

## SECTION 23 00 10 - BASIC MECHANICAL REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Basic Mechanical Requirements specifically applicable to Division 23 Sections, in addition to any requirements set forth in the General Conditions and Special Conditions of the Contract Documents.

#### 1.2 DESCRIPTION

- A. Furnish materials and perform labor required to execute this work as indicated on the drawings, as specified and as required to complete the work of this section, except as otherwise herein specifically excluded.

#### 1.3 WORK INCLUDED

- A. The complete Heating, Ventilating and Air Conditioning (HVAC) systems including, but not limited to, these major items:
  - 1. Coordinate work of this Section with related trades
  - 2. Verify applicable dimensions at the jobsite
  - 3. Diffusers and registers
  - 4. Furnishing and installation of miscellaneous hangers, supports, sleeves, inserts, anchors and other auxiliary equipment for systems under this Division
  - 5. Installation and connection of Contractor furnished equipment
  - 6. Shop drawings
  - 7. Equipment identification
  - 8. Equipment and systems adjustments and balancing
  - 9. Air, water and gas systems testing, adjusting and balancing
  - 10. Written operating and maintenance instructions
  - 11. Record drawings
  - 12. Guarantee

#### 1.4 WORK SPECIFIED ELSEWHERE

- A. None.

#### 1.5 SITE INSPECTION

- A. Contractor shall become familiar with the conditions at the site. No allowance will be made subsequently for any error through negligence in observing the site conditions. Contractor shall observe and make cost allowance for any mechanical and/or electrical items that must be relocated to accommodate the installation or servicing of any item covered under this contract.

#### 1.6 ORDINANCES, REGULATIONS AND CODES

- A. References to Technical Societies, Trade Organizations, Governmental Agencies is made in accordance with the following abbreviations:
  - 1. AFI - Air Filter Institute
  - 2. AMCA - Air Moving & Conditioning Association

3. ARI - Air Conditioning & Refrigeration Institute
4. ASHRAE - American Society of Heating, Refrigerating and Air Conditioning Engineers
5. ASME - American Society of Mechanical Engineers
6. ASTM - American Society of Testing Materials
7. AWS - American Welding Society Code
8. ANSI - American National Standards Institute
9. CBC - California Building Code
10. CCR - California Code of Regulations
11. CEC - California Electrical Code
12. CFC - California Fire Codes
13. CMC - California Mechanical Code
14. CPC - California Plumbing Code
15. FIA - Factory Insurance Association
16. NAFM - National Association of Fan Manufacturers
17. NEMA - National Electrical Manufacturer's Association
18. NFPA - National Fire Protection Association
19. ORS - Office of Regulatory Services
20. SCAQMD - South Coast Air Quality Management District
21. SMACNA - Sheet Metal and Air Conditioning Contractors National Association
22. UFC - Uniform Fire Code
23. UL - Underwriter's Laboratories
24. UPC - Uniform Plumbing Code

A. Requirements of Regulatory Agencies: Materials and installation shall comply with applicable local, state, and national codes and ordinances. Rulings and interpretations of the enforcing agencies shall be considered as part of the local codes. No extras will be permitted for furnishing items required by the local codes but not specified or shown on the drawings.

B. Codes and Standards:

1. UBC and California Amendments (California Building Code - Part 2, Title 24, CCR)
2. UMC and California Amendments (California Mechanical Code - Part 4, Title 24 CCR)
3. UPC and California Amendments (California Plumbing Code - Part 5, Title 24 CCR)
4. Uniform Fire Code with State Amendments (California Fire Code - Part 9, Title 24 CCR)
5. National Fire Protection Associations - National Fire Code

C. Nothing in these drawings and specifications is to be construed to permit work in violation thereof. Ordinances, regulations and codes are to be construed as minimum requirements.

D. It is the responsibility of the Contractor to conduct periodic safety reviews to access the adequacy of the Contractor's safety measures in, on, or near the construction site.

E. Ventilating, refrigeration and electrical equipment and appliances are required to be approved by the Underwriters Laboratory, Inc., or other nationally recognized testing agency and installed per the testing agency's specifications.

## **1.7 PERMITS, FEES AND INSPECTIONS**

A. Obtain and pay for all necessary permits, fees, assessments, complimentary drawings, required by any legally constituted public authority having jurisdiction.

