71-9239

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Our ref: UAM-07-03
Your Ref: USA/9239/AF

January 24, 2007

SUBJECT: CERTIFICATE OF COMPLIANCE NO. 9239 FOR THE MODEL NO. MCC PACKAGE: Submission of Revision 12 to the Safety Analysis Report (SAR) - Supplement

Dear Mr. E. William Brach:

An application request dated September 26, 2006, (Our ref: UAM-NRC-06-011) was submitted for the Certificate of Compliance No. 9239, Model MCC shipping package. Responses were provided to your request for additional information (Your ref: NRC letter from Stuart Brown dated November 9, 2006). This letter provides replacement pages to the SAR that supplement the responses sent on November 11, 2006 (Our ref: UAM-NRC-06-017)..

The response to the RAI included analysis results for the Westinghouse 17X17 STD fuel assembly design at an enrichment of 4.65 wt.% U-235. This information was provided for comparison purposes to demonstrate that the 17X17 OFA fuel assembly is the limiting fuel design at an enrichment of 4.65 wt.% U-235. An increase in enrichment to 4.85 wt.% had been previously approved for the 17X17 STD in the USA/9239/AF Certificate of Compliance, Rev. 10. The computer code input files are included Revision 12 of the SAR in Appendix 6-3 as Table 6-3-25 and Table 6-3-26. The analysis included the annular pellet blanket regions at the top and bottom of the fuel rods. An error that incorrectly identified the enrichment as 4.65 wt.% instead of 4.85 wt.% appeared in the heading of Table 6-3-25. The 4.85 wt.% was used in the actual material input, and the heading has been edited to show the correct enrichment. Replacement pages for A6-3-119 through A6-3-122 in Revision 12 of the SAR with the corrected Table 6-3-25 are provided as an enclosure.

The summary of KENO calculation results provided in Table 6-3-1 has been modified to correctly identify the annular pellet blanket regions in the notes. In addition, each of the results is now associated with a reference to the compute input provided in this Appendix 6-3. Appendix 1-5 of Revision 12 as provided in the response to RAI has also been changed to show the optional annular pellet blanket region length that is consistent with Table 6-3-1. Replacement pages with the correct Table 6-3-1 and all of Appendix 1-5 in Revision 12 are provided as enclosures.

NMSS01

Please direct any questions to Peter Vescovi at (803) 647-3167.

Sincerely,

Peter J. Vescovi
WESTINGHOUSE ELECTRIC COMPANY, LLC
Uranium Asset Management, Regulatory and International Logistics
Transport Licensing and Compliance

Enclosures

Appendix 1-5 pages A1-5-1 through A1-5-8

Table 6-3-1 pages A6-3-7 and A6-3-8

Table 6-3-25 pages a6-3-119 through A6-3-122

cc w/o encls: N. Kent, Manager, Transport Licensing and Compliance
B. Bayley, Manager, Regulatory and International Logistics

By Federal Express: uam-07-3.doc

APPENDIX 1-5
FUEL ASSEMBLY PARAMETERS

FUEL ASSEMBLY PARAMETERS

The attached tables are the fuel assembly parameters for 14X14, 15X15, 16X16, 17X17, and VVER-1000 fuel types to be transported in the MCC fuel shipping container. The parameters indicated are used in the Criticality Analysis section to support uncontained and contained fuel assembly calculations. All parameters are used in the criticality analysis section except for the fuel stack length which is assumed to be infinite except in the 3D calculations performed for square lattice fuel involving IFBA and all VVER-1000 fuel assemblies in containers. Assembly reactivities are provided to indicate the highest reactivity fuel (17X17 W-OFA) to be used in the HAC model for the criticality calculations. The tabulated reactivity values assume an enrichment of 5 wt%, moderation by water to the most reactive credible extent, and close reflection by water on all sides. Fuel assembly cross-sectional views are provided on Westinghouse Drawing 6481E15, Sheet 1 of 1. The assemblies are identified by design origin with location identified for all fuel rods, instrument tubes (IT), and guide tubes (GT or thimbles). The instrument tube is a single tube centrally located and surrounded by the guide tubes.

