

SECTION 01 10 00
SUMMARY

PART 1 GENERAL

1.01 PROJECT

- A. Project Name: Site Fire Alarm Upgrade.
- B. Owner's Name: Delaware Army National Guard - (DEARNG)
- C. The Project consists of the construction of a new fire protection system in building 115 and new fire alarm systems in building 115, 139, and 140.

1.02 CONTRACT DESCRIPTION

- A. Contract Type: A single prime contract based on a Stipulated Price as described in Document 00 52 00 - Agreement Form.

1.03 DESCRIPTION OF WORK

- A. Electrical Power and Lighting: Alter existing and add new construction.
- B. Fire Suppression Sprinklers: add new construction.
- C. Fire Alarm: add new construction.

1.04 OWNER OCCUPANCY

- A. Delaware Army National Guard intends to continue to occupy adjacent portions of the existing building during the entire construction period.
- B. Delaware Army National Guard intends to occupy the Project upon Substantial Completion.
- C. Cooperate with Delaware Army National Guard to minimize conflict and to facilitate continuation of normal Delaware Army National Guard's operations.
- D. Schedule the Work to accommodate Delaware Army National Guard occupancy.

1.05 CONTRACTOR USE OF SITE AND PREMISES

- A. Provide access to and from site as required by law and by Delaware Army National Guard:
 - 1. Emergency Building Exits During Construction: Keep all exits required by code clear and open during construction period; provide temporary exit signs if exit routes are temporarily altered.
 - 2. Do not obstruct roadways, sidewalks, or other public ways without permit.
- B. Utility Outages and Shutdown:
 - 1. Limit disruption of utility services to hours the building is unoccupied.
 - 2. Do not disrupt or shut down life safety systems, including but not limited to fire sprinklers and fire alarm system, without 7 days notice to Delaware Army National Guard and authorities having jurisdiction.
 - 3. Prevent accidental disruption of utility services to other facilities.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 20 00
PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Procedures for preparation and submittal of applications for progress payments.
- B. Change procedures.

1.02 SCHEDULE OF VALUES

- A. Forms to be used: AIA G703.
- B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit draft to DEDC, LLC for approval.
- C. Forms shall be typed. Forms filled out by hand will not be accepted.
- D. Submit Schedule of Values in duplicate within 5 days after date of Pre-Construction Meeting.

1.03 APPLICATIONS FOR PROGRESS PAYMENTS

- A. Payment Period: Submit at intervals stipulated in the Agreement.
- B. Form to be used: AIA G702.
- C. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to DEDC, LLC for approval.
- D. Forms shall be typed. Forms filled out by hand will not be accepted.
- E. Execute certification by signature of authorized officer.
- F. Submit three copies of each Application for Payment.
- G. Include the following with the application:
 - 1. OMB/DFM Project Number.
 - 2. FMO-DEARNG Project Number.
 - 3. Contractors Purchase Order Number from the State.

1.04 MODIFICATION PROCEDURES

- A. For minor changes not involving an adjustment to the Contract Sum or Contract Time, DEDC, LLC will issue instructions directly to Contractor.
- B. For other required changes, DEDC, LLC will issue a document signed by Delaware Army National Guard instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.
 - 1. The document will describe the required changes and will designate method of determining any change in Contract Sum or Contract Time.
 - 2. Promptly execute the change.
- C. For changes for which advance pricing is desired, DEDC, LLC will issue a document that includes a detailed description of a proposed change with supplementary or revised drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit a fixed price quotation within 5 days.
- D. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.
- E. Execution of Change Orders: DEDC, LLC will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.
- F. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.

- G. Promptly revise progress schedules to reflect any change in Contract Time, and revise sub-schedules to adjust times for other items of work affected by the change.
- H. Promptly enter changes in Project Record Documents.

1.05 APPLICATION FOR FINAL PAYMENT

- A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.
- B. Application for Final Payment will not be considered until the following have been accomplished:
 - 1. All closeout procedures specified in Section 01 70 00.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 21 00
ALLOWANCES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Contingency allowance.

1.02 RELATED REQUIREMENTS

- A. Delaware Army National Guard Front End Documents Division 0
- B. Section 01 20 00 - Price and Payment Procedures: Additional payment and modification procedures.

1.03 CONTINGENCY ALLOWANCE

- A. Contractor's costs for products, delivery, installation, labor, insurance, payroll, taxes, bonding, equipment rental, overhead and profit will be included in Change Orders authorizing expenditure of funds from this Contingency Allowance.
- B. Funds will be drawn from the Contingency Allowance only by Change Order.
- C. At closeout of Contract, funds remaining in Contingency Allowance will be credited to Owner by Change Order.

1.04 ALLOWANCES SCHEDULE

- A. Contingency Allowance: Include the stipulated sum/price of \$10,000 for use upon Owner's instructions for miscellaneous items found during construction.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 22 00
UNIT PRICES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. List of unit prices, for use in preparing Bids.

1.02 COSTS INCLUDED

- A. Unit Prices included on the Bid Form shall include full compensation for all required labor, products, tools, equipment, plant, transportation, services and incidentals; erection, application or installation of an item of the Work; overhead and profit.

1.03 UNIT QUANTITIES SPECIFIED

- A. Quantities indicated in the Bid Form are for bidding and contract purposes only. Quantities and measurements of actual Work will determine the payment amount.

1.04 MEASUREMENT OF QUANTITIES

- A. Measurement methods delineated in the individual specification sections complement the criteria of this section. In the event of conflict, the requirements of the individual specification section govern.
- B. Assist by providing necessary equipment, workers, and survey personnel as required.

1.05 PAYMENT

- A. Payment for Work governed by unit prices will be made on the basis of the actual measurements and quantities of Work that is incorporated in or made necessary by the Work and accepted by the DEDC, LLC, multiplied by the unit price.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 23 00
ALTERNATES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Description of Alternates.

1.02 RELATED REQUIREMENTS

- A. Delaware Army National Guard Front End Documents Division 0

1.03 ACCEPTANCE OF ALTERNATES

- A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Delaware Army National Guard's option. Accepted Alternates will be identified in the Owner-Contractor Agreement.
- B. Coordinate related work and modify surrounding work to integrate the Work of each Alternate.

1.04 SCHEDULE OF ALTERNATES

- A. Alternate No. 1, Provide a new fire alarm system for buildings 139 and 140.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 30 00
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Preconstruction meeting.
- B. Progress meetings.
- C. Construction progress schedule.
- D. Progress photographs.
- E. Coordination drawings.
- F. Submittals for review, information, and project closeout.
- G. Number of copies of submittals.
- H. Submittal procedures.

1.02 RELATED REQUIREMENTS

- A. Section 01 70 00 - Execution and Closeout Requirements: Additional coordination requirements.
- B. Section 01 78 00 - Closeout Submittals: Project record documents.
- C. Section 01 91 13 - General Commissioning Requirements: Additional procedures for submittals relating to commissioning.
 - 1. Where submittals are indicated for review by both DEDC, LLC and the Commissioning Authority, submit one extra and route to DEDC, LLC first, for forwarding to the Commissioning Authority.
 - 2. Where submittals are not indicated to be reviewed by DEDC, LLC, submit directly to the Commissioning Authority; otherwise, the procedures specified in this section apply to commissioning submittals.

1.03 PROJECT COORDINATION

- A. Project Coordinator: Delaware Army National Guard's Project Manager and DEDC, LLC.
- B. Cooperate with the Project Coordinator in allocation of mobilization areas of site; for field offices and sheds, for access, traffic, and parking facilities.
- C. During construction, coordinate use of site and facilities through the Project Coordinator.
- D. Comply with Project Coordinator's procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.
- E. Comply with instructions of the Project Coordinator for use of temporary utilities and construction facilities.
- F. Coordinate field engineering and layout work under instructions of the Project Coordinator.
- G. Make the following types of submittals to DEDC, LLC through the Project Coordinator:
 - 1. Requests for interpretation.
 - 2. Requests for substitution.
 - 3. Shop drawings, product data, and samples.
 - 4. Test and inspection reports.
 - 5. Design data.
 - 6. Manufacturer's instructions and field reports.
 - 7. Applications for payment and change order requests.
 - 8. Progress schedules.
 - 9. Coordination drawings.
 - 10. Correction Punch List and Final Correction Punch List for Substantial Completion.

11. Closeout submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRECONSTRUCTION MEETING

- A. Delaware Army National Guard will schedule a meeting after Notice of Award.
- B. Attendance Required:
 1. Delaware Army National Guard.
 2. DEDC, LLC.
 3. Contractor.
- C. Agenda:
 1. Execution of Delaware Army National Guard-Contractor Agreement.
 2. Designation of personnel representing the parties to Contract, Delaware Army National Guard, Contractor, Subcontractors, and DEDC, LLC.
 3. Designation of personnel representing the parties to Contract, owner, and DEDC, LLC.
 4. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
 5. Scheduling.

3.02 PROGRESS MEETINGS

- A. Schedule and administer meetings throughout progress of the Work at maximum two week intervals.
- B. DEDC, LLC will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
- C. Attendance Required: Job superintendent, major Subcontractors and suppliers, Delaware Army National Guard, DEDC, LLC, as appropriate to agenda topics for each meeting.
- D. Contractor shall provide a 3-week look ahead schedule in writing at each meeting and be prepared to review with attendees.
- E. Agenda:
 1. Review minutes of previous meetings.
 2. Review of Work progress.
 3. Field observations, problems, and decisions.
 4. Identification of problems that impede, or will impede, planned progress.
 5. Review of submittals schedule and status of submittals.
 6. Maintenance of progress schedule.
 7. Review contractor's 3 week look ahead schedule.
 8. Corrective measures to regain projected schedules.
 9. Planned progress during succeeding work period.
 10. Maintenance of quality and work standards.
 11. Effect of proposed changes on progress schedule and coordination.
 12. Other business relating to Work.

3.03 CONSTRUCTION PROGRESS SCHEDULE

- A. If preliminary construction progress schedule requires revision after review, submit revised schedule within 10 days.
- B. Within 20 days after review of preliminary construction progress schedule, submit draft of proposed final schedule for review.
 1. Include written certification that major Subcontractors have reviewed and accepted proposed schedule.
- C. Within 10 days after joint review, submit final schedule.
- D. Submit updated schedule with each Application for Payment.

3.04 PROGRESS PHOTOGRAPHS

- A. Submit photographs with each application for payment, taken not more than 3 days prior to submission of application for payment.
- B. Photography Type: Digital; electronic files.
- C. Provide photographs of construction throughout progress of Work produced by an experienced photographer, acceptable to DEDC, LLC.
- D. In addition to periodic, recurring views, take photographs of each of the following events:
- E. Views:
 - 1. Provide non-aerial photographs from four cardinal views at each specified time, until Date of Substantial Completion.
 - 2. Consult with DEDC, LLC for instructions on views required.
 - 3. Provide factual presentation.
 - 4. Provide correct exposure and focus, high resolution and sharpness, maximum depth of field, and minimum distortion.
- F. Digital Photographs: 24 bit color, minimum resolution of 1024 by 768, in JPG format; provide files unaltered by photo editing software.
 - 1. Delivery Medium: On photo CD.
 - 2. File Naming: Include project identification, date and time of view, and view identification.
 - 3. Point of View Sketch: Include digital copy of point of view sketch with each electronic submittal; include point of view identification in each photo file name.

3.05 COORDINATION DRAWINGS

- A. Provide information required by Project Coordinator for preparation of coordination drawings.

3.06 SUBMITTALS FOR REVIEW

- A. When the following are specified in individual sections, submit them for review:
 - 1. Product data.
 - 2. Shop drawings.
 - 3. Samples for selection.
 - 4. Samples for verification.
- B. Submit to DEDC, LLC for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
- C. Samples will be reviewed only for aesthetic, color, or finish selection.
- D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below .

3.07 SUBMITTALS FOR INFORMATION

- A. When the following are specified in individual sections, submit them for information:
 - 1. Design data.
 - 2. Certificates.
 - 3. Test reports.
 - 4. Inspection reports.
 - 5. Manufacturer's instructions.
 - 6. Manufacturer's field reports.
 - 7. Other types indicated.
- B. Submit for DEDC, LLC's knowledge as contract administrator or for Delaware Army National Guard.

3.08 SUBMITTALS FOR PROJECT CLOSEOUT

- A. Submit Correction Punch List for Substantial Completion.
- B. Submit Final Correction Punch List for Substantial Completion.

- C. When the following are specified in individual sections, submit them at project closeout:
 - 1. Project record documents.
 - 2. Operation and maintenance data.
 - 3. Warranties.
 - 4. Bonds.
 - 5. Other types as indicated.
- D. Submit for Delaware Army National Guard's benefit during and after project completion.

3.09 NUMBER OF COPIES OF SUBMITTALS

- A. Documents for Review:
 - 1. Small Size Sheets, Not Larger Than 8-1/2 x 11 inches: Submit the number of copies that Contractor requires, plus one copy that will be retained by DEDC, LLC.
- B. Documents for Information: Submit one copy.
- C. Documents for Project Closeout: Make one reproduction of submittal originally reviewed. Submit one extra of submittals for information.
- D. Samples: Submit the number specified in individual specification sections; one of which will be retained by DEDC, LLC.
 - 1. After review, produce duplicates.
 - 2. Retained samples will not be returned to Contractor unless specifically so stated.

3.10 SUBMITTAL PROCEDURES

- A. Shop Drawing Procedures:
 - 1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting the Contract Documents and coordinating related Work.
 - 2. Generic, non-project specific information submitted as shop drawings do not meet the requirements for shop drawings.
- B. Transmit each submittal with a copy of approved submittal form.
- C. Transmit each submittal with approved form.
- D. Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix.
- E. Identify Project, Contractor, Subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate on each copy.
- F. 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 the requirements of the Work and Contract Documents.
- G. Deliver submittals to DEDC, LLC at business address.
- H. Schedule submittals to expedite the Project, and coordinate submission of related items.
- I. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.
- J. Identify variations from Contract Documents and Product or system limitations that may be detrimental to successful performance of the completed Work.
- K. Provide space for Contractor and DEDC, LLC review stamps.
- L. When revised for resubmission, identify all changes made since previous submission.
- M. Distribute reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.
- N. Submittals not requested will not be recognized or processed.

END OF SECTION

SECTION 01 31 14
FACILITY SERVICES COORDINATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Services of a coordinator for facility services construction.
- B. Coordination documents.

1.02 RELATED REQUIREMENTS

- A. Section 01 10 00 - Summary: Responsibilities of separate contractors.
- B. Section 01 30 00 - Administrative Requirements: Additional requirements for coordination.
- C. Section 01 60 00 - Product Requirements: Spare parts and maintenance materials.
- D. Section 01 78 00 - Closeout Submittals: Project record documents.

1.03 MECHANICAL AND ELECTRICAL COORDINATOR

- A. Employ and pay for services of a person, technically qualified and administratively experienced in field coordination of the type of work required to be coordinated, for the duration of the Work.

1.04 SUBMITTALS

- A. Submit name, address, and telephone number of coordinator and name of principal officer for review.
- B. Submit coordination drawings and schedules prior to submitting shop drawings, product data, and samples.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 COORDINATION REQUIRED

- A. Coordinate the work listed below:
 - 1. Fire Suppression: Division 21.
 - 2. Plumbing: Division 22.
 - 3. Heating, Ventilating, and Air Conditioning: Division 23.
 - 4. Electrical: Division 26.
 - 5. Communications: Division 27.
 - 6. Electronic Safety and Security: Division 28.
 - 7. Site Utilities: Division 33.
- B. Conduct meetings among subcontractors and others concerned, to establish and maintain coordination and schedules, and to resolve coordination matters in dispute.
- C. Participate in progress meetings. Report on progress of work to be adjusted under coordination requirements, and any required changes in schedules. Transmit minutes of meetings and reports to concerned parties.

3.02 COORDINATION DOCUMENTS

- A. Prepare coordination drawings to organize installation of products for efficient use of available space, for proper sequence of installation, and to identify potential conflicts.
- B. Prepare a master schedule identifying responsibilities for activities that directly relate to this work, including submittals and temporary utilities; organize by specification section.
- C. Identify electrical power characteristics and control wiring required for each item of equipment.
- D. Maintain documents for the duration of the work, recording changes due to site instructions, modifications or adjustments.
- E. After DEDC, LLC review of original and revised documents, reproduce and distribute copies to concerned parties.

- F. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
 - a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
 - b. Coordinate the addition of trade-specific information to the coordination drawings by multiple contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
 - c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
 - e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
 - f. Indicate required installation sequences.
 - g. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

3.03 COORDINATION OF SUBMITTALS

- A. Review shop drawings, product data, and samples for compliance with Contract Documents and for coordination with related work. Transmit copies of reviewed documents to DEDC, LLC.
- B. Check field dimensions and clearances and relationship to available space and anchors.
- C. Check compatibility with equipment and work of other sections, electrical characteristics, and operational control requirements.
- D. Check motor voltages and control characteristics.
- E. Coordinate controls, interlocks, wiring of switches, and relays.
- F. Coordinate wiring and control diagrams.
- G. When changes in the work are made, review their effect on other work.
- H. Verify information and coordinate maintenance of record documents.

3.04 COORDINATION OF SUBSTITUTIONS AND MODIFICATIONS

- A. Review proposals and requests for substitution prior to submission to DEDC, LLC.
- B. Verify compliance with Contract Documents and for compatibility with work of other sections.
- C. Submit with recommendation for action.

3.05 OBSERVATION OF WORK

- A. Observe work for compliance with Contract Documents.
- B. Maintain a list of observed deficiencies and defects; promptly submit.

3.06 DOCUMENTATION

- A. Observe and maintain a record of tests. Record:
 1. Specification section number and product name.

2. Name of Contractor, subcontractor, and Commissioning Agent (if applicable).
 3. Name of testing agency and name of inspector.
 4. Name of manufacturer's representative present.
 5. Date, time, and duration of tests.
 6. Type of test, and results.
 7. Retesting required.
- B. Assemble background documentation for dispute and claim settlement.
- C. Submit copies of documentation to DEDC, LLC upon request.

3.07 EQUIPMENT START-UP

- A. Verify utilities, connections, and controls are complete and equipment is in operable condition as required by Section 01 70 00.
- B. Observe start-up and adjustments, test run, record time and date of start-up, and results.
- C. Observe equipment demonstrations made to Delaware Army National Guard; record times and additional information required for operation and maintenance manuals.

3.08 INSPECTION AND ACCEPTANCE OF EQUIPMENT

- A. Prior to inspection, verify that equipment is tested, operational, clean, and ready for operation.

END OF SECTION

SECTION 01 35 53
SECURITY PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Security measures including formal security program, entry control, personnel identification, guard service, and miscellaneous restrictions.
- B. The correctional facility has issued regulations to be observed by all Contractors, their subcontractors and employees and other firms providing services for or otherwise assigned to or working on the Project in order to minimize disruption to prison operations, maintain security and to facilitate the construction process. While working inside the prison facilities on a regular or occasional basis, it must be clearly understood that prison security requirements will at all times take precedence over construction operations. The contractor shall comply with all such regulations and consider the regulations when preparing his/her bid.

1.02 RELATED REQUIREMENTS

- A. Section 01 10 00 - Summary: use of premises and occupancy.
- B. Section 01 50 00 - Temporary Facilities and Controls: Temporary lighting.

1.03 SECURITY PROGRAM

- A. Protect Work, existing premises and Delaware Army National Guard's operations from theft, vandalism, and unauthorized entry.
- B. Initiate program in coordination with Delaware Army National Guard's existing security system at project mobilization.
- C. Maintain program throughout construction period until Delaware Army National Guard acceptance precludes the need for Contractor security.

1.04 ENTRY CONTROL

- A. Restrict entrance of persons and vehicles into Project site and existing facilities.
- B. Allow entrance only to authorized persons with proper identification.
- C. Maintain log of workers and visitors, make available to Delaware Army National Guard on request.
- D. Department of Correction (DOC) shall control entrance of persons and vehicles related to State of Delaware OMB - Division of Facilities Management's operations.

1.05 PERSONNEL IDENTIFICATION AND BACKGROUND CHECK

- A. All contractor workers must obtain a security clearance/background check for the facility in which work is to be performed. The clearance request forms are specific for each DOC facility and will be provided as requested.

1.06 GENERAL REQUIREMENTS

- A. When workers are finished for the day, all tools will be accounted for by the worker and the escorting officer.
- B. Workers once entering controlled areas are not permitted to wander from the work area. Should a worker need to go to another area, he/she will be escorted by an officer.
- C. Should work require more than one day to complete the job, permission to construct and use temporary storage facilities is solely at the discretion of the prison authorities. The facility will not accept responsibility for any loss or damage to materials left on site. All tools and equipment should be removed daily.
- D. It is essential that construction operation and debris removal be conducted in a manner to assure that materials which might be used as weapons do not fall into the hands of inmates.

- E. Anything of unusual nature such as loss of key, identification cards, tools, piping, etc., shall be reported immediately to the escorting officer.
- F. In the event that construction requires disruption of plumbing, electrical power, etc., the Director of Custody of Operations must receive at least twenty four (24) hours advance notice in order to preserve security and not to disrupt routine activities. When temporary shutdown of service is unavoidable, the work shall be completed at night during a time when the institution's routine will not be interfered with.
- G. Workers shall be subjected to all rules and regulations. Contractors are expected to follow the directive of any DOC uniformed personnel. Failure to comply with a directive will result in being escorted out of the institution and being banned from entering the institution until the Security Superintendent and/or the Warden has reviewed the case.
- H. Contractors shall include, in their bid, a sufficient amount of time to enter and depart the facility in a given day. as an example of past projects at a Department of Correction site, it takes between one half (1/2) hour to one (1) hour to enter or leave the facility.
- I. Normal work hours are from 7:00AM until 3:00PM Monday thru Friday. Contractor must be ready to enter gate at 7:00AM with cleanup and tool inventory completed and ready to exit facility by 2:45PM.

1.07 SPECIAL REQUIREMENTS

- A. Materials shall be moved through the buildings using rubber tired vehicles which shall be properly controlled at all times to avoid damage to existing walls, floors, and ceiling surfaces, including doors and door and/or window frames.
- B. Water damage will not be tolerated and it is incumbent upon the contractor to take all steps necessary to keep the existing premises dry at all times.
- C. All welding and cutting shall be performed by qualified and certified welders. Certificates shall be on file with the Construction Manager prior to commencement of any welding.
- D. Existing streets, pavements, lawns, curbs, and other finished surfaces disturbed or damaged by excavation or other construction activities shall be repaired and restored to their original conditions to the satisfaction of the Owner, Construction Manager, and local authorities.
- E. Open trenches must be barricaded. Nothing which can be used as a weapon or could conceal an inmate can be used as a barricade. Contractors are directed to use plastic tape and the existing trees, shrubbery, or fences where available.
- F. No dumping will be allowed on the project site. Trash, debris, and waste must be removed from the compound daily and from the site as required or directed.

1.08 SITE SECURITY

- A. The following regulations must be observed by all persons having any association with the construction of this project (employees, subcontractors, workmen, service men, manufacturer's representative, etc.)
 - 1. Access to the DOC Facility will be through a Main (Visitor) Gate or a SallyPort, as directed by the facility. Each contractor must have passed a security/background check. A state issued photo ID will need to be furnished to the Security Officer before a Visitor Pass can be issued to the contractor.

All contractors shall enter and leave as a group with an escort (Maintenance Personnel or Corrections Officer).

- 2. Assigning Men to the Site
 - a. Each trade subcontractor shall notify the Maintenance Superintendent twenty four (24) hours in advance, but not later than 12:00 noon, on the previous work day before sending men to the project site, so an officer can be assigned to accompany all his personnel.

3. Tools and Materials
 - a. No tool or materials shall be left unguarded at any time, and they shall be removed from the working areas at the end of each working day or at anytime the workmen or assigned officer leave the area.
4. Prison Records
 - a. Where workmen or representative visiting the institution has a prison record, the trade subcontractor shall be responsible for obtaining the particulars concerning his record, and notifying the institution at least twenty four (24) hours in advance of his visit. The institution will then notify the trade subcontractor and give or deny permission for that person to enter the institution. Any workmen denied entrance to the institution must be replaced by the trade subcontractor or subcontractor at no additional cost.
5. Workmen Lunch Area/Searches
 - a. Workmen will be expected to stay in their respective working areas during their lunch period, unless leaving the grounds is permitted by the DOC facility.
 - b. It is expected that once workers enter the facility, they will stay within the facility until the end of their shift.
 - c. All workmen will be expected to submit to search of themselves, their tool boxes, lunch containers, and/or their vehicles at any time, if the search is deemed necessary.
6. Prohibited Items
 - a. The following items are prohibited from being brought onto the prison grounds and construction site:
 - 1) Any intoxicating beverage.
 - 2) Any narcotic, hypnotic, barbiturate, hallucinogenic drug, central nervous stimulant or prescription drug except as authorized or approved by an institution affiliated physician.
 - 3) Any firearm or instrument customarily used or designed to be used as a dangerous weapon, or an explosive device, except as authorized by the institution and/or Departmental Administration.
 - 4) Any instrument that may be used as an aid in attempting an escape.
 - 5) Hypodermic needle, syringe or article, instrument or substance specifically prohibited by the institution administration except as authorized.
7. Working Dress and Workmen
 - a. Workmen will maintain proper attire while working at the institution.
 - 1) Short pants, open toed shoes, or bare chest are not permitted.
8. It is forbidden to aid or abet the escape of any inmate, or to advise, connive or assist in any escape, or to conceal any inmate after escape, or withhold information pertaining thereto. Violation of this prohibition can result in prosecution and the law provides for punishment of fine and imprisonment.
9. It is likewise strictly forbidden to bring into or take out of the prison either for pay, or for favor, for any inmate, any article without the proper authorization from the Maintenance Superintendent.
10. You are not authorized to roam at will throughout the prison. You will restrict yourself to going directly to those places where your work is conducted and remaining away from areas where you have no business.
11. Stopping to socialize, exchange pleasantries, or conduct business with inmates in traffic areas (hallways, center areas, etc.) is prohibited. Also no affectionate or intimate behavior between official visitors and inmates is permitted.
12. Your automobile is to be parked in a location designated by the Director of Custody of Operations. Parked vehicles must always have the ignition locked and if the interior of the car contains packages, clothing, or any other removable articles, the doors must be locked as well.
13. No photographs may be taken without proper authorization. No public news releases may be given without similar authorization.

14. You are not authorized to escort any person, not previously approved, onto the prison grounds or into the prison.
15. The offering and/or giving of any tips, gratuities, fees, etc. to any inmate and/or prison personnel is strictly prohibited.
16. The use of indecent, abusive or profane language is forbidden anywhere on the prison property.
17. Civilian or other clothing should not be left carelessly in places where it may be acquired and worn by inmates.
18. In the event an acquaintance, friend, or relative of contractor's employee should be an inmate of the institution at which you are working, it is advisable that you communicate this confidentially to the Maintenance Superintendent.
19. Tool and Equipment Safety
 - a. Flammable Liquids: Maintain flammable liquid (e.g., gasoline, fuels, etc.) in secure containers at all times, in compliance with OSHA regulations.
 - b. Tools: Maintain tools and related equipment (e.g., sprinkler heads, hydrants, wires, cables, ducts, manholes, posts, poles, signals, alarm boxes, etc.) at all times.
 - c. Powder Actuated Tools: Comply with Owner's Manual, and Maintenance Superintendent directions for control of powder used and storage.
 - d. Tool boxes shall be kept locked at all times.
20. Construction Personnel Vehicle Parking
 - a. Parking spaces for privately owned vehicles operated by construction personnel may be limited.
 - b. The Maintenance Superintendent will assign areas within the prison site for parking. Sufficient space will be provided to park privately owned vehicles operated by construction personnel on site.
 - c. Vehicle inspections may be conducted at the discretion of the Maintenance Superintendent for the duration of the Contract.
 - d. Vehicles should be kept clean. Trash within the vehicle increases the amount of time it takes the guards to inspect vehicle.
 - e. Do not leave keys in vehicles whether locked or unlocked.
21. Contractors shall not bring glass containers into the facility.
22. The use of cellular phones, pages, and other electronic communication devices will not be permitted unless specific approval is granted by the Security Superintendent.

1.09 FIRE PROTECTION

- A. Protect and maintain fire department facilities (e.g., sprinkler heads, hydrants, wire, cables, ducts, manholes, posts, poles, signals, alarm boxes, etc.) at all times.
- B. Maintain unobstructed access to the following at all times: Fire hydrants, and fire alarm boxes.
- C. Immediately notify the Fire Department in the event of accidental damage to fire department facilities.
- D. Immediately restore damage facilities to original conditional at no increase to the Contract Sum.

1.10 RESPONSIBILITY FOR DAMAGE AND CARE OF STATE PROPERTY

- A. The contractor in the performance of this Contract will be held financially responsible for any damage to the grounds, buildings, or equipment caused by them, their subcontractors or employees, or other persons engaged in the performance of the Contract.
- B. Every reasonable effort shall be made by workmen to proceed with the work as described in these specifications in a manner in trade circles as the highest level of workmanship. The successful bidder for this work shall be responsible for all damage to other work caused by his workmen or through the neglect of his workmen on the site.
- C. Workmanlike care shall be expected at all times in performing the work. It shall be the responsibility of the successful bidder to repair or replace all damaged property, the damage for which they or anyone working under his direction is responsible.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

PART 4 DAILY CONTRACTOR TOOL AND EQUIPMENT INVENTORY

4.01 THE CONTRACTOR TOOL/EQUIPMENT FORM SHALL BE COMPLETED AND SIGNED BY ALL CONTRACTOR PERSONNEL PRIOR TO ENTERING A DOC FACILITY. THE FOLLOWING REQUIREMENTS APPLY:

- A. An original signed and dated tool/equipment form shall be prepared each day.
- B. This form shall serve as an inventory of all work and personal equipment carried into a Department of Correction facility and will serve to ensure that the inventoried equipment is removed from the facility at the end of the work day.
- C. Each piece of work and personal equipment noted on this form shall be described in sufficient detail so that it can easily be identified and matched to the inventory by a Department of Correction staff.
- D. Department of Correction strongly recommends that when work/personal equipment is to be carried into a Department of Correction facility on a repetitive basis, the equipment be marked with a unique identifier (e.g. personnel initials + number) so that it can be matched to the same unique identifier noted on the tool/equipment form.
- E. Prior to entering and exiting secured areas of a Department of Correction facility, the daily tool/equipment inventory shall be reviewed and signed by the escorting officer.
- F. If, prior to exiting a secured area, the preparer of this form determines that he or she cannot account for each piece of equipment, then he or she shall immediately notify the escorting officer.
- G. If, prior to exiting a secure area, a Department of Correction staff cannot identify each tool or piece of equipment and reconcile it to the items inventoried on this form, then the Department of Correction staff will hold the group of contractor employees in the secure area until the discrepancy is resolved.
- H. The following list of tools and equipment is representative of the items inventoried on the form. All tools and equipment being brought into the institution will be inventoried. Every job box will have an exact inventory of all tool boxes and equipment stored in that box. The box must be lockable and remained locked when not in use. There are no exceptions to this rule. List all tools for example hand tools (ex. hammers, pliers, wrenches, and screwdrivers), electrical tools (ex. measuring equipment, splicing equipment), power tools (ex. drills, saws, demolition equipment) and supplies (saw blades, drill bits, fasteners). List all other equipment (ex. Two-way radios, writing pads, pens, pencils, etc.). However, the list may be expanded to cover equipment specific to a scope of work or project.
- I. Items not permitted include, but are not limited to: firearms, medicines, pocket knives, leather man tools, tobacco, matches, lighters, gum, beer, alcohol of any kind, glass bottles or containers, aluminum cans, metal knives, spoons or forks, music radios, i-Pods, newspapers, fliers, or magazines.
- J. Laptop computers, cameras, cell phones, and pagers are restricted items and their use can only be approved in writing, in advance by the Warden or his designee. Failure to declare an item at the sally port will result in that item being confiscated.

