ENGINEERING &
TECHNOLOGY CENTER
9933 E. 16th Street, Tulsa, OK 74128
918-256-5545, 918-610-9888 Fax

Relay Panel Specification

4/19/2023

We deliver affordable, reliable ELECTRICITY, with a focus on EFFICIENCY and a commitment to ENVIRONMENTAL STEWARDSHIP.

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DRY GULCH FEEDER 307 RELAY PANEL

Feeder 307 Line Panel & Metering

Abstract

Bid and fabrication specification for relay panel and various other equipment required for an upgrade of a line protection in an existing control building, delivered and offloaded at the GRDA warehouse in Pryor, Oklahoma for the Grand River Dam Authority.

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1 SCOPE

1.1 GENERAL REQUIREMENTS

This specification presents a general description, design criteria and the minimum requirements for construction, performance, specific equipment and material properties and characteristics, and testing for fabrication of control panels and wiring, as well as components to for upgrade of an existing Substation Control Building, housing control/monitoring equipment.

The completed equipment shall be suitable for shipment to the customer's project site or warehouse as indicated below. The relay panels shall be designed and fabricated so the fieldwork at the installation site is minimized.

Construction of the relay panels shall be performed in the highest manner of workmanship using only new and unused, top-quality materials.

1.2 IDENTIFICATION OF PARTIES

1.2.1 "Owner":

Grand River Dam Authority
9933 E. 16th Street, Tulsa, Oklahoma 74128
Telephone: (918)-256-0721

Correspondence with *Owner* shall be directed to:
Attn: Laurel Swift, Project Coordinator
laurel.swift@grda.com

and

Parker Rainbolt, Substation Engineer
parker.rainbolt@grda.com

and

Kyle Birkenfeld, Senior Project Manager
kyle.birkenfeld@grda.com

and

Paul Proctor, Procurement Specialist
paul.proctor@grda.com

1.2.2 "Engineer":

Correspondence with *Engineer* shall be directed to:

Parker Rainbolt, Substation Engineer
Parker.rainbolt@grda.com

1.2.3 "Seller":

The firm, company, or corporation whom the *Owner* selects for the purpose of supplying the modular control building described in these specifications.

1.3 CORRESPONDENCE PLAN

1.3.1 Pre-Award

All correspondence prior to award shall be directed to *Owner* as identified below.

Paul Proctor, Procurement Specialist
Grand River Dam Authority
201 NW 63rd St. Ste 305; Oklahoma City, OK 73116
Telephone: (406) 297-9963 ext. 6
paul.proctor@grda.com

1.3.2 Post- Award

All subsequent correspondence and drawing submittals after award shall be directed to *Owner* and *Engineer* as identified below.

1.3.3 Delivery

Control panel delivery shall be coordinated with *Owner* and *Engineer* as well as with a GRDA foreman or construction inspector to be identified prior to shipment.

1.4 BID REQUIREMENTS

1.4.1 Data to be Provided with Bid

Seller shall provide the following data and information to allow the Owner and Engineer to make an accurate evaluation of the Seller's product or equipment, as follows:

a. Outline drawings (plan view and elevation), or illustrations showing proposed general arrangement and layout with approximate physical dimensions and weights for the relay panels. Outline drawings or other bid data shall also confirm *Seller*'s intent to provide all requested enclosure accessories.
b. Provide a letter of bid transmittal that clearly states any exceptions taken by the Seller to the specifications, Proposal Data Sheets, and/or Terms and Conditions at time of bid. The *Owner* and *Engineer* may not accept Seller's "Standard Conditions of Sale" or similar standard policies for purposes of stating exceptions to the specifications.
c. A list of items requiring field assembly shall be included, along with an itemized list of any special tools required and if cost for *Seller* to furnish.
d. Proposed warranty, including option for extended warranty, if available.

1.4.2 Or-Equal Clause and Substitutions

a. Where specifications or drawings identify an item of material or equipment by manufacturer's name and model/type, "or equal", products of equal quality and performance by other manufacturers may be substituted provided that such substitution is of equal design and quality, and that this substitution is acceptable to the *Owner* and *Engineer*.
b. Furnish descriptive information, data, and/or drawings to demonstrate to *Engineer* that material or equipment proposed is equal to that originally specified. *Seller* shall be responsible for proving the equality of any proposed substitutions.
c. The *Engineer* shall have final decision regarding the acceptability of proposed substitutions of material or equipment.
d. In determining acceptability of proposed substitutions, the *Engineer* and *Owner* will consider proposed equipment, material stocking and spare parts as well as any effects to project schedule and cost.
e. Approval of substitutions by the *Engineer* or *Owner* shall not in any way, excuse the Seller of responsibility for providing workmanship, material, and equipment equal to that specified.

1.4.3 Interpretations:

Clarifications and interpretations during the project shall be requested from the *Engineer*. The *Engineer* will issue an opinion on all questions and provide any necessary written clarifications. The *Engineer's* interpretation shall be accepted as final.

1.5 DELIVERY

1.5.1 General

Bids shall include delivery, freight prepaid, to the location specified below in section 1.5.3.

