# U.S. NUCLEAR REGULATORY COMMISSION OFFICE OF INSPECTION AND ENFORCEMENT REGION IV

Report No. 71-6698/79-01

Docket No. 71-6698

Licensees: Nuclear Assurance Corporation

24 Executive Park West Atlanta, Georgia 30529 Nuclear Fuel Services, Inc. Attn: Mr. Larry Wiedermann

Post Office Box 124

West Valley, New York 14171

Inspection at: Nuclear Fuel Services, West Valley, New York

Inspection

Conducted: April 19-20, 1979

Inspectors:

. M. McNeill, Contractor Inspector,

Vendor Inspection Branch

5/18/79 Date

Approved by:

D. E. Whitesell, Chief, Components Section I,

Vendor Inspection Branch

5/18/19 Date

Summary

Special Inspection on April 19-20, 1979 (71-6698/79-01)

Areas Inspected: A special inspection of the spent fuel casks dimensional examination was performed as a result of the order to suspend the use of casks under Certificate of Compliance No. 6698. The inspection involved 12 inspector-hours on site by one NRC inspector.

Results: No items of noncompliance or deviations were identified.

#### Details Section

#### A. Persons Contacted

1. Nuclear Assurance Corporation (NAC)

\*R. C. Bonnett, Field Service Technician

\*J. C. Dembo, Cask Design Engineer
H. R. Panter, Cask Design Engineer

\*J. M. Viebrock, Manager On-site Operation

2. Nuclear Fuel Services (NFS)

W. A. Oldham, General Manager

\* .. E. Seitter, QA Engineer

W. Wiedermann, Shipping and Storage Engineer

\*de those present at the exit interview.

#### B. Dimensional Examination

#### 1. Background Information

An order was issued on April 6, 1979, which prohibits the use of model numbers NFS-4 and NAC-1 spent fuel shipping casks. Seven (7) of these casks currently exist, one of which has not completed fabrication. The order required licensees to make actual physical measurements of existing packages (i.e. cask inner shell's bow or straightness and cyality or circularity) in order to demonstrate that the casks are in accordance with the Certificate of Compliance Number 6698. Certificate of Compliance Number 6698 references drawing E10080 which specifies straightness of 0.130 of an inch for the inner shell. The Certificate also references QA plans which reference ASME Code, Class 2, which specifies an ovality tolerance of 0.135 of an inch for the inner shell. NAC designed and procured a special cask cavity measuring tool. This tool consisted of four major parts, A center shaft, two (2) three-legged positioning spiders (top and bottom) and one traveling spider with six (6) dial indicators at 600 positions. The traveling spider is lowered in six (6) inch increments the full length of the sk. Readings were taken by one operator and checked by a secon, sperator. The lower levels were read with the aid of binoculars. After all readings were taken, several random location readings were repeated. NAC documented this activity with a written procedure which also described the calibration of the tool. There were four (4) casks present, NFS-1A, NFS-1B, NAC-4C and NAC-4D. NAC-4E was measured at the fabricators shop, Excelco. NAC-4A and NAC-4B were at the Duke Power Oconee site.

#### 2. Objectives

The objectives were to verify that the dimensional inspection performed by NAC gave assurance the spent fuel casks meet the certificates. The objectives also include verifying that the measurement system was accurate, valid and reliable.

### Method of Accomplishment

The measurement process of all casks was observed by the inspector. This observation included:

- a. Verification that the gages and tools were calibrated,
- Checking the measurement tool after set up in the cask for excessive play and proper set up;
- Surveillance of the measurement activities for compliance to the documented procedure;
- d. Repeating random measurements during the measurement process; and
- e. Review of the data collected.

### 4. Findings

The gages and cask cavity measuring tool was found to have been calibrated currently. The set up was found to have very little play e.g. ± .00005. The NAC personnel complied with to documented procedure. The measurements repeated by the interest of the measurement with NAC measurements. In general, the measurement system was observed to be very accurate e.g. ± .0004. Some operator errors were observed. These errors were of random magnitude and were the result of reading dials through binoculars, background noise, and other various sources. The operator errors were not found at a significant frequency for the work environment. The raw data (See attached) indicated that some of the casks had a bow of about 0.170 to 0.180 of an inch, and others an ovality of about 0.170 to 0.180 of an inch. The raw data is to be reduced and fitted to "a line of best fit" and then submitted to NRC Transportation Branch for evaluation. NAC will have to perform an engineering evaluation of the bow and ovality conditions.

