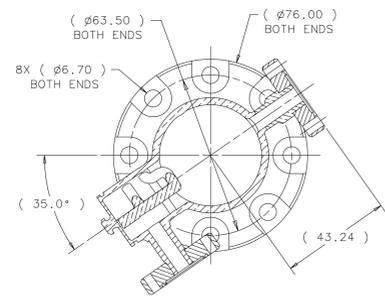
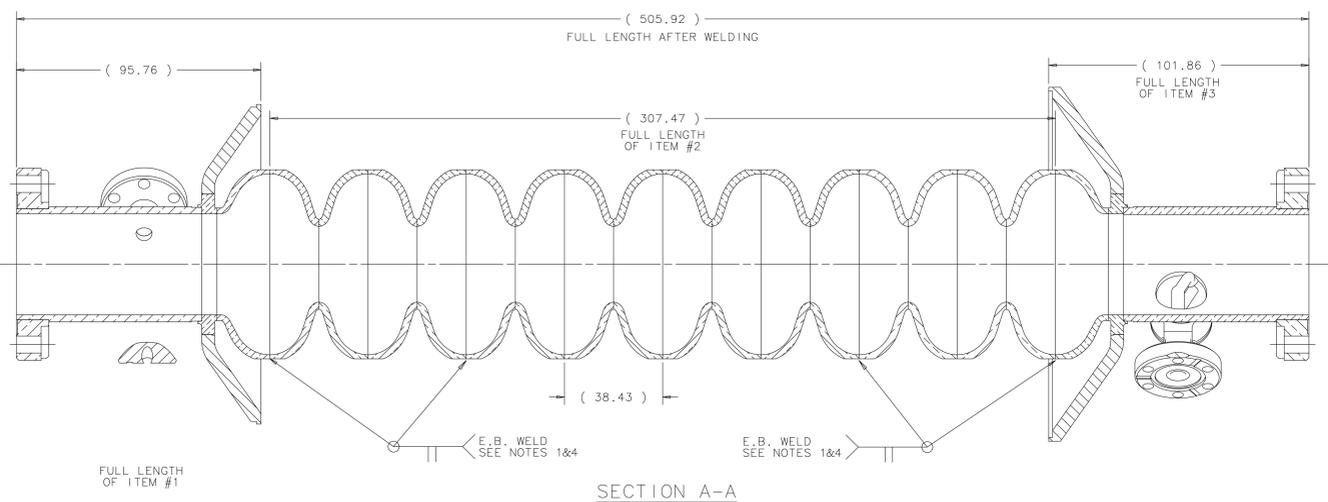


3rd Harmonic Cavity with 2-Leg Formteil

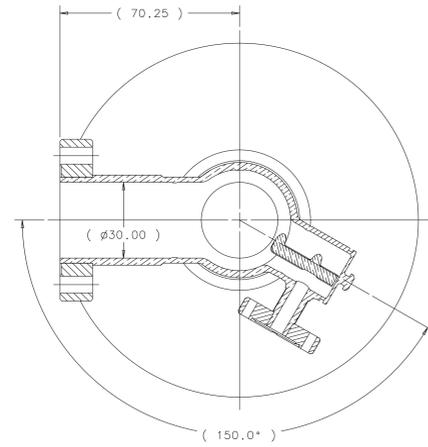
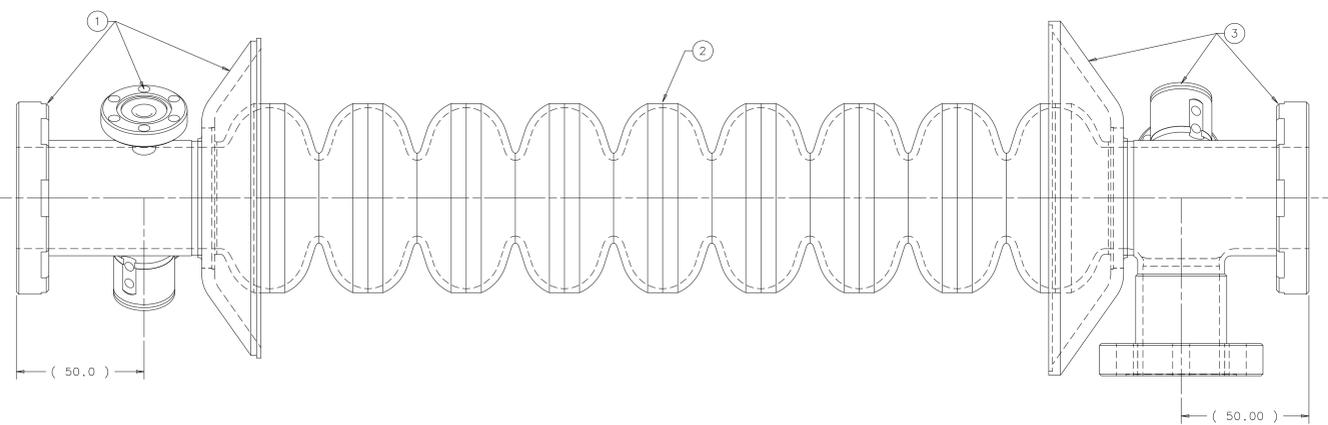
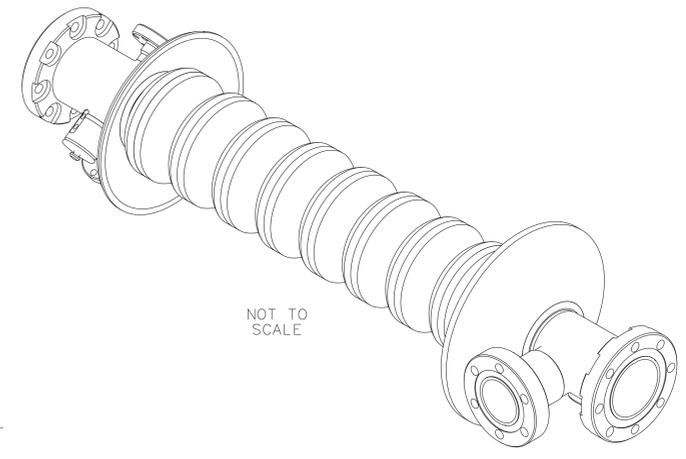
Helium vessel was fabricated and welded by Hi-Tech Machining. Hi-Tech provided the material and material certification.

Welded into a single, dressed cavity at Fermilab

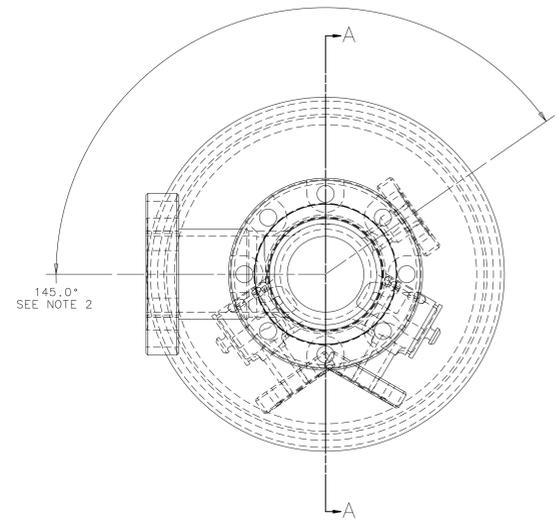
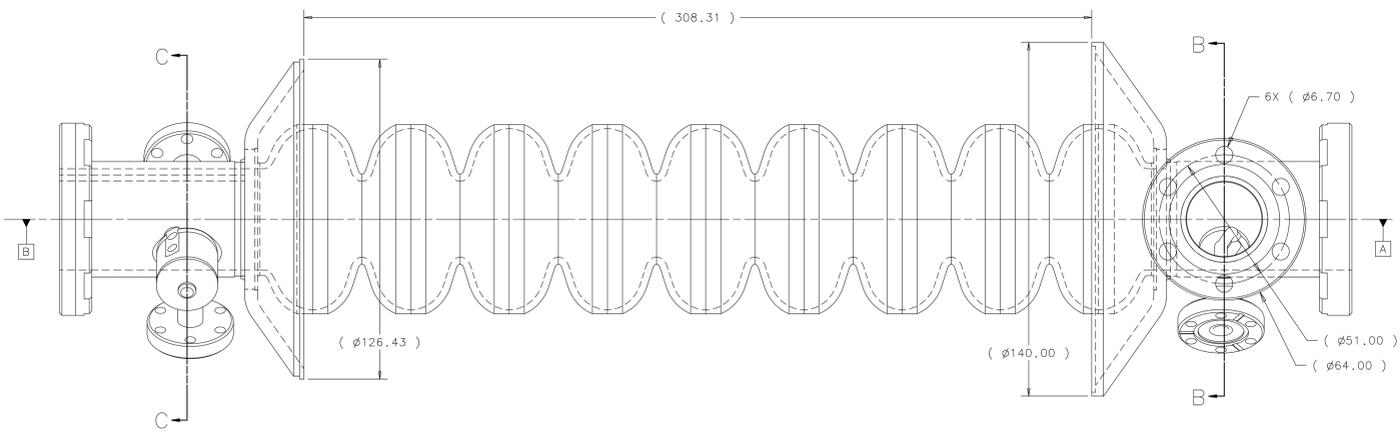
Note: Some of the cavities that will end up in the cryomodule destined to go to DESY will be of the 1-leg formteil design while others will be of the 2-leg formteil design. The exact configuration is dependant upon each cavity's performance.



SECTION C-C



SECTION B-B



- NOTES:
1. ALL ELECTRON BEAM WELDING, ACID ETCHING, CLEANLINESS, AND HANDLING ARE DETAILED IN ES-426451 AND MUST BE FOLLOWED.
 2. INSURE THAT THE CLOCKING OF THE ø76.00 END FLANGES ARE HELD TO ±0.5°.
 3. ITEMS #1, #2, AND #3 MUST BE HELD CONCENTRIC TO EACH OTHER TO ±ø0.08mm ALONG DATUMS A & B.
 4. DUE TO VARYING FABRICATION PROCEEDURES, THE VENDOR MAY CHOOSE THE DUMBBELL WELDING SEQUENCE BEST SUITED FOR THEIR PROCESS, TOOLING, AND FACILITY.
 5. THIS DEVICE IS EASLIY DEFORMED. A HANDLING FIXTURE IS REQUIRED FOR ALL HANDLING AND SHIPPING.
 6. ALL UNITS ARE IN MILLIMETERS.

THIS DESIGN IS THE INTELLECTUAL PROPERTY OF FERMILAB ACCORDING TO ISO 16016. THIS DRAWING IS PROVIDED FOR EXCLUSIVE FABRICATION USAGE BY TTC MEMBERS ONLY. USAGE OUTSIDE OF THE TTC MUST BE APPROVED BY FERMILAB.

REV	DESCRIPTION	DRAWN	DATE
---	NEW RELEASE - ER #7671	DVM	7/6/04
		M. FOLEY	7/7/04
A	ECO #7993; CHANGED NOTE 2 TO ALLOW FOR VENDOR FAB. PREFERENCE	DVM	8/2/05
		M. FOLEY	8/2/05
B	ECO #8803; PICTORAL UPDATE ONLY. FORMTEIL SHORTENED.	C. GRIMM	9/24/07
		D. MITCHELL	9/24/07

ITEM	PART NO.	DESCRIPTION OR SIZE	QTY.
3	MD-426323	END TUBE WITH MC, FAB PROCESS	1
2	MD-426330	DUMBBELL WELDMENT, FULL	1
1	MD-426332	END TUBE W/O MC, FAB PROCESS	1

PARTS LIST

UNLESS OTHERWISE SPECIFIED	ORIGINATOR	T. KHABI BOULLINE	OCT 2003
.XX	.XXX	X*	DRAWN
± N/A	± N/A	± 0.5*	CHECKED
			APPROVED
			M. FOLEY
			7/7/04
1. BREAK ALL SHARP EDGES 0.2 MAX.		USED ON	
2. DO NOT SCALE DRAWING.		5520-ME-426247	
3. DIMENSIONS BASED UPON ASSE #14-04-194		MATERIAL	
4. MAX. ALL MACH. SURFACES		PER ITEM WELDMENT	
5. DRAWING UNITS: METRIC			

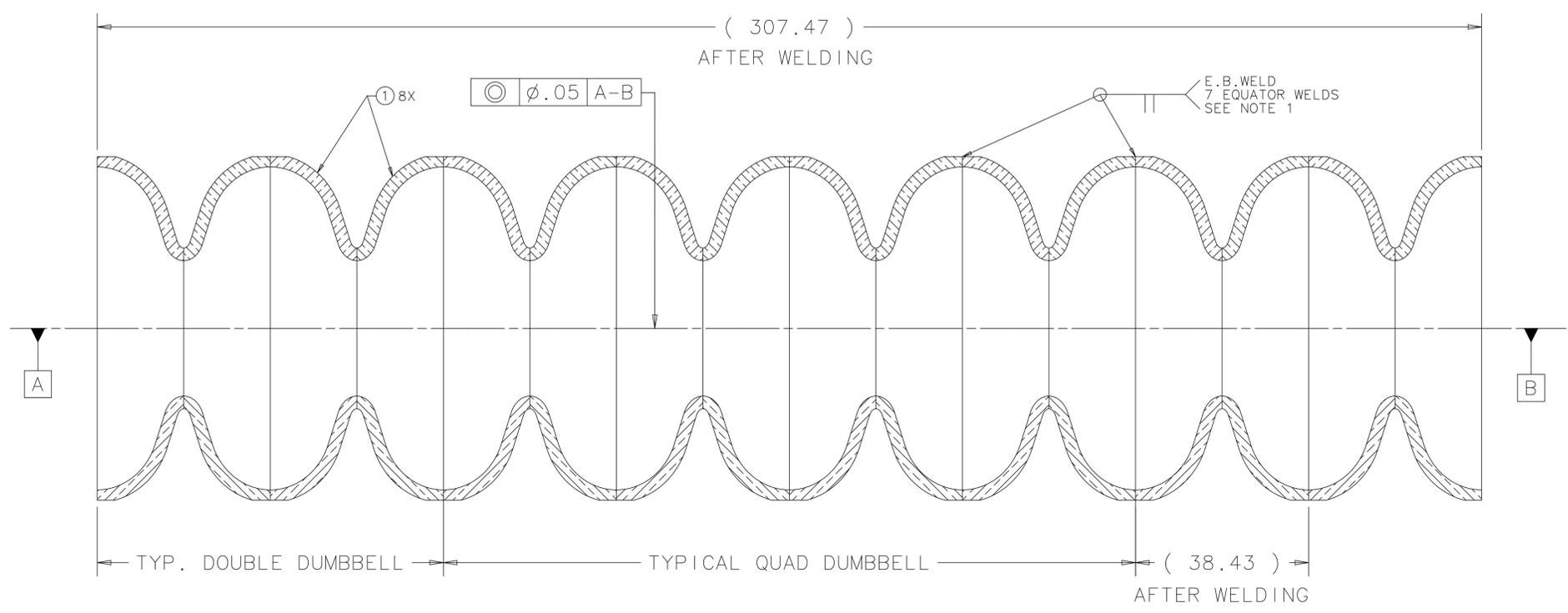
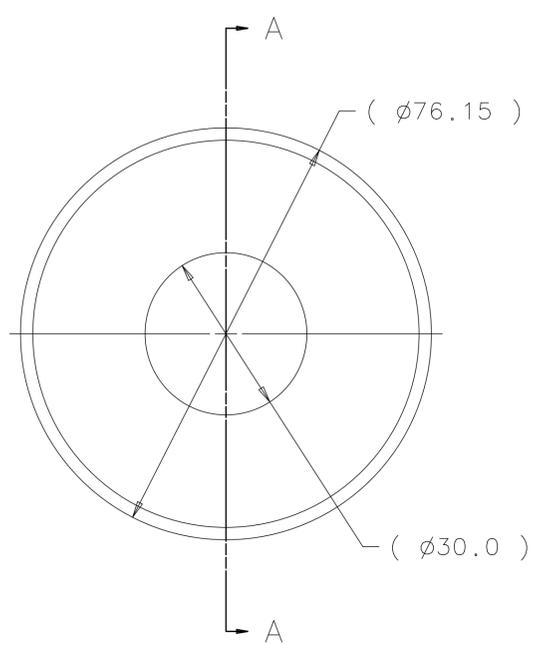
FERMI NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY

SCRF 3.9 GHZ 3RD HARMONIC
NIObIUM CAVITY ASSEMBLY
CAVITY WELDMENT, Nb, 9 CELL

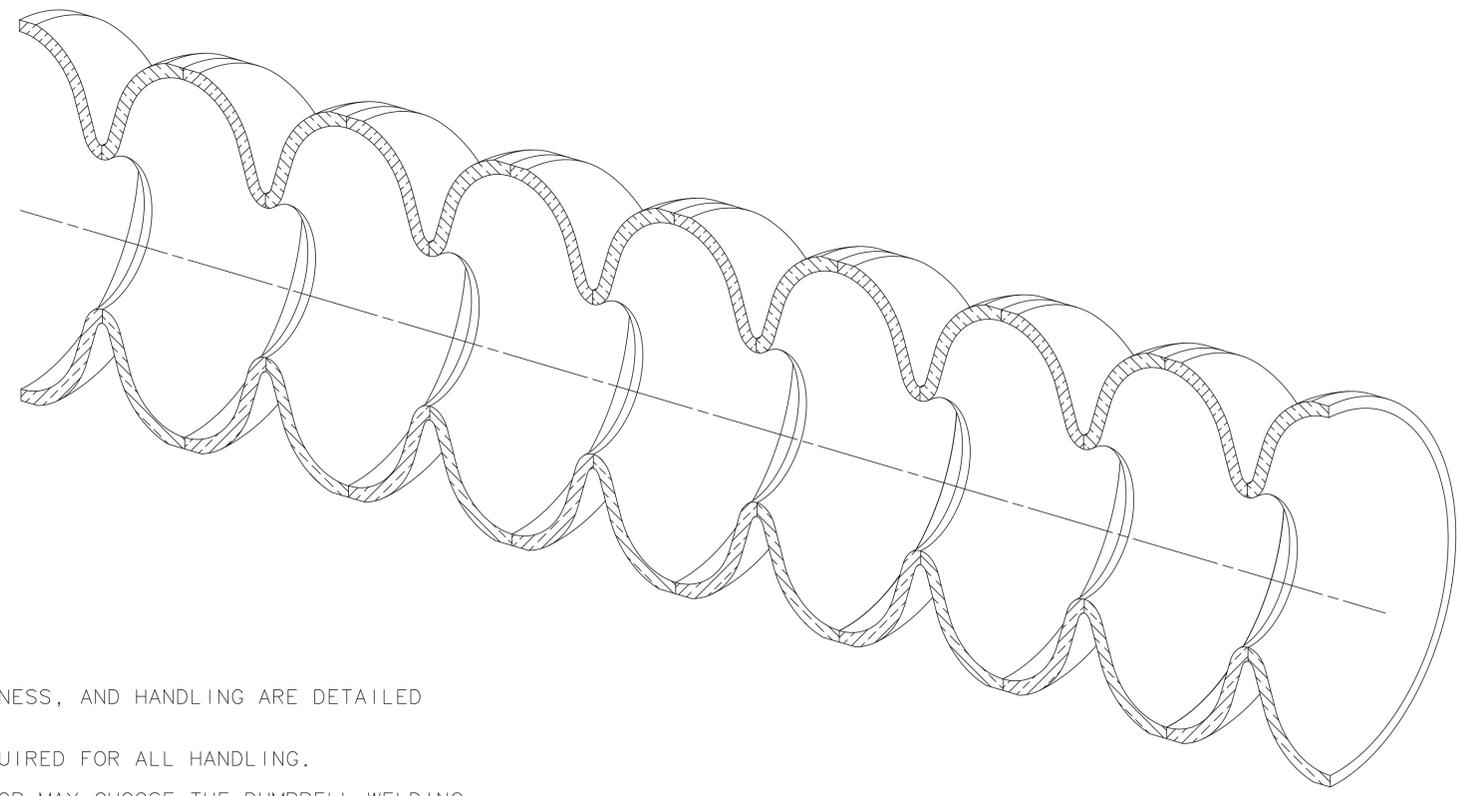
SCALE	DRAWING NUMBER	SHEET	REV
1:1	5520.000-ME-426321	1 OF 1	B

CREATED WITH: GROUP: USER NAME: dmitchel

REV.	DESCRIPTION	DRAWN	DATE
		APPD.	DATE
---	NEW RELEASE - ER #7671	DVM	7/6/04
		M. FOLEY	7/8/04
A	ECO #7993: ADDED NOTE 3 AND TYPICAL DUMBBELL NOMENCLATURE	DVM	8/2/05
		M. FOLEY	8/2/05



SECTION A-A



- NOTES:
1. ALL ELECTRON BEAM WELDING, ACID ETCHING, CLEANLINESS, AND HANDLING ARE DETAILED IN ES-426451 AND MUST BE FOLLOWED.
 2. THIS DEVICE IS EASILY DEFORMED. A FIXTURE IS REQUIRED FOR ALL HANDLING.
 3. DUE TO VARYING FABRICATION PROCEEDURES, THE VENDOR MAY CHOOSE THE DUMBBELL WELDING SEQUENCE BEST SUITED FOR THEIR PROCESS, TOOLING, AND FACILITY.
 4. ALL UNITS ARE IN MILLIMETERS.

THIS DESIGN IS THE INTELLECTUAL PROPERTY OF FERMILAB ACCORDING TO ISO 16016. THIS DRAWING IS PROVIDED FOR EXCLUSIVE FABRICATION USAGE BY TTC MEMBERS ONLY. USAGE OUTSIDE OF THE TTC MUST BE APPROVED BY FERMILAB.

1	MC-426182	MID CAVITY, Nb WELDMENT	8
ITEM	PART NO.	DESCRIPTION OR SIZE	QTY.
PARTS LIST			
UNLESS OTHERWISE SPECIFIED		ORIGINATOR	T. KHABIBOULLINE
.XX	.XXX	ANGLES	DRAWN
± N/A	± N/A	± N/A	CHECKED
1. DO NOT BREAK SHARP EDGES.		APPROVED	M. FOLEY
2. DO NOT SCALE DRAWING.		USED ON	ME-426321
3. DIMENSIONS BASED UPON ASME Y14.5M-1994		MATERIAL	RRR 300 NIOBIUM
4. MAX. ALL MACH. SURFACES N7			

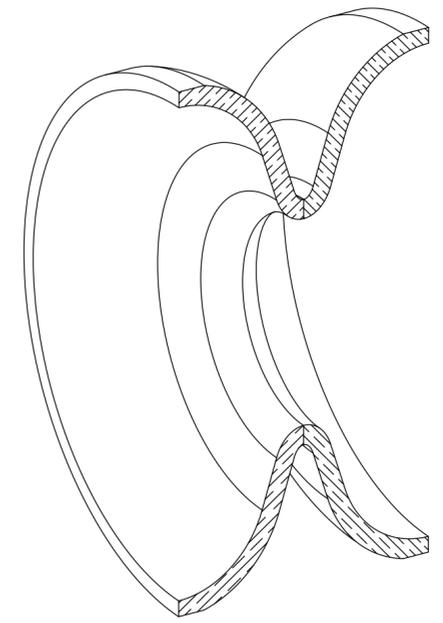
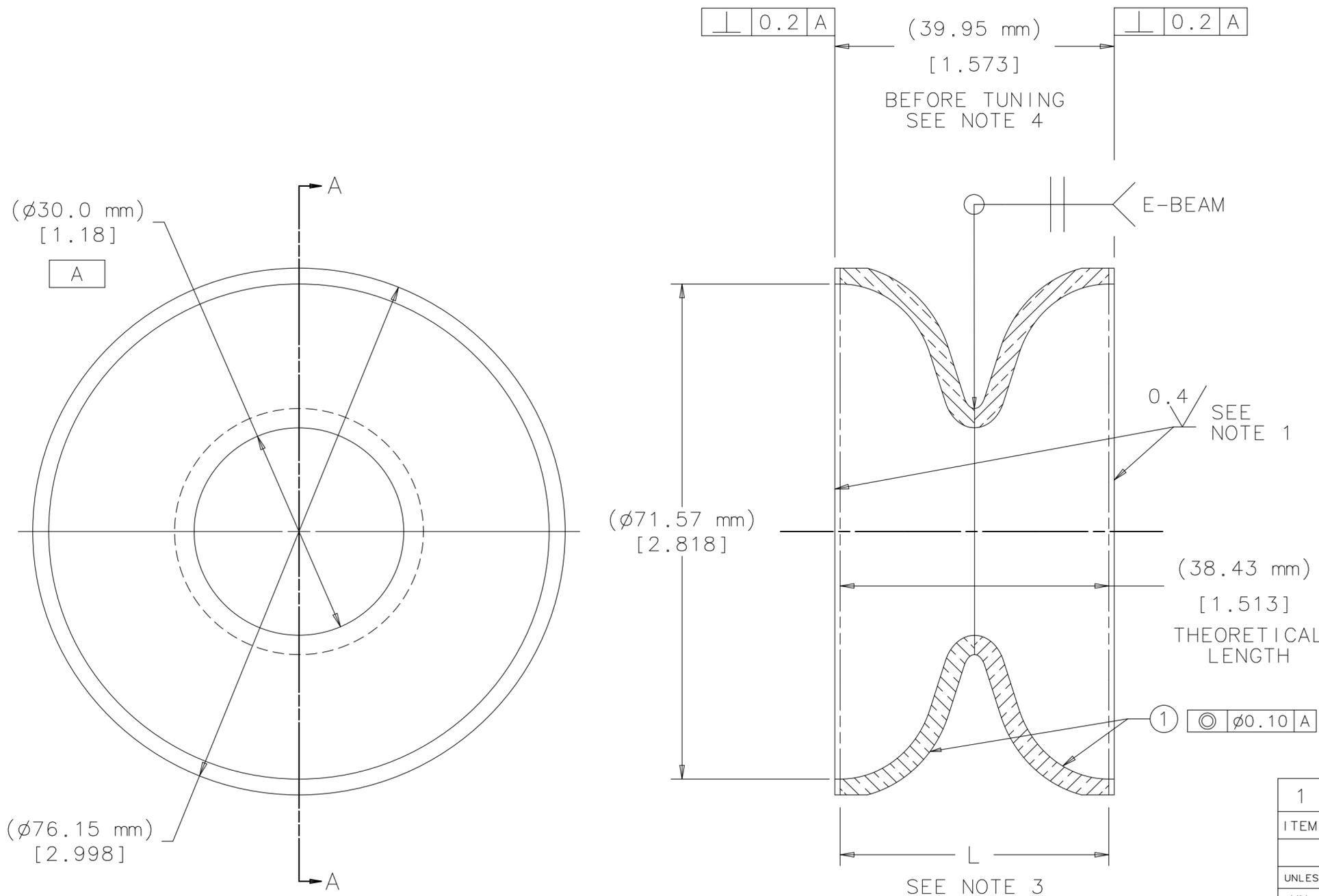
FERMI NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY

SCRF 3.9 GHZ 3RD HARMONIC NIOBIUM CAVITY ASSEMBLY DUMBBELL WELDMENT, FULL

SCALE	FILMED	DRAWING NUMBER	REV.
1.5:1		5520-MD-426330	A
CREATED WITH I-DEAS 11M2		USER NAME: dmitchel	



REV.	DESCRIPTION	DRAWN	DATE
		APPD.	DATE
---	NEW RELEASE - ER #7482	DVM	6/3/03
		NS	6/12/03



- NOTES**
- ADDITIONAL MATERIAL PROVIDED ON EACH HALF-CELL IS REQUIRED FOR CELL TUNING AND E-BEAM WELDING SHRINKAGE. FINAL SURFACES TO BE MACHINED TO A "0.4" SURFACE FINISH.
 - PRIMARY DIMENSIONS ARE MILLIMETERS. ENGLISH DIMENSIONS ARE FOR REFERENCE.
 - MID-CELL ASSEMBLIES WILL BE MACHINED TO ACHIEVE PROPER TUNING. THE FINAL CELL LENGTH "L" WILL BE RECORDED IN THE TRAVELER.

THIS DESIGN IS THE INTELLECTUAL PROPERTY OF FERMILAB ACCORDING TO US PATENT 5,161,616. THIS DRAWING IS PROVIDED FOR EXCLUSIVE FABRICATION USAGE BY TTC MEMBERS ONLY. USAGE OUTSIDE OF THE TTC MUST BE APPROVED BY FERMILAB.

ITEM	PART NO.	DESCRIPTION OR SIZE	QTY.
1	MC-426183	CELL, MID RF Nb CAVITY	2

PARTS LIST					
UNLESS OTHERWISE SPECIFIED	ORIGINATOR	N. SOLYAK	MAY 2002		
.XX mm	.XXX in	ANGLES	DRAWN	D. MITCHELL	6/3/03
± .05	± .002	± 1°	CHECKED	M. FOLEY	6/12/03
1. BREAK ALL SHARP EDGES .02 MAX.	APPROVED	N. SOLYAK	6/12/03		
2. DO NOT SCALE DRAWING.	USED ON MD-426180				
3. DIMENSIONS BASED UPON ANSI Y14.5M-1982					
4. MAX. ALL MACH. SURFACES 1.6√mm 63√in	MATERIAL RRR 300 NIOBIUM				

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UNITED STATES DEPARTMENT OF ENERGY

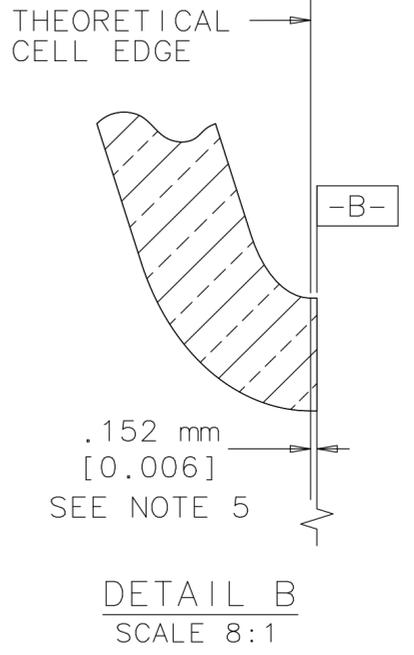
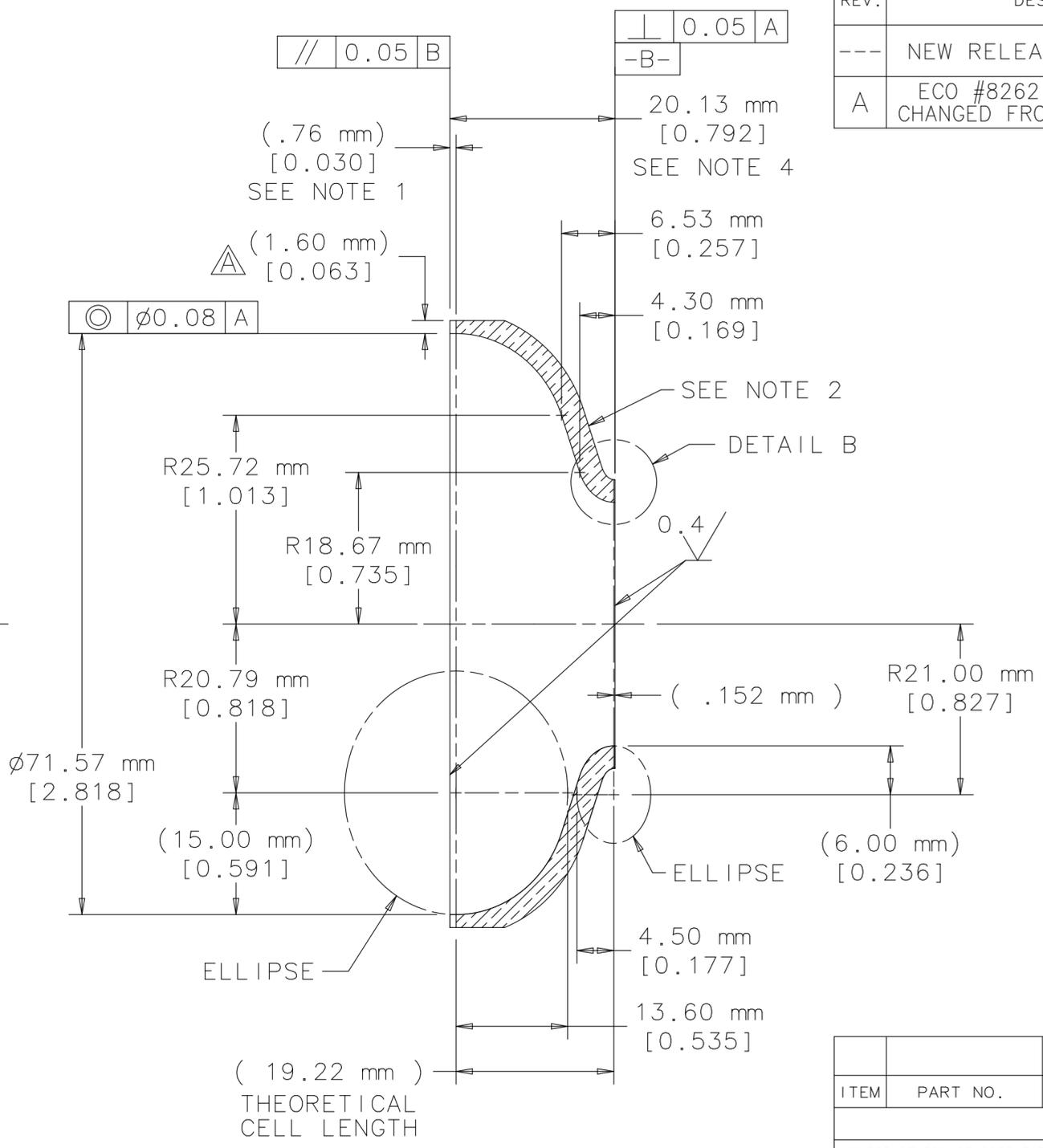
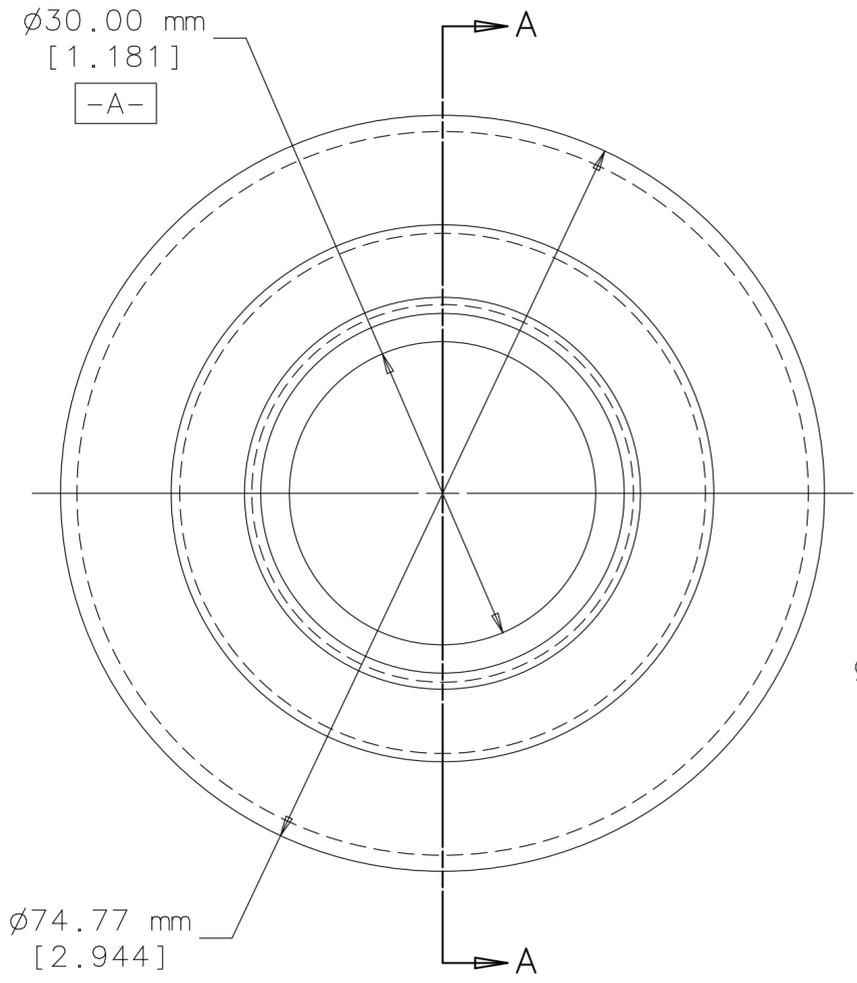
SCRF 3.9 GHZ 3RD HARMONIC NIOBIUM CAVITY ASSEMBLY MID CAVITY Nb WELDMENT

SCALE	FILMED	DRAWING NUMBER	REV.
2:1		5520-MC-426182	

CREATED WITH I-DEAS 9M3 USER NAME: dmitche1



REV.	DESCRIPTION	DRAWN	DATE
		APPD.	DATE
---	NEW RELEASE - ER #7482	DVM	6/3/03
		NS	6/12/03
A	ECO #8262 - EQUATOR WALL CHANGED FROM .090" TO .063"	DVM	2/1/06
		D.MITCHELL	02/20/06



NOTES

1. ADDITIONAL MATERIAL NEEDED FOR CELL TUNING PLUS ALLOWANCE FOR E-BEAM WELDING SHRINKAGE. FINAL SURFACE TO BE MACHINED TO A "0.4" SURFACE FINISH.
2. OUTER CELL PROFILE WILL VARY DUE TO THE STAMPING AND COINING PROCESS.
3. PRIMARY DIMENSIONS ARE MILLIMETERS. ENGLISH DIMENSIONS ARE FOR REFERENCE ONLY.
4. AFTER TUNING CELL, RECORD FINAL CELL LENGTH IN THE TRAVELER.
5. 0.152mm ADDED TO THEORETICAL CELL LENGTH TO COMPENSATE FOR E-BEAM WELD SHRINKAGE.

THIS DESIGN IS THE INTELLECTUAL PROPERTY OF FERMILAB ACCORDING TO ISO 10016. THIS DRAWING IS PROVIDED FOR EXCLUSIVE FABRICATION USAGE BY TTC MEMBERS ONLY. USAGE OUTSIDE OF THE TTC MUST BE APPROVED BY FERMILAB.

ITEM	PART NO.	DESCRIPTION OR SIZE	QTY.
PARTS LIST			
UNLESS OTHERWISE SPECIFIED		ORIGINATOR	N. SOLYAK
		DATE	MAY 2002
.XX mm	.XXX in	ANGLES	DRAWN
± .05	± .002	± 1°	CHECKED
		APPROVED	N. SOLYAK
		USED ON	5520-MC-426182
1. BREAK ALL SHARP EDGES .02 MAX.			
2. DO NOT SCALE DRAWING.			
3. DIMENSIONS BASED UPON ANSI Y14.5M-1982			
4. MAX. ALL MACH. SURFACES 1.6 $\sqrt{\text{mm}}$ 63 $\sqrt{\text{in}}$		MATERIAL	RRR 300 NIOBIUM 2.8mm [0.110"]

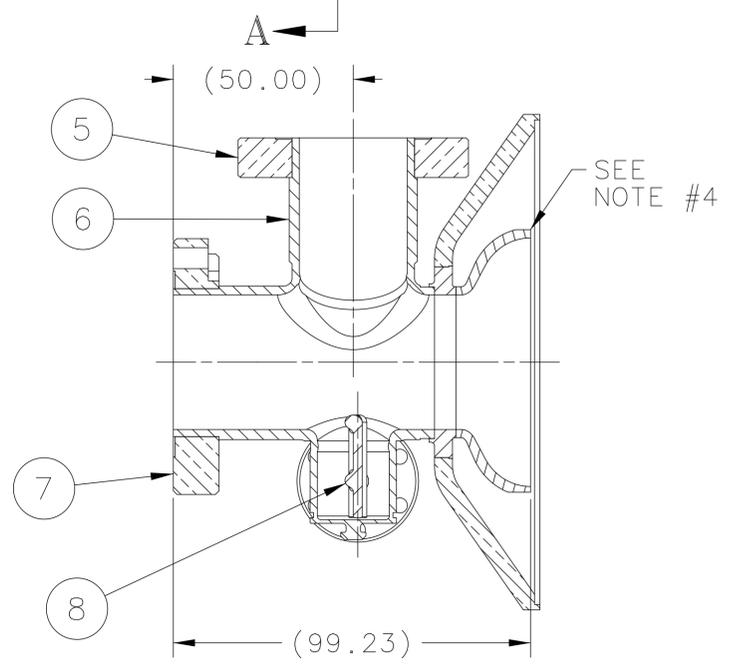
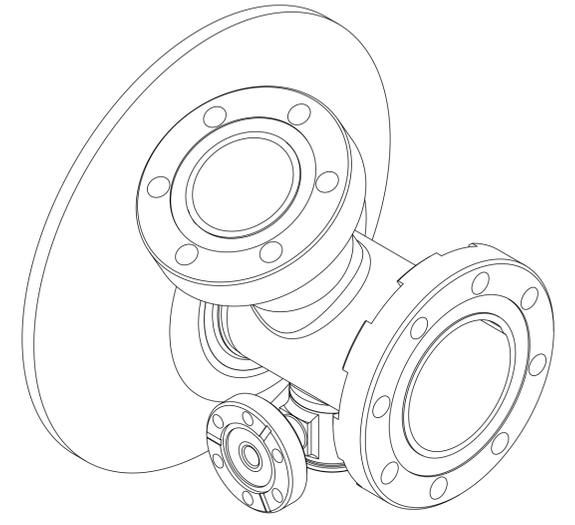
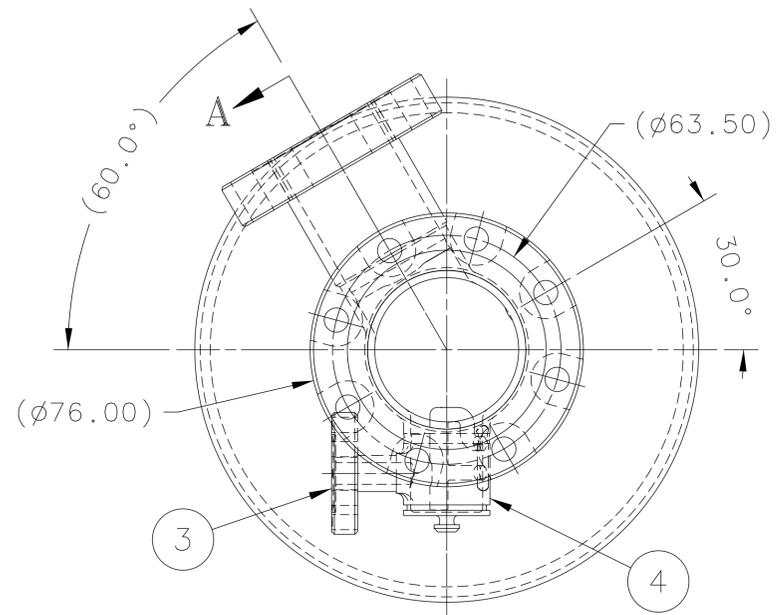
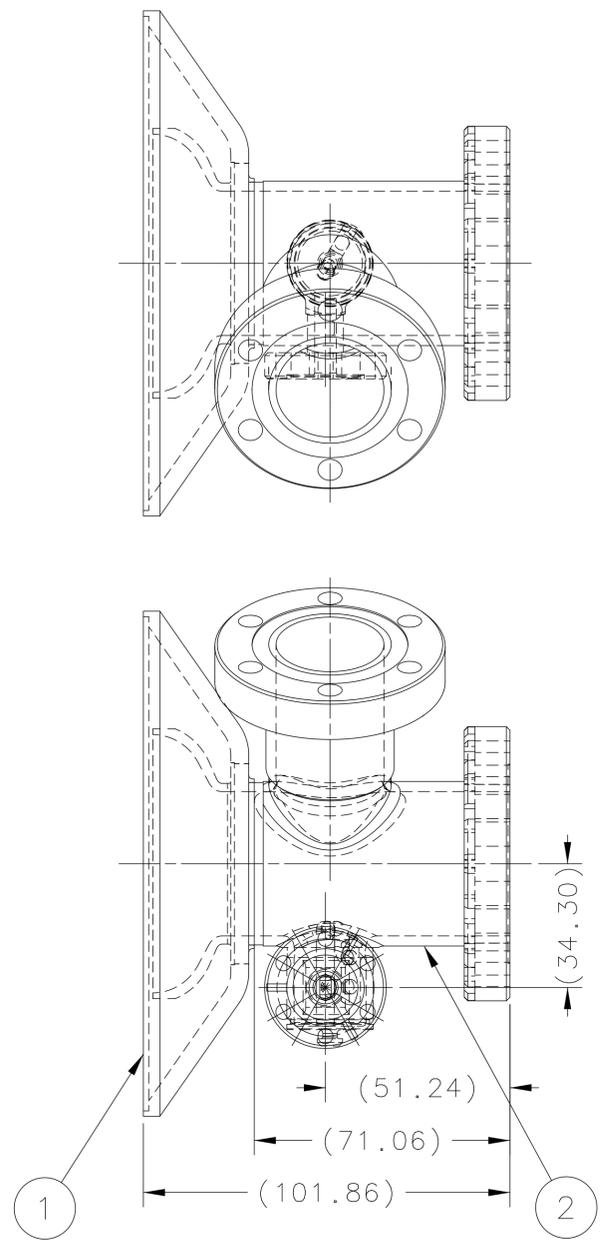
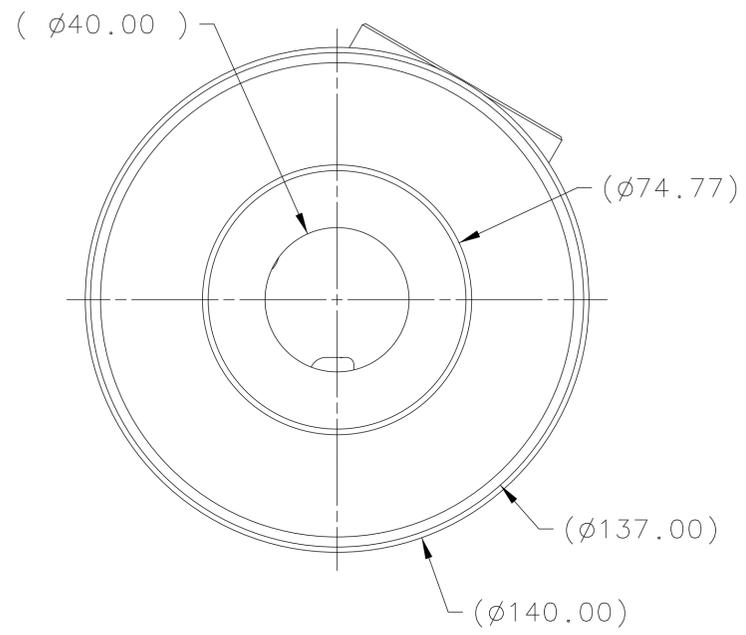
FERMI NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY

SCRF 3.9 GHZ 3RD HARMONIC NIOBIUM CAVITY ASSEMBLY MID CELL

SCALE	FILMED	DRAWING NUMBER	REV.
2:1		5520-MC-426183	A
CREATED WITH I-DEAS 9M3		USER NAME: dmitchel	



REV	DESCRIPTION	DRAWN	DATE
		APPROVED	DATE
---	E.R.# 7671		
A	ECO# 7993: UPDATE FLANGES	D. MITCHELL	8-1-05
		M. FOLEY	8-2-05
B	ECO# 8262 PICTORIAL UPDATE TO REFLECT END CELL DIAMETER CHANGE	V. MARTINEZ	02-07-06
		D. MITCHELL	02/20/06
C	ECO# 8803: PICTORIAL UPDATE ONLY. FORMTEIL LENGTH SHORTENED.	C. GRIMM	9/24/07
		D. MITCHELL	9/24/07



- NOTES:
1. FLANGE FACES TO BE FREE FROM ANY NICKS OR SCRATCHES.
 2. ALL ELECTRON-BEAM WELDING, ACID ETCHING, CLEANLINESS AND HANDLING ARE DETAILED IN ES-426451 AND MUST BE FOLLOWED.
 3. ALL DIMENSIONS ARE IN MILLIMETERS.
 4. DO NOT BREAK SHARP EDGES ON END-CELL.

THIS DESIGN IS THE INTELLECTUAL PROPERTY OF FERMILAB ACCORDING TO ISO 16016. THIS DRAWING IS PROVIDED FOR EXCLUSIVE FABRICATION USAGE BY TTC MEMBERS ONLY. USAGE OUTSIDE OF THE TTC MUST BE APPROVED BY FERMILAB.