Contractor Name:

Signature & Date:

TOOL AND EQUIPMENT INVENTORY

IN	OUT
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DATE		DATE	
CONTRACTOR NAME AND SIGNATURE		CONTRACTOR NAME AND SIGNATURE	
STAFF SIGNATURE		STAFF SIGNATURE	
TIME IN		TIME OUT	

ITEM DESCRIPTION	SIZE, TYPE, COLOR OR OTHER IDENTIFYING INFORMATION	QUANTITY	UNIQUE IDENTIFIER	VERIFY (CHECK)

END OF SECTION

SECTION 01 40 00
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Control of installation.
- B. Testing and inspection services.
- C. Manufacturers' field services.

1.02 RELATED REQUIREMENTS

- A. Section 01 30 00 - Administrative Requirements: Submittal procedures.
- B. Section 01 60 00 - Product Requirements: Requirements for material and product quality.

1.03 REFERENCE STANDARDS

- A. ASTM C1077 - Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation; 2014.

1.04 SUBMITTALS

- A. Design Data: Submit for DEDC, LLC's knowledge as contract administrator for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents, or for Delaware Army National Guard's information.
- B. Test Reports: After each test/inspection, promptly submit two copies of report to DEDC, LLC and to Contractor.
 - 1. Include:
 - a. Date issued.
 - b. Project title and number.
 - c. Name of inspector.
 - d. Date and time of sampling or inspection.
 - e. Identification of product and specifications section.
 - f. Location in the Project.
 - g. Type of test/inspection.
 - h. Date of test/inspection.
 - i. Results of test/inspection.
 - j. Conformance with Contract Documents.
 - k. When requested by DEDC, LLC, provide interpretation of results.

1.05 TESTING AND INSPECTION AGENCIES

- A. Delaware Army National Guard will employ and pay for services of an independent testing agency to perform other specified testing.
- B. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 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. Should manufacturers' instructions conflict with Contract Documents, request clarification from DEDC, LLC 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. Have Work performed by persons qualified to produce required and specified quality.
- F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 TESTING AND INSPECTION

- A. Testing Agency Duties:
 - 1. Provide qualified personnel at site. Cooperate with DEDC, LLC and Contractor in performance of services.
 - 2. Perform specified sampling and testing of products in accordance with specified standards.
 - 3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
 - 4. Promptly notify DEDC, LLC and Contractor of observed irregularities or non-conformance of Work or products.
 - 5. Perform additional tests and inspections required by DEDC, LLC.
 - 6. Submit reports of all tests/inspections specified.
- B. Limits on Testing/Inspection Agency Authority:
 - 1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 - 2. Agency may not approve or accept any portion of the Work.
 - 3. Agency may not assume any duties of Contractor.
 - 4. Agency has no authority to stop the Work.
- C. Contractor Responsibilities:
 - 1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
 - 2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
 - 3. Provide incidental labor and facilities:
 - a. To provide access to Work to be tested/inspected.
 - b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
 - c. To facilitate tests/inspections.
 - d. To provide storage and curing of test samples.
 - 4. Notify DEDC, LLC and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
 - 5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
 - 6. Arrange with Delaware Army National Guard's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
- D. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by DEDC, LLC.
- E. Re-testing required because of non-conformance to specified requirements shall be paid for by Contractor.

3.03 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, start-up of equipment, test, adjust and balance of equipment as applicable, and to initiate instructions when necessary.

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

3.04 DEFECT ASSESSMENT

- A. Replace Work or portions of the Work not conforming to specified requirements.
- B. If, in the opinion of DEDC, LLC, it is not practical to remove and replace the Work, DEDC, LLC will direct an appropriate remedy or adjust payment.

END OF SECTION

SECTION 01 60 00
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General product requirements.
- B. Re-use of existing products.
- C. Transportation, handling, storage and protection.
- D. Product option requirements.
- E. Substitution "or Equal" limitations and procedures.
- F. Procedures for Delaware Army National Guard-supplied products.
- G. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 RELATED REQUIREMENTS

- A. Document Instructions to Bidders: Product options and substitution procedures prior to bid date.
- B. Section 01 10 00 - Summary:
- C. Section 01 40 00 - Quality Requirements: Product quality monitoring.
- D. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions: Requirements for VOC-restricted product categories.
- E. Section 01 74 19 - Construction Waste Management and Disposal: Waste disposal requirements potentially affecting packaging and substitutions.

1.03 REFERENCE STANDARDS

- A. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS

- A. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- B. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- C. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
 - 1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

PART 2 PRODUCTS

2.01 EXISTING PRODUCTS

- A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by the Contract Documents.
- B. Unforeseen historic items encountered remain the property of the Delaware Army National Guard; notify Delaware Army National Guard promptly upon discovery; protect, remove, handle, and store as directed by Delaware Army National Guard.
- C. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Delaware Army National Guard, or otherwise indicated as to remain

the property of the Delaware Army National Guard, become the property of the Contractor; remove from site.

- D. Reused Products: Reused products include materials and equipment previously used in this or other construction, salvaged and refurbished as specified.
- E. Specific Products to be Reused: The reuse of certain materials and equipment already existing on the project site is not prohibited.
 - 1. See Section 01 10 00 for list of items required to be salvaged for reuse and relocation.

2.02 NEW PRODUCTS

- A. Provide new products unless specifically required or permitted by the Contract Documents.
- B. DO NOT USE products having any of the following characteristics:
 - 1. Made using or containing CFC's or HCFC's.
- C. Where all other criteria are met, Contractor shall give preference to products that:
 - 1. If used on interior, have lower emissions, as defined in Section 01 61 16.
 - 2. If wet-applied, have lower VOC content, as defined in Section 01 61 16.
 - 3. Are extracted, harvested, and/or manufactured closer to the location of the project.
 - 4. Have longer documented life span under normal use.
 - 5. Result in less construction waste.
 - 6. Are made of vegetable materials that are rapidly renewable.
 - 7. Have a published GreenScreen Chemical Hazard Analysis.
- D. Provide interchangeable components of the same manufacture for components being replaced.
- E. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Size terminal lugs to NFPA 70, include lugs for terminal box.

2.03 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named in accordance with this specification.

2.04 MAINTENANCE MATERIALS

- A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.
- B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION PROCEDURES

- A. The intent of this process is to allow for manufacturers not listed to provide an "Equal" product to DEDC, LLC for review and approval. This process must take place prior to award of bid.
- B. Instructions to Bidders specify time restrictions for submitting requests for substitutions during the bidding period. Comply with requirements specified in this section.
- C. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.
- D. A request for substitution constitutes a representation that the submitter:
 - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
 - 2. Will provide the same warranty for the substitution as for the specified product.
 - 3. Will coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Delaware Army National Guard.

4. Waives claims for additional costs or time extension that may subsequently become apparent.
 5. Has investigated proper clearances and working spaces for substituted equipment and waives claims for additional costs or time extension that may subsequently become apparent. These physical differences must be pointed out at the time of the submittal.
- E. Substitution Submittal Procedure:
1. Submit three copies of request for substitution for consideration. Limit each request to one proposed substitution.
 2. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer.
 3. The DEDC, LLC will notify Contractor in writing of decision to accept or reject request.

3.02 OWNER-SUPPLIED PRODUCTS

- A. Delaware Army National Guard's Responsibilities:
1. Arrange for and deliver Delaware Army National Guard reviewed shop drawings, product data, and samples, to Contractor.
 2. Arrange and pay for product delivery to site.
 3. On delivery, inspect products jointly with Contractor.
 4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
 5. Arrange for manufacturers' warranties, inspections, and service.
- B. Contractor's Responsibilities:
1. Review Delaware Army National Guard reviewed shop drawings, product data, and samples.
 2. Receive and unload products at site; inspect for completeness or damage jointly with Delaware Army National Guard.
 3. Handle, store, install and finish products.
 4. Repair or replace items damaged after receipt.

3.03 TRANSPORTATION AND HANDLING

- A. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
- B. Transport and handle products in accordance with manufacturer's instructions.
- C. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
- D. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
- E. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.
- F. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.04 STORAGE AND PROTECTION

- A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.
- B. Store and protect products in accordance with manufacturers' instructions.
- C. Store with seals and labels intact and legible.
- D. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.
- E. For exterior storage of fabricated products, place on sloped supports above ground.

- F. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- G. Prevent contact with material that may cause corrosion, discoloration, or staining.
- 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.

END OF SECTION

SECTION 01 70 00
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Examination, preparation, and general installation procedures.
- B. Requirements for alterations work, including selective demolition, except removal, disposal, and/or remediation of hazardous materials and toxic substances.
- C. Pre-installation meetings.
- D. Cutting and patching.
- E. Cleaning and protection.
- F. Starting of systems and equipment.
- G. Demonstration and instruction of Delaware Army National Guard personnel.
- H. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.
- I. General requirements for maintenance service.

1.02 RELATED REQUIREMENTS

- A. Section 01 10 00 - Summary: Limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.
- B. Section 01 30 00 - Administrative Requirements: Submittals procedures, Electronic document submittal service.
- C. Section 01 74 19 - Construction Waste Management and Disposal: Additional procedures for trash/waste removal, recycling, salvage, and reuse.
- D. Section 01 78 00 - Closeout Submittals: Project record documents, operation and maintenance data, warranties and bonds.
- E. Section 01 79 00 - Demonstration and Training: Demonstration of products and systems to be commissioned and where indicated in specific specification sections
- F. Section 01 91 13 - General Commissioning Requirements: Contractor's responsibilities in regard to commissioning.
- G. Section 07 84 00 - Firestopping.

1.03 REFERENCE STANDARDS

- A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2009.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
 - 1. Structural integrity of any element of Project.
 - 2. Integrity of weather exposed or moisture resistant element.
 - 3. Efficiency, maintenance, or safety of any operational element.
 - 4. Visual qualities of sight exposed elements.
 - 5. Work of Delaware Army National Guard or separate Contractor.
 - 6. Include in request:
 - a. Identification of Project.
 - b. Location and description of affected work.
 - c. Necessity for cutting or alteration.
 - d. Description of proposed work and products to be used.
 - e. Effect on work of Delaware Army National Guard or separate Contractor.
 - f. Written permission of affected separate Contractor.

g. Date and time work will be executed.

C. Project Record Documents: Accurately record actual locations of capped and active utilities.

1.05 PROJECT CONDITIONS

A. Use of explosives is not permitted.

B. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

C. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.

1. Provide dust-proof barriers between construction areas and areas continuing to be occupied by Delaware Army National Guard.

D. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.

1. Outdoors: Limit conduct of especially noisy exterior work to the hours of 8 am to 5 pm.

2. Indoors: Limit conduct of especially noisy interior work to the hours of 6 pm to 7 am.

E. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.

1.06 COORDINATION

A. See Section 01 10 00 for occupancy-related requirements.

B. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

C. Notify affected utility companies and comply with their requirements.

D. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

E. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

F. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

G. Coordinate completion and clean-up of work of separate sections.

H. After Delaware Army National Guard occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Delaware Army National Guard's activities.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

A. New Materials: As specified in product sections; match existing products and work for patching and extending work.

B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.

C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.
- B. Verify that 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. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.
- E. Verify that utility services are available, of the correct characteristics, and in the correct locations.
- F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 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 any new material or substance in contact or bond.

3.03 PREINSTALLATION MEETINGS

- A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.
- B. Require attendance of parties directly affecting, or affected by, work of the specific section.
- C. Notify DEDC, LLC four days in advance of meeting date.
- D. Prepare agenda and preside at meeting:
 - 1. Review conditions of examination, preparation and installation procedures.
 - 2. Review coordination with related work.
- E. Record minutes and distribute copies within two days after meeting to participants, with two copies to DEDC, LLC, Delaware Army National Guard, participants, and those affected by decisions made.

3.04 GENERAL INSTALLATION REQUIREMENTS

- A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.
- B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
- C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
- D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
- E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.05 ALTERATIONS

- A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
 - 1. Verify that construction and utility arrangements are as shown.
 - 2. Report discrepancies to DEDC, LLC before disturbing existing installation.
 - 3. Beginning of alterations work constitutes acceptance of existing conditions.

- B. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
 - 1. Where openings in exterior enclosure exist, provide construction to make exterior enclosure weatherproof.
 - 2. Insulate existing ducts or pipes that are exposed to outdoor ambient temperatures by alterations work.
- C. Remove existing work as indicated and as required to accomplish new work.
 - 1. Remove items indicated on drawings.
 - 2. Relocate items indicated on drawings.
 - 3. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
 - 4. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.
- D. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove, relocate, and extend existing systems to accommodate new construction.
 - 1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
 - 2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
 - 3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
 - a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
 - b. See Section 01 10 00 for other limitations on outages and required notifications.
 - c. Provide temporary connections as required to maintain existing systems in service.
 - 4. Verify that abandoned services serve only abandoned facilities.
 - 5. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.
- E. Protect existing work to remain.
 - 1. Prevent movement of structure; provide shoring and bracing if necessary.
 - 2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
 - 3. Repair adjacent construction and finishes damaged during removal work.
- F. Adapt existing work to fit new work: Make as neat and smooth transition as possible.
- G. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.
- H. Refinish existing surfaces as indicated:
 - 1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.
 - 2. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.
- I. Clean existing systems and equipment.

- J. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.
- K. Do not begin new construction in alterations areas before demolition is complete.
- L. Comply with all other applicable requirements of this section.

3.06 CUTTING AND PATCHING

- A. Whenever possible, execute the work by methods that avoid cutting or patching.
- B. See Alterations article above for additional requirements.
- C. Perform whatever cutting and patching is necessary to:
 - 1. Complete the work.
 - 2. Fit products together to integrate with other work.
 - 3. Provide openings for penetration of mechanical, electrical, and other services.
 - 4. Match work that has been cut to adjacent work.
 - 5. Repair areas adjacent to cuts to required condition.
 - 6. Repair new work damaged by subsequent work.
 - 7. Remove samples of installed work for testing when requested.
 - 8. Remove and replace defective and non-conforming work.
- D. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.
- E. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
- F. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
- G. Restore work with new products in accordance with requirements of Contract Documents.
- H. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- I. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 84 00, to full thickness of the penetrated element.
- J. Patching:
 - 1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
 - 2. Match color, texture, and appearance.
 - 3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.07 PROGRESS CLEANING

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a 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 the space.
- 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 trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.08 PROTECTION OF INSTALLED WORK

- A. Protect installed work from damage by construction operations.

- B. Provide special protection where specified in individual specification sections.
- C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
- F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- G. Remove protective coverings when no longer needed; reuse or recycle plastic coverings if possible.

3.09 SYSTEM STARTUP

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.
- C. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- D. Verify that wiring and support components for equipment are complete and tested.
- E. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.
- F. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.10 DEMONSTRATION AND INSTRUCTION

- A. See Section 01 79 00 - Demonstration and Training.

3.11 ADJUSTING

- A. Adjust operating products and equipment to ensure smooth and unhindered operation.

3.12 FINAL CLEANING

- A. Use cleaning materials that are nonhazardous.
- B. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.
- C. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
- D. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
- E. Clean filters of operating equipment.
- F. Clean debris from roofs, gutters, downspouts, and drainage systems.
- G. Clean site; sweep paved areas, rake clean landscaped surfaces.
- H. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.13 CLOSEOUT PROCEDURES

- A. Make submittals that are required by governing or other authorities.
 - 1. Provide copies to DEDC, LLC.

- B. Accompany Project Coordinator on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's Notice of Substantial Completion.
- C. Notify DEDC, LLC when work is considered ready for DEDC, LLC's Substantial Completion inspection.
- D. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for DEDC, LLC's Substantial Completion inspection.
- E. Conduct Substantial Completion inspection and create Final Correction Punch List containing DEDC, LLC's and Contractor's comprehensive list of items identified to be completed or corrected and submit to DEDC, LLC.
- F. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Delaware Army National Guard-occupied areas.
- G. Notify DEDC, LLC when work is considered finally complete and ready for DEDC, LLC's Substantial Completion final inspection.
- H. Complete items of work determined by DEDC, LLC listed in executed Certificate of Substantial Completion.

3.14 MAINTENANCE

- A. Provide service and maintenance of components indicated in specification sections.
- B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.
- C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.
- D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.
- E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Delaware Army National Guard.

END OF SECTION

SECTION 01 74 19
CONSTRUCTION WASTE MANAGEMENT

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes: Administrative and procedural requirements for construction waste management activities.

1.02 DEFINITIONS

- A. Construction, Demolition, and Land clearing (CDL) Waste: Includes all non-hazardous solid wastes resulting from construction, remodeling, alterations, repair, demolition and land clearing. Includes material that is recycled, reused, salvaged or disposed as garbage.
- B. Salvage: Recovery of materials for on-site reuse, sale or donation to a third party.
- C. Reuse: Making use of a material without altering its form. Materials can be reused on-site or reused on other projects off-site. Examples include, but are not limited to the following: Crushing or grinding of concrete for use as sub-base material. Chipping of land clearing debris for use as mulch.
- D. Recycling: The process of sorting, cleaning, treating, and reconstituting materials for the purpose of using the material in the manufacture of a new product.
- E. Source-Separated CDL Recycling: The process of separating recyclable materials in separate containers as they are generated on the job-site. The separated materials are hauled directly to a recycling facility or transfer station.
- F. Co-mingled CDL Recycling: The process of collecting mixed recyclable materials in one container on-site. The container is taken to a material recovery facility where materials are separated for recycling.
- G. Approved Recycling Facility: Any of the following:
 - 1. A facility that can legally accept CDL waste materials for the purpose of processing the materials into an altered form for the manufacture of a new product.
 - 2. Material Recovery Facility: A general term used to describe a waste-sorting facility.
 - a. Mechanical, hand-separation, or a combination of both procedures, are used to recover
 - b. recyclable materials.

1.03 SUBMITTALS

- A. Contractor shall develop a Waste Management Plan: Submit 3 copies of plan within 14 days of date established for the Notice to Proceed.
- B. Contractor shall provide Waste Management Report: Concurrent with each Application for Payment, submit 3 copies of report.

1.04 PERFORMANCE REQUIREMENTS

- A. General: Divert a minimum of 75% CDL waste, by weight, from the landfill by one, or a combination of the following activities:
 - 1. Salvage
 - 2. Reuse
 - 3. Source-Separated CDL Recycling
 - 4. Co-mingled CDL Recycling
- B. CDL waste materials that can be salvaged, reused or recycled include, but are not limited to, the following:
 - 1. Acoustical ceiling tiles
 - 2. Asphalt
 - 3. Asphalt shingles
 - 4. Cardboard packaging

5. Carpet and carpet pad
6. Concrete
7. Drywall
8. Fluorescent lights and ballasts
9. Land clearing debris (vegetation, stumps, dirt)
10. Metals
11. Paint (through hazardous waste outlets)
12. Wood
13. Plastic film (sheeting, shrink wrap, packaging)
14. Window glass
15. Wood
16. Field office waste, including office paper, aluminum cans, glass, plastic, and office cardboard.

1.05 QUALITY ASSURANCE

- A. Waste Management Coordinator Qualifications: Experienced firm, with a record of successful waste management coordination of projects with similar requirements, that employs a LEED Accredited Professional, certified by the USGBC as waste management coordinator.
- B. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.
- C. Regulatory Requirements: Conduct construction waste management activities in accordance with hauling and disposal regulations of all authorities having jurisdiction and all other applicable laws and ordinances.
- D. Preconstruction Conference: Schedule and conduct meeting at Project site prior to construction activities.
 1. Attendees: Inform the following individuals, whose presence is required, of date and time of meeting.
 - a. Owner
 - b. Architect
 - c. Contractor's superintendent
 - d. Major subcontractors
 - e. Waste Management Coordinator
 - f. Other concerned parties.
 2. Agenda Items: Review methods and procedures related to waste management including, but not limited to, the following:
 - a. Review and discuss waste management plan including responsibilities of Waste Management Coordinator.
 - b. Review requirements for documenting quantities of each type of waste and its disposition.
 - c. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
 - d. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
 - e. Review waste management requirements for each trade.
 3. Minutes: Record discussion. Distribute meeting minutes to all participants.
Note: If there is a Project Architect, they will perform this role.

1.06 WASTE MANAGEMENT PLAN - CONTACTOR SHALL DEVELOP AND DOCUMENT THE FOLLOWING:

- A. Develop a plan to meet the requirements listed in this section at a minimum. Plan shall consist of waste identification, waste reduction plan and cost/revenue analysis. Distinguish between demolition and construction waste. Indicate quantities by weight throughout the plan.

- B. Indicate anticipated types and quantities of demolition, site-cleaning and construction waste generated by the project. List all assumptions made for the quantities estimates.
- C. List each type of waste and whether it will be salvaged, recycled, or disposed of in an landfill. The plan should included the following information:
 - 1. Types and estimated quantities, by weight, of CDL waste expected to be generated during demolition and construction.
 - 2. Proposed methods for CDL waste salvage, reuse, recycling and disposal during demolition including, but not limited to, one or more of the following:
 - a. Contracting with a deconstruction specialist to salvage materials generated,
 - b. Selective salvage as part of demolition contractor's work,
 - c. Reuse of materials on-site or sale or donation to a third party.
 - 3. Proposed methods for salvage, reuse, recycling and disposal during construction including, but not limited to, one or more of the following:
 - a. Requiring subcontractors to take their CDL waste to a recycling facility;
 - b. Contracting with a recycling hauler to haul recyclable CDL waste to an approved recycling or material recovery facility;
 - c. Processing and reusing materials on-site;
 - d. Self-hauling to a recycling or material recovery facility.
 - 4. Name of recycling or material recovery facility receiving the CDL wastes.
 - 5. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location on project site where materials separation will be located.
- D. Cost/Revenue Analysis: Indicate total cost of waste disposal as if there was no waste management plan and net additional cost or net savings resulting from implementing waste management plan. Include the following:
 - 1. Total quantity of waste.
 - 2. Estimated cost of disposal (cost per unit). Include hauling and tipping fees and cost of collection containers for each type of waste.
 - 3. Total cost of disposal (with no waste management).
 - 4. Revenue from salvaged materials.
 - 5. Revenue from recycled materials.
 - 6. Savings in hauling and tipping fees by donating materials.
 - 7. Savings in hauling and tipping fees that are avoided.
 - 8. Handling and transportation costs. Including cost of collection containers for each type of waste.
 - 9. Net additional cost or net savings from waste management plan.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 CONSTRUCTION WASTE MANAGEMENT, GENERAL

- A. Provide containers for CDL waste that is to be recycled clearly labeled as such with a list of acceptable and unacceptable materials. The list of acceptable materials must be the same as the materials recycled at the receiving material recovery facility or recycling processor.
- B. The collection containers for recyclable CDL waste must contain no more than 10% non-recyclable material, by volume.
- C. Provide containers for CDL waste that is disposed in a landfill clearly labeled as such.
- D. Use detailed material estimates to reduce risk of unplanned and potentially wasteful cuts.
- E. To the greatest extent possible, include in material purchasing agreements a waste reduction provision requesting that materials and equipment be delivered in packaging made of recyclable material, that they reduce the amount of packaging, that packaging be taken back for reuse or

recycling, and to take back all unused product. Insure that subcontractors require the same provisions in their purchase agreements.

- F. Conduct regular visual inspections of dumpsters and recycling bins to remove contaminants.

3.02 SOURCE SEPARATION

- A. General: Contractor shall separate recyclable materials from CDL waste to the maximum extent possible.

Separate recyclable materials by type.

1. Provide containers, clearly labeled, by type of separated materials or provide other storage method for managing recyclable materials until they are removed from Project site.
2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water and to minimize pest attraction. Cover to prevent windblown dust.
3. Stockpile materials away from demolition area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from weather.

3.03 CO-MINGLED RECYCLING

- A. General: Do not put CDL waste that will be disposed in a landfill into a co-mingled CDL waste recycling container.

3.04 REMOVAL OF CONSTRUCTION WASTE MATERIALS

- A. Remove CDL waste materials from project site on a regular basis. Do not allow CDL waste to accumulate on-site.
- B. Transport CDL waste materials off Owner's property and legally dispose of them.
- C. Burning of CDL waste is not permitted.

WASTE MANAGEMENT PROGRESS REPORT

MATERIAL CATEGORY	DISPOSED IN MUNICIPAL SOLID WASTE LANDFILL	DIVERTED FROM LANDFILL BY	DIVERTED FROM LANDFILL BY	DIVERTED FROM LANDFILL BY
		RECYCLED	SALVAGED	REUSED
ACOUSTICAL CEILING TILES				
ASPHALT				
ASPHALT SHINGLES				
CARDBOARD PACKAGING				
CARPET AND CARPET PAD				
CONCRETE				
DRYWALL				
FLUORESCENT LIGHTS AND BALLASTS				
LAND CLEARING DEBRIS (VEGETATION, STUMPAGE, DIRT)				
METALS				
PAINT (THROUGH HAZARDOUS WASTE OUTLETS)				
WOOD				
PLASTIC FILM (SHEETING, SHRINK WRAP, PACKAGING)				
WINDOW GLASS				
FIELD OFFICE WASTE (OFFICE PAPER, ALUMINUM CANS, GLASSS, PLASTIC, AND COFFEE CARDBOARD)				
OTHER (INSERT DESCRIPTION)				
OTHER (INSERT DESCRIPTION)				
TOTAL (IN WEIGHT)				

PERCENTAGE OF WASTE DIVERTED.

(TOTAL WASTE DIVIDED BY TOTAL DIVERTED) _____

END OF SECTION

SECTION 01 78 00
CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Project Record Documents.
- B. Operation and Maintenance Data.
- C. Warranties and bonds.

1.02 RELATED REQUIREMENTS

- A. Division 00 Documents
- B. Section 01 30 00 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.
- C. Section 01 70 00 - Execution and Closeout Requirements: Contract closeout procedures.
- D. Individual Product Sections: Specific requirements for operation and maintenance data.
- E. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS

- A. Project Record Documents: Submit documents to DEDC, LLC prior to final payment application. The following documents must be submitted:
 - 1. Red line drawings (As-Builts)
 - a. One original paper copy
 - b. Two copies of the original.
- B. Electronic Documentation: Submit the electronic documentation on two long duration archival cd storage devices with gold lacquer finish. The following electronic data shall be included on each CD:
 - 1. Scanned copy of the As-Built in PDF format.
 - 2. Revised AutoCAD (release 2007 or later) drawing. Original copy of the AutoCAD file will be provided upon request.
 - 3. Approved project submittals (PDF Format).
 - 4. Operation and Maintenance Data (PDF Format)
- C. Operation and Maintenance Data:
 - 1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. DEDC, LLC will review draft and return one copy with comments.
 - 2. For equipment, or component parts of equipment put into service during construction and operated by Delaware Army National Guard, submit completed documents within ten days after acceptance.
 - 3. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with DEDC, LLC comments. Revise content of all document sets as required prior to final submission.
 - 4. Submit two sets of revised final documents in a 3-ring binder in final form within 10 days after final inspection.
- D. Warranties and Bonds:
 - 1. For equipment or component parts of equipment put into service during construction with Delaware Army National Guard'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 the date of acceptance as the beginning of the warranty period.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
 - 1. Drawings.
 - 2. Addenda.
 - 3. Change Orders and other modifications to the Contract.
 - 4. Manufacturer's instruction for assembly, installation, and adjusting.
- B. Ensure entries are complete and accurate, enabling future reference by Delaware Army National Guard.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress.
- E. Record Drawings : Legibly mark each item to record actual construction including:
 - 1. Field changes of dimension and detail.
 - 2. Details not on original Contract drawings.

3.02 OPERATION AND MAINTENANCE DATA

- A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.
- B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.
- D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.03 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

- A. For Each Item of Equipment and Each System:
 - 1. Description of unit or system, and component parts.
 - 2. Identify function, normal operating characteristics, and limiting conditions.
 - 3. Include performance curves, with engineering data and tests.
 - 4. Complete nomenclature and model number of replaceable parts.
- B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.
- C. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.
- D. 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 any special operating instructions.
- E. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- F. Provide servicing and lubrication schedule, and list of lubricants required.
- G. Include manufacturer's printed operation and maintenance instructions.
- H. Include sequence of operation by controls manufacturer.
- I. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

- J. Provide control diagrams by controls manufacturer as installed.
- K. Include test and balancing reports.
- L. Additional Requirements: As specified in individual product specification sections.

3.04 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

- A. Assemble operation and maintenance data into durable manuals for Delaware Army National Guard's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.
- B. Where systems involve more than one specification section, provide separate tabbed divider for each system.
- C. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.
- D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.
- E. Project Directory: Title and address of Project; names, addresses, and telephone numbers of DEDC, LLC, Consultants, Contractor and subcontractors, with names of responsible parties.
- F. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.
- G. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.
- H. Text: Manufacturer's printed data, or typewritten data on 24 pound paper.
- I. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

3.05 WARRANTIES AND BONDS

- A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Delaware Army National Guard's permission, leave date of beginning of time of warranty until the Date of Substantial completion is determined.
- B. Verify that documents are in proper form, contain full information, and are notarized.
- C. Co-execute submittals when required.
- D. Retain warranties and bonds until time specified for submittal.

END OF SECTION

SECTION 01 79 00
DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.01 SUMMARY

- A. Demonstration of products and systems to be commissioned and where indicated in specific specification sections.
- B. Training of Delaware Army National Guard personnel in operation and maintenance is required for:
 - 1. All software-operated systems.
 - 2. HVAC systems and equipment.
 - 3. Plumbing equipment.
 - 4. Electrical systems and equipment.
 - 5. Items specified in individual product Sections.
- C. Training of Delaware Army National Guard personnel in care, cleaning, maintenance, and repair is required for:
 - 1. Items specified in individual product Sections.

