From: <roger.grace@powerconv.alstom.com>
To: <jon-c@ipsc.com>
CC: <vince.terenzio@powerconv.alstom.com>
Date: 9/21/2001 12:01 PM
Subject: New Syncdrives for ID Fans

Jon,
As you requested, as an alternative to the proposal for upgrading the controls on these fan drives, we could also offer new LCI drives from our Syncdrive product range. These would be water cooled, with a closed circuit de-ionised water and water/air heat exchanger. This would significantly lower the heat loading on the electrical room where the Varichron drives are currently located. The heat exchanger could be located outside at a convenient location.

These are dual (independent) channel drives for the 6 phase, 4kV motors in a 12/12 configuration similar to what you have at present. Each channel would have a Sigma controllers for complete redundancy. This is the same controller proposed for the controls upgrade path. At this HP rating, and to achieve the 4kV rating, this means that this is in effect a 15,000HP drive and is thus well suited to the possibility of future fan upgrades (e.g. SCR emission controls). The current dependant components; dc reactors and input transformers would have to increased accordingly. Similarly the Syncdrive single channel rating would be around 7,500HP.

Total price (accurate budget) for Qty 4 Syncdrive LCI drive systems as described above would be $1,880,000.
This includes for the water to air heat exchanger, but assumes that the existing 12 pulse cast coil transformers and iron cored dc chokes would be used. Please advise if you want to consider replacing them as well.

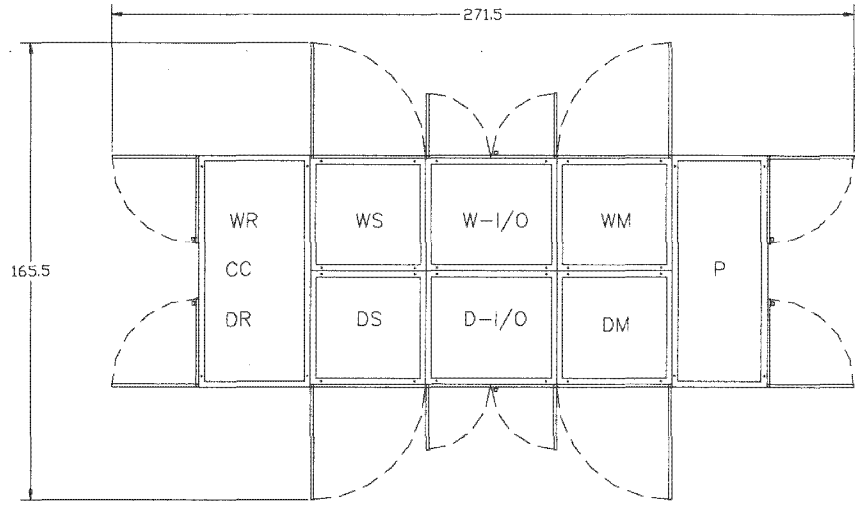
This LCI drive would be manufactured at our Pittsburgh facility, and on a FOB basis. Pricing does not account for any site related installation supervision or start-up services.

We would also like you to consider visiting our recent installations at the Reliant Parish 8 station. This would give you an opportunity to view first hand, similar fan drives that have had the Sigma controls upgrade, and also some new water cooled LCI drives that we have also installed at this site. Please let me know if this is of interest and I will arrange for this visit.

Please free to contact if you should require any further information whatsoever.

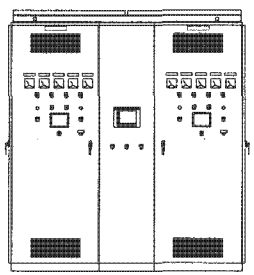
Roger Grace
Alstom Power Conversion,
General Drives,
Houston Office
281 870 1353

ALSTOM



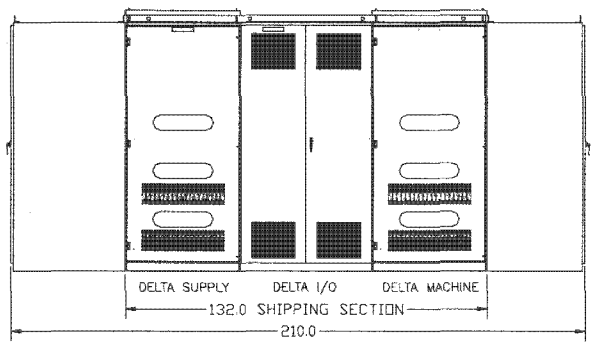
NOTES:

1. NEMA 1 CONSTRUCTION
2. APPROXIMATE TOTAL WEIGHT 10,100Lbs.
3. FOUR SHIPPING SECTIONS. REMOVABLE LIFTING ANGLES PROVIDED AS SHOWN. SHIPPING PALLETS ALSO SUPPLIED. ALL INTER-CONNECTIONS ARE INTERGRAL TO SYSTEM ENCLOSURES.
4. PAINT FINISH: GRAY ANSI 61
5. CABINET TO FLOOR MOUNTING BOLT LOCATIONS (5/8 DIA. HOLES) BOLTS NOT SUPPLIED
6. ALLOW MIN. OF 12" CLEARANCE ABOVE TOP HAT FOR AIR VENTING.
   REMOVABLE TOP HAT REDUCES HEIGHT BY 4.5".
7. DO NOT OBSTRUCT COOLING VENT AREA.
8. DIMENSIONS IN INCHES.
9. LOCKABLE DOOR HANDLES ON REGULATOR, INCOMERS & PUMP CABINETS. DOORS ON THE CONVERTER CABINETS ARE SECURED WITH HEX HEAD BOLTS (3 EA DOOR).
10. PUMP CABINET HAS SOLID BOTTOM AND BOLTED TOP ACCESS SHEET.
    INCOMING/OUTGOING COOLING WATER CONNECTIONS ARE THROUGH APERTURE IN TOP OR EITHER SIDE OF PUMP CUBICLE (TBD).
    DRAIN HOLE IS LOCATED AT FRONT OF PUMP CABINET. A QUICK DISCONNECT COUPLING FOR A 1/2" I.D. HOSE IS SUPPLIED FOR CONNECTION TO MATING COUPLING LOCATED ON DRAIN PAN.
11. NEMA HOLE PATTERN FOR 2 HOLE LUGS FOR SUPPLY, MACHINE AND CHOKE CONNECTIONS.
12. ALL CUSTOMER CABLE ENTRY/EXIT'S TO BE MADE FROM TOP OR BOTTOM OF CABINETS (TBD).

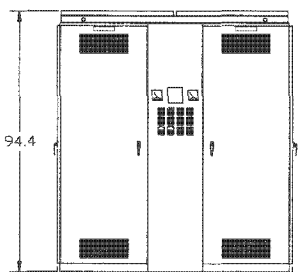


DELTA & WYE REGULATORS
& COMMON CONTROL

LEFT SIDE VIEW



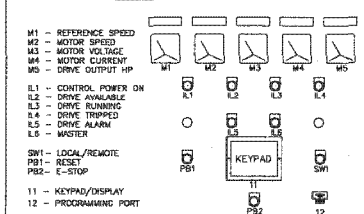
FRONT VIEW
(REAR VIEW IS SAME)



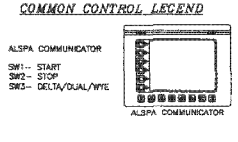
RIGHT SIDE VIEW

NOT FOR CONSTRUCTION
HOWEVER, DIMENSIONS & STATEMENTS NOT TO EXCEED OR CHANGE FROM THOSE SHOWN WITHOUT APPROVAL.

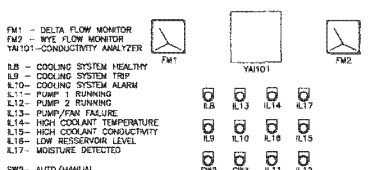
REGULATOR LEGEND



COMMON CONTROL LEGEND



PUMP LEGEND



ALSTOM Power Conversion
Pittsburgh, PA 15238, USA

© 2001 - ALSTOM Power Conversion - ALL RIGHTS RESERVED

DRAWING NUMBER	SAD00149
ISSUE	1

INTER MOUNTAIN POWER, UTAH
SYNC DRIVE, 4KV, 8000hp
DUAL CHANNEL

INTER MOUNTAIN POWER - UTAH
DRIVE OUTLINE

SCALE NTS DATE 10-OCT-01 DR. ELS TR. CK.
APPROVED

IP7012599

From: <roger.grace@powerconv.alstom.com>
To: <jon-c@ipsc.com>
CC: <vince.terenzio@powerconv.alstom.com>
Date: 10/18/2001 9:26 PM
Subject: New Syncdrives for ID Fans
Attachments: Intermtn01.doc

Jon,
As you requested, please see enclosed preliminary layout for the new water-cooled Syncdrives option.
We have also sent you a larger format hard copy of this drawing.
Note this is preliminary and we don't have detailed layout drawings of the electrical room, but we believe that it would fit in the space that the existing air-cooled equipment occupies.
Please fee free to contact me if you require any further information at all.
Regards,
rg

(See attached file: Intermtn01.doc)

---------- Forwarded by Roger GRACE/DCU/DRC/ICG/GECALSTHOM on 10/18/2001 10:06 PM ----------

Roger GRACE
09/21/2001 02:42 PM

To: jon-c@ipsc.com
cc: Vince TERENZIO/DCU/DRC/ICG/GECALSTHOM@GA

Subject: New Syncdrives for ID Fans

Jon,
As you requested, as an alternative to the proposal for upgrading the controls on these fan drives, we could also offer new LCI drives from our Syncdrive product range. These would be water cooled, with a closed circuit de-ionised water and water/air heat exchanger. This would significantly lower the heat loading on the electrical room where the Varichron drives are currently located. The heat exchanger could be located outside at a convenient location.

These are dual (independent) channel drives for the 6 phase, 4kV motors in a 12/12 configuration similar to what you have at present. Each channel would have a Sigma controllers for complete redundancy. This is the same controller proposed for the controls upgrade path. At this HP rating, and to achieve the 4kV rating, this means that this is in effect a 15,000HP drive and is thus well suited to the possibility of future fan upgrades (e.g. SCR emission controls). The current dependant components; dc reactors and input transformers would have to increased accordingly. Similarly the Syncdrive single channel rating would be around 7,500HP.

Total price (accurate budget) for Qty 4 Syncdrive LCI drive systems as described above would be $1,880,000.
This includes for the water to air heat exchanger, but assumes that the existing 12 pulse cast coil transformers and iron cored dc chokes would be used. Please advise if you want to consider replacing them as well.

This LCI drive would be manufactured at our Pittsburgh facility, and on a FOB basis. Pricing does not account for any site related installation supervision or start-up services.

We would also like you to consider visiting our recent installations at the Reliant Parish 8 station. This would give you an opportunity to view first hand, similar fan drives that have had the Sigma controls upgrade, and also some new water cooled LCI drives that we have also installed at this site. Please let me know if this is of interest and I will arrange for this visit.

Please free to contact if you should require any further information whatsoever.

Roger Grace
Alstom Power Conversion,
General Drives,
Houston Office
281 870 1353

From: Amy White
To: Jon Christensen
Date: 8/19/2003 12:04 PM
Subject: Spec. 45605 - ID Fan Medium Voltage Frequency Drive Systems
Attachments: 45605 Master Contract.wpd

Please find the above referenced specifications attached for your review and approval.

Please notify me of any necessary changes by 8/20/03 copying notification & changes to Connie Elmer & Lori Fullmer.

Thank you for your time & attention in this matter.

Contract No. 04-45605

CONTRACT AGREEMENT

THIS CONTRACT AGREEMENT, entered into this _____ day of _____ 20____, between the **INTERMOUNTAIN POWER SERVICE CORPORATION** (IPSC), a nonprofit organization under contract to the Intermountain Power Agency (IPA), a political subdivision of the state of Utah, organized and existing under the Interlocal Co-Operation Act, Title 11, Chapter 13, Utah Code Annotated 1953, as amended, and _____, a _____, with its principal office in _____, hereinafter called the (Contractor),

WHEREAS, IPSC has prepared specifications and other Contract Documents for **up to eight (8) Induced Draft Fan Medium Voltage Variable Frequency Drive Systems** as detailed in the Contract Documents (the Work), and has requested proposals from bidders to perform the Work;

WHEREAS, Contractor has submitted to IPSC a Proposal in accordance with the terms of this Contract Agreement; and

WHEREAS, IPSC has determined and declared Contractor to be the lowest and best, regular responsible bidder for the said Work, subject to execution of this Contract Agreement;

AGREEMENTS: In consideration of the compensation to be paid to Contractor, and of the mutual terms and conditions contained herein, IPSC for itself and its successors, and Contractor for itself and its permitted successors and assigns, hereby agree as follows:

ARTICLE I: Contractor shall perform in accordance with the provisions of this Contract Agreement, including the Contract Documents identified in Article III hereof.

ARTICLE II: Contractor will be paid for its performance under this Contract Agreement in accordance with the provisions of the Contract Documents, including those provisions in the Article entitled "Limitation of Liability; Responsible Party" in Part E, Division E1, General Conditions.

ARTICLE III: The term Contract Documents means and includes all of the following:

PART	DIVISION	TITLE
A	A1	Notice Inviting Proposals
B	B1	Instructions to Bidder
	B2	Supplementary Instructions to Bidders

IP7012603

PART	DIVISION	TITLE
C	C1	Bidder's Bond
	C1	Proposal
	C2	Proposal Schedule
	C3	Additional Bid Information
D	D1	Contract Documents Description
E	E1	General Conditions
	E2	Additional General Conditions
F	F1	Special Conditions
	F2	General Description and Scope of Work
	F3	General Equipment
	F4	Specifications Engineering Data
	F5	General Quality System Requirements
	F6	Seismic Design Requirements
	F7	Medium Voltage Variable Frequency Drives
	F8	Variable Frequency Drive Isolation (VFDI) Transformers
	F9	Medium Voltage Induction Motors

IP7012604

The foregoing Contract Documents, and the documents identified in Part D "Contract Documents Description," are an integral part of this Contract Agreement and are hereby incorporated as part of this Contract Agreement as if fully restated herein. The above listed Contract Documents shall prevail over other information submitted with Contractor's Proposal.

ARTICLE IV: This Contract Agreement, including the Contract Documents, constitutes the entire Agreement of the parties hereto with respect to the Work and other subjects addressed herein, and supersedes all prior oral communications or written documents.

WHEREFORE, IPSC and Contractor execute this Contract Agreement as of the date stated in the first introductory paragraph.

INTERMOUNTAIN POWER SERVICE CORPORATION
850 West Brush Wellman Road
Delta, UT 84624-9546

By: _____ _____
George W. Cross Date
President and Chief Operations Officer

Vendor
Vendor entity type and State of Organization
Vendor Full Address

By: _____ _____
Date

Title: _____

LIST OF SUGGESTED BIDDERS

Alstom Power Conversion
General Drive
610 Epsilon Drive
Pittsburgh, PA 15238-2880

Attention: Roger Grace/Gary Smith
Telephone: (412) 967-7691
Cell Phone: (604) 805-2399
Email: roger.grace@tde.alstom.com

General Electric Company
3800 Lewiston Street, Suite 400
Aurora, CO 80011

Attention: Lew Brown
Telephone: (303) 753-2251

Riter Engineering Company
PO Box 25005 (84104)
875 South Chestnut Street
Salt Lake City, UT 84125

Attention: Mike Jackson
Telephone: (801) 973-9063
Fax: (801) 973-8333
Email: mike@ritereng.com

ABB Inc.
16250 West Glendale Drive
New Berlin, WI 53151

Attention: Hansueli Krattiger
Telephone: (262) 785-8596
Fax: (860) 298-3644
Email: hans.krattiger@us.abb.com

Siemens Energy & Automation
100 Technology Drive
Altharetta, GA 30005

Attention: Wolfgang Hilmer
Telephone: (770) 740-3650
Fax: (770) 740-3298
Email: wolfgang.hilmer@siemens.com

(continued) **LIST OF SUGGESTED BIDDERS**

Codale Electric Supply
362 South Commerce Loop
Orem, UT 84058

Attention: Russ Terry
Telephone: (800) 443-8622
Fax: (801) 724-3044
Email: russt@codale.com

Energy Management Corporation
501 West 700 South
Salt Lake City, UT 84101

Attention: Bruce Tregaskis
Telephone: (800) 433-4548
Fax: (801) 487-7437
Email: btregaskis@emcsolutions.com

Toshiba International Corporation
Intermountain Region
1579 East Stonemoor Circle
Salt Lake City, UT 84121

Attention: Ken Jones
Telephone: (801) 277-3838
Fax: (801) 277-3882
Email: ken.jones@tic.toshiba.com

General Electric
130 East 1100 North
North Salt Lake City, UT 84054

Attention: David Zeller
Telephone: (801) 397-9259
Fax: (801) 397-9238
Email: davidh.zeller@ps.ge.com

Visalia Electric Motor Shop
7515 West Sunnyview Avenue
Visalia, CA 93291

Attention: Gene Quesnay
Telphone: (800) 437-4854
Fax: (559) 651-5117
Email: genevq@visaliaelectric.com

TABLE OF CONTENTS

SPECIFICATIONS

PART	DIV	TITLE	PAGE NUMBER
A	A1	Notice Inviting Proposals	A1-1
B	B1	Instructions to Bidders	B1-1 thru B1-2
	B2	Supplementary Instructions to Bidders	B2-1
C		Bidding Documents	
	C1	Bidder's Bond	C1-1
	C1	Proposal	C1-2
	C2	Proposal Schedule	C2-1 thru C2-2
	C3	Additional Bid Information	C3-1 thru C3-10
D	D1	Contract Documents Description	D1-1
E	E1	General Conditions	E1-1 thru E1-8
	E2	Additional General Conditions	E2-1 thru E2-2
F		Detailed Specifications	
	F1	Special Conditions	F1-1 thru F1-6
	F2	General Description and Scope of Work	F2-1 thru F2-13
	F3	General Equipment	F3-1 thru F3-10
	F4	Specifications Engineering Data	F4-1 thru F4-12
	F5	General Quality System Requirements	F5-1 thru F5-3
	F6	Seismic Design Requirements	F6-1
	F7	Medium Voltage Variable Frequency Drives	F7-1 thru F7-30
	F8	Variable Frequency Drive Isolation (VFDI) Transformers	F8-1 thru F8-9
	F9	Medium Voltage Induction Motors	F9-1 thru F9-13

PART A - DIVISION A1

NOTICE INVITING PROPOSALS

The Intermountain Power Service Corporation (IPSC) invites sealed bids for furnishing and delivering **up to eight (8) Induced Draft (ID) Fan Medium Voltage Frequency Drive (VFD) Systems** in accordance with **Specifications 45605**, available in the Purchasing Section, Intermountain Power Service Corporation (IPSC), 850 West Brush Wellman Road, Delta, Utah 84624-9546.

Proposals shall be submitted on IPSC's bidding forms. All Proposals shall be filed with the Buyer at the above address on or before **August 27, 2003.**

Each Proposal shall be accompanied by a certified or cashier's check payable to Intermountain Power Agency (IPA), or a Surety Bond payable to IPA, IPSC, and the City of Los Angeles Department of Water and Power (LADWP) in the amount of $50,000 as a guarantee that the bidder shall execute the proposed Contract Agreement if awarded.

Proposals shall be subject to acceptance within, and irrevocable for, a period of sixty (60) calendar days after date of bid opening.

IPSC reserves the right to reject any and all Proposals.

In the performance of any contract awarded, the bidder shall not discriminate in employment practices against any employee or applicant for employment because of race, religion, national origin, ancestry, sex, age, or physical disability.

Dated: _____

_____
John R. Larsen, Buyer
Intermountain Power Service Corporation

PART B - DIVISION B1

INSTRUCTIONS TO BIDDERS

1. Form, Signature, and Delivery of the Proposals: The bidder's Proposal shall be made on the yellow copy of the Bidding Documents. The Specifications printed on white paper shall be retained by the bidder.

   The bidder's name, address, and the date shall be stated in the Proposal. The Proposal shall be signed by the person authorized to bind the bidder.

   The Proposal shall be enclosed in a sealed envelope, plainly marked in the upper left-hand corner with the name and address of the bidder. The envelope shall bear the words "Proposal for," followed by the Specification Number, the title of the Specifications, and the date and hour of bid opening.

   If the Proposal is mailed, it shall be addressed as follows:

   Purchasing Section
   Intermountain Power Service Corporation
   850 West Brush Wellman Road
   Delta, UT 84624-9546

   If the Proposal is sent by messenger, it shall be delivered to the Administration Building, Intermountain Power Service Corporation, 850 West Brush Wellman Road, Delta, Utah.

2. Interpretations and Addenda: Should a bidder find discrepancies or omissions in the plans, specifications, or other documents, or should there be doubt as to their true meaning, the bidder shall submit to the Buyer a written request for an interpretation or clarification thereof. A request for addenda, interpretation, or clarification shall be delivered to the Buyer marked "Request for Interpretation" and must be received by the Buyer in time to permit a reasonable response before the date of opening bids. Any interpretation of, or change in the documents will be made only by addendum issued to each person to whom Specifications have been issued and will become a part of any contract awarded. IPSC will not be responsible for, or bound, by any other explanations or interpretations.

3. Correspondence: All inquiries or correspondence to IPSC prior to award of Contract shall be addressed to the Buyer.

4. Changes or Alternatives: The bidder shall not change any wording in the documents. Any explanations or alternatives offered shall be submitted in a letter attached to the front of the Bidding Documents. Alternatives which do not substantially comply with IPSC's Specifications cannot be considered. Language of negation or limitation of any rights, remedies, or warranties provided by law will not be considered part of the Proposal. Bids offered subject to conditions or limitations may be rejected.

IP7012610

5. Specified Materials or Equivalent: Whenever any particular material or process is specified by a patent or proprietary name, by a trade or brand name, of a manufacturer, such wording is used for the purpose of describing the material or process, fixing the standard of quality required, and shall be deemed to be followed by the words "or equivalent." The bidder may offer any material or process which shall be the equivalent of that so specified, but the bidder must identify the equivalent offered.

6. Language: Everything submitted by the bidder shall be written in the English language.

7. Sales or Use Taxes: Prices quoted by the bidder shall not include any applicable sales or use taxes or Federal Excise Taxes.

8. Duties: Prices quoted by the bidder shall include all applicable duties.

9. Award of Contract: Award of Contract will be made to the lowest and best, regular responsible bidder. The determination as to which is the lowest and best, regular responsible bidder may be made on the basis of the lowest ultimate cost of the services, materials, equipment, or other Work in place and use. The right is reserved to reject any or all Proposals.

   Within thirty (30) calendar days after the date of award of Contract, the successful bidder shall sign the Contract supplied by IPSC. The Contract will be effective upon execution by IPSC. Award of Contract is subject to execution of IPSC's form of Contract Agreement and other Contract Documents.

10. Comparison of Bids: For the purpose of comparing bids, it will be assumed that the quantity of **up to eight (8) Induced Fan Medium Voltage Variable Frequency Drive Systems** will be installed during the Contract period.

11. Bidder's Bond: The Proposal shall be accompanied by a certified check or a cashier's check issued by a responsible bank, payable in the state of Utah to the order of Intermountain Power Agency, in an amount not less than 10 percent of the aggregate sum of the Proposal. A surety bond payable to IPA, IPSC, and LADWP in a like amount will be accepted in lieu of a check.

12. Calculation of the Bonds: The estimated amount of the Proposal for the Bidder's Bond or of the Contract, will be considered to be the price, including freight charges, quoted by the bidder in the Proposal Schedule, times the assumed quantity under the Comparison of Bids in Article 10 of this Division.

PART B - DIVISION B2

SUPPLEMENTARY INSTRUCTIONS TO BIDDERS

1. Quantities: The Proposal shall be based on furnishing eight (8) VFD Systems in accordance with the Proposal Schedule in Division C2, Bidding Documents; however, IPSC reserves the right to reduce the quantity of VFD Systems purchased. IPSC will notify the successful bidder by the option date listed in Division C2, of the total quantity of VFD Systems required.

2. Exceptions: Bidders should note that comparison of bids shall be based upon adherence to the these Specifications and cost. Any exceptions to these Specifications are to be specifically highlighted and noted on a separate sheet of paper and submitted with the Proposal. Strict attention to any material changes or exceptions to these Specifications or commercial terms and conditions shall be taken into consideration in the bid evaluation. IPSC reserves the right to reject any or all bids.

3. Pre-Bid IPP Job Site Visits: The existing equipment layout is extremely congested with limited access. Bidders desiring to visit IPP Job Site to verify its proposed equipment can be moved and fit in the final mounting location, may do so by contacting John Larsen at (435) 864-6537.

PART C - DIVISION C1

BIDDING DOCUMENTS

BIDDER'S BOND

(Not necessary when certified or cashier's check accompanies bid. See below*.)

SURETY BOND

We, the undersigned Principal and Surety, acknowledge ourselves jointly and severally bound to Intermountain Power Agency (IPA) and Intermountain Power Service Corporation (IPSC) of the state of Utah, and the City of Los Angeles Department of Water and Power (LADWP), in the sum of _____ Dollars ($_____), to be paid to IPA if the attached Proposal shall be accepted and the proposed Contract awarded to said bidder, and said bidder shall fail to execute the Contract and Bond for the faithful performance thereof; otherwise this obligation to be void.

Dated: _____, 20___

Firm Name: _____

_____

By: _____
(Signature)**

(Surety): _____

By: _____
(Signature)

*When the bidder is submitting a check in lieu of a Bond, the check must be made payable to Intermountain Power Agency, must either be certified by a responsible bank or be a cashier's check issued by a responsible bank, and must be payable in the state of Utah.

If check is submitted herewith, state check number _____ and amount $_____

**See Form, Signature, and Delivery of the Proposals, Division B1

NOTE: All signatures above must be written in ink.

IP7012613

PROPOSAL

The undersigned hereby proposes to furnish and deliver **up to eight (8) Induced Draft Fan Medium Voltage Variable Frequency Drive Systems** to the Intermountain Power Service Corporation in accordance with **Specifications 45605**.

The undersigned agrees, upon the acceptance of this Proposal: (a) To execute IPSC's form of Contract (including the Contract Agreement and other Contract Documents identified in said Specifications) for furnishing and delivering the items and services embraced in the accepted Proposal; and (b) To perform its obligations under the Contract at the prices stated in the accompanying Proposal Schedule.

The undersigned furthermore agrees that, in case of failure to execute such Contract Agreement and provide the necessary check or Bidder's Bond accompanying this Proposal, and the monies payable thereon, shall be forfeited to and remain the property of Intermountain Power Agency.

The undersigned declares under penalty of perjury that this Proposal is genuine, is not a sham or collusive, and is not made in the interest or in behalf of any person or entity not herein named. The undersigned further declares under penalty of perjury that the bidder has not directly or indirectly induced or solicited any other bidder to submit a sham bid, or any other person, firm, or corporation to refrain from bidding. The undersigned also declares under penalty of perjury that the bidder has not in any manner sought by collusion to secure for itself an advantage over any other bidder.

I declare under penalty of perjury under the laws of the state of Utah that the foregoing is true and correct.

Date: _____, 20_____

Bidder: _____

Address: _____

_____

Signed By: _____
(Authorized Signature)

Print Name: _____

Title: _____

PART C- DIVISION C2

BIDDING DOCUMENTS - PROPOSAL SCHEDULE

Proposal is hereby made to furnish and deliver to IPSC **up to eight (8) Induced Draft Fan Medium Voltage Variable Frequency Drive Systems**, F.O.B., IPP Plant Site, 850 West Brush Wellman Road, Delta, UT 84624, in accordance with **Specifications 45605**, the following:

Lump Sum Price For One (1) Complete Drive System For One (1) ID Fan Delivered In January 2004	
Price in Words: _____	Price in Dollars: $_____
Lump Sum Price For Two (2) Complete Drive Systems For Two (2) ID Fans Delivered In January 2005	
Price in Words: _____	Price in Dollars: $_____
Lump Sum Price For Three (3) Complete Drive Systems For Three (3) ID Fans Delivered In January 2006	
Price in Words: _____	Price in Dollars: $_____
Lump Sum Price For Two (2) Complete Drive Systems For Two (2) ID Fans Delivered In January 2007	
Price in Words: _____	Price in Dollars: $_____
Latest Date for IPSC To Exercise Option To Purchase Two (2) Complete Drive Systems In January 2005	
Price in Words: _____	Price in Dollars: $ _____
Latest Date For IPSC To Exercise Option To Purchase Three (3) Complete Drive Systems In January 2006	
Date: _____	
Latest Date For IPSC To Exercise Option To Purchase Two (2) Complete Drive Systems in January 2007	
Date: _____	

****Note: Bids shall include an anticipated payment schedule.**

Contractor's Technical Services: The following adjuring prices will be used to adjust the Contract amount for manufacturer's service representatives time:

	Daily Rate	Daily Overtime Rate
Per Diem at the IPP Job Site:		
Per Round Trip to and from the IPP Job Site:		

Prices: The price or prices shall be firm.

Cash Terms: A discount for prompt payment is offered of _____ percent for Contract payments made within ____ calendar days after date of acceptance or delivery and receipt of invoice.

Taxes: The foregoing quoted prices are exclusive of all applicable sales and use taxes.

Manufacturer: _____

Location of Point of Manufacture: _____

Brand and Catalog Number or Other Designation: _____

Form of Business Organization: The bidder shall state below the form of its business organization.

Bidder is: _____, organized under the laws of the state of _____.
(Corporation, Partnership, Limited Partnership, Individual)

If a partnership, the bidder shall state below the names of the partners. If a corporation, the bidder shall state below the names of the president and of the secretary.

_____ _____

Person to Contact: Should IPSC desire information concerning this Proposal, please contact:

Name: _____ Telephone No: _____

Address: _____

(If different, the address of bidder's chief executive office is:) _____

_____

PART C - DIVISION C3

BIDDING DOCUMENTS - ADDITIONAL BID INFORMATION

1. Detailed Information: The bidder shall submit complete and definitive information on its offering in sufficient detail to permit a complete analysis of the Proposal. The requirements stated in the Instructions to Bidders, relative to information submittal, shall be followed.

   The requirements for information contained in this Division are basic requirements. Additional information shall be provided as requested by IPSC.

   The blank data sheets included in this Division shall be completely filled in. The data listed therein shall not relieve Contractor of its responsibility for meeting the requirements of the Detailed Specifications.

   The bidder shall not alter the original Proposal Data Division page numbers. If it becomes necessary to add pages, other than the end of the Division, a suffix such as a, b, c, etc., shall be added to the original number to designate the added page number. Pages added at the end of the Division shall be numbered sequentially by continuation of originally established numbering.

   Where alternates are indicated in the Proposal or Proposal Data, the bidder shall provide complete information for each alternate.

2. Drawings: Drawings shall be submitted with the Proposal in sufficient detail to permit evaluation of the equipment offered and to permit preliminary arrangement studies to be made.

   A plan view drawing showing the proposed equipment in the existing electrical equipment room shall be submitted. Contractor shall also include estimated weights for all equipment. Outdoor cooling equipment, if required, shall also be shown. External interconnection one-line diagram showing all power, control, and protection cabling required to complete the installation of the VFD systems.

3. Supplementary Information: The following supplementary information shall be submitted with the Proposal:

Supplementary Information
Complete Description of Proposed VFD. This Shall Include a Description of Shipping Components and Field Assembly Installation.
Summary Description of Codes and Standards Used If Different than Specified, Including a Review of Major Differences.

IP7012617

Supplementary Information
Identification of Any Modifications Required to IPSC's ID Fan System, Composed of ID Fan Motor, ID Fan, Connecting Shaft, Bearings, and Cable Connecting the ID Fan Motor to the VFD System to Allow this Equipment to Operate with the VFD While Maintaining a Normal Thirty (30) Year Lifetime of the ID Fan System.
Documentation Indicating Contractor's VFD System Does Not Produce Torsional Vibrations, Shaft Torsional Resonance, or Torque Pulsations Within the Connecting Shaft of the ID Fan System.
Documentation Indicating Contractor's VFD System Will Not Create Accelerated ID Fan System Bearing Wear Due to Common Mode Voltages Delivered by High Frequency PWM or Other Signals from Contractor's Inverter Drive.
Documentation Indicating Contractor's VFD System Does Not Contribute to Insulation Breakdown of the End Turns of the Motor Winding.
Names and Other Contact Information of Five (5) Purchasers of the Proposed VFD System Applied to Motors of 3,000 Horsepower (HP) and Above Who Have Had the Equipment Installed and Operating for at Least Two (2) Years.
Priced Preliminary Spare Parts List.
Input Current Including Harmonic Content at 25, 50, 75, 85, and 100 Percent Load.
Composite Data on Mean Time to Failure and Mean Time to Repair for Typical Components Contained Within the VFD System and Shown by Operating Experience to Fail or Require Replacement.
Detailed Description of the Installation Instructions of the Proposed Drive System Including All of Its Components and Any Modifications to Existing Equipment.
Description of the Failure Mode If Control Power Is Lost to the VFD Control System.
Description of VFD Operation When the Input Voltage Dips to 70 Percent.
Description of the Failure Modes of the Power Switching Devices (SCR, GTO, Diode, IGBT, IGCT, etc.), or Switching Device Control That Will Allow the Drive System to Continue to Operate Without Tripping the Fan.
Description of Accelerating and Decelerating Torque Programming Capabilities and Other Pertinent Capabilities and Limitations.
Preliminary Schedule.

IP7012618

Supplementary Information
Harmonic Calculation.
Efficiency (At the Input to VFD Isolation Transformer) Graph with Y-Axis Indicating 25, 50, 75, 85, and 100 Percent Torque and X-Axis Indicating 25, 50, 75, 85, and 100 Percent Frequency.
Catalog Brochures.
Complete List of Required Maintenance Tools as Discussed in Division F3, Article 15, General Equipment Specifications. The Listing Shall Include a Complete Description and Quantity of Each Item.
Information Specified in Division B1, Instructions to Bidders.
Equipment Storage Requirements, Including Inside or Outside Requirements and Requirements for Controlled Temperature or Humidity, etc.
Description of Manufacturing, Testing, and Inspection Procedures.
Written Description, Logic Diagrams, or Ladder Diagram Indicating Recommended Operating Sequence.
Maintenance Activities Required by the Manufacturer And/or by Contractor to Provide Adequate Storage and to Maintain Valid Material and Equipment Warranties.
Motor Information If Motor Is Furnished from Division F9, Medium Voltage Induction Motors.
Transformer Information Division F8, VFD Isolation (VFDI) Transformers

4. Equipment and Material Data: Please provide the following equipment and material data to assist IPSC in evaluating the Technical Proposal:

Equipment and Material Data
Complete Description of the Proposed System Indicating Exactly What Is Being Replaced and What Is Being Reused.
A Drawing (the Plant Arrangement - AQCS Control Building Mezzanine Drawing May Be Marked up to Show Equipment Layout) Showing the Proposed Arrangement and Dimensions Including Clearances Between Existing Items and All New Items. This Drawing Shall Also Indicate the Approximate Weight of All Components and Any New Wall or Floor Penetrations.

Equipment and Material Data
Guaranteed Reliability and Maintainability Times of the Proposed System.
Description of the Work Required for Complete Replacement.
A List of Maintenance Tools, Which Shall Be Furnished with the Equipment.
A Description of the Manufacturer's Standard Factory Test Procedure.
Expected and Maximum Heat Loss on a per Drive Basis.
A List of at Least Three (3) Sites and Names of Individuals That May Be Contacted Where Similar Equipment Has Been Retrofitted.
If a New Motor Is Being Provided, Verify That the Minimum Speed of 10 Percent Is Acceptable to the Motor Vendor.
Since the VFD Shall Be Suitable for Continuous Operation at Turning Gear Speed for Equipment Cool-down, Provide Information Describing the Operation at Turning Gear Speed.
Harmonic Analysis, Which Includes All Voltage and Current Harmonics up to the 49th.
Any Alternate Access Options Required.
Heat Dissipation Data Necessary to Verify Existing HVAC System or Design a New HVAC System.
A Summary Description of Codes and Standards Used If Different than Specified Including a Review of Major Differences.
A Price List of Recommended Spare Parts.
A List of Any Special and Maintenance Tools Being Furnished.
Bidder's Experience Record with Proposed Equipment.
A List of Factory Routine Tests Being Proposed.
A Complete Description of the Extent of Shop Assembly of Components, and What Will Not Be Shop Assembled.
Efficiency Versus Load Curves Based on the Driven Equipment.

IP7012620

Equipment and Material Data
A Written Description of the Results of a Failure of Any Power Switching Device (SCR, GTO, Diode, IGBT, IGCT, etc.), or Switching Device Control. Contractor Shall Include the Sequence of Each Channel in the Write-up.
A Description of Why Rear or Side Access Is Needed.
Contractor Shall Confirm That All Power Components in the Converter Sections Will Be Mounted on a Swing Frame or Rack-out for Ease of Maintenance. If Not, Contractor Shall Describe Proposed Mounting Method.

IP7012621

Variable Frequency Drive System	
VFD Isolation Transformer Rating (kVA):	
System Input Voltage:	
System Output Voltage:	
Rated Drive Output Power (Continuous kVA):	
Rated Drive Output Current (Continuous A):	
Nominal Load Power (HP):	
Rated VFD Input Current (A):	
Nominal VFD Input Current at 8,200 HP Output (A):	
Variable Frequency Drive	
Manufacturer and Model:	
Overall Dimensions:	
Height (Inches):	
Depth (Inches):	
Width (Inches):	
Shipping Height (Inches):	
Length of Longest Shipping Piece (Inches):	
Technology:	
Microprocessor-Based Multi-Level Switching:	
Phase/Frequency/Voltage (ph/Hz/V):	
Rectifier Device:	
Inverter Device:	
Cell Voltage (V):	
Number of Cells:	

IP7012622

Variable Frequency Drive	
In the Event of Any Power Switching Device (SCR, GTO, Diode, IGBT, IGCT, etc.), Failure, Will the VFD Continue to Operate at Full Rated Output?	Yes _____ No _____
If "No", Explain:	
Number of Pulses:	
DC Link Capacitors:	Yes _____ No _____
Input Power Factor (30 to 100 Percent Speed) (Cos f):	
Power Interrupt Ride-Through Duration (Cycles):	
Voltage Dip (With Continuous Operation) (Percent):	
VFD Output Voltage (V):	
Overload Capability for Sixty (60) Seconds (Percent):	
Torque Pulsations Across Speed Range (Percent):	
Cooling Medium:	
Enclosure Protection:	
Ambient Temperature Maximum (°C):	
Humidity (Non-Condensing) (Percent):	
Altitude (Feet):	

IP7012623

DC Link Reactor Data	
Manufacturer:	
Class and Type of Core:	
Insulating Liquid:	
Quantity:	
Nominal DC Voltage Rating (V):	
Continuous DC Current Rating (V):	
Rated DC Load (kW):	
Conductor Material of Winding (If Aluminum, State Grade):	
Basic Lighting Impulse Insulation Level (BIL) (kV):	
Approximate Resistance at 75°C (OHM):	
Inductance (Henrys) (H):	
Loses (Guaranteed):	
No-Load Loss (Excitation Only):	
At 100 Percent Voltage (kW):	
At 110 Percent Voltage (kW):	
Total Loss, No-Load Loss Plus Load Loss, With Full Rated DC Load (kW):	
Temperature Under Continuous Operation Guaranteed:	
Temperature Rise at Full Rated DC Load:	
Winding Temperature Rise by Resistance (°C):	
Hottest Spot Winding Temperature Rise (°C):	
Average Sound Level at Rated DC Load, Scale "A", Slow Response, at One (1) Foot from Reactor (DC):	

IP7012624

DC Link Reactor Data	
Short Circuit Capability:	
DC Short Circuit Current (A):	
Maximum Duration of Short Circuit Current (Seconds):	
Weight and Dimensions:	
Net Weights:	
Core and Coils (Pound):	
Insulating Liquid (Pound/Gallon):	
Total (Pounds):	
Heaviest Piece to Handle During Erection (Pounds):	
Overall Dimensions:	
Height (Inches):	
Depth (Inches):	
Width (Inches):	
Shipping Height (Inches):	
Tuned Filter Bank	
Is a Tuned Filter Bank Required for Harmonic Suppression:	Yes _____ No _____
If "Yes", Where Is it Mounted? (Include Dimensions and Weights):	
Drive Cooling System	
Manufacturer:	
Cooling Methodology (Liquid/Air):	
Type of Liquid:	
Is Cooling System 100 Percent Redundant:	Yes _____ No _____
Net Weight (Pounds):	

IP7012625

Harmonic Voltage Distortion			
Guaranteed Maximum Harmonic Voltage Distortion Contribution, Without Filters, to Auxiliary Electrical Power System Under the Worst Case Conditions:			
Harmonic	**90 Percent**	**100 Percent**	**110 Percent**
5			
7			
11			
13			
17			
19			
23			
25			
Total:			

Efficiency	
Guaranteed Overall System Efficiency at Rated Speed and Load (Percent):	
Total Guaranteed System Losses at Rated Speed and Load (kW):	
System Speed Response	
Maximum Deceleration Rate (Rpm/Sec):	
Maximum Acceleration Rate (Rpm/Sec):	
Interface	
Type and Quantity of Communication Ports Which Are Included, (i.e., RS232, RS485, USB):	

IP7012626

PART D - DIVISION D1

CONTRACT DOCUMENTS DESCRIPTION

The Contract Agreement, together with the documents listed in Article 3 thereof, the Reference Specifications, any other documents listed below, and such of Contractor's Proposal documents as are expressly agreed to by IPSC shall constitute the Contract (the Contract). Said Documents are complementary and require complete and finished Work. Anything shown or required of Contractor in any one or more of said documents shall be as binding as if contained in all of said documents. Contractor shall not be allowed to take advantage of any error, discrepancy, omission, or ambiguity in any document, but shall immediately report to the President and Chief Operations Officer, in writing, any such matter discovered. The President and Chief Operations Officer will then decide or correct the same and the decision will be final.

IP7012627

PART E - DIVISION E1

GENERAL CONDITIONS

1. Definitions: The following words shall have the following meanings:

   a. Bidder: The person, firm, or corporation adopting and submitting a Proposal under these Specifications.

   b. Buyer: The Purchasing Agent for IPSC.

   c. Contract Administrator: The IPSC employee designated by the President and Chief Operations Officer with primary responsibility for administration of the Contract, or other representatives designated by the Contract Administrator acting within the limits of their authority.

   d. Contractor: The person, firm, or corporation to whom the Contract is awarded.

   e. Directed, Required, Approved, etc.: The words *directed, required, approved, permitted, ordered, designated, prescribed, instructed, acceptable, accepted, satisfactory,* or similar words shall refer to actions, expressions, and prerogatives of the Contract Administrator unless otherwise expressly stated.

   f. Gallon: Liquid volume of 231 cubic inches at 60 degrees Fahrenheit.

   g. IGS: Intermountain Generating Station located at 850 West Brush Wellman Road, Delta, Utah 84624.

   h. IPA: Intermountain Power Agency, the owner of Intermountain Power Project, and a political subdivision of the state of Utah, organized and existing under the Interlocal Co-operation Act, Title 11, Chapter 13, Utah Code Annotated 1953, as amended.

   i. IPP: Intermountain Power Project, consisting of Intermountain Generating Station, Intermountain Railcar, Intermountain Converter Station, Adelanto Converter Station, Intermountain AC Switchyard and associated transmission lines, microwave stations, and support facilities.

   j. IPSC: Intermountain Power Service Corporation: (1) A nonprofit corporation, furnishing personnel to support the Operating Agent in the performance of operation and maintenance; and (2) Contracting agent for the Intermountain Power Agency (IPA), for the Intermountain Generating Station (IGS).

   k. Operating Agent, or LADWP: The City of Los Angeles Department of Water and Power which is responsible for operation and maintenance for IPP.

IP7012628

l. President and Chief Operations Officer: The President and Chief Operations Officer of IPSC, or other representatives designated by the President and Chief Operations Officer acting within the limits of their authority.

m. Reference Specifications: Those bulletins, standards, rules, methods of analysis or tests, codes, and specifications of other agencies, engineering societies, or industrial associations referred to in these Specifications. These refer to the latest edition, including amendments published and in effect at the date of the Invitation for Proposal, unless specifically referred to by edition, volume, or date. Unless the context otherwise requires, Reference Specifications also include all amendments published or adopted after the date of the Invitation for Proposal.

n. Subcontractor: A person, firm, or corporation, other than Contractor and employees thereof, who supplies labor, services or materials for a portion of the Work to be performed by Contractor under the Contract.

o. Ton: The short ton of 2,000 pounds.

p. Work: The services, materials, equipment, and other performance identified in these Specifications and other Contract Documents to be provided by Contractor.

2. Materials and Work: All Work shall comply with these Specifications. All materials used or supplied, and all equipment furnished, shall be new and unused, but this requirement shall not preclude the use of recycled materials in the manufacturing processes. All Work shall be done by qualified workers in a thorough and workmanlike manner that would pass without objection in both Contractor's trade and IPA's and IPSC's industry. Materials, equipment, workmanship, and other Work not definitely specified, but incidental to and necessary for the Work, shall conform to the best commercial practice for the type of Work in question and be of a quality that passes without objection in Contractor's trade and IPA's and IPSC's industry.

3. Nondiscrimination: The applicable provisions of Executive Order No. 11246 of September 24, 1965, and Bureau of Land Management regulations, and all other applicable governmental regulations pertaining to nondiscrimination in employment in the performance of contracts, are incorporated herein by reference, and made a part hereof as if they were fully set forth herein. During the performance of the Contract, Contractor shall not discriminate in its employment practices against any employee or applicant for employment because of the employee's or applicant's race, religion, national origin, ancestry, sex, age, or physical disability. All subcontracts awarded under or pursuant to the Contract shall contain a like nondiscrimination provision.

4. Governing Law; Venue: The Contract shall be governed by the substantive laws of the state of Utah, regardless of any rules on conflicts of laws or choice of law that would otherwise cause a court to apply the laws of any other state or jurisdiction. Any action,

in law or in equity, concerning any alleged breach of or interpretation of the Contract, or concerning any tort in relation to the Contract or incidental to performance under the Contract, shall be filed only in the state or federal courts located in the state of Utah.

5. Patents and Intellectual Property: Contractor shall fully indemnify and, at the election of IPA, defend IPA, IPSC, and the Operating Agent against any and all liability, whatsoever, by reason of any alleged infringement of any intellectual property rights (including, but not limited to, patents, copyrights, trademarks, or trade secrets) on any article, process, method, or application used in any designs, plans, drawings, or specifications provided under the Contract, or by reason of Contractor's manner of performance under the Contract, or by reason of use by IPA, IPSC, or the Operating Agent of any article, process, or material specified by Contractor.

   All drawings, specifications, calculations, models, data, and other engineering documents (collectively "Drawings") shall be delivered to and be the property of IPSC. IPSC shall be entitled to use the Drawings and the information contained therein for the construction, operation, maintenance, repair, alteration, improvement, and expansion of IPP Facilities.

6. Contractor's Address and Legal Service: The address given in the Proposal shall be considered the legal address of Contractor and shall be changed only by advance written notice to IPSC. Contractor shall supply an address to which certified mail can be delivered. The delivery of any written communication to Contractor personally, or delivery to such address, or the depositing in the United States Mail, registered or certified with postage prepaid addressed to Contractor at such address, shall constitute a legal service thereof.

7. Assignment of Contract Prohibited: Contractor shall not assign or otherwise attempt to dispose of the Contract, or any rights hereunder, or of any monies due or to become due hereunder, unless authorized by the prior written consent of the President and Chief Operations Officer. The Contract, and Contractor's rights hereunder (including rights of collection) are nonassignable without the President and Chief Operations Officer's prior written consent. No right or claim can be asserted against IPA, IPSC, or the Operating Agent, in law or equity, by any person, by reason of any assignment or disposition unless so authorized.

   If Contractor, without such prior written consent, purports to assign or dispose of the Contract, or any right or interest hereunder, IPSC may at its option terminate the Contract. Such termination shall relieve and discharge IPA, IPSC, and the Operating Agent from any and all liability, duties, and obligations to Contractor, and to any assignee or transferee thereof.

8. Quality Assurance: IPSC has the right to subject any or all materials, services, equipment, or other Work furnished and delivered under the Contract to rigorous

inspection and testing. (Unless otherwise specifically provided in the Contract with respect to specific materials, services, equipment, or other Work, IPSC has no duty to inspect, test, or

specifically accept.) Before offering any material, services, equipment, or other Work for inspection, testing, delivery, or acceptance, Contractor shall eliminate all items or portions which are defective or do not meet the requirements of these Specifications. If any items or portions are found not to meet the requirements of these Specifications, the lot, or any faulty portion thereof, may be rejected. Only the Contract Administrator may accept any material, service, equipment, or other Work as complying with these Specifications on behalf of IPSC.

IPSC may inspect and reject materials, services, equipment, or other Work tendered or purchased under the Contract at any reasonable location IPSC may choose (including, but not limited to, points of origin, while in transit to IPSC, IPSC specified receiving points, IPSC storage sites, or any point of use or installation). Inspection can include any testing that IPSC deems necessary or convenient to determine compliance with these Specifications. The expense of any initial tests will be borne by IPSC. All expenses of subsequent or additional tests will be charged against Contractor when due to failure of first-offered materials, services, equipment, or other Work to comply with these Specifications.

The fact that the materials, services, equipment, or other Work have or have not been inspected, tested, or accepted by IPSC, whether voluntarily or as required by any specific provision in the Contract, shall not relieve Contractor of responsibility in case of later discovery of nonconformity, flaws, or defects, whether patent or latent.

9. Extra Work, Reduced Work, and Change Orders by IPSC: IPSC reserves the right at any time before final acceptance of the entire Work to order Contractor to furnish or perform extra Work, or to make changes altering, adding to, or deducting from the Work, without invalidating the Contract. Changes shall not be binding upon either IPSC or Contractor unless made in writing in accordance with this Article.

Changes will originate with the President and Chief Operations Officer who will transmit to Contractor a written request for a Proposal covering the requested change, setting forth the changed Work in detail, and including any required supplemental plans or specifications. Upon receipt of such request, Contractor shall promptly submit in writing to the President and Chief Operations Officer a Proposal offering to perform such change, a request for any required extension of time caused by such change, and an itemized statement of the cost or credit for the proposed change. Failure of Contractor to include a request for extension of time in the Proposal shall constitute conclusive evidence that such extra Work or revisions will entail no delay and that no extension of time will be required.

If Contractor's Proposal is accepted by IPSC, a written change order will be issued by the President and Chief Operations Officer stating that the extra Work or change is authorized and granting any required adjustments of the Contract price and of time of completion. If Contractor's Proposal is rejected by IPSC, then IPSC may order the additional or changed Work from other vendors.

Additional Work or changes pursuant to the change order shall be performed in accordance with the terms and conditions of these Specifications. No extra Work shall be performed or change made unless pursuant to such written change order, and no claim for an addition to the Contract price shall be valid unless so ordered.

Notwithstanding anything in the preceding paragraphs to this Article, IPSC may issue a written order reducing the Scope of Work without issuing a request for Proposal. Any such reduction in the Scope of Work shall be effective upon issuance. Reductions ordered by IPSC shall constitute partial terminations and shall reduce the price to be paid.

10. Changes at Request of Contractor: Changes may be made to facilitate the Work of Contractor. Such changes may only be made without additional cost to IPSC, without extension of time, and pursuant to written permission from the President and Chief Operations Officer. Permission for such changes shall be requested in writing by Contractor to the President and Chief Operations Officer.

11. Time is of the Essence and Extensions of Time: Time is of the essence to the Contract. Delivery and other performance of Work must be completed within the times and by the dates specified. Time for delivery or other performance of Work shall not be extended except as provided in this Article. Failure to deliver or otherwise perform Work within the times and by the dates specified shall constitute a default and be grounds for IPSC to immediately terminate the Contract.

If Contractor makes a timely written request in accordance with this Article, the time for delivery or other performance of Work will be extended by a period of time equivalent to any delay in the whole Work which is: (a) Authorized in writing by the President and Chief Operations Officer; (b) Caused solely by IPSC; or (c) Due to unforeseeable causes (such as war, strikes, or natural disasters) and which delay is beyond the control and without the fault or negligence of Contractor and subcontractors.

Contractor shall promptly notify the President and Chief Operations Officer in writing at both the beginning and ending of any delay, of its cause, its effect on the whole Work, and the extension of time claimed. Failure of Contractor to provide such written notices and to show such facts shall constitute conclusive evidence that no excusable delay has occurred and that no extension of time is required.

The President and Chief Operations Officer will ascertain the facts and the extent of the delay and will extend the time for delivery when the findings of fact justify such an extension. The President and Chief Operations Officer's determination will be final and conclusive.

IPSC will be responsible for granting extensions of time as herein provided, but will not otherwise be responsible in any manner or liable to any extent for damage directly or indirectly suffered by Contractor as a result of any delay.

12. Protests and Claims: If Contractor considers any demand of the President and Chief Operations Officer to be outside of the requirements of the Contract, or considers any amount of payment, or any record, ruling, or other act, omission, or determination by the President and Chief Operations Officer to be unreasonable, Contractor shall promptly deliver to the President and Chief Operations Officer a written statement of the protest and of the amount of compensation or nature of accommodation, if any, claimed.

    Upon written request by the President and Chief Operations Officer, Contractor shall provide access to all records containing any evidence relating to the protest or claim.

    Upon review of the protest, claim, and evidence, the President and Chief Operations Officer will promptly advise Contractor in writing of the final decision which will be binding on all parties.

    The requirements of this Article shall be in addition to, and shall not be construed as waiving claims provisions of the Statutes of the state of Utah. Contractor is deemed to have waived and does waive all claims for extensions of time and for compensation in addition to the Contract price except for protests and claims made and determined in accordance with this Article.

13. Limitation of Liability; Responsible Party: It is understood and agreed that IPA shall be the sole party or person liable to Contractor for payments under or pursuant to the Contract, and for any breaches, defaults, or for any torts in the performance of or in relation to the Contract by IPA, IPSC, or the Operating Agent, or any officers, agents, or employees thereof. Contractor hereby expressly covenants and agrees that no suit shall be brought by Contractor against IPSC, or the Operating Agent, or their, or IPA's officers, agents, or employees, or any of the purchasers of power from IPA, but that all rights or remedies that Contractor may have or that may arise under or in relation to the Contract shall be asserted by Contractor solely against IPA. Without limiting the foregoing provisions of this Article, Contractor shall have no right against any of the foregoing (including IPA) to assert or recover, in contract or in tort, damages or losses in the nature of consequential damages, incidental damages, or punitive or exemplary damages.

14. Independent Contractor: Contractor shall perform all Work as an independent contractor in the pursuit of its independent calling. Contractor is not an employee, agent, joint venturer, partner, or other representative of IPA, IPSC, or the Operating Agent and shall be under the control of IPSC only to provide the Work requested and not as to the means or manner by which the Work is to be accomplished. Contractor has no authority to act for, bind, or legally commit IPA, IPSC, or the Operating Agent in any way.

15. Drug Policy: Contractor shall submit a current copy of its drug policy for review. IPP Facilities are a drug free and zero tolerance workplace. Contractor's employees and its

subcontractors' employees, who are to perform Work or otherwise be at the IPP Facilities, shall participate in a drug testing program prior to arrival, and at any additional time(s) during the Contract as IPSC may request.

16. Security and Safety Compliance: Contractor and its employees, agents, representatives, and/or subcontractors, while performing Work on IPP premises, or who are otherwise on IPP premises, shall fully comply with all security, fire prevention, and safety rules and procedures in force at IPP. IPSC has the right (but not duty) to make periodic and random inspections of the persons, and of their respective property, upon entering, at any time while on, and when departing any IPP facility. Such persons subject to inspection include Contractor, any subcontractor, and their respective employees, agents, and representatives. Property subject to inspection includes, but is not limited to, vehicles, clothing, toolboxes, lunch boxes, any other carrying case, tools or equipment, and anything contained therein. If violations are noted, the violations will be reported to Contractor's on-site supervisor and the Contract Administrator for appropriate action.

All Contractor's employees will be given security identification badges by IPSC and those badges shall be displayed each day to allow admittance on IPP premises. Contractor's employees who do not have security identification badges in their possession, will not be allowed on the IPP Job Site unless signed in by the Contract Administrator. All security identification badges shall be returned to the Security Contractor when the employee terminates their work at the IPP Job Site. All Contractor's vehicles will also receive parking stickers from the Security Contractor allowing entrance on IPP Premises. Temporary badges and parking stickers are available for intermittent Contractor employees and vehicles.

Contractor shall have access on IPP premises between the hours of 7:00 am to 7:00 pm Monday through Friday. Access may be allowed on weekends or at other times with the approval of the Contract Administrator.

Contractor will be directed to specified areas for parking vehicles and equipment by the Contract Administrator. Certain areas of IPP premises are restricted to IPSC vehicles

only. Exceptions to the parking restriction will be made on an as needed basis through Contractor's respective Contract Administrator. Contractor shall make its employees, agents, representatives, and/or subcontractors aware of all areas that are subject to restricted parking.

Contractor agrees, warrants, and represents that: (a) It is familiar with the risks of injury associated with the Work and otherwise being on IPP Premises; (b) Has reviewed the Work to be performed; (c) Has inspected the IPP Job Site with an IPSC representative, and (d) has determined that no unusual or peculiar risk of harm exists with regard to the Work to be performed on IPP Premises. Contractor further agrees that it shall, at all times, provide on IPP premises, a competent supervisor(s) familiar with IPSC's and the

industry's safety standards to ensure compliance with all federal, state, and local regulations pertaining to safety (including, but not limited to, Federal and State OSHA, as said regulations relate to the Work to be performed under the Contract). Although IPSC assumes no responsibility to oversee or supervise the Work, IPSC reserves the right to review safety programs and practices and to make recommendations to Contractor. No such review or recommendation by IPSC shall impose any liability or responsibility on IPSC, or relieve Contractor from providing a safe working environment and complying with all legal requirements.

Contractor shall comply with IPSC's safety and equipment requirements prior to starting the Work. Worker protective clothing, which includes, but is not limited to, hardhats, safety glasses, safety shoes, gloves, respirators, earplugs, safety harnesses, and face shields shall be provided by Contractor.

Prior to starting the Work, all of Contractor's personnel shall attend a safety orientation taught by a representative of IPSC. At Contractor's option and subject to IPSC approval, a supervisor of Contractor may attend the orientation taught by IPSC, and then present the orientation to the remainder of Contractor's personnel. In that case, a roll shall be provided to IPSC which lists each person who received the orientation and the date it was received.

17. Nonexclusive: This is a nonexclusive Contract. IPSC reserves the right to obtain services, materials, equipment, or other Work from other vendors or suppliers.

PART E - DIVISION E2

ADDITIONAL GENERAL CONDITIONS

1. Guarantee: Contractor guarantees and warrants for a minimum period of one (1) year after delivery, and for such longer period as may be specified by the applicable statute of limitations, that all materials, services, equipment, and other Work furnished are free from defects and otherwise conform to the terms of the Contract, including, but not limited to, the Article entitled "Materials and Work" in Part E, Division E1, General Conditions.

   Contractor shall repair or replace, as IPSC may direct, all defective materials, services, equipment, or other Work. Such repair or replacement shall be F.O.B. at such destination as IPSC may direct (contract delivery point, point of installation, point of consumption, etc.). IPSC's right to demand repair or replacement is in addition to any other remedies that may be available for breach of the foregoing guarantee and warranty.

   Contractor shall, for the protection and benefit of IPA, IPSC, and LADWP, obtain guarantees conforming to the foregoing two (2) paragraphs from each of its vendors and subcontractors with respect to their materials, services, equipment, or other portion of the Work. Such guarantees from vendors and subcontractors shall be in addition to, and not in lieu of, Contractor's own guarantees.

2. Payment: Payment will be made within thirty (30) calendar days after delivery and receipt of the invoice in the form directed by IPSC.

3. Invoices: Invoices shall be submitted in duplicate to Accounts Payable, Intermountain Power Service Corporation, 850 West Brush Wellman Road, Delta, Utah 84624-9546. All letters pertaining to invoices shall be addressed to the foregoing address.

   All invoices shall show the Contract number, release number, or other identification of each delivery covered by the invoice. In all cases, the amount of the applicable sales tax or use tax shall be separately stated on the invoice.

4. Regulations, Permits, Licenses, and Warrants: Contractor shall comply with all applicable federal, state, and local regulations including, but not limited to, Federal and State OSHA, as said regulations relate to the Contract, Contractor's performance, or Contractor's trade. In addition, Contractor shall ensure that all permits, licenses, and warrants relating to the Contract, Contractor's performance, and Contractor's trade be acquired.

5. Letters to IPSC: All inquiries relating to these Specifications prior to award of Contract shall be addressed to the Buyer.

   After award of Contract, all letters pertaining to performance of the Contract (other than invoice) shall be addressed as follows:

IP7012636

Mr. George W. Cross
President and Chief Operations Officer
Intermountain Power Service Corporation
850 West Brush Wellman Road
Delta, UT 84624-9546

Attention: Jon Christensen,
Contract Administrator

Regarding Contract No: **04-45605**

IP7012637

PART F - DIVISION F1

DETAILED SPECIFICATIONS - SPECIAL CONDITIONS

1. General: Under the terms of the Contract, Contractor shall furnish and deliver **up to eight (8) Induced Draft Fan Medium Voltage Variable Frequency Drive Systems** ordered by IPSC during the period of four (4) years beginning with date stated in the first introductory paragraph of the Contract Agreement (hereinafter called the Contractual Period).

2. Quantity: IPSC agrees to purchase **up to eight (8) Induced Draft Fan Medium Voltage Variable Frequency Drive Systems** during the Contractual Period.

   In consideration of the above agreed purchase quantity, IPSC will, during the Contractual Period, have the option (but not duty) to purchase **Induced Draft Fan Medium Voltage Variable Frequency Drive Systems** up to a quantity of eight (8). Said option may be exercised, in whole or in part, by the issuance to Contractor of releases for any portion thereof by the Buyer or the Buyer's duly authorized representative. Nothing contained herein shall require IPSC to order any of its requirements beyond the approximate quantities stated in Division A1 from Contractor as opposed to from other suppliers or contractors.

3. Delivery: Contractor shall make deliveries only upon receipt of releases issued by the Buyer. IPSC reserves the right to specify in said releases the amounts and dates of deliveries at the location described in the Proposal Schedule. IPSC will require ID fans to be delivered as indicated in Division F2, Article 15, Schedule of Activities, in the table titled, Equipment to be Delivered to the Job Site.

   Deliveries shall be made between the hours of 8:00 a.m and 3:00 p.m., except holidays, Monday through Friday, unless other arrangements are made in writing between Contractor and Buyer.

4. Printed Documents: All printed documents, including drawings and instruction books, if applicable, shall be in the English language. All units of measurement shall be in the English foot-pound-second system.

5. Delivery Arrangements: After award of the Contract and prior to delivery or other performance of any Work, Contractor shall become familiar with the unloading facilities at the delivery point(s) set forth in the Proposal Schedule, either by personal inspection or by contacting the Contract Administrator, (435) 864-4414.

6. Indemnity Clause: Contractor undertakes and agrees to indemnify, hold harmless, and at the option of the IPA, defend IPA, IPSC, LADWP, and any and all of their boards, officers, agents, representatives, employees, assigns, and successors in interest from and against any and all suits and causes of action, claims, charges, costs, damages, demands, expenses (including, but not limited to, reasonable attorneys' fees and cost of

IP7012638

litigation), judgments, civil fines and penalties, liabilities or losses of any kind or nature, including, but not limited to, violations of regulatory law, breach of contract, death, bodily injury or personal injury to any person, including Contractor's employees and agents, or damage or destruction to any property of either party hereto, or of third persons, arising in any manner by reason of or incident to the performance of the Contract on the part of Contractor, or Contractor's officers, agents, employees, or subcontractors of any tier, except as may be caused by the sole negligence of IPA, IPSC, LADWP, or their boards, officers, agents, representatives, or employees.

7. Insurance Requirements: Prior to the start of the Work, but not later than thirty (30) calendar days after date of award of Contract, Contractor shall furnish IPSC evidence of coverage from insurers acceptable to IPSC and in a form acceptable to IPSC Insurance Analyst. Such insurance shall be maintained by Contractor and at Contractor's sole cost and expense.

Such insurance shall not limit or qualify the liabilities and obligations of Contractor assumed under the Contract. IPA, IPSC, or LADWP shall not, by reason of any of their inclusion under these policies or otherwise, incur liability to the insurance carrier for payment of the premium for these policies.

Any insurance carried by IPA, IPSC, or LADWP which may be applicable is and shall be deemed excess insurance, and Contractor's insurance is and shall be primary for all purposes despite any provision in Contractor's policies to the contrary.

Should any portion of the required insurance be on a "Claims Made" policy, Contractor shall, prior to the policy expiration date following completion of the Work, provide evidence that the "Claims Made" policy has been renewed or replaced with the same limits and terms and conditions of the expiring policy at least for the Contract under which the Work was performed.

a. Workers' Compensation/Employer's Liability: Workers' Compensation Insurance covering all of Contractor's employees in accordance with the laws of all states in which the Work is to be performed and including Employer's Liability Insurance, and as appropriate, Broad Form All States Endorsement, Voluntary Compensation, Longshoremen's and Harbor Workers' Compensation, Jones Act, and Outer-Continental Shelf coverages. The limit for Employer's Liability coverage shall be not less than $1 million each accident and shall be a separate policy if not included with Workers' Compensation coverage. Evidence of such insurance shall be an endorsement to the policy providing for a thirty (30) calendar days prior written notice of cancellation or nonrenewal of a continuous policy to IPSC, by receipted delivery, and a Waiver of Subrogation in favor of IPA, IPSC, and LADWP, its officers, agents, and employees. Workers' Compensation/Employer's Liability exposure may be self-insured provided that IPSC is furnished with a copy of the certificate issued by the state authorizing Contractor to self-insure. Contractor

shall notify IPSC, by receipted delivery, as soon as possible of the state withdrawing authority to self-insure.

b. Commercial General Liability: Commercial General Liability with Blanket Contractual Liability, Products and Completed Operations, Broad Form Property Damage, Premises and Operations, Independent Contractors, and Personal Injury coverages included. Such insurance shall provide coverage for total limits actually arranged by Contractor, but not less than $2 million Combined Single Limit and be specific for the Contract. Should the policy have an aggregate limit, such aggregate limits should not be less than $4 million. Umbrella or Excess Liability coverages may be used to supplement primary coverages to meet the required limits. Evidence of such coverages shall be on IPSC's Additional Insured Endorsement Form or on an endorsement of the policy acceptable to IPSC and provide for the following:

(1) To include IPA, IPSC, LADWP, and their officers, agents, and employees as additional insured with the Named Insured for the activities and operations under and in connection with the Contract.

(2) That the insurance is primary and not contributing with any other insurance maintained by IPA, IPSC, or LADWP.

(3) A Severability-of-Interest or Cross-Liability Clause such as: "The policy to which this endorsement is attached shall apply separately to each insured against whom a claim is made or suit is brought, except with respect to the limits of the company's liability."

(4) That the policy shall not be subject to cancellation, change in coverage, reduction of limits or nonrenewal of a continuous policy, except after written notice to IPSC, by receipted delivery, no less than thirty (30) calendar days prior to the effective date thereof.

(5) A description of the coverages included under the policy.

c. Commercial Automobile Liability: Commercial Automobile Liability covering the use of owned, nonowned, hired, and leased vehicles for total limits actually arranged by Contractor, but not less than $1 million Combined Single Limit. Such insurance shall include Contractual Liability coverage. The method of providing evidence of insurance and requirements for additional insureds, primary insurance, notice of cancellation, and Severability-of-Interest shall be the same as required in the Commercial General Liability Division of terms and conditions.

d. Professional Liability: Contractor shall provide Professional Liability Insurance with Contractual Liability coverage included, covering Contractor's liability arising from

errors and omissions made directly or indirectly during the execution and performance of the Contract and shall provide coverage of $5 million Combined Single Limit. Evidence of such insurance shall be in the form of a special endorsement of insurance and shall include a Waiver of Subrogation against IPA, IPSC, and LADWP, their officers, agents, and employees.

The policy shall not be subject to cancellation, change in coverage, reduction of limits, or nonrenewal of a continuous policy, except after written notice to IPSC, by receipted delivery, not less than thirty (30) calendar days prior to the effective date thereof.

e. Other Conditions:

(1) Failure to maintain and provide acceptable evidence of any of the required insurance for the required period of coverage shall constitute a major breach of Contract, upon which IPSC may immediately terminate or suspend the Contract. In addition or in the alternative, IPSC has the right (but not duty), to procure such insurance and: (a) To deduct the cost thereof from any monies due Contractor under the Contract or otherwise; and/or (b) To charge and collect the cost thereof from Contractor, payable upon demand. Such claim, deduction, or charge shall include an administrative fee of two (2) percent of the cost of procuring said insurance. Said insurance may be procured and maintained in the name of Contractor, IPA, IPSC, LADWP, and/or any combination thereof, as primary and/or secondary insured, all as IPSC may from time to time elect.

(2) Contractor shall be responsible for all subcontractors' compliance with these insurance requirements. The foregoing remedies in subsection (1) shall be available to IPSC against Contractor for any failure by any subcontractor to maintain and provide the required insurance.

8. Transportation: All shipments of hazardous materials under the Contract or in connection herewith shall be handled in accordance with current U.S. Department of Transportation regulations and all other applicable federal, state, and local laws and regulations.

9. Material Safety Data Sheets: Contractor shall furnish IPSC with a Material Safety Data Sheet (MSDS) for all hazardous materials furnished under the Contract, used, stored, or transported on or near IPP premises in connection with the Contract. The MSDS shall be furnished to IPSC on, or prior to, the date of the first delivery, use, storage, or transportation of the materials or equipment. If these Specifications require that Contractor furnish instruction books, the MSDS shall also be included in such books.

IP7012641

10. Contract Termination:

a. For Convenience or Security: IPSC reserves the right, by giving twenty (20) calendar days prior written notice (or such longer notice as IPSC may select) to Contractor, to terminate the whole or any part of the Contract at IPSC's convenience, whether or not Contractor is in default. IPSC also reserves the right to terminate the Contract, effective immediately upon notice, for purposes of security or safety of IPP Facilities, persons who work at IPP Facilities, or the public. In the event of termination for convenience, security, or safety, IPA will pay Contractor reasonable and proper direct costs of termination (if, however, Contractor's Proposal includes cancellation charges, payment for termination costs shall not exceed the cancellation charges set forth therein). Contractor shall, after consultation with IPSC, take all reasonable steps to minimize the costs related to termination. Contractor shall provide IPSC with an accounting of costs claimed, including adequate supporting information and documentation and IPSC may, at its expense, audit the claimed costs and supporting information and documentation.

b. For Breach: IPSC may terminate the whole or any part of the Contract effective immediately upon notice, in the event Contractor is in material default, and without right on the part of Contractor to claim any termination costs. This right to terminate is in addition to, and not in lieu of, any other remedy provided in the Contract or otherwise provided by law or equity.

c. Limitation of Liability: In no event shall termination of this Contract, or any portion thereof, whether for convenience, security, safety, breach, or otherwise, constitute the basis for or result in any claim by Contractor for consequential or incidental damages (including loss of anticipated profits or other economic damages) or punitive damages, and Contractor hereby releases IPA, IPSC, and LADWP, and their officers, directors, employees, agents, and representatives, from any and all such claims or liability.

11. Suspension of Work: IPSC reserves the right to suspend and reinstate execution of the whole or any part of the Contract and the Work without invalidating the provisions of the Contract. In the event the Work is suspended, Contractor will be reimbursed for actual direct unavoidable costs that it reasonably incurs as a result of the suspension. Claims for such cost reimbursement shall be submitted by invoice. Contractor shall use all reasonable means to minimize such costs, and shall allow IPSC to audit costs claimed. Contractor shall, upon request by IPSC, provide a projection of costs it anticipates to incur during any suspension, or continuation of suspension, contemplated by IPSC. In no event shall suspension constitute the basis for, or result in, any claim for consequential or incidental damages (including loss of anticipated profits or other economic damages) or punitive damages, and Contractor hereby releases IPA, IPSC, and LADWP, and their officers, directors, employees, agents, and representatives, from any and all such claims or liability.

IP7012642

12. No Waiver: No breach, noncompliance, or other failure to perform (collectively "breach") by Contractor, or any subcontractor, or of any Work shall be deemed waived unless expressly waived in writing by the President and Chief Operations Officer. No waiver by IPSC of any one breach shall be deemed to waive any other prior, concurrent, or subsequent breach. No exercise, or failure to exercise, or delay in exercising any particular remedy by IPSC shall be deemed a waiver or preclude IPSC from subsequently invoking that remedy for that breach or any other breach. All remedies granted to IPSC in the Contract, or by law or equity, are cumulative and may be exercised in any combination or order.

IP7012643

PART F - DIVISION F2

GENERAL DESCRIPTION AND SCOPE OF WORK

1. General: The Intermountain Generating Station (IGS) consists of two (2) coal fired generating units with each having a maximum gross capacity of 950 Megawatts. IGS is operated and maintained by the Intermountain Power Service Corporation (IPSC).

   This Division covers the general description, scope of work, and supplementary requirements for equipment, materials, and services included under these Specifications.

   The equipment and materials covered by these Specifications will be incorporated in the Intermountain Power Project (IPP) ID Fan VFD System replacement project.

   The IPP Plant Site is located at 850 West Brush Wellman Road, Delta, Utah.

   It is desirable to provide the best suited and largest standard drive suitable for possible use at a later date due to unforeseen changes that may be required in the future.

   Reuse of the existing fan and motor is desirable. If the motor is reused, Contractor shall verify and warrantee the existing motor is acceptable for use with the new system.

   The existing output contactors and all power and control electronics shall be replaced. Contractor shall replace or reuse any and all other items as is deemed appropriate; however, Contractor shall include in its Proposal a complete description of the proposed system and what is being replaced and what is being reused.

   Contractor shall include in its Proposal a drawing showing the proposed arrangement and dimensions, including, clearances between existing items and all new items. This drawing shall also indicate the approximate weight of all components.

2. Existing System Description: Each generating unit has four (4) ID fan rated 7,415 HP at 954 RPM existing maximum speed limit. The motors are 6-phase synchronous, 8-pole, 3,876 volt machines. Each motor has two (2) 3-phase windings. Winding 1 is phase shifted thirty (30) electrical degrees from Winding 2. The motor windings are not re-connectable to change the motor voltage. Each motor is controlled by a pair of current source, load commutated inverter (LCI) variable frequency drives. Each drive has an input transformer to connect the 3,876 volt drive to the 6,900 volt circuit breaker. The transformer pairs are connected delta-delta and delta-wye such that the 6,900 volt bus sees harmonics associated with 12-pulse rectification at full load of the drives. The motors and drives are about twenty (20) years old and were manufactured by Westinghouse. The drive controls are a combination of analog and digital technologies.

3. New System Requirements: The replacement equipment must include features that will fulfill the following requirements:

IP7012644

Harmonic content on the 6,900 volt bus must meet IEEE 519.
Power factor at the 6,900 volt feed to each ID fan shall be 0.95 or better at full load. Contractor shall include in its Proposal the power factor at 25, 50, 75, 85, and 100 percent loads.
Existing fan capacities shall not be decreased.
External controls and interlocks of the new equipment shall coordinate with the existing plant control system.
New components proposed must not degrade rating or service life of existing components that are being reused.
Contractor shall include in its Proposal the guaranteed reliability and maintainability of ID fan system. New equipment must fit in existing space.
It is desirable to have the new equipment use the existing conduits that are encased in concrete to minimize the installation costs. If necessary, others will do core drilling of the concrete; however, Contractor shall list all core drilling necessary in its Proposal.
Equipment for VFDs shall be replaced and checked out during a scheduled twenty-four (24) calendar day outage. Contractor shall include in its Proposal a description of the ***work*** required for complete replacement.

4. Long Range Goals: The replacement equipment shall have features that will provide or make provision for the following goals:

Increased fan capacity to allow a 950 MW generating capacity with three (3) fans operating with additional pollution control equipment added.
Provide for future ID fan increases using Contractor's standard equipment.
Replace existing transformers.

5. Work Included Under These Specifications: The Work under these Specifications shall include furnishing F.O.B. at the IPP Plant Site, the medium voltage VFDs, miscellaneous materials, and services complete as specified herein and in accordance with the Contract Agreement.

All equipment and materials required for complete medium voltage VFD systems shall be furnished, except as specified otherwise in these Specifications. The equipment, materials, and services to be furnished shall include, but not necessarily be limited to, the following major items:

a. The furnishing of integrated medium voltage VFD systems, to operate the ID fans. Each set shall be an engineered system composed of the existing input switchgear, a VFD, self-contained closed cycle cooling system, and output contactor with connections to an existing ID fan motor. Drive equipment shall be housed in the existing control building. Equipment and software furnished shall be suitable for powering IPSC's ID fan motors or new motors provided by Contractor. Contractor shall identify any modifications required to IPSC's ID fan system, composed of ID fan motor, fan, connecting shaft, bearings, and cable connecting the ID fan motor to the VFD system to allow this equipment to operate with the VFD and still maintain a normal lifetime of the ID fan system. Contractor shall also provide services to coordinate the proper selection of IPSC's ID fan system and programming of the VFD software. This includes, but is not limited to, coordination of information transfer associated with IPSC's ID fan system, such as WK^2 of the fan, critical speeds, starting/running torque, and meetings with the new or existing fan motor supplier.

b. Each VFD system shall consist of all system components required to meet the performance, protection, safety, testing, and certification criteria of these Specifications. These components may include incoming harmonic filter/power factor correction unit, input isolation transformer, VFD converter/DC-link/inverter, and output filter. The VFD system shall represent a fully integrated package. All material and labor necessary to interconnect any VFD system elements shall be included, even if shipped separately, except as specified otherwise herein. The minimum VFD size shall be such that the motor will operate continuously at the horsepower rating multiplied by the motor service factor.

c. It is intended that Contractor's standard product, with available options, be provided under these Specifications. Any modifications to a standard product provided to meet these Specifications shall be performed by Contractor only. Contractor shall explicitly indicate all exceptions or deviations to these Specifications in its Proposal, per Division B1, Article 4, Instructions to Bidders. Only exceptions or deviations identified in the Proposal Section will be considered for negotiation and possible inclusion in the executed Contract.

d. The main VFD system components shall be completely factory prewired, assembled, and then tested as a complete package by Contractor, to assure a properly coordinated, fully integrated drive system. It is desirable that the factory acceptance tests include all components being furnished, including the transformer.

e. Contractor shall conduct a certified startup of all Contractor-furnished equipment to confirm conformance to these Specifications.

f. Any third party certification, safety, or protection requirements shall be applied to the VFD system as a whole. Certification or protection of system elements or individual components by themselves is not acceptable.

g. IPSC will test the equipment after erection to demonstrate its ability to operate under the specified conditions and fulfill the guarantees as set forth herein. If the tests indicate that the equipment fails to meet guaranteed performance, Contractor shall make additional tests and modifications until the equipment performs as specified.

h. Contractor shall provide drawings and other engineering data, manufacturer's field services, tools, instruction manuals, recommended spare parts list, and miscellaneous materials and services, and shall participate in design conferences, all as specified herein.

i. Equipment, materials, and accessories furnished shall be delivered to the IPP Job Site where items will be unloaded, received, stored, and erected under separate purchase orders. Deficiencies shall be sufficient cause to reject equipment. Unloading from carrier and storing will not constitute acceptance.

6. Miscellaneous Materials and Services: Miscellaneous materials and services not otherwise specifically called for shall be furnished by Contractor in accordance with the following:

a. All piping integral to or between any equipment furnished under these Specifications, except as otherwise specified.

b. All necessary instrument, power and control wiring, and raceways integral to any equipment furnished under these Specifications. This shall include terminal blocks and internal wiring to these terminal blocks for equipment requiring external connection.

c. Coupling guards for all exposed shafts and couplings.

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

e. Erection drawings, prints, information, instructions, and other data for use by IPSC's erection subcontractor.

f. Detailed storage and lubrication requirements (including frequencies) for use by IPSC's erection subcontractor.

g. The use of all special tools required for erection of the equipment, exclusive of the maintenance tools specified to be furnished under Division F3, Article 15, General Equipment Specifications. Erection tools shall remain the property of Contractor and all shipping costs to and from the IPP Job Site shall be at Contractor's expense.

7. Work or Materials Furnished by Others: IPSC will furnish the following items:

   a. ID fan system, composed of ID fan motor (if existing motor is used), ID fan, connecting shaft, bearings, and cable connecting the ID fan motor for each ID fan (if Contractor verifies existing cabling is acceptable). The connecting cable will be shielded 8 kV Type MV-90 single conductor medium voltage power cable. The WK^2 of the fan is 347,700 lb-ft^2. The fan will be a variable torque load and high breakdown/starting torque will be required.

   b. One (1) or two (2) 6.9 kV incoming power feeds to each Contractor-furnished VFD system.

   c. One (1) 125 volt DC power feed to each Contractor-furnished VFD.

   d. Control wiring from IPSC's plant control system to the VFD control system.

   e. Supply and install power cables as required to interconnect the VFDs, isolation transformers, input circuit breakers, and ID fan motors.

   f. Receiving, unloading, storing, and field erection of all equipment.

   g. Foundations, foundation bolts, bolt sleeves, and equipment bases.

   h. Grouting materials and the placing thereof.

   i. Permanent electric wiring to connect equipment terminal boxes to IPP's electrical system.

   j. Lubricants and fuels for operation.

   k. Solvents and cleaning materials.

   l. Finish painting of all equipment except as specified herein.

   m. Operating personnel for startup and tests.

8. Contractor's Services: Contractor's services as stated in Division F2, Article 5, Work Included Under These Specifications, shall be in accordance with the following:

   a. Submittal of Engineering Data: Drawings and other engineering data for the specified equipment and materials are vital to the design and subsequent construction of the entire project.
   Contractor will be required to submit drawings and engineering data in accordance with the schedule and requirements specified herein to assure compliance with the overall construction and operating schedule.

Contractor shall allow a reasonable amount of time for mailing, processing, and IPSC Contract Administrator's review of drawings and data in Contractor's schedule and procurement/production/shipping schedule.

b. Manufacturer's Technical Services: Contractor shall furnish the service of one (1) or more manufacturer's technical service representatives. The service representatives shall be technically competent, factory trained, experienced in the installation and operation of the equipment, and authorized by the manufacturer to perform the Work stipulated.

The Manufacturer's technical service representatives shall furnish written certification to IPSC that, the equipment has been inspected and adjusted by or under representatives direction and that the equipment is ready for service, all of which shall be done before initial operation of the equipment.

The duties of manufacturer's technical services representatives may include, but may not be limited to, the following:

(1) Provide technical advice to assist the erection subcontractor in installing the equipment.

(2) Inspect and test the equipment after installation and direct any change or adjustments required to assure proper operation.

(3) Provide technical direction during startup and initial operation of the equipment.

(4) Direct the correction of any design or manufacturing errors.

(5) Instruct IPSC's personnel in the operation and maintenance of the equipment.

(6) Provide services required as a condition to providing the warranties and guarantees specified.

For each VFD system, the lump sum prices stated in the Proposal, shall include the recommended number of days of service and round trips to the IPP Job Site for field service. Contractor shall include as a minimum fifteen (15) days per drive. The manufacturer's technical representatives, shall provide the services specified under items (1), (2), (3), and (6) above. When, in the judgment of the Contract Administrator, field service representative's time is required under item (4) above solely and expressly, for the purpose of correcting design or manufacturing errors, no payment will be made, nor will the time spent at the IPP Job Site while correcting such errors apply toward the days of service or round trips specified in items (1), (2), (3), and (6) above.

When additional field service representatives time is required by IPSC under item (5) above, the per diem rates for service time, plus the rate for each round trip, will be paid in accordance with applicable adjustment prices for manufacturer's technical services as stated in the Proposal.

The per diem rates shall include all costs associated with the field service representative's Work at the IPP Job Site, including local travel, local travel time wages, and living expenses. The round trip rate shall include all expenses for travel to and from the manufacturer's facilities and the IPP Job Site, including any salary costs for travel time. IPSC will not reimburse Contractor for air fare costs exceeding tourist class air fare unless unusual circumstances exist. Contractor shall notify IPSC of such circumstances.

A day of service (per diem) is defined as eight (8) man-hours at the IPP Job Site. The total number of days of service shall be defined as the total regular time man-hours at the IPP Job Site divided by eight (8).

9. Instruction Manuals: Instruction manuals shall be furnished in accordance with the requirements stated in Division F4, Article 9, Engineering Data, of these Specifications and as scheduled herein.

10. Recommended Spare Parts: Contractor shall provide a complete listing of recommended spare parts with unit prices F.O.B., IPP Plant Site, not later than the date listed in Division F2, Article 15, Schedule of Activities. The listing shall include the manufacturer of each part, a description of each part (including industry standard part number if available), the assembly or equipment in which each part will be used, and recommended quantities to be stocked; shall classify the relative criticality of parts based on the manufacturer's experience; and shall list the lead time required for manufacturer and delivery of each part.

    IPSC will retain the option of purchasing any one or any combination of spare parts listed at the prices quoted until six (6) months after final startup testing and acceptance.

11. Factory Witness Tests: Supplementing the provisions of Division 7, Division 8, and Division 9 concerning factory witness tests, Contractor shall notify IPSC's Contract Administrator not less than ten (10) working days prior to the date of each factory witness test. IPSC's Contract Administrator will have the right to witness the factory acceptance test and be present for all other tests conducted.

12. Schedule: Contractor shall complete the specified activities in accordance with the milestone time periods and dates listed in addition to the timely delivery of the equipment and materials.
    The Schedule of Activities stipulates the milestone dates and time periods for the Work included in the Contract. It is necessary that Contractor perform the activities shown on or before the dates indicated to avoid delay of the entire project.

a. Activity Periods and Dates: The time periods and dates listed in the Schedule of Activities indicate the latest dates by which the listed activities shall be completed. Data, drawings, and lists for planning, engineering, and documentation may be submitted earlier than the indicated dates at Contractor's option.

Equipment and materials shall be delivered within the time frame specified. IPSC will not be obligated to accept delivery or make payment for equipment delivered prior to the earliest acceptable delivery date.

b. Engineering Schedule: Contractor shall submit a schedule for engineering associated with the equipment being provided. Such schedules shall be updated and submitted by the first of each month until completion of the engineering effort.

c. Procurement/Production/Shipping Schedule: Contractor shall submit a detailed procurement/production/shipping schedule for the equipment and materials not later than the date indicated; thereafter, the schedule shall be updated as directed by IPSC's Contract Administrator; however, at least every thirty (30) days.

13. Reference Drawings: Contractor shall field verify the information shown on the referenced drawings for any information that is used in the design and fabrication of the variable frequency ID fan drive equipment. All travel and living expenses expended by Contractor for field verification of Reference Drawings, shall be included in the lump sum Contract Price. Refer to Division F2, Drawing List, for drawings included with these Specifications.

14. Right to Operate Unsatisfactory Equipment: If the operation of the equipment after installation proves to be unsatisfactory to the Contract Administrator, IPSC shall have the right to operate such equipment until it can be taken out of service without injury to IPSC for the correction of defects, errors, or omissions, provided the period of such operation pending the correction of defects, errors, or omissions shall not exceed one (1) year without written consent of the IPSC and Contractor.

15. Schedule of Activities: Contractor shall be required to complete the following:

Activity	**Days After Award of Contract**
Planning, Engineering, and Documentation	
Participate in Design Conference at the IPP Job Site	Fifteen (15) Days
Activity	**Days After Award of Contract**
Planning, Engineering, and Documentation	

IP7012651

Supply Schedule of Engineering	Fifteen (15) Days
Supply Quality System Manual as Specified in Division F3	Twenty (20) Days
Supply Inspection and Test Plan as Specified in Division F3	Thirty (30) Days Prior to First Fabrication
Supply Notification of Tests/Test/ Inspections as Specified in Division F3	Ten (10) Days Prior to Inspection
Supply Hazardous Materials Documentation	Thirty (30) Days After Award of Contract and With Material Lists
Supply Outline Drawings	Fifteen (15) Days
Supply Schematic and Wiring Diagrams	Twenty (20) Days
Supply Input/Output List to Plant Control System	Fifteen (15) Days
Supply Block Diagram Showing Basic Control and Protection Systems Specifying the Protection, Control, Trip, and Alarm Functions at Different Locations; and Reference Signals, Commands, and Auxiliary Supplies (i.e., Air, Oil, and Cooling Water)	Fifteen (15) Days
Supply Single-Line Diagram Showing Main and Auxiliary Circuitry, Including Main Power Input, Switchgear, Transformer, VFD, System Earthing and Auxiliary Supplies, Showing All CTs, PTs, Relays, Meters, etc., for the Control, Protection, and Operation of Drive System with Electrical Data (i.e., Voltage, Current, Time Ratings, Impedances, and Tolerances)	Twenty (20) Days
Supply Equipment Dimensions, Including Stub-Up Locations, Shipping Splits, and Shipping Weights	Fifteen (15) Days
Supply Nameplate Drawings	Fifteen (15) Days
Activity	**Days After Award of Contract**
Planning, Engineering, and Documentation	

IP7012652

Supply Torsional Analysis	Twenty (20) Days
Supply Efficiency and Power Factor Values	Fifteen (15) Days
Supply Startup and Commissioning Instructions and Data	Six (6) Weeks Prior to Shipment
Supply VFD Equipment Interface Information, Including Dead and Seismic Loads	Twenty (20) Days
Supply Anchor Bolt Information, Including Material, Size, and Projection	Twenty (20) Days
Supply Certified Report, Including Test Data for all System Level Tests	Fifteen (15) Days After Completion of System Level Tests
Supply Schedule of System Level Tests, Including Proposed Test Procedures	Thirty (30) Days Prior to Tests
Supply Schedule of Certified Field Startup and Acceptance Tests	Thirty (30) Days Before Shipment
Supply Completed Motor Information Sheets to IPSC's Contract Administrator	Fifteen (15) Days
Supply Cash Flow Projection	Fifteen (15) Days
Supply Initial Detailed Procurement, Production, Shipping Schedule	Fifteen (15) Days
Supply Recommended Detailed Erection Sequence and Procedure	Twenty (20) Days
Submit "Proof Copy" of Instruction Manual(s) to IPSC's Contract Administrator	Thirty (30) Days Prior to Shipment
Distribute Twelve (12) Copies Each for Unit 1 and 2 of Accepted Instruction Manuals as Designated by IPSC's Contract Administrator	Thirty (30) Days Prior to Shipment
Supply Recommended Spare Parts List to IPSC's Contract Administrator	Thirty (30) Days Prior to Shipment

Activity	**Days After Award of Contract**
Planning, Engineering, and Documentation	

IP7012653

Notify IPSC's Contract Administrator for Pre-Shipment Inspection	Thirty (30) Days Prior to Shipment
Notify IPSC's Contract Administrator of Factory Witness Test(s)	Ten (10) Days Prior to Date of Test(s)

Equipment to be Delivered to IPP Job Site

Equipment	Earliest Acceptable Delivery Date	Latest Acceptable Delivery Date
Unit 2 - One (1) Fan	January 02, 2004	February 20, 2004
Unit 1 - Two (2) Fans	January 02, 2005	January 31, 2005
Unit 2 - Three (3) Fans	January 02, 2006	January 31, 2006
Unit 1 - Two (2) Fans	January 02, 2007	January 31, 2007

Twenty-Four (24) Plant Outage
(For Installation of Equipment, Final Startup Testing, and Acceptance)

Unit	Date
Unit 2 - One (1) Fan	March 2004
Unit 1 - Two (2) Fans	March 2005
Unit 2 - Three (3) Fans	March 2006
Unit 1 - Two (2) Fans	March 2007

Note: Exact Dates to be Determined After Award of Contract

IP7012654

DRAWING LIST

The following reference drawings and pictures are included on the CD that is included with these Specifications:

Existing Design Drawings		
Drawing Number	**Rev**	**Title**
9255-1APE-E1002	9	One-Line Diagrams Overall Functional Relaying
9255-1APE-E1006	8	One-Line Diagrams 6900V Unit Switchgear 1A2
9255-1APE-E1008	9	One-Line Diagrams 6900V Unit Substation 1B2
9255-1BSB-M1040	13	Plant Arrangement - AQCS Control Bldg and ID Fan Area Ground Floor - El 4676'0"
9255-1BSB-M1041	9	Plant Arrangement - AQCS Control Bldg and ID Fan Area Mezzanine Floor - El 4692'0"
9255-2APE-E1002	4	One-Line Diagrams Overall Functional Relaying
9255-2APE-E1006	5	One-Line Diagrams 6900V Unit Switchgear 2A2
9255-2APE-E1008	5	One-Line Diagrams 6900V Unit Substation 2B2
9255-2BSB-M1040	8	Plant Arrangement - AQCS Control Bldg and ID Fan Area Ground Floor - El 4676'0"
9255-2BSB-M1041	6	Plant Arrangement - AQCS Control Bldg and ID Fan Area Mezzanine Floor - El 4692'0"
Existing ID Fan Drawings		
Drawing Number	**Rev**	**Title**
2090F87	7	Contract Drawing 4132 Special ID Fan CL. 954 ARR. 3 DW W/324" Boxes 60" Tau Disch. CW & CCW Rota
2429D95	2	Fan Foundation System Design Criteria Category IV for Adjustable Speed Drive Systems

IP7012655

Existing Drive and Motor Drawings Pictures	
File Name	**Description**
Pb130002.jpg	Looking West at Unit 2 Wall of AQCS Control Building
Pb130003.jpg	Looking West at Unit 2 Wall of AQCS Control Building and ID Fan 1A
Pb130010.jpg	Looking West at Unit 1 Wall of AQCS Control Building
Pb130012.jpg	Looking West at Uni1 Wall of AQCS Control Building and ID Fan IA

Note: The existing drive and motor drawings are included as files 00250001.tif through 00250156.tif.

IP7012656

PART F - DIVISION F3

GENERAL EQUIPMENT SPECIFICATIONS

1. General: These General Equipment Specifications apply in general to all equipment and materials and are supplementary to the Detailed Specifications. If requirements specified herein are in conflict with requirements specified in the Detailed Specifications, the Detailed Specifications shall govern to the extent of such conflict.

   The Proposal shall be based upon the use of equipment and materials complying fully with the requirements specified in the Contract Documents. It is recognized that Contractor may have standardized on the use of certain components, materials, processes, or procedures different than those specified herein. Alternates in addition to the base Proposal on the basis of supplying Contractor's standard components, materials, processes, or procedures will be considered. The alternate Proposal shall clearly stipulate the alternate proposed, the specific exceptions to the specifications, and the price change applicable for suppling such alternate.

2. Referenced Standards: Reference to the standards of any technical society, organization, or association, or to the laws, ordinances, or codes of governmental authorities shall mean the latest standard, code, or specification adopted, published, and effective at the date of taking bids unless specifically stated otherwise in these Specifications.

   The specifications, codes, and standards referenced in these Specifications (including addenda, amendments, and errata) shall govern in all cases where references thereto are made except where they conflict with these Specifications. In case of conflict between the referenced specifications, codes, or standards and these Specifications, the latter shall govern to the extent of such difference.

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

4. Identification: All correspondence, shipping notices, specifications, engineering data, and other documents pertaining to the equipment and materials furnished under these Specifications shall be identified by IPSC's name, the project name and number, the unit number, and the Specifications number.

5. Pre-Shipment Inspection: IPSC Contract Administrator reserves the right to inspect the equipment prior to shipment. Contractor shall notify IPSC's Contract Administrator of all shipments not less than ten (10) working days prior to the date of shipment to allow IPSC's Contract Administrator to inspect the equipment if so desired.

6. Material List: Contractor shall prepare and submit with the first shipping notice two (2) copies of an itemized material list covering all material and equipment furnished under

IP7012657

these Specifications. The material list shall be in sufficient detail to permit an accurate determination of the completion of shipment.

7. Hazardous Materials: All shipments of hazardous materials shall be identified on the material list. A copy of the hazardous materials documentation required per Division F1, Detailed Specifications - Special Conditions, Article 9, Material Safety Data Sheets, shall be included with the material list and shall also be included with the shipping papers attached to the shipment.

8. Correction of Errors: Equipment and materials shall be complete in all respects within the limits herein outlined. All errors or omissions required to be corrected in the field shall be done by the manufacturer or his duly authorized representative at Contractor's expense.

9. Numbering System: IPSC has established an identification numbering system to provide consistent numbering of all plant equipment. All electrical devices, control and instrumentation equipment, valves, and other items of similar nature shall be permanently identified with the identification number supplied by IPSC. Except as specified otherwise in these Specifications, the identification shall be engraved on stainless steel tags, laminated phenolic tags, nameplates, or an equally permanent method at the option of, and as acceptable to, IPSC and shall be permanently affixed to the device. IPSC's identification numbers shall also be included on the manufacturer's drawings.

