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***CERTIFICATE AND RECORDS OF PNC
FUEL PELLETS AND PIN COMPONENTS
FOR POWER-TO-MELT EXPERIMENT
(HEDL P-E01) IN EBR-II***

November 1978

Tokai Works

Power Reactor and Nuclear Fuel Development Corporation

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2001

November, 1978



Certificate and Records of PNC Fuel Pellets
and Pin Components for Power-to-Melt
Experiment (HEDL P-E01) in EBR-II

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1. General remarks

Uranium-Plutonium mixed oxide pellets and the other components for fuel pins have been fabricated by PNC. These materials are expected to be assembled to three fuel pins by HEDL (Hanford Engineering Development Laboratory) for irradiation test P-E01 in EBR-II. The components includes claddings, end plugs, plenum spacers and springs.

2. Fabrication process of the fuel pellets and claddings

2-1 Fabrication flow sheet of pellets Fig. 2-1

2-2 Fabrication flow sheet of claddings Fig. 2-2

3. Fabrication records of fuel pellets and pin components

3-1 Fuel pellets : 30% PuO₂-UO₂ mixed oxide pellets

3-1-1 Sampling

(1) Lot size and lot number

Lot size of PuO₂-UO₂ powder mixing process 575.9 g

Lot size of sintering 558.8 g

Lot number of sintering 1

(2) Sampling

Samples were taken out at random from the sintering lot for the following examinations.

(a) Plutonium content	2 samples
(b) Impurity (Spectroscopy)	1 sample
(c) Impurity (Chemical analysis)	1 "
(d) O/M ratio	1 "
(e) Volume of volatile gas (Included moisture)	1 "
(f) Ceramography, α -autoradiography, and X-ray diffraction	each 1 "

3-1-2 Methods of examination and analysis

The examination and analysis listed above, were performed by methods which are in the routine work at PNC.

3-1-3 Inspection results

(1) Isotopic composition of plutonium is shown in Table 3-1-1.

(2) Chemical analysis

The analysis results of plutonium content, impurities and O/M ratio in the mixed oxide fuel pellets are shown in Table 3-1-2.

(3) Volume of volatile gas

The volume of volatile gas measured at 1700°C for 30 minutes in vacuum are shown in Table 3-1-2.

(4) X-ray diffraction

The X-ray diffraction chart are shown with lattice constant in Fig. 3-1-1. The chart indicates good homogeneity of UO₂-PuO₂ solid solution.

(5) Macrography

The ceramographies and alpha-autoradiographies of the fuel pellets are shown in Photo. 3-1-1 ~ 3-1-3.

(6) Dimensions and density

The diameter, height and weight of all pellets were measured for determination of geometrical densities. Measured values and calculated densities are listed in Table 3-1-3 ~ 3-1-6.

3-2 Claddings (SUS-316)

3-2-1 Inspection results

(a) Chemical composition

Results of chemical analysis of cladding are shown in Table 3-2-1.

(b) Mechanical properties

The results of mechanical properties are shown in Table 3-2-2.

(c) Metallography

The results of grain size measurement are listed in Table 3-2-2.

Typical micrography of cladding are shown in Photo. 3-2-1.

(d) Dimensions

The results of dimensional measurements are listed in Table 3-2-3.

(e) Non-destructive test

The results of non-destructive test are shown in Table 3-2-4.

3-3 End plugs (Bar) (SUS-316)

(a) Chemical composition

The results of chemical analysis are shown in Table 3-3-1.

(b) Mechanical property

The result of tensile strength is shown in Table 3-3-2.

3-4 Plenum spacers (SUS-316)

(a) Chemical composition

The results of chemical analysis are shown in Table 3-4-1.

(b) Dimensions

The results of dimensional measurements are listed in Table 3-4-2.

3-5 Springs (SUS-304 WPB)

(a) Dimensions

The results of dimensional measurements are listed in Table 3-5-1.