1.02 RELATED REQUIREMENTS

- A. Section 01 78 00 - Closeout Submittals: Operation and maintenance manuals.
- B. Section 01 91 13 - General Commissioning Requirements: Additional requirements applicable to demonstration and training.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures; except:
 - 1. Make all submittals specified in this section, and elsewhere where indicated for commissioning purposes, directly to the Commissioning Authority.
 - 2. Submit one copy to the Commissioning Authority, not to be returned.
 - 3. Make commissioning submittals on time schedule specified by Commissioning Authority.
 - 4. Submittals indicated as "Draft" are intended for the use of the Commissioning Authority in preparation of overall Training Plan; submit in editable electronic format, Microsoft Word 2003 preferred.
- B. Draft Training Plans: Delaware Army National Guard will designate personnel to be trained; tailor training to needs and skill-level of attendees.
 - 1. Submit to DEDC, LLC for transmittal to Delaware Army National Guard.
 - 2. Submit to Commissioning Authority for review and inclusion in overall training plan.
 - 3. Submit not less than four weeks prior to start of training.
 - 4. Revise and resubmit until acceptable.
 - 5. Provide an overall schedule showing all training sessions.
 - 6. Include at least the following for each training session:
 - a. Identification, date, time, and duration.
 - b. Description of products and/or systems to be covered.
 - c. Name of firm and person conducting training; include qualifications.
 - d. Intended audience, such as job description.
 - e. Objectives of training and suggested methods of ensuring adequate training.
 - f. Methods to be used, such as classroom lecture, live demonstrations, hands-on, etc.
 - g. Media to be used, such as slides, hand-outs, etc.
 - h. Training equipment required, such as projector, projection screen, etc., to be provided by Contractor.
- C. Training Manuals: Provide training manual for each attendee; allow for minimum of two attendees per training session.
 - 1. Include applicable portion of O&M manuals.

2. Include copies of all hand-outs, slides, overheads, video presentations, etc., that are not included in O&M manuals.
 3. Provide one extra copy of each training manual to be included with operation and maintenance data.
- D. Training Reports:
1. Identification of each training session, date, time, and duration.
 2. Sign-in sheet showing names and job titles of attendees.
 3. List of attendee questions and written answers given, including copies of and references to supporting documentation required for clarification; include answers to questions that could not be answered in original training session.
 4. Include Commissioning Authority's formal acceptance of training session.
- E. Video Recordings: Submit digital video recording of each demonstration and training session for Delaware Army National Guard's subsequent use.
1. Format: DVD Disc.
 2. Label each disc and container with session identification and date.

1.04 QUALITY ASSURANCE

- A. Instructor Qualifications: Familiar with design, operation, maintenance and troubleshooting of the relevant products and systems.
1. Provide as instructors the most qualified trainer of those contractors and/or installers who actually supplied and installed the systems and equipment.
 2. Where a single person is not familiar with all aspects, provide specialists with necessary qualifications.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 DEMONSTRATION - GENERAL

- A. Demonstrations conducted during system start-up do not qualify as demonstrations for the purposes of this section, unless approved in advance by Delaware Army National Guard.
- B. Demonstrations conducted during Functional Testing need not be repeated unless Delaware Army National Guard personnel training is specified.
- C. Demonstration may be combined with Delaware Army National Guard personnel training if applicable.
- D. Operating Equipment and Systems: Demonstrate operation in all modes, including start-up, shut-down, seasonal changeover, emergency conditions, and troubleshooting, and maintenance procedures, including scheduled and preventive maintenance.
1. Perform demonstrations not less than two weeks prior to Substantial Completion.
 2. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
- E. Non-Operating Products: Demonstrate cleaning, scheduled and preventive maintenance, and repair procedures.
1. Perform demonstrations not less than two weeks prior to Substantial Completion.

3.02 TRAINING - GENERAL

- A. Commissioning Authority will prepare the Training Plan based on draft plans submitted.
- B. Conduct training on-site unless otherwise indicated.
- C. Delaware Army National Guard will provide classroom and seating at no cost to Contractor.
- D. Do not start training until Functional Testing is complete, unless otherwise specified or approved by the Commissioning Authority.
- E. Provide training in minimum two hour segments.

- F. The Commissioning Authority is responsible for determining that the training was satisfactorily completed and will provide approval forms.
- G. Training schedule will be subject to availability of Delaware Army National Guard's personnel to be trained; re-schedule training sessions as required by Delaware Army National Guard; once schedule has been approved by Delaware Army National Guard failure to conduct sessions according to schedule will be cause for Delaware Army National Guard to charge Contractor for personnel "show-up" time.
- H. Review of Facility Policy on Operation and Maintenance Data: During training discuss:
 - 1. The location of the O&M manuals and procedures for use and preservation; backup copies.
 - 2. Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.
 - 3. Typical uses of the O&M manuals.
- I. Product- and System-Specific Training:
 - 1. Review the applicable O&M manuals.
 - 2. For systems, provide an overview of system operation, design parameters and constraints, and operational strategies.
 - 3. Review instructions for proper operation in all modes, including start-up, shut-down, seasonal changeover and emergency procedures, and for maintenance, including preventative maintenance.
 - 4. Provide hands-on training on all operational modes possible and preventive maintenance.
 - 5. Emphasize safe and proper operating requirements; discuss relevant health and safety issues and emergency procedures.
 - 6. Discuss common troubleshooting problems and solutions.
 - 7. Discuss any peculiarities of equipment installation or operation.
 - 8. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage.
 - 9. Review recommended tools and spare parts inventory suggestions of manufacturers.
 - 10. Review spare parts and tools required to be furnished by Contractor.
 - 11. Review spare parts suppliers and sources and procurement procedures.
- J. Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within three days.

END OF SECTION

SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Concrete formwork.
- B. Concrete reinforcement.
- C. Miscellaneous concrete elements, including equipment pads.
- D. Concrete curing.

1.02 REFERENCE STANDARDS

- A. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials; American Concrete Institute International; 2010.
- B. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; American Concrete Institute International; 1991 (Reapproved 2002).
- C. ACI 301 - Specifications for Structural Concrete; American Concrete Institute International; 2010 (Errata 2012).
- D. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; American Concrete Institute International; 2000.
- E. ACI 306R - Cold Weather Concreting; American Concrete Institute International; 2010.
- F. ACI 308R - Guide to Curing Concrete; American Concrete Institute International; 2001 (Reapproved 2008).
- G. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; American Concrete Institute International; 2011.
- H. ACI 347 - Guide to Formwork for Concrete; American Concrete Institute International; 2004.
- I. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon Billet-Steel Bars for Concrete Reinforcement; 2014.
- J. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2013.
- K. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2014.
- L. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2010a.
- M. ASTM C150/C150M - Standard Specification for Portland Cement; 2012.
- N. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete; 2007.
- O. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2012.
- P. ASTM C685/C685M - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing; 2011.
- Q. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures; 2012.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.

1.04 QUALITY ASSURANCE

- A. Perform work of this section in accordance with ACI 301 and ACI 318.
 - 1. Maintain one copy of each document on site.
- B. Follow recommendations of ACI 306R when concreting during cold weather.

PART 2 PRODUCTS

2.01 FORMWORK

- A. Formwork Design and Construction: Comply with guidelines of ACI 347 to provide formwork that will produce concrete complying with tolerances of ACI 117.
- B. Form Materials: Contractor's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.
 - 1. Form Ties: Cone snap type that will leave no metal within 1-1/2 inches of concrete surface.

2.02 REINFORCEMENT

- A. Reinforcing Steel: ASTM A615/A615M, Grade 60 - 60,000 psi.
- B. Reinforcement Accessories:
 - 1. Tie Wire: Annealed, minimum 16 gage, 0.0508 inch.

2.03 CONCRETE MATERIALS

- A. Cement: ASTM C150, Type I - Normal Portland type.
 - 1. Acquire all cement for entire project from same source.
- B. Fine and Coarse Aggregates: ASTM C 33.
 - 1. Acquire all aggregates for entire project from same source.
- C. Fly Ash: ASTM C618, Class C or F.
- D. Calcined Pozzolan: ASTM C618, Class N.
- E. Silica Fume: ASTM C1240, proportioned in accordance with ACI 211.1.

2.04 ACCESSORY MATERIALS

- A. Moisture-Retaining Cover: ASTM C 171; regular curing paper, white curing paper, clear polyethylene, or white polyethylene.

2.05 CONCRETE MIX DESIGN

- A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.
- B. Concrete Strength: Establish required average strength for each type of concrete on the basis of trial mixtures, as specified in ACI 301.
 - 1. For trial mixtures method, employ independent testing agency acceptable to DEDC, LLC for preparing and reporting proposed mix designs.
- C. Normal Weight Concrete:
 - 1. Compressive Strength, when tested in accordance with ASTM C 39/C 39M at 28 days: As scheduled in part 3.09.
 - 2. Fly Ash Content: Maximum 15 percent of cementitious materials by weight.
 - 3. Calcined Pozzolan Content: Maximum 10 percent of cementitious materials by weight.
 - 4. Silica Fume Content: Maximum 5 percent of cementitious materials by weight.

2.06 MIXING

- A. On Project Site: Mix in drum type batch mixer, complying with ASTM C685. Mix each batch not less than 1-1/2 minutes and not more than 5 minutes.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify lines, levels, and dimensions before proceeding with work of this section.

3.02 PREPARATION

- A. Formwork: Comply with requirements of ACI 301. Design and fabricate forms to support all applied loads until concrete is cured, and for easy removal without damage to concrete.

3.03 INSTALLING REINFORCEMENT AND OTHER EMBEDDED ITEMS

- A. Comply with requirements of ACI 301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.

3.04 PLACING CONCRETE

- A. Place concrete in accordance with ACI 304R.

3.05 CONCRETE FINISHING

- A. Repair surface defects, including tie holes, immediately after removing formwork.

3.06 CURING AND PROTECTION

- A. Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
- C. Surfaces Not in Contact with Forms:
 - 1. Initial Curing: Start as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by water ponding, water-saturated sand, water-fog spray, or saturated burlap.
 - 2. Final Curing: Begin after initial curing but before surface is dry.
 - a. Moisture-Retaining Cover: Seal in place with waterproof tape or adhesive.

3.07 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests.
- B. Provide free access to concrete operations at project site and cooperate with appointed firm.
- C. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.
- D. Tests of concrete and concrete materials may be performed at any time to ensure conformance with specified requirements.
- E. Compressive Strength Tests: ASTM C39/C39M. For each test, mold and cure four concrete test cylinders. Obtain test samples for every 100 cu yd or less of each class of concrete placed.
- F. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.
- G. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.

3.08 DEFECTIVE CONCRETE

- A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.
- B. Repair or replacement of defective concrete will be determined by the DEDC, LLC. The cost of additional testing shall be borne by Contractor when defective concrete is identified.

3.09 SCHEDULE - CONCRETE TYPES AND FINISHES

- A. Generator Foundation: 4,500 PSI 28 day concrete, form finish with honeycomb filled side surfaces, level float finish top surface.
- B. Conduit Duct Bank: 3,000 PSI 28 day concrete, side surfaces cast against earth or forms, level top surface with red pigment.
- C. Condensing Unit Pad: 4,500 PSI 28 day concrete, form finish with honeycomb exposed side surfaces, level broom finish top surface.

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- D. Interior Housekeeping Pads: 4.000 PSI 28 day concrete, form finish with honeycomb filled side surfaces, hard trowel finish top surface.

END OF SECTION

SECTION 07 84 00
FIRESTOPPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Firestopping systems.
- B. Firestopping of all joints and penetrations in fire-resistance rated and smoke-resistant assemblies, whether indicated on drawings or not, and other openings indicated.

1.02 RELATED REQUIREMENTS

- A. Section 01 70 00 - Execution and Closeout Requirements: Cutting and patching.

1.03 REFERENCE STANDARDS

- A. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2013a.
- B. ITS (DIR) - Directory of Listed Products; Intertek Testing Services NA, Inc.; current edition.
- C. FM 4991 - Approval Standard for Firestop Contractors; Factory Mutual Research Corporation; 2013.
- D. FM P7825 - Approval Guide; Factory Mutual Research Corporation; current edition.
- E. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168; current edition; www.aqmd.gov.
- F. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.; current edition.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.
- C. Product Data: Provide data on product characteristics, performance ratings, and limitations.

1.05 QUALITY ASSURANCE

- A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.
 - 1. Listing in the current-year classification or certification books of UL, FM, or ITS (Warnock Hersey) will be considered as constituting an acceptable test report.
 - 2. Valid evaluation report published by ICC Evaluation Service, Inc. (ICC-ES) at www.icc-es.org will be considered as constituting an acceptable test report.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Installer Qualifications: Company specializing in performing the work of this section and:
 - 1. Approved by Factory Mutual Research Corporation under FM 4991, or meeting any two of the following requirements:.
 - 2. With minimum 3 years documented experience installing work of this type.
 - 3. Able to show at least 5 satisfactorily completed projects of comparable size and type.
 - 4. Licensed by authority having jurisdiction.

PART 2 PRODUCTS

2.01 FIRESTOPPING - GENERAL REQUIREMENTS

- A. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Type required for tested assembly design.

2.02 FIRESTOPPING SYSTEMS

- A. Firestopping: Any material meeting requirements.

1. Fire Ratings: Use any system listed by UL or tested in accordance with ASTM E814 that has F Rating equal to fire rating of penetrated assembly and minimum T Rating Equal to F Rating and that meets all other specified requirements.

2.03 MATERIALS

- A. Firestopping Sealants: Provide only products having lower volatile organic compound (VOC) content than required by South Coast Air Quality Management District Rule No.1168.
- B. Elastomeric Silicone Firestopping: Single component silicone elastomeric compound and compatible silicone sealant; conforming to the following:
 1. Color: Black, dark gray, or red.
 2. Manufacturers:
 - a. A/D Fire Protection Systems Inc: www.adfire.com.
 - b. 3M Fire Protection Products: www.3m.com/firestop.
 - c. Hilti, Inc: www.us.hilti.com.
 - d. Specified Technologies, Inc: www.stifirestop.com.
 - e. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Foam Firestopping: Single component silicone foam compound; conforming to the following:
 1. Durability and Longevity: Permanent.
 2. Color: Dark grey.
 3. Manufacturers:
 - a. 3M Fire Protection Products: www.3m.com/firestop.
 - b. Hilti, Inc: www.us.hilti.com.
 - c. Specified Technologies, Inc: www.stifirestop.com.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
- D. Fibered Compound Firestopping: Formulated compound mixed with incombustible non-asbestos fibers; conforming to the following:
 1. Durability and Longevity: Permanent.
 2. Color: Dark grey.
 3. Manufacturers:
 - a. A/D Fire Protection Systems Inc: www.adfire.com.
 - b. USG: www.usg.com.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.
- E. Fiber Firestopping: Mineral fiber insulation used in conjunction with elastomeric surface sealer forming airtight bond to opening; conforming to the following:
 1. Durability and Longevity: Permanent.
 2. Manufacturers:
 - a. A/D Fire Protection Systems Inc: www.adfire.com.
 - b. Pecora Corporation: www.pecora.com.
 - c. Thermafiber, Inc: www.thermafiber.com.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
- F. Firestop Devices - Wrap Type: Mechanical device with incombustible filler and sheet stainless steel jacket, intended to be installed after penetrating item has been installed; conforming to the following:
 1. Manufacturers:
 - a. Grace Construction Products: www.na.graceconstruction.com.
 - b. 3M Fire Protection Products: www.3m.com/firestop.
 - c. Hilti, Inc: www.us.hilti.com.
 - d. Specified Technologies, Inc: www.stifirestop.com.
 - e. Substitutions: See Section 01 60 00 - Product Requirements.
- G. Intumescent Putty: Compound that expands on exposure to surface heat gain; conforming to the following:
 1. Potential Expansion: Minimum 1000 percent.

2. Durability and Longevity: Permanent.
3. Color: Black, dark gray, or red.
4. Manufacturers:
 - a. Grace Construction Products: www.na.graceconstruction.com.
 - b. 3M Fire Protection Products: www.3m.com/firestop.
 - c. Hilti, Inc: www.us.hilti.com.
 - d. Specified Technologies, Inc: www.stifirestop.com.
 - e. Substitutions: See Section 01 60 00 - Product Requirements.
- H. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Type required for tested assembly design.

PART 3 EXECUTION

3.01 PREPARATION

- A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter that could adversely affect bond of firestopping material.
- B. Remove incompatible materials that could adversely affect bond.
- C. Install backing materials to arrest liquid material leakage.

3.02 INSTALLATION

- A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.
- B. Do not cover installed firestopping until inspected by authority having jurisdiction.

3.03 CLEANING

- A. Clean adjacent surfaces of firestopping materials.

3.04 PROTECTION

- A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

SECTION 09 90 00
PAINTING AND COATING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Surface preparation.
- B. Field application of paints.
- C. Scope: Finish all interior and exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
- D. Do Not Paint or Finish the Following Items:
 - 1. Items fully factory-finished unless specifically so indicated; materials and products having factory-applied primers are not considered factory finished.
 - 2. Items indicated to receive other finishes.
 - 3. Items indicated to remain unfinished.
 - 4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
 - 5. Floors, unless specifically so indicated.
 - 6. Glass.
 - 7. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

- A. Section 22 05 53 - Identification for Plumbing Piping and Equipment: Painted identification.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Provide all paint and coating products used in any individual system from the same manufacturer; no exceptions.
- B. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PAINTS AND COATINGS - GENERAL

- A. Paints and Coatings: Ready mixed, unless intended to be a field-catalyzed coating.
 - 1. Provide paints and coatings of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 - 2. Supply each coating material in quantity required to complete entire project's work from a single production run.
 - 3. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.
- B. Primers: As follows unless other primer is required or recommended by manufacturer of top coats; where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.
- C. Volatile Organic Compound (VOC) Content:
 - 1. Provide coatings that comply with the most stringent requirements specified in the following:
 - a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
 - 2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

2.03 PAINT SYSTEMS - EXTERIOR

- A. Paint ME-OP-3A - Ferrous Metals, Unprimed, Alkyd, 3 Coat:
 - 1. One coat of alkyd primer.

2. Semi-gloss: Two coats of alkyd enamel; .

2.04 PAINT SYSTEMS - INTERIOR

- A. Paint MI-OP-3L - Ferrous Metals, Unprimed, Latex, 3 Coat:
 1. One coat of latex primer.
 2. Semi-gloss: Two coats of latex enamel; .

2.05 ACCESSORY MATERIALS

- A. Accessory Materials: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required to achieve the finishes specified whether specifically indicated or not; commercial quality.
- B. Patching Material: Latex filler.
- C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

3.02 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to coating application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or repair existing coatings that exhibit surface defects.
- D. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
- E. Seal surfaces that might cause bleed through or staining of topcoat.
- F. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- G. Uncorroded Uncoated Steel and Iron Surfaces to be Painted: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by hand or power tool wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Prime paint entire surface; spot prime after repairs.
- H. Shop-Primed Steel Surfaces to be Finish Painted: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.

3.03 APPLICATION

- A. Apply products in accordance with manufacturer's instructions.
- B. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.
- C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- D. Apply each coat to uniform appearance.
- E. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.
- F. Sand metal surfaces lightly between coats to achieve required finish.
- G. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

- H. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

- A. Protect finished coatings until completion of project.
- B. Touch-up damaged coatings after Substantial Completion.

3.06 SCHEDULE - PAINT SYSTEMS

- A. Steel Fabrications: Finish all surfaces exposed to view.
 - 1. Exterior: ME-OP-3A, gloss; finish all surfaces, including concealed surfaces, before installation.
 - 2. Interior: MI-OP-3L, gloss.

3.07 SCHEDULE - COLORS

- A. Interior Gas Piping - Yellow
- B. Exterior Gas Piping - Brown

END OF SECTION

SECTION 21 13 00

FIRE SUPPRESSION SPRINKLERS

PART 1 - GENERAL

1.1 GENERAL DESCRIPTION

- A. The Delaware Army National Guard (DEARNG) is requesting bids for the installation of a new Automatic Wet Pipe Sprinkler System for building 115 located in Bethany Beach, Delaware. Bidders (referred to herein as the "Bidder" or "Contractor") are being solicited for the bids based upon their reputation, demonstrated skills in previous installations and the acceptable quality of equipment that each bidder can provide to the Delaware Army National Guard (referred to herein as the "Owner"). The new sprinkler system being bid shall be designed and installed in accordance with these specifications and associated bid drawings. All work, including design, installation and testing shall be coordinated with DEDC, LLC and the Delaware Army National Guard.
- B. The scope of work as referenced in these specifications (21 13 00) shall include the work as required for the design, installation and testing of the new automatic wet pipe and dry pipe sprinkler systems. All work as required for the new sprinkler systems shall be coordinated with the existing building structure, building equipment and existing water supply.
- C. Building 115 is an "existing" structure which is fully occupied and in use by the Delaware Army National Guard. The building is located in the Bethany Beach Training Site (BBTS) 163 Scannell Blvd, Bethany Beach, Delaware. This is a single story building approximately 7,200 sq ft.
- D. The scope of work for this project shall include the installation of a new wet pipe sprinkler system, and a new dry pipe system.
- E. The contractor's scope of work for the new automatic wet pipe sprinkler and new dry pipe systems shall include the design, installation and testing as required in order to provide the Owner with a complete and fully operational sprinkler system for the building. Contractor shall field coordinate new design with existing field conditions and all new construction. Contractor shall make changes to bid design where necessary. New sprinkler system shall be designed, installed and tested in accordance with all codes and standards as required for wet pipe sprinklers systems, the bid documents and the State of Delaware Fire Marshal's Office.
- F. The building will be occupied throughout the sprinkler and standpipe installation project. Contractor shall coordinate all design, installation and testing work accordingly with the Owner's designated Project Manager. All core drilling required for the sprinkler and/or standpipe installation shall be completed during off hours and coordinated with project manager.
- G. Related Specifications
 - 1. 28 31 00 FIRE DETECTION AND ALARM

1.2 GENERAL REQUIREMENTS

- A. At the time of bid, all exceptions taken to these requirements, all variances from these requirements and all substitutions of operating capabilities or equipment called for in these requirements shall be listed in writing and forwarded to DEDC, LLC at the time of bid submission. Any such exceptions, variances or substitutions that were not listed at the time of bid and are identified in the required submittals, in the installed equipment, associated work or at the time of acceptance testing, shall be grounds for immediate disapproval without comment.
- B. The design, installation, workmanship, testing and final documentation of the new sprinkler system must be of the highest quality. The intent of the new sprinkler system is to meet all code requirements as required, but in addition, shall meet the specific level of life safety and protection as specified by through these specifications. In almost all cases, these requirements will specify a higher degree of protection and workmanship than that specified by the referenced codes. The Owner and DEDC, LLC will be the final judge of all quality issues.

1.3 DESIGN BASIS & INSTALLATION REQUIREMENTS

- A. The new sprinkler system shall be designed as per the code requirements listed in these specifications and as approved by the local authority having jurisdiction (AHJ).
- B. Prior to starting their design, the contractor shall review the fire protection design requirements as listed in the Facility Design Standard as issued by State of Delaware Division of Facilities Management. All exceptions taken to these requirements shall be submitted for review to DEDC, LLC and the Owner.
- C. The contractor shall review all notes on the bid drawings and review all requirements as listed in these specifications

1.3.1 Water Supply Information

- A. The existing water supply to the building enters in the kitchen area and is utilized for domestic water applications. The existing water supply is to remain.
- B. Refer to drawings for current fire hydrant flow test data is as follows.
- C. A new double-check backflow assembly shall be installed on the interior fire protection water supply main located in the Storage room of the building. Backflow assembly shall be installed as required by the Sussex Shores Water Company and coordinated with the installation of the new sprinkler system.

1.3.2 Sprinkler Systems

- A. The sprinkler systems shall be designed to meet the requirements as listed in NFPA 13 and shall be in accordance with these bid documents and in accordance with the requirements of the State of Delaware's Fire Marshal's Office. The sprinkler systems shall provide the minimum density requirements as listed in NFPA 13 and be hydraulically calculated using the density/area approach. Contractor shall verify the appropriate occupancy hazard classification for each area of the building in accordance with NFPA 13.
- B. For light hazard and ordinary hazard areas using approved "Quick Response" type sprinklers the design area may be reduced (without revising the density) where calculated in accordance with the requirements as listed in NFPA 13.
- C. The final sprinkler system design and hydraulic calculations shall include a 10 psi safety factor over and above the sprinkler system demand in accordance with the State of

- D. The minimum water supply requirements for the sprinkler system shall include a 100 gpm inside hose stream allowance in accordance with NFPA 13.

1.4 SUMMARY OF WORK

- A. The work covered by this section of the requirements shall include all labor, equipment, materials, design, AHJ approvals, Owner approvals and services to design, furnish, install, test and document a complete and fully operational automatic wet pipe and dry pipe sprinkler system.
- B. The new sprinkler systems shall be complete in all respects for operation and in coordination with all building equipment and operations and all existing mechanical, electrical and plumbing (MEP) equipment. Final acceptance testing of the sprinkler systems shall be completed as listed in these specifications and as required by the AHJ and NFPA 13.
- C. Contractor shall provide all labor, materials, equipment, components, power and tools to install the new sprinkler systems.
- D. Contractor shall provide all basic materials applicable to this project in strict accordance with the methods specified herein and with the equipment manufacturer's recommendations.
- E. The sprinkler system design, installation and testing shall be complete in every respect. Contractor shall provide each item of equipment in quantities as required by code, design intent and as necessary to install and test a complete and fully operational sprinkler system.
- F. The sprinkler contractor shall perform all drawing and design work necessary and/or required to meet the Facility Design Standard as issued by State of Delaware Division of Facilities Management, the Delaware State Fire Prevention Regulations (DSFPR), National Fire Protection Association (NFPA) Standards and the State of Delaware's Fire Marshal (AHJ) regulations.
- G. The work shall include the provision of any required permits and payment of fees associated with the installation of the new sprinkler system.
- H. Final pipe sizes for the sprinkler system shall be based on the contractors working/shop drawings and hydraulic calculations and shall be in accordance with NFPA 13.
- I. All electrical circuits and wiring required for interface of the new sprinkler system equipment with the building fire alarm system shall be coordinated with the fire alarm contractor and shall be installed and supervised in accordance with the requirements of the fire alarm system specifications (28 31 00). Any and all wiring/cable used shall be "solid copper" conductors only. All wiring, connections, junctions, splices and arrangements must be installed in accordance with the National Electrical Code and approved for intended use.

1.5 QUALIFICATIONS

- A. Contractor shall (or be contractually supported by a company) specializing in automatic sprinkler system installation and have a minimum of five years of documented experience with the design and installation of same. The contractor shall hold a current Fire Suppression Systems License issued by the State of Delaware. The classification of the license shall be appropriate for the occupancy being protected and type of systems being installed.
- B. Contractor shall have (or be contractually supported by a company) on staff and assigned to the project a person who is NICET Level III certified for automatic sprinkler systems. Such person shall have a minimum of five years of documented experience in the design and installation of NFPA compliant automatic sprinkler systems. The NICET certified person shall also be listed as a certificate holder of the appropriate classification for the occupancy

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being protected.

- C. The contractor shall assign the NICET Level III certified person to supervise the preparation of all technical documentation and shop drawings, installation and acceptance testing as required by these requirements and appropriate NFPA standards.
- D. All qualification documentation shall be submitted at the time of bidding and verified at bid acceptance.

1.6 REFERENCES AND REQUIRED CODE COMPLIANCE

- A. IBC - International Building Code, 2009 edition.
- B. Delaware State Fire Prevention Regulations, 2012 edition.
- C. Facility Design Standard as issued by State of Delaware Division of Facilities Management
- D. Sussex Shores Water Company – Water Handbook
- E. State of Delaware Fire Marshal's Office
- F. NFPA 1 - Uniform Fire Code, 2009 edition.
- G. NFPA 13 - Installation of Sprinkler Systems, 2010 edition
- H. NFPA 72 - National Fire Alarm Code, 2010 edition.
- J. NFPA 25 Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems, 2011 edition.
- K. NFPA 101 - Life Safety Code, 2012 edition.
- L. Underwriters' Laboratories (UL) equipment listings, approvals and standards.
- M. ASME 17.1 – Safety Code for Elevators and Escalators

1.7 REQUIREMENTS OF REGULATORY AGENCIES

- A. All equipment, design, acceptance testing and installation of all items and systems as described or implied in this document shall be reviewed and approved by the listed code authorities. The contractor shall be responsible to submit as required all design documents, obtain and pay for all approvals from each listed code authority with final submission and approval from the Owner.
 - 1. State of Delaware Fire Marshal's Office
 - 2. Delaware Army National Guard
- B. All equipment, components, wiring, design and installation of all items as described or implied in this document shall meet all of the appropriate requirements in the codes, standards and guidelines listed under specification section 1.06.
- C. All equipment, components, design and installation of all items as described or implied in this document shall be UL Listed and approved by the AHJ for the use intended with installations conforming to the installation requirements of NFPA and the Delaware Army National Guard.
- D. The contractor shall be responsible for the submission, cost and obtaining all required approvals, permits and acceptance inspections/approvals from all legal and or required agencies, inspection organizations and insurance groups as listed in section 1.07 "A" above.

1.8 COORDINATION

- A. Fully coordinate the design, installation and testing of the new sprinkler system with the designated Owner and/or Owner representatives throughout each developmental phase of the project. This is an existing facility and will be in operation during the renovations. All work

shall be coordinated accordingly with the Owner, Architect and all designated personnel.

- B. Fully coordinate the installation with other trades work in progress or proposed progress at the time of the contractor's design and installation.
- C. The contractor shall be responsible for coordination with all existing and new building equipment. Contractor shall coordinate all sprinkler system pipe elevations and locations in order to avoid conflicts with lighting locations and other trades as existing and for future work.
- D. All sprinkler system piping shall be fully coordinated with existing building conditions and shall not be installed where it will obstruct building and/or maintenance operations, will not be subject to physical damage.

1.9 SUBMITTALS

A. General

- 1. Transmit each submittal with accepted transmittal form.
- 2. Sequentially number the transmittal forms. Re-submittals to have original number with an alphabetic suffix following.
- 3. Identify project, contractor, subcontractor or supplier; pertinent drawing sheet and detail number(s), and requirements section number, as appropriate.
- 4. Apply Contractor's stamp, signed or initialed certifying that review, verification of products required, field dimensions, adjacent construction work, and coordination of information, is in accordance with the requirements of the work and contract documents.
- 5. Schedule submittals to expedite the project, and deliver to the Owner as required. Coordinate submission of related items.
 - a. Identify variations from Contract Documents and Products or system limitations that may be detrimental to successful performance of completed work.
 - b. Provide space for contractor review stamps.
 - 1) Revise and resubmit submittals as required, identify all changes made since previous submittal.
 - 2) Distribute copies of reviewed submittals to concerned parties. Instruct parties to promptly report any inability to comply with provisions.

