPC Paint 20 zinc rich.

2.2 FABRICATION

A. Fit and shop assemble components in largest practical sizes for delivery to site.

B. Fabricate components with joints tightly fitted and secured. Furnish spigots and sleeves to accommodate site assembly and installation.

C. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

D. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

E. Exterior Components: Continuously seal joined pieces by continuous welds. Drill condensate drainage holes at bottom of members at locations not encouraging water intrusion.

F. Interior Components: Continuously seal joined pieces by continuous welds.

G. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

H. Accurately form components to suit stairs and landings, to each other and to building structure.

I. Accommodate for expansion and contraction of members and building movement without damage to connections or members.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 013000 - Administrative Requirements: Coordination and project conditions.

B. Verify field conditions are acceptable and are ready to receive work.

C. Verify concealed blocking and reinforcement is installed and correctly located to receive wall mounted handrails.

3.2 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply items required to be embedded in masonry with setting templates, to appropriate sections.

3.3 INSTALLATION

A. Install components plumb and level, accurately fitted, free from distortion or defects.

B. Anchor railings to structure with anchors, plates, angles.

C. Field weld anchors as indicated on Drawings. Touch-up welds with primer. Grind welds smooth.

D. Conceal bolts and screws whenever possible.

3.4 ERECTION TOLERANCES

A. Section 014000 - Quality Requirements: Tolerances.

END OF SECTION

SECTION 061000

ROUGH CARPENTRY

PART 1 GENERAL

1.1 SUMMARY

A. Section includes roof framing; roof sheathing; fire retardant treatment; electrical panel back boards.

1.2 SUBMITTALS

A. Submit 3 copies of Product Submittal for Fire Retardant Treatment.

1.3 QUALITY ASSURANCE

A. Perform Work in accordance with the following:
1. Lumber Grading Agency: Certified by DOC PS 20.
2. Wood Structural Panel Grading Agency: Certified by EWA - The Engineered Wood Association
3. Lumber: DOC PS 20.
4. Wood Structural Panels: DOC PS 1 or DOC PS 2.

B. Surface Burning Characteristics:
1. Fire Retardant Treated Materials: Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

C. Apply label from agency approved by authority having jurisdiction to identify each fire retardant treated material.

D. Maintain 1 copy of each document on site.

PART 2 PRODUCTS

2.1 LUMBER MATERIALS

A. Lumber Grading Rules: SPIB

2.2 SHEATHING MATERIALS

A. Plywood Roof Sheathing: Rated Sheathing, plywood; Exposure Durability 1.

B. Telephone and Electrical Panel Boards: Plywood.

2.3 SHEATHING LOCATIONS

A. Sloped Roof Sheathing: 3/4 inch thick, 48 x 96 inch sized sheets, square edges.

2.4 WOOD TREATMENT

A. Fire Retardant Treatment: Chemically treated and pressure impregnated, having flame spread of 25 or less when tested in accordance with ASTM E 84 and showing no evidence of significant progressive combustion when test is continued for an additional 20 minute period, Exterior Type.

B. Moisture Content after Treatment:
1. Lumber: Maximum 19 percent.
2. Structural Panels: Maximum 15 percent.

C. All wood and sheathing used in Class B Fuel Buildings shall be fire retardant treated. All wood and sheathing used in Class A Fuel Buildings shall not be fire retardant treated.

PART 3 EXECUTION

3.1 FRAMING

A. Set structural members level and plumb, in correct position.

B. Fasten framing in accordance with applicable code.

3.2 SHEATHING

A. Fasten sheathing in accordance with applicable code.

B. Install sheathing to 2 span continuous. Use sheathing clips between sheets between roof framing members.

C. Install telephone and electrical panel back boards with plywood sheathing material where required. Size back board by 12 inches beyond size of electrical panel.

END OF SECTION

SECTION 071400

FLUID-APPLIED WATERPROOFING

PART 1 GENERAL

1.1 SUMMARY

A. Section includes fluid applied polymer modified Portland cement slurry membrane waterproofing; protective covering.

B. Related Sections:
None.

1.2 REFERENCES

1.3 SYSTEM DESCRIPTION

A. Waterproofing System: Portland cement application fluid applied material to prevent moisture migration to interior through concrete slabs.

1.4 PERFORMANCE REQUIREMENTS

1.5 SUBMITTALS

A. Section 013300 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit data for coating with temperature range for application of waterproofing membrane.

C. Manufacturer's Installation Instructions: Submit special procedures and perimeter conditions requiring special attention.

D. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.6 QUALITY ASSURANCE

A. Maintain 1 copy of each document on site.

1.7 QUALIFICATIONS

A. Waterproofing Material Manufacturer: Company specializing in waterproofing membrane with minimum 3 years documented experience.

B. Applicator: Company specializing in performing the work of this section with minimum 3 years experience. Applicator will have received training for product by manufacturer.

1.8 WARRANTY

A. Section 017000 - Execution Requirements: Product warranties and product bonds.

B. Furnish 5 year manufacturer warranty for waterproofing failing to resist penetration of water.

C. For warranty repair work, remove and replace materials concealing waterproofing.

PART 2 PRODUCTS

2.1 FLUID APPLIED WATERPROOFING

The following list of manufacturers shall be completed by the owner's architectural/ engineering firm. Jurisdictions should solicit at a minimum 3 vendors/manufacturers. The following is a template to help with the procurement process:

A. Manufacturers:
1. _____ Corporation. Model: _____
2. _____ Company. Model: _____
3. _____ Incorporated. Model: _____
4. Or an Approved Equal.

2.2 COMPONENTS

A. Waterproofing Membrane: polymer-modified Portland cement slurry.

B. Cured Membrane Characteristics at 28 days:

Properties	Test	Results
Tensile Strength	ASTM C307	870 psi
Bond Strength	ACI 503R-30 Modified	180 psi
Moisture Vapor permeability	ASTM E96	18 perms
Compressive Strength	ASTM D695	3000 psi
Flexibility	ASTM D522 Modified	25%

2.3 ACCESSORIES

PART 3 EXECUTION

3.1 PREPARATION

A. Substrate must be clean, sound and free of surface contaminants. Remove dust, laitance, grease, oils, curing compounds, form release agents, and all foreign particles by mechanical means.

B. An open-textured, sandpaper-like substrate is ideal. Substrates shall be in accordance with ICRI Guideline No. 03732 for coatings and fall within CSP4.

C. All surfaces must be saturated surface dry (SSD), with no standing water at time of application. Protect adjacent surfaces not designated to receive waterproofing.

D. Do not apply waterproofing to surfaces unacceptable to manufacturer or applicator.

3.2 INSTALLATION

A. Mix components per the manufacturer's recommendations.

B. Apply with stiff bristle brush. Work material into the prepared substrates, filling all pores and voids. For brush grade: Apply first coat, with horizontal brush strokes and leave to harden (4 to 8 hours). Apply second coat with vertical brush strokes.

C. When applying the coating, never stop the application until the entire surface has been coated. Always stop application at an edge, corner, or joint. Never let a previously coated film dry; always coat into a wet film. Always apply the coating at a 45° angle to an edge, corner, or joint.

D. Adhere to all limitations and cautions for the polymer-modified cement coating in the manufacturer's printed literature.

3.3 PROTECTION OF INSTALLED CONSTRUCTION

A. Section 017000 - Execution Requirements: Protecting installed construction.

B. Do not permit traffic over unprotected or uncovered membrane.

END OF SECTION

SECTION 078000

FIRE AND SMOKE PROTECTION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract Documents, including General and Supplementary Conditions and Division 1 Specification Section, apply to this Section.

1.2 SUMMARY

A. This section includes requirements for the thermal lining system.

1.3 PERFORMANCE REQUIREMENTS FOR THERMAL LINING

A. Thermal lining shall provide thermal protection for the structural components from temperatures attained during fire training.
   1. Thermal lining shall withstand spike temperatures at the exposed face of thermal lining of up to 1,500°F.
   2. Temperature behind thermal lining during live fire training, at the face of the protected structure, shall not exceed 350°F when the room temperature at the exposed face of the thermal lining is 1,500°F.
   3. During a live fire training day, multiple live fire training evolutions may occur. After each evolution, the fire may be left smoldering, but not completely extinguished. At the beginning of the next evolution, the fire is reignited. This cycle typically repeats all day during a training day. As a result, significant residual heat builds up in the building by the last training evolution. The thermal lining shall withstand, without damage, residual heat buildup created by a minimum of 20 consecutive live fire training evolutions within a 24 hour day.

B. Thermal lining shall withstand, without damage, repetitive thermal shock created by rapid cooling of heated surfaces with cool water from water mains. Thermal lining shall allow for expansion and contraction caused by rapid heating and cooling.

C. Thermal lining shall withstand, without damage, impact loads and other associated stresses induced by pressurized water sprayed from hoses (300 gallons per minute, 100 pounds per square inch of pressure) and thermally pressurized steam.
   1. Thermal lining shall prevent water and steam penetration to the protected structure.
   2. Thermal lining shall be designed to expel any absorbed moisture, whether absorbed during training evolutions, changes in humidity, or temperature-related condensation.
   3. Thermal lining shall not be damaged by absorbed moisture or by rapid heating of absorbed moisture during live fire training.

4. For multi-component thermal lining systems consisting of an insulation layer protected by another layer of durable materials, the insulation layer shall not sag or move behind the protective layer.

D. Thermal lining shall withstand, without damage, routine physical abuse during typical live fire training evolutions, including but limited to:
   1. Impact of fire fighters' protective clothing, self-contained breathing apparatuses, or hand tools.
   2. Impact of wood pallets or other Class A fuel materials "tossed" onto the fire and impacting the thermal lining.

E. Thermal lining shall be functional year-round, withstanding the effects of seasonal weather considerations, including seasonal temperate changes, freeze/thaw cycles, humidity, and precipitation.

F. Thermal lining shall withstand, without damage, the effects of oxygen deficient atmosphere.

G. Thermal lining shall allow for the use of surface and subsurface mounted thermocouples that penetrate the lining.

H. Thermal lining shall be free from asbestos or other harmful ingredients, and shall not produce toxic byproducts during live fire training.

I. Thermal lining properties shall not degrade under repeated use.

1.4 QUALIFICATIONS PROCEDURE

A. For any prospective thermal lining manufacturer/supplier/product that is not listed under Section 2, submit a written request for qualification to the Architect/Engineer. For all requests for qualification, include the information defined in the following sections and deliver to the Engineer 14 calendar days before the stated date of bid opening as identified in the solicitation documents. Lack of adequate information is sufficient cause for rejection. References to catalogs or other descriptive documents not included with the application for qualification to the Architect/Engineer are not acceptable.

B. Company and Product Capabilities: Provide the following information:
   1. Corporate qualifications and capabilities that fully describe the ability to prove the required thermal lining systems and support to the Owner.
   2. A history of corporate experience with the thermal lining in live fire training structures.
   3. A list of 5 completed projects, at least 2 of which shall be more than 3 years old, illustrating thermal lining performance equal or greater to the performance criteria listed in this specification. Include the award date, the completion date, the contract value, and the name and telephone number of the person employed by the Owner who has personal knowledge of the thermal lining supplier's contractual and technical performance.

4. If the product does not meet the requirements for number and age of completed projects, then submit to the Architect/Engineer test data that clearly shows that the product can meet all of the performance criteria.
5. Material and installation data.

1.5 SUBMITTALS

A. General: Submit each item in this article according to the General Conditions of the Contract and Division 1 Specification Sections.

B. Evidence of installer qualifications, including certification by thermal lining manufacturer.

C. Certificate of Conformance: Manufacturer's certification that materials and equipment are physically and chemically compatible with each other, that materials are in compliance with performance requirements of this specification, and that each material and/or equipment is suitable for the intended purpose. Material and equipment not listed in the certificate will not be permitted in the work area. Submit Material Safety Data Sheets (MSDS) for the thermal lining.

D. Materials Certification: Letter from the manufacturer certifying that materials shipped meet manufacturer's specification data.

E. Samples of materials to be used.

F. Shop drawings detailing fabrication and erection of thermal lining. Include plans, elevations, sections, and details of thermal lining and connections to substrates. Show anchorage and accessory items.

G. Operations and Maintenance manual describing all required maintenance and operational requirements. If required maintenance requires training, provide 1 on-site training session, for Owner's representatives at a date and time agreeable to Owner.

1.6 QUALITY ASSURANCE

A. All thermal linings shall be provided by 1 manufacturer.

B. Installer Qualifications: Thermal lining shall be installed by manufacturer or by a contractor approved by the manufacturer and under the supervision of the manufacturer.

C. Warranties:
1. The manufacturer shall furnish a 1 year warranty for the thermal lining system, starting from the date of Owner's acceptance of the Work, to cover replacement of all defective materials and materials that failed to meet the performance criteria.

2. The installer shall furnish a 1 year warranty for the thermal lining system, starting from the date of Owner's acceptance of the Work, to cover replacement of all materials found to be defective due to workmanship.
3. Warranties can exclude repairs, replacement, and corrective work to the substrate, structure, and/or property. Warranties can exclude mechanical damage to lining system due to abuse or neglect (including training that does not conform to NFPA 1403), structural failure, or forces of nature greater than normal weather conditions.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver thermal lining materials in manufacturer's original unopened containers or wrapped with labels intact and legible.

B. Store and protect materials from damage and weather in accordance with the manufacturer's instructions. Keep materials clean and dry at all times.

C. Handle materials in accordance with manufacturer's recommendations.

PART 2 – PRODUCTS

2.1 THERMAL LINING MANUFACTURERS

The following list of manufacturers shall be completed by the owner's architectural/ engineering firm. Jurisdictions should solicit at a minimum 3 vendors/manufacturers. The following is a template to help with the procurement process:

A. Manufacturers:
1. _____ Corporation. Model: _____
2. _____ Company. Model: _____
3. _____ Incorporated. Model: _____
4. Or an Approved Equal.

PART 3 – EXECUTION

3.1 PREPARATION

A. Clean surfaces to receive thermal lining of oils, dust, and other deleterious matter. Install thermal lining over dry surfaces.

3.2 INSTALLATION

A. Install thermal lining at locations shown on drawings.
B. Install thermal linings and all accessories in accordance with the manufacturer's requirements.

3.3 CLEAN UP

A. Remove all debris, scraps, containers, and any other trash resulting from the installation of the thermal lining.

END OF SECTION

SECTION 079000

JOINT PROTECTION

PART 1 GENERAL

1.1 SUMMARY

A. Section includes sealants and joint backing.

1.2 SUBMITTALS

A. Product Data: Submit data indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations, and color availability.

1.3 ENVIRONMENTAL REQUIREMENTS

A. Maintain temperature and humidity recommended by sealant manufacturer during and after installation.

PART 2 PRODUCTS

2.1 JOINT SEALERS

The following list of manufacturers shall be completed by the owner's architectural/ engineering firm. Jurisdictions should solicit at a minimum 3 vendors/manufacturers. The following is a template to help with the procurement process:

A. Manufacturers:
1. _____ Corporation. Model: _____
2. _____ Company. Model: _____
3. _____ Incorporated. Model: _____
4. Or an Approved Equal.

B. Product Description:
1. Exterior Foam Expansion Joint Sealer: Precompressed foam sealer; urethane with water-repellent.
   a. Size: As required to provide weather tight seal when installed.
   b. Applications: Use for exterior wall expansion joints.

2. Exterior Metal Lap Joint Sealant: Butyl or polyisobutylene, non-drying, non-skinning, non-curing.
   a. Applications: Use for concealed sealant bead in sheet metal work and concealed sealant bead in siding overlaps.
3. Sealant - Silicone Sealant: ASTM C920, Grade NS, Class 25, Uses NT, A; single component, solvent curing, non-sagging, non-staining, non-bleeding.
   a. Movement Capability: Plus 40 percent, minus 25 percent.]
   b. Service Temperature Range: -20 to 750 degrees F.

c. Shore A Hardness Range: 15 to 35.

2.2 ACCESSORIES

A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.

B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

C. Joint Backing: Round foam rod compatible with sealant; ASTM D1667, closed cell PVC; oversized 30 to 50 percent larger than joint width.

D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify substrate surfaces and joint openings are ready to receive work.

B. Verify joint backing and release tapes are compatible with sealant.

3.2 PREPARATION

A. Remove loose materials and foreign matter impairing adhesion of sealant.

B. Clean and prime joints.

C. Perform preparation in accordance with ASTM C1193.

3.3 INSTALLATION

A. Perform installation in accordance with ASTM C1193.

B. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer.

C. Install bond breaker where joint backing is not used.

D. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

E. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

F. Tool joints concave.

END OF SECTION

SECTION 131440

MODULAR/INTERMODAL SHIPPING CONTAINERS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes modular/intermodal shipping containers and associated structural components used as live fire training structures including exterior doors windows, louvers, and openings for chop-out blocks. Such modular/intermodal shipping container buildings and structures shall comply with the VDFP Program Criteria listed in the Summary of Live Fire Training Structure Grant Program.
   1. Section 004113 – Bid Form

B. Related Sections:
   1. Section 033000 - Cast-In-Place Concrete: Execution requirements for placement of anchor bolts and base plates specified in this section in concrete.
   2. Section 055000 – Metal Fabrications
   3. Section 055100 – Metal Stairs
   4. Section 055200 – Metal Railings
   5. Section 079000 - Joint Protection
   6. Section 409119 – Temperature Monitoring Equipment

1.2 REFERENCES

A. American Institute of Steel Construction:
   1. AISC S335 - Specification for Structural Steel Buildings Allowable Stress Design and Plastic Design.
   2. AISC S342L - Load and Resistance Factor Design Specification for Structural Steel Buildings.

B. ASTM International:
   1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
   2. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
   3. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
   4. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
   5. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
   6. ASTM A490 - Standard Specification for Heat-Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength.
   7. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

8. ASTM A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
9. ASTM A529/A529M - Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality.
10. ASTM A572/A572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
11. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
12. ASTM A792/A792M - Standard Specification for Steel Sheet, 55 Percent Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
13. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
14. ASTM C991 - Standard Specification for Flexible Glass Fiber Insulation for Pre-Engineered Metal Buildings.
15. ASTM C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
16. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
17. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.

C. American Welding Society:
1. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
2. AWS D1.1 - Structural Welding Code - Steel.

D. National Fire Protection Association:
1. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.
2. NFPA 1402 – Standard on Facilities for Fire Training and Associated Props.
3. NFPA 1403 – Standard on Live Fire Training Evolutions.

E. SSPC: The Society for Protective Coatings:
1. SSPC - Steel Structures Painting Manual.
2. SSPC Paint 20 - Zinc-Rich Primers (Type I - Inorganic and Type II - Organic).

F. Underwriters Laboratories Inc.:
1. UL - Building Materials Directory.
2. UL 723 - Tests for Surface Burning Characteristics of Building Materials.

1.3 SYSTEM DESCRIPTION

A. Modular/Intermodal Shipping Containers: As indicated on Drawings.

B. Bay Spacing: As indicated on Drawings.

C. Primary Framing: Container frame, rigid frame of rafter, beams, and columns, canopy beams, braced end frames, end wall columns, and wind bracing.

D. Secondary Framing: Container frame, purlins, girts, eave struts, flange bracing, sill supports, clips, and other items detailed.

E. Wall System: Container frame, preformed metal panels of vertical profile and accessory components.

F. Roof System: Container frame, preformed metal panels and accessory components.

G. Roof Slope: Rafters, beams, and miscellaneous steel framing, see Drawings.

1.4 DESIGN REQUIREMENTS

A. Design members to withstand dead load, applicable snow load, vertical and horizontal seismic loads, and design loads due to pressure and suction of wind calculated in accordance with design load schedule.

B. Design members to support fire fighter training equipment and suppression indicated.

C. Maximum allowable deflection: 1/240 of span with imposed loads for exterior wall and roof system.

D. Provide drainage to exterior for water entering or condensation occurring within floor, wall, or roof system.

E. Permit expansion and movement of components without buckling, failure of joint seals, undue stress on fasteners or other detrimental effects, when subject to temperature range denoted on Drawings.

F. Size and fabricate wall and roof systems free of distortion or defects detrimental to appearance or performance.

1.5 PERFORMANCE REQUIREMENTS

A. Conform to Program Criteria listed in the VDFP Summary of Live Fire Training Structure Grant Program.

B. Conform to applicable code for submission of design calculations, as well as reviewed shop and erection drawings as required for acquiring permits.

C. Cooperate with regulatory agency or authority and provide data as requested authority having jurisdiction.

D. Provide components of each type from single manufacturer compatible with adjacent materials.

1.6 SUBMITTALS

A. Section 013300 - Submittal Procedures: Submittal procedures.

B. Shop Drawings: Indicate assembly dimensions, locations of structural members, connections, attachments, openings, cambers, and loads; wall and roof system dimensions, panel layout, general construction details, window and door framing, anchorages and method of anchorage, and method of installation; framing anchor bolt settings, sizes, and locations from datum, and foundation loads; indicate welded connections with AWS A2.4 welding symbols; indicate net weld lengths; provide professional seal and signature.

C. Product Data: Submit data on profiles, component dimensions, fasteners, and performance characteristics.

D. Compliance Matrix: Submit matrix illustrating modular/intermodal shipping container buildings and structures comply with the Program Criteria listed in the VDFP Summary of Live Fire Training Structure Grant Program.

E. Manufacturer's Instructions: Submit preparation requirements and anchor bolt placement.

F. Erection Drawings: Indicate members by label, assembly sequence, and temporary erection bracing.

1.7 CLOSEOUT SUBMITTALS

A. Section 017000 - Execution Requirements: Closeout procedures.

B. Project Record Documents: Record actual locations of concealed components and utilities.

1.8 QUALITY ASSURANCE

A. Perform Work in accordance with AISC S335, AISC S342L, and AWS D1.1 Systems Manual.

1.9 QUALIFICATIONS

A. Vendor/Manufacturer/Supplier: Company specializing in manufacturing/supplying products specified in this section with minimum 5 years documented experience.

B. Erector: Company specializing in performing Work of this section with minimum 5 years experience.

C. Design structural components, develop shop drawings, and perform shop and site work under direct supervision of Professional Engineer experienced in design of this Work and licensed in the Commonwealth of Virginia.

D. Such design shall include calculations and construction documents sealed by a registered design professional with the Commonwealth of Virginia.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store all modular/intermodal shipping budling containers above ground, separted and protected from physical damage caused by handling or adjacent activities.

1.11 PRE-INSTALLATION MEETINGS

A. Section 013000 - Administrative Requirements: Pre-installation meeting.

B. Convene meeting minimum 1 week prior to commencing work of this section.

1.12 WARRANTY

A. Section 017000 - Execution Requirements: Product warranties and product bonds.

B. Furnish 5 year manufacturer warranty for pre-engineered building systems and components.

C. Furnish 20 year extended warranty to include coverage for exterior finished surfaces color coat against chipping, cracking or crazing, blistering, peeling, chalking, or fading.

PART 2 PRODUCTS

2.1 MODULAR/INTERMODAL SHIPPING CONTAINERS

The following list of vendors/manufacturers/suppliers shall be completed by the owner's architectural/engineering firm. Jurisdictions should solicit, at a minimum, 3 vendors/ manufacturers/suppliers. The following is a template to help with the procurement process:

A. Vendors/Manufacturers/Suppliers:
1. _____ Corporation. Model: _____
2. _____ Company. Model: _____
3. _____ Incorporated. Model: _____
4. Or an Approved Equal.

2.2 COMPONENTS - FRAMING

A. Structural Steel Members: ASTM A572/A572M, Grade 50.

B. Structural Tubing (HSS): ASTM A500, Grade B

C. Plate or Bar Stock: ASTM A529/A529M.

D. Anchor Bolts: ASTM A307, galvanized.

E. Bolts, Nuts, and Washers: ASTM A325, galvanized.

F. Welding Materials: AWS D1.1; type required for materials being welded.

G. Primer: SSPC Paint 20, Red Oxide.

H. Grout: ASTM C1107, Non-shrink type, premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents, capable of developing minimum compressive strength of 2400 psi in 2 days and 7000 psi in 28 days.

I. Galvanize all structural and non-structural materials less than 1/4 inch in thickness.

2.3 COMPONENTS - WALL AND ROOF SYSTEM

A. Sheet Steel Stock: ASTM A653/A653M galvanized to G90 designation.

B. Joint Seal Gaskets: Manufacturer's standard type.

C. Fasteners: Provide pre-drilled/pre-punched holes for attachment of containers, materials, and parts. Fasteners shall be galvanized and finished to match adjacent surfaces when exterior exposed. Provide fasteners of sufficient strength to support connected members and loads.

D. Sealant: Manufacturer's standard type, as specified in Section 079000, non-staining, elastomeric, skinning.

2.4 COMPONENTS - STEEL DOORS, WINDOWS, FRAMES, AND HARDWARE

A. Doors and Frames: Minimum 11 gauge steel plate doors with HSS framing.

B. Door Sweeps: High temperature door sweeps.

C. Windows and Frames: Minimum 11 gauge steel plate window shutters with HSS framing.

D. Chop-Out Frames: HSS framing.

E. Hardware: Stainless steel hinges, handles, and latches.

2.5 COMPONENTS – LAMINATED BEARING PADS

A. All laminated bearing pads shall be 55 durometer hardness elastomer. Steel laminate shall conform to ASTM A1011 or ASTM A36 steel.

B. Elastomeric bearing pads shall be molded as a single unit.

2.6 COMPONENTS – INTERMODAL SHIPPING CONTAINERS

A. All containers shall comply with ISO 668 and 1496.1.

B. All containers shall comply with Section 3115 of the International Building Code.

C. All containers shall bear an existing date plate containing information required by ISO 6346. Such plate can be removed following approval of the Building Official.

D. All containers shall be minimum 40 feet in length, 8 feet in width, and 9 feet 6 inches in height.

E. Containers shall bear on laminated bearing pads when supported by cast-in-place concrete slabs-on-grade.

F. Siding shall be 14 gauge metal thickness.

G. Tubular steel for top/bottom side rails and end frames shall be 7 gauge thickness.

H. Construction documents shall contain information to verify the dimensions and physical properties of the steel components.

2.7 FABRICATION - FRAMING

A. Fabricate members in accordance with AISC Specification for plate, bar, tube, or rolled structural shapes.

B. Anchor Bolts: Formed with bent shank, assembled with template for casting into concrete.

C. Provide framing for door and window openings.

D. Provide galvanized metal from deck below concrete floors.

2.8 FABRICATION - WALL AND ROOF SYSTEMS

A. Siding: Minimum 18 gauge metal thickness.

B. Roofing: Minimum 18 gauge metal thickness.

C. Girts/Purlins: Rolled formed structural shape to receive siding and roofing sheet.

D. Internal and External Corners: Same material thickness and finish as adjacent material.

E. Flashings, Closure Pieces, Fascia, Infills, and Caps: Same material and finish as adjacent material, profile to suit system.

F. Fasteners: To maintain load requirements and weather tight installation, same finish as cladding, non-corrosive type.

G. Wall Louvers: blade design, same finish as adjacent material, with steel mesh screen and frame.

2.9 FACTORY FINISHING

A. Galvanize all structural and non-structural materials used less than 1/4” in thickness whether or not exposed to elements.

B. Framing Members: Clean, prepare, and galvanize to ASTM A123/A123M; minimum 2.0 oz/sq ft coating thickness.

C. Galvanizing for Components, Including Nuts, Bolts and Washers: ASTM A153/A153M.

2.10 SHOP FINISH PAINTING/COATING

A. Clean, prepare surfaces and shop prime structural steel except where members are zinc or aluminum-zinc alloy coated, or are to be incased in concrete.

B. Paint System for Wall Panel Steel Exposed to the Exterior: Factory applied silicone modified polyester in accordance with manufacturer’s standard procedures. Minimum dry film thickness 1.0 mils. Color to be selected by Architect from the full range of manufacturer’s standard wall colors.

