City of Hailey, Idaho

Public Works Department
115 S. Main St, Hailey, ID 83333
(208) 788-9830

Contract Documents and Specifications

WASTEWATER TREATMENT PLANT IMPROVEMENTS STANDBY GENERATOR REPLACEMENT PROJECT

January 20, 2021

Prepared by:

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&

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INVITATION TO BID

The City of Hailey, Idaho, is accepting sealed bids at the office of the City Clerk, 115 Main St. S, Hailey, Idaho 83333, until 2:00 p.m., local time, Wednesday, February 10, 2021, for the following project:

STANDBY GENERATOR REPLACEMENT

At 2:00 p.m. on the same day, all bid proposals will be opened publicly and read aloud in the Hailey City Hall council chambers.

The proposed Work includes: Removal of existing 250KW and 400KW diesel generators (for Owner salvage) and replacement with single 750 KW diesel generator and switch gear (Owner Furnished). Ancillary work including: demolition, wiring, new generator pad construction and re-paving around work.

The contract documents, plans and specifications may be obtained at the City of Hailey Public Works Department, 115 Main St. S, Hailey, Idaho 83333. The contract documents, plans and specifications may also be obtained via email by contacting Nancy Arellano at the City of Hailey: (208) 788-9830 x1 or nancy.arellano@haileycityhall.org. Questions regarding the contract documents or scope of work should be submitted in writing to nancy.arellano@haileycityhall.org.

Bidders must hold a valid Idaho Public Works License prior to the bid due date. Bidders must submit a list of all subcontractors with their bid.

Any objections to the contents or terms of the contract documents, plans and specifications shall be raised no later than three (3) days prior to the bid opening date and time.

The City of Hailey reserves the right to reject any and all bids.

______________________________
Mary Cone, City Clerk

Publish January 27 and February 3, 2021
INSTRUCTIONS TO BIDDERS

BID PROPOSALS

The City of Hailey, Idaho, is accepting sealed bids at the office of the City Clerk, 115 Main St. S, Hailey, Idaho 83333, until 2:00 p.m., local time, Wednesday, February 10, 2020, for the following project:

GENERATOR REPLACEMENT AT HAILEY WASTEWATER PLANT

At 2:00 p.m. on the same day, all bid proposals will be opened publicly and read aloud in the Hailey City Hall council chambers.

The contract documents, plans and specifications may be obtained at the City of Hailey Public Works Department, 115 Main St. S, Hailey, Idaho 83333. The contract documents, plans and specifications may also be obtained via email by contacting Nancy Arellano at the City of Hailey: (208) 788-9830 x1 or nancy.arellano@haileycityhall.org. Questions regarding the contract documents or scope of work should be submitted in writing to nancy.arellano@haileycityhall.org.

The Bidder must hold a valid Idaho Public Works License prior to the bid due date. The Bidder must submit a list of all subcontractors with their BID PROPOSAL.

The BID PROPOSAL must be submitted in a sealed envelope, plainly marked on the outside as:

“BID FOR GENERATOR REPLACEMENT”

If forwarded by mail, the sealed envelope containing the BID PROPOSAL must be enclosed in another envelope addressed to the HAILEY PUBLIC WORKS DEPARTMENT, in care of the receiving office.

The BID PROPOSAL must be made on the required BID FORM. All blank spaces for bid prices must be filled in, in ink or typewritten, and the BID FORM must be fully completed and executed when submitted. Only one copy of the BID FORM is required.

The CITY OF HAILEY may waive any informalities or minor defects or reject any and all BID PROPOSALS. Any BID PROPOSAL may be withdrawn prior to the above scheduled time for the opening of BID PROPOSALS or authorized postponement thereof. Any BID PROPOSAL received after the time and date specified shall not be considered. No Bidder may withdraw a BID PROPOSAL within 20 days after the actual date of the opening thereof. Should there be reasons why the contract cannot be awarded within the specified period, the time may be extended by mutual agreement between the CITY OF HAILEY and the Bidder.

The Bidder is responsible for inspecting the site and for reading and being thoroughly familiar with the CONTRACT DOCUMENTS. The failure or omission of the Bidder to do any of the foregoing shall in no way relieve the Bidder from any obligation in respect to the Bidder’s BID PROPOSAL. The Bidder must satisfy themselves of the accuracy of any estimated quantities in the BID PROPOSAL by examination of the site and a review of the drawings and specifications including ADDENDA. The quantities shown in the BID PROPOSAL are estimated quantities and are given solely for the purpose of facilitating the comparison of Proposals. All computations of the Contractor's compensation shall be based upon the quantities of work actually performed, whether greater or less than estimated quantities. After BID PROPOSALS have been submitted, the Bidder shall not assert that there was a misunderstanding concerning the quantities of WORK or of the nature of the WORK to be done. Any objections to the contents or terms of the contract documents, plans and specifications shall be raised no later than three (3) days prior to the bid opening date and time.

The CONTRACT DOCUMENTS contain the provisions required for the construction of the project. Information obtained from an officer, agent, or employee of the CITY OF HAILEY, or any other person, shall not affect the risks or obligations assumed by the CONTRACTOR or relieve him from fulfilling any of the conditions of the AGREEMENT.

A PERFORMANCE BOND and a PAYMENT BOND, each in the amount of 100 percent of the CONTRACT PRICE, with a corporate surety approved by the CITY OF HAILEY, will be required for the faithful performance of the contract. Attorneys-in-fact who sign PERFORMANCE BONDS or PAYMENT BONDS must file with each bond a certified and effective dated copy of their power of attorney.

A conditional or qualified BID PROPOSAL will not be accepted.

The CITY OF HAILEY reserves the right to reject any or all BID PROPOSALS, and to postpone the award of the CONTRACT for a period not to exceed sixty (60) days.
SUCCESSFUL BIDDER, NOTICE-OF-AWARD, EXECUTION OF AGREEMENT, and NOTICE-TO-PROCEED

The Bidder to whom the CITY OF HAILEY issues a NOTICE-OF-AWARD is deemed the “Successful Bidder.”

The CITY OF HAILEY may make such investigations as deemed necessary to determine the ability of the Successful Bidder to perform the WORK, and the Successful Bidder shall furnish to the CITY OF HAILEY all such information and data for this purpose as the CITY OF HAILEY may request. The Successful Bidder shall supply the names and addresses of major material SUPPLIERS and SUBCONTRACTORS, if requested to do so by the CITY OF HAILEY. The CITY OF HAILEY reserves the right to reject any the Successful Bidder’s BID PROPOSAL if the evidence submitted by, or investigation of, the Successful Bidder fails to satisfy the CITY OF HAILEY that the Successful Bidder is properly qualified to carry out the obligations of the AGREEMENT and to complete the WORK contemplated therein.

The CITY OF HAILEY shall include with the NOTICE-OF-AWARD the necessary agreement and bond forms. Within seven (7) calendar days from the date when the NOTICE-OF-AWARD is delivered to the Successful Bidder, the Successful Bidder will be required to execute the AGREEMENT and provide the acceptable PERFORMANCE BOND, PAYMENT BOND, and CERTIFICATE OF INSURANCE. If the Successful Bidder is unable to execute the AGREEMENT, as described, the CITY OF HAILEY may consider the Successful Bidder in default.

The CITY OF HAILEY, within ten (10) days of receipt of acceptable PERFORMANCE BOND, PAYMENT BOND, CERTIFICATE OF INSURANCE, and AGREEMENT, signed by the Successful Bidder to whom the AGREEMENT was awarded, shall sign the AGREEMENT and return an executed duplicate of the AGREEMENT to the Successful Bidder. Should the CITY OF HAILEY not execute the AGREEMENT within this ten (10) day period, the Successful Bidder may, by written notice, withdraw the signed AGREEMENT. Such notice of withdrawal shall be effective upon receipt of the notice by the CITY OF HAILEY. Upon execution of the AGREEMENT, the Successful Bidder is deemed the “CONTRACTOR.”

The CITY OF HAILEY shall issue the NOTICE-TO-PROCEED immediately following execution of the AGREEMENT by the CITY OF HAILEY. Should there be reasons why the NOTICE-TO-PROCEED cannot be issued within such period, the time may be extended by mutual agreement between the CITY OF HAILEY and CONTRACTOR. If the NOTICE-TO-PROCEED has not been issued after sixty (60) days of the bid opening or within the period mutually agreed upon, the CONTRACTOR may terminate the AGREEMENT without further liability on the part of either party.

All applicable laws, ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the PROJECT shall apply to the contract throughout as if written therein in full.

PROJECT DESCRIPTION

The proposed Work includes: construction of a 10’-0” wide by 24’-6” long by 3’ deep concrete pad for installation of a new 750KW standby generator and switch gear (Owner furnished). Miscellaneous associated work includes: demolition of an existing concrete fuel containment pad and two bollards, removal of 250KW and 400KW generators (Owner salvaged) and all associated electrical work to make a fully operational standby generator system supplying complete plant power in event of main power disruption. Work to be completed 90 days after notice to proceed.

This is a lump sum price basis project and the Contractor shall verify and confirm all quantities. Refer to the Bid documents for additional information.

Construction MUST be completed before the date specified in the agreement or liquidated damages will be enforced. The successful Contractor will be responsible for providing a work schedule with one week increments, and diligently following said schedule. The Contractor shall schedule a pre-construction meeting with the OWNER, to be held prior to commencing construction.

Questions regarding the contract documents or scope of work should be submitted in writing to nancy.arellano@haileycityhall.org.

PROJECT SPECIFICATION

This project’s specifications are as noted on the CONTSTRUCITON DRAWINGS, the most current edition of the City of Hailey Standard Drawings and Specifications, and the Idaho State Public Works Construction Standard Specifications.
PROJECT IDENTIFICATION:

CITY OF HAILEY
STANDBY GENERATOR REPLACEMENT AT HAILEY WASTEWATER PLANT

THIS BID IS SUBMITTED TO:

City of Hailey
115 Main St. S
Hailey, ID 83333

1.01 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an agreement with the CITY OF HAILEY in the form included in the Bidding Documents to perform all work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

2.01 The undersigned Bidder accepts all of the terms and conditions of the Advertisement and/or Invitation to Bid and Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. The Bid will remain subject to acceptance for 60 days after the opening of Bid Proposals, or for such longer period of time that Bidder may agree to in writing upon request of the CITY OF HAILEY.

3.01 In submitting this Bid, the undersigned Bidder represents, as set forth in the AGREEMENT, that:

A. The Bidder has examined and carefully studied the Bidding Documents, the other related data identified in the Bidding Documents, and the following Addenda, receipt of all of which is hereby acknowledged.

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B. The Bidder has visited the project site and become familiar with and is satisfied as to the general, local and project site conditions that may affect cost, progress, and performance of the WORK.

C. The Bidder is familiar with and is satisfied as to all federal, state and local laws and regulations that may affect cost, progress and performance of the WORK.

D. The Bidder has carefully studied all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the project site. The Bidder acknowledges that the CITY OF HAILEY does not assume responsibility for the accuracy or completeness of information and data shown or indicated in the Bidding Documents with respect to underground facilities at or contiguous to the site.

E. The Bidder does not consider that any further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the work at the price(s) bid and within the times and in accordance with the other terms and conditions of the Bidding Documents.
F. The Bidder is aware of the general nature of work to be performed by the CITY OF HAILEY and others at the project site that relates to the WORK as indicated in the Bidding Documents.

G. The Bidder has correlated the information known to the Bidder, information and observations obtained from visits to the project site, reports and drawings identified in the Bidding Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Bidding Documents.

H. The Bidder has given the City of Hailey Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and the written resolution thereof by the City of Hailey Engineer is acceptable to the Bidder.

I. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the WORK for which this Bid is submitted.

4.01 The Bidder further represents that this Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any agreement or rules of any group, association, organization or corporation; Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid; The Bidder has not solicited or induced any individual or entity to refrain from bidding; and the Bidder has not sought by collusion to obtain for itself any advantage over any other Bidder or over the CITY OF HAILEY.

4.02 Construction Schedule Coordination: The Bidder, after receipt of NOTICE-TO-PROCEED, shall coordinate with the City of Hailey Engineer to verify the proposed construction start date as indicated in the Agreement. The Contractor shall schedule a pre-construction meeting with the City of Hailey Engineer, to be held prior to commencing construction.

5.01 LUMP SUM BID: The Bidder will complete the WORK in accordance with the Contract Documents for the following price:

PROJECT: STANDBY GENERATOR PAD AT HAILEY WASTEWATER PLANT

LUMP SUM BID PRICE: $____________________________

LUMP SUM AMOUNT WRITTEN IN WORDS

__________________________________________________________ Dollars

6.01 The Bidder agrees that the WORK will be substantially completed and ready for final payment on or before the dates or within the number of calendar days indicated in the AGREEMENT.

6.02 The Bidder accepts the provisions of the AGREEMENT as to liquidated damages in the event of failure to complete the WORK within the times specified above, which shall be stated in the AGREEMENT.

7.01 The following information is included in this bid package:

A. Instructions to Bidders
B. Bid Form
C. Notice of Award
D. Agreement
E. Payment Bond
F. Performance Bond
G. Certificate of Insurance  
H. Notice to Proceed  
I. Drawings by HDR Inc. and DC Engineering, Inc. dated January 20, 2021 titled “Generator Replacement at Hailey Wastewater Plant”

7.02 The following documents are attached to and made a condition of this Bid:

A. The Bidder shall include in his Bid the name, or names and address, or addresses, and Idaho Public Works Contractor License Numbers of the Subcontractors who shall, in the event the Bidder secures the Contract, subcontract the plumbing, heating and air-conditioning work, and electrical work under the general Contract; and

B. In addition to subcontractors for plumbing, heating and air-conditioning work, and electrical work, provide the names and addresses of the additional subcontractors, suppliers, individuals or entities called for in the Instructions to Bidders (include Idaho Public Works Contractor License Numbers for any subcontractors).

C. The Bidder and the Bidder’s subcontractors must hold a valid Idaho Public Works License prior to the bid due date. The Bidders must submit a list of all subcontractors with their bid.

SUBMITTED on __________________, 2021.

Idaho Public Works Contractor License No______________________________.

Expiration Date______________________________.

If Bidder is:

An Individual

Name (typed or printed): ____________________________________________

By: _____________________________ (SEAL)  
(Individual’s signature)

Doing business as: ________________________________________________

Business address: ________________________________________________

__________________________________________________________________

Phone No.: ____________________  FAX No.: ________________________
A Partnership

Partnership Name: ________________________________ (SEAL)

By: ________________________________
   (Signature of general partner -- attach evidence of authority to sign)

Name (typed or printed): ________________________________

Title: ________________________________

Business address: ________________________________

______________________________________________

Phone No.: _______________  FAX No.: _______________

A Corporation

Corporation Name: ________________________________ (SEAL)

By: ________________________________
   (Signature -- attach evidence of authority to sign)

Name (typed or printed): ________________________________

Title: ________________________________

   (CORPORATE SEAL)

Attest: ________________________________
   (Signature of Corporate Secretary)

Business address: ________________________________

______________________________________________

Phone No.: _______________  FAX No.: _______________

State of Incorporation: ________________________________

Date of Qualification to do business is ________________________________.
A Joint Venture

Joint Venturer Name: ________________________________ (SEAL)

By: ________________________________
   (Signature of joint venture partner -- attach evidence of authority to sign)

Name (typed or printed): ________________________________

Title: ________________________________

Business address: ________________________________

____________________________________________________________________________________

Phone No.: __________________ FAX No.: __________________

Joint Venturer Name: ________________________________ (SEAL)

By: ________________________________
   (Signature -- attach evidence of authority to sign)

Name (typed or printed): ________________________________

Title: ________________________________

Business address: ________________________________

____________________________________________________________________________________

Phone No.: __________________ FAX No.: __________________

Phone and FAX Number, and Address for receipt of official communications:

____________________________________________________________________________________

(Each joint venturer must sign. The manner of signing for each individual, partnership, and corporation that is a party to the joint venture should be in the manner indicated above.)
A Limited Liability Company

Limited Liability Company Name: ____________________________ (SEAL)

By: ____________________________
   (Signature -- attach evidence of authority to sign)

Name (typed or printed): ____________________________

Title: ____________________________

Attest ____________________________
   (Signature of Member/Manager)

Business address: ____________________________

Phone No.: ______________________ FAX No.: ___________________

State of Organization: ____________________________

Date of Qualification to do business is _________________________.
NOTICE OF AWARD

Dated: __________________

[Certified Mail -- Return Receipt Requested]

TO:___________________________________________________________

                  (BIDDER)

ADDRESS: _____________________________________________________

________________________________________________________________

Contract: GENERATOR REPLACEMENT AT HAILEY WASTEWATER PLANT

(Insert name of Contract as it appears in the Bidding Documents)

Project: City of Hailey Standby Generator Replacement at Hailey Wastewater Plant

OWNER's Contract No. N/A

________________________________________________________________

You are notified that your Bid dated __________________, for the above Contract has been considered. You are the apparent Successful Bidder and have been awarded a Contract for the Standby Generator Replacement at Hailey Wastewater Plant project.

The Contract Price of your Contract is ________________________________

($________________)

One (1) copy of the proposed Contract Documents and one (1) copy of the Construction Drawings accompany this Notice of Award.

You must comply with the following conditions upon receipt of this Notice of Award.

1. Deliver to the CITY OF HAILEY one (1) fully executed copy of the Contract Documents within seven (7) calendar days of this Notice of Award.

2. Deliver with the executed Contract Documents the Contract security (Bonds) and Certificate of Insurance as specified in this document within fourteen (14) calendar days of this Notice of Award.
3. (List other conditions precedent).

Failure to comply with these conditions within the time specified will entitle the CITY OF HAILEY to consider your Bid in default, to annul this Notice of Award and to declare your Bid security, if any, forfeited.

Within fourteen (14) calendar days after you comply with the above conditions, the CITY OF HAILEY will return to you one fully executed counterpart of the Contract Documents.

City of Hailey

(OWNER)

By:

(AUTHORIZED SIGNATURE)

Mayor

(TITLE)
AGREEMENT

This AGREEMENT, made this __________ day of ________________, 2021, by and between the City of Hailey, Idaho, hereinafter called “CITY OF HAILEY” and ____________________________________ hereinafter called “CONTRACTOR”.

WITNESSETH: That for and in consideration of the payments and agreements hereinafter mentioned:

1. The CONTRACTOR will commence and complete the construction of:
   STANDBY GENERATOR REPLACEMENT AT HAILEY WASTEWATER PLANT.

2. The CONTRACTOR will furnish all of the material, supplies, tools, equipment, labor and other services necessary for the construction and completion of the WORK described herein.

3. The CONTRACTOR will commence work no later than 60 days after Notice to Proceed. All work must achieve final completion by 120 days after Notice to Proceed (“Date of Final Completion”), unless otherwise extended by the CONTRACT DOCUMENTS.

4. The CONTRACTOR agrees to perform all of the WORK described in the CONTRACT DOCUMENTS and comply with the terms therein for the sum of:

   $ __________________________

   as shown in the submitted BID PROPOSAL.

5. The term “CONTRACT DOCUMENTS” means and includes the following:

   5.01 INSTRUCTIONS TO BIDDERS
   5.02 BID FORM
   5.03 NOTICE OF AWARD
   5.04 AGREEMENT
   5.05 PAYMENT BOND
   5.06 PERFORMANCE BOND
   5.07 CERTIFICATE OF INSURANCE
   5.08 NOTICE TO PROCEED
   5.09 DRAWING BY HDR ENGINEERING DATED JANUARY 8, 2021 TITLED “GENERATOR REPLACEMENT AT HAILEY WASTEWATER PLANT”
   5.10 CITY OF HAILEY STANDARD DRAWINGS AND SPECIFICATIONS
   5.11 IDAHO STATE PUBLIC WORKS CONSTRUCTION STANDARD SPECIFICATIONS

6. Retainage. The CITY OF HAILEY will pay to the CONTRACTOR in the manner and at such times as set forth in the General Conditions such amounts as required by the CONTRACT DOCUMENTS. Five-percent (5%) retainage will be held from each payment. Retainage will be released upon Certification of Substantial Completion.

7. Liquidated Damages. The CITY OF HAILEY and CONTRACTOR recognize that time is of the essence of this Agreement and that the CITY OF HAILEY will suffer financial loss if the WORK is not completed within the times specified in paragraph 3 above. They also recognize the delays, expense and difficulties involved in proving the actual loss suffered by the CITY OF HAILEY if the WORK is not completed on time. Accordingly, instead of requiring any such proof, the CITY OF HAILEY and CONTRACTOR agree that as liquidated damages for delay (but not as a penalty) CONTRACTOR shall pay the CITY OF HAILEY five hundred dollars ($500.00) for each day that expires after the Date of Final Completion, or any proper extension thereof granted by the CITY OF HAILEY.

8. This Agreement shall be binding upon all parties hereto and their respective heirs, executors, administrators, successors, and assigns.

IN WITNESS WHEREOF, the parties hereto have executed, or caused to be executed by their duly authorized officials, this Agreement, deemed an original on the date first above written.
OWNER:

CITY OF HAILEY, IDAHO

BY: ________________________________

(SEAL)

Martha Burke, Mayor

ATTEST:

________________________________________________________________________

Mary Cone, Clerk

CONTRACTOR:

________________________________________________________________________

BY: ________________________________

Title: ________________________________

Address: ________________________________

(SEAL)

ATTEST:

________________________________________________________________________

Name: ________________________________ (Type or Print)

Title: ________________________________
Payment Bond

Any singular reference to Contractor, Surety, Owner (CITY OF HAILEY) or other party shall be considered plural where applicable.

CONTRACTOR (Name and Address): SURETY (Name and Address of Principal Place of Business):

OWNER (Name and Address):  

CONTRACT
Date:
Amount:
Description (Name and Location):

BOND
Date (Not earlier than Contract Date):
Amount:
Modifications to this Bond Form:

Surety and Contractor, intending to be legally bound hereby, subject to the terms printed on the reverse side hereof, do each cause this Payment Bond to be duly executed on its behalf by its authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL
Company: (Corp. Seal)
Signature: ____________________________
Name and Title: _______________________

SURETY
Company: (Corp. Seal)
Signature: ____________________________
Name and Title: _______________________
(Attach Power of Attorney)

(Space is provided below for signatures of additional parties, if required.)

CONTRACTOR AS PRINCIPAL
Company: (Corp. Seal)
Signature: ____________________________
Name and Title: _______________________

SURETY
Company: (Corp. Seal)
Signature: ____________________________
Name and Title: _______________________

1. The CONTRACTOR and the Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the OWNER to pay for labor, materials and equipment furnished for use in the performance of the Contract, which is incorporated herein by reference.

2. With respect to the OWNER, this obligation shall be null and void if the CONTRACTOR:

Originally prepared through the joint efforts of the Surety Association of America, Engineers Joint Contract Documents Committee, the Associated General Contractors of America, the American Institute of Architects, the American Subcontractors Association, and the Associated Specialty Contractors
OWNER has promptly notified the CONTRACTOR and the Surety (at the addresses described in paragraph 12) of any claims, demands, liens or suits and tendered defense of such claims, demands, liens or suits to the CONTRACTOR and the Surety, and provided there is no OWNER Default.

3. With respect to Claimants, this obligation shall be null and void if the CONTRACTOR promptly makes payment, directly or indirectly, for all sums due.

4. The Surety shall have no obligation to Claimants under this Bond until:

4.1. Claimants who are employed by or have a direct contract with the CONTRACTOR have given notice to the Surety (at the addresses described in paragraph 12) and sent a copy, or notice thereof, to the OWNER, stating that a claim is being made under this Bond and, with substantial accuracy, the amount of the claim.

4.2. Claimants who do not have a direct contract with the CONTRACTOR:

1. Have furnished written notice to the CONTRACTOR and sent a copy, or notice thereof, to the OWNER, within 90 days after having last performed labor or last furnished materials or equipment included in the claim stating, with substantial accuracy, the amount of the claim and the name of the party to whom the materials were furnished or supplied or for whom the labor was done or performed; and

2. Have either received a rejection in whole or in part from the CONTRACTOR, or not received within 30 days of furnishing the above notice any communication from the CONTRACTOR by which the CONTRACTOR had indicated the claim will be paid directly or indirectly; and

3. Not having been paid within the above 30 days, have sent a written notice to the Surety and sent a copy, or notice thereof, to the OWNER, stating that a claim is being made under this Bond and enclosing a copy of the previous written notice furnished to the CONTRACTOR.

5. If a notice required by paragraph 4 is given by the OWNER to the CONTRACTOR or to the Surety, that is sufficient compliance.

6. When the Claimant has satisfied the conditions of paragraph 4, the Surety shall promptly and at the Surety's expense take the following actions:

6.1. Send an answer to the Claimant, with a copy to the OWNER, within 45 days after receipt of the claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed.

6.2. Pay or arrange for payment of any undisputed amounts.

7. The Surety's total obligation shall not exceed the amount of this Bond, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.

8. Amounts owed by the OWNER to the CONTRACTOR under the Contract shall be used for the performance of the Contract and to satisfy claims, if any, under any Performance Bond. By the CONTRACTOR furnishing and the OWNER accepting this Bond, they agree that all funds earned by the CONTRACTOR in the performance of the Contract are dedicated to satisfy obligations of the CONTRACTOR and the Surety under this Bond, subject to the OWNER's priority to use the funds for the completion of the Work.

9. The Surety shall not be liable to the OWNER, Claimants or others for obligations of the CONTRACTOR that are unrelated to the Contract. The OWNER shall not be liable for payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligations to make payments to, give notices on behalf of, or otherwise have obligations to Claimants under this Bond.

10. The Surety hereby waives notice of any change, including changes of time, to the Contract or to related Subcontracts, purchase orders and other obligations.

11. No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the location in which the Work or part of the Work is located or after the expiration of one year from the date (1) on which the Claimant gave the notice required by paragraph 4.1 or paragraph 4.2.3, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

12. Notice to the Surety, the OWNER or the CONTRACTOR shall be mailed or delivered to the addresses shown on the signature page. Actual receipt of notice by Surety, the OWNER or the CONTRACTOR, however accomplished, shall be sufficient compliance as of the date received at the address shown on the signature page.

13. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the Contract was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted here from and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. The intent is, that this Bond shall be construed as a statutory Bond and not as a common law bond.

14. Upon request of any person or entity appearing to be a potential beneficiary of this Bond, the CONTRACTOR shall promptly furnish a copy of this Bond or shall permit a copy to be made.

15. DEFINITIONS

15.1. Claimant: An individual or entity having a direct contract with the CONTRACTOR or with a Subcontractor of the CONTRACTOR to furnish labor, materials or equipment for use in the performance of the Contract. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental equipment used in the Contract, architectural and engineering services required for performance of the Work of the CONTRACTOR and the CONTRACTOR's Subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials or equipment were furnished.

15.2. Contract: The agreement between the OWNER and the CONTRACTOR identified on the signature page, including all Contract Documents and changes thereto.

15.3. OWNER Default: Failure of the OWNER, which has neither been remedied nor waived, to pay the CONTRACTOR as required by the Contract or to perform and complete or comply with the other terms thereof.

Originally prepared through the joint efforts of the Surety Association of America, Engineers Joint Contract Documents Committee, the Associated General Contractors of America, the American Institute of Architects, the American Subcontractors Association, and the Associated Specialty Contractors

PAYMENT BOND - 2
Performance Bond

Any singular reference to Contractor, Surety, Owner (CITY OF HAILEY) or other party shall be considered plural where applicable.

CONTRACTOR (Name and Address): SURETY (Name and Address of Principal Place of Business):

OWNER (Name and Address):

CONTRACT
Date:
Amount:
Description (Name and Location):

BOND
Date (Not earlier than Contract Date):
Amount:
Modifications to this Bond Form:

Surety and Contractor, intending to be legally bound hereby, subject to the terms printed on the reverse side hereof, do each cause this Performance Bond to be duly executed on its behalf by its authorized officer, agent or representative.

CONTRACTOR AS PRINCIPAL
Company: (Corp. Seal)
Signature: ________________________________
Name and Title: __________________________

SURETY
Company: (Corp. Seal)
Signature: ________________________________
Name and Title: __________________________
(Attach Power of Attorney)

(Space is provided below for signatures of additional parties, if required.)

CONTRACTOR AS PRINCIPAL
Company: (Corp. Seal)
Signature: ________________________________
Name and Title: __________________________

SURETY
Company: (Corp. Seal)
Signature: ________________________________
Name and Title: __________________________
1. The CONTRACTOR and the Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner for the performance of the Contract, which is incorporated herein by reference.

2. If the CONTRACTOR performs the Contract, the Surety and the CONTRACTOR have no obligation under this Bond, except to participate in conferences as provided in paragraph 3.1.

3. If there is no OWNER Default, the Surety's obligation under this Bond shall arise after:

3.1. The Owner has notified the CONTRACTOR and the Surety at the addresses described in paragraph 10 below, that the Owner is considering declaring a CONTRACTOR Default and has requested and attempted to arrange a conference with the CONTRACTOR and the Surety to be held not later than fifteen days after receipt of such notice to discuss methods of performing the Contract. If the Owner, the CONTRACTOR and the Surety agree, the CONTRACTOR shall be allowed a reasonable time to perform the Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a CONTRACTOR Default; and

3.2. The Owner has declared a CONTRACTOR Default and formally terminated the CONTRACTOR's right to complete the Contract. Such CONTRACTOR Default shall not be declared earlier than twenty days after the CONTRACTOR and the Surety have received notice as provided in paragraph 3.1; and

3.3. The Owner has agreed to pay the Balance of the Contract Price to:

3.3.1. The Surety in accordance with the terms of the Contract;

3.3.2. Another contractor selected pursuant to paragraph 4.3 to perform the Contract.

4. When the Owner has satisfied the conditions of paragraph 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

4.1. Arrange for the CONTRACTOR, with consent of the Owner, to perform and complete the Contract; or

4.2. Undertake to perform and complete the Contract itself, through its agents or through independent contractors; or

4.3. Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Contract, arrange for a contract to be prepared for execution by the Owner and the contractor selected with the Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the Bonds issued on the Contract, and pay to the Owner the amount of damages as described in paragraph 6 in excess of the Balance of the Contract Price incurred by the Owner resulting from the CONTRACTOR Default;

4.4. Waive its right to perform and complete, arrange for completion, or obtain a new contractor and with reasonable promptness under the circumstances;

4.4.1. After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, tender payment therefor to the Owner; or

4.4.2. Deny liability in whole or in part and notify the Owner citing reasons therefor.

5. If the Surety does not proceed as provided in paragraph 4 with reasonable promptness, the Surety shall be deemed to be in default on this Bond fifteen days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in paragraph 4.4, and the Owner refuses the payment tendered or the Surety has denied pliability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.

6. After the Owner has terminated the CONTRACTOR's right to complete the Contract, and if the Surety elects to act under paragraph 4.1, 4.2, or 4.3 above, then the responsibilities of the Surety to the Owner shall not be greater than those of the CONTRACTOR under the Contract, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Contract. To a limit of the amount of this Bond, but subject to commitment by the Owner of the Balance of the Contract Price to mitigation of costs and damages on the Contract, the Surety is obligated without duplication for:

6.1. The responsibilities of the CONTRACTOR for correction of defective Work and completion of the Contract;

6.2. Additional legal, design professional and delay costs resulting from the CONTRACTOR's Default, and resulting from the actions or failure to act of the Surety under paragraph 4; and

6.3. Liquidated damages, or if no liquidated damages are specified in the Contract, actual damages caused by delayed performance or non-performance of the CONTRACTOR.

7. The Surety shall not be liable to the Owner or others for obligations of the CONTRACTOR that are unrelated to the Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, or successors.

8. The Surety hereby waives notice of any change, including changes of time, to the Contractor or to related subcontracts, purchase orders and other obligations.

9. Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the Work or part of the Work is located and shall be instituted within two years after CONTRACTOR Default or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

10. Notice to the Surety, the Owner or the CONTRACTOR shall be mailed or delivered to the address shown on the signature page.

11. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the Contract was be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted here from and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. The intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

12. Definitions.

12.1 Balance of the Contract Price: The total amount payable by the Owner to the CONTRACTOR under the Contract after all proper adjustments have been made, including allowance to the CONTRACTOR of any amounts received or to be received by the Owner in settlement of insurance or other Claims for damages to which the CONTRACTOR is entitled, reduced by all valid and proper payments made to or on behalf of the CONTRACTOR under the Contract.

