CITY OF WORCESTER

80 MCKEON ROAD FIRE STATION

GENERATOR UPGRADE

Prepared by:

200 Brickstone Square

Andover, Massachusetts 01810

NV5 Project No: 0240238

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DOCUMENT 00 01 00

SECTION 01 10 00

SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

B. Reference to Drawings: Work to be performed under this Section requires review the entire set of Construction Drawings including but not limited to:

T100	Cover Sheet

ELECTRICAL:

E000	ELECTRICAL LEGEND, NOTES AND ABBREVIATIONS
E100	ELECTRICAL SITE PLAN
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1.2 PREVAILING REQUIREMENTS

A. Refer to the GENERAL CONDITIONS for additional requirements for construction facilities and temporary controls. Wherever the requirements set forth in this SECTION 01 10 00 are inconsistent or ambiguous when read in conjunction with the requirements contained in the GENERAL CONDITIONS, the more stringent requirements shall govern.

1.3 RESPONSIBILITY AND COMPLIANCE

A. All requirements set forth under this SECTION 01 10 00 are directed to the General Contractor (also referred herein to as the Contractor), except as otherwise specifically set forth herein.

B. Be responsible for arranging for facilities as specified herein and in the GENERAL CONDITIONS, as required for proper and expeditious prosecution of the work. Pay costs for such general services and temporary facilities, except as otherwise specified, until final acceptance of the work, and remove same at completion of work.

C. Comply with applicable OSHA, State, and municipal regulations and requirements for services and facilities required under this SECTION 01 10 00, and in performance of all requirements of this Contract.

1.4 CONTRACT CONDITIONS SPECIFICALLY REQUIRED BY LAW AND REGULATIONS

A. This Contract is subject to all applicable Federal regulations, State and local laws, and all amendments thereto, and where any requirements contained herein do not

conform to such regulations and statutes governing the construction work of this Contract, the regulations and statutes shall govern.

1.5 SUMMARY

A. Section Includes:

1. Working Times and Time for Substantial Completion
2. Project information.
3. Work covered by Contract Documents.
4. Definitions – Owner and Architect
5. Work by Owner.
6. Owner-furnished products.
7. Access to site.
8. Coordination with occupants.
9. Work restrictions.
10. Specification and drawing conventions.
11. Municipal Police and Firefighter Services.
12. Coordination of the Work.
13. Owner's Project Manager.
14. Temporary and Trial Usage.
15. Project Supervision.

1.6 WORKING TIMES AND TIME FOR SUBSTANTIAL COMPLETION

A. It is hereby understood and mutually agreed, by and between the Contractor and the Owner, that the time for Substantial Completion as specified in the Contract of the work to be done hereunder is an essential condition of this Contract, and it is further mutually understood and agreed that the work encompassed in this Contract shall be commenced upon receipt of the Notice To Proceed from the Owner.

B. The Contractor agrees that said work shall be prosecuted regularly, diligently, and uninterruptedly at such a rate of progress as will ensure completion thereof within the time specified. It is expressly understood and agreed, by and between the Contractor and the Owner, that the time for the completion of the work described herein is a reasonable time for the completion of the same, taking into consideration the usual industrial and climatic conditions prevailing in this locality. Refer to SECTION 01 33 00, SUBMITTAL PROCEDURES, for progress schedule requirements and submittal procedures.

C. It is further agreed that the time is of the essence of each and every portion of the Contract Documents wherein a definite and certain length of time is fixed for the performance of any act whatsoever; and where under the Contract an additional time is allowed for the completion of any work, the new limit fixed by such extension shall be of the essence of this Contract.

1.7 PROJECT INFORMATION

A. Project Identification: Generator Upgrades

B. Project Locations: 80 McKeon Road, Worcester, MA

C. Engineer: NV5 Inc., 200 Brickstone Square, Suite 201, Andover, MA 01810

D. Consultants: The Engineer has retained the following design professionals who have prepared designated portions of the Contract Documents: N/A

1.8 DEFINITIONS – OWNER AND ENGINEER

A. Wherever the term “Owner” is used in the Contract Documents, it refers to:

1. Worcester Fire Department
City of Worcester
141 Grove Street
Worcester, Massachusetts, 01605

B. The terms “Owner” and “Awarding Authority” as used in the Project Manual have the same meaning and are interchangeable in Contract Documents. Both terms are the same entity.

C. Important Tax note: The City of Worcester (Owner) is a municipal authority exempt from certain taxes. It is therefore required that the Contractor and all Subcontractors purchasing taxable goods or services make known to suppliers that tax-exempt status of the Owner, in order that such taxes are paid on any items, the Contractor shall obtain rebates for the taxes and reimburse the Owner the full amount by Change Order. The Owner will provide the necessary evidence and certificates of its tax-exempt status upon request of those concerned. The most prevalent taxes concerned are:

1. Federal Excise Taxes as applied to articles which are taxable under Chapter 32 of the Internal Revenue Code of 1954, as amended.

2. Sales and Use Tax imposed by the Commonwealth of Massachusetts: The Owner has been assigned an Exemption Certificate with respect to leases, rental, or purchase of “tangible personal property”, including building materials and supplies, subject to Massachusetts Sales and Use Tax. This exemption does not apply to any equipment leased or rented by the Contractor for his own use on the construction of the Project.

3. Sales and Use Tax imposed by the states where the Owner does not have exemption status: The Owner may choose to apply for tax exemption status in other states where major building materials and supplies are being purchased. In the event that the Owner obtains exemption status after bids are received, the Contractor shall adjust the Stipulated Sum by change order, for the amount equal to the scheduled taxes that were included in the Contractor’s Bid.

D. All papers required to be delivered to the Owner shall, unless otherwise specified in writing to the contrary, be delivered to the office of the Engineer.

1. Wherever the term “Engineer” is used in the Contract Documents, it refers to:

NV5 Inc.
200 Brickstone Square, Suite 201
Andover, MA 01810
And its consultants

1.9 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consists of the following:

1. Worcester Fire Department, City of Worcester – Generator Upgrade

B. Type of Contract:

1. Project will be constructed under a single prime contract, single Phase.

1.10 WORK BY OWNER

A. General: Cooperate fully with Owner so work may be carried out smoothly, without interfering with or delaying work under this Contract or work by Owner. Coordinate the Work of this Contract with work performed by Owner.

1.11 CONTEMPLATED WORK BY OWNER:

A. NONE

1.12 ACCESS TO SITE

A. General: Contractor shall have full use of Project site as indicated on Drawings by the Contract limits for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project.

1.13 COORDINATION WITH OCCUPANTS

A. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.

B. The GC shall provide the City of Worcester with a 2-week look ahead schedule each week that construction is occurring. This shall identify what scope, assumed manpower and hours to be proposed. Special attention shall be paid to any work that will interrupt power, fire alarm, or entrance/egress. Notify the City of Worcester immediately of any deviations from the original schedule so work can be accommodated. The Owner will not be responsible for any interruptions in work schedule without 3 weeks written notice.

1.14 CONDUCT OF CONSTRUCTION PERSONNEL

A. The contractor shall establish and enforce such rules as are appropriate or requested by the Owner to insure the safety and continued operation of the public programs.

B. There shall be no contact between construction workers and City of Worcester Staff, or visitors to the buildings other than with Custodial staff. In the event that any employee of the contractor, or subcontractors, be deemed to be disruptive, at the sole discretion of the Owner, he shall be removed by the contractor from the project site.

C. Profanity and all other types of disruptive noise shall not be audible to City of Worcester staff, or visitors in occupied areas of the building or site.

D. Radios and electronic entertainment equipment will not be allowed within the building or on the property.

1.15 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.

1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.

City of Worcester office hours are Monday and Wednesday 8:00 a.m. to 7:00 p.m., Tuesday thru Thursday, 8:00 AM to 5:00 PM and closed on Friday.

2. On-Site Work Hours: Unless written authorization to the contrary is received from the City of Worcester, perform the work of this Contract between the hours of 7:00 A.M. and 12:00 A.M., overtime hours will not be at the expense to the City, Mondays through Fridays. Deliveries or idling engines shall not occur at the site outside of these hours. Saturday and Sunday work may be performed only when approved by the Owner's Project Manager, and only when scheduled in advance.

3. Nonsmoking: Per Massachusetts General Law, Smoking is not permitted on the grounds, within the building or within 50 feet of entrances, operable windows, or outdoor-air intakes.

4. Controlled Substances: Use of tobacco products, including vaping, and other controlled substances within the existing building and on Project site is not permitted.

B. Maintain a list of approved, screened personnel with the City of Worcester.

C. Identification Badges: Provide identification badges for Contractor's employees, and for employees of the contractor's, subcontractors, sub-subcontractors, and suppliers. Personnel shall wear these identification badges at all times while on the site.

1. Include the following on each badge:

a. Employee's Name
b. Current Photograph
c. Date Issued
d. Employer's Name
e. Project Name
f. Owner's Name

2. Dress: Contractor shall require construction personnel, when on site or in the building to wear shirts (work shirts and T-shirts are acceptable) as well as pants and shoes.

3. General: Perform daily cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

4. Complete the following daily cleaning in any area impacted by construction at the end of each shift.

a. Remove any trash, boxes, or loose materials to dumpster

b. Tools, construction equipment, construction materials, machinery, and surplus material should be stored in storage locations, job boxes job boxes, or storage boxes in locations coordinated in advance with the City of Worcester.

c. All work areas to be left broom clean at the end of the workday.

5. GC will be allowed to leave materials in place, so long as any materials are safely stored, and if approved by the City of Worcester. Any materials that may be tripping hazards shall be left in an area that does not impact egress and shall have caution tape or other physical temporary barrier placed around any temporarily stored materials. All small tools shall be left in locked job-boxes or other similar sized storage devices.

6. Locations of any storage must be discussed in advance with the City of Worcester.

1.16 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

3. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

4. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:

a. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.

b. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.

c. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual or via text notations.

1.17 MUNICIPAL POLICE AND FIREFIGHTER SERVICES

A. The Contractor shall make all necessary arrangements with the Worcester Police Department in advance of times when regular off-duty, or reserve, police officers will be needed for traffic control or protection, due to the operations performed under this Contract. Pay police officers at the prevailing wage rates in the municipality for such services. Extend the Workman's Compensation Insurance and Employer's Liability Insurance, required under the General Contract, to cover police used on the project.

B. The Contractor shall make all necessary arrangements with the municipal fire department, at least twenty-four (24) hours in advance, to provide a regular off-duty, or reserve, firefighter for stand-by duties (1) at times when welding and/or other open flame operations will be performed in the existing building, (2) during times when the fire alarm system is inoperative, and (3) at other times as may be required by the municipal fire department. Pay the stand-by firefighters at the prevailing wage rates in the municipality for such services. Extend the Workman's

Compensation Insurance and Employer's Liability Insurance, required under the General Contract, to cover stand-by firefighters used on the project.

1.18 COORDINATION OF THE WORK

A. The Contractor and each subcontractor shall coordinate their work with all adjacent work and shall cooperate with all other trades so as to facilitate general progress of the work. Each trade shall afford all other trades every reasonable opportunity for the installation of their respective work and for the storage of their materials and equipment. The Contractor shall be responsible for coordination. Refer to SECTION 01 33 00, SUBMITTAL PROCEDURES and SECTION 01 31 00, PROJECT MANAGEMENT AND COORDINATION for coordination drawing requirements, preparation, and submittal procedures.

B. Each subcontractor shall assume responsibility for the correctness and adequacy of his work. Each subcontractor shall be responsible for and pay for all damages done by his work or his workmen.

C. The Contractor shall cooperate with and provide access and working area to the Owner's contractors for the performance of specific work assigned to them.

D. The Contractor shall submit a 2-week look ahead schedule using MS Project, and overall project approach and schedule as identified in the project documents.

1.19 OWNER’S PROJECT MANAGER

A. Through its Facilities Management Department, NV5 is serving as the Owner’s Project Manager (OPM) for the Project. Upon request from the Contractor, the Owner will provide the Contractor with a written statement defining the duties, responsibilities, and limitations of authority of the OPM.

1.20 TEMPORARY AND TRIAL USAGE

A. Temporary and trial usage by Owner of any mechanical device, machinery, apparatus, equipment, or any work or materials supplied under Contract, before final completion and written acceptance by the Engineer, shall not be construed as evidence of Engineer's acceptance of same.

B. The Owner reserves the privilege of such temporary or trial usage, for such reasonable time as required to properly test such item. Claims for damages, due to injury to, or breaking of, any parts of such work, when the determined cause is weakness or inaccuracy of structural parts, or by defective material or workmanship, will not be permitted.

C. The Contractor shall appoint a fully qualified person or persons, to instruct and train designated municipal personnel in the use of various HVAC, fire alarm, and other building controls and equipment; and to assist in trial usage of the various pieces of equipment and systems. Trials shall be made under the Engineer's supervision.

D. The Contractor shall bear all costs in conjunction with the requirements of this Paragraph 1.19.

1.21 PROJECT SUPERVISION

A. Superintendent: Employ an experienced full-time Project Superintendent, approved by the Owner, to provide supervision and management on the site whenever work is in progress, except for reasonable absences such as personal

vacations and illness. Site Project Superintendent shall possess a current Massachusetts Construction Supervisor's License.

B. Do not reassign or replace the Project Superintendent during the entire duration of the project without obtaining the Owner's written consent. Reassigning or replacing the Project Superintendent without the Owner's written consent shall be a breach of the Contract.

C. If requested by the Owner, and at no increase in the Contract Amount, the Contractor shall reassign the Project Superintendent to another project, and shall provide a replacement Project Superintendent to whom the Owner has no objection.

D. The Project Superintendent shall not have dual responsibilities and shall not work with tools. The Project Superintendent's sole job shall be on site supervision and management, and no direct construction.

E. Contractor's Project Manager: Employ an experienced Project Manager, approved by the Owner, to provide supervision and management from the Contractor's base office.

F. Do not reassign or replace the Contractor's Project Manager during the entire duration of the project without obtaining the Owner's written consent. Reassigning or replacing the project Contractor's Project Manager without the Owner's written consent shall be a breach of the Contract.

G. If requested by the Owner, and at no increase in the Contract Amount, the Contractor shall reassign the Contractor's Project Manager to another project, and shall provide a replacement Project Superintendent to whom the Owner has no objection.

H. The Project Superintendent and Project Manager from the GC are required to attend at least a monthly meeting during preconstruction, and weekly construction meetings, or as required to coordinate the work.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 01 10 00

SECTION 01 11 00

SPECIAL CONDITIONS

PART 1 - GENERAL

1.1 RESPONSIBILITY AND COMPLIANCE

A. All requirements set forth under this Section are directed to the General Contractor.

B. Be responsible for arranging for facilities as specified herein and as required for proper and expeditious prosecution of the work. Pay costs for such general services and temporary facilities, except as otherwise specified, until final acceptance of the work, and remove at completion of work.

C. Comply with applicable OSHA, state, and municipal regulations and requirements for services and facilities required under this Section, and in performance of all requirements of this Contract.

1.2 COORDINATION OF THE WORK

A. The Contractor shall coordinate all work with all adjacent work and shall cooperate with all other trades so as to facilitate general progress of the work. Each trade shall afford all other trades every reasonable opportunity for the installation of their respective work and for the storage of their materials and equipment. The Contractor shall be responsible for coordination.

B. The Contractor shall assume responsibility for the correctness and adequacy of his work. The Contractor shall be responsible for and pay for all damages done by his work or his workmen.

C. The Contractor shall cooperate with and provide access and working area to other Owner's contractors for the performance of specific work assigned to them.

D. Execution of work for this project shall be coordinated with the owner regarding interruption of service to the building including but not limited to domestic hot water and cooking operations.

1.3 PROJECT MEETINGS

A. The Contractor will be required to meet with the Owner, Engineer and the Owner's representatives, at the site of the work, at regular intervals (minimum of one meeting every two weeks) during the course of the contract for purposes of progress review, coordination of shop schedules, sample submittals, and any other items of work requiring such coordination. The dates of such meetings shall be as established by the Engineer and mutually agreed upon by the Contractor, the Engineer, and the Owner's Representative.

1.4 EXISTING BUILDING CONDITIONS

A. Before ordering any materials or doing any work, verify all measurements and existing building conditions and be responsible for the correctness of same. No extra charge or compensation will be allowed on account of difference between actual dimensions and the measurements indicated on the Drawings; any difference which may be found shall be submitted to the Engineer in writing for consideration before proceeding with the work.

1.5 PROTECTION OF EXISTING CONDITIONS

A. Take all proper precautions to protect the Owner and adjoining property from injury and unnecessary interference; and replace or put in good condition any existing items which are

damaged or injured in carrying out the work, unless designated to permanently be removed or demolished.

B. Keep all access drives and walks clear of debris during building operations. Repair streets, drives, curbs, sidewalks, poles, and the like, where disturbed by building operation and leave them in as good condition after completion of the work as before operations started. Floors, stairwells, and corridors must be kept clean of debris and means of egress maintained.

C. Take all necessary precautions to protect the roof from damage during operations performed on the roof. Contractors shall the video survey of the existing roof and identify any existing conditions.

1.6 TESTS AND INSPECTION

A. Make, or have made, such tests and inspections on workmanship and materials as may be required by the building code, state or municipal laws, or as called for under the various SECTIONS of this Specification.

B. Bear all expense to such tests and inspections, unless otherwise specified under the various SECTIONS of the Specifications and furnish all labor, tools, instruments, water, temporary power and light, construction, and equipment necessary for these tests and inspection. Furnish records of all tests and inspections to the Engineer. Remove all temporary work, materials, and equipment upon completion of tests and inspections.

C. Where, the various SECTIONS of the Specifications, inspections and testing of materials, processes, and the like is called for, the selection of bureaus, laboratories, and/or agencies for such inspection and testing shall be subject to the approval of the Engineer.

D. Should any material or work be found, after testing or inspections, to be defective or inferior, remove and replace such material and/or work with new sound materials and/or work as approved by the Engineer, and bear all costs thereof.

E. Permits and inspections from the City of Worcester will be required.

1.7 FIRE PROTECTION AND PREVENTION

A. Comply with the following minimum requirements for fire prevention:

1. Provide the services of a City of Worcester Firefighter during all welding, cutting, brazing, or other hot work operations performed within the building (i.e., demolition).

2. Provide sufficient quantity of carbon dioxide fire extinguishers in all areas of work.

3. Do not permit an accumulation of inflammable rubbish to stay in the building overnight.

4. Store no more than one gallon, in an approved safety can or sealed container, of any volatile inflammable liquid in any portion of the building.

5. Make arrangements for periodic inspection by local fire protection authorities and insurance underwriters' inspections. Cooperate with said authorities to facilitate proper inspection of the premises. Comply with all applicable laws and ordinances and with the Owner's fire prevention requirements.

6. Ensure that tarpaulins that may be used during construction of work are made of material which is resistant to fire, water, and weather, are UL approved, and comply with FS-CCC-D-746.

1.8 ACCIDENT PREVENTION

A. Comply with all federal, state and municipal recommendations and requirements for safety, and accident prevention, and those of the Associated General Contractors of America, and the American Standards Association Standard A10.2. Ensure that the field superintendent conducts regular, frequent inspections of the site for compliance with safety regulations.

B. Neither the Owner nor the Engineer shall be responsible for providing a safe working place for the Contractor, contractors, or their employees, or any individual responsible to them for the work.

1.9 WELDING AND CUTTING

A. Where electric or gas welding or cutting work is done above or within ten (10) feet of combustible material or above space that may be occupied by persons, use interposed shields of incombustible material to protect against fire damage or injury due to sparks and hot metal.

B. Place tank supplying gases for gas welding or cutting at no greater distance from the work than is necessary for safety, securely fastened and maintained in an upright position where practicable. Such tanks, when stored for use, shall be remote from any combustible material and free from exposure to the rays of the sun or high temperatures.

C. Maintain suitable fire extinguishing equipment near all welding and cutting operations. When operations cease for the noon hour or at the end of the day, thoroughly wet down the surroundings adjacent to welding and cutting operations.

D. Station a workman equipped with suitable fire extinguishing equipment near welding and cutting operations to see that sparks do not lodge in floor cracks or pass through floor or wall openings or lodge in any combustible material. Keep the workman at the source of work which offers special hazards for thirty (30) minutes after the job is completed to make sure that smoldering fires have not been started.

E. Place a qualified electrician in charge of installing and repairing electric or arc welding equipment.

F. All welding and cuttings shall be performed by certified welders.

G. Secure a fire watch from the local fire department as required by local ordinances.

1.10 OVERLOADING

A. Do not permit materials and fabricated work to be stacked on, or be transported over, floor and roof construction that would stress any of said construction beyond the designed live loads.

1.11 RUBBISH REMOVAL

A. Ensure that each workman engaged upon the work bears his full responsibility for cleaning up during and immediately upon completion of his work, and removes all rubbish, waste, tools, equipment, and appurtenances caused by and used in the execution of his work, but this shall in no way be construed to relieve the Contractor of his primary responsibility for maintaining the building and site clean and free of debris, leaving all work in a clean and proper condition satisfactory to the Engineer and/or Owner.

B. Do not permit rubbish to be thrown from the windows of the building.

C. Immediately after unpacking, all packing materials, case lumber, excelsior, wrapping or other rubbish, flammable or otherwise, shall be collected and removed from the building and premises.

1.12 BLASTING

A. No blasting will be permitted.

1.13 WORK AREAS, STORAGE, ACCESS, AND PARKING

A. The Contractor's work areas shall be as designated on the Drawings and shall be strictly adhered to. Access to the existing building shall be kept free of all obstructions at all times. Assume full responsibility for trespassing on and/or damage to other property by any person employed on the project.

B. A storage area for construction materials will be designated for the use of the Contractor. Storage of materials beyond the designated area will not be permitted.

C. Vehicular access to the site, and parking for employees' vehicles shall be restricted only to the specific areas designated by the Owner.

1.14 TEMPORARY SCAFFOLDING AND CONVEYANCES

A. Furnish, install, maintain, remove and pay for all temporary staging and planking, ladders, hoisting (including operator), rigging, and safety devices for all trades.

B. Staging shall be approved design, erected and removed by experienced stage builders and shall have all accident prevention devices required by state and local laws.

C. Permit no materials to be passed through the finished openings of exterior walls, without first providing protection to the opening thereof of a type as approved by the Engineer. Be responsible, and bear all costs, for repairs and/or replacement of damaged work caused thereby.

1.15 TEMPORARY PROTECTION

A. Furnish, erect, and maintain for the duration of the work period, temporary fire-retardant, dust proof coverings as required to prevent the spread of dust beyond the immediate area where work is being performed. Provide 2 layers of 6 mil poly and safety taping where required to prevent dust migration.

B. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

1. Maintain exit signs and power for illumination during construction. Provide temporary exit signs as required during construction.

1.16 ADVERTISING MATTER

A. Signs or advertisements will not be allowed on building enclosure or premises, unless written approval has been obtained from the Owner.

B. Advertising matter shall not appear on equipment, unless so specified. However, nameplates of a nominal size and inconspicuous nature will be permitted.

1.17 MUNICIPAL POLICE AND FIRE DEPARTMENT SERVICES

A. Make all necessary arrangements with the municipal police and fire departments in advance of times when regular off-duty, or reserve police officers or fire fighters will be needed for traffic control protection or fire watch, due to the operations performed under this Contract. Pay police officers and firemen at the prevailing wage rates in the municipality for such services. Extend the Worker's Compensation Insurance and

Employer's Liability Insurance, required under the General Contract to cover police and firefighter used on the project.

1.18 USE AND OCCUPANCY PRIOR TO ACCEPTANCE BY THE OWNER

A. The building will be occupied, for normal function thereof, during the stipulated construction period.

1.19 GLASS BREAKAGE

A. The contractor shall be responsible for all breakage of glass as a direct or indirect result of his work or actions of his workmen, from the time the construction operations commence until the project is complete. Replace all broken glass and deliver the building with all glazing intact and clean.

1.20 DAMAGE TO EXISTING SURFACES

A. The Contractor shall be fully responsible for any damage to existing surfaces caused by the operations of this Contract and shall correct all such damage to the Owner's satisfaction, at no additional cost to the Contract.

1.21 FINAL CLEANING

A. Before the final inspection, thoroughly clean the entire exterior and interior areas of the building where construction work has been performed, the immediate surrounding areas, and corridors, stairs, halls, storage areas, temporary offices and toilets, including the following:

1. Remove all construction facilities, debris, and rubbish from the Owner's property and legally dispose of same beyond the site limits.

2. Sweep, dust, wash, and polish all finished surfaces. This includes cleaning of the work of all finished trades where needed, whether or not cleaning for such trades is included in their respective SECTIONS.

3. Clean, wash and polish all building’s furnishings after being returned to classrooms from storage.

END OF SECTION

SECTION 01 23 00

ALTERNATES

1.1 SCOPE

A. This Section lists the Alternates which appear in the Contract Documents. Consult the individual sections of the detailed requirements of each Alternate.

B. Bid prices for each Alternate shall include overhead, profit, and all other expenses incidental to the Work under each Alternate.

C. The Contractor and Subcontractors shall be responsible for examining the scope of each Alternate generally defined herein and for recognizing modifications to the Work caused by the Alternates and including the cost thereof in the bid price.

D. The Contractor’s alternate amount shall include the net change in cost to perform all of the work described in the Alternate.

1.2 LIST OF ALTERNATES

A. Alternate No. 1 - Provide new automatic transfer switch.

B. Alternate No. 2 - Provide portable generator docking station.

END OF SECTION

SECTION 01 26 00

CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

1.3 STATUTORY REGULATIONS FOR PUBLIC CONSTRUCTION CONTRACTS

A.