C. Factory Finish for All Structural Roof Panels: Steel shall be galvanized to conform to ASTM A653 Z275 zinc coating.

D. Paint System for Wall Corner Steel Exposed to the Exterior: Factory applied silicone modified polyester or electrostatic-applied polyester powder coating in accordance with manufacturer’s standard procedures. Minimum dry film thickness 1.0 mils. Color to be selected by Architect from the full range of manufacturer’s standard wall colors.

E. Paint System for Flat Roof and Gabled Roof Steel Trim Exposed to the Exterior: Factory applied silicone modified polyester or electrostatic-applied polyester powder coating in accordance with manufacturer’s standard procedures. Minimum dry film thickness 1.0 mils. Color to be selected by Architect from the full range of manufacturer’s standard wall colors.

F. Paint System for all Window Shutters, Headers, Jambs, and Sills Exposed to the Exterior: Factory applied silicone modified polyester or electrostatic-applied polyester powder coating in accordance with manufacturer’s standard procedures. Minimum dry film thickness 1.0 mils. Color to be selected by Architect from the full range of manufacturer’s standard wall colors.

G. Paint System for All Protective Wear Plates Exposed to the Exterior: Factory applied silicone modified polyester or electrostatic-applied polyester powder coating in accordance with manufacturer’s standard procedures. Minimum dry film thickness 1.0 mils. Color to be selected by Architect from the full range of manufacturer’s standard wall colors.

H. Paint System for All Doors and Door Frames: Factory applied aliphatic urethane in accordance with manufacturer’s standard procedures. Minimum dry film thickness 2.0

mils. Color to be selected by Architect from the full range of manufacturer's standard wall colors.

I. Shop Finish for All Stair Stringers, Stair Rails, Guardrails, Bar Grate Treads, Bar Grate Roof Surfaces, Steel Balconies, Steel Landings, Ladders, and Rappelling Anchors: Steel shall be hot-dipped galvanized to conform to ASTM A123 after drilling, punching, cutting, bending, and welding.

J. Shop Finish for All Other Miscellaneous Items Including But Not Limited to Access Hatches, Studs, Sheeting, Hat Channels, and Decking: Steel shall be galvanized to conform to ASTM A123.

K. Factory Finish for Roof Hatches: Roof hatches shall be provided with manufacturer's standard factory-applied grey powder coat.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 013000 - Administrative Requirements: Coordination and project conditions.

B. Verify foundation, floor slab, mechanical and electrical utilities, and placed anchors are in correct position.

C. Verify foundation and floor slab have cured for a minimum of 28 days and reached concrete design strength.

3.2 ERECTION - FRAMING

A. Erect framing in accordance with AISC Specification.

B. Provide for temporary shoring for erection and wind loads. Provide temporary bracing to maintain structure plumb and in alignment until completion of erection and installation of permanent bracing.

C. Comply with the respective manufacturer's recommendations for preparation, lifting, and erecting intermodal shipping containers.

D. Set base plates with non-shrink grout to achieve full plate bearing.

E. Install Duro Hardness expansion pads between plates and steel modular/intermodal shipping container bearing points.

F. Do not field cut or alter structural members without approval of Architect/Engineer.

G. After erection, prime welds, abrasions, and surfaces not galvanized.

3.3 ERECTION - WALL AND ROOFING SYSTEMS

A. Exercise care when cutting prefinished material to ensure cuttings do not remain on finish surface.

B. Fasten cladding/flashing system to structural supports, aligned level and plumb.

C. Locate end laps over supports. End laps minimum 2 inches. Place side laps over bearing.

D. Install expansion/contraction joints where indicated on Drawings.

E. Use concealed fasteners.

F. Install sealant and gaskets to prevent weather penetration.

3.4 ERECTION - ACCESSORIES

A. Install door frame, door, window shutter and louvers.

B. Seal wall and roof accessories watertight with sealant in accordance with Section 07900.

C. Joints and voids that create concealed spaces between connected or stacked containers shall be protected by an approved non-combustible joint system.

D. Containers burning Class B fuel shall have appropriate mechanical venting system.

3.5 ERECTION TOLERANCES

A. Section 014000 - Quality Requirements: Tolerances.

B. Anchor Bolts: Placement within tolerance of +/- 1/8 inch.

C. Concrete: Erection of slab within tolerance of +/- 1/4 inch.

D. Siding and Roofing: 1/8 inch from indicated position.

E. Framing Members: 1/4 inch from level; 1/8 inch from plumb.

3.6 Adjusting and Cleaning

A. Repair or replace damaged components.

B. Contractor shall properly maintain the site, collect all waste material, place all debris in containers, and remove from site.

END OF SECTION

SECTION 133419

PRE-ENGINEERED BUILDING

PART 1 GENERAL

1.1 SUMMARY

A. Section includes pre-engineered, shop fabricated structural steel building frame; metal wall and sloped roof system including parapet walls and soffits; and exterior doors windows, louvers, and openings for chop-out blocks.

B. Related Sections:
1. Section 033000 - Cast-In-Place Concrete: Execution requirements for placement of anchor bolts and base plates specified in this section in concrete.
2. Section 079000 - Joint Protection

1.2 REFERENCES

A. American Institute of Steel Construction:
1. AISC S335 - Specification for Structural Steel Buildings Allowable Stress Design and Plastic Design.
2. AISC S342L - Load and Resistance Factor Design Specification for Structural Steel Buildings.

B. ASTM International:
1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
2. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
3. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
4. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
5. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
6. ASTM A490 - Standard Specification for Heat-Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength.
7. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
8. ASTM A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
9. ASTM A529/A529M - Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality.
10. ASTM A572/A572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
11. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

12. ASTM A792/A792M - Standard Specification for Steel Sheet, 55 Percent Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
13. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
14. ASTM C991 - Standard Specification for Flexible Glass Fiber Insulation for Pre-Engineered Metal Buildings.
15. ASTM C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
16. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
17. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.

C. American Welding Society:
1. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
2. AWS D1.1 - Structural Welding Code - Steel.

D. Metal Building Manufacturers Association:
1. MBMA - Low Rise Building Systems Manual.

E. National Fire Protection Association:
1. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.

F. SSPC: The Society for Protective Coatings:
1. SSPC - Steel Structures Painting Manual.
2. SSPC Paint 20 - Zinc-Rich Primers (Type I - Inorganic and Type II - Organic).

G. Underwriters Laboratories Inc.:
1. UL - Building Materials Directory.
2. UL 723 - Tests for Surface Burning Characteristics of Building Materials.

1.3 SYSTEM DESCRIPTION

A. Single span rigid frame or bearing wall.

B. Bay Spacing: As indicated on Drawings.

C. Primary Framing: Rigid frame of rafter beams and columns, canopy beams, braced end frames, end wall columns, and wind bracing.

D. Secondary Framing: Purlins, girts, eave struts, flange bracing, sill supports, clips, and other items detailed.

E. Wall System: Preformed metal panels of vertical profile and accessory components.

F. Roof System: Preformed metal panels and accessory components.

G. Roof Slope: Varies, see Drawings.

1.4 DESIGN REQUIREMENTS

A. Design members to withstand dead load, applicable snow load, vertical and horizontal seismic loads, and design loads due to pressure and suction of wind calculated in accordance with design load schedule.

B. Design members to support equipment and fire sprinkler system piping indicated.

C. Maximum allowable deflection: 1/240 of span with imposed loads for exterior wall and roof system.

D. Provide drainage to exterior for water entering or condensation occurring within wall or roof system.

E. Permit movement of components without buckling, failure of joint seals, undue stress on fasteners or other detrimental effects, when subject to temperature range denoted on Drawings.

F. Size and fabricate wall and roof systems free of distortion or defects detrimental to appearance or performance.

1.5 PERFORMANCE REQUIREMENTS

A. Conform to applicable code for submission of design calculations, as well as reviewed shop and erection drawings as required for acquiring permits.

B. Cooperate with regulatory agency or authority and provide data as requested authority having jurisdiction.

C. Provide components of each type from 1 manufacturer compatible with adjacent materials.

1.6 SUBMITTALS

A. Section 013300 - Submittal Procedures: Submittal procedures.

B. Shop Drawings: Indicate assembly dimensions, locations of structural members, connections, attachments, openings, cambers, and loads; wall and roof system dimensions, panel layout, general construction details, anchorages and method of anchorage, and method of installation; framing anchor bolt settings, sizes, and locations from datum, and foundation loads; indicate welded connections with AWS A2.4 welding symbols; indicate net weld lengths; provide professional seal and signature.

C. Product Data: Submit data on profiles, component dimensions, fasteners, and performance characteristics.

D. Manufacturer's Instructions: Submit preparation requirements and anchor bolt placement.

E. Erection Drawings: Indicate members by label, assembly sequence, and temporary erection bracing.

1.7 CLOSEOUT SUBMITTALS

A. Section 017000 - Execution Requirements: Closeout procedures.

B. Project Record Documents: Record actual locations of concealed components and utilities.

1.8 QUALITY ASSURANCE

A. Perform Work in accordance with AISC S335, AISC S342L, and MBMA Low Rise Building Systems Manual.

B. Maintain 1 copy of each document on site.

1.9 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum 5 years documented experience.

B. Erector: Company specializing in performing Work of this section with minimum 5 years experience.

C. Design structural components, develop shop drawings, and perform shop and site work under direct supervision of Professional Engineer experienced in design of this Work and licensed in the Commonwealth of Virginia.

1.10 PRE-INSTALLATION MEETINGS

A. Section 013000 - Administrative Requirements: Pre-installation meeting.

B. Convene minimum 1 week prior to commencing work of this section.

1.11 WARRANTY

A. Section 017000 - Execution Requirements: Product warranties and product bonds.

B. Furnish 5 year manufacturer warranty for pre-engineered building systems and components.

C. Furnish 20 year extended warranty to include coverage for exterior pre-finished surfaces color coat against chipping, cracking or crazing, blistering, peeling, chalking, or fading.

PART 2 PRODUCTS

2.1 PRE-ENGINEERED BUILDINGS

The following list of manufacturers shall be completed by the owner's architectural/ engineering firm. Jurisdictions should solicit at a minimum 3 vendors/manufacturers. The following is a template to help with the procurement process:

A. Manufacturers:
1. _____ Corporation. Model: _____
2. _____ Company. Model: _____
3. _____ Incorporated. Model: _____
4. Or an Approved Equal.

2.2 COMPONENTS - FRAMING

A. Structural Steel Members: ASTM A572/A572M, Grade 50.

B. Structural Tubing: ASTM A500, Grade B

C. Plate or Bar Stock: ASTM A529/A529M.

D. Anchor Bolts: ASTM A307, galvanized.

E. Bolts, Nuts, and Washers: ASTM A325, galvanized.

F. Welding Materials: AWS D1.1; type required for materials being welded.

G. Primer: SSPC Paint 20, Red Oxide.

H. Grout: ASTM C1107, Non-shrink type, premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents, capable of developing minimum compressive strength of 2400 psi in 2 days and 7000 psi in 28 days.

2.3 COMPONENTS - WALL AND ROOF SYSTEM

A. Sheet Steel Stock: ASTM A653/A653M galvanized to G90 designation.

B. Joint Seal Gaskets: Manufacturer's standard type.

C. Fasteners: Manufacturer's standard type, galvanized, finish to match adjacent surfaces when exterior exposed.

D. Sealant: Manufacturer's standard type, as specified in Section 079000, non-staining, elastomeric, skinning.

2.4 COMPONENTS - METAL DOORS AND FRAMES

A. Doors and Frames: Manufacturer's standard.

2.5 COMPONENTS - WINDOWS

A. Windows: Manufacturer's standard.

2.6 FABRICATION - FRAMING

A. Fabricate members in accordance with AISC Specification for plate, bar, tube, or rolled structural shapes.

B. Anchor Bolts: Formed with bent shank, assembled with template for casting into concrete.

C. Provide framing for door and window openings.

2.7 FABRICATION - WALL AND ROOF SYSTEMS

A. Siding: Minimum 18 gauge metal thickness.

B. Roofing: Minimum 18 gauge metal thickness.

C. Girts/Purlins: Rolled formed structural shape to receive siding and roofing sheet.

D. Internal and External Corners: Same material thickness and finish as adjacent material.

E. Flashings, Closure Pieces, Fascia, Infills, and Caps: Same material and finish as adjacent material, profile to suit system.

F. Fasteners: To maintain load requirements and weather tight installation, same finish as cladding, non-corrosive type.

G. Wall Louvers: blade design, same finish as adjacent material, with steel mesh screen and frame.

2.8 FACTORY FINISHING

A. Framing Members: Clean, prepare, and galvanize to ASTM A123/A123M; minimum 2.0 oz/sq ft coating thickness; galvanize after fabrication.

B. Galvanizing for Nuts, Bolts and Washers: ASTM A153/A153M.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 013000 - Administrative Requirements: Coordination and project conditions.

B. Verify foundation, floor slab, mechanical and electrical utilities, and placed anchors are in correct position.

3.2 ERECTION - FRAMING

A. Erect framing in accordance with AISC Specification.

B. Provide for erection and wind loads. Provide temporary bracing to maintain structure plumb and in alignment until completion of erection and installation of permanent bracing. Locate braced bays as indicated on Drawings.

C. Set column base plates with non-shrink grout to achieve full plate bearing.

D. Do not field cut or alter structural members without approval of Architect/Engineer.

E. After erection, prime welds, abrasions, and surfaces not galvanized.

3.3 ERECTION - WALL AND ROOFING SYSTEMS

A. Exercise care when cutting prefinished material to ensure cuttings do not remain on finish surface.

B. Fasten cladding system to structural supports, aligned level and plumb.

C. Locate end laps over supports. End laps minimum 2 inches. Place side laps over bearing.

D. Install expansion joints where indicated on Drawings.

E. Use concealed fasteners.

F. Install sealant and gaskets to prevent weather penetration.

3.4 ERECTION - ACCESSORIES

A. Install door frame, door, window shutter and louvers.

B. Seal wall and roof accessories watertight with sealant in accordance with Section 07900.

3.5 ERECTION TOLERANCES

A. Section 014000 - Quality Requirements: Tolerances.

B. Framing Members: 1/4 inch from level; 1/8 inch from plumb.

C. Siding and Roofing: 1/8 inch from indicated position.

END OF SECTION

SECTION 211200

FIRE-SUPPRESSION STANDPIPES

PART 1 GENERAL

1.1 SUMMARY

A. Section includes entire standpipe system from fire department connection to fire hose connection.

1.2 REFERENCES

A. FM Global:
1. FM - Approval Guide, A Guide to Equipment, Materials & Services Approved By Factory Mutual Research For Property Conservation.

B. National Fire Protection Association:
1. NFPA 14 - Standard for the Installation of Standpipe, Private Hydrants, and Hose Systems.

1.3 SUBMITTALS

A. Section 013300 - Submittal Procedures: Submittal procedures.

B. Shop Drawings: Indicate supports, components, accessories, and sizes.

C. Product Data: Submit manufacturer's catalog sheet for equipment indicating rough-in size, finish, and accessories.

D. Field Test Reports: Indicate compliance with specified performance.

E. Manufacturer's Installation Instructions: Submit with product data.

F. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS

A. Section 017000 - Execution Requirements: Closeout procedures.

B. Operation and Maintenance Data: Submit servicing requirements and test schedule.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with NFPA 14.

B. Maintain 1 copy of each document on site.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum 5 years documented experience.

B. Installer: Company specializing in performing Work of this section with minimum 5 years documented experience approved by manufacturer.

1.7 PRE-INSTALLATION MEETINGS

A. Section 013000 - Administrative Requirements: Pre-installation meeting.

B. Convene minimum 1 week prior to commencing work of this section.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Section 016000 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Deliver and store products in shipping packaging until installation.

1.9 WARRANTY

A. Section 017000 - Execution Requirements: Product warranties and product bonds.

B. Furnish 5 year manufacturer warranty for standpipes and hoses.

1.10 EXTRA MATERIALS

A. Section 017000 - Execution Requirements: Spare parts and maintenance products.

B. Furnish 2 hose nozzles and hoses.

PART 2 PRODUCTS

2.1 FIRE HOSE CABINETS

The following list of manufacturers shall be completed by the Owner's Architectural/ Engineering firm. Jurisdictions should solicit a minimum of 3 vendors/manufacturers. The following is a template to help with the procurement process:

A. Manufacturers:
1. [_____ Incorporated] Model [_____].
2. [_____ Corp.] Model [_____].
3. [_____ Systems] Model [_____].
4. or an approved equal

B. Hose Cabinets:

1. Style: Surface mounted.
2. Tub: 16 gage thick steel, prepared for pipe and accessory rough in.
3. Door: 12 gage thick steel, glazed, with 1/4 inch thick wired glass full panel, hinged, positive latch device.
4. Finish: Enameled, color as selected.

C. Hose Rack: Steel; with polished chrome finish; swivel type with pins and water stop.

D. Hose: 1 inch diameter, 75 feet long, of linen, polyurethane lined synthetic or rubber lined synthetic hose; mildew and rot-resistant.

E. Nozzle: Chrome plated brass; combination fog, straight stream, and adjustable shut-off.

2.2 VALVES

The following list of manufacturers shall be completed by the Owner's Architectural/ Engineering firm. Jurisdictions should solicit a minimum of 3 vendors/manufacturers. The following is a template to help with the procurement process:

A. Manufacturers:
1. [_____ Incorporated] Model [_____].
2. [_____ Corp.] Model [_____].
3. [_____ Systems] Model [_____].
4. or an approved equal

B. Hose Station Valve: Angle type, brass finish, 1 1/2 inch nominal size with automatic ball drip.

C. Hose Connection Valve: Angle type; brass finish; 2 1/2 inch size, thread to match fire department hardware, 300 psi working pressure, with threaded cap and chain of brass finish.

D. Hose Connection Valve Cabinets:
1. Style: Surface mounted.
2. Tub: 1 gage thick steel, prepared for pipe and accessory rough in.
3. Door: 12 gage thick steel, glazed, with 1/4 inch thick wired glass full panel, hinged, positive latch device.
4. Finish: Enameled, color as selected.

2.3 FIRE DEPARTMENT CONNECTION

A. Type: Flush mounted wall type with brass finish.

B. Outlets: 2-way with fire department thread size. Threaded dust cap and chain of matching material and finish.

C. Drain: 3/4 inch automatic drip, outside.

D. Label: "Standpipe - Fire Department Connection".

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 013000 - Administrative Requirements: Coordination and project conditions.

B. Verify blocking in place for cabinet installation.

3.2 INSTALLATION

A. Install in accordance with NFPA 14.

B. Install cabinets plumb and level. Secure to adjacent surfaces. Establish top of cabinet (inside horizontal) surface 66 inches above finished floor.

C. Install hose station valve in cabinet at 60 inches above floor. Install hose-connection valve under hose station valve and not closer than 4 inches from side or bottom of cabinet.

D. Connect standpipe system to water source ahead of domestic water connection.

3.3 FIELD QUALITY CONTROL

A. Section 014000 - Quality Requirements, 017000 - Execution Requirements: Field inspecting, testing, adjusting, and balancing.

B. Test entire system in accordance with NFPA 14.

C. Require test be witnessed by Fire Marshall.

3.4 CLEANING

A. Section 017000 - Execution Requirements: Final cleaning.

B. Flush entire system of foreign matter.

END OF SECTION

SECTION 220500

COMMON WORK RESULTS FOR PLUMBING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Identification for Plumbing Piping and Equipment.
2. Sleeves.
3. Mechanical sleeve seals.
4. Formed steel channel.

1.2 SUBMITTALS

A. Shop Drawings: Submit for piping and equipment identification list of wording, symbols, letter size, and color coding for pipe identification and valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

B. Product Data for Pipe and Equipment Identification: Submit for mechanical identification manufacturers catalog literature for each product required.

1.3 QUALITY ASSURANCE

A. Perform Work in accordance with Commonwealth of Virginia standard.

B. Maintain 1 copy of each document on site.

PART 2 PRODUCTS

2.1 IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

The following list of manufacturers shall be completed by the Owner's Architectural/ Engineering firm. Jurisdictions should solicit a minimum of 3 vendors/manufacturers. The following is a template to help with the procurement process:

A. Manufacturers:
1. [_____ Incorporated] Model [_____].
2. [_____ Corp.] Model [_____].
3. [_____ Systems] Model [_____].
4. or an approved equal

B. Plastic Nameplates: Laminated 3-layer plastic with engraved black letters on light background color.

C. Plastic Tags: Laminated 3-layer plastic with engraved black letters on light background color, minimum 1 1/2 inches diameter.

D. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering. Larger sizes may have maximum sheet size with spring fastener. Color and Lettering: Conform to ASME A13.1.

E. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings. Color and Lettering: Conform to ASME A13.1.

F. Plastic Underground Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

2.2 SLEEVES

A. Sleeves for Pipes Through Non-Fire Rated Floors: 18 gage thick galvanized steel.

B. Sleeves for Pipes Through Non-Fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or 18 gage thick galvanized steel.

C. Sealant: Refer to Section 079000 – Joint Protection.

2.3 MECHANICAL SLEEVE SEALS

The following list of manufacturers shall be completed by the Owner's Architectural/ Engineering firm. Jurisdictions should solicit a minimum of 3 vendors/manufacturers. The following is a template to help with the procurement process:

A. Manufacturers:
   1. [_____ Incorporated] Model [_____].
   2. [_____ Corp.] Model [_____].
   3. [_____ Systems] Model [_____].
   4. or an approved equal

B. Product Description: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between object and sleeve, connected with bolts and pressure plates causing rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

2.4 FORMED STEEL CHANNEL

The following list of manufacturers shall be completed by the Owner's Architectural/ Engineering firm. Jurisdictions should solicit a minimum of 3 vendors/manufacturers. The following is a template to help with the procurement process:

A. Manufacturers:
   1. [_____ Incorporated] Model [_____].
   2. [_____ Corp.] Model [_____].
   3. [_____ Systems] Model [_____].

4. or an approved equal

B. Product Description: Galvanized 12 gage thick steel. With holes 1 1/2 inches on center.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify openings are ready to receive sleeves.

3.2 INSTALLATION - PIPING AND EQUIPMENT IDENTIFICATION

A. Install plastic nameplates with adhesive.

B. Install plastic tags with corrosion resistant metal chain.

3.3 INSTALLATION - SLEEVES

A. Exterior watertight entries: Seal with mechanical sleeve seals.

B. Set sleeves in position in forms. Provide reinforcing around sleeves.

C. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

D. Extend sleeves through floors 1 inch above finished floor level. Caulk sleeves.

E. Where piping or ductwork penetrates floor, ceiling, or wall, close off space between pipe or duct and adjacent work with stuffing insulation and caulk airtight. Provide close fitting metal collar or escutcheon covers at both sides of penetration.

F. Install chrome plated steel escutcheons at finished surfaces.

END OF SECTION

SECTION 231100

FACILITY FUEL PIPING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Pipe hangers and supports.
2. Pipe and pipe fittings.
3. Valves.

1.2 SUBMITTALS

A. Product Data:
1. Pipe Hangers and Supports: Submit manufacturers catalog data including load carrying capacity.
2. Valves: Submit manufacturers catalog information with valve data and ratings for each service.

B. Pipe Hangers and Supports: Design data, indicate pipe sizes, load carrying capacity of trapeze, multiple pipe, and riser support hangers.

C. Manufacturer's Installation Instructions: Submit installation instructions for material and equipment.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Submit spare parts lists and maintenance procedures.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with NFPA 30 and NFPA 54.

B. List and label flexible connectors and hoses in accordance with UL 536.

C. Perform Work in accordance with Commonwealth of Virginia standard.

D. Maintain 1 copy of each document on site.

1.5 WARRANTY

A. Furnish 5 year manufacturer warranty for pumps.

PART 2 PRODUCTS

2.1 PIPE HANGERS AND SUPPORTS

The following list of manufacturers shall be completed by the Owner's Architectural/ Engineering firm. Jurisdictions should solicit a minimum of 3 vendors/manufacturers. The following is a template to help with the procurement process:

A. Manufacturers:
   1. [_____ Incorporated] Model [_____].
   2. [_____ Corp.] Model [_____].
   3. [_____ Systems] Model [_____].
   4. or an approved equal

B. Conform to MSS SP 58.

C. Hangers for Pipe Sizes 1/2 to 1 1/2 inch: Carbon steel, adjustable swivel, split ring.

D. Hangers for Pipe Sizes 2 inches and Over: Carbon steel, adjustable, clevis.

E. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

F. Wall Support for Pipe Sizes to 3 inches: Cast iron hook.

G. Wall Support for Pipe Sizes 4 inches and Over: Welded steel bracket and wrought steel clamp.

H. Vertical Support: Steel riser clamp.

I. Floor Support for Pipe Sizes to 4 inches: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

J. Floor Support for Pipe Sizes 6 inches and Over: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.

K. Copper Pipe Support: Copper-plated, carbon-steel adjustable, ring.

2.2 PIPES AND TUBES

A. Natural Gas Piping, Buried:
   1. Steel Pipe: ASTM A53/A53M, Grade B, Schedule 40 black with polyethylene jacket and welded joints.
   2. Polyethylene Pipe: ASTM D2513, SDR 11.5, with socket type fittings and fusion welded joints.

B. Natural Gas Piping, above Grade:
   1. Steel Pipe: ASTM A53/A53M, Grade B, Schedule 40 black, with malleable iron or forged steel fittings, screwed or welded.

2. Copper Tubing: ASTM B88, Type K, annealed with wrought copper fittings and compression joints.
3. Corrugated Stainless Steel Tubing: ANSI LC 1.
4. Regulator Vent Piping, Above Grade:
   a. Indoors: Same as natural gas piping, above grade.
   b. Outdoors: PVC pipe, tubing, and fittings, UL 651.

2.3 VALVES

The following list of manufacturers shall be completed by the Owner's Architectural/ Engineering firm. Jurisdictions should solicit a minimum of 3 vendors/manufacturers. The following is a template to help with the procurement process:

A. Manufacturers:
   1. [_____ Incorporated] Model [_____].
   2. [_____ Corp.] Model [_____].
   3. [_____ Systems] Model [_____].
   4. or an approved equal

B. Gate Valves:
   1. Up to 2 inches: Bronze body, bronze trim, non-rising stem, hand wheel, inside screw, double wedge disc, soldered or threaded.
   2. Over 2 inches: Iron body, bronze trim, rising stem, hand wheel, OS&Y, solid wedge, flanged or grooved ends.

C. Globe Valves:
   1. Up to 2 Inches: Bronze body, bronze trim, rising stem and hand wheel, inside screw, renewable composition disc, solder or threaded ends, with back seating capacity.
   2. Over 2 inches: Iron body, bronze trim, rising stem, hand wheel, OS&Y, plug type disc, flanged ends, renewable seat and disc.

D. Ball Valves:
   1. Up to 2 inches: Bronze or stainless steel 1 piece body, chrome plated brass ball, teflon seats and stuffing box ring, lever handle, solder or threaded ends.
   2. Over 2 inches: Cast steel flanged body, chrome plated steel ball, Teflon seat and stuffing box seals and lever handle.

E. Plug Valves:
   1. Up to 2 inches: Bronze body, bronze tapered plug, non-lubricated, Teflon packing, threaded ends.
   2. Over 2 inches: Cast iron body and plug, pressure lubricated, Teflon packing, flanged ends.

F. Swing Check Valves:
   1. Up to 2 inches: Bronze body and swing disc, solder or threaded ends.
   2. Over 2 inches: Iron body, bronze trim, swing disc, renewable disc and seat, flanged ends.

G. Spring Loaded Check Valves:

1. Iron body, bronze trim with threaded, wafer or flanged ends, and stainless steel spring with renewable composition disc.