SECTION "A-A"

ITEM	PART NO.	DESCRIPTION OR SIZE	QTY.
8	MB-426286	FORMTEIL	1
7	MB-426178	FLANGE, RF CAVITY (NW40)	1
6	MB-426353	TUBE, MAIN COUPLER Nb	1
5	MB-426327	FLANGE, MAIN COUPLER NbTi	1
4	MB-426582	HOM COUPLER	1
3	MB-426328	FLANGE, HOM COUPLER	1
2	MB-426357	END TUBE W/MC PORT	1
1	MC-426324	CONICAL FLANGE "A" WELDMENT	1

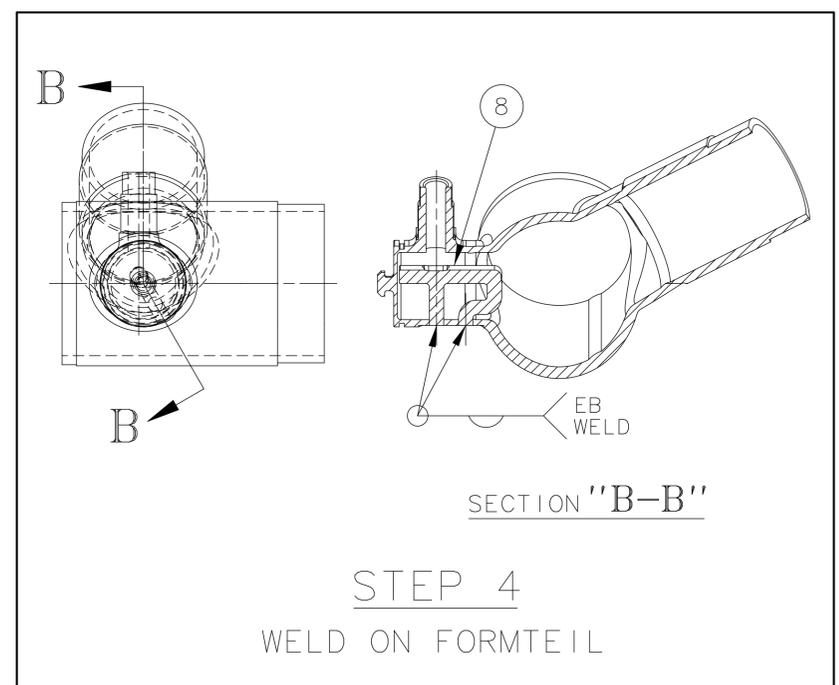
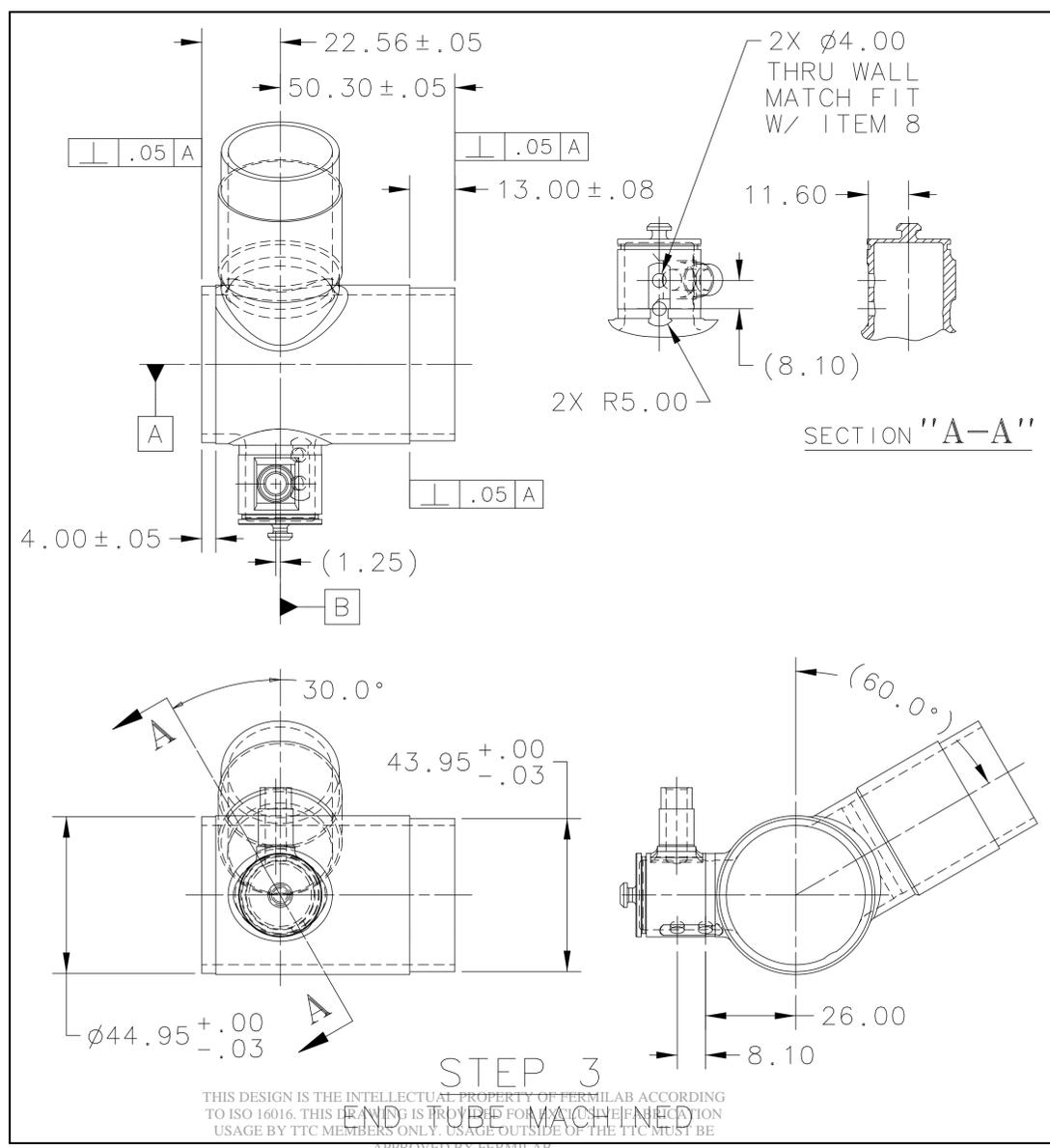
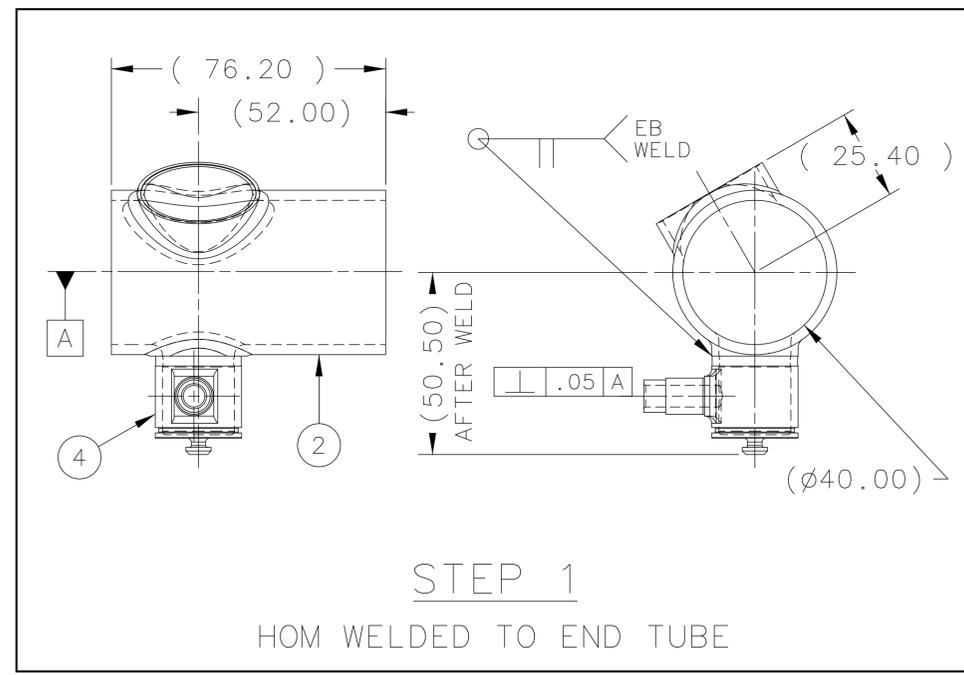
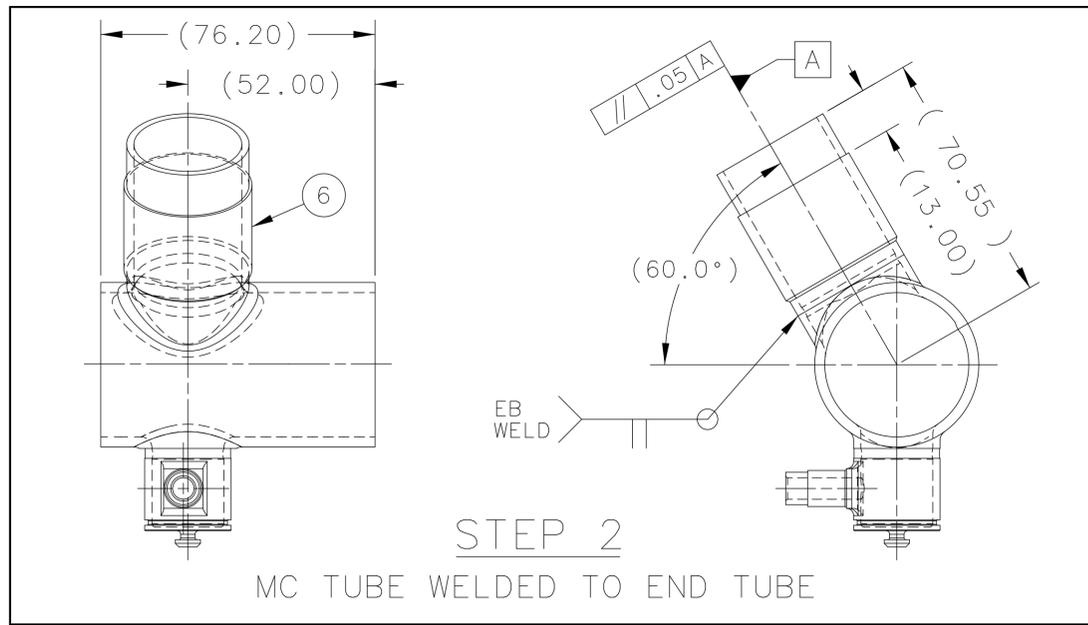
PARTS LIST			
UNLESS OTHERWISE SPECIFIED		ORIGINATOR	D. MITCHELL
.X	.XX	DRAWN	P. BELKO 7/8/04
±	±	CHECKED	
1. BREAK ALL SHARP EDGES .10mm MAX.		APPROVED	M. FOLEY 8/19/04
2. DO NOT SCALE DRAWING.		USED ON	ME-426321
3. DIMENSIONS BASED UPON ASME Y14.5M-1994		MATERIAL	SHOWN ABOVE
4. MAX. ALL MACH. SURFACES N7			

FERMI NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY

HELIUM VESSEL WELDMENT W/9 CELL CAVITY CAVITY WELDMENT, Nb CELL CAVITY END TUBE W/MC FABRICATING PROCESS

SCALE	FILMED	DRAWING NUMBER	SH'T. 1	REV.
FULL		5520-MD-426323	OF 3	C
CREATED WITH I-DEAS 11m2		USER NAME: pbelko		

REV	DESCRIPTION	DRAWN	DATE
		APPROVED	DATE
---	E.R.# 7671		
A	ECO# 7993: REMOVED HOM COUPLER AST WELDING STEPS	D. MITCHELL	8/2/05
B	ECO# 8262 PICTORIAL UPDATE TO REFLECT END CELL DIAMETER CHANGE	V. MARTINEZ	02-07-06
		D. MITCHELL	02/20/06
C	ECO# 8803: PICTORIAL UPDATE ONLY. FORMTEIL LENGTH SHORTENED.	C. GRIMM	9/24/07
		D. MITCHELL	9/24/07

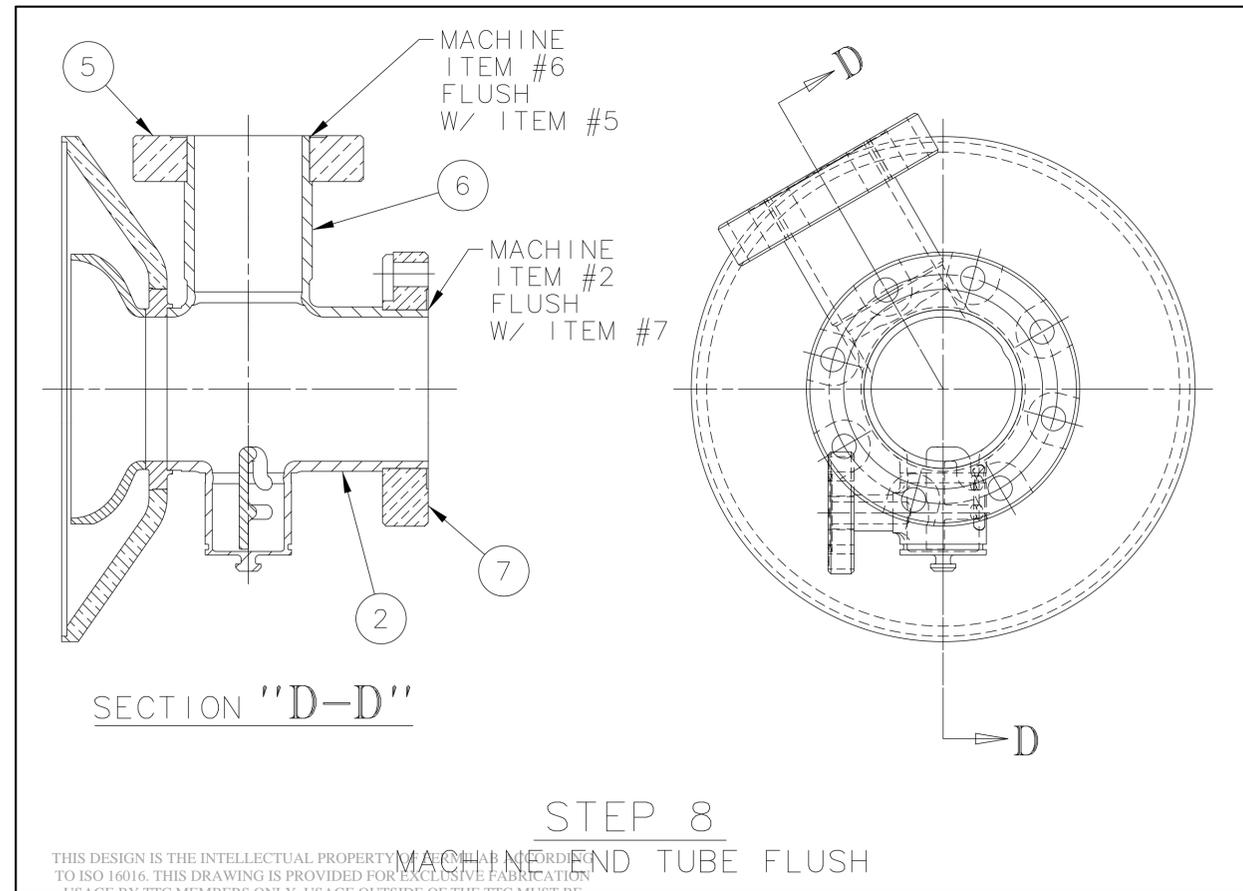
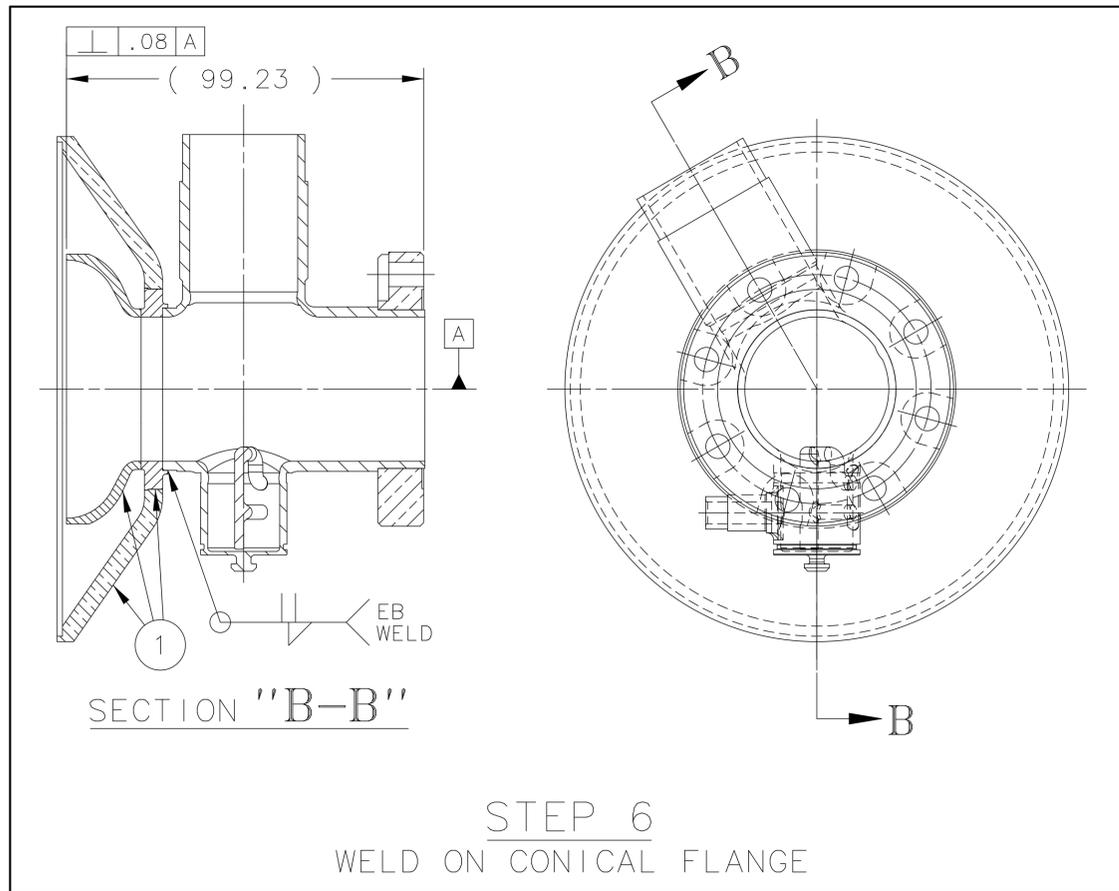
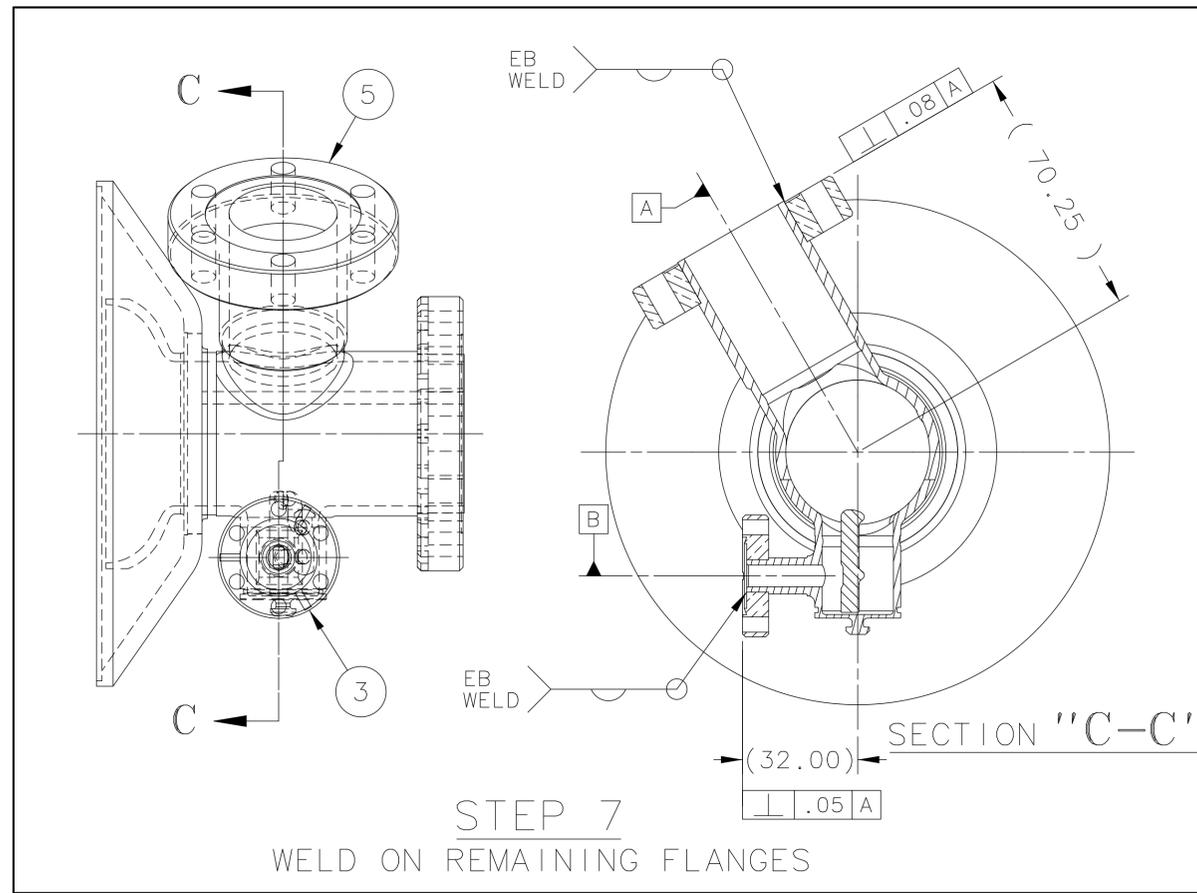
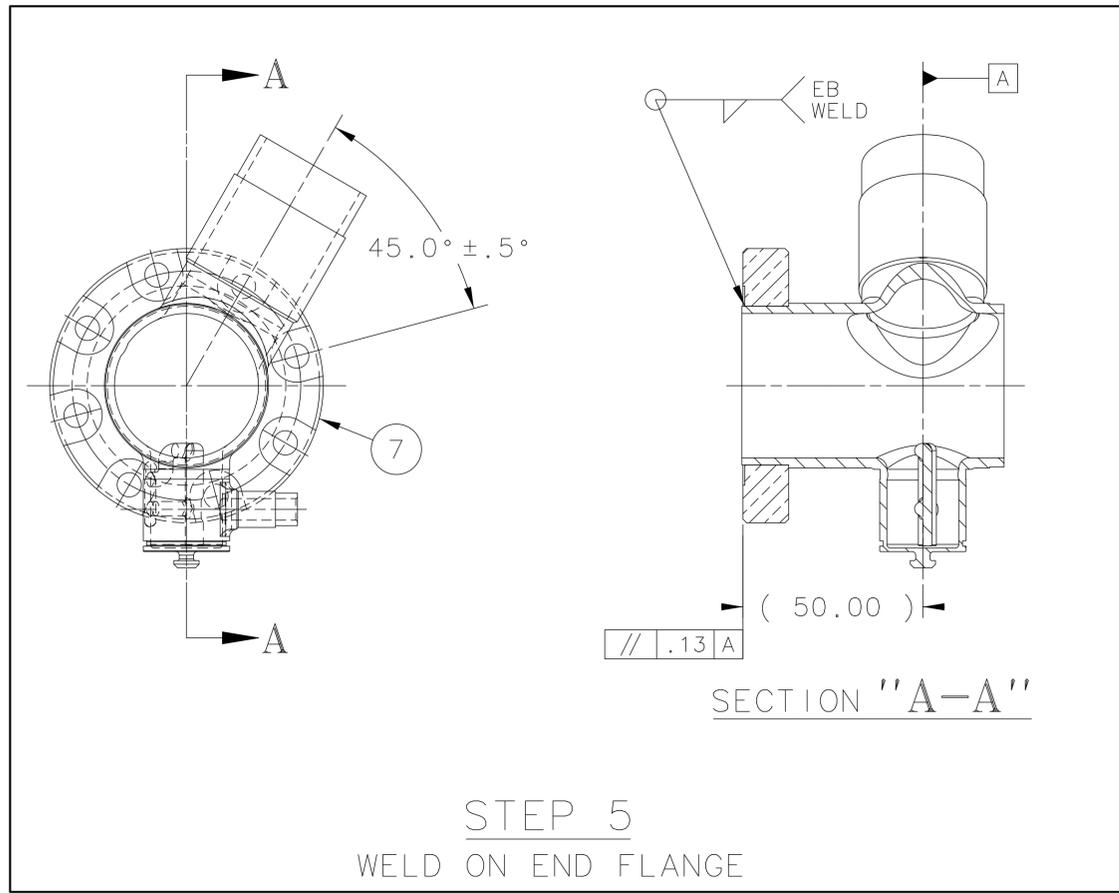


FERMI NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY

HELIUM VESSEL WELDMENT W/9 CELL CAVITY
CAVITY WELDMENT, Nb CELL CAVITY
END TUBE W/MC FABRICATING PROCESS

SCALE	FILMED	DRAWING NUMBER	SH'T. 2	REV.
FULL		5520-MD-426323	OF 3	C
CREATED WITH I-DEAS 11m2		USER NAME: pbelko		

THIS DESIGN IS THE INTELLECTUAL PROPERTY OF FERMI LAB ACCORDING TO ISO 16016. THIS DESIGN IS PROVIDED FOR INFORMATIONAL PURPOSES ONLY. USAGE BY TTC MEMBERS ONLY. USAGE OUTSIDE OF THE TTC MUST BE APPROVED BY FERMI LAB.



REV	DESCRIPTION	DRAWN	DATE
---	E.R.# 7671		
A	ECO# 7993: UPDATED NOTATION AND CHANGED STEP NUMBERING	D. MITCHELL	8/2/05
B	ECO# 8262 PICTORIAL UPDATE TO REFLECT END CELL DIAMETER CHANGE	V. MARTINEZ	02/07/06
C	ECO# 8803: PICTORIAL UPDATE ONLY. FORMTEIL LENGTH SHORTENED.	C. GRIMM	9/24/07
		D. MITCHELL	9/24/07

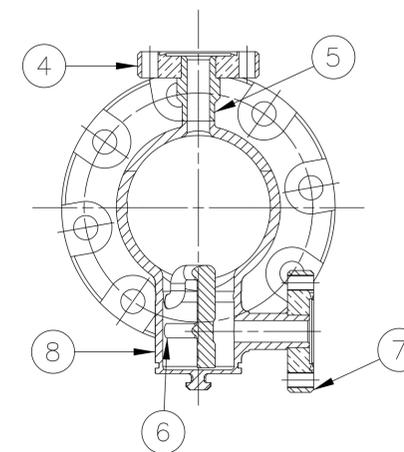
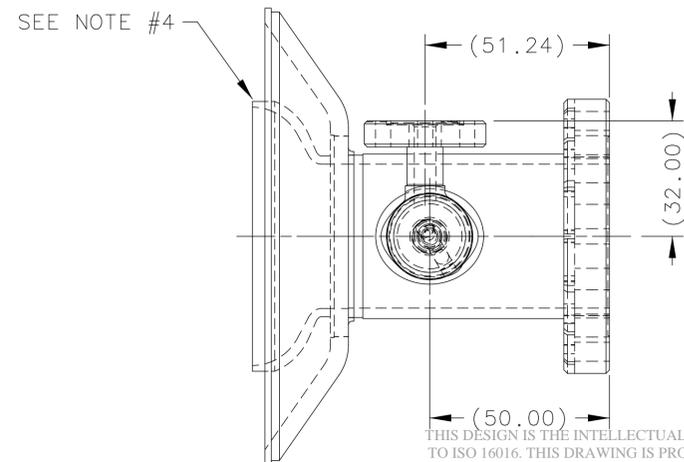
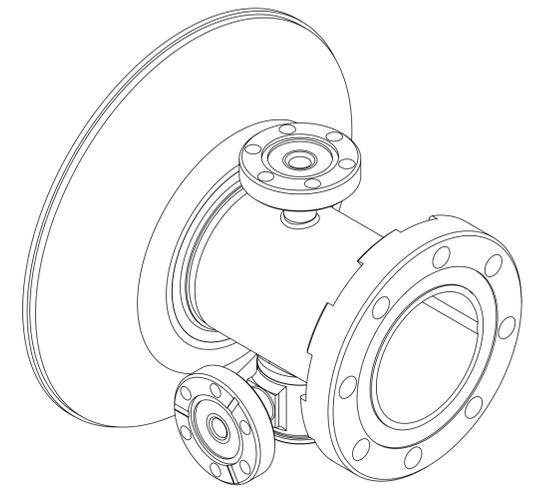
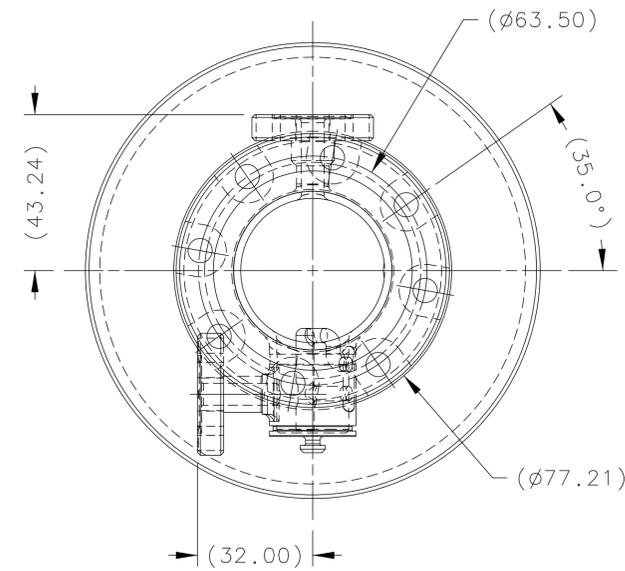
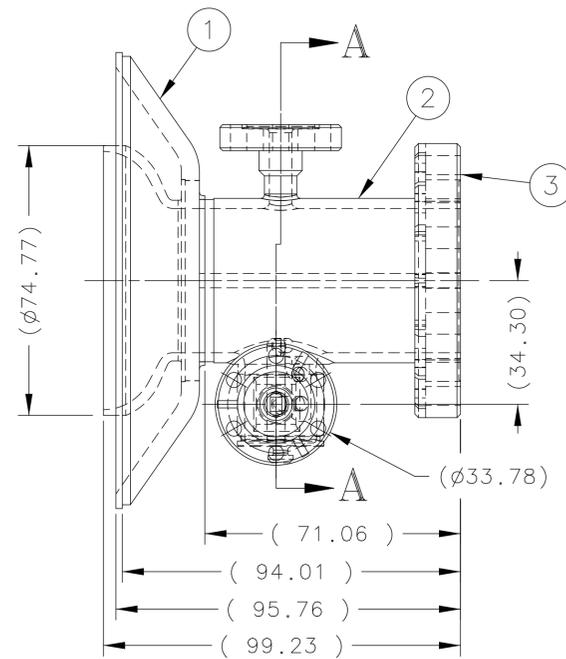
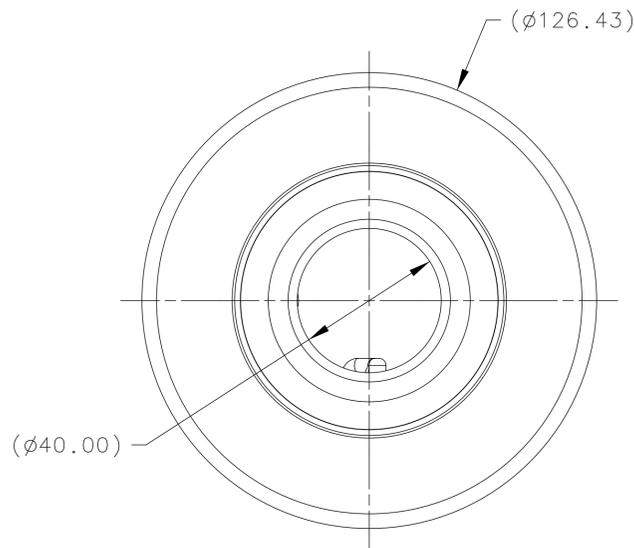
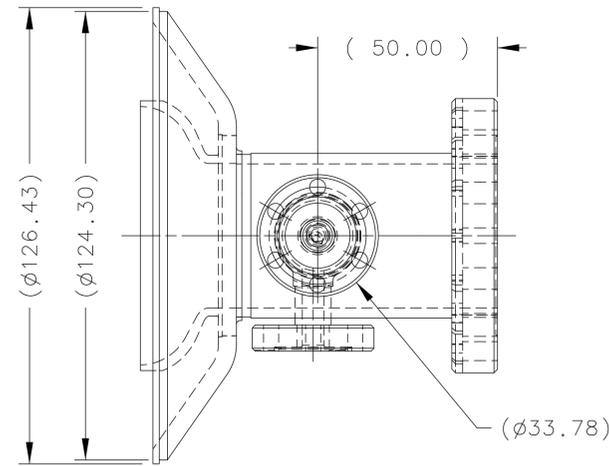
THIS DESIGN IS THE INTELLECTUAL PROPERTY OF FERMILAB AND IS PROVIDED TO ISO 16016. THIS DRAWING IS PROVIDED FOR EXCLUSIVE FABRICATION USAGE BY TTC MEMBERS ONLY. USAGE OUTSIDE OF THE TTC MUST BE APPROVED BY FERMILAB.

FERMI NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY

HELIUM VESSEL WELDMENT W/9 CELL CAVITY
CAVITY WELDMENT, Nb CELL CAVITY
END TUBE W/MC FABRICATING PROCESS

SCALE	FILMED	DRAWING NUMBER	SH.T. 3	REV.
FULL		5520-MD-426323	OF 3	C
CREATED WITH I-DEAS 9m3		USER NAME: pbelko		

REV	DESCRIPTION	DRAWN	DATE
		APPROVED	DATE
---	E.R.# 7671		
A	ECO# 7993: UPDATED FLANGES	D. MITCHELL	8/2/05
		M. FOLEY	8/2/05
B	ECO# 8262 PICTORIAL UPDATED TO REFLECT END CELL DIAMETER CHANGE	V. MARTINEZ	02/07/06
		D. MITCHELL	02/20/06
C	ECO# 8803: PICTORIAL UPDATE ONLY. FORMTEIL LENGTH SHORTENED.	C. GRIMM	9/24/07
		D. MITCHELL	9/24/07



SECTION "A-A"

NOTES:

1. FLANGE FACES TO BE FREE FROM ANY NICKS OR SCRATCHES.
2. ALL ELECTRON-BEAM WELDING, ACID ETCHING, CLEANLINESS AND HANDLING ARE DETAILED IN ES-426451 AND MUST BE FOLLOWED.
3. ALL DIMENSIONS ARE IN MILLIMETERS.
4. DO NOT BREAK SHARP EDGES ON END-CELL.

THIS DESIGN IS THE INTELLECTUAL PROPERTY OF FERMILAB ACCORDING TO ISO 16016. THIS DRAWING IS PROVIDED FOR EXCLUSIVE FABRICATION USAGE BY TTC MEMBERS ONLY. USAGE OUTSIDE OF THE TTC MUST BE APPROVED BY FERMILAB.

ITEM	PART NO.	DESCRIPTION OR SIZE	QTY.
8	MB-426582	HOM COUPLER	1
7	MB-426328	FLANGE, HOM COUPLER	1
6	MB-426286	FORMTEIL	1
5	MB-426333	TUBE, PICKUP ANTENNA	1
4	MB-426334	FLANGE, CF PICKUP ANTENNA	1
3	MB-426178	FLANGE, RF CAVITY (NW40)	1
2	MB-426358	END TUBE W/O MC PORT	1
1	MC-426335	CONICAL FLANGE B WELD'T STEPPED	1

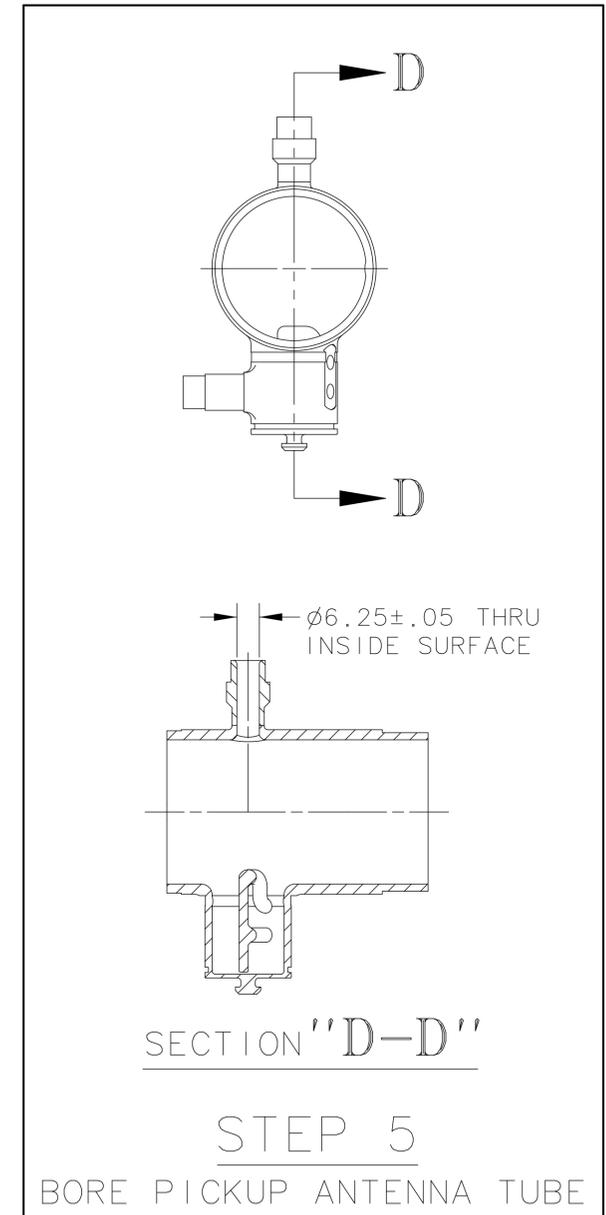
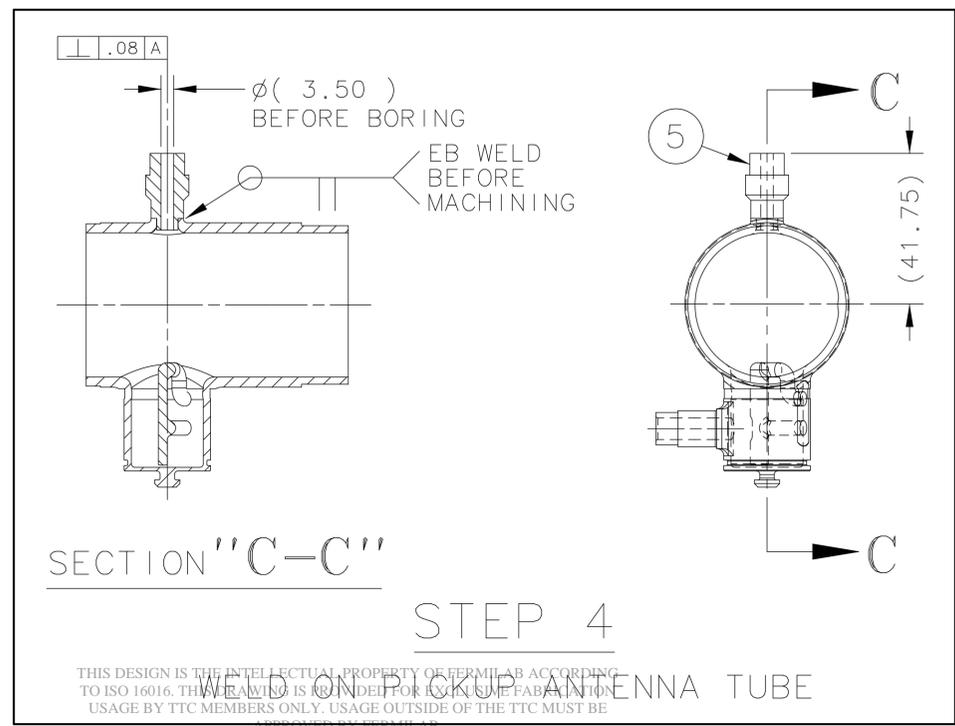
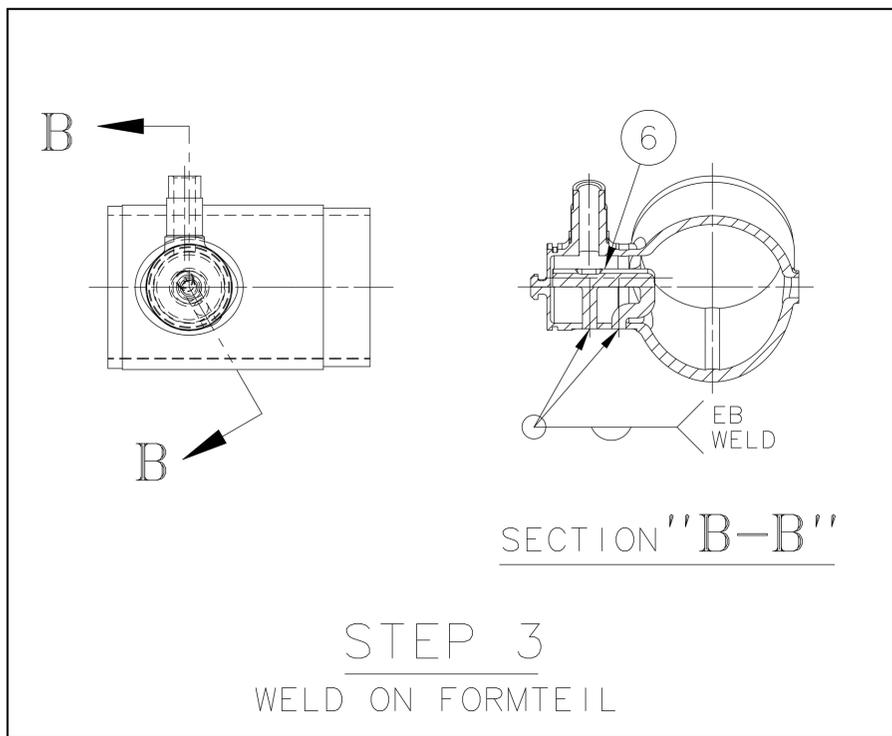
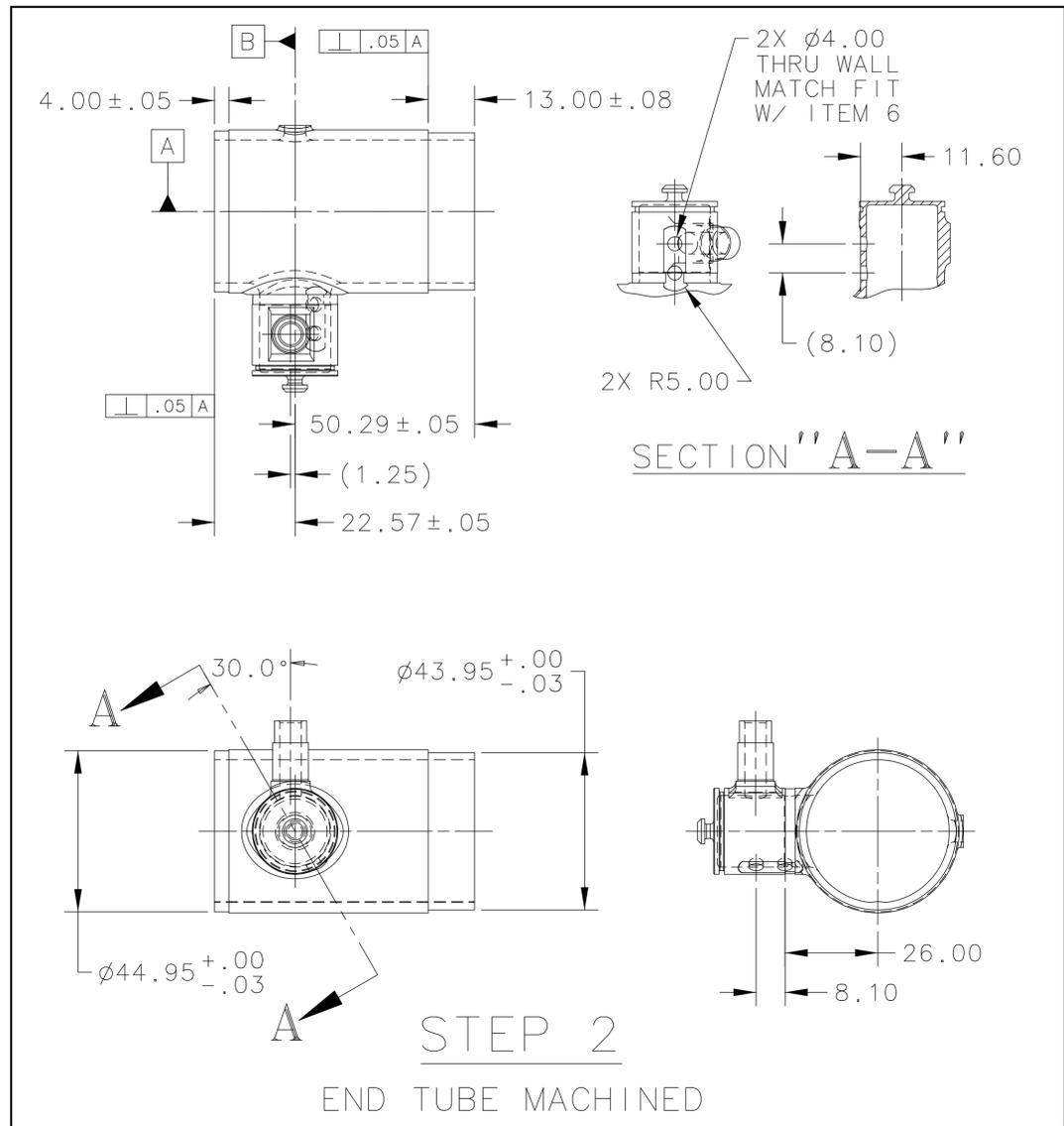
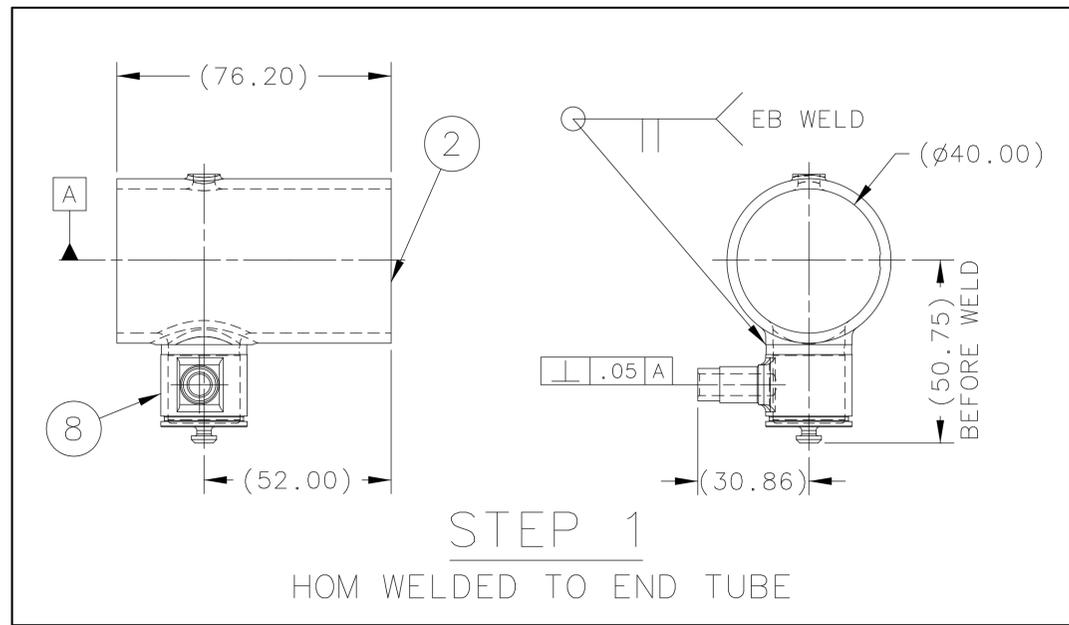
PARTS LIST			
UNLESS OTHERWISE SPECIFIED	ORIGINATOR	D. MITCHELL	
.X	.XX	ANGLES	DRAWN
±	±	±	CHECKED
1. BREAK ALL SHARP EDGES .10mm MAX.		APPROVED	M. FOLEY
2. DO NOT SCALE DRAWING.		USED ON ME-426321	
3. DIMENSIONS BASED UPON ASME Y14.5M-1994		MATERIAL SHOWN ABOVE	
4. MAX. ALL MACH. SURFACES N7			

FERMI NATIONAL ACCELERATOR LABORATORY
 UNITED STATES DEPARTMENT OF ENERGY
 HELIUM VESSEL WELDMENT W/9 CELL CAVITY
 CAVITY WELDMENT, Nb 9 CELL CAVITY
 END TUBE W/O MC, FABRICATING PROCESS

SCALE	FILMED	DRAWING NUMBER	SH'T. 1	REV.
FULL		5520-MD-426332	OF 3	C
CREATED WITH I-DEAS 9m3		USER NAME: pbelko		



REV	DESCRIPTION	DRAWN	DATE
		APPROVED	DATE
---	E.R.# 7671		
A	ECO# 7993: REMOVED HOM COUPLER AST WELDING STEPS	D. MITCHELL	8/2/05
B	ECO# 8262 PICTORIALY UPDATED TO REFLECT END CELL DIAMETER CHANGE	M. FOLEY	8/2/05
		V. MARTINEZ	02/07/06
		D. MITCHELL	02/20/06
C	ECO# 8803: PICTORAL UPDATE ONLY. FORMTEIL LENGTH SHORTENED.	C. GRIMM	9/24/07
		D. MITCHELL	9/24/07



THIS DESIGN IS THE INTELLECTUAL PROPERTY OF FERMI LAB ACCORDING TO ISO 16016. THIS DRAWING IS FOR MODELING PURPOSES ONLY. FABRICATION USAGE BY TTC MEMBERS ONLY. USAGE OUTSIDE OF THE TTC MUST BE APPROVED BY FERMI LAB.