10. Nameplates: Nameplates shall be furnished for all equipment when specified in the Detailed Specifications.

    Nameplates shall be laminated white phenolic engraving stock with black core, or 2-ply vinyl white with reverse engraved black fill as manufactured by B.F. Plastics of Lawrence, Ohio, or acceptable equal. The lettering shall not be less than 3/16 inch high. As space permits, nameplates shall have an overall minimum size of 3/4 inch by 3 inches for small equipment nameplates, and 2 inches by 8 inches minimum for major equipment nameplates. The nameplate size shall be subject to acceptance by IPSC during drawing review. Nameplates shall be attached with stainless steel screws.

11. Factory Assembly: Equipment shall be shipped completely factory assembled, except when the physical size, arrangement or configuration of the equipment, or shipping and handling limitations make the shipment of completely assembled equipment impracticable, in which case the equipment shall be assembled and shipped as stated in Contractor's Proposal.

    All separately packaged accessory items and parts shall be shipped with the equipment. Containers for separately packaged items shall be marked so the containers are identified with the main equipment. An itemized packing slip, indicating what is in that container only, shall be attached to the outside of each container used for packaging.

A similar list shall be inside of each container. A master packing slip, covering all accessory items for a given piece of equipment which are shipped in separate containers, shall be attached to one (1) container.

12. Service Conditions: Unless specified otherwise, equipment and material furnished under these Specifications shall be suitable for service at an altitude of 4,700 feet above sea level, temperatures between -35°C and 50°C.

    Equipment located outdoors shall also be suitable for exposure to solar radiation, fog, rain, snow, ice, coal dust, fly ash, wind, and windblown dust and sand.

13. Control and Electrical Equipment: Control and electrical equipment, including panels, cabinets, switchgear, transformers, and motors, shall be finish painted. Exterior surfaces shall be the manufacturer's standard color. The interior portions of cabinets shall be gloss white. Touch-up paint shall be provided for repair painting.

14. Protection: All equipment shall be boxed, crated, or otherwise suitably protected during shipment, handling, and storage.

    Electrical equipment, controls, and insulations shall be protected against moisture and water damage.

15. Tools: Contractor shall furnish and ship with each piece of equipment one (1) set of all special tools required for installation and maintenance of the equipment. Maintenance tools for each piece of equipment shall be boxed separately and the boxes shall be marked with the large painted legend as follows:

    INTERMOUNTAIN POWER SERVICE CORPORATION
    INTERMOUNTAIN POWER PROJECT
    MAINTENANCE TOOLS FOR: _____
    (Name of Equipment)

    ERECTION SUPPLIER DO NOT OPEN EXCEPT WITH IPSC'S PERMISSION

    A weatherproofed itemized list of the contents shall also be attached to the outside of each box.

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

    In addition to the tools for maintenance and dismantling, Contractor shall furnish the use of all special tools required for erection of the equipment. Erection tools shall remain

the property of Contractor and all shipping costs to and from the IPP Job Site shall be at Contractor's expense. Erection tools for each piece of equipment shall be boxed separately. Erection tools shall not be boxed with maintenance tools.

16. Alignment and Balance: All rotating parts shall be true and dynamically balanced. Excessive noise or vibration, in the opinion of IPSC's Contract Administrator, will be sufficient cause for rejection of the equipment. All rotating equipment shall be balanced at the factory.

17. Noise Level: The equivalent "A" weighted sound pressure level for equipment furnished under these Specifications (excluding drive motors) shall not exceed 85 dBA free field measured 3 feet horizontally from the base of the equipment and 5 feet about floor level. If the drive motors for the equipment are also furnished under these Specifications, the combined sound pressure level of the motor and driven equipment shall not exceed 90 dBA free field. The sound pressure levels stated are decibels to a reference of 20 micropascals.

18. Design Coordination: Contractor shall be responsible for the selection and design of all equipment and materials which will provide the best coordinated performance of the entire system. Components of rotating equipment shall be selected so that the natural frequency of the complete unit is not at or critically near the operating range of the unit.

19. Control Power: Electrical power for control and instrumentation will be a nominal 120 volt, single-phase, 60 hertz, alternating current, or a nominal 125 volt direct current. Contractor shall provide any devices required for proper operation and protection of the equipment during electrical power supply and ambient temperature fluctuations described in the following paragraphs.

    All dc electrical control devices shall be designed for continuous operation on an ungrounded station battery at any voltage from 100 to 140 volts dc. Electrical devices served from this supply shall not impose any ground connections on it. All ac electrical control devices shall, unless other specified, be designed for continuous operation at any voltage from 102 to 132 volts alternating current. The dropout voltage shall be less than 75 volts for relays and 90 volts for contactors and starters. Alternating current electrical control devices operating at nominal voltages other 120 volts shall be designed for continuous operation over proportional voltage variations.

    All devices shall be guaranteed to operate satisfactorily under voltage conditions specified in the above paragraphs and at a range of ambient temperatures from 50°C to -35°C outdoors and from 50°C to10°C indoors.

20. Auxiliary Power: Auxiliary equipment, such as motors, transformers, and rectifiers, requiring electrical power shall be designed to operate from one of the nominal electrical power sources as follows:

Auxiliary Power		
Volt	**Phase**	**Hertz**
6,900	3	60
480	3	60
208	3	60
120	1	60
125	dc	– (Emergency)

Alternating current motor voltage ratings with relation to horsepower shall be in accordance with the following:

Alternating Current Motor Voltage Rating		
Horsepower	**Volt**	**Phase**
Below ½	115	1
½ through 249	460	3

21. Electrical Enclosure Heating: Where electrical enclosure heating is specified, at least two (2) space heaters, one (1) adjustable thermostat, and one (1) fuse and fuse block shall be provided completely wired in the enclosure. The space heaters, thermostat, and fuse block shall not interfere with normal cable entrance into the enclosure or with maintenance or replacement of devices within the enclosure. Normal use of space heaters shall not change or discolor any painted surface.

Space heater capacity shall be as required to maintain the enclosure internal temperature above the dew point under the specified service conditions. Space heater voltage, for circuits greater than 1,000 watts rating shall be 208 volts. Voltage applied to space heaters, less than 1,000 watts shall be 120 volts. Space heaters shall be controlled by an adjustable thermostat, factory set to close on falling temperature at 80°F (on) and open on rising temperature at 95°F (off). The thermostat shall incorporate an indicating thermometer and set point temperature indication.

Any thermally controlled devices within the enclosure shall be temperature compensated for correct operation at 85°F and above.

Space heater leads shall be stranded copper cable with 600 volt insulation and shall include terminal connectors. Space heater sheaths shall be of a corrosion-resistant, nonoxidizing material and shall have a thickness not less than 0.025 inch.

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

Splices will not be permitted.

One (1) spare normally open and one (1) spare normally closed contact on each control switch and lockout relay shall be wired out to terminal blocks.

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

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

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

Terminal blocks shall not be mounted in compartments containing cables or buses operating at voltages above 600 volts.

A shorting-type terminal block shall be installed at an accessible location for each set of current transformers supplied with the equipment furnished under these Specifications. The shorting-type terminal block shall be the one nearest the current transformers. No other shorting-type terminal blocks are required unless specified otherwise. The shorting-type terminal blocks shall be furnished with white marking strips. All electrical cables shall be conservatively selected for the electrical and environmental conditions of the installations and shall be of the best construction for the service where unusual service conditions are encountered. Proper temperature application cable shall be used throughout. Except where required to be otherwise to perform satisfactorily in the service, or unless otherwise specified in the Detailed Specifications, all electrical power and control conductors shall be Class B, stranded copper conductors, 14 AWG or larger.

IP7012662

Electrical cables which utilize mineral insulation (NEC Type MI) or polyvinyl chloride (PVC) insulation (NEC Types AWM, MTW, TA, TBS, THHN, THHW, THWN, TW, or THW) shall not be utilized. PVC shall not be utilized as a jacketing material on any of the cable constructions.

Control panel and cabinet wiring shall utilize stranded copper conductors with flame retardant cross-linked polyethylene or flame retardant ethylene-propylene rubber insulation rated 600 volts and shall meet the requirements of UL 44 for Types SIS and XHHW. The cables shall also meet the UL 44 VW-1 flame test and shall be Rockbestos Type SIS, VW-1; American Insulated Wire Type SIS, VW-1; Continental Wire & Cable Type SIS, VW-1; or acceptable equal.

Preinsulated terminal connectors shall include a vinyl sleeve, color coded to indicate conductor size. Preinsulated terminal connectors shall include a metallic support sleeve bonded to the vinyl insulating sleeve and designed to grip the conductor insulation.

Ring-type connectors shall be manufactured by AMP, 3M, or acceptable equal. Spade-type connectors shall be AMP slotted spring spade or 3M Scotchlok Series 61 snap spade terminal connectors.

Each terminal block, terminal, conductor, relay, breaker, fuse block, and other auxiliary device shall be permanently labeled to coincide with the identification indicated on the drawings. All terminals provided for termination of external circuits shall be identified by inscribing circuit designations acceptable to IPSC's Contract Administrator on the terminal block marking strips with permanent black ink. All other wiring terminations shall be identified by printing on conductor identification sleeves. A conductor identification sleeve shall be provided on each end of each internal conductor. Each sleeve shall be marked with the opposite end destination identification. Conductor identification sleeves shall be PVC, not less than 1/2 inch long, and shall be as manufactured W.H. Brady Company, Milwaukee, Wisconsin, or acceptable equal. Conductor identification shall be printed on the sleeve with permanent black ink acceptable to IPSC's Contract Administrator. After inscription of the conductor identification, the sleeve shall be coated as required to prevent smudging. Conductor identification shall be permanent, unaffected by age, heat, solvents, or steam, and not easily dislodged. Adhesive labels are not acceptable.

The arrangement of connections on terminal blocks shall be acceptable to IPSC. All connections requiring disconnect plug and receptacle-type devices shall be provided with factory terminated conductors on each plug and receptacle. Plugs and receptacles shall be factory wired into junction boxes containing terminal blocks for external connections. All conductors on the disconnect portion of plug-receptacle assemblies shall be in a common jacket.

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

23. Equipment Safety Grounding: All electrical equipment that is part of an integral shipping unit or assembly shall be furnished with bare copper grounding conductor extending to a central ground connection lug. The lug shall be suitable for field connection to the station ground grid by others.
Isolated logic system or single-point ground connections required for proper operation of electronic equipment shall be insulated from the equipment safety ground. Such connections shall be extended, using insulated cable, to a single termination point suitable for field connection to the appropriate ground system by others.

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

24. Terminal Blocks: Terminal blocks shall be furnished with white marking strips and, where permitted by the safety codes and standards, shall be without covers. Twenty percent spare terminals shall be furnished.

All terminal blocks, except internal terminal blocks in factory prewired electronic systems cabinets and terminal blocks for thermocouple extension wire, shall be Buchanan Medium Duty, rated 600 volts, with thermocouple contacts or Marathon 200 Series with Omega Engineering, Inc., Type TL terminal lugs for terminal blocks, or acceptable equal. Terminal blocks shall be appropriately sized for larger wire size or higher voltage insulated incoming conductors as necessary.

25. Indicating Lights: Status indicating lights shall be either Micro Switch Type PTW, with Type 387 lamps, plastic lenses, and appropriately sized resistors; General Electric Type ET-16, with incandescent screw connectors, plastic lenses, and appropriately sized resistors; or acceptable equal.

Engraved indicating lights shall be Honeywell Micro Switch Series 2 with Type 387 lamps or acceptable equal.

Indicating lights shall be energized when the condition exists and shall be de-energized when the condition does not exist. Indicating light lens colors shall be coordinated with indicated conditions as specified in the following table:

Lens Color	Condition
Red	Equipment Energized, Such as Motor Running, Valve Open, or Breaker Closed

Lens Color	Condition
Green	Equipment De-Energized, Such as Motor Stopped, Valve Closed, or Breaker Open
White	Equipment Abnormality, Such as Motor Trip or Breaker Trip
Amber or Yellow	Equipment Start Permissive

26. Alarm Contacts: Alarm contacts for remote annunciation shall be suitable for operation at 125 volts dc. All contacts shall be rated at least 0.5 ampere make or break, at 125 volts dc. Alarm contacts shall be normally closed contacts which open to alarm condition.

27. Molded Case Circuit Breakers: Molded case circuit breakers used in equipment furnished under these Specifications shall be as listed in the following tables:

AC Service							
				Interrupting Capacity (NEMA)			
				AC		DC	
Pole	Service Volt AC	Frame Rating Ampere	Trip Range Ampere	Symmetrical Ampere	Volt	Ampere	Volt
1	120	100	15-100	10,000	120	5,000	125
2	208	100	15-100	10,000	240	5,000	250
2	480	100	15-100	25,000	480	10,000	250
3	208	100	15-100	10,000	240	**	**
3	480	100	15-100	25,000	480	**	**
2	480	225		25,000	480	10,000	250
3	480	225		25,000	480	**	**

**The construction of all 3-pole circuit breakers furnished under these Specifications shall be equivalent to 1-pole and 2-pole circuit breakers specified. This shall include heavy-duty construction and spacing between poles as required for dc rated circuit breakers.

DC Service							
				Interrupting Capacity (NEMA)			
				AC		DC	
Pole	Service Volt DC	Frame Rating Ampere	Trip Range Ampere	Symmetrical Ampere	Volt	Ampere	Volt
2	125	100	15-100	10,000	120	5,000	125

28. Factory Prewired Electronic Systems Cabinets: Internal wiring in factory prewired electronic systems cabinets may be installed according to Contractor's standard as to wire size, insulation, and method of termination on internal equipment except that insulation for all wiring (including circuit board wiring, back plane wiring, and power supply wiring) shall meet the VW-1 (vertical wire) flame test requirements of UL 44. Interconnecting cables between devices shall meet the flame test requirements of IEEE Standard 383 (ANSI N41.10) using a gas burner flame source. The individual conductors of the interconnecting cables shall meet the flame resisting test requirements of ICEA S-19-81, Paragraph 6.19.6. Identification of conductors may be done by insulation color coding identified on drawings or by printed wiring lists. Terminal blocks for connection of external circuits into factory prewired electronic systems cabinets shall meet all the requirements of Article 24, Terminal Blocks, of this Division.

29. Solid-State Logic Systems: All electrical equipment containing solid-state logic systems shall be tested in accordance with the manufacturer's standard tests for a minimum of 120 hours under power prior to shipment from the factory. The components to be tested shall include the electronic devices, power supplies, input/output devices, operator interface devices, and interconnecting cables provided with the system. The system shall be tested as a complete assembly. Testing of individual components or modules will not be acceptable as system tests. Testing should be done at maximum operating temperature. All solid-state boards should under go a burn in phase prior to any actual tests.

    A description of the manufacturer's standard factory test procedure shall be provided in the Proposal.

30. Contractor-Furnished AC Motor Starters: The AC motor starters furnished with the equipment shall provide wiring in accordance with the following requirements:

    Motor starters for 480 volt AC service shall include 480 volt, 3-phase, 60 hertz contactors with manual reset thermal overload relays, 120 volt ac operating coils, and 480 to 120 volt dry-type control transformers complete with one secondary lead fused and the other secondary lead grounded.

PART F - DIVISION F4

ENGINEERING DATA

1. General: This Division stipulates the requirements for engineering data which Contractor shall submit to IPSC for design information and review. Compliance with the specified schedule for engineering data submittal is vital to the scheduled progress and completion of the Project.

   All engineering data shall be identified with the equipment or structure it represents by use of the nomenclature established by the Contract Documents. Equipment drawings shall have IPSC's equipment name and number clearly displayed. Material drawings shall have the engineer's structure name and structure number (when applicable) clearly displayed.

   a. Document Index: A document index listing all drawings and data to be submitted shall be included with the initial submittal. The document index shall be resubmitted as required to indicate revisions to the list. The list shall include the document number and title, if known, or the general document category, e.g., wiring diagrams for each item of equipment.

2. Review of Engineering Data: IPSC's review of engineering data will cover only general conformity of the data to the specifications and documents, external connections, interfaces with equipment and materials furnished under separate specifications, and dimensions which affect plant arrangements. IPSC's review does not indicate a thorough review of all dimensions, quantities, and details of the equipment, material, device, or item indicated or the accuracy of the information submitted; nor shall review by IPSC be construed as relieving Contractor from any responsibility for errors or deviations from the requirements of the Contract Documents.

   All engineering data submitted, after final processing by IPSC shall become a part of the Contract Documents and the Work indicated or described thereby shall be performed in conformity therewith, unless otherwise required by IPSC.

3. Performance Curves: If applicable, six (6) copies of the performance curves shall be submitted as scheduled in Division F2, General Description and Scope of Work.

4. Design Data: If applicable, six (6) copies of the design data shall be submitted as scheduled in Division F2, General Description and Scope of Work.

5. Test and Inspection Data: Certified copies of test and inspection reports shall be provided by Contractor for all tests and inspections conducted on the specified equipment. Six (6) copies of each report shall be submitted to IPSC within two (2) weeks after completion of each test or inspection.

IP7012667

6. Motor Information Sheets: Motor Information Sheets are included at the end of this Division. If applicable, a copy of the appropriate sheets shall be completed for each motor furnished under these Specifications. Copies of the completed sheets shall be submitted as specified in this Division and as scheduled in Division F2, General Description and Scope of Work. The number of copies submitted shall be the same as for other manufacturer's drawings.

7. Drawings: Drawings shall be in sufficient detail to indicate the kind, size, arrangement, weights of each component, breakdown for shipment, and operation of component materials and devices; the external connections, anchorages, and supports required; the dimensions needed for installation and correlation with other materials and equipment; and the information specifically requested in the drawing submittal schedule specified in Division F2, General Description and Scope of Work.

   Drawings shall be fully completed and certified by Contractor as to the compliance of the information contained thereon with the requirements of these Specifications. Drawings shall have title block entries clearly indicating the drawing is certified. Drawings will be reviewed by IPSC and processed as specified in this Division.

   Each drawing submitted shall be clearly marked with the name of the Project, the unit designation, the Specification title, the Specification number, the project equipment or structure nomenclature, Contractor's name, and IPSC's drawing number (after it is assigned upon initial submittal of the drawing). Catalog pages are not acceptable. If standard drawings are submitted, the applicable equipment and devices furnished shall be clearly marked. Separate drawings shall be submitted for each of the two (2) generating units.

   Drawings shall be submitted in accordance with the schedule specified in Division F2.

   a. Drawing Submittal: Six (6) prints of each drawing shall be submitted. Prints shall be black line on white background. Print size shall not exceed 34 inches by 44 inches unless due to the size of the equipment larger drawings are necessary. Drawings shall be folded to 8-1/2 inches by 11 inches. One (1) copy of each drawing shall be submitted in AutoCAD drawing file format.

      Drawing and lettering practices shall be in general accordance with the requirements of US Department of Defense, Military Standards - Engineering Drawing Practices, DOD-STD-100C.

   b. Drawing Processing: A copy of each drawing reviewed will be returned to Contractor as stipulated herein. Copies of drawings returned to Contractor will be in the form of a print with IPSC's marking.

IP7012668

When drawings and data are returned marked '*exceptions noted*', the changes shall be made as noted thereon, and six (6) corrected copies shall be submitted to IPSC.
When the drawings and data are returned marked '*returned for correction*', the corrections shall be made as noted thereon and as instructed by IPSC and six (6) corrected copies shall be submitted.

When a drawing is revised and resubmitted, Contractor shall include an issue number and revision description in the drawing revision block. All revisions pertaining to that particular drawing issue shall be clouded or otherwise clearly noted on the drawing.

When the drawings are returned marked '*no exceptions noted*' or '*received for distribution*', Contractor shall submit drawings for final distribution as specified hereinafter under Final Drawings. Drawings marked '*received for distribution*' have been filed; however, have not been reviewed.

No Work shall be performed in connection with the fabrication or manufacture of equipment and materials until the drawings and data therefor have been reviewed by IPSC except at Contractor's own risk and responsibility. Work may proceed on equipment and materials when the drawings and data therefor have been returned marked '*no exceptions noted*' or '*received for distribution*', and when drawings have been returned marked '*exceptions noted*', provided the Work is performed in accordance with IPSC's notations.

If changes are made to the equipment at the IPP Job Site, revised drawings indicating the changes made shall be prepared by Contractor and submitted to IPSC.

c. Final Drawings: Upon receipt, from IPSC, of drawings marked '*no exceptions noted*' or '*received for distribution*', Contractor shall transmit seven (7) additional prints of each drawing to IPSC for final distribution. However, if during the submittal process, Contractor makes further changes to drawings that have been reviewed by IPSC, the changes shall be clearly marked on the drawings and the submittal process shall be repeated.

d. Electronic File Copies: One (1) electronic copy, in AutoCAD drawing file format, of each final electrical wiring and elementary diagram for equipment shall be furnished. Electronic copies shall be submitted to IPSC on archival quality compact disks.

8. Wiring Diagrams: Connection and interconnection wiring diagrams furnished by Contractor shall be as indicated in ANSI Y14.15a-1971, Section 15-11, Article 15-11.3.2.1 and Figure 11-4 except that function information and wire run code are not

required. Each device connection shall have near each termination, indicated in breaks, conductor identification consisting of the opposite end destination. The wiring diagrams shall be drawn with all devices indicted in their relative physical locations and shall represent the equipment and terminals arranged as they would appear to a person wiring the equipment.

Wiring diagrams shall be prepared on sheets approximately 30 inches by 42 inches. Where interconnecting wiring from different items of equipment or sectional wiring diagrams of the same item of equipment appear on different wiring diagram sheets, all interconnections shall be clearly identified. Where sectional wiring diagrams are required for a single item of equipment, such as a relay panel or control panel, that section of the panel which is represented by each individual wiring diagram sheet shall be keyed on that sheet in a manner acceptable to IPSC.

Information indicated on Contractor's drawings shall include wiring of the individual panel items as they actually will appear in the panel, contact arrangements of switches, and internal wiring of relays and instruments.

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

Sufficient space shall be left on IPSC's side of outgoing terminal blocks for adding cable color codes and circuit numbers. Color codes and circuit numbers will be added by IPSC. Contractor shall be responsible for adding the color codes and circuit numbers to its drawings after they are assigned by IPSC.

9. Instruction Manuals: Instruction manuals for the unloading, storage, installation, operation, and maintenance of the equipment shall be furnished. The number of manuals and the required time of delivery are specified in Division F2, Article 15, Schedule of Activities.

   a. Content: Manuals shall include the following information specific to the furnished equipment:

Contents of Manual(s)
Table of Contents and Index Tabs
Specifications, Test Data, and Curves
Description of the Equipment
Instructions in the Methods of Receiving, Inspection, Storage, and Handling Prior to Installation

Contents of Manual(s)
Installation Instructions, Including Instructions for Any Modifications That Are Required for Existing Equipment
Operating Instructions
Maintenance Instructions
Assembly Drawings
Parts Lists
List of Acceptable Lubricants
Nameplate Information and Shop Order Numbers for Each Item of Equipment and Component Part Thereof
List of Recommended Spare Parts
List of Maintenance Tools Furnished with Equipment

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

b. Binding: Each copy of the manuals shall be assembled and bound in a special binder in accordance with the following:

Manufacturer:	Viatech Publishing Solutions 424 North Cedarbrook Avenue Springfield, Missouri 65802 Telephone: (800) 888-0823
Direct Contact:	Karen Bailey 10621 West 98th Street Overland Park, Kansas 66214 email: kbailey@viatechpub.com Telephone: (913) 894-9699 Fax: (913) 894-2505
Binder-Type:	Swing Hinge C78 Split Prong
Construction:	Stiff Binder Board
Covering:	Supported Vinyl, Skytogen Liner
Color:	Black

IP7012671

Imprinting:	Foil Stamp in Accordance with Drawing Bound at End of this Division. Imprinting Color: Gold
Capacities Available:	Split Prong, Swing Hinge 2 Inches or 3 Inches as Required

Binder capacities shall not exceed 3 inches, nor shall material included exceed the designed binder capacity. If material to be bound exceeds capacity rating, multiple volumes shall be furnished. Binder capacity should not be more than approximately 1/2 inch greater than the thickness of the material within the binder.

c. Submittal: One (1) complete "proof copy" of the proposed manual(s) shall be submitted to IPSC for review. IPSC's review will be for general conformity to specified requirements and is not intended to constitute detailed review of content.

The copy submitted for review shall be complete with binder; however, to expedite the manufacture and shipment of the binders, the binder supplier may contact IPSC directly to secure acceptance of the binder and its imprinting on the basis of the supplier's layout drawing. This will enable manufacturer to proceed without requiring the submittal of a binder proof copy.

Upon acceptance of the manual by IPSC, Contractor shall distribute the remaining copies to the addresses designated by IPSC. Separate manuals shall be provided for each of the two (2) units.

IP7012672

TYPICAL INSTRUCTION BOOK COVER

(Backbone)	(Cover)	
VARIABLE FREQUENCY ID FAN DRIVES	INTERMOUNTAIN POWER PROJECT	36
	INTERMOUNTAIN GENERATING STATION	24
		24
INTERMOUNTAIN POWER PROJECT	INSTRUCTION BOOK FOR VARIABLE FREQUENCY	36
	ID FAN DRIVES	36
	VOLUME 1	36
		36
INTERMOUNTAIN GENERATING STATION	SUPPLIER/MANUFACTURER ADDRESS	24
	ADDRESS	24
FILE NUMBER**		14
		14
VOLUME 1*		

Notes:

1. All imprinting shall be "News Gothic" style font.
2. All backbone imprinting shall be 14-point.
3. Cover imprinting shall be point sizes indicated in column to right of cover illustration.
4. *Volume number required only if instructions are contained in more than one (1) volume.
5. **IPSC assigned file number.

MOTOR INFORMATION SHEET (TO BE SUBMITTED WITH BID)

SHEET 1

Manufacturer				Model			
HP		Volts		Phase		Hertz	
Service Factor		NEMA Design Letter		Full-Load Speed	____ RPM		
ENCLOSURE:							
Type				Frame Size			
INSULATION SYSTEM:							
Class		Standard		Sealed		Ambient Temperature	____ °C
Temperature Rise	____ °C	By Resistance at Service Factor of 1.0: By Resistance at Service Factor of 1.15:				____ ____	
Full-Load Current	____ Amps			Locked-Rotor Current	____ Amps		
SPACE HEATER (IF FURNISHED):							
Number of Units				Unit Rating	____ Watts		
Volts				Phase			
BEARINGS:							
Type		ABMA L-10 Rating Life		Not Less Than ____ Hours			
LUBRICATION:							
Type				System			
SOUND LEVELS:							

SOUND POWER LEVEL	OVERALL MEAN NO-LOAD SOUND PRESSURE LEVEL
Re 10^{-12} Watts ___ dBA Free Field Total Motor Weight ___ Pounds	Re 20 Micropascals (0.0002 Microbar) Reference Distance of 1 Meter _____ Reference Distance of 2 Meters _____ : dBA Free Field _____

IP7012674

MOTOR INFORMATION SHEET (TO BE SUBMITTED WITH BID)

SHEET 2

MULTI-SPEED MOTORS:					
Variable Torque		Constant Torque		Constant Horsepower	
Motor Terminal Connection Diagram Number (Attached Copy of Diagram)			No: _____		
WOUND ROTOR MOTORS:					
Sec Volts		Sec Amp		Sec Res, OHM M-M At 25°C	
MOTORS IN HAZARDOUS LOCATIONS:					
Motor Enclosure Surface Temperature Motor Enclosure Surface Temperature	_____°C _____°C		At Service Factor of 1.0 At Service Factor of 1.15		_____ _____
Will Motor Contain a Surface Temperature Control Thermostat Requiring Connection Into the Motor Starter Control Circuit: Yes _____ No _____					
DUST IGNITION PROOF MOTORS:					
Motor Enclosure Surface Temperature Rise Under Any Abnormal Operating Condition Including Overload, Single-Phase, etc., Assuming Enclosure Surface Temperature of 120°C When Abnormal Condition Develops:					
Minimum Time to Reach 165°C	_____ S		Maximum Rate of Rise		_____°C IN 5 S
Additional Motor Data for Motors Larger Than 200 HP and for All Motors Rated Above					

IP7012675

MOTOR INFORMATION SHEET (TO BE SUBMITTED WITH BID)

SHEET 3

Additional Motor Data to be Submitted for Motors Larger than 200 HP and for All Motors Rated Above 600 Volts			
Efficiency, Percent Guaranteed, Load:	1/2 _____	3/4 _____	4/4 _____
Power Factor, Percent Guaranteed, Load:	1/2 _____	3/4 _____	4/4 _____
Minimum Starting Voltage in Percent of Rated Voltage:		Calculated: ____	Specified: ____
Octave Band Mean No-Load Sound Pressure Level Re 20 Micropascals (0.0002 Microbar)			
Reference Distance of 1 Meter: _____		2 Meters: _____	

Center Frequency Hz	Level dBC	Outline Drawing Number: _____	
31.5		Accelerating Time at Rated Voltage:	_____S
63		At Minimum Specified Starting Voltage:	_____S
125		Locked-Rotor PF:	_____%
250		Locked-Rotor Torque:	_____Lb/Ft
500		Pull-Up Torque:	_____Lb/Ft
1,000		Breakdown Torque:	_____Lb/Ft
2,000		Total Rotor Wt:	_____Lb
4,000		Rotor Inertia:	_____Lb/Ft^2
8,000		Open Cir Time Constant:	_____S
		For Vertical Motors Reed Frequency:	_____Hz

Thermal Limit Curve Under Locked-Rotor, Acceleration, and Running Overload Conditions; and Time-Current Curves During Acceleration at Rated Voltage and at Minimum Specified Starting Voltage Curve Number: _____ (Attach Curve)

Locked-Rotor Safe Stalled Time, S	Rated Voltage	Minimum Specified Starting Voltage
Motor Initially at Maximum Specified Ambient Temperature		
Motor Initially at Service Factor Load Operating Temperature		

IP7012676

MOTOR INFORMATION SHEET (TO BE SUBMITTED WITH BID)

SHEET 4

Additional Motor Data to be Submitted for Motors Larger than 200 HP and for All Motors Rated Above 600 Volts				
Speed-Torque-Current Curves at Rated Voltage and at Minimum Specified Starting Voltage, in Percent of Full Load or Curve Numbers _____	Rated Voltage		Minimum Specified Starting Voltage	
	Torque	Current	Torque	Current
(ATTACH CURVES)	LB-FT	AMP	LB-FT	AMP
At Speed Corresponding to Maximum Torque				
At 80% Speed				
At 60% Speed				
At Locked-Rotor				
Number of Successive Starts	AT Rated Voltage		At Minimum Specified Starting Voltage	
Motor Initially at Maximum Specified Ambient Temperature (Cold)				
Motor Initially at Service Factor Load Operating Temperature (Hot)				
Cooling Period Required After Completion of the Preceding Maximum Number of Successive Starts Before Making Additional Starts Based on the Following Cooling Conditions, Minutes				
Motor Running at Service Factor Load				
Motor Running with Driven Equipment Unloaded				
Motor De-Energized, Coasted to Stop, and Left Idle				

IP7012677

MOTOR INFORMATION SHEET (TO BE SUBMITTED WITH BID)

SHEET 5

Additional Motor Data to be Submitted for Motors Larger than 200 HP and for All Motors Rated Above 600 Volts						
For Motors Which Differential Protection is Specified, Stator Conn	Wye			Delta		
For Motors Requiring Integral Water Cooling of Bearing Oil						
Flow of Cooling Water Required				GPM		
Maximum Cooling Water Inlet Temperature				°C		
For Motors Connected to External Lubricant Recirculating System						
Flow of Oil Required to Motor Bearings		GPM at		°C Max at		PSI
Bearing Heat Rejection to Oil				BTU/H		
Outlet Temperature of Oil from Motor Bearings				°C Maximum		
For Horizontal Motors Rated 1,000 HP and Larger at 3,600 RPM and for all Motors Rated 3,500 HP and Larger at all Speeds						
Critical Speeds	First Critical			RPM		
	Second Critical			RPM		

IP7012678

PART F - DIVISION F5

GENERAL QUALITY SYSTEM REQUIREMENTS

1. Purpose/Scope: The purpose of this supplemental document to the Technical Requirements is to establish a set of requirements pertaining to the quality of supplied equipment and commodities.

2. Quality System: It is the responsibility of Contractor to define and implement a detailed and documented quality management system which ensures that all equipment and commodities supplied are in conformance with required drawing and/or specifications and which meets all the guidelines (requirements) set forth in this document. The system shall be capable of providing assurance that design, purchasing, materials, manufacturing, examination, and testing of equipment, shipping, storage, and related services comply with the requirements of the Contract.

   Contractor quality system shall include, at a minimum, procedures or methods to ensure that the following are controlled:

Design documents , drawings, specifications, quality assurance procedures, quality records, inspection procedures, inspection and test status, and Contract Documents maintained current, accurate, and under control.
Purchased materials, equipment, and services conform to the requirements of the Contract.
Receipt inspection, in-process inspection, examination, testing, and checkouts conducted.
Shipping, storage, and preservation of equipment and commodities supplied meet Contract requirements.
Adequate inspection of subcontracted work.
Control of special processes such as welding, heat treating, hot forming, and nondestructive testing.
Proper methods employed for the qualification of personnel who are performing special processes: Welding, nondestructive examinations, coatings, etc.
Inspection, measuring, and test equipment.
Procedures that document and control the verification, storage, use, and maintenance of customer supplied product provided for incorporation into manufactured equipment or commodities.

IP7012679

Any applicable commercial standards (such as ANSI, AGMA, API, ASME, etc.) should also be incorporated into this system. This system shall be made available to IPSC's Technical Services Department for review upon request.

3. Quality System Manual: The quality system shall be documented in a quality system manual. One (1) controlled copy of the quality system manual shall be submitted to the IPSC's Contract Administrator's. The quality system manual shall be kept current by submittal of revisions as applicable throughout the life of the Contract.

4. Subcontractor(s): Contractor shall notify IPSC in writing prior to the award of Contract of the intention to use subcontractors. If, at the time of award of Contract, the prime Contractor does not know the name of the subcontractor(s), the prime Contractor's shall provide the name, type, and location of the subcontractor(s) and the Contractor's subcontractor(s) qualification documentation prior to award of subcontractor's work.

   Contractor shall ensure that subcontractor(s) have the capabilities to fulfill the Contract requirements. Contractor shall submit objective evidence of subcontractor(s) capabilities, processes, or in-process work involving the fabricating and manufacturing of equipment and commodities for IPSC.

   Subcontractor(s) qualification and monitoring are the responsibility of Contractor, in accordance with this supplemental specification, to ensure the same high-quality standards. When deemed necessary, IPSC has the authority to perform quality audits and inspections, and monitor and/or review subcontractor(s) processes and facilities.

5. Inspections by IPSC: IPSC may elect to perform inspections, quality audits, or witness testing at any time during the manufacturing process. IPSC may designate an authorized agent for inspections, witness testing, or quality audits. Authorized agent can be an employee of IPSC or an outside agency. When an outside agency is designated as an authorized agent for IPSC, such designation will be in writing with a copy provided to Contractor. Hereinafter, when an IPSC representative is used, it may also mean IPSC or the authorized agent.

   The following requirements shall apply for IPSC's inspection of Contractor's mill, factory, yard, or warehouse.

   a. Inspection and Test Plan: In accordance with the Division F2, Schedule of Submittals, a detailed inspection and test plan (i.e., a Quality Assurance/Quality Control Plan) for the Work shall be submitted to IPSC as specified in the Contract. The inspection and test plan is a detailed step-by-step list of operation and requirements which shall identify the inspection and testing points for major components of the Work and shall be maintained current throughout the Contract. The plan shall include Contractor's strategy for inspecting subcontractor's work, including inspection by Contractor at subcontractor's

facilities. IPSC will designate any test witness points or other inspection points required.

b. Access: IPSC will have the right to inspect Contractor's and subcontractor's Work and related documents in the course of manufacture providing no delays in manufacture are caused thereby. Contractor is required to provide, at its own expense, reasonable facilities including tools and instruments for demonstrating acceptability of the Work.

c. Test Witnessing: If called for in the Contract and when designated as a hold point, witnessing of mill or factory tests must be performed in the presence of IPSC's Contract Administrator unless waived in writing by IPSC's Contract Administrator. Contractor shall bear all expense of such tests except the compensation and expense of IPSC's representative.

Contractor shall inform and notify IPSC at least ten (10) working days in advance of the appropriate times of inspections and tests, when such inspection and test points have been designated as required hold points for witnessing. The Work shall not progress past a required inspection and test point until IPSC has inspected the Work or witnessed the designated test, or waived in writing the right to perform an inspection or to witness a test.

d. Corrective Action: Upon detention of a noncompliance with the requirements of the Contract or Contractor's quality system, Contractor shall document the noncompliance issue and provide IPSC's representative a copy of the report. If Contractor does not document the noncompliance, then IPSC's representative shall issue a corrective action report to Contractor. Contractor will be required to correct, in a timely manner, all deficiencies identified.

e. Rejection: If any items or articles are found not to meet the requirements of these Specifications, the lot, or any faulty portion thereof, may be rejected. Before offering specified material or equipment for shipment, Contractor is required to inspect the material and equipment and eliminate any items that are defective or do not meet the requirements of the Contract. The fact that materials or equipment have been previously inspected, tested, and accepted does not relieve Contractor of responsibility in the case of later discovery of flaws or defects.

6. Receipt Inspection: Materials or equipment purchased under the Contract may be inspected at the specified receiving points and will either be accepted or rejected. Inspection will include the necessary testing for determining compliance with these Specifications. All expense of initial acceptance tests will be borne by IPSC. The expense of subsequent tests, due to initial test failures, will be charged against Contractor.

PART 6 - DIVISION F6

SEISMIC DESIGN REQUIREMENTS

1. General: This Division specifies the general criteria and procedures that shall be used to ensure that structures, systems, and components will meet their performance objectives during and following a seismic event.

2. Seismic Loads: Seismic loads shall be determined in accordance with applicable portions of Chapter 16, Sections 1613 to 1622 of the 2000 IBC Code. The VFD equipment is being erected in a seismically active area. The importance factor (I_E) shall be 1.5. The site class shall be "D". The spectral response acceleration at short period "S_S" shall be equal to 0.50g and the spectral response acceleration at one (1) second period "S_1" shall be 0.15g. The seismic use group shall be III.

   Contractor shall submit the seismic design calculations for review. These calculations shall indicate all assumptions and references used, and shall be subject to audit to verify that the design is in compliance with these Specifications.

IP7012682

PART F - DIVISION F7

MEDIUM VOLTAGE VARIABLE FREQUENCY DRIVES

1. General: This Division specifies requirements for VFDs for large 3-phase synchronous or squirrel-cage induction motors. Both current source LCIs and PWM drives are being considered.

To the extent possible, considering the application is a retrofit application, the intent is to purchase the suppliers standard equipment with needed available options. Alternate configurations will be considered. If existing synchronous motors are used, two (2) VFDs, complete with all required control components, shall be furnished for each motor. If new motors are provided, one (1) drive per motor is needed. The Project requires VFDs for eight (8) ID fan motors.

VFDs shall be manufactured and completely assembled, including the input transformer at Contractor's factory.

The VFDs shall be housed in the existing control building along with any associated cooling equipment. Contractor shall include in the Proposal the expected and maximum heat loss on a per drive basis for the VFD proposed.

Rated Capacity	10,000 HP per Fan at 1,050 RPM and 8,200 HP per Fan at 954 RPM
Quantity	VFD Systems for Eight (8) Fans Total Over the Next Four (4) Years
Application	ID Fan Service
Input Voltage	Existing Transformers - 6,900 to 3,876 Volts (See Nameplate)
Nominal Frequency	60 Hz
Short-Circuit Current at Point of Common Coupling	32 kA at 6,900 Volts Symmetrical (Maximum)
VFD Equipment Enclosure	NEMA 1
Ambient Temperature	-35°C to 50°C
Speed Range	Existing 0 to 954 RPM, 0 to 1,050 RPM

a. Coordination: The design of each VFD shall be coordinated with the design of the electric supply and driven equipment. Contractor shall be responsible for

IP7012683

furnishing each VFD, for matching the motor and the drive, and for coordinating the collection of data and the design effort to limit harmonics to the specified levels. Contractor shall be knowledgeable of the requirements specific to the loads that are powered by each VFD. Applicable VFD system options, unique to the load-type, shall be provided.

b. Nameplates: All devices mounted on the face of each drive shall be provided with suitable nameplates. Push buttons, selector switches, and pilot lights shall have the device manufacturer's standard legend plate. All other devices shall have an engraved, phenolic laminated plate, with black lettering on a white background.

c. Instruction Manuals: In addition to requirements indicated in Division F4, Engineering Data, Article 9, Instruction Manuals, for each size of VFD shall be furnished and shall include the following:

(1)Contractor's standard manuals for each size and type of bypass switch, output contactor, transformer, line reactor, and filter.

(2)Schematics, wiring diagrams, and panel drawings in conformance with construction records.

(3)Troubleshooting procedures, with a cross-reference between symptoms and corrective recommendations.

(4)Connection data to permit removal and installation of recommended smallest field-replaceable parts.

(5)Information on testing of power supplies and printed circuit boards and an explanation of the drive diagnostics.

d. Codes and Standards: It is desirable that the proposed layout of the equipment be in accordance with standards listed below; however, if due to the equipment sizing, the proposed arrangement cannot comply with any of the standards, Contractor shall list in the Proposal the variation and reason. The equipment shall be provided in full accordance with the latest applicable rules, regulations, and standards of the following:

IP7012684

Codes and Standards
National Electrical Code (NEC)
Underwriters' Laboratories (UL)
American National Standards Institute (ANSI)
National Electrical Manufacturers Association (NEMA)
Institute of Electrical and Electronics Engineers (IEEE)
Federal Communications Commission (FCC)

e. Acceptable VFD Systems: Contractor shall be able to demonstrate at least ten (10) years experience in manufacturing VFDs at medium voltage, to demonstrate capability to provide parts and service support. The proposed VFD system shall have been commercially available for a period of not less than two (2) years prior to the date of Contract award. Contractor shall provide at least three (3) sites and names of individuals that may be contacted in the Proposal where similar equipment has been retrofitted.

f. Experience: It is the intent of these Specifications to purchase dependable and reliable equipment offering the best performance available from current proven technology. All equipment furnished under the Contract shall, therefore, have documentation showing proof of actual operation for a minimum of two (2) years in similar service. It is also the intent of these Specifications to procure Contractor's standard system with any options required to meet these Specifications. However, any deviations from these Specifications shall be clearly identified in the Proposal Section as exceptions.

2. Performance: Each VFD system for a fan motor shall be capable of 10,000 HP output at 0.9 per unit input voltage to the VFD. Each VFD shall also be designed and constructed to meet the required performance as specified in the following:

a. Operating Envelope: Each VFD shall meet the following speed and torque requirements.

Each drive shall provide a turning gear speed of 10 percent speed. Contractor shall verify the minimum speed of 10 percent is acceptable to the motor vendor.

Each VFD shall be capable of producing a variable AC voltage/frequency output to provide continuous operation over the speed range of 10 percent to 1,050

IP7012685

RPM. Drives shall include a software setable maximum speed limit. Each VFD shall be capable of sustained operation at 1/10 speed to facilitate checkout and maintenance of the driven equipment. As a commissioning and troubleshooting feature, each VFD power circuit shall be capable of operating without a motor connected to a VFD output.

Each VFD shall be capable of operating any new standard AC motor of equivalent rating (horsepower and speed) over the specified speed range. Each VFD shall be rated to power the motor continuously at the motor's rated nameplate horsepower multiplied by the service factor.

The controls in each VFD shall provide an adjustable maximum horsepower limit so the drive output can be matched to the existing motor (if being reused) or to a larger motor (up to 10,000 HP).

Overload torque shall be at 105 percent of full load torque.

b. Operating Range: Each VFD system shall be designed to enable fan operation over the entire operating range defined on the speed-torque curve shown in Figure 3.3, page F7-25, located at the end of this Division.

c. Input Harmonics: VFDs input harmonics shall comply with the latest edition of IEEE 519 for total harmonic voltage and current distortion limits:

(1) Voltage Harmonics: Individual or simultaneous operation of the VFDs shall not add more than 2.5 percent total harmonic voltage distortion while operating from the utility source.

(2) Current Harmonics: Maximum allowable total harmonic current distortion limits for each VFD shall not exceed 5 percent as calculated and measured at the point of common coupling.

(3) Each motor converter shall be 24 pulse or provide harmonic filters to provide equivalent harmonic performance.

(4) Compliance shall be verified by Contractor with field measurements of harmonic distortion differences at the point of common coupling with and without VFDs operating. The Point of Common Coupling (PCC) for all harmonic calculations and field measurements for both voltage and current distortion shall be defined as the main breaker feeding the 6,900 volt bus feeding the drive, based on individual motors.

IP7012686

(5) Power quality metering shall be installed in each VFD system to continuously monitor and display input and output power quality. The power quality data shall include the following:

(a) Input voltage (average RMS value).

(b) Input current (individual phase RMS values and average RMS value).

(c) Input frequency.

(d) Power factor.

(e) Input (kW, kvar).

(f) Input (kWh).

(g) Input current THD (average of three (3) phases).

(h) Single harmonic calculation in input voltage or current (phase A, B, or C).

(i) Drive efficiency.

(j) Motor voltage (RMS).

(k) Motor current (RMS).

(l) Motor speed (in RPM or percent).

(m) Motor flux (percent).

(n) Motor torque (percent).

(o) Drive output power (kW).

(p) Output (kWh).

IP7012687

d. Motor Compatibility: Characteristics of the existing ID fan motors are as follows:

Service	ID Fan
Machine-Type	Synchronous
Mounting	Horizontal
Enclosure	NEMA WPII with Filters
Insulation	Class F, Thermalastic
Temperature Rise	75°C
Standards	NEMA and IEEE
Ambient Temperature Maximum	50°C
Altitude Maximum	4,700 Ft Above Mean Sea Level
Duty	Continuous
Rated Output, HP	7,415 HP
Service Factor	1.0
Voltage, Volts/Frequency/Phase	3876 V, 63.6 Hz, 3-Phase
Speed, RPM	954
Current, amps	Two (2) Windings, Shifted 30°, 472 Full Load Amps Each When Two (2) Windings in Service; With One (1) Winding in Service, 506 Amps
Locked Rotor amps, maximum	N/A
Efficiency, Minimum (Full Load)	97 Percent
Power Factor, Minimum (Full Load)	0.9 Percent
Starting Voltage Range	VFD
Starting Capability	VFD
Running Capability	VFD

Bearings	Sleeve
Service	**ID Fan**
Bearing Lubrication	Forced Oil, Recirculation-Type; Each Bearing Requires 2.5 GPM at 20 Psig
Temperature Detectors	One (1) Type E Thermocouple per Bearing; Two (2) 10 OHM Copper RTDs per Winding
Windings	Copper
Vibration Detectors	Mounting Only
Terminal Box	Two (2) per Motor, Includes Three (3) Neutral Current Transformers
Space Heater	Yes
Sound Level	85 dB at 3 Ft in Accordance with IEEE 85
Tests	Copies Will be Made Available for Review
Incoming Cable	Shielded Cable in Conduit
Current Transformers	If Required
Surge Capacitors	No
Lightning Arresters	No

If the existing motors are used, each VFD system shall provide an output waveform suitable for the existing motors. Contractor shall verify equipment will not be detrimental to the motor life expectancy, which shall not be compromised in any way by operation with a VFD system. Each VFD shall provide motor overload protection in any operating condition.

The system design shall not have any inherent output harmonic resonance in the operating speed range.

Each VFD output shall be tuned to minimize electrically induced pulsating torque to the output shaft and the mechanical system. Contractor shall be responsible

for damage to the existing motor, coupling, and fan due to torque pulsations. Contractor shall repair and/or replace items damaged at no cost to IPSC. Existing input transformers and reactors may be used if adequate for the service. New transformers and reactors shall be provided if existing transformers and reactors are not adequate.

e. VFD System Efficiency: Guaranteed minimum total VFD system efficiency (ηsys) shall be a minimum of 96 percent at 100 percent speed and 100 percent load, and a minimum of 95 percent at 80 percent speed and 50 percent load. Efficiency evaluation shall include input transformer, harmonic filter, power factor correction (if applicable), VFD converter, and output filter, as indicated below. Auxiliary controls, such as internal VFD control boards, cooling fans, or pumps shall be included in all loss calculations.

The efficiency of a VFD system shall be calculated as follows:

$\eta sys = \eta VFD \times \eta xfmr \times \eta pfc \times \eta harm \times \eta filt$	
Converter/Inverter (VFD)	ηVFD
Input Transformer	$\eta xfmr$
Power Factor Correction	ηpfc
Input Harmonic Filter	$\eta harm$
Output Filter	$\eta filt$

Total VFD system efficiency (ηsys) shall be 96 percent at full load and 95 percent at 50 percent load.

A penalty ($1,275 per kW) shall be assessed if efficiency is not achieved and shall be deducted from the Contract price.

f. System Input Power Factor: Each BFD system shall maintain a 95 percent minimum true power factor from 30 percent to 100 percent of rated speed. Contractor shall supply a power factor correction system, if required, to meet this requirement. The power factor correction unit shall include a separate input isolating contractor with fuses, power factor correction grade capacitors (voltage class shall be consistent with each VFD system input voltage), and series harmonic decoupling reactors, all integrated into the VFD system and mounted within each VFD enclosure. A penalty ($50 per kVAR) shall be assessed if power factor is not achieved and shall be deducted from the Contract price.

g. Speed Control System: The speed control system shall be designed to be compatible with the IPSC-furnished plant control system. The speed control system, shall also be in accordance with the paragraphs which follow.

The speed control system shall provide linear speed control corresponding to IPSC-furnished 4-20 mA (linear from 0 to100 percent) speed control signal. Dynamic speed control range shall be 0 to 100 percent. Steady-state speed control range shall be 10 to 100 percent. The speed control shall be capable of setting the motor speed to an accuracy of plus or minus 1 percent of the test block speed of the fan.

A change in IPSC-furnished speed control signal shall not initiate a drive system acceleration or deceleration torque command unless the IPSC-furnished speed control signal changes by a field adjustable amount.

The range of this field adjustable amount shall be from plus or minus 0.5 percent to plus or minus 5 percent of full speed.

The speed control system shall be inherently stable when the IPSC-furnished speed control signal is in a steady-state condition. The speed control system shall automatically adjust rectifier SCR firing to maintain motor speed to compensate for motor load changes and 6,900 volt bus voltage changes. Changes in motor load and 6,900 volt bus voltage shall not initiate acceleration or deceleration torques. Steady-state speed control shall be within plus or minus 1 rpm without encoder or tachometer feedback.

It is expected that during starting of other large motors, the 6,900 volt bus voltage will drop momentarily to as low as 5,400 volts. This condition shall not affect motor speed as long as sufficient current, up to current limit, is available in relation to supply voltage to maintain motor speed. If insufficient current is available to maintain drive speed, the current applied shall be the current limit. The speed control system and all components of the ID Fan Variable Frequency Drive shall be capable of sustaining this condition for a minimum of 30 seconds after which coasting of the motor will be permitted. Normal control shall be initiated as soon as the 6,900 volt bus voltage reaches 6,600 volts. Speed control should resume once motor is out of current limit.

During certain times the input voltage will drop to 70 percent of its rating, motor coasting shall be initiated. Normal control shall be initiated as soon as the 6,900 volt bus voltage reaches 6,600 volts.

The electric adjustable speed drive systems shall be suitable for continuous operation at turning gear speed for equipment cool-down. Proposed information shall describe operation at turning gear speed.

h. Sound Level: Maximum allowable audible noise from a VFD system shall be 75 dB(A) at a distance of 1 meter (3.3 feet) at any speed or load condition. VFD systems with audible noise in excess of the limit shall be provided with sufficient noise abatement treatment to reduce the sound pressure level below 75 dB(A).

3. Design Calculations:

a. Torsional Analysis: The price of a torsional analysis shall be included in the base price. A deduction shall be included in case IPSC chooses not to have a torsional analysis. The total rotating system shall be analyzed to determine its natural resonant frequencies. Stresses shall be calculated for elements of the rotating system, utilizing torsional excitation data from the drive and driven system, taking into account potential fault conditions and appropriate amplification and damping factors of the rotating system. A written report on the analysis, which details the procedures used and the assumptions that were considered, shall be provided. The results of the analysis shall be presented in both detailed and summary form. Specific data presented shall include the following:

(1) A diagram of the frequencies of the torque pulsations and the mechanical resonant frequencies showing the coincident points.

(2) A plot of total shaft stress versus operating speed for the most highly stressed areas of the rotating system.

(3) A diagram of the rotating system model and mode shapes for resonance(s) of interest.

(4) Tables summarizing total calculated stresses for each element of the rotating system at operating speeds where interference(s) exist between torsional excitations and torsional resonance.

(5) Details of the rotating system used in the analysis, including the specified or a recommended alternate coupling. If a new coupling is required, Contractor shall furnish it.

IP7012692

(6) Recommendations for any modifications to the proposed system, if indicated by the analysis to be advisable, the cost of which shall be borne by Contractor.

b. Harmonic Study: A preliminary harmonic analysis shall be performed. A power system short-circuit ratio of twenty shall be assumed, with all VFDs operating at maximum speed and maximum load. Short-circuit current (ISC) utilized for harmonic analysis calculations is defined as:

I_{SC} = 10 * (Sum of total full load amps of all VFD systems)

Contractor shall submit the harmonic analysis at the time of bid, which includes all voltage and current harmonics up to the forty-ninth.

4. Availability:

a. Firing Signals: All internal firing signals, and other communications (which link operational controls with power components such as status and diagnostic signals) shall meet noise immunity and safety requirements as defined by applicable IEEE Standards.

b. Failed Switch Bypass/Ride-Through Capability: The failure of any power switching device (SCR, GTO, diode, IGBT, IGCT, etc.) or switching device control shall not result in a process trip and shall allow for continued operation of each VFD system. Either N-1 or cell bypass is acceptable. In the event of a device or device control failure, a VFD shall annunciate and identify the specific location of the failed device and allow for continued operation until such time as repairs can be scheduled. The failure of any power switching device (SCR, GTO, diode, IGBT, IGCT, etc.) or switching device control shall not result in a channel trip and shall allow for continued operation of each VFD system with both channels in service. If one (1) channel does trip, Contractor shall state this in the Proposal.

c. Power Interrupt Ride-Through: Each VFD system shall be capable of continuous operation in the event of a power loss of 5 cycles or less.

Each VFD system shall be capable of automatically restarting in event of a loss of power. Each VFD system shall provide IPSC with the choice of automatically restarting or not. The choice will be selected by the operator and retained by the control system until changed by the operator. IPSC will be able to selectively apply this feature and have the ability to set the allowable restart time applicable

IP7012693

to some (but not necessarily all) conditions as determined by IPSC to be appropriate for the specific application.

d. Power Sag Ride-Through: Each VFD system shall be capable of continuous operation with a 30 percent voltage sag on the input power line.

e. "Catch-A-Spinning-Load" Capability: Each VFD system shall be able to catch and take control of a spinning load if started while rotating equipment is already spinning. Appropriate safeguards shall be included in this operation to prevent damaging torque(s), voltages, or currents from impacting any of the equipment. IPSC shall have the option of employing this feature or disabling it.

f. Auto Restart Capability: Each VFD system shall be capable of automatically restarting in the event of an undervoltage trip. Each VFD system shall provide IPSC with the choice of automatically restarting or not. IPSC shall be able to selectively apply this feature to some (but not necessarily all) conditions as determined by IPSC to be appropriate for the specific application.

g. Ground Fault Withstand: In the event of a ground fault, a VFD shall be capable of annunciating the ground fault condition, safely operating and, by IPSC selection, either trip or continue operation. As a result of a ground fault trip, a VFD shall be capable of being reset and begin operating normally again after the ground fault condition has been corrected. There shall be no risk of fire or electric shock as a result of the ground fault.

5. Serviceability/Maintainability:

a. Front Access: It is preferred that each system of channel be designed for front access only. Contractor shall state in the Proposal if rear or side access is required. An explanation of reason for any required rear or side access shall be given.

b. Power Component Accessibility: All power components in the converter sections shall be mounted on a wing frame or rack-out for ease of maintenance and to minimize repair downtime. Alternate access options shall be described in the Proposal for the IPSC Contract Administrator's review and evaluation.

c. Voltage Isolation: All low voltage components, circuits, and wiring shall be separated with physical barriers from any sources of medium voltage.

d. Remote Diagnostics: Each VFD system shall be provided with the capability for remote diagnostics via modem communication or Ethernet link.

e. Marking/Labeling: Sleeve-type wire marker tags or other acceptable means of permanent identification shall be applied to power and control wiring. Individual nameplates shall be provided for all major components of a VFD system.

f. Mean Time to Repair (MTTR): The VFD design shall demonstrate an actual mean time to repair of less than 15 minutes in the event of any power switching component failure.

6. Physical Requirements:

a. Environmental Requirements: Each VFD system shall be capable of continuous operation in an average ambient temperature between -10°C and 50°C at an elevation up to 4,700 feet above mean seal level without derating. Each VFD system shall also be simultaneously suitable for continuous operation in a maximum humidity between 0 and 95 percent non-condensing.

b. Heat Dissipation/Cooling System: Each VFD system shall be air cooled unless air cooling is unavailable or impractical, in which case, liquid cooling shall be provided. The existing system is air cooled and it is desirable to reuse the existing system. If liquid cooling is required, Contractor shall furnish the heat exchangers and any or all modifications to the building wall to accommodate the exchangers.

c. Air Cooling Requirements: Air cooled VFDs shall be provided with 100 percent fan redundancy and automatic switch over in the event of a fan failure for enhanced reliability. If a fan fails, the system shall automatically switch to the alternate fan and generate an alarm to notify operator of initial fan system failure. The drive shall have ability to detect failed operation of initial fan system. (Using temperature detectors as the only protection against loss of fan system is not acceptable.) During normal operation, the system shall periodically cycle between the two (2) fan systems to "exercise" the systems and prevent drying out of bearings, seals, etc., and to ensure availability of all systems. Contractor shall provide, with the Proposal, heat dissipation data necessary to verify existing HVAC systems or design new HVAC systems.

d. Liquid-Cooling Requirements: Liquid cooled VFDs shall be provided with 100 percent redundant pumps and heat exchangers with automatic switch over in the event of a pump or heat exchanger failure. Redundant systems shall be provided so a cooling system can be taken out of service for maintenance or repair without taking a drive out of service.

IP7012695

The system shall be arranged for an external liquid-to-air heat exchanger for mounting on a deck engineered, designed, and furnished as a complete system by Contractor.

A minimum of 90 percent of the heat generated (losses) by the drive system shall be removed through the liquid cooling system. Contractor shall provide heat dissipation data necessary to design all auxiliary cooling systems and utilities. The system shall be designed so a failed pump can be safely isolated and repaired while a VFD system remains in service. Cooling pump motors shall have sealed bearings for a long, maintenance-free life.

Liquid-to-air heat exchangers shall be furnished and installed outdoors on a deck attached to the control building by Contractor. Contractor shall furnish piping, power, and control wiring between each VFD and the heat exchanger. The cooling system shall be filled following installation of the drive. Coolant liquid shall be furnished by Contractor.

The cooling system shall consist of two (2) circuits. One (1) internal circuit where deionized water is used and one (1) exterior circuit where propylene glycol is used to provide an ambient service temperature range of -35°C to 50°C. Ethylene glycol is NOT acceptable due to environmental and hazardous material concerns.

Quick disconnect fittings shall be provided at each connection between the header and the supply hose.

Dissimilar metals shall be completely avoided in cooling liquid piping. Plastic piping is not acceptable. The use of threaded connections shall be minimized. All connections and fittings shall be designed based upon the system cooling fluid and the required flow, and shall be tested at two (2) times the normal system design operating temperature and pressure.

Each VFD cooling system shall maintain system coolant temperature within a safe minimum and safe maximum temperature to avoid thermal shock and/or condensation.

e. Enclosure: All VFD system components, including transformer (for PWM drives), shall be mounted and wired by Contractor in a grounded enclosure meeting the following requirements without exception.

Input filters, transformer, power conversion, output filters and auxiliary equipment enclosure sections shall be NEMA 12 design. Air cooled units shall be NEMA 12

IP7012696

Ventilated, with gasketed doors. Liquid cooled units shall be NEMA 12 Non-ventilated. Air cooled units shall have changeable filters covering all air inlets. Filters shall be front replaceable (for replacement) while each VFD is in operation without exposing maintenance personnel to any of the power components. Microprocessor and control logic boards and power supplies shall be housed in a sealed, non-ventilated NEMA 12 section, safely accessible without exposure to high voltages and without drive shutdown. All low voltage wiring shall be fully isolated from medium voltage compartments by metal barriers.

Cabinets and doors shall be fabricated using heavy gauge steel (12 gauge minimum) for sturdy construction and dimensional integrity to ensure long-term fit and function. All doors shall be gasketed to provide environmental protection and secure fits.

Enclosures shall be designed to avoid harmonic and inductive heating effects. The enclosure shall be designed to shield any outside equipment form interference, enclosing, and shielding the complete component to eliminate any radio frequency interference in compliance with FCC Part 18 requirements.

f. Installation/Cabling: IPSC will set the VFD equipment in place and install interconnecting wiring. Contractor's Proposal shall include a detailed description of installation requirements.

g. Space Limitation - Footprint: Contractor shall provide a proposed layout of equipment with the Proposal. Floor plans of all existing control buildings are included.

h. Interlocks: Mechanical key interlocks shall be provided on all doors. Interlocking shall be fully coordinated to prevent access to all high voltage compartments, including transformer, filters, or any switchgear that is part of the supply, when line power is applied to each VFD system. Interlocks shall be mechanical to provide positive lockout prevention and safety. Electrical interlock switches alone are not acceptable due to the possibility of inadvertent shutdown and the ease with which such switches could be bypassed.

i. Control Power and UPS System: Contractor's Proposal shall include a detailed description of control and accessory power requirements for the proposed system.

j. Space Heaters: The power/control assembly including individual compartments shall be provided with space heaters to prevent condensation of moisture within

IP7012697

the enclosures. The heaters shall be spaced away and thermally insulated from any painted surfaces.

Space heater capacity shall be as required to maintain the compartment internal temperature above the dew point.

Voltage normally applied to the space heaters is 120 volts AC. Space heater voltage rating shall be 120 volts AC.

IPSC will provide a 2-wire, 120 volt, 60 hertz space heater supply feeder to each assembly. Contractor shall provide all required internal wiring and suitable branch circuit protection for each space heater circuit.

All space heaters shall be controlled by an adjustable thermostat, factory set to close at 85°F (ON) and to open at 95° F (OFF).

7. Protective Devices/Diagnostics:

a. Power Component Protection: Each VFD system shall include intermediate class surge arresters to protect the input transformer and VFD against voltage surges.

Each VFD system shall include protection to the converter rectifier devices to protect the secondary of the transformer from any potentially harmful fault currents. Arrangements that involve coordinated protection with an input circuit breaker are not as desirable and, if proposed, Contractor shall furnish all coordinating elements, including the circuit breaker and a detailed description of the protection scheme with the Proposal.

b. Protective Features and Circuits: The controller shall include the following alarms and protective features:

Alarms and Protective Features
Static Instantaneous Over-Current and Over-Voltage Trip
Under-Voltage and Power Loss Protection
Over-Temperature Protection
Electronic Motor Inverse Time Over-Load Protection
Motor Over Speed

Each VFD system shall be protected from damage due to the following, without requiring an output contactor:

1-Phase Fault or 3-Phase Short Circuit on VFD System Output Terminals
Failure to Commutate Inverter Thyristor Due to Severe Overload or Other Conditions
Loss of Input Power Due to Opening of VFD Input Disconnect Device or Utility Power Failure During VFD Operation
Loss of 1-Phase of Input Power

c. Data Displays: A door-mounted LCD display shall be furnished, capable of displaying VFD operational status and drive parameters. The digital display shall present all diagnostic message and parameter values in plain language engineering units when accessed, without the use of codes.

As a minimum, the following door-mounted digital indications shall be supplied:

Door-Mounted Digital Indications
Speed Demand in Percent
Actual Speed
Input Current in Amperes
Output Current in Amperes
Output Frequency in Hertz
Input Voltage
Output Voltage
Total 3-Phase kW Output
Kilowatt-Hour Meter
Elapsed Time Running Meter

d. Diagnostics and Fault Recording: The control logic section shall be fully digital and not require analog adjustment pots or fixed selector resistors.

IP7012699

Fault log data storage memory shall be stored in nonvolatile memory or be supported by a UPS size to provide a minimum of 48-hour data retention.

Each VFD shall include a comprehensive microprocessor based digital diagnostic system, which monitors its own control functions and displays faults and operating conditions.

A '*Fault Log*' shall record, store, display, and print, upon demand, the following for the fifty (50) most recent events:

Fault Log
VFD Mode (Auto/Manual)
Date and Time of Day
Type of Fault
Reset Mode (Auto/Manual)

A '*Historic Log*' shall record, store, display, and print, upon demand, the following control variables at an adjustable time interval for the fifty (50) intervals immediately preceding a fault trip and one-hundred (100) intervals following such trip:

Historic Log
VFD Mode (Manual/Auto/Inhibited/Tripped/Etc.)
Speed Demand
VFD Output Frequency
Demand (Output) Amps
Feedback (Motor) Amps
VFD Output Volts
Type of Fault
Drive Inhibit (On/Off)

The fault log record shall be accessible via a fiber-optic link as well as line-by-line on the keypad display.

Two (2) laptop PCs, a printer, and a "Windows 95" or newer based graphical tool suite shall be provided with the VFDs. This graphical PC tool shall be able to plot and display **up to eight (8)** different VFD parameters and have the ability to freeze plotting and print hard copy versions of the plots. Capability to display at least eight (8) different VFD system parameters is required, and all parameters displayed on the PC tool shall be synchronized with the standard keypad display.

8. Programming and Communications:

a. User Input/Keypad: The door of each unit shall include a manual speed device, a mode selector marked '*Manual/Automatic*', a '*Power On*' light, a VFD '*Fault*' light, a VFD '*Running*' light, a start push button, a stop push button, and a reset button.

A door-mounted keypad with integral digital LCD display shall be furnished, capable of controlling a VFD and setting drive parameters. The display shall present all diagnostic messages and parameter values in standard engineering units when accessed, without the use of codes. The keypad shall allow the operator to enter exact numerical settings in standard engineering units. A plain language user menu (rather than codes) shall be provided in software as a guide to parameter setting.

Drive parameters shall be factory set in non-volatile EEPROM registers and resettable in the field through the keypad. Multiple levels of password security shall be available to protect drive parameters from unauthorized personnel. The EEPROM stored drive variables shall be able to be transferred for programming of new or spare boards. System shall allow programming changes while in service.

The keypad module shall contain a "self test" software program that can be activated to verify proper keypad operations.

Each VFD system shall have the user selectable option of programming up to three (3) speed avoidance bands. This gives the user the ability to block out and prevent operation at any undesirable speed, such as one (1) that may be coincident with a mechanical resonance condition.

b. Hard-Wired Communication: Contractor shall provide five (5) additional analog, ten (10) additional digital inputs, and ten (10) additional digital outputs for connection to IPSC's plant control system for each VFD drive. All trip and start commands from IPSC's plant control system shall be hard wired. A listing of the existing hard-wired control signals is included at the end or this Division. A copy

of the existing schematics will be provided to Contractor after the Contract is awarded.

Contractor shall provide drive-to-drive communications and coordination of drives associated with each boiler. Certain parameters of this feature may be controlled by the operator.

c. Serial Communication/Protocols/Modem or Cable: VFD shall be capable of direct communication to an IBM or compatible computer via fiber-optic link for setup of parameters, fault diagnostics, trending, and diagnostic log downloading. VFD parameters, fault log, and diagnostic log shall be downloadable for hard copy printout via the fiber-optic link and the standard serial printer.

Each VFD shall be provided with single port digital communication capability to allow status communication with the IPSC plant control system. Modbus communication protocol shall be provided.

An Ethernet communications link shall be provided for future use.

9. Component Requirements:

a. Printed Circuit Boards: All printed circuit boards shall be new and coated for moisture and chemical resistance, in addition to, any dielectric coating properties. All boards shall be tested in accordance with Division F2.

b. Power Bus and Wiring: Main power bus shall be high-conductivity copper and plated for chemical and corrosion resistance and low losses. The bus shall be appropriately sized for the VFD continuous current rating and braced to withstand the mechanical forces caused by a momentary short-circuit current of 32 kA at 6900V. All connections shall be bolted or continuously welded.

c. Ground Connection: Corrosion-resistant grounding pads shall be provided in each power cubicle. A copper ground bus shall be provided for grounding of control circuits.

d. Input Isolation Transformer: Each VFD system shall use a drive isolation transformer to provide common mode voltage protection and phase shifting. The existing input transformers may be used if adequate. If new transformers are proposed, the transformers shall be as specified in Division F8.

e. DC Link Inductors: DC link inductors, if required, shall be air core to prevent saturation. Separate inductors (split dual winding-type) shall be provided in the

positive and negative legs of the DC link to minimize stray magnetic fields. Maximum temperature rise shall not exceed 115°C with a minimum 220°C insulation and over-temperature protection. To minimize cabling costs, the inductors shall be integral to each VFD system lineup. If it is not possible to integrate the inductors into each VFD system enclosure, the cabling and connecting shall be entirely furnished by Contractor, and approved by the IPSC Contract Administrator. Inductors shall meet the requirements of ANSI C57.16 and shall be designed to prevent saturation under maximum fault current conditions.

f. DC Link Capacitors: Capacitors used in the converter DC link shall be integral to each VFD system lineup to minimize cabling costs.

Capacitors used in the converter DC link shall contain discharge resistors and shall be capable of reducing the residual charge to 50 volts or less within five (5) minutes after the capacitor is disconnected from the source of supply.

g. Input Harmonic Filters: If after meeting the requirements of Division F7, Medium Voltage Variable Frequency Drives, harmonic filters are still required to meet power factor requirements, stricter local requirements, or telephone interference factor restrictions, Contractor shall provide the filter, upstream filter isolation, protection, and protection coordination. As harmonic filters are power system dependent, Contractor is responsible for maintaining and providing any required upgrades required during the warranty period at no cost to IPSC. To minimize cabling costs, the harmonic filter components shall be integral to each VFD system lineup, but isolated from other components so the components can be disconnected from the power source and accessed for maintenance/repair while each VFD is in operation. If it is not possible to integrate the filters into each VFD system enclosure, the cabling and connecting shall be entirely furnished by Contractor, and approved by the IPSC Contract Administrator. Harmonic filters shall be located on the primary side of the input isolation transformer and shall be switchable with the VFD, to prevent filters remaining on the power line in the event of a VFD trip, which could create a damaging leading power factor condition. The complete filter shall have independent protection for over-current, phase differential, and ground fault.

Any inductors used shall be iron core or air core with a maximum temperature rise of 115°C with minimum 220°C insulation and over-temperature protection. Reactors shall be designed to prevent saturation under maximum fault current conditions. Reactors shall meet the requirements of ANSI C57.16.

Capacitors used in the harmonic filter banks shall meet the requirements of

IEEE 18 and IEEE 1036 for shunt power capacitors. Capacitors used in any harmonic filter banks shall be provided with a method of shorting the phases to ground once power has been removed and the capacitors have been discharged to a safe voltage level.

h. Output Filters: If an output filter is required to meet the output harmonics requirements of these Specifications, or to meet any special requirements of the application, the filters shall be fully incorporated into each VFD system design. To minimize cabling costs, the output filter components shall be integral to each VFD system lineup. If it is not possible to integrate the output filters into each VFD system enclosure, the cabling and connecting shall be entirely furnished by Contractor, and approved by the IPSC Contract Administrator.

Any inductors used shall be iron core with a maximum temperature rise of 115°C with minimum 220°C insulation and over-temperature protection. Reactors shall be designed to prevent saturation under maximum fault current conditions. Reactors shall meet the requirements of IEEE C57.16.

i. Capacitors: Capacitors used in the harmonic filter banks shall meet the requirements of IEEE 18 and IEEE 1036 for shunt power capacitors. Capacitors used in any harmonic filter banks shall be provided with method of shorting the phases to ground once power has been removed and the capacitors have been discharged to a safe voltage level.

Where potential exists for self-excitation between the output filter and the motor system, a fully (voltage and current) rated output contactor shall be provided by Contractor as part of each VFD system delivery.

j. Input Power Terminations: Input and output power connections shall be made to isolated, supported, and plated bus strap connections. Sufficient space shall be provided for termination connections from the top or the bottom of each VFD cubicle. Space provisions shall be provided for application of standard stress cones, and provisions shall be provided for grounding of shielded cabling.

10. Output Contactor or Switchgear: Each VFD output section shall contain a suitably rated load break disconnect switch interlocked with the door. The switch shall isolate a VFD for maintenance and service. For safety, blade position shall be visible through the door. The disconnect switch shall be integrated into each VFD system so as to appear as a single integrated package. The switch shall be electrically interlocked with a contact from the drive input circuit breaker to prevent the switch from changing positions while the input circuit breaker is closed. The switch shall consist of dead front, completely metal enclosed vertical sections containing isolation switches or breakers.

The door shall be interlocked with the switch so that: (a) The switch must be opened before the door can be opened; and (b) The door must be closed before the switch can be closed. There shall be a provision for padlocking the switch in either the open or closed position. The switch shall have permanent "open" and "closed" switch position indicators. The switch shall have a quick-make, quick-break mechanism providing isolation. Insulating barriers shall separate each phase and between the outer phases and the enclosure. All switches shall comply with ANSI C37.20.3, ANSI C37.22, ANSI C37.57, ANSI C37.58, NEMA SG5, and UL Standards.

11. Testing: A no load test shall be performed on the system. The drive shall be connected to an unloaded motor and feed back signals shall be verified. Output voltage shall be calibrated. All logic and interlocks, including customer logic and instrumentation, shall be tested.

    The drive shall be given a full power test at rated current and rated voltage (simultaneously) for a minimum of four (4) hours (or until all system temperatures stabilize, whichever is longer). The test shall be performed as an integrated system, including all supplied input switchgear, input transformer, input filter (if supplied), power section, and output filter (if supplied). Contractor shall perform the factory system test to verify total system efficiency, power factor, and harmonic distortion limits are met as specified. Total system efficiency shall be measured using watt meters or Multilin PQM or approved equivalent meters on both the input and output of the complete system. System shall not be shipped unless performance criteria are met. Certified test data of all tests conducted shall be provided with final documentation.

    The testing may be witnessed by the IPSC Contract Administrator. A projected test schedule and a copy of proposed test procedures shall be provided at least one (1) month in advance of test date. The IPSC Contract Administrator shall be given at least one (1) week prior notice or confirmation of actual test date(s).

12. Delivery: The VFD system shall be delivered to the IPP Job Site preassembled and wired with all specified interconnecting wiring and cable. Cabling for connection across shipping splits shall be neatly coiled and identified. Exposed sections of equipment shall be fully protected from damage during shipment. All necessary hardware for reconnecting shipping splits shall be provided.

    Setting equipment in place, aligning, and anchoring will be done by others. Contractor shall supervise all system interconnections across shipping splits at the IPP Job Site.

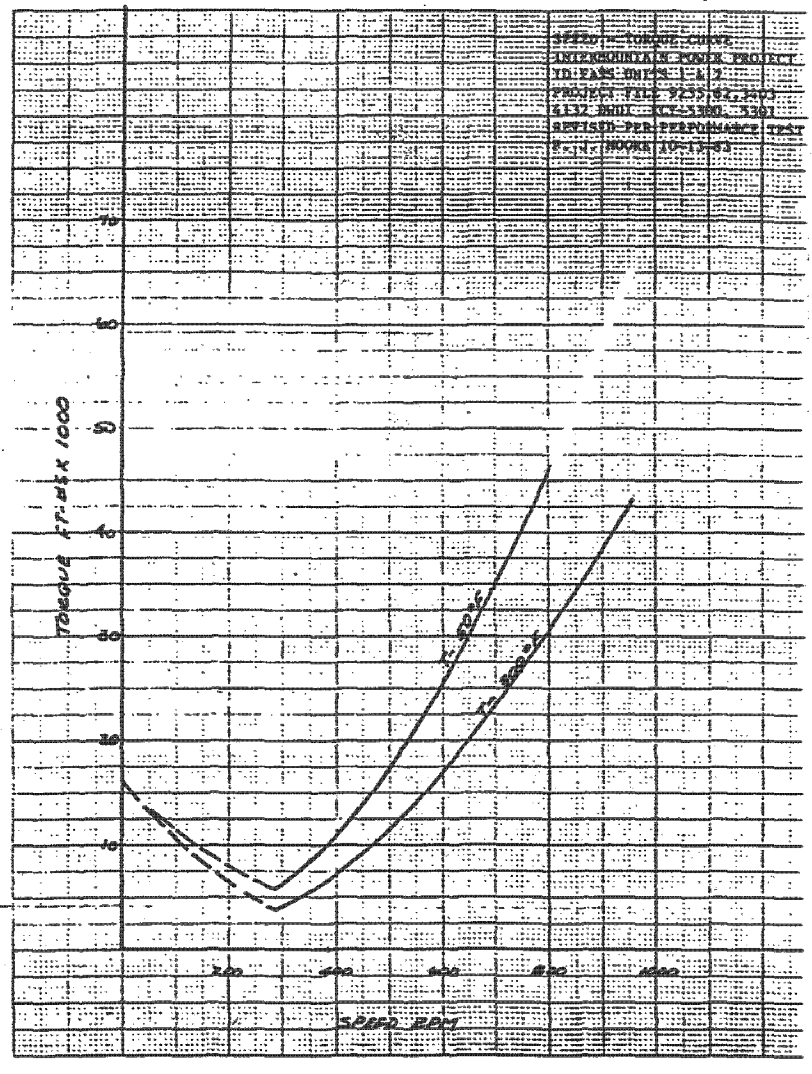
    Complete instructions for handling and storage shall be provided prior to delivery of the equipment. All equipment shall have adequate provisions for handling by overhead crane or forklift.

13. Training: Contractor shall provide an on-site training school for IPSC Operations, Maintenance, and service personnel (fifteen [15] total). The training school shall include classroom discussion on the theory of operation of the equipment, as well as maintenance and service methods for the purchased equipment. Topics covered shall include, safety, hardware layout and functions, power and control wiring, diagnostic indicators, keypad/display interface, software mapping, programming, setup, configuration, control loop tuning, operational indicators, faults, diagnostic tools, troubleshooting, and preventative maintenance. Hands-on training shall be provided on equipment of the same design as the equipment provided. Documentation shall be provided and shall include actual manuals for the equipment and drawings and schematics of equipment supplied for the Project. IPSC reserves the right to video tape all training sessions.

14. Startup: Contractor shall provide the field services of a factory technician as necessary to supervise/inspect installation, test, and startup all equipment provided as part of the fixed price proposal. The firm price shall include all travel and living expenses in addition to the start-up engineer's time required to complete supervision of the installation, testing, and startup as indicated in Division F2. All equipment required for testing, startup, and performance verification shall be provided by the start-up technician. Contractor shall furnish all required start-up spare parts.

    Verification of VFD input harmonic voltage and current distortion limits specified shall be verified at rated speed and rated power as part of final startup and acceptance. A recording-type Fluke, Multilin PQM, BMI, or equivalent harmonic analyzer displaying individual and total harmonic currents and voltages shall be utilized.

	SYSTEM DESCRIPTION	FILE NO. 9255.93.1405
	INDUCED DRAFT (CCE)	IPP 121284-1



INDUCED DRAFT FAN
SPEED-TORQUE CURVE
FIGURE 3-3

IP7012707

Existing Hardwired Control Signal List - One (1) ID Fan Variable Frequency Drive						
Device	**Type**	**Switch**	**Description**	**Power Source**	**Point Name**	**Signal**
Contactor	DI		Induced Draft Fan Contactor 1A2 Closed	ID Fan 1A Remote I/O Power	10234	120 VAC
Contactor	DI		Induced Draft Fan Contactor 1A1 Open	ID Fan 1A Remote I/O Power	10235	120 VAC
Contactor	DI		Induced Draft Fan Contactor 1A2 Open	ID Fan 1A Remote I/O Power	10233	120 VAC
Contactor	DI		ID Fan Cont 1A1 Disconn Key SW Permit To Close Bkr	Field Power		125 VDC
Contactor	DI		SWGR Power OFF (Green Light)	Field Power		125 VDC
Contactor	DI		ID Fan Feeder Bkr Trip Push Button	Field Power		125 VDC
Contactor	DI		Induced Draft Fan Contactor 1A1 Closed	ID Fan 1A Remote I/O Power	10236	120 VAC
Contactor	DI		ID Fan Feeder Bkr Door Switch	Field Power		125 VDC
Contactor	DI		Swgr Power On (Red Light)	Field Power		125 VDC
Contactor	DI		ID Fan Cont 1A1 Disconn Key Sw Trip Surge Bkr	Field Power		125 VDC
Motor	AI	TE-946	ID Fan 1A Motor Inbd Bearing Temperature			4-20 MA
Motor	AI	TE-681	ID Fan 1A Motor Inbd Bearing Temperature			4-20 MA
Motor	AI	TE-685	ID Fan 1A Motor Outbd Bearing Temperature			4-20 MA

Existing Hardwired Control Signal List - One (1) ID Fan Variable Frequency Drive						
Device	**Type**	**Switch**	**Description**	**Power Source**	**Point Name**	**Signal**
Motor	AI	TE-986	ID Fan 1A Motor Winding Temperature			4-20 MA
Motor	AI	TE-942	ID Fan 1A Motor Winding Temperature			4-20 MA
Motor	AI	TE-980	ID Fan 1A Motor Outbd Bearing Temperature			4-20 MA
Motor	DI	TS-603	XFMR 1A1 Temp HI-HI	ID Fan 1A Remote I/O Power	10179	120 VAC
Motor	DI	TS-602	XFMR 1A1 Temp HI-HI	ID Fan 1A Remote I/O Power	10179	120 VAC
Motor	DI	TS-604	1A2 XFMR HI-HI	ID Fan 1A Remote I/O Power	10180	120 VAC
Motor	DI	TS-601	XFMR 1A1 Temp HI-HI	I/D Fan 1A Remote I/O Power	10179	120 VAC
Motor	DI	PS-426	ID Fan 1A Motor Air Filter Diff Press HI	ID Fan 1A Remote I/O Power	10178	120 VAC
Motor	DI	TS-606	1A2 XFMR HI-HI	ID Fan 1A Remote I/O Power	10180	120 VAC
Motor	DI	TS-605	1A2 XFMR HI-HI	ID Fan 1A Remote I/O Power	10180	120 VAC
VSD	DI		ID Fan Variable Speed Drive 1A2 Fdr Brkr Closed		10129	
VSD	DI		ID Fan Variable Speed Drive 1A2 Contactor	ID Fan 1A Remote I/O Power	10232	120 VAC
VSD	DI		ID Fan Variable Speed Drive 1A1 Turning Gear Speed	ID Fan 1A Remote I/O Power	10225	120 VAC

Existing Hardwired Control Signal List - One (1) ID Fan Variable Frequency Drive						
Device	**Type**	**Switch**	**Description**	**Power Source**	**Point Name**	**Signal**
VSD	DI		ID Fan Variable Speed Drive 1A2 Fdr Brkr Closed		10130	
VSD	DI		ID Fan Variable Speed Drive 1A1 Contactor	ID Fan 1A Remote I/O Power	10244	120 VAC
VSD	DI		ID Fan Variable Speed Drive 1A1 Zero Speed	ID Fan 1A Remote I/O Power	10227	120 VAC
VSD	DI		ID Fan Variable Speed Drive 1A2 Min Speed 150 RPM	ID Fan 1A Remote I/O Power	10226	120 VAC
VSD	DI		ID Fan Variable Speed Drive 1A1 Fan Control Run			
VSD	DI		ID Fan Variable Speed Drive 1A2 Zero Speed	ID Fan 1A Remote I/O Power	10227	120 VAC
VSD	DI		ID Fan Variable Speed Drive 1A2 Trouble	ID Fan 1A Remote I/O Power	10228	120 VAC
VSD	DI		ID Fan Variable Speed Drive 1A2 Fdr Brkr Open		10134	
VSD	DI		ID Fan Variable Speed Drive 1A2 Trngr Spd Command		10131	
VSD	DI		ID Fan Variable Speed Drive 1A2 Norm Sp Command		10132	

Existing Hardwired Control Signal List - One (1) ID Fan Variable Frequency Drive						
Device	**Type**	**Switch**	**Description**	**Power Source**	**Point Name**	**Signal**
VSD	DI		ID Fan Variable Speed Drive 1A2 Turning Gear Speed	ID Fan 1A Remote I/O Power	10225	120 VAC
VSD	DI		ID Fan Variable Speed Drive 1A2 Ready	ID Fan 1A Remote I/O Power	10231	120 VAC
VSD	DI		ID Fan Variable Speed 1A1 Drive Ready	ID Fan 1A Remote I/O Power	10243	120 VAC
VSD	DI		ID Fan Variable Speed Drive 1A1 Reference Failure			
VSD	DI		ID Fan Variable Speed Drive 1A1 Trouble	ID Fan 1A Remote I/O Power	10229	120 VAC
VSD	DI		ID Fan Variable Speed Drive 1A1 Fan Control Off			
VSD	DI		ID Fan Variable Speed Drive 1A1 Min Speed 150 RPM	ID Fan 1A Remote I/O Power	10226	120 VAC
VSD	DO		ID Fan Variable Speed Drive 1A1 Norm Sp Command		00344	
VSD	DO		ID Fan Variable Speed Drive 1A1 Fdr Breaker Open		00345	
VSD	DO		ID Fan Variable Speed Drive 1A1 Fdr Breaker Closed		00341	

Existing Hardwired Control Signal List - One (1) ID Fan Variable Frequency Drive						
Device	**Type**	**Switch**	**Description**	**Power Source**	**Point Name**	**Signal**
VSD	DO		ID Fan Variable Speed Drive 1A1 Trngr Sp Command		00343	
VSD	DO		ID Fan Variable Speed Drive 1A1 Breaker Closed		00346	
VSD	DO		ID Fan Variable Speed Drive 1A1 Run Command		00347	
VSD	DO		ID Fan Variable Speed Drive 1A1 Off Command		00342	
VSD	DI		ID Fan Variable Speed Drive 1A1 Regenerative Braking			
VSD	AI		ID Fan Variable Speed Drive 1A1 Speed Control Signal			
VSD	DO		Miscellaneous Alarms 1A1			
VSD	DI		ID Fan Variable Speed Drive 1A2 Regenerative Braking			
VSD	AI		ID Fan Variable Speed Drive 1A2 Speed Control Signal			
VSD	DO		Miscellaneous Alarms 1A2			

PART F - DIVISION F8

VFD ISOLATION TRANSFORMERS

1. General: The transformers for the VFD input shall be manufacturers' standard and furnished as specified in this Division. Each transformer shall be suitable for continuous operation at 100 percent of nameplate rating, with normal life expectancy, based on the specified ambient conditions.

   This Division describes the features of acceptable transformers. The bidder shall provide detailed information on what is being offered.

2. Input Isolation Transformer: Each VFD system shall use a drive isolation transformer to provide common mode voltage protection and phase shifting (for 24 pulse or higher converter bridge, if employed to meet the power quality requirements of Division F7).

   Transformer design shall be a rectifier grade isolation-type with a K Factor of 12 for variable torque loads or a K Factor of 20 for constant torque loads when applied to a SCR converter, in accordance with current EPRI recommendations and ANSI/IEEE Standard C57.110. A K Factor of 6 is required for diode rectifier converters. Transformers shall have a BIL rating in accordance with the requirements of ANSI/IEEE Standard C57.12.01.

   Dry-type construction transformers shall be AA rated to base capacity of the VFD and provided with provisions for a fan-cooled system. If a FA transformer is supplied it shall be provided with one (1) redundant fan.

   Transformer shall be supplied with electrostatic shield, electronic temperature monitoring with alarm and trip contact, auxiliary terminal box, distribution class surge arresters, and vibration dampers.

3. Dry-Type Transformers: The insulating materials used shall be suitable for operations at a temperature of 220° C with a temperature rise limited to 115° C for conventional dry-type transformers.

   The windings shall be sealed and protected using a Vacuum Pressure Impregnation (VPI) or encapsulation process. The preheated windings shall be subjected to a dry vacuum cycle, followed by a wet vacuum cycle during which time the windings are impregnated with an electrical grade varnish resin, polyester resin, or silicone resin. A pressure cycle shall then force the resin throughout the insulation. The windings shall then be cured to bind the resin to the insulation material, while eliminating voids which could create hot spots, partial discharge, or cause corona formation. This process shall completely seal and protect the windings from moisture, dust, dirt, salt air, and other industrial contaminants.

IP7012713

4. Mechanical Construction: All transformer enclosures, incoming sections, and outgoing sections shall have completely enclosed sheet metal bottoms. All side panels shall be removable. The ventilated enclosure shall be of heavy gauge sheet steel, and be suitable for outdoor or indoor operation.

   Each transformer enclosure shall be gasketed and shall be provided with tops and shields required to prevent falling or dripping water from entering the enclosure. Each transformer enclosure, both interior and exterior shall be thoroughly cleaned, then given a rust-resisting primer coat and two (2) or more finish coats of enamel. The Proposal shall include a complete description of the paint system.

   External lifting eyes, or other means acceptable to IPSC for handling of the complete transformer assembly, shall be furnished as part of each enclosure framework so during movement of the unit its core and coils remain completely protected from damage or shifting.

   The unit(s) shall also be constructed and supported so movement in any direction on rollers will not damage or permanently distort the enclosure, frame, or internal apparatus.

5. Core and Coil Assembly: The core and coil assembly shall be adequately braced to withstand short-circuit forces without damage or displacement, limited only by the transformer impedance. The assembly shall also withstand normal moving and handling without the use of special shipping braces. Verification that short-circuit withstand tests have been performed on a prototype or identical transformer design shall be submitted.

   The core and coil assembly shall rest on vibration dampers designed to isolate core vibration from the enclosure.

   The core shall be constructed of high-grade grain oriented silicon steel.

   Standard values of impedance shall be used, unless otherwise required for the VFD system.

   The basic impulse insulation level shall be inherent to the design, and is to be obtained without the use of supplemental surge arresters.

6. De-Energized Taps: The high-voltage winding shall have four (4) approximately 2-1/2 percent rated full capacity de-energized taps, two (2) above and two (2) below rated primary voltage. A different tap setting is acceptable, if required, for the VFD system. The tap connections shall be bolted, flexible jumper, or rigid bar-type, easily accessible

IP7012714

by removal of one (1) of the enclosure side panels. The tap position indicator and terminal markings shall be clearly visible and identical with those used on the transformer nameplate.

7. Forced Cooling: If a forced cooled rating is specified in the Technical Data, Article 15 of this Division, the transformer shall be furnished with a complete forced air cooling system, including cooling fans, fan support brackets, winding temperature controls, fan power supply transformers, circuit protective devices, wiring, terminal blocks, and control panel. The fan power supply transformers shall be factory wired to the low voltage side of the transformer. All current carrying parts shall be sized for the maximum FA rating.

8. Accessories: Each transformer shall be furnished with the manufacturer's standard accessories including the following:

   a. Two (2) grounding pads.

   b. Stainless steel diagrammatic nameplate.

   c. Provisions for lifting and jacking, mounted on the transformer enclosure.

   d. Digital winding temperature indicator.

   Two (2) sets of SPDT alarm contacts and one (1) SPDT trip contact shall be furnished on the digital winding temperature indicator. All contacts shall be wired to identified terminal points in the control compartment.

   All accessories shall be clearly identified and described in the Proposal.

9. Termination Compartments: Each transformer shall include HV and LV termination compartments if the transformers are not an integral part of the VFD lineup, in accordance with the following:

   a. HV Compartments: HV termination compartments shall be of the type specified in this Division and in accordance with the following paragraphs:

      (1) The compartments shall be metal-enclosed air insulated terminal chambers with gasketed and bolted covers.

      (2) The compartments shall be large enough to accommodate working space for field installation of stress cones on HV cables that are shielded and to house other accessories specified, such as surge arresters.

IP7012715

(3) Enclosures shall be fabricated of electro-galvanized sheet steel or aluminum and painted in accordance with these Specifications.

(4) Indoor enclosures shall be dust-tight and impervious to dripping or falling water. Hardware shall be stainless steel or cadmium plated steel.

(5) All exterior hardware for units located outdoors shall be stainless steel.

b. LV Compartments: LV termination compartments shall be of the type specified in this Division and in accordance with the following:

(1) The compartments shall be metal enclosed air insulated terminal chambers with gasketed and bolted covers.

(2) Enclosures shall be fabricated of electro-galvanized sheet steel or aluminum and painted in accordance with these Specifications.

(3) Indoor enclosures shall be dust tight and impervious to dripping or falling water. Hardware shall be stainless steel or cadmium plated steel.

(4) All exterior hardware for units located outdoors shall be stainless steel.

(5) Terminal compartments shall be one of the following:

(a) Terminal compartments being provided that are "throat" connected to LV equipment shall be designed to connect directly to the specified equipment to form a complete assembly. All required hardware, bus splice plates, flexible connectors, etc., shall be provided.

(b) Terminal compartments being provided that are connected to LV bus duct shall be designed to connect directly to the specified bus duct to form a complete assembly. All required flanges, gaskets, hardware, bus splice plates, flexible connectors, etc., shall be provided.

(c) Terminal compartments being provided that are connected to LV cables shall be designed to accommodate field installation of the size and number of cables specified from the direction indicated in this Division.

IP7012716

10. Factory Testing: Each transformer shall be completely assembled and tested at the factory in accordance with applicable standards and the manufacturer's standard practices, using materials and equipment that will be a part of the final assembled unit and receive the routine and design tests as indicated by the latest revision of the applicable standard. Certified test reports shall be supplied, summarizing the results of all tests. In particular, the calculated hottest spot temperature rises of the primary and secondary windings shall be shown.

    Hottest spot temperature rises shall conform to the appropriate standard and shall be calculated using mathematical models verified by thermal tests on test windings and/or a prototype transformer representative of the design family. Tests shall have been conducted at conditions of full load or conditions simulating full load. Complete data shall be available for IPSC's review.

    IPSC reserves the right to witness factory testing and shall be informed in writing at least ten (10) calendar days prior to the scheduled starting date of tests so that arrangements can be made for a representative to be present.

11. Scope of Supply: Input isolation transformers shall be provided for configurations in which existing transformers are not suitable. These are not required on drives which include integral input transformers.

12. Schedule of Contract Submittals:

Submittal Item Activity	**To Be Received No Later Than ... Days After Award of Contract**
Outline Drawings	15
Schematic and Wiring Diagrams	30
Nameplate Drawings	15
Design Data and Performance Curves	15
Certified Test Reports	15 Days After Tests Are Completed

IP7012717

13. Performance and Design Technical Requirements:

Performance and Design Technical Requirements	
Transformer Name	VFD Input Transformer
Transformer-Type	Dry
ID Number	1CCE-XF-1A1 1CCE-XF-1B1 1CCE-XF-1C1 1CCE-XF-1D1 1CCE-XF-1A2 1CCE-XF-1B2 1CCE-XF-1C2 1CCE-XF-1D2
Quantity	1 Each
Standard	ANSI/IEEE C57
Self-Cooled Rating Capacity	As Required kVA
Force-Cooled Rating Capacity	Provisions kVA
Primary Voltage	6,900 Volts
Secondary Voltage	As Required Volts
Primary Insulation	45 kV BIL
Secondary Insulation	Full kV BIL
Primary Winding	Wye
Secondary Winding	Wye-Grounded/Delta
Primary Termination Compartment	Yes
Secondary Termination Compartment	Yes
Frequency	60 Hz
Number of Phases	3
Average Winding Rise	115°C
Cooling Class	FA or OA/AA

IP7012718

Performance and Design Technical Requirements	
Enclosure-Type	NEMA 1
Vector Relationship	24 Pulse
HV De-Energized Taps	± 2 X 2.5% or 1 X ± 5%
Sound Level	75 dBA
IPP Job Site Altitude	4,700 ft
Impedance	As Required %Z at Self-Cooled Rating
Maximum Ambient Temperature	50°C
Maximum Monthly Average Ambient Temperature	30°C
Average Annual Ambient Temperature	20°C
Maximum 24 Hour Average Ambient Temperature	40°C
Conductor Material	Copper
Paint System and Color	Manufacturer's Standard
Auxiliary AC Power Supply	120 Volt
K-Rating for Non-sinusoidal Loads	As Required for Service
Neutral Grounding	Solid
Unusual Operating Conditions	VFD Input
Special Accessories	Thermostat or Electronic Temperature Monitor
Additional Requirements	Space Heaters

14. Required Bid Submittals:

a. Submittal description.

b. *Complete description of proposed transformer.*

IP7012719

c. Preliminary outline drawings showing estimated weights, dimensions, and locations of major accessories.

d. Summary description of codes and standards used if different than specified, including a review of major differences.

e. Price list of recommended spare parts.

f. List of special and maintenance tools to be furnished.

g. Bidder experience record with proposed equipment.

h. List of factory routine tests.

i. Complete description of the extent of shop assembly of components.