2.4 PIPING SPECIALTIES

A. Flanges, Unions, and Couplings:
   1. Pipe Size 2 inches and Under: Malleable iron unions for threaded ferrous piping; bronze unions for copper pipe, soldered joints.
   2. Pipe Size Over 2 inches: Forged steel flanges for ferrous piping; bronze flanges for copper piping; preformed neoprene gaskets.
   3. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

B. Strainers:

The following list of manufacturers shall be completed by the Owner's Architectural/ Engineering firm. Jurisdictions should solicit a minimum of 3 vendors/manufacturers. The following is a template to help with the procurement process:

   1. Manufacturers:
      a. [_____ Incorporated] Model [_____].
      b. [_____ Corp.] Model [_____].
      c. [_____ Systems] Model [_____].
      d. or an approved equal
   2. Size 2 inches and Under: Threaded brass or iron body for 175 psig working pressure, Y pattern with 1/32 inch stainless steel perforated screen.
   3. Size 2 1/2 inch to 4 inch: Flanged iron body for 175 psig working pressure, Y pattern with 3/64 inch stainless steel perforated screen.
   4. Size 5 inch and Larger: Flanged iron body for 175 psig working pressure, basket pattern with 1/8 inch stainless steel perforated screen.

C. Flexible Connectors:

The following list of manufacturers shall be completed by the Owner's Architectural/ Engineering firm. Jurisdictions should solicit a minimum of 3 vendors/manufacturers. The following is a template to help with the procurement process:

   1. Manufacturers:
      a. [_____ Incorporated] Model [_____].
      b. [_____ Corp.] Model [_____].
      c. [_____ Systems] Model [_____].
      d. or an approved equal
   2. Corrugated stainless steel hose with single layer of stainless steel exterior braiding, minimum 9 inches long with copper tube ends; for maximum working pressure 500 psig.

D. Pressure Gauges:

The following list of manufacturers shall be completed by the Owner's Architectural/ Engineering firm. Jurisdictions should solicit a minimum of 3 vendors/manufacturers. The following is a template to help with the procurement process:

1. Manufacturers:
   a. [_____ Incorporated] Model [_____].
   b. [_____ Corp.] Model [_____].
   c. [_____ Systems] Model [_____].
   d. or an approved equal
2. Gauge: ASME B40.1, UL 404 with bourdon tube, rotary brass movement, brass socket, front calibration adjustment, black scale on white background.
   a. Case: Cast aluminum.
   b. Bourdon Tube: Brass.
   c. Dial Size: 4 inch diameter.
   d. Mid-Scale Accuracy: 1 percent.
   e. Scale: Psi.

E. Pressure Regulator: Comply with ANSI Z21.80.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify excavations are to required grade, dry, and not over-excavate.

3.2 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside piping before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.3 INSTALLATION - INSERTS

A. Install inserts for placement in concrete forms.

B. Install inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

C. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.

D. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

E. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut recessed into and grouted flush with slab.

3.4 INSTALLATION - PIPING SYSTEMS

A. Install dielectric connections wherever jointing dissimilar metals.

B. Install unions downstream of valves and at equipment or apparatus connections.

C. Route piping parallel to building structure and maintain gradient.

D. Install piping to maintain headroom. Group piping to conserve space. Group piping whenever practical at common elevations.

E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

F. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

G. Sleeve pipe passing through partitions, walls, and floors.

H. Install piping system allowing clearance for installation of insulation and access to valves and fittings.

I. For exposed natural gas lines other than steel pipe, attach yellow pipe labels with "GAS" in black lettering, at maximum 5 foot spacing.

J. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

K. Where required, bend pipe with pipe bending tools in accordance with procedures intended for that purpose.

3.5 INSTALLATION - VALVES

A. Install valves with stems upright or horizontal, not inverted.

B. Install gate or ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

C. Install globe or ball valves for throttling or manual flow control services.

3.6 INSTALLATION - PIPING SPECIALTIES

A. Install pressure gauges with pulsation dampers. Provide needle valve or ball valve to isolate each gauge. Extend nipples and siphons to allow clearance from insulation.

B. Install gauges in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.

C. Adjust gauges to final angle, clean windows and lenses, and calibrate to 0.

3.7 INSTALLATION - FUEL PIPING

A. Install natural gas or LPG piping in accordance with ASME B31.2 and ASME B31.4.

B. Install natural gas or LPG piping in accordance with NFPA 54 or NFPA 58, respectively.

C. Size and install gas piping to provide sufficient gas to supply maximum appliance demand at pressure higher than appliance minimum inlet pressure.

D. Provide clearance for installation of insulation and access to valves and fittings.

E. Establish elevations of buried piping outside building to provide not less than 3 feet of cover.

F. Provide support for utility meters in accordance with requirements of utility company.

G. Pipe vents from gas pressure reducing valves to outdoors and terminate in weatherproof hood. Protect vent against entry of insects and foreign material.
   1. Minimum Vent Size: Connection size at regulator vent connection.
   2. Run individual vent line from each relief device, independent of breather vents.
   3. Breather vents may be manifolded together with piping sized for combined appliance vent requirements.

H. Test natural gas or LPG piping in accordance with NFPA 54 or NFPA 58.

3.8 INSTALLATION - PIPE HANGERS AND SUPPORTS

A. Support horizontal piping as scheduled.

B. Install hangers with minimum 1/2 inch space between finished covering and adjacent work.

C. Place hangers within 12 inches of each horizontal elbow.

D. Use hangers with 1 1/2 inch minimum vertical adjustment.

E. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers.

F. Support vertical piping at every other floor. Support vertical cast iron pipe at each floor at hub.

G. Where piping is installed in parallel and at same elevation, provide multiple pipe or trapeze hangers.

H. Support riser piping independently of connected horizontal piping.

I. Provide copper plated hangers and supports for copper piping sheet lead packing between hanger or support and piping.

J. Design hangers for pipe movement without disengagement of supported pipe.

3.9 SCHEDULES

PIPE HANGER SPACING				
PIPE SIZE Inches	COPPER TUBING MAXIMUM HANGER SPACING Feet	STEEL PIPE MAXIMUM HANGER SPACING Feet	COPPER TUBING HANGER ROD DIAMETER Inches	STEEL PIPE HANGER ROD DIAMETER Inches
1/2	5	7	3/8	3/8
3/4	5	7	3/8	3/8
1	6	7	3/8	3/8
1-1/4	7	7	3/8	3/8
1-1/2	8	9	3/8	3/8
2	8	10	3/8	3/8
2-1/2 (Note 2)	9	11	1/2	1/2
3	10	12	1/2	1/2
4	12	14	1/2	5/8
5	13	16	1/2	5/8
6	14	17	5/8	3/4
8	16	19	3/4	3/4
10	18	22	3/4	7/8
12	19	23	3/4	7/8
14	22	25	7/8	1
16	23	27	7/8	1
18	25	28	1	1
20	27	30	1	1-1/4
24	28	32	1-1/4	1-1/4

Note 1: Refer to manufacturer's recommendations for grooved end piping systems.

END OF SECTION

SECTION 260500

COMMON WORK RESULTS FOR ELECTRICAL

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The drawings and general provisions of the Contract Documents apply to this Section.

1.2 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

1.3 COORDINATION

A. Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange in building structure during progress of construction to facilitate the electrical installations that follow:
   1. Set inserts and sleeves in poured-in-place concrete, masonry work, and other structural components as they are constructed.

B. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning before closing in the building.

C. Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.

D. Where electrical identification markings and devices will be concealed by acoustical ceilings and similar finishes, coordinate installation of these items before ceiling installation.

PART 2 PRODUCTS

2.1 CONCRETE BASES

A. Concrete Forms and Reinforcement Materials: As specified in Division 3 Section “Cast-in-Place Concrete.”

B. Concrete: 3000 psi (20.7-MPa), 28 day compressive strength as specified in Division 3 – Concrete: Section 033000 - Cast-in-Place Concrete.

2.2 TOUCHUP PAINT

A. For Equipment: Equipment manufacturer's paint selected to match installed equipment finish.

B. Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

2.3 SUPPORTING DEVICES

A. Material: Cold-formed steel, with corrosion resistant coating acceptable to authorities having jurisdiction.

B. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel.

C. Slotted-Steel Channel Supports: Flange edges turned toward web, and 9/16 inch diameter slotted holes at a maximum of 2 inches o.c., in webs.

D. Slotted Steel Channel Supports: Comply with Division 5 Section "Metal Fabrications" for slotted channel framing.
1. Channel Thickness: Selected to suit structural loading.
2. Fittings and Accessories: Products of the same manufacturer as channel supports.

E. Nonmetallic Channel and Angle Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with 9/16 inch diameter holes at a maximum of 8 inches o.c., in at least 1 surface.
1. Fittings and Accessories: Products of the same manufacturer as channels and angles.
2. Fittings and Accessory Materials: Same as channels and angles, except metal items may be stainless steel.

F. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring-steel clamps or click-type hangers.

G. Pipe Sleeves: ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.

H. Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for nonarmored electrical cables in riser conduits. Plugs have number and size of conductor gripping holes as required to suit individual risers. Body constructed of malleable-iron casting with hot-dip galvanized finish.

I. Expansion Anchors: Carbon-steel wedge or sleeve type. Plastic conical anchors are not allowed.

J. Toggle Bolts: All-steel springhead type.

K. Power-Driven Threaded Studs: Heat-treated steel.

PART 3 EXECUTION

3.1 ELECTRICAL EQUIPMENT INSTALLATION

A. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide the maximum possible headroom.

B. Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.

C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.

D. Right of Way: Give to raceways and piping systems installed at a required slope.

3.2 CONCRETE HOUSEKEEPING BASES

A. Construct concrete housekeeping bases of dimensions indicated, but not less than 4 inches (100 mm) larger, in both directions, than supported unit and 4 inches thick. Follow supported equipment manufacturer's anchorage recommendations and setting templates for anchor-bolt and tie locations, unless otherwise noted.

3.3 CUTTING AND PATCHING

A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved.

B. Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Install new fireproofing where existing firestopping has been disturbed. Repair and refinish materials and other surfaces by skilled mechanics involved.

3.4 FIELD QUALITY CONTROL

A. Inspect installed components for damage and faulty work, including the following:
1. Raceways.
2. Building wire and connectors.
3. Supporting devices for electrical components.
4. Electrical identification.
5. Electricity-metering components.
6. Concrete bases.
7. Electrical demolition.
8. Cutting and patching for electrical construction.
9. Touchup painting.

3.5 ELECTRICAL SUPPORTING DEVICE APPLICATION

A. Damp Locations and Outdoors: Hot-dip galvanized materials or nonmetallic, U-channel system components.

B. Dry Locations: Steel materials.

C. Support Clamps for PVC Raceways: Click-type clamp system.

D. Selection of Supports: Comply with manufacturer's written instructions.

E. Strength of Supports: Adequate to carry present and future loads, times a safety factor of at least 4; minimum of 200 lb design load.

3.6 SUPPORT INSTALLATION

A. Install support devices to securely and permanently fasten and support electrical components.

B. Install individual and multiple raceway hangers and rise clamps to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assemblies and for securing hanger rods and conduits.

C. Support parallel runs of horizontal raceways together on trapeze-or bracket-type hangers.

D. Size supports for multiple raceway installations so capacity can be increased by 25 percent minimum in the future.

E. Support individual horizontal raceways with separate, malleable-iron pipe hangers or clamps.

F. Install 1/4 inch diameter or larger threaded steel hanger rods, unless otherwise indicated.

G. Spring-steel fasteners specifically designed for supporting single conduits or tubing may be used instead of malleable-iron hangers for 1 1/2 inch and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings and for fastening raceways to slotted channel and angle supports.

H. Arrange supports in vertical runs so the weight of raceways and enclosed conductors is carried entirely by raceway supports, with no weight load on raceway terminals.

I. Simultaneously install vertical conductor supports with conductors.

J. Separately support cast boxes that are threaded to raceways and used for fixture support. Support sheetmetal boxes directly from the building structure or by bar hangers. If bar hangers are used, attach bar to raceways on opposite sides of the box

and support the raceway with an approved fastener not more than 24 inches from the box.

K. Install metal channel racks for mounting cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformer, and other devices unless components are mounted directly to structural elements of adequate strength.

L. Install sleeves for cable and raceway penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.

M. Securely fasten electrical items and their supports to the building structure, unless otherwise indicated. Perform fastening according to the following, unless other fastening methods are indicated.
1. Wood: Fasten with wood screws or screw-type nails.
2. Masonry: Toggle bolts on hollow masonry units and expansion bolts on solid masonry units. Plastic conical anchors are not allowed.
3. New Concrete: Concrete inserts with machine screws and bolts.
4. Existing Concrete: Steel expansion bolts.
5. Instead of expansion bolts, threaded studs driven by a powder charge and provided with lock washers may be used in existing concrete.
6. Steel: Welded threaded studs or spring-tension clamps on steel.
   a. Field Welding: Comply with AWS D1.1.
7. Welding to steel structure may be used only for threaded studs, not for conduits, pipe straps, or other items.
8. Light Steel: Sheet-metal screws.
9. Fasteners: Select so the load applied to each fastener does not exceed 25 percent of its proof-test load.

3.7 CLEANING AND PROTECTION

A. On completion of installation, including outlets, fittings, and devices, inspect exposed finish. Remove burrs, dirt, paint spots, and construction debris.

B. Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 262416

PANELBOARDS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract Documents apply to this Section.

1.2 SUMMARY

A. This Section includes load centers and panelboards, overcurrent protective devices, and associated auxiliary equipment rated 600 V and less for the following types:
   1. Lighting and appliance branch-circuit panelboards.
   2. Distribution panelboards.

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. RFI: Radio-frequency interference.

D. RMS: Root mean square.

E. SPDT: Single pole, double throw.

1.4 SUBMITTALS

A. Product Data: For each type of panelboard, overcurrent protective device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical, characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.
   1. Dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings. Include the following:
      a. Enclosure types and details for types other than NEMA 250, Type 1.
      b. Bus configuration, current, and voltage ratings.
      c. Short-circuit current rating of panelboards and overcurrent protective devices.
      d. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

C. Field Test Reports: Submit written test reports and include the following:
   1. Test procedures used.
   2. Test results that comply with requirements.

3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

D. Panelboard Schedules: For installation in panelboards, submit final versions after load balancing.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NEMA PB 1.

C. Comply with NFPA 70.

1.6 COORDINATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, and encumbrances to workspace clearance requirements.

1.7 EXTRA MATERIALS

A. Key: 6 spares of each type of panelboard cabinet lock.

PART 2 PRODUCTS

2.1 FABRICATION AND FEATURES

A. Enclosures: Surface mounted cabinets. NEMA PB 1, Type 1, to meet environmental conditions at installed location.

B. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.

C. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.

D. Finish: Manufacturer's standard enamel finish over corrosion-resistant treatment or primer coat.

E. Directory Card: With transparent protective cover, mounted inside metal frame, inside panelboard door.

F. Bus: Hard-drawn copper, 98 percent conductivity.

G. Main and Neutral Lugs: Mechanical type suitable for use with conductor material.

H. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment ground conductors; bonded to box.

I. Service Equipment Label: UL labeled for use as service equipment for panelboards with main service disconnect switches.

J. Future Devices: Mounting brackets, bus connections, and necessary appurtenances required for future installation of devices.

K. Gutter Barrier: Arrange to isolate individual panel sections.

2.2 PANELBOARD SHORT-CIRCUIT RATING

A. Fully rated to interrupt symmetrical short-circuit current available terminals.

2.3 LOAD CENTERS

A. Are not allowed.

2.4 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

B. Doors: Front mounted with concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.5 DISTRIBUTION PANELBOARDS

A. Doors: Front mounted, except omit in fused-switch panelboards; secured with vault-type latch with tumbler lock; keyed alike.

B. Main Overcurrent Protective Devices: Circuit breaker.

C. Branch overcurrent protective devices shall be 1 of the following:

1. For Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.
2. For Circuit Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers: plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

2.6 OVERCURRENT PROTECTIVE DEVICES

A. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit breaker frame sizes 250 A and larger.

B. Molded-Case Circuit-Breaker Features and Accessories. Standard frame sizes, trip ratings, and number of poles.
1. Lugs: Mechanical style, suitable for number, size, trip ratings, and material of conductors.
2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.

2.7 CONTROLLERS

A. Motor Controllers: NEMA ICS 2, Class A combination controller equipped for panelboard mounting and including the following accessories:
1. Individual control-power transformers.
2. Fuses for control-power transformers.
3. Bimetallic-element overload relay.
4. Melting-alloy overload relay.
5. Indicating lights.
6. Seal-in contact.
7. Push buttons.
8. Selector switches.

2.8 ACCESSORY COMPONENTS AND FEATURES

A. Accessory Set: Tools and miscellaneous items required for over current protective device test, inspection, maintenance, and operation.

B. Fungus Proofing: Permanent fungicidal treatment for panelboard interior, including overcurrent protective devices and other components.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install panelboards accessories according to NEMA PB1.1.

B. Mounting Heights: Top of trim 74 inches above finished floor, unless otherwise indicated.

C. Mounting: Plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish.

D. Circuit Directory: Create a directory to indicate installed circuit loads after balancing panelboard loads. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable. Directory shall indicate

Owners actual space designations, not those space designations indicated in the Contract Documents.

E. Install filler plates in unused spaces.

F. Wiring in Panelboard Gutters: Arrange conductors into groups and bundle and wrap with wire ties after completing load balancing.

3.2 IDENTIFICATION

A. Panelboard Nameplates: Label each panelboard with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

3.3 CONNECTIONS

A. Install equipment grounding connections for panelboards with ground continuity to main electrical ground bus.

B. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:
1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

B. Testing: After installing panelboards and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.
1. Procedures: Perform each visual and mechanical inspection and electrical test indicated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

C. Balance Loads: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes as follows:
1. Measure as directed during period of normal system loading.
2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24 hour services such as fax machines and on-line data-processing, computing, transmitting, and receiving equipment.
3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
4. Tolerance: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

3.5 CLEANING

A. On completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

END OF SECTION

SECTION 310513

SOILS FOR EARTHWORK

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Subsoil materials.
2. Topsoil materials.

B. Related Documents and Sections:

1. Document: Geotechnical report; bore hole locations and findings of subsurface materials.
2. Section 310516 - Aggregates for Earthwork.
3. Section 312323 - Fill.

1.2 UNIT PRICES - MEASUREMENT AND PAYMENT

A. Subsoil:
1. Basis of Measurement: By cubic foot.
2. Basis of Payment: Includes excavating existing subsoil, supplying subsoil materials, and stockpiling.

B. Topsoil:
1. Basis of Measurement: By cubic foot.
2. Basis of Payment: Includes excavating existing topsoil, supplying topsoil materials, and stockpiling.

1.3 REFERENCES

A. ASTM International:
1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).

1.4 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Samples: Submit, in air-tight containers, 10 lb sample of each type of fill to testing laboratory.

C. Materials Source: Submit name of imported materials source.

D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. Furnish each subsoil and topsoil material from single source throughout the Work.

B. Perform Work in accordance with VDOT standard.

C. Maintain 1 copy on site.

PART 2 PRODUCTS

2.1 SUBSOIL MATERIALS

A. Subsoil Type S1: Conforming to VDOT standard.

B. Subsoil Type S2:
1. Excavated and re-used material.
2. Graded.
3. Free of lumps larger than 3 inches, rocks larger than 2 inches, and debris.

2.2 TOPSOIL MATERIALS

A. Topsoil Type S3: Conforming to VDOT standard.

B. Topsoil Type S4:
1. Excavated and reused material.
2. Graded.
3. Free of roots, rocks larger than 1/2 inch, subsoil, debris, large weeds, and foreign matter.
    a. Screening: Single screened.

C. Topsoil Type S5:
1. Imported borrow.
2. Friable loam.
3. Reasonably free of roots, rocks larger than 1/2 inch, subsoil, debris, large weeds, and foreign matter.
    a. Screening: Single screened.
4. Acidity range (pH) of 5.5 to 7.5.
5. Containing minimum of 4 percent and maximum of 25 percent inorganic matter.

2.3 SOURCE QUALITY CONTROL

A. Section 014000 - Quality Requirements: Testing and Inspection Services Testing and analysis of soil material.

B. Testing and Analysis of Subsoil Material: Perform in accordance with ASTM D698.

C. Testing and Analysis of Topsoil Material: Perform in accordance with ASTM D698.

D. When tests indicate materials do not meet specified requirements, change material and retest.

E. Furnish materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.1 EXCAVATION

A. Excavate subsoil and topsoil from areas designated. Strip topsoil to full depth of topsoil in designated areas.

B. Stockpile excavated material meeting requirements for subsoil materials and topsoil materials.

C. Remove excess excavated materials not intended for reuse, from site.

D. Remove excavated materials not meeting requirements for subsoil materials and topsoil materials from site.

3.2 STOCKPILING

A. Stockpile materials on site at locations designated by Architect/Engineer.

B. Stockpile in sufficient quantities to meet Project schedule and requirements.

C. Separate differing materials with dividers or stockpile apart to prevent mixing.

D. Stockpile topsoil 8 feet high maximum.

E. Prevent intermixing of soil types or contamination.

F. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.

G. Stockpile unsuitable materials on impervious material and cover to prevent erosion and leaching, until disposed of.

3.3 STOCKPILE CLEANUP

A. Remove stockpile, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

B. Leave unused materials in neat, compact stockpile.

C. When borrow area is indicated, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

END OF SECTION

SECTION 310516

AGGREGATES FOR EARTHWORK

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Coarse aggregate materials.
2. Fine aggregate materials.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Aggregate: Required.
1. Basis of Measurement: By cubic foot.

1.3 SUBMITTALS

A. Samples: Not required.

PART 2 PRODUCTS

2.1 COARSE AGGREGATE MATERIALS

A. Coarse Aggregate: Conforming to VDOT standard.

B. Coarse Aggregate: Crushed Gravel: Angular crushed stone; free of shale, clay, friable material, and debris.

C. Aggregate: Natural stone; washed, free of clay, shale, organic matter.

2.2 FINE AGGREGATE MATERIALS

A. Fine Aggregate: Conforming to VDOT standard.

B. Fine Aggregate: Natural river or bank sand; washed; free of silt, clay, loam, friable or soluble materials, and organic matter.

PART 3 EXECUTION

3.1 EXCAVATION

A. Excavate aggregate materials from on-site locations designated by Architect/Engineer in accordance with Section 312000 – Earth Moving.

B. Stockpile excavated material meeting requirements for coarse aggregate materials and fine aggregate materials.

3.2 STOCKPILING

A. Stockpile materials on site at locations designated by Architect/Engineer.

END OF SECTION

SECTION 311000

SITE CLEARING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Removing surface debris.
2. Removing designated paving, curbs, and [_____].
3. Removing designated trees, shrubs, and other plant life.
4. Removing abandoned utilities.
5. Excavating topsoil.

1.2 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit data for herbicide. Indicate compliance with applicable codes for environmental protection.

1.3 QUALITY ASSURANCE

A. Conform to applicable code for environmental requirements, disposal of debris, burning debris on site, and use of herbicides.

B. Maintain 1 copy of each document on site.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 013000 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify existing plant life designated to remain is tagged or identified.

C. Identify waste area for placing removed materials.

3.2 PREPARATION

A. Call Local Utility Line Information service at Miss Utility of Virginia not less than 3 working days before performing Work.
   1. Request underground utilities to be located and marked within and surrounding construction areas.

3.3 PROTECTION

A. Locate, identify, and protect utilities indicated to remain from damage.

B. Protect trees, plant growth, and features designated to remain as final landscaping as specified in Section 015000 - Temporary Facilities and Controls.

C. Protect bench marks and survey control points from damage or displacement.

3.4 CLEARING

A. Clear areas required for access to site and execution of Work to minimum depth of 12 inches.

B. Remove trees and shrubs indicated. Remove stumps and main root ball to depth of 24 inches and surface rock.

C. Clear undergrowth and deadwood, without disturbing subsoil.

D. Apply herbicide to remaining stumps to inhibit growth.

3.5 REMOVAL

A. Remove debris, rock, and extracted plant life from site.

B. Remove abandoned utilities. Indicated removal termination point for underground utilities on Record Documents.

C. Continuously clean-up and remove waste materials from site. Do not allow materials to accumulate on site.

D. Do not burn or bury materials on site. Leave site in clean condition.

3.6 TOPSOIL EXCAVATION

A. Excavate topsoil from areas to be further excavated, relandscaped, or regraded, without mixing with foreign materials for use in finish grading.

B. Do not excavate wet topsoil.

C. Stockpile in area designated on site to depth not exceeding 8 feet and protect from erosion. Stockpile material on impervious material, until disposal.

D. Remove excess topsoil not intended for reuse, from site.

END OF SECTION

SECTION 312000

EARTH MOVING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Site grading, removal of topsoil and subsoil, building excavating and trenching, backfilling, and compacting.

1.2 SUBMITTALS

A. Samples: Not required.

PART 2 PRODUCTS

2.1 SOIL MATERIALS

A. Soil Materials: As specified in Section 310513 – Soils for Earthwork.

2.2 FILL MATERIALS

A. Fill Materials: As specified in Section 310516 – Aggregates for Earthwork.

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Call Local Utility Line Information service at Miss Utility of Virginia not less than 3 working days before performing Work.

3.2 TOPSOIL EXCAVATING

A. Excavate topsoil and remove excess topsoil not being reused from site.

3.3 SUBSOIL EXCAVATING

A. Remove excess subsoil not being reused from site.

3.4 TRENCHING

A. Excavate for water and gas piping.

3.5 BACKFILLING

A. Backfill areas to contours and elevations.

3.6 PLACING TOPSOIL

A. Place topsoil in areas where seeding is scheduled.

3.7 TESTS

A. Perform laboratory material tests in accordance with ASTM D1557.

B. Density Tests: ASTM D1556 or ASTM D2922.

C. Frequency of Tests: [_____].

END OF SECTION

SECTION 312323

FILL

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Backfilling building perimeter to subgrade elevations.
2. Backfilling site structures to subgrade elevations.
3. Fill under slabs-on-grade.
4. Fill for over-excavation.

B. Related Sections:

1. Section 310513 - Soils for Earthwork: Soils for fill.
2. Section 310516 - Aggregates for Earthwork: Aggregates for fill.
3. Section 033000 - Cast-in-Place Concrete: Concrete materials.

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:
1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54 kg (10 lb) Rammer and a 457 mm (18 in.) Drop.

B. ASTM International:
1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).

1.3 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Materials Source: Submit name of imported fill materials suppliers.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with local standard.

B. Maintain 1 copy of each document on site.

PART 2 PRODUCTS

2.1 FILL MATERIALS

A. Subsoil Fill: Type [S1] [S2] [_____] as specified in Section [02055.] [_____.]

B. Structural Fill: Type [S1] [S2] [A1] [A2] [A3] [A7] [_____] as specified in Section [02055.] [02060.] [_____.]

C. Granular Fill: Type [A1] [A2] [A3] [A7] [_____] as specified in Section [02060.] [_____.]

D. Concrete: Lean concrete with compressive strength of 350 psi.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 013000 - Administrative Requirements: Coordination and project conditions.

B. Verify subdrainage, dampproofing, or waterproofing installation has been inspected.

C. Verify structural ability of unsupported walls to support loads imposed by fill.

3.2 PREPARATION

A. Compact subgrade to density requirements for subsequent backfill materials.

B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with structural fill and compact to density equal to or greater than requirements for subsequent fill material.

C. Scarify subgrade surface to depth of 8 inches.

D. Proof roll to identify soft spots; fill and compact to density equal to or greater than requirements for subsequent fill material.

3.3 BACKFILLING

A. Backfill areas to contours and elevations with unfrozen materials.

B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.

C. Place material in continuous layers as follows:

1. Subsoil Fill: Maximum 8 inches compacted depth.
2. Structural Fill: Maximum 8 inches compacted depth.
3. Granular Fill: Maximum 6 inches compacted depth.