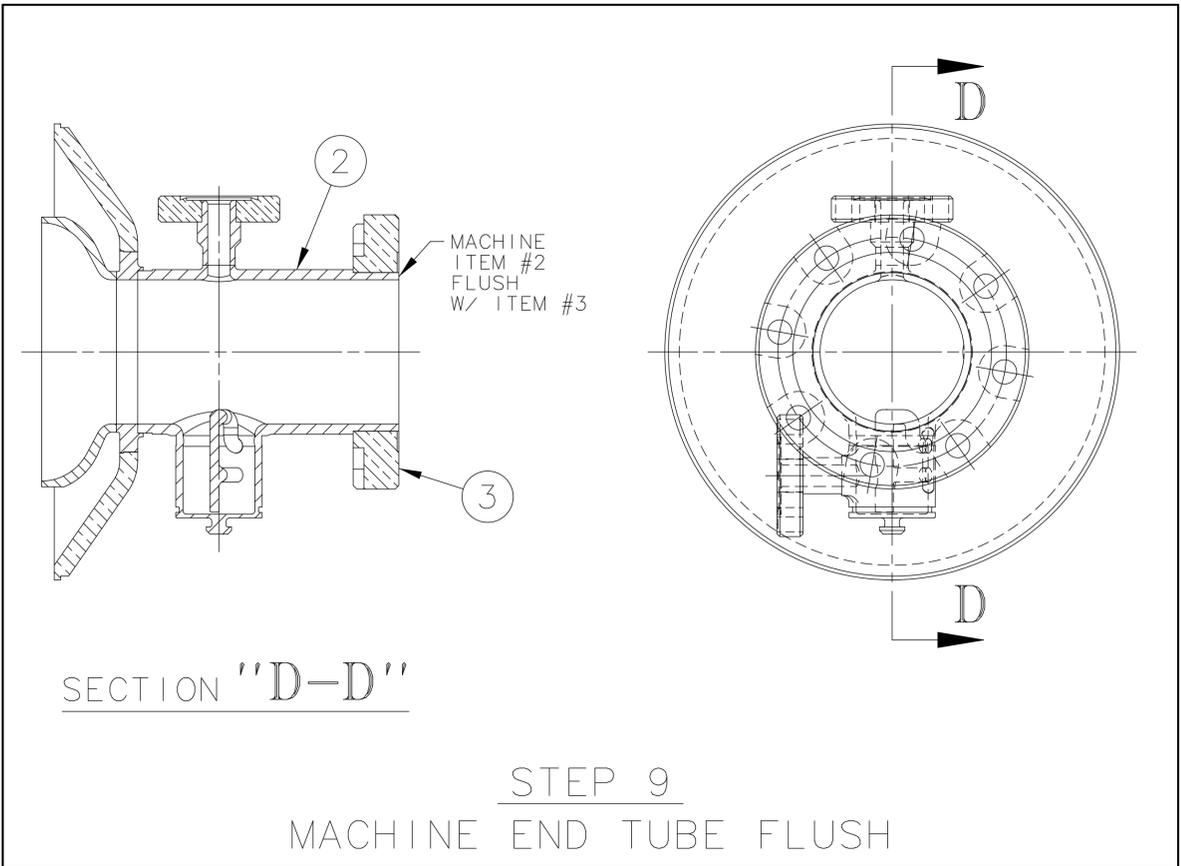
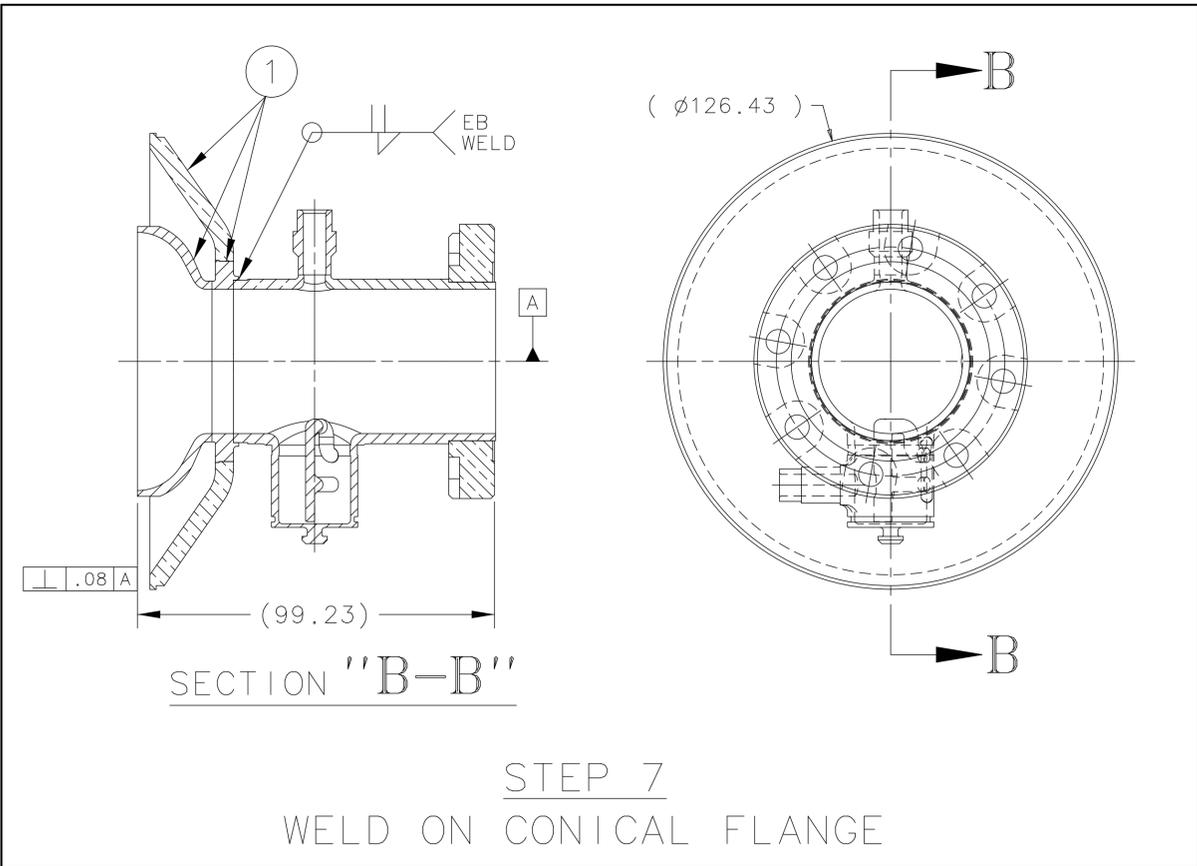
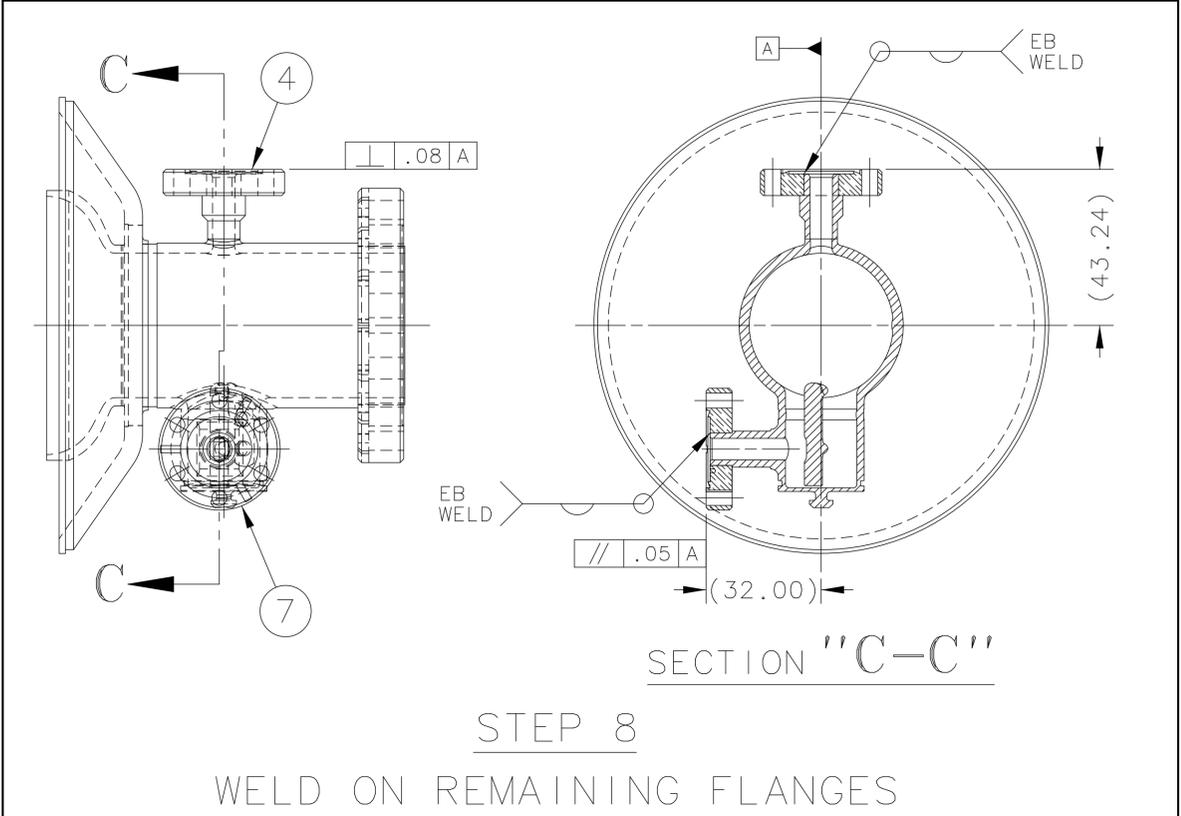
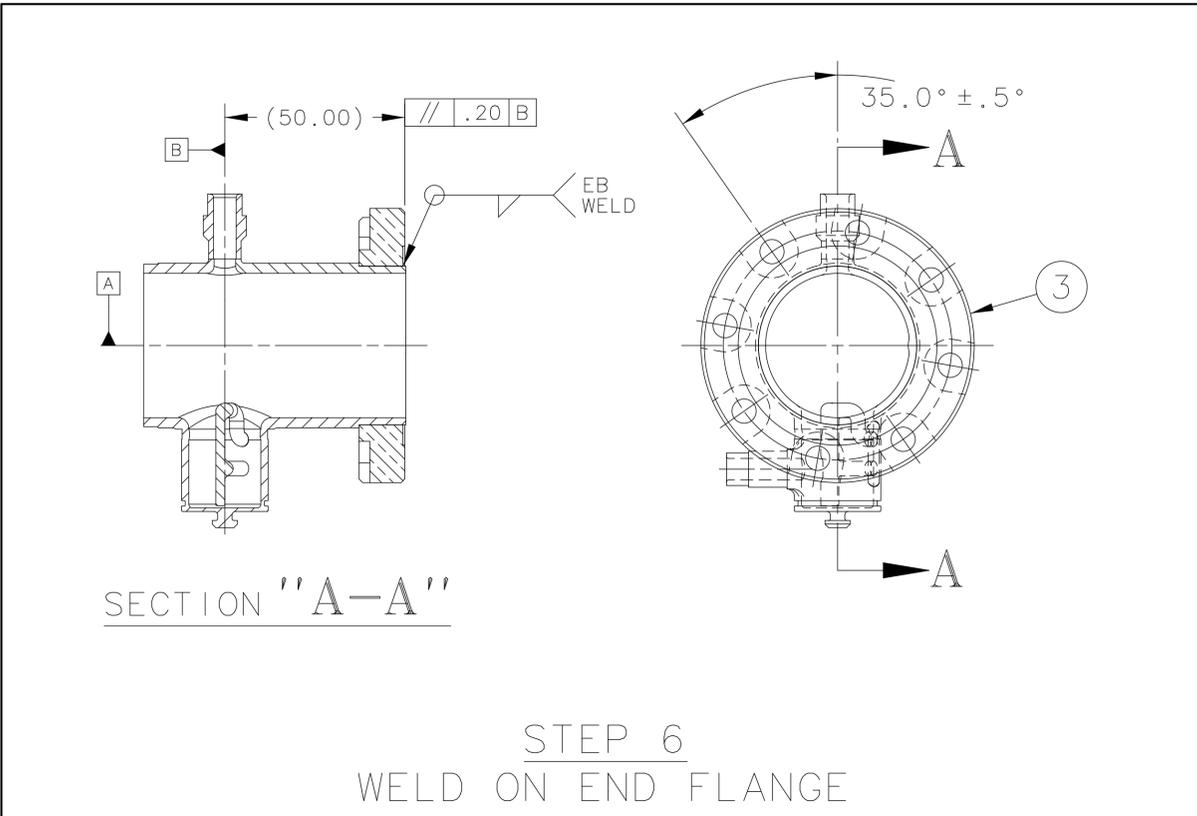
FERMI NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY

HELIUM VESSEL WELDMENT W/9 CELL CAVITY
CAVITY WELDMENT, N₉ CELL CAVITY
END TUBE W/O MC, FABRICATING PROCESS

SCALE	FILMED	DRAWING NUMBER	SH.T. 2	REV.
FULL		5520-MD-426332	OF 3	C
CREATED WITH I-DEAS 11M2		USER NAME: dmitchel		



REV.	DESCRIPTION	DRAWN	DATE
		APPD.	DATE
	E.R. #7671		
A	ECO #7993: UPDATED NOTATION AND CHANGED STEP NUMBERING	D. MITCHELL	8/2/05
B	ECO #8262 PICTORIALY UPDATED TO REFLECT END CELL DIAMETER CHANGE	M. FOLEY	8/2/05
		V. MARTINEZ	02/07/06
		D. MITCHELL	02/20/06
C	ECO #8803: PICTORIAL UPDATE ONLY. FORMTEIL LENGTH SHORTENED.	C. GRIMM	9/24/07
		D. MITCHELL	9/24/07



THIS DESIGN IS THE INTELLECTUAL PROPERTY OF FERMILAB ACCORDING TO ISO 16016. THIS DRAWING IS PROVIDED FOR EXCLUSIVE FABRICATION USAGE BY TTC MEMBERS ONLY. USAGE OUTSIDE OF THE TTC MUST BE APPROVED BY FERMILAB.

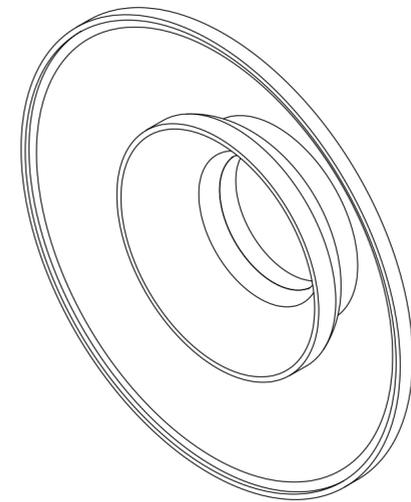
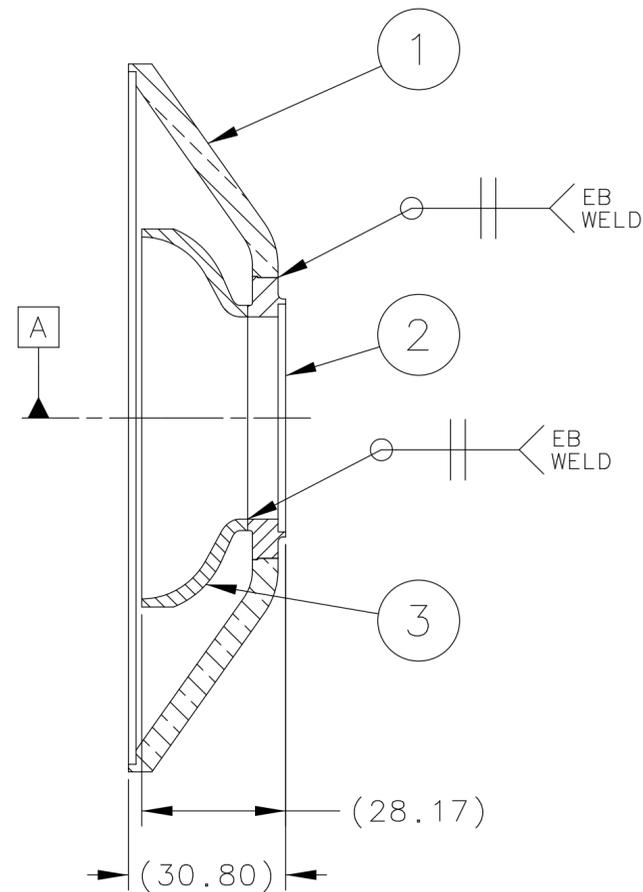
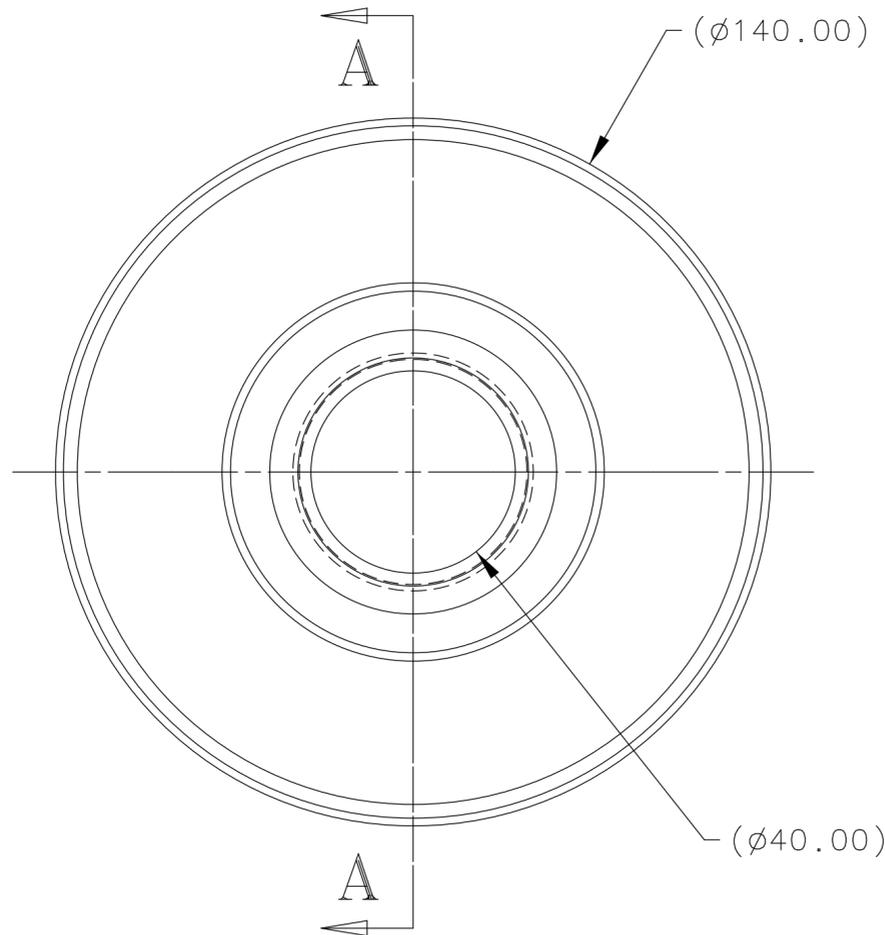
FERMI NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY

HELIUM VESSEL WELDMENT W/9 CELL CAVITY
CAVITY WELDMENT, Nb 9 CELL CAVITY
END TUBE W/O MC, FABRICATING PROCESS

SCALE	FILMED	DRAWING NUMBER	SH'T. 3	REV.
FULL		5520-MD-426332	OF 3	C
CREATED WITH I-DEAS 11m2		USER NAME: pbelko		



REV.	DESCRIPTION	DRAWN	DATE
		APPD.	DATE
	E.R. #7671		



SECTION "A-A"

NOTES:

1. ALL PARTS TO BE CONCENTRIC WITHIN $\pm\phi.08$.

2. ALL ELECTRON-BEAM WELDING ACID ETCHING, CLENLINESS AND HANDLING ARE DETAILED IN ES-426451 AND MUST BE FOLLOWED.

THIS DESIGN IS THE INTELLECTUAL PROPERTY OF FERMILAB ACCORDING TO ISO 16016. THIS DRAWING IS PROVIDED FOR EXCLUSIVE FABRICATION USAGE BY TTC MEMBERS ONLY. USAGE OUTSIDE OF THE TTC MUST BE APPROVED BY FERMILAB.

ITEM	PART NO.	DESCRIPTION OR SIZE	QTY.
3	MC-426329	CELL END Nb CELL CAVITY	1
2	MB-426354	FLANGE, Nb TUBE END	1
1	MB-426325	END CAP VESSEL (LARGE)	1

PARTS LIST					
UNLESS OTHERWISE SPECIFIED		ORIGINATOR	D. MITCHELL		
.XX	.XXX	ANGLES	DRAWN	P.BELKO	7/13/04
±	±	±	CHECKED		
1. BREAK ALL SHARP EDGES .02 MAX.		APPROVED	D. MITCHELL	7/26/04	
2. DO NOT SCALE DRAWING.		USED ON MD-426323			
3. DIMENSIONS BASED UPON ASME Y14.5M-1994					
4. MAX. ALL MACH. SURFACES		MATERIAL SHOWN ABOVE			

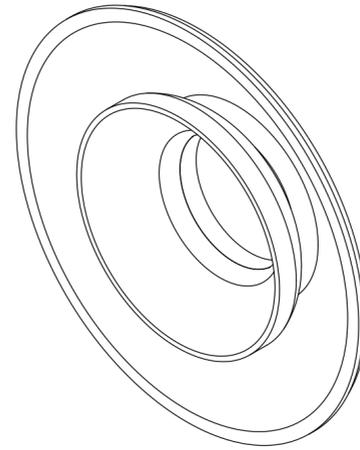
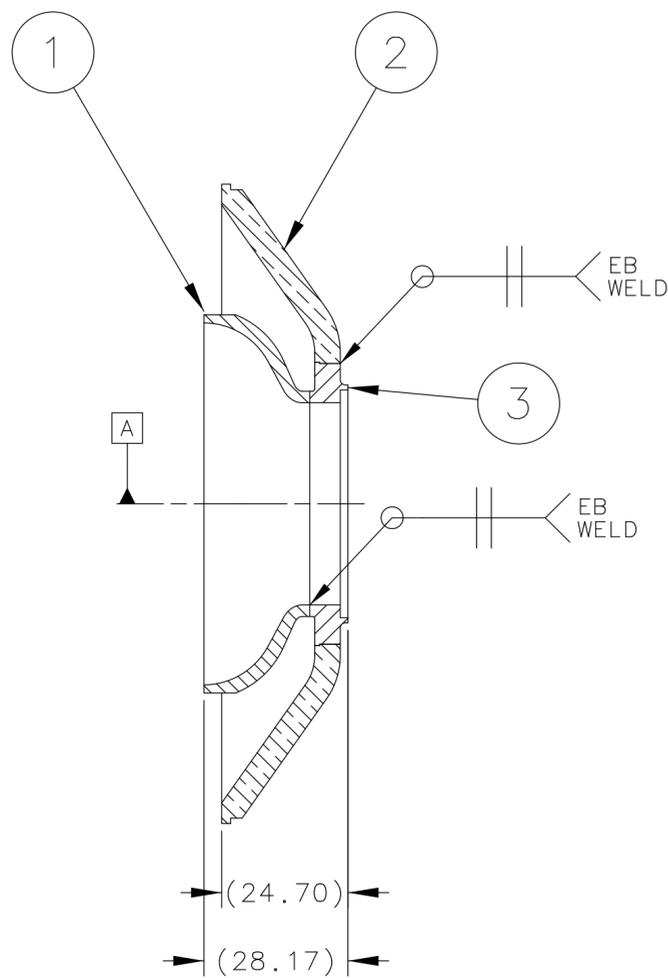
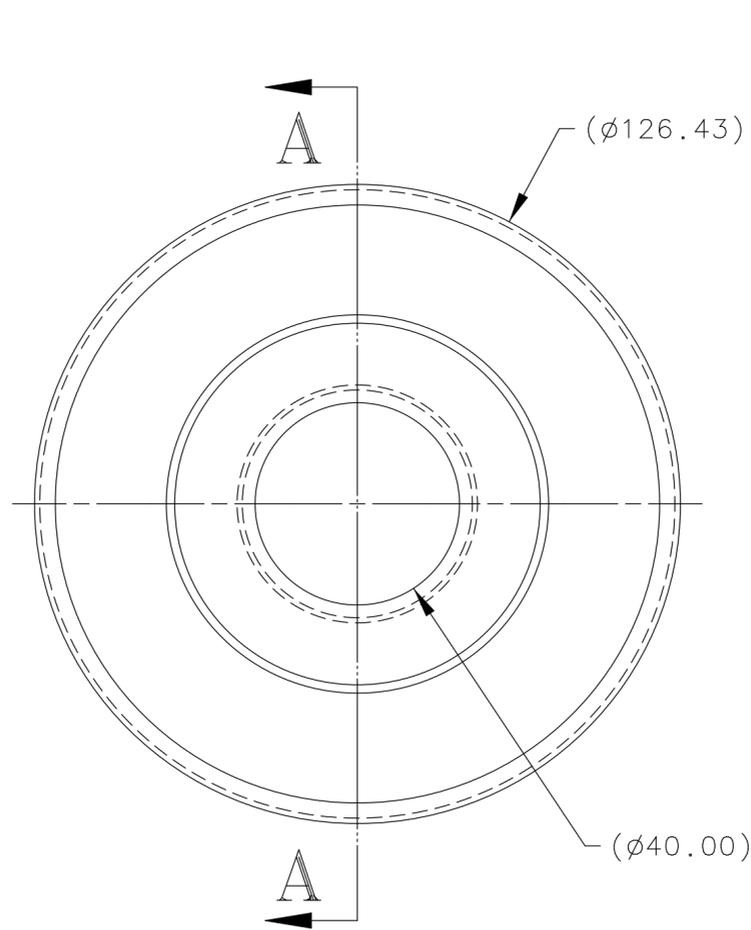


FERMI NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY

HELIUM VESSEL WELDMENT W/9 CELL CAVITY
CAVITY WELDMENT, Nb 9 CELL CAVITY
CONICAL FLANGE "A" WELDMENT

SCALE	FILMED	DRAWING NUMBER	REV.
FULL		5520-MC-426324	
CREATED WITH I-DEAS 9m3		USER NAME: pbelko	

REV.	DESCRIPTION	DRAWN	DATE
	E.R. #7671	APPD.	DATE



SECTION "A-A"

NOTES:

1. ALL PARTS TO BE CONCENTRIC WITHIN $\pm\phi.08$.
2. ALL ELECTRON-BEAM WELDING, ACID ETCHING, CLEANLINESS AND HANDLING ARE DETAILED IN ES-426451 AND MUST BE FOLLOWED.

THIS DESIGN IS THE INTELLECTUAL PROPERTY OF FERMILAB ACCORDING TO ISO 16016. THIS DRAWING IS PROVIDED FOR EXCLUSIVE FABRICATION USAGE BY TTC MEMBERS ONLY. USAGE OUTSIDE OF THE TTC MUST BE APPROVED BY FERMILAB.

ITEM	PART NO.	DESCRIPTION OR SIZE	QTY.
3	MB-426354	FLANGE Nb TUBE END	1
2	MB-426336	END CAP VESSEL - SMALL	1
1	MC-426329	CELL END Nb 9 CELL CAVITY	1

PARTS LIST					
UNLESS OTHERWISE SPECIFIED		ORIGINATOR	D. MITCHELL		
.XX	.XXX	ANGLES	DRAWN	P.BELKO	7/7/04
±	±	±	CHECKED		
1. BREAK ALL SHARP EDGES .02 MAX.		APPROVED	D. MITCHELL	7/26/04	
2. DO NOT SCALE DRAWING.		USED ON MD-426332			
3. DIMENSIONS BASED UPON ASME Y14.5M-1994					
4. MAX. ALL MACH. SURFACES		MATERIAL SHOWN ABOVE			

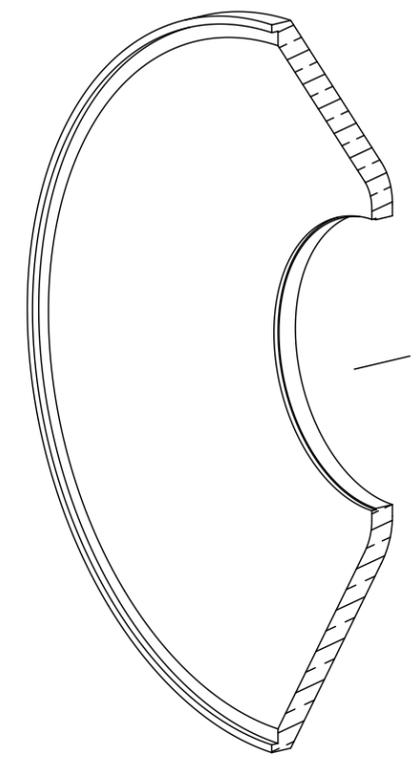
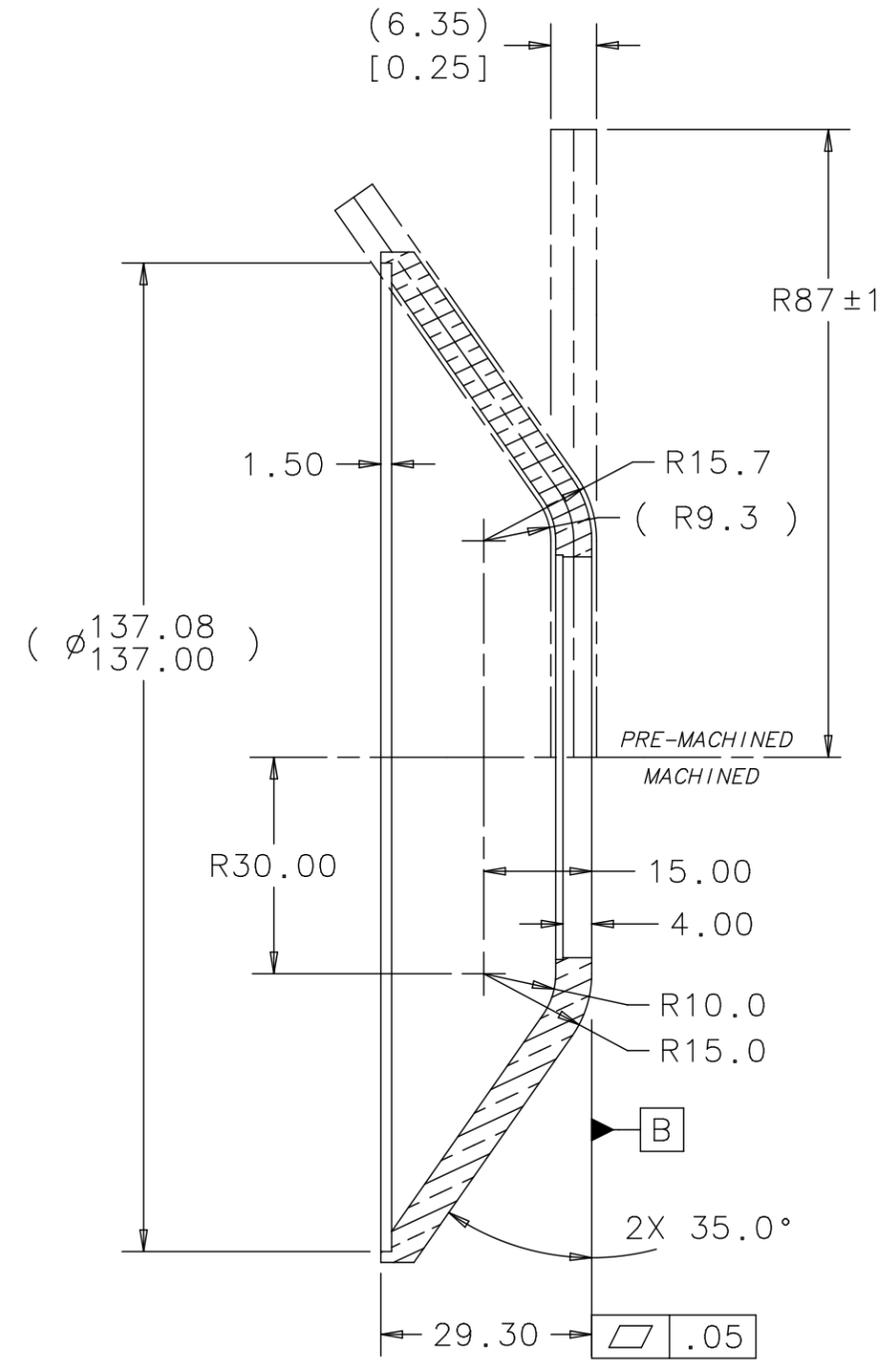
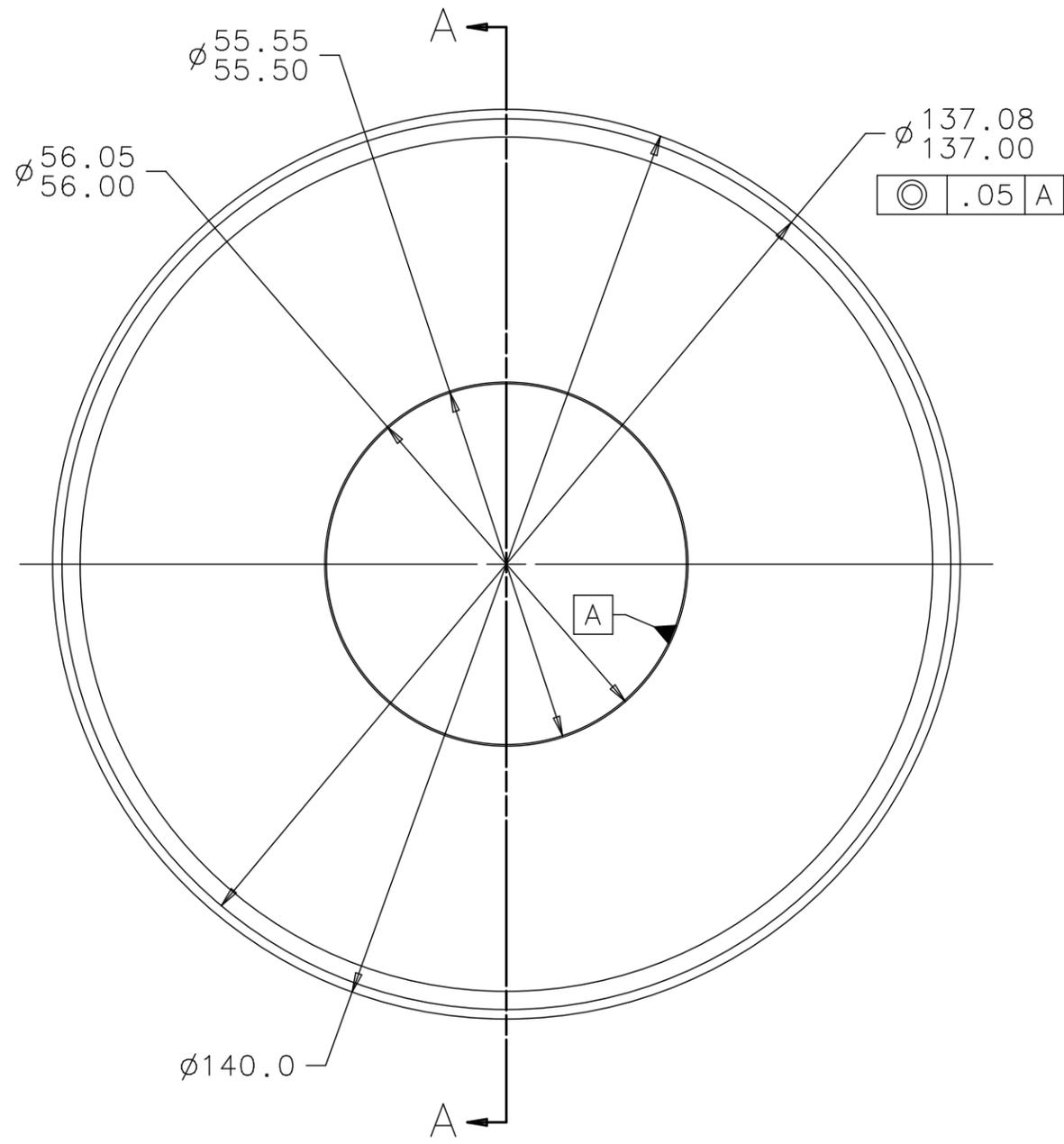


FERMI NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY

**HELIUM VESSEL WELDMENT W/9 CELL CAVITY
CAVITY WELDMENT, Nb 9 CELL CAVITY
CONICAL FLANGE "B" WELDMENT**

SCALE	FILMED	DRAWING NUMBER	REV.
FULL		5520-MC-426335	
CREATED WITH I-DEAS 9m3		USER NAME: pbelko	

REV.	DESCRIPTION	DRAWN	DATE
		APPD.	DATE
---	NEW RELEASE - ER #7671	DVM	2/20/04
		M. FOLEY	8/19/04



SECTION A-A

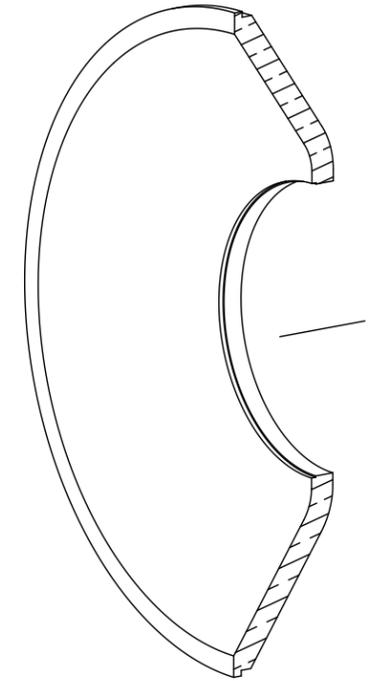
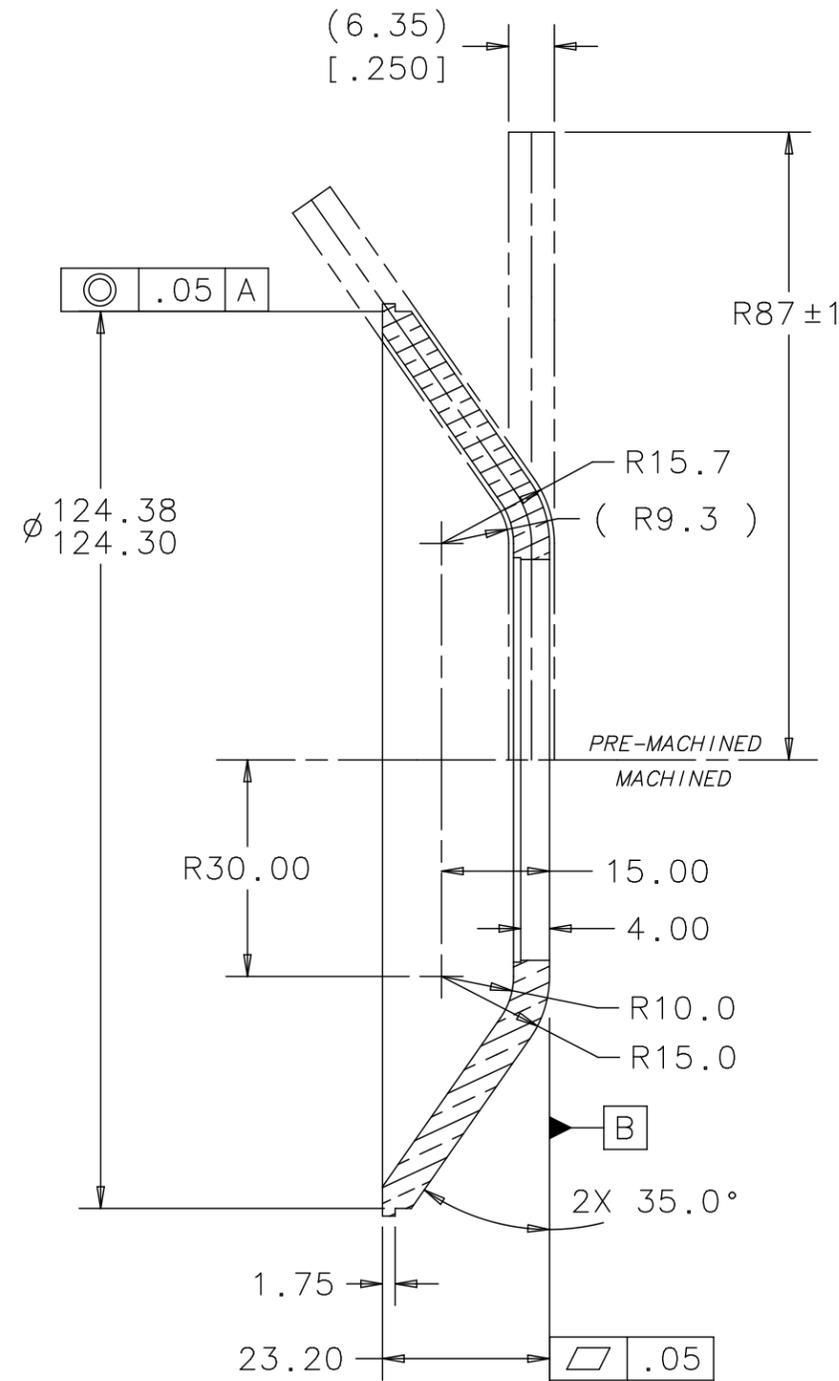
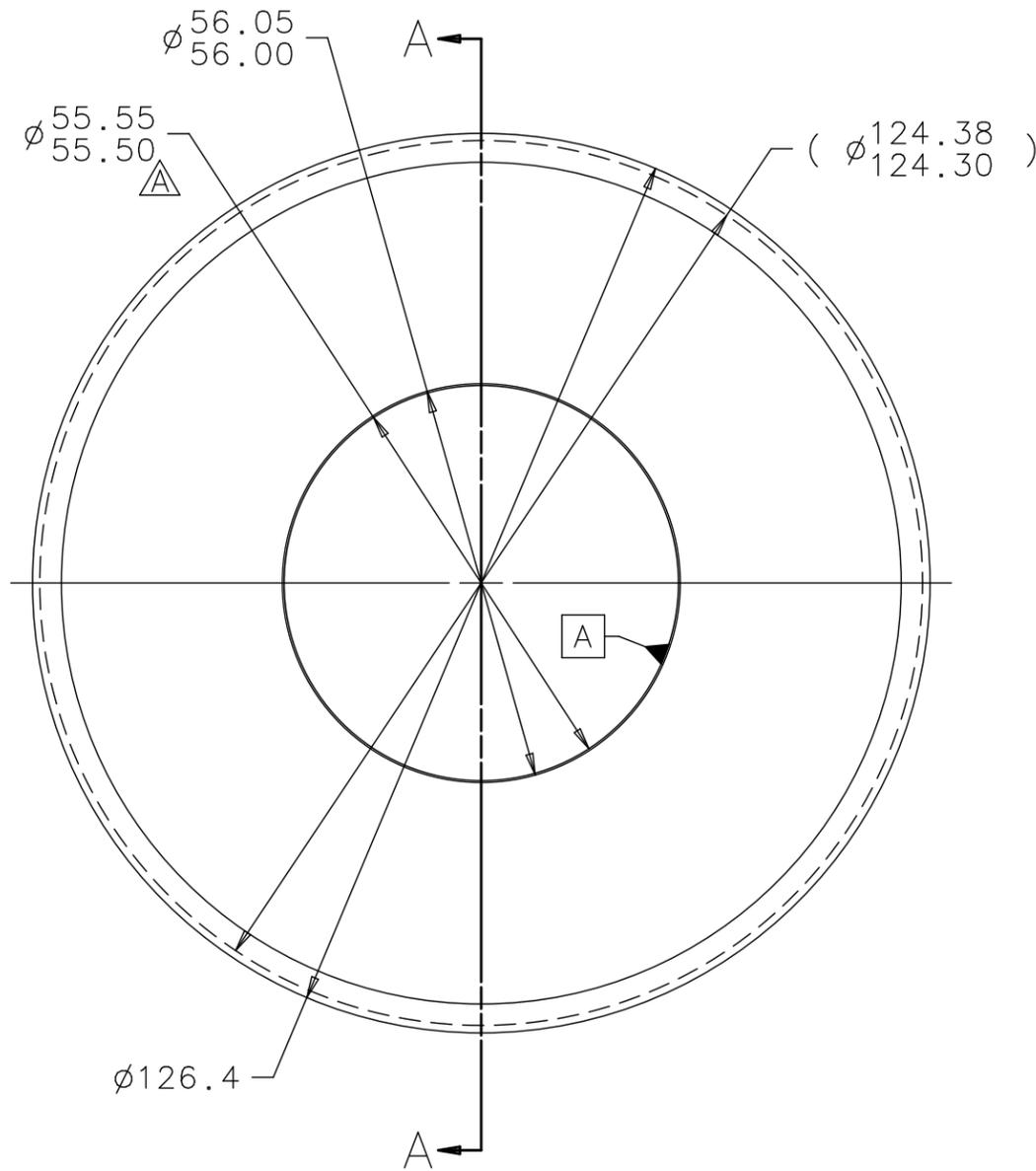
NOTES:

1. ALL UNITS ARE IN MILLIMETERS.
2. FORM 6.35mm [0.25"] Nb-Ti PLATE INTO CONE SHAPE PRIOR TO MACHINING.
3. AFTER MACHINING, THE PROFILE MAY HAVE SOME MEMORY SPRINGBACK AND MAY NEED TO BE STAMPED AND COINED TO FINAL DIMENSIONS.

THIS DESIGN IS THE INTELLECTUAL PROPERTY OF FERMILAB ACCORDING TO ISO 16016. THIS DRAWING IS PROVIDED FOR EXCLUSIVE FABRICATION USAGE BY TTC MEMBERS ONLY. USAGE OUTSIDE OF THE TTC MUST BE APPROVED BY FERMILAB.

ITEM	PART NO.	DESCRIPTION OR SIZE	QTY.
PARTS LIST			
UNLESS OTHERWISE SPECIFIED		ORIGINATOR	D. MITCHELL
NOV 2003		DRAWN	D. MITCHELL
2/20/04		CHECKED	
APPROVED		M. FOLEY	8/19/04
USED ON		MC-426324	
MATERIAL		Nb-Ti 55%	
FERMI NATIONAL ACCELERATOR LABORATORY UNITED STATES DEPARTMENT OF ENERGY			
SCRF 3.9 GHZ 3RD HARMONIC NB RF CAVITY END TUBES END CAP, VESSEL, LARGE			
SCALE	FILMED	DRAWING NUMBER	REV.
1:1		5520-MB-426325	
CREATED WITH I-DEAS 9M3		USER NAME: dmitchel	

REV.	DESCRIPTION	DRAWN	DATE
---	NEW RELEASE - ER #7671	DVM	2/24/04
		NS	2/27/04
A	ECO #5747: TOLERANCE CORRECTION	DVM	9/23/04
		D. MITCHELL	9/23/04



NOT TO SCALE

SECTION A-A

NOTES:

1. ALL UNITS ARE IN MILLIMETERS.

2. FORM 6.35mm [0.25"] Nb-Ti PLATE INTO CONE SHAPE PRIOR TO MACHINING.

3. AFTER MACHINING, THE PROFILE MAY HAVE SOME MEMORY SPRINGBACK AND MAY NEED TO BE STAMPED AND COINED TO FINAL DIMENSIONS.

THIS DESIGN IS THE INTELLECTUAL PROPERTY OF FERMILAB ACCORDING TO ISO 16016. THIS DRAWING IS PROVIDED FOR EXCLUSIVE FABRICATION USAGE BY TTC MEMBERS ONLY. USAGE OUTSIDE OF THE TTC MUST BE APPROVED BY FERMILAB.

ITEM	PART NO.	DESCRIPTION OR SIZE	QTY.
PARTS LIST			
UNLESS OTHERWISE SPECIFIED		ORIGINATOR	D. MITCHELL
		DATE	NOV 2003
.X	.XX	ANGLES	DRAWN
			D. MITCHELL
			2/24/04
± .1	± .05	± 0.5°	CHECKED
			V. POLOUBOTKO
			9/23/04
1. BREAK ALL SHARP EDGES .35mm MAX.		APPROVED	D. MITCHELL
			9/23/04
2. DO NOT SCALE DRAWING.		USED ON	MC-426335
3. DIMENSIONS BASED UPON ASME Y14.5M-1994		MATERIAL	Nb-Ti 55%
4. MAX. ALL MACH. SURFACES N7			

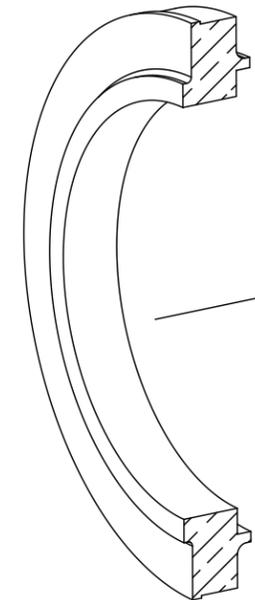
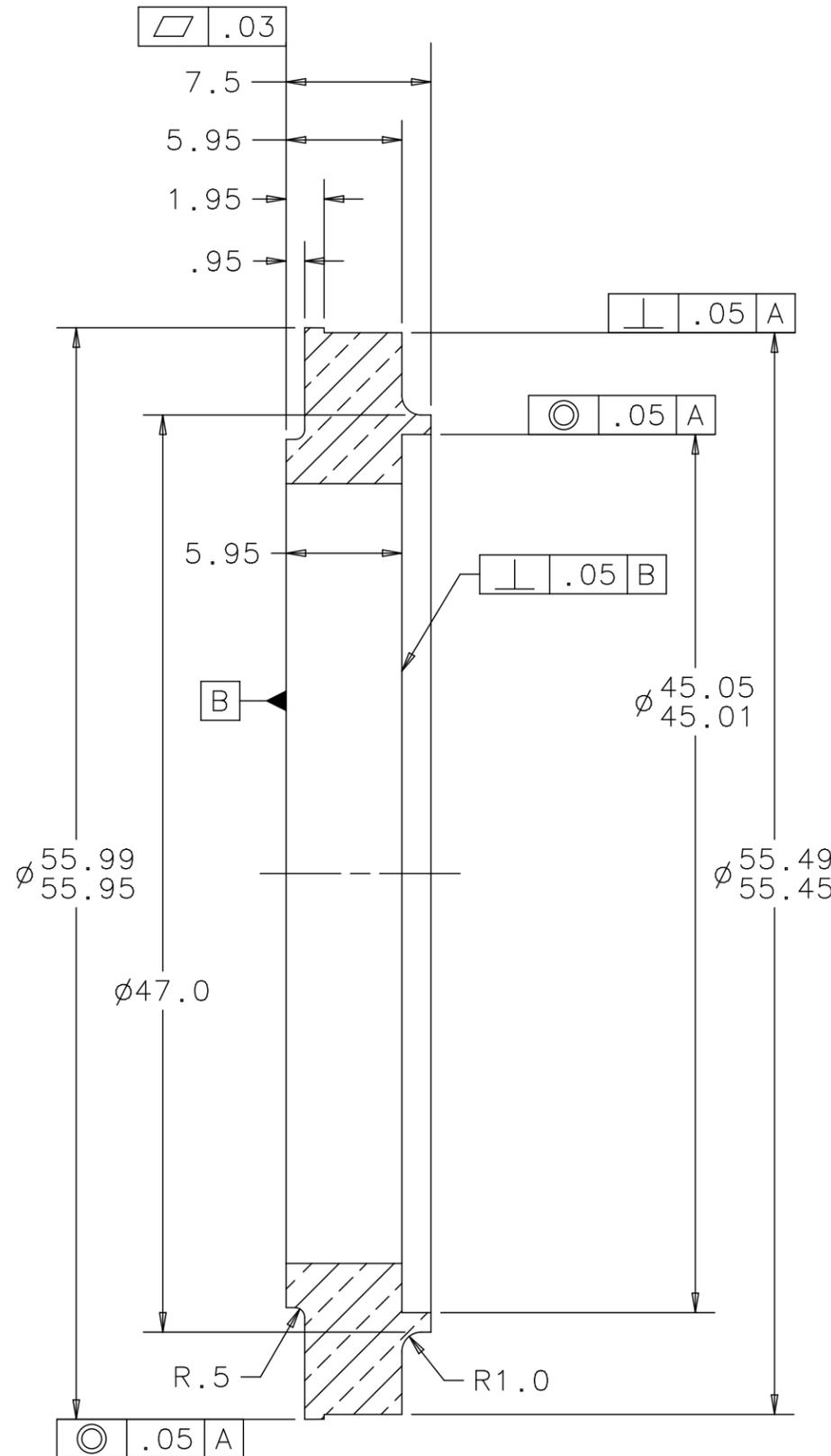
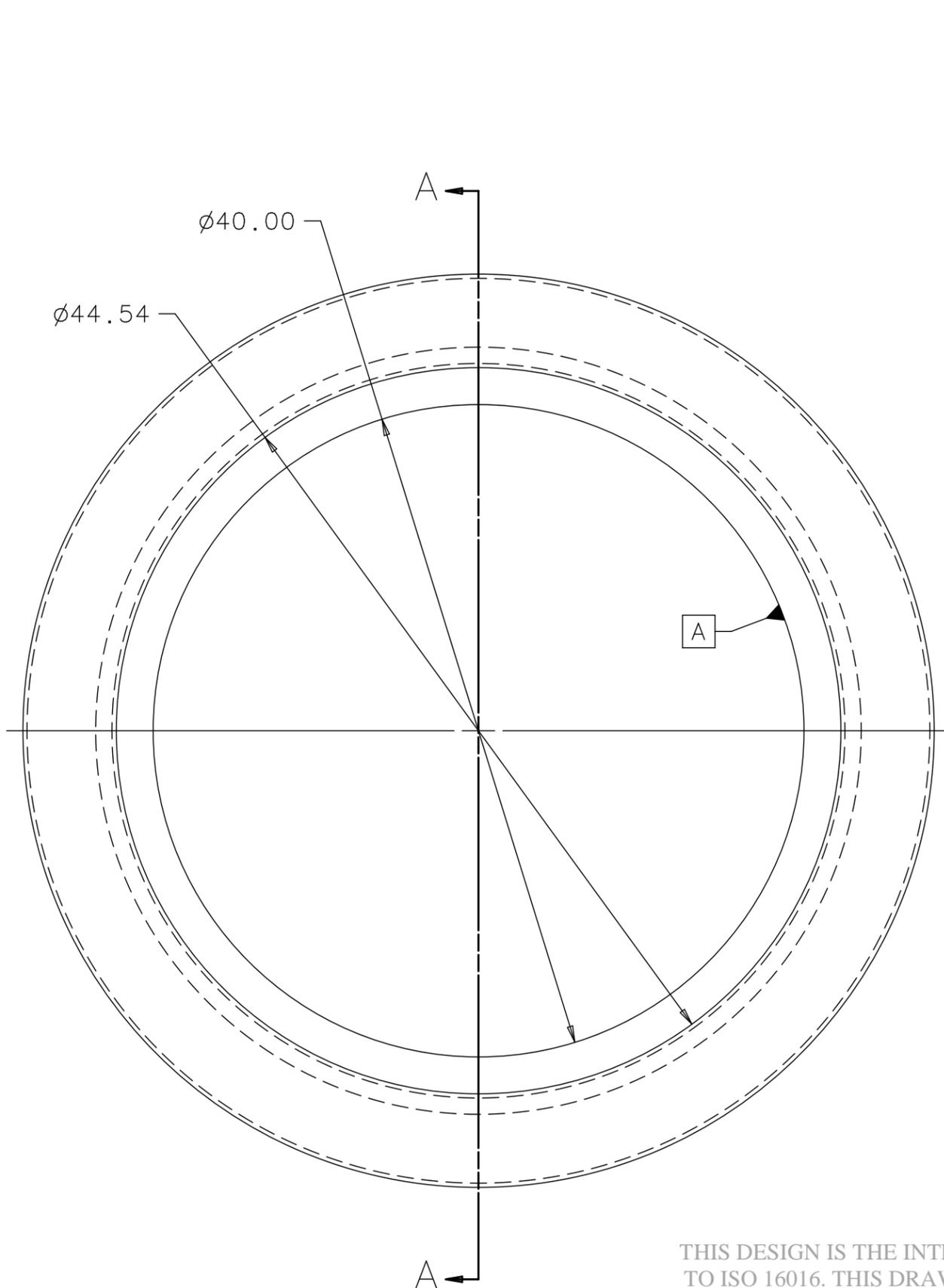


FERMILAB NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY

**SCRF 3.9 GHZ 3RD HARMONIC
NB RF CAVITY END TUBES
END CAP, VESSEL, SMALL**

SCALE	FILMED	DRAWING NUMBER	REV.
1:1		5520-MB-426336	A
CREATED WITH I-DEAS 9M3		USER NAME: dmitchel	

REV.	DESCRIPTION	DRAWN	DATE
---	NEW RELEASE - ER #7671	DVM	3/29/04
		M. FOLEY	8/19/04



NOT TO SCALE

NOTES:

1. ALL UNITS ARE IN MILLIMETERS.

THIS DESIGN IS THE INTELLECTUAL PROPERTY OF FERMI LAB ACCORDING TO ISO 16016. THIS DRAWING IS PROVIDED FOR EXCLUSIVE FABRICATION USAGE BY TTC MEMBERS ONLY. USAGE OUTSIDE OF THE TTC MUST BE APPROVED BY FERMI LAB.