1.10 SUBMITTALS AT TIME OF SHOP DRAWINGS

- A. All shop drawings, associated hydraulic calculations and equipment cut sheets shall be approved by the Owner, DEDC, LLC and the AHJ. All shop drawing submittals shall be in accordance with these specifications and DHSS requirements
- B. All shop drawings, associated hydraulic calculations and equipment cut sheets shall be submitted to the Owner, DEDC, LLC and the AHJ a minimum of 2 weeks in advance of the start of any equipment delivery and/or installation.
- C. Submit five (5) copies of all shop drawings, hydraulic calculations and equipment data sheets to the Owner and DEDC, LLC for initial approval. Where shop drawing submittals are submitted in PDF format, contractor shall include one paper copy of all submittals.
- D. Submit required copies of shop drawings, associated hydraulic calculations and equipment cut sheets to the AHJ for approval. Furnish copies of approved drawings and approval/review letters from the AHJ to DEDC, LLC and Delaware Army National Guard for their records.
- E. Submit detailed shop/working drawings of the new sprinkler system using AutoCAD (version approved by the Owner) format. Submit all data on the drawings as required by the referenced NFPA Standards. Hand drawn working plans will not be accepted. Drawings shall be of a standard size sheet and scale.
- F. Submit manufacturer's catalog data included with the shop drawings for all items specified herein. The data shall be highlighted to show model, size, options, etc., that are intended

for consideration. Data shall be adequate to demonstrate compliance with all contract requirements.

- G. Shop drawings and/or construction documents for the sprinkler system shall contain plans that include at a minimum the following data and information:
 - 1. Floor plans showing the locations and sizes of all sprinkler system piping, equipment, control valves, isolation valves, pipe elevations, fire department connections, sources of water supply and other essential features of the system.
- H. All shop drawings shall show all information required for working plans as required in the referenced NFPA codes and shall include the following:
 - 1. Drawings shall show all building background features for coordination.
 - 2. Drawings shall use varying line widths based on the size of the piping. Separate pen widths shall demarcate equipment, branch lines, cross mains and supply mains.
 - 3. Drawings shall show all pipe sizes and elevations of piping above finished floor.
 - 4. Drawings shall show NICET III certification information of designer.
 - 5. All shop drawings shall show pipe hangers, supports and expansions fittings where required in accordance with NFPA 13, ASTM standards and equipment manufacturer's recommendations. NICET III designer shall verify by note on the drawings that the hangers, braces and expansion fittings have been laid out in accordance with a specific standard and list the appropriate standard or reference material in the drawing note.

1.11 SUBMITTALS AT TIME OF ACCEPTANCE TESTING

- A. At the completion of acceptance testing and prior to closeout the contractor shall submit three complete manuals of "the specific" system being installed and shall contain the following:
 - 1. Contractor shall provide all items identified by these specifications in bounded and labeled three-ring binders with zippered ends. The binder shall be labeled on the cover as follows: DELAWARE ARMY NATIONAL GUARD, BETHANY BEACH TRAINING SITE – SITE FIRE ALARM UPGRADE.
 - a. Each section of the manuals shall be arranged with section tags and documentation as follows:
 - 1) Project coversheet listing project name, Owner, general contractor and Owner representative.
 - 2) Manual index.
 - 3) Service Directory.
 - 4) System Approvals. Section shall include:
 - (a) Copy of AHJ Application for fire protection plan review, completed and marked paid.
 - (b) Copy of AHJ plan review approval form.
 - (c) Copy of Contractors Suppression Systems Company License.
 - (d) Copy of Contractors NICET Certification, certificate of technician.
 - (e) Original of NFPA 13 Contractor's Material and Test Certificate for Aboveground Piping.
 - (f) Copy of all acceptance testing and reports.
 - (g) Copy of AHJ's Final System Inspection and Approval Form.
 - 5) List of all necessary inspections and service for the first five years of the system usage based upon NFPA standards and manufacturer requirements.
 - 6) All literature and instructions provided by the manufacturer describing the operation and maintenance of the equipment and devices installed.
 - 7) Equipment inventory list including approved equipment data sheets.
 - 8) Divider section labeled "Punch List Items".
 - 9) First year warranty and test schedule.
 - 10) Three (3) sets of As-built drawings. Drawings shall be actual as-built drawings revised from original shop drawings and field changes to reflect actual installed

conditions. Drawings are to be provided in protective clear plastic sleeve with one drawing per sleeve. A complete set of final as-built drawings shall also be provided on CD.

- 11) Contractor shall provide a letter on Company letterhead verifying compliance with equipment manufacturer's requirements and verifying that all mechanical fittings and/or equipment have installed and torqued in accordance with manufacturer's requirements.
- 12) A copy of NFPA 25, Standard for the Inspection, Testing and Maintenance of Water-based Fire Protection Systems.

B. MANUFACTURER'S CERTIFICATES

1. When specified in individual specification sections, submit manufacturer's equipment certificates to Owner, in quantities specified for product data.
2. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
3. Certificates may be recent or previous test results on material or product, but must be acceptable to the Owner.

C. WARRANTY DOCUMENTATION

1. Submit warranty documentation when specified in individual specification sections.

1.12 QUALITY ASSURANCE

- A. Design and installation to conform to National Fire Protection Association (NFPA) standards and all standards and guidelines as referenced under section 1.06.
- B. Equipment and Components shall bear UL label or marking.
- C. The sprinkler contractor shall have a minimum of three years experience in sprinkler installation and be licensed by State of Delaware as a Sprinkler Installation Contractor.
- D. The contractor shall have on staff and assigned to the project a person who holds a Level III NICET certificate in Automatic Sprinkler Systems. NICET certificate holder shall verify on all drawings that the design and system components meet all required codes and standards.
- E. The contractor shall assign to the project a job superintendent who shall supervise the sprinkler work being performed. The job superintendent shall have a minimum of 10 years of documented experience as a sprinkler fitter and be responsible to supervise and certify quality control of all materials, workmanship and equipment set-up of all field work as follows:
 1. Certify that all prefabricated pipe joints are within tolerance with intended fitting and pipe manufacturer's specifications and requirements.
 2. Certify that all field grooved, welded or threaded pipe joints are within tolerance with intended fitting and pipe manufacturer's specifications and requirements and meet a high standard of workmanship.
 3. Certify that all installation fitters were supervised by the job superintendent and have performed their work with acceptable industry standard workmanship consistent with these minimum requirements.
 4. Certify that all installation fitters were provided with and showed proficiency with all required tools (i.e. torque wrenches, calibration devices, etc) to perform all necessary work in accordance with fitting and pipe manufacturer's specifications and requirements, including pipe support, bracing, hanging and expansion methods.
 5. Certify that the system has been installed in accordance with the approved shop drawings and the project's minimum specifications.
 6. Certification shall be in written form on company letterhead at the time of Acceptance Testing Submittals as listed under Section 1.12.
- F. The purpose of item 1.13 (E) and other related specification sections is to provide the project with a quantifiable way to measure and ensure a high degree of integrity of workmanship and materials. Any nationally recognized certification program may be submitted for review as an

“or equal”. To qualify, the certified “person” must be assigned to supervise all work being performed at the job site and must have responsible charge over all materials and labor.

- G. All mechanical fittings and appliances shall be torqued in accordance with the manufacture's recommendations. Contractor shall provide documentation as noted in section 1.12 and shall indicate the following:
1. Torque limits used as required by manufacture and the name of mechanic and supervisor responsible for torquing of equipment.

1.13 WARRANTY

- A. The successful bidder shall be responsible for all warranty and guarantee issues regardless of subcontractors, vendors or others operating as subcontractors under the successful bidders contract as follows:
1. All new equipment installed as part of the sprinkler system retrofit project shall be guaranteed for a period of two year from date of final acceptance of each system in accordance with these requirements.
 2. All sprinkler system components including but not limited to piping, fittings, hangers, valves, etc. are guaranteed to be free from inherent mechanical or electrical defects for one year from date of final acceptance of the system in accordance with these requirements.
- B. As part of the successful bidder's warranty package, the successful bidder shall submit at the time of system acceptance, a schedule of maintenance, testing and service as prescribed by these requirements and referenced standards, for the two (2) year warranty period. Cost of the two (2) year maintenance and testing shall be included in the base bid price.
- C. All warranty service that impairs the function of the fire suppression systems shall be provided with four hours of notification to the Contractor. Cost for this service shall be included within the base bid price.
- D. All warranty service that does not impair the function of the fire suppression systems but is obligated under the warranty shall be performed within 24 hours of notification to the Contractor unless otherwise approved by the Owner.
- E. Warranty starting period shall be based upon the determination of substantial completion as defined by the American Institute of Architects General and Federal Supplementary Conditions of The Contract for Construction AIA Document A201-1976 and A201/SC-1977. For purposes of this project, DEDC shall be known as the “architect” regarding implementation of substantial completion.

1.14 SYSTEM STARTUP

- A. Coordinate a schedule with the Owner and/or Owner Representative for the start-up of all systems in order to put systems in service.
- B. Notify the Owner seven days prior to putting each system in service.
- C. Verify that all equipment and system components have been checked for proper installation and support and any conditions that may cause damage.
- D. Verify that all acceptance tests and installations agree with those required by the equipment and/or system manufacturers.
- E. Where necessary, execute start-up under supervision of responsible manufacturer's representative and/or contractor's personnel in accordance with manufacturer's instructions. Where specified in individual requirements or sections, manufacturer shall 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.

- F. Submit a written report that the equipment and/or systems have been properly installed and are functioning correctly.

1.15 CLOSEOUT PROCEDURES AND ACCEPTANCE TESTING

- 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 Owner's inspection and acceptance testing.
- B. Submit schedule to Owner prior to starting any acceptance testing and closeout procedures. Coordinate all testing with Owner before starting.
- C. Remove waste and surplus materials, rubbish, and construction equipment from the building.
- D. Verify and adjust all valves and other operating equipment to ensure smooth and unhindered operation.
- E. Perform all required acceptance testing documentation as listed in these specifications and as required by NFPA standards.
- F. All sprinkler system alarm and trouble conditions, both local and remote, shall be simulated to demonstrate proper operation and interface with the fire alarm panel and offsite monitoring service.
- G. Provide Hydraulic Design Information signs for the sprinkler system at the main riser in the Mechanical Room. Hydraulic signs shall meet the requirements of NFPA 13.
- H. Provide signage in accordance with these specifications and NFPA standards for each valve on the sprinkler system.
- I. Complete AHJ final inspections and testing. Provide copies of all AHJ closeout documentation and approvals to Owner.
- J. Complete Owner education as specified in section 3.09.

PRODUCTS

- 2.1** Refer to section 01 60 00 Product Requirements for substitutions on all items.
- 2.2** Refer to Underwriters' Laboratories, Inc. (UL) listing for approved manufacturers of all equipment and materials to be used for the new sprinkler system.
 - A. All materials and equipment shall be new and current products of a manufacturer regularly engaged in the production of such materials and equipment.
 - B. All materials and equipment shall be in accordance with NFPA 13 and shall be UL listed and installed in strict conformance to the conditions of their listing and/or approval.
 - C. Components that do not affect the system performance such as drain piping, drain valves and signage shall not be required to be listed.
 - D. Where materials or manufacturers are specified and where the words "no approved or equal" are used, only the materials or manufacturers specified will be permitted to be furnished and installed. Where the words "or equal" or "approved equal" are used, the contractor shall be responsible to insure that all materials or equipment submitted as "equal" equipment meets all performance, quality and dimensional requirements as listed in these specifications and as required by the Owner. Contractor shall submit equipment data sheets for all equipment and materials with shop drawings to Owner and AHJ for review and approval.

2.3 ABOVEGROUND INTERIOR PIPING

- A. Aboveground piping shall be steel pipe and shall meet or exceed the standards as listed in NFPA 13. Copper piping is permitted where required by manufacturer for trim piping. All piping and fittings must be listed for the maximum pressure demands of the system.

- B. Pipe schedules shall be as follows:
 - 1. Schedule 10 for 2 1/2 inch pipe and larger.
 - 2. Schedule 40 for 2 inch and smaller pipe.
- C. All steel piping shall have a minimum Corrosion Resistance Ratio (CRR) of 1.00 per the UL listing. Equipment data sheets for steel piping as required for shop drawing submittals shall indicate the CRR.
- D. Final pipe sizes for all sprinkler system piping shall be based on contractor's hydraulic calculations and shown on shop drawings.
- E. Installation, support and joining of piping shall be in accordance with NFPA 13 and these specifications. All materials used shall be UL listed and/or approved for fire protection use.
- F. All piping shall be marked along its length by the manufacturer in such a way as to properly identify the pipe. The marking shall be visible on every piece of pipe over 2 feet in length.
- G. Acceptable manufacturers (or equal):
 - 1. Allied Tube & Conduit
 - 2. Bull Moose Tube company
 - 3. Youngstown Tube

2.4 UNDERGROUND PIPING MATERIALS

- A. Coordinate the design and installation of new underground water supply piping in accordance with the fire suppression bid drawings, NFPA 24 and the Sussex Shores Public Utilities Department.
- B. Underground piping design and installation shall be approved by the Sussex Shores Public Utilities Department, Delaware Army National Guard and the AHJ and shall include the following:
 - 1. New underground fire main shall be sized per hydrostatic calculations. New underground fire protection water main shall be cement lined Class 52 ductile iron pipe in accordance with AWWA C151 and AWWA C150. All fittings shall be of an approved type with joints and pressure class ratings compatible to the underground pipe being installed. Minimum depth of cover shall be 48 inches unless approved otherwise by Sussex Shores Public Utilities.
 - 2. All materials used on new underground supply main must be approved by the Sussex Shores Public Utilities Departments. All water supply construction and materials shall meet all City of Bethany Beach standards and specifications as well as current requirements and practices.
 - 3. Coordinate the tapping of the existing Sussex Shores water main for the new underground with the Sussex Shores Public Utilities Department. Valves shall be in accordance with NFPA 24 and shall be of an approved type.
 - 4. Restraint of the underground piping shall be detailed on contractors shop drawings and approved by Sussex Shores. The new underground fire protection water main shall be installed with joints anchored in accordance with NFPA 24 and the Sussex Shores Public Utilities Department. Concrete thrust blocks shall be designed and installed in accordance with NFPA 24 and NFPA 13.
 - 5. Connection between the underground and the aboveground piping shall be made with a suitable transition piece and shall be properly strapped by approved devices. When piping

is located under the foundation wall, clearance shall be provided to prevent breakage of the piping due to building settlement. Pipe joints shall not be installed in or under foundation walls. All pipes through walls and slabs must be Class 52 cement lined ductile iron pipe.

6. Provide isolation control valve with roadbox on new fire service main. Coordination location, type and installation with tapping of public main and with Sussex Shores Public Utilities.

2.5 PIPE FITTINGS

- A. All fittings shall be listed or approved for the specific pipe and type of system they are to be installed on and shall meet or exceed the standards as listed in NFPA 13.
- B. Joining of pipe and fittings shall be in accordance with the requirements as listed in NFPA 13 and the methods as listed in these specifications.
 1. For pipe sizes 2" and smaller, all fittings shall be either welded or threaded. No mechanical grooved, drilled, hole-cut outlets, clamped or gasket fittings will be permitted.
 2. For pipe sizes 2-1/2" and larger, contractor may use UL listed grooved style fittings or flanged fittings. Only "rigid" type mechanical couplings are approved.
 3. Plain-end, hooker, press-on, key type or slip type fittings are not permitted and will not be approved.
- C. Where threaded pipe and fittings are used, all threaded pipe and fittings shall have threads cut to ASME B1.20.1. Fittings shall be cast iron conforming to ASME B16.4 or malleable iron conforming to ASME B16.3. Only steel piping having a minimum Corrosion Resistance Ratio (CRR) of 1.00 per the UL listing and meeting the requirements of NFPA 13 shall be joined by threaded fittings.
- D. Contractor may use UL listed grooved style mechanical fittings or flanged fittings. Piping joined with grooved fittings shall be joined by a listed combination of fittings, gaskets and grooves. Only roll-groove joints shall be permitted and grooves shall be dimensionally compatible with the fittings. Only "rigid" type couplings are approved for grooved mechanical fittings except where "flexible" fittings are required by NFPA 13.
- E. All grooved mechanical joints and fittings shall be designed for not less than 175 psi service and all grooved mechanical fittings and couplings provided shall be the product of a single manufacturer. Fitting and couplings shall be ductile iron conforming to ASTM A536. All fasteners, parts, and materials used shall be the product of the coupling manufacturer, and specifically intended by the manufacturer for the installation with the fitting and coupling.
- F. Flanges shall conform to NFPA 13 and ASME B16.1. Gaskets shall be non-asbestos compressed material in accordance with ASME B16.21, 1/16 inch thick, and full face or self-centering flat ring type.
- G. Welding of sprinkler piping shall be in accordance with NFPA 13. Welded fittings shall be listed fabricated fittings or manufactured in accordance with the requirements as listed in NFPA 13. Any leakage repairs required to welded pipe or welded/threaded outlets shall only be repaired by cutting out the damaged area and replacement with a threaded joint.
- H. All flanged fittings and mechanical fittings and appliances shall be torqued in accordance with the manufacturer's recommendations. Bolts shall extend no less than three full threads beyond the nut with the bolts tightened to the required torque. See section 1.13.
 - I. Acceptable manufacturers for mechanical fittings (no approved or equal):
 1. Central Sprinkler Company (TYCO)
 2. Anvil International, Inc., Gruvlok
 3. Victaulic Fire Protection

2.6 VALVES

- A. All valves shall be UL listed for their intended use and the specific fire suppression system they are installed on. All valves controlling connections to water supplies and sprinklers shall be listed indicating type valves and shall be supervised.
- B. The pressure ratings of all valves shall meet or exceed the maximum working pressures of the sprinkler system.
- C. Drain valves and test valves shall be approved for their intended use.
- D. Valves listed as supervised in these specifications or as noted on drawings shall be provided with a UL listed supervisory switch and shall be connected to the building fire alarm system. See section 2.08 for tamper switch requirements.
- E. All control, drain and test connection valves shall be provided with signs as listed in NFPA 13. All control valves shall have a sign indicating the portion of the system that is controlled by the valve. All drain and test connection valves shall be provided with signs indicating their purpose.
- F. Where a main or isolation control valve is located in a concealed space, the location of the valve shall be indicated by a sign in an approved location near the opening to the concealed space.
- G. Acceptable manufacturers (or equal):
 - 1. TYCO
 - 2. NIBCO Inc.
 - 3. Viking Corp.
 - 4. Victaulic

2.4.1 VALVE OPERATORS

- A. Provide hand wheels for gate, globe (or angle) and drain valves.
- B. For butterfly valves provide gear operators.
- C. Provide chain operators for all control, isolation and drain valves that are installed 10 feet or greater above the finished floor.
- D. Listed indicating valves shall not close in less than 5 seconds when operated at maximum operating speed from the fully open position.

2.4.2 VALVE CONNECTIONS

- A. Provide valve connections to match pipe joints. Use valves of pipe size.
- B. For copper tube, provide threaded solder adapters for connection to valve.
- C. Provide butterfly valve with tapped lug body when used for isolating service.

2.5 TAMPER SWITCH

- A. Provide a valve supervisory/tamper switch capable of monitoring the open position of all control or sectional valves such as OS&Y gate valves, butterfly valves and ball type valves. The switch shall be equipped with two sets of Form "C" (SPDT) contacts.
- B. Tamper switches shall be provided for all valves which control or isolate the various water supplies for the sprinkler systems. Valves may have tamper switches which are integral to the valve operator or they may be mounted externally on the valve.
- C. Switches shall be wired to provide supervisory signal and shall be connected to the existing building fire alarm system control panel.
- D. Acceptable Manufacturers (or equal):
 - 1. Viking Corporation

2.6 WATERFLOW DETECTION

- A. Provide and install a UL listed vane type waterflow switch. Waterflow switch shall include metal enclosure, adjustable pneumatic retard and electrical characteristics compatible with alarm system. The switch housing shall be metallic, NEMA 4 rated, and oil resistant. The cover shall have tamper resistant screws.
- B. The waterflow detector shall have a sensitivity setting to signal a waterflow that equals or exceeds the discharge from one sprinkler head.
- C. The detector switch mechanism shall incorporate an instantly recycling pneumatic retard element with an adjustable range of 0 to 75 seconds.
- D. Waterflow detectors shall be wired to provide a waterflow alarm and shall be connected to the building fire alarm system control panel. Coordinate wiring and interface with fire alarm system and with fire alarm contractor.
- E. Acceptable Manufacturers (or equal):
 - 1. Viking Corporation
 - 2. Potter Electric Signal

2.7 SPRINKLER HEADS

- A. Only new sprinklers shall be installed. New sprinklers shall be UL listed and shall not include O-ring seals. Any sprinkler that incurs damage, is painted, or is sprayed with any obstructive material during installation and/or testing shall be replaced at no cost to the Owner. Installation of sprinklers shall be coordinated with all building construction and ceiling equipment, including HVAC diffusers and electric light fixtures, to prevent obstructions to sprinkler discharge.
- B. All sprinklers shall be selected and installed in accordance with their manufacturer's listings and the requirements of NFPA 13. Sprinklers shall be UL listed and approved for their intended use, occupancy hazard and the specific system they are installed on.
- C. Install new quick response (QR) sprinklers in all building areas, except where specifically prohibited or not listed for the area or occupancy hazard. Extended coverage sprinklers may be utilized if proven in the hydraulic calculations.
- D. Chrome, recessed type pendent sprinklers with matching escutcheons shall be provided in all areas with suspended tile ceiling. Brass upright sprinklers shall be provided in areas with gypsum ceilings and areas where open to the deck/floor above. Verify sprinkler type and finish with the Owner prior to purchasing.
- E. Sprinklers located less than seven feet above finished floor or installed where they may be subject to mechanical damage shall be provided with guards listed for use with the model of sprinkler installed.
- F. All pendent sprinkler heads where installed in suspended ceilings with lay-in tiles shall be installed in the center of 2'x2' tiles or in center of 2'x2' section for 2'x4' tiles. Any deviation from this requirement must be approved by the Owner. Sprinklers shall be centered in two directions in ceiling tiles. Pendent sprinklers required to be placed in the center of ceiling tiles, shall be supplied from a return bend that connects to an outlet at the top of the fire sprinkler branch line piping.
- G. Upright sprinklers shall have a brass finish and shall be installed with the frame arms parallel to the branch lines.
- H. Temperature ratings of sprinkler heads shall have an ordinary temperature rating unless higher rating is required based on building conditions. Final temperature ratings for each area shall be

verified by the contractor and based on NFPA 13 requirements.

- I. Acceptable Manufacturers (or equal):
 1. Viking Corp.
 2. TYCO
 3. Reliable

2.8 FIRE DEPARTMENT CONNECTION (FDC)

- A. Contractor shall install a new 5 inch Storz type Large Diameter FDC. New FDC shall meet the requirements of the AHJ and local fire department. New FDC shall supply both the sprinkler systems. For the wet and dry systems the new fire department connection (FDC) shall be provided for use by the fire department to pump/supply the primary water supply to the manual standpipe system at the required system demand.
- B. Storz FDC shall have a 30 degree body style and shall be provided with a female NPT outlet and locking Storz Inlet. FDC shall be a straight pattern 4" NPT x 5" Storz. FDC shall be provided with escutcheon and be labeled as "Sprinkler/Standpipe". FDC shall be provided with a blind cap including securing wire and chain.
- C. Fire department connection shall be designated by a sign. The sign shall have raised or engraved letters at least 1 inch in height that reads "STANDPIPE". A sign shall be provided at the new fire department connection (FDC) supplying the systems indicating the pressure and flow required at the FDC inlets in order to deliver the system demand.
- D. A listed check valve with automatic ball drip shall be installed in the fire department connection piping and located to maximize accessibility and minimize freezing.
- E. The fire department connection shall be connected to the sprinkler systems on the system side of the control valve and check valve, but on the supply side of any isolation valves.
- F. The fire department connection should be located not less than 18 inches and not more than 4 feet above the level of the adjacent grade or access level. Fire department connection shall be located and arranged so that hose lines can be readily and easily attached without interference from nearby objects.
- G. Acceptable Manufacturers (or equal):
 1. Guardian Fire Equipment, Inc.
 2. Fire-End & Croker Corp.

2.9 DOUBLE-CHECK BACKFLOW PREVENTION ASSEMBLY

- A. Backflow prevention shall be in accordance with the Sussex Shores Water Company. The backflow prevention device shall be a double check assembly and shall consist of two independently operating spring loaded check valves, two shutoff valves and required test cocks. Backflow prevention assembly shall meet or exceed the requirements of AWWA C510-07 and UL listed for fire suppression systems.
- B. Assembly shall be approved for use with UL/FM gate valves attached at each end of the combined check valve housing. Housing shall be constructed with either grooved or flanged connections.
- C. Shall be approved for horizontal or vertical installations. Assembly shall be installed with adequate clearance and accessibility for maintenance and testing.
- D. Means shall be provided downstream of backflow assembly for flow tests at system demand.
- E. Acceptable Manufacturers (or equal):
 1. AMES Company
 2. WATTS

2.10 PIPE HANGERS & SUPPORTS

- A. Hangers shall be UL listed and of the type suitable for the application, construction, and pipe type and size to be supported.
- B. Provide hangers and supports in accordance with referenced standards. Do not mix piping material and hanger material of dissimilar metals. Hanger rods shall be of a diameter in accordance with NFPA 13.
- C. Piping shall be hung with hangers and supports independent of any other hangers, support systems, or devices. Non-related materials may not be suspended from or attached to sprinkler piping or components.

EXECUTION

3.1 PREPARATION

- A. Ream pipe and tube ends to full inside diameter.
- B. Remove all fins and burrs.
- C. Remove scale and foreign material, inside and outside, before assembly.
- D. All mechanical piping outlets using drilled pipe connections shall be made no closer than 10" from the (1) end of the pipe, (2) another joint or (3) another outlet.

3.2 INSTALLATION - PIPE

- A. All piping, valves and fittings shall be inspected for damage when received at site and shall be re-inspected prior to installation.
- B. Install interior piping and equipment at elevations to minimize obstructions to building equipment and operations, to other trades and located so it is protected from physical damage.
- C. Install and support all interior piping in accordance with NFPA standards and install all piping and fittings to allow for draining of systems. All drain and test piping shall discharge to the exterior unless approved otherwise by Owner.
- D. All mechanical grooved piping shall be grooved as per manufacturer's specifications. All mechanical fittings and appliances shall be torqued in accordance with the manufacturer's recommendations and documented in accordance with these specifications.
- E. Die cut screw joints with full cut standard taper pipe threads with red lead and linseed oil or other non-toxic joint compound applied to male threads only.
- F. Coat threaded ends with pipe lubricant compound approved for fire protection systems. Solder or Braze copper piping.
- G. Do not penetrate building structural members unless approved. Coordinate all building penetrations and sealing with Owner and structural engineer prior to starting work.
- H. Provide sleeves for all pipes passing through slabs, concrete walls, and lath and plaster ceilings (except drop nipples for heads) and partitions. Sleeves shall extend three inches above floors and be flush with walls, ceilings, and partitions.
- I. Clearance between sleeves and pipes shall be one-inch for pipes up to 3 inches and two-inches for pipe sizes 4 inches and greater.

- J. For sleeves set in fire walls and floors, caulk space between pipe and sleeve with flexible fire-resistant packing compound to achieve rating at least equal to that of the wall or floor penetrated.
- K. The contractor shall be responsible for cutting and patching of walls where piping and/or accessories must be mounted on walls or where penetrations of walls are required by the installation.

3.3 INSTALLATION - VALVES

- A. Install valves with stems upright or horizontal, not inverted.
- B. All control valves shall be located where readily accessible, free of obstructions and shall be supervised.
- C. Provide valves for control and/or isolating service as listed in these specifications and as required by NFPA standards.
- D. Butterfly valves may be used instead of gate valves where approved by applicable codes and AHJ.
- E. Provide drain and inspectors test valves as listed in these specifications, as shown on drawings and as required by NFPA 13.

3.4 SPRINKLER SYSTEM ACCEPTANCE TESTING

- A. All sprinkler system work that is installed and completed for the project shall have the completed systems tested as required by these specifications, NFPA 13 and the AHJ.
- B. Prior to starting the acceptance testing for the sprinkler system, the contractor shall as a minimum complete the following:
 - 1. All piping shall be flushed as per NFPA 13 in order to remove any foreign materials that may have entered the piping during installation. All flushing of piping shall be witnessed by the Owner and/or Owners representative and the contractors job superintendent.
 - 2. All piping and equipment shall be visually inspected to verify that they are complete and have been properly installed and supported.
 - 3. All equipment shall be checked for proper identification, operation and accessibility.
 - 4. Contractor shall verify that the required alarm, supervisory and notification devices are installed and operational and are interfaced with the building fire alarm systems.
 - 5. Complete all preliminary testing where required before starting acceptance testing.
 - 6. Contractor shall submit to owner a letter certifying successful completion of the above tests and inspections.
 - 7. Contractor shall perform all acceptance testing as required by NFPA 13, these specifications and the State of Delaware Fire Marshal's office. All acceptance testing shall be performed by qualified personnel from the contractor and by appropriate manufacturer representatives.
 - 8. All testing shall be witnessed by the Owner, Owner representatives and the contractor's job superintendent. Testing shall also be witnessed by Authority Having Jurisdiction where required.
 - 9. All system testing shall be conducted in accordance with approved test protocols as prepared by the contractor. Written test protocols including detailed test procedures, documentation sheets, testing personnel and proposed test schedule shall be submitted to Owner for approval at least 10 working days prior to the start of acceptance testing.
 - 10. System testing shall include, but not be limited to, the operational and supervisory testing of all control equipment, waterflow devices, remote signaling devices and valve tamper switches. Proper operation of all equipment is to be verified through acceptance testing.
 - 11. At the completion of final acceptance testing the contractor shall provide a complete test report documenting the completed acceptance testing. Report shall state that all of the

installed systems are complete, fully tested, fully approved and ready for AHJ approval and ready to be placed in service.

12. Contractor and/or manufacturer representative shall provide all testing equipment as required in appropriate NFPA standards. All equipment shall be calibrated as required and all gauges shall bear a label with latest date of calibration.
13. Contractor shall take all precautions required to protect the building structure, building equipment, building occupants and other trades during acceptance testing.
14. The contractor shall clean and restore all systems and areas to normal conditions after completion of testing.