Seller shall assume all responsibility for the safe delivery of equipment shipped DAP destination.

All required components shall be delivered by means of a single shipment, or as mutually agreed to by the *Owner* and the *Seller*. Shipping papers, crates, drawings, manuals, etc. shall bear the following job references:

Grand River Dam Authority
Dry Gulch Substation
PO Number
Relay Panels
Purchase Order Number & Manufacturer's Order Number

Seller, or any of *Seller's* agents making direct shipment, shall transmit by First Class mail, on the same day shipment goes forward to *Owner*:

- Packing List – Two (2) copies
- Bill of Lading – Original and two (2) copies

Owner's Purchase Order Number shall be shown on all shipping papers and parcels.

Domestic shipping shall be by motor freight as completely assembled as possible insofar as is consistent with good shipping practice. Any components packaged separately shall be so secured that they cannot shift, tip, or

drop during shipment. Suitable coverings shall be provided for protection during shipment of all units or components. Any required conveyance across waterways shall be by barge or ship as determined to be best means by the Seller. The equipment shall be carefully blocked and secured for shipment. If items must be disassembled for shipment, they shall be tagged or stenciled with proper identification. A complete packing list shall also accompany each shipment.

Prior to shipment, the Seller shall inform the Owner of the estimated time in shipment, routing, shipping company and PRO number, if shipped by common carrier. Shipments will not be received on weekends; nor are weekends included when figuring time for notification of delivery. Notification shall be given at the time the shipment leaves the plant; additionally, notification shall be given 48 hours prior to arrival at the destination. Notification shall be directed to the Owner as identified in Section 1.2.1 of these specifications.

1.5.2 Coordination

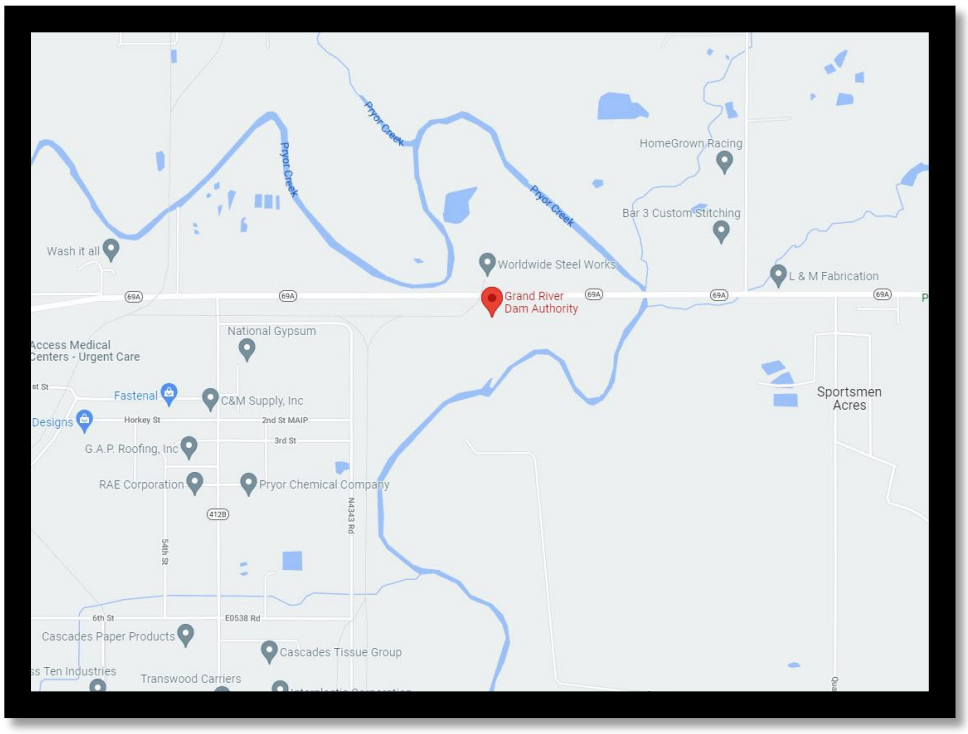
Delivery date shall be on or before that specified by the Seller in the Proposal. The control building and all required accessories shall be delivered by means of a single shipment. Seller is requested to provide an optional cost for all transportation, off-loading and placing on pad at jobsite. Where the building design includes shipping splits, Seller shall also provide an optional cost to supervise and direct assembly of control building at the project site.

Prior to shipment, the Seller shall inform the *Owner* and appointed GRDA Foreman or Construction Inspector of the estimated time in shipment, routing, shipping company and PRO number, if shipped by common carrier. Shipments will not be received on weekends; nor are weekends included when figuring time for notification of delivery. Notification shall be given at the time the shipment leaves the plant; additionally, notification shall be given 72 hours prior to arrival at the destination. Notification shall be directed to the Owner as identified in Section 1.2.1 of these specifications.