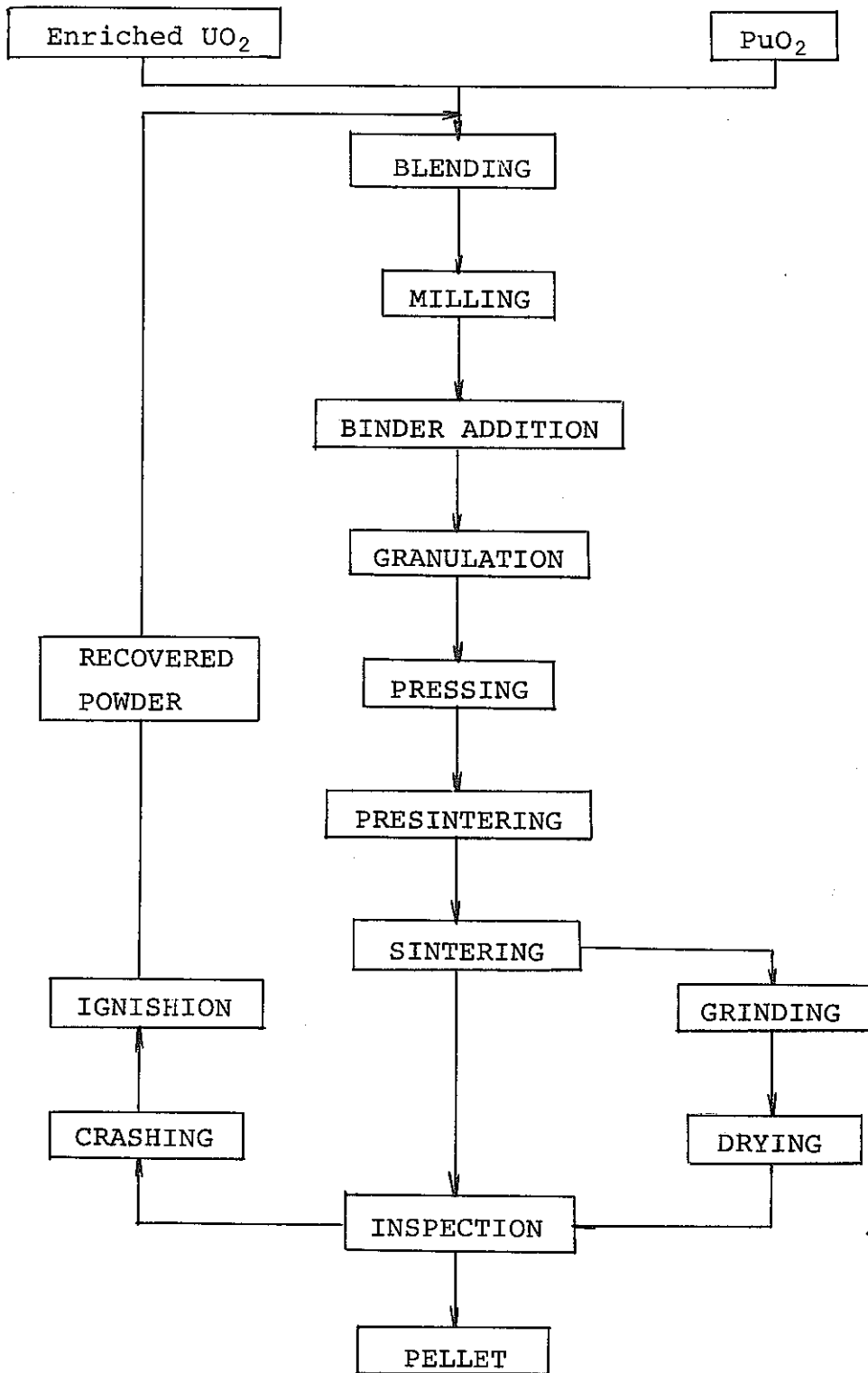


Fig. 2-1 Fabrication Flow Sheet of Pellets

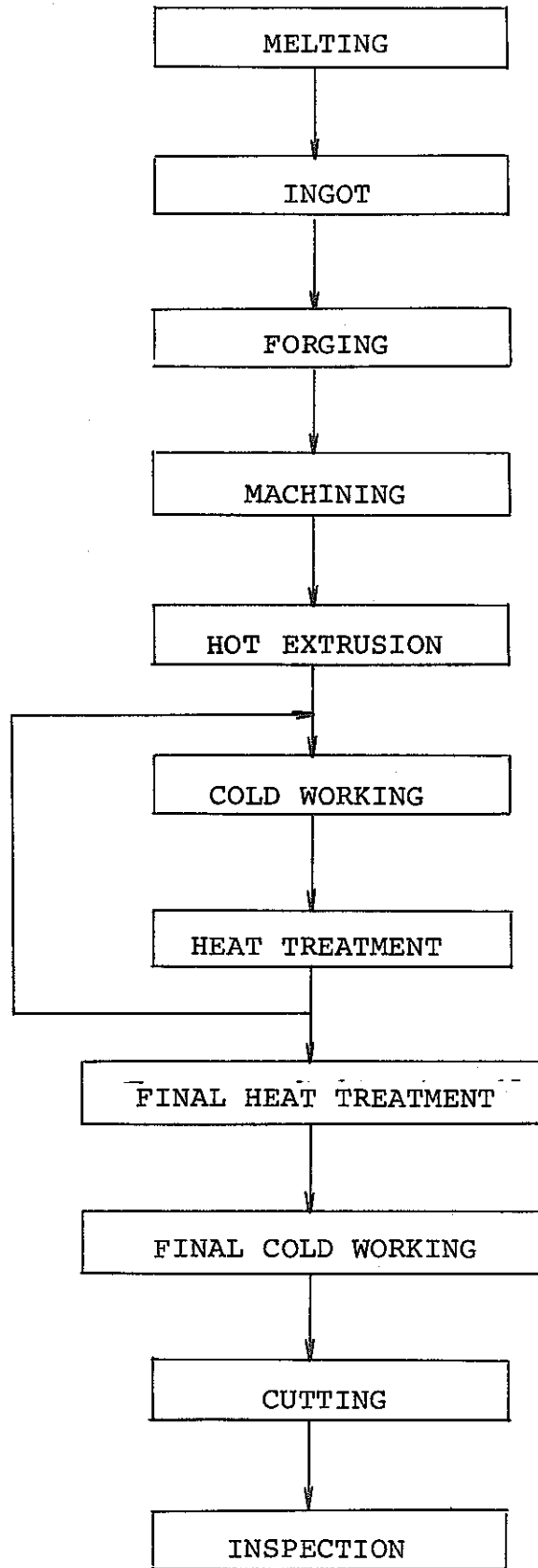


Fig.2-2 Fabrication Flow Sheet of Claddings



Fig.3-1-1 X-ray diffraction result

Lattice constant $5.44952 \pm 0.00024 \text{ \AA}$
Solid homogeneity 100 %
O/M ratio 1.99

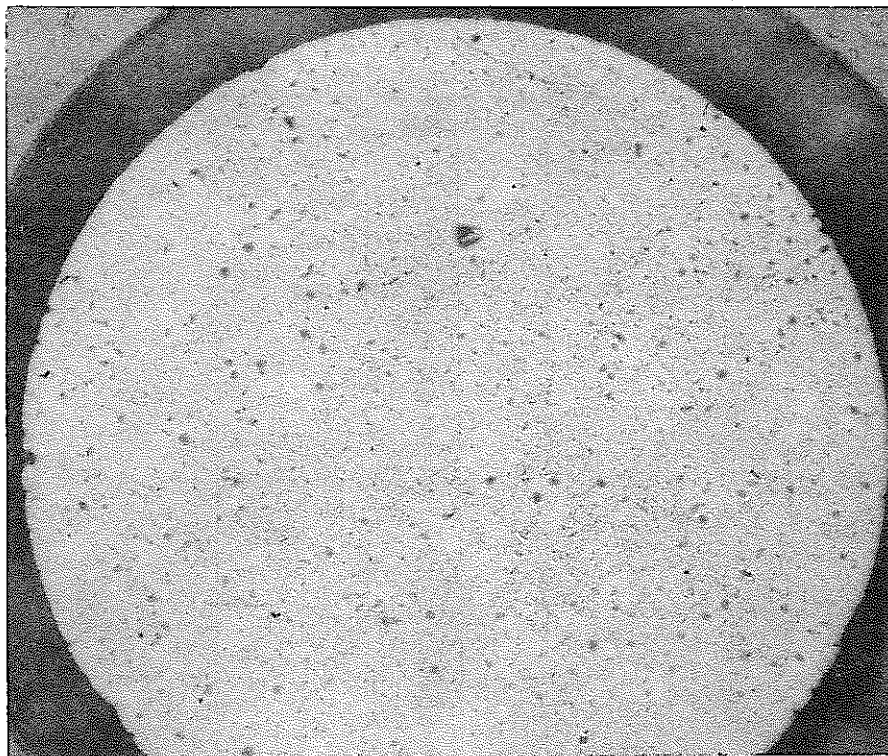
Table 3-1-1 Isotopic composition of plutonium

	Specification (%)	Isotopic Composition (%)	Date of Analysis
U-235 enrichment	87.0±1.0	86.21	
Pu-238	0.12	0.12	Feb.26,'78
Pu-239	75.54	75.54	"
Pu-240	20.23	20.23	"
Pu-241	3.46	3.46	"
Pu-242	0.65	0.65	"
Am-241	—	1680[ppm]	Jan.13,'76

Table 3-1-2 Results of chemical analysis of fuel pellet

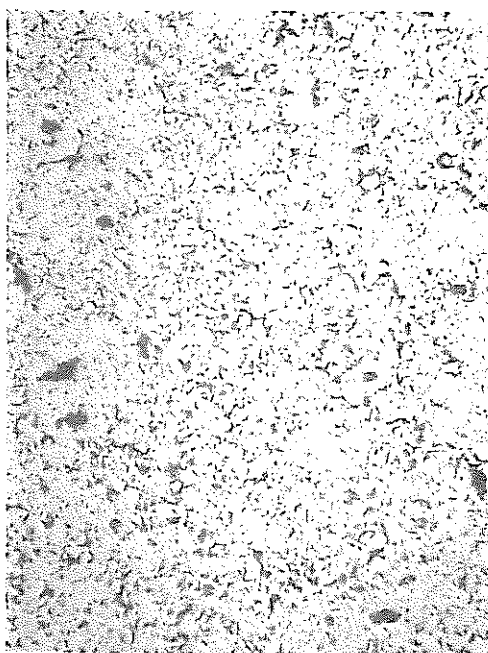
	Specification	Results
PuO ₂	30±1 w/o	29.37 w/o
O/M	1.97±0.02	1.99
Al	≤ 500 ppm	60 ppm
B	≤ 20	< 1
C	≤ 150	40
Ca	≤ 80	30
Cd	≤ 20	< 5
Cl	≤ 25	<10
Cr	≤ 500	<20
F	≤ 25	<10
Mg	≤ 25	<10
N	≤ 200	75
Fe	≤ 800	50
Ni	≤ 500	45
V	≤ 500	<50
Cu+Zn+Si	≤ 700	<160
Ag+Mn+Mo+Pb+Sn	≤ 200	< 51
Total Impurities	≤3000	<617
Volatile gas (included moisture)	< 150 μl/g (1700°C, 30 min)	< 10 μl/g