3.5 HYDROSTATIC TESTING - SYSTEM PIPING

- A. Hydrostatically test all aboveground sprinkler system and fire department connection piping for two hours at not less than 200 psi or 50 psi above maximum working pressure with no visible leakage. The hydrostatic pressure shall be measured at the low point of the individual system being tested.
- B. Contractor shall provide all instruments, equipment and personnel required for testing of each system. The contractor shall provide a source of water for testing and pumps, if required.
- C. All acceptance test documentation and test procedures must be approved by NFPA 13, the Owner and AHJ. All test reports shall be on NFPA Standard forms and copies shall be submitted to Owner at closeout. The test reports shall include, but not be limited to, the following:
 1. Identification of system being tested and the test date.
 2. List of personnel witnessing test.
 3. Test results
 4. Approval by Owner or their representative.
- D. Before any tests are started, consult with Owner and obtain approval for locations or areas where test water drainage is permissible.
- E. All personnel or agencies from which test approval is required shall be notified sufficiently in advance of testing to permit reasonable time for their representative to be present during the test.
- F. Tests shall be performed in compliance with the specified codes, standards, and manufacturer's recommendations.
- G. Should leaks occur during testing, the test shall stop, the leak shall be repaired and the test shall be repeated, starting at the beginning. All costs pertaining to the repair and repeat of the test shall be borne by the contractor.

3.7 SYSTEM OPERATIONAL TESTS

- A. Perform all system operational testing required under provisions of NFPA 13. Provide all documentation required to Owner and AHJ.
- B. All tests shall be witnessed by Owner or Owner's representative and AHJ when required. All testing shall be coordinated with the Owner and a schedule with test procedures shall be submitted at least 10 days prior to and testing.
- C. The sprinkler contractor is responsible for the testing of all devices on each system. Provide all instruments, equipment and personnel required for testing the sprinkler systems.
- D. All operational test documentation and test procedures must be approved by NFPA 13. All test reports shall be on NFPA Standard forms and copies shall be submitted to Owner at closeout. The test reports shall include, but not be limited to, the following:
 1. Identification of system being tested and the test date.
 2. List of personnel witnessing test.

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3. Test results
 4. Approval by Owner or their representative.
- E. The main drain valve shall be opened and shall remain open until the system pressure stabilizes. The static and residual pressures shall be recorded and on the contractor's test certificate.
- F. All control valves shall be manually opened and closed for its full range and returned to its normal position.
- G. Each alarm and supervisory device provided shall be tested in accordance with NFPA 72.
- H. Contractor shall verify that all signage as listed in these specifications and as required by NFPA 13 has been installed, is correct and is secure.

3.8 OWNER EDUCATION

- A. The sprinkler contractor shall provide the Owner with a minimum of one, four-hour training class on the new sprinkler system and standpipe system. Duration of training class may be reduced only when approved by the Owner. The training shall include, but not limited to the following:
1. Overview of system operation.
 2. Overview of Operation and Maintenance manuals.
 3. Detailed maintenance procedures.
 4. Periodic testing and procedures.
 5. Overview of system equipment and device locations.
- B. Training sessions shall be scheduled by the Owner at a time that is mutually agreeable to the contractor and owner. The instruction shall be scheduled for after final acceptance testing but prior to final payment.
- C. Each attendee shall receive an instructional certificate indicating attendance and satisfactory completion of the training.

3.9 DOCUMENTATION

- A. Prior to close-out and final payment the Contractor shall deliver to the Owner a complete set of approved documentation as described in section 1.12 of these specifications.

END OF SECTION

SECTION 22 05 53

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Nameplates.
- B. Tags.
- C. Pipe Markers.

1.02 REFERENCE STANDARDS

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; The American Society of Mechanical Engineers; 2007.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

- A. Piping: Tags.
- B. Pumps: Nameplates.
- C. Tanks: Nameplates.

2.02 NAMEPLATES

- A. Description: Laminated three-layer plastic with engraved letters.
 - 1. Letter Color: White.
 - 2. Letter Height: 1/4 inch.
 - 3. Background Color: Black.

2.03 TAGS

- A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.
- B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

2.04 PIPE MARKERS

- A. Comply with ASME A13.1.
- B. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

PART 3 EXECUTION

3.01 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.

3.02 INSTALLATION

- A. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install tags with corrosion resistant chain.
- C. Install plastic pipe markers in accordance with manufacturer's instructions.
- D. Use tags on piping 3/4 inch diameter and smaller.
 - 1. Identify service, flow direction, and pressure.
 - 2. Install in clear view and align with axis of piping.

3. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

3.03 SCHEDULES

- A. Domestic Water: Green Background with White Lettering
- B. Hazardous Gases: Yellow Background with Black Lettering
- C. Non-Hazardous Gases: Blue Background with White Lettering
- D. Fire Protection: Red Background with White Lettering

END OF SECTION

SECTION 26 05 01
MINOR ELECTRICAL DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electrical demolition.

1.02 RELATED REQUIREMENTS

- A. Section 01 70 00 - Execution and Closeout Requirements: Additional requirements for alterations work.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

- A. Materials and equipment for patching and extending work: As specified in individual sections.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify field measurements and circuiting arrangements are as shown on Drawings.
- B. Verify that abandoned wiring and equipment serve only abandoned facilities.
- C. Demolition drawings are based on casual field observation and existing record documents.
- D. Report discrepancies to Delaware Army National Guard before disturbing existing installation.
- E. Beginning of demolition means installer accepts existing conditions.

3.02 PREPARATION

- A. Disconnect electrical systems in walls, floors, and ceilings to be removed.
- B. Coordinate utility service outages with utility company.
- C. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.
- D. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.
 - 1. Obtain permission from Delaware Army National Guard at least 24 hours before partially or completely disabling system.
 - 2. Make temporary connections to maintain service in areas adjacent to work area.
- E. Existing Fire Alarm System: Maintain existing system in service until new system is accepted. Disable system only to make switchovers and connections. Minimize outage duration.
 - 1. Notify Delaware Army National Guard before partially or completely disabling system.
 - 2. Notify local fire service.
 - 3. Make notifications at least 24 hours in advance.
 - 4. Make temporary connections to maintain service in areas adjacent to work area.

3.03 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

- A. Remove, relocate, and extend existing installations to accommodate new construction.
- B. Remove abandoned wiring to source of supply.
- C. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.
- D. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets that are not removed.
- E. Repair adjacent construction and finishes damaged during demolition and extension work.

- F. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.

3.04 CLEANING AND REPAIR

- A. See Section 01 74 19 - Construction Waste Management and Disposal for additional requirements.
- B. Clean and repair existing materials and equipment that remain or that are to be reused.
- C. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.
- D. Luminaires: Remove existing luminaires for cleaning. Use mild detergent to clean all exterior and interior surfaces; rinse with clean water and wipe dry. Replace lamps, ballasts and broken electrical parts.

3.05 UNIVERSAL WASTE DIVERSION

- A. Remove all universal waste from fixtures, panels, and related devices for proper diversion and reclamation.
- B. Universal waste components are as follows: electric motors, PCB ballasts, non PCB ballasts, capacitors, contactors, circuit breakers, elemental and liquid mercury containing articles, transformers, lead acid batteries, fluorescent light bulbs, and all HID light bulbs.
- C. Exemption: electric motors, circuit breakers, transformers and lighting contactors are exempt from this provision provided the contractor chooses to salvage or reuse the components.
- D. No identified universal waste will be discarded into the waste stream.

END OF SECTION

SECTION 26 05 19

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Single conductor building wire.
- B. Metal-clad cable.
- C. Wire and cable for 600 volts and less.
- D. Wiring connectors.

1.02 REFERENCE STANDARDS

- A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013.
- B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2011.
- C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010.
- D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2009).
- E. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.
- F. NECA 120 - Standard for Installing Armored Cable (AC) and Metal-Clad Cable (MC); National Electrical Contractors Association; 2006.
- G. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; National Electrical Manufacturers Association; 2009 (ANSI/NEMA WC 70/ICEA S-95-658).
- H. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; International Electrical Testing Association; 2013 (ANSI/NETA ATS).
- I. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.
- K. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.
- L. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.
- M. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.
- N. UL 1569 - Metal-Clad Cables; Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

1.04 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.

PART 2 PRODUCTS

2.01 CONDUCTOR AND CABLE APPLICATIONS

- A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.
- B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.
- C. Concealed Dry Interior Locations: Use only building wire in raceway or metal clad cable.
- D. Exposed Dry Interior Locations: Use only building wire in raceway.

- E. Above Accessible Ceilings: Use only building wire in raceway or metal clad cable.
- F. Wet or Damp Interior Locations: Use only building wire in raceway.
- G. Exterior Locations: Use only building wire with Type THWN-2 insulation in raceway.
- H. Use solid conductor for feeders and branch circuits 10 AWG and smaller.
- I. Use stranded conductors for control circuits.
- J. Use conductor not smaller than 12 AWG for power and lighting circuits.
- K. Use conductor not smaller than 14 AWG for control circuits.
- L. Use 10 AWG conductors for 20 ampere, 120 volt branch circuits longer than 75 feet.
- M. Use 10 AWG conductors for 20 ampere, 277 volt branch circuits longer than 200 feet.

2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.
- D. Comply with NEMA WC 70.
- E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.
- F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.
- G. Conductor Material:
 - 1. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B 787M unless otherwise indicated.
 - 2. Tinned Copper Conductors: Comply with ASTM B33.
- H. Conductor Color Coding:
 - 1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
 - 2. Color Coding Method: Integrally colored insulation.
 - 3. Color Code:
 - a. Equipment Ground, All Systems: Green.

2.03 SINGLE CONDUCTOR BUILDING WIRE

- A. Description: Single conductor insulated wire.
- B. Conductor Stranding:
 - 1. Feeders and Branch Circuits:
 - a. Size 10 AWG and Smaller: Solid.
 - b. Size 8 AWG and Larger: Stranded.
- C. Insulation Voltage Rating: 600 V.
- D. Insulation:
 - 1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.
- E. Conductor: Copper.
- F. Insulation Voltage Rating: 600 volts.
- G. Insulation: NFPA 70, Type THHN/THWN.
- H. Insulation: Thermoplastic material rated 75 degrees C.

2.04 METAL-CLAD CABLE

- A. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.

- B. Conductor Stranding:
 - 1. Size 10 AWG and Smaller: Solid.
 - 2. Size 8 AWG and Larger: Stranded.
- C. Insulation Voltage Rating: 600 V.
- D. Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.
- E. Grounding: Full-size integral equipment grounding conductor.
- F. Armor: Steel, interlocked tape.
- G. Description: NFPA 70, Type MC.
- H. Conductor: Copper.
- I. Insulation Voltage Rating: 600 volts.
- J. Insulation Temperature Rating: 75 degrees C.
- K. Insulation Material: Thermoplastic.
- L. Armor Material: Steel.
- M. Armor Design: Interlocked metal tape.

2.05 WIRING CONNECTORS

- A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that interior of building has been protected from weather.
- B. Verify that work likely to damage wire and cable has been completed.
- C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.
- D. Verify that raceway installation is complete and supported.
- E. Verify that field measurements are as shown on the drawings.
- F. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

- A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.03 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install conductors and cable in a neat and workmanlike manner in accordance with NECA 1.
- C. Install metal-clad cable (Type MC) in accordance with NECA 120.
- D. Installation in Raceway:
 - 1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
 - 2. Pull all conductors and cables together into raceway at same time.
 - 3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
 - 4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.
- E. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.

- F. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
- G. Terminate cables using suitable fittings.
 - 1. Metal-Clad Cable (Type MC):
 - a. Use listed fittings.
 - b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.
- H. Install conductors with a minimum of 12 inches of slack at each outlet.
- I. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.
- J. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.
- K. Make wiring connections using specified wiring connectors.
 - 1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
 - 2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
 - 3. Do not remove conductor strands to facilitate insertion into connector.
 - 4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminants. Do not use wire brush on plated connector surfaces.
- L. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.
- M. Insulate ends of spare conductors using vinyl insulating electrical tape.
- N. Color Code Legend: Provide identification label identifying color code for ungrounded conductors at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.
- O. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.
- P. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.
- Q. Install wire and cable securely, in a neat and workmanlike manner, as specified in NECA 1.
- R. Route wire and cable as required to meet project conditions.
 - 1. Wire and cable routing indicated is approximate unless dimensioned.
 - 2. Where wire and cable destination is indicated and routing is not shown, determine exact routing and lengths required.
- S. Use wiring methods indicated.
- T. Pull all conductors into raceway at same time.
- U. Use suitable wire pulling lubricant for building wire 4 AWG and larger.
- V. Protect exposed cable from damage.
- W. Support cables above accessible ceiling, using spring metal clips or metal cable ties to support cables from structure or ceiling suspension system. Do not rest cable on ceiling panels.
- X. Use suitable cable fittings and connectors.
- Y. Neatly train and lace wiring inside boxes, equipment, and panelboards.
- Z. Clean conductor surfaces before installing lugs and connectors.

- AA. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.
- AB. Use split bolt connectors for copper conductor splices and taps, 6 AWG and larger. Tape uninsulated conductors and connector with electrical tape to 150 percent of insulation rating of conductor.
- AC. Use solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller.
- AD. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.
- AE. Identify and color code wire and cable under provisions of Section 26 05 53. Identify each conductor with its circuit number or other designation indicated.

3.04 FIELD QUALITY CONTROL

- A. Perform inspection, testing, and adjusting in accordance with Section 01 40 00.
- B. Perform field inspection and testing in accordance with Section 01 40 00.
- C. Inspect and test in accordance with NETA ATS, except Section 4.
- D. Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required.
- E. Correct deficiencies and replace damaged or defective conductors and cables.
- F. Perform inspections and tests listed in NETA STD ATS, Section 7.3.2.

END OF SECTION

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Grounding and bonding requirements.
- B. Conductors for grounding and bonding.
- C. Connectors for grounding and bonding.
- D. Grounding and bonding components.
- E. Provide all components necessary to complete the grounding system(s) consisting of:
 - 1. Existing metal underground water pipe.
 - 2. Metal underground water pipe.
 - 3. Metal frame of the building.
 - 4. Rod electrodes.

1.02 RELATED REQUIREMENTS

- A. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.
- B. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- C. Section 03 30 00 - Cast-in-Place Concrete.

1.03 REFERENCE STANDARDS

- A. IEEE 81 - Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System; 2012.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.
- C. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Verify exact locations of underground metal water service pipe entrances to building.
 - 2. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.
 - 3. Notify DEDC, LLC of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.05 PERFORMANCE REQUIREMENTS

- A. Grounding System Resistance: 5 ohms.

1.06 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittals procedures.
- B. Test Reports: Indicate overall resistance to ground and resistance of each electrode.

1.07 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.

PART 2 PRODUCTS

2.01 GROUNDING AND BONDING REQUIREMENTS

- A. Do not use products for applications other than as permitted by NFPA 70 and product listing.
- B. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.
- C. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- D. Grounding System Resistance:
 - 1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by DEDC, LLC. Precipitation within the previous 48 hours does not constitute normally dry conditions.
 - 2. Grounding Electrode System: Not greater than 5 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.
 - 3. Between Grounding Electrode System and Major Electrical Equipment Frames, System Neutral, and Derived Neutral Points: Not greater than 0.5 ohms, when tested using "point-to-point" methods.
- E. Grounding Electrode System:
 - 1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
 - a. Provide continuous grounding electrode conductors without splice or joint.
 - b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.
 - 2. Metal Building or Structure Frame:
 - a. Provide connection to metal building or structure frame effectively grounded in accordance with NFPA 70 at nearest accessible location.
 - 3. Ground Ring:
 - a. Provide a ground ring encircling the building or structure consisting of bare copper conductor not less than 2 AWG in direct contact with earth, installed at a depth of not less than 30 inches.
 - b. Where location is not indicated, locate ground ring conductor at least 24 inches outside building perimeter foundation.
 - 4. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.

2.02 GROUNDING AND BONDING COMPONENTS

- A. General Requirements:
 - 1. Provide products listed, classified, and labeled as suitable for the purpose intended.
 - 2. Provide products listed and labeled as complying with UL 467 where applicable.
- B. Conductors for Grounding and Bonding, in addition to requirements of Section 26 05 19:
 - 1. Use insulated copper conductors unless otherwise indicated.
 - a. Exceptions:
 - 1) Use bare copper conductors where installed underground in direct contact with earth.
 - 2) Use bare copper conductors where directly encased in concrete (not in raceway).
- C. Connectors for Grounding and Bonding:
 - 1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.

2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.

2.03 MANUFACTURERS

- A. Cooper Power Systems, a division of Cooper Industries: www.cooperindustries.com.
- B. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 ELECTRODES

- A. Manufacturers:
 1. Cooper Power Systems, a division of Cooper Industries: www.cooperindustries.com.
 2. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Rod Electrodes: Copper-clad steel.
 1. Diameter: 3/4 inch.
 2. Length: 10 feet.
 3. Substitutions: See Section 01 60 00 - Product Requirements.

2.05 CONNECTORS AND ACCESSORIES

- A. Mechanical Connectors: Bronze.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that work likely to damage grounding and bonding system components has been completed.
- B. Verify that field measurements are as shown on the drawings.
- C. Verify that conditions are satisfactory for installation prior to starting work.
- D. Verify existing conditions prior to beginning work.
- E. Verify that final backfill and compaction has been completed before driving rod electrodes.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install grounding and bonding system components in a neat and workmanlike manner in accordance with NECA 1.
- C. Make grounding and bonding connections using specified connectors.
 1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
 2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
 3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
 4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
 5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- D. Identify grounding and bonding system components in accordance with Section 26 05 53.
- E. Install ground electrodes at locations indicated. Install additional rod electrodes as required to achieve specified resistance to ground.
- F. Provide grounding electrode conductor and connect to reinforcing steel in foundation footing where indicated. Bond steel together.

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- G. Provide bonding to meet requirements described in Quality Assurance.
- H. Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.

END OF SECTION

SECTION 26 05 29

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Support and attachment components for equipment, conduit, cable, boxes, and other electrical work.

1.02 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2013.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.
- C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2013.
- D. MFMA-4 - Metal Framing Standards Publication; Metal Framing Manufacturers Association; 2004.
- E. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.
- F. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for metal channel (strut) framing systems, non-penetrating rooftop supports, and post-installed concrete and masonry anchors.

1.04 QUALITY ASSURANCE

- A. Comply with NFPA 70.
- B. Comply with applicable building code.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.
- B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

- A. General Requirements:
 - 1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.
 - 2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
 - 3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported with a minimum safety factor of 50%. Include consideration for vibration, equipment operation, and shock loads where applicable.
 - 4. Do not use products for applications other than as permitted by NFPA 70 and product listing.
 - 5. Steel Components: Use corrosion resistant materials suitable for the environment where installed.

- a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
 - b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Conduit and Cable Supports: Straps, clamps, etc. suitable for the conduit or cable to be supported.
 - 1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
 - 2. Conduit Clamps: Bolted type unless otherwise indicated.
 - C. Outlet Box Supports: Hangers, brackets, etc. suitable for the boxes to be supported.
 - D. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
 - 1. Comply with MFMA-4.
 - E. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
 - F. Anchors and Fasteners:
 - 1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.

2.02 MANUFACTURERS

- A. Thomas & Betts Corporation: www.tnb.com.
- B. Threaded Rod Company: www.threadedrod.com.
- C. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 MATERIALS

- A. Hangers, Supports, Anchors, and Fasteners - General: Corrosion-resistant materials of size and type adequate to carry the loads of equipment and conduit, including weight of wire in conduit.
- B. Supports: Fabricated of structural steel or formed steel members; galvanized.
- C. Anchors and Fasteners:

	Drop in Sleeve Anchors	Expansion Machine Bolt Anchors	Lag Shield Anchors	Nail-in Anchors	Toggle Bolts	Hollow Wall Anchors	Power Driven Studs
Brick	X	X	X	X			X
Concrete	X	X	X	X			X
Concrete Block	X		X	X	X		
Cinder Block		X			X	X	
Stone	X	X		X			X
Marble	X		X				
Building Tile		X			X	X	
Ceramic Tile		X			X		
Terrazzo		X		X			
Terra Cotta		X			X	X	
Plaster					X	X	
Drywall				X	X		
Slate		X			X		
Steel							X

ANCHOR HARDWARE TABLE

- D. Formed Steel Channel:
 1. Product: Steel "U" shaped with in-turned clamping ridges manufactured by Unitstrut, Power Wtrut, B-Line Strut or Kindorf.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install support and attachment components in a neat and workmanlike manner in accordance with NECA 1.
- C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- D. Unless specifically indicated or approved by DEDC, LLC, do not provide support from suspended ceiling support system or ceiling grid.
- E. Unless specifically indicated or approved by DEDC, LLC, do not provide support from roof deck.
- F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- G. Equipment Support and Attachment:
 1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
 2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
 3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
 4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- H. Secure fasteners according to manufacturer's recommended torque settings.

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- I. Remove temporary supports.

END OF SECTION

SECTION 26 05 34
CONDUIT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Flexible metal conduit (FMC).
- B. Liquidtight flexible metal conduit (LFMC).
- C. Electrical metallic tubing (EMT).
- D. Conduit fittings.
- E. Conduit, fittings and conduit bodies.

1.02 REFERENCE STANDARDS

- A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2005.
- B. ANSI C80.3 - American National Standard for Steel Electrical Metallic Tubing (EMT); 2005.
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.
- D. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); National Electrical Contractors Association; 2006.
- E. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; National Electrical Manufacturers Association; 2012 (ANSI/NEMA FB 1).
- F. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.
- H. UL 360 - Liquid-Tight Flexible Steel Conduit; Current Edition, Including All Revisions.
- I. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.
- J. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittals procedures.

1.04 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for purpose specified and shown.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.
- B. Accept conduit on site. Inspect for damage.
- C. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

PART 2 PRODUCTS

2.01 CONDUIT REQUIREMENTS

- A. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.02 METAL CONDUIT

- A. Manufacturers:
 - 1. Allied Tube & Conduit: www.alliedtube.com.
 - 2. Wheatland Tube Company: www.wheatland.com.
 - 3. Triangle
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Rigid Steel Conduit: ANSI C80.1.
- C. Fittings and Conduit Bodies: NEMA FB 1; material to match conduit.

2.03 FLEXIBLE METAL CONDUIT (FMC)

- A. Description: NFPA 70, Type FMC standard wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems to be used.
- B. Fittings:
 - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Material: Use steel or malleable iron.
- C. Description: Interlocked steel construction.
- D. Fittings: NEMA FB 1.

2.04 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

- A. Manufacturers:
 - 1. AFC Cable Systems, Inc: www.afcweb.com.
 - 2. Electri-Flex Company: www.electriflex.com.
 - 3. International Metal Hose: www.metalhose.com.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.
- C. Fittings:
 - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Material: Use steel or malleable iron.
- D. Description: Interlocked steel construction with PVC jacket.
- E. Fittings: NEMA FB 1.

2.05 ELECTRICAL METALLIC TUBING (EMT)

- A. Manufacturers:
 - 1. Allied Tube & Conduit: www.alliedeg.com.
 - 2. Wheatland Tube Company: www.wheatland.com.
 - 3. Triangle
- B. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.
- C. Fittings:
 - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Material: Use steel or malleable iron.
 - 3. Connectors and Couplings: Use compression (gland) or set-screw type.
 - a. Do not use indenter type connectors and couplings.
- D. Description: ANSI C80.3; galvanized tubing.
- E. Fittings and Conduit Bodies: NEMA FB 1; steel or malleable iron compression type.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as shown on drawings.
- B. Verify that mounting surfaces are ready to receive conduits.
- C. Verify that conditions are satisfactory for installation prior to starting work.
- D. Conduit routing is shown on drawings in approximate locations unless dimensioned. Route as required to complete wiring system.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install conduit in a neat and workmanlike manner in accordance with NECA 1.
- C. Conduit Support:
 - 1. Secure and support conduits in accordance with NFPA 70 and Section 26 05 29 using suitable supports and methods approved by the authority having jurisdiction.
 - 2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- D. Connections and Terminations:
 - 1. Use suitable adapters where required to transition from one type of conduit to another.
 - 2. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
 - 3. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.
 - 4. Secure joints and connections to provide maximum mechanical strength and electrical continuity.
- E. Penetrations:
 - 1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
 - 2. Make penetrations perpendicular to surfaces unless otherwise indicated.
 - 3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
 - 4. Conceal bends for conduit risers emerging above ground.
 - 5. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.
 - 6. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
 - 7. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty. Include proposed locations of penetrations and methods for sealing with submittals.
 - 8. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.
- F. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
 - 1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
 - 2. Where conduits are subject to earth movement by settlement or frost.
- G. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:

1. Where conduits pass from outdoors into conditioned interior spaces.
2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.

H. Provide grounding and bonding in accordance with Section 26 05 26.

3.03 INTERFACE WITH OTHER PRODUCTS

- A. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.
- B. Route conduit through roof openings for piping and ductwork wherever possible. Where separate roofing penetration is required, coordinate location and installation method with roofing installation specified in Section 01700.

END OF SECTION

SECTION 26 05 37
BOXES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Outlet and device boxes up to 100 cubic inches, including those used as junction and pull boxes.
- B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches.
- C. Wall and ceiling outlet boxes.
- D. Pull and junction boxes.

1.02 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.
- B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; National Electrical Contractors Association; 2010.
- C. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; National Electrical Manufacturers Association; 2012 (ANSI/NEMA FB 1).
- D. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; National Electrical Manufacturers Association; 2013 (ANSI/NEMA OS 1).
- E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); National Electrical Manufacturers Association; 2008.
- F. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- H. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- I. UL 508A - Industrial Control Panels; Current Edition, Including All Revisions.
- J. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

1.04 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.

PART 2 PRODUCTS

2.01 BOXES

- A. General Requirements:
 - 1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
 - 2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
 - 3. Provide products listed, classified, and labeled as suitable for the purpose intended.
 - 4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
 - 5. Provide grounding terminals within boxes where equipment grounding conductors terminate.

- B. Outlet and Device Boxes Up to 100 cubic inches, Including Those Used as Junction and Pull Boxes:
 - 1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
 - 2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
 - 3. Use suitable concrete type boxes where flush-mounted in concrete.
 - 4. Use suitable masonry type boxes where flush-mounted in masonry walls.
 - 5. Use raised covers suitable for the type of wall construction and device configuration where required.
 - 6. Use shallow boxes where required by the type of wall construction.
 - 7. Do not use "through-wall" boxes designed for access from both sides of wall.
 - 8. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
 - 9. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
 - 10. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
 - 11. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes.
 - 12. Wall Plates: Comply with Section 26 27 26.
- C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches:
 - 1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
 - 2. NEMA 250 Environment Type, Unless Otherwise Indicated:
 - 3. Junction and Pull Boxes Larger Than 100 cubic inches:
 - a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.

2.02 MANUFACTURERS

- A. Appleton Electric: www.appletonelec.com.
- B. Hoffman
- C. Steel City
- D. Crouse-Hinds
- E. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 OUTLET BOXES

- A. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel.
 - 1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; include 1/2 inch male fixture studs where required.
- B. Cast Boxes: NEMA FB 1, Type FD, aluminum. Provide gasketed cover by box manufacturer. Provide threaded hubs.
- C. Wall Plates for Finished Areas: As specified in Section 26 27 26.

2.04 PULL AND JUNCTION BOXES

- A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.
- B. Surface Mounted Cast Metal Box: NEMA 250, Type 4; flat-flanged, surface mounted junction box:
 - 1. Material: Galvanized cast iron.
 - 2. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in a neat and workmanlike manner in accordance with NECA 1 and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Box Supports:
 - 1. Secure and support boxes in accordance with NFPA 70 and Section 26 05 29 using suitable supports and methods approved by the authority having jurisdiction.
 - 2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
- E. Install boxes plumb and level.
- F. Flush-Mounted Boxes:
 - 1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch or does not project beyond finished surface.
 - 2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
 - 3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch at the edge of the box.
- G. Install boxes as required to preserve insulation integrity.
- H. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- I. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.
- J. Close unused box openings.
- K. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.
- L. Provide grounding and bonding in accordance with Section 26 05 26.
- M. Install boxes securely, in a neat and workmanlike manner, as specified in NECA 1.
- N. Install in locations as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and as required by NFPA 70.
- O. Set wall mounted boxes at elevations to accommodate mounting heights indicated.
- P. Electrical boxes are shown on Drawings in approximate locations unless dimensioned.
 - 1. Adjust box locations up to 10 feet if required to accommodate intended purpose.
- Q. Orient boxes to accommodate wiring devices oriented as specified in Section 26 27 26.
- R. Maintain headroom and present neat mechanical appearance.
- S. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.
- T. Install boxes to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.
- U. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.
- V. Use flush mounting outlet box in finished areas.

- W. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.
- X. Do not install flush mounting box back-to-back in walls; provide minimum 6 inches separation. Provide minimum 24 inches separation in acoustic rated walls.
- Y. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.
- Z. Do not fasten boxes to ceiling support wires.
- AA. Support boxes independently of conduit, except cast box that is connected to two rigid metal conduits both supported within 12 inches of box.
- AB. Use gang box where more than one device is mounted together. Do not use sectional box.
- AC. Use cast outlet box in exterior locations exposed to the weather and wet locations.
- AD. Use cast floor boxes for installations in slab on grade; formed steel boxes are acceptable for other installations.

3.02 ADJUSTING

- A. Adjust flush-mounting outlets to make front flush with finished wall material.
- B. Install knockout closures in unused box openings.

3.03 CLEANING

- A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

END OF SECTION

SECTION 26 05 53
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electrical identification requirements.
- B. Large Device Identification.
- C. Nameplates and Labels.
- D. Wire and cable markers.
- E. Voltage markers.
- F. Warning signs and labels.

1.02 REFERENCE STANDARDS

- A. ANSI Z535.2 - American National Standard for Environmental and Facility Safety Signs; 2011.
- B. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2011.
- C. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittals procedures.

PART 2 PRODUCTS

2.01 IDENTIFICATION REQUIREMENTS

- A. Identification for Equipment:
 - 1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
- B. Identification for Conductors and Cables:
 - 1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26 05 19.
 - 2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.

2.02 MANUFACTURERS

- A. Brady Corporation: www.bradycorp.com.
- B. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 LARGE DEVICE IDENTIFICATION

- A. Identify all disconnect switches, pull boxes, junction boxes (larger than 4" X 4") in unfinished areas with Brady voltage markers, catalog #B-498, series #44xxx (xxx indicates last 3 numbers of model number which vary based on voltage, size, etc. Contractor shall coordinate this information prior to ordering). Sizes for each label shall be as large as possible, style "A", "B" or "C" as the device permits.
- B. Identify all disconnect switches, pull boxes, junction boxes (larger than 4" X 4") finished with black engraved lamicaid self-adhesive labels, 1" X 4". The label shall state the power feed, circuit or section number, and the equipment identification number that the large device serves.

