CITY OF GRAND ISLAND

Working Together for a Better Tomorrow. Today.

SPECIFICATION PACKAGE

for

BURDICK UNIT #2
GENERATOR BREAKER ADDITION

Bid Opening Date/Time
Tuesday, March 16, 2010 @ 2:00 p.m.
City of Grand Island, City Hall
100 East 1st Street, P.O. Box 1968
Grand Island, NE 68802-1968

Contact
City of Grand Island – Utilities Department
Platte Generating Station
308/385-5496

Date issued: February 11, 2010

ADVERTISEMENT TO BIDDERS
FOR
BURDICK UNIT #2 GENERATOR BREAKER ADDITION
FOR
CITY OF GRAND ISLAND, NEBRASKA

Sealed bids will be received at the office of the City Clerk, 100 E. First Street, P.O. Box 1968, Grand Island, Nebraska 68802, until Tuesday, March 16, 2010 at 2:00 p.m. local time for Burdick Unit #2 Generator Breaker Addition, FOB the City of Grand Island, freight prepaid. Bids will be publicly opened at this time in the Grand Island City Hall Council Conference Room #1 located on 1st floor of City Hall. Submit an original and three copies. Bid proposal package is also available on-line at www.grand-island.com under Calendar/City Clerk. Bids received after the specified time will be returned unopened to sender.

The successful bidder will be required to comply with fair labor standards as required by Nebraska R.R.S.73-102 and comply with Nebraska R.R.S. 48-657 pertaining to contributions to the Unemployment Compensation Fund of the State of Nebraska. Successful bidder shall maintain a drug free workplace policy. Every public contractor and his, her or its subcontractors who are awarded a contract by the City for the physical performance of services within the State of Nebraska shall register with and use a federal immigration verification system to determine the work eligibility status of new employees physically performing services within the State of Nebraska.

Each bidder shall submit with the bid a certified check, a cashiers check, or bid bond payable to the City Treasurer in an amount no less than five percent (5%) of the bid price which shall guarantee good faith on the part of the bidder and the entering into a contract within fourteen (14) days at the bid price if accepted by the City. **Your certified check, cashier's check or bid bond must be submitted in a separate envelope attached to the outside of the envelope containing the bid. Each envelope must be clearly marked indicating its contents. Failure to submit the necessary qualifying information in clearly marked and separate envelopes will result in your bid not being opened or considered.** Surety companies authorized to do business in the State of Nebraska must issue bid bonds.

Bids will be evaluated by the Purchaser based on price, schedule, quality, adherence to schedule, plan and specifications, economy and efficiency of operation, experience and reputation of the bidder, ability, capacity, and skill of the bidder to perform contract required and adaptability of the particular items to the specific use intended.

The Purchaser reserves the right to reject any or all bids, to waive irregularities therein, and to accept whichever bid that may be in the best interest of the City, at its sole discretion.

No bidder may withdraw his bid for a period of thirty (30) days after date of bid opening.

RaNae Edwards, City Clerk

CHECKLIST FOR BID SUBMISSION

FOR

BURDICK UNIT #2 GENERATOR BREAKER ADDITION

Bids must be received by the City Clerk before *2:00 p.m. on TUESDAY, MARCH 16, 2010*.

The following items must be completed for your bid to be considered.

- ❑ A signed original and three copies of the bidding documents.
- ❑ A reference list of at least three projects of similar scope and complexity.
- ❑ A summary of the experience of the service supervisor proposed for this project.
- ❑ Firm lump sum pricing; firm unit pricing in case adjustments are necessary, and breakout of sales tax pricing.
- ❑ A proposed construction/test schedule.
- ❑ A description of the system proposed, including equipment, controls, alarms and operation.
- ❑ Proposed manufacturer's warranty.
- ❑ Selection of Nebraska Sales Tax Option.
- ❑ Acknowledgment of Addenda Number(s) _____.
- ❑ Bidders must complete and sign the Bid Data Form provided in these Documents. All blank spaces must be filled in. Bidders shall acknowledge receipt of any Addenda information on the Bid Data Form.
- ❑ A certified check, cashiers check or bid bond in a separate envelope attached to the **outside of the envelope containing the bid**. Each envelope must be clearly marked indicating its contents. Failure to submit the necessary qualifying information in clearly marked and separate envelopes will result in your bid not being opened.

  Please check off each item as completed.

_____ _____

Company Signature

Telephone No. _____ Fax No. _____

(All bids must be submitted on this form)

BURDICK UNIT #2 GENERATOR BREAKER ADDITION

BID DATA FORM

CITY OF GRAND ISLAND
GRAND ISLAND, NE

The undersigned bidder, having examined all specifications and other bidding documents, and all addenda thereto, and being acquainted with and fully understanding all conditions relative to the specified materials and equipment, hereby proposes to provide such equipment FOB the City of Grand Island, freight prepaid, at the following price:

ITEM DESCRIPTION	EXTENDED COST
Base Bid:	
Material	$ _____
Labor	$ _____
Applicable Sales tax*	$ _____
Total Base Bid	$ _____

*** If bidder fails to include sales tax in their bid price or takes exception to including sales tax in their bid price, the City will add a 7.0% figure to the bid price for evaluation purposes; however, the City will only pay actual sales tax due.**

☐ By checking this box, Bidder acknowledges that Addenda Number(s) _____ were received and considered in Bid preparation.

☐ By checking this box, Bidder acknowledges the specified completion date of the project is **November 30, 2010.**

According to Nebraska Sales and Use Tax Requirements, Section 1-017, Contractors, check which option you have selected to file with the Nebraska Department of Revenue:

Nebraska law provides a sales and use tax exemption on contractor labor charges for the construction, repair, or annexation of any structure used for the generation, transmission, or distribution of electricity. Separately stated contractor labor would be exempt, all materials are taxable according to the contractor's option.

Option 1 (Section 1-017.05)_____ Option 2 (Section 1-017.06)_____ Option 3 (Section 1-017.07)_____

If the Nebraska sales and use tax election is not filed or noted above, the contractor will be treated as a retailer under Option 1 for sales and use tax purposes.

_____
Bidder Company Name Date

_____
Company Address City State Zip

_____
Print Name of Person Completing Bid Signature

Telephone No._____ Fax No._____

☐ By checking this box, Bidder acknowledges there are Exceptions noted to the bid.
NOTE: Any exceptions to specifications must be fully explained on a separate sheet attached to bid.

INSTRUCTIONS TO BIDDERS

1. GENERAL INFORMATION.

   The following instructions outline the procedure for preparing and submitting Bids. Bidders must fulfill all requirements as specified in these Documents.

2. TYPE OF BID.

   Bidders shall be required to submit prices for all items listed in the Bid Data Form.

3. PREPARATION OF BIDS.

   Bidders shall use only the Bid Data Form provided in these Documents. All blank spaces in the Bid Data Form, must be filled in, preferably in BLACK ink, in both words and figures where required. No changes to the wording or content of the forms is permitted. Written amounts shall govern in case of discrepancy between the amounts stated in writing and the amounts stated in figures.

   Prices stated shall be f.o.b. with freight and full insurance paid by Bidder, to the job site located in Grand Island.

   The Bidder shall acknowledge receipt of all addenda in the Bid Data Form. Bids received without acknowledgement or without the Addendum enclosed will be considered informal.

4. SUBMISSION OF BIDS.

   All Bids must be submitted intact not later than the time prescribed, at the place, and in the manner set forth in the ADVERTISEMENT FOR BIDS. Bids must be made on the Bid Data Form provided here in. Each Bid must be submitted intact in a sealed envelope, so marked as to indicate its contents without being opened, and delivered in person or addressed and mailed in conformance with the instructions in the ADVERTISEMENT FOR BIDS.

5. BID SECURITY.

   Bids must be accompanied by cash, a certified check, or cashier's check drawn on a bank which is insured by the Federal Deposit Insurance Corporation, or a bid bond issued by a Surety authorized to issue such bonds in the state where the Work is located, in the amount of 5 percent of the bid amount payable to OWNER. This bid security shall be given as a guarantee that the Bidder will not withdraw his Bid for a period of 30 days after bid opening, and that if awarded the Contract, the successful Bidder will execute the attached Contract and furnish a properly executed Performance Bond and Payment Bond each in the full amount of the Contract price within the time specified.

   The Attorney-in-Fact that executes this bond in behalf of the Surety must attach a notarized copy of his power of attorney as evidence of his authority to bind the Surety on the date of execution of the bond. Where State Statue requires, certification by a resident agent shall also be provided.

6. RETURN OF BID SECURITY.

   Within 15 days after the award of the Contract, the OWNER will return the bid securities to all Bidders whose Bids are not to be further considered in awarding the contract. All other retained bid securities will be held until the Contract has been finally executed, after which all bid securities, other than Bidders' bonds and guarantees which have been fortified, will be returned to the respective Bidders whose Bids they accompanied.

7. BASIS OF AWARD

The award will be made by the OWNER on the basis of the Bid from the lowest responsive, responsible Bidder which, in the OWNER's sole and absolute judgment will best serve the interest of the OWNER. All Bids will be considered on the following basis:

- Conformance with the terms of the Bid Documents.
- Bid price.
- Cost of installation.
- Suitability to project requirements.
- Delivery time.
- Responsibility and qualification of Bidder.

The OWNER reserves the right to reject all Bids, or any Bid not in conformance with the intent of the Bid Documents, and to waive any informalities and irregularities in said Bids.

8. EXECUTION OF CONTRACT.

The successful Bidder shall, within 15 days after receiving notice of award, sign and deliver to the OWNER the Contract hereto attached together with the acceptable bonds as required in these Bid Documents. Within 15 days after receiving the signed Contract with acceptable bond(s) from the successful Bidder, the OWNER's authorized agent will sign the Contract. Signature by both parties constitutes execution of the Contract.

9. PERFORMANCE AND PAYMENT BONDS.

The successful Bidder shall file with the OWNER Performance and Payment Bonds in the full amount (100 percent) of the Contract price, as security for the faithful performance of the Contract and the payment of all persons supplying labor and materials for the Work under this Contract, and to cover all guarantees against defective workmanship or materials, or both, for a period of 1 year after the date of final acceptance of the Work by the OWNER. The Surety furnishing these bonds shall have a record of service satisfactory to the OWNER, be authorized to do business in the State where the OWNER's project is located and shall be named on the current list of approved Surety Companies, acceptable on Federal bonds as published by the Audit Staff, Bureau of Accounts, U.S. Treasury Department.

The Attorney-in-Fact (Resident Agent) who executes these bonds on behalf of the Surety must attach a notarized copy of his power-of-attorney as evidence of his authority to bind the Surety on the date of execution of the bond.

10. TIME OF COMPLETION.

The time of completion of the Work to be performed under this Contract is the essence of the Contract. The time allowed for the completion of the Work is stated in the Bid Data Form.

11. GRATUITIES AND KICKBACKS

City Code states that it is unethical for any person to offer, give, or agree to give any City employee or former City employee, or for any City employee or former City employee to solicit, demand, accept, or agree to accept from another person, a gratuity or an offer of employment in connection with any decision, approval, disapproval, recommendation, or preparation of any part of a program requirement or a purchase request, influencing the content of any specification or procurement standard, rendering of advice, investigation, auditing, or in any other advisory capacity in any proceeding or application, request for ruling, determination, claim or controversy, or other particular matter, pertaining to any program requirement or a contract or subcontract, or to any solicitation or proposal therefor. It shall be unethical for any payment, gratuity, or offer of employment to be made by or on behalf of a subcontractor under a contract to the prime contractor or higher tier subcontractor or any person associated therewith, as an inducement for the award of a subcontract or order.

12. FISCAL YEAR

The City of Grand Island, Nebraska operates on a fiscal year beginning October 1st and ending on the following September 30th. It is understood and agreed that any portion of this agreement which will be performed in a future fiscal year is contingent upon the City Council adopting budget statements and appropriations sufficient to fund such performance.

CONTRACT AGREEMENT

THIS AGREEMENT made and entered into by and between **[SUCCESSFUL BIDDER]**, hereinafter called the Contractor, and the **CITY OF GRAND ISLAND, NEBRASKA**, hereinafter called the City.

WITNESSETH:

THAT, WHEREAS, in accordance with law, the City has caused contract documents to be prepared and an advertisement calling for bids to be published for *BURDICK UNIT #2 GENERATOR BREAKER ADDITION;* and

WHEREAS, the City, in the manner prescribed by law, has publicly opened, examined, and canvassed the bids submitted, and has determined the aforesaid Contractor to be the lowest responsive and responsible bidder, and has duly awarded to the said Contractor a contract therefore, for the sum or sums named in the Contractor's bid, a copy thereof being attached to and made a part of this contract;

NOW, THEREFORE, in consideration of the compensation to be paid to the Contractor and of the mutual agreements herein contained, the parties have agreed and hereby agree, the City for itself and its successors, and the Contractor for itself, himself, or themselves, and its, his, or their successors, as follows:

ARTICLE I. That the following documents shall comprise the Contract, and shall together be referred to as the "Agreement" or the "Contract Documents";

1. This Contract Agreement.
2. City of Grand Island's Specification for this project.
3. [NAME OF SUCCESSFUL BIDDER] bid signed and dated [DATE OF BID].

In the event of any conflict between the terms of the Contract Documents, the provisions of the document first listed shall prevail.

ARTICLE II. That the contractor shall (a) furnish all tools, equipment, superintendence, transportation, and other construction materials, services and facilities; (b) furnish, as agent for the City, all materials, supplies and equipment specified and required to be incorporated in and form a permanent part of the completed work; (c) provide and perform all necessary labor; and (d) in a good substantial and workmanlike manner and in accordance with the requirements, stipulations, provisions, and conditions of the contract documents as listed in the attached General Specifications, said documents forming the contract and being as fully a part thereof as if repeated verbatim herein, perform, execute, construct and complete all work included in and covered by the City's official award of this contract to the said Contractor, such award being based on the acceptance by the City of the Contractor's bid;

ARTICLE III. That the City shall pay to the Contractor for the performance of the work embraced in this contract and the Contractor will accept as full compensation therefore the sum (subject to adjustment as provided by the contract) of **[DOLLAR AMOUNT] ($00.00)** for all services, materials, and work covered by and included in the contract award and designated in the foregoing Article II; payments thereof to be made in cash or its equivalent in the manner provided in the General Specifications.

The total cost of the Contract includes:

Base Bid:	$	.00
Sales Tax on Materials/Equipment:	$	.00
Sales Tax on Labor:	$	.00
Total	$	.00

The City of Grand Island, Nebraska operates on a fiscal year beginning October 1st and ending on the following September 30th. It is understood and agreed that any portion of this agreement which will be performed in a future fiscal year is contingent upon the City Council adopting budget statements and appropriations sufficient to fund such performance.

ARTICLE IV. The Contractor hereby agrees to act as agent for the City in purchasing materials and supplies for the City for this project. The City shall be obligated to the vendor of the materials and supplies for the purchase price, but the Contractor shall handle all payments hereunder on behalf of the City. The vendor shall make demand or claim for payment of the purchase price from the City by submitting an invoice to the Contractor. Title to all materials and supplies purchased hereunder shall vest in the City directly from the vendor. Regardless of the method of payment, title shall vest immediately in the City. The Contractor shall not acquire title to any materials and supplies incorporated into the project. All invoices shall bear the Contractor's name as agent for the City. This paragraph will apply only to these materials and supplies actually incorporated into and becoming a part of the finished product of the BURDICK UNIT #2 GENERATOR BREAKER ADDITION.