M.G.L. c.30, '39I: Deviations from plans and specifications.
Every contractor having a contract for the construction, alteration, maintenance, repair or demolition of, or addition to, any public building or public works for the commonwealth, or of any political subdivision thereof, shall perform all the work required by such contract in conformity with the plans and specifications contained therein. No willful and substantial deviation from said plans and specifications shall be made unless authorized in writing by the awarding authority or by the engineer or architect in charge of the work who is duly authorized by the awarding authority to approve such deviations. In order to avoid delays in the prosecution of the work required by such contract such deviation from the plans or specifications may be authorized by a written order of the awarding authority or such engineer or architect so authorized to approve such deviation. Within thirty days thereafter, such written order shall be confirmed by a certificate of the awarding authority stating:
(1) if such deviation involves any substitution or elimination of materials, fixtures or equipment, the reasons why such materials, fixtures or equipment were included in the first instance and the reasons for substitution or elimination, and, if the deviation is of any other nature, the reasons for such deviation, giving justification therefor;
(2) that the specified deviation does not materially injure the project as a whole;
(3) that either the work substituted for the work specified is of the same cost and quality, or that an equitable adjustment has been agreed upon between the contracting agency and the contractor and the amount in dollars of said adjustment; and
(4) that the deviation is in the best interest of the contracting authority.
Such certificate shall be signed under the penalties of perjury and shall be a permanent part of the file record of the work contracted for.
Whoever violates any provision of this section willfully and with intent to defraud shall be punished by a fine of not more than five thousand dollars or by imprisonment for not more than six months, or both.

M.G.L. c.30, '39J: Public construction contracts; effect of decisions of contracting body or administrative board.

Notwithstanding any contrary provision of any contract for the construction, reconstruction, alteration, remodeling, repair or demolition of any public building or public works by the commonwealth, or by any county, city, town, district, board, commission or other public body, when the amount of the contract is more than five thousand dollars in the case of the commonwealth and more than two thousand dollars in the case of any county, city, town, district, board, commission or other public body, a decision, by the contracting body or by any administrative board, official or agency, or by any architect or engineer, on a dispute, whether of fact or of law, arising under said contract shall not be final or conclusive if such decision is made in bad faith, fraudulently, capriciously, or arbitrarily is unsupported by substantial evidence, or is based upon error of law.

C.

M.G.L. c.30, '39N: Construction contracts; equitable adjustment in contract price for differing subsurface or latent physical conditions.

Every contract subject to M.G.L. c.149, '44A or subject to M.G.L. C.30, '39M shall contain the following paragraph in its entirety and an awarding authority may adopt reasonable rules or regulations in conformity with that paragraph concerning the filing, investigation and settlement of such claims:

If, during the progress of the work, the contractor or the awarding authority discovers that the actual subsurface or latent physical conditions encountered at the site differ substantially or materially from those shown on the plans or indicated in the contract documents either the contractor or the contracting authority may request an equitable adjustment in the contract price of the contract applying to work affected by the differing site conditions. A request for such an adjustment shall be in writing and shall be delivered by the party making such claim to the other party as soon as possible after such conditions are discovered. Upon receipt of such a claim from a contractor, or upon its own initiative, the contracting authority shall make an investigation of such physical conditions, and, if they differ substantially or materially from those shown on the plans or indicated in the contract documents or from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the plans and contract documents and are of such a nature as to cause an increase or decrease in the cost of performance of the work or a change in the construction methods required for the performance of the work which results in an increase or decrease in the cost of the work, the contracting authority shall make an equitable adjustment in the contract price and the contract shall be modified in writing accordingly.

D.

M.G.L. c.30, '39O: Contracts for construction and materials; suspension, delay or interruption due to order of awarding authority; adjustment in contract price; written claim.

Every contract subject to the provisions of M.G.L. c.30, '39M or subject to M.G.L. c.149, '44A shall contain the following provisions (a) and (b) in their entirety and, in the event a suspension, delay, interruption or failure to act of the awarding authority increases the cost of performance to any subcontractor, that subcontractor shall have the same rights against the general contractor for payment for an increase in the cost of his performance as provisions (a) and (b) give the general contractor against the awarding authority, but nothing in provisions (a) and (b) shall in any way

M.G.L. c.30, '39O: Contracts for construction and materials; suspension, delay or interruption due to order of awarding authority; adjustment in contract price; written claim.
change, modify or alter any other rights which the general contractor or the subcontractor may have against each other.
(a) The awarding authority may order the general contractor in writing to suspend, delay, or interrupt all or any part of the work for such period of time as it may determine to be appropriate for the convenience of the awarding authority; provided however, that if there is a suspension, delay or interruption for fifteen days or more or due to a failure of the awarding authority to act within the time specified in this contract, the awarding authority shall make an adjustment in the contract price for any increase in the cost of performance of this contract but shall not include any profit to the general contractor on such increase; and provided further, that the awarding authority shall not make any adjustment in the contract price under this provision for any suspension, delay, interruption or failure to act to the extent that such is due to any cause for which this contract provides for an equitable adjustment of the contract price under any other contract provisions.
(b) The general contractor must submit the amount of a claim under provision (a) to the awarding authority in writing as soon as practicable after the end of the suspension, delay, interruption or failure to act and, in any event, not later than the date of final payment under this contract and, except for costs due to a suspension order, the awarding authority shall not approve any costs in the claim incurred more than twenty days before the general contractor notified the awarding authority in writing of the act or failure to act involved in the claim.

1.4 ADMINISTRATIVE CHANGE ORDERS

A. Unit-Price Adjustment: See Section 01 22 00 "Unit Prices" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect measured scope of unit-price work.

1.5 CHANGE ORDER PROCEDURES

A. Submit claims for increased costs because of change in scope or nature of Allowance described in Contract Documents, whether for Purchase Order amount or Contractor's handling, labor, installation, overhead, and profit.

B. Submit claims within 14 days of receipt of Change Order or Construction Change Directive authorizing work to proceed.

C. Owner will reject claims submitted later than 14 days after such authorization.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 26 00

SECTION 012900

PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Requirements:
1. Section 012600 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
2. Section 013200 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

1.3 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.

1. Coordinate line items in the schedule of values with other required administrative forms and schedules, including the following:

   a. Application for Payment forms with continuation sheets.
   b. Submittal schedule.
   c. Items required to be indicated as separate activities in Contractor's construction schedule.

2. Submit the schedule of values to Engineer at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
3. Sub schedules for Phased Work: Where the Work is separated into phases requiring separately phased payments, provide sub schedules showing values coordinated with each phase of payment.
4. Sub schedules for Separate Elements of Work: Where the Contractor's construction schedule defines separate elements of the Work, provide sub schedules showing values coordinated with each element.

5. Sub schedules for Separate Design Contracts: Where the Owner has retained design professionals under separate contracts who will each provide certification of payment requests, provide sub schedules showing values coordinated with the scope of each design services contract as described in Section 011000 "Summary."

B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the schedule of values:

    a. Project name and location.
    b. Name of Engineer.
    c. Engineer's project number.
    d. Contractor's name and address.
    e. Date of submittal.

2. Arrange schedule of values consistent with format of AIA Document G703.
3. Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:

    a. Related Specification Section or Division.
    b. Description of the Work.
    c. Name of subcontractor.
    d. Name of manufacturer or fabricator.
    e. Name of supplier.
    f. Change Orders (numbers) that affect value.
    g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.

        1) Labor.
        2) Materials.
        3) Equipment.

4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.

    a. Include separate line items under Contractor and principal subcontracts for Project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.

5. Round amounts to the nearest whole dollar; total shall equal the Contract Sum.
6. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.

    a. Differentiate between items stored on-site and items stored off-site. If required, include evidence of insurance.

7. Provide separate line items in the schedule of values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
8. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by

measured quantity. Use information indicated in the Contract Documents to determine quantities.

9. Purchase Contracts: Provide a separate line item in the schedule of values for each purchase contract. Show line-item value of purchase contract. Indicate owner payments or deposits, if any, and balance to be paid by Contractor.
10. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

    a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.

11. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Engineer and paid for by Owner.

   1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.

C. Payment Application Times: Submit Application for Payment to Engineer by the twenty-first of the month. The period covered by each Application for Payment is one month, ending on the last day of the month.

   1. Submit draft copy of Application for Payment seven days prior to due date for review by Architect.

D. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.

E. Application for Payment Forms: Use forms provided by Owner for Applications for Payment. Sample copies are included in Project Manual.

F. Application for Payment Forms: Use forms acceptable to Engineer and Owner for Applications for Payment. Submit forms for approval with initial submittal of schedule of values.

G. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Engineer will return incomplete applications without action.

   1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
   2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.

3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.

H. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.

1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.
2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
3. Provide summary documentation for stored materials indicating the following:

    a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
    b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
    c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.

I. Transmittal: Submit one electronic pdf signed and notarized of each Application for Payment to Engineer by email. One copy shall include waivers of lien and similar attachments if required.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

J. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.

1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
2. When an application shows completion of an item, submit conditional final or full waivers.
3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
4. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.

K. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.

1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
2. When an application shows completion of an item, submit conditional final or full waivers.
3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
5. Waiver Forms: Submit executed waivers of lien on forms, acceptable to Owner.

L. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of values.
3. Sustainable design submittal for project materials cost data.
4. Contractor's construction schedule (preliminary if not final).
5. Combined Contractor's construction schedule (preliminary if not final) incorporating Work of multiple contracts, with indication of acceptance of schedule by each Contractor.
6. Products list (preliminary if not final).
7. Sustainable design action plans.
8. Schedule of unit prices.
9. Submittal schedule (preliminary if not final).
10. List of Contractor's staff assignments.
11. List of Contractor's principal consultants.
12. Copies of building permits.
13. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
14. Initial progress report.
15. Report of preconstruction conference.
16. Certificates of insurance and insurance policies.
17. Performance and payment bonds.
18. Data needed to acquire Owner's insurance.

M. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

N. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.
2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.
4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
6. AIA Document G707, "Consent of Surety to Final Payment."
7. Evidence that claims have been settled.
8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

SECTION 01 31 00

PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
   1. General coordination procedures.
   2. Coordination drawings.
   3. Field Engineering.
   4. Requests for Information (RFIs).
   5. Project meetings.

B. Each subcontractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific subcontractor.

C. Related Requirements:
   1. Section 01 32 00 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
   2. Section 01 77 00 "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

A. RFI: Request from Owner, Engineer, or Contractor seeking information required by or clarifications of the Contract Documents.

1.4 INFORMATIONAL SUBMITTALS

A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
   1. Name, address, and telephone number of entity performing subcontract or supplying products.
   2. Number and title of related Specification Section(s) covered by subcontract.
   3. Drawing number and detail references, as appropriate, covered by subcontract.

B. Key Personnel Names: Within 15 fifteen days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.
   1. Post copies of list in project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

1.5 GENERAL COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, which depend on each other for proper installation, connection, and operation.
   1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
   2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
   3. Make adequate provisions to accommodate items scheduled for later installation.

B. Coordinate scheduling, submittals, and Work of various sections of Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements.

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

D. Coordinate space requirements, supports, and installation of mechanical and electrical Work 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.

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

F. Coordinate completion and clean-up of Work of separate sections in preparation for Substantial Completion.

G. After Owner occupancy of premises, coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

H. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
   1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

I. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
   1. Preparation of Contractor's construction schedule.
   2. Preparation of the schedule of values.
   3. Installation and removal of temporary facilities and controls.
   4. Delivery and processing of submittals.
   5. Progress meetings.
   6. Preinstallation conferences.
   7. Project closeout activities.
   8. Startup and adjustment of systems.

J. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1.6 FIELD ENGINEERING

A. Provide field engineering services. Establish elevations, lines, and levels, utilizing recognized engineering survey practices.

B. Submit copy of site drawing signed by Land Surveyor certifying elevations and locations of the Work are in conformance with Contract Documents.

C. Maintain complete and accurate log of control and survey work as Work progresses.

1.7 REQUESTS FOR INFORMATION (RFIs)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
   1. Engineer will return RFIs submitted to Engineer by other entities controlled by Contractor with no response.
   2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
   1. Project name.
   2. Project number.
   3. Date.
   4. Name of Contractor.
   5. Name of Engineer.
   6. RFI number, numbered sequentially (i.e. 001-01, 002-01)
   7. RFI subject.
   8. Specification Section number and title and related paragraphs, as appropriate.
   9. Drawing number and detail references, as appropriate.
   10. Field dimensions and conditions, as appropriate.
   11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
   12. Contractor's signature.
   13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
      a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: AIA Document G716 or software-generated form with substantially the same content as indicated above, acceptable to Engineer.
   1. Attachments shall be electronic files in Adobe Acrobat PDF format.

D. Engineer's Action: Engineer will review each RFI, determine action required, and respond. Allow fourteen (14) working days for Engineer's response for each RFI. RFIs received by Engineer after 1:00 p.m. (EST) will be considered as received the following working day.
   1. The following Contractor-generated RFIs will be returned without action:
      a. Requests for approval of submittals.

b. Requests for approval of substitutions.
c. Requests for approval of Contractor's means and methods.
d. Requests for coordination information already indicated in the Contract Documents.
e. Requests for adjustments in the Contract Time or the Contract Sum.
f. Requests for interpretation of Engineer's actions on submittals.
g. Incomplete RFIs or inaccurately prepared RFIs.

2. Engineer's action may include a request for additional information, in which case Engineer's time for response will date from time of receipt of additional information.
3. Engineer's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."
   a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Engineer in writing within (5) five days of receipt of the RFI response.

E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Use CSI Log Form 13.2B. or software log with not less than the following:
1. Project name.
2. Name and address of Contractor.
3. Name and address of Engineer.
4. RFI number including RFIs that were returned without action or withdrawn.
5. By whom the request was made.
6. RFI description.
7. Date the RFI was submitted.
8. To whom the request was made.
9. Date Engineer's response was received.
10. Engineer’s response.
11. Drawing reference or Specification Section to which the request pertains.

F. On receipt of Engineer's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Engineer within five (5) days if Contractor disagrees with response.
1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

1.8 PROJECT MEETINGS

A. General: The Contractor shall schedule and conduct meetings and conferences at Project site unless otherwise indicated.
1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Engineer of scheduled meeting dates and times.
   a. Engineer's Consultants attendance at meetings: For each progress meeting or other project meeting where the Contractor requests attendance by any Engineer or other Consultant to the Engineer who is not regularly in attendance at such meetings, the Contractor shall make the attendance request at least 72 hours in advance of the meeting, and shall clearly identify the Consultant-related issues and topics to be discussed.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. The Contractor shall distribute the meeting minutes to everyone concerned, including Owner and Engineer.

B. Preconstruction Conference: Engineer will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Engineer, but no later than (15) fifteen days after execution of the Agreement.
   1. Conduct the conference to review responsibilities and personnel assignments.
   2. Attendees: Authorized representatives of Owner and Engineer, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
   3. Agenda: Discuss items of significance that could affect progress, including the following:
      a. Tentative construction schedule.
      b. Phasing.
      c. Critical work sequencing and long-lead items.
      d. Designation of key personnel and their duties.
      e. Lines of communications.
      f. Procedures for processing field decisions and Change Orders.
      g. Procedures for RFIs.
      h. Procedures for testing and inspecting.
      i. Procedures for processing Applications for Payment.
      j. Distribution of the Contract Documents.
      k. Submittal procedures.
      l. Preparation of record documents.
      m. Use of the premises and existing building.
      n. Work restrictions.
      o. Working hours.
      p. Owner's occupancy requirements.
      q. Responsibility for temporary facilities and controls.
      r. Procedures for moisture and mold control.
      s. Procedures for disruptions and shutdowns.
      t. Construction waste management and recycling.
      u. Parking availability.
      v. Office, work, and storage areas.
      w. Equipment deliveries and priorities.
      x. First aid.
      y. Security.
      z. Saftey.
      aa. Progress cleaning.
   4. Minutes: The Engineer will chair the meeting and will prepare written minutes of the meeting and record significant discussions and agreements achieved. The Engineer will distribute electronic copies of the meeting minutes to everyone concerned, including Owner and Contractor.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
   1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Engineer of scheduled meeting dates.
   2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
      a. Contract Documents.
      b. Options.
      c. Related RFIs.
      d. Related Change Orders.
      e. Purchases.
      f. Deliveries.
      g. Submittals.

h. Review of mockups.
i. Possible conflicts.
j. Compatibility requirements.
k. Time schedules.
l. Weather limitations.
m. Manufacturer's written instructions.
n. Warranty requirements.
o. Compatibility of materials.
p. Acceptability of substrates.
q. Temporary facilities and controls.
r. Space and access limitations.
s. Regulations of authorities having jurisdiction.
t. Testing and inspecting requirements.
u. Installation procedures.
v. Coordination with other work.
w. Required performance results.
x. Protection of adjacent work.
y. Protection of construction and personnel.

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Project Closeout Conference: The Contractor shall schedule and conduct a project closeout conference, at a time convenient to Owner and Engineer, but no later than (30) thirty days prior to the scheduled date of Substantial Completion.
1. Conduct the conference to review requirements and responsibilities related to Project closeout.
2. Attendees: Authorized representatives of Owner and Engineer, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
a. Preparation of record documents.
b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
c. Submittal of written warranties.
d. Requirements for preparing operations and maintenance data.
e. Requirements for delivery of material samples, attic stock, and spare parts.
f. Requirements for demonstration and training.
g. Preparation of Contractor's punch list.
h. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
i. Submittal procedures.
j. Owner's partial occupancy requirements.
k. Installation of Owner's furniture, fixtures, and equipment.
l. Responsibility for removing temporary facilities and controls.
4. Minutes: Entity conducting meeting will record and distribute meeting minutes.

E. Progress Meetings: Except as otherwise directed or permitted by the Owner, the Contractor, all major Subcontractors, and suppliers will be required to meet with the Engineer at the site of the work, at regular intervals during the course of the Contract for purpose of progress review,

coordination of shop drawing schedules, sample submittals, and any other items of work requiring such coordination. The dates of such meetings shall be established by the Engineer and mutually agreed upon by the Contractor, the Owner and the Engineer. The intervals of such meetings shall be no less than once a month, unless otherwise determined by the Engineer. The Engineer shall not be required to attend meetings which are scheduled without the Engineer's agreement, nor shall the Engineer be required to attend meetings which are scheduled within 72 hours of request for meeting. Any meeting held without the Engineer in attendance shall not be an official Progress Meeting.

1. Attendees: In addition to representatives of Owner and Engineer, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
    a. Representatives of the Contractor, Subcontractors, and suppliers who are present at the Progress Meetings shall have full authority to commit their respective organizations to decisions, commitments, and agreements made at the progress meetings. The Owner or Engineer shall each have the right to exclude, from any Progress Meeting, without making any statement of reason or cause, any person or persons that the Owner or Engineer may wish to exclude.
2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
        1) Review schedule for next period.
    b. Review present and future needs of each entity present, including the following:
        1) Interface requirements.
        2) Sequence of operations.
        3) Status of submittals.
        4) Deliveries.
        5) Off-site fabrication.
        6) Access.
        7) Site utilization.
        8) Temporary facilities and controls.
        9) Progress cleaning.
        10) Quality and work standards.
        11) Status of correction of deficient items.
        12) Field observations.
        13) Status of RFIs.
        14) Status of proposal requests.
        15) Pending changes.
        16) Status of Change Orders.
        17) Pending claims and disputes.
        18) Documentation of information for payment requests.
3. Chairperson and minutes: The Engineer will chair the meetings and will prepare written minutes of the meeting and distribute electronic copies to participants, with copies to, Owner, Engineer, Contractor and those affected by decisions made prior to the next Progress Meeting. The Contractor shall copy and distribute hard copy meeting minutes to each attendee and each other entity affected by decisions, commitments, and agreements made at the Progress Meetings at the subsequent Progress Meeting.

a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

F. Payment Meetings: Hold Payment Meetings regularly at the project site before preparation of payment requests, at times approved by the Engineer, and generally immediately after the Progress Meetings. Payment Meetings are intended to create a forum for the orderly review of the progress of the work as it relates to the Contractor's applications for progress payments. The Contractor's ordinary business relations with Subcontractors and suppliers are not part of the Payment Meeting's purpose. Subcontractors, suppliers, and other parties may only attend Payment meetings when permitted by the Engineer.

G. Coordination Meetings: The Contractor shall convene and conduct Project Coordination meetings at regular periodic intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.

1. Attendees: In addition to representatives of Owner and Engineer, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meetings shall be familiar with Project and authorized to conclude matters relating to the Work. Attendance by the Contractor and forepersons representing affected Subcontractors is mandatory and a Contract requirement.
2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to combined Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
    b. Schedule Updating: Revise combined Contractor's construction schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
    c. Review present and future needs of each contractor present, including the following:
        1) Interface requirements.
        2) Sequence of operations.
        3) Status of submittals.
        4) Deliveries.
        5) Off-site fabrication.
        6) Access.
        7) Site utilization.
        8) Temporary facilities and controls.
        9) Work hours.
        10) Hazards and risks.
        11) Progress cleaning.
        12) Quality and work standards.
        13) Change Orders.
3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

H. Safety Meetings: The Contractor shall be solely responsible for project site safety and compliance with OSHA and requirements of authorities having jurisdiction. Convene and conduct regular project Safety Meetings, and require all Subcontractors to attend such

meetings. Notify the City of Worcester in advance so that they may attend if they choose so to do.

I. Building Committee Meetings: The Contract requires the Contractor to attend the Owner's Permanent Building Committee meetings, when requested by the Owner or City of Worcester. As a courtesy to the Contractor, the City of Worcester will try to give the Contractor approximately 48 hours advance notice before the Contractor's attendance is required for a Permanent Building Committee meeting.

J. Other meetings of the Owner: The Contract requires the Contractor to attend, when so requested by the City of Worcester, evening meetings of the City and the Building Committee.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 31 00

SECTION 01 32 00

CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
   1. Startup construction schedule.
   2. Contractor's construction schedule.
   3. Construction schedule updating reports.
   4. Daily construction reports.
   5. Material location reports.
   6. Site condition reports.
   7. Special reports.

B. The GC shall provide 2 week look ahead schedules during the scope of the work so that other facility activities can be made aware of the work.

C. Weekly meetings – Contractors will be required to meet with the City once a week for coordination purposes.

D. Related Requirements:
   1. Section 01 33 00 "Submittal Procedures" for submitting schedules and reports.
   2. Section 01 40 00 "Quality Requirements" for submitting a schedule of tests and inspections.

1.3 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
   1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
   2. Predecessor Activity: An activity that precedes another activity in the network.
   3. Successor Activity: An activity that follows another activity in the network.

B. Event: The starting or ending point of an activity.

C. Float: The measure of leeway in starting and completing an activity.
   1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
   2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.

3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

D. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

1.4 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:
1. Working electronic copy of schedule file, where indicated.
2. PDF electronic file.

B. Startup construction schedule.
1. Approval of cost-loaded, startup construction schedule will not constitute approval of schedule of values for cost-loaded activities.

C. Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.

D. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

E. Construction Schedule Updating Reports: Submit with Applications for Payment.

F. Daily Construction Reports: Submit at weekly intervals.

G. Material Location Reports: Submit at monthly intervals.

H. Site Condition Reports: Submit at time of discovery of differing conditions.

I. Special Reports: Submit at time of unusual event.

1.5 QUALITY ASSURANCE

A. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Section 01 31 00 "Project Management and Coordination." Review methods and procedures related to the preliminary construction schedule and Contractor's construction schedule, including, but not limited to, the following:
1. Discuss constraints, including phasing, work stages, area separations and partial Owner occupancy.
2. Review submittal requirements and procedures.
3. Review time required for review of submittals and resubmittals.
4. Review requirements for tests and inspections by independent testing and inspecting agencies.
5. Review time required for Project closeout and Owner startup procedures.
6. Review and finalize list of construction activities to be included in schedule.
7. Review procedures for updating schedule.

1.6 COORDINATION

A. Coordination with other projects: GC will be required to coordinate any construction activities at the building with the owner’s facilities staff, normal City of Worcester operations, and any other contractors working on site at the time of construction.

B. Coordinate Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.
   1. Secure time commitments for performing critical elements of the Work from entities involved.
   2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.
   3.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Time Frame: Extend schedule from date established for the Notice to Proceed to date of final completion.
   1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

B. Activities: Treat each story or separate area as a separate numbered activity for each main element of the Work. Comply with the following:
   1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Engineer.
   2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
   3. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
   4. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Owner’s project manager or engineer's administrative procedures necessary for certification of Substantial Completion.
   5. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and final completion.

C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.

D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion, and including but not limited to the following interim milestones:
   1. Temporary enclosures within existing building.
   2. Start and completion of Accessible Parking Areas.

E. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
   1. Unresolved issues.
   2. Unanswered Requests for Information.
   3. Rejected or unreturned submittals.
   4. Notations on returned submittals.
   5. Pending modifications affecting the Work and Contract Time.