## **1.8 DRAWINGS AND SPECIFICATIONS**

- A. The Project Managers decision will be final on interpretation of the Drawings and Specifications.
- B. The Drawings and Specifications are complimentary. Any work called for on the Drawings and not mentioned in the Specifications, or vice versa, shall be performed as though fully set forth in both.
- C. Piping, ductwork and other equipment shown as existing has been taken from the Owner's drawings. Contractor shall verify exact location in field before proceeding with the work.
- D. Where codes, standards, drawings or specifications conflict, the most stringent shall prevail, unless prior approval for variance is obtained. Specific details on the drawings shall supersede the specification in the event of a conflict.
- E. Alternate support or seismic detail shall have prior approval by the Project Manager; the Contractor shall obtain agency approval without any additional cost or time to the contract and without any time penalty on the work schedule.

## **1.9 SUBMITTALS**

- A. Before starting work, the Contractor shall furnish for the approval of the Project Manager, Shop Drawings and Submittals with itemized equipment lists, complete in all details that they proposes to install. All items shall be submitted at the same time.
- B. Submittals must be specific to this project with respect to model number, capacities, performance, etc., generic submittals will not be accepted.
- C. Variations or deviations on submitted items from those specified must be clearly tagged and/or identified.
- D. Submittals shall include, but not necessarily be limited to, the following, which are mandatory:
  - 1. Draw Equipment Layouts to 1/4" scale, including equipment, piping accessories, and showing clearances for operating and servicing
  - 2. Foundations, supports, hangers, inserts
  - 3. Insulation
  - 4. Ventilation and air conditioning equipment, specialties and the air control systems
  - 5. Fans, fan characteristic curves, fan tests
  - 6. Dampers, louvers, grilles, registers, diffusers
  - 7. Shop fabrication drawings and installation drawings of ductwork and piping layouts. Submit for approval prior to fabrication. Drawings shall indicate dimensions from bottom of piping and ductwork to finish floor level.
  - 8. Wiring diagrams, control panel board, motor starters and controls for electrically operated equipment furnished by mechanical trades
  - 9. Automatic control system diagrams
  - 10. Exhaust, supply and return fans
  - 11. Access panels
  - 12. Hangers, inserts, supports, anchors
  - 13. Sleeves, escutcheons, caulking, waterproofing, fireproofing
  - 14. Expansion joints, guides and anchors
  - 15. Shop fabrications drawings and calculations
  - 16. Special and miscellaneous products furnished under this section and not listed herein

## **1.10 RECORD DRAWINGS AND MANUALS**

- A. Record Set During the Work: At the site, maintain at least one set of drawings as a Field As-Built drawing set. Also, maintain at least one copy of all addenda, modifications, approved submittals,

correspondence, and transmittals, at the site. Keep drawings and data in good order and readily available for the Construction Manager, Project Manager, and Owner's representatives. Changes: Clearly and correctly mark As-Built drawings to reflect changes made during the construction process at the time the changed work takes place. No such changes shall be made to the work unless authorized by the Project Manager and the Owner.

- B. Final Record Set drawings: Conform to General Conditions and Special Conditions of the Contract Documents.
- C. Preparation of Final Record Set drawings: Contractor shall transfer recorded changes in the work indicated on the Field As-Built Set to the Record Set. Changes shall be neatly and clearly drawn and noted by skilled draftsmen, and shown technically correct.
- D. Approval: Prior to Project Manger's inspection for Substantial Completion, submit the Final Record Set drawings to the Construction Manager for review, and make such revisions as may be necessary for Final Record Set drawings to reflect a true, complete, and accurate record of the work.
- E. Manuals: Obtain data from the various manufacturers and submit instruction, installation, operation, and maintenance manuals as required and to the extent required under other Sections.
- F. Contents: Each manual shall have an index listing the contents. Information in the manuals shall include not less than:
  - 1. General introductions and overall equipment description, purpose, functions and simplified theory of operation.
  - 2. Specifications
  - 3. Installation instructions, procedures, sequences, and precautions, including tolerances for level, horizontal and vertical alignment.
  - 4. Grouting requirements.
  - 5. List showing lubricants for each item of mechanical equipment and recommended lubrication intervals.
  - 6. Start-up and beginning operation procedures.
  - 7. Operational procedures.
  - 8. Shutdown procedures.
  - 9. Maintenance and calibration procedures
  - 10. Parts lists
  - 11. Name, address and telephone number of each manufacturer's local representative.
- H. Manual Submittals: Unless otherwise specified, each submittal shall include two copies of each manual, one of which will be returned to the Contractor, marked to show the required review. When approved, deliver four copies to Architect unless otherwise specified.
- I. As-Built drawings of ductwork and piping, including all elbows, transitions, damper and valve locations shall be provided prior to commencement of air and water balance.