2.04 IDENTIFICATION NAMEPLATES AND LABELS

- A. Identification Nameplates:
 - 1. Materials:

2. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch high; Four, located at corners for larger sizes.
- B. Identification Labels:
 1. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
 2. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.
- C. Nameplates: Engraved three-layer laminated plastic, black letters on white background, 2" by 6" in size
- D. Locations:
 1. Each electrical distribution and control equipment enclosure.
 2. Disconnect Switches
 3. Panelboards.
- E. Letter Size:
 1. Use 1/8 inch letters for identifying individual equipment and loads.
- F. Labels: Embossed adhesive tape, with 3/16 inch (5 mm) white letters on black background. Use only for identification of individual wall switches and receptacles, and control device stations.

2.05 WIRE AND CABLE MARKERS

- A. Manufacturers:
 1. Brady, Bradysleeve, Catalog #B-320 PVC.
 2. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.
- C. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.
- D. Legend: Power source and circuit number or other designation indicated.
- E. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.
- F. Minimum Text Height: 1/8 inch.
- G. Color: Black text on white background unless otherwise indicated.
- H. Locations: Each conductor at pull boxes, junction boxes, and Termination or connection points including each load connection.
- I. Legend:
 1. Power and Lighting Circuits: Branch circuit or feeder number indicated on drawings.

2.06 VOLTAGE MARKERS

- A. Minimum Size:
- B. Legend:
- C. Color: Black text on orange background unless otherwise indicated.
- D. Location: Furnish markers for each conduit longer than 6 feet.
- E. Spacing: 20 feet on center.

2.07 WARNING SIGNS AND LABELS

- A. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.
- B. Warning Signs:
 1. Materials:
 2. Minimum Size: 7 by 10 inches unless otherwise indicated.

- C. Warning Labels:
 - 1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
 - 2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
 - 3. Minimum Size: 2 by 4 inches unless otherwise indicated.

PART 3 EXECUTION

3.01 PREPARATION

- A. Clean surfaces to receive adhesive products according to manufacturer's instructions.
- B. Degrease and clean surfaces to receive nameplates and labels.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
 - 1. Surface-Mounted Equipment: Enclosure front.
 - 2. Flush-Mounted Equipment: Inside of equipment door.
 - 3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
 - 4. Elevated Equipment: Legible from the floor or working platform.
 - 5. Interior Components: Legible from the point of access.
 - 6. Conductors and Cables: Legible from the point of access.
- C. Install identification products centered, level, and parallel with lines of item being identified.
- D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.
- E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.

END OF SECTION

SECTION 26 28 17
ENCLOSED CIRCUIT BREAKERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Enclosed circuit breakers.

1.02 RELATED REQUIREMENTS

- A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- B. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

- A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; Federal Specification; Revision E, 2013.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.
- C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2008.
- D. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; International Electrical Testing Association; 2013 (ANSI/NETA ATS).
- E. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- G. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- H. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

1.05 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Maintain one copy of each document on site.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Eaton Corporation; Cutler-Hammer Products: www.eaton.com.
- B. General Electric Company: www.geindustrial.com.
- C. Schneider Electric; Square D Products: www.schneider-electric.us.
- D. Siemens: www.siemens.com.
- E. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ENCLOSED CIRCUIT BREAKERS

- A. Description: Units consisting of molded case circuit breakers individually mounted in enclosures.

- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
 - 1. Altitude: Less than 6,600 feet.
 - 2. Ambient Temperature: Between 23 degrees F and 104 degrees F.
- D. Short Circuit Current Rating:
- E. Conductor Terminations: Suitable for use with the conductors to be installed.
- F. Provide solidly bonded equipment ground bus in each enclosed circuit breaker, with a suitable lug for terminating each equipment grounding conductor.
- G. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
 - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
- H. Provide externally operable handle with means for locking in the OFF position.

2.03 MOLDED CASE CIRCUIT BREAKERS

- A. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
- B. Interrupting Capacity:
 - 1. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
 - 2. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
- C. Conductor Terminations:
 - 1. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
- D. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.
- E. Molded Case Circuit Breakers: UL listed for the following service conditions:

2.04 TRIP UNITS

- A. Field-Adjustable Trip Circuit Breakers: Provide circuit breakers with frame sizes 600 amperes and larger with mechanism for adjusting long time continuous current, short time pickup current setting for automatic operation.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install enclosed circuit breakers where indicated, in accordance with manufacturer's instructions.
- B. Install enclosed circuit breakers securely, in a neat and workmanlike manner in accordance with NECA 1.
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide required supports in accordance with Section 26 05 29.
- E. Install enclosed circuit breakers plumb.
- F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed circuit breakers such that the highest position of the operating handle does not exceed 79 inches above the floor or working platform.
- G. Provide grounding and bonding in accordance with Section 26 05 26.
- H. Provide identification nameplates for each enclosed circuit breaker in accordance with Section 26 05 53.

- I. Provide arc flash warning labels in accordance with NFPA 70.

3.02 FIELD QUALITY CONTROL

- A. Perform inspection, testing, and adjusting in accordance with Section 01 40 00.
- B. Inspect and test in accordance with manufacturer's instructions and NETA ATS, except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for circuit breakers used for service entrance and for circuit breakers larger than _____ amperes. Tests listed as optional are not required.
- D. Correct deficiencies and replace damaged or defective enclosed circuit breakers.
- E. Perform field inspection and testing in accordance with Section 01 40 00.
- F. Inspect and test each circuit breaker.
- G. Inspect each circuit breaker visually.
- H. Perform several mechanical ON-OFF operations on each circuit breaker.
- I. Verify circuit continuity on each pole in closed position.
- J. Determine that circuit breaker will trip on overcurrent condition, with tripping time to NEMA AB 1 requirements.
- K. Include description of testing and results in test report.

3.03 ADJUSTING

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

END OF SECTION

SECTION 28 31 00

FIRE DETECTION AND ALARM SPECIFICATION

PART 1 - GENERAL

1.1 General Description

- A. The Delaware Army National Guard (DEARNG) is requesting a proposal/bid for the installation of a new, standard fire alarm and detection system at the Bethany Beach Training Site in Bethany Beach, Delaware. The fire alarm and detection system being bid shall be designed and installed in accordance with these specifications.
- B. The Bethany Beach Training Site has three buildings in which fire alarm and detection is to be installed. Building 115 is used as the site dining hall and is classified as a Use Group A occupancy per IBC (2009). In addition to the replacement of the fire alarm system, the building is to have new sprinkler system installed. Building 139 and 140 are utilized as site sleeping areas and area classified as a Use Group R-1 occupancy per IBC (2009). Buildings 139 and 140 are not to have new sprinkler systems.
- C. The installation of the new fire alarm and detection system is to be coordinated with the existing building conditions and all new construction.
- D. Building 115 will have a standalone new fire alarm system as follows:
- Voice evacuation speaker audio system
 - Standard visual alarm
 - Water flow monitoring
 - Valve tamper monitoring
 - Low air pressure monitoring
 - Duct smoke detection
 - Remote test switches for duct detection
 - Kitchen extinguishing system monitoring
 - Standard manual pull stations.
- E. Building 139 will have a standalone new fire alarm system as follows:
- Standard Visual alarms
 - 177 cd residential visual alarms in sleeping rooms
 - Standard audio alarms
 - 520 hz audio alarms in sleeping rooms
 - Duct smoke detection
 - Remote test switches for duct detection
 - Standard manual pull stations.
- F. Building 140 will have a standalone new fire alarm system as follows:
- Standard Visual alarms
 - 177 cd residential visual alarms in sleeping rooms
 - Standard audio alarms
 - 520 hz audio alarms in sleeping rooms

- Duct smoke detection
- Remote test switches for duct detection
- Standard manual pull stations.

1.2 General Requirements

- A. All exceptions taken to these specifications, all variances from these specifications and all substitutions of operating capabilities or equipment called for in these specifications shall be listed in writing and forwarded to the Delaware Army National Guard at the time of bid submission. Any such exceptions, variances or substitutions that were not listed at the time of bid submission and are identified in the shop drawing submittals, installed equipment, associated work or at the time of acceptance testing, shall be grounds for immediate disapproval without comment.
- B. The intent of the system shall meet the minimum code requirements as specified, but in addition, shall meet the specific level of life safety and protection as required by the State of Delaware in these minimum requirements. In almost all cases, these minimum requirements will require a higher degree of protection and workmanship than that specified by the referenced codes.
- C. The system shall be designed in a modular fashion to insure future expansion capability. It shall be the intent of the system to monitor all fire suppression systems, fire extinguishing systems and building services as designated. The fire alarm and detection system is the centerpiece of the State of Delaware's life safety systems and is intended to provide a high degree of alarm notification, detection critical system monitoring and selected control outputs. Currently, this design is intended to provide the State of Delaware with a high degree of reliability and NO unwanted alarms.
- D. The new fire alarm system shall be a single point addressable fire alarm and detection system. The new fire alarm system shall include several features as follows:
1. Manually actuated fire alarm boxes. Alarm boxes shall be double-action type. Alarm boxes in public areas are to have safety covers.
 2. Alarm notification devices consisting of horn and strobe devices installed to provide alarm notification throughout the building.
 4. Interface with the new sprinkler system to provide monitoring.
 5. HVAC duct smoke detection installed for the control of smoke spread.
- E. The intent of the new fire alarm and detection system is to meet all code requirements as required, but in addition, shall meet the specific level of life safety and protection as specified by through these specifications. The design, installation, workmanship, testing and documentation of the system must be of the highest quality. The design team and the OMB shall be the final judge of quality issues and their decision is final. If bidders or any interested parties have a concern with these conditions, they shall note their concerns in writing at the time of pre-bid meetings and at the time of bid submission.
- F. The fire alarm systems shall be a stand-alone fire alarm system. The system shall be

provided with a digital alarm communicator and be connected with existing phone lines to the State of Delaware monitoring service.

- G. The fire alarm system shall be complete in all respects for operation and interface with new and/or existing building equipment related to or desired to be controlled by the fire alarm system. All work shall be coordinated with other contract work being conducted in the building relating and coordinated with the Delaware Army National Guard. The successful contractor shall include in their design all work necessary to interface, HVAC shut-down, sprinkler and standpipe monitoring and control, building systems monitoring and control and other code specified supervisory functions. Any equipment, wiring, installation or other work necessary to finish all interface and output wiring or equipment shall be included in the design and in this contract under the base bid.
- H. All system parts and components shall be **NEW**, not rebuilt or reconditioned parts or equipment.

1.3 Work Included

- A. The work covered by these Specifications shall include all labor, equipment, materials, code official approvals, insurance approvals and services to design, furnish, install, test and document a complete fire alarm, detection and audio/visual system protecting the facility.
- B. All labor, materials, equipment, components, and tools to provide the fire alarm, detection systems, and wiring as specified herein for the design, installation and testing of the fire alarm and detection system for the entire building.
- C. Provide all basic materials applicable to this work in strict accordance with methods specified herein and with manufacturer's recommendations.
- D. Fire alarm and detection systems described shall be complete in every respect. Provide each item of equipment in quantities shown and as required by code, design, intent and as necessary to provide a complete system in a complete operating status with final testing and documentation as specified.

1.4 Related Work

- A. Documentation, testing and acceptance testing as specified in this document.
- B. Two year warranty, two year inspection and two year service. Contractor shall provide in the base bid contract for two year complete warranty, two years of complete inspection, maintenance and service in accordance with NFPA 72.

1.5 References/Required Code Compliance

- A. IBC – International Building Code, 2009 edition.
- B. IFC – International Fire Code, 2009 edition.
- C. State of Delaware Fire Prevention Regulations, 2012 edition.

- D. State of Delaware Office of Budget and Management (OMB) for Fire Alarm and Detection System Designs and Installations
- E. NFPA 1 – Uniform Fire Code, 2009 edition.
- F. NFPA 70 – National Electrical Code, 2011 edition.
- G. NFPA 72 – National Fire Alarm Code, 2010 edition.
- H. NFPA 90A – Installation of Air Condition and Ventilating Systems, 2009 edition.
- I. NFPA 101 – Life Safety Code, 2012 edition.
- J. Underwriters' Laboratories (UL) equipment listings, approvals and standards.
- K. Americans with Disabilities Act (except as modified per these specifications).

1.6 Requirements of Regulatory Agencies

- A. All equipment, components, wiring, design and installation of all items as described or implied in this document shall be Underwriters Laboratory listed and approved for the use intended.
- B. All equipment, components, wiring, design and installation of all items as described or implied in this document shall be reviewed and approved by listed approving authority. The Contractor shall be responsible to submit all design documents and obtain all approvals from each code authority as listed below. No submission will be made to a code authority until DEDC, LLC approval.

Code Authority review required for this project is as follows:

- 1. State of Delaware Fire Marshal's Office
 - 2. DEDC, LLC
- C. The Contractor/fire alarm vendor shall be responsible for all submission costs and the Contractor/fire alarm vendor shall be responsible for obtaining of all required approvals, permits, and acceptance inspections/approvals from all legal and/or required agencies, inspection organizations and insurance groups as listed in 1.6B above.

1.7 Coordination

- A. The alarm contractor shall fully coordinate design, equipment, devices, installation, wiring and connection of all fire alarm systems with the Delaware Army National Guard and all other related trades throughout each developmental stage of the project.
- B. Fully coordinate the design and installation of all systems with other contractors and other work in progress or proposed progress at the time of Contractors design and installation. It shall be the Contractor's responsibility to communicate with the Delaware Army National Guard's on-site representatives and identify all other work or trades that will require coordination with the fire alarm system design and installation.

- C. The Contractor shall include in his schedule key times to notify the State Liaison Representative for periodic inspection of the system installation. The State requires an inspection of the installation at the following points of:
1. Shop drawing development
 2. 25% of rough in wiring installation
 3. Device and panel installation
 4. Pre-acceptance inspection by DEDC, LLC.
 5. Final acceptance testing

1.8 Submittals

1.8.1 Submittals at Time of Shop Drawings

- A. Submit five (5) copies of all shop drawings to Delaware Army National Guard. All shop drawings shall be approved by DEDC, LLC and the code authorities as listed in section 1.6 above prior to equipment delivery and installation.
- B. The contractor shall be responsible to submit all approval drawings, shop drawings, and as-built drawings in 1/8th inch scale unless approved otherwise by the Delaware Army National Guard.
- C. **All** shop drawings shall show proposed wiring diagrams point-to-point with labeled terminal and splice points, data sheets, equipment ratings, layout, dimensions, material type and finishes.
- D. Submit material list indicating proposed manufacturer's name and design/installation data for all systems and materials listed, specified or intended for use by the Contractor.
- E. The Contractor shall be required to submit the following series of drawings in 1/8 inch scale as follows:
1. Shop drawings
 2. Panel drawings (as-built drawings)
 3. As-built drawings of installation
 4. Schematics of all auxiliary devices and auxiliary system connections such as Emergency Power Off system, HVAC, Power Distribution Unit, etc.
- F. Contractor shall be responsible to provide all shop, panel, schematic and as- built drawings in an AutoCAD (2009 version or higher) format. Drawings shall be multiple-colored ink on high quality, white bond plotting paper of a standard size sheet to include the following parameters:
1. CAD (Computer aided drafting) form using an acceptable CAD system capable of producing the magnetic media in AutoCAD or an AutoCAD compatible DXF format.
 2. All magnetic media shall be on disk, using one disk per drawing, building or local stand-alone system.

3. Computer Aided Drafting system and format shall be of the type that is directly transferable through DXF format.
- G. The Delaware Army National Guard shall own all media and original drawings addressed under this specification. The Delaware Army National Guard shall have the right to modify, reproduce, distribute and use the media and original drawings in any fashion or for any use that the Delaware Army National Guard may desire.
- H. The Contractor and manufacturer shall retain a copy of all as-built drawings and documentation as discussed in these specifications. The Contractor and manufacturer shall not have the right to use any magnetic media, drawings, documentation or other material describing or relating to the fire alarm system without the express written permission of the Delaware Army National Guard.
- I. All drawings shall show building background features in “green” ink with single narrow pen width. Panel drawings shall show panel box and chassis in green.
- J. All drawings shall show fire alarm and detection features in “black” ink with varying pen widths. Separate pen widths shall demarcate devices, point-to-point wiring, device labels, and notes.
- K. All drawings shall show underfloor fire alarm and detection features (where applicable) in “red” ink with varying pen widths. Separate pen widths shall demarcate devices, point-to-point wiring, devices labels, and notes.
- L. All drawings shall show wire sizes and other similar information in “blue” ink.
- M. Contractor shall show exposed conduit in “orange” with a heavy pen width. All fiber optics connectivity and conduit shall be shown in “pink” ink.
- N. Contractor may use other colors to demarcate other features of information on the drawings, but such colors shall be consistent from drawing to drawing.
- O. Match wiring details, including number of wires per initiating and signal circuit, and location and type of end-of-line device to type of supervision specified.
- P. Contractor shall show locations of fire alarm control panel, remote annunciator panels and all associated power supplies on drawings to ensure adequate space is available for power supply equipment and control cabinets.
- Q. Contractor shall ensure that shop drawings and specifications agree with respect to type of cable specified and that cable specified is suitable for the environment of the specific project.
- R. Ensure that door release devices, including combination smoke detectors and door closers, are specified to match existing conditions and locations required.
- S. Contractor shall produce and provide electrical schematic diagrams of any electrical connections between the fire alarm system and building equipment. These drawings shall be submitted at the time of shop drawings and as-built drawing submission.

- T. As part of this project and included within the base bid cost, the Contractor shall provide the Delaware Army National Guard with “as-built” drawings for the entire fire alarm system showing all features as described in these specifications in their entirety as as-built conditions. These are not shop drawings; this is intended to clearly mean “as-builts”. All changes and/or additions made to approved shop drawings during the system installation and testing shall be documented in field and shown on final as-built drawings.
- U. Along with the as-built drawing submission, the Contractor shall supply two complete sets of Computer Aided Drafting files of all drawings including the panel drawings.
- V. The Contractor shall provide a wall-mounted cabinet adjacent to the fire alarm control panel (FACP). Cabinet shall contain one set of all system documentation to include as-built drawings, zippered binder, system program software disk and drawing AUTOCAD drawing files. The cabinet shall be locked and keyed using the same key as FACP. The cabinet shall be acceptable to the State of Delaware and be labeled on the front, “FIRE ALARM SYSTEM DOCUMENTATION”, “FOR SERVICE USE ONLY”. The State of Delaware will return one of the three sets of documentation as required by these specifications back to the Contractor for installation into the cabinet.

Note: It is the intent of this section to ensure that a complete and adequate set of documentation exists on site and is available to service technicians, inspectors, and fire department. **No documents or other items will be permitted to be stored inside of any fire alarm control equipment or other enclosure.**

- W. All shop drawing submissions shall include the following:
 - 1. The Contractor shall provide a narrative description of the fire alarm and detection system proposed design and arrangement. This shall include type and features of the equipment proposed for use. Description should be accompanied by manufacturer cut sheets of each proposed device and control equipment. The narrative description shall include an exact English description of all signaling arrangements, detection arrangements, output and supervisory functions.
 - 2. All panel drawings shall show power and battery calculations for the system. Panel drawings shall show all wiring, ribbon and other cable point connections. Show any field or manufacturer modifications and include dip switch set-up positions, jumpers and snipped components including wire color coding and labeling.
 - 3. The system shop drawings shall have a plan view of each floor and detailed riser diagram.
 - 4. Actual wire, wire molding and conduit layout with anticipated methods of matching backgrounds or concealment of wire and conduit. Wire molding and conduit placement must be approved by the Delaware Army National Guard.
 - 5. System annunciation descriptors for each alarm, trouble and supervisory output signal. Such descriptors shall be in “plain English” for each alarm, trouble and supervisory output signal. The English annunciation descriptors shall use actual terminology used at the Delaware Army National Guard to include floor names and point of compass designations un-coded. Contractor shall confirm descriptors with the Delaware Army National Guard on-site representative prior to shop drawing submission.

Note: Code numbers, zone numbers or abbreviated text will not be approved without exception.

Submission of coded, zoned or abbreviated text will be rejected at the time of shop drawing submission without cause or comment! If bidder does not understand this requirement, seek clarification from the Delaware Army National Guard prior to bid submission. Only complete and understandable English descriptors for fire alarm point and trouble annunciation will be approved.

6. Contractor shall show all exposed conduit (if any) at the time of shop drawings and receive approval of the Delaware Army National Guard. All exposed conduit must be clearly annunciated on shop drawings by use of heavy weight pen markings and color.
- X. Contractor shall submit one (1) actual sample of each type of device intended for installation. If devices differ from area to area, then two actual samples of each type of device labeled for the specific area must be submitted. These items include but are not limited to the following:
1. Manual Pull Stations
 2. Audio Devices
 3. Visual Devices
 4. Smoke Detectors
 5. Heat Detectors
 6. Duct Detectors
 7. Conduit and Pipe
 8. Wiring
 9. Junction and Back Boxes
 10. Weather-proof Enclosures
 11. Water Tight Junction Boxes
 12. Mounting Plates
 13. Addressable Modules (if not in Monitor Control Panel)
- Y. Submit large scale drawings (plan and elevation) showing all architectural and technical features of the following:
1. Main alarm panel location.
 2. Remote annunciators and graphic annunciators.

1.8.2 Submittals at the Time of Acceptance Testing

- A. Prior to acceptance test submit manufacturer's descriptive literature of actual equipment installed and the following:
1. Equipment installation manual.
 2. Equipment and device operating instructions manual.
 3. Equipment maintenance and programming manuals.
 4. Equipment/system service and repair data manual.
 5. Parts lists.
 6. Spare equipment and parts equipment and inventory list.
 7. Testing and maintenance schedule as per requirements of 1.9B of these specifications.

- B. For testing and documentation submittal requirements, see Testing and Documentation, Part 5

1.9 Warranty

- A. The successful Bidder shall be responsible for all warranty and guarantee issues regardless of subcontractors, vendors or others operating as subcontractors under the successful Bidder's contract. Bid submission documents shall include a document executed by the successful Bidder's senior corporate or company officer indicating that the successful Bidder understands that he/she is solely responsible legally and financially to the Delaware Army National Guard for compliance to warranty and guarantee issues as follows:
 - 1. As part of the design/bidding package the Delaware Army National Guard requires the contractor to include two year's testing, maintenance and inspection of the fire alarm system for the duration of the two year warranty period of the system. The contractor shall submit at the time of system acceptance a schedule of maintenance, testing, and service as prescribed by these specifications and referenced standards, for the two year warranty period, (see National Fire Protection Association 72 for additional requirements). **The cost for the two year maintenance and testing shall be included in the base bid price.** All system equipment shall be guaranteed for a period of two years from date of final acceptance of the fire alarm and detection system in accordance with Part 5 of these specifications.
 - 2. All raceways and wiring are guaranteed to be free from inherent mechanical or electrical defects for two years from the date of final acceptance of the systems in accordance with Part 5 of these specifications.
 - 3. Regardless of typical manufacturer or Contractor canned warranties and guarantees, the base bid price shall include all fees for warranty or guarantee cost to include parts, labor, shipping, stocking, overhead, markup or other costs associated with performing work under the warranty or guarantee agreement. It is the intent of this section that the entire system will be warranted and guaranteed from any fault (other than an act of God or acts by other than the alarm system Contractor). If anything goes wrong with the system, the Contractor shall repair/correct at no cost to the State of Delaware with components, parts and workmanship that are NEW, not rebuilt or reconditioned parts or equipment. If this intent is not clear or understood by the Bidder, the Bidder shall seek clarification from the State of Delaware prior to bid submission.
- B. As part of the successful bidder's warranty package, the successful bidder shall submit at the time of system acceptance under Part 5 of the specifications, a schedule of maintenance, testing, and service as prescribed by these specifications and referenced standards, for the first year warranty period, (see NFPA 72 for additional requirements). The cost for the first year maintenance and testing shall be included in the base bid price.
- C. All warranty service that impairs the function of the fire alarm system shall be provided with four hours of notification to the Contractor. Cost for this service shall be included within the base bid price.

- D. All warranty service that does not impair the function of the fire alarm system but is obligated under the warranty shall be performed within 24 hours of notification to the Contractor unless otherwise approved by the State of Delaware.
- E. It is the Delaware Army National Guard policy for fire alarm systems that the warranty period shall begin only after the Delaware Army National Guard has accepted the acceptance test results, verified completion of punch list items and released final payment. Date of commencement of warranty period shall be no greater than 10 working days after verification of completion of punch list. Delaware Army National Guard to provide affective dates of service for warranty period.

1.10 Qualifications

- A. The fire protection contractor shall be licensed with the Delaware State Fire Marshals Office. Copy of license shall be submitted at the time of bidding and verified at bid acceptance.
- B. Contractor shall (or contractually be supported by a company) specialize in fire alarm systems and have a minimum of five years of documented experience with the design and installation of the actual system and devices being installed.
- C. Contractor shall have (or contractually be supported by a company) on staff and assigned to the project a NICET Level III certified person for fire alarm systems.
- D. The Contractor shall assign the NICET Level III certified person to supervise the preparation of all technical documentation, drawings, installation, testing and acceptance testing as required by these specifications. The NICET Level III certified person shall be present at shop drawing review meetings, design issue meetings and all acceptance testing.
- E. All drawings shall include the NICET Level III persons name and license's number. In lieu of a NICET Level III person, the Contractor may substitute a Delaware registered licensee's professional engineer who is specialized in fire protection, electrical engineering or electronic engineering.
- F. Equipment manufacturer shall be a company specializing in NFPA 72 fire alarm and detection systems with a minimum of ten years of documented experience.
- G. All qualification documentation shall be submitted at the time of bidding and verified at bid acceptance.
- H. Contractor shall assign to the project a project manager who is experienced in the installation of fire alarm systems. The Project Manager shall be assigned to the project as a primary responsibility. He shall be dedicated to the design, installation and successful completion of a complete and working system. The Project Manager shall demonstrate qualification through experience and/or education to the satisfaction of the State of Delaware. The Project Manager shall supervise the preparation of all technical documentation, drawings, installation, testing and acceptance testing as required by these specifications. The Project Manager shall have a position within his/her company that allows him/her to make decisions and commit his/her company legally and financially so as to minimize corporate bureaucracy during the resolution of issues and problems.

- I. All qualification documentation shall be submitted at the time of bidding and verified at bid acceptance.

PART 2 - PRODUCTS

2.1 Manufacturers

- A. Simplex
- B. Siemens
- C. Notifier
- D. EST
- E. Silent Knight
- F. Substitutions – See Section 01 60 00 – Product Requirements

2.1.1 Contractor shall refer to State of Delaware Fire Alarm Systems Matrix included in Part VII of the State of Delaware's Facility Design Standards for approved manufacturers and approved Fire Alarm Control Panels.

2.2 Fire Alarm and Detection Control Panels

- A. Fire Alarm Control Panels: As specified under 2.1. Control panel(s) shall be flush wall-mounted enclosure unless otherwise approved by the Delaware Army National Guard. Fire alarm control panels shall be installed in approved areas in accordance with NFPA 72 and the manufacture listings. The fire alarm control panel and system design shall have alarm verification features for all smoke detection.
- B. In the event that the project incorporates automatic suppression and/or extinguishing systems, the Delaware Army National Guard will make the decision whether or not to require the primary fire panel to be Underwriters Laboratory listed as a releasing panel suitable for operation and control of and proposed suppression or extinguishing system. Additional releasing panels shall be incorporated into the design unless approved by the Delaware Army National Guard.
- C. Power Supply: Adequate to serve control panel modules, remote detectors, remote annunciators, door holders, (smoke dampers) (relays) and alarm signaling devices. (Include battery-operated emergency power supply with capacity for operating system in standby mode for 24 hours followed by alarm mode for five minutes. See Section 4.2.4 for additional requirements on batteries.

All fire alarm equipment in the project shall be provided with primary AC power obtained a building electrical subpanel which provides emergency power, if emergency power is provided to the facility. The DC secondary power supply shall consist of a standard fire alarm battery secondary supply, or emergency generator as specified in this document and National Fire Protection Association 72.

- D. Initiating Circuits: Supervised remote addressable zone monitor capable of alarm and trouble indication at primary control panel. Each initiating circuit shall have a supervised addressable point which can be switched or have a programmed disconnect feature independent of all other initiating zones or points. Each circuit shall be 18 gauge twisted/shielded.
- E. Signal Circuits: Supervised signal module, 14 gauge twisted/shielded circuits sufficient for

signal devices connected to system. All signal circuits shall be sized so as not to exceed 70% capacity of amp ratings on cards/circuits.

- F. Auxiliary Relays: Provide sufficient SPDT auxiliary relay contacts (for each detection zone) to provide accessory functions specified.
- G. Monitor and control modules shall have separate power supply circuits and not depend upon data circuit power for complete function and operation unless specifically approved by the Delaware Army National Guard on a device-by-device basis.
- H. Provide TROUBLE ACKNOWLEDGE, DRILL and ALARM SILENCE switch.
- I. Control panel shall have historical record recordation ability inherent in panel memory for Alarm, Trouble and Supervisory signals.

2.2.1 Surge Protector (AC transient suppressor, AC power)

- A. All AC power supplies to any fire alarm panel or components shall be provided with separate surge protection as follows:
 - 1. Suitable for protection of electronic equipment and electrical systems 600 volts and less. Device shall be capable of protection of all AC electrical circuits and equipment from the effects of lightning inducted voltages, external switching transients, and internally generated switching transients resulting from inductive and/or capacitive load switching.
 - 2. Surge protector and installation shall be in accordance with:
 - a. NFPA 70
 - b. UL #1449 Standard for Fire and Safety-TVSS/SPD
 - c. IEEE Std. 142-Recommended Practice for Grounding Std. 518-Recommended Guide on Electrical Noise ANSI/IEEE C62.41- 1991 Edition. Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.
 - d. Federal Information processing Standards Publication 94 (FIPS PUB 94)
- B. **Acceptable Manufacturers:**
 - 1. Transtector Systems, Inc.
10701 Airport Drive Hayden
Lake, ID 83835 Tel: 1-800-
882-9110 FAX: 208-762-6133
- C. Service Protection Panel enclosure shall be a minimum of a (NEMA 4) construction, factory primed and field painted to match mounting surface.
- D. The Service Protection Panel system as required shall consist of a Service Protection Panel for each service rated 600 volts or less, and/or Branch Panel Protectors. All devices shall operate as a total coordinated and engineered system, as well as be engineered as a system by the manufacturer.