ARTICLE V. That the Contractor shall start work as soon as possible after the contract is signed and the required bonds and insurance are approved, and that the Contractor shall deliver the equipment, tools, supplies, and materials F.O.B. Platte Generating Station, and complete the work on or before ***NOVEMBER 30, 2010.***

ARTICLE VI. The Contractor agrees to comply with all applicable State fair labor standards in the execution of this contract as required by Section 73-102, R.R.S. 1943. The Contractor further agrees to comply with the provisions of Section 48-657, R.R.S. 1943, pertaining to contributions to the Unemployment Compensation Fund of the State of Nebraska. During the performance of this contract, the Contractor and all subcontractors agree not to discriminate in hiring or any other employment practice on the basis, of race, color, religion, sex, national origin, age or disability. The Contractor agrees to comply with all applicable Local, State and Federal rules and regulations. The Contractor agrees to maintain a drug-free workplace policy and will provide a copy of the policy to the City upon request. Every public contractor and his, her or its subcontractors who are awarded a contract by the City for the physical performance of services within the State of Nebraska shall register with and use a federal immigration verification system to determine the work eligibility status of new employees physically performing services within the State of Nebraska.

GRATUITIES AND KICKBACKS

City Code states that it is unethical for any person to offer, give, or agree to give any City employee or former City employee, or for any City employee or former City employee to solicit, demand, accept, or agree to accept from another person, a gratuity or an offer of employment in connection with any decision, approval, disapproval, recommendation, or preparation of any part of a program requirement or a purchase request, influencing the content of any specification or procurement standard, rendering of advice, investigation, auditing, or in any other advisory capacity in any proceeding or application, request for ruling, determination, claim or controversy, or other particular matter, pertaining to any program requirement or a contract or

subcontract, or to any solicitation or proposal therefor. It shall be unethical for any payment, gratuity, or offer of employment to be made by or on behalf of a subcontractor under a contract to the prime contractor or higher tier subcontractor or any person associated therewith, as an inducement for the award of a subcontract or order.

[SUCCESSFUL BIDDER]

By_____ Date _____

Title_____

CITY OF GRAND ISLAND, NEBRASKA

By_____ Date _____
Mayor

Attest:_____
City Clerk

The contract is in due form according to law and hereby approved.

_____ Date _____
Attorney for the City

CITY OF GRAND ISLAND

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BURDICK UNIT #2
GENERATOR BREAKER ADDITION

General and Technical Supplemental Specifications

CITY OF GRAND ISLAND

Working Together for a Better Tomorrow, Today.

REQUEST FOR BIDS - GENERAL SPECIFICATIONS

The Bid shall be in accordance with the following and with all attached BID DATA and DETAILED SPECIFICATIONS.

All prices are to be furnished and installed FOB, Grand Island, Nebraska. **All prices shall be firm, and shall include all sales and use taxes as lawfully assessed under laws and regulations of the State of Nebraska.** * If bidder fails to include sales tax in their bid price or takes exception to including sales tax in their bid price, the City will add a 7.0% figure to the bid price for evaluation purposes; however, the City will only pay actual sales tax due.

Bids shall include the following on the **outside** of the mailing envelope: **"Burdick Unit #2 Generator Breaker Addition".** All sealed bids are due no later than **Thursday, March 16, 2010 at 2:00 p.m. local time**. Submit **an original and three copies** of the bid to:

Mailing Address: City Clerk
City Hall
P. O. Box 1968
Grand Island, NE 68802

Street Address: City Clerk
City Hall
100 E. First Street
Grand Island, NE 68801

Bids will be opened at this time in the City Hall Council Conference Room #1 located on 1st floor of City Hall. Any bid received after the specified date will not be considered. No verbal bid will be considered.

Bids will be evaluated by the Purchaser based on price, schedule, quality, adherence to schedule, plan and specifications, economy and efficiency of operation, experience and reputation of the bidder, ability, capacity, and skill of the bidder to perform contract required and adaptability of the particular items to the specific use intended.

The successful bidder will be required to comply with fair labor standards as required by Nebraska R.R.S.73-102 and comply with Nebraska R.R.S. 48-657 pertaining to contributions to the Unemployment Compensation Fund of the State of Nebraska. Contractor shall maintain a drug free workplace policy. Every public contractor and his, her or its subcontractors who are awarded a contract by the City for the physical performance of services within the State of Nebraska shall register with and use a federal immigration verification system to determine the work eligibility status of new employees physically performing services within the State of Nebraska.

The equipment and materials must be new, the latest make or model, unless otherwise specified. Prior to approving the invoice for payment, the City reserves the right to thoroughly inspect and test the equipment to confirm compliance with specifications. Any equipment or material which does not meet the City's requirements will be returned at vendor's expense for correction. The invoice will be paid after approval at the next regularly scheduled Council meeting and occurring after departmental approval of invoice; the City Council typically meets the second and fourth Tuesday of each month. Invoices must be received well in advance of Council date to allow evaluation and processing time.

Each bidder shall submit with the bid a certified check, a cashiers check, or bid bond payable to the City Treasurer in an amount no less than five percent (5%) of the bid price which shall guarantee good faith on the part of the bidder and the entering into a contract within fourteen (14) days at the bid price if accepted by the City. **Your certified check, cashier's check or bid bond must be submitted in a separate envelope attached to the outside of the envelope containing the bid. Each envelope must be clearly marked indicating its contents. Failure to submit the necessary qualifying information in clearly marked and separate envelopes will result in your bid not being opened or considered.** Surety companies authorized to do business in the State of Nebraska must issue bid bonds.

Successful bidder shall comply with the City's insurance requirements; performance and payment bonds are required for this project as outlined in the Detailed Specifications and Instructions to Bidders.

All bids shall be valid for at least thirty (30) working days after the bid deadline for evaluation purposes.

All bids must be on the bid form and must be signed and dated to be accepted. Please contact Lynn Mayhew at 308-385-5495, for questions concerning this specification.

Detailed Specifications - Table of Contents

01400 - Technical Supplemental Specifications

This section contains technical supplemental specifications that provide additional requirements applicable to the work covered under the technical sections which follow this Section 01400.

01400.1 Summary of Applicable Supplementals

The technical supplementals applicable to each technical section are indicated below.

	Technical Section Number	Technical Section Name	Applicable Technical Supplementals
1	16126	Generator Breaker	D100, E000, E100, E510, E520, E530, Q003, Q301, Q400, Q500, Q501, Q502, S100, S400

01400.2 Technical Supplemental Specifications

The technical supplemental specifications follow.

D100 Site Meteorological and Seismic Data

(Source: 25Mar08 - Revised by Project: 04Jan10)

Work shall be designed according to the following building code and site conditions:

General Design Data:	
Building Code	IBC 2006 as amended by the City of Grand Island, NE
Occupancy Category	III
Site Elevation (Mean Sea Level), ft	1845
Wind Design Data:	
Basic Wind Speed, V, Nominal 3 second gust wind speed at 33 ft above ground for Exposure C category, mph	90
Exposure Category	C
Topographic Factor, Kzt	1
Importance Factor (Wind Loads), I	1.15
Snow Design Data:	
Ground Snow Load, P_g, lb/ft^2	25
Importance Factor (Snow Loads), I	1.1
Ice Design Data:	
Nominal Ice Thickness, t, Due to freezing rain at a height of 33 ft, inches	0.75
Concurrent Wind Speed, V_c, mph	50
Importance Factor (Ice Loads – Ice Thickness), I_i	1.25

Importance Factor (Ice Loads – Concurrent Wind), I_w	1.0
Seismic Design Data:	
Short Period Mapped Spectral Acceleration, S_s	15%g
One Second Period Mapped Spectral Acceleration, S_1	4%g
Site Class	D
Importance Factor (Seismic Loads), I	1.25

E000 Electrical Equipment and System Voltages
(Source: 22May09 - Revised by Project: 04Jan10)

Power Supply Code	Continuous Voltage (Volts)	Momentary Voltage Dip to X% of Nominal	Frequency (Hz)	Configuration	System Grounding	Transfer to Alternate Source	Max Sym Short-Circuit Amps
GEN-1 Generator	13,800 Nom 14,490 Max 13,110 Min	90	60 Nom 61.5 Max 58.5 Min	3-Phase, 3 Wire, Wye (3/PE)	High Resistance (IT)	N/A	10,000 (3-Ph) 10 (L-G)
LV-3 Low Voltage (Power)	208Y/120 Nom 220Y/127 Max 187Y/108 Min	80	60 Nom 61.5 Max 58.5 Min	3-Phase, 4 Wire, Wye (3/N/PE)	Solidly Grounded (TN)	N/A	10,000 (3-Ph) 10,000 (L-G)
DC-1 DC Power	125 Nom 140 Max 100 Min	70	N/A	Two-Pole	Ungrounded	N/A	N/A

Definitions: N – neutral; PE – protective earth conductor; IT - unearthed transformer neutral; TN - transformer neutral earthed, frame connected to neutral

E100 Wiring Methods, Cable, and Raceway
(Source: 05Feb07 - Revised by Project: N/A)

E100.1 General Requirements
In general, all devices furnished under these specifications and requiring electrical connections shall be designed for wiring into electrical enclosures with terminal blocks. Terminal blocks shall be furnished for conductors requiring connection to circuits external to the specified equipment, for internal circuits crossing shipping splits, and where equipment parts replacement and maintenance will be facilitated.

Splices will not be permitted.

Unless otherwise specified, one spare normally open and one spare normally closed contact on each control switch and lockout relay shall be wired out to terminal blocks.

All wiring leaving an enclosure shall leave from terminal blocks and not from other devices in the enclosure.

Auxiliary equipment such as terminal blocks, auxiliary relays, or contactors shall be readily accessible. Auxiliary equipment shall be located in compartments, enclosures, or junction boxes in such an arrangement that service personnel will have direct access to the equipment without removal of barriers, cover plates, or wiring.

Terminal blocks for external connections shall be grouped in the instrument and control compartment for easy accessibility, unrestricted by interference from structural members and instruments. Sufficient space shall be provided on each side of each terminal block to allow an orderly arrangement of all leads to be terminated on the block.

Terminal blocks shall not be mounted in compartments containing uninsulated conductors operating at voltages above 1000 volts.

When current transformers are supplied with the equipment furnished under these specifications, a shorting type terminal block shall be installed at an accessible location for each set of current transformers. The shorting terminal blocks shall be the nearest to the current transformers. No other shorting type terminal blocks are required unless specified otherwise. The shorting terminal blocks shall be furnished with white marking strips.

For safety reasons, the current transformer shall be grounded but the grounding shall occur only at the shorting terminal blocks. The grounding conductor shall be identified so that it may be disconnected in the field as required.

Materials containing asbestos shall not be used in any of the wiring devices or cable.

Control conductors 8 AWG (10 mm^2) and smaller shall be terminated with compression type connectors properly sized for the conductor and the terminal. Terminal connectors for connecting to screw terminals shall be preinsulated ring type or preinsulated snap spade type terminal connectors. Except for internal wiring of factory prewired electronic system cabinets, crimping ferrules with plastic insulating sleeves shall be provided on all stranded control conductors that are to be terminated to compression Type IEC terminal blocks. Conductors for current transformer circuits shall be terminated with preinsulated ring type terminal connectors.

Each terminal block, terminal, conductor, relay, breaker, fuse block, and other auxiliary devices shall be permanently labeled to coincide with the identification indicated on the drawings. All terminals provided for termination of external circuits shall be identified by inscribing terminal designations acceptable to the Purchaser on the terminal block white marking strips with permanent black ink. All internal wiring terminations shall be identified by printing on conductor identification sleeves. A conductor identification sleeve shall be provided on each end of each internal conductor. Each sleeve shall be marked with the opposite end destination identification using permanent black ink. Conductor identification shall be permanent, unaffected by age, heat, or solvents and not easily dislodged. Adhesive labels are not acceptable.

The arrangement of connections on terminal blocks shall be acceptable to the Purchaser.

All connections requiring disconnect plug and receptacle type devices shall be provided with factory terminated conductors on each plug and receptacle. Plugs and receptacles shall be factory wired into junction boxes containing terminal blocks for external connections. All conductors on the disconnect portion of plug-receptacle assemblies shall be in a common jacket. The plug-receptacle assemblies shall have provisions for locking the devices together. The assembly shall also be watertight when installed outdoors.

All temporary wiring installed in the factory for equipment testing shall be removed prior to shipment of the equipment.

Reference to NEC means the codes and standards as defined by the USA National Electrical Code, ANSI/NFPA 70.

E100.2 Equipment Safety Grounding (Earthing)

All electrical equipment that is part of an integral shipping unit or assembly shall be furnished with a bare copper grounding pad. The pad shall be suitable for field connection to the station ground grid by others.

Isolated logic system or single-point ground connections required for proper operation of electronic equipment shall be insulated from the equipment safety ground. Such connections will be extended, using insulated cable, to a single termination point suitable for field connections to the appropriate ground system by others.

Electrical equipment requiring grounding provisions shall include all enclosures containing electrical connections or bare conductors with the exception of control devices, such as solenoids, pressure switches, and limit switches, unless such devices require grounding for proper operation.

The raceway system shall not be considered to be a ground conductor except for itself. All metal conduits containing power circuits shall be provided with grounding type bushings and shall be wired together inside enclosures and connected internally to the enclosure grounding pad or grounding bus with bare copper conductor. The grounding bushing ground conductor shall be sized in accordance with NEC or other internationally recognized standard but shall not be less than 8 AWG (10 mm^2) bare copper conductor.

Ground conductors shall be soft drawn, bare stranded copper strand Class B as defined in NEMA WC 3 (formerly ICEA S-19-81) (or Class II in IEC 60228). All clamps, conductors, bolts, washers, nuts, and other hardware used with the grounding system shall be copper.

E100.3 Electrical Interconnections

All electrical interconnections between devices, panels, and boxes shall use one of the following wiring methods as specified on the table at the end of this section:

Nonarmored Cable. Nonarmored cable which is continuously supported and protected by conduit or installed in cable tray.

Armored Cable. Armored cable which is continuously supported by metal ladder-type tray. The armored cable shall be terminated with cable glands.

Armored Metal Clad (MC) Lighting Cable. Armored (MC) cable, used for lighting design only, which is continuously supported per manufacturer's recommendations and which shall be terminated with suitable cable connectors.

Manufacturer's Standard. The manufacturer shall choose between either nonarmored cable, armored cable, or armored MC lighting cable construction.

The installation of the cable and raceway system shall meet the requirements of NEC or other internationally recognized standard.

E100.4 Cable

Unless otherwise specified on the table at the end of this section, both nonarmored and armored cable shall meet the following minimum requirements:

Stranded copper conductors.

Flame retardant cross-linked polyethylene (FRXLPE) or ethylene propylene rubber (FREPR) insulation on power and control cables.

Polyvinyl chloride (PVC) insulation on instrument and thermocouple extension cables.

FR-PVC jacket on all multi-conductor cables.

Minimum size of 16 AWG (1.5 mm^2) for control cables.

Minimum size of 14 AWG (2.5 mm^2) for power cables.

Minimum size of 12 AWG (4 mm^2) for current transformer cables.

Minimum size of 12 AWG (4 mm^2) for potential transformer cables.

Minimum size of 20 AWG (0.5 mm^2) for instrument and thermocouple extension cables.

Minimum size of 12 AWG (3.31 mm^2) for lighting/receptacle cables.

General service power and control cables, integral to the equipment furnished but not internal wiring of control cabinets or panels, shall be rated for the maximum service voltage but not less than 600 volts.

Cables which are routed through environmental conditions that differ along the cable run shall be selected using the environmental condition that results in the largest cable size.