ITEM	PART NO.	DESCRIPTION OR SIZE	QTY.
PARTS LIST			
UNLESS OTHERWISE SPECIFIED		ORIGINATOR	D. MITCHELL
		DATE	NOV 2003
.X	.XX	ANGLES	DRAWN
			D. MITCHELL
			2/20/04
± .1	± .05	± 1°	CHECKED
1. BREAK ALL SHARP EDGES .35mm MAX.		APPROVED	M. FOLEY
2. DO NOT SCALE DRAWING.		8/19/04	
3. DIMENSIONS BASED UPON ASME Y14.5M-1994		USED ON	
4. MAX. ALL MACH. SURFACES		MC-426324	
N7		MC-426335	
		MATERIAL	
		300 RRR NIOBIUM	

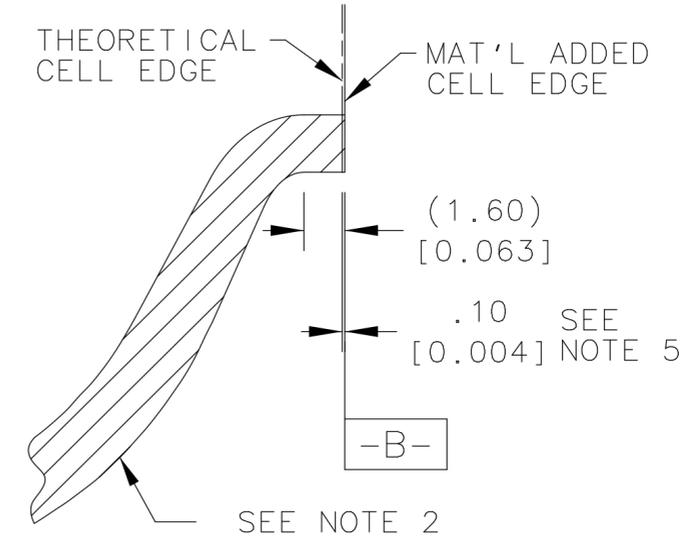
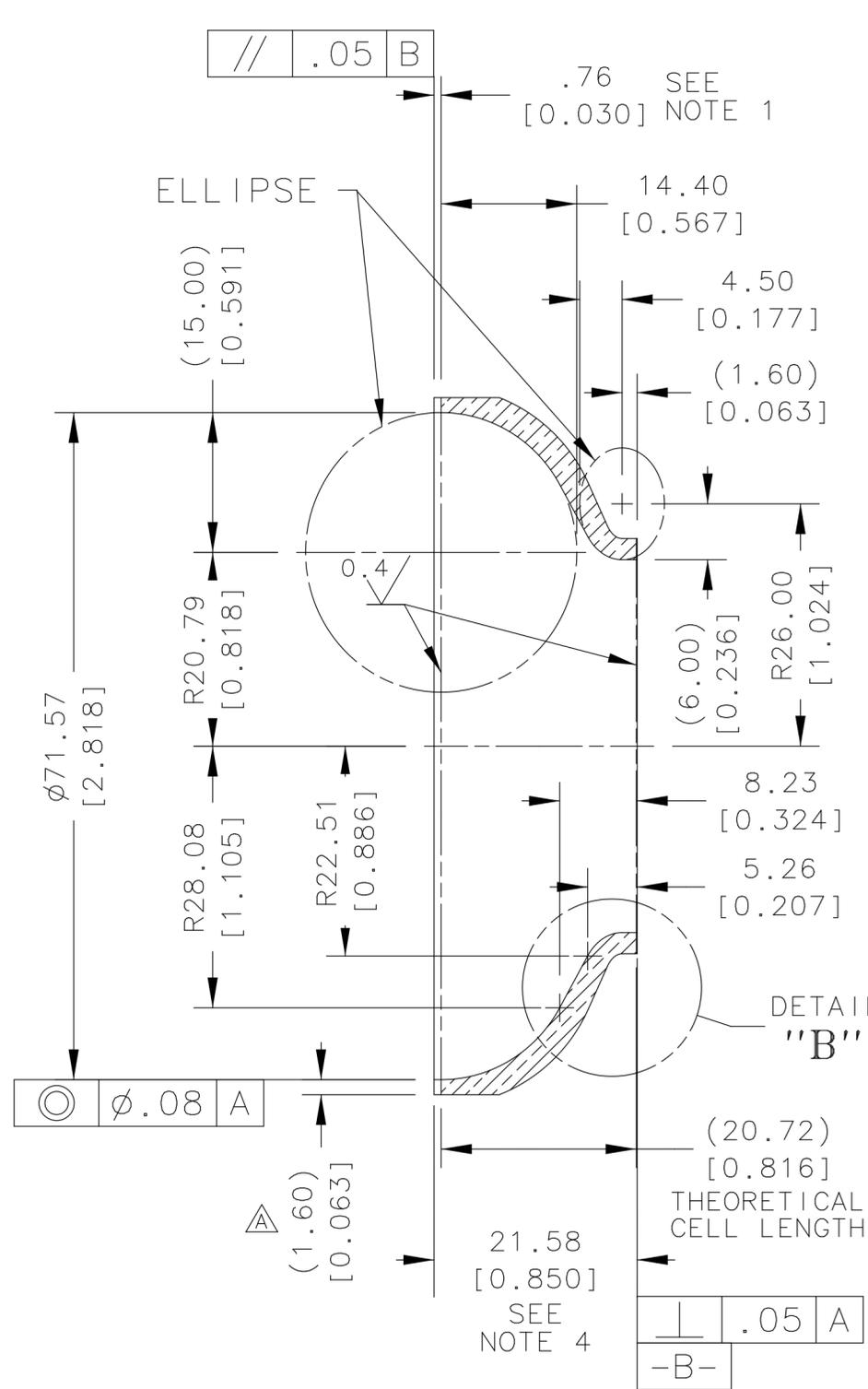
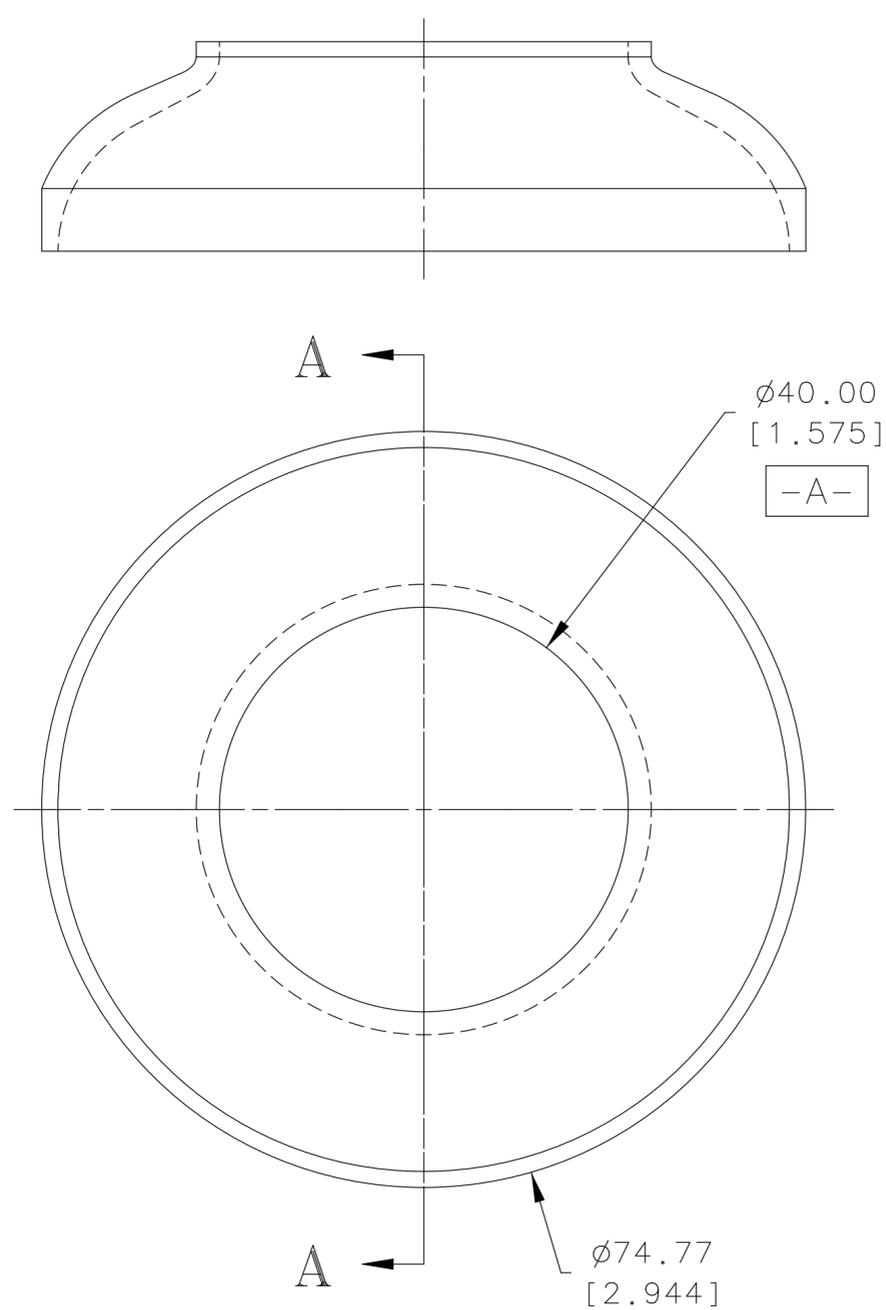


FERMI NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY

SCRF 3.9 GHZ 3RD HARMONIC
NB RF CAVITY END TUBES
FLANGE, NIOBIUM, TUBE END

SCALE	FILMED	DRAWING NUMBER	REV.
3:1		5520-MB-426354	
CREATED WITH I-DEAS 9M3		USER NAME: dmitche	

REV.	DESCRIPTION	DRAWN	DATE
		APPD.	DATE
	E.R. #7671		
A	ECO #8262 - EQUATOR WELD CHANGED FROM .090" TO .063"	D. MITCHELL	1 FEB 06
		D. MITCHELL	02/20/06



DETAIL "B"
SCALE: 5X

NOTES:

- ADDITIONAL MATERIAL NEEDED FOR CELL TUNING PLUS ALLOWANCE FOR E-BEAM WELDING SHRINKAGE. FINAL SURFACES TO BE MACHINED TO A 0.4 (N5) SURFACE FINISH.
- OUTER CELL PROFILE WILL VARY DUE TO THE STAMPING AND COINING PROCESS.
- PRIMARY DIMENSIONS ARE MILLIMETERS. ENGLISH DIMENSIONS ARE FOR REFERENCE.
- AFTER TUNING CELL, RECORD FINAL LENGTH IN THE TRAVELER.
- 0.10mm ADDED TO THEORETICAL CELL LENGTH TO COMPENSATE FOR E-BEAM WELD SHRINKAGE.

THIS DRAWING IS THE INTELLECTUAL PROPERTY OF FERMILAB ACCORDING TO ISO 16016. THIS DRAWING IS PROVIDED FOR EXCLUSIVE FABRICATION USAGE BY TTC MEMBERS ONLY. USAGE OUTSIDE OF THE TTC MUST BE APPROVED BY FERMILAB.

ITEM	PART NO.	DESCRIPTION OR SIZE	QTY.
PARTS LIST			
UNLESS OTHERWISE SPECIFIED		ORIGINATOR	D. MITCHELL
.XX mm	.XXX in	ANGLES	DRAWN P. BELKO 2/24/04
±.05	±.002	± 1°	CHECKED
1. BREAK ALL SHARP EDGES .02mm MAX.		APPROVED	M. FOLEY 8/19/04
2. DO NOT SCALE DRAWING.		USED ON	MD-426323
3. DIMENSIONS BASED UPON ANSI Y14.5M-1982			MD-426332
4. MAX. ALL MACH. SURFACES 1.6√mm 63√in		MATERIAL	RRR 300 NIOBIUM 2.8mm [0.110"]

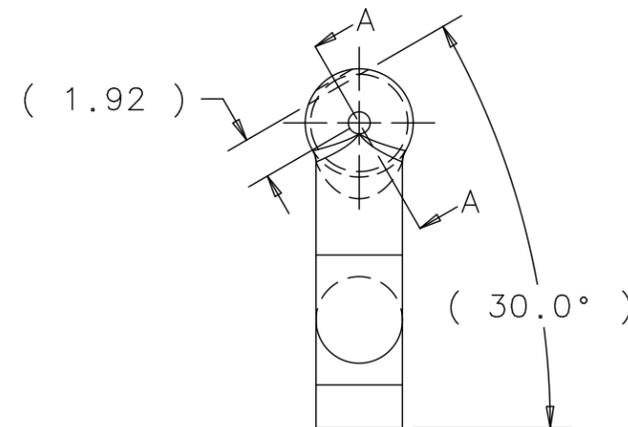
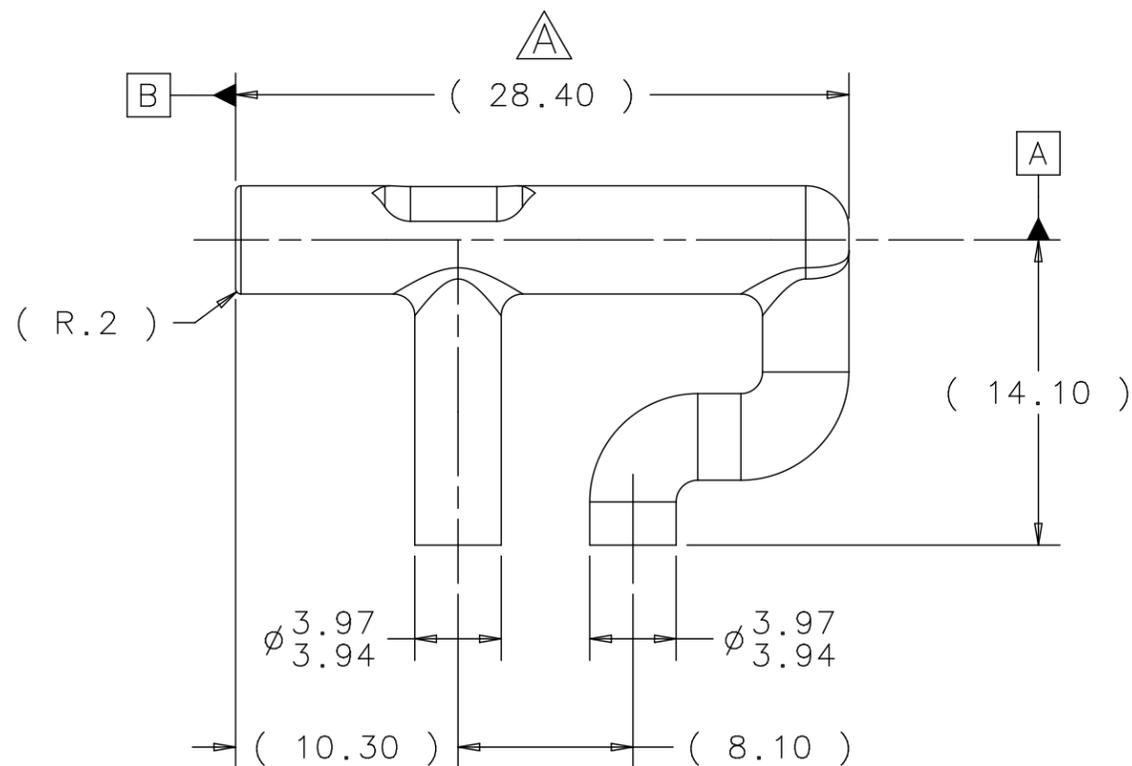
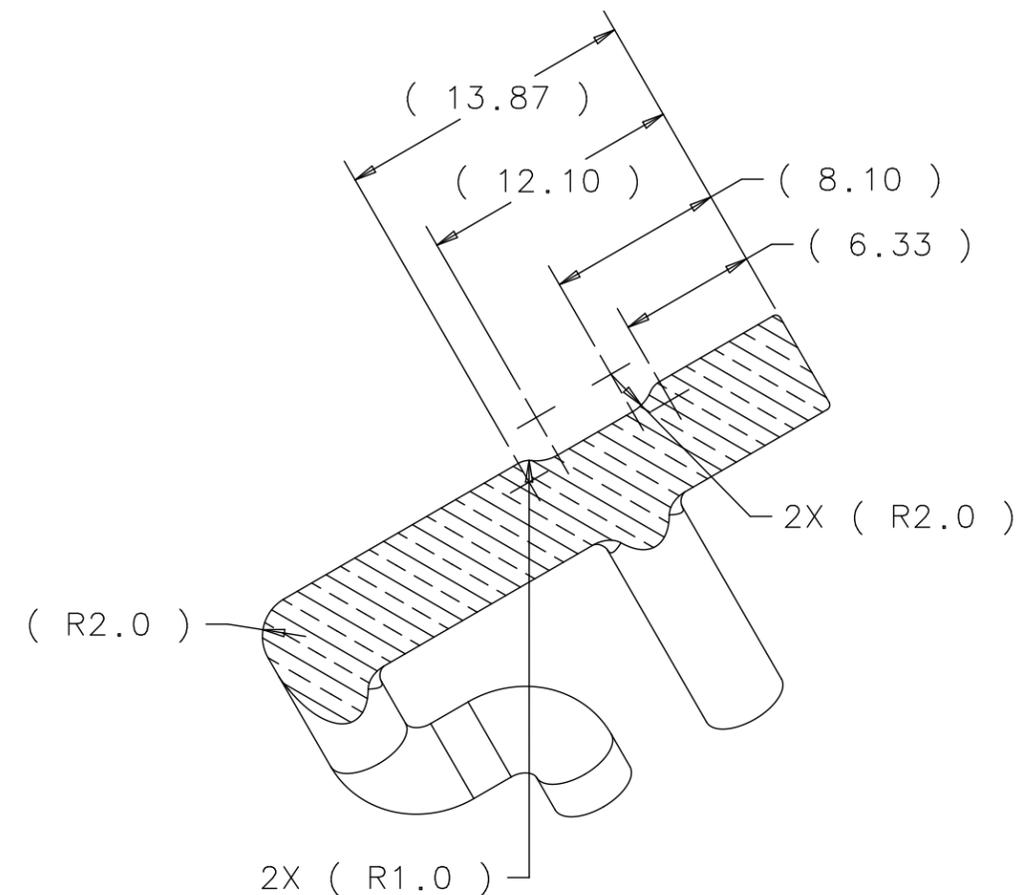
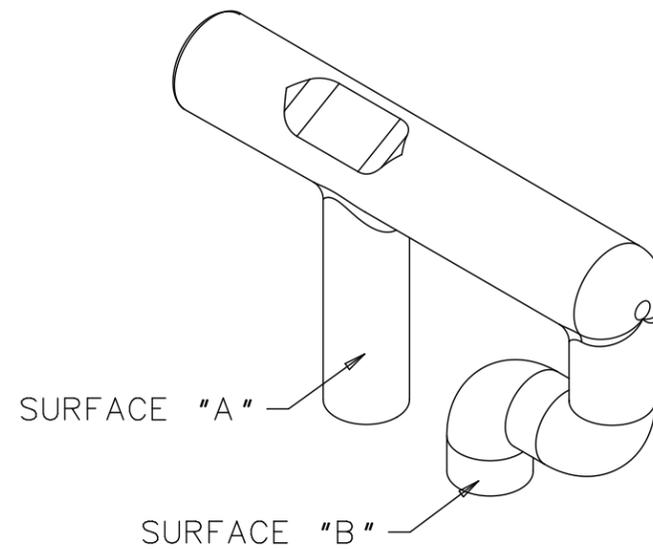
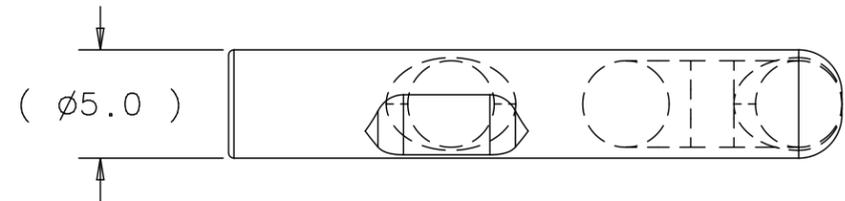
FERMI NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY

**SCRF 3.9 GHZ 3RD HARMONIC
CAVITY WELDMENT NIOBIUM 9 CELL
CELL, END, Nb 9 CELL CAVITY**

SCALE	FILMED	DRAWING NUMBER	REV.
2X		5520-MC-426329	A
CREATED WITH I-DEAS 9m3		USER NAME: pbelko	



REV.	DESCRIPTION	DRAWN	DATE
---	NEW RELEASE - ER #7671	APPD.	DATE
		DVM	1/15/04
		DVM	9/23/04
A	ECO #8803: TIP SHORTENED BY 3MM. 28.4 WAS 31.4	C. GRIMM	9/24/07
		D. MITCHELL	9/24/07



SECTION A-A

NOTES:

1. ALL UNITS ARE IN MILLIMETERS.
2. PART TO BE MACHINED DIRECTLY FROM A 3-D MODEL STEP FILE PROVIDED BY FERMILAB.
3. ALL TOLERANCES TO BE HELD TO $\pm .08\text{mm}$ [.003"] EXCEPT FOR SURFACES "A" AND "B". SURFACES "A" AND "B" ARE TO BE MACHINED PER DRAWING.

THIS DESIGN IS THE INTELLECTUAL PROPERTY OF FERMILAB ACCORDING TO ISO 16016. THIS DRAWING IS PROVIDED FOR EXCLUSIVE FABRICATION USAGE BY TTC MEMBERS ONLY. USAGE OUTSIDE OF THE TTC MUST BE APPROVED BY FERMILAB.

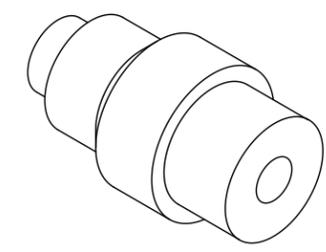
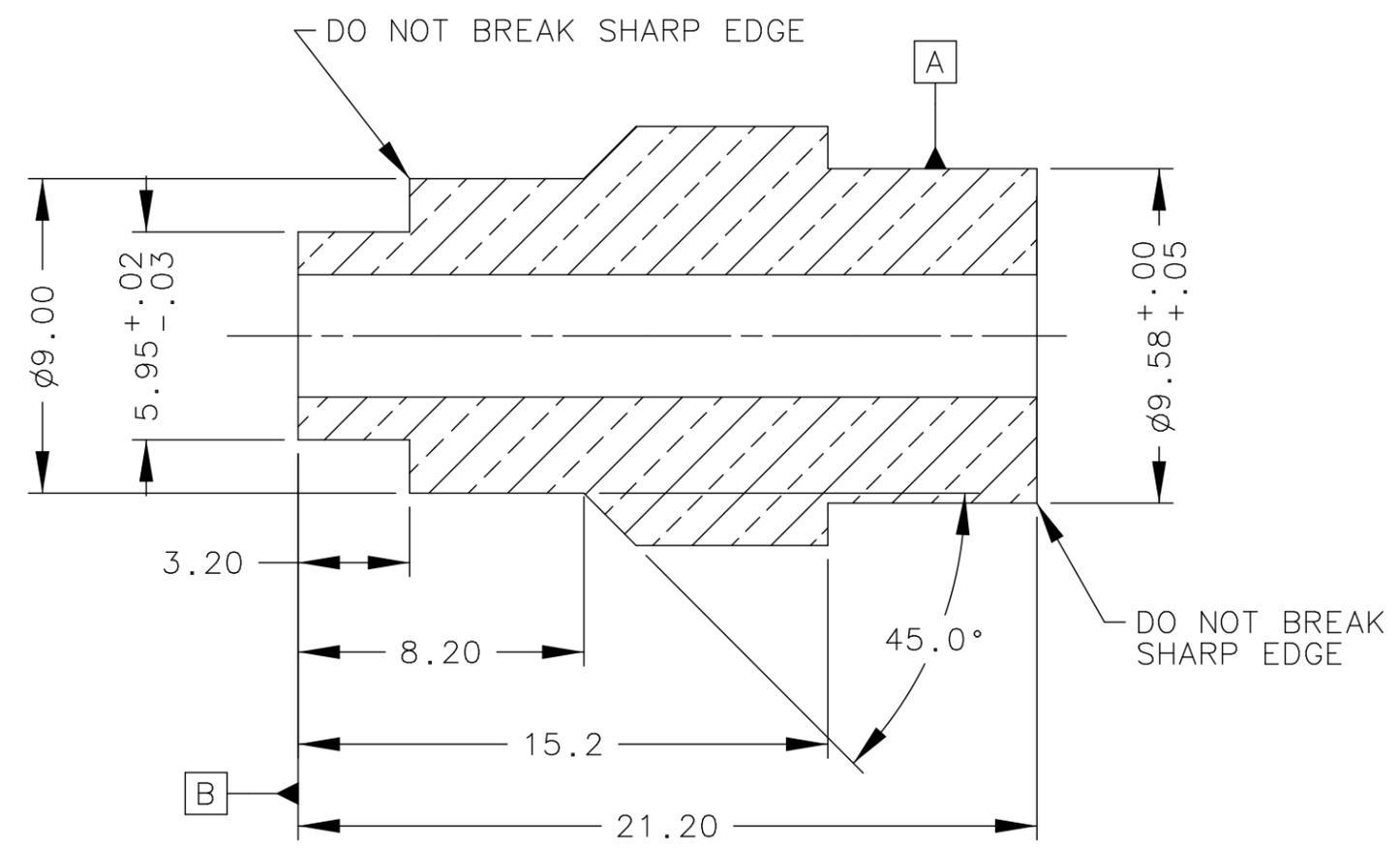
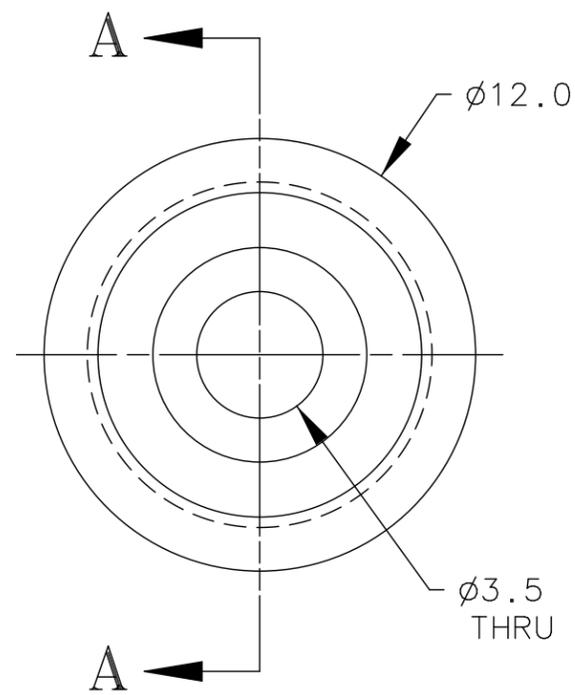
ITEM	PART NO.	DESCRIPTION OR SIZE	QTY.
PARTS LIST			
UNLESS OTHERWISE SPECIFIED		ORIGINATOR	T. KHABIBOULLINE
		DATE	JAN 2004
.X	.XX	ANGLES	DRAWN
			D. MITCHELL
			1/15/04
±	±	±	CHECKED
			V. POLOUBOTKO
			9/23/04
1. BREAK ALL SHARP EDGES .35mm MAX.		APPROVED	D. MITCHELL
2. DO NOT SCALE DRAWING.		USED ON	
3. DIMENSIONS BASED UPON ASME Y14.5M-1994		5520-MB-426284	
4. MAX. ALL MACH. SURFACES 1.6		MATERIAL	
		RRR 300 NIOBIUM	

FERMI NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY

SCRF 3.9 GHZ 3RD HARMONIC NIOBIUM CAVITY ASSEMBLY FORMTEIL

SCALE	FILMED	DRAWING NUMBER	REV.
3:1		5520-MB-426286	A
CREATED WITH I-DEAS 9M3		USER NAME: dmitche	

REV.	DESCRIPTION	DRAWN	DATE
	E.R #7671	APPD.	DATE



SECTION "A-A"

NOTES:

1. ALL UNITS ARE IN MILLIMETERS.

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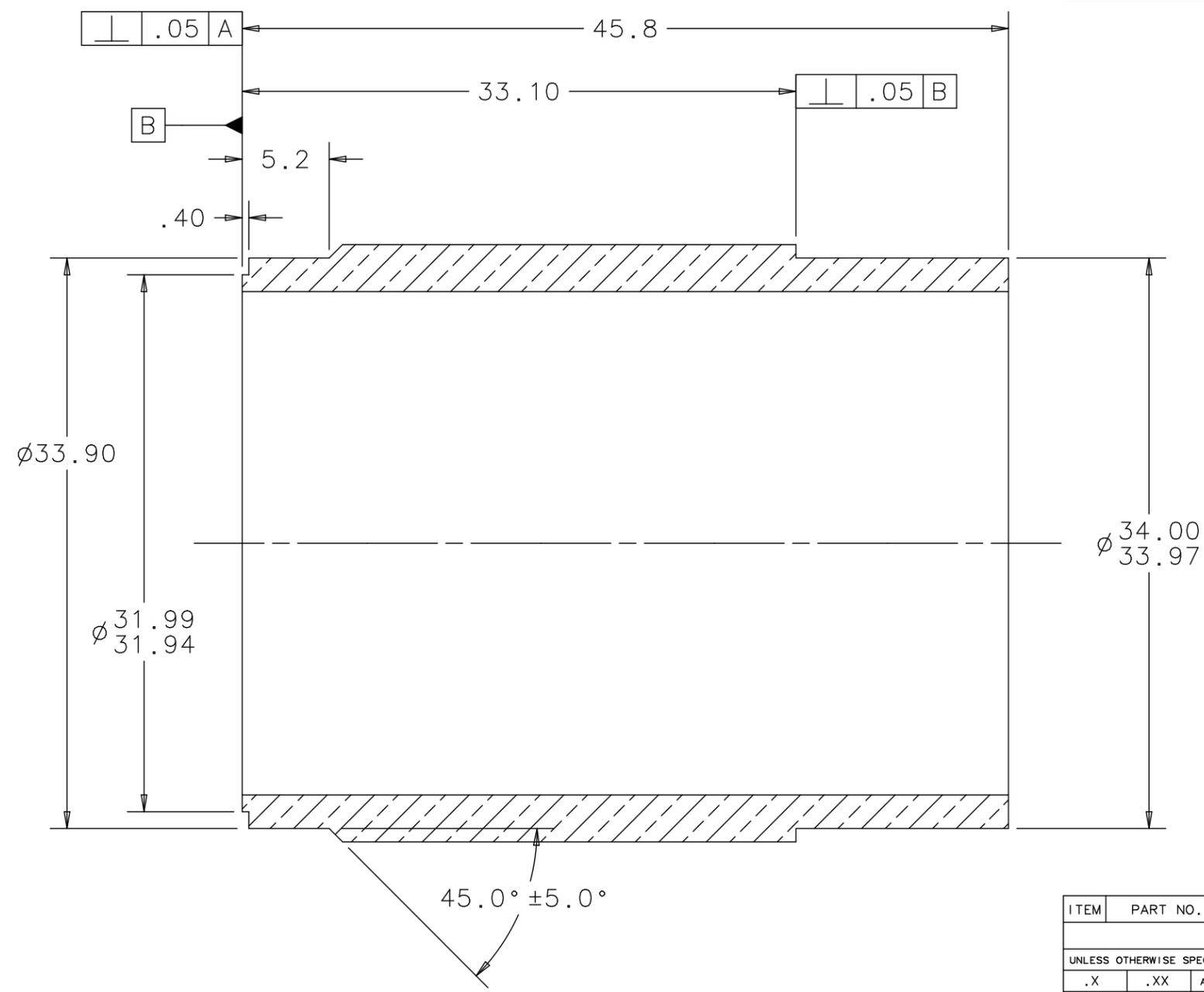
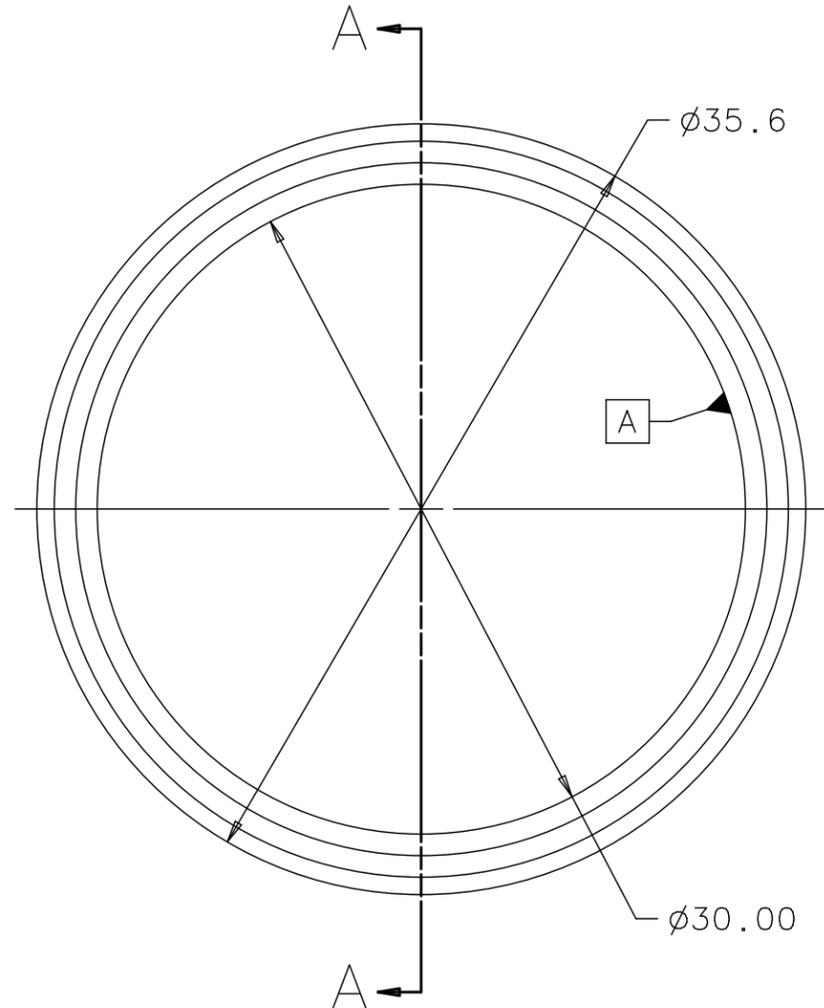
ITEM	PART NO.	DESCRIPTION OR SIZE	QTY.
PARTS LIST			
UNLESS OTHERWISE SPECIFIED		ORIGINATOR	D. MITCHELL
.X	.XX	ANGLES	DRAWN P. BELKO 2/26/04
± .1	± .05	± 1°	CHECKED V. POLOUBOTKO 9/23/04
1. BREAK ALL SHARP EDGES .1mm MAX.		APPROVED	D. MITCHELL 9/23/04
2. DO NOT SCALE DRAWING.		USED ON MD-426332	
3. DIMENSIONS BASED UPON AMCE Y14.5M-1994		MATERIAL RRR 300 NIOBIUM	
4. MAX. ALL MACH. SURFACES N7			

FERMI NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY

SCRF 3.9 GHZ 3RD HARMONIC CAVITY WELDMENT NIOBIUM 9 CELL TUBE, PICKUP ANTENNA

SCALE	FILMED	DRAWING NUMBER	REV.
5X		5520-MB-426333	
CREATED WITH I-DEAS 9M3		USER NAME: pbelko	

REV.	DESCRIPTION	DRAWN	DATE
		APPD.	DATE
---	NEW RELEASE - ER #7671	DVM	3/29/03
		M. FOLEY	8/19/04
A	ECO #7993 CHANGED .20 STEP TO .40	DVM	8/1/05
		M. FOLEY	8/2/05



SECTION A-A

ITEM	PART NO.	DESCRIPTION OR SIZE	QTY.
PARTS LIST			
UNLESS OTHERWISE SPECIFIED		ORIGINATOR	D. MITCHELL
MAY 2003			
.X	.XX	ANGLES	DRAWN
			D. MITCHELL
			3/29/04
± .1	± .05	± 1°	CHECKED
1. BREAK ALL SHARP EDGES .13mm MAX.		APPROVED	M. FOLEY
2. DO NOT SCALE DRAWING.			
3. DIMENSIONS BASED UPON ASME Y14.5M-1994		USED ON	MD-426323
4. MAX. ALL MACH. SURFACES 1.6 $\sqrt{\text{mm}}$		MATERIAL	RRR 300 NIOBIUM
			8/19/04

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UNITED STATES DEPARTMENT OF ENERGY

SCRF 3.9 GHZ 3RD HARMONIC NIOBIUM CAVITY ASSEMBLY TUBE, MAIN COUPLER, NIOBIUM

SCALE	FILMED	DRAWING NUMBER	REV.
3:1		5520-MB-426353	A

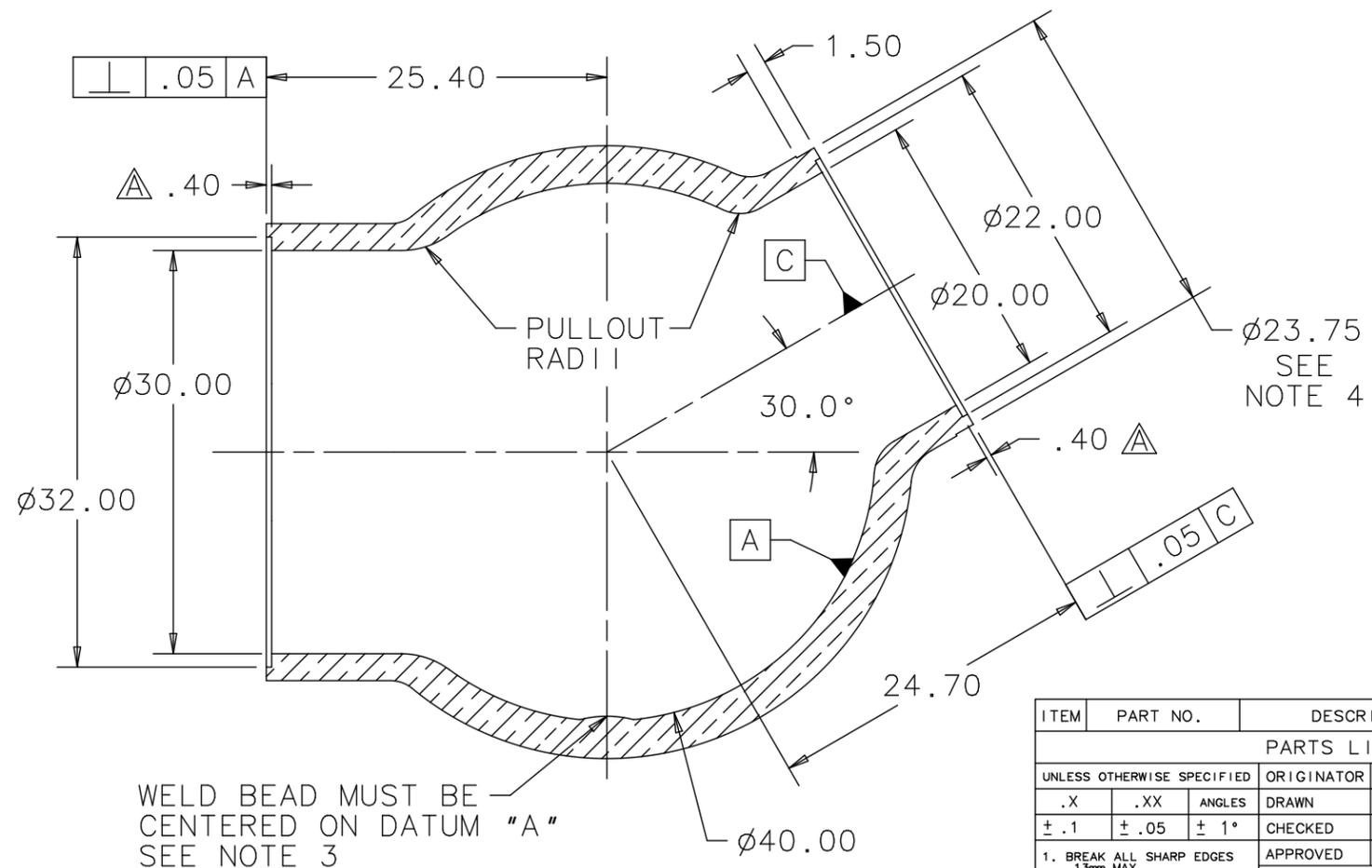
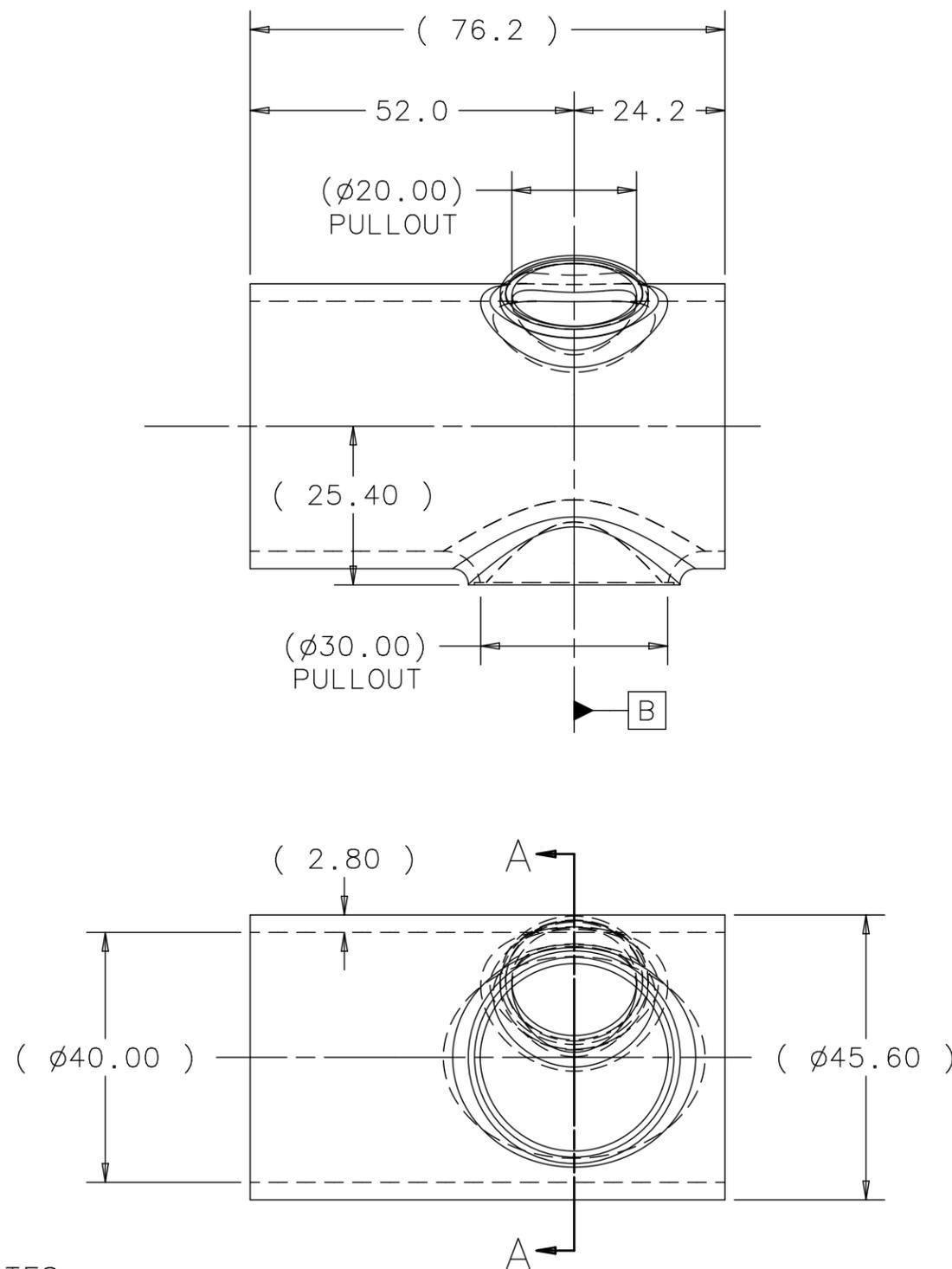
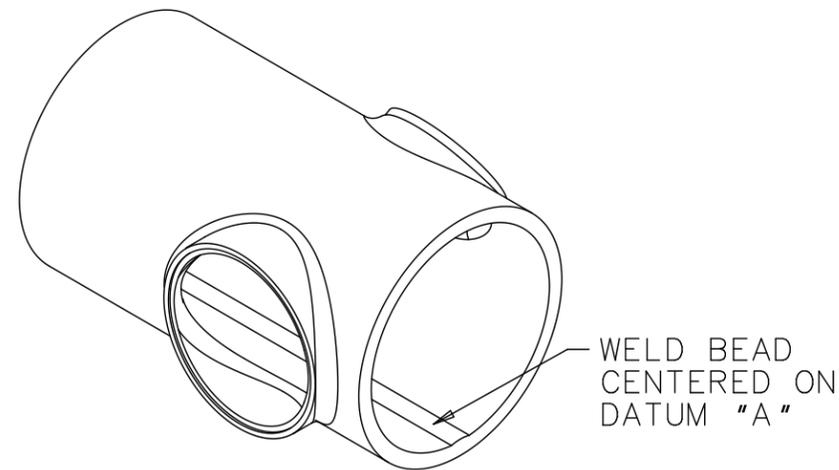
CREATED WITH I-DEAS 11M2 USER NAME: dmitchel

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NOTES:

1. ALL UNITS ARE IN MILLIMETERS.

REV.	DESCRIPTION	DRAWN	DATE
---	NEW RELEASE - ER #7671	DVM	3/29/04
		M. FOLEY	5/5/04
A	ECO #7993: .20mm STEPS CHANGED TO .40mm	DVM	8/1/05
		M. FOLEY	8/2/05



NOTES:

1. ALL UNITS ARE IN MILLIMETERS.
2. A 2.8mm THICK NIOBIUM SHEET SHALL BE ROLLED AND SEAM WELDED TO FORM A 40mm INNER DIAMETER TUBE.
3. THE TUBE WELD BEAD MUST BE CENTERED ON DATUM "A" TO $\pm 4^\circ$.
4. $\phi 23.75$ MAY BE REDUCED UNTIL A TRUE DIAMETER IS ACQUIRED. THE FINAL DIAMETER WILL BE MATCHED TO FIT WITH THE HOM COUPLER, P/N 5520-MB-426348.

