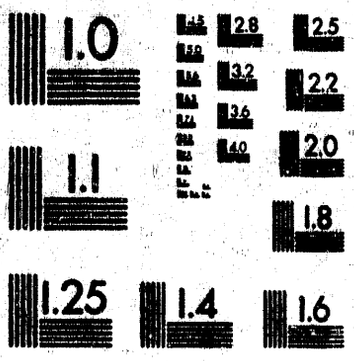
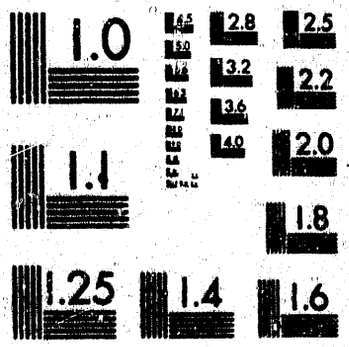
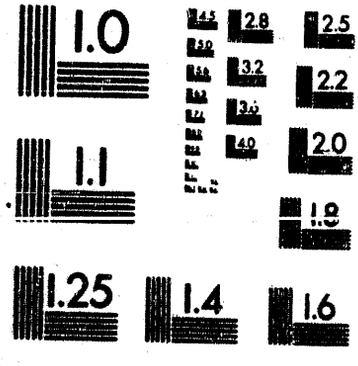
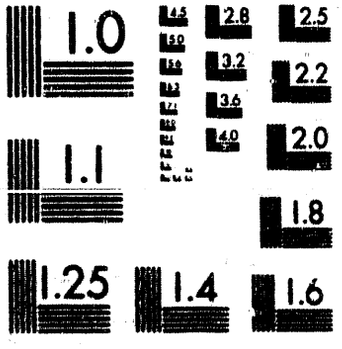




MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A





Contents

Appendices A. Data and Summary of Methodology, Babcock and Wilcox

Appendix A1

Joseph Oat Corporation (Vendor A)

Cost Data Package

QUALITY ASSURANCE

This cost estimate furnished by the Joseph Oat Corporation was to the best of my knowledge obtained in accordance with the specification for use in making production cost estimates of high level nuclear waste containers and internals for the Yucca Mountain Project, Rev. 2, and the Quality Program outline for Yucca Mountain Project - High Level Nuclear Waste Container Fabrication Cost Estimate Quality Assurance specified in B&W P.O. 537-0A163948-UB.

10-27-87

G. W. Roberts, Manager QA
Babcock & Wilcox Company
Research and Development Division

GWR/lmm

Babcock & Wilcox

a McDermott company

Research and Development Division

1562 Beeson Street
Alliance, OH 44601
(216) 821-9110

September 22, 1989

Mr. Ed Russell, L-197
University of California
Lawrence Livermore National Lab.
Yucca Mountain Project
P. O. Box 5514, L-217
Livermore, CA 94551

Dear Ed:

Subject: Revised Copies of YMP-HLNW Container Production Cost Estimates by Joseph Oat Corporation

Attached are two copies of the subject cost estimate provided by the Joseph Oat Corporation in response to our P.O. 537-0A163948-UB. These include estimates for tanks 1C, 3C, 5C, 2N, 4N, 5N, 6S, 8S and the total price form which are to be substituted for the copies submitted to you on September 22nd.

The total prices given in our letter of September 22nd are unaffected by these changes. This completes the Joseph Oat data to be submitted to you.

Sincerely,

THE BABCOCK & WILCOX COMPANY
Research and Development Division

N.G. Domian

E. A. Domian
Metallurgy & Manufacturing
Technology Section

cll

cc: R. L. Fish - BWFC
K. K. Everett (w/o att.)
D. F. LaCount (w/o att.)
E. S. Robitz (w/o att.)

002

Babcock & Wilcox

a McDermott company

Research and Development Division

1562 Beeson Street
Alliance, OH 44601
(216) 821-9110

September 22, 1989

Mr. Ed Russell, L-197
University of California
Lawrence Livermore National Lab.
Yucca Mountain Project
P. O. Box 5514, L-217
Livermore, CA 94551

Subject: YMP-HLNW Container Production Cost Estimates by Joseph Oat Corporation

Dear Ed:

Attached are two copies of the subject cost estimate provided by the Joseph Oat Corporation in response to our P.O. 537-0A163948-UB. The price for these containers and internals before taxes are estimated to be as follows:

Container Including Lower Unit and Upper Head Price, $/Container

Size	Materials: Raw	Materials: Expendable	Labor	Total
		C71500 Alloy		
26S	25,775	10,013	9,025	44,813
26L	30,583	12,293	10,125	53,001
28L	33,737	13,326	11,375	58,458
		N08825 Alloy		
26S	37,707	11,487	9,825	59,019
26L	42,520	14,141	11,075	67,736
28L	47,877	15,389	12,425	75,691

Internals, $/Assembly

		S30403 (TP 304LSS) Alloy		
Cons. 6 PWR	1,307	1,381	2,400	5,088
3 PWR	817	951	1,900	3,668
3 PWR + 4 BWR	1,794	175	3,280	5,249
10 BWR	1,880	1,958	3,175	7,013
4 PWR	982	1,029	2,150	4,161

003

The following features of these estimates are noteworthy.

- Container lower unit flange blank costs are high because it is made by cutting it from a large piece with attendant high scrap losses. An alternative method of ring rolling and butt welding should reduce the cost of this item. I estimate that this reduction could amount to about 1/2 of the material cost for this item. This could result in the following container cost reductions depending on the cost of the material.

Cost Reduction per Container

Size	C71500 Alloy	N08825 Alloy
26S	1144	2304
26L	1144	2160
28L	1354	2802

- Further reductions in cost may be possible with the following items:

  Bottom head to be made from forging
  Upper head to be made from forging
  Internals for 3 PWR and 4 BWR fuel assemblies

- Subvendor quotes for the following services:

  - Forming of cylinder
  - Spin forming of lower unit
  - Inspection and testing of the lower unit
  - Forming of dividers (6S, 7S, 9S, 10S)

  which are labor intensive are reported as expendables rather than labor. This does not affect the total price but it does make the labor costs appear to be too low.

Please note the marked-up figures on the attached cost estimates. Corrected copies are to be obtained from Joseph Oat and forwarded to you.

CONCLUSION

These estimates with indicated corrections that are to be made are acceptable.

Sincerely,

THE BABCOCK & WILCOX COMPANY
Research and Development Division

H. A. Domian

H. A. Domian
Metallurgy & Manufacturing
Technology Section

cll
Attach.
cc: R. L. Fish - BWFC
K. K. Everett (w/o att.)
D. F. LaCount (w/o att.)
E. S. Robitz (w/o att.)

ESTABLISHED 1788
JOSEPH OAT CORPORATION
CHEMICAL ENGINEERS & FABRICATORS

September 13, 1989

Babcock & Wilcox Company
Alliance Research Center
1562 Beeson Street
Alliance, Ohio 44601

Attention: R. Bruckner

Reference: PO# 537-OA163948UB
Joseph Oat Ref. Q-2699

Gentlemen:

We enclose our proposal on YMP HLNW Container.

Should you have any questions, please do not hesitate to call.

Very truly yours,

Ron Kaplan
Vice President

2500 Broadway / Drawer 10 / Camden, New Jersey 08104 / (609) 541-2900
FAX (609) 541-0864 / TELEX 834618

LOWER UNITS NOTE (LU)

Note 1 - Includes rolling costs and weldwire

Note 2 - Includes weldwire

Note 3 - Seamless flange blank quoted cut from plate - Less expensive alternatives are being investigated

Note 4 - This line is used for annealing of the blanks prior to shipment to the extrunder. The annealing performed by the extruder is included in task 5.

Note 5 - Radiography & UT is included in this price. Radiography is performed twice - first when blank is assembled, and second when spun part is returned. X-rays are subcontracted reading and interpretation are performed by Oat QA Oat performs its own UT examination.

Note 6 - Includes cleaning costs.

Note 7 - Includes test fixture.

Note 8 - Wooden box and protective jacket costs.

Note 9 - Hogged out plate considered for head. Forging price not available of time of quote weight, therefore, includes full disc prior to machining.

Note 10- One 9/13 we received lower inconel 825 base prices from G. O. Carlson which are lower than those quoted by Jessop. Due to lack of time they are not included in pricing sheets.

Note 11 - All raw materials prices include Joseph Oat markup of 10% G & A overhead, and 10% profit.

UPPER HEAD NOTE

Note 1 - Pintle is quoted a estimated solid bar price, machined. If time permitted an ext ded bar shop could be less costly and lower machining cost. Alternatively, a forging made to the rough pintle shape could also be attractive.

Note 2 - All raw materials prices include Joseph Oat markup of 10% G & A overhead and 10% profit.

INTERNALS NOTE

Note 1 - "Exp" price includes roll forming raw material to shape. Roll forming is selected due to the consistant shape and camber we would expect from this process.

Note 2 - Internals to ship inside cans.

JOSEPH OAT CORPORATION
CHEMICAL ENGINEERS & FABRICATORS
NUCLEAR POWER COMPONENTS
ESTABLISHED 1788

INTERNALS NOTE

Note 3 - Tooling cost for "Form Dividers" is for the first 750 sets of internals only. Therefore, the tooling costs would be substantially reduced for maintainence of existing tools. Therefore we estimate a $10.00 charge per can for quantities over 750, with the balance of the tooling per size eliminated for this item.

Note 4 - The 3 BW and 4 BWR F.A. design cannot be roll formed by our vendor. Therefore we estimate breaking costs and a higher price per pound for material since a flat rolled sheet must be utilized rather than a coil produced.

Note 5 - All raw material prices, and roll forming and associated tooling prices include Joseph Oat markup of 10% G & A overhead plus 10% profit.

JOSEPH OAT CORPORATION
CHEMICAL ENGINEERS & FABRICATORS
NUCLEAR POWER COMPONENTS
ESTABLISHED 1788

ASSUMPTIONS

1. Copper nickel plate is sold on the basis of actual weight. For estimating purposes, theoretical weight is used. Actual weight could differ from theoretical weight by up to 10% depending on gage, but in heavy materials, the difference should be much closer.

2. Some items which could be less expensive as forgings are being considered from plate due to forging vendor late response.

3. Raw material prices are based as follows:

   Alloy N08825 is based on $5.50/lb nickel price and is subject to price in effect at time of shipment. Metal mix price is approximately 5.00/lb. Labor is balance of the mateial prices.

   Alloy C71500 prices are based on a metal-mix price of 3.2302/lb, which in turn is based on 1.36/1 copper and $7.50/lb. nickel. Labor is the balance of material price. See Revere Copper quotation. Price in effect at time of order. Labor escalation on this material about 3%/year apples. Securing metals on the commodity exchange (futures) could make for less pricing volitility.

3a. In certain cases items which are ring configurations are purchased as such from plate vendors. Price per lb. is much higher due to scrap generated. Forgings could be more economical.

4. Please review Kaiser Rollmet quotation attached for assumption regarding extended shells.

5. Dividers are spot welded to each other in a fixture intended to keep them relatively straight. This will be followed by manual straighting to the best degree possible. Dividers are not joined to the can in any way.

6. Vendor prices utilized are as follows:

   Roll Forming - Teledyne Metals
   Alloy C71500 - Revere Copper
   Alloy N08825 - Jessop Steel (Also G. O. Carlson prices received).
   Heavy Plate Rolling - John Lutz
   Extruding - Kaiser Rollmet

JOSEPH OAT CORPORATION
CHEMICAL ENGINEERS & FABRICATORS
NUCLEAR POWER COMPONENTS
ESTABLISHED 1788

September 19, 1989

R BRUCKNER

SEP 21 1989

cc: H. Doman
w/ ATTACHMENTS

Babcock & Wilcox Company
Alliance Research Center
1562 Beeson Street
Alliance, Ohio 44601

Attn: Rod Bruckner

Subject: Response to 9/15/89 fax

Gentlemen:

1) Please see item 3 of assumptions.

2) We regret the error which was caused by a confusing vendor quotation. It has been corrected.

3) We have placed information on the proper forms with our revised quotation.

4) See note 3a. under assumptions.

5) QA Labor is adequate. We consider QA Labor as Quality Systems Management. Inspection cost is QC labor and is done by the same corporate department. To determine total QC/QA hours, you must add Inspection and QA labor together.

6) Done

7) Not necessary - 1 hour of QA Labor is necessary for each part. Rather than arbitrarily dividing it, we assigned it to documentation item.

8) OK

9) Jessop Steel was used as source for N00825 alloy. G.O. Carlson also provided a quotation, but too late to include in our figures. It seems their prices may be lower.

10) OK

11) Acknowledged received.

12) We will attempt to send by 9/20.

Very truly yours,

Ron Kaplan
Vice President

RK:rmc
#007

009

TOTAL PRICE AND TAX ESTIMATE FOR YMP HLNV CONTAINER FABRICATION PER PIECE AT 750 PIECES/YEAR AS OF 8/1/89 (NO ESCALATION)

Offeror: JOSEPH OAT CORP. Quotation No.: Q-2699

Tank	Price Before Taxes, $/Pc.	Taxes: Sales $	Sales Rate	Business $	Business Rate	Inventory $	Inventory Rate	Other $	Other Rate	Price After Taxes $/Pc.
				C71500 Alloy						
1C.0	33696									33696
2C.0	41884									41884
3C.0	46309									46309
4C.0	11117									11117
5C.0	12149									12149
				N08825 Alloy						
1N.0	43993									43993
2N.0	52710									52710
3N.0	59188									59188
4N.0	15026									15026
5N.0	16503									16503
				S30403 Alloy						
6S.0	5088									5088
7S.0	3668									3668
8S.0	5249									5249
9S.0	7013									7013
10S.0	4161									4161

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W P.O. _____.

Estimated By: JOSEPH OAT CORP. Verified By: Martin Kaplan OK MK

Date: 9-22-89 Date: 9-22-89

Name: Ron Kaplan Name: Martin Kaplan

Title: Vice President Title: President

*Approved By: OK RK

Date: 9-22-89

Name: Ron Kaplan

Title: Vice President

*Must be a responsible officer of the Company.

(Either type or use black ink to complete this form.

[illegible] CONTAINER FABRICATION PRICE ESTIMATE

Component: Lower Unit (LU) Alloy: C71500 Offeror: JOSEPH OAT Quotation No: Q-2699

[illegible]ce per unit for 750 units/year for a total produc[illegible] of 15,000 units as of 8/1/89 (no escalation)

20S Container

Task	Description	Raw Materials: Plate Wt. ($/Lb)	Raw Materials: Bar Wt. ($/Lb)	Raw Materials: Forging Wt. ($/Lb)	Raw Materials: Total $/Comp.	Materials: Exp. $	Materials: Tools $	Materials: Ship $	Labor: Engr. $ (Hrs)	Labor: Mfr. $ (Hrs)	Labor: Insp. $ (Hrs)	Labor: QA $ (Hrs)	
1C.1	Note 9 Bottom Head (BH)	895 (6.85) [illegible]		( )	6131	0	5	6	75 (1)	400 (8)	50 (1)	5 (.1)	
.2	Body (B)	1373 (624) 9/a/89		( )	8568	Note 1 480	18	20	75 (1)	1400 (28)	50 (1)	5 (.1)	
.3	Flange Blank (FB)	183 [illegible] 12.50			2288	0	0	2	7.5 (.1)	200 (4)	5 (.1)	5 (.1)	Note 3
.4	Join BH to B					Note 2 280	10	-	75 (1)	1500 (30)	50 (1)	10 (.2)	
.5	Spin Form LU					6828	0	125	75 (1)	N/A	50 (1)	10 (.2)	
.6	Join FB to LU					60	5		75 (1)	275 (5.5)	50 (1)	5 (.1)	
.7	Note 4 Anneal LU					100	10		37.5 (.5)	250 (5)	50 (1)	5 (.1)	
.8	Machine LU					25	10	0	15 (.2)	400 (8)	50 (1)	5 (.1)	
.9	Note 5 Inspect & Test					770	Note 7 30	0	150 (2)	800 (16)	300 (6)	50 (1)	
.10	QA & Document								( )	( )	( )	100 (2)	
.11	Note 6 Package & Ship					Note 8 450	10	250	( )	400 (8)	50 (1)	( )	
	Additional Tooling &						100		( )	( )	( )	( )	
1C.0	Total LUC				16907	8993	198	403	595 (7.8)	5625 (112.5)	795 (14.1)	200 (4)	

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W P.O. 537-[illegible]

Estimated By: Ron Kaplan C/O Joseph Oat

Date: 9-22-89

Name: Ron Kaplan

Title: Vice President

Verified By: [signature] OK MJK

Date: 9-22-89

Name: Martin Kaplan

Title: President

*Approved By: [signature] OK RK

Date: 9-22-89

Name: Ron Kaplan

Title: V Vice President

*Must be a responsible officer of the Company. (Either type or use black ink to complete this form.)

