

ATTACHMENT C

ATTACHMENT C: ELECTRICAL SPECIFICATIONS

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Costco Intertie Vista Grande PRV Station
Douglas County, Nevada

SECTION 16000 ELECTRICAL

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1. GENERAL PROVISIONS

- (A) Consider the General and Special Conditions of the Contract and the complete set of drawings as part of all Sections of this Division of the Specifications. Where requirements of this Division do not coincide with General and Special Conditions, the stricter requirements will govern.

2. WORK INCLUDED

- (A) Provide all labor, apparatus, and materials required for the electrical systems indicated by the drawings and specifications, including those reasonably inferred for proper execution of the work of this Division.

3. RELATED WORK SPECIFIED ELSEWHERE

- (A) Consider all drawings and all divisions of these specifications as a whole and provide work of this Division shown anywhere therein. Coordinate all work with other Divisions. Provide all electrical work required to connect fixtures, appliances, apparatus, and controls furnished under other Divisions. Supervise work done to accommodate requirements of this Division to insure adequacy and proper location whether or not work is under this Division.

4. DEFINITIONS

- (A) Refer to the National Electrical Code Article 100 for definitions related to electrical work. The specifications and notes on the drawings are directed as instructions to the Contractor and the words "The Contractor Shall" are hereby included in each instruction which uses the verbs Provide, Install, Connect, Rough-In, Use, etc.

(1) **Provide** - Supply and deliver complete.

(2) **Install** - Place, secure, and connect as required to make fully operational.

(3) **Connect** - Complete hookup of item with indicated services.

(4) **Rough-In** - Provide all indicated services and necessary arrangement suitable for making final connections to fixture or equipment.

(5) **Use (verb)** - Furnish and install as defined above.

(6) **Above Grade** - Not buried in ground and not embedded in concrete slab on

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ground.

- (7) **Below Grade** - Buried in ground or embedded in concrete slab on ground.
- (8) **Concealed** - Inside building above grade enclosed within walls, furred spaces, crawl spaces, attics, etc., and not visible; not directly accessible.
- (9) **Exposed** - Either visible or subject to mechanical or weather damage, indoors or outdoors, including areas such as mechanical and storage rooms; directly accessible.
- (10) **Indoor** - Enclosed within building structure, including inside crawl spaces, roof overhangs, etc.
- (11) **Outdoor** - Outside of building structure, including on roof, under eaves, along exterior walls, etc.

5. VISIT TO SITE

- (A) Visit site before submitting bid. No extra payment will be made for required work apparent from inspection of site and all local conditions at that time.

6. REGULATIONS AND STANDARDS

- (A) Provide materials and workmanship in full accordance with the rules and requirements of the following codes and standards:

- (1) Codes:

- (i) 2011 National Electrical Code (NEC) Handbook or latest edition adopted by Carson City & Douglas County.
- (ii) Standard Specifications for Public Works Construction "SSPWC Orange Book", latest edition as adopted by Carson City & Douglas County.
- (iii) National Electric Safety Code.
- (iv) Local Ordinances as adopted by Carson City & Douglas County.

- (2) Standards:

- (i) IEEE Recommended Practice for Grounding of Industrial and Commercial Power Systems, ANSI Standard C114.1.
- (ii) Insulation Testing by D-C Methods, Technical Publication 22T1a by the James

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G. Biddle Company.

- (B) Do not construe anything in these drawings or specifications to permit work not conforming to these requirements. The regulations shall govern where they require higher standards or are violated by the drawings and specifications. Rulings and interpretations of these specifications of the enforcing agencies shall be considered a part of these specifications if commonly known to the trade prior to the submittal of bids. All regulations and standards shall be latest issue unless governing authorities require an earlier issue.
- (C) With specific respect to design requirements of the American With Disabilities Act (ADA) of 1990 or certified state or local accessibility regulations, we represent that our drawings and specifications have been prepared in the regular course of our professional service to the best of our knowledge in conformance with known, published, and prevailing interpretation and practices at the time of design.

7. FEES

- (A) Secure and pay fees for permits, licenses, inspections, and royalties required for work of this Division.

8. GUARANTEE (WARRANTY)

- (A) Replace or repair defects arising in work of this Division and any damage resulting there from within one year of date of filing of Notice of Completion if, in the opinion of the Engineer, such defects are due to imperfection of workmanship or materials or failure to follow drawings or specifications. Submit written guarantee to this effect.