## C. Exit Interview

The inspector met with licensee representatives (denoted in paragraph A) at the conclusion of the inspection on April 20, 1979. The inspector summarized the results of the inspection. The licensee representatives had no comment in response to each item discussed by the inspector.

No.	
Cack Straightness Ovo	1:

PCB-on Stofa

Distance Love   A distant quantities   B   C   D   E   F		NFS-4A Cask	Straightness	ovolity H	casumencests	4.19.79	
## 4.5   .255   .265   .314   .236   .264   .77    ## 4.5   .256   .304   .318   .250   .245   .267    ## 12.5   .256   .304   .318   .250   .245   .267    ## 12.5   .253   .302   .330   .255   .232   .236    ## 13.5   .256   .302   .302   .409   .302   .222   .153    ## 30.5   6   .201   .302   .409   .302   .222   .153    ## 30.5   6   .201   .302   .409   .302   .222   .153    ## 30.5   7   .173   .373   .435   .320   .220   .138    ## 4.5   7   .173   .373   .435   .320   .220   .138    ## 4.5   7   .173   .373   .435   .320   .220   .138    ## 4.5   9   .136   .339   .451   .359   .225   .128    ## 5.4   10   .145   .342   .433   .352   .215   .106    ## 6.0.5   11   .50   .343   .481   .355   .200   .100    ## 6.0.5   11   .172   .331   .481   .355   .200   .100    ## 6.0.5   11   .172   .331   .481   .355   .200   .100    ## 6.0.5   11   .172   .331   .480   .320   .220   .112    ## 7.8   11   .123   .325   .420   .320   .220   .112    ## 7.8   12   .123   .325   .420   .320   .220   .112    ## 7.8   12   .123   .325   .420   .320   .220   .112    ## 7.8   12   .123   .325   .420   .320   .220   .112    ## 7.8   12   .123   .333   .472   .381   .231   .153    ## 10.2   5   .151   .333   .472   .381   .231   .153    ## 10.2   5   .151   .333   .472   .381   .231   .153    ## 10.2   5   .151   .333   .472   .381   .231   .153    ## 10.2   5   .151   .333   .472   .381   .231   .153    ## 10.2   5   .151   .333   .472   .381   .231   .153    ## 13.5   2   .228   .334   .329   .224   .231   .153    ## 13.5   2   .228   .334   .329   .224   .231   .235   .147    ## 13.5   2   .226   .335   .352   .224   .225   .224   .231   .235    ## 13.5   2   .225   .335   .352   .225   .224   .231   .235   .158    ## 13.5   2   .225   .315   .350   .245   .225   .224   .231   .235	Distance from	A disseason	B.	C	_D	E	F.
4.5 1 .255	Top of Cavity	(150°)	(90°)	(30°)	(3300)	(270")	(210°)
6.5 7 256 334 318 250 245 251 236 12.5 3 7.53 302 330 255 232 236 13.5 4 24.5 5 219 308 354 363 227 237 131 305 5 6 201 302 449 302 227 153 36.5 7 113 373 455 325 457 220 153 34.5 7 113 373 455 325 225 128 358 359 225 128 358 359 225 128 358 359 225 128 358 359 225 128 358 359 225 128 359 225 128 359 225 128 359 225 128 359 225 128 359 225 128 359 225 128 359 225 128 359 225 128 359 225 128 359 225 128 359 225 128 359 225 128 359 225 128 359 100 145 242 451 255 255 205 100 145 242 451 255 255 205 100 145 242 451 255 255 205 100 100 100 100 100 100 100 100 100 1	(wiches)						
12.5   3.253   302   350   355   232   236   326   334   326   354   283   227   131   300.5   5   201   322   459   302   227   131   300.5   5   201   322   459   302   220   133   373   476   329   220   133   476   329   220   133   476   329   220   133   476   329   220   133   476   329   220   133   476   329   220   133   476   329   220   133   476   329   225   138   476   329   225   138   476   329   225   138   476   329   225   138   476   329   225   138   476   375   3	→ 4.5 I	.255	. 285	.314	-238	. 264	. 277