All thermocouple cable shall use solid conductors with twisted and shielded pairs. Unless otherwise noted, insulation shall be color coded in accordance with IISA-MC96.1. This requirement also applies to thermocouple extension wire which is furnished internal to Supplier-furnished equipment.

All instrument cable shall use stranded copper conductors with twisted and shielded pairs or triads. These requirements also apply to instrument cable which is furnished internal to Supplier-furnished equipment.

Shielding of thermocouple and instrument cables shall consist of aluminum-polyester tape and copper drain wire.

Finished cables shall be capable of passing the IEC 60332-3-10 Category C flame test or the IEEE 1202 (70,000 Btu/h) vertical tray flame test. This requirement also applies to multi-conductor control cable, instrumentation cable, and thermocouple cable which are furnished internal to Supplier-furnished equipment including control panels and cabinets.

Single conductor cables used for internal wiring of control panels and cabinets may be installed according to the Supplier's standard as to wire size, insulation, and method of termination on internal equipment, except that insulation for all wires shall meet the IEC 60332-1 flame test or the UL 1581 VW-1 flame test.

Additional requirements as defined in each applicable section.

Armored (armoured) cables shall meet the following additional requirements:

Armor shall be steel wires on multi-conductor cables and shall be aluminum wires on single conductor cables.

A PVC jacket shall be extruded over the armor wires.

The cables shall be capable of passing the IEC 60332-3-10 Category C flame test or the IEEE 1202 (70,000 Btu/h) vertical tray flame test.

E100.5 Conduit

All conduit interconnections between devices, panels, boxes, and fittings shall be rigid metal conduit which conforms to NEMA C80.1 and UL 6. All conduit connections shall be of the threaded type, and all conduit, couplings, and fittings shall be hot-dipped galvanized steel. The interior and exterior surfaces of all rigid metal conduit, couplings, and fittings shall have a continuous zinc coating with an overcoat of transparent enamel, lacquer, or zinc chromate. Liquidtight flexible metal conduit may be used as long as the length does not exceed 3 feet (1 meter). All conduit which enters the top of an enclosure or which enters outdoor enclosures shall enter through raintight steel or malleable iron hubs or threaded openings.

All liquidtight flexible metal conduit shall be constructed of continuously interlocked rust resistant metal core. Conduit shall be coated with sunlight resistant thermoplastic jacket. The conduit shall also resist heat, oil, and chemical breakdown and shall be UL listed.

One exterior locknut, one interior locknut, and one bushing shall be provided at the termination of each rigid metal conduit not terminated in a hub.

Grounding type insulated bushings with insulating inserts in metal housings shall be provided on all conduits not terminated in hubs and couplings. Bushings shall be galvanized.

All conduit fittings shall conform to the requirements of UL 514. All liquidtight flexible metal conduit fittings shall be galvanized steel or malleable iron with insulated throat.

Conduit fittings used on outdoor equipment shall be gasketed.

All conduit shall be installed in exposed runs parallel or perpendicular to dominant surfaces with right angle turns made of symmetrical bends or fittings. Conduit shall be supported by means of conduit clamps and clamp-backs.

Moisture pockets shall be eliminated from conduits. If water cannot drain to the natural opening in the conduit system, a hole shall be drilled in the bottom of a pull box or conduit fitting provided in the low point of the conduit run.

E100.6 Cable Tray

All cable trays furnished and installed by the Supplier shall be in accordance with this specification and/or drawings included with this specification. Cable tray components shall include cable tray, fittings, supports, accessories, and hardware required for a complete system.

Cable tray and associated component materials shall conform to the requirements of NEMA VE-1 for metal cable trays, NEMA FG-1 for fiberglass cable trays, and these specifications. In case of conflict between the NEMA standards publications and these specifications, the requirements of these specifications shall govern to the extent of such conflict. All cable tray components for similar cable tray materials shall be manufactured by the same manufacturer. Specific cable tray sizes and routing as required by the Owner shall be as indicated on the drawings.

Cable tray shall be aluminum ladder type tray with a 9 inch (225 mm) rung spacing on centers and shall be fabricated from copper free aluminum or aluminum alloy unless noted otherwise on the drawings or technical sections. Cable tray shall have a 4 inch loading depth with a minimum NEMA 16C classification. The rung spacing shall be maintained at the center line of all horizontal and vertical elbows. Individual rungs shall provide a minimum of 1 inch (25 mm) of cable support surface. Individual rungs shall support, without collapse, a 200 lb (90.7 kg) concentrated load applied at the mid-span of the rung, over and above the NEMA rated cable load with a 1.5 safety factor. All cable tray fittings shall have concentric curved radius fittings.

Hardware for aluminum cable tray shall be case hardened galvanized steel suitable for indoor and outdoor use. Hardware for aluminum cable tray in corrosive areas shall be Type 316 stainless steel.

Cable trays shall be cut to length as required. The trays shall be cut with saws and all surfaces over which the conductors and cables will be laid shall be ground or filed to remove any sharp edges which could cause damage to the cable jacket or insulation, either during installation or in normal service.

Cable trays shall be bracket supported from walls or columns and hanger supported from overhead structural members, at intervals not exceeding 12 feet (3660 mm), when measured along tray center lines between supports. All fittings shall be supported in accordance with NEMA VE-2 for metal trays.

Cable tray supports shall be capable of supporting the uniform weight of the trays, plus their NEMA rated cable loads, plus a 200 pound (91 kg) concentrated load without exceeding the allowable load limit for any element of the support system with a minimum safety factor of 2.0.

A 2/0 AWG (70 mm^2) bare, stranded copper, grounding conductor shall be installed on all power level cable trays containing single conductor power cables. The tray grounding conductor shall be installed on the outside of the tray side rails, along the entire length of the trays, attaching to each tray fitting and to each straight section of tray at 6 foot (1.8 m) maximum intervals. The tray grounding conductor shall be attached to the trays using bolted ground clamps and shall be connected to the enclosure grounding system. Splices for the tray grounding conductor shall be made using compression connectors.

Cable trays containing multi-conductor power, control, or instrument cables shall not require a continuous ground conductor installed along the tray. These tray levels shall be grounded by means of a ground jumper extended from the tray side rail to the continuous ground conductor installed along a power level cable tray, to building steel, or to the enclosure grounding system.

Cable tray covers shall be installed for indoor cable trays at the following locations with the type of cover indicated. (Also refer to National Electrical Code (NEC) Article 392.6(D).) Cable tray covers shall be furnished with side flanges for strength:

> Ventilated covers shall be installed on accessible vertical ladder type trays, starting 1 foot (0.3 m) below the access floor or platform and extending to a height of 8 feet (2.4 m) above the access floor or platform.
>
> Covers shall be installed on horizontal trays located under grating floors, platforms, or insulated pipe. Covers shall extend at least 2 feet (0.6 m) beyond the portion of the tray directly exposed beneath the grating floor, platform, or insulated pipe. Covers may be omitted on lower stacked ladder type trays where a covered tray at a higher elevation in the stack provides complete vertical shielding to the lower trays. Covers in these areas shall be as follows:
>
> > Power trays - tight-fitting, ventilated covers or raised solid covers.
> >
> > Control and instrument trays - tight-fitting or raised solid covers.
>
> Solid covers shall be installed on all trays where there is potential for accumulation of oil or other combustible materials on the cables.

E100.7 Cable Glands

All cable glands shall comply with the requirements for mechanical cable glands as specified in British Standards Institution BS 6121:Part 1. All glands shall be rated IP66 in accordance with IEC 60529. Cable glands terminating Low Smoke and Fume Cable (LSF) shall be provided with LSF seals. Cable glands selected for use in hazardous areas shall meet the requirements of national and international standards and shall be acceptable to the Purchaser.

E100.8 Terminations

The capacities of conduit entrances and terminal enclosures for terminating the Purchaser's cable shall be coordinated with the Purchaser. Final sizes shall be acceptable to the Purchaser.

The following criteria apply to wiring methods, cable, and raceway specified herein:

Wiring Methods, Cable, and Raceway	
Electrical Interconnections Between Electrical Enclosures, Devices, or Lighting	Nonarmored cable routed in tray and/or conduit Armored cable routed in tray Armored cable for lighting routed in accordance with manufacturer's standard
Thermocouple Cable Insulation Color Coding	ISA-MC96.1
Cable - Additional Requirements	600 volt multi-conductor power and control cable shall supply power to loads at 480 VAC and 250 VDC or less. 600 volt single-conductor power cable shall have FR-XLPE insulation with no jacket (UL Type RHH/RHW-2/USE-2) or FR-EPR insulation with CSPE jacket. 600 volt multi-conductor power and control cable shall have FR-EPR or FR-XLPE insulation with flame-retardant PVC jacket. All cables shall be UL listed for tray installation. Instrument cable shall be twisted shielded pairs or triads with 300 volt class insulation (minimum). This cable shall have XLPE or PVC insulation with flame retardant PVC jacket (minimum). Single and multiple pairs shall have an overall shield. Multiple pairs shall also have pairs shielded. Thermocouple extension cable shall be rated 300 volts minimum. Switchboard and panel wire shall be multi-stranded Type SIS VW-1, XLPE insulated for 600 volts.

E520 Terminal Blocks and Fuse Holders

(Source: 27Jan04 - Revised by Project: N/A)

E520.1 General

In general, manufacturer standard terminal blocks will be accepted provided they meet the requirements of this specification and quality levels equivalent to the manufacturer's terminal blocks listed in the table at the end of this section. Self-stripping terminal blocks, multiple deck (step type) terminal blocks, and angled terminal blocks will not be acceptable. Screw type terminals suitable for ring lug termination shall be furnished for all current transformer secondary lead connections.

Each terminal block shall be provided with a unique identifier. All terminal points shall have provisions to be uniquely identified on the terminal block white marking strip and, where permitted by the safety codes and standards, shall be without covers. Spare points shall be provided with blank strips that can be field marked with a permanent ink marking pen. Spare (unused) terminals shall be furnished evenly distributed on the terminal blocks for circuit modifications. No fewer than two spare unused terminals shall be furnished for every ten terminals used. Fuses may be mounted on terminal blocks.

Terminal blocks shall be manufactured from materials that will not support combustion. Terminal blocks shall meet the Inflammability Class V0 rating in accordance with UL 94. All terminal blocks, except internal terminal blocks in factory prewired electronic systems cabinets and terminal blocks for thermocouple extension wire, shall be rated for 600 volts or greater. No more than two conductors shall be terminated at one connection point. For terminal blocks interfacing with the Purchaser's field cabling, one side of the terminal block shall be used by the equipment manufacturer for factory wiring and the other side of the terminal block shall be reserved for the Purchaser's field cabling terminations.

E520.2 Compression Clamp Modular Terminal Blocks (IEC Requirements)

The modular terminal block systems shall be complete with mounting rails, end brackets, fixing brackets, covers, and test plugs as required. Terminal block colors shall be as follows: red for ungrounded power conductors, blue for power circuit neutral conductors, yellow-green for all ground conductors, and gray for all control circuit conductors.

Terminal spacing on compression clamp terminal blocks shall be capable of terminating 20 AWG (0.5 mm^2) to 8 AWG (10 mm^2) wire and shall have point-to-point spacing of not less than 0.315 inch (8 mm). The clamping parts shall be made of copper alloys that are resistant to stress corrosion cracking. The clamping parts shall be designed to maintain a spring-like force when gripping the conductor. The copper alloy surface of the clamping units shall be protected by galvanic plating. The terminal screw shall be bronze and protected with galvanic plating. When possible, jumpering between adjacent terminal points shall be achieved with fixed bridges. All terminal screws shall be tightened with a calibrated screwdriver, and set to the recommended torques provided by the terminal block manufacturer. Torque values shall be approximately 1.5 times the test torque values defined in IEC 947-1, but approximately 40 percent below the fracture torque of the terminal screw.

For installations requiring "Increased Safety" terminal blocks, the terminal blocks shall have a CENELEC Certification Code marked on the terminal block.

Knife disconnect terminal blocks shall be suitable for terminating 20 AWG (0.5 mm^2) to 12 AWG (4 mm^2). The knife disconnect shall be permanently attached to the block, shall have a continuous ampere rating of 15 amperes, and shall have a voltage rating of 600 volts or greater. Test ports shall be provided on both sides of the knife disconnect.

Mounting rails shall be of a top hat construction in accordance with EN 50 022. Rails not used as a grounding conductor shall be manufactured from steel with a corrosion-resistant coating. Rails used as a grounding conductor shall be manufactured from copper.

E520.3 Strap Screw Terminal Blocks

Strap screw terminal blocks shall be of heavy-duty construction capable of terminating a conductor from 16 AWG (1.5 mm^2) to 10 AWG (6 mm^2). The point-to-point spacing shall not be less than 0.375 inch (9.5 mm).

E520.4 Power Terminal Blocks

Power terminal blocks shall be used for conductors 8 AWG (10 mm^2) and larger.

E520.5 Thermocouple Terminal Blocks

Thermocouple terminal blocks shall be provided for terminating thermocouple extension cable. The terminal blocks shall be capable of terminating solid conductors ranging from 20 AWG (0.5 mm^2) to 16 AWG (1.5 mm^2). The current carrying parts of the terminal block shall be of the same materials as the thermocouple extension wire. Termination points for extending the shield wire of the thermocouple extension cable shall be provided adjacent to the block or shall be integral to the block.

E520.6 Fuse Holders for Power Circuits

When fuses rated from 1 to 30 amperes at 250 volts maximum are required, the fuse holders shall be suitable for 30 ampere, 250 volt, Class H cartridge fuses. The fuse holders shall be in accordance with

ANSI/UL 521, shall have a withstand rating of 10,000 rms symmetrical amperes, and shall have reinforced fuse contact clips.

The bases shall be molded phenolic, polyester, or other plastic having a Flammability Rating of V-0 when tested in accordance with UL 94. Porcelain, slate, and marble are not acceptable materials for fuse holder bases.

The following criteria shall apply to terminal blocks and fuse holders:

Terminal Blocks and Fuse Holders				
Terminal Block Type	**Applications**	**Acceptable Termination Methods**	**Acceptable Construction**	**Acceptable Manufacturers**
Feed-Through	Thermocouple Extension Wire	Strap Screw, Compression	Manufacturer's Standard	Manufacturer's Standard
Feed-Through	DCS I/O and PLC I/O	Compression, Strap Screw	Modular, Rail, Grouped Block, Bolted	Manufacturer's Standard
Feed-Through	General Purpose	Strap Screw	Grouped Block, Bolted, Modular, Rail	Marathon 1500 Series or Purchaser-Approved Equal
Shorting	Current Transformer	Strap Screw	Grouped Block, Bolted	Marathon 1500 Series or Purchaser-Approved Equal
Power	600 Volt Power (8 AWG through 4/0 AWG [10 mm^2 through 95 mm^2])	Screw, Compression, Stud	Grouped Block, Bolted	Manufacturer's Standard

E530 Electrical Accessory Devices

(Source: 27Jan04 - Revised by Project: N/A)

E530.1 Electrical Indicating Instruments

All metering devices shall be designed for flush mounting. All analog instrument scales shall consist of black markings on a white background.

All instrumentation with current elements shall be designed for use with current transformers having high overcurrent capability. The current elements shall be capable of 10 times the rated end scale overload values for a period of 1/2 second duration for a minimum of nine successive overloads with 1 minute between overloads without exceeding the deviations defined in the specified standard. Switchboard meters shall not open the circuit when subjected to 30 times the rated secondary current of the associated current transformer circuit for a period of 2 seconds.

The electrical indicating instruments shall be as specified on the E530 Electrical Accessory Devices - Supplemental Requirements sheets.