1.5.3 Location

The delivery address is:

GRDA Transmission Warehouse
Attn: Laurel Swift/Dry Gulch
635 Hwy 69A
Pryor, OK 74361



2 APPLICABLE STANDARDS

The design, material, manufacture, testing and performance of the Relay Panels shall meet the requirements of the applicable sections of the latest revisions of the standards listed below:

- ANSI American National Standards Institute
- AISC American Institute of Steel Construction
- ASTM American Society for Testing and Materials
- NEMA National Electrical Manufacturers Association
- AWS American Welding Institute
- IEEE Institute of Electrical and Electronics Engineers, Inc.
- NEC National Electric Code
- NFPA National Fire Protection Association
- SSPC Steel Structures Painting Council (Society for Protective Coatings)
- OSHA Occupational Safety and Health Administration
- AISI American Iron and Steel Institute
- ICEA Insulated Cable Engineers Association
- NESC National Electric Safety Code

3 RELAY EQUIPMENT

Terminal boards for current circuits and control shall be rated 30-amp, 150° C, 600 volt and shall be one piece molded phenolic with barriers and screw connections. Twelve-point terminal boards shall be GE Type EB-25 or equivalent. Shorting strip terminal boards used for termination of current circuits shall be four-point GE type EB-27, or equivalent.

Terminal boards for annunciation and supervisory shall be rated 24 Amp, 85° C, 600 volt and shall have end barriers and end anchors as required. DIN rail for mounting shall be included. Associate jumpers and marking system shall be utilized as recommended by manufacturer. Boards shall be Allen Bradley, Type 1492-HM2, or equal.

Spare terminal boards shall be provided on each panel to the extent of 10% used or a minimum of two spare twelve-point terminal boards, whichever is greater.

3.1 RELAY, CONTROL AND COMMUNICATION EQUIPMENT

Relay and Control Panels, as well as Communications Panels, indicated on the "Control Building Equipment Layout" will be furnished by *Seller*. *Seller* shall provide a design having adequate wire way provisions, and grounding provisions for relay panel and rack equipment. Panel elevations are provided for bidding purposes. The complete electrical schematics and wiring for the control building, as well as additional information for the cabling/installation of the termination cabinet, relay control panels and communications panels will be provided at a later date. Panels included in this bid are detailed in the attached panel list.

3.1.1 Panel Construction

1. The panel assembly shall be 90 inches high by 30 inches wide and 24 inches deep formed from 11-gauge sheet steel, U.S.S. gauge commercial grade, hot-rolled, pickled, and oiled steel. The relay and control panel shall be vertical type construction with top and bottom cable entry. Flat surfaces on the plan of any panel shall not deviate more than 1/8" from the true plane, provided with rack type drilling for equipment plates to be mounted allowing the flexibility for change after the panels are installed, with allowance for 48 standard 1 ¾" rack units and shall be manufactured in accordance to GRDA Drawings. The sides shall extend to the floor, thus providing a rigid structure.

2. The relay and control panel will be a self-contained unit with factory wiring complete to conveniently located terminal blocks for the field incoming leads. The equipment plates are designed in increments of typical rack units of 1-3/4" allowing for the easy insertion of rack mounted equipment. The combination of non-rack mountable components shall be mounted on removable steel mounting plates. All of this contributes to a pleasing overall switchboard appearance that is readily accessible and easily maintainable.

3. The panel shall be bolted to a 3" channel base (5.0 lbs./ft.) with 5/8": holes accessible for fastening to the floor. The channel shall extend under the front, both sides, and the open back. The panel shall be self-supporting. The sides and front must be permanently attached to this channel (welded is recommended).

4. The panel manufacturer shall make provisions for mounting auxiliary relays, diodes, and fuse blocks, etc., on the rear of the panels. Mounting of this equipment shall not hinder accessibility to the terminals of the front-mounted devices. All rear mounted subpanels (if required as indicated on drawings) shall be hinged in place to allow for future relocation, if required. Provisions shall be made to mount a hinged rear auxiliary equipment panel on the rear of the assembly, as required. When opened, the hinged rear panels allow free access to the back of the front panel components. The components that are mounted on the rear subpanel shall be placed on it so that when the subpanel is closed the components are inside the panel (that is not exposed to the area behind the panel).

5. Continuous ¼ inch by 1 inch cross-section bare copper horizontal ground bus shall be provided across the top or bottom (as listed on the drawings) in each relay and control panel. Panels located adjacent to each other shall be furnished with a similar copper ground bus section for interconnection of each panel's ground bus to form one continuous ground bus. Each panels ground bus shall be furnished with holes tapped every 1" for 10-32 machine screws. The horizontal ground bus will be joined to two (2) vertical ground buses located one on each side of relay and control panel near the cable entrance area for termination of incoming cable ground wires. The vertical ground buses shall also be furnished with holes tapped every 1" for 10-32 machine screws. The entire panel ground bus system shall be interconnected and form one continuous ground bus system. The ground bus shall be equipped with a solder-less connector for # 2/0 AWG copper cable at each end for connection to the ground grid.

6. Where required for future equipment installation, cover plates for cutouts are to be furnished when so indicted on the drawings. Cover plates shall be furnished for all areas of the front of the panel where other devices are not located. They shall be painted the same color as the panel.