F. Recovery Schedule: When periodic update indicates the Work is (7) seven or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to

working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's construction schedule within 20 days after date of Owner-Contractor Agreement for Owner's project manager or engineer's review. Final Schedule for Approval will be due 50 days after date of Owner-Contractor Agreement. Final Schedule will be due 65 days after date of Owner-Contractor Agreement. Revise and resubmit schedules as required. Base schedule on the startup construction schedule and additional information received since the start of Project.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

C. The Schedule shall show the sequence and phasing of activities required and shall reflect the manner in which actual work will be performed. The number of activities shown in the Schedule must be at least equal and related to the number of items listed in the Schedule of Values including back -up detail.
   1. Show a separate line for each major portion of the Work or operation, or section of the Work, identifying the first workday of each week, and consecutively numbering the weeks of construction.
   2. Show a complete sequence of construction by activity, identifying the Work of separate stages and other logically grouped activities. Indicate the early and late start, the early and late finish, float dates, and the duration. Indicate implementation and termination of each temporary utility.
   3. Define portions of work which are dependent on the schedule of other related activities and phasing.
   4. Define activities on which the work is dependent, including:
      a. Submittal of shop drawings, equipment schedules, samples, color submission, coordination drawings, templates, fabrication, material delivery times,
      b. Engineer's review of shop drawings, equipment schedules, samples and templates,
      c. Delivery times of Owner-furnished equipment.
      d. Provision of work or work by others under separate contract with the Owner.
      e. Commissioning start and duration.
   5. Conclude all activities on one common end date, show contract completion dates for each construction phase as a milestone activity on the Schedule.
   6. Provide a separate schedule of submittal dates for shop drawings, product data, and samples, including Owner furnished Products and Products identified under Allowances, if any, and the dates reviewed submittals will be required from the Engineer. Indicate the decision dates for selection of the finishes.

2.3 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
   1. List of subcontractors at Project site.
   2. List of separate contractors at Project site.
   3. Approximate count of personnel at Project site.
   4. Equipment at Project site.
   5. Material deliveries.
   6. High and low temperatures and general weather conditions, including presence of rain or snow.
   7. Accidents.
   8. Meetings and significant decisions.

9. Unusual events (see special reports).
10. Stoppages, delays, shortages, and losses.
11. Meter readings and similar recordings.
12. Emergency procedures.
13. Orders and requests of authorities having jurisdiction.
14. Change Orders received and implemented.
15. Construction Change Directives received and implemented.
16. Services connected and disconnected.
17. Equipment or system tests and startups.
18. Partial completions and occupancies.
19. Substantial Completions authorized.

B. Material Location Reports: At weekly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site. Indicate the following categories for stored materials:
1. Material stored prior to previous report and remaining in storage.
2. Material stored prior to previous report and since removed from storage and installed.
3. Material stored following previous report and remaining in storage.

C. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Contractor's Construction Schedule Updating: At bi-weekly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before required monthly update.
1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate final completion percentage for each activity.
4. Prepare a Schedule Analysis for submission with revised project schedules. The Schedule Analysis shall include a description of problem areas, current and anticipated delaying factors and their estimated impact on performance of other activities and completion dates, and an explanation of corrective action to be taken. All activities that are behind schedule by more than two weeks shall be addressed individually in the Schedule Analysis.

B. Distribution: Distribute copies of approved schedule to Engineer, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

3. Submit revised schedules with attached Schedule Analysis, with each Application for Payment, submission of revised schedule will be a pre-requisite for Payment; clearly identify changes since previous version. Indicate estimated percentage of completion for each item of Work at each submission.

END OF SECTION 01 32 00

SECTION 01 33 00

SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. Related Requirements:
1. Section 01 79 00 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

1.3 DEFINITIONS

A. **Action Submittals:** Written and graphic information and physical samples that require Engineer's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

B. **Informational Submittals:** Written and graphic information and physical samples that do not require Engineer's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

C. **File Transfer Protocol (FTP):** Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.

D. **Portable Document Format (PDF):** An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.4 ACTION SUBMITTALS

A. Submittal Schedule: Submit a schedule of submittals, within (20) twenty calendar days after being awarded the Contract, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Engineer and additional time for handling and reviewing submittals required by those corrections.
1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
2. Initial Submittal: Submit within 14 days of date established for commencement of the Work. Include submittals required during the first 60 days of construction. List those

submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.

3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.
   a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.
4. Format: Arrange the following information in a tabular format:
   a. Add information, such as scheduled dates for purchasing and installation and the activity or event number, if using a CPM construction schedule.
   b. Submittal Status: Open (action required) or Closed (no action required)
   c. Submittal Number: The numbering of submittals shall include the Specification Section number followed by a dash and then a sequential number. Resubmittals shall include an numeric suffix after another dash
      1) Example: 042000-001-000
   d. Specification Section number and title identifying submittal requirement.
   e. Submittal category: Product Data, Certified Test Reports, Sample, Shop Drawing, Mock-Up, etc…
   f. Name of subcontractor. If applicable
   g. Description of the Work covered.
   h. Scheduled date for first submittal (planned or actual dates).
   i. Scheduled date for second (resubmittal) of disapproved submittals (planned or actual dates)
   j. Type of action by Engineer and consulting engineers (approved; approved as noted; not approved, revise and resubmit).
   k. Date of action by Engineer and consulting engineers (planned and actual dates).
      1) The Engineer's review period, including those of his consultants, will not exceed 30 calendar days from the established date of each submission of shop drawings, product data, and samples, plus the additional time, if any, for distribution by the Contractor and receipt of submissions by the Engineer. The Contractor shall be required to strictly adhere to the dates established in the schedule.
   l. Scheduled date of fabrication.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Engineer's Digital Data Files: Electronic digital data files of the Contract Drawings will be provided by Engineer for Contractor's use in preparing submittals.
   1. Engineer will furnish Contractor one set of digital data drawing files of engineering floor plans only, excluding sheet borders and notes, of the Contract Drawings for use in preparing Shop Drawings. Contractor may purchase additional drawing files by contacting Engineer.
      a. Engineer makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
      b. Digital Drawing Software Program: The Contract Drawings are available in AutoCAD 2015.
      c. Contractor shall execute a data licensing agreement in the form of AIA Document C106, Digital Data Licensing Agreement, or other Agreement furnished by the Engineer.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
   1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
   2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.

3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
    a. Engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Engineer's receipt of submittal. Submittals received after 1:00p.m. Eastern Time on Monday through Friday will be marked received the next business day. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow (30) thirty days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Engineer will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow (30) thirty days for review of each resubmittal.
4. Sequential Review: Where sequential review of submittals by Engineer's consultants, Owner, or other parties is indicated, allow (21) twenty-one days for initial review of each submittal.
5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Engineer and to Engineer's consultants, allow (30) thirty days for review of each submittal. Submittal will be returned to Engineer before being returned to Contractor.

D. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.
    a. File name shall use project identifier and Specification Section number followed by a dash and then a sequential number (e.g., **LNHS-061000-001**). Resubmittals shall include numeric suffix (e.g., LNHS-061000-001**-001**), bolded here for emphasis.
3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Engineer.
4. Transmittal Form for Electronic Submittals: Use electronic cover form (Section 013301) and Product Form (Section 013302) or alternative(s) acceptable to Owner, containing the following information:
    a. Project name.
    b. Date of preparation.
    c. Name and address of Engineer.
    d. Name of Contractor.
    e. Name of firm or entity that prepared submittal.
    f. Names of subcontractor, manufacturer, and supplier.
    g. Category and type of submittal.
    h. Submittal number, purpose and description.
    i. Specification Section number and title.
    j. Specification paragraph number or drawing designation and generic name for each of multiple items.
    k. Drawing number and detail references, as appropriate.
    l. Location(s) where product is to be installed, as appropriate.

m. Related physical samples submitted directly.
n. Indication of full or partial submittal.
o. Transmittal number.
p. Submittal and transmittal distribution record.
q. Other necessary identification.
r. Remarks.
s. Clear identification of the exact number of pages included in the submittal.
t. Statement or stamp of approval by the Contractor, which shall signify that he has seen and examined the drawing, and has complied with the requirements of the GENERAL CONDITIONS.

5. All shop drawings and product data shall be submitted, via the Contractor only, to the Engineer and to the Engineer's applicable consultants. Drawings and product data submitted directly to the Engineer or the respective consultants from subcontractors, manufacturers, or vendors, without prior consent, will be returned to the Contractor without action.

E. Options: Identify options requiring selection by Engineer.

F. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Engineer on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.

G. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Engineer's action stamp.

H. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

I. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Engineer's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
1. Contractor shall identify preferred method of electronic submittal delivery. Once identified, all electronic submittals shall use the same method. Post electronic submittals as PDF electronic files directly to a) Contractor's project web site specifically established for Project (access to be provided to Engineer, City of Worcester and Owner), b) Engineer's FTP site (address to be provided) or c) submit electronic submittals via email as PDF electronic files.
a. Engineer will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

2. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
    a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
    b. Provide a notarized statement on original paper copy certificates and certifications where indicated.
3. Shop drawings and product data relating to various units comprising a proposed assembly shall be submitted simultaneously, so that said unit may be checked individually and as an assembly. For Division 2 through 14 submittals, submission shall include applicable electrical and mechanical components.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:
    a. Manufacturer's catalog cuts: If catalog cuts of standard manufactured items show different types, options, finishes, performance requirements, or other variations, such features which the Contractor proposes to furnish shall be clearly circled or otherwise emphasized, and all irrelevant diagrams, notes, or other information deleted or canceled. If any variations from the catalog description are proposed or required, such variations must be clearly noted on the cut, by the Contractor.
    b. Manufacturer's product specifications and installation instructions.
    c. Standard color charts.
    d. Statement of compliance with specified referenced standards.
    e. Testing by recognized testing agency.
    f. Application of testing agency labels and seals.
    g. Notation of coordination requirements.
    h. Availability and delivery time information.
    i. Mill reports.
4. For equipment, include the following in addition to the above, as applicable:
    a. Wiring diagrams showing factory-installed wiring. Catalog cuts of wiring diagrams will not be acceptable.
    b. Printed performance curves.
    c. Operational range diagrams.
    d. Clearances required to other construction, if not indicated on accompanying Shop Drawings, to include rough-in diagrams and templates.
5. Submit (1) one hard copy of Product Data (in addition to electronic copy) before or concurrent with Samples.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
    a. Identification of products.
    b. Schedules.
    c. Compliance with specified standards.
    d. Notation of coordination requirements.
    e. Notation of dimensions established by field measurement.
    f. Relationship and attachment to adjoining construction clearly indicated.
    g. Seal and signature of professional engineer if specified.

h. Details shall be identified by reference to sheet and detail, schedule or room numbers shown on Contract drawings.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 30 by 42 inches. Unless permitted by Engineer, coordination drawings shall not be drawn smaller than ¼" = 1'-0".
3. Submit Shop Drawings in the following format:
   a. PDF electronic file.
   b. Paper copy: Provide one opaque (bond) copy of each submittal to Engineers, and one copy to each of the Engineer's applicable consulting engineers. Paper copy will not be returned, but will be used by Engineer to assist in review. Provide coordination drawings in color.
4. Shop drawings shall clearly indicate all details, sectional views, arrangements, working and erection dimensions, kinds and quality of materials and their finishes, and other information necessary for proper checking, fabrication, and installation of the items, and shall include all information required for making connections to other work.
5. If any information on previously submitted shop drawings, except for notations made by the Engineer, is revised in any way, such revisions shall be circled or otherwise graphically brought to the Engineer's attention. If approved shop drawings are subsequently revised, they shall be resubmitted to the Engineer with all revisions clearly marked for the Engineer's attention. Whenever drawings are revised, the latest revisions shall be circled, shaded, or otherwise emphasized to distinguish them from clearly from all previous revisions (and from the information on the original drawing). Unless such written notice has been given, the Engineer's approval of a resubmitted shop drawing, product data, or sample, shall not constitute approval of any changes requested on the prior submittal.
6. Should the Engineer, in checking shop drawings, make changes which the Contractor deems will increase the Contract Price, the Contractor shall so inform the Engineer in writing within fourteen (14) calendar days following receipt of the checked shop drawings and prior to starting fabrication of the item or items. Failing this, the Contractor and his Subcontractors shall be deemed to have waived all claims for extra compensation for the work involved.
7. The Contractor shall be responsible for obtaining and distributing copies of approved shop drawings to the applicable subcontractors, material suppliers, and others whose work is affected thereby, at no additional cost to the Owner.
8. The Contractor shall have a complete up-to-date set of all approved shop drawings and product data, at the site, and maintain same in continuous good order, available for inspection at all times by the Engineer and/or the Owner's Representative.

D. Contractor's Construction Schedule: Comply with requirements specified in Section 01 32 00 "Construction Progress Documentation."

E. Emergency Contact Data: Within 15 days of Notice to Proceed, submit to both the Owner and the Engineer, in writing, the name, addresses and telephone numbers of key members of their organization including Superintendent and personnel at the site, to be contacted in the event of emergencies at the building site, which may occur during non-working hours.

F. Application for Payment and Schedule of Values: Comply with requirements specified in Section 01 29 00 "Payment Procedures."

G. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 01 40 00 "Quality Requirements."

H. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 01 77 00 "Closeout Procedures."

I. Maintenance Data: Comply with requirements specified in Section 01 78 23 "Operation and Maintenance Data."

J. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of engineers and owners, and other information specified.

K. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.

L. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

M. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

N. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

O. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

P. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

Q. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

R. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
   1. Name of evaluation organization.
   2. Date of evaluation.
   3. Time period when report is in effect.
   4. Product and manufacturers' names.
   5. Description of product.
   6. Test procedures and results.
   7. Limitations of use.

S. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

T. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

U. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

V. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.2 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a Massachusetts' licensed design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Engineer.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file and three (3) paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. All submittals shall be transmitted electronically to andover.submittals@nv5.com indicating the project number (0220448) and the submittal specification section.

B. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Identify any deviations. Mark with approval stamp before submitting to Engineer.

C. Project Closeout and Maintenance Material Submittals: See requirements in Section 01 77 00 "Closeout Procedures."

D. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

E. Submit satisfactory evidence of kind and quality of materials and equipment if required by Engineer.

F. Notice of tests and inspections required by law or Contract Documents must be submitted to the Engineer prior to tests and inspections, so the Engineer may observe the test.

G. Begin no fabrication or work which requires submittals until return of submittals by Engineer.

H. Information concerning reduction of insurance coverage must be submitted to the Owner with reasonable promptness.

I. Claims (a) for concealed / unknown conditions must be given to the Engineer or Owner within fourteen (14) calendar days after Engineer's written decision; (b) for personal or property damage must be submitted in writing to the Owner within fourteen (14) calendar days of observance; (c) all other claims must be submitted in writing to the Engineer within fourteen (14) calendar days after the event or recognition of the condition giving rise to the claim, whichever is later.

J. Preliminary punch list (contractor's work list)/ request for inspection of Substantial

K. Completion must be given to the Engineer when the General Contractor considers the work substantially complete, the Engineer will then inspect the work. If the Engineer's first inspection discloses work not in conformance with the Contract Documents, submit request for inspection of substantial completion to the Engineer after the General Contractor or Sub-Contractor has made corrections.

L. Request for final inspection should be made when the work is ready for final inspection.

M. Submit affidavit of payment, certificate of insurance, statement of renewability of insurance, consent to surety of final payment, release of liens, claims, etc. to Engineer before final payment is due.

3.2 ENGINEER'S ACTION

A. Action Submittals: Engineer will review each submittal, provide notes and/or make marks to indicate corrections or revisions required, and return it. Engineer will review each submittal for conformance with the Contract Documents, the design intent and will indicate review action, as follows:
   1. **Approved** - No corrections, no marks.
   2. **Approved as noted** - Resubmission not required. Minor amount of corrections; all items can be fabricated without further corrections to original drawing; checking is complete and all corrections are deemed obvious without ambiguity.
   3. **Approved as noted, resubmit for record –** Resubmission is required. FOR RECORD indication after any of the above shop drawing grades indicates acceptance of shop drawing with comments; all items can be fabricated. Corrections to original drawing shall be made by the Contractor and resubmitted to the Engineer and applicable Consultant with corrections as shown in the returned submittal for record. Submit one (1) hardcopy and one (1) electronic PDF copy to Engineer and to applicable consultant. No further action is required.
   4. **Not approved, revise and resubmit** - Resubmission required. Minor amounts of corrections; checking is not complete; details of items noted by checker are to be clarified further before full review can be given. Correct and resubmit, do not fabricate noted items requiring correction.
   5. **Not approved** - Submission is not in accord with the Contract Documents
   6. Not reviewed

B. Informational Submittals: Engineer will review each submittal and will not return it, or will return it if it does not comply with requirements. Engineer will forward each submittal to appropriate party.

C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Engineer.

D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

E. Submittals not required by the Contract Documents may be returned by the Engineer without action.

F. Notes or other information on the shop drawings, labels, transmittals or other items submitted, which are contrary to the provisions of the Contract Documents, shall be deemed to be addressed to the applicable Contractor, subcontractor, material supplier, or other parties involved, and shall have no force or effect with respect to this Contract, even though the shop drawing or sample involved is approved by the Engineer. In particular, the terms "By Others", "N.I.C.", or words of similar meaning and import, on submissions, shall not be deemed to imply that the referenced items are to be omitted from this Contract.

G. Contractor shall provide Owner with two (2) hard copies of all approved submittals.

END OF SECTION 01 33 00

SECTION 01 40 00

QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
   1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
   2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
   3. Requirements for Contractor to provide quality-assurance and -control services required by Engineer, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
   4. Specific test and inspection requirements are not specified in this Section.

1.3 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Engineer.

C. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.
   1. Integrated Exterior Mockups: Mockups of the exterior envelope erected separately from the building but on Project site, consisting of multiple products, assemblies, and subassemblies.

D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.

E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

F. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.

G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
   1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

1.4 CONFLICTING REQUIREMENTS

A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Engineer for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Engineer for a decision before proceeding.

1.5 INFORMATIONAL SUBMITTALS

A. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

1.6 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
   1. Date of issue.
   2. Project title and number.
   3. Name, address, and telephone number of testing agency.
   4. Dates and locations of samples and tests or inspections.
   5. Names of individuals making tests and inspections.
   6. Description of the Work and test and inspection method.

7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, and telephone number of technical representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, and telephone number of factory-authorized service representative making report.
2. Statement that equipment complies with requirements.
3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
4. Statement whether conditions, products, and installation will affect warranty.
5. Other required items indicated in individual Specification Sections.

D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.7 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.

F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
   1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
   1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
   2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

J. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
   1. Build mockups in location and of size indicated or, if not indicated, as directed by Engineer.
   2. Notify Engineer seven days in advance of dates and times when mockups will be constructed.
   3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at Project.
   4. Demonstrate the proposed range of aesthetic effects and workmanship.
   5. Mockup design, construction and testing shall be completed in a timely manner to ensure that there will be no delays in performance and completion of the work for this project. Contractor shall schedule and construct mockup(s) and perform testing to allow for review(s), possible rejection(s), and the need to reconstruct and retest without interfering with the work of others and/or delaying the project schedule.
   6. Mockup(s) shall be fabricated, assembled and glazed (if shop glazed for the project) at the locations where and by the same persons as will do this work for the project. Mockup installation and field glazing and demonstration field glazing procedures shall be performed by the same personnel for the mockup as will do this work on the site.
   7. Tests will be performed under the provisions identified in this Section and identified in the respective product specification Sections.
   8. Assemble and erect the specified items full sized with the specified attachment and anchorage devices, flashings, seals, and finishes.
   9. Provide final lighting or accurate simulation of final lighting for Owner’s and Engineer’s review of in-place interior mockups.

10. Obtain Engineer's approval of mockups before starting work, fabrication, or construction.
    a. Allow seven days for initial review and each re-review of each mockup.
11. The Owner or Engineer may reject in-place mockups for any reason including subjective decisions about color and visual appearance. The Contractor shall remove and replace rejected in-place mock-ups at no additional cost to the Owner. There is no limit on the number of rejections and replacement of in-place mock-ups.
12. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
13. Demolish and remove mockups when directed unless otherwise indicated.

K. Integrated Exterior Mockups: Construct integrated exterior mockup according to approved Shop Drawings. Coordinate installation of exterior envelope materials and products for which mockups are required in individual Specification Sections, along with supporting materials.

1.8 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
1. The Owner will select and provide an independent firm to perform the testing and inspection services. The Owner shall pay for testing and inspection services.
2. The independent firm will perform the tests, inspections and other services specified in the individual specification Sections and as required.
    a. Laboratory: Authorized to operate in the location in which the Project is located.
    b. Laboratory Staff: Maintain a full time registered Engineer on staff to review the services.
    c. Testing Equipment: Calibrated at reasonable intervals with devices of accuracy traceable to either the National Bureau of Standards or to the accepted values of natural physical constants.
3. Testing, inspections and source quality control may occur on or off the project site. Perform off-site testing as required by the Owner.
4. Reports will be submitted by the independent firm to the Owner, the Engineer and the Contractor, in duplicate, indicating the observations and results of tests and indicating the compliance or non- compliance with Contract Documents.
5. Cooperate with the independent firm; furnish samples of the materials, design mix, equipment, tools, storage, safe access, and the assistance by incidental labor as requested.
    a. Notify the Engineer and the independent firm 48 hours prior to the expected time for operations requiring services.
    b. Make arrangements with the independent firm and pay for any additional samples and tests required for the Contractor's use.
6. Testing and employment of the testing agency or laboratory shall not relieve Contractor of an obligation to perform the Work in accordance with the requirements of the Contract Documents.
7. Re-testing or re-inspection required because of a non-conformance to the specified requirements shall be performed by the same independent firm on instructions by the Engineer. Payment for the re-testing or re-inspection will be charged to the Contractor deducting the testing charges from the Contract Sum.
8. Agency Responsibilities:
    a. Test samples of mixes submitted by the Contractor.
    b. Provide qualified personnel at the site. Cooperate with the Engineer and the Contractor in performance of services.
    c. Perform specified sampling and testing of the products in accordance with the specified standards.
    d. Ascertain compliance of the materials and mixes with the requirements of the Contract Documents.

e. Promptly notify the Engineer and the Contractor of observed irregularities or non-conformance of the Work or products.
f. Perform additional tests required by the Owner's Project Manager and the Engineer.
g. Attend the preconstruction meetings and the progress meetings.

9. Agency Reports: After each test, promptly submit two copies of the report to the Engineer and to the Contractor. When requested by the City of Worcester or Engineer, provide an interpretation of the test results.
10. Include the following:
    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 inspection or test.
    h. Date of test.
    i. Results of tests.
    j. Conformance with Contract Documents.
11. Limits On Testing Authority:
    a. Agency or laboratory may not release, revoke, alter, or enlarge on the requirements of the Contract Documents.
    b. Agency or laboratory may not approve or accept any portion of the Work.
    c. Agency or laboratory may not assume any duties of the Contractor.
    d. Agency or laboratory has no authority to stop the Work.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
    a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
3. Notify testing agencies at least 48 hours in advance of time when Work that requires testing or inspecting will be performed.
4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
7. Quality Control and Control of Installation:
    a. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
    b. Comply with manufacturers' instructions, including each step in sequence.
    c. When manufacturers' instructions conflict with Contract Documents, request clarification from Engineer before proceeding.
    d. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
    e. Perform Work by persons qualified to produce required and specified quality.

f. Verify field measurements are as indicated on Shop Drawings or as instructed by manufacturer.
g. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement

8. Tolerances:
   a. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
   b. Comply with manufacturers' tolerances. When manufacturers' tolerances conflict with Contract Documents, request clarification from Engineer before proceeding.
   c. Adjust products to appropriate dimensions; position before securing products in place.
9. Review and Inspection by Contractor: The Contractor shall frequently review and inspect work to ensure compliance with Contract Document requirements and to verify construction tolerances.
   a. Certification Required: At major milestones such as completion of primary structure, completion of secondary structure, completion of interior framing and other logical milestones, the Contractor shall thoroughly check and verify the work completed and installed to date of the certification complies with the Contract Document requirements, is correct and within specified tolerances including, without limitations, tolerances, plumb, level and alignment.
   b. Construction Tolerances: At any time during the work, if construction tolerances are determined to be in excess of limits the tolerances specified in the Contract Documents, the Contractor shall correct the work or cause the work to be corrected to comply with the specified requirements. Improper or non-conforming previous work or substrates is not an acceptable reason for deviating from the Contract Requirements or exceeding specified tolerances.
10. Installer’s Acceptance of Conditions: All installers shall inspect previous work, substrates, related work, and conditions under which work is to be executed and shall report in writing to the Contractor, all deficiencies and conditions detrimental to the proper execution and completion of the work. Do no proceed with work until unsatisfactory conditions are corrected. Beginning work means installer accepts previous work, substrates, related work conditions.
11. Observation: Notify the Engineer at least 72 hours in advance of concealing any work. Comply with requirements of authorities having jurisdiction for notice before concealing work

C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."
   1. When specified in the individual specification Sections, require the material or Product suppliers, or manufacturers, to provide qualified staff personnel to observe the site conditions, the conditions of the surfaces and installation, the quality of workmanship, the start-up of equipment, or test, adjust and balance of equipment as applicable, and to initiate instructions when necessary.
   2. Submit the qualifications of the observer to the Engineer 30 days in advance of the required observations. Observer subject to approval of the Owner and the Engineer.
   3. Report the observations and the site decisions or instructions given to the applicators or installers that are supplemental or contrary to the manufacturers' written instructions.

D. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

E. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

F. Testing Agency Responsibilities: Cooperate with Engineer and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Engineer and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform any duties of Contractor.

G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.9 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Conducted by a qualified testing agency as required by authorities having jurisdiction, as indicated in individual Specification Sections, and as follows:
1. Notifying Engineer and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
2. Submitting a certified written report of each test, inspection, and similar quality-control service to Engineer with copy to Contractor and to authorities having jurisdiction.
3. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
4. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
5. Retesting and reinspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
   1. Date test or inspection was conducted.
   2. Description of the Work tested or inspected.
   3. Date test or inspection results were transmitted to Engineer.
   4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Engineer's reference during normal working hours.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
   1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching.