D. Employ placement method that does not disturb or damage other work.

E. Maintain optimum moisture content of backfill materials to attain required compaction density.

F. Backfill against supported foundation walls. Do not backfill against unsupported foundation walls.

G. Backfill simultaneously on each side of unsupported foundation walls until supports are in place.

H. Slope grade away from building minimum 2 percent slope for minimum distance of 10 feet, unless noted otherwise.

I. Make gradual grade changes. Blend slope into level areas.

J. Remove surplus backfill materials from site.

K. Leave fill material stockpile areas free of excess fill materials.

3.4 TOLERANCES

A. Section 014000 - Quality Requirements: Tolerances.

B. Top Surface of Backfilling Within Building Areas: Plus or minus 1 inch from required elevations.

C. Top Surface of Backfilling Under Paved Areas: Plus or minus 1 inch from required elevations.

D. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

3.5 FIELD QUALITY CONTROL

A. Section 014000 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.

B. Perform laboratory material tests in accordance with ASTM D698.

C. Perform in place compaction tests in accordance with the following:
1. Density Tests: ASTM D1556.
2. Moisture Tests: ASTM D3017.

D. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

E. Proof roll compacted fill surfaces under slabs-on-grade.

3.6 PROTECTION OF FINISHED WORK

A. Section 017000 - Execution Requirements: Protecting finished work.

B. Reshape and re-compact fills subjected to vehicular traffic.

3.7 SCHEDULE

A. Interior Slab-On-Grade:
1. Fill Type [_____], [_____] inches thick, compacted to [95] [_____] percent.
2. Cover with Fill Type [_____], [2] [_____] inches thick, compact uniformly to [95] [_____] percent of maximum density.

B. Exterior Side of Foundation Walls [Retaining Walls] [and] [Over Granular Filter Material and Foundation Perimeter Drainage]:
1. Fill Type [_____], [to subgrade elevation.] [[_____] thick.], each lift, compact uniformly to [90] [_____] percent of maximum density.

C. Fill Under Grass Areas:
1. Fill Type [_____], to [6] [_____] inches below finish grade, compact uniformly to [_____] percent of maximum density.

D. Fill Under Concrete Paving:
1. Compact subsoil to [95] [_____] percent of its maximum dry density.
2. Fill Type [_____], to [_____] inches below finish paving elevation, compact uniformly to [_____] percent of maximum density.

E. Fill to Correct Over-excavation:
1. Lean concrete to minimum compressive strength of 350 psi.

END OF SECTION

SECTION 409119

TEMPERATURE MONITORING EQUIPMENT

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawing and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Section, apply to this Section.

1.2 SUMMARY

A. This Section includes requirements for the temperature monitoring system, including:
   1. Central Recorder.
   2. Thermocouples.
   3. Extension wire connecting thermocouples to central recorder.
   4. Central recorder enclosure with heater.
   5. Alarms.

1.3 RELATED SECTIONS

A. See Division 26 – Electrical for electrical wiring, conduit, junction boxes, and other miscellaneous electrical equipment.

1.4 PERFORMANCE REQUIREMENTS

A. Temperature monitoring system shall be specifically manufactured for and capable of registering and displaying temperatures in the training structure during live fire training:
   1. Temperature range during operating conditions at the central recorder: 40°F to 120°F.
   2. Temperature range during operating conditions at the thermocouples: 32°F to 2,300°F.

B. Central recorder shall be capable of scanning and recording temperature readings from a minimum of 6 thermocouples. Recorder model and requirements have been pre-approved by the Virginia Department of Fire Programs.

C. Locations of thermocouples shall be as indicated on the construction drawings.

D. Wiring, conduit, and other miscellaneous electrical items shall be protected from high temperatures by installing them outside of the training structure or behind thermal linings inside the training structure, as indicated on the construction drawings and in Division 26.

1.5 CLASS B FUEL LIVE FIRE TRAINING STRUCTURES

A. System Interface

1. The temperature monitoring and recording system shall be a separate system from the gas burn prop control system.

1.6 SUBMITTALS

A. General:
   1. Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for central recorder, thermocouples, wiring, and NEMA enclosure.

C. Warranties for central recorder and thermocouples.

D. Maintenance and operations manuals for central recorder and thermocouples.

PART 2 – PRODUCTS

2.1 CENTRAL RECORDER

A. Minimum Requirements of Central Recorder
   1. Central recorder shall have a digital display that indicates readings during operation. The digital display shall:
      a. Be capable of displaying a minimum of 6 channels simultaneously and shall be readable at 3 foot line of sight.
      b. Be readable in direct sunlight for exterior installations.
      c. Have back lighting or be bright enough to read in low level light conditions such as a mechanical room.
      d. Be capable of scanning continuously through readings from all of the thermocouples.
      e. Be capable of being programmed so that different thermocouples can be scanned during different training evolutions.
   2. Control of the central recorder shall be local and not require the use of an interface. Operation of the instrument shall be accomplished through either a touch screen or push button interface.
   3. Central recorder shall be capable of recording the total number of sensors installed in the live fire training structure.
   4. Central recorder shall be capable of recording all of the channels at a 10 second or less interval.
   5. Central recorder shall be capable of storing data on removable storage media, such as PCMCIA/compact flash cards or USB Flash Drives.
   6. Central recorder shall interface with a computer via standard wireless interface, Ethernet, USB, or RS-232, or RS-485.
   7. Central recorder shall have at least 1 output to control an alarm. Each channel shall have an independent high set point.
   8. Central recorder shall be capable of displaying and recording temperatures in degrees Fahrenheit and, if also available, degrees Celsius.
   9. Central recorder shall be supplied with software that can display the live fire burn data in either a graphical or tabular format. The software shall be capable

of exporting the data in a csv, txt, or other format compatible with commercially available spread sheet software.

10. Central recorder shall have an on/off switch.
11. Data recording will start at central recorder power on or by a single record command.
12. Central recorder shall have sufficient internal memory to store at least 24 hours of continuous measurement data for all connected channels based on 1 second sampling interval. The data shall have a date and time stamp.
13. Central recorder shall be capable of transferring or dumping data to an external storage device without erasing the internal memory.
14. Loss of power or turning the unit to the off position shall not affect the internal memory. A secondary back up power source is not permitted as an alternative.
15. Central recorder shall have open thermocouple detection and in the event a sensor fails, the instrument shall initiate an alarm condition.
16. Data management
    a. All data shall be stored in a non-volatile internal memory continuously throughout the training period.
    b. All data shall be date and time stamped specific.
    c. All data shall be able to be transferred to a permanent storage media. The memory shall be sufficient to hold at least 30 days of continuous data.
    d. The data shall also be capable of being downloaded via connection to a computer in a usable format compatible with commercially available spread sheet programs.

B. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following manufacturers:

The following list of manufacturers shall be completed by the owner's architectural/ engineering firm. Jurisdictions shall solicit at a minimum 3 vendors/manufacturers. The following is a template to help with the procurement process:

1. _____ Corporation. Model: _____
2. _____ Company. Model: _____
3. _____ Incorporated. Model: _____
4. Or an approved equal.

2.2 THERMOCOUPLES

A. Type K sensors (ASTM E230) shall be used for ceiling and wall mount installations meeting the following criteria:
    1. Sensors shall be ungrounded according to ASTM E608.
    2. Sensor sheath shall be suitable for operation from ambient to 2300°F and shall be 310SS or Inconel 600.
    3. Sensors shall be 1/8 inch nominal diameter with a transition fitting not larger than 3/8 inch nominal diameter and 2 inches long. The maximum exposure temperature of the transition fitting shall be greater than 250°F.

4. Lead wire for the sensors shall be 20 gauge glass over glass construction length as required by drawings and field conditions, minimum 4 inches.
5. Each sensor shall be terminated using a standard thermocouple plug having type K terminals complying with ASTM 1129.

B. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following manufacturers:

The following list of manufacturers shall be completed by the owner's architectural/ engineering firm. Jurisdictions shall solicit at a minimum 3 vendors/manufacturers. The following is a template to help with the procurement process:

1. _____ Corporation. Model: _____
2. _____ Company. Model: _____
3. _____ Incorporated. Model: _____
4. Or an approved equal.

2.3 EXTENSION WIRE CONNECTING THERMOCOUPLES TO CENTRAL RECORDER

A. All connecting wire between the central recorder enclosure and the thermocouple sensor shall be run in rigid conduit.
1. All conduit connections shall be sealed and free of obstruction.
2. Connections to the TMS enclosure shall be made through the bottom of the box using water tight fittings.
3. Conduit junction shall be taped where the fittings will be within wet concrete.
4. Single runs from each junction box in a room shall be made directly to the TMS enclosure.
5. Close bends and pull boxes are not permitted. Sweeping bends shall be made at all 90° corners.

B. Extension wire shall be 20 gauge solid wire with a glass/glass color coded covering with a classification of A Duplex or E Duplex according to ASTM E574.

C. Extension wire shall be capable of continuous operation at 650°F or higher and meet all other performance requirements of E574.

D. Extension wire shall meet the calibration tolerances specified in Table 1 of ASTM E230.

E. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following manufacturers:

The following list of manufacturers shall be completed by the owner's architectural/ engineering firm. Jurisdictions shall solicit at a minimum 3 vendors/manufacturers. The following is a template to help with the procurement process:

1. _____ Corporation. Model: _____
2. _____ Company. Model: _____
3. _____ Incorporated. Model: _____
4. Or an approved equal.

2.4 CENTRAL RECORDER ENCLOSURE WITH HEATER

A. Enclosure shall be a NEMA 4 or 4X rated enclosure with a lockable clear plexiglass full front cover at indicated location. The enclosure shall:
   1. Provide easy access to the front of the data recorder as well as the rear for wiring termination.
   2. Include a top mounted high intensity strobe light with audible alarm and silence push button if the central recorder does not provide its own alarm indication.
   3. Be capable of supporting both portable and permanent mountings.

B. A 2 position power on/off switch shall be provided. Power shall include a surge protector.

C. Heater for the NEMA enclosure shall be installed to protect the system from moisture and possible damage due to low temperatures. The heater shall be set for 50°F to 60°F. The wattage of the heater shall be determined based on the size of the enclosure. The enclosure heater shall be either convection or forced air type, 115V electric heater.

D. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following manufacturers:

The following list of manufacturers shall be completed by the owner's architectural/ engineering firm. Jurisdictions shall solicit at a minimum 3 vendors/manufacturers. The following is a template to help with the procurement process:

1. _____ Corporation. Model: _____
2. _____ Company. Model: _____
3. _____ Incorporated. Model: _____
4. Or an approved equal.

2.5 ALARMS

A. An audio visual alarm indicating that that the high set point has been reached shall be supplied and mounted on the exterior of the building. It shall have a red flashing strobe and audible alarm of 85 dB or greater.

B. The alarm may be either DC or AC powered but the AC version shall not exceed a 110VAC 3 AMP requirement.

C. An audio visual alarm shall be mounted on the central recorder enclosure if the recorder does not have its own alarm indication.

D. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following manufacturers:

The following list of manufacturers shall be completed by the owner's architectural/ engineering firm. Jurisdictions shall solicit at a minimum 3 vendors/manufacturers. The following is a template to help with the procurement process:

1. _____ Corporation. Model: _____
2. _____ Company. Model: _____
3. _____ Incorporated. Model: _____
4. Or an approved equal.

PART 3 – EXECUTION

3.1 CENTRAL RECORDER

A. Install central recorder in either a permanent or portable mount in accordance with manufacturer's requirements inside NEMA enclosure.

B. Mount central recorder according to the instrument manufacturer's guidelines.

C. Ground central recorder to the panel and an earth ground. The central recorder shall also be current limited by fuse or breaker according to the instrument specifications.

D. For portable central recorders, place the instrument in the NEMA enclosure during the live fire training. It shall have its own case and all connections shall be clearly marked. All sensors shall be connected for each burn regardless of which room the burn is being performed in, connecting select channels is not permitted. Further, the portable central recorder shall be connected to the alarm indicator.

3.2 THERMOCOUPLE

A. Install thermocouples as shown on the construction drawings. Connect lead wire to extension wire as indicated.

B. Mount sensors using a combination of compression fittings, boxes and mounting plates that result in a water tight connection.

C. Compression fittings may be omitted at sensors mounted behind the thermal linings.

D. Install sensors in a manner that protects the back section of the sensor from temperatures that exceed its specified operating temperature. See the construction drawings for additional mounting information.

E. Mount ceiling sensors no more than 6 feet from center of the burn location.

F. Mount wall sensors between 36 inches and 48 inches above finished floor no more than 6 feet from center of the burn location and on the wall adjoining the corner where the majority of burns will be conducted.

G. Extend sensors at least 2 inches from the mounting and at least 1/2 inch beyond any guards or shields.

H. Gas Safety Sensor Location

1. Locate gas safety sensor approximately 5 feet above the floor and where practical not more than 6 feet from the gas burn prop. The sensor shall be exposed and cannot be covered by metal protectors. The sensor shall protrude at least 2 inches off the wall.

3.3 EXTENSION WIRE CONNECTING THERMOCOUPLES TO CENTRAL RECORDER

A. Run extension wire from connection point between lead wire and extension wire to central recorder panel within conduit as indicated. Manufacturer's instructions and requirements of Division 26 shall be followed. Manufacturer's instructions govern where there are conflicts.

B. Connect extension wires from each thermocouple to central recorder.

C. Install the extension wire carefully to prevent any damage to the outer wire sheath material. Replace all damaged wire.

D. Make connections in the panel using Type K connectors or terminal strips.

E. Directly connect Type K extension wire to the instrument panel.

F. Make all connections at the sensor using Type K connectors. Where standard connectors cannot be used other Type K compensated connections are permissible.

G. Cover ends of the glass wire in the panel with shrink tube to minimize fraying of the glass covering. Protect the wire at the jack connection with high temperature tubing.

3.4 NEMA ENCLOSURE WITH HEATER

A. Mount NEMA enclosure at location shown on construction drawing.

B. Mount enclosure heater inside the NEMA enclosure following all manufacturer requirements.

3.5 ALARMS

A. Install alarm on the outside of the building in a visible area near the mechanical room. It shall be mounted at an elevation of 84 inches above the first floor slab elevation and it shall not protrude more than 15 inches from the structure.

3.6 CALIBRATION AND TESTING

A. System

1. Test recording system at initial installation and at the prescribed interval. The inputs shall be tested using an appropriate calibrator. Verify alarm outputs and data storage. Verify all panel enunciators or audio visual alarms.
2. Test system as a complete loop. Apply heat source with a known temperature to each sensor and the record readings. A minimum of 2 temperatures shall be tested, 1 at 1/3 of span and 1 at 2/3 of span. The loop resistance at room temperature shall also be recorded.
3. Calibrate and test temperature monitoring system in accordance with manufacturer's requirements. Program central recorder to tailor the system to the requirements of the Owner's training program.
4. Function Tests
   a. Test TMS for functionality before every burn. All sensors shall be reading and the alarm shall be in working order.
5. Physical Tests
   a. Perform diagnostic tests as determined by a service professional annually in accordance with ASTM E1350, E780, and E2846.
6. Physical Inspection
   a. Visually inspect thermocouples annually for damage. The protective plates and tiles shall be removed and the insulation, connection and sensor assessed. The wires insulation and thermal insulation shall be inspected to verify that it is intact and dry. Melted or physically compromised materials shall be replaced.
7. Calibration
   a. Calibrate system annually. Each sensor shall be tested at specific points using a loop test. A report of test and calibration shall be provided for all new equipment installations and at least annually for existing systems. A report of test and calibration shall be supplied any time service to the TMS is performed.

B. Thermocouple
1. Loop Resistance
   a. Measure the ambient temperature loop resistance in ohms in accordance with ASTM E1350.
2. Insulation Resistance
   a. Measure the insulation resistances according to ASTM E780 and meet the requirements set forth in ASTM E608 1000 Meg-Ohms @ 500 Volts DC for Un-Grounded sensors only.
3. Sensor Calibration
   a. The sensors shall meet standard limits of error calibration tolerance when new. Tolerances are specified in ASTM E230. The allowable loop temperature error for any sensor shall meet the standard tolerance

requirement. Used thermocouples shall meet a 1 percent tolerance of full span.

4. Gas Safety Thermocouple Testing
   a. Test gas prop safety thermocouple sensors for function when installed and at the frequency specified by the gas prop manufacturers or once a year whichever is less.

C. Extension Wiring

1. Electrical Assessment
   a. Shorts to Ground
      i. Test each leg of the extension wire to assure there is no connection to the building ground. There shall not be a connection between the extension wire and the conduit.
   b. Loop Resistance
      i. Test the loop resistance in ohms and the value verified to be consistent with typical values for the estimated length of the extension wire.

D. Alarms

1. Perform a functional test to assure the alarm is working properly. It shall be tested at a preset temperature using the alarm output from the recorder. An optional emergency alarm trip may be installed to allow the alarm to be manually activated by anyone operating the TMS.

3.7 DEMONSTRATION AND TRAINING PERIOD

A. Provide 1 qualified person for a minimum of 1 full day to demonstrate the system and train Owner's personnel in use and maintenance of system. The amount of training time required will depend on the complexity of the system.

B. Train department personnel on the operation of the monitoring/recording system. In addition, they shall be instructed on how the system functions and given specific instruction on maintaining data integrity.

C. The first live burn test of the system shall be made independently of training and for the sole purpose of testing the system under live conditions.

END OF SECTION

COMMONWEALTH OF VIRGINIA
LIVE FIRE TRAINING STRUCTURE
PROTOTYPE 4 MODULAR/INTERMODAL SHIPPING CONTAINER BUILDING – CLASS B FUEL

Street Address
City, Virginia, Zip Code

OWNER
LOCALITY/MUNICIPALITY
Street Address
City, Virginia Zip Code
Phone:
Fax:

LIVE FIRE TRAINING STRUCTURE GRANT
FUNDS PROVIDED BY:
COMMONWEALTH of VIRGINIA
Department of Fire Programs
1005 Technology Park Drive
Glen Allen, VA 23059
Phone: (804) 371-0220

ARCHITECT/ ENGINEER
ARCHITECT AND/OR ENGINEERING FIRMS
Street Address
City, State Zip Code
Phone:
Fax:

THIS IS A PROTOTYPICAL DESIGN SET OF DRAWINGS NOT INTENDED FOR CONSTRUCTION. THESE DRAWINGS ARE INTENDED TO BE MODIFIED IN CONJUNCTION WITH THE PROJECT MANUAL AND SPECIFICATIONS PREPARED BY AN ARCHITECT/ENGINEER EMPLOYED BY THE GRANT RECIPIENT IN THE DESIGN OF A NEW LIVE FIRE TRAINING STRUCTURE.

BUILDING CODE DATA

JURISDICTION:
CITY/COUNTY, VIRGINIA

BUILDING CODE:
A. VIRGINIA UNIFORM STATEWIDE BUILDING CODE (VUSBC) LATEST EDITION
B. INTERNATIONAL BUILDING CODE (IBC) LATEST EDITION AS ADOPTED/AMENDED BY VUSBC

USE GROUP/OCCUPANCY (IBC SECTIONS 312, 1004): EDUCATIONAL

	FLOOR AREA (SQ. FT.)	DENSITY (SQ. FT./PERSON)	OCCUPANTS
BUILDING, GROSS	1,558	50	31

THE STRUCTURE IS DESIGNED AS A TRAINING PROP AND IS NOT HEATED OR AIR CONDITIONED AND DOES NOT INCLUDE RESTROOMS.*

CONSTRUCTION TYPE (IBC SECTION 602):
(II-B) NON-COMBUSTIBLE/UNPROTECTED

SPRINKLED:
NOT REQUIRED

HEIGHT/AREA LIMITATIONS (IBC SECTIONS 504 AND 506): UTILITY OCCUPANCY

	ACTUAL:	ALLOWABLE:
A) AREA:	1,558 SQ. FT.	8,500 SQ. FT.
B) HEIGHT:	+/- 19'-2" (2 STORY)	40'-0" (2 STORY)

*NOTE: A CODE MODIFICATION REQUEST MUST BE SUBMITTED TO THE BUILDING OFFICIAL FOR CONSTRUCTION OF THIS NON-HABITABLE TRAINING PROP.

INDEX OF DRAWINGS

LOCATION MAP

PRIME PROFESSIONAL FIRM LOGO

Project Title
COMMONWEALTH OF VIRGINIA LIVE FIRE TRAINING STRUCTURE PROTOTYPE 4 CLASS B FUEL

SUB-CONSULTANT'S LOGO

Department of Fire Programs

NOT FOR CONSTRUCTION

No.	REVISIONS	Date

Sheet Title
TITLE SHEET, BUILDING CODE DATA, & LOCATION MAP

CITY/COUNTY	VIRGINIA
Drawn By: ATA	Approved By: MAM
Checked By: MAM	Date: 01/31/24

PROFESSIONAL SEAL

Sheet No.
T0.1
1 of 16

ABBREVIATIONS

@	AT
ADJ	ADJACENT, ADJUSTABLE
AFF	ABOVE FINISHED FLOOR
AGG	AGGREGATE
ANCH	ANCHOR, ANCHORAGE
ANOD	ANODIZED
APP'D	APPROVED
ARCH	ARCHITECTURAL
ASSOC	ASSOCIATED
AUTO	AUTOMATIC
AUX	AUXILIARY
AVG	AVERAGE
BLDG	BUILDING
BLK	BLOCK
BOTT	BOTTOM
BR	BURN ROOM
BUR	BUILT UP ROOFING
CEM	CEMENT
CHK'D	CHECKED
CJ	CONTROL JOINT
℄	CENTER LINE
CLG	CEILING
CLR	CLEAR
COL	COLUMN
CONC	CONCRETE
CONT	CONTINUOUS
CONTR	CONTRACTOR
COORD	COORDINATE
CTR	CENTER
D	DEEP (DEPTH)
DBL	DOUBLE
DEP	DEPRESSION, DEPRESS
DET	DETAIL
DIA	DIAMETER
DIM	DIMENSION
DN	DOWN
DR	DOOR
DWG(S)	DRAWING(S)
DWL	DOWEL
EA	EACH
ELEV	ELEVATION
ELECT	ELECTRICAL
ENCLOS	ENCLOSURE
EQ	EQUAL
EQUIP	EQUIPMENT
EXP	EXPANSION, EXPOSED
EJ	EXPANSION JOINT
EXIST	EXISTING
EXT	EXTERIOR
FDN	FOUNDATION
FIN	FINISH
FLR	FLOOR
FLEX	FLEXIBLE
FRT	FIRE RETARDANT TREATED
FT(')	FEET (FOOT)
FTG	FOOTING
GA	GAUGE
GALV	GALVANIZED
GC	GENERAL CONTRACTOR
GEN	GENERAL
H	HIGH
HDW	HARDWARE
HM	HOLLOW METAL
HORIZ	HORIZONTAL
HP	HIGH POINT
HT(H)	HEIGHT
IN(")	INCH
INFO	INFORMATION
INSUL	INSULATE, INSULATION
INT	INTERIOR
JT	JOINT
L	LENGTH
LB(S)	POUND, POUNDS
LTWT CONC	LIGHTWEIGHT CONCRETE
MATL	MATERIAL
MAX	MAXIMUM
MECH	MECHANICAL
MED	MEDIUM
MANUF	MANUFACTURER
MIN	MINIMUM
MISC	MISCELLANEOUS
MTD	MOUNTED
MTG HT	MOUNTING HEIGHT
MTL	METAL
N/A	NOT APPLICABLE
NEC	NECESSARY
NIC	NOT IN CONTRACT
NTS	NOT TO SCALE
NO.#	NUMBER
NOM	NOMINAL
OC	ON CENTER
OD	OUTSIDE DIAMETER
OH	OVERHEAD
OPENG	OPENING
OPP	OPPOSITE
PART	PARTITION
PL	PLATE
PLMBG	PLUMBING
PR	PAIR
PREFAB	PREFABRICATED
PROV	PROVIDE
PSF	POUNDS PER SQUARE FOOT
PSI	POUNDS PER SQUARE INCH
PT	PAINT, POINT
PVC	POLYVINYL CHLORIDE
R	RADIUS, RISER
REF	REFLECTED, REFERENCE, REFER
REINF	REINFORCEMENT
REQ	REQUIRE, REQUIRED
REV	REVISE, REVISION
ROOFG	ROOFING
RH	RIGHT HAND
RO	ROUGH OPENING
RM	ROOM
SCHED	SCHEDULE
SEAL	SEALANT
SHT	SHEET
SIM	SIMILAR
SPEC(S)	SPECIFICATION
SQ	SQUARE
SS	STAINLESS STEEL
STD	STANDARD
STL	STEEL
STRUC	STRUCTURAL (STRUCTURE)
SUSP	SUSPEND, SUSPENDED
T	TOP, THICK
T&B	TOP AND BOTTOM
TEMP	TEMPERED, TEMPORARY, TEMPERATURE
THK	THICK, THICKNESS
THRU	THROUGH
TS	STRUCTURAL STEEL TUBE OR TOP OF STEEL
TYP	TYPICAL
UL	UNDERWRITERS LABORATORIES
UNO	UNLESS NOTED OTHERWISE
VERT	VERTICAL
V.I.F.	VERIFY IN FIELD
WT	WEIGHT
WWF	WELDED WIRE FABRIC
W	WIDTH, WIDE
W/	WITH
W/I	WITHIN
W/O	WITHOUT
WP	WORKING POINT

A/E TO PROVIDE ABBREVIATIONS AS NEEDED

MATERIAL INDICATIONS

EARTH

GRANULAR FILL

STEEL

INSULATION

FIRE BRICK

CONCRETE

A/E TO PROVIDE MATERIAL INDICATIONS AS NEEDED

GRAPHIC SYMBOLS

COLUMN CENTER-LINES

A — COLUMN LINE & LETTER

1 — GRID LINE & NUMBER

SECTION

A — SECTION LETTER

X2 | X2 — SECTION SHOWN ON SHEET NUMBER; SECTION CALLED OUT ON SHEET NUMBER

DETAIL REFERENCE

1 — DETAIL NUMBER

X2 | X2 — DETAIL SHOWN ON SHEET NUMBER; DETAIL CALLED OUT ON SHEET NUMBER

WALL ELEVATION REFERENCE

A — DIRECTION OF WALL

X2 | X2 — WALL TYPE (IN SECTION); SECTION SHOWN ON SHEET NUMBER; SECTION CALLED OUT ON SHEET NUMBER

SLOPE

SLOPE — DIRECTION OF DOWNWARD SLOPE

SPOT ELEVATION- NEW

ELEV. = 0.00'

DOOR NUMBER

101-1 — NEW DOOR & NUMBER

ROOM NUMBER

101 / BR — ROOM NUMBER; BURN ROOM

EXTERIOR ELEVATION

A — A3.2 | A3.2 — DIRECTION OF REFERENCED ELEVATION; ELEVATION LETTER; ELEVATION SHOWN ON SHEET NUMBER; ELEVATION CALLED OUT ON SHEET NUMBER

DIMENSIONING CONVENTIONS

2'-0"

A/E TO PROVIDE GRAPHIC SYMBOLS AS NEEDED

ELEVATION TARGET

TOP OF STEEL ELEV. = 11'-0" — ITEM BEING REFERENCED; ELEVATION

WINDOW TYPE

4 — WINDOW TYPE

NORTH ARROW

NORTH

KEY NOTE

7

REVISION

AREA OF REVISION

1 — REVISION NUMBER

LIMITS OF CONSTRUCTION

PRIME, PROFESSIONAL FIRM LOGO

Project Title

COMMONWEALTH OF VIRGINIA LIVE FIRE TRAINING STRUCTURE PROTOTYPE 4 CLASS B FUEL

SUB-CONSULTANT'S LOGO

Department of Fire Programs

NOT FOR CONSTRUCTION

No.	REVISIONS	Date

Sheet Title

ABBREVIATIONS MATERIAL INDICATORS, & GRAPHIC SYMBOLS

CITY/COUNTY VIRGINIA

Drawn By: ATA	Approved By: MAM
Checked By: MAM	Date: 01/31/24

PROFESSIONAL SEAL

Sheet No.

