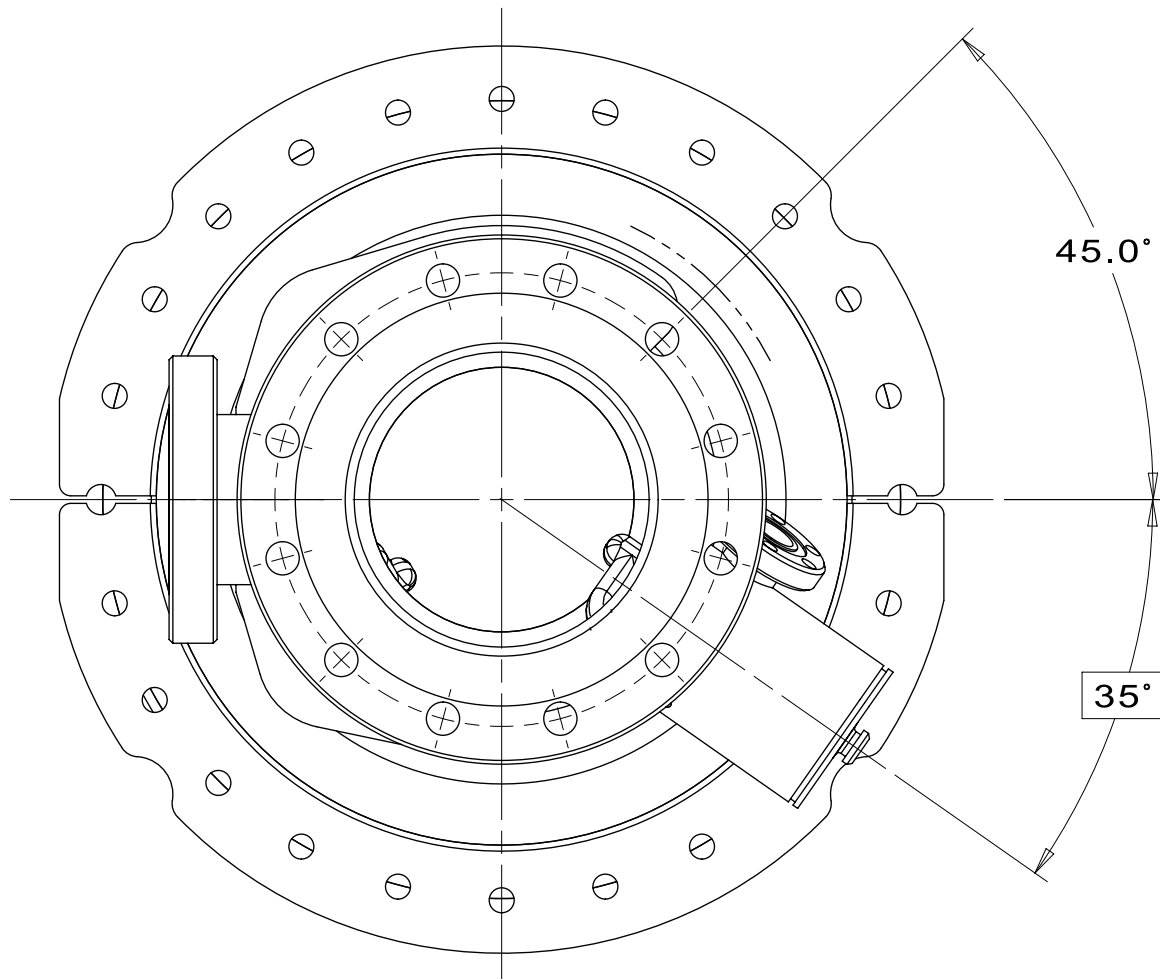
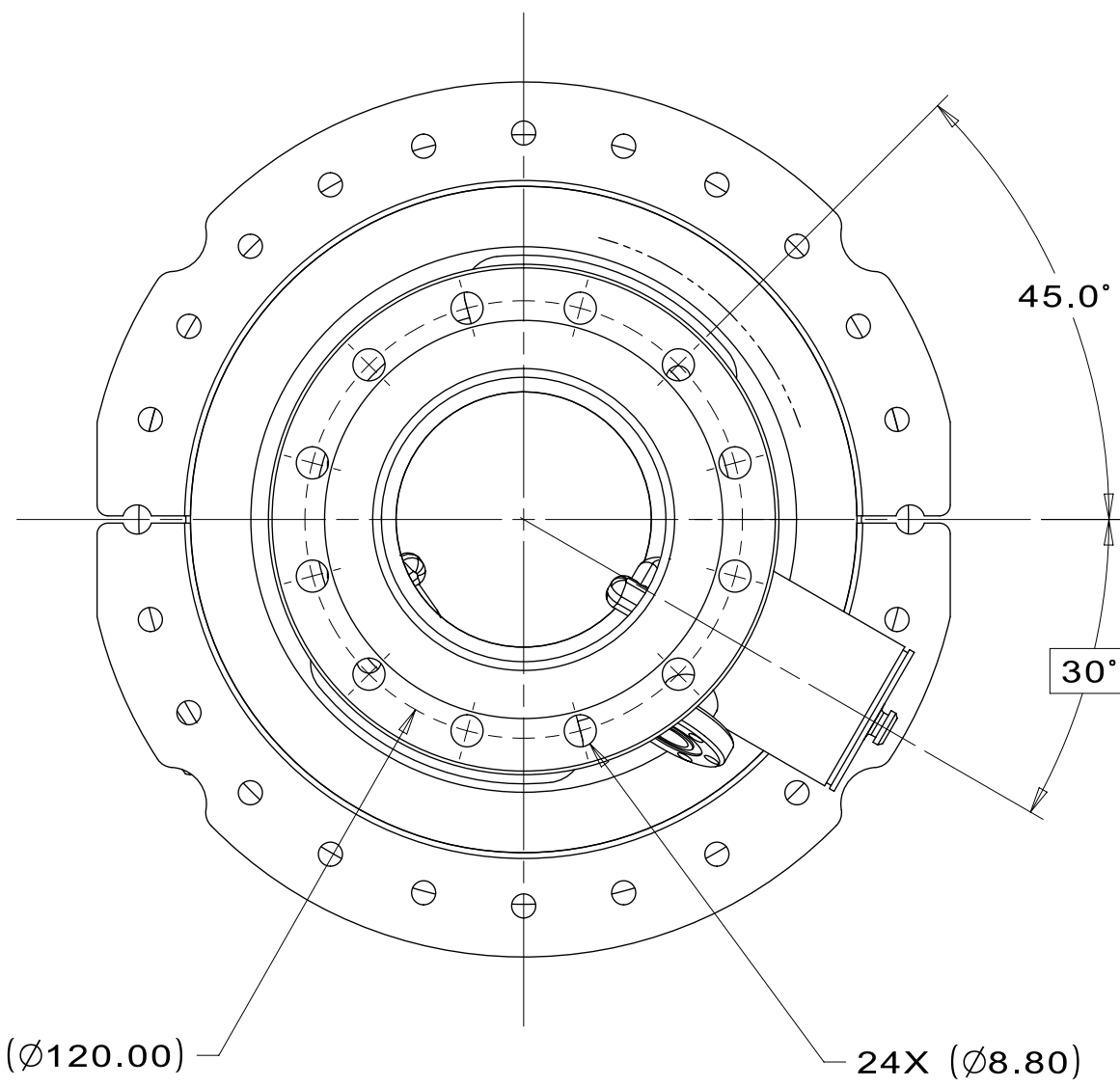
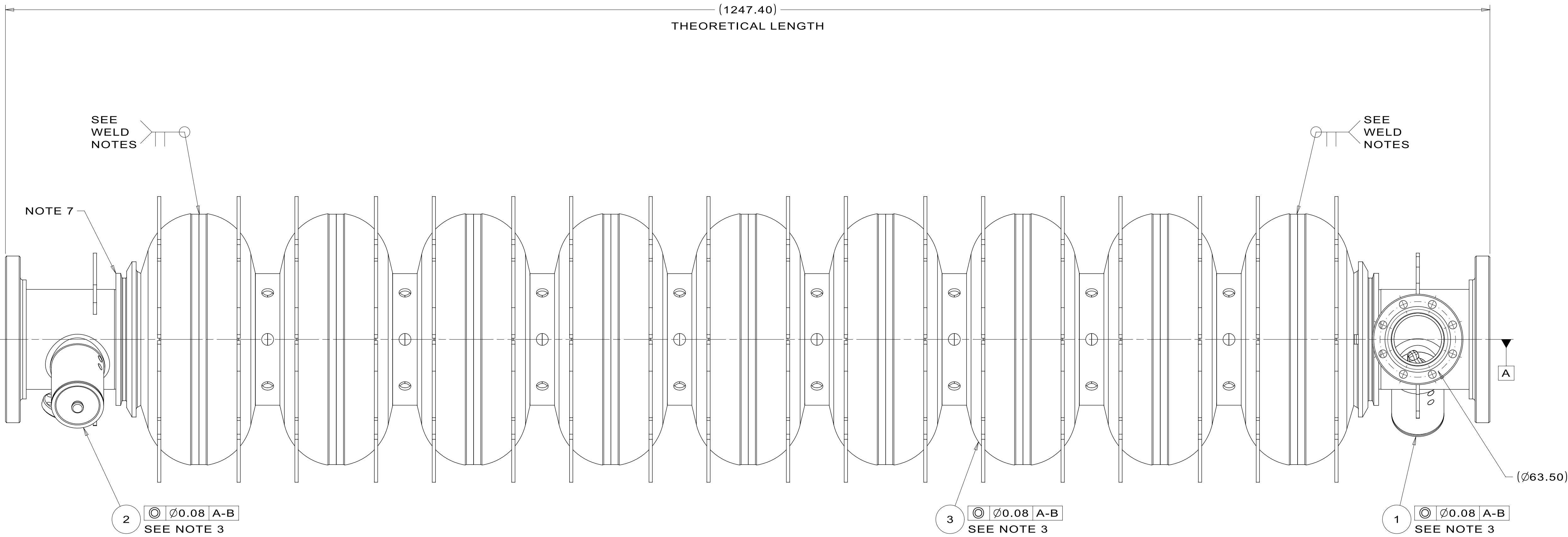
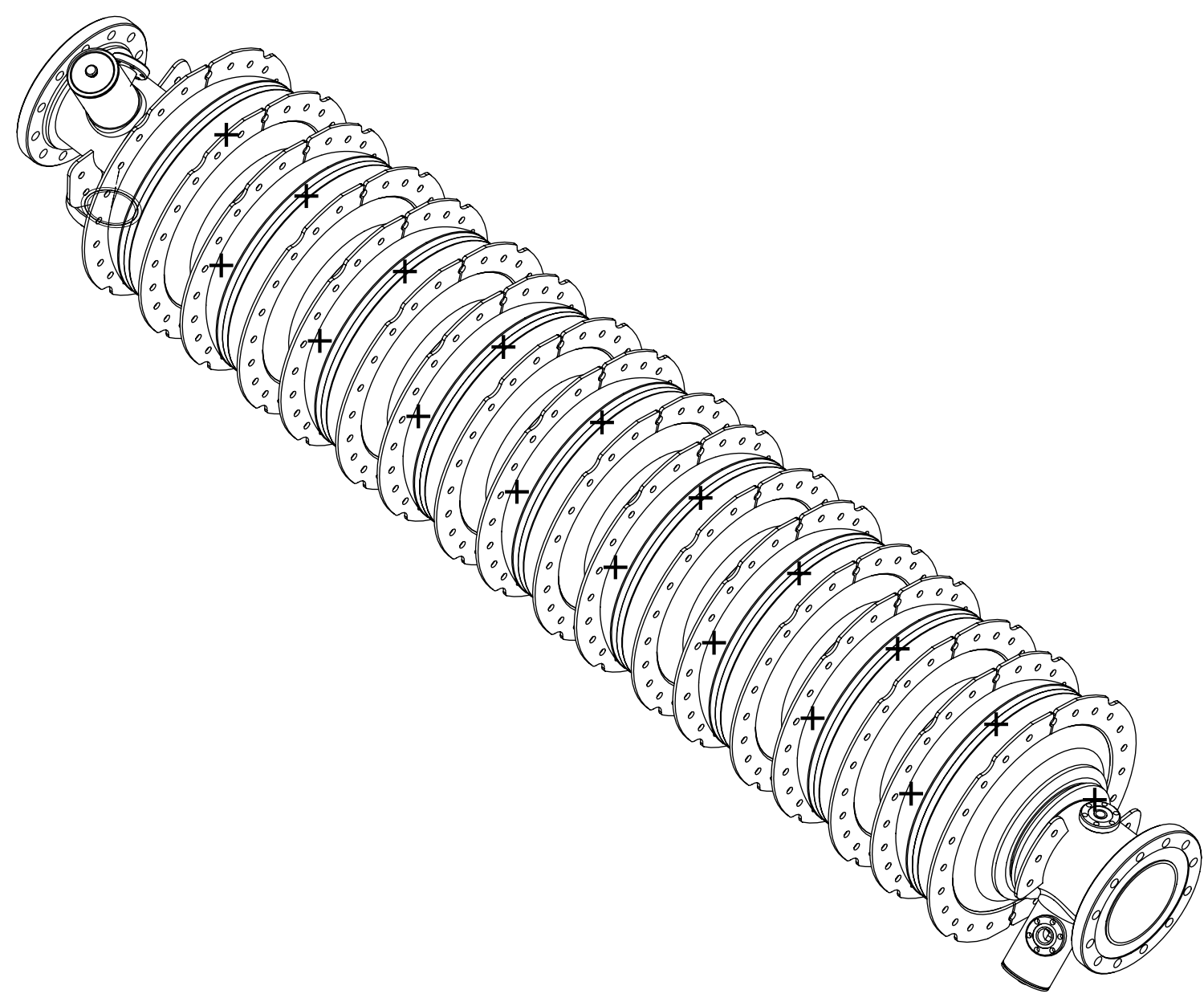
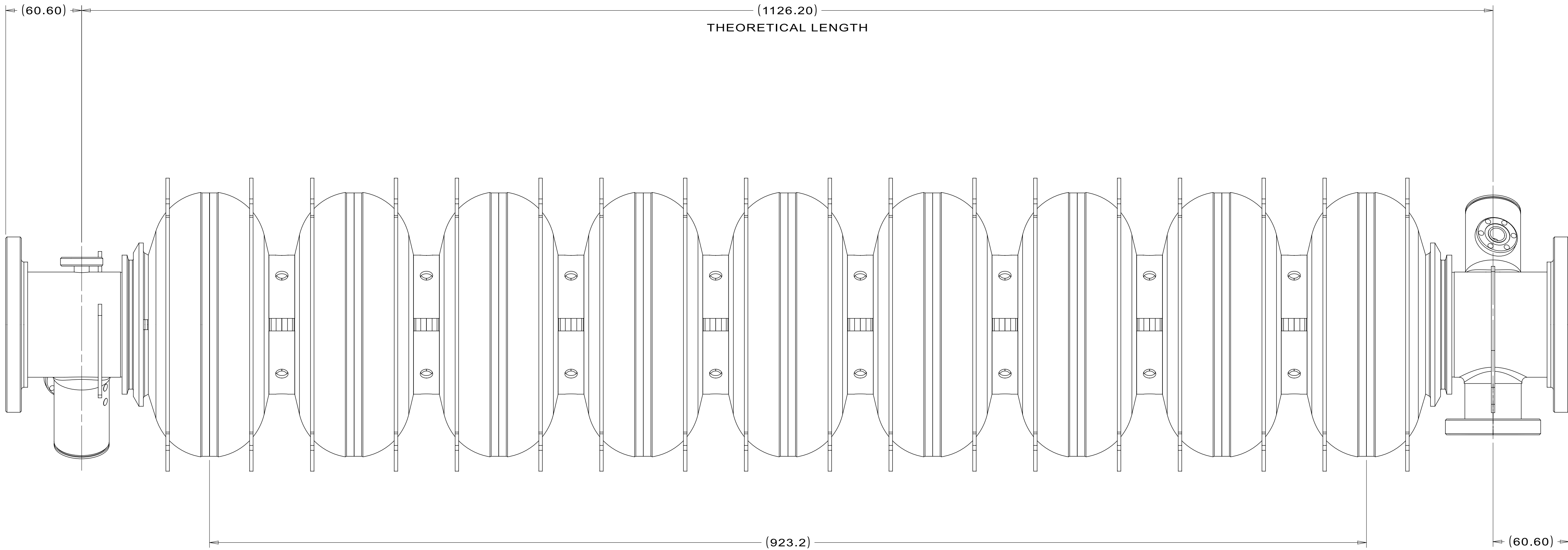




NOTES (UNLESS OTHERWISE SPECIFIED):

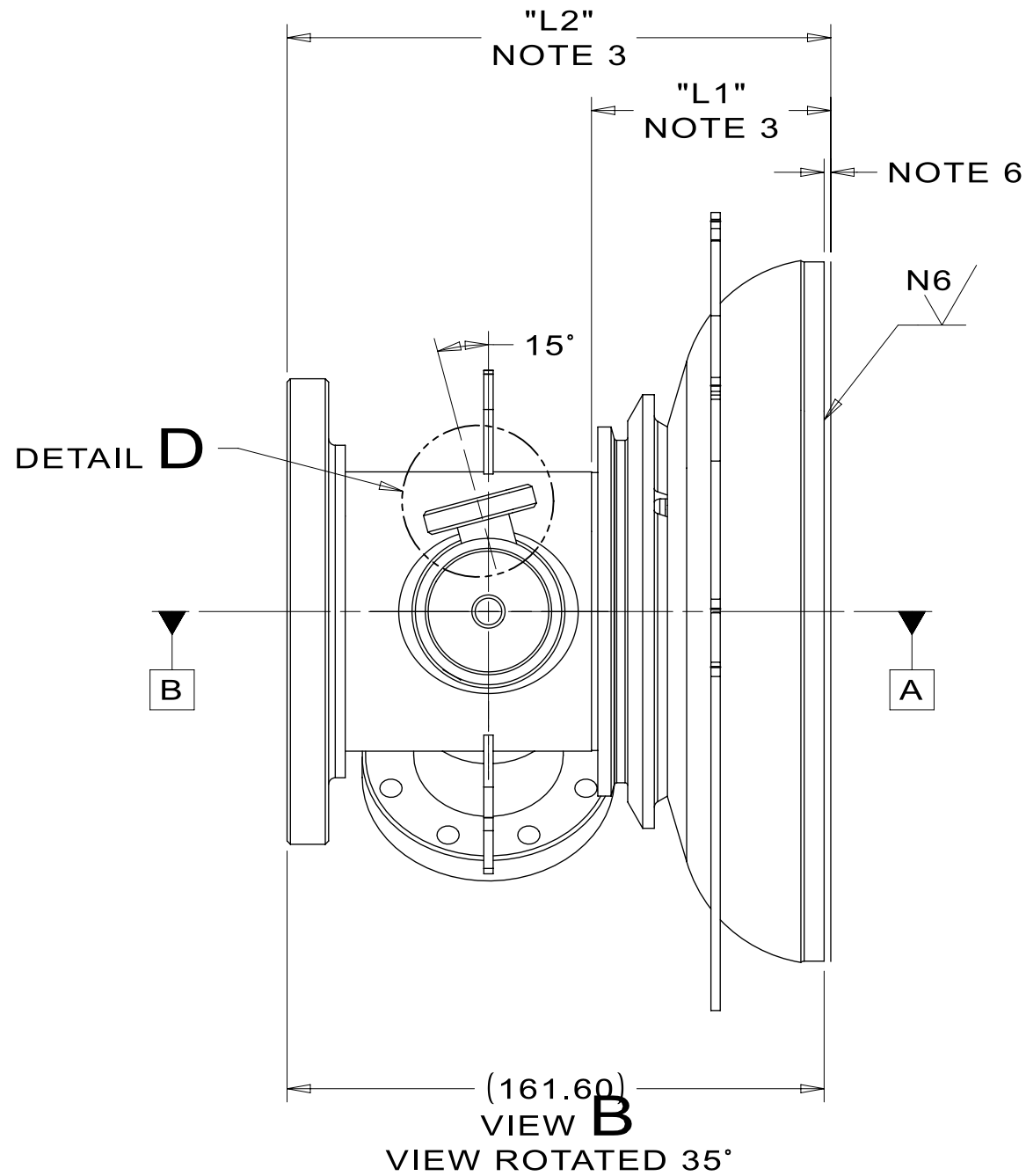
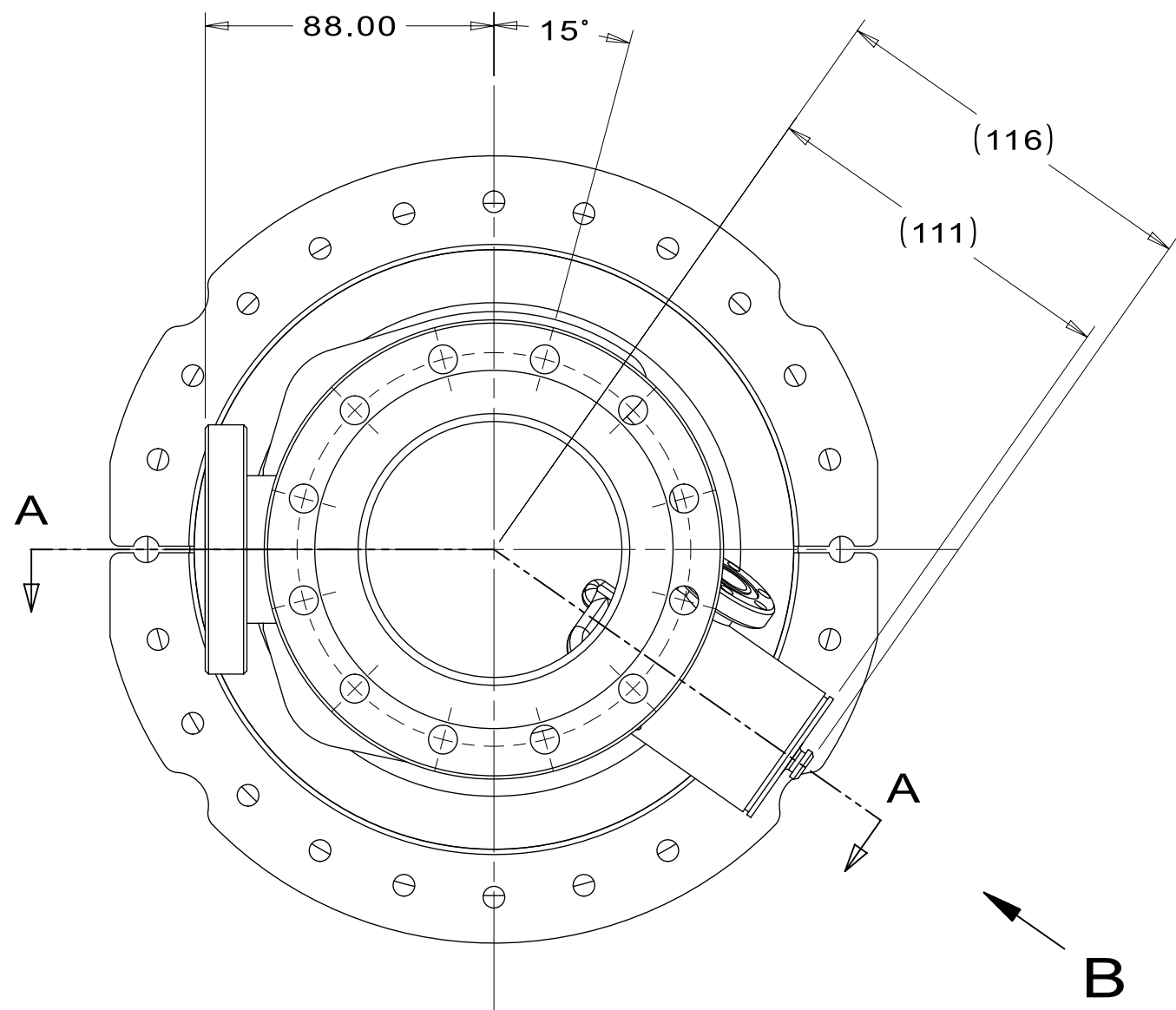
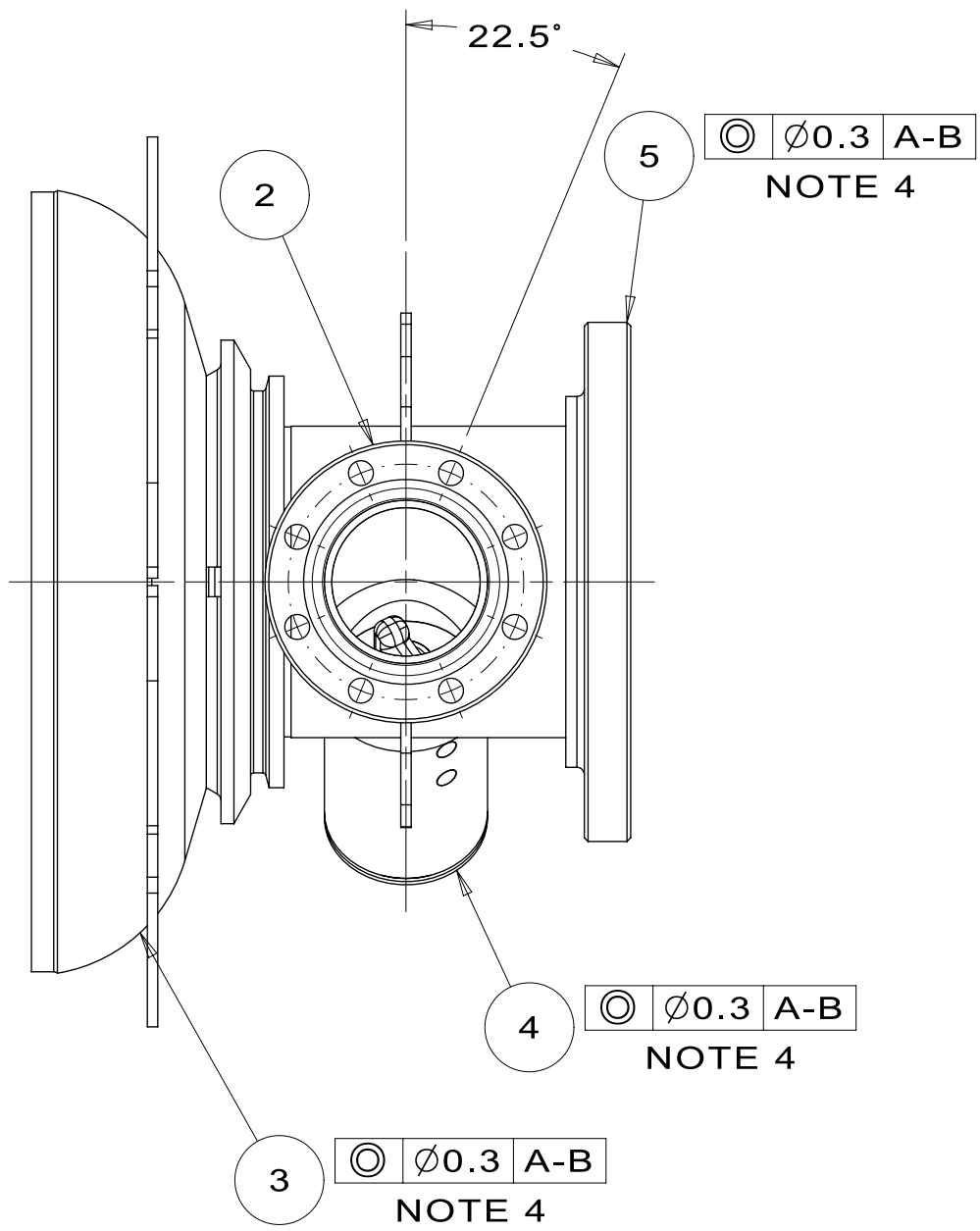
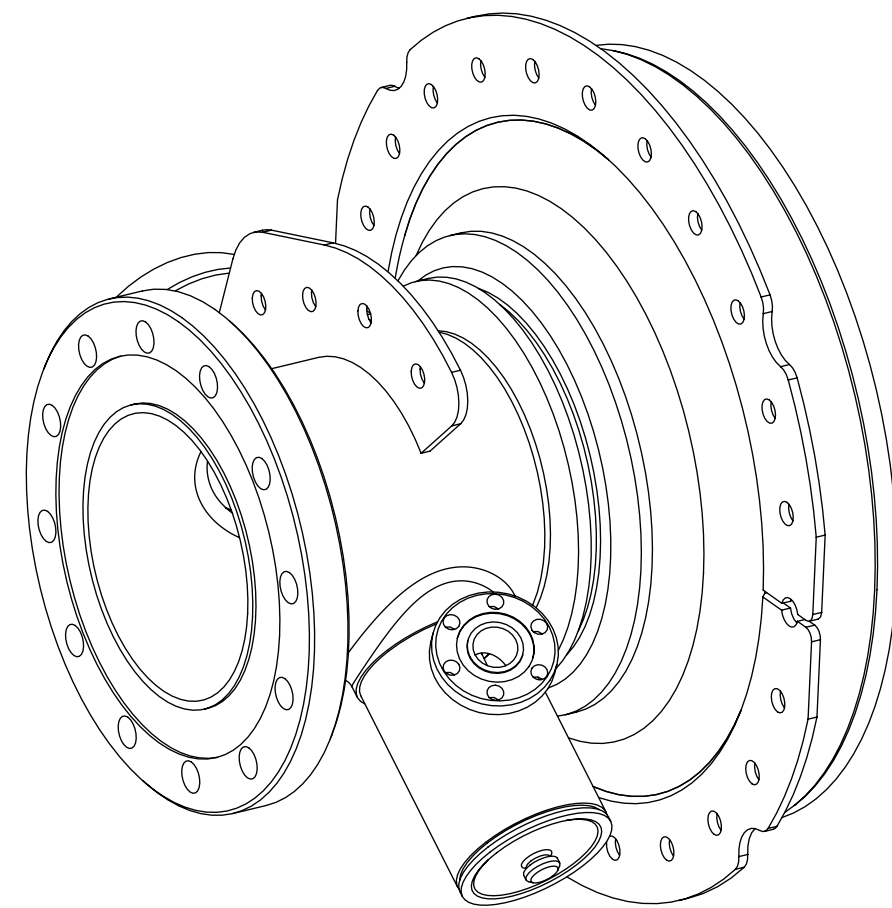
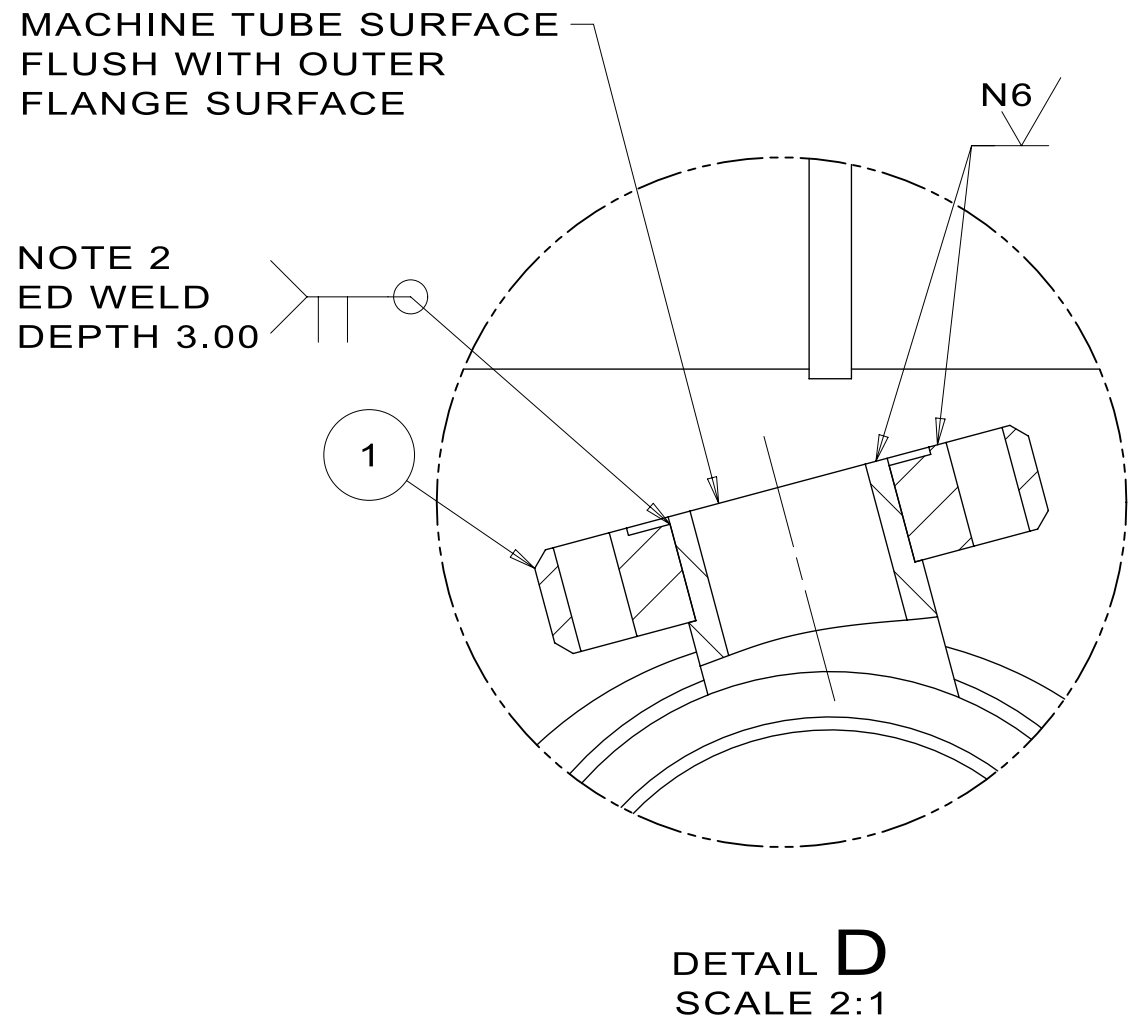
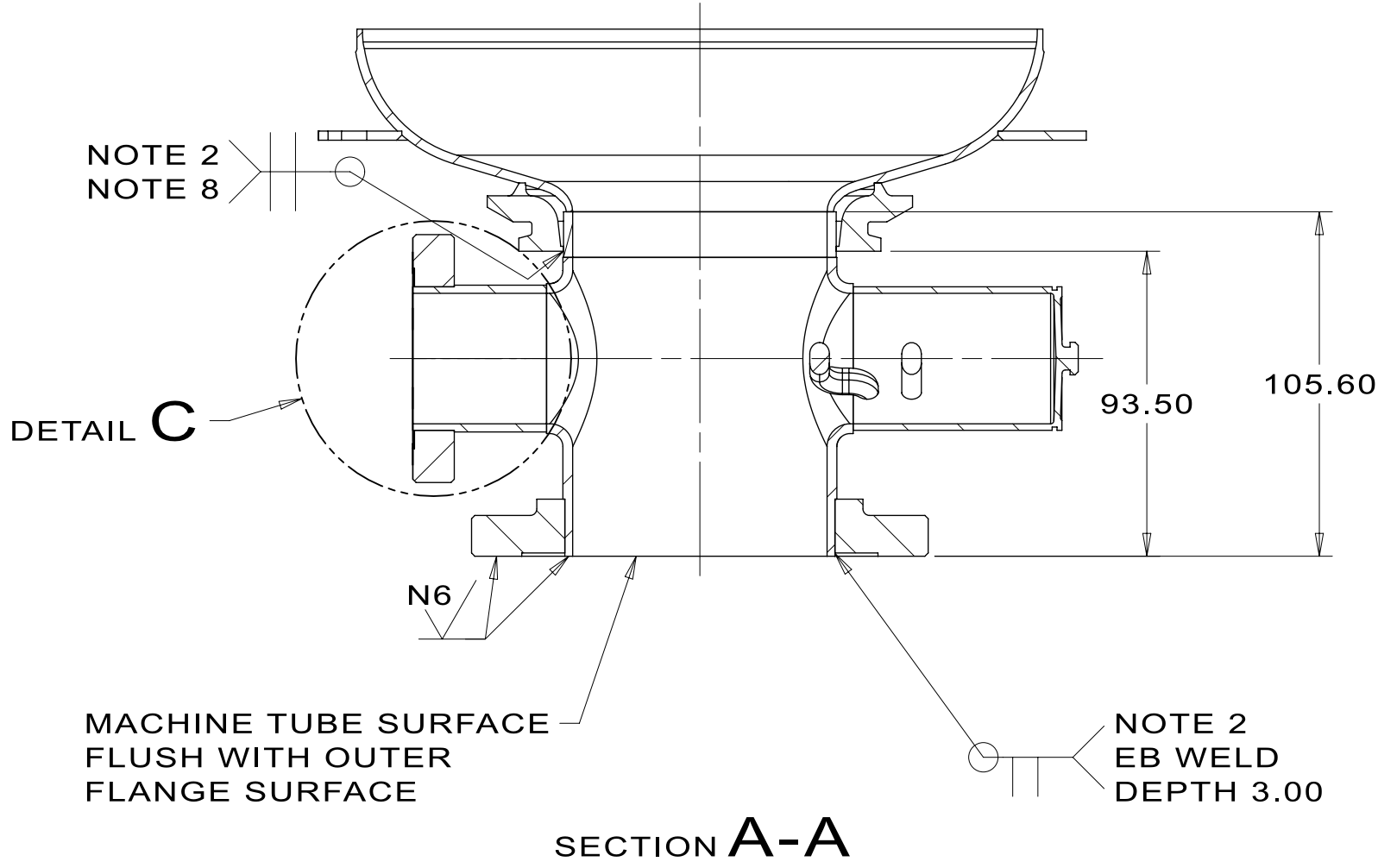
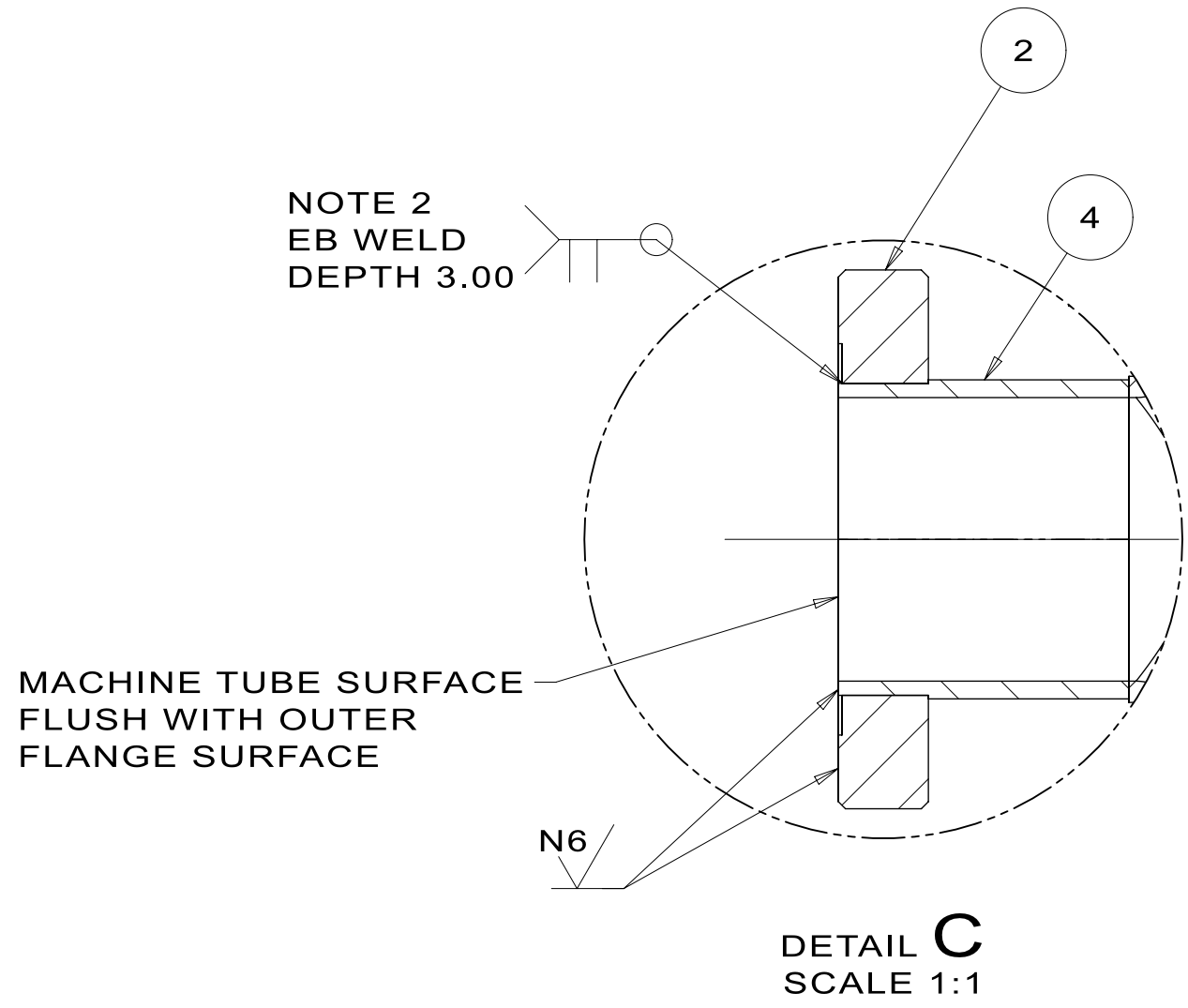
- WELDMENT TO BE FREE OF DUST , GREASE, OIL, CHIPS, AND BURRS.
- WELDING NOTES:
 - ASSEMBLY TO BE VACUUM TIGHT:
NO LEAK SHALL BE DETECTABLE ON THE MOST SENSITIVE SCALE OF A HELIUM MASS SPECTROMETER LEAK DETECTOR WITH A MINIMUM SENSITIVITY OF 2×10^{-10} ATM CC/SEC FOR HELIUM.
 - ASSEMBLY TO BE CLEANED, AND PACKAGED SO AS TO ASSURE NO CONTAMINATION FOR FOREIGN MATERIALS, METAL CHIPS, OR OTHER CONTAMINATES. CLEANING PROCEDURE TO BE APPROVED BY FERMILAB.
 - ALL DESIGN, ASSEMBLY, AND HANDLING IS TO CONFORM TO STANDARD ULTRA HIGH VACUUM PRACTICES.
 - ALL ELECTRON BEAM WELDING, ACID ETCHING, CLEANLINESS, AND HANDLING PROCEDURES ARE DETAILED IN DESY SPECIFICATION MHF-SL-1-1999 AND MUST BE FOLLOWED.
- THIS DEVICE IS EASILY DEFORMED. A FIXTURE IS REQUIRED FOR ALL HANDLING.
- ENSURE THAT THE CLOCKING OF THE SUB-ASSEMBLIES ARE HELD TO $\pm 0.5^\circ$.
- ITEMS 1, 2, AND 3 ARE TO BE CONCENTRIC WITHIN 0.4MM ALONG DATUMS A AND B.
- DEFINITION OF FORM AND TOLERANCES CONCERNING WELD JOINT PREPARATION AT THE IRIS AND THE EQUATOR TO BE COORDINATED BETWEEN MANUFACTURERS AND FNAL.
- PUNCH 4MM HIGH, 0.2MM DEEP SERIAL NUMBERS ON OUTWARD FACE OF P/N F10251541. REFER TO SPECIFICATION ED0046127 FOR NAMING CONVENTION.