011

SEP 22 '89 11:25 No.022 P.02

YMP HLW CONTAINER FABRICATION PRICE ESTIMATE

Component: Lower Unit (LU) Alloy: C71500 Offeror: JOSEPH OAT Quotation No: Q-2699

Price per unit for 750 units/year for a total production of 15,000 units as of 8/1/89 (no escalation)

26L Container

		Raw Materials				Materials			Labor			
Task	Description	Plate Wt. ($/Lb)	Bar Wt. ($/Lb)	Forging Wt. ($/Lb)	Total $/Comp.	Exp. $	Tools $	Ship $	Engr. $ (Hrs)	Manuf. $ (Hrs)	Insp. $ (Hrs)	QA $ (Hrs)
2C.1	Bottom Head (BH)	895 (6.85)	( )	( )	6131		5	6	75 (1)	400 (8)	50 (1)	5 (.1)
.2	Body (B)	2147 (6.23)	( )	( )	13376	750	18	30	75 (1)	2050 (41)	50 (1)	5 (.1)
.3	Flange Blank (FB)	183 12.50			2288	0	0	2	7.5 (.1)	200 (4)	5 (.1)	5 (.1)
.4	Join BH to B					280	10	-	75 (1)	1500 (30)	50 (1)	10 (.2)
.5	Spin Form LU					8378	0	175	75 (1)	(N/A)	50 (1)	10 (.2)
.6	Join FB to LU					60	5	---	75 (1)	275 (5.5)	50 (1)	5 (.1)
.7	Anneal LU					115	10		37.5 (.5)	300 (6)	50 (1)	5 (.1)
.8	Machine LU					30	10		15 (.2)	450 (9)	50 (1)	5 (.1)
.9	Inspect & Test					950	30	0	150 (2)	1000 (20)	350 (7)	50 (1)
.10	QA & Document								( )	( )	( )	100 (2)
.11	Package & Ship					550	10	350	( )	500 (10)	50 (1)	( )
	Additional Tooling						100		( )	( )	( )	( )
2C.0	Total LUC				21795	11113	198	563	585 (7.8)	6675 (133.5)	755 (15.1)	200 (4)

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W P.O. 537-OA163948UB.

Estimated By: JOSEPH OAT CORP.
Date: 9-19-89
Name: Ron Kaplan
Title: Vice President

Verified By: Martin Kaplan
Date: 9-19-89
Name: Martin Kaplan
Title: President

*Approved By:
Date: 9-19-89
Name: Ron Kaplan
Title: Vice President

*Must be a responsible officer of the Company. (Either type or use black ink to complete this form.)

012

YMP HLW CONTAINER FABRICATION [illegible] ESTIMATE

Component: Lower Unit (LU) Alloy: C71500 Offeror: JOSEPH OAT CORP. Quotation No: 0-2609

Price per unit for 750 units/year for a total production of 15,000 units as of 8/1/89 (no escalation)

28L Container

		Raw Materials				Materials			Labor			
Task	Description	Plate Wt. ($/Lb)	Bar Wt. ($/Lb)	Forging Wt. ($/Lb)	Total $/Comp.	Mfg. $	Tools $	Ship $	Engr. $ (Hrs)	Manuf. $ (Hrs)	Insp. $ (Hrs)	QA $ (Hrs)
3C.1	Bottom Head (BH)	1027 (6.85)	( )	( )	7035		5	8	75 (1)	500 (10)	50 (1)	5 (.1)
.2	Body (B)	2297 (6.23)	( )	( )	14310	900	18	35	75 (1)	2400 (48)	50 (1)	5 (.1)
.3	Flange Blank (FB)	240 (11.28)			2707	0	0	2	7.5 (.1)	250 (5)	5 (.1)	5 (.1)
.4	Join BH to B					310	10	-	75 (1)	1750 (35)	50 (1)	10 (.2)
.5	Spin Form LU					8974		190	75 (1)	(N/A)	50 (1)	10 (.2)
.6	Join FB to LU					70	5		75 (1)	325 (6.5)	50 (1)	5 (.1)
.7	Anneal LU					120	10		37.5 (.5)	350 (7)	50 (1)	5 (.1)
.8	Machine LU					35	10		15 (2)	500 (10)	50 (1)	5 (.1)
.9	Inspect & Test					1075	30	0	150 (2)	1250 (25)	350 (7)	50 (1)
.10	QA & Document								( )	( )	( )	100 (2)
.11	Package & Ship					600	10	375	( )	500 (10)	50 (1)	( )
	Additional Tooling						100		( )	( )	( )	( )
3C.0	Total LUC				24052	12084	198	610	585 (7.8)	7825 (156.5)	755 (15.1)	200 (4)

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W P.O. 537-QA163940B.

Estimated By: JOSEPH OAT CORP.
Date: 9-22-89
Name: Ron Kaplan
Title: Vice President

Verified By: [signature] OK RK
Date: 9-22-89
Name: Martin Kaplan
Title: President

*Approved By: [signature]
Date: 9-22-89
Name: Ron Kaplan
Title: Vice President

OK RK

*Must be a responsible officer of the Company. (Either type or use black ink to complete this form.)

013

Rev. 0

YMP HLNW CONTAINER FABRICATION PRICE ESTIMATE

Component: Upper Head (UH) Alloy: C71500 Offeror: JOSEPH OAT Quotation No: 0-2699

Price per unit for 750 units/year for a total production of 15,000 units as of 8/1/89 (no escalation)

26S or 26L Container

Task	Description	Raw Materials: Plate Wt. ($/Lb)	Raw Materials: Bar Wt. ($/Lb)	Raw Materials: Forging Wt. ($/Lb)	Raw Materials: Total $/Comp.	Materials: Exp. $	Materials: Tools $	Materials: Ship $	Labor: Engr. $ (Hrs)	Labor: Manuf. $ (Hrs)	Labor: Insp. $ (Hrs)	Labor: QA $ (Hrs)
4C.1	Upper Head (UH)	1039 (6.84)	( )	( )	7107			60	37.5 (.5)	In Mach Below	( )	( )
.2	Pintle (P) Note 1	( )	177 (9.50)	( )	1681			11	37.5 (.5)	100 (2)	25 (.5)	( )
.3	Join P to UH					13	15	--	7.5 (.1)	200 (4)	25 (.5)	( )
.4	Anneal UH					75	--	--	7.5 (.1)	200 (4)	50 (1)	( )
.5	Machine UH					10			37.5 (.5)	800 (16)	25 (.5)	( )
.6	Inspect & Clean					10			7.5 (.1)	100 (2)	50 (1)	( )
.7	QA & Document								( )	( )	( )	50 (1)
.8	Package & Ship					100	--	125	(--)	100 (2)	50 (1)	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
4C.0	Total UHC				3788	208	15	196	135 (1.8)	1500 (30)	225 (4.5)	50 (1)

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W P.O. 537-OA163940UB.

Estimated By: JOSEPH OAT CORP.
Date: 9-19-89
Name: Ron Kaplan
Title: Vice President

Verified By: Martin Kaplan
Date: 9-19-89
Name: Martin Kaplan
Title: President

*Approved By:
Date: 9-19-89
Name: Ron Kaplan
Title: Vice President

*Must be a responsible officer of the Company. (Either type or use black ink to complete this form.)

014

TMP HLNW CONTAINER FABRICATION PRICE ESTIMATE

Component: Upper Head (UH) Alloy: 6/1500 Offeror: [illegible] Quotation No: Q-2699

Price per unit for 750 units/year for a total production of [illegible],000 units as of 8/1/89 (no escalation)

28L Container

		Raw Materials				Materials			Labor			
Task	Description	Plate Wt. ($/Lb)	Bar Wt. ($/Lb)	Forging Wt. ($/Lb)	Total $/Comp.	Exp. $	Tools $	Ship $	Engr. $ (Hrs)	Manuf. $ (Hrs)	Insp. $ (Hrs)	QA $ (Hrs)
SC.1	Upper Head (UH)	1173 (6.84)	( )	( )	8023			65	37.5 (.5)	In Mach ( )	( )	( )
.2	Pintle (P)	( )	177 (9.50)	( )	1682			11	37.5 (.5)	100 (2)	25 (.5)	( )
.3	Join P to UH					13	15		7.5 (.1)	200 (4)	25 (.5)	( )
.4	Anneal UH					75			7.5 (.1)	200 (4)	50 (1)	( )
.5	Machine UH					10			37.5 (.5)	900 (18)	25 (.5)	( )
.6	Inspect & Clean					10			7.5 (.1)	100 (2)	50 (1)	( )
.7	QA & Document								( )	( )	( )	50 (1)
.8	Package & Ship					100		135	( )	100 (2)	50 (1)	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
SC.0	Total UHC				9705	208	15	211	135 (1.8)	1600 (32)	225 (4.5)	50 (1)

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W P.O. 537-QA163948UB.

Estimated By: JOSEPH OAT CORP.

Date: 9-22-89

Name: Ron Kaplan

Title: Vice President

Verified By: [signature] OK MK

Date: 9-22-89

Name: Martin Kaplan

Title: President

*Approved By: [signature] OK

Date: 9-22-89

Name: Ron Kaplan

Title: Vice President

*Must be a responsible officer of the Company. (Either type or use black ink to complete this form.)

015

YMP HLNW CONTAINER FABRICATION PRICE ESTIMATE

Component: Lower Unit (LU) Alloy: N08825 Offeror: JOSEPH OAT CORP. Quotation No: Q-2699

Price per unit for 750 units/year for a total production of 15,000 units as of 8/1/89 (no escalation)
26S Container

Task	Description	Raw Materials: Plate Wt. ($/Lb)	Raw Materials: Bar Wt. ($/Lb)	Raw Materials: Forging Wt. ($/Lb)	Raw Materials: Total $/Comp.	Materials: Exp. $	Materials: Tools $	Materials: Ship $	Labor: Engr. $ (Hrs)	Labor: Manuf. $ (Hrs)	Labor: Insp. $ (Hrs)	Labor: QA $ (Hrs)
1N.1	Bottom Head (BH)	815 (11.76)	( )	( )	9585	0	5	6	75 (1)	400 (8)	50 (1)	5 (.1)
.2	Body (B)	1251 (8.70)	( )	( )	10883	810	18	20	75 (1)	1750 (35)	50 (1)	5 (.1)
.3	Flange Blank (FB)	175 26.33			4608	0	0	2	7.5 (1)	250 (5)	5 (.1)	5 (.1)
.4	Join BH to B					740	10	-	75 (1)	1800 (36)	50 ( )	10 (.2)
.5	Spin Form LU					7421	0	125	75 (1)	(N/A)	50 ( )	10 (.2)
.6	Join FB to LU					135	5	---	3753 (1)	325 (1.5)	50 ( )	5 (1)
.7	Anneal LU					100	10		37.5 (.5)	250 (5)	50 ( )	5 (.1)
.8	Machine LU					25	10	0	15 (.2)	400 (8)	50 ( )	5 (.1)
.9	Inspect & Test					770	30	0	150 (2)	800 (16)	300 ( )	50 (1)
.10	QA & Document								( )	( )	( )	100 (2)
.11	Package & Ship					450	10	250	( )	400 (8)	50 ( )	( )
	Additional Tooling						100		( )	( )	( )	( )
1N.0	Total LUN				25076	10451	198	403	585 (7.8)	6375 5 (127.)	705 (14.1)	200 (4)

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W P.O. 537-0A163948UB.

Estimated By: JOSEPH OAT CORP.
Date: 9-19-89
Name: Ron Kaplan
Title: Vice President

Verified By: Martin Kaplan
Date: 9-19-89
Name: Martin Kaplan
Title: President

*Approved By:
Date: 9-19-89
Name: Ron Kaplan
Title: Vice President

*Must be a responsible officer of the Company. (Either type or use black ink to complete this form.)

016

YMP HLW/W CONTAINER FABRICATION PRICE ESTIMATE

Component: Lower Unit (LU) Alloy: N06825 Offeror: JOSEPH OAT CORP. Quotation No: Q-2699

Price per unit for 750 units/year for a total production of 15,000 units as of 8/1/89 (no escalation)

26L Container

		Raw Materials				Materials			Labor			
Task	Description	Plate Wt. ($/Lb)	Bar Wt. ($/Lb)	Forging Wt. ($/Lb)	Total $/Comp.	Exp. $	Tools $	Ship $	Engr. $ (Hrs)	Manuf. $ (Hrs)	Insp. $ (Hrs)	QA $ (Hrs)
2N.1	Bottom Head (BH)	815 (1.71)	( )	( )	9544		5	6	75 (1)	400 (8)	50 (1)	5 (.1)
.2	Body (B)	1933 (8.29)	( )	( )	16025	1265	18	30	75 (1)	2550 (51)	50 (1)	5 (.1)
.3	Flange Blank (FB)	185 23.35			4320	0	0	2	7.5 (1)	250 (5)	5 (.1)	5 (.1)
.4	Join BH to B					740	10	—	75 (1)	1800 (36)	50 (1)	10 (.2)
.5	Spin Form LU					9160	0	175	75 (1)	(N/A)	50 (1)	10 (.2)
.6	Join FB to LU					135	5	---	75 (1)	325 (.65)	50 (1)	5 (.1)
.7	Anneal LU					115	10	.5	37.5 (.5)	300 (6)	50 (1)	5 (.1)
.8	Machine LU					30	10		15 (.2)	450 (9)	50 (1)	5 (.1)
.9	Inspect & Test					950	30		150 (2)	1000 (20)	350 (7)	50 (1)
.10	QA & Document								( )	( )	( )	100 (2)
.11	Package & Ship					550	10	350	( )	500 (10)	50 (1)	( )
	Additional Tooling						100		( )	( )	( )	( )
2N.0	Total LUN				29889	12945	198	563	585 (7.8)	7575 (51.5)	755 (15.1)	200 (4)

Changed Engr & QA hours and $/hr per HLW 9/21/89

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W P.O. 537-QA163948UB.

Estimated By: JOSEPH OAT CORP.
Date: 9-22-89
Name: Ron Kaplan
Title: Vice President

Verified By: Martin Kaplan
Date: 9-22-89
Name: Martin Kaplan
Title: President

*Approved By:
Date: 9-22-89
Name: Ron Kaplan
Title: Vice President

*Must be a responsible officer of the Company. (Either type or use black ink to complete this form.)

012

Sep 21,89 11:25 No.022 P.0

YMP HLNW CONTAINER FABRICATION PRICE ESTIMATE

Component: Lower Unit (LU) Alloy: ~~N08825~~ N08825 Offeror: JOSEPH OAT CORP. Quotation No: Q-2699 Rev.

Price per unit for 750 units/year for a total production of 15,000 units as of 8/1/89 (no escalation)

28L Container

Task	Description	Raw Materials: Plate Wt. ($/Lb)	Raw Materials: Bar Wt. ($/Lb)	Raw Materials: Forging Wt. ($/Lb)	Raw Materials: Total $/Comp.	Materials: Exp. $	Materials: Tools $	Materials: Ship $	Labor: Engr. $ (Hrs)	Labor: Manuf. $ (Hrs)	Labor: Insp. $ (Hrs)	Labor: $ (Hrs)
3N.1	Bottom Head (BH)	935 (11.7)	( )	( )	10949		5	8	75 (1)	500 (10)	50 (1)	5 (.1)
.2	Body (B)	2090 (8.29)	( )	( )	17326	1518	18	35	75 (1)	3000 (60)	50 (1)	5 (.1)
.3	Flange Blank (FB)	240 23.35			5604		0	2	7.5 (.1)	250 (5)	5 (.1)	5 (.1)
.4	Join BH to B					800	10		75 (1)	2100 (42)	50 (1)	10 (.2)
.5	Spin Form LU					9838		190	75 (1)	(N/A)	50 (1)	10 (.2)
.6	Join FB to LU					150	5		75 (1)	375 (7.5)	50 (1)	5 (.1)
.7	Anneal LU					120	10		37.5 (.5)	350 (7)	50 (1)	5 (.1)
.8	Machine LU					35	10		15 (.2)	500 (10)	50 (1)	5 (.1)
.9	Inspect & Test					1075	30		150 (2)	1250 (25)	350 (7)	50 (1)
.10	QA & Document								( )	( )	( )	100 (2)
.11	Package & Ship					600	10	375	( )	500 (10)	50 (1)	( )
	Additional Tooling						100		( )	( )	( )	( )
3N.0	Total LUN				33879	14136	198	610	585 (7.8)	8825 (176.5)	755 (15.1)	200 (4)

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&V P.O. 537-OA163948UB.

Estimated By: JOSEPH OAT CORP.
Date: 9-19-89
Name: Ron Kaplan
Title: Vice President

Verified By: Martin Kaplan
Date: 9-19-89
Name: Martin Kaplan
Title: President

*Approved By:
Date: 9-19-89
Name: Ron Kaplan
Title: Vice President

*Must be a responsible officer of the Company. (Either type or use black ink to complete this form.)

