Design of the Spherical Interface Between the CC Stanchions and Carriage

Engineering Note #3740.214-EN-103

Issued: August 7, 1987
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Originator: Richard D. Luther

Revised 9/23/87
RDLuther

DETERMINE THE RADIUS OF THE SPHERICAL INTERFACE
BETWEEN THE STANCHION AND THE CARRIAGE OF THE
CC CRYOSTAT.

Engineering Note 8740.2'S-EN-14 contains displacements (skt. 4) for
the support plate on the carriage under the full weight of
the CC calorimeter, determined by Finite Element Analysis (FEA).
(See Note)

These are:

The spherical interface is sized to ensure that the vertical
centerline of the stanchion does not move laterally as the
carriage deflects.

NOTE: NUMBER IN PARENTHESES ABOVE ARE TAKEN FROM
THE RESULTS OF THE LOAD TEST PERFORMED ON
THE CC CARRIAGE; SEE APPENDIX A.

FIND R SUCH THAT THE
CENTER MOVES $0.0902''$ ($.0635''$)
WHEN ROTATED 0.2083° ($.147^\circ$)

$$\sin \alpha = \frac{.0902}{R}$$

$$R = \frac{0.0902''}{\sin(.2083^\circ)}$$

$$= 24.814''$$

$$\text{USE } R = 24 \frac{13}{16}''$$

$$\frac{.0635}{.00257}$$

$$24.71''$$

$$\text{USE } R = 24 \frac{11}{16}''$$

REVISED
9/23/87
RDL:thor

CURRENT DESIGN CALLS FOR AN OVERALL HEIGHT OF 1.538" FOR THE 2 PCS. OTHER DIMENSIONS ARE DETERMINED BELOW AFTER HOLDING THE MINIMUM THICKNESS OF THE CONCAVE PIECE TO $\frac{3}{8}$ ".

JD, CW. DO DETECTOR
 9-21-87 CENTRAL CALORIMETER SUPPORT
 BK 0075-1 CRADLE WELDMENT LOAD TEST
 LOCATED AT LAB A

FOR INFORMATION ON LOAD TEST SETUP
 SEE DRAWING # 3740-MD-123703

PERSON IN CHARGE IS RICK LUTHER EXT 2322
 PAGE # 781

HORIZONTAL MEASUREMENTS AT LOCATIONS SHOWN
 ON P. 3 THIS BOOK.

LOCATION	LOAD (PSIG)	READ	CHANGE FROM 0	LOCATION	LOAD (PSIG)	READ	CHANGE FROM 0
PAD #1	0	6.733		PAD #2	0	4.932	
"	3000	6.807	+ .074"	"	3000	4.831	- .101"
"	6000	6.785	+ .052"	"	6000	4.803	- .129"
"	9000	6.768	+ .035"	"	9000	4.766	- .166"
"				"			
"				"			

NOTE: CRADLE IS UNSTABLE AND TENDS
 TO MOVE DURING LOAD CHANGES.

NOTE: A POSITIVE CHANGE ON PADS 1 & 4 AND
 A NEGATIVE CHANGE ON PADS 2 & 3 DENOTES
 AN OVERALL MOVE IN THE SAME DIRECTION.

HORIZONTAL MEASUREMENTS AT LOCATIONS SHOWN
 ON PAGE 3 THIS BOOK.

LOCATION	LOAD (PSIG)	READ	CHANGE FROM 0	LOCATION	LOAD (PSIG)	READ	CHANGE FROM 0
PAD #3	0	4.956		PAD #4	0	6.717"	
"	3000	4.854	- .102"	"	3000	6.786"	+ .069"
"	6000	4.816	- .140"	"	6000	6.776"	+ .059"
"	9000	4.776	- .180"	"	9000	6.774"	+ .057"
"				"			
"				"			

JD,CW

9-21-87

BK 0075-1

SUPPORT CRADLE LOAD TEST CONTINUED
FROM P. 2 THIS BK

FRONT VIEW

9/22/87

J.D. CW SUPPORT GRADE LOAD TEST CONTINUED
 9-21-87 FROM P. 3 THIS BK.
 BK 00 75-1

LOCATION	PSIG	B.S.	H.I.	F.S.	HEIGHT	CHANGE FROM 0	REMARK
BENCH MK	0	44.145	45.145		1.000		FIRST SET OF READINGS
PAD #3 A	0			.580	44.565		A RANDOM
B	0			.505	44.640		B.M. ASSIGNED
C	0			.664	44.481		1.000" FOR
PAD #2 A	0			0.787	44.358		SIMPLICITY
B	0			0.850	44.295		LOCATED ON
C	0			1.007	44.138		FLOOR.
BENCH MK	0			44.146	.999		
BENCH MK	0	43.202	44.202		1.000		
PAD #1 A	0			1.274	42.928		
B	0			1.338	42.864"		
C	0			1.190	43.012"		
PAD #4 A	0			1.117	43.085"		
B	0			1.061	43.141"		
C	0			0.890	43.312"		
BM	0			43.202	1.000"		
BM	3000	43.203	44.203		1.000		CHANGE PSIG
PAD #1 A	3000			1.131	43.072"	+.144"	
B	3000			1.211	42.992"	+.128"	
C	3000			1.096	43.107	+.095"	
PAD #4 A	3000			0.932	43.271	+.186"	
B	3000			0.850	43.353	+.212"	
C	3000			0.713	43.490	+.178"	
BM	3000			43.201	1.002		
BM	3000	44.146	45.146		1.000"		
PAD #3 A	3000			0.817"	44.329"	-.236"	
B	3000			0.738"	44.408"	-.232"	
C	3000			0.827"	44.319"	-.162"	
PAD #2 A	3000			1.101"	44.045"	-.313"	
B	3000			1.175"	43.971"	-.321"	
C	2000			1.269"	43.877"	-.261"	
BM	3000			44.146	1.000		
BM		44.146	45.146"		1.000"		
PAD #3 A	6000			0.910"	44.236"	-.337"	CHANGE PSIG
B	6000			0.828"	44.318"	-.322"	
C	6000			0.898	44.248"	-.233"	
PAD #2 A	6000			1.187	43.959	-.397"	
B	6000			1.257	43.889	-.406"	
C	6000			1.326	43.820	-.372"	

OK
 9/22/1981

JD, CW

9-21-87

SUPPORT CRADLE LOAD TEST

CONTINUED FROM R.4 THIS BK.