12.5   3   253   302   352   255   232   236     18.5   4   246   326   354   263   223   227     24.5   5   219   308   34   283   227   151     30.5   6   201   322   449   302   222   153     36.5   7   113   373   445   320   220   153     42.5   5   145   325   449   322   225   118     48.5   0   136   39   4451   339   225   118     54.5   10   145   242   433   352   255   100     48.5   0   145   242   433   352   255   100     48.5   0   145   242   431   355   269   100     48.5   0   136   312   481   355   269   100     48.5   0   136   312   480   340   212   103     72.5   13   128   351   486   34   208   105     78.5   14   173   325   430   320   212   103     84.5   5   125   373   430   320   212   103     84.5   5   125   373   430   220   112     90.5   1   122   338   470   360   221   112     90.5   1   123   338   470   360   221   113     102.5   13   132   316   454   345   223   153     14.5   0   17   340   410   225   222   147     170.5   1   195   352   431   255   236   153     144.5   2   17   340   410   225   232   147     170.5   3   195   352   431   255   236   158     132.5   7   120   315   350   279   1739   158     132.5   7   120   315   350   255   245   224     142.5   23   245   255   320   245   225     156.5   24   725   725   725   725   725   725   725     156.5   24   725   7	6.5 ?	.250	.324	,318	. 250	, 245	. 251
24.5	12.5 3	,253	302	. 330		. 232	.236
24.5	18.5 4	246	300	354	. 263	. 223	: 207
30.5 6   201   322   469   302   222   153     26.5	24.5 5	219	308	33-1	.783		
26.5 7	30.5 4	. 201	322	,409	302		.153
42.5 4 H5 325 45 129 119  48.5 9 136 339 451 359 225 118  54.5 10 145 342 43 352 215 106  60.5 11 50 73 418 355 20 100  76.5 12 136 332 481 355 20 100  76.5 12 136 332 481 355 20 100  77.5 13 128 331 486 34 20 360 212 108  84.5 15 125 35 318 360 220 112  90.5 1, 122 339 418 352 221 112  90.5 1, 122 339 418 352 221 112  90.5 1, 122 339 418 352 221 112  90.5 1, 123 308 470 300 715 113  102.5 15 151 333 472 348 251 153  103.5 19 151 333 472 348 251 153  114.5 2 172 340 410 226 232 153  126.5 27 208 382 40 410 226 232 158  132.5 71 220 325 330 279 274 253 194  -V 133.5 24 279 315 325 255 245 125 193  144.5 25 245 258 356 329 279 279 139  144.5 25 245 258 356 329 279 279 168  132.5 71 220 325 336 329 279 279 193  144.5 25 245 258 356 329 279 279 193  144.5 25 245 258 356 329 279 279 193  144.5 25 245 258 356 329 279 279 193  144.5 25 245 258 356 329 279 279 193  144.5 25 245 258 356 329 274 255 193  144.5 25 245 258 356 264 255 193  156.5 37 256 265 330 255 265 264 263 276  168.5 29 255 362 265 330 255 245 262  168.5 29 255 361 366 276  174.5 39 255 275 320 274 273  174.5 39 255 275 320 274 273  174.5 39 255 275 320 274 273  174.5 39 275 275 320 275 330 276  168.5 29 255 376 320 274 275 320  168.5 29 255 376 320 274 275 320  168.5 29 255 376 320 274 275 320  168.5 29 255 376 320 275  174.5 39 275 320 376  174.5 39 275 320 376  174.5 39 275 375 320 329 343 320 329  174.5 39 275 329 315  174.5 39 275 329 315  174.5 39 275 329 316  175.5 31 229 314 366 224 255 378  102.5 31 134 315 345 355 349 229 133  102.5 31 134 315 345 355 347 329 313  102.5 31 134 315 345 355 347 329 313  103.5 31 329 313  103.5 31 329 313  103.5 34 329 31  103.5 34 329 31  103.5 34 329 329  103.5 34 329 329  10	36.5 7	.173	323	.436	320		_
48 S 9 136 339 451 359 225 188  54 S 10 145 342 43 352 215 106  60.5 11 50 313 418 355 209 100  9 66 S 12 136 332 481 355 209 102  32 S 13 J28 331 486 34 208 102  32 S 14 123 32 480 340 212 108  84 S 15 125 32 480 340 212 108  84 S 15 125 32 480 320 212 108  84 S 15 125 32 480 320 212 108  90 S 1, 122 339 418 352 221 112  90 S 1, 122 339 418 352 221 112  90 S 1, 122 339 418 352 221 112  90 S 1, 122 339 418 352 221 112  90 S 1, 122 339 418 252 221 112  90 S 1, 122 339 418 252 221 112  90 S 1, 122 339 418 352 221 112  90 S 1, 122 330 470 340 229 122  103 S 18 151 333 452 38 251 153  114 S 2 117 240 410 226 232 147  170 S 21 195 352 451 285 236 153  126 S 21 208 336 390 279 239 168  132 S 2 220 325 330 279 239 168  133 S 2 245 252 193  144 S 25 245 255 350 274 251 194  150 S 16 252 245 350 255 264 252 193  150 S 16 253 245 326 255 330 255 245 245 226  165 S 21 155 37 256 265 330 255 245 262  165 S 21 155 37 256 265 330 255 245 262  165 S 21 155 370 256 265 330 255 245 262  165 S 21 155 370 256 265 330 255 245 262  165 S 21 155 370 256 265 330 255 245 262  165 S 21 155 370 250 255 320 243 263 259  Reproducibility  138 S 31 229 314 366 244 253 178  102.5 31 134 315 455 347 229 133  Reproducibility  138 S 31 229 314 366 264 253 178  Reproducibility  138 S 31 229 314 366 264 253 178  Reproducibility  138 S 31 229 314 366 264 253 178  Reproducibility  138 S 31 229 314 366 347 351 209 133	42.5 3	.45	325	,45)	. 349		