12.2. Contract: The agreement between the Owner and the CONTRACTOR identified on the signature page, including all Contract Documents and changes thereto.

12.3. CONTRACTOR Default: Failure of the CONTRACTOR, which has neither been remedied nor waived, to perform or otherwise to comply with the terms of the Contract.

12.4. OWNER Default: Failure of the OWNER, which has neither been remedied nor waived, to pay the CONTRACTOR as required by the Contract or to perform and complete or comply with the other terms thereof.

Originally prepared through the joint efforts of the Surety Association of America, Engineers Joint Contract Documents Committee, the Associated General Contractors of America, and the American Institute of Architects

PERFORMANCE BOND - 2
NOTICE TO PROCEED

Dated _________________________

TO __________________________________________________________

(CONTRACTOR)

ADDRESS: ____________________________________________________

__________________________________________________________________

Contract: STANDBY GENERATOR REPLACEMENT AT HAILEY WASTEWATER PLANT
(Insert name of Contract as it appears in the Contract Documents)

You are hereby notified to commence WORK on _________________________ in accordance with the AGREEMENT, and you are to complete the WORK by _________________________, unless the period for completion is extended otherwise by the CONTRACT DOCUMENTS.

You are required to return an acknowledged copy of this NOTICE-TO-PROCEED to the CITY OF HAILEY.

Dated this ______ day of ________________________, 2021.

CITY OF HAILEY
(OWNER)

By: ____________________________________________________________

(AUTHORIZED SIGNATURE)

MARTHA BURKE, MAYOR
(TITLE)

__________________________________________________________________

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE TO PROCEED is hereby acknowledged on this _________ day of ________________________, 2021 by: __________________________________________

(Contractor)

By: _____________________________________________________________

Title: ___________________________________________________________
SECTION 01 11 00
SUMMARY OF WORK

PART 1 - GENERAL

1.1 DESCRIPTION
A. General:
   1. Furnish all labor, materials, tools, equipment and services as indicated in accordance with provisions of Contract Documents.
   2. It is the intent of the Contract Documents to describe a functionally complete project. Furnish and install all supplementary or miscellaneous items, appurtenances, and devices incidental to or necessary for a sound, secure, complete, and functional installation.

1.2 WORK COVERED BY CONTRACT
A. The Work of this Contract under the Base Bid generally includes the following:
   1. Base Bid:
      a. Removal of two existing generators and associated switch gear with a single generator.
      b. Installation of Owner Furnished generator and switch gear included all associated wiring.
      c. All miscellaneous earthwork, paving, and electrical associated with the generator upgrade.

B. The Work of this Contract under the Alternate Bid generally includes the following:
   1. Alternate Bid:
      a. None.

1.3 WORK BY OTHERS
A. The primary electric utilities will be replaced to provide the plant 480V power. Coordinate the construction with the electric utilities and provide adequate notice to the utilities of any work required in advance or requiring presence of their personnel. Contacts for coordination with the communications utilities are as follows:
   1. Idaho Power

1.4 WORK SEQUENCE
A. Organize and plan the construction activities to assure the safety and reliability of and to minimize the interruption to the treatment system, electric system and all other utilities.

B. The proposed Work sequence shall be submitted to the Engineer in the Schedule of Construction.
   1. Coordinate all power outages with Owner. Brief power outages (minutes not hours) will be allowed with proper planning and temporary systems in place (if necessary).
   2. Isolation of main power to existing temporary power for changes to existing main power for new generator system. Return main power for plant operation while removal of existing generators and associated switch gear. Period-of-time with no standby power during work shall be clearly understood and approved by Owner.
   3. Construction of generator pad for new Owner Furnished generator.
   4. Placement of new generator and final wiring.
   5. Functional testing of generator.

1.5 OWNER OCCUPANCY
A. Owner will occupy the premises during the entire period of construction for the conduct of his normal operations. Coordinate with Owner in all construction operations to minimize conflicts and to facilitate Owner usage.
1.6 PARTIAL OWNER OCCUPANCY
   A. Schedule operations so as to complete certain areas of the Work, as designated below, to enable
      Owner’s occupancy prior to Substantial Completion of the entire Work.

1.7 OUTAGES
   A. Organize and plan the construction activities so that the number and length of any required
      outages shall be minimized.
   B. An outage to any customer shall require specific approval of the Owner. The Owner reserves
      the right to reject any request for an outage.
   C. In some cases it may be necessary, at Contractor's expense, to either install temporary facilities
      for service or schedule the Work during a period when the outage would have minimal impact
      on treatment.
   D. Provide the Owner at least 72 HRS notice in advance of any requested outage so that the Owner
      may advise and coordinate the outage.

1.8 OWNER-FURNISHED PRODUCTS
   A. Products furnished and paid for by Owner shall be as follows:
      1. 750kW generator (see attached information)
      2. 1200-amp service entrance rated automatic transfer switch (see attached information)
   B. Contractor shall:
      1. Install Owner-furnished equipment per Contract Documents and manufacturer’s
         instructions.
      2. Perform inspection and testing as specified herein in accordance with industry standards and
         Owner-furnished equipment manufacturer’s recommendations.
      3. The equipment purchase contract with Western States Cat includes startup assistance (8
         hours, 1 trip, 1 day) and 1 hour of Owner training at the time of startup. The Contractor
         shall procure any additional needed services if required to assure a complete and functional
         system.

1.9 CONTRACTOR-FURNISHED PRODUCTS
   A. Furnish all products, other than Owner-furnished products designated above.
   B. Components required to be supplied in quantity within a specification section shall all be the
      same and shall be interchangeable.
   C. Unless otherwise indicated in the Contract Documents, provide materials and equipment that:
      1. is produced by reputable manufacturers having adequate experience in the manufacture of
         these items; and
      2. is designed for the service intended; and
      3. have not been previously been incorporated into another project or facility; and
      4. have not changed ownership since their initial production or fabrication and shipment from
         the manufacturer’s factory or facility; and
      5. if stored since their manufacture or fabrication, have, while in storage, been properly
         maintained and serviced in accordance with the manufacturer’s recommendations for long-
         term storage; submit documentation under the relevant technical section that such
         maintenance and service has been performed; and
      6. have not been subject to degradation or deterioration since manufacture; and
      7. are the current model(s) or type(s) furnished by the Supplier and only modified as necessary
         to comply with the design.

1.10 UNDERGROUND UTILITIES
   A. Utilities known to the Engineer who may have underground facilities in the vicinity of the Work,
      may be contacted as follows:
1. Idaho Power

1.11 PERMITS AND LICENSES

A. The Contractor shall apply for and obtain the following permits and approvals for the Work:
   1. Building Permit (paid by Owner)

B. Obtain, at his expense, all other permits and licenses necessary for the construction of the Work in accordance with City of Hailey code.

1.12 PHASING

A. Contractor shall be responsible for determining phasing of the existing system and insuring that the phasing of the new system is correct.

B. The implementation of generator replacement with new system electrical is critical to overall plant operation.

PART 2 - PRODUCTS - (NOT USED)

PART 3 - EXECUTION - (NOT USED)

END OF SECTION
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PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Administrative and procedural requirements for:
      a. Schedule of Values.
B. Related Specification Sections include but are not necessarily limited to:
   1. Division 00 - Procurement and Contracting Requirements.
   2. Division 01 - General Requirements.

1.2 QUALITY ASSURANCE
A. Referenced Standards:
   1. Building Code:
      a. International Code Council (ICC):

1.3 SUBMITTALS
A. As required in this section.

1.4 SCHEDULE OF VALUES
A. Where a Contract is awarded on a lump sum basis, file with the Owner a balanced price segregation of the lump sum bid into items similar to the various subdivisions of the general and detailed specifications, the sum of which shall equal the lump sum bid.
   1. The cost of various materials shall be furnished upon request of the Owner, and such data will then be used as a basis for making progress estimates.
   2. Breakdown costs, itemized by Specification Section and trade, and distribute cost to individual applicable units and structures.
   3. Where structures, units, equipment or other components are identified by a specific series or, identification number, utilize said designation throughout cost breakdown.
   4. Provide detailed breakdown for individual yard piping or conduit runs and identify approximate quantities involved to satisfaction of the Owner.
   5. Provide separate breakdown for change order items requested.
B. A reasonable allocation of the Contract Price to the component parts of the Work will be approved if component parts of the Work have values assigned to them that are well-balanced with respect to relative values for similar work established by published estimating guides.
   1. Unless otherwise agreed to at the Preconstruction Conference, Means Estimator Guide or other similar nationally recognized estimating guide shall be used for resolving differences between Engineer's and Contractor's opinions of allocation of values.
   2. Consent of Surety: If Contractor and Engineer cannot mutually agree on a Schedule of Values, Owner will approve a Schedule of Values approved by the Surety providing the Performance Bond.
C. Contractor's costs shall not govern the allocation of values when application of Contractor's costs to a component part of the Work results in any other component part or combination of component parts being under-valued in relation to conventional estimating guides.

1.5 APPLICATION FOR PAYMENT
A. Provide a Summary Sheet and cost breakdown sheets equivalent to those of Contractor's Application for Payment forms.
B. Submit this sheet each month with Contractor's pay request breakdown to the Engineer for review and recommendation for payment to the Owner.

C. If the Engineer cannot recommend payment to the Owner, the Engineer will notify the Contractor of reasons and changes needed. Make the changes and resubmit the application for payment.

D. The Summary, cost breakdown, and Stored Material Summary sheets shall be submitted to the Engineer for approval.

PART 2 - PRODUCTS - (NOT USED)

PART 3 - EXECUTION - (NOT USED)

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY
   A. Section Includes:
      1. Administrative and procedural requirements for:
         a. Preconstruction Conference.
         b. Temporary sanitary facilities
         c. Contractor's Field Office.
         d. Drawings and Contract Documents for Contractor use.
         e. Testing and Special Inspections.
         f. Schedule of values.
         g. Project meetings.
         h. Special considerations related to adjacent properties and facilities.
         i. Administrative procedures.
   B. Related Specification Sections include but are not necessarily limited to:
      1. Division 00 - Procurement and Contracting Requirements.
      2. Division 01 - General Requirements.

1.2 QUALITY ASSURANCE

1.3 SUBMITTALS
   A. Shop Drawings:
      1. See Specification Section 01 33 00 for requirements for the mechanics and administration of
         the submittal process.

1.4 PRECONSTRUCTION CONFERENCE
   A. Coordinate Project Meetings with Owner and Engineer.

1.5 TEMPORARY SANITARY FACILITIES
   A. Provide temporary sanitary facilities for use of construction workers during construction.
      Temporary facilities will be located near active construction areas.
   B. Do not use existing toilet facilities in occupied areas in construction area without Owner’s
      written consent.
   C. Provide facilities complying with local, State and Federal sanitary laws and regulations.
   D. Follow facility provider’s minimum maintenance frequency or service more frequently to keep in
      clean and sanitary condition.
   E. Provide adequate supplies of toilet paper, cleaning supplies, and other required items.

1.6 CONTRACTOR'S FIELD OFFICE
   A. Establish at site of Project, if needed.
   B. Remove field office from site upon acceptance of the entire work by the Owner.

1.7 DRAWINGS AND CONTRACT DOCUMENTS FOR CONTRACTOR USE
   A. Refer to General Conditions.
   B. Pick up all "no-charge" documents within 10 days from date of Notice to Proceed.
   C. Additional documents after "no-charge" documents will be furnished to Contractor at cost.
1.8 TESTING AND SPECIAL INSPECTIONS
   A. Provide all testing to confirm work adheres to specifications and serves final purpose.

1.9 SCHEDULE OF VALUES
   A. See Section 01 29 73 - Schedule of Values (Lump Sum Projects).

1.10 PROJECT MEETINGS
   A. Coordinate with Owner and Engineer.

1.11 SPECIAL CONSIDERATIONS RELATED TO FACILITIES
   A. Contractor shall be responsible for arrangements required to enable transportation of materials to the site.
   B. Access, Traffic Control, and Parking:
      1. Maintain conditions of access road to site such that access is not hindered as the result of construction related deterioration.
      2. Do not permit driving across or transporting materials or equipment across areas outside the construction limits shown on the Drawings.
      3. Provide traffic control devices and personnel necessary to ensure a safe interface of construction traffic with business traffic to and from adjacent sites.
      4. Provide access routes for emergency vehicles at all times.
      5. Provide daily sweeping of hard-surface roadways to remove soils tracked onto roadway.
      6. Provide on-site parking for all staff to limit interference with adjacent properties and businesses.

1.12 ADMINISTRATIVE PROCEDURES
   A. Unless otherwise specified, or agreed to in the Pre-Construction Conference, use the Owners standard forms for Work Change Directives, Change Orders, and Field Orders.

PART 2 - PRODUCTS - (NOT USED)

PART 3 - EXECUTION - (NOT USED)

END OF SECTION
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SECTION 01 73 29
DEMOLITION, CUTTING AND PATCHING

PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Demolition, cutting and patching of existing construction where shown on Drawings, or as required to accommodate new work shown or specified.
   2. Removal and protection of items identified to be saved or reused.
B. Related Specification Sections include but are not necessarily limited to:
   1. Division 00 - Procurement and Contracting Requirements.
   2. Division 01 - General Requirements.

1.2 SUBMITTALS
A. Shop Drawings:
   1. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
   2. Provide documentation of demolition and removal. Indicate limits and sequencing to be used. Show and identify any items to be kept for Owner reuse or retention.
   3. Provide schedule of demolition activities including overall schedule, planned utility interruptions, interruptions of Owner/Using Agency services and traffic control if required.
   4. Indicating manufacturer and type of:
      a. Proposed materials and methods to be used for new construction, matching and repairing existing construction.

1.3 DELIVERY, STORAGE, AND HANDLING
A. General:
   1. Salvage items, designated for Owner's salvage, as a functional unit.
   2. Protect from damage and deliver to location designated.
   3. Salvage each item with auxiliary or associated equipment required for operation.

1.4 PROJECT CONDITIONS
A. Perform preliminary investigations as required to ascertain extent of work.

1.5 SEQUENCING AND SCHEDULING
A. Coordinate and reschedule work as required to preclude interference with other operations.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
A. Subject to compliance with the Contract Documents.
B. Submit request for substitution in accordance with Owner’s protocol.

2.2 MATERIALS
A. As specified.
PART 3 - EXECUTION

3.1 PREPARATION

A. Provide and maintain covered passageways where necessary to ensure safe passage of persons in or near areas of work.

B. Provide and maintain substantial barricades and safety lights as required.

C. Provide and maintain temporary dustproof partitions where indicated or necessary.
   1. Prevent infiltration of dust into occupied areas.

D. Provide and maintain temporary weather protection as necessary.

E. Provide adequate temporary bracing to maintain safety, stability and to resist all loads to which the structure may be subjected.

3.2 DEMOLITION

A. Cutting and Removal:
   1. Remove existing work indicated to be removed, or as necessary for installation of new work.
   2. Neatly cut and remove materials, and prepare all openings to receive new work.
   3. Remove masonry or concrete in small sections.

B. Modification of Existing Concrete:
   1. Where indicated, remove existing concrete and finish remaining surfaces as shown.
      a. Make openings by sawing through the existing concrete.
         1) Core drill with 6 IN DIA core at the corners of rectangular openings to avoid overcutting at corners.
      b. Break out concrete after initial saw cuts in the event concrete thickness prevents cutting through.
      c. Where saw cutting is not possible, make openings by drilling holes around perimeter of opening and then chipping out the concrete.
         1) Holes shall be sufficient in number to prevent damage to remaining concrete.
   2. Oversize required openings in existing concrete 1 IN on all sides and build back to required opening size by means of grout epoxy bonded to the existing concrete.
   3. Where oversized openings cannot be made, remove the concrete to the required opening size and cut back exposed reinforcing 1 IN from face of concrete and fill resulting holes with bonding agent and non-shrink grout.
      a. At liquid containing structures, coat entire surface with cementitious waterproofing mortar.
   4. Protect remaining concrete from damage.
      a. If existing concrete to remain becomes damaged, cease demolition and make corrections as required to avoid further damage.
      b. Notify Engineer immediately of any damage to remaining concrete.

C. Removal of Existing Anchor Bolts or Other Protruding Elements:
   1. Remove all protruding elements.
   2. Remove to a depth of 1/4 IN from finished surface.
   3. Fill void with epoxy patch.

D. Matching and Patching:
   1. Walls, ceilings, floors or partitions:
      a. Repair abutting walls, ceilings, floors or partitions disturbed by removal.
      b. Match and patch existing construction disturbed during installation of new work.
   2. Methods and materials:
      a. Similar in appearance, and equal in quality to adjacent areas for areas or surfaces being repaired.
      b. Subject to review of Owner.
   3. Reinforcing steel that is cut and exposed:
a. Remove to a depth of 1/4 IN.
b. Fill void with epoxy patch.

E. Salvaged Items:
1. Thoroughly dry and clean all metal surfaces.
2. Dispose of items or materials not designated for Owner's salvage or reuse.
   a. Promptly remove from site.
3. Do not store or sell Contractor salvaged items or materials on-site.
4. Carefully remove items to be salvaged and reused or to be delivered to Owner's storage.
   a. Store and protect items indicated on Drawings or those which have been marked by Owner to be salvaged or to be reused in Work.
   b. Replace any item damaged through carelessness in removal, storage, or handling with new items of same type.
   c. Do not reuse materials or equipment not specifically indicated or specified to be reused.
5. Preparation of equipment for storage:
   a. Place small parts of wooden boxes and clearly mark contents on the outside.
   b. Attach unit to suitable crate bottom.
   c. Construct crate of wooden slats around top and sides of unit.

F. Clean Up: Transport debris and legally dispose of off-site.

3.3 SCHEDULE
A. Items to be salvaged to Owner:

<table>
<thead>
<tr>
<th>EQUIPMENT NAME /DESIGNATION</th>
<th>EQUIPMENT LOCATION</th>
<th>DELIVER TO OWNER'S LOCATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>250 KW Generator</td>
<td>Inside Electrical Building</td>
<td>As directed to on-site location</td>
</tr>
<tr>
<td>400 KW Generator</td>
<td>Outdoor near electrical building</td>
<td>As directed to on-site location</td>
</tr>
</tbody>
</table>

END OF SECTION
PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. All equipment anchoring and mounting shall be in accordance with manufacturer’s requirements for the seismic zone criteria.

B. Owner-Furnished Equipment:
   1. Owner-furnished equipment includes the following:
      a. 750kW generator
      b. 1200-amp service entrance rated automatic transfer switch
   2. Contractor shall:
      a. Install Owner-furnished equipment per Contract Documents and manufacturer’s instructions.
      b. Perform inspection and testing as specified herein in accordance with industry standards and Owner-furnished equipment manufacturer’s recommendations.
      c. The equipment purchase contract with Western States Cat includes startup assistance (8 hours, 1 trip, 1 day) and 1 hour of Owner training at the time of startup. The Contractor shall procure any additional needed services if required to assure a complete and functional system.

1.2 SHIPMENT AND STORAGE

A. Materials and equipment shall be stored in a manner to keep them dry and clean. Equipment and materials to be located indoors shall be stored indoors and sealed with plastic film wrap. Electrical and electronic equipment found stored or staged outdoors over night or in inclement weather shall be considered grounds for equipment rejection and shall be replaced at no cost to the Owner.

1.3 SUBMITTALS

A. Action Submittals: Provide arrangement and dimensional drawings, ratings, schematic and wiring diagrams, connection diagrams, bill of materials, nameplate schedule, and manufacturer descriptive information.
   1. Boxes and device plates.
   2. Junction and pull boxes.
   3. Circuit breakers and switches.
   4. Control devices, terminal blocks, and relays.
   5. Support and framing channels.
   7. Conduit, fittings, and accessories.
   8. Conductors, cable, and accessories.

B. Informational Submittals:
   1. Submit 30 days prior to performing inspections and test:
      a. Schedule for performing inspection and tests.
      b. List of references used for each test.
      c. Sample copy of equipment and materials inspection form(s).
   2. Factory test reports.
   3. Field test reports.
   4. Signed permits indicating Work is acceptable to regulatory authorities having jurisdiction.
   5. Operation and Maintenance Data:
      a. Provide for all equipment, as well as each device having features that can require adjustment, configuration, or maintenance.
b. Minimum information shall include manufacturer’s preprinted instruction manual, one copy of the approved submittal information for the item, tabulation of any settings, and copies of any test reports.

1.4 APPROVAL BY AUTHORITY HAVING JURISDICTION

A. Provide the Work in accordance with NFPA 70, National Electrical Code (NEC). Where required by the Authority Having Jurisdiction (AHJ), material and equipment shall be labeled or listed by a nationally recognized testing laboratory (or other organization acceptable to the AHJ) in order to provide a basis for approval under the NEC.

B. Materials and equipment manufactured within the scope of standards published by Underwriters Laboratories, Inc. shall conform to those standards and shall have an applied UL listing mark or label.

1.5 QUALIFICATIONS

A. PVC-Coated Rigid Steel Conduit Installer: Certified by conduit manufacturer as having received minimum 2 hours of training on installation procedures.

1.6 ENVIRONMENTAL CONDITIONS

A. Size and de-rate equipment and materials for the ambient conditions, but not less than an ambient temperature of 40 degrees C at an elevation of 5,300 feet without exceeding the manufacturer's stated tolerances.

B. Use materials and methods required for the following area classifications:
   1. All exterior areas: Wet.
   2. All interior areas: Dry:
   3. Use NEMA 12 materials and methods in all other areas.

1.7 EQUIPMENT COORDINATION AND SYSTEM RESPONSIBILITY

A. The Contractor is responsible to review and coordinate the equipment supplied from various manufacturers and vendors. This includes but is not limited to the following:
   1. Obtaining specific information on equipment ratings and sizes and verifying the electrical components supplied meet the requirements such as voltage, phase, frequency, starter types, etc.
   2. Due to the proprietary nature of digital control systems, including but not limited to, lighting control systems, fire alarm systems, SCADA systems, and motor control systems, the Contractor shall select, update the design (as required), and provide all components such that they are compatible, operate reliably, and comprise a functional and listed system suitable for the required performance.
   3. Providing equipment that will fit within the space allocated and meet OSHA and N.E.C. clearances.
   4. Coordination of the supplied equipment’s electrical power and control requirements.
   5. Providing power and control equipment, wiring, and raceways to meet the requirements of the mechanical equipment supplied.
   6. Providing all necessary control wiring and components for any special requirements from an equipment manufacturer.
   7. Provide single source coordination responsibility and ensure all system elements are products for which the manufacturer has accepted system responsibility. Agents, representatives, or entities not a direct division of the manufacturing corporation will not be accepted as a substitute for the system manufacturer.
   8. The equipment manufacturer shall not condition or void any warranty for the performance of this drawing/specification product due to incompatibility of any components covered in other drawing/specifications. This requirement does not obligate the manufacturer to warranty the workmanship or quality of components not manufactured by them.

B. The Contractor shall verify as a minimum:
   1. Correct voltage, phase and frequency
2. Size and space requirements
3. Mounting requirements
4. Correct motor starter type and size.
5. Proper coordination with the controls and control system integrator.

C. Bring any discrepancies between the electrical equipment and other equipment to the immediate attention of the Owner.

1.8 BASIS OF DESIGN
A. The basis of design is the installation of equipment and loads as shown in the drawings. In the event that different equipment is provided due to substituted equipment, value engineering, or for the vendor’s equipment to meet mechanical performance requirements the contractor shall coordinate various suppliers, vendors, and subcontractors to change the required electrical and control infrastructure as necessary to meet the vendor’s equipment installation requirements. The traits and characteristics of all provided materials, equipment, and devices shall meet the specifications. These changes to materials, equipment, and devices shall be at no cost to the Owner. Submittal information shall be coordinated with the provided equipment.

1.9 ARC FLASH MITIGATION METHODS
A. The following mitigation method requirements shall apply to all power distribution and utilization equipment supplied for any products supplied on the project and applies to all equipment divisions in the Contract Documents. Refer to the NFPA-70 (NEC) and NFPA-70E (Electrical Safety in the Workplace) for equipment labeling requirements.
B. Equipment Labels: Install equipment labels on the outside of the electrical equipment enclosure, cabinet, and panels to avoid opening the equipment to access the manufacture’s data or the equipment ratings.
C. Hinged Doors: Power distribution equipment shall have hinged rear doors where back access shown.
D. Insulated Power Bus and Insulated Cable Boots:
   1. Provide insulated power bus in power distribution equipment where accessible to installers or maintenance workers.
   2. Provide cable boots for power conductor connections to insulate the exposed power conductor connections.
E. Power and Control Equipment Separation:
   1. Provide separation between power equipment within an enclosure, cabinet, or panel by the use of barriers, separate access doors, or by other means.
   2. Provide separation barriers between main breaker feeders coming into equipment and other termination points or bussing on the load side of the main breaker.
F. Automatic Shutters: Provide automatic shutters, where possible, to close the access to the power bus when a power device is not engaged.
G. Arc flash maintenance system for circuit breakers where indicated.

1.10 EXTRA MATERIALS
A. Furnish, tag, and box for shipment and storage the following spare parts and special tools:
   1. Fuses, 0 to 600 Volts: Six of each type and each current rating installed.
   2. One spare LED driver for each light fixture type used.

PART 2 - PRODUCTS
2.1 GENERAL
A. Products shall comply with all applicable provisions of NFPA 70.
B. Like Items of Equipment: Products of one manufacturer in order to achieve standardization for appearance, operation, maintenance, spare parts, and manufacturer’s service.

C. Equipment Finish: Manufacturer’s standard finish color, unless otherwise indicated.

### 2.2 ENCLOSES

A. Finish: Sheet metal structural and enclosure parts completely painted using an electrodeposition process so interior and exterior surfaces as well as bolted structural joints have a complete finish coat on and between them.

B. Color: Manufacturer’s standard color (gray) baked-on enamel, unless otherwise shown.

C. Barriers: Provide metal barriers within enclosures to separate wiring of different systems and voltage.

D. Enclosure Selections: Except as shown otherwise, provide electrical enclosures according to the following table:

<table>
<thead>
<tr>
<th>Location</th>
<th>Finish</th>
<th>Environment</th>
<th>NEMA 250 Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indoor</td>
<td>Finished</td>
<td>Dry</td>
<td>1</td>
</tr>
<tr>
<td>Indoor</td>
<td>Unfinished</td>
<td>Industrial Use/Wet</td>
<td>12</td>
</tr>
<tr>
<td>Outdoor</td>
<td>Any</td>
<td>Wet (rain/snow)</td>
<td>3R</td>
</tr>
<tr>
<td>Indoor and Outdoor</td>
<td>Any</td>
<td>Wet/Corrosive</td>
<td>4X: 304 Stainless Steel</td>
</tr>
</tbody>
</table>

### 2.3 OUTLET AND DEVICE BOXES

A. Sheet Steel: One-piece drawn type, zinc or cadmium plated.

B. Cast Metal:
   1. Box: Cast ferrous metal.
   2. Cover: Gasketed, weatherproof, and cast ferrous metal with stainless steel screws.
   3. Hubs: Threaded.
   4. Lugs: Cast Mounting.
   5. Manufacturers and Products, Nonhazardous Locations:
      a. Crouse-Hinds; Type FS or FD.
      b. Appleton; Type FS or FD.
      c. Or equal.

### 2.4 JUNCTION AND PULL BOXES

A. Outlet Boxes Used as Junction or Pull Box: As specified under Article Outlet and Device Boxes.

B. Conduit Bodies Used as Junction Boxes: As specified under Article Conduit and Fittings.

C. Sheet Steel Box:
   1. NEMA 250, Type 1.
   3. Cover: Hinged with clamps.

### 2.5 DEVICE PLATES

A. General: Sectional type plates not permitted.

B. Cast Metal:
1. Material: Malleable ferrous metal with gaskets.
2. Screw: Oval-head stainless steel.

C. Engraved:
   1. Character Height: 3/16 inch.
   2. Filler: Black

D. Weatherproof:
   1. For Switches:
      a. Gasketed, cast-metal, incorporating external operator for internal switch.
      b. Mounting Screw: Stainless steel.
      c. Manufacturers and Products:
         1) Crouse-Hinds; DS-181 or DS-185.
         2) Appleton; FSK-1VTS or FSK-1VS.
         3) Or equal.
   2. For Receptacles, Damp Locations:
      a. Gasketed, cast-aluminum, with individual cap over each receptacle opening.
      b. Mounting Screw and Cap Spring: Stainless steel.
      c. Manufacturers and Products:
         1) Crouse-Hinds; Type WLRD-1.
         2) Appleton; Type FSK-WRD.
         3) Or equal.
   3. For Receptacles, Wet Locations:
      a. Impact-resistant, nonmetallic, single-gang, horizontal mounting, providing, while in-use, NEMA 3R rating.
      b. Stainless steel mounting and hinge hardware.
      c. Lockable, paintable.
      d. Color: Gray.
      e. Manufacturers:
         1) Carlon.
         2) Leviton.
         3) Or equal.

2.6 SUPPORT AND FRAMING CHANNELS

A. Carbon Steel Framing Channel:
   1. Material: Rolled, mild strip steel, 12 gauge, ASTM A1011/A1011M, Grade 33.

B. Stainless Steel Framing Channel: Rolled, ASTM A167, Type 316 stainless steel, 12 gauge.

C. Manufacturers:
   1. B-Line Systems, Inc.
   2. Unistrut Corp.
   3. Or equal.

2.7 NAMEPLATES

A. Material: Laminated plastic.

B. Attachment: Adhesive.

C. Color: Black, engraved to a white core, or as shown.

D. Engraving:
   1. Devices and Equipment: Name or tag shown, or as required.
   2. Panelboards:
      a. Designation.
      b. Service voltage.
c. Phases.
3. Minimum Requirement: Label metering and power distribution equipment, local control panels, junction boxes, motor controls, and transformers.

E. Letter Height:
1. Pushbuttons, Selector Switches, and Other Devices: 1/8 inch.
2. Equipment and Panelboards: 1/4 inch.

2.8 CONDUIT AND FITTINGS

A. Intermediate Metal Conduit (IMC):
   1. Meet requirements of NEMA C80.6 and UL 1242.
   2. Material: Hot-dip galvanized, with chromated and lacquered protective layer.

B. Rigid Galvanized Steel Conduit (RGS):
   1. Meet requirements of NEMA C80.1 and UL 6.
   2. Material: Hot-dip galvanized, with chromated protective layer.

C. PVC Schedule 40 Conduit:
   1. Meet requirements of NEMA TC 2 and UL 651.
   2. UL listed for concrete encasement, underground direct burial, concealed, or direct sunlight exposure, and 90 degrees C insulated conductors.

D. PVC-Coated Rigid Galvanized Steel Conduit:
   1. Meet requirements of NEMA RN 1.
   2. Material:
      a. Meet requirements of NEMA C80.1 and UL 6.
      b. Exterior Finish: PVC coating, 40 mils nominal thickness, bond to metal shall have tensile strength greater than PVC.
      c. Interior finish: Urethane coating, 2 mils nominal thickness.
   3. Threads: Hot-dipped galvanized and factory coated with urethane.
   4. Bendable without damage to either interior or exterior coating.

E. Flexible Metal, Liquid-Tight Conduit:
   1. UL 360 listed for 105 degrees C insulated conductors.

F. Fittings:
   1. Provide bushings, grounding bushings, conduit hubs, conduit bodies, couplings, unions, expansion fittings, and cable sealing fittings, as applicable.
   2. Rigid Galvanized Steel and Intermediate Metal Conduit:
      a. Meet requirements of UL 514B.
      b. Type: Threaded, galvanized.
   3. PVC Conduit:
      a. Meet requirements of NEMA TC 3.
      b. Type: PVC, slip-on.
   4. PVC-Coated Rigid Galvanized Steel Conduit:
      a. Meet requirements of UL 514B.
      b. Fittings: Rigid galvanized steel type, PVC-coated by conduit manufacturer.
      c. Conduit Bodies: Cast metal hot-dipped galvanized or urethane finish. Cover shall be of same material as conduit body. PVC-coated by conduit manufacturer.
      d. Finish: 40-mil PVC exterior, 2-mil urethane interior.
      e. Overlapping pressure sealing sleeves.
      g. Manufacturers:
         1) Robroy Industries.
         2) Ocal.
         3) Or equal.
      h. Expansion Fitting Manufacturer and Product: Ocal; Ocal-Blue XJG, or equal.
   5. Flexible Metal, Liquid-Tight Conduit:
Metal insulated throat connectors with integral nylon or plastic bushing rated for 105 degrees C.