#### **1.11 QUALITY OF EQUIPMENT, MATERIALS AND WORKMANSHIP**

- A. Unless otherwise specified, equipment and materials used in the installation shall be new and in perfect condition when installed. Articles provided for the same general purpose or use shall be of the same make. Workmanship shall be of the best quality and none but competent mechanics skilled in their trades shall be employed. Furnish the services of an experienced superintendent, who shall be constantly in charge of the work, together with all necessary journeymen, helpers and laborers required.

### **1.12 SEISMIC DESIGN**

- A. Contractor shall be responsible for anchors and connections of mechanical work to the building structure including calculations for approval by structural engineer or for approval by inspector of record, as applies, for items or work, where approval is deferred or where alternate support or anchorage detail is proposed to prevent damage as a result of an earthquake, including manufactured equipment, the connection and integrity of shop fabricated and field fabricated materials and equipment. The anchorage of all pipes, ducts, conduits, fixtures, equipment, etc. shall withstand the lateral forces and shall accommodate calculated building displacement as required by the California Building Code, and local city/county codes. (Building equipment and connections therefore shall be designed to resist lateral seismic forces equal to 1.0 of equipment weight to working allowable stress. Cantilever posts supporting equipment shall be designed to resist lateral seismic forces equal to 0.5 of equipment weight to allowable working stress. Conform to the following:
1. In accordance with Title 24, 2010 CBC Chapter 16, details shall be provided for the seismic anchorage of all mechanical and electrical equipment, anchorage details shall be based upon appropriate design calculations.
  2. For equipment weighing 400 pounds or more anchorage details and appropriate design calculations shall be submitted as part of the mechanical and electrical drawings. "Deferred Approval" items will not be permitted unless specifically approved by the plan check supervisor.
    - a. Exception: Attachments of equipment weighing less than 400 pounds and supported directly on the floor or roof structure, furniture, or temporary or movable equipment and equipment weighing less than 20 pounds which is supported by vibration isolation devices suspended from the roof, wall or floor, need not be detailed on the plans provided the following notes are included on the mechanical and electrical plans.
  3. The seismic anchorage of mechanical and electrical equipment shall conform to C.C.R. Title 24, 2010 CBC Chapter 16. Anchorage details for roof/floor-mounted equipment shall be shown on plans.

### **1.13 SUBSTITUTIONS AND CHANGES**

- A. The design has been based on data from certain manufacturers, suitable for each application. Recommendations for alternative manufacturers are made for each product, except when "no substitutions permitted" is indicated.
- B. It is the intent of the Owner to have this project constructed with materials, products and system originally designed and specified for this project.
- C. Alternatives that may require the modification, realignment and/or adjustment of other associated components, including impact on other trades, shall be accomplished at no additional cost or time to the contract and shall have the approval of the Architect.
- D. Substitutions shall be submitted addressing all features listed in the specifications. Features that deviate from the plans and specifications shall be clearly identified including justification for deviations. The Project Manager will review initial submittal on substitutes only. Subsequent submittals made to correct deficiencies in original submittals will be reviewed at Contractor's expense based on a mechanical engineering consultant's hourly rate for HVAC engineering services.
- E. Should the Contractor elect to propose substitutions for the Owner's interest, the substitutions

shall be in compliance with General Conditions and Special Conditions in the Contract Documents, and all other applicable conditions specified in drawings and Contract Documents.

#### **1.14 APPROVALS**

- A. The Owner will have the right to accept or reject equipment, materials, workmanship, tests, and determine when the Contractor has complied with the requirements herein specified.