Table 1-5-1 Fuel Assembly Parameters 14X14 Type Fuel Assembly						
Fuel Assembly Description	**14X14**	**14X14**	**14X14**	**14X14**	**14X14**	**14X14**
Fuel Assembly Type	W-STD	422 V+	W-OFA	CE-1	CE-2	W-SS
Nominal Pellet Diameter	0.3659	0.3659	0.3444	0.3765	0.3805	0.3835
Annular Pellet Inner Diameter	N/A	0.183	0.172	N/A	N/A	N/A
Nominal Clad Thickness	0.0243	0.0243	0.0243	0.0280	0.0260	0.0165
Clad Material	ZIRC	ZIRLO	ZIRC	ZIRC	ZIRC	SS-304
Nominal Clad Outer Diameter	0.4220	0.4220	0.4000	0.4400	0.4400	0.4220
GT Diameter	0.5390	0.5260	0.5260	1.1110	1.1110	0.5355
GT Thickness	0.0170	0.0170	0.0170	0.0380	0.0380	0.0120
GT Material	ZIRC	ZIRLO	ZIRC	ZIRC	ZIRC	SS-304
IT Diameter	0.4220	0.4220	0.3990	1.1110	1.1110	0.5355
IT Thickness	0.0240	0.0240	0.0235	0.0380	0.0380	0.0120
IT Material	ZIRC	ZIRLO	ZIRC	ZIRC	ZIRC	SS-304
Maximum Stack Length	145	145	145	145	145	145
Nominal Assembly Envelope	7.756	7.751	7.756	8.110	8.110	7.756
Kg's ^{235}U/ Assembly	21	21	19	22	23	23
Nominal Lattice Pitch	0.5560	0.5560	0.5560	0.5800	0.5800	0.5560
Assembly K_∞	0.9124	0.9134	0.9359	0.9296	0.9350	0.8859

Notes:

1. Fuel assembly parameters identified on Westinghouse Drawing 6481E15.
2. Non-specified dimensions are units of inches.
3. Optional annular pellet zones, nominally 6.0-inches long, at top and bottom of fuel rod.

Table 1-5-2 Fuel Assembly Parameters 15X15 Type Fuel Assembly			
Fuel Assembly Description	**15X15**	**15X15**	**15X15**
Fuel Assembly Type	W-STD	W-OFA	B&W
Nominal Pellet Diameter	0.3659	0.3659	0.3659
Annular Pellet Inner Diameter	0.183	0.183	0.183
Nominal Clad Thickness	0.0243	0.0243	0.0243
Clad Material	ZIRC	ZIRC	ZIRC
Nominal Clad Outer Diameter	0.4220	0.4220	0.4220
GT Diameter	0.5460	0.5330	0.5330
GT Thickness	0.0170	0.0170	0.0170
GT Material	ZIRC	ZIRC	ZIRC
IT Diameter	0.5460	0.5330	0.5300
IT Thickness	0.0170	0.0170	0.0450
IT Material	ZIRC	ZIRC	ZIRC
Maximum Stack Length	145	145	145
Nominal Assembly Envelope	8.418	8.418	8.528
Kg's ^{235}/U Assembly	24	24	24
Nominal Lattice Pitch	0.5630	0.5630	0.5680
Assembly K_∞	0.9632	0.9615	0.9599

Notes:

1. Fuel assembly parameters identified on Westinghouse Drawing 6481E15.
2. Non-specified dimensions are units of inches.
3. Optional annular pellet zones, nominally 8.5-inches long, at top and bottom of fuel rod.

Table 1-5-3 Fuel Assembly Parameters 16X16 Type Fuel Assembly		
Fuel Assembly Description	**16X16**	**16X16**
Fuel Assembly Type	W-STD	CE
Nominal Pellet Diameter	0.3225	0.3250
Annular Pellet Inner Diameter	0.155	N/A
Nominal Clad Thickness	0.0225	0.0250
Clad Material	ZIRC	ZIRC
Nominal Clad Outer Diameter	0.3740	0.3820
GT Diameter	0.4710	0.9800
GT Thickness	0.0180	0.0400
GT Material	ZIRC	ZIRC
IT Diameter	0.4710	0.9800
IT Thickness	0.0180	0.0400
IT Material	ZIRC	ZIRC
Maximum Stack Length	145	151
Nominal Assembly Envelope	7.763	8.122
Kg's ^{235}U Assembly	22	23
Nominal Lattice Pitch	0.4850	0.5060
Assembly K_∞	0.9055	0.9302

Notes:

1. Fuel assembly parameters identified on Westinghouse Drawing 6481E15.
2. 16X16 CE Fuel Design to be shipped only in MCC-4.
3. Non-specified dimensions are units of inches.
4. Optional annular pellet zones, nominally 6.0-inches long, at top and bottom of fuel rod.