Insulated throat and sealing O-rings.

### 2.9 CONDUIT ACCESSORIES

#### A. Duct Bank Spacers:
1. Type: Nonmetallic, interlocking, for multiple conduit sizes.
2. Suitable for all types of conduit.
3. Manufacturers:
   a. Underground Device, Inc.
   b. Carlon.
   c. Or equal.

#### B. Identification Devices:
1. Raceway Tags:
   b. Shape: Round.
   c. Raceway Designation: Pressure stamped, embossed, or engraved.
   d. Tags relying on adhesives or taped-on markers not permitted.
2. Warning Tape:
   a. Material: Polyethylene, 4-mil gauge with detectable strip.
   b. Color: Red.
   c. Width: Minimum 6 inches.
   d. Designation: Warning on tape that electric circuit is located below tape.
   e. Identifying Letters: Minimum 1-inch high permanent black lettering imprinted continuously over entire length.

#### C. Raceway Band:
1. Slip-on Type:
   a. Provide heat-shrinkable, black, medium-wall polyolefin tubing with factory-applied adhesive/sealant. Select product size based upon raceway outside diameter.
   b. Manufacturer and Product: 3M; Type IMCSN, medium wall cable sleeve.
2. Wrap-around Type:
   a. Provide 4-inch width, 20-mil thickness, nonprinted black PVC corrosion protection tape with primer.
   b. Manufacturer and Product: 3M; Type Scotchrap 51 with Scotchrap Pipe Primer, or equal.

### 2.10 CONDUCTORS

#### A. Conductors 600 Volts and Below:
1. Conform to applicable requirements of NEMA WC 71, WC 72, and WC 74.
2. Conductor Type:
   a. 120- and 277-Volt Lighting, No. 10 AWG and Smaller: Solid copper.
   b. 120-Volt Receptacle Circuits, No. 10 AWG and Smaller: Solid copper.
   c. All Other Circuits: Stranded copper.
3. Insulation: Type THHN/THWN, except for sizes No. 6 and larger, with XHHW-2 insulation.

### 2.11 600-VOLT RATED CABLE:

#### A. General:
1. Type TC, meeting requirements of UL 1277, including Vertical Tray Flame Test at 20,000 Btu per hour, and NFPA 70, Article 340, or UL 13 meeting requirements of NFPA 70, Article 725.
2. Permanently and legibly marked with manufacturer’s name, maximum working voltage for which cable was tested, type of cable, and UL listing mark.
3. Suitable for installation in open air, in cable trays, or conduit.
5. Overall Outer Jacket: PVC, flame-retardant, sunlight- and oil-resistant.

B. No. 16 AWG, Twisted, Shielded Pair (TSP), Instrumentation Cable: Single pair, designed for noise rejection for process control, computer, or data log applications meeting NEMA WC 55 requirements.
   1. Outer Jacket: 45 mils nominal thickness.
   2. Individual Pair Shield: 1.35 mils, double-faced aluminum/synthetic polymer overlapped to provide 100 percent coverage.
   3. Dimension: 0.31-inch nominal outside diameter.
   4. Conductors:
      a. Bare soft annealed copper, Class B, seven-strand concentric, meeting requirements of ASTM B8.
      b. 20 AWG, seven-strand tinned copper drain wire.
      c. Insulation: 15 mils nominal PVC.
      d. Jacket: 4 mils nominal nylon.
      e. Color Code: Pair conductors black and red.
   5. Manufacturers: Okonite Co.

C. Foil Shielded/Shielded Twisted Pair (F/STP) Telephone and Data Cable, 600V:
   1. Category 6A, UL listed, and third party verified to comply with TIA/EIA 568-C.2 Category 6A requirements.
   2. Suitable for high-speed network applications including gigabit Ethernet and video. Cable shall be interoperable with other standards compliant products and shall be backward compatible with Category 5 and Category 5e.
   3. Four each individually twisted pair and PVC jacket.
   4. 1585 Ethernet cable as recommended by PLC manufacturer.

2.12 ACCESSORIES FOR CONDUCTORS:

A. Tape:
   1. General Purpose, Flame Retardant: 7 mils, vinyl plastic, Scotch Brand 33, rated for 90 degrees C minimum, meeting requirements of UL 510.
   2. Flame Retardant, Cold and Weather Resistant: 8.5 mils, vinyl plastic, Scotch Brand 88.
   3. Arc and Fireproofing:
      a. 30 mils, elastomer.
      b. Manufacturers and Products:
         1) 3M; Scotch Brand 77, with Scotch Brand 69 glass cloth tapebinder.
         2) Plymount; Plyarc 53, with Plyglas 77 glass cloth tapebinder.
         3) Or equal.

B. Identification Devices:
   1. Sleeve-type, permanent, PVC, yellow or white, with legible machine-printed black markings.
   2. Manufacturer and Products: Raychem; Type D-SCE or ZH-SCE, or equal.

C. Connectors and Terminations:
   1. Nylon, Self-Insulated Crimp Connectors:
      a. Manufacturers and Products:
         1) Thomas & Betts; Sta-Kon.
         2) Burndy; Insulug.
         3) ILSCO.
         4) Or equal.

D. Self-Insulated, Freespring Wire Connector (Wire Nuts):
   1. Plated steel, square wire springs.
   2. UL Standard 486C.
   3. Manufacturers and Products:
a. Thomas & Betts.
b. Ideal; Twister.
c. Or equal.

E. Cable Lugs:
1. In accordance with NEMA CC 1.
2. Rated 600 volts of same material as conductor metal.
3. Uninsulated Crimp Connectors and Terminators:
   a. Suitable for use with 75 degrees C wire at full NFPA 70, 75 degrees C ampacity.
   b. Manufacturers and Products:
      1) Thomas & Betts; Color-Keyed.
      2) Burndy; Hydent.
      3) ILSCO.
      4) Or equal.
4. Uninsulated, Bolted, Two-Way Connectors and Terminators:
   a. Manufacturers and Products:
      1) Thomas & Betts; Locktite.
      2) Burndy; Quiklug.
      3) ILSCO.
      4) Or equal.

F. Cable Ties:
1. Nylon, adjustable, self-locking, and reusable.
2. Manufacturer and Product: Thomas & Betts; TY-RAP, or equal.

G. Heat Shrinkable Insulation:
1. Thermally stabilized, crosslinked polyolefin.
2. Manufacturer and Product: Thomas & Betts; SHRINK-KON, or equal.

2.13 GROUNDING
A. Ground Rods: Provide copper with minimum diameter of 5/8-inch, and length of 10 feet.
B. Ground Conductors: Stranded copper.
C. Equipotential Grounding Busbar and Mounting Kit: Erico Products, Inc. EGB series, or equal.
D. Connectors:
1. Exothermic Weld Type:
   a. Outdoor Weld: Suitable for exposure to elements or direct burial.
   b. Indoor Weld: Utilize low-smoke, low-emission process.
   c. Manufacturers:
      1) Erico Products, Inc.; Cadweld and Cadweld Exolon.
      2) Thermoweld.
      3) Or equal.
2. Compression Type:
   a. Compress-deforming type; wrought copper extrusion material.
   b. Single indentation for conductors 6 AWG and smaller.
   c. Double indentation with extended barrel for conductors 4 AWG and larger.
   d. Single barrels prefilled with oxide-inhibiting and anti-seizing compound.
   e. Manufacturers:
      1) Burndy Corp.
      2) Thomas and Betts Co.
      3) ILSCO.
      4) Or equal.
3. Mechanical Type:
   a. Split-bolt, saddle, or cone screw type; copper alloy material.
   b. Manufacturers:
      1) Burndy Corp.
PART 3 - EXECUTION

3.1 GENERAL

A. Install materials and equipment in accordance with manufacturer’s instructions and recommendations.

B. Work shall comply with all applicable provisions of NECA 1.

C. Electrical Drawings show general locations of equipment, devices, and raceway, unless specifically dimensioned.

3.2 COMBINING CIRCUITS INTO COMMON RACEWAY

A. Drawings show each homerun circuit. Do not combine power or control circuits into common raceways without authorization of Engineer.

B. Homerun circuits shown on Drawings indicate functional wiring requirements for power and control circuits. Circuits may be combined into common raceways in accordance with the following requirements:

1. Analog control circuits from devices in same general area to same destination.
   a. Do not combine power or AC discrete control circuits in same conduit with analog circuits.
   b. Do not combine Class 2 or Class 3 circuits including, but not limited to, HVAC control circuits, fire alarm circuits, and paging system circuits with power or Class 1 circuits.
   c. Analog circuits shall be continuous from source to destination. Do not add TJB, splice, or combine into a multi-pair cable without authorization of Engineer.
   d. Raceways: Do not exceed 40 percent fill.
   e. Record and document all changes on record drawings.

2. Discrete control circuits from devices in the same general area to the same destination.
   a. Do not combine power or analog control circuits in same conduit with discrete circuits.
   b. Do not combine Class 2 or Class 3 circuits including, but not limited to, HVAC control circuits, fire alarm circuits, and paging system circuits with power or Class 1 circuits.
   c. Raceways: Do not exceed 40 percent fill.
   d. Record and document all changes on record drawings.

3. Power circuits from loads in same general area to same source location (such as panelboard, switchboard, and low voltage motor control center).
   a. Lighting Circuits: Combine no more than three circuits to a single raceway. Contractor is responsible for increasing conduit and conductor size for derating as required by NEC.
   b. Receptacle Circuits, 120-Volt Only: Combine no more than three circuits to a single raceway. Provide a separate neutral conductor for each circuit. Contractor is responsible for increasing conduit and conductor size for derating as required by NEC.
   c. All Other Power Circuits: Do not combine power circuits without authorization of Engineer.

3.3 DEMOLITION

A. General Demolition:
   1. Where shown, de-energize and disconnect nonelectrical equipment for removal by others.
   2. Where shown, de-energize, disconnect, and remove electrical equipment.
   3. Remove affected circuits and raceways back to serving panelboard or control panel. Where affected circuits are consolidated with others, remove raceways back to first shared conduit or box. Where underground or embedded raceways are to be abandoned, remove raceway to 1 inch below surface of structure or 12 inches belowgrade and restore existing surface.
3.4 PROTECTION FOLLOWING INSTALLATION
A. Protect materials and equipment from corrosion, physical damage, and effects of moisture on insulation.
B. Cap conduit runs during construction with manufactured seals.
C. Close openings in boxes or equipment during construction.

3.5 SERVICE ENTRANCE EQUIPMENT AND UTILITY METERING
A. Unless otherwise specified or shown, schedule and coordinate work with Idaho Power (serving utility) as required for electric utility service.
B. Verify utility metering is connected and operating in accordance with utility requirements as applicable.

3.6 OUTLET AND DEVICE BOXES
A. Install suitable for conditions encountered at each outlet or device in wiring or raceway system, sized to meet NFPA 70 requirements.
B. Size:
   1. Depth: Minimum 2 inches, unless otherwise required by structural conditions. Box extensions not permitted.
C. Locations:
   1. Drawing locations are approximate.
   2. To avoid interference with mechanical equipment or structural features, relocate outlets as directed by Engineer.
D. Install plumb and level.
E. Flush Mounted:
   1. Install with concealed conduit.
   2. Install proper type extension rings or plaster covers to make edges of boxes flush with finished surface.
F. Support boxes independently of conduit by attachment to building structure or structural member.
G. Box Type (Steel Raceway System):
   1. Outdoor Locations: Cast metal.
   2. Indoor Dry Locations: Cast metal.

3.7 JUNCTION AND PULL BOXES
A. Install where shown and where necessary to terminate, tap-off, or redirect multiple conduit runs.
B. Install pull boxes where necessary in raceway system to facilitate conductor installation.
C. Install in conduit runs at least every 150 feet or after the equivalent of three right-angle bends.
D. Use outlet boxes as junction and pull boxes wherever possible and allowed by applicable codes.
E. Use conduit bodies as junction and pull boxes where no splices are required and their use is allowed by applicable codes.
F. Installed boxes shall be accessible.
G. Do not install on finished surfaces.
H. Install plumb and level.
I. Support boxes independently of conduit by attachment to building structure or structural member.
J. At or below grade:
1. Install boxes for below grade conduit flush with finished grade in locations outside of paved areas, roadways, or walkways.
2. If adjacent structure is available, box may be mounted on structure surface just above finished grade in accessible but unobtrusive location.
3. Obtain Owner’s written acceptance prior to installation in paved areas, roadways, or walkways.
4. Use boxes and covers suitable to support anticipated weights.

K. Flush Mounted:
   1. Install with concealed conduit.
   2. Holes in surrounding surface shall be no larger than required to receive box.
   3. Make edges of boxes flush with final surface.

L. Mounting Hardware:
   1. Noncorrosive Indoor Dry Areas: Galvanized.
   2. Outdoor or Noncorrosive Indoor Wet Areas: Stainless steel.

3.8 DEVICE PLATES
A. Securely fasten to wiring device; ensure a tight fit to box.
B. Flush Mounted: Install with all four edges in continuous contact with finished wall surfaces without use of mats or similar materials. Plaster fillings will not be acceptable.
C. Surface Mounted: Plate shall not extend beyond sides of box, unless plates have no sharp corners or edges.
D. Install with alignment tolerance to box of 1/16 inch.
E. Engrave with designated titles.
F. Types (Unless Otherwise Shown):
   2. Indoor Surface Mounted Metal Boxes: Cast.

3.9 SUPPORT AND FRAMING CHANNELS
A. Install where required for mounting and supporting electrical equipment and raceway systems.
B. Channel Type:
   1. Interior, Wet or Dry Noncorrosive Locations: Carbon steel.
   2. Interior, Wet or Dry Corrosive Locations: Type 316 stainless steel.
   4. Outdoor, Corrosive Locations: Type 316 stainless steel.
C. Paint carbon steel channel cut ends prior to installation with zinc-rich primer.

3.10 NAMEPLATES
A. Provide identifying nameplate on all equipment.

3.11 CONDUIT AND FITTINGS
A. General:
   1. Crushed or deformed raceways not permitted.
   2. Maintain raceway entirely free of obstructions and moisture.
   3. Immediately after installation, plug or cap raceway ends with watertight and dust-tight seals until time for pulling in conductors.
   4. Sealing Fittings: Provide drain seal in vertical raceways where condensate may collect above sealing fitting.
   5. Avoid moisture traps where possible. When unavoidable in exposed conduit runs, provide junction box and drain fitting at conduit low point.
   6. Group raceways installed in same area.
7. Follow structural surface contours when installing exposed raceways. Avoid obstruction of
passageways.
8. Run exposed raceways parallel or perpendicular to walls, structural members, or
intersections of vertical planes.
9. Block Walls: Do not install raceways in same horizontal course with reinforcing steel.
10. Install watertight fittings in outdoor, underground, or wet locations.
11. Paint threads and cut ends, before assembly of fittings, galvanized conduit or PVC-coated
galvanized conduit installed in exposed or damp locations with zinc-rich paint or liquid
galvanizing compound.
12. Metal conduit to be reamed, burrs removed, and cleaned before installation of conductors,
wires, or cables.
13. Do not install raceways in concrete equipment pads, foundations, or beams.
14. Horizontal raceways installed under floor slabs shall lie completely under slab, with no part
embedded within slab.
15. Install concealed, embedded, and buried raceways so that they emerge at right angles to
surface and have no curved portion exposed.
16. Install conduits for Category 6 data cables in strict conformance with the requirements of
EIA/TIA 569.

B. Installation in Cast-in-Place Structural Concrete:
1. Minimum cover 2 inches, including all fittings.
2. Conduit placement shall not require changes in reinforcing steel location or configuration.
3. Provide nonmetallic support during placement of concrete to ensure raceways remain in
position.
4. Conduit larger than 1 inch shall not be embedded in concrete slabs, walls, foundations,
columns or beams, unless approved by Engineer.
5. Slabs and Walls:
   a. Trade size of conduit not to exceed one-fourth of the slab or wall thickness.
   b. Install within middle one-third of slab or wall.
   c. Separate conduit less than 2-inch trade size by a minimum ten times conduit trade size,
center-to-center, unless otherwise shown.
   d. Separate conduit 2 inches and greater trade size by a minimum eight times conduit trade
size, center-to-center, unless otherwise shown.
   e. Cross conduit at an angle greater than 45 degrees, with minimum separation of 1 inch.
   f. Separate conduit by a minimum six times the outside dimension of expansion and
deflection fittings at expansion joints.
   g. Conduit shall not be installed below the maximum water surface elevation in walls of
water holding structures.
6. Columns and Beams:
   a. Trade size of conduit not to exceed one-fourth of beam thickness.
   b. Conduit cross-sectional area not to exceed 4 percent of beam or column cross section.

C. Conduit Application:
2. Outdoor, Exposed: Rigid galvanized steel
3. Indoor, Exposed: Intermediate metal or rigid galvanized steel.
6. Transition from Underground or Concrete Embedded to Exposed: PVC-coated rigid
galvanized steel.

D. Connections:
1. For equipment where flexible connection is required to minimize vibration:
   a. General: Flexible metal, liquid-tight conduit.
   b. Length: 18 inches minimum, 60 inches maximum, sufficient to allow movement or
adjustment of equipment.
E. Penetrations:
1. Make at right angles, unless otherwise shown.
2. Notching or penetration of structural members, including footings and beams, not permitted.
3. Fire-Rated Walls, Floors, or Ceilings: Firestop openings around penetrations to maintain fire-resistance rating.
5. Entering Structures:
   a. General: Seal raceway at the first box or outlet with oakum or expandable plastic compound to prevent the entrance of gases or liquids from one area to another.
   b. Concrete Roof or Membrane Waterproofed Wall or Floor: Provide watertight seal.
   c. Existing or Precast Wall (Underground): Core drill wall and install watertight entrance seal device.
   d. Nonwaterproofed Wall or Floor (Underground, without Concrete Encasement):
      1) Provide Schedule 40 galvanized pipe sleeve or watertight entrance seal device.
      2) Fill space between raceway and sleeve with expandable plastic compound or oakum and lead joint on each side.

F. Support:
1. Support from structural members only, at intervals not exceeding NFPA 70 requirements, and in any case not exceeding 8 feet. Do not support from piping, pipe supports, or other raceways.
2. Application/Type of Conduit Strap:
   a. Steel Conduit: Zinc-coated steel, pregalvanized steel, or malleable iron.
   b. PVC-Coated Rigid Steel Conduit: PVC-coated metal.
   c. Nonmetallic Conduit: Nonmetallic or PVC-coated metal.
3. Provide and attach wall brackets, strap hangers, or ceiling trapeze as follows:
   a. Wood: Wood screws.
   b. Hollow Masonry Units: Toggle bolts.
   c. Concrete or Brick: Expansion shields, or threaded studs driven in by powder charge, with lock washers and nuts.
   e. Location/Type of Hardware:
      1) Dry, Noncorrosive Areas: Galvanized.
      2) Wet, Noncorrosive Areas: Stainless steel.

G. Bends:
1. Install concealed raceways with a minimum of bends in the shortest practical distance.
2. Make bends and offsets of longest practical radius. Bends in conduits and ducts being installed for fiber optic cables shall be not less than 20 times cable diameter, 15 inches minimum.
3. Install with symmetrical bends or cast metal fittings.
4. Avoid field-made bends and offsets, but where necessary, make with acceptable hickey or bending machine. Do not heat metal raceways to facilitate bending.
5. Make bends in parallel or banked runs from same center or centerline with same radius so that bends are parallel.
6. Factory elbows may be installed in parallel or banked raceways if there is change in plane of run and raceways are same size.
7. PVC Conduit:
   b. 90-Degree Bends: Provide rigid steel elbows, PVC-coated where direct buried.
   c. Use manufacturer’s recommended method for forming smaller bends.
8. Flexible Conduit: Do not make bends that exceed allowable conductor bending radius of cable to be installed or that significantly restricts conduit flexibility.

H. Expansion and Deflection Fittings: Provide on all raceways at structural expansion joints and in long tangential runs.

I. PVC Conduit:
1. Solvent Welding:
   a. Provide manufacturer recommended solvent; apply to all joints.
   b. Install such that joint is watertight.
2. Adapters:
   a. PVC to Metallic Fittings: PVC terminal type.
   b. PVC to Rigid Metal Conduit: PVC female adapter.
3. Belled-End Conduit: Bevel the unbelled end of the joint prior to joining.

J. PVC-Coated Rigid Steel Conduit:
1. Install in accordance with manufacturer’s instructions.
2. All tools and equipment used in the cutting, bending, threading, and installation of PVC-coated rigid steel conduit shall be designed to limit damage to the PVC coating.
3. Provide PVC boot to cover all exposed threading.

K. Termination at Enclosures:
2. Nonmetallic, Cabinets, and Enclosures: Terminate conduit in threaded conduit hubs, maintaining enclosure integrity.
3. Sheet Metal Boxes, Cabinets, and Enclosures:
   a. Rigid Galvanized Conduit:
      1) Provide one lock nut each on inside and outside of enclosure.
      2) Install grounding bushing.
      3) Provide bonding jumper from grounding bushing to equipment ground bus or ground pad; if neither ground bus nor pad exists, connect jumper to lag bolt attached to metal enclosure.
      4) Install insulated bushing on ends of conduit where grounding is not required.
      5) Provide insulated throat when conduit terminates in sheet metal boxes having threaded hubs.
      6) Utilize sealing locknuts or threaded hubs on outside of NEMA 3R and NEMA 12 enclosures.
      7) Terminate conduits with threaded conduit hubs at NEMA 4 and 4X boxes and enclosures.
   b. Flexible Metal Conduit: Provide two-screw type, insulated, malleable iron connectors.
   c. PVC-Coated Rigid Galvanized Steel Conduit: Provide PVC-coated, liquid-tight, metallic connector.
   d. PVC Schedule 40 Conduit: Provide PVC terminal adapter with locknut.
4. Free-Standing Enclosures:
   a. Terminate metal conduit entering bottom with grounding bushing; provide a grounding jumper extending to equipment ground bus or grounding pad.
   b. Terminate PVC conduit entering bottom with bell end fittings.

L. Empty Raceways:
1. Provide permanent, removable cap over each end.
2. Provide nylon pull cord.
3. Identify with waterproof tags attached to pull cord at each end, and at intermediate pull point.

3.12 UNDERGROUND RACEWAYS:

A. Grade: Maintain minimum grade of 4 inches in 100 feet, either from one manhole, handhole, or pull box to the next, or from a high point between them, depending on surface contour.
B. Cover: Maintain minimum 2-foot cover above conduit, unless otherwise shown.
C. Make routing changes as necessary to avoid obstructions or conflicts.
D. Couplings: In multiple conduit runs, stagger so couplings in adjacent runs are not in same transverse line.
E. Union type fittings not permitted.

F. Spacers:
   1. Provide preformed, nonmetallic spacers, designed for such purpose, to secure and separate parallel conduit runs in a trench.
   2. Install at intervals not greater than that specified in NFPA 70 for support of the type conduit used, but in no case greater than 10 feet.

G. Support conduit so as to prevent bending or displacement during backfilling.

H. Installation with Other Piping Systems:
   1. Crossings: Maintain minimum 12-inch vertical separation.
   2. Parallel Runs: Maintain minimum 12-inch separation.
   3. Installation over valves or couplings not permitted.

I. Metallic Raceway Coating: Along entire length, coat with raceway coating.

J. Provide expansion fittings that allow minimum of 4 inches of movement in vertical conduit runs from underground where exposed conduit will be fastened to or will enter building or structure.

K. Provide deflectional/expansion fittings in conduit runs that exit building or structure below grade. Conduit from building wall to fitting shall be PVC-coated rigid steel.

3.13 CONDUCTORS

A. Conductor storage, handling, and installation shall be in accordance with manufacturer’s recommendations.

B. Do not exceed manufacturer’s recommendations for maximum pulling tensions and minimum bending radii.

C. Conduit system shall be complete prior to drawing conductors. Lubricate prior to pulling into conduit. Lubrication type shall be as approved by conductor manufacturer.

D. Terminate all conductors and cables, unless otherwise shown.

E. Do not splice conductors, unless specifically indicated or approved by Engineer.

F. Bundling: Where single conductors and cables in manholes, handholes, vaults, cable trays, and other indicated locations are not wrapped together by some other means, bundle conductors from each conduit throughout their exposed length with cable ties placed at intervals not exceeding 12 inches.

G. Wiring within Equipment and Local Control Panels: Remove surplus wire, dress, bundle, and secure.

H. Power Conductor Color Coding:
   1. No. 6 AWG and Larger: Apply general purpose, flame retardant tape at each end, and at accessible locations wrapped at least six full overlapping turns, covering an area 1-1/2 to 2 inches wide.
   2. No. 8 AWG and Smaller: Provide colored conductors.
   3. Colors:
      c. Live Wires, 240/120-Volt, Three-Phase, Four-Wire, Delta, and Center Tap Ground on Single-Phase:
         1) Phase A: Black
         2) High (wild) Leg: Orange
         3) Phase C: Blue
      d. Live Wires, 277/480-Volt, Three-Phase System: Brown, orange, yellow.
      e. Ground Wire: Green.

I. Circuit Identification:
1. Assign circuit name based on device or equipment at load end of circuit. Where this would result in same name being assigned to more than one circuit, add number or letter to each otherwise identical circuit name to make it unique.

2. Method: Identify with sleeves. Taped-on markers or tags relying on adhesives not permitted.

J. Connections and Terminations:
   1. Install wire nuts only on solid conductors.
   2. Install nylon self-insulated crimp connectors and terminators for instrumentation and control circuit conductors.
   3. Tape insulate all uninsulated connections.
   4. Install crimp connectors and compression lugs with tools approved by connector manufacturer.

3.14 GROUNDING

A. Grounding comply with NFPA 70 and as shown.

B. Ground electrical service neutral at service entrance equipment to supplementary grounding electrodes.

C. Ground each separately derived system neutral to nearest effectively grounded building structural steel member or separate grounding electrode.

D. Bond together system neutrals, service equipment enclosures, exposed noncurrent-carrying metal parts of electrical equipment, metal raceways, ground conductor in raceways and cables, receptacle ground connections, and metal piping systems.

E. Shielded Instrumentation Cables:
   1. Ground shield to ground bus at power supply for analog signal.
   2. Expose shield minimum 1 inch at termination to field instrument and apply heat shrink tube.
   3. Do not ground instrumentation cable shield at more than one point.

F. Equipment Grounding Conductors: Provide in all conduits containing power conductors and control circuits above 50 volts.

G. Ground Rods: Install full length with conductor connection at upper end.

3.15 FIELD QUALITY CONTROL

A. General:
   1. Test equipment shall have an operating accuracy equal to, or greater than, requirements established by InterNational Electrical Testing Association (NETA) Acceptance Testing Specifications (ATS).
   2. Test instrument calibration shall be in accordance with NETA ATS.
   3. Perform inspection and electrical tests after equipment is installed.
   4. Perform tests with apparatus de-energized whenever feasible.
   5. Inspection and electrical tests on energized equipment are to be:
      a. Scheduled with Engineer prior to de-energization.
      b. Minimized to avoid extended period of interruption to the operating plant equipment.

B. Quality Assurance:
   1. Testing Firm Qualifications:
      a. Corporately and financially independent organization functioning as an unbiased testing authority.
      b. Professionally independent of manufacturers, suppliers, and installers of electrical equipment and systems being tested.
      c. Employer of engineers and technicians regularly engaged in testing and inspecting of electrical equipment, installations, and systems.
      d. Supervising engineer accredited as Certified Electrical Test Technologist by NICET or NETA and having a minimum of 5 years’ testing experience on similar projects.
      e. Technicians certified by NICET or NETA.
f. Assistants and apprentices assigned to Project at ratio not to exceed two certified to one noncertified assistant or apprentice.
g. In compliance with OSHA CFR 29, Part 1910.7 criteria for accreditation of testing laboratories or a full member company of NETA.

2. Test equipment shall have an operating accuracy equal to or greater than requirements established by NETA ATS.
3. Test instrument calibration shall be in accordance with NETA ATS.

C. Tests and inspection shall establish that:
1. Electrical equipment is operational within industry and manufacturer’s tolerances.
2. Installation operates properly.
3. Equipment is suitable for energization.
4. Installation conforms to requirements of Contract Documents and NFPA 70.

D. Perform inspection and testing in accordance with NETA ATS, industry standards, and manufacturer’s recommendations.

E. Adjust mechanisms and moving parts for free mechanical movement.

F. Adjust adjustable relays and sensors to correspond to operating conditions, or as recommended by manufacturer.

G. Verify nameplate data for conformance to Contract Documents.

H. Realign equipment not properly aligned and correct unlevelness.

I. Properly anchor electrical equipment found to be inadequately anchored.

J. Tighten accessible bolted connections, including wiring connections, with calibrated torque wrench to manufacturer’s recommendations, or as otherwise specified.

K. Clean contaminated surfaces with cleaning solvents as recommended by manufacturer.

L. Provide proper lubrication of applicable moving parts.

M. Investigate and repair or replace:
1. Electrical items that fail tests.
2. Active components not operating in accordance with manufacturer’s instructions.
3. Damaged electrical equipment.

N. Electrical Enclosures:
1. Remove foreign material and moisture from enclosure interior.
2. Vacuum and wipe clean enclosure interior.
3. Remove corrosion found on metal surfaces.
4. Repair or replace, as determined by Engineer, door and panel sections having damaged surfaces.
5. Replace missing or damaged hardware.

O. Provide certified test report(s) documenting the successful completion of specified testing. Include field test measurement data.

P. Test the following equipment and materials:
1. Owner-furnished equipment.
2. Conductors: Insulation resistance, No. 4 and larger only.
3. Panelboards, switches, and circuit breakers.
4. Dry-type transformers
5. Metering
6. Motor controls and VFD’s.
7. Grounding systems.
8. AC induction motors
9. Active Harmonic Conditioners

Q. Controls and Metering:
1. Test control and signal wiring for proper termination and function.
2. Test local control panels and other control devices for proper terminations, configuration and settings, and functions.
3. Demonstrate proper operation of control, metering, monitoring, and indication functions in presence of Owner and Engineer.

R. Balance electrical load between phases on panelboards after installation.

S. Voltage Testing:
   1. When installation is complete and facility is in operation, check voltage to Project.
   2. Check voltage amplitude and balance between phases for loaded and unloaded conditions.

T. Equipment Line Current:
   1. Check line current in each phase for each piece of equipment.

END OF SECTION
PART 1  GENERAL

1.01  REFERENCES

A. The following is a list of standards which may be referenced in this section:
   1. Institute of Electrical and Electronics Engineers (IEEE):
      a. 43, Recommended Practice for Testing Insulating Resistance of Rotating Machinery.
      b. 81, Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System.
   2. National Electrical Manufacturers Association (NEMA):
      a. AB 4, Guidelines for Inspection and Preventive Maintenance of Molded Case Circuit Breakers Used in Commercial and Industrial Applications.
      b. PB 2, Deadfront Distribution Switchboards.
      a. 70, National Electrical Code (NEC).
      b. 70B, Recommended Practice for Electrical Equipment Maintenance.
      c. 70E, Standard for Electrical Safety in the Workplace.

1.02  SUBMITTALS

A. Informational Submittals:
   1. Testing Agency Qualifications: For testing agencies to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
   2. Submit 30 days prior to performing inspections or tests:
      a. Schedule for performing inspection and tests.
      b. List of references to be used for each test.
      c. Sample copy of equipment and materials inspection form(s).
      d. Sample copy of individual device test form.
      e. Sample copy of individual system test form.
   3. Energization Plan: Prior to initial energization of electrical distribution equipment; include the following:
      a. Owner’s representative sign-off form for complete and accurate arc flash labeling and proper protective device settings for equipment to be energized.
b. Staged sequence of initial energization of electrical equipment.
c. Lock-Out-Tag-Out plan for each stage of the progressive energization.
d. Barricading, signage, and communication plan notifying personnel of newly energized equipment.

4. Submit test or inspection reports and certificates for each electrical item tested within 30 days after completion of test:

5. Operation and Maintenance Data:
   a. In accordance with Section compare actual measured loads to those we forecasted 4 years ago, Operation and Maintenance Data.
   b. After test or inspection reports and certificates have been reviewed by Engineer and returned, insert a copy of each in Operation and Maintenance Manual.

6. Programmable Settings: At completion of Performance Demonstration Test, submit final hardcopy printout and electronic files on compact disc of as-left set points, programs, and device configuration files for:
   a. Intelligent electronic devices (IED’s).