#### **1.15 SELECTION AND ORDERING OF EQUIPMENT AND MATERIALS**

- A. Immediately after award of the Contract, and after the approval of submittals by the Project Manager, the Contractor shall arrange for the purchase and delivery of equipment and materials required, in ample quantities, and at the proper time. He shall deliver to the Owner and Project Manager a complete list of equipment and materials ordered, giving descriptions, plate numbers, brochures, name of the wholesalers, date of the orders, and approximate delivery dates.

#### **1.16 LOCATIONS AND ACCESSIBILITY**

- A. Drawings show pipe and ductwork diagrammatically. Conform to Drawings as closely as possible in layout work. Vary run of piping, run and shape of ductwork and make offsets during progress of work as required to meet structural and other interferences as approved by the Owner. Install piping and ductwork to best suit field conditions after coordinating with other trades. Run exposed piping and ductwork parallel to, or at right angle to, building walls. Keep horizontal lines as close to bottom of structures as possible. Conform to ceiling heights established on Drawings.
- B. Install equipment in such a manner as to be readily accessible for maintenance and repairs. Install piping, ducts and conduit in such a manner as to preserve headroom, avoid obstructions and keep openings and passageways clear.
- C. Installation at valves, thermometers, gauges, cleanouts, dampers, controls, steam and water specialties, duct access doors, or any other indicating equipment or specialties requiring reading, adjustment, inspection, maintenance, shall be conveniently and accessible located with reference to the finished building.
- D. Where wall and ceiling access doors are required but not shown, such doors shall be furnished under other sections and as directed by the Owner. Coordinate this requirement with appropriate trades.
- E. If changes in the indicated locations or arrangements are required, they shall be made without additional charges to the Owner.
- F. In an existing area, where required, remove, reinstall, reconnect or replace, etc., any existing work to accommodate new work without any additional cost to the Owner. Material shall match existing, unless otherwise specified or approved in writing by the Owner.
- G. Provide sheaves and belts if required, to Test, Adjust and Balance Agency, to allow air moving equipment to meet flow requirements specified at no additional cost to the Owner.

#### **1.17 COORDINATION OF TRADES**

- A. Contractor shall coordinate all trades in the interest of obtaining the most practical overall arrangement of equipment, piping, conduit, and ducts, and to maintain maximum headroom and accessibility.
- B. No extras will be allowed for changes made necessary by interference between trades.
- C. Submit Composite Drawings in accordance with contract General Conditions and Special Conditions. Include dimensioned plans, elevations, sections and details, and give complete

information particularly as to the kinds and types of materials and equipment, size and location of sleeves, inserts, attachments, chases, openings, conduits, ducts, boxes, lighting, and structural interferences. Coordinate these Composite Drawings and field layouts in the field for proper relationship to work of applicable trades based on field conditions. Contractor shall have competent personnel readily available for coordinating, checking, and supervision of field layouts. The procedures for submittals and re-submittals, and final distribution, shall be as specified in Division 01. Do not start installation of work involved under Composite Drawings until the Architect reviews applicable submittal. Discrepancies between the Drawings and Composite Drawings shall be specifically noted and identified on the Composite Drawings. Drawings for the various trades involved shall be submitted as required and reviewed prior to preparation of Composite Drawings.

1. Equipment Foundations and Bases: Furnish certified details and drawings for approval before fabrication. Furnish parts necessary for each foundation sub base and support.
2. Pipe Sleeves and Inserts: Furnish and install pipe sleeves and pipe support inserts before concrete is poured.
3. Roof, Wall and Floor Openings: Furnish Shop Drawings showing exact locations and sizes of openings through roofs, walls and floors.
4. Concrete: Conform to Concrete Section of the Specifications.

#### **1.18 GUARANTEES**

- A. Contractor shall guarantee workmanship, equipment and materials installed under his contract for a period of not less than one (1) year from the date of Substantial Completion. Should any defects occur during this period, the Contractor shall promptly repair or replace the defective item and any other damage caused to the building free of charge to the Owner, including cost of labor and materials.
- B. Guarantee included in this section to cover:
  1. Faulty or inadequate design of equipment or material installed
  2. Improper assembly or erection
  3. Defective workmanship or material
  4. Incorrect or inadequate operation or other failure
- C. Contractor shall guarantee the complete and perfect operation of the entire system, and that equipment will be supported in such a way as to be free of objectionable vibration and noise.
- D. Furnish the parts and labor to replace any items found to be defective in the refrigeration equipment with the guarantee period.
- E. In addition to other guarantees, Contractor will furnish free maintenance for the refrigeration equipment, including replacement of refrigerant and oil, for a period of one (1) year. This shall include regular monthly maintenance and "On Call" service if required.
- F. For equipment bearing a manufacturer's warranty in excess of one year, furnish a copy of the warranty to the Owner, who shall be named as beneficiary.