A0.1

GENERAL NOTES:

GENERAL:

1. WORK PERFORMED SHALL COMPLY WITH THE FOLLOWING:
   A. THE VIRGINIA UNIFORM STATEWIDE BUILDING CODE (VUSBC); LATEST EDITION
   B. THE INTERNATIONAL BUILDING CODE (IBC); LATEST EDITION AS ADOPTED/AMENDED BY THE VUSBC
   C. ALL APPLICABLE STATE AND LOCAL CODES, ORDINANCES AND REGULATIONS
2. MAINTAIN UTILITY EQUIPMENT IN SERVICE AND PROTECT AGAINST DAMAGE DURING CONSTRUCTION. IF REQUIRED, CONTRACTORS SHALL, PROVIDE TEMPORARY SERVICES DURING INTERRUPTIONS TO EXISTING UTILITIES. PROVIDE NO LESS THAN 72 HOURS PRIOR NOTICE TO THE OWNER IF SHUTDOWN OF SERVICE IS REQUIRED.

DESIGN LOADS:

1. BUILDING CLASSIFICATION CATEGORY _____ II

2. GROUND SNOW, Pg _____ 30 PSF*
   FLAT ROOF SNOW LOAD, Pf _____ 23 PSF*
   SNOW EXPOSURE FACTOR, Ce _____ 0.9
   SNOW THERMAL FACTOR, Ct _____ 1.2
   SNOW IMPORTANCE FACTOR, I _____ 1.0

3. WIND SPEED _____ 115 MPH*
   EXPOSURE _____ C*
   IMPORTANCE FACTOR, I _____ 1.0
   INTERNAL PRESSURE COEFFICIENT _____ ±0.18

4. COMPONENTS AND CLADDING (A = 10 SQFT):
   ROOF WIND LOADING:
   ZONE 1 _____ +12.5, -21.8 PSF*
   ZONE 2 _____ +12.5, -36.5 PSF*
   ZONE 3 _____ +12.5, -55.0 PSF*
   WALL WIND LOADING:
   ZONE 4 _____ +21.8, -23.6 PSF*
   ZONE 5 _____ +21.8, -29.1 PSF*

5. LIVE LOADS:

	UNIFORM
FLAT AND SLOPED ROOFS	30 PSF
FLOORS	30 PSF
STAIRS	100 PSF
* MINIMUM CONCENTRATED LOAD OF 300 POUNDS ON STAIR TREADS (ON AREA OF 4 SQUARE INCHES)	
RAILINGS	30 PSF UNIFORM OR 200 LB POINT LOAD
EXTERIOR APRON	125 PSF

6. SEISMIC DESIGN:
   SEISMIC IMPORTANCE FACTOR, I _____ 1.0
   MAPPED SPECTRAL RESPONSE ACCELERATION__Ss _____ 0.42*
   MAPPED SPECTRAL RESPONSE ACCELERATION__S1 _____ 0.15*
   SEISMIC USE GROUP _____ I
   SITE SOIL CLASS _____ D*
   SPECTRAL COEFFICIENT, Sds _____ 0.448*
   SPECTRAL COEFFICIENT, Sd1 _____ 0.184*
   SEISMIC DESIGN CATEGORY _____ C*
   BASIC STRUCTURAL SYSTEM _____ LIGHT FRAME W/ SHEAR PANELS OF ALL OTHER MATERIAL
   SEISMIC FORCE RESISTING SYSTEM _____ A (ASCE 7 TABLE 12.2-1)
   DESIGN BASE SHEAR _____ 12.2 KIPS*
   SEISMIC RESPONSE COEFFICIENT Cs _____ 0.12*
   RESPONSE MODIFICATION COEFFICIENT R _____ 2
   SEISMIC ANALYSIS _____ EQUIV. LATERAL FORCE PROCEDURE

*VERIFY WITH LOCAL JURISDICTION

ARCHITECTURAL:

1. UNLESS NOTED OTHERWISE, ALL PARTITIONS ARE DIMENSIONED TO THE FACE OF FINISHED WALL.
2. THE DATUM ELEVATION IS TAKEN AT THE TOP OF THE EXTERIOR APRON SLAB WHERE THE APRON INTERSECTS THE PERIMETER OF THE BUILDING (EXCEPT AT GROUND FLOOR DOORS).
3. THE DATUM ELEVATION IS X.XX FEET.
4. ALL BUILDING ELEVATIONS ARE SHOWN IN THE PLANS AS +X.XX OR -X.XX IN FEET RELATIVE TO THE DATUM.

FOUNDATIONS:

1. CONTRACTOR SHALL NOTIFY "MISS UTILITY" PRIOR TO BEGINNING EXCAVATION FOR LOCATION OF UNDERGROUND UTILITIES.
2. EXTERIOR FOOTINGS AND COLUMN FOOTINGS WERE DESIGNED TO BEAR ON UNDISTURBED SOIL BELOW THE FROST LINE A MINIMUM OF 18" BELOW EXISTING GRADE.
3. MINIMUM SOIL BEARING PRESSURE IS ASSUMED TO BE 2000* PSF. THE OWNER SHALL EMPLOY A GEOTECHNICAL ENGINEER TO VERIFY THAT THIS ALLOWABLE SOIL BEARING PRESSURE IS ATTAINABLE. IF THIS IS NOT ATTAINABLE, THE OWNER/CONTRACTOR SHALL CONTACT THE ENGINEER FOR REDESIGN.
4. SOIL POISONING TREATMENT SHALL BE PROVIDED FOR AREAS BENEATH CONCRETE SLABS ON EARTH AND ALONG INTERIOR SURFACES OF FOUNDATION BY APPLICATOR CERTIFIED TO PERFORM SUCH WORK IN THE STATE OF VIRGINIA. FURNISH OWNER WITH A WRITTEN 5-YEAR INSURED GURARANTEE.
5. ALL COLUMN FOOTINGS SHALL BE CENTERED UNDER COLUMN CENTER LINES UNLESS NOTED OTHERWISE.
6. ALL UTILITIES WHICH CROSS FOOTINGS MUST PASS ABOVE STRIP FOOTING THROUGH THE FOUNDATION WALL, SLEEVE, PATCH, AND PARGE. STEP FOOTINGS AS REQUIRED. REINFORCING SHALL BE CONTINUOUS AT ALL FOOTING STEPS.
7. CONCRETE SLABS ON GRADE SHALL BEAR ON A MINIMUM OF 6" COMPACTED #57 STONE. WHERE REQUIRED, SOIL UNDER FOOTINGS SHALL BE COMPACTED TO AT LEAST 95% OF MAXIMUM DENSITY AS DETERMINED BY ASTM METHOD D-698 (STANDARD PROCTOR).

CONCRETE:

1. CONCRETE FOR FOOTINGS SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 3,000 PSI AT 28 DAYS AND A MAXIMUM WATER/CEMENT RATIO OF 0.5.
2. CONCRETE FOR FLOOR SLABS AND OTHER ABOVE GROUND CONSTRUCTION SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 5000* PSI AT 28 DAYS AND A MAXIMUM WATER/CEMENT RATIO OF 0.40* UNLESS NOTED OTHERWISE.
3. ALL CONCRETE SHALL BE MIXED, PLACED AND TESTED IN ACCORDANCE WITH THE LATEST EDITION OF ACI 318.
4. ALL CONCRETE SHALL HAVE A SLUMP OF 4" ± 1" UNLESS NOTED OTHERWISE.
5. CONCRETE MIX DESIGNS SHALL BE SUBMITTED TO THE STRUCTURAL ENGINEER OF RECORD FOR APPROVAL PRIOR TO USE.
6. ALL CONCRETE TO BE POURED IN COLD WEATHER, AS DEFINED IN SECTION 1.1 OF ACI 306R, COLD WEATHER CONCRETING, SHALL FULLY COMPLY WITH ACI 306.1, STANDARD SPECIFICATIONS FOR COLD WEATHER CONCRETING, AND ACI 306R.
7. ALL CONCRETE TO BE POURED IN HOT WEATHER, AS DEFINED IN SECTION 1.2 OF ACI 305R, HOT WEATHER CONCRETING, SHALL FULLY COMPLY WITH ACI 305.1, STANDARD SPECIFICATIONS FOR HOT WEATHER CONCRETING, AND ACI 305R.
8. REINFORCING BARS SHALL BE ASTM A-615, GRADE 60. EPOXY COATED BARS SHALL BE ATSM A-775 GRADE 60 AS A BID ALTERNATE
9. ALL CONCRETE REINFORCING SHALL BE DETAILED AND CONSTRUCTED PER ACI 318.
10. CONTRACTOR SHALL SUBMIT REINFORCING SHOP DRAWINGS FOR CONCRETE REINFORCING STEEL FOR APPROVAL.
11. ALL CONCRETE REINFORCING STEEL SHALL HAVE CORNER OR "Z" BARS OF THE SAME DIAMETER AT ALL CORNERS AND CHANGES IN DIRECTION. CORNER AND "Z" BARS SHALL LAP CONTINUOUS BARS A MINIMUM OF 48 TIMES THE NOMINAL BAR DIAMETER ON BOTH ENDS.
12. ALL CONCRETE SLABS ON GRADE SHALL BE REINFORCED WITH WELDED WIRE FABRIC OF THE SIZE INDICATED ON THE PLANS AND SHALL BE PLACED OVER 6 MIL VAPOR BARRIER UNLESS SHOWN OTHERWISE ON DRAWINGS.
13. SAW CUTTING CONTROL JOINTS SHALL BE PERFORMED AS SOON AS THE CONCRETE SLAB ON GRADE IS HARD ENOUGH TO SUPPORT THE CUTTING MACHINE WITHIN FIRST FOUR HOURS OF CURING.
14. SLABS ON GRADE INCLUDING THE EXTERIOR APRON SLAB SHALL BE AIR ENTRAINED CONCRETE AND REINFORCED WITH WELDED WIRE FABRIC PLACED ON CONCRETE BLOCKS. AIR ENTRAINMENT FOR SLABS SHALL BE 6% BY VOLUME ± 1%.
15. ALL CONCRETE EXCEPT FOOTINGS SHALL BE AIR-ENTRAINED 6% BY VOLUME ± 1% UNLESS SHOWN OTHERWISE ON DRAWING.
16. CONCRETE PROTECTION FOR STEEL REINFORCEMENT OF CAST-IN-PLACE CONCRETE SHALL BE AS SPECIFED BELOW:

TYPE OF STRUCTURE	MINIMUM CLEAR COVER (UNLESS OTHERWISE NOTED IN DRAWINGS)
FOOTINGS AND OTHER EARTH FORMED CONCRETE	3"

17. SPECIAL INSPECTIONS SHALL BE REQUIRED FOR THE CAST IN PLACE CONCRETE MATERIALS AND INSTALLATION, INCLUDING BUT NOT LIMITED TO REINFORCEMENT, BOLTS, FORMWORK, PLACEMENT, CURING AND STRENGTH AS IDENTIFIED IN THE SCHEDULE OF SPECIAL INSPECTIONS.

STRUCTURAL STEEL:

1. ALL STRUCTURAL STEEL FRAMING SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF AISC "MANUAL OF STEEL CONSTRUCTION." ALL STRUCTURAL STEEL BEAM, COLUMN AND CHANNEL SHAPES SHALL BE ASTM A-992. ALL STEEL ANGLES AND PLATES SHALL BE ASTM A-36. ALL STRUCTURAL STEEL TUBES SHALL BE ASTM A500 GRADE B.
2. CONTRACTOR TO SUBMIT STRUCTURAL STEEL SHOP DRAWINGS FOR APPROVAL BY THE STRUCTURAL ENGINEER OF RECORD.
3. ALL STRUCTURAL STEEL SHOP WORK TO BE WELDED WITH E70XXX ELECTRODES. FIELD WORK CONNECTIONS TO BE BOLTED WITH 3/4" HIGH STRENGTH A325X BOLTS OR WELDED WITH E70XXX ELECTRODES. PRE-DRILL HOLES IN STEEL MEMBERS AS REQUIRED FOR FASTENING, BLOCKING, ETC.
4. ALL COLUMNS SHALL BE FURNISHED WITH CAP PLATES AND BASE PLATES OF SIZE CALLED FOR AND SHALL BE SHOP WELDED. BASE PLATES SHALL BEAR ON LEVELING NUTS SET IN 1" THICKNESS OR APPROVED SHRINK RESISTANT GROUT EXCEPT WHEN SHOWN OTHERWISE, AND ANCHORED WITH FOUR (4) 3/4" DIAMETER 12" THREADED RODS WITH A WASHER AND DOUBLE NUTS. SHIM UNDER BASE PLATES AS REQUIRED.
5. ALL STRUCTURAL STEEL FRAMING TO HAVE ONE SHOP COAT OF RUST INHIBITIVE PAINT AFTER FABRICATION, AND ONE FINISH COAT OF APPROVED PAINT, UNLESS NOTED OTHERWISE. ALL EXPOSED STEEL TO HAVE TWO (2) COATS OF APPROVED COLOR SELECTED BY OWNER.
6. SPECIAL INSPECTIONS SHALL BE REQUIRED FOR THE STRUCTURAL STEEL MATERIALS, QUALITY CONTROL PROGRAM, BOLTS, NUTS AND WASHERS, WELDING, AND STRUCTURAL DETAILS AS IDENTIFIED IN THE SCHEDULE OF SPECIAL INSPECTIONS.

STEEL GRATING AND TREADS:

1. STEEL GRATING SHALL BE 2" DEEP, 14 GAUGE, GALVANIZED GRIP STRUT DIAMOND SAFETY GRATING OR EQUIVALENT. INSTALL GRATING IN ACCORDANCE WITH THE MANUFACTURER'S REQUIREMENTS TO CREATE A TWO-SPAN CONDITION BY WELDING. WELD SIDES OF ADJACENT PANELS TOGETHER PER MANUFACTURER'S RECOMMENDATIONS.
2. STEEL STAIR TREADS SHALL BE 2" DEEP, 14 GAUGE GALVANIZED GRIP STRUT DIAMOND STAIR TREADS OR EQUIVALENT. INSTALL TREADS IN ACCORDANCE WITH THE MANUFACTURER'S REQUIREMENTS USING STANDARD ZINC COATED BOLTS.

WOOD:

1. WOOD FRAMING IS BASED ON DESIGN VALUES NOTED IN THE LATEST EDITION OF THE NATIONAL DESIGN SPECIFICATION FOR WOOD CONSTRUCTION.
2. RAFTERS FOR CHOP OUT OPENING SHALL BE CONSTRUCTED WITH No. 2 SOUTHERN YELLOW PINE (SYP) WITH MINIMUM Fb = 1050 PSI AND E = 1,600,000 PSI ALLOWABLE STRESSES.
3. ALL PLYWOOD SHALL BE MANUFACTURED AND GRADED IN ACCORDANCE WITH U.S. DEPARTMENT OF COMMERCE (DOC) PRODUCT STANDARD PS1-95 FOR PLYWOOD CONSTRUCTION FROM GROUP I SPECIES. EACH PLYWOOD SHEET SHALL BEAR THE "APA" GRADE TRADEMARK.
4. PLYWOOD ROOF SHEATHING SHALL CONFORM TO APA C-D RATED EXTERIOR 3/4" MINIMUM THICKNESS PLYWOOD SHEATHING UNLESS NOTED OTHERWISE. PROVIDE APPROPRIATE SPACING BETWEEN JOINTS. USE "H" CLIPS REQUIRED ON ROOF SHEATHING.
5. THE FACE GRAIN OF THE PLYWOOD SHALL BE LAID AT RIGHT ANGLES TO THE RAFTERS.
6. FASTENERS SHALL BE PLACED 3/8" MINIMUM FROM THE EDGE OF THE PLYWOOD SHEETS.
7. ALL PLYWOOD END JOINTS SHALL BE STAGGERED AND SHALL BE LOCATED ALONG THE CENTER LINES OF THE FRAMING MEMBERS.
8. PLYWOOD USED FOR SLOPED ROOF PROP, WITH THE EXCEPTION OF THE TRAINING CHOP OUT, SHALL BE FIRE RETARDANT TREATED. PLYWOOD AND WOOD FRAMING USED FOR TRAINING CHOP OUT SHALL NOT BE PRESERVATIVE OR FIRE RETARDANT TREATED.

MODULAR/INTERMODAL SHIPPING CONTAINER COMPONENTS:

1. CONTRACTOR SHALL SUBMIT SEALED COMMONWEALTH OF VIRGINIA LICENSED PROFESSIONAL ENGINEER'S STRUCTURAL DESIGN CALCULATIONS AND SHOP DRAWINGS FOR APPROVAL PRIOR TO CONSTRUCTION OF MODULAR/INTERMODAL SHIPPING CONTAINER BUILDING FOUNDATION.
2. SHOP DRAWINGS SUBMITTAL REQUIREMENTS: SUBMIT COMPLETE ERECTION DRAWINGS SHOWING ANCHOR BOLT SETTINGS, SIDEWALL, ENDWALL AND ROOF FRAMING, TRANSVERSE CROSS SECTIONS, COVERING AND TRIM DETAILS AND ACCESSORY INSTALLATION DETAILS TO CLEARLY INDICATE PROPER ASSEMBLY OF BUILDING COMPONENTS.
3. MANUFACTURER SHALL PROVIDE A COMPLETE AND PROPERLY INSTALLED SYSTEM AS REQUIRED FOR A WEATHER TIGHT, 20 YEAR WARRANTED BUILDING.
4. THE LOCATION OF ANCHOR BOLTS, SIZE OF BASE PLATES, LOCATION OF MODIFIED COMPONENTS, ETC., MUST BE VERIFIED AGAINST MANUFACTURER'S FRAMING ARRANGEMENT. ANY DEVIATIONS MUST BE BROUGHT TO THE ATTENTION OF THE ENGINEER. ALL SUCH DEVIATIONS MUST BE COORDINATED AND APPROVED BEFORE CONCRETE IS PLACED.
5. DESIGN OF THE MODULAR/INTERMODAL SHIPPING CONTAINER BUILDING TO SUPPORT ROOF, SNOW, WIND AND SEISMIC LOADS AS STATED IN THE DESIGN LOADS ABOVE AND IN ACCORDANCE WITH CHAPTERS 16 AND 31 OF THE INTERNATIONAL BUILDING CODE AS ADOPTED BY THE VUSBC.
6. INTERMODAL SHIPPING CONTAINERS REPURPOSED FOR USE AS STRUCTURAL COMPONENTS SHALL BEAR AN EXISTING DATA PLATE AS REQUIRED BY ISO 6346 AND SHALL BE VERIFIED BY AN APPROVED AGENCY. A REPORT OF THE VERIFICATION PROCESS AND FINDINGS SHALL BE PROVIDED FOR REVIEW AND APPROVAL.
7. INTERMODAL SHIPPING CONTAINERS SHAL BEAR ON A LAMINATED ELASTOMERIC BEARING PAD WHEN SUPPORTED BY CAST-IN-PLACE CONCRETE SLABS OR GRADE.

EXPANSION ANCHORS:

1. ALL ANCHORS SHALL BE INSTALLED IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE MANUFACTURER.
2. EXPANSION ANCHORS SHALL BE WEDGE TYPE WITH A SINGLE PIECE THREE SECTION WEDGE. THE ANCHORS SHALL MEET THE DESCRIPTION IN FEDERAL SPECIFICATION FF-S-325, GROUP II, TYPE 4, CLASS 1 FOR CONCRETE EXPANSION ANCHORS. ANCHORS SHALL BE HILTI KWIK BOLT III, MANUFACTURED BY HILTI FASTENING SYSTEMS, OR EQUIVALENT.
3. ALL EXPANSION ANCHORS SHALL BE ZINC PLATED IN ACCORDANCE WITH ASTM B633, SERVICE CONDITION SC 1, TYPE III UNLESS INDICATED IN THE DRAWINGS AS STAINLESS STEEL.
4. UNLESS OTHERWISE NOTED, THE FOLLOWING MINIMUM REQUIREMENTS SHALL BE MET FOR EXPANSION ANCHORS:

ANCHOR DIAMETER	EMBEDMENT DEPTH	ALLOWABLE LOADS IN CONCRETE	
		TENSION (POUNDS)	SHEAR (POUNDS)
3/8"	2 3/8"	2,440	3,005
1/2"	3 1/2"	4,960	12,450

THERMAL LINING:

1. THE THERMAL LINING SHALL BE INSTALLED IN ACCORDANCE WITH THE REQUIREMENTS OF THE MANUFACTURER.
2. THE THERMAL LINING SYSTEM SHALL BE DESIGNED TO PROVIDE THE REQUIRED LEVEL OF PROTECTION AS INDICATED IN THE SPECIFICATIONS.

TEMPERATURE MONTIORING SYSTEM:

1. THE TEMPERATURE MONITORING SYSTEM SHALL CONSIST OF A CENTRAL RECORDER LOCATED IN THE MONITORING EQUIPMENT ROOM AND THERMOCOUPLES AS SHOWN ON ELECTRICAL DRAWINGS, SEE SPECIFICATION FOR REQUIREMENTS.

ELECTRICAL:

1. PROVIDE ALL NECESSARY LABOR, EQUIPMENT, ETC. FOR ALL WORK INDICATED AND REQUIRED FOR A COMPLETE INSTALLATION TO COMPLY WITH THE LATEST EDITION OF THE NATIONAL ELECTRICAL CODE (NEC).
2. ELECTRICAL SUB CONTRACTOR TO PROVIDE SYSTEM DESIGN AND PLAN LAYOUT FOR REVIEW AND APPROVAL.
3. THE ELECTRICAL CONTRACTOR SHALL KEEP THE PREMISES FREE FROM ACCUMULATION OF WASTE MATERIAL AND RUBBISH DAILY AND AT THE COMPLETION OF THE WORK, CONTRACTOR SHALL REMOVE FROM THE PREMISES ALL RUBBISH, IMPLEMENTS, AND SURPLUS MATERIALS AND LEAVE THE BUILDING "BROOM CLEAN".
4. THE ELECTRICAL CONTRACTOR SHALL PROVIDE A WRITTEN WARRANTY STATING THAT ALL MATERIALS AND WORKMANSHIP ARE FREE FROM DEFECTS FOR A PERIOD OF 12 MONTHS FROM DATE OF FINAL ACCEPTANCE.
5. MATERIALS:
   A. WIRE AND CABLE SHALL BE COPPER WITH THHN/THWN INSULATION AND BE SIZED AS PER THE LATEST EDITION OF THE NEC.
   B. ALL WIRING SHALL BE CONCEALED WHERE POSSIBLE. WHERE APPROVED BY THE DESIGNER, EXPOSED WIRING SHALL BE RUN PARALLEL AND PERPENDICULAR TO THE BUILDING CONSTRUCTION.
   C. DISCONNECT SWITCHES SHALL BE SQUARE-D GENERAL DUTY FUSIBLE WITH CLASS "R" FUSE CLIPS OR EQUAL.
   D. FUSES SHALL BE TIME-DELAY DUAL ELEMENT TYPE AND SHALL BE SIZED AS REQUIRED, AND QUANTITY.
   E. ALL SWITCHES AND RECEPTACLES SHALL BE SPECIFICATION GRADE AND COLOR AS CHOSEN BY OWNER.
6. THE ELECTRICAL CONTRACTOR MUST INSPECT JOB SITE PRIOR TO BIDDING JOB AND WILL INCLUDE COMPLETE RESPONSIBILITY FOR ALL LABOR AND MATERIALS AS SPECIFIED ON PLANS.
7. ELECTRICAL CONTRACTOR SHALL VERIFY THE AIC BEFORE PURCHASE OF SERVICE ENTRANCE EQUIPMENT.
8. ELECTRICAL CONTRACTOR SHALL VERIFY EQUIPMENT CAPACITY BEFORE ROUGH-IN.
9. ALL WIRING SHALL BE IN CONDUIT AND BE 12 AWG UNLESS OTHERWISE SPECIFIED. CONDUIT SHALL BE EMT OR RMC.
10. CONDUIT IN AND UNDER SLAB SHALL BE SCHEDULE 40 PVC AND SHALL BE BELOW THE FROST LINE.

1. THESE PROTOTYPE DRAWINGS HAVE BEEN DESIGNED TO PROVIDE ADEQUATE FACILITIES FOR FIRE FIGHTER I & II TRAINING AND TO MEET THE REQUIREMENTS OF NFPA 1403 AND 1402.
2. THE ATTACHED DRAWINGS, PROJECT MANUAL, AND SPECIFICATIONS ARE FOR INFORMATIONAL PURPOSES ONLY AND ARE NOT TO BE USED AS CONSTRUCTION DOCUMENTS. GRANT RECIPIENTS SHALL RETAIN A LICENSED DESIGN PROFESSIONAL TO PROVIDE SITE SPECIFIC CONTRACT DOCUMENTS SUITABLE FOR USE AS THE BASIS OF CONSTRUCTION.
3. THE GRANT RECIPIENT SHALL RETAIN A LICENSED DESIGN PROFESSIONAL TO CREATE A SITE PLAN, CIVIL DRAWINGS AND CIVIL SPECIFICATIONS TO ACCOMPANY THE ABOVE REFERENCED SITE SPECIFIC CONTRACT DOCUMENTS.
4. THESE PROTOTYPE DRAWINGS HAVE BEEN DESIGNED TO BE COMPARED WITH THE VARIOUS REQUIREMENTS FOR WIND SPEED, FROST DEPTH, SEISMIC VALUES, ETC. WITHIN THE COMMONWEALTH OF VIRGINIA. AS THESE VALUES ARE SITE DEPENDENT, THE LICENSED DESIGN PROFESSIONAL SHALL VERIFY ALL SITE RELATED VALUES WITH THE LOCAL JURISDICTION & MODIFY THE PROTOTYPE DRAWINGS ACCORDINGLY.
5. DESIGN LOADS AND NOTES WITH ASTERISKS (*) SIGNIFY THOSE THAT ARE SITE DEPENDENT AND SHALL BE VERIFIED WITH THE LOCAL JURISDICTION.

1. ALL CONCRETE ADJACENT TO AND WITHIN THE LIVE FIRE TRAINING STRUCTURE SHALL STAND A MINIMUM OF TWO (2) MONTHS TO CURE BEFORE CONDUCTING THE FIRST LIVE FIRE TRAINING EVOLUTION.
2. NO VEHICLE TRAFFIC SHALL BE PERMITTED ON THE APRON SLAB FOR A MINIMUM OF ONE (1) MONTH AFTER APRON SLAB HAS BEEN PLACED.