15. Technical Data:

Technical Data		
Manufacturer		
Factory Location		
Quantity		
Class and Type of Core		
Phase		
Type (Dry, etc.)		
Conductor Material of Each Winding		
kVA, Self-Cooled		kVA
kVA, Force-Cooled (Top Rating)		kVA
High-Voltage Winding		kV
kV BIL		kV BIL
Delta or Wye		
Taps		

IP7012720

Technical Data					
Low Voltage Winding					c'
kV BIL					kV BIL
Delta or Wye					
Taps					
Average Winding Rise-HV					°C
Insulation System Maximum Temperature-HV					°C
Insulation System Maximum Temperature-LV					°C
Cooling Class					
Frequency					
Enclosure-Type					Hz
Impedance					%Z
Vector Group					
Maximum Sound Level					dBA
No-Load Losses					kW
Load Losses					kW
Fan Losses					kW
Efficiency at Unity Power Factor					
At Full Load					
At 85% Load					
At 75% Load					
K-Factor Rating					
Total Weight					
Dimensions, L X W X H		X		X	

IP7012721

Technical Data	
Efficiency at Unity Power Factor	
HV Winding Description	
LV Winding Description	
Terminal Compartment-Type	
Accessories	

PART F - DIVISION F9

MEDIUM VOLTAGE INDUCTION MOTORS

1. General: This motor specification is applicable to all medium voltage, 3-phase, squirrel-cage induction electric motors.

2. Design and Construction: Motors shall be designed for use with a variable frequency drive. All motors shall be capable of continuous running duty.

   a. Nameplates: All motor nameplate data shall conform to the requirements of the standards listed in this Division. The following additional nameplate data shall be included:

      (1) Insulation system class designation.

      (2) Maximum ambient temperature for which motor is designed and temperature rise by resistance.

      (3) For motors with connections to an external lubricant recirculating system, or with an integral forced lubrication system, oil pressure and oil flow required. The existing motor and fan have an existing lube oil system. The existing motor requires 2.5 GPM at 20 PSIG per bearing. If the new motor requires more lube oil than available, a new lube oil system shall be furnished.

      (4) Type and grade of bearing lubricant, attached adjacent to lubricant filling devices.

      (5) For motors with current transformers for differential protection, connection diagram indicating motor lead terminal connections.

      (6) For motors with air filters, recommended set point for differential pressure device, attached on or near device enclosure.

      All motor nameplates and attachment pins shall be corrosion-resistant metal.

   b. Enclosures: New motors shall match critical dimensions and weight of existing motors as shown on the reference drawings. An adapter sole plate is allowed. Enclosure parts for all motors (e.g. frames, bearing brackets, terminal housings, external fan covers) shall be made of cast iron, cast steel, sheet steel, or steel plates. Aluminum enclosure parts are not acceptable.

IP7012723

Air filters are required and shall be removable from the outside of the motor and from the side only, not from the front or back. Replaceable-type air filters shall be furnished.

Cooling fans, when provided, shall be bi-directional to allow for continuous motor operation in either a clockwise or counterclockwise direction. Specific cases where such a fan is impractical for mechanical reasons shall be brought to the attention of IPSC.

c. Air Filter Pressure Differential Devices: A pressure differential device shall be provided at the air inlet of all motors furnished with air filters. The device shall be furnished with a snap-action sealed switch, having one (1) normally open and one (1) normally closed contact (Form C) which change state (close) on high-pressure differential. The switch shall have an adjustable set point which is accessible for calibration while the motor is in service. The initial adjustment shall be made at the motor supplier's factory. The purpose of the switch is to prevent motor excessive temperature by alarming clogged filters.

d. Insulation and Windings: All stator coils shall utilize copper conductors, shall be form-wound, and shall be insulated with mica based materials. All stator winding materials shall have a Class F (155° C) thermal classification and shall utilize a vacuum pressure impregnation (VPI) system.

Motor windings shall be furnished with a fly ash resistant coating.

e. Temperature Rise: The temperature rises at rated output shall not exceed those for a Class B thermal insulation classification.

f. Space Heaters: All motors shall have space heaters. Heaters shall be located and insulated so they do not damage motor components or finish.

Space heaters shall be sized as required to maintain the motor internal temperature above the dew point when the motor is idle. Space heaters below 1,000 watts shall be rated at 120 volts for use on a 120-volt system. Space heaters 1,000 watts and above shall be rated at 208 volts for use on a 3-phase, 208-volt system.

g. Terminal Housings: A terminal housing for power leads and a separate accessory terminal housing for accessory leads shall be furnished on all motors. The existing motor conduits shall be reused.

All terminal housings shall be externally mounted on the motor frame enclosure. Terminal housings for all motors shall be cast iron or sheet steel. Minimum

IP7012724

protection requirements shall be equivalent to NEMA 4 (IP 54). A Type II motor terminal box shall be furnished.

All motor leads located in the housings shall be permanently marked for ease of identification.

A separate accessory terminal housing shall be provided for space heater leads, temperature detector leads, and other similar accessory equipment leads. It shall be complete with screw-type terminal blocks for termination of such leads. Each terminal in the blocks shall be identified and marked for its respective leads. Accessory terminal housing shall be accessible from outside the motor.

When current transformers for motor differential protection are specified, the current transformers shall be mounted in the power lead terminal housing.

Motor power lead terminal housings shall be large enough to provide working space for the field fabrication of stress relief kits for shielded cable within the housing, and to contain the stress relief kits after fabrication. Type II terminal boxes shall be furnished.

Location and dimensions of terminal housings shall match the existing motor terminal box.

h. Leads: All leads, including motor power leads, space heater leads, and temperature detector leads, shall be wired into their respective terminal housings.

All motors shall have the direction of rotation marked by an arrow mounted visibly on the stator frame near the terminal housing or on the nameplate and the leads marked for phase sequence to correspond to the direction of rotation and supply voltage sequence.

When current transformers for motor differential protection are specified for single-speed motors, the motor phase leads shall be wired to the motor power lead terminal housing for connection for self-balancing current-type differential protection. Each current transformer shall encircle all power leads to the associated winding. The motor winding Wye or Delta connections shall be completed at the factory, leaving only three (3) leads, T1, T2, T3 (U, V, W), for field connection in the power lead terminal housing. The Wye or Delta connection shall be completed in a manner which will allow easy access to the end of each phase for field testing.

IP7012725

Cable motor leads shall utilize stranded copper conductors insulated with silicone rubber covered with a glass braid or acceptable equal.

i. Bearings: The type of bearing furnished shall be determined by the motor supplier based upon the load, speed, and thrust conditions of the driven equipment.

(1) Sliding-Type Bearings: Sleeve bearings for horizontal motors shall be oil ring lubricated-type. The bearings, end bells, and bearing housings shall be split-type when available. Air gap measurement holes or other acceptable means shall be provided in each motor end enclosure for checking air gap of sleeve bearing motors.

(2) Bearing Lubrication System: Motors shall be designed to use the existing pressurized bearing oil system.

(3) Miscellaneous Bearing Requirements: All bearing mountings shall be designed to prevent the entrance of lubricant into the motor enclosure or dirt into the bearings and shall be provided with pipes and drain plugs.

Bearings and bearing housings shall be designed to permit disassembly in the field for inspection of the bearings or removal of the rotor.

All oil-lubricated bearings shall be provided with oil level sight glasses marked for required oil level at motor running and standstill. Plastic sight windows or bottles shall be of a material not adversely affected by continuous exposure to sunlight.

Insulation shall be provided to prevent circulation of shaft current on bearings, on bearing temperature detectors, or on oil piping connections.

Bearing lubricants shall contain a corrosion inhibitor. The type and grade of lubricant shall be indicated on a nameplate attached to the motor frame or end shield adjacent to the lubricant-filling device. Contractor shall verify the existing lubrication system to ensure proper equipment startup and subsequent bearing maintenance.

j. Oil Lubrication Systems: For the existing external lubricant recirculating system, Contractor shall furnish pipe taps for oil inlet and outlet connections in addition to the internal lubricant recirculating system previously specified. The reused lubrication system shall maintain proper lubrication and cooling of the bearings over the complete speed range.

IP7012726

k. Rotors: All induction motors shall have squirrel-cage rotors. Rotors shall be adequately sized to avoid overheating during acceleration of the motor and driven equipment. Rotors shall be copper or copper alloy cage material. All fabricated cage rotors shall include a swaging or wedging method during the installation of rotor bars to prevent rotor bar vibration.

All motor rotating components shall be dynamically balanced after mounting on the shaft. Motor vibration shall not exceed the peak-to-peak amplitude values listed in the following table:

Synchronous Speed, rpm	Maximum Amplitude, Inches, (mm) Peak-to-Peak
999 and below	0.001 (0.025)

In addition, the magnitude of vibration values for twice the line frequency vibrations shall not exceed 0.0005 inches (0.013 mm).

The minimum clearance space required for removal of the rotor shall be indicated both in the Proposal data and on the dimensional outline drawing.

l. Shafts: All shafts shall be solid. Each shaft shall be furnished with a corrosion-resistant treatment or shall be made of a corrosion-resistant material.

The output shafts of motors furnished with sleeve bearings shall be circumscribed with permanent marks indicating the motor magnetic center and end float limits when level and running at rated speed. A permanent, identified reference point shall be indicated or attached to the bearing housing or shaft seal. The markings shall be easily identifiable for use during motor installation.

For horizontal sleeve bearing motors, the rotor end float and coupling end play shall be in accordance with NEMA requirements. The distance from the magnetic center line mark to each end float limit mark shall be not less than 37.5 percent of the total rotor end float.

m. Grounding Pads: External grounding pads shall be provided in at least two (2) locations (near mounting feet at opposite corners).

n. Torque Characteristics: Breakaway, run-up/pull-up, and pull-out/breakdown torque shall at all times be at least 10 percent higher than the load-torque of the driven machine, at minimum specified starting voltage. Load-torque characteristics are specified in Medium Voltage Variable Frequency Drives, Division F7, and as shown on the speed torque curve in Figure 3.3,

IP7012727

page F7-25; however, the responsibility for successful starting under the given conditions rests with the motor manufacturer.

o. Quality Control Tests and Inspections: Each motor shall be tested and inspected at the manufacturer's factory to determine that it is free from electrical or mechanical defects and to provide assurance that it meets the requirements of these Specifications. Test procedures shall be in accordance with IEEE or NEMA test procedures for 3-phase induction motors.

Copies of reports of the quality control tests and inspections for each motor shall be submitted prior to shipment of the motor from the manufacturer's factory.

The routine tests listed in NEMA shall be performed on each motor. One of the motors shall have complete test in accordance with IEEE Standard 112.

Additional tests shall be performed to determine the efficiency and power factor for each motor.

p. Drawings and Engineering Data: Motor dimensional drawings shall include the following information in addition to the requirements listed in these Specifications:

(1) Complete nameplate data.

(2) Rotor weight and motor total weight.

q. Couplings: The motor shaft shall be designed so the existing motor half coupling can be transferred to the new motor and reused. The existing coupling shall be reconditioned so the existing vibration dampening materials are replaced with new. Contractor has the option of furnishing a new coupling. If a new coupling is being proposed Contractor shall provide coupling information in the Proposal data.

r. Sole Plates: Existing sole plates shall be used; however, if an adapter plate is required, Contractor shall furnish one that can be bolted directly to the existing sole plate. Contractor shall provide adapter information as part of the Proposal.

s. Critical Speeds: Motors shall be designed to keep torsional and rotational natural frequencies of vibration at least 25 percent above, the motor rated speed ranges to avoid resonant vibration over the operating speed range of the equipment-motor unit.

t. Vibration Transducer Mounting: A vibration transducer mounting for field installation of an IPSC-furnished vibration transducer shall be provided on the

drive shaft bearing housing of the motor. The vibration transducer and monitoring equipment will be furnished under separate specifications.

3. Scope of Supply: Provide squirrel-cage induction motors for configurations in which existing motors are not suitable.

4. Scope of Erection/Construction: Motors must be constructed to replace existing motors on the existing foundation and on existing sole plates and all conduits. Contractor shall include a detailed description of Work required to mate new motor with existing fan and motor foundation. The written Work description shall be submitted for review with the motor dimensional drawings, and included in the instruction manuals. The Work description shall be of sufficient detail to provide the installing contractor with all information needed to install the new motors and modify any of the existing equipment.

5. Schedule of Contract Submittals:

Submittal Item Activity	**To Be Received No Later Than... Days After Award of Contract**
Power Factor and Efficiency Versus Percent Load Curves for Medium Voltage Motors	15
Motor Dimensional Drawings	15
Wiring Diagrams	30
Motor Nameplate Data	20
Medium Voltage Motor Rotor Removal Clearance Drawings	15
Bearing Disassembly and Reassembly Drawings	With Instruction Manual

IP7012729

6. Performance and Design: This motor data sheet is applicable for motors with nameplate ratings:

Driven Equipment		IPSC Tag Number		Quantity
ID Fan		1CCE-FAN-1A		1
Minimum Output Rating				
NEMA (HP)	**Service Factor**	**IEC (kW)**	**Synchronous Speed (RPM)**	**Direction of Rotation***
8,700	1.15	N/A	900**	CW/CCW

* Direction of shaft rotation shall be viewed from motor end opposite the motor output shaft and looking at the driven equipment. Contractor to coordinate direction of rotation existing ID Fan.

** Motors shall be designed to operate continuously at 1050 RPM.

Horizontal Shaft Mounting Arrangement - Horizontally Mounted Motor	
NEMA Motor	Horizontal, Single Shaft Extension
Rated Voltage (volts)/Frequency (hertz)	As Required
Maximum Ambient Temperature (°C)	50
Minimum Ambient Temperature (°C)	-35
Altitude	4,700 Feet
Efficiency, Minimum	High Percent

Motors shall be manufactured to NEMA/ANSI Standards.

a. Features: The following features shall be provided:

Feature	NEMA
Enclosure/Degree of Protection	WP II
Enclosure Openings Shall be Covered with Screens Manufactured from the Following Materials	Stainless
Air Filters	Replaceable

Feature	NEMA
No-Load Sound Produced by the Motor at one (1) Meter	80 dBA
Current Transformers	If Required
Stator Winding Temperature Devices	RTDs - 10 OHM - Copper (Two [2] per Phase per Winding)
Starting Voltage Range	Minimum **VFD** Percent / Minimum **VFD** Percent
Incoming Power Supply Cable and Terminations	Must Match Existing Cables or Cables Required to Fit Existing Conduits
Anti-Condensation Space Heaters	Space Heater Shall be Provided
Space Heaters Shall be Energized at	120 V for volt Heaters, 1,000 W and 208, 3Ø for Heaters 1,000 W and Above

b. Dollar Value: The following dollar value shall be used to evaluate motor energy losses at driven equipment maximum brake horsepower (kW) as defined on the Motor Proposal Data Sheet:

Dollars (US)/kW
$1275

c. Horizontal Motors:

Horizontal Motors	
Sole Plates	Use Existing Sole Plates
Terminal Box Location, Viewed From Motor End Opposite the Motor Output Shaft	Match Existing
Horizontal Motor Bearing-Type	Sleeve Bearings Forced Oil Lubricated

IP7012731

Bearings		
Bearing Temperature Detectors Shall be Furnished	On Each Motor Sleeve Bearing	
Bearing Temperature Detectors	Type E Thermocouple	
Bearing Lubrication System	Oil Rings	
Bearing Lubrication System Cooling	Existing	
Driven Equipment Characteristics		
Driven Equipment Inertia	wk^2 - lb ft^2	388,240
Synchronous Speed Required Torque	954 rpm	
Starting Load	Fan-Dampers Closed	

7. Additional Requirements:

a. Special Requirements: Special requirements beyond the established standards have been defined for this Project.

Provided below are technical exceptions to, or deviations from, the requirements specified in the associated Technical Specifications for the equipment or service. These exceptions and deviations shall govern over the standard specifications only to the extent of the difference.

b. Codes and Standards: Work performed under these Specifications shall be done in accordance with the following codes and standards. The version that is latest adopted, published, and effective at the date of this Contract shall apply unless specifically stated otherwise. These references shall govern the Work except where the references conflict with IPSC Specifications. In cases of conflict, the latter shall govern to the extent of such difference.

Codes and Standards
NEMA MG1
ANSI C50.41
IEEE 112
IEEE 522

c. Approved Manufacturers:

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

Component	Approved Manufacturer
Medium Voltage Induction Motors	ABB Electric Machinery General Electric Reliance Siemens TECO - Westinghouse Motor Co. Toshiba

8. Required Bid Submittals: The following data shall be submitted for use in the evaluation of bids. The Proposal will be considered incomplete until the required submittals are received.

a. Submittal description.

b. Overall size, weight, and configuration for each motor and arrangement of accessory items.

c. Overall drawing showing center lines and major dimensions of each motor and minimum clearance space required for removal of the rotor shall be indicated on the dimensional outline drawing.

d. Efficiency versus percent load curves.

e. Power factor versus percent load curves.

f. If a new coupling is being proposed, provide coupling information, manufacturer, and type.

g. If an adapter plate is being proposed, provide adapter information, size, and dimensions.

h. Motor thermal limit curves.

9. Motor Technical Data:

Motor Technical Data			
Manufacturer			
Model Number			
Location of Manufacturer			
Design Standards (i.e., NEMA)			
Type and Application			
RPM Maximum			
Bearing Temperature Detectors			
Winding Temperature Detectors			
Insulation Class			
Driven Equipment Maximum Brake HP			
Motor Nameplate Horsepower			
Service Factor (NEMA Motors Only)			
Motor Losses When Operating at the Driven Equipment Maximum Brake HP			
Motor Bearing-Type			
Enclosure			
Starting Voltage Range			
Bearing Lubrication System			
Space Heater Rating, Watts/Voltage/Phase			
Minimum Clearance Required to Remove Rotor			
Height			
Length			
Width			

IP7012734

Motor Technical Data	
Minimum Clearance Required to Remove Rotor	
Weight	
Stator	
Rotor	
TOTAL	
Overall Dimensions, Including Shaft Extension	
Length	
Width	
Height	
Minimum Clearance Space Required for Rotor Removal	
List of Special Tools that will be Furnished	
Field Assembly Work Required	

From: John Larsen
To: Jon Christensen
Date: 8/25/2003 2:44 PM
Subject: Fwd: RFQ - Specification 45605

More questions

>>> <gary.smith@tde.alstom.com> 8/25/2003 3:27:30 PM >>>
Upon initial review of the subject specification, we need clarification on several technical items to prepare our bid.

Harmonic Distortion
What should be the basis for our harmonic calculations? IEEE 519 as indicated in Section F2 or Section F7 para 2

The plant single lines do not have sufficient information to perform our harmonic analysis. The size and impedance are needed for the main plant auxiliary transformers which feed the drives.

Power Factor
Is the power factor to be .95 at full load per Section F2 or .95 from 30 - 100% speed as indicated in F7 para 2f?

Ambient Temperature
Section F7 para 1, is the indoor ambient temperature range -10 to 50 degrees C?

Thank for your assistance

From: John Larsen
To: gary.smith@tde.alstom.com
CC: beth.godwin@tde.alstom.com; roger.grace@tde.alstom.com
Date: 8/25/2003 4:39 PM
Subject: Re: RFQ - Specification 45605

The instructions are found in Part C - Division C1, page C1-1. The check must be certified or be a cashier's check and must be payable in the state of Utah.
Thanks for asking for clarifications.

>>> <gary.smith@tde.alstom.com> 8/25/2003 3:51:19 PM >>>
For the subject RFQ, we have the following commercial question:

Part C - Division C1 Bidder's Bond
If a check is used in lieu of a Bond, does the check have to drawn on a bank in the State of Utah?

Thank you for your assistance.

From: John Larsen
To: Jon Christensen
Date: 8/26/2003 3:44 PM
Subject: Fwd: RFQ - Specification 45605

Please address these questions:

>>> <gary.smith@tde.alstom.com> 8/26/2003 4:04:35 PM >>>
We have the reviewed the plant drawings cover on the CD which we received yesterday and request that the following additional information be provided:

1. A drawing for the mezzanine foundation with dimensions.

2. A drawing for the mezzanine cable/conduit locations.

3. A readable copy of the drive outline drawing # 3097D30

We would appreciate receiving this information ASAP because it is needed to finalize our physical drive layout to ensure that we need existing cable entry locations.

Thank you for your assistance.

From: John Larsen
To: Jon Christensen
Date: 8/29/2003 10:16 AM
Subject: Fwd: RFQ - Specification 45605

Please respond to this.

>>> <gary.smith@tde.alstom.com> 8/29/2003 11:07:32 AM >>>
For the subject RFQ, we have the following question:

Reference drawing 9255-1BSB-S7325, beside the different floor cutouts, designations of E-59, E-60 etc. are given. What is the significance or meaning of those designations.

Thank you for your assistance.

Jon Christensen - Attached

From: <JOHN.A.BENZ@sargentlundy.com>
To: <jon-c@ipsc.com>
Date: 9/17/2003 7:46 AM
Subject: Attached
CC: <DAVID.A.ROBERTS@sargentlundy.com>
Attachments: Alstrom questions.doc

Attached

IP7012740

Meeting with Alstom on September 16, 2003 to discuss their proposal for replacement drives a IPSC.

Those present:

Jon Christensen	IPSC
John Larsen (part time)	IPSC
Roger Grace	Alstom
Joe McGrath	Alstom
Bill Oleyar	Alstom
David Smith	Alstom
Gary Smith	Alstom
John Benz	Sargent & Lundy
Dave Roberts	Sargent & Lundy

The following is a list of questions discussed with the responses.

- Who is the contact at Mississippi power and when was it installed?

Answer: Alstom will give us the contact. The referenced installation was just a controls upgrade and HMI addition.

- Can detailed installation information and sequencing of installation be provided? What shipping splits if any and how equipment will be moved into the room should be discussed?

Answer: Alstom will prepare a write-up of the installation sequence and inform IPSC if any shipping splits will be required. They will also confirm the that there will be no price adder.

- What piping (isolation/check valves etc.) and support structures are being furnished with the heat exchangers?

Answer: None, all piping valves etc. will be by IPSC as part of the installation.

- Are there any concerns on the bearing due to excessive wear for a 12 –12 LCI drive?

Answer: None, because of the LCI technology.

- Can project specific wiring diagrams be provided? Proposal indicates that only standard drawings will be provided. What drawing format are the drawings going to be provided in?

Answer: Alstom presented their standard drawing format and stressed that all external (IPSC) wiring can be added to their standard wiring diagrams for installation purposes. The drawings are in Autocad 2000 format and can be submitted via e-mail or on CD's. Paper copies will also be submitted. IPSC also stated that Alstom had to provide a block for their drawing numbers to be added to all vendor drawings. Alstom confirmed this would be done.

- Independent labeling asked for in the specification, please indicate what is required to furnish such a label.

Answer: Alstom stated there is no independent labeling was offered since there is not a standard for large medium voltage drives.

- The drawings show the HMI on only one lineup of cabinets, explain how this is fully redundant.

Answer: The HMI is a common controller for both channels. If the HMI fails both channels can still run and have full redundant control as well as first level fault indication. The printout of the fault is via a personal PC through the HMI.

- The drawings show the cooling cabinet only on one lineup. Is this fully redundant?

Answer: There are 2-100% pumps in the cooling cabinet and the air to water heat exchanger has 3-50% fans. IPSC would provide 2 – 480 volt feeds (one per pump) from external MCC's. As part of the cooling cabinet motor control combination starters are furnished. The cooling system is for both channels.

- What is the available head on the cooling system to the remote cooler?

Answer: Alstom to provide. They will alsonprovide any requirements or restrictions on piping. Alstom was told to use a length of 200 to 250 feet with a vertical rise of 50 feet.

- Why is a Potential Transformer reference required to the 6.9 kV system?

Answer: Need it for phase reference. After discussions if was agreed that Alstom would investigate providing the PT as part of the input cabinet. They will advise if this would require any change to the proposal.

- Will the system meet IEEE 519 when the drive is operated at 10,000 HP? What modification will be required?

Answer: No.

- What if any are the shipping splits in the cabinets? Has a plan been worked out as to how the equipment will be moved into and out of the room?

Answer: See above. Alstom will prepare a write-up of the installation sequence and inform IPSC if any shipping splits will be required. They will also confirm that there will be no price adder.

- Explain what additional openings will be needed in the existing flooring to connect the drive.

Answer: None the Alstom proposal matched all existing openings. The only possible exception would be core drilling for the water cooling cabinet new cabling. This will have to be investigated when the drawings are submitted.

- What cost savings are available if 10,000 HP is not a requirement?

Answer: Alstom explained that the size of the drive is based on voltage, and that the proposed drive could actually be used up to 14,000 horsepower. There would be no savings if the drive was sized for only 8200 horsepower. This is only for the proposed equipment. The equipment that would have to be added when and if the drive is ever converted to 10,000 horsepower would still be required.

- Explain where the exciter is located. Is the exciter sized for 10000 hp is this fully redundant?

Answer: Each channel has an exciter located in the proposed cabinet.

- Please explain how the LCI drive is more efficient than a PWM and is this saving for the entire system (ie feed breaker through the motor)?

Answer: The LCI is more efficient than a PWM for the drive itself.

- Please furnish a list of power plants where we can see this type of drive in service, and provide contacts.

Answer: Contact Mississippi Power, Alstom to provide phone numbers.

- Please explain how the drives will be tied into the existing plant control scheme. What unique features does your drive require that will cause the plant to modify existing interlocks?

Answer: The control is same as it is now i.e. Alstom will provide the specified number of analog and digital outputs.

- Please explain the weight difference between the existing drive cabinets and those being proposed?

Answer: The exciter and input sections of the existing drive would weigh more. Alstom verified that the proposed weights are correct.

- Please explain what provisions have been made to bidders equipment to meet the seismic design requirements.

Answer: Alstom verified that the specified seismic design will be furnished and that the design will be sealed by a registered professional structural engineer.

- Can cooling equipment be shipped to site sooner.

Answer: Yes, it should be able to ship be the first of the year.

- Provide further explanation of the replacement of the existing transformers for conversion to 10,000 HP drives. What will need to be modified in the drive and transformer room?

Answer: The proposed three winding transformer is an extended delta winding and when it is installed on two drives on the same bus there is a cancellation of harmonics as long as both drives are close in speed. The reactors will also have to be replaced and the cooling system upgraded.

- Can vertically mounted coolers be furnished in place of the horizontal model shown? What are the dimensions of a vertical cooler?

Answer: Alstom will investigate and respond. The subject of a water to water heat exchanger was discussed since there is presently chilled water used to provide cooling for the room. Alstom stated that approximately 10 GPM of 65-degree water would be required for one drive. Alstom will submit an alternate for a water to water heat exchanger with redundant pumps provided on a per channel basis.

- Is it possible to vertically stack the coolers on top of the other?

Answer: Alstom to respond.

- Will the cooling cabinet rear door be assessable given the existing beams?

Answer: The water cooling section is in the delta line up which is not against the beams, therefore there will be access since the proposed drives are located front to back in the room.

- Are all the control interfaces accounted for that is listed in the specification?

Answer: Yes, per the specification. All the present interlocking will also be the same as it is now.

- Which type of terminal blocks are being furnished for IPSC cabling?

Answer: Sargent & Lundy stated that Marathon 200 terminal blocks were specified. Alstom confirmed they would be provided.

- Is any of the internal Alstom wiring PVC?

Answer: No.

- What if any PC for drive programming and diagnostics is being provided?

Answer: Alstom is not providing any PC's.

- Verify that 20% spare terminal blocks for customer use has been provided and that terminal blocks are Marathon 200.

Answer: Alstom to verify.

- Confirm that the system manuals have Viatech binders included in the pricing.

Answer: They will be provided.

Other items discussed:

Schedule was discussed and Alstom was requested to have all answers to IPSC by Monday September 29, 2003, they confirmed the date. They were told to allow for two weeks after that for notification.

Training was discussed and Alstom confirmed that 5 days of training was included. IPSC stated that there may be up to 30 people requiring the training manuals. Alstom stated that they would be provided.

Alstom stated that they had received a quote for a three winding 10 MVA transformer for $156,000. This is the quote not what IPSC would be charged. Alstom was asked if IPSC could purchaser the transformer directly and they stated yes. Alstom would prepare a specification for IPSC to purchase the transformer. The size of the proposed transformer is 134" high, 84" deep and 156" wide with a weight of 29,000 pounds.

Everything being proposed now should be for 8200 horsepower.

Jon Christensen - Attached

From: <JOHN.A.BENZ@sargentlundy.com>
To: <jon-c@ipsc.com>
Date: 9/18/2003 4:20 PM
Subject: Attached
CC: <DAVID.A.ROBERTS@sargentlundy.com>
Attachments: Food for thought.doc

Jon attached are my comments. If you need anything just call. One more question for Alstom is where will the electronics be made?

IP7012745

Jon;
The following is a listing of pro's and con's of the two drive vendors that are in contention. There are a lot of intangibles that are listed below. I have put dollars on some of them where I though it appropriate.

ITEM	ALSTOM	ROBICON
Equipment selection	Reusing the transformer, reactor and motor	Reusing only the motor
Transformer	Reused; purchase a new 3 winding and keep old ones for spares $200,000	All new transformers
Reactors	Reusing 20 years old now	New smoothing reactors
Motor	Reusing LCI drive which has 20 to 30 % harmonics.	Robicon has 2% harmonics, motor will run cooler less stress.
Motor power factor	No change	1.0 power factor to motor less motor stress and can get more HP.
Motor speed & horsepower	LCI may not be able to speed over 809 RPM on one channel; still have pf and harmonic concerns.	Should be able to get to 8200 HP and maybe 10,000 HP with no problem as well as speed increase. This would give you 952 MW with 2 ½ fans.
Cooling	Water cooled, may be able to use water from the chilled water system. Piping is $30/foot installed cost, 2-3 inch. If air to water need pad outside. Cost $90,000 total 4 VFD's most in foundation $.	Air cooled. Could divide up and use both the chilled cooling duct work and also vent outside. Maybe vent the back units outside and use chilled air for front units
Cabinets	A one for one replacement. They have to review getting the cabinets in.	All new. 3 shipping section did review how to get into room.
Future failure.	Upstairs would be difficult to get cabinets past reactors.	Reactors go away. Lots of room to slid cabinets out.
HVAC	Since water cooled the existing system should become 2-100% units A&B. However if you use a water to chilled water system you may not be able to get back to 2-100% systems on the A&B system.	Air cooled may exhaust outside.
HVAC duct work	Requires modification	Requires modification

Floor loading	Will be OK since new equipment weights less than existing.	Floor loading will have to be verified. May have to add more intake air.
Cabinet height	90" will be close when skidding in. Cable tray steel 93" lowest point.	87" with out top hat. More room for sliding.
Power cells	Will be OK for 8200 HP and even 10,000 HP	Can change to 500 amp cells and save $31,400 per channel. Can upgrade just the cell in the future if you go to 10,000HP
Identical equipment	Delta and wye side different	Both side idnetical
Aux power	Approximately the same as now	Per Robicon 7.6 MVA savings because of pf. Does save amps on bus and can sell more power.
Costs	Much less 2.4 million for all 8 drives.	Could save a little by going to 500 amp cells.
Motor cabling	See below	See below
Installation	Have to install piping, at HL&P had leaks but were found and fixed during startup.	May be easier to slide in because of 4" channel under equipment.
Service	I think fromPittsburgh	Local in Salt Lake

The motor junction box problems could be caused by "0" crossing between the rectifier and inverter. This basically puts almost a short circuit on the system and the motor leads and lugs are the weakest link. In an LCI drive the inverter is commutated by the motor and the reactor is commutated by the line. If you have line regulation problems it is possible but unlikely that both could be fired at the same time and put a fault out. Since this happens about once a year it could be the cause of the motor junction problems. This would also explain why there was one transformer cable attachment failure.

Jon one more thing is the LCI technology is old so if you go to Alstom I would get Alstom to guarantee a minimum of 20 year for part support. Remember Robicon said they would.

Bottom line is costs. You could reduce the Robicon price by using a 500 amp cells, which would give you 8200HP at 49 degrees C and 4700 feet. If you ever go to 10,000HP you could change out the cells. Robicon did verify that it would fit, I would not put in a smaller transformer. Is the fact that you get all new equipment and will have less stress on the motor if you purchase Robicon worth 2.4 million dollars? If you take credit for the 7.6 MVA savings the answer is Robicon. BUT that is not MW and if you look at just MW there would be little difference.

I don't know how much you have budgeted for but don't forget there will be installation costs. If we go to Alstom I would look at getting the money to commit to the remaining 7 units for $ 3.? Million. You might be able to get them to offer some assurances since you would be committing to all 8 units by next spring.

I still have a little concern over Alstom's present financial situation. Have you been to the Alstom factory in Pittsburgh? It may be worth a trip to see how much they have on the floor and how much engineering staff they have. If you go to Pittsburgh you could visit both Alstom and Robicon.
What does it take to justify Robicon?
The difference $2,408,905 without the Robicon 500 amp cell, if you take the 500 amp cell the difference is $1,906,505 for all eight drives. If you purchase a three winding transformer for each unit and assume you need an air to water heat exchanger for each unit you would add the following to Alstom. Transformers $400,000 water to air pad $200,000 and piping $80,000 total $680,000 which makes a difference of $1, 226,505 or $153,313 per drive. Is the aux power savings and the fact you get all new equipment worth $153,313 per drive?
If you need anything else or want to talk to me please call. Dave Roberts will also be available.

From: <gary.smith@tde.alstom.com>
To: <Jon-c@ipsc.com>, <john-l@ipsc.com>
CC: <roger.grace@tde.alstom.com>, <william.oleyar@tde.alstom.com>, <david.sm...
Date: 9/18/2003 6:11 PM
Subject: Ajustable Speed Drives - Specification 45605
Attachments: IPSC & ALSTOM Meeting 9-16-03.ZIP

Referencing our meeting of September 16, 2003, the attached documents provide replies to questions raised and information on our revised drive configuration.

Based on our meeting inputs, we have made every effort to offer a totally independent channel arrangement. Our cooling solution will eliminate any costly mounting and seismic issues associated with the outdoor heat exchangers. Our cooling package offers an efficient low impact solution for heat removal from the drive converters.

If you have any questions on the information submitted, please contact.

(See attached file: IPSC & ALSTOM Meeting 9-16-03.ZIP)
"IPSC & ALSTOM Meeting 9-16-03.doc"

Adjustable Speed Drives
IPSC and ALSTOM Meeting
September 16, 2003

As a result of our meeting on the 16th, questions were raised which required responses from ALSTOM. Additionally, after our site inspection and meeting discussions, we have made significant modifications to further increase our overall drive reliability.

1. Contact person at Mississippi

   Joel Serafin – Manager Technical Services Phone: 205-257-1348

2. Installation procedures for the first drive (2 channels)

   As a result of our site inspection, the first drive will be supplied with three shipping splits. Each shipping section will be mounted on its own pallet for shipment to the site. Before lifting to the second story drive room, each section would be transferred to a framed tank roller assembly. We would assume the lift to the second story would be accomplished via a forklift. The maximum lift would be approximately 1500 pounds.

   Once on the second floor, each section would be moved into place on the roller assembly. Reactors 16, 22 and 24 would have to be moved to allow passage of the sections because of present overhead height restrictions. Alternatively, the sections could be rotated to allow passage but this would complicate the rigging process.

   In addition to the service time already included, ALSTOM will provide a factory technician at no charge for a week (5 days) to assist in the installation process.

3. Drive Redundancy and Reliability Issues

   As a result of our meeting, ALSTOM proposes to make the following physical configuration changes to our drive line-up.

   - Each channel will be provided with its own cooling cabinet. The cooling cabinet of each channel will have redundant pumps and motors. Each channel cooling cabinet will have a plate type water-to-water heat exchanger. IPSC will need to supply as a minimum 5GPM of 20°C water to each channel.

   - Each drive channel will be provided with its own expanded HMI. The HMI screen will be mounted on the drive regulator cabinet of each channel. The common controller cabinet will be eliminated.

   - The changes made will result in the drive channels being duplicates of each other. Each channel will be fully independent.

   - Revised drawings for each of the channels have been attached showing the configuration changes and the shipping splits.

4. Pricing Impact

For the modifications and expanded scope covered by items 2 and 3 above, ALSTOM will maintain the prices as quoted in our Proposal SAD 00149 dated September 4, 2003.

From: <gary.smith@tde.alstom.com>
To: <jon-c@ipsc.com>
CC: <david.smith@tde.alstom.com>
Date: 9/19/2003 9:58 AM
Subject: Adjustable Speed Drives - Spec. 45605
Attachments: InterMtnSyncDrive-3-9-03-SHT 1-R1.ZIP; InterMtnSyncDrive-3-9-03-SHT 2-R1.ZIP; InterMtnSyncDrive-3-9-03-SHT 3-R1.ZIP

Referencing my email of Sept. 18, 2003, attached our the revised outline drawings for the drive channels and the site plan view.

If you have any questions, please contact me.

(See attached file: InterMtnSyncDrive-3-9-03-SHT 1-R1.ZIP)(See attached file: InterMtnSyncDrive-3-9-03-SHT 2-R1.ZIP)(See attached file: InterMtnSyncDrive-3-9-03-SHT 3-R1.ZIP)

From: Jon Christensen
To: John.A.Benz@sargentlundy.com
Date: 10/2/2003 11:12 AM
Subject: ID Fan Bid Analysis
Attachments: Drive Bid evaluation.xls

Please review the attached and provide me with your comments. Thanks

ID Fan Variable Frequency Drives - Economic Evaluation

Manufacturer	Allen Bradley	Allen Bradley (alt)	ABB	ABB (alt)	GE	GE (alt)	Robicon	Robicon (alt)	Alstom	Alstom
Vendor	Codale	Codale	ABB	ABB	GE	GE	Ryder	Ryder	Alstom	Alstom (alt)
2004 (one drive)	$800,000	$897,500	$763,165	$824,924	$896,040	$589,820	$822,073	$749,673	$606,000	$606,000
2005 (two drives	$1,600,000	$1,795,000	$1,400,607	$1,543,976	$1,834,710	$1,202,620	$1,636,586	$1,491,786	$1,014,000	
2006 (three drives)	$2,400,000	$2,692,500	$2,100,910	$2,315,964	$2,820,900	$1,850,430	$2,444,660	$2,227,460	$1,481,000	$3,250,000
2007 (two drives)	$1,700,000	$1,895,000	$1,400,607	$1,543,976	$1,925,390	$1,262,820	$1,629,586	$1,485,056	$1,023,000	
Total Base	**$6,500,000**	**$7,280,000**	**$5,665,289**	**$6,228,840**	**$7,477,040**	**$4,905,690**	**$6,532,905**	**$5,953,975**	**$4,124,000**	**$3,856,000**
shipping					included	$120,000	included	included	included	included
Start-up supervision					included	included	included	included	included	included
Training					$14,300	$14,300	included	included	included	included
Harmonic analysis					with bid	with bid	with bid	with bid	included	included
Torsional analysis					$29,000	$29,000	Not required	Not required	included	included
Spare parts					$75,000	$69,600	$31,442	$31,442	included	included
VFD witness testing					$2,500	$2,500	included	included	included	included
pf correction ($50/kVAR)					$748,800	$418,400	none	none	$480,800	$480,800
Cost for equipment mod.					$100,000	$100,000	$100,000	$100,000	$100,000	$100,000
Xfmr /reactor cost factor (80% material replacement for 14 xfmrs)					included	$896,000	included	included	$896,000	$896,000
Installation-reactor					$10,000	$10,000	$75,000	$75,000	none	none
Total			**N/A**		**$8,456,640**	**$6,555,490**	**$6,664,347**	**$6,085,417**	**$5,600,800**	**$5,332,800**

IP7012754

ID Fan Variable Frequency Drives - Economic Evaluation

Manufacturer	Allen Bradley	Allen Bradley (alt)	ABB	ABB (alt)	GE	GE (alt)	Robicon	Robicon (alt)	Alstom	Alstom (alt)
Vendor	Codale	Codale	ABB	ABB	GE	GE	Ryder	Ryder	Alstom	Alstom
Notes			**Not evaluated** cabinets do not fit into the existing door.		New components (xfmrs and drives) sized for 10,000 HP.	New 10,000 HP drives only.	New drives with built in reactors and xfmrs.	Xfmrs and drives derated to 8200 HP @49 C.	Drives only - sized for 10,000 HP	Alternate requires the release of the seven remaining drive systems in April 2004.

Xfmr /reactor cost factor is calculated by multiplying the cost for each of the transformers ($80,000) by 80% for replacing fourteen transformers.

Installation - reactor move costs are calculated by factoring the removal of the reactors during drive installation. The new cabinets are too wide to install in the existing aisle. Robicon requires more effort for installation because of the cabinet weight and size. Some floor modifications are required because of the location of the exisitng openings. The supply cable will have to be spliced and extended.

Equipment modification costs are calculated by the following. Robicon requires modifying the existing supply and air return to the drives and removing the duct work for the reactors. The capacity of the building air conditioner will have to be increased. Alstom and GE requires modifying the chilled water system in the building.

IP7012755

From: John Larsen
To: gary.smith@tde.alstom.com; roger.grace@tde.alstom.com
CC: Jon Christensen
Date: 10/7/2003 7:12 AM
Subject: Letter of Intent
Attachments: Letter of Intent - Alstom Power.tif

Attached is our letter of intent for Alstom to proceed with the project defined by Specifications 45605. The Contract, which will be coming your way shortly for signature, is 04-45605.

If there are questions please advise.

INTERMOUNTAIN POWER SERVICE CORPORATION

October 6, 2003

Alstom Power Conversion Inc.
General Drives
610 Epsilon Drives
Pittsburgh, PA 15238-2880
Attention: Roger Grace

Letter of Intent to Award Contract 04-45605
Induced Draft Fan Medium Voltage Frequency Drive Systems

Dear Mr. Grace:

Intermountain Power Service Corporation (IPSC) has approval to award the above referenced Contract to Alstom Power Conversion Inc. Please note that the Contract number will be 04-45605. The Contract will be awarded upon finalization of all agreed upon Commercial and Technical terms which will become part of the final Contract Documents. In an effort to prevent further delay to this Project, IPSC is sending this "Letter of Intent" as a precursor to the formal Contract. IPSC anticipates that Alstom Power Conversion Inc. will begin work on this Project immediately.

Although there has been some delay, it is imperative that the delivery schedule for the Induced Draft Fan Medium Voltage Frequency Drive Systems be on time as proposed in the Bidding Documents.

The formal Contract will be forwarded for signature within seven (7) to ten (10) working days. If you have any questions regarding this matter, please contact John Larsen at (435) 864-6537.

Sincerely,

George W. Cross
President and Chief Operations Officer

JRL:cle

c: George W. Cross
Dennis Killian
Jon Christensen
John Larsen
Contract File

850 West Brush Wellman Road, Delta, Utah 84624 / Telephone: (435) 864-4414 / FAX: (435) 864-6670 / Fed. I.D. #87-0388573

From: <roger.grace@tde.alstom.com>
To: "John Larsen" <john-l@ipsc.com>
CC: <gary.smith@tde.alstom.com>, "Jon Christensen" <JON-C@ipsc.com>
Date: 10/7/2003 10:22 AM
Subject: Re: Letter of Intent
Attachments: Letter of Intent - Alstom Power.tif

John,
Thank you for this. We do appreciate your business and vote of confidence.
We are proceeding on this basis.

Could you please address the following immediate queries:

(1) Please confirm that the initial PO will be for Qty. 1 drive unit.
There was some discussion at the bid meeting that you may in fact order
Qty. 2 initially.

(2) We would like to have an initial engineering / kick off meeting next
week Wed and Thurs. October 15/16.
Could you please confirm that these dates are convenient, and that you
would have the appropriate people available.

Thank you.

Regards,
rg

Roger Grace

Alstom Power Conversion
General Drives

Tel: 604 948 2585
Fax: 604 948 2586
Cell: 604 805 2399
e mail: roger.grace@tde.alstom.com

"John Larsen" <john-l@ipsc.com> on 10/07/2003 09:12:53 AM

To: Gary SMITH/USPIT01/TDE/ALSTOM@GA, Roger GRACE/USPIT01/TDE/ALSTOM@GA
cc: "Jon Christensen" <JON-C@ipsc.com>

Subject: Letter of Intent

Attached is our letter of intent for Alstom to proceed with the project
defined by Specifications 45605. The Contract, which will be coming
your way shortly for signature, is 04-45605.

If there are questions please advise.

(See attached file: Letter of Intent - Alstom Power.tif)

INTERMOUNTAIN POWER SERVICE CORPORATION

October 6, 2003

Alstom Power Conversion Inc.
General Drives
610 Epsilon Drives
Pittsburgh, PA 15238-2880
Attention: Roger Grace

Letter of Intent to Award Contract 04-45605
Induced Draft Fan Medium Voltage Frequency Drive Systems

Dear Mr. Grace:

Intermountain Power Service Corporation (IPSC) has approval to award the above referenced Contract to Alstom Power Conversion Inc. Please note that the Contract number will be 04-45605. The Contract will be awarded upon finalization of all agreed upon Commercial and Technical terms which will become part of the final Contract Documents. In an effort to prevent further delay to this Project, IPSC is sending this "Letter of Intent" as a precursor to the formal Contract. IPSC anticipates that Alstom Power Conversion Inc. will begin work on this Project immediately.

Although there has been some delay, it is imperative that the delivery schedule for the Induced Draft Fan Medium Voltage Frequency Drive Systems be on time as proposed in the Bidding Documents.

The formal Contract will be forwarded for signature within seven (7) to ten (10) working days. If you have any questions regarding this matter, please contact John Larsen at (435) 864-6537.

Sincerely,

George W. Cross
President and Chief Operations Officer

JRL:cle

c: George W. Cross
Dennis Killian
Jon Christensen
John Larsen
Contract File

850 West Brush Wellman Road, Delta, Utah 84624 / Telephone: (435) 864-4414 / FAX: (435) 864-6670 / Fed. I.D. #87-0388573

From: <david.smith@tde.alstom.com>
To: <jon-c@ipsc.com>
CC: <roger.grace@tde.alstom.com>, <william.oleyar@tde.alstom.com>, <john.bra...
Date: 10/8/2003 2:15 PM
Subject: Re: Letter of Intent

Jon,

Thank you for your vote of confidence.

Regarding next week's meetings, I understand that you have spoken to Roger about this and already understand that we are coming prepared for two days but will try to fit everything into one day. Here are the things that I believe we need to cover: -

Spec. review and comments. We need to leave the meeting with a clear understanding of your requirements and a document that we have agreed as the basis for our contract. This, in and of itself could take the best part of a day to plod through but, I hope that you agree, does need to be done. It also serves to make sure that our people fully understand your wishes before the contract specific design work begins.

It will be necessary to revisit the installed drives to let our project people see the existing equipment and what will be necessary for the replacement. I expect that we will need a couple of hours for this.

A review of the I/O should be done in some detail so that we are clear about the interfaces. 1 hour?

Similarly we need to go over the schedule for the project. Again 1 hour?

Finally we should go through the list of submittal requirements, one by one to make sure that each will be addressed. Perhaps 1 more hour.

If we are lucky and get through the spec. say before lunch, we might just squeeze everything into one day. However, the above does not allow for anything you may want to cover in more detail (things like the cooler arrangements, harmonics, power factor, etc. must come up during our spec review) so I felt that we should provision for two days.

As you can see the above matters are of a technical rather than commercial nature. If any commercial issues need to be addressed I expect that Roger will be able to deal with these in a side meeting.

I look forward to seeing you next week.

Sincerely,

David M Smith

---------- Forwarded by David SMITH/USPIT01/TDE/ALSTOM on 10/08/2003 03:40 PM ----------

Roger GRACE
10/07/2003 10:27 AM

To: Ron DORRIAN/DCU/DRC/ICG/GECALSTHOM@GA
cc: David SMITH/DCU/DRC/ICG/GECALSTHOM@GA, Gary SMITH/USPIT01/TDE/ALSTOM

Subject: Re: Letter of Intent

---------- Forwarded by Roger GRACE/USPIT01/TDE/ALSTOM on 10/07/2003 10:27 AM ----------

"Jon Christensen" <JON-C@ipsc.com> on 10/07/2003 12:41:17 PM

To: Roger GRACE/USPIT01/TDE/ALSTOM@GA
cc: "John Larsen" <john-l@ipsc.com>

Subject: Re: Letter of Intent

The purchase order will be for one drive assembly (two channels) for one Induced Draft Fan. There was some discussion about ordering two drive assemblies to take advantage of Alstom's proposal of reduced pricing if all of the drive units were ordered in 2004 but we will discuss other ordering options after the first unit is installed and tested.

I will be available on October 15 and 16 for the initial kickoff meeting. Please send me a list of items you feel we need to cover at this meeting. In addition, please prepare a preliminary schedule for completing this work.

I appreciate your efforts in the bid process and look forward to working with you on this project.

>>> <roger.grace@tde.alstom.com> 10/7/2003 7:19:23 AM >>>

John,
Thank you for this. We do appreciate your business and vote of confidence.
We are proceeding on this basis.

Could you please address the following immediate queries:

(1) Please confirm that the initial PO will be for Qty. 1 drive unit.
There was some discussion at the bid meeting that you may in fact order
Qty. 2 initially.

(2) We would like to have an initial engineering / kick off meeting next
week Wed and Thurs. October 15/16.
Could you please confirm that these dates are convenient, and that you would have the appropriate people available.

Thank you.

Regards,
rg

Roger Grace

Alstom Power Conversion
General Drives

Tel: 604 948 2585
Fax: 604 948 2586
Cell: 604 805 2399
e mail: roger.grace@tde.alstom.com

"John Larsen" <john-l@ipsc.com> on 10/07/2003 09:12:53 AM

To: Gary SMITH/USPIT01/TDE/ALSTOM@GA, Roger GRACE/USPIT01/TDE/ALSTOM@GA
cc: "Jon Christensen" <JON-C@ipsc.com>

Subject: Letter of Intent

Attached is our letter of intent for Alstom to proceed with the project
defined by Specifications 45605. The Contract, which will be coming your way shortly for signature, is 04-45605.

If there are questions please advise.

(See attached file: Letter of Intent - Alstom Power.tif)

From: Jon Christensen
To: John.A.Benz@sargentlundy.com
Date: 10/9/2003 12:28 PM
Subject: Fwd: Re: Letter of Intent

>>> <david.smith@tde.alstom.com> 10/8/2003 3:06:35 PM >>>
Jon,

Thank you for your vote of confidence.

Regarding next week's meetings, I understand that you have spoken to Roger about this and already understand that we are coming prepared for two days but will try to fit everything into one day. Here are the things that I believe we need to cover: -

Spec. review and comments. We need to leave the meeting with a clear understanding of your requirements and a document that we have agreed as the basis for our contract. This, in and of itself could take the best part of a day to plod through but, I hope that you agree, does need to be done. It also serves to make sure that our people fully understand your wishes before the contract specific design work begins.

It will be necessary to revisit the installed drives to let our project people see the existing equipment and what will be necessary for the replacement. I expect that we will need a couple of hours for this.

A review of the I/O should be done in some detail so that we are clear about the interfaces. 1 hour?

Similarly we need to go over the schedule for the project. Again 1 hour?

Finally we should go through the list of submittal requirements, one by one to make sure that each will be addressed. Perhaps 1 more hour.

If we are lucky and get through the spec. say before lunch, we might just squeeze everything into one day. However, the above does not allow for anything you may want to cover in more detail (things like the cooler arrangements, harmonics, power factor, etc. must come up during our spec review) so I felt that we should provision for two days.

As you can see the above matters are of a technical rather than commercial nature. If any commercial issues need to be addressed I expect that Roger will be able to deal with these in a side meeting.

I look forward to seeing you next week.

Sincerely,

David M Smith

---------- Forwarded by David SMITH/USPIT01/TDE/ALSTOM on

10/08/2003 03:40 PM ----------

Roger GRACE
10/07/2003 10:27 AM

To: Ron DORRIAN/DCU/DRC/ICG/GECALSTHOM@GA
cc: David SMITH/DCU/DRC/ICG/GECALSTHOM@GA, Gary SMITH/USPIT01/TDE/ALSTOM

Subject: Re: Letter of Intent

---------- Forwarded by Roger GRACE/USPIT01/TDE/ALSTOM on 10/07/2003 10:27 AM ----------

"Jon Christensen" <JON-C@ipsc.com> on 10/07/2003 12:41:17 PM

To: Roger GRACE/USPIT01/TDE/ALSTOM@GA
cc: "John Larsen" <john-l@ipsc.com>

Subject: Re: Letter of Intent

The purchase order will be for one drive assembly (two channels) for one Induced Draft Fan. There was some discussion about ordering two drive assemblies to take advantage of Alstom's proposal of reduced pricing if all of the drive units were ordered in 2004 but we will discuss other ordering options after the first unit is installed and tested.

I will be available on October 15 and 16 for the initial kickoff meeting. Please send me a list of items you feel we need to cover at this meeting. In addition, please prepare a preliminary schedule for completing this work.

I appreciate your efforts in the bid process and look forward to working with you on this project.

>>> <roger.grace@tde.alstom.com> 10/7/2003 7:19:23 AM >>>

John,
Thank you for this. We do appreciate your business and vote of confidence.
We are proceeding on this basis.

Could you please address the following immediate queries:

(1) Please confirm that the initial PO will be for Qty. 1 drive unit.
There was some discussion at the bid meeting that you may in fact order
Qty. 2 initially.

(2) We would like to have an initial engineering / kick off meeting next
week Wed and Thurs. October 15/16.
Could you please confirm that these dates are convenient, and that you

would have the appropriate people available.

Thank you.

Regards,
rg

Roger Grace

Alstom Power Conversion
General Drives

Tel: 604 948 2585
Fax: 604 948 2586
Cell: 604 805 2399
e mail: roger.grace@tde.alstom.com

"John Larsen" <john-l@ipsc.com> on 10/07/2003 09:12:53 AM

To: Gary SMITH/USPIT01/TDE/ALSTOM@GA, Roger GRACE/USPIT01/TDE/ALSTOM@GA
cc: "Jon Christensen" <JON-C@ipsc.com>

Subject: Letter of Intent

Attached is our letter of intent for Alstom to proceed with the project
defined by Specifications 45605. The Contract, which will be coming your way shortly for signature, is 04-45605.

If there are questions please advise.

(See attached file: Letter of Intent - Alstom Power.tif)

Jon Christensen - Notes

From: <JOHN.A.BENZ@sargentlundy.com>
To: <jon-c@ipsc.com>
Date: 10/17/2003 10:01 AM
Subject: Notes
CC: <DAVID.A.ROBERTS@sargentlundy.com>
Attachments: Meeting 101503.doc

Jon attached are my notes from our meeting, please review and issue to ALSTOM.
Don't forget to forward an electronic copy of the spec and any letters you have from ALSTOM so I can revise the spec for contract.

Thanks
John Benz
10/17/03

IP7012767

Meeting with ALSTOM on 10/15/03 at IPSC.
Those present:

Jon P. Christensen	IPSC
David M. Smith	ALSTOM
Roger Grace	
Steve	
John	
Ivan	
John A. Benz	Sargent & Lundy

The purpose of the meeting was to review the contract and walk down the Variable Speed Drive (VFD) room as part of IPSC's reliability improvement project for the I D Fans.

IPSC (Jon Christensen) stated that Gerry Finlinson is the controls engineer, Pam Bahr is the electrical engineer, Kevin Miller is the maintenance planner, and Bob Wright is the supervisor of the Unit 2 electricians.

All technical items should be directed to Jon Christensen and all commercial items should be directed to John Larson. ALSTOM (Steve) said that the T&C' s were all agreed to.

IPSC reminded ALSTOM that they needed to forward the letter to IPSC stating that they will support the VFD's that are part of the project for the next 20 years including spare part availability. This will become part of the contract.
Action: ALSTOM to provide letter week of 10/20/03.

The Unit 2 outage starts after load reduction in LA on 2/27/04, at 7 AM on the 28th IPSC electricians will disconnect all field cables and pull them back to the cable tray under the drives. This is scheduled for one day, the removal of 2D existing VFD's will start on 2/29/04 and the setting in place of the new 2D drives will be complete on 3/1/04. ALSTOM will be on site for inspection of the new equipment. After inspection ALSTOM shall provide a letter to IPSC stating that the equipment is installed correctly and the warranty is in effect.

IPSC requested advanced training for their personal so they can become familiar with the system and the controls. ALSTOM stated that they have a 4-day class but it includes some generic information on LCI type drives. ALSTOM may reduce the class to a 3-day class since the majority of IPSC personal are familiar with LCI drives. ALSTOM to provide a quote to IPSC for a training class on just the controls with additional time for generic LCI training if IPSC would want to sent some personal for generic training.
Action: ALSTOM to provide letter week of 10/20/03.

Spare parts was discussed and it was agreed that any spare parts that are used during startup will be replaced at no cost to IPSC this is necessary so IPSC has a full set of spare parts after startup.

It was agreed that there would be a status conference call every two weeks the exact day will be agreed upon later.

The schedule in the proposal was discussed and it was agreed that the days for submittal are working days not calendar days. Based on this the following is a list of submittals and the dates they are due.

TASKS	DATE
Efficiency & pf values	10/27/03 (15 days)
Detailed schedule	10/27/03 (15 days)
Detailed Engineering Sch	10/27/03 (15 days)
Procurement sch	10/27/03 (15 days)
Outline drawings	10/27/03 (15 days)
Design conference	10/27/03 (15 days)
Torsional Analysis HOLD	11/3/03 (20 days)
Interface & Seismic	11/3/03 (20 days)
Anchor bolt complete	11/3/03 (20 days)
Schematic & Wiring	11/17/03 (30 days)
Hazardous Material Doc	11/3/03 (20 days)
I/O list to plant control	11/3/03 (20 days)
Block diagrams	11/3/03 (20 days)
Single lines	11/3/03 (20 days)
Recommended erection	11/3/03 (20 days)

ALSOM handed out a schedule that showed the wiring and schematics much earlier 1027/03. After some discussion it was agreed that the drawings would be submitted via AUTO CAD with one hard copy. It was also agreed that the drawing (outlines, wiring and schematics and I/O list would be submitted by the end of October and that a review meeting would be held the first week of November (11/4/03) at IPSC office. ALSTOM to confirm the date by 10/21/03.
Action: ALSTOM to confirm date for drawing review at IPSC office.

IPSC stressed the on site date and stated that the drive shall be on site no latter than 2/25/04.

The water to water heat exchanger was discussed and IPSC confirmed that their water is a 50-50 mixture of water and glycol. ALSTOM stated that they intend to use pure water in their equipment.

The color of the drive cabinets was discussed and ALSTOM stated they would provide any color IPSC wanted. It was agreed that the cabinet would be ANSI 61 gray.

IPSC stressed the fact that MSDS sheets were required on everything including the resin, touch up paint and any lubricant that is furnished.

IPSC stressed that their unique number had to be added to all ALSTOM drawings and on anything that interfaces with IPSC.

ALSOTM stated that no special tools were required. After some discussion it was agreed that a special crimp tool may be required to replace some internal wiring if it every became necessary. ALSTOM to provide cut sheets on any special tools required.
Action: ALSTOM to provide cut sheets the week of 10/20/03.

IPSC stressed that everything had to be screwed down including the wire raps no clueing is allowed however it is acceptable to use stickon wire raps providing they are screwed down before shipment. IPSC also requested that AVO International (States) type terminal blocks be used for all connections to IPSC wiring. Indicating lights were also discussed and IPSC stressed that all indicating lights should be large i.e. 32 mm. ALSTOM to verify that indicating lights are being furnished for the contactor.

Instruction books were discussed and ALSTOM requested that have at least one month after startup to include all documentation in the instruction books. IPSC stated they would not award the next drive until they have received all documentation including final instruction books and had sufficient time to review them, a minimum of 30 days.

The interface with the motor was discussed. IPSC requested a letter from ALSTOM detailing everything that TECO Westinghouse had to review including what was necessary for 8200 HP and single channel operation. The list should be very specific.
Action: ALSTOM to provide letter week of 10/20/03.

ALSTOM to provide a take out price for deletion of the torsional analysis.
Action: ALSTOM to provide takeout price the week of 10/20/03.

The I/O list was discussed and it was agreed that ALSTOM would submit a revise the I/O list based on the external cabling and submit to IPSC early next week. ALSTOM stated they would wire all spare I/O points to terminal blocks.
Action: ALSTOM to submit revised I/O list by 10/22/03.

The only items on the doors of the drive will be the HMI, a reset push button and the programming port.

ALSTOM discussed an encoder and suggested that it be added to the motor. IPSC will investigate and inform ALSTOM if they plan on adding it.

John Benz
10/17/03

From: <john.bradley@tde.alstom.com>
To: <jon-c@ipsc.com>
Date: 10/18/2003 10:46 AM
Subject: Cabling questions

John,

In reviewing the I/O for the upcoming drives I have the following questions.

Refer to 2CCE-K2128B (ID2 Cabling Diagram). Cable # 18 color R-BK currently lands on 5TB: C1721. From my understanding, this cable goes to the Modicon however this d/i is designated as going to the Switchgear (see Westinghouse Dwg 5065C890 sht C17).
Refer to 2CCE-K2128B (ID2 Cabling Diagram). Cable # 15 color BK & R currently lands on Incomig Cabinet B212 & B214. From my understanding, this cable goes to the Modicon however this d/i is designated as going to the Switchgear (see Westinghouse Dwg 5065C890 sht B2).
With respect to the Annunciator, do you have the capability of fitting new windows thereto. I ask this as some of the annunciations are no longer valid and I would like to change the engravings to be more descriptive.
What would you like the drive to do if it loses the speed reference from the control room?

Regards

jb

From: <steve.klein@tde.alstom.com>
To: <jon-c@ipsc.com>, <roger.grace@tde.alstom.com>, <david.smith@tde.alstom....
CC: <ron.dorrian@tde.alstom.com>, <william.oleyar@tde.alstom.com>, <gary.smi...
Date: 10/20/2003 11:42 AM
Subject: GD70107 - Intermountain Power Adjustable Speed Drive Project kick-offmeeting minutes
Attachments: GD70107 Meeting at IPSC 101503.ZIP

Gentlemen,

Attached please find minutes from our meeting of Wednesday October 15, 2003.

(See attached file: GD70107 Meeting at IPSC 101503.ZIP)
"GD70107 Meeting at IPSC 101503.doc"

Best Regards,

Steve Klein

Alstom Power Conversion Inc.

610 Epsilon Drive

Pittsburgh, PA 15238

Phone: 412-967-7168

Fax: 412-967-9326

αβχδ

MEETING REPORT

Project:	GD70107 – Intermountain Power Adj Speed Drive	Date of Meeting:	10/15/03
Venue:	Delta, Utah	Date of Issue:	10/18/03
Subject:	Project Kick-off meeting	No. of Pgs.:	1 of 4
Author:	S. P. Klein	Ref:	

Present:

John Benz, Sargent & Lundy

Jon Christensen, IPSC

Roger Grace, ALSTOM

Dave Smith, ALSTOM

John Bradley, ALSTOM

Ivan Martorell, ALSTOM

Steve Klein, ALSTOM

Copies:

R. Dorrian, ALSTOM

B. Oleyar, ALSTOM

G. Smith, ALSTOM

Subject: Minutes of Meeting

ACTION

- Jon Christensen of Intermountain Power (IPSC) advised site work schedule:
  - IPSC will disconnect existing drives morning of 2/28/04
  - IPSC contractor will disassemble & remove existing drive and install new ALSTOM drive – 2/29 – 3/03/04
  - IPSC will connect/cable ALSTOM drive immediately following installation
- The main focus of the project is reliability improvement and to address

ALSTOM Power Conversion Inc.
610 Epsilon Drive
Pittsburgh, PA 15238-2880 USA
Tel.: +1 (412) 967 0765
Fax: +1 (412) 967 7660
www.alstom.com

ACTION

lack of availability of maintenance, parts availability and problems with nuisance trips

- John Christensen identified IPSC personnel involved in the project

- Pam Bahr, Electrical Engineer; Kevin Miller, Maintenance Planner; Bob Wright, Electrical Supervisor for electricians; John Larsen, Purchasing agent and Brett Kent, mechanical engineer

- IPSC requested a letter advising 20 years of support, as promised — G. Smith
- Specification 45606, Part F was reviewed. The specification was marked-up with applicable comments and changes to be incorporated in a revised version by IPSC. Steve Klein is in possession of ALSTOM's marked-up copy. The following issues/actions were raised, additional to the simple spec mark-ups.
  - A letter is to be issued by ALSTOM following installation confirming provision & installation in accordance with the specification and identifying the start of the warranty period. — S. Klein
  - ALSTOM will quote a SIGMA training class for prior to testing. This is in addition to the training included in the proposal. — S. Klein
  - Start-up spares identified in section 2.1 & 2.2 of proposal shall be delivered with the drive
  - Schedule shall be updated on 1st of each month. An initial project schedule was distributed by ALSTOM. IPSC requested interim conference calls be held. — S. Klein
  - Autocad 2002 format is acceptable to IPSC for drawing transmittal. Submittal requirements defined in specification.
  - Week of 11/3/03 tentatively set for drawing review meeting. ALSTOM to confirm by 10/22/03. — S. Klein
  - Cooling water supply requirement to be reviewed by ALSTOM relative to 50/50 glycol solution. — D. Smith
  - IPSC provided additional plant details to John Bradley, including operating procedures, detailed floor plan, schematics/wiring diagrams, drive Instruction Books (IBs).

	ACTION
- 10 day notice is required prior to start of test & shipment.	S. Klein
- MSDS to be provided for mixed resin bed, any touch-up paint, thyristor grease and any other similar chemicals.	S. Klein
- Cabinet shall be painted ANSI 61 gray and touch-up paint shall be supplied.	
- IPSC drawing numbers must appear on ALSTOM drawings and IPSC will advise ID numbers for certain components at drawing review meeting.	
- Weidmuller crimp tool cut sheets shall be provided, 1 tool 10/12 ga. and 1 tool 14 ga. and higher.	S. Klein
- Extra ferrules and 20% extra terminal blocks shall be supplied.	Martorell/ Bradley
- Ribbon cables are to be labeled with sources on each end.	
- States TBs are preferred by IPSC. ALSTOM to confirm size can be accommodated and if so, quote adder for their use.	Martorell/ Klein
- Storage/Off-loading/Installation-Startup guidelines are to be provided 30 days prior to delivery.	ALSTOM
- Final IBs are required 30 days after startup. Draft copy to be provided 30 days before shipment.	ALSTOM
- A release is required from IPSC for shipment.	
- IPSC will send representative(s) to witness system testing at their expense. It is IPSC's position that expenses for witnessing of re-testing, performed at a later date due to ALSTOM problems at the original testing, should be to ALSTOM's account.	D. Smith
- ALSTOM to submit specific questions for motor manufacturer re: up-rating beyond current scope.	
- ALSTOM will quote take-out price for Torsional Analysis.	G. Smith/ Klein
- Spec. section F7-8, Programming & Communication will be rewritten by ALSTOM for inclusion in the revised specification.	D. Smith

	ACTION
- Harmonic study was done based upon 32KA. A correction factor may be applied to field test results if less than 32KA at time of test.	
- Door meters are not needed for analog signals.	
- I/O schedule to be submitted by ALSTOM by 10/24/03.	J. Bradley
- ALSTOM proposed IPSC consider adding encoders to facilitate start-up from non-moving fan condition. Jon Christensen will consider.	
- ALSTOM to submit response to $50/KVAR penalty based upon power factor evaluation.	G. Smith/D. Smith
- ALSTOM to confirm type of door lights (if any) to be used.	S. Klein

- Existing equipment was inspected and required measurements taken.

From: <john.bradley@tde.alstom.com>
To: <jon-c@ipsc.com>
CC: <gary.smith@tde.alstom.com>, <steve.klein@tde.alstom.com>
Date: 10/21/2003 1:36 PM
Subject: ID Fan I/O Schedule
Attachments: IPP IO Spec.ZIP

Jon,

Attached, please find the I/O schedule that the drives will be designed to. Please note that I have not included any internal I/O (PSU Failure etc) as this only affects the external i/o.

Regards

John

(See attached file: IPP IO Spec.ZIP)
"IPP IO Spec.xls"

				Ch 1 Channel				Ch 2 Channel			
I/O	Address	New Description	TB	Current Termination	Cable #	Color	Destination	Current Termination	Cable #	Color	Destination
Sigma Digital Inputs	A1.0	Off	5TB	B2CX C1811	2CCE-K2127 B12	BK Y	Modicon	B2CX C1811	2CCE-K2128 B18	BK Y	Modicon
	A1.1	Turning Gear		B2CX C1812		Com BL		B2CX C1812		Com BL	
	A1.2	Run		B2CX C1813		Com O		B2CX C1813		Com O	
	A1.3	Start	5TB	B2CX C1823		Com BR		B2CX C1823		Com BR	
	A1.4	Output Disconect Closed	5TB	B2CX C1720	2CCE-K2127 B07	BK R	Output Disconnect	B2CX C1720	2CCE-K2128 B07	BK R	Output Disconnect
			EXX-V	C2X C213	2CCE-K2127 B06	BR R-BK	Output Disconnect	C2X C213	2CCE-K2128 B06	BR R-BK	Output Disconnect
	A1.5	Reactor Fan Fail Alarm OK	5TB	B2CX C1714	2CCE-K2127 B01	BK R	Reactor Cabinet	B2CX C1714	2CCE-K2128 B01	BK R	Reactor Cabinet
	A1.6	Reactor Temp Trip OK	5TB	C1715 B2CX C1716		BL Com O		C1715 B2CX C1716		BL Com O	
	A1.7	Slave Input (From Other Ch's Master O/P)			NEW CABLE		Ch 2 Regualtor		NEW CABLE		Ch 1 Regualtor
	A2.0	Other Ch Running	5TB	C1725 B2CX	2CCE-K2128 B25	R BK	Ch 2 Regualtor	C1725 B2CX	2CCE-K2128 B19	R BK	Ch 1 Regualtor
	A32.1	Position Sensor 1			NEW CABLE				NEW CABLE		
	A32.2	Position Sensor 2									
	A32.3	Position Sensor 3									
	A32.7	Pulse Release Permissive			Internal				Internal		
Sigma Digital Outputs	B1.8	Drive Healthy (DHR)	EXX V	C1930 C1931	2CCE-K2127 B14	BR Com	Modicon	C1930 C1931	2CCE-K2128 B14	BR Com	Modicon
	B1.9	Drive Alarm (DAR)	EXX V	C1934 C1935	2CCE-K2127 B08	BK R-Com	Annunciator	C1934 C1935	2CCE-K2128 B26	BK R-Com	Annunciator
	B1.10	I/P Bkr Trip (IBT)	A20TB	C2011 C2012	2CCE-K2127 B02	BK-1 W-1	Bkr Trip Pnl (Module)	C2011 C2012	2CCE-K2128 B02	BK-1 W-1	Bkr Trip Pnl (Module)
			EXX V	C1928 C1929	2CCE-K2127 B14	BK R	Modicon	C1928 C1929	2CCE-K2128 B14	Y Com	Modicon
			EXX V	C1936 C1937	2CCE-K2127 B08	BL Com	Annunciator	C1936 C1937	2CCE-K2128 B26	BL Com	Annunciator
	B1.11	Close Exc (FCC)	Internal								
	B1.13	Close Output Disconnect	EXX V	B7A13 B7A14	2CCE-K2127 B06	BL O	Output Disconnect	B7A13 B7A14	2CCE-K2128 B06	BL O	Output Disconnect
	B1.14	Spare									
	B1.15	Spare									
	B3.0	Zero Speed	EXX V	C1942	2CCE-K2128 B23	BK	D Channel	C1942	2CCE-K2128 B14 2CCE-K2128 B23	O BK	Modicon D Channel
				C1943		R-Com	D Channel	C1943	2CCE-K2128 B23	R-Com	D Channel
	B3.1	Min Speed		C1944		BL	D Channel	C1944	2CCE-K2128 B14 2CCE-K2128 B23	BL BL	Modicon D Channel
								C1945	2CCE-K2128 B14	Com	Modicon
	B3.2	Turning Gear Speed		C1954		Y	D Channel	C1954	2CCE-K2128 B14 2CCE-K2128 B23	R Y	Modicon D Channel
								C1955	2CCE-K2128 B14	BK-Com	Modicon
	B3.3	Speed Reference Lost		C1946 C1947	2CCE-K2127 B09	BK R	Bailey	C1946 C1947	2CCE-K2128 B24 2CCE-K2128 B24	BK R	Bailey
	B3.4	Running Speed									
	B3.5	Master Slave Output (To Other Ch's Slave I/P)			NEW CABLE		Ch 2 Regualtor		NEW CABLE		Ch 1 Regualtor
	B3.6	This Ch Running	EXX V	MP1-8 MP1-9	2CCE-K2128 B19	BK R	Ch 2 Regualtor	MP1-8 MP1-9	2CCE-K2128 B25	BK R	Ch 1 Regualtor
	B3.7	Spare									
Sigma Analogue Inputs	C14	Customer Speed Ref	A20TB	C917 C918	2CCE-K2127 B10	BK W	Bailey Boiler Control	C917 C918	2CCE-K2128 B22	BK W	Bailey Boiler Control
	C15	Torque Ref Input	ATB19	C3317 C3318	2CCE-K2128 B21	W-1 BK-1	Ch 2 Regulator	C3317 C3318	2CCE-K2128 B21	W-2 BK-2	Ch 1 Regulator
	C16	Spare from other channel									
	C17	Spare									
Sigma Analogue Outputs	D0	Exciter Reference									
	D1	Torque Ref Output	ATB19	C3313 C3314	2CCE-K2128 B21	W-2 BK-2	Ch 2 Regulator	C3313 C3314	2CCE-K2128 B21	W-1 BK-1	Ch 1 Regulator
	D2	Spare to other channel									
	D3	Spare									
	D4	Motor Speed						C33B11 C33B12	2CCE-K2128 B09		Bailey Boiler Control
			EXX H	C3315 C3316 C3311 C3312	2CCE-K2128 B08	BK-1 W-1 BK-2 W-2	Ch 2 Regulator	MP1-5 MP1-14 MP11-5 MP11-14	2CCE-K2128 B08	BK-1 W-1 BK-2 W-2	Ch 1 Regulator
	D5	Motor Voltage	3TB	C3323 C3324	2CCE-K2104 C03	BK-1 W-1	Metering Controll Panel (MCP)	C3323 C3324	2CCE-K2104 C04	BK-1 W-1	Metering Controll Panel (MCP)
	D6	Motor Current	3TB	C911 C912		BK-2 W-2		C911 C912		BK-2 W-2	
	D7	Spare									

IP7012778

From: Jon Christensen
To: John.A.Benz@sargentlundy.com
Date: 10/22/2003 4:07 PM
Subject: Fwd: GD70107 - Intermountain Power Adjustable Speed Drive Project kick-offmeeting minutes
Attachments: GD70107 Meeting at IPSC 101503.ZIP

Jon P. Christensen
Supervising Engineer
Intermountain Power Corp

This e-mail, including attachments, contains information that is confidential. This e-mail, including attachments, constitutes non-public information intended to be conveyed only to the designated recipient(s). If you are not an intended recipient, please delete this e-mail, including attachments, and notify me. The unauthorized use, dissemination, distribution or reproduction of this e-mail, including attachments, is prohibited and may be unlawful.

>>> <steve.klein@tde.alstom.com> 10/20/2003 12:32:27 PM >>>

Gentlemen,

Attached please find minutes from our meeting of Wednesday October 15, 2003.

(See attached file: GD70107 Meeting at IPSC 101503.ZIP)
"GD70107 Meeting at IPSC 101503.doc"

Best Regards,

Steve Klein

Alstom Power Conversion Inc.

610 Epsilon Drive

Pittsburgh, PA 15238

Phone: 412-967-7168

Fax: 412-967-9326

αβχδ

MEETING REPORT

Project:	GD70107 – Intermountain Power Adj Speed Drive	Date of Meeting:	10/15/03
Venue:	Delta, Utah	Date of Issue:	10/18/03
Subject:	Project Kick-off meeting	No. of Pgs.:	1 of 4
Author:	S. P. Klein	Ref:	

Present:

John Benz, Sargent & Lundy

Jon Christensen, IPSC

Roger Grace, ALSTOM

Dave Smith, ALSTOM

John Bradley, ALSTOM

Ivan Martorell, ALSTOM

Steve Klein, ALSTOM

Copies:

R. Dorrian, ALSTOM

B. Oleyar, ALSTOM

G. Smith, ALSTOM

Subject: Minutes of Meeting

ACTION

- Jon Christensen of Intermountain Power (IPSC) advised site work schedule:
  - IPSC will disconnect existing drives morning of 2/28/04
  - IPSC contractor will disassemble & remove existing drive and install new ALSTOM drive – 2/29 – 3/03/04
  - IPSC will connect/cable ALSTOM drive immediately following installation
- The main focus of the project is reliability improvement and to address

ALSTOM Power Conversion Inc.
610 Epsilon Drive
Pittsburgh, PA 15238-2880 USA
Tel.: +1 (412) 967 0765
Fax: +1 (412) 967 7660
www.alstom.com

ACTION

lack of availability of maintenance, parts availability and problems with nuisance trips

- John Christensen identified IPSC personnel involved in the project

- Pam Bahr, Electrical Engineer; Kevin Miller, Maintenance Planner; Bob Wright, Electrical Supervisor for electricians; John Larsen, Purchasing agent and Brett Kent, mechanical engineer

- IPSC requested a letter advising 20 years of support, as promised — G. Smith
- Specification 45606, Part F was reviewed. The specification was marked-up with applicable comments and changes to be incorporated in a revised version by IPSC. Steve Klein is in possession of ALSTOM's marked-up copy. The following issues/actions were raised, additional to the simple spec mark-ups.
  - A letter is to be issued by ALSTOM following installation confirming provision & installation in accordance with the specification and identifying the start of the warranty period. — S. Klein
  - ALSTOM will quote a SIGMA training class for prior to testing. This is in addition to the training included in the proposal. — S. Klein
  - Start-up spares identified in section 2.1 & 2.2 of proposal shall be delivered with the drive
  - Schedule shall be updated on 1st of each month. An initial project schedule was distributed by ALSTOM. IPSC requested interim conference calls be held. — S. Klein
  - Autocad 2002 format is acceptable to IPSC for drawing transmittal. Submittal requirements defined in specification.
  - Week of 11/3/03 tentatively set for drawing review meeting. ALSTOM to confirm by 10/22/03. — S. Klein
  - Cooling water supply requirement to be reviewed by ALSTOM relative to 50/50 glycol solution. — D. Smith
  - IPSC provided additional plant details to John Bradley, including operating procedures, detailed floor plan, schematics/wiring diagrams, drive Instruction Books (IBs).

	ACTION
- 10 day notice is required prior to start of test & shipment.	S. Klein
- MSDS to be provided for mixed resin bed, any touch-up paint, thyristor grease and any other similar chemicals.	S. Klein
- Cabinet shall be painted ANSI 61 gray and touch-up paint shall be supplied.	
- IPSC drawing numbers must appear on ALSTOM drawings and IPSC will advise ID numbers for certain components at drawing review meeting.	
- Weidmuller crimp tool cut sheets shall be provided, 1 tool 10/12 ga. and 1 tool 14 ga. and higher.	S. Klein
- Extra ferrules and 20% extra terminal blocks shall be supplied.	Martorell/ Bradley
- Ribbon cables are to be labeled with sources on each end.	
- States TBs are preferred by IPSC. ALSTOM to confirm size can be accommodated and if so, quote adder for their use.	Martorell/ Klein
- Storage/Off-loading/Installation-Startup guidelines are to be provided 30 days prior to delivery.	ALSTOM
- Final IBs are required 30 days after startup. Draft copy to be provided 30 days before shipment.	ALSTOM
- A release is required from IPSC for shipment.	
- IPSC will send representative(s) to witness system testing at their expense. It is IPSC's position that expenses for witnessing of re-testing, performed at a later date due to ALSTOM problems at the original testing, should be to ALSTOM's account.	D. Smith
- ALSTOM to submit specific questions for motor manufacturer re: up-rating beyond current scope.	G. Smith/ Klein
- ALSTOM will quote take-out price for Torsional Analysis.	D. Smith
- Spec. section F7-8, Programming & Communication will be rewritten by ALSTOM for inclusion in the revised specification.	

	ACTION
- Harmonic study was done based upon 32KA. A correction factor may be applied to field test results if less than 32KA at time of test.	
- Door meters are not needed for analog signals.	
- I/O schedule to be submitted by ALSTOM by 10/24/03.	J. Bradley
- ALSTOM proposed IPSC consider adding encoders to facilitate start-up from non-moving fan condition. Jon Christensen will consider.	
- ALSTOM to submit response to $50/KVAR penalty based upon power factor evaluation.	G. Smith/D. Smith
- ALSTOM to confirm type of door lights (if any) to be used.	S. Klein

- Existing equipment was inspected and required measurements taken.

From: Jon Christensen
To: John.A.Benz@sargentlundy.com
Date: 10/22/2003 4:08 PM
Subject: Fwd: ID Fan I/O Schedule
Attachments: IPP IO Spec.ZIP

Jon P. Christensen
Supervising Engineer
Intermountain Power Corp

This e-mail, including attachments, contains information that is confidential. This e-mail, including attachments, constitutes non-public information intended to be conveyed only to the designated recipient(s). If you are not an intended recipient, please delete this e-mail, including attachments, and notify me. The unauthorized use, dissemination, distribution or reproduction of this e-mail, including attachments, is prohibited and may be unlawful.

>>> <john.bradley@tde.alstom.com> 10/21/2003 2:27:02 PM >>>
Jon,

Attached, please find the I/O schedule that the drives will be designed to. Please note that I have not included any internal I/O (PSU Failure etc) as this only affects the external i/o.

Regards

John

(See attached file: IPP IO Spec.ZIP)
"IPP IO Spec.xls"

				Ch 1 Channel				Ch 2 Channel			
I/O	Address	New Description	TB	Current Termination	Cable #	Color	Destination	Current Termination	Cable #	Color	Destination
Sigma Digital Inputs	A1.0	Off	5TB	B2CX	2CCE-K2127 B12	BK	Modicon	B2CX	2CCE-K2128 B18	BK	Modicon
				C1811		Y		C1811		Y	
	A1.1	Turning Gear		B2CX		Com		B2CX		Com	
				C1812		BL		C1812		BL	
	A1.2	Run		B2CX		Com		B2CX		Com	
				C1813		O		C1813		O	
	A1.3	Start	5TB	B2CX		Com		B2CX		Com	
				C1823		BR		C1823		BR	
	A1.4	Output Disconect Closed	5TB	B2CX	2CCE-K2127 B07	BK	Output Disconnect	B2CX	2CCE-K2128 B07	BK	Output Disconnect
				C1720		R		C1720		R	
			EXX-V	C2X	2CCE-K2127 B06	BR	Output Disconnect	C2X	2CCE-K2128 B06	BR	Output Disconnect
				C213		R-BK		C213		R-BK	
	A1.5	Reactor Fan Fail Alarm OK	5TB	B2CX	2CCE-K2127 B01	BK	Reactor Cabinet	B2CX	2CCE-K2128 B01	BK	Reactor Cabinet
				C1714		R		C1714		R	
	A1.6	Reactor Temp Trip OK	5TB	C1715		BL		C1715		BL	
				B2CX		Com		B2CX		Com	
				C1716		O		C1716		O	
	A1.7	Slave Input (From Other Ch's Master O/P)			NEW CABLE		Ch 2 Regualtor		NEW CABLE		Ch 1 Regualtor
	A2.0	Other Ch Running	5TB	C1725	2CCE-K2128 B25	R	Ch 2 Regualtor	C1725	2CCE-K2128 B19	R	Ch 1 Regualtor
				B2CX		BK		B2CX		BK	
	A32.1	Position Sensor 1			NEW CABLE				NEW CABLE		
	A32.2	Position Sensor 2									
	A32.3	Position Sensor 3									
	A32.7	Pulse Release Permissive			Internal				Internal		
Sigma Digital Outputs	B1.8	Drive Healthy (DHR)	EXX V	C1930	2CCE-K2127 B14	BR	Modicon	C1930	2CCE-K2128 B14	BR	Modicon
				C1931		Com		C1931		Com	
	B1.9	Drive Alarm (DAR)	EXX V	C1934	2CCE-K2127 B08	BK	Annunciator	C1934	2CCE-K2128 B26	BK	Annunciator
				C1935		R-Com		C1935		R-Com	
	B1.10	I/P Bkr Trip (IBT)	A20TB	C2011	2CCE-K2127 B02	BK-1	Bkr Trip Pnl (Module)	C2011	2CCE-K2128 B02	BK-1	Bkr Trip Pnl (Module)
				C2012		W-1		C2012		W-1	
			EXX V	C1928	2CCE-K2127 B14	BK	Modicon	C1928	2CCE-K2128 B14	Y	Modicon
				C1929		R		C1929		Com	
			EXX V	C1936	2CCE-K2127 B08	BL	Annunciator	C1936	2CCE-K2128 B26	BL	Annunciator
				C1937		Com		C1937		Com	
	B1.11	Close Exc (FCC)	Internal								
	B1.13	Close Output Disconnect	EXX V	B7A13	2CCE-K2127 B06	BL	Output Disconnect	B7A13	2CCE-K2128 B06	BL	Output Disconnect
				B7A14		O		B7A14		O	
	B1.14	Spare									
	B1.15	Spare									
	B3.0	Zero Speed	EXX V	C1942	2CCE-K2128 B23	BK	D Channel	C1942	2CCE-K2128 B14	O	Modicon
									2CCE-K2128 B23	BK	D Channel
				C1943		R-Com	D Channel	C1943	2CCE-K2128 B23	R-Com	D Channel
	B3.1	Min Speed		C1944		BL	D Channel	C1944	2CCE-K2128 B14	BL	Modicon
									2CCE-K2128 B23	BL	D Channel
								C1945	2CCE-K2128 B14	Com	Modicon
	B3.2	Turning Gear Speed		C1954		Y	D Channel	C1954	2CCE-K2128 B14	R	Modicon
									2CCE-K2128 B23	Y	D Channel
								C1955	2CCE-K2128 B14	BK-Com	Modicon
	B3.3	Speed Reference Lost		C1946	2CCE-K2127 B09	BK	Bailey	C1946	2CCE-K2128 B24	BK	Bailey
				C1947		R		C1947	2CCE-K2128 B24	R	
	B3.4	Running Speed									
	B3.5	Master-Slave Output (To Other Ch's Slave I/P)			NEW CABLE		Ch 2 Regualtor		NEW CABLE		Ch 1 Regualtor
	B3.6	This Ch Running	EXX V	MP1-8	2CCE-K2128 B19	BK	Ch 2 Regualtor	MP1-8	2CCE-K2128 B25	BK	Ch 1 Regualtor
				MP1-9		R		MP1-9		R	
	B3.7	Spare									
Sigma Analogue Inputs	C14	Customer Speed Ref	A20TB	C917	2CCE-K2127 B10	BK	Bailey Boiler Control	C917	2CCE-K2128 B22	BK	Bailey Boiler Control
				C918		W		C918		W	
	C15	Torque Ref Input	ATB19	C3317	2CCE-K2128 B21	W-1	Ch 2 Regulator	C3317	2CCE-K2128 B21	W-2	Ch 1 Regulator
				C3318		BK-1		C3318		BK-2	
	C16	Spare from other channel									
	C17	Spare									
Sigma Analogue Outputs	D0	Exciter Reference									
	D1	Torque Ref Output	ATB19	C3313	2CCE-K2128 B21	W-2	Ch 2 Regulator	C3313	2CCE-K2128 B21	W-1	Ch 1 Regulator
				C3314		BK-2		C3314		BK-1	
	D2	Spare to other channel									
	D3	Spare									
	D4	Motor Speed						C33B11	2CCE-K2128 B09		Bailey Boiler Control
								C33B12			
			EXX H	C3315	2CCE-K2128 B08	BK-1	Ch 2 Regulator	MP1-5	2CCE-K2128 B08	BK-1	Ch 1 Regulator
				C3316		W-1		MP1-14		W-1	
				C3311		BK-2		MP11-5		BK-2	
				C3312		W-2		MP11-14		W-2	
	D5	Motor Voltage	3TB	C3323	2CCE-K2104 C03	BK-1	Metering Controll Panel (MCP)	C3323	2CCE-K2104 C04	BK-1	Metering Controll Panel (MCP)
				C3324		W-1		C3324		W-1	
	D6	Motor Current	3TB	C911		BK-2		C911		BK-2	
				C912		W-2		C912		W-2	
	D7	Spare									

IP7012785

From: Jon Christensen
To: John.A.Benz@sargentlundy.com
Date: 10/22/2003 4:12 PM
Subject: Fwd: Cabling questions

Jon P. Christensen
Supervising Engineer
Intermountain Power Corp

This e-mail, including attachments, contains information that is confidential. This e-mail, including attachments, constitutes non-public information intended to be conveyed only to the designated recipient(s). If you are not an intended recipient, please delete this e-mail, including attachments, and notify me. The unauthorized use, dissemination, distribution or reproduction of this e-mail, including attachments, is prohibited and may be unlawful.

>>> <john.bradley@tde.alstom.com> 10/18/2003 10:44:23 AM >>>
John,

In reviewing the I/O for the upcoming drives I have the following questions.

Refer to 2CCE-K2128B (ID2 Cabling Diagram). Cable # 18 color R-BK currently lands on 5TB: C1721. From my understanding, this cable goes to the Modicon however this d/i is designated as going to the Switchgear (see Westinghouse Dwg 5065C890 sht C17).
Refer to 2CCE-K2128B (ID2 Cabling Diagram). Cable # 15 color BK & R currently lands on Incomig Cabinet B212 & B214. From my understanding, this cable goes to the Modicon however this d/i is designated as going to the Switchgear (see Westinghouse Dwg 5065C890 sht B2).
With respect to the Annunciator, do you have the capability of fitting new windows thereto. I ask this as some of the annunciations are no longer valid and I would like to change the engravings to be more descriptive.
What would you like the drive to do if it loses the speed reference from the control room?

Regards

jb

From: <john.bradley@tde.alstom.com>
To: <jon-c@ipsc.com>
CC: <steve.klein@tde.alstom.com>, <william.oleyar@tde.alstom.com>
Date: 10/23/2003 7:49 AM
Subject: Regualtor Door Indication

Jon,

Per our telephonic conversation, we are going to add 2 lamp indications to the door (above the HMI) to indicate the following:

Drive Running Red
Drive Healthy Amber

Regards

john b

From: Jon Christensen
To: john.bradley@tde.alstom.com
Date: 10/23/2003 8:18 AM
Subject: Re: Regualtor Door Indication

I agree with adding the two indicating lights. Based on our conversation, the lights will be LED type and will provide a way for the operator to determine the drive status from a greater distance.

>>> <john.bradley@tde.alstom.com> 10/23/2003 8:39:24 AM >>>
Jon,

Per our telephonic conversation, we are going to add 2 lamp indications to the door (above the HMI) to indicate the following:

Drive Running Red
Drive Healthy Amber

Regards

john b

From: <steve.klein@tde.alstom.com>
To: <jon-c@ipsc.com>
CC: <john.bradley@tde.alstom.com>, <david.smith@tde.alstom.com>
Date: 10/24/2003 9:02 AM
Subject: Specification 045605, Division F7, Section 8 Programming and Communications
Attachments: Spec Section 8 rewrite.ZIP

Jon,

Attached is ALSTOM's rewrite of the Programming and Communications section no. 8 of specification 045605, as required from our review on 10/16.
Additions are in noted in red, while deletions are identified in blue.

Please advise if you have any questions or comments.

(See attached file: Spec Section 8 rewrite.ZIP)
"Spec Section 8 rewrite.doc"

Best Regards,

Steve Klein

Alstom Power Conversion Inc.

610 Epsilon Drive

Pittsburgh, PA 15238

Phone: 412-967-7168

Fax: 412-967-9326

Programming and Communications

a. User Input/Keypad: The door of each unit shall include a HMI plus a 9-pin programmer port, manual speed device, a mode selector marked *'Manual/Automatic'*, a red *'Drive Running'* *'Power On'* light, a green *'VFD Healthy'* VFD *'Fault'* light, a VFD *'Running'* light, a start push button, a stop push button, and a reset push button.

An internal door-mounted keypad with integral digital LCD display shall be furnished, capable of controlling a VFD and setting drive parameters. The display shall present all diagnostic messages and parameter values in standard engineering units when accessed, without the use of codes. The keypad shall allow the operator to enter exact numerical settings in standard engineering units. A plain language user menu (rather than codes) shall be provided in software as a guide to parameter setting, accessible via the programming port.

Drive parameters shall be factory set in non-volatile battery backed-up RAM EEPROM registers and resettable in the field through the keypad. Multiple levels of password security shall be available to protect drive parameters from unauthorized personnel. The battery backed-up RAM EEPROM stored drive variables shall be able to be transferred downloadable for programming of new spare boards. Systems shall allow programming changes while in service.

The keypad module shall contain a "self test" software program that can be activated to verify proper keypad operations.

Each VFD system shall have the user selectable option of programming up to three (3) speed avoidance bands. This gives the user the ability to block out and prevent operation at any undesirable speed, such as one (1) that may be coincident with a mechanical resonance condition.

b. Hard-Wired Communication: Contractor shall provide five (5) additional analog, ten (10) additional digital inputs and ten (10) additional digital outputs for connection to IPSC's plant control system for each VFD drive. All trip and start commands from IPSC's plant control system shall be hard wired. A listing of the existing hard-wired control signals is included at the end of this Division. A copy of the existing schematics will be provided to Contractor after the contract is awarded.

Contractor shall provide drive-to-drive communications and coordination of drives associated with each boiler. Certain parameters of this feature may be controlled by the operator.

c. Serial Communication/Protocols/Modem or Cable: VFD shall be capable of direct communication to an IBM or compatible computer via digital link fiber-optic link for setup of parameters, fault diagnostics, trending, and diagnostic log downloading. VFD parameters, fault log, and diagnostic log shall be downloadable for hard copy printout via the digital fiber-optic link to a and the standard serial printer connected to the computer.

Each VFD shall be provided with single port digital communication capability to allow status communication with the IPSC plant control system. Modbus communication protocol shall be provided.

An Ethernet communications link shall be provided for future use.

From: Jon Christensen
To: John.A.Benz@sargentlundy.com
Date: 10/24/2003 9:21 AM
Subject: Fwd: Specification 045605, Division F7, Section 8 Programming and Communications
Attachments: Spec Section 8 rewrite.ZIP

Please review and provide me with your comments.

IPSC's Purchasing is in the process of conforming the contract (they are very reluctant to allow me to send you a copy to mark up). Please e-mail your comments to me. I am particularly interested in the rewrite of the power factor section. If you have any questions please let me know. Thanks

Jon P. Christensen
Supervising Engineer
Intermountain Power Corp

This e-mail, including attachments, contains information that is confidential. This e-mail, including attachments, constitutes non-public information intended to be conveyed only to the designated recipient(s). If you are not an intended recipient, please delete this e-mail, including attachments, and notify me. The unauthorized use, dissemination, distribution or reproduction of this e-mail, including attachments, is prohibited and may be unlawful.

>>> <steve.klein@tde.alstom.com> 10/24/2003 9:52:56 AM >>>

Jon,

Attached is ALSTOM's rewrite of the Programming and Communications section no. 8 of specification 045605, as required from our review on 10/16. Additions are in noted in red, while deletions are identified in blue.

Please advise if you have any questions or comments.

(See attached file: Spec Section 8 rewrite.ZIP)
"Spec Section 8 rewrite.doc"

Best Regards,

Steve Klein

Alstom Power Conversion Inc.

610 Epsilon Drive

Pittsburgh, PA 15238

Phone: 412-967-7168

Fax: 412-967-9326

Programming and Communications

a. User Input/Keypad: The door of each unit shall include a HMI plus a 9-pin programmer port, manual speed device, a mode selector marked '*Manual/Automatic*', a red '*Drive Running*' '*Power On*' light, a green '*VFD Healthy*' VFD '*Fault*' light, a VFD '*Running*' light, a start push button, a stop push button, and a reset push button.

An internal door-mounted keypad with integral digital LCD display shall be furnished, capable of controlling a VFD and setting drive parameters. The display shall present all diagnostic messages and parameter values in standard engineering units when accessed, without the use of codes. The keypad shall allow the operator to enter exact numerical settings in standard engineering units. A plain language user menu (rather than codes) shall be provided in software as a guide to parameter setting, accessible via the programming port.

Drive parameters shall be factory set in non-volatile battery backed-up RAM EEPROM registers and resettable in the field through the keypad. Multiple levels of password security shall be available to protect drive parameters from unauthorized personnel. The battery backed-up RAM EEPROM stored drive variables shall be able to be transferred downloadable for programming of new spare boards. Systems shall allow programming changes while in service.