7. After fabrication and before devices or cover plates are installed, the panel and parts including channel base, brackets, and interior parts shall be primed and painted with a minimum of one coat of primer and a finish coat of ANSI No. 61 light gray enamel paint on the exterior and standard white enamel for the interior.

8. All relay and control panels shall be designed to accommodate the addition of future panels on either side or the panel may be removed from a line-up and a new panel inserted.

9. The relay and control panels shall be open back design with necessary framing, cross bracing, and stiffeners to form a rigid self supporting structure.

10. Provisions shall be made to support instrument cases that exceed 12" in depth with rear instrument case supports.

11. Vertical raceways shall be bolted to the right and left sides to the back of the panel front and will be suitable for either top or bottom cable entrances. Roof sheets and floor channels shall be bolted to the panel assembly.

3.1.2 Finish

1. All mill scale, oxides, and other coatings shall be removed prior to painting. Exposed surfaces shall be finished smooth, thoroughly cleaned, and filled as necessary to provide a smooth uniform base for painting. Surface preparation prior to paint shall be accomplished by acid washing all metallic parts to etch the surfaces for proper paint adhesion. The washed product must be air-dried, dried with compressed air, or passed through a dry-off oven prior to applying the finish paint.

2. All metallic surfaces subject to corrosion shall be protected by suitable coatings. Surfaces that will be inaccessible after assembly shall be protected for the life of the equipment.

3.1.3 Panel Wiring

1. Control wiring shall be securely supported and connected to terminal blocks and panel equipment.

2. Vertical (terminal block) Panduit shall be used for wire runs containing more than ten wires. The Panduit shall be mounted on Unistrut and securely fastened to the panels. Adhesives are not acceptable. Panduit covers are to be easily accessible and removable.

3. Wiring extending from Panduit wire troughs to the instruments shall be neatly formed and securely fastened with suitable black nylon wire ties. Bends in the wiring shall be carefully made to avoid damaging the insulation and conductor.

4. Switchboard control wire shall be stranded, tinned, copper, with 600-volt flame-proof insulation, NEC type SIS, or approved equal. Green type SIS or approved equal wire shall be used for all grounding conductors. Wire sizes shall be as follows:

    - Current Transformer Circuits — #12 AWG, 65 strands
    - AC & DC Auxiliary Power Circuits — #14 AWG, 41 strands
    - Potential Circuits — #14 AWG, 41 strands
    - Control Circuits — #14 AWG, 41 strands
    - Annunciator Circuits — #18 AWG, 26 strands
    - Transducer Output Circuits — #16 AWG, Shielded Pair
    - Revenue Metering Circuits — #10 AWG, 105 strands

5. Control devices, protective relays and 12-point terminal blocks shall be terminated with crimp-type, non-insulated ring tongue terminals. All lugs shall be ring tongue non-insulated Burndy YAV style manufactured by Burndy or equivalent. The lugs shall be crimped with a ratchet type crimping tool as recommended by the lug manufacturer. When installing the lugs, care must be used in the removal of the conductor insulation so the wire will not be cut or nicked.

6. Wire termination shall be limited to two wires per screw on terminal blocks and relay terminals as indicated on wiring diagrams. All terminations shall be made with non-insulated ring lug terminals. Burndy YAV style is required unless written authorization is granted by *Engineer.*

7. Where through-the-panel mounted items are indicated as “future,” they are to be provided as cutouts and cover plates. In general, no wiring will be required to items indicated as future.

8. If wiring to future devices is required, it will be so indicated on the panel front-view, and shall be terminated on suitable “dummy” devices with terminal numbers as shown on the wiring diagram.

9. Temporary wiring installed at the factory for equipment testing shall be removed prior to shipment.

10. Each end of each wire shall be marked with circuit name and address of equipment and terminal of remote end. All wiring shall be labeled with Raychem wire labels.

11. Wiring and equipment shall not block space available for future equipment, nor access to wire ducts, terminal blocks, or equipment terminals.

12. All internal wiring shall be terminated with no more than two (2) conductors per terminal point, and on only one side of a terminal block, the other side shall remain open for field cabling connections.

13. All wiring between panels shall terminate on the external side of a terminal block. All wiring leaving the panel shall leave from a terminal block and not from any other devices within the panel.

3.1.4 Panel Equipment and Materials

1. The panel builder shall procure all relays, switches, meters, lamps, terminal blocks, fuse cutouts, transducers, etc., unless specifically noted on the panel front view and equipment list. No substitutions to the equipment listed on panel front-view drawings will be permitted without written authorization from GRDA.

2. All terminal blocks shall be rated 600 volts, 30 amps, and General Electric type EB25 or EB27, 12 point or AVO “Sliding-link” type M-25012 with white marking strip, or equal, as approved in writing by GRDA.

3. Terminal blocks shall be provided with white identification strips which shall be marked, in black, as indicated on the wiring diagrams. All wire numbers shall be legible and clearly visible. A minimum of 15 percent spare terminals shall be supplied, excluding current transformer terminal blocks where spare terminals are not required.

4. Terminal blocks for current transformer secondary circuits shall be of the short circuiting type and shall be GE EB-27.