54.5 10	48.5 3	136	,339	.451	.359		
60.5   1   50   3/3   418   355   208   100    76.5   1   126   332   481   355   289   102    72.5   13   128   331   486   34   208   105    78.5   14   123   325   430   340   212   108    84.5   15   125   325   418   352   221   112    90.5   1   123   308   470   340   215   113    102.5   15   137   308   470   340   229   122    103.5   1   151   333   432   348   251   153    114.5   15   152   340   410   128   123   147    120.5   1   125   340   410   128   128    120.5   1   125   340   410   128   128    120.5   1   125   340   410   128   128    120.5   1   125   340   410   128   128    120.5   1   125   340   410   128   128    120.5   1   125   336   336   320   279   123    144.5   2   120   315   330   274   225   194    132.5   2   228   336   320   274   225   193    144.5   25   245   252   355   350   255   245   224    150.5   16   252   255   352   252   245   224    150.5   26   252   255   352   255   320   245   263   276    165.5   27   275   275   275   325   320   274   275   320    174.5   36   275   275   275   275   320   274   275   275    165.5   27   275   275   275   320   274   275   320    Reproducibility (38.5   31   227   251   315   366   242   231   235    174.5   36   755   782   302    Reproducibility (38.5   31   227   137   315   366   242   231   235    174.5   36   755   782   302    Reproducibility (38.5   31   227   137   315   365   349   229   133    102.5   31   127   315   315   355   349   229   133    102.5   31   127   315   315   355   349   229   133    102.5   31   127   315   315   355   349   229   133    102.5   31   127   315   315   355   349   229   133    102.5   31   127   315   315   355   349   229   133    102.5   31   127   315   315   355   349   229   133    102.5   31   127   315   315   355   349   229   133    102.5   31   32   321   347   355   360   360   360    10   300   300   300   300   300    10   300   300   300   300    10   300   300   300    10   300   300    10   300   300   300    10   300   300    10   300   300    10	54.5 10	.145	342	.43	. 352		
136	60.5 11	150	363	.478	: 355		
72.5 13 128 331 486 31. 208 .105  78.5 14 .123 .225 480 .340 .212 103  84.5 15 125 .355 .413 .360 .220 .112  90.5 17 .122 .330 .418 .352 .221 .112  96.5 17 .123 .308 .470 .340 .716 .13  1 102.5 15 .133 .435 .229 .122  103.5 18 .151 .333 .432 .318 .251 .153  114.5 25 .172 .240 .410 .226 .232 .147  170.5 21 .195 .352 .41 .285 .236 .158  126.5 22 .228 .336 .220 .279 .239 .168  132.5 23 .220 .325 .339 .224 .251 .194  - V 133.5 24 .229 .315 .228 .336 .224 .251 .193  1 150.5 16 .252 .255 .352 .251 .252 .193  1 150.5 26 .255 .255 .352 .255 .245 .262  1 162.5 21 .256 .265 .320 .255 .245 .262  1 162.5 21 .256 .265 .320 .255 .261 .239  1 163.5 24 .259 .255 .350 .255 .265 .265  1 164.5 27 .256 .265 .320 .255 .265 .265  1 165.5 24 .255 .255 .350 .255 .265 .265  1 174.5 25 .255 .350 .255 .265 .265  1 174.5 25 .255 .350 .255 .265 .265  1 174.5 25 .755 .255 .350 .255 .265 .265  1 174.5 25 .755 .255 .350 .255 .265 .265  1 174.5 25 .755 .255 .350 .255 .265 .265  1 174.5 25 .755 .255 .350 .255 .265 .265  1 174.5 25 .755 .252 .302 .255 .265 .265  1 174.5 25 .755 .255 .350 .255 .265 .265  1 174.5 25 .755 .255 .350 .245 .262  1 102.5 31 .124 .366 .242 .251 .235  1 102.5 31 .124 .315 .455 .349 .229 .135  1 102.5 31 .124 .315 .455 .349 .229 .135  1 102.5 31 .124 .315 .457 .354 .208 .101	V 66.5 17	136	. 332 .	481	355		
