DIVISION 26: GENERAL ELECTRICAL REQUIREMENTS 1 GENERAL INSTRUCTIONS A. GENERAL REQUIREMENTS All requirements under Division 01 and the general and supplementary conditions of thes specifications apply to this section and division. Where the requirements of this section and division where the requirements of this section and division exceed those of Division 01, this section and division take precedence. Become thoroughly familiar with all its contents as to requirements that affect this division, section, or both. Work required under this division includes all material, equipment, section, or both, work required under this division includes all material, equipment, appliances, transportation, services, and labor required to complete the entire system as required by the drawings and specifications, or reasonably inferred to be necessary to facilitate the function of each system as implied by the design and the equipment The specifications and drawings for the project are complementary, and any portion of work described in one shall be provided as if described in both. In the event of discrepancies, notify the Engineer and request clarification prior to proceeding with the Work involved. Drawings are graphic representations of the work upon which the contract is based. They show the materials and their relationship to one another, including sizes, shapes, locations, and connections. They convey the scope of work, indicating the intended general arrangement of the systems without showing all of the exact details as to gorder an anaryment or time's pecunis munition inventing and to the oxact occurs as or observations, offsets, control lines, and other installation requirements. Use the drawings as a guide when laying out the work and to verify that materials and equipment will fit into the designated spaces, and which when installed per manufacturers' requirements, will ensure a complete, coordinated, salisfactory, and properly operating system. Division: References contained in this specification follow the numbering system defined in the Construction Specifications Institute (CSI) MasterFormat 2004 Edition. Specification Divisions 01 through 13 provided with this project may reference the CSI MasterFormat 1995 Edition. The corresponding division references between the 2004 Edition and 1995 Edition are as follows:
2004 Edition

1. Division 21 - Fire Sup
2. Division 22 - Plumbin;
3. Division 23 - HVAC Furnish: "to supply and deliver to the project site, ready for unloading, unpacking, assembling, installing, and similar operations." install: "to perform all operations at the project site including, but not limited to, the actual unloading, unpacking, assembling, erecting, placing, anchoring, applying, working to Provide: "to furnish and install. ncidental to the work necessary for proper installation and operation. Include the Engineer: Where referenced in this Division, "Engineer' is the Engineer of Record and the Design Professional for the work under this division, and is a consultant to, and an authorized representative of the Architect, as defined in the General and Supplementary Conditions. When used in this division, Engineer means increased involvement by and obligations to the Engineer, in addition to involvement by and involvement by and obligations to the Engineer. AHJ: The local code and/or inspection agency (Authority) Having Jurisdiction over the NRTL: Nationally Recognized Testing Laboratory, as defined and listed by OSHA in 29 CFR 1910.7 (e.g., UL, ETL, CSA), and acceptable to the AHJ over this project. Nationally recognized testing laboratories and standards isted are used only to represe the characteristics required and are not intended to restrict the use of other NRTLs that are acceptable to the AHJ and standards that meet the specified criteria. Homerun: That portion of an electrical circuit originating at a junction box, termination box, receptacle, or switch with termination at an electrical panelboard. Note: Where MC cable is utilized for receptacle and/or lighting branch circuiting loads, the originating point of the choremoun shall be at the first load in the circuit or at a junction box located in an accessible The terms "approved equal", "equivalent", or "equal" are used synonymously and shall mean "accopited by or accopitable to the Engineer as equivalent to the item or manufacturer specified". The term "approved" shall mean labeled, listed, certified, or all three, by an NRTL, and acceptable to the AHJ over this project. Prior to submitting bid, visit the site of the proposed work and become fully informed as to the conditions under which the work is to be done. Failure to comply with this requirement shall not be considered sufficient justification to request or obtain extra compensation over and above the contract price. D. MATERIAL AND WORKMANSHIP Provide new material, equipment, and apparatus under this contract unless otherwise of the trim govern model numbers. olde markings or a nameplate for all material and equipment identifying the sufacturer and providing sufficient reference to establish quality, size, and capac kmanship shall be of the finest possible by experienced mechanics of the propet

In general, provide the following quality grade(s) for all materials and equipmen

Provide all hoists, scaffolds, staging, runways, tools, machinery, and equipment required for the performance of the electrical work. Store and maintain material and equipment in clean condition, and protected from weather, moisture, and physical damage.