#### **1.19 PROTECTION OF EQUIPMENT AND MATERIALS**

- A. Provide adequate storage facilities for equipment and materials on the site and shall make provisions to protect such materials and equipment from damage.

#### **1.20 CLOSING-IN OF UNINSPECTED WORK**

- A. Contractor shall not allow or cause any of the work, specifically ductwork and piping, to be

covered up or enclosed until it has been inspected, tested, and approved by the Architect. Should any of work be covered up or enclosed before such inspection and test, Contractor will at his own expense, uncover the work, and after it has been inspected, tested, and approved, make repairs with such materials as may be necessary to restore work to its original condition.

#### **1.21 BUILDING FOOTING CLEARANCES**

- A. Under no circumstances shall pipes, ducts, or conduits penetrate footings. They shall cross below footings or through sleeves above footings. Those running parallel to footings shall have the minimum clearance from the cone of influence indicated on the Drawings or as required by Code.

#### **1.22 DAMAGE BY LEAKS**

- A. Contractor shall be responsible for all damage to any part of the premises caused by rain leaks through or around ducts or pipes, leaks or breaks in piping, equipment or fixtures furnished or installed by him for a period of one (1) year from the date of Substantial Completion.

#### **1.23 EQUIPMENT LABELS**

- A. Equipment provided under this Section shall be provided with the manufacturer's metal identification labels attached to each individual piece of equipment showing complete performance characteristics, size, model, and serial number.

#### **1.24 PRELIMINARY OPERATION**

- A. Should the Owner request that any portion of the plant, apparatus, or equipment be operated for the Owner's beneficial use prior to the final completion and acceptance of the work, the Contractor shall conform to Beneficial Occupancy Provisions of the General Conditions. Such operation shall be under the supervision and direction of the Contractor. Such preliminary operation shall not be construed as an acceptance of any portion of the work.

#### **1.25 MAINTAINING EXISTING SERVICES**

- A. The premises and existing building at the site will be in use at the time the work of this Section is in progress. Contractor shall conduct his work so as to cause no inconvenience or danger to the personnel on the premises.
- B. Contractor shall maintain continuity of service to the existing mechanical systems, except for designated intervals during which connections can be made. The scheduling of the shut down period shall be at a time directed by the Owner, or the Owner's representatives.
- C. In some instances, it may be necessary to defer work in certain areas and locations until such time as existing facilities can be relocated or rearranged by the Owner. Therefore, whenever it becomes necessary for the Contractor to perform work under this contract in areas in which the Owner's work is being performed, the contractor shall advise the Construction Manager relative to this requirement and shall follow closely the directive issued by the Construction Manager insofar as time and procedure are concerned. **Provide Owner a minimum of 72 hours prior notice.**
- D. The contractor shall include in his bid all premium time to which he may be subjected for performing work in such procedure and at such time as may be necessary to cause the least interference with the function of the Owner.

#### **1.26 ELECTRICAL WORK**

- A. Coordinate with Division 26 in making the line and low *voltage* electrical connections and be



responsible for the operation of the equipment furnished under this section.

- B. Voltage for electrical work will be included in Division 26. However, any control wiring which is required that is not shown on the control diagram shall be as described under this Section. In the event that the Contractor chooses to provide equipment that requires extra expense in the power or control wiring, Contractor shall pay additional electrical costs.
- C. Safety switches, starters, circuit breakers, unless provided as a portion of package equipment, and the electrical connections of mechanical equipment to the electrical power service, shall be provided under Division 26.
- D. Interconnecting wiring, safety switches, relays, controllers and motor starters which are integral components of packaged equipment shall be provided as an integral part of that equipment.
- E. All interconnecting power wiring and conduits shall be provided by Division 26.
- F. Control wiring shall be provided by Division 23, unless otherwise indicated on the drawings.
- G. Conduit for control wiring shall be provided by Division 26.