Table 1-5-4 Fuel Assembly Parameters 17X17 Type Fuel Assembly							
Fuel Assembly Description	**17X17**			**17X17**			**17X17**
Fuel Assembly Type	W-STD[5]			W-STD/XL[5]			W-OFA[4]
Nominal Pellet Diameter	0.3225			0.3225			0.3088
Annular Pellet Inner Diameter	0.155			0.155			0.155
Nominal Clad Thickness	0.0225			0.0225			0.0225
Clad Material	ZIRC			ZIRC			ZIRC
Nominal Clad Outer Diameter	0.3740			0.3740			0.3600
Maximum Stack Length	145			169			145
Nominal Assembly Envelope	8.418			8.418			8.418
Kg's ^{235}U Assembly	24			28			22
Nominal Lattice Pitch	0.4960			0.4960			0.4960
	GT1	GT2	GT3	GT1	GT2	GT3	
GT Diameter	0.4820	0.4820	0.4740	0.4820	0.4820	0.4740	0.4740
GT Thickness	0.0160	0.0200	0.0160	0.0160	0.0200	0.0160	0.0160
GT Material	ZIRC	ZIRC	ZIRC	ZIRC	ZIRC	ZIRC	ZIRC
IT Diameter	0.4820	0.4820	0.4740	0.4820	0.4820	0.4740	0.4740
IT Thickness	0.0160	0.0200	0.0160	0.0160	0.0200	0.0160	0.0160
IT Material	ZIRC	ZIRC	ZIRC	ZIRC	ZIRC	ZIRC	ZIRC
Assembly K_∞	0.9541	0.9530	0.9536	0.9541	0.9530	0.9536	0.9644

Notes:

1. Fuel assembly parameters identified on Westinghouse Drawing 6481E15.
2. 17X17 XL Fuel Design to be shipped only in MCC-4.
3. Non-specified dimensions are units of inches.
4. Optional annular pellet zones, nominally 8.5-inches long, at top and bottom of fuel rod.
5. Optional annular pellet zones, nominally 10.75-inches long, at top and bottom of fuel rod.

Table 1-5-5 Fuel Assembly Parameters VVER-1000 Type Fuel Assembly	
Fuel Assembly Description	**VVER-1000**
Nominal Pellet Diameter	0.3088
Annular Pellet Inner Diameter	0.1550
Nominal Clad Thickness	0.0225
Clad Material	ZIRC
Nominal Clad Outer Diameter	0.3600
GT Diameter	0.4740
GT Thickness	0.0160
GT Material	ZIRC
IT Diameter	0.4740
IT Thickness	0.0160
IT Material	ZIRC
Maximum Stack Length	144
Kg ^{235}U Assembly	26
Nominal Lattice Pitch	0.5020
Assembly K_∞	0.9432

Notes:

1. Fuel assembly parameters identified on Westinghouse Drawing 6481E15.
2. VVER-1000 fuel design to be shipped only in MCC-5 containers.
3. Non-specified dimensions are units of inches.
4. Optional annular pellet zones, nominally 10 inches long, at top and bottom of fuel rod.