5. Terminal Blocks shall be grouped as to service (i.e. CT leads, lighting, control, interconnecting wiring, etc.) and the grouped blocks shall be located in the same location in each panel. Each terminal shall be identified as noted on the wiring diagrams.
6. Devices not shown with specific dimensions on the front-view and equipment list drawing, such as rear-mounted items, are to be installed as close as possible to their relative location, as indicated on the panel wiring diagram.

7. All relays, including auxiliary relays, regardless of whether mounted on the front or the rear of the panel, shall be enclosed and have covers. Open-type relays without covers are not acceptable.

8. All relays, switches, terminal blocks, instruments, etc., shall have brass or tinned brass terminal screws or nuts installed in all terminals including the spare terminals.

9. All fuse blocks shall be barrier type Bakelite fuse blocks for use with cartridge type fuses, rated 250 volts, 30 amps, and shall be Bryant type M-3 or Bussmann Class H with screw terminals.

10. Relay software/firmware versions have been standardized within GRDA. The version number will be provided to the vendor after award.

3.1.5 Device and Wire Identification

Nameplates for front mounted devices shall be installed as shown on the front view with suitable adhesive. Nameplates for rear-mounted devices shall be applied below devices above eye level (approximately 5’4” above floor) and above devices below eye level. Nameplate size, letter size, material, and color shall be specified on the panel front view drawings. In addition, each device on the panel shall be permanently identified on the rear with the letter coordinated system used to locate equipment on the wiring diagram for the point-to-point wiring system. Such identification shall not be placed on removable covers.

All terminal block points shall be clearly and permanently labeled with the wire identifications shown on the drawings. Each individual wire shall be labeled at each end with wire number using Raychem shrinkable wire sleeves (or equal), using heat impregnated lettering.

3.1.6 Communication Panel

Not Needed

3.2 RELAY PANEL TESTING

GRDA shall have the right to inspect at the factory, at any time during the process of manufacture or assembly, all equipment covered by this specification, and shall be advised at least five working days prior to any schedule tests so that they can arrange to have their representative present during such tests.

All tests shall be made in accordance with latest approved applicable IEEE and ANSI standards. Vender shall furnish GRDA with three copies of the results of all tests specified and/or required.

Test procedures and results shall be subject to the approval of GRDA's Project Engineer. All test procedures and certified copies of test data and reports shall be submitted to GRDA prior to the preparation for shipment of the switchboard. The Manufacturer shall schedule the test far enough in advance of the shipping date to allow time to correct any errors or omissions discovered during testing.

The following tests shall be performed as a minimum:

- Complete visual inspection of all components and physical appearance of the structure for damage, looseness, paint, and wire bundles.
- Perform a visual inspection of wire terminations for proper insertion of the stripped wire into the lug, for proper crimp of the lug, for tightness of crimp, and for the connection of the lug to the device terminal.
- Check all components and identification labels against the Bill of Material and Nameplate List.
- Check device markings on the rear of the panel.
- Check all relays and other devices to ensure freedom of moving parts. Remove any shipping material that would prevent the operation of the device (i.e., time dials, moving contacts) during test.
- Perform a wiring continuity check per ANSI C37.21.5.3.2 utilizing the electrical schematics and perform a simulated operation and sequence test to functionally check all circuits for proper operation and correctness of wiring.
- Check relays and other devices to ensure that all internal voltage and current taps are at the proper settings.

During these tests, the following requirements apply:

a) The circuit schematics shall be used as a basis for performing tests.
b) Component instruction books shall be used, as required, to perform relay acceptance tests.
c) Apply AC voltage and current of the proper phase and magnitude to the required circuit.
d) Apply DC voltage of the proper magnitude to the required circuit.
e) Allow equipment to be energized for a sufficient time for normal operating temperatures to be reached.
f) Check all relays, meters, recorders, and transducers for proper operation and/or output to specified voltage and current ranges.
g) Check off schematics and record readings (i.e., meter reading and transducer outputs) on the appropriate schematic.

The electrical test shall demonstrate freedom from unintentional ground and accuracy of the wiring of all switchboard-mounted devices. The test shall include point-to-point continuity tests and electrical insulation tests in accordance with applicable ANSI Standards (Note: Megger or other high voltage tests shall not be applied to any coaxial shielded cables or solid state components). The Manufacturer shall be responsible for proper protection of instruments and devices that may be damaged by high voltage tests. Tests and checks shall be made by the Manufacturer before shipment to ensure that all electrical equipment and wiring furnished and installed by the Manufacturer is in proper operating condition and that the wiring is in exact accordance with the wiring diagram, and that all wiring will function as intended. The Manufacturer's tests shall include a functional test of each panel. This test shall be carried out by providing dc power, ac current and potentials as required, and proving each specific circuit through the operation of the relays forming that circuit. Relay studs or terminal blocks shall not be shorted to simulate the operation of any relay unless that relay is located on panels or equipment not supplied by this Manufacturer. Circuit isolation, by removal of fuses, shall be verified against the schematic diagrams. Opening and closing of all relay contacts shall be verified. All wiring for instruments shipped separately or at a later date than the switchboard shall be completed and tested prior to shipment of the switchboard. The expense of any necessary reworking of the wiring to make it conform to the wiring diagrams shall be back-charged to the Manufacturer.