3	F10251521	1.3GHz BARBELL WELDMENT ASSY ERDC	1
2	F10251519	LONG END HALF CELL ASSY ERDC	1
1	F10251517	SHORT HALF CELL ASSY 1.3GHz ERDC	1
ITEM	FERMI #	PART NAME	QTY

PARTS LIST

UNLESS OTHERWISE SPECIFIED:				DRAWN: M.WADE		DATE: 03-Sep-2025			FERMI NATIONAL ACCELERATOR LABORATORY UNITED STATES DEPARTMENT OF ENERGY					
1X	1X	1X	1X	CHECKED: J.COCHILL	DATE: 11-Mar-2026		APPROVED: J.F.HELSPER							
2	0.3	0.12	N/A	1"	DATE: 11-Mar-2026									
BREAK ALL SHOWN TO SCALE UNLESS OTHERWISE NOTED				DO NOT SCALE DRAWING				DIMENSIONS BASED ON ASME Y14.5M-2009				MAX UNCHISEL ALL SURFACES Ra: 3.2		
DRAWING DATE: 11/1/2025				THIRD ANGLE PROJECTION				MATERIAL: SEE PARTS LIST				GROUP: Technical Division - Design and Drafting		
CASE CODE: 0088				DATE: 11-Mar-2026				DATE: 11-Mar-2026				DATE: 11-Mar-2026		

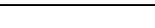
REV	REVISION CONTROL DOCUMENT	DATES	SIGNATURES
-	F10251517---RCD		DRAWN APPROVED



NOTES (UNLESS OTHERWISE SPECIFIED):

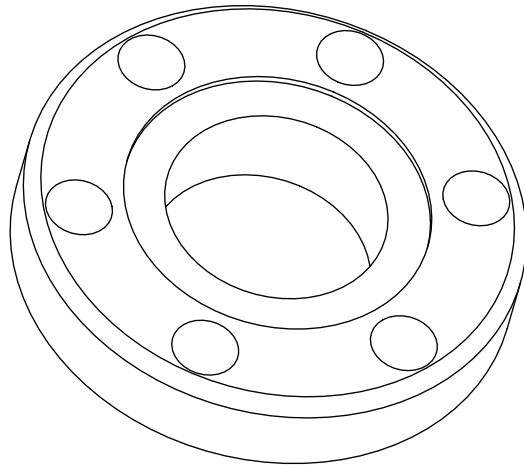
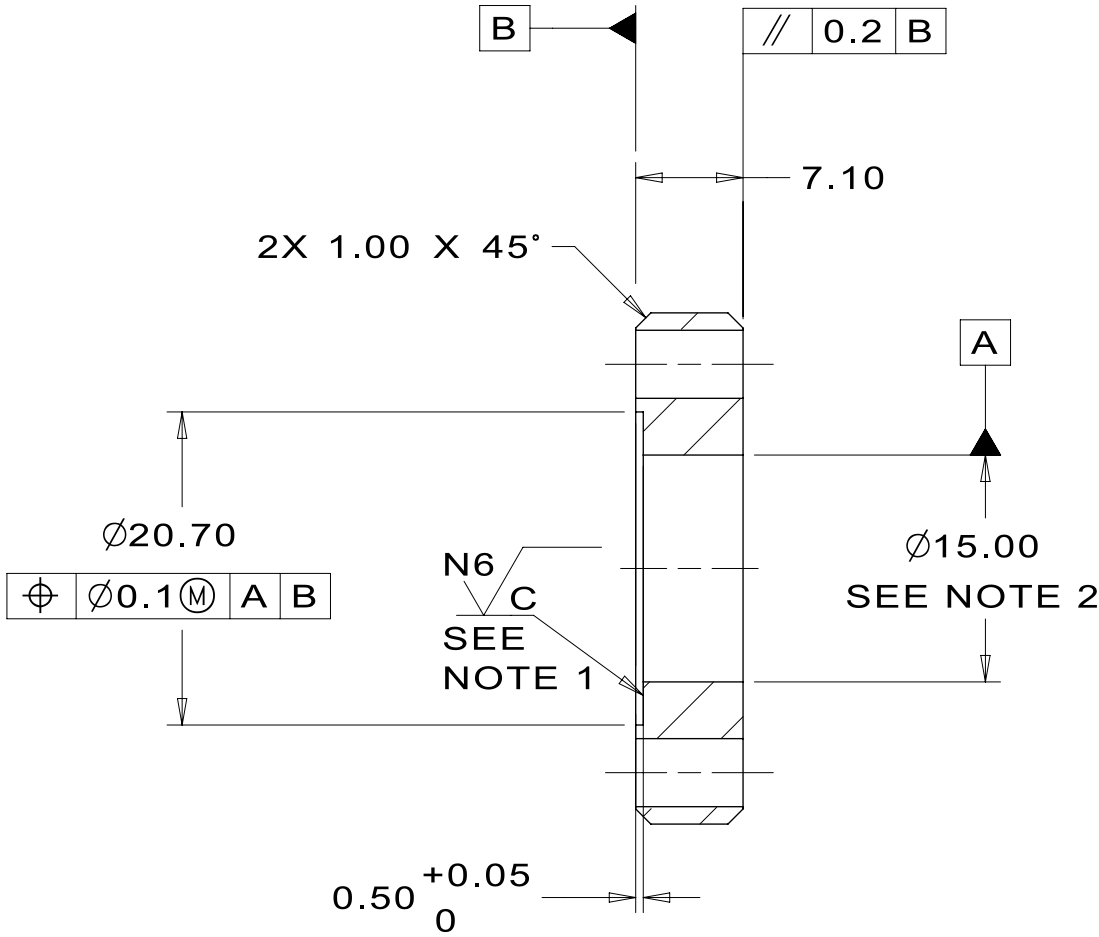
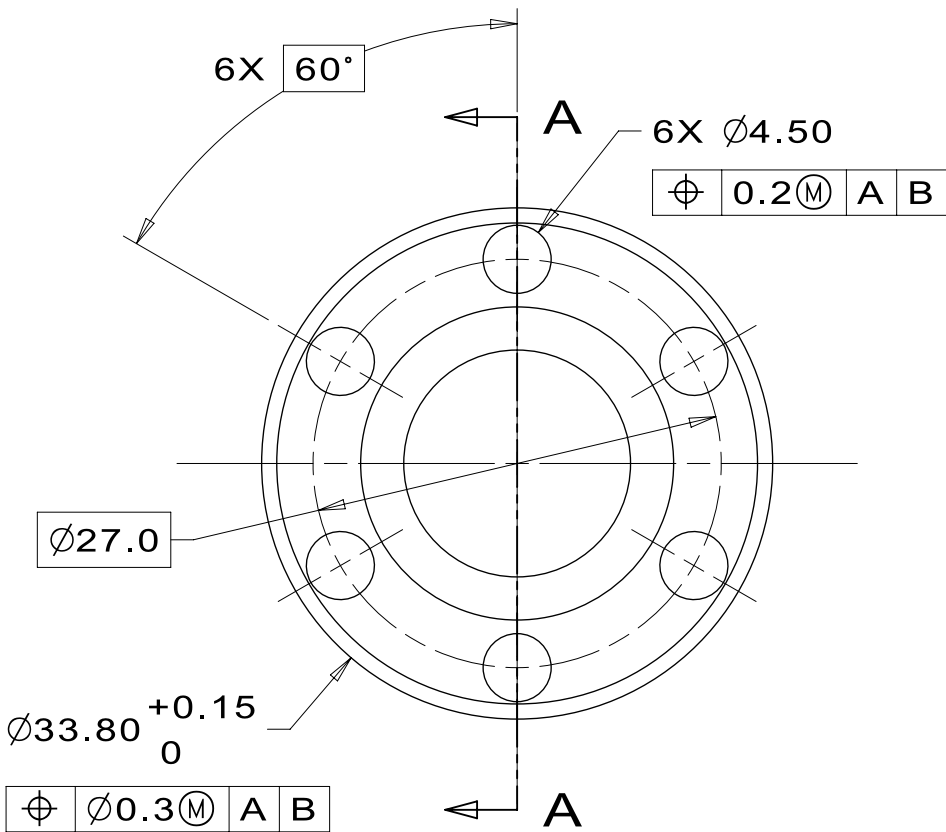
- WELDMENT TO BE FREE OF DUST , GREASE, OIL, CHIPS, AND BURRS.
- WELDING NOTES:
 - ASSEMBLY TO BE VACUUM TIGHT:
NO LEAK SHALL BE DETECTABLE ON THE MOST SENSITIVE SCALE OF A HELIUM MASS SPECTROMETER LEAK DETECTOR WITH A MINIMUM SENSITIVITY OF 2×10^{-10} ATM CC/SEC FOR HELIUM.
 - ASSEMBLY TO BE CLEANED, AND PACKAGED SO AS TO ASSURE NO CONTAMINATION FOR FOREIGN MATERIALS, METAL CHIPS, OR OTHER CONTAMINATES. CLEANING PROCEDURE TO BE APPROVED BY FERMILAB.
 - ALL DESIGN, ASSEMBLY, AND HANDLING IS TO CONFORM TO STANDARD ULTRA HIGH VACUUM PRACTICES.
 - ALL ELECTRON BEAM WELDING, ACID ETCHING, CLEANLINESS, AND HANDLING PROCEDURES ARE DETAILED IN DESY SPECIFICATION MHF-SL-1-1999 AND MUST BE FOLLOWED.
- DIMENSIONS L1 AND L2 ARE DEPENDENT ON A FREQUENCY MEASUREMENT. HALF CELL EQUATOR IS TO BE FINISHED TO FNAL SPECIFICATIONS RELATED TO SAID MEASUREMENT ALLOWING ADDITIONAL MATERIAL FOR WELD SHRINKAGE "S".
- ITEMS 3, 4 AND 5 ARE TO BE CONCENTRIC WITHIN $\varnothing 0.3$ MM ALONG DATUM A AND B.
- SEALING SURFACE MUST BE FREE OF SCRATCHES WITH NO RADIAL SCORING SURFACE MUST BE FREE OF DAMAGES.
- ADDITIONAL MATERIAL NEEDED FOR CELL TUNING PLUS ALLOWANCE FOR E-BEAM WELD SHRINKAGE. FINAL SURFACE TO BE MACHINED UNTIL TUNED.
- DO NOT BREAK EDGES ON END CELL.
- ELECTRON-BEAM WELD FROM BOTH SIDES TO ENSURE FULL PENETRATION AND OVERLAP FROM FULL JOINT CONSUMPTION.
- ALL DIMENSIONS WITH TRAILING ZEROS DENOTE TOLERANCE.

5	F10251527	1.3GHz NW78 BEAM FLANGE ERDC	1
4	F10251526	WELDMENT SHORT END TUBE 1.3GHz RF CAVITY 1	1
3	F10251524	WELDMENT SHORT END CELL 1.3GHz ERDC	1
2	F10251523	1.3GHz RF CAVITY NW 40 FLANGE	1
1	F10251522	1.3GHz RF CAVITY NW 12 FLANGE, END HOM, ERDC	1
ITEM	FERMI #	PART NAME	QTY

UNLESS OTHERWISE SPECIFIED					DRAWN		M.WADE		DATE		03-Sep-2025				FERMI NATIONAL ACCELERATOR LABORATORY UNITED STATES DEPARTMENT OF ENERGY												
1X					1X		1X		1X		1X								CHECKED		J.COGHILL		DATE		11-Mar-2026		
2					0.3		0.12		N/A		1"								APPROVED		J.F.HELSPER		DATE		11-Mar-2026		
BREAK ALL SHARP EDGES, MAX: 0.5 DO NOT SCALE DRAWING DIMENSIONS BASED ON: ASME Y14.5M-2009 MAX MACHINE ALL SURFACES, Ra: 3.2 DRAWING UNITS: MM												F10251514				NAME		SHORT HALF CELL ASSY 1.3GHz ERDC 1									
												MATERIAL				SEE PARTS LIST		SCALE		SIZE		DRAWING NUMBER		SHEET		REV	
THIRD ANGLE PROJECTION												GROUP: Technical Division - Design and Drafting				CAGE CODE: OUSR8		1:2		A1		F10251517		1 of 1 -			

DESCRIPTION: 1.3GHz RF CAVITY NW 12 FLANGE, END HOM, ERDC
PROJECT: IARC_ERDC1_3GHzCryostat
CATEGORY: FLANGE

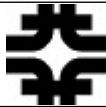
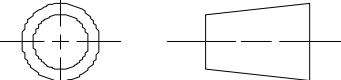
REV	REVISION CONTROL DOCUMENT	DATES	SIGNATURES	
-	F10251522---RCD		DRAWN	
			APPROVED	



SECTION A-A

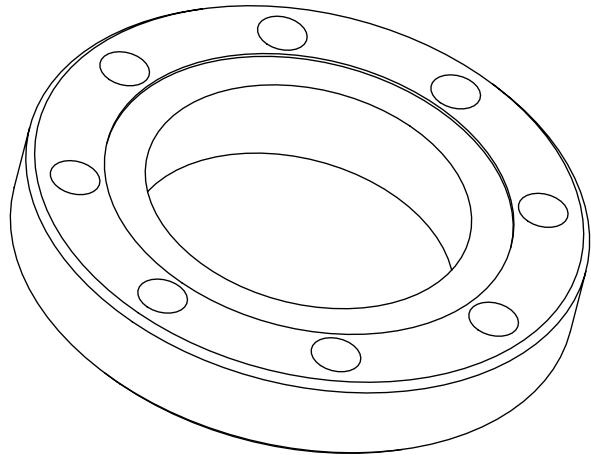
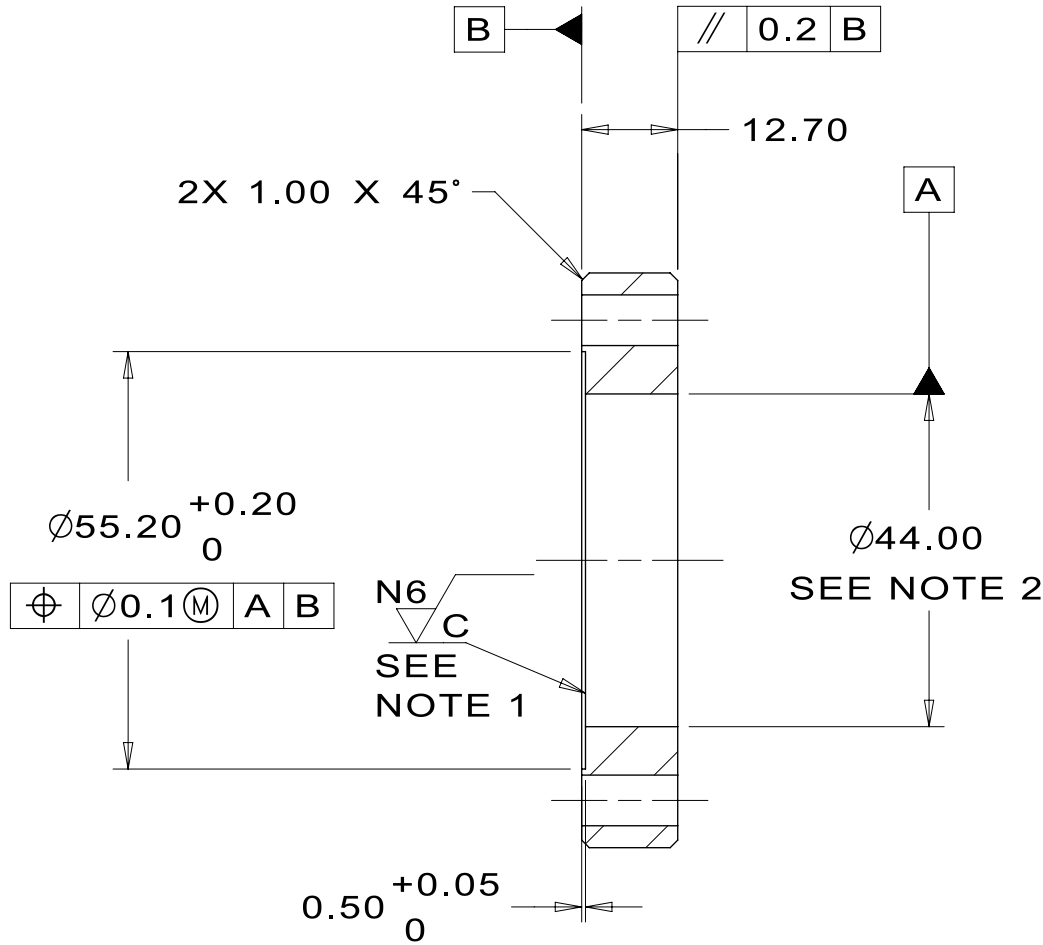
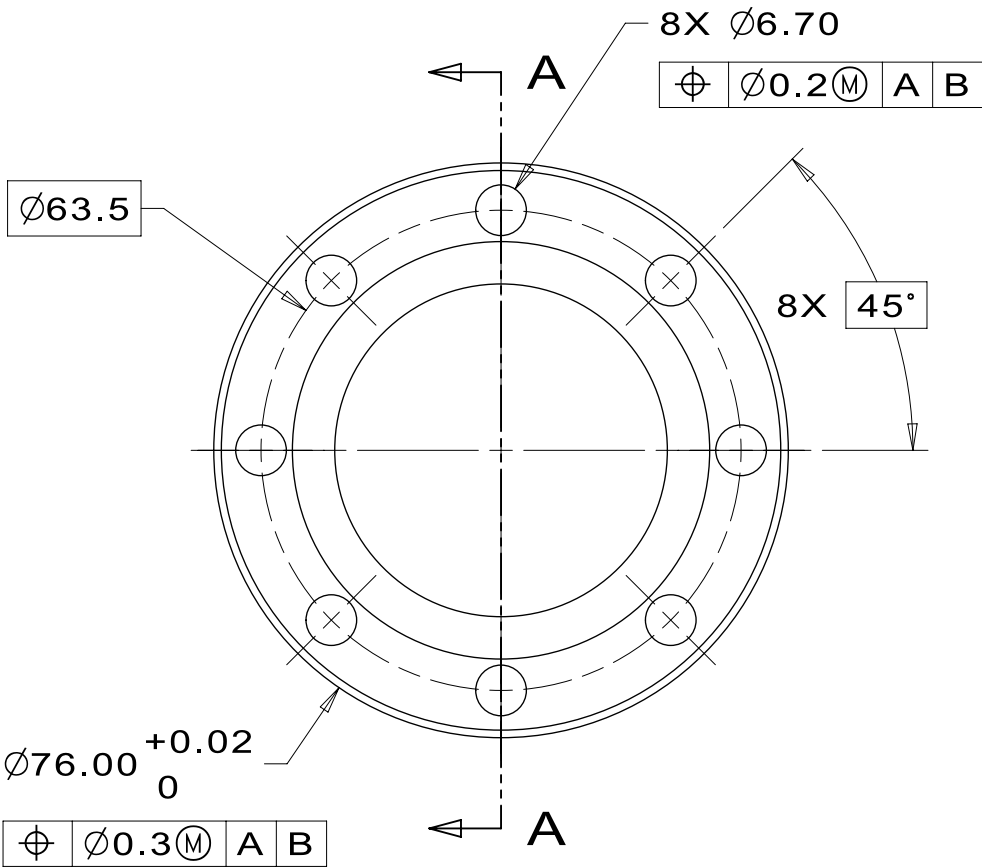
NOTES (UNLESS OTHERWISE SPECIFIED):

- SEALING SURFACE MUST BE FREE OF SCRATCHES WITH NO RADIAL SCORING.
- DIMENSION CORRESPONDS WITH PART NUMBER F10251547. TOLERANCE IS TO BE COORDINATED BETWEEN MANUFACURERS AND EB-WELDERS.
- USE PRIMARY MILLIMETER DIMENSIONS TO MAKE PART. [INCHES] SHOWN FOR REFERENCE.
- TRAILING ZEROS DENOTE TOLERANCE.

UNLESS OTHERWISE SPECIFIED					DRAWN	M.WADE		DATE	28-Aug-2025			FERMI NATIONAL ACCELERATOR LABORATORY UNITED STATES DEPARTMENT OF ENERGY			
±X	±X.X	±X.XX	±X/X	±X*	CHECKED	J.COGHILL		DATE	11-Mar-2026						
2	0.3	0.12	N/A	1*	APPROVED	J F.HELSPER		DATE	11-Mar-2026						
BREAK ALL SHARP EDGES, MAX: 0.5 DO NOT SCALE DRAWING DIMENSIONS BASED ON: ASME Y14.5M-2009 MAX MACHINE ALL SURFACES, Ra: 3.2 DRAWING UNITS: MM  THIRD ANGLE PROJECTION					USED ON						NAME				
					F10251517, F10251519						1.3GHz RF CAVITY NW 12 FLANGE, END HOM, ERDC				
					MATERIAL						SCALE				SIZE
Nb55TI						2:1				A3	F10251522		1 OF 1	-	
GROUP: Technical Division - Design and Drafting					CAGE CODE: OU5R6										

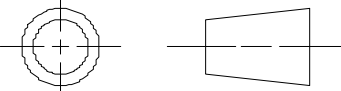
DESCRIPTION: 1.3GHz RF CAVITY NW 40 FLANGE
PROJECT: IARC_ERDC1_3GHzCryostat
CATEGORY: FLANGE

REV	REVISION CONTROL DOCUMENT	DATES	SIGNATURES	
-	F10251523---RCD		DRAWN	
			APPROVED	

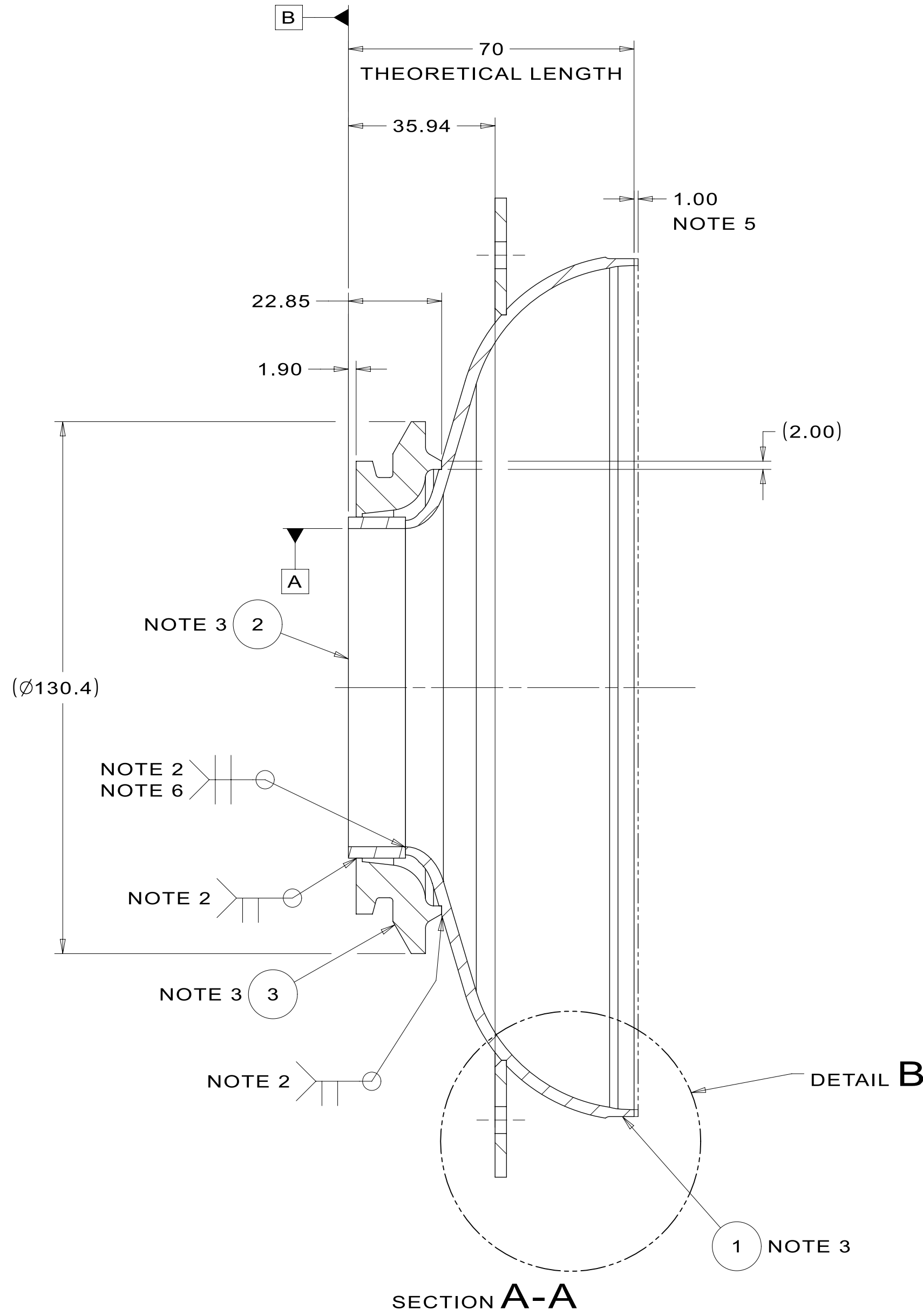
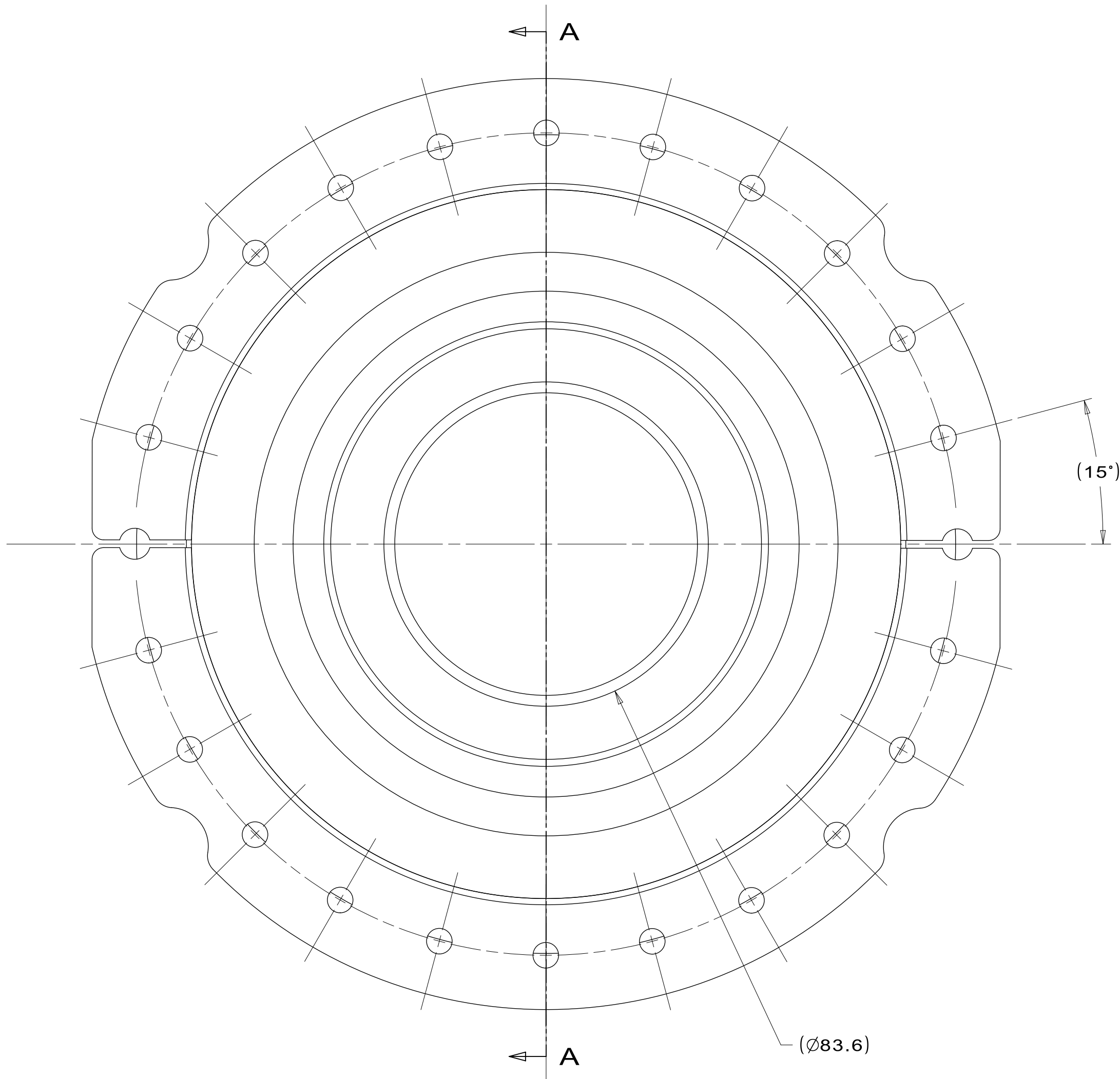


NOTES (UNLESS OTHERWISE SPECIFIED):

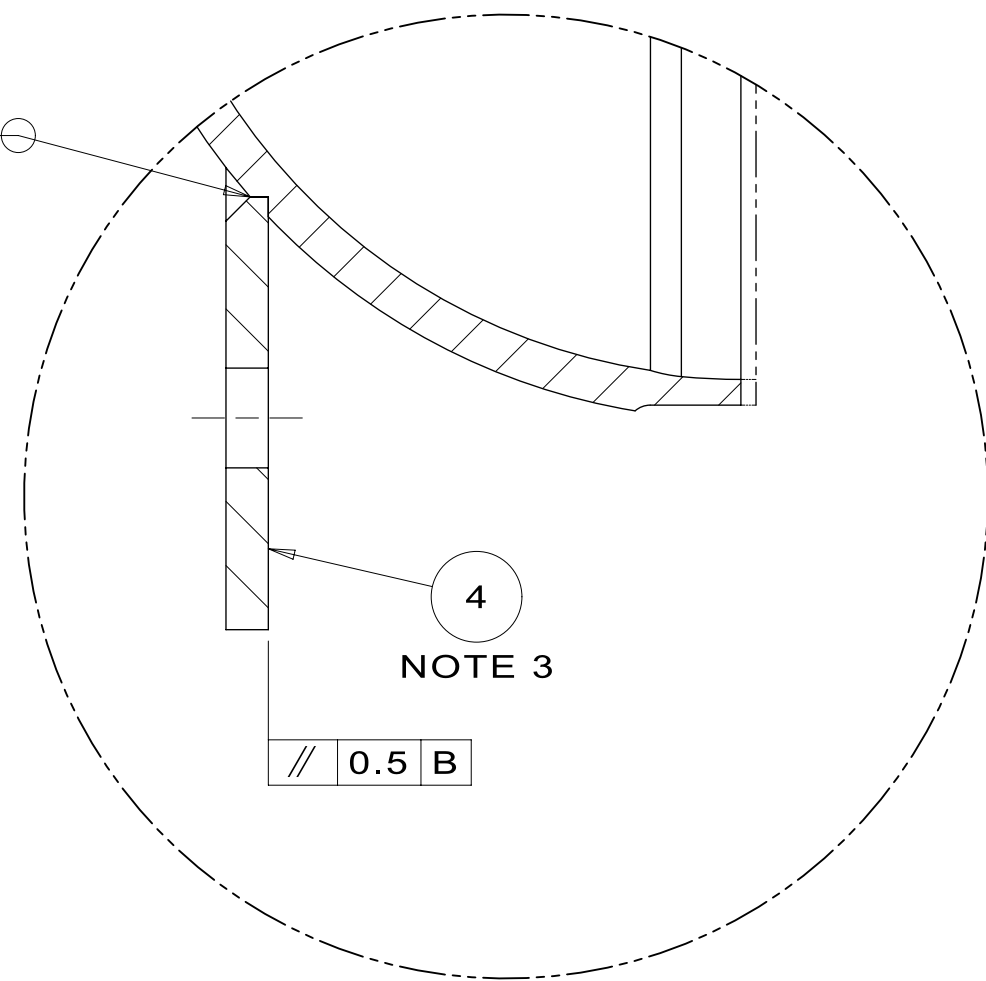
- SEALING SURFACE MUST BE FREE OF SCRATCHES WITH NO RADIAL SCORING.
- DIMENSION CORRESPONDS WITH PART NUMBER F10251543. TOLERANCE IS TO BE COORDINATED BETWEEN MANUFACURERS AND EB-WELDERS.
- TRAILING ZEROS DENOTE TOLERANCE.

UNLESS OTHERWISE SPECIFIED					DRAWN	M.WADE	DATE	28-Aug-2025		FERMI NATIONAL ACCELERATOR LABORATORY UNITED STATES DEPARTMENT OF ENERGY								
±X	±X.X	±X.XX	±X/X	±X*	CHECKED	J.COGHILL	DATE	11-Mar-2026										
2	0.3	0.12	N/A	1*	APPROVED	J F.HELSPER	DATE	11-Mar-2026										
BREAK ALL SHARP EDGES, MAX: 0.5 DO NOT SCALE DRAWING DIMENSIONS BASED ON: ASME Y14.5M-2009 MAX MACHINE ALL SURFACES, Ra: 3.2 DRAWING UNITS: MM  THIRD ANGLE PROJECTION					USED ON				NAME 1.3GHz RF CAVITY NW 40 FLANGE									
					F10251517													
					MATERIAL				Nb55Ti				SCALE 1:1		SIZE A3	DRAWING NUMBER F10251523	SHEET 1 OF 1	REV -
					GROUP: Technical Division - Design and Drafting				CAGE CODE: OU5R6									

REV	REVISION CONTROL DOCUMENT	DATES	SIGNATURES	
-	F10251524---RCD		DRAWN	
			APPROVED	



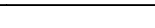
0.8-1.2 MM
PENETRATION MIN



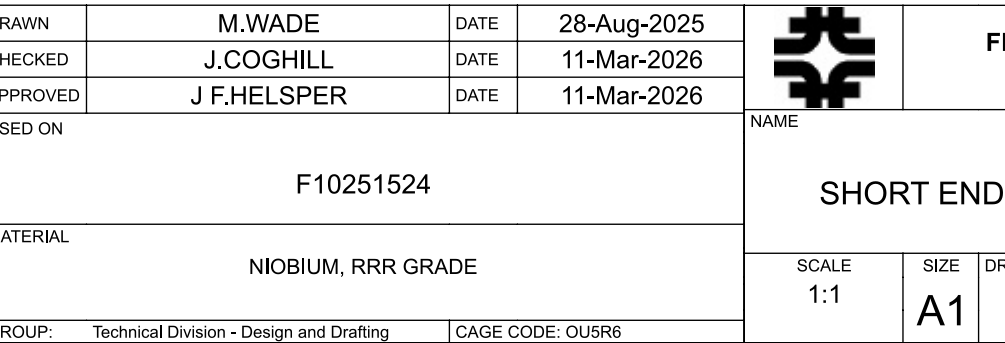
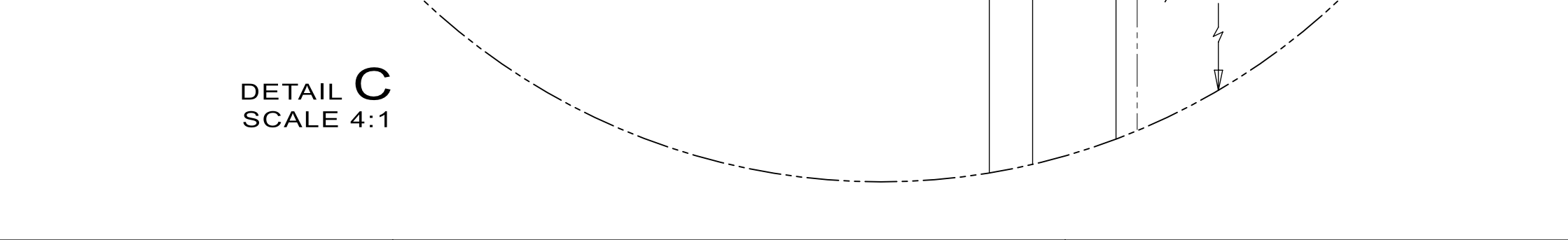
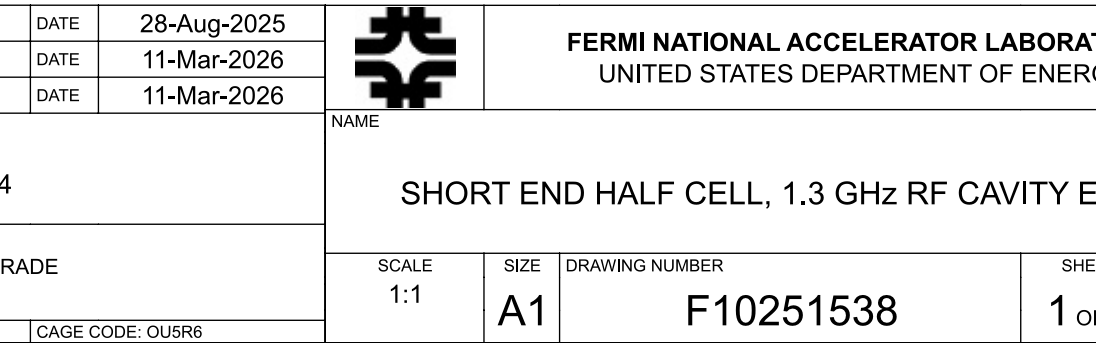
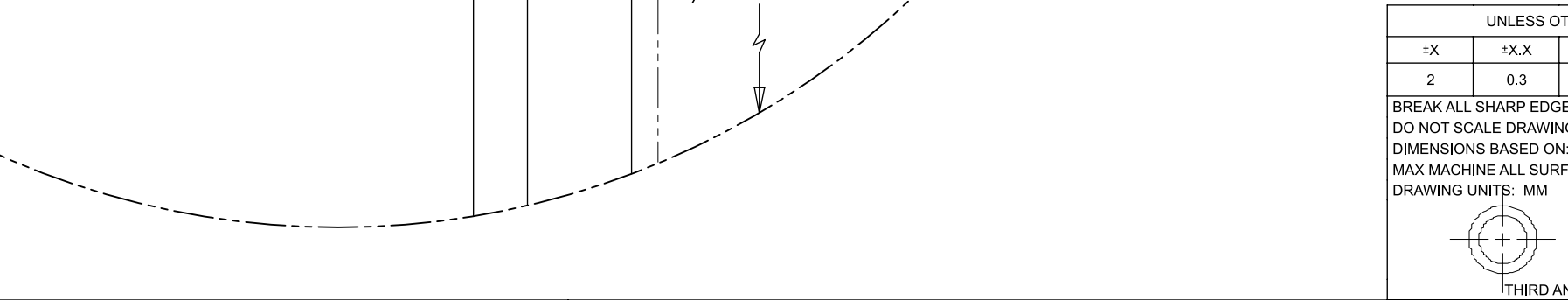
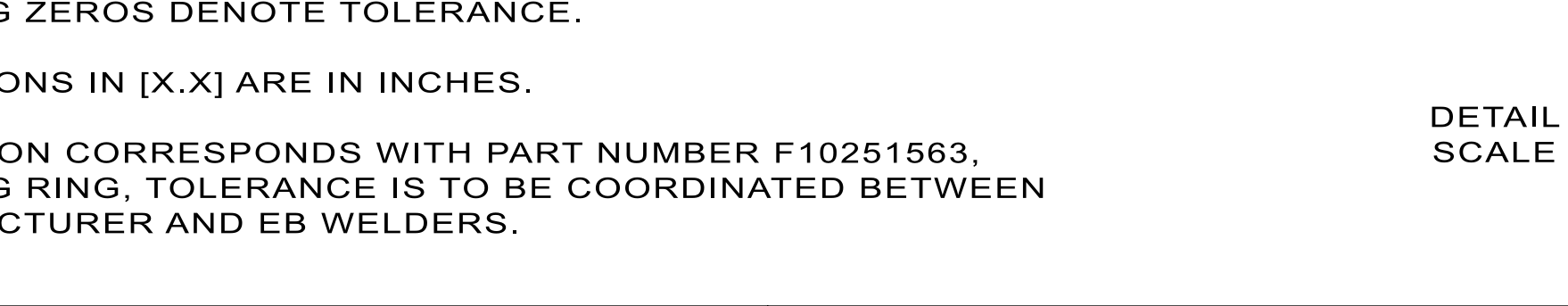
NOTES (UNLESS OTHERWISE SPECIFIED):

- WELDMENT TO BE FREE OF DUST , GREASE, OIL, CHIPS, AND BURRS.
- WELDING NOTES:
 - ASSEMBLY TO BE VACUUM TIGHT:
NO LEAK SHALL BE DETECTABLE ON THE MOST SENSITIVE SCALE OF A HELIUM MASS SPECTROMETER LEAK DETECTOR WITH A MINIMUM SENSITIVITY OF 2×10^{-10} ATM CC/SEC FOR HELIUM.
 - ASSEMBLY TO BE CLEANED, AND PACKAGED SO AS TO ASSURE NO CONTAMINATION FOR FOREIGN MATERIALS, METAL CHIPS, OR OTHER CONTAMINATES. CLEANING PROCEDURE TO BE APPROVED BY FERMILAB.
 - ALL DESIGN, ASSEMBLY, AND HANDLING IS TO CONFORM TO STANDARD ULTRA HIGH VACUUM PRACTICES.
 - ALL ELECTRON BEAM WELDING, ACID ETCHING, CLEANLINESS, AND HANDLING PROCEDURES ARE DETAILED IN DESY SPECIFICATION MHF-SL-1-1999 AND MUST BE FOLLOWED.
- ALL PARTS TO BE CONCENTRIC WITHIN $\varnothing 0.3\text{mm}$.
- DO NOT BREAK EDGES ON END CELL.
- ADDITIONAL MATERIAL NEEDED FOR CELL TUNING. PLUS ALLOWANCE FOR E-BEAM WELD SHRINKAGE. FINAL SURFACE TO BE MACHINED UNTIL TUNED.
- WELD PREP JOINT TO MATCH WALL THICKNESS AT THE DISCRETION OF THE MANUFACTURER -- DUAL PASS WELD -- ENSURE OVERLAP.
- ALL DIMENSIONS WITH TRAILING ZEROS DENOTE TOLERANCE.