**\*END OF SECTION 23 00 10\***

## SECTION 26 00 10 - BASIC ELECTRICAL REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 SCOPE

- A. This section supplements all sections of this division and shall apply to all phases of work hereinafter specified, shown on the drawings, or required to provide a complete installation of electrical systems for the Project. The work required under this division is not limited to the electrical specifications and drawings. The intent of the Specifications is to provide a complete and operable electrical system, which shall include all documents that are a part of the entire Project Contract.
1. Work included: Furnish all labor, material, tools, equipment, facilities, transportation, skilled supervision necessary for, and incidental to, performing operations in connection with furnishing, delivery, and installation of the work in this division complete as shown or noted on the Drawings and specified herein.
- B. Related Work Specified Elsewhere:
1. Refer to all sections in the contract General Conditions, Special Conditions, and Contract Requirements.
- C. Work Installed but Furnished by Others:
1. The electrical work includes the installation or connection of certain materials and equipment furnished by others. Verify installation details. Foundations for apparatus and equipment will be furnished by others unless otherwise noted or detailed.

#### 1.2 GENERAL REQUIREMENTS

- A. Guarantee See General Conditions:
1. Except as may be specified under other Sections in the specification, guarantee equipment furnished under the specifications for a period of one year, except for equipment required to have a longer guarantee period, from date of final completion. Guarantee all work against defective workmanship, material, and improper installation. Upon notification of failure, correct deficiency immediately and without additional cost to the Owner.
  2. Standard warranty of manufacturer shall apply for replacement of parts after expiration of the above period. Manufacturer shall furnish replacement parts to the Owner or his service agency as approved. Furnish to the Owner, through the Architect, printed manufacturer's warranties complete with material included and expiration dates, upon completion of project. Conform to Division 01.
- B. Equipment Safety: All electrical materials and equipment shall be new and shall be listed by Underwriter's Laboratories and bear their label, or listed and certified by a nationally recognized testing authority where UL does not have an approval. Custom made equipment must have complete test data submitted by the manufacturer attesting to its safety.
- C. Codes and Regulations:
1. Design, manufacturer, testing and method of installation of all apparatus and materials

furnished under the requirements of these specifications shall conform to the latest publications or standard rules of the following:

- a. Institute of Electrical and Electronic Engineers -IEEE
  - b. National Electrical Manufacturers' Association -NEMA
  - c. Underwriters' Laboratories, Inc. -UL
  - d. National Fire Protection Association -NFPA
  - e. American Society for Testing and Materials -ASTM
  - f. American National Standards Institute -ANSI
  - g. California Electrical Code -CEC, Title 24, Part 3
  - h. California Code of Regulations, Title 8, Subchapter 5
  - i. California Building Code-CBC, Title 24 Parts 1&2
  - j. State & Municipal Codes in Force in the Specific Project Area
  - k. Occupational Safety & Health Administration -OSHA
  - l. California State Fire Marshal
  - m. California Fire Code-CFC, Title 24 Part 9
  - n. National Electrical Testing Association -NETA
2. The term "Code", when used within the specifications, shall refer to the Publications, Standards, ordinances and codes, listed above. In the case where the codes have different levels of requirements the most stringent rules shall apply.

D. Requirements of Regulatory Agencies:

1. Codes, Permits, and Fees: Where the Contract Documents exceed minimum requirements, the Contract Documents take precedence. Where code conflicts occur, the most stringent shall apply. The most stringent condition shall be as interpreted by the Engineer.
  - a. Comply with all requirements for permits, licenses, fees and Code. Permits, licenses, fees, inspections and arrangements required for the Contractor at his expense shall obtain the Work, unless otherwise specified.
  - b. Comply with the requirements of the applicable utility companies serving the Project. Make all arrangements with the utility companies for proper coordination of the Work.

E. Shop Drawings:

1. See General Conditions and Special Conditions, Contract Documents for additional requirements.
2. Time Schedules for Submission and Ordering: The Contractor shall prepare, review and coordinate his schedule of submissions carefully, determining the necessary lead time for preparing, submitting, checking, ordering and delivery of materials and equipment for timely arrival. The Contractor shall be responsible for conformance with the overall construction schedule.
3. Submittals will be checked for general compliance with specifications only. The Contractor shall be responsible for deviations from the drawings or specifications and for errors or omissions of any sort in submittals.
4. Submit a complete list of materials and equipment proposed for the job, including manufacturers names and catalog numbers.