The keypad module shall contain a "self test" software program that can be activated to verify proper keypad operations.

Each VFD system shall have the user selectable option of programming up to three (3) speed avoidance bands. This gives the user the ability to block out and prevent operation at any undesirable speed, such as one (1) that may be coincident with a mechanical resonance condition.

b. Hard-Wired Communication: Contractor shall provide five (5) additional analog, ten (10) additional digital inputs and ten (10) additional digital outputs for connection to IPSC's plant control system for each VFD drive. All trip and start commands from IPSC's plant control system shall be hard wired. A listing of the existing hard-wired control signals is included at the end of this Division. A copy of the existing schematics will be provided to Contractor after the contract is awarded.

Contractor shall provide drive-to-drive communications and coordination of drives associated with each boiler. Certain parameters of this feature may be controlled by the operator.

c. Serial Communication/Protocols/Modem or Cable: VFD shall be capable of direct communication to an IBM or compatible computer via digital link fiber-optic link for setup of parameters, fault diagnostics, trending, and diagnostic log downloading. VFD parameters, fault log, and diagnostic log shall be downloadable for hard copy printout via the digital fiber-optic link to a and the standard serial printer connected to the computer.

Each VFD shall be provided with single port digital communication capability to allow status communication with the IPSC plant control system. Modbus communication protocol shall be provided.

An Ethernet communications link shall be provided for future use.

Jon Christensen - Contract spec

From: <JOHN.A.BENZ@sargentlundy.com>
To: <jon-c@ipsc.com>
Date: 10/24/2003 1:28 PM
Subject: Contract spec
CC: <DAVID.A.ROBERTS@sargentlundy.com>
Attachments: Spec Section 8 rewrite.doc; spec.pdf

Attached is the ALSTOM write-up highlighted with my comments in BOLD. Also attached is a PDF file 40 pages of the marking I think should be included in the contract.

IP7012793

Spec. 045605, Division F7, Section 8

Programming and Communications

a. User Input/Keypad: The door of each unit shall include a HMI plus a 9-pin programmer port, manual speed device, a mode selector marked '*Manual/Automatic*', a red '*Drive Running*' '*Power On*' light, a green '*VFD Healthy*' VFD '*Fault*' light, a VFD '*Running*' light, a start push button, a stop push button, and a reset push button.

An internal door-mounted keypad with integral digital LCD display shall be furnished, capable of controlling a VFD and setting drive parameters. The display shall present all diagnostic messages and parameter values in standard engineering units when accessed, without the use of codes. The keypad shall allow the operator to enter exact numerical settings in standard engineering units. A plain language user menu (rather than codes) shall be provided in software as a guide to parameter setting, accessible via the programming port.

Drive parameters shall be factory set in non-volatile battery backed-up RAM EEPROM registers and resettable in the field through the keypad. Multiple levels of password security shall be available to protect drive parameters from unauthorized personnel. The battery backed-up RAM EEPROM stored drive variables shall be able to be transferred downloadable for programming of new spare boards. Systems shall allow programming changes while in service.

The keypad module shall contain a "self test" software program that can be activated to verify proper keypad operations.

Each VFD system shall have the user selectable option of programming up to three (3) speed avoidance bands. This gives the user the ability to block out and prevent operation at any undesirable speed, such as one (1) that may be coincident with a mechanical resonance condition.

b. Hard-Wired Communication: Contractor shall provide five (5) additional analog, ten (10) additional digital inputs and ten (10) additional digital outputs for connection to IPSC's plant control system for each VFD drive. ***This is the minimum I/O that shall be provided. Additional I/O shall be provided if required per the drawings of the Westinghouse/IPSC drawings.*** -All trip and start commands from IPSC's plant control system shall be hard wired. A listing of the existing hard-wired control signals is included at the end of this Division. A copy of the existing schematics will be provided to Contractor after the contract is awarded.

Contractor shall provide ***Channel to channel*** ~~drive-to-drive~~ communications and coordination of drives associated with each boiler. Certain parameters of this feature may be controlled by the operator.

c. Serial Communication/Protocols/Modem or Cable: VFD shall be capable of direct communication to an IBM or compatible computer via digital link fiber-optic link for setup of parameters, fault diagnostics, trending, and diagnostic log downloading. VFD parameters, fault log, and diagnostic log shall be downloadable for hard copy printout via the digital fiber-optic link to a and the standard serial printer connected to the computer.

Each VFD shall be provided with single port digital communication capability to allow status communication with the IPSC plant control system. Modbus communication protocol shall be provided.

An Ethernet communications link shall be provided for future use. ***We deleted this in the meeting but this is better so I would leave it in.***

Formatted

Contractor and all shipping costs to and from the IPP Job Site shall be at Contractor's expense.

7. Work or Materials Furnished by Others: IPSC will furnish the following items:

a. ID fan system, composed of ID fan motor (if existing motor is used), ID fan, connecting shaft, bearings, and cable connecting the ID fan motor for each ID fan (if Contractor verifies existing cabling is acceptable). The connecting cable will be shielded 8 kV Type MV-90 single conductor medium voltage power cable. The WK^2 of the fan is 347,700 lb-ft^2. The fan will be a variable torque load and high breakdown/starting torque will be required.

b. One (1) or two (2) 6.9 kV incoming power feeds to each Contractor-furnished VFD system.

c. One (1) 125 volt DC power feed to each Contractor-furnished VFD.

→ INSERT PAGE F 2-5a

d. Control wiring from IPSC's plant control system to the VFD control system.

e. Supply and install power cables as required to interconnect the VFDs, isolation transformers, input circuit breakers, and ID fan motors.

f. Receiving, unloading, storing, and field erection of all equipment.

g. Foundations, foundation bolts, bolt sleeves, and equipment bases.

h. Grouting materials and the placing thereof.

i. Permanent electric wiring to connect equipment terminal boxes to IPP's electrical system.

j. Lubricants and fuels for operation.

k. Solvents and cleaning materials.

l. Finish painting of all equipment except as specified herein.

m. Operating personnel for startup and tests.

8. Contractor's Services: Contractor's services as stated in Division F2, Article 5, Work Included Under These Specifications, shall be in accordance with the following:

a. Submittal of Engineering Data: Drawings and other engineering data for the specified equipment and materials are vital to the design and subsequent construction of the entire project.

One 3Φ, 480 volt, 60 Hz, approximately 30KVA, exciter and auxiliary power supply per channel.

One 120 volt, 60 Hz, single phase UPS supported control power source, approximately 2 KVA per channel

F 2-5a

IP7012796

15. Schedule of Activities: Contractor shall be required to complete the following:

Activity	Days After Award of Contract
Planning, Engineering, and Documentation	
Participate in Design Conference at the IPP Job Site	Fifteen (15) Days
Supply Schedule of Engineering	Fifteen (15) Days
Supply Quality System Manual as Specified in Division F3	WITH BID ~~Twenty (20) Days~~
Supply Inspection and Test Plan as Specified in Division F3	Thirty (30) Days Prior to First Fabrication
Supply Notification of Tests/Test/ Inspections as Specified in Division F3	Ten (10) Days Prior to Inspection
Supply Hazardous Materials Documentation	Thirty (30) Days After Award of Contract and With Material Lists
Supply Outline Drawings	Fifteen (15) Days
Supply Schematic and Wiring Diagrams	Twenty (20) Days
Supply Input/Output List to Plant Control System	Fifteen (15) Days
Supply Block Diagram Showing Basic Control and Protection Systems Specifying the Protection, Control, Trip, and Alarm Functions at Different Locations; and Reference Signals, Commands, and Auxiliary Supplies (i.e., Air, Oil, and Cooling Water)	Thirty (30) Days ~~Fifteen (15) Days~~
Supply Single-Line Diagram Showing Main and Auxiliary Circuitry, Including Main Power Input, Switchgear, Transformer, VFD, System Earthing and Auxiliary Supplies, Showing All CTs, PTs, Relays, Meters, etc., for the Control, Protection, and Operation of Drive System with Electrical Data (i.e., Voltage, Current, Time Ratings, Impedances, and Tolerances)	Thirty (30) Days ~~Twenty (20) Days~~

IP7012797

Activity	Days After Award of Contract
Planning, Engineering, and Documentation	
Supply Nameplate Drawings	~~Fifteen (15) Days~~ 30 DAYS BEFORE S #IP
Supply Torsional Analysis	Twenty (20) Days
Supply Efficiency and Power Factor Values	Fifteen (15) Days
Supply Startup and Commissioning Instructions and Data	Six (6) Weeks Prior to Shipment
Supply VFD Equipment Interface Information, Including Dead and Seismic Loads	Twenty (20) Days
Supply Anchor Bolt Information, Including Material, Size, and Projection	Twenty (20) Days
Supply Certified Report, Including Test Data for all System Level Tests	Fifteen (15) Days After Completion of System Level Tests
Supply Schedule of System Level Tests, Including Proposed Test Procedures	Thirty (30) Days Prior to Tests
Supply Schedule of Certified Field Startup and Acceptance Tests	Thirty (30) Days Before Shipment
Supply Completed Motor Information Sheets to IPSC's Contract Administrator	~~Fifteen (15) Days~~ N/A
Supply Cash Flow Projection	~~Fifteen (15) Days~~ N/A
Supply Initial Detailed Procurement, Production, Shipping Schedule	Fifteen (15) Days
Supply Recommended Detailed Erection Sequence and Procedure	Thirty (30) Days ~~Twenty (20) Days~~
Submit "Proof Copy" of Instruction Manual(s) to IPSC's Contract Administrator	Thirty (30) Days Prior to Shipment
Distribute Twelve (12) Copies Each for Unit 1 and 2 of Accepted Instruction Manuals as Designated by IPSC's Contract Administrator	Thirty (30) Days ~~Prior to Shipment~~ After startup
Supply Recommended Spare Parts List to IPSC's Contract Administrator	Thirty (30) Days Prior to Shipment

Activity	Days After Award of Contract
Planning, Engineering, and Documentation	
Notify IPSC's Contract Administrator for Pre-Shipment Inspection	Thirty (30) Days Prior to Shipment
Notify IPSC's Contract Administrator of Factory Witness Test(s)	Ten (10) Days Prior to Date of Test(s)

Equipment to be Delivered to IPP Job Site

Equipment	Earliest Acceptable Delivery Date	Latest Acceptable Delivery Date
Unit 2 - One (1) Fan	January 02, 2004	February 20 2004
Unit 1 - Two (2) Fans	January 02, 2005	January 31, 2005
Unit 2 - Three (3) Fans	January 02, 2006	January 31, 2006
Unit 1 - Two (2) Fans	January 02, 2007	January 31, 2007

25

Twenty-Four (24) Day Plant Outages
(For Installation of Equipment, Final Startup Testing, and Acceptance)

Unit	Date
Unit 2 - One (1) Fan	March 2004
Unit 1 - Two (2) Fans	March 2005
Unit 2 - Three (3) Fans	March 2006
Unit 1 - Two (2) Fans	March 2007

Note: Exact Dates to be Determined After Award of Contract

IP7012799

Existing Drive and Motor Drawings Pictures	
File Name	**Description**
Pb130002.jpg	Looking West at Unit 2 Wall of AQCS Control Building
Pb130003.jpg	Looking West at Unit 2 Wall of AQCS Control Building and ID Fan 1A
Pb130010.jpg	Looking West at Unit 1 Wall of AQCS Control Building
Pb130012.jpg	Looking West at Uni1 Wall of AQCS Control Building and ID Fan IA

Note: The existing drive and motor drawings are included as files 00250001.tif through 00250156.tif.

Add-details and cutouts
- Operating procedures
- Cable schedule

IP7012800

identified with the main equipment. An itemized packing slip, indicating what is in that container only, shall be attached to the outside of each container used for packaging. A similar list shall be inside of each container. A master packing slip, covering all accessory items for a given piece of equipment which are shipped in separate containers, shall be attached to one (1) container.

12. Service Conditions: Unless specified otherwise, equipment and material furnished under these Specifications shall be suitable for service at an altitude of 4,700 feet above sea level, temperatures between -35°C and 50°C, and indoor 0°C and 50°C

    Equipment located outdoors shall also be suitable for exposure to solar radiation, fog, rain, snow, ice, coal dust, fly ash, wind, and windblown dust and sand.

13. Control and Electrical Equipment: Control and electrical equipment, including panels, cabinets, switchgear, transformers, and motors, shall be finish painted. Exterior surfaces shall be the manufacturer's standard color. The interior portions of cabinets shall be gloss white. Touch-up paint shall be provided for repair painting.

14. Protection: All equipment shall be boxed, crated, or otherwise suitably protected during shipment, handling, and storage.

    Electrical equipment, controls, and insulations shall be protected against moisture and water damage.

15. Tools: Contractor shall furnish and ship with each piece of equipment one (1) set of all special tools required for installation and maintenance of the equipment. Maintenance tools for each piece of equipment shall be boxed separately and the boxes shall be marked with the large painted legend as follows:

    INTERMOUNTAIN POWER SERVICE CORPORATION
    INTERMOUNTAIN POWER PROJECT
    MAINTENANCE TOOLS FOR: _____
    (Name of Equipment)

    ERECTION SUPPLIER DO NOT OPEN EXCEPT WITH IPSC'S PERMISSION

    A weatherproofed itemized list of the contents shall also be attached to the outside of each box.

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

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

16. Alignment and Balance: All rotating parts shall be true and dynamically balanced. Excessive noise or vibration, in the opinion of IPSC's Contract Administrator, will be sufficient cause for rejection of the equipment. All rotating equipment shall be balanced at the factory.

17. Noise Level: The equivalent "A" weighted sound pressure level for equipment furnished under these Specifications (excluding drive motors) shall not exceed 85 dBA free field measured 3 feet horizontally from the base of the equipment and 5 feet about floor level. If the drive motors for the equipment are also furnished under these Specifications, the combined sound pressure level of the motor and driven equipment shall not exceed 90 dBA free field. The sound pressure levels stated are decibels to a reference of 20 micropascals.

18. Design Coordination: Contractor shall be responsible for the selection and design of all equipment and materials which will provide the best coordinated performance of the entire system. Components of rotating equipment shall be selected so that the natural frequency of the complete unit is not at or critically near the operating range of the unit.

The Alstom offer includes power converters, heat exchangers and output isolation switches.

19. Control Power: Electrical power for control and instrumentation will be a nominal 120 volt, single-phase, 60 hertz, alternating current, or a nominal 125 volt direct current. Contractor shall provide any devices required for proper operation and protection of the equipment during electrical power supply and ambient temperature fluctuations described in the following paragraphs.

All dc electrical control devices shall be designed for continuous operation on an ungrounded station battery at any voltage from 100 to 140 volts dc. Electrical devices served from this supply shall not impose any ground connections on it. All ac electrical control devices shall, unless other specified, be designed for continuous operation at any voltage from 102 to 132 volts alternating current. The dropout voltage shall be less than 75 volts for relays and 90 volts for contactors and starters. Alternating current electrical control devices operating at nominal voltages other 120 volts shall be designed for continuous operation over proportional voltage variations.

All devices shall be guaranteed to operate satisfactorily under voltage conditions specified in the above paragraphs and at a range of ambient temperatures from 50°C to -35°C outdoors and from 50°C to ~~10~~°C indoors, non freezing.

0°C

Any thermally controlled devices within the enclosure shall be temperature compensated for correct operation at 85°F and above.

Space heater leads shall be stranded copper cable with 600 volt insulation and shall include terminal connectors. Space heater sheaths shall be of a corrosion-resistant, nonoxidizing material and shall have a thickness not less than 0.025 inch.

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

Splices will not be permitted.

One (1) spare normally open and one (1) spare normally closed contact on each control switch and lockout relay shall be wired out to terminal blocks.

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

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

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

Terminal blocks shall not be mounted in compartments containing cables or buses operating at voltages above 600 volts. Insert F3-6a

A shorting-type terminal block shall be installed at an accessible location for each set of current transformers supplied with the equipment furnished under these Specifications. The shorting-type terminal block shall be the one nearest the current transformers. No other shorting-type terminal blocks are required unless specified otherwise. The shorting-type terminal blocks shall be furnished with white marking strips. All electrical cables shall be conservatively selected for the electrical and environmental conditions of the installations and shall be of the best construction for the service where unusual service conditions are encountered. Proper temperature application cable shall be used throughout. Except where required to be otherwise to perform satisfactorily in the service, or unless otherwise specified in the Detailed Specifications, all electrical power

IP7012803

except internal feedback CT's which are wired point to point, no terminal blocks at all.

F3-6a

and control conductors shall be Class B, stranded copper conductors, 14 AWG or larger. Internal wiring to circuit boards will be sized per ALSTOM standards
Electrical cables which utilize mineral insulation (NEC Type MI) or polyvinyl chloride (PVC) insulation (NEC Types AWM, MTW, TA, TBS, THHN, THHW, THWN, TW, or THW) shall not be utilized. PVC shall not be utilized as a jacketing material on any of the cable constructions.

Control panel and cabinet wiring shall utilize stranded copper conductors with flame retardant cross-linked polyethylene or flame retardant ethylene-propylene rubber insulation rated 600 volts and shall meet the requirements of UL 44 for Types SIS and XHHW. The cables shall also meet the UL 44 VW-1 flame test and shall be Rockbestos Type SIS, VW-1; American Insulated Wire Type SIS, VW-1; Continental Wire & Cable Type SIS, VW-1; or acceptable equal. All control panel and cabinet wiring to be type SIS, 600V. insulation
Preinsulated terminal connectors shall include a vinyl sleeve, color coded to indicate conductor size. Preinsulated terminal connectors shall include a metallic support sleeve bonded to the vinyl insulating sleeve and designed to grip the conductor insulation.

Ring-type connectors shall be manufactured by AMP, 3M, or acceptable equal. Spade-type connectors shall be AMP slotted spring spade or 3M Scotchlok Series 61 snap spade terminal connectors.

Each terminal block, terminal, conductor, relay, breaker, fuse block, and other auxiliary device shall be permanently labeled to coincide with the identification indicated on the drawings. All terminals provided for termination of external circuits shall be identified by inscribing circuit designations acceptable to IPSC's Contract Administrator on the terminal block marking strips with permanent black ink. All other wiring terminations shall be identified by printing on conductor identification sleeves. A conductor identification sleeve shall be provided on each end of each internal conductor. ~~Each sleeve shall be marked with the opposite end destination identification.~~ Conductor identification sleeves shall be PVC, not less than 1/2 inch long, and shall be as manufactured W.H. Brady Company, Milwaukee, Wisconsin, or acceptable equal. Conductor identification shall be printed on the sleeve with permanent black ink acceptable to IPSC's Contract Administrator. After inscription of the conductor identification, the sleeve shall be coated as required to prevent smudging. Conductor identification shall be permanent, unaffected by age, heat, solvents, or steam, and not easily dislodged. Adhesive labels are not acceptable.

The arrangement of connections on terminal blocks shall be acceptable to IPSC. All connections requiring disconnect plug and receptacle-type devices shall be provided with factory terminated conductors on each plug and receptacle. Plugs and receptacles shall be factory wired into junction boxes containing terminal blocks for external

connections. All conductors on the disconnect portion of plug-receptacle assemblies shall be in a common jacket.

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

23. Equipment Safety Grounding: All electrical equipment that is part of an integral shipping unit or assembly shall be furnished with bare copper grounding conductor extending to a central ground connection lug. The lug shall be suitable for field connection to the station ground grid by others.

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

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

24. Terminal Blocks: Terminal blocks shall be furnished with white marking strips and, where permitted by the safety codes and standards, shall be without covers. Twenty percent spare terminals shall be furnished. AVO blocks is available.

All terminal blocks shall be stud type. An option for International (STARES) type terminal blocks, except internal terminal blocks in factory prewired electronic systems cabinets and terminal blocks for thermocouple extension wire, shall be Buchanan Medium Duty, rated 600 volts, with thermocouple contacts or Marathon 200 Series with Omega Engineering, Inc., Type TL terminal lugs for terminal blocks, or acceptable equal. Terminal blocks shall be appropriately sized for larger wire size or higher voltage insulated incoming conductors as necessary.

25. Indicating Lights: Status indicating lights shall be either Micro Switch Type PTW, with Type 387 lamps, plastic lenses, and appropriately sized resistors; General Electric Type ET-16, with incandescent screw connectors, plastic lenses, and appropriately sized resistors; or acceptable equal.

Engraved indicating lights shall be Honeywell Micro Switch Series 2 with Type 387 lamps or acceptable equal.

Indicating lights shall be energized when the condition exists and shall be de-energized when the condition does not exist. Indicating light lens colors shall be coordinated with indicated conditions as specified in the following table:

IP7012806

6. Motor Information Sheets: Motor Information Sheets are included at the end of this Division. If applicable, a copy of the appropriate sheets shall be completed for each motor furnished under these Specifications. Copies of the completed sheets shall be submitted as specified in this Division and as scheduled in Division F2, General Description and Scope of Work. The number of copies submitted shall be the same as for other manufacturer's drawings.

7. Drawings: Drawings shall be in sufficient detail to indicate the kind, size, arrangement, weights of each component, breakdown for shipment, and operation of component materials and devices; the external connections, anchorages, and supports required; the dimensions needed for installation and correlation with other materials and equipment; and the information specifically requested in the drawing submittal schedule specified in Division F2, General Description and Scope of Work.

   Drawings shall be fully completed and certified by Contractor as to the compliance of the information contained thereon with the requirements of these Specifications. Drawings shall have title block entries clearly indicating the drawing is certified. Drawings will be reviewed by IPSC and processed as specified in this Division.

   Each drawing submitted shall be clearly marked with the name of the Project, the unit designation, the Specification title, the Specification number, the project equipment or structure nomenclature, Contractor's name, and IPSC's drawing number (after it is assigned upon initial submittal of the drawing). Catalog pages are not acceptable. If standard drawings are submitted, the applicable equipment and devices furnished shall be clearly marked. Separate drawings shall be submitted for each of the two (2) generating units.

   Drawings shall be submitted in accordance with the schedule specified in Division F2.

   a. Drawing Submittal: Six (6) prints of each drawing shall be submitted. Prints shall be black line on white background. Print size shall not exceed 34 inches by 44 inches unless due to the size of the equipment larger drawings are necessary. Drawings shall be folded to 8-1/2 inches by 11 inches. One (1) copy of each drawing shall be submitted in AutoCAD drawing file format. ALSTOM Power Conversion Inc's Engineering Work Instruction CEW 40502 CAD standards
   Drawing and lettering practices shall be in general accordance ~~with the requirements of US Department of Defense, Military Standards - Engineering Drawing Practices, DOD-STD-100C.~~

   b. Drawing Processing: A copy of each drawing reviewed will be returned to Contractor as stipulated herein. Copies of drawings returned to Contractor will be in the form of a print with IPSC's marking.

IP7012807

When drawings and data are returned marked '*exceptions noted*', the changes shall be made as noted thereon, and six (6) corrected copies shall be submitted to IPSC.

When the drawings and data are returned marked '*returned for correction*', the corrections shall be made as noted thereon and as instructed by IPSC and six (6) corrected copies shall be submitted.

When a drawing is revised and resubmitted, Contractor shall include an issue number and revision description in the drawing revision block. All revisions pertaining to that particular drawing issue shall be clouded or otherwise clearly noted on the drawing.

When the drawings are returned marked '*no exceptions noted*' or '*received for distribution*', Contractor shall submit drawings for final distribution as specified hereinafter under Final Drawings. Drawings marked '*received for distribution*' have been filed; however, have not been reviewed.

No Work shall be performed in connection with the fabrication or manufacture of equipment and materials until the drawings and data therefor have been reviewed by IPSC except at Contractor's own risk and responsibility. Work may proceed on equipment and materials when the drawings and data therefor have been returned marked '*no exceptions noted*' or '*received for distribution*', and when drawings have been returned marked '*exceptions noted*', provided the Work is performed in accordance with IPSC's notations.

If changes are made to the equipment at the IPP Job Site, revised drawings indicating the changes made shall be prepared by Contractor and submitted to IPSC.

c. Final Drawings: Upon receipt, from IPSC, of drawings marked '*no exceptions noted*' or '*received for distribution*', Contractor shall transmit seven (7) additional prints of each drawing to IPSC for final distribution. However, if during the submittal process, Contractor makes further changes to drawings that have been reviewed by IPSC, the changes shall be clearly marked on the drawings and the submittal process shall be repeated.

d. Electronic File Copies: One (1) electronic copy, in AutoCAD drawing file format, of each final electrical wiring and elementary diagram for equipment shall be furnished. Electronic copies shall be submitted to IPSC on archival quality compact disks.

8. Wiring Diagrams: separate from connection and interconnection data contained in the standard supplied drive system elementary drawing are not furnished. ~~Connection and interconnection wiring diagrams furnished by Contractor shall be as indicated in ANSI Y14.15a-1971, Section 15-11, Article 15-11.3.2.1 and Figure 11-4 except that function information and wire run code are not~~ However the customer terminal block orientation is shown with sufficient room for adding customer external cabling.

~~required. Each device connection shall have near each termination, indicated in breaks, conductor identification consisting of the opposite END destination~~. The wiring diagrams shall be drawn with all devices indicted in their relative physical locations and shall represent the equipment and terminals arranged as they would appear to a person wiring the equipment.

Wiring diagrams shall be prepared on sheets approximately 30 inches by 42 inches. Where interconnecting wiring from different items of equipment or sectional wiring diagrams of the same item of equipment appear on different wiring diagram sheets, all interconnections shall be clearly identified. Where sectional wiring diagrams are required for a single item of equipment, such as a relay panel or control panel, that section of the panel which is represented by each individual wiring diagram sheet shall be keyed on that sheet in a manner acceptable to IPSC.

Information indicated on Contractor's drawings shall include wiring of the individual panel items as they actually will appear in the panel, contact arrangements of switches, and internal wiring of relays and instruments.

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

Sufficient space shall be left on IPSC's side of outgoing terminal blocks for adding cable color codes and circuit numbers. Color codes and circuit numbers will be added by IPSC. Contractor shall be responsible for adding the color codes and circuit numbers to its drawings after they are assigned by IPSC.

9. Instruction Manuals: Instruction manuals for the unloading, storage, installation, operation, and maintenance of the equipment shall be furnished. The number of manuals and the required time of delivery are specified in Division F2, Article 15, Schedule of Activities.

   a. Content: Manuals shall include the following information specific to the furnished equipment:

Contents of Manual(s)
Table of Contents and Index Tabs
Specifications, Test Data, and Curves
Description of the Equipment
Instructions in the Methods of Receiving, Inspection, Storage, and Handling Prior to Installation

IP7012809

PART F - DIVISION F5

GENERAL QUALITY SYSTEM REQUIREMENTS

1. Purpose/Scope: The purpose of this supplemental document to the Technical Requirements is to establish a set of requirements pertaining to the quality of supplied equipment and commodities.

2. Quality System: It is the responsibility of Contractor to define and implement a detailed and documented quality management system which ensures that all equipment and commodities supplied are in conformance with required drawing and/or specifications and which meets all the guidelines (requirements) set forth in this document. The system shall be capable of providing assurance that design, purchasing, materials, manufacturing, examination, and testing of equipment, shipping, storage, and related services comply with the requirements of the Contract. The power converters will be built at the ALSTOM Power conversion facility located in Pittsburgh, PA per their ISO 9001 procedures. Contractor quality system shall include, at a minimum, procedures or methods to ensure that the following are controlled:

Design documents , drawings, specifications, quality assurance procedures, quality records, inspection procedures, inspection and test status, and Contract Documents maintained current, accurate, and under control.
Purchased materials, equipment, and services conform to the requirements of the Contract.
Receipt inspection, in-process inspection, examination, testing, and checkouts conducted.
Shipping, storage, and preservation of equipment and commodities supplied meet Contract requirements.
Adequate inspection of subcontracted work.
Control of special processes such as welding, heat treating, hot forming, and nondestructive testing.
Proper methods employed for the qualification of personnel who are performing special processes: Welding, nondestructive examinations, coatings, etc.
Inspection, measuring, and test equipment.
Procedures that document and control the verification, storage, use, and maintenance of customer supplied product provided for incorporation into manufactured equipment or commodities.
Any applicable commercial standards (such as ANSI, AGMA, API, ASME) should also be incorporated into this system. This system shall be made available to IPSC's Technical Services Department for review upon request.

PART 6 - DIVISION F6

SEISMIC DESIGN REQUIREMENTS

1. General: This Division specifies the general criteria and procedures that shall be used to ensure that structures, systems, and components will meet their performance objectives during and following a seismic event.

2. Seismic Loads: Seismic loads shall be determined in accordance with applicable portions of Chapter 16, Sections 1613 to 1622 of the 2000 IBC Code. The VFD equipment is being erected in a seismically active area. The importance factor (I_E) shall be 1.5. The site class shall be "D". The spectral response acceleration at short period "S_S" shall be equal to 0.50g and the spectral response acceleration at one (1) second period "S_1" shall be 0.15g. The seismic use group shall be III.

   Contractor shall submit the seismic design calculations for review. These calculations shall indicate all assumptions and references used, and shall be subject to audit to verify that the design is in compliance with these Specifications.

All seismic design drawings and calculations shall be stamped by a registered structural proffessional engineer.

IP7012811

PART F - DIVISION F7

MEDIUM VOLTAGE VARIABLE FREQUENCY DRIVES

1. General: This Division specifies requirements for VFDs for large 3-phase synchronous or squirrel-cage induction motors. Both current source LCIs and PWM drives are being considered.

To the extent possible, considering the application is a retrofit application, the intent is to purchase the suppliers standard equipment with needed available options. Alternate configurations will be considered. If existing synchronous motors are used, two (2) VFDs, complete with all required control components, shall be furnished for each motor. If new motors are provided, one (1) drive per motor is needed. The Project requires VFDs for eight (8) ID fan motors.

VFDs shall be manufactured and completely assembled, ~~including the input transformer~~ at Contractor's factory.

The VFDs shall be housed in the existing control building along with any associated cooling equipment. Contractor shall include in the Proposal the expected and maximum heat loss on a per drive basis for the VFD proposed.

Rated Capacity	10,000 HP per Fan at 1050 RPM and 8,200 HP per Fan at 954 RPM
Quantity	VFD Systems for Eight (8) Fans Total Over the Next Four (4) Years
Application	ID Fan Service
Input Voltage	Existing Transformers - 6,900 to 3,876 Volts (See Nameplate)
Nominal Frequency	60 Hz
Short-Circuit Current at Point of Common Coupling	32 kA at 6,900 Volts Symmetrical (Maximum)
VFD Equipment Enclosure	NEMA 1
Ambient Temperature	~~-10°C~~ 0° to 50°C non freezing
Speed Range	Existing 0 to 954 RPM, 0 to 1050 RPM

a. Coordination: The design of each VFD shall be coordinated with the design of the electric supply and driven equipment. Contractor shall be responsible for furnishing each VFD, for matching the motor and the drive, and for coordinating

the collection of data and the design effort to limit harmonics to the specified levels. Contractor shall be knowledgeable of the requirements specific to the loads that are powered by each VFD. Applicable VFD system options, unique to the load-type, shall be provided.

b. Nameplates: All devices mounted on the face of each drive shall be provided with suitable nameplates. Push buttons, selector switches, and pilot lights shall have the device manufacturer's standard legend plate. All other devices shall have an engraved, phenolic laminated plate, with black lettering on a white background.

c. Instruction Manuals: In addition to requirements indicated in Division F4, Engineering Data, Article 9, Instruction Manuals, for each size of VFD shall be furnished and shall include the following:

(1) Contractor's standard manuals for each size and type of bypass switch, output contactor, transformer, line reactor, and filter.

(2) Schematics, wiring diagrams, and panel drawings in conformance with construction records.

(3) Troubleshooting procedures, with a cross-reference between symptoms and corrective recommendations.

(4) Connection data to permit removal and installation of recommended smallest field-replaceable parts. failed components and an explaination of drive diagnostics.

(5) Information on testing of power supplies and printed circuit boards and an explanation of the drive diagnostics.

d. Codes and Standards: It is desirable that the proposed layout of the equipment be in accordance with standards listed below; however, if due to the equipment sizing, the proposed arrangement cannot comply with any of the standards, Contractor shall list in the Proposal the variation and reason. The equipment shall be provided in full accordance with the latest applicable rules, regulations, and standards of the following:

IP7012813

Codes and Standards
National Electrical Code (NEC)
[redacted]
American National Standards Institute (ANSI)
National Electrical Manufacturers Association (NEMA)
Institute of Electrical and Electronics Engineers (IEEE)
Federal Communications Commission (FCC)

e. Acceptable VFD Systems: Contractor shall be able to demonstrate at least ten (10) years experience in manufacturing VFDs at medium voltage, to demonstrate capability to provide parts and service support. The proposed VFD system shall have been commercially available for a period of not less than two (2) years prior to the date of Contract award. Contractor shall provide at least three (3) sites and names of individuals that may be contacted in the Proposal where similar equipment has been retrofitted.

f. Experience: It is the intent of these Specifications to purchase dependable and reliable equipment offering the best performance available from current proven technology. All equipment furnished under the Contract shall, therefore, have documentation showing proof of actual operation for a minimum of two (2) years in similar service. It is also the intent of these Specifications to procure Contractor's standard system with any options required to meet these Specifications. However, any deviations from these Specifications shall be clearly identified in the Proposal Section as exceptions.

2. Performance: Each VFD system for a fan motor shall be capable of 10,000 HP output at 0.9 per unit input voltage to the VFD. Each VFD shall also be designed and constructed to meet the required performance as specified in the following:

a. Operating Envelope: Each VFD shall meet the following speed and torque requirements.

Each drive shall provide a turning gear speed of 10 percent speed. Contractor shall verify the minimum speed of 10 percent is acceptable to the motor vendor.

Each VFD shall be capable of producing a variable AC voltage/frequency output to provide continuous operation over the speed range of 10 percent to 1050

IP7012814

RPM. Drives shall include a software setable maximum speed limit. Each VFD shall be capable of sustained operation at 1/10 speed to facilitate checkout and maintenance of the driven equipment. As a commissioning and troubleshooting feature, each VFD power circuit shall be capable of operating without a motor connected to a VFD output.

synchronous

Each VFD shall be capable of operating any new standard AC motor of equivalent rating (horsepower and speed) over the specified speed range. Each VFD shall be rated to power the motor continuously at the motor's rated nameplate horsepower multiplied by the service factor.

The controls in each VFD shall provide an adjustable maximum horsepower limit so the drive output can be matched to the existing motor (if being reused) or to a larger motor (up to 10,000 HP).

The drive shall be capable of giving a

Overload torque shall be at 105 percent of full load torque.

b. Operating Range: Each VFD system shall be designed to enable fan operation over the entire operating range defined on the speed-torque curve shown in Figure 3.3, page F7-25, located at the end of this Division.

c. Input Harmonics: VFDs input harmonics shall comply with the latest edition of IEEE 519 1992 for total harmonic voltage and current distortion limits:

(1) Voltage Harmonics: Individual or simultaneous operation of the VFDs shall not add more than 2.5 5 percent total harmonic voltage distortion while operating from the utility source.

~~(2) Current Harmonics: Maximum allowable total harmonic current distortion limits for each VFD shall not exceed 5 percent as calculated and measured at the point of common coupling.~~

~~(3) Each motor converter shall be 24 pulse or provide harmonic filters to provide equivalent harmonic performance.~~

(4) Compliance shall be verified by Contractor with field measurements of harmonic distortion differences at the point of common coupling with and without VFDs operating. The Point of Common Coupling (PCC) for all harmonic calculations and field measurements for both voltage and current distortion shall be defined as the main breaker feeding the 6,900 volt bus feeding the drive, based on individual motors.

IP7012815

(5) Power quality metering shall be installed in each VFD system to continuously monitor and display input and output power quality. The power quality data shall include the following:

(a) Input voltage (average RMS value).

(b) Input current (individual phase RMS values and average RMS value).

(c) Input frequency.

(d) Power factor.

(e) Input (kW, kvar).

(f) Input (kWh).

(g) Input current THD (average of three (3) phases).

(h) Single harmonic calculation in input voltage or current (phase A, B, or C).

(i) Drive efficiency.

(j) Motor voltage (RMS).

(k) Motor current (RMS).

(l) Motor speed (in RPM or percent).

(m) Motor flux (percent).

(n) Motor torque (percent).

(o) Drive output power (kW).

(p) Output (kWh).

IP7012816

Existing input transformers and reactors may be used if adequate for the service. New transformers and reactors shall be provided if existing transformers and reactors are not adequate.

e. VFD System Efficiency: Guaranteed minimum total VFD system efficiency (ηsys) shall be a minimum of 96 percent at 100 percent speed and 100 percent load, and a minimum of 95 percent at 80 percent speed and 50 percent load. Efficiency evaluation shall include input transformer, harmonic filter, power factor correction (if applicable), VFD converter, and output filter, as indicated below. Auxiliary controls, such as internal VFD control boards, cooling fans, or pumps shall be included in all loss calculations.

The efficiency of a VFD system shall be calculated as follows:

ηsys = ηVFD x ηxfmr x ηpfc x ηharm x ηfilt	
Converter/Inverter (VFD)	ηVFD
Input Transformer	ηxfmr
Power Factor Correction	ηpfc
Input Harmonic Filter	ηharm
Output Filter	ηfilt

Total VFD system efficiency (ηsys) shall be 96 percent at full load and 95 percent at 50 percent load.

A penalty ($1,275 per kW) shall be assessed if efficiency is not achieved and shall be deducted from the Contract price.

f. System Input Power Factor: Each VFD system shall maintain a 95 percent minimum true power factor from 30 percent to 100 percent of rated speed. Contractor shall supply a power factor correction system, if required, to meet this requirement. The power factor correction unit shall include a separate input isolating contractor with fuses, power factor correction grade capacitors (voltage class shall be consistent with each VFD system input voltage), and series harmonic decoupling reactors, all integrated into the VFD system and mounted within each VFD enclosure. A penalty ($50 per kVAR) shall be assessed if power factor is not achieved and shall be deducted from the Contract price.

Add three pages F7-8 a, b, c

IP7012817

Summary of Findings

IEEE Standard 519-1992 "Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems" provides recommended practices for Utilities within Chapter 11. The recommended practices are based on voltage distortion limits as stated in Table 11.1 on page 85 and repeated here below for reference.

Bus Voltage at PCC	Individual Voltage Distortion (%)	Total Voltage Distortion THD (%)
69 kV and below	3.0	5.0
69,001 V through 161 kV	1.5	2.5
161,001 V and above	1.0	1.5

Voltage Distortion Limits per IEEE 519 Table 11.1

Current distortion limits are also provided in Chapter 10 of the standard as a way to distinguish individual user contributions to a possible voltage distortion problem. The current distortion limitations are not applicable in this case where the design goals for the correct application of the LCI equipment are:

- To ensure that the supply voltage available to the consumer is substantially free of harmonic distortion.
- To ensure that other plant equipment is relatively unaffected by the addition of the LCI drive units.

Both of these design goals can be achieved by following the guideline for voltage distortion outlined in Table 11.1

Voltage Distortion at the 6.9 kV Bus

Due to the extremely high fault levels at the primary of the 6.9 kV Bus feeder transformers, each 6.9 kV Bus can be considered practically in isolation. Very little harmonic distortion from the other LCI drive units on the other busses will be seen reflected at the 6.9 kV level.

Other power equipment connected to the 6.9 kV Bus (motors) will tend to help to reduce the distortion levels and because the THD is not more than 5% in the worst case (steady state) will operate relatively unaffected by the harmonic distortion.

Voltage Distortion at the Plant Distribution Level

An estimate of the worst case total voltage distortion at the plant distribution level can be made for each plant based on the estimated fault level for the generator bus (5,000 MVA). A mathematical addition of the contribution of 8 drive units can be made in order to assess this. Due to the estimation of the system fault level some degree of error may exist but the calculated levels are less than 1.5% THD and less than 1% at any single harmonic frequency. IEEE 519 compliance is therefore confirmed.

© 2003 ALSTOM

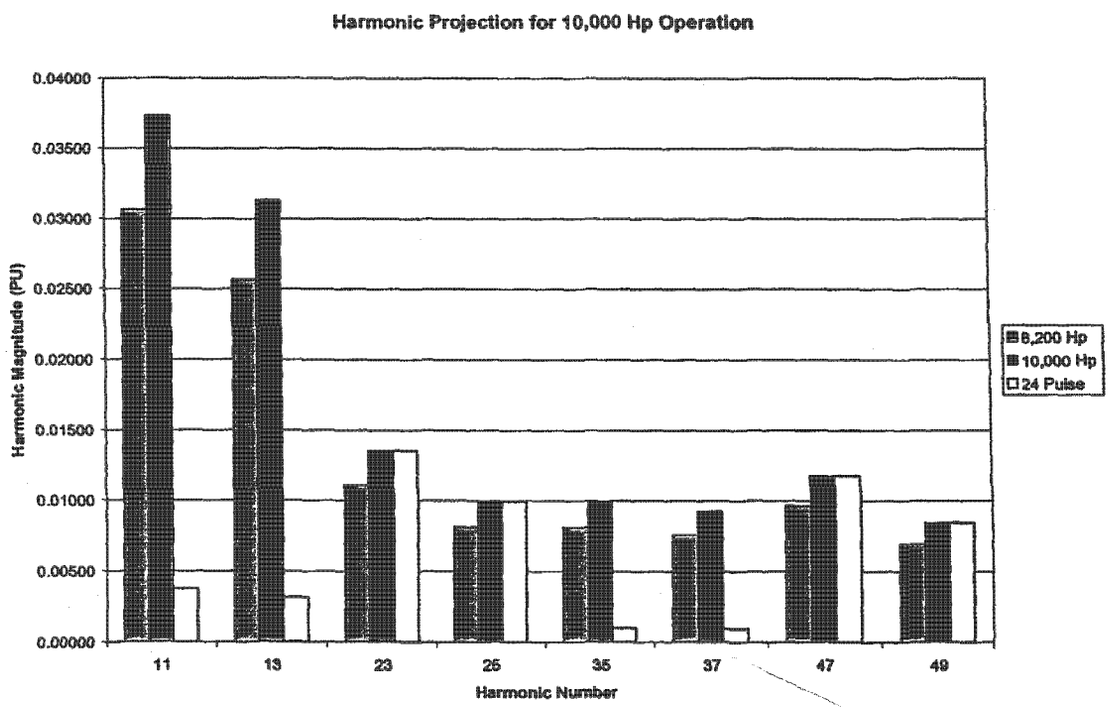
F - 7a

Future Operation at 10,000 Hp

At some time in the future it is proposed to operate each fan to a possible maximum load of 10,000 Hp and speed of 1,050 rpm. Operation of the existing motors with the new LCI drives at the new power and speed level will require close examination by the motor manufacturer but is certainly not out of the question. A number of possible options for this exist.

From the preceding review of the harmonic levels generated by the new drive equipment when operated at 7,415 HP or 8,200 Hp it can be seen that, from a purely harmonic distortion point of view, operation at 10,000 Hp will create excessive distortion.

Looking to the other components of the system it is also apparent that the choke and transformer may have to be changed in order to sustain the future, higher power levels. This gives rise to the possibility of replacing the existing transformers with transformers that provide 24-pulse harmonic cancellation. This can be readily achieved by arranging for each pair of drives on each auxiliary bus to be fed by a 12-pulse transformer that has a +/-7.5° primary phase shift. This technique has been successfully employed at other boilers and will greatly reduce the overall harmonic load by virtue of the additional harmonic cancellation that this provides. Harmonic levels will be reduced to levels below those projected for the new drives operating in 12-pulse mode as illustrated below. THD will be reduced to around 3% by this means.



Power Factor Correction

The following graph illustrates the typical LCI drive power factor characteristic as would be applicable to this application at nominal supply voltage levels and with the optimization discussed in the earlier sections employed. The best sustainable power factor is approximately that of a

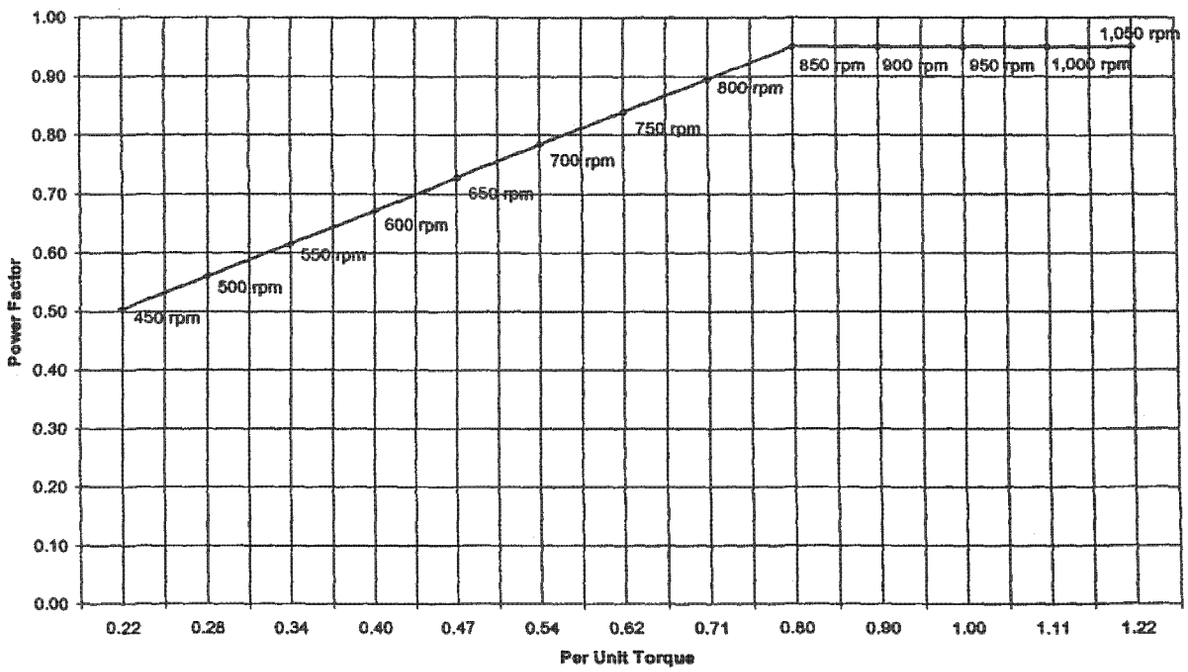
© 2003 ALSTOM

F. 7-8 b

diode bridge (~0.95 lag) due to operation at near free firing conditions for the thyristor rectifier front end of the LCI drive system.

Below 850 rpm the LCI power factor will reduce in an approximately linear fashion, as shown due to the phasing back of the supply side rectifier and the reduction of the motor voltage with speed. This is the characteristic of a current source drive system.

Approximate Power Factor Plot
(Assumes Square Law Torque Load)



In the consideration of power factor correction the following illustration is very important as this shows how the reactive power consumption of the drive system varies with operating power levels and speed when operated with a square law torque load profile. It is important to note that the VARs consumed by the drive are at the maximum value when the drive is operated at full load, full speed. Even though the power factor of the drive does reduce steadily at lower speeds the reactive power consumption remains less than that at full speed.

When sizing correction equipment for power factor the amount of VARs consumed by the load is the important factor and in this case it can be seen that each drive will require approximately 35% of its rating in VARs leading to bring the power factor to unity.

(6) Recommendations for any modifications to the proposed system, if indicated by the analysis to be advisable, the cost of which shall be borne by Contractor.

b. Harmonic Study: A preliminary harmonic analysis shall be performed. A power system short-circuit ratio of twenty shall be assumed, with all VFDs operating at maximum speed and maximum load. Short-circuit current (ISC) utilized for harmonic analysis calculations is ~~defined as~~: based on 32 KA.

~~I_{sc} = 10 * (Sum of Total Full Load Amps of All Vfd Systems)~~

Contractor shall submit the harmonic analysis at the time of bid, which includes all voltage and current harmonics up to the forty-ninth.

4. Availability:

a. Firing Signals: All internal firing signals, and other communications (which link operational controls with power components such as status and diagnostic signals) shall meet noise immunity and safety requirements as defined by applicable IEEE Standards.

b. Failed Switch Bypass/Ride-Through Capability: The failure of any power switching device (SCR, GTO, diode, IGBT, IGCT, etc.) or switching device control shall not result in a process trip and shall allow for continued operation of each VFD system. Either N-1 or cell bypass is acceptable. In the event of a device or device control failure, a VFD shall annunciate and identify the specific location of the failed device and allow for continued operation until such time as repairs can be scheduled. The failure of any power switching device (SCR, GTO, diode, IGBT, IGCT, etc.) or switching device control shall not result in a channel trip and shall allow for continued operation of each VFD system with both channels in service. If one (1) channel does trip, Contractor shall state this in the Proposal.

c. Power Interrupt Ride-Through: Each VFD system shall be capable of continuous operation in the event of a power loss of 5 cycles or less.

Each VFD system shall be capable of automatically restarting in event of a loss of power. Each VFD system shall provide IPSC with the choice of automatically restarting or not. ~~The choice will be selected by the operator and retained by the control system until changed by the operator.~~ IPSC will be able to selectively apply this feature and have the ability to set the allowable restart time applicable

IP7012821

to some (but not necessarily all) conditions as determined by IPSC to be appropriate for the specific application.

d. Power Sag Ride-Through: Each VFD system shall be capable of continuous operation with a 30 percent voltage sag on the input power line.

e. "Catch-A-Spinning-Load" Capability: Each VFD system shall be able to catch and take control of a spinning load if started while rotating equipment is already spinning. Appropriate safeguards shall be included in this operation to prevent damaging torque(s), voltages, or currents from impacting any of the equipment. IPSC shall have the option of employing this feature or disabling it.

f. Auto Restart Capability: Each VFD system shall be capable of automatically restarting in the event of an undervoltage trip. Each VFD system shall provide IPSC with the choice of automatically restarting or not. IPSC shall be able to selectively apply this feature to some (but not necessarily all) conditions as determined by IPSC to be appropriate for the specific application.

g. Ground Fault Withstand: In the event of a ground fault, a VFD shall be capable of annunciating the ground fault condition, safely operating and, by IPSC selection, either trip or continue operation. As a result of a ground fault trip, a VFD shall be capable of being reset and begin operating normally again after the ground fault condition has been corrected. There shall be no risk of fire or electric shock as a result of the ground fault.

5. Serviceability/Maintainability:

a. Front Access: It is preferred that each system of channel be designed for front access only. Contractor shall state in the Proposal if rear or side access is required. An explanation of reason for any required rear or side access shall be given.

b. Power Component Accessibility: All power components in the converter sections shall be mounted on a swing frame or rack-out for ease of maintenance and to minimize repair downtime. Alternate access options shall be described in the Proposal for the IPSC Contract Administrator's review and evaluation.

c. Voltage Isolation: All low voltage components, circuits, and wiring shall be separated with physical barriers from any sources of medium voltage.

d. ~~Remote Diagnostics: Each VFD system shall be provided with the capability for remote diagnostics via modem communication or Ethernet link.~~

IP7012822

e. Marking/Labeling: Sleeve-type wire marker tags or other acceptable means of permanent identification shall be applied to power and control wiring. Individual nameplates shall be provided for all major components of a VFD system.

f. Mean Time to Repair (MTTR): The VFD design shall demonstrate an actual mean time to repair of less than 15 minutes in the event of any power switching component failure. Based or replacement of a set of 10 thyristors.

6. Physical Requirements:

a. Environmental Requirements: Each VFD system shall be capable of continuous operation in an average ambient temperature between 10°C and 50°C at an elevation up to 4,700 feet above mean seal level without derating. Each VFD system shall also be simultaneously suitable for continuous operation in a maximum humidity between 0 and 95 percent non-condensing. 0°C

b. Heat Dissipation/Cooling System: Each VFD system shall be air cooled unless air cooling is unavailable or impractical, in which case, liquid cooling shall be provided. The existing system is air cooled and it is desirable to reuse the existing system. If liquid cooling is required, Contractor shall furnish the heat exchangers and all mounting material and hardware to accommodate the exchangers.

c. Air Cooling Requirements: Air cooled VFDs shall be provided with 100 percent fan redundancy and automatic switch over in the event of a fan failure for enhanced reliability. If a fan fails, the system shall automatically switch to the alternate fan and generate an alarm to notify operator of initial fan system failure. The drive shall have ability to detect failed operation of initial fan system. (Using temperature detectors as the only protection against loss of fan system is not acceptable.) During normal operation, the system shall periodically cycle between the two (2) fan systems to "exercise" the systems and prevent drying out of bearings, seals, etc., and to ensure availability of all systems. Contractor shall provide, with the Proposal, heat dissipation data necessary to verify existing HVAC systems or design new HVAC systems.

d. Liquid-Cooling Requirements: Liquid cooled VFDs shall be provided with 100 percent redundant pumps and heat exchangers with automatic switch over in the event of a pump or heat exchanger failure. Redundant systems shall be provided so a ~~cooling system~~ can be taken out of service for maintenance or repair without taking a drive out of service.

pump

IP7012823

~~The system shall be arranged for an external liquid-to-air heat exchanger for mounting on a deck engineered, designed, and furnished as a complete system by Contractor.~~

A minimum of 90 percent of the heat generated (losses) by the drive system shall be removed through the liquid cooling system. Contractor shall provide heat dissipation data necessary to design all auxiliary cooling systems and utilities. The system shall be designed so a failed pump can be safely isolated and repaired while a VFD system remains in service. Cooling pump motors shall have sealed bearings for a long, maintenance-free life.

Liquid-to-~~air~~ liquid heat exchangers shall be furnished by Contractor. IPSC will furnish piping, ~~power, and control wiring~~ between each VFD and the heat exchanger, and a water supply of 50% glycol The cooling system shall be filled following installation of the drive. Coolant liquid shall be furnished by Contractor.

The cooling system shall consist of two (2) circuits. One (1) internal circuit where deionized water is used and one (1) exterior circuit where propylene glycol is used to provide an ambient service temperature range of -35°C to 50°C. Ethylene glycol is NOT acceptable due to environmental and hazardous material concerns.

Quick disconnect fittings shall be provided at each connection between the header and the supply hose. in the drive

Dissimilar metals shall be completely avoided in cooling liquid piping. Plastic piping is not acceptable. The use of threaded connections shall be minimized. All connections and fittings shall be designed based upon the system cooling fluid and the required flow, and shall be tested at two (2) times the normal system design operating temperature and pressure.

Each VFD cooling system shall maintain system coolant temperature within a safe minimum and safe maximum temperature to avoid thermal shock and/or condensation.

e. Enclosure: All VFD system components, including transformer (for PWM drives), shall be mounted and wired by Contractor in a grounded enclosure meeting the following requirements without exception.

~~Input filters~~, Transformer, power ~~conversion~~, output filters and auxiliary equipment, gasketed enclosure sections shall be NEMA 12 design. Air cooled units shall be NEMA 12 Ventilated, with gasketed doors. Liquid cooled units shall be NEMA 12 Non-

IP7012824

ventilated. Air cooled units shall have changeable filters covering all air inlets. Filters shall be front replaceable (for replacement) while each VFD is in operation without exposing maintenance personnel to any of the power components. Microprocessor and control logic boards and power supplies shall be housed in a sealed, non-ventilated NEMA 12 section, safely accessible without exposure to high voltages and without drive shutdown. All low voltage wiring shall be fully isolated from medium voltage compartments by metal barriers.

Cabinets and doors shall be fabricated using heavy gauge steel (12 gauge minimum) for sturdy construction and dimensional integrity to ensure long-term fit and function. All doors shall be gasketed to provide environmental protection and secure fits.

Enclosures shall be designed to avoid harmonic and inductive heating effects. The enclosure shall be designed to shield any outside equipment form interference, enclosing, and shielding the complete component to eliminate any radio frequency interference in compliance with FCC Part 18 requirements.

f. Installation/Cabling: IPSC will set the VFD equipment in place and install interconnecting wiring. Contractor's Proposal shall include a detailed description of installation requirements.

g. Space Limitation - Footprint: Contractor shall provide a proposed layout of equipment with the Proposal. Floor plans of all existing control buildings are included.

Doors with high voltage will have lockable handles and electrical

h. Interlocks: Mechanical key interlocks shall be provided on all doors. Interlocking shall be fully coordinated to prevent access to all high voltage compartments, including transformer, filters, or any switchgear that is part of the supply, when line power is applied to each VFD system. ~~Interlocks shall be mechanical to provide positive lockout prevention and safety. Electric~~al interlock switches alone are not acceptable due to the possibility of inadvertent shutdown and the ease with which such switches could be bypassed.

i. Control Power and UPS System: Contractor's Proposal shall include a detailed description of control and accessory power requirements for the proposed system.

j. Space Heaters: The power/control assembly including individual compartments shall be provided with space heaters to prevent condensation of moisture within the enclosures. The heaters shall be spaced away and thermally insulated from any painted surfaces.

IP7012825

Space heater capacity shall be as required to maintain the compartment internal temperature above the dew point.

Voltage normally applied to the space heaters is 120 volts AC. Space heater voltage rating shall be 120 volts AC.

IPSC will provide a 2-wire, 120 volt, 60 hertz space heater supply feeder to each assembly. Contractor shall provide all required internal wiring and suitable branch circuit protection for each space heater circuit.

All space heaters shall be controlled by an adjustable thermostat, factory set to close at 85°F (ON) and to open at 95° F (OFF).

7. Protective Devices/Diagnostics:

a. ~~Power Component Protection: Each VFD system shall include intermediate class surge arresters to protect the input transformer and VFD against voltage surges.~~

Each VFD system shall include protection to the converter rectifier devices to protect the secondary of the transformer from any potentially harmful fault currents. Arrangements that involve coordinated protection with an input circuit breaker are not as desirable and, if proposed, Contractor shall furnish all coordinating elements, including the circuit breaker and a detailed description of the protection scheme with the Proposal.

b. Protective Features and Circuits: The controller shall include the following alarms and protective features:

Alarms and Protective Features
Static Instantaneous Over-Current and Over-Voltage Trip
Under-Voltage and Power Loss Protection
Over-Temperature Protection
Electronic Motor Inverse Time Over-Load Protection
Motor Over Speed

IP7012826

Each VFD system shall be protected from damage due to the following, without requiring an output contactor:

1-Phase Fault or 3-Phase Short Circuit on VFD System Output Terminals
Failure to Commutate Inverter Thyristor Due to Severe Overload or Other Conditions
Loss of Input Power Due to Opening of VFD Input Disconnect Device or Utility Power Failure During VFD Operation
Loss of 1-Phase of Input Power

c. Data Displays: A door-mounted LCD display shall be furnished, capable of displaying VFD operational status and drive parameters. The digital display shall present all diagnostic message and parameter values in plain language engineering units when accessed, without the use of codes.

As a minimum, the following door-mounted digital indications shall be supplied:

Door-Mounted Digital Indications
Speed Demand in Percent
Actual Speed
Input Current in Amperes
Output Current in Amperes
Output Frequency in Hertz
Input Voltage
Output Voltage
~~Total 3-Phase Kw-Output~~ HMI
Kilowatt-Hour Meter or Horsepower
Elapsed Time Running Meter

d. Diagnostics and Fault Recording: The control logic section shall be fully digital and not require analog adjustment pots or fixed selector resistors.

IP7012827

Fault log data storage memory shall be stored in nonvolatile memory or be supported by a UPS size to provide a minimum of 48-hour data retention.

Each VFD shall include a comprehensive microprocessor based digital diagnostic system, which monitors its own control functions and displays faults and operating conditions.

A '*Fault Log*' shall record, store, display, and print, upon demand, the following for the fifty (50) most recent events:

Fault Log
VFD Mode (Auto/Manual)
Date and Time of Day
Type of Fault
Reset Mode (Auto/Manual)

A '*Historic Log*' shall record, store, display, and print via a lap top computer, upon demand, the following control variables at an adjustable time interval for the fifty (50) intervals immediately preceding a fault trip and one-hundred (100) intervals following such trip:

Historic Log
VFD Mode (Manual/Auto/Inhibited/Tripped/Etc.)
Speed Demand
VFD Output Frequency
Demand (Output) Amps
Feedback (Motor) Amps
VFD Output Volts
Type of Fault
Drive Inhibit (On/Off)

The fault log record shall be accessible via a ~~fiber-optic link as well as line-by-line on the keypad display.~~ RS-232 connection

IP7012828

~~Two (2) laptop PCs, a printer, and a "Windows 95" or newer based graphical tool suite shall be provided with the VFD~~s. This graphical PC tool shall be able to plot and display **up to eight (8)** different VFD parameters and have the ability to freeze plotting and print hard copy versions of the plots. Capability to display at least eight (8) different VFD system parameters is required, and all parameters displayed on the PC tool shall be synchronized with the standard keypad display.

8. Programming and Communications: ALSTOM

a. User Input/Keypad: The door of each unit shall include a manual speed device, a mode selector marked '*Manual/Automatic*', a '*Power On*' light, a VFD '*Fault*' light, a VFD '*Running*' light, a start push button, a stop push button, and a reset button.

A door-mounted keypad with integral digital LCD display shall be furnished, capable of controlling a VFD and setting drive parameters. The display shall present all diagnostic messages and parameter values in standard engineering units when accessed, without the use of codes. The keypad shall allow the operator to enter exact numerical settings in standard engineering units. A plain language user menu (rather than codes) shall be provided in software as a guide to parameter setting.

RAM

Drive parameters shall be factory set in non-volatile ~~EEPROM~~ registers and resettable in the field through the keypad. Multiple levels of password security shall be available to protect drive parameters from unauthorized personnel. The ~~EEPROM~~ stored drive variables shall be able to be transferred for programming of new or spare boards. System shall allow programming changes while in service.

RAM

The keypad module shall contain a "self test" software program that can be activated to verify proper keypad operations.

Each VFD system shall have the user selectable option of programming up to three (3) speed avoidance bands. This gives the user the ability to block out and prevent operation at any undesirable speed, such as one (1) that may be coincident with a mechanical resonance condition.

b. Hard-Wired Communication: Contractor shall provide five (5) additional analog, ten (10) additional digital inputs, and ten (10) additional digital outputs for connection to IPSC's plant control system for each VFD drive. All trip and start commands from IPSC's plant control system shall be hard wired. A listing of the existing hard-wired control signals is included at the end or this Division. A copy

IP7012829

of the existing schematics will be provided to Contractor after the Contract is awarded.

Contractor shall provide ~~drive-to-drive~~ channel to channel communications and coordination of drives associated with each boiler. Certain parameters of this feature may be controlled by the operator.

c. Serial Communication/Protocols/Modem or Cable: VFD shall be capable of direct communication to an IBM or compatible computer via ~~fiber-optic link~~ a RS232 for setup of parameters, fault diagnostics, trending, and diagnostic log downloading. VFD parameters, fault log, and diagnostic log shall be downloadable for hard copy printout via the fiber-optic link and the standard serial printer.

Each VFD shall be provided with single port digital communication capability to allow status communication with the IPSC plant control system. Modbus communication protocol shall be provided.

~~An Ethernet communications link shall be provided for future use.~~

9. Component Requirements:

a. Printed Circuit Boards: All printed circuit boards shall be new and ~~coated~~ for moisture and chemical resistance, in addition to, any dielectric coating properties. All boards shall be tested in accordance with Division F2.

b. Power Bus and Wiring: Main power bus shall be high-conductivity copper and plated for chemical and corrosion resistance and low losses. The bus shall be appropriately sized for the VFD continuous current rating and braced to withstand the mechanical forces caused by a momentary short-circuit current of 32 kA at 6900V. All connections shall be bolted or continuously welded.

c. Ground Connection: Corrosion-resistant grounding pads shall be provided in each power cubicle. A copper ground bus shall be provided for grounding of control circuits.

d. ~~Input Isolation Transformer: Each VFD system shall use a drive isolation transformer to provide common mode voltage protection and phase shifting. The existing input transformers may be used if adequate. If new transformers are proposed, the transformers shall be as specified in Division F8.~~

e. ~~DC Link Inductors: DC link inductors, if required, shall be air core to prevent saturation. Separate inductors (split dual winding-type) shall be provided in the~~

IP7012830

positive and negative legs of the DC link to minimize stray magnetic fields. Maximum temperature rise shall not exceed 115°C with a minimum 220°C insulation and over-temperature protection. To minimize cabling costs, the inductors shall be integral to each VFD system lineup. If it is not possible to integrate the inductors into each VFD system enclosure, the cabling and connecting shall be entirely furnished by Contractor, and approved by the IPSC Contract Administrator. Inductors shall meet the requirements of ANSI C57.16 and shall be designed to prevent saturation under maximum fault current conditions.

f. DC Link Capacitors: Capacitors used in the converter DC link shall be integral to each VFD system lineup to minimize cabling costs.

Capacitors used in the converter DC link shall contain discharge resistors and shall be capable of reducing the residual charge to 50 volts or less within five (5) minutes after the capacitor is disconnected from the source of supply.

g. Input Harmonic Filters: If after meeting the requirements of Division F7, Medium Voltage Variable Frequency Drives, harmonic filters are still required to meet power factor requirements, stricter local requirements, or telephone interference factor restrictions, Contractor shall provide the filter, upstream filter isolation, protection, and protection coordination. As harmonic filters are power system dependent, Contractor is responsible for maintaining and providing any required upgrades required during the warranty period at no cost to IPSC. To minimize cabling costs, the harmonic filter components shall be integral to each VFD system lineup, but isolated from other components so the components can be disconnected from the power source and accessed for maintenance/repair while each VFD is in operation. If it is not possible to integrate the filters into each VFD system enclosure, the cabling and connecting shall be entirely furnished by Contractor, and approved by the IPSC Contract Administrator. Harmonic filters shall be located on the primary side of the input isolation transformer and shall be switchable with the VFD, to prevent filters remaining on the power line in the event of a VFD trip, which could create a damaging leading power factor condition. The complete filter shall have independent protection for over-current, phase differential, and ground fault.

Any inductors used shall be iron core or air core with a maximum temperature rise of 115°C with minimum 220°C insulation and over-temperature protection. Reactors shall be designed to prevent saturation under maximum fault current conditions. Reactors shall meet the requirements of ANSI C57.16.

IP7012831

Capacitors used in the harmonic filter banks shall meet the requirements of IEEE 18 and IEEE 1036 for shunt power capacitors. Capacitors used in any harmonic filter banks shall be provided with a method of shorting the phases to ground once power has been removed and the capacitors have been discharged to a safe voltage level.

h. Output Filters: If an output filter is required to meet the output harmonics requirements of these Specifications, or to meet any special requirements of the application, the filters shall be fully incorporated into each VFD system design. To minimize cabling costs, the output filter components shall be integral to each VFD system lineup. If it is not possible to integrate the output filters into each VFD system enclosure, the cabling and connecting shall be entirely furnished by Contractor, and approved by the IPSC Contract Administrator.

Any inductors used shall be iron core with a maximum temperature rise of 115°C with minimum 220°C insulation and over-temperature protection. Reactors shall be designed to prevent saturation under maximum fault current conditions. Reactors shall meet the requirements of IEEE C57.16.

i. Capacitors: Capacitors used in the harmonic filter banks shall meet the requirements of IEEE 18 and IEEE 1036 for shunt power capacitors. Capacitors used in any harmonic filter banks shall be provided with method of shorting the phases to ground once power has been removed and the capacitors have been discharged to a safe voltage level.

Where potential exists for self-excitation between the output filter and the motor system, a fully (voltage and current) rated output contactor shall be provided by Contractor as part of each VFD system delivery.

j. Input Power Terminations: Input and output power connections shall be made to isolated, supported, and plated bus strap connections. Sufficient space shall be provided for termination connections from the top or the bottom of each VFD cubicle. Space provisions shall be provided for application of standard stress cones, and provisions shall be provided for grounding of shielded cabling.

10. Output Contactor or Switchgear: Each VFD output section shall contain a suitably rated load break disconnect switch interlocked with the door. The switch shall isolate a VFD for maintenance and service. For safety, blade position shall be visible through the door. The disconnect switch shall be ~~integrated into~~ each VFD system so as to appear as a single integrated package. The switch shall be electrically interlocked with a contact from the drive input circuit breaker to prevent the switch from changing positions while the input circuit breaker is closed. The switch shall consist of dead front,

free standing and next to

IP7012832

completely metal enclosed vertical sections containing isolation switches or breakers. The door shall be interlocked with the switch so that: (a) The switch must be opened before the door can be opened; and (b) The door must be closed before the switch can be closed. There shall be a provision for padlocking the switch in either the open or closed position. The switch shall have permanent "open" and "closed" switch position indicators. The switch shall have a quick-make, quick-break mechanism providing isolation. Insulating barriers shall separate each phase and between the outer phases and the enclosure. All switches shall comply with ANSI C37.20.3, ANSI C37.22, ANSI C37.57, ANSI C37.58, NEMA SG5, and UL Standards.

11. Testing: A no load test shall be performed on the system. The drive shall be connected to an unloaded motor and feed back signals shall be verified. Output voltage shall be calibrated. All logic and interlocks, including customer logic and instrumentation, shall be tested.

The drive shall be given a full power test at rated current and rated voltage (simultaneously) for a minimum of four (4) hours (or until all system temperatures stabilize, whichever is longer). The test shall be performed as an integrated system, including all supplied input switchgear, input transformer, input filter (if supplied), power section, and output filter (if supplied). Contractor shall perform the factory system test to verify total system efficiency, power factor, and harmonic distortion limits are met as specified. Total system efficiency shall be measured using watt meters or Multilin PQM or approved equivalent meters on both the input and output of the complete system. System shall not be shipped unless performance criteria are met. Certified test data of all tests conducted shall be provided with final documentation.

The testing may be witnessed by the IPSC Contract Administrator. A projected test schedule and a copy of proposed test procedures shall be provided at least one (1) month in advance of test date. The IPSC Contract Administrator shall be given at least one (1) week prior notice or confirmation of actual test date(s).

12. Delivery: The VFD system shall be delivered to the IPP Job Site preassembled and wired with all specified interconnecting wiring and cable. Cabling for connection across shipping splits shall be neatly coiled and identified. Exposed sections of equipment shall be fully protected from damage during shipment. All necessary hardware for reconnecting shipping splits shall be provided.

Rolling in, setting equipment in place, aligning, and anchoring will be done by others. Contractor shall supervise all system interconnections across shipping splits at the IPP Job Site. Complete instructions for handling and storage shall be provided prior to delivery of the equipment. All equipment shall have adequate provisions for handling by overhead crane or forklift.

Contractor shall preform a system test after the drive in installed

13. Training: Contractor shall provide an on-site training school for IPSC Operations, Maintenance, and service personnel (fifteen [15] total). The training school shall include classroom discussion on the theory of operation of the equipment, as well as maintenance and service methods for the purchased equipment. Topics covered shall include, safety, hardware layout and functions, power and control wiring, diagnostic indicators, keypad/display interface, software mapping, programming, setup, configuration, control loop tuning, operational indicators, faults, diagnostic tools, troubleshooting, and preventative maintenance. Hands-on training shall be provided on equipment of the same design as the equipment provided. Documentation shall be provided and shall include actual manuals for the equipment and drawings and schematics of equipment supplied for the Project. IPSC reserves the right to video tape all training sessions.

14. Startup: Contractor shall provide the field services of a factory technician as necessary to supervise/inspect installation, test, and startup all equipment provided as part of the fixed price proposal. The firm price shall include all travel and living expenses in addition to the start-up engineer's time required to complete supervision of the installation, testing, and startup as indicated in Division F2. All equipment required for testing, startup, and performance verification shall be provided by the start-up technician. Contractor shall furnish all required start-up spare parts.

Verification of VFD input harmonic voltage and current distortion limits specified shall be verified at rated speed and rated power as part of final startup and acceptance. A recording-type Fluke, Multilin PQM, BMI, or equivalent harmonic analyzer displaying individual and total harmonic currents and voltages shall be utilized.

equivalent

IP7012834

From: <john.bradley@tde.alstom.com>
To: <jon-c@ipsc.com>
CC: <david.smith@tde.alstom.com>
Date: 10/27/2003 3:11 PM
Subject: Cooling Water System

Jon,

Regarding the drive cooling system we intend on using an Amot 2470 Thermo Static control valve (see attachment). In order to know exaclty what to install though, we need to know the following about the glycol cooling water supply that will be provided to the drive.

What is the water pressure?
Is the glycol water pre-filtered i.e. can we be sure that there will be no particles that will interfere with the valve workings?

Regards

John b

From: <john.bradley@tde.alstom.com>
To: <jon-c@ipsc.com>
CC: <david.smith@tde.alstom.com>
Date: 10/27/2003 3:14 PM
Subject: Cooling Water System (with attachment)
Attachments: Amot 2470 Thermostatic Valve.ZIP

Guess it would help to attach the "attachments."

(See attached file: Amot 2470 Thermostatic Valve.ZIP)
"Amot 2470 Thermostatic Valve.pdf"

---------- Forwarded by John BRADLEY/USPIT01/TDE/ALSTOM on 10/27/2003 04:09 PM ----------

John BRADLEY
10/27/2003 05:01 PM

To: jon-c@ipsc.com
cc: David SMITH/DCU/DRC/ICG/GECALSTHOM@GA

Subject: Cooling Water System

Jon,

Regarding the drive cooling system we intend on using an Amot 2470 Thermo Static control valve (see attachment). In order to know exaclty what to install though, we need to know the following about the glycol cooling water supply that will be provided to the drive.

What is the water pressure?
Is the glycol water pre-filtered i.e. can we be sure that there will be no particles that will interfere with the valve workings?

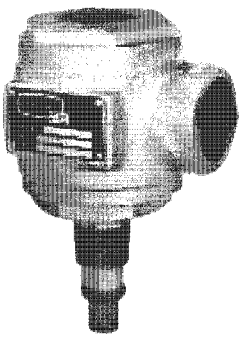
Regards

John b

AMOT CONTROLS

Model 2470

Thermostatic Valve



FEATURES

- 2-WAY VALVE
- EXTERNAL SENSING
- FOR LIQUID OR STEAM SERVICE
- OPEN OR CLOSE ON RISING TEMPERATURE
- TAMPER-PROOF TEMPERATURE SETTINGS 70˚F TO 250˚F
- CONSERVES WATER AND STEAM

APPLICATIONS

- ENGINE & COMPRESSOR COOLING SYSTEMS
- LUBE OIL SYSTEMS
- COGENERATION HEAT RECOVERY SYSTEMS
- PROCESS CONTROL

AMOT Model 2470 is a 2-way self-actuated temperature regulating valve with external sensor. The valve senses temperature via an expanding-wax element, located external to the valve body. Flow through the valve is modulated or shutoff in response to the temperature sensed by the element which may be located in the fluid circuit being controlled (Figure 2), or in a separate fluid circuit, as in remote sensing applications (Figure 3).

The valve will either open or close on rising temperature, depending on configuration selected. The highly reliable expanding wax-element encased in bronze retaining cup produces exceptional valve travel per unit of temperature change. Metal seats and O-ring seal of ethylene propylene rubber minimize leakage in steam applications.

Body housing of cast iron with bronze seats and sliding valve, and stainless steel element adapter provide rugged performance. When the sensed circuit is corrosive or fluid containment is necessary, stainless steel wells are available. Extended insertion lengths are also available, see Table D.

MODEL 2470B(-)1
This valve opens as the sensed temperature rises above the setpoint, and closes as temperature falls. Valve seat of Buna-N rubber can withstand 125 psi liquid pressure in closed position. Commonly used in cooling water control, as shown in Figure 2.

MODEL 2470B(-)2
This valve closes as the sensed temperature rises above the setpoint, and opens as temperature falls. Metal-to-metal bronze seat will handle up to 50 psi saturated steam or 80 psi liquid pressures. The valve will function to 125 psi maximum liquid pressure, but shutoff will not be leak-tight. Commonly used in heating applications, see Figure 3.

MODEL 2470B(-)3
This valve operates the same as the 2470B(-)2 except it has Buna-N rubber seat which will seal leak-tight up to 125 psi in liquid heating applications.

FORM 596

Typical Applications

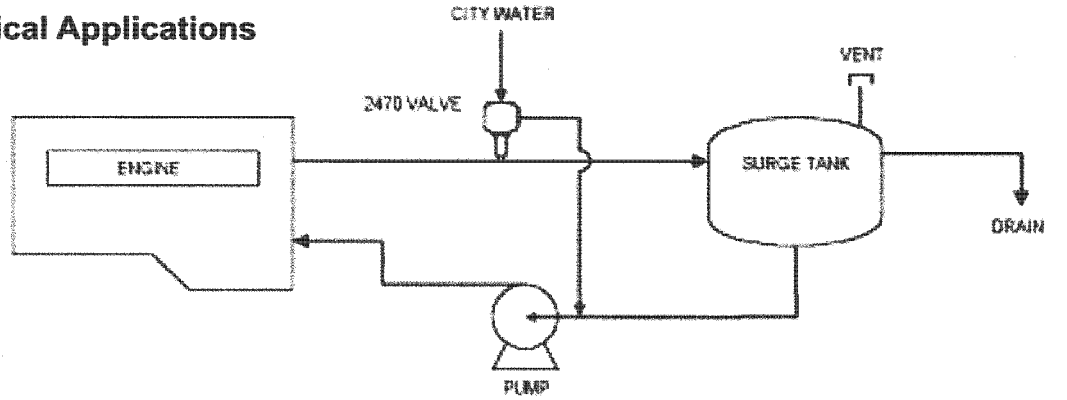


Figure 2
Cooling of Standby Engine or Generator Set

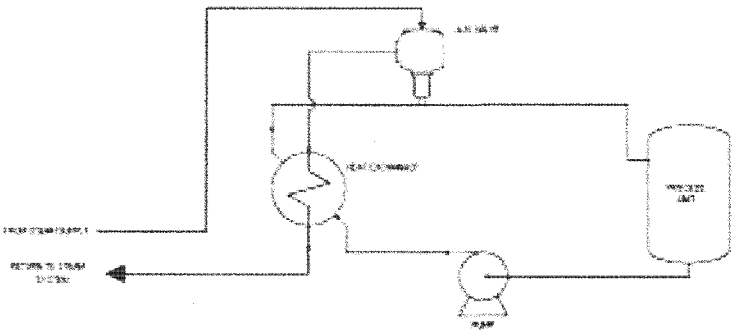


Figure 3
Heating of Process Fluid - Remote Sensing Application

Installation

Model 2470 Thermostatic Valves can be mounted in the position best suited for your installation. As with all valves, a strainer or filter should be placed ahead of the inlet port to prevent entry of foreign matter. Care should be exercised to see that the element is not damaged by dropping the valve or banging it against a sharp object. For best results the temperature element must be completely immersed in the fluid line.

IMPORTANT! Do not use the housing assembly to tighten valve when installing in the line. Use the hex on the temperature element adapter. If the 3250L Well is used, remove it from the 2470 Valve and install it separately. Then mount the 2470 Valve. Do not use the valve to support long runs of pipe.

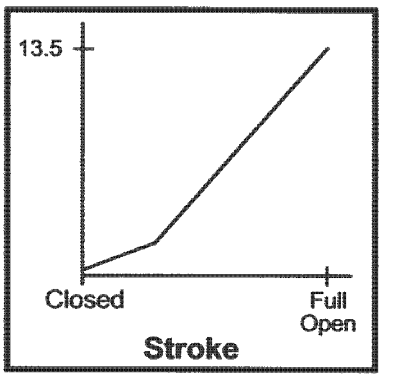
Operation

To obtain maximum long life from the temperature element, the valve must not be operated continuously at more than 50°F above the opening point on the 2470B(-)1; or more than 30°F above the closing point on the 2470B(-)2 and 2470B(-)3. If it is necessary to operate at a continuous over-temperature, the factory should be consulted for alternate elements. The available valve opening and closing ranges are shown in Table C. Limited field adjustment of temperature setting can be achieved by turning the Adjusting Nut (14) located inside the valve. If a different temperature range is required after initial use of the valve, the Temperature Element (5) must be changed and the valve recalibrated. If the valve gives an indication of sticking or binding, check O-ring (2) for excessive swelling and replace if necessary.

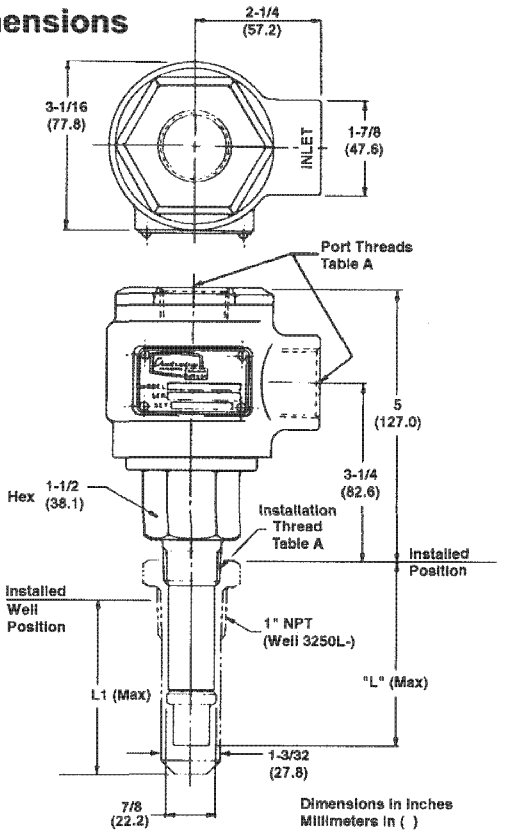
Specifications

Housing (1)	Cast Iron
Internal Parts	Bronze
Temperature element (5) & Extensions (11)	Brass
Adapter Assembly (3)	Stainless Steel
Dynamic Seal (2)	EPR
Maximum Pressure on Element	800 psi
Maximum Pressure on Well	*5000 psi
Flow Coefficient, Cv	13.5
Maximum Shutoff Pressure	
2470B(-)1	125 psi Liquid
2470B(-)2	50 psi Steam
2470B(-)2	80 psi Liquid
2470B(-)3	125 psi Liquid
Net Weight	4.6 lbs (2.1 kg)

* Pressure shown is maximum allowable. To obtain working pressure, factors of safety should be applied as required by appropriate codes or regulations. In certain adverse conditions, a corrosion or erosion allowance should also be made.



Dimensions



Stainless Steel Well

Model 3250L Stainless Steel Well is available for the 2470 Thermostatic Valve. If valves and wells are ordered together to permit shipment at the same time, they will be assembled at the factory using AMOT 907L002 Heat Transfer Compound. When valves and wells are ordered separately, AMOT 907L002 Heat Transfer Compound should be ordered and inserted in well before installing the 2470 Valve. Sufficient compound should be used to fully cover the element extension. Excess pressure due to compound expansion will be vented via the small relief hole in the 3250L Well. If compound is not used, an excessive temperature lag between the sensed fluid and valve operating point may be experienced.

Installed Depth Dimensions			
Element Extension Code No.	Element Installed Depth - L	Well Installed Depth - L1	Well Part No.
0	2	Not Available	Not Available
3	3-7/16	3-1/8	3250L004
4	3-15/16	3-5/8	3250L005
5	4-7/16	4-1/8	3250L006
6	4-15/16	5-5/8	3250L007
7	5-7/16	Not Available	Not Available

Model Code Table

2470B 1 1 E 0 - - ( )

- ( ) — Special Requirements (MTO) Made to Order
- - — Add "V" if calibrated in a Well.

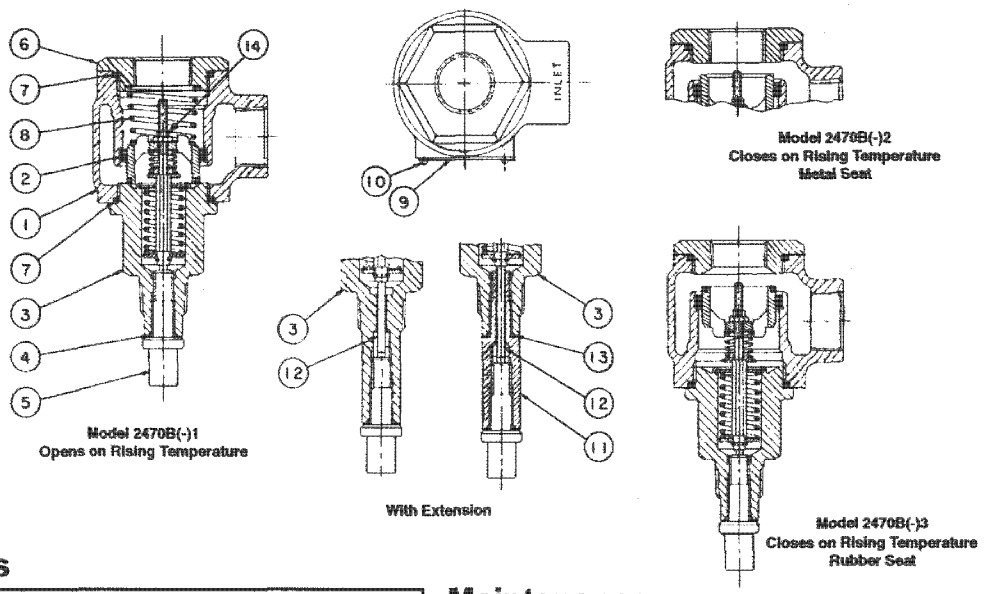
Table A Threads & Material			Table B Function		Table C Operating Temperatures*†, °F				Table D Element Extensions	
Code No.	Port Threads	Installation Threads	Code No.	Description	Temp. Code	Table B, Code 1 / Table B, Code 2 & 3	Open / Open	Closed / Closed	Code No.	Installed Depth - L (in)
1	1" NPT	3/4" NPT	1	Opens on Rising Temp. Rubber Seat	A		70	85	0	2 (standard)
3*	1" BSP (PL)	3/4" BSP (Tr)			B		85	105	3	3-7/16 (87.3)
5*	1" BSP (PL) DIN 3852 Form X	3/4" BSP (Tr)	2	Closes on Rising Temp. Metal Seat for steam applications	C		100	115	4	3-15/16 (100)
					D		110	130	5	4-7/16 (112.7)
					E		120	140	6	4-15/16 (125.4)
					F		130	150	7	5-7/16 (138.1)
					G		140	160		
					H		155	170		
					K		165	180		
					M		170	185		
			3	Closes on Rising Temp. Rubber Seat	N		185	200		
					P		200	215		
					R		205	225		
					S		215	235		
					T		225	250		

* Available from U.K. Factory Only † Add 10 °F to all temperatures if well is used.

[ ] Indicates Non Standard, Special Charges May Apply

NOTE: Letters or numbers in the MTO space, other than nothing, A1 or AA, indicate the unit is built to special requirements and some of the other code numbers may not be valid. Check with the factory for full specification of such models.

Cut-Away



Service Parts

Ref. No.	Part No.	Qty.	Description
2	11142L001	1	O-Ring, EPR Table B Codes 1 & 3
2	727	1	O-ring, EPR Table B Code 2
4	1462	1	O-ring
5	9654X075	1	Temperature Element Table C Code A
5	9654X095	1	Temperature Element Table C Code B
5	9654X110	1	Temperature Element Table C Code C
5	9654X120	1	Temperature Element Table C Code D
5	9654X130	1	Temperature Element Table C Code E
5	9654X140	1	Temperature Element Table C Code F
5	9654X150	1	Temperature Element Table C Code G
5	9654X160	1	Temperature Element Table C Code H
5	9654X170	1	Temperature Element Table C Code K
5	9654X175	1	Temperature Element Table C Code M
5	9654X190	1	Temperature Element Table C Code N
5	9654X205	1	Temperature Element Table C Code P
5	9654X215	1	Temperature Element Table C Code R
5	9654X225	1	Temperature Element Table C Code S
5	9654X235	1	Temperature Element Table C Code T
7	552	2	O-ring
13	1462	1	O-ring - Table D Code 3, 4, 5, 6 & 7

This parts list effective with Serial No. D851

Maintenance

Periodic inspection and cleaning is the only maintenance normally required with your AMOT Thermostatic Valve. It is recommended that O-rings (7) and (2) be replaced when reassembling valve.

> **Notice:** Model 2470 is furnished with an O-ring seal (2) around the sliding valve made of EPR rubber, which is primarily for steam and water applications. For use with oil or other fluids not compatible with EPR, use Buna-N O-ring Part No. 516. Contact factory for special model coding using Buna-N.

AMOT designs and tests all its products to ensure that high quality standards are met. For good product life, carefully follow AMOT's installation and maintenance instructions; failure to do so could result in damage to the equipment being protected or controlled.

When communicating with AMOT regarding operation of a control, always give the Model No. and Serial No. If ordering service parts, also include the Description, Part No., and quantity desired. If any parts are ordered by Reference No. only, please also include the Form No., Revision No., and date of this brochure.

Temperature Element Replacement

The temperature element (5) is threaded into the valve assembly (3). It can be removed simply by unscrewing it. The use of pliers such as "Channel Lok" may be required since "Locktite #222" is used on the temperature element threads.

Before installing the new temperature element (5), it is recommended that a new O-ring (4) be installed. "Locktite #222" should be put on the temperature element threads to maintain the vibration resistance of the valve. Screw the temperature element (5) into the valve assembly (3) until tight.

The temperature setting can then be recalibrated by turning the adjustment nut (14). To decrease the setting, turn the nut counter clockwise. To increase the setting, turn the nut clockwise.

AMOT Controls Corporation
401 First Street
Richmond, CA 94801-2906
Tel: (510) 236-8300
Fax: (510) 234-9950

AMOT Controls Ltd.
Western Way
Bury St. Edmunds IP33 3SZ
Suffolk England
Tel: (01284) 762-222
Fax: (01284) 760-256

AMOT Controls Corporation
230 Orchard Road
09-230 Faber House
Singapore 238854
Tel: (65) 235-8187
Fax: (65) 235-8869

©1997 AMOT Controls Corporation

From: <JACK.M.DALY@sargentlundy.com>
To: <Jon-C@ipsc.com>
Date: 10/31/2003 3:59 PM
Subject: VFD Scope extension
Attachments: VFD scope extension.doc

John

I appreciate the opportunity to continue working with you on this project. Do not hesitate to call be if you have any questions on the attached letter.

(See attached file: VFD scope extension.doc)

Jack M. Daly
Phone: 312-269-6257
Fax: 312-269-7290
Email: jack.m.daly@sargentlundy.com

Sargent & Lundy LLC

Jack M. Daly
Senior Vice President
312-269-6257
312-269-7290 (fax)
jack.m.daly@sargentlundy.com

October 31, 2003
Project No. 11271-002
Letter No. IPSC-03-002

Intermountain Power Service Corporation
Engineering of Variable Frequency Drives

Mr. Jon Christensen:
Intermountain Power Service Corporation
850 W. Brushwellman Road
Delta, Utah 84624

Dear Mr. Christensen:

In accordance with a meeting between your Mr. Jon Christensen and our Mr. John Benz on October 15, 2003, we are pleased to submit our proposal to continue providing assistance to you in the engineering of your Variable Frequency Drives replacement project. I recommend that Mr. Benz, our variable speed drive specialist, continue to coordinate this effort. Mr. David Roberts will also continue to assist Mr. Benz.

We view our role in continuing to provide assistance to Intermountain Power Service Corporation (IPSC) as primarily a technical consultant. Consequently, we assume that IPSC will continue to follow the commercial terms and conditions, and issue the contract specification with input from Sargent & Lundy (S&L). As discussed during the October 15, 2003 meeting IPSC will "As-built" the existing drive drawings for use in reviewing the ALSTOM drawings.

We have included the following tasks in this proposal as we believe they are required to provide IPSC with a drive that will replace/upgrade the existing drive and to insure delivery on schedule.

- Submit a marked copy of the contract specification for IPSC to use in revising and insuring the contract specification to ALSTOM.
- Attend two drawing review meetings either at IPSC or ALSTOM offices. These reviews will be including review of the ALSTOM drawings as well as a comparison to the "as-built" drawing that IPSC are presently marking.
- One expediting trip to ALSTOM offices to review schedule and ALSTOM progress.
- Participate in weekly conference calls with ALSTOM and IPSC.

- Obtain IPSC numbering system and verify the ALSTOM drawings incorporates it.
- Attend ALSTOM factory tests for the drive.

Based on the above we estimate the total effort to be 225 man-hours. We estimate the cost for our services to support the procurement process described herein to be less than $35,000 for labor and would expect travel expenses to be in the range of $5,000. The billing rates for Messrs. Benz and Roberts are $130 and $112 per hour, respectively.

We suggest that this work be performed on a time and material basis as described in our Service Agreement 03-45568, dated December 13, 2002 using the engineering rates listed in our letter dated March 20, 2003. Performing this work on a time and material basis will allow IPSC to reduce or increase our level of support as required during the engineering and manufacturing of the drives.

I trust that this proposal meets your needs. If it does not, or you have any questions, please contact Mr. John Benz at 312-269-2111 or me.

We thank you for the opportunity to assist you in this project and look forward to continuing working together.

Yours very truly,

Jack M. Daly
Project Director

JMD:cl
J. Benz
D. Roberts
File
IPSC-03-002.doc

Sargent & Lundy LLC

Jack M. Daly
Senior Vice President
312-269-6257
312-269-7290 (fax)
jack.m.daly@sargentlundy.com

October 31, 2003
Project No. 11271-002
Letter No. IPSC-03-002

Intermountain Power Service Corporation
Engineering of Variable Frequency Drives

Mr. Jon Christensen:
Intermountain Power Service Corporation
850 W. Brushwellman Road
Delta, Utah 84624

Dear Mr. Christensen:

In accordance with a meeting between your Mr. Jon Christensen and our Mr. John Benz on October 15, 2003, we are pleased to submit our proposal to continue providing assistance to you in the engineering of your Variable Frequency Drives replacement project. I recommend that Mr. Benz, our variable speed drive specialist, continue to coordinate this effort. Mr. David Roberts will also continue to assist Mr. Benz.

We view our role in continuing to provide assistance to Intermountain Power Service Corporation (IPSC) as primarily a technical consultant. Consequently, we assume that IPSC will continue to follow the commercial terms and conditions, and issue the contract specification with input from Sargent & Lundy (S&L). As discussed during the October 15, 2003 meeting IPSC will "As-built" the existing drive drawings for use in reviewing the ALSTOM drawings.

We have included the following tasks in this proposal as we believe they are required to provide IPSC with a drive that will replace/upgrade the existing drive and to insure delivery on schedule.

- Submit a marked copy of the contract specification for IPSC to use in revising and insuring the contract specification to ALSTOM.
- Attend two drawing review meetings either at IPSC or ALSTOM offices. These reviews will be including review of the ALSTOM drawings as well as a comparison to the "as-built" drawing that IPSC are presently marking.
- One expediting trip to ALSTOM offices to review schedule and ALSTOM progress.
- Participate in weekly conference calls with ALSTOM and IPSC.

- Obtain IPSC numbering system and verify the ALSTOM drawings incorporates it.
- Attend ALSTOM factory tests for the drive.

Based on the above we estimate the total effort to be 225 man-hours. We estimate the cost for our services to support the procurement process described herein to be less than $35,000 for labor and would expect travel expenses to be in the range of $5,000. The billing rates for Messrs. Benz and Roberts are $130 and $112 per hour, respectively.

We suggest that this work be performed on a time and material basis as described in our Service Agreement 03-45568, dated December 13, 2002 using the engineering rates listed in our letter dated March 20, 2003. Performing this work on a time and material basis will allow IPSC to reduce or increase our level of support as required during the engineering and manufacturing of the drives.

I trust that this proposal meets your needs. If it does not, or you have any questions, please contact Mr. John Benz at 312-269-2111 or me.

We thank you for the opportunity to assist you in this project and look forward to continuing working together.

Yours very truly,

Jack M. Daly
Project Director

JMD:cl
J. Benz
D. Roberts
File
IPSC-03-002.doc

From: <john.bradley@tde.alstom.com>
To: <jon-c@ipsc.com>
Date: 11/4/2003 9:27 AM
Subject: Fast Operating relays

Jon,

I have located the 110V DC relays that we were discussing yesterday. The are

Siemens
Potter & Brumfield
K10P-11D15-110

They have an input resistance of 11,150 ohms. I rekon that if we use a 2k resistor in series with the coil making it 13,150 ohms will give about 119V across the coil (assuming that your DC supply is 140V) when the drive has tripped. You may want to consider wiring the coil in directly around the breaker's trip coil such that when the breaker is about to trip the relay picks up but then also drops out upon the breaker being opened. We then need a second breaker 'a' auxiliary wired in series with one of the n/o relay contacts and brought over to its respective channel as a breaker status.

Regarding the trip circuit supervision (TCS) indication, I believe that the breaker trip coil is a substantially smaller impedance than the relay, and should therefore not really present a problem. If however there is a problem, is it possible to obtain another lamp with a higher "turn-on" current rating? If the LED will illuminate due to the auxilliary relay even if the breaker trip circuit is unhealthy, it may be worth your while (if possible) putting in a higher pick up current LED. Thus if the breaker trip circuit fails total impedance will rise and limit the current to a value less than the pickup value of the lamp. The indication should go out. I thnk the greater concern is to be sure that the new realy does not pick up through the TCS indication.

Would you like me to send the two that I have to you? If so I will get them off to you on Wednesday upon confirmation that you want them.