SN841-78-70



MACRO

500 μ



MICRO

100 μ

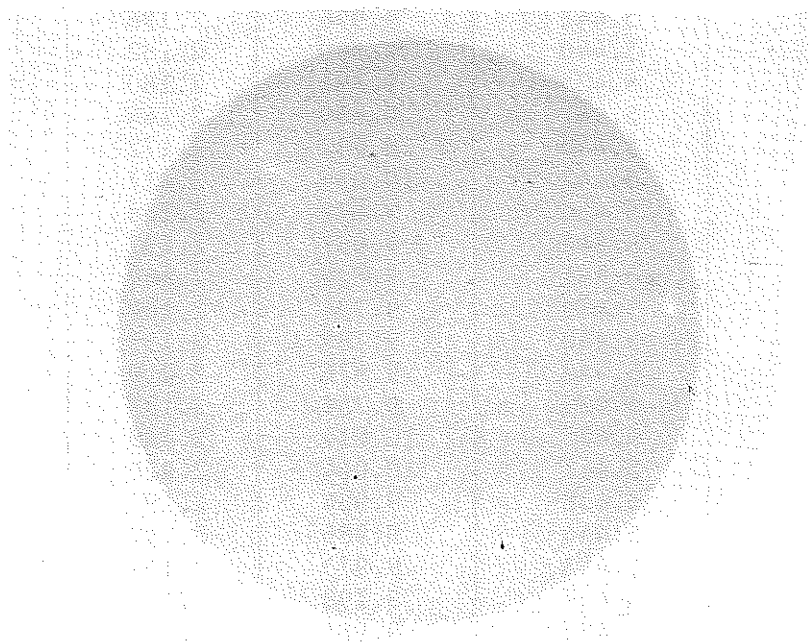
Photo. 3-1-1 Ceramography as polished



MICRO

25 μ

Photo. 3-1-2 Ceramography as etched



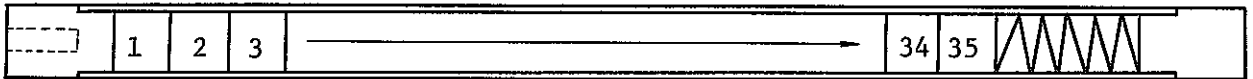
MACRO

1mm

Photo. 3-1-3 α -autoradiography

Table 3-1-3 Results of measured values of dimensions and calculated densities (No.1 5.44 φmm)

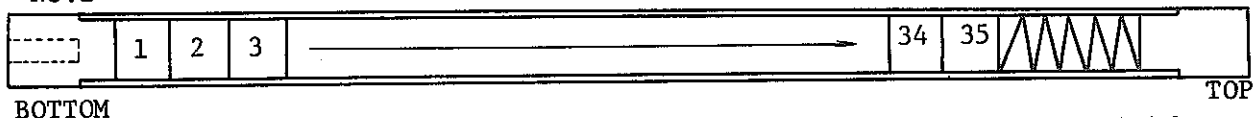
No.1



Specification	Diameter (mm)	Height (mm)	Weight (g)	Density(%T.D.)
Pellet No.	5.440±0.015	11.0±1.5	—	85±2
1	5.437	9.713	2.136	85.95
2	5.440	9.992	2.201	86.00
3	5.440	9.847	2.168	85.96
4	5.438	9.666	2.122	85.77
5	5.426	9.690	2.117	85.74
6	5.443	9.993	2.203	85.97
7	5.432	9.820	2.158	86.05
8	5.425	9.960	2.184	86.08
9	5.442	9.869	2.167	85.66
10	5.443	9.876	2.170	85.69
11	5.427	9.917	2.177	86.12
12	5.430	9.918	2.173	85.85
13	5.438	9.920	2.190	86.25
14	5.440	9.996	2.210	96.32
15	5.439	9.882	2.180	86.16
16	5.442	9.996	2.196	85.71
17	5.440	9.900	2.182	86.05
18	5.435	9.894	2.180	86.18
19	5.441	9.800	2.144	85.38
20	5.440	9.832	2.172	86.25
21	5.442	10.054	2.217	86.03
22	5.430	9.877	2.169	86.05
23	5.442	9.967	2.197	86.00
24	5.441	9.820	2.167	86.12
25	5.436	9.794	2.162	86.31
26	5.440	9.788	2.157	86.04
27	5.443	9.976	2.210	86.39
28	5.439	9.756	2.137	85.55
29	5.436	10.016	2.199	85.84
30	5.441	10.064	2.211	85.74
31	5.438	9.934	2.195	86.33
32	5.444	9.986	2.197	85.77
33	5.443	9.973	2.197	85.91
34	5.437	9.798	2.150	85.76
35	5.425	9.985	2.178	85.63
Average	5.438	9.878	—	85.96
Standard Deviation	0.006	0.157	—	0.24
Total	—	345.9	76.173	—

Table 3-1-4 Results of measured values of dimensions and calculated densities (No.2 5.38 ϕ mm)

No.2



Specification	Diameter (mm)	Height (mm)	Weight (g)	Density (%T.D.)
Pellet No.	5.380±0.015	11.0±1.5	—	85±2
1	5.375	9.975	2.149	86.16
2	5.370	9.753	2.094	86.02
3	5.377	9.886	2.132	86.18
4	5.378	9.990	2.137	85.45
5	5.373	9.868	2.127	86.26
6	5.377	9.994	2.152	86.05
7	5.373	9.922	2.143	86.44
8	5.373	9.842	2.124	86.37
9	5.372	9.920	2.152	86.85
10	5.371	9.591	2.058	85.94
11	5.378	9.940	2.144	86.16
12	5.372	9.852	2.123	86.27
13	5.378	9.950	2.142	86.00
14	5.377	9.678	2.081	85.93
15	5.371	9.855	2.127	86.44
16	5.379	9.892	2.137	86.27
17	5.373	9.900	2.145	86.71
18	5.373	9.776	2.114	86.54
19	5.373	9.909	2.137	86.31
20	5.378	9.938	2.148	86.34
21	5.376	9.736	2.093	85.94
22	5.374	9.845	2.122	86.23
23	5.378	9.759	2.098	85.88
24	5.374	9.901	2.137	86.35
25	5.378	10.016	2.170	86.55
26	5.377	9.855	2.141	86.82
27	5.371	9.917	2.141	86.47
28	5.373	9.855	2.132	86.58
29	5.375	9.872	2.133	86.41
30	5.371	9.755	2.109	86.59
31	5.370	9.783	2.105	86.21
32	5.374	9.889	2.134	86.33
33	5.378	9.874	2.141	86.62
34	5.372	9.968	2.143	86.07
35	5.380	9.884	2.134	86.18
Average	5.375	9.867	—	86.28
Standard Deviation	0.003	0.092	—	0.29
Total	—	345.1	74.499	—