018

TMP NLHW CONTAINER FABRICATION [illegible] ESTIMATE

Component: Upper Head (UH) Allow: M05825 Offeror: JOSEPH OAT CORP. Quotation No: Q-2699

Price per unit for 750 units/year for a total production of 15,000 units as of 8/1/89 (no escalation)

26S or 26L Container

Task	Description	Raw Materials: Plate Wt. ($/Lb)	Raw Materials: Bar Wt. ($/Lb)	Raw Materials: Forging Wt. ($/Lb)	Raw Materials: Total $/Comp.	Materials: Exp. $	Materials: Tools $	Materials: Ship $	Labor: Engr. $ (Hrs)	Labor: Manuf. $ (Hrs)	Labor: Insp. $ (Hrs)	Labor: QA $ (Hrs)
4N.1	Upper Head (UH)	940 (11.7)	( )	( )	11036			60	37.5 (.5)	In Mach. Below	( )	( )
.2	Pintle (P)	( )	155 (10.2)	( )	1595			11	37.5 (.5)	100 (2)	25 (.5)	( )
.3	Join P to UH					29	15		7.5 (.1)	250 (5)	25 (.5)	( )
.4	Anneal UH					75			7.5 (.1)	200 (4)	50 (1)	( )
.5	Machine UH					10			37.5 (.5)	800 (16)	25 (.5)	( )
.6	Inspect & Clean					10			7.5 (.1)	100 (2)	50 (1)	( )
.7	QA & Document								( )	( )	( )	50 (1)
.8	Package & Ship					100		125	( )	100 (2)	50 (1)	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									135 (1.8)	1550 (31)	225 (4.5)	50 (1)
4N.0	Total UHN				12631	224	15	196				

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and NSW P.O. 537-OA163948UB.

Estimated By: JOSEPH OAT CORP.
Date: 9-22-89
Name: Ron Kaplan
Title: Vice President

Verified By: Martin Kaplan OK MK
Date: 9-22-89
Name: Martin Kaplan
Title: President

*Approved By: [signature] OK
Date: 9-22-89
Name: Ron Kaplan
Title: Vice President

*Must be a responsible officer of the Company. (Either type or use black ink to complete this form.)

019

THP HLNW CONTAINER FABRICATION PRICE ESTIMATE

Component: Upper Head (UH) Alley: NNH825 Offeror: JOSEPH OAT CORP. Quotation No: Q-2699

Price per unit for 750 units/year for a total production of 15,000 units as of 8/1/89 (no escalation)
28H Container

Task	Description	Raw Materials: Plate Wt. ($/Lb)	Raw Materials: Bar Wt. ($/Lb)	Raw Materials: Forging Wt. ($/Lb)	Raw Materials: Total $/Comp.	Materials: Exp. $	Materials: Tools $	Materials: Ship $	Labor: Engr. $ (Hrs)	Labor: Manuf. $ (Hrs)	Labor: Insp. $ (Hrs)	Labor: QA $ (Hrs)
SN.1	Upper Head (UH)	1061 (11.6)	( )	( )	12403			70	37.5 (.5)	In Mach. Below	( )	( )
.2	Pintle (P)	( )	155 (10.2)	( )	1595			11	37.5 (.5)	100 (2)	25 (.5)	( )
.3	Join P to UH					29	15		7.5 (.1)	250 (5)	225 (.5)	( )
.4	Anneal UH					75			7.5 (.1)	200 (4)	50 (1)	( )
.5	Machine UH					10			37.5 (.5)	900 (18)	25 (.5)	( )
.6	Inspect & Clean								7.5 (.1)	100 (2)	50 (1)	( )
.7	QA & Document								( )	( )	( )	50 (1)
.8	Package & Ship					100		135	( )	100 (2)	50 (1)	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									135 (1.8)	1650 (33)	225 (4.5)	50 (1)
SN.0	Total UHH				13998	214	15	216				

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W P.O. :537-OA163948UB.

Estimated By: JOSEPH OAT CORP.
Date: 9-22-89
Name: Ron Kaplan
Title: Vice President

Verified By: Martin Kaplan OK MK
Date: 9-22-89
Name: Martin Kaplan
Title: President

*Approved By:
Date: 9-22-89
Name: Ron Kaplan
Title: Vice President

*Must be a responsible officer of the Company. (Either type or use black ink to complete this form.)

020

TRP BLDG CONTAINER FABRICATION PRICE ESTIMATE

Component: Internals Alloy: S30403 Offeror: JOSEPH OAT CORP. Quotation No: Q-2699

Price per unit for 750 units/year for a total production of 15,000 units as of 8/1/89 (no escalation)
Consolidated 6 PWR fuel assemblies

		Raw Materials				Materials			Labor			
Task	Description	Plate Wt. ($/Lb)	Bar Wt. ($/Lb)	Forging Wt. ($/Lb)	Total $/Comp.	Exp. $	Tools $	Ship $	Engr. $ (Hrs)	Manuf. $ (Hrs)	Insp. $ (Hrs)	QA $ (Hrs)
6S.1	Form Dividers	674 (1.94)*	( )	( )	1307	1137	59	75	75 (1)	N/A	100 (2)	50 (1)
.2	Join Dividers,	( )	( )	( )		20	50	—	75 (1)	1350 (27)	150 (3)	50 (1)
.3	Machine, Straight & Clean					10	10	—	( )	325 (6.5)	50 (1)	( )
.4	Inspect					5	5		15 (.2)	( )	100 (2)	( )
.5	QA & Document					—	—	—	( )	( )	( )	10 (.2)
.6	Pack & Ship					10	—	—	( )	50 (1)	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
6S.0	Total Internals				1307	1182	124	75	165 (2.2)	1725 (34.5)	400 (8)	110 (2.2)

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W P.O. 537-QA163948UB.

Estimated By: JOSSEPH OAT CORP.
Date: 9-22-89
Name: Ron Kaplan
Title: Vice President

Verified By: Martin Kaplan OK MK
Date: 9-22-89
Name: Martin Kaplan
Title: President

*Approved By: Ron Kaplan
Date: 9-22-89
Name: Ron Kaplan
Title: Vice President

*Must be a responsible officer of the Company. (Either type or use black ink to complete this form.)

021

TMP HLNW CONTAINER FABRICATION PRICE ESTIMATE

Component: Internals Alloy: ~~S30400~~ 304 Offeror: JOSEPH OAT CORP. Quotation No: 0-2699

Price per unit for 750 units/year for a total production of 15,000 units as of 8/1/89 (no escalation)

3 PWR fuel assemblies

Task	Description	Raw Materials: Plate Wt. ($/Lb)	Raw Materials: Bar Wt. ($/Lb)	Raw Materials: Forging Wt. ($/Lb)	Raw Materials: Total $/Comp.	Materials: Exp. $	Materials: Tools $	Materials: Ship $	Labor: Engr. $ (Hrs)	Labor: Manuf. $ (Hrs)	Labor: Insp. $ (Hrs)	Labor: QA $ (Hrs)
7S.1	Form Dividers	421 (1.94)	( )	( )	817	732	64	45	75 (1)	(----)	100 (2)	50 (1)
.2	Join Dividers	( )	( )	( )		20	50	--	75 (1)	900 (18)	150 (3)	50 (1)
.3	Machine, Straight & Clean					10	10		(----)	275 (5.5)	50 (1)	(----)
.4	Inspect					5	5	---	15 (.2)	(----)	100 (2)	(----)
.5	QA & Documentation					--	--	---	(----)	(----)	(----)	10 (2)
.6	Pack & Ship					10	--	---	( )	50 (1)	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
7S.0	Total Internals				817	777	129	45	165 (2.2)	1225 (24.5)	400 (8)	110 (2.2)

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W P.O. 537-OA163948UB.

Estimated By: JOSEPH OAT CORP.
Date: 9-19-89
Name: Ron Kaplan
Title: Vice President

Verified By: Martin Kaplan
Date: 9-19-89
Name: Martin Kaplan
Title: President

*Approved By:
Date: 9-19-89
Name: Ron Kaplan
Title: Vice President

*Must be a responsible officer of the Company. (Either type or use black ink to complete this form.)

020

THE BLRA CONTAINER FABRICATION PRICE ESTIMATE

Component: Internals Alloy: S30403 Offeror: JOSEPH OAT CORP. Quotation No: 0-2699

Price per unit for 750 units/year for a total production of 15,000 units as of 8/1/89 (no escalation)
3 PWR and 4 BWR fuel assemblies

Task	Description	Raw Materials: Plate Wt. ($/Lb)	Raw Materials: Bar Wt. ($/Lb)	Raw Materials: Forging Wt. ($/Lb)	Raw Materials: Total $/Comp.	Materials: Exp. $	Materials: Tools $	Materials: Ship $	Labor: Engr. $ (Hrs)	Labor: Manuf. $ (Hrs)	Labor: Insp. $ (Hrs)	Labor: QA $ (Hrs)
8S.1	Form Dividers	801 (2.24)	( )	( )	1794	--	10	40	75 (1)	525 (10.5)	5 (.1)	50 (1)
.2	Join Dividers	( )	( )	( )		20	65	--	75 (1)	1650 (33)	25 (.5)	50 (1)
.3	Machine, Straight & Clean					10	10	--	(-----)	375 (7.5)	50 (1)	( )
.4	Inspect					5	5		15 (.2)	(-----)	100 (2)	( )
.5	QA & Document								( )	( )	( )	10 (.2)
.6	Pack & Ship					10			( )	50 (1)	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
8S.0	Total Internals				1794	45	90	40	165 (2.2)	2600 (52)	405 (8.1)	110 (2.2)

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W P.O. 537-QA163948UB.

Estimated By: JOSEPH OAT CORP.
Date: 9-22-89
Name: Ron Kaplan
Title: Vice President

Verified By: Martin Kaplan OK MK
Date: 9-22-89
Name: Martin Kaplan
Title: President

*Approved By:
Date: 9-22-89
Name: Ron Kaplan
Title: Vice President

*Must be a responsible officer of the Company. (Either type or use black ink to complete this form.)

YMP HLNW CONTAINER FABRICATION PRICE ESTIMATE

Component: Internals Alloy: S30403 Offeror: JOSEPH OAT CORP. Quotation No: Q-2699

Price per unit for 750 units/year for a total production of 15,000 units as of 8/1/89 (no escalation)
10 BWR fuel assemblies

		Raw Materials				Materials			Labor			
Task	Description	Plate Wt. ($/Lb)	Bar Wt. ($/Lb)	Forging Wt. ($/Lb)	Total $/Comp.	Exp. $	Tools $	Ship $	Engr. $ (Hrs)	Manuf. $ (Hrs)	Insp. $ (Hrs)	QA $ (Hrs)
9S.1	Form Dividers	969 (1.94)	( )	( )	1880	1629	92	107	75 (1)	( )	100 (2)	50 (1)
.2	Join Dividers	( )	( )	( )		20	65	----	75 (1)	2050 (41)	150 (3)	50 (1)
.3	Machine, Straight & Clean					10	15		(----)	400 (8)	50 (1)	(----)
.4	Inspect					5	5		15 (.2)	(----)	100 (2)	(----)
.5	QA & Document								( )	( )	( )	10 (.2)
.6	Pack & Ship					10			( )	50 (1)	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
9S.0	Total Internals				1880	1674	177	107	165 (2.2)	2500 (50)	400 (8)	110 (2.2)

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W P.O. 537-OA163948UB.

Estimated By: JOSEPH OAT CORP.
Date: 9-19-89
Name: Ron Kaplan
Title: Vice President

Verified By: [signature]
Date: 9-19-89
Name: Martin Kaplan
Title: President

*Approved By: [signature]
Date: 9-19-89
Name: Ron Kaplan
Title: Vice President

*Must be a responsible officer of the Company. (Either type or use black ink to complete this form.)

024

TMI MLNW CONTAINER FABRICATION PRICE ESTIMATE

Component: Internals Alloy: S30403 Offeror: JOSEPH OAT CORP. Quotation No: Q-2699

Price per unit for 750 units/year for a total production of 15,000 units as of 8/1/89 (no escalation)

4 PWR fuel assemblies

		Raw Materials				Materials			Labor			
Task	Description	Plate Wt. ($/Lb)	Bar Wt. ($/Lb)	Forging Wt. ($/Lb)	Total $/Comp.	Exp. $	Tools $	Ship $	Engr. $ (Hrs)	Manuf. $ (Hrs)	Insp. $ (Hrs)	QA $ (Hrs)
10S.1	Form Dividers	506 (1.94)	( )	( )	982	840	28	56	75 (1)	(----→	100 (2)	50 (1)
.2	Join Dividers	( )	( )	( )		20	45		75 (1)	1150 (23)	150 (3)	50 (1)
.3	Machine, Straight & Clean					10	10		( )	275 (5.5)	50 (1)	( )
.4	Inspect					5	5		15 (.2)	( )	100 (2)	( )
.5	QA & Document								( )	( )	( )	10 (2)
.6	Pack & Ship					10			( )	50 (1)	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
10S.0	Total Internals				982	885	88	56	165 (2.2)	1475 (29.5)	400 (8)	110 (2.2)

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W P.O. 537-OA163948UB.

Estimated By: JOSEPH OAT CORP.
Date: 9-19-89
Name: Ron Kaplan
Title: Vice President

Verified By: Mark Kaplan
Date: 9-19-89
Name: Martin Kaplan
Title: President

*Approved By:
Date: 9-19-89
Name: Ron Kaplan
Title: Vice President

*Must be a responsible officer of the Company. (Either type or use black ink to complete this form.)

025

JOSEPH OAT CORPORATION
CHEMICAL ENGINEERS & FABRICATORS
NUCLEAR POWER COMPONENTS
ESTABLISHED 1788

"EXHIBITS"

ESTABLISHED 1908
JOSEPH OAT CORPORATION
CHEMICAL ENGINEERS & FABRICATORS

JOSEPH OAT CORP. REQUEST FOR QUOTE

Attention: Sales Department

Reference: Request for Quote

Gentlemen:

You are requested to supply price on the below list of materials. Material must be produced to a stringent quality assurance system which will be the subject of future discussion. Obviously firm prices cannot be established for future purchases. Therefore please quote prices which are in effect this date, and escalation formulas or information, if possible. Initial procurement is not anticipated for over a year. Written quotations are requested.

Item No.	Quantity	Dimensions	Material
1	750	39 x 87-3/16 x 1.25	Alloy 825 plate sheet or forging. (Alloy UNS 08825) Cast products not permitted.
2	750	61 x 87-3/16 x 1.25	Alloy 825 plate sheet or forging. (Alloy UNS 08825) Cast products not permitted.
3	750	61 x 93-1/4 x 1.25	Alloy 825 plate sheet or forging. (Alloy UNS 08825) Cast products not permitted.
4	1500	28" Dia. x 4.5	Alloy 825 plate sheet or forging. (Alloy UNS 08825) Cast products not permitted.

027

2500 Broadway / Drawer 10 / Camden, New Jersey 08104 / (609) 541-2900

Sales Department

JOSEPH OAT CORPORATION
CHEMICAL ENGINEERS & FABRICATORS
NUCLEAR POWER COMPONENTS
ESTABLISHED 1798

Item No.	Quantity	Dimensions	Material
5	750	30" Dia. x 4.5	Alloy 825 plate sheet or forging. (Alloy UNS 08825) Cast products not permitted.
6 (OPT. A)	1500	32" Dia. x 1-7/8	Alloy 825 plate sheet or forging. (Alloy UNS 08825) Cast products not permitted.
6 (OPT. B)	1500	Rings - 32" OD x 25-1/4 ID x 1-7/8"	Alloy 825 plate sheet or forging. (Alloy UNS 08825) Cast products not permitted.
7 (OPT. A)	750	34" Dia. x 1-7/8	Alloy 825 plate sheet or forging. (Alloy UNS 08825) Cast products not permitted.
7 (OPT. B)	750	Rings 34" OD x 25-1/2 ID x 1-7/8	Alloy 825 plate sheet or forging. (Alloy UNS 08825) Cast products not permitted.
8	1500	32" Dia. x 4"	Alloy 825 plate sheet or forging. (Alloy UNS 08825) Cast products not permitted.
9	750	34" Dia. x 4"	Alloy 825 plate sheet or forging. (Alloy UNS 08825) Cast products not permitted.
10	2250	10" Dia. x 7-1/4" thk. (Can be supplied as 10" Dia. round bar x R/L.)	Alloy 825 plate sheet or forging. (Alloy UNS 08825) Cast products not permitted.

ESTABLISHED 1708
JOSEPH OAT CORPORATION
CHEMICAL ENGINEERS & FABRICATORS

JOSEPH OAT CORP. REQUEST FOR QUOTE

Attention: Sales Department

Reference: Request for Quote

Gentlemen:

You are requested to supply price on the below list of materials. Material must be produced to a stringent quality assurance system which will be the subject of future discussion. Obviously firm prices cannot be established for future purchases. Therefore please quote prices which are in effect this date, and escalation formulas or information, if possible. Initial procurement is not anticipated for over a year. Written quotations are requested.

Item No.	Quantity	Dimensions	Material
1	750	39 x 87-3/16 x 1.25	70-30 Copper Nickel plate, sheet or forging (Alloy UNS C71500 cast products not permitted.
2	750	61 x 87-3/16 x 1.25	70-30 Copper Nickel plate, sheet or forging (Alloy UNS C71500 cast products not permitted.
3	750	61 x 93-1/4 x 1.25	70-30 Copper Nickel plate, sheet or forging (Alloy UNS C71500 cast products not permitted.
4	1500	28" Dia. x 4.5	70-30 Copper Nickel plate, sheet or forging (Alloy UNS C71500 cast products not permitted.