1.03 QUALITY ASSURANCE

A. Testing Firm Qualifications:
   1. Corporately and financially independent organization functioning as an unbiased testing authority.
   2. Professionally independent of manufacturers, suppliers, and installers of electrical equipment and systems being tested.
   3. Employer of engineers and technicians regularly engaged in testing and inspecting of electrical equipment, installations, and systems.
   4. Supervising engineer accredited as Certified Electrical Test Technologist by NICET or NETA and having a minimum of 5 years’ testing experience on similar projects.
   5. Technicians certified by NICET or NETA.
   6. Assistants and apprentices assigned to Project at ratio not to exceed two certified to one noncertified assistant or apprentice.
   7. In compliance with OSHA CFR 29, Part 1910.7 criteria for accreditation of testing laboratories or a full member company of NETA.

B. Test equipment shall have an operating accuracy equal to or greater than requirements established by NETA ATS.

C. Test instrument calibration shall be in accordance with NETA ATS.

1.04 SEQUENCING AND SCHEDULING

A. Perform inspection and electrical tests after equipment listed herein has been installed.

B. Equipment will be considered defective if they do not pass tests and inspections.

C. Perform tests with apparatus de-energized whenever feasible.

D. Inspection and electrical tests on energized equipment shall be:
   1. Scheduled with Engineer prior to de-energization.
2. Minimized to avoid extended period of interruption to the operating plant equipment.

E. Notify Engineer at least 24 hours prior to performing tests on energized electrical equipment.

F. Manufacturer’s Services: The services of qualified manufacturer’s representatives have been specified for testing under certain specification sections. Coordinate and employ those services as required to provide complete testing in accordance with this section and the manufacturer’s recommendations.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

A. Perform tests in accordance with requirements of Section 01 75 00, Testing and Commissioning.

B. Tests and inspections shall establish:
   1. Electrical equipment is operational within industry and manufacturer’s tolerances and standards.
   2. Installation operates properly.
   3. Equipment is suitable for energization.

C. Perform inspection and testing in accordance with NETA ATS, industry standards, and manufacturer’s recommendations.

D. Adjust mechanisms and moving parts of equipment for free mechanical movement.

E. Adjust and set electromechanical electronic relays and sensors to correspond to operating conditions, or as recommended by manufacturer.

F. Verify nameplate data for conformance to Contract Documents and approved Submittals.

G. Realign equipment not properly aligned and correct unlevelness.

H. Properly anchor electrical equipment found to be inadequately anchored.

I. Tighten accessible bolted connections, including wiring connections, with calibrated torque wrench/screw driver to manufacturer’s recommendations, or as otherwise specified in NETA ATS.

J. Clean contaminated surfaces with cleaning solvents as recommended by manufacturer.
K. Provide proper lubrication of applicable moving parts.

L. Inform Engineer of working clearances not in accordance with NFPA 70.

M. Investigate and repair or replace:
   1. Electrical items that fail tests.
   2. Active components not operating in accordance with manufacturer’s instructions.
   3. Damaged electrical equipment.

N. Electrical Enclosures:
   1. Remove foreign material and moisture from enclosure interior.
   2. Vacuum and wipe clean enclosure interior.
   3. Remove corrosion found on metal surfaces.
   4. Repair or replace, as determined by Engineer, door and panel sections having dented surfaces.
   5. Repair or replace, as determined by Engineer poor fitting doors and panel sections.
   6. Repair or replace improperly operating latching, locking, or interlocking devices.
   7. Replace missing or damaged hardware.
   8. Finish:
      a. Provide matching paint and touch up scratches and mars.
      b. If required because of extensive damage, as determined by Engineer, refinish entire assembly.

O. Replace fuses and circuit breakers that do not conform to size and type required by the Contract Documents or approved Submittals.

3.02 CHECKOUT AND STARTUP

A. Voltage Field Test:
   1. Check voltage at point of termination of power company supply system to Project when installation is essentially complete and in operation.
   2. Check voltage amplitude and balance between phases for loaded and unloaded conditions.
   3. Unbalance Corrections:
      a. Make written request to power company to correct condition if balance (as defined by NEMA) exceeds 1 percent, or if voltage varies throughout the day and from loaded to unloaded condition more than plus or minus 4 percent of nominal.
      b. Obtain written certification from responsible power company official that voltage variations and unbalance are within their normal standards if corrections are not made.

B. Equipment Line Current Tests:
   1. Check line current in each phase for each piece of equipment.
   2. Make line current check after power company has made final adjustments to supply voltage magnitude or balance.
3. If phase current for a piece of equipment is above rated nameplate current, prepare Equipment Line Phase Current Report that identifies cause of problem and corrective action taken.

3.03 LOW VOLTAGE CABLES, 600 VOLTS MAXIMUM

A. Visual and Mechanical Inspection:
1. Inspect each individual exposed power cable No. 4 and larger for:
   a. Physical damage.
   b. Proper connections in accordance with single-line diagram.
   c. Cable bends not in conformance with manufacturer’s minimum allowable bending radius where applicable.
   d. Color coding conformance with specification.
   e. Proper circuit identification.
2. Mechanical Connections for:
   a. Proper lug type for conductor material.
   b. Proper lug installation.
   c. Bolt torque level in accordance with NETA ATS, Table 100.12, unless otherwise specified by manufacturer.
3. Shielded Cables for:
   a. Proper shield grounding.
   b. Proper terminations.
   c. Proper circuit identification.
4. Control Cables for:
   a. Proper termination.
   b. Proper circuit identification.
5. Cables Terminated Through Window Type CTs: Verify neutrals and grounds are terminated for correct operation of protective devices.

B. Electrical Tests for Conductors No. 4 and Larger:
1. Insulation Resistance Tests:
   a. Utilize 1,000-volt dc megohmmeter for 600-volt insulated conductors.
   b. Test each conductor with respect to ground and to adjacent conductors for 1 minute.
   c. Evaluate ohmic values by comparison with conductors of same length and type.
   d. Investigate values less than 50 megohms.
2. Continuity test by ohmmeter method to ensure proper cable connections.

3.04 GROUNDING SYSTEMS

A. Visual and Mechanical Inspection:
1. Equipment and circuit grounds in electrical assemblies for proper connection and tightness.
2. Ground bus connections in electrical assemblies for proper termination and tightness.
3. Effective transformer core and equipment grounding.
4. Accessible connections to grounding electrodes for proper fit and tightness.
5. Accessible exothermic-weld grounding connections to verify that molds were fully filled and proper bonding was obtained.
B. Electrical Tests:
   1. Fall-of-Potential Test:
      a. In accordance with IEEE 81, Section 8.2.1.5 for measurement of main ground system’s resistance.
      b. Main ground electrode system resistance to ground to be no greater than 1 ohm.
   2. Two-Point Direct Method Test:
      a. In accordance with IEEE 81, Section 8.2.1.1 for measurement of ground resistance between main ground system, equipment frames, and system neutral and derived neutral points.
      b. Equipment ground resistance shall not exceed main ground system resistance by 0.25 ohm.

3.05 STANDBY GENERATION SYSTEMS

A. Visual and Mechanical Inspection:
   1. Compare generator nameplate rating and connection with one-line diagram.
   2. Verify circuit breaker sizes and types conform to Contract Documents.
   3. Check nameplates for proper identification of equipment title and tag number with latest one-line diagram.
   4. Proper operation of jacket water heaters.
   5. Inspect physical and mechanical condition.
   7. Inspect anchorage, alignment, and grounding.
   8. Integrity of engine cooling and fuel supply systems.
   10. Proper installation of vibration isolators.
   11. Proper cooling liquid type and level.
   12. Proper operation of meters and instruments.
   13. Verify engine-generator operation with adjustable frequency drives and power factor correction capacitors energized and operating under normal load conditions.
   14. Inspect and test all enclosure related systems for proper condition and operation, including enclosure condition and finish, door operation and securing, space heating, power distribution, ventilation system, and lighting system.
   15. Complete functional and performance testing of paralleling controls as applicable.
   16. Complete functional and performance testing of generator digital master controls as applicable.

B. Electrical and Mechanical Tests:
   1. Perform insulation-resistance tests according to IEEE 43.
      a. Machines Larger Than 150 kW: Test duration shall be 10 minutes. Calculate polarization index.
   2. Test protective relay devices.
   3. Verify phase rotation, phasing, and synchronized operation as required by the application.
   4. Functionally test engine shutdown for low oil pressure, overtemperature, overspeed, and other protection features as applicable.
   5. Verify correct functioning of the governor and regulator.
6. Cold-start test by interrupting normal power source with test load consisting of connected building load to verify:
   a. Transfer switch operation
   b. Automatic starting operation
   c. Operating ability of engine-generator
   d. Overcurrent devices capability to withstand inrush currents.
7. Vibration base-line test on generator sets rated above 250-kW for levels in accordance with manufacturer’s recommendations.

C. NFPA 110 Acceptance Tests: Perform tests required by NFPA 110 that are additional to those specified here, including, but not limited to, single-step full-load pickup test.

D. Battery Tests: Equalize charging of battery cells according to manufacturer's written instructions. Record individual cell voltages.
   1. Measure charging voltage and voltages between available battery terminals for full-charging and float-charging conditions. Check electrolyte level and specific gravity under both conditions.
   2. Test for contact integrity of all connectors. Perform an integrity load test and a capacity load test for the battery.
   3. Verify acceptance of charge for each element of the battery after discharge.
   4. Verify that measurements are within manufacturer’s specifications.

E. Battery-Charger Tests: Verify specified rates of charge for both equalizing and float-charging conditions.

F. System Integrity Tests: Methodically verify proper installation, connection, and integrity of each element of engine generator system before and during system operation. Check for air, exhaust, and fluid leaks.

G. Exhaust Emissions Test: Comply with applicable government test criteria.

H. Voltage and Frequency Transient Stability Tests: Use recording oscilloscope to measure voltage and frequency transients for 50 and 100 percent step-load increases and decreases, and verify that performance is as specified.

I. Harmonic-Content Tests: Measure harmonic content of output voltage at 25 and 100 percent of rated linear load. Verify that harmonic content is within specified limits.

J. Coordinate tests with tests for transfer switches and run them concurrently.

K. Leak Test: After installation, charge exhaust, coolant, and fuel systems and test for leaks. Repair leaks and retest until no leaks exist.

L. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation for generator and associated equipment.

M. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
3.06 AUTOMATIC TRANSFER SWITCH

A. Visual and Mechanical Inspection:
   1. Compare equipment nameplate data with Drawings and Specifications.
   2. Inspect physical and mechanical condition.
   3. Inspect anchorage, alignment, grounding, and required clearances.
   4. Verify that the unit is clean.
   5. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
   6. Verify that manual transfer warnings are attached and visible.
   7. Verify tightness of all control connections.
   8. Inspect bolted electrical connections for high resistance using one of the following methods, or both:
      a. Use of low-resistance ohmmeter.
      b. Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method according to manufacturer’s published data.
   10. Verify positive mechanical interlocking between normal and alternate sources.
   11. Perform visual and mechanical inspection of surge arresters.
   12. Inspect control power transformers.
      a. Inspect for physical damage, cracked insulation, broken leads, tightness of connections, defective wiring, and overall general condition.
      b. Verify that primary and secondary fuse or circuit-breaker ratings match Drawings.
      c. Verify correct functioning of drawout disconnecting contacts, grounding contacts, and interlocks.
   13. Check nameplates for proper identification of:
      a. Equipment title and tag number with latest one-line diagram.
   15. Perform visual inspection of controller and associated UPS as applicable.

B. Electrical Tests:
   1. Perform insulation-resistance tests on all control wiring with respect to ground.
   2. Verify settings and operation of control devices.
   3. Calibrate and set all relays and timers.
   4. Verify phase rotation, phasing, and synchronized operation.
   5. Perform automatic transfer tests.
   6. Verify correct operation and timing of the following functions:
      a. Normal source voltage-sensing and frequency-sensing relays.
      b. Engine start sequence.
      c. Time delay on transfer.
      d. Alternative source voltage-sensing and frequency-sensing relays.
      e. Automatic transfer operation.
      f. Interlocks and limit switch function.
      g. Time delay and retransfer on normal power restoration.
      h. Engine cool-down and shutdown feature.
      a. Check for electrical continuity of circuits and for short circuits.
b. Inspect for physical damage, proper installation and connection, and integrity of barriers, covers, and safety features.
c. Verify that manual transfer warnings are properly placed.
d. Perform manual transfer operation.

8. After energizing circuits, perform each electrical test and demonstrate interlocking sequence and operational function for each switch at least three times.
   a. Simulate power failures of normal source to automatic transfer switches and retransfer from emergency source with normal source available.
   b. Simulate loss of phase-to-ground voltage for each phase of normal source.
   c. Verify time-delay settings.
   d. Verify pickup and dropout voltages by data readout or inspection of control settings.
   e. Verify proper operation with generator set controller I/O and digital master control I/O.

   a. Perform contact-resistance test across main contacts and correct values exceeding 500 microhms and values for one pole deviating by more than 50 percent from other poles.
   b. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown.

10. Ground-Fault Tests: Coordinate with testing of ground-fault protective devices for power delivery from both sources.
    a. Verify grounding connections and locations and ratings of sensors.

C. Coordinate tests with tests of generator and run them concurrently.

D. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation and contact resistances and time delays. Attach a label or tag to each tested component indicating satisfactory completion of tests.

END OF SECTION
Hailey WWTP
750 KW Generator and 1200 Amp ATS

Prepared by:
Donovan Hull-Riggs
Power Systems Specialist
208.501.4074
Proposal

Project: Hailey WWTP      Date: 05/19/2020    Quote: CSQ #30738499
Attn: Steve Holyoak Valid: 60 days    From: Andrew Erickson

Generator Set:

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>UL2200 Listed:</td>
<td>Yes</td>
<td>IBC Certified: Yes</td>
<td>Misc Items:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Controls:

<table>
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<tr>
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<th></th>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Misc Items:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Accessory Systems:

<table>
<thead>
<tr>
<th>Coolant Heater:</th>
<th>Yes 208/240 vac</th>
<th>Battery Heater: Yes 208/240</th>
<th>Alternator Heater: None</th>
<th>Battery Charger: 10 amp NFPA110</th>
<th>Battery System: Wet Battery, Rack and Cables 24 vdc</th>
<th>Misc Items: Heavy duty air cleaner included</th>
</tr>
</thead>
</table>

Alternator / Breaker:

<table>
<thead>
<tr>
<th>Excitation System:</th>
<th>AREP Brushless</th>
<th>Voltage Regulator: Cat IVR</th>
<th>Ground Fault: None</th>
<th>Circuit Breaker # 1: 1200 amp</th>
<th>Circuit Breaker # 2: n/a</th>
<th>Circuit Breaker # 3: n/a</th>
<th>Misc Items:</th>
</tr>
</thead>
</table>

Packaging:

<table>
<thead>
<tr>
<th>Enclosure: Sound Attenuated</th>
<th>Sound Level: 75 dBA</th>
<th>Fuel Tank: 24 Hr</th>
<th>Fuel Tank Type: Double Wall UL142</th>
<th>Exhaust System:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interior Mounted</td>
<td>Enclosure Color: White</td>
<td>Electrical Package: Yes</td>
<td>Misc Items: enclosure heater included</td>
<td></td>
</tr>
</tbody>
</table>

Automatic Transfer Switch:

|--------------------|---------------------|--------------------|---------------|---------|--------------------|--------------------------|

Included:

Startup: 8 hrs - 1 trip - 1 day
Maintenance Program: Available
Warranty ATS: 24 month standby [parts labor & travel] Freight: Included to first destination
Site Load test: 100% available building load
Not included:
Installation / Anchor Calculations:
Taxes / Permits of any kind / Any engineering
Any fuel or fuel piping
Offloading at jobsite:

Spare parts kit: No
Warranty Genset: 60 month

Factory Test: 100% load at 0.8 pF
Owner training: Yes 1 hr at time of startup
Western States Equipment - Power Systems Service Department

Southern Territory Contact List

24/7 Service

Meridian 208-884-2312
Twin Falls 208-735-2330
Pocatello 208-235-6383
Idaho Falls 208-552-3426

Office Staff

<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>Office</th>
<th>Mobile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rob Miller</td>
<td>Service Manager</td>
<td>208-947-4525</td>
<td>208-871-4890</td>
</tr>
<tr>
<td>Justin Keller</td>
<td>Field Service Supervisor</td>
<td>208-947-4543</td>
<td>208-859-2637</td>
</tr>
<tr>
<td>Steffiny Akers</td>
<td>PSSR Southern Territory</td>
<td>208-947-4554</td>
<td></td>
</tr>
<tr>
<td>Michell Raney</td>
<td>Customer Service Rep</td>
<td>208-947-4504</td>
<td></td>
</tr>
</tbody>
</table>

Power Systems Technicians

<table>
<thead>
<tr>
<th>Name</th>
<th>Location</th>
<th>Office</th>
<th>Mobile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carl Brown</td>
<td>Meridian</td>
<td>208-884-2312</td>
<td>208-565-0827</td>
</tr>
<tr>
<td>Mark Mandrak</td>
<td>Meridian</td>
<td>208-884-2312</td>
<td>208-407-6994</td>
</tr>
<tr>
<td>Matt Warner</td>
<td>Meridian</td>
<td>208-884-2312</td>
<td>208-697-2837</td>
</tr>
<tr>
<td>Devin Landes</td>
<td>Idaho Falls</td>
<td>208-884-2312</td>
<td>208-869-8879</td>
</tr>
<tr>
<td>Chris Teuscher</td>
<td>Twin Falls</td>
<td>208-735-2330</td>
<td>208-697-3992</td>
</tr>
<tr>
<td>Brad Wright</td>
<td>Pocatello</td>
<td>208-235-6383</td>
<td>208-251-9241</td>
</tr>
<tr>
<td>Ismael Diaz</td>
<td>Pocatello</td>
<td>208-235-6383</td>
<td>208-251-1452</td>
</tr>
</tbody>
</table>
**Note: Use Stranded Conductors Only for all wiring**

Conduit A: Accessory Power
(1)- 208 vac - 50 amp 2 pole - Coolant heater, enclosure heater and charger

Conduit B: MGate MB3170
(1) Ethernet RJ45 cable.

Conduit C: Generator Control
4 # 14 awg stranded
(1) pair for start circuit
(1) pair for ats on line

Control conduits B & C are for control. It is acceptable to combined these circuits in one conduit to generator control panel.
INCLUDES THE FOLLOWING:

**ALTERNATOR**
Alternator insulation system is UL Recognized (UL 1446). PMG and AREP alternators are available. Automatic voltage regulators are UL Recognized.

**WIRE HARNESS**
AC, DC, and power harnesses are made with UL Listed wire and UL Listed terminals.

**CONTROL PANEL**
Control panels are comprised of UL Listed and UL Recognized components. EMCP is UL Recognized.

**CIRCUIT BREAKER**
Output circuit breaker is 100% rated and UL Listed.

**TESTING**
All UL Listed sets are designed and rigorously tested in accordance with UL Standard for Safety, UL 2200.

**LABELING**
Labeling meets UL requirements.

**MECHANICAL OPTIONS**
Mechanical options do not require UL Listing and, therefore, are not affected. The exceptions to this are:

**FUEL TANKS**
If a fuel tank is ordered with the unit, it must be UL Listed. Two versions are available: 24 hour integral (FCUL2) and 24/48 hour sub-base (FSBT)

**ENCLOSURES**
Factory installed enclosures meet UL requirements. Weatherproof and sound attenuated versions are available.

---

**ELECTRICAL OPTIONS**
The table below shows electrical options that meet UL requirements:

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>EOS</td>
<td>Lube Oil Sump Heater</td>
</tr>
<tr>
<td>WCA1</td>
<td>Low Coolant Level Shutdown</td>
</tr>
<tr>
<td>WSS1</td>
<td>Low Coolant Temperature Alarm</td>
</tr>
<tr>
<td>AH1H</td>
<td>Anti-Condensation Heater</td>
</tr>
<tr>
<td>WHH</td>
<td>Coolant Heater</td>
</tr>
<tr>
<td>GOVES</td>
<td>Electronic Governor (Fully Adjustable)</td>
</tr>
<tr>
<td>FSS1</td>
<td>Critical Low Fuel Level Shutdown</td>
</tr>
<tr>
<td>FSS2</td>
<td>Low Fuel Level Alarm</td>
</tr>
<tr>
<td>FSSS</td>
<td>Critical High Fuel Alarm</td>
</tr>
<tr>
<td>PBCSUL</td>
<td>UL Listed Battery Charger</td>
</tr>
<tr>
<td>PBC10NU</td>
<td>NFPA Battery Charger, UL Listed</td>
</tr>
</tbody>
</table>

UL Listing is available on all diesel fuelled generator sets up to 175 kW at 60 Hz, 600 vac maximum.
**Standby & Prime: 60Hz**

| Engine Model | Cat® C18 ATAAC™ In-line 6, 4-cycle diesel |
| Bore x Stroke | 145mm x 183mm (5.7in x 7.2in) |
| Displacement | 18.13 L (1106.3 in³) |
| Compression Ratio | 14:1 |
| Aspiration | Turbocharged Air-to-Air Aftercooled |
| Fuel Injection System | Electronic Unit Injection |
| Governor | Electronic ADEM™ A4 |

### PACKAGE PERFORMANCE

<table>
<thead>
<tr>
<th>Model</th>
<th>Standby</th>
<th>Prime</th>
<th>Emission Strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>C18</td>
<td>750 ekW, 938 kVA</td>
<td>680 ekW, 850 kVA</td>
<td>EPA TIER II</td>
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</tbody>
</table>

#### Performance

<table>
<thead>
<tr>
<th>Performance</th>
<th>Standby</th>
<th>Prime</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>60 Hz</td>
<td></td>
</tr>
<tr>
<td>Genset Power Rating</td>
<td>938 kVA</td>
<td>850 kVA</td>
</tr>
<tr>
<td>Genset power rating with fan @ 0.8 power factor</td>
<td>750 ekW</td>
<td>680 ekW</td>
</tr>
<tr>
<td>Emissions</td>
<td></td>
<td>EPA TIER II</td>
</tr>
<tr>
<td>Performance Number</td>
<td>EM3842</td>
<td>EM3843</td>
</tr>
</tbody>
</table>

#### Fuel Consumption

<table>
<thead>
<tr>
<th>Load</th>
<th>L/hr (gal/hr)</th>
<th>L/hr (gal/hr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100% load with fan</td>
<td>205.5 (54.2)</td>
<td>188.5 (49.7)</td>
</tr>
<tr>
<td>75% load with fan</td>
<td>164.3 (43.4)</td>
<td>146.3 (38.6)</td>
</tr>
<tr>
<td>50% load with fan</td>
<td>108.9 (28.7)</td>
<td>100.3 (26.5)</td>
</tr>
<tr>
<td>25% load with fan</td>
<td>63.5 (16.7)</td>
<td>59.4 (15.6)</td>
</tr>
</tbody>
</table>

#### Cooling System

<table>
<thead>
<tr>
<th>Component</th>
<th>Value</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radiator air flow restriction (system), kPa (in. Water)</td>
<td>0.12 (0.48)</td>
<td>0.12 (0.48)</td>
</tr>
<tr>
<td>Radiator air flow, m³/min (cfm)</td>
<td>900 (31783)</td>
<td>900 (31783)</td>
</tr>
<tr>
<td>Engine coolant capacity, L (gal)</td>
<td>20.8 (5.5)</td>
<td>20.8 (5.5)</td>
</tr>
<tr>
<td>Radiator coolant capacity, L (gal)</td>
<td>77 (20.3)</td>
<td>77 (20.3)</td>
</tr>
<tr>
<td>Total coolant capacity, L (gal)</td>
<td>97.8 (25.8)</td>
<td>97.8 (25.8)</td>
</tr>
</tbody>
</table>

#### Inlet Air

<table>
<thead>
<tr>
<th>Component</th>
<th>Value</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Combustion air inlet flow rate, m³/min (cfm)</td>
<td>67.3 (2376)</td>
<td>65.6 (2316)</td>
</tr>
<tr>
<td>Max. Allowable Combustion Air Inlet Temp, °C (°F)</td>
<td>49 (120)</td>
<td>49 (120)</td>
</tr>
</tbody>
</table>

#### Exhaust System

<table>
<thead>
<tr>
<th>Component</th>
<th>Value</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exhaust stack gas temperature, °C (°F)</td>
<td>452.9 (847.2)</td>
<td>432.9 (811.2)</td>
</tr>
<tr>
<td>Exhaust gas flow rate, m³/min (cfm)</td>
<td>170.7 (6028)</td>
<td>161 (5686)</td>
</tr>
<tr>
<td>Exhaust system backpressure (maximum allowable) kPa (in. water)</td>
<td>10.0 (40.0)</td>
<td>10.0 (40.0)</td>
</tr>
</tbody>
</table>

#### Heat Rejection

<table>
<thead>
<tr>
<th>Component</th>
<th>Value</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heat rejection to jacket water, kW (Btu/min)</td>
<td>225 (12795)</td>
<td>208 (11828)</td>
</tr>
<tr>
<td>Heat rejection to exhaust (total) kW (Btu/min)</td>
<td>714 (40604)</td>
<td>664 (37761)</td>
</tr>
<tr>
<td>Heat rejection to aftercooler, kW (Btu/min)</td>
<td>272 (15468)</td>
<td>253 (14387)</td>
</tr>
<tr>
<td>Heat rejection to atmosphere from engine, kW (Btu/min)</td>
<td>142 (8075)</td>
<td>123 (6995)</td>
</tr>
</tbody>
</table>
**Cat® C18 DIESEL GENERATOR SETS**

### Emissions (Nominal)²

<table>
<thead>
<tr>
<th></th>
<th>Standby</th>
<th>Prime</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOₓ, mg/Nm³ (g/hp-hr)</td>
<td>2468 (5.42)</td>
<td>2213 (4.91)</td>
</tr>
<tr>
<td>CO, mg/Nm³ (g/hp-hr)</td>
<td>100.1 (0.22)</td>
<td>75.6 (0.17)</td>
</tr>
<tr>
<td>HC, mg/Nm³ (g/hp-hr)</td>
<td>23.5 (0.06)</td>
<td>24.1 (0.06)</td>
</tr>
<tr>
<td>PM, mg/Nm³ (g/hp-hr)</td>
<td>11.7 (0.03)</td>
<td>10.6 (0.03)</td>
</tr>
</tbody>
</table>

### Alternator²

<table>
<thead>
<tr>
<th>VOLTAGES</th>
<th>208V</th>
<th>220V</th>
<th>240V</th>
<th>480V</th>
<th>600V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor starting capability @ 30% Voltage Dip</td>
<td>1917 skVA</td>
<td>2129 skVA</td>
<td>2501 skVA</td>
<td>2512 skVA</td>
<td>2512 skVA</td>
</tr>
<tr>
<td>Current</td>
<td>2602.2 amps</td>
<td>2460.3 amps</td>
<td>2512 amps</td>
<td>1127.6 amps</td>
<td>902.1 amps</td>
</tr>
<tr>
<td>Frame Size</td>
<td>LC7224N</td>
<td>LC7224L</td>
<td>LC7224L</td>
<td>LC7224L</td>
<td>LC7224L</td>
</tr>
<tr>
<td>Excitation</td>
<td>AREP</td>
<td>AREP</td>
<td>AREP</td>
<td>AREP</td>
<td>AREP</td>
</tr>
<tr>
<td>Temperature Rise</td>
<td>130 °C</td>
<td>130 °C</td>
<td>130 °C</td>
<td>105 °C</td>
<td>130 °C</td>
</tr>
</tbody>
</table>

### WEIGHTS & DIMENSIONS

<table>
<thead>
<tr>
<th>Dim “A” mm (in)</th>
<th>Dim “B” mm (in)</th>
<th>Dim “C” mm (in)</th>
<th>Dry Weight kg (lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3512 (138)</td>
<td>1746 (69)</td>
<td>2322 (92)</td>
<td>4863 (10721)</td>
</tr>
</tbody>
</table>

### APPLICABLE CODES AND STANDARDS:


Note: Codes may not be available in all model configurations. Please consult your local Cat Dealer representative for availability.

### STANDBY:

Output available with varying load for the duration of the interruption of the normal source power. Average power output is 70% of the standby power rating. Typical operation is 200 hours per year, with maximum expected usage of 500 hours per year.

### PRIME:

Output available with varying load for an unlimited time. Average power output is 70% of the prime power rating. Typical peak demand is 100% of prime rated ekW with 10% overload capability for emergency use for a maximum of 1 hour in 12. Overload operation cannot exceed 25 hours per year.

### RATINGS:

Ratings are based on SAE J1349 standard conditions. These ratings also apply at ISO3046 standard conditions.

### DEFINITIONS AND CONDITIONS

¹ For ambient and altitude capabilities consult your Cat dealer. Air flow restriction (system) is added to existing restriction from factory.

² Emissions data measurement procedures are consistent with those described in EPA CFR 40 Part 89, Subpart D & E and ISO8178-1 for measuring HC, CO, PM, NOₓ. Data shown is based on steady state operating conditions of 77° F, 28.42 in HG and number 2 diesel fuel with 35° API and LHV of 18,390 BTU/lb. The nominal emissions data shown is subject to instrumentation, measurement, facility and engine to engine variations. Emissions data is based on 100% load and thus cannot be used to compare to EPA regulations which use values based on a weighted cycle.

³ UL 2200 Listed packages may have oversized generators with a different temperature rise and motor starting characteristics. Generator temperature rise is based on a 40° C ambient per NEMA MG1-32.
Enclosures

C13 / C15 / C18
SOUND ATTENUATED ENCLOSURES
US Sourced
Diesel Generator Set
350 – 750 ekW 60 Hz

Image shown may not reflect actual configuration

Features

Robust / Highly Corrosion Resistant Construction
• Factory installed on skid base
• Environmentally friendly, polyester powder baked paint
• 14 gauge steel
• Interior zinc plated fasteners
• Exterior stainless steel fasteners
• Internally mounted exhaust silencing system
• Designed and tested to comply with UL 2200 Listed generator set package
• Compression door latches providing solid door seal

Excellent Access
• Large cable entry area for installation ease
• Accommodates side mounted single or multiple breakers
• Three doors on both sides
• Vertically hinged allow 180° opening rotation and retention with door stays
• Lube oil and coolant drains piped to the exterior of the enclosure base
• Radiator fill cover

Security and Safety
• Lockable access doors which give full access to control panel and breaker
• Cooling fan and battery charging alternator fully guarded
• Fuel fill, oil fill and battery can only be reached via lockable access
• Externally mounted emergency stop button
• Designed for spreader bar lifting to ensure safety
• Stub-up area is rodent proof

Transportability
These enclosures are of extremely rugged construction to withstand outdoor exposure and rough handling common on many construction sites.

Options
• Enclosure constructed with 14 gauge steel
• Enclosure constructed with 12 gauge aluminum (5052 grade)
• Caterpillar yellow or white paint
• Control panel viewing window
• UL Listed integral fuel tank with 670, 400, and 300 gallon capacities
• UL Listed sub base fuel tank with 660, 1000, 1900, and 2200 gallon capacities.
• CBC 2007, CBC 2010
• IBC Certification for 150 mph wind loading
• AC/DC lighting package
• 5 kW Canopy space heater to facilitate compliance with NFPA 110
• Motorized louvers and gravity discharge damper
• 125A Load Center
• GFCI outlets
*Not available with aluminum enclosures.
## Level 1 Sound Attenuated Enclosure (Steel) Sound Levels

<table>
<thead>
<tr>
<th>Model</th>
<th>Standby ekW</th>
<th>Cooling Air Flow Rate</th>
<th>Ambient Capability*</th>
<th>Sound Pressure Levels (dBA) at 7m (23 ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>m³/s</td>
<td>cf</td>
<td>°C</td>
<td>°F</td>
</tr>
<tr>
<td>C13</td>
<td>350</td>
<td>8.5</td>
<td>18010</td>
<td>57</td>
</tr>
<tr>
<td></td>
<td>400</td>
<td>8.5</td>
<td>18010</td>
<td>56</td>
</tr>
<tr>
<td>C15</td>
<td>350</td>
<td>10.4</td>
<td>22072</td>
<td>59</td>
</tr>
<tr>
<td></td>
<td>400</td>
<td>10.4</td>
<td>22072</td>
<td>51</td>
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<tr>
<td></td>
<td>450</td>
<td>10.4</td>
<td>22072</td>
<td>46</td>
</tr>
<tr>
<td></td>
<td>500</td>
<td>12.5</td>
<td>26415</td>
<td>48</td>
</tr>
<tr>
<td>C18</td>
<td>550</td>
<td>8.1</td>
<td>17234</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td>600</td>
<td>8.1</td>
<td>17234</td>
<td>43</td>
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<tr>
<td></td>
<td>650</td>
<td>12.7</td>
<td>26909</td>
<td>51</td>
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<td></td>
<td>700</td>
<td>12.7</td>
<td>26909</td>
<td>48</td>
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<tr>
<td></td>
<td>750</td>
<td>12.7</td>
<td>26909</td>
<td>48</td>
</tr>
</tbody>
</table>

## Sound Attenuated Enclosure (Aluminum) Sound Levels

<table>
<thead>
<tr>
<th>Model</th>
<th>Standby ekW</th>
<th>Cooling Air Flow Rate</th>
<th>Ambient Capability*</th>
<th>Sound Pressure Levels (dBA) at 7m (23 ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>m³/s</td>
<td>cf</td>
<td>°C</td>
<td>°F</td>
</tr>
<tr>
<td>C13</td>
<td>350</td>
<td>8.5</td>
<td>18010</td>
<td>57</td>
</tr>
<tr>
<td></td>
<td>400</td>
<td>8.5</td>
<td>-</td>
<td>56</td>
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## Level 2 Sound Attenuated Enclosure (Steel) Sound Levels

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<th>Cooling Air Flow Rate</th>
<th>Ambient Capability*</th>
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*Cooling system performance at sea level. Consult your Cat® dealer for site specific ambient and altitude capabilities.