9. DRAWINGS AND SPECIFICATIONS

- (A) The electrical drawings are generally schematic. Outlet and equipment locations, raceway routes, and circuiting have been shown as accurately as possible; however, extreme accuracy of drawings and specifications cannot be guaranteed. Actual job conditions will govern exact requirements. Check all information and report any discrepancies before submitting bid.
- (B) Check actual job conditions while preparing shop drawings or fabricating work and coordinate work with other Divisions.
- (C) Follow manufacturer's directions where they cover details not specifically indicated and, if they are in conflict with these drawings and specifications, obtain clarification

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from Engineer before starting work.

(D) Provide contractor 'As-Built' construction drawings based on installed conditions.

10. UTILITY COMPANY COSTS

(A) Provide facilities for utility company connections and metering. Adjust work shown to comply with detailed requirements issued by the utility company.

(B) Utility company fees & applications for permanent power to be provided by Owner.

11. PRELIMINARY OPERATION

(A) If the Owner demands that any portion of the electrical system be operated prior to final completion and acceptance of the work, the Contractor shall consent, and such operation shall be under the supervision and direction of the Contractor, but all operating expense thereof will be paid by the Owner.

12. MATERIALS

(A) Materials shall be new and in perfect conditions. Inspect all material and immediately remove defective items from site.

(B) Provide Underwriters Laboratories listed and/or labeled materials wherever standards for those materials have been established. Where an unlisted device must be installed in equipment normally listed or labeled, the basic equipment must conform to U.L. standards as far as possible. Install all labeled materials and equipment in accordance with manufacturers' instructions and testing and labeling procedures used by the labeling agency or authority.

(C) Trade names are used to establish standards. The names on the drawings indicate the basis of project design. Other names in the specification indicate product lines of generally comparable quality but are substitute items and are subject to proof of acceptability as stated under Substitutions and Submittal Data.

(D) Catalog numbers are given to assist in identifying the basic requirements and indicate a level of quality. The catalog numbers are not intended to specify color and accessories. Check all data related to the complete installation and provide suitable material and accessories required for a complete installation.

(E) All items of a similar nature shall be the product of one manufacturer.

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13. QUIETNESS

- (A) Quietness is a requirement. Eliminate noise, other than that caused by specified equipment operating at optimum conditions, as directed by Engineer.
- (B) Unless special requirements are noted, materials and equipment shall operate at sound levels not exceeding the best standards established by NEMA or CBM.
- (C) Install equipment with due regard for low noise levels. Provide adequate bases and vibration isolators to prevent transmission of noise.

14. WATERPROOFING WALL AND FLOOR PENETRATIONS

- (A) Where electrical work penetrates exterior walls of vaults or buildings, provide approved waterproof sealant and if necessary comply with other requirements under other Divisions of this Specification. The seal shall prevent moisture leaks across any wall separating a wet and dry area.

15. SCHEDULING, ORDERING AND EXPEDITING MATERIALS

- (A) Upon award of contract, review the construction schedule and determine the dates on which materials will be required for installation. The items named on submitted materials lists shall be available in time to meet the construction schedule.
- (B) Promptly order all materials requesting supplier's acknowledgments and delivery dates.
- (C) As work progresses, expedite materials and update schedules to suit the progress of the work.
- (D) Keep adequate records of all orders, acknowledgments, and expediting procedures for review upon request of the Engineer.

16. SUPERVISION AND WORKMANSHIP

- (A) Supervise and direct the work efficiently and with the best skill and attention. Contractor shall be solely responsible for coordination, means, methods, techniques, safety, sequences, and procedures of construction. The Contractor shall be responsible to see that the finished work accurately complies with the contract documents.

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- (B) Keep a competent superintendent on the job during progress of the work. The superintendent shall be the Subcontractor's representative at the site and shall have the authority to act on behalf of the Contractor. All communications given to the superintendent shall be as binding as if given to the Contractor.
- (C) The Engineer shall not be responsible for acts or omissions of the Contractor.
- (D) Employ only experienced, competent and properly equipped workmen on job. Electrical material and equipment shall be installed and checked out by journeyman electricians certified for competence in that phase of the work.
- (E) Workmanship shall be first class in all respects. Replace work falling below these standards as directed by Engineer.