Table 3-1-5 Results of measured values of dimensions and calculated densities (No.3 5.38 φmm)

No.3



Specification	Diameter (mm)	Height (mm)	Weight (g)	Density (%T.D.)
Pellet No.	5.380±0.015	11.0±1.5	—	85±2
1	5.370	9.794	2.120	86.93
2	5.371	9.770	2.100	86.09
3	5.377	9.878	2.125	85.97
4	5.377	9.900	2.154	86.95
5	5.375	9.792	2.115	86.38
6	5.378	9.780	2.117	86.47
7	5.372	9.975	2.155	86.49
8	5.375	9.850	2.128	86.40
9	5.372	9.782	2.114	86.52
10	5.374	9.730	2.098	86.26
11	5.376	9.650	2.085	86.37
12	5.368	9.634	2.082	86.65
13	5.370	9.714	2.093	86.33
14	5.371	9.640	2.066	85.84
15	5.375	9.778	2.105	86.09
16	5.371	9.940	2.150	86.63
17	5.371	9.803	2.109	86.17
18	5.370	9.814	2.120	86.55
19	5.373	9.735	2.100	86.33
20	5.375	9.863	2.122	86.04
21	5.368	9.912	2.140	86.57
22	5.370	9.773	2.115	86.71
23	5.372	9.930	2.135	86.08
24	5.369	9.805	2.115	86.46
25	5.373	9.793	2.125	86.84
26	5.370	9.835	2.130	86.77
27	5.373	9.780	2.100	85.94
28	5.375	9.730	2.093	86.03
29	5.374	9.909	2.139	86.36
30	5.370	9.930	2.146	86.59
31	5.373	9.940	2.147	86.44
32	5.378	9.860	2.125	86.09
33	5.370	10.020	2.166	86.61
34	5.376	9.747	2.100	86.13
35	5.370	9.798	2.117	86.57
Average	5.373	9.817	—	86.39
Standard Deviation	0.003	0.094	—	0.29
Total	—	342.9	74.151	—

Table 3-1-6 Results of measured values of dimensions and calculated densities (No.4 5.346 ϕ mm)

No.4



BOTTOM

TOP

Specification	Diameter (mm)	Height (mm)	Weight (g)	Density (%T.D.)
Pellet No.	5.346 \pm 0.015	11.0 \pm 1.5	—	85 \pm 2
1	5.334	9.765	2.087	86.79
2	5.339	9.897	2.119	86.78
3	5.339	9.756	2.097	87.12
4	5.339	9.700	2.086	87.17
5	5.339	9.683	2.074	86.82
6	5.336	9.812	2.107	87.14
7	5.339	9.835	2.115	87.17
8	5.335	9.892	2.122	87.08
9	5.335	9.795	2.090	86.62
10	5.337	9.943	2.125	86.69
11	5.338	9.600	2.056	86.84
12	5.340	9.578	2.019	85.41
13	5.338	9.598	2.067	97.32
14	5.339	9.665	2.082	87.31
15	5.336	9.873	2.117	87.01
16	5.337	9.590	2.062	87.22
17	5.337	9.701	2.080	86.97
18	5.335	9.847	2.107	86.86
19	5.336	9.864	2.114	86.97
20	5.337	9.705	2.072	86.60
21	5.335	9.802	2.108	87.30
22	5.337	9.574	2.060	87.28
23	5.338	9.546	2.050	87.08
24	5.337	9.800	2.093	86.63
25	5.337	9.888	2.128	87.30
26	5.338	9.744	2.083	86.68
27	5.336	10.072	2.168	87.35
28	5.340	9.922	2.125	86.78
29	5.342	10.085	2.144	86.07
30	5.334	9.953	2.134	87.07
31	5.336	9.830	2.113	87.23
32	5.337	9.700	2.071	86.60
33	5.339	9.886	2.098	86.02
34	5.339	9.640	2.061	86.66
35	5.338	9.662	2.053	86.16
Average	5.337	9.777	—	86.86
Standard Deviation	0.002	0.139	—	0.43
Total	—	341.8	73.287	—

Table 3-2-1 Chemical composition of cladding

	Specification (%)	Result of analysis (%)
Cr	17.00~18.00	17.76
Ni	13.00~14.00	13.85
Mo	2.00~3.00	2.30
Mn	1.50~2.00	1.69
C	0.035~0.064	0.052
B	≥0.0005	0.0020
N	≤0.010	0.0071
Co	≤0.10	0.07
P	≥0.015	0.027
S	≤0.010	0.005
Si	≤0.75	0.42
Cu	≤0.20	0.02
V	≤0.20	0.04
Nb+Ta	≤0.05	≤0.005
Ti	≤0.10	0.003
As	≤0.03	0.003
Al	≤0.05	0.048
Fe	Balance	

Table 3-2-2 Mechanical properties of cladding

	Specification	Result
Tensile strength (kg/mm ²)		
At room temp.	≥75	85.9, 86.4
At 650°C	≥40	54.7, 54.9
0.2% offset strength (kg/mm ²)		
At room temp.	≥60	81.0, 80.3
At 650°C	≥30	49.5, 49.7
Elongation (%)		
At room temp.	≥10	15.6, 15.9
At 650°C	≥ 7	9.8, 9.7
Grain size	ASTM E-112	
	No. 6~9	No.8.5, No.8.5

Table 3-2-3 The results of dimensional measurements

Cladding No.	Specification	K5634	K5637	K5642	K5643	K5676
1. Outer Diameter (mm)	6.500±0.030 mm					
	(Max. 6.505 Min. 6.500	6.505	6.510	6.512	6.511	6.507
2. Inner Diameter (mm)	5.600±0.025 mm					
	(Max. 5.592 Min. 5.587	5.592	5.605	5.602	5.603	5.605
3. Thickness (mm)	0.450±0.030 mm					
	(Max. 0.467 Min. 0.449	0.467	0.463	0.463	0.463	0.462
		0.449	0.447	0.445	0.443	0.446

Table 3-2-4 The results of non destructive tests

Cladding No.	Specification	K5634	K5637	K5642	K5643	K5676
1. Surface roughness	<3,2 S	GO	GO	GO	GO	GO
2. Visual inspection	defect ≤32 μm	GO	GO	GO	GO	GO