Table 6-3-1 Summary of KENO Calculational Results					
Assembly Type	**Enrichment wt.%**	**Added Absorbers**	**KENO $k_{eff} \pm \sigma$**	**95/95 w/Bias**	**Reference**
Type A[1]	5.00	None	0.90486 ± 0.00462	0.9204	Table 6-3-2
Type B[2]	4.75	None	0.93449 ± 0.00426	0.9495	Table 6-3-3
	5.00	32 1X IFBA	0.92820 ± 0.00495	0.9455	Table 6-3-4
	5.00	4 Pyrex BA	0.92718 ± 0.00559	0.9442	Table 6-3-5
	5.00	4 WABA	0.92021 ± 0.00498	0.9363	Table 6-3-6
	5.00	4 Ag-In-Cd	0.92521 ± 0.00540	0.9420	Table 6-3-7
	5.00	Optional Gd Plates	0.92602 ± 0.00517	0.9424	Table 6-3-8
Type C[4]	4.80	None	0.92774 ± 0.00431	0.9428	Table 6-3-9
	5.00	24 1X IFBA	0.91739 ± 0.00474	0.9339	Table 6-3-10
	5.00	4 WABA	0.92180 ± 0.00576	0.9391	Table 6-3-11
	5.00	4 Ag-In-Cd	0.90730 ± 0.00517	0.9237	Table 6-3-12
	5.00	Gd Coated Guides	0.90996 ± 0.00495	0.9260	Table 6-3-13
Optimum Moderation Condition					
Type A[1]	5.00	None	0.77578 ± 0.00420	0.7907	Figure 6-3-10
Type B[2]	5.00	None	0.79200 ± 0.00427	0.8070	Table 6-3-14
Type C[4]	5.00	None	0.79158 ± 0.00369	0.8057	Figure 6-3-10
17X17 STD[5]	5.00	None	0.80429 ± 0.00382	0.8186	Figure 6-3-10
Lumped Structure	5.00	None	0.87092 ± 0.00343	0.8847	Table 6-3-15
Fuel Pin Gap Flooding with Annular Fuel Blankets					
Full Water Density Outside the Pins					
Type A[1, 6]	5.00	None	0.9080 ± 0.00241	0.9207	Table 6-3-1
Type B[3, 7]	4.85	None	0.9387 ± 0.0010	0.9475	Table 6-3-25
	5.00	Optional Gd Plates	0.9223 ± 0.00105	0.9334	Table 6-3-26
Type B[2, 8]	4.65	None	0.9382 ± 0.00103	0.9494	Table 6-3-23
	5.00	Optional Gd Plates	0.9335 ± 0.00103	0.9447	Table 6-3-24
Type C[4, 9]	4.80	None	0.9295 ± 0.00100	0.9383	Table 6-3-28
Partial Water Density Outside the Pins					
Type A[1]	5.00	None	0.7482 ± 0.00140	0.7597	Table 6-3-20
Type B[2]	5.00	None	0.7697 ± 0.00165	0.7814	Table 6-3-21
17X17 STD[5]	5.00	None	0.7796 ± 0.00161	0.7913	Table 6-3-22

Table 6-3-1 Summary of KENO Calculational Results (cont.)

Assembly Type	Enrichment wt.%	Added Absorbers	KENO $k_{eff} \pm \sigma$	95/95 w/Bias	Reference
Tightly Packed Fuel Rods					
14x14 CE[10]	5.00	None	0.71372 ± 0.00296	0.7268	Table 6-3-16

Notes:

1. Type A assemblies include all 14x14 and 16x16 designs. Calculations were performed using the 14x14 OFA since this assembly is the most reactive of the Type A assemblies.
2. Type B assemblies include all 15x15 and 17x17 designs. Calculations were performed using the 17x17 OFA since this assembly is the most reactive of all Type B assemblies.
3. Type B assembly applies only to 17x17 STD lattice design.
4. Type C assembly is the VVER-1000 fuel assembly.
5. 17x17 STD assembly was used for calculation since this design has the highest uranium loading of all A and B assembly types.
6. Annular fuel blanket model consists of 6.00 inches annular fuel at top and bottom of rods.
7. Annular fuel blanket model consitsts of 10.75 inches annular fuel at top and bottom of rods.
8. Annular fuel blanket model consists of 8.50 inches annular fuel at top and bottom of rods.
9. Annular fuel blanket model consists of 10.00 inches annular fuel at top and bottom of rods.
10. The calculation was performed using a 19x19 array of this type of fuel rod, which was shown to be the most reactive for a tightly packed lattice.

Table 6-3-25 KENO Input Deck for 17STD XL – 4.85 WT% Enrichment – 10.75-Inch Annular Pellet Zone – MCC Container with No Horizontal Gadolinia Plates

```
#job -jn mcc17xl4.65_10.75inann
#
# mcc 17std xl with 10.75-in annular no horizontal gad plates 4.85wt%
#
#
ln -s /opt/wec/etc/227binlib  ftn51
ln -s /opt/wec/etc/albedos  ftn79
ln -s /opt/wec/etc/weights  ftn80
#
/EOF
title-cask with 17std assembly

read parameters
  tme=180   run=yes   plt=no
  gen=400   npg=1500  nsk=050   lib=29
  xs1=yes   nub=yes
end parameters

read start
  NST=1 XSM=0.00 XSP=21.4173
  YSM=0.00 YSP=21.4173 ZSM=0.00 ZSP=182.88
end start

read mixt  sct=2
mix= 1
' solid uo2 pellet 4.85 w/o (96.5% td, 0% dish)
          1192235     1.15848E-03
          1192238     2.24406E-02
           118016     4.71982E-02
mix= 2
' h2o at 1.00 g/cc in solid pellet gap
           231001     0.066854
           238016     0.033427
mix= 3
' solid zirc fuel rod cladding
         2140302     0.043326
mix= 4
' h2o at 1.00 g/cc in blanket fuel annulus
           151001     0.066854
           158016     0.033427
mix= 5
' annular uo2 pellet 4.85 w/o (96.5% td)
          1192235     1.15848E-03
          1192238     2.24406E-02
           118016     4.71982E-02
mix= 6
' h2o at 1.00 g/cc in annular pellet gap
           341001     0.066854
           348016     0.033427
mix= 7
' annular zirc fuel rod cladding
          3240302     0.043326
mix= 8
' h2o at 1.00 g/cc
            31001     0.066854
            38016     0.033427
```