- E. Power supply side surge suppression device(s) shall be installed in a separate enclosure adjacent to each fire control panel but shall not be installed inside of the fire control panel. The enclosure shall be labeled "Power Supply Surge Suppression" and marked with its unique identifier number. The enclosure shall be of sufficient size to contain all components parts of the surge suppression system to include terminal strips. All wire connections between the surge suppression system and the fire alarm control panel shall be in conduit. It is the intent of this specification to require additional and redundant surge protection for all system components where they receive external AC or DC power.
- F. Maximum continuous operating voltages of any system component shall not be less than 115% of the nominal system operating voltage.
- G. All Service Protection Panel components shall be rated with an operating temperature range of 30 to 120 degrees Fahrenheit, and from 0 to 85% humidity non-condensing.
- H. Nominal system frequently is 60 Hertz, operating frequency range of the Service Protection Panel system shall be 0 to 400 Hertz.
- I. All Service Protection Panels shall be connected in parallel with the power system they are protecting. Series connected components shall not be used. Suppression paths shall not be ground.
- J. All Service Protection Panels shall be UL 1449 listed and bear the UL label.

2.2.2 Remote Annunciator

- A. When a remote annunciator is proposed for the facility, the contractor shall provide a supervised LCD remote annunciator including audible and visual indication of fire alarm by zone, and audible and visual indication of system trouble. Install in a flush, wall-mounted enclosure. All remote annunciators shall provide the same English descriptor as other required annunciation from printers, CRTs and fire alarm panel annunciators. Provide annunciator at all locations shown on drawings. Annunciation shall be remote LCD annunciators which shall indicate alarm, trouble and supervisory conditions by individual English descriptors. The remote LCD annunciator shall also be provided with a keyed switch keyed alike to the main fire alarm panel - or access code to perform system acknowledgment and system reset.

2.2.3 Digital Alarm Communicator

- A. A digital alarm communicator may be installed in the main fire control panel.

2.3 Initiating Devices

- A. General requirements for initiating devices are listed below. Not all devices as listed below will be required for this project. Contractor shall review specific types, mounting and colors for each required device with the Delaware Army National Guard during design. Devices subject to mechanical damage shall be suitably protected. If guards or covers are employed, they shall be listed for use with that specific device.
- B. Manual Station - Break Glass, Double Action, flush mounted as indicated by the specific building or identified in Part 4 of these specifications.

Note: Manual pull devices shall be flush mounted to all wall surfaces without an extended back box. Where wall surface is exposed concrete or concrete block, the wiring shall be fished or channeled in wall and not exposed. No wire mold or surface mounted conduit permitted.

- C. Heat Detector in conditioned spaces: Shall be addressable combination rate-of-rise and fixed temperature, rated 135 degrees F for conditioned spaces. Contractor shall survey areas where heat detector is to be installed for possible need of high fixed temperature rating. Higher temperature ratings must be approved by the Delaware Army National Guard.
- D. Heat Detector in unconditioned spaces: Shall be rate-of-rise and fixed temperature Thermotech model 302ET or EPM anticipation type self-restoring 2098-9491 rated at 194 degrees F, no or equal. All heat detectors in unconditioned spaces shall be individually addressable through monitor module. Contractor shall survey areas where heat detector is to be installed for possible need of higher fixed temperature rating. Higher temperature ratings must be approved by the Delaware Army National Guard.
- E. Smoke Detectors: NFPA 72: photoelectric sensor with visual indication of detector actuation, bug screen and suitable for mounting on 4 inch outlet box. Must be compatible with alarm verification and environmental compensation where required.
- F. Duct Mounted Smoke Detectors: NFPA 72, photoelectric type with auxiliary SPDT relay contact, key-operated remote alarm lamp with NORMAL- RESET-TEST switch, with duct sampling tubes extending width of duct, and visual indication of detector actuation, in duct-mounted housing. Duct detectors must be provided with remote annunciation lamp at key switch as noted on drawings.

Remote annunciation lamp must be located in normal occupied area at the approval of the Delaware Army National Guard. Duct Mounted Smoke Detectors must be securely mounted "without possibility of vibration" and located for accessibility and ease of maintenance/testing. Duct detector shall be provided with a remote test switch: Key-operated switch mounted may be on flush cover with lamp to indicate detector actuation. (Provide one switch for each duct mounted smoke detector). All flex connections from and to duct detector and fan/damper control equipment shall be installed in Sealtight.

- G. Contractor shall coordinate with sprinkler contractor in Building 115 to determine number of sprinkler monitoring devices. For Bid purposes, the contractor shall provide monitoring of the following.
 - 1 dry pipe alarm pressure switch
 - 1 dry pipe low air pressure alarm switch
 - 1 water flow switch
 - 6 valve tamper switches.

2.4 Alarm Notification Devices

- A. General requirements for notification devices are listed below. Not all devices as listed below will be required for this project. Contractor shall review specific types, mounting and colors for each required device with the Delaware Army National Guard during design. Devices subject to mechanical damage shall be suitably protected. If guards or covers are employed, they shall be listed for use with that specific device.
- B. Alarm Strobes/Lights - Wall and/or ceiling mount series visible notification appliances. Ceiling mounted appliance assemblies shall have white housing with clear lens. NFPA 72 meeting the requirements of ADA.

- C. Horn - the Delaware Army National Guard choice based upon contractor's recommendations and submittals. Must be approved by the Delaware Army National Guard. Must provide ceiling mounted appliance assemblies with white housing.
- D. Combination Horn & ADA Strobe. The Delaware Army National Guard choice based upon contractor's recommendations and submittals. Must be approved by the Delaware Army National Guard. Must provide ceiling mounted appliance assemblies with white housing.
- E. Exterior Alarm Light and Horn. The alarm light shall be a 360° revolving red light, weather tight, seal beams and approved for use in exterior locations. Each exterior light shall be combined with an exterior audio horn in a weather tight and approved enclosure for exterior use. The alarm light can be powered by ordinary building AC power and need not be provided with a secondary power supply.
- F. Audio alarms in residential sleeping rooms shall be 520 hz.

2.5 Auxiliary Devices

- A. Door Release: Where required, magnetic door holders with integral diodes to reduce buzzing, 24 VDC coil voltage.

2.6 Fire Alarm Wire and Cable

- A. Fire Alarm Power Branch Circuits: Shall be wired in accordance with NFPA 72 Local Fire Alarm and NFPA 70, Section 760. Each power source shall be obtained from an emergency power circuit and the breaker shall be marked "FIRE ALARM POWER SOURCE" and be provided with a "red" locking device so as to prevent accidental power loss. Contractor shall be responsible to run all power from the closest emergency circuit panel to the fire alarm system.
- B. Initiating, Signal and Communication Buss Circuits: Shall be Aerospace Wire & Cable Inc.,
 - #7140 18/2 TW/SH 200 deg.C. FPLP (New York City Certified)
 - #7130 16/2 TW/SH 200 deg.C. FPLP (New York City Certified)
 - #7120 14/2 TW/SH 200 deg.C. FPLP (New York City Certified)
 - #7110 12/2 TW/SH 200 deg.C. FPLP (New York City Certified)

Any and all fire alarm cable used in this system shall be "solid copper" conductors. No exceptions.

Important Note: 12 inch wire samples for 18 T/S, 16 T/S, 14 T/S and 12 T/S shall be submitted at the time of shop drawings/submittals, prior to material purchase and installation. **Samples shall be approved by prior to purchase.**

- C. Any fire alarm cable which is not required in conduit and is located in a supply or return air plenum space must be a type of cable and insulation which is approved by UL for air plenums regardless of whether a plenum exists.
- D. All wiring, connections, junctions, splices and arrangements must be installed in accordance with the national Electrical Code and approved for intended use.
- E. All wiring for initiating, signaling and auxiliary devices shall be installed in EMT conduit

except those areas where the wire can be fished in walls or hung above suspended ceilings. All wire shall be secured within 12 inches of all junction boxes, back boxes, other devices or splice connections. All conduits shall be secured every 4 feet.

- F. Use 14 AWG minimum size twisted/shielded conductors for fire alarm signal (audio/visual) circuit conductors. All communication bus cable shall be 18 AWG twisted/shielded solid copper wiring using fire alarm listed plenum cable in all exposed areas. Any area subject to moisture or the effects of weather shall use water resistant conduit, enclosures, fittings, adapters, and like equipment. No stranded cable shall be permitted.
- H. Any area subject to moisture or the effects of weather shall use water resistant conduit, enclosures, fittings, adapters, and like equipment. This includes all exterior mounted devices. Weather tight and water resistant installation shall extend for 12 inches within building envelope.

PART3-EXECUTION

3.1 Installation

- A. Install fire alarm and detection system in accordance with manufacturer's instructions, code requirements, and these specifications.
- B. All devices, boxes and conduit shall be installed plumb and level.
- C. Install manual station with operating handle 48 inches above floor. All visual signal devices where installed on walls shall be installed no less than 80 inches above finished floors.
- D. All detectors and other alarm devices shall be securely mounted with approved back box. If visible, back box shall either match color of device or match color of wall surface if surface mounted. Standard back boxes and extension rings with knockouts are not permitted when location requires surface mounted boxes. Contractor must use a finished back box suitable for painting. Only approved and appropriate type of conduit connectors and/or wire connectors shall be used for connection to back boxes or devices.
- E. All wiring for initiating, signaling and auxiliary devices shall be installed in "red" Allied Tube Fire Alarm EMT or equal conduit, or wire molding except those areas where the wire can be fished in walls or hung above suspended ceilings. When wire is installed above ceilings and not in conduit, it must be run above the bottom of any red steel (or other type of super structure) and supported every 4-1/2 feet by a bridle ring or other approved support device. Wiring shall not be laid directly on a ceiling or supported by pipes, duct work or other building equipment. All wiring shall be secured within 12 inches of all junction boxes, back boxes, other devices or splice connections. All conduits shall be secured to building structure every 4 feet. **When construction is of a wood frame, wire staples shall not be used to secure wire in place of bridle rings.**
- F. All fire alarm cabling and/or devices which are installed within 10 feet of water or sprinkler equipment shall be installed in Sealtight conduit with liquid tight connections and liquid tight (waterproof) boxes. When there are three or more monitoring/alarm points within the same area, monitor relays shall be mounted with a NEMA 4 Hoffman.
- G. Mount end-of-line device in box with last device or separate box adjacent to last device in circuit. Each EOL device box shall be labeled "EOL" and be visible from front of device. If

“EOL” is mounted in separate junction box, the face of the box shall be labeled.

- H. Mount outlet box for electric magnetic door hold open and release devices to withstand 80 pounds of pulling force.
- I. All wiring connections to fire suppression system waterflow switches and valve tamper switches, fire extinguishing systems, duct detectors and building interface equipment using conduit to within ten feet of device wherein the conduit shall terminate at a junction box. From the junction box to the device, the fire alarm wire shall be run in an approved Sealtight conduit and secured at each connection point to withstand a 50 lb. pull force.
- J. Automatic Detector Installation: Devices shall be installed as per the requirements of NFPA 72 and these specifications. All detectors shall be securely mounted with approved back box. All back boxes shall be recessed. Only approved and appropriate type of conduit connectors shall be used for connection to back box or manual pull station.
- K. Any wire entry or exit from a device, conduit, Sealtight or Greenfield shall be through an appropriate and approved box which is designed and installed to prevent chafing, cutting or other damage to the cable. All connections to devices, boxes, back boxes and like devices including any wiring exiting properly terminated conduit or EMT shall be provided with strain relief sufficient to secure cable at the point of entry or exit. **Strain relief from back boxes, devices junction and panel boxes for wire cable shall consist of Arlington Ind., Inc LPCG50 connectors for single cable entry.**
- L. All fire alarm cabling and devices which are installed within 10 feet of water equipment and sprinkler equipment shall be installed in Sealtight conduit with liquid tight connections and liquid tight (waterproof) boxes. All seal tight shall be connected so as to tolerate a minimum pull force of 50 lb. without separating from the connected device.
- M. Any fire alarm cable which is not required in conduit and is located in a supply or return air plenum space must be a type of cable and insulation which is approved by Underwriters Laboratory for air plenums regardless of whether a plenum exists.
- N. All system devices, panel and junction boxes shall have a unique identifier number which shall be:
 - 1. Labeled on each device, panel and junction box with durable label capable of surviving environmental conditions.
 - 2. Labeled on all drawings.
 - 3. Labeled on all parts lists and required testing documentation.
 - 4. The unique identifier numbering system shall be approved by DEDC LLC at the time of shop drawing submittal.

Note: The intent of this requirement is to have each and every device and component (except panel components) have a logical and unique number whereby all inventory, documentation and life effort can be tracked by the unique number.

- O. Each conductor (individual wire) shall receive a unique and durable wire number at each

terminal block, splice connection, device terminal and any other location where a conductor is landed. Only “Brady Permasleeve” heat-shrink wire markers will be permitted. No other systems shall be approved. Each wire number shall be shown on as-built drawings or a separate document shall be produced in final documentation, which describes the wiring to each device. In all areas where the atmosphere is unconditioned, the wire number shall be protected with a clear heat shrink protector sleeve or similar method.

1. System devices that are located above a suspended lay-in ceiling shall have the heat shrink wire markers installed on each cable 12 inches before entering the back box and 12 inches after exiting the back box.
2. Cable labeling in junction panels, control panels and other covered boxes shall have the shrink wire marker installed at the end of the cable prior to the protective heat shrink stripping cap. See wiring detail on bid drawings.

Each wire number shall be shown on the final as-built drawings or on a separate approved document which shall be included in the final documentation and describes the wiring to each device as follows:

Device No.	Circuit Type	In From/ Out to	Last/Next Termination	Wire No.	Wire Type	Color

- P. Contractor shall provide fire alarm circuit conductors with color coded insulation, or use color tape at each conductor termination and in each junction box. Color code shall be specified by the Contractor at the time of shop drawings and shall be consistent throughout all fire alarm systems. Color code shall be listed on all shop and as-built documentation and/or drawings.
- Q. Where required, all smoke detectors and alarm monitor or control devices which are installed under a raised floor shall be provide with an approved drip shield to shield the device from water that could drip from above or on top of the raised floor surface. Each device shall also be provided with LED annunciation at an approved location. The design and installation method shall be proposed by the contractor and shall be subject to the approval of the Delaware Army National Guard at the time of shop drawings.
- R. Any panel or device needing any type of key (standard, hex, etc.) to open or reset any panel or device must be keyed to the fire alarm system.
- S. The power supply surge suppression device(s) shall be installed in a separate NEMA 4 enclosure adjacent to each fire control panel and shall not be installed inside of the fire control panel. The surge suppression enclosure shall be labeled “Power Supply Surge Suppression” and marked with a unique identifier number. The surge suppression enclosure shall be of sufficient size to contain all components of the surge suppression system and including terminal strips. All wire connections between the surge suppression devices and the fire alarm control panel shall be in conduit. It is the intent of this specification to require additional and redundant surge suppression protection for all system components whenever they receive AC or DC power.
- T. When installing wire numbers at back boxes, the wire numbers shall be installed on each cable inside of the back box when the back of the back box is **not** accessible (i.e. when the back box is installed on hard ceilings, on concrete or block surfaces or in gypsum walls). If the back of the back box **is** accessible, then the wire number shall be

installed as listed in section M (1) above.

- U. The labeling of system devices and other equipment may be accomplished by using a P-touch type labeling system. No hand written labels or “Sharpie” markers will be permitted.
- V. Traditional wire ties are permitted for use in the system to secure wire bundles. The contractor shall provide written instruction to each employee on the correct use of wire ties so as to avoid compression of the cable jacket, shield or conductor insulation. Wire ties may not be used to secure cables to bridle rings, building structure, back boxes, panel enclosures, conduit or as wire restraint at device and other terminations.
- W. All terminal blocks, cards, relays and other devices shall be rigidly mounted within a cabinet enclosure or back box using screws, bolt & nut or epoxy glue. Double back tape or similar mounting systems shall not be permitted.

Wire terminations, splice connections and all other connections shall be made by the use of UL listed compression terminal blocks as follows:

All back box connections for shields and small connections:

- **"Ideal" #89-608 Barrier Strip, 600V, 20A or equal**

No wire nuts or crimp connection devices will be approved. When terminal blocks are added to devices which incorporate a pig tail, the terminal block shall be securely mounted with mechanical fasteners (no double back tape) in the back box or on the back of the fire alarm device.

- X. All conduit, devices and other system components that are installed in areas subject to moisture, water, rain or water drainage shall be installed using approved water resistant and water tight conduit, NEMA 4 enclosures and like equipment.
- Y. Provide power supply wiring to fire alarm system components from building electrical panel. Circuit breaker shall be sized in accordance with fire alarm system demand and the NEC. Branch circuit breaker shall be clearly labeled for fire alarm service, contiguous to the circuit breaker toggle switch and the toggle switch shall be provided with a lock to prevent accidental movement.
- AA. Provide all low voltage signal wiring for systems specified herein in a workmanlike manner. Provide system raceways in accordance with manufacturer's requirements for installation of system's wiring. Provide and tag conductors at all junction and terminal points and identify by same number on all shop drawings. All conduit, cable, outlet and mounting boxes required as part of mounting arrangements shall be color-coded red if not in public area.
- BB. Protect exposed wiring installed above ceiling construction from physical damage where necessary by conduit, guard strips or other approved means. Install all drops to wall devices in wire mold unless fished in walls. Properly support all low voltage cables and conduit from the building structure by the use of Bridle Rings. At those points where the wire descends below the concrete/steel structure, the wire must be provided with adequate strain relief which is designed not to cut or ground the cable shields. The wire

shall descend plumb to the device or transition. Secure cable in place at intervals not exceeding 4-1/2 feet and within 12 inches from every cabinet, box or device. Cable stress relief shall be required for all connections to devices and boxes.

- CC. In running plenum cable not in conduit, all bridle rings running parallel with red steel (and/or wood framing) shall be turned up on the bottom flange of red steel (and/or wood framing) so as the wire run is on top of the bottom flange and cradled by the bottom flange. Where intersecting beams must be crossed, the wire run shall be routed as follows:
- 1). When a corrugated steel flute is available above the red steel, the wire shall be routed through the flute and over top of the steel beam.
 - 2). When a corrugated steel flute is not available, the wire run shall be taken under the intersecting beam and held off the beam by bridle rings on each side.
 - 3). When running wire through wood flooring and truss members, the wire shall be secured so as not to be exposed to metal gusset edges or other metal objects that could cause damage to the cable from weight, strain or vibration over time.
- DD. When any wire run transitions from above a suspended or hard ceiling into a room or area which has no ceiling and is below an elevation of 7 feet above the floor, the entire wire run shall be run in red EMT through the entire room or until the red EMT terminates within a junction or back box. The intent of this requirement is to not permit any exposed plenum wire in areas without ceilings.
- EE. Install all fire alarm wiring in separate raceways. Do not mix 120 volt AC power with fire alarm initiating, signaling or communications cable in the same raceway. All 120 volt AC power wiring shall be separated from initiating, signaling or communications cable inside of FACP, NAC or junction boxes with a paper or fiber board separation.
- FF. Be responsible for assuring that conduit sizes and the wire quantity, size and type are suitable for the equipment and conditions as they exist. Review the proper installation of each type of device with the equipment supplier. Make final connections between the wiring and equipment under the supervision of equipment manufacturer's certified technician and NICET person in charge.
- GG. Be responsible to seal all floor, ceiling and wall penetrations with approved materials which will provide the equivalent fire resistive rating as that of the wall, floor or ceiling that was penetrated. Contractor shall also be responsible to re-seal or repair any access ways or penetrations made through draft stops or fire stops with materials and workmanship which equals the original intended fire rating of the draft stop. All fire penetrations shall be sealed the same day of penetration.
- HH. All fire alarm wiring which is not concealed above ceilings, fished in walls, run in Greenfield or run in Sealtight, shall be installed in conduit and/or wire mold unless specified otherwise on drawings.

3.2 Wire Jacket Ends and Shield Drains

- A. All signal, communications and power wire (low voltage) shall be twisted/ shielded as specified in Section 2.6, B. There shall be no use of unshielded cable on the project

with the exception of 120 VAC power to surge suppressors and system power supplies.
All cable and shields shall be installed as follows:

1. Initiating circuits: all shields shall be carried through each device back box through the use of a compression terminal block as specified in Section 3.1 (R) of these specifications. Each shield drain wire shall be insulated with “clear” heat shrink wire insulation installed from the cable end heat shrink strip to the terminal block. The shield shall be landed at the “panel end” as per manufactures recommendations. The “field end” of the shield shall be terminated in the last device back box at the compression terminal strip.
2. Indicating horn, speaker (where applicable) and strobe circuits: all shields shall be carried through each device back box through the use of a compression terminal block as specified in Section 3.1 (R) of these specifications. Each shield drain wire shall be insulated with “clear” heat shrink wire insulation from the cable end heat shrink strip to the terminal block. Shield landing shall be as follows:
 - In NAC panels, the shield shall be landed on an acceptable ground at the junction panel (See Section 2.2 F) located adjacent to the NAC panel. The field end of the shield shall be terminated in the last device back box, in the compression terminal strip.
 - In FACP or transponder/data collection panels, the shield shall be landed as specified by the system manufacturer.
3. Communication, signal and data circuits shall be carried through each device junction box, back box, or other enclosure necessary through the use of a compression terminal block as specified in Section 3.1(R) of these specifications. Each shield drain wire shall be insulated with “clear” heat shrink wire insulation from the cable end heat shrink strip to the terminal strip. The shield shall be landed at the panel as per manufactures recommendations. The field end of the shield shall be terminated in the last device back box, in the compression terminal block.
 - B. Wire stripped ends shall be protected with “red” heat shrink insulation placed at the cable jacket end to insulate the transition from the cable to the stripped drain wire.

3.3 Field Quality Control

- A. Test in fire alarm and detection system in accordance with NFPA 72 and these specifications, Part 5.
- B. Contractor shall be responsible to install all system components, wiring and conduit in a workmanship like manner and to the satisfaction of DEDC LLC. DEDC LLC shall determine acceptable level of workmanship. Examples of existing installations or other contractor installations shall not be used for evaluation of acceptable workmanship under the fire alarm contract work. Only the highest quality workmanship will be accepted. **There are no exceptions to this requirement.** Simply said, just because you see another system installed with less than the highest quality of workmanship, doesn't mean it will be acceptable for the fire alarm system.

- C. Contractor shall connect and monitor all alarm, trouble, and supervisory points for each fire suppression system, fire extinguishing system and fire pump system with the new fire alarm and detection system. It shall be the responsibility of the contractor to coordinate with the Delaware Army National Guard on-site representative to identify any and all such systems prior to development of shop drawings.

3.4 Fire Alarm Wire and Cable Color Code

- A. Provide fire alarm circuit conductors with color coded insulation, or use color tape at each conductor termination and in each junction box. Color code shall be specified by the Contractor at the time of shop drawings and shall be consistent throughout all fire alarm systems. Color code shall be listed on all shop and as-built documentation/drawings.

3.5 Electrical Service for Installation Operations

- A. Contractor may use any existing electrical service, outlet or system available. Contractor shall not assume that evidence of existing outlets implies energized circuits.
- B. When electrical service is not available, Contractor shall provide his own electrical supplies from generators or other suitable service.
- C. Contractor shall provide all necessary cords, leads, generators and other necessary equipment to perform necessary work.

3.6 Ceiling and/or Wall Device Installations

- A. All installations of ceiling devices including smoke detectors, horns and strobes and where installed in a suspended lay-in ceiling **shall be provided with a ten foot coil of wire**. The wire coil shall be secured at the floor/roof deck level just prior to the device drop using a “loose secured wire tie” so as not to crimp wire shields. In the case of minimal space above a suspended ceiling, the coil shall be secured to a bridle ring or other approved mounting point.

3.7 Fire Alarm Control Panel Installation.

- A. All field wiring within the fire alarm control panel shall be dressed and cornered. Wiring shall be run parallel with 90 degree bends for directional changes. Wire ties shall not be used to restrain wire bundles. Wire straps if applied shall not compress wiring jackets.

3.8 Visual Strobe Synchronization

- A. All visual strobe devices that are within the same viewing area must be in synchronization. The contractor and equipment vendor shall provide a design and installation that meets the requirements of NFPA 72, Section 7.5.4.3.2.

PART 4 - BUILDING SYSTEM DESCRIPTIONS

4.1 Sequence of Operations

A. Upon any alarm:

1. All audio and visual alarms to sound throughout the building upon any initiating alarm device i.e. water flow, manual pull station, smoke detector, extinguishing system, etc.
2. Annunciate specific device or zone in common plain English at the Fire Alarm Control Panel, printer and remote annunciators in plain English description. Annunciation descriptors shall be the standard terminology used by the State of Delaware the specific building and for each area within the building. Descriptors shall not be abbreviated. All terminology and descriptors shall be approved by the State of Delaware Liaison Representative at the time of shop drawings.
3. Cause transmission of an alarm signal to the State's central station service monitoring.
4. Deactivate electro-magnetic door hold open devices.
5. Output fan shut-down if affected air handler is involved.
6. Activate other outputs as required by design.

Note: A general alarm device signal is any device signal that is not identified as a special or supervisory device signal.

B. Special systems may require a special operation sequence.

1. The fire alarm should be programmed to permit a fire drill sequence. The system should be programmed in such a way so as to allow Owner to run a fire drill on any selected floor without interfering with other floors, elevators, smoke control or other alarm control features.
2. For each fire suppression system or fire extinguishing system.

C. Activation of any supervisory or trouble alarm shall cause the following:

1. Annunciate specific device or zone in common plain English at Fire Alarm Control Panel, printer and remote annunciators in plain English description. Annunciation descriptors shall be the standard terminology used by the State, for each area. Descriptors shall not be abbreviated. All terminology and descriptors shall be approved by the State Liaison Representative at the time of shop drawings.
2. Cause transmission of the supervisory or trouble alarm signal to the State of Delaware's central station service.

4.2 Spare Capacity and Parts

- A. The system shall be designed and installed with a specified spare capacity (meaning that all cards, modules, power supply, programming and other related head end equipment installed in the control panel) after completion of the system as follows:
1. Spare signal circuits -----2
 2. Spare output relays ----- 6
- B. The Contractor shall include per system, in their **base bid** the following “installed as spares” parts and devices to be used at the Owners discretion only. The purpose of these spare installed devices is to assure that the base bid price is sufficient to cover most intangible device placements for the proposed building renovations.
1. Manual Pull Stations - 1 of each type used on the project
 2. Monitor Modules - 2 of each type used on the project
 3. Control Modules - 1 of each type used on the project
 4. Smoke Detectors -2of each type used on the project
 5. Duct Smoke Detectors - 1 of each type used on the project
 6. Heat Detectors - 1 of each type used on the project
 7. Audio Device - 2 of each type used on the project
 8. Visual Device - 2 of each type used on the project

Note: Spare duct smoke detector as listed above shall include the duct detector housing, detector test switch and interface module.

- C. In addition to the spare devices and parts listed in section 4.2B, the contractor shall include in their **base bid** the cost to provide all manufacturer’s recommended spare parts and devices. At a minimum, the Contractor shall provide at the final acceptance testing the following spare parts and devices:
1. Manual Pull Stations - 1
 2. Monitor Modules - 1
 3. Control Modules - 1
 4. Smoke Detectors - 1
 5. Duct Smoke Detectors - 1
 6. Heat Detectors - 1
 7. Audio Device - 1
 8. Visual Device - 1

Note: Spare duct smoke detector as listed above shall include the duct detector housing, detector test switch and interface module.

- D. All spare parts shall be listed on all inventory lists and each spare part shall be labeled for the specific system or component it is intended.
- E. All secondary power supplies (batteries) shall be calculated in accordance with manufacturer’s recommendations and include design spare capacity. Battery size shall be increased by 20% above minimum calculation.

PART 5 - ACCEPTANCE TESTING AND DOCUMENTATION

5.1 General

- 5.1.1 All fire alarm systems, component parts, and supervisory functions shall be subject to an acceptance test to be conducted by the Contractor but at the direction of the Delaware Army National Guard's Liaison Representative. The system shall be completely operational, finished and ready for acceptance testing in accordance with anticipated project schedule.
- 5.1.2 The Delaware Army National Guard shall be notified 15 working days prior to any acceptance test with the specific date, time and system being tested.
- 5.1.3 All approvals (with the exception of the acceptance test approval) required by these specifications shall be completed and submitted with the notification of acceptance test date. This includes the following groups: Authority Having Jurisdiction, Delaware Army National Guard.
- 5.1.4 Prior to acceptance test submit manufacturer's descriptive literature of actual equipment installed and the following:
- a. Equipment installation manual.
 - b. Equipment and device operating instructions manual.
 - c. Equipment maintenance and programming manuals.
 - d. Equipment/system service and repair data manual.
 - e. Parts lists.
 - f. Spare equipment and inventory list.
 - g. Testing and maintenance schedule as per requirements of this document.
- 5.1.5 All as-built completed drawings required by these specifications shall be completed and submitted with the notification of acceptance test date.
- 5.1.6 All Contractor field testing and manufacturer testing documentation as required by these specifications shall be submitted with the notification of acceptance test date.
- 5.1.7 Contractor shall provide three complete manuals of "the specific" fire alarm and detection system being tested. The manuals shall document all components of the system identified by unique number, consistent with the shop drawings and "as-built" drawings.
- 5.1.8 Contractor shall provide all documentation, testing and inspection items as identified under these specifications in bounded and labeled three-ring binders with zippered ends. Each binder shall be labeled on the cover indicating the fire alarm systems and building being documented as follows: (XXX represents the building number)
- BBTS Building XXX
Fire Alarm & Detection System
- 5.1.9 Each section of the manuals shall be arranged with section tags and documentation as follows:
- a. Project cover sheet listing project name, contractor, vendor, and consultant.

- b. Manual index.
- c. Service Directory.
- d. Fire Alarm System Approvals which shall include:
 - 1. Copy of Fire Marshal Application for fire protection plan review, completed and marked paid.
 - 2. Copy of Fire Marshal's Office plan approval form.
 - 3. Copy of Fire Alarm Signaling Systems Company License.
 - 4. Copy of NICET Certification, certificate of technician.
 - 5. Original of NFPA 72 Fire Alarm System Certification and Description.
 - 6. Copy of Fire Marshal's System Inspection and Final Approval Form.
- e. Narrative of system description and operation.
- f. System installation and service manual. (Note that these are two separate documents.)
- g. Equipment inventory list, with unique identifier labels for each device. Include equipment data sheets.
- h. Parts list of all components, modules, devices, wiring harness, and cross referenced with unique identifier number/label.
- i. Divider section labeled "Punch List Items".
- j. Manufacturer/vendor system testing. This section shall contain all installation, check-out and acceptance testing data as per these specifications.
- k. Two year warranty and test schedule.
- l. Wire list.
- m. Alarm and Supervisory Zone Listing; as worded on actual plain English descriptors.
- n. As-built drawings. To be installed in protective clear plastic sleeves. One drawing per sleeve.