4	F10251563	CAVITY COOLING RING, ERDC	2
3	F10251541	END DISK FLANGE, 1.3GHz RF CAVITY ERDC	1
2	F10251539	END TUBE SPOOL PIECE, 1.3GHz RF CAVITY ERDC	1
1	F10251538	SHORT END HALF CELL, 1.3 GHz RF CAVITY ERDC	1
ITEM	FERMI #	PART NAME	QTY
PARTS LIST			

UNLESS OTHERWISE SPECIFIED				DRAWN	M.WADE		DATE	02-Sep-2025			FERMI NATIONAL ACCELERATOR LABORATORY UNITED STATES DEPARTMENT OF ENERGY		
±X	±X.X	±X.XX	±X.X	CHECKED	J.COGHILL		DATE	11-Mar-2026					
2	0.3	0.12	N/A	APPROVED	J F.HELSPER		DATE	11-Mar-2026					
BREAK ALL SHARP EDGES, MAX: 0.5 DO NOT SCALE DRAWING DIMENSIONS BASED ON: ASME Y14.5M-2009 MAX MACHINE ALL SURFACES, Ra: 3.2 DRAWING UNITS: MM				USED ON		F10251517		NAME		WELDMENT SHORT END CELL 1.3GHz ERDC			
				MATERIAL		SEE PARTS LIST		SCALE 1:1					
THIRD ANGLE PROJECTION				GROUP: Technical Division - Design and Drafting		CAGE CODE: OUSR6		SIZE A1					
								DRAWING NUMBER F10251524		SHEET 1 of 1		REV -	

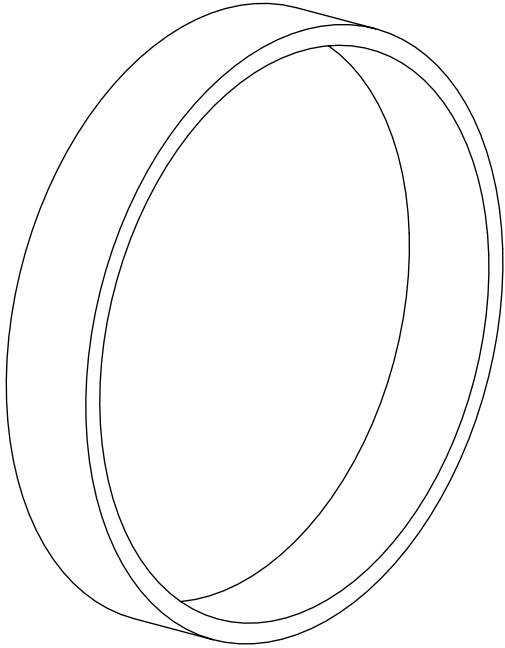
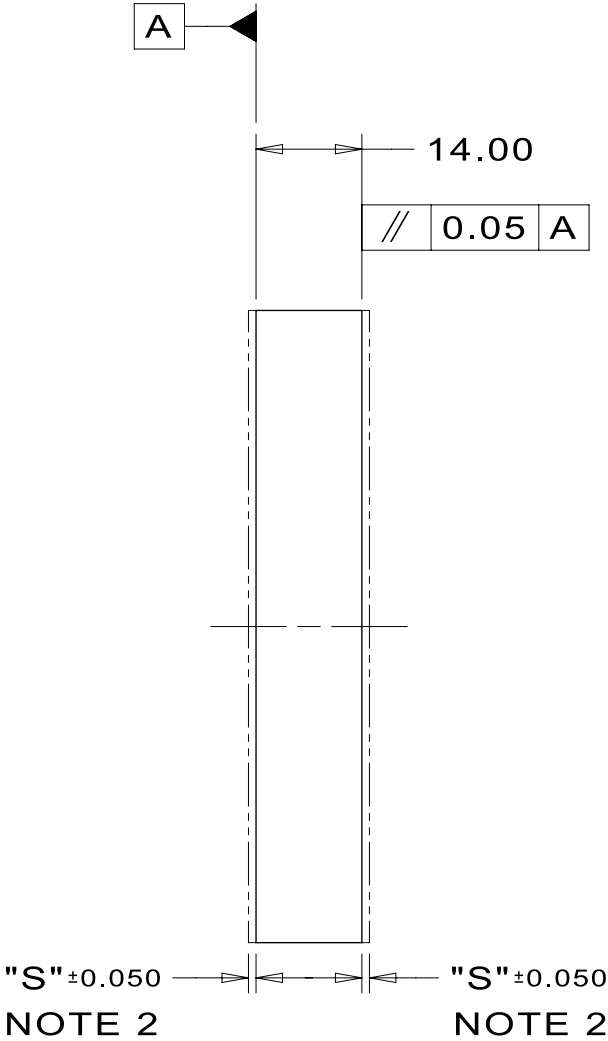
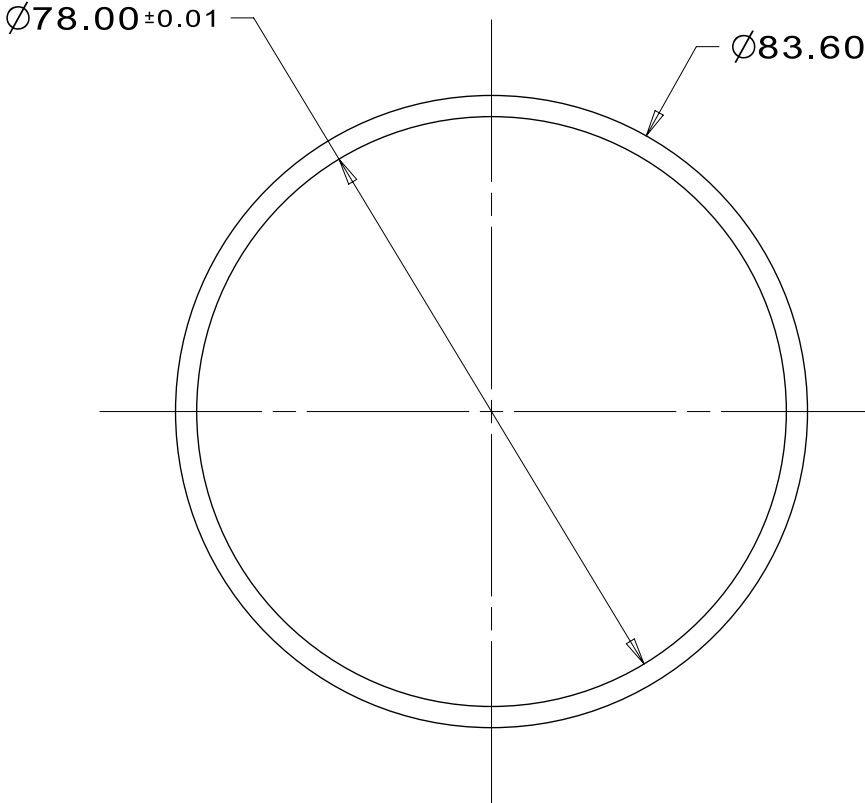
DATE	28-Aug-2025		FERMI NATIONAL ACCELERATOR LABORATORY UNITED STATES DEPARTMENT OF ENERGY						
DATE	11-Mar-2026								
DATE	11-Mar-2026								
NAME		SHORT END HALF CELL, 1.3 GHz RF CAVITY ERDC							
GRADE									
CAGE CODE 04SR6									
SCALE	1:1	SIZE	DRAWING NUMBER				SHEET	REV	
	A1	F10251538				1 of 1	-		



- 10) TRAILING ZEROS DENOTE TOLERANCE.
- 11) DIMENSIONS IN [X.X] ARE IN INCHES.
- 12) DIMENSION CORRESPONDS WITH PART NUMBER F10251563, COOLING RING, TOLERANCE IS TO BE COORDINATED BETWEEN MANUFACTURER AND EB WELDERS.

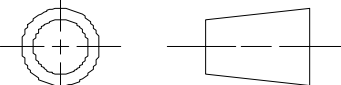
DESCRIPTION: END TUBE SPOOL PIECE, 1.3GHz RF CAVITY ERDC
PROJECT: IARC_ERDC1_3GHzCryostat
CATEGORY: SPOOL

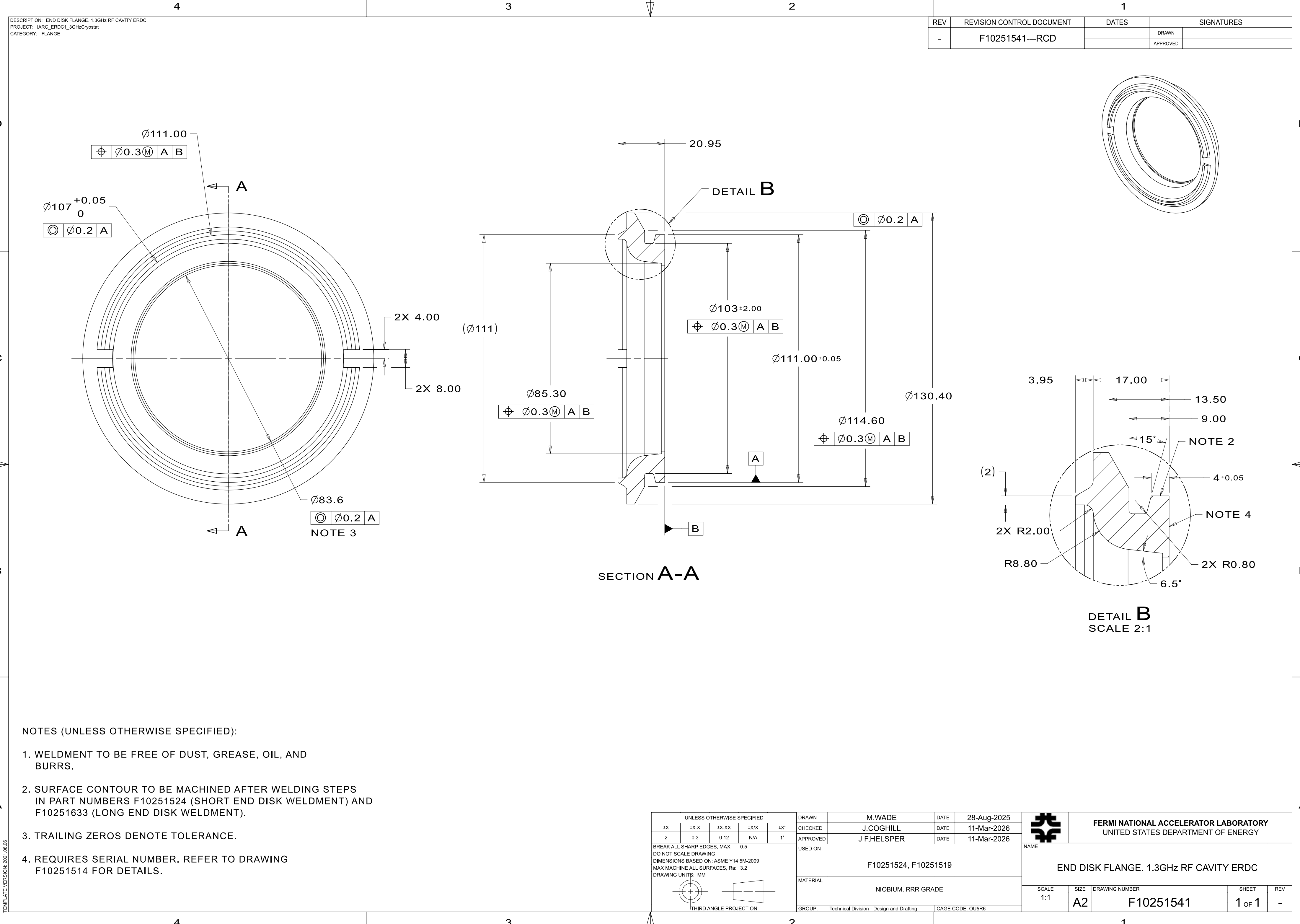
REV	REVISION CONTROL DOCUMENT	DATES	SIGNATURES	
-	F10251539---RCD		DRAWN	
			APPROVED	



NOTES (UNLESS OTHERWISE SPECIFIED):

1. SEALING SURFACE MUST BE FREE OF SCRATCHES WITH NO RADIAL SCORING
2. SUPPLEMENT FOR WELD SHRINKAGE ("S") TO BE DETERMINED BY E-BEAM WELDERS.
3. TRAILING ZEROS DENOTE TOLERANCE.

UNLESS OTHERWISE SPECIFIED					DRAWN	M.WADE		DATE	28-Aug-2025			FERMI NATIONAL ACCELERATOR LABORATORY UNITED STATES DEPARTMENT OF ENERGY			
±X	±X.X	±X.XX	±X/X	±X*	CHECKED	J.COGHILL		DATE	11-Mar-2026						
2	0.3	0.12	N/A	1*	APPROVED	J F.HELSPER		DATE	11-Mar-2026						
BREAK ALL SHARP EDGES, MAX: 0.5 DO NOT SCALE DRAWING DIMENSIONS BASED ON: ASME Y14.5M-2009 MAX MACHINE ALL SURFACES, Ra: 3.2 DRAWING UNITS: MM  THIRD ANGLE PROJECTION					USED ON		NAME								
					F10251524, F10251519										
					MATERIAL		END TUBE SPOOL PIECE, 1.3GHz RF CAVITY ERDC								
					NIOBIUM, RRR GRADE										
GROUP: Technical Division - Design and Drafting					CAGE CODE: OU5R6		SCALE 1:1	SIZE A3	DRAWING NUMBER F10251539		SHEET 1 OF 1	REV -			



TEMPLATE VERSION: 2021.08.06

A

B

C

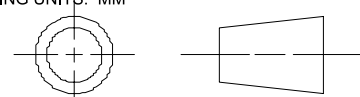
D

A

B

C

D

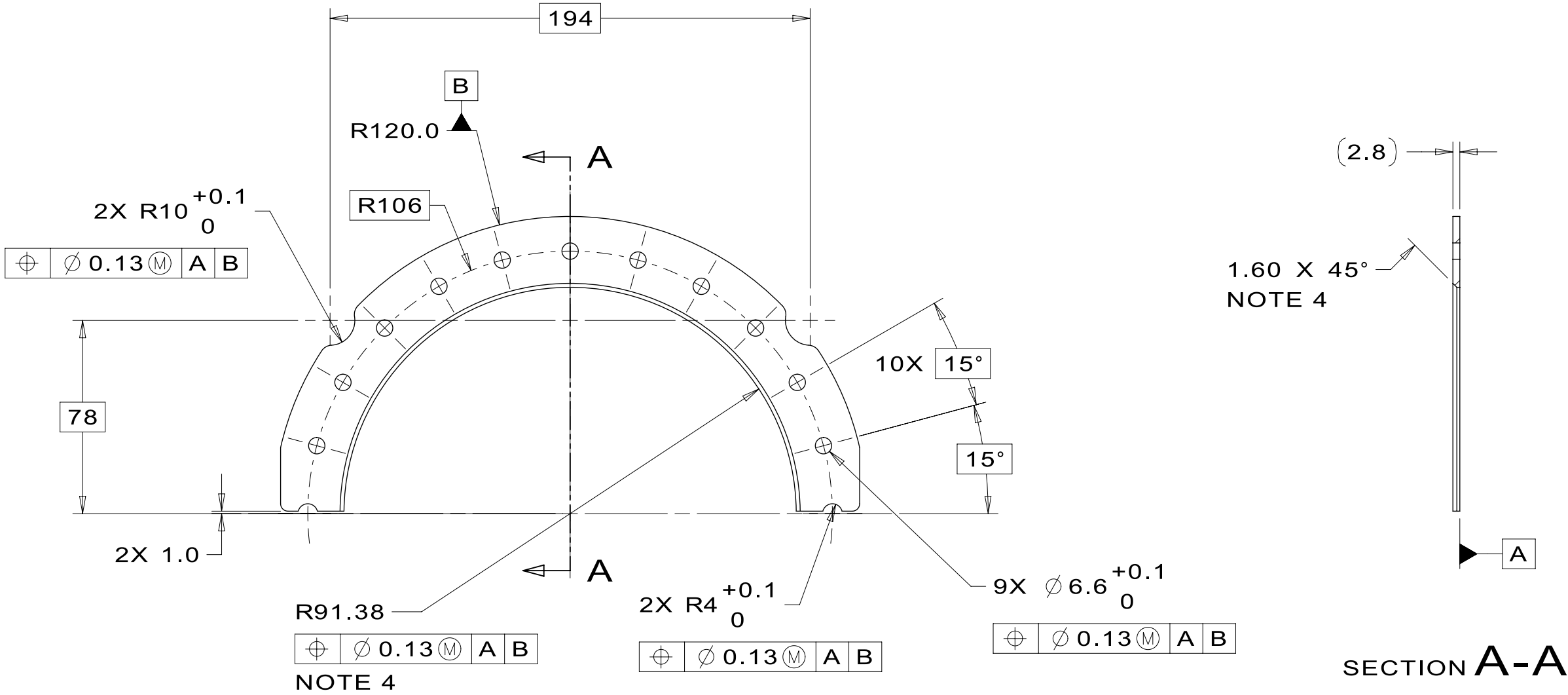
UNLESS OTHERWISE SPECIFIED					DRAWN	M.WADE		DATE	28-Aug-2025			FERMI NATIONAL ACCELERATOR LABORATORY UNITED STATES DEPARTMENT OF ENERGY			
±X	±X.X	±X.XX	±X/X	±X"	CHECKED	J.COHHILL		DATE	11-Mar-2026						
2	0.3	0.12	N/A	1"	APPROVED	J F.HELSPER		DATE	11-Mar-2026						
BREAK ALL SHARP EDGES, MAX: 0.5 DO NOT SCALE DRAWING DIMENSIONS BASED ON: ASME Y14.5M-2009 MAX MACHINE ALL SURFACES, Ra: 3.2 DRAWING UNITS: MM					USED ON					NAME					
 THIRD ANGLE PROJECTION					F10251524, F10251519					END DISK FLANGE. 1.3GHz RF CAVITY ERDC					
					MATERIAL										
					NIOBIUM, RRR GRADE										
GROUP: Technical Division - Design and Drafting					CAGE CODE: OUSR6					SCALE 1:1	SIZE A2	DRAWING NUMBER F10251541		SHEET 1 OF 1	REV -

4				3				2				1			
DESCRIPTION: THE BAKER LUTHER LAM DISK NUMBER															

4					3				
2					1				

DESCRIPTION: CAVITY COOLING RING, ERDC
PROJECT: IARC_ERDC1_3GHzCryostat
CATEGORY: RING

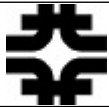
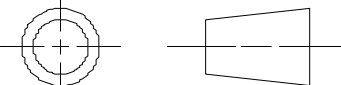
REV	REVISION CONTROL DOCUMENT	DATES	SIGNATURES	
-	F10251563---RCD		DRAWN	
			APPROVED	



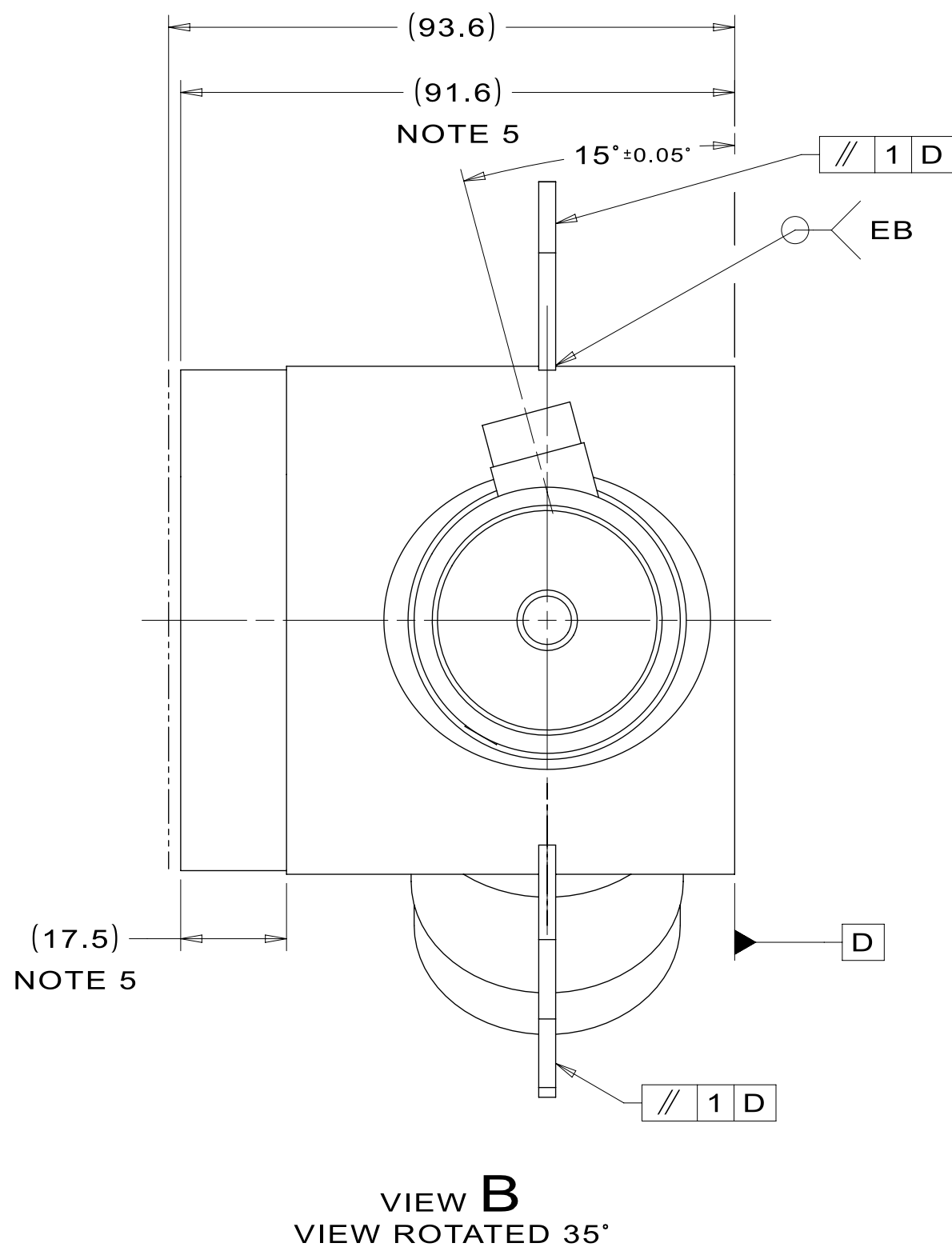
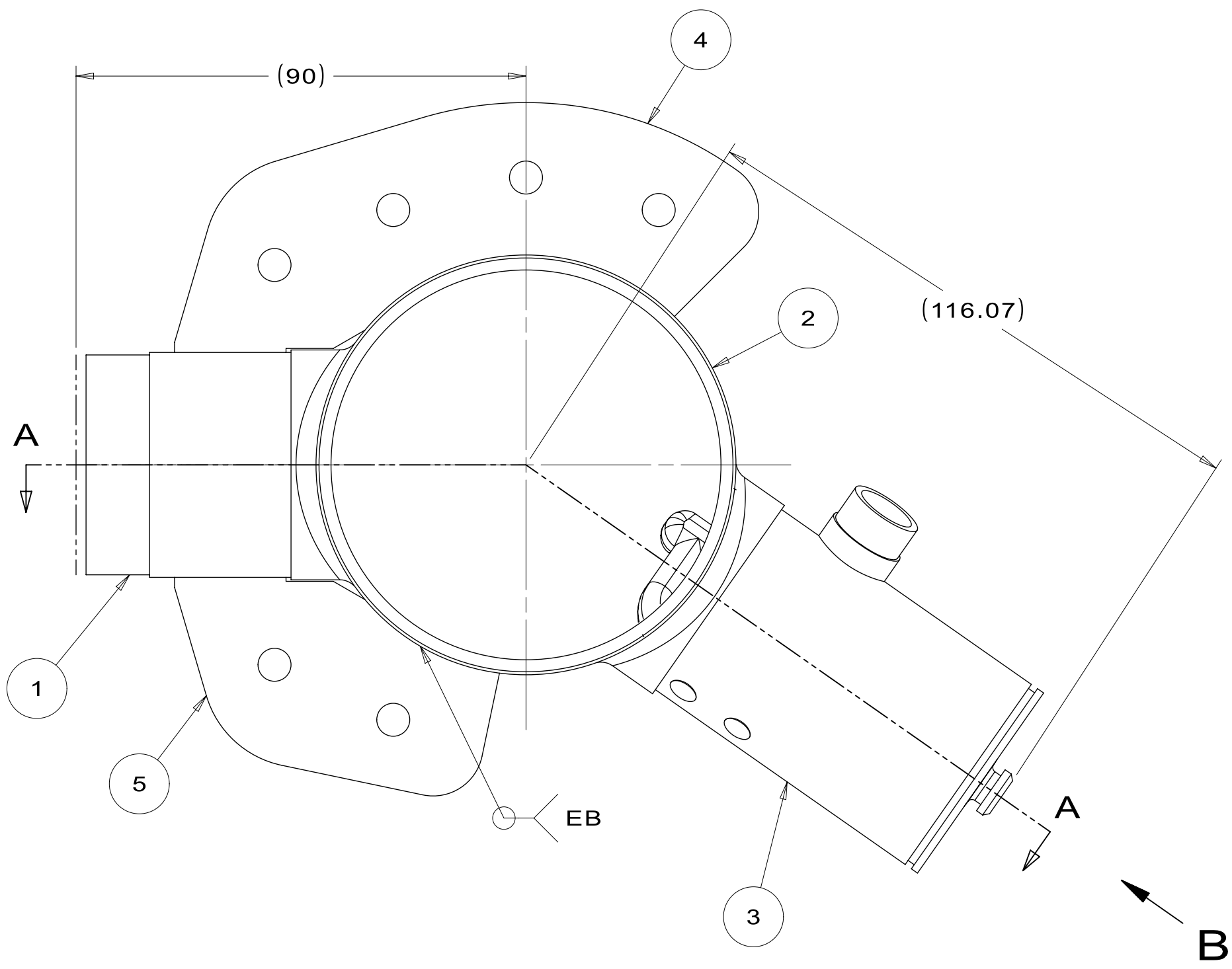
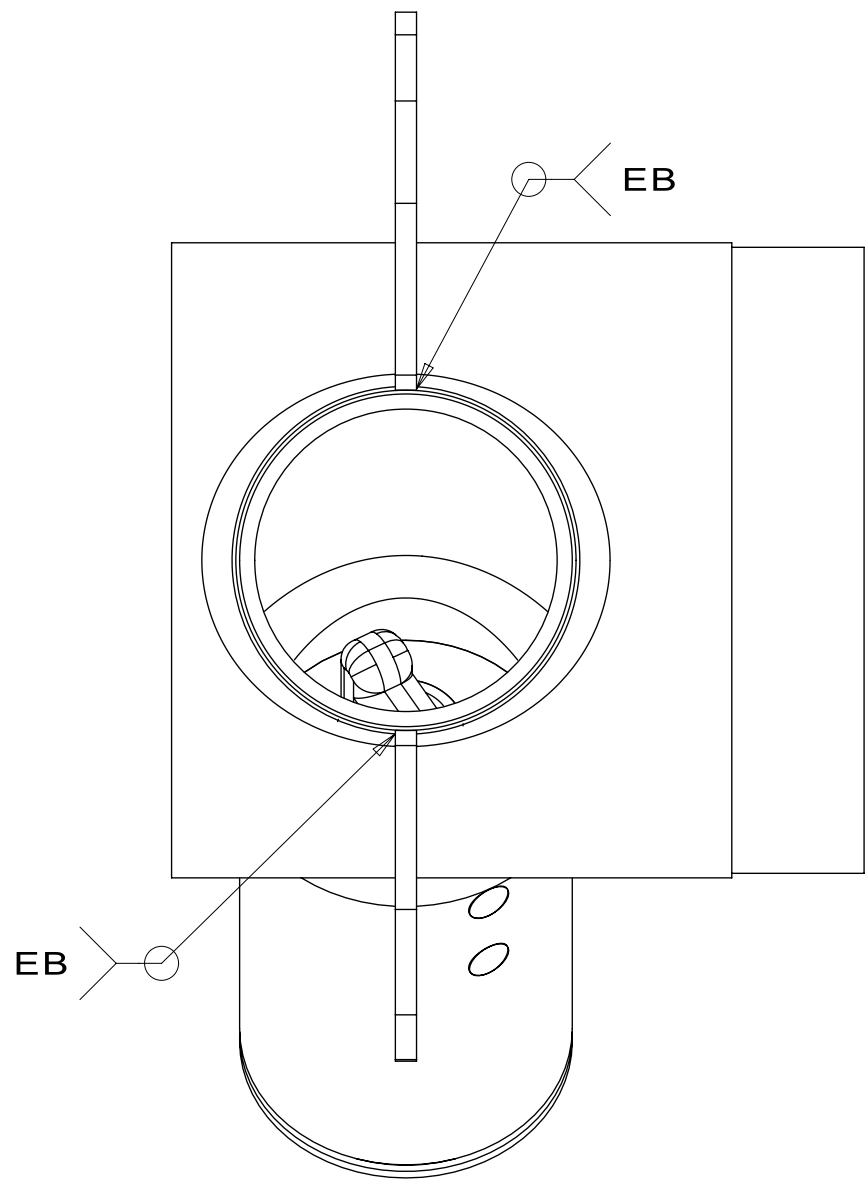
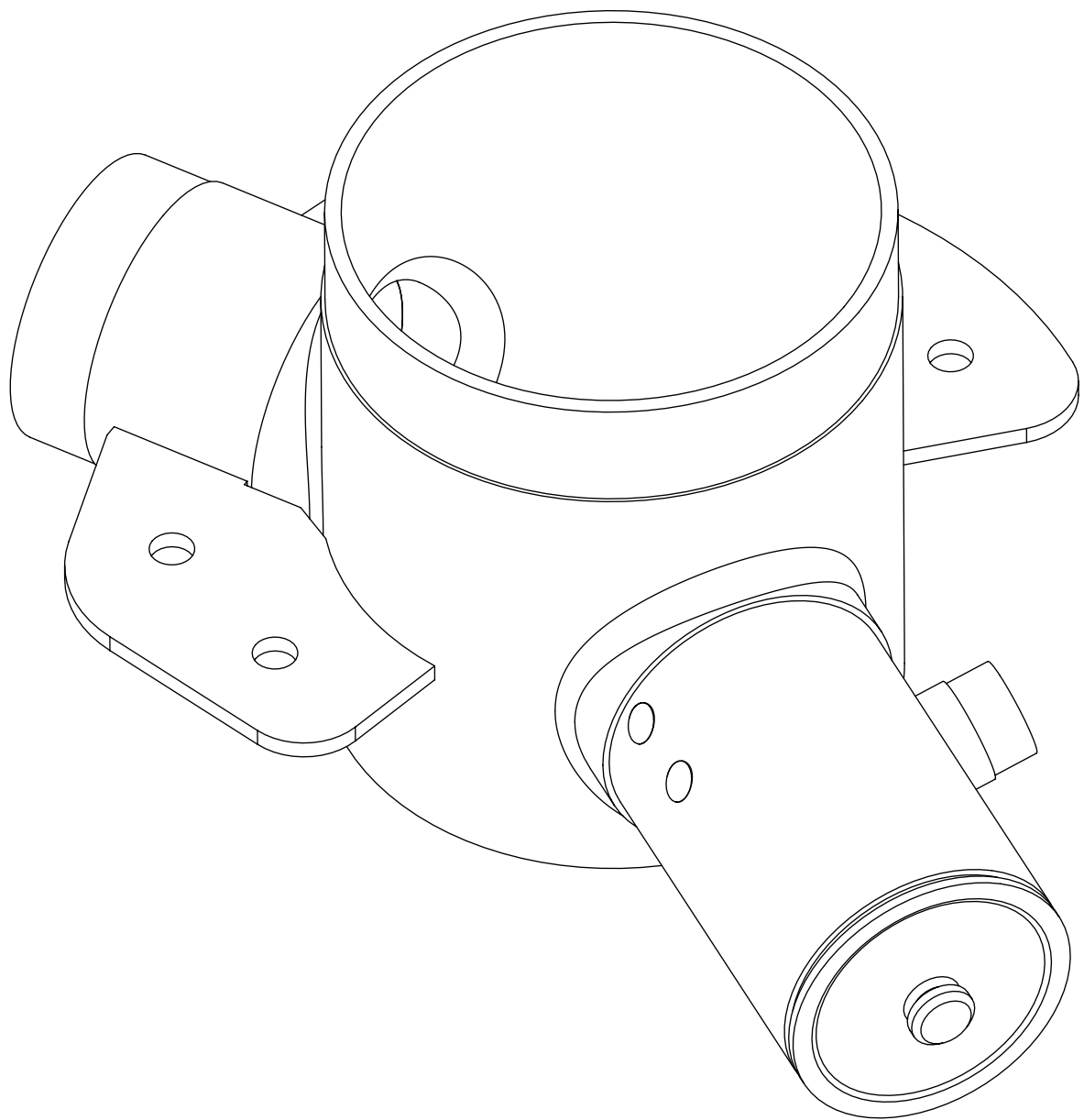
NOTES:(UNLESS OTHERWISE SPECIFIED)

- PART MUST BE FREE OF DIRT, GREASE, OIL AND CHIPS.
- PART TO BE FREE OF ALL SHARP EDGES, CORNERS, AND BURRS.
- TRAILING ZEROS DENOTE TOLERANCE.

4. DIMENSION CORRESPONDS WITH P/N F10251538(SHORT VERSION), F10251560 (MID VERSION), AND F10251557(LONG VERSION). TOLERANCE IS TO BE COORDINATED BETWEEN MANUFACTURERS AND EB WELDERS.

UNLESS OTHERWISE SPECIFIED					DRAWN	J.VANDER MEULEN		DATE	08-Aug-2025			FERMI NATIONAL ACCELERATOR LABORATORY				
±X	±X.X	±X.XX	±X/X	±X°	CHECKED	J.COGHILL		DATE	11-Mar-2026			UNITED STATES DEPARTMENT OF ENERGY				
2	0.3	0.12	N/A	1°	APPROVED	J F.HELSPER		DATE	11-Mar-2026							
BREAK ALL SHARP EDGES, MAX: 0.5 DO NOT SCALE DRAWING DIMENSIONS BASED ON: ASME Y14.5M-2009 MAX MACHINE ALL SURFACES, Ra: 3.2 DRAWING UNITS: MM  THIRD ANGLE PROJECTION					USED ON						NAME					
					F10251607, F10251524, F10251633						CAVITY COOLING RING, ERDC					
					MATERIAL											
					RRR 300 NIOBIUM											
					GROUP: Technical Division - Design and Drafting				CAGE CODE: OU5R6		SCALE 1:2 AS SHOWN	SIZE A3	DRAWING NUMBER F10251563		SHEET 1 OF 1	REV -

DATE	02-Sep-2025		FERMI NATIONAL ACCELERATOR LABORATORY UNITED STATES DEPARTMENT OF ENERGY				
DATE	11-Mar-2026						
DATE	11-Mar-2026						
NAME		WELDMENT SHORT END TUBE 1.3GHz RF CAVITY 1					
SCALE							
SIZE							
DRAWING NUMBER		SHEET		REV			
1:1		A1		F10251526			
1 of 1							
ST		SCALE CODE: OUSR6					

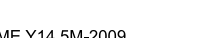


1. WELDMENT TO BE FREE OF DUST, GEASE, OIL, CHIPS, AND BURRS.

- A. ASSEMBLY TO BE VACUUM TIGHT:
NO LEAK SHALL BE DETECTABLE ON THE MOST SENSITIVE SCALE OF A HELIUM MASS SPECTROMETER LEAK DETECTOR WITH A MINIMUM SENSITIVITY OF 2×10^{-10} ATM CC/SEC FOR HELIUM.
- B. ASSEMBLY TO BE CLEANED, AND PACKAGED SO AS TO ASSURE NO CONTAMINATION FOR FOREIGN MATERIALS, METAL CHIPS, OR OTHER CONTAMINATES. CLEANING PROCEDURE TO BE APPROVED BY FERMILAB.
- C. ALL DESIGN, ASSEMBLY, AND HANDLING IS TO CONFORM TO STANDARD ULTRA HIGH VACUUM PRACTICES.
- D. ALL ELECTRON BEAM WELDING, ACID ETCHING, CLEANLINESS, AND HANDLING PROCEDURES ARE DETAILED IN DESY SPECIFICATION MHF-SL-1-1999 AND MUST BE FOLLOWED.
- E. WELD PREP TO MATCH WALL THICKNESS AT DISCRETION OF MANUFACTURER.