78.5 4 123 325 480 .340 .212 108  84.5 5 125 .325 .418 .360 .222 112  90.5 17 .122 .339 .418 .352 .221 112  90.5 17 .123 .308 .40 .340 .276 .13  / 102.5 13 .137 .316 .454 .349 .229 .122  103.5 19 .151 .333 .432 .388 .251 .158  114.5 5 .172 .240 .410 .226 .232 .147  1170.5 21 .195 .352 .471 .285 .232 .147  1170.5 21 .195 .352 .471 .285 .236 .158  126.5 21 .228 .336 .230 .279 .239 .168  132.5 7 .220 .325 .319 .274 .251 .194  - V 133.5 24 .249 .315 .265 .364 .252 .193 .  144.5 25 .245 .258 .352 .255 .352 .245 .224  150.5 16 .255 .255 .352 .255 .352 .255 .245 .224  150.5 27 .256 .255 .352 .255 .255 .265  116.5 27 .256 .255 .320 .255 .265 .262  165.5 27 .256 .255 .320 .248 .263 .276  165.5 27 .255 .271 .306 .242 .281 .283  Reproducibility  138.5 31 .223 .214 .366 .242 .281 .233  102.5 31 .134 .315 .455 .349 .229 .135  Reproducibility  138.5 31 .223 .314 .366 .242 .253 .158  102.5 31 .134 .315 .455 .349 .229 .135	32.5 13	128	. 351	. 436	36		
84.5 E 125 .75 .418 .360 .220 .112 90.5 F. 122 .330 .418 .352 .221 .112 96.5 17 .123 .308 .40 .360 .765 .13  / 102.5 15 .132 .316 .454 .349 .229 .122 103.5 18 .151 .338 .452 .348 .251 .153 114.5 2 .172 .240 .410 .726 .232 .147 170.5 2 .195 .352 .41 .725 .726 .158 132.5 71 .220 .375 .319 .274 .279 .123 132.5 71 .220 .375 .319 .274 .279 .194 132.5 71 .220 .315 .325 .241 .252 .193 144.5 25 .245 .258 .356 .255 .352 .254 .245 .224 150.5 16 .253 .255 .352 .255 .245 .224 150.5 26 .253 .255 .352 .255 .245 .225 156.5 27 .756 .265 .330 .255 .245 .263 156.5 27 .756 .265 .330 .255 .245 .263 165.5 27 .250 .255 .320 .243 .263 .276 165.5 27 .255 .251 .306 .242 .231 .239  Reproducibility 138.5 31 .229 .114 .306 .242 .231 .239  Reproducibility 138.5 31 .229 .114 .366 .765 .349 .229 .135 102.5 31 .135 .315 .455 .349 .229 .135	78.5 14	.123	. 325	.430	. 360		
90.5 1, 122 339 48 .352 ,221 112 96.5 17 123 308 .4D 360 776 133  / 102.5 15 127 316 .454 349 .229 .122 103.5 17 151 .333 452 38 .251 .153 114.5 2 117 240 .410 .2% .232 .147 170.5 21 195 352 .421 .285 .296 .158 126.5 22 .28 .336 .320 .279 .299 .168 132.5 23 .220 .325 .319 .274 .25 .193 144.5 25 .241 .290 .315 .365 .261 .252 .193 144.5 25 .241 .290 .315 .365 .261 .252 .193 144.5 25 .241 .290 .315 .352 .252 .245 .224 150.5 16 .252 .265 .352 .252 .240 .230 156.5 27 .256 .265 .350 .255 .265 .265 16.5 27 .256 .265 .350 .255 .265 .265 16.5 27 .256 .265 .320 .255 .265 .265 16.5 27 .256 .265 .320 .255 .265 .265 16.5 27 .256 .265 .320 .255 .265 .265 16.5 27 .256 .265 .320 .255 .265 .265 16.5 27 .256 .265 .320 .255 .265 .265 16.5 27 .256 .265 .320 .255 .265 .265 16.5 27 .256 .265 .320 .255 .265 .265 16.5 27 .256 .265 .320 .255 .265 .265 16.5 27 .256 .265 .320 .255 .265 .265 16.5 27 .256 .265 .320 .255 .265 .265 16.5 27 .256 .265 .320 .265 .320 .265 16.5.5 27 .256 .265 .320 .265 .320 .265 16.5.5 27 .256 .265 .320 .265 .320 .265 16.5.5 27 .256 .265 .320 .265 .320 .265 16.5.5 27 .256 .265 .320 .265 .320 .265 16.5.5 27 .256 .265 .320 .265 .320 .265 .265 .265 .265 16.5.5 27 .256 .265 .320 .265 .320 .265 .265 .265 .265 .265 .265 .265 .265	84.5 E	125	. 35	. 478	360		
96.5 17 123 308 40 360 776 18  102.5 13 137 316 A54 349 229 122  103.5 19 151 333 432 318 251 153  114.5 2 172 340 410 226 232 147  170.5 21 195 352 421 1285 236 158  126.5 27 228 326 326 279 129 168  132.5 20 220 325 319 274 259 194  - V 133.5 24 220 315 365 264 252 193 1  144.5 25 245 258 326 255 264 270 1230  156.5 27 256 265 320 255 245 224 1230  156.5 27 256 265 320 255 245 262 193 1  156.5 27 256 265 320 255 245 262 1230  156.5 27 256 265 320 255 245 262 1230  168.5 29 255 265 320 255 245 262 1230  168.5 29 256 265 320 255 245 262 1230  174.5 30 255 252 326 230 276  168.5 29 255 252 320 1230 276  168.5 29 255 255 320 1248 263 276  168.5 29 255 252 320 1248 263 276  168.5 29 255 265 320 242 261 230 1748  174.5 30 255 320 1240 226 230  Reproducibility  138.5 31 229 314 366 264 255 369 229 133  102.5 31 134 315 457 354 209 133	90.5	.122	339	478			