5.1.10 At the conclusion, the Contractor shall document each part or test result from the acceptance test in a form suitable for installation into the required three-ring zippered binder. It is recommended that the test data collected in the acceptance tests be performed and documented during the Contractor's system check-out and documented in the binder prior to delivery to the Delaware Army National Guard. If this recommendation is accepted, acceptance test will be performed much faster and any delays in release of final payment will be avoided.

5.1.11 The Delaware Army National Guard acceptance of system shall not be completed until all faults, malfunctions and documentation as required by these specifications have been completed and delivered and then verified by the State of Delaware Liaison Representative.

5.1.12 Prior to acceptance testing the Contractor shall purchase and install a documentation cabinet adjacent to the primary fire alarm panel. This documentation cabinet shall be keyed alike with the fire alarm panel and shall be large enough to contain a complete set of documentation as described in these specifications. The cabinet shall be the same color and match the fire alarm panel.

5.2 Fire Alarm System Testing

5.2.1 The fire alarm system shall be tested in accordance with the guidelines set forth in these specifications and NFPA 72. All testing shall be documented in report form to the Delaware Army National Guard Liaison Representative in accordance with these specifications. Documentation and testing shall consist of each item noted in NFPA 72 and the following:

- a. Stray voltages between circuit conductors and ground. Verify compliance on as-builts.
- b. Ground faults on all conductors other than those intentionally and permanently grounded should be tested for isolation from grounding using an isolation testing devices such as a "megger". Documentation of "megger" testing shall identify each conductor in note form on as-builts or in ledger form identifying tested conductors and test results.
- c. Short circuits on all conductors other than those intentionally and permanently connected together for conductor-to-conductor isolation. To be verified on as-builts.
- d. Measure and record on as-builts loop resistance with each circuit pair short-circuited at the far end of the circuit with an ohmmeter and record the resistance on each circuit as shown on the as-builts.

5.2.2 Manufacturer's representative check. Prior to placing power to the system, a Manufacturer's representative check-out shall be conducted and verified in writing to the Delaware Army National Guard Liaison Representative. The report shall contain the following, but shall not be limited to:

- a. A complete list of equipment installed and wired.
- b. Indicate that all equipment is properly installed and conforms to the manufacturer's requirements and these specifications.
- c. Test individual devices in accordance with NFPA 72 acceptance test criteria.
- d. Technician's name, manufacturer certification, and date.
- e. Test of individual inputs and outputs for intended function and supervision.
- f. Test to verify the functional operation of the central monitoring point and remote annunciators individually and as a complete system under the following conditions:
 1. Normal operational condition
 2. Alarm condition

3. Under primary power failure
 - g. Test and demonstrate proper coordinated interfaces with HVAC, suppression and extinguishing systems and any other interfaced system or device, under the following conditions:
 1. Normal operational condition
 2. Alarm condition
 3. Under primary power failure
 4. Output function features
 - h. Measure, adjust, and record each smoke detector (including duct smoke detection and beam detection), to its medium sensitivity setting. This must be performed at the operational location of the unit and under normal environmental conditions. The sensitivities shall be recorded with serial number, location number and model number for each detector. Confirm that smoke detectors are within their UL listed sensitivity production window. All sensitivity testing shall be recorded in the documentation or as- builts. All sensitivity recordation shall be in "percent per lineal foot light obscuration", not voltage, using an approved smoke detector sensitivity testing apparatus as listed by the manufacturer.
 - i. Confirm and document that all alarm point annunciation descriptors are correct, in compliance with shop drawings, presented in plain unabbreviated English, and are annunciated to all remote annunciators and printer as required by these specifications.
- 5.2.3 Upon completion of fire alarm testing, the Contractor and respective Manufacturer's authorized field engineer shall conduct functional and instructional tests for the State of Delaware Liaison Representative.
- 5.2.4 Acceptance testing shall be specified by the contractor (see requirements 5.2.4). The Contractor shall develop an outline for approval by the Delaware Army National Guard Liaison Representative, but at a minimum, the testing shall be as follows:
- a. Confirm all documentation has been received:
 - As-builts - check accuracy
 - plan views
 - riser diagram
 - panel drawings
 - battery calculations
 - Disk labeled
 - Manual - check content
 - system descriptions
 - parts list
 - spare parts inventory
 - device cut sheets s installed
 - schedule for first year's maintenance and testing
 - testing documentation of devices and system
 - b. Inspect panel for installation, power, etc.

- c. General walk-down of devices to identify any missing device or obvious problems.
- d. Test horn circuits for audio level with dB measurements.
- e. Test of battery back up including:
 - full load test for five minutes
 - test and record voltage during full load test
 - test and record amps during full load test
 - test and record recharge amp rating
 - test and record battery draw during normally standby mode in amps
 - test and record battery recharge voltage no load = vac
 - test and record battery recharge voltage with load = vac
- f. Test of primary power including:
 - voltage = vac/vdc
 - circuit breaker tagged and locked open
 - surge protection under full load after system has been operating on secondary power for 24 hours
- g. Audio and visual circuit amp loads.
 - circuit #1 = amps
 - circuit #2 = amps
 - etc.
- h. Inspect panel boards for faults.
- i. Check spare capacity of system.
- j. Check supervision of all circuits, signal and detection.
- k. A random sample test of detection and pull station devices for function, supervision and proper installation.
- l. Confirm English descriptors and labels for zones.
- m. A random inspection of junction boxes, terminal/splice point boxes, conduit, wiring and general installation features. Looking for workmanship and specification issues.
- n. Copies of hard and magnetic media of software.
- o. Additional tests as required by individual system design or arrangement for each fire suppression system, fire extinguishing system and fire pump system.

5.2.5 The Contractor shall be responsible to conduct all acceptance testing with the Contractor's calibrated equipment, in the presence of the Delaware Army National Guard Liaison Representative.

The Contractor shall submit at the time of acceptance testing, notification and an outline similar to the one listed in 5.2.4 for approval by the Delaware Army National Guard Liaison Representative.

- 5.2.6 At the conclusion, the Contractor shall document each part or test result from the acceptance test in a form suitable for installation into the required three-ring zippered binders.
- 5.3 Owner Instruction
- 5.3.1 Contractor or Manufacturer shall provide the Delaware Army National Guard's Liaison Representative, maintenance personnel and others with a minimum of four hours of formal instruction on the operation, maintenance, service and testing of the fire alarm system, devices and related building interfaces. The instruction shall be scheduled after acceptance testing but prior to final payment.
- 5.3.2 Contractor and/or Manufacturer shall provide to the Delaware Army National Guard Liaison Representative an instructional outline for each class with all visual aids. All classes shall be structured consistently with traditional educational standards with performance objectives and testing for all participants. Each student shall receive an instructional certificate indicating number of hours of instruction and satisfactory completion of the course.

PART 6 - WIRING AND CONDUIT

6.1 General Conditions

- 6.1.1 This section "General Conditions" shall be used when in conjunction with the specific requirements of Parts 1, 2, 3, 4, 5 and 7. In case of conflicting information, the specific requirements of Parts 1, 2, 3, 4, 5, and 7 shall prevail, but in no case shall any equipment, material or workmanship be less than that specified in Part 6.
- 6.1.2 Contractor shall conceal all conduit and wiring above ceilings unless noted otherwise on drawings. The decision to allow exposed conduit and/or wire molding shall be reviewed with the Delaware Army National Guard Delaware Liaison Representative at the time of design and shop drawings. Any exposed conduit, wiring or wire molding shall be clearly annunciated by the Contractor through the use of color code or other annunciation method on the shop drawings so that it can be easily identified for approval during shop drawing review.
- 6.1.3 All wiring, conduit, junction boxes, terminal blocks, back boxes and like equipment used for or as part of the specified fire alarm system shall be approved for use in fire alarm service by UL and shall be consistent with the appropriate NFPA code and the NEC.
- 6.1.4 Terminations, splice connections and all other connections shall be made by the use of UL listed compression terminal strips as approved by the Delaware Army National Guard Liaison Representative. **No wire nuts or crimp connection devices will be approved.** When terminal strips are added to devices that incorporate a pig tail, the terminal strip shall be securely mounted with mechanical fasteners (no double back tape) in the back box or on the back of the fire alarm device.
- 6.1.5 All end-of-line resistors shall be landed on terminal strips mounted into back boxes or other appropriate electrical enclosures. All end-of-line device leads shall be insulated from short conditions by use of standard wire insulation material or approved heat treated wire insulation. No electrical tape will be permitted.

- 6.1.6 All conduit, devices and other system components that are installed in areas subject to unconditioned atmospheres, moisture, watering, rain or drainage shall be installed using approved water resistant and water tight conduit, enclosures and like equipment.
- 6.1.7 All installations of each system component and its associated equipment and wiring shall be in strict accordance with the manufacturer's recommendations and instructions and these specifications.
- 6.1.8 Provide and tag conductors at all junction and terminal points and identify by same number on all shop drawings.
- 6.1.9 All conduit, cable, outlet and mounting boxes required as part of mounting arrangements shall be color-coded red if not in public area.
- 6.1.10 Provide power supply wiring to system components from building electrical panel emergency circuits. The primary power supply shall be taken from an existing emergency circuit that is supplemented by the building's emergency generator. Circuit breaker shall be sized in accordance with system demand and the NEC. Branch circuit breaker shall be clearly labeled for fire alarm service, contiguous to the circuit breaker toggle switch and the toggle switch shall be provided with a lock to prevent accidental movement.
- 6.1.11 Provide all low voltage signal wiring for systems specified herein in a workmanlike manner. Provide system raceways in accordance with manufacturer's requirements for installation of system's wiring. Provide and tag conductors at all junction and terminal points and identify by same number on all shop drawings. All conduit, cable, outlet and mounting boxes required as part of mounting arrangements shall be color-coded red if not in public area.
- 6.1.12 Protect exposed wiring above hung/suspended ceiling construction from physical damage where necessary by conduit, guard strips or other approved means. Install all drops to wall devices in conduit or Greenfield unless fished. **Properly support low voltage cables and conduit from the structure by the use of Bridle Rings.** At those points where the wire descends below concrete/steel structure, the wire must be provided with adequate strain relief which is designed not to cut or ground cable shields (no wire ties). The wire shall descend plumb to the device or transition. Secure cable in place at intervals not exceeding 4-1/2 feet and within 12 inches from every cabinet, box or device. Cable stress relief shall be required for all connections to devices and boxes.
- 6.1.13 In running plenum cable not in conduit, all bridle rings running parallel with red steel shall be turned up on the bottom flange of red steel so as the wire run is on top of the bottom flange and cradled by the bottom flange. Where intersecting beams must be crossed, the wire run shall be routed as follows:
- a. When a corrugated steel flute is available about the red steel, the wire shall be routed through the flute, over top of the steel beam.
 - b. When a corrugated steel flute is not available, the wire run shall be taken under the intersecting beam and held off the beam by bridle rings on each side.
- 6.1.14 When any wire run transitions from above a suspended or hard ceiling, into a room or area which has no ceiling and is above 7 feet above the floor, the entire wire run shall be run in EMT through the entire room or until the EMT terminates within a junction or back box. The intent of

this requirement is to not permit any exposed plenum wire in areas without ceilings.

- 6.1.15 Provide all wiring within air handling plenum areas in conduit, and extend three feet beyond and outside of plenum.
- 6.1.16 All wiring for a system shall be in accordance with Articles 725, 760 and 800 of the NEC and local electrical codes and authorities having jurisdiction.
- 6.1.17 Provide all fire alarm wiring in separate raceways.
- 6.1.18 Be responsible for assuring that conduit size and wire quantity, size and type are suitable for the equipment and conditions as they exist. Review the proper installation of each type of device with the equipment supplier. Make final connections between the wiring and equipment under the supervision of equipment manufacturer's certified technician and NICET person in charge.
- 6.1.19 Be responsible to seal all floor and wall penetrations with approved materials which will provide the equivalent fire resistive rating as that of the wall, floor or ceiling that was penetrated. Contractor shall also be responsible to re-seal or repair any access ways or penetrations made through draft stops or fire stops with materials and workmanship which equals the original intended fire rating of the draft stop.

PART7-SPECIALCONDITIONS

7.1 Device Demarcation

- 7.1.1 Each and every alarm initiating device, supervisory device, monitoring device, control panel and junction box shall be provided with a unique number which shall be intended to specifically identify that item uniquely within its parent system. The unique number shall be clearly marked on the face of the device so as to be visible from 10 feet from a normal visual position. The type and style of unique label shall be approved by the Delaware Army National Guard prior to installation. It shall be a type of label that will survive for a minimum of 10 years under installed conditions.
- 7.1.2 The unique number shall be an identifier within a logical system and numbers shall be assigned in a logical and systematic order.
- 7.1.3 The unique number shall be shown on all shop drawings and other documentation that annunciates, describes or documents said item. This would include inventory listing, materials lists and manuals.

7.2 Software and Programming

- 7.2.1 Copies and adequate, explanatory documentation of all software and programming used in any fire alarm system shall be provided to the Delaware Army National Guard at the time of acceptance testing.
- 7.2.2 The Delaware Army National Guard shall own all software and programming both hard copy listing and digital media that is part of the operational, updating, renovation and maintenance need of the system. Software in a hard copy listing and magnetic media acceptable to the compatibility of the equipment supplied by the Contractor.
- 7.2.3 If it is a condition of the Contractor or Manufacturer to require licensing of any software or programming, the Contractor and/or Manufacturer shall provide such licensing to the Delaware

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Army National Guard as part of this project. Cost of such licensing shall be part of the base bid package.

- 7.2.4 The Delaware Army National Guard shall have the right to modify, use or reproduce for his own use, any software or programming which is part of this project.

---- END OF SPECIFICATION ----

SECTION 27 10 05

STRUCTURED CABLING FOR VOICE AND DATA - INSIDE-PLANT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Communications system design requirements.
- B. Copper cable and terminations.
- C. Fiber optic cable and interconnecting devices.
- D. Communications identification.
- E. Cabling and pathways inside building(s).
- F. Distribution frames, cross-connection equipment, enclosures, and outlets.
- G. Grounding and bonding the telecommunications distribution system.

1.02 RELATED REQUIREMENTS

- A. Section 07 84 00 - Firestopping.

1.03 REFERENCE STANDARDS

- A. CEA-310 - Cabinets, Racks, Panels, and Associated Equipment; Consumer Electronics Association; Revision E, 2005.
- B. NECA/BICSI 568 - Standard for Installing Building Telecommunications Cabling; National Electrical Contractors Association; 2006. (ANSI/NECA/BICSI 568)
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. TIA-455-21 - FOTP-21 - Mating Durability of Fiber Optic Interconnecting Devices; Telecommunications Industry Association; 2012.
- E. TIA-492AAAA-B - Detail Specification for 62.5-um Core Diameter/125-um Cladding Diameter Class Ia Graded-Index Multimode Optical Fibers; Telecommunications Industry Association; Rev B, 2009.
- F. TIA-526-14 - OFSTP-14 - Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant; Telecommunications Industry Association; Rev B, 2010.
- G. TIA-568-C.1 - Commercial Building Telecommunications Cabling Standard; Telecommunications Industry Association; Rev C, 2009 (with Addenda; 2012).
- H. TIA-568-C.2 - Commercial Building Telecommunications Cabling Standard - Part 2: Balanced Twisted Pair Cabling Components; Telecommunications Industry Association; Rev C, 2009.
- I. TIA-569-C - Telecommunications Pathways and Spaces; Telecommunications Industry Association; Rev C, 2012 (with Addenda; 2013).
- J. TIA-606-B - Administration Standard for the Telecommunications Infrastructure; Telecommunications Industry Association; Rev B, 2012.
- K. TIA-607-B - Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises; Telecommunications Industry Association; Rev B, 2012 (with Addenda; 2013).
- L. ANSI/J-STD-607 - Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications; Rev A, 2002.
- M. UL 444 - Communications Cables; Current Edition, Including All Revisions.
- N. UL 1863 - Communications-Circuit Accessories; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.

1. Storage and handling requirements and recommendations.
2. Installation methods.
- C. Shop Drawings: Show compliance with requirements on isometric schematic diagram of network layout, showing cable routings, telecommunication closets, rack and enclosure layouts and locations, service entrance, and grounding, prepared and approved by BICSI Registered Communications Distribution Designer (RCDD).
- D. Manufacturer Qualifications.
- E. Evidence of qualifications for installer.
- F. Field Test Reports.
- G. Project Record Documents: Prepared and approved by BICSI Registered Communications Distribution Designer (RCDD).
 1. Record actual locations of outlet boxes and distribution frames.
 2. Show as-installed color coding, pair assignment, polarization, and cross-connect layout.
 3. Identify distribution frames and equipment rooms by room number on contract drawings.
- H. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of project record documents.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: At least 3 years experience manufacturing products of the type specified.
- B. Installer Qualifications: A company having at least 3 years experience in the installation and testing of the type of system specified, and:
 1. Employing a BICSI Registered Communications Distribution Designer (RCDD).
 2. Supervisors and installers factory certified by manufacturers of products to be installed.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Keep stored products clean and dry.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a 2 year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Cabling and Equipment:
 1. 3M Communications Technologies: solutions.3m.com.
 2. TE Connectivity: www.te.com.
 3. Siemon Company: www.siemon.com.
 4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 COPPER CABLE AND TERMINATIONS

- A. Copper Horizontal Cable: TIA/EIA-568 Category 6 solid conductor unshielded twisted pair (UTP), 24 AWG, 100 ohm; 4 individually twisted pairs; covered with blue jacket and complying with all relevant parts of and addenda to latest edition of TIA/EIA-568 and UL 444.
 1. In locations other than in plenums, provide NFPA 70 type CMG general purpose, CMR riser-rated, or type CMP plenum-rated cable.
 2. In plenums, provide NFPA 70 type CMP plenum-rated cable.
- B. Copper Cable Terminations: Insulation displacement connection (IDC) type using appropriate tool; use screw connections only where specifically indicated.

- C. Jacks and Connectors: Modular RJ-45, non-keyed, terminated with 110-style insulation displacement connectors (IDC); high impact thermoplastic housing; suitable for and complying with same standard as specified horizontal cable; UL 1863 listed.
 - 1. Performance: 500 mating cycles.
 - 2. Voice and Data Jacks: 8-position modular jack, color-coded for both T568A and T568B wiring configurations.

2.03 FIBER OPTIC CABLE AND INTERCONNECTING DEVICES

- A. Fiber Optic Interconnecting Devices:
 - 1. Connector Type: Type SC.
 - 2. Connector Performance: 500 mating cycles, when tested in accordance with TIA-455-21.
 - 3. Maximum Attenuation/Insertion Loss: 0.3 dB.
- B. Fiber Optic Backbone Cable: 24-fiber, multimode 62.5/125 um, complying with TIA-492AAAA; covered with orange cable jacket and complying with relevant portions of and addenda to latest edition of TIA/EIA-568.
 - 1. In locations other than in plenums, provide NFPA 70 type OFNR nonconductive-riser-rated or type OFNP nonconductive-plenum-rated cable.
 - 2. In plenums, provide NFPA 70 type OFNP nonconductive-plenum-rated cable.
- C. Fiber Optic Adapters and Connectors: Duplex SC, push-on-push-off type, multimode adaptors with zirconia ceramic alignment sleeves; complying with relevant parts and addenda to latest edition of TIA/EIA-568 and with maximum attenuation of 0.3 dB at 1300 nm with less than 0.2 dB change after 500 mating cycles when tested in accordance with TIA-455-21.

2.04 IDENTIFICATION PRODUCTS

- A. Comply with TIA-606.

2.05 CROSS-CONNECTION EQUIPMENT

- A. Connector Blocks for Category 5e and Up Cabling: Type 110 insulation displacement connectors; capacity sufficient for cables to be terminated plus 25 percent spare.
- B. Patch Panels for Copper Cabling: Sized to fit EIA standard 19 inch wide equipment racks; 0.09 inch thick aluminum; cabling terminated on Type 110 insulation displacement connectors; printed circuit board interface.
 - 1. Jacks: Non-keyed RJ-45, suitable for and complying with same standard as cable to be terminated; maximum 48 ports per standard width panel.
 - 2. Capacity: Provide ports sufficient for cables to be terminated plus 25 percent spare.
 - 3. Labels: Factory installed laminated plastic nameplates above each port, numbered consecutively; comply with TIA/EIA-606 using encoded identifiers.
 - 4. Provide incoming cable strain relief and routing guides on back of panel.
 - 5. Patch Cords: Provide one patch cord for each pair of patch panel ports.
- C. Patch Panels for Fiber Optic Cabling: Sized to fit EIA standard 23 inch wide equipment racks; 0.09 inch thick aluminum.
 - 1. Adaptors: As specified above under FIBER OPTIC CABLING; maximum of 24 duplex adaptors per standard panel width.
 - 2. Labels: Factory installed laminated plastic nameplates above each port, numbered consecutively; comply with TIA/EIA-606 using encoded identifiers.
 - 3. Provide incoming cable strain relief and routing guides on back of panel.
 - 4. Provide rear cable management tray at least 8 inches deep with removable cover.
 - 5. Provide dust covers for unused adaptors.
 - 6. Patch Cords: Provide one patch cord for each pair of patch panel ports.

2.06 ENCLOSURES

- A. Backboards: Interior grade plywood without voids, 3/4 inch thick; UL-labeled fire-retardant.
 - 1. Do not paint over UL label.

- B. Equipment Racks and Cabinets: CEA-310 standard 19 inch wide component racks.
 - 1. Wall Mounted Racks: 8 gage aluminum brackets, hinged to allow access to back of installed components.
 - 2. Floor Mounted Racks: 16 gage steel construction with corrosion resistant finish; vertical and horizontal cable management channels, top and bottom cable troughs, and grounding lug.
 - 3. Wall Mounted Cabinets: Front doors with locks, louvered side panels, top and bottom cable access, and ground lug.
 - a. Cover inside of cabinet back with plywood backboard as specified.
 - 4. Cabinets: 16 gage steel construction with corrosion resistant finish.
 - 5. Locks: Keyed alike.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

- A. Comply with latest editions and addenda of TIA-568 (cabling), TIA-569 (pathways), TIA-607 (grounding and bonding), NECA/BICSI 568, NFPA 70, and SYSTEM DESIGN as specified in PART 2.
- B. Comply with Communication Service Provider requirements.
- C. Grounding and Bonding: Perform in accordance with TIA-607 and NFPA 70.

3.02 INSTALLATION OF PATHWAYS

- A. Install pathways with the following minimum clearances:
 - 1. 48 inches from motors, generators, frequency converters, transformers, x-ray equipment, and uninterruptible power systems.
 - 2. 12 inches from power conduits and cables and panelboards.
 - 3. 5 inches from fluorescent and high frequency lighting fixtures.
 - 4. 6 inches from flues, hot water pipes, and steam pipes.
- B. Conduit:
 - 1. Do not install more than 2 (two) 90 degree bends in a single horizontal cable run.
 - 2. Leave pull cords in place where cables are not initially installed.
 - 3. Conceal conduit under floor slabs and within finished walls, ceilings, and floors except where specifically indicated to be exposed.
 - a. Conduit may remain exposed to view in mechanical rooms, electrical rooms, and telecommunications rooms.
 - b. Treat conduit in crawl spaces and under floor slabs as if exposed to view.
 - c. Where exposed to view, install parallel with or at right angles to ceilings, walls, and structural members.
 - d. Under floor slabs, locate conduit at 12 inches, minimum, below vapor retarder; seal penetrations of vapor retarder around conduit.
- C. Grounding and Bonding: Perform in accordance with ANSI/J-STD-607 and NFPA 70.
- D. Firestopping: Seal openings around pathway penetrations through fire-rated walls, partitions, floors, and ceilings in accordance with Section 07 84 00.

3.03 INSTALLATION OF EQUIPMENT AND CABLING

- A. Cabling:
 - 1. Do not bend cable at radius less than manufacturer's recommended bend radius; for unshielded twisted pair use bend radius of not less than 4 times cable diameter.
 - 2. Do not over-cinch or crush cables.
 - 3. Do not exceed manufacturer's recommended cable pull tension.
 - 4. When installing in conduit, use only lubricants approved by cable manufacturer and do not chafe or damage outer jacket.
- B. Copper Cabling:

1. Category 5e and Above: Maintain cable geometry; do not untwist more than 1/2 inch from point of termination.
 2. For 4-pair cables in conduit, do not exceed 25 pounds pull tension.
 3. Use T568B wiring configuration.
 4. Copper Cabling Not in Conduit: Use only type CMP plenum-rated cable as specified.
- C. Fiber Optic Cabling:
1. Prepare for pulling by cutting outer jacket for 10 inches from end, leaving strength members exposed. Twist strength members together and attach to pulling eye.
 2. Support vertical cable at intervals as recommended by manufacturer.
- D. Wall-Mounted Racks and Enclosures:
1. Install to plywood backboards only, unless otherwise indicated.
 2. Mount so height of topmost panel does not exceed 78 inches above floor.
- E. Floor-Mounted Racks and Enclosures: Permanently anchor to floor in accordance with manufacturer's recommendations.
- F. Identification:
1. Use wire and cable markers to identify cables at each end.
- G. Field-Installed Labels: Comply with TIA/EIA-606 using encoded identifiers.
1. Cables: Install color coded labels on both ends.
 2. Outlets: Label each jack on its face plate as to its type and function, with a unique numerical identifier.
 3. Patch Panels: Label each jack as to its type and function, with a unique numerical identifier.
 4. Patch Cords: Label with jack identifier corresponding to initial installation.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Comply with inspection and testing requirements of specified installation standards.
- C. Visual Inspection:
1. Inspect cable jackets for certification markings.
 2. Inspect cable terminations for color coded labels of proper type.
 3. Inspect outlet plates and patch panels for complete labels.
 4. Inspect patch cords for complete labels.
- D. Testing - Copper Cabling and Associated Equipment:
1. Test operation of shorting bars in connection blocks.
 2. Category 5e and Above Links: Perform tests for wire map, length, attenuation, NEXT, and propagation delay.
- E. Testing - Fiber Optic Cabling:
1. Backbone: Perform optical fiber end-to-end attenuation test using an optical time domain reflectometer (OTDR) and manufacturer's recommended test procedures; perform verification acceptance tests and factory reel tests.
 2. Multimode Backbone: Perform tests in accordance with TIA-526-14 Method B.
- F. Final Testing: After all work is complete, including installation of telecommunications outlets, and telephone dial tone service is active, test each voice jack for dial tone.

END OF SECTION

SECTION 31 23 16.13
TRENCHING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Backfilling and compacting for utilities outside the building to utility main connections.

1.02 PRICE AND PAYMENT PROCEDURES

- A. Excavating Soil Materials:
 - 1. Measurement method: By the cubic foot.
 - 2. Includes: Excavating to required elevations, loading and placing materials in stockpile.
 - 3. Does Not Include Over-Excavation: Payment will not be made for over-excavated work nor for replacement materials.
- B. General Fill:
 - 1. Measurement Method: By the cubic foot.
 - 2. Includes: Excavating existing soil, stockpiling, scarifying substrate surface, placing where required, and compacting.
- C. Granular Fill:
 - 1. Measurement Method: By the cubic foot.
 - 2. Includes: Excavating existing material, stockpiling, scarifying substrate surface, placing where required, and compacting.
- D. Aggregates:
 - 1. Measurement Method: By the cubic foot.
 - 2. Includes: Excavating existing material, stockpiling, scarifying substrate surface, placing where required, and compacting.

1.03 DEFINITIONS

- A. Finish Grade Elevations: Indicated on drawings.

1.04 REFERENCES

- A. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54 kg (10-lb) Rammer and a 457 mm (18 in.) Drop; American Association of State Highway and Transportation Officials; 2010
- B. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)); 2012.
- C. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN m/m³)); 2012.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used.
- C. Compaction Density Test Reports.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. When necessary, store materials on site in advance of need.
- B. When fill materials need to be stored on site, locate stockpiles where indicated.
 - 1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
 - 2. Prevent contamination.
 - 3. Protect stockpiles from erosion and deterioration of materials.

PART 2 PRODUCTS

2.01 FILL MATERIALS

- A. General Fill: Conforming to State of Delaware Highway Department standard.

2.02 SOURCE QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for general requirements for testing and analysis of soil material.
- B. Where fill materials are specified by reference to a specific standard, test and analyze samples for compliance before delivery to site.
- C. If tests indicate materials do not meet specified requirements, change material and retest.

PART 3 EXECUTION

3.01 EXAMINATION

3.02 PREPARATION

- A. Identify required lines, levels, contours, and datum locations.
- B. Notify utility company to remove and relocate utilities.
- C. Protect plants, lawns, rock outcroppings, and other features to remain.

3.03 TRENCHING

- A. Notify DEDC, LLC of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.
- B. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored.
- C. Do not interfere with 45 degree bearing splay of foundations.
- D. Cut trenches wide enough to allow inspection of installed utilities.
- E. Hand trim excavations. Remove loose matter.
- F. Remove excavated material that is unsuitable for re-use from site.
- G. Remove excess excavated material from site.

3.04 PREPARATION FOR UTILITY PLACEMENT

- A. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.
- B. Compact subgrade to density equal to or greater than requirements for subsequent fill material.
- C. Until ready to backfill, maintain excavations and prevent loose soil from falling into excavation.

3.05 BACKFILLING

- A. Backfill to contours and elevations indicated using unfrozen materials.
- B. Employ a placement method that does not disturb or damage other work.
- C. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.
- D. Maintain optimum moisture content of fill materials to attain required compaction density.
- E. Soil Fill: Place and compact material in equal continuous layers not exceeding 8 inches compacted depth.
- F. Slope grade away from building minimum 2 inches in 10 ft, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.
- G. Correct areas that are over-excavated.
 - 1. Other areas: Use general fill, flush to required elevation, compacted to minimum 97 percent of maximum dry density.
- H. Compaction Density Unless Otherwise Specified or Indicated:
 - 1. At other locations: 95 percent of maximum dry density.

- I. Reshape and re-compact fills subjected to vehicular traffic.

3.06 BEDDING AND FILL AT SPECIFIC LOCATIONS

- A. Use general fill unless otherwise specified or indicated.
- B. Conduits and Duct Bank :
 1. Bedding: Use general fill.
 2. Cover with general fill.
 3. Fill up to subgrade elevation.
 4. Compact in maximum 8 inch lifts to 95 percent of maximum dry density.

3.07 TOLERANCES

- A. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

3.08 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection and testing.
- B. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D698 ("standard Proctor"), ASTM D1557 ("modified Proctor"), or AASHTO T 180.
- C. If tests indicate work does not meet specified requirements, remove work, replace and retest.

3.09 CLEANING

- A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

END OF SECTION