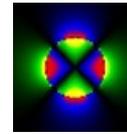


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Magnet Division Procurement Specification

Specification Number: SMD-ILC-RD2001

Revision: A



Superconducting
Magnet Division

ILC Service Cryostat 2K-4K JT Heat Exchanger, Procurement Specification For

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Revision History

Rev A: Initial Release 7-09

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1.0 Scope

- 1.1 This specification defines the requirements for a low-temperature, single layer heat exchanger to be delivered to Brookhaven National Laboratory (BNL).

2.0 Applicable Documents

Fermilab Drawing 1670-MA-304854	Revision -
Fermilab Drawing 1670-MB-304853	Revision -
Fermilab Drawing 1670-MD-418298	Revision -
Fermilab Drawing 1670-MD-418299	Revision -
RHIC-CR-E-4703-0041	

3.0 General Vessel Description

- 3.1 The vessel will contain helium as cold as 1.8⁰ Kelvin. It will be installed in a vacuum-insulated container by BNL. Pressure relief devices as required by the code will be provided and installed by BNL.
- 3.2 Dimensions shown on Fermilab drawing 1670-MD-418298 and associated drawings are to be maintained unless a violation of the ASME Code would result.
- 3.3 Material thicknesses and weld design and dimensions must be determined or verified by the manufacturer to ensure compliance with pressure piping code requirements. Any change in dimensions from those on Fermilab drawing 1670-MD-418298 and associated drawings must be approved by BNL before being implemented.

4.0 Vessel Design

- 4.1 The vessel shall be fabricated in accordance with the ASME Boiler and Pressure Piping Code, Section VIII, Division 1. The vessel shall be registered with the National Board of Boiler and Pressure Vessel Inspectors.
- 4.2 The vessel shall be capable of withstanding full internal vacuum with one atmosphere pressure on the outside with a safety factor of two, and with an internal pressure of 75 psig.

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5.0 Internal Tubing

- 5.1 The tubing MAWP is 300 psi. Normal operating conditions are 25 psia, 1.8 Kelvin.
- 5.2 Copper-to-copper or copper-to-stainless steel joints are to be silver brazed.

6.0 Cold Shock And Leak Testing

- 6.1 The vessel shall be cold shocked with liquid nitrogen prior to leak check.
- 6.2 Tubing shall be tested according to ASME code. All joints shall be soap and bubble checked for leakage at the test pressure.
- 6.3 As a final leak check the following tests shall be performed with the heat exchanger vessel vacuum connected to a leak detector of minimum sensitivity of 2×10^{-9} torr-liter/sec of helium:
 - 6.3.1 All joints on the outside of the vessel shall be sprayed with helium. Max leak rate 2×10^{-10} Std cc He /Sec per RHIC-CR-E-4703-0041
 - 6.3.2 The tubing shall be pressurized to 125% of its MAWP with helium with no detectable leak.

7.0 Documentation

- 7.1 The manufacturer shall provide BNL the code UA-1 form and certificates of mass spectrometer tests.
- 7.2 Copies of any material certifications and material test results required to ensure pressure vessel code compliance must be supplied with the assembly.

8.0 Cleaning And Packaging

- 8.1 The final assembly must be free of grease, residue, dirt, and chips and packaged such as to ensure delivery in a clean condition.
- 8.2 Packaging must be such as to protect the assembly from damage during shipping and handling.

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9.0 Quality Assurance Provisions

- 9.1 Conformance to Supplier's/Manufacturer's quality program or system
- 9.2 Refer to Procurement documentation (SOW, specifications, drawings) for all quality requirements
- 9.3 **Protection of Material and Equipment:** The supplier shall employ procedures, which assure adequate protection of material and equipment during shipment and while in storage. Such protection shall include special environmental packaging, as necessary. All items shipped (originally packaged or repackaged) to BNL or other locations cited in the purchase order or contract, shall comply with the requirements for preservation, packaging and marking as stated in the latest revision of ASTM Standard D3951-98 Standard Practice for Commercial Packaging
- 9.4 **Shipment of Documentation Package to Buyer:** Three (3) copies of the documentation package shall be shipped to the buyer with or prior to each shipment of the purchased items.
- 9.5 **Certificate of Conformance (C of C):** With each shipment, per the procurement documentation, the supplier shall submit a certificate of conformance. In case of drop shipment, a copy of the certificate shall be submitted to the Buyer at the time of shipment. The certificate shall include the title of and be signed by an authorized representative of the company, and shall constitute a representation by the Supplier that:
 - A. Materials used are those which have been specified by the Buyer, and that the items delivered were produced from materials for which the Supplier has on file, reports of chemical or physical analysis, or any other equivalent evidence of conformance of such item to applicable specifications:
 - B. Processes used in the fabrication of items delivered were in compliance with applicable specification forming a part of the purchase order/contract, or Buyer approved procedures or specifications:
 - C. The items as delivered comply with all applicable drawings, specifications and other requirements of the procurement documentation
 - D. When specified, cleaning and cleanliness requirements have been completely satisfied. The C of C shall reference the Supplier's applicable cleaning procedures.
- 9.6 **Notification of Change to Design, Methods or Processes:** The Supplier shall immediately notify the Buyer or any significant changes (those that may affect form, fit, function, reliability, safety, or interchangeability) in product design, fabrication methods, material or processing from those used by the Supplier at