Furnish only material and equipment that are listed, labeled, certified, or all three, by an NRTL whenever any listing or labeling exists for the types of material and equipment

At a minimum, general work practices for electrical construction shall be in a with NECA 1 (latest edition), "Standard Practices for Good Workmanship in E Construction".

E. MANUFACTURERS

F. COORDINATION

Coordinate all work with other divisions and trades so that various components of the systems are installed at the proper time, if the available space, and allow proper servic access to those times requiring maintenance. Components which are installed without regard to the above shall be relocated at no additional cost to the Owner.

Unless otherwise indicated, the General Contractor shall provide chases and openings in building construction required for installation of the systems specified herein. Contractor shall furnish the General Contractor with information where chases and openings are required. Contractor shall keep informed as to the work of other trades engaged in the construction of the project and shall execute work in a manner as to not interfere with or delay the work of other trades.

Figured dimensions shall be taken in preference to scale dimensions. Contractor shall take his own measurements at the building, as variations may occur. Contractor shall be hold responsible for errors that could have been avoided by proper checking and insenention.

Provide materials with trim that will properly fit the types of ceiling, wall, or floor finished

Make all offsets required to clear equipment, beams, and other structural members, and to facilitate concealing raceways in the manner anticipated in the design. Provide materials with trim that will fit properly the types of ceiling, wall, or floor finishes actually installed.

G. ORDINANCES AND CODES

Work performed under this contract shall, at a minimum, be in conformance with work performed under this contact shall, at a minimum, be in controlled with applicable national, state and local codes having jurisdiction. Equipment furnished and associated installation work performed under this contract shall be in strict compliance with current applicable codes adopted by the local AHJ, including any amendments and standards as set forth by the following:

- National Fire Protection Association (NFPA)
- National File Frocesion Associated Williams (National File Frocesion)

 Occupational Safety and Health Administration (OSHA)

 American National Standards Institute (ANSI)
- Rules and regulations of public utilities and municipal departments affected by

Where the contract documents exceed the requirements of the referenced code standards, etc., the contract documents shall take precedence. Where conflicts betwee various codes, ordinances, rules, and regulations exist, comply with the most stringent

Promptly bring all conflicts observed between codes, ordinances, rules, regulations referenced standards, and these documents to the attention of the Architect and Engineer for final resolution. Contractor will be held responsible for any violation of the law.

Procure and pay for permits and licenses required for the accomplishment of the work Owner. Provide all safety lights, guards, and warning signs required for the performance of the work and for the safety of the public.

H. PROTECTION OF EQUIPMENT AND MATERIALS

Store and protect from damage equipment and materials delivered to job site. For Sorior and protect viow clausings equipment and materials and equipment susceptible to changing weather conditions, dampness, or temperature variations, store inside in conditioned spaces. For materials and equipment not susceptible to these conditions, cover with waterproof, lear-resistant, heavy tarp or polyethylene plastic as required to protect from plaster, dirt, paint, water, or physical damage. Equipment and material damaged by construction activities shall be rejected, and Contractor shall furnish new equipment and material of a like kind at his own expense.

ntract. Conduit, equipment, etc. shall have a neat and clean appearance at the

SUBSTITUTIONS

The base bid shall include only the products from manufacturers specifically named in the drawings and specifications. No substitution will be considered prior to receipt of bids unless written request for approval to bid has been received by the Enjineer at least ten (10) calendar days prior to the date for receipt of bids. Each such request shall include the name of the material or equipment for which substitution is being requested and a complete description of the proposed substitution including drawings, cut sheets, performance and test data, and all other information necessary for an evaluation, include a salament setting forth charges in other materials, explament, or there work that proposed substitution is upon the proposer. The Engineer's decision to approve or disapprove a substitution in a bid is final.