Table 6-3-25 (cont.) KENO Input Deck for 17STD XL – 4.85 WT% Enrichment – 10.75-Inch Annular Pellet Zone – MCC Container with No Horizontal Gadolinia Plates

```
mix= 9
'  carbon steel for strongback & shell
            36012     4.728898e-4
           315031     5.807008e-5
           316032     6.642906e-5
           325055     3.877064e-4
           326000     8.420119e-2
mix= 10
'  gadolinia oxide absorber (0.02 gm gd2o3/cm2 @ 0.01016 cm thickness)
            48016     9.810529e-3
           464152     1.308071e-5
           464154     1.373474e-4
           464155     9.679722e-4
           464156     1.347313e-3
           464157     1.026835e-3
           464158     1.622008e-3
           464160     1.425792e-3
mix= 11
'  carbon steel sheet for gd absorber
            56012     4.728898e-4
           515031     5.807008e-5
           516032     6.642906e-5
           525055     3.877064e-4
           526000     8.420119e-2
end mixt

read geometry
unit 1
com=" 17std fuel rod - enriched region"
cylinder    1  1    0.40960   186.055  0.0
cylinder    2  1    0.41780   186.055  0.0
cylinder    3  1    0.47500   186.055  0.0
cuboid      8  1  4p0.62992   186.055  0.0
unit 2
com=" 17std guide and instrument tube - enriched region"
cylinder    8  1    0.57150   186.055  0.0
cylinder    3  1    0.61214   186.055  0.0
cuboid      8  1  4p0.62992   186.055  0.0
unit 3
com=" 17std fuel rod - blanket region"
cylinder    4  1    0.19685    27.305  0.0
cylinder    5  1    0.40960    27.305  0.0
cylinder    6  1    0.41780    27.305  0.0
cylinder    7  1    0.47500    27.305  0.0
cuboid      8  1  4p0.62992    27.305  0.0
unit 4
com=" 17std guide and instrument tube - blanket region"
cylinder    8  1    0.57150    27.305  0.0
cylinder    3  1    0.61214    27.305  0.0
cuboid      8  1  4p0.62992    27.305  0.0
unit 7      com='strong back, horizontal'
  cuboid    9 1 25.413 0.0  0.4572  0.0  230.56  0.0
unit 8      com='strong back, vertical'
  cuboid    9 1 0.4572 0.0  24.14   0.0  230.56  0.0
unit 9      com='verticle gad poison plat between assembly'
  cuboid   11 1 0.0889 0.0  18.415  0.0   230.56  0.0
  cuboid   10 1 .09906 -.01016 18.415 0.0 230.56  0.0
```