SECTION A-A
SCALE 2:1

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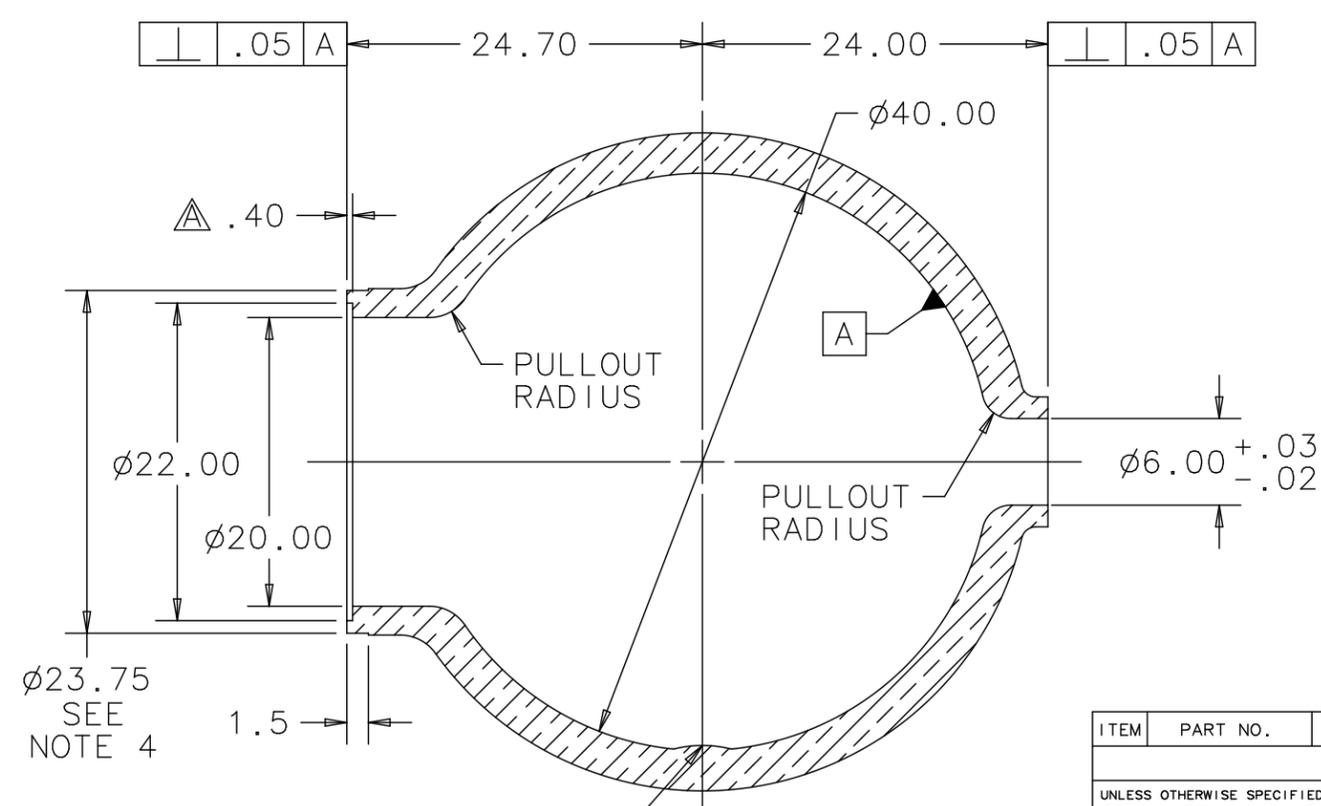
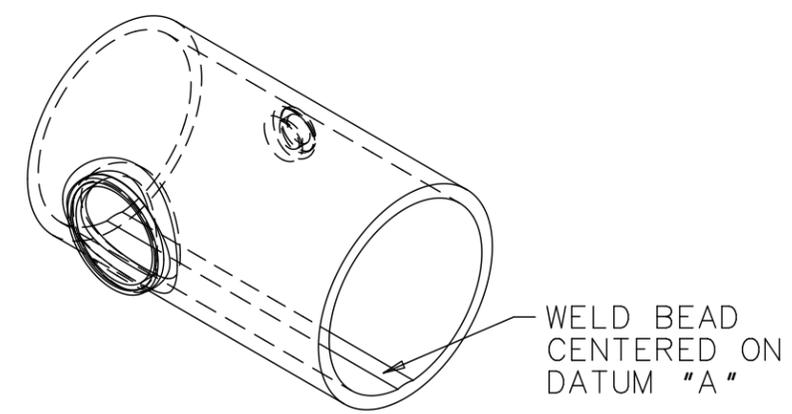
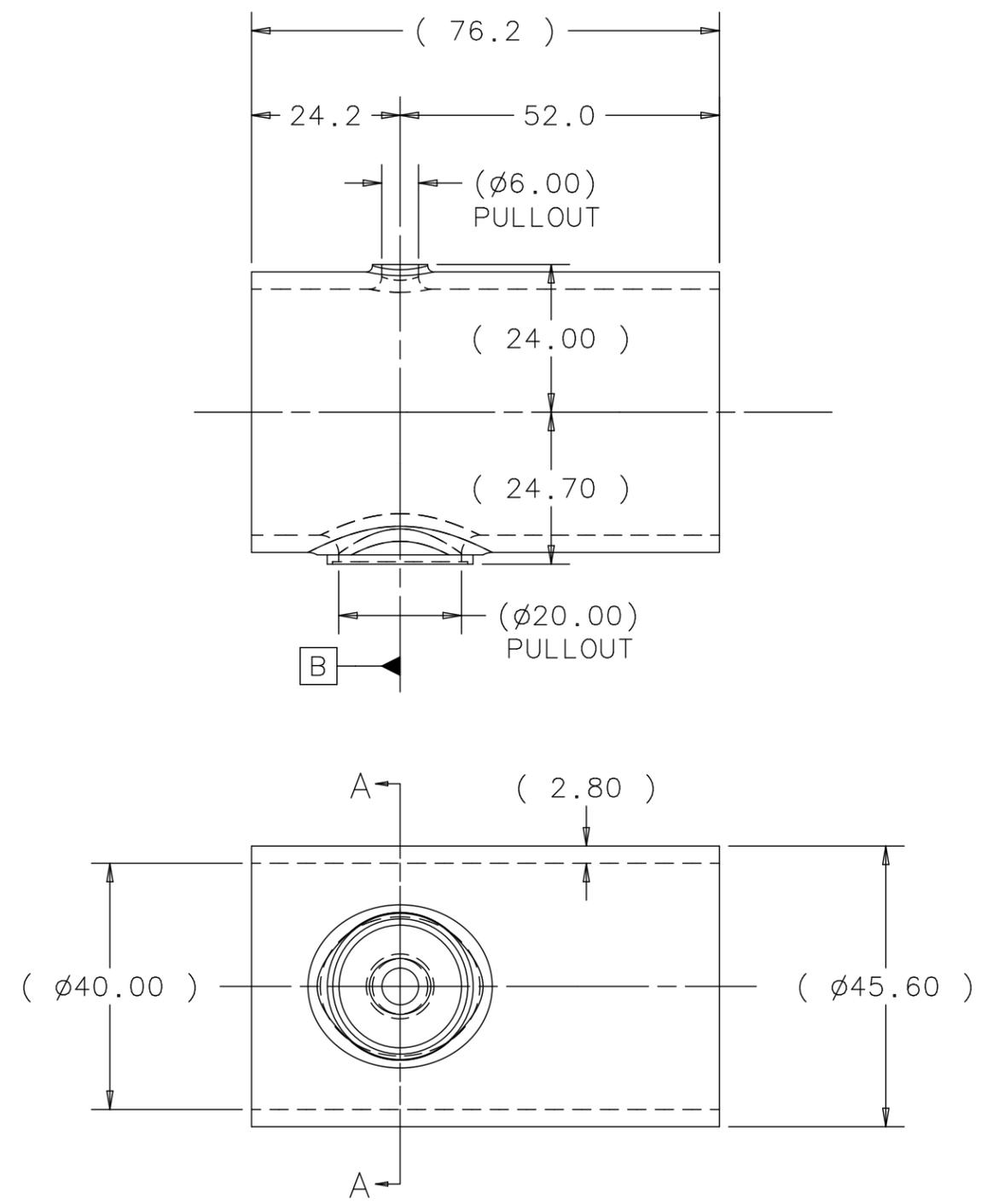
ITEM	PART NO.	DESCRIPTION OR SIZE	QTY.
PARTS LIST			
UNLESS OTHERWISE SPECIFIED	ORIGINATOR	D. MITCHELL	MAY 2003
.X	.XX	ANGLES	DRAWN D. MITCHELL 3/29/04
$\pm .1$	$\pm .05$	$\pm 1^\circ$	CHECKED M. FOLEY 5/5/04
1. BREAK ALL SHARP EDGES .13mm MAX.	APPROVED	M. FOLEY	5/5/04
2. DO NOT SCALE DRAWING.	USED ON MD-426323		
3. DIMENSIONS BASED UPON ASME Y14.5M-1994	MATERIAL RRR 300 NIOBIUM SHEET		
4. MAX. ALL MACH. SURFACES $N7\sqrt{mm}$	2.8mm THK ROLLED AND SEAM WELDED		

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UNITED STATES DEPARTMENT OF ENERGY

**SCRF 3.9 GHZ 3RD HARMONIC
NIOBIUM CAVITY ASSEMBLY
END TUBE W/ MC PORT**

SCALE	FILMED	DRAWING NUMBER	REV.
1:1		5520-MB-426357	A
CREATED WITH I-DEAS 9M3		USER NAME: dmitchel	

REV.	DESCRIPTION	DRAWN	DATE
---	NEW RELEASE - ER #7671	DVM	3/29/04
		M. FOLEY	8/19/04
A	ECO #7993: CHANGED .20mm STEP TO .40mm	DVM	8/1/05
		M. FOLEY	8/2/05



WELD BEAD MUST BE CENTERED ON DATUM "A" SEE NOTE 3

SECTION A-A
SCALE 2:1

- NOTES:
1. ALL UNITS ARE IN MILLIMETERS.
 2. A 2.8mm THICK NIOBIUM SHEET SHALL BE ROLLED AND SEAM WELDED TO FORM A 40mm INNER DIAMETER TUBE.
 3. THE TUBE WELD BEAD MUST BE CENTERED ON DATUM "A" TO $\pm 4^\circ$.
 4. $\phi 23.75$ MAY BE REDUCED UNTIL A TRUE DIAMETER IS ACQUIRED. THE FINAL DIAMETER WILL BE MATCHED TO FIT WITH THE HOM COUPLER, P/N 5520-MB-426348.

ITEM	PART NO.	DESCRIPTION OR SIZE	QTY.
PARTS LIST			
UNLESS OTHERWISE SPECIFIED	ORIGINATOR	D. MITCHELL	MAY 2003
.X	.XX	ANGLES	DRAWN
$\pm .1$	$\pm .05$	$\pm 1^\circ$	CHECKED
1. BREAK ALL SHARP EDGES .13mm MAX.	APPROVED	M. FOLEY	8/19/04
2. DO NOT SCALE DRAWING.	USED ON MD-426332		
3. DIMENSIONS BASED UPON ASME Y14.5M-1994	MATERIAL RRR 300 NIOBIUM SHEET		
4. MAX. ALL MACH. SURFACES $N7\sqrt{mm}$	2.8mm THK ROLLED AND SEAM WELDED		

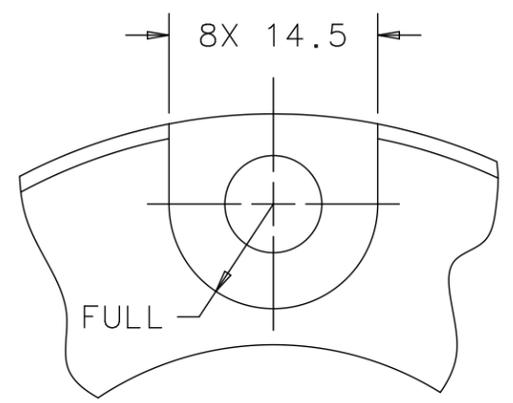
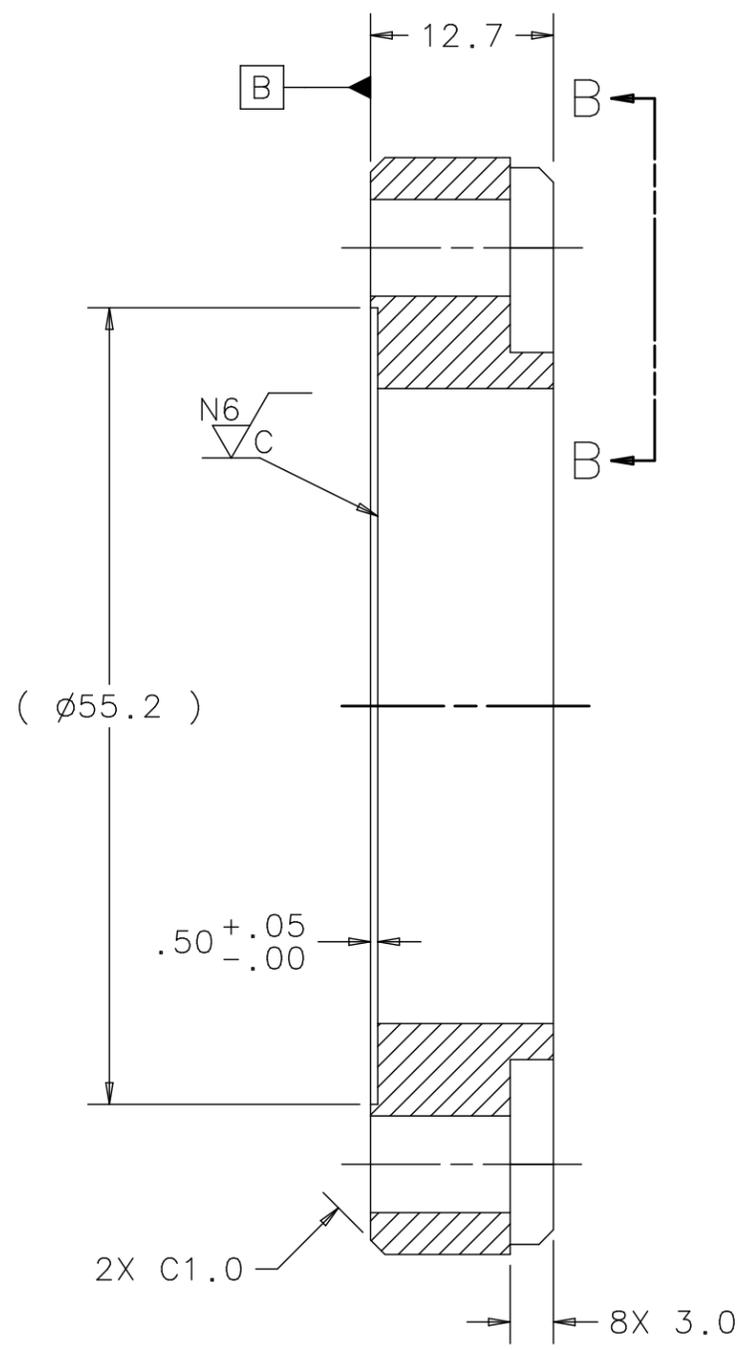
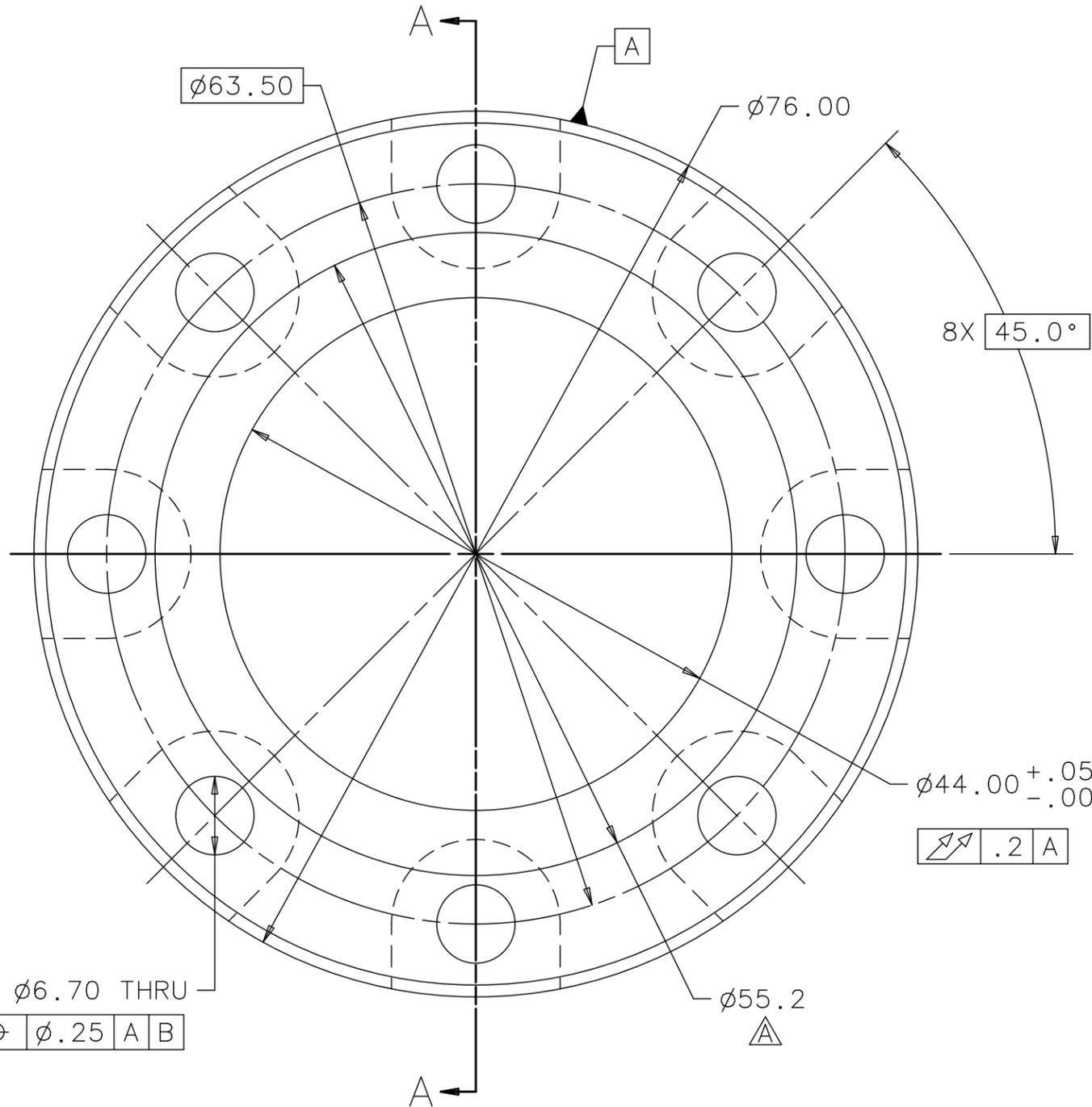
FERMI NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY

SCRF 3.9 GHZ 3RD HARMONIC NIOBIUM CAVITY ASSEMBLY END TUBE W/O MC PORT

SCALE	FILMED	DRAWING NUMBER	REV.
1:1		5520-MB-426358	A

CREATED WITH I-DEAS 9M3 USER NAME: dmitchel

REV.	DESCRIPTION	DRAWN	DATE
---	NEW RELEASE - ER #7482	DVM	5/27/03
		NS	6/12/03
A	ECO #7993: ADDED SEAL  , ADDED  NUT RELIEFS	DVM	8/1/05
		M. FOLEY	8/1/05



VIEW B-B 

SECTION A-A

8X $\phi 6.70$ THRU
 $\phi .25$ A B

NOTES:

1. ALL UNITS ARE IN MILLIMETERS.
2. SEALING SURFACE MUST BE FREE OF SCRATCHES WITH NO RADIAL SCORING.

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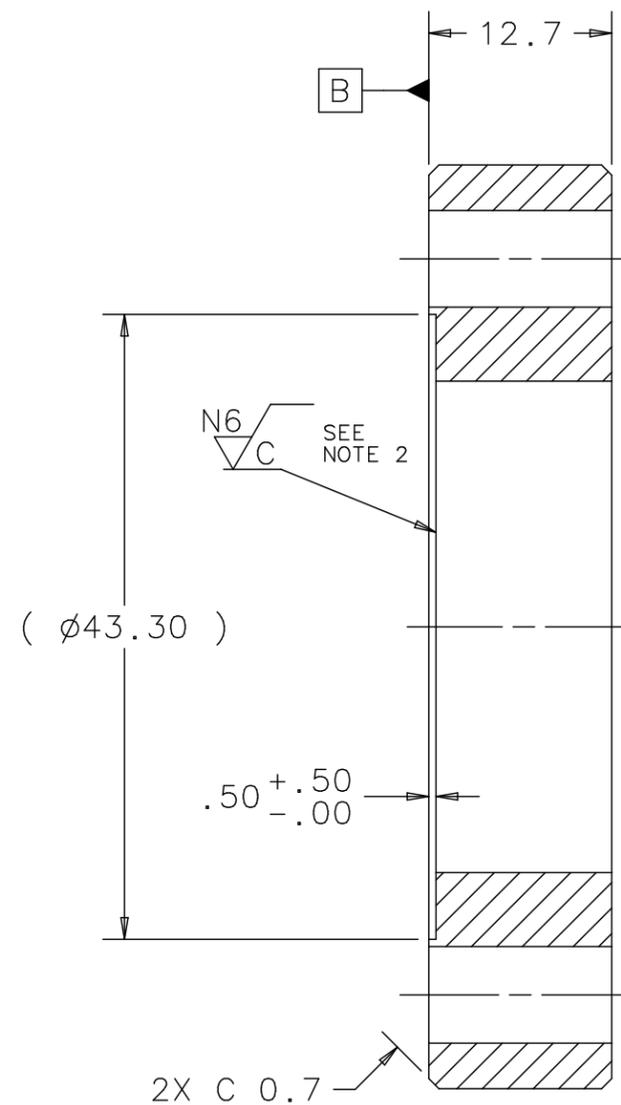
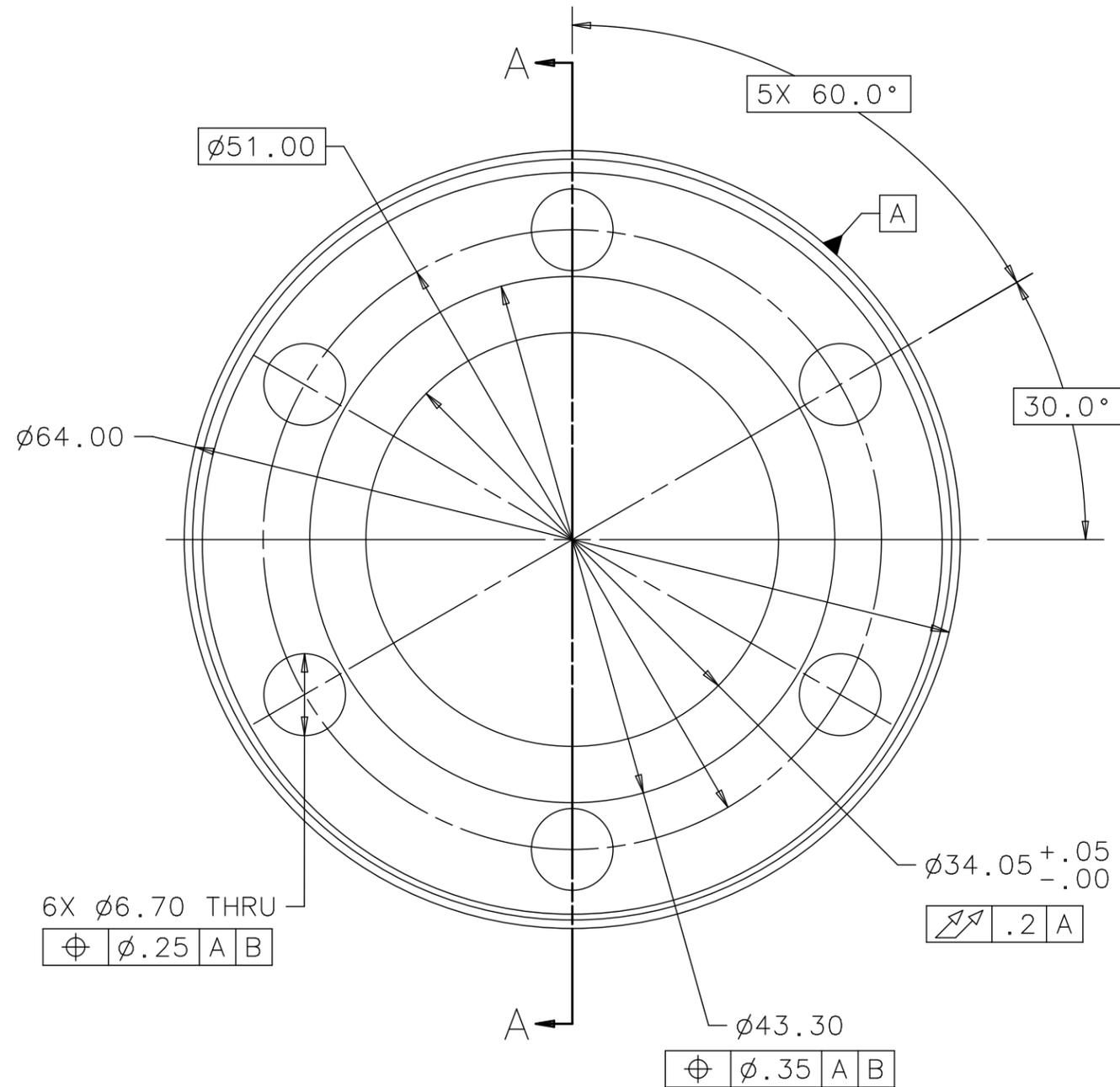
ITEM	PART NO.	DESCRIPTION OR SIZE	QTY.
PARTS LIST			
UNLESS OTHERWISE SPECIFIED	ORIGINATOR	N. SOLYAK	MAR 2003
.X	.XX	ANGLES	DRAWN
$\pm .3$	$\pm .13$	$\pm 1^\circ$	CHECKED
		APPROVED	N. SOLYAK
		USED ON	ALL 3RD HARMONIC Nb CAVITY ASSEMBLIES USED AT DESY
		MATERIAL	NbTi (55%)

 FERMILAB NATIONAL ACCELERATOR LABORATORY
 UNITED STATES DEPARTMENT OF ENERGY

SCRF 3.9 GHZ 3RD HARMONIC
 NIOBIUM CAVITY ASSEMBLY
 FLANGE, RF CAVITY, NW40

SCALE	FILMED	DRAWING NUMBER	REV.
2:1		5520-MB-426178	A
CREATED WITH I-DEAS 11M2		USER NAME: dmitchel	

REV.	DESCRIPTION	DRAWN	DATE
---	NEW RELEASE - ER #7671	DVM	2/23/04
		M. FOLEY	8/19/04
A	ECO #7993: REMOVED WELD PREP	DVM	8/1/05
		M. FOLEY	8/1/05



SECTION A-A

ITEM	PART NO.	DESCRIPTION OR SIZE	QTY.
PARTS LIST			
UNLESS OTHERWISE SPECIFIED		ORIGINATOR	N. SOLYAK
		DATE	MAR 2003
.X	.XX	ANGLES	DRAWN
± .2	± .08	± 1°	CHECKED
1. BREAK ALL SHARP EDGES .35mm MAX.		APPROVED	M. FOLEY
2. DO NOT SCALE DRAWING.		USED ON	MD-426323
3. DIMENSIONS BASED UPON ASME Y14.5M-1994		MATERIAL	Nb-Ti 55%
4. MAX. ALL MACH. SURFACES N7			



SCRF 3.9 GHZ 3RD HARMONIC
NB RF CAVITY END TUBES
FLANGE, MAIN COUPLER, NbTi

SCALE	FILMED	DRAWING NUMBER	REV.
2:1		5520-MB-426327	A
CREATED WITH I-DEAS 11M2		USER NAME: dmitche1	

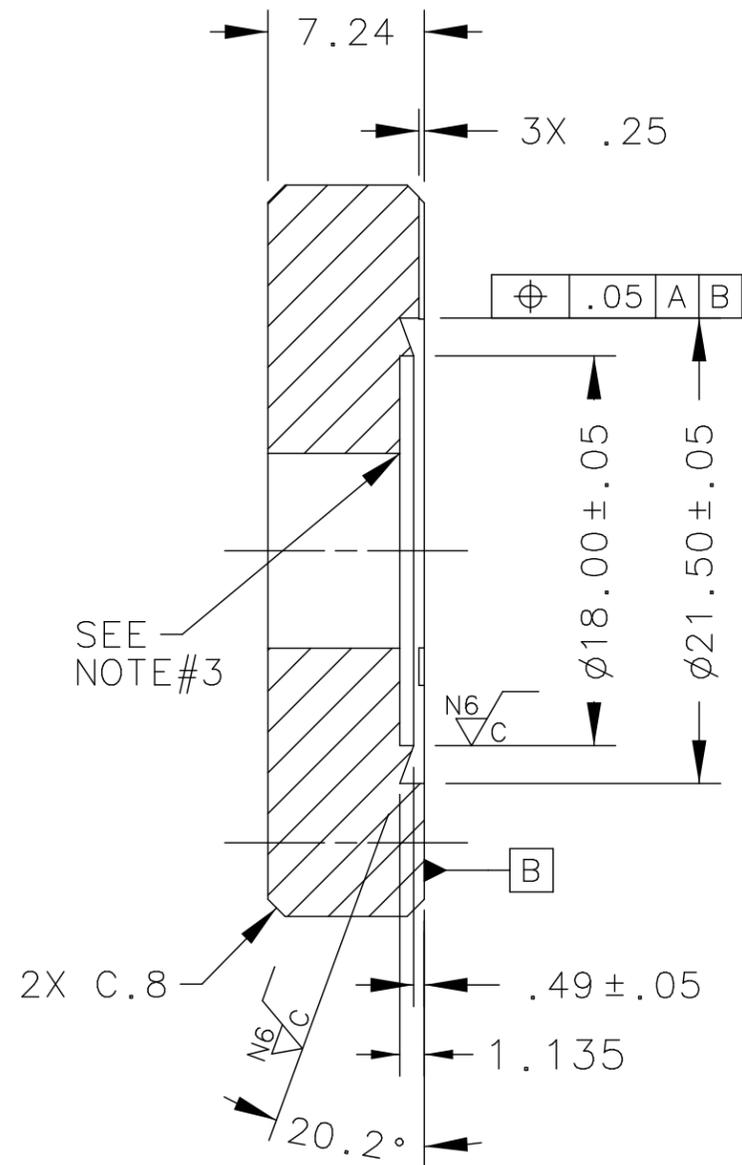
NOTES:

1. ALL UNITS ARE IN MILLIMETERS.

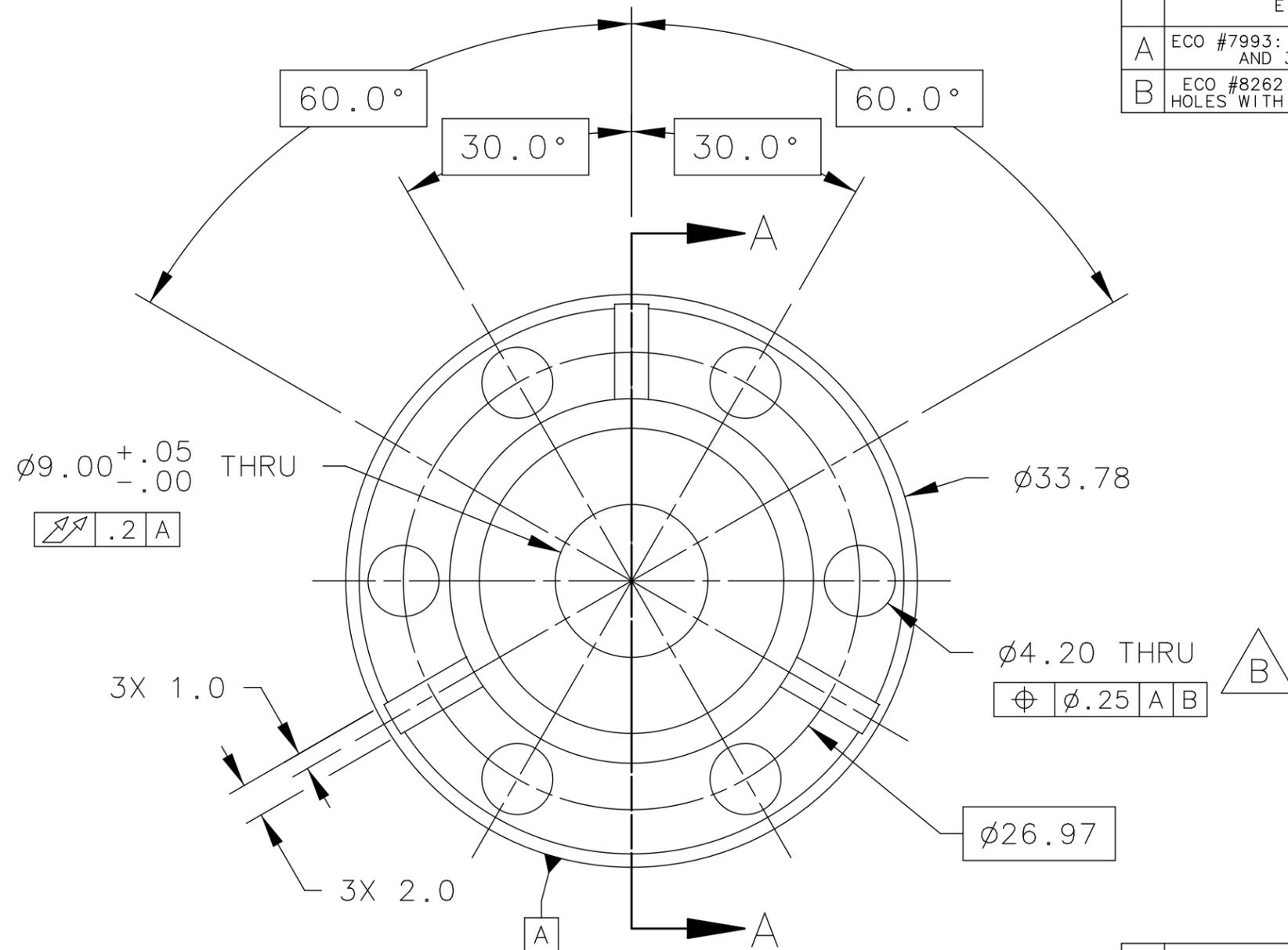
2. SEALING SURFACE MUST BE FREE OF SCRATCHES WITH NO RADIAL SCORING.

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REV.	DESCRIPTION	DRAWN	DATE
		APPD.	DATE
	E.R #7671		
A	ECO #7993: REMOVED WELD PREP AND 3 THRU HOLES	DVM	8/1/05
		M. FOLEY	8/1/05
B	ECO #8262: REPLACED TAPPED HOLES WITH $\phi 4.2\text{MM}$ THRU HOLES	DVM	1/31/06
		M. FOLEY	1/31/06



SECTION "A-A"



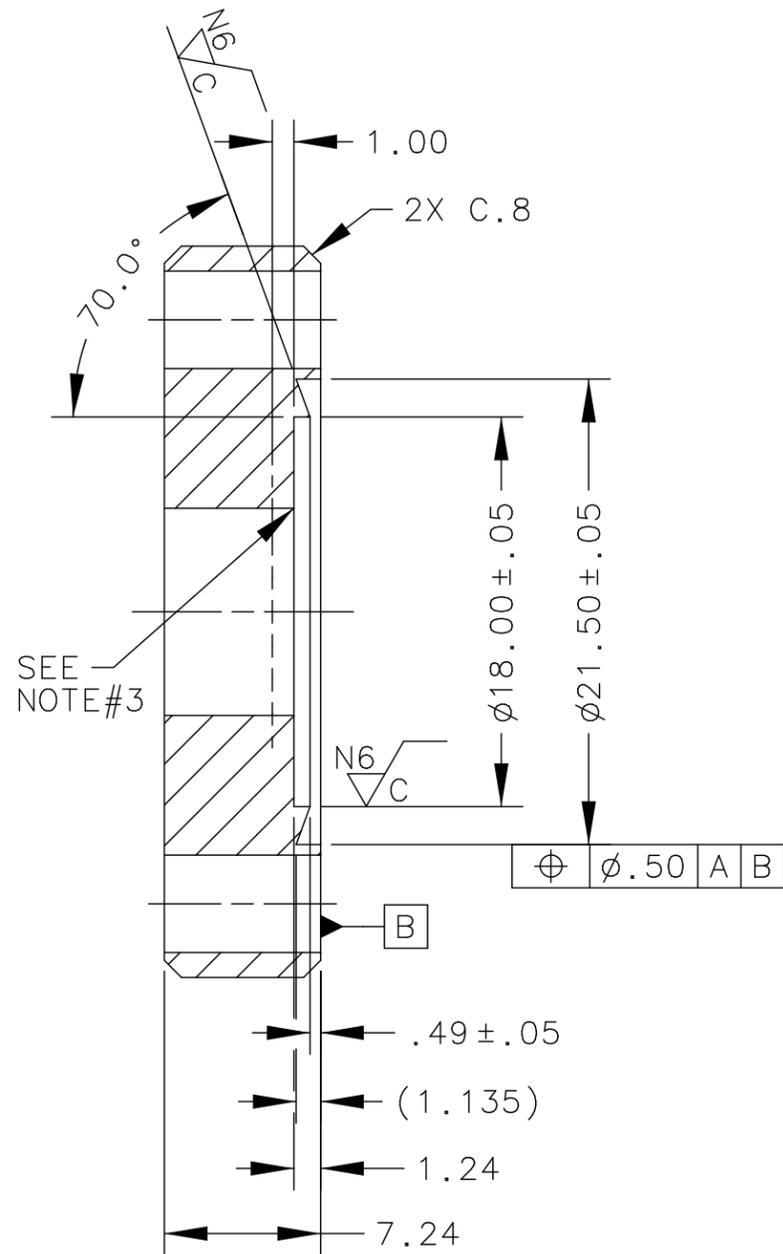
NOTES:

1. ALL UNITS ARE IN MILLIMETERS.
2. SEALING SURFACE MUST BE FREE OF ANY SCRATCHES WITH NO RADIAL SCORING
3. DO NOT BREAK SHARP EDGE.

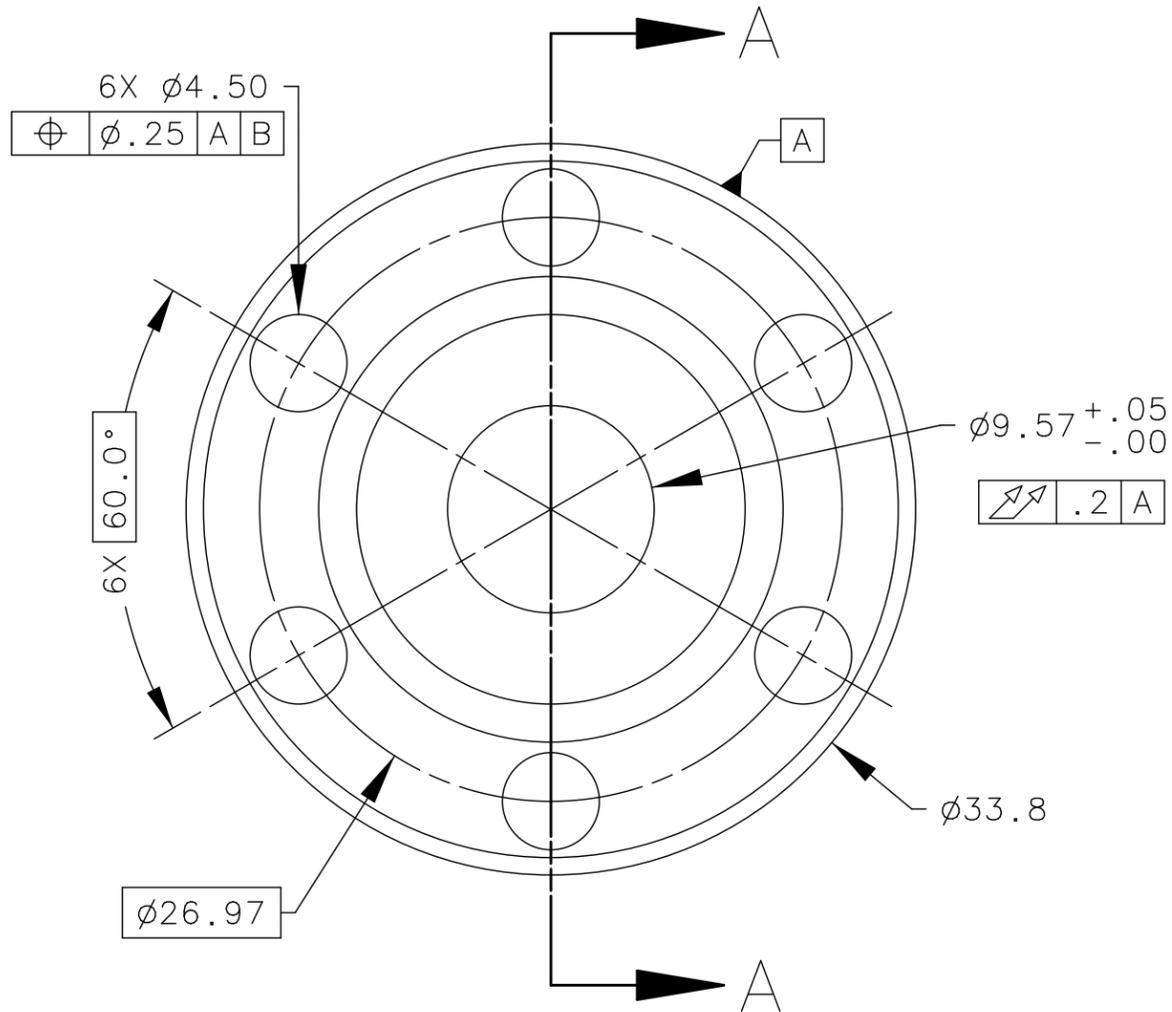
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ITEM	PART NO.	DESCRIPTION OR SIZE	QTY.
PARTS LIST			
UNLESS OTHERWISE SPECIFIED		ORIGINATOR	D. MITCHELL
.XX	.XXX	ANGLES	DRAWN P. BELKO 2/2/04
± .2	± .13	± 1°	CHECKED
1. BREAK ALL SHARP EDGES .02mm MAX.		APPROVED	M. FOLEY 8/19/04
2. DO NOT SCALE DRAWING.		USED ON	MD-426323
3. DIMENSIONS BASED UPON ASME Y14.5M-1994			MD-426332
4. MAX. ALL MACH. SURFACES N7		MATERIAL	Nb55%Ti
FERMI NATIONAL ACCELERATOR LABORATORY UNITED STATES DEPARTMENT OF ENERGY			
CAVITY WELDMENT NIOBIUM 9 CELL END TUBE WELDMENT W/MAIN COUPLER PORT FLANGE, HOM. COUPLER			
SCALE	FILMED	DRAWING NUMBER	REV.
3X		5520-MB-426328	B
CREATED WITH I-DEAS 11M2 USER NAME: dmitchel			

REV.	DESCRIPTION	DRAWN	DATE
	E.R #7671	APPD.	DATE
A	ECO #7993: REMOVED WELD PREP	D. MITCHELL	8/1/05
		M. FOLEY	8/1/05



SECTION "A-A"



NOTES:

1. ALL UNITS ARE IN MILLIMETERS.
2. SEALING SURFACE MUST BE FREE OF ANY SCRATCHES WITH NO RADIAL SCORING.
3. DO NOT BREAK SHARP EDGE.

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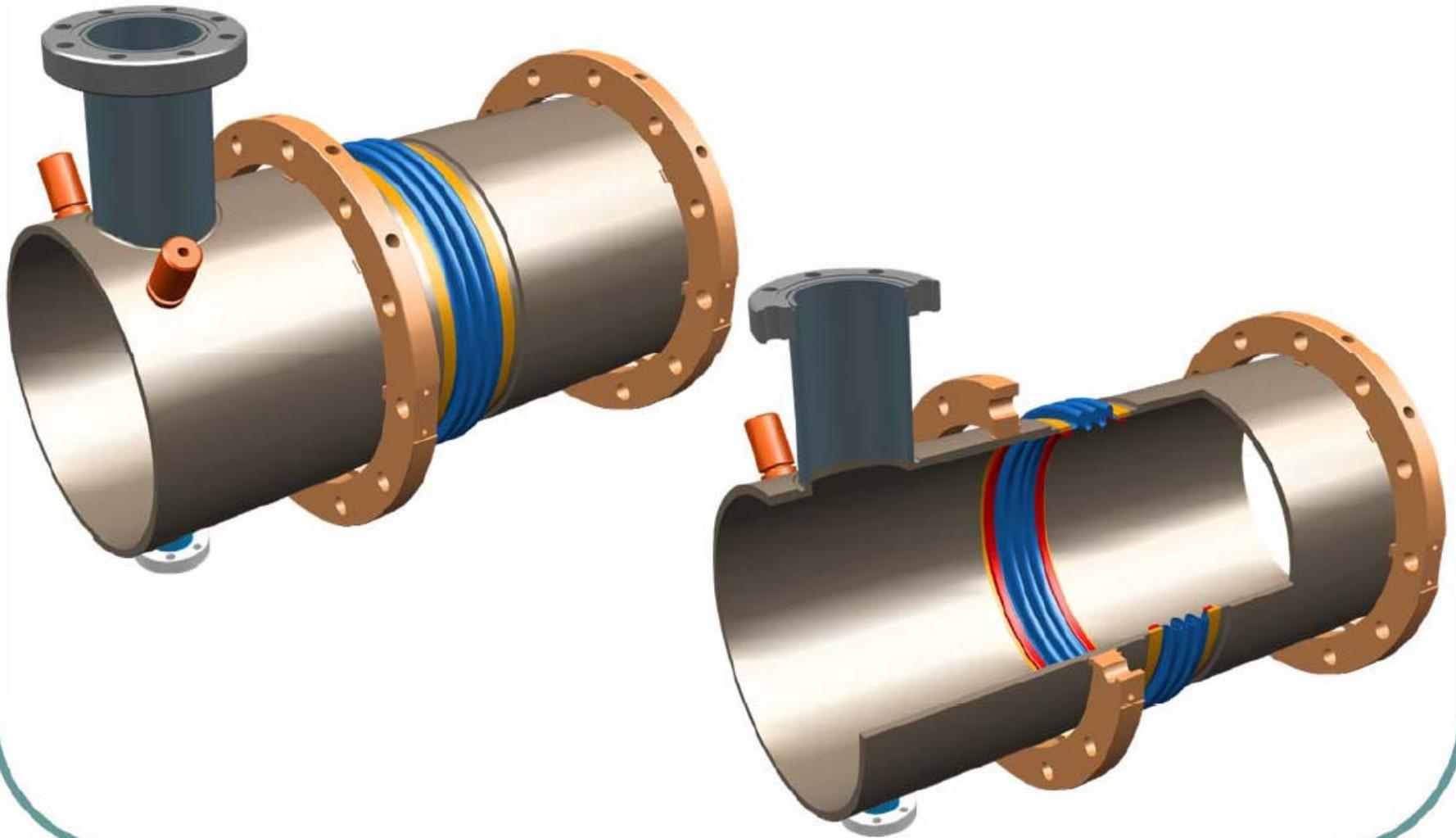
ITEM	PART NO.	DESCRIPTION OR SIZE	QTY.
PARTS LIST			
UNLESS OTHERWISE SPECIFIED		ORIGINATOR	D. MITCHELL
.X	.XX	ANGLES	DRAWN P. BELKO 2/28/04
± .2	± .13	± 1°	CHECKED
1. BREAK ALL SHARP EDGES .2mm MAX.		APPROVED	M. FOLEY 8/19/04
2. DO NOT SCALE DRAWING.		USED ON	MD-426332
3. DIMENSIONS BASED UPON ASME Y14.5M-1994		MATERIAL	Nb(55%)-Ti
4. MAX. ALL MACH. SURFACES N7			

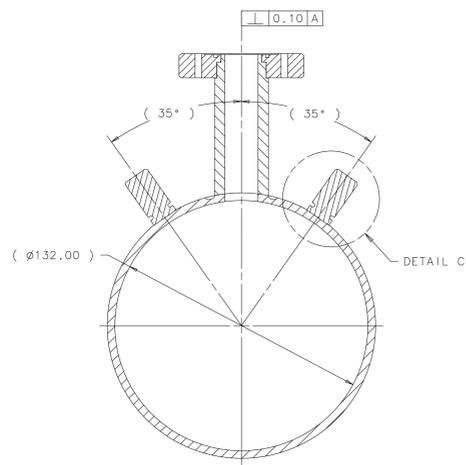
FERMI NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY

SCRF 3.9 GHZ 3RD HARMONIC
CAVITY WELDMENT NIOBIUM 9 CELL
FLANGE, CF PICKUP ANTENNA

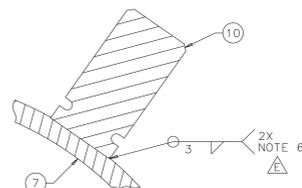
SCALE	FILMED	DRAWING NUMBER	REV.
3X		5520-MB-426334	A
CREATED WITH I-DEAS 11M2		USER NAME: dmitchel	

3.9 GHz Titanium Helium Vessel

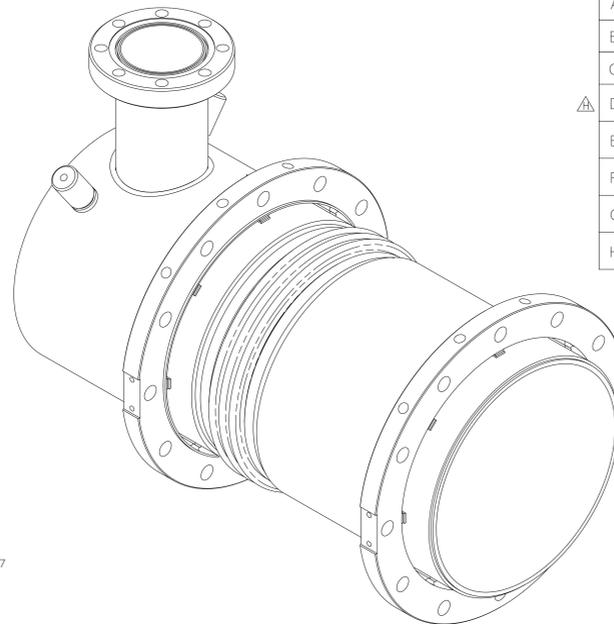
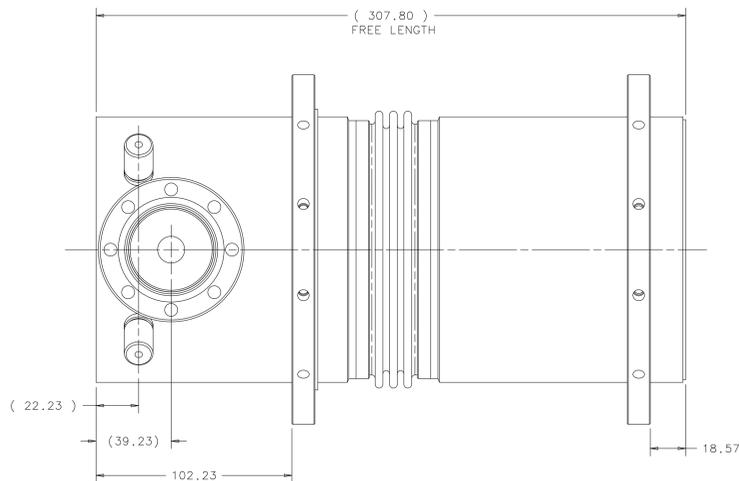




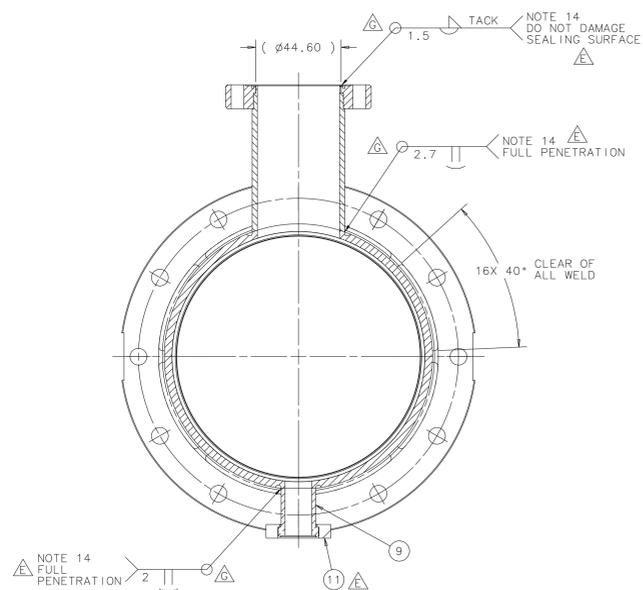
SECTION B-B



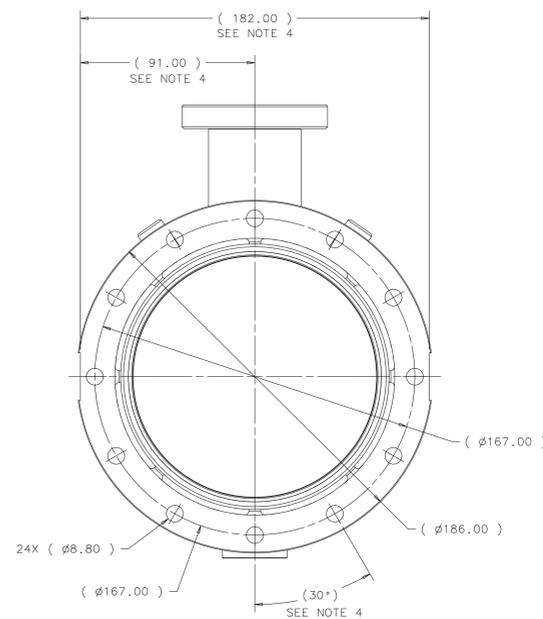
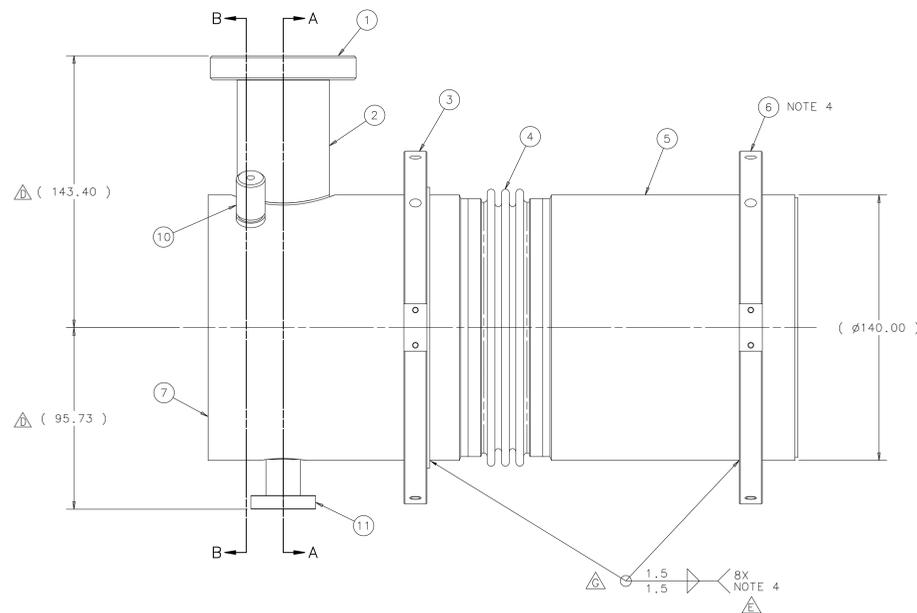
DETAIL-C
SCALE 2:1