Coordinate and verify with other trades whether or not the substituted equipment can be Coordinate and verify on the traces writtened in our substituted equipment can be installed as shown on the construction drawings without modification to associated systems or architectural or engineering design, include additional costs for architectural and engineering design fees in bid if drawing modifications are required because of substituted equipment.

If the proposed substitution is approved prior to receipt of bids, such approval will be stated in an addendum. Bidders shall not rely upon approvals made in any other way. Verbal approval will not be given in So substitution swill be considered after the contract awarded unless specifically provided in the contract documents.

e terms "approved", "approved equal", and "equal" refer to ap acceptable alternate bid. No substitutions will be considered emate. No material substitutions shall be considered for appro

Submittals shall contain the project name, applicable specification section, submittal data, equipment identifications acroymy as used on the drawings, and the Contractor's stamp, 'The stamp shall certify that the submittal has been checked by the Contractor, complies with the drawings and specifications, and is coordinated with other tractes. Manufacturer product literature shall include shop drawings, product data, performance shoets, samples, and other submittels required by the division. Highlight, mark, list, or indicate the materials, performance oritistica, and accessories that are being proposed. General product required without provision.

ibmittals and shop drawings shall not contain firm name, logo, the seal, or signature of a Engineer. They shall not be copies of the work product of the Engineer. If the ontractor desires to use elements of such product, refer to paragraph "Electronic

Separate submittals according to individual specification sections. Illegible submittals will be rejected and returned without review. Catalog data shall be properly bound, Identified, indixed and tabbod in a 3-ring birder. Each time or model number shall be clearly marked and accessories indicated. Label the catalog data with the outpiment identification acromy or number as used on the drawings and include performance curves, capacities, sizes, weights, materials, finishes, witing diagrams, electrical requirements and deviations from specified outpiment or materials. Mark out Inapplicable learns. Shop drawings will be or the deciments of the Senting vention, contractor shall allow for the Engineer. Contractor shall allow for the Engineer review time as specified above in the construction schedule. Contractor shall submit only the documents required to purchase the materials and/or equipment in the submittal.

The checking and subsequent acceptance of submittals by the Engineer and/or Architec The creating and solvequent acceptance or subminisately by the Engineer attrochromets shall not relieve the Contractor from responsibility for deviations from the drawings and specifications, errors in dimensions, details, sizes of equipment, or quantities, omissions of components or fittings, coordination of electrical requirements, and not coordinating Items with actual building conditions and adjacent work. Contractor shall request and secure written acceptance from the Engineer and Architect prior to implementing any

K. ELECTRONIC DRAWING FILES

26 | 26 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 13 _|

In preparation of shop drawings or record drawings, Contractor may, at his option, obtain electronic drawing files in AutoCAD or DXF format on CD-ROM disk, DVD disk, flash drive, or direct download, as destioned, from the Engineer for a stheping and handling fee of \$200 for a drawing set up to 12 sheets and \$15 per sheet for each additional sheet. Contact the Architect for written authorization and Engineer for the necessary agreement form and to specify shipping method and drawing format. In addition to payment, the

L. RECORD DRAWINGS (AS-BUILT DRAWINGS)

During progress of the work in this division, Contractor shall maintain an accurate record of all changes made during the installation of the system. Upon completion of the work, accurately transfer all record information to three identical sets of the approved shop drawings. Insert one set into each copy of the manual described below.

M. OPERATION AND MAINTENANCE INSTRUCTIONS

During the course of construction, collect and compile a complete brochure of equipr turnished and installed on this project. Include operational and maintenance instruction manufacturer's catalog sheets, withing diagrams, parts lists, approved submittals and drawings, warranties, and descriptive literature as turnished by the equipment manufacturer, include an inside cover sheet that lists the project name, date, Owner, Architect, Engineer, General Contractor, Sub-Contractor, and an index of contents.