17. SAFETY AND PROTECTION: EMERGENCIES

- (A) Establish, maintain, and service all precautions and programs for safety and provide protection to prevent damage, injury or loss to:
 - (1) All employees on the work and other persons who may be affected thereby.
 - (2) All the work and all materials or equipment to be incorporated herein, whether in storage on or off the site.
 - (3) Other property at the site or adjacent thereto, including pavements, roadways, structures, and utilities not designated for removal, relocation or replacement in the course of construction.
- (B) Damage, injury or loss to any property referred to above, caused directly or indirectly, in whole or in part, by the Contractor, any Subcontractor or anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, shall be remedied by the Contractor.
- (C) Designate a responsible member of his organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated in writing by the Contractor to the Engineer.
- (D) In emergencies affecting the safety of persons or the work or property at the site or adjacent thereto, the Contractor, without special instruction or authorization from the Engineer or Owner, is obligated to act, at his discretion, to prevent threatened damage, injury or loss.

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18. PROTECTION OF EQUIPMENT

- (A) Provide protective plywood barriers and/or 4 mil polyethylene dust covers for all existing equipment within the area of work. The Engineer shall approve protection before commencing work.

19. CLEANING

- (A) Raceways, fixtures, and equipment are to be cleaned before the installation will be accepted. Regularly remove debris of work of this Division from site.

20. CLOSING IN OF UNINSPECTED WORK

- (A) Do not cover or enclose work before tests and inspections have been made and the work is approved. Reopen work prematurely closed in and restore all work damaged thereby.

21. STANDARD FIELD TESTS

- (A) Perform tests in presence of Job Inspector. Give timely notice and furnish the Engineer the required certificates of testing for review. The Contractor shall pay the cost of all tests.
- (B) Work which fails to meet the requirements of any test and does not meet the requirements of the Contract Documents, shall be considered defective and shall be promptly corrected or removed from the site.
- (C) The entire electrical installation shall be free from short circuits and improper grounds. Test panels and circuits with mains disconnected from feeder, branches connected, switches closed, and all fixtures in place and connected for proper operation. Upon completion of the work, operate and test equipment under normal conditions, all to the satisfaction of the Engineer.
- (D) The following tests and checks shall be performed on new, relocated, or renovated equipment before it is placed in operation:
 - (1) Check all bus and cable connections for proper contact pressure and mark each bolt to indicate it has been checked.
 - (2) Check the equipment for mechanical adjustments, lubrication, and freedom of operation. Remove all shipping blocks.
 - (3) Test all control circuits for correct connections and operation.

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- (4) Perform rotation checks on motor circuits.
- (5) Check the polarity of receptacles.
- (6) An insulation test shall be conducted on all power, light, and control wire systems having 600 volt insulation by a device applying 500 volts, D.C., minimum to the system. Each test result shall be reported with a description of the circuit(s) tested and the resistance(s) to ground in megohms recorded adjacent to the circuit description.
- (7) Phase balance tests of major feeders shall be made using the maximum expected load of those feeders as designed. If that load is unavailable at the time the test is conducted, the maximum available load shall be used, provided that load is at least half the capacity of the feeder.
- (8) Adjust sound volume on all audible devices installed under this contract.

22. SPECIAL FIELD TESTS - SIGNAL SYSTEMS

- (A) Where signal systems are installed, the final connections and tests shall be made or supervised by an authorized representative approved by the Owner.
- (B) The contractor shall certify in writing that the complete system has been tested and is in perfect working order.
- (C) Where special calibration is required, the report shall include triplicate copies of test and calibration data listing each and every device as tested or calibrated.

23. IDENTIFICATION

- (A) Provide nameplates, labels, and signs to identify all equipment and circuiting. Wording and size of characters shall be approved by the Engineer. This shall include but is not limited to items such as: switchboards, panelboards, transformers, disconnects, fused switches, circuit breakers, starters, control stations, relays, time switches, special receptacles, remote switches, signal systems, conductors, terminal strips, high voltage warnings, special instruction to indicate the function of the system or device, and the circuit number.
- (B) Use screw-on black plastic nameplates with white characters for equipment where the nameplate is attached to a cover. Characters shall be $\frac{1}{4}$ " high at switchgear or panels and $\frac{3}{16}$ " high for small devices.
- (C) Use stenciled, typewritten or stick-on markers for terminal strips.
- (D) Use typewritten circuit directories for panelboards indicating type and location of load

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(matching As-Built room name or number).