Table 6-3-25 (cont.) KENO Input Deck for 17STD XL – 4.85 WT% Enrichment – 10.75-Inch Annular Pellet Zone – MCC Container with No Horizontal Gadolinia Plates

```
unit 10     com='rest of strongback and cradle'
  cuboid    8 1 7.1051 0.5149 12.1851 0.5149 230.56  0.0
  cuboid    9 1 7.62   0.0    12.70   0.0    230.56  0.0
unit 11     com='container flanges and bracket'
  cuboid    9 1 1.285  0.0    22.86   0.0    230.56  0.0
unit 12     com='skid angle'
  cuboid    8 1 7.62   0.9652 7.62    0.9652 230.56  0.0
  cuboid    9 1 7.62   0.0    7.62    0.0    230.56  0.0
unit 13     com='middle top clamping assembly'
  cuboid    9 1 33.02  0.0    5.08     0.0   2.5908  0.0
unit 14     com='middle side clamping assembly'
  cuboid    9 1  5.08  0.0    24.120    0.0   2.5908  0.0
unit 15     com='unistrut channel assembly'
  cuboid    8 1 1.799  0.0    3.556   0.7399 230.56  0.0
  cuboid    9 1 2.538  0.0    3.556   0.0    230.56  0.0
unit 16     com='top clamping assembly'
  cuboid    9 1 33.02  0.0    5.08     0.0   5.1816  0.0
unit 17     com='side clamping assembly'
  cuboid    9 1  5.08  0.0    24.120    0.0   5.1816  0.0
unit 18     com='horizontal gad poison plate below assembly, space 3,4,5,6'
  cuboid   11 1 22.225 0.0  0.0889   0.0   21.59  0.0
  cuboid   10 1 22.225 0.0  .09906 -.01016 21.59  0.0
unit 19     com='horizontal gad poison plate below assembly, space 2 and 7'
  cuboid   11 1 22.225 0.0  0.0889   0.0   53.34  0.0
  cuboid   10 1 22.225 0.0  .09906 -.01016 53.34  0.0
unit 20     com='horizontal gad poison plate below assembly, space 1 and 8'
  cuboid   11 1 22.225 0.0  0.0889   0.0   57.33  0.0
  cuboid   10 1 22.225 0.0  .09906 -.01016 57.33  0.0
global
unit 21
com=" 17std assembly in cask "
array 1   0.0       0.0       0.0
cuboid      8  1    43.026   -3.1    31.586    -38.56    232.29   0.0

hole        7  -0.4572  -0.4572   0.0
hole        8  -0.4572   0        0.0
hole        9  -0.8979   0.8128   0.0
hole       10  24.958   -18.237   0.0
hole       11  41.74    -12.7     0.0
hole       12  30.48    -38.55    0.0
hole       13  -1.443    26.50    0.0
hole       14  26.50     2.367    0.0
hole       16  -1.443    26.50    63.93
hole       17  26.50     2.367    63.93
hole       16  -1.443    26.50    130.5
hole       17  26.50     2.367    130.5
hole       16  -1.443    26.50    177.7
hole       17  26.50     2.367    177.7
hole       16  -1.443    26.50    224.9
hole       17  26.50     2.367    224.9
hole       15  -2.997    20.87    0.0
cuboid      9  1    43.25    -3.1    31.81    -38.78    232.51   0.0
end geom
```

Table 6-3-25 (cont.) KENO Input Deck for 17STD XL – 4.85 WT% Enrichment – 10.75-Inch Annular Pellet Zone – MCC Container with No Horizontal Gadolinia Plates

```
read array
ara=1 nux=17 nuy=17 nuz=2 com=" 17std assembly "
loop
 1   1  17   1     1  17   1     1   1   1
 2   3  15   3     6  12   3     1   1   1
 2   4  14  10     4  14  10     1   1   1
 2   6  12   3     3  15  12     1   1   1
 3   1  17   1     1  17   1     2   2   1
 4   3  15   3     6  12   3     2   2   1
 4   4  14  10     4  14  10     2   2   1
 4   6  12   3     3  15  12     2   2   1
end loop
end array

read bounds
all=specular
end bounds

read plot
  ttl='box slice through cask'
  pic=box
  nch='0ugiugiabcdefhjklmnop.'
  xul= -4.0     yul= 30.1     zul= 66.52
  xlr= 45.0     ylr= -40.0    zlr= 66.52
  uax=1.0    vdn=-1.0   nax=130 end
  ttl='box slice through cask'
  pic=mat
  nch='0u.z.u.z.sgs'
  xul= -4.0     yul= 30.1     zul= 66.52
  xlr= 45.0     ylr= -40.0    zlr= 66.52
  uax=1.0    vdn=-1.0   nax=130 end
  ttl='box slice through assembly'
  pic=box
  nch='0ugiugiabcdefhjklmnop.'
  xul= 0.0      yul= 20.0     zul= 66.52
  xlr= 20.0     ylr= 0.0    zlr= 66.52
  uax=1.0    vdn=-1.0   nax=130 end
  ttl='mat slice through annular pellet'
  pic=mat
  nch='0u.z.u.z.sgs'
  xul= 1.41     yul= 4.24   zul= 180.0
  xlr= 4.24     ylr= 1.41   zlr= 180.0
  uax=1.0    vdn=-1.0   nax=130 end
  ttl='mat slice through annular pellet'
  pic=mat
  nch='0u.z.u.z.sgs'
  xul= -1.0     yul= 18.0   zul= 180.0
  xlr= -0.5     ylr= 0.0    zlr= 180.0
  uax=1.0    vdn=-1.0   nax=130  ndn=100  end
end plot
end data
end
```