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time of Supplier's quotation or offer to the Buyer, which resulted in the purchase order.

- 9.7 **Material Traceability:** Materials used must be identified by material type, applicable specification and revision number, and be traceable to their lot number(s) and /or heat number(s). Traceability records shall be available for review by the Buyer's representative.
- 9.8 **Pressure or Leak Test Reports:** Test reports shall be prepared for all pressure and leak tests. Such reports shall state the requirement, the supplier's test procedure number, and the observed result for each item, joint or connection tested. When items are serialized the serial numbers shall appear on the report. The reports shall contain the signature and title of authorized Supplier representative and shall accompany each shipment.

10.0 Attachments

- Figure 1 - Drawing 1670-MB-304853
- Figure 2 - Drawing 1670-MA-304854
- Figure 3 - Drawing 1670-MD-418298
- Figure 4 - Drawing 1670-MD-418299

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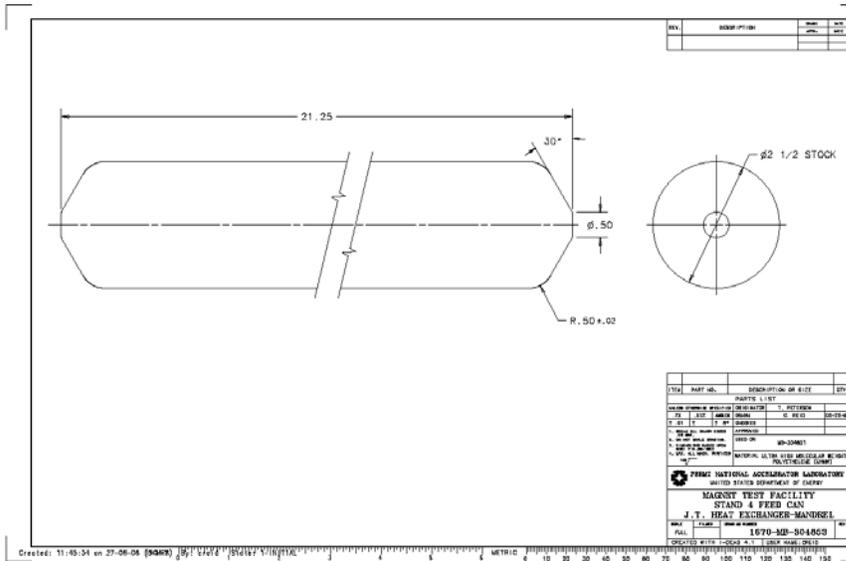