102.5	96.5 17	_123	308	-40			
103.5	/ 102.5 _ 13 .	133		.454	349		
14.5	103.5	. 151	338				
170 S 21 195 352 471 ,285 236 158  126 S 22 288 336 390 279 ,239 168  132 S 23 220 325 339 274 .25 184  - V 135 S 24 ,250 315 365 264 .252 193 .  144 S 25 ,245 .258 352 252 .240 .230  156 S 27 256 265 330 .255 245 .262  162 S 28 123 .255 .350 .255 .245 .262  163 S 29 .255 .255 .360 .242 .261 .282  Reproducibility  138 S 30 .255 .366 .263 .265  Reproducibility  138 S 31 .229 .314 .366 .264 .253 .158  102 S 30 .134 .315 .455 .349 .229 .133  102 S 30 .135 .321 .325 .251 .208 .101	114.5 3		340	.410			
126.5   22   .278   .376   .379   .279   .129   .168     132.5   23   .220   .325   .319   .274   .253   .194     -	1705 2	195	352				
132,5	126.5 22	278	3%	,350	.279		
138.5 24		,220	. 325			1	
144.5   25   ,245   ,258   ,358   ,256   ,245   ,224   ,230   ,255   ,245   ,230   ,230   ,255   ,245   ,245   ,230   ,245   ,	-V 138.5 24	230	. 315	.365			
150.5   16   1253   1255   1352   1252   1240   1230     156.5   27   1256   1265   1320   1255   1245   1262     162.5   28   1263   1255   1320   1243   1263   1276     165.5   29   1250   1271   1306   1242   1231   1239     174.5   30   1257   1282   1302   1264   1253   1253     Reproducibility   136.5   31   1229   134   135   135   135   135   135   135   135   135   135     166.5   13   135   135   135   135   135   135   135   135     166.5   13   135   135   135   135   135   135     166.5   13   135   135   135   135   135     166.5   16   135   135   135   135   135     166.5   16   135   135   135   135     175   135   135   135   135   135     176   136   136   136   136   136     176   136   136   136   136     176   136   136   136   136     176   136   136   136   136     177   186   186   186   186     186   186   186   186   186     187   187   187   187     187   187   187   187     187   187   187   187     187   187   187     187   187   187     187   187   187     187   187   187     187   187   187     187   187   187     187   187   187     187   187   187     187   187   187     187   187   187     187   187   187     187   187   187     187   187   187     187   187     187   187   187     187   187	144.5 25		. 298	758			
156.5 27 256 .765 .330 .255 .245 .262  162.5 28 .263 .255 .320 .748 .763 .276  165.5 29 .25) .711 .306 .242 .731 .239  174.5 30 .755 .282 .302 POOR PRAIL .239  Reproducibility  138.5 31 .229 .314 .366 .264 .253 .178  102.5 30 .134 .315 .455 .349 .229 .133  66.5 .9 .135 .321 .487 .354 .208 .101	150.5 16	253	,265	.352	.252		
162.5 28 .255 .320 .748 .763 .276  165.5 29 .255 .306 .242 .231 .239  174.5 30 .755 .282 .302  Reproducibility  138.5 31 .229 .514 .366 .264 .253 .158  102.5 31 .134 .315 .455 .349 .229 .133  66.5 .3 .175 .321 .487 .354 .208 .101		256	265		. 255		
168.5 29 .25) .271 .306 .242 .281 .283 174.5 30 .755 .282 .302 POOR OPICAL .253 .235 Reproducibility .366 .264 .253 .178 102.5 30 .134 .315 .455 .349 .229 .133 .66.5 .61 .135 .31 .487 .354 .208 .101	162,5 23	1263	255	,320	,748		
Reproducibility  138.5 31 .223 .314 .366 .264 .253 .178  102.5 30 .134 .315 .455 .349 .229 .133  66.5 .51 .135 .331 .487 .354 .208 .101	165.5 29	25)		.300	.242		
Reproducibility  138.5 31 .229 .314 .366 .264 .253 .178  102.5 30 .134 .315 .455 .349 .229 .133  66.5 .31 .135 .321 .487 .354 .208 .101			.282	.302	noch .	minath as	.235
102.5 31 .134 .315 .455 .349 .229 .133 .66.5 .9 .135 .331 .437 .354 .208 .101	Reproducibility				PUUK !	JKIGINAL	
102.5 30 .134 .315 .455 .349 .229 .133 .66.5 .3 .135 .331 .457 .354 .208 .101		. 229	.514	.366	. 264	.253	.158
. 66.5 . 3 . 135 . 331 . 437 . 354 . 208 101	102.5 32			l .		1	
4.0 4.1 204 1 207	665. 3	.135			1		
s and some and a second	4.5 31		. 284	1 313	. 237	. 263	. 270