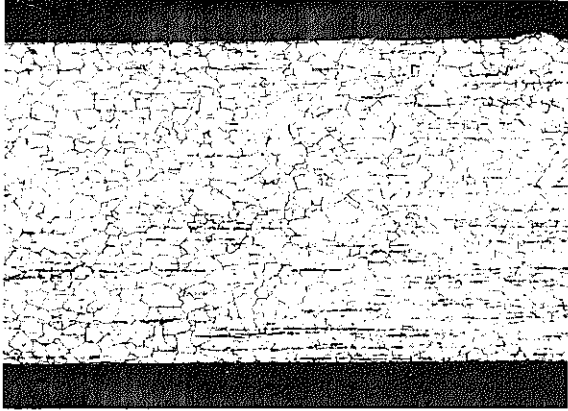
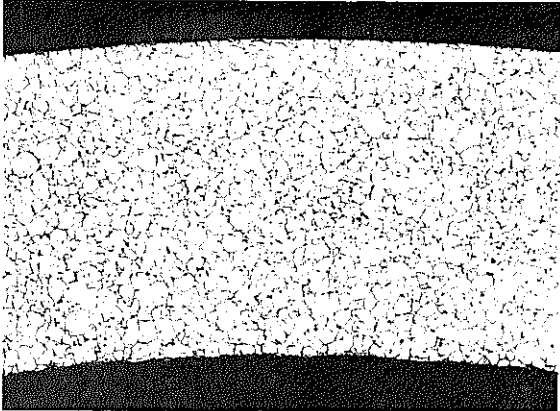

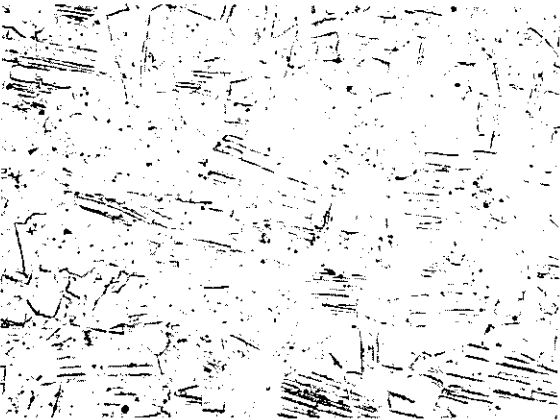
	LONGITUDINAL	TRANSVERSE
GRAIN SIZE (100X)	 <p>ASTM No. 8.5</p>	 <p>ASTM No. 8.5</p>
CARBIDE TEST (400X)		

Photo. 3-2-1 Micrography of cladding (cladding No. K-5653)

Table 3-3-1 Chemical composition of end plug (bar)

	Specification (%)	Results of analysis (%)
Cr	16.00~18.00	16.78 , 16.68
Ni	12.00~14.00	13.90 , 13.85
Mo	2.00~3.00	2.32 , 2.30
Mn	1.50~2.00	1.84 , 1.87
C	0.035~0.064	0.057 , 0.058
B	≤0.001	0.0004, 0.0005
Co	≤0.10	0.01 , 0.01
N	≤0.010	0.0066, 0.0057
P	≤0.03	0.007 , 0.006
S	≤0.02	0.006 , 0.005
Si	≤0.75	0.51 , 0.51
Cu	≤0.20	0.02 , 0.02
Fe	Balance	

Table 3-3-2 Mechanical properties of end plug (bar)

	Specification	Result
Tensile strength (kg/mm ²)	≥65	84.7, 86.7

Table 3-4-1 Chemical composition of plenum spacer

	Specification (%)	Results of analysis (%)
Cr	16.00~18.00	17.20
Ni	12.00~14.00	12.92
Mo	2.00~3.00	2.50
C	0.035~0.064	0.058
B	≤0.0005	0.0001
Co	≤0.10	0.06
N	≤0.010	0.006
P	≤0.03	0.003
S	≤0.02	0.007
Si	≤0.75	0.52

Table 3-4-2 Results of dimensional measurements

1 Bottom plenum spacer

Spacer No.	Specification	1	2	3	4	5	6
1. Length	25.4±0.3 mm	25.25	25.65	25.55	25.30	25.60	25.65
2. Weight	——	0.92	0.93	0.93	0.92	0.93	0.93

2 Upper plenum spacer

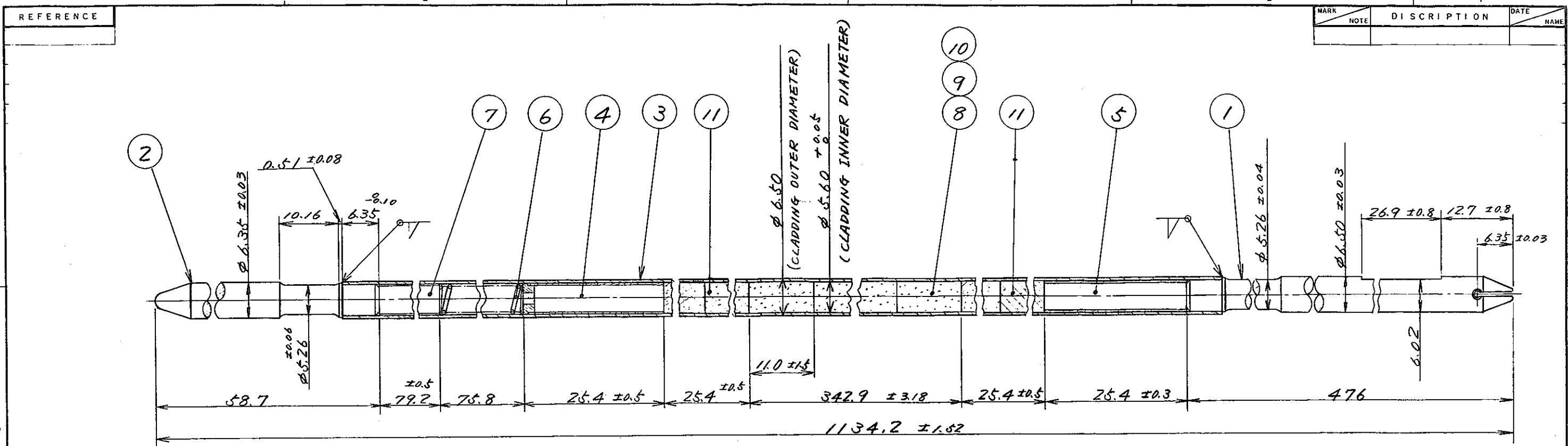
Spacer No.	Specification	1	2	3	4	5	6
1. Length	25.4±0.5 mm	25.75	25.75	25.60	25.05	25.80	25.15
2. Weight	——	1.08	1.08	1.08	1.05	1.08	1.06

Table 3-5-1 The results of dimensional measurements

Spring No.	Specification	1	2	3	4	5	6
1. Total Turns	52	52	52	52	52	52	52
2. Coil Outer Dia. (mm)	5	4.9	4.9	5.0	5.0	4.9	4.9
3. Wire Dia. (mm)	0.60±0.015	0.6	0.6	0.6	0.6	0.6	0.6
4. Free Length(mm)	90 ⁺⁰ ₋₁	90	90	90	90	90	90
5. Spring Constant (kg/mm)	0.029	0.029	0.029	0.029	0.029	0.029	0.029