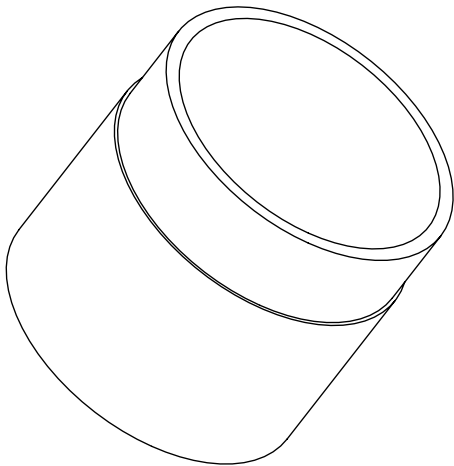
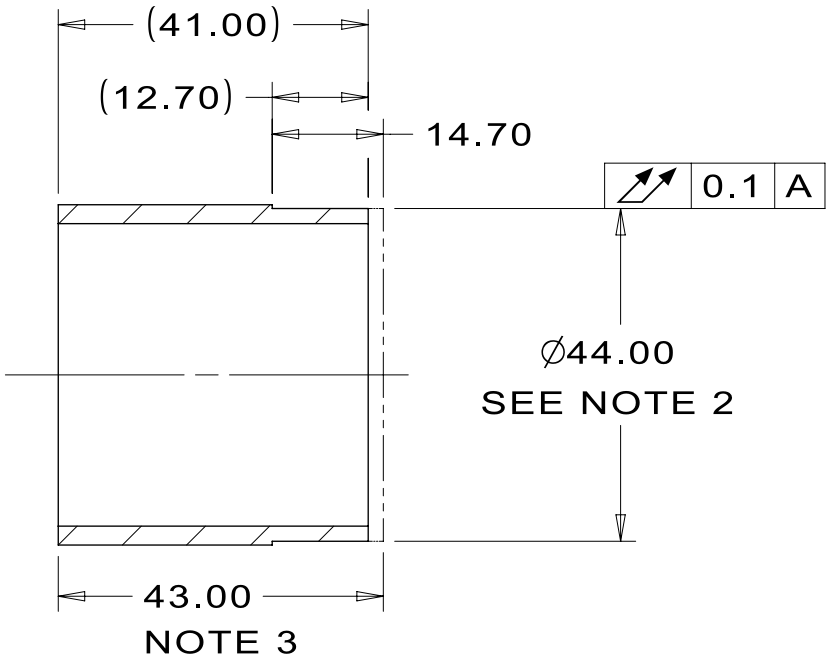
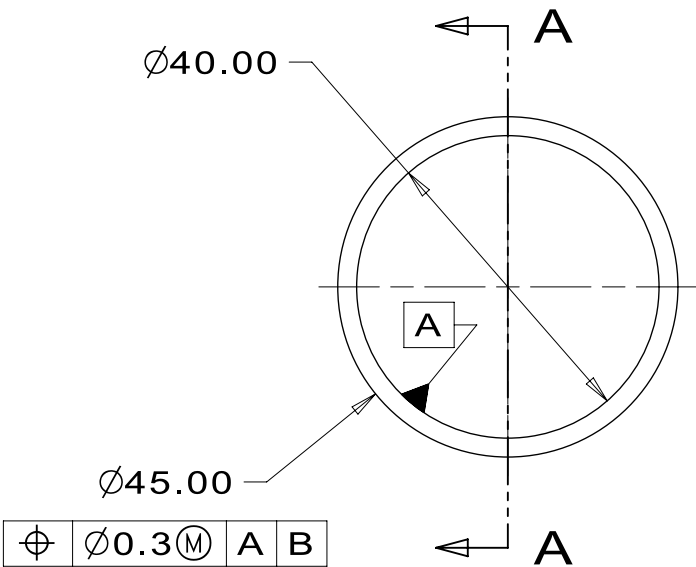
4. SUPPLEMENT FOR WELD SHRINKAGE REFERRED TO IN PIECE PART DRAWINGS.

6. ALL DIMENSIONS WITH TRAILING ZEROS DENOTE TOLERANCE.

UNLESS OTHERWISE SPECIFIED						DRAWN		M.WADE		DATE		02-Sep-2025		 FERMI NATIONAL ACCELERATOR LABORATORY UNITED STATES DEPARTMENT OF ENERGY					
						CHECKED		J.COGHILL		DATE		11-Mar-2026							
2 0.3 0.12 N/A 1'						APPROVED		J.F.HELSPER		DATE		11-Mar-2026							
BREAK ALL SHARP EDGES, MAX: 0.5 DO NOT SCALE DRAWING DIMENSIONS BASED ON: ASME Y14.5M-2009 MAX MACHINE ALL SURFACES, Ra: 3.2 DRAWING UNITS: MM						USED ON		F10251517		NAME		WELDMENT SHORT END TUBE 1.3GHZ RF CAVITY 1							
 THIRD ANGLE PROJECTION						MATERIAL				SCALE 1:1		SIZE A1		DRAWING NUMBER F10251526		SHEET 1 of 1		REV -	
						GROUP:		Technical Division - Design and Drafting		CAGE CODE:		GUSR6							
								SEE PARTS LIST											

DESCRIPTION: COUPLER SPOOL PIECE, 1.3GHz RF CAVITY ERDC
PROJECT: IARC_ERDC1_3GHzCryostat
CATEGORY: SPOOL

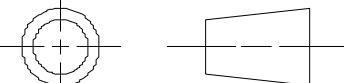
REV	REVISION CONTROL DOCUMENT	DATES	SIGNATURES	
-	F10251543---RCD		DRAWN	
			APPROVED	



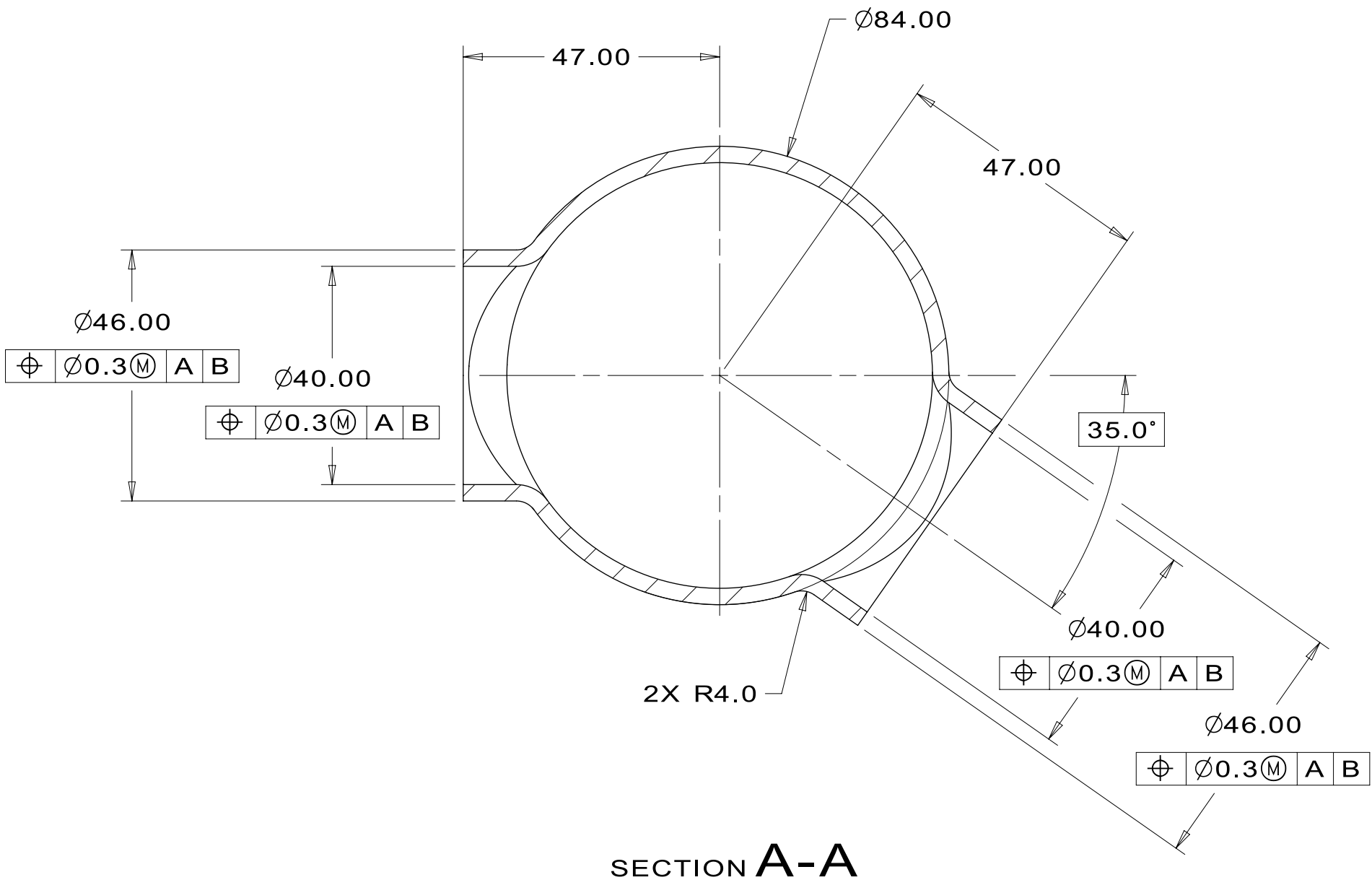
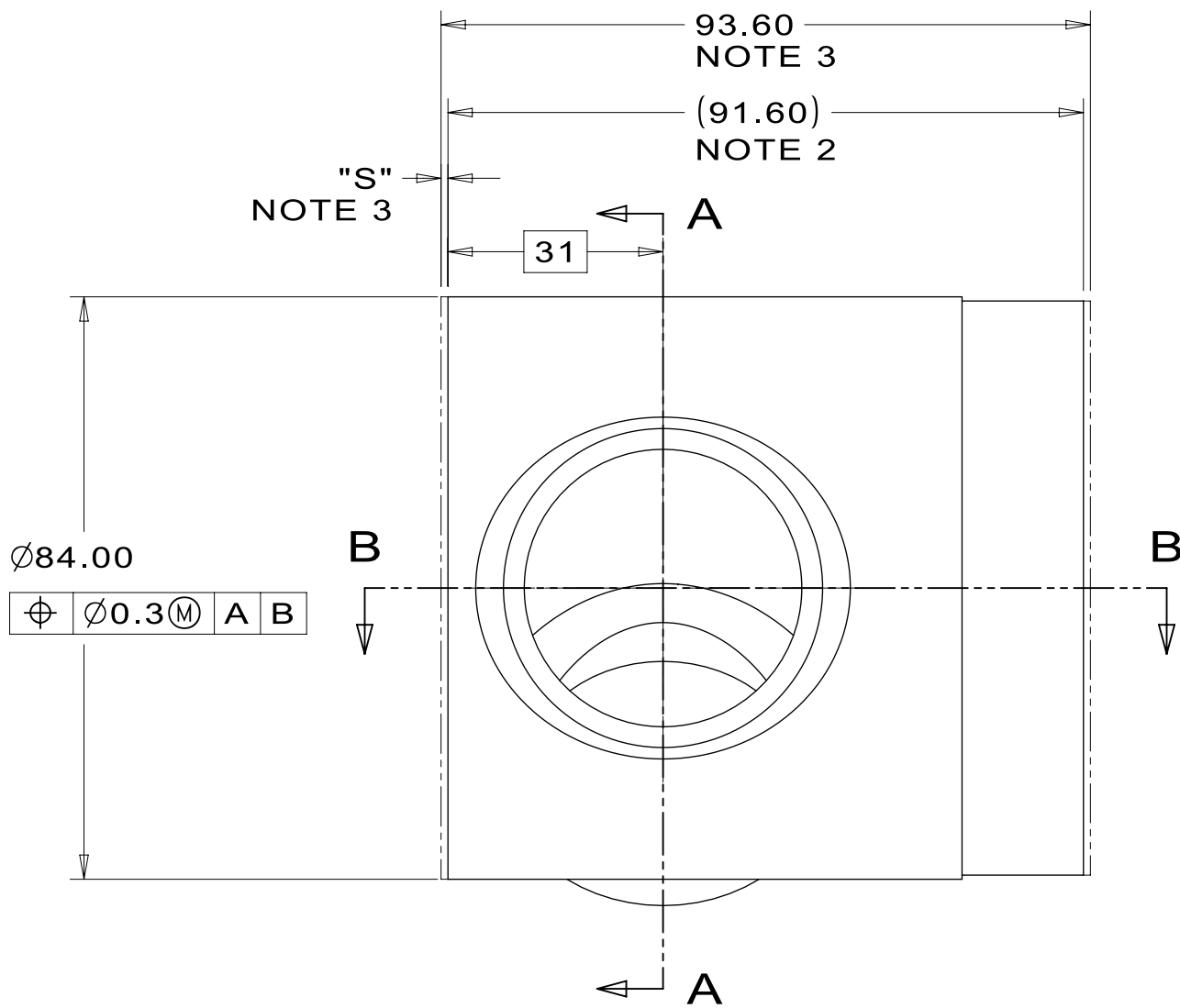
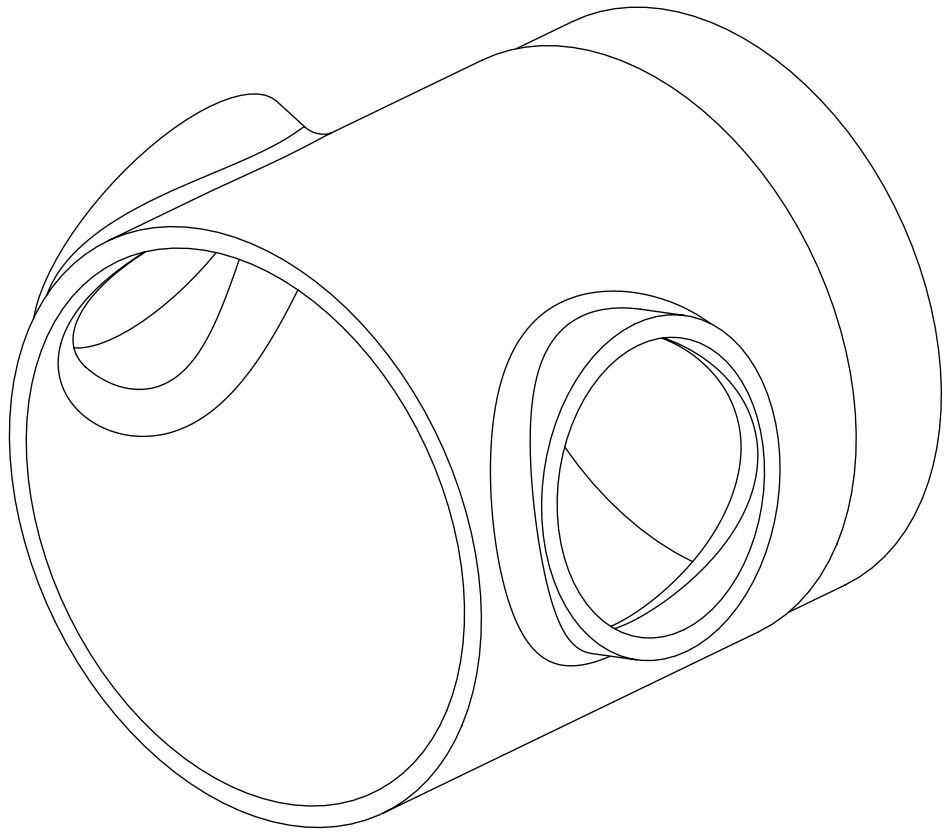
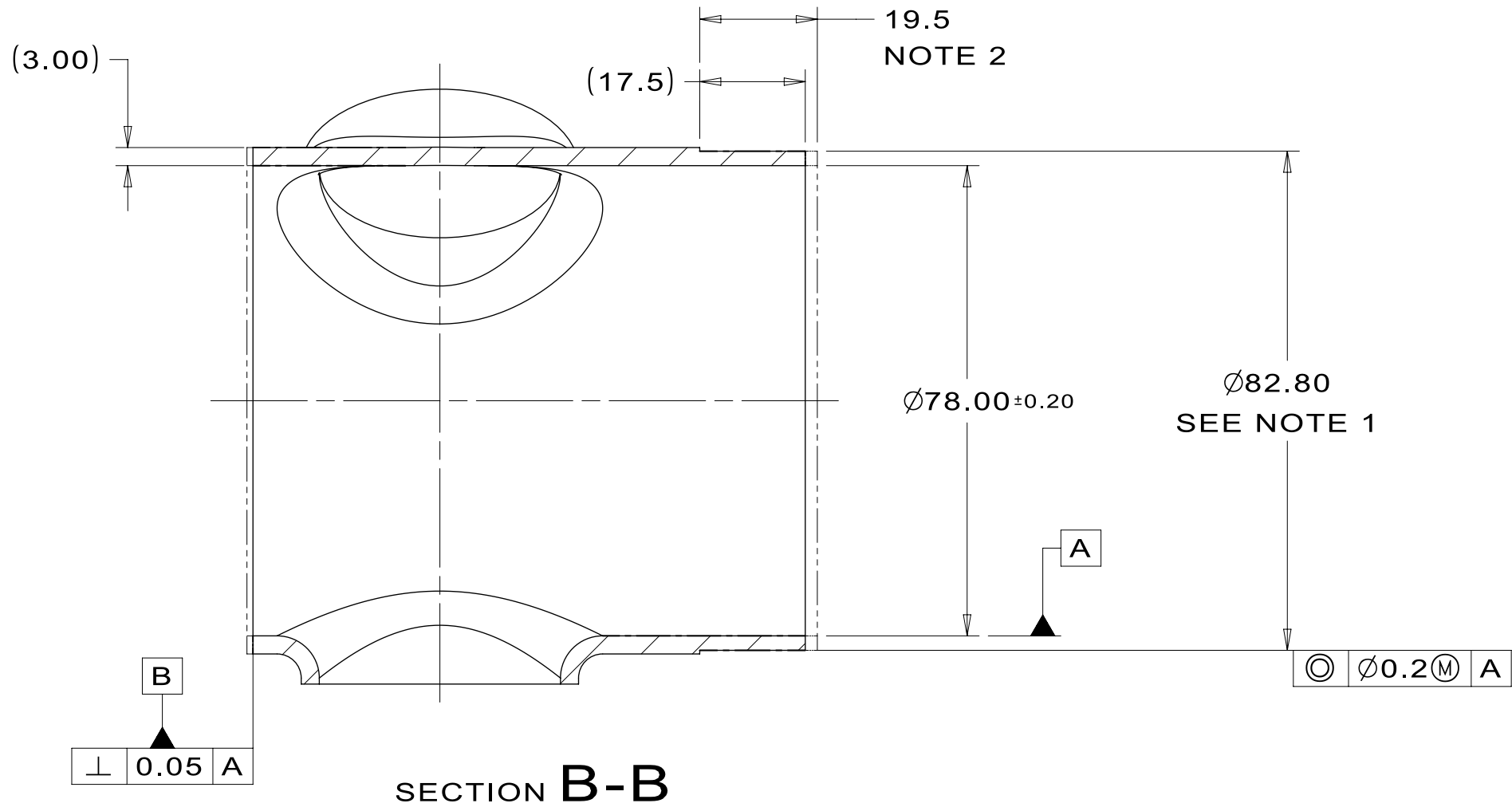
SECTION A-A

NOTES (UNLESS OTHERWISE SPECIFIED):

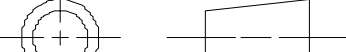
- SURFACE FREE OF DAMAGE.
- DIMENSION CORRESPONDS WITH PART NUMBER F10251523. TOLERANCE IS TO BE COORDINATED BETWEEN MANUFACURERS AND EB-WELDERS.
- FINAL LENGTH AFTER MACHINING OPERATION DETAILED ON DRAWING NUMBER F10251517.
- TRAILING ZEROS DENOTE TOLERANCE.

UNLESS OTHERWISE SPECIFIED					DRAWN	M.WADE	DATE	28-Aug-2025		FERMI NATIONAL ACCELERATOR LABORATORY UNITED STATES DEPARTMENT OF ENERGY			
±X	±X.X	±X.XX	±X/X	±X*	CHECKED	J.COGHILL	DATE	11-Mar-2026					
2	0.3	0.12	N/A	1*	APPROVED	J F.HELSPER	DATE	11-Mar-2026					
BREAK ALL SHARP EDGES, MAX: 0.5 DO NOT SCALE DRAWING DIMENSIONS BASED ON: ASME Y14.5M-2009 MAX MACHINE ALL SURFACES, Ra: 3.2 DRAWING UNITS: MM  THIRD ANGLE PROJECTION					USED ON				NAME				
					F10251526				COUPLER SPOOL PIECE, 1.3GHz RF CAVITY ERDC				
					MATERIAL				NIOBIUM, RRR GRADE				
					GROUP: Accelerator Mechanical Support				CAGE CODE: OU5R6				
				SCALE 1:1		SIZE A3		DRAWING NUMBER F10251543		SHEET 1 OF 1		REV -	

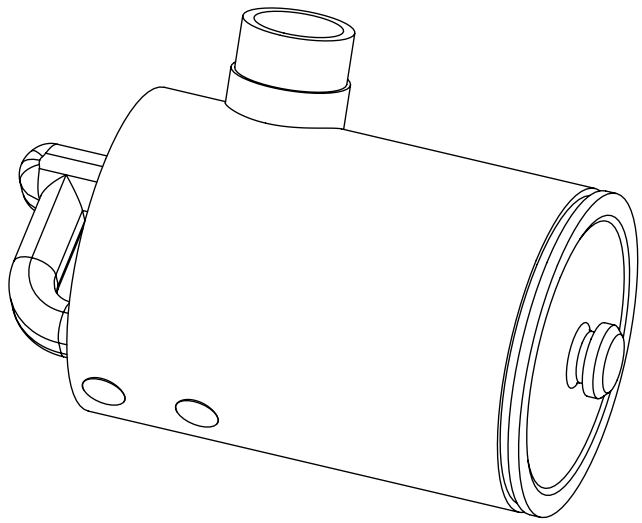
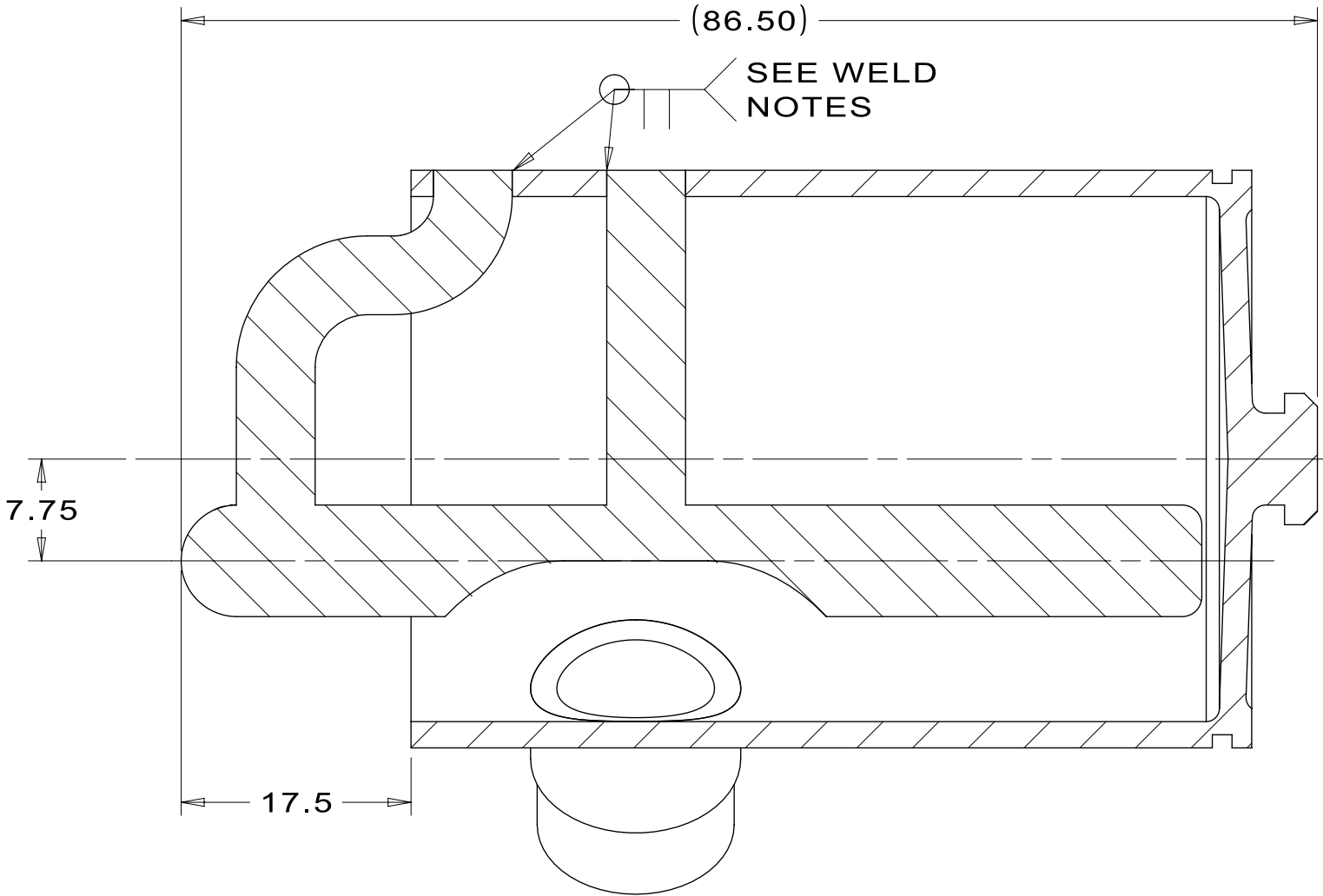
REV	REVISION CONTROL DOCUMENT	DATES		SIGNATURES	
				DRAWN	
-	F10251544---RCD			APPROVED	



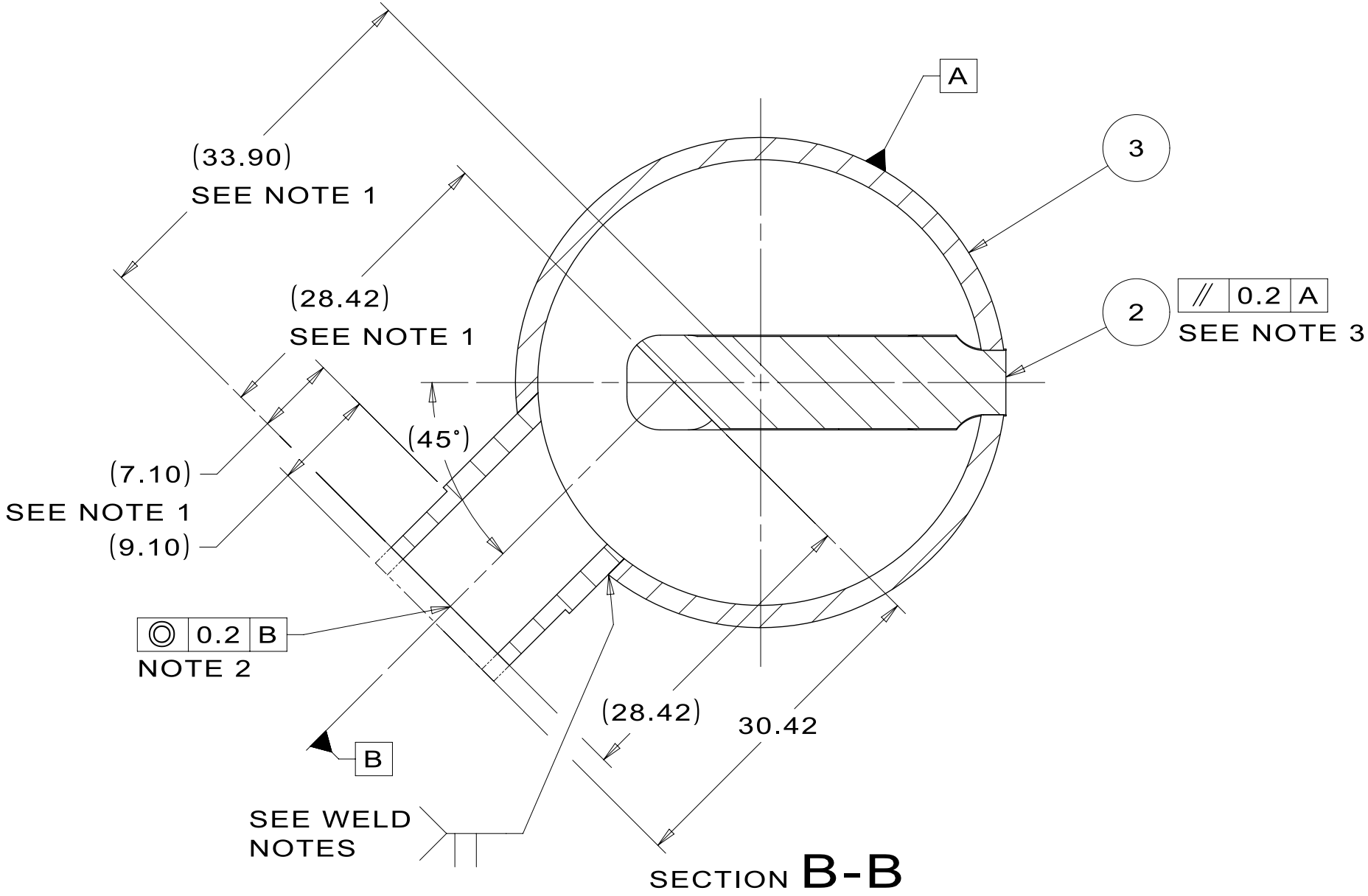
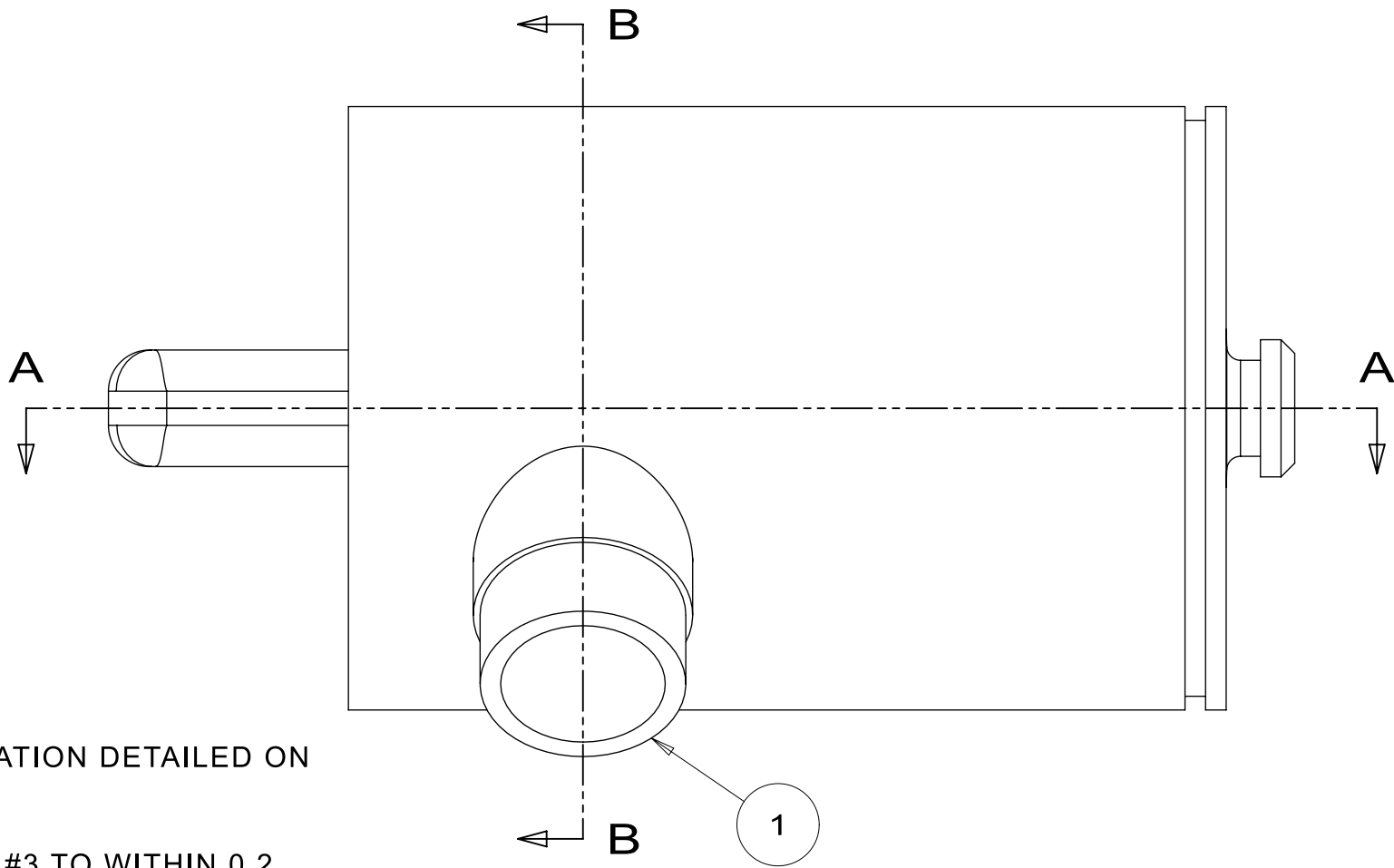
- NOTES (UNLESS OTHERWISE SPECIFIED):
- DIMENSION CORRESPONDS WITH PART NUMBER F10251527. TOLERANCE IS TO BE COORDINATED BETWEEN MANUFACTURERS AND EB-WELDERS.
 - FINAL LENGTH AFTER MACHINING OPERATION DETAILED ON DRAWING F10251517.
 - SUPPLEMENT FOR WELD SHRINKAGE ("S") TO BE DETERMINED BY EB-WELDERS.
 - TRAILING ZEROS DENOTE TOLERANCE.

UNLESS OTHERWISE SPECIFIED					DRAWN	M.WADE		DATE	27-Aug-2025			FERMI NATIONAL ACCELERATOR LABORATORY UNITED STATES DEPARTMENT OF ENERGY				
±X	±X.X	±X.XX	±X/X	±X"	CHECKED	J.COGHILL		DATE	11-Mar-2026							
2	0.3	0.12	N/A	1"	APPROVED	J F.HELSPER		DATE	11-Mar-2026							
BREAK ALL SHARP EDGES, MAX: 0.5 DO NOT SCALE DRAWING DIMENSIONS BASED ON: ASME Y14.5M-2009 MAX MACHINE ALL SURFACES, Ra: 3.2 DRAWING UNITS: MM					USED ON F10251526						NAME SHORT END TUBE, 1.3GHz RF CAVITY ERDC					
 THIRD ANGLE PROJECTION																
					MATERIAL NIOBIUM, RRR GRADE						SCALE 1:1		SIZE A2		DRAWING NUMBER F10251544	
GROUP: Technical Division - Mechanical Support					CAGE CODE: 0U5R6											

REV	REVISION CONTROL DOCUMENT	DATES	SIGNATURES	
-	F10251546---RCD		DRAWN	
			APPROVED	



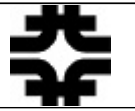
SECTION A-A



NOTES (UNLESS OTHERWISE SPECIFIED):

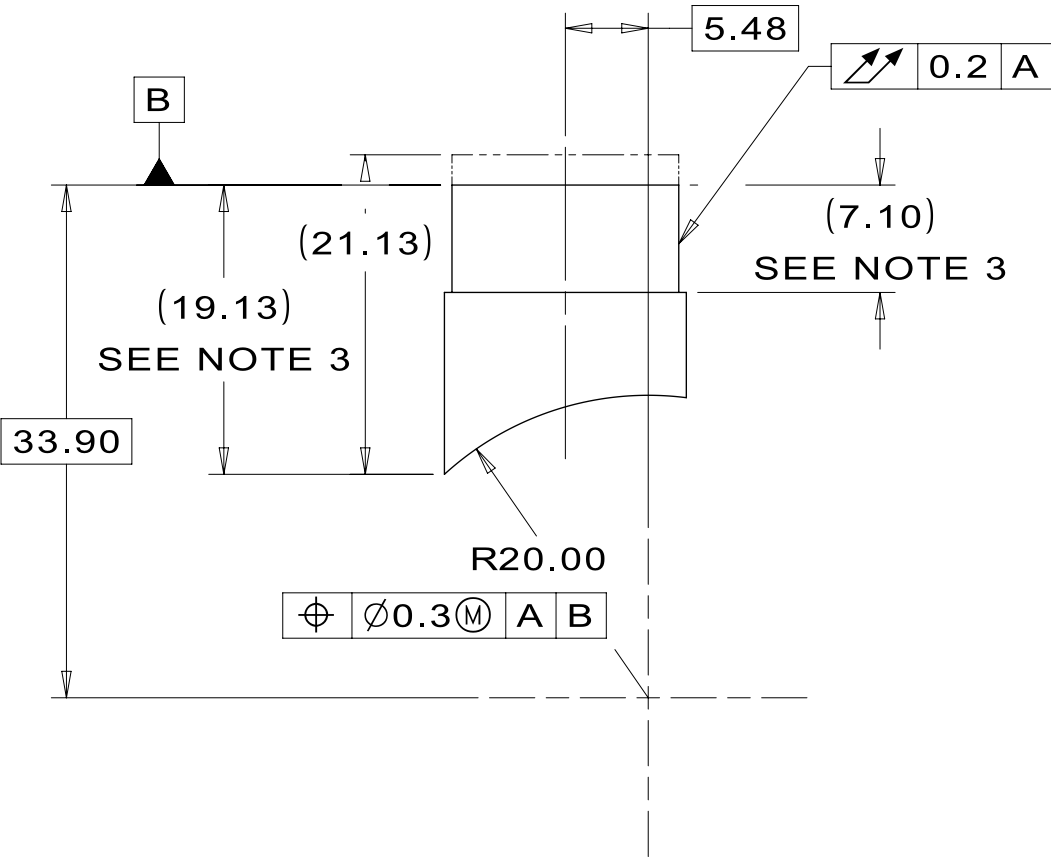
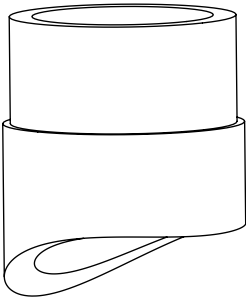
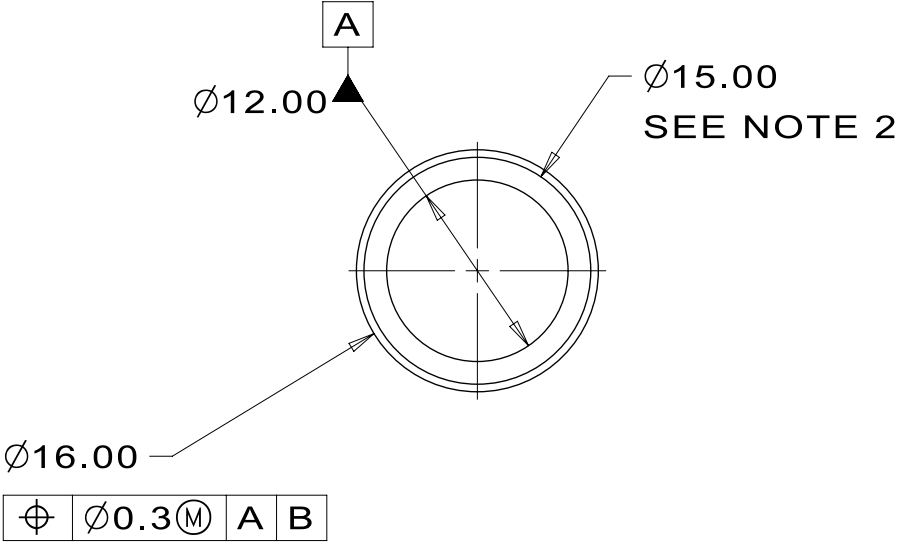
1. FINAL LENGTH AFTER MACHINING OPERATION DETAILED ON DRAWING NUMBER F10251517.
2. ITEM #1 MUST BE CONCENTRIC TO ITEM #3 TO WITHIN 0.2
3. ITEM #2 MUST BE CONCENTRIC TO ITEM #3 TO WITHIN 0.2
4. WELDING NOTES:
 - A. ASSEMBLY TO BE VACUUM TIGHT:
NO LEAK SHALL BE DETECTABLE ON THE MOST SENSITIVE SCALE OF A HELIUM MASS SPECTROMETER LEAK DETECTOR WITH A MINIMUM SENSITIVITY OF 2×10^{-10} ATM CC/SEC FOR HELIUM.
 - B. ASSEMBLY TO BE CLEANED, AND PACKAGED SO AS TO ASSURE NO CONTAMINATION FOR FOREIGN MATERIALS, METAL CHIPS, OR OTHER CONTAMINATES. CLEANING PROCEDURE TO BE APPROVED BY FERMILAB.
 - C. ALL DESIGN, ASSEMBLY, AND HANDLING IS TO CONFORM TO STANDARD ULTRA HIGH VACUUM PRACTICES.
 - D. ALL ELECTRON BEAM WELDING, ACID ETCHING, CLEANLINESS, AND HANDLING PROCEDURES ARE DETAILED IN DESY SPECIFICATION MHF-SL-1-1999 AND MUST BE FOLLOWED.
 - E. WELD PREP TO MATCH WALL THICKNESS AT DISCRETION OF MANUFACTURER.