2500 Broadway / Drawer 10 / Camden, New Jersey 08101 / (609) 541-2000

Item No.	Quantity	Dimensions	Material
5	750	30" Dia. x 4.5	70-30 Copper Nickel plate, sheet or forging (Alloy UNS C71500 cast products not permitted.
6 (OPT. A)	1500	32" Dia. x 1-7/8	70-30 Copper Nickel plate, sheet or forging (Alloy UNS C71500 cast products not permitted.
6 (OPT. B)	1500	Rings - 32" OD x 25-1/4 ID x 1-7/8"	70-30 Copper Nickel plate, sheet or forging (Alloy UNS C71500 cast products not permitted
7 (OPT. A)	750	34" Dia. x 1-7/8	70-30 Copper Nickel plate, sheet or forging (Alloy UNS C71500 cast products not permitted.
7 (OPT. B)	750	Rings 34" OD x 25-1/2 ID x 1-7/8	70-30 Copper Nickel plate, sheet or forging (Alloy UNS C71500 cast products not permitted.
8	1500	32" Dia. x 4"	70-30 Copper Nickel plate, sheet or forging (Alloy UNS C71500 cast products not permitted.
9	750	34" Dia. x 4"	70-30 Copper Nickel plate, sheet or forging (Alloy UNS C71500 cast products not permitted.
10	2250	10" Dia. x 7-1/4" thk. (Can be supplied as 10" Dia. round bar x R/L.)	70-30 Copper Nickel plate, sheet or forging (Alloy UNS C71500 cast products not permitted.

JOHN L. LUTZ WELDING AND FABRICATING, INC.

BOX 2995, R. D. #1 (RTE 12)
FRENCHTOWN, NEW JERSEY 08825
201—782-0300

FAXX 201-782-3346

To: Joseph Orr

Date: 17 Aug 89

Attention: Ron Kaplan

Reference: RFQ.

Gentlemen:

In reply to your inquiry of 16 Aug 89 we are pleased to quote as follows:

DISTRIBUTION RECORD released
J #
JOB FILE SECTION:
P. O., COR, P. R. TRANS. INV.
OTHER
COPIES ADDRESSEE)

Material By Orr : 70/30 Cu Ni
or
Inconel 825

750 Pcs - 1 1/4" x 61" x 83 1/4" Long (No Excess Req'd)

Machine Bevel 1 Long Edge Both Sheet Edges,
Double V - 60° Incl, 1/8" ℄ Land
Roll and Form
1 1/4" Wide x 37 3/4" OD x 61" Long.

Price $325.00 Each

Note:
Inconel 825 must be in annealed condition for us to Roll.

By: Vince Williams

Delivery:

Prices are for immediate acceptance, F.O.B. our plant, Frenchtown, N. J.
Regular Terms, 30 days net, subject to approval.
Work is guaranteed to be within agreed tolerances but we assume no responsibility for consequential or contingent damages.

031

TELEDYNE
METAL FORMING
P.O. BOX 767 ELKHART, INDIANA 46515-0767
Phone#: 219/295-5525
FAX 219-295-5074

FAX FAX FAX FAX FAX FAX FAX FAX

FACSIMILE TRANSMISSION

DISTRIBUTION RECORD
J #______ DATE: Sept 11, 89
JOB FILE SECTION:
P. O., COR., P. R. TRANS. INV.
OTHER ______

DELIVER TO: Ron Kaplan
J. OAT Corp.
Camden, NJ.

SUBJECT: Labor only prices

COPIES TO: (OTHER THAN ADDRESSEE)
- ☐ QC MGR.
- ☐ PLANT MGR.
- ☐ PROJ. ENG. TC
- ☑ GEN. MGR.
- ☐ OTHER: ______

MESSAGE: Conversion charges to convert your coiled strip are:

6 PWR com FA	10.7? per foot	Tools $36200.00
3 PWR FA	13.81 per foot	Tools 39500.00
4 PWR FA	11.89 per foot	Tools 17050.00
10 BWR FA shape A	11.28 per foot	Tools 36500.00
10 BWR FA shape B	13.34 per foot	Tools 20500.00

Joseph Oat Note: The 3 PWR + 4 BWR dividers cannot be made by this vendor.

SIGNED: Larry Hartsough

Total Number of Pages 1

For problems with transmittal call 219/295-5525, Ext 19 and ask for LARRY W. HARTSOUGH Assistant Sales Manager

TELEDYNE
METAL FORMING
1937 STERLING AVENUE
P.O. BOX 767

Facsimile No. sending to: (609) 541-0864 Date: 9/12/89

From: ALLEGHENY LUDLUM STEEL CORPORATION
Eastern Regional Sales Office
80 Valley Street
Wallingford, CT 06492

TO: Joe Caplin at Joseph Oat Corporation

FROM: E.A. Polson at Allegheny Ludlum Steel Corp.

No. of pages: 1 (including cover sheet) Main Phone 203-265-9166
Fax No. 203-284-2238

Type 304, #2B Finish, #3 Edge, A240/SA240

Approximately 150,000 Pounds .125 x 20" < 24" x Coil

Price: $1.5390/pound plus surcharge

Alt 24" - < 36" Wide Coil

Price: $1.4760/pound plus surcharge

Alt 36" Wide Coil

Price: $1.4580/pound plus surcharge

Current surcharge for September 1989 - $.0601/pound

Above price for budget estimate only and subject to change.
Additional cost for packaging $10.00/skid.

All items to ship F.O.B.: Leechburg, PA

Current Lead Times: Start 3-8 weeks at a rate to be negotiated.

DISTRIBUTION RECORD

J #_____

JOB FILE SENT

P. O., SOR, P. R. TRAVEL

OTHER _____

COPIES TO: (OTHER THAN ADDRESSEE)

☐ Q C MGR.
☐ PLANT MGR. TC
☐ PROJ. ENG. _____
☐ GEN. MGR.
☐ OTHER: _____

KAISER ROLLMET
A KAISER AEROSPACE & ELECTRONICS COMPANY

1988 DEERE AVENUE, IRVINE, CALIFORNIA 92714
(714) 250-4171 • (213) 924-0314 • FAX# (714) 261-1841

September 8, 1989

Joseph Oat Corporation
2500 Broadway - Drawer #10
Camden, NJ 08104

Attn: Mr. Ron Kaplan
General Manager & Vice President

Subj: Nuclear Waste Containers for the Yucca Mountain Project
in support of Babcock & Wilcox/Alliance RFQ RB-Q020-789

Ref: Kaiser Rollmet B&P #6420

Gentlemen:

We have had the opportunity to discuss the underlying assumptions of this effort with Babcock & Wilcox. As a result, we are providing this revised cost estimate. Please note that there are significant differences in the assumptions which facilitate utilizing drawings "as is" without changing the bottom head.

In response to your inquiry, and in support of the above subject, Kaiser Rollmet, a Kaiser Aerospace & Electronics company, is pleased to submit the following proposal for your consideration.

This proposal provides for the conversion of material furnished by you into a finished unit (Ref: Babcock & Wilcox Drawing No. 1196363 Rev. "O").

	Type	Selling Price/Each
OPTION 1: UNS C71500	26S	36,838
	26L	8,378
	28L	8,974
OPTION 2: UNS N08825	26S	$7,421
	26L	9,160
	28L	9,838

All items are to be manufactured in full compliance with ANSI/ASME NQA-1-1986 Edition and Supplements, Quality Assurance Requirements for Nuclear Facilities including ASME BPVC Section VIII, Div. I.

The following assumptions were made by Kaiser Rollmet in preparing the above quotation:

KAISER ROLLMET

1. Kaiser Rollmet will be able to develop either new or modified equipment and tooling which will eliminate the need to weld on an extraneous gripper. Although Kaiser Rollmet currently welds a gripper piece as its current manufacturing process the large quantity involved in the container project can justify development of an alternative method to hold the workpiece. This has been considered for other Kaiser Rollmet projects, and is considered feasible.

2. Kaiser Rollmet assumes that we will be able to Roll Extrude the circumferential seam weld of the preform even though it is located only about 3" from the end. The rolling on a circumferential weld is a developmental aspect of this approach, which will be evaluated in a subscale development effort anticipated for next year. This assumption will be revisited after this development effort.

3. Kaiser Rollmet assumes that we will be responsible for machining the I.D. and O.D. to improve the tolerance we require, beyond the +/-50 mils wall tolerance indicated on the Drawing. This cost of machining is included in our quotation.

4. Based upon the results of the development effort and tooling design vis-a-vis assumptions #1, #2 and #3, the preform volume may require adjustment. It is presumed to be adequate for this exercise. Adjustment of the preform volume would have minimal effect on Kaiser Rollmet's cost of processing.

5. Blanks are to be supplied in the annealed condition.

6. Welds on the blanks must be ground flush on the O.D. and I.D. surfaces.

7. Babcock & Wilcox "Specification for Use in Making Production Cost Estimates" (Rev. 2, August 7, 1989), in Section 2.3.4 specifies that Annealing is to be performed on the completed container lower unit and upper head using either an inert atmosphere or vacuum. Not provided for are criteria for in-process or intermediate thermal processing. Kaiser Rollmet possesses the ability to process the Type 268 variant in our vacuum furnace (longer vacuum furnaces are not known to Kaiser Rollmet). To preclude exceptional annealing costs, Kaiser Rollmet proposes for the 26L and 28L versions that Nitrogen be utilized in lieu of the "true" inert gases of Argon or Helium. Our proposal is so conditioned.

KAISER ROLLMET

September 8, 1989

Page Three

8. Blanks are to be supplied to Kaiser Rollmet after full visual, liquid penetrant, radiographic and ultrasonic inspections are completed. A data package containing the results of each of these tests is to accompany the part itself when delivered to Kaiser Rollmet.

9. This proposal assumes no weld repair cycles are included. In the event this condition arises, responsibility for weld repair is to be account of the supplier.

10. After conversion to finished configuration, all testing required is to be performed by Kaiser Rollmet and is already included in the above cost figures. This includes heat treatment and mechanical testing.

11. Packing or crating for return shipment is included. All items are F.O.B. (our plant) Irvine, California.

Kaiser Rollmet looks forward to the opportunity to meet with you to resolve this abbreviated list of concerns. Please do not hesitate to contact the undersigned for additional clarification.

Best regards,

Larry F. Totzke

Larry F. Totzke
Product Development
Engineer

Copy: S. Gordon, KR

LFT/js

036

Printed: 30-Aug-89 12:24 PM
PHI

08-30-89

6547000

GOC Inquiry Number 73202

JOSEPH OAT CORPORATION

Cust Inq # B5295-2

2500 BROADWAY
CAMDEN, NJ 08104

Attention of: RON KAPLAN

Telephone no: 609-541-2900

ITEM	QUAN.	DESCRIPTION	TOTAL ITEM WEIGHT	PRICE	SHIPMENT
		Type C 625 ESR Finish ASTM B424-87 UNS-N08825 HRAD TECHNICAL COMMENTS/EXCEPTIONS: 1) MATERIAL WILL BE PRODUCED AS COMMERCIAL PLATE PRODUCT TO ABOVE PLATE SPECIFICATION WITH NO CORROSION TESTING REQUIREMENTS 2) USE OF MOST NOVIS- STRINGENT QUALITY REQUIREMENTS SUCH AS [illegible] FOR ACCURATE [illegible] DELIVERY			
1	100	1.000 x 34.00000 x 97.18750 Plasma Cut (PRICE IS SAME FOR 750 PCS)	12500C	6,727.00 ea 5.38/lb	
2	30	1.00 [illegible] x 61.00000 x 87.18750 Plasma Cut (PRICE IS SAME FOR 750 PCS)	15640C	10,511.00 ea 5.38/lb	
3	10	1.2500[illegible] x 61.0000 x 93.25000 Plasma Cut (PRICE IS SAME FOR 750 PCS)	18720C	11,230.00 ea 5.38/lb	
4	1	9.0 [illegible] x [illegible].00000 DIAMETER Ship: [illegible]-SVILLE, PA	91520	5,954.00 ea	

CANDY L. PECK

Printed: 30-Aug-89 12:24 PM
PHI

08-30-89

6547000

GOC Inquiry Number 73202

JOSEPH OAT CORPORATION

Cust Inq # 85295-2

2500 BROADWAY
CAMDEN, NJ 08104

Attention of: RON KAPLAN

Telephone no: 609-541-2900

ITEM	QUAN.	DESCRIPTION	TOTAL ITEM WEIGHT	PRICE	SHIPMENT
		Flame Cut OD + 1 / - 0 (PRICE IS SAME FOR 1500 PCS)			
	100	[illegible] x 33.00000 DIAMETER Flame Cut [illegible] (PRICE IS SAME FOR 750 PCS)	93500	6,787.00 ea	
6	100	1.[illegible] x 32.00000 DIAMETER Plasma Cut OD + .25 / - .00 (PRICE IS SAME FOR 1500 PCS)	44300	2,951.00 ea	
5A	100	.[illegible]500 x 25.25000ID x 32.00000 OD Plasma Cut [illegible] + .[illegible] / - .03 [illegible] + .[illegible] / - .25 ([illegible] IS SAME FOR 1500 PCS)	15700	2,377.00 ea	
7	100	1.[illegible] x 34.00000 DIAMETER Flame Cut [illegible]: [illegible] NVILLE, PA	[illegible]00	3,332.00 ea	

Printed: 30-Aug-89 12:24 PM
PHI

08-30-89

6547000

GDC Inquiry Number 73202

JOSEPH DAT CORPORATION

Cust Inq # 85295-2

2500 BROADWAY
CAMDEN, NJ 08104

Attention of: RON KAPLAN

Telephone no: 609-541-2900

ITEM	QUAN.	DESCRIPTION	TOTAL ITEM WEIGHT	PRICE	SHIPMENT
		OD + .25 / - .00 (PRICE IS SAME FOR 750 PCS)			
7A	100	1.375[illegible] x 25.500000 ID x 34.00000 OD Plasma Cut	21900	2,747.00	ea
		[illegible] + .[illegible] / - .00 ID + .[illegible] / - .25 ([illegible] FOR 750 PCS)			
8	1[illegible]	4.000[illegible] x 32.00000 DIAMETER Flame Cut	9[illegible]600	6,830.00	ea
		OD + 1 / - 0 (PRICE IS SAME FOR 1500 PCS)			
9	150	4.000000 x 34.00000 DIAMETER Flame Cut	10[illegible]800	7,673.00	ea
		OD + 1 / - 0 (PRICE IS SAME FOR 750 PCS)			
		• [illegible] 2250 PCS - 7-1/4 X 10 DIA AS AS [illegible] PRODUCE AT THIS TIME			
		• [illegible] 1/4 OR 11 GA COIL AS WE DO NOT [illegible]			
		• DELAY [illegible] INITIATE AT TIME OF ORDER FOR: [illegible], PA			

Revere Copper Products, Inc.

August 23, 1989 DISTRIBUTION RECORD

J # _____

JOB FILE SECTION:

P. O., CONTRACT, TRANS. NO.

OTHER: _____

COPIES TO (OTHER THAN ADDRESSEE)

☐ QC MGR.

☐ [illegible]

☐ PROJ. ENG. JC

☒ GEN. MGR. AL

☒ OTHER: RK

Joseph Oat Corporation
Chemical Engineers & Fabricators
2500 Broadway Drawer #10
Camden, NJ 08104

Al Gats

Attn: Mr. Ron Kaplan, General Manager

Dear Sir:

Revere is pleased to offer the following on your letter inquiry of August 17, 1989 for copper-nickel plate and coils.

COPPER-NICKEL PLATE, COMP 70/30, ALLOY C71500
HOT ROLLED AND LEVELLED TO ASME-SB171

Item No.	Pcs./lbs.	Size	Fabrication Price ($ per lb.)
1	750/1,029,657	39" x 87-3/16" x 1.25"	$1.9236
2	750/1,610,489	61" x 87-3/16" x 1.25"	1.9111
3	750/1,722,773	61" x 93-1/4" x 1.25"	1.9111
4	1500/1,342,501	28" Dia. x 4.50"	2.4236
5	750/ 770,251	30" Dia. x 4.50"	2.4236
6A	1500/ 730,610	32" Dia. x 1-7/8"	2.4236
6B	1500/ 275,718	32" OD x 25-1/4" ID x 1-7/8"	7.0921
7A	750/ 412,500	34" Dia. x 1-7/8"	2.4236
7B	750/ 180,423	34" OD x 25-1/2" ID x 1-7/8"	6.1004
8	1500/1,558,636	32" Dia. x 4.0"	2.4236
9	750/ 879,777	34" Dia. x 4.0"	2.4236

Items 10 and 11 are outside Revere's limits of manufacture.

The above fabricating prices will escalate approximately 3% per year.

Metal price is $3.2302 per pound based on copper at $1.3600 and nickel at $7.5000 to be added to the above fabricating charges.

Future pricing will be price in effect at time of shipment unless you choose to secure metals on the Commodity Exchange at time of order placement.

Delivery and acceptable quantities will be determined prior to order placement dependent upon mill scheduling and capacity.

Thank you for this opportunity to offer our initial quotation on your requirements.