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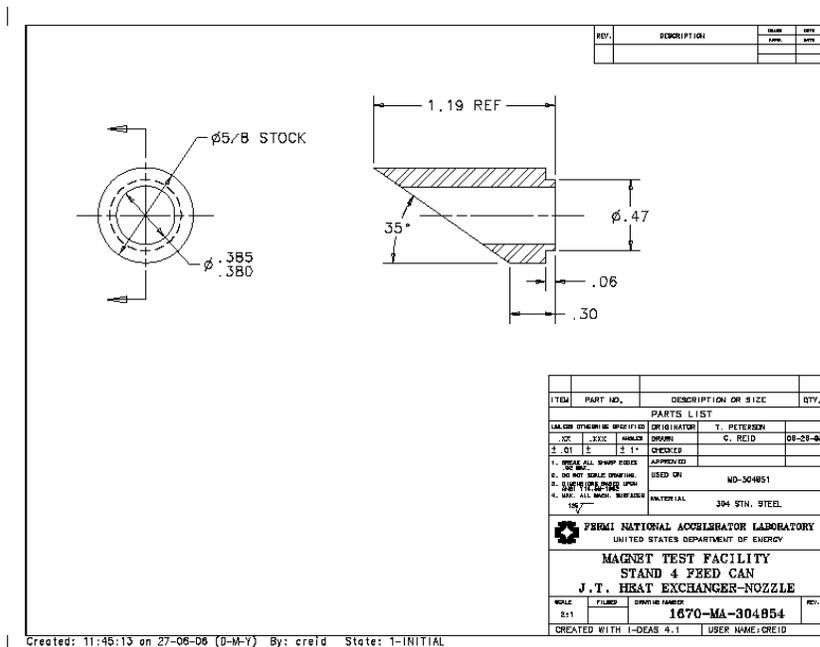
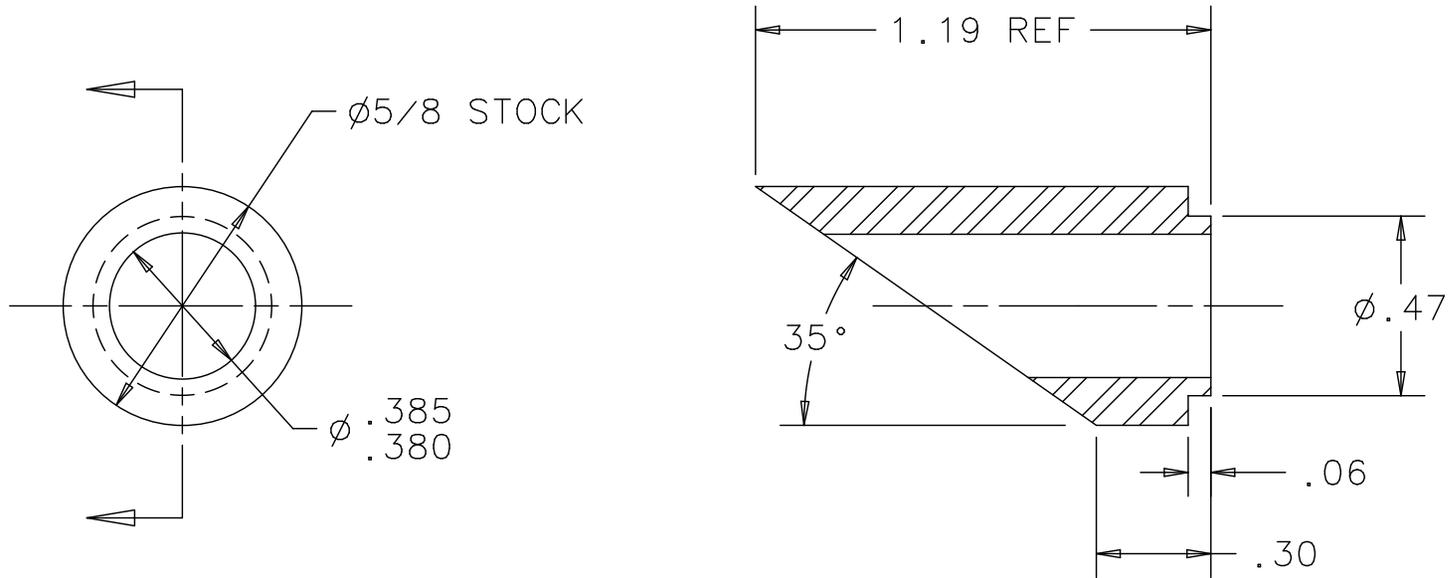