4 FACTORY ASSEMBLY AND TESTING

Control building shall be fully assembled for complete testing and inspection prior to shipping. *Seller* shall have QA procedures and be able to provide documentation to ensure that all electrical and mechanical systems are installed correctly and function properly before shipment. Mechanical inspections shall be performed on doors, locks, door stops, louvers, etc. for proper operation. Electrical inspections shall verify all AC and DC circuits and ground connections. Control wiring continuity will be verified. HVAC, lights, and vent fan will all have power applied and have proper operation verified before shipment.

Complete wiring and function tests will be made. *Seller* shall furnish all facilities necessary to perform such production tests and give prior notice to *Owner* before performing them. Verification of these tests shall be supplied as a part of the Instruction Book.

Field tests shall be made at the expense of *Owner*. If requested and at *Owner's* expense, *Seller* shall have qualified service personnel available to perform or assist with the field tests.

When unloading services is requested, *Seller* shall provide pricing for unloading of building and placing on foundation(s), as well as all required field assembly. Field installation and testing of *Owner's* equipment interconnection wiring will be performed by *Owner*.

5 FIELD INSTALLATION

5.1 UNLOADING AND LIFTING INSTRUCTIONS

Seller shall submit detailed written instructions and diagrams to show plan for lifting and setting. Information to include spreader requirements and lead lengths to provide vertical plumb and level lifting. Detailed written instructions and diagrams showing safe lifting procedures shall be sent to individual shown on the purchase order a minimum of four (4) weeks prior to shipment.

5.2 FIELD ASSEMBLY

Not Required

6 WARRANTY

a. All parts and material shall be new and free from defects or imperfections. All workmanship shall meet or exceed accepted construction practices, resulting in a neat and professionally finished appearance.
b. The *Seller* shall be responsible for correcting any defects in material, equipment, and workmanship discovered within a minimum of one year after erection is completed. All manufacturers' warranties for equipment shall be transferred in their entirety to the *Owner*.

7 ACCEPTANCE OF EQUIPMENT

a. After delivery, the equipment will be inspected by GRDA for visible damage, missing items, and signs of poor workmanship. Equipment or materials that are not acceptable shall be repaired, corrected, or replaced by the Fabricator at no additional cost to GRDA before the steel is accepted.
b. Acceptance does not occur until all equipment and documentation required by the specification and necessary to install the equipment is received by GRDA.
c. Acceptance of the equipment by GRDA does not relieve the Fabricator of the responsibility for the adequacy of materials and proper operation of equipment.

8 TERMS OF PAYMENT AND CONDITIONS

a. All proposals, bids, or quotations shall be FOB Substation Foundation.
b. No partial payments shall be made for partial shipments.
c. Conditions of the "Acceptance of Equipment" must be met before any payment will be made.

9 EVALUATION OF BIDS

Bids shall be evaluated based on the following:

- Price: original cost and life cost (the bid may include an option for different prices for different delivery dates).
- Delivery: as needed for the project
- Adherence to this specification
- Suitability: ability to meet the needs of the project

The bid must include enough technical data and information to allow the evaluator to understand what is being bid, and how this meets the needs of the project.

Any and/or all exceptions shall be specifically enumerated with reference to the item in the specification that they are taking exception to. If these are not specifically listed, it will be assumed that the bidder will meet the specification and will be held to it.

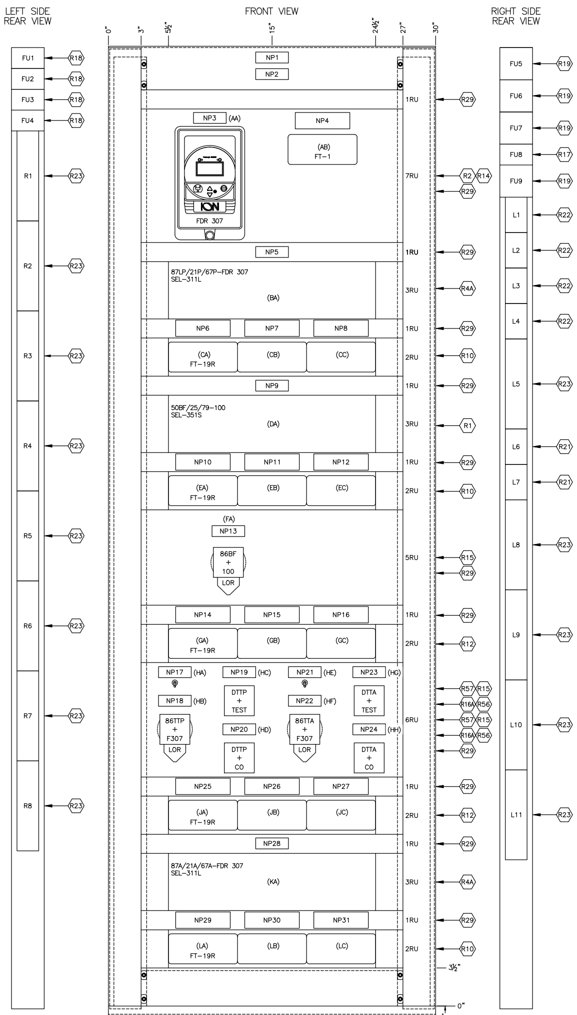
Appendix A: RELAY PANEL LIST

Seller shall furnish and install relay panels as indicated in the below list and attached drawings.