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01 40 00

SECTION 01 42 00

REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Engineer's action on Contractor's submittals, applications, and requests, "approved" is limited to Engineer's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Engineer. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
   1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.4 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
   1. AABC - Associated Air Balance Council; www.aabc.com.
   2. AAMA - American Architectural Manufacturers Association; www.aamanet.org.
   3. AAPFCO - Association of American Plant Food Control Officials; www.aapfco.org.
   4. AASHTO - American Association of State Highway and Transportation Officials; www.transportation.org.
   5. AATCC - American Association of Textile Chemists and Colorists; www.aatcc.org.
   6. ABMA - American Bearing Manufacturers Association; www.americanbearings.org.
   7. ACI - American Concrete Institute; (Formerly: ACI International); www.concrete.org.
   8. ACPA - American Concrete Pipe Association; www.concrete-pipe.org.
   9. AEIC - Association of Edison Illuminating Companies, Inc. (The); www.aeic.org.
   10. AF&PA - American Forest & Paper Association; www.afandpa.org.
   11. AGA - American Gas Association; www.aga.org.
   12. AHAM - Association of Home Appliance Manufacturers; www.aham.org.
   13. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); www.ahrinet.org.
   14. AI - Asphalt Institute; www.asphaltinstitute.org.
   15. AIA - American Institute of Architects (The); www.aia.org.
   16. AISC - American Institute of Steel Construction; www.aisc.org.
   17. AISI - American Iron and Steel Institute; www.steel.org.
   18. AITC - American Institute of Timber Construction; www.aitc-glulam.org.
   19. AMCA - Air Movement and Control Association International, Inc.; www.amca.org.
   20. ANSI - American National Standards Institute; www.ansi.org.
   21. AOSA - Association of Official Seed Analysts, Inc.; www.aosaseed.com.
   22. APA - APA - The Engineered Wood Association; www.apawood.org.
   23. APA - Architectural Precast Association; www.archprecast.org.
   24. API - American Petroleum Institute; www.api.org.
   25. ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).
   26. ARI - American Refrigeration Institute; (See AHRI).
   27. ARMA - Asphalt Roofing Manufacturers Association; www.asphaltroofing.org.
   28. ASCE - American Society of Civil Engineers; www.asce.org.
   29. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
   30. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; www.ashrae.org.
   31. ASME - ASME International; (American Society of Mechanical Engineers); www.asme.org.
   32. ASSE - American Society of Safety Engineers (The); www.asse.org.
   33. ASSE - American Society of Sanitary Engineering; www.asse-plumbing.org.
   34. ASTM - ASTM International; (American Society for Testing and Materials International); www.astm.org.
   35. ATIS - Alliance for Telecommunications Industry Solutions; www.atis.org.
   36. AWEA - American Wind Energy Association; www.awea.org.
   37. AWI - Architectural Woodwork Institute; www.awinet.org.
   38. AWMAC - Architectural Woodwork Manufacturers Association of Canada; www.awmac.com.

39. AWPA - American Wood Protection Association; (Formerly: American Wood-Preservers' Association); www.awpa.com.
40. AWS - American Welding Society; www.aws.org.
41. AWWA - American Water Works Association; www.awwa.org.
42. BHMA - Builders Hardware Manufacturers Association; www.buildershardware.com.
43. BIA - Brick Industry Association (The); www.gobrick.com.
44. BICSI - BICSI, Inc.; www.bicsi.org.
45. BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association); www.bifma.com.
46. BISSC - Baking Industry Sanitation Standards Committee; www.bissc.org.
47. BOCA - BOCA; (Building Officials and Code Administrators International Inc.); (See ICC).
48. BWF - Badminton World Federation; (Formerly: International Badminton Federation); www.bwfbadminton.org.
49. CDA - Copper Development Association; www.copper.org.
50. CEA - Canadian Electricity Association; www.electricity.ca.
51. CEA - Consumer Electronics Association; www.ce.org.
52. CFFA - Chemical Fabrics & Film Association, Inc.; www.chemicalfabricsandfilm.com.
53. CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
54. CGA - Compressed Gas Association; www.cganet.com.
55. CIMA - Cellulose Insulation Manufacturers Association; www.cellulose.org.
56. CISCA - Ceilings & Interior Systems Construction Association; www.cisca.org.
57. CISPI - Cast Iron Soil Pipe Institute; www.cispi.org.
58. CLFMI - Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.
59. CPA - Composite Panel Association; www.pbmdf.com.
60. CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
61. CRRC - Cool Roof Rating Council; www.coolroofs.org.
62. CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
63. CSA - Canadian Standards Association; www.csa.ca.
64. CSA - CSA International; (Formerly: IAS - International Approval Services); www.csa-international.org.
65. CSI - Construction Specifications Institute (The); www.csinet.org.
66. CSSB - Cedar Shake & Shingle Bureau; www.cedarbureau.org.
67. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); www.cti.org.
68. CWC - Composite Wood Council; (See CPA).
69. DASMA - Door and Access Systems Manufacturers Association; www.dasma.com.
70. DHI - Door and Hardware Institute; www.dhi.org.
71. ECA - Electronic Components Association; www.ec-central.org.
72. ECAMA - Electronic Components Assemblies & Materials Association; (See ECA).
73. EIA - Electronic Industries Alliance; (See TIA).
74. EIMA - EIFS Industry Members Association; www.eima.com.
75. EJMA - Expansion Joint Manufacturers Association, Inc.; www.ejma.org.
76. ESD - ESD Association; (Electrostatic Discharge Association); www.esda.org.
77. ESTA - Entertainment Services and Technology Association; (See PLASA).
78. EVO - Efficiency Valuation Organization; www.evo-world.org.
79. FIBA - Federation Internationale de Basketball; (The International Basketball Federation); www.fiba.com.
80. FIVB - Federation Internationale de Volleyball; (The International Volleyball Federation); www.fivb.org.
81. FM Approvals - FM Approvals LLC; www.fmglobal.com.
82. FM Global - FM Global; (Formerly: FMG - FM Global); www.fmglobal.com.
83. FRSA - Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.; www.floridaroof.com.
84. FSA - Fluid Sealing Association; www.fluidsealing.com.
85. FSC - Forest Stewardship Council U.S.; www.fscus.org.
86. GA - Gypsum Association; www.gypsum.org.
87. GANA - Glass Association of North America; www.glasswebsite.com.

88. GS - Green Seal; www.greenseal.org.
89. HI - Hydraulic Institute; www.pumps.org.
90. HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
91. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
92. HPVA - Hardwood Plywood & Veneer Association; www.hpva.org.
93. HPW - H. P. White Laboratory, Inc.; www.hpwhite.com.
94. IAPSC - International Association of Professional Security Consultants; www.iapsc.org.
95. IAS - International Approval Services; (See CSA).
96. ICBO - International Conference of Building Officials; (See ICC).
97. ICC - International Code Council; www.iccsafe.org.
98. ICEA - Insulated Cable Engineers Association, Inc.; www.icea.net.
99. ICPA - International Cast Polymer Alliance; www.icpa-hq.org.
100. ICRI - International Concrete Repair Institute, Inc.; www.icri.org.
101. IEC - International Electrotechnical Commission; www.iec.ch.
102. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); www.ieee.org.
103. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); www.ies.org.
104. IESNA - Illuminating Engineering Society of North America; (See IES).
105. IEST - Institute of Environmental Sciences and Technology; www.iest.org.
106. IGMA - Insulating Glass Manufacturers Alliance; www.igmaonline.org.
107. IGSHPA - International Ground Source Heat Pump Association; www.igshpa.okstate.edu.
108. ILI - Indiana Limestone Institute of America, Inc.; www.iliai.com.
109. Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); www.intertek.com.
110. ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); www.isa.org.
111. ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
112. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); www.isfanow.org.
113. ISO - International Organization for Standardization; www.iso.org.
114. ISSFA - International Solid Surface Fabricators Association; (See ISFA).
115. ITU - International Telecommunication Union; www.itu.int/home.
116. KCMA - Kitchen Cabinet Manufacturers Association; www.kcma.org.
117. LMA - Laminating Materials Association; (See CPA).
118. LPI - Lightning Protection Institute; www.lightning.org.
119. MBMA - Metal Building Manufacturers Association; www.mbma.com.
120. MCA - Metal Construction Association; www.metalconstruction.org.
121. MFMA - Maple Flooring Manufacturers Association, Inc.; www.maplefloor.org.
122. MFMA - Metal Framing Manufacturers Association, Inc.; www.metalframingmfg.org.
123. MHIA - Material Handling Industry of America; www.mhia.org.
124. MIA - Marble Institute of America; www.marble-institute.com.
125. MMPA - Moulding & Millwork Producers Association; (Formerly: Wood Moulding & Millwork Producers Association); www.wmmpa.com.
126. MPI - Master Painters Institute; www.paintinfo.com.
127. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; www.mss-hq.org.
128. NAAMM - National Association of Architectural Metal Manufacturers; www.naamm.org.
129. NACE - NACE International; (National Association of Corrosion Engineers International); www.nace.org.
130. NADCA - National Air Duct Cleaners Association; www.nadca.com.
131. NAIMA - North American Insulation Manufacturers Association; www.naima.org.
132. NBGQA - National Building Granite Quarries Association, Inc.; www.nbgqa.com.
133. NCAA - National Collegiate Athletic Association (The); www.ncaa.org.
134. NCMA - National Concrete Masonry Association; www.ncma.org.
135. NEBB - National Environmental Balancing Bureau; www.nebb.org.
136. NECA - National Electrical Contractors Association; www.necanet.org.

137. NeLMA - Northeastern Lumber Manufacturers Association; www.nelma.org.
138. NEMA - National Electrical Manufacturers Association; www.nema.org.
139. NETA - InterNational Electrical Testing Association; www.netaworld.org.
140. NFHS - National Federation of State High School Associations; www.nfhs.org.
141. NFPA - NFPA; (National Fire Protection Association); www.nfpa.org.
142. NFPA - NFPA International; (See NFPA).
143. NFRC - National Fenestration Rating Council; www.nfrc.org.
144. NHLA - National Hardwood Lumber Association; www.nhla.com.
145. NLGA - National Lumber Grades Authority; www.nlga.org.
146. NOFMA - National Oak Flooring Manufacturers Association; (See NWFA).
147. NOMMA - National Ornamental & Miscellaneous Metals Association; www.nomma.org.
148. NRCA - National Roofing Contractors Association; www.nrca.net.
149. NRMCA - National Ready Mixed Concrete Association; www.nrmca.org.
150. NSF - NSF International; (National Sanitation Foundation International); www.nsf.org.
151. NSPE - National Society of Professional Engineers; www.nspe.org.
152. NSSGA - National Stone, Sand & Gravel Association; www.nssga.org.
153. NTMA - National Terrazzo & Mosaic Association, Inc. (The); www.ntma.com.
154. NWFA - National Wood Flooring Association; www.nwfa.org.
155. PCI - Precast/Prestressed Concrete Institute; www.pci.org.
156. PDI - Plumbing & Drainage Institute; www.pdionline.org.
157. PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association); www.plasa.org.
158. RCSC - Research Council on Structural Connections; www.boltcouncil.org.
159. RFCI - Resilient Floor Covering Institute; www.rfci.com.
160. RIS - Redwood Inspection Service; www.redwoodinspection.com.
161. SAE - SAE International; (Society of Automotive Engineers); www.sae.org.
162. SCTE - Society of Cable Telecommunications Engineers; www.scte.org.
163. SDI - Steel Deck Institute; www.sdi.org.
164. SDI - Steel Door Institute; www.steeldoor.org.
165. SEFA - Scientific Equipment and Furniture Association; www.sefalabs.com.
166. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
167. SIA - Security Industry Association; www.siaonline.org.
168. SJI - Steel Joist Institute; www.steeljoist.org.
169. SMA - Screen Manufacturers Association; www.smainfo.org.
170. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
171. SMPTE - Society of Motion Picture and Television Engineers; www.smpte.org.
172. SPFA - Spray Polyurethane Foam Alliance; www.sprayfoam.org.
173. SPIB - Southern Pine Inspection Bureau; www.spib.org.
174. SPRI - Single Ply Roofing Industry; www.spri.org.
175. SRCC - Solar Rating and Certification Corporation; www.solar-rating.org.
176. SSINA - Specialty Steel Industry of North America; www.ssina.com.
177. SSPC - SSPC: The Society for Protective Coatings; www.sspc.org.
178. STI - Steel Tank Institute; www.steeltank.com.
179. SWI - Steel Window Institute; www.steelwindows.com.
180. SWPA - Submersible Wastewater Pump Association; www.swpa.org.
181. TCA - Tilt-Up Concrete Association; www.tilt-up.org.
182. TCNA - Tile Council of North America, Inc.; (Formerly: Tile Council of America); www.tileusa.com.
183. TEMA - Tubular Exchanger Manufacturers Association, Inc.; www.tema.org.
184. TIA - Telecommunications Industry Association; (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); www.tiaonline.org.
185. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).

186. TMS - The Masonry Society; www.masonrysociety.org.
187. TPI - Truss Plate Institute; www.tpinst.org.
188. TPI - Turfgrass Producers International; www.turfgrasssod.org.
189. TRI - Tile Roofing Institute; www.tileroofing.org.
190. UBC - Uniform Building Code; (See ICC).
191. UL - Underwriters Laboratories Inc.; www.ul.com.
192. UNI - Uni-Bell PVC Pipe Association; www.uni-bell.org.
193. USAV - USA Volleyball; www.usavolleyball.org.
194. USGBC - U.S. Green Building Council; www.usgbc.org.
195. USITT - United States Institute for Theatre Technology, Inc.; www.usitt.org.
196. WASTEC - Waste Equipment Technology Association; www.wastec.org.
197. WCLIB - West Coast Lumber Inspection Bureau; www.wclib.org.
198. WCMA - Window Covering Manufacturers Association; www.wcmanet.org.
199. WDMA - Window & Door Manufacturers Association; www.wdma.com.
200. WI - Woodwork Institute; (Formerly: WIC - Woodwork Institute of California); www.wicnet.org.
201. WMMPA - Wood Moulding & Millwork Producers Association; (See MMPA).
202. WSRCA - Western States Roofing Contractors Association; www.wsrca.com.
203. WPA - Western Wood Products Association; www.wwpa.org.

B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.
   1. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.
   2. ICC - International Code Council; www.iccsafe.org.
   3. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.

C. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Information is subject to change and is up-to-date as of the date of the Contract Documents.
   1. COE - Army Corps of Engineers; www.usace.army.mil.
   2. CPSC - Consumer Product Safety Commission; www.cpsc.gov.
   3. DOC - Department of Commerce; National Institute of Standards and Technology; www.nist.gov.
   4. DOD - Department of Defense; http://dodssp.daps.dla.mil.
   5. DOE - Department of Energy; www.energy.gov.
   6. EPA - Environmental Protection Agency; www.epa.gov.
   7. FAA - Federal Aviation Administration; www.faa.gov.
   8. FG - Federal Government Publications; www.gpo.gov.
   9. GSA - General Services Administration; www.gsa.gov.
   10. HUD - Department of Housing and Urban Development; www.hud.gov.
   11. LBL - Lawrence Berkeley National Laboratory; Environmental Energy Technologies Division; http://eetd.lbl.gov.
   12. OSHA - Occupational Safety & Health Administration; www.osha.gov.
   13. SD - Department of State; www.state.gov.
   14. TRB - Transportation Research Board; National Cooperative Highway Research Program; www.trb.org.
   15. USDA - Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; www.ars.usda.gov.
   16. USDA - Department of Agriculture; Rural Utilities Service; www.usda.gov.
   17. USDJ - Department of Justice; Office of Justice Programs; National Institute of Justice; www.ojp.usdoj.gov.
   18. USP - U.S. Pharmacopeia; www.usp.org.
   19. USPS - United States Postal Service; www.usps.com.

D. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
   1. CFR - Code of Federal Regulations; Available from Government Printing Office; www.gpo.gov/fdsys.
   2. DOD - Department of Defense; Military Specifications and Standards; Available from Department of Defense Single Stock Point; http://dodssp.daps.dla.mil.
   3. DSCC - Defense Supply Center Columbus; (See FS).
   4. FED-STD - Federal Standard; (See FS).
   5. FS - Federal Specification; Available from Department of Defense Single Stock Point; http://dodssp.daps.dla.mil.
      a. Available from Defense Standardization Program; www.dsp.dla.mil.
      b. Available from General Services Administration; www.gsa.gov.
      c. Available from National Institute of Building Sciences/Whole Building Design Guide; www.wbdg.org/ccb.
   6. MILSPEC - Military Specification and Standards; (See DOD).
   7. USAB - United States Access Board; www.access-board.gov.
   8. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).

E. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
   1. CBHF - State of California; Department of Consumer Affairs; Bureau of Electronic Appliance and Repair, Home Furnishings and Thermal Insulation; www.bearhfti.ca.gov.
   2. CCR - California Code of Regulations; Office of Administrative Law; California Title 24 Energy Code; www.calregs.com.
   3. CDHS - California Department of Health Services; (See CDPH).
   4. CDPH - California Department of Public Health; Indoor Air Quality Program; www.cal-iaq.org.
   5. CPUC - California Public Utilities Commission; www.cpuc.ca.gov.
   6. SCAQMD - South Coast Air Quality Management District; www.aqmd.gov.
   7. TFS - Texas Forest Service; Forest Resource Development and Sustainable Forestry; http://txforestservice.tamu.edu.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 42 00

SECTION 01 60 00

PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements governing Contractor's selection of products for use in Project where named by specific manufacturer and/or product or described by physical properties without naming manufacturer and/or product; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

B. Related Requirements:
   1. Section 01 42 00 "References" for applicable industry standards for products specified.

1.3 DEFINITIONS

A. General:
   1. Definitions used in this Article are not intended to change meaning of other terms used in Contract Documents, such as, specialties, systems, structure, finishes, accessories, and similar terms.
   2. Such terms are self-explanatory and have well recognized meanings in construction industry.

B. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
   1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
   2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
   3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

C. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

D. Foreign products, as distinguished from domestic products, are items substantially manufactured (50 percent or more of value) outside of United States and its possessions; or

produced or supplied by entities substantially owned (more than 50 percent) by persons who are not citizens of nor living within United States and its possessions.

E. Materials: Products substantially shaped, cut, worked, mixed, finished, refined, or otherwise fabricated, processed, or installed to form part of work.

F. Equipment: Product with operational parts, whether motorized or manually operated, requiring service connections such as wiring or piping.

1.4 DEVIATIONS FROM PLANS AND SPECIFICATIONS:

A.

M.G.L. c.30, '39I: Deviations from plans and specifications.
Every contractor having a contract for the construction, alteration, maintenance, repair or demolition of, or addition to, any public building or public works for the commonwealth, or of any political subdivision thereof, shall perform all the work required by such contract in conformity with the plans and specifications contained therein. No willful and substantial deviation from said plans and specifications shall be made unless authorized in writing by the awarding authority or by the engineer or architect in charge of the work who is duly authorized by the awarding authority to approve such deviations. In order to avoid delays in the prosecution of the work required by such contract such deviation from the plans or specifications may be authorized by a written order of the awarding authority or such engineer or architect so authorized to approve such deviation. Within thirty days thereafter, such written order shall be confirmed by a certificate of the awarding authority stating:
(1) if such deviation involves any substitution or elimination of materials, fixtures or equipment, the reasons why such materials, fixtures or equipment were included in the first instance and the reasons for substitution or elimination, and, if the deviation is of any other nature, the reasons for such deviation, giving justification therefor;
(2) that the specified deviation does not materially injure the project as a whole;
(3) that either the work substituted for the work specified is of the same cost and quality, or that an equitable adjustment has been agreed upon between the contracting agency and the contractor and the amount in dollars of said adjustment; and
(4) that the deviation is in the best interest of the contracting authority.
Such certificate shall be signed under the penalties of perjury and shall be a permanent part of the file record of the work contracted for.
Whoever violates any provision of this section willfully and with intent to defraud shall be punished by a fine of not more than five thousand dollars or by imprisonment for not more than six months, or both.

1.5 ACTION SUBMITTALS

A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
   1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
   2. Engineer's Action: If necessary, Engineer will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Engineer will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
      a. Form of Approval: As specified in Section 01 33 00 "Submittal Procedures."

B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 01 33 00 "Submittal Procedures." Show compliance with requirements.

C. Product List Schedule:
   1. Prepare Schedule showing products specified in tabular form acceptable to Engineer.
   2. Include generic names of products required.
   3. Include manufacturer's name and proprietary product names for each item listed.
   4. Coordinate Product List Schedule with Contractor's Construction Schedule and Schedule of Submittals.
   5. Form: Prepare Product Listing Schedule with information on each item tabulated under following column headings.
      a. Related Specification Section number.
      b. Generic name as used in Contract Documents.
      c. Proprietary name, model number, and similar designations.
      d. Manufacturer's name and address.
      e. Supplier's name and address.
      f. Installer's name and address.
      g. Projected delivery date, or time span of delivery period.
   6. Submittal:
      a. Within 30 days after date of commencement of work, submit 3 copies of initial Product List Schedule.
      b. Provide written explanation for omissions of data, and for known variations from Contract requirements.
      c. At Contractor's option, initial submittal may be limited to product selections and designations that must be established early in Contract period.
   7. Completed Schedule:
      a. Within 60 days after commencement of work, submit 3 copies of completed Product List Schedule.
      b. Provide written explanation for omissions of data and for known variations from Contract requirements.
   8. Engineer's Action:
      a. Engineer will respond to Contractor in writing within 2 weeks of receipt of completed Product List Schedule.
      b. No response within this time constitutes no objection to listed products or manufacturers, but does not constitute waiver of requirement that products comply with Contract Documents.
      c. Engineer's response will include following: List of unacceptable product selections, containing brief explanation of reasons for this action.

1.6 QUALITY ASSURANCE

A. Source Limitations: To fullest extent possible, provide products of same kind, from single source.
   1. When specified products are available only from sources that do not or cannot produce quantity adequate to complete Project requirements in timely manner, consult with Engineer for determination of most important product qualities before proceeding.
   2. Qualities may include attributes relating to visual appearance, strength, structural, durability, or compatibility.
   3. When determination has been made, select products from sources that produce products possessing these qualities, to fullest extent possible.

B. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1. Each prime Contractor is responsible for providing products and construction methods compatible with products and construction methods of other prime or separate Contractors.
2. If a dispute arises between prime Contractors over concurrently selectable but incompatible products, Engineer will determine which products shall be used.

C. Foreign Product Limitations: Except under one or more of following conditions, provide domestic, not foreign, products for inclusion in work.
1. No available domestic product complies with Contract Documents.
2. Domestic products complying with Contract Documents are only available at prices or terms substantially higher than foreign products complying with Contract Documents.

D. Nameplates:
1. Except for required labels and operating data, do not attach or imprint manufacturers or producer's nameplates or trademarks on exposed surfaces of products that will be exposed to view in occupied spaces or on exterior.
2. Labels: Locate required product labels and stamps on concealed surface or, where required for observation after installation, on accessible surface that is not conspicuous.
3. Equipment Nameplates:
   a. Provide permanent nameplate on each item of service-connected or power-operated equipment.
   b. Locate on easily accessible surface that is inconspicuous in occupied spaces.
   c. Nameplate shall contain following information and other essential operating data: Name of Product or Manufacturer, Model and Serial Number, Capacity, Speed, Ratings.

1.7 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:
1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:
1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.

1.8 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
   1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
   2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
   1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
   2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
   3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Section 017700 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
   1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
   2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
   3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
   4. Where products are accompanied by the term "as selected," Engineer will make selection.
   5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
   6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures:
   1. Product selection is governed by Contract Documents and governing regulations, not by previous Project experience.
   2. Semi-proprietary Specification Requirements:
      a. Where three or more products or manufacturers are named, provide one of indicated products.
      b. Where products or manufacturers are specified by name, it is inferred terms "or equal," or "or approved equal," are included in compliance with M.G.L. Chapter 30, '39M; comply with Section 01631 concerning "substitutions" for "or equal," or "or approved equal," to obtain approval for use of unnamed product; substitutions will be processed as Change Order Requests.
   3. Performance Specification Requirements:

a. Where Specifications require compliance with performance requirements, provide products complying with these requirements, and are recommended by manufacturer for application indicated.
b. General overall performance of product is implied where product is specified for specific application.
c. Manufacturer's recommendations may be contained in published product literature, or by manufacturer's certification of performance.

4. Compliance with Standards, Codes and Regulations: Where Specifications only require compliance with imposed code, standard, or regulation, select product complying with standards, codes, or regulations specified.
5. Visual Matching:
   a. Where Specifications require matching established sample, Engineer's decision will be final on whether proposed product matches satisfactorily.
   b. Where no product available within specified category matches satisfactorily and also complies with other specified requirements, comply with provisions of Contract Documents concerning "substitutions" for selection of matching product in another product category, or for noncompliance with specified requirements.
6. Visual Selection:
   a. Where specified product requirements include phrase ". . . as selected from manufacturer's standard colors, patterns, textures . . ." or similar phrase, select product and manufacturer complying with other specified requirements.
   b. Engineer will select color, pattern, and texture from product line selected.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration: Engineer will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Engineer may return requests without action, except to record noncompliance with these requirements:
   1. Evidence that the proposed product does not require revisions to the Contract Documents that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
   2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
   3. Evidence that proposed product provides specified warranty.
   4. List of similar installations for completed projects with project names and addresses and names and addresses of engineers and owners, if requested.
   5. Samples, if requested.