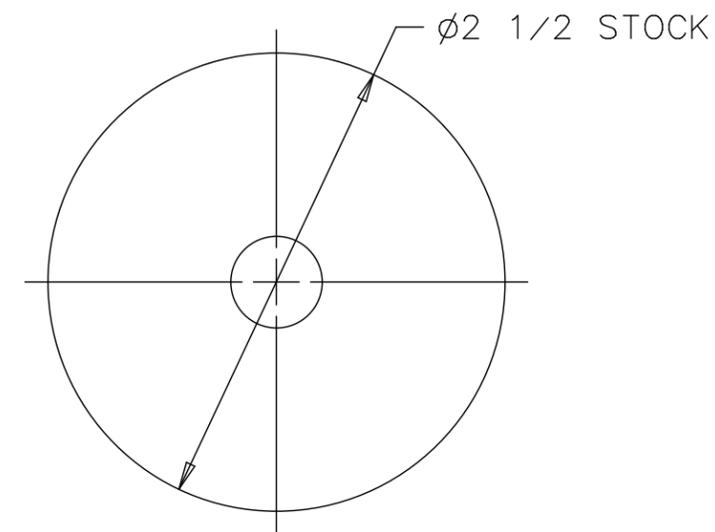
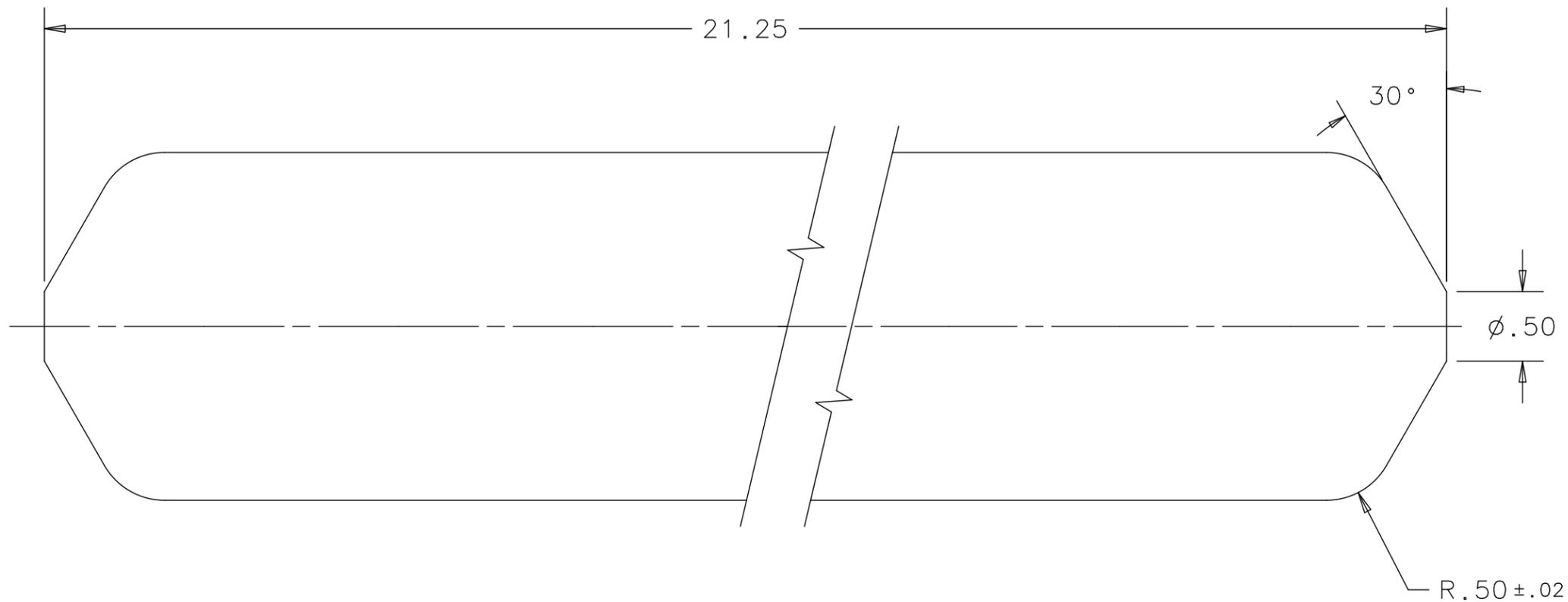
Figure 2
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		APPD.	DATE