E530.2 Control Relays

General service auxiliary relays shall be Allen-Bradley Bulletin 700 Type P or Purchaser approved equal. Where current carrying requirements exceed the capacity of the general service auxiliary relays, auxiliary relays shall be Allen-Bradley Bulletin 700 Type PK, General Electric Type HFA or HGA, Westinghouse Type MG-6, or Purchaser approved equal.

Timing relays for general service where the delay period is 1 minute or less shall be either pneumatic or solid-state. Timing relays for critical service shall be solid-state. Timing relays shall be Agastat Series 7000 or Purchaser approved equal.

If the manufacturer proposes the use of auxiliary or timing relays other than the ones listed above, technical data sheets for the proposed relays shall be submitted for approval by the Purchaser.

Unless otherwise specified, dc relays that interface with the Purchaser's control system shall have a diode surge suppressor installed across the relay coil.

E530.3 Electrical Switches

Control switches shall be 600 volt, 20 ampere, multistage, rotary type. Unless otherwise specified, switches shall have black, fixed, modern, pistol grip type handles and engraved black plastic escutcheon plates with targets.

Push buttons and selector switches shall be heavy-duty oiltight.

The electrical switches shall be as specified on the E530 Electrical Accessory Devices - Supplemental Requirements sheets.

E530.4 Indicating Lights

Indicating lights for local control stations shall be heavy-duty oiltight and shall permit light changing from the front. Luminous output shall be suitable for the location and ambient lighting conditions. Unless otherwise specified, LED type indicators are preferred on panels.

Indicating light lens colors shall be coordinated with the indicated conditions identified on the E530 Electrical Accessory Devices - Supplemental Requirements sheets. Indicating lights shall be energized when the condition exists and shall be de-energized when the condition does not exist.

E530.5 Contacts

Contact ratings for all electrical accessory devices shall be suitable for interface with the Purchaser's control system. The Purchaser's control system interrogation voltages will range up to 120 volts ac and between 24 and 125 volts dc.

All contacts that interface with the Purchaser's control system shall be electrically "dry." Solid-state switches or triac outputs are not acceptable for contacts that interface with the Purchaser's electronic control system.

Alarm contacts shall consist of one normally open and one normally closed contact "Form C."

Electrical accessory device contacts, including alarm contacts, wired to the Purchaser's control system consisting of DCS or PLC I/O cards, shall be suitable for switching currents in the milliampere range for the range of voltages listed above. The electrical accessory device contacts, including alarm contacts, shall allow the Purchaser's I/O cards to distinguish between a normally open and a normally closed contact.

E530.6 Fuses

Fuses shall be provided with ampere ratings sized for the application. The types and manufacturers of fuses shall be as specified on the E530 Electrical Accessory Devices - Supplemental Requirements sheets.

E530.7 Colors of Indicating Devices and Actuators

Coding of indicating devices and switch actuators (push button, knob, selector switch, or handle) shall be subject to Purchaser review. If words or recognized abbreviations are required to describe the function of

the indicating device or actuator, the language used shall be English. Indicating lights shall be energized when the condition described in the following table exists, and shall be de-energized when the condition does not exist. Unless permitted otherwise in the individual equipment specification, indicating light lens colors shall be as specified on the E530 Electrical Accessory Devices - Supplemental Requirements sheets.

E530 Electrical Accessory Devices - Supplemental Requirements

Colors of Indicating Devices			
Color	**Meaning**	**Explanation**	**Examples**
Green	Equipment de-energized; process stopped	Normal off condition requiring no action by the operator	Motor stopped; valve (damper) closed; breaker open, contactor de-energized
Red	Equipment energized; process normal	Normal running condition requiring no action by the operator	Motor running; valve (damper) open; breaker closed, contactor energized; process within normal limits; cabinet/panel power available
White	Equipment abnormality; process abnormality	Abnormal condition requiring monitoring and/or intervention by the operator	Motor trip; breaker trip, contactor trip; tripping by a protective device or interlock; electrical lockout relay tripped; position change from normal; pressure or temperature beyond normal limits; overload
White Flashing	Emergency	Dangerous condition requiring immediate action by the operator	Pressure or temperature beyond safe limits; loss of critical process
Blue	Mandatory	Indication of a condition which requires action by the operator	Instruction to enter a value; paralleled electrical power sources to bus causing bus rating to be exceeded
Amber	Permissive	Equipment start permissive; equipment protective relay reset	General information; electrical lockout relay reset

Colors of Actuators		
Color	**Meaning**	**Examples**
Red	Emergency	Emergency-stop/off
Black	Normal stop/off	Normal stop; open breaker, contactor de-energized

Colors of Actuators		
Color	**Meaning**	**Examples**
Black	Normal start/on	Normal start; closed breaker, energize contactor

Electrical Switches		
Application	**Description**	**Manufacturer/Style**
Control Switches	Control Panel	General Electric Type SB-1 with large cover General Electric Type SB-10 with large cover Electro-Switch Type 24 Electro-Switch Type W Electro-Switch Type 20K Purchaser Approved Equal
Push Buttons and Selector Switches	Control Panel or Local	Honeywell Micro Switch Type PT Square D Class 9001 Type K Purchaser Approved Equal
Toggle Switches	Control Panel	Honeywell Micro Switch Type TL Purchaser Approved Equal

Fuses and Fuse Blocks	
Application	**Manufacturer/Style**
Slow Blow Fuses	Purchaser Approved Equal Gould Shawmut/GDL Bussman/MDL
Fast Acting Fuses	Purchaser Approved Equal Gould Shawmut/OT Bussman/NON
Extremely Fast Acting Fuses	Purchaser Approved Equal Bussman/KAB

Electrical Indicating Instruments								
		Input Range						
Meter Type	**Standard**	**Voltage Element**	**Current Element**	**Transducer**	**Manufacturer**	**Accuracy Class (% of Full Scale Value)**	**Size (approximate)**	**Display**
Panel Meter		0-150 V	0-5 A	4-20 mA	Yokogawa Weschler Electric Corporation Crompton Instruments Purchaser Approved Equal	3	3.5 in^2 (90 mm^2)	Analog and Digital LCD
Switch-Board Meters		0-150 V	0-5 A	4-20 mA	Yokogawa Weschler Electric Corporation	1	4.5 in^2 (115 mm^2)	Analog and Digital

Electrical Indicating Instruments								
		Input Range						
Meter Type	Standard	Voltage Element	Current Element	Transducer	Manufacturer	Accuracy Class (% of Full Scale Value)	Size (approximate)	Display
					Crompton Instruments Purchaser Approved Equal			LCD

Q003 Quality System Requirements (No Purchaser Surveillance)

(Source: 04Nov05 - Revised by Project: N/A)

This Supplemental Specification establishes the quality management system requirements for suppliers of equipment and commodities.

Q003.1 Quality System

It is the Supplier's responsibility to define and implement a detailed and documented quality management system which ensures that all equipment and commodities supplied are in conformance with required drawings and/or specifications. The Supplier shall meet all the guidelines (requirements) set forth in this document. The quality management system shall be capable of providing assurance that design, purchasing, materials, manufacturing, examination and testing of equipment, shipping, storage, and related services comply with the purchase order requirements.

The Supplier's quality management system shall include, at a minimum, procedures and/or methods that ensure the following processes are controlled:

Design documents, drawings, specifications, procedures, inspection and test status and procurement documents are current, accurate, and controlled.

Materials, equipment, and services conform to the requirements of the purchase order.

Receipt inspection, in-process inspection, examination, testing, checkouts, and final acceptance testing are conducted.

Shipping, storage, and preservation of equipment and commodities are adequate to prevent damage during delivery and storage of the equipment.

Quality system requirements are passed on to subtier suppliers for subcontracted work, and the Supplier has adequate oversight of subtier supplier activities.

Special processes, such as welding, heat treatment, hot forming, bending and nondestructive examination, are monitored.

Personnel performing special processes, such as welding, nondestructive examinations, coatings, heat treatment, etc., are qualified.

Inspection, measuring, and test equipment is appropriately maintained.

Processes exist for the verification, storage, use, and maintenance of client supplied product.

Applicable industry standards (such as ANSI, AGMA, API, ASME, IEEE, AISC, etc.) shall be incorporated into the quality management system. The quality management system shall be made available to the

Purchaser's Quality Management Services (QMS) Department for review, inspection, and/or audit upon request at the Supplier's facility.

Q003.2 Verification

The Purchaser shall have access to perform assessments, quality audits, or witness test activities during the manufacturing process and to review applicable records. Purchaser may designate an authorized agent to perform these activities. The authorized agent may be an employee of the Purchaser or an outside agency. When an outside agency is designated as an authorized agent for the Purchaser, such designation shall be in writing with a copy provided to the Supplier. Hereinafter, when the term "Purchaser's representative" is used, it may also mean the Purchaser or the authorized agent.

The following requirements apply for Purchaser's inspection at the Supplier's mill, factory, yard, warehouse, or subtier supplier's facilities.

Q003.2.1 Access

The Purchaser shall have the right to access the Supplier's and subtier supplier's work and related documents at any time during the manufacturing process without delaying the schedule. The Supplier shall provide, without cost, reasonable facilities including tools, personnel, and instruments for demonstrating acceptability of the work.

Q003.2.2 Control of Special Processes

The Supplier shall ensure that personnel are qualified in accordance with industry standards to perform special processes such as welding, nondestructive examination (NDE), coating, painting, etc. If special processes were conducted by unqualified employees, the Purchaser has the option to validate and test the product at the Supplier's expense and/or reject the product.

Q003.2.3 Corrective Action

Upon identification of a noncompliance with the requirements of the purchase order, the Supplier shall document the noncompliance issue. For noncompliance issues where the nonconforming characteristic can be restored to a condition such that the capability of an item to function reliably and safely is unimpaired, even though that item still does not conform to the original requirement, the Supplier shall submit the noncompliance to the Purchaser for approval.

During witness and hold point activities, if the Purchaser's representative identifies a noncompliance issue, the Supplier shall document the noncompliance issue and provide a copy of the report to the Purchaser's representative. If the Supplier disagrees and does not document the noncompliance, the Purchaser's representative shall issue a corrective action report to the Supplier for disposition and action. The Supplier shall correct, in a timely manner, all deficiencies identified.

Q003.2.4 Rejection

If any items or articles are identified as not meeting the requirements of the specifications, the lot, or any faulty portion thereof, may be rejected. Before offering specified material or equipment for shipment, the Supplier shall inspect the material and equipment and eliminate any items that are defective or do not meet the requirements of the purchase order. The fact that equipment or materials have been previously inspected, tested, and accepted does not relieve the Supplier of responsibility in the case of later discovery of flaws or defects.

Q003.2.5 Receipt Inspection

Materials or equipment purchased under this purchase order may be inspected at the specified receiving points and will either be accepted or rejected. Receipt inspection will include testing to determine compliance with the purchase specifications. Initial receipt inspection acceptance tests will be performed by the Purchaser at the Purchaser's expense. Items found to be defective may be returned to the Supplier for correction at the Supplier's expense, including shipping cost, or the cost to correct and inspect the item will be charged to the Supplier.

Q301 Manufacturer's Standard Coating

(Source: 11Dec07 - Revised by Project: N/A)

Unless otherwise specified, the manufacturer's standard coating systems shall be applied in the shop to ferrous metal surfaces of equipment and materials. The coating systems shall provide resistance to corrosion caused by weather and industrial environments. Surfaces that will be inaccessible after assembly shall be protected for the life of the equipment.

Coating material and application shall conform to the regulations of the air quality management agency having jurisdiction. Materials shall be formulated to contain less than 0.06 percent lead or chromium in the dried film.

Surfaces shall be cleaned, prepared, and coated in accordance with the coating manufacturer's instructions and specified codes. Surfaces to be painted shall be prepared, as necessary, to provide a smooth, uniform base for painting.

Coating films that show defects such as sags, checks, blisters, teardrops, fat edges, et cetera will not be accepted. Any coated surface that contains any of the previously mentioned defects shall be repaired or, if necessary, entirely removed from the member or unit involved and the surface recoated.

All internal surfaces that will be exposed to steam or treated feedwater shall be blasted with aluminum oxide (pink or white grade), cut steel wire (SAE J441), steel grit or steel shot. The blasting media used shall contain no more than 1.2 percent complexed silica and 0 percent free silica.

Surfaces to be finish painted after installation shall be shop painted with one coat of manufacturer's standard primer.

Touchup paint shall be provided for repair painting of at least 10 percent of the finish painted equipment surface. The touchup paint shall be the same type and color as the shop applied material. Application instructions shall be provided.

No coating shall be applied to surfaces within 3 inches (75 mm) of field welded connections.

Coating dry film thicknesses shall be measured using a magnetic or electronic thickness detector in accordance with SSPC-PA2. Additional coating shall be applied to all areas which show a deficiency in dry film thickness.

Q301.1 Control and Electrical Equipment

Control and electrical equipment, including panels, cabinets, switchgear, transformers, and motors, shall be finish painted. Exterior surfaces shall be the manufacturer's standard color unless specified otherwise. The interior portions of cabinets shall be painted a light reflecting color.

Q301.2 Mechanical Equipment

Mechanical equipment, including pumps, compressors, valves, valve operators, external piping surfaces, and other similar equipment, shall be cleaned, prepared, and primed. If mechanical equipment will operate at temperatures above 200° F (93° C) and will not be insulated, a high temperature coating system designed for the operating temperatures shall be applied.

Q301.3 Documentation

Shop drawings shall identify the shop applied coating systems. Data to be provided shall include the coating system manufacturer's name and product designation, the degree of surface preparation, dry film thickness, finish color, and Material Safety and Data Sheets (MSDS). Final dry film thickness test results shall be submitted to the Purchaser for verification.

Q400 General Equipment Requirements

(Source: 21Oct08 - Revised by Project: 04Jan10)

Q400.1 Miscellaneous Materials and Services

Miscellaneous materials and services not otherwise specifically called for shall be furnished by the Supplier in accordance with the following, as applicable:

All nuts, bolts, gaskets, special fasteners, backing rings, etc., between components and equipment furnished under these specifications.

All piping integral to or between any equipment furnished under these specifications, except as otherwise specified.
All necessary instrument, power, and control wiring and raceways integral to any equipment furnished under these specifications. This shall include terminal blocks and internal wiring to these terminal blocks for equipment requiring external connection.

Coupling guards for all exposed shafts and couplings.

Leveling blocks, soleplates, thrust blocks, matching blocks, and shims.

Erection drawings, prints, information, instructions, and other data for use by the Purchaser's erection contractor.

Detailed storage requirements and lubrication requirements (including frequencies) for use by the Purchaser's erection contractor.

All special tools or lifting beams.

Lifting eyes and lugs for offloading and setting equipment.

The use of all special tools required for erection of the equipment, exclusive of the maintenance tools furnished. Erection tools shall remain the property of the Supplier, and all shipping costs to and from the jobsite shall be at the Supplier's expense.

Q400.2 Fabrication Restrictions

Unless specifically provided otherwise in each case, all materials and equipment furnished for permanent installation in the work shall conform to applicable standard specifications and shall be new, unused, and undamaged.

Asbestos containing materials will not be allowed.

Flanges, fittings, and valves manufactured in the People's Republic of China shall meet following requirements.

Manufacturer’s quality system shall be in accordance with ISO 9001 and the manufacturer shall hold a valid ISO 9001 certificate issued by the certified ISO 9000 certification organization.

Manufacturer shall hold a manufacturer's license issued by the China Special Equipment Inspection & Research Center (CSEI) under General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China (AQSIQ).

Products shall have markings as required by ASME B16.1, ASME B16.5, ASME B16.9, ASME B16.10, ASME B16.11, ASME B16.25, or ASME B16.34 as applicable.