3	F10251549	FORMTEIL HOUSING, 1.3GHz RF CAVITY ERDC	1
2	F10251548	HOM FORMTEIL, 1.3GHz RF CAVITY ERDC	1
1	F10251547	HOM SPOOL PIECE, 1.3GHz RF CAVITY ERDC	1
ITEM	FERMI #	PART NAME	QTY

UNLESS OTHERWISE SPECIFIED					DRAWN	M.WADE	DATE	02-Sep-2025	 FERMI NATIONAL ACCELERATOR LABORATORY UNITED STATES DEPARTMENT OF ENERGY			
±X	±X.X	±X.XX	±X/X	±X"	CHECKED	J.COZHILL	DATE	11-Mar-2026				
2	0.3	0.12	N/A	1"	APPROVED	J F.HELSPER	DATE	11-Mar-2026				
BREAK ALL SHARP EDGES, MAX: 0.5 DO NOT SCALE DRAWING DIMENSIONS BASED ON: ASME Y14.5M-2009 MAX MACHINE ALL SURFACES, Ra: 3.2 DRAWING UNITS: MM					USED ON				NAME			
					F10251526, F10254453				HOM ASSEMBLY, 1.3GHz RF CAVITY ERDC			
					MATERIAL				SCALE			
					SEE PARTS LIST				2:1			
					GROUP: Technical Division - Design and Drafting				SIZE			
					CAGE CODE: OU5R6				A2			
									DRAWING NUMBER			
									F10251546			
									SHEET			
									1 OF 1			
									REV			
									-			

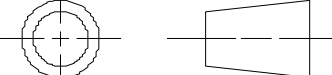
DESCRIPTION: HOM SPOOL PIECE, 1.3GHz RF CAVITY ERDC
PROJECT: IARC_ERDC1_3GHzCryostat
CATEGORY: SPOOL

REV	REVISION CONTROL DOCUMENT	DATES	SIGNATURES	
-	F10251547---RCD		DRAWN	
			APPROVED	

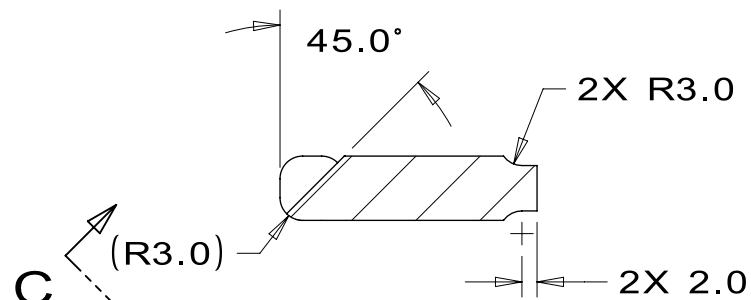


NOTES (UNLESS OTHERWISE SPECIFIED):

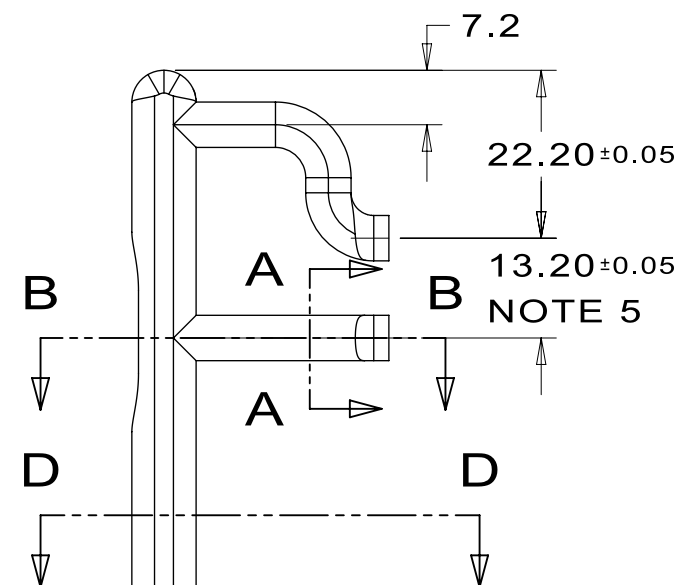
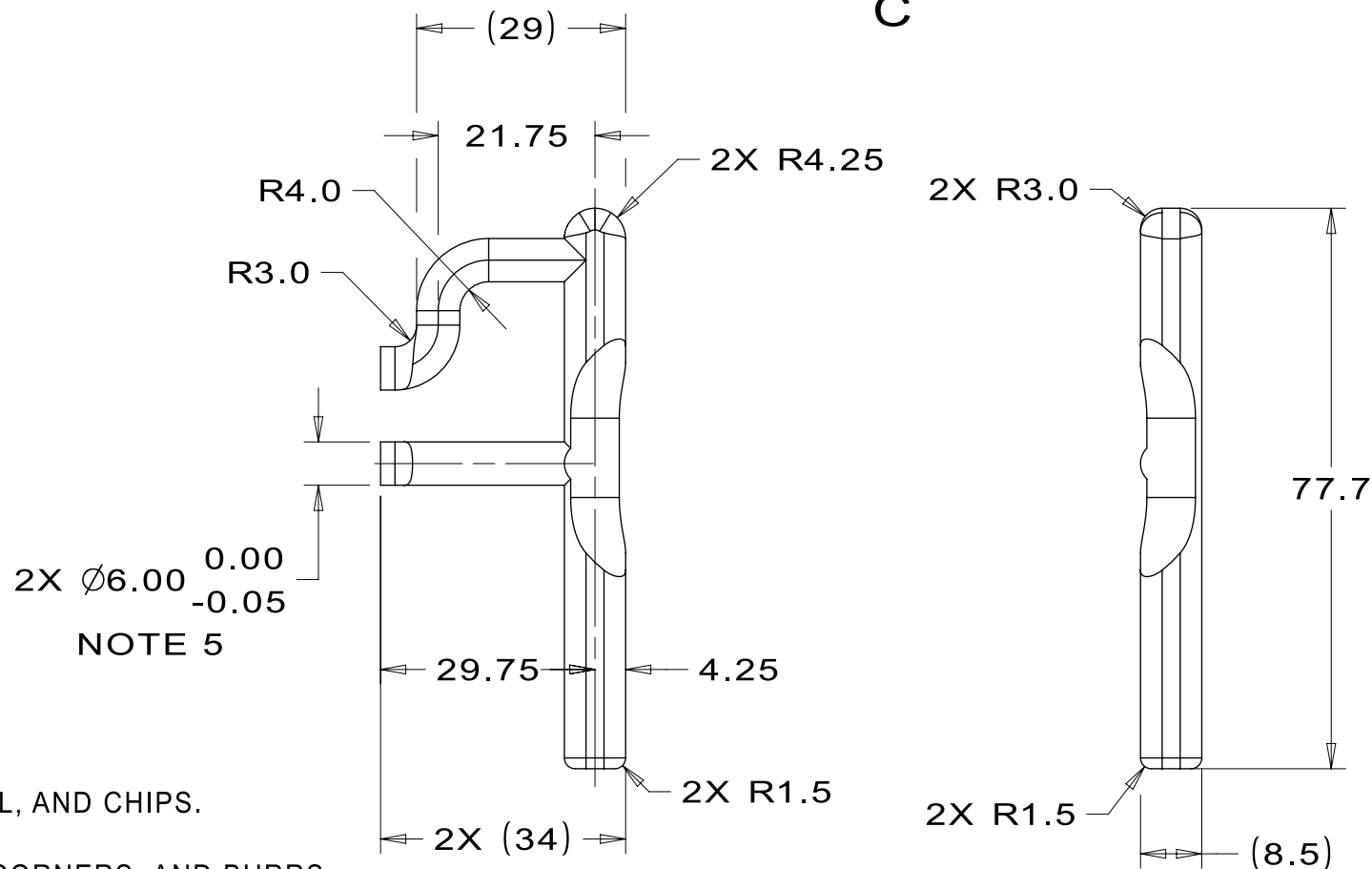
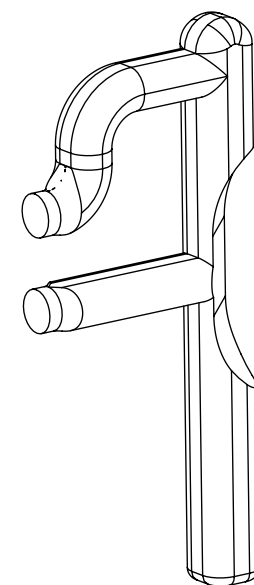
1. SURFACE FREE OF DAMAGE
2. DIMENSION CORRESPONDS WITH PART NUMBER F10251522. TOLERANCE IS TO BE COORDINATED BETWEEN MANUFACTURERS AND EB-WELDERS.
3. FINAL LENGTH AFTER MACHINING OPERATION DETAILED ON DRAWING NUMBER F10251546.
4. TRAILING ZEROS DENOTE TOLERANCE.

UNLESS OTHERWISE SPECIFIED					DRAWN	J.VANDER MEULEN		DATE	18-Aug-2025			FERMI NATIONAL ACCELERATOR LABORATORY UNITED STATES DEPARTMENT OF ENERGY							
±X	±X.X	±X.XX	±X/X	±X*	CHECKED	J.COGHILL		DATE	11-Mar-2026										
2	0.3	0.12	N/A	1*	APPROVED	J F.HELSPER		DATE	11-Mar-2026										
BREAK ALL SHARP EDGES, MAX: 0.5 DO NOT SCALE DRAWING DIMENSIONS BASED ON: ASME Y14.5M-2009 MAX MACHINE ALL SURFACES, Ra: 3.2 DRAWING UNITS: MM  THIRD ANGLE PROJECTION					USED ON						NAME HOM SPOOL PIECE, 1.3GHz RF CAVITY ERDC								
					F10251546														
					MATERIAL						SCALE 2:1				SIZE A3	DRAWING NUMBER F10251547		SHEET 1 OF 1	REV -
					NIOBIUM RRR GRADE														
GROUP: Accelerator Mechanical Support					CAGE CODE: OU5R6														

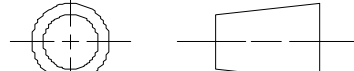
REV	REVISION CONTROL DOCUMENT	DATES	SIGNATURES	
-	F10251548---RCD		DRAWN	
			APPROVED	



SECTION **B-B**



5. DIMENSION CORRESPONDS WITH PART NUMBER F10251549. TOLERANCE IS TO BE COORDINATED BETWEEN MANUFACTURERS AND EB-WELDERS.

UNLESS OTHERWISE SPECIFIED					DRAWN	M.WADE	DATE	27-Aug-2025
±X	±X.X	±X.XX	±X/X	±X*	CHECKED	J.COGHILL	DATE	11-Mar-2026
2	0.3	0.12	N/A	1*	APPROVED	J F.HELSPER	DATE	11-Mar-2026
BREAK ALL SHARP EDGES, MAX: 0.5 DO NOT SCALE DRAWING DIMENSIONS BASED ON: ASME Y14.5M-2009 MAX MACHINE ALL SURFACES, Ra: 3.2 DRAWING UNITS: MM  THIRD ANGLE PROJECTION					USED ON			
					F10251546			
					MATERIAL			
					NIOBIUM, RRR GRADE			
GROUP:					Technical Division - Design and Drafting			CAGE CODE: OU5R6



FERMI NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY

NAME

HOM FORMTEIL, 1.3GHz RF CAVITY ERDC

SCALE
1:1

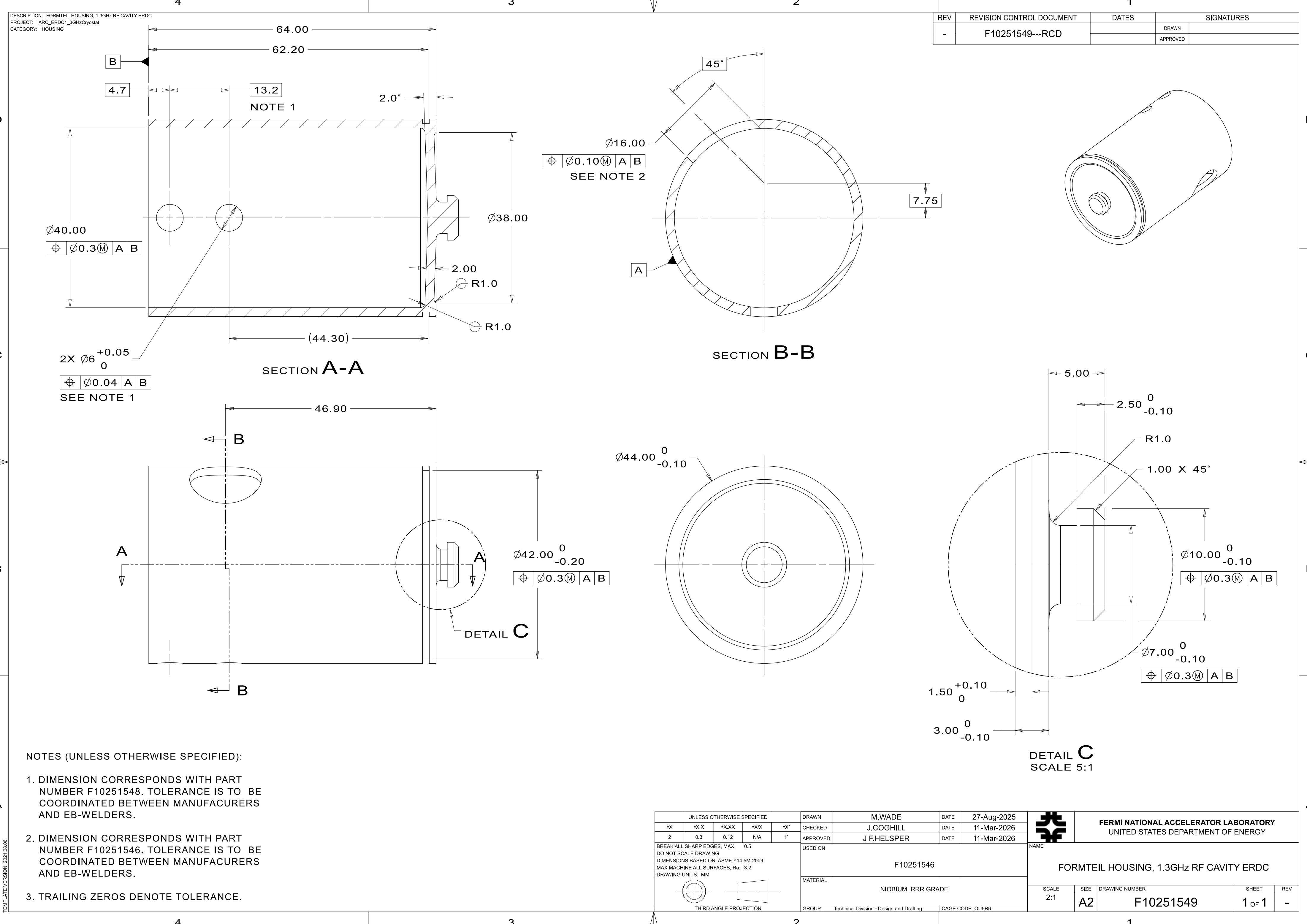
SIZE
A3

DRAWING NUMBER

F10251548

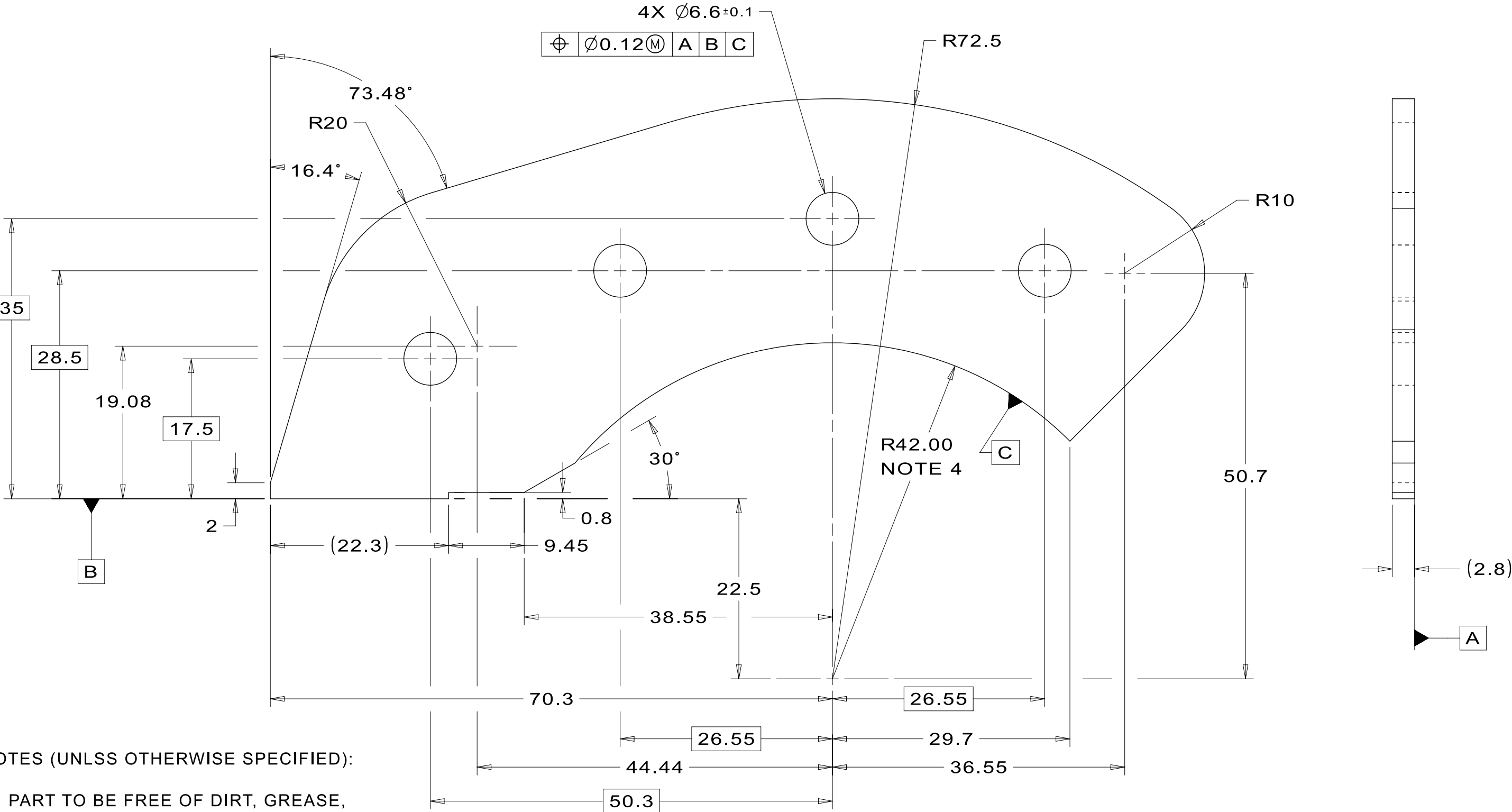
SHEET

REV



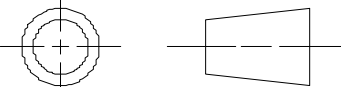
DESCRIPTION: F10259369
PROJECT: IARC_ERDC1_3GHzCryostat
CATEGORY: RIB

REV	REVISION CONTROL DOCUMENT	DATES	SIGNATURES	
-	F10259369---RCD		DRAWN	
			APPROVED	



NOTES (UNLSS OTHERWISE SPECIFIED):

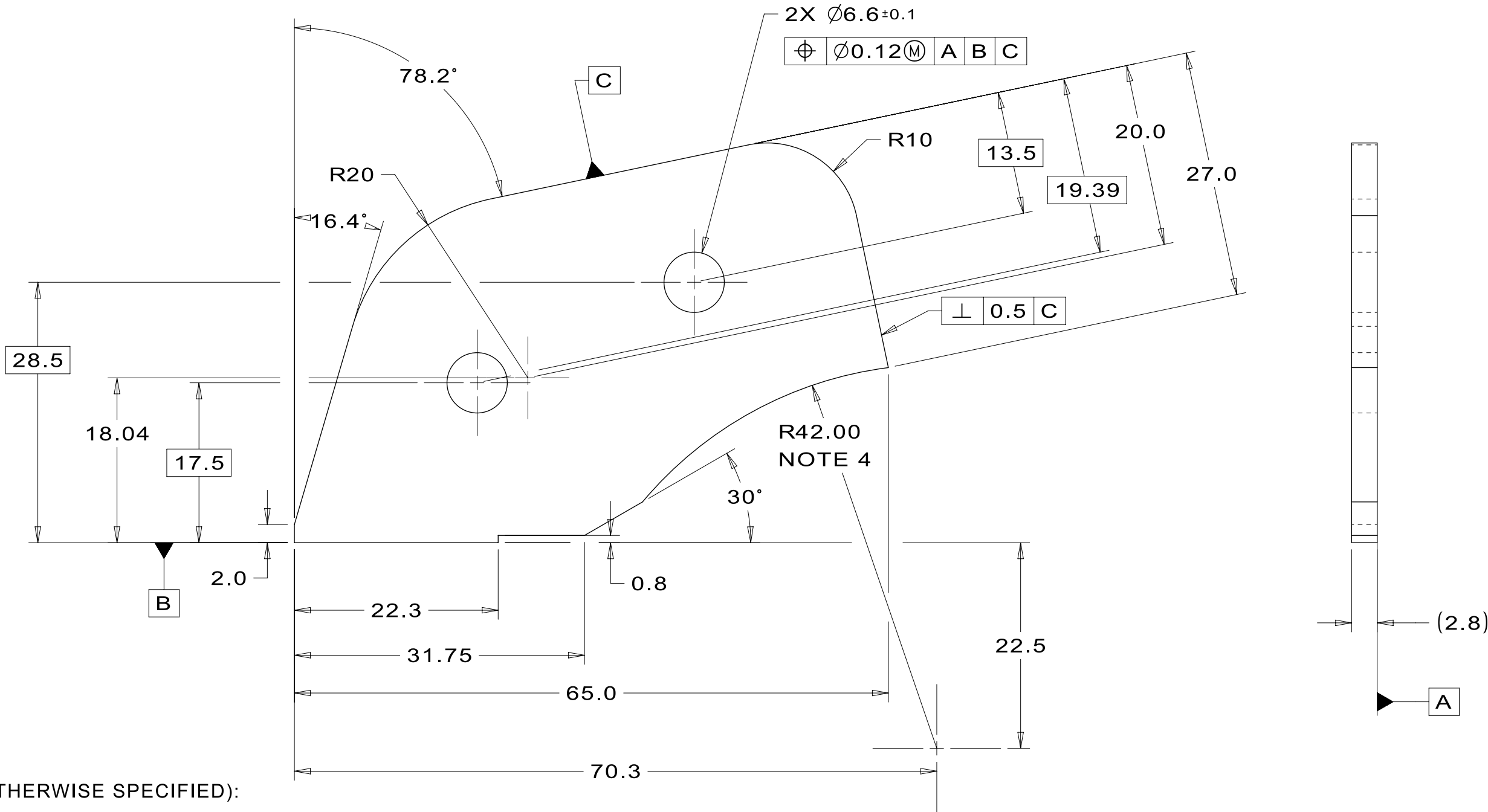
- PART TO BE FREE OF DIRT, GREASE, OIL AND CHIPS.
- PART TO B FREE OF SHARP EDGES, CORNERS AND BURRS.
- TRAILING ZEROS DENOTE TOLERANCE.
- DIMENSION CORRESPONDS WITH PART NUMBER F10251544. TOLERANCE IS TO BE COORDINATED BETWEEN MANUFACTURERS AND EB-WELDERS.

UNLESS OTHERWISE SPECIFIED					DRAWN	J.VANDER MEULEN		DATE	12-Aug-2025			FERMI NATIONAL ACCELERATOR LABORATORY UNITED STATES DEPARTMENT OF ENERGY			
±X	±X.X	±X.XX	±X/X	±X*	CHECKED	J.COGHILL		DATE	11-Mar-2026						
2	0.3	0.12	N/A	1*	APPROVED	J F.HELSPER		DATE	11-Mar-2026						
BREAK ALL SHARP EDGES, MAX: 0.5 DO NOT SCALE DRAWING DIMENSIONS BASED ON: ASME Y14.5M-2009 MAX MACHINE ALL SURFACES, Ra: 3.2 DRAWING UNITS: MM  THIRD ANGLE PROJECTION					USED ON						NAME				
					F10251526						SHORT END TUBE COOLING FIN TYPE 2, 1.3 GHz RF CAVITY ERDC				
					MATERIAL										
					NIOBIUM, RRR GRADE 2.8MM STK THICKNESS										
GROUP: Technical Division - Design and Drafting					CAGE CODE: OU5R6					SCALE 2:1	SIZE A3	DRAWING NUMBER F10259369		SHEET 1 OF 1	REV -

TEMPLATE VERSION: 2021.08.06

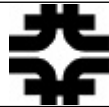
DESCRIPTION: F10259371
PROJECT: IARC_ERDC1_3GHzCryostat
CATEGORY: RIB

REV	REVISION CONTROL DOCUMENT	DATES	SIGNATURES	
-	F10259371---RCD		DRAWN	
			APPROVED	



- NOTES (UNLSS OTHERWISE SPECIFIED):
- PART TO BE FREE OF DIRT, GREASE, OIL AND CHIPS.
 - PART TO BE FREE OF SHARP EDGES, CORNERS AND BURRS.
 - TRAILING ZEROS DENOTE TOLERANCE.
 - DIMENSION CORRESPONDS WITH PART NUMBER F10251544. TOLERANCE IS TO BE COORDINATED BETWEEN MANUFACTURERS AND EB-WELDERS.

UNLESS OTHERWISE SPECIFIED					DRAWN	J.VANDER MEULEN	DATE	12-Aug-2025
±X	±X.X	±X.XX	±X/X	±X°	CHECKED	J.COGHILL	DATE	11-Mar-2026
2	0.3	0.12	N/A	1°	APPROVED	J F.HELSPER	DATE	11-Mar-2026
BREAK ALL SHARP EDGES, MAX: 0.5 DO NOT SCALE DRAWING DIMENSIONS BASED ON: ASME Y14.5M-2009 MAX MACHINE ALL SURFACES, Ra: 3.2 DRAWING UNITS: MM					USED ON			
					F10251526			
					MATERIAL			
					NIOBIUM, RRR GRADE 2.8MM STK THICKNESS			
					GROUP: Technical Division - Design and Drafting			
					CAGE CODE: OU5R6			

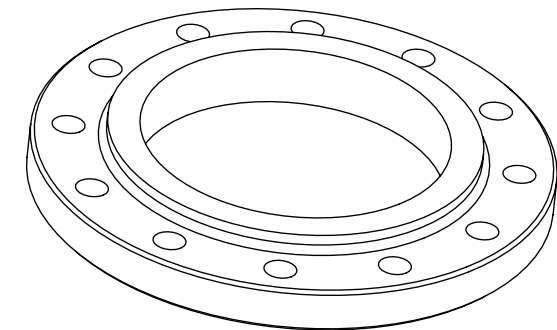
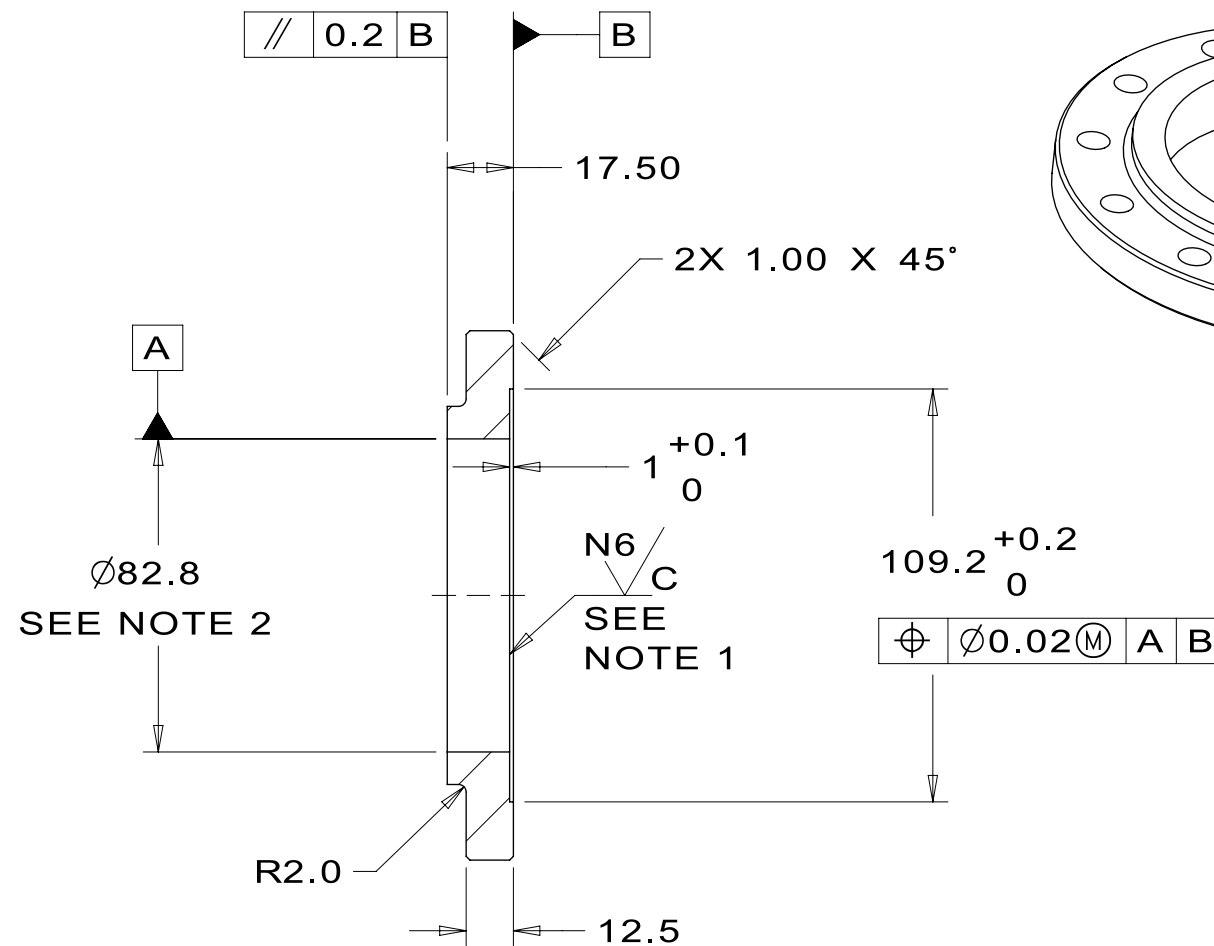


FERMI NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY

SHORT END TUBE COOLING FIN TYPE 1, 1.3 GHZ RF
CAVITY ERDC

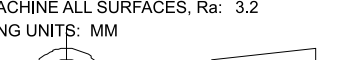
SCALE	SIZE	DRAWING NUMBER	SHEET	REV
2:1	A3	F10259371	1 OF 1	-

REV	REVISION CONTROL DOCUMENT	DATES	SIGNATURES	
-	F10251527---RCD		DRAWN	
			APPROVED	

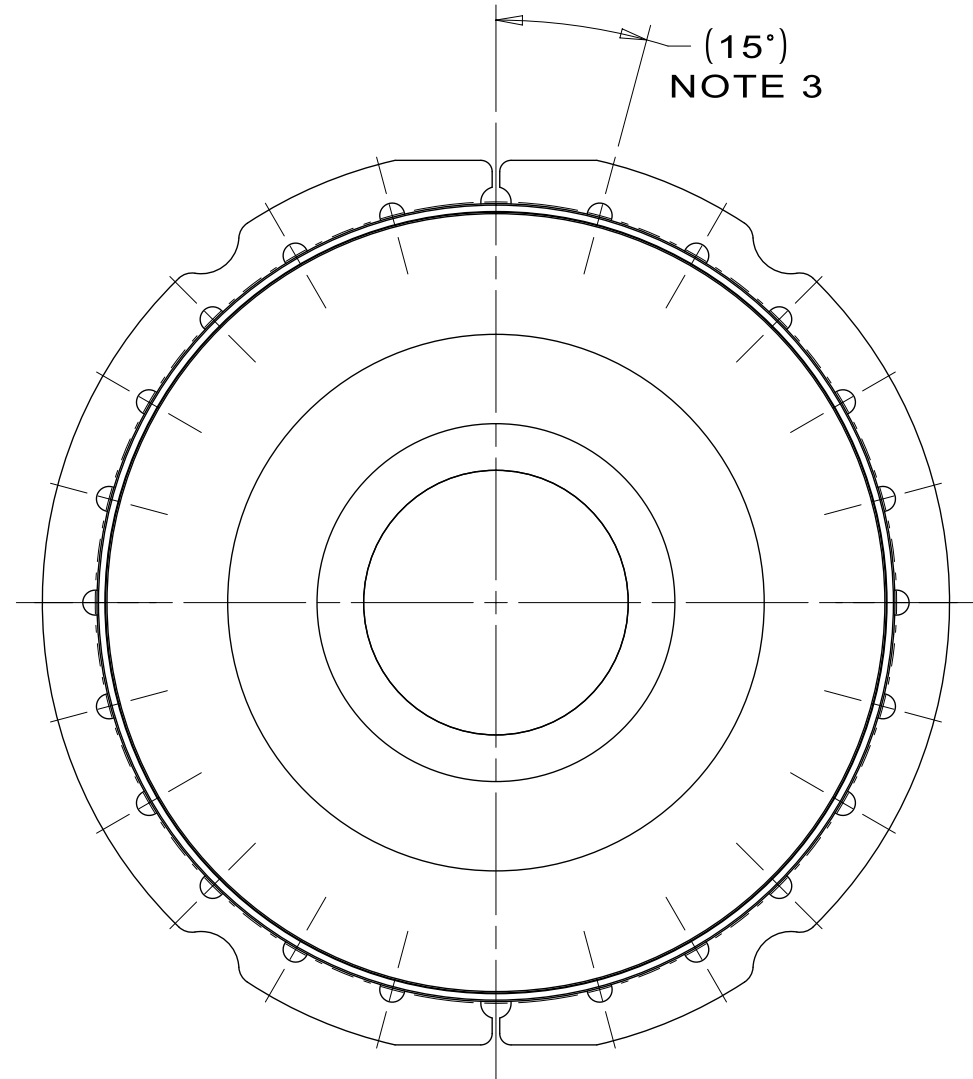
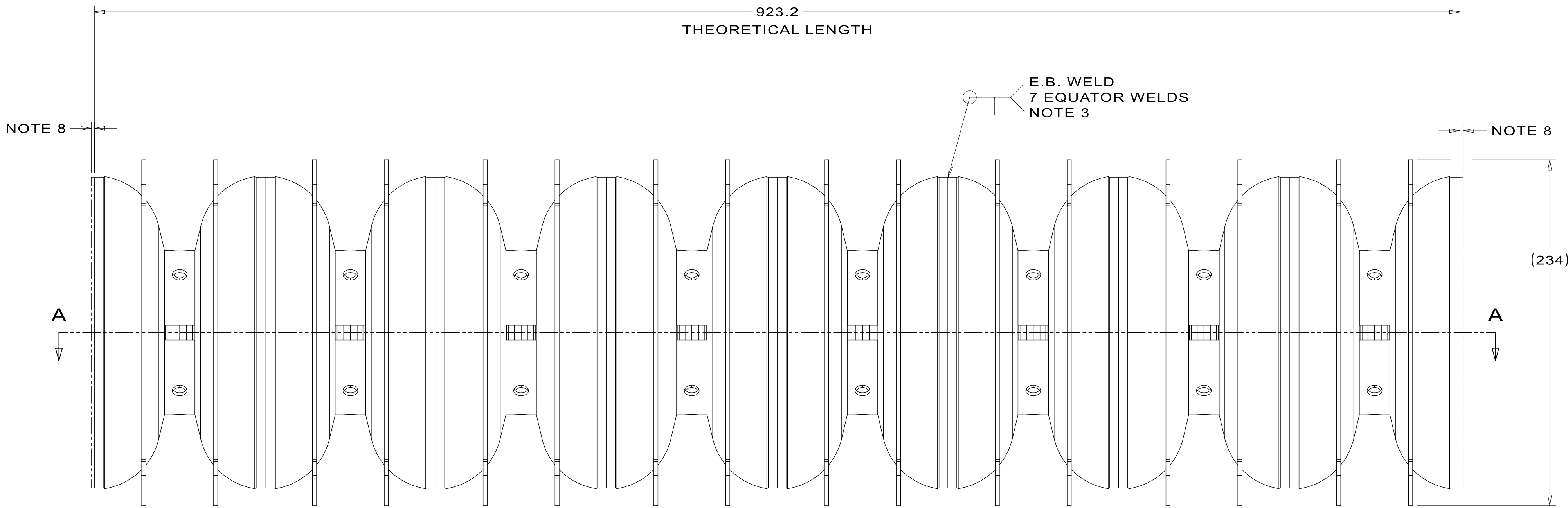
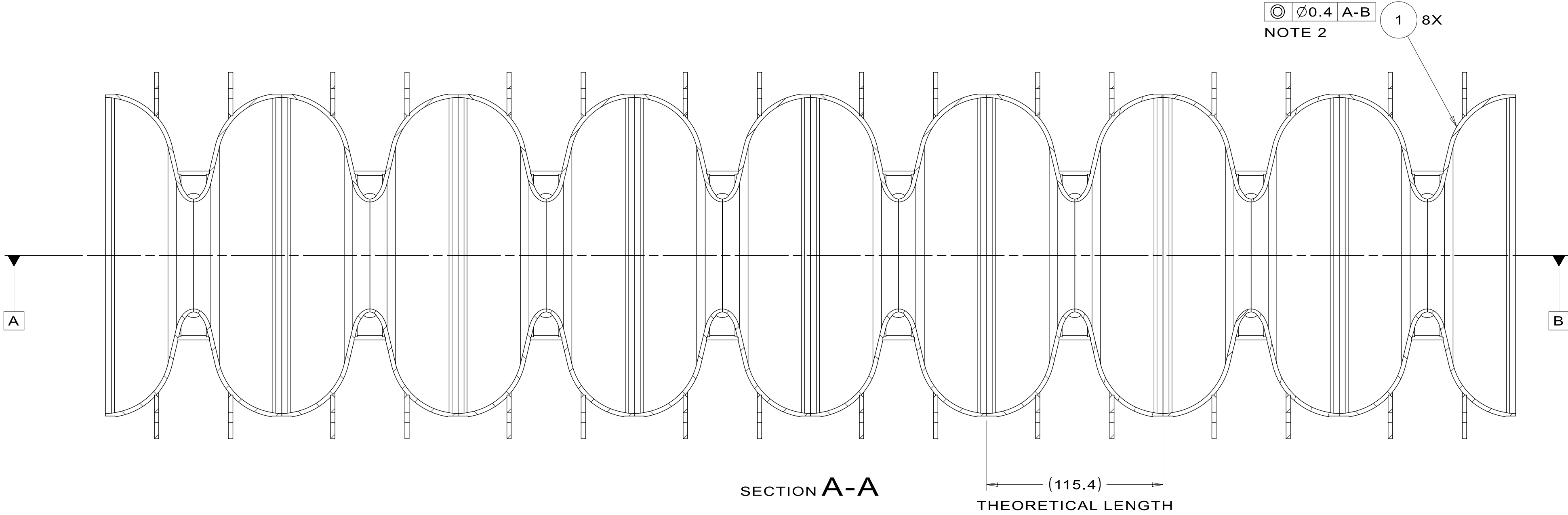