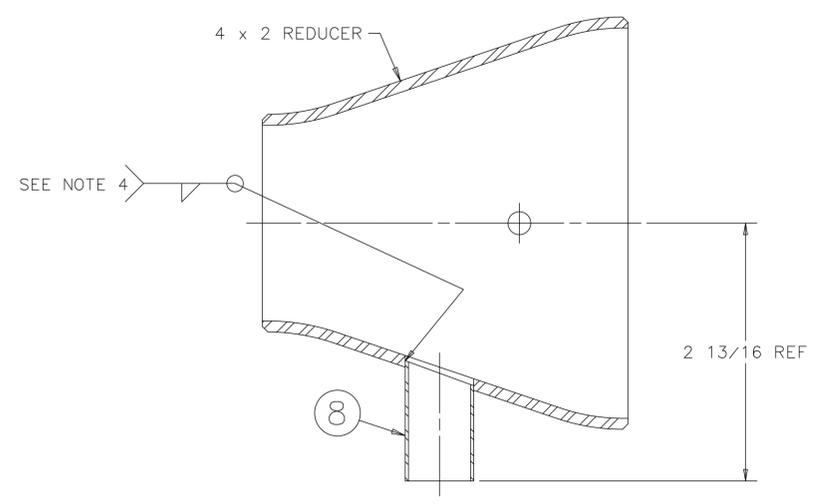
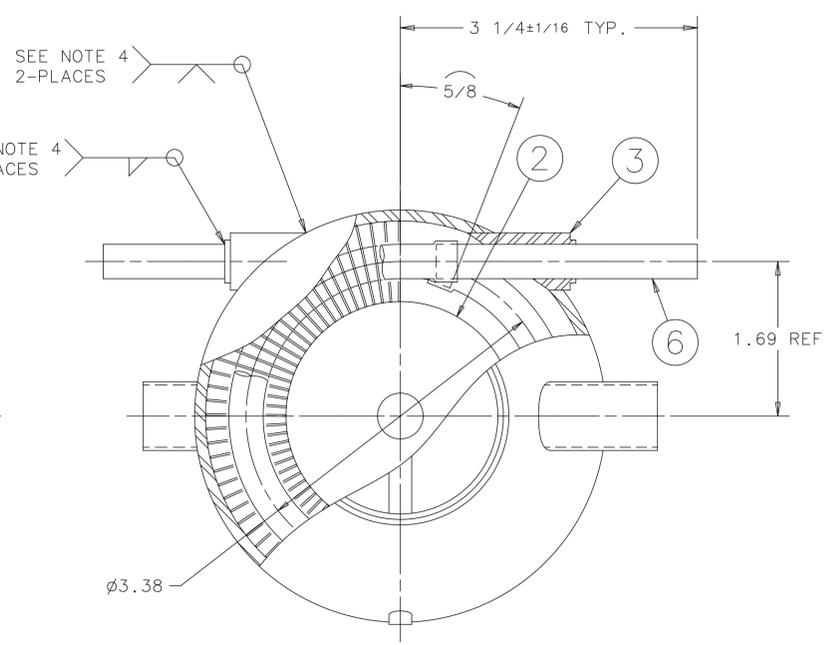
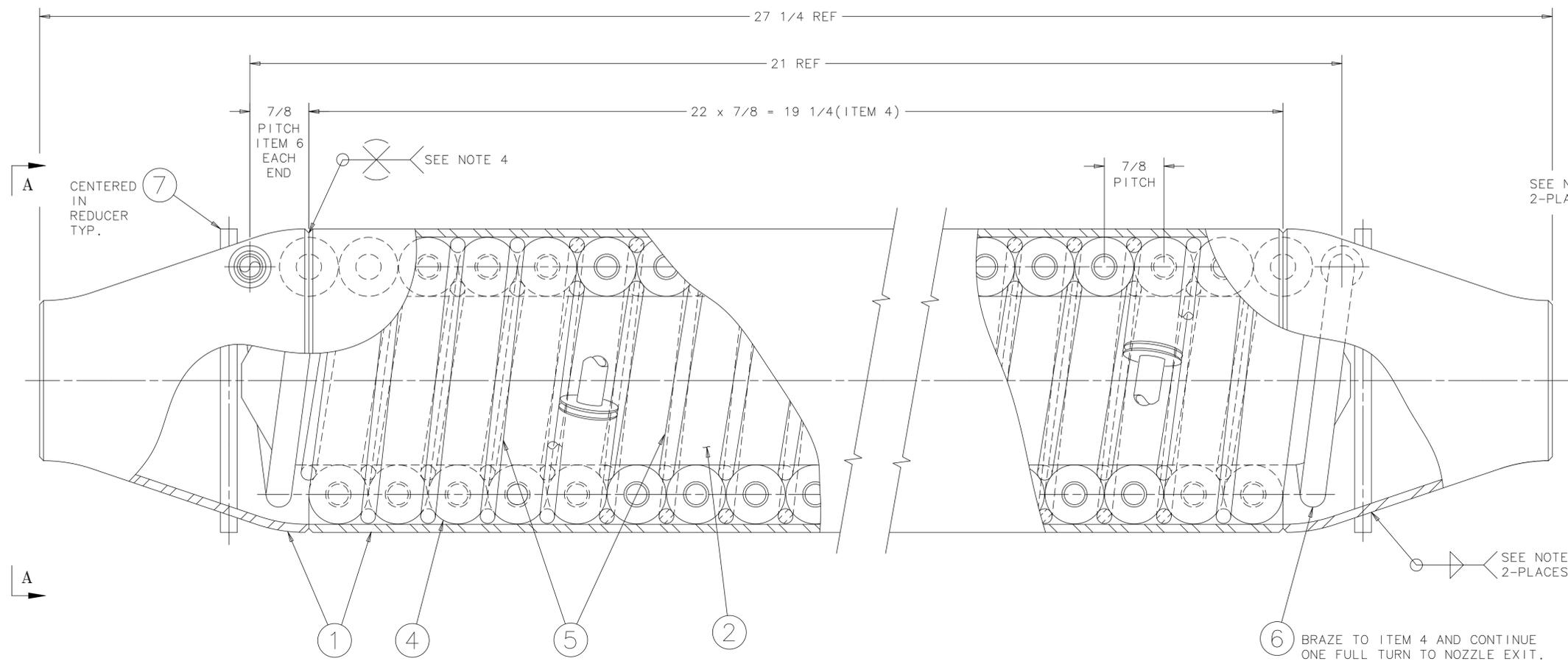
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± .01	±	± 1°	CHECKED
1. BREAK ALL SHARP EDGES .02 MAX.		APPROVED	
2. DO NOT SCALE DRAWING.		USED ON	
3. DIMENSIONS BASED UPON ANSI Y14.5M-1982		MD-304851	
4. MAX. ALL MACH. SURFACES 125√		MATERIAL	304 STN. STEEL
 FERMI NATIONAL ACCELERATOR LABORATORY UNITED STATES DEPARTMENT OF ENERGY			
MAGNET TEST FACILITY STAND 4 FEED CAN J.T. HEAT EXCHANGER-NOZZLE			
SCALE	FILMED	DRAWING NUMBER	REV.
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CREATED WITH I-DEAS 4.1		USER NAME: CREID	