- (E) Use high voltage, porcelain enamel, warning signs or standard manufacture with red letters on white background. Use self-adhesive labels applied to exposed conduit after final painting. Exact wording and quantity of signs shall be approved by Engineer and code authorities.
- (F) Provide special operating instructions or diagrams in frames behind glass protection or provide etched and paint filled metal plates as directed, for special instructions.
- (G) Provide $\frac{3}{4}$ " x $1\frac{3}{4}$ " engraved nameplates with $\frac{1}{8}$ " high letters indicating panelboard & circuit number in all light fixtures, wiring devices with metal plates and without plates.
- (H) Provide panelboard & circuit numbers professionally engraved with $\frac{1}{8}$ " paint filled letters (use contrasting color) at the top of all plastic wiring device plates (including switches). Name plates will not be accepted.

24. CUTTING AND PATCHING

- (A) This Division of the Contract shall do all cutting and patching and shall provide all openings and supports which may be required for the installation of the work under this Division.
- (B) Cutting shall not be allowed to endanger the strength of the structure. Cutting of load bearing structural members shall be done only with written approval.
- (C) Provide additional work required where structural members must be reinforced because of cutting.
- (D) Cutting shall be done neatly using proper tools to avoid unnecessary damage to adjacent surfaces.
- (E) Patching shall be of the same workmanship, materials, and finish as, and shall match accurately, all surrounding construction.
- (F) Where electrical work penetrates the intermediate floors or exterior walls provide approved waterproof sealant and if necessary comply with other requirements under other Divisions of this Specification. The seal shall prevent moisture leaks between floors and across any wall separating a wet and dry area.

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25. SLEEVES AND PLATES

- (A) Provide sleeves wherever openings are required through new concrete or masonry members. Place sleeves accurately and coordinate locations with structural work.

26. EXCAVATION AND BACKFILL

- (A) Provide excavation and backfill required for work of this Division. Conform to requirements of Earthwork Section where same covers points not specified herein.
- (B) Excavate as required; furnish required shoring and pumping; install raceways promptly and backfill after the installation has been tested, inspected, and approved.
- (C) Locate existing underground services and hand excavate within five feet on each side of service. Repair existing services damaged during excavation to the satisfaction of the Engineer.
- (D) Backfill with properly vibrated fine pea gravel or sand rodded in place to 12" above burial raceways. Omit pea gravel or sand for concrete encased raceways. Backfill shall be free of rocks or other debris, placed in 6" layers, properly moistened and mechanically tamped as defined in the Earthwork Section, to finish grade. Backfill may be hydraulically jetted only where specifically shown on the drawings.
- (E) Comply with requirements of the civil engineer where special materials and compaction is required to support the structure or paved areas.
- (F) Utility infrastructure improvements shall comply with the requirements of the utility work order drawings.

27. CONCRETE WORK

- (A) Provide concrete work for electrical equipment bases, unless specifically noted otherwise.
- (B) Use Ready-Mix concrete with an ultimate compressive strength of 3000 PSI at 28 days. Mix shall conform to ASTM Specifications.
- (C) Curing compound shall conform to ASTM C309 for type I, clear or translucent.
- (D) Provide red color for high voltage ducts by adding red oxide of iron at the rate of 3 pounds per sack of cement to dry mix before adding water.

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- (E) Deformed reinforcing bars, where required, shall conform to ASTM A615-40. Accurately place reinforcing steel; tie at all intersections with No. 18 gauge black annealed wire. Hold in place with ties or spacers while depositing concrete. Place bars as indicated on the drawings and provide at least 1 ½ inches of concrete cover.
- (F) Finish all exposed concrete surfaces using a wood float and chamfering tool on all edges.
- (G) Housekeeping pad shall be provided for all free standing electrical equipment, i.e. switchboards, distribution panels, branch circuit panels, fusible panelboards, motor control centers, dry type transformers, and other appropriate items.
 - (1) Pad will be 3" above floor or ground grade, extend 6" beyond equipment "Foot Print", include inset channel iron for equipment bolt-down and 4" x 4" wire mesh reinforcement.