REV	DESCRIPTION	DRAWN	DATE
--	E.# 7569		
A	ECO# 5737: UPDATE TUBE CONNECTIONS	P. BELKO	08/31/04
B	ECO# 8278: REMOVED SUPPORT LUGS ADDED SECOND INVAR PIN ADDED NOTES 8, 9 AND 10	D. MITCHELL	08/31/04
C	ECO #8570: REMOVE NOTES 8 AND 9 REMOVE FLANGE, VESSEL END STEPPED	V. MARTINEZ	03/17/06
D	ECO #8711: REPLACED MB-426261 WITH MC-426262. EXTENDED LENGTH OF ITEMS 2 & 9. REMOVED ALL NOTES.	D. MITCHELL	17-APR-08
E	ECO #8719: NOTES REVISED AND MODIFIED WELD CALLOUTS. ITEM #8 - MC-426263 WAS REPLACED WITH MC-457114, ADDED ITEM #11.	J. MONTELONGO	20-OCT-08
F	ECO #8747: NOTES #8 & #9 REVISED. ADDED VENDOR'S OPTION FOR PART CLEANING.	D. MITCHELL	27-OCT-08
G	ECO #8823: ALTERED JOINTS TO IMPROVE FULL-PENETRATION WELDS; SEE PART DETAILS FOR CLARITY.	C. GRIMM	1-JUN-07
H	ECO# 8978: BOM ITEM 8 MODIFIED TO REMOVE LINED-OUT P/N MB-426261 AND INCREASE QUANTITY TO 1. REMOVED REVISION #D.	D. MITCHELL	22-JUN-07
		M. FOLEY	7-FEB-08

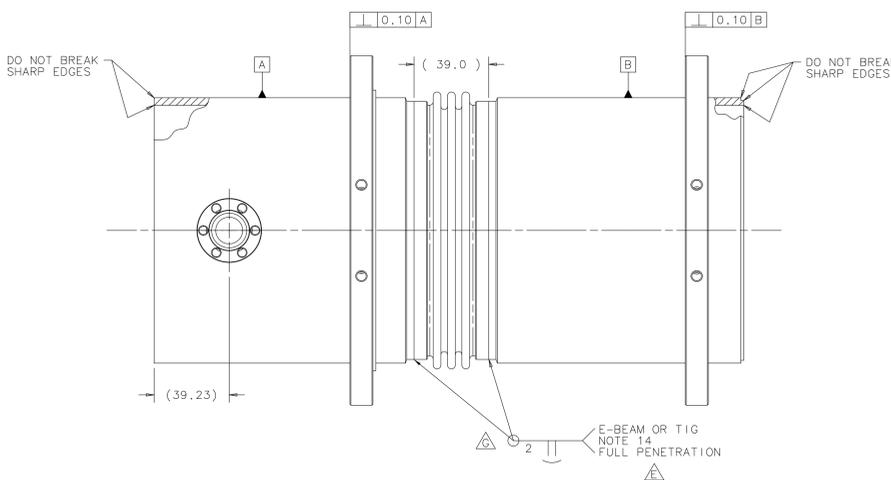


SECTION A-A



NOTES:

- ALL DIMENSIONS ARE IN MILLIMETERS.
- SEALING SURFACES ON FLANGES MUST BE FREE FROM ANY NICKS AND RADIAL SCRATCHES.
- ASSEMBLY MUST BE FREE FROM DIRT, GREASE, OIL AND CHIPS AND PROPERLY PACKAGED TO AVOID DAMAGE DURING SHIPPING.
- MOUNTING HOLES FROM FLANGES, ITEM 3 AND ITEM 6, ARE TO BE IN-LINE WITHIN ±0.15°. FLATS ON ITEMS 3 & 6 SHALL BE PERPENDICULAR TO [A] AND [B] WITHIN 0.10mm.
- ITEM 5 AND ITEM 7 MUST BE CONCENTRIC WITH EACH OTHER WITHIN Ø0.15mm.
- ITEM 10 TO BE LOCATED ON PRE-MACHINED FLAT SURFACES ON ITEM 7.
- ALL CLEANING AND WELDING PROCEDURES WILL CONFORM TO THE AMERICAN WELDING SOCIETY SPECIFICATION: AWS G2.4/G2.4M: 2007, *GUIDE FOR THE FUSION WELDING OF TITANIUM AND TITANIUM ALLOYS.*
- VENDOR'S OPTION: AN ACCEPTABLE PICKLE BATH MAY BE IMPLEMENTED TO CLEAN THE WELD JOINT MATERIAL. USE A RECOMMENDED BATH OF 35 VOL.% NITRIC ACID (70% CONCENTRATION), AND 5 VOL.% HYDROFLUORIC ACID (48% CONCENTRATION). RINSE WITH COLD WATER AND THEN RINSE WITH HOT WATER TO FACILITATE FASTER DRYING. INSURE THAT THE PARTS ARE CLEAN, COMPLETELY DRY, AND OXIDATION FREE PRIOR TO WELDING. CLEAN PARTS MUST BE USED WITHIN 4 HOURS OR STORED IN AN OXYGEN PURGED ENVIRONMENT.
- ALL WELDS MUST BE PERFORMED INSIDE OF AN ARGON FILLED GLOVEBOX WITH AN OXYGEN COUNT OF 20-30 PPM OR LESS. WELDS MUST BE FREE OF ALL TITANIUM OXIDATION AND DISCOLORATION. E-BEAM WELDING IN A VACUUM ENVIRONMENT IS AN ACCEPTABLE VENDOR OPTION.
- WELDERS MUST BE QUALIFIED AND CERTIFIED IN TITANIUM WELDING. VERIFICATION DOCUMENTS AND WELDING COUPONS FOR EACH WELDER MUST BE SUPPLIED TO FERMI LAB FOR WRITTEN APPROVAL PRIOR TO ANY PRODUCT WELDING. THE VENDOR WILL CREATE WELD SAMPLES (DRAWING THE TESTING A-4) AND PERFORM DESTRUCTIVE TESTING TO VERIFY THE WELD QUALITY. RESULTS OF THE TESTING WILL BE PROVIDED TO FERMI LAB.
- ON A DAILY BASIS, PRIOR TO PRODUCT WELDING, WELD COUPONS OF COMPARABLE SIZE AND TYPE WILL BE PREPARED BY THE WELDER. THESE COUPONS WILL BE ETCHED WITH THE DATE, TIME, AND WELDER'S NAME AND KEPT FOR RECORD. THE WELD COUPONS WILL BE PART OF THE DELIVERABLE TO FERMI LAB.
- THE VENDOR'S WRITTEN PROCEDURE DESCRIBING THE CLEANING AND WELDING PROCEDURES MUST BE SUPPLIED TO FERMI LAB FOR WRITTEN APPROVAL PRIOR TO ANY PRODUCT WELDING.
- INSPECTION OF FINAL PRODUCT WILL BE CONDUCTED AT FERMI LAB PRIOR TO ANY ULTRASONIC OR WIRE-BRUSH CLEANING. DO NOT MODIFY THE FINAL WELDS PRIOR TO PRODUCT ACCEPTANCE.
- ALL WELDS TO BE VACUUM TIGHT. NO LEAK SHALL BE DETECTABLE ON THE MOST SENSITIVE SCALE OF A HELIUM LEAK DETECTOR WITH A MINIMUM SENSITIVITY OF 2 X 10⁻⁹ ATM. CC/SEC. STABILIZE VESSEL BETWEEN ITEMS 3 & 6 WITH THREADED RODS AND NUTS PRIOR TO VACUUM LEAK TESTING.
- MATERIAL CERTIFICATIONS ARE REQUIRED AND MUST BE INCLUDED WITH SHIPPING. THERE WILL BE NO PRODUCT ACCEPTANCE WITHOUT THE PROPER MATERIAL CERTIFICATIONS.



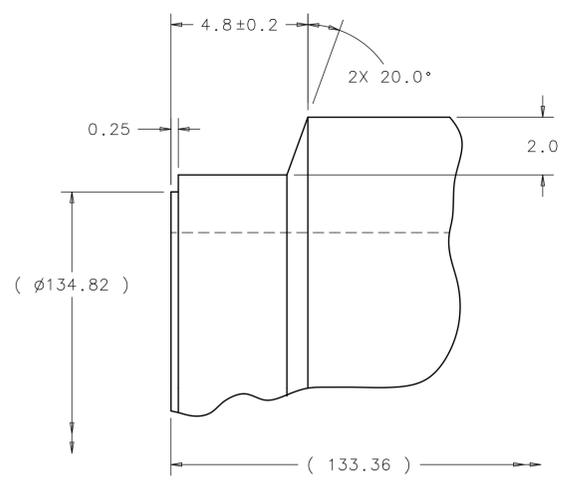
THIS DESIGN IS THE INTELLECTUAL PROPERTY OF FERMI LAB ACCORDING TO ISO 16016. THIS DRAWING IS PROVIDED FOR EXCLUSIVE FABRICATION USAGE BY TTC MEMBERS ONLY. USAGE OUTSIDE OF THE TTC MUST BE APPROVED BY FERMI LAB.

ITEM	PART NO.	DESCRIPTION OR SIZE	QTY.
11	COM'L	FLANGE OF 1-1/3" ROTATABLE BODY 316L S.S. KURT LESKER P/N F0133X00R	1
10	MB-426260	PIN, HELIUM VESSEL, INVAR CONNECTION	2
9	MC-426262	FLANGE, HELIUM VESSEL DRAIN	1
8		REMOVED FROM BOM	
7	MD-426251	SHELL, He VESSEL-He SUPPLY LINE	1
6	MC-426258	FLANGE, HELIUM VESSEL TUNER RING	1
5	MD-426250	SHELL, HELIUM VESSEL	1
4	MC-457114	BELLOWS WELDMENT	1
3	MC-426257	FLANGE, VESSEL TUNER STEPPED RING	1
2	MB-426278	TUBE, He VESSEL SUPPLY A0	1
1	MC-426277	FLANGE, RF CAVITY He SUPPLY	1

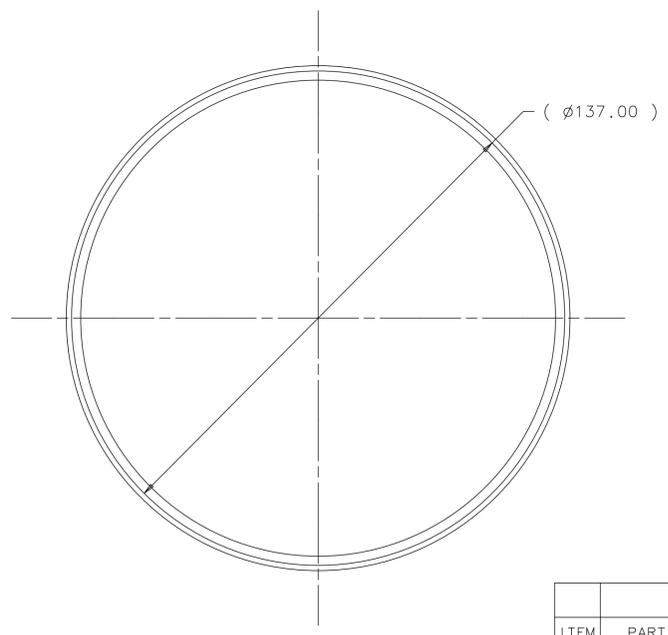
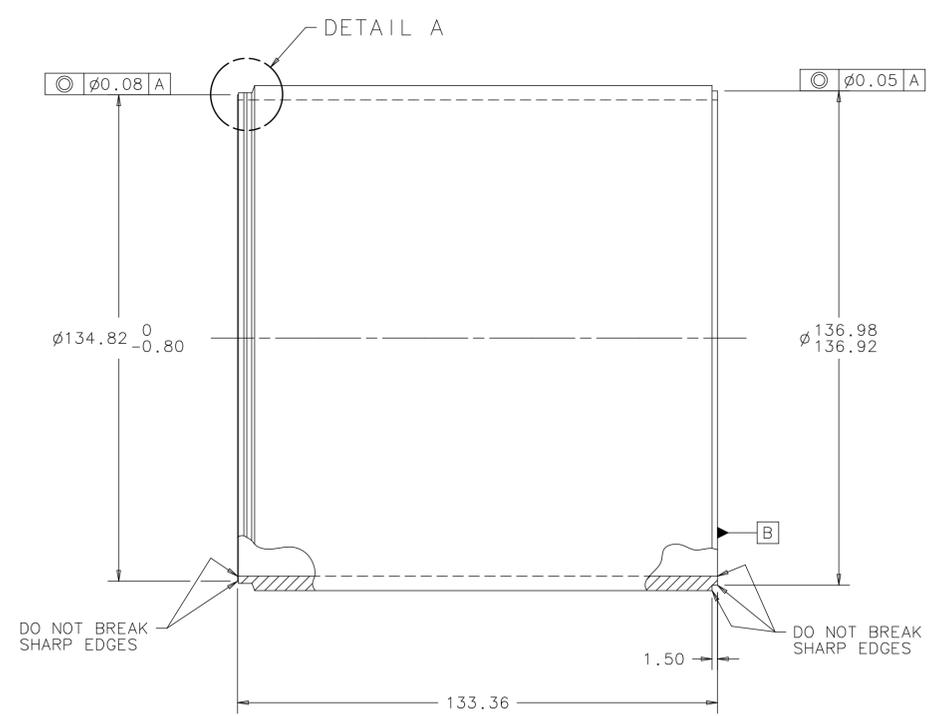
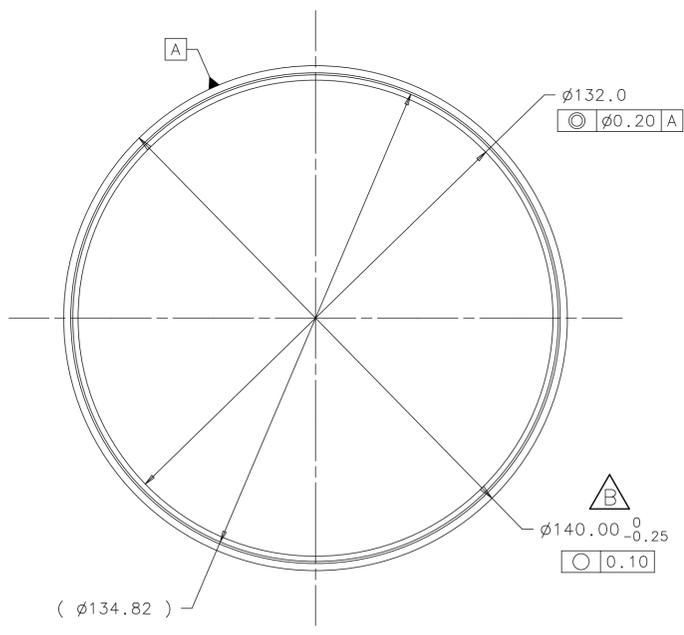
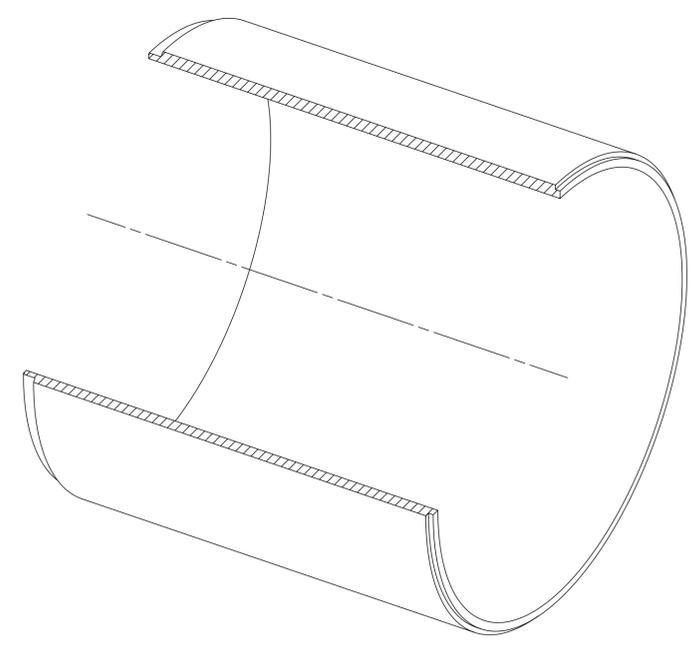
PARTS LIST			
UNLESS OTHERWISE SPECIFIED	ORIGINATOR	DRAWN	DATE
.X	.XX	X*	
± 0.1	± 0.08	± 1*	
1. BREAK ALL SHARP EDGES	APPROVED	D. MITCHELL	06/24/04
2. DO NOT SCALE DRAWING.	USED ON		
3. DIMENSIONS BASED UPON ASME Y14.5M-1994			
4. MAX. ALL MACH. SURFACES			
5. DRAWING UNITS: mm			

FERMI NATIONAL ACCELERATOR LABORATORY UNITED STATES DEPARTMENT OF ENERGY			
SCRF - 3RD HARMONIC ACCEL HELIUM VESSEL HELIUM VESSEL WELDMENT STYLE C			
SCALE	DRAWING NUMBER	SHEET	REV
3/4 & AS NOTED	5520.000-ME-426450	1 OF 1	H
CREATED WITH:	Idaes11NXSeries	GROUP:	TU/DDCS-DESIGN-COMPUTING

REV.	DESCRIPTION	DRAWN	DATE
		APPD.	DATE
	E.R. #7659		
A	ECO #8711: COMPLETE REDRAW	C. GRIMM	1 JUN 07
		D. MITCHELL	7 JUN 07
B	ECO #8798: $\phi 140.00 +0/-0.25$ WAS $\phi 140.00 \pm 0.15$	W. SHARP	13 SEP 07
		D. MITCHELL	18 SEP 07
C	ECO #8823: REDESIGNED DETAIL A	D. MITCHELL	4 OCT 07
		M. FOLEY	8 OCT 07
D	ECO #8978: MODIFIED MATERIAL CALLOUT FROM TITANIUM GRADE 1 TO GRADE 2	D. MITCHELL	8-FEB-08
		M. FOLEY	8-FEB-08



DETAIL A 
SCALE 8:1



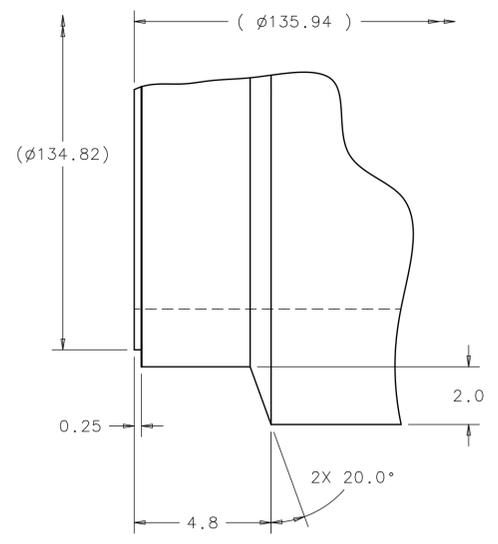
- NOTES (UNLESS OTHERWISE SPECIFIED):
1. FINISH: CLEAN AND DEGREASED.
 2. ALL UNITS ARE IN MILLIMETERS.
 3. PART TO BE FREE OF ALL SHARP EDGES, CORNERS AND BURRS. A MAXIMUM DEBURRING CHAMFER OF 0.5mm X 45° IS ALLOWED.
 4. ALL MACHINE FINISHED SURFACES TO BE 3.2 MICRO-METERS OR BETTER UNLESS OTHERWISE SPECIFIED.

THIS DESIGN IS THE INTELLECTUAL PROPERTY OF FERMILAB ACCORDING TO ISO 16016. THIS DRAWING IS PROVIDED FOR EXCLUSIVE FABRICATION USAGE BY TTC MEMBERS ONLY. USAGE OUTSIDE OF THE TTC MUST BE APPROVED BY FERMILAB.

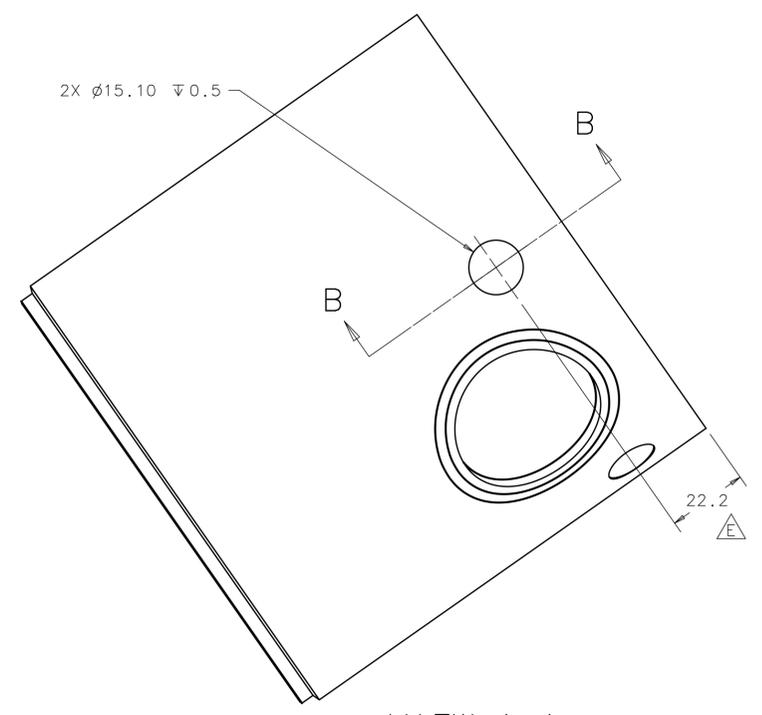
ITEM	PART NO.	DESCRIPTION OR SIZE	QTY.
PARTS LIST			
UNLESS OTHERWISE SPECIFIED		ORIGINATOR	D. MITCHELL
.X	.XX	ANGLES	DRAWN P. BELKO 1/23/04
± 0.3	± 0.05	± 1°	CHECKED D. MITCHELL 6/18/04
1. BREAK ALL SHARP EDGES 0.5 MAX.		APPROVED	D. MITCHELL 6/18/04
2. DO NOT SCALE DRAWING.		USED ON MD-426450	
3. DIMENSIONS BASED UPON ASME Y14.5M-1994		MATERIAL TITANIUM GRD. 2 	
4. MAX. ALL MACH. SURFACES 3.2 			
 FERMILAB NATIONAL ACCELERATOR LABORATORY UNITED STATES DEPARTMENT OF ENERGY			
HELIUM VESSEL WELDMENT W/9 CELL CAVITY HELIUM VESSEL SHELL WELDMENT SHELL, HELIUM VESSEL			
SCALE 1:1 & AS NOTED	FILMED	DRAWING NUMBER 5520-MD-426250	REV. D
CREATED WITH I-DEAS 9m3		USER NAME: pbelko	



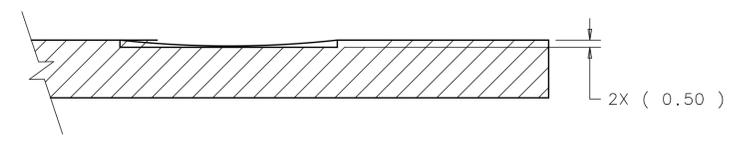
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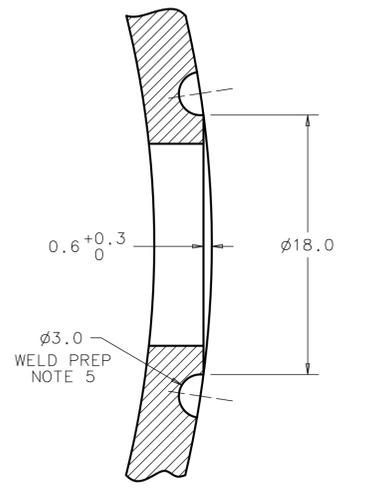
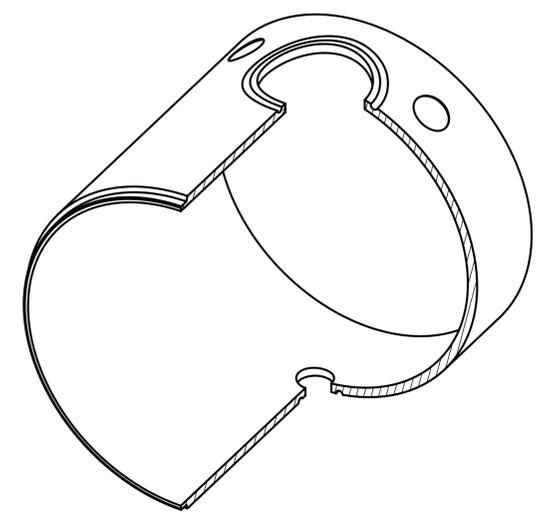
DETAIL C
SCALE: 8:1



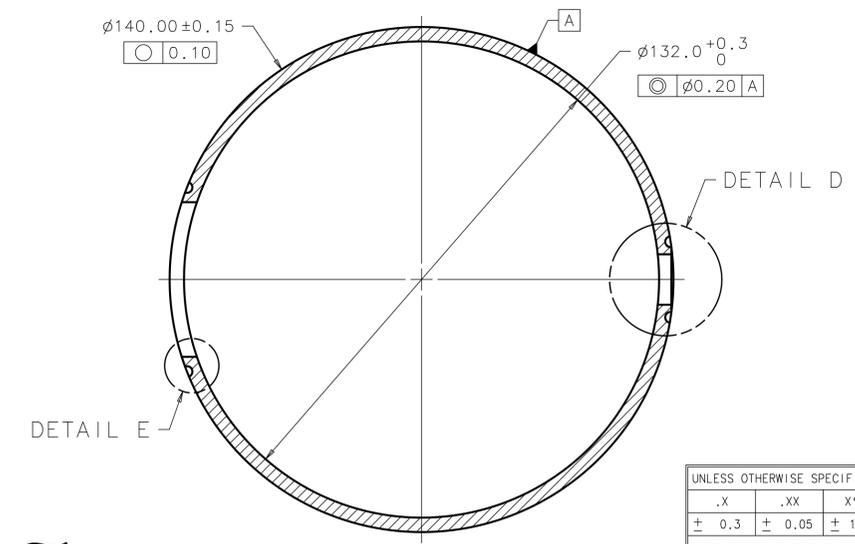
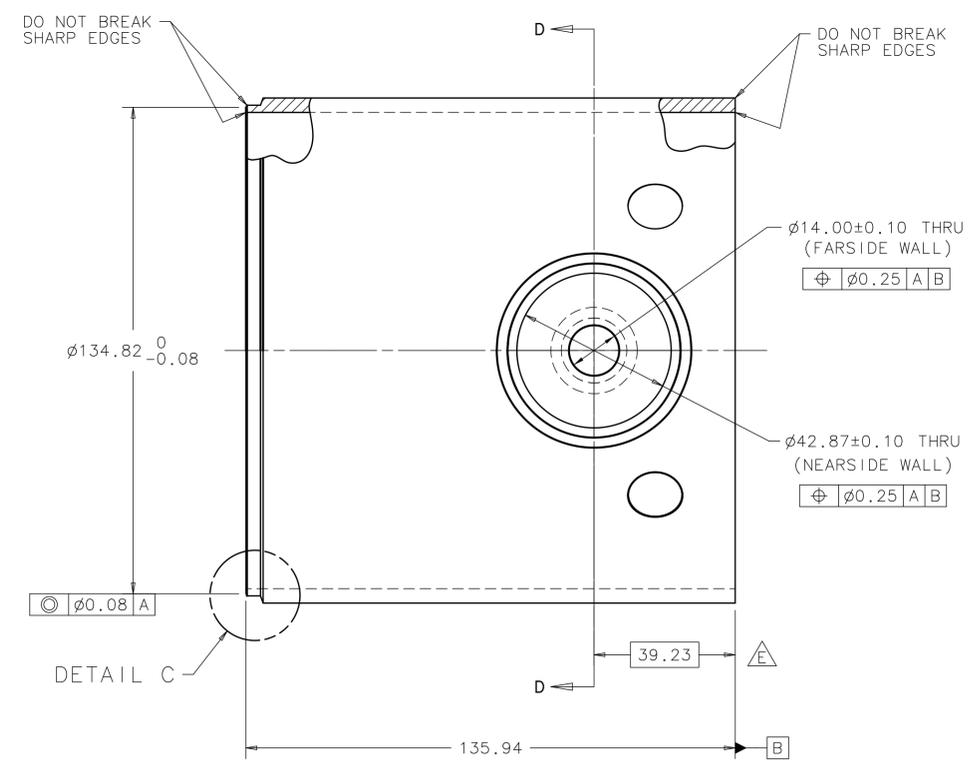
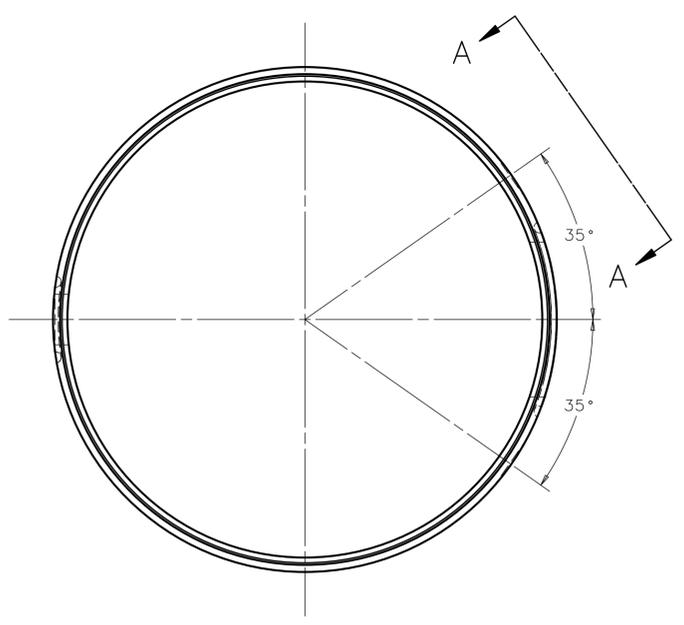
VIEW A-A



SECTION B-B
SCALE 4:1



DETAIL D
SCALE 4:1



DETAIL E
SCALE 4:1

- NOTES (UNLESS OTHERWISE SPECIFIED):
1. FINISH: CLEAN AND DEGREASED.
 2. ALL UNITS ARE IN MILLIMETERS.
 3. PART TO BE FREE OF ALL SHARP EDGES, CORNERS AND BURRS. A MAXIMUM DEBURRING CHAMFER OF 0.5mm X 45° IS ALLOWED.
 4. ALL MACHINE FINISHED SURFACES TO BE 3.2 MICRO-METERS OR BETTER UNLESS OTHERWISE SPECIFIED.
 5. WELD PREP TO BE CREATED WITH A 3MM DIAMETER BALL END-MILL FOLLOWING THE PATH AS DEFINED BY THE 3-D SOLID MODEL. THE INNER EDGE WILL CONFORM TO THE O.D. OF THE MATING TUBE.

THIS DESIGN IS THE INTELLECTUAL PROPERTY OF FERMI LAB ACCORDING TO ISO 16016. THIS DRAWING IS PROVIDED FOR EXCLUSIVE FABRICATION USAGE BY TTC MEMBERS ONLY. USAGE OUTSIDE OF THE TTC MUST BE APPROVED BY FERMI LAB.

REV	DESCRIPTION	DRAWN	DATE
		APPROVED	DATE
--	E.R. #7659		
A	ECO #5737 INCREASED DIA. TO ø48.31	P. BELKO	08/27/04
B	ECO #8278 ADDED ADDITIONAL SPOT FACE FLAT	D. MITCHELL	08/27/04
C	ECO #8570: DIM. 135.94 WAS 133.10	V. MARTINEZ	02/23/06
D	ECO #8711: COMPLETE REDRAW	D. MITCHELL	14-APR-06
E	ECO #8719: UPDATED HOLE LOCATIONS. 39.23 WAS 36.64 22.2 WAS 19.6	J. MONTELONGO	20-OCT-06
F	ECO #8798: ø140.00 +0/-0.25 WAS 140.00 ±0.15	D. MITCHELL	27-OCT-06
G	ECO #8823: ADDED WELD PREPS (DETAILS D & E) AND NOTE 5. REDUCED WELD PREP, DETAIL C.	C. GRIMM	1 JUN 07
		D. MITCHELL	7 JUN 07
		C. GRIMM	22 JUN 07
		D. MITCHELL	22 JUN 07
		W. SHARP	13 SEP 07
		DONALD V. MITCHELL	18 SEP 07
		DONALD V. MITCHELL	4 OCT 07
		MIKE FOLEY	8 OCT 07

UNLESS OTHERWISE SPECIFIED			ORIGINATOR	D. MITCHELL
.X	.XX	X*	DRAWN	P. BELKO
± 0.3	± 0.05	± 1*	CHECKED	D. MITCHELL
1. BREAK ALL SHARP EDGES 0.5 MAX.			APPROVED	D. MITCHELL
2. DO NOT SCALE DRAWING.			USED ON	
3. DIMENSIONS BASED UPON ASME Y14.5M-1994			ME-426450	
4. MAX. ALL MACH. SURFACES 3.2			MATERIAL	
5. DRAWING UNITS: mm			TITANIUM GRD. 2	

FERMI NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY

SCRF - 3RD HARMONIC ACCEL
HELIUM VESSEL
SHELL, HE VESSEL-HE SUPPLY SIDE

SCALE 1:1 & AS NOTED	DRAWING NUMBER 5520.000-MD-426251	SHEET 1 OF 1	REV G
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CREATED WITH : Ideas11NXSeries GROUP: TD/DCIS-DESIGN-COMPUTING

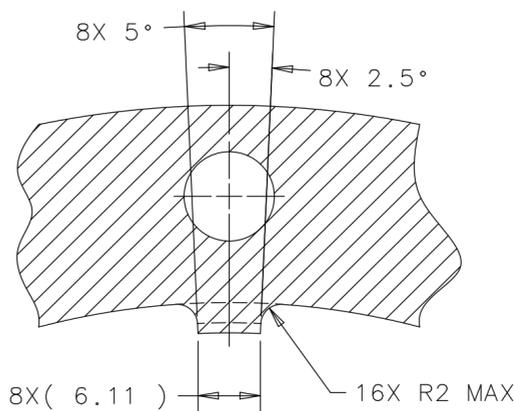
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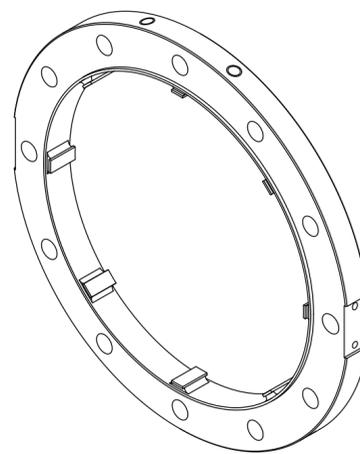
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2

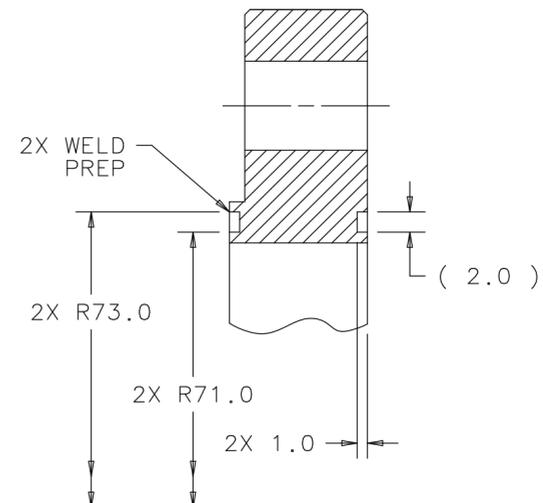
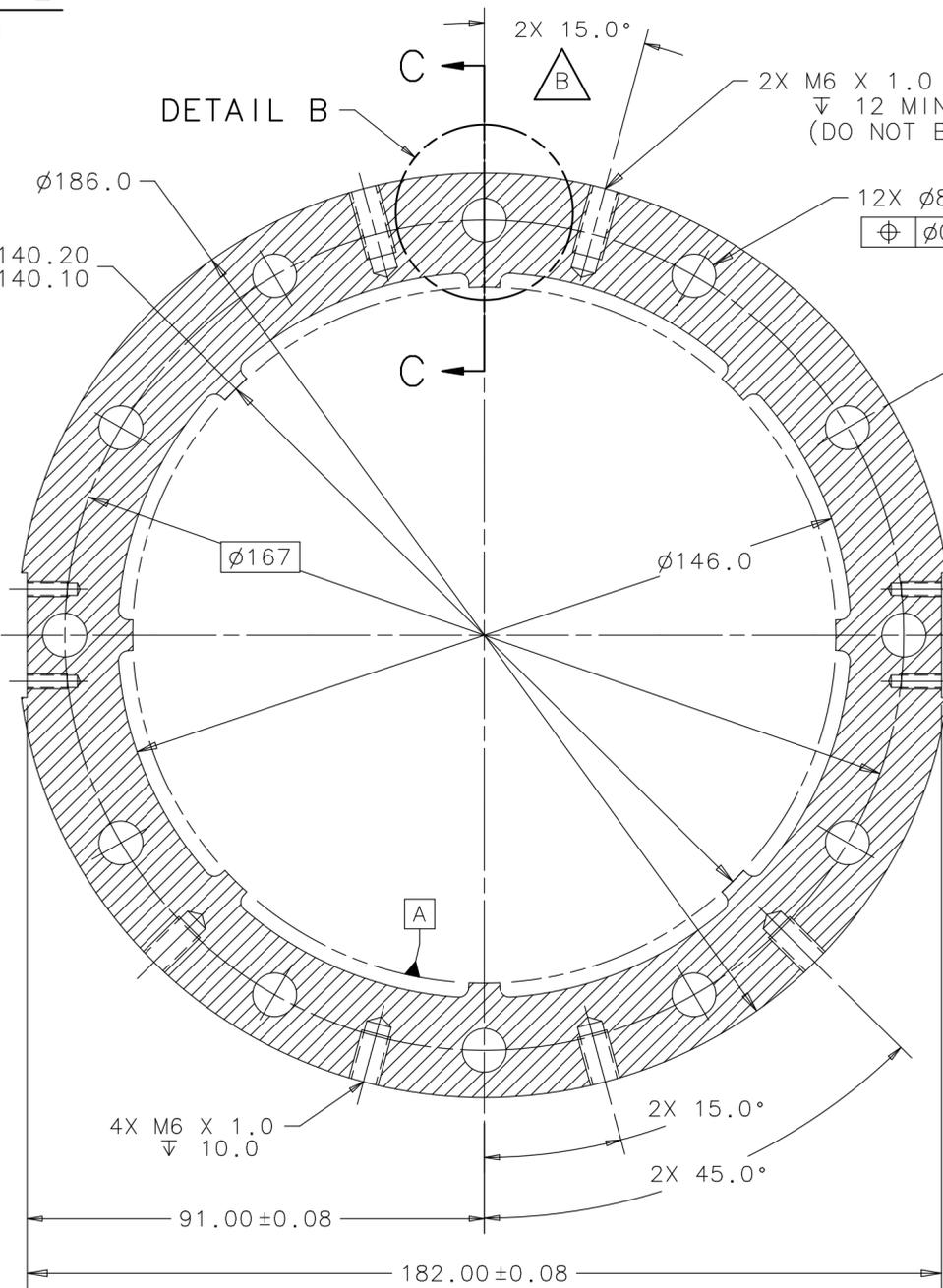
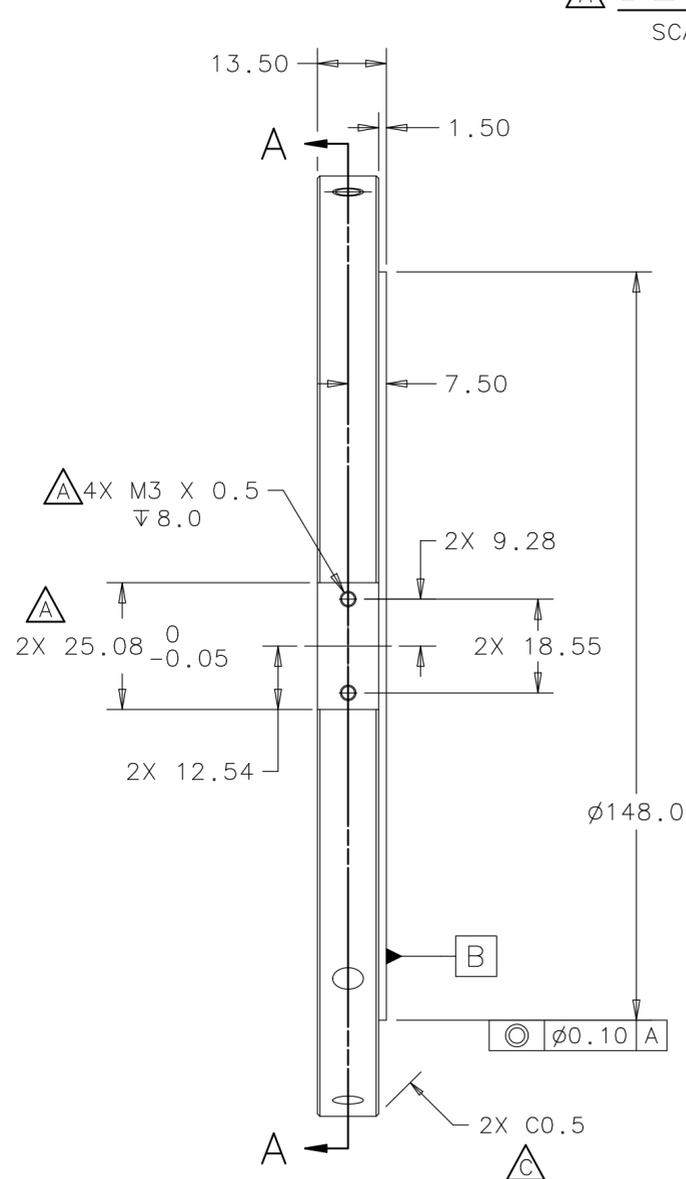
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DETAIL B
SCALE: 2:1



REV	DESCRIPTION	DRAWN	DATE
		APPROVED	DATE
--	E.R. #7659		
A	ECO #8278: 4 INTERNAL SUPPORTS CHANGED TO 8 TO REDUCE CONTACT AREA ADDED 2, 25.08 MM NOTCHES ADDED 4, M3 TAP HOLES	V. MARTINEZ	03/14/06
B	ECO #8691: 2X 15° AND 2X M6 X 1.0 DIMENSIONS ADDED	W. SHARP D. MITCHELL	15 MAY 07 15 MAY 07
C	ECO #8711: 2X C0.5 ADDED CHANGED NOTES. TITLE CHANGE.	C. GRIMM D. MITCHELL	1 JUN 07 7 JUN 07
D	ECO #8798: $\phi 140.20/140.10$ WAS $\phi 140.05/140.00$	W. SHARP DONALD V. MITCHELL	13 SEP 07 18 SEP 07
E	ECO #8823: ADDED SECTION C-C ADDED 16 WELD RELIEFS.	D. MITCHELL M. FOLEY	4 OCT 07 8 OCT 07



SECTION C-C
SCALE: 2:1
8 PLACES

NOTES (UNLESS OTHERWISE SPECIFIED):

1. FINISH: CLEAN AND DEGREASED.
2. PART TO BE FREE OF ALL SHARP EDGES, CORNERS AND BURRS. A MAXIMUM DEBURRING CHAMFER OF 0.5mm X 45° IS ALLOWED.
3. ALL MACHINE FINISHED SURFACES TO BE 3.2 MICRO-METERS OR BETTER UNLESS OTHERWISE SPECIFIED.

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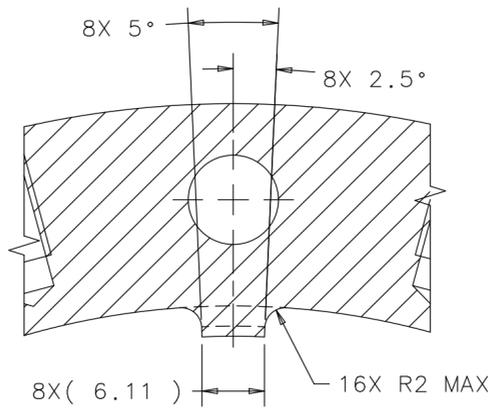
UNLESS OTHERWISE SPECIFIED		ORIGINATOR	D. MITCHELL
.X	.XX	DRAWN	P. BELKO
± 0.2	± 0.10	CHECKED	D. MITCHELL
	± 1°	APPROVED	D. MITCHELL
1. BREAK ALL SHARP EDGES 0.5 MAX.		USED ON	
2. DO NOT SCALE DRAWING.		ME-426450	
3. DIMENSIONS BASED UPON ASME Y14.5M-1994		MATERIAL	
4. MAX. ALL MACH. SURFACES 3.2		TITANIUM GRD. 2	
5. DRAWING UNITS: mm			

FERMI NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY

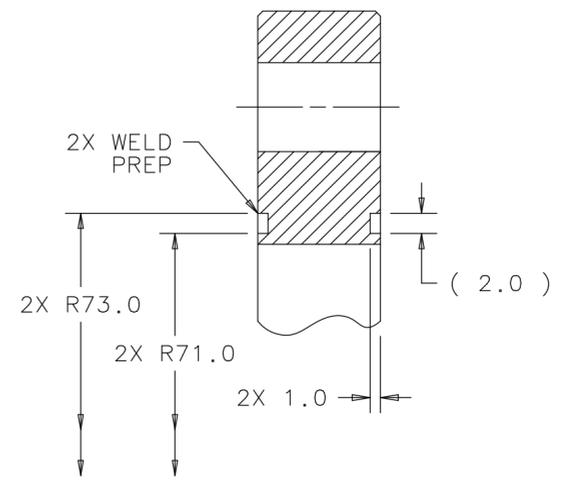
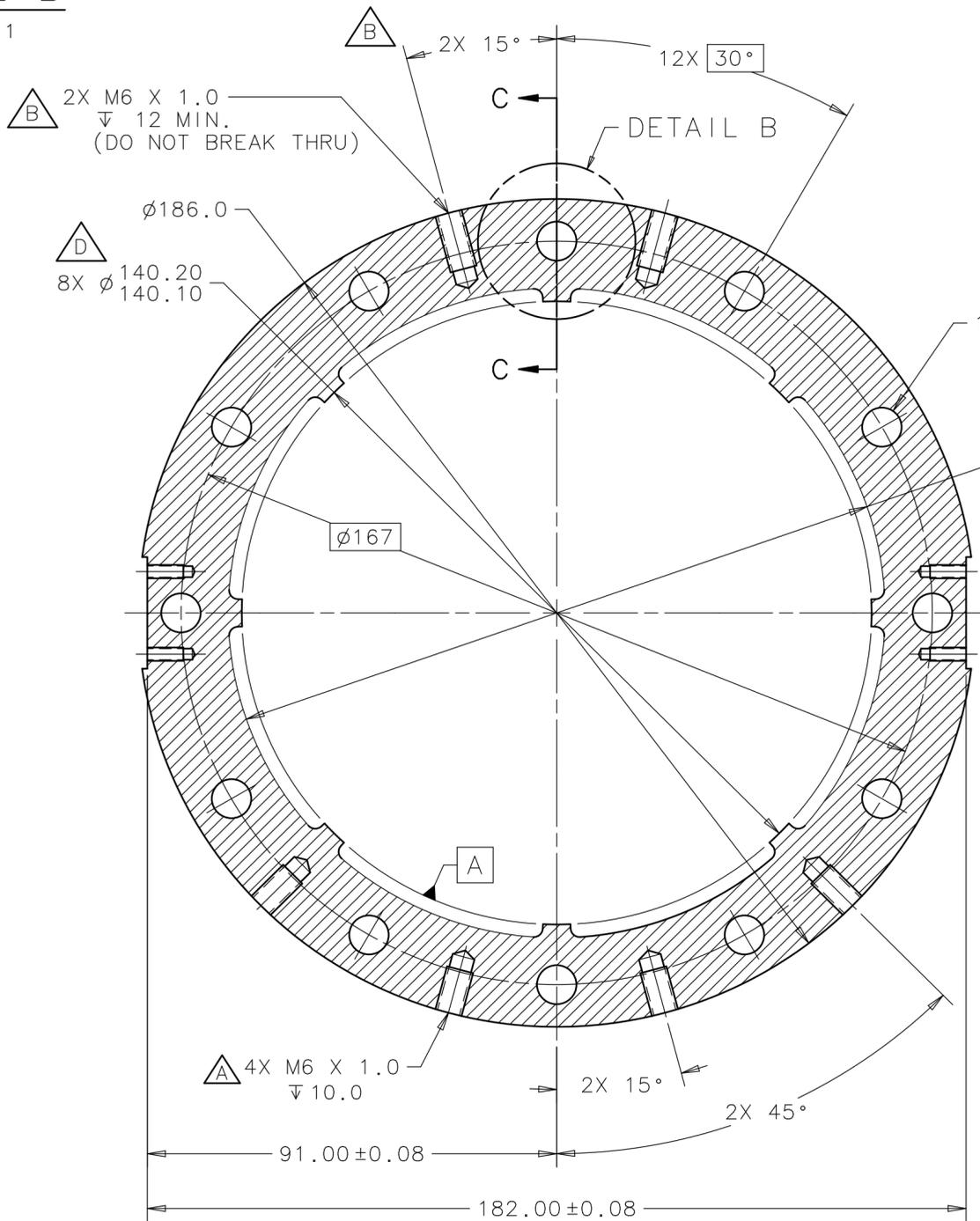
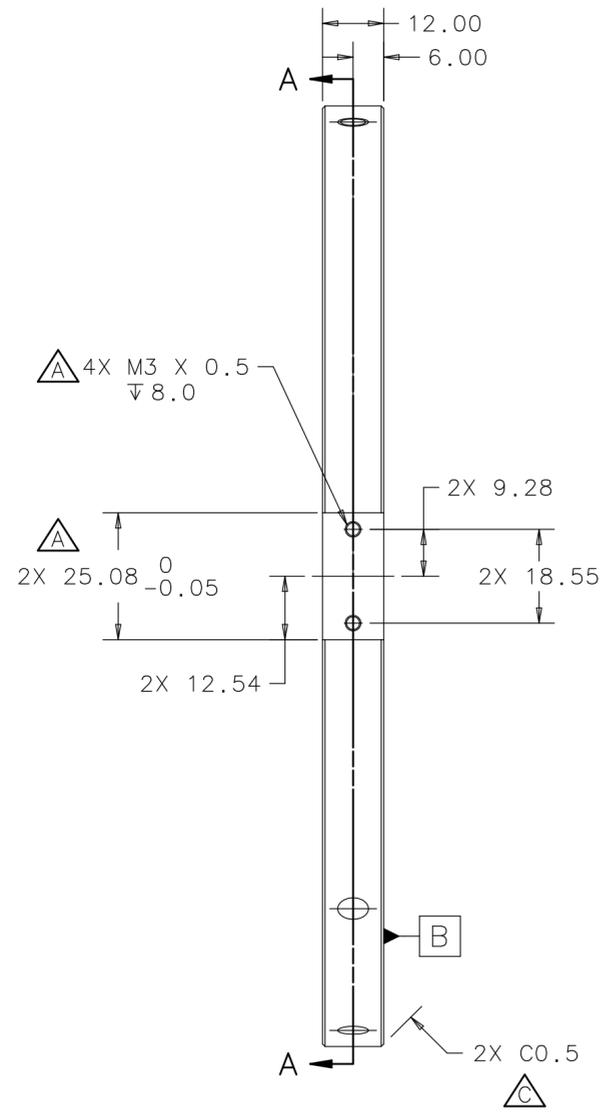
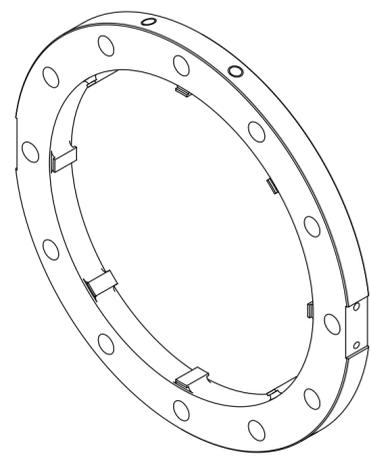
SCRF - 3RD HARMONIC ACCEL HELIUM VESSEL FLANGE, VESSEL TUNER STEPPED RING

SCALE	DRAWING NUMBER	SHEET	REV
1:1 & AS NOTED	5520.000-MC-426257	1 OF 1	E

CREATED WITH : Ideas11NXSeries GROUP: TD/DCIS-DESIGN-COMPUTING



DETAIL B
SCALE 2:1



SECTION C-C
SCALE 2:1
8 PLACES

REV	DESCRIPTION	DRAWN	DATE
		APPROVED	DATE
--	E.R #7659		
A	ECO #8278: 4 INTERNAL SUPPORTS CHANGED TO 8 TO REDUCE CONTACT AREA ADDED 2, 25.08 MM NOTCHES ADDED 4 M3 TAP HOLES ADDED 4 M6 TAP HOLES	V. MARTINEZ	03/13/06
B	ECO #8691: 2X 15° AND 2X M6 X 1.0 DIMENSIONS ADDED	W. SHARP D. MITCHELL	15 MAY 07 15 MAY 07
C	ECO #8711: 2X C0.5 ADDED. CHANGED NOTES.	C. GRIMM D. MITCHELL	1 JUN 07 7 JUN 07
D	ECO #8798: $\phi 140.20/140.10$ WAS $\phi 140.05/140.00$	W. SHARP DONALD V. MITCHELL	13 SEP 07 18 SEP 07
E	ECO #8823: ADDED SECTION C-C ADDED 16 WELD RELIEFS.	D. MITCHELL M. FOLEY	4 OCT 07 8 OCT 07

- NOTES (UNLESS OTHERWISE SPECIFIED):
1. FINISH: CLEAN AND DEGREASED.
 2. PART TO BE FREE OF ALL SHARP EDGES, CORNERS AND BURRS. A MAXIMUM DEBURRING CHAMFER OF 0.5mm X 45° IS ALLOWED.
 3. ALL MACHINE FINISHED SURFACES TO BE 3.2 MICRO-METERS OR BETTER UNLESS OTHERWISE SPECIFIED.