Respectfully,

L. O. Salmon
Sales Service Representative

040

LOS:c

bcc: RLLarkin PRevere, Jr. JHHiggins, Jr. File

J E S S O P S T E E L C O M P A N Y

Philadelphia Sales District

FAX COVER SHEET

DATE: 8/28

TO: J. Bate Corp.

ATTN: Ron Kaplan

Number of Pages (Including cover page) 2

FROM: J. McCann

Message: In reference to your quotation for Alloy 825 bar we are pleased to submit the following prices. The prices are based on 5.50 per lb price. All prices are subject to P.E.E. and review of additional specification: Queen and D.I.B Washington Pa. Delivery as negotiated can be 180,000 lb per month

Item 1 9000.00 ea

2 6.85 per lb. 1466.250 lb.

3 6.85 per lb 1567.500 lb.

4 7927.00 ea.

5 9049.00 ea

6 4143.00 ea. 68 3809.00 ea.

DISTRIBUTION RECORD

J #_____

JOB FILE SECTION

P. O., COR, P. R. TRAI... NV.

OTHER_____

COPIES TO: (OTHER THAN ADDRESSEE)

- ☐ QC MGR.
- ☐ PLANT MGR.
- ☐ PROJ. ENG. TC RW
- ☒ GEN. MGR.
- ☐ OTHER: _____

FAX NUMBER 215/640-9118

041

J E S S O P S T E E L C O M P A N Y

Philadelphia Sales District

FAX COVER SHEET

DATE: _____

TO: _____

ATTN: _____

Number of Pages (Including cover page) Cover + 4

FROM: _____

Message: _____

Item 7A. $668.00/m Item 7B $327.00/m

Item 8 9118.00/m

" 9 10,253.00/m.

" 10 By quote

" 11 By Quote

FAX NUMBER 215/640-9118

042

Appendix A2

B&W Commercial Nuclear Fuel Plant (Vendor B)

Cost Data Package

Babcock & Wilcox

a McDermott company

Research and Development Division

1562 Beeson Street
Alliance, OH 44601
(216) 821-9110

November 6, 1989

Mr. Ed Russell, L-197
University of California
Lawrence Livermore National Lab.
Yucca Mountain Project
P. O. Box 5514, L-217
Livermore, CA 94551

Dear Ed:

Subject: YMP-HLNW Container Production Cost Estimates by B&W CNFP

The data provided by B&W CNFP has not been signed-off by B&W management and is being submitted as advance data without full QA certification as in the case of the other two vendors. We will forward the QA certification for this data and cost estimate forms without the disclaimer as soon as this is accomplished.

Sincerely,

THE BABCOCK & WILCOX COMPANY
Research and Development Division

H. A. Domian
Metallurgy & Manufacturing
Technology Section

cll

cc: w/o att.
KKEverett
RLFish - BWFC, Lynchburg
DFLaCount

001

Babcock & Wilcox

a McDermott company

Research and Development Division

1562 Beason Street
Alliance, OH 44601
(216) 821-9110

September 27, 1989

Mr. Ed Russell, L-197
University of California
Lawrence Livermore National Lab.
Yucca Mountain Project
P. O. Box 5514, L-217
Livermore, CA 94551

Dear Ed:

Subject: YMP-HLNW Container Production Cost Estimates by B&W CNFP

The results of the cost estimates provided by the B&W Commercial Nuclear Fuel Plant that were sent to you as a facsimile advance copy on September 26th are summarized below:

Container Including Lower Unit Plus Upper Head Price, $/Container

Size	Materials: Raw	Materials: Expendable	Labor	Total
		C71500 Alloy		
26S	27,432	14,306	6,417	48,155
26L	31,582	16,814	6,507	54,903
28L	33,896	17,624	6,681	58,201
		N08825 Alloy		
26S	32,962	15,112	6,419	54,493
26L	39,882	17,677	6,420	64,179
28L	42,461	18,799	6,507	67,767
		Internals, $/Assembly		
Cons 6 PWR	3,590	200	1,414	5,204
3 PWR	898	150	629	1,677
3 PWR + 4 BWR	1,792	200	1,542	3,534
10 BWR	3,887	200	1,411	5,498
4 PWR	1,197	200	673	2,070

cc: KKEverett
RLFish - BWFC
DFLaCount
ESRobitz

The flange blank raw material costs are high because they are cut from large pieces with attendant high scrap losses.

The raw material costs for internals 6S (6 consolidated PWR F.A.) and 9S (10 BWR F.A.) are high because of the limited size of the sheet available to make these pieces and the attendant high scrap losses.

CONCLUSION

These estimates are acceptable.

Sincerely,

THE BABCOCK & WILCOX COMPANY
Research and Development Division

H. A. Domian

H. A. Domian
Metallurgy & Manufacturing
Technology Section

cll

Advance Data
Quality Assurance
Certification Incomplete

ASSUMPTIONS

1. Flange Blank for Lower Unit to be ring shape flame cut from plate.

2. Estimate does not include any attachment of Internal Structure to Lower Unit.

BASIS FOR LABOR RATES USED FOR TMP HLNW CONTAINER FABRICATION

Offeror: B&W - CNFP Quotation No.: P-2060

The labor costs are based on the following factors:

	Used Yes	No
Base Rate	X	—
Shift Differential	X	—
Holidays	X	—
Vacations	X	—
Casual Overtime	X	—
Training	X	—
Social Security	X	—
Workmen's Compensation	X	—
Pension	X	—
Health & Welfare	X	—
Other (Identify)	—	—

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W ~~XXXX~~ PA 83-779060-00.

Estimated By: C. E. Campbell
Date: 9/26/89
Name: _____
Title: _____

Verified By: Veldon D. Holaday
Date: 9/26/89
Name: VELDON D. HOLADAY
Title: Mgr. Spec. Mfg

*Approved By: _____
Date: _____
Name: _____
Title: _____

*Must be a responsible officer of the Company.

(Either type or use black ink to complete this form.)

Advance Data
Quality Assurance
Certification Incomplete

TOTAL PRICE AND TAX ESTIMATE FOR YMP HLNW CONTAINER FABRICATION PER PIECE AT 750 PIECES/YEAR AS OF 8/1/89 (NO ESCALATION)

Offeror: B&W - CNFP Quotation No.: P-2060 Rev. 1

Task	Price Before Taxes, $/Pc.	Taxes: Sales $	Sales Rate	Business $	Business Rate	Inventory $	Inventory Rate	Other $	Other Rate	Price After Taxes $/Pc.
				C71500 Alloy						
1C.0	36127	NONE		Included In PRICE		Included In PRICE		NONE		36127
2C.0	42875									42875
3C.0	45305									45305
4C.0	12028									12028
5C.0	12896									12896
				N08825 Alloy						
1N.0	42519									42519
2N.0	52204									52204
3N.0	55210									55210
4N.0	11975									11975
5N.0	12557									12557
				S30403 Alloy						
6S.0	5204									5204
7S.0	1677									1677
8S.0	3534									3534
9S.0	5498									5498
10S.0	2070									2070

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W ~~PXQX~~ PA 83-779060-00

Estimated By: C. E. Campbell Verified By: Veldon D. Holaday

Date: 10/4/89 Date: 10/2/89

Name: C. E. Campbell Name: Veldon D. Holaday

Title: Spec. Mfg. Eng. Title: Mgr, Spec. Mfg.

*Approved By: _____

Date: _____

Name: _____

Title: _____

*Must be a responsible officer of the Company.

(Either type or use black ink to complete this form.

Advanco Data
Quality Assurance
Certification Incomplete

YMP HLNW CONTAINER FABRICATION PRICE ESTIMATE

Component: Lower Unit (LU) Alloy: C71500 Offeror: B+W CNFP Quotation No: P-2060 Rev.

Price per unit for 750 units/year for a total production of 15,000 units as of 8/1/89 (no escalation)

26S Container

Task	Description	Raw Materials: Plate Wt. ($/Lb)	Raw Materials: Bar Wt. ($/Lb)	Raw Materials: Forging Wt. ($/Lb)	Raw Materials: Total $/Comp.	Materials: Exp. $	Materials: Tools $	Materials: Ship $	Labor: Engr. $ (Hrs)	Labor: Manuf. $ (Hrs)	Labor: Insp. $ (Hrs)	Labor: QA $ (Hrs)
1C.1	Bottom Head (BH)	( )	( )	670 (11.57)	7752		110		131 (3.0)	522 (12.0)	174 (4.0)	( )
.2	Body (B)	1381 (5.32)	( )	( )	7347	1200			( )	218 (5.0)	87 (2.0)	( )
.3	Flange Blank (FB)	153 (18.38)			2812				( )	( )	( )	( )
.4	Join BH to B					800			( )	435 (10.0)	87 (2.0)	( )
.5	Spin Form LU					9286			( )	( )	( )	( )
.6	Join FB to LU					300			348 ( )	~~435~~ (8.0)	87 (2.0)	( )
.7	Anneal LU								( )	( )	( )	( )
.8	Machine LU						110		( )	522 (12.0)	131 (3.0)	( )
.9	Inspect & Test					500			( )	( )	1392 (32.0)	( )
.10	QA & Document								( )	( )	( )	348 (8.0)
.11	Package & Ship					200		1100	( )	131 (3.0)	( )	( )
									( )	( )	( )	( )
1C.0	Total LUC	10,159		7752	17911	12,286	220	1,100	131 (3.0)	2176 (50.0)	1958 (45.0)	348 (8.0)

Advance Data
Quality Assurance
Certification Incomplete

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W ~~P.O.~~ 83-779060-00.

Estimated By: C E Campbell
Date: 10/4/89
Name: Calvin E. Campbell
Title: Spec. Mfg. Eng

Verified By: V. D. Holady
Date: 10/4/89
Name: Veldon D. Holada
Title: Mgr., Spec. Mfg.

*Approved By:
Date:
Name:
Title:

*Must be a responsible officer of the Company. (Either type or use black ink to complete this form.)

007

YMP HLNW CONTAINER FABRICATION PRICE ESTIMATE

Component: Lower Unit (LU) Alloy: C71500 Offeror: B+W CNFP Quotation No: P-2560 Rev. 1

Price per unit for 750 units/year for a total production of 15,000 units as of 8/1/89 (no escalation)

26L Container

		Raw Materials				Materials			Labor			
Task	Description	Plate Wt. ($/Lb)	Bar Wt. ($/Lb)	Forging Wt. ($/Lb)	Total $/Comp.	Exp. $	Tools $	Ship $	Engr. $ (Hrs)	Manuf. $ (Hrs)	Insp. $ (Hrs)	QA $ (Hrs)
2C.1	Bottom Head (BH)	( )	( )	670 (11.57)	7752		110		131 (3.0)	522 (12.0)	174 (4.0)	( )
.2	Body (B)	2161 (5.32)	( )	( )	11497	11600.00			( )	218 (5.0)	87 (2.0)	( )
.3	Flange Blank (FB)	153 (19.38)			2812				( )	( )	( )	( )
.4	Join BH to B					800.00			( )	522 (12.0)	87 (2.0)	( )
.5	Spin Form LU					11394.00			( )	( )	( )	( )
.6	Join FB to LU					300.00			( )	348 (8.0)	87 (2.0)	( )
.7	Anneal LU								( )	( )	( )	( )
.8	Machine LU						110		( )	522 (12.0)	131 (3.0)	( )
.9	Inspect & Test					500.00			( )	( )	1392 (32.0)	( )
.10	QA & Document								( )	( )	( )	348 (8.0)
.11	Package & Ship					200.00		1100	( )	131 (3.0)	( )	( )
									( )	( )	( )	( )
2C.0	Total LUC	14309		7752	22061	14794	220	1100	131 (3.0)	2263 (52.0)	1958 (45.0)	348 (8.0)

Advance Data
Quality Assurance
Certification Incomplete

42875

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W P.O. 83-779060-00.

Estimated By: C. E. Campbell
Date: 10/4/89
Name: Calvin E Campbell
Title: Spec. Mfg. Eng.

Verified By: V. D. Holaday P.A.
Date: 10/4/89
Name: Veldon D. Holaday
Title: Mgr. Spec. Mfg.

*Approved By:
Date:
Name:
Title:

*Must be a responsible officer of the Company. (Either type or use black ink to complete this form.)

008

YMP HLNW CONTAINER FABRICATION PRICE ESTIMATE

Component: Lower Unit (LU) Alloy: C71500 Offeror: B+W CNFP Quotation No: P-2063 Rev. 1.

Price per unit for 750 units/year for a total production of 15,000 units as of 8/1/89 (no escalation)
28L Container

Task	Description	Raw Materials: Plate Wt. ($/Lb)	Raw Materials: Bar Wt. ($/Lb)	Raw Materials: Forging Wt. ($/Lb)	Raw Materials: Total $/Comp.	Materials: Exp. $	Materials: Tools $	Materials: Ship $	Labor: Engr. $ (Hrs)	Labor: Manuf. $ (Hrs)	Labor: Insp. $ (Hrs)	Labor: QA $ (Hrs)
3C.1	Bottom Head (BH)	( )	( )	719 (11.5%)	8319		110		131 (3.0)	522 (12.0)	174 (4.0)	( )
.2	Body (B)	2321 (5.32)	( )	( )	12348	1600.00			( )	218 (5.0)	87 (2.0)	( )
.3	Flange Blank (FB)	164 (19.38)			2014				( )	( )	( )	( )
.4	Join BH to B					800.00			( )	522 (12.0)	87 (2.0)	( )
.5	Spin Form LU					12204.00			( )	( )	( )	( )
.6	Join FB to LU					300.00			( )	348 (8.0)	87 (2.0)	( )
.7	Anneal LU								( )	( )	( )	( )
.8	Machine LU						110		( )	522 (12.0)	131 (3.0)	( )
.9	Inspect & Test					500.00			( )	( )	1392 (32.0)	( )
.10	QA & Document								( )	( )	( )	348 (8.0)
.11	Package & Ship					200.00		1100	( )	131 (3.0)	( )	( )
									( )	( )	( )	( )
3C.0	Total LUC	15362		8319	23681	15604	220	1100	131 (3.0)	2263 (52.0)	1958 (45.0)	348 (8.0)

Advance Data
Quality Assurance
Certification Incomplete

4-5305

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W P.O. 83-779060-00

Estimated By: C E Campbell
Date: 8/15/89
Name: Calvin E. Campbell
Title: Spec. Mfg. Eng

Verified By: V. D. Holaday P.A.
Date: 10/4/89
Name: Veldon D. Holaday
Title: Mgr. Spec. Mfg.

*Approved By:
Date:
Name:
Title:

*Must be a responsible officer of the Company. (Either type or use black ink to complete this form.)

609

YM/ RLNW CONTAINER FABRICATION PRICE ESTIMATE

Component: Upper Head (UH) Alloy: C71500 Offeror: Btw CNFP Quotation No: P-2065 Rev. 1

Price per unit for 750 units/year for a total production of 15,000 units as of 8/1/89 (no esca ation)

26S or 26L Container

Task	Description	Raw Materials: Plate Wt. ($/Lb)	Raw Materials: Bar Wt. ($/Lb)	Raw Materials: Forging Wt. ($/Lb)	Raw Materials: Total $/Comp.	Materials: Exp. $	Materials: Tools $	Materials: Ship $	Labor: Engr. $ (Hrs)	Labor: Manuf. $ (Hrs)	Labor: Insp. $ (Hrs)	Labor: QA $ (Hrs)
4C.1	Upper Head (UH)	676 (11.57)	(—)	(—)	7752				87 (2.0)	696 (16.0)	87 (2.0)	( )
	Pintle (P)	(—)	163 (10.85)	(—)	1769				( )	( )	( )	( )
.3	Join P to UH					300.00			( )	174 (4.0)	87 (2.0)	( )
.4	Anneal UH					100.00			( )	44 (1.0)	( )	( )
.5	Machine UH						100		( )	348 (8.0)	( )	( )
.6	Inspect & Clean								( )	22 (.5)	174 (5.0)	( )
.7	QA & Document								( )	( )	( )	44 (1.0)
.8	Package & Ship					200.00			( )	87 (2.0)	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
4C.0	Total UHC	7752	1169		9521	600.00	100		87 (2.0)	1371 (31.5)	305 (7.0)	44 (1.0)

Advance Data
Quality Assurance
Certification Incomplete

12028

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W P.O. 83-779060-00.

Estimated By: C. E. Campbell
Date: 10/4/89
Name: Calvin E. Campbell
Title: Spec. Mfg Eng

Verified By: V. D. Holaday P.A.
Date: 10/4/89
Name: Velden D. Holaday
Title: Mgr. Spec. Mfg.

*Approved By:
Date:
Name:
Title:

*Must be a responsible officer of the Company. (Either type or use black ink to complete this form.)