PART 3 - EXECUTION

3.1 INSTALLATION OF PRODUCTS

A. Comply with manufacturer's instructions and recommendations for installation of products in applications indicated.

B. Anchor each product securely in space, accurately located, and aligned with other work.

C. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

END OF SECTION 01 60 00

SECTION 01 77 00

CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
   1. Substantial Completion procedures.
   2. Final completion procedures.
   3. Warranties.
   4. Final cleaning.
   5. Repair of the Work.

B. Related Requirements:
   1. Section 01 79 00 "Demonstration and Training" for requirements for instructing Owner's personnel.

1.3 ACTION SUBMITTALS

A. Product Data: For cleaning agents.
B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.4 CLOSEOUT SUBMITTALS

A. Certificates of Release: From authorities having jurisdiction.
B. Certificate of Insurance: For continuing coverage.
C. Field Report: For pest control inspection.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.6 SUBSTANTIAL COMPLETION PROCEDURES

A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.
B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 business days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Owner and/or Engineer. Label with manufacturer's name and model number where applicable.
    a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Engineer's signature for receipt of submittals.
5. Submit test/adjust/balance records.
6. Submit sustainable design submittals not previously submitted.
7. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 business days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Advise Owner of pending insurance changeover requirements.
2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
3. Complete startup and testing of systems and equipment.
4. Perform preventive maintenance on equipment used prior to Substantial Completion.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 01 79 00 "Demonstration and Training."
6. Advise Owner of changeover in heat and/or other utilities.
7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
9. Complete final cleaning requirements, including touchup painting.
10. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 business days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Engineer will either proceed with inspection or notify Contractor of unfulfilled requirements. Engineer will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Engineer, that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for final completion.

1.7 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:
   1. Submit a final Application for Payment according to Section 01 29 00 "Payment Procedures."
   2. Certified List of Incomplete Items: Submit certified copy of Engineer's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Engineer. A certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
   3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
   4. Submit pest-control final inspection report.

B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 business days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Engineer will either proceed with inspection or notify Contractor of unfulfilled requirements. Engineer will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
   1. Re-inspection: Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.8 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction. Use CSI Form 14.1A.
   1. Organize list of spaces in sequential order, starting with exterior areas first.
   2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
   3. Include the following information at the top of each page:
      a. Project name.
      b. Date.
      c. Name of Engineer.
      d. Name of Contractor, or Subcontractor.
      e. Page number.
   4. Submit list of incomplete items in the following format as agreed upon between Owner, Engineer and Contractor:
      a. MS Excel electronic file. Engineer will return annotated file.
      b. PDF electronic file. Engineer will return annotated file.

1.9 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Engineer for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.
B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.

1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.
   1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
   1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
      a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
      b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
      c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
      d. Remove tools, construction equipment, machinery, and surplus material from Project site.
      e. Remove snow and ice to provide safe access to building.
      f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.

g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
h. Sweep floors broom clean in unoccupied spaces.
i. Vacuum floors and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
k. Remove labels that are not permanent.
l. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
m. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
n. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
o. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
p. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
q. Leave Project clean and ready for occupancy.

C. Construction Waste Disposal: Comply with waste disposal requirements in Section 01 74 19 "Construction Waste Management and Disposal."

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.
B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.
a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION 017700

SECTION 01 79 00

DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
   1. Demonstration of operation of systems, subsystems, and equipment.
   2. Training in operation and maintenance of systems, subsystems, and equipment.
   3. Demonstration and training video recordings.

1.3 INFORMATIONAL SUBMITTALS

A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
   1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.

B. Qualification Data: For instructor.

C. Attendance Record: For each training module, submit list of participants and length of instruction time.

D. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

1.4 CLOSEOUT SUBMITTALS

A. Demonstration and Training Video Recordings: Submit two (2) copies within seven (7) days of end of each training module.
   1. Identification: On each copy, provide an applied label with the following information:
      a. Name of Project.
      b. Name and address of videographer.
      c. Name of Engineer.
      d. Name of Contractor.
      e. Date of video recording.
   2. Transcript: Hard copy and PDF electronic format prepared and bound in format matching operation and maintenance manuals. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding video recording. Include name of Project and date of video recording on each page.

3. At completion of training, submit complete training manual(s) for Owner's use prepared and bound in format matching operation and maintenance manuals and in PDF electronic file format on compact disc.

1.5 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 01 40 00 "Quality Requirements," experienced in operation and maintenance procedures and training.

C. Videographer Qualifications: A professional videographer who is experienced photographing demonstration and training events similar to those required.

D. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Section 01 31 00 "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:
1. Inspect and discuss locations and other facilities required for instruction.
2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
3. Review required content of instruction.
4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.6 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Engineer.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system (BMS controls, air handlers, fans, etc.) and for equipment not part of a system, as required by individual Specification Sections.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
1. Basis of System Design, Operational Requirements, and Criteria: Include the following:

a. System, subsystem, and equipment descriptions.
b. Performance and design criteria if Contractor is delegated design responsibility.
c. Operating standards.
d. Regulatory requirements.
e. Equipment function.
f. Operating characteristics.
g. Limiting conditions.
h. Performance curves.

2. Documentation: Review the following items in detail:
   a. Emergency manuals.
   b. Operations manuals.
   c. Maintenance manuals.
   d. Project record documents.
   e. Identification systems.
   f. Warranties and bonds.
   g. Maintenance service agreements and similar continuing commitments.
3. Emergencies: Include the following, as applicable:
   a. Instructions on meaning of warnings, trouble indications, and error messages.
   b. Instructions on stopping.
   c. Shutdown instructions for each type of emergency.
   d. Operating instructions for conditions outside of normal operating limits.
   e. Sequences for electric or electronic systems.
   f. Special operating instructions and procedures.
4. Operations: Include the following, as applicable:
   a. Startup procedures.
   b. Equipment or system break-in procedures.
   c. Routine and normal operating instructions.
   d. Regulation and control procedures.
   e. Control sequences.
   f. Safety procedures.
   g. Instructions on stopping.
   h. Normal shutdown instructions.
   i. Operating procedures for emergencies.
   j. Operating procedures for system, subsystem, or equipment failure.
   k. Seasonal and weekend operating instructions.
   l. Required sequences for electric or electronic systems.
   m. Special operating instructions and procedures.
5. Adjustments: Include the following:
   a. Alignments.
   b. Checking adjustments.
   c. Noise and vibration adjustments.
   d. Economy and efficiency adjustments.
6. Troubleshooting: Include the following:
   a. Diagnostic instructions.
   b. Test and inspection procedures.
7. Maintenance: Include the following:
   a. Inspection procedures.
   b. Types of cleaning agents to be used and methods of cleaning.
   c. List of cleaning agents and methods of cleaning detrimental to product.
   d. Procedures for routine cleaning
   e. Procedures for preventive maintenance.
   f. Procedures for routine maintenance.
   g. Instruction on use of special tools.
8. Repairs: Include the following:

a. Diagnosis instructions.
b. Repair instructions.
c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
d. Instructions for identifying parts and components.
e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 017823 "Operation and Maintenance Data."

B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.

B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
1. Owner will furnish Contractor with names and positions of participants.

C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
1. Schedule training with Owner, through Engineer, with at least seven (7) days' advance notice.

D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

E. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a demonstration performance-based test.

F. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

3.3 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

A. Video: Provide minimum 640 x 480 video resolution converted to format file type acceptable to Owner, on electronic media.
1. Electronic Media: Read-only format compact disc acceptable to Owner, with commercial-grade graphic label.
2. File Hierarchy: Organize folder structure and file locations according to project manual table of contents. Provide complete screen-based menu.
3. File Names: Utilize file names based upon name of equipment generally described in video segment, as identified in Project specifications.

4. Contractor and Installer Contact File: Using appropriate software, create a file for inclusion on the Equipment Demonstration and Training DVD that describes the following for each Contractor involved on the Project, arranged according to Project table of contents:
    a. Name of Contractor/Installer.
    b. Business address.
    c. Business phone number.
    d. Point of contact.
    e. E-mail address.

B. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to adequately cover area of demonstration and training. Display continuous running time.
1. Film training session(s) in segments not to exceed 15 minutes.
    a. Produce segments to present a single significant piece of equipment per segment.
    b. Organize segments with multiple pieces of equipment to follow order of Project Manual table of contents.
    c. Where a training session on a particular piece of equipment exceeds 15 minutes, stop filming and pause training session. Begin training session again upon commencement of new filming segment.

C. Light Levels: Verify light levels are adequate to properly light equipment. Verify equipment markings are clearly visible prior to recording.
1. Furnish additional portable lighting as required.

D. Narration: Describe scenes on video recording by audio narration by microphone while video recording is recorded. Include description of items being viewed.

E. Transcript: Provide a transcript of the narration. Display images and running time captured from videotape opposite the corresponding narration segment.

F. Pre-produced Video Recordings: Provide video recordings used as a component of training modules in same format as recordings of live training.

G. Review all Specification Divisions and Drawings for specific system requirements. At a minimum, all new systems, portions of systems and equipment will be included. Include 8 hours of total instruction time.

END OF SECTION 01 79 00

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SECTION 26 00 00

ELECTRICAL

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. The GENERAL REQUIREMENTS, DIVISION 1, and BIDDING AND CONTRACT REQUIREMENTS, DIVISION 0, are hereby made a part of this Specification Section.

B. Examine all drawings and all sections of the specifications and requirements and provisions affecting the work of this section.

C. The work listed in the following sections shall be made part of this Specification Section:

26 05 74	Short Circuit, Coordination and Arc Flash Study
26 32 14	Generator – Natural Gas
26 36 00	Automatic Transfer Switch

1.2 SCOPE OF WORK

A. This project includes the replacement of an existing gas-fired standby generator and automatic transfer switch. Selective demolition of existing systems shall be required.

B. The work under this section shall include the furnishing of all materials, labor, equipment and supplies and the performance of all operations to provide complete working systems, in general, to include the following items:

1. Identification
2. Raceways and Conduit
3. Wire and Cable (600V)
4. Junction Boxes, Pull Boxes and Wireways
5. Sleeving
6. Fire Seal and Fireproof Sealant
7. Supervision and Approval
8. Operating and maintenance instructions and manuals
9. Shop drawings
10. Record (as-built) drawings

C. Work of this section is generally shown on the Electrical Drawings.

1.3 RELATED WORK

A. Principal classes of Work related to the Work of this section are listed in the Specification Table of Contents, and are specified to be performed under the indicated sections of the specifications. Refer to the indicated sections for description of the extent and nature of the indicated Work, and for coordination with related trades. This listing may not include

all related Work items. It is the responsibility of the Contractor to coordinate and schedule the Work of this section with that of all other trades.

B. The following work is not included in this section and will be provided under other sections:

1. Structural supports necessary to distribute loading from equipment to roof or floor except as specified.
2. Temporary light, power, water, heat, gas and sanitary facilities for use during construction and testing. Refer to Division 1, General Conditions.
3. Excavation and backfill.
4. Concrete work including concrete housekeeping pads and blocks for vibrating and rotating equipment, and ductbank envelopes.
5. Flashing of roof and wall penetrations.
6. Painting, except as specified herein.

1.4 DEFINITIONS

A. As used in this section, the following items are understood to have the following meaning:

1. "*Contractor or Subcontractor* ", unless otherwise qualified, shall mean the installer of the work specified under this section.
2. *"Furnish"* shall mean purchase and deliver to the project site, complete with every necessary appurtenance.
3. *"Install"* shall mean unload at the delivery point at the site and perform all work necessary to establish secure mounting and proper operation at the proper location in the project.
4. *"Provide"* shall mean "Furnish" and "Install".
5. *"Work"* shall mean all labor, materials, equipment, apparatus, controls, accessories and all other items required for a proper and complete installation.
6. *"Concealed"* shall mean hidden from sight in chases, furred-in spaces, shafts, hung ceilings, embedded in construction or in a crawl space. Areas to be concealed as part of tenant alterations to the building shall also be considered in this definition.
7. *"Exposed"* shall mean not installed underground or concealed as defined above.
8. *"Furnished by Others"* shall mean materials or equipment purchased under other sections of the general contract and installed by this section of the specifications by this trade Contractor.
9. *"Owners Representative"* shall be the party responsible to make decisions regarding all contractual obligations in reference to the Scope of Work for the Owner.
10. *"Date of Substantial Completion"* shall indicate the date where the work has been formally accepted as evidenced by completed final punch list or where the work has reached the stage that the Owner obtains beneficial use and commences utilization of the installed systems for business or occupancy purposes. The GENERAL REQUIREMENTS, DIVISION 1, shall supersede this definition where specifically defined.

1.5 CODES, REFERENCES AND PERMITS

A. Materials, installation of systems and equipment provided under this section shall be done in strict accordance with the Department of Public Safety, Department of

Environmental Protection, State Building Code and any other Codes and Regulations having jurisdiction including but not limited to:

1. All Applicable NFPA Standards
2. National Electrical Code (NEC).
3. Occupational Safety and Health Administration (OSHA)
4. State and Local Building Codes
5. Underwriters' Laboratories, Inc. (UL)

B. Unless otherwise specified or indicated, materials, workmanship and equipment performance shall conform with the latest governing edition of the following standards, codes, specifications, requirements, and regulations, except when more rigid requirements are specified or are required by applicable codes but not limited to:

1. American National Standards Institute (ANSI)
2. American Society of Mechanical Engineers (ASME).
3. American Society of Testing and Materials (ASTM)
4. Illuminating Engineering Society (IES)
5. Institute of Electrical and Electronics Engineers (IEEE)
6. Insulated Cable Engineers Association (ICEA)
7. National Electrical Contractors Association (NECA)
8. National Electric Manufacturers Association (NEMA)
9. Thermal Insulation Manufacturers Association (TIMA)

C. Codes, laws and standards provide a basis for the minimum installation criteria acceptable. The drawings and specifications illustrate the scope required for this project, which may exceed minimum codes, laws and standards.

D. Give all notices, file all plans, obtain all permits and licenses, and obtain all necessary approvals from authorities having jurisdiction. Deliver all certificates of inspection to the authorities having jurisdiction. No work shall be covered before examination and approval by the Owner’s Representative, inspectors, and authorities having jurisdiction. Replace imperfect or condemned work to conform to requirements, satisfactory to Owner’s Representative, and without extra cost to the Owner. If work is covered before inspection and approval, this Contractor shall pay costs of uncovering and reinstalling the covering, whether it meets contract requirements or not.

1.6 GENERAL REQUIREMENTS

A. Nameplates

1. Each major component of equipment shall have the manufacturer's name, address, type or style, model or serial number, and catalog number on a plate secured to the equipment.

B. Equipment Guards

1. Belts, pulleys, chains, gears, couplings, projecting setscrews, keys, and other rotating parts so located that any person may come in close proximity thereto shall be completely enclosed or guarded. High-temperature equipment and piping so located as to endanger personnel or create a fire hazard shall be guarded or covered with insulation of type specified for service.

1.7 MATERIAL AND EQUIPMENT STANDARDS

A. Where equipment or materials are specified with the name of a manufacturer, such specification shall be deemed to be used for the purpose of establishing a standard for that particular item. No equipment or material shall be used unless previously approved by the Owner's Representative.

B. Substitutions may be offered for review provided the material, equipment or process offered for consideration is equal in every respect to that indicated or specified. The request for each substitution must be accompanied by complete specifications together with drawings or samples to properly appraise the materials, equipment or process. The Contractor shall highlight and list all applicable specification requirements which the substituted material deviates from.

C. If a substitution of materials or equipment in whole or in part is made, this Contractor shall bear the cost of any changes necessitated by any other trade as a result of said substitution.

D. All materials, equipment and accessories provided under this section shall be new and unused products of recognized manufacturers as approved.

1.8 SUBMITTALS

A. Conform to the requirements of Division 1, General Conditions, for schedule and form of all submittals unless specifically noted otherwise in this section. Coordinate this submittal with submittals for all other finishes. Shop drawings and design layouts shall be prepared by licensed installing Contractor s and shall note the name(s), license number(s) and license expiration date(s) of the Contractor (s) installing electrical systems.

B. Definitions:

1. Shop Drawings are information prepared by the Contractor to illustrate portions of the work in more detail than indicated in the Contract Documents.
2. Acceptable Manufacturers: The mechanical design for each product is based on the single manufacturer listed in the schedule or shown on the drawings. In Part 2 of the specifications, certain Alternate Manufacturers are listed as being acceptable. In addition, the MATERIAL AND EQUIPMENT STANDARDS paragraph potentially allows for substitutions as being acceptable. These are acceptable only if, as a minimum, they:

    a. Meet all performance criteria listed in the schedules and outlined in the specifications. For example, to be acceptable, an emergency generator must deliver equal kW / KVA at equal or greater efficiency using equal or less fuel as the emergency generator listed in the schedules.
    b. Fit within the available space it was designed for, including space for maintenance and component removal, with no modification to either the space or the product. Clearances to walls, ceilings, and other equipment will be at least equal to those shown on the design drawings. The fact that a manufacturer's name appears as acceptable shall not be taken to mean the Engineer has determined that the manufacturer's products will fit within the available space – this determination is solely the responsibility of the Contractor.
    c. For rooftop mounted equipment and equipment mounted in areas where structural matters are a concern, the products must have a weight no greater than the product listed in the schedules or specifications.

d. Products must adhere to all architectural considerations including, but not limited to; being of the same color as the product scheduled or specified, fitting within the architectural enclosures and details, and for lighting – being the same size and of the same physical appearance as scheduled or specified products.

C. Submittal Procedures, Format and Requirements

1. Review submittal packages for compliance with Contract Documents and then submit to Owner's Representative for review. Submit enough sets of shop drawings such that, after review, two (2) sets will be kept by the reviewer, with only the remaining sets returned with reviewer's marks and comments.
2. Each Shop Drawing shall indicate in title block, and each Product Data package shall indicate on cover sheet, the following information:

   a. Title
   b. Equipment number
   c. Name and location of project
   d. Names of Owner, Engineer and Seller
   e. Names of manufacturers, suppliers, vendors, etc.
   f. Date of submittal
   g. Whether original submittal or resubmitted

3. Shop Drawings showing manufacturer's product data shall contain detailed dimensional drawings (minimum ¼ inch – 1 foot scale) including plans and sections (where physical clearance could be an issue). Provide larger scale details as necessary.
4. Submit accurate and complete description of materials of construction, manufacturer's published performance characteristics, sizes, weights, capacity ratings (performance data, alone, is not acceptable), electrical requirements, starting characteristics, wiring diagrams, and acoustical performance for complete assemblies. Drawings shall clearly indicate location (terminal block or wire number), voltage and function for all field terminations, and other information necessary to demonstrate compliance with all requirements of Contract Documents.
5. Provide Shop Drawings showing details of piping connections to all equipment. If connection details are not submitted and connections are found to be installed incorrectly, this Contractor shall reinstall them within the original contract price.
6. Provide complete data for all auxiliary services and utilities required by submitted equipment. This shall include fuel, cooling and exhaust requirements and points of connections.
7. Provide a complete description of all controls and instrumentation required including electrical power connection drawing for all components and interconnection wiring to starters, detailed information on starters, control diagrams, termination diagrams, and all control interfaces with a central control system.
8. Provide installation and erection information including; lifting requirements, and any special rigging or installation requirements for all equipment.
9. The Owner's Representative shall approve all materials before commitment for materials is made.

D. Specifications and Schedule Compliance Statement

1. The manufacturer shall submit a point by point statement of compliance with each specification criteria listed in each paragraph for those submittals listed in Paragraph E: Product Data that are noted with an asterisk (*).

2. The statement of compliance shall consist of a list of all paragraphs (line by line) identified in Part 2 and applicable Part 3 of the specification for which the submitted product in the opinion of the manufacturer complies, deviates, or does not meet.
3. Where the proposed submittal complies fully, the word “comply” shall be placed opposite the paragraph number.
4. Where the proposed submittal does not comply, or accomplishes the stated function in a manner different from that described, a full description of the deviation shall be provided.
5. Verify each field of the associated schedule where associated technical data is presented on the drawings. Where the submitted material does not ‘comply” provide the value the submitted equipment will achieve based upon the specified conditions.
6. Where a full description of a deviation is not provided, it shall be assumed that the proposed system does not comply with the paragraph in question and the product will be rejected.
7. Submissions which do not include a point by point statement of compliance as specified shall be disapproved.

E. Product Data: Submit complete manufacturer’s product description and technical information including:

1. Identification
2. Raceways and Conduit
3. Wire and Cable (600V)
4. Junction Boxes, Pull Boxes and Wireways

F. Submit shop drawings and product data grouped to include complete submittals of related systems, products and accessories in a single submittal.

1. Access panel shop drawings shall be submitted to the Construction Supervisor for approval.
2. Do not submit multiple product information in a single bound manual.
3. Three-ring binders shall not be accepted.

G. Deviations:

1. Concerning deviations other than substitutions, proposed deviations from Contract Documents shall be requested individually in writing whether deviations result from field conditions, standard shop practice, or other cause. Submit letter with transmittal of Shop Drawings which flags the deviation to the attention of the Owner’s Representative.
2. Without letters flagging the deviation to the Owner’s Representative, it is possible that the Engineer may not notice such deviation or may not realize its ramifications. Therefore, if such letters are not submitted to the Owner’s Representative, the Seller shall hold the Engineers, his consultants and the Owner harmless for any and all adverse consequences resulting from the deviations being implemented. This shall apply regardless of whether the Engineer has reviewed or approved shop drawings containing the deviation, and will be strictly enforced.
3. Approval of proposed deviations, if any, will be made at discretion of Engineer.

H. Schedule: Incorporate shop drawing review period into construction schedule so that Work is not delayed. This Contractor shall assume full responsibility for delays caused by not incorporating the following shop drawing review time requirements into his project

schedule. Allow at least ten (10) working days, exclusive of transmittal time, for review each time shop drawing is submitted or resubmitted.

I. Responsibility

1. Intent of Submittal review is to check for capacity, rating, and certain construction features. The Contractor shall ensure that work meets requirements of Contract Documents regarding information that pertains to fabrication processes or means, methods, techniques, sequences and procedures of construction; and for coordination of work of this and other sections. Work shall comply with approved submittals to extent that they agree with Contract Documents. Submittal review shall not diminish responsibility under this Contract for dimensional coordination, quantities, installation, wiring, supports and access for service, nor the shop drawing errors or deviations from requirements of Contract Documents. The Engineer's noting of some errors while overlooking others will not excuse the Contractor from proceeding in error. Contract Documents requirements are not limited, waived nor superseded in any way by review.
2. Inform Contractor, manufacturers, suppliers, etc. of scope and limited nature of review process and enforce compliance with contract documents.

J. In the event that the Contractor fails to provide Shop Drawings for any of the products specified herein:

1. The Contractor shall furnish and install all materials and equipment herein specified in complete accordance with these specifications.
2. If the Contractor furnishes and installs material and/or equipment that is not in complete accordance with these specifications, he shall be responsible for the removal of this material and/or equipment. He shall also be responsible for the replacement of this material and/or equipment with material and/or equipment that is in complete accordance with these specifications, at the direction of the Owner’s Representative.
3. Removal and replacement of materials and/or equipment that is not in complete compliance with these specifications shall be done at no extra cost to the Owner.
4. Removal and replacement of materials and/or equipment that is not in complete compliance with these specifications shall not be allowed as a basis for a claim of delay of completion of the Work.

K. Mark dimensions and values in units to match those specified.

L. Submit Material Safety Data Sheets (MSD) on each applicable product with submittal.

1.9 COORDINATION

A. Refer to Division 1, General Conditions, for coordination requirements applicable to this section, unless specifically noted otherwise in this section.

B. Materials and apparatus shall be installed as fast as conditions of the building will permit and must be installed promptly when and as required.

C. Confer with all other trades relative to location of all apparatus and equipment to be installed and select locations so as not to conflict with work of other sections. Any conflicts shall be referred immediately to the Owner’s Representative for decision to prevent delay in installation of work. All work and materials placed in violation of this

clause shall be readjusted to the Owner's Representative's satisfaction at no expense to the Owner.

D. Where work of this section will be installed in close proximity to work of other sections or where there is evidence that the work of this section may interfere with work of other sections, assist in working out space conditions to make satisfactory adjustment. Prepare and submit for approval 3/8" scale or larger working drawings and sections, clearly showing how the work is to be installed in relation to the work of other sections. If the work of this section is installed before coordinating with other trades or so as to cause interference with work of other trades, make changes necessary to protect conditions without extra charge.

E. Keep fully informed as to the shape, size and position of all openings required for all apparatus, conduit, cable, sleeves, etc., and give information in advance to allow construction of required openings. Furnish all sleeves, pockets, supports and incidentals, and coordinate with the General Contractor for the proper setting of same.

F. All distribution systems which require pitch or slope such as condensate drains and water piping shall have the right of way over those which do not. Confer with other trades as to the location of pipes, ducts, lights and apparatus and install work to avoid interferences.

G. Make reasonable modifications in the work as required by structural interferences, or by interference with work of other trades, or for proper execution of the work without extra charge.

1.10 RECORD DRAWINGS

A. Refer to DIVISION 1, General Conditions, for record drawings and procedures to be provided under this section, unless specifically noted otherwise in this section.