425 195

4.20.79 R CBurnet (150°) (90°) 330°) (S10°) (300) " Willes ! .317 4.5 ,271 .347 .733 .209 .242 e.5 . 270 .361 ,243 .300 .233 30% 12.5 743 .345 . 293 .249 .242 281 .255 15.5 .343 230 .235 .231 .279 24.5 . 380 .275 .185 .212 30.5 .221 272 .401 .189 .185 291 .195 34.5 .253 .412 .195 328 .170 .186 .251 42.5 .15 .317 .167 43.5 .162 .250 423 . 3/8 .159 .179 . 255 54.5 .131 .214 476 .362 .126 63.5 . 255 416 ,380 100 .244 .122 .096 . 244 409 80.5 . 395 .270 .115 72.5 .093 .232 403 402 .273 .115 F3.5 COL. .212 385 416 .230 .112 84.5 .200 E01. .371 .301 429 090 .193 90.5 .122 .361 439 015. .070 96.5 .123 . 183 361 439 .322 .075 114 : 189 102.5 ,355 ,429 . 325 .007 .127 .19-1 108.5 .360 430 319 063 114.5 211 .149 413 .371 .322 071 120,5 ,372 433 303 .085 .192 134.5 173 .360 420 .313 092 132.5 , 183 .173 .355 .333 329 .110 133.5 .172 185 ,356 .382 .321 .115 144.5 192 350 372 .320 128 150.5 193 .195 346 360 312 132 154.5 -211 ,350 .340 293 128 122.5 .218 216 358 . 285 . 339 .123 13.5 .228 34 210 .319 , 126 272 1745 .213 .230 .320 .122 .330 Percoducibility .183 39.5 171 116 945 126 .201 473 .091 .370 .300 414 .135 310 .750 .193 .163 4.5 .270 ,318 .203 .241