010

YMP HLNW CONTAINER FABRICATION PRICE ESTIMATE

Component: Upper Head (UH) Alloy: C71500 Offeror: B&W CNPP Quotation No: P-2060 Rev. 1

Price per unit for 750 units/year for a total production of 15,000 units as of 8/1/89 (no escalation)
28L Container

Task	Description	Raw Materials: Plate Wt. ($/Lb)	Raw Materials: Bar Wt. ($/Lb)	Raw Materials: Forging Wt. ($/Lb)	Raw Materials: Total $/Comp.	Materials: Exp. $	Materials: Tools $	Materials: Ship $	Labor: Engr. $ (Hrs)	Labor: Manuf. $ (Hrs)	Labor: Insp. $ (Hrs)	Labor: QA $ (Hrs)
5C.1	Upper Head (UH)	130 (11.57)	(—)	(—)	8446				87 (2.0)	783 (18.0)	87 (2.0)	( )
.2	Pintle (P)	(—)	163 (10.85)	( )	1769				( )	( )	( )	( )
.3	Join P to UH					300.00			( )	174 (4.0)	87 (2.0)	( )
.4	Anneal UH					100.00			( )	44 (1.0)	( )	( )
.5	Machine UH						100		( )	435 (10.0)	( )	( )
.6	Inspect & Clean								( )	22 (.5)	131 (3.0)	( )
.7	QA & Document								( )	( )	( )	44 (1.0)
.8	Package & Ship					200.00			( )	87 (2.0)	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
5C.0	Total UHC	8446	1769		10215	600.00	100		87 (2.0)	1545 (35.5)	305 (7.0)	44 (1.0)

Advance Data
Quality Assurance
Certification Incomplete

12896

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W P.O. 83-779060-00.

Estimated By: C E Campbell
Date: 10/4/89
Name: Calvin E Campbell
Title: Spec. Mfg. Eng

Verified By: V. D. Holaday P.A.
Date: 10/4/89
Name: Veldon D. Holaday
Title: Mgr. Spec. Mfg.

*Approved By:
Date:
Name:
Title:

*Must be a responsible officer of the Company. (Either type or use black ink to complete this form.)

011

YMP HLNW CONTAINER FABRICATION PRICE ESTIMATE

Component: Lower Unit (LU) Alloy: N08825 Offeror: B+W CNFP Quotation No: P-2060

Price per unit for 750 units/year for a total production of 15,000 units as of 8/1/89 (no escalation)
26S Container

Task	Description	Raw Materials: Plate Wt. ($/Lb)	Raw Materials: Bar Wt. ($/Lb)	Raw Materials: Forging Wt. ($/Lb)	Raw Materials: Total $/Comp.	Materials: Exp. $	Materials: Tools $	Materials: Ship $	Labor: Engr. $ (Hrs)	Labor: Manuf. $ (Hrs)	Labor: Insp. $ (Hrs)	Labor: QA $ (Hrs)
1N.1	Bottom Head (BH)	( )	( )	610 (12.93)	7887		110		131 (3.0)	522 (12.0)	174 (4.0)	( )
.2	Body (B)	1258 (9.76)	( )	( )	12278	1200.00			( )	218 (5.0)	87 (2.0)	( )
.3	Flange Blank (FB)	140 (23.78)			3329				( )	( )	( )	( )
.4	Join BH to B					800.00			( )	435 (10.0)	87 (2.0)	( )
.5	Spin Form LU					10.092.00			( )	( )	( )	( )
.6	Join FB to LU					300.00			( )	348 (8.0)	87 (2.0)	( )
.7	Anneal LU					—			( )	( )	( )	( )
.8	Machine LU					—	110		( )	522 (12.0)	131 (3.0)	( )
.9	Inspect & Test					500.00			( )	( )	1392 (32.0)	( )
.10	QA & Document								( )	( )	( )	348 (8.0)
.11	Package & Ship					200.00		1100	( )	131 (3.0)	( )	( )
									( )	( )	( )	( )
1N.0	Total LUN	15607		7887	23494	13092	220	1100	131 (3.0)	2176 (50.0)	1958 (45.0)	348 (8.0)

Advance Data
Quality Assurance
Certification Incomplete

42519

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W P.O. 83-779060-00.

Estimated By: C E Campbell
Date: 10/4/89
Name: Calvin E Campbell
Title: Spec. Mfg. Eng.

Verified By: V D Holaday P.A.
Date: 10/4/89
Name: Veldon D. Holaday
Title: Mgr. Spec. Mfg.

*Approved By: _____
Date: _____
Name: _____
Title: _____

*Must be a responsible officer of the Company. (Either type or use black ink to complete this form.)

012

YMP HLNW CONTAINER FABRICATION PRICE ESTIMATE

Quotation No: P-2065 Rev 1

Component: Lower Unit (LU) Alloy: N08825 Offeror: B&W CNFP

Price per unit for 750 units/year for a total production of 15,000 units as of 8/1/89 (no escalation)

26L Container

Task	Description	Raw Materials: Plate Wt. ($/Lb)	Raw Materials: Bar Wt. ($/Lb)	Raw Materials: Forging Wt. ($/Lb)	Raw Materials: Total $/Comp.	Materials: Exp. $	Materials: Tools $	Materials: Ship $	Labor: Engr. $ (Hrs)	Labor: Manuf. $ (Hrs)	Labor: Insp. $ (Hrs)	Labor: QA $ (Hrs)
2N.1	Bottom Head (BH)	( )	( )	C/O (12.93)	7887		110		13050 (3.0)	522 (12.0)	174 (4.0)	( )
.2	Body (B)	1961 (9.1%)	( )	( )	19198	1600.00			( )	218 (5.0)	87 (2.0)	( )
.3	Flange Blank (FB)	140. (23.78)			3329				( )	( )	( )	( )
.4	Join BH to B					800.00			( )	435 (10.0)	87 (2.0)	( )
.5	Spin Form LU					12,457.00			( )	( )	( )	( )
.6	Join FB to LU					300.00			( )	348 (8.0)	87 (2.0)	( )
.7	Anneal LU					—			( )	( )	( )	( )
.8	Machine LU					—	110		( )	522 (120)	131 (3.0)	( )
.9	Inspect & Test					500.00			( )	( )	1392 (32.0)	( )
.10	QA & Document								( )	( )	( )	348 (8.0)
.11	Package & Ship					200.00		1100	( )	131 (3.0)	( )	( )
									( )	( )	( )	( )
2N.0	Total LUN	22527		7887	30414	15,857	220	1100	131 (3.0)	2176 (50.0)	1958 (45.0)	348 (8.0)

52204

Advance Data
Quality Assurance
Certification Incomplete

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W P.O. P.A. 83-779065-00.

Estimated By: C E Campbell
Date: 10/4/89
Name: Calvin E. Campbell
Title: Spec. Mfg. Eng

Verified By: V.D. Holaday
Date: 10/4/89
Name: Veldon D. Holaday
Title: Mgr. Spec. Mfg.

*Approved By: _____
Date: _____
Name: _____
Title: _____

*Must be a responsible officer of the Company. (Either type or use black ink to complete this form.)

013

YMP HLNW CONTAINER FABRICATION PRICE ESTIMATE

Component: Lower Unit (LU) Alloy: N08825 Offeror: B&W CNFP Quotation No: P-206 Rev. 1

Price per unit for 750 units/year for a total production of 15,000 units as of 8/1/89 (no escalation)
28L Container

		Raw Materials				Materials			Labor			
Task	Description	Plate Wt. ($/Lb)	Bar Wt. ($/Lb)	Forging Wt. ($/Lb)	Total $/Comp.	Exp. $	Tools $	Ship $	Engr. $ (Hrs)	Manuf. $ (Hrs)	Insp. $ (Hrs)	QA $ (Hrs)
3N.1	Bottom Head (BH)	( )	( )	655 (12.93)	8469		110		131 (3.0)	522 (12.0)	174 (4.0)	( )
.2	Body (B)	2112 (9.76)	( )	( )	20613	1600.00			( )	218 (5.0)	87 (2.0)	( )
.3	Flange Blank (FB)	440 (23.72)			3329				( )	( )	( )	( )
.4	Join BH to B					800.00			( )	522 (12.0)	87 (2.0)	( )
.5	Join Form LU					13,379.00			( )	( )	( )	( )
.6	Join FB to LU					300.00			( )	348 (8.0)	87 (2.0)	( )
.7	Anneal LU								( )	( )	( )	( )
.8	Machine LU						110		( )	522 (12.0)	131 (3.0)	( )
.9	Inspect & Test					500.00			( )	( )	1392 (32.0)	( )
.10	QA & Document								( )	( )	( )	348 (8.0)
.11	Package & Ship					200.00		1100	( )	131 (3.0)	( )	( )
									( )	( )	( )	( )
3N.0	Total LUN	23942		8469	32411	16779	220	1100	131 (3.0)	2263 (52.0)	1958 (45.0)	348 (8.0)

55210

Advance Data
Quality Assurance
Certification Incomplete

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W ~~P.O.~~ 83-779062-00.

Estimated By: C. E. Campbell
Date: 10/4/89
Name: Calvin E. Campbell
Title: Spec. Mfg. Eng.

Verified By: V. D. Holbrey P.A.
Date: 10/4/89
Name: Veldon D. Holbrey
Title: Mgr. Spec. Mfg.

*Approved By:
Date:
Name:
Title:

*Must be a responsible officer of the Company. (Either type or use black ink to complete this form.)

014

YMP HLNW CONTAINER FABRICATION PRICE ESTIMATE

Component: Upper Head (UH) Alloy: N08825 Offeror: BTW CNPP Quotation No: P-2066 Rev. 1

Price per unit for 750 units/year for a total production of 15,000 units as of 8/1/89 (no escalation)

26S or 26L Container

Task	Description	Raw Materials: Plate Wt. ($/Lb)	Raw Materials: Bar Wt. ($/Lb)	Raw Materials: Forging Wt. ($/Lb)	Raw Materials: Total $/Comp.	Materials: Exp. $	Materials: Tools $	Materials: Ship $	Labor: Engr. $ (Hrs)	Labor: Manuf. $ (Hrs)	Labor: Insp. $ (Hrs)	Labor: QA $ (Hrs)
4N.1	Upper Head (UH)	610 (12.20)	(—)	(—)	7887				87 (2.0)	696 (16.0)	87 (2.0)	( )
.2	Pintle (P)	(—)	148 (10.68)	(—)	1581				( )	( )	( )	( )
.3	Join P to UH					300			( )	174 (4.0)	87 (2.0)	( )
.4	Anneal UH					100			( )	43.50 (1.0)	( )	( )
.5	Machine UH						100		( )	348 (8.0)	( )	( )
.6	Inspect & Clean								( )	21.75 (.5)	130.50 (3.0)	( )
.7	QA & Document								( )	( )	( )	43.50 (1.0)
.8	Package & Ship					200			( )	87 (2.0)	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
4N.0	Total UHN	7887	1581		9468	600	100		87 (2.0)	1371 (31.5)	305 (7.0)	44 (1.0)

Advance Data
Quality Assurance
Certification Incomplete

11975

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W P.O. 83-7790660-00.

Estimated By: C. E. Campbell
Date: 10/4/89
Name: Calvin E. Campbell
Title: Spec. Mfg. Eng.

Verified By: V. D. Holaday P.A.
Date: 10/4/89
Name: Veldon D. Holaday
Title: Mgr. Spec. Mfg.

*Approved By:
Date:
Name:
Title:

*Must be a responsible officer of the Company. (Either type or use black ink to complete this form.)

015

YMP HLNW CONTAINER FABRICATION PRICE ESTIMATE

Component: Upper Head (UH) Alloy: N08825 Offeror: B&W CNFP Quotation No: P-2065 Rev. 1

Price per unit for 750 units/year for a total production of 15,000 units as of 8/1/89 (no escalation)

28L Container

Task	Description	Raw Materials: Plate Wt. ($/Lb)	Raw Materials: Bar Wt. ($/Lb)	Raw Materials: Forging Wt. ($/Lb)	Raw Materials: Total $/Comp.	Materials: Exp. $	Materials: Tools $	Materials: Ship $	Labor: Engr. $ (Hrs)	Labor: Manuf. $ (Hrs)	Labor: Insp. $ (Hrs)	Labor: QA $ (Hrs)
5N.1	Upper Head (UH)	655 (12.93)	( )	( )	8469				87 (2.0)	696 (16.0)	87 (2.0)	( )
.2	Pintle (P)	( )	148 (10.68)	( )	1581				( )	( )	( )	( )
.3	Join P to UH					300[00]			( )	174 (4.0)	87 (2.0)	( )
.4	Anneal UH					100[00]			( )	44 (1.0)	( )	( )
.5	Machine UH						100		( )	348 (8.0)	( )	( )
.6	Inspect & Clean								( )	22 (.5)	131 (3.0)	( )
.7	QA & Document								( )	( )	( )	44 (1.0)
.8	Package & Ship					200[00]			( )	87 (2.0)	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
5N.0	Total UHN	8469	1581		10050	600[00]	100		87 (2.0)	1371 (31.5)	305 (7.0)	44 (1.0)

Advance Data
Quality Assurance
Certification Incomplete

12557

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W ~~P.O.~~ P.A. 83-779060-00.

Estimated By: C E Campbell
Date: 10/4/89
Name: Calvin E. Campbell
Title: Spec. Mfg. Eng.

Verified By: V D Holaday
Date: 10/4/89
Name: Veldon D. Holaday
Title: Mgr. Spec. Mfg.

*Approved By: _____
Date: _____
Name: _____
Title: _____

*Must be a responsible officer of the Company. (Either type or use black ink to complete this form.)

016

THP HLNW CONTAINER FABRIC__ON PRICE ESTIMATE

Component: Internals Alloy: S30403 Offeror: B+W CNPP Quotation No: P-2060 Rev. 1

Price per unit for 750 units/year for a total production of 15,000 units as of 8/1/89 (no escalation)
Consolidated 6 PWR fuel assemblies

Task	Description	Raw Materials: Plate Wt. ($/Lb)	Raw Materials: Bar Wt. ($/Lb)	Raw Materials: Forging Wt. ($/Lb)	Raw Materials: Total $/Comp.	Materials: Exp. $	Materials: Tools $	Materials: Ship $	Labor: Engr. $ (Hrs)	Labor: Manuf. $ (Hrs)	Labor: Insp. $ (Hrs)	Labor: QA $ (Hrs)
6S.1	Form Dividers	1320 (272)	( )	( )	3590				( )	522 (12.0)	87 (2.0)	( )
.2	Join Dividers	( )	( )	( )		100.00			( )	261 (6.0)	( )	( )
.3	Machine, Straight & Clean								( )	261 (6.0)	( )	( )
.4	Inspect								( )	( )	174 (4.0)	( )
.5	QA & Document								( )	( )	( )	44 (1.0)
.6	Pack & Ship					100.00			( )	65 (1.5)	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
6S.0	Total Internals	3590			3590	200			( )	1109 (25.5)	261 (6.0)	44 (1.0)

Quality Assurance Certification Incomplete

5204

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W ~~P.O.~~ 83-779065-00.

Estimated By: C. E. Campbell
Date: 10/5/89
Name: Calvin E. Campbell
Title: Spec. Mfg. Eng.

Verified By: V D P.A. Holaday
Date: 10/4/89
Name: Vellon D. Holaday
Title: Mgr. Spec. Mfg.

*Approved By: _____
Date: _____
Name: _____
Title: _____

*Must be a responsible officer of the Company. (Either type or use black ink to complete this form.)

017

TMP BLNK CONTAINER FABRICATION PRICE ESTIMATE

Component: Internals Alloy: S30403 Offeror: B&W CNPP Quotation No: P-206 Rev. 1

Price per unit for 750 units/year for a total production of 15,000 units as of 8/1/89 (no escalation)
3 PWR fuel assemblies

Task	Description	Raw Materials: Plate Wt. ($/Lb)	Raw Materials: Bar Wt. ($/Lb)	Raw Materials: Forging Wt. ($/Lb)	Raw Materials: Total $/Comp.	Materials: Exp. $	Materials: Tools $	Materials: Ship $	Labor: Engr. $ (Hrs)	Labor: Manuf. $ (Hrs)	Labor: Insp. $ (Hrs)	Labor: QA $ (Hrs)
7S.1	Form Dividers	330 (2.72)	( )	( )	898				( )	174 (4.0)	62 (1.5)	( )
.2	Join Dividers	( )	( )	( )		50.00			( )	131 (3.0)	( )	( )
.3	Machine, Straight & Clean								( )	87 (2.0)	( )	( )
.4	Inspect								( )	( )	87 (2.0)	( )
.5	QA & Document								( )	( )	( )	44 (1.0)
.6	Pack & Ship					100.00			( )	44 (1.0)	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
7S.0	Total Internals	898			898	150			( )	436 (10.0)	149 (3.5)	44 (1.0)

Quality Assurance Certification Incomplete

1677

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W P.O. 83-779060-00.

Estimated By: C. E. Campbell
Date: 10/16/89
Name: Calvin E. Campbell
Title: Spec. Mfg. Engr.

Verified By: V. D. Holaday
Date: 10/4/89
Name: Veldon D. Holaday
Title: Mgr. Spec. Mfg.

*Approved By: _____
Date: _____
Name: _____
Title: _____

*Must be a responsible officer of the Company. (Either type or use black ink to complete this form.)