28. SUPPORTS AND FASTENINGS

- (A) Secure equipment to the structure so the entire load is supported in vertical and horizontal directions.
- (B) Refer to other Divisions for blocking and framing provided by those Divisions. Provide all additional supports and fastenings required to secure electrical equipment. All supports shall be designed with a safety factor of four (4). Submit calculations or tests if required by the Engineer.
- (C) The use of perforated iron strap is not acceptable. Wire may be used only for support of fixtures in suspended ceilings. Use materials specifically intended for the use.
 - (1) Structural Steel: Beam Clamps, welded studs, or approved equal.
 - (2) Concrete: Rawl or Phillips self-drill anchors, Hilti powder actuated devices, or Simpson, or approved equal.
 - (3) Equipment Supports & Trapeze Hangers: Formed galvanized channel, Unistrut, or approved equal.
 - (4) Use galvanized or plated fasteners in all locations.
 - (5) Hot-dip galvanize ferrous items after fabrication for exterior, underground or otherwise corrosive locations.

29. CONNECTIONS TO OWNER'S EQUIPMENT

- (A) Provide electrical connections to equipment furnished by the Owner as indicated on

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the drawings.

- (B) Verify all power requirements with the equipment nameplates and report any significant differences to the Engineer.
- (C) Coordinate work with exact location of equipment and point of connection. Locations shown on the drawings are approximate and may be moved up to ten feet without additional cost.
- (D) Provide a code approved disconnect means wherever required by code and not furnished with the Owner's equipment. Where this disconnect is not called for on the drawings submit a quotation for the extra cost before proceeding. Where the disconnect is furnished with the equipment, but not installed, the Contractor shall mount and connect same without additional cost.

30. INDIVIDUAL CIRCUIT BREAKERS

- (A) Provide circuit breakers with suitable NEMA enclosures where indicated on the plans. Breakers shall be manually operated, trip-free and designed so that all poles open simultaneously. Tripping mechanism shall be thermally and magnetically operated. External operating mechanism shall have provision for padlocking in the **off** position. Non-automatic breakers shall be similar to above, without trip mechanism.
- (B) Ratings and frame sizes are indicated on the drawings. Provide special features such as shunt trip devices and electrical operators where required.
- (C) Manufacturer shall be Cutler Hammer - Eaton Corporation or Square-D.

31. DIRECT BURIAL UNDERGROUND RACEWAYS

- (A) Provide schedule 40 plastic PVC conduit U.L. listed for direct burial. Place conduit in sand envelope at least 24 inches below finish grade.
- (B) Use factory fittings. (No field bends). Use rigid steel conduit for all bends and terminations extending above grade.
- (C) Install green insulated ground conductors in all non-metallic conduits.
- (D) Direct burial conduit shall be used only where listed on the drawings.

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32. CONDUIT SYSTEMS

- (A) Provide RMC, rigid galvanized steel conduit for exposed work.
- (B) Provide rigid steel galvanized conduit, (U.L. Std. No. 6) for work within vaults. Scotchrap rigid steel conduit where in contact with the earth using No. H50 tape applied halflap.
- (C) Provide Schedule-40 PVC conduit U.L. listed for use in earth or for direct burial within concrete. Use rigid steel conduit for all bends and terminations. Install green insulated ground conductors in all non-metallic conduits.
- (D) Conduits running to devices mounted on the water piping in the vaults shall be run along the vault wall and to device(s) parallel with the water piping. Do not install slack span flexible conduits jumping from the vault wall to the device(s). Final connection to the device(s) shall be accomplished using seal-tight flexible conduit.
- (E) Locknuts shall be steel or malleable iron. Bushings shall be metal with insulated throats.
- (F) Size shall be as indicated on the plans, or required by the National Electrical Code for number and size of conductors installed. Use 3/4" minimum below floor-slabs. All conduit below slab on grade to be embedded in the base material.
- (G) Joints shall be cut square, threaded, reamed smooth and drawn up tight. Bends or offsets shall be made with standard elbows, field bends made with an approved bender or hickey, or hub-type conduit fittings. Number of bends per run shall conform to code limitations.
- (H) Raceways shall be continuous from terminal to terminal and terminated with connectors, hubs, or Locknuts and bushings in such manner, that each shall be electrically continuous throughout. Conduit ends shall be capped to prevent entrance of foreign materials during construction. Install systems completely before conductors are pulled in. Cap ends during construction.
- (I) Conduits shall be securely fastened in place at intervals required by the National Electrical Code and at each elbow and at the end of each straight run terminating at a box or cabinet. Horizontal and vertical conduit runs shall be fastened securely by one-hole malleable straps and clamp-backs, or other approved devices with suitable bolts, expansion shields, beam clamps, or special brackets for mounting to building structure. Install trapeze hangers to securely fasten groups of parallel conduits with U-bolt or similar type clamps used at intervals required by the National Electric Code.