**Note:** Sound level measurements are subject to instrumentation, installation and manufacturing variability, as well as ambient site conditions.

## Component Weights to Calculate Package Weight

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<th>Model</th>
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<th>Narrow Skid Base</th>
<th>Wide Skid Base</th>
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<th>Sound Attenuated Enclosure (Aluminum)</th>
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## Sound Attenuated Enclosure on Skid Base

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## Sound Attenuated Enclosure on a UL Listed Integral Fuel Tank Base

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C13 / C15 / C18
Integral and Sub-Base Fuel Tanks

US Sourced
Diesel Generator Set
350 – 750 ekW 60 Hz

Features

- UL Listed for United States (UL 142) and Canada (CAN/ULC S601)
- Facilitates compliance with NFPA30 code, NFPA37 and 110 standards and CSA C282 code
- Dual wall
- Lockable fuel fill cap, 4” (101.6 mm) NPT
- Low fuel level warning standard, customer configurable warning or shutdown
- Primary tank leak detection switch in containment basin
- Tank design provides capacity for thermal expansion of fuel
- Fuel supply dip tube is positioned so as not to pick up fuel sediment
- Fuel return and supply dip tube is separated by an internal baffle to prevent immediate re-supply of heated return fuel
- Pressure washed with an iron phosphate solution
- Interior tank surfaces coated with a solvent-based thin-film rust preventative
- Heavy gauge steel gussets with internal lifting rings
- Primary and secondary tanks are leak tested at 20.7 kPa (3 psi) minimum
- Compatible with open packages and enclosures
- Gloss black polyester alkyd enamel exterior paint
- Welded steel containment basin (minimum of 110% of primary tank capacity)
- Direct reading fuel gauge with variable electrical output
- Emergency vents on primary and secondary tanks are sized in accordance with NFPA 30

Sub Base

- The sub-base fuel tank mounts below the generator set wide base

Integral

- Integral diesel fuel tank is incorporated into the generator set base frame
- Robust base design includes linear vibration isolators between tank base and engine generator

Options

- Audio/visual fuel level alarm panel
- 5 gal (18.9 L) spill containment
- 5 gal (18.9 L) spill containment with fuel fill drop tube with in 6” (152 mm) from bottom of tank
- 5 gal (18.9 L) spill containment with overfill prevention valve and fuel fill drop tube with in 6” (152 mm) from bottom of tank
- ULC Listed 7.5 gal (28.4 L) spill containment with vent extensions, vent whistle, and drop tube facilitating compliance with CSA 8139-09
- ULC Listed 7.5 gal (28.4 L) spill containment with overfill prevention valve, vent extensions, vent whistle and drop tube facilitating compliance with CSA 8139-09
## Integral & Sub-Base Fuel Tank Base Useable Capacities with Fuel Tank Dimensions & Weights

**Integral** - Width(W) 2014 mm (79.3 in)

**Sub-base** - Width(W) 2056 mm (81 in)

**Integral** - Width(W) 2315 mm (91.2 in)

**Sub-base** - Width(W) 2357 mm (92.7 in)

### Sound Attenuated Enclosure

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<th>C13 Tank Design</th>
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<th>Overall Package Height with Tank</th>
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The heights listed above do not include lumber used during manufacturing and shipping.

### Estimated Run Times (Hours) at 100% Load

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*For ratings 650, 700 & 750 ekW only
Tanks with full electrical stub-up area include removable end channel. Tanks with RH stub-up include stub-up area directly below the circuit breaker or power terminal strips. Dimensions include weather-protective enclosure exhaust system.

Dual wall sub-base tanks are UL Listed and constructed in accordance with UL Standard for Safety UL 142, Steel Aboveground Tanks for Flammable and Combustible Liquids and Canada CAN/ULC S601, Standard for Shop Fabricated Steel Aboveground Horizontal Tanks for Flammable and Combustible Liquids.

Fuel tanks and applicable options facilitate compliance with the following United States NFPA Code and Standards:
NFPA 30: Flammable and Combustible Liquids Code
NFPA 37: Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines
NFPA 110: Standard for Emergency and Standby Power Systems

Fuel tanks and applicable options facilitate compliance with the following Canadian Standard and Code:
CSA C282 – Emergency Electrical Power Supply for Buildings
CSA B139-09 – Installation Code for Oil-Burning Equipment

The following sub-base fuel tanks meet Chicago code for containment and labelling:
FTDW005
FTDW008
FTDW011
**CZ220 HEAVY ELECTRIC UTILITY HEATER**

**DESCRIPTION**
Electric utility heaters are designed to handle a variety of heating requirements. Total output ranges from 10,000 BTU per hour to 24,000 BTU per hour, featuring both horizontal and vertical flow (horizontal air through approximately 4800, horizontal return horizontal and vertical return). The heaters are equipped with a built-in thermostat and a safety switch. They are suitable for use in commercial, industrial, and residential applications.

**SPECIFICATIONS**
- **Output**: 10,000 BTU to 24,000 BTU
- **Input**: 120V to 240V, 1-phase, 60Hz
- **Power**: 1000W to 2500W
- **Efficiency**: 90% to 95%

**Operation**
1. Connect the power cord to the power source.
2. Adjust the thermostat to the desired temperature.
3. Start the heater by pressing the on/off switch.

**Thermal Cutout**
- When the temperature reaches a preset level, the thermal cutout will activate.
- The heater will automatically shut off and the fan will continue to run until the temperature returns to safe levels.

**SAFETY INSTRUCTIONS**
- Ensure the heater is properly grounded.
- Do not use the heater near flammable materials.
- Keep children away from the heater.
- Do not modify or alter the heater in any way.

**Maintenance**
- Regular cleaning of the heater is recommended.
- Check the thermostat for proper operation.
- Inspect the power cord and plug regularly.

**Installation**
1. Mount the heater on a flat, level surface.
2. Secure the heater to the wall with the provided mounting brackets.
3. Connect the power cord to the power source.

**WARNING**
Improper installation or failure to follow the instructions may result in severe electrical shock.

**Locating the Heater**
- Choose a location that is free from drafts and direct sunlight.
- Ensure adequate ventilation is provided.

**Hanging the Heater**
- Attach the mounting bracket to the wall.
- Hang the heater on the bracket.

**Connecting the Power**
- Ensure the power cord is properly connected to the power source.

**Cleaning the Heating Element**
- Regular cleaning of the heating element is recommended to maintain efficiency.

**Cleaning the Fan and Motor**
- Dust and debris can accumulate on the fan and motor, reducing efficiency.

**NOTICE**
Always unplug and turn off the heater before cleaning.

---

**General Safety Information**
- Read and understand all instructions and operation instructions before using the heater.
- Keep the area around the heater free from combustible materials.
- Do not use the heater near flammable materials.
- Always use the heater with the appropriate power cord.
- Ensure the heater is properly grounded.

---

**Location of the Heater**
- The heater should be located in a well-ventilated area.
- Avoid placing the heater near electrical appliances.
- Ensure the heater is not exposed to direct sunlight.

---

**Maintenance**
- Check the thermostat for proper operation.
- Clean the heater regularly.
- Check the power cord and plug for damage.

---

**Installation**
- Refer to the installation instructions for proper setup.
- Ensure all connections are secure.
- Follow the manufacturer's recommendations for proper operation and maintenance.

---

**Warranty**
- The warranty covers defects in materials and workmanship.
- Contact the manufacturer for warranty claims.

Manufactured by:
Comfort Zone, LLC
8900 Amherst Drive
Cleveland, OH 44210
800-677-3990
www.comfortzoneinc.com

*May vary*
The Cat® EMCP 4.2B offers fully featured power metering, protective relaying and engine and generator control and monitoring. Engine and generator controls, diagnostics, and operating information are accessible via the control panel keypads; diagnostics from the EMCP 4 optional modules can be viewed and reset through the EMCP 4.2B.

### Full range of attachments
- Wide range of system expansion attachments, designed specifically to work with the EMCP 4
- Flexible packaging options for easy and cost effective installation

### World wide product support
- Cat dealers provide extensive pre and post sale support
- Cat dealers have over 1,600 dealer branch stores operating in 200 countries

### Features
- Ability to view and reset diagnostics on EMCP 4 optional modules via the control panel removes the need for a separate service tool for troubleshooting
- Set points and software stored in non-volatile memory, preventing loss during a power outage
- Five levels of security allow for configurable operator privileges
- Programmable security levels for groups of setpoints.
- Programmable kW Relays (3)
- Programmable weekly exerciser timer
- Dealer configurable resistive maps
- Default overview screen
- Real (kW) Load histogram
- Auto mains failure
- Programmable logic functionality enhanced system

### Selectable units
- Temperature: °C or °F
- Pressure: psi, kPa, bar
- Fuel Consumption: Liter/hr or Gal/hr (U.S. or U.K.)

---

**EMCP 4.2B**

**GENERATOR SET CONTROLLER**

**Picture shown may not reflect actual configuration**
### Standard Features
- Voltage (L-L, L-N)
- Current (Phase)
- Average Volt, Amp, Frequency
- kW, kVA, kVAR (Average, Phase, %)
- Power Factor (Average, Phase)
- kW-hr, kVAR-hr (total)
- Excitation voltage and current (with CDVR)
- Desired Voltage, Excitation Command, Operating Mode (with IVR)
- Generator stator and bearing temp (with optional module)
- kW load histogram

### Generator Protection
- Generator phase sequence
- Over/Under voltage (27/59)
- Over/Under frequency (81 O/U)
- Reverse Power (kW) (32)
- Reverse Reactive Power (kVAR) (32RV)
- Overcurrent (50/51)
- Thermal Damage Curve

### Engine Monitoring
- Coolant temperature
- Oil pressure
- Engine speed (RPM)
- Battery voltage
- Run hours
- Crank attempt and successful start counter
- Enhanced engine monitoring (with electronic engines)

### Engine Protection
- Control switch not in auto (alarm)
- High coolant temp (alarm and shutdown)
- Low coolant temp (alarm)
- Low coolant level (alarm)
- High engine oil temp (alarm and shutdown)
- Low, high, and weak battery voltage
- Overspeed
- Overcrank
- Low Oil Pressure

### Control
- Run / Auto / Stop control
- Speed and voltage adjust
- Local and remote emergency stop
- Remote start/stop
- Cycle crank

### Inputs & Outputs
- Two dedicated digital inputs
- Three analog inputs
- Six programmable digital inputs
- Eight relay out
- Two programmable digital outputs

### Communications
- Primary and accessory CAN data links
- RS-485 annunciator data link
- Modbus RTU (RS-485 Half duplex)

### Language Support
- Arabic, Bulgarian, Czech, Chinese, Danish, Dutch, English, Estonian, Finnish, French, German, Greek, Hungarian, Italian, Icelandic, Japanese, Latvian, Lithuanian, Norwegian, Polish, Portuguese, Romanian, Russian, Spanish, Swedish, Turkish

### Environmental
- Control module operating temperature: -40°C to 70°C
- Display operating temperature: -20°C to 70°C
- Humidity: 100% condensing 30°C to 60°C
- Storage temperature: -40°C to 85°C
- Vibration: Random profile, 24-1000 Hz, 4.3G rms

### Standards
- UL Recognized
- CSA C22.2 No.100.14.94
- Complies with all necessary standards for CE Certification
- IEC529, IEC60034-5, IEC61131-3
- MIL STND 461
FEATURES

When used with an Excitation Module, EMCP 4.3/4.4 and IVR-compatible EMCP 4.1/4.2 (B) controllers offers:

- Automatic Voltage Regulation (AVR)
- Programmable stability settings
- Soft start control with an adjustable time setting in AVR control mode
- Dual Slope, Configurable Under Frequency (Volts/Hz) regulation
- Three-phase or single-phase generator voltage (RMS) sensing/regulation in AVR mode
- Setpoint adjustment from the EMCP display or Cat ET ServiceTool
- IVR Operating Status and Voltage Bias Overview screens to provide an enhanced level of user interface
- Integrated Voltage Regulator event monitoring

EMCP 4.3/4.4 and IVR-compatible EMCP 4.2 (B) controllers also offer:

- Power Factor Regulation (PF)
- Reactive Droop compensation
- Line drop compensation

WORLDWIDE PRODUCT SUPPORT

- Worldwide parts availability through the Cat dealer network
- Over 1,800 dealer branch stores operating in 200 countries
- The best product support record in the industry
- Cat dealers provide extensive post sale support including maintenance and repair agreements

COMPLETE SYSTEM INTEGRATION

Fully designed and factory tested to work seamlessly with Cat generators using Self Excitation (SE), Internal Excitation (IE) or Permanent Magnet (PMG) excitation systems and EMCP controls.

The Integrated Voltage Regulator (IVR) is designed to provide robust, precise closed-loop control of the generator voltage, optimized transient performance and industry leading feature specification.

Caterpillar is leading the power generation marketplace with power solutions engineered to deliver unmatched flexibility, expandability, reliability and cost-effectiveness.
## INTEGRATED VOLTAGE REGULATOR FEATURE SPECIFICATION

### SPECIFICATIONS

<table>
<thead>
<tr>
<th>Feature</th>
<th>EMCP 4.1</th>
<th>EMCP 4.2(B)</th>
<th>EMCP 4.3</th>
<th>EMCP 4.4</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Load to Full Load Regulation</td>
<td>±0.5%</td>
<td>±0.25%</td>
<td>±0.25%</td>
<td>±0.25%</td>
</tr>
<tr>
<td>Configurable Volts / Hz Characteristic</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Configurable Knee Frequency</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Regulator Response Time</td>
<td>10 ms</td>
<td>10 ms</td>
<td>5 ms</td>
<td>5 ms</td>
</tr>
<tr>
<td>Single and Three Phase Sensing</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Voltage Adjustment Range</td>
<td>± 30%</td>
<td>± 30%</td>
<td>± 30%</td>
<td>± 30%</td>
</tr>
</tbody>
</table>

### CONTROL

<table>
<thead>
<tr>
<th>Feature</th>
<th>EMCP 4.1</th>
<th>EMCP 4.2(B)</th>
<th>EMCP 4.3</th>
<th>EMCP 4.4</th>
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</thead>
<tbody>
<tr>
<td>Characteristic</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
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<tr>
<td>Excitation Enable</td>
<td>Disable Selection</td>
<td>•</td>
<td>•</td>
<td>•</td>
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<tr>
<td>Line Loss (1/2R) Compensation</td>
<td>–</td>
<td>•</td>
<td>•</td>
<td>•</td>
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<tr>
<td>Reactive Droop Compensation</td>
<td>–</td>
<td>•</td>
<td>•</td>
<td>•</td>
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<tr>
<td>Power Factor Control Mode</td>
<td>–</td>
<td>•</td>
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</table>

### PROTECTION | ALARMS

<table>
<thead>
<tr>
<th>Feature</th>
<th>EMCP 4.1</th>
<th>EMCP 4.2(B)</th>
<th>EMCP 4.3</th>
<th>EMCP 4.4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Generator Overvoltage</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
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<tr>
<td>Generator Under voltage</td>
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<td>•</td>
<td>•</td>
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<tr>
<td>Over Excitation</td>
<td>•</td>
<td>•</td>
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<td>•</td>
</tr>
<tr>
<td>Loss of Sensing</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Generator Reverse VARs</td>
<td>–</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Event Log</td>
<td>•</td>
<td>•</td>
<td>•</td>
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</tbody>
</table>

### METERING

<table>
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<tr>
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<th>EMCP 4.1</th>
<th>EMCP 4.2(B)</th>
<th>EMCP 4.3</th>
<th>EMCP 4.4</th>
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</thead>
<tbody>
<tr>
<td>EMCP AC Metering</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>EMCP Power Metering</td>
<td>–</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Excitation Command Percentage</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Operating Mode Status Indication</td>
<td>•</td>
<td>•</td>
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</tbody>
</table>

### VOLTAGE ADJUSTMENT

<table>
<thead>
<tr>
<th>Feature</th>
<th>EMCP 4.1</th>
<th>EMCP 4.2(B)</th>
<th>EMCP 4.3</th>
<th>EMCP 4.4</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMCP 4 Display Voltage Bias</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Digital Input [Raise</td>
<td>Lower] Voltage Bias¹</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Potentiometer Voltage Bias¹</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Analog Voltage Bias - Voltage Range¹</td>
<td>0V to SV</td>
<td>0V to SV</td>
<td>-10V to +10V</td>
<td>-10V to +10V</td>
</tr>
<tr>
<td>Analog Voltage Bias - Current Range¹</td>
<td>-</td>
<td>-</td>
<td>0mA to 20mA</td>
<td>0mA to 20mA</td>
</tr>
<tr>
<td>Analog Voltage Bias - PWM Range¹</td>
<td>-</td>
<td>-</td>
<td>0% to 100%</td>
<td>0% to 100%</td>
</tr>
<tr>
<td>SCADA (Modbus) Voltage Bias</td>
<td>-</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
</tbody>
</table>

¹Requires an available input on the EMCP 4.
EMCP 4 DISPLAY

EXAMPLE SCREENS - EMCP 4.1/4.2

Figure 3: IVR Overview Screen

Figure 4: Voltage Bias Overview Screens

EXAMPLE SCREENS - EMCP 4.3/4.4

Figure 5: IVR Overview Screen

Figure 6: Voltage Bias Overview Screen
MGate MB3170/MB3270 Series

1 and 2-port advanced serial-to-Ethernet Modbus gateways

Features and Benefits

• Supports Auto Device Routing for easy configuration
• Supports route by TCP port or IP address for flexible deployment
• Connects up to 32 Modbus TCP servers
• Connects up to 31 or 62 Modbus RTU/ASCII slaves
• Accessed by up to 32 Modbus TCP clients (retains 32 Modbus requests for each Master)
• Supports Modbus serial master to Modbus serial slave communications
• Built-in Ethernet cascading for easy wiring
• 10/100BaseTX (RJ45) or 100BaseFX (single mode or multi-mode with SC/ST connector)
• Emergency request tunnels ensure QoS control
• Embedded Modbus traffic monitoring for easy troubleshooting
• Serial port with 2 kV isolation protection (for “-I” models)
• -40 to 75°C wide operating temperature models available
• Supports redundant dual DC power inputs and 1 relay output

Certifications

Introduction

The MGate MB3170 and MB3270 are 1 and 2-port Modbus gateways, respectively, that convert between Modbus TCP, ASCII, and RTU communications protocols. The gateways provide both serial-to-Ethernet communication and serial (master) to serial (slave) communications. In addition, the gateways support simultaneously connecting serial and Ethernet masters with serial Modbus devices. The MGate MB3170 and MB3270 Series gateways can be accessed by up to 32 TCP master/clients or connect to up to 32 TCP slave/servers. Routing through the serial ports can be controlled by IP address, TCP port number, or ID mapping. A featured priority control function allows urgent commands to obtain an immediate response. All models are rugged, DIN-rail mountable, and offer optional built-in optical isolation for serial signals.

Integrate TCP Masters without Altering the Modbus RTU/ASCII Network or Software

The MB3270 can integrate Modbus TCP with Modbus RTU/ASCII, without modifying the existing Modbus RTU/ASCII architecture or software. With the serial redirector function, a serial master can maintain direct access to serial slave devices through a specially mapped serial port. This allows the serial and TCP masters to access serial slaves simultaneously.

Optical Fiber for Ethernet Communication

The MGate MB3170 Series includes 100BaseFX fiber models that support transmission distances up to 4 km for multi-mode models, and up to 40 km for single-mode models. Optical fiber is well-suited for industrial applications because it is immune to electromagnetic noise and interference. For environments that experience high ground loop voltages, fiber provides the best isolation protection, and because there is no danger of sparking, optical fiber is safer than copper wire to use in hazardous environments.

Auto-Device Routing for Easy Configuration (Patent Pending)

Moxa’s Auto-Device Routing function helps eliminate many of the problems and inconveniences encountered by engineers who need to configure large numbers of Modbus devices. A single mouse click is all that’s required to set up a slave ID routing table and configure Modbus gateways to automatically detect Modbus requests from a supervisory control and data acquisition (SCADA) system. By removing the need to manually create the slave ID routing table, the Auto-Device Routing function saves engineers significant time and cost.

Priority Control for Urgent Commands (Patented)

As Modbus networks increase in size and complexity, the lag time between commands and responses becomes a major concern. Advanced models of the MB3000 Series provide a priority control function for urgent commands, allowing users to force certain commands to get an immediate response. Depending on your system’s requirements, different methods are available to define which commands receive priority.
Specifications

Ethernet Interface

| 10/100BaseT(X) Ports (RJ45 connector) | 2 (1 IP, Ethernet cascade) | Auto MDI/MDI-X connection |

Magnetic Isolation Protection

1.5 kV (built-in)

Optical Fiber

<table>
<thead>
<tr>
<th>Fiber Cable Type</th>
<th>100BaseFX</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Multi-Mode</td>
</tr>
<tr>
<td>OM1</td>
<td>50/125 µm</td>
</tr>
<tr>
<td></td>
<td>800 MHz x km</td>
</tr>
</tbody>
</table>

Typical Distance

|          | 4 km | 5 km | 40 km |

Wavelength

<table>
<thead>
<tr>
<th></th>
<th>Typical (nm)</th>
<th>TX Range (nm)</th>
<th>RX Range (nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1300</td>
<td>1260 to 1360</td>
<td>1100 to 1600</td>
</tr>
</tbody>
</table>

Optical Power

<table>
<thead>
<tr>
<th></th>
<th>TX Range (dBm)</th>
<th>RX Range (dBm)</th>
<th>Link Budget (dB)</th>
<th>Dispersion Penalty (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-10 to -20</td>
<td>-3 to -32</td>
<td>12</td>
<td>3</td>
</tr>
</tbody>
</table>

Note: When connecting a single-mode fiber transceiver, we recommend using an attenuator to prevent damage caused by excessive optical power.

Note: Compute the “typical distance” of a specific fiber transceiver as follows: Link budget (dB) > dispersion penalty (dB) + total link loss (dB).

Ethernet Software Features

Industrial Protocols

Modbus TCP Client (Master), Modbus TCP Server (Slave)

Configuration Options

Web Console (HTTP/HTTPS), Device Search Utility (DSU), MGate Manager, Telnet Console

Management

ARP, DHCP Client, DNS, HTTP, HTTPS, SMTP, SNMP Trap, SNMPv1/v2c/v3, TCP/IP, Telnet, UDP, NTP Client

MIB

RFC1213, RFC1317

Time Management

NTP Client

Serial Interface

No. of Ports

MGate MB3170 Series: 1
MGate MB3270 Series: 2

Connector

MGate MB3170/MB3170I: DB9 male for RS-232 and terminal block for RS-422/485
MGate MB3270/MB3270I: 2 x DB9 male

Serial Standards

RS-232/422/485 (software selectable)

Baudrate

50 bps to 921.6 kbps

Data Bits

7, 8

Parity

None, Even, Odd, Space, Mark
<table>
<thead>
<tr>
<th>Stop Bits</th>
<th>1, 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow Control</td>
<td>DTR/DSR, RTS Toggle (RS-232 only), RTS/CTS</td>
</tr>
<tr>
<td>RS-485 Data Direction Control</td>
<td>ADDC® (automatic data direction control)</td>
</tr>
<tr>
<td>Pull High/Low Resistor for RS-485</td>
<td>1 kilo-ohm, 150 kilo-ohms</td>
</tr>
<tr>
<td>Terminator for RS-485</td>
<td>120 ohms</td>
</tr>
<tr>
<td>Isolation</td>
<td>MGate MB3170I: 2 kV (I models)</td>
</tr>
<tr>
<td></td>
<td>MGate MB3170I-T: 2 kV (T models)</td>
</tr>
<tr>
<td></td>
<td>MGate MB3170I-M-SC: 2 kV (I models)</td>
</tr>
<tr>
<td></td>
<td>MGate MB3170I-M-SC-T: 2 kV (T models)</td>
</tr>
<tr>
<td></td>
<td>MGate MB3170I-S-SC: 2 kV (I models)</td>
</tr>
<tr>
<td></td>
<td>MGate MB3170I-S-SC-T: 2 kV (T models)</td>
</tr>
<tr>
<td></td>
<td>MGate MB3270I: 2 kV (I models)</td>
</tr>
<tr>
<td></td>
<td>MGate MB3270I-T: 2 kV (T models)</td>
</tr>
</tbody>
</table>

| Serial Signals            | Rs-232: TxD, RxD, RTS, CTS, DTR, DSR, DCD, GND |
|                          | Rs-422: Tx+, Tx-, Rx+, Rx-, GND                |
|                          | Rs-485-2w: Data+, Data-, GND                  |
|                          | Rs-485-4w: Tx+, Tx-, Rx+, Rx-, GND             |

| Serial Software Features  | Industrial Protocols: Modbus RTU/ASCII Master, Modbus RTU/ASCII Slave |
|                          | Modbus (Transparent)                                           |
| Max. No. of Client Connections | 32 |
| Max. No. of Server Connections | 32 |

| Power Parameters          | Input Voltage: 12 to 48 VDC                                   |
|                          | Input Current: MGate MB3170/MB3270: 435 mA @ 12 VDC           |
|                          | MGate MB3170/MB3170-S-SC/MB3170-M-SC/MB3170-M-ST: 555 mA @ 12 VDC |
|                          | MGate MB3270/MB3170-M-SC/MB3170-M-ST: 510 mA @ 12 VDC          |
|                          | Power Connector: 7-pin terminal block                         |

| Relays                   | Contact Current Rating: Resistive load: 1 A @ 30 VDC         |

<p>| Physical Characteristics  | Housing: Plastic                                             |
|                          | IP Rating: IP30                                                |
|                          | Dimensions (with ears): 29 x 89.2 x 124.5 mm (1.14 x 3.51 x 4.90 in) |
|                          | Dimensions (without ears): 29 x 89.2 x 118.5 mm (1.14 x 3.51 x 4.67 in) |
|                          | Weight: MGate MB3170 Series: 360 g (0.79 lb)                |
|                          | MGate MB3270 Series: 380 g (0.84 lb)                         |</p>
<table>
<thead>
<tr>
<th>Environmental Limits</th>
<th>Operating Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MGate MB3170: 0 to 60°C (32 to 140°F)</td>
</tr>
<tr>
<td></td>
<td>MGate MB3170-T: -40 to 75°C (-40 to 167°F)</td>
</tr>
<tr>
<td></td>
<td>MGate MB3170-M-SC: 0 to 60°C (32 to 140°F)</td>
</tr>
<tr>
<td></td>
<td>MGate MB3170-M-SC-T: -40 to 75°C (-40 to 167°F)</td>
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<td>MGate MB3170-S-SC: 0 to 60°C (32 to 140°F)</td>
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<td>MGate MB3270: 0 to 60°C (32 to 140°F)</td>
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<td>MGate MB3270I-M-ST: 0 to 60°C (32 to 140°F)</td>
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<td>MGate MB3270I-M-ST-T: -40 to 75°C (-40 to 167°F)</td>
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<td>MGate MB3270I-S-SC: 0 to 60°C (32 to 140°F)</td>
</tr>
<tr>
<td></td>
<td>MGate MB3270I-S-SC-T: -40 to 75°C (-40 to 167°F)</td>
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<tr>
<td></td>
<td>Storage Temperature (package included)</td>
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<tr>
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<td>-40 to 85°C (-40 to 185°F)</td>
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<td></td>
<td>Ambient Relative Humidity</td>
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<tr>
<td></td>
<td>5 to 95% (non-condensing)</td>
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<tr>
<th>Standards and Certifications</th>
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<tr>
<td>EMC</td>
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<tr>
<td>EMI</td>
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<td>Hazardous Locations</td>
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<tr>
<td>Maritime</td>
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<tr>
<td>Freefall</td>
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<tr>
<td>Shock</td>
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<td>Vibration</td>
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<td>Safety</td>
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<td>Standards</td>
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<tr>
<th>Warranty</th>
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<tbody>
<tr>
<td>Warranty Period</td>
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<tr>
<td>Details</td>
</tr>
</tbody>
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Package Contents

<table>
<thead>
<tr>
<th>Device</th>
<th>1 x MGate MB3170/MB3270 Series gateway</th>
</tr>
</thead>
<tbody>
<tr>
<td>Documentation</td>
<td>1 x quick installation guide</td>
</tr>
<tr>
<td></td>
<td>1 x warranty card</td>
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Dimensions

Unit: mm (inch)

Ordering Information

<table>
<thead>
<tr>
<th>Model Name</th>
<th>Ethernet</th>
<th>No. of Serial Ports</th>
<th>Serial Standards</th>
<th>Serial Isolation</th>
<th>Operating Temp.</th>
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<tbody>
<tr>
<td>MGate MB3170</td>
<td>2 x RJ45</td>
<td>1</td>
<td>RS-232/422/485</td>
<td>–</td>
<td>0 to 60°C</td>
</tr>
<tr>
<td>MGate MB3170I</td>
<td>2 x RJ45</td>
<td>1</td>
<td>RS-232/422/485</td>
<td>2 kV</td>
<td>0 to 60°C</td>
</tr>
<tr>
<td>MGate MB3270</td>
<td>2 x RJ45</td>
<td>2</td>
<td>RS-232/422/485</td>
<td>–</td>
<td>0 to 60°C</td>
</tr>
<tr>
<td>MGate MB3270I</td>
<td>2 x RJ45</td>
<td>2</td>
<td>RS-232/422/485</td>
<td>2 kV</td>
<td>0 to 60°C</td>
</tr>
<tr>
<td>MGate MB3170-T</td>
<td>2 x RJ45</td>
<td>1</td>
<td>RS-232/422/485</td>
<td>–</td>
<td>-40 to 75°C</td>
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<tr>
<td>MGate MB3170-T</td>
<td>2 x RJ45</td>
<td>1</td>
<td>RS-232/422/485</td>
<td>2 kV</td>
<td>-40 to 75°C</td>
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<tr>
<td>MGate MB3270-T</td>
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<td>2</td>
<td>RS-232/422/485</td>
<td>–</td>
<td>-40 to 75°C</td>
</tr>
<tr>
<td>MGate MB3270-T</td>
<td>2 x RJ45</td>
<td>2</td>
<td>RS-232/422/485</td>
<td>2 kV</td>
<td>-40 to 75°C</td>
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<tr>
<td>MGate MB3170-M-SC</td>
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<tr>
<td>MGate MB3170-M-ST</td>
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<td>0 to 60°C</td>
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<tr>
<td>MGate MB3170-S-SC</td>
<td>1 x Single-Mode SC</td>
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<td>RS-232/422/485</td>
<td>–</td>
<td>0 to 60°C</td>
</tr>
<tr>
<td>MGate MB3170-M-SC</td>
<td>1 x Multi-Mode SC</td>
<td>1</td>
<td>RS-232/422/485</td>
<td>2 kV</td>
<td>0 to 60°C</td>
</tr>
<tr>
<td>MGate MB3170-S-SC</td>
<td>1 x Single-Mode SC</td>
<td>1</td>
<td>RS-232/422/485</td>
<td>2 kV</td>
<td>0 to 60°C</td>
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<tr>
<td>MGate MB3170-MI-SC-T</td>
<td>1 x Multi-Mode SC</td>
<td>1</td>
<td>RS-232/422/485</td>
<td>–</td>
<td>-40 to 75°C</td>
</tr>
<tr>
<td>MGate MB3170-M-ST-T</td>
<td>1 x Multi-Mode ST</td>
<td>1</td>
<td>RS-232/422/485</td>
<td>–</td>
<td>-40 to 75°C</td>
</tr>
<tr>
<td>MGate MB3170-S-SC-T</td>
<td>1 x Single-Mode SC</td>
<td>1</td>
<td>RS-232/422/485</td>
<td>–</td>
<td>-40 to 75°C</td>
</tr>
<tr>
<td>Model Name</td>
<td>Ethernet</td>
<td>No. of Serial Ports</td>
<td>Serial Standards</td>
<td>Serial Isolation</td>
<td>Operating Temp.</td>
</tr>
<tr>
<td>---------------------</td>
<td>----------------</td>
<td>---------------------</td>
<td>------------------</td>
<td>------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>MGate MB3170I-M-SC-T</td>
<td>1 x Multi-mode SC</td>
<td>1</td>
<td>RS-232/422/485</td>
<td>2 kV</td>
<td>-40 to 75°C</td>
</tr>
<tr>
<td>MGate MB3170I-S-SC-T</td>
<td>1 x Single-Mode SC</td>
<td>1</td>
<td>RS-232/422/485</td>
<td>2 kV</td>
<td>-40 to 75°C</td>
</tr>
</tbody>
</table>

**Accessories (sold separately)**

**Cables**
- **CBL-F9M9-150**: DB9 female to DB9 male serial cable, 1.5 m
- **CBL-F9M9-20**: DB9 female to DB9 male serial cable, 20 cm

**Connectors**
- **Mini DB9F-to-TB**: DB9 female to terminal block connector

**Power Cords**
- **CBL-PJT8-10**: Non-locking barrel plug to bare-wire cable

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Battery Charger

Features
- Electronically current limited at 105% of rated output
- Alarm system
- Digital display
- Lightning and voltage transient protection
- Protection of connected equipment against load dump protection
- Constant voltage, current limited, 4-rate automatic equalization
- IP 20 housing
- Temperature compensation
- On board temperature sensor with remote port
- Auto AC line compensation
- Output regulated by sensed battery voltage

Standards
- C-UL listed to UL 1236
- NFPA 70, NFPA 110
- CSA 22.2 No 107 certified
- CE DOC to EN 60335
- IBC Seismic Certification

UL 10 Amp Battery Charger

This battery charger offers accurate, automatic charging of lead-acid and nickel cadmium batteries. The output voltage automatically adjusts to changing input, load, battery and ambient conditions. This prevents battery over-charging and consequent loss of battery electrolyte.