SECTION A-A

3. TRAILING ZEROS DENOTE TOLERANCE.

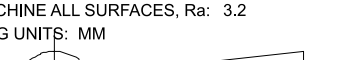
UNLESS OTHERWISE SPECIFIED					DRAWN	M.WADE		DATE	28-Aug-2025			FERMI NATIONAL ACCELERATOR LABORATORY UNITED STATES DEPARTMENT OF ENERGY			
±X	±X.X	±X.XX	±X/X	±X*	CHECKED	J.COGHILL		DATE	11-Mar-2026						
2	0.3	0.12	N/A	1*	APPROVED	J F.HELSPER		DATE	11-Mar-2026						
BREAK ALL SHARP EDGES, MAX: 0.5 DO NOT SCALE DRAWING DIMENSIONS BASED ON: ASME Y14.5M-2009 MAX MACHINE ALL SURFACES, Ra: 3.2 DRAWING UNITS: MM  THIRD ANGLE PROJECTION					USED ON		NAME 1.3GHz NW78 BEAM FLANGE ERDC								
					F10251517, F10251519										
					MATERIAL						SCALE 1:2				SIZE A3
					NIOBIUM 55/TITANIUM 45 ALLOY										
GROUP: Technical Division - Design and Drafting					CAGE CODE: QJUR6										

REV	REVISION CONTROL DOCUMENT	DATES	SIGNATURES
-	F10251521---RCD		DRAWN APPROVED

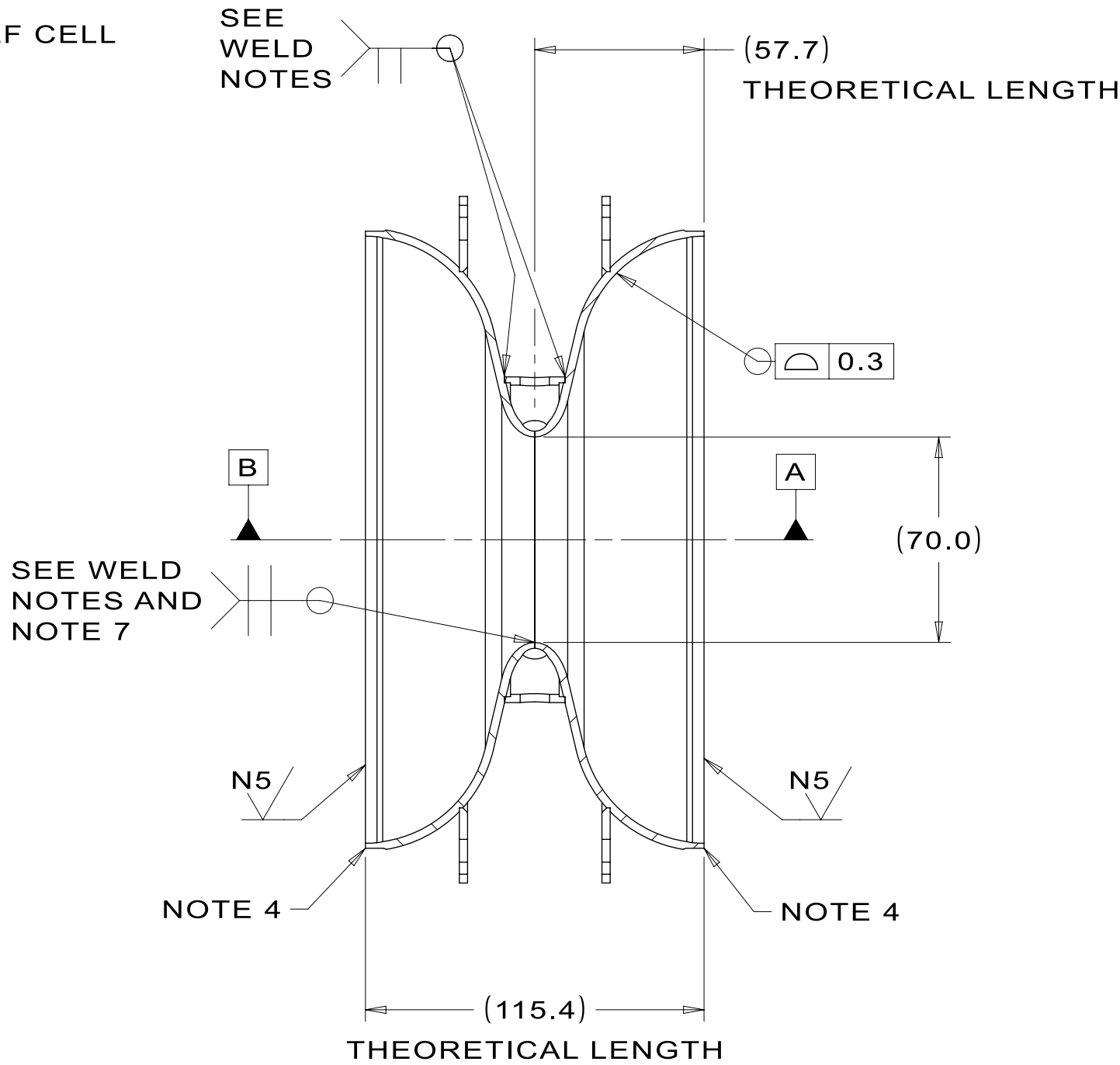
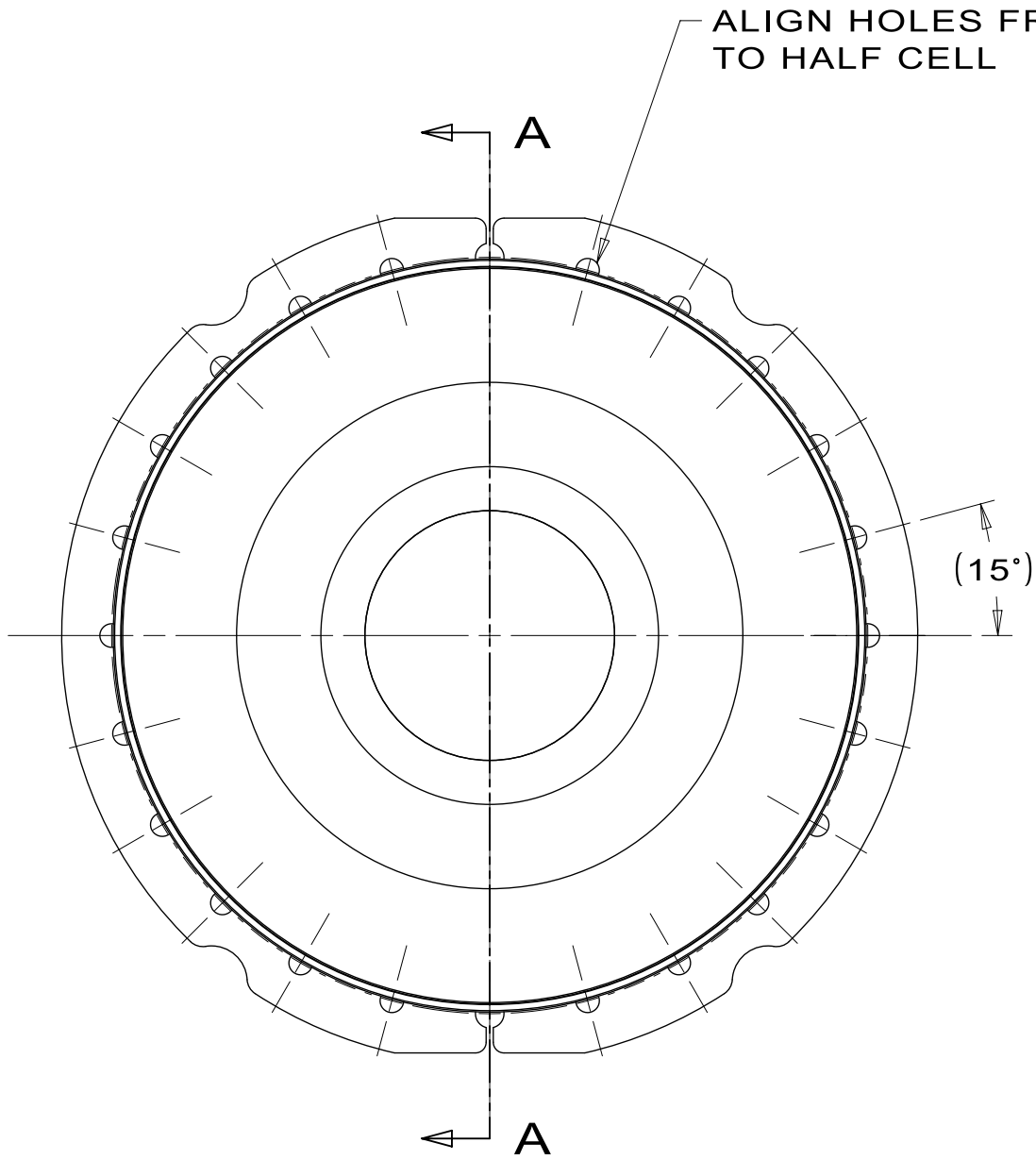
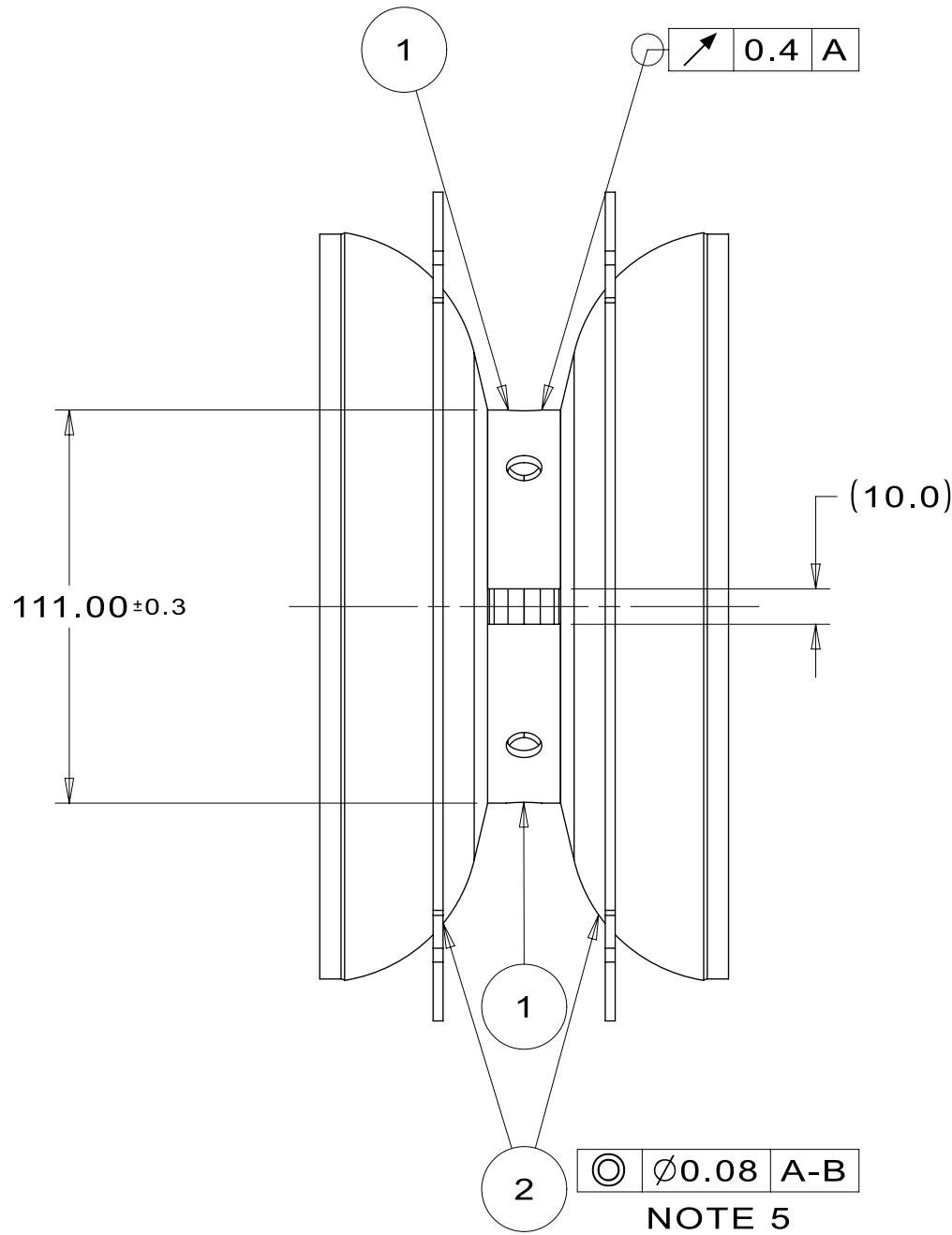


NOTES (UNLESS OTHERWISE SPECIFIED):

- WELDMENT TO BE FREE OF DUST, GREASE, OIL, CHIPS, AND BURRS.
- WELDING NOTES:
 - ASSEMBLY TO BE VACUUM TIGHT:
NO LEAK SHALL BE DETECTABLE ON THE MOST SENSITIVE SCALE OF A HELIUM MASS SPECTROMETER LEAK DETECTOR WITH A MINIMUM SENSITIVITY OF 2×10^{-10} ATM CC/SEC FOR HELIUM.
 - ASSEMBLY TO BE CLEANED, AND PACKAGED SO AS TO ASSURE NO CONTAMINATION FOR FOREIGN MATERIALS, METAL CHIPS,OR OTHER CONTAMINATES. CLEANING PROCEDURE TO BE APPROVED BY FERMILAB.
 - ALL DESIGN, ASSEMBLY, AND HANDLING IS TO CONFORM TO STANDARD ULTRA HIGH VACUUM PRACTICES.
 - ALL ELECTRON BEAM WELDING, ACID ETCHING, CLEANLINESS, AND HANDLING PROCEDURES ARE DETAILED IN DESY SPECIFICATION MHF-SL-1-1999 AND MUST BE FOLLOWED.
- ENSURE THAT THE CLOCKING OF THE SUPPORT RINGS ON THE DUMBELL WELDMENTS ARE HELD TO 0.5°. ENSURE THAT THE CLOCKING OF THE COOLING RINGS ON THE DUMBELL WELDMENTS ARE HELD TO 0.5°.
- ALL PARTS ARE TO BE CONCENTRIC WITHIN 0.4mm ALONG DATUM A AND B.
- DEFINITION OF FORM AND TOLERANCES CONCERNING WELD JOINT PREPARATION AT THE IRIS AND THE EQUATOR TO BE COORDINATED BETWEEN MANUFACTURERS AND FNAL.
- INDIVIDUAL PART DIMENSIONS ARE FINAL LENGTH AFTER ACID ETCHING AND TUNING
- THIS DEVICE IS EASILY DEFORMED. A FIXTURE IS REQUIRED FOR ALL HANDLING.
- ADDITIONAL MATERIAL NEEDED FOR CELL TUNING PLUS ALLOWANCE FOR E-BEAM WELD SHRINKAGE. FINAL SURFACE TO BE MACHINED UNTIL TUNED.
- DO NOT BREAK SHARP EDGES ON END CELL

UNLESS OTHERWISE SPECIFIED					DRAWN	M.WADE		DATE	02-Sep-2025			FERMI NATIONAL ACCELERATOR LABORATORY UNITED STATES DEPARTMENT OF ENERGY															
+X		+X.X		1X.XX		1X.X		1"		CHECKED					J.COGHILL		DATE	11-Mar-2026									
2		0.3		0.12		N/A		1"		APPROVED					J.F.HELSPER		DATE	11-Mar-2026									
BREAK ALL SHARP EDGES, MAX: 0.5 DO NOT SCALE DRAWING DIMENSIONS BASED ON: ASME Y14.5M-2009 MAX MACHINE ALL SURFACES, Ra: 3.2 DRAWING UNITS: MM											USED ON				F10241514		NAME		1.3GHz BARBELL WELDMENT ASSY ERDC 1								
											MATERIAL				SEE PARTS LIST		SCALE 1:2		SIZE A1		DRAWING NUMBER F10251521		SHEET 1 of 1		REV -		
											GROUP: Technical Division - Design and Drafting						CAGE CODE: OUSR6										

REV	REVISION CONTROL DOCUMENT	1	
		DATES	SIGNATURES
-	F10251558---RCD		DRAWN APPROVED



NOTES (UNLESS OTHERWISE SPECIFIED):

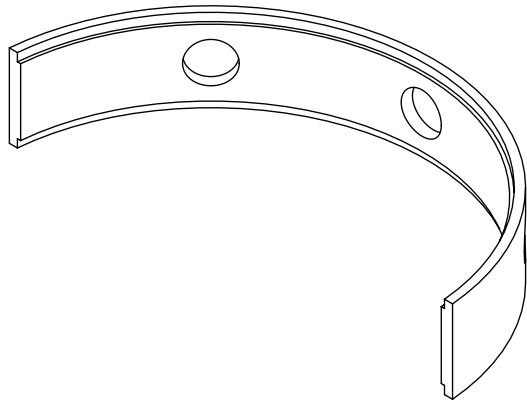
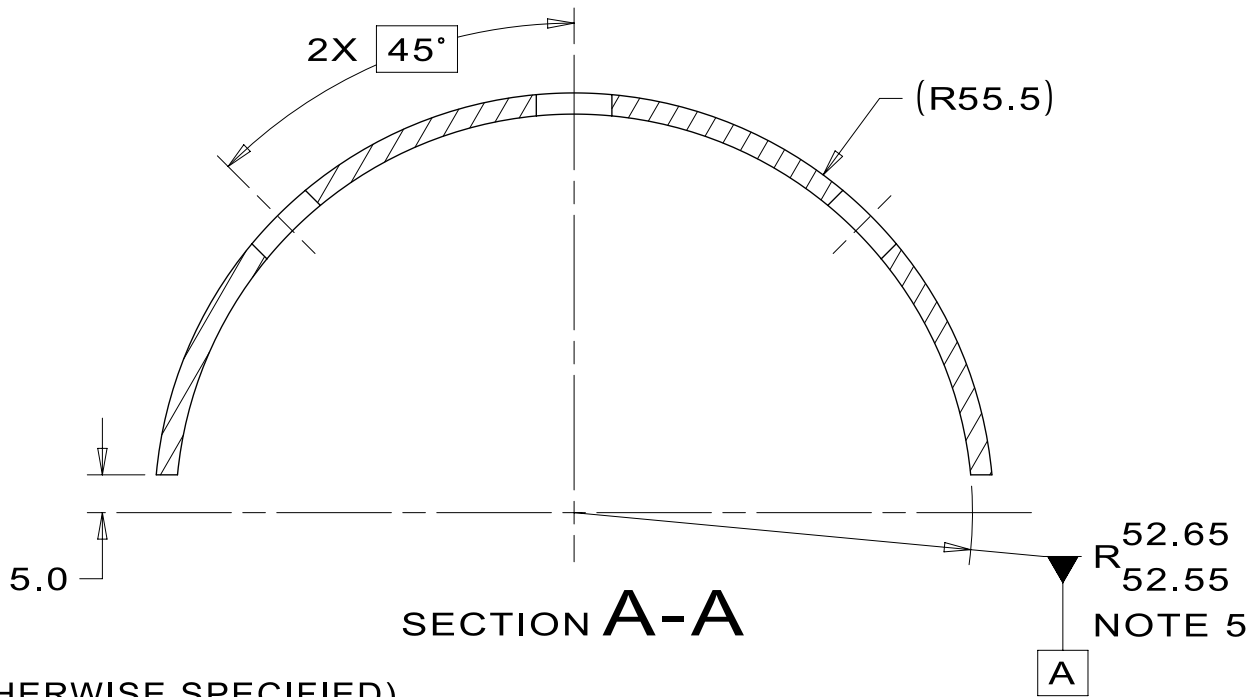
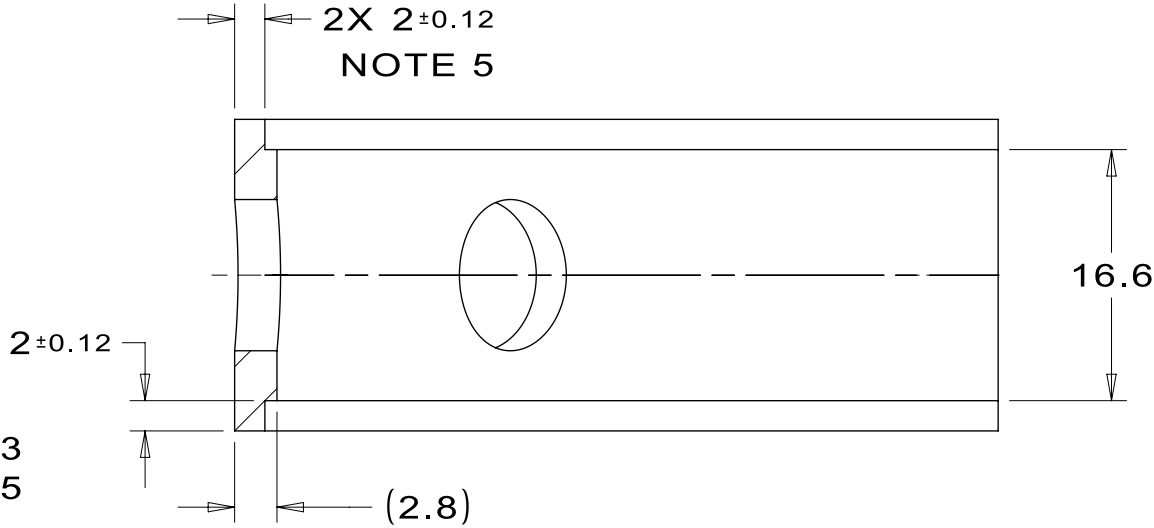
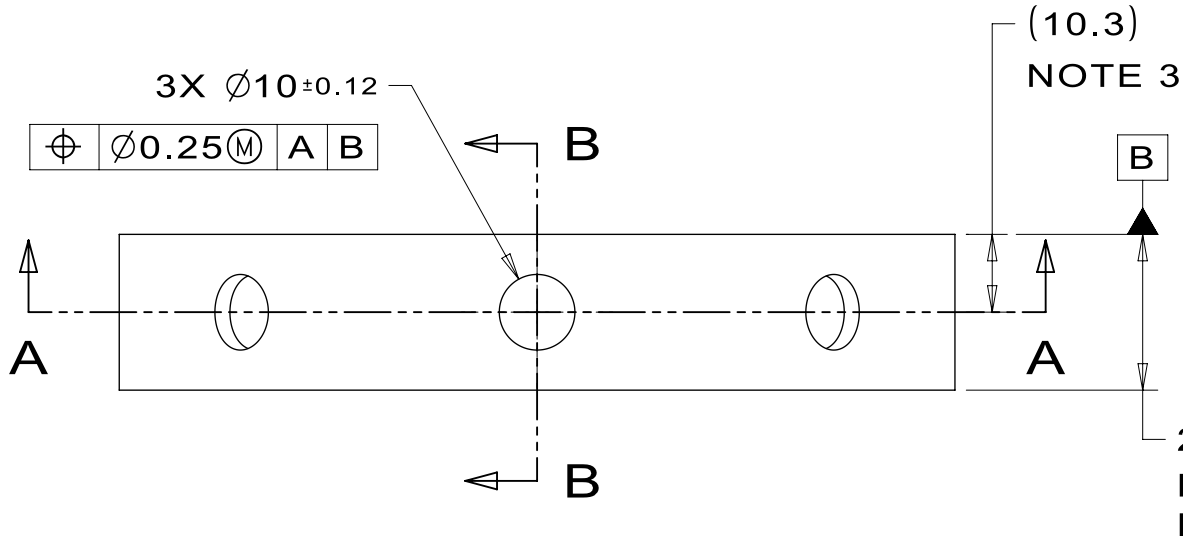
1. WELDMENT TO BE FREE OF DUST , GREASE, OIL, CHIPS, AND BURRS.
2. WELDING NOTES:
- A. ASSEMBLY TO BE VACUUM TIGHT:
NO LEAK SHALL BE DETECTABLE ON THE MOST SENSITIVE SCALE OF A HELIUM MASS SPECTROMETER LEAK DETECTOR WITH A MINIMUM SENSITIVITY OF 2×10^{-10} ATM CC/SEC FOR HELIUM.
- B. ASSEMBLY TO BE CLEANED, AND PACKAGED SO AS TO ASSURE NO CONTAMINATION FOR FOREIGN MATERIALS, METAL CHIPS, OR OTHER CONTAMINATES. CLEANING PROCEDURE TO BE APPROVED BY FERMILAB.
- C. ALL DESIGN, ASSEMBLY, AND HANDLING IS TO CONFORM TO STANDARD ULTRA HIGH VACUUM PRACTICES.
- D. ALL ELECTRON BEAM WELDING, ACID ETCHING, CLEANLINESS, AND HANDLING PROCEDURES ARE DETAILED IN DESY SPECIFICATION MHF-SL-1-1999 AND MUST BE FOLLOWED.
3. RF SURFACES IS TO BE FREE OF DAMAGE
4. ADDITIONAL MATERIAL NEEDED FOR CELL TUNING PLUS ALLOWANCE FOR E-BEAM WELD SHRINKAGE. FINAL SURFACE TO BE MACHINED UNTIL TUNED.
5. ALL PARTS ARE TO BE CONCENTRIC WITHIN 0.08mm ALONG DATUM A AND B
6. DO NOT BREAK EDGES ON END CELL.
7. DUAL PASS WELD -- WELD BOTH SIDES TO ENSURE OVERLAP.

2	F10251607	WELDMENT, MID HALF CELL, 1.3 GHz RF CAVITY ERDC	2
1	F10251559	BARBELL STIFFENING RING, 1.3GHz RF CAVITY, ERDC	2
ITEM	FERMI #	PART NAME	QTY
PARTS LIST			
FERMI NATIONAL ACCELERATOR LABORATORY UNITED STATES DEPARTMENT OF ENERGY			
DUMBBELL, 1.3GHz RF CAVITY ERDC			
SCALE 1:2	SIZE A2	DRAWING NUMBER F10251558	SHEET 1 OF 1
		REV -	

UNLESS OTHERWISE SPECIFIED					DRAWN	M.WADE	DATE	29-Aug-2025
±X	±X.X	±X.XX	±X/X	±X"	CHECKED	J.COZHILL	DATE	11-Mar-2026
2	0.3	0.12	N/A	1"	APPROVED	J F.HELSPER	DATE	11-Mar-2026
BREAK ALL SHARP EDGES, MAX: 0.5 DO NOT SCALE DRAWING DIMENSIONS BASED ON: ASME Y14.5M-2009 MAX MACHINE ALL SURFACES, Ra: 3.2 DRAWING UNITS: MM					USED ON F10251521			
THIRD ANGLE PROJECTION					MATERIAL SEE PARTS LIST			
					GROUP: Technical Division - Design and Drafting CAGE CODE: OUSR6			

DESCRIPTION: BARBELL STIFFENING RING, 1.3GHz RF CAVITY, ERDC
PROJECT: IARC_ERDC1_3GHzCryostat
CATEGORY: RING

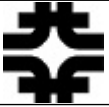
REV	REVISION CONTROL DOCUMENT	DATES	SIGNATURES	
-	F10251559---RCD		DRAWN	
			APPROVED	



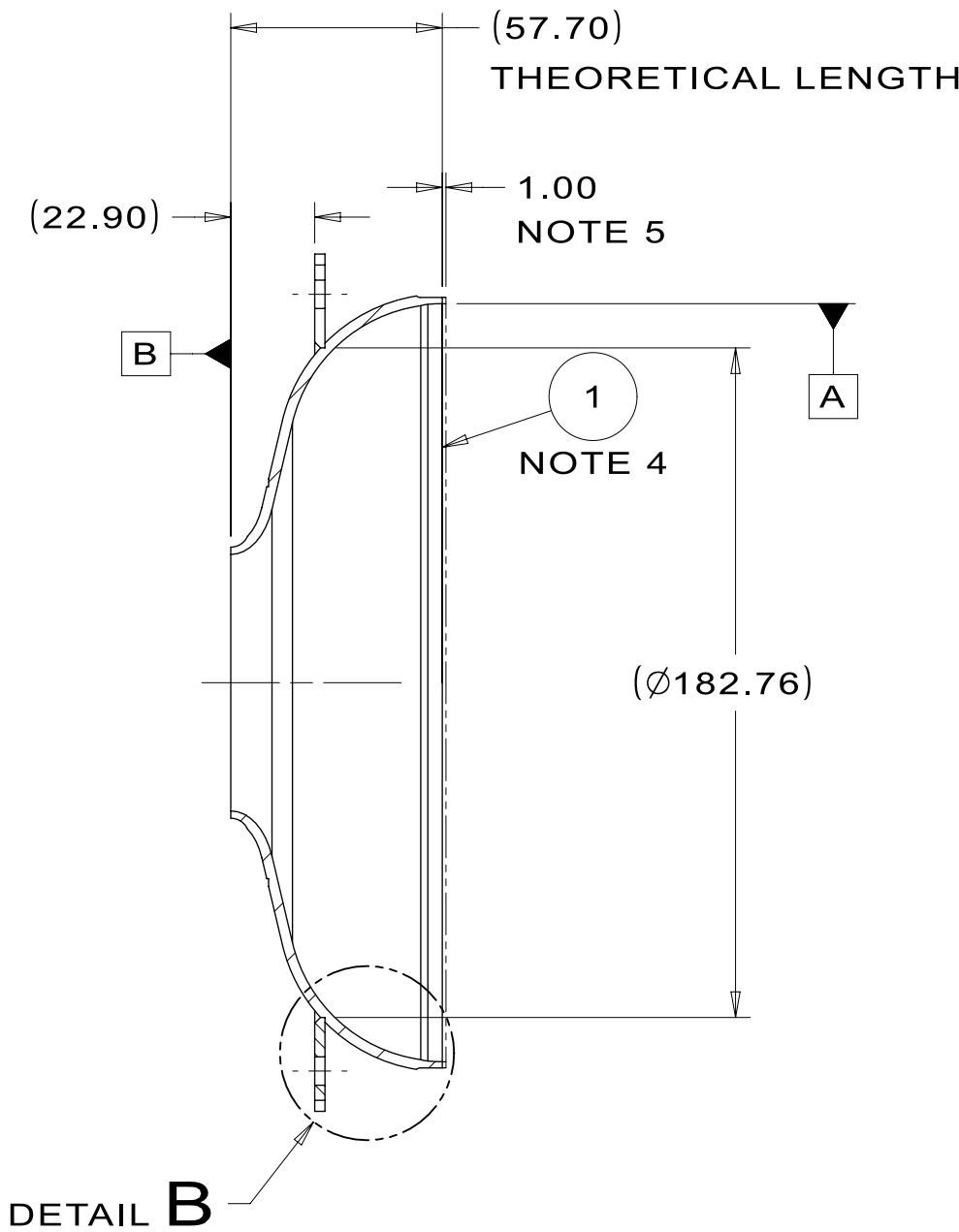
NOTES (UNLESS OTHERWISE SPECIFIED)

- PART TO BE FREE OF DIRT, GREASE, OIL AND CHIPS.
- PART TO BE FREE OF ALL SHARP EDGES, CORNERS AND BURRS.
- DIMENSIONS TO BE DETERMINED BY THE MANUFACTURER TO ALLOW FOR FUTURE EB-WELDING CONTRACTION.
- TRAILING ZEROS DENOTE TOLERANCE.
- DIMENSION CORRESPONDS WITH PART # F10251560, MID HALF CELL. TOLERANCE IS TO BE COORDINATED BETWEEN MANUFACTURER AND EB WELDERS.

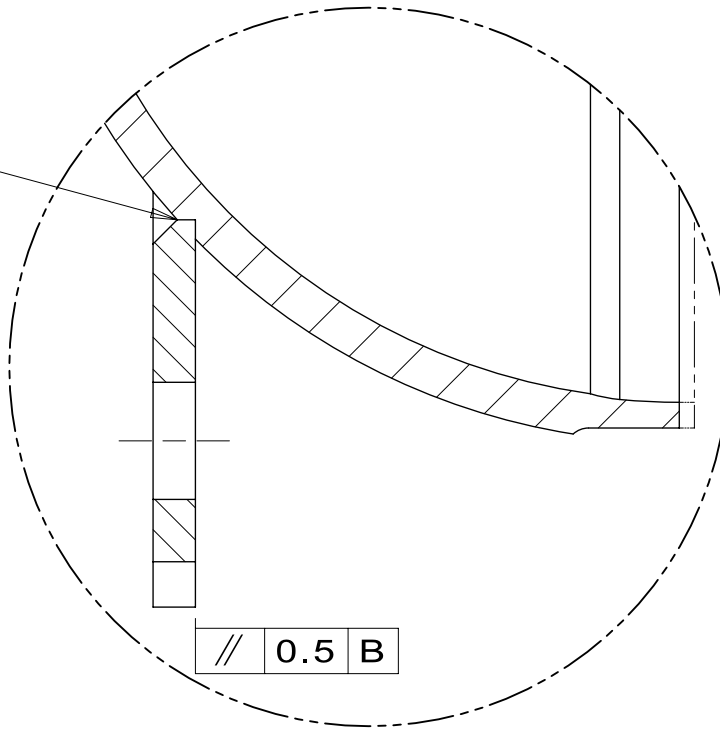
UNLESS OTHERWISE SPECIFIED					DRAWN	J.VANDER MEULEN	DATE	13-Aug-2025
±X	±X.X	±X.XX	±X/X	±X*	CHECKED	J.COGHILL	DATE	11-Mar-2026
2	0.3	0.12	N/A	1*	APPROVED	J F.HELSPER	DATE	11-Mar-2026
BREAK ALL SHARP EDGES, MAX: 0.5 DO NOT SCALE DRAWING DIMENSIONS BASED ON: ASME Y14.5M-2009 MAX MACHINE ALL SURFACES, Ra: 3.2 DRAWING UNITS: MM					USED ON			
					F10251558			
					MATERIAL			
					NIOBIUM, RRR GRADE 2.8MM STK THICKNESS			
					GROUP: Technical Division - Design and Drafting CAGE CODE: OU5R6			

					FERMI NATIONAL ACCELERATOR LABORATORY UNITED STATES DEPARTMENT OF ENERGY			
					NAME			
					BARBELL STIFFENING RING, 1.3GHz RF CAVITY, ERDC			
SCALE	SIZE	DRAWING NUMBER		SHEET	REV			
1:1	A3	F10251559		1 OF 1	-			

TEMPLATE VERSION: 2021.08.06



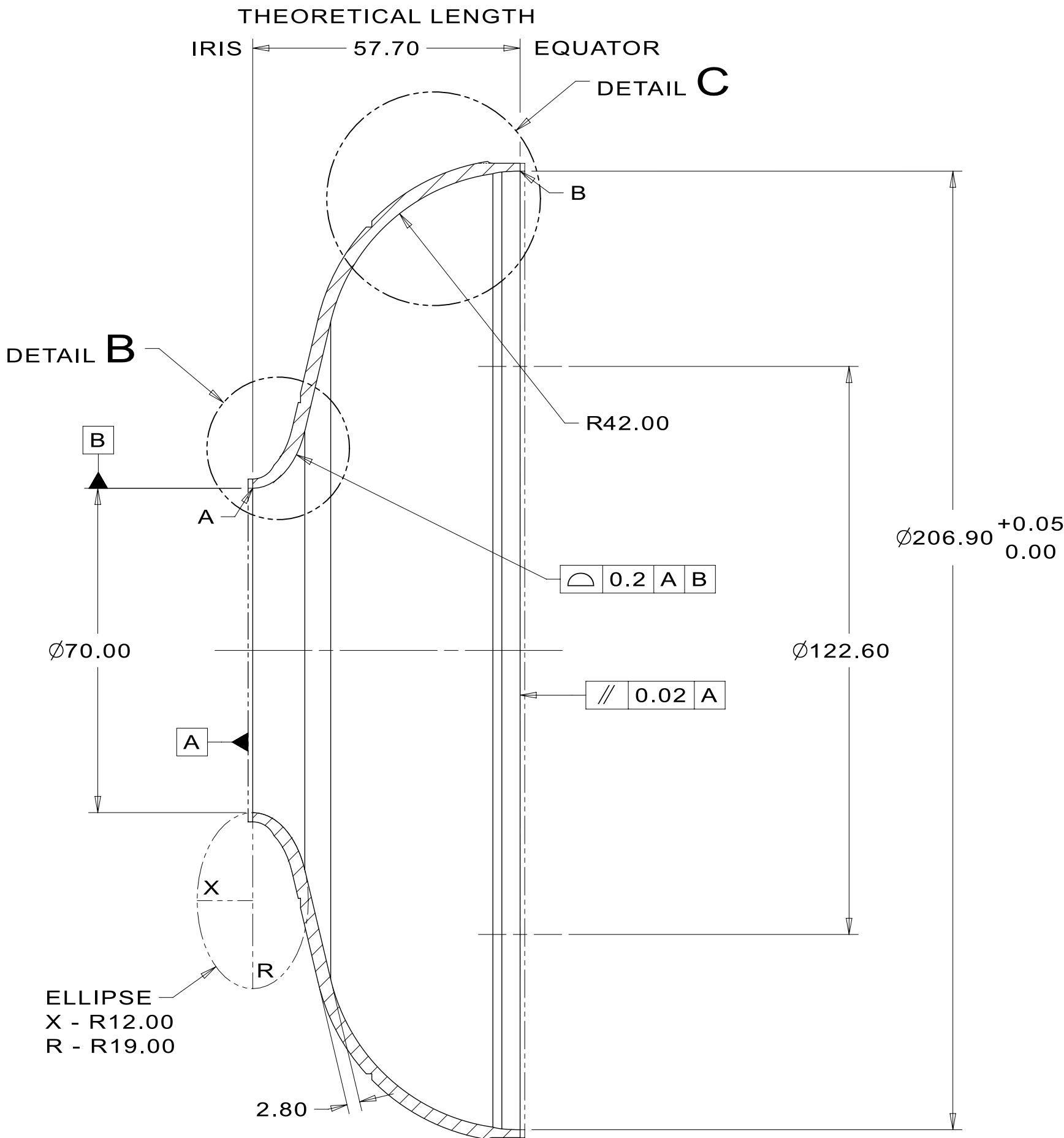
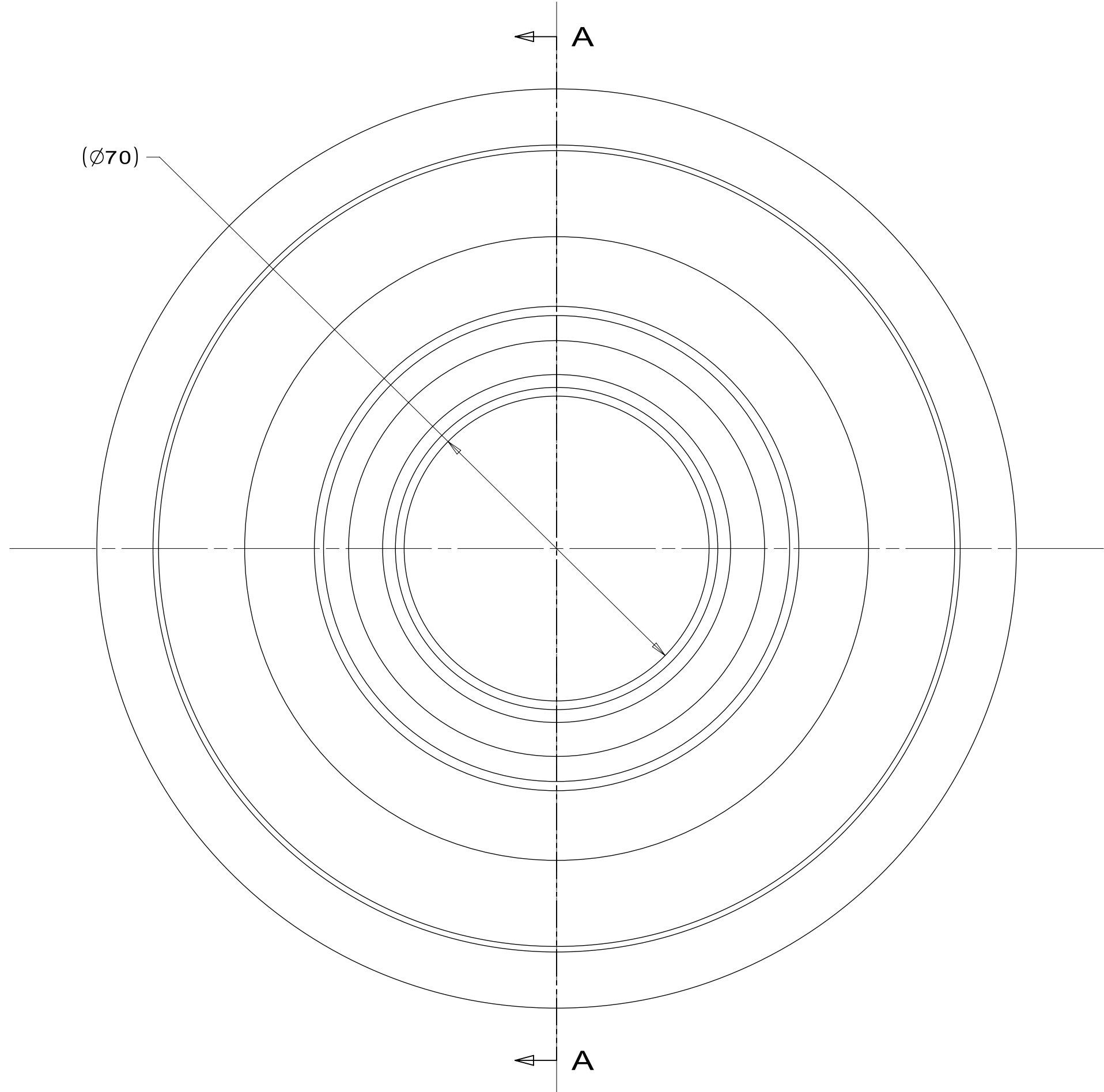
0.8-1.2 MM
PENETRATION MIN