Regards

jb

From: Jon Christensen
To: john.bradley@tde.alstom.com
Date: 11/4/2003 3:09 PM
Subject: Re: Fast Operating relays

Send the relays and I will set up a test. Thanks

Jon P. Christensen
Supervising Engineer
Intermountain Power Corp

This e-mail, including attachments, contains information that is confidential. This e-mail, including attachments, constitutes non-public information intended to be conveyed only to the designated recipient(s). If you are not an intended recipient, please delete this e-mail, including attachments, and notify me. The unauthorized use, dissemination, distribution or reproduction of this e-mail, including attachments, is prohibited and may be unlawful.

>>> <john.bradley@tde.alstom.com> 11/4/2003 9:20:22 AM >>>
Jon,

I have located the 110V DC relays that we were discussing yesterday. The are

Siemens
Potter & Brumfield
K10P-11D15-110

They have an input resistance of 11,150 ohms. I rekon that if we use a 2k resistor in series with the coil making it 13,150 ohms will give about 119V across the coil (assuming that your DC supply is 140V) when the drive has tripped. You may want to consider wiring the coil in directly around the breaker's trip coil such that when the breaker is about to trip the relay picks up but then also drops out upon the breaker being opened. We then need a second breaker 'a' auxiliary wired in series with one of the n/o relay contacts and brought over to its respective channel as a breaker status.

Regarding the trip circuit supervision (TCS) indication, I believe that the breaker trip coil is a substantially smaller impedance than the relay, and should therefore not really present a problem. If however there is a problem, is it possible to obtain another lamp with a higher "turn-on" current rating? If the LED will illuminate due to the auxilliary relay even if the breaker trip circuit is unhealthy, it may be worth your while (if possible) putting in a higher pick up current LED. Thus if the breaker trip circuit fails total impedance will rise and limit the current to a value less than the pickup value of the lamp. The indication should go out. I thnk the greater concern is to be sure that the new realy does not pick up through the TCS indication.

Would you like me to send the two that I have to you? If so I will get them off to you on Wednesday upon confirmation that you want them.

Regards

jb

From: Jon Christensen
To: John.A.Benz@sargentlundy.com
Date: 11/6/2003 1:11 PM
Subject: IPP ID Fan VFD Project -status update
Attachments: 2000-8100-RR1.dwg; 2000-8100-02.dwg; 2000-8100-01.dwg; 2001-RR1.dwg; 2001-002.dwg; 2001-003.dwg; 2001-004.dwg; 2001-005.dwg; 2001-007.dwg; 2001-007A.dwg; 2001-008.dwg; 2001-008A.dwg; 2001-008B.dwg; 2001-009.dwg; 2001-010.dwg; 2001-011.dwg; 2001-012A.dwg; 2001-012B.dwg; 2001-012C.dwg; 2001-012D.dwg; 2001-013.dwg; 2001-101.dwg; 2001-102.dwg; 2001-103.dwg; 2001-104.dwg; 2001-105.dwg; 2001-106.dwg; 2001-001.dwg

I received drawings from Alstom this morning (they arrived yesterday afternoon by FedEx). I will send you a copy by e-mail.

I have your proposal to finish the project but I have not submitted a requisition yet. Is there enough money left in the current budget for another trip? I will submit a requisition in the next few days. I suggested to Alstom it might not be necessary to meet to review the drawings (it is based on how complete the drawings submittal is)

I have not heard from Alstom on the motor study requirements. I have had some preliminary discussions with TECO-Westinghouse. They called because of discussions they had been having with you (Sargent & Lundy).

I am still trying to determine whether to install the encoder.

The electricians have completed the as-builts. We still have a few questions, such as the fast contact for the breaker opening.

I still think we need to meet, but I would like you to look at the drawings first.

Please call me when you have looked at them. Thanks

Jon P. Christensen
Supervising Engineer
Intermountain Power Corp

This e-mail, including attachments, contains information that is confidential. This e-mail, including attachments, constitutes non-public information intended to be conveyed only to the designated recipient(s). If you are not an intended recipient, please delete this e-mail, including attachments, and notify me. The unauthorized use, dissemination, distribution or reproduction of this e-mail, including attachments, is prohibited and may be unlawful.

From: "Watanabe, Bryan" <watanabb@tecowestinghouse.com>
To: "Parker, Jim" <parkerj@tecowestinghouse.com>, "Avey, Jerry" <aveyjerr@te...
CC: "Elliott, Craig" <elliottc@tecowestinghouse.com>, "Kosar, Dennis" <kosar...
Date: 11/12/2003 7:53 AM
Subject: RE: Proposal # 020911JCP01 for Engineering Study on Synchronous Motors

Jon:
Jerry Avey I believe will be answering your questions. I am sending you the response from Jim Parker last night.
Jon if you need to contact these guys Jim Parker extension is 512-218-7438 or Jerry Avey is 512-218-7249.
Or you can use this e-mail I am sending you.

Regards,
Bryan Watanabe
TECO Westinghouse Motor Company
Field Sales Representative
801-446-4600 Phone
801-209-7191 Cell Phone
801-446-4318 Fax
e-mail watanabb@tecowestinghouse.com

> -----Original Message-----
> From: Parker, Jim
> Sent: Tuesday, November 11, 2003 5:44 PM
> To: Watanabe, Bryan; Avey, Jerry; Thomas, Ella
> Cc: Elliott, Craig; Kosar, Dennis
> Subject: RE: Proposal # 020911JCP01 for Engineering Study on
> Synchronous Motors
>
> Brian, I also talked to Jon about this one.
>
> JERRY AVEY, need your help. There are three questions we need to get
> answers on regarding the 8 motors supplied 4 each on SOs 1729AA and
> 1729AB. They are buying new Alstom LCI drives with digital controls to
> power these synchronous motors. The questions are:
> 1. What are the Volts/Hz limits for this motor design? He's interested
> in flattening out the curve for PF control.
>
> 2. The drives OEMs who bid on the drives told Intermountain Power that
> the current (amps) value we show on the outline drawing for the 3 winding
> connection appear to be wrong - don't make sense. What are the correct
> values?
>
> 3. Can the motors be operated at 4160V?
>
> Jerry, please try to come up with answers by Friday so we can respond to
> Jon in a timely manner. Monday at latest.
> Thanks,
>
> James C. Parker
> General Manager
> DC & Service Business Unit
> 512-218-7438

> Fax: 512-218-7398
> E-Mail: parkerj@tecowestinghouse.com
>
> -----Original Message-----
> From: Watanabe, Bryan
> Sent: Tuesday, November 11, 2003 1:48 PM
> To: Parker, Jim
> Cc: Elliott, Craig
> Subject: RE: Proposal # 020911JCP01 for Engineering Study on
> Synchronous Motors
>
> Jim:
> Jon Christensen has purchased a new GEC-Alstrom Load Communtator
> Inverter 7415/4596HP Sync. motor. We have given him some initial data on
> upgrading the existing sync. motor. He made the comment this morning that
> he thought there might be some kind of mistake in his calculations for
> this job. And is trying to determine if we gave him some wrong information
> or do he do something wrong?
> He now needs to begin process on getting motor rename-plated or
> reconditioned for the shut down next spring 2004.
> Should Jon be contacting you with his technical questions or who
> should he go to at this time.
> Intermountain Power
> Jon Christensen-Lead E.E.
> Phone: 435-864-6481
> e-mail jon-c@ipsc.com
> Jim can you call him to straighten this out and keep me in the loop
> as to what the situation is.
> Thanks.
>
> Bryan Watanabe
> TECO Westinghouse Motor Company
> Field Sales Representative
> 801-446-4600 Phone
> 801-209-7191 Cell Phone
> 801-446-4318 Fax
> e-mail watanabb@tecowestinghouse.com
>
>
> -----Original Message-----
> From: Parker, Jim
> Sent: Wednesday, September 11, 2002 6:12 PM
> To: Parker, Jim; 'Jon Christensen @ Intermountain Power'
> Cc: Elliott, Craig; Watanabe, Bryan; Bailey, Charlie;
> Crislip, Linda
> Subject: RE: Proposal # 020911JCP01 for Engineering
> Study on Synchronous Motors
>
> Jon, I failed to note in my previous e-mail that our quote
> is offered subject to our standard terms and conditions as detailed in
> Selling Policy WMC 4500. If you or your purchasing department need a
> copy, I can forward one.
> Regards,
>
> James C. Parker
> Manager, DC & Service

> 512-218-7438
> Fax: 512-218-7398
> E-Mail: parkerj@teco-wmc.com
>
> -----Original Message-----
> From: Parker, Jim
> Sent: Wednesday, September 11, 2002 6:42 PM
> To: 'Jon Christensen @ Intermountain Power'
> Cc: Elliott, Craig; Watanabe, Bryan; Bailey,
> Charlie; Crislip, Linda
> Subject: Proposal # 020911JCP01 for
> Engineering Study on Synchronous Motors
>
> Jon, in follow up to our recent conversation, I am
> sending this quotation by e-mail. Please accept my apologies for not
> getting this to you early last week as planned. We have had a number of
> people in my department out for various reasons, and I have simply gotten
> far behind.
>
> We propose to perform an engineering study regarding
> the quantity 8 - 7415/4596 HP, 954/809 RPM synchronous motors manufactured
> on Westinghouse S.O. #1729AA to determine if they can be uprated to 8500
> HP at 954 RPM with 10% overspeed. We will also determine whether
> operation at 4160V nominal vs 4000V nominal would provide greater motor
> capacity. These evaluations will investigate two scenarios: 1) Can the
> desired uprate be accomplished without modifications to/rewinding the
> existing motors? and 2) If not, can the uprate be accomplished by redesign
> and remanufaturing of the motors? This study will be performed on the
> basis of an assumption the motors have been well maintained, are in good
> operating condition, and have not been subjected to conditions which have
> prematurely shortened their life expectancy. A written report covering
> the findings will be generated and supplied to Intermountain Power. The
> price for this study is $3950, and we will need 2 to 3 weeks to complete
> the study after receipt of a Purchase Order.
>
> I trust this will serve your needs for a quotation.
> If you have questions or require more information, please contact Bryan
> Watanabe or me. We look forward to being of service to Intermountain
> Power.
> Regards,
>
> James C. Parker
> Manager, DC & Service
> 512-218-7438
> Fax: 512-218-7398
> E-Mail: parkerj@teco-wmc.com
>

From: <steve.klein@tde.alstom.com>
To: <jon-c@ipsc.com>
CC: <john.bradley@tde.alstom.com>, <david.smith@tde.alstom.com>, <william.ol...
Date: 11/12/2003 3:02 PM
Subject: Questions for Motor Manufacturer
Attachments: Motor Rating Questions.ZIP

Jon,

Attached are Alstom's questions to be asked of the motor manufacturer per the action item from our 10/15/03 meeting. Dave Smith has prepared this response regarding ultimate motor power capability.

(See attached file: Motor Rating Questions.ZIP)
"Motor Rating Questions.doc"

Best Regards,

Steve Klein

Alstom Power Conversion Inc.

610 Epsilon Drive

Pittsburgh, PA 15238

Phone: 412-967-7168

Fax: 412-967-7668

αβγδ

MEMORANDUM

To: Steve Klein

cc: John Bradley, Gary Smith, Bill Oleyar

From: David M Smith

Date: January 10, 2011

Ref:

Subject: IPP Motor Rating Questions

Steve,

At the kick-off meeting with IPP we obligated ourselves to provide support for the determination of the existing ID fan motor's ultimate power capability. I have made a review of the existing motor data and design requirements and from this some questions do arise.

The existing ID Fan motor was supplied with the following ratings for operation from an LCI type of variable frequency drive system at 4,676 ft ASL and 45 °C ambient:

1. Base Rating of 7,415 Hp, 6 phase, 954 rpm, 3,876 volts, 472 A, 0.9 PF with 75 °C temperature rise.
2. 6 pulse rating of 4,596 Hp, 3 phase, 809 rpm, 3,876 volts, 538 A, 0.9 PF with 75 °C temperature rise.
3. 6 pulse rating of 4,590 Hp, 3 phase, 743 rpm, 3,560 volts, 646 A, 0.9 PF with 100 °C temperature rise.

(Data source – Westinghouse Outline drawing 2136 F72 rev. 5 and document 1729AADATAPACK.txt by J. Portos 8/28/03)

Question 1 – Do Teco-Westinghouse agree with the above design data?

From the project specifications and discussion with IPP's Mr. Jon Christensen we also have the following requirements for future operation of the motor with the same type of drive and ambient conditions:

1. 8,200 Hp, 6 phase, 954 rpm, 0.9 PF
2. 10,000 Hp, 6 phase, 1,050 rpm, 0.9 PF
3. 5,300 Hp, 3 phase, 850 rpm, 0.9 PF

Question 2 – Is the existing motor designed to operate continuously at 1,050 rpm?

Some discussion of the future requirements follows:

1. 8,200 Hp at 954 rpm implies an increase in operating voltage or current or a combination of the two by 8,200/7,415 = 1.106 times the base rating for the motor i.e. approximately 10%. Comparison of design point 3 with design point 2 suggests that operation is possible to 646/538 = 1.2 pu current i.e. a 120% increase in current to reach 100 °C rise (or even higher as design point 3 is at a lower speed than design point 2). Therefore, an increase in current of more than 10% can be accommodated by allowing the motor temperature rise to exceed 75 °C. However, by increasing the motor's operating voltage by 10% it may be

ALSTOM Power Conversion
610 Epsilon Drive
Pittsburgh, PA 15238 USA
Tel.: +1 412 967 0765
Fax: +1 412 967 7660

possible to achieve the desired power increase without exceeding the 75 °C temperature rise. This would require that the motor operate at 4,286 volts instead of 3,876 volts. The volts per rpm at this level (an indication of the working flux level of the machine) would be 4,286/954 = 4.493 whereas the volts per rpm from design point 3 is 3,560/743 = 4.791. This suggests that the machine would be capable of operating this way provided that the motor stator's insulation system is suitable for 4,286 volts. NEMA standard MG1 requires motors of this type to be built with the capability to operate at up to +10% supply voltage.

Question 3: - What is the maximum recommended operating voltage for the motor?

2. 10,000 Hp at 1,050 rpm implies a further increase in voltage and/or current by an additional 22% over the 8,200 Hp requirement. If operated at +10% voltage, as proposed for operation to 8,200 Hp the per winding current would then be approximately: -

   Iac = (10,000 x 746)/($\sqrt{3}$ x 4,286 x 0.9 x 0.97 x 2) = 575 A (assumes 97% motor efficiency)

   This value is 22% higher than the base rating current level of 472 A as expected but it is lower than the design point 3 current capability of 646 A at 743 rpm. Plus, additional cooling air will also be available at the higher operating speed.

   On this basis it would appear that operation to 10,000 Hp at 1,050 rpm would be possible within the class F temperature rise of +100°C.

Question 4: - What is the predicted temperature rise for this operating condition?

3. 5,300 Hp at 850 rpm is perhaps the worst of the three requirements as this requirement extends the three phase loading beyond the design point of 4,590 Hp at 743 rpm and may be considered somewhat equivalent to operation with six phases at 10,600 Hp. However, design point 3 does permit operation to 646 A within a class F temperature rise. Operation at the same voltage to rpm ratio as is permitted for design point 3 leads to an operating voltage of 4,073 volts (+5% over the base voltage rating) at 850 rpm where the current required to operate at 5,300 Hp would be:-

   Iac = (5,300 x 746)/($\sqrt{3}$ x 4,073 x 0.9 x 0.97) = 642 A (again assumes 97% motor efficiency)

   This value is in line with the design point 3 value suggesting that the motor operating conditions for the new requirement would be very similar to the design point 3 operating condition but at a higher speed and voltage. Assuming that the higher voltage can be accommodated, the higher operating speed should provide additional cooling and so improve the operating conditions over those for design point 3.

Question 5: - What is the predicted temperature rise for this operating condition?

Summary Remarks:

The new drive units are being built to be capable of operation to 4,286 volts (+10%) and 642 A ac (823 A dc) but the existing transformers and chokes will not support this (max 768 A dc continuous). However, operation to +10% motor voltage should be possible with the existing equipment and short time operation to 823 A dc would permit operational tests to be conducted at all three of the new requirement points. Thermal testing of the motor and continuous operating duty will not be possible at the new requirement points 2 and 3 without first up-rating the transformers and chokes.

Some remaining questions:

Question 6: - Is the motor's insulation system suitable for operation with one phase grounded?

Question 7: - The motor test data provided indicates that the motor may be capable of operation to 4,476 volts and 817 A ac – is this a correct interpretation of the data provided?

From: <steve.klein@tde.alstom.com>
To: <jon-c@ipsc.com>
CC: <john.bradley@tde.alstom.com>, <ivan.martorell@tde.alstom.com>, <william...
Date: 11/12/2003 3:26 PM
Subject: Conference Call - Thursday 3pm (EST)

Jon,

This confirms our schedule of a conference call to review drawings at 3:00pm (EST) on Thursday 11/13/03. Please call 412-967-0765 and ask for x7133 to connect to the phone in the conference room. We look forward to speaking with you.

To Alstom recipients: Call will take place in the Olympic conference room.

Best Regards,

Steve Klein

Alstom Power Conversion Inc.

610 Epsilon Drive

Pittsburgh, PA 15238

Phone: 412-967-7168

Fax: 412-967-9326

From: <steve.klein@tde.alstom.com>
To: <jon-c@ipsc.com>
Date: 11/17/2003 3:43 PM
Subject: Comm No. AP-IP-E-005; Quotation for SIGMA Training Course - TypicalSyllabus
Attachments: Syncdrive_Syllabus_Pilot.ZIP

Jon,

As promised in my quote dated November 13, 2003, I am forwarding a copy of a typical syllabus for a SIGMA Training Course. We are flexible with our courses and can tailor the course content to your needs, if desired.

(See attached file: Syncdrive_Syllabus_Pilot.ZIP)
"Syncdrive_Syllabus_Pilot.doc"

Best Regards,

Steve Klein

Alstom Power Conversion Inc.

610 Epsilon Drive

Pittsburgh, PA 15238

Phone: 412-967-7168

Fax: 412-967-9326

TRAINING COURSE SYLLABUS

for

SIGMA SYNCDRIVE MAINTENANCE TRAINING

αβχδ

COURSE AIM

The aim of the course is to provide the trainee with a working knowledge of Sigma Syncdrive system control concepts, hardware and software architectures, maintenance, fault diagnostic facilities and fault recovery procedures that are to be applied by the first line maintainer.

Where possible every opportunity is taken during the course to re-enforce the theory with comprehensive practical hands on exercises using Sigma Syncdrive equipment.

COURSE DURATION

The duration of the Sigma Syncdrive Maintenance Training course is 4 days.

COURSE PRE-REQUISITES

The trainee must be familiar with general electrical theory and basic safety precautions associated with working on electrical drive control systems. The trainee should be conversant with general drive theory.

COURSE CONTENT

The content of the Sigma Syncdrive Maintenance training course is summarized as follows as appropriate to the supplied system.

1. Description of the Sigma Syncdrive system and hardware architecture, identification and function of the major hardware components that comprise the Sigma Syncdrive system.

2. Familiarisation with the Alstom Syncdrive contract diagrams.

3. Description of the Syncdrive software architecture and concepts of the links application program, ladder application program and software control modules.

4. Description of the basic software configuration of the Syncdrive in conjunction with drive application diagrams.

IP7012859

5. Practical hands on experience in monitoring, editing and fault finding using the diagnostic facilities of the Syncdrive, P80-P (Pilot) programming package and the local keypad in conjunction with drive application diagrams.

6. Practical hands on experience in using the P80-P (Pilot) programming package to reload the Syncdrive user program/firmware.

7. Description of the Sigma history recording package, practical demonstration of collection and interpretation of Syncdrive trip histories using P80-View.

8. Familiarisation with Alstom supplied converter, power boards and power interface boards.

9. Description of the converter cooling system and cooling system fault diagnostics.

From: <john.bradley@tde.alstom.com>
To: <jon-c@ipsc.com>
Date: 11/19/2003 2:41 PM
Subject: Outstanding Cabling Issues

Jon,

Regarding the cabling for the drives, Steve is sending you the revised prints for the entire drive electrical. The cabling is on sheets 12A/B/C/D as it was but it has now been revised. With any comments that you are going to add, following is a list of issues that you ned to be aware of in order to complete the design.

The cable going from 1D1 to the Remote I/O that replaces the Annunciator cabling. I believe that you were going to re-route cable 2CCE-K2127 B08 (between the Annunciator and 1D1) from the Annunciator to the Modicon.
The cable going from 1D2 to the Remote I/O that replaces the Annunciator cabling. I believe that you were going to re-route cable 2CCE-K2128 B26 (between the Annunciator and 1D2) from the Annunciator to the Modicon.
As a note to this and #1 above, are you sure that nothing else (i.e. bearing temps/vibrations) go to the annunciator and then that cable carring the common alarm (including drive alarms/trips) carries them to the Modicon?
The cable going from the Input Breaker to 1D1 for status feedback. If the cable between 1D1 Breaker Trip Panel and the Breaker itself has spares we can use 1D1 Breaker Trip Panel as a junction since the cable between 1D1 and 1D1 Breaker Trip Panel has spares. Alternatively, I think there is a cable between the existing output disconnect and the input breaker. If this cable will reach the regulator panel we may be able to use this.
The cable going from the Input Breaker to 1D2 for status feedback. If the cable between 1D2 Breaker Trip Panel and the Breaker itself has spares we can use 1D2 Breaker Trip Panel as a junction since the cable between 1D2 and 1D2 Breaker Trip Panel has spares. Alternatively, I think there is a cable between the existing output disconnect and the input breaker. If this cable will reach the regulator panel we may be able to use this.
The cable carrying the transformer temperature alarms to annunciator needs to be re-routed from the annunciator to 1D1. I also need to know this cable number and color coding realtive to winding.
The cable carrying the transformer temperature alarms to the annunciator needs to be re-routed from the annunciator to 1D2. I also need to know this cable number and color coding realtive to winding.
I am going to need a minimum of 8 cores running between the regulators of the two channels. There will be prudence in running a 12 core, or even a 16 core between channels just in case something comes up later that we/you would like to add. I will need this cable number and core identification.
If we are going to use the encoder solution, we will need a 5 pair screened cable between 1D1 and the motor encoders.
If we are going to use the encoder solution, we will need a 5 pair screened cable between 1D2 and the motor encoders.

Unless you are willing to approve the drawings without this info on them we will need it ASAP. We only really need this info around the start of the factory tests so that I can finalise the drawings before the drives ship to

site.

Regards

jb

From: <steve.klein@tde.alstom.com>
To: <jon-c@ipsc.com>
CC: <john.bradley@tde.alstom.com>
Date: 11/19/2003 2:59 PM
Subject: Revised Schematics & Project Schedule
Attachments: Valise.ZIP; GD70107 Schedule 111903.ZIP

Jon,

Attached is our revised preliminary schematic drawing and an updated project schedule. Let me know if you had any trouble with the documents.

(See attached file: Valise.ZIP) (See attached file: GD70107 Schedule 111903.ZIP)
"GD70107 Schedule 111903.mpp"

Best Regards,

Steve Klein

Alstom Power Conversion Inc.

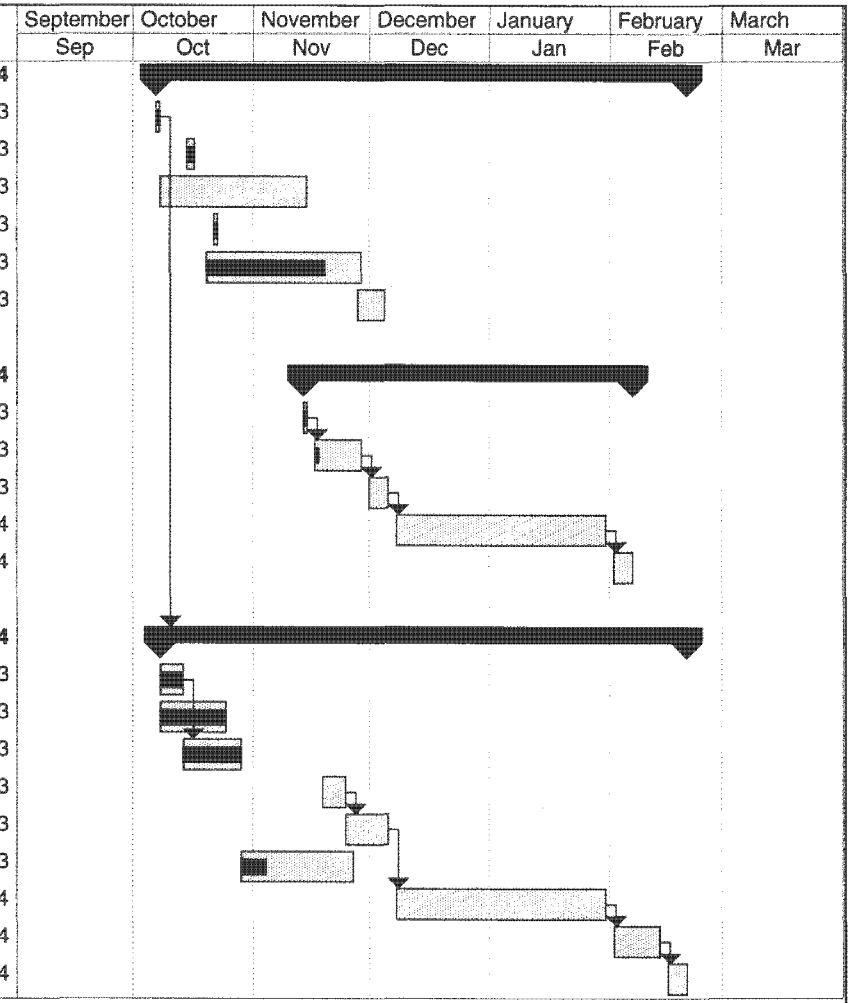
610 Epsilon Drive

Pittsburgh, PA 15238

Phone: 412-967-7168

Fax: 412-967-9326

ID		Task Name	Duration	Start	Finish
1		**Project Overview**	**99 days?**	**Tue 10/7/03**	**Fri 2/20/04**
2	✓	Receive Letter of Intent	1 day	Tue 10/7/03	Tue 10/7/03
3	✓	Customer Kick-off meeting	2 days	Wed 10/15/03	Thu 10/16/03
4		Customer Finalize PO	28 days	Wed 10/8/03	Fri 11/14/03
5	✓	Order Entry	1 day	Wed 10/22/03	Wed 10/22/03
6		Submit Approval Drawings	30 days	Mon 10/20/03	Fri 11/28/03
7		Drawing Approval	5 days	Fri 11/28/03	Thu 12/4/03
8					
9		**Disconnect Switch**	**61 days**	**Fri 11/14/03**	**Fri 2/6/04**
10	✓	Place Purchase Order	1 day	Fri 11/14/03	Fri 11/14/03
11		Submit Approval Drawings	10 days	Mon 11/17/03	Fri 11/28/03
12		Release for Manufacture	5 days	Mon 12/1/03	Fri 12/5/03
13		Manufacture	8 wks	Mon 12/8/03	Fri 1/30/04
14		Shipment	5 days	Mon 2/2/04	Fri 2/6/04
15					
16		**Drive System**	**98 days?**	**Wed 10/8/03**	**Fri 2/20/04**
17	✓	Advanced Electrical BOM	4 days	Wed 10/8/03	Mon 10/13/03
18	✓	Advanced Mechanical BOM	13 days	Wed 10/8/03	Fri 10/24/03
19	✓	Issue P.O.s for Long Lead Items	11 days	Tue 10/14/03	Tue 10/28/03
20		Final BOM	4 days	Wed 11/19/03	Mon 11/24/03
21		Release for Manufacture	9 days	Tue 11/25/03	Fri 12/5/03
22		Balance of Procurement	21 days	Wed 10/29/03	Wed 11/26/03
23		Manufacture	8 wks	Mon 12/8/03	Fri 1/30/04
24		Test	2 wks	Mon 2/2/04	Fri 2/13/04
25		Shipment	5 days?	Mon 2/16/04	Fri 2/20/04



Project: GD70107 Schedule 111903.n
Date: Mon 1/10/11

Task		Milestone		External Tasks	
Split		Summary		External Milestone	
Progress		Project Summary		Deadline	

INTERMOUNTAIN POWER SERVICE CORPORATION, DELTA, UTAH
UNIT 1 - ID FANS ADJUSTABLE SPEED DRIVE

IP7012864

From: <steve.klein@tde.alstom.com>
To: <jon-c@ipsc.com>
Date: 11/19/2003 3:15 PM
Subject: Updated project schedule
Attachments: GD70107 Schedule 111903.ZIP

Jon,

I've been having trouble sending the updated schematic drawings & project schedule. It appears that the schematics were successfully transmitted, but on a low priority basis because of the size of the file. You should receive it overnight. If it has not arrived by tomorrow morning, let me know & I'll resend.

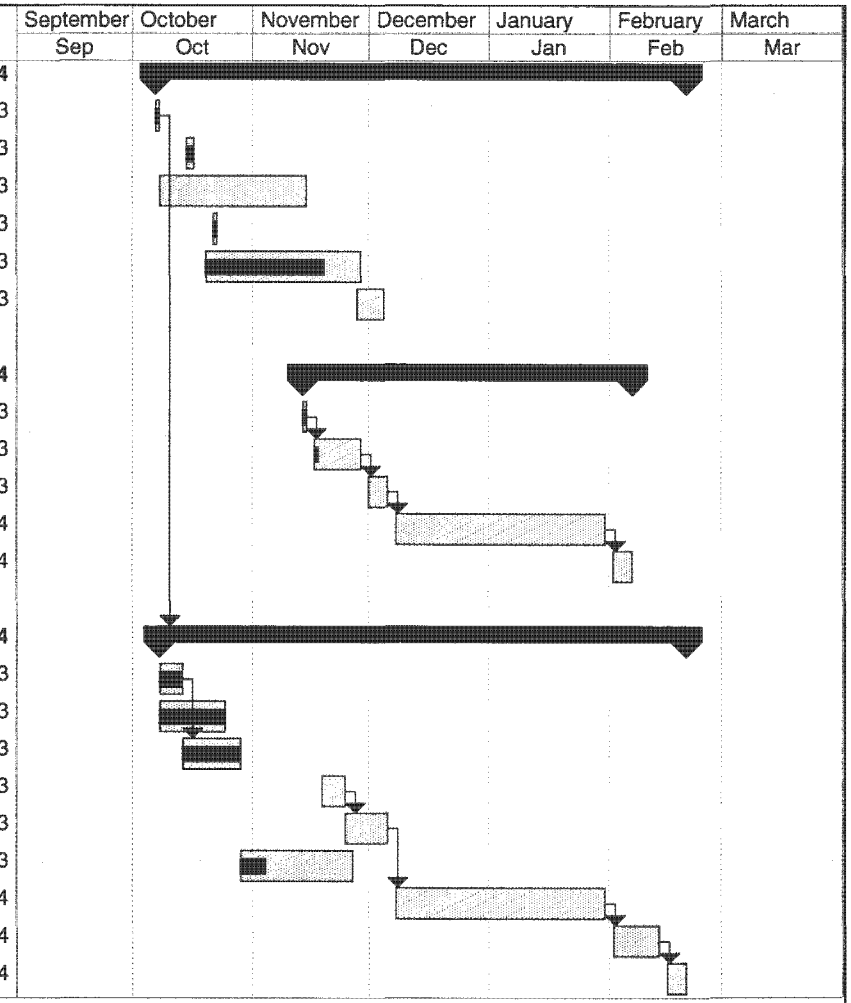
I am attaching the updated project schedule here.

(See attached file: GD70107 Schedule 111903.ZIP)
"GD70107 Schedule 111903.mpp"

Best Regards,

Steve Klein

ID		Task Name	Duration	Start	Finish
1		**Project Overview**	**99 days?**	**Tue 10/7/03**	**Fri 2/20/04**
2	✓	Receive Letter of Intent	1 day	Tue 10/7/03	Tue 10/7/03
3	✓	Customer Kick-off meeting	2 days	Wed 10/15/03	Thu 10/16/03
4		Customer Finalize PO	28 days	Wed 10/8/03	Fri 11/14/03
5	✓	Order Entry	1 day	Wed 10/22/03	Wed 10/22/03
6		Submit Approval Drawings	30 days	Mon 10/20/03	Fri 11/28/03
7		Drawing Approval	5 days	Fri 11/28/03	Thu 12/4/03
8					
9		**Disconnect Switch**	**61 days**	**Fri 11/14/03**	**Fri 2/6/04**
10	✓	Place Purchase Order	1 day	Fri 11/14/03	Fri 11/14/03
11		Submit Approval Drawings	10 days	Mon 11/17/03	Fri 11/28/03
12		Release for Manufacture	5 days	Mon 12/1/03	Fri 12/5/03
13		Manufacture	8 wks	Mon 12/8/03	Fri 1/30/04
14		Shipment	5 days	Mon 2/2/04	Fri 2/6/04
15					
16		**Drive System**	**98 days?**	**Wed 10/8/03**	**Fri 2/20/04**
17	✓	Advanced Electrical BOM	4 days	Wed 10/8/03	Mon 10/13/03
18	✓	Advanced Mechanical BOM	13 days	Wed 10/8/03	Fri 10/24/03
19	✓	Issue P.O.s for Long Lead Items	11 days	Tue 10/14/03	Tue 10/28/03
20		Final BOM	4 days	Wed 11/19/03	Mon 11/24/03
21		Release for Manufacture	9 days	Tue 11/25/03	Fri 12/5/03
22		Balance of Procurement	21 days	Wed 10/29/03	Wed 11/26/03
23		Manufacture	8 wks	Mon 12/8/03	Fri 1/30/04
24		Test	2 wks	Mon 2/2/04	Fri 2/13/04
25		Shipment	5 days?	Mon 2/16/04	Fri 2/20/04



Project: GD70107 Schedule 111903.n
Date: Mon 1/10/11

Task		Milestone		External Tasks	
Split		Summary		External Milestone	
Progress		Project Summary		Deadline	

INTERMOUNTAIN POWER SERVICE CORPORATION, DELTA, UTAH
UNIT 1 - ID FANS ADJUSTABLE SPEED DRIVE

IP7012866

From: Jon Christensen
To: John.A.Benz@sargentlundy.com
Date: 11/19/2003 3:49 PM
Subject: Fwd: Revised Schematics & Project Schedule
Attachments: Valise.ZIP; GD70107 Schedule 111903.ZIP

First set of revised drawings

Jon P. Christensen
Supervising Engineer
Intermountain Power Corp

This e-mail, including attachments, contains information that is confidential. This e-mail, including attachments, constitutes non-public information intended to be conveyed only to the designated recipient(s). If you are not an intended recipient, please delete this e-mail, including attachments, and notify me. The unauthorized use, dissemination, distribution or reproduction of this e-mail, including attachments, is prohibited and may be unlawful.

>>> <steve.klein@tde.alstom.com> 11/19/2003 2:44:13 PM >>>

Jon,

Attached is our revised preliminary schematic drawing and an updated project schedule. Let me know if you had any trouble with the documents.

(See attached file: Valise.ZIP) (See attached file: GD70107 Schedule 111903.ZIP)
"GD70107 Schedule 111903.mpp"

Best Regards,

Steve Klein

Alstom Power Conversion Inc.

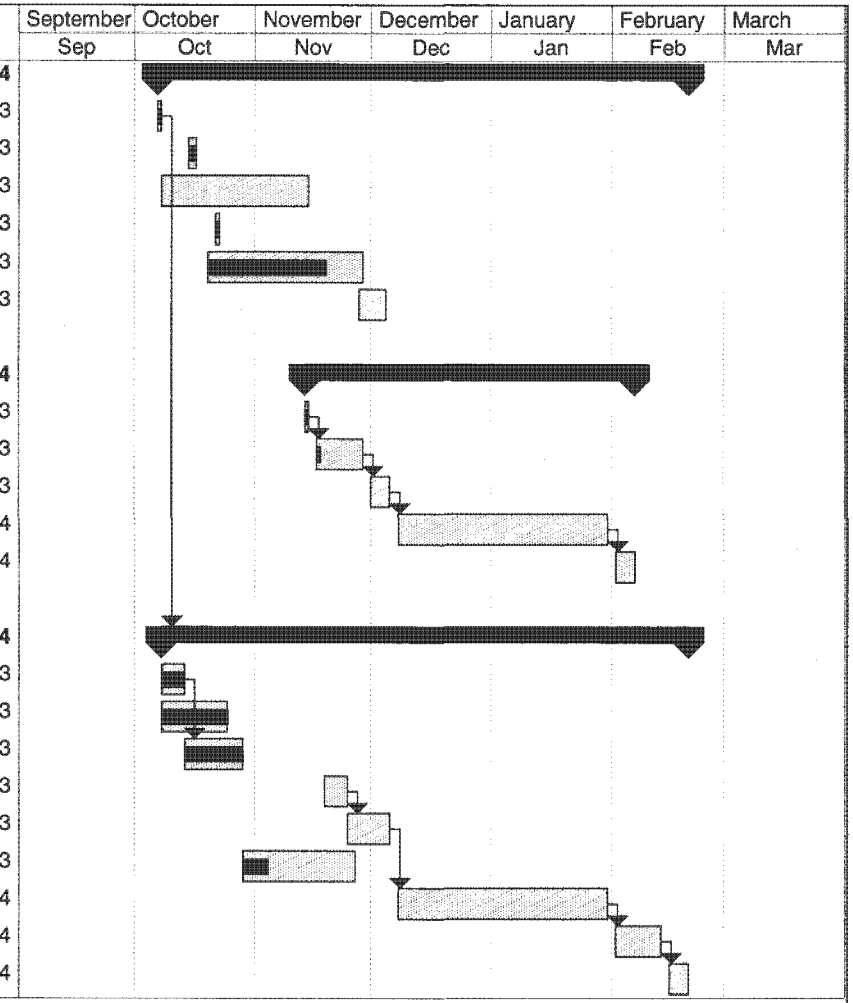
610 Epsilon Drive

Pittsburgh, PA 15238

Phone: 412-967-7168

Fax: 412-967-9326

ID		Task Name	Duration	Start	Finish
1		**Project Overview**	**99 days?**	**Tue 10/7/03**	**Fri 2/20/04**
2	✓	Receive Letter of Intent	1 day	Tue 10/7/03	Tue 10/7/03
3	✓	Customer Kick-off meeting	2 days	Wed 10/15/03	Thu 10/16/03
4		Customer Finalize PO	28 days	Wed 10/8/03	Fri 11/14/03
5	✓	Order Entry	1 day	Wed 10/22/03	Wed 10/22/03
6		Submit Approval Drawings	30 days	Mon 10/20/03	Fri 11/28/03
7		Drawing Approval	5 days	Fri 11/28/03	Thu 12/4/03
8					
9		**Disconnect Switch**	**61 days**	**Fri 11/14/03**	**Fri 2/6/04**
10	✓	Place Purchase Order	1 day	Fri 11/14/03	Fri 11/14/03
11		Submit Approval Drawings	10 days	Mon 11/17/03	Fri 11/28/03
12		Release for Manufacture	5 days	Mon 12/1/03	Fri 12/5/03
13		Manufacture	8 wks	Mon 12/8/03	Fri 1/30/04
14		Shipment	5 days	Mon 2/2/04	Fri 2/6/04
15					
16		**Drive System**	**98 days?**	**Wed 10/8/03**	**Fri 2/20/04**
17	✓	Advanced Electrical BOM	4 days	Wed 10/8/03	Mon 10/13/03
18	✓	Advanced Mechanical BOM	13 days	Wed 10/8/03	Fri 10/24/03
19	✓	Issue P.O.s for Long Lead Items	11 days	Tue 10/14/03	Tue 10/28/03
20		Final BOM	4 days	Wed 11/19/03	Mon 11/24/03
21		Release for Manufacture	9 days	Tue 11/25/03	Fri 12/5/03
22		Balance of Procurement	21 days	Wed 10/29/03	Wed 11/26/03
23		Manufacture	8 wks	Mon 12/8/03	Fri 1/30/04
24		Test	2 wks	Mon 2/2/04	Fri 2/13/04
25		Shipment	5 days?	Mon 2/16/04	Fri 2/20/04



Project: GD70107 Schedule 111903.m
Date: Mon 1/10/11

Task		Milestone		External Tasks	
Split		Summary		External Milestone	
Progress		Project Summary		Deadline	

INTERMOUNTAIN POWER SERVICE CORPORATION, DELTA, UTAH
UNIT 1 - ID FANS ADJUSTABLE SPEED DRIVE

IP7012868

From: <steve.klein@tde.alstom.com>
To: <jon-c@ipsc.com>
CC: <john.bradley@tde.alstom.com>
Date: 11/19/2003 10:09 PM
Subject: SCHEMES RELOADED
Attachments: Valise.ZIP

Jon,

Attached are updated preliminary schematics and the project schedule. I had difficulty sending earlier, so you may have already received this. If so, you can delete this e-mail. Let me know if you have any problems with the files.

Best Regards,

Steve Klein
---------- Forwarded by Steve KLEIN/USPIT01/TDE/non-ALSTOM on 11/19/2003 04:52 PM ----------

Ivan MARTORELL
11/19/2003 04:14 PM

To: Steve KLEIN/USPIT01/TDE/non-ALSTOM@GA
cc: Ian BRADLEY/GBSFY01/TDE/ALSTOM@GA

Subject: SCHEMES RELOADED

(See attached file: Valise.ZIP)
"2001-001.dwg"
"2001-002.dwg"
"2001-003.dwg"
"2001-004.dwg"
"2001-005.dwg"
"2001-006.dwg"
"2001-007.dwg"
"2001-007A.dwg"
"2001-008.dwg"
"2001-008A.dwg"
"2001-008B.dwg"
"2001-009.dwg"
"2001-010.dwg"
"2001-011.dwg"
"2001-012A.dwg"
"2001-012B.dwg"
"2001-012C.dwg"
"2001-012D.dwg"
"2001-013.dwg"
"2001-101.dwg"
"2001-102.dwg"
"2001-103.dwg"
"2001-104.dwg"
"2001-105.dwg"
"2001-106.dwg"
"2001-RR1.dwg"

From: <steve.klein@tde.alstom.com>
To: <jon-c@ipsc.com>
CC: <john.bradley@tde.alstom.com>
Date: 11/19/2003 10:09 PM
Subject: SCHEMES RELOADED
Attachments: GD70107 Schedule 111903.ZIP; Valise.ZIP

Attached are our updated preliminary schematics and project schedule. Let me know if you have any difficulty with the files.

Best Regards,

Steve Klein

(See attached file: GD70107 Schedule 111903.ZIP)
"GD70107 Schedule 111903.mpp"

---------- Forwarded by Steve KLEIN/USPIT01/TDE/non-ALSTOM on 11/19/2003 05:00 PM ----------

Ivan MARTORELL
11/19/2003 04:14 PM

To: Steve KLEIN/USPIT01/TDE/non-ALSTOM@GA
cc: Ian BRADLEY/GBSFY01/TDE/ALSTOM@GA

Subject: SCHEMES RELOADED

(See attached file: Valise.ZIP)
"2001-001.dwg"
"2001-002.dwg"
"2001-003.dwg"
"2001-004.dwg"
"2001-005.dwg"
"2001-006.dwg"
"2001-007.dwg"
"2001-007A.dwg"
"2001-008.dwg"
"2001-008A.dwg"
"2001-008B.dwg"
"2001-009.dwg"
"2001-010.dwg"
"2001-011.dwg"
"2001-012A.dwg"
"2001-012B.dwg"
"2001-012C.dwg"
"2001-012D.dwg"
"2001-013.dwg"
"2001-101.dwg"
"2001-102.dwg"
"2001-103.dwg"
"2001-104.dwg"
"2001-105.dwg"
"2001-106.dwg"
"2001-RR1.dwg"

From: <steve.klein@tde.alstom.com>
To: <jon-c@ipsc.com>
CC: <john.bradley@tde.alstom.com>
Date: 11/19/2003 10:11 PM
Subject: SCHEMES RELOADED
Attachments: GD70107 Schedule 111903.ZIP; Valise.ZIP

Attached are our updated preliminary schematics and project schedule. Let me know if you have any difficulty with the files.

Best Regards,

Steve Klein

(See attached file: GD70107 Schedule 111903.ZIP)
"GD70107 Schedule 111903.mpp"

---------- Forwarded by Steve KLEIN/USPIT01/TDE/non-ALSTOM on 11/19/2003 05:00 PM ----------

Ivan MARTORELL
11/19/2003 04:14 PM

To: Steve KLEIN/USPIT01/TDE/non-ALSTOM@GA
cc: Ian BRADLEY/GBSFY01/TDE/ALSTOM@GA

Subject: SCHEMES RELOADED

(See attached file: Valise.ZIP)
"2001-001.dwg"
"2001-002.dwg"
"2001-003.dwg"
"2001-004.dwg"
"2001-005.dwg"
"2001-006.dwg"
"2001-007.dwg"
"2001-007A.dwg"
"2001-008.dwg"
"2001-008A.dwg"
"2001-008B.dwg"
"2001-009.dwg"
"2001-010.dwg"
"2001-011.dwg"
"2001-012A.dwg"
"2001-012B.dwg"
"2001-012C.dwg"
"2001-012D.dwg"
"2001-013.dwg"
"2001-101.dwg"
"2001-102.dwg"
"2001-103.dwg"
"2001-104.dwg"
"2001-105.dwg"
"2001-106.dwg"
"2001-RR1.dwg"

From: <steve.klein@tde.alstom.com>
To: <jon-c@ipsc.com>
Date: 11/20/2003 7:36 AM
Subject: Project Review Conference Call

Jon,

Confirming our scheduled conference call for 3:00pm (EST) today. Again, you can call in at 412-967-0765 and ask for extension 7133 or, if preferable, you can advise a number for us to call.

Best Regards,

Steve Klein

Alstom Power Conversion Inc.

610 Epsilon Drive

Pittsburgh, PA 15238

Phone: 412-967-7168

Fax: 412-967-9326

From: Jon Christensen
To: John.A.Benz@sargentlundy.com
Date: 11/20/2003 11:58 AM
Subject: Fwd: Project Review Conference Call

Jon P. Christensen
Supervising Engineer
Intermountain Power Corp

This e-mail, including attachments, contains information that is confidential. This e-mail, including attachments, constitutes non-public information intended to be conveyed only to the designated recipient(s). If you are not an intended recipient, please delete this e-mail, including attachments, and notify me. The unauthorized use, dissemination, distribution or reproduction of this e-mail, including attachments, is prohibited and may be unlawful.

>>> <steve.klein@tde.alstom.com> 11/20/2003 7:27:49 AM >>>

Jon,

Confirming our scheduled conference call for 3:00pm (EST) today. Again, you can call in at 412-967-0765 and ask for extension 7133 or, if preferable, you can advise a number for us to call.

Best Regards,

Steve Klein

Alstom Power Conversion Inc.

610 Epsilon Drive

Pittsburgh, PA 15238

Phone: 412-967-7168

Fax: 412-967-9326

From: James Nelson
To: Jon Christensen
Date: 11/24/2003 3:09 PM
Subject: Alstom LCI Drives

Just to close the loop: John Bradley wanted some written documentation regarding the AMOT Valves they want to use on the cooling circuit for these drives.

This is to confirm that the 80psi AMOT valve class is adequate for this application as long as the 80psi represents the allowable operating pressure on these valves. John is checking to confirm this. Shutoff pressures in this system will not exceed 35psi.

From: <john.bradley@tde.alstom.com>
To: <jon-c@ipsc.com>
Date: 11/25/2003 8:17 AM
Subject: Re: Sht 12
Attachments: Valise.ZIP

Jon,

Attached are the updated cabling diagrams for your review. We can discuss them this afternoon.

Regards

jb

(See attached file: Valise.ZIP)
"2001-012A.dwg"
"2001-012B.dwg"
"2001-012C.dwg"
"2001-012D.dwg"

From: Jon Christensen
To: John.A.Benz@sargentlundy.com
Date: 11/25/2003 10:08 AM
Subject: Fwd: Re: Sht 12
Attachments: Valise.ZIP

More revisions

Jon P. Christensen
Supervising Engineer
Intermountain Power Corp

This e-mail, including attachments, contains information that is confidential. This e-mail, including attachments, constitutes non-public information intended to be conveyed only to the designated recipient(s). If you are not an intended recipient, please delete this e-mail, including attachments, and notify me. The unauthorized use, dissemination, distribution or reproduction of this e-mail, including attachments, is prohibited and may be unlawful.

>>> <john.bradley@tde.alstom.com> 11/25/2003 8:07:49 AM >>>
Jon,

Attached are the updated cabling diagrams for your review. We can discuss them this afternoon.

Regards

jb

(See attached file: Valise.ZIP)
"2001-012A.dwg"
"2001-012B.dwg"
"2001-012C.dwg"
"2001-012D.dwg"

From: Jon Christensen
To: John.A.Benz@sargentlundy.com
Date: 11/25/2003 10:10 AM
Subject: Alstom Drawings
Attachments: 2000-8100-RR1.dwg; 2000-8100-02.dwg; 2000-8100-01.dwg; TR-2.dwg; CW256001.DWG; CW256101.DWG; K17533.TXT; NP111981.dwg; NP111982.dwg; plot.log; C13467.DWG; Powercon Seismic Calculations.pdf

Here is a copy of the second CD. Received 11/24/03.

Jon P. Christensen
Supervising Engineer
Intermountain Power Corp

This e-mail, including attachments, contains information that is confidential. This e-mail, including attachments, constitutes non-public information intended to be conveyed only to the designated recipient(s). If you are not an intended recipient, please delete this e-mail, including attachments, and notify me. The unauthorized use, dissemination, distribution or reproduction of this e-mail, including attachments, is prohibited and may be unlawful.

From: <steve.klein@tde.alstom.com>
To: <jon-c@ipsc.com>
Date: 11/25/2003 1:42 PM
Subject: Contract 04-45605, Order Acceptance
Attachments: AP-IP-L-008.ZIP; CONTRACT 04-45605 CO No.1_112103.ZIP

Jon,

As discussed last Friday morning, Alstom proposes to submit our order acceptance subject to resolution of a few cited unresolved issues and with previously agreed specification changes being added to the contract per change order. I have attached drafts of a letter and change order I would issue to accomplish order acceptance.

Please review these documents and advise your comments and/or agreement to proceed with issuing them.

(See attached file: AP-IP-L-008.ZIP) (See attached file: CONTRACT 04-45605 CO No.1_112103.ZIP)
"CONTRACT 04-45605 CO No.1_112103.doc"

"AP-IP-L-008.doc"

Best Regards,

Steve Klein

To:	Mr. George W. Cross President and Chief Operating Officer Intermountain Power Service Corporation 850 West Brush Wellman Road Delta, UT 84624-9546 Attention: Jon Christensen, Contract Administrator	From:	Stephen P. Klein Project Manager
cc:		Tel: Fax: Email:	412 967-7168 412 967-7668 Steve.klein@tde.alstom.com
Your Ref: Our Ref:	Contract No.: 04-45605 GD70107	Date: No. of Pgs.:	November 25, 2003 1 of 2
Project:	Unit No. 1 ID Fans Adjustable Speed Drive	Comm. No:	AP-IP-L-008
Subject:	Order Acceptance		

Dear Jon:

Subsequent to Alstom's review of Contract No. 04-45605 and joint discussions to date relative to comments submitted in Alstom's letter of November 18, 2003, AP-IP-L-006, Alstom hereby submits the following items.

1. Three (3) original Contract Agreements signed by Alstom

2. Change Order No. 1 to Contract No. 04-45605 implementing revisions agreed by Alstom and Intermountain Power – This change order should be transferred onto Intermountain Power letterhead and returned for acceptance signature by Alstom. An electronic version can be provided, if desired.

Additionally, the following issues remain to be resolved.

a. Specification 45605 Division F3, Section 24, Terminal Blocks: States stud-type terminal blocks are not Alstom's standard and the incremental cost for use of States terminal blocks instead of our standard has been quoted on 11/24/03.

b. Specification 45606 Division F7, Section 8, Programming and Communications, Paragraph b., Hard-Wired Communication: The number of required I/O signals must be agreed.

c. Specification 45606 Division 7, Pages F7-21 through F7-25, Existing Hardware Control Signal List: To be discussed further and resolved following Jon Christensen's review of revised schematic drawings submitted on 11/19/03.

Please advise if you have any comments or would like to discuss this letter further prior to forwarding it to John Larsen.

Sincerely,

Stephen P. Klein

CONTRACT NUMBER 04-45606

INDUCED DRAFT FAN MEDIUM VARIABLE FREQUENCY DRIVE SYSTEMS

CHANGE ORDER NUMBER 1

The following revisions are hereby incorporated into Specifications 45606.

1. Division F3, Section 22, Wiring:

   The first 3 sentences of paragraph 8 are to be removed and replaced with. "**Internal feedback CTs are not being run to terminal blocks.**"

2. Division F7, Section1, General:

   In the third paragraph, the words "**including the input transformer**" are to be deleted.

3. Division F7, Section 2.e., VFD System Efficiency:

   Drive efficiency evaluation and calculations shall be made in accordance with IEEE 995 –1987 Section 5.3.5 at the dual channel raring point of 7,415HP, 954RPM, 3,876V with 4,031V, 60Hz supply.

4. Division F7, Section 2.f., System Input Power Factor:

   The power factor will be measured in accordance with the following requirements

   a. Total 12-pulse power factor is measured – this will require that the power drawn by two transformers, and only two transformers be measured together (for one drive).
   b. The 6.9KV supply voltage be at its nominal value for the duration of the testing.
   c. The drive be fully adjusted for optimization.
   d. Adjustments be allowed to correct for any deviation.
   e. A margin of error of +/- 2% be permitted on readings.
   f. Readings be made by visual comparison of phase current of voltage waveforms to obtain the apparent power factor as defined in the bid documents.

g. To conduct the test, it must be permitted to increase the motor voltage by at least 5% as described in the bid.
h. It must, also, be possible to tap down the supply transformer(s) in order to achieve firing angle optimization as described in the bid.
i. The evaluation is made at fan speed of 800rpm.
j. The target power factor is 0.88 at 800rpm (penalty assessment point).

INTERMOUNTAIN POWER SERVICE CORPORATION
850 West Brush Wellman Road
Delta, UT 84624-9546

By: _____ _____
George W. Cross Date
President and Chief Operations Officer

ALSTOM POWER CONVERSION INC.
General Drives
610 Epsilon Drive
Pittsburgh, PA 15238-2880

By: _____ _____
Date

Title: _____

From: <john.bradley@tde.alstom.com>
To: <jon-c@ipsc.com>
CC: <ivan.martorell@tde.alstom.com>, <steve.klein@tde.alstom.com>
Date: 11/26/2003 10:37 AM
Subject: Thermostats

Jon,

Further to our conversation yesterday regarding the thermostat temperature ranges, we are able to get another that open at 110 deg F and close at 100 deg F. The spec originally called for close at 85 and open at 95.

Will this range suffice?

Regards

jb

From: <steve.klein@tde.alstom.com>
To: <jon-c@ipsc.com>
Date: 12/3/2003 9:45 AM
Subject: Contract 04-45605, Order Acceptance
Attachments: AP-IP-L-008.ZIP; CONTRACT 04-45605 CO No.1_A_120203.ZIP

Jon,

Attached are the final drafts of the cover letter & change order no. 1 that I propose to submit as Alstom's order acceptance. If these are OK with you I will formally send the signed Contract Agreements and originals of the attached documents via Fedex this evening. Please advise your concurrence with proceding in this manner.

(See attached file: AP-IP-L-008.ZIP) (See attached file: CONTRACT 04-45605 CO No.1_A_120203.ZIP)
"CONTRACT 04-45605 CO No.1_A_120203.doc"

"AP-IP-L-008.doc"

Best Regards,

Steve Klein

Alstom Power Conversion Inc.

610 Epsilon Drive

Pittsburgh, PA 15238

Phone: 412-967-7168

Fax: 412-967-9326

To:	Mr. George W. Cross President and Chief Operating Officer Intermountain Power Service Corporation 850 West Brush Wellman Road Delta, UT 84624-9546 Attention: Jon Christensen, Contract Administrator	From:	Stephen P. Klein Project Manager
cc:		Tel: Fax: Email:	412 967-7168 412 967-7668 Steve.klein@tde.alstom.com
Your Ref: Our Ref:	Contract No.: 04-45605 GD70107	Date: No. of Pgs.:	December 3, 2003 1 of 1
Project:	Unit No. 1 ID Fans Adjustable Speed Drive	Comm. No:	AP-IP-L-008
Subject:	Order Acceptance		

Dear Jon:

Subsequent to Alstom's review of Contract No. 04-45605 and joint discussions to date relative to comments submitted in Alstom's letter of November 18, 2003, AP-IP-L-006, Alstom hereby submits the following items.

1. Three (3) original Contract Agreements signed by Alstom

2. Change Order No. 1 to Contract No. 04-45605 implementing revisions agreed by Alstom and Intermountain Power – This change order should be transferred onto Intermountain Power letterhead and returned for acceptance signature by Alstom. An electronic version can be provided, if desired.

Please advise if you have any comments or would like to further discuss any issues addressed in this letter.

Sincerely,

Stephen P. Klein

CONTRACT NUMBER 04-45606

INDUCED DRAFT FAN MEDIUM VARIABLE FREQUENCY DRIVE SYSTEMS

CHANGE ORDER NUMBER 1

The following revisions are hereby incorporated into Specifications 45606.

1. Division F3, Section 22, Wiring:

   The first 3 sentences of paragraph 8 are to be removed and replaced with. "**Internal feedback CTs are not being run to terminal blocks.**" Price Change: $0.00

2. Division F7, Section1, General:

   In the third paragraph, the words "**including the input transformer**" are to be deleted. Price Change: $0.00

3. Division F7, Section 2.e., VFD System Efficiency:

   Drive efficiency evaluation and calculations shall be made in accordance with IEEE 995 –1987 Section 5.3.5 at the dual channel rating point of 7,415HP, 954RPM, 3,876V with 4,031V, 60Hz supply. Price Change: $0.00

4. Division F7, Section 2.f., System Input Power Factor:

   The power factor will be measured in accordance with the following requirements

   a. Total 12-pulse power factor is measured – this will require that the power drawn by two transformers, and only two transformers be measured together (for one drive).
   b. The supply voltage shall be at its nominal value of 6.9KV for the duration of the testing.
   c. The drive is to be fully adjusted for optimization.
   d. Adjustments are allowed to correct for any deviation.
   e. A margin of error of +/- 2% is to be permitted on readings.
   f. Readings shall be made by visual comparison of phase current of voltage waveforms to obtain the apparent power factor as defined in Alstom bid ref: SAD00149 dated September 4, 2003.

IP7012889

g. To conduct the test, it must be permitted to increase the motor voltage by at least 5% as described in Alstom bid ref: SAD00149 dated September 4, 2003.
h. It must, also, be possible to tap down the supply transformer(s) in order to achieve firing angle optimization as described in Alstom bid ref: SAD00149 dated September 4, 2003.
i. The evaluation is made at fan speed of 800rpm.
j. The target power factor is 0.88 at 800rpm (penalty assessment point).
Price Change: $0.00

5 Division F3, Section 24, Terminal Blocks: States stud-type terminal blocks are not Alstom's standard. States terminal blocks will be provided in lieu of Alstom's standard for the incremental cost incurred. Price Change: $1,710.00

6 Division F7, Section 8, Programming and Communications, Paragraph b., Hard-Wired Communication: The number of I/O signals will be agreed based upon review of approval drawings transmitted on December 2, 2003. Price Change: $0.00

7. Division F7, Pages F7-21 through F7-25, Existing Hardware Control Signal List: The hardware control signal list will be agreed based upon review approval drawings transmitted on December 2, 2003. Price Change: $0.00

8. SIGMA Synchdrive Training Course at Alstom's office in Pittsburgh, PA for a maximum of six (6) people for four (4) days of training in accordance with Alstom's quotation letter AP-IP-L-004, dated November 13, 2003. Date of training to be determined. Price Change: $9,250.00

TOTAL PRICE CHANGE FOR CHANGE ORDER NO. 1: $10,960.00

INTERMOUNTAIN POWER SERVICE CORPORATION
850 West Brush Wellman Road
Delta, UT 84624-9546

By: _____ _____
George W. Cross Date
President and Chief Operations Officer

ALSTOM POWER CONVERSION INC.
General Drives
610 Epsilon Drive
Pittsburgh, PA 15238-2880

By: _____ _____
Date

Title: _____

IP7012890

From: <steve.klein@tde.alstom.com>
To: <jon-c@ipsc.com>
Date: 12/3/2003 10:27 AM
Subject: Drawings
Attachments: 2000-8100-RR1.zip; Cw256001.zip

Jon,

Here are the switch and layout drawings from yesterday's transmittal. I will send the schematic separately so as not to delay transmission.

(See attached file: 2000-8100-RR1.zip) (See attached file: Cw256001.zip)

Best Regards,

Steve Klein

Alstom Power Conversion Inc.

610 Epsilon Drive

Pittsburgh, PA 15238

Phone: 412-967-7168

Fax: 412-967-9326

From: <steve.klein@tde.alstom.com>
To: <jon-c@ipsc.com>
Date: 12/3/2003 10:39 AM
Subject: Drawing
Attachments: 2001-RR1.zip

Jon,

Here is the schematic drawing.

(See attached file: 2001-RR1.zip)

Best Regards,

Steve Klein

Alstom Power Conversion Inc.

610 Epsilon Drive

Pittsburgh, PA 15238

Phone: 412-967-7168

Fax: 412-967-9326

Jon Christensen - Re: Fwd: Thermostats

From: <JOHN.A.BENZ@sargentlundy.com>
To: "Jon Christensen" <JON-C@ipsc.com>
Date: 12/4/2003 6:49 AM
Subject: Re: Fwd: Thermostats

Jon sorry I was so late, out of town. I think it would be OK, however, attached are a couple of cut sheets that would work per the spec temperatures.
QUESTIONS!

Do we have a status phone call today? If so when?
Is your mechanical group doing the new pump and piping?
Did you send in the new PO for S&L services?

I will give you a call later this morning.
Thanks.

"Jon Christensen" <JON-C@ipsc.com>

11/26/2003 12:16 PM

To: <John.A.Benz@sargentlundy.com>
cc:
Subject: Fwd: Thermostats

Please send me your comments. Thanks

Jon P. Christensen
Supervising Engineer
Intermountain Power Corp

This e-mail, including attachments, contains information that is confidential. This e-mail, including attachments, constitutes non-public
information intended to be conveyed only to the designated recipient(s).
If you are not an intended recipient, please delete this e-mail, including attachments, and notify me. The unauthorized use, dissemination, distribution or reproduction of this e-mail, including attachments, is prohibited and may be unlawful.

>>> <john.bradley@tde.alstom.com> 11/26/2003 10:28:38 AM >>>
Jon,

Further to our conversation yesterday regarding the thermostat temperature
ranges, we are able to get another that open at 110 deg F and close at 100
deg F. The spec originally called for close at 85 and open at 95.

Will this range suffice?

IP7012893

Regards

jb

IP7012894

Jon Christensen - Re: Fwd: Thermostats

From: <JOHN.A.BENZ@sargentlundy.com>
To: "Jon Christensen" <JON-C@ipsc.com>
Date: 12/4/2003 7:02 AM
Subject: Re: Fwd: Thermostats
Attachments: 00.pdf

This time they are attached.

"Jon Christensen" <JON-C@ipsc.com>

11/26/2003 12:16 PM

To: <John.A.Benz@sargentlundy.com>
cc:
Subject: Fwd: Thermostats

Please send me your comments. Thanks

Jon P. Christensen
Supervising Engineer
Intermountain Power Corp

This e-mail, including attachments, contains information that is confidential. This e-mail, including attachments, constitutes non-public
information intended to be conveyed only to the designated recipient(s).
If you are not an intended recipient, please delete this e-mail, including attachments, and notify me. The unauthorized use, dissemination, distribution or reproduction of this e-mail, including attachments, is prohibited and may be unlawful.

>>> <john.bradley@tde.alstom.com> 11/26/2003 10:28:38 AM >>>
Jon,

Further to our conversation yesterday regarding the thermostat temperature
ranges, we are able to get another that open at 110 deg F and close at 100
deg F. The spec originally called for close at 85 and open at 95.

Will this range suffice?

Regards

jb

IP7012895

OTS-1A Specifications

Enclosure: NEMA 4X. Watertight, dust tight, and corrosion resistant die cast aluminum with green polyurethane coating. Other exposed metal is stainless steel.

Connection: Screw terminals on covered terminal strip through 3/4" NPT conduit connection. 14-10 AWG range.

Switch: Single pole, double throw, snap action switching element.

Range: 25°F to 325°F

Ambient Range of Enclosure: -40°F to 160°F

Rating: 22 Amps up to 480V AC

Sensor: 10' SS capillary
.312" dia x 7.75" bulb

Differential: 10°F (approximate)

Wiring: Heating-open on temperature rise - wire to C (purple) and NC (blue).

OTS-2A Specifications

Enclosure: NEMA 4X. Watertight, dust tight, and corrosion resistant die cast aluminum with green polyurethane coating. Other exposed metal is stainless steel.

Connection: Screw terminals on covered terminal strip through 3/4" NPT conduit connection. 14-10 AWG range.

Switch: Single pole, double throw, snap action switching element.

Range: 15°F to 140°F

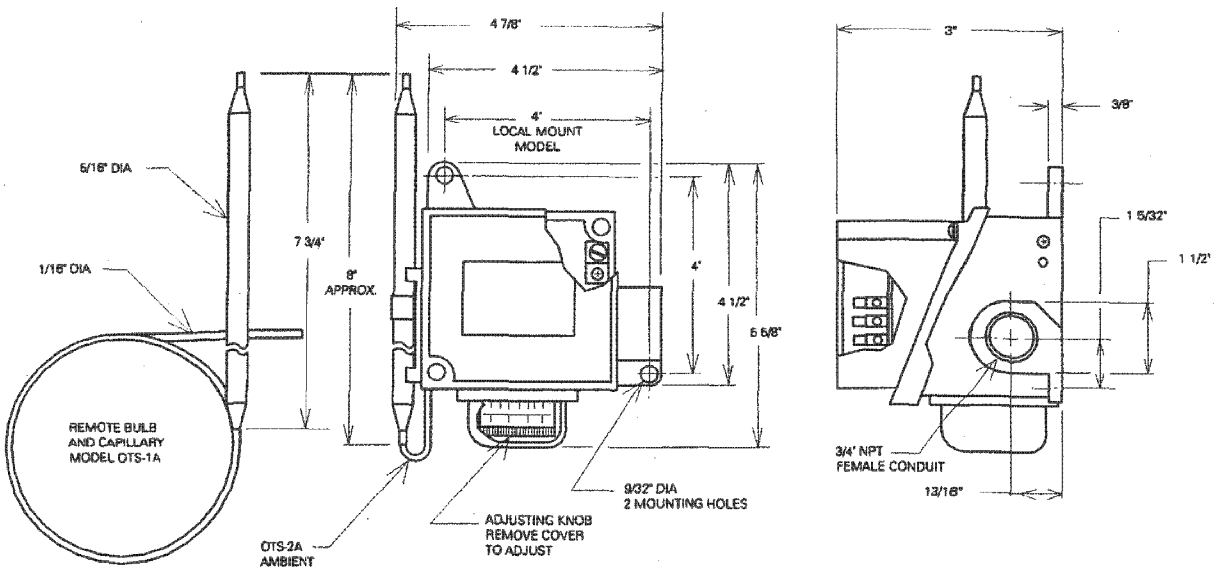
Ambient Range of Enclosure: -40°F to 160°F

Rating: 22 Amps up to 480V AC

Sensor: 316L series SS sensor bulb in local mount. .312" dia x 7.75"

Differential: 10°F

Wiring: Heating-open on temperature rise - wire to C (purple) and NC (blue).



DELTA-THERM CORPORATION ®

398 W. Liberty St. P.O. Box 345 Wauconda, IL 60084
(800) 526-7887 (847) 526-2407 (312) 346-0053 FAX (847) 526-4456
Email heat@delta-therm.com Internet http://www.delta-therm.com

PRINTED WITH SOY INK

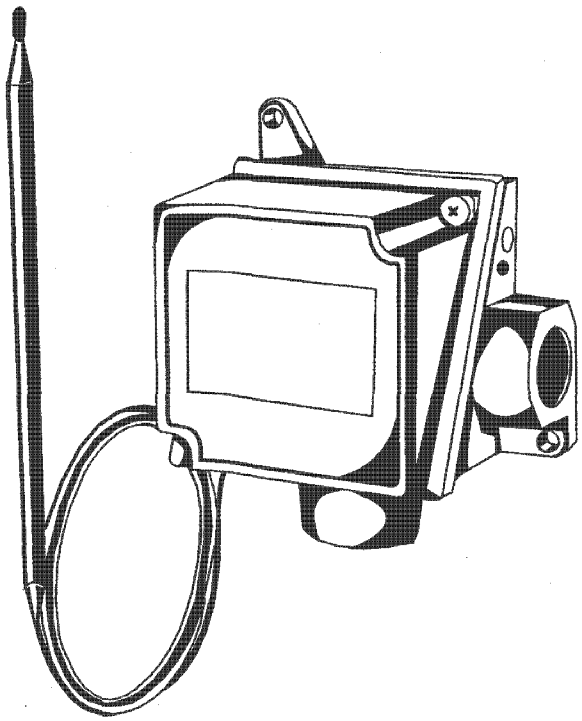
C-OTS-1A-2A-08/03

IP7012896

DELTA-THERM CORPORATION®

CONTROLS

OTS-1A AND OTS-2A THERMOSTATS



Shown here is the OTS-1A, the OTS-2A has the same enclosure with a SS sensor bulb in local mount.

OTS-1A Description

Delta-Therm's OTS-1A is a NEMA 4X line-sensing thermostat featuring a watertight, dust tight, and corrosion resistant die cast enclosure. The thermostat contains a calibrated reference dial and tamper-proof adjustment for outdoor or indoor locations. A liquid-filled thermal system, with its stainless steel bulb and capillary, ensures a dependable and accurate control system.

Applications

OTS-1A thermostats typically control:

- Pipe Tracing Systems
- Tank Heating Systems
- Process Heating Systems

Approvals

- UL Listed
- CSA Certified

OTS-2A Description

Delta-Therm's OTS-2A is a NEMA 4X ambient-sensing thermostat featuring a watertight, dust tight, and corrosion resistant die cast enclosure. The thermostat contains a calibrated reference dial and tamper-proof adjustment for outdoor or indoor locations. A liquid-filled thermal system, with its stainless steel bulb and capillary, ensures a dependable and accurate control system.

Applications

OTS-2A thermostats typically control:

- Pipe Tracing Systems
- Tank Heating Systems

Approvals

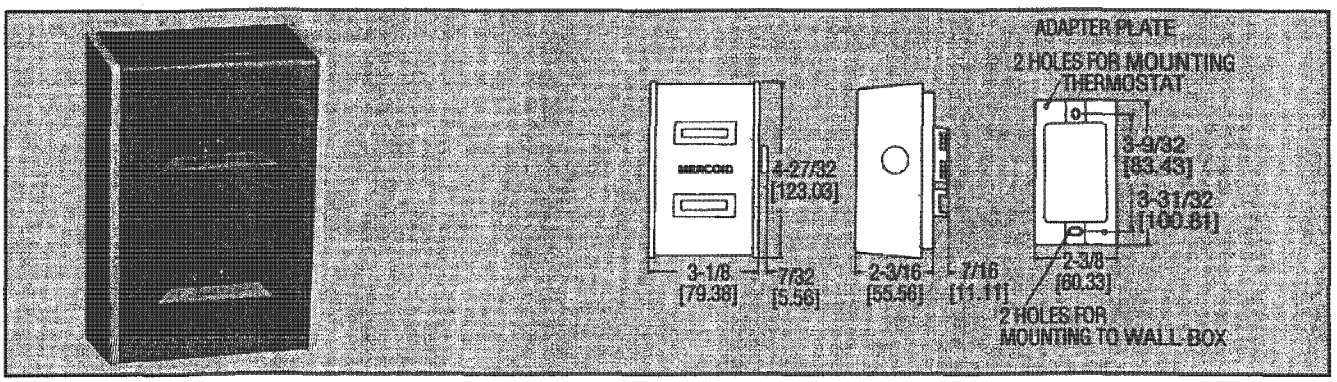
- UL Listed
- CSA Certified

IP7012897

Series 860

Line Voltage Thermostats

Built-in Thermometer, heavy duty construction.



Heavy duty and reliable, Model 860 Line Voltage thermostat is designed for direct control of motors operating HVAC equipment in industrial environments. Hermetically sealed mercury switch resists dust, dirt, grease and moisture. Cadmium plated steel and brass mechanism resist corrosion. Setpoint is easily adjustable via knurled knob located on the side of the unit. Knob may be removed to prevent tampering. Contacts rated up to 17A available on special order.

Suggested Specification

Thermostats shall have heavy duty controls suitable for 120/240 V operation. Contacts shall be hermetically sealed and mercury wetted. Units shall include integral thermometer. Enclosures shall be (indoor) (explosion-proof) type. Units shall be bellows actuated and shall have removable setpoint adjust knob.

PHYSICAL DATA

Maximum Ambient Temperature: –10°F to 140°F (–23°C to 60°C).
Dial Calibration: Degrees – F.
Mounting: Standard – to wall switch box. Adapter plate supplied. Explosion-proof. – top and bottom mounting lugs.
Electrical Rating: See chart.
Conduit Opening: Standard – wall switch box. Explosion-proof – 1/2″NPT top and bottom.
Switch Type: Mercury.
Setpoint Adjustment: Removable knob.
Housing: Standard – plastic. Explosion-proof – plastic/aluminum.
Weight: Standard – 1½ lbs. (0.7 kg). Explosion-proof – 4½ lbs. (2 kg).
Installation: Vertical.

ELECTRICAL RATINGS

CIRCUIT OPTION	RATING
-2 (except 2MS), -3	10A @ 120 VAC/DC 5A @ 240 VAC/DC – 3/4 HP single phase 120/240 VAC 1/4 HP 120/240 VDC.
-2MS	10A @ 120 VAC/DC 5A @ 240 VAC/DC – 1/2 HP single phase 120/240 VAC 1/4 HP 120/240 VDC.
-26, -36	Same as first ratings above plus non-inductive 17A @ 120 VAC (2040 Watts), 17A @ 240 VAC (4080 Watts).
-153	4A @ 120 VAC/DC 2A @ 240 VAC/DC, 1/8 HP, single phase 120/240 VAC.

temperature

MODEL CHART – SERIES 860

EXAMPLE	860				61	860-2-61 Line Voltage thermostat, fixed deadband, automatic, reset, adjustable range 25-60°F (–4-15°C).		
CONSTRUCTION	860					General purpose enclosure (standard)	UL	CSA
HOUSING OPTIONS			EH			Explosion-proof enclosure, NEMA-7, 9 – Class I, Group C & D; Class II, Group E, F & G	UL	
CIRCUIT (SWITCHING) OPTIONS				2		SPST mercury switch – opens on temperature rise.	UL	CSA
				2MS		SPST mercury switch – opens on temperature rise, 3 position manual selector – off, auto on. Available with circuit –2 only, reduced electrical rating.	UL	CSA
				3		SPST mercury switch – closes on temperature rise	UL	CSA
				26		SPST mercury switch – closes on temperature rise	UL	CSA
				36		SPST mercury switch – opens on temperature rise		CSA
				153		SPDT mercury switch	UL	CSA
ADJUSTABLE TEMPERATURE RANGES						Approximate Deadband of °F (°C)		
					61	Adjustable range 25-60°F (–4-15°C) 2° (1)	UL	CSA
					62	Adjustable range 38-70°F (4-21°C) 2° (1)	UL	CSA
					63	Adjustable range 56-80°F (14-27°C) 2° (1)	UL	CSA
					64	Adjustable range 65-90°F (18-33°C) 2° (1)	UL	CSA
					65	Adjustable range 80-110°F (27-43°C) 4° (2)	UL	CSA

Manual Selector: Type 860-2MS provided with three-position manual selector marked for no heat, automatic fan settings. Fan settings maintains continuously closed circuit for operation of ventilating equipment.
Thermostat Guard: Metal guard with steel case. Order No. 12-85 for exposed wiring, No. 12-82 for concealed wiring.
NOTE: Types 860-26 & 860-36 are for electric heating and are not furnished with thermometers as standard. Thermometers available at no extra charge on request.

IP7012898

From: <steve.klein@tde.alstom.com>
To: <jon-c@ipsc.com>
Date: 12/4/2003 1:51 PM
Subject: Powercon Switch Approval Drawings
Attachments: Powercon Approval Drawings 120203.zip

Jon,

Once again, my apologies on sending the wrong drawings. The correct ones are attached below. The Fedex package contains hard copy of the correct drawings.

(See attached file: Powercon Approval Drawings 120203.zip)

Best Regards,

Steve Klein

Alstom Power Conversion Inc.

610 Epsilon Drive

Pittsburgh, PA 15238

Phone: 412-967-7168

Fax: 412-967-9326

From: <steve.klein@tde.alstom.com>
To: <jon-c@ipsc.com>
CC: <john.bradley@tde.alstom.com>, <john.fakner@tde.alstom.com>
Date: 12/5/2003 7:39 AM
Subject: Contract 04-45605
Attachments: GD70107 Schedule .ZIP

Jon,

Attached is a current, updated project schedule.

(See attached file: GD70107 Schedule .ZIP)
"GD70107 Schedule .mpp"

Best Regards,

Steve Klein

Alstom Power Conversion Inc.

610 Epsilon Drive

Pittsburgh, PA 15238

Phone: 412-967-7168

Fax: 412-967-9326

From: <steve.klein@tde.alstom.com>
To: <jon-c@ipsc.com>
Date: 12/11/2003 7:33 AM
Subject: Schematic
Attachments: Valise.ZIP

Jon,

Attached are about 1/3 of the schematic drawings. I will send 2 more e-mails to complete the transmittal.

(See attached file: Valise.ZIP)
"2001-001.dwg"
"2001-002.dwg"
"2001-003.dwg"
"2001-004.dwg"
"2001-005.dwg"
"2001-006.dwg"
"2001-007.dwg"
"2001-007A.dwg"

Best Regards,

Steve Klein

Alstom Power Conversion Inc.

610 Epsilon Drive

Pittsburgh, PA 15238

Phone: 412-967-7168

Fax: 412-967-9326

From: <steve.klein@tde.alstom.com>
To: <jon-c@ipsc.com>
Date: 12/11/2003 7:37 AM
Subject: Schematic Drawings
Attachments: Valise.ZIP

Jon,

Here is the 2nd batch.

(See attached file: Valise.ZIP)
"2001-008.dwg"
"2001-008A.dwg"
"2001-008B.dwg"
"2001-009.dwg"
"2001-010.dwg"
"2001-011.dwg"
"2001-012A.dwg"
"2001-012B.dwg"
"2001-012C.dwg"

Best Regards,

Steve Klein

Alstom Power Conversion Inc.

610 Epsilon Drive

Pittsburgh, PA 15238

Phone: 412-967-7168

Fax: 412-967-9326

From: <steve.klein@tde.alstom.com>
To: <jon-c@ipsc.com>
Date: 12/11/2003 7:42 AM
Subject: Schematic Drawings
Attachments: Valise.ZIP

Jon,

Here is the final batch. Please let me know if you have any problem with the transmittal.

(See attached file: Valise.ZIP)
"2001-012D.dwg"
"2001-013.dwg"
"2001-101.dwg"
"2001-102.dwg"
"2001-103.dwg"
"2001-104.dwg"
"2001-105.dwg"
"2001-106.dwg"
"2001-RR1.dwg"

Best Regards,

Steve Klein

Alstom Power Conversion Inc.

610 Epsilon Drive

Pittsburgh, PA 15238

Phone: 412-967-7168

Fax: 412-967-9326

From: Sheila Bronson
To: John Larsen; Jon Christensen
Date: 12/11/2003 9:37 AM
Subject: Alstom 04-45605

For your information only. I received an invoice for $90,900.00 dated 12-04-03. It is my understanding that this contract has not even been signed yet.

Jon Christensen - Alstom comments

From: <JOHN.A.BENZ@sargentlundy.com>
To: <jon-c@ipsc.com>
Date: 12/12/2003 11:51 AM
Subject: Alstom comments
CC: <DAVID.A.ROBERTS@sargentlundy.com>
Attachments: Drawing comments 121203.doc

Attached are my comments on the drawings.

IP7012905

Jon;
I have the following comments on the Alstom drawings.
General comments, none of the drawings have a checked person on the CK like. For the outline we are on rev. 4 yet we are still on rev. 1 for the other Alstom drawings. Rev. 1 is the initial issue. On all drawings that show a SS shipping split, there are many that only show SS on one side and the other side is to a terminal block, I think we should show a SS on both sides.
Drawing Numbers:

2000-8100-01 and –02.

Submit details of the anchor bolts including size and type of installation with a Structural PE stamp on the calculation and details.
Add height dimension on all power cable connection points.
Submit details of the power cable connections.

2001-RR1

See general comments on drawing revisions and signatures.

2001-01

The input terminals to the drive were R1, R3, and R5 changed last rev. Drawing now shows R1,R2, &R3.
Alstom was to add terminal numbers on this drawing for all cabling.
Delete the shaft encoder. Not per spec.

2001-002

At A10 it shows a SS and the other side 008A-H13 also shows a SS and that is what we want on all SS's.
The input is R1,R2 and R3 we had R1,R3 and R5 before. What do you want.
At U10 add drawing number for disconnect switch.

2001-003

The cross-reference at B9 and G9 are reversed for the 25 ribbon cables, Correct.
At V6 the cross-reference should be U11 not U1.

2001-004

The cross-reference at E2 and R2 are reversed for the 25 ribbon cables, Correct see comment on sheet –003.

2001-005

I think there should be a SS at E9 for the 24 VDC cable 1030.

2001-006

Typical no cross-references

2001-007

At R15 the dashed resistors are shown as external. Where are they? They should be internal and wired by Alstom. It also shows furnished by IPSC since it is dashed.

2001-007A

Jon for the spare analogs do you want 4-20ma? I would think so, but the drawing shows 0-10v.
At P11 add contact numbers to SOR both contacts.
At T11 the speed feedback should be 150-1000RPM
At R3 the cable to exciter is shown as twisted and the other side is shown as shielded, what is correct?

2001-008

General comment add ALL relay contacts at ALL relays.

At P12 where is DIS used?

2001-008A

General comment add SS at both sides of all shipping splits.

2001-008B

General comment add ALL relay contacts at ALL relays

2001-009

At K12 the exciter cable is show as shielded on other side it is twisted, what is correct?

At P6 the FCN top connect needs contact numbers. This complete contact has to be looked at.

2001-010

At E3 add wire 1056 to TB2-8

At D14 remove MCB6 it is in IPSC MCC.

At C15 TB2-1 should be 1037 wire # per other end, correct.

At C15 TB2-2 should be 1038 wire # per other end, correct.

At K7 wire # 1019D should cross-reference 11-F13 not 11-B13

At U6 wire # 1026 add TB3-21

At U6 wire # 1027 add TB2-22

At U9 wire number 1031 should go to 011-F2 not 011-B2.

2001-011

At E5 the light should be A not G

At D14 the wiring of FCN has to be checked as well as TB's. see sheet 009 P5

At J15 add contact numbers to FCN, check wiring of FCN last contact.

At J15 relay BKTP shows 2 contacts (not numbered) on sheet 12A and 12C it shows both contacts in series. If in series need to show 4 contacts not 2.

At T2 terminal TB2-4 should be wire #1039

2001-12A

TB2-1 should be wire # 1046

TB2-2 should be wire # 1047

TB2-4 should be wire # 1049A and cross-reference should be 011-T3

TB2-5 should be wire # 1017

TB2-6 should be wire #1019 and cross reference should be 010-B2 not N1

TB2-7 and 8 should NOT show a wire on sheet 12A it is only on sheet 12C

At L19 cross-reference should be 010-E5 not 010-C5.

TB2-11 and 12 each show a contact (2 in series) not that way on other end.

Contact on TB3-36 and 37 should be numbered.

2001-12B, C and D

I did not check external cables.

2001-13

No comment

2001-101

Show all contacts on all relays

2001-102

At N8 cross reference should be 101-M2 not M7

At N11 cross reference should be 101-N2 not N7

The OL is before the contactor, I have always seen it after the contactor i.e. between the contactor and motor. It will work but what do you want.
The OL is set at 1.5 amps, too low the FLA is 1.4 per this drawing and 2.5 per sheet 106. What is correct?

2001-103

At L all cross-references letter 7 should be letter 2.
At M18 and M19 the last two wires should have a wire # 1030
At M4 wire #10311 should be 10318
At P2 cross-reference 011-B11 should be 011F11

2001-104

TBP1-17 on the left side should be wire # 10311 per cross reference, yet the other side 10318 is correct per the cross reference.

2001-105

At R12 the low point drain goes where? To the drip pan?

2001-106

The motor data is different FLA 2.5 on sheet 104 it is 1.4.
At G14 install at lowest point, does it go to drip pan?
At B17 is the drain and is shows in the base at ground on the GA, how to you drain any water? Is there a valve? How can you drain it to a container since the drain is at floor level. Water will not run up hill.

CW-12561 and CW-12560

Add cross reference to Alstom drawings for 120 V.AC.
Drawing shows remote start and stop. What is this?

C-13467

Still shows a J bolt, this will not work.
Submit details of the anchor bolts including size and type of installation with a Structural PE stamp on the calculation and details.
Drawing shows 5 foot aisle not available
The remote control conduit, if used would have to be core drilled.
The enclosure has to be gasketed.

From: "Watanabe, Bryan" <watanabb@tecowestinghouse.com>
To: "Jon P. Christensen (E-mail)" <jon-c@ipsc.com>
CC: "Elliott, Craig" <elliottc@tecowestinghouse.com>
Date: 12/15/2003 10:24 AM
Subject: Jerry Avey answers to LCI motors.
Attachments: IPP-Jon Christensen12-15-03.doc

Jon:
Please see attached file. Question two needs further discussion.

<<IPP-Jon Christensen12-15-03.doc>>

Bryan Watanabe
TECO Westinghouse Motor Company
Field Sales Representative
801-446-4600 Phone
801-209-7191 Cell Phone
801-446-4318 Fax
e-mail watanabb@tecowestinghouse.com

JERRY AVEY, need your help. There are three questions we need to get answers on regarding the 8 motors supplied 4 each on SOs 1729AA and 1729AB. They are buying new Alstom LCI drives with digital controls to power these synchronous motors. The questions are:

1. What are the Volts/Hz limits for this motor design? He's interested in flattening out the curve for PF control. Please use 76.3

2. The drives OEMs who bid on the drives told Intermountain Power that the current (amps) value we show on the outline drawing for the 3 winding connection appear to be wrong - don't make sense. What are the correct values? Please elaborate on what does not make sense because these values were checked

3. Can the motors be operated at 4160V? yes, continuos duty at 4160 is no problem with the motors.

From: <steve.klein@tde.alstom.com>
To: Jon Christensen <JON-C@ipsc.com>
Date: 12/17/2003 3:14 PM
Subject: Re: Draft drawing comments
Attachments: 2001-012A JPC REVIEW.dwg; Comments on ALSTOM drawings 12-15-03.doc

Jon,

As advised in my voice mail of earlier today, the following Powercon drawing was omitted from the drawing numbering system in your approval drawing comments. I have advised Powercon to number that drawing as follows:

Powercon Drawing CW-12560, IPP Drawing No. 63.2203.1.05-900006.

Best Regards,

Steve Klein

Jon Christensen <JON-C@ipsc.com> on 12/15/2003 08:25:02 PM

To: John BRADLEY/USPIT01/TDE/ALSTOM@GA, Steve KLEIN/USPIT01/TDE/non-ALSTOM@GA
cc:

Subject: Draft drawing comments

We will finalize the comments Tuesday at 9:00 am. Thanks

Jon P. Christensen
Supervising Engineer
Intermountain Power Corp

This e-mail, including attachments, contains information that is confidential. This e-mail, including attachments, constitutes non-public
information intended to be conveyed only to the designated recipient(s).
If you are not an intended recipient, please delete this e-mail, including attachments, and notify me. The unauthorized use, dissemination, distribution or reproduction of this e-mail, including attachments, is prohibited and may be unlawful.

(See attached file: 2001-012A JPC REVIEW.dwg)
(See attached file: Comments on ALSTOM drawings 12-15-03.doc)

ALSTOM DRAWING REVIEW COMMENTS
APPROVAL DRAWINGS SUBMITTED 12/11/03

General comments

1. In the title bock change IPCS to IPSC.

2. On all drawings that show a SS shipping split, there are many that only show the SS on one side and the other side is to a terminal block. Show the SS on both ends of the cable.

3. Show all relay contacts.

4. Drawing Numbering System

Alstom Drawing Number	Unit Designation	Project Equipment	IPP Drawing #
2000-8100-01	Unit 2	2CCE-EXX-1D2	63.2203.1.05-240001
2000-8100-02	Unit 2	2CCE-EXX-1D1	63.2203.1.05-240002
GD70107\2001-RR1	Unit 2	2CCE-EXX-1D	63.2203.1.05-240003
GD70107\2001-001	Unit 2	2CCE-EXX-1D	63.2203.1.05-240004
GD70107\2001-002	Unit 2	2CCE-EXX-1D	63.2203.1.05-240005
GD70107\2001-003	Unit 2	2CCE-EXX-1D	63.2203.1.05-240006
GD70107\2001-004	Unit 2	2CCE-EXX-1D	63.2203.1.05-240007
GD70107\2001-005	Unit 2	2CCE-EXX-1D	63.2203.1.05-240008
GD70107\2001-006	Unit 2	2CCE-EXX-1D	63.2203.1.05-240009
GD70107\2001-007	Unit 2	2CCE-EXX-1D	63.2203.1.05-240010
GD70107\2001-007A	Unit 2	2CCE-EXX-1D	63.2203.1.05-240011
GD70107\2001-008	Unit 2	2CCE-EXX-1D	63.2203.1.05-240012
GD70107\2001-008A	Unit 2	2CCE-EXX-1D	63.2203.1.05-240013
GD70107\2001-008B	Unit 2	2CCE-EXX-1D	63.2203.1.05-240014
GD70107\2001-009	Unit 2	2CCE-EXX-1D	63.2203.1.05-240015
GD70107\2001-010	Unit 2	2CCE-EXX-1D	63.2203.1.05-240016
GD70107\2001-011	Unit 2	2CCE-EXX-1D	63.2203.1.05-240017
GD70107\2001-012A	Unit 2	2CCE-EXX-1D	63.2203.1.05-240018
GD70107\2001-012B	Unit 2	2CCE-EXX-1D	63.2203.1.05-240019
GD70107\2001-0012C	Unit 2	2CCE-EXX-1D	63.2203.1.05-240020
GD70107\2001-0012D	Unit 2	2CCE-EXX-1D	63.2203.1.05-240021
GD70107\2001-0013	Unit 2	2CCE-EXX-1D	63.2203.1.05-240022
GD70107\2001-101	Unit 2	2CCE-EXX-1D	63.2203.1.05-240023
GD70107\2001-102	Unit 2	2CCE-EXX-1D	63.2203.1.05-240024
GD70107\2001-103	Unit 2	2CCE-EXX-1D	63.2203.1.05-240025
GD70107\2001-104	Unit 2	2CCE-EXX-1D	63.2203.1.05-240026
GD70107\2001-105	Unit 2	2CCE-EXX-1D	63.2203.1.05-240027
GD70107\2001-106	Unit 2	2CCE-EXX-1D	63.2203.1.05-240028

IP7012912

GD70107\2001-107	Unit 2	2CCE-EXX-1D	63.2203.1.05-240029
QF0209r1	*not required*	*not required*	63.2203.1.05-900001*
C-13467 sheet 1 of 1	*not required*	*not required*	63.2203.1.05-900002*
NP-11198 sheet 1 of 2	*not required*	*not required*	63.2203.1.05-900003*
NP-11198 sheet 2 of 2	*not required*	*not required*	63.2203.1.05-900004*
CW-12561	*not required*	*not required*	63.2203.1.05-900005*

* The IPP drawing numbers for the motor operated switch assumes the switch drawings are generic for all eight drive assemblies. If separate drawings are being furnished for each drive assembly the numbers will be changed to reflect the correct unit number.

IPP numbering scheme

63.2203.1.AA-BCDDDD

63.2203.1	Alstom Contract 45605	
AA	drawings	.05
	reports	.06
	instruction books	.07
B	Unit 1, 2 or 9 (common equipment)	
C	equipment number	A drive is 1, B drive is 2, C drive is 3, D drive is 4
DDDD	sequential number for each vendor drawing number	

<u>Drawing No. GD70107/2000-8100-01 and -02</u>

1. Provide a detail drawing of the bus connections for the high voltage power cable connections. Verify electrical clearances are in accordance with ANSI standards, including any de-rating required for elevation. Provide detailed information on cable connection including bolt torques, bolting assembly and installation requirements. Submit details of the power cable connections.
2. Submit details of the anchor bolts including size and type of installation with a Structural PE stamp on the calculation and details. Seismic details shall be based on installation on the existing floors.
3. Provide cabinet layout drawings showing major components and terminal blocks.

<u>Drawing No. GD70107/2001-RR1</u>

1. See General comments

<u>Drawing No GD70107/2001-001</u>

1. Add terminal numbers on this drawing for all cabling, including DC Link Reactors, exciters and shaft encoders.

IP7012913

Drawing. GD70107/2001- 002

1. Show shipping splits (SS) in a consistent manner. At A10 it shows a SS and the other end of the cable on 008A-H13 also shows a SS. Show shipping splits on both ends of each cable.
2. At U10 add drawing number for disconnect switch.
3. The existing DC Link Reactor has a distribution class arrestor connected to the line terminal. This should be shown on this drawing.

Drawing. No GD70107/2001- 003

1. At P3 provide the reference drawing MN/H4294
2. The cross-reference at B9 and G9 are reversed for the 25 ribbon cables.
3. At V6 the cross-reference should be U11 not U1.

Drawing No. GD70107/2001- 004

1. The cross-reference at E2 and R2 are reversed for the 25 ribbon cables, See comment on sheet 2001–003.

Drawing No. GD70107/2001- 005

1. There should be a SS at E9 for the 24 VDC cable 1030.

Drawing No. GD70107/2001- 006

1. No exceptions noted.

Drawing No. GD70107/2001- 007

1. At R15, change the dashed outline to a solid line to indicate the resistors are furnished by Alstom.

Drawing No. GD70107/2001- 007A

1. Provide a write up of operation and logic diagrams.
2. All spare analog circuits are to be 4 – 20 mA.
3. At P11 add contact numbers to SOR both contacts.
4. At T11 the speed feedback should be 150-1100RPM.
5. At R3 the cable to exciter is shown as twisted and the other side is shown as shielded, what is correct?

IP7012914

Drawing No. GD70107/2001- 008

1. At P12 where is DIS used? Provide reference to switch drawings.

Drawing No. GD70107/2001- 008A

1. No exceptions noted.

Drawing No. GD70107/2001-008B

1. No exceptions noted.

Drawing No. GD70107/2001-009

1. At K12 the exciter cable is shown as shielded on other side it is twisted, what is correct?
2. At P6 the FCN top connect needs contact numbers. This complete contact has to be looked at.

Drawing No. GD70107/2001-010

1. At E3 add wire 1056 to TB2-8
2. At C15 TB2-1 should be 1037 wire # per other end, correct.
3. At C15 TB2-2 should be 1038 wire # per other end, correct.
4. At K7 wire # 1019D should cross-reference 11-F13 not 11-B13
5. At U6 wire # 1026 add TB3-21
6. At U6 wire # 1027 add TB2-22
7. At U9 wire number 1031 should go to 011-F2 not 011-B2.
   2001-011

Drawing No. GD70107/2001-011

1. At E5 the light should be A not G
2. At D14 the wiring of FCN has to be checked as well as TB's. see sheet 009 P5
3. At J15 add contact numbers to FCN, check wiring of FCN last contact.
4. At J15 relay BKTP shows 2 contacts (not numbered) on sheet 12A and 12C it shows both contacts in series. If in series need to show 4 contacts not 2.
5. At T2 terminal TB2-4 should be wire #1039

Drawing No. GD70107/2001-012A

General comments for the wiring drawings 12A, 12B, 12C and 12D

The circuit numbers do not have any hyphens or spaces to differentiate them from the drawing numbers. A typical circuit number would be 2CCEK2127B01. The drawing number associated with that circuit is 2CCE-K2127B.

Attached is a revised drawing for 12A showing the correct format.

IP7012915

1. TB2-1 should be wire # 1046
2. TB2-2 should be wire # 1047
3. TB2-4 should be wire # 1049A and cross-reference should be 011-T3
4. TB2-5 should be wire # 1017
5. TB2-6 should be wire #1019 and cross reference should be 010-B2 not N1
6. TB2-7 and 8 should NOT show a wire on sheet 12A it is only on sheet 12C
7. At L19 cross-reference should be 010-E5 not 010-C5.
8. TB2-11 and 12 each show a contact (2 in series) not that way on other end.
9. Contact on TB3-36 and 37 should be numbered.