Standard features include AC line compensation, precision voltage regulation, current limiting, automatic 2-rate charging, voltmeter and ammeter, temperature compensation and UL Listing.

The user interface is easy to understand with digital metering, NFPA 110 alarms and a battery fault alarm.

Image Shown may not Reflect Actual Package.
Specifications

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Input supply</td>
<td>110 – 120 V</td>
</tr>
<tr>
<td></td>
<td>208 – 240 V</td>
</tr>
<tr>
<td>AC and DC fuses</td>
<td>2 input and 2 output</td>
</tr>
<tr>
<td>Output voltage</td>
<td>24V</td>
</tr>
<tr>
<td>Output amps</td>
<td>10</td>
</tr>
<tr>
<td>Frequency</td>
<td>50 / 60 Hz</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>-20°C (-4°F) to +60°C (140°F)</td>
</tr>
<tr>
<td>Housing</td>
<td>constructed of rustproof anodized Aluminum</td>
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Dimensions

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>Width</td>
<td>Depth</td>
<td>Height</td>
<td>Weight</td>
</tr>
<tr>
<td>195 mm (7.66 in)</td>
<td>165 mm (6.5 in)</td>
<td>318 mm (12.5 in)</td>
<td>10.4 kg (23 lb)</td>
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</table>

NFPA 110 alarm package as follows:

- AC on  Green led (indication)
- AC fail  Red led and form C contact (2A)
- Float mode  LED
- Fast charge  LED
- Temp comp active  LED
- Low battery volts  Red led and Form C conta
- High Battery Volts  Red led and Form C conta
- Charger fail  Red led and Form C conta
- Battery fault  Red led and Form C conta
- Battery disconnected
- Battery polarity reversed
- Mismatched charger battery voltage
- Open or high resistance charger to battery connection
- Open battery cell or excessive internal resistance

Feature Codes:

BTC1024  BTC1028  BTC1035  BTC1025  BTC1032
C13, C15 and C18 Jacket Water Heater

Factory installed jacket water heater for increased cold-starting capability. The system includes a tank-style metal heater with an integral high limit thermostat and a remote engine mounted control thermostat, durable silicone hoses and heater control relay wired to a common connection point in the control panel. The heater and thermostat location is optimized for maximum coolant flow and heating power efficiency.

FEATURES

FACTORY INSTALLED

- Complete with silicone hoses
- Isolated tank heater vibration and shock tested to extreme limits to guarantee durability
- Optimized location of the heater on the genset base for maximum coolant flow
- Remote pilot thermostat located on the engine for optimized power cycle efficiency is factory set to 100° F (37.8°C)
- Automatically disconnected when engine is running via a dedicated heater relay located in the control panel.
- Supplied with UL recognized components
- Compatible with Cat® ELC and all chemicals
- All parts are serviceable and field replaceable
- Incoloy heater element for longer service life

SPECIFICATIONS

<table>
<thead>
<tr>
<th>Feature Code</th>
<th>JWH0059</th>
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<table>
<thead>
<tr>
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<tr>
<td>Frequency</td>
<td>50/60 Hz</td>
<td>50/60 Hz</td>
<td>50/60 Hz</td>
</tr>
<tr>
<td>Phase</td>
<td>1</td>
<td>1</td>
<td>1</td>
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<tr>
<td>Amps</td>
<td>10.82</td>
<td>11.45</td>
<td>12.5</td>
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<tr>
<td>Design Voltage</td>
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<td>220</td>
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<tr>
<td>Frequency</td>
<td>50/60 Hz</td>
<td>50/60 Hz</td>
<td>50/60 Hz</td>
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</table>
WIRING DIAGRAMS

Wiring diagram reference for 240V Line to Neutral power connection

Wiring diagram reference for 240V or 208V Line to Line and 120V Line to Neutral power connection (Note: Including Optional Space Heater and Battery Charger)

LEHE0297-03
The heater uses compliant components to UL and CSA, and is both CSA and UL approved.

When the generator set is not running, the heater is automatically connected to the AC supply through a power relay mounted in the control panel. Upon receiving a start signal, the AC supply is automatically disconnected by the power relay and automatically reconnected when the start signal is removed and the engine has stopped.

Pilot thermostat located on the engine precisely monitors and controls the engine coolant temperature and is wired to energize and de-energize heater power cycles.

A high-limit thermostat is built into the heater to regulate the output temperature to within safe limits.
Features

- 100% UL Listing
- Thermal Magnetic Trip Units (Frames T1N and T3N)
- Electronic Trip Units (Frames T4N, T5N, T6N & T7S/T7M-S)
- Double insulation
- Clear indication of breaker status
- Can be used in normal operation in an ambient of –25° C and +70° C
- Auxiliary contacts available
- Insulating case constructed from fiberglass reinforced synthetic resin
- Anti-corrosion treatment on all metal parts
- Optional Dual Circuit Breakers

Conformity with International Standards

The T1N through T6N and T7S/T7M-S Frame Circuit Breakers have been designed to comply with these major standards:

- UL 489
- CSA22.2 No.5
- IEC 60947-2

CIRCUIT BREAKERS

Molded Case Circuit Breakers: 30A – 1200A

40 kW – 600 kW Gensets

Picture shown may not represent actual package
### Manually Operated Circuit Breakers

<table>
<thead>
<tr>
<th>Current (A)</th>
<th>Frame</th>
<th>Number of Poles</th>
<th>Interrupting Ratings (kA rms)</th>
<th>Trip Units</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>240V</td>
<td>480V</td>
</tr>
<tr>
<td>30</td>
<td>T1N</td>
<td>3</td>
<td>50</td>
<td>22</td>
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<tr>
<td>40</td>
<td>T1N</td>
<td>3</td>
<td>50</td>
<td>22</td>
</tr>
<tr>
<td>50</td>
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<td>3</td>
<td>50</td>
<td>22</td>
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<td>60</td>
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<td>3</td>
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<td>22</td>
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<td>70</td>
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<td>800</td>
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<td>1200</td>
<td>T7S</td>
<td>3</td>
<td>65</td>
<td>50</td>
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</table>

### Electrically Operated Circuit Breakers

<table>
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<th>Current (A)</th>
<th>Frame</th>
<th>Number of Poles</th>
<th>Interrupting Ratings (kA rms)</th>
<th>Trip Units</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>240V</td>
<td>480V</td>
</tr>
<tr>
<td>800</td>
<td>T7M-S</td>
<td>3</td>
<td>65</td>
<td>50</td>
</tr>
<tr>
<td>1200</td>
<td>T7M-S</td>
<td>3</td>
<td>65</td>
<td>50</td>
</tr>
</tbody>
</table>

Electronic LS/I Trip Units offer LS or LI Protection

**L-I Mode**
- Long Time / Overload Protection, "L" has an adjustable trip threshold and adjustable time delay
- Instantaneous Short Circuit Protection, "I" has an adjustable short circuit trip threshold and once exceeded will cause the circuit breaker to trip instantaneously

**L-S Mode**
- Long Time / Overload Protection, "L" has an adjustable trip threshold and adjustable time delay
- Short Circuit Protection, "S" has an adjustable short circuit trip threshold and adjustable time delay if necessary for coordinating with downstream loads
- Instantaneous Short Circuit Protection, "I" is still included, but the threshold level is not adjustable and exists at a predetermined level

Electronic L-S-I Trip Units
- Long Time / Overload Protection, "L" has an adjustable trip threshold and adjustable time delay
- Short Circuit Protection, "S" has an adjustable short circuit trip threshold and adjustable time delay if necessary for coordinating with downstream loads
- Instantaneous Short Circuit Protection, "I" has an adjustable short circuit trip threshold and once exceeded will cause the circuit breaker to trip instantaneously
Tmax T7 PR231/P Functions L-I Trip curves
Motor Starting

![Motor Starting Graph]

- Percent Volt Dip
- SKVA

- 0
- 10
- 20
- 30
- 40
- 0
- 1,000
- 2,000
- 3,000
- 4,000

KWWSV,WPLZHEFODVVLFFDFRPWPLVHUYOHW70,'LUHFWRU"$FWLRQ RSHQZLQGRZORJ JHQ;PO'DWDW'SH 51"HQ'DWD5HI1XPUI6HR V-
Current Decrement

Open Circuit
Air Gap

Line - Line Volt vs Field Current

Operating Chart

Leading
0.6 PF
0.8 PF
1.0 PF

Lagging
0.6 PF
0.8 PF
1.0 PF

Watts vs VAR

kW / Rated kVA

kVAR / Rated kVA

Engine Limit

0.6 PF
0.4 PF
0.2 PF

0.6 PF
0.4 PF
0.2 PF
CATERPILLAR LIMITED WARRANTY

Industrial, Petroleum, Locomotive, and Agriculture Engine Products and Electric Power Generation Products Worldwide

Effective with sales to the first user on or after June 1, 2012

Caterpillar Inc. or any of its subsidiaries (“Caterpillar”) warrants new and remanufactured engines and electric power generation products sold by it (including any products of other manufacturers packaged and sold by Caterpillar), to be free from defects in material and workmanship.

This warranty does not apply to engines sold for use in on-highway vehicle or marine applications; engines in machines manufactured by or for Caterpillar; C175, 3500 and 3600 series engines used in locomotive applications; 3000 Family engines, C0.5 through C4.4 and ACERT (C6.6, C7, C7.1, C9, C9.3, C11, C13, C15, C18, C27, and C32) engines used in industrial, mobile agriculture and locomotive applications; or Cat batteries. These products are covered by other Caterpillar warranties.

This warranty is subject to the following:

Warranty Period

• For new industrial engines, engines in a petroleum applications or Petroleum Power Systems (excluding petroleum fire pump application), or engines in a Locomotive application, or Uninterruptible Power Supply (UPS) systems, the warranty period is 12 months after date of delivery to the first user.

• For new engines used in petroleum fire pump and mobile agriculture applications the warranty period is 24 months after date of delivery to the first user.

• For controls only (EPIC), configurable and custom switchgear products, and automatic transfer switch products, the warranty period is 24 months after date of delivery to the first user.

• For CG132, CG170 and CG260 series power generation products the warranty period is 24 months/16,000 hours, whichever comes first, after date of delivery to the first user.

• For electric power generation products other than CG132, CG170 and CG260 series in prime or continuous applications the warranty period is 24 months/1000 hours. For emergency standby applications the warranty period is 24 months/1000 hours. For emergency standby applications the warranty period is 24 months/400 hours. All terms begin after date of delivery to the first user.

• For all Remanufactured Generator (GenEnds) products in prime or continuous applications the warranty period is 12 months. For standby applications the warranty period is 24 months/1000 hours. For emergency standby applications the warranty period is 24 months/400 hours. All terms begin after date of delivery to the first user.

• For all other applications the warranty period is 12 months after date of delivery to the first user.

Caterpillar Responsibilities

If a defect in material or workmanship is found during the warranty period, Caterpillar will, during normal working hours and at a place of business of a Cat dealer or other source approved by Caterpillar:

• Provide (at Caterpillar’s choice) new, Remanufactured, or Caterpillar approved repaired parts or assembled components needed to correct the defect.

Note: New, remanufactured, or Caterpillar approved repaired parts or assembled components provided under the terms of this warranty are warranted for the remainder of the warranty period applicable to the product in which installed as if such parts were original components of that product. Items replaced under this warranty become the property of Caterpillar.

• Replace lubricating oil, filters, coolant, and other service items made unusable by the defect.

• Provide reasonable and customary labor needed to correct the defect, including labor to disconnect the product from and reconnect the product to its attached equipment, mounting, and support systems, if required.

For new 3114, 3116, and 3126 engines and electric power generation products (including any new products of other manufacturers packaged and sold by Caterpillar):

• Provide travel labor, up to four hours round trip, if in the opinion of Caterpillar, the product cannot reasonably be transported to a place of business of a Cat dealer or other source approved by Caterpillar (travel labor in excess of four hours round trip, and any meals, mileage, lodging, etc. is the user’s responsibility).

For all other products:

• Provide reasonable travel expenses for authorized mechanics, including meals, mileage, and lodging, when Caterpillar chooses to make the repair on-site.

User Responsibilities

The user is responsible for:

• Providing proof of the delivery date to the first user.

• Labor costs, except as stated under “Caterpillar Responsibilities,” including costs beyond those required to disconnect the product from and reconnect the product to its attached equipment, mounting, and support systems.

• Travel or transporting costs, except as stated under “Caterpillar Responsibilities.”

• Premium or overtime labor costs.

• Parts shipping charges in excess of those that are usual and customary.

• Local taxes, if applicable.

• Costs to investigate complaints, unless the problem is caused by a defect in Caterpillar material or workmanship.

• Giving timely notice of a warrantable failure and promptly making the product available for repair.

• Performance of the required maintenance (including use of proper fuel, oil, lubricants, and coolant) and items replaced due to normal wear and tear.

• Allowing Caterpillar access to all electronically stored data.

Limitations

Caterpillar is not responsible for:

• Failures resulting from any use or installation that Caterpillar judges improper.

• Failures resulting from attachments, accessory items, and parts not sold or approved by Caterpillar.

• Failures resulting from abuse, neglect, and/or improper repair.

(continue on the reverse side…….)
• Failures resulting from user’s delay in making the product available after being notified of a potential product problem.
• Failures resulting from unauthorized repairs or adjustments, and unauthorized fuel setting changes.
• Damage to parts, fixtures, housings, attachments, and accessory items that are not part of the engine or electric power generation product (including any products of other manufacturers packaged and sold by Caterpillar).
• Repair of components sold by Caterpillar that is warranted directly to the user by their respective manufacturer. Depending on type of application, certain exclusions may apply. Consult your Cat dealer for more information.

For products operating outside of Australia, Fiji, Nauru, New Caledonia, New Zealand, Papua New Guinea, the Solomon Islands and Tahiti, the following is applicable:

NEITHER THE FOREGOING EXPRESS WARRANTY NOR ANY OTHER WARRANTY BY CATERPILLAR, EXPRESS OR IMPLIED, IS APPLICABLE TO ANY ITEM CATERPILLAR SELLS THAT IS WARRANTED DIRECTLY TO THE USER BY ITS MANUFACTURER.

THIS WARRANTY IS EXPRESSLY IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, EXCEPT CATERPILLAR EMISSION-RELATED COMPONENTS WARRANTIES FOR NEW ENGINES, WHERE APPLICABLE. REMEDIES UNDER THIS WARRANTY ARE LIMITED TO THE PROVISION OF MATERIAL AND SERVICES, AS SPECIFIED HEREIN.

CATERPILLAR IS NOT RESPONSIBLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.

CATERPILLAR EXCLUDES ALL LIABILITY FOR OR ARISING FROM ANY NEGLIGENCE ON ITS PART OR ON THE PART OF ANY OF ITS EMPLOYEES, AGENTS OR REPRESENTATIVES IN RESPECT OF THE MANUFACTURE OR SUPPLY OF GOODS OR THE PROVISION OF SERVICES RELATING TO THE GOODS.

IF OTHERWISE APPLICABLE, THE VIENNA CONVENTION ON CONTRACTS FOR THE INTERNATIONAL SALE OF GOODS IS EXCLUDED IN ITS ENTIRETY.

For personal or family use engines or electric power generation products, operating in the USA, its territories and possessions, some states do not allow limitations on how long an implied warranty may last or allow the exclusion or limitation of incidental or consequential damages. Therefore, the previously expressed exclusion may not apply to you. This warranty gives you specific legal rights and you may also have other rights, which vary by jurisdiction. To find the location of the nearest Cat dealer or other authorized repair facility, call (800) 447-4986. If you have questions concerning this warranty or its applications, call or write:

In USA and Canada: Caterpillar Inc., Engine Division, P. O. Box 610, Mosaicville, IL 61552-0610, Attention: Customer Service Manager, Telephone (800) 447-4986. Outside the USA and Canada: Contact your Cat dealer.

For products operating in Australia, Fiji, Nauru, New Caledonia, New Zealand, Papua New Guinea, the Solomon Islands and Tahiti, the following is applicable:

THIS WARRANTY IS IN ADDITION TO WARRANTIES AND CONDITIONS IMPLIED BY STATUTE AND OTHER STATUTORY RIGHTS AND OBLIGATIONS THAT BY ANY APPLICABLE LAW CANNOT BE EXCLUDED, RESTRICTED OR MODIFIED (“MANDATORY RIGHTS”). ALL OTHER WARRANTIES OR CONDITIONS, EXPRESS OR IMPLIED (BY STATUTE OR OTHERWISE), ARE EXCLUDED.

NEITHER THIS WARRANTY NOR ANY OTHER CONDITION OR WARRANTY BY CATERPILLAR, EXPRESS OR IMPLIED (SUBJECT ONLY TO THE MANDATORY RIGHTS), IS APPLICABLE TO ANY ITEM CATERPILLAR SELLS THAT IS WARRANTED DIRECTLY TO THE USER BY ITS MANUFACTURER.


CATERPILLAR EXCLUDES ALL LIABILITY FOR OR ARISING FROM ANY NEGLIGENCE ON ITS PART OR ON THE PART OF ANY OF ITS EMPLOYEES, AGENTS OR REPRESENTATIVES IN RESPECT OF THE MANUFACTURE OR SUPPLY OF GOODS OR THE PROVISION OF SERVICES RELATING TO THE GOODS.

CATERPILLAR IS NOT LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES UNLESS IMPLIED UNDER MANDATORY RIGHTS.

IF OTHERWISE APPLICABLE, THE VIENNA CONVENTION ON CONTRACTS FOR THE INTERNATIONAL SALE OF GOODS IS EXCLUDED IN ITS ENTIRETY.

This warranty covers every major component of the products. Claims under this warranty should be submitted to a place of business of a Cat dealer or other source approved by Caterpillar. For further information concerning either the location to submit claims or Caterpillar as the issuer of this warranty, write Caterpillar Inc., 100 N. E. Adams St., Peoria, IL USA 61629.
HAILEY WWTP
TRANSFER SWITCH SUBMITTAL
REVISION 00

July 9, 2020
## HAILEY WWTP
### Bill of Material

<table>
<thead>
<tr>
<th>ATS NAME</th>
<th>QTY</th>
<th>AMPS/POLES</th>
<th>BYPASS</th>
<th>TRANSITION TYPE</th>
<th>CATALOG NUMBER</th>
<th>ACCESSORIES</th>
<th>OUTLINE DRAWING</th>
<th>WIRING DIAGRAM</th>
<th>BOM NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>1</td>
<td>1200 / 4</td>
<td>YES</td>
<td>DELAYED</td>
<td>G 7ADUB B3 1200 N5XM</td>
<td>6DL,18B,18G,31Z, 40LB,44G,72EE2, 82E,125A</td>
<td>740256-084</td>
<td>617429-534</td>
<td>TO BE ENGINEERED</td>
</tr>
</tbody>
</table>


HAILEY WWTP
Transfer Switch Details

<table>
<thead>
<tr>
<th>Product</th>
<th>Series 7000 Transfer Switches</th>
<th>Catalog Number</th>
<th>G7ADUBB31200N5XM</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMPS:</td>
<td>1200</td>
<td>QTY:</td>
<td>1</td>
</tr>
<tr>
<td>Service Voltage / Hz</td>
<td>480V/60Hz</td>
<td>Optional Accessories</td>
<td>6DL,18B,18G,31Z,40LB,44G, 72EE2,82E,125A</td>
</tr>
<tr>
<td>Bypass Isolation</td>
<td>YES</td>
<td>Product Description</td>
<td>7000 Series, Automatic Service Entrance Delayed Transition Bypass Switch - Breaker on Normal</td>
</tr>
<tr>
<td>Switched Poles</td>
<td>4</td>
<td>Neutral Configuration</td>
<td>Switched [B]</td>
</tr>
<tr>
<td>Withstand Rating</td>
<td>Please refer to WCR chart</td>
<td>Cables and Lug Sizes</td>
<td>See Applicable Outline Drawing</td>
</tr>
<tr>
<td>Enclosure</td>
<td>3R(M) Secure 3R</td>
<td>Service</td>
<td>Three Phase, 4-wire</td>
</tr>
<tr>
<td>Extended Warranty</td>
<td>Not Included</td>
<td>Markings</td>
<td></td>
</tr>
</tbody>
</table>

### ACCESSORIES DESCRIPTIONS

<table>
<thead>
<tr>
<th>Item</th>
<th>Accessory Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6DL</td>
<td>Retransfer to normal mode selector. Maintained two position selector switch permits selection of manual or automatic retransfer. Manual retransfer requires a second selector switch 6B or 6C be momentarily closed to initiate a retransfer to the normal source. While in manual retransfer mode if an emergency source failure should occur and the normal source is still available manual retransfer will be automatically bypassed. A pilot light indicates manual retransfer mode.</td>
</tr>
<tr>
<td>2</td>
<td>18B/18G</td>
<td>2pole D/T contacts that operate when emergency and normal source voltage is present at transfer switch terminals</td>
</tr>
<tr>
<td>3</td>
<td>31Z</td>
<td>Selective Load disconnect circuit to provide a pre-transfer and/or post transfer signal when transferring from emergency to normal and/or normal to emergency. The signal can be programmed to occur during all transfers or only when the transfer is occurring between two live sources. The length of the pre and post transfer delays can be set to 0-5 minutes 59 seconds.</td>
</tr>
<tr>
<td>4</td>
<td>40LB</td>
<td>Special Service Configuration: 1200A – Normal &amp; Emergency Reversed</td>
</tr>
<tr>
<td>Item</td>
<td>Accessory Code</td>
<td>Description</td>
</tr>
<tr>
<td>------</td>
<td>----------------</td>
<td>-------------</td>
</tr>
<tr>
<td>5</td>
<td>44G</td>
<td>208-240VAC and or 440-480VAC Accessory 44 Strip heater is designed to keep humidity and or temperature within the ATS enclosure at acceptable levels. This accessory consists of a mounting bracket with strip heater, thermostat and terminal block.</td>
</tr>
<tr>
<td>6</td>
<td>72EE2</td>
<td>5170 Quad-Ethernet Module provides transfer switch dashboard screen with password protected control capabilities, email alerts and open protocol support in a single module with an integrated 4 port Ethernet switch.</td>
</tr>
<tr>
<td>7</td>
<td>82E</td>
<td>Standard Bypass Isolation Status Display Replaced With Membrane Display to match the J and H frame switches. Should be used on G, Q, S, and U Bypass Switches.</td>
</tr>
<tr>
<td>8</td>
<td>125A</td>
<td>Seismic 2.5 Certification</td>
</tr>
</tbody>
</table>
### Table II. ASCO UL1008 Withstand and Closing Ratings 1,2,7

(RMS Symmetrical Amps)

<table>
<thead>
<tr>
<th>Frame</th>
<th>Current Limiting Fuses</th>
<th>Specific Breaker</th>
<th>Time Based</th>
<th>Short Time Ratings3</th>
<th>4000 &amp; 7000 Series</th>
<th>7000 Series</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Class</td>
<td>Specific</td>
<td>Time</td>
<td>Class</td>
<td>Specific</td>
<td>Time</td>
</tr>
<tr>
<td>D</td>
<td>30</td>
<td>-</td>
<td>100kA</td>
<td>300 J</td>
<td>22kA</td>
<td>22kA</td>
</tr>
<tr>
<td>D</td>
<td>70, 100</td>
<td>-</td>
<td>200kA</td>
<td>200 J</td>
<td>22kA</td>
<td>22kA</td>
</tr>
<tr>
<td>D</td>
<td>150</td>
<td>-</td>
<td>200kA</td>
<td>200 J</td>
<td>10kA</td>
<td>10kA</td>
</tr>
<tr>
<td>D</td>
<td>200</td>
<td>-</td>
<td>200kA</td>
<td>200 J</td>
<td>10kA</td>
<td>10kA</td>
</tr>
<tr>
<td>D</td>
<td>230</td>
<td>-</td>
<td>200kA</td>
<td>200 J</td>
<td>10kA</td>
<td>10kA</td>
</tr>
<tr>
<td>E</td>
<td>260, 400</td>
<td>-</td>
<td>200kA</td>
<td>200 J</td>
<td>10kA</td>
<td>10kA</td>
</tr>
<tr>
<td>J</td>
<td>150, 200</td>
<td>150, 200, 230, 260</td>
<td>200kA</td>
<td>200 J</td>
<td>10kA</td>
<td>10kA</td>
</tr>
<tr>
<td>J</td>
<td>400</td>
<td>400</td>
<td>200kA</td>
<td>200 J</td>
<td>10kA</td>
<td>10kA</td>
</tr>
<tr>
<td>J</td>
<td>600</td>
<td>600</td>
<td>200kA</td>
<td>200 J</td>
<td>10kA</td>
<td>10kA</td>
</tr>
<tr>
<td>J</td>
<td>660</td>
<td>660</td>
<td>200kA</td>
<td>200 J</td>
<td>10kA</td>
<td>10kA</td>
</tr>
<tr>
<td>p</td>
<td>800</td>
<td>800</td>
<td>200kA</td>
<td>200 J</td>
<td>10kA</td>
<td>10kA</td>
</tr>
<tr>
<td>Q</td>
<td>600-1600</td>
<td>600-1600</td>
<td>200kA</td>
<td>200 J</td>
<td>10kA</td>
<td>10kA</td>
</tr>
<tr>
<td>S</td>
<td>800</td>
<td>800</td>
<td>200kA</td>
<td>200 J</td>
<td>10kA</td>
<td>10kA</td>
</tr>
<tr>
<td>G</td>
<td>1600 - 2000</td>
<td>1600 - 2000</td>
<td>200kA</td>
<td>200 J</td>
<td>10kA</td>
<td>10kA</td>
</tr>
<tr>
<td>G</td>
<td>3000 - 3000</td>
<td>3000 - 3000</td>
<td>200kA</td>
<td>200 J</td>
<td>10kA</td>
<td>10kA</td>
</tr>
<tr>
<td>L</td>
<td>3200</td>
<td>3200</td>
<td>200kA</td>
<td>200 J</td>
<td>10kA</td>
<td>10kA</td>
</tr>
<tr>
<td>U</td>
<td>3600</td>
<td>3600</td>
<td>200kA</td>
<td>200 J</td>
<td>10kA</td>
<td>10kA</td>
</tr>
</tbody>
</table>

Notes:
1) All WCR values indicated are tested in accordance with the requirements of UL 1008, 7th Edition. See ASCO Pub. 1128 for more WCR information.
2) Application requirements may permit higher WCR for certain switch sizes.
3) Short Time ratings are provided for applications involving circuit breakers that utilize trip delay settings for system selective coordination.
4) Max fuse rating is 1200A on front connected H frame switches.
5) Switches utilizing overlapping neutral (code “C”) have 35kA, 0.050 Sec time based rating at 480V Max.
6) Rating shown is for Bypass switches only, Transfer Switch rating is 100kA.
7) See ASCO for Service Entrance Switch ratings.
8) These frames are only available on the 7000 Series product.
9) Short Time Rating applies to 600A Bypass switch only, the 600A Transfer Switch does not have a Short Time Rating.

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**Table II. UL1008 Withstand and Closing Ratings by Switch Frame**
Limited Guardian Warranty

ASCO Power Technologies®

7000 Series Power Transfer Switches

This Warranty is given ONLY to purchasers who buy for commercial or industrial use in the ordinary course of each purchaser’s business.

General:

ASCO Power Technologies, LP products and systems are in our opinion the finest available. We take pride in our products and are pleased that you have chosen them. Under certain circumstances we offer with our products the following Limited Guardian Warranty Against Defects in Material and Workmanship.

Please read your Guardian Warranty carefully. This Warranty sets forth our responsibilities in the unlikely event of defect and tells you how to obtain performance under this Warranty.

LIMITED WARRANTY AGAINST DEFECTS IN MATERIAL AND WORKMANSHIP

<table>
<thead>
<tr>
<th>Product Description</th>
<th>Catalog Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automatic Transfer Switch</td>
<td>7ATS, 7ADTS, 7ACTS</td>
</tr>
<tr>
<td>Automatic Transfer Bypass - Isolation Switch</td>
<td>7ATB, 7ADTB, 7ACTB</td>
</tr>
<tr>
<td>Non Automatic Transfer Switch (Electrically Operated)</td>
<td>7NTS</td>
</tr>
<tr>
<td>Manual Transfer Switch</td>
<td>7MTS</td>
</tr>
<tr>
<td>Service Entrance Transfer Switch (SEATS)</td>
<td>7AUS, 7ADUS, 7ACUS, 7AUB, 7ADUB, 7ACUB, 7APS, 7ARS, 7ASUD, 7ASUS, 7ASUB</td>
</tr>
<tr>
<td>Power Transfer Load Center (PTLC)</td>
<td>7000L</td>
</tr>
<tr>
<td>Automatic Soft Load Transfer Switch &amp; Bypass-Isolation Switch</td>
<td>7ASLS, 7ASLD, 7ASLE, 7ASLB</td>
</tr>
</tbody>
</table>

Terms of Warranty:

The following Limited Warranty is conditioned upon User’s compliance with the following:

1. The ASCO 7000 Power Transfer Switch is installed in accordance with ASCO specifications and state and local codes and standards by an electrician licensed in the state of installation.

2. The ASCO 7000 Power Transfer Switch is maintained in accordance with ASCO instructions and used under normal conditions for the purposes intended by ASCO.

As provided herein, the ASCO product is warranted to be free of defects in material and workmanship for a period of two, five, and ten years from date of shipment from ASCO provided that the product has been stored in a suitable environment prior to installation; except, however, for 7AUS, 7AUB, 7APS, 7ARS, 7ASLD, 7ASLE, 7ASUD, 7ASUS, 7ASUB and 7000L products, the warranty period for the circuit breaker shall be two (2) years from date of shipment from ASCO. The product shipment date will be determined only from the ASCO bill of lading. If any part or portion of the ASCO product fails to conform to the Warranty within the Warranty period, ASCO, at its option, will furnish new or factory remanufactured products for repair or replacement of that portion or part.