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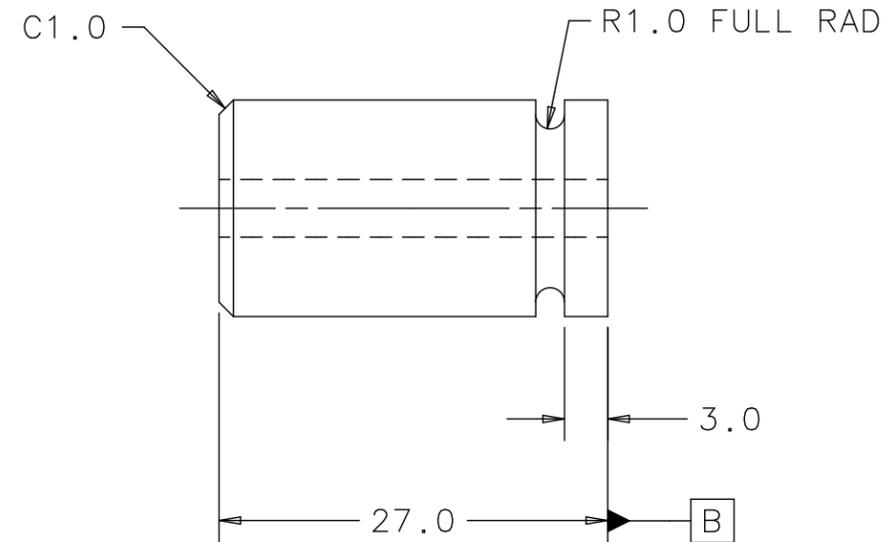
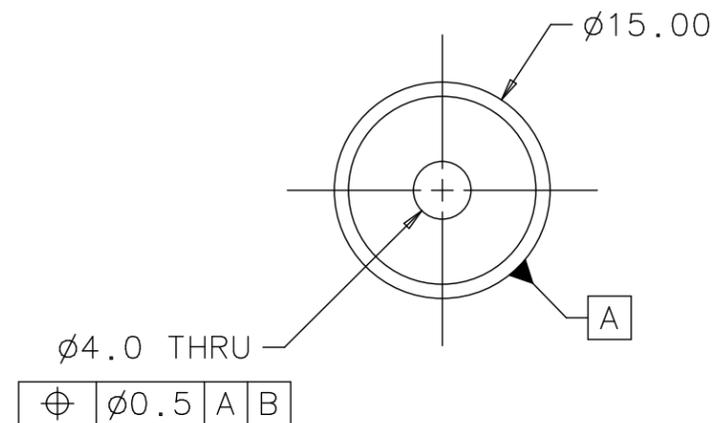
UNLESS OTHERWISE SPECIFIED		ORIGINATOR	D. MITCHELL
.X	.XX	DRAWN	P. BELKO
± 0.2	± 0.10	CHECKED	D. MITCHELL
X°	± 1°	APPROVED	D. MITCHELL
1. BREAK ALL SHARP EDGES 0.5 MAX.		USED ON	ME-426450
2. DO NOT SCALE DRAWING.		MATERIAL	TITANIUM GRD. 2
3. DIMENSIONS BASED UPON ASME Y14.5M-1994			
4. MAX. ALL MACH. SURFACES 3.2			
5. DRAWING UNITS: mm			

FERMI NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY

SCRF - 3RD HARMONIC ACCEL
HELIUM VESSEL
FLANGE, HELIUM VESSEL TUNER RING

SCALE 1:1 & AS NOTED	DRAWING NUMBER 5520.000-MC-426258	SHEET 1 OF 1	REV E
CREATED WITH : Ideas11NXSeries		GROUP: TD/DCIS-DESIGN-COMPUTING	

REV.	DESCRIPTION	DRAWN	DATE
		APPD.	DATE
	E.R. #7659		
A	ECO #8711: COMPLETE REDRAW	C. GRIMM D. MITCHELL	1 JUN 07 7 JUN 07

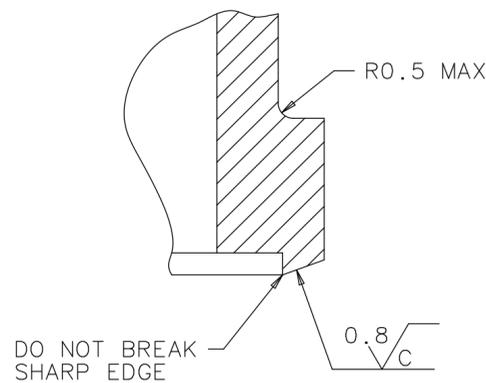
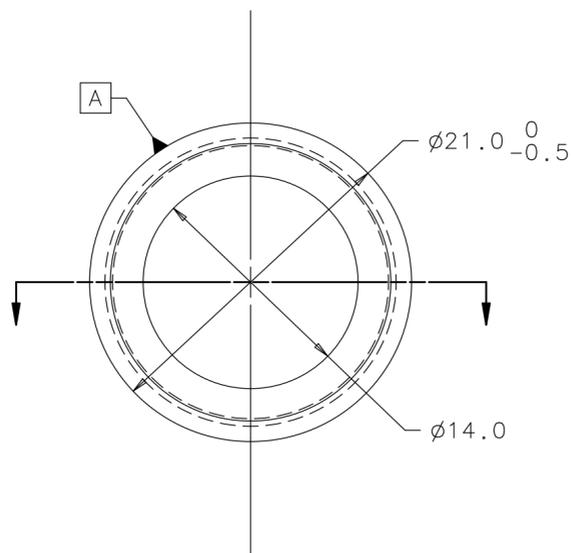
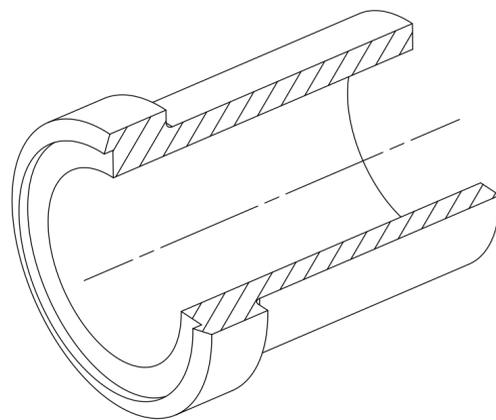
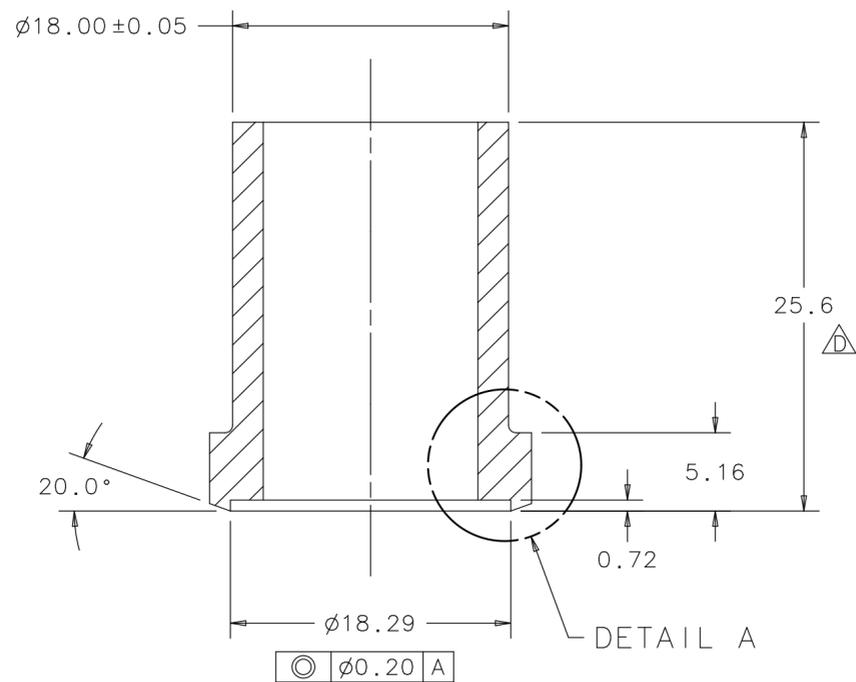


NOTES (UNLESS OTHERWISE SPECIFIED):

1. FINISH: CLEAN AND DEGREASED.
2. ALL UNITS ARE IN MILLIMETERS.
3. PART TO BE FREE OF ALL SHARP EDGES, CORNERS AND BURRS. A MAXIMUM DEBURRING CHAMFER OF 0.5mm X 45° IS ALLOWED.
4. ALL MACHINE FINISHED SURFACES TO BE 3.2 MICRO-METERS OR BETTER UNLESS OTHERWISE SPECIFIED.

THIS DESIGN IS THE INTELLECTUAL PROPERTY OF FERMILAB ACCORDING TO ISO 16016 THIS DRAWING IS PROVIDED FOR EXCLUSIVE FABRICATION USAGE BY TTC MEMBERS ONLY. USAGE OUTSIDE OF THE TTC MUST BE APPROVED BY FERMILAB.

ITEM	PART NO.	DESCRIPTION OR SIZE	QTY.
PARTS LIST			
UNLESS OTHERWISE SPECIFIED		ORIGINATOR	D. MITCHELL
.X	.XX	ANGLES	DRAWN P. BELKO 1/22/04
± 0.2	± 0.10	$\pm 1^\circ$	CHECKED D. MITCHELL 6/18/04
1. BREAK ALL SHARP EDGES 0.5 MAX.		APPROVED	D. MITCHELL 6/18/04
2. DO NOT SCALE DRAWING.		USED ON ME-426450	
3. DIMENSIONS BASED UPON ASME Y14.5M-1994		MATERIAL TITANIUM GRD. 2	
4. MAX. ALL MACH. SURFACES 3.2			
 FERMI NATIONAL ACCELERATOR LABORATORY UNITED STATES DEPARTMENT OF ENERGY			
HELIUM VESSEL WELDMENT W/9 CELL CAVITY HELIUM VESSEL SHELL WELDMENT PIN, HELIUM VESSEL INVAR CONNECTION			
SCALE	FILMED	DRAWING NUMBER	REV.
2:1		5520-MB-426260	A
CREATED WITH I-DEAS 9m3		USER NAME: dmitche	



DETAIL A
SCALE 6:1

NOTES (UNLESS OTHERWISE SPECIFIED):

1. FINISH: CLEAN AND DEGREASED.
2. SEALING SURFACES MUST BE FREE OF SCRATCHES WITH NO RADIAL SCORING.
3. PART TO BE FREE OF ALL SHARP EDGES, CORNERS AND BURRS. A MAXIMUM DEBURRING CHAMFER OF 0.5mm X 45° IS ALLOWED.
4. ALL MACHINE FINISHED SURFACES TO BE 1.6 MICROMETERS OR BETTER UNLESS OTHERWISE SPECIFIED.

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REV.	DESCRIPTION	DRAWN	DATE
		APPD.	DATE
	E.R. #7659		
A	ECO #5737: ADDED OD ϕ 33.80 DIMENSION	P.BELKO	8/27/04
		D.MITCHELL	8/27/04
B	ECO #8711: COMPLETE REDESIGN	C. GRIMM	1 JUN 07
		D.MITCHELL	7 JUN 07
C	ECO #8719: COMPLETE REDESIGN. CONVERTED PART TO MATE WITH ROTATABLE FLANGE.	C. GRIMM	22 JUN 07
		D.MITCHELL	22 JUN 07
D	ECO #8823: DIM. 25.6 WAS (29.5) REMOVED RADIUS ON TUBE END. REMOVED CHAMFER.	D.MITCHELL	4 OCT 07
		M. FOLEY	8 OCT 07

ITEM	PART NO.	DESCRIPTION OR SIZE	QTY.
PARTS LIST			
UNLESS OTHERWISE SPECIFIED		ORIGINATOR	D.MITCHELL
.X	.XX	ANGLES	DRAWN P.BELKO 1/21/04
± 0.2	± 0.08	$\pm 1^\circ$	CHECKED D.MITCHELL 6/18/04
1. BREAK ALL SHARP EDGES 0.25 MAX.		APPROVED	D.MITCHELL 6/18/04
2. DO NOT SCALE DRAWING.		USED ON ME-426450	
3. DIMENSIONS BASED UPON ASME Y14.5M-1994			
4. MAX. ALL MACH. SURFACES 1.6 \sqrt{C} UNITS: mm		MATERIAL TITANIUM GRD. 2	

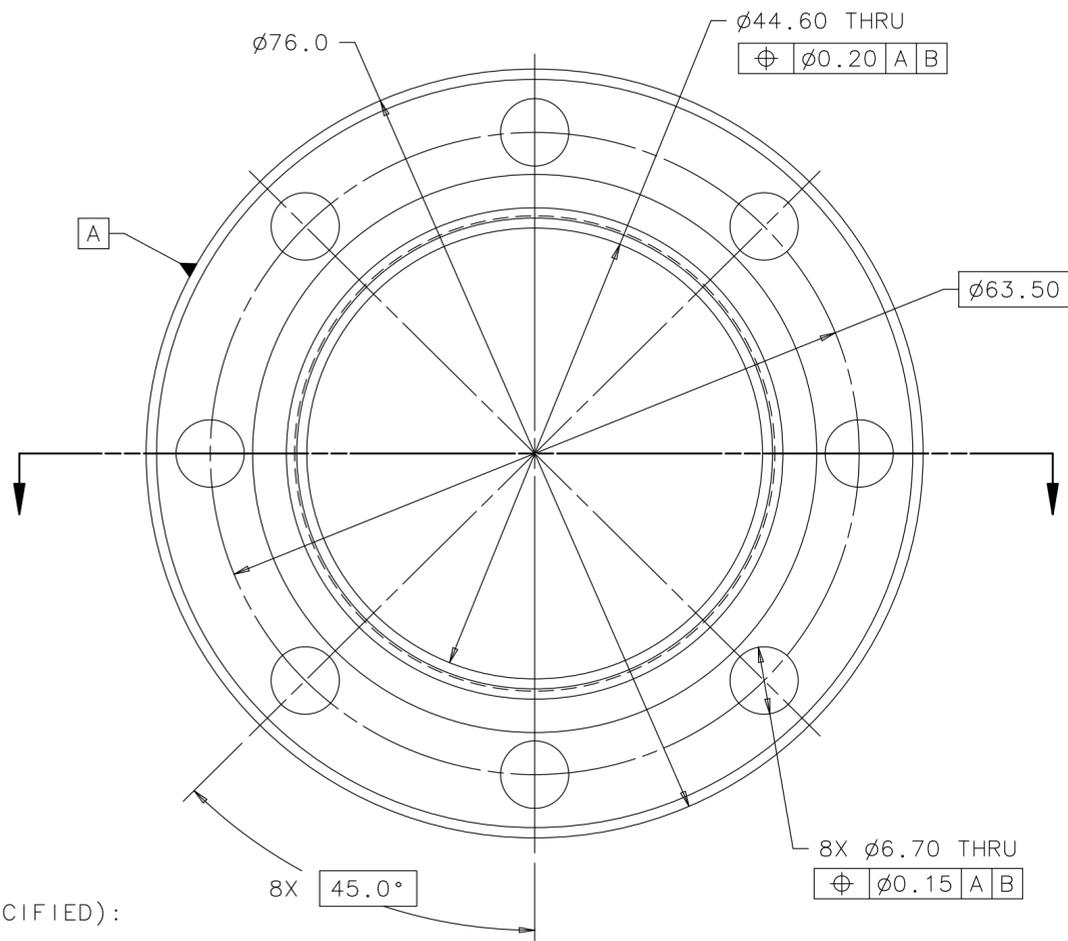
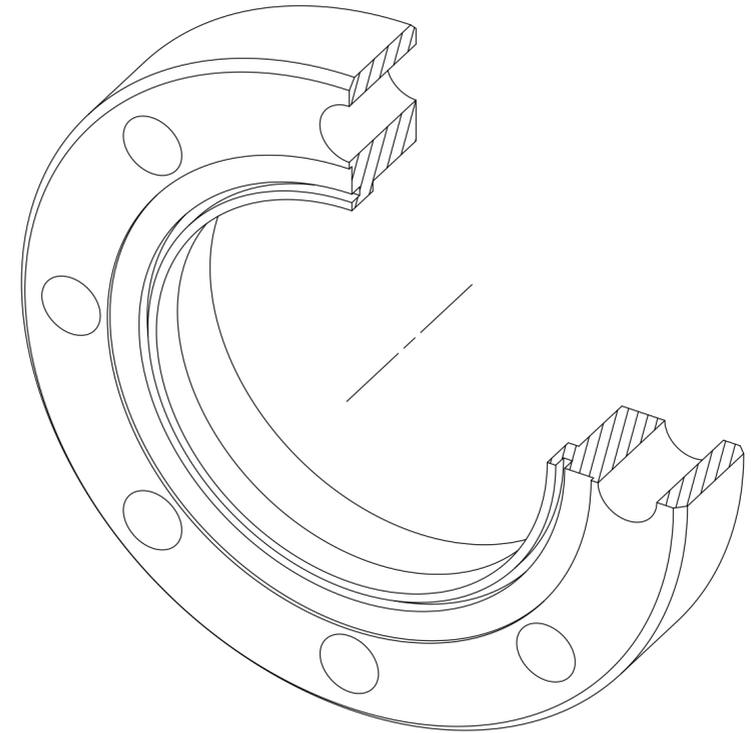
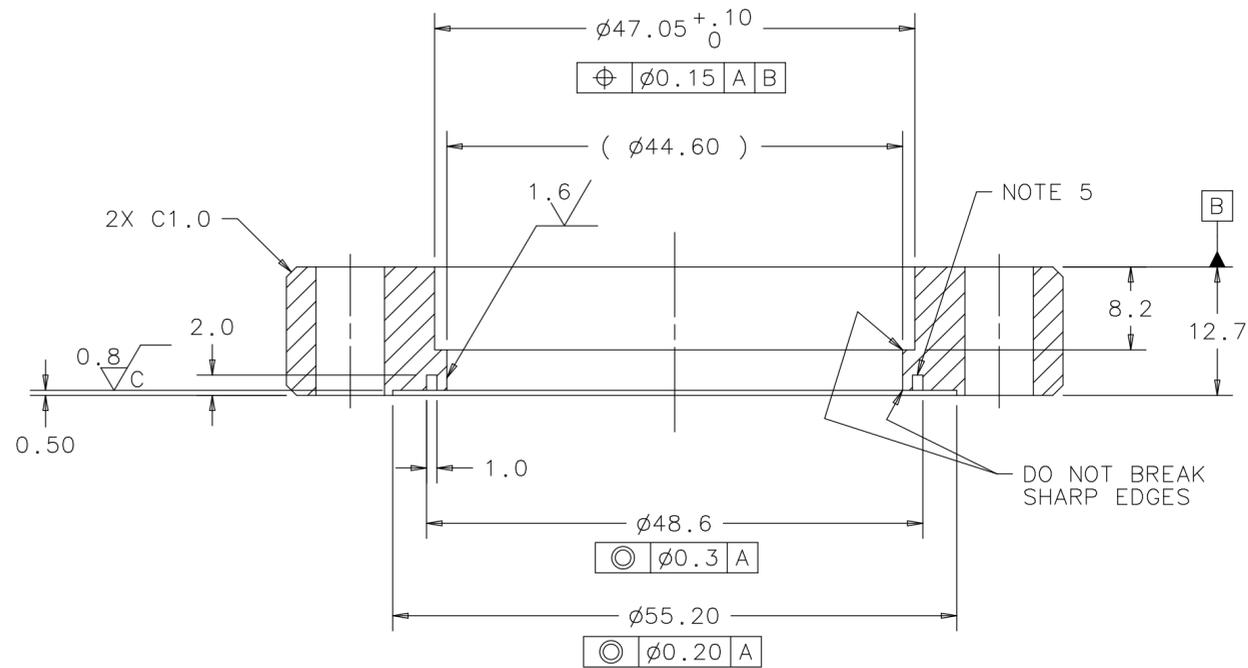


FERMI NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY

HELIUM VESSEL WELDMENT W/9 CELL CAVITY
HELIUM VESSEL SHELL WELDMENT
FLANGE, HELIUM VESSEL DRAIN

SCALE 3:1 & AS NOTED	FILMED	DRAWING NUMBER 5520-MC-426262	REV. D
CREATED WITH I-DEAS 12m2		USER NAME: pbelko	

REV.	DESCRIPTION	DRAWN	DATE
	E.R. #7659	APPD.	DATE
A	ECO #8711: COMPLETE REDRAW	C. GRIMM	1 JUN 07
		D. MITCHELL	7 JUN 07



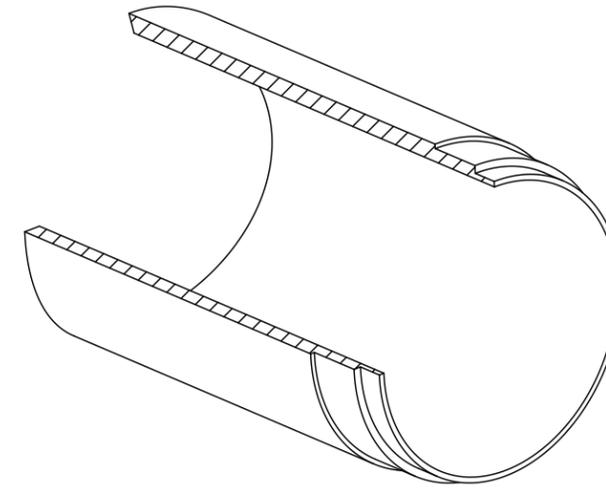
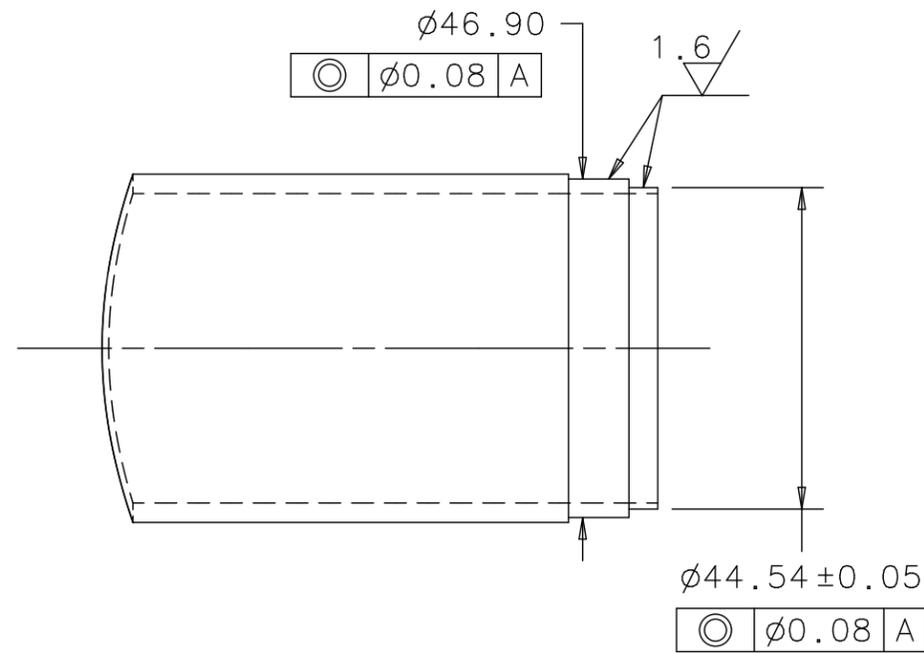
NOTES (UNLESS OTHERWISE SPECIFIED):

1. FINISH: CLEAN AND DEGREASED.
2. ALL UNITS ARE IN MILLIMETERS.
3. PART TO BE FREE OF ALL SHARP EDGES, CORNERS AND BURRS. A MAXIMUM DEBURRING CHAMFER OF 0.5mm X 45° IS ALLOWED.
4. ALL MACHINE FINISHED SURFACES TO BE 3.2 MICRO-METERS OR BETTER UNLESS OTHERWISE SPECIFIED.
5. VENDOR OPTION: SHARP CORNERS OR FULL RADIUS ARE ACCEPTABLE.

THIS DESIGN IS THE INTELLECTUAL PROPERTY OF FERMILAB ACCORDING TO ISO 16016. THIS DRAWING IS PROVIDED FOR EXCLUSIVE FABRICATION USAGE BY TTC MEMBERS ONLY. USAGE OUTSIDE OF THE TTC MUST BE APPROVED BY FERMILAB.

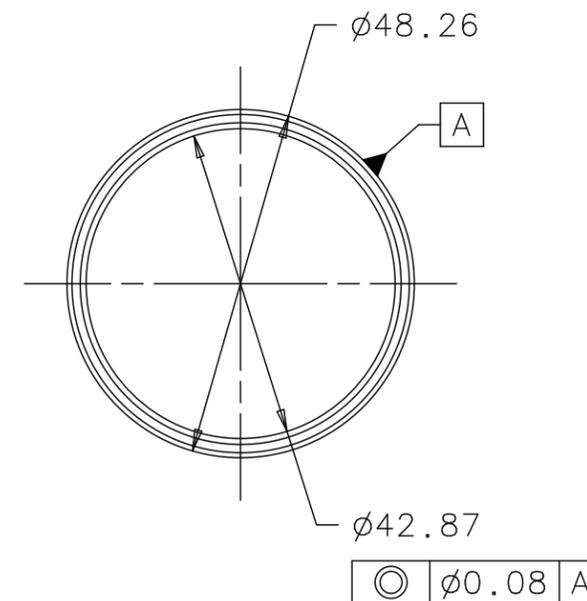
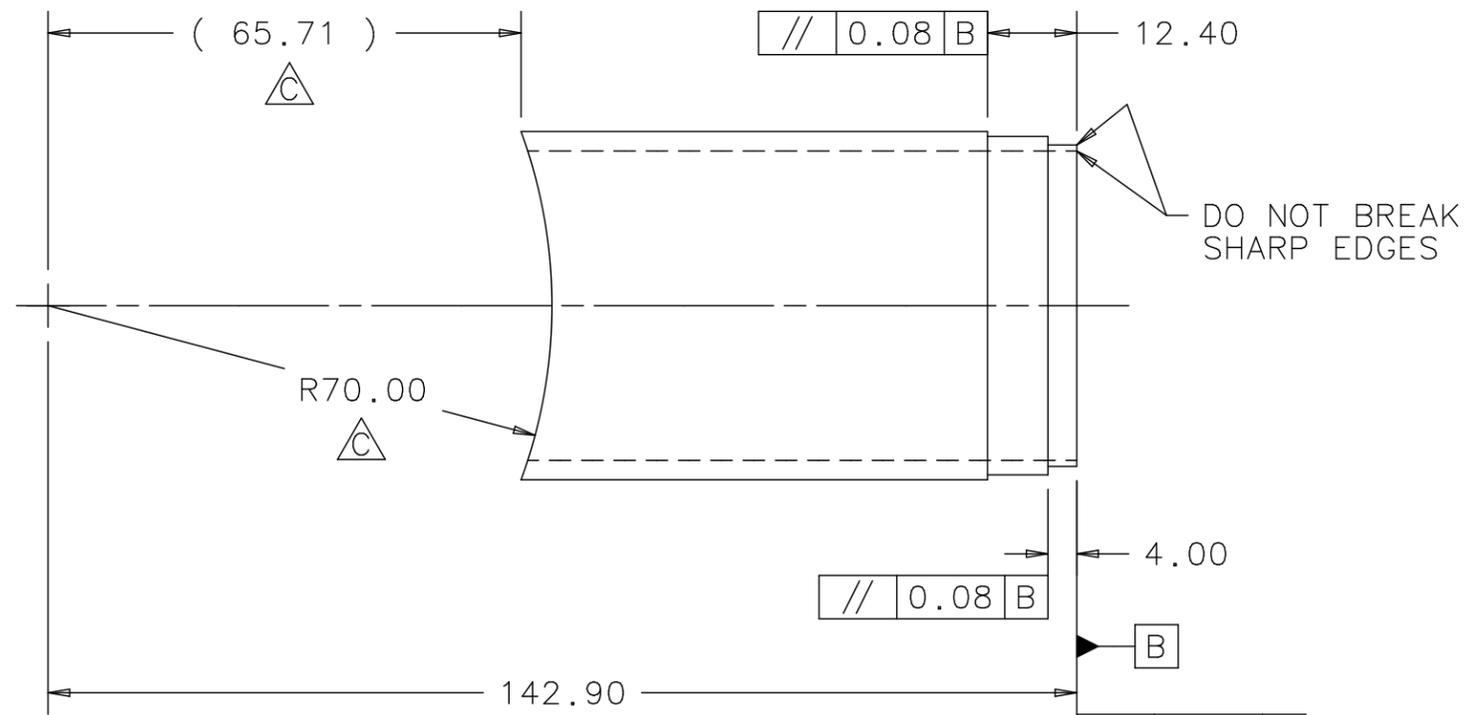
ITEM	PART NO.	DESCRIPTION OR SIZE	QTY.
PARTS LIST			
UNLESS OTHERWISE SPECIFIED		ORIGINATOR	D. MITCHELL
.X	.XX	ANGLES	DRAWN P. BELKO 6/24/04
± 0.1	± 0.08	$\pm 1^\circ$	CHECKED D. MITCHELL 6/24/04
1. BREAK ALL SHARP EDGES 0.5 MAX.		APPROVED	D. MITCHELL 6/24/04
2. DO NOT SCALE DRAWING.		USED ON ME-426450	
3. DIMENSIONS BASED UPON ASME Y14.5M-1994		MATERIAL TITANIUM GRD. 2	
4. MAX. ALL MACH. SURFACES 3.2			
 FERMI NATIONAL ACCELERATOR LABORATORY UNITED STATES DEPARTMENT OF ENERGY			
HELIUM VESSEL WELDMENT W/9 CELL CAVITY HELIUM VESSEL SHELL WELDMENT FLANGE, RF CAVITY He SUPPLY			
SCALE	FILMED	DRAWING NUMBER	REV.
2:1		5520-MC-426277	A
CREATED WITH I-DEAS 9m3		USER NAME: pbelko	

REV.	DESCRIPTION	DRAWN	DATE
		APPD.	DATE
	E.R. #7659		
A	ECO #5737: INCREASED TUBE LENGTH	P.BELKO D.MITCHELL	8/27/04 8/27/04
B	ECO #8711: INCREASED TUBE LENGTH AND COMPLETE REDRAW.	C. GRIMM D.MITCHELL	1 JUN 07 7 JUN 07
C	ECO #8823: R70.00 WAS R66.0 (65.71) WAS (62.12).	D.MITCHELL M. FOLEY	4 OCT 07 8 OCT 07



NOTES (UNLESS OTHERWISE SPECIFIED):

1. FINISH: CLEAN AND DEGREASED.
2. DIMENSIONS ARE IN MILLIMETERS.
3. PART TO BE FREE OF ALL SHARP EDGES, CORNERS AND BURRS. A MAXIMUM DEBURRING CHAMFER OF 0.5mm X 45° IS ALLOWED.
4. ALL MACHINE FINISHED SURFACES TO BE 3.2 MICRO-METERS OR BETTER UNLESS OTHERWISE SPECIFIED.



THIS DESIGN IS THE INTELLECTUAL PROPERTY OF FERMILAB ACCORDING TO ISO 16016. THIS DRAWING IS PROVIDED FOR EXCLUSIVE FABRICATION USAGE BY TTC MEMBERS ONLY. USAGE OUTSIDE OF THE TTC MUST BE APPROVED BY FERMILAB.

ITEM	PART NO.	DESCRIPTION OR SIZE	QTY.
PARTS LIST			
UNLESS OTHERWISE SPECIFIED		ORIGINATOR	D.MITCHELL
.X	.XX	ANGLES	DRAWN P.BELKO 6/25/04
± 0.1	± 0.08	±	CHECKED D.MITCHELL 6/25/04
1. BREAK ALL SHARP EDGES 0.5 MAX.		APPROVED	D.MITCHELL 6/25/04
2. DO NOT SCALE DRAWING.		USED ON ME-426450	
3. DIMENSIONS BASED UPON ASME Y14.5M-1994		MATERIAL TITANIUM GR.2 TUBE	
4. MAX. ALL MACH. SURFACES 3.2			
 FERMI NATIONAL ACCELERATOR LABORATORY UNITED STATES DEPARTMENT OF ENERGY			
HELIUM VESSEL WELDMENT W/9 CELL CAVITY HELIUM VESSEL SHELL WELDMENT TUBE, He VESSEL SUPPLY AO			
SCALE	FILMED	DRAWING NUMBER	REV.
1:1		5520-MB-426278	C
CREATED WITH I-DEAS 9m3		USER NAME: pbelko	

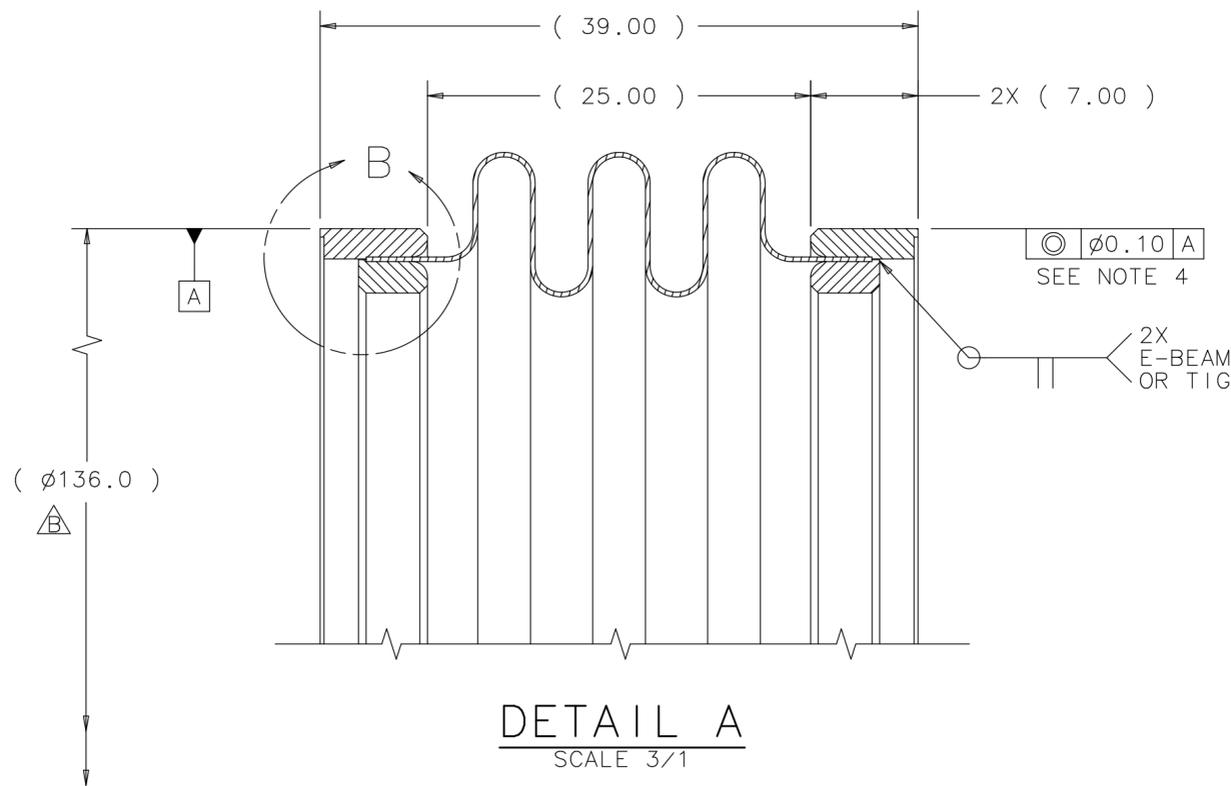
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2

1

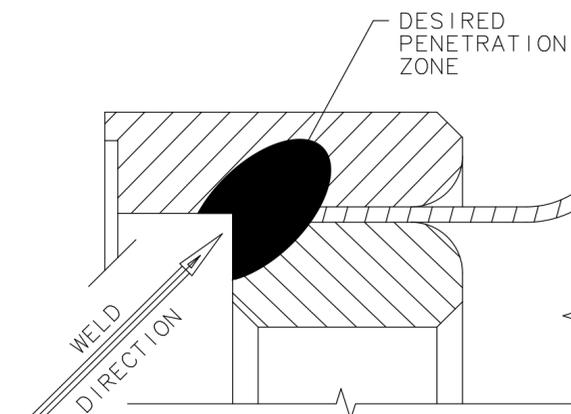
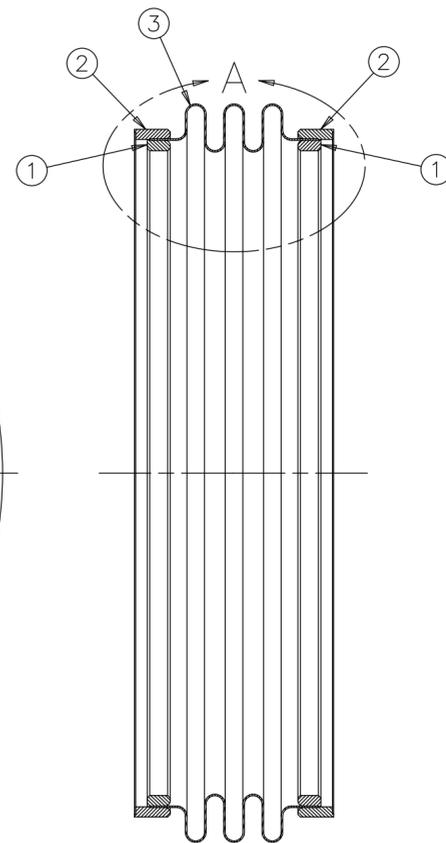
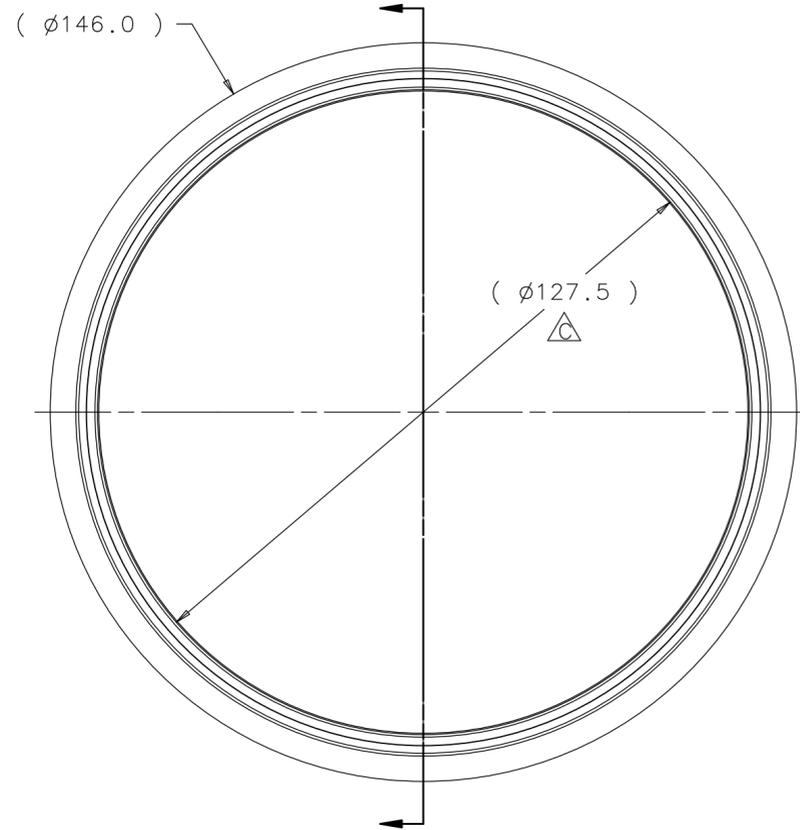
REV	DESCRIPTION	DRAWN	DATE
		APPROVED	DATE
--	NEW RELEASE ER# 7146	L ROSINE	21-JUN-2007
		D MITCHELL	22-JUN-2007
A	ECO #8747: REVISED NOTES #2 & #6: VENDOR'S OPTION	C. GRIMM	30-JUL-07
		D. MITCHELL	30-JUL-07
B	ECO #8823: ADDED NOTE 13 REDESIGNED WELD CUFF, ITEM 2	D. MITCHELL	4-OCT-07
		M. FOLEY	8-OCT-07
C	ECO# 8978 DIMENSION $\phi 127.5$ WAS $\phi 126$	D. MITCHELL	6-FEB-08
		M. FOLEY	7-FEB-08



DETAIL A
SCALE 3/1

NOTES:

- ALL DIMENSIONS ARE IN MILLIMETERS.
- DO NOT BREAK SHARP CORNERS. WELDING REQUIRES SHARP, CRISP EDGES.
- ASSEMBLY MUST BE FREE FROM DIRT, GREASE, OIL AND CHIPS AND PROPERLY PACKAGED TO AVOID DAMAGE DURING SHIPPING.
- ITEM 2 (2 PLACES) MUST BE CONCENTRIC WITH EACH OTHER WITHIN $\phi 0.10$ mm.
- ALL CLEANING AND WELDING PROCEDURES WILL CONFORM TO THE AMERICAN WELDING SOCIETY SPECIFICATION: AWS G2.4/G2.4M: 2007, "GUIDE FOR THE FUSION WELDING OF TITANIUM AND TITANIUM ALLOYS."
- VENDOR'S OPTION: AN ACCEPTABLE PICKLE BATH MAY BE IMPLEMENTED TO CLEAN THE WELD JOINT MATERIAL. USE A RECOMMENDED BATH OF 35 VOL.% NITRIC ACID (70% CONCENTRATION), AND 5 VOL.% HYDROFLUORIC ACID (48% CONCENTRATION). RINSE WITH COLD WATER AND THEN RINSE WITH HOT WATER TO FACILITATE FASTER DRYING. INSURE THAT THE PARTS ARE CLEAN, COMPLETELY DRY, AND OXIDATION FREE PRIOR TO WELDING. CLEAN PARTS MUST BE USED WITHIN 4 HOURS OR STORED IN AN OXYGEN PURGED ENVIRONMENT.
- WELDERS MUST BE QUALIFIED AND CERTIFIED IN TITANIUM WELDING. VERIFICATION DOCUMENTS FOR EACH WELDER MUST BE SUPPLIED TO FERMILAB FOR WRITTEN APPROVAL PRIOR TO ANY PRODUCT WELDING.
- THE VENDOR WILL SUPPLY 1 COMPARABLE WELD SAMPLE TO FERMILAB FOR WRITTEN APPROVAL PRIOR TO ANY PRODUCT WELDING.
- THE VENDOR'S WRITTEN PROCEDURE DESCRIBING THE CLEANING AND WELDING PROCEDURES MUST BE SUPPLIED TO FERMILAB FOR WRITTEN APPROVAL PRIOR TO ANY PRODUCT WELDING.
- INSPECTION OF FINAL PRODUCT WILL BE CONDUCTED AT FERMILAB PRIOR TO ANY ULTRASONIC OR WIRE-BRUSH CLEANING. DO NOT MODIFY THE FINAL WELDS PRIOR TO PRODUCT ACCEPTANCE.
- ALL WELDS TO BE VACUUM TIGHT. NO LEAK SHALL BE DETECTABLE ON THE MOST SENSITIVE SCALE OF A HELIUM LEAK DETECTOR WITH A MINIMUM SENSITIVITY OF 2×10^{-10} ATM. CC/SEC. STABILIZE BELLOWS PRIOR TO VACUUM LEAK TESTING TO AVOID DAMAGE.
- MATERIAL CERTIFICATIONS ARE REQUIRED AND MUST BE INCLUDED WITH SHIPPING. THERE WILL BE NO PRODUCT ACCEPTANCE WITHOUT THE PROPER MATERIAL CERTIFICATIONS.
- ALL WELDS MUST BE PERFORMED INSIDE OF AN ARGON FILLED GLOVEBOX WITH AN OXYGEN COUNT OF 20-30 PPM OR LESS. WELDS MUST BE FREE OF ALL TITANIUM OXIDATION AND DISCOLORATION. E-BEAM WELDING IN A VACUUM ENVIRONMENT IS AN ACCEPTABLE VENDOR OPTION.