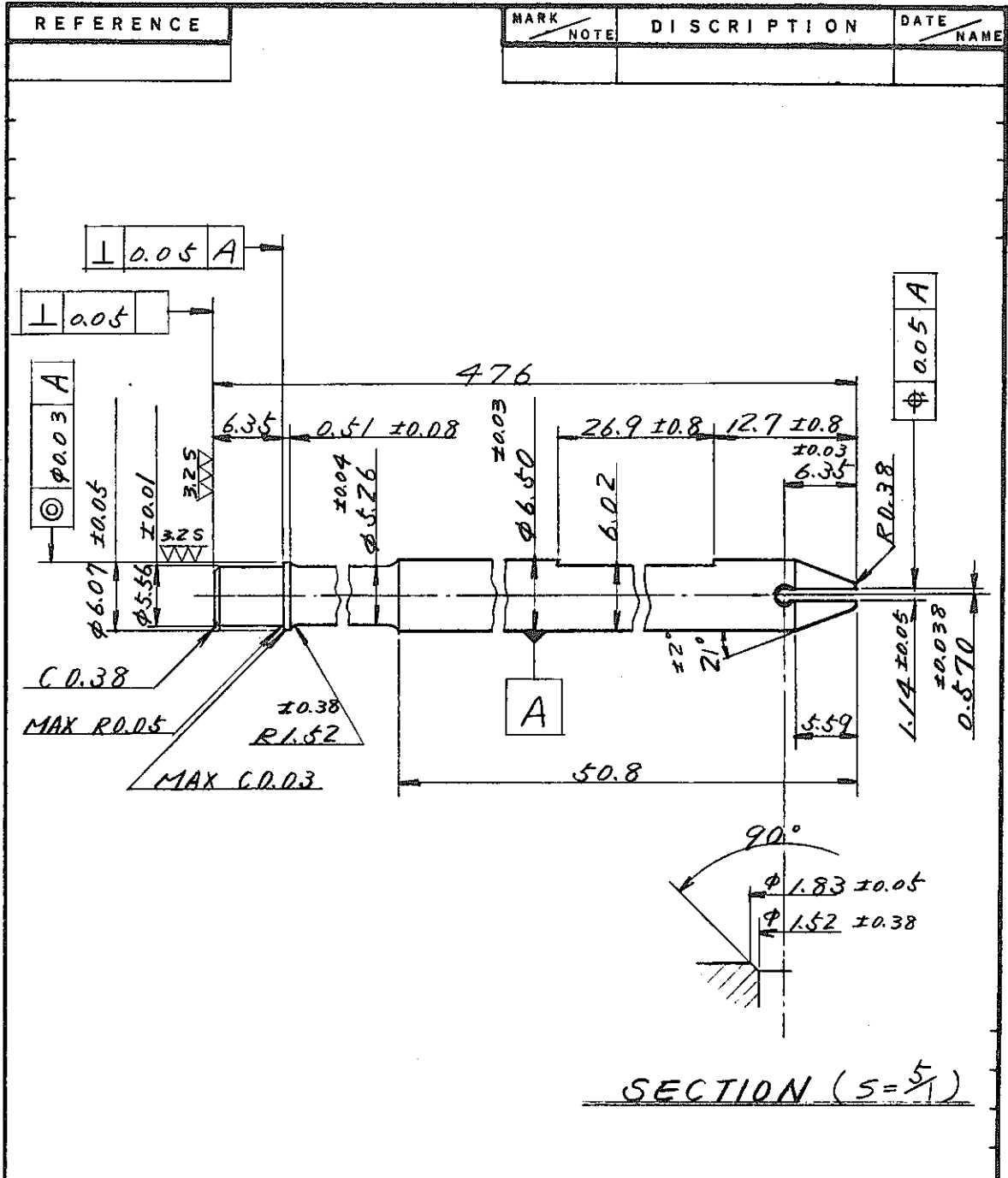
4. Drawings

DRAWING NO.	TITLE
POWER TO MELT-1-200P 780162	POWER TO MELT PNC FUEL PIN
POWER TO MELT-1-201P 780163	BOTTOM END CAP
POWER TO MELT-1-202P 780164	TOP END CAP
POWER TO MELT-1-203P 780165	CLADDING TUBE
POWER TO MELT-1-204P 780166	APPER PLENUM SPACER
POWER TO MELT-1-205P 780167	PLENUM SPACER
POWER TO MELT-1-206P 780168	PLATE
POWER TO MELT-1-207P 780169	SPRING
POWER TO MELT-1-100P 780170	FUEL PELLETT
POWER TO MELT-1-101P 780171	INSULATOR PELLETT



MARK	NOTE	DI DESCRIPTION	DATE	NAME				
4	4	4	12	POWER TO MELT				
A/R			11	- I-121 P INSULATOR PELLET UO ₂				
	A/R		10	" - 100(3) P FUEL PELLET (3) PuO ₂ -UO ₂				
		A/R	9	" - 100(2) P FUEL PELLET (2) "				
			8	" - 100(1) P FUEL PELLET (1) PuO ₂ -UO ₂				
			7	TAG GAS CAPSULE ASSEMBLY				
			6	" - 209 P SPRING SUS304 W/PB				
			5	" - 205 P (1) BOTTOM PLENUM SPACER SUS 316				
			4	" - 204 P UPPER PLENUM SPACER "				
			3	" - 203 P CLADDING TUBE "				
			2	" - 202 P TOP END CAP "				
			1	POWER TO MELT - I-201 P BOTTOM END CAP SUS 316				
A	B	C	ITEM	DRAWING NO.	NAME	MATERIAL	NUMBERS	REMARKS

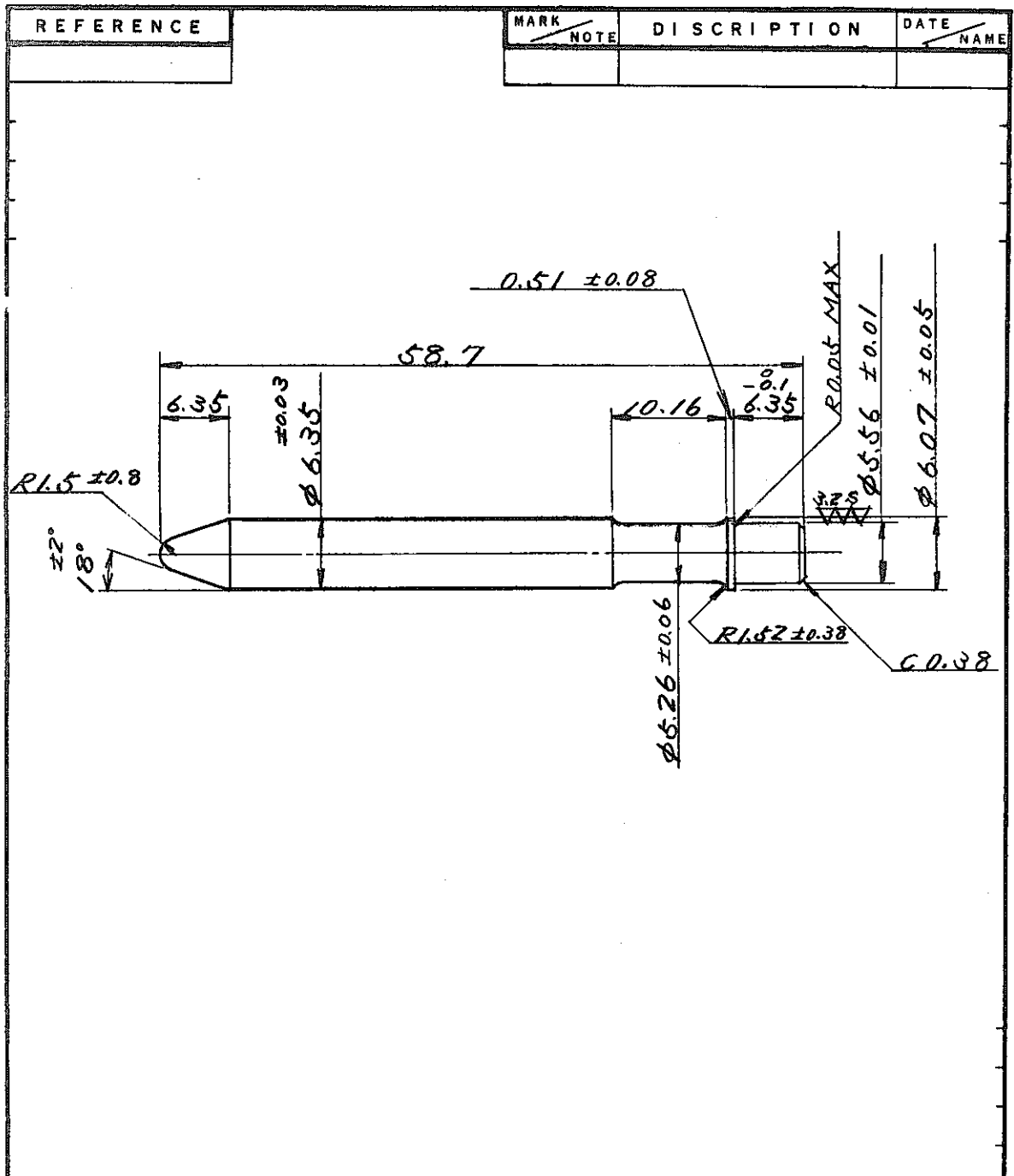
ANGLE	SCALE	DESIGN	DWG.	CHECK	APPR.
THIRD	2/1				
NAME		T. Koike H. Kajitani R. Yamoto			
DATE		98 9 20 98 10 11 98 10 12			
DIVISION		TITLE			
EBR-II - A2		POWER TO MELT PNC FUEL PIN			
CODE NO		DWG. NO			
411951		POWER TO MELT-I-200P			
		SEQ. NO			
		780162			