Submit three copies of literature bound in approved binders with index and tabs separating submit interections on literature bound in approved binders with index and assesses and equipment types to the Architect, at the termination of the work. Paper cities, staples, rubber bands, loose-leaf binding, and mailing envelopes are not considered approved binders. Final approval of systems installed under this contract shall be withhold until this equipment brochure is received and deemed complete by the Architect and Engineer. truct workmen to save required literature shipped with the equipment itself for inclu

Refer to Division 01 for acceptance of electronic manuals for this project, manuals, refer to paragraph "Submittals" for requirements.

TRAINING

At a time mutually agreed upon between the Owner and Co

to carry a longer warranty in these

ranties shall include labor and material, including travel expenses. Make repairs o acements without any additional costs to the Owner, and to the satisfaction of the ter, Architect, and Engineer.

Perform the remedial work promptly, upon written notice from the Engineer or Owner.

Also warrant the following additional items:

1. All raceways are free from obstructions, holes, crushing, or breaks of any nature.

2. All raceway seals are effective.

The entire electrical system is free from all short circuits and unwanted open

At the time of Substantial Completion, deliver to the Owner all warranties, in writing and At the sime of substantial completion, deliver to the Owner all warranties, in writing an properly executed, including term limits for warranties extending beyond the one year period and any actions the Owner must take in order to maintain warranty status. Each warranty instrument shall be addressed to the Owner and state the commencement date.

2. GENERAL MATERIALS AND INSTALLATION

A. BUILDING OPERATION

Comply with the schedule of operations as outlined in the architectural portions of this specification. Building shall be in operation during normal workday hours. Accomplish work requiring interruption of building operation at a time when the building is not in operation and only with written approval of building Owner and/or tenant. Coordinate interruption of building operation with the Owner and/or tenant a minimum of seven (7) days in advance of work.

B. EXISTING EQUIPMENT REUSE AND REMOVAL

Provide all demolition of existing electrical systems and new electrical system modifications required because of building remodeling, as noted on the Drawin necessary for proper operation and new construction. Remove all abandoned or wiring and conduit above accessible ceilings and ventilation shafts.

Remove all existing wiring, light fixtures, exposed conduits, and other electrical installations not reused prior to substantial completion of the work.

Cut, patch, and repair where required for new electrical installations, and patch and repair all surface damage resulting from this work. Cut flush with the floor and plug at both ends raceways stubbed above the floor and not used at substantial completion of the work.

even if not specifically indicated in the drawings or specifications

sting service entrance conductors and feeder conductors may be reused if all of the owing conditions are met: Conductor sizes meet or exceed the sizes specified on the drawings.

Conductor insulation is in good or better condition.

Conductor insulation is the correct type for the conditions.

C. COINCIDENTAL DAMAGE

Repair streets, sidewalks, drives, paving, walls, finishes, and other facilities damaged in the ocurs of this Work. Repair materials shall match existing construction. Repair work shall meet all requirements of the Owner, local authorities having jurisdiction, and meet the satisfaction of the Architect. Repair work shall be thoroughly first class.

D. CUTTING AND PATCHING

Conform to the requirements in Division 01. Cut walls, floors, ceilings, and other portions of the facility as required to install work under this division. Obtain permission of the Architect prior to cutting. Do not cut or disturb structural members without prior approv from the Architect. Cut holes as small as possible. Patch walls, stors, and other portior of the facility as required by work under this division. Patching shall match the original and the control of the condition of adjoining surfaces in a manner satisfactory to the condition of adjoining surfaces in a manner satisfactory to the Architect.

F. ROUGH-IN

Coordinate without delay all roughing-in with other divisions, Conceal all and duit and raceways except in unfinished areas and where otherwise indicated are drawings.

F. SUPPORT SYSTEMS

oth, with an abrasive material (e.g., file, grinding stone, or similar) and cleanser to ove oils, rust, sharp edges, and shards.

For channel with a factory-applied coating, re-finish cut edges with a coating compatible with the factory finish and as recommended by the manufacturer (e.g., manufacturer's touch-up paint or zinc-rich cold-galvanizing compound, as applicable).