DETAIL B
2 PLACES
SCALE 10/1

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ITEM	PART NO.	DESCRIPTION OR SIZE	QTY.
3	MC-457113	BELLOWS	1
2	MB-457115	CUFF BELLOWS	2
1	MB-457116	BACKING RING BELLOWS	2

PARTS LIST			
UNLESS OTHERWISE SPECIFIED	ORIGINATOR	D. MITCHELL	21-JUN-2007
.X	.XX	ANGLES	DRAWN
±	--	±	---
±	--	±	---
±	--	±	---
1. BREAK ALL SHARP EDGES -- MAX.	APPROVED	D. MITCHELL	22-JUN-2007
2. DO NOT SCALE DRAWING.	USED ON		
3. DIMENSIONS BASED UPON ASME Y14.5M-1994	ME-426450		
4. MAX. ALL MACH. SURFACES 1.6	MATERIAL		
5. DRAWING UNITS: METRIC	AS NOTED ABOVE		

FERMI NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY

**SCRF - 3RD HARMONIC ACCEL
HELIUM VESSEL
BELLOWS WELDMENT**

SCALE	DRAWING NUMBER	SHEET	REV
1:1 & AS NOTED	5520.000-MC-457114	1 OF 1	C
CREATED WITH : Ideas12NXSeries		GROUP : TD/SRF-DEVELOPMENT	

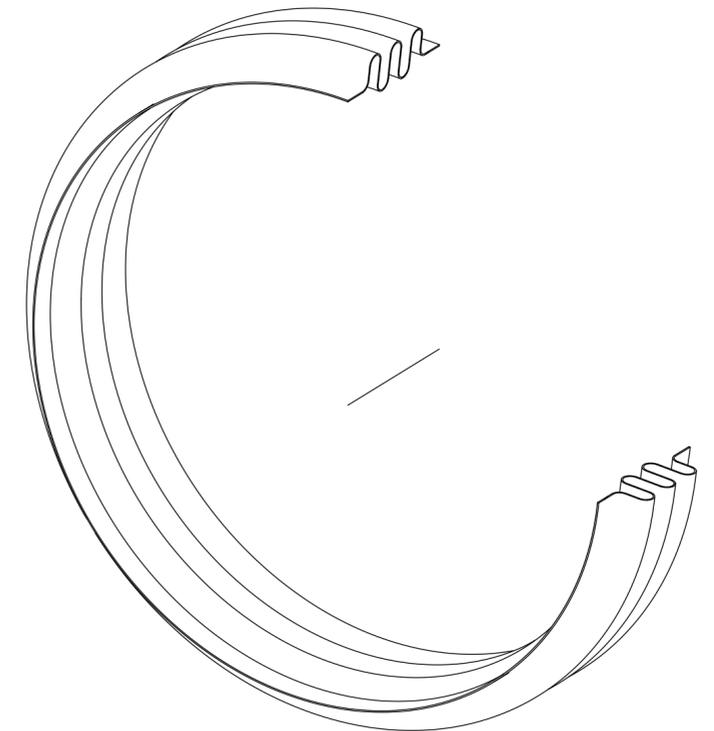
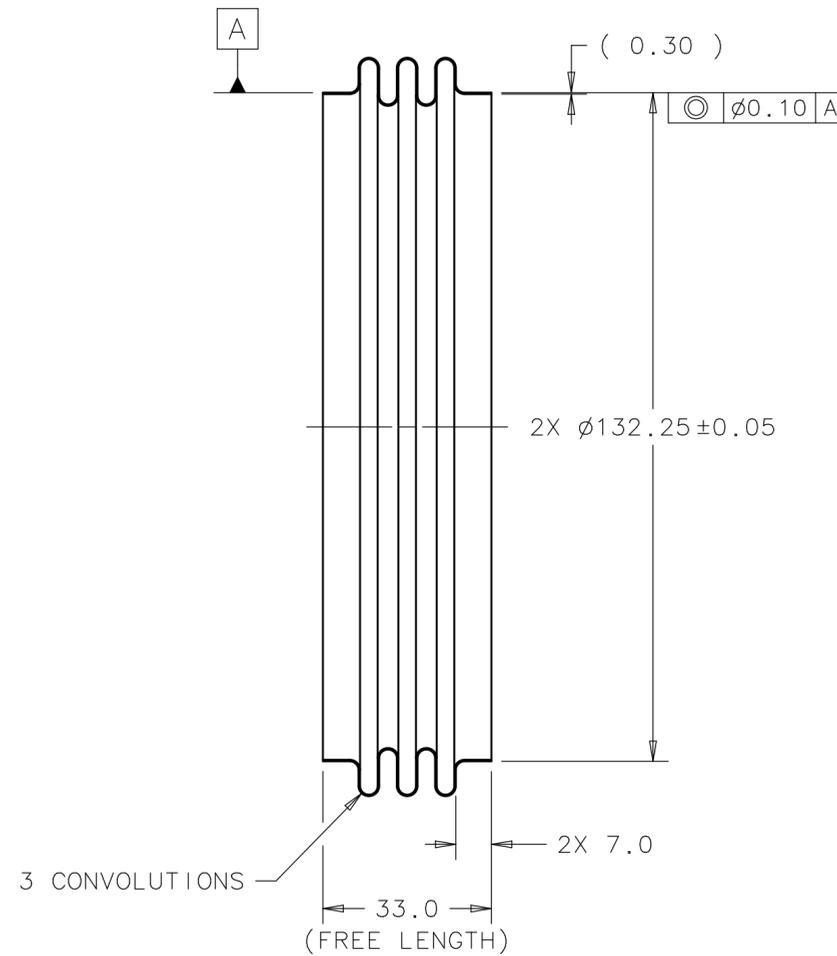
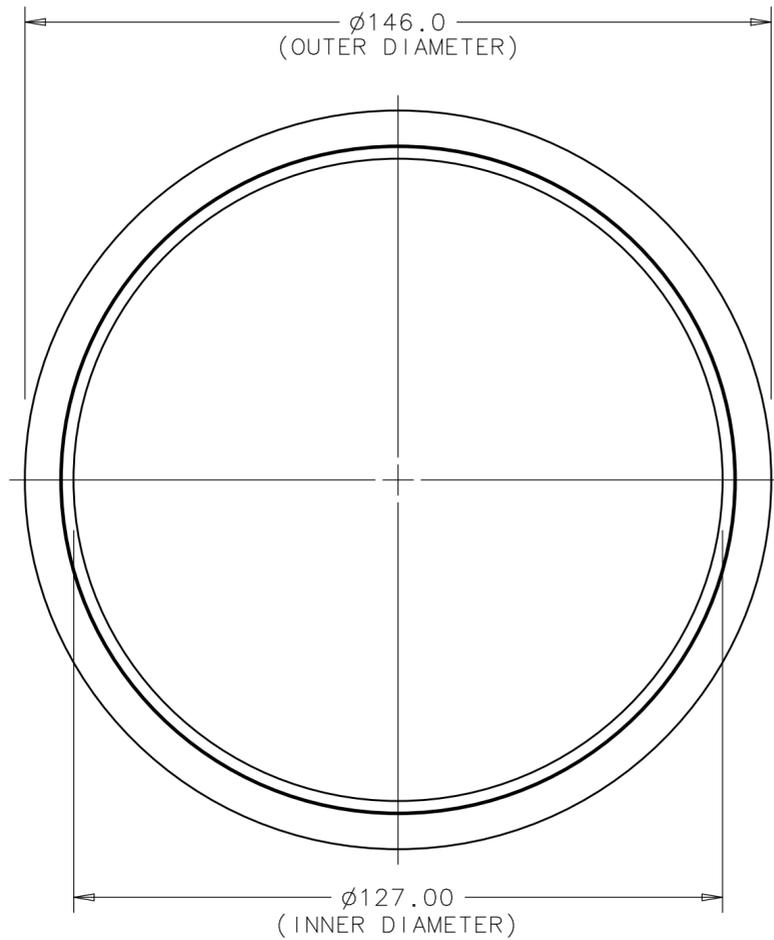
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3

2

1

REV	DESCRIPTION	DRAWN	DATE
		APPROVED	DATE
--	NEW RELEASE ER #7146	W. SHARP D. MITCHELL	21 JUN 07 22 JUN 07



NOTES:

1. FINISH: CLEAN AND DEGREASED.
2. PART TO BE FREE OF ALL BURRS.
3. 3 CONVOLUTIONS ARE REQUIRED. CONVOLUTION DETAILS ARE TO BE SET BY THE SUPPLIER. INNER AND OUTER DIAMETERS ARE TO BE CONTROLLED BY THE DIMENSIONS SHOWN.
4. BELLOWS SHALL BE HYDROFORMED WITH NO CRACKS, HOLES, PITS, DENTS, OR OTHER VISIBLE FLAWS THAT WOULD RENDER THE BELLOWS USELESS FOR CRYOGENIC VACUUM USE.
5. MATERIAL CERTIFICATION IS REQUIRED. PRODUCT ACCEPTANCE IS SUBJECT TO THE RECEIPT OF MATERIAL CERTIFICATION.

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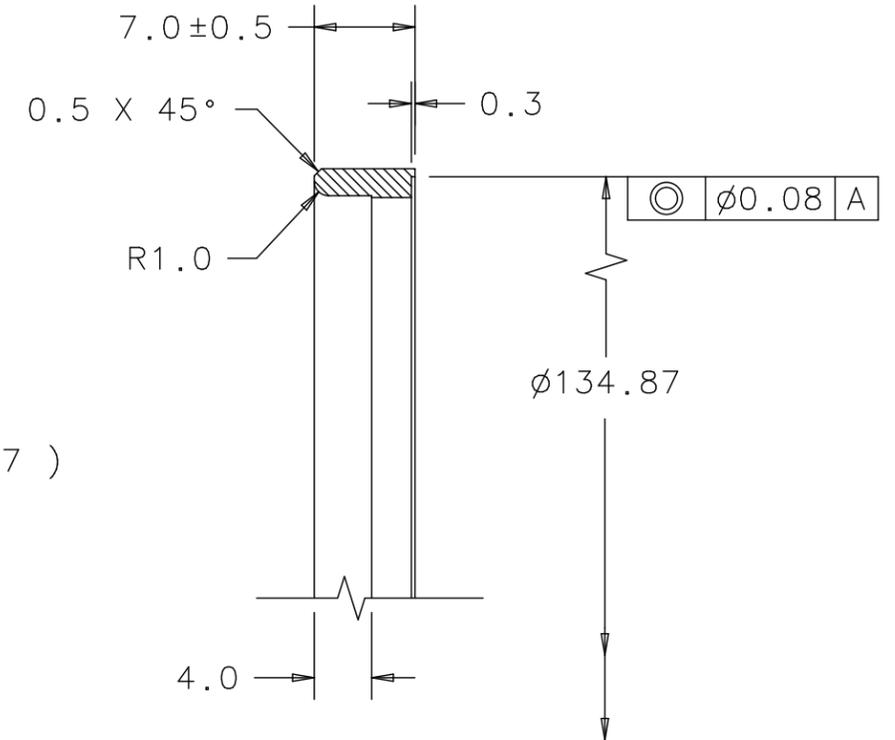
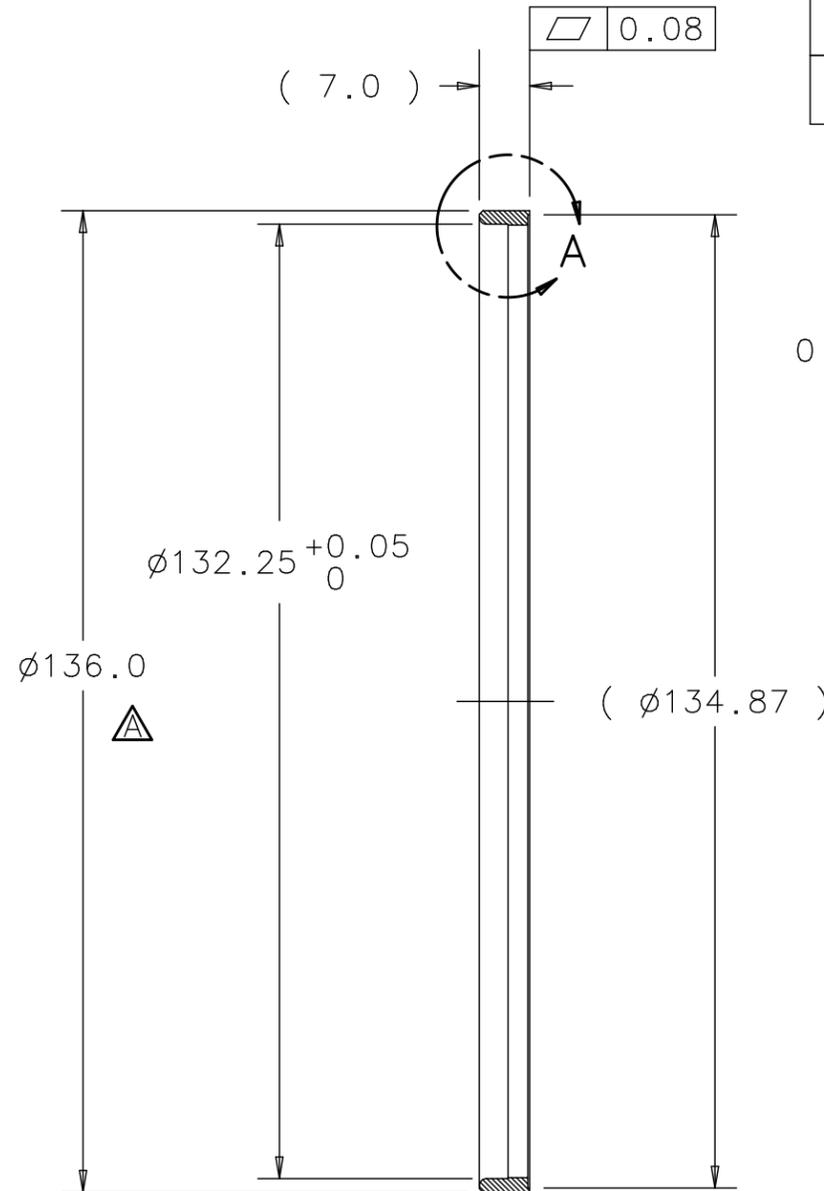
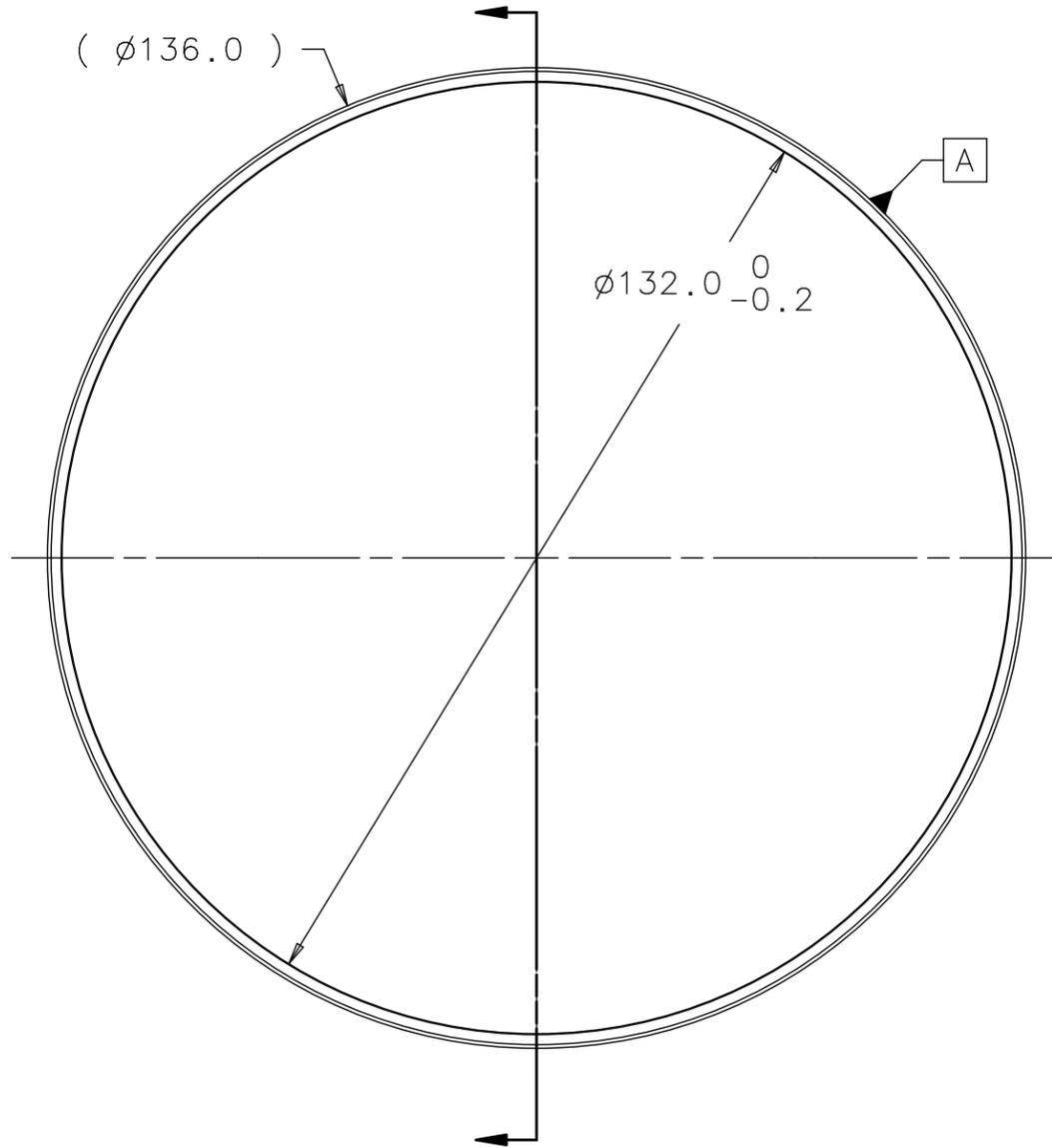
UNLESS OTHERWISE SPECIFIED			ORIGINATOR	D. MITCHELL	21-JUN-2007
X.X	X.XX	ANGLES	DRAWN	W. SHARP	21-JUN-2007
± 0.3	± 0.10	$\pm --$	CHECKED	C.M. GRIMM	22-JUN-2007
1. BREAK ALL SHARP EDGES 0.10 MAX. 2. DO NOT SCALE DRAWING. 3. DIMENSIONS BASED UPON ASME Y14.5M-1994 4. MAX. ALL MACH. SURFACES $1.6 \sqrt{\quad}$ 5. DRAWING UNITS: METRIC			APPROVED	D. MITCHELL	22-JUN-2007
			USED ON		
			MATERIAL	TITANIUM GRADE 2 0.3MM (0.012") THICK SHEET	

 FERMILAB NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY

SCRF - 3RD HARMONIC ACCEL
HELIUM VESSEL
BELLOWS

SCALE 1:1	DRAWING NUMBER 5520.000-MC-457113	SHEET 1 OF 1	REV
CREATED WITH : Ideas12NXSeries		GROUP: TD/DCCIS-DESIGN-COMPUTING	

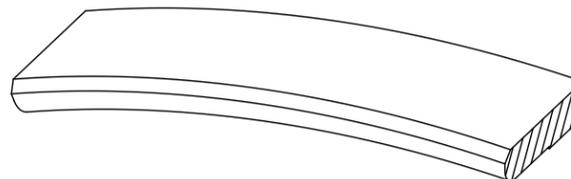
REV	DESCRIPTION	DRAWN	DATE
		APPROVED	DATE
--	NEW RELEASE ER# 7146	L. ROSINE	21-JUN-2007
		D. MITCHELL	22-JUN-2007
A	ECO #8823: WELD PREP ø136.0 WAS ø140.0	D. MITCHELL	4 OCT 07
		M. FOLEY	8-OCT-07



DETAIL A
SCALE 2/1

NOTES (UNLESS OTHERWISE SPECIFIED):

1. FINISH: CLEAN AND DEGREASED.
2. ALL UNITS ARE IN MILLIMETERS.
3. PART TO BE FREE OF ALL BURRS. DO NOT BREAK SHARP EDGES. E-BEAM WELDING REQUIRES SHARP, CRISP EDGES.
4. ALL MACHINE FINISHED SURFACES TO BE 3.2 MICRO-METERS OR BETTER UNLESS OTHERWISE SPECIFIED.



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UNLESS OTHERWISE SPECIFIED			ORIGINATOR	D. MITCHELL	21-JUN-2007
.X	.XX	ANGLES	DRAWN	L. ROSINE	21-JUN-2007
± 0.2	± 0.08	± 1°	CHECKED	C.M. GRIMM	22-JUN-2007
1. BREAK ALL SHARP EDGES -- MAX. 2. DO NOT SCALE DRAWING. 3. DIMENSIONS BASED UPON ASME Y14.5M-1994 4. MAX. ALL MACH. SURFACES 3.2/ 5. DRAWING UNITS: METRIC			APPROVED	D. MITCHELL	22-JUN-2007
			USED ON		
			MATERIAL	TITANIUM GR. 2	

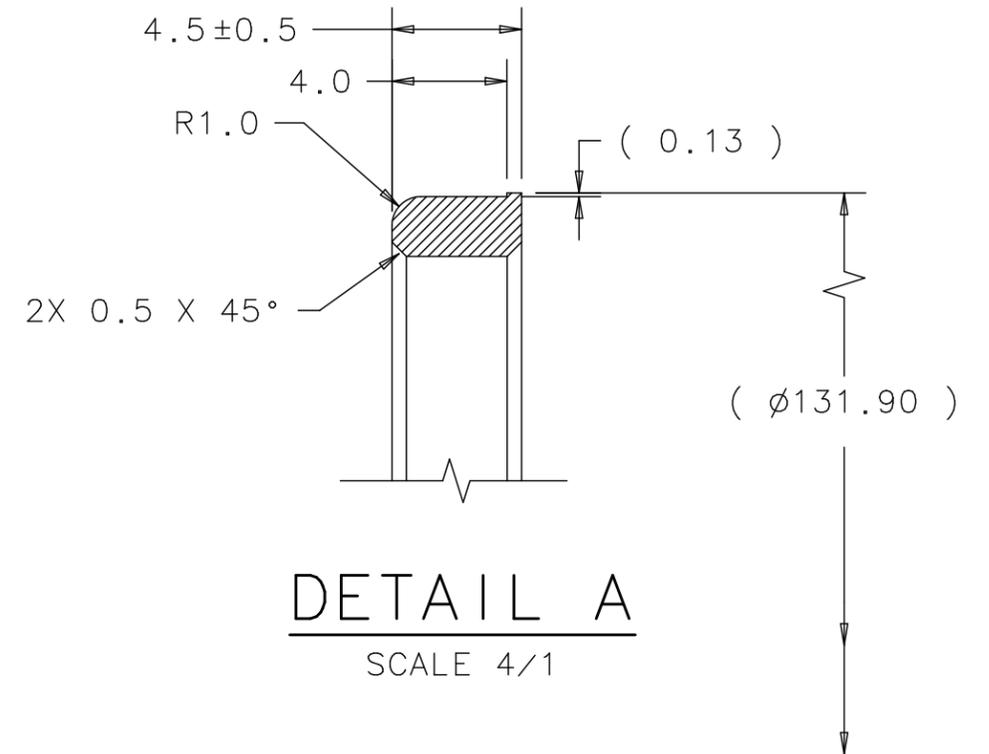
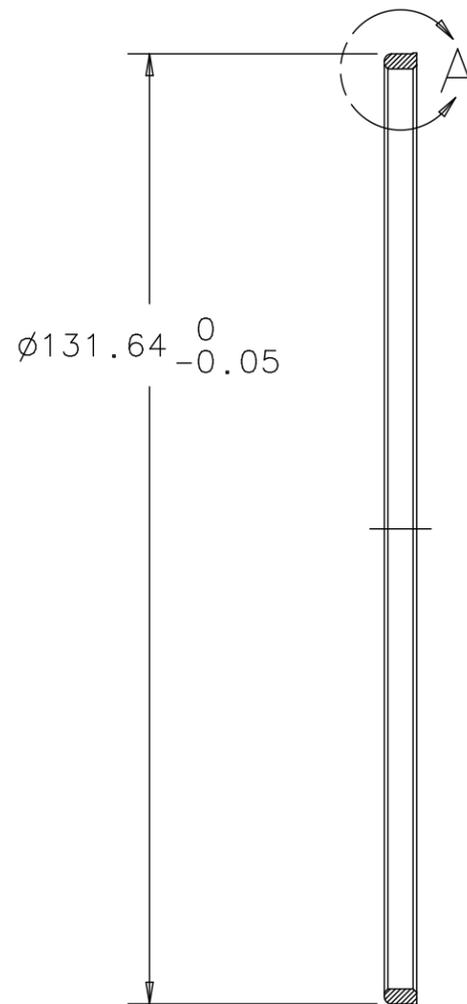
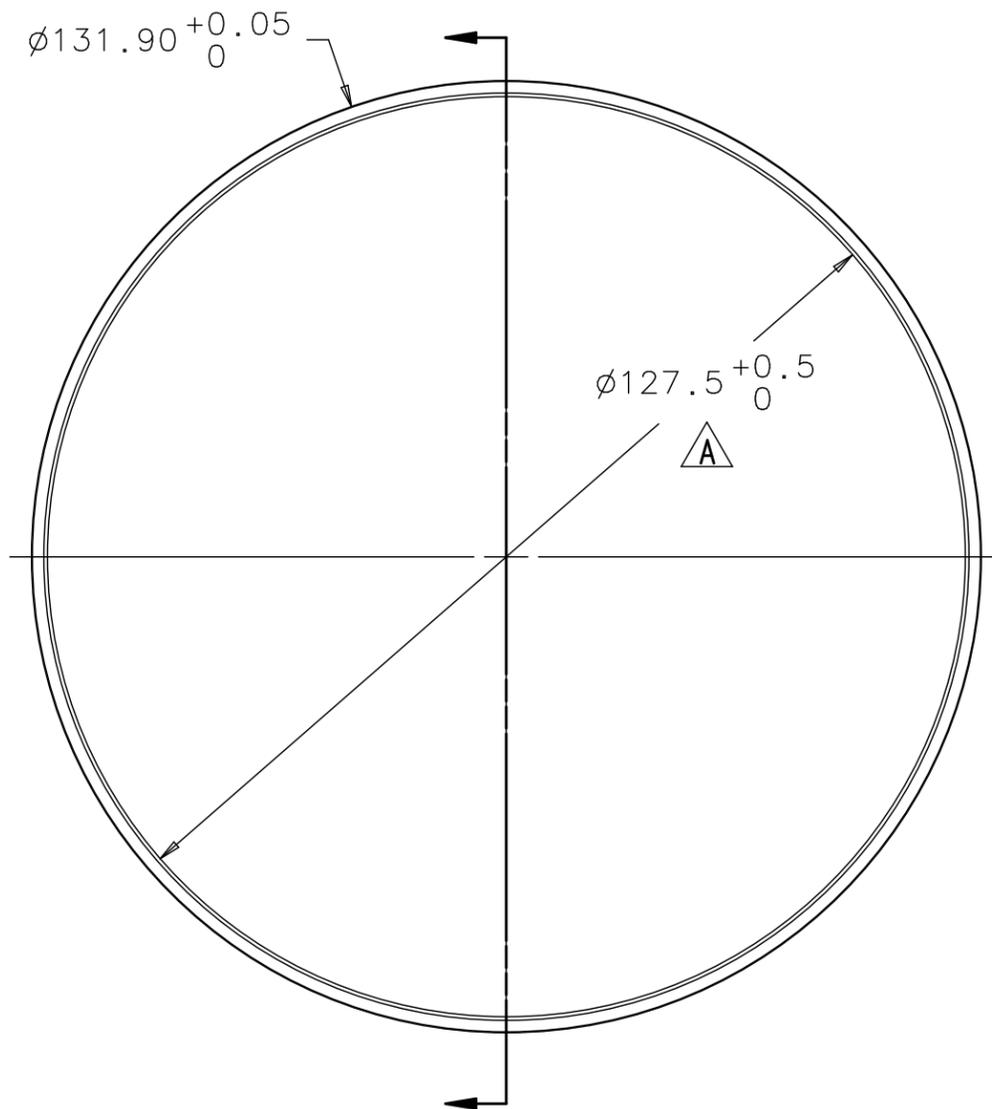


FERMI NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY

**SCRF - 3RD HARMONIC ACCEL
HELIUM VESSEL
CUFF BELLOWS**

SCALE 1:1 & AS NOTED	DRAWING NUMBER 5520.000-MB-457115	SHEET 1 OF 1	REV A
CREATED WITH : Ideas12NXSeries		GROUP: TD/SRF-DEVELOPMENT	

REV	DESCRIPTION	DRAWN	DATE
		APPROVED	DATE
--	NEW RELEASE ER# 7146	L. ROSINE	21-JUN-2007
		D. MITCHELL	22-JUN-2007
A	ECO# 8978 DIMENSION $\phi 127.5$ WAS $\phi 126$	D. MITCHELL	6-FEB-2008
		M. FOLEY	7-FEB-08



DETAIL A
SCALE 4/1

NOTES (UNLESS OTHERWISE SPECIFIED):

1. FINISH: CLEAN AND DEGREASED.
2. ALL UNITS ARE IN MILLIMETERS.
3. PART TO BE FREE OF ALL BURRS. DO NOT BREAK SHARP EDGES. E-BEAM WELDING REQUIRES SHARP, CRISP EDGES.
4. ALL MACHINE FINISHED SURFACES TO BE 3.2 MICRO-METERS OR BETTER UNLESS OTHERWISE SPECIFIED.

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UNLESS OTHERWISE SPECIFIED			ORIGINATOR	D. MITCHELL	21-JUN-2007
.X	.XX	ANGLES	DRAWN	L. ROSINE	21-JUN-2007
± 0.2	± 0.08	$\pm 1^\circ$	CHECKED	C.M. GRIMM	22-JUN-2007
1. BREAK ALL SHARP EDGES -- MAX. 2. DO NOT SCALE DRAWING. 3. DIMENSIONS BASED UPON ASME Y14.5M-1994 4. MAX. ALL MACH. SURFACES 3.2/ 5. DRAWING UNITS: METRIC			APPROVED	D. MITCHELL	22-JUN-2007
			USED ON		
			MATERIAL		
			TITANIUM GR. 2		

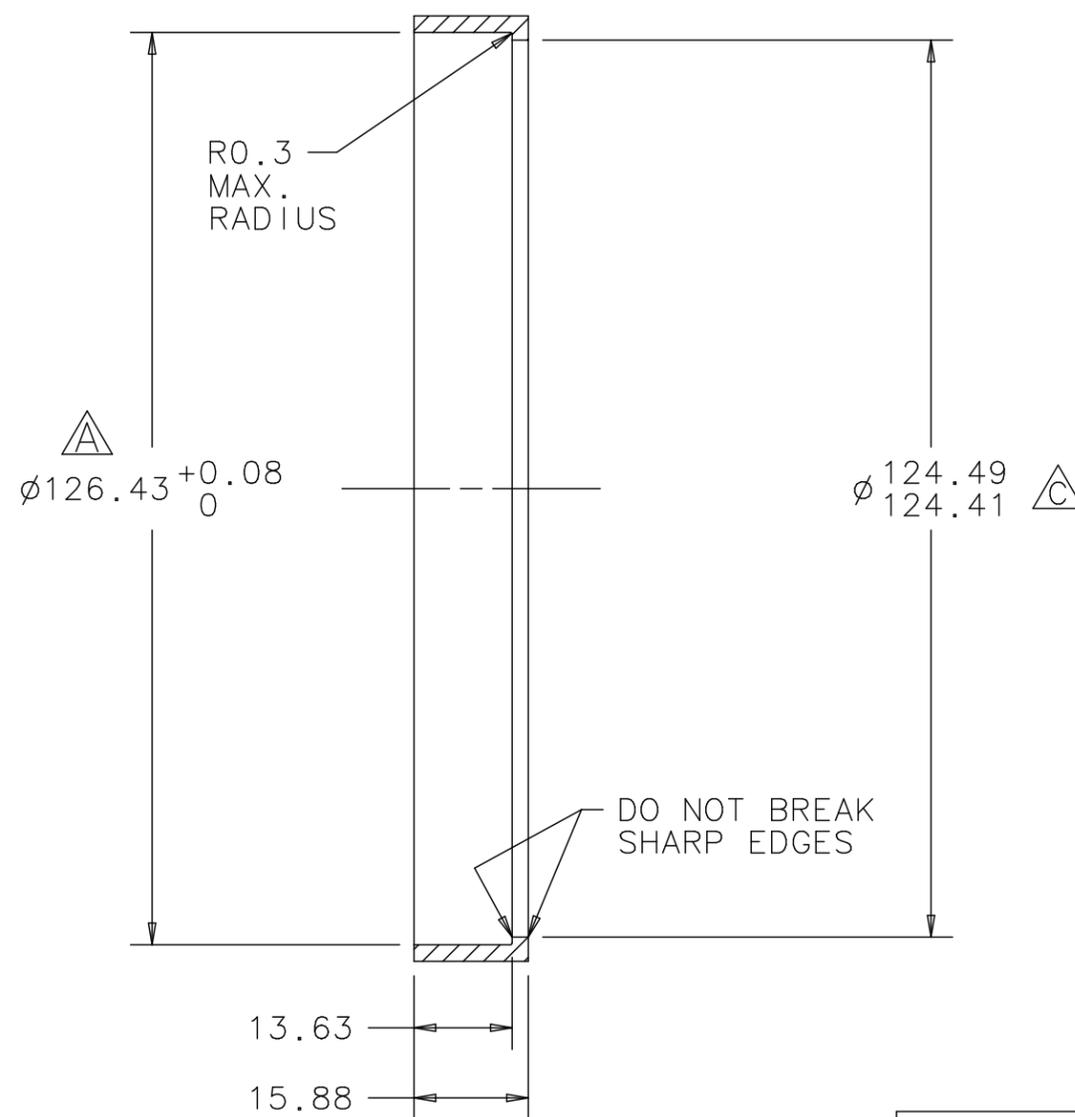
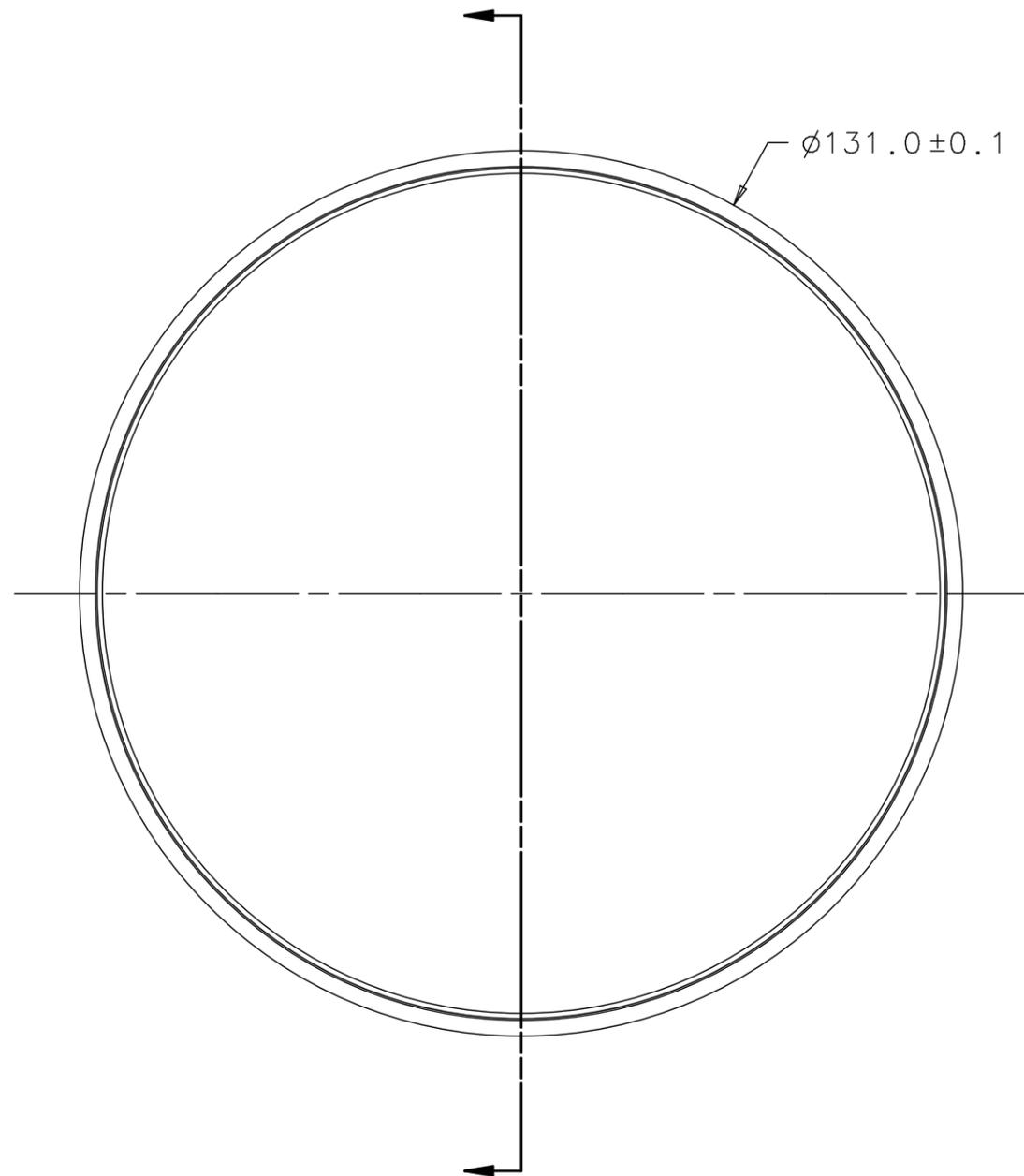


FERMI NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY

**SCRF - 3RD HARMONIC ACCEL
HELIUM VESSEL
BACKING RING BELLWS**

SCALE 1:1 & AS NOTED	DRAWING NUMBER 5520.000-MB-457116	SHEET 1 OF 1	REV A
CREATED WITH : Ideas12NXSeries		GROUP: TD/SRF-DEVELOPMENT	

REV	DESCRIPTION	DRAWN	DATE
		APPROVED	DATE
-	E.R. #7659		
A	E.C.O. #8278 MODIFIED TOLERANCES	D. MITCHELL DVM	3/2/06 3/2/06
B	E.C.O. #8570: RE-DESIGN FLANGE, CHANGE USED ON NUMBER	J. MONTELONGO D. MITCHELL	10/20/06 27-OCT-06
C	ECO #8711: COMPLETE REDRAW MODIFIED TOLERANCE	C. GRIMM D. MITCHELL	1 JUN 07 7 JUN 07



NOTES (UNLESS OTHERWISE SPECIFIED):

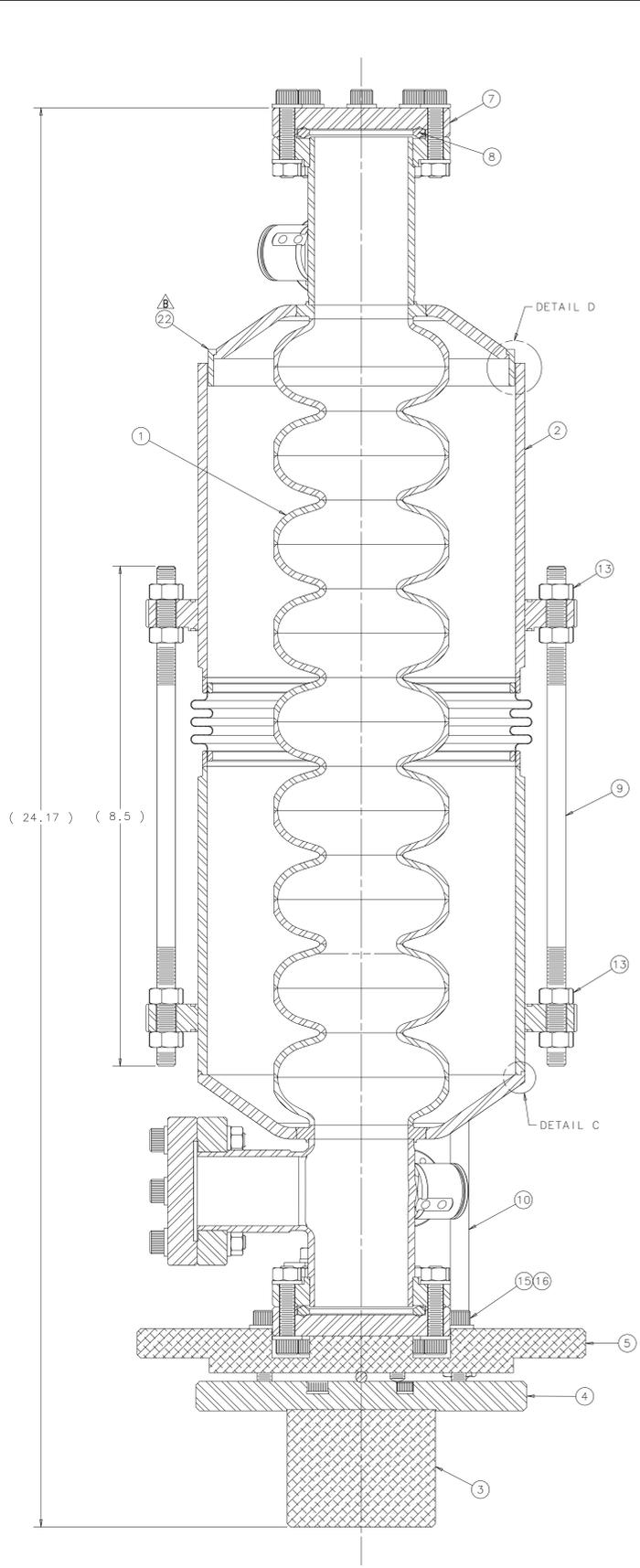
1. FINISH: CLEAN AND DEGREASED.
2. ALL UNITS ARE IN MILLIMETERS.
3. PART TO BE FREE OF ALL SHARP EDGES, CORNERS AND BURRS. A MAXIMUM DEBURRING CHAMFER OF 0.5mm X 45° IS ALLOWED.
4. ALL MACHINE FINISHED SURFACES TO BE 3.2 MICRO-METERS OR BETTER UNLESS OTHERWISE SPECIFIED.

UNLESS OTHERWISE SPECIFIED			ORIGINATOR	D. MITCHELL	
.X	.XX	ANGLES	DRAWN	P. BELKO	1/22/04
± --	± 0.25	± --	CHECKED	D. MITCHELL	6/18/04
1. BREAK ALL SHARP EDGES 0.5 MAX.			APPROVED	D. MITCHELL	6/18/04
2. DO NOT SCALE DRAWING.			USED ON ME-440598 $\triangle B$		
3. DIMENSIONS BASED UPON ASME Y14.5M-1994			MATERIAL TITANIUM GRD. 2		
4. MAX. ALL MACH. SURFACES 3.2 $\sqrt{\text{R}}$					

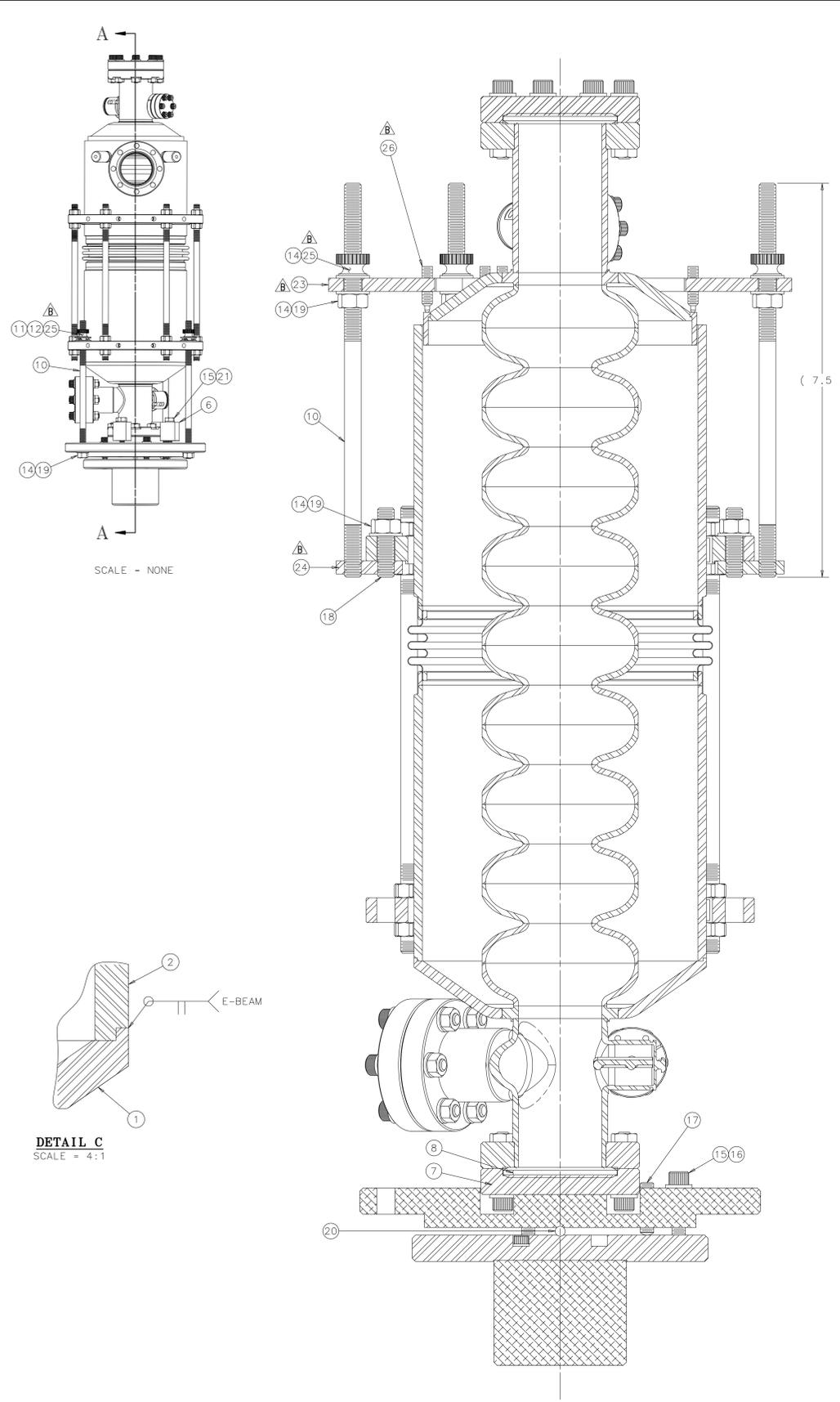
FERMILAB FERMILAB NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY

HELIUM VESSEL WELDMENT W/9 CELL CAVITY
HELIUM VESSEL SHELL WELDMENT
FLANGE, VESSEL END STEPPED

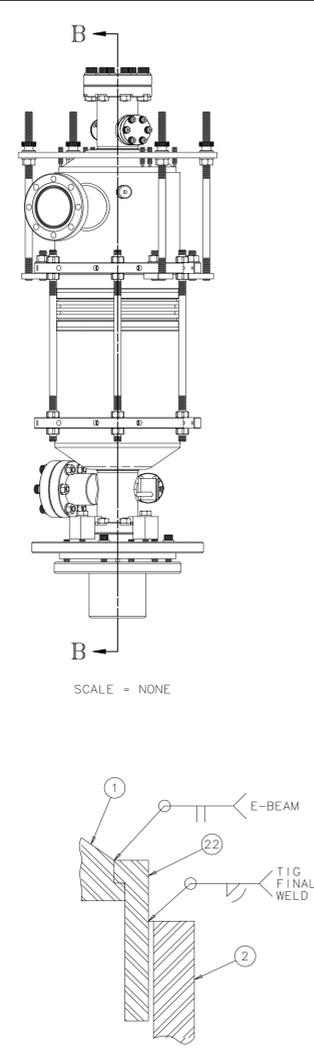
SCALE	FILMED	DRAWING NUMBER	REV.
1:1		5520-MB-426252	C
CREATED WITH I-DEAS 9m3		USER NAME: pbelko	



SECTION A-A
STEP 1 SETUP



SECTION B-B
STEP 2 SETUP



EXPLODED VIEW
SCALE = NONE

DETAIL D
SCALE = 4:1

DETAIL C
SCALE = 4:1

REV	DESCRIPTION	DRAWN	DATE
-	NEW RELEASE - ER #8319	J. MONTELONGO	15-MAR-06
A	ECO #8348 - ADD MATERIAL TYPE TO PARTS LIST	J. MONTELONGO	06-APR-06
B	ECO #8951 MODIFIED ITEM #22 & #10 ADDED ITEMS #23, 24, 25, 26 ADDED EXPLODED VIEW UPDATED PER CHANGES TO #2	D. MITCHELL	12-FEB-08
C	ECO #9075 - ADDED NOTE 6	D. MITCHELL	2-JUN-08

STEPPED FLANGE END RING TO SLIDE OVER CAVITY ASSEMBLY AND SEAT ON SMALL END CAVITY. E-BEAM WELD STEPPED FLANGE TO SMALL END FLANGE. THEN, TIG WELD STEPPED FLANGE TO HE VESSEL PER STEP 2 SET-UP.

HELIUM VESSEL TO SLIDE OVER CAVITY ASSEMBLY AND SEAT ON LARGE END CAVITY FLANGE. E-BEAM WELD THAT LOCATION PER STEP 1 SET-UP.

CAVITY ASSEMBLY TO BE MOUNTED IN VERTICAL WELD FIXTURE.

- NOTES:
- TIGHTEN ALL CLAMPING ROD HARDWARE FINGER TIGHT ONLY! DO NOT USE TOOLS. OVER-TIGHTENING WILL CAUSE DAMAGE TO THE CAVITY, OR AT LEAST, EFFECT CAVITY FREQUENCY.
 - ITEM # 20, "PRECISION BALL", WILL ASSIST WITH THE FIXTURE LEVELING PROCESS, BUT CAN BE OMITTED IF DESIRED. LEVELING AND ALIGNMENT ARE REQUIRED TO CONTROL THE ELECTRON BEAM WELDING PROCESS.
 - AFTER FINAL WELD, ITEM # 9, "THREADED ROD", MUST BE ADJUSTED TO FULLY FIX THE CAVITY LENGTH PRIOR TO SHIPPING AND HANDLING. 3 ADDITIONAL RODS (ITEM #9) AND RELATED HARDWARE MUST ALSO BE ADDED TO THE ASSEMBLY.
 - PRIOR TO WELDING, THE CAVITY WILL BE CLEAN, DRY, EVACUATED OF ALL AIR, AND WILL HAVE ALL PORTS BLANKED-OFF.
 - CAVITY VACUUM VALVE IS NOT SHOWN.
 - ALTERNATIVELY, THE 1-LEG FORMTEIL CAVITY DESIGN, DWG #442200, CAN REPLACE ITEM #1. BOTH STYLE CAVITIES ARE WELDED ONTO A HELIUM VESSEL WITH THE SAME TOOLING AND BY THE SAME PROCEDURE.

ITEM	PART NO.	DESCRIPTION OR SIZE	QTY.
26	COM'L.	SPRING PLUNGER #10-32 X .75" LG. McMASTER-CARR PART #8490A39	8
25	COM'L.	ROUND THUMB NUT - 5/16-18 THD. S.S. McMASTER-CARR PART #95150A180	7
24	MB-442474	BOTTOM BLOCK (ALUMINUM)	4
23	MC-442473	PLUNGER HOLDER (ALUMINUM)	1
22	MB-426252	FLANGE, VESSEL END STEPPED (TITANIUM)	1
21	COM'L.	1/4-20 UNC X 1.750 LG. HEX HEAD SCREW - STAINLESS STEEL	3
20	COM'L.	3/16 DIA. PRECISION BALL S.S McMASTER-CARR PART #9642K35	1
19	COM'L.	HEX NUT 5/16-18 UNC STAINLESS STEEL	11
18	COM'L.	5/16-18 UNC X 1.50 LG. STAINLESS STEEL THREADED ROD	4
17	COM'L.	1/4-20 X 1.0 LG. OVAL PT. SET SCREW STEEL McMASTER-CARR PART #9276S311	3
16	COM'L.	1/4-20 UNC X 1.375 LG - SHCS STAINLESS STEEL	3
15	COM'L.	FLAT WASHER FOR 1/4 SCREW STAINLESS STEEL	6
14	COM'L.	FLAT WASHER FOR 5/16 SCREW STAINLESS STEEL	39
13	COM'L.	HEX NUT 5/16-24 UNF STAINLESS STEEL	24
12	COM'L.	FINGER DISC SPRING WASHER - STEEL McMASTER-CARR PART #9717K52	3
11	COM'L.	FLAT WASHER FOR 5/16 SCREW - ALUM. McMASTER-CARR PART #93286A030	6
10	COM'L.	5/16-18 UNC X 7.50 LG. STAINLESS STEEL THREADED ROD	7
9	COM'L.	5/16-24 UNF X 8.50 LG. STAINLESS STEEL THREADED ROD	6
8	MB-439231	SEAL FOR NW40 FLANGE (ALUMINUM HEX)	2
7	MB-440576	FLANGE BLANKOFF NW40 Nb (53%) Ti	2
6	MB-440564	CLAMP, WELD BENCH (ALUMINUM)	3
5	MB-440562	PLATE-LEVELING, WELD BENCH (ALUMINUM)	1
4	MB-440558	BASE, WELD BENCH (STAINLESS STEEL)	1
3	MB-440560	SHAFT, WELD BENCH (ALUMINUM)	1
2	ME-426450	HELIUM VESSEL SHELL WELDMENT	1
1	ME-426321	CAVITY WELDMENT NIOBIUM 9 CELL	1

PARTS LIST

UNLESS OTHERWISE SPECIFIED	ORIGINATOR	DATE
.XX	J. MONTELONGO	15-MAR-2006
.XXX	J. MONTELONGO	14-MAR-2006
±	D. MITCHELL	21-MAR-2006
±	D. MITCHELL	21-MAR-2006

1. BREAK ALL SHARP EDGES
2. DO NOT SCALE DRAWING.
3. DIMENSIONS BASED UPON ASME Y14.5M-1994
4. MAX. ALL MACH. SURFACES
5. DRAWING UNITS: U.S. INCH

APPROVED: D. MITCHELL

USED ON: MATERIAL: SEE PARTS LIST

FERMI NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY

SCRF - 3RD HARMONIC ACCEL HELIUM VESSEL VERTICAL HE VESSEL WELD FIXTURE

SCALE	DRAWING NUMBER	SHEET	REV
1:1	5525.000-ME-440598	1 OF 1	C

CREATED WITH: Ideas12NXSeries | GROUP: TD/SRF-DEVELOPMENT