REV.	DESCRIPTION	DRAWN	DATE
		APPD.	DATE

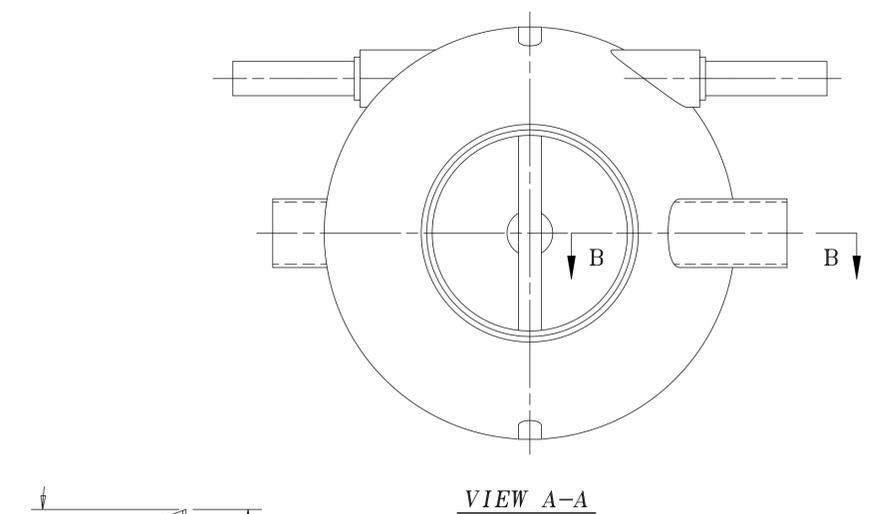


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.XX	.XXX	ANGLES	DRAWN C. REID 06-26-98
± .01	±	± 5°	CHECKED
1. BREAK ALL SHARP EDGES .02 MAX.		APPROVED	
2. DO NOT SCALE DRAWING.		USED ON MD-304851	
3. DIMENSIONS BASED UPON ANSI Y14.5M-1982		MATERIAL ULTRA HIGH MOLECULAR WEIGHT POLYETHELENE (UHMW)	
4. MAX. ALL MACH. SURFACES 125			
 FERMI NATIONAL ACCELERATOR LABORATORY UNITED STATES DEPARTMENT OF ENERGY			
MAGNET TEST FACILITY STAND 4 FEED CAN J.T. HEAT EXCHANGER-MANDREL			
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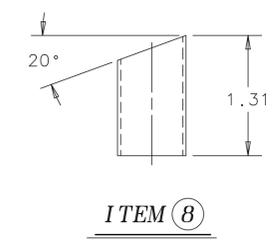
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		APPD.	DATE



SECTION B-B
TYPICAL 2- REDUCERS



VIEW A-A



ITEM 8

6 BRAZE TO ITEM 4 AND CONTINUE ONE FULL TURN TO NOZZLE EXIT. TYP. BOTH ENDS SEE NOTE 3

NOTES:

- 1) COIL MATERIAL: 3/8 OD x .035 WALL COPPER TUBE WITH .25 HIGH X .02 THK. HELICAL WOUND BRAZED COPPER FINS SPACED AT 8 PER INCH (.875 MAX. OD). APPROX. FINNED LENGTH IS 234" (OVERALL LENGTH IS 235 1/4").
- 2) INNER CORD (ITEM NO. 5) TO BE WRAPPED ONTO THE MANDREL DURING WINDING OF THE FINNED TUBE. OUTER CORD (ITEM NO. 5) TO BE WRAPPED ONTO THE WOUND COILS.
- 3) APPROX. LENGTH OF 3/8 S.S. TUBING IS 10 7/8 WITH FEMALE EXPANDED ENDS 1/4" DP. TO MATE WITH COPPER COIL (ONE END) AND S.S. TUBE (OTHER END).
- 4) ALL WELDS AND BRAZE JOINTS ARE TO BE VACUUM LEAK TIGHT. NO LEAK SHALL BE DETECTABLE ON THE MOST SENSITIVE SCALE OF A HELIUM LEAK DETECTOR WITH A MINIMUM SENSITIVITY OF 10⁻⁹ ATM. CC/SEC.

ITEM	PART NO.	DESCRIPTION OR SIZE	QTY.
8		TUBE 3/4 O.D. x .035 W. x 1.31 LG. 304 STN. STEEL	2
7		ROD 1/4 O.D. x 4.50 LG. 304 STN. STEEL	2
6		TUBE 3/8 O.D. x .035 W. 304 STN. STEEL	AS REQ'D
5	SEE NOTE 2	CORD 7/32 O.D. COTTON BRAIDED WITH NYLON REINFORCED CORE (TRADE SIZE #7)	AS REQ'D
4	SEE NOTE 1	EXCHANGER COIL	1
3	MA-304854	J.T. HEAT EXCHANGER-NOZZLE	2
2	MB-304853	J.T. HEAT EXCHANGER-MANDREL	1
1	MD-418299	J.T. HEAT EXCHANGER-OUTER SHELL	1

PARTS LIST					
UNLESS OTHERWISE SPECIFIED					
.XX	.XXX	ANGLES	DRAWN	C. SYLVESTER	
± .02	±	± 2°	CHECKED	Y. HYUANG	06-27-06
1. BREAK ALL SHARP EDGES .02 MAX.			APPROVED	C. SYLVESTER	06-27-06
2. DO NOT SCALE DRAWING.			USED ON ME-441XXX		
3. DIMENSIONS BASED UPON ANSI Y14.5M-1982			MATERIAL AS NOTED		
4. MAX. ALL MACH. SURFACES 125					