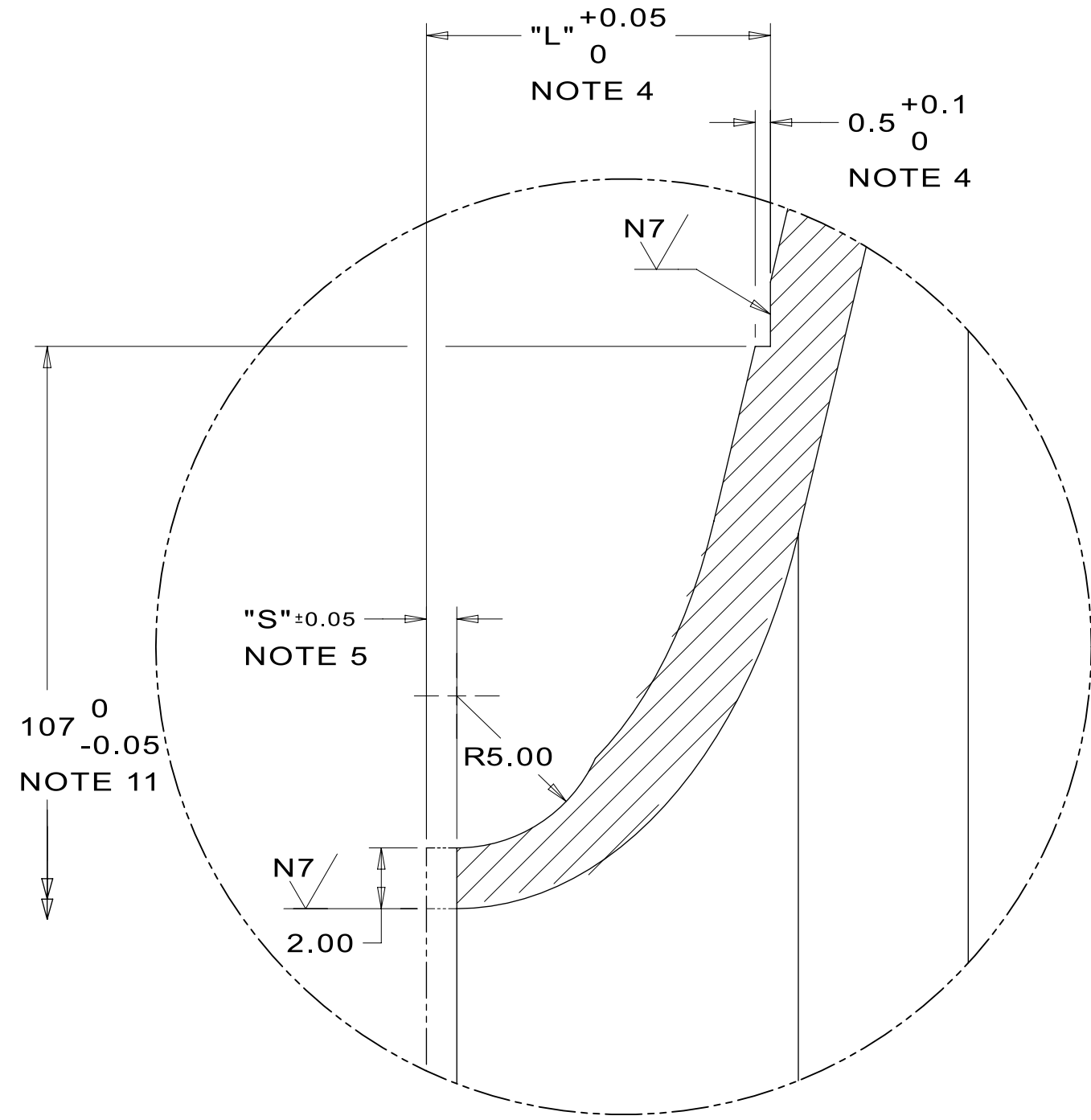
THIRD ANGLE PROJECTION

- | | | | | | | |
|------------------|-------------|---|---|-----------------------------|-----------------|----------|
| 2 | F10251563 | CAVITY COOLING RING, ERDC | | | | 2 |
| 1 | F10251560 | MID HALF CELL, 1.3GHz RF CAVITY ERDC | | | | 1 |
| ITEM | FERMI # | PART NAME | | | | QTY |
| PARTS LIST | | | | | | |
| DATE | 29-Aug-2025 |  | FERMI NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY | | | |
| DATE | 11-Mar-2026 | | | | | |
| DATE | 11-Mar-2026 | | | | | |
| | | NAME | | | | |
| | | WELDMENT, MID HALF CELL, 1.3 GHz RF CAVITY ERDC | | | | |
| | | SCALE
1:2 | SIZE
A2 | DRAWING NUMBER
F10251607 | SHEET
1 OF 1 | REV
- |
| CAGE CODE: 0U5R6 | | | | | | |

REV	REVISION CONTROL DOCUMENT	DATES	SIGNATURES
-	F10251560---RCD		DRAWN APPROVED



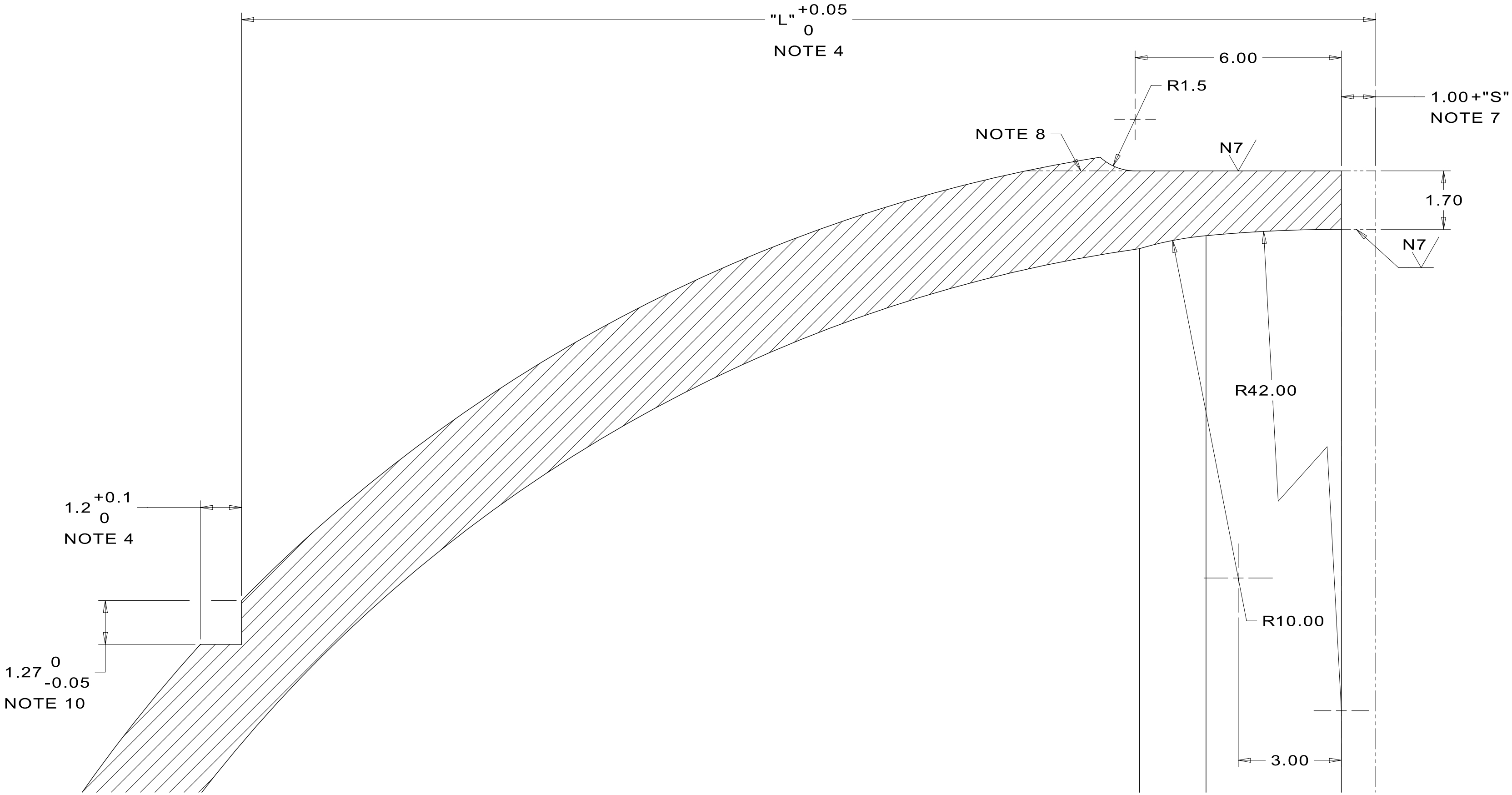
SECTION **A-A**



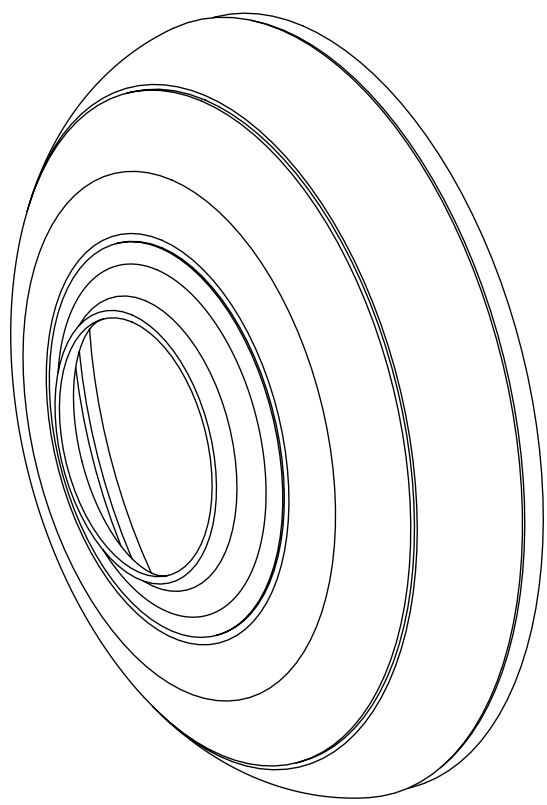
DETAIL **B**
SCALE 5:1

NOTES (UNLSS OTHERWISE SPECIFIED):

1. THE INTERNAL SURFACE MAY SHOW NO DAMAGE CAUSED BY FORMING.
2. DIAMETER, FORM, AND POSITION TOLERACES MEASURED IN HALF CELL'S STRAINED CONDITION.
3. DO NOT BREAK EDGES ON END CELL.
4. DIMENSION "L" DETERMINED BY THE MANUFACTURER SO THAT DIMENSION 0.50mm IS KEPT.
5. SUPPLEMENT FOR WELD SHRINKING ("S") TO BE DETERMINED BY EB WELDERS.
6. DUE TO THE MANUFACTURING PROCESS, THE WALL THICKNESS BETWEEN THE IRIS AND EQUATOR IS NOT CONSTANT.
7. ADDITIONAL MATERIAL NEEDED FOR CELL TUNING PLUS ALLOWANCE FOR E-BEAM WELD SHRINKAGE ("S"). FINAL SURFACE TO BE MACHINED UNTIL TUNED.
8. VENDOR OPTION TO MACHINE FLAT OMITTING R1.5.
9. TRAILING ZEROS DENOTE TOLERANCE.
10. DIMENSION CORRESPONDS WITH PART NUMBER F10251563, COOLING RING. TOLERANCE IS TO BE COORDINATED BETWEEN MANUFACTURER AND EB WELDERS.
11. DIMENSION CORRESPONDS WITH PART NUMBER F10251559, BARBELL STIFFENING RING. TOLERANCE IS TO BE COORDINATED BETWEEN MANUFACTURER AND EB WELDERS.



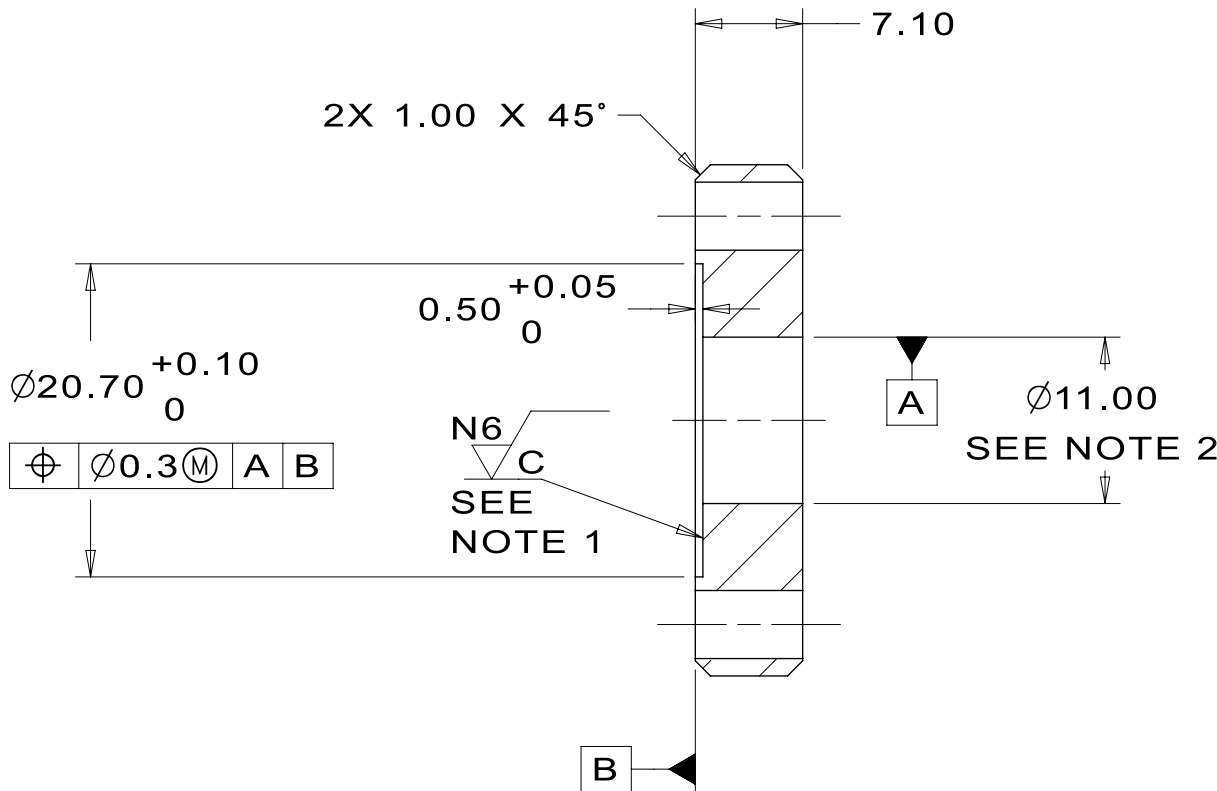
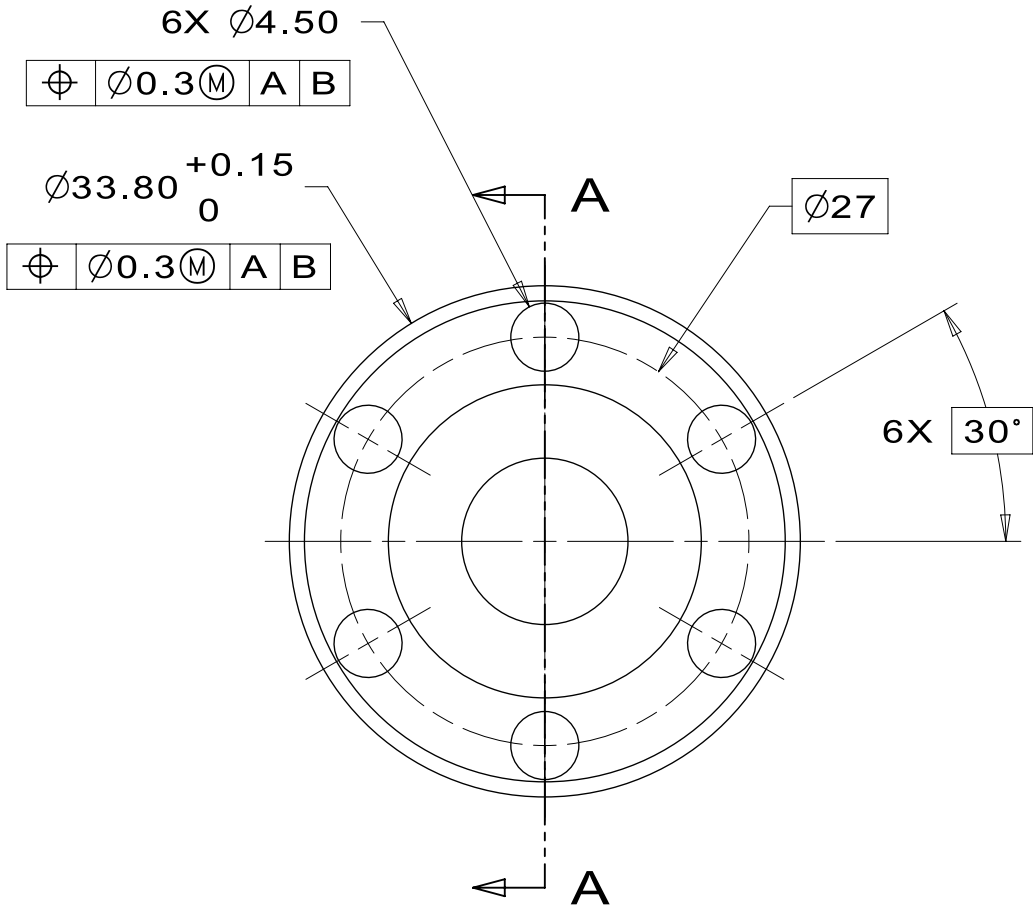
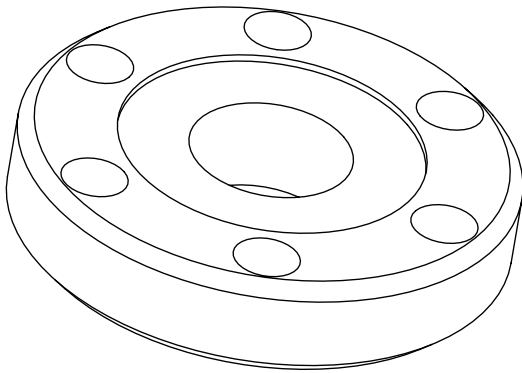
DETAIL **C**
SCALE 10:1



UNLESS OTHERWISE SPECIFIED					DRAWN	J.VANDER MEULEN		DATE	13-Aug-2025			FERMI NATIONAL ACCELERATOR LABORATORY UNITED STATES DEPARTMENT OF ENERGY		
±X	+X.X	1X.XX	1X/X	±X"	CHECKED	J.COGHILL		DATE	11-Mar-2026					
2	0.3	0.12	N/A	1"	APPROVED	J.F.HELSPER		DATE	11-Mar-2026					
BREAK ALL SHARP EDGES, MAX: 0.5 DO NOT SCALE DRAWING DIMENSIONS BASED ON: ASME Y14.5M-2009 MAX MACHINE ALL SURFACES, Ra: 3.2 DRAWING UNITS: MM					USED ON		F10251607		NAME		MID HALF CELL, 1.3GHz RF CAVITY ERDC			
					MATERIAL		NIOBIUM, TYPE 5 RRR GRADE		SCALE 1:1 & AS SHOWN		SIZE A1	DRAWING NUMBER F10251560	SHEET 1 of 1	REV -
					GROUP: Technical Division - Design and Drafting		CAGE CODE: OUSR6							

DESCRIPTION: NW8 FLANGE, 1.3GHz RF CAVITY ERDC
PROJECT: IARC_ERDC1_3GHzCryostat
CATEGORY: FLANGE

REV	REVISION CONTROL DOCUMENT	DATES	SIGNATURES	
-	F10251550---RCD		DRAWN	
			APPROVED	

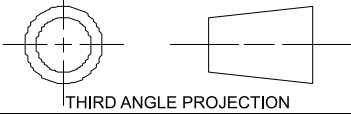


SECTION A-A

NOTES (UNLESS OTHERWISE SPECIFIED):

- SEALING SURFACE MUST BE FREE OF SCRATCHES WITH NO RADIAL SCORING.
- DIMENSION CORRESPONDS WITH PART NUMBER F10251552. TOLERANCE IS TO BE COORDINATED BETWEEN MANUFACURERS AND EB-WELDERS.
- TRAILING ZEROS DENOTE TOLERANCE.

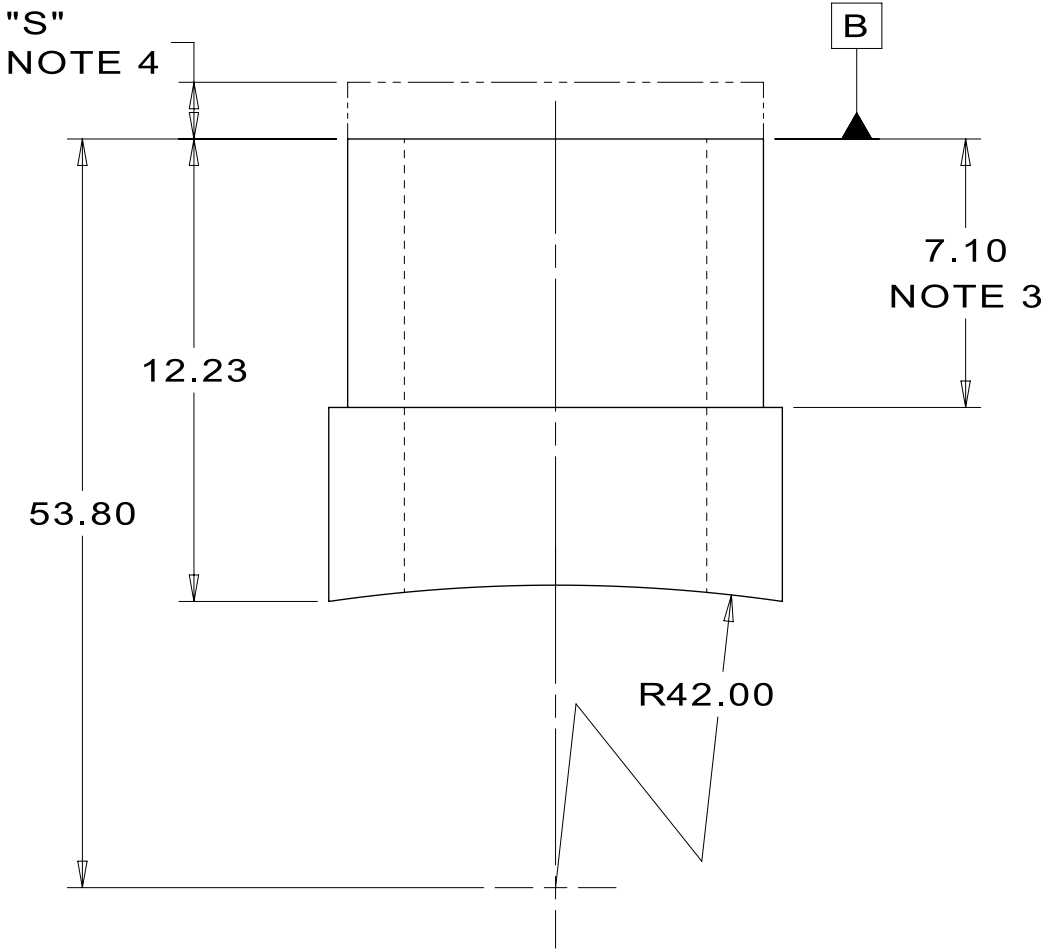
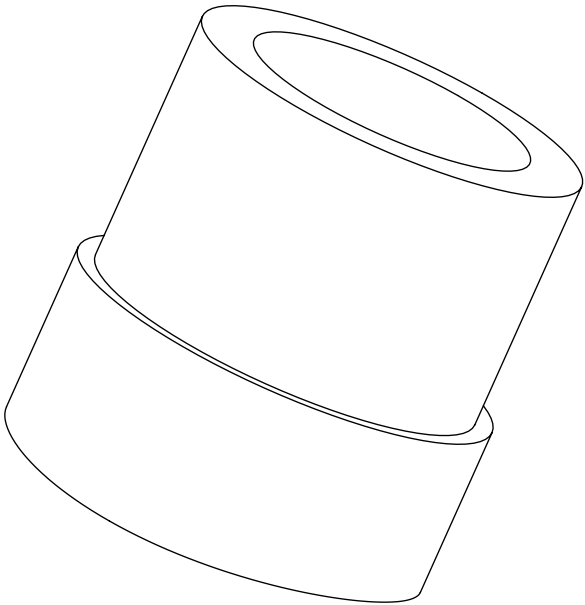
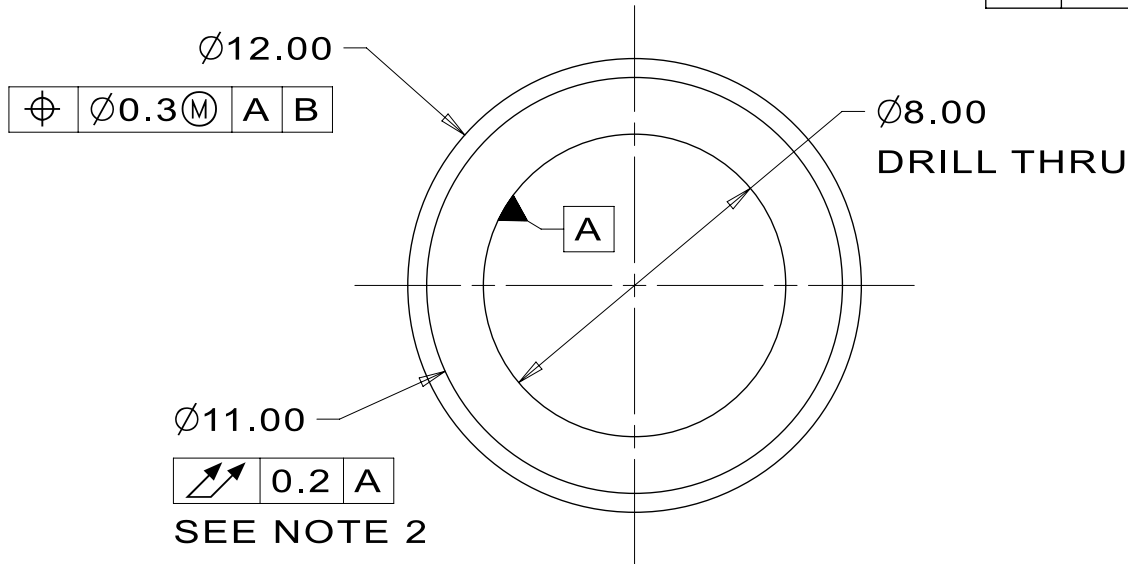
UNLESS OTHERWISE SPECIFIED					DRAWN	M.WADE	DATE	26-Aug-2025	 FERMI NATIONAL ACCELERATOR LABORATORY UNITED STATES DEPARTMENT OF ENERGY				
±X	±X.X	±X.XX	±X/X	±X*	CHECKED	J.COGHILL	DATE	11-Mar-2026					
2	0.3	0.12	N/A	1*	APPROVED	J F.HELSPER	DATE	11-Mar-2026					
BREAK ALL SHARP EDGES, MAX: 0.5 DO NOT SCALE DRAWING DIMENSIONS BASED ON: ASME Y14.5M-2009 MAX MACHINE ALL SURFACES, Ra: 3.2 DRAWING UNITS: MM					USED ON				NAME				
					F10251519				NW8 FLANGE, 1.3GHz RF CAVITY ERDC				
					MATERIAL								
					Nb55Ti								
					GROUP: Technical Division - Design and Drafting								
					CAGE CODE: OU5R6								



THIRD ANGLE PROJECTION

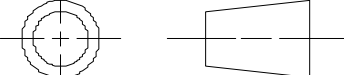
DESCRIPTION: LONG END ANTENNA SPOOL PIECE, 1.3GHz RF CAVITY ERDC
PROJECT: IARC_ERDC1_3GHzCryostat
CATEGORY: SPOOL

REV	REVISION CONTROL DOCUMENT	DATES	SIGNATURES	
-	F10251552---RCD		DRAWN	
			APPROVED	

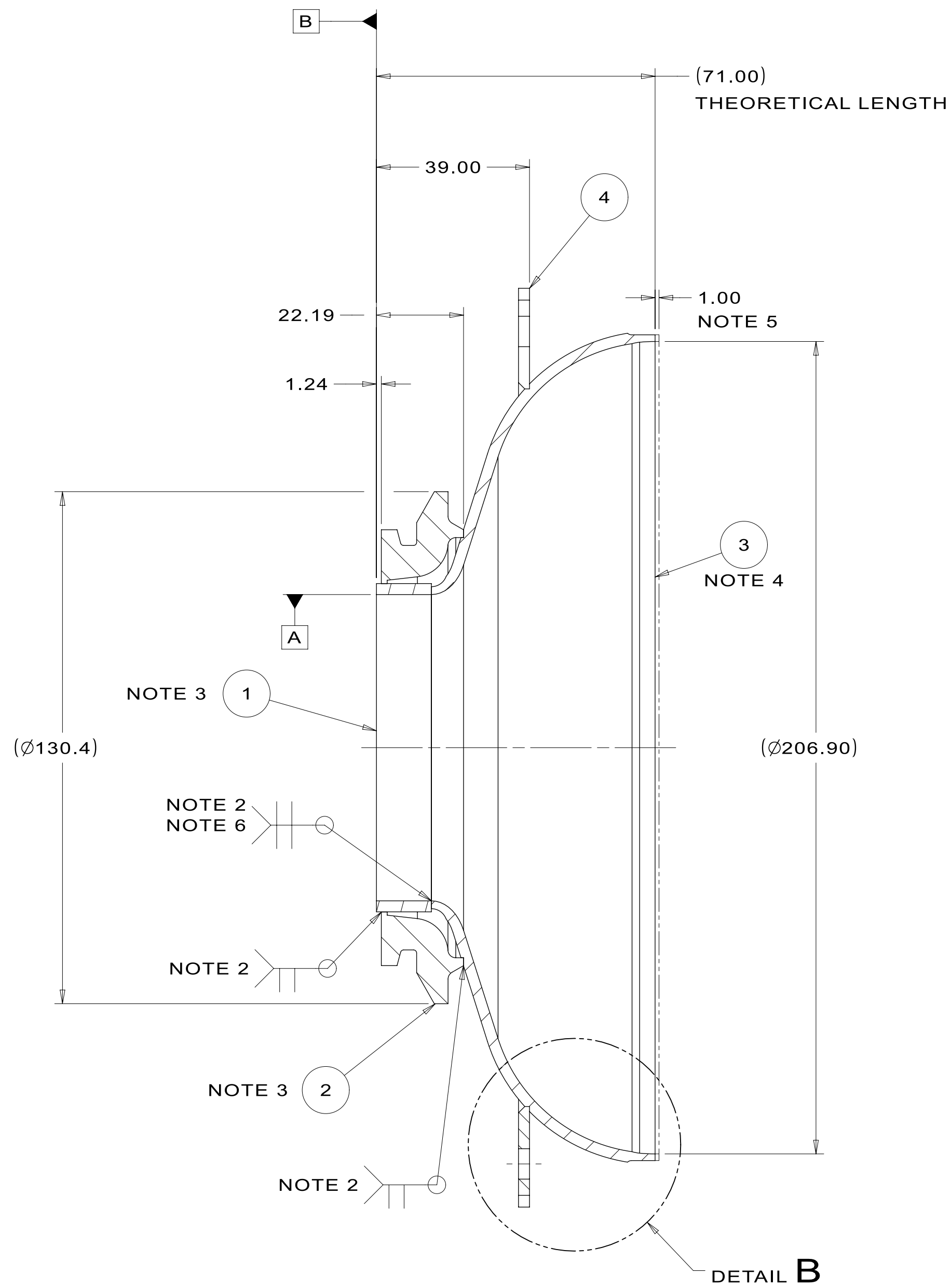


NOTES (UNLESS OTHERWISE SPECIFIED):

1. SURFACE FREE OF DAMAGE
2. DIMENSION CORRESPONDS WITH PART NUMBER F10251550. TOLERANCE IS TO BE COORDINATED BETWEEN MANUFACTURERS AND EB-WELDERS.
3. FINAL LENGTH AFTER MACHINING OPERATION DETAILED ON DRAWING NUMBER F10251519.
4. ADDITIONAL MATERIAL NEEDED TO ALLOW FOR WELD SHRINKAGE.
5. TRAILING ZEROS DENOTE TOLERANCE.

UNLESS OTHERWISE SPECIFIED					DRAWN	M.WADE	DATE	26-Aug-2025	 FERMI NATIONAL ACCELERATOR LABORATORY UNITED STATES DEPARTMENT OF ENERGY				
±X	±X.X	±X.XX	±X/X	±X*	CHECKED	J.COGHILL	DATE	11-Mar-2026					
2	0.3	0.12	N/A	1*	APPROVED	J F.HELSPER	DATE	11-Mar-2026					
BREAK ALL SHARP EDGES, MAX: 0.5 DO NOT SCALE DRAWING DIMENSIONS BASED ON: ASME Y14.5M-2009 MAX MACHINE ALL SURFACES, Ra: 3.2 DRAWING UNITS: MM  THIRD ANGLE PROJECTION					USED ON			NAME					
					F10251519								
					MATERIAL			LONG END ANTENNA SPOOL PIECE, 1.3GHz RF CAVITY ERDC					
					NIOBIUM RRR GRADE								
					GROUP: Technical Division - Design and Drafting								CAGE CODE: OU5R6
			SCALE 5:1		SIZE A3	DRAWING NUMBER F10251552			SHEET 1 OF 1	REV -			

TEMPLATE VERSION: 2021.08.06

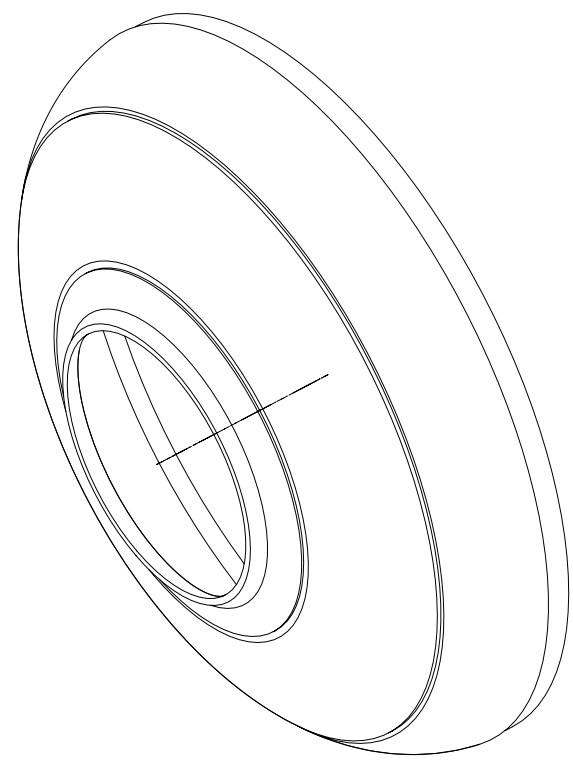
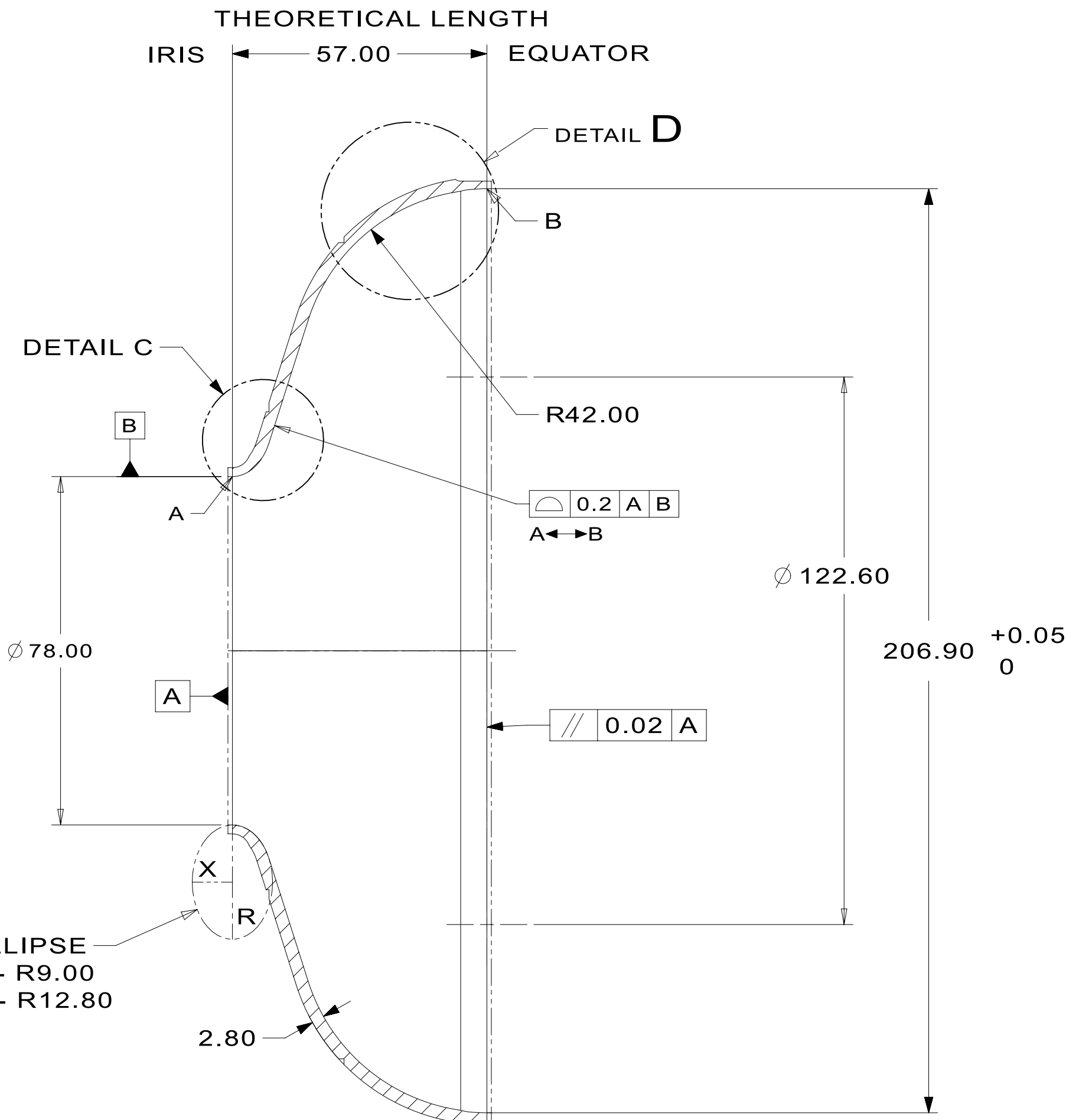
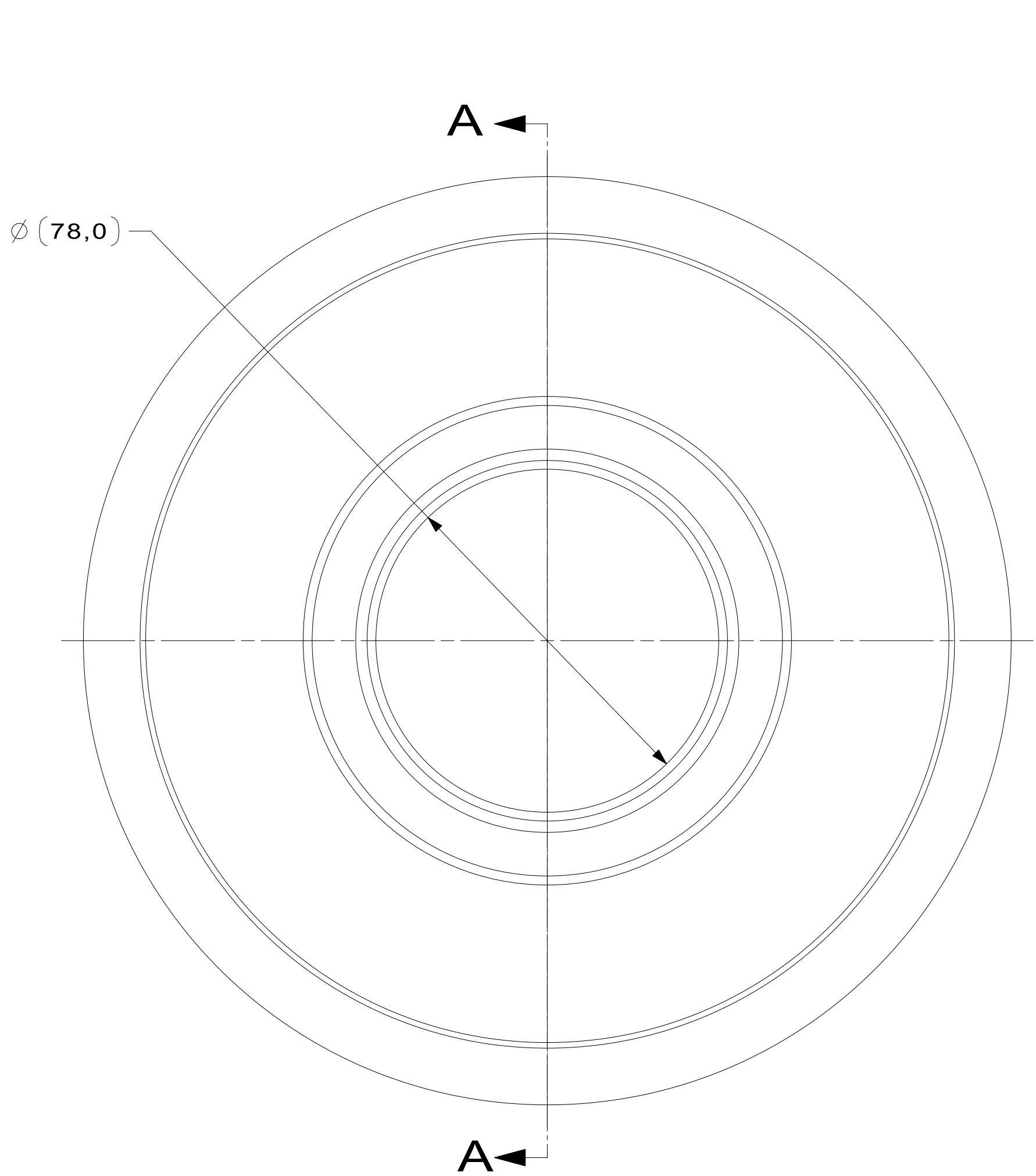