YEARS 1 – 2: Covers all replacement parts, labor, and travel expenses necessary to remedy the defects in material and/or workmanship. All warranty repair or replacement of said equipment will be performed at ASCO’s option at ASCO’s service facility location, factory, or User’s installation site by ASCO’s certified service personnel as deemed most practical by ASCO.

YEARS 3 – 5: Following expiration of the initial two year warranty period as detailed herein, parts only determined to be defective will be provided at no charge. Customer is responsible for all other related costs (labor and travel expenses). This does not apply to circuit breakers in 7AUS, 7AUB, 7APS, 7ARS, 7ASLD, 7ASLE, 7ASUD, 7ASUS, 7ASUB and 7000L products.

YEARS 6 – 10: Following expiration of year five warranty period as detailed herein, Main Contacts only determined to be defective will be provided at no charge. Customer is responsible for all other related costs (labor and travel expenses).

Optional Available Extended Warranty:

Optional extended warranty coverage may be purchased from ASCO for a specified fee at the time of the original sale. If purchased, it shall extend the coverage conditions noted for years 1-2 above up to an additional three (3) years, to provide up to five (5) years of coverage applicable to the above referenced products. Extended warranty coverage must be purchased in one (1) year increments.
The length of the optional extended coverage shall be reflected on the ASCO invoice and/or order acknowledgement document. The extended warranty coverage does not affect the standard warranty described above for years 3-10 or the 2 year circuit breaker warranty; those warranty periods will remain the same.

All warranty related repairs, replacements or adjustments must be made by ASCO Services Inc. or its duly authorized representative.

Warranty Extends to First Purchaser for Use, Non-transferable:

This Warranty is extended to the first person, firm, association or corporation for whom the ASCO product specified herein is originally installed for use (the "User") in the fifty United States or Canada. This Warranty is not transferable or assignable without the prior written permission of ASCO.

Assignment of Warranties:

ASCO assigns to User any warranties which are made by manufacturers and suppliers of components of, or accessories to, the ASCO product and which are assignable, but ASCO makes NO REPRESENTATIONS as to the effectiveness or extent of such warranties, assumes NO RESPONSIBILITY for any matters which may be warranted by such manufacturers or suppliers and extends no coverage under this Warranty to such components or accessories.

Drawings, Descriptions:

ASCO warrants for the period and on the terms of the Warranty set forth herein that the ASCO product will conform to the descriptions contained in the certified drawings, if any, applicable thereto, to ASCO's final invoices, and to applicable ASCO product brochures and manuals current as of the date of product shipment ("Descriptions"). ASCO does not control the use of any ASCO product. Accordingly, it is understood that the Descriptions are NOT WARRANTIES OF PERFORMANCE and NOT WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE.

Warranty Claims Procedure:

Within a reasonable time, but in no case to exceed thirty (30) days, after User's discovery of a defect, User shall contact ascopowerwarranty@ascopower.com. Subject to the limitations specified herein, (i) during the first two years of the warranty, an ASCO service representative will repair the non-conforming ASCO product warranted hereunder without charge for parts, labor, or travel expenses; (ii) during the remainder of the warranty, ASCO will arrange for an ASCO service representative to repair or replace the non-conforming ASCO product warranted hereunder without charge for covered parts, and User shall bear all labor, travel expenses, and shipping charges associated with repair or replacement of the product herein. Warranty coverage will apply only after ASCO's inspection discloses the claimed defect and shows no signs of treatment or use that would void the coverage of this Warranty. All defective products and component parts replaced under this warranty become the property of ASCO.

Warranty Performance of Component Manufacturers:

It is ASCO's practice, consistent with its desire to remedy Warranty defects in the most prompt and effective manner possible, to cooperate with and utilize the services of component manufacturers and their authorized representatives in the performance of work to correct defects in the product components. Accordingly, ASCO may utilize third parties in the performance of Warranty work, including repair or replacement hereunder, where, in ASCO's opinion, such work can be performed in less time, with less expense, or in closer proximity to the ASCO product.

Items Not Covered By Warranty:

THIS WARRANTY DOES NOT COVER DAMAGE OR DEFECT CAUSED BY misuse, improper application, wrong or inadequate electrical current or connection, negligence, inappropriate on site operating conditions, repair by non-ASCO designated personnel, accident in transit, tampering, alterations, a change in location or operating use, exposure to the elements, water, or other corrosive liquids or gases, Acts of God, theft or installation contrary to ASCO's recommendations or specifications, or in any event if the ASCO serial number has been altered, defaced, or removed.

THIS WARRANTY DOES NOT COVER shipping costs, installation costs, external circuit breaker resetting or maintenance or service items and further, except as may be provided herein, does NOT include labor costs or transportation charges arising from the replacement of the ASCO product or any part thereof or charges to remove or reinstall same at any premises of User.

REPAIR OR REPLACEMENT OF A DEFECTIVE PRODUCT OR PART THEREOF DOES NOT EXTEND THE ORIGINAL WARRANTY PERIOD.

THE PRODUCTS LISTED IN THIS WARRANTY ARE NOT FOR USE IN THE CONTROL AREA OR ANY REACTOR CONNECTED OR SAFETY APPLICATIONS OR WITHIN THE CONTAINMENT AREA OF A NUCLEAR FACILITY OR FOR INTEGRATION INTO MEDICAL DEVICES.

Limitations:

THIS WARRANTY IS IN LIEU OF AND EXCLUDES ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

USER'S SOLE AND EXCLUSIVE REMEDY IS REPAIR OR REPLACEMENT OF THE ASCO PRODUCT AS SET FORTH HEREIN.

IF USER'S REMEDY IS DEEMED TO FAIL OF ITS ESSENTIAL PURPOSE BY A COURT OF COMPETENT JURISDICTION, ASCO'S RESPONSIBILITY FOR PROPERTY LOSS OR DAMAGE SHALL NOT EXCEED THE NET PRODUCT PURCHASE PRICE.
IN NO EVENT SHALL ASCO ASSUME ANY LIABILITY FOR INDIRECT, SPECIAL, INCIDENTAL, CONSEQUENTIAL OR EXEMPLARY DAMAGES OF ANY KIND WHATSOEVER, INCLUDING WITHOUT LIMITATION LOST PROFITS, BUSINESS INTERRUPTION OR LOSS OF DATA, WHETHER ANY CLAIM IS BASED UPON THEORIES OF CONTRACT, NEGLIGENCE, STRICT LIABILITY, TORT, OR OTHERWISE.

**Miscellaneous:**

NO SALESPERSON, EMPLOYEE OR AGENT OF ASCO IS AUTHORIZED TO ADD TO OR VARY THE TERMS OF THIS WARRANTY. Warranty terms may be modified, if at all, only in writing signed by an ASCO officer.

ASCO obligations under this Warranty are conditioned upon ASCO timely receipt of full payment of the product purchase price and any other amounts due. ASCO reserves the right to supplement or change the terms of this Warranty in any subsequent warranty offering to User or others.

In the event that any provision of this Warranty should be or becomes invalid and/or unenforceable during the warranty period, the remaining terms and provisions shall continue in full force and effect.

This Warranty shall be governed by, and construed under, the laws of the State of New Jersey, without reference to the conflict of laws principles thereof.

This Warranty represents the entire agreement between ASCO and User with respect to the subject matter herein and supersedes all prior or contemporaneous oral or written communications, representations, understandings or agreements relating to this subject.
ASCO 7000 SERIES
Power Transfer Switches

ascopower.com

Life Is On
ASCO 7000 Series POWER TRANSFER SWITCHES

Protecting:
- Healthcare Facilities
- Enterprise / Colocation / Cloud Data Centers
- Commercial Buildings / Industrial Buildings
- Telecom Mobile / Central Switching Centers
- Process Manufacturing
- Distributed Energy Resources (Microgrid) / Load Management
- Water Treatment Facilities
As society becomes increasingly dependent on the quality and reliability of electrical power, interruption or complete loss of power can result in serious hardships, significant financial losses, or dangers to life and safety.

ASCO Power Technologies (ASCO) provides industry-leading products and solutions for reliably transferring critical loads to emergency power sources. Using ASCO products can mean the difference between a minor inconvenience and a major catastrophe. You’ll find ASCO Power Transfer Switches wherever there is a critical load to protect.

ASCO offers a variety of product solutions to meet virtually every requirement, including distributed generation applications. That’s why the 7000 SERIES is available in open, delayed, closed and soft load transition configurations. Additionally, switched or overlapping neutral options provide for more accurate operation of ground fault protection systems and reduction of voltage transients from unbalanced load switching.

7000 SERIES

ASCO Power Transfer Switches are the standard of the industry. High speed transfer of loads between alternate sources of power, regardless of amperage, is achieved using a reliable, field-proven solenoid operating mechanism. When combined with a programmable microprocessor controller with keypad and LCD display, they offer the most advanced method of transferring all types of loads, such as motors, electronic drives, UPS’s and microprocessor-based systems. 7000 SERIES Power Transfer Switches are available open or enclosed, in amperages ranging from 30 through 4000 amps with the largest selection of optional accessories offered anywhere. All switching configurations are available with an integrally mounted bypass-isolation switch. Configurations are also available for service entrance applications.

7000 SERIES POWER TRANSFER SWITCHES PRODUCT FEATURES

- Conventional two-position transfer configuration, plus closed and delayed transition modes of operation. All configurations available with either automatic or non-automatic control.
- Listed to UL 1008 Transfer Switch Equipment for Automatic Transfer Switches and Certified to CSA 22.2, No. 178.
- Qualified and certified to IEC 60947-6-1, CE marked (optional). (Limited to certain accessories.)
- Rated up to 600 VAC, 30 through 4000 amps.
- 3 to 18-Cycle Withstand and Closing Rating (WCR) Standard, 30-Cycle WCR Optional.
- Reliable and field-proven solenoid operating mechanism.
- High WCRs including short-time withstand current rating for optimum flexibility in circuit breaker coordination (600-4000 amps).
- Solid, switched, or overlapping neutral conductor options.
- Front replaceable main and arcing contacts (800-4000 amps).
- Programmable microprocessor controller with keypad and LCD display.
- Centrally located terminal block for customer control connections (260-4000 amps).
- 16mm, industrial grade control switches and indicating lights.
- Switch position and source acceptability LED indicators.
- Standard ground conductor connections.
- Four auxiliary contacts, two contacts closed when switch is in normal position and two contacts closed when switch is in emergency position.
- Local/remote communications capability for interfacing with ASCO POWERQUEST® communication products.
- Protected by a comprehensive 2, 5, or 10 year warranty.
ASCO 7000 SERIES POWER SWITCHING SOLUTIONS

Automatic & Non-Automatic Transfer Switching

ASCO Transfer Switches are available in both automatic & non-automatic initiation types. Both types are electrically operated. For automatic transfer switches, the controller initiates transfer. For non-automatic transfer switches, the user initiates switching transfer between power sources using switches mounted locally or at remote locations. Non-automatic switches have the following features:

- Sizes from 30 through 4000 amps.
- Microprocessor-based controller provides for addition of optional accessories.
- Controller prevents inadvertent operation under low voltage conditions.
- Low control circuit operating currents allow for long distances between remotely mounted manual control switches and the transfer switch.
- Source acceptability lights inform operator when sources are available to accept load.
- Standard inphase monitor can be activated for transferring motor loads.

Fig. 2: Four Pole, Non-Automatic, Electrically-Operated 400 Amp Switch in a Type 1 Enclosure.
ASCO 7000 SERIES POWER SWITCHING SOLUTIONS

Open Transition Transfer Switching
ASCO Transfer Switches are available in a standard, 2-position, open transition configuration to reliably transfer loads between power sources. Loads transfer to the alternate source in less than 100ms. In phase transfer can be activated for transferring motor loads. Open transition switches are suitable for a wide range of applications.

- Available from 30 to 4000 amps.
- Utilizes reliable, field-proven, single solenoid operating mechanisms.
- Single operator design prevents direct connection of both sources.

Delayed Transition Transfer Switching
ASCO Delayed Transition Transfer Switches are designed to provide transfer of loads between power sources with a timed load disconnect position for an adjustable period of time. Applications include older style variable frequency drives, rectifier banks, and load management applications.

- 150 through 4000 amps.
- Utilizes reliable, field-proven solenoid operating mechanisms.
- Mechanical interlocks to prevent direct connection of both sources.
- Indicator light (16mm, industrial grade type LED) for load disconnect position.
- Adjustable time delay for load disconnect position.

Closed Transition Transfer Switching
ASCO Automatic Closed Transition Transfer Switches feature main contacts that overlap, permitting the transfer of electrical loads without power interruption. The switch transfers in a make-before-break mode if both sources are within acceptable parameters. Control logic continuously monitors source conditions and automatically determines whether the load transfer should be open (conventional non-overlap mode) or closed transition.

- Available 150 through 4000 amps.
- Utilizes reliable, field proven solenoid operating mechanism.
- Closed Transition Transfer is achieved passively within 5 electrical degrees, without control of engine generator set.
- Additional control wiring not required.
- Overlap time is less than 100 milliseconds (consult your local utility on protective relay requirements).
- Failure to synchronize and extended parallel time indication.

Fig. 3: Four pole, Delayed Transition 2000 Amp Transfer Switch.

Fig. 4: Four Pole, Closed Transition, 1000 Amp Transfer Switch in a Type 1 enclosure.
WITHSTANDING AND CLOSING ON SHORT CIRCUIT FAULT CURRENTS

Withstanding and closing on short circuit currents require transfer switches that can handle extremely high electromagnetic forces and thermal stresses. Circuit breakers and fuses are designed to open on short circuit currents. However, while transfer switches must withstand a short circuit current until the over-current device clears the fault.

The withstand and closing rating (WCR) indicates the highest level of current a transfer switch can close on and carry for a specific amount of time. For system coordination purposes, the time must be sufficient for the upstream over-current protective device to clear the fault. The WCR must equal or exceed the available fault current and system voltage at the power source terminals of the switch.

The purpose of a power transfer switch is to maintain power to the load, whereas an overcurrent device is designed to open under a fault condition to protect the circuit conductors and equipment. ASCO power transfer switches use a unique solenoid operator design to force and lock the main contacts closed on a high current fault, rather than allowing them to open like a circuit breaker.

Main contact material composition, contact geometry, arcing contact design, and other features all affect the ability of the power transfer switch to withstand and close-on high fault currents. ASCO employs a variety of computer modeling programs to determine the optimal combination of all these elements to create a superior transfer switch design.

ASCO power transfer switches are available with a full range of WCRs to accommodate a variety of over-current devices with fault-clearing times from 0.004 to 0.5 seconds (1/4 to 30 cycles). In fact, ASCO transfer switches provide the industry's most comprehensive solution for all short circuit requirements. Our 7000 SERIES WCR table addresses all time-based, specific breaker, current-limiting fuse, and short-time ratings necessary for accommodating selective coordination requirements.

In order to meet NEC selective coordination requirements, short-time settings are specified on circuit breakers following a coordination study. A circuit breaker's short-time settings require transfer switches to withstand and close-on short circuit currents for time durations of 0.1 seconds (6 cycles for a 60Hz system) or longer. The 4th Edition of UL1008 added this optional “Short-Time Rating” for transfer switches in 2002. Underwriters Laboratories does not require a specific time or specific number of cycles to qualify for this rating, but the transfer switch WCRs must coordinate with the short-time settings on the breakers.

While there are no ideal time delay breaker settings for selective coordination, many engineers have been successful with using 0.3 seconds (18 cycles) for the most upstream breaker short-time settings. However, 0.5 second (30-cycle) settings may be required for larger projects with multiple levels of distribution breakers or where transfer switches are served by ANSI switchgear with 30-cycle withstand ratings.

As with most electrical devices, higher ratings usually result in higher costs. The goal is to optimize selective coordination in the system while incorporating power transfer switches at a reasonable cost. ASCO 7000 SERIES H and G frame Power Transfer Switches include a 0.3 second (18-cycle) short-time rating as standard along with a 0.05 second (3-cycle) short-circuit rating. The 18-cycle rating should be sufficient to satisfy most selective coordination requirements without adding cost to the transfer switch budget.

The ASCO P, Q, S, and U frame 7000 SERIES Power Transfer Switches are perfect for larger projects, or for systems using ANSI switchgear requiring a 0.5 second (30-cycle) rating. These switches feature a re-designed contact assembly with more robust contact frames, heavier-duty crank arms, and a high-speed coil closing circuit. These design enhancements enable flexibility for selective coordination solutions and provide safe and reliable fault current endurance for up to 0.5 seconds.
# ASCO Withstand and Closing Ratings for all 7000 SERIES Products

(RMS Symmetrical Amps)

The chart below indicates Withstand and Closing Ratings for all 7000 SERIES Power Transfer Switches, including 0.5 second (30-cycle) designs.

<table>
<thead>
<tr>
<th>Frame</th>
<th>Switch Rating (Amps)</th>
<th>Current Limiting Fuses</th>
<th>Specific Breaker</th>
<th>Time Based</th>
<th>Short Time Ratings (sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Transfer Switches</td>
<td>Bypass Switches</td>
<td></td>
<td></td>
<td>480V Max.</td>
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<tr>
<td>D</td>
<td>30</td>
<td>-</td>
<td>100kA - 300 J</td>
<td>22kA</td>
<td>10kA</td>
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<tr>
<td>D</td>
<td>70, 100</td>
<td>-</td>
<td>100kA - 300 J</td>
<td>150kA</td>
<td>10kA</td>
</tr>
<tr>
<td>D</td>
<td>150</td>
<td>-</td>
<td>100kA - 300 J</td>
<td>200kA</td>
<td>10kA</td>
</tr>
<tr>
<td>D</td>
<td>200</td>
<td>-</td>
<td>100kA - 300 J</td>
<td>200kA</td>
<td>10kA</td>
</tr>
<tr>
<td>D</td>
<td>230</td>
<td>-</td>
<td>100kA - 300 J</td>
<td>200kA</td>
<td>10kA</td>
</tr>
<tr>
<td>J</td>
<td>150, 200, 260</td>
<td>150, 200, 230, 260</td>
<td>100kA - 300 J</td>
<td>200kA</td>
<td>10kA</td>
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<tr>
<td>J</td>
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<tr>
<td>J</td>
<td>600</td>
<td>600</td>
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<tr>
<td>G</td>
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<td>600</td>
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<tr>
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</tr>
<tr>
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<td>100kA - 300 J</td>
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<td>7000</td>
<td>100kA - 300 J</td>
<td>200kA</td>
<td>10kA</td>
</tr>
</tbody>
</table>

Notes:
1. All WCR values indicated are tested in accordance with the requirements of UL 1008, 7th Edition. See ASCO Pub. 1128 for more WCR information.
2. Application requirements may permit higher WCR for certain switch sizes.
3. Short Time ratings are provided for applications involving circuit breakers that utilize trip delay settings for system selective coordination.
4. Max fuse rating is 1200A on front connected H frame switches.
5. Switches utilizing overlapping neutral (code “C”) have 35kA, 0.050 sec time based rating at 480V Max.
6. Rating shown is for Bypass switches only. Transfer Switch rating is 100kA.
7. Contact ASCO for Service Entrance Switch ratings.
8. Short Time Rating applies to 600A Bypass switch only, the 600A Transfer Switch does not have a Short Time Rating.
ASCO 7000 SERIES BYPASS ISOLATION SWITCHES

Automatic Transfer Bypass-Isolation Switches

ASCO Automatic Transfer & Bypass-Isolation Switches are available in open transition, closed transition, and delayed transition designs. The bypass and isolation features allow the primary automatic transfer switch to be inspected, tested, and maintained without interrupting power to the load. They also provide redundant power transfer if the ATS is disabled or removed from service.

- Available 150 to 4000 amps.
- Allows bypass-isolation without load interruption.
- Bypass switch and transfer switch have identical electrical ratings.
- Heavy-duty mechanical interlocks prevent unintended operation.
- Bypass contacts carry current only during bypass mode.
- Drawout design allows for easy transfer switch maintenance.
- Bypass and isolation handles are permanently mounted. The bypass switch has dead front quick-make, quick-break operation for transferring loads between live sources.
- Bypass switch is fully rated for use as a manual 3-position transfer switch.
- Bypass and isolation functions are simple, requiring a total of two operating handles.
- No toggle switches, push buttons, selector switches, or levers are required for bypass-isolation operation.
- Mechanical indicators show bypass and transfer switch positions.
- 800 - 1200 amp models available in shallow depth, front connected or rear connected designs.

Transfer Switch Drawout Features (150-4000 Amps)

- Automatic secondary disconnects remove all control power as switch is withdrawn.
- Drawout carriage provides for easy transfer switch mechanism maintenance and/or removal via commercially available breaker hoists.
- Optional transfer switch lifting yoke kit available
- Optional automatic shutters that close when the transfer switch is withdrawn to provide bus isolation. Specify accessory 82C (1600-3000 Amp only).
ASCO 7000 SERIES BYPASS ISOLATION SWITCHES

Bypass and Isolation Handles - Simple as 1, 2, 3

1. Bypass to Normal
   - Push in bypass handle and turn it counter clockwise
   - Bypass handle
   - Isolation handle
   - Automatic Transfer Switch

2. Test Position
   - Turn isolation handle counter clockwise until window shows “Test”
   - Isolation handle
   - Automatic Transfer Switch

3. Isolation Position
   - Turn isolation handle counter clockwise until window shows “isolate”
   - Isolation handle
   - Automatic Transfer Switch
**ASCO 7000 SERIES SERVICE ENTRANCE POWER TRANSFER SWITCHES**

The ASCO Service Entrance Power Transfer Switch combines automatic power switching with a disconnect and overcurrent protective device on the utility source. The power transfer switch meets all National Electric Code requirements for installation at a facility's main utility service entrance. Service entrance rated transfer switches generally are installed at facilities that have a single utility feed and a single emergency power source. A circuit breaker serves as the utility disconnect and links are provided to disconnect both neutral and ground connections. This product is available up to 600V and 4000 amps in Standard, Delayed, Closed Transition, Soft Load, and Bypass Isolation Configurations.

**Standard Features**

- Available from 70 to 4000 amps
  - 70 - 400 amp listed to UL 1008
  - 600 - 4000 amp listed to UL 891
- The ASCO 7000 SERIES Power Transfer Switch mechanism is UL 1008 Listed
- Standard UL Type 1 Enclosure
- Disconnect and overcurrent protective device on the utility source. 70 to 2000 amp models use molded case circuit breakers; 2500 to 4000 amp models use insulated case circuit breakers.
- Disconnect link on Neutral
- Disconnect link on Ground
- Ground and Neutral Bus, all silver-plated copper
- Solderless screw-type terminals for External Power Connections
- Meets all NEC requirements for use as service entrance
- Internet-enabled monitoring and control
- Service Entrance Continuous Breaker Ratings: 80% for standard transfer switches below 2500 amps and Bypass Isolation Switches below 1000 amps, otherwise 100%

![One line diagram of a typical service entrance-rated transfer switch available in Solid, Switched or Overlapping Neutral](image)

*Ground fault trip protection provided on models of 1000 amps and above

**Additional Options**

- Enclosures - Secure Door Over Door/Panel
  - UL Type 3R w/strip heater & thermostat
  - UL Type 4 or 4X
  - UL Type 12
- Connections
  - Crimp lugs
  - Bus Riser on Normal, Emergency or Load
- Protective Relays/Metering
  - Accessory 135L (see page 22)
- Surge Suppression
  - Accessory 73, Surge protector (see page 19)
- Additional Breaker(s)
  - Circuit Breaker on Emergency
  - Load Distribution Panel
- Optional High AIC Ratings on Breakers
- Technology Packages including
  - 7-inch Color Touch Display including 5210 Meter (Acc. 150AT/150BT)
  - 7-inch Color Touch Display Interface including 5410 Power Quality Meter (Acc. 150AT1/150BT1)
  - Base Package including 5210 Power Meter (Acc. 150A/150B)
- ATS Remote Annunciators (see page 23)
  - 1-ATS 7-inch Color Touch Annunciator (5370)
  - 8-ATS / 1-ATS LED Annunciator (5350/5310)
- Remote Power Monitoring (see pages 25-27)
  - 8-Device Annunciator, (5705)
  - Critical Power Management System (5710/5750/5790)

Note: All Tech Packs include Meter, Acc. 72EE2 Ethernet Module and Acc. 1PS1 power ride-through. 150A* (ATS) and 150B* (Bypass ATS).

Consult ASCO for additional features.
ASCO 7000 SERIES GROUP 5 CONTROLLER

The 7000 SERIES Controller (Group 5) is used with all sizes of Power Transfer Switches from 30 through 4000 amps. It is the most reliable and field-proven transfer switch controller in the industry and includes, as standard, all of the voltage, frequency, control, timing and diagnostic functions required for most emergency and standby power applications. It can be equipped with a color Touch Display Interface that provides information to better manage your transfer and bypass switch. (See page 16 for additional information)

Because severe voltage transients are frequently encountered in industrial distribution systems, the controller's logic board is separated and isolated from its power board. This improves electrical noise immunity performance and helps assure compliance with the rigorous transient suppression standards shown in the table below.

| Group 5 Controller Standard Display | Advanced Touch Display Interface (TDI) Accessory 150 Tech. Package (see page 16) |

### 7000 SERIES Group 5 Controller

<table>
<thead>
<tr>
<th>Emission Standard - Group 1, Class A</th>
<th>EN 55011:1991</th>
</tr>
</thead>
<tbody>
<tr>
<td>Generic Immunity Standard, from which:</td>
<td>EN 50082-2:1995</td>
</tr>
<tr>
<td>Electrostatic Discharge (ESD) Immunity</td>
<td>EN 61000-4-2:1995</td>
</tr>
<tr>
<td>Radiated Electromagnetic Field Immunity</td>
<td>ENV 50140:1993</td>
</tr>
<tr>
<td>Electrical Fast Transient (EFT) Immunity</td>
<td>EN 61000-4-4:1995</td>
</tr>
<tr>
<td>Surge Transient Immunity</td>
<td>EN 61000-4-5:1995</td>
</tr>
<tr>
<td>Conducted Radio-Frequency Field Immunity</td>
<td>EN 61000-4-6:1996</td>
</tr>
<tr>
<td>Voltage Dips, Interruptions and Variations Immunity</td>
<td>EN 61000-4-11:1994</td>
</tr>
</tbody>
</table>
ASCO 7000 SERIES GROUP 5 CONTROLLER

Control Features

• Touch pad programming of features and settings without the need for meters or variable power supplies.
• Sixteen (16) selectable operating voltages available in a single Controller.
• On-board diagnostics provide control panel and ATS status information for analyzing system performance.
• Displays and counts down active timing functions.
• Selectable multi-language display (English, German, Portuguese, Spanish, or French. For other languages, contact ASCO).
• Password protection to prevent unauthorized tampering of settings.
• Optional Color Touch Display Interface simplifies control management and expands event log to 1,000 events. Specify Accessory 150AT (ATS) or 150BT (Bypass).
• Remote monitoring and control with ASCO POWERQUEST® communication products. Specify Accessory 72EE2.
• Load shed option for bus optimization applications. Specify optional accessory 30B.
• Historical event log.
• Statistical ATS systems monitoring information.

Voltage and Frequency Sensing

• 3-Phase under-voltage and over-voltage settings on normal and emergency sources.
• Under-frequency and over-frequency settings on normal and emergency.
• True RMS Voltage Sensing with +/- 1% accuracy; Frequency Sensing Accuracy is +/- 0.2%.
• Selectable settings: single or 3-phase voltage sensing on normal and emergency; 50 or 60Hz.
• Phase sequence sensing for phase-sensitive loads.
• Voltage unbalance detection between phases.

Status and Control Functions

• Output contact (N/O or N/C) for engine-start signals.
• Selection between “commit/no-commit” on transfer to emergency after engine start and normal restores before transfer.
• Advanced inphase algorithm that automatically measures the frequency difference between the two sources and initiates transfer at appropriate phase angles to minimize disturbances when transferring motor loads.
• Standard event log displays 99 logged events with the time and date of the event, event type and event reason.
• Output signals for remote indication of normal and emergency source acceptability.
• Statistical ATS/System monitoring data screens that provide:
  - Total number of ATS transfers.
  - Number of ATS transfers caused by power source failure.
  - Total number of days ATS has been in operation.
  - Total number of hours that the normal and emergency sources have been available.

Time Delays

• Engine start time delay - delays engine starting signal to override momentary normal source outages - adjustable 0 to 6 seconds.
• Transfer to emergency time delay - adjustable 0 to 60 minutes.
• Emergency source stabilization time delay to ignore momentary transients during initial generator set loading - adjustable 0 to 6 seconds.
• Retransfer to normal time delay with two settings:
  - Power failure mode - 0 to 60 minutes.
  - Test mode - 0 to 10 hours.
• Unloaded running time delay for engine cool down - adjustable 0 to 60 minutes.
• Pre-transfer and post-transfer signal time delay for selective load disconnect with a programmable bypass on source failures - adjustable 0 to 5 minutes. This signal can be used to drive a customer-furnished relay, or for two sets of double throw contacts rated 3 amps at 480 volts AC. Specify ASCO optional accessory 31Z.
• Fully programmable engine exerciser with seven independent routines to exercise the engine generator, with or without loads, on a daily, weekly, bi-weekly or monthly frequency.
• Alarm signals, logic, and time delays for use with closed transition switches.
  - In synch time delay - 0 to 3 seconds.
  - Failure to synchronize - 1 to 5 minutes.
  - Extended parallel - 0.1 to 1.0 seconds.
• Delayed transition load disconnect time delay - adjustable 0 to 5 minutes.
## Status

### System Status
- **Normal OK**
- **Load on Normal**

Displays system status in clear, concise language. Message shown indicates normal source is acceptable and the load is connected to the normal source.

### Time Delay Status
- **Normal OK**
- **TD.Engine.Cooldown:** 4min15s

Active time delay status displays time remaining until next control event.

## Settings

### Voltage and Frequency Settings
- **Normal Voltage**
  - Dropout: 85%, 408V
  - Pickup: 90%, 432V
  - O.U. Trip: 110%, 528V

Provides voltage and frequency setting values for normal and emergency sources. Voltage pick-up, dropout and trip settings are set in percentage of nominal voltage and are also displayed in rms voltage values.

### Engine Exerciser
- **P1, Engine, Exerciser**
- **Enable:** Yes
- **Start:** 19h30min. ALL MON
- **Run Time:** 21h15min

Seven independent programs, load/no load selection, flexible run times and daily, weekly, bi-weekly and monthly exercise routines.

### Feature Settings
- **Shed Load**
  - **Direction:** From E
  - **Inphase**

Standard features can be activated with the keypad. As an example, when enabled, the “shed load” option causes the transfer switch to transfer the load off of the specified source. If desired, the load shed transfer can be made inphase.

### Time Delay Settings
- **TD NE Xfer Signal**
  - **Bypass if N Fail:** No
  - **Pre Xfer:** 0 min 20s
  - **Post Xfer:** 0 min 20s

Provides direct reading display for setting time delays.

## Data Logging

### ATS Statistics
- **ATS Statistics**
  - **ATS Total Xfers:** 46
  - **SRC Fail Tot Xfers:** 20
  - **Days Energized:** 36.5

Instant availability of statistical information on total number of ATS transfers, number of transfers caused by power failures and total days controller has been energized, plus more.

### Historical Event Log
- **16.AUG.95 13:18:**
- **15.AUG.95 13:18:**

Displays detailed information for last 99 events, including time of occurrence, length of event, date and reason for event.
Control Switches and Indicating Lights

- Switch position indicating lights (16 mm, industrial grade LEDs).
- Source acceptability indicating lights with true indication of the acceptability of each source, as determined by the voltage, frequency, voltage unbalance, and phase sequence settings of the control panel (16mm, industrial grade LEDs).
- Three position (16mm, industrial grade type) selector switch:
  - Automatic: Normal maintained position.
  - Test: Momentary position to simulate normal source failure for system test function.
  - Reset Delay Bypass: Momentary position to bypass transfer and re-transfer time delay.