PRIME PROFESSIONAL FIRM LOGO

Project Title

COMMONWEALTH OF VIRGINIA LIVE FIRE TRAINING STRUCTURE PROTOTYPE 4 CLASS B FUEL

SUB-CONSULTANT'S LOGO

Department of Fire Programs

NOT FOR CONSTRUCTION

No.	REVISIONS	Date

Sheet Title

GENERAL NOTES

CITY/COUNTY VIRGINIA

Drawn By: ATA	Approved By: MAM
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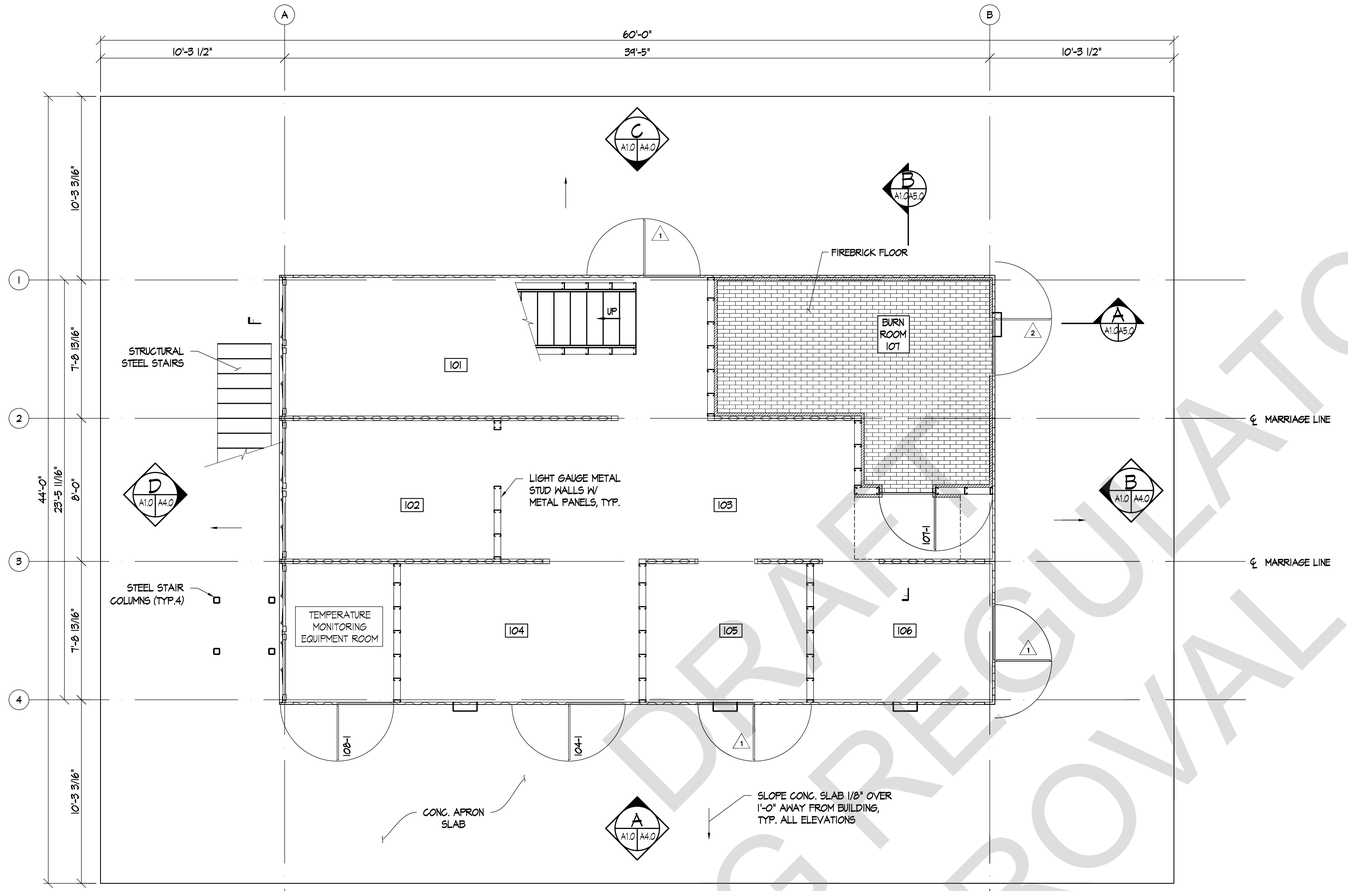
PROFESSIONAL SEAL

Sheet No.

A0.2

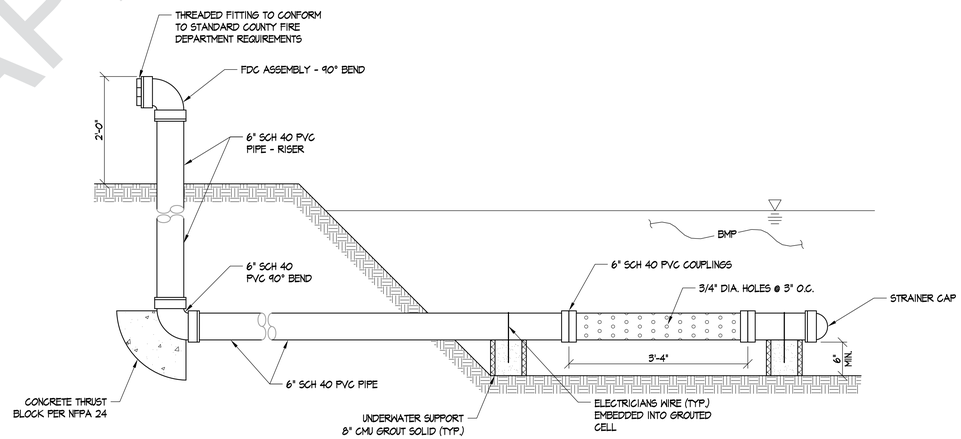


FIRST FLOOR PLAN

SCALE: 1/4" = 1'-0"

NOTES:

1. ROOM 101 IS THE BURN ROOM. NO BURNING IS ALLOWED IN ROOMS 101, 102, 103, 104, 105, 106, THE MONITORING EQUIPMENT ROOM, OR ON THE STAIRS OR LANDING.
2. DOORS SHALL BE HOT DIPPED GALV. METAL WITH CONTINUOUSLY WELDED SEAMS AND GALV. STEEL ANGLE SUPPORT FRAME. DOORS SHALL HAVE PULLS ON EACH SIDE AS WELL AS A LOCKABLE LATCH THAT IS OPERABLE FROM BOTH SIDES.
3. WINDOW SHUTTERS SHALL BE HOT DIPPED GALV. METAL WITH CONTINUOUSLY WELDED SEAMS AND GALV. STEEL ANGLE FRAME SUPPORT. WINDOW SHUTTERS SHALL HAVE WINDOW SHUTTER PULLS ON EACH SIDE AS WELL AS A LOCKABLE LATCH THAT IS OPERABLE FROM BOTH SIDES.



DETAIL

DRY HYDRANT ALTERNATE

SCALE: NTS

PRIME PROFESSIONAL FIRM LOGO

Project Title

COMMONWEALTH OF VIRGINIA LIVE FIRE TRAINING STRUCTURE PROTOTYPE 4 CLASS B FUEL

SUB-CONSULTANT'S LOGO

Department of Fire Programs

NOT FOR CONSTRUCTION

No.	REVISIONS	Date

Sheet Title

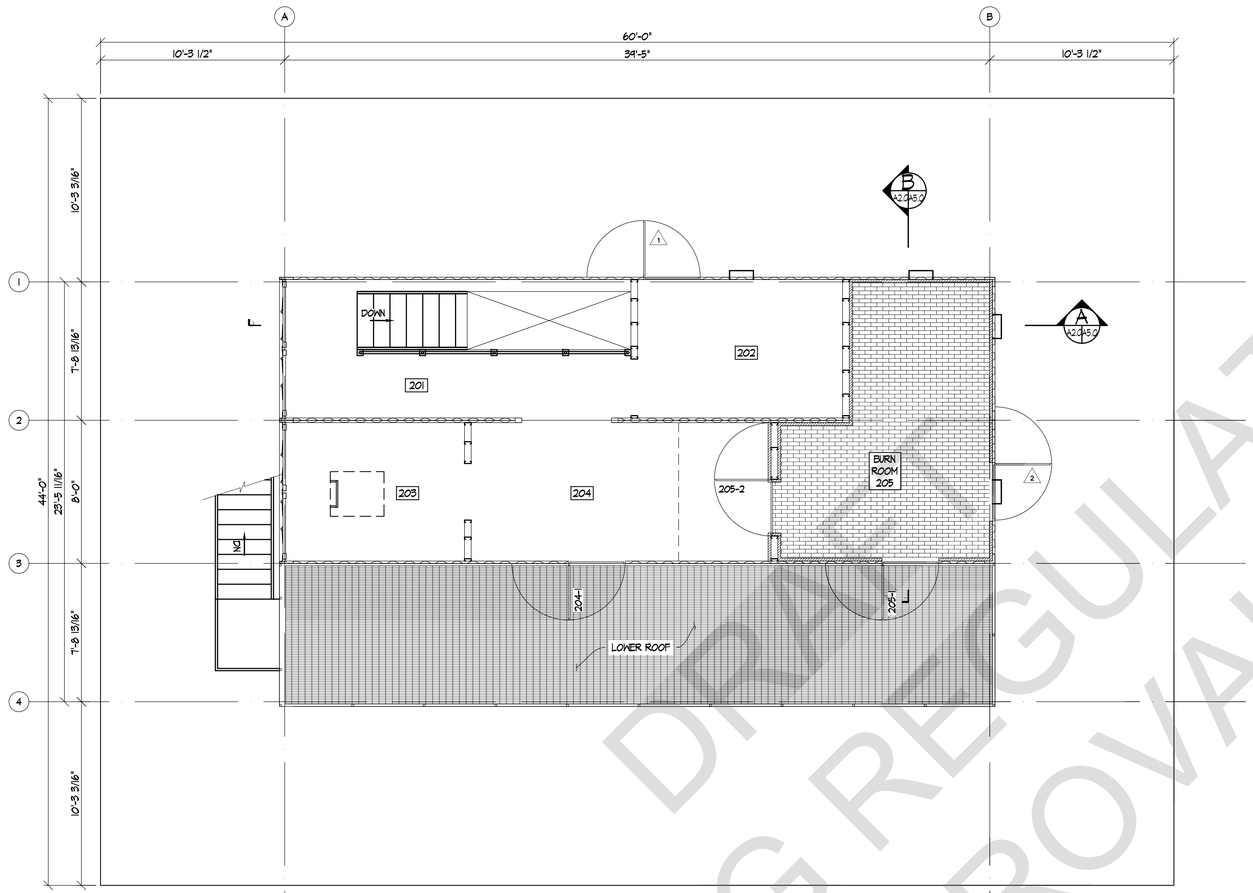
FIRST FLOOR PLAN

CITY/COUNTY	VIRGINIA
Drawn By: ATA	Approved By: MAM
Checked By: MAM	Date: 01/31/24

PROFESSIONAL SEAL

Sheet No.

A1.0



SECOND FLOOR/LOWER ROOF PLAN

SCALE: 1/4" = 1'-0"

NOTES:

1. INTERIOR ELEVATED FLOOR SLABS SHALL BE CONCRETE SLAB OVER METAL DECK DESIGNED TO SUPPORT THE SUPERIMPOSED LIVE LOADS INDICATED ON SHEET A0.2.
2. EXTERIOR LOW FLAT ROOF SHALL BE WATERTIGHT LIGHT GAGE METAL PANELS COVERED WITH GALV. GRIP STRUT DIAMOND PLANKS.
3. ROOM 205 IS A BURN ROOM. NO BURNING IS ALLOWED IN ROOMS 201, 202, 203, & 204, ON THE STAIRS, LANDING OR ON THE LOWER ROOF.
4. REFER TO SHEET A3.0 FOR POST AND GUARDRAIL ELEVATION LOCATIONS.
5. DOORS SHALL BE HOT DIPPED GALV. METAL WITH CONTINUOUSLY WELDED SEAMS AND GALV. STEEL ANGLE SUPPORT FRAME. DOORS SHALL HAVE PULLS ON EACH SIDE AS WELL AS A LOCKABLE LATCH THAT IS OPERABLE FROM BOTH SIDES.
6. WINDOW SHUTTERS SHALL BE HOT DIPPED GALV. METAL WITH CONTINUOUSLY WELDED SEAMS AND GALV. STEEL ANGLE FRAME SUPPORT. WINDOW SHUTTERS SHALL HAVE WINDOW SHUTTER PULLS ON EACH SIDE AS WELL AS A LOCKABLE LATCH THAT IS OPERABLE FROM BOTH SIDES.

PRIME PROFESSIONAL FIRM LOGO

Project Title

COMMONWEALTH OF VIRGINIA LIVE FIRE TRAINING STRUCTURE PROTOTYPE 4 CLASS B FUEL

SUB-CONSULTANT'S LOGO

Department of Fire Programs

NOT FOR CONSTRUCTION

No.	REVISIONS	Date

Sheet Title

SECOND FLOOR/LOWER ROOF PLAN

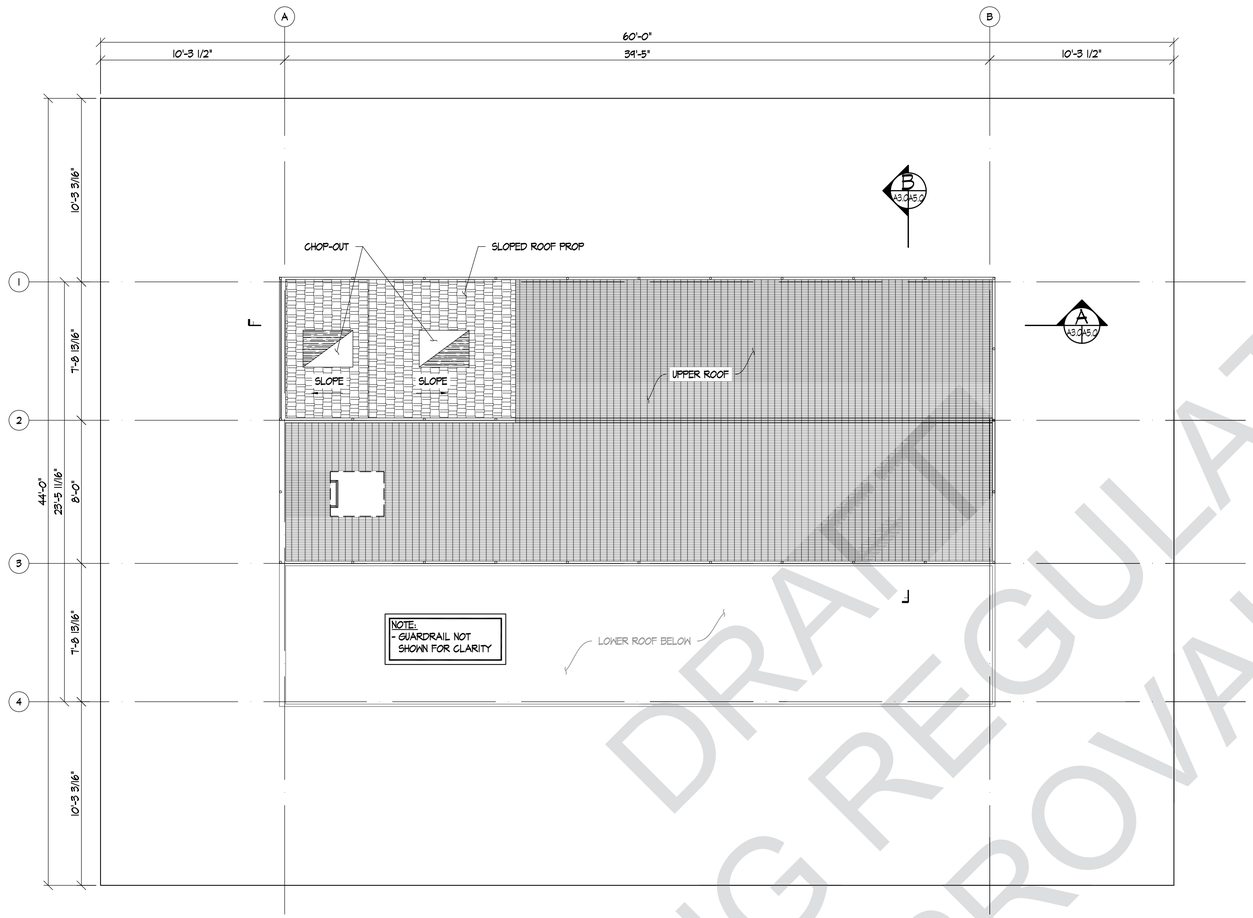
CITY/COUNTY VIRGINIA

Drawn By: ATA	Approved By: MAM
Checked By: MAM	Date: 01/31/24

PROFESSIONAL SEAL

Sheet No.

A2.0



UPPER ROOF PLAN W/ SLOPED ROOF PROP

SCALE: 1/4" = 1'-0"

NOTES:

1. NO BURNING IS ALLOWED ON THE UPPER ROOF OR BELOW THE SLOPED ROOF PROP.
2. EXTERIOR UPPER FLAT ROOF SHALL BE WATERTIGHT LIGHT GAGE METAL PANELS COVERED WITH GALV. GRIP STRUT DIAMOND PLANKS.
3. REFER TO SHEET A4.0 FOR POST AND GUARDRAIL ELEVATION LOCATIONS.
4. SLOPED ROOF PROP SHALL BE 3/4" TONGUE AND GROOVE PLYWOOD COVERED WITH COMPOSITE ASPHALT SHINGLES AND SHALL BE DESIGNED TO SUPPORT THE SUPERIMPOSED LIVE LOADS INDICATED ON SHEET A0.2.

PRIME PROFESSIONAL FIRM LOGO

Project Title

COMMONWEALTH OF VIRGINIA LIVE FIRE TRAINING STRUCTURE PROTOTYPE 4 CLASS B FUEL

SUB-CONSULTANT'S LOGO

Department of Fire Programs

NOT FOR CONSTRUCTION

No.	REVISIONS	Date

Sheet Title

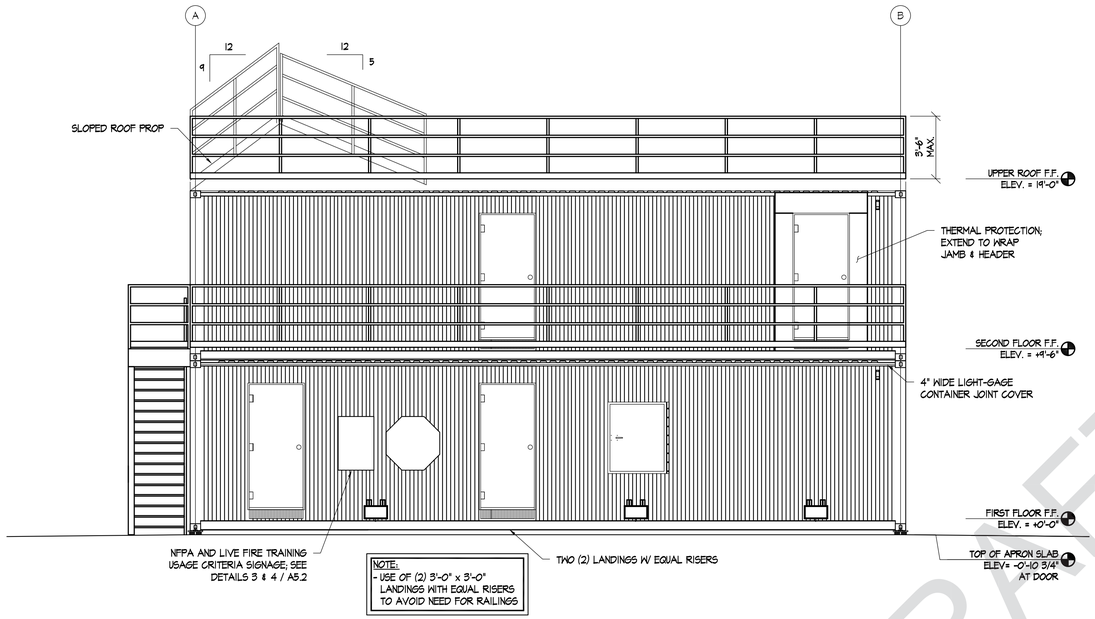
UPPER ROOF PLAN W/ SLOPED ROOF PROP

CITY/COUNTY	VIRGINIA
Drawn By: ATA	Approved By: MAM
Checked By: MAM	Date: 01/31/24

PROFESSIONAL SEAL

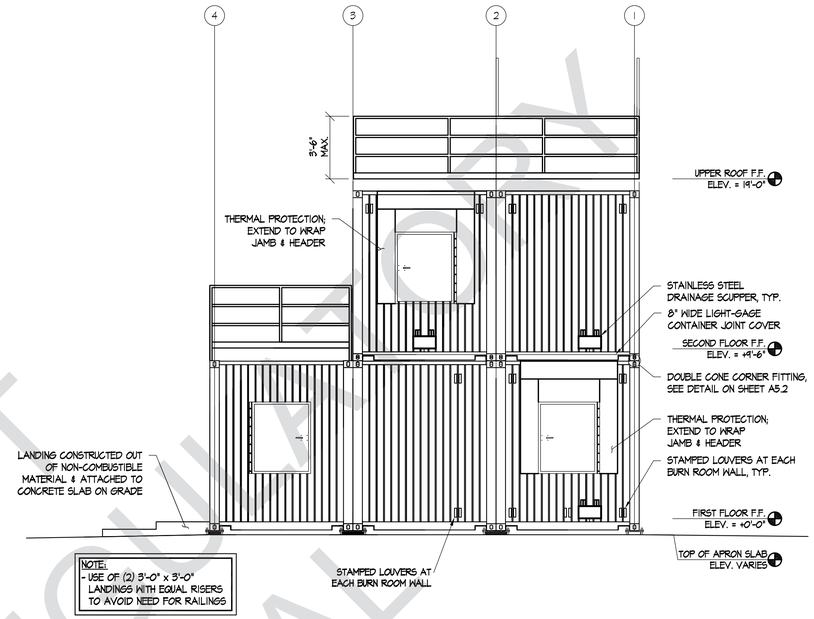
Sheet No.

A3.0



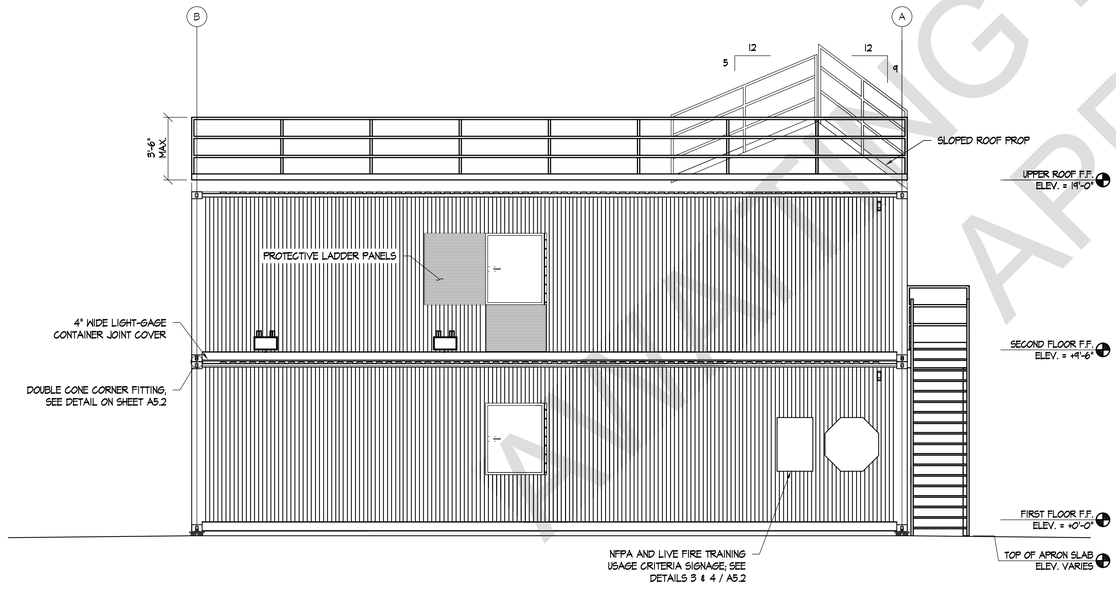
FRONT ELEVATION

SCALE: 1/4" = 1'-0"



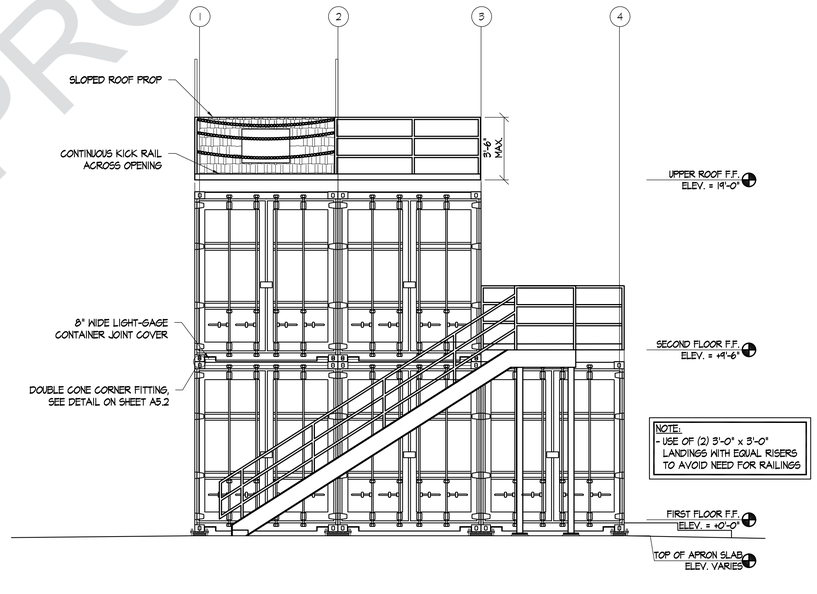
RIGHT ELEVATION

SCALE: 1/4" = 1'-0"



REAR ELEVATION

SCALE: 1/4" = 1'-0"



LEFT ELEVATION

SCALE: 1/4" = 1'-0"

PRIME, PROFESSIONAL FIRM LOGO

Project Title

COMMONWEALTH OF VIRGINIA LIVE FIRE TRAINING STRUCTURE PROTOTYPE 4 CLASS B FUEL

SUB-CONSULTANT'S LOGO

Department of Fire Programs

NOT FOR CONSTRUCTION

No.	REVISIONS	Date

Sheet Title

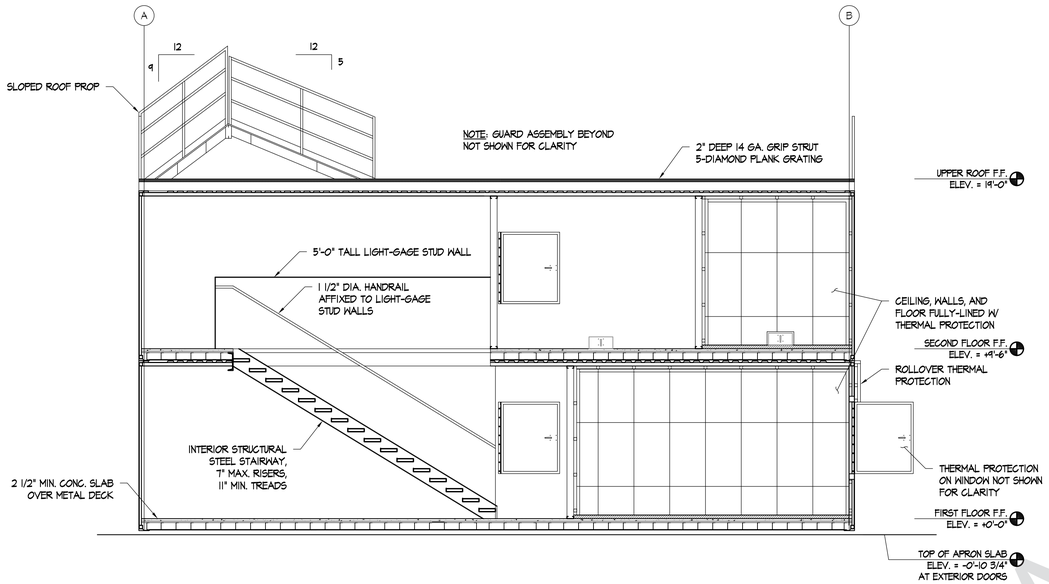
BUILDING ELEVATIONS

CITY/COUNTY	VIRGINIA
Drawn By: ATA	Approved By: MAM
Checked By: MAM	Date: 01/31/24

PROFESSIONAL SEAL

Sheet No.