BK 00 75-1

MARK	LOCATION	PSIG	B.S.	H.I.	F.S.	HEIGHT	CHANGE FROM 0	REMARK
	BM	6000			44.145	1.001"		
1 SET	BM	6000	43.201	44.201		1.000		
2 READINGS	PAD #1 A	6000			1.158	43.043	+ .115"	
INDUCTION	B	6000			1.232"	42.969	+ .105"	
ASSIGNED	C	6000			1.109"	43.092	+ .080"	
"FOR	PAD #4 A	6000			0.953"	43.248"	+ .163"	
ACTIVITY	B	6000			0.869"	43.332"	+ .191"	
TESTED ON	C	6000			0.723"	43.478"	+ .166"	
OR	BM	6000			43.203"	.998"		
	BM	9000	44.146	45.146		1.000		CHANGE PSIG
	PAD #2 A	9000			1.305	43.841	- .517"	T.O. MAXIMUM
	B	9000			1.371	43.775	- .520"	LOAD
	C	9000			1.415	43.731"	- .407"	
	PAD #3 A	9000			1.006	44.140	- .425"	
	B	9000			0.926	44.220	- .420"	
	C	9000			0.972	44.174	- .307"	
	BM	9000			44.149	.997"		
	BM	9000	43.203	44.203		1.000		
4- PSIG	PAD #1 A	9000			1.184	43.019	+ .091"	
	B	9000			1.256	42.947	+ .083"	
	C	9000			1.129"	43.074	+ .062"	
	PAD #4 A	9000			0.960	43.243	+ .158"	
	B	9000			0.870	43.333	+ .192"	
	C	9000			0.722	43.481	+ .169"	
	BM	9000			43.202	1.001		
	BM	0	43.202	44.202		1.000		RETURN TO
	PAD #1 B	0			1.313"	42.889	+ .025	0 PSIG
	PAD #4 B	0			1.014"	43.188	+ .047	SECOND SET
	BM	0			43.203	.999		OF READINGS
	BM	0	44.147	45.147		1.000		
	PAD #2 B	0			0.954	44.193	- .102"	
	PAD #3 B	0			0.592"	44.555	- .085"	
	BM	0			44.146	1.001		
	BM	6000	44.146	45.146		1.000		CHANGE PSIG
	PAD #2 B	6000			1.320"	43.826	- .367	CHANGES
GE PSIG	PAD #3 B	6000			0.869"	44.277	- .278	RELATIVE TO
	BM	6000			44.146	1.000"		SECOND SET
	BM	6000	43.202	44.202		1.000"		OF 0 PSIG
	PAD #1 B	6000			1.211"	42.991"	+ .102	READINGS
	PAD #4 B	6000			0.841	43.361"	+ .173	

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JD, CW
9-21-87
BK 0075-1

SUPPORT CRADLE LOAD TEST CONTINUED
FROM P. 5 THIS BOOK.

STATION	PSIG	BS	HI	FS	HEIGHT	CHANGE FROM 0	REMARKS
BM	6000			43.204	1.998		
BM	9000	43.204	44.204		1.000		
PAD#1B	9000			1.248	42.756	+ .067	CHANGE PSIG
PAD#4B	9000			0.864	43.340	+ .152	
BM	9000			43.203	1.002		
BM	9000	44.149	45.149"		1.000		
PAD#2B	9000			1.392"	43.757	- .436"	
PAD#3B	9000			0.934"	44.215"	- .340"	
BM	9000			44.147	1.002"		

128
9/22/87

150

DOL 9/23/87

$$\text{Avg Kor} = \frac{.00231 + .00283}{2}$$

$$= .00257 \text{ RAD}$$

$$= .147^\circ$$

$$\text{Avg TRANS} = \frac{.0655 + .0615}{2}$$

$$= .0635$$

run 11-7-

PAD 1B

LOAD HT

0 0	42.864
3K .04	42.992
6K .05	42.969
9K .05	42.947
0	42.889
6K	42.991
9K	42.956

1A

HT

47.928
43.072
43.043
43.019

1C

43.012
43.107
43.092
43.074

PAD 2B

LOAD HT

0 0	44.295
3K .01	43.971
6K .12	43.889
9K .16	43.775
0	44.193
6K	43.826
9K	43.757

2A

HT

44.358
44.045
43.959
43.841

2C

44.188
43.877
43.820
43.751

PAD 4B

LOAD HT

0 0	43.41
3K .04	43.353
6K .05	43.332
9K .05	43.333
0	43.381
6K	43.361
9K	43.340

4A

HT

43.355
43.327
43.323
43.323

4C

43.312
43.490
43.478
43.478

PAD 3B

LOAD HT

0 0	44.640
3K .04	44.408
6K .14	44.318
9K .14	44.220
0	44.555
6K	44.277
9K	44.215

3A

HT

44.565
44.329
44.236
44.140

3C

44.481
44.349
44.248
44.170

TRANSLATIONS

$$r = \frac{0.0635}{0.00257} = \underline{\underline{24.71''}}$$