Control Switches and Indicating Lights for Closed Transition Switches

- Extended Parallel Time - Provides visual indication when the pre-set extended parallel time has been exceeded. The controls automatically open the emergency or normal main contacts. Separate contact also available to shunt trip external breaker.
- Failure To Synchronize - Visually displays a failure to synchronize alarm if the time delay settings are exceeded during closed transition transfer operation.
- TS Locked Out - Prevents transfer in either direction if the extended parallel time is exceeded.
- Alarm Reset - Resets extended parallel and failure to synchronize alarms.
- Closed Transition Bypass - Pushbutton allows transfer between sources in an open transition mode.

ASCO 7000 SERIES OPTIONAL ACCESSORIES

Time Delays and Extended Control Power

- **2C** Provides an extended time delay on engine starting. The standard feature one-time delay is adjustable from 0 to 6 seconds. Accessory 2C allows this time delay to be adjustable from 0 to 60 minutes in one-second intervals; factory set at 5 minutes.
- **1G1** Similar to accessory 2C except using 24 volt DC external input signal. Controls, metering and communication remain active when both power sources are de-energized.
- **1GB1** Same as accessory 1G1 except using 120 volt AC external input.
- **1PS1** Extended control power ride-through (approx. 25 seconds) for Group 5 ATS controller and select communications and metering accessories, e.g. Acc. 72EE2, 72FC, 135L, etc.

Manual Controls for Automatic Transfer Switches

- **6C** Reset switch for manual retransfer to normal with automatic retransfer in the event of emergency source failure.
- **6D** Selector switch for automatic/manual retransfer to normal. Automatic bypass if emergency fails.
Extension Harness
37B Six foot (6’) extension harness to increase distance between transfer switch and control panel on open-type units.

Indicators
14A/ Additional auxiliary contact sets to indicate switch position. Two sets are standard. Specify total number of sets if more are required.
18B Two-pole, double-throw contacts operate when emergency source voltage is present at transfer switch terminals.
18G Two-pole, double-throw contacts operate when normal source voltage is present at transfer switch terminals.
99 “Push-to-Test” feature on all pilot light indicators.

Customer Control Circuits
30A Load-shedding circuit initiated by opening of a customer-supplied contact.
30B* Load-shedding circuit initiated by removal of customer-supplied control voltage. *(Specify voltage).
31Z Selective load disconnect control contacts (two provided) that operate with time delay prior to and/or after load transfer and retransfer.
43R Terminal block for all customer control connections on 30 to 150 amp models only (standard on all other sizes).

Neutral Conductor Options
• Solid neutral, with fully-rated terminals. (AL-CU) UL Listed.
• Conventional neutral switching pole.
• Overlapping neutral transfer contacts. Allows for proper ground-fault sensing and avoids generator voltage transients during transfer.

Communications
107G Provides Building Monitoring Systems with transfer switch, bypass and load power metering information in Modbus TCP/IP, BACnet IP and SNMP Protocols. Compatible with any Accessory 150 Technology Package or 72EE2.
72EE2 Offers remote Ethernet monitoring via open Mod bus and SNMP protocols, email notifications and embedded monitoring web pages. (Catalog No. 5170 for stand alone product).

Surge Protection
ASCO 510 TVSS, rated 65KA
73AC1 Normal source protection. (3Ø, 4wire WYE)
73AC2 Emergency source protection. (3Ø, 4wire WYE)
73AC3 Load side protection. (3Ø, 4wire WYE)

Special Applications
45 Custom Alphanumeric nameplate mounted on the front of the switch
111A Generator - to - Generator for Standby Applications
111B Generator - to - Generator for Prime Power Applications
125A Seismic Certification to the requirements of the International Building Code for electrical equipment
131 Certification of compliance with the American Recovery & Reinvestment Act (Buy American Provision) - Must be specified at time of order placement

Bypass-Isolation switch Options
14A1 Auxiliary contact to close in “Bypass to Normal” position.
14B1 Auxiliary contact to close in “Bypass to Emergency” position.
14T Auxiliary contact to close when transfer switch is in “Automatic” position.
14U Auxiliary contact to close when transfer switch is in “Isolate” position.
14V Auxiliary contact to close when transfer switch is in “Test” position.
82C Automatic shutters for bus isolation when transfer switch is withdrawn. (See page 6 for details)
82E LED Bypass status indicator, optional on G frame 1600 to 4000 amps only. Standard for all other size switches.
ASCO TOUCH DISPLAY INTERFACE TECHNOLOGY PACKAGE

The Touch Display Interface (TDI) is the best way to comprehensively connect to and manage your power transfer switch. The TDI enables you to centrally monitor, control and log the performance of transfer and bypass switches and power meters from a single device. It provides you with quick access to real-time information and historical event logs needed to increase the reliability, efficiency, and regulatory compliance of your power system.

Technology Packages are the easiest way to locally and remotely manage your critical power transfer switch and bypass switch.

<table>
<thead>
<tr>
<th>Technology Package Options¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Included Meter</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>5210 Power Meter</td>
</tr>
<tr>
<td>5410 Power Quality Meter</td>
</tr>
<tr>
<td>5450 Power Quality Meter</td>
</tr>
<tr>
<td>5490 Power Quality Meter</td>
</tr>
</tbody>
</table>

Notes
1. All Technology Packages includes Acc. 1PS1, 72EE2, Meter of choice, CTs, Shorting Blocks and Bypass Status Monitoring via discrete I/O when necessary.
2. Contact for availability.
ASCO MONITORING GATEWAY ACCESSORIES

The Monitoring Gateway (Accessory 107G) monitors the state and performance of your transfer switch and its associated devices, including engine-generators, utility power quality meters, surge protection devices, and circuit breakers. The Monitoring Gateway simplifies the NFPA 110 fire code and Joint Commission compliance and reporting activities required for critical and healthcare facilities. It is compatible with Building Monitoring Systems, sharing data in open Modbus TCP/IP and BACnet IP formats.

Meets NFPA and Joint Commission Compliance requirements

Provides required engine-generator and transfer switch safety indicators and shutdowns. Automatically generates NFPA test and utility outage reports. Listed to UL 1008.

Gain real-time status and performance insights

Provides instant access to critical utility power, engine-generator, transfer switch, surge protection and load bank information. Transmits immediate email and text alerts of alarm and event conditions.

Integrates with common building monitoring systems and the ASCO Critical Power Management System

Shares power system data with other monitoring systems, allowing greater analysis of operating data and faster response to changing conditions.
ASCO QUAD-ETHERNET MODULE ACCESSORIES

The Quad-Ethernet Module is the easiest way to connect, monitor and control your power transfer switch, utility power and engine-generator. Through the web app, you can monitor power conditions, start your engine-generator, and transfer between power sources.

Monitoring

- Engine-generator, utility, and transfer switch status
- Email Notification
- Alarms and Alerts
- Statistics and Activity
- Event Log (downloadable)
- Controller Setpoints
- Power Monitoring*
- Energy Consumption*
- Historical KW Demand*

*Accessory 150A or 150B

Control

- Engine Start/Stop
- ATS Transfer/Retransfer
- Generator Test
- Bypass Timer Delays

Communicate

- Modbus
- SNMP
- SMTP Advanced Encryption Standard
- Four Port Ethernet Switch
- RS485 Port

Ordering and Specifications Information

<table>
<thead>
<tr>
<th>Ordering</th>
<th>Ports</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catalog Number</td>
<td>Ethernet</td>
</tr>
<tr>
<td>5170</td>
<td>Number of Ports</td>
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<tr>
<td>Catalog Name</td>
<td>Type of Ports</td>
</tr>
<tr>
<td>Quad-Ethernet Module</td>
<td>Protocol</td>
</tr>
<tr>
<td>Transfer Switch Accessory</td>
<td>RS485</td>
</tr>
<tr>
<td>72EE2</td>
<td>Number of Ports</td>
</tr>
<tr>
<td>ATS Tech Package</td>
<td>Type of Connection</td>
</tr>
<tr>
<td>150A for Non-Bypass</td>
<td>Protocol</td>
</tr>
<tr>
<td>ATB Tech Package</td>
<td></td>
</tr>
<tr>
<td>150B for Bypass</td>
<td></td>
</tr>
<tr>
<td>Part Number for Kit</td>
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<tr>
<td>K1106217-001</td>
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</table>
### ASCO ENERGY AND POWER METERS

#### 5210 Power Meter
![Power Meter Image]

#### 5400 SERIES Power Quality Meter

<table>
<thead>
<tr>
<th>Feature</th>
<th>5210</th>
<th>5410</th>
<th>5450</th>
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<tr>
<td>Technology Packages</td>
<td>150A</td>
<td>150B</td>
<td>150A1</td>
<td>150B1</td>
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<td>Meter Accessories</td>
<td>135L</td>
<td>135SB</td>
<td>140L</td>
<td>140B</td>
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<td>Meter Catalog Number</td>
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<td>5490</td>
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<tr>
<td>Energy and Power Measurements</td>
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<tr>
<td>Technology Packages</td>
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<td>Meter Accessories</td>
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<td>Meter Catalog Number</td>
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<tr>
<td>Power Quality Analysis</td>
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</tr>
<tr>
<td>Total harmonics distortion</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Continuous waveform recording, harmonics, inter-harmonics, voltage sag and swell detection, unbalanced components (zero, negative, positive), flicker, fast flickering, crest factor, K-factor</td>
<td></td>
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<tr>
<td>Power Quality Analytics Software</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Yes (Acc. 107G)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes (Acc. 107G)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Web-page interface</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>Communications Protocol</td>
<td>Modbus TCP/IP, SNMP</td>
<td>Modbus TCP/IP</td>
<td>Modbus TCP/IP</td>
<td>Modbus TCP/IP</td>
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<td>Sampling Rate (samples per cycle)</td>
<td>32</td>
<td>256</td>
<td>512</td>
<td>1024</td>
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<tr>
<td>Voltage Harmonics</td>
<td>15th</td>
<td>127th</td>
<td>255th</td>
<td>511th</td>
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<tr>
<td>Internal Memory</td>
<td>128KB</td>
<td>128MB</td>
<td>4GB</td>
<td>16GB</td>
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<tr>
<td>Transient Detection at 60/50Hz</td>
<td>No</td>
<td>65.1 / 78.1us</td>
<td>32.5 / 39 us</td>
<td>16.3 / 19.5 us</td>
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<tr>
<td>NTP Time Synchronization</td>
<td>Yes (Acc. 107G)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<td>Digital Inputs / Outputs</td>
<td>-</td>
<td>-</td>
<td>8 / 4</td>
<td>16 / 8</td>
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<tr>
<td>Analog Inputs / Outputs</td>
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<td>-</td>
<td>4 / 4</td>
<td>8 / 8</td>
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<tr>
<td>Form-C Relay Contacts</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>6</td>
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### ASCO ATS REMOTE ANNUNCIATORS

<table>
<thead>
<tr>
<th>Description</th>
<th>5350 8-ATS Annunciator</th>
<th>5705 8-Device Annunciator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Listed to UL 1008</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>NIST Compliant Security</td>
<td>AES 128-bit Encryption</td>
<td>AES 128-bit Encryption</td>
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<tr>
<td>Monitoring Interface</td>
<td>LED</td>
<td>Graphical Touchscreen</td>
</tr>
<tr>
<td>ATS Supported</td>
<td>Up to 8 (5310, 1-ATS)</td>
<td>Up to 8</td>
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<tr>
<td>Transfer and Engine-Start Control</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Transfer Switch Monitoring</td>
<td>Transfer Switch Position, Source Availability, Time-Delay Active, Communications Status, Locked Out, Fail-to-Synchronize, Extended Parallel</td>
<td></td>
</tr>
<tr>
<td>NFPA 110 Engine-Generator Safety Indicators and Shutdowns</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Surge Protective Devices</td>
<td>No</td>
<td>ASCO SERIES 500 and 400 with Active Surge Monitoring</td>
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<tr>
<td>Load Bank</td>
<td>No</td>
<td>ASCO Avtron 5000 and 4000 SERIES with Accessory 150LB</td>
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<tr>
<td>Email Notification</td>
<td>No</td>
<td>Yes</td>
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<tr>
<td>Audible Alarm</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Mounting</td>
<td>Wall or Flush-mounted</td>
<td>Wall-mounted</td>
</tr>
<tr>
<td>Common Alarm Output</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Control Security</td>
<td>Key Lock</td>
<td>Multi-Level Password</td>
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<tr>
<td>Control Power</td>
<td>24VDC or 120VAC</td>
<td>24VDC or 120VA</td>
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<td>Ethernet Ports</td>
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<td>Power-outage ride-through (seconds)</td>
<td>0.1</td>
<td>60</td>
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<tr>
<td>ATS accessory required</td>
<td>Any ASCO Accessory 150 Technology Package or Accessory 72EE2</td>
<td>Any ASCO Accessory 150 Technology Package</td>
</tr>
</tbody>
</table>
With the ASCO PowerQuest® CPMS, you can

- Understand power system and equipment status throughout a facility
- Quickly identify and resolve alarms to reduce downtime risk and increase reliability
- Monitor KW capacity and demand at any point in the distribution system
- Automatically generate outage reports for NFPA and Joint Commission compliance
- Ensure power quality compliance to increase the service life of business critical equipment and devices
- Leverage existing network infrastructure and add existing legacy equipment
- Analyze comprehensive forensic power quality and sequence of event data in millisecond granularity
- Identify utility energy usage and demand billing discrepancies
- Reduce or eliminate power factor and demand penalties
- Monitor, benchmark and increase energy efficiency
- Allocate energy costs to departments or processes

<table>
<thead>
<tr>
<th></th>
<th>5710</th>
<th>5750</th>
<th>5790</th>
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</thead>
<tbody>
<tr>
<td><strong>Hardware</strong></td>
<td>Server+22-inch Touchscreen</td>
<td>Server+22-inch Touchscreen</td>
<td>Server+22-inch Touchscreen</td>
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<tr>
<td>Number of Equipment Monitored</td>
<td>32</td>
<td>64</td>
<td>128(^1)</td>
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<tr>
<td>Remote Clients Support</td>
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<td>10</td>
<td>25(^1)</td>
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<tr>
<td>Monitoring &amp; Control</td>
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<td>✓</td>
<td>✓</td>
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<tr>
<td>Email Notification</td>
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<tr>
<td>BMS Communications</td>
<td>✓</td>
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<td>System Event Log</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Historical Trending</td>
<td>✓</td>
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<tr>
<td>Automated Reports</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Power Quality Meter Analytics</td>
<td>✓</td>
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<tr>
<td>Reference Library</td>
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<tr>
<td>Redundant Storage</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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</tbody>
</table>

\(^1\) Consult ASCO for engineered dashboards, additional equipment or clients.
Weight: 2200 lbs
Total package weight: 17,250
Drawings For

City of Hailey
Wastewater Department

GENERATOR REPLACEMENT

Construction Drawings
HDR Project No.
000000000211869
JANUARY 2021
EXISTING GENERATOR TO BE REMOVED BY CONTRACTOR AND SALVAGED BY OWNER TO ON-SITE LOCATION.

EXISTING 250 kW GENERATOR

EXISTING 400 kW GENERATOR

EXISTING FUEL TANK TO BE REMOVED BY OWNER. CONTAINMENT CONCRETE TO BE REMOVED & DISPOSED BY CONTRACTOR.

NEW CONCRETE AROUND NEW GENERATOR

EXISTING 400 kW GENERATOR

EXISTING 250 kW GENERATOR

EXISTING GENERATOR AND ASSOCIATED FOUNDATION TO BE REMOVED BY CONTRACTOR. ASPHALT AROUND NEW GENERATOR FOUNDATION. SEE DETAIL 3 ON THIS SHEET.

NOTE:
BASE COURSE GRAVEL SHALL CONSIST OF A MINIMUM OF 10 INCHES OF SUB-BASE COURSE MATERIAL AND A MINIMUM OF 2 INCHES OF CRUSHED SURFACE BASE COURSE MATERIAL AS SPECIFIED. SEE GENERAL NOTE 1.

GENERAL NOTES:
1. SUBGRADE AND PAVING: PAVED AREA BASE SHALL BE CRUSHED AGGREGATES PER ISPWC SECTION 802. PLANT MIX AGGREGATES FOR CLASS III PER ISPWC SECTION 803. ASPHALT SHALL BE PER ISPWC SECTION 805. PLANT MIX PAVEMENT SHALL BE FOR A CLASS III MIX PER ISPWC SECTION 810. MEASUREMENT AND PAYMENT FOR AGGREGATES AND ASPHALT SHALL BE LUMP SUM AND INCLUDED IN THE OVERALL PROJECT PRICE.

EXISTING FUEL TANK TO BE REMOVED BY OWNER. CONTAINMENT CONCRETE TO BE REMOVED & DISPOSED BY CONTRACTOR.

NEW CONCRETE AROUND NEW GENERATOR

FULL PAVEMENT WIDTH

NEW HOT MIX ASPHALT

NEW BASE COURSE GRAVEL, SEE NOTE.

RECOMPACT SUBGRADE

SAWCUT EXISTING PAVEMENT AS NEEDED.

FULL PAVEMENT WIDTH

MATCH EXISTING PAVEMENT

NEW ASPHALT

EXISTING CONCRETE AROUND NEW GENERATOR

EXISTING ASPHALT GENERATOR FOUNDATION

EXISTING GENERATOR TO BE REMOVED BY CONTRACTOR.

EXISTING ASPHALT GENERATOR FOUNDATION. SEE DETAIL 3 ON THIS SHEET.


EXISTING ASPHALT GENERATOR FOUNDATION

EXISTING CONCRETE AROUND NEW GENERATOR

EXISTING GENERATOR TO BE REMOVED BY CONTRACTOR AND SALVAGED BY OWNER TO ON-SITE LOCATION.

EXCEPTION GENERATOR Site PHOTO

EXISTING 250 kW GENERATOR

EXISTING 400 kW GENERATOR

EXISTING FUEL TANK TO BE REMOVED BY OWNER. CONTAINMENT CONCRETE TO BE REMOVED & DISPOSED BY CONTRACTOR.

NEW CONCRETE AROUND NEW GENERATOR

EXISTING 400 kW GENERATOR

EXISTING 250 kW GENERATOR

EXISTING GENERATOR AND ASSOCIATED FOUNDATION TO BE REMOVED BY CONTRACTOR. ASPHALT AROUND NEW GENERATOR FOUNDATION. SEE DETAIL 3 ON THIS SHEET.

NOTE:
BASE COURSE GRAVEL SHALL CONSIST OF A MINIMUM OF 10 INCHES OF SUB-BASE COURSE MATERIAL AND A MINIMUM OF 2 INCHES OF CRUSHED SURFACE BASE COURSE MATERIAL AS SPECIFIED. SEE GENERAL NOTE 1.

EXISTING FUEL TANK TO BE REMOVED BY OWNER. CONTAINMENT CONCRETE TO BE REMOVED & DISPOSED BY CONTRACTOR.

NEW CONCRETE AROUND NEW GENERATOR

EXISTING ASPHALT GENERATOR FOUNDATION

EXISTING ASPHALT GENERATOR FOUNDATION. SEE DETAIL 3 ON THIS SHEET.


EXISTING ASPHALT GENERATOR FOUNDATION

EXISTING CONCRETE AROUND NEW GENERATOR

EXISTING GENERATOR TO BE REMOVED BY CONTRACTOR AND SALVAGED BY OWNER TO ON-SITE LOCATION.

EXCEPTION GENERATOR Site PHOTO

EXISTING 250 kW GENERATOR

EXISTING 400 kW GENERATOR

EXISTING FUEL TANK TO BE REMOVED BY OWNER. CONTAINMENT CONCRETE TO BE REMOVED & DISPOSED BY CONTRACTOR.

NEW CONCRETE AROUND NEW GENERATOR

EXISTING 400 kW GENERATOR

EXISTING 250 kW GENERATOR

EXISTING GENERATOR AND ASSOCIATED FOUNDATION TO BE REMOVED BY CONTRACTOR. ASPHALT AROUND NEW GENERATOR FOUNDATION. SEE DETAIL 3 ON THIS SHEET.

NOTE:
BASE COURSE GRAVEL SHALL CONSIST OF A MINIMUM OF 10 INCHES OF SUB-BASE COURSE MATERIAL AND A MINIMUM OF 2 INCHES OF CRUSHED SURFACE BASE COURSE MATERIAL AS SPECIFIED. SEE GENERAL NOTE 1.

EXISTING FUEL TANK TO BE REMOVED BY OWNER. CONTAINMENT CONCRETE TO BE REMOVED & DISPOSED BY CONTRACTOR.

NEW CONCRETE AROUND NEW GENERATOR

EXISTING ASPHALT GENERATOR FOUNDATION

EXISTING ASPHALT GENERATOR FOUNDATION. SEE DETAIL 3 ON THIS SHEET.

GENERAL NOTES

1. ORDER OF PRECEDENCE: DRAWINGS GOVERN OVER NOTES, NOTES ON THE DRAWINGS GOVERN OVER THESE GENERAL NOTES. FOUNDATION DETAILS WHICH ARE TO BE PERFORMED BY OTHERS. OBSERVATIONS ARE PERFORMED SOLELY BETWEEN PLANS, SPECIFICATIONS AND GOVERNING CODE.

II. CONTRACTOR SHALL PROVIDE PROPER DEWATERING OF EXCAVATIONS FROM BEARING PARTITIONS, STAIR HANGERS, ETC. COORDINATE THESE ITEMS WITH ADJOINING PROPERTIES TO INCLUDE BUT NOT LIMITED TO VIBRATIONS AND LATERAL OR VERTICAL MOVEMENT, OR BOTH.

III. NOMINAL DESIGN WIND SPEED: V = 120 MPH, 3 SECOND GUST

IV. SPECTRAL RESPONSE ACCELERATION:
   a. SHORT PERIOD, Sds = 0.343g
   b. 1 SECOND PERIOD, S1 = 0.133g

V. SEISMIC LOADING MAY BE APPLIED)

VI. REINFORCING STEEL BAR:
   +. 1/2" MINIMUM BAR SHEAR STRENGTH AS REQUIRED.
   ++. 3/4" MAXIMUM AGGREGATE SIZE, UNO.

VII. SULFATE EXPOSURE - NOT PROVIDED

GUIDE TO COLD WEATHER CONCRETING (FOR CONCRETE REINFORCEMENT. PROVIDE ELEVATIONS IN WALLS AS PLACING DRAWINGS THAT DETAIL FABRICATION, BENDING, AND PLACEMENT. PROJECT SPECIFICATIONS. CONSTRUCTION JOINTS SHALL BE THOROUGHLY

PART 2 - MATERIALS AND DESIGN CRITERIA

I. INSTALLATION OF OPEN-WEB STEEL JOISTS AND JOIST GIRDERS

A. ACCESS TO JOB SITE REQUIREMENTS:
   1. INSTALLATION OF OPEN-WEB STEEL JOISTS AND JOIST GIRDERS
   2. INSTALLATION OF STRUCTURAL SHEET METAL
   3. INSTALLATION OF STEEL BEAMS AND STEEL FLOOR BEAMS
   4. INSTALLATION OF REINFORCED CONCRETE
   5. INSTALLATION OF WIRE FABRIC
   6. INSTALLATION OF WIRE FABRIC...

B. INSTALLATION OF OPEN-WEB STEEL JOISTS AND JOIST GIRDERS

1. CONCRETE SHEETmetal(TM)
2. WALL PLATES
3. STEEL FRAMING
4. STEEL BEAMS
5. STEEL MATERIALS
6. CONCRETE MATERIALS
7. CONCRETE MORTAR
8. CONCRETE AGGREGATE
9. CONCRETE MIXTURES

C. GEOTECHNICAL INSPECTION

1. THE GEOTECHNICAL ENGINEER SHALL CONDUCT ANY ADDITIONAL INSPECTIONS AS PREPARATION AND FOOTING EXCAVATIONS BEFORE CONCRETE OR REINFORCING

D. CONCRETE:

1. CONCRETE SHALL BE PLACED IN ACCORDANCE WITH THE CODE REQUIREMENTS.
2. CONCRETE SHALL BE PLACED IN ACCORDANCE WITH THE CONCRETE SPECIFICATIONS.
3. CONCRETE SHALL BE PLACED IN ACCORDANCE WITH THE CONCRETE STANDARDS.

E. REINFORCING STEEL:

1. CONCRETE SHEET metal(TM) SHALL BE PLACED IN ACCORDANCE WITH THE CONCRETE TYPICAL DETAIL SHEETS.
2. CONCRETE SHEET metal(TM) SHALL BE PLACED IN ACCORDANCE WITH THE CONCRETE TYPICAL DETAIL SHEETS.
3. CONCRETE SHEET metal(TM) SHALL BE PLACED IN ACCORDANCE WITH THE CONCRETE TYPICAL DETAIL SHEETS.

F. STEEL:

1. CONCRETE SHEET metal(TM) SHALL BE PLACED IN ACCORDANCE WITH THE CONCRETE TYPICAL DETAIL SHEETS.
2. CONCRETE SHEET metal(TM) SHALL BE PLACED IN ACCORDANCE WITH THE CONCRETE TYPICAL DETAIL SHEETS.
3. CONCRETE SHEET metal(TM) SHALL BE PLACED IN ACCORDANCE WITH THE CONCRETE TYPICAL DETAIL SHEETS.

PART 3 - EXECUTION

I. REINFORCING STEEL:

A. THE CONTRACTOR MAY REMOVE EXISTING CONSTRUCTION AND REPLACE WITH THE ORIGINAL.

B. THE CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONS TO MAINTAIN AND ENSURE THE SAFETY OF ALL PERSONS AND PROPERTY DURING THE REMOVAL.

C. THE CONTRACTOR SHALL TAKE THE RESPONSIBILITY TO INSURE THE REMOVAL OF ALL EXISTING CONSTRUCTION.

II. CONCRETE SHEET metal(TM):

A. CONCRETE SHEET metal(TM) SHALL BE PLACED IN ACCORDANCE WITH THE CONCRETE TYPICAL DETAIL SHEETS.

B. CONCRETE SHEET metal(TM) SHALL BE PLACED IN ACCORDANCE WITH THE CONCRETE TYPICAL DETAIL SHEETS.

C. CONCRETE SHEET metal(TM) SHALL BE PLACED IN ACCORDANCE WITH THE CONCRETE TYPICAL DETAIL SHEETS.

D. CONCRETE SHEET metal(TM) SHALL BE PLACED IN ACCORDANCE WITH THE CONCRETE TYPICAL DETAIL SHEETS.

E. CONCRETE SHEET metal(TM) SHALL BE PLACED IN ACCORDANCE WITH THE CONCRETE TYPICAL DETAIL SHEETS.

F. CONCRETE SHEET metal(TM) SHALL BE PLACED IN ACCORDANCE WITH THE CONCRETE TYPICAL DETAIL SHEETS.

G. CONCRETE SHEET metal(TM) SHALL BE PLACED IN ACCORDANCE WITH THE CONCRETE TYPICAL DETAIL SHEETS.

H. CONCRETE SHEET metal(TM) SHALL BE PLACED IN ACCORDANCE WITH THE CONCRETE TYPICAL DETAIL SHEETS.

II. SPECIAL INSPECTIONS AND STRUCTURAL OBSERVATIONS:

A. THE SPECIAL INSPECTIONS AND STRUCTURAL OBSERVATIONS SHALL BE PERFORMED BY A QUALIFIED TESTING LABORATORY AND WET STAMPED BY A LICENSED STRUCTURAL ENGINEER.

B. THE SPECIAL INSPECTIONS AND STRUCTURAL OBSERVATIONS SHALL BE PERFORMED BY A QUALIFIED TESTING LABORATORY AND WET STAMPED BY A LICENSED STRUCTURAL ENGINEER.

C. THE SPECIAL INSPECTIONS AND STRUCTURAL OBSERVATIONS SHALL BE PERFORMED BY A QUALIFIED TESTING LABORATORY AND WET STAMPED BY A LICENSED STRUCTURAL ENGINEER.

D. THE SPECIAL INSPECTIONS AND STRUCTURAL OBSERVATIONS SHALL BE PERFORMED BY A QUALIFIED TESTING LABORATORY AND WET STAMPED BY A LICENSED STRUCTURAL ENGINEER.

E. THE SPECIAL INSPECTIONS AND STRUCTURAL OBSERVATIONS SHALL BE PERFORMED BY A QUALIFIED TESTING LABORATORY AND WET STAMPED BY A LICENSED STRUCTURAL ENGINEER.

F. THE SPECIAL INSPECTIONS AND STRUCTURAL OBSERVATIONS SHALL BE PERFORMED BY A QUALIFIED TESTING LABORATORY AND WET STAMPED BY A LICENSED STRUCTURAL ENGINEER.

G. THE SPECIAL INSPECTIONS AND STRUCTURAL OBSERVATIONS SHALL BE PERFORMED BY A QUALIFIED TESTING LABORATORY AND WET STAMPED BY A LICENSED STRUCTURAL ENGINEER.

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NOTES:
1. COORDINATE EXACT GENERATOR LOCATION WITH OWNER.
2. CONCRETE TO HAVE 28'-6" DAY COMPRESSIVE STRENGTH, f'c = 4500 PSI MIN AND MAX W/CM RATIO OF 0.40

TOC=0'-0"

BOLLARD, TYP SEE 3
S-02_______

S-02_______

DENOTES BLOCKOUT FOR ELECTRICAL STUB-UP

GENERATOR, COORDINATE ANCHORAGE WITH EQUIPMENT SUBMITTAL, MIN 1/2" DIA x 6" EMBED ANCHOR BOLT AT EACH HOLE (12 TOTAL)

#5 BARS AT 12" OC EACH WAY, TOP AND BOTTOM

(4) #5 BARS CONT AT PERIMETER GENERATOR

NOTE:
1. LOCATE ALL EXISTING UNDERGROUND UTILITIES PRIOR TO EXCAVATING FOR FOUNDATION.

Rounded concrete cap paint (2) coats traffic yellow

8" STD PIPE BOLLARD, FILLED WITH CONCRETE PROVIDED EXPANSION JOINT AT CONCRETE PAVING ASPHALT OR CONCRETE

SLOPE CONCRETE 1" ABOVE PAVING UNDISTURBED SOIL

3000 PSI CONCRETE

NOTE:

BRAD BJERKE
DAN FRIESEN
MINIMUM EXTERIOR CONCRETE COVER OVER REINFORCING

1. LAP SPLICE LENGTH VALUES ARE BASED ON ACI 318 CHAPTER 10 LAP LENGTHS FOR HOOK AND TIE OR STIRRUP. FOR STANDARD END HOOKS OR SMALLER END HOOKS, MULTIPLE THE LAP SPLICE LENGTH VALUE BY 1.5.

2. SMALLER BAR LAP LENGTH MAY BE USED WHEN SPLICING LIGHTWEIGHT AGGREGATE CONCRETE. FOR LIGHTWEIGHT AGGREGATE CONCRETE, MULTIPLY THE LAP SPLICE LENGTH VALUE BY 1.5.

3. FOR SIDE COVER < 2 1/2 INCHES AND END COVER < 2" , MULTIPLY THE TABULATED VALUES BY 1.43.

4. NON CONTACT LAP SPLICED BARS SHALL NOT BE PLACED IN CONCRETE. REFER TO ACI 318, SECTION 10.6.1.2 FOR REQUIREMENTS.

5. FOR STANDARD END HOOKS OR 180° HOOKS, REFER TO ACI 318, SECTION 10.6.1.2 FOR REQUIREMENTS.

6. STANDARD END HOOKS OR SMALLER END HOOKS SHALL NOT BE PLACED IN CONCRETE. REFER TO ACI 318, SECTION 10.6.1.2 FOR REQUIREMENTS.

7. FOR STANDARD END HOOKS OR SMALLER, LAP SPLICE LENGTH MAY BE USED.

8. LAP SPLICE LENGTH VALUES ARE BASED ON ACI 318 CHAPTER 10 LAP LENGTHS FOR HOOK AND TIE OR STIRRUP. FOR STANDARD END HOOKS OR SMALLER END HOOKS, MULTIPLE THE LAP SPLICE LENGTH VALUE BY 1.5.

9. SMALLER BAR LAP LENGTH MAY BE USED WHEN SPLICING LIGHTWEIGHT AGGREGATE CONCRETE. FOR LIGHTWEIGHT AGGREGATE CONCRETE, MULTIPLY THE LAP SPLICE LENGTH VALUE BY 1.5.

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17. SMALLER BAR LAP LENGTH MAY BE USED WHEN SPLICING LIGHTWEIGHT AGGREGATE CONCRETE. FOR LIGHTWEIGHT AGGREGATE CONCRETE, MULTIPLY THE LAP SPLICE LENGTH VALUE BY 1.5.

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