WELD JOINT? Original Summer &

NAC-ID Cack Straightness ! Ovality Measuremore						
Distance from	. 4	e'	c	D ·	F	6
Top of County	(150°)	(90°)	(30°)	(3:300)	(270)	(2:0°)
(meirs)				ン・		1
4.5	.292	,304 ·	.329	.267	.312	324
6.5	309/800	.325	.353 Near	The second secon	,330	.352)
12.5	.209)	.281	.322 WELD	.193)	.269	.300
18.5	.206	.285	.318	.222	,271	.272
24.5	.205	.270	311	.252	.260	.261
30.5	.202	,260	.312	.272	.260	
36.5	.198	.256	.318	.298	.258	.245
42.5	190	.250	.324	, 305	_254	.234
43.5	190	,251	.330	.311	.254	. 232
54.5	. 189	.252	.336	312	. 254	.232
60.5	195	. 249	354	.312	.249	.192
_ 66.5	. 212	,240	.368	.319	.245	
72.5 ->	.209	.235	.370	.320 -	.230 -	
78.5	209	.238	,375	.315	.226	182
84.5	.215	.240	.372	310		181
90.5	.225	,246	.354	.302	.225	.176
96.5	.222	.256	355 *	,300		159
102.5	.228	.262	.343	.295	.222	166
103.5 >	.236 .	.269	.344	.289.	.229	151
114.5	,241	.268	346	,282		.154
1:05	.250	,265	.340	,285	225	150
126.5	.263	.258	,331	,290	.236	.159_
132.5	, 275	.248	,330	.292	.225	.170
138:2	.275	.244	.322	.290	.219	.190
144.5.	.270	.245	.321	.280	.220	.203
150,5	.261	.251	,320	.280	.215	.219
156.5	.253	.260	.320	.265	.215	.225
162.5	.259	.269	. 312	,250	217	240
168.5	.255	, 271	.300	.230	.228	.232
174.5	.222	,265	290		.255	.230
Reproducibility		DNND	OPICINA	.290	.260	,239
144.5	.270	54011	,325	.280	215	220
108.5	.235	.269	.346	.291	.215	,270
72.5	,210	.236	.370	.322	.230	.154
4.5	.292		25.32897	.266	.311	
The second secon		4	72.266411	, 200		1347

Suberceins out	111.05 18	(0)	/ '	Oper ors	יי ב באט מי	C residence
4-20-79 NFS (E) 276 [ ( ) [190 (B) ] Wulick					_	
	- CIPALIP					
NES-4B Cask Straightness Ovolity Measurements						
Distance from	4	B B	- Tovailly .	TO TOTAL TO THE		
Top of Cavity	(150°)	(90°)	(30°)	(230°)	1/2701	1 (2100)
(inches) a	.257	280	.298	.22/	(270°)	(210°)
4.5	. 253	.281	,290	,223		-283
6.5	. 240	,224	.321	.202	.28?	. 286
12.5	.225	.265	.322	.225	.258	.228
18.5	.222	.268	,326	. 256		,269
_24.5	.218	.250	.323	_,268	.262	.260
30.5	.221	. 248	. 324	.229	.273	1358
36.5	.225	,241	.3/8	.283	.225	253
42.5	.232	.223	.314	.280	,280	.256
48.5	-235	.219	.309	.272	.292	.267
54.5	.243	.218	. 281	:261	, 302	
60.5	,250	.202	.221	. 251	,3//	-270
66.5	.265	,185	.251	.245	.315	.3/0
72,5	.275	.175	.221	.236	.332	.275
78.5	, 285	.180	.212	. 221	.327	.282
84.5	,290	_,180	. 200	.199	.337	.304
90.5	.300	181	.188	./23	.345	.319
96.5	,353	.168	.172	.145	.344	.332
102.5 ->	.3/2	.208	.169	.129	.320	.342
103,5	. 36.5	.208	:160	.119	.3/9	.340
	. 375	. 212	.164	.127	.288	.334
1705	.383	-216	. 123	. 140	.27/	.329
126.5	.328	.211	. 138	.150	.262	.320
132,5	.364	. 215	_,212	.160	.250	.31/
138.5	, 3.5/	. 220	.231 -	.120	.261	.290
1445	-345	.236	.245	.172	.250	.268
150.5	,326	.252	.270	.180	- 248	.240
156,5	.3/7	.268	.293	. 196	.248	.2//.
162.5	292	.304	.310	.220	.248	.280
168.5	., 265	,286	.335	.259	,280	. 272
174.5 (174.5-	) . 236	, 255	293	111232	.254	.253
Reproducibility		P	UK UKI	INAL		
138.5	.352	.222	.232		.240 F	.288
102.5	.344	.216	.172	./28 .	.308	.338
4,5	. 252	.279	425	19821	272	.286
			1 425	11.00		

bcc:
AD/RCI (Reinmuth)
IE Files
NMSS:FCMS
NMSS:FCSL
NRR:DPM:QAB
REG. I, II, III, & V
PDR HQS
CENTRAL FILES
WEVETTER, RIV