The final quality certificate and quality inspection documents shall bear the official stamp of CSEI or AQSIQ or its branches.

Individual parts shall be manufactured to standard sizes and gauges so that repair parts furnished at any time can be installed in the field. Like parts of duplicate units shall be interchangeable.

Q400.3 Nameplates and Tags

Nameplates and tags shall be furnished for all equipment with a Purchaser's identification number based upon the guidelines provided herein. The Purchaser will annotate the Supplier's drawings on initial submittals of technical drawings of the equipment. The information will include the nameplate description, tag number, physical size, and lettering height. The type of nameplate will vary because of size constraints, equipment location and/or orientation, or the environment in which the equipment is located.

In general, nameplates shall be furnished for major equipment, including all operator interfaces, control and electrical panels, cabinets, and instrument racks. The nameplates shall be beveled, laminated white phenolic plastic engraving stock with black core or beveled, two-ply vinyl white with reverse engraved black fill. These nameplates shall be 2 inches by 8 inches (50 mm by 200 mm) with three lines of text. The top two lines of text shall be a brief description of the equipment. These lines of text shall be 3/8 inch (10 mm) high. The bottom line of text shall be the Purchaser's identification number of the equipment. This line of text shall be 3/16 inch (5 mm) high. Nameplates that are to be mounted on equipment to be installed in nonair-conditioned areas shall be attached with stainless steel panhead screws, rivets, drive screws, or epoxy glue. Nameplates that are to be mounted on equipment to be installed in heated and air-conditioned areas shall be attached with high performance adhesive tape. Nameplates shall be 1/16 to 1/8 inch (2 mm to 4 mm) thick.

Stainless steel tags shall be furnished for field instrumentation, process valves, and other small devices that a plant operator is not likely to have any direct interface with, as directed by the Purchaser. These stainless steel tags shall be permanently attached to the equipment with stainless steel panhead screws, rivets, drive screws, or, with the Purchaser's acceptance, stainless steel wire. The size of these tags shall be a minimum of 3/4 inch by 3 inches (20 mm by 75 mm) and include the Purchaser's identification number. The text shall be sized as large as possible within the size constraints.

Separate nameplates are not required for pressure indicators. They may be provided instead with nameplate information, as described above, permanently engraved on the faces. Face engraving text size and layout shall be readable without magnification.

Q400.4 Factory Assembly

Equipment shall be shipped completely factory assembled, except when the physical size, arrangement or configuration of the equipment, or shipping and handling limitations make the shipment of completely assembled equipment impracticable, in which case the equipment shall be assembled and shipped as stated in the Supplier's proposal. Any deviations after Purchase Order award could result in Supplier's performance of some assembly at the site or backcharges to the Supplier for others required to perform such assembly. When proposals are submitted without statements describing sectional shipments, it will be understood that no field assembly of the equipment will be required and the Supplier shall be responsible for all costs encountered in the field for assembly of sections, accessories, or appurtenances not listed in the Proposal as requiring field assembly.

All separately packaged accessory items and parts shall be shipped with the equipment. Containers for separately packaged items shall be marked so that they are identified with the main equipment. An itemized packing slip indicating what is in that container only shall be attached to the outside of each container used for packaging. A similar list shall be inside each container. A master packing slip covering all accessory items for a given piece of equipment which are shipped in separate containers shall be attached to one container.

Q400.5 Tools

The Supplier shall furnish and ship with each piece of equipment one set of all special tools required for dismantling, maintenance, and overhaul of the equipment. The tools shall be shipped in separate, heavily constructed wooden boxes provided with hinged covers and padlock hasps.

Maintenance tools for each piece of equipment shall be boxed separately and the boxes shall be marked with the name of the project and the name of the equipment.

The maintenance tools shall include all special handling rigs, bars, slings, and cable. All maintenance tools shall be in new and unused condition and shall become the property of the Purchaser. The bidder's proposal shall include the list of maintenance tools which shall be furnished with the equipment.

In addition to the tools for maintenance and dismantling, the Supplier shall furnish the use of all special tools required for erection of the equipment. Erection tools shall remain the property of the Supplier and all shipping costs to and from the jobsite shall be at the Supplier's expense. Erection tools for each piece of equipment shall be boxed separately. Erection tools shall not be boxed with maintenance tools.

Q500 Shop Drawings and Instruction Manuals

(Source: 08Apr09 - Revised by Project: 04Jan10)

This section, in conjunction with the Schedule of Submittals, stipulates the requirements for engineering data that Supplier shall submit for design information and review. Document submittal procedures shall be in accordance with the requirements of this Purchase Order.

Q500.1 Submittal Requirements

Technical data shall be submitted in electronic format. Hard copy prints of the electronic files shall also be submitted, as specified below.

Electronic technical data submittals shall be made using email.

The hard copy prints shall be submitted to the address indicated for Technical Documents in the Supplementary Terms and Conditions of this Purchase Order. The following number of prints shall be submitted unless otherwise indicated in the Schedule of Submittals:

Submittal Description	Copies Required
Performance Curves	3
Design Data	3
Test and Inspection Data	3
Drawings	3

Q500.2 Compliance Reports

Reports shall be submitted that record the tests and/or calculations required in the specification technical sections. Reports shall be submitted for each piece of equipment or each plant system. Specified drawings shall be submitted with the compliance reports.

Q500.3 Motor and Electric Actuator Information

If required by the Specifications, Motor and Electric Actuator Information shall be submitted in accordance with Supplemental Q502.

Q500.4 Drawings

Drawings shall be in sufficient detail to indicate the kind, size, arrangement, component weight, breakdown for shipment, and operation of component materials and devices; the external connections, anchorages, and supports required; the dimensions needed for installation and correlation with other materials and equipment; and the information specifically requested in the Schedule of Submittals.

Supplier shall fully complete and certify drawings for compliance with the Purchase Order requirements. Drawings shall have title block entries that clearly indicate the drawing is certified.

Each submitted drawing shall be project unique and shall be clearly marked with the name of the project, unit designation, Purchaser's Purchase Order title, Purchaser's Purchase Order file number, project equipment or structure nomenclature, component identification numbers, and Purchaser's name. Equipment, instrumentation, and other components requiring Purchaser-assigned identification tag numbers shall be clearly identified on the drawings. If standard drawings are submitted, the applicable equipment and devices furnished for the project shall be clearly marked.

Transmittal letters shall identify which Schedule of Submittals item (by item number) is satisfied by each drawing or group of drawings. The transmittal letter shall include the manufacturer's drawing number, revision number, and title for each drawing attached. Each drawing title shall be unique and shall be descriptive of the specific drawing content. Transmittal letters for resubmitted drawings shall include the Purchaser's drawing numbers.

Catalog pages are not acceptable, except as drawings for standard nonengineered products and when the catalog pages provide all dimensional data, all external termination data, and mounting data. The catalog page shall be submitted with a typed cover page clearly indicating the name of the project, unit designation, specification title, specification number, component identification numbers, model number, Supplier's drawing number, and Purchaser's name.

Drawings shall be submitted with all numerical values in English units.

Q500.4.1 Drawing Submittal

Drawings shall be submitted electronically in Adobe Acrobat (.pdf) format. AutoCAD or MicroStation format files are not acceptable. If Supplier does not have the capability to provide .pdf drawings, an alternative submittal format shall be used as mutually agreed between Purchaser and Supplier.

If hard copies are required for submittal, the separately submitted hard copy drawing prints shall be black line on white background. Blue line on white background or color prints are not acceptable. Purchaser will use an electronic imaging system in processing the hard copy drawings. All drawings shall be suitable for electronic imaging and shall have the maximum contrast. Preferred print size is 11 inches by 17 inches. Print size shall not exceed 34 inches by 44 inches. Drawings shall be folded to 8-1/2 inches by 11 inches. Drawings shall be collated in sets. Reproducibles can be plots or photocopies for drawings larger than 34 inches by 44 inches.

Q500.4.2 Drawing Processing

Supplier's engineering schedule shall allow a minimum of three (3) weeks for mailing, processing, and review of drawings and data by Purchaser.

Unless this Purchase Order indicates that a drawing or engineering data submittal by Supplier is to be for Purchaser's information only, Purchaser, upon receipt of submittals, shall review and return same to Supplier, marked "No Exceptions Noted," "Exceptions Noted," "Received for Distribution," "Returned for Corrections," "Release for Record," "Void," or "Superseded." The timing of Supplier's submittals and Purchaser's review shall be in accordance with the Completion Dates for same as set forth in the Purchase Order. The submittal of any drawing or other submittal document by Supplier to Purchaser under this Purchase Order will be certification by Supplier that the information set forth therein is accurate in all material respects.

Q500.4.2.1 No Exceptions Noted (NE) or Received for Distribution (RD). Upon receipt of a submittal marked "No Exceptions Noted" or "Received for Distribution," Supplier may proceed with its Work to the extent of and in accordance with the submittal. Supplier shall not resubmit unless the drawing or document is revised, in which case it shall be resubmitted as a new document revision in accordance with Q500.4.2.7.

Q500.4.2.2 Exceptions Noted (EN). Upon receipt of a submittal marked "Exceptions Noted" and if Supplier concurs with Purchaser's comments, Supplier shall incorporate same and may proceed with its Work to the extent of and in accordance with the annotated submittal. Supplier shall submit to Purchaser within fourteen calendar days a revision to the original submittal in which Purchaser's comments have been incorporated. If Supplier determines that it cannot incorporate Purchaser's comments without prejudice to Supplier's warranty or other obligations under this Purchase Order, Supplier shall so advise Purchaser in writing within seven calendar days of its receipt of Purchaser's comments, stating the reasons therefore. Supplier may proceed with its Work to the extent of and in accordance with the annotated submittal only upon Purchaser and Supplier resolving Purchaser's comments.

Q500.4.2.3 Returned for Corrections (RC). Upon receipt of a submittal marked "Returned for Corrections," Supplier shall immediately take all necessary action to revise its submittal in accordance with Purchaser's comments, the Specification, and the Drawings, and shall resubmit to Purchaser for review the corrected original submittal, voiding previous information and adding new documents if required. In no event shall Supplier proceed with the affected Work until its revised submittals have been returned to Supplier marked "No Exceptions Noted" or "Exceptions Noted" by Purchaser.

Q500.4.2.4 Release for Record (RR). Receipt of a submittal marked "Release for Record" indicates that there are no specific objections to the document. Work may proceed. Certain project information required by the Purchaser's document management system may have been added electronically to the drawing and provided to Supplier for the record. Supplier shall not resubmit the drawing or document unless revisions to the design are required. If revisions are required, Supplier shall incorporate Purchaser's information and resubmit as a new revision. Purchaser's project-specific information shall be added if future revisions and submittals are made.

Q500.4.2.5 Void (VO) or Superseded (SS). Receipt of a submittal marked "Void" or "Superseded" does not require any action by Supplier. "Void" indicates that the submittal is no longer applicable to the project and is not being replaced by other drawings or data. "Superseded" indicates that different drawings or data have replaced the previously submitted drawings and data; this status does not pertain to revisions of the same drawings and data.

Q500.4.2.6 Hold (HO). A submittal may be given a status of "Hold" by the Purchaser, or the Supplier may have "Holds" on the submitted drawing.

For a Hold status designated by the Purchaser, the Supplier shall not proceed with the work that is designated on "Hold" except as specifically directed by the Purchaser. Additional information required for the Supplier to release the "Hold" will be transmitted from the Purchaser later.

The Supplier shall provide information to the Purchaser about the cause for any "Holds" designated on the drawing and immediately take all action necessary to resolve the "Holds". The Supplier shall resubmit the drawing for review once the "Holds" are removed from the drawing and should make all efforts to not submit drawings to the Purchaser until drawing review comments have been received back from the Purchaser.

Q500.4.2.7 Resubmittals. If during or subsequent to the completion of the submittal process, Supplier makes further changes to the equipment and materials shown on submittals that have been reviewed by Purchaser, the changes shall be clearly marked on the submittal by Supplier and the submittal process shall be repeated. If changes are made by Supplier after delivery to the Jobsite, as-built drawings

indicating the changes shall be prepared by Supplier and submitted to Purchaser for review. Any resubmittal of information shall clearly identify the revisions by footnote or by a form of back-circle, with revision block update, as appropriate.

Q500.4.2.8 Purchaser's Review. Purchaser's review of drawings and other submittals will cover only general conformity of the data to the Specifications and Drawings, external connections, interfaces with equipment and materials furnished under separate specifications, and dimensions that affect plant arrangements. Purchaser's review does not include a thorough review of all dimensions, quantities, and details of the equipment, material, device, or item indicated or the accuracy of the information submitted. Review and comment by Purchaser of Supplier's Drawings or other submittals shall not relieve Supplier of its sole responsibility to meet the Completion Dates requirement of this Purchase Order and to supply Goods that conform to the requirements of this Purchase Order.

Q500.4.2.9 File Returns to Supplier. Email will be used by Purchaser to return files to Supplier.

A copy of the manifest will be returned to Supplier indicating drawings statused as NE (No Exceptions Noted).

Each packet of drawings returned to Supplier will include a manifest generated by Purchaser. The manifest will include a list of drawings transmitted, manufacturer's drawing numbers, Purchaser's assigned drawing numbers, Purchaser's drawing titles, and the status of the drawings.

Files returned to Supplier will be in Adobe Acrobat (.pdf) format unless another format is agreed upon by Purchaser and Supplier.

Q500.5 Wiring Diagrams
If required by the Specifications, Wiring Diagrams shall be submitted in accordance with Supplemental Q502.

Q500.6 Instruction Manuals.
If required by the Specifications, Instruction Manuals shall be submitted in accordance with Supplemental Q501.

Q501 Instruction Manuals
(Source: 08Apr09 - Revised by Project: 04Jan10)

This section, in conjunction with Section Q500 and the Schedule of Submittals included in the Supplemental Terms and Conditions of this Purchase Order, stipulates the requirements for Instruction Manuals that Supplier shall submit for design information and review. Document submittal procedures shall be in accordance with the requirements of this Purchase Order, Section Q500, and the following.

Q501.1 Submittal Requirements
Hard copies shall be submitted to the address indicated for Technical Documents in the Supplementary Terms and Conditions of this Purchase Order for the documents listed below. The following number of copies shall be submitted unless otherwise indicated in the Schedule of Submittals:

Submittal Description	Copies Required
Final Copies	6 + 3 electronic on CDROM

Q501.2 Instruction Manuals.
Supplier shall furnish final instruction manuals for the unloading, storage, installation, operation, and maintenance of the equipment. The manuals shall be delivered as specified in the Schedule of Submittals.

Manuals shall include the following information specific to the furnished equipment. The documents or drawings submitted within the Instruction Manual shall be consistent with the documents or drawings previously submitted for Purchaser's review. Documents or drawings which were previously submitted for review and are included within the Instruction Manual shall be identical, with the same revision number. If these documents or drawings were revised due to design revisions subsequent to issuance of the Instruction Manuals, the document or drawing shall be resubmitted in accordance with Article Q500.4.2.7 in Supplemental Q500 so the Purchaser can provide updated drawings to the holders of the Instruction Manuals.

Table of contents and index tabs. (If multiple volumes are required, a table of contents listing materials included in each volume shall be supplied for each volume.)

Specifications, test data, and all performance curves specified in the technical specifications.

Description of the equipment, including illustrations showing elevations, cross section, and all details of the equipment with all parts named, numbered, and identified with Purchaser's tag numbers. When multiple model numbers are shown on the drawings, the equipment supplied for the project shall be clearly identified.