B. Record Drawings (red-line drawings) will be updated by this Contractor daily for review with the monthly requisition. The record drawing shall be an accurate depiction of the systems as completed, including dimensions (vertical/horizontal) of concealed components off fixed building elements.

C. The Electrical Foreman shall maintain complete and separate set of prints of Contract Drawings at job site at all times and shall record work completed and all changes from original Contract Drawings clearly and accurately including work installed as a modification or addition to the original design.

D. At completion of work the Electrical Contractor shall prepare a complete set of record drawings on AutoCAD showing all systems as actually installed. The Architectural background AutoCAD files will be made available for the Contractor's copying, at his expense, to serve as backgrounds for the drawings. The Electrical Contractor shall transfer changes from field drawings onto AutoCAD drawings and submit copy of files and three sets of prints to Owner's Representative for comments as to compliance with this section. CADD layering as established by the design team shall be maintained with any and all changes done by the Contractor.

E. The Engineer is not granting to the Contractor any ownership or property interest in the CADD Drawings by the delivery of the CADD Disks to the Contractor. The Contractor's rights to use the CADD disks and the CADD Drawings are limited to use for the sole purpose of assisting in the Contractor's performance of its contractual obligations under

its contract with respect to the Project. The Engineer is granting no further rights. Any reuse or other use by the Contractor will be at the Contractor's sole risk and without liability to the Engineer. The Contractor hereby waives and releases any losses, claims, damages, liabilities of any nature whatsoever, and costs (including attorney fees) arising out of, resulting from, or otherwise related to the use of the CADD Disks and CADD Drawings by the Contractor. The Contractor, to the maximum extent permitted by law, hereby agrees to indemnify, defend and hold the Architect and Engineer harmless from all loses, claims, damages, liabilities, and costs (including attorney fees) arising out of, resulting from, or otherwise related to the use of the CADD Disks and CADD Drawings by the Contractor.

F. Record Drawings, shall show "as-built" condition of details, sections, riser diagrams, control changes and corrections to schedules. Schedules shall show actual manufacturer and model numbers of final equipment installation.

G. The Electrical Contractor shall submit the record set for approval by the engineer a minimum of four (4) weeks prior to seeking the permanent certificate of occupancy.

1.11 WARRANTIES

A. Submit manufacturer's standard replacement warranties for material and equipment furnished under this section. Such warranties shall be in addition to and not in lieu of all liabilities which the manufacturer and the Electrical Contractor may have by law or by provisions of the Contract Documents.

B. All materials, equipment and work furnished under this section shall be guaranteed against all defects in materials and workmanship for a minimum period of one-year (1) commencing with the Date of Substantial Completion. Where individual equipment sections specify longer warranties, provide the longer warranty. Any failure due to defective material, equipment or workmanship which may develop, shall be corrected at no expense to the Owner including all damage to areas, materials and other systems resulting from such failures.

C. Guarantee that all elements of each system meet the specified performance requirements as set forth herein or as indicated on the drawings.

D. Upon receipt of notice from the Owner of the failure of any part of the systems during the warranty period, the affected parts shall be replaced. Any equipment requiring excessive service shall be considered defective and shall be replaced.

1.12 INTERPRETATION OF DRAWINGS AND SPECIFICATIONS

A. It is the intention of the specifications and drawings to call for complete, finished work, tested and ready for continuous operation. Any apparatus, appliance, material or work not shown on the drawings, but mentioned in the specifications or vice-versa, or any incidental accessories necessary to make the work complete in all respects and ready for operation, even if not particularly specified, shall be provided by this Contractor without additional expense to the Owner.

B. The drawings are generally diagrammatic. The locations of all items that are not definitely fixed by dimensions are approximate only. The exact locations must be

determined at the project and shall have the approval of the Owner's Representative before being installed. This Contractor shall follow drawings, including his shop drawings, in laying out work and shall check the drawings of other trades to verify spaces in which work will be installed. Maintain maximum headroom and space conditions. Where space conditions appear inadequate, notify the Owner's Representative before proceeding with the installation. This Contractor shall, without extra charge, make reasonable modifications in the layout as needed to prevent conflict with work of other trades or for proper execution of the work.

C. Any requests for information (RFI) for resolving an apparent conflict or unclarity, or a request for additional detail, shall include a sketch or equivalent description of Contractor's proposed solution.

D. Size of conduits, cable trays, raceways and methods of running them are shown, but it is not intended to show every offset and fitting, nor every structural difficulty that may be encountered. To carry out the true intent and purpose of the drawings, all necessary parts to make complete approved working systems ready for use, shall be furnished without extra charge. All work shall be installed in an approved workmanlike manner.

1.13 INSPECTION OF SITE CONDITIONS

A. Prior to submission of bid, visit the site and review the related construction documents to determine the conditions under which the Work has to be performed and send a report, in writing, to the Owner's Representative, noting any conditions which might adversely affect the Work of this section of the specifications.

1.14 SURVEY AND MEASUREMENTS

A. Base all required measurements, horizontal and vertical, from referenced points established WITH the Owner's Representative. The Electrical Contractor shall be responsible for correctly laying out the Work required under this section of the specifications.

B. In the event of discrepancy between actual measurements and those indicated, notify the Owner's Representative in writing and do not proceed with the related work until instructions have been issued.

1.15 DELIVERY, STORAGE AND HANDLING

A. No materials shall be delivered or stored on site until corresponding Shop Drawings have been approved.

B. All manufactured materials shall be delivered to the site in original packages or containers bearing the manufacturer's labels and product identification.

C. Protect materials against dampness. Store off floors, under cover and adequately protected from damage.

D. Inspect all equipment and materials, upon receipt at the job site, for damage and conformance to approved shop drawings.

1.16 PROTECTION OF WORK AND PROPERTY

A. This Contractor shall be responsible for the care and protection of all work included under this section until the completion and final acceptance of this Contract.

B. Protect all equipment and materials from damage from all causes including, but not limited to, fire, vandalism and theft. All materials and equipment damaged or stolen shall be repaired or replaced with equal material or equipment at no additional cost to the Owner.

C. Protect all equipment, outlets and openings with temporary plugs, caps and covers. Protect work and materials of other trades from damage that might be caused by work or workmen under this section and make good damage thus caused.

D. Damaged materials are to be removed from the site; no site storage of damaged materials will be allowed.

1.17 SUPERVISION

A. Supply the service of a competent Supervisor with a minimum of five (5) years of experience in Electrical construction supervision who shall be in charge of the Electrical work at the site.

1.18 SAFETY PRECAUTIONS

A. Life safety and accident prevention shall be a primary consideration. Comply with all of the safety requirements of the Owner and OSHA throughout the entire construction period of the project.

B. Furnish, place and maintain proper guards and any other necessary construction required to secure safety of life and/or property.

1.19 SCHEDULE

A. Construct work in sequence under provisions of Division 1 and as coordinated with the Owner’s Representative.

1.20 HOISTING, SCAFFOLDING AND PLANKING

A. The work to be done under this section of the specifications shall include the furnishing, set-up and maintenance of all derricks, hoisting machinery, cranes, helicopters, scaffolds, staging and planking as required for the work.

1.21 CUTTING AND PATCHING

A. Include all coring, cutting, patching, and fireproofing necessary for the execution of the work of this section. Structural elements shall not be cut without written approval of the Architect. This Contractor shall be responsible for taking all precautions required to

identify hidden piping, conduits, etc. before any core drilling and/or cutting of slabs commences, including X-raying the affected slabs. Provide fire stopping to maintain the fire rating of the fire resistance-rated assembly. All penetrations and associated fire stopping shall be installed in accordance with the fire stopping manufacturer's listed installation details and be listed by UL or FM.

B. All work shall be fully coordinated with all phases of construction, in order to minimize the requirements for cutting and patching.

C. Form all chases or openings for the installation of the work of this section of the specifications, or cut the same in existing work and see that all sleeves or forms are in the work and properly set in ample time to prevent delays. Be responsible that all such chases, openings, and sleeves are located accurately and are of the proper size and shape and consult with the Owner's Representative and all other trades concerned in reference to this work. Confine the cutting to the smallest extent possible consistent with the work to be done. In no case shall piers or structural members be cut without the approval of the Owner's Representative.

D. Fit around, close up, repair, patch, and point around the work specified herein to match the existing adjacent surfaces and to the satisfaction of the Owner's Representative.

E. Fill and patch all openings or holes left in the existing structures by the removal of existing equipment which is part of this section of the specifications.

F. All of this work shall be carefully done by workmen qualified to do such work and with the proper and smallest tools applicable.

G. Any cost caused by defective or ill-timed work required by this section of the specifications shall be borne by this Contractor.

H. When, in order to accommodate the work required under this section of the specifications, finished materials of other trades must be cut or fitted, furnish the necessary drawings and information to the trades whose materials must be cut or fitted.

1.22 SLEEVES, INSERTS AND ANCHOR BOLTS

A. Coordinate with other trades the location of and maintaining in proper positions, sleeves, inserts and anchor bolts to be supplied and/or set in place under this section of the specifications. In the event of incorrectly located preset sleeves, inserts and anchor bolts, etc., all required cutting and patching of finished work shall be done under this section of the specifications.

B. All pipes passing through floors, walls, ceilings or partitions shall be provided with fire stopping to maintain the fire rating of the structure. All penetrations and associated fire stopping shall be installed in accordance with the fire stopping manufacturer's listed installation details. Provide sleeves for all penetrations where required by the listed detail, for the penetration of all mechanical room floors and where specifically required on the drawings.

C. Field drilling (core drilling), when required, shall be performed under this section of the specifications, after receipt of approval by the Owner's Representative.

1. When coring cannot be avoided, provide ¼ inch pilot hole prior to coring. When coring through floor or slab, verify location of core on floor below and protect and piping, ductwork, wiring, furniture, personnel, etc., below the location of the core.

1.23 SUPPLEMENTARY STEEL, CHANNELS AND SUPPORTS

A. Provide all supplementary steel, factory fabricated channels and supports required for the proper installation, mounting and support of all Electrical equipment, piping, etc., required by the specifications.

B. Supplementary steel and factory fabricated channels shall be firmly connected to building construction in a manner approved by the Owner's Representative as shown on the drawings or herein specified.

C. The type and size of the supporting channels and supplementary steel shall be determined by the Contractor and shall be of sufficient strength and size to allow only a minimum deflection in conformance with the manufacturer's requirements for loading.

D. All supplementary steel and factory fabricated channels shall be installed in a neat and workmanlike manner parallel to the walls, floors and ceiling construction. All turns shall be made with 90 degree and 45 degree fittings, as required to suit the construction and installation conditions.

E. All supplementary steel including factory fabricated channels, supports and fittings shall be galvanized steel, aluminum or stainless steel where exposed or subject to rust producing atmosphere. Factory fabricated channels shall be manufactured by Unistrut, H-strut, Powerstrut or approved equal.

1.24 ACCESSIBILITY

A. All work provided under this section of the specification shall be installed so that parts requiring periodic inspection, maintenance and repair are accessible. Work of this trade shall not infringe upon clearances required by equipment of other trades, especially code required clearances to electrical gear. Minor deviations from the drawings may be made to accomplish this, but changes of substantial magnitude shall not be made prior to written approval from the Owner's Representative.

1.25 SEISMIC RESTRAINT REQUIREMENTS

A. Submit working plans and calculations reviewed, signed and stamped by a professional engineer who is registered in the State where the project is located and has specific experience in seismic calculations, certifying that the plans meet all seismic requirements established by authorities having jurisdiction over the project.

B. For each seismic restraint, provide certified calculations to verify adequacy to meet the following design requirements:

1. Ability to accommodate relative seismic displacements of supported item between points of support.
2. Ability to accommodate the required seismic forces.

C. For each respective set of anchor bolts provide calculations to verify adequacy to meet combined seismic-induced sheer and tension forces.

D. For each weldment between structure and item subject to seismic force, provide calculations to verify adequacy.

E. Restraints shall maintain the restrained item in a captive position without short circuiting the vibration isolation.

1.26 PROJECT CLOSEOUT

A. Certificates Of Approval

1. Upon completion of all work, provide certificates of inspections from the following equipment manufacturers stating that the authorized factory representatives have inspected and tested the operation of their respective equipment and found the equipment to be in satisfactory operating condition and installed per the manufacturers installation instructions and requirements.

   a. Emergency or Standby Generator
   b. Automatic Transfer Switch

B. Construction Observations By The Engineer

1. The engineer shall make progress site visits during construction and one (1) substantial completion (punch list) site visit for determining substantial completion.
2. The Trade Contractors and the General Contractor are required to inspect their own work and make any corrections to the work to comply with the specifications and the contract documents. It is not the responsibility of the engineer to develop lists of incomplete work items.
3. Progress Site Visits

   a. The purpose of the progress site visit by the engineer is to observe if the work is proceeding in accordance with the contract documents.
   b. The engineer will prepare a field report which will note in general the work completed since the last observation visit, work found not to be in accordance with the contract documents and work not corrected since the previous observation visit.

C. Substantial Completion

1. When the Contractor considers the Work under this section is substantially complete, the Contractor shall submit written notice, through the General Contractor, with a detailed list of items remaining to be completed or corrected and a schedule of when each remaining work item will be completed. Should the engineer determine the list of remaining work does not constitute substantial completion the engineer will notify the Architect and/or Owner and he will not make a substantial completion site visit.
2. The following items shall be completed prior to the written request for substantial completion site visit:

   a. Certification of successful operation of all systems.
   b. Training of the Owner’s personnel in the operation of the systems.
   c. Record Drawings in accordance with the contract specifications.
   d. Operation and Maintenance manuals.

e. Testing reports.
f. Manufacturer's certificates of approvals.
g. Emergency contact list for reporting of malfunctioning equipment during the warranty period.
h. Contractors Project Completion certificate.

3. Should the Engineer, during the substantial completion visit, observe that the Work is substantially complete, s/he will provide a written listing of the observed deficiencies referred herein as the Punch List. The Punch List will provide for a place for the Contractor and General Contractor to sign off and date each item individually indicating that the observed deficiency item has been corrected.
4. Should the Engineer, during the substantial completion site visit, observe that the Work is not substantially complete, s/he will provide, a written list of the major deficiencies and a reason for the work not being considered substantially complete.
5. If the work is found not to be substantially complete then the engineer shall be reimbursed for his time to reobserve the work. A reobservation fee shall be charged to the Contractor through the contractual agreement for any further observations by the engineer.
6. The Contractor shall remedy all deficiencies listed in the punch list within the time frame required by the contract.

D. Engineer's Construction Completion Certification

1. Where required by the applicable code, the Engineer's Construction Completion Certification will be issued by NV5 when all life safety and health related issues are complete, all required functional tests are complete and all reports are complete. The following is a minimum listing of the required systems to be tested with reports generated indicating they are complete and ready for use:

   a. Emergency and Standby Generator
   b. Automatic Transfer Switch

2. There shall be NO outstanding items identified on the punch list for scope within any of these categories.

E. Final Completion

1. The following items shall be submitted prior to the written request for Final completion:

   a. Revised Substantial Completion items to be resubmitted in accordance with the review process comments.
   b. Warranties commencing the date of Substantial completion
   c. Individual Signed and dated Punch List acknowledging completion of all punch list items

2. When the Contractor considers all of the punch list work items complete, the Contractor shall submit written notice through the General Contractor that all Punch List items are complete and resolved and the work is ready for final observation site visit. The signature lines for completion of each punch list item shall be signed by the Contractor indicating the work is complete and signed by the General Contractor indicating s/he has inspected the work and found it to be complete. Should the Engineer find the work to be finally complete and all Punch List items are complete the Engineer will make a recommendation to the Architect or Owner. If the Engineer has found the punch list work to be

incomplete during final inspection a written listing of the observed deficiencies will be prepared by the Engineer.

3. If the work is not fully complete then the engineer shall be reimbursed for his time to reobserve the work. A reobservation fee shall be charged to the Contractor through the contractual agreement for any reobservations by the Engineer.

F. Re-observation Fees

1. The re-observation fee shall be $1200.00 per visit.

G. Contractor's Project Completion Certificate

1. Upon completion of work and prior to request for Certificate of Occupancy, each Trade Contractor and the General Contractor shall issue a certificate stating that work has been installed generally consistent with construction documents and all applicable codes. NV5 can furnish a blank Contractor's certificate form upon request. The certificate shall certify:

   a. Execution of all work has been in accordance with the approved construction documents.
   b. Execution and control of all methods of construction was in a safe and satisfactory manner in accordance with all applicable local, state and federal statutes and regulations.

2. The certificate shall include the following information:

   a. Project.
   b. Permit Number.
   c. Location.
   d. Construction Documents.
   e. Date on Plans and specifications submitted for approval and issuance of the Building Permit.
   f. Addendum(a) and Revision Dates.

3. The certificate shall be signed by the Contractor and include the following:

   a. Signature.
   b. Date.
   c. Company.
   d. License Number.
   e. License Expiration Date.

PART 2 - PRODUCTS

2.1 NOT USED

2.2 IDENTIFICATION

A. Nameplates

1. Nameplates shall be laminated black Bakelite with minimum ¼ inch high white recessed letters.
2. Nameplates shall be securely attached to the equipment. Utilize mechanical fasteners such as galvanized steel or brass screws for exterior applications. High strength adhesives or cements may be used for interior applications.

2.3 RACEWAYS AND CONDUIT

A. Rigid Galvanized Steel (RGS) Conduit

1. RGS shall be zinc-coated steel that conforms to ANSI C80.1, UL Specification No. 6 and Federal Specification WW-C-581e by Allied Tube and Conduit, Republic Steel, Wheatland Tube or approved equal.
2. RGS fittings shall be threaded. Split couplings or non-threaded fittings shall not be used.
3. Nipples and Close Nipples shall be RGS, length as noted or as required to conform to field conditions.

B. Intermediate Metal Conduit (IMC)

1. IMC shall be zinc-coated steel that conforms to ANSI C80.6, UL Standard No. 1242 and Federal Specification WW-C-581e by Allied Tube and Conduit, Wheatland Tube or approved equal.
2. IMC fittings shall be threaded.

C. Electrical Metallic Tubing (EMT)

1. EMT shall be zinc-coated steel that conforms to ANSI C80.3, UL Standard No. 797 and Federal Specification WW-C-563 a by Republic Steel, Allied Tube and Conduit or approved equal.

2. EMT fittings shall be zinc plated pressed steel gland and ring compression up to two (2) inches and zinc plated pressed steel double set screw from two (2) inches and up

D. Polyvinyl Chloride (PVC) Non-metallic Conduit

1. PVC conduit and fittings shall be Schedule 40 or Schedule 80, 90°C. UL Listed equal to Carlon Plus 40 or Plus 80. PVC shall meet NEMA Specification TC-2, TC-3 and UL-651.
2. PVC, fittings and solvent cement shall be by single approved manufacturer.
3. PVC shall be sunlight resistant and listed for exposed or outdoor usage.

E. Fiberglass Reinforced Epoxy (FRE) Conduit Schedule 40 or Schedule 80 UL Listed equal to FRE Composites Inc. Type ID, SW and HW for below ground and above ground applications. FRE shall comply with UL 1684.

F. Miscellaneous Conduit Fittings

1. Elbows shall be standard radius unless noted otherwise. Where Large Radius elbows are specified, provide forty-eight (48) inch radius unless noted otherwise.
2. Bushings shall be threaded pressed steel hot dipped galvanized with conduit end stop and integrally molded noncombustible phenolic insulated surface rated for 150^{o}C.
3. Bonding bushings shall be threaded pressed steel hot dipped galvanized with conduit end stop and integrally molded noncombustible phenolic insulated surface rated for 150^{o}C with a lay-in tin plated copper grounding lug.
4. Exposed conduit expansion fittings shall be hot-dipped galvanized malleable iron with external bonding jumper equal to O.Z./Gedney Type EX for RGS or Type TX for EMT (four (4) inch maximum expansion).
5. Provide water-tight gland sealing assemblies with pressure bushings equal to OZ/Gedney Type WSK for new cast-in-place installations or Type CSCM for

retrofit (core drilling of existing walls) as required for below grade wall and floor penetrations.

G. Flexible Metallic Conduit

1. Liquidtight Metal Conduit shall be UL Listed fabricated from a spiral wound strip of heavy gauge, corrosion resistant, hot dipped galvanized steel equal to Electri-flex Company Type LA. The jacket shall be flame retardant, sunlight resistant PVC extruded over the spiral wrap. Sizes through 1 ¼ inch shall have an integral copper bonding strip.
2. Liquidtight fittings shall be UL listed zinc plated insulated throat.
3. Flexible metal conduit shall be UL Listed non-jacketed steel fabricated from a spiral wound strip of heavy gauge, corrosion resistant, hot dipped galvanized steel equal to Electri-flex Company Type BR.

H. Wireways shall be minimum 16-gauge steel with all straight runs having hinged spring-latched covers. Finish shall be painted over a corrosion resistant phosphate pretreatment to protect against corrosion. Interior parts shall be smooth and free of sharp edges and burrs. Provide wireway as identified on the drawings for NEMA 1, 3R or 12 service. Wireways shall be equal to Square D and UL Listed.

2.4 WIRE AND CABLE (600V)

A. Provide single-conductor, annealed copper wire and cable with insulation rated for 600 V, of sizes specified and scheduled on drawings, by General Electric, Southwire, Okonite or approved equal, for secondary service, feeders, branch and system wiring. Wire sizes shown and specified are American Wire Gauge for copper conductors.

B. The use of aluminum conductors is not allowed.

C. Wire #10 and larger shall be stranded; #12 and smaller shall be solid. Wire and cable shall have THWN-THHN or XHHW insulation for branch circuit and feeder conductors. Type RHWUSE shall be used for all conductors installed in below grade raceways for generator applications only.

D. Conductor Color-coding

1. Service entrance, branch circuit and feeder conductors shall be color-coded. Conductors #12 and #10 shall be colored with a factory applied solid or striped compound coating (black, red, blue, brown, orange or yellow). Neutrals and equipment grounds shall have solid compound or solid color coating (white, gray and green), except that neutrals with colored stripe shall be used where required by code. Phase conductors #8 and larger with stripes, bands or hash marks shall have background color other than white, green and gray.
2. Alternative field-applied color coding methods may be used for wire #8 or larger, with color code as specified in other sections of this specification. Coloring shall be applied by the use of flame-retardant vinyl tape, equal to 3M Scotch 35.

E. Cable

1. Flexible Metal Clad (MC) cable shall be UL Listed with THHN insulated conductors with an insulated grounding conductor within galvanized steel or aluminum interlocked armor. Connectors shall be provided with lock nut connection to the termination point enclosure.

F. Splices and Terminations

1. Ampacity and temperature rating of splices and connectors shall be equal to or greater than those of associated wires and cables.
2. Make splices in branch circuit or feeder wiring from #12 to #10 with UL-listed, solderless screw on connectors rated 600 V.
3. Make splices in branch circuit or feeder wiring above #10 with UL-listed 90°C, 600V, compression butt splice barrel equal to Burndy YS-L HYLINK.
4. Conductor terminations shall be standard bolt-on lugs with hex screws listed for attachment of copper wire and cable to panelboards, switchboards, disconnect switches and other electrical equipment.
5. Make terminations for stranded conductors on screw terminals with UL Listed 105°C, 600V PVC insulated barrel compression locking fork tongue terminal equal to Burndy TP-LF VINYLUG.
6. Make bus terminations for conductors #6 and larger with UL-listed 90°C, 600V, compression standard barrel length lugs equal to Burndy YA-L for conductor sizes to #4/0. Connectors for cable 250 KCMil and larger shall be with UL-listed 90°C, 600V, compression long barrel length two hole lugs equal to Burndy YA-2N. Lugs shall be high conductivity seamless copper electro-tin plated for corrosion protection.

G. Wire management shall be provided by self-extinguishing self-locking nylon ties with -65 to 350°F. range for bundling conductors.

H. Cable pulling compounds shall be UL Listed and be suitable for use with the specified cable insulation system. The compound shall reduce the coefficient of friction, while not adding any long term issues to the installation such as premature aging of the insulation system, added flammability or drying in such a manner as to stick the cable in place in the raceway.

2.5 JUNCTION AND PULL BOXES

A. Provide galvanized steel junction and pull boxes where indicated and as necessary to facilitate installation. Steel shall be minimum 16 gauge. Junction and pull boxes shall be of code required dimensions. Cover shall be of the same type and thickness material as the box construction.

B. Junction and pull boxes intended for dry interior locations shall be NEMA 1 enclosures with accessible, removable screw-on covers. Covers shall be secured with corrosion-resistant screws with keyhole slots to accommodate easy removal.

C. Junction and pull boxes intended for wet or exterior locations shall be NEMA 3R enclosures with hinged gasketed covers. Interior and exterior shall be finished with a gray enamel powder coat over the galvanized metal. Hinge shall be galvanized steel with stainless steel pin. Covers shall be secured with corrosion-resistant zinc plated lockable pull catches.

D. Custom fabricated medium to large junction and pull boxes shall have internal structural steel bracing welded to form a rigid assembly adequate to maintain alignment and shape in shipment and installation.

PART 3 - EXECUTION

3.1 DEMOLITION

A. General

1. Refer to the drawings for demolition scope applicable to the project.

3.2 IDENTIFICATION

A. Nameplates

1. Provide nameplates on all equipment listed in other sections of this specification including but not limited to switchboards, substations, panelboards, transformers, junction and pull boxes, disconnect switches, motor starters and motor control centers, contactors, time clocks, remote control stations, fire alarm panels, smoke detector remote test/alarm stations and fire alarm annunciators.
2. Nameplates shall designate equipment tag number as defined on the drawings, system voltage where applicable, circuit number, device controlled and system function. Refer to typical nameplate detail on the drawings for additional requirements.
3. Submit a complete list of proposed nameplates prior to order to ensure conformance to design criteria. Submittal shall include nomenclature, size and layout of each tag.
4. Samples of stickers together with color schedules shall be submitted during the submittal phase of this project.