5. Shop drawings shall be submitted in completed groups of materials (i.e., lighting fixtures or switchgear). The Contractor shall add and sign the following paragraph on equipment and materials submitted for review. **"It is hereby certified that the (equipment) (material) shown and marked in this submittal is that proposed to be incorporated into the project; is in compliance with the Contract Drawings and specifications and can be installed in the allocated spaces"**. Failure to add the above written statement for compliance will result in return of submittals without review.
    - a. Bind catalog cuts, plate numbers, descriptive bulletins and drawings, 11" x 17" (275 mm x 435 mm) or smaller, in sets with covers neatly showing titles.
    - b. The Contractor shall verify dimensions of equipment and be satisfied as to Code compliance for fit prior to submitting shop drawings for approval.
    - c. Where current limiting devices are specified, submit technical data to substantiate adequate protection of equipment cascaded downstream. Submittals shall not be reviewed unless supporting calculations and data are submitted therewith.
    - d. Include complete catalog information such as construction, ratings, insulation systems, as applicable.
    - e. For any material specified to meet **UL** or trade standards, furnish the manufacturers or vendor's certification that the material furnished for the work does in fact equal or exceed such specifications.
    - f. Reference listings to the specifications' Sections and Article to which each is applicable.
    - g. Equipment Floor Plans: After approval of material is secured prepare a floor plan of each electrical and communication equipment space, room or yard, drawn to scale at 1/2 inch equals 1foot and submit for approval in the same manner as for shop drawings. The layout drawings shall be exact scale.
  6. Contractor shall prepare coordinated drawings when required by General Conditions or Special conditions in the contract documents, or where noted otherwise.
- F. Interpretations: The Contractor through the Architect must make Requests for interpretations of drawings and specifications. Any such requests made by equipment manufacturers or suppliers will be referred to the Contractor.
- G. Standard of Quality
1. The contract Drawings and Specifications establish the "MINIMUM STANDARD OF QUALITY" each product and/or system must meet to be considered acceptable. Products of other manufactures will be considered if the product and/or system meet or exceed the "MINIMUM STANDARD OF QUALITY" established by this Contract Document.
  2. Items for similar application shall be of the same manufacturer.
  3. The label of listing by **UL** shall appear on all materials and equipment for which standards have been established by the agency.
  4. Where codes as listed in the General Requirement Section of the Specifications that establish label or approved requirements, furnish all materials and equipment with either the required labels affixed or the necessary written approval.
  5. Provide the type and quantity of electrical materials and equipment necessary to complete Work and all systems in operation, tested and ready for use.
  6. Provide and install all incidental items that belong to the Work described and which are required for complete systems.

7. All switchboards, distribution boards, panel boards and circuit breakers shall be of the same manufacturer.
  8. All wiring devices such as switches and receptacles shall be of the same manufacturer.
- H. Substitutions: Refer to the General Conditions sections of the contract documents.
- I. Submit comprehensive material list, shop drawings and complete technical data for the following equipment and materials:
1. General Requirements:
    - a. Conduits.
    - b. Conductors, include all selected insulation types.
    - c. Disconnect switches and Starters.
    - d. Standard lighting fixtures, specially fabricated fixtures, ballasts and lamps, with samples and sample of standard finish available (where requested).
    - e. Control devices, standard and special receptacles, switches, outlets and finish device plates.
- J. Record Drawings: Refer to General Conditions and Special Conditions of the contract documents, and also the following:
1. The drawings indicate diagrammatically the desired locations or arrangement of conduit runs, outlets, junction boxes and equipment and are to be followed. Execute the work so as to secure the best possible installation in the available space and to overcome local difficulties due to space limitations. The Contractor is responsible for the correct placing of the work. Where conflicts occur in plans and/or specifications, the most stringent application shall apply and shall be part of the base bid.
  2. In the event minor changes in the indicated locations or arrangement are necessary due to developed conditions in the building construction or rearrangement of furnishings or equipment or due to interference with other trades, such changes shall be made without extra cost.
  3. Verify dimensions and the correct location of Owner-Furnished equipment before proceeding with the roughing-in of connections.
  4. All scaled and figured dimensions are approximate of typical equipment of the class indicated. Before proceeding with work carefully check and verify dimensions and sizes with the drawings to see that the furnished equipment will fit into the spaces provided without violation of applicable Codes.
  5. Should any changes to the work indicated on the drawings or described in the specifications be necessary in order to comply with the above requirements, notify the Construction Manager.
  6. Contractor shall be responsible for coordination of coordinated drawings when required by the Architect.
  7. Replace or repair, without additional compensation, any work which does not comply with or which is installed in violation of any of these requirements.