Complete and detailed operating instructions, including safety precautions, philosophy of operation and, where applicable, process optimization techniques.

Detailed minor and major maintenance instructions, including description, use of special tools furnished, and preventive maintenance schedule.

Instructions for receiving, inspection, storage, and handling of equipment prior to installation.

Installation instructions.

Inspection procedures.

Troubleshooting guide.

All fluid systems schematics and piping diagrams.

Control logic diagrams, as applicable.

Electrical wiring diagrams, as applicable.

Calibration Data Sheet for each adjustable instrument included in the scope of supply.

Motor Information Sheets, as applicable.

Electric Actuator Information Sheets, as applicable.

Control Panel Arrangements, as applicable.

Supplier and Sub-supplier operating and maintenance manuals.

Illustrated parts breakdown.

Assembly drawings.

Parts lists.

List of acceptable lubricants.

Nameplate information and shop order numbers for each item of equipment and associated component parts thereof.

List of recommended spare parts.

List of maintenance tools furnished with the equipment.

The above listed requirements are the minimum requirements; however, requirements that are clearly not applicable to the equipment may be deleted with Purchaser's approval. Additional information that is necessary for proper operation and care of the equipment shall also be included.

Q501.2.1 Binding
Each copy of the manuals shall be assembled and bound in a three-ring binder designed for rough usage. Typical binder specifications are as follows:

Binder type:	Split prong swing hinge (C78) 2", 3"
Construction:	Stiff binder board
Covering:	Black imitation leather
Lining:	Black Skytogen lining
Fonts:	News Gothic Condensed
Imprinting:	White imprinting

Binders may be obtained from the following source (or approved equal):

ViaTech Publishing Solutions
424 N. Cedarbrook
Springfield, MO 65802

Karen Bailey (Direct contact for quotes and orders)
11003 W. 124th Terr.
Overland Park, KS 66213
kbailey@viatechpub.com
(913) 685-4996
(913) 851-4199 fax

Front covers and backbones of the manuals shall be permanently marked with lettering per the Typical Instruction Book Cover attached at the end of this section.

TYPICAL INSTRUCTION BOOK COVER

(Backbone)	(Cover)	
NAME OF EQUIPMENT	**CLIENT'S NAME**	36
	NAME OF UNIT	24
	UNIT NUMBER	24
CLIENT'S NAME	**INSTRUCTION BOOK**	36
	FOR	36
	NAME OF EQUIPMENT	36
	VOLUME NUMBER*	36
NAME OF UNIT	**PURCHASE ORDER NUMBER****	24
	MANUFACTURER'S NAME	24
	MANUFACTURER'S ADDRESS	24
UNIT NUMBER		
PURCHASE ORDER NUMBER**		
	BLACK & VEATCH	14
	KANSAS CITY, MISSOURI	14
VOLUME NUMBER*		

NOTES:
1. All lettering shall be a block style font such as Arial.
2. All backbone lettering shall be 14 point.
3. Cover lettering shall be point sizes indicated in column to right of cover illustration.
4. *Volume number required only if instructions are contained in more than one volume.
5. **Purchaser assigned Purchase Order number.

Q502 Electrical Data

(Source: 08Apr09 - Revised by Project: 04Jan10)

This section, in conjunction with Section Q500 and the Schedule of Submittals included in the Supplemental Terms and Conditions of this Purchase Order, stipulates the requirements for Electrical Data that Supplier shall submit for design information and review. Document submittal procedures shall be in accordance with the requirements of this Purchase Order, Section Q500, and the following.

Q502.1 Submittal Requirements

Electronic copies shall be submitted to the address indicated for Technical Documents in the Supplementary Terms and Conditions of this Purchase Order for the documents listed below. The following number of copies shall be submitted unless otherwise indicated in the Schedule of Submittals:

Submittal Description	Copies Required
Motor Information Sheets	Electronic + 2 hardcopies
Electric Actuator Information Sheets	Electronic + 2 hardcopies
Wiring Diagrams	Electronic + 2 hardcopies

Q502.2 Motor and Electric Actuator Information

Copies of Motor Information Sheets and Electric Actuator Information Sheet are included at the end of this section. Electronic copies of these information sheets shall be downloaded from the following websites (no password required), electronically completed by filling in the requested data, and submitted by the dates shown in the Schedule of Submittals.

http://www.bv.com/downloads/Forms/Energy/MotorInfoSheet.doc

http://www.bv.com/downloads/Forms/Energy/ElecActuatorInfoSheet.doc

An information sheet shall be completed for each motor and electric actuator furnished under the Purchase Order.

Q502.3 Wiring Diagrams

Connection and interconnection wiring diagrams furnished by Supplier shall be drawn with all devices indicated in their relative physical locations and shall accurately show the equipment and terminals arranged as they would appear to a person wiring the equipment. When accepted by Purchaser, termination schedules identifying field terminations may be substituted for wiring diagrams for connections external to equipment.

When the equipment furnished by the Supplier is split for shipment and provided with terminal blocks and wiring required to interconnect the shipping sections in the field, the wiring diagrams from the Supplier shall clearly identify that the wiring across the shipping splits needs to be field installed.

Where interconnecting wiring from different items of equipment or sectional wiring diagrams of the same item of equipment appear on different wiring diagram sheets, all interconnections shall be clearly identified. Where sectional wiring diagrams are required for a single item of equipment, such as a relay panel or control panel, the section of the panel that is represented by each individual wiring diagram sheet shall be keyed on that sheet in a manner acceptable to Purchaser.

Information indicated on Supplier's drawings shall include wiring and terminal numbers of the individual panel items as they actually will appear in the panel, set points, contact arrangements of switches and relays (state of device and device contacts shall be clearly indicated), and internal wiring of relays and instruments. Spare terminals and all unused contacts of the individual panel items shall be shown on the drawings.

Elementary diagrams shall be cross-referenced to terminal markings on the connection and interconnection diagrams, but do not need to indicate complete details of circuits external to the panels, unless required by Purchaser. Each item of panel mounted equipment indicated on the diagrams shall be identified by item number and name.

Q502.3.1 As-Built Drawings

As-built prints of each final electrical wiring and elementary diagram for equipment shall be furnished in accordance with Article Q500.4.2.7. An electronic copy of each drawing shall be submitted to Purchaser.

MOTOR INFORMATION SHEET

DRIVEN EQUIPMENT DATA

Name _____
ID(s) _____
Manufacturer _____
Driven Equip Max Brake Load _____ Horsepower (hp) or kW at Design Conditions _____

MOTOR DATA – ALL MOTORS (check choices)

☐ Horizontal ☐ Vertical ☐ Induction ☐ Synchronous
Manufacturer _____
Model _____
Outline/Wiring/Connection Drawing Numbers _____

Design Standard* _____ Nameplate: Volts _____ Phase _____ Hz _____
For NEMA Motors - Nameplate hp _____ Service Factor _____
Locked-Rotor Code Letter _____ NEMA Design Letter _____
For IEC Motors - Nameplate kW _____
Max Continuous Voltage (rated frequency) _____ Min Continuous Voltage (rated frequency) _____
Duty Type: ☐ Continuous ☐ Definite Time (minutes) _____ Full Load Speed (rpm) _____
Full Load Current at Rated hp or kW (amps) _____
Locked-Rotor Current (amps) _____
NEMA or IEC Enclosure _____ Frame Size _____
IEC Cooling (IC Code) _____ IEC Mounting (IM Code) _____
Design Ambient Temperature (°C) _____ Insulation System Class _____
Temp Rise by Resistance (at service factor load) for NEMA Motor (°C) _____
Space Heaters (SP) Furnished? ☐ Yes ☐ No Total SP Load: Watts _____ Volts _____ Phase _____

Bearings: Type _____
Lubrication Type _____ System _____
ABMA L-10 Rating Life, Not Less than _____ Hours
Connection: (check one) ☐ Direct ☐ Belt ☐ Chain

Overall Mean No-Load Sound Pressure Level, re micro-pascals (0.0002 microbar), Reference Distance of 3 Feet _____ Free Air
Total Motor Weight (lb) _____ Is Motor Reversible? ☐ Yes ☐ No

Multi-Connectable Motors: (check choices)
☐ Part Winding ☐ Star-Delta ☐ Variable Torque ☐ Constant Torque
☐ Constant Horsepower ☐ PAM ☐ Two Winding ☐ One Winding
☐ Other _____

rpm _____ FL Amps _____ LR Amps _____ rpm _____ FL Amps _____ LR Amps _____
rpm _____ FL Amps _____ LR Amps _____ rpm _____ FL Amps _____ LR Amps _____

For Motors in Hazardous Locations: Motor Enclosure Maximum Surface Temperature (°C) _____
Will Motor Contain a Surface Temperature Control Thermostat Requiring Connection into the Motor Starter Control Circuit? ☐ Yes ☐ No

Motor Full-Load Efficiency as Defined by NEMA MG-1-2006 Tables 12-10, 12-11, and 12-12: (check one)
☐ Normal Efficiency ☐ Energy Efficient ☐ Premium Efficiency
Full Load Nominal Efficiency Rating _____

*NEMA, IEC, etc.

ELECTRIC ACTUATOR INFORMATION SHEET

Name	ID Number

GENERAL INFORMATION

Manufacturer _____
Model No. _____
Rated Output Torque (ft-lb) or (Nm) _____
Factory Torque Switch Settings
- Open _____
- Close _____
- Torque Close Seating Required for This Application (Yes/No) _____
- Speed of Operation _____
- Open to Close (sec) _____
- Close to Open (sec) _____
- Maximum Differential Pressure Which Actuator is Capable of Operating Against (psi) or (Pa) _____
- Valve Stem Diameter (in.) or (mm) _____
- Thrust Allowance for Valve Packing Friction Weight (lb) or (N) _____
- Gear Housing Material _____
- Self-Locking Gearing (Yes/No) _____

MOTOR DATA

Manufacturer _____
Enclosure/Cooling Rating _____ _____
Horsepower/rpm or kW/rpm _____ _____
Voltage/Phase/Hz _____ _____ _____
Full Load Current (amps) _____
Locked-Rotor Current (amps) _____
Load Current for Setting Overload Relay Protection (amps) _____
Motor Time Rating at Maximum Driven Equipment Torque in a 50° C Ambient (minutes) _____
Motor Space Heater (watts/volts) _____ _____
Are Motor Self-Reset Thermal Switches, if Provided, Required to be Wired in Purchaser's Starter Coil Circuit? (Yes/No/Recommended) _____

CONTROLS DATA

Enclosure Rating _____
Network Communications, if Applicable _____
Enclosure Space Heater (watts/volts) _____ _____
Integral Starter (Yes/No) _____

DRAWINGS

Item	Drawing Title	Drawing Number	Revision
Outline Diagram			
Schematic/Wiring Diagram			

S100 Seismic Design

(Source: 25Mar08 - Revised by Project: 04Jan10)

S100.1 General

This article specifies the general criteria and procedures that shall be used to ensure that structures, components, and equipment meet performance objectives during and following a seismic event. The intent of these procedures is to minimize the hazard to human life. Buildings and structures may be damaged but remain suitable for occupancy and use, albeit in an impaired condition. The damage is anticipated to be repairable. Components and equipment are expected to remain in place without collapsing or breaking away from supports, and to remain intact to the extent that they do not create an ignition hazard or release hazardous materials.

The building structural system shall provide a continuous load path or paths, with adequate strength and stiffness to transfer all seismic forces from the point of application to the final point of resistance.

Components and equipment shall be attached so that seismic forces are transferred to the structural system of the building. These attachments shall be bolted, welded, or otherwise positively fastened. Frictional resistance due to gravity shall not be considered in evaluating the required resistance to seismic forces.

For seismic design of vessels, tanks, and other components, contents that are flammable, explosive, corrosive, acidic, caustic, toxic, or that otherwise present a danger to the general public if released shall be considered hazardous materials.

Seismic design shall be performed in accordance with the building code specified in Supplemental Specification D100 Site Meteorological and Seismic Data in this Section 01400, along with the applicable edition (as required by the specified building code) of the following references:

American Institute of Steel Construction (AISC), AISC 360, "Specification for Structural Steel Buildings."

American Institute of Steel Construction (AISC), AISC 341, "Seismic Provisions for Structural Steel Buildings."

American Concrete Institute (ACI), ACI 318, "Building Code Requirements for Structural Concrete."

American Concrete Institute (ACI), ACI 307, "Design and Construction of Reinforced Concrete Chimneys."

American Society of Mechanical Engineers (ASME), "Boiler and Pressure Vessel Code" and all addenda.

American National Standards Institute (ANSI), "ASME Code for Pressure Piping, ASME B31.1, Power Piping."

Manufacturers Standardization Society of the Valve and Fitting Industry (MSS), MSS SP-58, "Pipe Hangers and Supports - Materials, Design, and Manufacture."

American Petroleum Institute (API), API 650, "Welded Steel Tanks for Oil Storage."

American Water Works Association (AWWA), AWWA D100, “Welded Steel Tanks for Water Storage.”

National Fire Protection Association (NFPA), NFPA 13, “Standard for the Installation of Sprinkler Systems.”

Other nationally recognized and accepted design standards and references as appropriate.

S100.2 Seismic Forces

Seismic forces shall be determined from the basic seismic parameters given in Supplemental D100. The design forces and their distribution over the height of the building or structure shall be determined using a linearly elastic analysis model and the procedures listed in the specified building code. Load combinations, including seismic, shall be in accordance with the specified building code.

Hydrodynamic effects of contents shall be considered in the seismic design of vessels and tanks as required by the specified building code. Seismic dynamic forces shall be considered in the seismic design of below ground structures in addition to the static soil pressures.

S100.3 Seismic Design

S100.3.1 Buildings

Buildings shall provide sufficient strength and ductility to resist the specified seismic effects and may use any of the basic structural systems permitted by the specified building code. Usage of structural systems shall be in accordance with the limitations prescribed in the specified building code. The effects of both plan and vertical irregularities shall be considered, as required by the specified building code.

Buildings shall be seismically analyzed using either Equivalent Lateral Forces or Modal Analysis in accordance with the specified building code and shall meet all of the design, proportioning, detailing, inspection, and quality assurance provisions of the specified building code.

"W" for buildings shall include the total dead load, the total operating weight of permanent equipment and the effective contents of vessels, and applicable portions of other loads, as required by the specified building code.

S100.3.2 Nonbuilding Structures

Nonbuilding structures include all self-supporting structures, other than buildings, bridges, and dams, that are supported by the earth; that carry gravity loads; and that may be required to resist seismic effects. Design of nonbuilding structures shall provide sufficient strength and ductility, consistent with the requirements for buildings, to resist the specified seismic effects.

Nonbuilding structures shall be seismically analyzed using either Equivalent Lateral Forces or Modal Analysis in accordance with the specified building code, and shall meet all of the design, proportioning, detailing, inspection, and quality assurance provisions of the specified building code and other referenced codes.

"W" for nonbuilding structures shall include all dead load as defined for buildings, and shall also include all normal operating contents of tanks, vessels, bins, and piping.

Seismic design of reinforced concrete chimneys shall use the Dynamic Response Spectrum Analysis method of ACI 307. Seismic design of steel stacks shall also use the Dynamic Response Spectrum Analysis method. The analytical model used in the dynamic analysis of these structures shall be sufficiently refined to represent variations of chimney, stack, and liner masses; variations of stiffness; and the foundation support condition.

S100.4 Documentation

Complete structural support and anchorage details shall be shown on all drawings, including the size of members, details of connections, anchor bolt sizes, etc.

The following seismic design data shall be indicated on the design drawings:

Occupancy Category.

Mapped Spectral Response Accelerations, S_s and S_1.