B. Equipment Identification

1. Equipment identification designations shall be taken from equipment schedules and coordinated with the Owner's facility group to assure designations match up with Owner's maintenance management system identification database.

3.3 RACEWAYS AND CONDUIT

A. General

1. Unless specified or shown on drawings otherwise, install raceways and conduits concealed. Raceways and conduits may be run exposed on unfinished walls and basement ceilings with exposed structure, in mechanical rooms, electric rooms, attics and roof spaces.
2. Run concealed raceways and conduits in as direct lines as possible with minimum number of bends of longest possible radius. Install exposed raceways and conduits parallel to or at right angles to building lines.
3. Raceway and conduit runs shall be mechanically and electrically continuous from supply to outlet. Conduit shall enter and be secured to metallic enclosures with lock nut and bushing inside. Provide additional exterior lock nut for RGS connections. Bushings shall be the bonding type for conduit connections to metallic enclosures with concentric or eccentric knockouts. Lock nuts and bushings will not be required where conduits are screwed into threaded hubs.
4. Size raceways and conduits as required by NEC unless oversized raceways and conduits are shown on the drawings. Raceways and conduits shall be ¾ inch minimum.
5. Install conduit systems complete before installation of conductors. Blow through and swab after plaster is finished and dry, and before conductors are installed.

6. Raceways and conduits supports shall be rigidly attached to the building structure utilizing corrosion resistant components suitable for use with the selected raceway or conduit. Refer to the seismic restraint sections of this specification for any additional requirements.
7. Field bending, cutting and threading shall be executed with the proper tools, resulting in bends and shortened conduits and raceways that are equivalent to factory fabricated and purchased components.
8. Provide standoff clips for conduits on exterior and wet location walls.
9. Protect all vertical conduit runs from the entrance of foreign material before installation of conductors and the final closure of the raceway system. All spare conduits (vertical and horizontal runs) shall be sealed with a bushing and appropriate insert to prohibit entrance of debris or vermin. Affix a label that indicates "Spare Conduit to _____" at each seal. Label shall be in accordance with the labeling section of this specification.

B. Rigid Galvanized Steel (RGS) Conduit

1. RGS may be used for all raceway applications outlined for EMT and PVC. RGS shall be used in locations where subject to accidental damage or abuse and for all above grade exterior applications unless other wiring methods are specified on the drawings. All circuit conductors in excess of 600 V shall be installed in RGS.
2. RGS shall not be used in corrosive environments.
3. All RGS fittings shall be threaded. Utilize Erickson couplings where joining two (2) threaded conduits that cannot be rotated.

C. Intermediate Metal Conduit (IMC) may be used in any application, with same requirements, where RGS is allowed except for circuits operating at more than 600 V.

D. Electrical Metallic Tubing (EMT)

1. EMT may be used for lighting and receptacle branch circuits, telephone, fire alarm, communications, signal and instrumentation circuits and for control circuits. EMT may be used in masonry walls, above hung ceilings, in equipment rooms, in mechanical and electrical chases and closets, in exposed locations along ceilings or walls above normal traffic level and where not subject to accidental damage or abuse.
2. EMT shall not be used in exposed applications below eight (8) feet above finished floor or in exterior or damp/wet/corrosive locations. Electrical, telephone and communications closets are considered exempt from this restriction and EMT may be installed below 8' AFF in this application only. EMT shall not be installed underground, in slabs on grade, in exterior locations, in hazardous areas, or for circuits operating at more than 600 V.

E. Polyvinyl Chloride (PVC) Non-metallic Conduit

1. PVC may be used for installation in concrete or direct burial applications where not subject to damage. PVC may be used in corrosive environments where specifically allowed on the drawings.
2. PVC shall not be used for penetrations from concrete slabs. Transition to RGS shall be made a minimum of two (2) inches below the slab finished surface, prior to penetration.
3. All connections shall utilize solvent and glue in accordance with the recommendations of the conduit manufacturer.

F. Fiberglass Reinforced Epoxy (FRE) Conduit shall be used in corrosive environments and where specified on the drawings, to replace PVC conduit.

G. Miscellaneous Conduit Fittings

1. Expansion/Deflection Fittings: Raceways and conduit buried or secured rigidly on opposite sides of building expansion joints and long runs of exposed conduit subject to expansion and contraction due to variations in temperature shall have expansion fittings. Raceways and conduit shall cross building expansion joints at right angles. Provide separate external copper bonding jumper secured with grounding straps on each end of fitting. Fittings shall safely deflect and/or expand/contract to twice the distance of potential movement.
2. Penetrations of all below grade exterior walls and flooring shall require approval by the Engineer and Architect. Submit proposed penetration points, size openings and penetration methods to Engineer and Architect. Penetrations shall utilize sealing fittings appropriately sized for the application. Duct bank penetrations are excluded from this requirement.
3. Sealing Fittings shall be installed wherever conduits pass from warm to cold locations to minimize condensation within the conduit. Sealing fittings shall be installed with RGS penetration of the wall and terminate in a suitably sized junction box.
4. Refer to other specification sections for requirements pertaining to sealing for hazardous atmospheres.

H. Flexible Metallic Conduit

1. Provide flexible metallic conduits for connections to electrical equipment and to equipment furnished under other Divisions that are subject to movement, vibration or misalignment and/or where noise transmission must be eliminated or reduced.
2. Flexible metallic conduit shall be liquid-tight under the following conditions:

    a. Exterior locations
    b. Moisture or humidity-laden atmospheres
    c. Environments where seepage or dripping of water, grease, oil or other fluids is possible. All mechanical equipment rooms and penthouses, kitchens and;
    d. Corrosive atmospheres

I. Wireways shall be provided where specifically shown on the drawings or where the group mounting of controllers, disconnects, enclosures, etc warrant the use for elimination of multiple short conduit runs. Wireways shall be provided complete with all required appurtenances necessary to have a totally enclosed system rated for the environment. Wireways shall not be installed in any location where subject to accidental damage or abuse.

3.4 WIRE AND CABLE (600V)

A. Homerun designations on the drawings are diagrammatic only. Install branch circuits and feeders from the power source to the attachment point as required for a complete system. Provide slack wire for connections to equipment installed by others. Refer to schedules and risers where specific conductor and associated raceway sizes are not indicated on the floor plans.

B. Connect branch circuit homerun with two (2) or three (3) circuits and common neutral only where specifically shown on the drawings. Circuits with common neutrals shall not be connected to the same phase to ensure cancellation of the return current in the neutral conductor.

C. Install wires and cable in raceways as specified. All conductor sizing is based upon no greater than three (3) current carrying conductors in a conduit. Installation of up to six (6) circuits (no greater than twelve current carrying conductors) in a single conduit will be allowed if the conductor sizing is increased to the required ampacity to accommodate de-rating factors required by the NEC and NFPA 70.

D. The minimum wire size shall be #12 unless #14 specifically allowed on the drawings for wiring of controls. Branch circuits longer than 75 feet for 120 V from panel to last outlet shall be increased a minimum of one (1) size above that shown on the drawings to minimize voltage drop to less than 3%.

E. Conductors shall be identified at all accessible locations in the following manner:

1. Color code secondary service, feeders and branch circuit conductors as follows:

208/120 Volts	Phase
Black	A
Red	B
Blue	C
White	Neutral
Green	Ground

Provide nonferrous wire markers, embossed or printed to correspond with the drawings. Labels shall be permanently marked so that the source of the branch circuit or feeder may be readily identified. Hand written labels are not acceptable. Embossed tag equal to 3M Scotch Code STL-TAG or SCS-TM shall be applied with two (2) miniature cable ties or slipped through both end holes. Heat bonded tag equal to 3M Scotch Code SCS-HB shall be permanently affixed with a heat gun.

F. Cable

1. Flexible Metal Clad (MC) cable may be used in concealed locations for branch circuit wiring.
2. Flexible Armored (AC) cable shall not be used.
3. Flexible Hospital Grade Armored Cable (AC) cable shall not be used.
4. Conductor color code shall comply with identification requirements as indicated in this section.

G. Splices and Terminations

1. No more than twelve splices of current carrying conductors or six (6) circuits, whichever is greater, shall be allowed in a single enclosure or junction box.
2. Splices and terminations shall be sized to the specified conductor. The insulation shall be cut back with the appropriate tools such that the conductors are not nicked or damaged.
3. The compression tool shall be appropriate for the installation of the provided lug or butt splice to ensure pressure necessary for a proper connection is applied.

4. Terminations shall not be stacked or bent unless specifically listed for the application.

H. Cable Pulling

1. Pull cables that share conduit at same time into completely installed raceway. Conductors shall not be pulled in raceways with existing wiring.
2. Submit cable pulling calculations for engineers' approval prior to all mechanically assisted pulls. Attach pull ropes to conductors with basket-weave grips on pulling eyes. Provide means to measure tension during entire pull. Utilize pulling compounds to lessen friction in accordance with the manufacturer's recommendations.
3. Mechanically assisted pulls shall utilize equipment specifically designed for the purpose such as ropes, electric wench, pulleys, etc. The use of a motorized vehicle to assist in a cable pull is prohibited.

3.5 JUNCTION AND PULL BOXES

A. Junction box covers shall be accessible. Do not install junction boxes above suspended ceilings except where ceiling is removable or where an access panel is provided.

B. Pull boxes connected to concealed conduits shall be mounted with covers flush with finished wall or ceiling.

C. Pull boxes exposed to rain or in damp/wet locations shall be weatherproof NEMA 3R unless noted otherwise on the drawings.

D. No pull box shall be within two (2) feet of another.

E. Provide clamps, grids, cable ties and other non-conductive or combustible appurtenances to secure cables. No cable shall be unsupported for more than thirty (30) inches. Cables shall not touch or be unsupported within one (1) inch of the box cover.

F. Each junction and pull box shall have a suitable laminated plastic nameplate with white cut letters identifying power source, voltage and driven load of the associated branch circuits or feeders.

G. Submit box sizing calculations to confirm all box dimensions are in accordance with code requirements with product data prior to installation.

3.6 BASIC ACCEPTANCE TESTS

A. General Scope

1. This section covers the required field tests and inspections to assess the suitability for initial energization of electrical power distribution equipment and systems. Failed components shall be replaced and retested for no additional cost to the project.
2. The purpose of this specification is to assure that all tested electrical equipment and systems are operational and within applicable standards and manufacturer's tolerances and that the equipment and systems are installed in accordance with design specifications.

3. All testing shall be performed by the Contractor responsible for the installation of the systems or by an independent testing organization under contract with the Contractor.
4. All equipment utilized for testing shall have a valid calibration sticker. All test reports shall indicate the equipment utilized and its associated calibration due date.
5. Coordinate all required shutdowns with the Owner. Any and all testing required after the Owner has taken occupancy (temporary or permanent) shall be assumed to be conducted during premium time.
6. A written record of all tests and a final report summarizing the findings shall be submitted for approval prior to energizing any electrical power distribution equipment and systems. All equipment shall be left in clean operational condition.

B. Inspection and Test Procedures

The following tests shall be conducted using the noted section of the latest edition of NETA ATS Acceptance Testing Specifications for Electrical Power Distribution Equipment Systems as a reference:

1. Low Voltage Cables - All feeders illustrated on the one line diagram shall be inspected and tested in accordance with the referenced standard. Visually inspect cables for physical damage, color code and proper termination. Check continuity for proper labeling and megger for insulation resistance. Megger test voltage shall be 1000VDC for one (1) minute with no values less than 50 megohms. Tabulate readings for each feeder. NETA ATS-7.3
2. Disconnect the main bonding jumper at the service and at each separately derived system and verify single connection between the grounded and grounding conductor. Reconnect all disconnected bonding connections. Test the grounding electrode system for resistance to earth to verify a maximum of 25 ohms. NETA ATS-7.13

END OF SECTION 26 00 00

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SECTION 26 05 74

SHORT CIRCUIT, COORDINATION AND ARC FLASH STUDY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.

B. All criteria establish within Specification 26 00 00 shall apply to this section unless specifically noted otherwise.

1.2 SCOPE OF SERVICES

A. Section includes a computer-based fault-current study to determine the minimum interrupting capacity of circuit protective devices, overcurrent protective device coordination study to determine overcurrent protective device settings and an arc-flash study to determine the arc-flash hazard distance and the incident energy to which personnel could be exposed during work on or near electrical equipment.

B. The studies shall include all portions of the electrical distribution system from the normal and alternate sources of power throughout the low-voltage distribution system. Normal system operating methods, alternate operation, and operations which could result in maximum-fault conditions shall be thoroughly covered in the study.

1.3 DEFINITIONS

A. One-Line Diagram: A diagram which shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.

B. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion from the system.

C. SCCR: Short-circuit current rating.

D. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

1.4 ACTION SUBMITTALS

A. The results of the power system studies shall be summarized in a final report.

B. Submit the following submittals prior to or concurrently with the submittal of system protective devices included with panelboards, switchboards/switchgear, starters, VFDs, etc.

C. The report shall include the following sections:

1. Description, purposes, basis, and scope of the study and a single-line diagram of the portion of the power system which is included within the scope of study.
2. Tabulations of circuit breaker, fuse, and other equipment ratings versus calculated short-circuit duties and commentary regarding same.
3. Protective device time versus current coordination curves, tabulations of relay and circuit breaker trip settings, fuse selection, and commentary regarding same.
4. Fault-current tabulations including a definition of terms and a guide for interpretation.
5. Study report; signed, dated, and sealed by a qualified professional engineer.
6. Submit study report for action prior to receiving final approval of the distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Engineer for preliminary submittal of sufficient study data to ensure that the selection of devices and associated characteristics is satisfactory. Failure to submit the study prior to release of associated equipment shall be at the sole risk of the Contractor, who will bear all costs associated with changes necessary to comply with the requirements of the Electrical Construction documents.

1.5 QUALITY ASSURANCE

A. Studies shall use computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with requirements of standards and guides specified in this Section. Manual calculations are unacceptable.

B. Study Software Developer Qualifications: An entity that owns and markets computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.

1. The computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.

C. Study Specialist Qualifications: Professional engineer in charge of performing the study, analyzing the arc flash, and documenting recommendations, licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.

1.6 COORDINATION

A. An independent testing firm shall be engaged for the purpose of inspecting, setting, testing, and calibrating the protective relays, circuit breakers and other applicable devices as recommended in the power-system study report.

PART 2 - PRODUCTS

2.1 NOT USED

PART 3 - EXECUTION

3.1 SHORT-CIRCUIT STUDY

A. The study shall be in accordance with applicable ANSI and IEEE standards.

B. The study input data shall include the utility company's short-circuit single and three phase contribution with the X/R ratio, the resistance and reactance components of each branch impedance, motor and generator contributions, base quantities selected, and all other applicable circuit parameters.

C. Short-momentary duties and interrupting duties shall be calculated on the basis of maximum available fault current at each switchgear bus, switchboard, motor control center, distribution panelboard, pertinent branch circuit panelboards, and other significant locations through the system.

D. An equipment evaluation study shall be performed to determine the adequacy of circuit breakers, controllers, surge arresters, busways, switches, and fuses by tabulating and comparing the short-circuit ratings of these devices with the maximum short-circuit momentary and interrupting duties. Evaluation study should be submitted prior to final approval of equipment submittals.

3.2 PROTECTIVE-DEVICE COORDINATION STUDY

A. A protective-device coordination study shall be performed to select or to verify the selection of power fuse ratings, protective-relay characteristics and settings, ratios, and characteristics of associated voltage and current transformers, and low-voltage breaker trip characteristics and settings.

B. The coordination study shall include all voltage classes of equipment from the utility's incoming line protective device down to and including each motor control center and/or panelboard. The phase and ground overcurrent protection shall be included as well as settings for all other adjustable protective devices.

C. Coordination shall be in accordance with requirements of the NEC and the recommendations of the IEEE Standard 399. TC curves shall be provided for each typical branch scenario from source to largest branch circuit device.

D. The selection and settings of the protective devices shall be provided separately in a tabulated form listing circuit identification, IEEE device number, current transformer ratios, manufacturer, type range of adjustment, and recommended settings. A tabulation of the recommended power fuse selection shall be provided for all fuses in the system. Discrepancies, problem areas, or inadequacies shall be promptly brought to the Owner's attention.

3.3 ARC FLASH STUDY

A. Determine arc flash levels based upon minimum and maximum available utility fault and protective device settings as determined in the Protective Device Coordination Study.

B. Label all switchboards, panelboards, disconnects, starters, VFD's and any other electrical equipment likely to require maintenance or adjustment while energized.

C. Identify the current appropriate ratings of personal protective equipment (PPE).

D. Establish the Flash Protection Boundary (approach limit distance) as required by NFPA 70E.

E. Provide equipment specific environment and chemical arc-flash hazard warning labels per NEC® Section 110.16 requirements.

F. Label shall identify the level of arc flash hazard and the required PPE level.

G. Identify the risk of personal injury as a result of exposure to incident energy released during an arc flash event for each electrical distribution component (switchboard, switchgear, MCC, starter, panelboard, disconnect).

END OF SECTION 26 05 74

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SECTION 26 32 14

GENERATOR – NATURAL GAS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. All criteria establish within Specification 26 00 00 shall apply to this section unless specifically noted otherwise.

1.2 SUMMARY

A. Section includes packaged engine-generator sets for **standby** power supply with the following features:

1. Outdoor enclosure
2. Acceptance Testing

B. Related Sections include the following:

1. Division 26 00 00 Electrical
2. Section 26 36 00 Transfer Switches for transfer switches including sensors and relays to initiate automatic-starting and -stopping signals for engine-generator sets.

C. Engine driven electrical generating systems shall be as manufactured by

1. Caterpillar
2. Cummins
3. Kohler

Obtain packaged generator sets and all associated auxiliary components through one source from a single manufacturer. Walk-in enclosures may deviate from this requirement.

1.3 DEFINITIONS

A. EPS: Emergency power supply.

B. EPSS: Emergency power supply system

1.4 ACTION SUBMITTALS

A. Product Data: For each required component provide manufacturer’s standard cut sheet containing technical details, listings and general information illustrating compliance with these specification requirements.

B. Provide the following detailed documentation for review and evaluation:

1. The manufacturer shall provide copies of following documents for review and evaluation in accordance with general requirements of Division 01 and Division 26:

   a. Factory published specification sheet indicating standard and optional accessories, ratings, etc. Weights of all equipment shall be highlighted.
   b. Manufacturer's catalog cut sheets of all auxiliary components such as battery charger, silencer, exhaust flex, main circuit breaker, etc.
   c. Dimensional elevation and layout drawings of the generator set and enclosure with related accessories. Concrete pad recommendation, layout and stub-up locations of electrical and fuel systems shall be included.
   d. Engine mechanical data, including heat rejection, exhaust gas flows, combustion air and ventilation air flows, noise data, etc. Air flow requirements shall be for cooling and combustion air in CFM at 0.8 power factor, with air supply temperature of 95, 80, 70, and 50 °F.
   e. Fuel consumption at 0.8 power factor at 0.5, 0.75 and 1.0 times generator capacity. Gas pressure range shall be specifically outlined and shall not deviate from the basis of design gas pressure range.
   f. Generator electrical data including resistances, reactances, time constants, temperature and insulation data, thermal damage curve, cooling requirements, excitation ratings, voltage regulation, voltage regulator, efficiencies, waveform distortion and telephone influence factor.
   g. Certified trip curves for each circuit breaker and the generator electronic protection relay inherent in the generator controller.
   h. Certified copies of all Type (Design) and Verification Test Reports for prototype units.
   i. Interconnect wiring diagram of complete emergency system, including generator, switchgear, day tank, remote pumps, battery charger, and remote alarm indications.
   j. Control panel schematics.
   k. Calculations indicating acceptable performance of the submitted unit starting and running the specified load.

2. Report of exhaust emissions showing compliance with applicable regulations.
3. Third party certified noise test data on an equal or similar enclosure design.
4. Manufacturers and dealers written warranty.
5. Seismic Qualification Certificates for engine-generator set, accessories, and components.

1.5 CLOSEOUT SUBMITTALS

A. Submit test report confirming acceptance of all Installation inspections and tests as outlined in Part 3 of this specification.

B. Submit operation and maintenance data based on factory and field-testing, operation and maintenance of specified product.

C. Submit maintenance manuals and recommended spare parts list required to conform to industry standard maintenance guidelines. Instructions shall include but not be limited to:

1. Instructions for replacing any renewable components of the system.
2. Instructions for periodic cleaning and adjustment of equipment with a schedule of

these functions.

3. A complete list of all equipment and components with information as to the address and telephone number of both the manufacturer and local supplier of each item.

1.6 QUALITY ASSURANCE

A. The system design and installation shall conform to the following standards

1. All equipment shall be UL listed for its intended purpose, including UL 2200 where applicable.
2. All applicable NFPA standards, including but not limited to: 70 and 110.
3. State Building Code.
4. All requirements of the Authority Having Jurisdiction (AHJ)

B. The equipment supplier and the Contractor shall demonstrate a minimum five (5) years' experience in the successful design and installation of standby generation systems similar in size and scope to that required for this project.

1.7 WARRANTY

A. The installer and manufacturer's warranty shall be for a minimum period of five (5) years from the date of the final acceptance test approval.

B. The supplier shall provide a trailer mounted portable engine generator with accessories (including interconnection to the electrical distribution system) to provide backup power for any warrantee related system outages that exceed five calendar days.

1.8 COORDINATION

A. Coordinate sizes and locations of actual equipment provided. Provide sketches to illustrate submitted equipment will fit within the allocated space where the dimensions of the submitted equipment exceed those illustrated on the drawings for the basis of design.

PART 2 - PRODUCTS

2.1 GENERAL

A. Provide factory assembled water cooled natural gas engine-driven electric generating system rated for emergency standby service. The automatic transfer switch(es) specified in other sections of this specification shall be supplied by the generator set manufacturer in order to establish and maintain a single source of system responsibility and coordination. Refer to the drawings for service ratings at 60 Hz.

B. The system shall automatically start and accept full rated load within ten (10) seconds of being signaled to start.

C. Engine generator and accessories including control panel, engine starting batteries and output circuit breaker(s) shall be mounted within a sound attenuated weatherproof enclosure. Refer to the enclosure specification section for additional details.

D. Specified kW is for continuous service during utility source interruption, as established in ISO 8528-3 at 86°F. Rating shall be substantiated by manufacturer's standard published curves. Special and maximum ratings will not be accepted.

E. Supplier shall have been engaged regularly in generator or engine manufacture, or both, for at least twenty-five (25) years. The generator manufacturer and dealer shall be ISO 9001 certified.

F. The supplier shall maintain a full time in-house parts and service organization so that parts and service are readily available, twenty-four (24) hours/day seven (7) days/week. Qualified, factory trained service personnel shall be available within four (4) hours of notification.

G. Prototype testing shall certify the acceptable performance of the generating set series. The test shall prove acceptance, as a system, of the design and integration of all components. Proposed system shall be a current factory production model. Prototype testing shall confirm:

1. Fuel consumption at ¼, ½, ¾ and full load.
2. Exhaust emissions.
3. Mechanical and exhaust noise levels.
4. Governor speed regulation at ¼, ½, ¾ and full load.
5. Generator temperature rise in accordance with NEMA MG1-22.40
6. Harmonic analysis, voltage waveform deviation and telephone influence factor.
7. Generator short circuit capacity.
8. Cooling system capacity.

H. Provide manufacturer's load analysis calculation confirming that the generating set submitted is compatible with loads to be applied.

1. Generator-Set Performance: Steady-State Voltage Operational Bandwidth: 3% of rated output voltage from no load to full load.
2. Transient Voltage Performance: Not more than 20% variation for 50% step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within three (3) seconds.
3. Steady-State Frequency Operational Bandwidth: 0.5% of rated frequency from no load to full load.
4. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.
5. Transient Frequency Performance: Less than 5% variation for 50% step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within five (5) seconds.
6. Output Waveform: At no load, harmonic content measured line to line or line to neutral shall not exceed 5% total and 3% for single harmonics. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50%.
7. Sustained Short-Circuit Current: For a three-phase, bolted short circuit at system output terminals, system shall supply a minimum of 250% of rated full-load current for not less than 10% and then clear the fault automatically, without damage to generator system components.
8. Below requires ten (10) second maximum start time under specific conditions and includes startup only, not load assumption.
9. Start Time: Comply with NFPA 110, Type 10, system requirements.

I. The proposed generator set shall be EPA Tier Certified and in compliance with the Commonwealth of Massachusetts Emission regulations at the time of

installation/commissioning. Actual engine emissions values must be in compliance with EPA Tier emissions standards per ISO 8178 – D2 Emissions Cycle at specified EKW/BHP rating. Utilization of the “Transition Program for Equipment Manufacturers” also known at “Flex Credits” to achieve Tier certification is not in compliance with MA Regulation “310 CMR 7.02 U Plan Approval and Emission Limitations” and will not be accepted.

J. The manufacturer’s warrantee shall be for a minimum period of five (5) years from the date of initial system start-up and acceptance or 1,500 operating hours, whichever occurs first. The warrantee shall include repair parts, expendables (lubricating oil, filters, antifreeze, etc.), labor and travel expenses necessary for repairs at the job site. The supplier shall provide a trailer mounted portable engine generator with accessories (including interconnection to the electrical distribution system) to provide backup power for any warrantee related system outages that exceed five (5) calendar days.