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Perforated iron strap and iron wire shall not be used for supporting conduits. Strength of the supporting equipment and size and type of anchors shall be based on the combined weight of conduit, hanger and cables with a safety factor of four.

- (J) All metal conduit, couplings, elbows, and fittings in soil or under membrane shall be coated with PVC or 1/2- lap wrapped with an approved tape, such as Scotch H50.
- (K) No conduit runs shall be installed in concrete slab. Conduit risers are permitted to be installed in concrete slabs. Special framing may be required where conduits enter a panelboard.
- (L) Transitions between nonmetallic conduits and conduits of other materials shall be made with the manufacturer's standard adapters designed for such purpose.

33. OUTLET BOXES AND FITTINGS

- (A) Size all outlet and junction boxes to suit the number of conductors and conduits as required by code.
- (B) Use junction boxes with blank covers to terminate, tap-off or redirect multiple conduit runs. Boxes shall be galvanized code gauge sheet finish. They shall have full access screw covers. Stainless steel covers shall be for flush installation.
- (C) All fixtures, wiring devices, and other items of equipment having provisions for mounting to an outlet box or ring shall be securely mounted to a 4" square, or larger as required, junction box and ring of the size and type as required using the number of screws provided for on the device with a minimum of two.
- (D) Outlets on exposed conduit systems shall be of the threaded-hub, cast metal, conduit type fitting suitable for the wiring devices to be installed. Fittings shall be Type FS as manufactured by the Crouse-Hinds Company, Red Dot, Appleton, Bridgeport, or approved equal. Covers shall be a type designed to fit the specified fittings.
- (E) Materials shall be of the best quality designed for the type of hazard indicated. At least five full threads shall be engaged on all conduit connections to couplings and fitting hubs. Sealing fitting shall be properly installed at all required locations in accordance with the Code and local Code regulations.
- (F) Installation and workmanship shall be of the best quality performed by experienced mechanics to assure operating safety.

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(G) Outlet box and switch covers shall be wet-location type.

34. FLEXIBLE CONDUIT

(A) Provide liquid-tight flexible metallic conduit (LFMC) with liquid-tight connectors for short connections to motors and devices requiring adjustment or subject to vibration. Maximum length shall be 16 inches plus 6 times the conduit diameter. Provide bonding jumpers as required by code.

35. 600 VOLT WIRE AND CABLE IN RACEWAYS

(A) Conductors shall conform to the requirements of the current editions of the Codes U.L. Standards. The size, type of insulation, voltage rating, and manufacturer's name shall be permanently marked on outer covering at regular intervals.

(B) Deliver wire and cable to the job in standard coils or reels and suitably protect from weather and damage during storage, handling, and installation.

(C) Conductors shall be standard American wire gauge soft drawn copper. Stranded. Minimum size shall be No. 12, unless otherwise noted. Only Conductors for lighting outlets shall be solid.

(D) Insulation shall be rated 600 volts. Unless otherwise noted, conductor insulation shall be type XHHW-2.

(E) Color code conductors consistently throughout the electrical system. Where integral pigmentation color coding is not available, use colored plastic tape applied in a spiral half-lap manner over exposed conductor portions in manholes, boxes, panels, switchboards, and other enclosures.

(F) Install wire and cable in conduits, ducts, or raceways after the raceway system has been complete. Exercise care to prevent damage to conductor or insulation. Cable lubricants shall be approved for the type of cable, Minerallic No. 100, Fiber Jell, or Yellow.

(G) Cables shall be continuous from origin to equipment termination without running splices in intermediate pull or splice boxes. Where taps and splices are necessary and approved, they shall be made in approved splice boxes with suitable connectors as noted herein.