Drawing No. GD70107/2001-012B

1. Correct the format to match 12A.

Drawing No. GD70107/2001-013

1. No exceptions noted.

Drawing No. GD70107/2001-101

1. Show all contacts on all relays

Drawing No. GD70107/2001-102

1. At N8 cross reference should be 101-M2 not M7
2. At N11 cross reference should be 101-N2 not N7
3. The OL is before the contactor, I have always seen it after the contactor i.e. between the contactor and motor. It will work but what do you want.
4. The OL is set at 1.5 amps, too low the FLA is 1.4 per this drawing and 2.5 per sheet 106. What is correct?

Drawing No. GD70107/2001-103

1. At L all cross-references letter 7 should be letter 2.
2. At M18 and M19 the last two wires should have a wire # 1030
3. At M4 wire #10311 should be 10318
4. At P2 cross-reference 011-B11 should be 011F11

Drawing No. GD70107/2001-104

1. TBP1-17 on the left side should be wire # 10311 per cross reference, yet the other side 10318 is correct per the cross reference.

IP7012916

Drawing No. GD70107/2001-105

1. At R12 the low point drain goes where? To the drip pan?

Drawing No. GD70107/2001-106

1. The motor data is different FLA 2.5 on sheet 104 it is 1.4.
2. At G14 install at lowest point, does it go to drip pan?
3. At B17 is the drain and is shows in the base at ground on the GA, how to you drain any water? Is there a valve? How can you drain it to a container since the drain is at floor level. Water will not run up hill.

Drawing No. CW-12561 and CW-12560

1. Add cross reference to Alstom drawings for 120 V.AC.
2. Drawing shows remote start and stop. What is this?

Drawing No.C-13467

1. Still shows a J bolt, this will not work.
2. Submit details of the anchor bolts including size and type of installation with a Structural PE stamp on the calculation and details.
3. Drawing shows 5 foot aisle not available
4. The remote control conduit, if used would have to be core drilled.
5. The enclosure has to be gasketed.

IP7012917

From: <john.bradley@tde.alstom.com>
To: <jon-c@ipsc.com>, <steve.klein@tde.alstom.com>, <william.oleyar@tde.alst...
Date: 12/18/2003 9:39 AM
Subject: Reply to Comments on Drawings
Attachments: Reply to Comments on ALSTOM drawings 12-15-03.ZIP

Jon,

Attached, please find my reply to your comments on the Alstom/Powercon drawings per our meeting on Tuesday 12/16/03. (See attached file: Reply to Comments on ALSTOM drawings 12-15-03.ZIP)

Further to this I do have the following questions.

When a cable goes to more than one terminal strip and they are cross referenced between sheets (say 2CCEK2127B06 on 12A to 12C) I intend to only show that cable destination at one point similar to the current B&V cabling drawing that you gave me. So i.e., on one sheet 12A cable 2CCEK2127B06 will only be shown to go to 12B and on 12B it will reference back to 12A as well as give all the cable details i.e. cable #, Destination and drawing Cross References. Since this is the existing standard I assume it will be ok however it is a little different from the marked up drawing you sent back to us.
Cable 2CCE2127BB19 (the new inter-channel cable) needs to be a minimum of 8 cores and expands across 2 sheets per channel. You only identified the colors for 6 of the cores and never identified cores 7 & 8 on sht 12B TB4:57-58. Please advise on their colors.
Since this cable is not yet in, may I again request that there are say 4 spare cores on this cable. If you do leave spares on it can you also identify them so that I can be sure to add them to the drawing.
Drawing number 2000-8100-RR (General Arrangement Cover Sheet) was not identified on your list of drawings to reveive the IPSC title block.
Was this just an oversight or do you really not intend to have the General Arrangement Cover Sheet have the IPSC title block. Note that the schematics cover sheet does have the IPSC title block on GD70107\2001-RR1.

Regards.

jb

ALSTOM REPLY TO DRAWING REVIEW OF 12/16/03
APPROVAL DRAWINGS SUBMITTED 12/11/03

General comments

1. In the title bock change IPCS to IPSC.
   a. AGREE

Formatted: Bullets and Numbering

2. On all drawings that show a SS shipping split, there are many that only show the SS on one side and the other side is to a terminal block. Show the SS on both ends of the cable.
   a. DISAGREE. When reading the drawings distinction between SS1 and SS2 need to be made.

Formatted: Bullets and Numbering

~~1.~~3. Show all relay contacts.
   a. IPP and Alstom agreed to list all the relays and the corresponding manufacturers part number on the drawing sheet upon which the coil of the relevant relay is indicated.

Formatted: Bullets and Numbering

~~2.~~4. Drawing Numbering System

Alstom Drawing Number	Unit Designation	Project Equipment	IPP Drawing #
2000-8100-01	Unit 2	2CCE-EXX-1D2	63.2203.1.05-240001
2000-8100-02	Unit 2	2CCE-EXX-1D1	63.2203.1.05-240002
GD70107\2001-RR1	Unit 2	2CCE-EXX-1D	63.2203.1.05-240003
GD70107\2001-001	Unit 2	2CCE-EXX-1D	63.2203.1.05-240004
GD70107\2001-002	Unit 2	2CCE-EXX-1D	63.2203.1.05-240005
GD70107\2001-003	Unit 2	2CCE-EXX-1D	63.2203.1.05-240006
GD70107\2001-004	Unit 2	2CCE-EXX-1D	63.2203.1.05-240007
GD70107\2001-005	Unit 2	2CCE-EXX-1D	63.2203.1.05-240008
GD70107\2001-006	Unit 2	2CCE-EXX-1D	63.2203.1.05-240009
GD70107\2001-007	Unit 2	2CCE-EXX-1D	63.2203.1.05-240010
GD70107\2001-007A	Unit 2	2CCE-EXX-1D	63.2203.1.05-240011
GD70107\2001-008	Unit 2	2CCE-EXX-1D	63.2203.1.05-240012
GD70107\2001-008A	Unit 2	2CCE-EXX-1D	63.2203.1.05-240013
GD70107\2001-008B	Unit 2	2CCE-EXX-1D	63.2203.1.05-240014
GD70107\2001-009	Unit 2	2CCE-EXX-1D	63.2203.1.05-240015
GD70107\2001-010	Unit 2	2CCE-EXX-1D	63.2203.1.05-240016
GD70107\2001-011	Unit 2	2CCE-EXX-1D	63.2203.1.05-240017
GD70107\2001-012A	Unit 2	2CCE-EXX-1D1	63.2203.1.05-240018
GD70107\2001-012B	Unit 2	2CCE-EXX-1D1	63.2203.1.05-240019
GD70107\2001-0012C	Unit 2	2CCE-EXX-1D2	63.2203.1.05-240020
GD70107\2001-0012D	Unit 2	2CCE-EXX-1D2	63.2203.1.05-240021
GD70107\2001-0013	Unit 2	2CCE-EXX-1D	63.2203.1.05-240022
GD70107\2001-101	Unit 2	2CCE-EXX-1D	63.2203.1.05-240023

IP7012919

GD70107\2001-102	Unit 2	2CCE-EXX-1D	63.2203.1.05-240024
GD70107\2001-103	Unit 2	2CCE-EXX-1D	63.2203.1.05-240025
GD70107\2001-104	Unit 2	2CCE-EXX-1D	63.2203.1.05-240026
GD70107\2001-105	Unit 2	2CCE-EXX-1D	63.2203.1.05-240027
GD70107\2001-106	Unit 2	2CCE-EXX-1D	63.2203.1.05-240028
GD70107\2001-107	Unit 2	2CCE-EXX-1D	63.2203.1.05-240029
QF0209r1	*not required*	*not required*	63.2203.1.05-900001*
C-13467 sheet 1 of 1	*not required*	*not required*	63.2203.1.05-900002*
NP-11198 sheet 1 of 2	*not required*	*not required*	63.2203.1.05-900003*
NP-11198 sheet 2 of 2	*not required*	*not required*	63.2203.1.05-900004*
CW-12560	*not required*	*not required*	63.2203.1.05-900006*
CW-12561	*not required*	*not required*	63.2203.1.05-900005*

* The IPP drawing numbers for the motor operated switch assumes the switch drawings are generic for all eight drive assemblies. If separate drawings are being furnished for each drive assembly the numbers will be changed to reflect the correct unit number.

IPP numbering scheme

63.2203.1.AA-BCDDDD

63.2203.1	Alstom Contract 45605	
AA	drawings	.05
	reports	.06
	instruction books	.07
B	Unit 1, 2 or 9 (common equipment)	
C	equipment number	A drive is 1, B drive is 2, C drive is 3, D drive is 4
DDDD	sequential number for each vendor drawing number	

Note the change made to shts 12A, 12B, 12C, and 12D

Drawing No. GD70107/2000-8100-01 and -02

1. Provide a detail drawing of the bus connections for the high voltage power cable connections. Verify electrical clearances are in accordance with ANSI standards, including any de-rating required for elevation. Provide detailed information on cable connection including bolt torques, bolting assembly and installation requirements. Submit details of the power cable connections.
   a. Alstom shall:
      - Verify all clearances with respect to the altitude.
      - Verify and record shipping split buss bolts torque.
      - Indicate the elevation of the HV terminations.
2. Submit details of the anchor bolts including size and type of installation with a Structural PE stamp on the calculation and details. Seismic details shall be based on installation on the existing floors.

Formatted: Bullets and Numbering

IP7012920

a. Alstom will discuss this with the PE doing the seismic evaluation and advise IPSC

3. Provide cabinet layout drawings showing major components and terminal blocks.
   a. Alstom will review the existing arrangement and add it to the schematics at a time no later then the release of the "AS BUILT" schematics.

Drawing No. GD70107/2001-RR1

1. See General comments

Drawing No GD70107/2001-001

1. Add terminal numbers on this drawing for all cabling, including DC Link Reactors, exciters and shaft encoders.
   a. Alstom will add the terminal block numbers for the reactors, the excitation terminal block numbers and the encoders terminal block numbers. All control cables and their associated cable numbers only will also be added.

Drawing. GD70107/2001- 002

1. Show shipping splits (SS) in a consistent manner. At A10 it shows a SS and the other end of the cable on 008A-H13 also shows a SS. Show shipping splits on both ends of each cable.
   a. DISAGREE. When reading the drawings distinction of SS1 needs to be made from SS2.

~~1.~~2. At U10 add drawing number for disconnect switch.
   a. AGREE. CW-12561 will be added to this sheet to reference the output switch.

~~2.~~3. The existing DC Link Reactor has a distribution class arrestor connected to the line terminal. This should be shown on this drawing.
   a. AGREE.

Drawing. No GD70107/2001- 003

1. At P3 provide the reference drawing MN/H4294
   a. This reference will be removed from this schematic as no ribbon cable terminations are shown.
2. The cross-reference at B9 and G9 are reversed for the 25 ribbon cables.
   a. AGREE.
3. At V6 the cross-reference should be U11 not U1.
   a. AGREE.

Formatted: Bullets and Numbering
Formatted: Bullets and Numbering
Formatted: Bullets and Numbering
Formatted: Bullets and Numbering
Formatted: Bullets and Numbering
Formatted: Bullets and Numbering
Formatted: Bullets and Numbering
Formatted: Bullets and Numbering
Formatted: Bullets and Numbering
Formatted: Bullets and Numbering

IP7012921

Drawing No. GD70107/2001- 004

1. The cross-reference at E2 and R2 are reversed for the 25 ribbon cables, See comment on sheet 2001–003.
   a. AGREE

Drawing No. GD70107/2001- 005

1. There should be a SS at E9 for the 24 VDC cable 1030.
   a. DISAGREE. See general comments.

Drawing No. GD70107/2001- 006

1. No exceptions noted.

Drawing No. GD70107/2001- 007

1. At R15, change the dashed outline to a solid line to indicate the resistors are furnished by Alstom.
   a. AGREE.

Drawing No. GD70107/2001- 007A

1. Provide a write up of operation and logic diagrams.
   a. This will be provided with the instruction books post commissioning.
2. All spare analog circuits are to be 4 – 20 mA.
   a. AGREE.
3. At P11 add contact numbers to SOR both contacts.
   a. AGREE.
4. At T11 the speed feedback should be 150-1100RPM.
   a. AGREE.
5. At R3 the cable to exciter is shown as twisted and the other side is shown as shielded, what is correct?
   a. AGREE.

Drawing No. GD70107/2001- 008

1. At P12 where is DIS used? Provide reference to switch drawings.
   a. AGREE

Drawing No. GD70107/2001- 008A

1. No exceptions noted.

Formatted: Bullets and Numbering
Formatted: Bullets and Numbering
Formatted: Bullets and Numbering
Formatted: Bullets and Numbering
Formatted: Bullets and Numbering
Formatted: Bullets and Numbering
Formatted: Bullets and Numbering
Formatted: Bullets and Numbering
Formatted: Bullets and Numbering

IP7012922

Drawing No. GD70107/2001-008B

1. No exceptions noted.

Drawing No. GD70107/2001-009

1. At K12 the exciter cable is shown as shielded on other side it is twisted, what is correct?
    a. AGREE.
2. At P6 the FCN top connect needs contact numbers. This complete contact has to be looked at.
    a. AGREE.

Formatted: Bullets and Numbering

Formatted: Bullets and Numbering

Drawing No. GD70107/2001-010

1. At E3 add wire 1056 to TB2-8.
    a. AGREE
2. At C15 TB2-1 should be 1037 wire # per other end, correct.
    a. The other end on 12A/C is corrected.
3. At C15 TB2-2 should be 1038 wire # per other end, correct.
    a. The other end on 12A/C is corrected.
4. At K7 wire # 1019D should cross-reference 11-F13 not 11-B13.
    a. AGREE
5. At U6 wire # 1026 add TB3-21.
    a. AGREE
6. At U6 wire # 1027 add TB2-22
    a. AGREE
7. At U9 wire number 1031 should go to 011-F2 not 011-B2. 2001-011.
    a. AGREE

Formatted: Bullets and Numbering

Formatted: Bullets and Numbering

Formatted: Bullets and Numbering

Formatted: Bullets and Numbering

Formatted: Bullets and Numbering

Formatted: Bullets and Numbering

Drawing No. GD70107/2001-011

1. At E5 the light should be A- not G.
    a. AGREE
2. At D14 the wiring of FCN has to be checked as well as TB's. see sheet 009 P5.
    a. AGREE
3. At J15 add contact numbers to FCN, check wiring of FCN last contact.
    a. AGREE.
4. At J15 relay BKTP shows 2 contacts (not numbered) on sheet 12A and 12C it shows both contacts in series. If in series need to show 4 contacts not 2.
    a. AGREE.
5. At T2 terminal TB2-4 should be wire #1039.
    a. AGREE.

Formatted: Bullets and Numbering

Formatted: Bullets and Numbering

Formatted: Bullets and Numbering

Formatted

Formatted: Bullets and Numbering

Formatted: Bullets and Numbering

Drawing No. GD70107/2001-012A

General comments for the wiring drawings 12A, 12B, 12C and 12D

IP7012923

The circuit numbers do not have any hyphens or spaces to differentiate them from the drawing numbers. A typical circuit number would be 2CCEK2127B01. The drawing number associated with that circuit is 2CCE-K2127B.

Attached is a revised drawing for 12A showing the correct format.

1. TB2-1 should be wire # 1046
   a. AGREE
2. TB2-2 should be wire # 1047
   a. AGREE
3. TB2-4 should be wire # 1049A and cross-reference should be 011-T3
   a. AGREE
4. TB2-5 should be wire # 1017
   a. AGREE
5. TB2-6 should be wire #1019 and cross reference should be 010-B2 not N1
   a. AGREE
6. TB2-7 and 8 should NOT show a wire on sheet 12A it is only on sheet 12C
   a. DISAGREE. Alstom shall wire this supply to TB2:7&8. Should it only be used on CH2 this difference shall be noted on the cabling drawings. Both channels wiring will be identical.
7. At L19 cross-reference should be 010-E5 not 010-C5.
   a. AGREE
8. TB2-11 and 12 each show a contact (2 in series) not that way on other end.
   a. AGREE

~~8.~~9. Contact on TB3-36 and 37 should be numbered.
   a. AGREE.

Drawing No. GD70107/2001-012B

1. Correct the format to match 12A.
   a. AGREE

Drawing No. GD70107/2001-013

1. No exceptions noted.
   a. AGREE

Drawing No. GD70107/2001-101

1. Show all contacts on all relays
   a. See general comments.

Drawing No. GD70107/2001-102

Formatted: Bullets and Numbering
Formatted: Bullets and Numbering
Formatted: Bullets and Numbering
Formatted: Bullets and Numbering
Formatted: Bullets and Numbering
Formatted: Bullets and Numbering
Formatted: Bullets and Numbering
Formatted: Bullets and Numbering
Formatted: Bullets and Numbering
Formatted: Bullets and Numbering
Formatted: Bullets and Numbering

IP7012924

1. At N8 cross reference should be 101-M2 not M7.
   a. DISAGREE. Cross-references refer to the coil and not the contact.
2. At N11 cross reference should be 101-N2 not N7.
   a. DISAGREE. Cross-references refer to the coil and not the contact.
3. The OL is before the contactor, I have always seen it after the contactor i.e. between the contactor and motor. It will work but what do you want.
   a. DISAGREE. IPSC with S&L will discuss this and see what they prefer. Be aware that the hole pattern for these relays has already been drilled.
4. The OL is set at 1.5 amps, too low the FLA is 1.4 per this drawing and 2.5 per sheet 106. What is correct?
   a. AGREE.

Drawing No. GD70107/2001-103

1. At L all cross-references letter 7 should be letter 2.
   a. DISAGREE. Cross-references refer to the coil and not the contact.
2. At M18 and M19 the last two wires should have a wire # 1030.
   a. AGREE
3. At M4 wire #10311 should be 10318
   a. DISAGREE. There is still a problem with the #10311 wire that will be rectified.
4. At P2 cross-reference 011-B11 should be 011F11.
   a. AGREE

Drawing No. GD70107/2001-104

1. TBP1-17 on the left side should be wire # 10311 per cross reference, yet the other side 10318 is correct per the cross reference.
   a. DISAGREE. This concern does hoever tie in with **Drawing No. GD70107/2001-103** #3 above and will be rectified.

Drawing No. GD70107/2001-105

1. At R12 the low point drain goes where? To the drip pan?
   a. As discussed, this is a drain point and not a spillage recovery point. This will have a quick disconnect output to which customers can connect a flexible hose in the event they wish to drain the cooling system.

Drawing No. GD70107/2001-106

1. The motor data is different FLA 2.5 on sheet 104 it is 1.4.
   a. AGREE
2. At G14 install at lowest point, does it go to drip pan?
   a. No. Once again this is another drainage point, this time in the pump cabinet.

Formatted: Bullets and Numbering
Formatted: Bullets and Numbering
Formatted: Bullets and Numbering
Formatted: Bullets and Numbering
Formatted: Bullets and Numbering
Formatted: Bullets and Numbering
Formatted: Bullets and Numbering
Formatted: Bullets and Numbering
Formatted
Formatted: Bullets and Numbering
Formatted: Bullets and Numbering
Formatted: Bullets and Numbering

IP7012925

~~2.~~3. At B17 is the drain and is shows in the base at ground on the GA, how to you drain any water? Is there a valve? How can you drain it to a container since the drain is at floor level. Water will not run up hill.

a. This is a collection point. Obviously it has to be at the lowest point in the cabinet since, as you mentioned, water cannot run uphill. Therefore ground level or close to it is the only suitable place. Draining the drip pan is normally accomplished by using a rag, as spillage is not normally significant enough to warrant draining it. Should draining be required, it then becomes the responsibility of the commissioning/maintenance staff.

Formatted: Bullets and Numbering

Drawing No. CW-12561 and CW-12560

1. Add cross reference to Alstom drawings for 120 V.AC.
   a. DISAGREE. Alstom cannot expect vendor drawings to cross reference to Alstom drawings. In order to get around this problem the Alstom cabling drawings 12A & 12 C will cross reference to drawing number CW12560.
2. Drawing shows remote start and stop. What is this?
   a. The close and open from the drive.

Formatted: Bullets and Numbering

Formatted: Bullets and Numbering

Drawing No.C-13467

1. Still shows a J bolt, this will not work.
   a. This is a recommendation and not a prerequisite. It will however be remaoved from the drawings.
2. Submit details of the anchor bolts including size and type of installation with a Structural PE stamp on the calculation and details.
   a. Alstom will discuss this with the switch manufacturer and advise IPSC.
3. Drawing shows 5 foot aisle not available
   a. Alstom will discuss this with the switch manufacturer and advise IPSC.
4. The remote control conduit, if used would have to be core drilled.
   a. This will not be used.
5. The enclosure has to be gasketed.
   a. Alstom will discuss this with the switch manufacturer and advise IPSC.

Formatted: Bullets and Numbering

Formatted: Bullets and Numbering

Formatted: Bullets and Numbering

Formatted: Bullets and Numbering

Formatted: Bullets and Numbering

IP7012926

From: <steve.klein@tde.alstom.com>
To: <jon-c@ipsc.com>
Date: 12/22/2003 9:45 AM
Subject: Contract No. 04-45606, Communication No. AP-IP-F-011

Jon,

Alstom received the revised contract from IPSC on Thursday 12/18/03. After reviewing the document, I found 2 changes to wording that I thought had been agreed. Those differences are highlighted below.

1. Division F7, Section 2.e., VFD System Efficiency:

Drive efficiency evaluation and calculations shall be made in accordance with IEEE 995 ?1987 Section 5.3.5 at the dual channel rating point of 7,415HP, 954RPM, 3,876V with 4,031V, 60Hz supply.

The supply voltage specified "with 4031V" was omitted in the revised contract IPSC submitted. Was this an inadvertent omission or was it done for a reason, If so, what is that reason?

2. Division F7, Section 2.f., System Input Power Factor:

The power factor will be measured in accordance with the following requirements

a. Total 12-pulse power factor is measured ? this will require that the power drawn by two transformers, and only two transformers be measured together (for one drive).
b. The supply voltage shall be at its nominal value of 6.9KV for the duration of the testing.
c. The drive is to be fully adjusted for optimization.
d. Adjustments are allowed to correct for any deviation.
e. A margin of error of +/- 2% is to be permitted on readings.
f. Readings shall be made by visual comparison of phase current of voltage waveforms to obtain the apparent power factor as defined in Alstom bid ref: SAD00149 dated September 4, 2003.
g. To conduct the test, it must be permitted to increase the motor voltage by at least 5% as described in Alstom bid ref: SAD00149 dated September 4, 2003.
h. It must, also, be possible to tap down the supply transformer(s) in order to achieve firing angle optimization as described in Alstom bid ref: SAD00149 dated September 4, 2003.
i. The evaluation is made at fan speed of 800rpm.
j. The target power factor is 0.88 at 800rpm (penalty assessment point).

The word "permitted" in paragraph g. was changed to "performed" in the revised contract. Was this done intentionally or unintentionally? If intentionally, what is the reasoning?

Alstom would like to sign and submit contract acceptance, but would like to clarify these 2 issues first. I have left a phone message for John Larsen advising him of this situation.

Please let me know if you need further information.

Best Regards,

Steve Klein

Alstom Power Conversion Inc.

610 Epsilon Drive

Pittsburgh, PA 15238

Phone: 412-967-7168

Fax: 412-967-9326

From: <steve.klein@tde.alstom.com>
To: <jon-c@ipsc.com>
Date: 1/5/2004 9:45 AM
Subject: Contract No. 04-45606, Communication No. AP-IP-F-011

Jon,

I hope you had a good holiday and that 2004 will be good to you!!!

Have you been able to confirm that the discrepancies (identified below) in the revised contract received 12/18/03 were inadvertent typing errors? If so, does IPSC plan to issue corrected pages for insertion into the contract?

Also, have you completed the review of the comments submitted by John Bradley following our 12/16/03 conference call to review the project drawings? We had hoped to have a manufacturing release, at least with comments, by now.

Please advise.

Regards,

Steve Klein

---------- Forwarded by Steve KLEIN/USPIT01/TDE/non-ALSTOM on 01/05/2004 11:30 AM ----------

From: Steve KLEIN on 12/22/2003 11:29 AM

To: jon-c@ipsc.com
cc:
Subject: Contract No. 04-45606, Communication No. AP-IP-F-011

Jon,

Alstom received the revised contract from IPSC on Thursday 12/18/03. After reviewing the document, I found 2 changes to wording that I thought had been agreed. Those differences are highlighted below.

1. Division F7, Section 2.e., VFD System Efficiency:

   Drive efficiency evaluation and calculations shall be made in accordance with IEEE 995 ?1987 Section 5.3.5 at the dual channel rating point of 7,415HP, 954RPM, 3,876V with 4,031V, 60Hz supply.

   The supply voltage specified "with 4031V" was omitted in the revised contract IPSC submitted. Was this an inadvertent omission or was it done for a reason, If so, what is that reason?

2. Division F7, Section 2.f., System Input Power Factor:

   The power factor will be measured in accordance with the following requirements

a. Total 12-pulse power factor is measured ? this will require that the power drawn by two transformers, and only two transformers be measured together (for one drive).
b. The supply voltage shall be at its nominal value of 6.9KV for the duration of the testing.
c. The drive is to be fully adjusted for optimization.
d. Adjustments are allowed to correct for any deviation.
e. A margin of error of +/- 2% is to be permitted on readings.
f. Readings shall be made by visual comparison of phase current of voltage waveforms to obtain the apparent power factor as defined in Alstom bid ref: SAD00149 dated September 4, 2003.
g. To conduct the test, it must be permitted to increase the motor voltage by at least 5% as described in Alstom bid ref: SAD00149 dated September 4, 2003.
h. It must, also, be possible to tap down the supply transformer(s) in order to achieve firing angle optimization as described in Alstom bid ref: SAD00149 dated September 4, 2003.
i. The evaluation is made at fan speed of 800rpm.
j. The target power factor is 0.88 at 800rpm (penalty assessment point).

The word "permitted" in paragraph g. was changed to "performed" in the revised contract. Was this done intentionally or unintentionally? If intentionally, what is the reasoning?

Alstom would like to sign and submit contract acceptance, but would like to clarify these 2 issues first. I have left a phone message for John Larsen advising him of this situation.

Please let me know if you need further information.

Best Regards,

Steve Klein

Alstom Power Conversion Inc.

610 Epsilon Drive

Pittsburgh, PA 15238

Phone: 412-967-7168

Fax: 412-967-9326

From: John Larsen
To: steve.klein@tde.alstom.com
CC: Jon Christensen
Date: 1/5/2004 11:16 AM
Subject: Contract 04-45605

Steve,
I apologize for not getting back to you sooner. Actually, I was on vacation for the last two weeks of 2003 and was unable to answer your call or emails.

1- Please note that the contract number is 04-45605 and not 45606 as you have referenced in you Communication No. AP-IP-F-011. That will make a difference. Please change your records to agree with that number.

2- It appears that the two (2) areas you questioned were oversights on our part. Not sure how we missed them. You are correct and we will send you three (3) copies of the corrected page to insert in the contracts you were sent last.

If you have further questions, please feel free to contact me.

Thank you.

From: <john.bradley@tde.alstom.com>
To: <jon-c@ipsc.com>
Date: 1/7/2004 2:20 PM
Subject: Encoder Drawings
Attachments: 8 pole encoder - dual winding machine-Model.dwf

Jon,

Attached, please find the 8 pole motor encoder design. I will follow this e-mail with two other mail's attaching the photos of a previous job where we did something similar. This was a 6 pole single winding motor though hence only 3 lobes on the cam and 3 encoders per motor. The outfit that did this for our customer (Louisville Gas & Electric) was USA Precision Machining Company located in Houston. The contact person is Chester Montgomery at (281) 458-7304.

There may be value in having me review the design for the cam/encoder mounting bracket before you get it manufactured. Care must be taken to ensure that the bolt hles for the two halves are drilled through the cam recesess and not the lobe. Otherwise the encoder will see the hole and think it is the end of the lobe and give false feedback to the sigma.

In order to do the encoder alignment we will need to be able to measure the motor feedback voltage from both windings at the same time (i.e. Va-b from winding 1 and Va-b from winding 2) as well as be able to supply the encoders with a 24V DC supply and have the feedback from the encoders to measure the pulses. This can be done locally or at the drives themselves provided the cables can be run in before the Varichron's are demolished. I do also have a 6 phase voltage divider that can be used to measure the voltage feedbacks. We will need all 6 phases to verify phase rotation.

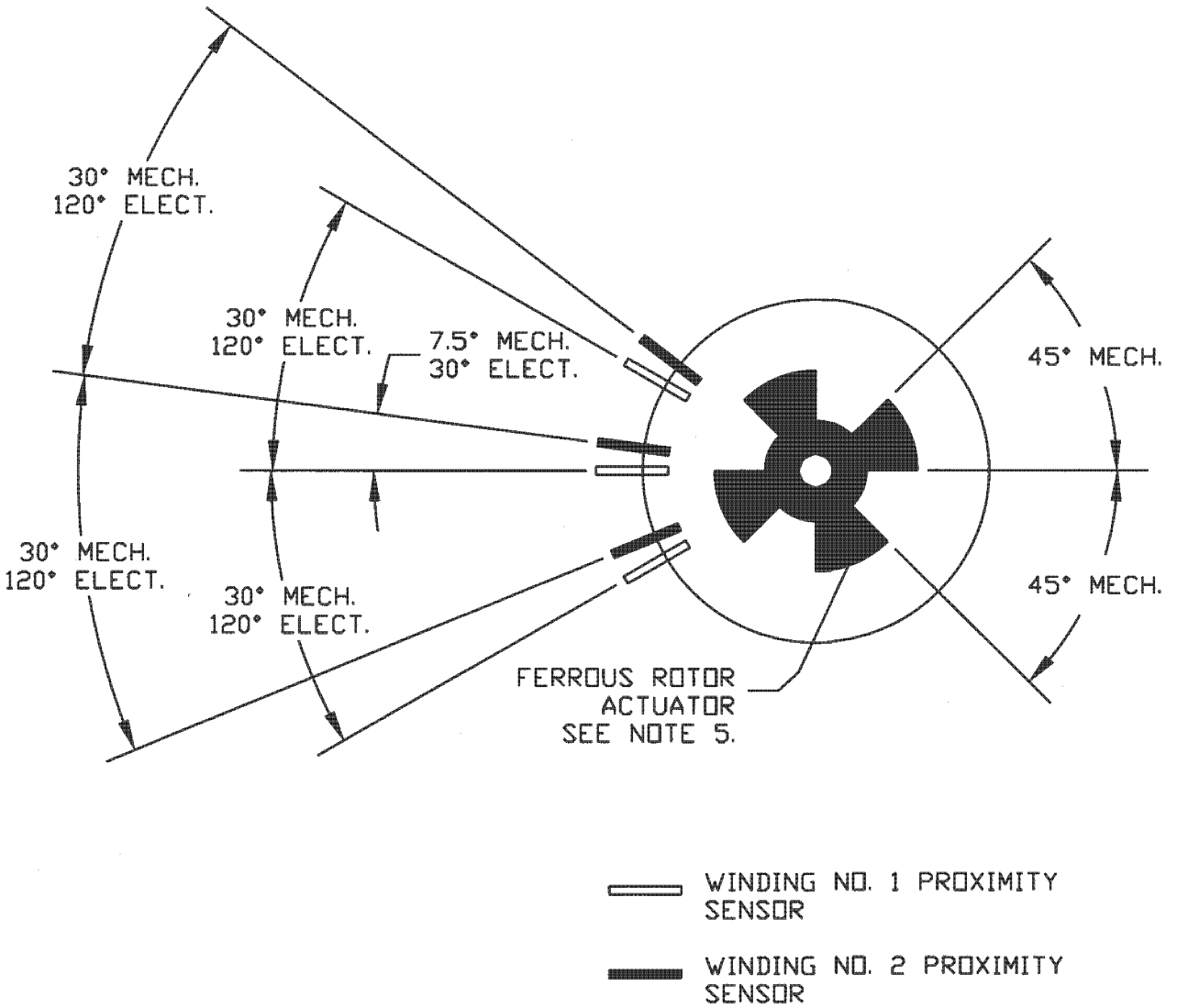
Regards

jb

(See attached file: 8 pole encoder - dual winding machine-Model.dwf)
"130-3061_IMG.JPG"
"130-3062_IMG.JPG"
"130-3063_IMG.JPG"
"130-3065_IMG.JPG"
"130-3066_IMG.JPG"
"130-3067_IMG.JPG"
"130-3068_IMG.JPG"
"130-3069_IMG.JPG"
"130-3070_IMG.JPG"
"130-3071_IMG.JPG"
"130-3072_IMG.JPG"
"130-3073_IMG.JPG"
"131-3126_IMG.JPG"
"131-3127_IMG.JPG"
"131-3128_IMG.JPG"
"131-3129_IMG.JPG"
"131-3130_IMG.JPG"
"131-3131_IMG.JPG"
"131-3132_IMG.JPG"
"131-3133_IMG.JPG"

"131-3134_IMG.JPG"
"131-3136_IMG.JPG"
"131-3137_IMG.JPG"

SHAFT MOUNTED ENCODER ARRANGEMENT
FOR SYNCDRIVE APPLICATIONS WITH AN 8-POLE DUAL
WINDING MACHINE.



NOTES:

1. REFERENCE ALSTOM POWER CONVERSION
   SYNCHRONOUS MOTOR SPEC. SM1, SECT. 20
2. USE TURK UPROX INDUCTIVE PROXIMITY SENSORS
   PART NO. Bi 3U-M12-AP6X OR Bi 3U-EM12-AP6X (STAINLESS)
3. +24VDC POWER IS SUPPLIED BY THE DRIVE. ENCODERS
   SHOULD BE WIRED TO A TERMINAL STRIP MOUNTED IN
   A BOX LOCAL TO THE MOTOR.
4. REFERENCE GEC INDUSTRIAL CONTROLS DRAWING
   RE4/L8260 - SHAFT MOUNTED ENCODERS FOR SYNCDRIVE
   APPLICATIONS.
5. CLEARANCE BETWEEN SENSORS AND ROTOR ACTUATOR
   ADJUSTABLE BETWEEN 1 AND 2 MM.

ALSTOM POWER CONVERSION
T. EITENMILLER
10/31/00

IP7012934

From: <john.bradley@tde.alstom.com>
To: <jon-c@ipsc.com>
Date: 1/7/2004 10:11 PM
Subject: Photos 1
Attachments: Valise.ZIP

(See attached file: Valise.ZIP)
"130-3061_IMG.JPG"
"130-3062_IMG.JPG"
"130-3063_IMG.JPG"
"130-3065_IMG.JPG"
"130-3066_IMG.JPG"
"130-3067_IMG.JPG"
"130-3068_IMG.JPG"
"130-3069_IMG.JPG"
"130-3070_IMG.JPG"
"130-3071_IMG.JPG"
"130-3072_IMG.JPG"
"130-3073_IMG.JPG"

From: <john.bradley@tde.alstom.com>
To: <jon-c@ipsc.com>
Date: 1/7/2004 10:13 PM
Subject: Photos 2
Attachments: Valise.ZIP

(See attached file: Valise.ZIP)
"131-3126_IMG.JPG"
"131-3127_IMG.JPG"
"131-3128_IMG.JPG"
"131-3129_IMG.JPG"
"131-3130_IMG.JPG"
"131-3131_IMG.JPG"
"131-3132_IMG.JPG"
"131-3133_IMG.JPG"
"131-3134_IMG.JPG"
"131-3136_IMG.JPG"
"131-3137_IMG.JPG"

From: <steve.klein@tde.alstom.com>
To: <jon-c@ipsc.com>
Date: 1/8/2004 6:26 AM
Subject: Contract No. 04-45605
Attachments: GD70107 Schedule .ZIP

Jon,

Attached is a the revised project schedule, with progress to date identified. We are planning to have our project review telephone conference at 3:00pm EST this afternoon. Please call the same number as previous conferences (412-967-7165, X7133).

(See attached file: GD70107 Schedule .ZIP)
"GD70107 Schedule .mpp"

Best Regards,

Steve Klein

Alstom Power Conversion Inc.

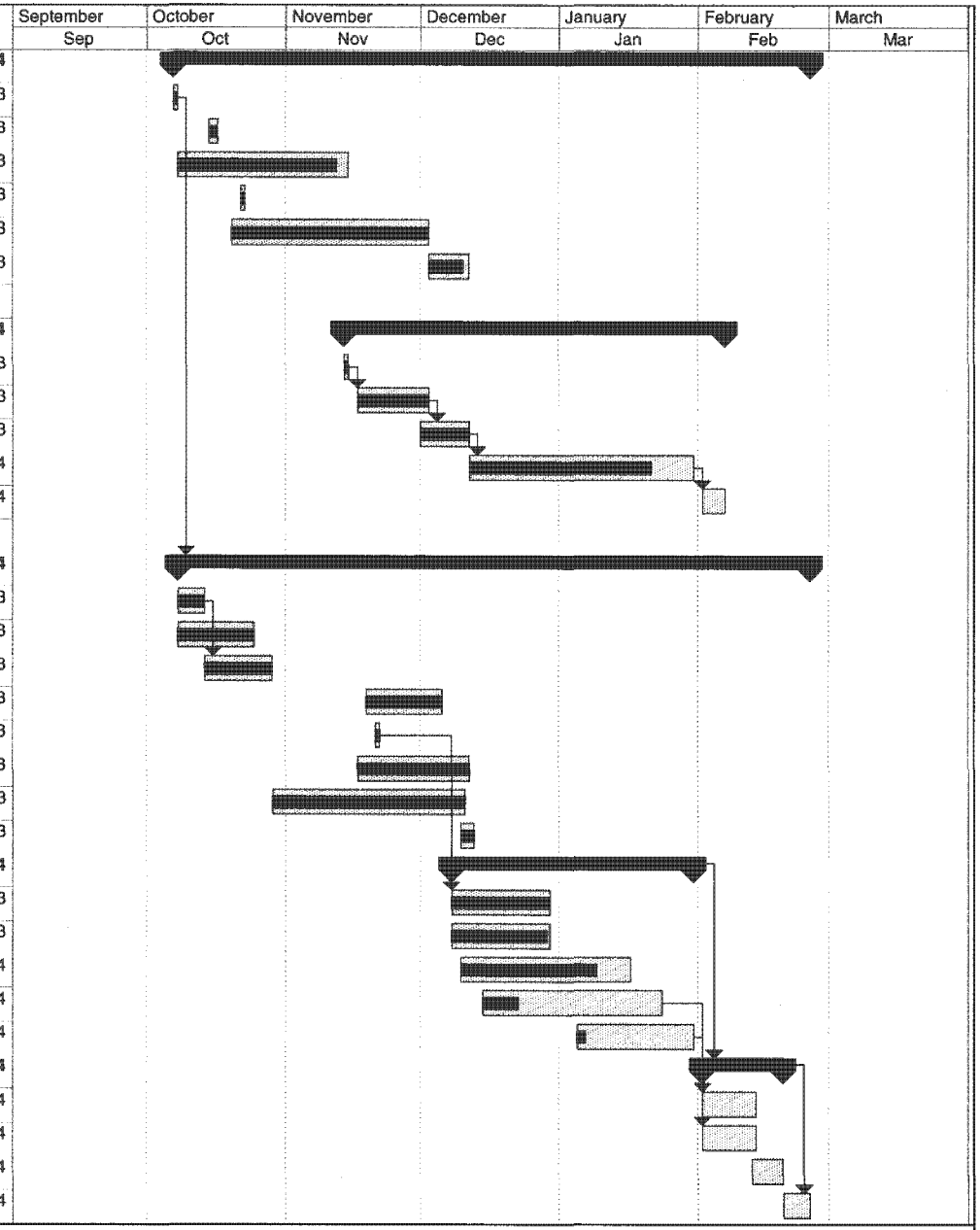
610 Epsilon Drive

Pittsburgh, PA 15238

Phone: 412-967-7168

Fax: 412-967-9326

ID		Task Name	Duration	Start	Finish
1		**Project Overview**	**102 days?**	**Tue 10/7/03**	**Wed 2/25/04**
2	✓	Receive Letter of Intent	1 day	Tue 10/7/03	Tue 10/7/03
3	✓	Customer Kick-off meeting	2 days	Wed 10/15/03	Thu 10/16/03
4		Customer Finalize PO	28 days	Wed 10/8/03	Fri 11/14/03
5	✓	Order Entry	1 day	Wed 10/22/03	Wed 10/22/03
6	✓	Submit Approval Drawings	32 days	Mon 10/20/03	Tue 12/2/03
7		Drawing Approval	7 days	Wed 12/3/03	Thu 12/11/03
8					
9		**Disconnect Switch**	**61 days**	**Fri 11/14/03**	**Fri 2/6/04**
10	✓	Place Purchase Order	1 day	Fri 11/14/03	Fri 11/14/03
11	✓	Submit Approval Drawings	12 days	Mon 11/17/03	Tue 12/2/03
12	✓	Release for Manufacture	9 days	Mon 12/1/03	Thu 12/11/03
13		Manufacture	7.2 wks	Fri 12/12/03	Fri 1/30/04
14		Shipment to Alstom	5 days	Mon 2/2/04	Fri 2/6/04
15					
16		**Drive System**	**101 days?**	**Wed 10/8/03**	**Wed 2/25/04**
17	✓	Advanced Electrical BOM	4 days	Wed 10/8/03	Mon 10/13/03
18	✓	Advanced Mechanical BOM	13 days	Wed 10/8/03	Fri 10/24/03
19	✓	Issue P.O.s for Long Lead Items	11 days	Tue 10/14/03	Tue 10/28/03
20	✓	Final BOM	13 days	Wed 11/19/03	Fri 12/5/03
21	✓	Sub Panel Delivery	1 day	Fri 11/21/03	Fri 11/21/03
22	✓	Release for Manufacture	19 days	Mon 11/17/03	Thu 12/11/03
23	✓	Balance of Procurement	31 days	Wed 10/29/03	Wed 12/10/03
24	✓	Enclosure Delivery	3 days?	Wed 12/10/03	Fri 12/12/03
25		**Manufacture**	**40 days**	**Mon 12/8/03**	**Fri 1/30/04**
26	✓	Sub Panel Drill/Assembly	16 days	Mon 12/8/03	Mon 12/29/03
27		Surge/Gr Fault Panel Assy	16 days	Mon 12/8/03	Mon 12/29/03
28		Module Sub-Assemblies	28 days	Wed 12/10/03	Fri 1/16/04
29		Component/Assy Install	30 days	Mon 12/15/03	Fri 1/23/04
30		Internal Wiring	20 days	Mon 1/5/04	Fri 1/30/04
31		**Test**	**14 days**	**Mon 2/2/04**	**Thu 2/19/04**
32		Wiring/Continuity Check	10 days	Mon 2/2/04	Fri 2/13/04
33		Cooling System Checkout	10 days	Mon 2/2/04	Fri 2/13/04
34		Drive Operation Testing	5 days	Fri 2/13/04	Thu 2/19/04
35		Shipment - Drive & Switch	4 days	Fri 2/20/04	Wed 2/25/04



Project: GD70107 Schedule .mpp
Date: Mon 1/10/11

Task		Milestone		External Tasks	
Split		Summary		External Milestone	
Progress		Project Summary		Deadline	

INTERMOUNTAIN POWER SERVICE CORPORATION, DELTA, UTAH
UNIT 1 - ID FANS ADJUSTABLE SPEED DRIVE

IP7012938

Jon;

Summary of our telephone conversation of January 8, 2004 with Alstom. Alstom had Dave Smith, John Bradley and Steve Klein on the call.

All the enclosures have been delivered except for the disconnect switch. The disconnect switch should ship to Alstom January 16, 2004. The subpanels have been preassembled and the surge and ground is 95% complete. The modules are 80 to 85% complete with 3 complete and the remaining 9 in progress.

The wiring has started and is 5 to 10% complete.

IPSC requested the site test plan be forwarded for review. IPSC requires the duration for all items. Alstom to forward next week.

IPSC stated it would take 2 weeks to install, which leaves 2 weeks for commissioning. Alstom stated they would like 4 weeks but feel the commissioning can be done in 2.

Alstom was reminded that the mounting details have not been submitted. Alstom will forward on January 9, 2004.

Alstom requested a phone and tables at the drive for commissioning.

Alstom stated they can be at the site earlier if required.

Additional comments: latest date for on site is 2/25/04. Scheduled shipment is 2/16 to 2/20/04.

The following is a list of items that Alstom still has to submit.

- MSDS to be provided for mixed resin bed, any touch-up paint, thyristor grease and any other similar chemicals. Due 30 days after award, 11/27/03. NOT YET
- Weidmuller crimp tool cut sheets shall be provided, 1 tool 10/12 ga. and 1 tool 14 ga. and higher. Jon don't know the status of this.
- Storage/Off-loading/Installation-Startup guidelines are to be provided 30 days prior to delivery. That would be NEXT WEEK.
- Final Instruction books are required 30 days after startup. Draft copy to be provided 30 days before shipment. NEXT WEEK.
- I/O schedule to be submitted by ALSTOM by 10/27/03. Did you every get it?
- Supply Block Diagram showing basic control and protection specifying the protection, control, trip, and alarm functions at different locations: and reference signals, commands, and auxiliary supplies. 30 days should have been submitted 11/17/04.
- Single lines diagrams showing main and auxiliary circuitry including main power input, switchgear, transformer, VFD, system earthing and auxiliary supplies, showing all CT's, PT's, relays, meters, etc. for control, protection, and operation of the drive system with electrical data(i.e., voltage, current, time ratings, impedances and tolerances. 30 days should have been submitted 11/17/04.

- Nameplates 30 days before shipment. NEXT WEEK.
- Startup and commissioning, instructions and data. 6 weeks before shipment. 1/1/04.
- Supply schedule of system level tests including proposed test procedures. provided 30 days before shipment. NEXT WEEK.
- Schedule of certified field startup and acceptance tests. provided 30 days before shipment. NEXT WEEK.
- Proof copy of instruction manual to IPSC contract administrator provided 30 days before shipment. NEXT WEEK.
- Supply recommended spare parts list to IPSC contract administrator provided 30 days before shipment. NEXT WEEK.
- Notify IPSC contract administrator for preshipment inspection, provided 30 days before shipment. NEXT WEEK.
- Notify IPSC contract administrator of factory witness test 10 days before shipment.

I will be at Alstom next Thursday the 15th.

John Benz

1/9/04

Jon Christensen - Notes and update.

From: <JOHN.A.BENZ@sargentlundy.com>
To: <jon-c@ipsc.com>
Date: 1/9/2004 12:51 PM
Subject: Notes and update.
CC: <DAVID.A.ROBERTS@sargentlundy.com>
Attachments: 010804.doc

Attached.

I will be at Alstom next Thur.

If you need anything let me know.

John Benz

IP7012941

From: <john.bradley@tde.alstom.com>
To: <jon-c@ipsc.com>
CC: <william.oleyar@tde.alstom.com>, <david.smith@tde.alstom.com>, <steve.kl...
Date: 1/9/2004 3:31 PM
Subject: Commissioning Schedule
Attachments: Commissioning Schedule.ZIP

Jon,

Attached, please find a schedule for the commissioning of the dual channel drives.

Regards

jb

(See attached file: Commissioning Schedule.ZIP)

αβχδ

Dual Channel Synchdrive Commissioning Schedule

	REF	TEST	PRE-CONDITIONS	Hrs
LV CHECKS 120V/480V Supplies on 1 man/channel	1.	**Preparation**	All test equipment on site	8
	2.	General equipment check	All Drives/auxiliaries on site & erected	4
	3.	Interconnections		4
	4.	Preliminary check with power off	All cabling complete & contractors off drive	4
	5.	Low voltage supply check	All auxiliary supplies available i.e. 480V, 120V phase reference	4
	6.	Cooling system fill & check	Customer provided de-ionised water on site and available	8
	7.	Power up regulator / gating power supply		2
	8.	Download software	Program complete and tested in factory	1
	9.	Digital I/O relay logic check		16
	10.	Analog I/O check		8
	11.	Exciter Reference Checks		6
	12.	Diagnostic serial link check		1
	13.	Hardware over current check		2
	14.	Supply breaker interlocks		2
	15.	Firing pulse check		8
	16.	Encoder Switching sequence Tests	Manual rotation of motor available. This may include all motor bearing lubrication to be commissioned. If encoder setup is completed prior to this then not necessary.	8
HV Checks Main Power on 1 man/channel	17.	Emergency Stop Tests to verify HV breaker will trip for E-Stop		2
	18.	Phasing checks	Main HV power available	4
	19.	DC link open circuit tests		4
	20.	Open Loop Short Circuit Tests	Shorting link to be fitted	4
	21.	Closed Loop Short Circuit Tests		2
	22.	Single channel uncoupled safety inspection		4
	23.	Main ACCB fast phase back timing check	Customer responsibility to be verified by Alstom	2
	24.	Emergency Stop Tests to verify HV breaker will trip for E-Stop		2
Motor rotational checks All power supplies on Freedom to run motor as needed	25.	Mode 1 checks	Motor made safe & ready to run	4
	26.	Stator volts feedback phasing and encoder alignment check		4
	27.	Speed regulator control check		4
	28.	Single channel load test-preliminary checks	Motor must be coupled. This may introduce a few hours time delay.	4
	29.	V/f control checks		4
	30.	Single channel load tests Remote mode		4
	31.	Dual channel no load operational & stability checks		4
	32.	Stop/Start Tests		2
	33.	Dual channel Full Load Current Checks	Entire Boiler available including all auxilliaries needed to draw 100% speed & load.	8
	34.	Chop over Checks		8
	35.	Final Procedures & wrap-up		8
	36.	Complete harmonic measurements		8
	37.	Hose re-torque		4
			TOTAL HOURS	176

IP7012943

INTERMOUNTAIN POWER SERVICE CORPORATION

TECHNICAL SERVICES INSTRUCTION

SURVEILLANCE OF UNDERGROUND OIL/WATER SEPARATORS
AND OIL SPILL PREVENTION (CONTAINMENT) SUMPS
Title

TSI - 007
NUMBER

2
REVISION NO.

Garth Block
PREPARED BY

APPROVED BY

PLANT MANAGER

DATE

Garth Block
ORIGINAL BY

DATE

Thomas Herbert
REV. 2 BY

DATE

IP7012944

TABLE OF CONTENTS

SECTION		TITLE	PAGE
1.0		Title	1
2.0		Purpose	1
3.0		Scope	1
4.0		Guidelines and Procedures	1
	4.1	Who Will Do the Inspections?	1
	4.2	Inspection Frequency	1
	4.3	Inspection Concerns 1	1
	4.4	Oil/Water Separator Locations	2
	4.5	Oil Spill Prevention Sumps	2

ATTACHMENTS

Oil/Water Separator Inspection Sheet 3

TECHNICAL SERVICES INSTRUCTION

1.0 Title

SURVEILLANCE OF UNDERGROUND OIL/WATER SEPARATORS AND OIL SPILL PREVENTION (CONTAINMENT) SUMPS

2.0 Purpose

To provide policy and instruction to ensure that oil does not escape the separators and flow to the settling basin where it could adversely affect the water quality and evaporation rate.

3.0 Scope

Surveillance of 11 oil/water separators and 14 oil spill prevention sumps located at the Intermountain Generating and Converter Stations. The settling basin pump intake structure is provided with an under-and -over weir arrrangement to eliminate oil in the effluent in the event oil is inadvertently discharge to the settling basin. Removal of oil in the settling basin is a manual skimming operation.

4.0 Guidelines and Procedures

4.1 Environmental will do the inspections (see attached inspection sheet).

4.2 Inspection Frequency

The separators and sumps should be checked every eighteen months using a sludge judge to determine the amount of oil contained.

4.3 Sampling Concerns

If entrance is required, the Safety Department personnel should first test the ambient air in the separators before climbing down into them. The separator capacities vary from three to five feet of oil, depending on the size of the separator. If any separator contains more than one foot of oil, the oil should be pumped out and stored in the waste oil storage tank located west of the Utilities Service Building.

4.4 Oil/Water Separator Locations

Separator covers can be distinguished from sewer manhole covers by the three foot vent pipe near the separator.

OIL/WATER SEPARATOR	DRAWING NUMBER	OS #
Unit 1&2 Transformer Trench Drains	9255-9STU-S3311	1
Unit 1&2 Turbine Lube Oil Storage Area	9255-9STU-S3311	3
Emergency Generation Building Oil Drains	9255-9STU-S3311	11
Fabric Filter Buildings Oil Drains	9255-9STU-S3308	10
Generation Building Unit 2 Oil Drains	9255-9STU-S3308	7
Generation Building Unit 1 Oil Drains	9255-9STU-S3308	6
General Services Building Oil Drains	9255-9STU-S3309	5
Water Treatment Building Oil Drains	9255-9STU-S3306	12
Thaw Shed Oil Drains	9255-9STU-S3301	1
Bulk Oil Storage Building	9255-9STU-S3327	13
Site Services Floor Drains	9255-9STU-S3333	

4.5 Converter Station Oil Spill Prevention Sumps

The Converter Station has 14 oil spill prevention sumps located at the transformer bases. Contact the Converter Station Control Room Operator for assistance in sampling these sumps.

D.C.	Smoothing Reactors	4 sumps
A.C.	Transformers	8 sumps
A.C.	Filterbank Reactors	2 sumps

Oil / Water Separator Inspection

Date _____

Separator	Oil Layer (inches)	Current Gallons	(capacity)	Size (ft.)
OS-1		0	(47,000)	16 x 56
LOCATION: So. Side, Unit 2, furthest western group of manholes.				
OS-3		0	(15,500)	12 x 20
LOCATION: So. Side, Twin manholes on mound, some evidence of overflow.				
OS-5		0	(3,000)	5 x 10
LOCATION: No. Side, GSB, East Aux Boiler Bay.				
OS-6		0	(3,000)	5 x 10
LOCATION: West Side, Unit 1 Generation Bldg, just outside fan room.				
OS-7		0	(3,000)	5 x 10
LOCATION: West Side, Unit 2 Generation Bldg, just outside fan room.				
OS-10		0	(2,500)	5 x 10
LOCATION: West side, So. End, Unit 1 fabric filter bldg.				
OS-11		0	(1,400)	6 x 5
LOCATION: West Side, North corner, Emergency Generation Bldg.				
OS-12		0	(750)	4 x 4
LOCATION: West Side of North end of Water Treatment Bldg, between acid tanks and SCU.				
OS-13		0	(13,000)	11 x 33
LOCATION: East side of USB Bulk Lube Storage Bldg, next to Used Oil Tank.				
Thaw Shed		0		7 x 12
LOCATION: North Side, middle of Thaw Shed, east of transformer.				
USB		0		4 x 13.5
LOCATION: Inside USB Wash Bay, north end, east wall.				
Site Svc Bldg		0		5 x 8
LOCATION: Southwest corner of Site Services.				
Other Used Oil				
USB Used Oil Tank				
	Total Gallons:	0		

αβχδ

Dual Channel Synchdrive Commissioning Schedule

	REF	TEST	PRE-CONDITIONS	Hrs
LV CHECKS 120V/480V Supplies on 1 man/channel	1.	**Preparation**	All test equipment on site	8
	2.	General equipment check	All Drives/auxiliaries on site & erected	4
	3.	Interconnections		4
	4.	Preliminary check with power off	All cabling complete & contractors off drive	4
	5.	Low voltage supply check	All auxiliary supplies available i.e. 480V, 120V phase reference	4
	6.	Cooling system fill & check	Customer provided de-ionised water on site and available	8
	7.	Power up regulator / gating power supply		2
	8.	Download software	Program complete and tested in factory	1
	9.	Digital I/O relay logic check		16
	10.	Analog I/O check		8
	11.	Exciter Reference Checks		6
	12.	Diagnostic serial link check		1
	13.	Hardware over current check		2
	14.	Supply breaker interlocks		2
	15.	Firing pulse check		8
	16.	Encoder Switching sequence Tests	Manual rotation of motor available. This may include all motor bearing lubrication to be commissioned. If encoder setup is completed prior to this then not necessary.	8
HV Checks Main Power on 1 man/channel	17.	Emergency Stop Tests to verify HV breaker will trip for E-Stop		2
	18.	Phasing checks	Main HV power available	4
	19.	DC link open circuit tests		4
	20.	Open Loop Short Circuit Tests	Shorting link to be fitted	4
	21.	Closed Loop Short Circuit Tests		2
	22.	Single channel uncoupled safety inspection		4
	23.	Main ACCB fast phase back timing check	Customer responsibility to be verified by Alstom	2
	24.	Emergency Stop Tests to verify HV breaker will trip for E-Stop		2
Motor rotational checks All power supplies on Freedom to run motor as needed	25.	Mode 1 checks	Motor made safe & ready to run	4
	26.	Stator volts feedback phasing and encoder alignment check		4
	27.	Speed regulator control check		4
	28.	Single channel load test-preliminary checks	Motor must be coupled. This may introduce a few hours time delay.	4
	29.	V/f control checks		4
	30.	Single channel load tests Remote mode		4
	31.	Dual channel no load operational & stability checks		4
	32.	Stop/Start Tests		2
	33.	Dual channel Full Load Current Checks	Entire Boiler available including all auxilliaries needed to draw 100% speed & load.	8
	34.	Chop over Checks		8
	35.	Final Procedures & wrap-up		8
	36.	Complete harmonic measurements		8
	37.	Hose re-torque		4
			TOTAL HOURS	176

From: <john.bradley@tde.alstom.com>
To: <jon-c@ipsc.com>
CC: <william.oleyar@tde.alstom.com>, <david.smith@tde.alstom.com>
Date: 1/10/2004 3:31 PM
Subject: Digital I/O to control room

Jon,

In the existing drives there are 3 feedbacks to the annunciator (I believe) to indicate trouble. They are discussed on page 2-2 of the manual. They are defined as ALARM 1 (cooling fan failure), ALARM 2 (shutdown/trip) & ALARM 3 (regulator hardware fault).

Since they go to the annunciator, I think the annunciator only sends a common alarm to the control room. Is this so?
Did the control system receive separate ALARMS for each channel or did the annunciator common them up and send a fan ALARM? Although there are no more drive cooling fans we still need to do something with the Reactor cooling fans failure annunciation. We can either:
ALARM on the loss of one and trip of the loss of 2 fans, or
ALARM on the loss of any fan or both fans since the reactor O/T is going to be considered a TRIP.
We have an ALARM and a TRIP d/o. Will you be able to use both of them? If not, what would you like us to do with one or the other. We can send you a common alarm. i.e. if there is an ALARM or TRIP, an ALARM is sent. Remember that we define an ALARM as only a warning, something the operators need to respond to ASAP. A trip is the loss of that channel. Obviously if the operator sees an ALARM and the fan is runnig down it has tripped.

Regards

jb

From: <john.bradley@tde.alstom.com>
To: <jon-c@ipsc.com>
Date: 1/13/2004 2:41 PM
Subject: IPP Bitmap

Jon,

Do you by chance have a 16 color bitmap of the IPP logo you can e-mail me?
We want it for the HMI.

Thanks

john

From: <steve.klein@tde.alstom.com>
To: <jon-c@ipsc.com>
Date: 1/14/2004 12:51 PM
Subject: Contract No. 04-45605

Jon,

I received the corrected contract page F7.7 and the signed agreement sheet from John Larsen. All contract issues related to acceptance are now resolved.

During last Thursday's conference call, you stated you would e-mail notification of drawings "approved as commented" (per John Bradley's 12/18/04 e-mail containing the notes of our 12/16/04 drawing review). I have not yet received this notification. Please advise if anything on our end may be holding this up.

Additionally, John Bradley posed 4 questions in that 12/18/04 e-mail to which we have not yet received replies. Finally, the drawing review notes for drawing no. GD70107/2001-102, item 3 required further response from IPSC/S & L. When can we expect these answers?

Thanks very much!

Best Regards,

Steve Klein

Alstom Power Conversion Inc.

610 Epsilon Drive

Pittsburgh, PA 15238

Phone: 412-967-7168

Fax: 412-967-9326

From: <john.bradley@tde.alstom.com>
To: <jon-c@ipsc.com>
Date: 1/19/2004 9:10 AM
Subject: Encoders

Jon,

I have been taking a look at the proximity sensors that we recommended to Mississippi Power when they installed their encoder. The details are:

Supplier: Turck
P/N: Bi 3U-EM12-AP6X

These are the 3 wire DC-PNP Transistor (Current Sourcing), 10-30V.

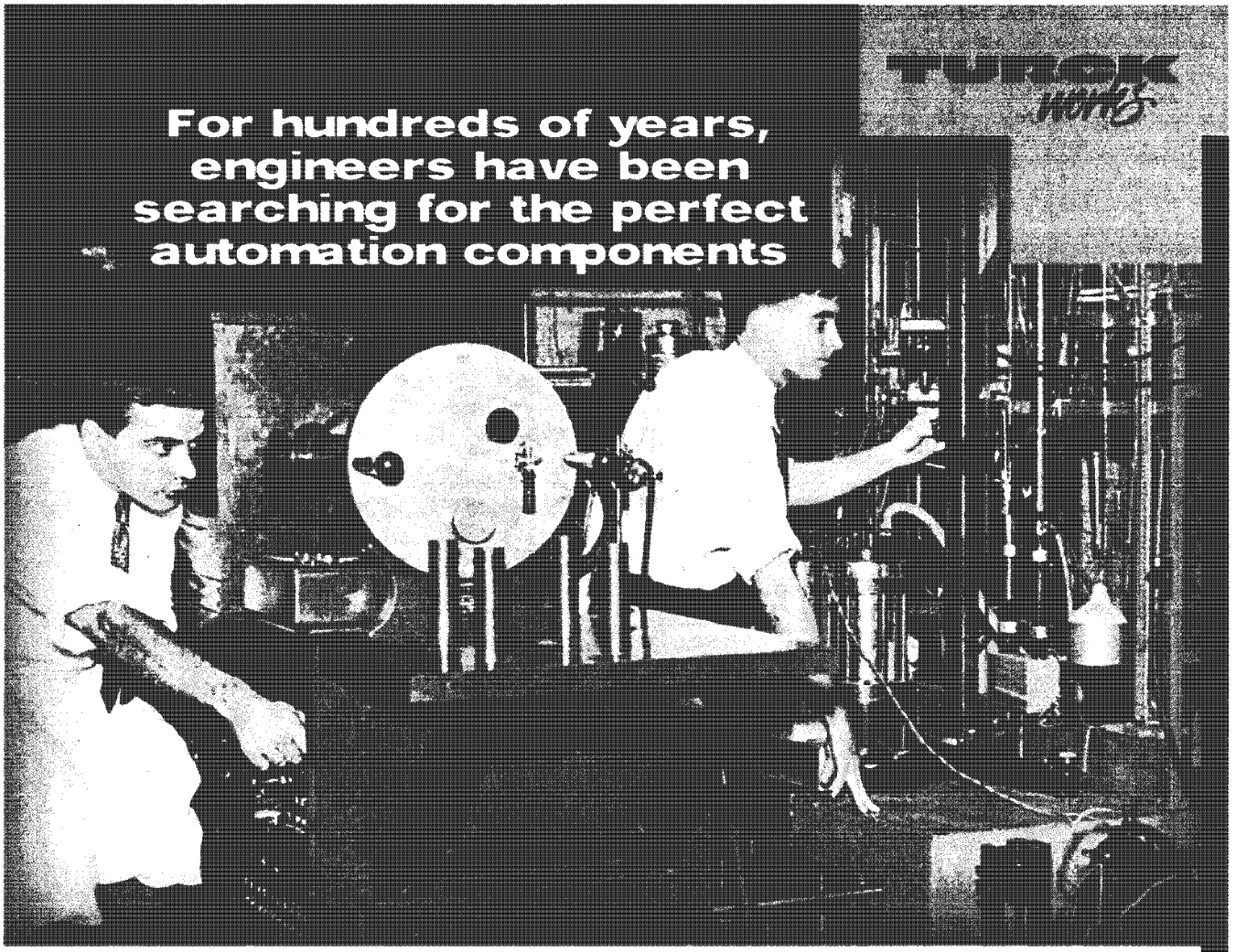
The full details are available on the web. Hope this is of use.

Regards

jb

TURCK Sensor Specification Sheet

Part Number	Bi 3U-EM12-AP6X
ID Number	M1634300
Mounting	Embeddable (Shielded)
Rated Operating Distance	3.0
Housing Style	Barrel, Metal, Partial Threading, Chrome Plated Brass
Connection	potted cable
Output	3-Wire DC - PNP Transistor (Current-Sourcing)
Voltage	10-30 VDC - Polarity Protected - Pulsed SCP
Output Function	Normally Open (N.O.)
Housing Size	12.0
Number of LEDs	1
Number of Pins	
Material	Barrels/Locknuts: M: Chrome Plated Brass; EM: Stainless Steel Sensing Face: PA 12-GF30 Plastic End Cap: PUR Plastic
Cable/Conductor	Cable: PVC Jacket; 2 Meter standard length Copper Conductor: 22 AWG (PVC insulated)
Ripple	<=10%
Differential Travel (Hysteresis)	3-15% (5% typical)
Voltage Drop Across Conducting Sensor	<=1.8 V at 200 mA
Trigger Current for Overload Protection	>=220 mA
Continuous Load Current	<=200 mA
Leakage (Off-State) Current	
No-Load Current	<=15 mA
Time Delay Before Availability	<=8 ms
Power-On Effect	Per IEC 947-5-2
Reverse Polarity Protection	Incorporated
Wire-Break Protection	Incorporated
Transient Protection	Per EN 60947-5-2, Level 2
Operating Temperature (10% temp. drift)	-25°C to +70°C (-13°F to +158°F)
Operating Temperature (15% temp. drift)	-30°C to +85°C (-22°F to +185°F)
Enclosure	Meets NEMA 1,3,4,6,13 and IEC IP 67
Shock	30 g, 11 ms
Vibration	55 Hz, 1 mm Amplitude in all 3 Planes
Repeatability	<=2% of Rated Operating Distance
LED On	Output Energized
LED Flashing	Short-Circuit Warning

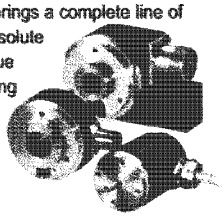


Announcing more great progress from TURCK

Our latest advanced technologies help improve your automation, products and profits.

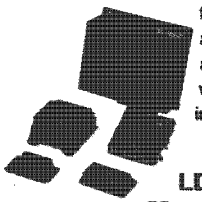
Encoders

Kübler by TURCK brings a complete line of incremental and absolute encoders with unique advantages, including temperature and aging compensation, plus improved EMI, vibration and shock resistance.



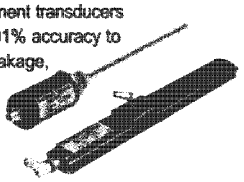
RFID Systems

New Balogh Distributed by TURCK, radio frequency ID systems allow you to track products and manage information with reliability, even in harsh industrial environments.



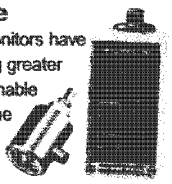
LDT's

EZ-track™ magnetorestrictive linear displacement transducers offer up to +0.01% accuracy to save wear, breakage, downtime and cost.



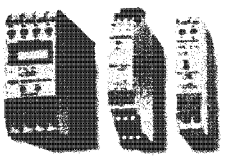
Flow & Pressure

Omni-directional flow monitors have no moving parts, offering greater reliability. Fully programmable pressure sensors offer the flexibility to perform in any application.



Intrinsic Safety

Isolated barriers eliminate the need for a dedicated ground. Zener barriers feature narrow 7 mm design and replaceable fuses. IS fieldbus I/O systems install directly in hazardous classified areas.



Level Detection

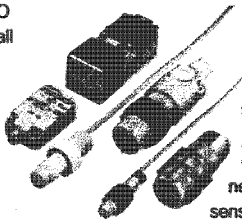
Compact *Q-pak*® capacitive sensors save space. Revolutionary new *levelprox*™ detects media levels through metal tank walls without the need for an access port – and with no leakage or cleaning issues.

Connectivity

Industry's broadest line of connectors, cable and cordsets. New *flexlife-10*® withstands 10 million flex cycles, twice the competition. Junction boxes consolidate devices and save wiring costs. HART compatible 4-20 mA models.

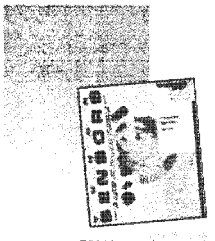
Proximity Sensors

Industry leading inductive and capacitive proximity sensors. From our tiniest 4 mm diameter *picoprox*®, to our durable *weldguard*®, new TURCK proximity sensors fit your applications better.



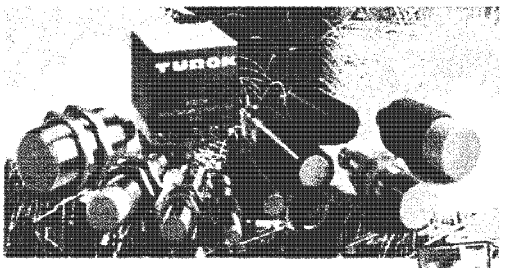
For critical automation improvement, connect with a dependable supplier that can deliver the latest, high-quality products, exceptional service and fast delivery. Call us today. We will help you meet your objectives for cost, quality and productivity.

IP7012957



B2000

Proximity Sensors

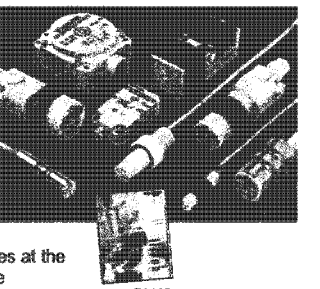


B0178

weldguard®

- Resists high heat, weld slag buildup and abrasion
- Up to 500 times more durable than other sensors
- Embeddable or non-embeddable
- Available in weld-field immune *Uprox*® and standard ferrite core versions
- *armorguard*™ protection for sensors in impact-prone locations

Inductive Sensors



B0165

- *amphibian*® washdown versions
- High temperature and low temperature
- Harsh duty (IP 67, 68, 69K)
- Die protection
- Ring & slot versions

Uprox®

- Detect all metal types at the same sensing range
- Inherently weld-field immune
- Up to 350% more range than conventional sensors
- Wide -30°C (-22°F) to +85°C (+185°F) temperature range

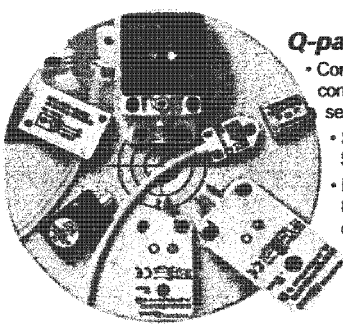
picoprox®

- Tiny 4 mm, 5 mm, 6.5 mm & 8 mm stainless steel housings
- Extended range to 4 mm

B0149

Capacitive Sensors

- Non-contact sensing of metallic and non-metallic materials
- Ideal for level detection
- Available in DC, AC and IS models
- Solid-state output, high switching frequency, no moving parts

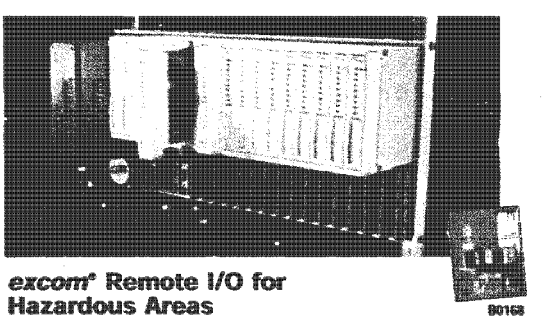


Q-pak™

- Compact size fits in confined areas where other sensors can't
- Superior 3 mm (0.01") to 50 mm (0.20") range
- Models from 5 mm to 80 mm size with embeddable versions

B2000

Intrinsically Safe Systems

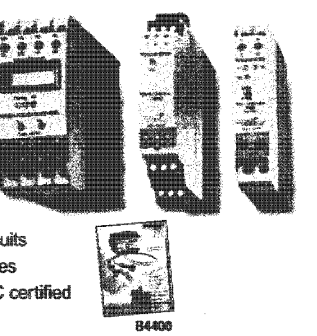


B0168

excom® Remote I/O for Hazardous Areas

- Eliminate need for conventional IS barriers
- Modular backplane bus with integrated voltage supply for 18, 9 or 5 modules
- Modules can be exchanged "hot swapped" during operation

multimodul® IS Barriers

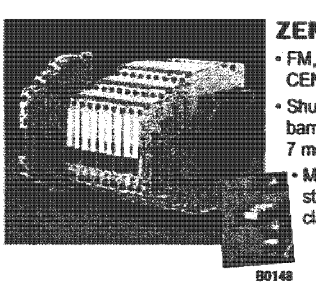


B4400

- Complete line features isolated design with no need for dedicated ground
- Hazardous circuits are galvanically isolated from non-hazardous circuits
- DIN-rail or Eurocard styles
- FM, CSA and CENELEC certified

NAMUR Sensors & Junctions

- Class I, Class II, Class III, Division 1 and Division 2 FM approved
- Full line of inductive, capacitive and magnet operated inductive sensors
- Numerous sizes and styles are available
- Eliminates multiple cable runs for wiring IS applications



B0148

ZENER Barriers

- FM, CSA, BASEEFA/ CENELEC certified
- Shunt-diode intrinsic safety barriers feature narrow 7 mm width
- Meet worldwide standards for use in classified atmospheres

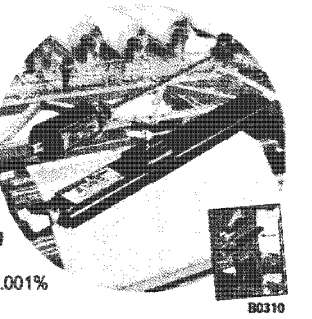
Measurement, Monitoring & Position Sensing

B4900

Radio Frequency Identification Systems (RFID)

- Track products and manage information
- Not reliant upon line-of-sight
- Read only, read/write, high speed, infrared tags, transceivers, control boards and interfaces

EZ-Track™ Linear Displacement Transducers

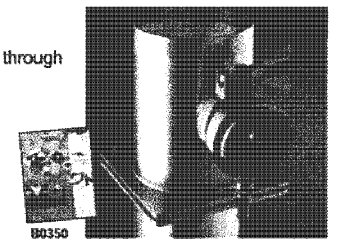


B0310

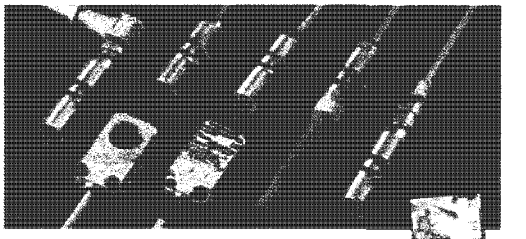
- Magnetorestrictive non-contact sensing
- Absolute position sensing
- +/-0.01% accuracy and repeatability of up to +/-0.001% of full stroke

levelprox™

- Detect media levels through metal-walls
- No possibility of a leak-point
- Not affected by stirring devices
- 100% hygienic



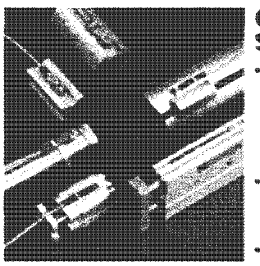
B0350



B0161

Linear Analog Sensors

- Voltage and or current output proportional to target distance from sensor
- Available in limit switch, barrel or *Q-pak*® rectangular styles
- Remote amplifiers available with adjustable switching points

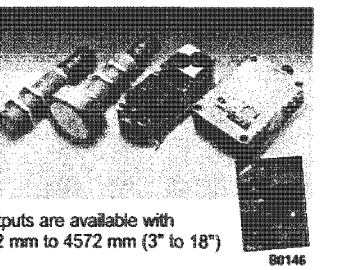


Cylinder Position Sensors

- *permaprox*® provides a precise sensing point anywhere along the stroke
- Ultra-miniature 5 mm BIM-INT fits into grooves of new-style cylinders
- Intrinsically safe models

B0163

Ultrasonic Sensors

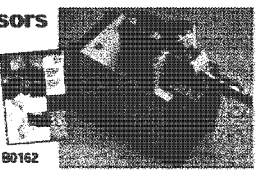


B0146

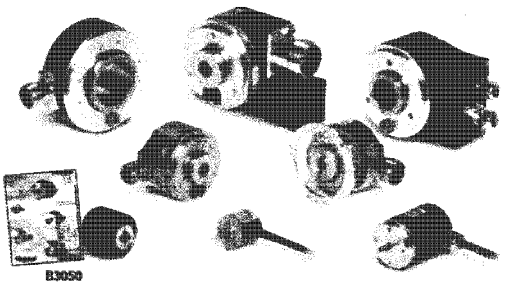
- Epoxy-potted units with adjustable sensing ranges
- Accurate over long sensing ranges for all types of objects
- Digital and analog outputs are available with sensing ranges of 762 mm to 4572 mm (3" to 18")
- High noise immunity

Valve Position Sensors

- Dual inductive solid state sensors
- Monitor valve position on rotary actuators



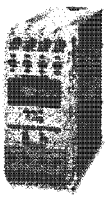
B0162



B3050

Kübler by TURCK Encoders

- Incremental and absolute, shaft and hollow-shaft models
- Single- and multi-turn absolute models in shaft and hollow-shaft styles
- Temperature and aging compensation



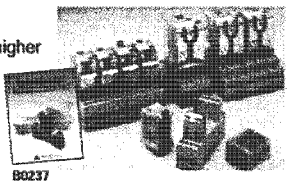
Rotational Controls

- Speed meters & monitors (overspeed/ underspeed detector)
- Analog output and direction discriminators
- DIN 19 234 and intrinsically-safe NAMUR sensor input

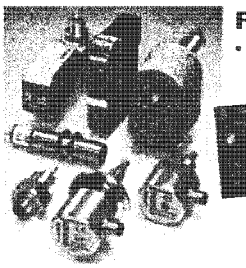
B4400

Relays

- Unique design provides higher reliability and longer relay life
- Integral mounting bracket and pin numbering on the socket for faster wiring



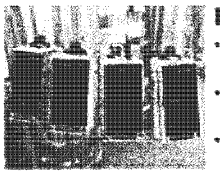
B0237



Flow Monitors

- Insertion and in-line styles, self-contained or remote amplifier
- Omnidirectional stainless steel, plastic or Teflon® housings

B0155

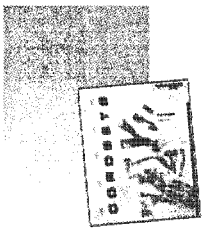


Pressure Sensors

- Bar or PSI measuring units & peak pressure memory function
- 13 pressure ranges from Vacuum to 600 bar
- Standard hysteresis mode for over/under pressure

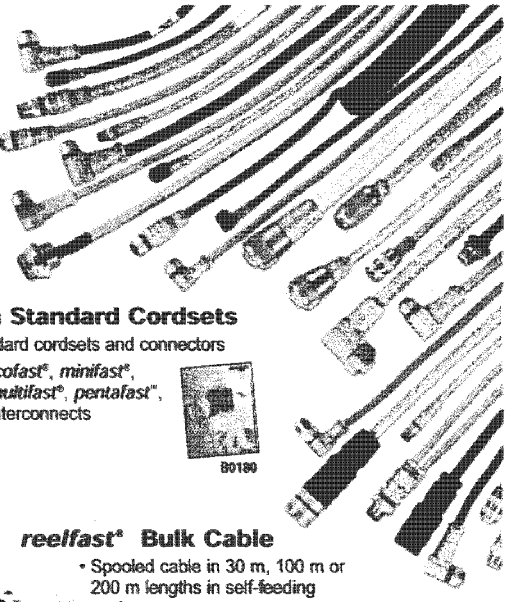
B0158

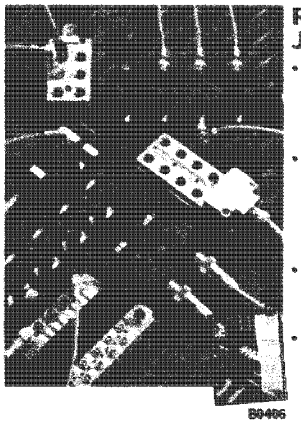
IP7012959



B2001

Cordsets, Junctions & Wiring





B0406

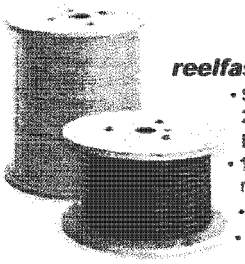
Rugged Junction Boxes

- *multibox*® junction boxes and splitters enable wiring consolidation from sensors and other devices
- M12 *eurofast*® terminal chamber style box offers terminal screw or spring clamp connections for the homerun cable connection
- Die-cast aluminum or industrial hardened plastic housings
- Choice of integral cable or a quick-disconnect *multifast*® homerun cable

3 to 5-pin Standard Cordsets

- Industry standard cordsets and connectors
- *eurofast*®, *picofast*®, *minifast*®, *microfast*®, *multifast*®, *pentafast*™, and *V*fast*® interconnects

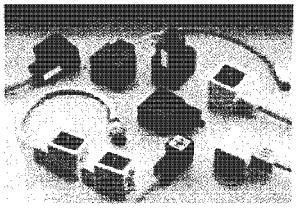
B0180



reelfast® Bulk Cable

- Spooled cable in 30 m, 100 m or 200 m lengths in self-feeding packages
- 170+ different PUR, PVC and rubber cables to choose from
- PLTC, high-flex and more
- 2-day drop-ship delivery available

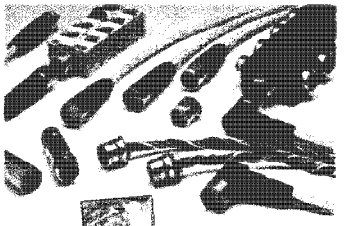
*V*fast*® DIN Valve Connectors



- DIN 43650 solid injection molded PUR plug body
- Oil and abrasion resistant PVC, PUR or CPE rubber cables
- Cordsets, extension cords or splitter styles with *eurofast*®, *picofast*®, *minifast*® or *microfast*® style connectors

B0145

multifast® 5-28 Conductor Solutions

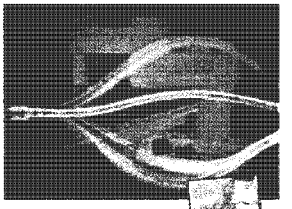


- Solid metal connector shell and fully molded connectors
- Receptacles in standard or long thread lengths
- NAMUR cordsets and extensions in blue PVC & PLTC rated

B0406

flexlife-10® Continuously Flexible Cable

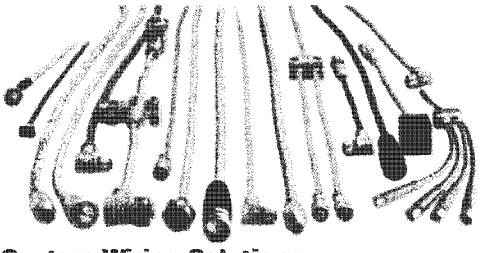
- Performance to 10 million continuous flexing cycles
- Ideal for power and signals to factory automation equipment
- Available with molded cordsets using industry standard connections
- UL recognized and CSA approved, with operating temperatures up to 105°C (221°F) and cold flexibility to -40°C (-40°F)



B0422

4-20 mA Analog Connectivity

- Reduce maintenance costs and consolidate wiring
- Compatible with HART transmitters

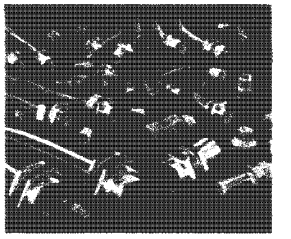


Custom Wiring Solutions

- Jacket options for any environment
- Diameters from 4.4 mm to 13.2 mm
- Gauges from 16 to 26 AWG
- 2 to 19 conductors, braided or foil shields

OEM Connectors

- Components for buses, networks, panels, circuit boards, enclosures and machines in *eurofast*®, *picofast*®, *minifast*®, *microfast*®, *multifast*®, *pentafast*™, and *V*fast*® style connectors
- Front mount, rear mount, feed-through with solder cups, leads, or PCB pins in straight or right angle



Go to turck.com or call 1-800-486-0322 for our latest catalogs

TURCK works.

TURCK Inc.
3000 Campus Drive,
Minneapolis, MN 55441

Phone: 763-553-7300
FAX: 763-553-0708
TOLL FREE: 1-800-486-0322
www.turck.com

B1100 Rev A 11/03

IP7012960

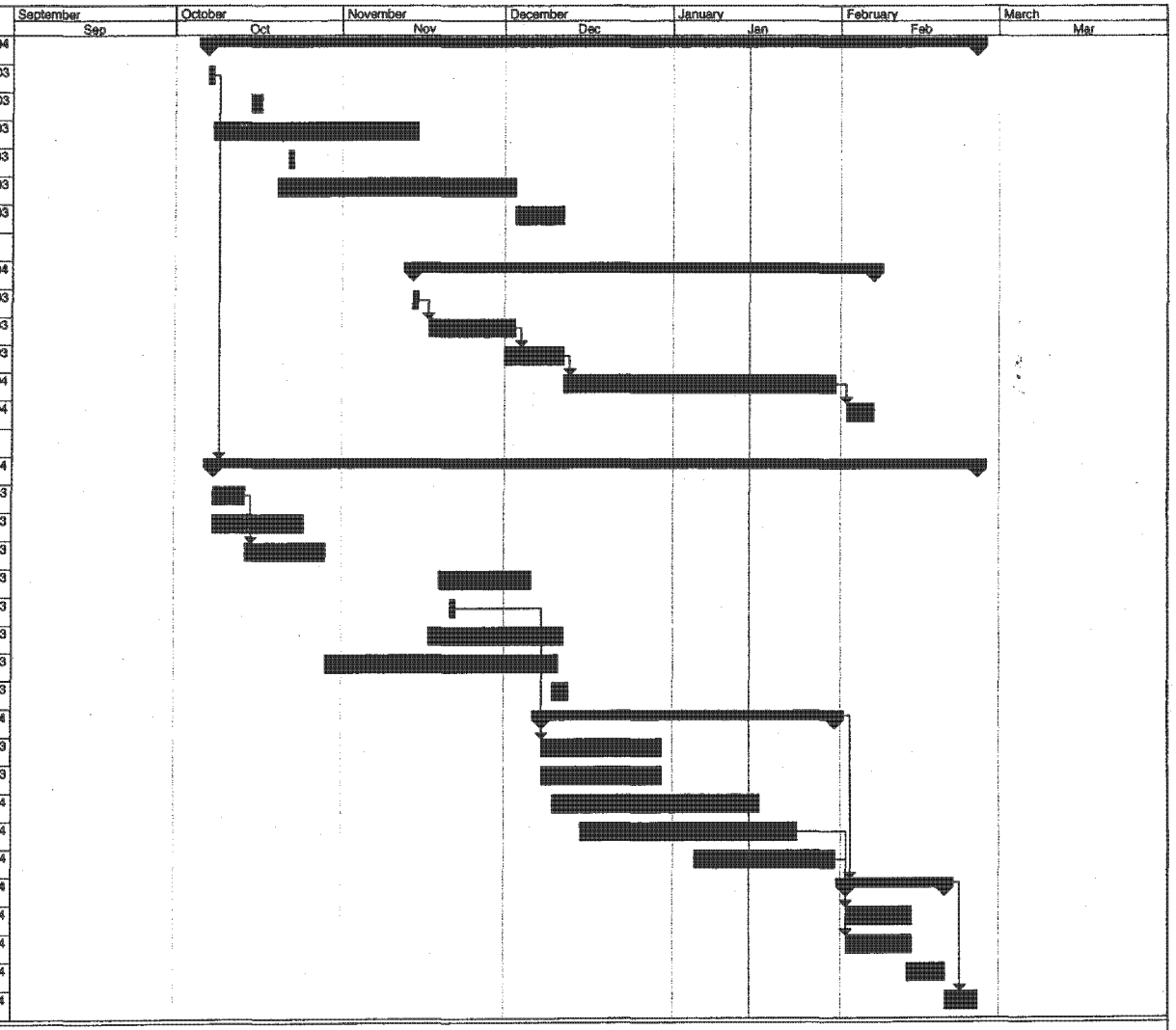
Jon Christensen - notes and photos

From: <JOHN.A.BENZ@sargentlundy.com>
To: <jon-c@ipsc.com>
Date: 1/19/2004 11:29 AM
Subject: notes and photos
Attachments: schedule.pdf; 011504.doc; vfd011504.zip

Jon attached is a copy of my notes, I did NOT send them to Alstom, if you want please do. The schedule and photos are also attached.
You said that TECO stated the motor can operate at 4160 volts, is there any restriction on that voltage with respect to hertz? Can it operate at 4160 at low hertz?

IP7012961

ID		Task Name	Duration	Start	Finish
1		**Project Overview**	**102 days?**	**Tue 10/7/03**	**Wed 2/25/04**
2	✓	Receive Letter of Intent	1 day	Tue 10/7/03	Tue 10/7/03
3	✓	Customer Kick-off meeting	2 days	Wed 10/15/03	Thu 10/16/03
4		Customer Finalize PO	28 days	Wed 10/8/03	Fri 11/14/03
5	✓	Order Entry	1 day	Wed 10/22/03	Wed 10/22/03
6	✓	Submit Approval Drawings	32 days	Mon 10/20/03	Tue 12/2/03
7		Drawing Approval	7 days	Wed 12/3/03	Thu 12/11/03
8					
9		**Disconnect Switch**	**61 days**	**Fri 11/14/03**	**Fri 2/6/04**
10	✓	Place Purchase Order	1 day	Fri 11/14/03	Fri 11/14/03
11	✓	Submit Approval Drawings	12 days	Mon 11/17/03	Tue 12/2/03
12	✓	Release for Manufacture	9 days	Mon 12/1/03	Thu 12/11/03
13		Manufacture	7.2 wks	Fri 12/12/03	Fri 1/30/04
14		Shipment to Alstom	5 days	Mon 2/2/04	Fri 2/6/04
15					
16		**Drive System**	**101 days?**	**Wed 10/8/03**	**Wed 2/25/04**
17	✓	Advanced Electrical BOM	4 days	Wed 10/8/03	Mon 10/13/03
18	✓	Advanced Mechanical BOM	13 days	Wed 10/8/03	Fri 10/24/03
19	✓	Issue P.O.s for Long Lead Items	11 days	Tue 10/14/03	Tue 10/28/03
20	✓	Final BOM	13 days	Wed 11/19/03	Fri 12/5/03
21	✓	Sub Panel Delivery	1 day	Fri 11/21/03	Fri 11/21/03
22	✓	Release for Manufacture	19 days	Mon 11/17/03	Thu 12/11/03
23	✓	Balance of Procurement	31 days	Wed 10/29/03	Wed 12/10/03
24	✓	Enclosure Delivery	3 days?	Wed 12/10/03	Fri 12/12/03
25		**Manufacture**	**40 days**	**Mon 12/8/03**	**Fri 1/30/04**
26	✓	Sub Panel Drill/Assembly	16 days	Mon 12/8/03	Mon 12/29/03
27		Surge/Gr Fault Panel Assy	16 days	Mon 12/8/03	Mon 12/29/03
28		Module Sub-Assemblies	28 days	Wed 12/10/03	Fri 1/16/04
29		Component/Assy Install	30 days	Mon 12/15/03	Fri 1/23/04
30		Internal Wiring	20 days	Mon 1/5/04	Fri 1/30/04
31		**Test**	**14 days**	**Mon 2/2/04**	**Thu 2/19/04**
32		Wiring/Continuity Check	10 days	Mon 2/2/04	Fri 2/13/04
33		Cooling System Checkout	10 days	Mon 2/2/04	Fri 2/13/04
34		Drive Operation Testing FAT	5 days	Fri 2/13/04	Thu 2/19/04
35		Shipment - Drive & Switch	4 days	Fri 2/20/04	Wed 2/25/04



Project: GD70107 Schedule
Date: Thu 1/15/04

Task | Progress | Summary | External Tasks | Deadline
Split | Milestone | Project Summary | External Milestone

INTERMOUNTAIN POWER SERVICE CORPORATION, DELTA, UTAH
UNIT 1 - ID FANS ADJUSTABLE SPEED DRIVE

IP7012962

011504
Notes of meeting held at the Alstom factory on January 15, 2004.
Met with Steve Klein and John Bradley and others on a part time basis.
The purpose of the meeting was to review the progress of the IPSC replacement variable frequency drives (VFD) and schedule for completion of the VFD. The VFD's as well as the exciter power supply and heat exchanger was reviewed. Several photos were taken of the IPSC VFD's. Alstom was asked if they had all material on site, they stated they were missing 7 resistors, the disconnect switch, and the Amot valve. All material is expected to ship within the week. The 12 modules were in progress with 5 of them completed and remaining 7 to be completed by January 23, 2004. The surge and ground panels are complete except for a few missing resistors.

Every week Mr. Bradley reviews the progress and verifies that the factory is using the latest drawings, and that there are no problems. Alstom stated that they are working 6 – 10 hour days to assure the completion and delivery date. The schedule was discussed and an updated schedule was handed out (copy attached). It should be noted that factory testing will start on February 2, 2004 with FAT starting on February 13 or 16, 2004.

Mr. Jon Christensen was called and the following items were discussed during the phone call. IPSC asked how long the VFD can operate without the input water being furnished, this is essentially the heat exchanger out of service. Alstom to inform IPSC the maximum time the heat exchanger can be out of service.

The color coding of the cabling was discussed and the following is the listing.

CONDUCTOR	COLOR
1	BLACK
2	RED
3	BLUE
4	ORANGE
5	YELLOW
6	BROWN
7	BLACK-RED
8	BLACK-BLUE
9	BLACK-ORANGE
10	BLACK-YELLOW
11	BLACK-BROWN
12	RED-BLACK
13	RED-BLUE
14	RED-ORANGE

If a neutral is used the color is RED\WHITE, and if a ground is used the color is BLUE\GREEN.

Alstom stated that there were several 81/2 X11 sheets that need to be included in the drawing list. IPSC to add.

Alstom stated that the encoder should be at least 2 inches wide.

IPSC stated that the motors can operate at 4160 volts. They also stated that side elevations and the report were required to size the bolts. Alstom will issue the report the end of the month and will have IPSC talk to person preparing the report.

The block diagrams were discussed and it was stated they were required for the FAT and IPSC needed some time to review them before the FAT.

Alstom will forward a standard copy of the commissioning instructions to IPSC.

Shaft Encoders for SYNCDRIVES

For the Alstom Sigma based syncdrives it is necessary for the motor to be fitted with shaft position sensors. A description of the operation of the sensors and a recommendation for their placement is given below.

Function

The shaft encoders connect into the sigma digital I/O board using three (or six on dual wound single sigma systems) dedicated 24v digital inputs. These inputs are connected by the system firmware into the machine converter firing circuit. They are used during starting and low speed operation when the available back emf from the machine is insufficient to commutate the machine converter thyristors. Based on the pattern of received sensor feedback the firing circuit firmware determines which pair of machine bridge thyristors will conduct at any particular instant in time.

With the machine at standstill, the encoder pattern selects with thyristors and hence which phases of the stator will carry current. The direction of current flow is also selected. When the machine is turning the encoder determines when the stator current is transferred from one phase to another so that maximum torque is maintained at all times.
Once a certain speed is reached (normally around 10-12%) the machine can produce enough back emf to naturally comutate the thyristors, the encoders are then only used as a supplemental source of speed feedback.

Mechanical Arrangement

The encoder arrangement varies with machine pole number. There is always one rotor lobe per pair of motor poles and the rotor lobes always cover an arc of 180° electrical.

There are 3 or 6 inductive proximity sensors separated by an angle of 120° electrical. Each sensor produces an output voltage while sensing the presence of a rotor lobe. When the motor is turning at constant speed, each sensor produces a nominally square wave output voltage. In the case of six phase or dual wound machines, the second set of encoders have the same 120 degree electrical separation but are displaced 30 electrical degrees lagging the first set.

Provision should be made for angular adjustment of all three or six sensors simultaneously, by mounting them on a common slotted ring bolted to the machine housing. The slot range of adjustment should cover a 120° electrical arc. The mechanical arrangement should allow angular adjustment to be done without disturbing the air gap settings.

Initial Sensor Alignment

Check that the sensors are positioned so that with the motor shaft at its magnetic center, the sensor tips are at the axial center of the rotor lobes. The axial width of the rotor lobes should be such that no part of the sensor tip ever extends beyond the lobe surface at the limits of shaft end play.