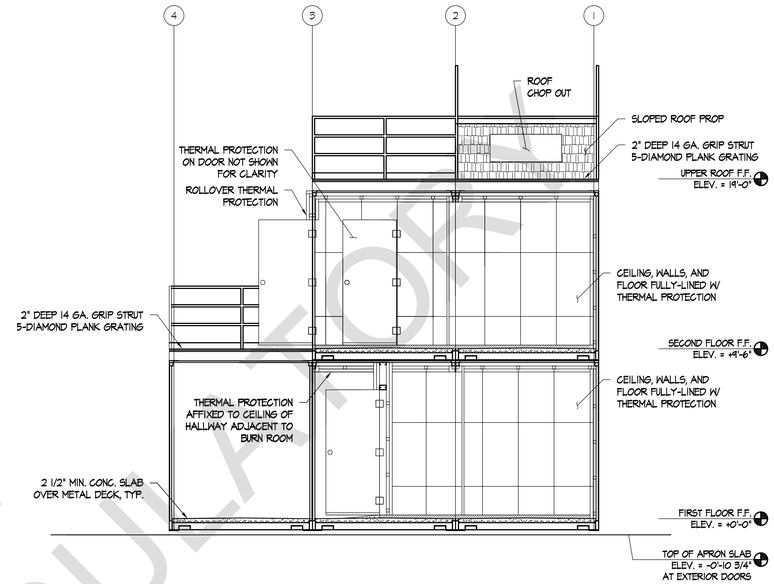
A4.0



SECTION A

SCALE: 1/4" = 1'-0"

A1.0, A2.0, A3.0, A5.0



SECTION B

SCALE: 1/4" = 1'-0"

A1.0, A2.0, A3.0, A5.0

PRIME PROFESSIONAL FIRM LOGO

Project Title

COMMONWEALTH OF VIRGINIA LIVE FIRE TRAINING STRUCTURE PROTOTYPE 4 CLASS B FUEL

SUB-CONSULTANT'S LOGO

Department of Fire Programs

NOT FOR CONSTRUCTION

No.	REVISIONS	Date

Sheet Title

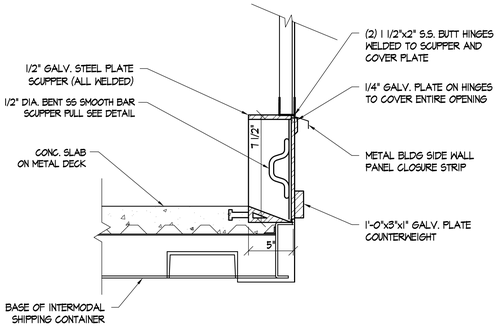
BUILDING SECTIONS

CITY/COUNTY	VIRGINIA
Drawn By: ATA	Approved By: MAM
Checked By: MAM	Date: 01/31/24

PROFESSIONAL SEAL

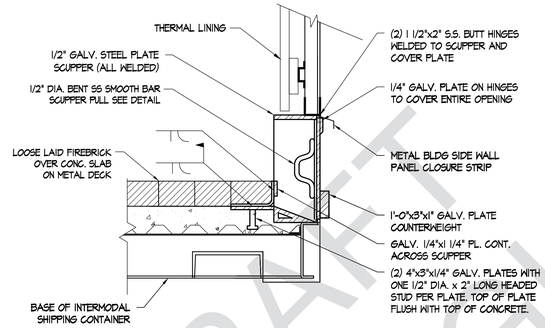
Sheet No.

A5.0



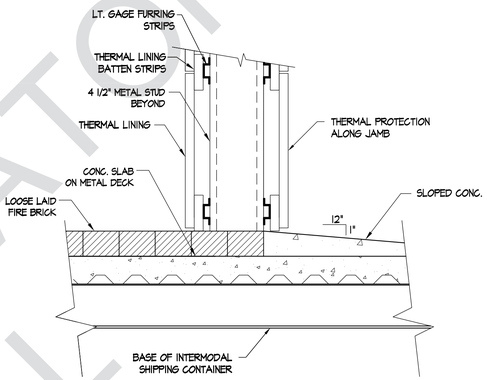
DETAIL — SCUPPER W/O THERMAL PROTECTION

SCALE: 1 1/2" = 1'-0"



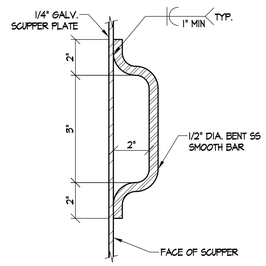
DETAIL — SCUPPER W/ THERMAL PROTECTION

SCALE: 1 1/2" = 1'-0"



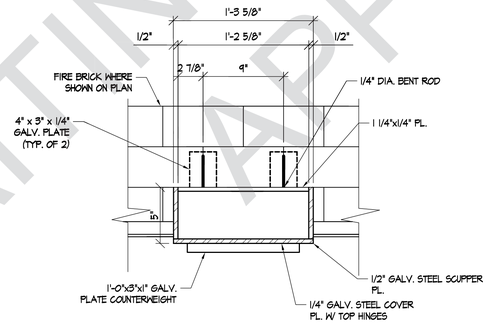
DETAIL — CONC. RAMP @ BURN ROOM DOOR

SCALE: 1 1/2" = 1'-0"



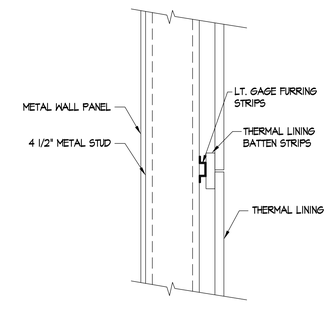
DETAIL — SCUPPER PULL

SCALE: 3" = 1'-0"



PLAN — SCUPPER W/ FIRBRICK

SCALE: 1 1/2" = 1'-0"



DETAIL — INTERIOR BURN ROOM WALL THERMAL LINING

SCALE: 1 1/2" = 1'-0"

PRIME PROFESSIONAL FIRM LOGO

Project Title

COMMONWEALTH OF VIRGINIA LIVE FIRE TRAINING STRUCTURE PROTOTYPE 4 CLASS B FUEL

SUB-CONSULTANT'S LOGO

Department of Fire Programs

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No.	REVISIONS	Date

Sheet Title

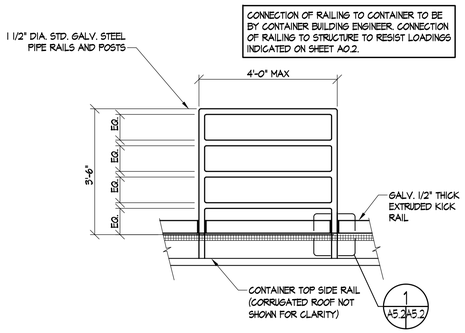
SCUPPER, RAMP, & THERMAL LINING DETAILS

CITY/COUNTY	VIRGINIA
Drawn By: ATA	Approved By: MAM
Checked By: MAM	Date: 01/31/24

PROFESSIONAL SEAL

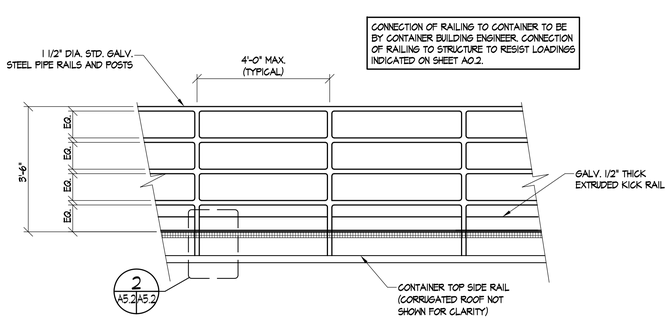
Sheet No.

A5.1



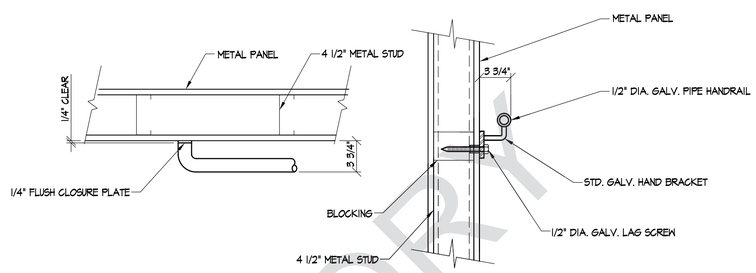
DETAIL — REMOVABLE GUARDRAIL

SCALE: 1/2" = 1'-0"



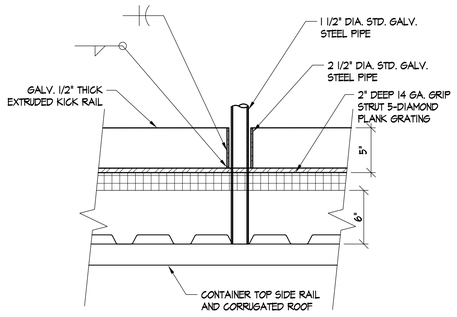
DETAIL — TYPICAL GUARDRAIL

SCALE: 1/2" = 1'-0"



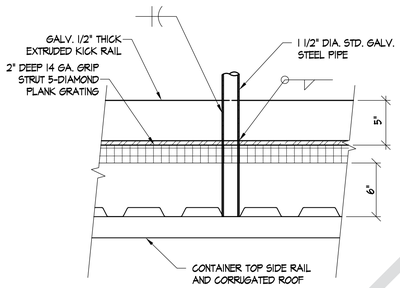
DETAIL — INTERIOR HAND RAIL

SCALE: 1 1/2" = 1'-0"



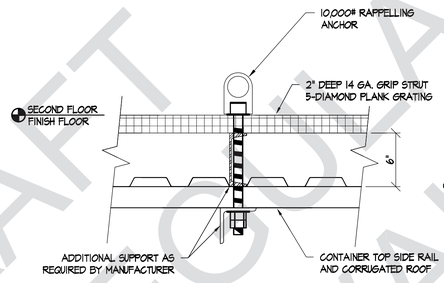
DETAIL — REMOVABLE GUARDRAIL

SCALE: 1 1/2" = 1'-0"



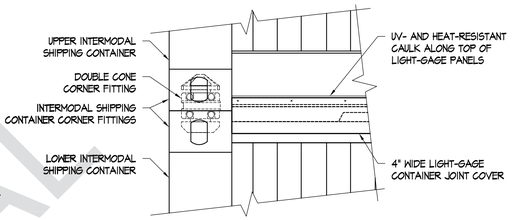
DETAIL — TYP. GUARDRAIL

SCALE: 1 1/2" = 1'-0"



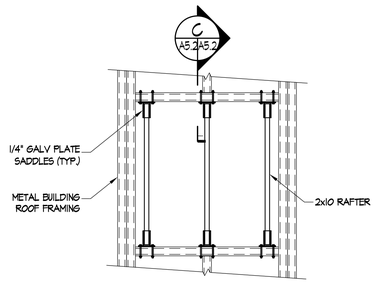
DETAIL — RAPELLING ANCHOR INSTALLATION DETAILS

SCALE: 1 1/2" = 1'-0"



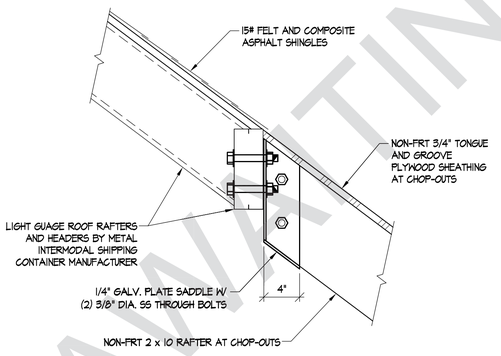
DETAIL — STACKED CONTAINER CONNECTION

SCALE: 1 1/2" = 1'-0"



DETAIL — CHOP OUT OPENING

SCALE: 1/2" = 1'-0"

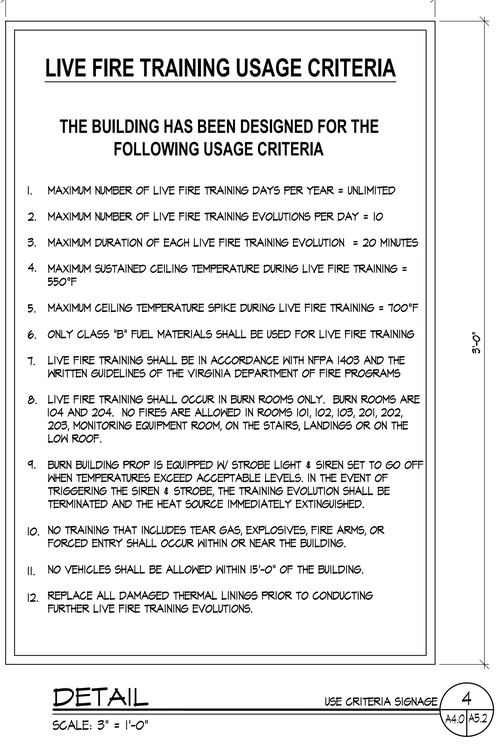


SECTION — C

SCALE: 1 1/2" = 1'-0"

DETAIL — NFPA 1403 SIGNAGE

SCALE: 1 1/2" = 1'-0"



DETAIL — USE CRITERIA SIGNAGE

SCALE: 3" = 1'-0"

PRIME, PROFESSIONAL FIRM LOGO

Project Title

COMMONWEALTH OF VIRGINIA LIVE FIRE TRAINING STRUCTURE PROTOTYPE 4 CLASS B FUEL

SUB-CONSULTANT'S LOGO

Department of Fire Programs

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No.	REVISIONS	Date

Sheet Title

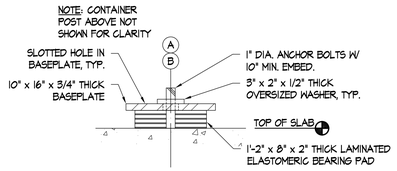
SIGNAGE, RAILING & CHOP OUT DETAILS

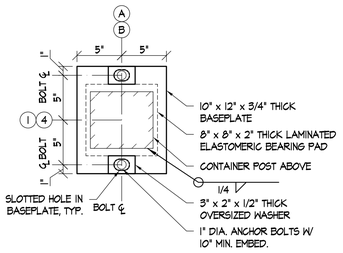
CITY/COUNTY	VIRGINIA
Drawn By: ATA	Approved By: MAM
Checked By: MAM	Date: 01/31/24

PROFESSIONAL SEAL

Sheet No.

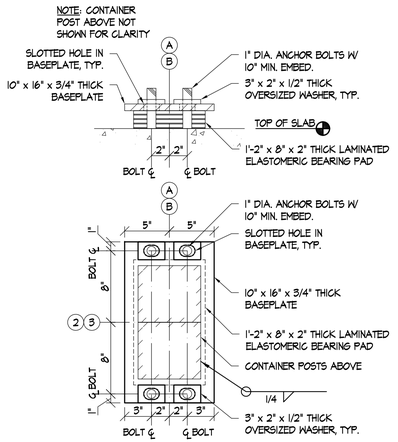
A5.2





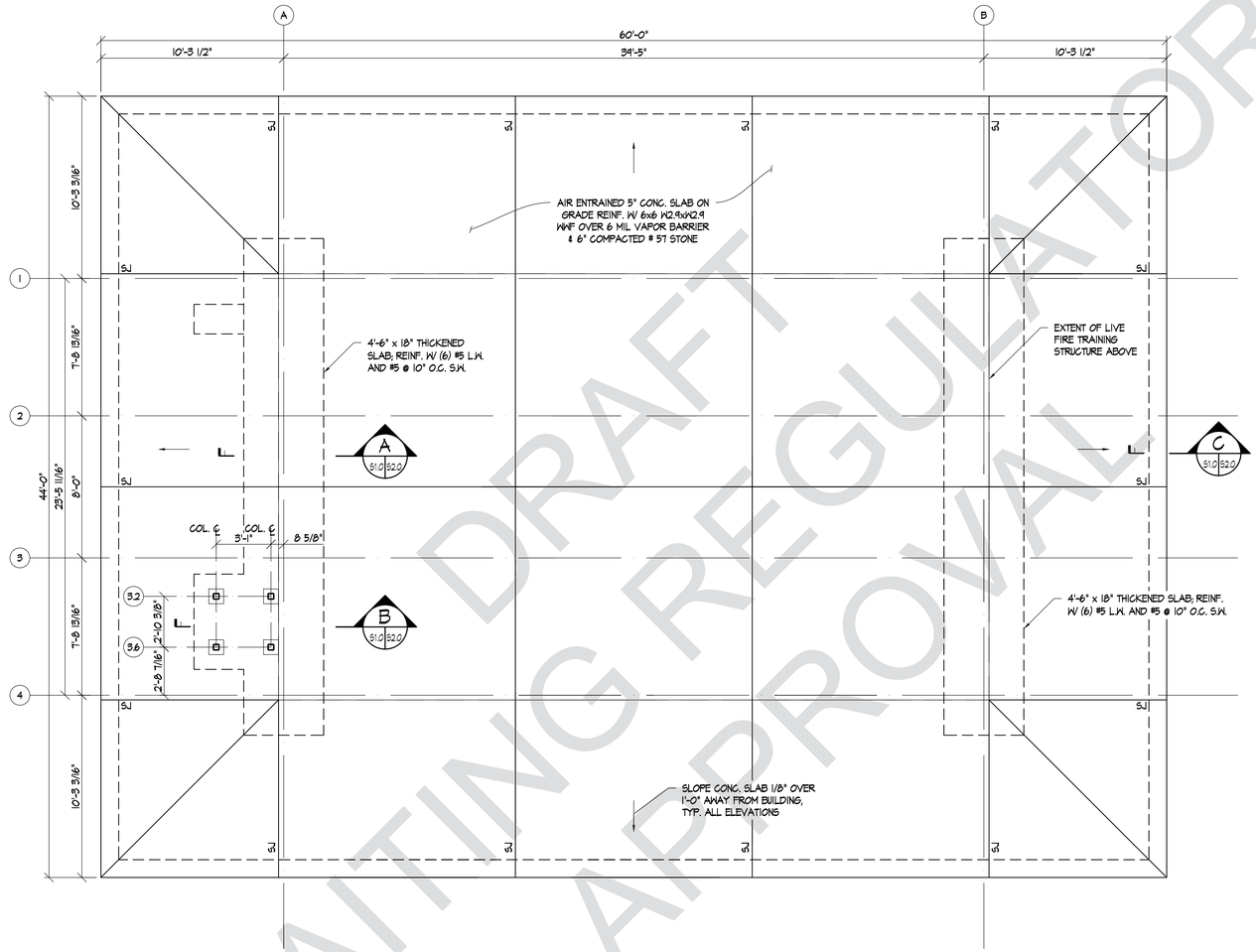
DETAIL — BASE PLATE SINGLE POST

SCALE: 1 1/2" = 1'-0"



DETAIL — BASE PLATE DOUBLE POST

SCALE: 1 1/2" = 1'-0"



FOUNDATION PLAN

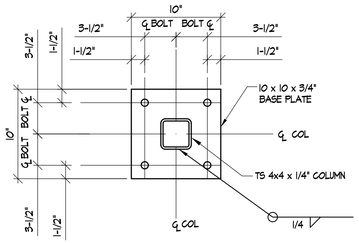
SCALE: 1/4" = 1'-0"

NOTES:

1. FOUNDATION PROVIDED FOR INTERMODAL SHIPPING CONTAINER STRUCTURE.
2. SEE SHEET A1.0 FOR SLAB ELEVATIONS AND SLOPES.
3. SLOPE TOP & BOTTOM OF SLAB TO MAINTAIN THICKNESS INDICATED.
4. DIMENSIONS TO COLUMN LINES A & B AND GRID LINES 1 & 4 ARE INTENDED TO BE TO THE CENTER OF THE COUPLING.

LAMINATED ELASTOMERIC BEARING PAD NOTES:

1. ALL LAMINATED ELASTOMERIC BEARING PADS SHALL BE OF 55 DUROMETER (HARDNESS) ELASTOMER. STEEL LAMINATE SHALL CONFORM TO ASTM A1011, GRADE 36 OR BETTER.
2. LAMINATED ELASTOMERIC BEARING PADS SHALL BE MOLDED AS A SINGLE UNIT.
3. AREA OF CONCRETE SLAB ON GRADE ON WHICH BEARING PADS WILL BE MOUNTED SHALL BE FINISHED TO A TRULY LEVEL PLATE AT THE EXACT REQUIRED ELEVATION. IF FULL CONTACT IS NOT ACHIEVED AFTER THE INTERMODAL SHIPPING CONTAINERS ARE ERECTED, FILED ADJUSTMENTS SHALL BE MADE BY THE CONTRACTOR TO ENSURE FULL CONTACT.
4. WELDING WHILE THE LAMINATED BEARING PAD IS IN CONTACT WITH THE METAL IS DISCOURAGED. WHERE WELDING IS REQUIRED, TEMPERATURE INDICATING WAX PENS OR OTHER SUITABLE MEANS SHALL BE UTILIZED TO ENSURE THE PAD NOT BE EXPOSED TO TEMPERATURES GREATER THAN 250°F.
5. ALL BEARINGS SHALL BE MARKED PRIOR TO SHIPPING AND SHALL BE PERMANENT AND VISIBLE AFTER THE BEARING IS INSTALLED.



DETAIL — COL. BASE PLATE

SCALE: 1 1/2" = 1'-0"

PRIME, PROFESSIONAL FIRM LOGO

Project Title

COMMONWEALTH OF VIRGINIA LIVE FIRE TRAINING STRUCTURE PROTOTYPE 4 CLASS B FUEL

SUB-CONSULTANT'S LOGO

Department of Fire Programs

NOT FOR CONSTRUCTION

No.	REVISIONS	Date

Sheet Title

FOUNDATION PLAN

CITY/COUNTY VIRGINIA

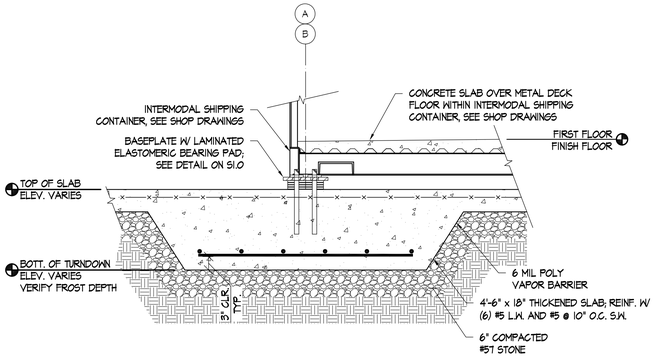
Drawn By: ATA	Approved By: MAM
Checked By: MAM	Date: 01/31/24

PROFESSIONAL SEAL

Sheet No.

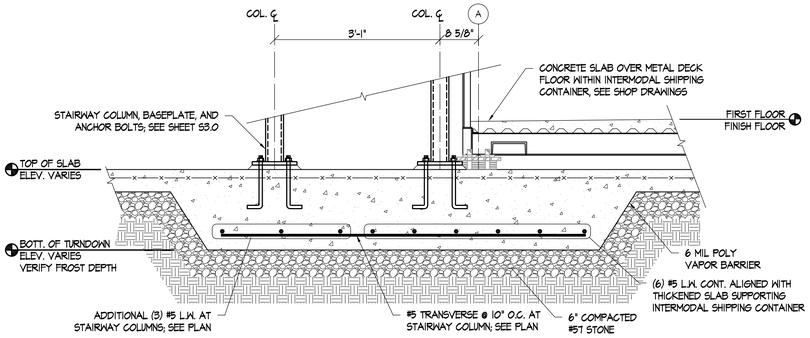
S1.0

11 of 16



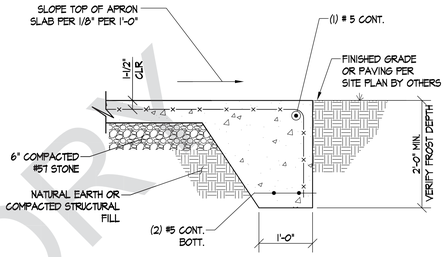
SECTION A

SCALE: 3/4" = 1'-0"



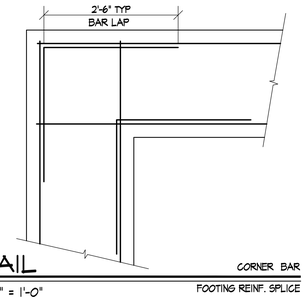
SECTION B

SCALE: 3/4" = 1'-0"



SECTION C

SCALE: 3/4" = 1'-0"

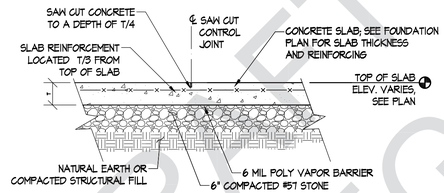


DETAIL

CORNER BAR

FOOTING REINF. SPLICE

SCALE:3/4" = 1'-0"



DETAIL

SAW CUT JOINT

SCALE: 3/4" = 1'-0"

PRIME, PROFESSIONAL FIRM LOGO

Project Title

COMMONWEALTH OF VIRGINIA LIVE FIRE TRAINING STRUCTURE PROTOTYPE 4 CLASS B FUEL

SUB-CONSULTANT'S LOGO

Department of Fire Programs

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Sheet Title

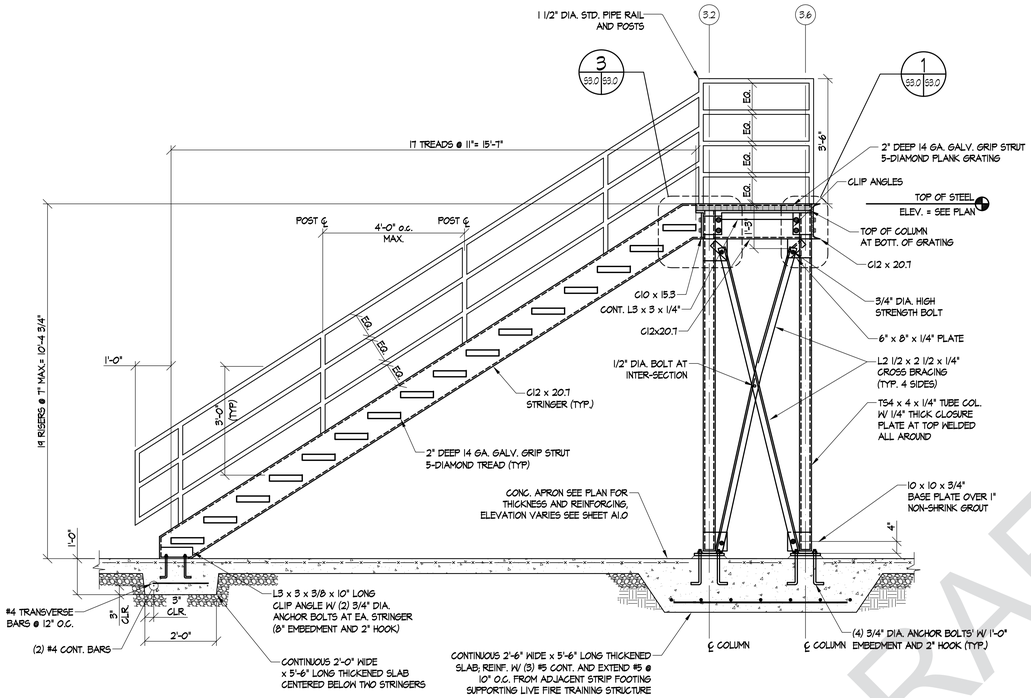
FOUNDATION SECTIONS & DETAILS

CITY/COUNTY	VIRGINIA
Drawn By: ATA	Approved By: MAM
Checked By: MAM	Date: 01/31/24

PROFESSIONAL SEAL

Sheet No.