G. ACCESS DOORS

Provide access doors for all concealed equipment where indicated or as required, excepwhere above lay-in ceilings. Access doors shall be adequately sized for the devices served with a minimum size of 18 inches x 18 inches. Access doors must be of the proper construction for the type of construction in which it is installed. Obtain Architect's approval of type, size, location and color before ordering. Provide factory-labricated and assembled units, complete with attachment devices and fasteners ready for installation, concoaled hinges, flush screwdriver-operated cam lock, and anchor straps. Provide access doors manufactured by: Bar-Co, J.L. Industries, Karp Associates, Milcor, Nystrom Building Products, Wade, or Zum.

H PENETRATIONS

Coordinate sleeve selection and application with selection and application of fire-stopping specified in Division 07 section "Through-Penetration Firestop Systems."

Coordinate all roof penetrations with Engineer, Owner, and as applicable, the roofing contractor providing a roof warranty.

- Flash and counterflash all openings through roof, and/or provide pre-fabricated molded seals compatible with the roof construction installed, or as required by the Engineer, Owner, or roofing contractor. All roof penetrations shall be leaktight at the termination of the work and shall not void any new or existing roof warranties.
- Cast-Iron Pipe Sleeves for Raceways and Cables: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop,
- Sleeves for Rectangular Openings: Galvanized sheet steel with minimum 0.138 inch thickness and of length to suit application.

I. FIRESTOPPING

Sealants and accessories shall have fire-resistance ratings indicated, as established by testing identical assemblies in accordance with UL 2079 or ASTM E 814, or other NRTL acceptable to AHJ.

Manufacturers: Hilli, RectorSeal, Specified Technologies Inc., United States Gypsum

Where project conditions require modification to qualified testing and inspecting agency's illustrations for a particular freekbeping condition, submit illustration, with modifications marked, approved by penetration freekbeping manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly, include qualifications data for testing agents.

J. EQUIPMENT FURNISHED BY OTHERS

Provide necessary equipment and accessories that are not provided by the equipment supplier or Owner to complete installation of equipment furnished by others in locations as indicated on the drawings, specified herein, or both. Equipment and accessories not provided by the equipment supplier may include, but not be limited to, flexible cords and

10 | 69 | 08 |

Contractor shall be responsible for correct rough-in dimensions, and verify them with Architect and/or equipment supplier prior to rough-in and service installations.

K. SYSTEM TESTING AND ADJUSTING

Adjust, align, and test all electrical equipment on this project provided under this division and all electrical equipment furnished by others for installation or wiring under this division for proper operation.

Maintain the following on the project premises at all times: a true RMS reading voltmeter, a true RMS reading ammeter, and a megohimmeter insulation resistance tester. Provide test data readings as requested or as required by the Engineer.

M. EQUIPMENT IDENTIFICATION

Provide equipment identification nameplates on all switchboards, panelboards, electrical equipment enclosures, access doors, transformers, disconnect switches, enclosed circuit breakers, motor starters, feoder devices in switchboards, distribution pagelboards, and motor control centers.

SYSTEM ST

- - s. If manufacturer's torque values are not UL 486A and UL 486B.
- d building's service entrance voltage, grounding conditions,
- Reference in the second of the

ACCEPTANCE TESTING

Perform acceptance test procedures in accordance with the specifications listed in the Reference Joint Appendices for the Building Energy Efficiency Standards of California. Reference the Non-Residential Certificate of Compilance (NRCC) forms on the drawings for the systems which shall be tested. Submit Non-Residential Certificate of Acceptance (NRCA) forms for each system for which the CLCATT is responsible.

END OF GENERAL ELECTRICAL REQUIREMENTS

DIVISION 26: BASIC ELECTRICAL MATERIALS AND METHODS

O. METALLIC CONDUIT AND TUBING

Electrical Metallic Tubing, Couplings, and Fittings (EMT): ANSI C80.3, UL 797. Only steel products allowed. Reduced wall EMT is not allowed.

Flexible Metal Conduit (FMC): Zinc-coated steel or aluminum, UL 1, Reduced-wall FMC is Intermediate Metal Conduit (IMC): Hot-dip Galvanized Rigid Steel Conduit, ANSI C80.6, UL 1242.