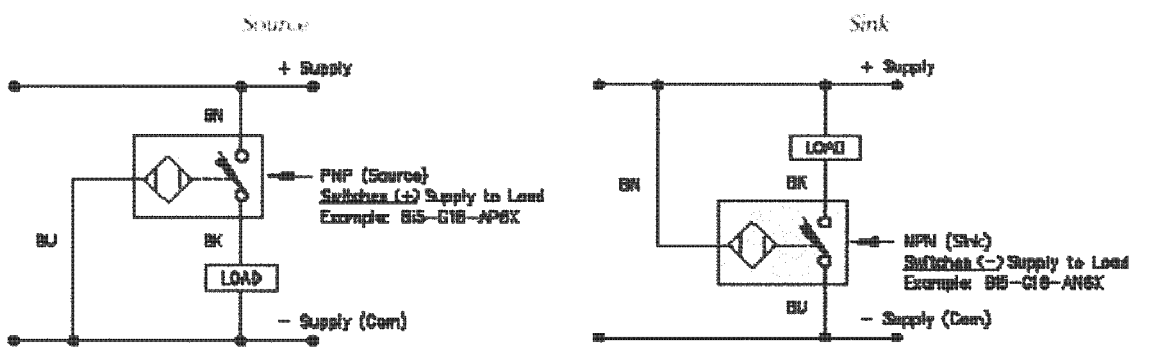
Check that the sensor bodies fan out radially from the shaft center and that they are also perpendicular to the shaft axis. The object is to ensure that the sensor tip is essentially parallel to the surface of the rotor lobe.

Sensor Air Gap Setting

Generally, the air gap between the sensor tip and rotor lobe surface should be set to 0.047 ± 0.004 inches. (1.2 ± 0.1mm) With this gap setting the sensor should switch to the on state when the edge of the rotor lobe just covers half the sensor tip.

DC power supply requirements for sensor testing

A suggested method of connection for the three wire Turck and or Pepperl & Fuchs type of encoders is shown below. The load can consist of a 10K ohm resistor.



Electrical Check of Encoder Operation

Having first set the sensor air gaps, the motor should be turned to check that all three sensors produce an output voltage across their load resistors. When a lobe is sensed, the output voltage should be 24v (or whatever V supply is used) In the absence of a lobe, the output voltage should be less than +1 volt. Check that each sensor changes state when approximately half the sensor tip is covered by a lobe.

If the motor can not be turned, a suitably shaped ferrous metal object can be used in place of the lobe (e.g., a screwdriver).

Setting of Encoder Phasing

It is suggested that the motor be run as an unloaded generator at some convenient low speed and that a comparison be made between the phasing of the induced stator voltages and the sensor signals.

First determine the specified direction of rotation for the motor and check electrically that the phase sequence of the induced stator voltages is 1,2,3 (or A,B,C) as marked on the stator cables/terminals. Also verify which motor winding is leading (in the case of a dual wound motor).

Permanently label each sensor and it's leads 1,2,3 (or Delta1, Delta2, Delta3, Wye1, Wye2, Wye3 in the case of a six phase machine) in the order in which the sensors come up as determined by the specified direction of shaft rotation. Sensor 2 will always be the middle sensor in the group. It must be noted that the leading winding is associated with the first set of encoders and the lagging winding with the second set of encoders.

With the encoders set up as shown in the above diagram, connect a single phase suitably rated potential transformer (with the secondary winding having the same polarity as the primary, as indicated by the dots on the windings) to the stator windings of the machine.
Adjust the angular position of the encoder mounting ring so that the phase relationship between the rising edge of the encoder signal and the positive going zero crossing of the stator voltage waveform conform with the following table.

1. Encoder 1 positive rising edge is in phase with the positive going zero crossing of stator phases 1-2
2. Encoder 2 positive rising edge is in phase with the positive going zero crossing of stator phases 2-3
3. Encoder 3 positive rising edge is in phase with the positive going zero crossing of stator phases 3-1

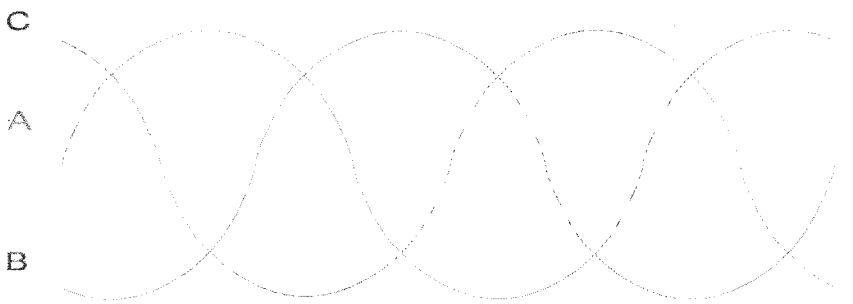
For a six phase machine, each set of encoders (Delta and Wye) must be aligned with the positive going zero crossing of the stator voltage waveform for that particular winding. After this test has been completed, there should be three or six encoders that are aligned with the three or six individual stator voltage zero crossings. Again ensure the probes are clearly identified.

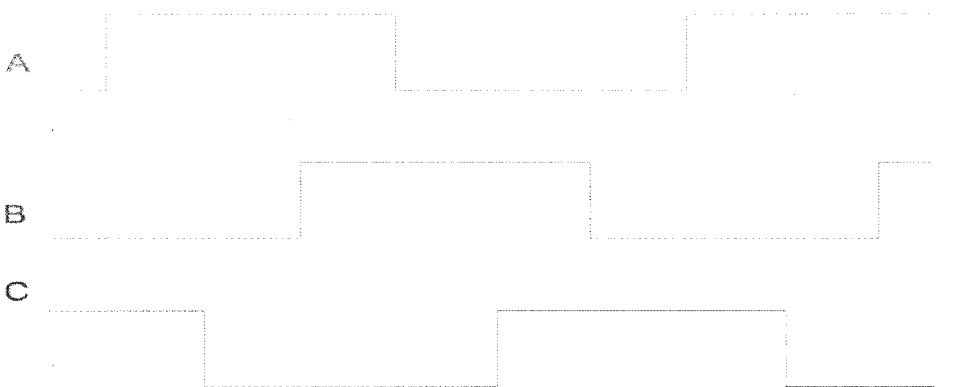
The mark space ratio of the encoder signal should be 50%. If the mark space ratio is not equal then the airgap of the individual sensors should be adjusted to achieve this.

Final check out

Once the above tests have been successfully completed, clearly mark the correct position of the encoder mounting ring with reference to the frame of the machine. Ensure all mechanical fastenings are secure and that the probe terminations are clearly identified at the external termination box.

Stator voltage waveform with respect to encoder signals





Jon Christensen - Notes of 1/29/04 Phone call

From: <JOHN.A.BENZ@sargentlundy.com>
To: <jon-c@ipsc.com>
Date: 1/29/2004 2:38 PM
Subject: Notes of 1/29/04 Phone call
CC: <DAVID.A.ROBERTS@sargentlundy.com>
Attachments: 012904.doc

Attached.

IP7012969

Jon;

Summary of my telephone conversation of January 29, 2004 with Alstom. Alstom had John Bradley and Steve Klein on the call.

Seven of the twelve modules have been tested. The rest will be done next week. They have enough for one VFD so they can start testing Monday.

All material including the disconnect switch has been received. They did make one very minor change and need one part yet, which is to be delivered next week. The one part is NOT required for the testing. They stressed they had no material concerns.

The wiring is 85 % complete as well as the complete assembly. The VFD will be complete Sunday 2/1/04. Testing will start on Monday 2/2/04. They will test one VFD at a time.

The training will start on Tuesday 2/3/04 for 4 IPSC personal. The logic will be finalized for the testing, I asked about getting a copy and they said they could put in on a laptop during the training. If you can give one of your guys a laptop computer with windows 2000 or NT plus office 2000 on it they will down load the logic so you can review it BEFORE the FAT. I don't understand why they can not give us a print of the logic. John Bradley said he never got copies of the sample logic. I forwarded your e-mail and it was returned, too big. I them sent a separate e-mail for each sample and it went though, so John has it now.

Alstom said they sent you a CD with the site test plan and Storage/Off-loading/Installation-Startup guidelines on it for your review. They have not received any comments. They also sent the FAT procedures to you and asked what you want to witness. They are still waiting for comments on what you want to look at during the FAT. I asked about the logic and said we would want to play with different scenarios to make sure the drive will do what is should.

The FAT will be 2/16/04. Alstom said they can't see more than one day to look at the open and short circuit test on the bridges and some I/O. I would think we want to play with the VFD for a couple of days, let them do their thing and then we can do our thing.

They asked how long the cable was from the VFD output to the input of the disconnect switch. I didn't know but I would think if there is a problem a new cable could be put in since it is very short. I told them I would ask you to get the length.

I asked about the MSDS reports and they are waiting for an electronic copy of the tough up paint. If they do not get it they can scan the paper copy and add it to the CD you already have.

Did you buy the Weidmuller crimp tool?

Shipment is scheduled for 2/20/04.

I will talk to you next week.

John Benz

1/29/04

IP7012971

From: <steve.klein@tde.alstom.com>
To: <jon-c@ipsc.com>
Date: 2/3/2004 2:55 PM
Subject: Contract 04-045605, Alstom Project GD70107 - Revised Project Schedule
Attachments: GD70107 Schedule .ZIP

Jon,

Attached is a revised project schedule.

(See attached file: GD70107 Schedule .ZIP)
"GD70107 Schedule .mpp"

Best Regards,

Steve Klein

Alstom Power Conversion Inc.

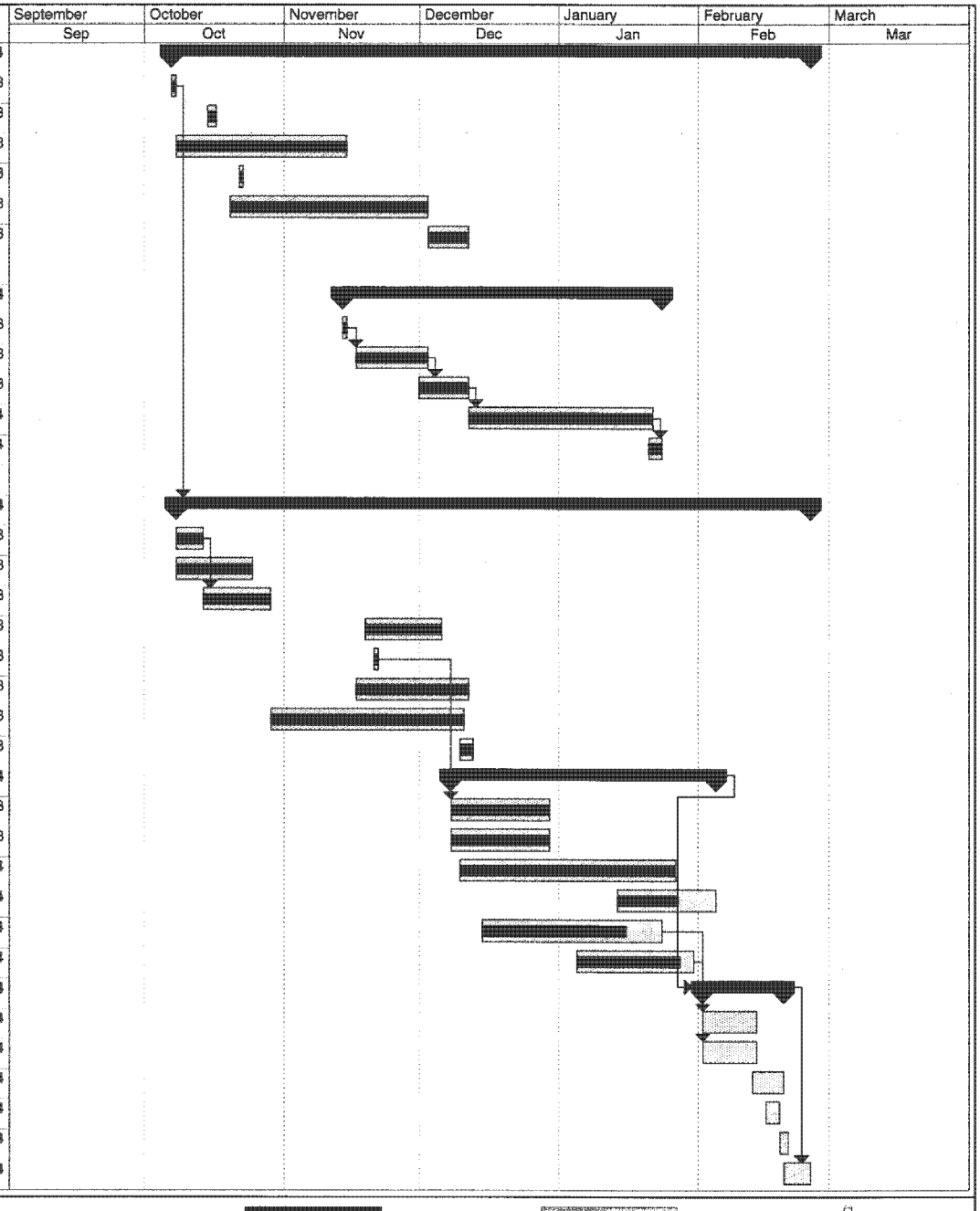
610 Epsilon Drive

Pittsburgh, PA 15238

Phone: 412-967-7168

Fax: 412-967-9326

ID		Task Name	Duration	Start	Finish
1		**Project Overview**	**102 days?**	**Tue 10/7/03**	**Wed 2/25/04**
2	✓	Receive Letter of Intent	1 day	Tue 10/7/03	Tue 10/7/03
3	✓	Customer Kick-off meeting	2 days	Wed 10/15/03	Thu 10/16/03
4	✓	Customer Finalize PO	28 days	Wed 10/8/03	Fri 11/14/03
5	✓	Order Entry	1 day	Wed 10/22/03	Wed 10/22/03
6	✓	Submit Approval Drawings	32 days	Mon 10/20/03	Tue 12/2/03
7		Drawing Approval	7 days	Wed 12/3/03	Thu 12/11/03
8					
9	✓	**Disconnect Switch**	**51 days**	**Fri 11/14/03**	**Fri 1/23/04**
10	✓	Place Purchase Order	1 day	Fri 11/14/03	Fri 11/14/03
11	✓	Submit Approval Drawings	12 days	Mon 11/17/03	Tue 12/2/03
12	✓	Release for Manufacture	9 days	Mon 12/1/03	Thu 12/11/03
13	✓	Manufacture	5.8 wks	Fri 12/12/03	Wed 1/21/04
14	✓	Shipment to Alstom	3 days	Wed 1/21/04	Fri 1/23/04
15					
16		**Drive System**	**101 days?**	**Wed 10/8/03**	**Wed 2/25/04**
17	✓	Advanced Electrical BOM	4 days	Wed 10/8/03	Mon 10/13/03
18	✓	Advanced Mechanical BOM	13 days	Wed 10/8/03	Fri 10/24/03
19	✓	Issue P.O.s for Long Lead Items	11 days	Tue 10/14/03	Tue 10/28/03
20	✓	Final BOM	13 days	Wed 11/19/03	Fri 12/5/03
21	✓	Sub Panel Delivery	1 day	Fri 11/21/03	Fri 11/21/03
22	✓	Release for Manufacture	19 days	Mon 11/17/03	Thu 12/11/03
23	✓	Balance of Procurement	31 days	Wed 10/29/03	Wed 12/10/03
24	✓	Enclosure Delivery	3 days?	Wed 12/10/03	Fri 12/12/03
25		**Manufacture**	**43 days**	**Mon 12/8/03**	**Wed 2/4/04**
26	✓	Sub Panel Drill/Assembly	16 days	Mon 12/8/03	Mon 12/29/03
27	✓	Surge/Gr Fault Panel Assy	16 days	Mon 12/8/03	Mon 12/29/03
28	✓	Module Sub-Assemblies	34 days	Wed 12/10/03	Mon 1/26/04
29		Module Testing	16 days	Wed 1/14/04	Wed 2/4/04
30		Component/Assy Install	30 days	Mon 12/15/03	Fri 1/23/04
31		Internal Wiring	20 days	Mon 1/5/04	Fri 1/30/04
32		**Test**	**14 days?**	**Mon 2/2/04**	**Thu 2/19/04**
33		Wiring/Continuity Check	10 days	Mon 2/2/04	Fri 2/13/04
34		Cooling System Checkout	10 days	Mon 2/2/04	Fri 2/13/04
35		Drive Operation Testing	5 days	Fri 2/13/04	Thu 2/19/04
36		Witness Testing	3 days?	Mon 2/16/04	Wed 2/18/04
37		Tear Down & Packaging	2 days	Thu 2/19/04	Fri 2/20/04
38		Shipment - Drive & Switch	4 days	Fri 2/20/04	Wed 2/25/04



Project: GD70107 Schedule .mpp
Date: Mon 1/10/11

Task | Progress | Summary | External Tasks | Deadline
Split | Milestone | Project Summary | External Milestone

INTERMOUNTAIN POWER SERVICE CORPORATION, DELTA, UTAH
UNIT 1 - ID FANS ADJUSTABLE SPEED DRIVE

IP7012973

From: <steve.klein@tde.alstom.com>
To: <jon-c@ipsc.com>
Date: 2/9/2004 8:21 AM
Subject: IPSC - Contract 04-45605 issues

Jon,

1. I realize that we may have asked this before and received a verbal reply, but could you please verify the specific lengths of the cables, both line and load side, for connection in the switch enclosure. We have the heights of the connections in the Westinghouse unit, but could not look inside the existing switch when we visited site because the drives were operating. We need a quick response because we don't have much time to modify the switch.

2. We need to know what John Benz would like to see during witness testing next week, so that we can determine how much time will be required and can schedule accordingly. Please advise.

3. Below is the result of Dave Smith's look at the chilled water supply loading following our discussion last Thursday.

Best Regards,

Steve Klein

---------- Forwarded by Steve KLEIN/USPIT01/TDE/non-ALSTOM on 02/09/2004 09:51 AM ----------

David SMITH
02/09/2004 07:47 AM

To: John BRADLEY/USPIT01/TDE/ALSTOM@GA
cc: Steve KLEIN/USPIT01/TDE/non-ALSTOM@GA

Subject: IPSC Chilled Water Supply Loading

John,

At 7,415 Hp the total load, per channel, should be very nearly 22 kW. This is a calculated figure for the nominal operating conditions and does not allow for any variation in supply voltage or frequency. When sizing the cooling equipment necessary to handle this amount of heat it would be prudent to allow some margin above this figure (e.g. 25 kW per channel) so that operation of the equipment is comfortably within design limits.

Regards,

From: Kevin Miller
To: Wes Bloomfield
CC: Bob Wright; john.bradley@powerconv.alstom.com; Jon Christensen; Pam Bahr
Date: 4/2/2004 1:41 PM
Subject: Status of the 1D2 Channel

Wes:

Shim Callister replaced the gating power supply in the 1D2 Channel today. We received them from Alstom this morning. The drive started up perfectly and was released to Ops.

In case an unexpected problem develops on 1D2 this afternoon, he will still wait until tomorrow with the Unit off line to change the supply in the reliable 1D1 Channel. He will also valve in the water tank. It shouldn't be a problem.

Thanks, Kevin

From: <john.bradley@powerconv.alstom.com>
To: Jon Christensen <JON-C@ipsc.com>
CC: <clive.reed@powerconv.alstom.com>, <steve.klein@powerconv.alstom.com>
Date: 11/23/2004 3:36 AM
Subject: Re: Training Attendees
Attachments: PITT Airport to Holiday Inn RIDC and Alstom Office.ZIP

Jon,

Attached are the directions to the Hotel and the office.

Cheers

jb

(See attached file: PITT Airport to Holiday Inn RIDC and Alstom Office.ZIP)
"PITT Airport to Holiday Inn RIDC and Alstom Office.doc"

Jon Christensen <JON-C@ipsc.com> on 11/22/2004 05:30:57 PM

To: John BRADLEY/USPIT01/APC/ALSTOM@GA
cc: Connie Elmer <CONNIE-E@ipsc.com>, Nathan Crop <Nathan-C@ipsc.com>,
Jane VOGEL/USPIT01/APC/ALSTOM@GA, Steve KLEIN/USPIT01/APC/ALSTOM@GA

Subject: Re: Training Attendees

Please make hotel reservations for Jon Christensen, Nathan Crop, Brian Bahr, Joe Tarin, Dick Goulding and Eric Wysong.

We arrive on January 9, 2005 and we are scheduled to leave, in the morning, January 14, 2005.

Please make hotel reservations for Jon Christensen and Nathan Crop on December 7 and December 8, 2004. We are scheduled to arrive Tuesday evening and leave Thursday morning. This is for the drive inspections.

I would also appreciate a map and directions from the Pittsburgh airport to the hotel and Alstom factory. Thanks

>>> <john.bradley@powerconv.alstom.com> 11/5/2004 10:31:52 AM >>>
Jon,

Just a reminder to let me have the names of the course attendees so we can
reserve your hotel.

Also, please send it to Steve and Jane Vogel on cc and she will take care
of it.

Thanks

jb

Airport to Holiday Inn RIDC and Office

Follow AIRPORT EXIT signs	1.4 miles
Merge onto PA-60 S toward PITTSBURGH	7.1 miles
Stay straight to merge onto US-22 E/US-30 E.	9.8 miles
US-22 E/US-30 E becomes I-279 N. This happens immediately once you have passed through the FORT PITT TUNNELS so be sure to be in the left hand lane when passing through the tunnels. Follow the I-279 N signs over a bridge after which it bears right so get into the extreme right hand lane on the bridge.	0.8 miles
Merge onto ALLEGHENY VALLEY EXPY/PA-28 N via EXIT 7C toward CHESTNUT ST/EAST OHIO ST/ETNA. This will take you through some construction. You will also be running parallel to the Allegheny River on the right.	9.1 miles
Take EXIT 10 toward R.I.D.C. DRIVE. The Holiday Inn Hotel can be seen directly ahead as you are taking exit 10	0.1 miles
Turn LEFT onto GAMMA DR at the stop after taking Exit 10.	0.5 miles
Turn RIGHT onto ALPHA DR at the first set of traffic lights.	0.1 miles
Turn LEFT onto DELTA DR, which will be the first left.	0.3 miles
Turn RIGHT onto EPSILON DR at the end of DELTA DR.	<0.1 miles

Alstom Power Conversion Inc 610 EPSILON DR PITTSBURGH, PA 15238 1-800-800 5290 http://www.powerconv.alstom.com/	**Holiday Inn Hotel & Suites** 180 GAMMA DR PITTSBURGH, PA 15238 1-412-963 0600 http://www.ichotelsgroup.com/h/d/hi/1/en/hd/pitav?irs=null

Jon Christensen - Re: Unit 1 'C' & 'D' ID Variable Frequency Drive Commissioning

From: <steve.klein@powerconv.alstom.com>
To: Jon Christensen <JON-C@ipsc.com>
Date: 3/14/2005 8:40 AM
Subject: Re: Unit 1 'C' & 'D' ID Variable Frequency Drive Commissioning
CC: Nathan Crop <Nathan-C@ipsc.com>

Jon,

I will set up a conference call for Monday at 2:00pm Pittsburgh time. I will confirm to you before noon.

Regards,

Steve

Jon Christensen <JON-C@ipsc.com>

Phone:

03/12/2005 03:00 PM

To: Steve KLEIN/USPIT01/APC/ALSTOM@GA
cc: Nathan Crop <Nathan-C@ipsc.com>
Subject: Unit 1 'C' & 'D' ID Variable Frequency Drive Commissioning

Please set up a telephone conference call, with the project personnel, to discuss the current drive commissioning status, problems, and schedule. I would prefer between 10:00 am and 11:00 am Monday morning.
Thanks

:._____

CONFIDENTIALITY : This e-mail and any attachments are confidential and may be privileged. If you are not a named recipient, please notify the sender immediately and do not disclose the contents to another person, use it for any purpose or store or copy the information in any medium.

Jon Christensen - GD70116 - Intermountain Power Project Commissioning Schedule

From: <steve.klein@powerconv.alstom.com>
To: <jon-c@ipsc.com>
Date: 3/16/2005 9:51 AM
Subject: GD70116 - Intermountain Power Project Commissioning Schedule
CC: <siddharth.pant@powerconv.alstom.com>, <barry.daugherty@powerconv.alstom...
Attachments: IPP MARCH 2005 Comm Schedule_A1.ZIP

Jon,

As requested during our conference call on Monday, attached is a commissioning schedule for units 1C & 1D. Please confirm the dates for turnover to operations and availability of full load. Additionally, please advise any other comments.

IP7012980

αβχδ

Commissioning Schedule for IPP Dual Channel ID Fans (Unit 1C & 1D)

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
MARCH 06, 2005	**MARCH 07, 2005** JBD Travel to site	**MARCH 08, 2005** - Installation Inspection - Begin Shipping Split re-connections	**MARCH 09, 2005** - Complete Shipping Split connections. - Start filling water cooling systems.	**MARCH 10, 2005** - Temporary power to cooling pumps. Purge systems of air. - Organize test areas, equipment, docs, etc. MZ Travel to site	**MARCH 11, 2005** - Begin Low Voltage Power-up Checks. - Begin I/O checks - Run water cooling systems.	**MARCH 12, 2005** - Continue I/O checks - Test ACCB trip circuits. - Check/adjust water cooling flows. - Start pulse checks on D Fan
MARCH 13, 2005 - Complete I/O checks. - Complete Pulse tests on D Fan. - Start Pulse checks on C Fan. - H/W Overcurrent trip tests. - Field Exciter Tests	**MARCH 14, 2005** - Motor disconnect switches tested. - Complete pulse checks. - Diagnostics tests as per commissioning inst. - Start HV tests on D	**MARCH 15, 2005** - Continue HV Tests for D Fan - Open Circuit Tests - Short Circuit Tests	**MARCH 16, 2005** - Complete Fan D HV Tests. - Move test equipment to Fan C Drives. - Start HV Tests for Fan C Drives.	**MARCH 17, 2005** - Continue HV Tests for Fan C drives. - Open Circuit Tests - Short Circuit Tests	**MARCH 18, 2005** .- Complete HV Tests for Fan C drives.	**MARCH 19, 2005** - Check readiness of C and D motors for preliminary rotations. - Prepare for preliminary rotation tests
MARCH 20, 2005 - Begin Single Channel No-Load rotation tests. - Fan D encoder alignment CH2 - Fan D encoder alignment CH1 .	**MARCH 21, 2005** - Single Channel No-Load tests continue. - Fan C encoder alignment CH2 - Fan C encoder alignment CH1 .	**MARCH 22, 2005** - Single Channel No-Load tests continue. - Fan D Exciter phase rotation checks. - Fan C Exciter phase rotation checks. **REQUIRES TOP SPEED**	**MARCH 23, 2005** - Single Channel No-Load tests continue. - Fan D Speed Regulator Control - Fan C Speed Regulator Control checks. **REQUIRES TOP SPEED**	**MARCH 24, 2005** - Single Channel No-Load tests continue. - Fan D V/F control checks. - Fan C V/F control checks. **REQUIRES TOP SPEED**	**MARCH 25, 2005** - Dual Channel No-Load tests. - Stop/Start tests Fan D - Operational & Stability checks Fan D - Master/Slave switch-over tests – Fan D.. **REQUIRES TOP SPEED**	**MARCH 26, 2005** - Dual Channel No-Load tests continue. - Stop/Start tests Fan C - Operational & Stability checks Fan C - Master/Slave switch-over tests – Fan C **REQUIRES TOP SPEED**
MARCH 27, 2005 - Single Channel Load Tests - Repeat V/F Control Tests with load on all four channels. **REQUIRES FULL LOAD**	**MARCH 28, 2005** - Dual Channel Full Load Tests - Full load current checks. Perform on both fans. **REQUIRES FULL LOAD**	**MARCH 29, 2005** - Dual Channel Full Load Tests - Beta and recovery time checks., Estop, master slave switchover.. Perform on both fans. **REQUIRES FULL LOAD**	**MARCH 30, 2005** - Monitor performance of drives. - Provide informal training for customer	**MARCH 31, 2005** - Monitor performance of drives. - Provide informal training for customer.	**APRIL 1, 2005** - Monitor performance of drives. - Provide informal training for customer.	**APRIL 2, 2005** - Monitor performance of drives. - Provide informal training for customer. **ID FANS TURNED OVER TO IPSC OPS**
APRIL 3, 2005 - Monitor performance of drives. - Provide informal training for customer.	**APRIL 4, 2005** - Monitor performance of drives. **UNIT 2 GEN AT FULL LOAD**	**APRIL 5, 2005** - Monitor performance of drives.	**APRIL 6, 2005** - Monitor performance of drives.			

IP7012981

From: John Larsen
To: Jon Christensen; Kevin Miller; Nathan Crop
Date: 3/16/2005 1:47 PM
Subject: Fwd: ALSTOM Quote for IPP RFQ - 212566
Attachments: ALSTOM Quote for IPP RFQ - 212566

For future reference and FYI see attached.

Jon Christensen - ALSTOM Quote for IPP RFQ - 212566

From: <steve.klein@powerconv.alstom.com>
To: John Larsen <john-l@ipsc.com>
Date: 3/16/2005 1:29 PM
Subject: ALSTOM Quote for IPP RFQ - 212566

Communication No.: AP-IP-E-018

John,

ALSTOM is pleased to submit our quotation for the items listed below in accordance with your RFQ 212566.

Item 1 - Hose clips Uniclip p/n Type B 6mm A/F Size 22, qty 50 - $14.00 each
Item 2 - Quick Disconnect, Female Threaded Type, p/n HFCD246-12, package of 25 at $9.00 per piece
Item 3 - Hose 1/2" Red, Wingfoot 300 Series, Goodyear p/n 569-008, 50 ft at $2.00 per foot
Item 4 - Hose 3/8" - not applicable
Item 5 - Quick Disconnect, Male Hose, p/n HFCD176-12, package of 25 at $11.80 per piece
Item 6 - Quick Disconnect, Female Hose, p/n HFCD226-12, package of 25 at $9.00 per piece

Please note the following:

1. Item 1 minimum quantity of 500 normally applies. Quantity of 50 will be accepted on one time basis only.
2. Item 2, 5 & 6 come in minimum size packages of 25 each. Above prices are per piece, not package
3. Shipment of items 1 & 3 can be made from our plant immediately upon receipt of an order. We will include freight costs for UPS ground shipment only. Costs for overnight delivery will be prepaid and added (at actual cost) to the material invoice.
4. Delivery of items 2, 5 & 6 can be made within 2 to 3 days of receipt of order and dropped shipped via overnight air freight from the manufacturer. Shipping cost for these items will be added, at actual cost, to the material invoice.

This quote will remain valid only through Thursday March 17, 2005.

Please let me know if you need additional information.

Best Regards,

Steve Klein

----- Forwarded by Steve KLEIN/USPIT01/APC/ALSTOM on 03/16/2005 02:06 PM -----

Steve KLEIN

APCI Marine & Offshore
Phone: 412-967-7168+
03/16/2005 08:21 AM

To: John Larsen <john-l@ipsc.com>
cc:
Subject: Re: RFQ - 212566 Link

John,

I apologize for not responding as quickly as I promised yesterday, but we were unable to contact one of the suppliers involved. I expect to have a price from them this morning and will forward a quote to you immediately thereafter. If we receive your order today, I think we'll still be able to deliver complete by Monday 3/21/05.

Best Regards,

Steve Klein

John Larsen <john-l@ipsc.com>

Phone:

03/15/2005 01:14 PM

To: Steve KLEIN/USPIT01/APC/ALSTOM@GA

cc:

Subject: RFQ - 212566

Steve,
I have a requisition coming for the following material which is required to be on our site this week. Please send me a quotation with costs and advise if all this can be shipped UPS Red or equivalent. I will have an order to you today, I believe, but need the costs first. Thanks.

1) 50 Each - HOSE CLIP, UNICLIP P/N TYPE B 6mm A/F SIZE 22

2) 20 Each - QUICK DISCONNECT, FEMALE THREADED TYPE,
COLDER PRODUCTS COMPANY P/N HFCD246-12

3) 50 Each - HOSE, 1/2", RED, WINGFOOT 300 SERIES.
GOODYEAR P/N 569-008

4) 50 Feet - HOSE, 3/8", RED, WINGFOOT 300 SERIES.
GOODYEAR P/N 569-008

5) 20 Each - QUICK DISCONNECT, MALE HOSE, COLDER PRODUCTS
COMPANY P/N HFCD176-12

6) 20 Each - QUICK DISCONNECT, FEMALE HOSE,
COLDER PRODUCTS COMPANY P/N HFCD226-12

John Larsen
Sr. Buyer
Intermountain Power Service Corp
850 West Brush Wellman Road
Delta, UT 84624
Tel: (435) 864-6537
Fax: (435) 864-0937
Fax: (435) 864-6678

IP7012984

:._____

CONFIDENTIALITY : This e-mail and any attachments are confidential and may be privileged. If you are not a named recipient, please notify the sender immediately and do not disclose the contents to another person, use it for any purpose or store or copy the information in any medium.

Jon Christensen - Monitoring of 120Vac essential services UPS power

From: <siddharth.pant@powerconv.alstom.com>
To: <barry.daugherty@powerconv.alstom.com>, <mzakin@yahoo.com>, <jon-c@ipsc....
Date: 3/21/2005 10:28 AM
Subject: Monitoring of 120Vac essential services UPS power
CC: <mikhail.zakin@tde.alstom.com>, <steve.klein@powerconv.alstom.com>, <nat...

Barry, Mikhail:

As part of the teleconference last week, IPSC had requested that the drives be set up to monitor 120 Vac UPS power in the Sigma history records. The idea is that IPSC will provide a 24 Vac signal through a 120Vac/24Vac transformer which will be brought into the Sigma via the Mains Channel 2 Sync Supply on the Type C PIB. This signal will then be monitored by looking at the raw analog input C5 and a filtered amplitude value via module 147.

To do the above in the Sigma, please set up the Sigma links as follows:

1. To monitor C5 in fast history 2, make the following edits
   L15906 = 'C' (is default 'L')
   L15907 = 5 (is 10710)

2. To monitor L14715 in control history 2, make the following edits
   L23507 = 14715 (is 12304)

3. To scale and filter L14715, add the following links (Add a comment dashed line before the links ;-------- Mains synchronization 2 (used for monitoring)-----)
   L14713 = 6875 (See note below)
   L14714 = 2.000 ms

Note: 6865 is the calculated value to get 100.00% at L14715 with a 24 Vac RMS into the Type C PIB. For reference, L10715 which does the same scaling for the sync input at C4 is set to 7007 on site. Some adjustment may be required on site.

5. If 24 Vac is available to feed into the type C, verify the signal set up above by triggering histories.

Jon:

To monitor the 120 Vac UPS power (or any other power source) you can supply a 24 Vac at Type C PIB terminal TB308-3 and -4, (see schematic sheet 007). We recommend a fused 24 Vac supply. One side grounded is preferable, but not essential.

Please contact me if there are any questions.

Regards,
Sid
:._____

CONFIDENTIALITY : This e-mail and any attachments are confidential and may be privileged. If you are not a named recipient, please notify the sender immediately and do not disclose the contents to another person, use it for any purpose or store or copy the information in any medium.

IP7012986

Jon Christensen - GD70116 - Plumbing PVC BOM

From: <steve.klein@powerconv.alstom.com>
To: <jon-c@ipsc.com>
Date: 3/21/2005 3:46 PM
Subject: GD70116 - Plumbing PVC BOM

Jon,

Responses on 2 issues from our telecon earlier this afternoon.

1. Plumbing PVC BOM - Bill of material listing for plumbing PVC parts is on drawing GD70116/2001-8302, sheet 3 of 7. If you cannot locate the drawing, let me know and I will send a copy immediately.

2. Needle Valve Leakage - I spoke with Ivan regarding your discovery of leaking at the needle valve connection points. He was not surprised to hear that, however, when we have experienced it, it usually occured during the initial pressurization of the system.

IP7012987

From: <ivan.martorell@powerconv.alstom.com>
To: <jon-c@ipsc.com>
Date: 3/24/2005 8:52 AM
Subject: Bill of Material
Attachments: 2001-8202P.pdf; 2001-8202E.pdf

Jon
Here is the bill of material you requested

(See attached file: 2001-8202P.pdf)(See attached file: 2001-8202E.pdf)

Catalogue Number: GD70116/2001-8202P Drawing Number: GD70116/2001-8202P Size: Category:
COOLING COMPONENTS, IPP Employee: MARTOR

BILL OF MATERIAL
PSM: M Job Number: GD70116
Revision Level: 04
Date Entered: JUN-16-2004
Date Revised: SEP-20-2004
Date Approved: SEP-20-2004
Category: MFG MATL Class: Subclass:

Item	Trans.	Sub Part Catalogue Description	Quantity	UOM	PSM Size	Drawing Number Reference	Remark	Revl	Length	Variable ECN	Oper. Message	Ship/Assy
001		M91130/002 PRESSURE GAUGE 2-1/2" DIAMETER 1% FS, 1/4" MPT CENTER BACK MTG, SS BLACK SCALE ON SILVER BACKGROUND ASHCROFT 251009AW02B 0/60PSI	2.000	EA	S	REV A PI	PI101-102	A	0.0000			
003		09-4-4SPV 1-1/2 CHECK VALVE, WAFER 1-1/2", 316 SST, VITON SEAL US VALVE: 09-4-4SPV 1-1/2	2.000	EA	P	CKV	CKV101-102		0.0000			
004		M59100/001 TANK DEIONIZATION MIXED BED 1/4 CUFT 3/4" FPT CONN ANDERSON CHEMICAL P/N ESODI618	1.000	EA	S	DITANK			0.0000			
005		M47011/001 COUPLING, QUICK-DISCONNECT, FEMALE 1/2" IN LINE HOSE BARB BODY CPC HFCD 178-12	7.000	EA	S	M47011		B	0.0000			
006		M47104/001 FILTER HOUSING 10" POLYPROPYLENE SPINOFF 1/4" FPT CONNECTIONS ANDERSON CHEMICAL P/N EFI9	1.000	EA	S	F			0.0000			
007		M47104/002 FILTER 10" 20 MICRON PAPER SEDIMENT ANDERSON CHEMICAL P/N EFIP5	1.000	EA	S	F			0.0000			
008		M47011/002 COUPLING QUICK-DISCONNECT MALE PIPE THREAD INSERT 1/2" NPT CPC HFCD 248-12	8 ~~7~~.000	EA	S	M47011		B	0.0000			
009		M47102/034 HOSE BARB, STAINLESS STEEL 1/2" HOSE I.D. X 1/4" MALE NPT MCMASTER-CARR P/N: 53505K71	4.000	EA	S	M47102		D	0.0000			
010		M91140/002 TEMPERATURE GAUGE OC TO 100C 1/2"MPT 3" DIAMETER, 4" STEM, 1% ACC, 1C DIV STAINLESS STEEL, BACK CONNECTION REOTEMP MODEL A,0 TO 100C,4",1/2"NPT	2.000	EA	S	REV A	TI101, TI102	A	0.0000			
011		M47101/001 VALVE, BALL 1-1/2", S X S, CPVC TRUE UNION, VITON OR FLUOREL SEAL CHEMTROL TYPE U51TB-V (1.5")	8.000	EA	S	HV	HV104-HV109		0.0000			
012		M47101/008 VALVE, BALL 1/2", S X S, CPVC, TRUE UNION, VITON OR FLUOREL SEALS CHEMTROL TYPE U51TB-V (1/2") OR EQUIV.	4.000	EA	S	HV	HV101-103		0.0000			
013		M47105/001 TANK MAKE-UP WATER 11 GAL POLYPROPYLENE 18LX12WX12D 3/16" MIN WALL WITH COVER ALT SUPPLIER MCMASTER CARR 3726K54 NALGENE 14200-0015 (SEPP1)	1.000	EA	S	MWTANK			0.0000			

CERTIFIED FOR MANUFACTURE/TEST
SEP 21 2004
Engineer: Ivan Martorell

IP7012989

Catalogue Number: GD70116/2001-8202P Drawing Number: GD70116/2001-8202P Size: Category:
COOLING COMPONENTS, IPP Employee: MARTOR

Item	Trans.	Sub Part Catalogue / Description	Quantity	UOM	PSM / Size	Drawing Number / Reference	Remark	Revl	Length	Variable / ECN Message	Oper.	Ship/Assy
014		M47102/002 FITTING TANK BULKHEAD 1/2" POLYPROPYLENE 1-3/8" THD OD US PLASTIC CORP P/N 16423	6 ~~5~~.000	EA	S	MWTANK			0.0000			
015		M47103/110 Y-STRAINER, CPVC, 1.5" SOCKET CONNECTION 2" HEX CAP, 1/32" CPVC SCREEN, VITON SEALS MCMASTER CARR P/N: 44315K54	1.000	EA	S	M47103 YS101		D	0.0000			
016		M47103/117 SCREEN, CPVC, 1/32" PERFORATIONS REPLACEMENT SCREEN FOR 1.5" CPVC Y-STRAINER P/N M47103/103 & /110 MCMASTER CARR P/N: 44315K74	1.000	EA	S	M47103		D	0.0000			
017		2470B11B0 VALVE, THERMOSTATIC, CAST IRON, 3/4" NPT INST. 1"NPT PORT CLOSE @ 85 DEG. F, OPEN @ 105 DEG. F AMOT P/N: 2470B11B0	1.000	EA	P		TV101		0.0000			
018		M47108/007 VALVE, BUTTERFLY, 1", BRONZE 1" FEMALE NPT CONNECTION McMASTER-CARR PN: 9798K83	3.000	EA	P		BV101,BV102,BV103		0.0000			
019		VFB-86-SSV FLOW METER WITH CONTROL VALVE 0.5-5 GPM 3% FS 4" SCALE 1/4" NPT BACK CONN ACRYLIC BODY SS VALVE & CONNECTIONS DWYER: VFB-86-SSV	1.000	EA	P		FIC101		0.0000			
020		M47014/B22 HOSE CLIP, UNEX, TYPE B, 6MM A/F SIZE 22 BOLT HEAD UNICLIP: TYPE B 6MM A/F SIZE 22	18.000	EA	P				0.0000			
021		854C-010 SOCKET FLANGE 1", 150 LBS VAN STONE STYLE, SCHEDULE 80 CPVC HARRINGTON PN: 854C-010	2.000	EA	P				0.0000			
022		154700010 GASKET, 1" FLANGE HARRINGTON PN: 154700010	2.000	EA	P				0.0000			
023		M47106/001 FITTING SENSOR 1½" SLIP X SLIP CPVC 80 USE WITH SIGNET P51530-PO FLOW SENSOR SIGNET P/N CPV8T015	1.000	EA	S	REV B		B	0.0000			
024		5-686-05-030-003 BRAZE PLATE HEAT EXCHANGER WATER TO WATER ITT HEAT TRANSFER: 5-686-05-030-003	1.000	EA	P				0.0000			
025		835-010CBR COUPLER, 1", BRASS TO CPVC SPEARS: 835-010CBR	4.000	EA	P				0.0000			
026		854C-015 SOCKET FLANGE 1-1/2", 150 LBS VAN STONE STYLE, SCHEDULE 80 CPVC HARRINGTON PN: 854C-015	4.000	EA	P							
027		154700015 GASKET, 1-1/2" FLANGE	4.000		P				0.0000			

CERTIFIED FOR MANUFACTURE/TEST
SEP 21 2004
Engineer Ivan Martorell

IP7012990

Catalogue Number: GD70116/2001-8202P Drawing Number: GD70116/2001-8202P Size: Category:
COOLING COMPONENTS, IPP Employee: MARTOR

Item	Trans.	Sub Part Catalogue Description	Quantity	UOM	PSM Size	Drawing Number Reference	Remark	Revl	Length	Variable ECN	Oper. Message	Ship/Assy
		NEOPRENE HARRINGTON P/N: 154700015										
028		HFCD 108-12 COUPLING, QUICK-DISCONNECT, FEMALE PIPE THREAD INSERT 1/2" NPT CPC HFCD 108-12	1.000	EA	P	M47011		B	0.0000			
029		M47011/003 COUPLER, QUICK DISCONNECT, MALE 1/2" IN LINE HOSE BARB BODY CPC HFCD 228-12	1.000	EA	P				0.0000			

*** End of Report ***

CERTIFIED FOR MANUFACTURE/TEST

SEP 21 2004

Engineer: Ivan Martorell

IP7012991

Catalogue Number: GD70116/2001-8202E
COOLING CABINET

ELECTRICAL BILL

BILL OF MATERIAL

Drawing Number: GD70116/2001-8202E Size: Category:
Employee: MARTOR

PSM: M Job Number: GD70116

Revision Level: 04

Date Entered: JUN-16-2004
Date Revised: OCT-18-2004
Date Approved: OCT-18-2004

Category: MFG MATL Class: Subclass:

Item	Trans.	Sub Part Catalogue Description	Quantity	UOM	PSM Size	Drawing Number Reference	Remark	Revl	Length	Variable ECN	Oper. Message	Ship/Assy
004		M91401/001 CELL CONDUCTIVITY 0.1 CELL CONSTANT 20' LEADS 3/4" MPT HONEYWELL PART # 04973-X01-333-20-00-000	2.000	EA	S		YAE102, YAE103		0.0000			
005Z		9782C-S0-C2-E0000-BD ANALYZER CONDUCTIVITY 0 - 20 uS STD RANGE, 2-CELL, w/ 2 ANALOG OUTPUTS 2 RELAY OUTPUTS HONEYWELL: 9782C-S0-C2-E0000-BD	1.000	EA	P		YAI101		0.0000			
007		M86701/001 SENSOR, MOISTURE FOR SERIES 52 RELAY MAGNETEK 6013-MSA-1	1.000	EA	S	REV A	YSH101	A	0.0000			
008		1ST1F5D4 PUMP, 3 PH, 1"x 1-1/4" OUT/IN 1.5 HP 3500RPM, 208-230/460 TEFC MOTOR SS304 WETTED PARTS MECHANICAL G&L PN: 1ST1F5D4	2.000	EA	P		P1,P2		0.0000			
009		84N1771 RESISTOR, METAL FILM 500 OHM, 1/4 WATT, 1% NEWARK: 84N1771	3.000	EA	P				0.0000			
011		M88220/001 SWITCH DOOR INTERLOCK 277V 10A PULL TO DEFEAT FEATURE MCROSW 1DM401	1.000	EA	S	REV B	DS2	B	0.0000			
012		M88930/001 FIXTURE FLUORESCENT LIGHT 18" 120V TRIGGER START BALLAST METALU SN-115LTS	1.000	EA	S	REV A	WL2	A	0.0000			
013		M88930/002 LAMP FLOURESCENT 24 WATT 18" METALUX F15T12CW	1.000	EA	S		WL2		0.0000			
014		M47107/001 SOLENOID VALVE ELECTRIC 3/8" BORE VALVE CLOSED WHEN DE-ENERGIZED 3/8" FPT CONNECTIONS MCMASTER CARR 4590K22	1.000	EA	S	M47107	SV101	C	0.0000			
019		M92307/001 SENSOR, FLOW, PADDLEWHEEL, FOR PIPE SIZE 0.5" TO 4", POLYPROPYLENE HOUSING, PVDF ROTOR, TITANIUM SHAFT SIGNET P/N: P51530-P0	1.000	EA	S	M92307	FP101	A	0.0000			
020		M88200/001 SWITCH LEVEL POLYPROPYLENE FLOAT & STEM 1/2" MPT FITTING 1/4" MALE QD'S 105°C 30 WATT 0.50 SG FLOAT MADISON M8725	2.000	EA	S	M88200	LSL101, LSL103	A	0.0000			
022		672 GP 15 BLOCK, TERMINAL, 15 PT, 30A MARATHON 672 GP 15	2.000	EA	P		TBP1		0.0000			
023		672 GP 06	1.000	EA	P				0.0000			

CERTIFIED FOR MANUFACTURE/TEST
OCT 18 2004
Engineer: Ivan Martorell

IP7012992

Catalogue Number: GD70116/2001-8202E Drawing Number: GD70116/2001-8202E Size: Category:
COOLING CABINET Employee: MARTOR

Item	Trans.	Sub Part Catalogue Description	Quantity	UOM	PSM Size	Drawing Number Reference	Remark	Revl	Length	Variable ECN	Oper. Message	Ship/Assy
		BLOCK, TERMINAL, 6 PT, 30A MARATHON 672 GP 06					TBP2					
029		48F1360 THERMOSTAT, SET POINT 85 DEG. F STO-85 STYLE NEWARK PN: 48F1360	1.000	EA	P		TS2		0.0000			
030		M98601/001 HEATER, STRIP, 240V, 400W, SEAMLESS STAINLESS STEEL SHEATH WITH AL FINS 8" LONG HOTWATT FS-8,400W,240V,OF TERMINATION	1.000	EA	S	M98601	HTR2	A	0.0000			
035		M91141/001 MONITOR/METER, FLOW, TWO ALARM CONTACTS 12/24VDC/AC SUPPLY, USE WITH SIGNET 515 FLOW SENSOR SIGNET P/N: 3-5500	1.000	EA	S		FM1		0.0000			

*** End of Report ***

CERTIFIED FOR MANUFACTURE/TEST

OCT 18 2004

Engineer: Ivan Martorell

IP7012993

Jon Christensen - GD70116 - Machine Incomer Unistrut Change

From: <steve.klein@powerconv.alstom.com>
To: <jon-c@ipsc.com>
Date: 4/1/2005 11:10 AM
Subject: GD70116 - Machine Incomer Unistrut Change
CC: <siddharth.pant@powerconv.alstom.com>

Jon,

Ivan has completed the engineering change to modify the machine incomer because the high voltage cables were resting on metal unistrut. On all future units the rear unistrut in the machine incomer that holds the PTs will be changed from metal to glastic. There isn't any futher detail, so if you need additional information to implement this change in the drives already delivered, let me know.

Also, I have not yet received any failed equipment from you. I'm sure it's quite hectic there during commissioning, but the sooner we receive the material. the easier it will be to process warranty claims. The most urgent need is the AMOT valve, since we took one from a drive currently in manufacture and need to replace it. Also, we don't want you to be short on any maintenance spares that may have been used to replaced failed parts.

I hope to speak with you next week, once things quiet down to review current status.

From: <ivan.martorell@powerconv.alstom.com>
To: <NATHAN-C@IPSC.COM>, <JON-C@IPSC.COM>
CC: <steve.klein@powerconv.alstom.com>
Date: 4/4/2005 8:05 AM
Subject: FERRITE

Nathan/Jon
I was just talking to Mikal. The round paper is part of the ferrite assembly. The paper is located between the ferrite cores.

Ivan

From: Kevin Miller
To: Jon Christensen; Nathan Crop
CC: Tim Souter
Date: 4/13/2005 6:56 AM
Subject: Remote Communications to Alstom ID Fan Channels

Just to let you know that the innerduct and Cat 5 cable are installed from both channels down to the communication room. Just doing Unit 2 1D Fan for now until it is proven to work. Due the numerous high voltage cables in the room, you may find that you have to go with a fiber connection instead of Cat 5.

Can you guys now massage the political system to get the connections made to install and configure the hardware. When it is done, can you give me the IP address so I can also log on and view the machine status in addition to you guys.

Thanks, Kevin

Jon Christensen - Regulator and incoming power cabinet layouts

From: <siddharth.pant@powerconv.alstom.com>
To: <jon-c@ipsc.com>
Date: 4/20/2005 6:50 AM
Subject: Regulator and incoming power cabinet layouts

Jon:

We were wondering if you had had a chance to consider the alternatives for the regulator cabinet layout and what your thoughts were. Also, we are awaiting your sketch for the incoming power cables.

Please email or call me at (412) 967-6975.

Thanks and regards,
Sid

:._____
CONFIDENTIALITY : This e-mail and any attachments are confidential and may be privileged. If you are not a named recipient, please notify the sender immediately and do not disclose the contents to another person, use it for any purpose or store or copy the information in any medium.

IP7012997

Jon Christensen - Re: Jumper settings on output disconnect switch

From: <siddharth.pant@powerconv.alstom.com>
To: Nathan Crop <Nathan-C@ipsc.com>
Date: 4/27/2005 8:12 AM
Subject: Re: Jumper settings on output disconnect switch
CC: Jon Christensen <JON-C@ipsc.com>, Nathan Crop <Nathan-C@ipsc.com>

Nathan:

Thanks for replying. I am assuming unit 1 trip is not related to our equipment.

Regards,
Sid

Nathan Crop <Nathan-C@ipsc.com>

Phone:

04/27/2005 09:49 AM

To: Jon Christensen <JON-C@ipsc.com>, Nathan Crop <Nathan-C@ipsc.com>, Siddharth PANT/USPIT01/APC/ALSTOM@GA

cc:

Subject: Re: Jumper settings on output disconnect switch

Hello Sid,
We have a Unit One Trip on our hands here and it is not pretty. I am sorry if I haven't answered anything lately. Jumper J8 to J9 and jumper J11 to J12 are the only ones that are in place at this time.
Nathan Crop

Electrical Engineer
850 West Brush Wellman Road
Delta, UT 84624-9522
Telephone (435) 864-6483
home: (435) 864-8429
Fax (435) 864-6670
E-mail: nathan-c@ipsc.com

>>> <siddharth.pant@powerconv.alstom.com> 4/26/2005 9:22:44 AM >>>
Nathan:

I am going through our marked-up schematics and see that the jumper settings on the Powerconv output disconnect switch terminal blocks for the
motor power supply selection are not marked-up to show the jumpers used on
site, specifically jumpers on dwg 2001-014E for Unit 1 Fan C terminal

IP7012998

blocks CH1 MOTOR POWER SELECTION TB - TBJ and CH2 MOTOR POWER SELECTION
TB
- TBJ. Also not marked up are the same jumpers on sheet 015E for Unit
1
Fan 1D.

Do you have these jumper settings? If so, could you please send them
to
me? I am assuming the jumper settings are the same on all 4 swtiches
installed in the outage this year.

Thanks,
Sid

:._____
CONFIDENTIALITY : This e-mail and any attachments are confidential
and
may be privileged. If you are not a named recipient, please notify the

sender immediately and do not disclose the contents to another person,

use

it for any purpose or store or copy the information in any medium.

IP7012999

Jon Christensen - Contract 04-45605; GD70116 - Intermountain Power

From: <steve.klein@powerconv.alstom.com>
To: <jon-c@ipsc.com>
Date: 5/10/2005 12:10 PM
Subject: Contract 04-45605; GD70116 - Intermountain Power
CC: Nathan Crop <Nathan-C@ipsc.com>, <siddharth.pant@powerconv.alstom.com>, ...

Jon,

It has been nearly four(4) weeks since Sid Pant initially discussed with you the options for modifications to the regulator panels to ease component access difficulties. We recognize that you have been preoccupied with a serious problem at the plant, however, we cannot delay production on the next set of drives any longer.

Therefore, ALSTOM will apply option 2 to the panel layout of the regulator cabinets when producing the remaining five(5) drives. This will consist of reducing the width of the 3"x3" wireway on the rear panel to 2". The Sigma power supply will be relocated to the left as far as possible and the side panels will be moved forward about 1/2". We feel confident that this modification will allow the necessary space for maintenance access to all panel components. It will, also, allow the space heater, thermostat and ethernet jack to remain in place. These may have had to come out if we had chosen option 1.

Additionally, we are waiting for a sketch from you on the incoming cables so that we can adjust the bus work accordingly.

Jon Christensen - Re: Contract 04-45605; GD70116 - Intermountain Power

From: <steve.klein@powerconv.alstom.com>
To: <jon-c@ipsc.com>
Date: 5/12/2005 2:57 PM
Subject: Re: Contract 04-45605; GD70116 - Intermountain Power
CC: <siddharth.pant@powerconv.alstom.com>, <ivan.martorell@powerconv.alstom....
Attachments: IMG_4274.JPG; IMG_4275.JPG; IMG_4277.JPG; IMG_4278.JPG; IMG_4279.JPG; IMG_4267.JPG; IMG_4268.JPG; IMG_4269.JPG

Communication No. AP-IP-E-024

Jon,

Prior to receiving your e-mail below, we had modified the first channel's regulator panel layout in the next drive being built. We reviewed your concerns from earlier discussions and your e-mail and made some further changes. We feel that this addresses your concern of adequate access for maintenance. The modification effort includes the following changes.

1. Moved the right panel approximately 3/4" forward
2. Will move the left panel 1/2" to 3/4" forward
3. Moved the SIGMA Power Supply and I/O Board on the rear panel approximately 1" to the left. To accomplish this the rear panel vertical wireway width had to be reduced from 3" to 2".
4. Reversed the hinges on the SIGMA to close in the forward direction. This makes it easier to close the hinges and gives much better visibility to the hinges.
5. We will, but have not yet relocated the ethernet jack away from the 480V power circuit. Our first thought is to place it towards the bottom of the rear panel. We will send a photo once the change is made.

Attached are photos that show the panels with the work done to date. Photo 4274 provides a "before modification" view of the wireway cutout on the right panel. Photo 4279 shows the "after modification" view. The other photos are post modification. We trust they will demonstrate to you that this modification provides a layout that meets your needs for maintenance access. If you want to view additional photo angles, please let me know.

Thanks for your consideration of this modification. We look forward to your comments.

Best Regards,

Steve

----- Forwarded by Steve KLEIN/USPIT01/APC/ALSTOM on 05/12/2005 03:31 PM -----

Jon Christensen <JON-C@ipsc.com>

To: Steve KLEIN/USPIT01/APC/ALSTOM@GA
cc:

Phone: Subject: Re: Contract 04-45605; GD70116 - Intermountain Power
05/10/2005 03:54 PM

Your proposal is unacceptable.

I appreciate the fact that this was discussed with Sid Pant during commissioning and after the Unit 1 Outage in March but this was also discussed with Alstom in January during the training class. At that time, Alstom agree to modify the layout of the cabinets to provide adequate access for maintenance.

Based on the discussions, in January, you are directed to relocate the temperature switch and ethernet jack and move the side panel (with the Spang exciter) toward the front of the cubicle. The original location of the ethernet jack is not correct anyway, it should not be routed next to the 480 volt power circuit. The temperature switch can be relocated to a position close to the top of the side panel. The wireway shall remain 3" x 3".

>>> <steve.klein@powerconv.alstom.com> 5/10/2005 12:10:56 PM >>>
Jon,

It has been nearly four(4) weeks since Sid Pant initially discussed with
you the options for modifications to the regulator panels to ease
component access difficulties. We recognize that you have been preoccupied
with a serious problem at the plant, however, we cannot delay production
on the next set of drives any longer.

Therefore, ALSTOM will apply option 2 to the panel layout of the regulator
cabinets when producing the remaining five(5) drives. This will consist of
reducing the width of the 3"x3" wireway on the rear panel to 2". The Sigma
power supply will be relocated to the left as far as possible and the side
panels will be moved forward about 1/2". We feel confident that this
modification will allow the necessary space for maintenance access to all
panel components. It will, also, allow the space heater, thermostat and

ethernet jack to remain in place. These may have had to come out if we had
chosen option 1.

Additionally, we are waiting for a sketch from you on the incoming cables
so that we can adjust the bus work accordingly.

:_____
CONFIDENTIALITY : This e-mail and any attachments are confidential and may be privileged. If you are not a named recipient, please notify the sender immediately and do not disclose the contents to another person, use it

for any purpose or store or copy the information in any medium.

Jon Christensen - IPP - new location of ethernet jack

From: <steve.klein@powerconv.alstom.com>
To: <jon-c@ipsc.com>
Date: 5/18/2005 1:07 PM
Subject: IPP - new location of ethernet jack
Attachments: DOC030.ZIP

Communication Number: AP-IP-E-025

Jon,

Attached for your information is an advance copy of the revised rear panel of the regulator cabinet. The new ethernet jack location is shown in the balloon. The drawing will be formally issued with the as-commissioned drawing set in the near future.

Best Regards,

Steve

----- Forwarded by Steve KLEIN/USPIT01/APC/ALSTOM on 05/18/2005 03:00 PM -----

Siddharth PANT

Engineering
Phone: (412)967-6975

05/18/2005 09:22 AM

To: Steve KLEIN/USPIT01/APC/ALSTOM@GA
cc: Ivan MARTORELL/USPIT01/TDE/ALSTOM@GA
Subject: IPP - new location of ethernet jack

Steve:

Attached is a drawing of the regulator cabinet rear panel with the new location of the ethernet jack shown in a balloon. The change was made in response to comments from IPP. Please forward this drawing to IPP.

"DOC030.pdf"

:._____
CONFIDENTIALITY : This e-mail and any attachments are confidential and may be privileged. If you are not a named recipient, please notify the sender immediately and do not disclose the contents to another person, use it for any purpose or store or copy the information in any medium.

Jon Christensen - GD70116 - Intermountain Power - Drives 2A, 2B & 2C

From: <steve.klein@powerconv.alstom.com>
To: <jon-c@ipsc.com>
Date: 6/7/2005 7:34 AM
Subject: GD70116 - Intermountain Power - Drives 2A, 2B & 2C
Attachments: GD70116 Rel B Schedule .ZIP

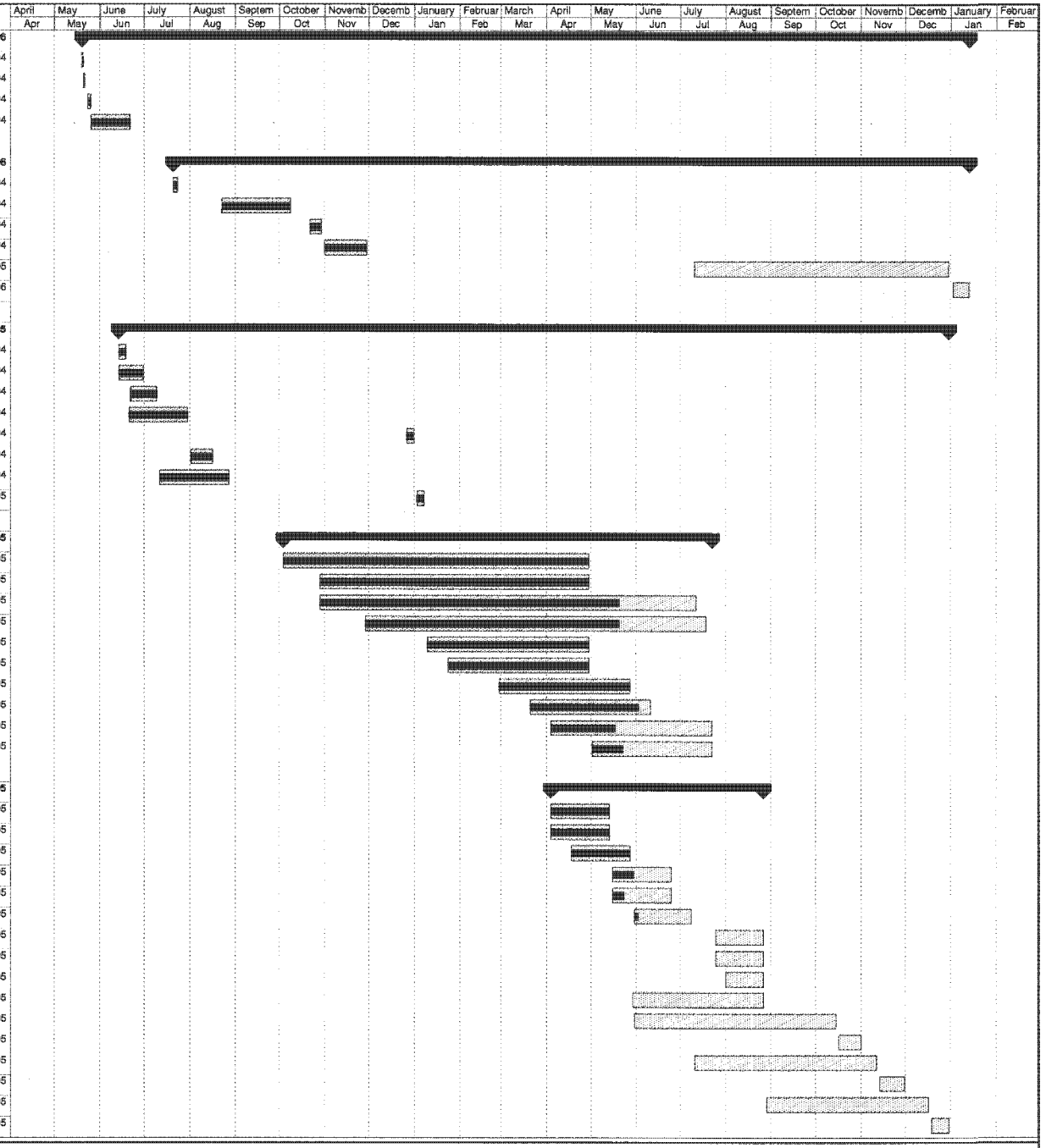
Jon,

Attached for your information is the schedule for Release B of ALSTOM contract GD70116, that details the production of drives 2A, 2B & 2C. As you can see, we have made significant progress to date on this portion of the contract.

Please advise if you have any comments. Also, if you are interested in attending any witness testing, please let me know so that the appropriate plans can be made and the schedule adjusted accordingly.

"GD70116 Rel B Schedule .mpp"

ID		Task Name	Duration	Start	Finish
1		**Project Overview**	**432 days?**	**Thu 5/20/04**	**Fri 1/13/06**
2	✓	Receive Letter of Release	1 day	Thu 5/20/04	Thu 5/20/04
3	✓	Order Entry	1 day	Fri 5/21/04	Fri 5/21/04
4	✓	Incorporate Design Enhancements	2 days?	Mon 5/24/04	Tue 5/25/04
5	✓	Issue Design Enhancements	19 days?	Wed 5/26/04	Mon 6/21/04
6					
7		**Disconnect Switch**	**388 days?**	**Wed 7/21/04**	**Fri 1/13/06**
8	✓	Issue RFQ	3 days?	Wed 7/21/04	Fri 7/23/04
9	✓	Receive & Evaluate Quotation	35 days?	Mon 8/23/04	Fri 10/8/04
10	✓	Place Purchase Order	6 days	Fri 10/22/04	Fri 10/29/04
11	✓	Approval Drawings	21 days?	Mon 11/1/04	Mon 11/29/04
12		Manufacture	25 wks	Mon 7/11/05	Fri 12/30/05
13		Shipment to Delta, Utah	9 days	Tue 1/3/06	Fri 1/13/06
14					
15		**Drive System**	**405 days?**	**Mon 6/14/04**	**Fri 12/30/05**
16	✓	Advanced Electrical BOM	5 days	Mon 6/14/04	Fri 6/18/04
17	✓	Advanced Mechanical BOM	13 days	Mon 6/14/04	Wed 6/30/04
18	✓	Issue P.O.s for Long Lead Items	14 days	Tue 6/22/04	Fri 7/9/04
19	✓	Final BOM	30 days	Mon 6/21/04	Fri 7/30/04
20	✓	Sub Panel Delivery	5 days	Mon 12/27/04	Fri 12/31/04
21	✓	Release for Manufacture	11 days	Mon 8/2/04	Mon 8/16/04
22	✓	Balance of Procurement	35 days	Mon 7/12/04	Fri 8/27/04
23	✓	Enclosure Delivery	5 days?	Mon 1/3/05	Fri 1/7/05
24					
25		**Manufacture**	**210 days?**	**Mon 10/4/04**	**Fri 7/22/05**
26	✓	Sub Panel Assembly	150 days	Mon 10/4/04	Fri 4/29/05
27	✓	DI Cores/Surge & Grd Fault Panel Assy	131 days	Fri 10/29/04	Fri 4/29/05
28		Module Sub-Assemblies	182 days	Fri 10/29/04	Mon 7/11/05
29		Module Testing	166 days	Mon 11/29/04	Mon 7/18/05
30	✓	Component/Assy Install - Drive 2A	80 days	Mon 1/10/05	Fri 4/29/05
31	✓	Internal Wiring - Drive 2A	70 days	Mon 1/24/05	Fri 4/29/05
32	✓	Component/Assy Install - Drive 2B	65 days?	Mon 2/28/05	Fri 5/27/05
33		Internal Wiring - Drive 2B	60 days?	Mon 3/21/05	Fri 6/10/05
34		Component/Assy Install - Drive 2C	80 days?	Mon 4/4/05	Fri 7/22/05
35		Internal Wiring - Drive 2C	60 days?	Mon 5/2/05	Fri 7/22/05
36					
37		**Test**	**105 days?**	**Mon 4/4/05**	**Fri 8/26/05**
38	✓	Wiring/Continuity Check Drive 2A	30 days	Mon 4/4/05	Fri 5/13/05
39	✓	Cooling System Checkout Drive 2A	30 days	Mon 4/4/05	Fri 5/13/05
40	✓	Drive Operation Testing - Drive 2A	30 days	Mon 4/18/05	Fri 5/27/05
41		Wiring/Continuity Check Drive 2B	30 days?	Mon 5/16/05	Fri 6/24/05
42		Cooling System Checkout Drive 2B	30 days?	Mon 5/16/05	Fri 6/24/05
43		Drive Operation Testing - Drive 2B	29 days?	Tue 5/31/05	Fri 7/8/05
44		Wiring/Continuity Check Drive 2C	25 days?	Mon 7/25/05	Fri 8/26/05
45		Cooling System Checkout Drive 2C	25 days?	Mon 7/25/05	Fri 8/26/05
46		Drive Operation Testing - Drive 2C	20 days?	Mon 8/1/05	Fri 8/26/05
47		Witness Testing	65 days?	Mon 5/30/05	Fri 8/26/05
48		Tear Down & Packaging Drive 2A	99 days	Tue 5/31/05	Fri 10/14/05
49		Shipment - Drive 2A	11 days	Mon 10/17/05	Mon 10/31/05
50		Tear Down & Packaging Drive 2B	90 days?	Mon 7/11/05	Fri 11/11/05
51		Shipment - Drive 2B	13 days?	Mon 11/14/05	Wed 11/30/05
52		Tear Down & Packaging Drive 2C	80 days?	Mon 8/29/05	Fri 12/16/05
53		Shipment - Drive 2C	10 days?	Mon 12/19/05	Fri 12/30/05



Project: GD70116 Rel B Schedule .mp
Date: Mon 1/10/11

Task | Split | Progress | Milestone | Summary | Project Summary | External Tasks | External Milestone | Deadline

INTERMOUNTAIN POWER SERVICE CORPORATION, DELTA, UTAH
UNITS 2A, 2B & 2C ID FANS ADJ SPEED DRIVE

IP7013006

Jon Christensen - GD70116 - Request fro Quote & Status of Warranty Items

From: <steve.klein@powerconv.alstom.com>
To: <john-l@ipsc.com>
Date: 6/8/2005 8:25 AM
Subject: GD70116 - Request fro Quote & Status of Warranty Items
CC: <jon-c@ipsc.com>

John,

ALSTOM is pleased to provide pricing as verbally requested yesterday for the following items.

1. Goodyear Wingfoot Hose, 30 ft. at $2.00 per foot - available from stock
2. Hose clamps, p/n M74014/B22, qty 20 at $7.00 each - available from stock - Please note that as previously advised, the hose clamps will no longer be available in less than the 500 minimum quantity manufacturing run, unless we happen to have some loose parts available at the time of receipt of an inquiry.

Additionally, status of the items returned for warranty repair or replacement is as follows:

All items are available for return to IPSC except as noted below.

1, Type "C" Interface Board, P/N M78001/209 qty 1 and Termination Panel Input Module, M78001/107 qty 2:
These units are with manufacturer. I am awaiting reply as to current status.

2. Thyristor Device, M73329/00X - qty 1: There is some question as to whether a single unit can be replaced since the original supply of these devices was in groups of five(5). ALSTOM is pursuing this further.

3. Resistor - 68 ohm, M62102/004 - qty 4: These have been received, but 2 of the 4 were damaged and will have to be returned to the manufacturer for replacement.

Please advise if you would like the available parts to be sent now.

Best Regards,

Jon Christensen - Re: HMI Logs

From: <siddharth.pant@powerconv.alstom.com>
To: Nathan Crop <Nathan-C@ipsc.com>
Date: 9/2/2005 8:04 AM
Subject: Re: HMI Logs
CC: Jon Christensen <JON-C@ipsc.com>, <steve.klein@powerconv.alstom.com>, <c...

Nathan,

There is nothing special we are doing in the lab to collect current data. I just loaded the latest IPSC HMI database into the HMI. To check that it worked as described. I reduced the settings of the number of samples and the number of files. It did work as described.

I then reloaded the original IPSC database and ran it for more than 48 hours. The logs were collected correctly, with the last 24 hours of data being retained.

I then changed the HMI time using the panel (jumping by an hour forward and back simulating changes for daylight savings time). The logs were still correct in either case.

Can you give exact dates and times of the last log files on your HMIs?

On site, are the amber and green LEDs on the HMI on? Are they flashing or steady?

If you can, please reload the HMI on one of your drives with the latest database 70116_08.cd2 and see if it functions correctly.

We can discuss this further during the telephone call later today.

Regards,
Sid

Nathan Crop <Nathan-C@ipsc.com>

Phone:
08/30/2005 02:49 PM

To: Jon Christensen <JON-C@ipsc.com>, Siddharth PANT/USPIT01/APC/ALSTOM@GA
cc:
Subject: Re: HMI Logs

Sid,

Thank you for responding so quickly.
If I understand you correctly the HMI will reach the dpecified number of files then start over agian overwriting one by one the first set of files.

If this is true I need to get our drives to do the same. At least this way there will be trends currently logging at all times. The fact that the HMI overwrites or discards previously logged trends is unfortunate. Even so I prefer to have the HMI recording current trends all the time so when there is a disturbance or trip I can see what in world was going with the trends at that pertenant time period.
Nathan

The other drives have info from the same period (End of April) I remember at the end of your visit we went through collected data from this other drive around that time.

Electrical Engineer
850 West Brush Wellman Road
Delta, UT 84624-9522
Telephone (435) 864-6483
home: (435) 864-8429
Fax (435) 864-6670
E-mail: nathan-c@ipsc.com

>>> <siddharth.pant@powerconv.alstom.com> 8/30/2005 7:36:28 AM >>>
Nathan,

You are right - we will get only 24 files in each folder, except for the
COOLING1 folder, which will have 7 files.

However, in the other drives, are the 24 files per folder from April, or are they
the last 24 hours? As you know, the file name gives the data and time in year, month, day,
24-hour format.

Each of the 24 files should have 1 hour of data to give 24 consecutive

hours of data. The files are First In First Out (FIFO) type. Let's call
them F1 to F24 with F24 being the one with the latest time tag

(filename).
They way it works is F24 collects data for the present hour and when it
fills up (hour is up), F1 is deleted, and a new file, call it F25, is
started to collect data for the new hour. That way we should always have
the last 24 hours of data (actually 23+ hours since the last file may not
be full at the time the data is looked at). Each of the 7 files for
COOLING1 has data for 12 hours.

I verfied the above in the lab by changing the HMI database such that each
file collects data for only 2 minutes, and setting the number of files to
different numbers including 2 and 5, thus collecting data for 4 and 10

minutes respectively. In all cases the most current data (4 or 10 minutes
in the 2 cases cited earlier) was retained and the earlier data

IP7013009

discarded.

Regards,
Sid

Nathan Crop <Nathan-C@ipsc.com>

Phone:
08/29/2005 05:51 PM

To: Siddharth PANT/USPIT01/APC/ALSTOM@GA
cc:
Subject: Re: HMI Logs

Hello Sid,
This is Nathan Crop. I have looked at another drive and saw the same thing. We are only getting 24 files in each folder except the COOLING1
file. The COOLING1 file will fill up at
7 files. If you look at the program on the logging page you will see this is exactly what the HMI is programmed to do.

Nathan

Electrical Engineer
850 West Brush Wellman Road
Delta, UT 84624-9522
Telephone (435) 864-6483
home: (435) 864-8429
Fax (435) 864-6670
E-mail: nathan-c@ipsc.com

>>> <siddharth.pant@powerconv.alstom.com> 8/29/2005 2:15:37 PM >>>
Nathan,

Further to the email below,

1. We checked in the lab setup here using the latest IPSC HMI software

(database 70116_08.cd2) and all data is being continually logged (all folders have updated excel files).
2. We talked to Red Lion and they are unaware of any problems in the data
collection.
3. As indicated below, please let us know if the problem is in one
6-pulse

drive only, or in others as well. If the problem is in one 6-pulse drive,
you might want to reload the HMI software and check if this corrects the
problem. If this does not work satisfactorily, we would recommend changing out the HMI.

Regards,
Sid

----- Forwarded by Siddharth PANT/USPIT01/APC/ALSTOM on 08/29/2005 03:51
PM -----

Siddharth PANT
Engineering
Phone: (412)967-6975
08/29/2005 02:04 PM

To: Nathan Crop <Nathan-C@ipsc.com>
cc: Jon Christensen <JON-C@ipsc.com>, Nathan Crop <Nathan-C@ipsc.com>, Steve KLEIN/USPIT01/APC/ALSTOM@GA, Cliff WATSON/USPIT01/APC/ALSTOM@GA
Subject: Re: A35.0 level

Nathan,

We are looking into this.

Can you confirm that the same data collection anomoly is happening on the
other drives as well?

When you say,...."even then not all the time",,,,what does this mean?
There are large gaps in data?

Regards,
Sid

Nathan Crop <Nathan-C@ipsc.com>

Phone:
08/29/2005 01:47 PM

To: Siddharth PANT/USPIT01/APC/ALSTOM@GA
cc: Jon Christensen <JON-C@ipsc.com>, Nathan Crop <Nathan-C@ipsc.com>
Subject: Re: A35.0 level

The HMI is only recording data for the events. and even then not all the time. All the other folders are nearly empty except some data from
like 4 months ago.

Nathan crop

Electrical Engineer
850 West Brush Wellman Road
Delta, UT 84624-9522
Telephone (435) 864-6483
home: (435) 864-8429
Fax (435) 864-6670
E-mail: nathan-c@ipsc.com

>>> <siddharth.pant@powerconv.alstom.com> 4/18/2005 10:53:12 AM >>>
Nathan:

I am trying to find out the battery voltage level at which A35.0 goes from
1 to 0 and will let you know when I get something.

Regards,
Sid

:._____
CONFIDENTIALITY : This e-mail and any attachments are confidential and
may be privileged. If you are not a named recipient, please notify the

sender immediately and do not disclose the contents to another person, use
it for any purpose or store or copy the information in any medium.

From: Nathan Crop
To: Jon Christensen; Nathan Crop
Date: 9/28/2005 8:58 AM
Subject: Nathans travel itinerary Oct 2005
Attachments: itinerary for 2005 Oct travel.jpg

Attached is a scanned copy of Nathan's travel itinerary for going to Alstom Power Conv. Oct 2005.

Electrical Engineer
850 West Brush Wellman Road
Delta, UT 84624-9522
Telephone (435) 864-6483
home: (435) 864-8429
Fax (435) 864-6670
E-mail: nathan-c@ipsc.com

From: Nathan Crop
To: Jon Christensen; siddharth.pant@powerconv.alstom.com
Date: 10/3/2005 4:20 PM
Subject: Ideas to focus on during my visit.
Attachments: Questions for Alstom.doc

Sid
Attached is a document that lists the concerns that I would like to work out with you while there in Pittsburgh.
Nathan

Electrical Engineer
850 West Brush Wellman Road
Delta, UT 84624-9522
Telephone (435) 864-6483
home: (435) 864-8429
Fax (435) 864-6670
E-mail: nathan-c@ipsc.com

>>> <siddharth.pant@powerconv.alstom.com> 8/29/2005 2:15:37 PM >>>
Nathan,

Further to the email below,

1. We checked in the lab setup here using the latest IPSC HMI software (database 70116_08.cd2) and all data is being continually logged (all folders have updated excel files).
2. We talked to Red Lion and they are unaware of any problems in the data collection.
3. As indicated below, please let us know if the problem is in one 6-pulse drive only, or in others as well. If the problem is in one 6-pulse drive, you might want to reload the HMI software and check if this corrects the problem. If this does not work satisfactorily, we would recommend changing out the HMI.

Regards,
Sid

----- Forwarded by Siddharth PANT/USPIT01/APC/ALSTOM on 08/29/2005 03:51 PM -----

Siddharth PANT
Engineering
Phone: (412)967-6975

08/29/2005 02:04 PM

To: Nathan Crop <Nathan-C@ipsc.com>
cc: Jon Christensen <JON-C@ipsc.com>, Nathan Crop <Nathan-C@ipsc.com>, Steve KLEIN/USPIT01/APC/ALSTOM@GA, Cliff WATSON/USPIT01/APC/ALSTOM@GA
Subject: Re: A35.0 level

Nathan,

We are looking into this.

Can you confirm that the same data collection anomoly is happening on the other drives as well?

When you say,...."even then not all the time",,,,what does this mean? There are large gaps in data?

Regards,
Sid

Nathan Crop <Nathan-C@ipsc.com>

Phone:
08/29/2005 01:47 PM

To: Siddharth PANT/USPIT01/APC/ALSTOM@GA
cc: Jon Christensen <JON-C@ipsc.com>, Nathan Crop <Nathan-C@ipsc.com>
Subject: Re: A35.0 level

The HMI is only recording data for the events. and even then not all the time. All the other folders are nearly empty except some data from like 4 months ago.

Nathan crop

Electrical Engineer
850 West Brush Wellman Road
Delta, UT 84624-9522
Telephone (435) 864-6483
home: (435) 864-8429
Fax (435) 864-6670
E-mail: nathan-c@ipsc.com

>>> <siddharth.pant@powerconv.alstom.com> 4/18/2005 10:53:12 AM >>>
Nathan:

I am trying to find out the battery voltage level at which A35.0 goes
from
1 to 0 and will let you know when I get something.

Regards,
Sid

:._____
CONFIDENTIALITY : This e-mail and any attachments are confidential
and
may be privileged. If you are not a named recipient, please notify the

sender immediately and do not disclose the contents to another person,
use
it for any purpose or store or copy the information in any medium.

Questions for Alstom
Nathan Crop

1. **How to look at both conductivity cells for alarm-**Only Cell 102 is being converted to a 4-20 mA signal. Thus only one is used for the alarm at 0.6uS/cm. Do all of Alstom's drives have two conductivity cells installed where only one of the readings is used for alarming?
    a. We have seen 2-3 conductivity cells fail in the past 2 years. With this kind of failure rate Sigma should be looking at both the conductivity measurements and disregarding any bogus readings. This would reduce the number of nuisance trips.
    b. When the conductivity reaches 0.6 uS/cm the HMI should at least see this as an event (We could just look at the solenoid flag B3.10).

2. **Resolve where, when and what to input for the time synchronizing-**Will you dedicate an input (A32.4) for the purpose of setting the HMI and Sigma clock to 00:00:00.
    a. Additionally will you alter the code in the Sigma and HMI for the purpose of this internal clock synchronization.

3. **Solution to the air burping into cooling system-**The low pressure side of the pumps is causing air to get into weak connections.
    a. The regularly changed DI tank is causing a lot of air leaks.
    b. Will you look into replacing the existing water filter housing with one that is see through and has <u>NO</u> bleeder-valve. The existing filter housing has a bleeder-valve that will weaken with time and let air into it.

4. **Solution to Nuisance Trips on High Conductivity-**Conductivity is compromised every ten day pump swap over because of the stagnant water over the off pump introduced back into the system. We have seen at least a dozen trips on high conductivity in the past two years. This seems to be what is happening.
    a. If a pump swap over happens when the water is already around 0.599 uS/cm then the dead leg will only get worse for the next ten days as it sits stagnant. Once this pump is turned back on this dirty water will cause a step increase of conductivity in the water. Occasionally it will raise up to 1.0u/cm (Trip level). If this level is reached the conductivity must get lower than 0.8uS/cm for the trip to de-activate (Dead band of 0.2uS/cm).
        1. We do not want to turn the pump on and off more frequently as this will cause unneeded wear on the motor.
        2. We have thought of reducing the dead band to 0.1uS/cm in conjunction with lowering the 0.6uS/cm alarm point to 0.5uS/cm. This will reduce the probability that the conductivity can reach the trip level and also it will allow the 15 second delay on the trip to be reduced for increased protection on our devices.

5. **HMI programming basics-** I would like to talk with the HMI programmer on site and go over some basic programming skills for this crimson software.
    a. Teach me how to program event logging.
    b. Getting rid of some unused portions of the logging folders.

6. **Ground Fault Relay Problems-**

This is a list of problems found during commissioning of drives in March 2005 outage.
Be more diligent in the wiring verification:

1. 1D1 & 1D2 mix up on removable doors - On drawing number GD70116/2001-8303 page 1 of 2, there is note number three indicating that on the 1D2 drive doors are removeable on the inverter/converter. By mistake alstom made the removeable doors on the 1D1 drive.
Solution:
We swapped the position of the 1D1 and 1D2 drives. This will require that alstom swaps all the necessary labels on the cabinet doors. Barry instructed our electricians on how to rewire.

2. Poorly connected wiring - The internal connections on the type C power interface board were not landed accurately. There were frayed wires touching other frayed wires.
Solution:
We had to have our help re-terminate the wires afore mentioned.

3. We last received emailed drawings on Jan. 4, 2005 -Our most current drawings sent to us on January 4, 2005 were what we gave to the contractors for the landing of field wiring. These were not the most up to date drawings.
Solution:
This costed us a couple of hours to make right. Had to do with TB-3 32,33,34,35.

4. Incomplete drawings for the door switch on the power-con switch- Door switch wiring needs to be done on 14E and 15E drawings.
Solution:
We did it and have noted it on drawings.

5. Pheonix analog isolator DIP switch settings need to be updated on the drawings.
Solution:
Alstom engineer has marked up the drawings for revision.

6. XFMR over temperature wiring for 1C1- On the 1C1 drive there was a wiring mistake with the 'B' phase over temperature input from the transformer.

7. One of the 1D drives had a door switch circuit missing- The internal wiring was incomplete.
Solution:
IPP wired the door switch.

8. Program bug was found for the pump one and two. When flow is not established by pump one running the Sigma tells pump two to go on. Then one second later the Sigma tells pump one to go on. It goes back and forth from pump one to two until it trips on low flow.

9. Found a broken optical coupler for digital input- (1C fan drives) It was labeled OC12.

Jon Christensen - Re: Ideas to focus on during my visit.

From: <siddharth.pant@powerconv.alstom.com>
To: Nathan Crop <Nathan-C@ipsc.com>
Date: 10/4/2005 6:27 AM
Subject: Re: Ideas to focus on during my visit.
CC: Jon Christensen <JON-C@ipsc.com>, <steve.klein@powerconv.alstom.com>
Attachments: Questions for Alstom.doc

Nathan,

Thanks. We'll plan to cover all the items you have listed in the attached document.

Regards,
Sid

Nathan Crop <Nathan-C@ipsc.com>

Phone:
10/03/2005 06:20 PM

To: Jon Christensen <JON-C@ipsc.com>, Siddharth PANT/USPIT01/APC/ALSTOM@GA
cc:
Subject: Ideas to focus on during my visit.

Sid
Attached is a document that lists the concerns that I would like to
work out with you while there in Pittsburgh.
Nathan

Electrical Engineer
850 West Brush Wellman Road
Delta, UT 84624-9522
Telephone (435) 864-6483
home: (435) 864-8429
Fax (435) 864-6670
E-mail: nathan-c@ipsc.com

>>> <siddharth.pant@powerconv.alstom.com> 8/29/2005 2:15:37 PM >>>
Nathan,

Further to the email below,

1. We checked in the lab setup here using the latest IPSC HMI software

(database 70116_08.cd2) and all data is being continually logged (all folders have updated excel files).
2. We talked to Red Lion and they are unaware of any problems in the data
collection.
3. As indicated below, please let us know if the problem is in one 6-pulse
drive only, or in others as well. If the problem is in one 6-pulse drive,
you might want to reload the HMI software and check if this corrects the
problem. If this does not work satisfactorily, we would recommend changing out the HMI.

Regards,
Sid

----- Forwarded by Siddharth PANT/USPIT01/APC/ALSTOM on 08/29/2005 03:51
PM -----

Siddharth PANT
Engineering
Phone: (412)967-6975
08/29/2005 02:04 PM

To: Nathan Crop <Nathan-C@ipsc.com>

cc: Jon Christensen <JON-C@ipsc.com>, Nathan Crop <Nathan-C@ipsc.com>, Steve
KLEIN/USPIT01/APC/ALSTOM@GA, Cliff WATSON/USPIT01/APC/ALSTOM@GA
Subject: Re: A35.0 level

Nathan,

We are looking into this.

Can you confirm that the same data collection anomoly is happening on the
other drives as well?

When you say,...."even then not all the time",,,,what does this mean?
There are large gaps in data?

Regards,
Sid

Nathan Crop <Nathan-C@ipsc.com>

Phone:
08/29/2005 01:47 PM

To: Siddharth PANT/USPIT01/APC/ALSTOM@GA

cc: Jon Christensen <JON-C@ipsc.com>, Nathan Crop <Nathan-C@ipsc.com>

Subject: Re: A35.0 level

The HMI is only recording data for the events. and even then not all
the time. All the other folders are nearly empty except some data
from
like 4 months ago.

Nathan crop

Electrical Engineer
850 West Brush Wellman Road
Delta, UT 84624-9522
Telephone (435) 864-6483
home: (435) 864-8429
Fax (435) 864-6670
E-mail: nathan-c@ipsc.com

>>> <siddharth.pant@powerconv.alstom.com> 4/18/2005 10:53:12 AM >>>
Nathan:

I am trying to find out the battery voltage level at which A35.0 goes
from
1 to 0 and will let you know when I get something.

Regards,
Sid

:._____
CONFIDENTIALITY : This e-mail and any attachments are confidential
and
may be privileged. If you are not a named recipient, please notify
the

sender immediately and do not disclose the contents to another person,
use
it for any purpose or store or copy the information in any medium.

From: Kevin Miller
To: Jon Christensen
Date: 10/12/2005 2:08 PM
Subject: Re: Fwd: GD70116 - Intermountain Power - Shipment of Drives 2A & 2B

Talked it over with the Warehouse. They would prefer a flat bed to allowing direct unloading at the WH doors from both sides of the trailer. They will accept a van if that is all that is available and offload on the ramp between WH 3 & 4 and forklift from there.

Kevin

>>> Jon Christensen 10/12/2005 10:16:00 AM >>>
Kevin, could you review this request with the warehouse and let me know their preference. Thanks

>>> <steve.klein@powerconv.alstom.com> 10/12/2005 8:43:37 AM >>>
Jon,

The carrier we would like to use to transport drives 2A & 2B to Delta has proposed using a 110" high box truck instead of a flatbed. Would that pose any unloading problems at your plant site? Please confirm.

From: Nathan Crop
To: Jon Christensen
Date: 10/24/2005 10:04 AM
Subject: where space heaters go
Attachments: to sid pant.jpg; history of problems.xls

Jon,
I want to send the following to Sid.
Nate

Sid,
Nate here. I found a pic showing where the space heaters are located on the presently installed drives here at Intermountain Power.
Also I am sending an excel sheet that summarizes the trips and alarms we've had through the past year or so.
Nate

Electrical Engineer
850 West Brush Wellman Road
Delta, UT 84624-9522
Telephone (435) 864-6483
home: (435) 864-8429
Fax (435) 864-6670
E-mail: nathan-c@ipsc.com

Alstom ID Fan Drive Alarm/Trip Summary

Date	Unit and drive	alarms	trips	Problem
4/1/2005	Unit 1 1D2	none	T38 COOL HIGH CONDUCTIVITY TRIP	False trip on high conductivity because the bit A4.4 would drop out for a small moment from time to time.
4/4/2005	Unit 1 1C1	A79 S1 OVERCURRENT RIDE THRU ALARM A80 M1 OVERCURRENT RIDE THRU ALARM	T20 MOTOR OVER FLUX TRIP	Current feed back to the PIB board was ugly from a bad CT on 'A' phase incoming cabinet
4/4/2005	Unit 1 1C2	none	T25 CONTROL PSU TRIP	Bad 12 VDC power supply which is the power supply #2.

IP7013025

4/5/2005	Unit 1 1C1	none	T20 MOTOR OVER FLUX TRIP	Noisy Stator Volt f/b signal at times

date	Unit and drive	alarms	trips	short description of problem
4/11/2005	Unit 2 1D1	F1=2 symbol table corruption; watchdog trip symbol table corruption	T15 We saw that there was a watchdog trip message on the Sigma Key pad. In the sigma technical manual section 4.4.1 we read that we should see what the variable F1-F5 were equal to.	So with the sigma key pad we looked at variable F1 and saw that we had what was called a symbol table corruption. See volume I, part 2, section ONE-page 4-19.

IP7013026

4/27/2005	Unit 2 1D2	AL89 HIGH WATER TEMP (Alarm temp is 45 degrees C).	the 1D2 drive was still running with high water temperature alarm on	The actual water temp was good. The actual conductivity was bad because the thermistor was giving falsely indicating high temp the temp compensated conductivity read too low.
5/18/2005	Unit 1 1C1	No alarms	T20 Motor Overflux Trip	The microcontrol trip history revealed that the stator voltage feedback had a sudden disturbance that caused the trip.
date	Unit and drive	alarms	trips	short description of problem

IP7013027

7/5/2005	Unit 2 1D2	AL89 HIGH WATER TEMP (Alarm temp is 45 degrees C). High coolant temperature alarm. The cell 2 thermistor is bad. It puts out 74 degrees C when the water is only 20 C.	T39 HIGH WATER TEMP (65 degrees C) 1D2 link tripped on high water temperature. Thermistors will fail as a short so the reading says the water is maximum temp. This is what tripped us.	They found the left cell looking in the cab. Had a bad temp sensing component. They swapped leads (C1 &C2) to the honeywell and the bad temperature reading followed the sensor cell.
7/11/2005	Unit 1 1C1	AL91 COOL PUMP 1 O/L. pump one over load alarm	No trip	We found that the pump one was in good working condition.

IP70130028

8/28/2005	Unit 1 1C1	There was no alarm indication on high conductivity on the HMI	T38 HIGH CONDUCTIVITY. Reading exceeds 1.0 and doesn't drop below 0.8 in under 15 seconds.	The cell may be going bad . Talking to cliff watson at alstom to fix the logging problem. It seems that we must erase the LOGS folder after getting data off HMI.
date	Unit and drive	alarms	trips	short description of problem

IP7013029

9/4/2005	Unit 2 1D2	There was no conductivity alarm. The conductivity must have went u past 0.6 then 1.0 in less than a 30 minute interval. It was a sudden step change on conductivity reading from cell one.	T38 HIGH CONDUCTIVITY. Reading exceeds 1.0 and doesn't drop below 0.8 in under 15 seconds.	high conductivity was indicated 28 seconds after pump 2 was turned on (Ten day swap). HMI only has last 24 hours.
9/11/2005	Unit 1 1C1	no alarms	T36 RES LEVEL LOW; if the lower level switch changes state and holds for more than 10 secondstripped on low reservoir level.	The reservoir level was good at time of trip. Bad indication for reservoir trip level.

IP70130030

Alstom ID Fan Drive Alarm/Trip Summary

date	Unit and drive	alarms	trips	short description of problem

IP7013031

9/21/2005	Unit 1 1D2	Fault Diagnostics Alarm on the HMI. Sigma keypad said, "M ARM 05 DEV3 S" See Volume I, section I, part 2 page 22. (One of five things is wrong--1bad pwr spplies, 2gate current, 3crowbar not fired, 4thermostat and 5volts collapsed)	no trip this time	One of the quick disconnect hoses was not fully connected and thus no cooling was available for arm 5 of the machine bridge. Thus the thermostat was getting hot as we tried to put a load on the fan.

IP7013032

Solution
Alstom recommended changing the trip delay from 5 seconds to 15 seconds (instruction 1890-1894. this means G410 was changed to 15,000 milliseconds on all the drives logic).
We did a open loop short circuit test on 1C1 drive and watched the DC link current for a spike. Moving wires around 'tween tests ruled out the PIB and other CT's till we found the bad CT.
We had to wire a separate input for all power supplies to narrow down which one was failing. We used some digital spare inputs temporarily.

IP7013033

We changed the type 'C' Power Interface Board and the problem has disappeared.
short description of solution
We then pulled the batteries and powered the sigma down completely. We then downloaded the sigma program fresh onto the Sigma Using Pilot-P80 with version 70116_01.

IP7013034

Sensor cell 103 gave correct readings of the water temp and cond. So we changed out the sensor cell 102. Only cell 102's water temp and conductivity readings will end up in the sigma. (This is a questionable design)
We tightened the connections on the stator voltage f/b network all the way to the type 'C' PIB board. Then we found a cable resting on the grey ribbon that goes from the PIB to the Sigma board.
short description of solution

IP7013035

The electricians put the temperature leads from the healthy cell on both C1 & C2 inputs to the honeywell. This made the temp reading nearly twice the actual temp. So we put in a 10k ohm resistor to C2 so it thinks the water is at 20 C. Once the new cell came we installed it and removed the resistor.
The overload alarm coming in was because of a loose wire on the over load normally open contact.