PNL NO.	DESCRIPTION	FRONT VIEW DWG
TERMINATION CABINETS (FOR REFERENCE)		
RELAY & CONTROL PANELS		
105	Feeder 307 Line Panel	S875PP105

Appendix B: CONTROL BUILDING DRAWING LIST (FOR REFERENCE)

DWG NO.	DESCRIPTION



PNL #105
161kV BKR 100
FDR 307

BILL OF MATERIALS PANEL #105			
ITEM	QTY.	DESCRIPTION	DEVICE NAME
R1	1	SEL-351S PROTECTION SYSTEM – CIRCUIT BREAKER CONTROL RELAY S# 0351S6XHD3E5421	50BF/25/79-100
R2	1	REVENUE METER ION8650 S# S8650A4C0H6E1B0A	FDR 307 REVENUE METER
R4A	2	SEL-311L TRANSMISSION SYSTEM – LINE PROTECTION RELAY S# 0311L0HDD3254XXXX	87LP/21P/67P-FDR 307 87LA/21A/67A-FDR 307
R10	3	ABB TYPE FT-19R FLEXITEST SWITCH ASSEMBLY, [(2) 10 POTENTIAL, (1) 4 POTENTIAL, 6 CURRENT] S# FR2H-014-001-001A	FT-19R
R12	2	ABB TYPE FT-19R FLEXITEST SWITCH ASSEMBLY, [(3) POTENTIAL] S# FR2H-001-001-001A	FT-19R
R14	1	ABB TYPE FT-1 TEST SWITCH, 10 POLE [4 POTENTIAL, 6 CURRENT] S# R129A514G01	FT-1
R15	3	ELECTROSWITCH, SERIES 24 AUXILIARY LOCK-OUT RELAY, 8 DECK, MANUAL RESET LOR WITH LIGHTS S# 78PB08D (125V DC)	86BF-100 86TTP-FDR 307
R16A	2	ELECTROSWITCH (125V DC) 31LSR S# 9303QB, ENGRAVED , "DTT ON OFF"	DTTP-CO DTTA-CO
R17	1	MARATHON #F30A2S FUSE BLOCK WITH TYPE NON-6 AMP FUSES	FU
R18	4	MARATHON #F30A2S FUSE BLOCK WITH TYPE NON-10 AMP FUSES	FU
R19	4	MARATHON #F30A3S FUSE BLOCK WITH TYPE NON-6 AMP FUSES	FU
R21	2	GENERAL ELECTRIC TYPE EB-25 TERMINAL BLOCKS 4 CIRCUIT S# EB25B04	L
R22	4	GENERAL ELECTRIC TYPE EB-27 SHORTING TERMINAL BLOCKS 4 CIRCUIT S# EB27B04S	L
R23	13	GENERAL ELECTRIC TYPE EB-25 TERMINAL BLOCKS 12 CIRCUIT S# EB25B12	R/L
R28	3	CABLE, SEL 273A, 25 FEET LONG, EACH	RTU CABLE
R29	12	COVER PLATE (9-1RU, 1-5RU, 1-6RU, 1-7RU)	
R56	2	DTT TEST GE SBM SWITCH, 1 STAGE, 2 POSITION, OVAL HANDLE S# 16SBMA2A02S3A2V1	DTTP-TEST DTTA-TEST
R57	2	NEWARK 723DK3	87LP-CO 87LA-CO

NP1 (1" × 3")
PANEL NO. #105

NP2
161kV BREAKER 100
FEEDER 307 PANEL

NP3
FEEDER 307
REVENUE

NP5
FEEDER 307
PRIMARY RELAY
87LP/21P/67P

NP4

ION 8650-FDR 307 REVENUE METER									TS1
POTENTIAL			CURRENT						POT.
			Aϕ		Bϕ		Cϕ		
Aϕ	Bϕ	Cϕ	OUT	IN	OUT	IN	OUT	IN	N

NP6 (1½" × 5")

SEL 311L-87LP/21P/67P-FDR 307									TS2
POTENTIAL			CURRENT						POT.
			Aϕ		Bϕ		Cϕ		
Aϕ	Bϕ	Cϕ	OUT	IN	OUT	IN	OUT	IN	N

NP7

FT-1 TRIP CUTOUT SWITCH 87LP/21P/67P-FDR 307 (CO2)									
BKR 100 (TC1) TRIP	BKR 100 (TC2) TRIP	BKR 9270 (TC1) TRIP	BKR 9270 (TC2) TRIP	BKR 100 RI	BKR 100 BFI	FDR 307 86TTP TRIP	BKR 100 RI	BKR 100 BFI	RELAY FAIL ALARM