Liquidtight Flexible Metal Conduit (LFMC): Flexible steel conduit with PVC jacket, UL 360; fittings: NEMA FB 1.

1. RACEWAYS

Hot-dip Galvanized Rigid Steel Conduit (GRS): ANSI C80.1, UL 6.

Plastic-Coated IMC, RMC, and Fittings: NEMA RN 1, NRTL listed. Coating thickness of

IMC and RMC Fittings: NEMA FB 1; compatible with conduit type and material, NRTL

C. NON-METALLIC CONDUIT AND TUBING

Rigid Nonmetallic Conduit (RNC): Schedule 40 PVC, 90 deg C rated, NEMA TC-2, UL 651 Fittings: NEMA TC 3, TC 6; UL 651, compatible with conduit/tubing type and material, NRTL listed.

Manufacturers: AFC Cable, American International, Anamet Electrical, Amco, Cantex, Certainteed, Condux International, Elecsys, Electri-Flex, Lamson and Sessions, Manhattan/CDT/Cole-Flex, Pilme Condut, Raco, Spraiduct, Superflex Ltd, or Thomas and Betts.

2. RACEWAY INSTALLATION

A. GENERAL RACEWAY INSTALLATION REQUIREMENTS

Install raceways to requirements of structure, to requirements of all other work on the project, and to clear all openings, depressions, pipes, ducts, reinforcing steel, and other immovable obstacles

Install raceways set in forms for concrete structure in such a manner that installation will not affect the strength of the structure.

bends between connections. Use manufactured elbows for all 45- and 90-degree bends unless approved by the Engineer in advance. Make other bends smooth and even and without flatening raceway or faking galvanizing or enamel. Radii of bends shall be as le as possible and never shorter than the corresponding trade elbow.

Use long radius elbows for all underground installations, where necessary, or where

Securely fasten raceways in place with approved straps, hangers, and steel suppo required. Attact raceways in place with approved stages, inaligues, and steen required. Attact raceways supports to the building structure. Hang single rac feeders with malicable split ring hangers with rod and turnbuckle suspension spaced not over 10 feet part in construction above. Clamp groups of horizor raceways to steel channels that are suspended from insorts spaced not over activitys to steer challense that are suspended from its neonstruction above. Securely clamp vertical feeder rac-nembers attached to structure. Install cable clamps for si equired. Add raceway supports within 12 inches of all be 30 not support raceways from suspended ceilling compor

Install a pull wire in each empty raceway that is left for installation of conductors or cables under other divisions or contracts. Use polypropylene or monofilament plastic line with not less than 2004b tensile strength. Leave at least 24 inches of slack at each end of pull wire.

Make all joints and connections in a manner that will ensure mechanical strength and

B. ABOVE GROUND RACEWAY USE:

Use compression type fittings for EMT, with all fittings NRTL listed for the environment in which they are used. Unless noted otherwise, set-screw type fittings are not allowed.

C. UNDERGROUND RACEWAY USE:

RNC conduit may be used underground where permitted by local code and where not specifically restricted by these documents. When used, provide plastic-coated GRS, as specified above, for all bands greater than 30 degrees, including the 90-degree ellows below grade and the entire vertical risers for transitions from below to above grade or above slab.

D. EQUIPMENT CONNECTIONS Use FMC for final connection to each motor, transformer, and any device that would otherwise transmit motion, vibration, or noise. Use LFMC where exposed to liquids, vapors, or sunlight. Provide all FMC and LFMC with an insulated bonding conductor

3. BUSHINGS AND LOCKNUTS terminate conduits entering sheet metal enclosures to the enclosure with a bushin knut on the inside and a locknut or an approved hub on the outside. Conduit shall

Use only metal raceways for all power wiring from the output of variable frequency drives to their respective motors

Provide bushings and locknuts made of galvanized malleable iron with sharp, clean-cut

Where EMT enters a box, provide approved EMT compression connectors Use insulated, grounding, or combination bushings wherever connection is subject to vibration or moisture, when required by NFPA 70, or both.

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ELECTRICAL

SPECIFICATIONS

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E-6