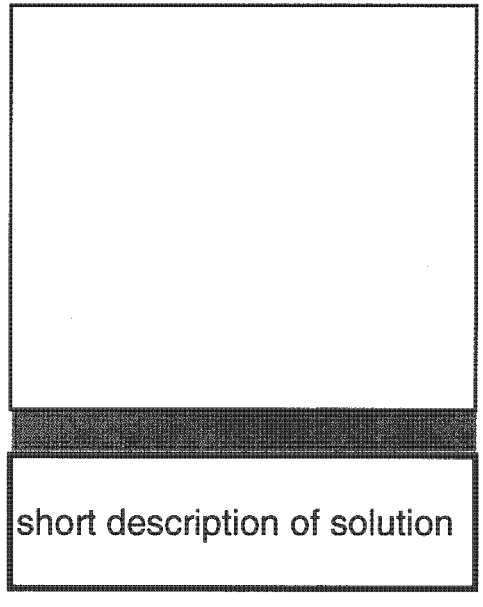
IP7013036

HMI is not seeing the local alarm for conductivity = 0.6uS/cm. It should record this in the event log.
short description of solution

IP7013037

I changed the HMI logging to have last 96 hours. Looks like pump swap over is causing trips. Dead leg is getting dirty and then once it is above 1.0uS/cm it has to get lower than 0.8uS/cm.
Need to consider a level indicator that does not bounce in and out when water level is good.

IP7013038



IP7013039

We spent a few hours thinking there was a bad board when Nathan looked under the module and saw the bad hose connection. We connected the hose and put the drive back in service with no further problems.

IP7013040

From: Nathan Crop
To: Jon Christensen
Date: 10/24/2005 11:31 AM
Subject: Alstom's HMI expert Cliff Watson

Jon,
Alstom said they were willing to send Cliff Watson to our site for a day in order to help resolve all the HMI questions we have. So now I think we should tell them a set of dates when he would be welcome. I will be here on site on these dates in the months of November and December.

November 1, 2, 7, 8, 9, 14, 16, 17, 21, 23, 28, 30.
December 1, 5, 7, 8, 12, 14, 15, 19, 21, 22.

Nathan Crop

Electrical Engineer
850 West Brush Wellman Road
Delta, UT 84624-9522
Telephone (435) 864-6483
home: (435) 864-8429
Fax (435) 864-6670
E-mail: nathan-c@ipsc.com

From: Nathan Crop
To: Jon Christensen; Souter, Tim
Date: 11/1/2005 2:20 PM
Subject: HMI

Hi Tim,
This is Nathan. Concerning the ID fan drives and the network connections. Jon Christensen asked me to inform you that two Alstom representatives are scheduled to visit us on Thursday, November 10th 2005. Primarily they come here to answer any questions and resolve any problems we have had with the HMI's. Jon thought you'ld help in finding out what is needed for making the HMI's network friendly to us users.

Will you put together a list of any questions you might have for these rep.'s?? We can email them the questions this week so they can perhaps come with the answers in hand.

Here are my questions so far.
Questions for Cliff Watson and Vince Terenzio (Alstom's HMI experts)
1. Alarm/Event logging: Design intent was for the analyzing of eventual or actual trips and alarms. We want all events logged onto the flash memory. Currently events are only logged if there is an alarm condition.
2. Event Page: Page down button. When looking at the HMI on the network it is very slow to go down line per line.
3. Event Page: Get rid of clear button. We have had people push this clear button.
4. Memory space versus desired logging: If we have the ability to put 1 Gig flash cards in lets do it.
Nate

Electrical Engineer
850 West Brush Wellman Road
Delta, UT 84624-9522
Telephone (435) 864-6483
home: (435) 864-8429
Fax (435) 864-6670
E-mail: nathan-c@ipsc.com

From: "Tradewell, John R" <john.tradewell@xcelenergy.com>
To: <jon-c@ipsc.com>
Date: 11/16/2005 5:49 AM
Subject: FW: Varichron equipment

Jon,

I got the attached e-mail and was wondering if you could let me know what Varichron equipment you have.

I work at the Xcel Energy Riverside Plant in Minneapolis, MN and we have four of these drives. Due to the MERP project the Riverside plant will be converted from coal to gas in 2008/2009 and we will be retiring these VSDs. It is my job to keep these old, obsolete pieces of equipment running until then. I have been informed by Alstom that they can no longer repair or replace any of the cards for the drives so I was looking for any spares out there.

The cards for our Westinghouse Varichron drives all start with 858...

Here are some of our part numbers we are looking for.

8580A79G01
8583A71H01
8583A20G01
8580A85G01
8580A60G01
8580A64G01
8580A87G01
8580A61G01
8580A62G01
8580A82G01
8580A63G01
8580A66G01
8580A95G01
8580A95G02
8580A84G01
8580A86G01
8581A01H02
8584A63H01
8584A66H07
8586A74G01
8586A73G01
8586A82H01
8583A85H01

Thank you for any help or information you can provide. Even if your spare parts are not compatible with ours that would be good to know so I will know that I have exhausted all my options.

John R. Tradewell
Xcel Energy Riverside Plant
3100 Marshall Street NE
Minneapolis, MN 55418
612-520-6833

-----Original Message-----
From: Ricker, Jeffrey L
Sent: Wednesday, November 16, 2005 6:36 AM

To: Tradewell, John R
Subject: FW: Varichron equipment

John,

Do you know about this?

-----Original Message-----
From: Hansen, Duane
Sent: Tuesday, November 15, 2005 8:42 AM
To: Ricker, Jeffrey L
Subject: Varichron equipment

Hi,

Do we have han Varichron equipment on site? If so, please read messsage below, if not, please disgard.

Thanks,

Duane Hansen
Xcel Energy
Buyer, Sourcing Services
Riverside Generating Plant (W,Th)
(612) 520-6837
A.S. King Generating Plant (M,T,F)
(651) 731-5730

-----Original Message-----
From: vince.terenzio@powerconv.alstom.com
[mailto:vince.terenzio@powerconv.alstom.com]
Sent: Monday, November 14, 2005 7:05 AM
To: Hansen, Duane
Cc: lisa.yost@powerconv.alstom.com
Subject: RE: Westinghouse Drive

Duane, Intermountain Power in Delta UT, is upgrading all of their Varichron equipment and as such they are disposing of their old Varichron parts.

I met with Jon Christensen their supervising engineer last week, and Jon stated that if anyone was interested in the old parts that they should give contact him.
His number is 435-864-6481. Email jon-c@ipsc.com.

Vince

:._____

CONFIDENTIALITY : This e-mail and any attachments are confidential and may be privileged. If you are not a named recipient, please notify the sender immediately and do not disclose the contents to another person, use it for any purpose or store or copy the information in any medium.

From: Nathan Crop
To: Jon-C@ipsc.com
Date: 12/1/2005 12:33 PM
Subject: Fwd: Re: Nathan from IPSC

Electrical Engineer
850 West Brush Wellman Road
Delta, UT 84624-9522
Telephone (435) 864-6483
home: (435) 864-8429
Fax (435) 864-6670
E-mail: nathan-c@ipsc.com

>>> <cliff.watson@powerconv.alstom.com> 12/1/2005 7:05:38 AM >>>
Good Morning Nathan,

I have competed the mods to the HMI software, which include:

1. Remote Control limiting - Menu Buttons listed below cannot be operated remotely, as well as all Control buttons on internal screens.
2. Event log clear can only be accessed by user level 3.
3. Red Lion looking into Page Down and Page Up buttons being added to alarm and event viewers.

These mods were performed on Build 216 of the Crimson II Software. This version will need to be loaded on your laptop. I have included it on the Jump Drive I am sending, along with the newly modified software. You can keep the Drive.

The package will be sent today.

Hope this takes care things for now. I f you have any questions don't hesitate to call.

Regards,
Cliff

Nathan Crop <Nathan-C@ipsc.com>

Phone:
11/14/2005 04:44 PM

To: Cliff WATSON/USPIT01/APC/ALSTOM@APC
cc:
Subject: Nathan from IPSC

Hello Cliff,

We would like to disable the following buttons from use when remotely looking at the HMI.
1. LOGON
2. DIM DISPLAY
3. TOUCH
4. TIME
5. CONFIG
6. CONTROL
7. TRIG HISTORY
8. PULSE TEST
These eight buttons should not ever be pushed when one is remotely looking at the HMI.
Nathan Crop

Electrical Engineer
850 West Brush Wellman Road
Delta, UT 84624-9522
Telephone (435) 864-6483
home: (435) 864-8429
Fax (435) 864-6670
E-mail: nathan-c@ipsc.com

:._____
CONFIDENTIALITY : This e-mail and any attachments are confidential and may be privileged. If you are not a named recipient, please notify the sender immediately and do not disclose the contents to another person, use it for any purpose or store or copy the information in any medium.

Jon Christensen - Fwd: send jeff payne schedule

From: Nathan Crop
To: Bahr, Brian; Christensen, Jon; Nathan Crop; Nuttall, Mike; Payne, Je...
Date: 1/26/2006 6:40 AM
Subject: Fwd: send jeff payne schedule
Attachments: 2006 April outage tentative schedule.doc

Here is a soft copy of the ID fan schedule for the outage (April 2006). It may change a little after the outage meeting.
Nathan

>>> Nathan Crop 1/25/2006 4:50:32 PM >>>

Electrical Engineer
850 West Brush Wellman Road
Delta, UT 84624-9522
Telephone (435) 864-6483
home: (435) 864-8429
Fax (435) 864-6670
E-mail: nathan-c@ipsc.com

IP7013048

Commissioning Schedule for IPSC Dual Channel ID Fans (Unit 2 1A, 1B & 1C)

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
MARCH 26, 2006	**MARCH 27, 2006**	**MARCH 28, 2006** - -	**MARCH 29, 2006** - Stage testing equipment for commissioning. - Phones, tables, power boards for multi-plugs, chairs, garbage pails etc.	**MARCH 30, 2006** - (CVE) stages drives. - (CVE) making sure labels on cables are taped down so not to loose them.	**MARCH 31, 2006** - (CVE) staging equipment necessary to begin extraction. - (CVE) making sure labels on cables are taped down so not to loose them.	**APRIL 01, 2006** - 7:00 am prepare door entrance. Take duct work apart (15 men per shift) - 6:00 am Request full clearance to be hung. - 8:00 am Sign on clearance. Request grounds to be hung. - 9:00 am Sign on gnds. - (CVE) begins.
APRIL 02, 2006 - 2nd day for CVE. (CVE) New drives in place and re-wiring begun. - (IPSC/ I&C) wire all remote I/O cabinets	**APRIL 03, 2006** - 3rd day for CVE. (CVE) Continue to re-wire new drives. - (CVE) Begin to verify wiring of drives. - (CVE) Verify all HV connections are same as before. - (CVE) start switchgear wiring.	**APRIL 04, 2006** - (CVE) done with drive cubicles. - (Alstom/IPSC) inspects installation. - (Alstom/IPSC) begin to re-connect shipping splits. - 10:00 am Alter clearance to give 480V and 120V for cabinet lights, rcptcl. pump and cntrl power. - (IPSC) electricians fill cooling systems with DI water and purge all air.	**APRIL 05, 2006** - (Alstom/IPSC) Complete shipping split re-connection. - (Alstom/IPSC)Continue verification of all internal wiring of drives. - (CVE) HV cable support – Link reactor and xfmr work complete. - (CVE) Switchgear cubicles done. - (IPSC) electricians done filling cooling systems and purging of all air.	**APRIL 06, 2006** - (Nate)Verify all wiring in switchgear cubicles. - (IPSC) Verify all HV connections are supported etc. - (IPSC) Verify all xfmr and link reactor work is done. - End of day Request clearance pulled off of all the ID fans and caution tags put in place (except for slide link tags)	**APRIL 07, 2006** - Morning Sign on caution tag clearance. - (IPSC/Alstom) Begin low voltage power-up checks. - (IPSC/Alstom) Begin I/O checks on all ID fan drives. - (Nate) Verify all wiring in Remote I/O cabinets.	**APRIL 08, 2006** - (IPSC/Alstom) Continue I/O checks. - (Relay Techs) Test switchgear tripping mechanism.
APRIL 09, 2006 - (IPSC/Alstom) Continue all I/O checks.	**APRIL 10, 2006** -(IPSC/Alstom) Continue all I/O checks. - (Alstom /Relay Techs) Start HV trip testing (A, B and C drives). - (IPSC/Alstom) Continue HV testing Phasing, DC OC test, OL SC test, CL SC test, E-stop checks etc.	**APRIL 11, 2006** - (IPSC/Alstom) Continue HV testing Phasing, DC OC test, OL SC test, CL SC test, E-stop checks etc.-(IPSC/Alstom) Thorough pulse tests on all drives.	**APRIL 12, 2006** - (IPSC/Alstom) Field Exciter testing.asd - (IPSC/Alstom) Continue pulse testing. - (IPSC/Alstom) Continue HV testing Phasing, DC OC test, OL SC test, CL SC test, E-stop checks etc.	**APRIL 13, 2006** - (Alstom/IPSC) Motor disconnect switch testing. - (IPSC/Alstom) Continue HV testing Phasing, DC OC test, OL SC test, CL SC test, E-stop checks etc. - (IPSC/Alstom) complete pulse testing.	**APRIL 14, 2006** - (Alstom/IPSC) Motor disconnect switch test - (IPSC/Alstom) Continue HV testing Phasing, DC OC test, OL SC test, CL SC test, E-stop checks etc. - (IPSC/Alstom) complete pulse testing.	**APRIL 15, 2006** - (IPSC/Alstom) Complete HV testing for all drives. -(IPSC) Jumper ID fan dampers in preparation for bottled up rotational tests. - (IPSC/Alstom) motor rotational checks/Encoder sequence testing.
APRIL 16, 2006 - Request OK TO HOT from operations to move leads for voltage dividers. - (IPSC/Alstom) Check A, B and C drives for preliminary rotation tests. -(IPSC/Alstom) set up voltage dividers on A. - (IPSC/Alstom) Begin rotation tests on A. **Requires mid-speed**	**APRIL 17, 2006** - (IPSC/Alstom) Continue to test A for proper encoder configuration tests. No load testing. Proper phase rotation on stator. **Requires mid-speed**	**APRIL 18, 2006** - (IPSC/Alstom) Continue with B ID fan encoder configuration tests. No load testing. Proper phase rotation on stator. **Requires mid-speed**	**APRIL 19, 2006** - (IPSC/Alstom) Finish B ID fan encoder configuration. No load testing. Proper phase rotation on stator. Start C **Requires mid-speed**	**APRIL 20, 2006** - (IPSC/Alstom) Finish C ID fan encoder configuration. No load testing. Proper phase rotation on stator. **Sign off caution tags and jmprs on damper indication.** **Requires mid-speed**	**APRIL 21, 2006** Single Channel No load testing. Speed Regulator Control Speed Regulator control checks v/f control checks start/stop checks Operational and stability checks. Master/Slave chop overs **MID-NITE shift Full load testing** **DAY-Requires mid-speed** **NIGHT-Requires Full draft**	**APRIL 22, 2006** Single Channel No load testing. Speed Regulator Control Speed Regulator control checks v/f control checks start/stop checks Operational and stability checks. Master/Slave chop overs **MID-NITE shift Full load testing** **DAY-Requires mid-speed** NIGHT-Requires Full draft

IP7013049

Commissioning Schedule for IPSC Dual Channel ID Fans (Unit 2 1A, 1B & 1C)

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
APRIL 23, 2006 Single Channel No load testing. Speed Regulator Control Speed Regulator control checks v/f control checks start/stop checks Operational and stability checks. Master/Slave chop-over **MID-NITE shift Full load testing** **DAY-Requires mid-speed** **NIGHT-Requires Full draft**	**APRIL 24, 2006** Single Channel No load testing. Speed Regulator Control Speed Regulator control checks v/f control checks start/stop checks Operational and stability checks. Master/Slave chop-over Hand over 'B' and 'C' drives to operations **MID-NITE shift Full load testing** **DAY-Requires mid-speed** **NIGHT-Requires Full draft**	**APRIL 25, 2006** Single Channel No load testing. Speed Regulator Control Speed Regulator control checks v/f control checks start/stop checks Operational and stability checks. Master/Slave chop-over **MID-NITE shift Full load testing** **DAY-Requires mid-speed** **NIGHT-Requires Full draft**	**APRIL 26, 2006** Single Channel load testing. Repeat v/f control testing on all six (6) channels. Full load current testing. Sign off **caution tags and jmprs on damper indication.** **MID-NITE shift Full load testing** **DAY-Requires mid-speed** **NIGHT-Requires Full draft**	**APRIL 27, 2006** Single Channel load testing. Repeat v/f control testing on all six (6) channels. Full load current testing. Dual Channel Full Load Tests. Beta and recovery time checks. E-Stop, master/slave chop over… Perform on all three (3) fans. Beta and recovery time checks. E-Stop, **MID-NITE shift Full load testing** **DAY-Requires mid-speed** **NIGHT-Requires Full draft**	**APRIL 28, 2006** Dual Channel Full Load Tests. Beta and recovery time checks. E-Stop, master/slave chop over… Perform on all three (3) fans. Beta and recovery time checks. E-Stop, Hand over 'A' (Last) drive to operations	**APRIL 29, 2006**
APRIL 30, 2006 Dual Channel Full Load Tests. Monitor performance of drives. **ID FANS TURNED OVER TO OPERATIONS.**	**MAY 01, 2006** Monitor performance of drives. - (IPSC) start clean up of scrubber electrical rooms and return all equipment.	**MAY 02, 2006** Monitor performance of drives. - (IPSC) finish clean up of scrubber electrical rooms and return all equipment.	**MAY 03, 2006** Monitor performance of drives.	**MAY 04, 2006** Monitor performance of drives.	**MAY 05, 2006** Monitor performance of drives.	**MAY 06, 2006** Monitor performance of drives.

(I&C, Maintenance, Mechanical)

1) Maintenance activities on A, B, C must be done by April 6, 2006.
2) 'D' will be turned over to maintenance and electricians after April 24, 2006.
3) We plan to rotate A, B, C fans starting April 15, 2006.
4) Full load testing is required and we plan to do it during the midnight shift on the last week of the outage (Starting on April 21, 2006).

IP7013050

Jon Christensen - First major ID fan clearance of April outage revised

From: Nathan Crop
To: McCann, Bruce
Date: 1/27/2006 8:04 AM
Subject: First major ID fan clearance of April outage revised
CC: Bahr, Pam; Christensen, Jon; Miller, Kevin; Nuttall, Mike; Payne, Je...
Attachments: PWR LIST FOR CLEARANCE IN APRIL 2006.xls; 2006 April outage tentative schedule.doc

Bruce,
Attached is an excel sheet showing all the things that I need clearanced on the first morning of the April outage. Also I attached a soft copy of the April outage ID fan schedule.

Below is listed seven major steps that I will be taking through the course of the outage.

1. I will be altering the clearance on April 04, 2006 in order to get some receptacle power and lights in the cabinets.

2. I will alter the clearance again on April 06, 2006 in order to give 480 V and all lower power sources. This is preparation to do my low voltage power-up checks.

3. (~April 15, 2006) Requesting jumpers made on ID fan modicon logic so to allow outlet dampers to be shut as we do no-load testing.
4. (~April 15, 2006) Requesting OK TO HOT condition for initial motor rotation problem shooting and encoder alignment. This is where I put caution tags on the major 6.9 KV breakers of the A, B and C ID fans. The electricians will use special PPE while connecting leads to High Voltage Bus.

5. (~April 20, 2006) Sign off all caution tags and start mid-night shift full load testing on fans. (Note: Pushing the denser cold air means we will not be able to get up to 954 RPM).

6. (April 24. 2006) Hand over 'A' and 'B' fans to Operations. This allows electricians to put clearance on 'D' fan for preventative maintenance chores.

7. (April 28, 2006) Hand over 'C' ID fan to Operations. Sign off all jumpers, caution tags and clearances remaining.

Nate

Electrical Engineer
850 West Brush Wellman Road
Delta, UT 84624-9522
Telephone (435) 864-6483
home: (435) 864-8429
Fax (435) 864-6670
E-mail: nathan-c@ipsc.com

IP7013051

Note: After clearance is signed on to there must be grounds hung on all six (6) of the corresponding ID fan transformers (Always on the high side).

SOURCE 1A1		LABEL
Trip & Close power	2APE-SWG-2A2 CUB 2	AX and AY for bkr close and bkr trip
2APE-SWG-2A2	CUB 2	2CCE-XF-1A1 ID FAN XFMR 1A1
2APC-2MCC 2A12	10-D	2CCE-EXX-1A1-B ID FAN VAR SP DRV 1A1 (EXCITER)
2APA-PPL-108	BKR 3	2CCE-KXX-342 (ID FAN 1A SPEED)
2APA-PPL-108	BKR 7	2CCE-XF-1A1 (2CCEK260203)
2APA-PPL-108	BKR 31:33:35	2CCE-29-1A1 (2CCEK213107)
2APA-PPL-109	BKR 8	2CCE-EXX-1A1 (2CCEK2122B18)
2API-PPL-1	BKR 2	2CCE-EXX-1A1 ID FAN VARIABLE SPEED DRIVE 1A1 (2CCEK2121B13)

SOURCE 1B1	
Trip & Close power	2APE-SWG-2A2 CUB 4
2APE-SWG-2A2	CUB 4
2APC-2MCC 2A12	11-D
2APA-PPL-108	BKR 4
2APA-PPL-108	BKR 8
2APA-PPL-108	BKRS 32:34:36
2APA-PPL-109	BKR 12
2API-PPL-1	BKR 4

SOURCE 1A2		LABEL
Trip & Close power	2APE-SWG-2A2 CUB 3	AX and AY for bkr close and bkr trip
2APE-SWG-2A2	CUB 3	2CCE-XF-1A2 ID FAN XFMR 1A2
2APC-2MCC 2A32	1-N	2CCE-EXX-1A2-B ID FAN VAR SP DRV 1A2 (EXCITER)
2APA-PPL-108	BKR 7	2CCE-XF-1A2 (2CCEK260206)

SOURCE 1B2	
Trip & Close power	2APE-SWG-2A2 CUB 5
2APE-SWG-2A2	CUB 5
2APC-2MCC 2A32	9-D
2APA-PPL-108	BKR 10

IP7013052

2APA-PPL-109	BKR 10	2CCE-EXX-1A2 (2CCEK2122B29)
2API-PPL-3	BKR 2	2CCE-EXX-1A2 ID FAN VARIABLE SPEED DRIVE 1A2

REMOTE I/O	6 LINKS TOTAL	LABEL
	TB7-258,261	2COF-CAB-31 WIRING
	TB7-286,289	
	TB8-310,313	

2APA-PPL-109	BKR 14
2API-PPL-3	BKR 4

REMOTE I/O	6 LINKS TOTAL
	TB7-258,261
	TB7-286,289
	TB8-310,313

IP7013053

:PLACEMENT (APRIL OUTAGE 2006)

LABEL	SOURCE 1C1		LABEL
AX and AY for bkr close and bkr trip	Trip & Close power	2APE-SWG-2B2 CUB 2	AX and AY for bkr close and bkr trip
2CCE-XF-1B1 ID FAN XFMR 1B1	2APE-SWG-2B2	CUB 2	2CCE-XF-1C1 ID FAN XFMR 1C1
2CCE-EXX-1B1-B ID FAN VAR SP DRV 1B1 (EXCITER)	MCC 2B12	10-D	2CCE-EXX-1C1-B ID FAN VAR SP DRV 1C1 (EXCITER)
2CCE-KXX-343 (ID FAN 1B SPEED)	2APA-PPL-108	BKR 5	2CCE-KXX-344 (ID FAN 1C SPEED)
2CCE-29-1B1 (2CCEK260303)	2APA-PPL-108	BKR 11	2CCE-29-1C1 (2CCEK260403)
2CCE-29-1B1 (2CCEK213207)	2APA-PPL-108	BKRS 37:39:41	2CCE-29-1C1 (2CCEK213307)
2CCE-EXX-1B1 (2CCEK2123B18)	2APA-PPL-109	BKR 16	2CCE-EXX-1C1 (2CCEK2125B18)
2CCE-EXX-1B1 ID FAN VARIABLE SPEED DRIVE 1B1	2API-PPL-2	BKR 2	2CCE-EXX-1C1 ID FAN VARIABLE SPEED DRIVE 1C1

LABEL	SOURCE 1C2		LABEL
AX and AY for bkr close and bkr trip	Trip & Close power	2APE-SWG-2A2 CUB 5	AX and AY for bkr close and bkr trip
2CCE-XF-1B2 ID FAN XFMR 1B2	2APE-SWG-2B2	CUB 3	2CCE-XF-1C2 ID FAN XFMR 1C2
2CCE-EXX-1B2-B ID FAN VAR SP DRV 1B2 (EXCITER)	2APC-2MCC 2B32	1-N	2CCE-EXX-1C2-B ID FAN VAR SP DRV 1C2 (EXCITER)
2CCE-XF-1B2 (2CCEK260306)	2APA-PPL-108	BKR 13	2CCE-XF-1C2 (2CCEK260406)

IP7013054

2CCE-EXX-1B2 (2CCEK2124B29)	2APA-PPL-109	BKR 18	2CCE-EXX-1C2 (2CCEK2126B29)
2CCE-EXX-1B2 ID FAN VARIABLE SPEED DRIVE 1B2	2API-PPL-4	BKR 2	2CCE-EXX-1C2 ID FAN VARIABLE SPEED DRIVE 1C2

LABEL	REMOTE I/O	6 LINKS TOTAL	LABEL
2COF-CAB-32 WIRING		TB7-258,261	2COF-CAB-33 WIRING
		TB7-286,289	
		TB8-310,313	

Nathan Crop

1/18/2006

IP7013055

Commissioning Schedule for IPSC Dual Channel ID Fans (Unit 2 1A, 1B & 1C)

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
MARCH 26, 2006	**MARCH 27, 2006**	**MARCH 28, 2006** - -	**MARCH 29, 2006** - Stage testing equipment for commissioning. - Phones, tables, power boards for multi-plugs, chairs, garbage pails etc.	**MARCH 30, 2006** - (CVE) stages drives. - (CVE) making sure labels on cables are taped down so not to loose them.	**MARCH 31, 2006** - (CVE) staging equipment necessary to begin extraction. - (CVE) making sure labels on cables are taped down so not to loose them.	**APRIL 01, 2006** - 7:00 am prepare door entrance. Take duct work apart (15 men per shift) - 6:00 am Request full clearance to be hung. - 8:00 am Sign on clearance. Request grounds to be hung. - 9:00 am Sign on gnds. - (CVE) begins.
APRIL 02, 2006 - 2nd day for CVE. (CVE) New drives in place and re-wiring begun. - (IPSC/ I&C) wire all remote I/O cabinets	**APRIL 03, 2006** - 3rd day for CVE. (CVE) Continue to re-wire new drives. - (CVE) Begin to verify wiring of drives. - (CVE) Verify all HV connections are same as before. - (CVE) start switchgear wiring.	**APRIL 04, 2006** - (CVE) done with drive cubicles. - (Alstom/IPSC) inspects installation. - (Alstom/IPSC) begin to re-connect shipping splits. - 10:00 am Alter clearance to give 480V and 120V for cabinet lights, rcptcl. pump and cntrl power. - (IPSC) electricians fill cooling systems with DI water and purge all air.	**APRIL 05, 2006** - (Alstom/IPSC) Complete shipping split re-connection. - (Alstom/IPSC)Continue verification of all internal wiring of drives. - (CVE) HV cable support – Link reactor and xfmr work complete. - (CVE) Switchgear cubicles done. - (IPSC) electricians done filling cooling systems and purging of all air.	**APRIL 06, 2006** - (Nate)Verify all wiring in switchgear cubicles. - (IPSC) Verify all HV connections are supported etc. - (IPSC) Verify all xfmr and link reactor work is done. - End of day Request clearance pulled off of all the ID fans and caution tags put in place (except for slide link tags)	**APRIL 07, 2006** - Morning Sign on caution tag clearance. - (IPSC/Alstom) Begin low voltage power-up checks. - (IPSC/Alstom) Begin I/O checks on all ID fan drives. - (Nate) Verify all wiring in Remote I/O cabinets.	**APRIL 08, 2006** - (IPSC/Alstom) Continue I/O checks. - (Relay Techs) Test switchgear tripping mechanism.
APRIL 09, 2006 - (IPSC/Alstom) Continue all I/O checks.	**APRIL 10, 2006** -(IPSC/Alstom) Continue all I/O checks. - (Alstom /Relay Techs) Start HV trip testing (A, B and C drives). - (IPSC/Alstom) Continue HV testing Phasing, DC OC test, OL SC test, CL SC test, E-stop checks etc.	**APRIL 11, 2006** - (IPSC/Alstom) Continue HV testing Phasing, DC OC test, OL SC test, CL SC test, E-stop checks etc.-(IPSC/Alstom) Thorough pulse tests on all drives.	**APRIL 12, 2006** - (IPSC/Alstom) Field Exciter testing.asd - (IPSC/Alstom) Continue pulse testing. - (IPSC/Alstom) Continue HV testing Phasing, DC OC test, OL SC test, CL SC test, E-stop checks etc.	**APRIL 13, 2006** - (Alstom/IPSC) Motor disconnect switch testing. - (IPSC/Alstom) Continue HV testing Phasing, DC OC test, OL SC test, CL SC test, E-stop checks etc. - (IPSC/Alstom) complete pulse testing.	**APRIL 14, 2006** - (Alstom/IPSC) Motor disconnect switch test - (IPSC/Alstom) Continue HV testing Phasing, DC OC test, OL SC test, CL SC test, E-stop checks etc. - (IPSC/Alstom) complete pulse testing.	**APRIL 15, 2006** - (IPSC/Alstom) Complete HV testing for all drives. -(IPSC) Jumper ID fan dampers in preparation for bottled up rotational tests. - (IPSC/Alstom) motor rotational checks/Encoder sequence testing.
APRIL 16, 2006 - Request OK TO HOT from operations to move leads for voltage dividers. - (IPSC/Alstom) Check A, B and C drives for preliminary rotation tests. -(IPSC/Alstom) set up voltage dividers on A. - (IPSC/Alstom) Begin rotation tests on A. **Requires mid-speed**	**APRIL 17, 2006** - (IPSC/Alstom) Continue to test A for proper encoder configuration tests. No load testing. Proper phase rotation on stator. **Requires mid-speed**	**APRIL 18, 2006** - (IPSC/Alstom) Continue with B ID fan encoder configuration tests. No load testing. Proper phase rotation on stator. **Requires mid-speed**	**APRIL 19, 2006** - (IPSC/Alstom) Finish B ID fan encoder configuration. No load testing. Proper phase rotation on stator. Start C **Requires mid-speed**	**APRIL 20, 2006** - (IPSC/Alstom) Finish C ID fan encoder configuration. No load testing. Proper phase rotation on stator. Sign off **caution tags and jmprs on damper indication.** **Requires mid-speed**	**APRIL 21, 2006** Single Channel No load testing. Speed Regulator Control Speed Regulator control checks v/f control checks start/stop checks Operational and stability checks. Master/Slave chop overs **MID-NITE shift Full load testing** **DAY-Requires mid-speed** **NIGHT-Requires Full draft**	**APRIL 22, 2006** Single Channel No load testing. Speed Regulator Control Speed Regulator control checks v/f control checks start/stop checks Operational and stability checks. Master/Slave chop overs **MID-NITE shift Full load testing** **DAY-Requires mid-speed** NIGHT-Requires Full draft

IP7013056

Commissioning Schedule for IPSC Dual Channel ID Fans (Unit 2 1A, 1B & 1C)

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
APRIL 23, 2006 Single Channel No load testing. Speed Regulator Control Speed Regulator control checks v/f control checks start/stop checks Operational and stability checks. Master/Slave chop-over **MID-NITE shift Full load testing** **DAY-Requires mid-speed** **NIGHT-Requires Full draft**	**APRIL 24, 2006** Single Channel No load testing. Speed Regulator Control Speed Regulator control checks v/f control checks start/stop checks Operational and stability checks. Master/Slave chop-over **Hand over 'B' and 'C' drives to operations** **MID-NITE shift Full load testing** **DAY-Requires mid-speed** **NIGHT-Requires Full draft**	**APRIL 25, 2006** Single Channel No load testing. Speed Regulator Control Speed Regulator control checks v/f control checks start/stop checks Operational and stability checks. Master/Slave chop-over **MID-NITE shift Full load testing** **DAY-Requires mid-speed** **NIGHT-Requires Full draft**	**APRIL 26, 2006** Single Channel load testing. Repeat v/f control testing on all six (6) channels. Full load current testing. Sign off **caution tags and jmprs on damper indication.** **MID-NITE shift Full load testing** **DAY-Requires mid-speed** **NIGHT-Requires Full draft**	**APRIL 27, 2006** Single Channel load testing. Repeat v/f control testing on all six (6) channels. Full load current testing. Dual Channel Full Load Tests. Beta and recovery time checks. E-Stop, master/slave chop over… Perform on all three (3) fans. Beta and recovery time checks. E-Stop, **MID-NITE shift Full load testing** **DAY-Requires mid-speed** **NIGHT-Requires Full draft**	**APRIL 28, 2006** Dual Channel Full Load Tests. Beta and recovery time checks. E-Stop, master/slave chop over… Perform on all three (3) fans. Beta and recovery time checks. E-Stop, Hand over 'A' (Last) drive to operations	**APRIL 29, 2006**
APRIL 30, 2006 Dual Channel Full Load Tests. Monitor performance of drives. **ID FANS TURNED OVER TO OPERATIONS.**	**MAY 01, 2006** Monitor performance of drives. - (IPSC) start clean up of scrubber electrical rooms and return all equipment.	**MAY 02, 2006** Monitor performance of drives. - (IPSC) finish clean up of scrubber electrical rooms and return all equipment.	**MAY 03, 2006** Monitor performance of drives.	**MAY 04, 2006** Monitor performance of drives.	**MAY 05, 2006** Monitor performance of drives.	**MAY 06, 2006** Monitor performance of drives.

(I&C, Maintenance, Mechanical)

1) Maintenance activities on A, B, C must be done by April 6, 2006.
2) 'D' will be turned over to maintenance and electricians after April 24, 2006.
3) We plan to rotate A, B, C fans starting April 15, 2006.
4) Full load testing is required and we plan to do it during the midnight shift on the last week of the outage (Starting on April 21, 2006).

IP7013057

Jon Christensen - Re: April Commissioning @ IPSC in Delta Utah

From: Nathan Crop
To: siddharth.pant@powerconv.alstom.com
Date: 2/2/2006 6:37 AM
Subject: Re: April Commissioning @ IPSC in Delta Utah
CC: Bahr, Pam; Christensen, Jon; McCann, Bruce

Hello Sid,
The Alstom ID fan project Manager and Nathan will meet 9:00 AM Friday Morning (Via phone conference) to discuss the schedule in April for IPSC's outage.
Nate

Electrical Engineer
850 West Brush Wellman Road
Delta, UT 84624-9522
Telephone (435) 864-6483
home: (435) 864-8429
Fax (435) 864-6670
E-mail: nathan-c@ipsc.com

>>> <siddharth.pant@powerconv.alstom.com> 1/30/2006 6:34:25 AM >>>

Hi Nathan,

I am tied up all day Thursday. How about Friday, 2/2, at 9:00 am your time (11:00 am Pittsburgh time)? I will call you. Please confirm.

Regards,
Sid

Nathan Crop <Nathan-C@ipsc.com>

Phone:

01/27/2006 02:58 PM

To: Siddharth PANT/USPIT01/APC@APC

cc:

Subject: April Commissioning @ IPSC in Delta Utah

Hello Sid,
I would like to meet with you on a phone conference to discuss my proposed schedule (See

attached). I will be available Thursday 2-2-06 after 12:00 noon or Friday 2-3-06 all day.

Please let me know when you can have a half hour discussion about the schedule.
Nate

Electrical Engineer
850 West Brush Wellman Road
Delta, UT 84624-9522
Telephone (435) 864-6483
home: (435) 864-8429
Fax (435) 864-6670
E-mail: nathan-c@ipsc.com

>> 2006 April outage tentative schedule.doc removed by Siddharth PANT on 30 January 2006

:._____
CONFIDENTIALITY : This e-mail and any attachments are confidential and may be privileged. If you are not a named recipient, please notify the sender immediately and do not disclose the contents to another person, use it for any purpose or store or copy the information in any medium.

Jon Christensen - ID fan outage schedule

From: Nathan Crop
To: McCann, Bruce
Date: 2/3/2006 10:26 AM
Subject: ID fan outage schedule
CC: Jon Christensen; Pam Bahr
Attachments: 2006 April outage tentative schedule.doc; PWR LIST FOR CLEARANCE IN APRIL 2006.xls

Bruce:
After a meeting with the Alstom commissioning engineer there were some minor changes to the proposed schedule.
Attached: (schedule and the clearance list).
Here is the 4 page clearance objectives for the ID fan drive outage.
Nate

Electrical Engineer
850 West Brush Wellman Road
Delta, UT 84624-9522
Telephone (435) 864-6483
home: (435) 864-8429
Fax (435) 864-6670
E-mail: nathan-c@ipsc.com

>>> Bruce McCann 2/3/2006 7:19:09 AM >>>
What attachment

IP7013060

Commissioning Schedule for IPSC Dual Channel ID Fans (Unit 2 1A, 1B & 1C)

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
MARCH 26, 2006	**MARCH 27, 2006**	**MARCH 28, 2006** - -	**MARCH 29, 2006** - Stage testing equipment for commissioning. - Phones, tables, power boards for multi-plugs, chairs, garbage pails etc.	**MARCH 30, 2006** - (CVE) stages drives. - (CVE) making sure labels on cables are taped down so not to loose them.	**MARCH 31, 2006** - (CVE) staging equipment necessary to begin extraction. - (CVE) making sure labels on cables are taped down so not to loose them.	**APRIL 01, 2006** - 7:00 am prepare door entrance. Take duct work apart (15 men per shift) - 6:00 am Request full clearance to be hung. - 8:00 am Sign on clearance. Request grounds to be hung. - 9:00 am Sign on gnds. - (CVE) begins.
APRIL 02, 2006 - 2nd day for CVE. (CVE) New drives in place and re-wiring begun. - (IPSC/ I&C) wire all remote I/O cabinets	**APRIL 03, 2006** - 3rd day for CVE. (CVE) Continue to re-wire new drives. - (CVE) Begin to verify wiring of drives. - (CVE) Verify all HV connections are same as before. - (CVE) start switchgear wiring. - (Alstom) set up laptops –(Alstom)start inspection of drive installation. -(Alstom) set up work area.	**APRIL 04, 2006** - (CVE) done with drive cubicles. - (Alstom/IPSC) inspects installation. - (Alstom/IPSC) begin to re-connect shipping splits. - 10:00 am Add DNO tags to O/P disconnects and make most tags into cautions ("OFF") -6.9KV bkrs remain DNO'ed.	**APRIL 05, 2006** - (Alstom/IPSC) Complete shipping split re-connection. - (Alstom/IPSC)Continue verification of all internal wiring of drives. - (CVE) HV cable support – Link reactor and xfmr work complete. - (CVE) Switchgear cubicles done. - (IPSC) electricians done filling cooling systems and purging of all air.	**APRIL 06, 2006** - (Nate)Verify all wiring in switchgear cubicles. - (IPSC) Verify all HV connections are supported etc. - (IPSC) Verify all xfmr and link reactor work is done. -(IPSC/Alstom) begin low voltage power-up checks. -(IPSC) safely turn on 480V. - (IPSC) electricians fill cooling systems with DI water and purge all air.	**APRIL 07, 2006** - (IPSC/Alstom) Continue low voltage power-up checks. - (IPSC/Alstom) Begin I/O checks on all ID fan drives. - (Nate) Verify all wiring in Remote I/O cabinets. -(Nate) will request one at a time for caution tagged bkrs to be turned on.	**APRIL 08, 2006** - (IPSC/Alstom) Continue and finish I/O checks. -(IPSC/Alstom) needle valve-cooling water flow calibration.
APRIL 09, 2006 - (IPSC/Alstom) Field Exciter testing. - (IPSC/Alstom) pulse testing. -Finish I/O??	**APRIL 10, 2006** - (IPSC/Alstom) Finish pulse tests on all drives. - (Alstom/IPSC) Motor disconnect switch testing. - (Relay Techs) Test switchgear tripping mechanism. - Request caution tags put on all 6.9KV bkrs.	**APRIL 11, 2006** - (Alstom /Relay Techs) Continue HV trip testing (A, B and C drives). - (IPSC/Alstom) Start HV testing Phasing, DC OC test, OL SC test, CL SC test, E-stop checks etc.	**APRIL 12, 2006** - (IPSC/Alstom) Continue HV testing Phasing, DC OC test, OL SC test, CL SC test, E-stop checks etc.	**APRIL 13, 2006** - (IPSC/Alstom) Continue HV testing Phasing, DC OC test, OL SC test, CL SC test, E-stop checks etc.	**APRIL 14, 2006** - (Alstom/IPSC) Motor disconnect switch test - (IPSC/Alstom) Continue HV testing Phasing, DC OC test, OL SC test, CL SC test, E-stop checks etc.	**APRIL 15, 2006** - (IPSC/Alstom) Complete 'B' and 'C' HV testing. -(IPSC) Jumper ID fan dampers in preparation for bottled up rotational tests. - (IPSC/Alstom) motor rotational checks/Encoder sequence testing.
APRIL 16, 2006 - Request OK TO HOT from operations to move leads for voltage dividers. - (IPSC/Alstom) Check A, B and C drives for preliminary rotation tests. -(IPSC/Alstom) set up voltage dividers on A. - (IPSC/Alstom) Begin rotation tests on A. -ground fault testing **-Start with 'B' and 'C'** **- Do baker no load** -(IPSC/Alstom) Finish HV testing on 'A'. **Requires mid-speed**	**APRIL 17, 2006** - (IPSC/Alstom) Continue to test A for proper encoder configuration tests. No load testing. Proper phase rotation on stator. -Ground fault testing **Do baker no load** **-Start with 'B' and 'C'** **Requires mid-speed**	**APRIL 18, 2006** - (IPSC/Alstom) Continue with B ID fan encoder configuration tests. No load testing. Proper phase rotation on stator. -Ground fault testing **Do Baker no load** **Requires mid-speed**	**APRIL 19, 2006** - (IPSC/Alstom) Finish B ID fan encoder configuration. No load testing. Proper phase rotation on stator. Start C -Ground fault testing **Do charlie** **Requires mid-speed**	**APRIL 20, 2006** - (IPSC/Alstom) Finish C ID fan encoder configuration. No load testing. Proper phase rotation on stator. **Sign off caution tags and jmprs on damper indication.** -Ground fault testing **Do charlie** **Requires mid-speed**	**APRIL 21, 2006** Single Channel No load testing. Speed Regulator Control Speed Regulator control checks v/f control checks start/stop checks Operational and stability checks. Master/Slave chop overs **Do charlie** **MID-NITE shift Full load testing** **DAY-Requires mid-speed** **NIGHT-Requires Full draft do 'B load'**	**APRIL 22, 2006** Single Channel No load testing. Speed Regulator Control Speed Regulator control checks v/f control checks start/stop checks Operational and stability checks. Master/Slave chop overs **Do 'A' fan no load** **MID-NITE shift Full load testing** **DAY-Requires mid-speed** **NIGHT-Requires Full draft do 'C load'**

IP7013061

Commissioning Schedule for IPSC Dual Channel ID Fans (Unit 2 1A, 1B & 1C)

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
APRIL 23, 2006 Single Channel No load testing. Speed Regulator Control Speed Regulator control checks v/f control checks start/stop checks Operational and stability checks. Master/Slave chop-over **Do 'A' fan no load** **MID-NITE shift Full load testing** **DAY-Requires mid-speed** **NIGHT-Requires Full draft "heat on B&C"**	**APRIL 24, 2006** Single Channel No load testing. Speed Regulator Control Speed Regulator control checks v/f control checks start/stop checks Operational and stability checks. Master/Slave chop-over **Do 'A' fan no load** **Hand over 'B' and 'C' drives to operations** **MID-NITE shift Full load testing** **DAY-Requires mid-speed (8 hours)** **NIGHT-Requires Full draft "Do 'A'"**	**APRIL 25, 2006** Single Channel No load testing. Speed Regulator Control Speed Regulator control checks v/f control checks start/stop checks Operational and stability checks. Master/Slave chop-over **MID-NITE shift Full load testing** **DAY-Requires mid-speed** **NIGHT-Requires Full draft Do "A"**	**APRIL 26, 2006** Single Channel load testing. Repeat v/f control testing on all six (6) channels. Full load current testing. **Sign off caution tags and jmprs on damper indication.** **MID-NITE shift Full load testing** **DAY-Requires mid-speed (8 hours)** **NIGHT-Requires Full draft do A heat run**	**APRIL 27, 2006** Single Channel load testing. Repeat v/f control testing on all six (6) channels. Full load current testing. Dual Channel Full Load Tests. Beta and recovery time checks. E-Stop, master/slave chop over… Perform on all three (3) fans. Beta and recovery time checks. E-Stop, **MID-NITE shift Full load testing** **DAY-Requires mid-speed** **NIGHT-Requires Full draft**	**APRIL 28, 2006** Dual Channel Full Load Tests. Beta and recovery time checks. E-Stop, master/slave chop over… Perform on all three (3) fans. Beta and recovery time checks. E-Stop, Hand over 'A' (Last) drive to operations	**APRIL 29, 2006**
APRIL 30, 2006 Dual Channel Full Load Tests. Monitor performance of drives. **ID FANS TURNED OVER TO OPERATIONS.**	**MAY 01, 2006** Monitor performance of drives. - (IPSC) start clean up of scrubber electrical rooms and return all equipment.	**MAY 02, 2006** Monitor performance of drives. - (IPSC) finish clean up of scrubber electrical rooms and return all equipment.	**MAY 03, 2006** Monitor performance of drives.	**MAY 04, 2006** Monitor performance of drives.	**MAY 05, 2006** Monitor performance of drives.	**MAY 06, 2006** Monitor performance of drives.

(I&C, Maintenance, Mechanical)

1) Maintenance activities on A, B, C must be done by April 6, 2006.
2) 'D' will be turned over to maintenance and electricians after April 24, 2006.
3) We plan to rotate A, B, C fans starting April 15, 2006.
4) Full load testing is required and we plan to do it during the midnight shift on the last week of the outage (Starting on April 21, 2006).

IP7013062

Commissioning Schedule for IPSC Dual Channel ID Fans (Unit 2 1A, 1B & 1C)

Talk with Sid,

Load testing (need two nights for "Full load test heat run"load testing run for three hours.)

B&C on 23rd?

A on the 27th?

2. One night for each fan load testing beyond the Full load test heat run

3. Three days per drive for no load testing.

4. Throttle dampers so we can reach top speed for our full load testing.

5. Get phones desks, plugs, cords,

6. under alstom guidance our IPSC will reconnect shipping splits

7. Make list of all I/O points to check with alstom.

IP7013063

OK-TO HOT FOR UNIT TWO ID FANS 1A, 1B & 1C REPLACEM

Second Alteration of major ID fan clearance. Change all 6.9 KV bkrs to caution in "OFF" position and remove DNO tag from all O/P disconnects.

Nathan wants to follow operator and watch the caution tags being hung in the "OFF" position so he will not need to walk it down later.

SOURCE 1A1		LABEL
Trip & Close power	2APE-SWG-2A2 CUB 2	AX and AY for bkr close and bkr trip
2APE-SWG-2A2	CUB 2	2CCE-XF-1A1 ID FAN XFMR 1A1
Output disconnect switch 1A1 NO TAG	ID fan drive 1A1	ID fan drive 1A1
2APC-2MCC 2A12	10-D	2CCE-EXX-1A1-B ID FAN VAR SP DRV 1A1 (EXCITER)
2APA-PPL-108	BKR 7	2CCE-XF-1A1 (2CCEK260203)
2APA-PPL-108	BKR 31:33:35	2CCE-29-1A1 (2CCEK213107)
2APA-PPL-109	BKR 8	2CCE-EXX-1A1 (2CCEK2122B18)
2API-PPL-1		2CCE-EXX-1A1 ID FAN VARIABLE SPEED DRIVE 1A1 (2CCEK2121B13)

SOURCE 1B1	
Trip & Close power	2APE-SWG-2A2 CUB 4
2APE-SWG-2A2	CUB 4
Output disconnect switch 1B1 NO TAG	ID fan drive 1B1
2APC-2MCC 2A12	11-D
2APA-PPL-108	BKR 8
2APA-PPL-108	BKRS 32:34:36
2APA-PPL-109	BKR 12
2API-PPL-1	BKR 4

Note for Nathan:

Nathan must make sure all internal breakers in drives are off so not to energize anything.

SOURCE 1A2		LABEL
Trip & Close power	2APE-SWG-2A2 CUB 3	AX and AY for bkr close and bkr trip
2APE-SWG-2A2	CUB 3	2CCE-XF-1A2 ID FAN XFMR 1A2
Output disconnect switch 1A2 NO TAG	ID fan drive 1A2	ID fan drive 1A2
2APC-2MCC 2A32	1-N	2CCE-EXX-1A2-B ID FAN VAR SP DRV 1A2 (EXCITER)
2APA-PPL-108	BKR 7	2CCE-XF-1A2 (2CCEK260206)
2APA-PPL-109	BKR 10	2CCE-EXX-1A2 (2CCEK2122B29)
2API-PPL-3	BKR 2	2CCE-EXX-1A2 ID FAN VARIABLE SPEED DRIVE 1A2

SOURCE 1B2	
Trip & Close power	2APE-SWG-2A2 CUB 5
2APE-SWG-2A2	CUB 5
Output disconnect switch 1B2 NO TAG	ID fan drive 1B2
2APC-2MCC 2A32	9-D
2APA-PPL-108	BKR 10
2APA-PPL-109	BKR 14
2API-PPL-3	BKR 4

REMOTE I/O	5 LINKS TOTAL	LABEL

REMOTE I/O	5 LINKS TOTAL

IP7013064

Nathan Crop
1/27/2006

TB7-258,261	2COF-CAB-31 WIRING
TB7-286,289	
TB8-313	

TB7-258,261
TB7-286,289
TB8-313

	SOURCES in Annunciator panel	LABEL
These tags will stay DNO the whole outage and we will never use these power supplies again.	125 VDC DC PP 3A 2APH-PPL-3A	ID FAN VAR SP DRV ANN CAB 1
	120 V AC PP 109 2APA-PPL-109	ID FAN VAR SP DRV ANN CAB 1

IP7013065

ENT (APRIL 16, 2006 first alteration)

LABEL	SOURCE 1C1		LABEL
AX and AY for bkr close and bkr trip	Trip & Close power	2APE-SWG-2B2 CUB 2	AX and AY for bkr close and bkr trip
2CCE-XF-1B1 ID FAN XFMR 1B1	2APE-SWG-2B2	CUB 2	2CCE-XF-1C1 ID FAN XFMR 1C1
ID fan drive 1B1	Output disconnect switch 1C1 NO TAG	ID fan drive 1C1	ID fan drive 1C1
2CCE-EXX-1B1-B ID FAN VAR SP DRV 1B1 (EXCITER)	MCC 2B12	10-D	2CCE-EXX-1C1-B ID FAN VAR SP DRV 1C1 (EXCITER)
2CCE-29-1B1 (2CCEK260303)	2APA-PPL-108	BKR 11	2CCE-29-1C1 (2CCEK260403)
2CCE-29-1B1 (2CCEK213207)	2APA-PPL-108	BKRS 37:39:41	2CCE-29-1C1 (2CCEK213307)
2CCE-EXX-1B1 (2CCEK2123B18)	2APA-PPL-109	BKR 16	2CCE-EXX-1C1 (2CCEK2125B18)
2CCE-EXX-1B1 ID FAN VARIABLE SPEED DRIVE 1B1	2API-PPL-2	BKR 2	2CCE-EXX-1C1 ID FAN VARIABLE SPEED DRIVE 1C1

LABEL	SOURCE 1C2		LABEL
AX and AY for bkr close and bkr trip	Trip & Close power	2APE-SWG-2A2 CUB 5	AX and AY for bkr close and bkr trip
2CCE-XF-1B2 ID FAN XFMR 1B2	2APE-SWG-2B2	CUB 3	2CCE-XF-1C2 ID FAN XFMR 1C2
ID fan drive 1B2	Output disconnect switch 1C2 NO TAG	ID fan drive 1C2	ID fan drive 1C2
2CCE-EXX-1B2-B ID FAN VAR SP DRV 1B2 (EXCITER)	2APC-2MCC 2B32	1-N	2CCE-EXX-1C2-B ID FAN VAR SP DRV 1C2 (EXCITER)
2CCE-XF-1B2 (2CCEK260306)	2APA-PPL-108	BKR 13	2CCE-XF-1C2 (2CCEK260406)
2CCE-EXX-1B2 (2CCEK2124B29)	2APA-PPL-109	BKR 18	2CCE-EXX-1C2 (2CCEK2126B29)
2CCE-EXX-1B2 ID FAN VARIABLE SPEED DRIVE 1B2	2API-PPL-4	BKR 2	2CCE-EXX-1C2 ID FAN VARIABLE SPEED DRIVE 1C2

LABEL	REMOTE I/O	5 LINKS TOTAL	LABEL

IP7013066

2COF-CAB-32 WIRING

TB7-258,261	2COF-CAB-33 WIRING
TB7-286,289	
TB8-313	

IP7013067

From: Kevin Miller
To: Wes Bloomfield
CC: Bob Wright; Jon Christensen; Mike Nuttall; Nathan Crop; Pam Bahr; s...
Date: 2/7/2006 3:33 PM
Subject: Preliminary Electrical Scope for U2 Major
Attachments: U2.2006.MAJOR.wpd

Wes:

Right click and OPEN the attached WordPerfect file. It contains the preliminary work scope so we have a place to start talking at your manpower planning meeting tomorrow. Right now, estimates are around 5000 hrs counting work orders not yet written.

There are some things missing. I have not received the Eng Inspection Checklist which may possibly have some additional work in it. Battery load testing comes to mind. I also have not yet written the 45-50 sub work orders to support the valve actuator overhaul plan because the mechanical work orders have not been written. Also, still waiting to hear on whether we will pull the 1C Condensate Pump motor.

There will be no time for some work we normally do during outages. I limited PMs that are nice but not essential for this outage e.g. valves/dampers (except CT Riser Gates) and many of the small MCC driven loads. If by some miracle there is time at the end, I could print them. This also doesn't include two WOs to 157 for electrical work (05-55722-2 & 06-77721-0). I suppose you will have Goodrich work with Winters during the outage and not be available for any of the work on the attached list. They are making modifications to all the superheat area blowers.

Finally, the "Assigned To" field on the list is really for Mike and Bob to decide which crew and which person is assigned to each task. I couldn't resist throwing in my own opinion on a few. Obviously, it's your call and not mine.

Good luck,

Kevin

ELECTRICAL SCOPE FOR THE UNIT 2 MAJOR OUTAGE - 2006

Work Order	Manpower Needs	Scope of Work	Comments	Assigned To
04-29298-1	1 Tech & 2 laborers 2-3 weeks	Remove and replace all Essential AC and Unit DC battery chargers. Would like to replace the oos DC charger starting a week early for the learning curve.	Bob Morris is providing two electrical journeyman from the labor pool to support Electricians. Need extra hands to manhandle the gear in and out of the room.	Recommend Bob Wilson since it ties into his little invention.
06-81857-0	1 Tech 4 weeks	Electrical support work order with Wasatch to change low and high side bushings on the Main Transformer	Is Wasatch providing the crane and operator under the contract or is IPSC. If IPSC, crane and operator need to be reserved now.	Brian Bahr unless you have bigger plans for him
04-41131-0	4 Techs 4 weeks	Electrical support work order with ABB to overhaul the Generator Breaker	I believe Andy Hartman will arrive on 4/3/06	
02-53663-54	4 Techs 4 weeks	Electrical support work order with Alstom to install and commission 1A, 1B, & 1C ID Fan Drives	Eng may want six techs.	
03-94387-2	1 Tech 4 weeks	Electrical support work order with GE on EX-2100 excitation installation and testing.	May want to consider a relay tech if moving this equipment ultimately to the Relay crew.	
06-90847-0	2 Techs 4 weeks	Cathodic Protection complete overhaul per recommendations of Corrpro. This job is not absolutely for sure yet pending cost estimate.	One man will never finish job. Can you bum an HVAC tech for the duration of the outage.	Barry Eggleston recommended.
50+ WOS Pending	2 Techs 4 weeks	Disconnect, reconnect, and setup 46 valve actuators being overhauled by Great Western Valve and Automation. There will be numerous other actuators to disconnect and reconnect to support mechanics who are doing valve repairs.	Lynn Labrum's crew will be removing and mounting all actuators. Other actuators not being overhauled will be determinated to allow valve work.	Gray & Holman Valve Specialty Services Inc.
06-91719-1	7.3 hours	Assist in removal and reinstallation of Closed Cycle Cooling Water Pump 1A motor.	Budgeted reconditioning based on TIS. TRAM scheduled for pickup on 4/5/06. Loukinas is lead.	
06-91708-0	5 hours	Replace deteriorating relays in Unit 2 relay room cabinets from previous walkdown inspection.	These are all plug-in type relays	
2 WOs	2 hours	Inverter PMs	Use caution. We cannot lose Essential AC power during DCS commissioning.	Bob Wilson recommended
5 WOs	200 hours	Normal PMs of the Cooling Tower SUSs including the replacement of the 2B11 Main Breaker and also dead bus PMs of buswork from the transformers outdoors to the gear.	Bus inspections at the request of Wes Bloomfield following the failure of the 1B11 bus in December.	Ryther and maybe another couple of HVAC Techs

IP7013069

Work Order	Manpower Needs	Scope of Work	Comments	Assigned To
6 WOs	60 hours	All PMs for all four UPSs including battery load testing and support of SCI tech for troubleshooting 1B voltage problems.	SCI Rep is scheduled here on 4/18/06	Wilson since he'll be in the area for other work.
06-92611-0	20 hours	Work with Mike Nuttall to make sure all dual fed MCC supply breakers in SUSs have the bell alarm wired.	We think U2 is pretty close. This is a verification of that.	I think Scotty did the previous job.
8 WOs	6.5 hrs each	Dual Fed MCC Sync Relay Testing and Breaker Service	Has been known to evolve into much more when SUS breakers do not function. Just be prepared.	
12 WOs	About 80 manhours per Fan	ID Fan PMs for 1A, 1B, 1C & 1D Fans including transformers, motor filters, and all peripheral equipment.	Fan "D" will be the ventilation fan. PMs for this fan must be done during the last week after successful startup of any other fan.	Guys assigned above to the retrofit project.
13 WOS	About 250 manhours	All Cooling Tower PMs for Riser Gates, Fanstack and Fandeck repairs, lightning protection, and perimeter conduit replacement for rcpts and ltg.	The largest job is the perimeter conduit replacement because of corrosion. If time is tight, this job could wait. Materials will be on site.	Who else but Ryther
1 WOs	5 hours	Assist in replacement of Helping Cooling Tower 2C01 gearbox immersion heater.	Loukinas is lead. A more difficult job than it sounds. Gearbox disassembly is required.	Ryther
3 WOs	15 hours	PMs of all three Circ Water Pump motors and breakers.	Did not print discharge valves PMs because of time restrictions.	
10 WOs	18 hours	PMs of all Turbine system critical motors and starters.		
03-06972-12	20 hours	Complete the Capital Project already started to tie in new raceway to new Steam Seal Control Valves on the Turbine Mezz	Rough-in in progress now.	Eggleston started it but he may be in the Water Boxes
2 WOs	28 hours	Replace drive motor with Warehouse spare for EHC Pump 1B and Stator Cooling Pump 1B.		
8 WOs	135 hours	All normal Generator PMs		
6 WOs	128 hours	All Air Heater PMs for drive motors and Sector Plate Controls on both A & B sides		
7 WOs	40 hours	All FD and PA Fans electrical PMs including the inspection with the rep looking for cracked welds on each rotor.	Rep is scheduled to be on site - 4/13/06	
12 WOs	100 hours	All Feedwater System (FWA) PMs and repairs including reviring MBV-41 and changing the bearings in 3 of the 4 LO Pump motors.	Eggleston has already installed new conduit and is stubbed at the actuator. Cables need to be pulled out of old conduits and pulled into new conduits. Old conduit interfered with actuator removal of MBV-43.	

Work Order	Manpower Needs	Scope of Work	Comments	Assigned To
2 WOs	40 hours	Iso-phase bus PMs for inspecting insulators for damage and also to replace the HP relief valves on the Generator Breaker poles after calibration in SLC.	Need to send valves to Bay Valve in SLC for calibration on 4/5/06. Need to pull ASAP.	Guys assigned to the Generator Breaker overhaul.
WOs	28 hours	Main Transformer PM along with repair work order to replace the intermittent oil pump gauge on bank 4,5,6.		Brian during all of his spare time.
05-58233-0	5 hours	This work order is to clean the filthy interiors of the Generator and Transformer PTs cubicles including the fuses and clips.		
06-90765-0	24 hours	Flue Gas Damper PMs.	May become part of the actuators overhauled but still need calibration of common controls	
2 WOs	8 hours	Replace the starter for Tight Shut Off Damper CDR-3 and fix wiring mistake on seven of the 8 damper starters.	Layne Harris found U1 ok. In U2, found the neutral on the control transformer fuse instead of the hot.	Spencer is familiar with the new AB style starters.
4 WOs	30 hours	All PMs and one repair work order for the Aux and RAT Transformers	Eng needs to consider their ID Fan startup schedule and request the RAT for the time they need it in service. It seems we should be able to do RAT maintenance for the first week.	
06-83408-0	3 hours	Attempt to fix leak on Scrubber Spray Pump 1D motor.	I have a new sight glass in my office.	
06-90841-0	60 hours	Lighting repairs after washdown.	Not sure when the washdown will occur. It may precede the outage and this work order will be completed ahead of time.	
06-90849-0	80 hours	Pre-outage mobilization and preparations	Some jobs are on individual work orders. Use this work order for anything else not covered.	
06-90814-0	4 hours	Pre-startup work order after outage to make sure all Baghouse heaters are turned on.		
06-74870-6	Estimated 200 hrs	Blanket WO for outage Temp Power hookups	This changes every year. Don't know exactly what to expect. The power for the Lube Oil Flush will be installed pre-outage. This work order is the main work order for Turbine Deck support.	

IP7013071

Jon Christensen - excel file showing readings on u2 id fans

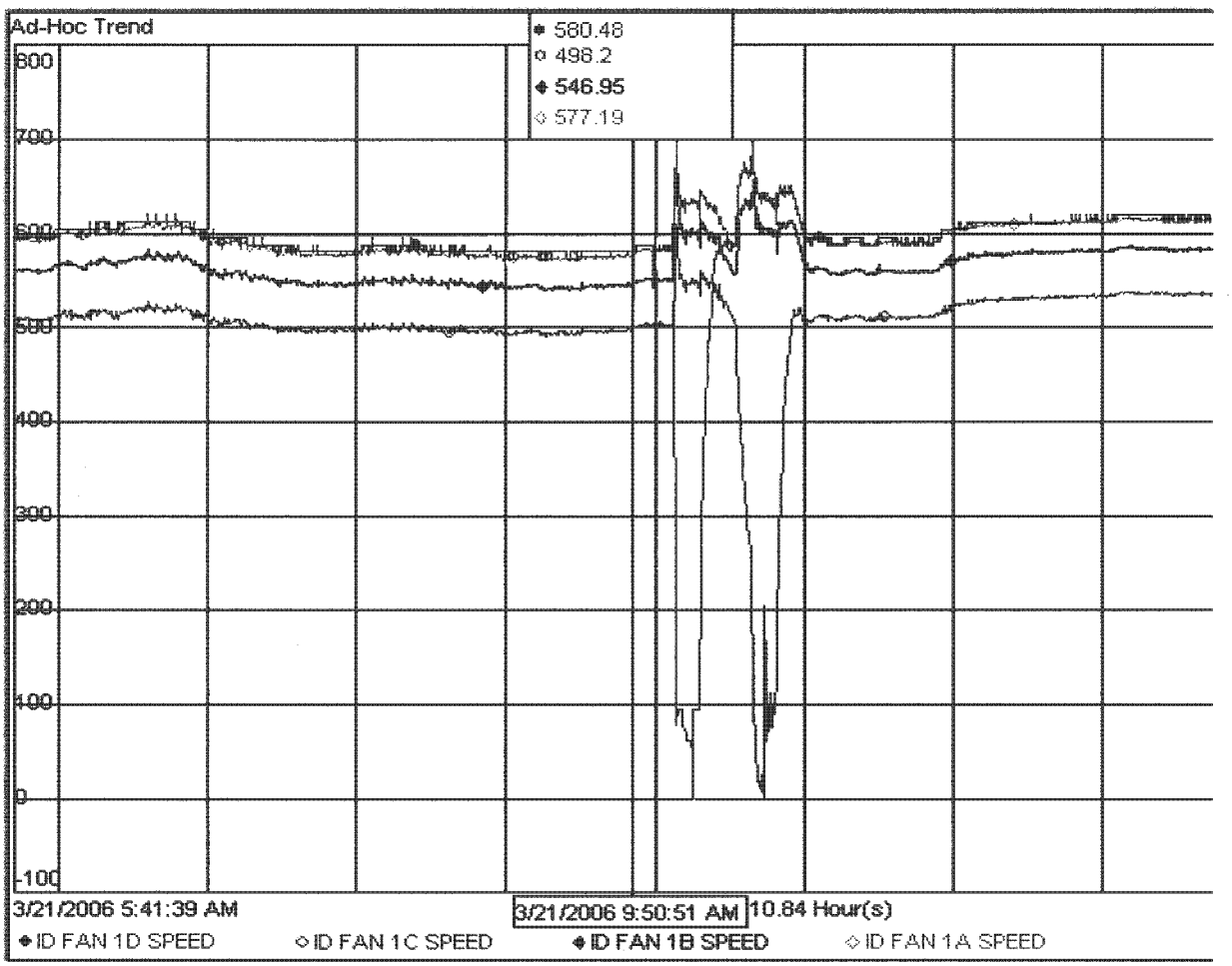
From: Nathan Crop
To: Christensen, Jon; siddharth.pant@powerconv.alstom.com
Date: 3/23/2006 2:22 PM
Subject: excel file showing readings on u2 id fans
Attachments: readings U2 3-23-06.xls

Electrical Engineer
850 West Brush Wellman Road
Delta, UT 84624-9522
Telephone (435) 864-6483
home: (435) 864-8429
Fax (435) 864-6670
E-mail: nathan-c@ipsc.com

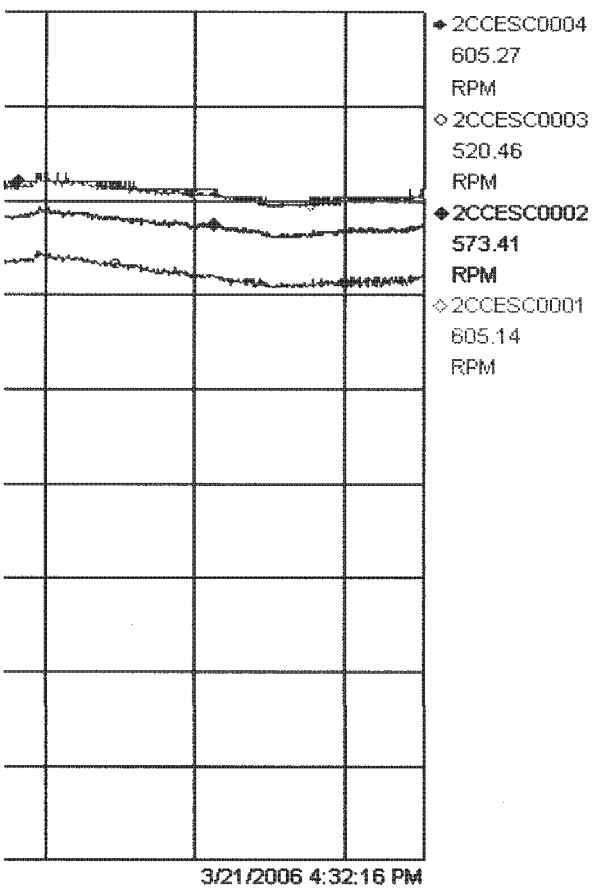
IP7013072

readings made on U2 ID fan drives
3/23/2006 8:55 AM

	1A1	1A2	1B1	1B2	1C1	1C2	1D1	1D2
KV	6.58	6.57	6.59	6.6	6.63	6.63	6.64	6.62
ACAMPS	168	171	191	188	159	158	124	122
PF	0.395	0.385	0.38	0.388	0.448	0.44	0.548	0.553
MW	0.73	0.71	0.8	0.79	0.76	0.76	0.74	0.75
MVA	1.9	1.89	2.08	2.09	1.74	1.74	1.38	1.38
MVAR	1.71	1.78	1.93	1.89	1.54	1.56	1.12	1.14
THID	31	28.3	32.7	29.7	32.7	35	28.9	32.9



IP7013073


2CCESC0004
605.27
RPM
2CCESC0003
520.46
RPM
2CCESC0002
573.41
RPM
2CCESC0001
605.14
RPM
3/21/2006 4:32:16 PM

IP7013074

Jon Christensen - Current harmonics

From: <siddharth.pant@powerconv.alstom.com>
To: "Nathan Crop" <Nathan-C@ipsc.com>, <jon-c@ipsc.com>
Date: 3/23/2006 4:54 PM
Subject: Current harmonics
CC: <steve.klein@powerconv.alstom.com>

Nathan,

As discussed, a side effect of the improvement of the line power factor is a reduction in the line current harmonics. In any case, for the same power the line current will be lower with the better power factor, so the absolute magnitude of the harmonic currents will also be lower.. I might not have adequately conveyed this in the phone call.

Regards,
Sid

:._____
CONFIDENTIALITY : This e-mail and any attachments are confidential and may be privileged. If you are not a named recipient, please notify the sender immediately and do not disclose the contents to another person, use it for any purpose or store or copy the information in any medium.

IP7013075

Jon Christensen - Sigma code changes to help with conductivity trips

From: Nathan Crop
To: Christensen, Jon; Crop, Nathan; Miller, Kevin; Nuttall, Mike
Date: 4/22/2006 6:52 AM
Subject: Sigma code changes to help with conductivity trips
Attachments: pump_chop-over_changes_in Sigma code-R2.doc

I put this report explaning the Sigma code changes in the following folder.
-
N:\Current\Electrical Equipment Test Reports\ID fan drives (Converteam-Alstom)\ID FAN HISTORIES\ID FAN SOFTWARE
-
Nathan

Electrical Engineer
850 West Brush Wellman Road
Delta, UT 84624-9522
Telephone (435) 864-6483
home: (435) 864-8429
Fax (435) 864-6670
E-mail: nathan-c@ipsc.com

IP7013076

Jon Christensen - IPSC checklist

From: Nathan Crop
To: barry.daugherty@converteam.com; Christensen, Jon; siddharth.pant@power...
Date: 4/24/2006 8:02 AM
Subject: IPSC checklist

Sid,
Here is a list of things I should get from you and Sid before the end of April 2006:

1. Latest version of the Sigma program code.
2. Latest version of HMI program code (local cntrl arrows work, motor current scaled correctly on local cntrl page, Bug with local start, new DI water alarm is 0.5uS/cm).
3. Broken door handles?
4. Damaged module sent back for repair and re-testing.
5. Notes on how we oriented the encoder sensors for both the CCW and CW rotation.
6. List of things you did not like about this years experience.
7. Suggestions on how I can improve next years.
8. Alarm if output disconnect key is in the wrong position for starting.

Nathan

Electrical Engineer
850 West Brush Wellman Road
Delta, UT 84624-9522
Telephone (435) 864-6483
home: (435) 864-8429
Fax (435) 864-6670
E-mail: nathan-c@ipsc.com

IP7013077

Jon Christensen - IPSC visit

From: <siddharth.pant@converteam.com>
To: <nathan-c@ipsc.com>
Date: 4/25/2006 3:09 PM
Subject: IPSC visit
CC: <jon-c@ipsc.com>, <steve.klein@powerconv.alstom.com>, <barry.daugherty@p...

Nathan;

As Jon and I discussed, I am going to be at your plant as follows:

Thu, 4/27: Travel from Pittsburgh to Delta
Fri, 4/28 AM: Arrive at IPSC
Fri 4/28 to Mon 5/1: At IPSC. All keys handed in by 5:00 PM Friday (ID fans at maximum load - Friday night, possibly, or Saturday). Unit @ 950 MW Mon. 7 am.
Mon 5/1 PM: To Salt Lake City
Tue 5/2: SLC to PIT

See you on Friday.

Regards,
Sid

:._____
CONFIDENTIALITY : This e-mail and any attachments are confidential and may be privileged. If you are not a named recipient, please notify the sender immediately and do not disclose the contents to another person, use it for any purpose or store or copy the information in any medium.

From: Kevin Miller
To: Nathan Crop
CC: Jon Christensen; Mike Nuttall
Date: 6/2/2006 8:36 AM
Subject: Spang Controller

I'm still waiting for the Spang Controller and the Thyristor Module to be returned from Alstom under warranty so I can put them back into our stock. It's been a long time and I'm starting to worry they have forgotten about little ole' IPSC. Can you please ensure they are still actively pursuing the replacements they owe us.

Is there anything else they owe us that I've forgotten about?

Thanks, Kevin

Jon Christensen - ID fan trip

From: Nathan Crop
To: Christensen, Jon; siddharth.pant@powerconv.alstom.com
Date: 7/31/2006 11:18 AM
Subject: ID fan trip
Attachments: UNIT2.C6; UNIT2.C7; UNIT2.F5; UNIT2.F6

Hello Sid,
Will you look at the attached microtrip histories from our unit 2 ID fan drive 1D1 and let me know why it tripped?
Nathan

Electrical Engineer
850 West Brush Wellman Road
Delta, UT 84624-9522
Telephone (435) 864-6483
home: (435) 864-8429
Fax (435) 864-6670
E-mail: nathan-c@ipsc.com

IP7013080

Jon Christensen - Re: ID fan trip

From: <siddharth.pant@converteam.com>
To: "Nathan Crop" <Nathan-C@ipsc.com>
Date: 7/31/2006 5:20 PM
Subject: Re: ID fan trip
CC: "Jon Christensen" <JON-C@ipsc.com>, <steve.klein@powerconv.alstom.com>, ...

Hello Nathan,

In all 4 trip histories the cause of the trip was annunciated as "Input Breaker Open". Also in the histories input A32.7 (where present) was the first bit going low. A32.7 is the early opening contact from the input breaker. From the histories, it appears that the drive saw the input breaker opening by itself (without a trip signal being sent from the drive). You can check the input breaker, the digital input and any intermediate relays.

Regards,
Sid

PS: I am on vacation starting Wed, Aug 2, and returning to the office on Monday, Aug 21. Please contact Steve in my absence and he will get you to the appropriate person.

Siddharth Pant
Senior Engineer
Converteam Inc.
610 Epsilon Dr
Pittsburgh, PA 15238, USA.
Phone: (412) 967-6975
FAX: (412) 967-7668

"Nathan Crop" <Nathan-C@ipsc.com>

Phone:
07/31/2006 01:18 PM

To: "Jon Christensen" <JON-C@ipsc.com>, Siddharth PANT/USPIT01/APC@APC
cc:
Subject: ID fan trip

Hello Sid,
Will you look at the attached microtrip histories from our unit 2 ID fan drive 1D1 and let me know why it tripped?
Nathan

Electrical Engineer
850 West Brush Wellman Road
Delta, UT 84624-9522
Telephone (435) 864-6483
home: (435) 864-8429

IP7013081

Fax (435) 864-6670
E-mail: nathan-c@ipsc.com

>> UNIT2.C6 removed by Siddharth PANT on 31 July 2006
>> UNIT2.C7 removed by Siddharth PANT on 31 July 2006
>> UNIT2.F5 removed by Siddharth PANT on 31 July 2006
>> UNIT2.F6 removed by Siddharth PANT on 31 July 2006

:._____

CONFIDENTIALITY : This e-mail and any attachments are confidential and may be privileged. If you are not a named recipient, please notify the sender immediately and do not disclose the contents to another person, use it for any purpose or store or copy the information in any medium.

From: <steve.klein@converteam.com>
To: <jon-c@ipsc.com>
CC: Nathan Crop <Nathan-C@ipsc.com>, <siddharth.pant@converteam.com>
Date: 8/8/2006 6:26 AM
Subject: Witness Testing of Drives 1A & 1B

Communication No. AP-IP-E-041

Jon,

I hope you've been well and had a chance to enjoy the summer so far. We have completed manufacture of drives 1A & 1B and would like to schedule witness testing as soon as can be arranged. When I last spoke with Nathan, he mentioned that sometime in August would be a possibility. Sid Pant is on vacation until the week of 21 August and I think it would be best to have him present when your representative comes to Pittsburgh. Let me know when you would like to schedule and we will accomodate accordingly.
Best Regards,

Steve Klein

Project Manager

Converteam

(formerly ALSTOM Power Conversion)

Pittsburgh, PA 15238

Phone: 412-967-7168

Fax: 412-967-7668

ITAR Controlled Technical Data. U.S. Persons or Foreign Nationals covered by an agreement or License approved by the U.S. Department of State ONLY.

:._____

CONFIDENTIALITY: This e-mail and any attachments are confidential and may be privileged. If you are not a named recipient, please notify the sender immediately and do not disclose the contents ot another person, use it for any purpose or store or copy the information in any medium.

From: Richard Schmit
To: Christensen, Jon
Date: 8/8/2006 1:01 PM
Subject: Re: Alstom ID Fan Drive Moisture Detected Alarms

Jon,
Thanks for the info.
RS

Jon Christensen - Fwd: Re: PO 07-55471

From: Nathan Crop
To: Christensen, Jon; Miller, Kevin; siddharth.pant@converteam.com; steve...
Date: 8/29/2006 4:02 PM
Subject: Fwd: Re: PO 07-55471
Attachments: EVENTS.CSV; history of problems.xls

Sid and Steve,
The Unit 2 1C2 channel tripped on 7-26-06 at ~8:30 pm with T24 Gating Power Supply Trip as the first item on the HMI events page. The events page downloaded off the HMI is attached to this email. Also a copy of the ID fan history of Trips and Problems over the past years is attached for your review.
Nathan Crop

Electrical Engineer
850 West Brush Wellman Road
Delta, UT 84624-9522
Telephone (435) 864-6483
home: (435) 864-8429
Fax (435) 864-6670
E-mail: nathan-c@ipsc.com

>>> Kevin Miller 08/29/06 2:54 PM >>>
Please answer this question and get with John Larsen and Steve Klein

Kevin

>>> John Larsen 8/25/2006 8:01 AM >>>
Steve,
I received your call requesting information about the failure of the power supply we sent for repair as follows:

1 Each - Warranty repair & return: Power Supply,
ID Fan, Gating, Alstom P/N GDS1194-6002
IPSC Stk. No. 79239

IPSC Work Order: 07-07865-0

Kevin Miller, the one we need to talk to is out of the office today. I am asking him to contact you on Monday regarding your questions about the failure of the power supply. I do not have that information.

Kevin, Please call Steve at 412-967-7168 and explain why this was considered a warranty repair and what the problems were.

Thank you,

IP7013085

John Larsen
Sr. Buyer
Intermountain Power Service Corp
850 West Brush Wellman Road
Delta, UT 84624
Tel: (435) 864-6537
Fax: (435) 864-0937
Fax: (435) 864-6678

Date	Time	Type	Description
7/26/2006	20:35:23	Alarm	T24 GATE PSU TRIP
7/26/2006	20:35:23	Event	DRIVE TRIP On
7/26/2006	20:35:23	Event	DRIVE HEALTHY Off
7/26/2006	20:35:23	Event	DRIVE RUNNING Off
7/26/2006	20:35:23	Event	12 PULSE MASTER Off
7/26/2006	20:35:23	Event	ANY MASTER Off
7/26/2006	20:35:23	Event	OP_B1_8 DRIVE HEALTHY OFF
7/26/2006	20:35:23	Event	OP_B1_10 HV BKR TRIP ON
7/26/2006	20:35:23	Event	OP_B1_11 CLOSE EXC OFF
7/26/2006	20:35:23	Event	OP_B1_12 O/P DISC OFF
7/26/2006	20:35:23	Event	IP_A2_0 SLAVE I/P ON
7/26/2006	20:35:23	Event	IP_A2_1 OTHER RUN OFF
7/26/2006	20:35:23	Event	IP_A2_7 GATE PSU TRP ON
7/26/2006	20:35:23	Event	OP_B3_1 AT MIN OFF
7/26/2006	20:35:23	Event	OP_B3_4 SLAVE O/P OFF
7/26/2006	20:35:23	Event	OP_B3_5 RUNNING OFF
7/26/2006	20:35:23	Event	IP_A32_7 PULSE PERM OFF
7/26/2006	20:35:24	Event	IP_A2_1 OTHER RUN ON
7/26/2006	20:35:25	Event	IP_A1_4 O/P DISC CLOSED OFF
7/26/2006	20:35:25	Event	IP_A2_11 SURGE CCT OK OFF
7/26/2006	20:39:14	Accept	T24 GATE PSU TRIP
7/26/2006	20:39:18	Event	IP_A2_5 RESET ON
7/26/2006	20:39:18	Clear	T24 GATE PSU TRIP
7/26/2006	20:39:18	Event	DRIVE TRIP Off
7/26/2006	20:39:18	Event	DRIVE HEALTHY On
7/26/2006	20:39:18	Event	OP_B1_8 DRIVE HEALTHY ON
7/26/2006	20:39:18	Event	OP_B1_10 HV BKR TRIP OFF
7/26/2006	20:39:18	Event	IP_A2_5 RESET OFF
7/26/2006	20:39:18	Alarm	T24 GATE PSU TRIP
7/26/2006	20:39:18	Event	DRIVE TRIP On
7/26/2006	20:39:18	Event	DRIVE HEALTHY Off
7/26/2006	20:39:18	Event	OP_B1_8 DRIVE HEALTHY OFF
7/26/2006	20:39:18	Event	OP_B1_10 HV BKR TRIP ON
7/26/2006	20:39:24	Event	IP_A2_5 RESET ON
7/26/2006	20:39:24	Event	DRIVE TRIP Off
7/26/2006	20:39:24	Event	DRIVE HEALTHY On
7/26/2006	20:39:24	Event	OP_B1_8 DRIVE HEALTHY ON
7/26/2006	20:39:24	Event	OP_B1_10 HV BKR TRIP OFF
7/26/2006	20:39:25	Event	DRIVE TRIP On
7/26/2006	20:39:25	Event	DRIVE HEALTHY Off
7/26/2006	20:39:25	Event	OP_B1_8 DRIVE HEALTHY OFF
7/26/2006	20:39:25	Event	OP_B1_10 HV BKR TRIP ON
7/26/2006	20:39:25	Event	IP_A2_5 RESET OFF
7/26/2006	20:39:33	Accept	T24 GATE PSU TRIP
7/26/2006	20:39:36	Event	IP_A2_5 RESET ON
7/26/2006	20:39:36	Clear	T24 GATE PSU TRIP

7/26/2006	20:39:36	Event	DRIVE TRIP Off
7/26/2006	20:39:36	Event	DRIVE HEALTHY On
7/26/2006	20:39:36	Event	OP_B1_8 DRIVE HEALTHY ON
7/26/2006	20:39:36	Event	OP_B1_10 HV BKR TRIP OFF
7/26/2006	20:39:36	Event	OP_B1_8 DRIVE HEALTHY OFF
7/26/2006	20:39:36	Event	OP_B1_10 HV BKR TRIP ON
7/26/2006	20:39:36	Alarm	T24 GATE PSU TRIP
7/26/2006	20:39:36	Event	DRIVE TRIP On
7/26/2006	20:39:36	Event	DRIVE HEALTHY Off
7/26/2006	20:39:36	Event	IP_A2_5 RESET OFF
7/26/2006	20:39:59	Event	IP_A2_5 RESET ON
7/26/2006	20:39:59	Event	DRIVE TRIP Off
7/26/2006	20:39:59	Event	DRIVE HEALTHY On
7/26/2006	20:39:59	Event	OP_B1_8 DRIVE HEALTHY ON
7/26/2006	20:39:59	Event	OP_B1_10 HV BKR TRIP OFF
7/26/2006	20:40:00	Event	OP_B1_8 DRIVE HEALTHY OFF
7/26/2006	20:40:00	Event	OP_B1_10 HV BKR TRIP ON
7/26/2006	20:40:00	Event	DRIVE TRIP On
7/26/2006	20:40:00	Event	DRIVE HEALTHY Off
7/26/2006	20:40:01	Event	IP_A2_5 RESET OFF
7/26/2006	20:40:02	Accept	T24 GATE PSU TRIP
7/26/2006	20:40:05	Event	IP_A2_5 RESET ON
7/26/2006	20:40:05	Clear	T24 GATE PSU TRIP
7/26/2006	20:40:05	Event	DRIVE TRIP Off
7/26/2006	20:40:05	Event	DRIVE HEALTHY On
7/26/2006	20:40:05	Event	OP_B1_8 DRIVE HEALTHY ON
7/26/2006	20:40:05	Event	OP_B1_10 HV BKR TRIP OFF
7/26/2006	20:40:05	Alarm	T24 GATE PSU TRIP
7/26/2006	20:40:05	Event	DRIVE TRIP On
7/26/2006	20:40:05	Event	DRIVE HEALTHY Off
7/26/2006	20:40:05	Event	OP_B1_8 DRIVE HEALTHY OFF
7/26/2006	20:40:05	Event	OP_B1_10 HV BKR TRIP ON
7/26/2006	20:40:06	Event	IP_A2_5 RESET OFF

Alstom ID Fan Drive Alarm/Trip Summary

Date	Unit and drive	alarms	trips	Problem
4/1/2005	Unit 1 1D2	none	T38 COOL HIGH CONDUCTIVITY TRIP	False trip on high conductivity because the bit A4.4 would drop out for a small moment from time to time.
4/4/2005	Unit 1 1C1	A79 S1 OVERCURRENT RIDE THRU ALARM A80 M1 OVERCURRENT RIDE THRU ALARM	T20 MOTOR OVER FLUX TRIP	Current feed back to the PIB board was ugly from a bad CT on 'A' phase incoming cabinet
4/4/2005	Unit 1 1C2	none	T25 CONTROL PSU TRIP	Bad 12 VDC power supply which is the power supply #2.

IP7013089

4/5/2005	Unit 1 1C1	none	T20 MOTOR OVER FLUX TRIP	Noisy Stator Volt f/b signal at times
4/11/2005	Unit 2 1D1	F1=2 symbol table corruption; watchdog trip symbol table corruption	T15 We saw that there was a watchdog trip message on the Sigma Key pad. In the sigma technical manual section 4.4.1 we read that we should see what the variable F1-F5 were equal to.	So with the sigma key pad we looked at variable F1 and saw that we had what was called a symbol table corruption. See volume I, part 2, section ONE-page 4-19.
date	Unit and drive	alarms	trips	short description of problem
4/27/2005	Unit 2 1D2	AL89 HIGH WATER TEMP (Alarm temp is 45 degrees C).	the 1D2 drive was still running with high water temperature alarm on	The actual water temp was good. The actual conductivity was bad because the thermistor was giving falsely indicating high temp the temp compensated conductivity read too low.

IP7013090

5/18/2005	Unit 1 1C1	No alarms	T20 Motor Overflux Trip	The microcontrol trip history revealed that the stator voltage feedback had a sudden disturbance that caused the trip.
7/5/2005	Unit 2 1D2	AL89 HIGH WATER TEMP (Alarm temp is 45 degrees C). High coolant temperature alarm. The cell 2 thermistor is bad. It puts out 74 degrees C when the water is only 20 C.	T39 HIGH WATER TEMP (65 degrees C) 1D2 link tripped on high water temperature. Thermistors will fail as a short so the reading says the water is maximum temp. This is what tripped us.	They found the left cell looking in the cab. Had a bad temp sensing component. They swapped leads (C1 &C2) to the honeywell and the bad temperature reading followed the sensor cell.

IP7013091

Alstom ID Fan Drive Alarm/Trip Summary

date	Unit and drive	alarms	trips	short description of problem
7/11/2005	Unit 1 1C1	AL91 COOL PUMP 1 O/L. pump one over load alarm	No trip	We found that the pump one was in good working condition.
8/28/2005	Unit 1 1C1	There was no alarm indication on high conductivity on the HMI	T38 HIGH CONDUCTIVITY. Reading exceeds 1.0 and doesn't drop below 0.8 in under 15 seconds.	The cell may be going bad . Talking to cliff watson at alstom to fix the logging problem. It seems that we must erase the LOGS folder after getting data off HMI.

IP7013092

9/4/2005	Unit 2 1D2	There was no conductivity alarm. The conductivity must have went u past 0.6 then 1.0 in less than a 30 minute interval. It was a sudden step change on conductivity reading from cell one.	T38 HIGH CONDUCTIVITY. Reading exceeds 1.0 and doesn't drop below 0.8 in under 15 seconds.	high conductivity was indicated 28 seconds after pump 2 was turned on (Ten day swap). HMI only has last 24 hours.

date	Unit and drive	alarms	trips	short description of problem
9/11/2005	Unit 1 1C1	no alarms	T36 RES LEVEL LOW; if the lower level switch changes state and holds for more than 10 secondstripped on low reservoir level.	The reservoir level was good at time of trip. Bad indication for reservoir trip level.

IP7013093

9/21/2005	Unit 1 1D2	Fault Diagnostics Alarm on the HMI. Sigma keypad said, "M ARM 05 DEV3 S" See Volume I, section I, part 2 page 22. (One of five things is wrong-- 1bad pwr spplies, 2gate current, 3crowbar not fired, 4thermostat and 5volts collapsed)	no trip this time	One of the quick disconnect hoses was not fully connected and thus no cooling was available for arm 5 of the machine bridge. Thus the thermostat was getting hot as we tried to put a load on the fan.
10/27/2005	Unit 1 1C1	no alarms	T36 RES LEVEL LOW; if the lower level switch changes state and holds for more than 10 secondstripped on low reservoir level.	The reservoir level was good at time of trip. Bad indication for reservoir trip level.
12/28/2005	Unit 1 1C2	trip	t07 PIB plug interlock trip	10:18 in the morning
2/8/2006	Unit 1 1C2	trip	11:43:00 PM t08 PIB configuration trip	

IP7013094

Alstom ID Fan Drive Alarm/Trip Summary

date	Unit and drive	alarms	trips	short description of problem
3/5/2006	Unit 2 1D2	There was no conductivity alarm. The conductivity went past 0.6 then 1.0 in less than a 30 minute interval. It was a sudden step change on conductivity reading from cell one.	T38 HIGH CONDUCTIVITY.	Reading exceeds 1.0 and doesn't drop below 0.8 in under 15 seconds. This happens directly following a pump swap over. The dirty water slug above the 10 day off pump is doing this problem. We plan to make changes during outage.
3/14/2006	Unit 1 1D2	22:51:39 A79 S1 OVERCURRENT RIDE THROUGH ALARM 22:51:39 CONVERTER DIAGS FLT - SEE SIGMA PAD 22:51:47 TR35 3 OVER CURRENT FAULTS IN 60S TRIP	22:51:47 TR35 3 OVER CURRENT FAULTS IN 60S TRIP.	First thing noted was that on Arm 3 device 0b10 of the Machine bridge there was a thyristor board with the green led off. All the other thyristor boards had the green light on.
5/1/2006	Unit 2 1C2		trip on motor flux	The resistor voltage divider had really loose connections.
5/3/2006	Unit 2 1A1		9:15:00 AM 1A1 tripped when 1A2 was taken out of service	this was from either a slid open link or Modicon logic mistake. I can't remember

IP70130095

5/7/2006	unit 2 1D1		06:27AM 1D1 ID fan link tripped on motor overload flux alarm	

date	Unit and drive	alarms	trips	short description of problem
5/8/2006	Unit 1 1C1	0417 pump one fault and DI water flow alarm	event on DI water flow trip (No actual trip)	Facts: 1. This pump fault alarm comes in only when pump one is being turned on. 2. Once the pump one fault alarm is cleared pump one is turned on and then stays on with no apparent problem. 3. The flow does in fact go down. 4. The logic shows that the loss of flow is bringing in the pump one fault (Not a motor fault).

IP7013096

5/9/2006	Unit 1 1C1		trip on under flux	we found a loose connection from wire 202 to the power interface board.
5/22/2006	Unit 2 1B1		ID fan link 1B1 tripped- motor overflux. It tripped on this at least twice in one day.	We found that the wires going into the power interface board had two of the three wires loose.
5/29/2006	Unit 1	04:42 AM C1, D1, D2 ID fan link trouble alarms.	no trip	All three alarms were high temperature.
6/20/2006	Unit 2 1C1	conductivity alarm,	no trip	DI tank had a cracked internal pipe.
6/21/2006	Unit 2 1A2	No alarm is available for this scenario	21:21 conductivity trip from pump swap over	
6/21/2006	unit 2 1B2		16:43 1B2 ID fan link tripped. Electrician checking.	Nathan found the drive in need of a complete download. No electrician was available to speak with.

date	Unit and drive	alarms	trips	short description of problem
6/24/2006	Unit 2 1D1	conductivity alarm,	no trip	
6/29/2006	Unit 1 1C2	3:40 AM "moisture detected".	no trip	moisture detector on bottom of pump cabinet got wet

IP70130097

6/30/2006	Unit 1 1C2	0517 "moisture detected".	no trip	moisture detector on bottom of pump cabinet got wet
7/1/2006	Unit 2 1A2		19:46 tripped on conductivity	alarm reset and link placed back in service. Electrician checking.
7/21/2006	Unit 2 1A2		21:18 tripped - conductivity.	alarm reset and link placed back in service. Electrician checking.
7/26/2006	Unit 2 1C1	6:50:00 PM speed deviation alarm	T8 PIB Configuration Trip and T7 PIB Plug Interlock Trip	must make sure jumpers for electrical interlock and configuration on the PIB are tight. If so the board is damage.
7/26/2006	Unit 2 1C2	8:33 PM	T24 Gate PSU Trip	trip on gate power supply failure. The link was found slid open on TB5-22 for the speed feed back.
7/29/2006	Unit 2 1D1	9:51 PM	tripped on supply breaker opening	The fast history collected off the drive was sent to Converteam and they affirmed that the 6.9kv bkr was opened A32.7 went low.
8/4/2006	Unit 2 1D1	cabinet moisture detected alarm is in.		It appears the cooling tank over filled and Elect. is drying out the detector
8/6/2006	Unit 2 all	unit 2 boiler tube leak outage		updated HMI, Had to uninstall crimson and re-install it to get the download to work.
8/29/2006	Unit 2 1A1	No alarm is available for this scenario	12:02 AM conductivity trip from pump swap over	

IP7013098

Solution	
Alstom recommended changing the trip delay from 5 seconds to 15 seconds (instruction 1890-1894. this means G410 was changed to 15,000 milliseconds on all the drives logic).	1
We did a open loop short circuit test on 1C1 drive and watched the DC link current for a spike. Moving wires around 'tween tests ruled out the PIB and other CT's till we found the bad CT.	2
We had to wire a separate input for all power supplies to narrow down which one was failing. We used some digital spare inputs temporarily.	3

IP7013099

We changed the type 'C' Power Interface Board and the problem has disappeared.	4
We then pulled the batteries and powered the sigma down completely. We then downloaded the sigma program fresh onto the Sigma Using Pilot-P80 with version 70116_01.	5
short description of solution	
Sensor cell 103 gave correct readings of the water temp and cond. So we changed out the sensor cell 102. Only cell 102's water temp and conductivity readings will end up in the sigma. (This is a questionable design)	6

IP7013100

We tightened the connections on the stator voltage f/b network all the way to the type 'C' PIB board. Then we found a cable resting on the grey ribbon that goes from the PIB to the Sigma board.	7
The electricians put the temperature leads from the healthy cell on both C1 & C2 inputs to the honeywell. This made the temp reading nearly twice the actual temp. So we put in a 10k ohm resistor to C2 so it thinks the water is at 20 C. Once the new cell came we installed it and removed the resistor.	8

IP7013101

short description of solution	
The overload alarm coming in was because of a loose wire on the over load normally open contact.	9
HMI is not seeing the local alarm for conductivity = 0.6uS/cm. It should record this in the event log.	10

IP7013102

I changed the HMI logging to have last 96 hours. Looks like pump swap over is causing trips. Dead leg is getting dirty and then once it is above 1.0uS/cm it has to get lower than 0.8uS/cm.	11

short description of solution	
Need to consider a level indicator that does not bounce in and out when water level is good.	12

IP70131103

We spent a few hours thinking there was a bad board when Nathan looked under the module and saw the bad hose connection. We connected the hose and put the drive back in service with no further problems.	13
Need to consider a level indicator that does not bounce in and out when water level is good.	14
pressed all plugs in power interface board and reset the drive.	15
We made sure jumper from 7 to 8 on TB310 located on the PIB Type 'C' was securely fastened. If it was it is then necessary to assume that there is an internal problem with the type C board itself.	16

IP70131104

short description of solution	
Spoke with Alstom engineer (Sid Pant). He and Nathan will re-program the sigma and change the 0.6 set point to 0.5uS/cm during the April 2006 outage.	17
took and recorded all thyristor resistances and then replaced the bad thyristor board. No bad thyristor was detected. We did a gate pulse test. Channel went back in service after that with no problems.	18
MiKale Zakim tightening it and it fell apart and we had to wait for him to put it back together.	19
	20

IP7013105