2.2 ENGINE

A. The engine shall be natural gas fueled, water-cooled, either vertical in-line or V-type, with dry exhaust manifolds, operating with nominal speed not exceeding 1800 RPM. It shall have 8 cylinders with a minimum cubic inch displacement of 8.8L(535 in2)

B. Frequency regulation shall be Isochronous, regulated to within +/- 0.25% from no load to full load.

C. All fuel piping shall be black iron or flexible fuel hose rated for this service. Flexible fuel lines rated 300°F and 100 PSI.

D. The engine shall be equipped with a rail-mounted, engine-driven radiator with blower fan and all accessories. The cooling system shall be sized to operate at full load conditions, 110°F ambient air entering the room or enclosure (where an enclosure is specified), and permanent anti-freeze solution of 5 ethylene-glycol-based antifreeze and water with anticorrosion additives as recommended by engine manufacturer.to protect equipment to –15°F without derating the unit. Antifreeze shall have a service life of 3,000 hours without maintenance. The generator set supplier is responsible for providing a properly sized cooling system based on the installed static pressure restriction.

E. Provide thermostatically-controlled electric-immersion type engine jacket water heater, be sized by the manufacturer to maintain jacket water temperature at 90°F, 208 V, single-phase, 60 Hz mounted, piped and prewired to terminal strip.

F. Lube oil pump shall be mechanically driven positive displacement. Lube oil system shall be piped through an oil cooler and a full flow filter with replaceable cartridge. Filter and strainer shall be rated to remove 90% of particles five (5) micrometers and smaller while passing full flow.

G. Air intake shall be via a heavy duty replaceable dry element filter and "blocked filter" indicator.

H. Provide lubricating oil pressure gauge, water temperature gauge, battery charge rate ammeter and running time meter mounted in common panel with engine controls, alternator controls and alternator instruments.

I. A critical type silencer (25-34DBA at 500HZ exhaust noise reduction), companion

flanges, and flexible stainless steel exhaust fitting properly sized shall be furnished and installed according to the manufacturer's recommendation. Exhaust pipe size shall be sufficient to ensure that exhaust backpressure does not exceed the maximum limitations specified by the engine manufacturer. The silencer shall be mounted so that its weight is not supported by the engine nor will exhaust system growth due to thermal expansion be imposed on the engine. The muffler and all indoor exhaust piping shall be "lagged" by the Contractor to maintain a surface temperature not to exceed 150°F. The insulation shall be installed so that it does not interfere with the functioning of the flexible exhaust fitting.

2.3 ALTERNATOR

A. The synchronous generator shall be a single bearing, self-ventilated, drip-proof design in accordance with NEMA MG 1 and directly connected to the engine flywheel housing with a flex coupling to ensure permanent alignment. The insulation material shall meet NEMA standards for Class H insulation and be impregnated in a polyester varnish or vacuum impregnated with epoxy varnish to be fungus resistant. Temperature rise of the rotor and stator shall not exceed NEMA class F (130 ºC rise by resistance over 40°C ambient). Stator windings shall be random wound two-thirds pitch. Subtransient resistance shall not exceed 12%.

B. The excitation system shall be of brushless construction. The permanent magnet brushless exciter shall be independent of main stator windings, shall consist of a three-phase armature and a three-phase full wave bridge rectifier mounted on the rotor shaft. Surge suppressors shall be included to protect the diodes from voltage spikes. Generator shall have the ability to sustain short circuit current for ten (10) seconds of 300% of rated current to allow protective devices to operate.

C. The automatic voltage regulator (AVR) shall maintain generator output voltage within +/- 0.5% for any constant load between no load and full load. The regulator shall be three phase sensing, totally solid state design, which includes electronic voltage buildup, volts per Hertz regulation, overexcitation protection, loss of sensing protection, temperature compensation, shall limit voltage overshoot on startup, and shall be environmentally sealed. System shall reduce voltage automatically if load demand exceeds engine capacity and remove excitation when generator is overloaded for more than 10 seconds. Voltage regulator shall be, volts-per-hertz and include over voltage and under voltage protection.

1. Maintain voltage within 20% on one step, full load
2. Maintain frequency within 10% and stabilize at rated frequency within two (2) seconds.

D. Generator Protection: Microprocessor-based unit shall continuously monitor current level in each phase of generator output, integrate generator heating effect over time, and predict when thermal damage of alternator will occur. When signaled by generator protector or other generator-set protective devices, a shunt-trip device in the generator disconnect switch shall open the switch to disconnect the generator from load circuits. Protector performs the following functions:

1. Initiates a generator overload alarm when generator has operated at an overload equivalent to 110% of full-rated load for sixty (60) seconds. Indication for this alarm is integrated with other generator-set malfunction alarms. Contacts shall be available for load shed functions.
2. Under single or three-phase fault conditions, regulates generator to 300% of rated full-load current for up to ten (10) seconds.
3. As overcurrent heating effect on the generator approaches the thermal damage

point of the unit, protector switches the excitation system off, opens the generator disconnect device, and shuts down the generator set.

4. Senses clearing of a fault by other overcurrent devices and controls recovery of rated voltage to avoid overshoot.

E. The alternator output shall be wired via a generator mounted 3 pole molded case circuit breaker, trip rating as indicated on the drawings. Breaker shall utilize an electronic LSI solid state trip. Unit breaker shall each be housed in a steel NEMA 1 enclosure mounted on a separate support stand vibration isolated from the engine / generator arrangement. Each separate branch (NEC 700, 701 702 and Fire Pump) shall be in its own separate enclosure. Refer to the one line diagram for branches required. Bus bars, sized for the cable type shown on drawing, shall be supplied on the load side of breaker.

2.4 VIBRATION ISOLATION

A. Provide spring vibration mounts between engine generator set and structural sub-base as recommended by equipment manufacturer. Unit shall be suitable for installation on any level surface.

2.5 STARTING

A. A DC electric starting system with positive engagement shall be furnished. The motor voltage shall be as recommended by the engine manufacturer.

B. Provide 24 V lead acid batteries as recommended by equipment manufacturer, sized to provide no less than three cranking cycles without recharging. Provide unit mounted battery rack fabricated of metal with acid-resistant finish and thermal insulation, hold down and battery cables.

C. A current limiting automatic-equalizing and float battery charger shall be furnished to recharge batteries. Unit shall comply with UL 1236 and include the following features:

1. Equalizing-charging rate of 10 amps shall be initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit shall then be automatically switched to a lower float-charging mode and shall continue to operate in that mode until battery is discharged again.
2. Adjust float and equalize voltages for variations in ambient temperature from minus 40°F to 140°F to prevent overcharging at high temperatures and undercharging at low temperatures.
3. Maintain constant output voltage regardless of input voltage variations up to plus or minus 10%.
4. Ammeter and Voltmeter shall be flush mounted in door. Meters shall indicate charging rates.
5. Sense abnormally low battery voltage and close contacts providing low battery voltage indication on control and monitoring panel. Sense high battery voltage and loss of ac input or dc output of battery charger. Either condition shall close contacts that provide a battery-charger malfunction indication at system control and monitoring panel.
6. Enclosure and Mounting: NEMA 250, Type 1, wall-mounted cabinet.

D. Provide battery blanket heater to maintain battery temperature between 50°F and 90°F.

2.6 CONTROL PANEL

A. Provide a generator set mounted control panel for complete control and monitoring of the engine and generator set functions. Panel shall include automatic start/stop operation, cycle cranking, AC metering (0.5% true RMS accuracy) with phase selector switch, shutdown sensors and alarms with horn and reset, adjustable cool-down timer, emergency stop push-button and engine run time meter (non-resettable).

B. Critical components shall be environmentally sealed to protect against failure from moisture and dirt. Components shall be housed in a NEMA 1/IP22 enclosure with hinged door.

C. The panel itself shall be mounted on a separate support stand isolated from the engine / generator arrangement. Panel / breaker arrangements mounted on the generator set in such a way that access to the AC Generator terminal box is restricted in any way whatsoever are not acceptable.

D. Provide the following readouts:

1. Engine oil pressure
2. Coolant temperature
3. Engine RPM
4. System DC Volts
5. Engine running hours
6. Generator AC volts
7. Generator frequency
8. Generator AC amps

E. Provide the following indications for protection and diagnostics according to NFPA 110 Level 1:

1. Low oil pressure
2. High water temperature
3. Low coolant level
4. Overspeed
5. Overcrank
6. Emergency stop depressed
7. Approaching high coolant temperature
8. Approaching low oil pressure
9. Low coolant temperature
10. Low voltage in battery
11. Control switch not in auto position
12. Low fuel pressure
13. Battery charger AC failure
14. High battery voltage
15. Engine running
16. One (1) Spare Point

F. Diagnostics capabilities shall identifying both system and component level issues. The diagnostic codes shall be maintained in a history log specifying the number of occurrences, and second/minute/hour at which they occur.

G. Provide the following control functions:

1. Terminals located inside the control panel for REMOTE EMERGENCY STOP
2. ON / OFF / AUTO control switch

H. Provide a minimum of 4 programmable output dry contacts for connection to the Owner's security or ATC system. Three of the 4 outputs shall be programmed to alarm "Engine Running", "Summary Alarm" and "Generator not in Automatic".

2.7 ANNUNCIATOR

A. Provide an annunciator to meet the requirements of NFPA 110, Level 1, installed in enclosure suitable for flush mounting. The annunciator shall provide remote annunciation of all points stated above and shall incorporate ring-back capability so that after silencing the initial alarm, any subsequent alarms will sound the horn.

2.8 I/O MODULE

A. Provide two (8) point remote I/O modules for redundant monitoring of NFPA110, Level 1 alarms by the Owner's security or ATC system. The remote I/O modules shall interconnect with the ECP on the remote annunciator network wiring and be located in the building adjacent to the Owner's data collection panel.

2.9 SOUND ATTENUATED WEATHERPROOF ENCLOSURE.

A. Engine generator set, generator control panel, engine starting batteries and internally mounted exhaust silencer shall be enclosed in factory-assembled, rainproof-weather-protective skid-base enclosure with full floor panel. The enclosure shall have a resulting sound level of less than 71 DBA at fifty (50) feet. The enclosure and generator shall be UL2200 labeled.

B. Enclosure will consist of a roof, two (2) side walls, and two (2) end walls, of highly corrosion resistant construction made from galvanized steel. Stainless steel flush fitting latches and hinges tested and proven to withstand extreme conditions of corrosion. The sheet steel components shall be pre-tested with zinc phosphate prior to polyester powder coating at 392 °F. Roof bows shall be cambered to aid in rain runoff.

C. Intake openings shall be screened to prevent the entrance of rodents. The system shall include a cooling and combustion air inlet silencer system, an equipment enclosure section, and a cooling air discharge silencer section.

D. Number of doors on enclosure shall be as required so that all normal maintenance operations, such as lube oil change, filter change, belt adjustment and replacements, hose replacements, access to the control panels, etc., may be accomplished without disassembly of any enclosure components. Access doors shall be fabricated of the same material as the enclosure walls. They shall be reinforced for rigidity and set is a welded frame to ensure proper operation. Handles shall be key lockable, all doors keyed alike, and hinges shall be zinc die cast or stainless steel. Fasteners shall be zinc plated or stainless steel. Doors shall be of a lift off design allowing one person to remove door if necessary and/or top hung and supported by gas struts.

E. Battery racks and batteries shall be factory-installed and wired. Exhaust silencer, flexible exhaust connector and condensate drain valve shall be factory-installed.

F. Lube oil and coolant drains shall be extended to the exterior of the enclosure and terminated with drain valves and capped with pipe nipples on flanged connectors. Radiator access shall be through a hinged, lockable cover on enclosure. Cooling fan and

charging alternator shall be fully guarded to prevent injury.

G. Owner shall select finish color of enclosure.

H. The exhaust stack shall be a minimum of 10 feet-0 inches above the enclosure roof. All required supports shall be attached to the enclosure. No obstructions shall be allowed to the exhaust outlet.

I. Provide a manual stop break-glass station to allow emergency shutdown of the unit. The station shall be integrated into the enclosure and accessible from the exterior, no greater than 6 feet- 0 inches AFG.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Placement of the generator shall be the responsibility of the Electrical Contractor. Coordinate placement with the Owner's Representative and obtain all associated permits and permissions necessary for blockage of public way, interference with parking, etc.

B. Fill all fluid levels to maximum recommended levels by the manufacturer prior to and after testing completed.

3.2 START-UP AND TESTING

A. After installation is complete and normal power is available, the manufacturer's local dealer shall perform the following four (4) hour load test:

1. Verify that the equipment has been properly installed.
2. Check all auxiliary devices for proper operation, including battery charger, jacket water heater(s), generator space heater, all remote annunciator points, etc.
3. Test all alarms and safety shutdown devices for proper operation and annunciation.
4. Check all fluid levels.
5. Start engine and check for exhaust, oil, fuel leaks, vibrations, etc.
6. Verify proper voltage and phase rotation at the transfer switch before connecting to the load.
7. Connect the generator to building load and verify that the generator will start and run all designated loads. Testing shall be performed in accordance with NFPA 110 from a "cold start" condition. Each of the following shall be observed and recorded upon opening of the Normal supply circuit breaker to the ATS:

    a. Time delay on start
    b. Cranking time until the prime mover starts and runs
    c. Time required to reach operating speed
    d. Voltage and frequency overshoot
    e. Time required to reach steady state conditions with all switches transferred to the emergency position
    f. Voltage, frequency and current

    The system shall be tested under load for a period of two (2) hours. The following readings shall taken at fifteen (15) minute intervals:

    g. Oil pressure

h. Coolant temperature
i. Battery charge rate
j. AC volts
k. AC Amperes- all phases
l. Frequency
m. Kilowatts
n. Kilovolt-amperes
o. Ambient Temperature

8. Allow system to cool for five (5) minutes.
9. The system shall be tested for a period of two (2) hours with the use of a portable resistive/reactive load bank at 100% rated resistive load. Load shall be applied upon reaching rated RPM in one step. All data specified above shall be recorded for this segment until completion of the two-hour test.
10. The Generator Distributor shall provide a written test report upon completion of testing. Report shall specifically indicate the successful completion of each item referenced above and submit all recordings in a format similar to NFPA 110 tables.

B. All costs associated with the referenced testing, including fuel consumption, load bank rental, temporary cables from the generator to the load bank, etc. shall be included in the bid price.

3.3 TRAINING

A. Provide a one (1) day of on-site training to instruct the Owner's personnel in the proper operation and maintenance of the equipment. Review operation and maintenance manuals, parts manuals, and emergency service procedures.

END OF SECTION 26 32 14

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SECTION 26 36 00

AUTOMATIC TRANSFER SWITCH

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.

B. All criteria establish within Specification 26 00 00 shall apply to this section unless specifically noted otherwise.

1.2 SUMMARY

A. Section Includes Automatic Transfer Switch (ATS) for [**emergency**] [**and**] [**standby**] power supply with the following features:

1. Automatic transfer between the primary and secondary sources.
2. Regularly scheduled control of the engine-generator for exercising.
3. Bypass Isolation.
4. Remote monitoring and control.
5. Acceptance Testing

B. Related Sections include the following:

1. Division 26 00 00 Electrical
2. Section 26 32 14 Generator Natural Gas for automatic-starting and -stopping signals for the engine-generator set.

C. The automatic transfer switch shall be 300 Series as manufactured by ASCO or approved equal from Russelectric or Eaton ATC-300

D. Obtain ATS from the engine-generator set supplier.

1.3 DEFINITIONS

A. EPS: Emergency Power Supply.

B. EPSS: Emergency Power Supply System

C. ATS: Automatic Transfer Switch

D. WCR: Withstand and Close Rating

1.4 ACTION SUBMITTALS

A. Product Data: For each required component provide manufacturer's standard cut sheet containing technical details, listings and general information illustrating compliance with

these specification requirements.

B. Provide the following detailed documentation for review and evaluation:

1. Factory published specification sheet indicating standard and optional accessories, ratings, etc.
2. Dimensional elevation and layout drawings of automatic transfer switch and related accessories.
3. Certified copies of all Type (Design) and Verification Test Reports
4. Interconnect wiring diagram of complete system.
5. Control schematics.

1.5 CLOSEOUT SUBMITTALS

A. Submit test report confirming acceptance of all Installation inspections and tests as outlined in Part 3 of this specification.

B. Submit operation and maintenance data based on factory and field-testing, operation and maintenance of specified product.

C. Submit maintenance manuals and recommended spare parts list required to conform to industry standard maintenance guidelines. Instructions shall include but not be limited to:

1. Instructions for replacing any renewable components of the system.
2. Instructions for periodic cleaning and adjustment of equipment with a schedule of these functions.
3. A complete list of all equipment and components with information as to the address and telephone number of both the manufacturer and local supplier of each item.

1.6 QUALITY ASSURANCE

A. The system design and installation shall conform to the following standards

1. All equipment shall be UL listed for its intended purpose.
2. All applicable NFPA standards, including but not limited to: 70 and 110.
3. State Building Code.
4. All requirements of the Authority Having Jurisdiction (AHJ)

B. The equipment supplier and the Contractor shall demonstrate a minimum ten (10) years' experience in the successful design and installation of standby and emergency power systems similar in size and scope to that required for this project.

1.7 WARRANTY

A. The installer and manufacturer's warranty shall be for a minimum period of two (2) years from the date of the final acceptance test approval.

1.8 COORDINATION

A. Coordinate sizes and locations of actual equipment provided. Provide sketches to illustrate submitted equipment will fit within the allocated space where the dimensions of

the submitted equipment exceed those illustrated on the drawings for the basis of design.

PART 2 - PRODUCTS

2.1 GENERAL

A. The ATS shall consist of power transfer unit and controller interconnected to provide complete automatic operation. The ATS shall be mechanically held and electrically operated by single-solenoid mechanism energized from the source to which load is to be transferred. Switch shall be rated for continuous duty and shall be inherently double throw. The ATS shall be mechanically interlocked to prohibit simultaneous closure of both normal and emergency contacts. The ATS shall be suitable for use with an engine driven emergency generator and utility sources. The entire assembly shall be contained in a NEMA 1 Enclosure.

B. Main contacts shall be of silver composition. Contacts rated 600A and above shall have segmented blow-on construction and be protected by separate arcing contacts for withstand capability. Operating transfer time in either direction shall not exceed one-sixth of one second. An ATS with components of molded-case circuit breakers, contactors or components not designed for continuous duty or repetitive load transfer switching will not be accepted.

C. The neutral contacts shall be fully rated overlapping where four-pole design is required by the Drawings.

D. The ATS shall be rated to close on and withstand the available fault current at the transfer switch terminals. Where specific breaker or fused inputs are required to meet the stated WCR, these shall only be used where specifically indicated on the drawings.

E. Contacts, coils, springs and control elements shall be inspectable and removable from front of transfer switch without major disassembly or disconnection of power conductors. A manual operating handle shall be provided to permit full movement of contacts throughout their full travel for inspection and service.

F. Automatic transfer switch controller shall be a single microprocessor with the ability to be networked through an optional serial communications port. An LCD display and keypad shall provide access to all available data and function for setting all operational parameters. Control module shall have protective cover and shall be mounted separately from transfer switch. Sensing and control logic shall be solid-mounted on plug-in printed circuit boards. Printed circuit boards shall be keyed to prevent incorrect installation. Provide industrial control grade plug-in interfacing relays with dust covers.

G. Automatic transfer switch shall meet NEMA ICS 10-199, NFPA 110 and UL-1008 standards.

H. Unless specifically illustrated on the drawings, the ATS shall be suitable for Front Access Only.

2.2 CONTROLLER

A. Voltage sensing shall be close differential three phase line-to-line. Pickup shall be adjustable from 85% to 100% of nominal; dropout voltage shall be adjustable from 78%

to 98% of pickup value. Transfer to emergency shall be initiated upon reduction of normal source to 85% of nominal voltage and retransfer to normal shall occur when normal source reaches 95% of nominal.

B. Time delay to override momentary normal source outages shall delay transfer switch signals and engine starting signals. Time delay shall be field-adjustable from 0.5 to six (6) seconds and factory set at one (1) second.

C. Time delay on retransfer to normal source shall be bypassed automatically if emergency source fails and normal source is available. Time delay shall be field-adjustable from zero (0) to sixty (60) minutes.

D. Unloaded running time delay for emergency generator cooldown shall be field-adjustable from zero (0) to sixty (60) minutes.

E. Time delay on transfer to emergency shall be field-adjustable from zero (0) to five (5) minutes for controlled timing of load transfer to emergency, where indicated.

F. A time delay activated output signal shall be provided to drive external relays for selective load shedding. The controller shall be adjustable from zero (0) to five (5) minutes in any of the following modes:

1. Prior to transfer only.
2. Prior to and after transfer.
3. Normal to emergency only.
4. Emergency to normal only.
5. Normal to emergency and emergency to normal.
6. All transfer conditions or only when both sources are available.
7. The controller shall include capabilities for optional Closed Transition and Delayed Transition operation where specifically called out on the drawings:

2.3 AUXILIARIES

A. Provide a contact that closes when normal source fails for initiating engine start, rated 10 A, 32 V DC. The start circuit shall be supervised and cause a local and remote alarm and start the generator in the event that the connection integrity is lost.

B. Provide push to test LED indicators, green to indicate when the ATS is connected to the normal source and red to indicate when automatic transfer switch is connected to emergency source.

C. Provide two auxiliary contacts that are closed when the automatic transfer switch is connected to normal and two auxiliary contacts that are closed when automatic transfer switch is connected to emergency. Contacts shall be rated 10 A, 480 V AC, 60 Hz.

D. Provide transfer inhibit input function to prohibit transfer of the ATS from normal to emergency upon a dry contact signal (open on inhibit) input. Install a labeled jumper across terminals from the factory.

E. Provide load shed input function to shed load if powered via the emergency source upon a dry contact signal (open to shed) input. Install a labeled jumper across the terminals from the factory.

F. Provide a normally closed output which shall open prior to transfer from emergency to

normal. This output shall be used to warn the elevator equipment of the pending transfer. The contacts shall be time adjustable from 10-300 seconds.

G. Provide engine generator exerciser, which shall allow up to seven different exercise routines. The user shall be able to do the following to each routine:

1. Enable or disable the routine.
2. Enable or disable transfer of the load during the routine.
3. Set the start time, day, week and period.
4. Set the duration of the run.
5. Where multiple ATSs are specified, engine exerciser option is required in one ATS only.

2.4 IN-PHASE MOTOR TRANSFER

A. Provide in-phase monitor to inhibit transfer of loads from emergency to normal sources and vice versa until sources are in phase.

B. Transfer shall be initiated only when power sources are approaching synchrony and when relative phase angle crosses set point towards 0°.

C. In-phase monitor shall operate accurately regardless of which source is at highest frequency. In-phase monitor shall be solid state, with gated silicon transistor circuitry to ensure positive and crisp operation independent of variations in voltage input of 70% to 110% of nominal, with temperature between 0 and 45°C.

1. Repetitive accuracy throughout temperature and voltage ranges shall not exceed +/-30º (electrical) of setting. Monitor shall be capable of operating within frequency range of +/-3 Hz of nominal. Provide manual bypass circuit.

D. Where an in-phase monitor is not manufactured for the submitted transfer switch, the following changes shall be incorporated into the design:

1. Transfer switch shall be double-throw activated by dual electrical operators energized momentarily and connected to transfer mechanism with over-center linkage. Minimum transfer time shall be 400 milliseconds.
2. Provide for time delay between opening closed contacts and closing open contacts sufficient to demagnetize loads.
3. Motor and transformer loads shall be re-energized with normal in-rush current after transfer.
4. Switch shall transfer in either direction with 70% rated voltage applied to terminals.

PART 3 - EXECUTION

3.1 AUTOMATIC TRANSFER SWITCH

A. Storage

1. Contractor shall store, protect, and handle products in accordance with recommended practices listed in manufacturer's Installation and Maintenance Manuals. Contractor shall store in a clean, dry space. Cover with heavy canvas or plastic to keep out dirt, water, construction debris, and traffic. Heat enclosures to prevent condensation.

2. Automatic transfer switches shall be located in well-ventilated areas, free from excess humidity, dust and dirt and away from hazardous materials. Ambient temperature of area will be between -30 ºC and +25 ºC. Indoor locations shall be protected to prevent moisture from entering enclosure.

B. Installation

1. Provide ½ inch spacers for automatic transfer switches mounted at exterior walls below grade to establish ½ inch air space behind enclosure.
2. Inspect installed automatic transfer switches for anchoring, alignment, grounding and physical damage. Clean interiors to remove construction debris, dirt and shipping materials.
3. Check tightness of all electrical connections with calibrated torque wrench. Minimum acceptable values are specified in manufacturer's instructions.
4. Each automatic transfer switch shall have laminated plastic nameplates with white cut letters identifying power source, voltage and circuit identified for both inputs and the output.

C. Start-Up and Testing

1. After installation is complete and normal and emergency power is available, the manufacturer's local dealer shall perform the following:

   a. Verify that the equipment has been properly installed.
   b. Check all transfer switch functions for proper operation.
   c. Check all auxiliary device functions for proper operation. Perform integrated testing as outlined in the generator specification

2. Provide on-site training to instruct the Owner's personnel in the proper operation and maintenance of the equipment. Review operation and maintenance manuals, parts manuals, and emergency service procedures.

END OF SECTION 26 36 00