SECTION (S=5)

1		BOTTOM END CAP	SUS 316	1	
ITEM	DRAWING NO.	NAME	MATERIAL	NUMBERS	REMARKS
DESIGN					
DWG.	T. Koike	78-9-20	EBR-II - A4	TITLE	BOTTOM END CAP
CHECK	M. Kajitani	78-10-11			
APPR.	B. Yumoto	78-10-1A			
ANGLE	SCALE	CODE .NO	DWG. NO	POWER TO MELT-I-201P	
THIRD	2/1 ()	411951	SEQ. NO	780163	

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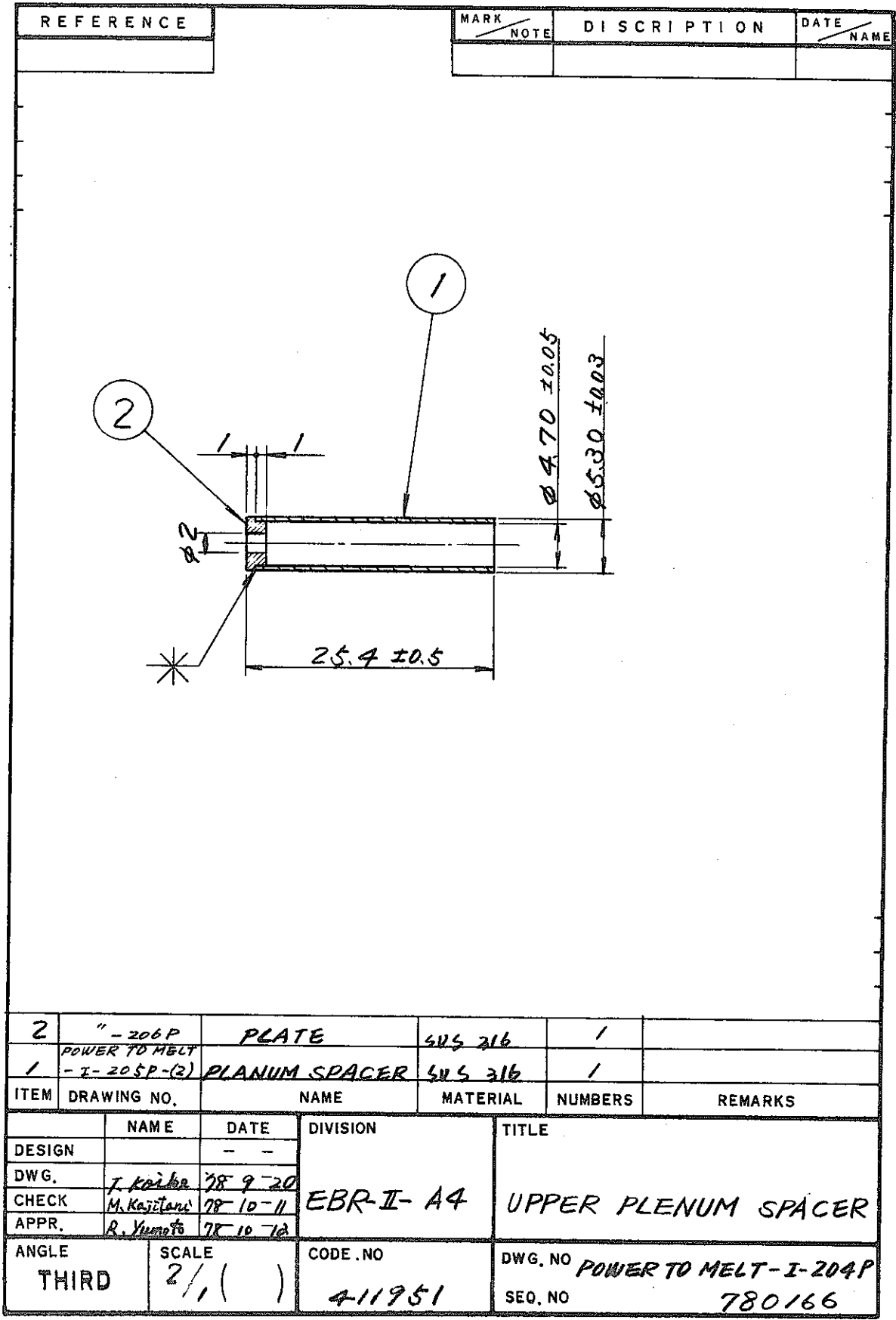


1		TOP END CAP	SUS 316	1	
ITEM	DRAWING NO.	NAME	MATERIAL	NUMBERS	REMARKS
	NAME	DATE	DIVISION	TITLE	
DESIGN		--			
DWG.	T. Kashi	78-9-20	EBR-II-A4	TOP END CAP	
CHECK	M. Kaitani	78-10-11			
APPR.	R. Yamato	78-10-12			
ANGLE	SCALE	CODE .NO	DWG. NO	POWER TO MELT-I-202P	
THIRD	2/1 ()	411951	SEQ. NO	780164	