018

THE BLOW CONTAINER FABRICATION PRICE ESTIMATE

Component: Internals Alloy: S30403 Offeror: B+W CNFP Quotation No: P-2060 rev. 1

Price per unit for 750 units/year for a total production of 15,000 units as of 8/1/89 (no escalation)
3 PWR and 4 BWR fuel assemblies

Task	Description	Raw Materials: Plate Wt. ($/Lb)	Raw Materials: Bar Wt. ($/Lb)	Raw Materials: Forging Wt. ($/Lb)	Raw Materials: Total $/Comp.	Materials: Sup. $	Materials: Tools $	Materials: Ship $	Labor: Engr. $ (Hrs)	Labor: Manuf. $ (Hrs)	Labor: Insp. $ (Hrs)	Labor: QA $ (Hrs)
8S.1	Form Dividers	659 (8.72)	( )	( )	1792				( )	532 (12.0)	131 (3.0)	( )
.2	Join Dividers	( )	( )	( )		100.00			( )	261 (6.0)	87 (2.0)	( )
.3	Machine, Straight & Clean								( )	261 (6.0)	( )	( )
.4	Inspect								( )	( )	174 (4.0)	( )
.5	QA & Document								( )	( )	( )	44 (1.0)
.6	Pack & Ship					100.00			( )	62 (1.5)	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
8S.0	Total Internals	1792			1792	200.00			( )	1106 (25.5)	392 (9.0)	44 (1.0)

Advance Data
Quality Assurance
Certification Incomplete

3534

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W P.O. 83-779060-00.

Estimated By: C. E Campbell
Date: 10/4/89
Name: Calvin E Campbell
Title: Spec. Mfg. Eng.

Verified By: V.D. Holaday
Date: 10/4/89
Name: Yeldon D. Holaday
Title: Mgr. Spec. Mfg.

*Approved By: _____
Date: _____
Name: _____
Title: _____

*Must be a responsible officer of the Company. (Either type or use black ink to complete this form.)

019

THP MLHW CONTAINER FABRI[illegible]ON PRICE ESTIMATE

Component: Internals Alloy: S30403 Offeror: B+W CNFP Quotation No: P-2060 Rev. 1

Price per unit for 750 units/year for a total production of 15,000 units as of 8/1/89 (no escalation)
10 BWR fuel assemblies

		Raw Materials				Materials			Labor			
Task	Description	Plate Wt. ($/Lb)	Bar Wt. ($/Lb)	Forging Wt. ($/Lb)	Total $/Comp.	Exp. $	Tools $	Ship $	Engr. $ (Hrs)	Manuf. $ (Hrs)	Insp. $ (Hrs)	QA $ (Hrs)
9S.1	Form Dividers	1429 (2.72)	( )	( )	3887				( )	522 (12.0)	87 (2.0)	( )
.2	Join Dividers	( )	( )	( )		100.00			( )	261 (6.0)	( )	( )
.3	Machine, Straight & Clean								( )	261 (6.0)	( )	( )
.4	Inspect								( )	( )	74 (4.0)	( )
.5	QA & Document								( )	( )	( )	44 (1.0)
.6	Pack & Ship					100.00			( )	62 (1.5)	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
9S.0	Total Internals	3887			3887	200			( )	1106 (25.5)	261 (6.0)	44 (1.0)

Advance Data
Quality Assurance
Certification Incomplete

5498

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W P.O. 83-779063-00.

Estimated By: C. E. Campbell
Date: 10/4/89
Name: Calvin E Campbell
Title: Spec. Mgr. Eng.

Verified By: V.D. P.A. Holaday
Date: 10/4/89
Name: Velden D. Holaday
Title: Mgr. Spec. Mfg.

*Approved By: _____
Date: _____
Name: _____
Title: _____

*Must be a responsible officer of the Company. (Either type or use black ink to complete this form.)

020

YNP BLNG CONTAINER FABR TION PRICE ESTIMATE

Component: Internals Alloy: S30403 Offeror: BTW CNPP Quotation No: P-2060 Rev. 1

Price per unit for 750 units/year for a total production of 15,000 units as of 8/1/89 (no escalation)

4 PWR fuel assemblies

Task	Description	Raw Materials: Plate Wt. ($/Lb)	Raw Materials: Bar Wt. ($/Lb)	Raw Materials: Forging Wt. ($/Lb)	Raw Materials: Total $/Comp.	Materials: Exp. $	Materials: Tools $	Materials: Ship $	Labor: Engr. $ (Hrs)	Labor: Manuf. $ (Hrs)	Labor: Insp. $ (Hrs)	Labor: QA $ (Hrs)
10S.1	Form Dividers	440 (2.72)	( )	( )	1197				( )	218 (5.0)	62 (1.5)	( )
.2	Join Dividers	( )	( )	( )		100 QR			( )	131 (3.0)	( )	( )
.3	Machine, Straight & Clean								( )	87 (2.0)	( )	( )
.4	Inspect								( )	( )	87 (2.0)	( )
.5	QA & Document								( )	( )	( )	44 (1.0)
.6	Pack & Ship					100 QR			( )	44 (1.0)	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
10S.0	Total Internals	1197			1197	200			( )	480 (11.0)	149 (3.5)	44 (1.0)

Advance Data
Quality Assurance
Certification Incomplete

2070

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W P.O. 83-779060-00.

Estimated By: C. E. Campbell
Date: 10/4/89
Name: Calvin E Campbell
Title: Spec. Mfg. Eng.

Verified By: V. D. Holaday
Date: 10/4/89
Name: Veldon D. Holaday
Title: Mgr. Spec. Mfg.

*Approved By: _____
Date: _____
Name: _____
Title: _____

*Must be a responsible officer of the Company. (Either type or use black ink to complete this form.)

021

Appendix A3

Youngstown Welding and Engineering Company (Vendor C)

Cost Data Package

QUALITY ASSURANCE

This cost estimate furnished by the Youngstown Welding and Engineering Company was to the best of my knowledge obtained in accordance with the specification for use in making production cost estimates of high level nuclear waste containers and internals for the Yucca Mountain Project, Rev. 2, and the Quality Program outline for Yucca Mountain Project - High Level Nuclear Waste Container Fabrication Cost Estimate Quality Assurance specified in B&W P.O. 537-0A163950-UB.

10.27-89

G. W. Roberts, Manager QA
Babcock & Wilcox Company
Research and Development Division

GWR/lmm

001

Babcock & Wilcox

a McDermott company

Research and Development Division

1562 Beeson Street
Alliance, OH 44601
(216) 821-9110

September 19, 1989

Mr. Ed Russell, L-197
University of California
Lavrence Livermore National Lab.
Yucca Mountain Project
P. O. Box 5514, L-217
Livermore, CA 94551

Dear Ed:

Subject: YMP-HLNW Container Production Cost Estimates by Youngstown Welding and Engineering Co.

Dear Ed:

Attached are two copes of the subject cost estimate provided by the Youngstown Welding and Engineering Co. in response to our P.O. 537-0A163950-UB. The price for these containers and internals before taxes are estimated to be as follows:

Container Including Lower Unit and Upper Head Price, $/Container

Size	Materials: Raw	Materials: Expendable	Labor	Total
		C71500 Alloy		
26S	31,395	4,969	24,146	60,510
26L	36,472	5,700	27,482	69,654
28L	40,564	6,231	30,383	77,178
		N08825 Alloy		
26S	31,022	4,921	25,819	61,762
26L	35,980	5,610	29,591	71,181
28L	40,368	6,141	31,583	78,092

Internals, $/Assembly

S30403 (TP 304LSS) Alloy

Cons. 6 PWR	390	253	964	1,607
3 PWR	538	259	1,173	1,970
3 PWR + 4 BWR	884	281	1,278	2,443
10 BWR	1,080	253	1,172	2,505
4 PWR	649	274	1,016	1,939

002

Please note that there is an error in addition for the total of 4N.0. It should read $13,312 instead of $13,307.

The following features of these estimates are noteworthy.

- Labor hours for vendor furnished services, such as spin forming the lower unit, are not included in the labor hours breakdown.
- Raw material costs include overhead and mark-up by Youngstown Welding and Engineering.

CONCLUSION

These estimates are acceptable.

Sincerely,

THE BABCOCK & WILCOX COMPANY
Research and Development Division

H. A. Domian

H. A. Domian
Metallurgy & Manufacturing
Technology Section

cll
Attach.

cc: R. L. Fish - BWFC
K. K. Everett (w/o att.)
D. F. LaCount (w/o att.)
E. S. Robitz (w/o att.)

THE YOUNGSTOWN WELDING
AND ENGINEERING COMPANY
FABRICATORS AND MACHINISTS IN ALLOYS
AND STEEL SINCE NINETEEN TWELVE

WELDCO

September 18, 1989

BABCOCK & WILCOX COMPANY
Alliance Research Center
1562 Beeson Street
Alliance, OH 44601

ATTN: Mr. Rod Bruckner

REF: P.O. 5370A163950UB
YW&E C-9066

Dear Rod:

Please find attached our Cost Estimating Data Package on the above.

In preparing this package, several areas of concern arose and will need further Engineering/Production Development, such as:

1.) Lower Unit Assembly - Shrinkage at the weld joining the Head and the Hex Flange.

2.) Upper Head Assembly - Pintle to Head weld design may not be adequate to handle the loaded vessel.

3.) Internals - Design does not allow for taper at bottom of vessel.

4.) Internals - Nothing indicates shipping method. Are they to be inserted in vessel?

5.) Internals - Design length indicates fit for only (1) vessel length and (2) diameters.

6.) Internals - Quantity (5) Units of 750 pieces each per year while only 1500 vessels will be made in which these internals can fit. (This will cause discrepancies in tooling costs since they are amortized over the 3750 piece total internal quantity.)

004

P. O. BOX 2461 YOUNGSTOWN, OHIO 44509-0461 (216) 799-3215 FAX (216) 793-5044

THE YOUNGSTOWN WELDING
AND ENGINEERING COMPANY

7.) Lower Vessel - Roll forming will apparently require further process development, since there is concern over rolling the circumferential weld.

Thank you for the privilege of working with you on this order.

Very truly yours,

A.D. "Dave" Luptak
Contract Sales Administrator

DL:js

Enclosures: Bid Package
Inco Alloys International Quotation
Kaiser Rollmat Quotation

BASIS FOR LABOR RATES USED FOR THP ELNV CONTAINER FABRICATION

Offeror: Youngstown Welding & Eng. Co. Quotation No.: 9066

The labor costs are based on the following factors:

	Used Yes	Used No
Base Rate	X	—
Shift Differential	X	—
Holidays	X	—
Vacations	X	—
Casual Overtime	X	—
Training	X	—
Social Security	X	—
Workmen's Compensation	X	—
Pension	X	—
Health & Welfare	X	—
Other (Identify)	—	—

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W P.O. 5370A163950UB.

Estimated By: A. D. "Dave" Luptak
Date: 9/14/89
Name: [signature]
Title: Sales Adm.

Verified By: [signature]
Date: 9/14/89
Name: Doreen Morton
Title: Secretary

*Approved By: [signature]
Date: 9/14/89
Name: Donna Soich
Title: Corporate Secretary

*Must be a responsible officer of the Company.

(Either type or use black ink to complete this form.)

TOTAL PRICE AND TAX ESTIMATE FOR YMP HLNW CONTAINER FABRICATION PER PIECE AT 750 PIECES/YEAR AS OF 8/1/89 (NO ESCALATION)

Offeror: Youngstown Welding & Engineering Quotation No.: 9066

Task	Price Before Taxes, $/Pc.	Taxes: Sales $	Sales Rate	Business $	Business Rate	Inventory $	Inventory Rate	Other $	Other Rate	Price After Taxes $/Pc.
					C71500 Alloy					
1C.0	47,418.00									
2C.0	56,562.00									
3C.0	62,769.00									
4C.0	13,092.00									
5C.0	14,409.00									
					N08825 Alloy					
1N.0	48,450.00									
2N.0	57,869.00									
3N.0	63,447.00									
4N.0	13,307.00									
5N.0	14,685.00									
					S30403 Alloy					
6S.0	1,607.00									
7S.0	1,970.00									
8S.0	2,443.00									
9S.0	2,505.00									
10S.0	1,939.00									

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W P.O. 5370A163950UB.

Estimated By: A.D. "Dave" Luptak

Date: 9/14/89

Name: A.D. Luptak

Title: Sales Adm.

Verified By: Doreen J. Morton

Date: 9/14/89

Name: Doreen Morton

Title: Secretary

*Approved By: Donna L. Soich

Date: 9/14/89

Name: Donna Soich

Title: Corporate Secretary

*Must be a responsible officer of the Company.

(Either type or use black ink to complete this form.

We are quoting for resale. We are exempt

YMP HLNW CONTAINER FABRICATION PRICE ESTIMATE

Component: Lower Unit (LU) Alloy: C71500 Offeror: YW&E Quotation No: 9066

Price per unit for 750 units/year for a total production of 15,000 units as of 8/1/89 (no escalation)

26S Container

		Raw Materials				Materials			Labor			
Task	Description	Plate Wt. ($/Lb)	Bar Wt. ($/Lb)	Forging Wt. ($/Lb)	Total $/Comp.	Exp. $	Tools $	Ship $	Engr. $ (Hrs)	Manuf. $ (Hrs)	Insp. $ (Hrs)	QA $ (Hrs)
1C.1	Bottom Head (BH)	1377 (7.09)	( )	( )	9763				10 (.2)	821 (15.7)	52 (1)	52 (1)
.2	Body (B)	1536 (7.09)	( )	( )	10890	332	2		10 (.2)	2196 (42)	209 (4)	78 (1.5)
.3	Flange Blank (FB)		132 7.90		1043	40	1		10 (.2)	904 (17.3)	52 (1)	78 (1.5)
.4	Join BH to B					572	2		( )	1778 (34)	157 (3)	52 (1)
.5	Spin Form LU					20		970	( )	7510 ( )	157 (3)	105 (2)
.6	Join FB to LU					1064	2		5 (.1)	1542 (29.5)	157 (3)	105 (2)
.7	Anneal LU					110	2	300	5 (.1)	1400 (10)	157 (3)	105 (2)
.8	Machine LU					45	6		( )	627 (12)	52 (1)	25 (.5)
.9	Inspect & Test					113	6		( )	209 (4)	261 (5)	105 (2)
.10	QA & Document					1		2	( )	( )	52 (1)	52 (1)
.11	Package & Ship					700		240	( )	523 (10)	52 (1)	26 (.5)
4.5	Anneal & Clean					100			( )	1400 (10)	( )	( )
1C.0	Total LUC				21696	3097	21	1512	40 (.8)	18910 (384.2)	1358 (26)	784 (15)

47418.

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W P.O. 5370A163950UB.

Estimated By: A. D. "Dave" Luptak
Date: 9/14/89
Name: [signature]
Title: Sales Adm.

Verified By: [signature]
Date: 9/14/89
Name: Doreen Morton
Title: Secretary

*Approved By: [signature]
Date: 9/14/89
Name: Donna Soich
Title: Corp. Secretary

*Must be a responsible officer of the Company. (Either type or use black ink to complete this form.)

.800

YMP HLNW CONTAINER FABRI(ION PRICE ESTIMATE

Component: Lower Unit (LU) Alloy: C71500 Quotation No: 9066

Price per unit for 750 units/year for a total production of 15,000 units as of 8/1/89 (no escalation)

26L Container

Task	Description	Raw Materials: Plate Wt. ($/Lb)	Raw Materials: Bar Wt. ($/Lb)	Raw Materials: Forging Wt. ($/Lb)	Raw Materials: Total $/Comp.	Materials: Exp. $	Materials: Tools $	Materials: Ship $	Labor: Engr. $ (Hrs)	Labor: Manuf. $ (Hrs)	Labor: Insp. $ (Hrs)	Labor: QA $ (Hrs)	
2C.1	Bottom Head (BH)	1377 (7.09)	( )	( )	9763				10 (.2)	821 (15.7)	52 (1)	52 (1)	
.2	Body (B)	2252 (7.00)	( )	( )	15967	498	2		10 (.2)	3293 (63)	209 (4)	78 (1.5)	
.3	Flange Blank (FB)		132 7.90		1043	40	1		10 (.2)	904 (17.3)	52 (1)	78 (1.5)	
.4	Join BH to B					572	2		( )	2778 (34)	157 (3)	52 (1)	
.5	Spin Form LU					20		1200	( )	9216 ( )	157 (3)	105 (2)	
.6	Join FB to LU					1064	2		5 (.1)	1625 (31)	157 (3)	105 (2)	
.7	Anneal LU					110	2	375	5 (.1)	1625 (10)	157 (3)	105 (2)	
.8	Machine LU					45	6		( )	627 (12)	52 (1)	26 (.5)	
.9	Inspect & Test					113	6		( )	209 (4)	261 (5)	105 (2)	
.10	QA & Document					1		2	( )	( )	52 (1)	52 (1)	
.11	Package & Ship					900		300	( )	523 (10)	52 (1)	26 (.5)	
4.5	Anneal & Clean					100			( )	1625 (10)	( )	( )	
2C.0	Total LUC				26773	3463	21	1877	40 (.8)	22246 (207)	1358 (26)	784 (15)	56562.0

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W P.O. 5370A163950UB.

Estimated By: A. D. "Dave" Luptak
Date: 9/14/89
Name: [signature]
Title: Sales Adm.