(H) The electrical contractor shall furnish and install all hangers, racks, cable cleats, and

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supports required to make a neat and substantial cable installation.

| TYPICAL CABLE COLOR CODE CHART | |
|--|-------------------|
| SYSTEMS VOLTAGE | CONDUCTOR 240/120 |
| Phase A | Black |
| Phase B | Red |
| Neutral | White |
| Equipment Ground | Green |
| Control wire to be yellow for A.C. and blue for D.C. | |

36. CONDUCTOR TERMINATIONS AND SPLICES

- (A) Use solderless pressure-type connectors, unless otherwise specified. Connectors shall be 3M, Scotchlok, or approved equal for wire Size No. 14 through No. 8; Burndy type KVS, Stack-Ons, Thomas Betts, or approved equal for cable #6 and larger.
- (B) Where compression-type connectors are noted on the plans, they shall be of the type as manufactured by the Burndy Company, or approved equal, and shall be installed with approved hydraulic tools to assure a permanent mechanically secure high-conductivity joint.
- (C) Connections to any bus shall be made with compression-type lugs (swage fitting) which are listed as having passed the requirements of UL 486B. Bolts fastening such lugs to the surface shall use Belleville (dished) washers.
- (D) All aluminum terminations shall be protected with properly applied oxidation-inhibitors.
- (E) Where conductors are to be connected to metallic surface, the coated surfaces of the metal shall be polished before installing the connector. Lacquer coating of conduits shall be removed where ground clamps are to be installed.
- (F) Each cable or conductor group in panels, pullboxes, or troughs shall have a permanent tag or pressure sensitive label with suitable numbers and letters for easy

ATTACHMENT C

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identifications.

37. WIRING DEVICES AND PLATES

- (A) Provide specification (heavy duty nylon or polycarbonate) grade receptacles, switches, and pilot lights as indicated on the drawings.
- (B) Devices and covers shall be the product of one manufacturer: Hubbell, Arrow-Hart, Bryant, Leviton, Pass & Seymore, or approved equal.
- (C) Coordinate color with room finish and obtain the Engineer's approval before installation.
- (D) Provide grounding type receptacles with NEMA configurations as scheduled.
- (E) Provide 20 amp, 120/277 volt switches as scheduled.
- (F) Provide nylon or polycarbonate plates in all finished areas. Galvanized steel plates shall be used only in mechanical equipment areas.
- (G) Provide weatherproof covers with gasketed spring lift openings in wet locations or outdoors.
- (H) Provide one piece covers and gang outlets to suit the number of devices installed at a given location.
- (I) Special duty receptacles and switches are scheduled on the drawings.

38. MISCELLANEOUS DEVICES

- (A) Provide all miscellaneous devices required to complete the electrical system indicated.

39. GROUNDING AND BONDING

- (A) Ground all electrical equipment as required by the Division of Industrial Safety, and Article 250 of the National Electrical Code.
- (B) Install bonding conductors sized in accordance with code and with green type XHHW-2 insulation in each nonmetallic raceway containing power conductors.

ATTACHMENT C

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40. GENERAL SCADA PROVISIONS

- (A) Contractor shall install SCADA system instrumentation conduits, including water-tight penetrations, to RTU Cabinet(s) and seal complete.
- (B) Contractor shall install SCADA system instrumentation conductors, with detailed labels. Final terminations completed by electrical contractor.
- (C) Provide all SCADA requirements as listed and described in the SCADA control diagram.
- (D) Flow meter displays to include: flow rate in GPM, as percent of upper range value, and separate totalizer values for forward and backward flow.
- (E) Each individual cabinet shall have intrusion alarm specific to the cabinet.

41. INSTRUMENTATION

- (A) Install, and connect instrumentation, including conductors and conduit for the following items:
 - (1) Flow meters.
 - (2) Float switches.
 - (3) Pressure transducers.
 - (4) Magnetic intrusion switches.
 - (5) Instrumentation transmitters.
 - (6) Fiber-Optic lines.
 - (7) Other sensing/signal devices not listed here.

Instrumentation to be provided by electrical contractor.

- (B) Commissioning: Electrical contractor to guarantee the accuracy and operation of all instrumentation, as well as provide coordination with SCADA personnel, for instrumentation calibration and testing.

END OF SECTION