Spectral Response Coefficients, S_{DS} and S_{D1}.

Site Class.

Seismic Design Category.

For Structures and Nonbuilding Structures Similar to Buildings:

Importance Factor, I.

Basic Seismic Force Resisting System.

Design Base Shear.

Seismic Response Coefficient, C_s.

Response Modification Factor, R.

Analysis Procedure.

Seismic Drift.

Seismic Detailing.

For Nonstructural Components Including Equipment:

Component Importance Factor, I_p.

Seismic Design Force, F_p.

Component Response Modification Factor, R_p.

Component Amplification Factor, a_p.

Equipment and component drawings shall indicate the total load and/or loads to be transmitted to the structure that must ultimately restrain the components, equipment, or structure. This information shall include the weight, dimensions locating the center of gravity of the component or equipment, or the seismic design forces (magnitude, direction, and location) acting on the supports.

If requested by the Purchaser, design calculations shall be submitted for all structures, equipment, or components which are designed in accordance with this Supplemental Specification. If requested by the Purchaser, these calculations shall be certified by a professional engineer registered in the appropriate jurisdiction.

S400 Standard Supplier Load Tables for Equipment and Components

(Source: 25Mar08 - Revised by Project: N/A)

S400.1 General

This article specifies the Supplier load information that shall be provided for all components (including tanks, vessels, and piping or cable tray systems) and all equipment or skid mounted equipment that is directly supported by the Purchaser's structural steel and/or concrete foundations, unless noted otherwise within these specifications. Accurate and properly formatted loads are critical to ensure that communication of load information between the Supplier and Purchaser is consistent and inherently clear.

S400.2 Load Table Requirements

The Standard Supplier Load Table for Equipment included at the end of this section shall be used to convey the Supplier's load information to the Purchaser. A load table or load list on the Supplier's drawings does not constitute compliance with this requirement. An electronic copy of this table shall be downloaded from the following website (no password required), electronically completed, and submitted by the dates shown in the Schedule of Submittals.

http://www.bv.com/downloads/Forms/Energy/SupplierLoadTableEquipmentAndComponents.xls

The Supplier shall submit this table in its original file format (.xls) for all load submittals for every individual piece of equipment where load is transferred to the Purchaser's support structure(s). This load information shall also be shown on the appropriate supplier drawings. The Supplier's name, the equipment name, and revision block data shall be provided for every submittal of loads.

S400.2.1 Revision Block Data

The revision number shall be entered for every load submittal. Alphabetic revision numbers shall be used for all preliminary load submittals, starting with revision "A". Numeric revision numbers shall be used for all "not-to-exceed" and final/certified load submittals, starting with revision "0". The date and description blocks shall also be completed for each load submittal.

S400.2.2 Load Classifications

S400.2.2.1 Preliminary Loads. Preliminary loads are defined as loads that are not to be used for detailed design by the Purchaser. Preliminary loads shall not be submitted when Not-to-Exceed (NTE) or certified loads have been requested. Preliminary loads shall be based on data that is representative of the structure or equipment being supplied without excessive safety factors on the loads. Any load submittal classified as "preliminary" in the load table shall be in accordance with the load classification noted in the Schedule of Submittals.

S400.2.2.2 Not-To-Exceed (NTE) Loads. NTE loads are defined as loads that may be used for detailed design by the Purchaser but are not classified as final or certified loads in accordance with Section S400.2.2.3. NTE loads are generally submitted by the Supplier when certified load information is not available but the Purchaser needs to begin detailed design of the supporting structure(s). NTE loads shall be based on data that is representative of the equipment being supplied without excessive safety factors on the loads. It is expected that final loads will not exceed the NTE loads. Any load submittal classified as "Not-to-Exceed" in the load table shall be in accordance with the load classifications as noted in the Schedule of Submittals.

If the Supplier anticipates that previously submitted NTE loads may be more than or significantly less than the certified loads for any piece of equipment and/or load case, the Supplier shall notify the Purchaser as soon as they are aware of this situation and re-submit the load tables with the updated NTE loads soon thereafter.

S400.2.2.3 Final (Certified) Loads. Certified loads are defined as loads that have been verified as final and accurate by the Supplier and which may be used for detailed design by the Purchaser. Certified

loads shall be submitted by the Supplier as soon as the verified load information becomes available. Certified loads shall be submitted by the Supplier regardless of whether NTE loads were submitted at a prior date. Any load submittal classified as “final” or “certified” in the load table shall be in accordance with the load classifications as noted in the Schedule of Submittals.

Supplier Load Table for Equipment and Components

Purchase Order No: XXXXXX.YY.ZZZZ
Supplier Name: XYZ Company
Equipment Name: Equipment 1

Rev.	Date	Load Class.*	Revision Description

* - Load classifications are Preliminary, Not-to-Exceed (NTE), and Final/Certified

Units: All units are in kips and feet
Notation: +/- X (horiz) as shown on supplier dwgs
+/- Y (horiz) as shown on vendor dwgs
+Z is vertical (down); -Z is vertical (up)
+/- M in accordance with the "right-hand" rule
Supplier loads and moments shall be calculated at the interface elevation with the Purchaser's supporting structure

Equip or Support ID	Dead Load (Min**)			Dead Load (Normal)			Live Load (Vertical)			Snow Load		
	Z	Mx	My	Z	Mx	My	Z	Mx	My	Z	Mx	My

** - Minimum Dead Load is the "reliable" dead load available to resist uplift.

Equip or Support ID	+X Seismic Load			-X Seismic Load			+Y Seismic Load			-Y Seismic Load			Z Seismic Ld	
	X	My	Mz	X	My	Mz	Y	Mx	Mz	Y	Mx	Mz	+Z	-Z

Equip or Support ID	+X Wind Load			-X Wind Load			+Y Wind Load			-Y Wind Load		
	X	My	Mz	X	My	Mz	Y	Mx	Mz	Y	Mx	Mz

Equip or Support ID	Other Load						Other Load					
	X	Y	Z	Mx	My	Mz	X	Y	Z	Mx	My	Mz

16126 - Generator Breaker(s)

16126.1 General

16126.1.1 Scope of Supply

Scope of supply shall include furnishing the generator breaker(s) as specified herein and on the attached 16126 Specification Sheets. The work under these specifications shall include the following:

> Furnish, FOB factory, one 15kV, 2000A, 50kA interrupting capacity IEEE C37.013a rated generator circuit breaker, multiple conductor in/out top entry, 6 CT's, 5 VT's, 115 VDC control, reduced height enclosure if possible.

In the event of technical conflicts, errors, or discrepancies, these detailed technical specifications take precedence over Section 01400, Technical Supplemental Specifications.

16126.1.2 Items Furnished by Others and Interfaces

Items furnished by others and not in this scope of supply include the following:

> Installation of equipment.
>
> Connection of field circuits.
>
> Field testing.

16126.1.3 Performance and Design Requirements

Performance and design requirements for each generator breaker are specified herein and on the 16126 Specification Sheets included at the end of this specification.

> It is desirable from an installation standpoint for the generator breaker package height to be 86" or less if possible. If unable to meet this constraint, submit a bid using the manufacturer's standard height offering. Provide overall dimensions on the tech fill-in sheet included in this bid package.
>
> Systems greater than 48" in width must be designed to be split for shipping and will be reassembled by the purchaser upon installation.
>
> Supplier shall confirm the generator breaker ratings based on design data provided in the 16126 Specification Sheets.

16126.1.4 Codes and Standards

Work performed under these specifications shall be done in accordance with the following codes and standards. Unless otherwise specified, the applicable governing edition and addenda to be used for all references to codes or standards specified herein shall be interpreted to be the jurisdictionally approved edition and addenda. If a code or standard is not jurisdictionally mandated, then the current edition and addenda in effect at the date of this document shall apply. These references shall govern the work except where they conflict with the Purchaser's specifications. In case of conflict, the latter shall govern to the extent of such difference:

Work	In Accordance With
Generator breaker(s)	Latest revisions of C37.013(a)

16126.1.5 Not Used

16126.1.6 Approved Manufacturers of Components

For the following components, only the listed manufacturers are recognized as maintaining the level of quality of workmanship required by these specifications. If the Supplier wishes to propose a non-listed manufacturer that is considered to provide an equivalent level of quality, this manufacturer must be identified and supporting testimony provided. Acceptance of the manufacturer as a substitute is at the discretion of the Purchaser:

Component	Manufacturer
Generator breaker	ABB, Eaton, Siemens, Square D or approved supplier

16126.1.7 Test Requirements

The following testing shall be conducted in accordance with the specified source. This testing is to be considered part of the defined Scope of Work, and all associated costs are the responsibility of the Supplier unless specifically identified as a Bid Option or Purchaser-conducted. Tests identified as an option are to be priced separately. If identified as Purchaser-conducted, costs for the initial test will be the responsibility of the Purchaser. However, the Supplier is responsible for all costs associated with correcting deficiencies and retesting in the event of a test failure:

Tests	In Accordance With	Conducted By
Production tests	IEEE C37.013(a)	Supplier

16126.1.8 Not Used

16126.1.9 Supplemental Specifications

Technical supplemental specifications that are applicable to the work covered under this technical specification section are identified and included in Section 01400.

16126.2 Products

16126.2.1 General

The design and construction of the generator breaker shall be in accordance with manufacturer and power industry standard practices, except as modified in accordance with these specifications. The generator breaker shall meet the operating conditions and equipment sizing criteria as specified herein and on the 16126 Specification Sheets.

16126.2.2 Design and Construction

The generator breaker shall be suitable for application at the generator terminals with no transformation of voltages between the generator and the breaker. The breaker design and associated ratings shall be capable of switching load currents, transformer magnetization currents, out-of-phase currents, and fault currents. In addition, the breaker shall be capable of synchronizing the generator to the electrical system.

The generator breaker shall be supplied as a complete stand-alone assembly. A mechanical operating mechanism shall be common to the 3-phase interrupters. Provisions shall be provided for remote operation. A local mechanical trip facility shall be provided for emergency use by actuating the trip mechanism directly. A mechanical position indicator shall be furnished to indicate the open and closed position of the circuit breaker(s). The generator breaker test switch shall have a trip-close escutcheon, a

center normal position, spring return to normal from close and trip, one open indicating light, and one close indicating light for each trip coil. The test switch shall be furnished with four spare contacts wired out to terminal blocks for use by the Purchaser.

One close and two trip coils shall be provided for each breaker. In addition, each breaker shall have the following minimum control requirements:

Low spring energy block close and alarm.

Operation counter.

Trip power and trip coil monitors shall be furnished with Form "C" contacts wired out to terminal blocks for Purchaser's use. The trip coil monitors shall be wired to monitor the integrity of the breaker trip coil while the breaker is in either the open or close state (E-MAX, RAW-ID, or acceptable equal).

Three independent control power sources for Trip Coil 1, Trip Coil 2, and close/switch power.

Usage and wiring of contacts along with breaker interlock philosophy shall be determined during detailed design.

Each generator breaker bus conductor shall be installed with rigid, nontracking, fire-resistant, and nonhygroscopic insulation supports.

16126.2.3 Short-Circuit Ratings

The Supplier shall furnish the generator breaker with short-circuit current ratings that meet or exceed the greater of the ratings provided on the 16126 Specification Sheets or the ratings which are calculated by the generator or system parameters provided on the 16126 Specification Sheets. The generator breaker ratings shall meet or exceed all related inherent transient recovery voltages calculated from or specified on the 16126 Specification Sheets.

16126.2.4 Voltage Transformers

Voltage transformers shall have a capability of withstanding a secondary short-circuit for not less than 1 second. The voltage transformer basic impulse level (BIL) rating shall be equal to or greater than the breaker BIL rating. The minimum voltage transformer metering accuracy ratings for each standard indicated shall be as specified on the 16126 Specification Sheets. The voltage transformer metering accuracy ratings shall apply to each secondary winding independent of the loading of the other secondary windings for voltage transformers with two or more secondary windings. The voltage transformer accuracy ratings shall be guaranteed at the normal operating voltage of the transformer indicated on the 16126 Specification Sheets.

When specified on the 16126 Specification Sheets, primary current limiting fuses shall be adequately rated for the transformer inrush and load current, and they shall have an interrupting capacity equal to or greater than the specified fuse interrupting rating. Current limiting resistors in series with the primary fuses shall be provided when the specified fuse interrupting rating exceeds available fuse ratings. The connections from the main conductor to the primary of the voltage transformer shall be capable of carrying the current equal to the specified fuse interrupting rating for a time equal to the short-circuit time rating specified for the circuit breaker.

If drawout construction is furnished, the transformers shall be mounted with primary fuses on a drawout type removable unit designed to isolate and ground the secondary potential circuits when the unit is in the fully withdrawn position. Provisions shall be made to prevent an arc on the primary disconnecting contacts of each voltage transformer by arranging to open the secondary circuits before the primary

disconnecting contacts part. Provisions shall be made to prevent personnel from coming in contact with the voltage transformer primary fuses until after the primary disconnecting devices are separated by a safe distance and grounded. Four electrically isolated contacts shall be provided to indicate the position of the voltage transformers drawout unit. These contacts shall change state when the unit is in the withdrawn position. The type of contacts (normally open and normally closed) shall be established during detailed design.

16126.2.5 Current Transformers

When specified on the 16126 Specification Sheets, the Supplier shall furnish current transformers. The current transformers and related equipment shall be included as part of the generator breaker enclosure and shall be located as indicated on the 16126 Specification Sheets. The continuous thermal current rating factor (RF) shall be 1.0 minimum. The current transformer secondary leads shall be wired to shorting terminal blocks located in the generator breaker control cabinet.

16126.2.6 Not Used

16126.2.7 Not Used

16126.2.8 Not Used

16126.2.9 Not Used

16126.2.10 Surge Arresters

When specified on the 16126 Specification Sheets, the Supplier shall furnish station type gapless metal-oxide surge arresters designed for rotating machine protection. Copies of test reports proving conformance of the arresters with the applicable standard shall be submitted by the Supplier. The tests shall be performed on those arresters being furnished under these specifications.

Each surge arrester shall be complete with a discharge counter connected in the arrester ground circuit. Discharge counters shall be visible without opening compartment doors.

16126.2.11 Surge Capacitors

When specified on the 16126 Specification Sheets, the Supplier shall furnish surge capacitors designed for rotating machine protection with built-in resistors. The surge capacitors shall be coordinated with other capacitors required to limit the rate-of-rise of the transient recovery voltage appearing across the contact of the breaker after a short-circuit current interruption.

16126.2.12 Auxiliary Switches

A sufficient quantity of auxiliary switches and contacts shall be provided in accordance with the following, as specified on the 16126 Specification Sheets.

16126.2.12.1 Position Status Auxiliary Switches. These auxiliary switches are mounted on the generator breaker mechanism to provide ‘a’ contacts (contact is closed when the main interrupter contacts are closed and open when the main interrupter contacts are open) and ‘b’ contacts (contact is closed when the main interrupter contacts are open and open when the main interrupter contacts are closed). For drawout generator breakers, the electrical connection between the switches on the generator breaker mechanism and the secondary connections in the generator breaker enclosure shall be such that external indication of open or closed status from these switches are active when the generator breaker is in both the “connected” and “test” positions. The Supplier shall furnish each generator breaker with a sufficient number of position status auxiliary switch contacts to meet all control and status indication requirements plus the quantity of spare position status auxiliary switch contacts as specified on the 16126 Specification Sheets. Spare position status auxiliary switch contacts shall be wired to terminal blocks in the generator breaker control cabinet for the Purchaser's use.