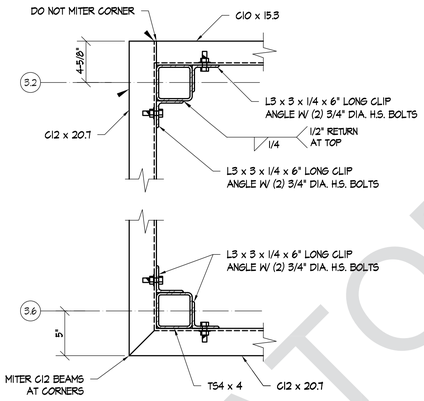
S2.0



NOTE:
ALL STEEL AND GRATING IN THIS SECTION SHALL BE GALVANIZED U.N.O.

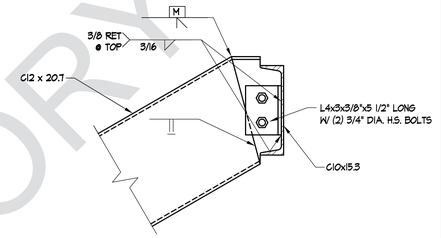
ELEVATION — EXTERIOR STAIRS

SCALE: 1/2" = 1'-0"



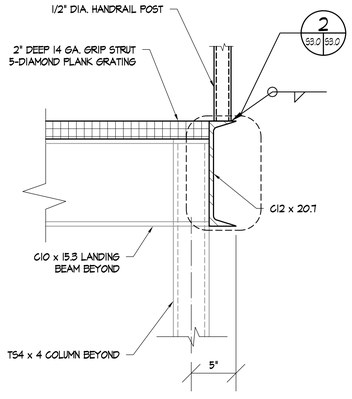
DETAIL — LANDING BEAMS TO COLUMNS

SCALE: 1 1/2" = 1'-0"



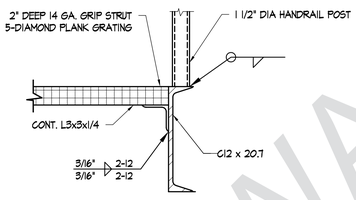
DETAIL — STAIR STRINGER SPLICE AND CONNECTION

SCALE: 1 1/2" = 1'-0"



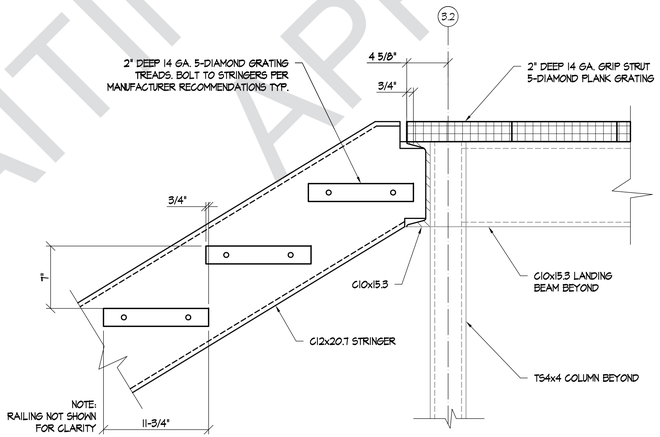
DETAIL 1 (33.0 | 33.0)

SCALE: 1 1/2" = 1'-0"



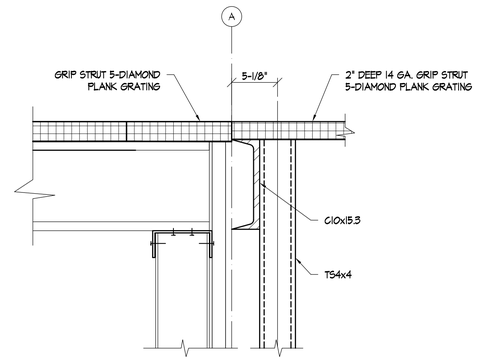
DETAIL 2 (33.0 | 33.0)

SCALE: 1 1/2" = 1'-0"



DETAIL 3 (33.0 | 33.0)

SCALE: 1 1/2" = 1'-0"



DETAIL

SCALE: 1 1/2" = 1'-0"

PRIME PROFESSIONAL FIRM LOGO

Project Title

COMMONWEALTH OF VIRGINIA LIVE FIRE TRAINING STRUCTURE PROTOTYPE 4 CLASS B FUEL

SUB-CONSULTANT'S LOGO

Department of Fire Programs

NOT FOR CONSTRUCTION

No.	REVISIONS	Date

Sheet Title

EXTERIOR STEEL STAIR ELEVATION, SECTIONS, & DETAILS

CITY/COUNTY VIRGINIA

Drawn By: ATA	Approved By: MAM
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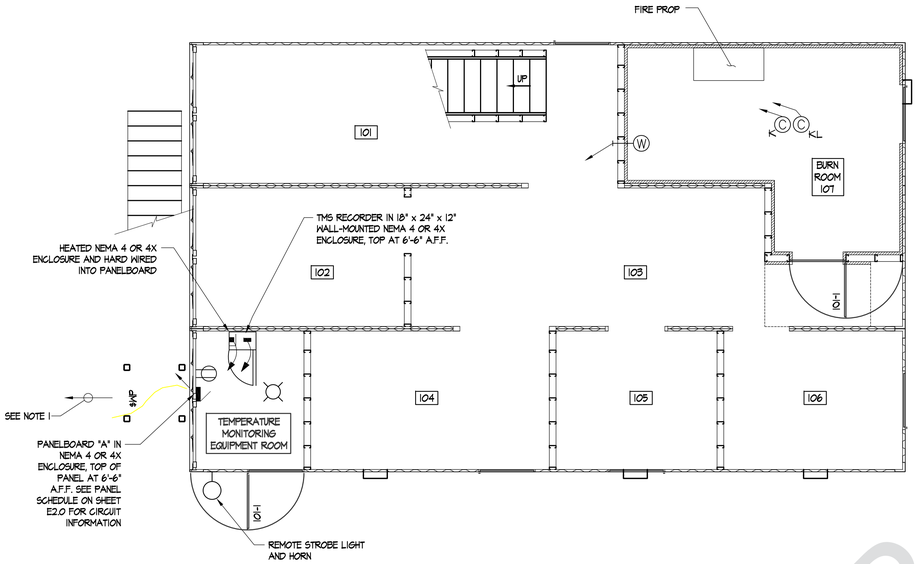
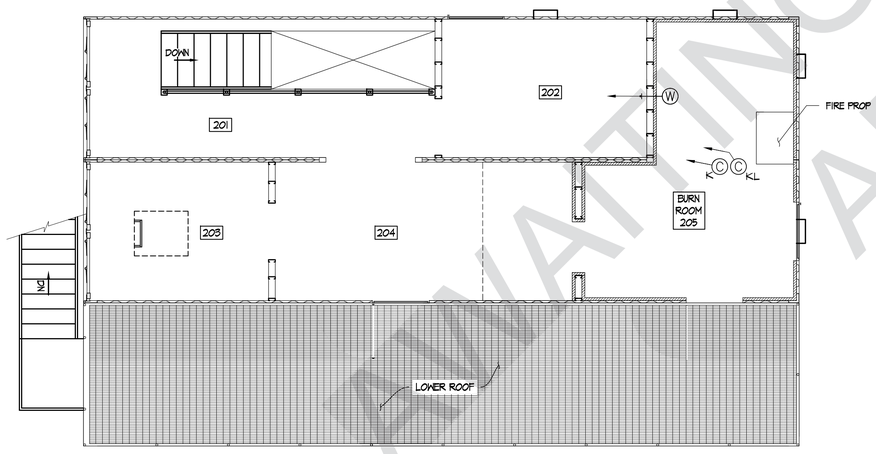
Sheet No.

S3.0



FIRST FLOOR ELECTRICAL PLAN

SCALE: 1/4" = 1'-0"



SECOND FLOOR ELECTRICAL PLAN

SCALE: 1/4" = 1'-0"

ELECTRICAL NOTES:

1. ELECTRICAL PANEL "A" SHALL BE 120/208 VOLT 3 PHASE, 4 WIRE 200AMP MAIN CIRCUIT BREAKER, 30 POLE PANEL. CONTRACTOR SHALL COORDINATE POWER SOURCE TO PANEL AND SIZE FEEDER TO ACCOMMODATE VOLTAGE DROP. CONDUIT SHALL BE RUN AT A MINIMUM OF 36" BELOW GRADE AND SHALL BE PVC COATED RIGID STEEL.
2. CONTRACTOR SHALL PROVIDE AN ALTERNATE PRICE FOR INSTALLATION OF EXTERIOR DUPLEX RECEPTACLES. RECEPTACLES SHALL BE RECESSED MOUNTED. PORVIDE CAST IRON RECEPTACLE WITH DIE CAST ALUMINUM COVERPLATE. DUPLEX RECEPTACLE SHALL BE CERAMIC AND HEAVY DUTY TYPE.
3. ALL ELECTRICAL FIXTURES SHALL BE G.F.C.I.
4. ALL WIRING SHALL COMPLY WITH THE APPLICABLE NATIONAL, STATE, AND LOCAL ELECTRICAL CODES. USE MINIMUM OF #12 AWG IN 1/2 INCH RIGID STEEL CONDUITS. UNLESS OTHERWISE NOTED.

ABBREVIATIONS:

A.	AMPERE (S)
A.F.F.	ABOVE FINISHED FLOOR
A.I.C	AMPERE INTERRUPTING CAPACITY
AWG	AMERICAN WIRE GUAGE
G.F.I	GROUND FAULT INTERRUPT
GND	GROUND
MCB	MAIN CIRCUIT BREAKER
S/WP	WEATHERPROOF SINGLE POLE 20 AMP SWITCH. SURFACE MOUNTED,42" MOUNTING HEIGHT A.F.F.
T.L.	THERMAL LINING
T.M.S.	TEMPERATURE MONITORING SYSTEM
V	VOLT (S)
W	WATT
WP	WEATHERPROOF (NEMA 4X)

SYMBOLS:

- WEATHERPROOF CEILING MOUNTED, 100W, 120V, INCANDESCENT FIXTURE.
- WEATHERPROOF DUPLEX RECEPTACLE, 20A, 125V, GROUNDING TYPEHAVING NEMA TYPE 5-20 R CONFIGURATION,SURFACE MOUNTED, 18" MOUNTING HEIGHT A.F.F.
- J — JUNCTION BOX
- CONDUIT TURNED UP
- CONDUIT TURNED DOWN
- CONDUIT RUN TO RECORDER FOR TEMPERATURE MONITORING SYSTEM U.O.N
- W — WALL-MOUNTED TYPE K DUPLEX THERMOCOUPLE, 60" A.F.F. SEE 1-16/I7 U.O.N.
- C — RECESSED CEILING-MOUNTED TYPE K DUPLEX THERMOCOUPLE,SEE 2-16/I7
- C KL — RECESSED CEILING-MOUNTED TYPE K DUPLEX THERMOCOUPLE,SEE PLACED BEHIND INSULATION OF THERMAL LINING,SEE 2-16/I7
- M — EXISTING METER
- BRANCH CIRCUIT CONDUIT WITH 2 #12 AWG + GROUND WIRE,U.O.N,RUN EXPOSED TO PANELBOARD
- CONNECTION POINT
- REMOTE STROBE LIGHT & HORN

PRIME PROFESSIONAL FIRM LOGO

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COMMONWEALTH OF VIRGINIA LIVE FIRE TRAINING STRUCTURE PROTOTYPE 4 CLASS B FUEL

SUB-CONSULTANT'S LOGO

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FIRST & SECOND FLOOR ELECTRICAL PLAN, NOTES SYMBOLS & ABBREVIATIONS

CITY/COUNTY VIRGINIA

Drawn By: ATA	Approved By: MAM
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Sheet No.

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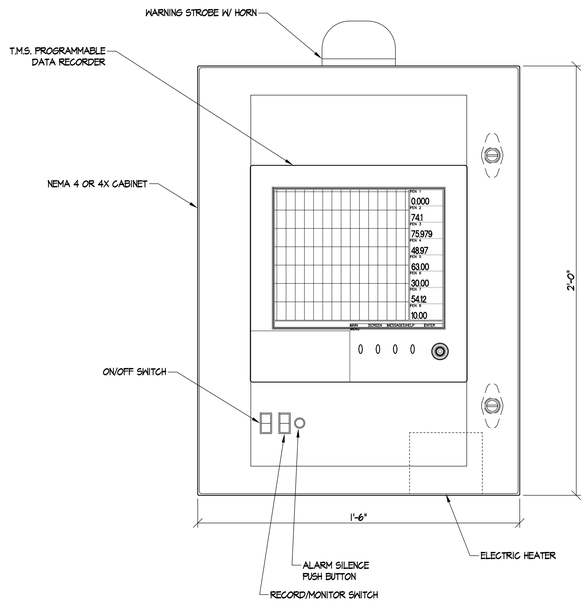
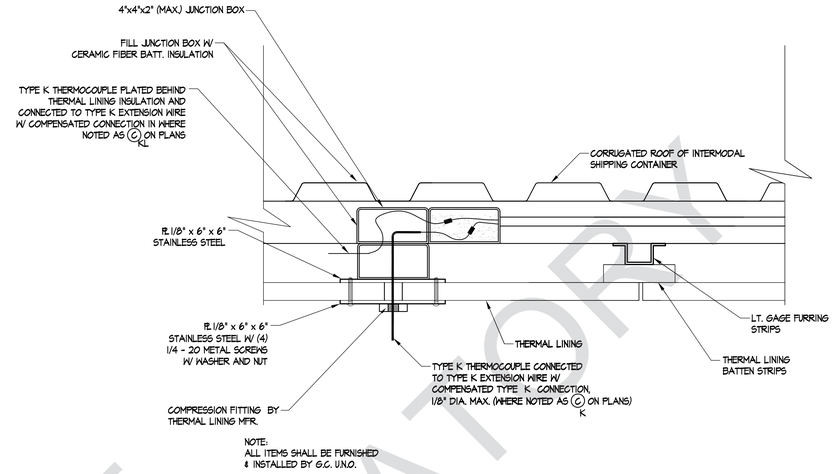


ELEVATION

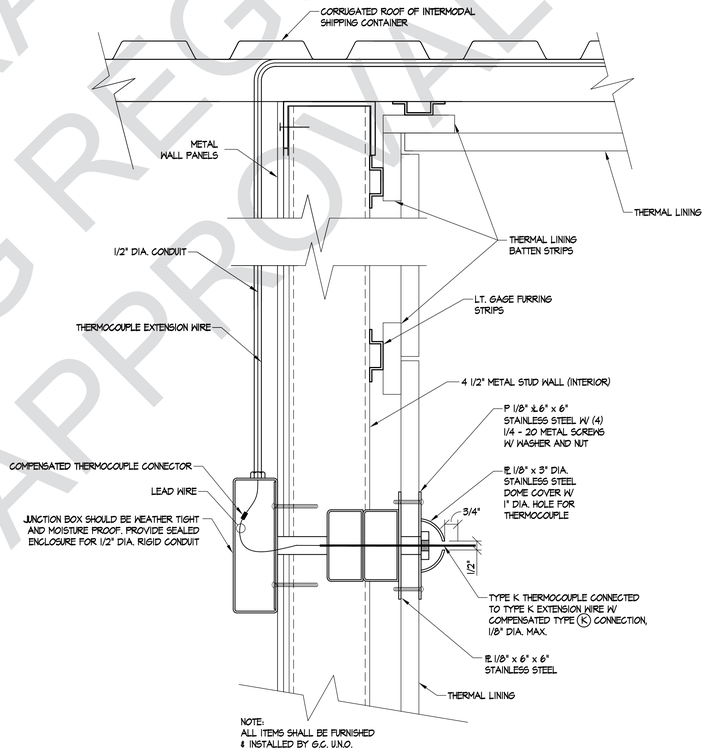
T.M.S. INDICATOR PANEL

SCALE: 3" = 1'-0"



DETAIL

SCALE: 3" = 1'-0"



DETAIL

SCALE: 3" = 1'-0"

PANELBOARD SCHEDULE LP-1

LOCATION: 105
SERVICE: 208Y/120V 3-P 4-W
MAIN LUGS: A
MAIN BUS TYPE: -
INTERRUPT RATING: - AIC

FED FROM: SWBD MSB
NEUTRAL BUS: 100%
GROUND BUS: STANDARD
MOUNTING: SURFACE
ENCLOSURE: NEMA 1

1 - GFI
2 - SHUNT TRIP
3 - BREAKER LOCK
4 - HACR

DESCRIPTION		CCT. NO.	CIRCUIT BREAKER	CIRCUIT LOAD	CONNECTED LOAD (VA) A	B	C	CIRCUIT LOAD	CIRCUIT BREAKER	CCT. NO.	DESCRIPTION	
T.M.S. PANEL	(N)	1	20A-1P	500	680			180	20A-1P	2	RECEPTACLE	(E)
		3	20A-1P						20A-1P	4		
		5	20A-1P						20A-1P	6		
		7	20A-1P						20A-1P	8		
		9	20A-1P						20A-1P	10		
		11	20A-1P						20A-1P	12		
		13	20A-1P						20A-1P	14		
		15	20A-1P						20A-1P	16		
		17	20A-1P						20A-1P	18		
		19	20A-1P						20A-1P	20		
		21	20A-1P						20A-1P	22		
		23	20A-1P						20A-1P	24		
		25	20A-1P						20A-1P	26		
		27	20A-1P						20A-1P	28		
		29	20A-1P						20A-1P	30		
					680							

TOTAL VA PER PHASE

PRIME PROFESSIONAL FIRM LOGO

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ELECTRICAL DETAILS & PANELBOARD SCHEDULE

CITY/COUNTY VIRGINIA

Drawn By: ATA	Approved By: MAM
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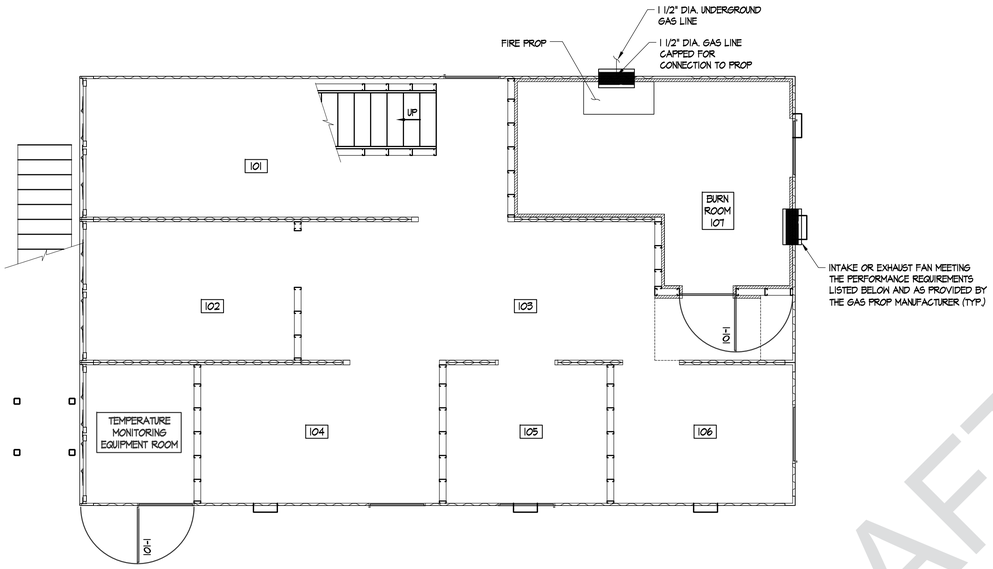
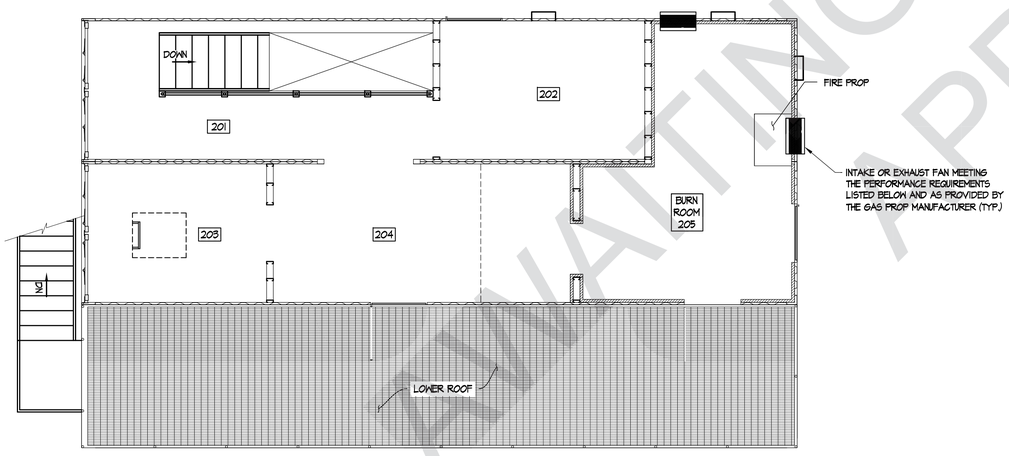


FIRST FLOOR MECHANICAL PLAN

SCALE: 1/4" = 1'-0"



SECOND FLOOR MECHANICAL PLAN

SCALE: 1/4" = 1'-0"

MECHANICAL NOTES:

1. THE AUTOMATED LIVE FIRE CLASS B FUEL SYSTEM SHALL BE EQUIPPED WITH A VENTILATION SYSTEM TO REMOVE EXCESS HEAT, COMBUSTION BY-PRODUCTS, AND UNBURNED GAS FROM EACH TRAINING COMPARTMENT WITHIN THE BUILDING AND VENTILATION SYSTEM SHALL BE DESIGNED TO FULLY PURGE EACH TRAINING COMPARTMENT AT THE RATE OF ONE (1) AIR CHANGE PER MINUTE AS PER NFPA 1403. THE LIVE FIRE TRAINING SYSTEM SHALL CONTROL THE OPERATION AND MONITOR THE AIRFLOW OF THE VENTILATION SYSTEM IN THE BURN BUILDING. THE VENTILATION SYSTEM SHALL ONLY BE ACTIVATED DURING THE FOLLOWING CONDITIONS:
   A) TO FULLY PURGE THE TRAINING COMPARTMENTS AT POWER UP.
   B) TO FLUSH THE BURN BUILDING PRIOR TO TRAINING.
   C) TO FULLY PURGE THE TRAINING COMPARTMENTS WHEN EXCESSIVE GAS OR TEMPERATURE LEVELS ARE DETECTED DURING TRAINING.

2. THE LIVE FIRE CLASS B FUEL SYSTEM SHALL HAVE A COMPARTMENT TEMPERATURE DETECTION SENSOR THAT MONITORS TEMPERATURES AT 5' A.F.F. IF TEMPERATURES IN THE TRAINING COMPARTMENT EXCEED 550° THE VENTILATION SYSTEM SHALL RUN. IF TEMPERATURES AT THE 5' LEVEL EXCEED 100°, THE SYSTEM SHALL SHUTDOWN AND THE VENTILATION SYSTEM SHALL RUN UNTIL TEMPERATURES ARE REDUCED.

3. THE LIVE FIRE CLASS B FUEL SYSTEM SHALL HAVE A HARD-WIRED EMERGENCY SHUTDOWN CIRCUIT THROUGHOUT THE FACILITY TO PROVIDE WIDESPREAD ACCESS TO SHUTDOWN (E-STOP) PUSH BUTTONS. E-STOP PUSH BUTTONS SHALL BE LOCATED AT THE ENTRANCE(S) TO EACH TRAINING COMPARTMENT, ON THE SCENARIO CONTROL ASSEMBLIES, AND ON EACH CONTROL PENDANT. THE EFFECT OF PUSHING ANY E-STOP BUTTON SHALL CAUSE ALL BURNER CONTROL VALVES TO CLOSE, FACILITY GAS SUPPLY TO BE SECURED AND SMOKE PRODUCTION TO STOP. VENTILATION FANS WILL AUTOMATICALLY RUN AT MAXIMUM ONCE THE E-STOP PUSH BUTTON HAS BEEN ACTIVATED. THE VENTILATION SYSTEM WILL RUN CONTINUOUSLY AT MAXIMUM LEVEL UNTIL THE E-STOP HAS BEEN MANUALLY RESET AND SAFE OPERATING CONDITIONS EXIST.

4. THE LIVE FIRE CLASS B FUEL SYSTEM SHALL HAVE A GAS DETECTION SYSTEM WHICH CONTINUALLY MONITORS UNBURNED CLASS "B" FUEL LEVELS IN THE TRAINING COMPARTMENTS AND ANY EQUIPMENT ROOMS WHERE CLASS "B" FUEL LINES ARE INSTALLED. A MINIMUM OF TWO (2) GAS SENSORS SHALL BE SUPPLIED PER TRAINING COMPARTMENT. IF GAS LEVELS REACH 10% LEL, THE VENTILATION SYSTEM SHALL RUN. IF GAS LEVELS REACH 25% LEL, THE VENTILATION SYSTEM SHALL RUN AT MAXIMUM SPEED AND ALL GAS VALVES SHALL CLOSE. THE VENTILATION SYSTEM SHALL CONTINUOUSLY RUN UNTIL GAS LEVELS ARE REDUCED BELOW 10% LEL.

5. THE LIVE FIRE CLASS B FUEL SYSTEM FUEL CONTROL ASSEMBLY SHALL CONNECT TO THE CLASS "B" FUEL SUPPLY LINE. THE FUEL CONTROL ASSEMBLY SHALL CONSIST OF BOTH HIGH AND LOW PRESSURE SWITCHES. THE LINE PRESSURE SHALL BE MONITORED FOR ABNORMAL CONDITIONS AND SHALL SHUT DOWN THE SYSTEM IF THE LINE PRESSURE IS TOO HIGH OR TOO LOW. SHOULD A HIGH-PRESSURE CONDITION EXIST, THE VENTILATION SYSTEM SHALL START AND AN EMERGENCY SHUTDOWN SHALL OCCUR.

6. A MINIMUM OF TWO (2) EXTINGUISHING AGENT SENSORS SHALL BE LOCATED IN EACH BURN ROOM WITH ONE (1) DIRECTLY WITHIN THE BURN PROP. THE OUTPUT OF THESE SENSORS SHALL BE UTILIZED BY THE INSTRUCTOR TO DETERMINE THE EFFECTIVENESS OF AGENT APPLICATION WITH REGARD TO RATE AT WHICH FIRE IS EXTINGUISHED.

7. ALL COMPONENTS IN THIS SYSTEM SHALL PERFORM WITHIN THE FOLLOWING MINIMUM STANDARDS:
   A) CONTROL ROOM EQUIPMENT:
      TEMPERATURE: 65 TO 85° F (OPERATING)
      20 TO 125° F (STORAGE)
      HUMIDITY: 0 TO 95% (NON-CONDENSING)
   B) OUTDOOR EQUIPMENT:
      TEMPERATURE: 20 TO 100° F (OPERATING)
      -20 TO 125° F (STORAGE)
      HUMIDITY: 0 TO 100%
   C) COMPARTMENT EQUIPMENT:
      TEMPERATURE: 32° F TO MAX. (OPERATING)
      -20 TO 125° F (STORAGE)
      HUMIDITY: 0 TO 100%
   D) MECHANICAL: ALL TRANING COMPARTMENT EQUIPMENT SHALL WITHSTAND DIRECT HOSE PRESSURE OF 100 PSI AT 150 GPM FROM A DISTANCE OF THREE (3) FEET.
   E) TOTAL TRANING SYSTEM: MTBF (MEAN TIME BETWEEN FAILURES) > 500 HOURS (OPERATING).
   F) MTTR (MEAN TIME TO REPAIR) < 30 MINUTES (WHEN REPAIRS ARE PERFORMED BY QUALIFIED SERVICE PERSONNEL).

PRIME, PROFESSIONAL FIRM LOGO

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MECHANICAL PLANS & NOTES

CITY/COUNTY	VIRGINIA
Drawn By: ATA	Approved By: MAM
Checked By: MAM	Date: 01/31/24

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