NP8

FT-1 TRIP CUTOUT SWITCH 87LP/21P/67P-FDR 307 (CO3)									
FDR 307 CARR. START	FDR 307 CARR. STOP								

NP9
BF & RECLOSE RELAY
BREAKER 100
50BF/25/79

NP10

SEL 351S-50BF/25/79-100									TS3
POTENTIAL			CURRENT						POT.
			Aϕ		Bϕ		Cϕ		
Aϕ	Bϕ	Cϕ	OUT	IN	OUT	IN	OUT	IN	N

NP11

FT-1 TRIP CUTOUT SWITCH 50BF/25/79-100 (CO4)									
BKR 9270 CLOSE	BKR 9270 (TC1) TRIP	BKR 9270 (TC2) TRIP	BKR 9270 86BF TRIP	BKR 100 CLOSE	BKR 100 (TC1) TRIP	BKR 100 (TC2) TRIP	BKR 100 86BF TRIP		RELAY FAIL ALARM

NP12

FT-1 TRIP CUTOUT SWITCH 50BF/25/79-100 (CO5)									
								SYNC VS 161kV FDR 307	SYNC NS 161kV FDR 307

NP13
86BF/100
BF LOR/CONTROL
RELAY

NP14

FT-1 TRIP CUTOUT SWITCH 86BF/100 (CO6)									
BKR 100 (TC1) TRIP	BKR 100 (TC2) TRIP	BKR 9270 (TC1) TRIP	BKR 9270 (TC2) TRIP						86BF TRIP IND

NP15

FT-1 TRIP CUTOUT SWITCH 86BF/100 (CO7)									
FDR 307 DTT PRI	FDR 307 CARR STOP								

NP16

FT-1 TRIP CUTOUT SWITCH 86BF/100 (CO8)									

NP17
161kV FEEDER 307
PRIMARY RELAY
87LP/CO SW

NP18
161kV FEEDER 307
PRIMARY RELAY 86TTP

NP19
161kV FEEDER 307
DTTP TEST

NP20
161kV FEEDER 307
DTTP/CO
ON/OFF SWITCH

NP21
161kV FEEDER 307
ALTERNATE RELAY
87LA/CO SW

NP22
161kV FEEDER 307
ALTERNATE RELAY
86TTA

NP23
161kV FEEDER 307
DTTA TEST

NP24
161kV FEEDER 307
DTTA/CO
ON/OFF SWITCH

NP25

FT-1 TRIP CUTOUT SWITCH 86TTP/F307 (CO9)									
BKR 100 (TC1) TRIP	BKR 100 (TC2) TRIP	BKR 9270 (TC1) TRIP	BKR 9270 (TC2) TRIP						86TTP TRIP IND

NP26

FT-1 TRIP CUTOUT SWITCH 86TTA/F307 (C10)									
BKR 100 (TC1) TRIP	BKR 100 (TC2) TRIP	BKR 9270 (TC1) TRIP	BKR 9270 (TC2) TRIP						86TTA TRIP IND

NP27

FT-1 TRIP CUTOUT SWITCH SPARE (CO11)									

NP28
FEEDER 307
ALTERNATE RELAY
87A/21A/67A

NP29

SEL 311L-87A/21A/67A-FDR 307									TS4
POTENTIAL			CURRENT						POT.
			Aϕ		Bϕ		Cϕ		
Aϕ	Bϕ	Cϕ	OUT	IN	OUT	IN	OUT	IN	N

NP30

FT-1 TRIP CUTOUT SWITCH 87A/21A/67A-FDR 307 (CO12)									
BKR 100 (TC1) TRIP	BKR 100 (TC2) TRIP	BKR 9270 (TC1) TRIP	BKR 9270 (TC2) TRIP	BKR 100 RI	BKR 100 BFI	BKR 9270 RI	BKR 9270 BFI		RELAY FAIL ALARM

NP31

FT-1 TRIP CUTOUT SWITCH 87A/21A/67A-FDR 307 (CO13)									

CONSTRUCTION NOTES:

EXISTING BKR 9270 WILL BECOME BKR 100

ISSUED FOR REVIEW

REV NO.	JOB NO.	DATE	DESIGN ENGR	DFTR	DESIGN CHECK	ISSUE APPRVD
DESCRIPTION: 30% REVIEW						
A	RF024-01283	22MAY24	PR	TT		

REV NO.	JOB NO.	DATE	DESIGN ENGR	DFTR	DESIGN CHECK	ISSUE APPRVD
DESCRIPTION:						
0						

GRAND RIVER DAM AUTHORITY
DRY GULCH SUBSTATION — S875
MAYES COUNTY, OKLAHOMA — 161kV

PNL #105 ELEVATION
161kV FDR 307 & BKR 100

P.O. BOX 669
CHOUTEAU, OK 74337

ENGINEER: PR	SCALE: AS SHOWN	DATE: 05APR24	REV.
DRAWN BY: DK	DRAWING NO.		A
CHECKED BY: PR	S875PP105		
APPROVED BY: PR			