POWER REACTOR AND NUCLEAR FUEL DEVELOPMENT CORPORATION, TOKAI

REFERENCE	MARK / NOTE	DISCRIPTION	DATE / NAME		
1		CLADDING TUBE	SUS 316		
ITEM	DRAWING NO.	NAME	MATERIAL	NUMBERS	REMARKS
DESIGN	NAME	DATE	DIVISION	TITLE	
DWG.	<i>T. Koike</i>	<i>78-9-20</i>	EBR-II-A4	CLADDING TUBE	
CHECK	<i>M. Kasitani</i>	<i>78-10-11</i>			
APPR.	<i>R. Yumoto</i>	<i>78-11-12</i>			
ANGLE	SCALE	CODE .NO	DWG. NO	POWER TO MELT-I-203P	
THIRD	2/1 ()	411951	SEQ. NO	780165	

POWER REACTOR AND NUCLEAR FUEL DEVELOPMENT CORPORATION, TOKAI



POWER REACTOR AND NUCLEAR FUEL DEVELOPMENT CORPORATION, TOKAI

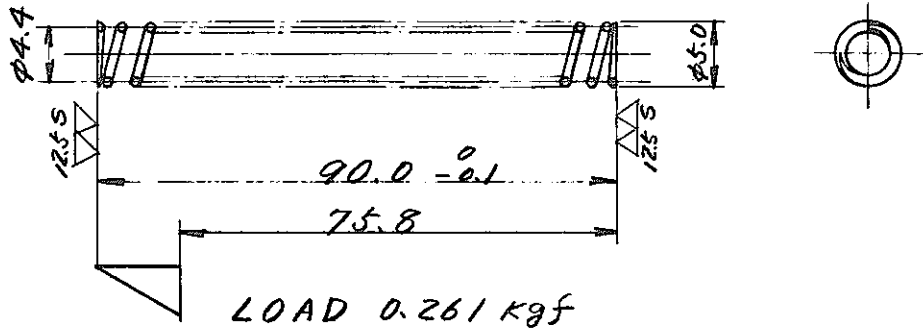
REFERENCE	MARK / NOTE	DISCRIPTION	DATE / NAME						
<table border="1" style="margin-left: auto;"> <tr><td></td><td style="text-align: center;">L</td></tr> <tr><td>1</td><td style="text-align: center;">25.4 ± 0.3</td></tr> <tr><td>2</td><td style="text-align: center;">24.4 ± 0.3</td></tr> </table>					L	1	25.4 ± 0.3	2	24.4 ± 0.3
	L								
1	25.4 ± 0.3								
2	24.4 ± 0.3								
2	"-205P-2)	PLENUM SPACER	SUS 316	1					
1	POWER TO MELT- I-205P-1)	BOTTOM PLENUM SPACER	SUS 316	1					
ITEM	DRAWING NO.	NAME	MATERIAL	NUMBERS	REMARKS				
	NAME	DATE	DIVISION	TITLE					
DESIGN		--							
DWG.	T. Kaibe	78-9-20	EBR-II-A4	PLENUM SPACER					
CHECK	M. Kasitani	78-10-11							
APPR.	R. Yumoto	78-10-12							
ANGLE	SCALE	CODE .NO	DWG. NO						
THIRD	2/1 ()	411951	POWER TO MELT-I-205P						
			SEQ. NO						
			780167						

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REFERENCE	MARK / NOTE	DISCRIPTION	DATE / NAME		
<i>PLATE</i>		<i>4NS 316</i>	<i>1</i>		
ITEM	DRAWING NO.	NAME	MATERIAL	NUMBERS	REMARKS
	NAME	DATE	DIVISION	TITLE	
DESIGN		--	<i>EBR-II - A4</i>	<i>PLATE</i>	
DWG.	<i>T. Kaiho</i>	<i>78-9-20</i>			
CHECK	<i>M. Kajitani</i>	<i>78-10-11</i>			
APPR.	<i>R. Yumoto</i>	<i>78-10-12</i>			
ANGLE	SCALE	CODE .NO	DWG. NO	<i>POWER TO MELT-I-206P</i>	
<i>THIRD</i>	<i>5/1 ()</i>	<i>411951</i>	SEQ. NO		

POWER REACTOR AND NUCLEAR FUEL DEVELOPMENT CORPORATION, TOKAI

REFERENCE	MARK / NOTE	DISCRIPTION	DATE / NAME



MATERIAL	SUS 304 - WPB
WIRE DIA.	φ 0.60 ± 0.015 mm
MEAN DIAMETER	φ 4.4 mm
COIL OUTER DIA.	φ 5.0 mm
EFFECTIVE TURNS	50
TOTAL TURNS	52
COIL DIRECTION	RIGHT
FREE LENGTH	90
SPRING CONSTANT	0.029 kgf/mm
COMMON USE	LOAD 0.261 kgf
	HIGHT 75.8 mm

1		SPRING		1	
ITEM	DRAWING NO.	NAME	MATERIAL	NUMBERS	REMARKS
DESIGN					
DWG.	T. Koike	78-9-20	EBR-II - A4	TITLE	SPRING
CHECK	M. Kajitani	78-10-11			
APPR.	R. Yumoto	78-10-10			
ANGLE	SCALE	CODE . NO	DWG. NO	POWER TO MELT-I-207P	
THIRD	N.T.S. ()	411951	SEQ. NO	780169	

REFERENCE	MARK / NOTE	DISCRIPTION	DATE / NAME								
<p style="text-align: center;">MAX C.D. 1.3</p> <p style="text-align: center;">ϕA</p> <p style="text-align: center;">11.0 ± 1.5</p>											
<table border="1" style="margin-left: auto;"> <tr> <td></td> <td style="text-align: center;">ϕA 20.03</td> </tr> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">5.44</td> </tr> <tr> <td style="text-align: center;">2</td> <td style="text-align: center;">5.38</td> </tr> <tr> <td style="text-align: center;">3</td> <td style="text-align: center;">5.35</td> </tr> </table>					ϕA 20.03	1	5.44	2	5.38	3	5.35
	ϕA 20.03										
1	5.44										
2	5.38										
3	5.35										
3		FUEL PELLETT (3)	PuO ₂ -UO ₂ 31								
2		FUEL PELLETT (2)	" 31								
1		FUEL PELLETT (1)	PuO ₂ -UO ₂ 31								
ITEM	DRAWING NO.	NAME	MATERIAL	NUMBERS	REMARKS						
		NAME	DATE	DIVISION	TITLE						
DESIGN											
DWG.	T. Koike	78-9-20	EBR-II - A4	FUEL PELLETT							
CHECK	M. Kasitani	78-10-11									
APPR.	R. Yumoto	78-10-12									
ANGLE	SCALE	CODE .NO	DWG. NO	POWER TO MELT-I-100P 780170							
THIRD	2/1 ()	411951	SEQ. NO								

SN841-78-70

REFERENCE	MARK / NOTE	DISCRIPTION	DATE / NAME		
1		INSULATOR PELLET	1123 4		
ITEM	DRAWING NO.	NAME	MATERIAL	NUMBERS	REMARKS
DESIGN	NAME	DATE	DIVISION		TITLE
DWG.	T. Kaike	78-9-20	EBR-II - A4		INSULATOR PELLET
CHECK	M. Kajitani	78-10-11			
APPR.	R. Yumoto	78-10-12			
ANGLE	SCALE	CODE .NO	DWG. NO		
THIRD	2/1 ()	411951	POWER TO MELT-I-101P		
			SEQ. NO		
			780171		

POWER REACTOR AND NUCLEAR FUEL DEVELOPMENT CORPORATION, TOKAI