16126.2.12.2 Stationary Position Status Auxiliary Switches. These auxiliary switches are not mounted on the generator breaker mechanism but are mounted in the generator breaker enclosure and operated by linkage to the main interrupter mechanism. These auxiliary switches provide 'a' contacts (contact is closed when the main interrupter contacts are closed and open when the main interrupter contacts are open) and 'b' contacts (contact is closed when the main interrupter contacts are open and open when the main interrupter contacts are closed). For drawout generator breakers, these switches shall be actuated only when the generator breaker is in the "connected" position. When a drawout generator breaker is not in the "connected" position, these contacts shall indicate that the main interrupter contacts are in the "open" state. The Supplier shall furnish each generator breaker with a sufficient number of stationary position status auxiliary switch contacts to meet all control and status indication requirements plus the quantity of spare stationary position status auxiliary switch contacts as specified on the 16126 Specification Sheets. Spare stationary position status auxiliary switch contacts shall be wired to terminal blocks in the generator breaker control cabinet for the Purchaser's use.

If stationary position status auxiliary switches are not available for the switching device type, then an equivalent arrangement shall be provided by wiring connection status auxiliary switches in series or parallel, as appropriate, with position status auxiliary switches to provide the required quantity of equivalent stationary position status auxiliary switches. If interposing relays must be used to achieve that equivalency, the method used by the Supplier to achieve this equivalency shall be subject to the Purchaser's approval. The connection status auxiliary switches and position status auxiliary switches used in this arrangement shall not count toward the quantity of spare contacts required for each of those types.

16126.2.12.3 Connection Status Auxiliary Switches. These auxiliary switches are mounted in the generator breaker enclosure to provide indication that a drawout device is in the "connected" ("in-service") or not in the "connected" ("test" or "disconnected") position. These auxiliary switches provide normally-closed (contact is closed when the generator breaker is in the connected position and open when not in the connected position) and normally-open (contact is open when the generator breaker is in the connected position and closed when not in the connected position) contacts. The Supplier shall furnish each generator breaker with a sufficient number of connection status auxiliary switch contacts to meet all control and indication requirements plus the quantity of spare connection status auxiliary switch contacts as specified on the 16126 Specification Sheets. Spare connection status auxiliary switch contacts shall be wired to terminal blocks in the generator breaker control cabinet for the Purchaser's use. Because these contacts are utilized as permissives for closing control of drawout devices, the Supplier shall ensure, either by mechanical interlocks or the design of the connection status position auxiliary switch, that the generator breaker cannot be closed unless the generator breaker is in the fully-connected position or it is sufficiently racked out that closure of the generator breaker will not cause arcing.

16126.2.13 Channel Sills

Where specified on the 16126 Specification Sheets, channel sills shall be furnished with specified equipment. These sills shall be arranged to provide for track welding to the equipment base on the inside of the units, and shall be shipped sufficiently in advance to the project site for installation in the concrete base which will support the equipment.

Minimum Warranty

The bidder's proposal shall include a minimum of one-year warranty that the Work will be in accordance with the Contract Documents and will not be defective. If within 1 year after the date of Final Payment, any Work is found to be defective, Contractor shall, without cost to Owner, correct the defective Work, or if it has been rejected by Owner, replace it with Work that is not defective. If Contractor does not promptly comply with the terms of such instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or the rejected Work removed and replaced, and all claims, costs, losses and damages caused by or resulting from such removal and replacement shall be paid by Contractor. Where defective Work has been corrected or replaced, the correction period with respect to such Work will be extended for an additional period of one year after such correction or replacement has been satisfactorily completed.

Generator Breaker Specification Sheet

	Steam Turbine Generator Breaker
Breaker Model	Determined by manufacturer
Identification	52 UNIT 2 GEN
Quantity	One (1)
General Requirements	
Standards for manufacturing and testing	IEEE C37.013a
Design ambient temperature (° C)	40° C to -30° C
Location	Indoor
Elevation	Less than 3,300 ft (1,000 m)
Degree of protection	
Control cubicle and mechanism	IP 54
Phase enclosure	IP 65
Operating mechanism	Manufacturer's standard
Duty cycle for switching rated continuous current	CO-3 min-CO
Duty cycle for switching rated interrupting current for polyphase faults	CO-30 min-CO
Number of trip coils	2
Interrupting medium	Vacuum
Pole-to-pole spacing (mm)	Determined by manufacturer
Breaker interfaces with	Cable in / cable out
Power conductor generator side	4-500 KCM/phase top entry
Power conductor transformer side	4-500 KCM/phase top entry
Control wiring entrance	Top entry
Additional Requirements	Provide in reduced height configuration (86" or less) if possible. Ship in split configuration if overall width is greater than 48". Provide lockable doors with common-keyed locks where applicable.
Technical Attachments	
Voltage Ratings	
Maximum service voltage (kV, rms)	14.5

	Steam Turbine Generator Breaker		
Rated frequency (Hz)	60		
Rated normal power frequency withstand voltage (kV, rms)	50		
Rated full wave/lightning impulse withstand voltage (kV, peak)	110		
Voltages for ancillary devices			
Application	**Power Supply Code**	**Nominal Voltage**	**Number of Sources**
Auxiliary power (cabinet heaters)	LV-3	120V	1
Control dc	DC-1	125 V	1
Current Ratings			
Required continuous current at design ambient temperature (amperes, rms)	1231		
Rated interrupting current for single-phase-to-ground faults (amperes, rms, symmetrical)	Less than 50		
Symmetrical interrupting capability for polyphase faults			
System source (kA, rms)	15.2		
Degree of asymmetry (%)	52		
Generator source, full load condition (kA, rms)	9.5		
Degree of asymmetry (%)	85		
Generator source, full load maximum degree of asymmetry condition (kA, rms)	9.1		
Degree of asymmetry (%)	87		
Generator source, no load condition (kA, rms)	8.1		
Degree of asymmetry (%)	79		
Asymmetrical interrupting capability			
System source (kA, rms)	18.8		
Generator source, full load condition (kA, rms)	14.8		
Generator source, full load maximum degree of asymmetry condition (kA, rms)	14.4		
Generator source, no load condition (kA, rms)	13.3		

	Steam Turbine Generator Breaker
Required closing and latching (asymmetrical momentary) capability (kA, peak)	41.6
Required short-time current carrying capability (kA, rms, symmetrical)	15.2
Required out-of-phase (90 degrees) switching capability (kA, rms, symmetrical)	8.5
Current Transformers	
Generator Side	
Application	Protective relaying
Quantity per phase	1
Total	3
Standard	ANSI C57.13
Ratio(s)	1500:5
Accuracy class	C800
Laboratory calibration required	No
Transformer Side	
Application	Protective relaying
Quantity per phase	1
Total	3
Standard	ANSI C57.13
Ratio(s)	1500:5
Accuracy class	C800
Laboratory calibration required	No
Voltage Transformers Set 1	
Voltage transformer function	Metering
Location	Generator side
Quantity per phase	1
Total	3
Construction	Manufacturer’s standard
Standard	ANSI C57.13
Insulating materials	Manufacturer’s standard
Basic impulse insulation level (BIL) (kV, crest)	110
Rating and characteristic group	IEEE Group 4 or RVF 1.9/8 hrs

	Steam Turbine Generator Breaker
Accuracy class – Guaranteed at normal operating voltage.	0.3.W,X,M,Y,1.2ZZ
Primary winding voltage rating (V)	8400, fluxed and insulated for 14,400V
Primary winding normal operating voltage (V)	Generator line-to-neutral voltage
Primary connection	Wye - neutral solidly grounded
Primary winding thermal VA rating	Minimum rating shall be the sum of the secondary winding thermal VA rating
Number of secondary windings	1
Secondary winding voltage rating at normal operating primary voltage (V)	120
Secondary winding connection	Wye - 3-phase, 4 wire (neutral solidly grounded)
Secondary winding thermal VA rating	1000
Primary fuses	Current limiting
Primary fuse interrupting rating	As required by VT manufacturer
Secondary fuses (or MCBs)	1 per ungrounded phase
Voltage Transformers Set 2	
Voltage transformer function	Metering
Location	Generator side
Quantity per phase	1
Total	2
Construction	Manufacturer's standard
Standard	ANSI C57.13
Insulating materials	Manufacturer's standard
Basic impulse insulation level (BIL) (kV, crest)	110
Rating and characteristic group	Group 2
Accuracy class – Guaranteed at normal operating voltage.	0.3.W,X,M,Y,1.2ZZ
Primary winding voltage rating (V)	14400
Primary winding normal operating voltage (V)	Generator line-to-line voltage
Primary connection	Open delta
Primary winding thermal VA rating	Minimum rating shall be the sum of the secondary winding thermal VA rating
Number of secondary windings	1

	Steam Turbine Generator Breaker
Secondary winding voltage rating at normal operating primary voltage (V)	120
Secondary winding connection	Open delta - B phase grounded
Secondary winding thermal VA rating	1000
Primary fuses	Current limiting
Primary fuse interrupting rating	As required by VT manufacturer
Secondary fuses (or MCBs)	Not required
Accessories	
Ground (earthing) switch	No
Quantity	n/a
Location	n/a
Peak withstand current (kA, peak)	n/a
Short-time withstand current (kA), seconds	n/a
Operating time (sec)	n/a
Isolator switch (series disconnector)	No
Quantity	n/a
Location	n/a
Peak withstand current (kA, peak)	n/a
Short-time withstand current (kA)	n/a
Operating time (sec)	n/a
Static start switch	No
Static start system maximum voltage (V)	n/a
Static start system max continuous current (A)	n/a
Static start system maximum short-circuit current (kA, rms, symmetrical)	n/a
Short-circuiting switch	No
Operating mechanism	n/a
Auxiliary transformer supply connection	No
Auxiliary supply current (A, rms, continuous)	n/a
Surge Arresters	Yes
Quantity	1 per phase

	Steam Turbine Generator Breaker
Location	Transformer side of interrupter
Standard	IEEE C62.11
Class	Station class
Type	Metal oxide
MCOV rating	To be determined during detailed design
Surge Capacitors	Manufacturer's standard to limit TRV
Quantity	Manufacturer's standard to limit TRV
Location	Not required on generator side
Type	Manufacturer's standard to limit TRV
Voltage rating (V)	Manufacturer's standard to limit TRV
Capacitance	
Generator side	n/a
Transformer side	Manufacturer's standard to limit TRV
Auxiliary switches	
Quantity of spare position status auxiliary switch contacts	12 'a' 12 'b'
Quantity of spare stationary position status auxiliary switch contacts	12 'a' 12 'b'
Quantity of spare connection status auxiliary switch contacts	4 'NO' 4 'NC'
Additional Accessories	
Temperature Limitations	
Parts handled by operator in normal course of his duties	50° C
External surfaces not accessible to operator	110° C
Enclosure and support structures with easy access	70° C
Contact surfaces	
Copper connection	70° C
Silver surfaced, bolted	105° C
Enclosure with conducting joints	
Aluminum connection, bolted or welded	70° C
Miscellaneous Requirements	

	Steam Turbine Generator Breaker
Trip coil monitoring relay (one for each trip coil)	Yes
Type/Model No.	EMAX-RAW-1d or equiv
Spare terminal points for customer wiring	24
Space heaters	Yes
Control cabinet internal temperature requirement	Above dew point
Minimum voltage rating (VAC)	240VAC operated at 120VAC
Control device	Adjustable thermostat or fixed humidistat
Design Data	
Generator Data (Rated Values)	
Base, MVA	23.529
Rated voltage (kV)	13.8
Reactance values (Per unit on generator MVA base)	
Synchronous, direct axis, unsaturated (Xdi)	1.47
Synchronous, quadrature axis, unsaturated (Xqi)	Unknown
Transient, direct axis, saturated (X'dv)	0.174
Transient, quadrature axis, saturated (X'qv)	Unknown
Subtransient, direct axis, saturated (X"dv)	0.101
Subtransient, quadrature axis, saturated (X"qv)	Unknown
Time Constants (seconds)	
3-phase direct axis short-circuit transient (T'd3)	Unknown
3-phase direct axis short-circuit subtransient (T"d3)	Unknown
3-phase armature winding dc (Ta3)	Unknown
Generator Neutral Grounding	High resistance (distribution xfmr + resistor)
Capacitance of armature winding-to-ground (all phases tied together) (microfarads)	Unknown
System Data	
System source short-circuit current on high voltage side of generator step-up transformer (kA)	40 assumed

	Steam Turbine Generator Breaker
X/R ratio of the high voltage system	20 assumed
Transformer Data	
High voltage winding, rated voltage (kV)	115
Low voltage winding, rated voltage (kV)	13.8
Base, MVA	22.5
Connection	Delta - Wye
Impedance (Per unit on nominal tap at XFMR base MVA)	7.57%
Tap changer range	+/- 5%
X/R ratio	22

MINIMUM INSURANCE REQUIREMENTS
CITY OF GRAND ISLAND, NEBRASKA

The successful bidder shall obtain insurance from companies authorized to do business in Nebraska of such types and in such amounts as may be necessary to protect the bidder and the interests of the City against hazards or risks of loss as hereinafter specified. This insurance shall cover all aspects of the Bidder's operations and completed operations. Failure to maintain adequate coverage shall not relieve bidder of any contractual responsibility or obligation. Minimum insurance coverage shall be the amounts stated herein or the amounts required by applicable law, whichever are greater.

1. WORKERS COMPENSATION AND EMPLOYER'S LIABILITY

This insurance shall protect the Bidder against all claims under applicable State workers compensation laws. This insurance shall provide coverage in every state in which work for this project might be conducted. The liability limits shall not be less than the following:

Workers Compensation	Statutory Limits
Employers Liability	$100,000 each accident
	$100,000 each employee
	$500,000 policy limit

2. BUSINESS AUTOMOBILE LIABILITY

This insurance shall be written in comprehensive form and shall protect the Bidder, Bidder's employees, or subcontractors from claims due to the ownership, maintenance, or use of a motor vehicle. The liability limits shall be not less than the following:

Bodily Injury & Property Damage	$ 500,000 Combined Single Limit

3. COMPREHENSIVE GENERAL LIABILITY

The comprehensive general liability coverage shall contain no exclusion relative to explosion, collapse, or underground property. The liability limits shall be not less than the following:

Bodily Injury & Property Damage	$ 500,000 each occurrence
	$1,000,000 aggregate

4. UMBRELLA LIABILITY INSURANCE

This insurance shall protect the Bidder against claims in excess of the limits provided under employer's liability, comprehensive automobile liability, and commercial general liability policies. The umbrella policy shall follow the form of the primary insurance, including the application of the primary limits. The liability limits shall not be less than the following:

Bodily Injury & Property Damage	$1,000,000 each occurrence
	$1,000,000 general aggregate

5. ADDITIONAL REQUIREMENTS

The City may require insurance covering a Bidder or subcontractor more or less than the standard requirements set forth herein depending upon the character and extent of the work to be performed by such Bidder or subcontractor.

Insurance as herein required shall be maintained in force until the City releases the Bidder of all obligations under the Contract.

The Bidder shall provide and carry any additional insurance as may be required by special provisions of these specifications.

6. CERTIFICATE OF INSURANCE

Satisfactory certificates of insurance shall be filed with the City prior to starting any work on this Contract**. The certificates shall show the City as an additional insured on all coverage except Workers Compensation. The certificate shall state that thirty (30) days written notice shall be given to the City before any policy is cancelled (strike the "endeavor to" wording often shown on certificate forms). If the bidder cannot have the "endeavor to" language stricken, the bidder may elect to provide a new certificate of insurance every 30 days during the contract. Bidder shall immediately notify the City if there is any reduction of coverage because of revised limits or claims paid which affect the aggregate of any policy.**