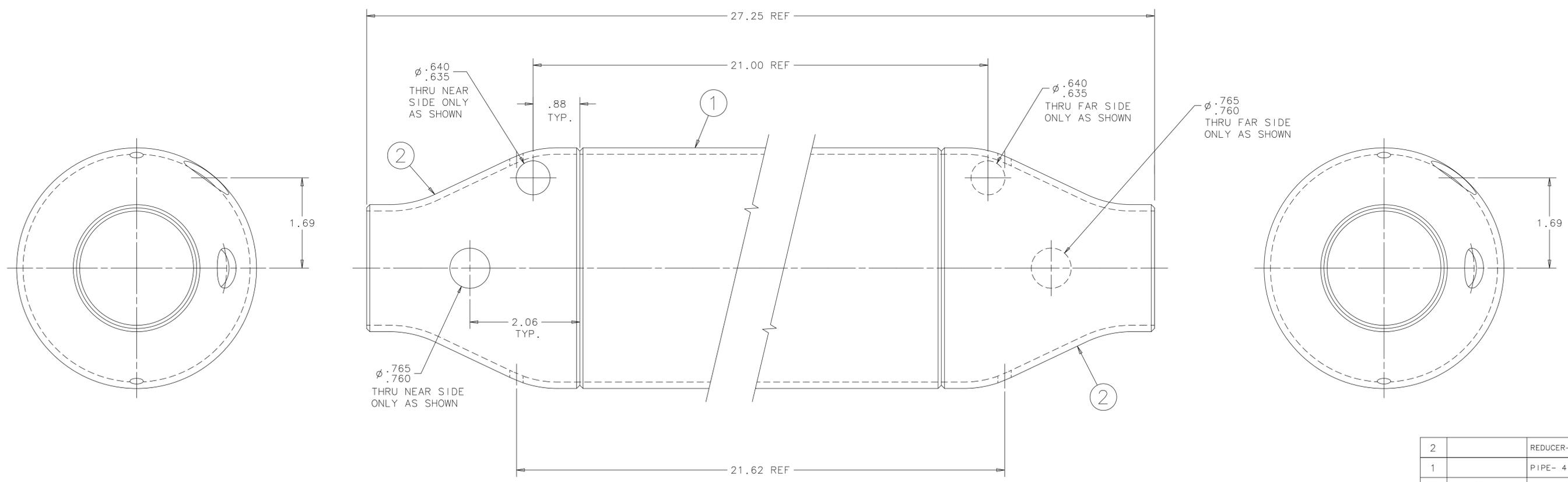
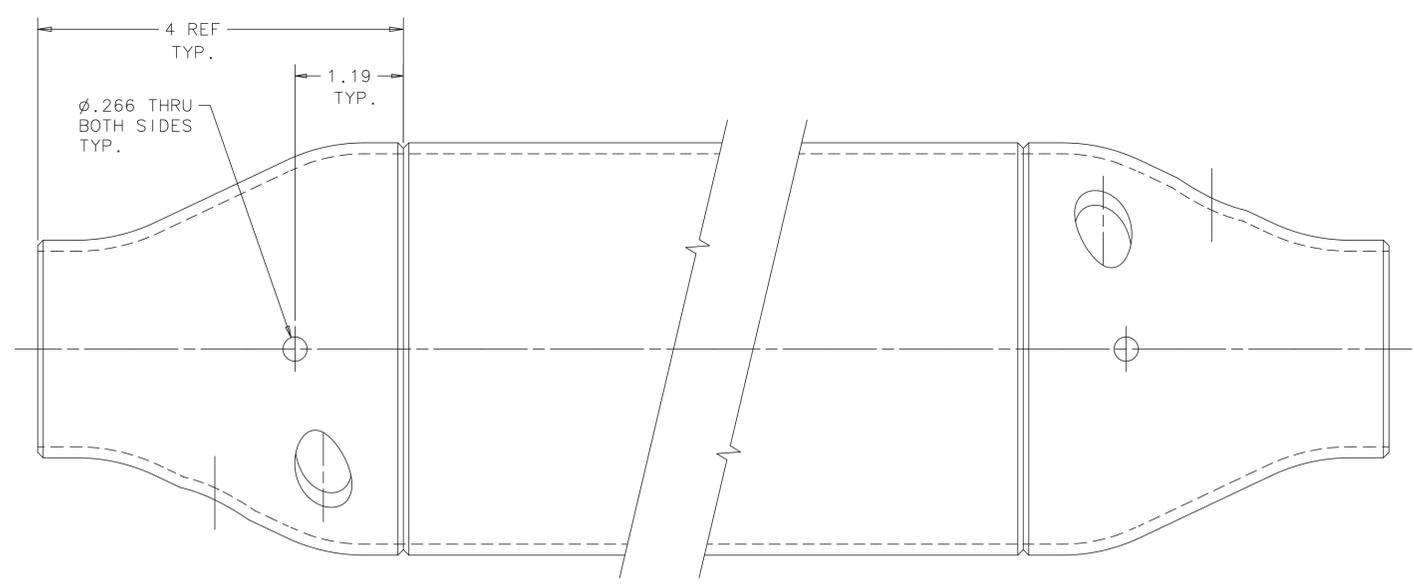
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UNITED STATES DEPARTMENT OF ENERGY

MAGNET TEST FACILITY
VERTICAL CRYOSTAT
J.T. HEAT EXCHANGER-ASSEMBLY

SCALE	FILMED	DRAWING NUMBER	REV.
FULL		1670-MD-418298	
CREATED WITH I-DEAS 4.1		USER NAME: CREID	



REV.	DESCRIPTION	DRAWN	DATE
		APPD.	DATE



2		REDUCER- 4 x 2 SCH. 10	2
1		PIPE- 4 SCH. 10 x 19.25 LG.	1
ITEM	PART NO.	DESCRIPTION OR SIZE	QTY.

PARTS LIST					
UNLESS OTHERWISE SPECIFIED			ORIGINATOR	C. SYLVESTER	
.XX	.XXX	ANGLES	DRAWN	C. REID	06-26-06
±.01	±.005	±	CHECKED	Y. HYUANG	06-27-06
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2. DO NOT SCALE DRAWING.			USED ON MD-418298		
3. DIMENSIONS BASED UPON ANSI Y14.5M-1982			MATERIAL 304 STN. STEEL		
4. MAX. ALL MACH. SURFACES			125		

FERMI NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY

MAGNET TEST FACILITY
VERTICAL CRYOSTAT
J.T. HEAT EXCHANGER-OUTER SHELL

SCALE	FILMED	DRAWING NUMBER	REV.
FULL		1670-MD-418299	
CREATED WITH I-DEAS 4.1		USER NAME: CREID	