UNLESS OTHERWISE SPECIFIED					DRAWN		M.WADE		DATE		28-Aug-2025		
1X		1X,X		1X,XX		1X,X		1X"		CHECKED		J.COCHILL	
2		X,3		0.12		N/A		1"		APPROVED		J.F.HELSPER	
BREAK ALL SHARP EDGES, MAX. 0.5					USED ON								
DO NOT SCALE DRAWING					F10251519								
DIMENSIONS BASED ON: ASME Y14.5M-2009													
MAX MACHINE ALL SURFACES, Ra: 3.2													
DRAWING UNITS: MM					MATERIAL								
 THIRD ANGLE PROJECTION					SEE PARTS LIST								
					GROUP: Technical Division - Design and Drafting				PAGE CODE: 005R6				

WELDMENT, LONG END HALF CELL, 1.3 GHz RF CAVITY
ERDC

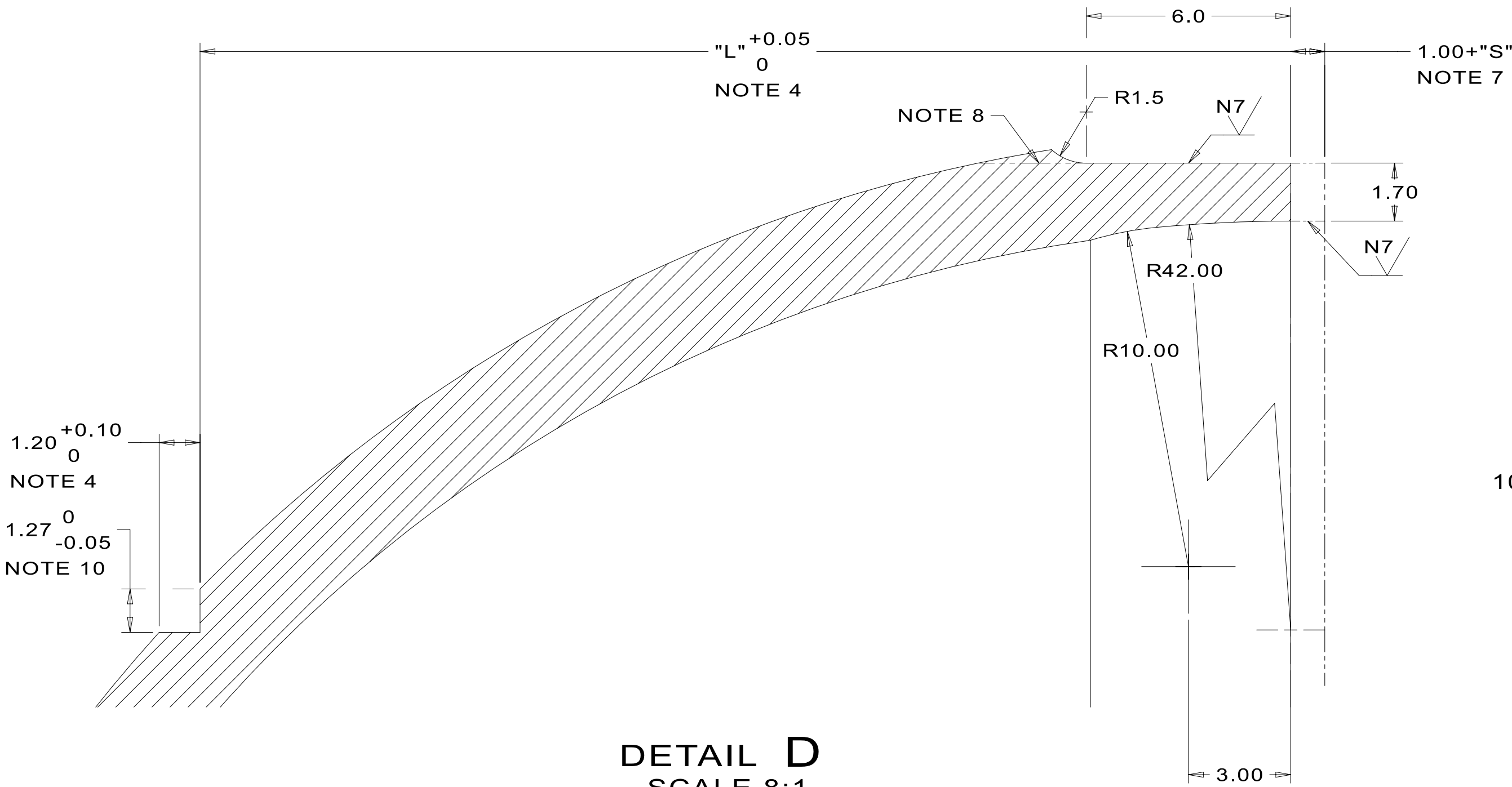
SCALE 1:2	SIZE A1	DRAWING NUMBER F10251633	SHEET 1 OF 1	REV -
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REV	REVISION CONTROL DOCUMENT	DATES	DRAWN	SIGNATURES
-	F10251557---RCD		APPROVED	

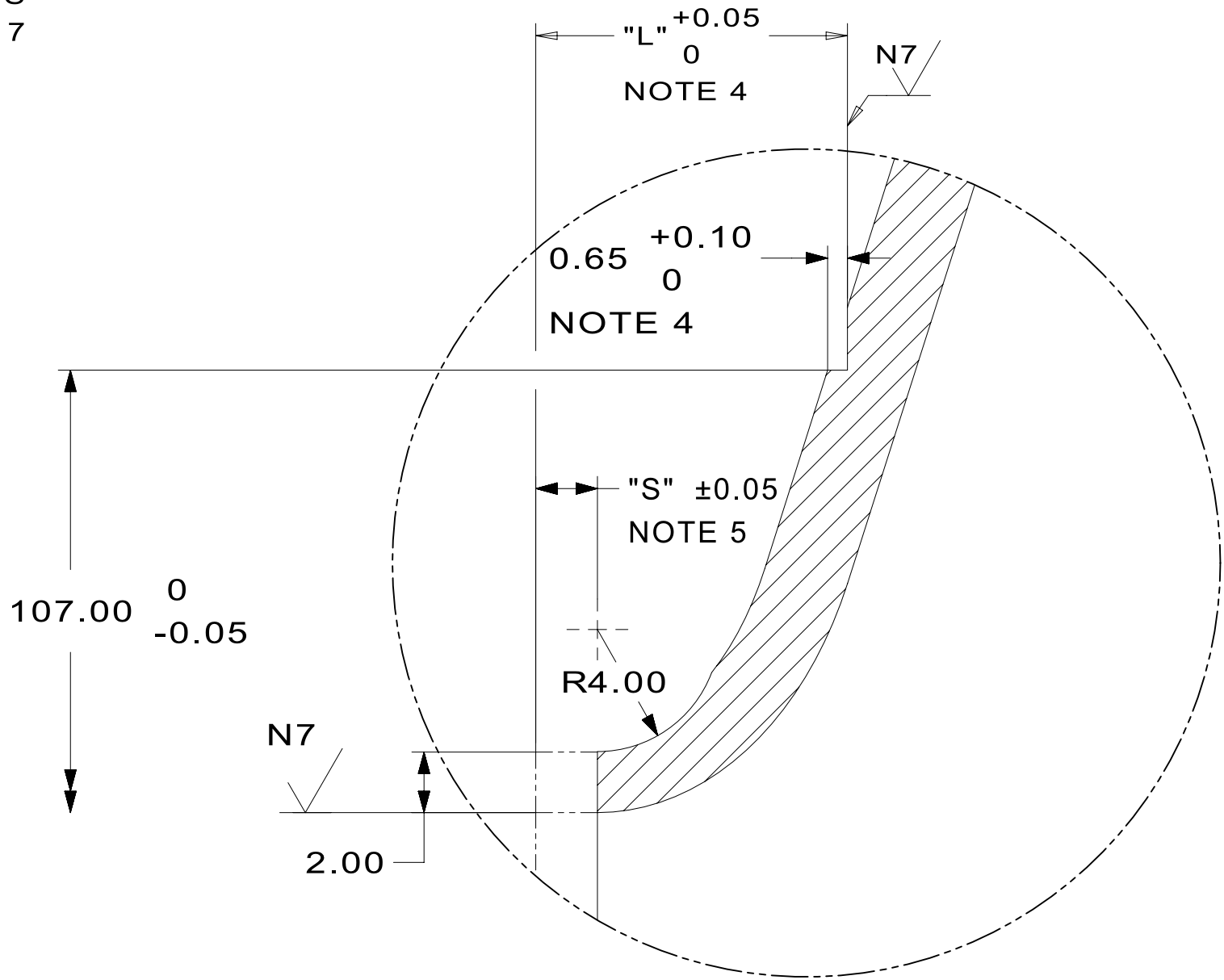


NOTES:

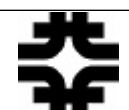
- 1) THE INTERNAL SURFACE MAY SHOW NO DAMAGE CAUSED BY FORMING
- 2) DIAMETER, FORM, AND POSITION TOLERANCES MEASURED IN HALF CELL'S STRAINED CONDITION
- 3) DO NOT BREAK EDGES ON END CELL
- 4) DIMENSION "L" DETERMINED BY THE MANUFACTURER SO THAT DIMENSIONS 0.65 AND 2.82 ARE KEPT
- 5) SUPPLEMENT FOR WELD SHRINKAGE ("S") TO BE DETERMINED BY EB-WELDERS
- 6) DUE TO THE MANUFACTURING PROCESS THE WALL THICKNESS BETWEEN IRIS AND EQUATOR IS NOT CONSTANT
- 7) ADDITIONAL MATERIAL NEEDED FOR CELL TUNING PLUS ALLOWANCE FOR E-BEAM WELD SHRINKAGE ("S"). FINAL SURFACE TO BE MACHINED UNTIL TUNED.
- 8) VENDOR OPTION TO MACHINE FLAT OMITTING R1.5
- 9) TRAILING ZEROS DENOTE TOLERANCE.
- 10) DIMENSIONS CORRESPONDS WITH PART NUMBER F10251563, COOLING RING. TOLERANCE IS TO BE COORDINATED BETWEEN MANUFACTURER AND EB WELDERS.



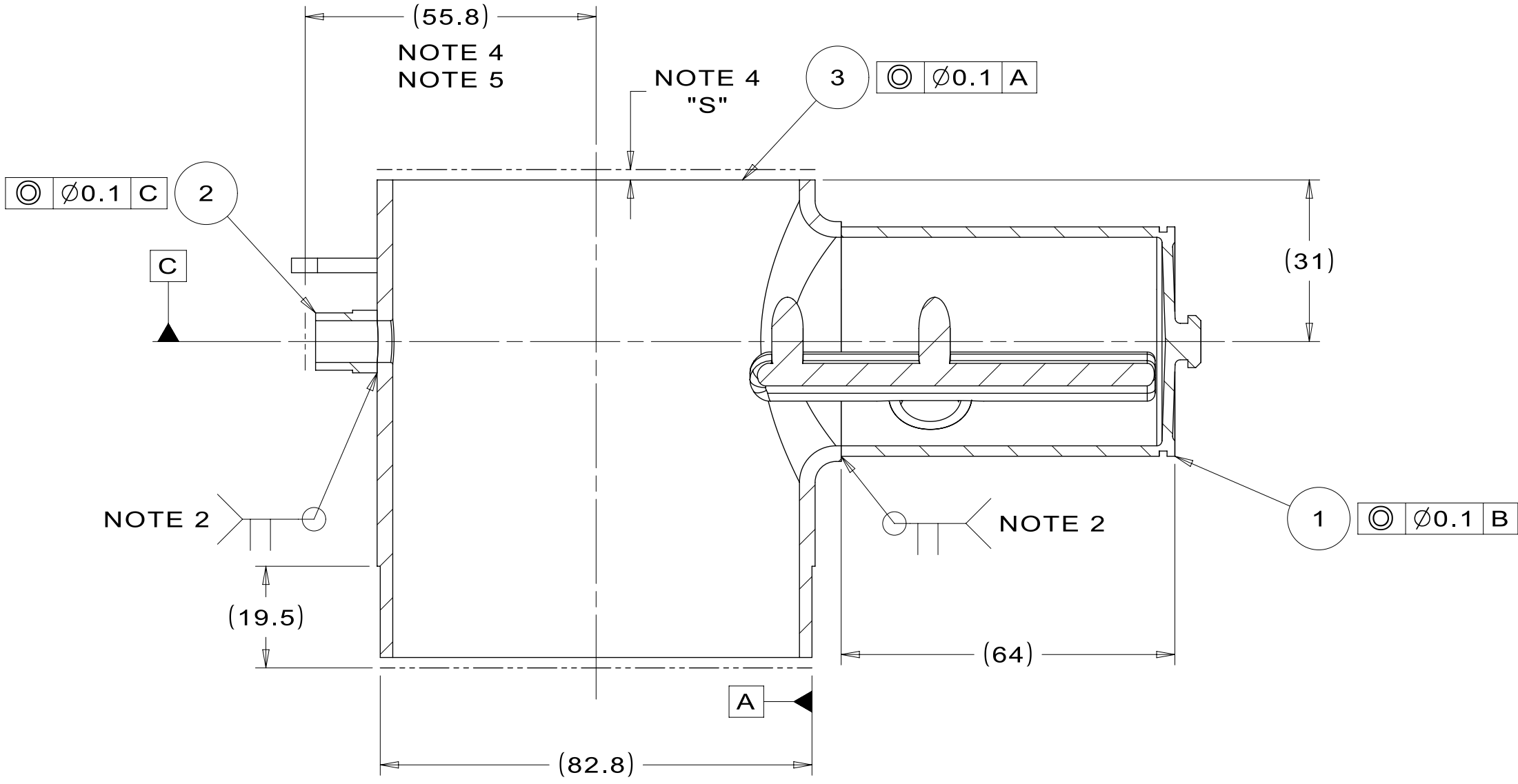
DETAIL D
SCALE 8:1



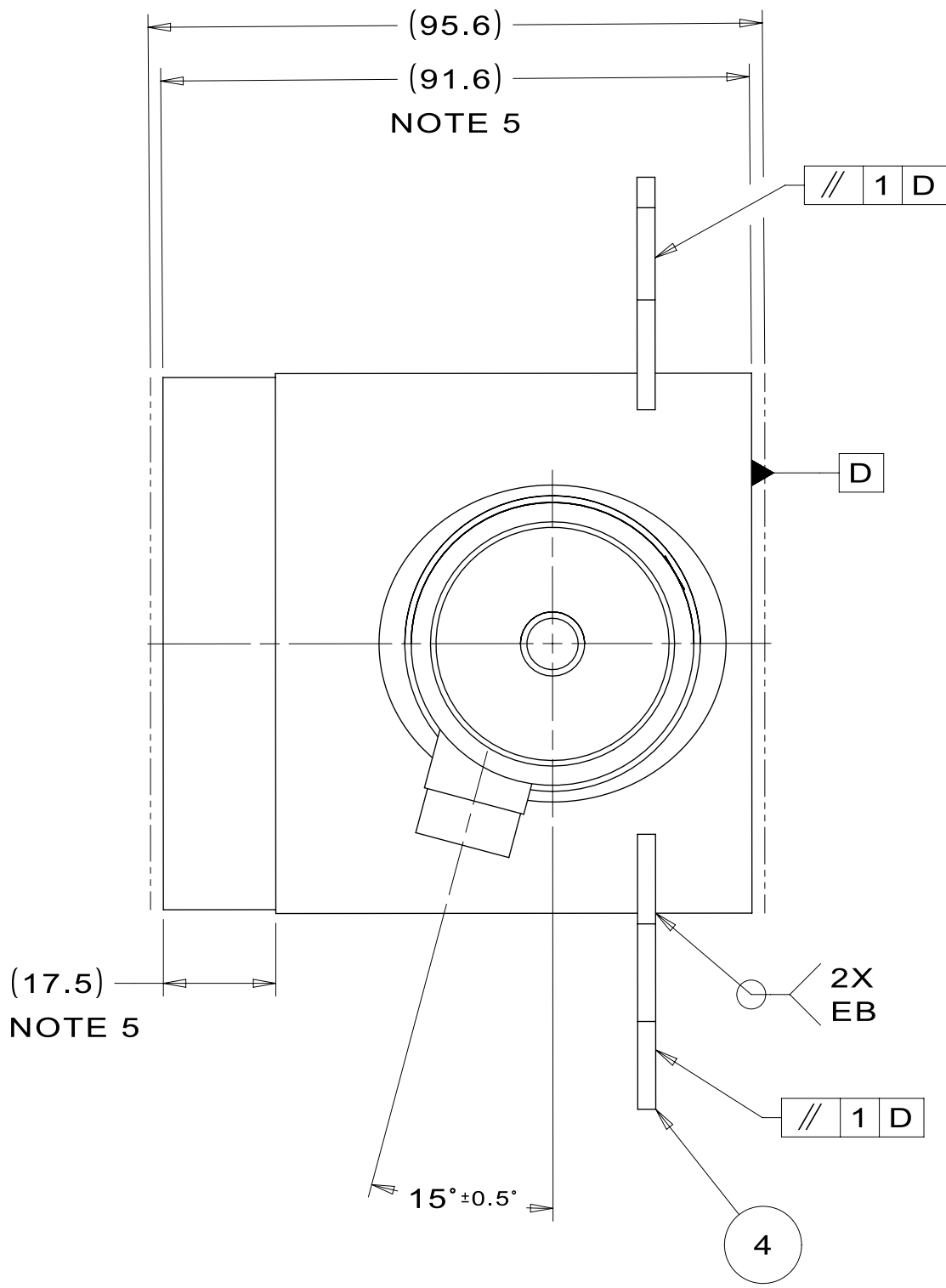
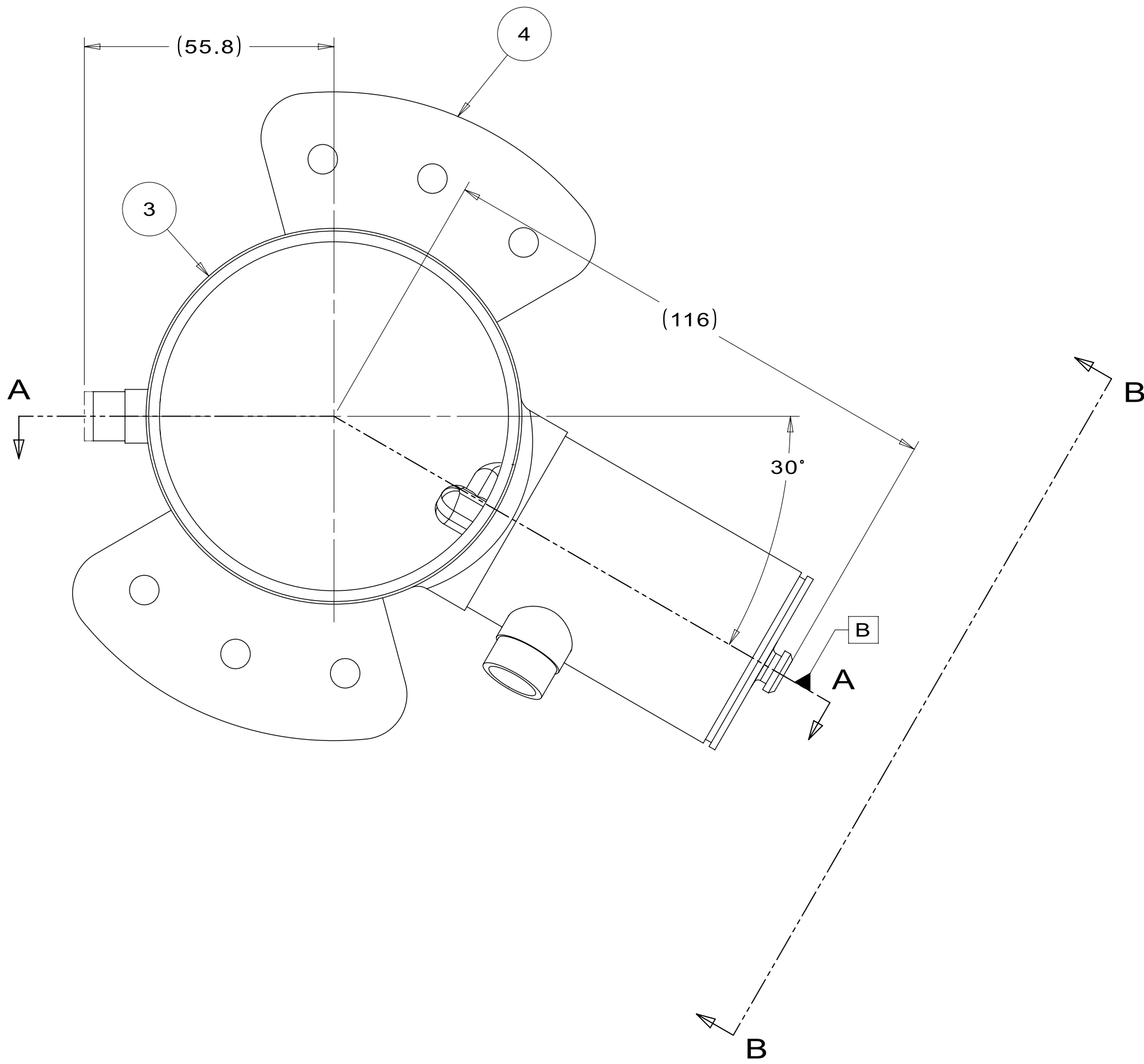
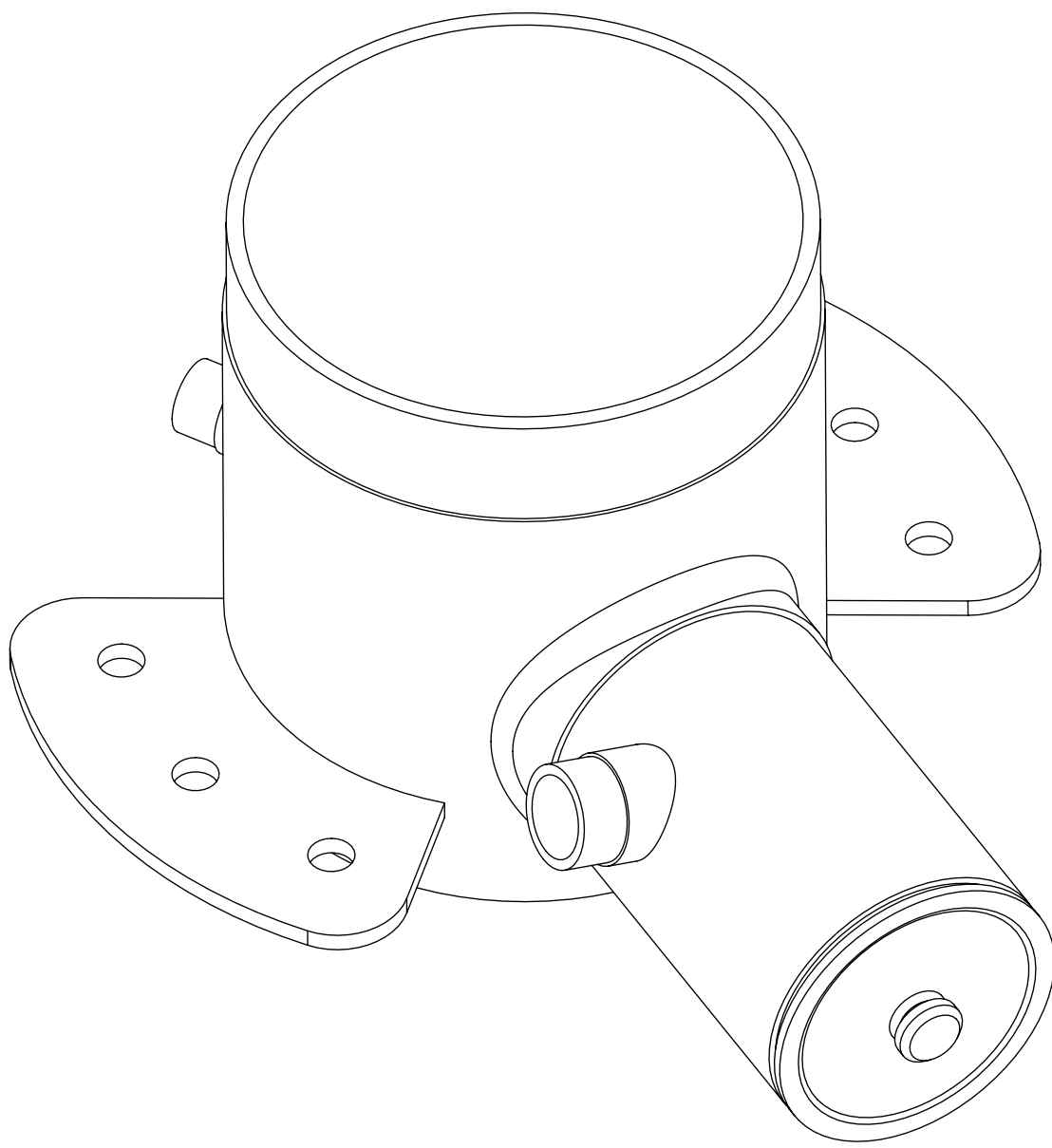
DETAIL C
SCALE 10:1

UNLESS OTHERWISE SPECIFIED					DRAWN	J.VANDER MEULEN	DATE	13-Aug-2025		FERMI NATIONAL ACCELERATOR LABORATORY UNITED STATES DEPARTMENT OF ENERGY			
±X	±X.X	±X.XX	±X.X	±X"	CHECKED	J.COCHILL	DATE	11-Mar-2026					
2	0.3	0.12	N/A	1	APPROVED	J.F.HELSPER	DATE	11-Mar-2026					
BREAK ALL SHARP EDGES, MAX: 0.5 DO NOT SCALE DRAWING DIMENSIONS BASED ON: ASME Y14.5M-2009 MAX MACHINE ALL SURFACES, Ra: 3.2 DRAWING UNITS: MM					USED ON				NAME				
					F10251633				LONG END HALF CELL, 1.3GHz RF CAVITY ERDC				
					MATERIAL				SCALE				
					NIOBIUM RRR GRADE				1:1				
					GROUP: Technical Division - Design and Drafting				SIZE				
					CAGE CODE: OUSR6				A1				
									DRAWING NUMBER				
									F10251557				
									SHEET				
									1 of 1				
									REV				
									-				

REV	REVISION CONTROL DOCUMENT	DATES	SIGNATURES	
-	F10254453---RCD		DRAWN	
			APPROVED	



SECTION A-A



SECTION B-B

NOTES (UNLESS OTHERWISE SPECIFIED):

1. WELDMENT TO BE FREE OF DUST, GEASE, OIL, CHIPS, AND BURRS.

2. WELDING NOTES:

- ASSEMBLY TO BE VACUUM TIGHT:
NO LEAK SHALL BE DETECTABLE ON THE MOST SENSITIVE SCALE
OF A HELIUM MASS SPECTROMETER LEAK DETECTOR WITH A
MINIMUM SENSITIVITY OF 2×10^{-10} ATM CC/SEC FOR HELIUM.
- ASSEMBLY TO BE CLEANED, AND PACKAGED SO AS TO ASSURE
NO CONTAMINATION FOR FOREIGN MATERIALS, METAL CHIPS,
OR OTHER CONTAMINATES. CLEANING PROCEDURE TO BE APPROVED
BY FERMILAB.
- ALL DESIGN, ASSEMBLY, AND HANDLING IS TO CONFORM TO
STANDARD ULTRA HIGH VACUUM PRACTICES.
- ALL ELECTRON BEAM WELDING, ACID ETCHING, CLEANLINESS, AND
HANDLING PROCEDURES ARE DETAILED IN DESY SPECIFICATION
MHF-SL-1-1999 AND MUST BE FOLLOWED.
- WELD PREP TO MATCH WALL THICKNESS AT DISCRETION OF MANUFACTURER.

3. DEFINITION OF FORM AND TOLERANCES CONCERNING WELD JOINT PREPARATION
AT THE IRIS AND THE EQUATOR TO BE COORDINATED BETWEEN MANUFACTURERS
FERMILAB.

4. SUPPLEMENT FOR WELD SHRINKAGE REFERRED TO IN PIECE PART DRAWINGS.

5. FINAL LENGTH AFTER MACHINING OPERATION DETAILED ON DRAWING F10241519.

6. ALL DIMENSIONS WITH TRAILING ZEROS DENOTE TOLERANCE.

4	F10259092	LONG END TUBE COOLING FIN, 1.3 GHz RF CAVITY ERDC	2
3	F10251556	LONG END TUBE, FNAL, 1.3GHz RF CAVITY ERDC	1
2	F10251552	LONG END ANTENNA SPOOL PIECE, 1.3GHz RF CAVITY ERDC	1
1	F10251546	HOM ASSEMBLY, 1.3GHz RF CAVITY ERDC	1
ITEM	FERMI #	PART NAME	QTY

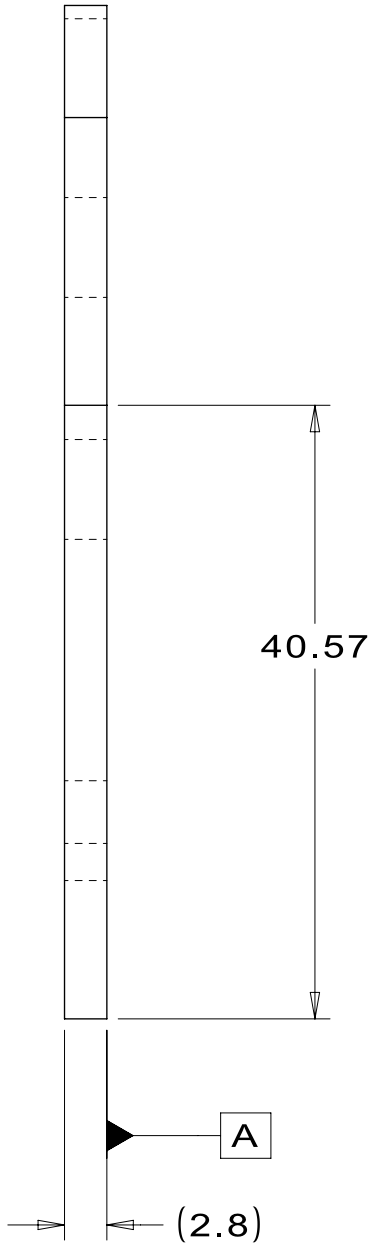
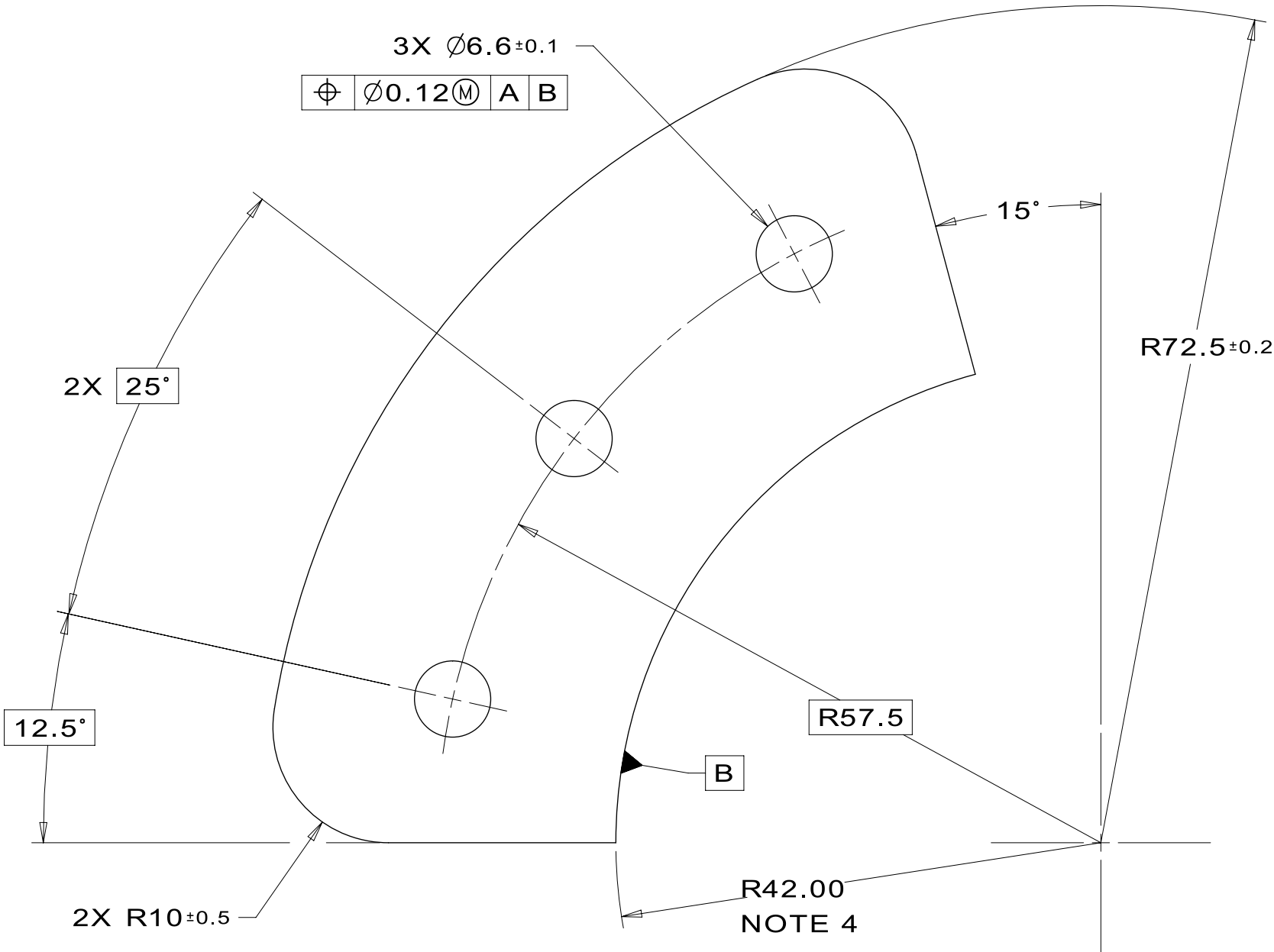
PARTS LIST

UNLESS OTHERWISE SPECIFIED				DRAWN	J.VANDER MEULEN	DATE	20-Nov-2025		FERMI NATIONAL ACCELERATOR LABORATORY UNITED STATES DEPARTMENT OF ENERGY	
±X	±X.X	±X.XX	±X.X	CHECKED	J.COCHILL	DATE	11-Mar-2026			
2	0.3	0.12	N/A	APPROVED	J.F.HELSPER	DATE	11-Mar-2026			
BREAK ALL SHARP EDGES, MAX: 0.5 DO NOT SCALE DRAWINGS DIMENSIONS BASED ON: ASME Y14.5M-2009 MAX MACHINE ALL SURFACES, Ra: 3.2 DRAWING UNITS: MM				USED ON				NAME	WELDMENT LONG END TUBE 1.3GHz RF CAVITY	
THIRD ANGLE PROJECTION				MATERIAL				SCALE	SIZE	DRAWING NUMBER
				SEE PARTS LIST				1:1	A1	F10254453
				GROUP: Technical Division - Design and Drafting				SHEET		REV
				CAGE CODE: OUSR6				1 OF 1		-

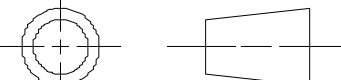
DATE	18-Aug-2025		FERMI NATIONAL ACCELERATOR LABORATORY			
DATE	11-Mar-2026		UNITED STATES DEPARTMENT OF ENERGY			
DATE	11-Mar-2026					
NAME		LONG END TUBE, FNAL, 1.3GHz RF CAVITY ERDC				
GRADE		SCALE 2:1	SIZE A1	DRAWING NUMBER F10251556	SHEET 1 of 1	REV -
CAGE CODE 04SR6						

DESCRIPTION: F10259092
PROJECT: IARC_ERDC1_3GHzCryostat
CATEGORY: PLATE

REV	REVISION CONTROL DOCUMENT	DATES	SIGNATURES	
-	F10259092---RCD		DRAWN	
			APPROVED	



- NOTES (UNLESS OTHERWISE SPECIFIED):
- PART MUST BE FREE OF DIRT, GREASE, OIL, AND CHIPS.
 - MUST BE FREE OF SHARP EDGES, CORNERS, AND BURRS.
 - TRAILING ZEROS DENOTE TOLERANCE.
 - DIMENSION CORRESPONDS WITH PART NUMBER F10251556. TOLERANCE IS TO BE COORDINATED BETWEEN MANUFACTURERS AND EB-WELDERS.

UNLESS OTHERWISE SPECIFIED					DRAWN	J.VANDER MEULEN		DATE	03-Mar-2026			FERMI NATIONAL ACCELERATOR LABORATORY UNITED STATES DEPARTMENT OF ENERGY			
±X	±X.X	±X.XX	±X/X	±X*	CHECKED	J.COGHILL		DATE	11-Mar-2026						
2	0.3	0.12	N/A	1*	APPROVED	J F.HELSPER		DATE	11-Mar-2026						
BREAK ALL SHARP EDGES, MAX: 0.5 DO NOT SCALE DRAWING DIMENSIONS BASED ON: ASME Y14.5M-2009 MAX MACHINE ALL SURFACES, Ra: 3.2 DRAWING UNITS: MM  THIRD ANGLE PROJECTION					USED ON						NAME				
					F10254453						LONG END TUBE COOLING FIN, 1.3 GHz RF CAVITY ERDC				
					MATERIAL										
					NIOBIUM, TYPE 5 RRR GRADE 2.8MM STK THICKNESS										
					GROUP: Technical Division - Design and Drafting						CAGE CODE: OU5R6		SCALE 2:1		SIZE A3

TEMPLATE VERSION: 2021.08.06