L. Tests

1. Equipment and systems for which the National Electrical Testing Association (NETA) has an approved or recommended procedure, shall be tested in accordance with that procedure. Test values shall equal values recommended by NETA. Copies of test reports shall be submitted as required under shop drawing submittals.
2. Prior to energizing any motor, measure the service voltage for phase balance and report if unbalance exceeds 1% from mean.
3. Measure the three-phase voltage at no load and at maximum load conditions and submit to the engineer a report showing the results of these measurements.
4. Upon completion of the work and adjustment of all equipment, conduct an operating test. Conduct the test in the presence of an authorized representative of the Owner. Demonstrate system and equipment to operate in accordance with requirements of the Contract Documents and to be free from electrical and mechanical defects. Provide systems free from short circuits and grounds and show an insulation resistance between phase conductors and ground not less than the requirements of the governing electric code. Test circuits for proper neutral connection.
5. Complete tests prior to final inspection of project, including corrective work based on the results of the tests.
6. Perform special tests on systems and equipment as specified herein using personnel qualified to perform such tests.

M. Protection: Protect finish parts of the materials and equipment against damage during the progress of the work and until final completion and acceptance. Cover materials and equipment in storage and during construction in such a manner that no finished surfaces will be damaged or marred. Keep moving parts clean, dry and lubricated.

N. Cleaning Up:

1. Upon completion of the work and at various times during the progress of the work, remove from the building all surplus materials, rubbish and debris resulting from the work of this Division.
2. Thoroughly clean switchgear including busses, apparatus, exposed conduit, metal work including the exterior and interior, and accessories for the work of this Division, of cement, plaster and other deleterious materials; remove grease and oil spots with cleaning solvent; carefully wipe surfaces and scrape cracks and corners clean.
3. Thoroughly polish chromium or plated work. Remove dirt and stains from lighting fixtures.
4. Leave the entire installation in a clean condition.

O. Completion:

1. The work will not be reviewed for final acceptance until operating and maintenance data, manufacturer's literature, panel directories and nameplates specified herein have been approved and properly posted or installed and final cleaning of equipment and premises has been completed.
2. When the installation is complete and adjustments have been made, operate the system for a period of one week, during which time demonstrate that systems are completed and operating in conformance with the specifications.

- P. Operating and Maintenance Data: Submit complete and at one time, prior to acceptance of the installation, 4 copies of manufacturer's instructions for operation and maintenance of electrical equipment, including replacement parts lists as specified.
- Q. Inspection and Acceptance Procedures: The Project manager will submit observation reports periodically during the construction phase detailing Contract deficiencies. The Contractor is responsible for making corrections immediately. Notice of Completion of the project will not be made until all items have been corrected.
- R. Final Completion of Electrical Systems:
  - 1. Prior to Final Completion of operating electrical systems, the Contractor shall:
    - a. Provide materials of the type and quality specified and as necessary for proper operation, tested and ready for use.
    - b. Furnish the required Operating and Maintenance Data/Manuals.
    - c. Clean up of the project pertaining to this Division of the work.
    - d. After installation has been completed and adjustments made, operate the system for a period of one week, during which time, demonstrate to the Owner that systems are complete and operating in conformance with Contract Documents.
    - e. Conduct tests required and as specified in this Division and submit test reports and corrective actions taken.
    - f. Submission of warranties and guarantees.
  - 2. Final Completion of Work Shall be Contingent On:
    - a. Contractor replacing defective materials and workmanship.
    - b. Upon completion of work and adjustments made, Contractor shall conduct an operating test for each system for approval at such time as the Owner directs. Conduct test in presence of Owner, or authorized representative of Owner, and demonstrate that systems and equipment do operate in accordance with requirements of the Contract Documents and are free from electrical and mechanical defects.

**\*END OF SECTION 26 00 10\***