Verified By: [signature]
Date: 9/14/89
Name: Doreen Morton
Title: Secretary

*Approved By: [signature]
Date: 9/14/89
Name: Donna Soich
Title: Corp. Secretary

*Must be a responsible officer of the Company. (Either type or use black ink to complete this form.)

609

YMP HLNW CONTAINER FABRICATION PRICE ESTIMATE

Component: Lower Unit (LU) Alloy: C71500 Offeror: YW&F Quotation No: 9066

Price per unit for 750 units/year for a total production of 15,000 units as of 1/1/89 (no escalation)

28L Container

Task	Description	Raw Materials: Plate Wt. ($/Lb)	Raw Materials: Bar Wt. ($/Lb)	Raw Materials: Forging Wt. ($/Lb)	Raw Materials: Total $/Comp.	Materials: Exp. $	Materials: Tools $	Materials: Ship $	Labor: Engr. $ (Hrs)	Labor: Manuf. $ (Hrs)	Labor: Insp. $ (Hrs)	Labor: QA $ (Hrs)	
3C.1	Bottom Head (BH)	1615 (7.09)	( )	( )	11450				10 (.2)	889 (17)	52 (1)	52 (1)	
.2	Body (B)	2422 (7.09)	( )	( )	17172	498	2		10 (.2)	3450 (66)	209 (4)	78 (1.5)	
.3	Flange Blank (FB)		145 7.90		1146	44	1		10 (.2)	993 (19)	52 (1)	78 (1.5)	
.4	Join BH to B					629	2		( )	1934 (37)	157 (3)	52 (1)	
.5	Spin Form LU					20		1350	( )	9871 ( )	157 (3)	105 (2)	
.6	Join FB to LU					1170	2		5 (.1)	1778 (34)	157 (3)	105 (2)	
.7	Anneal LU					110	2	420	5 (.1)	2260 (10)	157 (3)	105 (2)	
.8	Machine LU					50	6		( )	680 (13)	52 (1)	26 (.5)	
.9	Inspect & Test					123	6		( )	261 (5)	261 (5)	105 (2)	
.10	QA & Document					1		2	( )	( )	52 (1)	52 (1)	
.11	Package & Ship					1000		330	( )	575 (11)	52 (1)	26 (.5)	
4.5	Anneal & Clean					100			( )	2260 (10)	( )	( )	
3C.0	Total LUC				29768	3745	21	2102	40 (.8)	24951 (222)	1358 (26)	784 (15)	62769.0

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W P.O. 5370A163950UB.

Estimated By: [signature]
Date: 9/14/89
Name: A. D. "Dave" Luptak
Title: Sales Adm.

Verified By: [signature]
Date: 9/14/89
Name: Doreen Morton
Title: Secretary

*Approved By: [signature]
Date: 9/14/89
Name: Donna Spich
Title: Corp. Secretary

*Must be a responsible officer of the Company. (Either type or use black ink to complete this form.)

010

YMP HLNW CONTAINER FABRICATION PRICE ESTIMATE

Component: Upper Head (UH) Alloy: C71500 Offeror: YW&E Quotation No: 9066

Price per unit for 750 units/year for a total production of 15,000 units as of 8/1/89 (no escalation)

26S or 26L Container

Task	Description	Raw Materials: Plate Wt. ($/Lb)	Raw Materials: Bar Wt. ($/Lb)	Raw Materials: Forging Wt. ($/Lb)	Raw Materials: Total $/Comp.	Materials: Exp. $	Materials: Tools $	Materials: Ship $	Labor: Engr. $ (Hrs)	Labor: Manuf. $ (Hrs)	Labor: Insp. $ (Hrs)	Labor: QA $ (Hrs)	
4C.1	Upper Head (UH)	1174 (7.26)	( )	( )	8523				10 (.2)	( )	26 (.5)	10 (.2)	
.2	Pintle (P)	( )	162 (7.26)	( )	1176	1	1		( )	52 (1)	26 (.5)	10 (.2)	
.3	Join P to UH					90			( )	209 (4)	52 (1)	26 (.5)	
.4	Anneal UH							140	( )	480 ( )	26 (.5)	26 (.5)	
.5	Machine UH					50	5		10 (.2)	1412 (27)	183 (3.5)	52 (1)	
.6	Inspect & Clean					5	2		( )	105 (2)	52 (1)	52 (1)	
.7	QA & Document					1			( )	( )	52 (1)	52 (1)	
.8	Package & Ship					12		32	( )	105 (2)	( )	26 (.5)	
									( )	( )	( )	( )	
									( )	( )	( )	( )	
									( )	( )	( )	( )	
									( )	( )	( )	( )	
4C.0	Total UHC				9699	159	8	172	20 (.4)	2363 (36)	417 (8)	254 (4.9)	13,092.

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W P.O. 5370A163950UB.

Estimated By: A.D. "Dave" Luptak
Date: 9/14/89
Name: [signature]
Title: Sales Adm.

Verified By: [signature]
Date: 9/14/89
Name: Doreen Morton
Title: Secretary

*Approved By: [signature]
Date: 9/14/89
Name: Donna Soich
Title: Corp. Secretary

*Must be a responsible officer of the Company. (Either type or use black ink to complete this form.)

011

YMP HLNW CONTAINER FABRICATION PRICE ESTIMATE

Component: Upper Head (UH) Alloy: C71500 Offeror: YW&E Quotation No: 9066

Price per unit for 750 units/year for a total production of 15,000 units as of 8/1/89 (no escalation)
28L Container

Task	Description	Raw Materials: Plate Wt. ($/Lb)	Raw Materials: Bar Wt. ($/Lb)	Raw Materials: Forging Wt. ($/Lb)	Raw Materials: Total $/Comp.	Materials: Exp. $	Materials: Tools $	Materials: Ship $	Labor: Engr. $ (Hrs)	Labor: Manuf. $ (Hrs)	Labor: Insp. $ (Hrs)	Labor: QA $ (Hrs)
5C.1	Upper Head (UH)	1325 (7.26)	( )	( )	9620				10 (.2)	( )	26 (.5)	10 (.2)
.2	Pintle (P)	( )	162 (7.26)	( )	1176	1	1		( )	52 (1)	26 (.5)	10 (.2)
.3	Join P to UH					90			( )	209 (4)	52 (1)	26 (.5)
.4	Anneal UH							155	( )	520 ( )	26 (.5)	26 (.5)
.5	Machine UH					55	6		10 (.2)	1568 (30)	183 (3.5)	52 (1)
.6	Inspect & Clean					5	2		( )	105 (2)	52 (1)	52 (1)
.7	QA & Document					1			( )	( )	52 (1)	52 (1)
.8	Package & Ship					12		35	( )	105 (2)	( )	26 (.5)
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
5C.0	Total UHC				10796	164	9	190	20 (.4)	2559 (39)	417 (8)	254 (4.9)

14409.

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W P.O. 5370A163950UB.

Estimated By: A. D. "Dave" Luptak
Date: 9/14/89
Name: [signature]
Title: Sales Adm.

Verified By: [signature]
Date: 9/14/89
Name: Doreen Morton
Title: Secretary

*Approved By: [signature]
Date: 9/14/89
Name: Donna Soich
Title: Corp. Secretary

*Must be a responsible officer of the Company. (Either type or use black ink to complete this form.)

012

YMP HLNW CONTAINER FABRICATION PRICE ESTIMATE

Component: Lower Unit (LU) Alloy: N08825 Offeror: YW&E Quotation No: 9066

Price per unit for 750 units/year for a total production of 15,000 units as of 8/1/89 (no escalation)

26S Container

Task	Description	Raw Materials: Plate Wt. ($/Lb)	Raw Materials: Bar Wt. ($/Lb)	Raw Materials: Forging Wt. ($/Lb)	Raw Materials: Total $/Comp.	Materials: Exp. $	Materials: Tools $	Materials: Ship $	Labor: Engr. $ (Hrs)	Labor: Manuf. $ (Hrs)	Labor: Insp. $ (Hrs)	Labor: QA $ (Hrs)	
1N.1	Bottom Head (BH)	1236 (7.71)	( )	( )	9530				10 (.2)	821 (15.7)	52 (1)	52 (1)	
.2	Body (B)	1379 (7.71)	( )	( )	10632	332	2		10 (.2)	2196 (42)	209 (4)	78 (1.5)	
.3	Flange Blank (FB)		120 8.80		1056	40	1		10 (.2)	904 (17.3)	52 (1)	78 (1.5)	
.4	Join BH to B					572	2		( )	1778 (34)	157 (3)	52 (1)	
.5	Spin Form LU					20		900	( )	8163 ( )	157 (3)	105 (2)	
.6	Join FB to LU					1064	2		5 (.1)	1542 (29.5)	157 (3)	105 (2)	
.7	Anneal LU					110	2	330	5 (.1)	1850 (10)	157 (3)	[illegible] (2)	
.8	Machine LU					45	3		( )	627 (12)	52 (1)	26 (.5)	
.9	Inspect & Test					113	6		( )	209 (4)	261 (5)	105 (2)	
.10	QA & Document					1		2	( )	( )	52 (1)	52 (1)	
.11	Package & Ship					700		240	( )	523 (10)	52 (1)	26 (.5)	
4.5	Anneal & Clean					100			( )	1850 (10)	( )	( )	
1N.0	Total LUN				21218	3097	18	1472	40 (.8)	20463 (18.45)	1358 (26)	784 (15)	48450.0

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W P.O. 5370A163950UB.

Estimated By: A. D. "Dave" Luptak
Date: 9/14/89
Name: [signature]
Title: Sales Adm.

Verified By: [signature]
Date: 9/14/89
Name: Doreen Morton
Title: Secretary

*Approved By: [signature]
Date: 9/14/89
Name: Donna Soich
Title: Corp. Secretary

*Must be a responsible officer of the Company. (Either type or use black ink to complete this form.)

013

YMP HLNW CONTAINER FABRICATION PRICE ESTIMATE

Component: Lower Unit (LU) Alloy: N08825 Offeror: YM&F Quotation No: 9066

Price per unit for 750 units/year for a total production of 15,000 units as of 8/1/89 (no escalation)

26L Container

		Raw Materials				Materials			Labor			
Task	Description	Plate Wt. ($/Lb)	Bar Wt. ($/Lb)	Forging Wt. ($/Lb)	Total $/Comp.	Exp. $	Tools $	Ship $	Engr. $ (Hrs)	Manuf. $ (Hrs)	Insp. $ (Hrs)	QA $ (Hrs)
3N.1	Bottom Head (BH)	1236 (7.7)	( )	( )	9530				10 (.2)	821 (15.7)	52 (1)	52 (1)
.2	Body (B)	2022 (7.7)	( )	( )	15590	498	2		10 (.2)	3293 (63)	209 (4)	78 (1.5)
.3	Flange Blank (FB)		120 880		1056	40	1		10 (.2)	904 (17.3)	52 (1)	78 (1.5)
.4	Join BH to B					572	2		( )	1778 (34)	157 (3)	52 (1)
*.5	Spin Form LU					20		1115	5 (.1)	10075 ( )	157 (3)	105 (2)
.6	Join FB to LU					1064	2		5 (.1)	1625 (37)	157 (3)	105 (2)
.7	Anneal LU					110	2	375	( )	2190 (10)	157 (3)	105 (2)
.8	Machine LU					45	6		( )	627 (12)	52 (1)	26 (.5)
.9	Inspect & Test					113	6		( )	209 (4)	261 (5)	105 (2)
.10	QA & Document					1		2	( )	( )	52 (1)	52 (1)
.11	Package & Ship					900		300	( )	523 (10)	52 (1)	26 (.5)
*	Anneal & Clean					100			( )	2190 (10)	( )	( )
3N.0	Total LUN				26176	3463	21	1792	40 (.8)	2435 (207)	1358 (26)	784 (15)

57,869.(

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W P.O. 5370A163950UB.

Estimated By: A. D. "Dave" Luptak
Date: 9/14/89
Name: [signature]
Title: Sales Adm.

Verified By: [signature]
Date: 9/14/89
Name: Doreen Morton
Title: Secretary

*Approved By: [signature]
Date: 9/14/89
Name: Donna Soich
Title: Corporate Secretary

*Must be a responsible officer of the Company. (Either type or use black ink to complete this form.)

0114

YMP HLNW CONTAINER FABRI(ION PRICE ESTIMATE

Component: Lower Unit (LU) Alloy: N08825 Vendor: YW&E Quotation No: 9066

Price per unit for 750 units/year for a total production of 15,000 units as of 8/1/89 (no escalation)

28L Container

Task	Description	Raw Materials: Plate Wt. ($/Lb)	Raw Materials: Bar Wt. ($/Lb)	Raw Materials: Forging Wt. ($/Lb)	Raw Materials: Total $/Comp.	Materials: Exp. $	Materials: Tools $	Materials: Ship $	Labor: Engr. $ (Hrs)	Labor: Manuf. $ (Hrs)	Labor: Insp. $ (Hrs)	Labor: QA $ (Hrs)	
3N.1	Bottom Head (BH)	1495 (7.71)	( )	( )	11526				10 (.2)	889 (17)	52 (1)	52 (1)	
.2	Body (B)	2175 (7.71)	( )	( )	16769	498	2		10 (.2)	3450 (66)	209 (4)	78 (1.5)	
.3	Flange Blank (FB)		132 8.80		1161	44	1		10 (.2)	993 (19)	52 (1)	78 (1.5)	
.4	Join BH to B					629	2		( )	1934 (37)	157 (3)	52 (1)	
.5	Spin Form LU					20		1260	( )	10821 ( )	157 (3)	105 (2)	
.6	Join FB to LU					1170	2		5 (.1)	1778 (34)	157 (3)	105 (2)	
.7	Anneal LU					110	2	420	5 (.1)	2390 (10)	157 (3)	105 (2)	
.8	Machine LU					50	6		( )	680 (13)	52 (1)	26 (.5)	
.9	Inspect & Test					123	6		( )	261 (5)	261 (5)	105 (2)	
.10	QA & Document					1		2	( )	( )	52 (1)	52 (1)	
.11	Package & Ship					1000		330	( )	575 (11)	52 (1)	26 (.5)	
4.5	Anneal & Clean					100			( )	2260 (10)	( )	( )	
3N.0	Total LUN				29456	3745	21	2012	40 (.8)	26031 (222)	1358 (26)	784 (15)	63,447.C

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W P.O. 5370A163950UB.

Estimated By: A.D. "Dave" Luptak

Date: 9/14/89

Name: [signature]

Title: Sales Adm.

Verified By: [signature]

Date: 9/14/89

Name: Doreen Morton

Title: Secretary

*Approved By: [signature]

Date: 9/14/89

Name: Donna Soich

Title: Corp. Secretary

*Must be a responsible officer of the Company. (Either type or use black ink to complete this form.)

YMP HLNW CONTAINER FABRICATION PRICE ESTIMATE

Component: Upper Head (UH) Alloy: N08825 Offeror: YW&E Quotation No: 9066

Price per unit for 750 units/year for a total production of 15,000 units as of 8/1/89 (no escalation)

26S or 26L Container

Task	Description	Raw Materials: Plate Wt. ($/Lb)	Raw Materials: Bar Wt. ($/Lb)	Raw Materials: Forging Wt. ($/Lb)	Raw Materials: Total $/Comp.	Materials: Exp. $	Materials: Tools $	Materials: Ship $	Labor: Engr. $ (Hrs)	Labor: Manuf. $ (Hrs)	Labor: Insp. $ (Hrs)	Labor: QA $ (Hrs)	
4N.1	Upper Head (UH)	1054 (8.15)	( )	( )	8590				10 (.2)	( )	26 (.5)	10 (.2)	
.2	Pintle (P)	( )	149 (3.15)	( )	1214	1	1		( )	52 (1)	26 (.5)	10 (.2)	
.3	Join P to UH					90			( )	209 (4)	52 (1)	26 (.5)	
.4	Anneal UH							135	( )	600 ( )	26 (.5)	26 (.5)	
.5	Machine UH					50	5		10 (.2)	1412 (27)	183 (3.5)	52 (1)	
.6	Inspect & Clean					5	2		( )	105 (2)	52 (1)	52 (1)	
.7	QA & Document					1			( )	( )	52 (1)	52 (1)	
.8	Package & Ship					12		32	( )	105 (2)	( )	26 (.5)	
									( )	( )	( )	( )	
									( )	( )	( )	( )	
									( )	( )	( )	( )	
									( )	( )	( )	( )	
4N.0	Total UHN				9804	159	8	167	20 (.4)	2483 (36)	417 (8)	254 (4.9)	13307.0

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W P.O. 5370A163950UB.

Estimated By: A. D. "Dave" Luptak
Date: 9/14/89
Name: [signature]
Title: Sales Adm.

Verified By: [signature]
Date: 9/14/89
Name: Doreen Morton
Title: Secretary

*Approved By: [signature]
Date: 9/14/89
Name: Donna Soich
Title: Corp. Secretary

*Must be a responsible officer of the Company. (Either type or use black ink to complete this form.)

YMP HLNW CONTAINER FABRIC[illegible]ON PRICE ESTIMATE

Component: Upper Head (UH) Alloy: N08825 Offeror: YW&E Quotation No: 9066

Price per unit for 750 units/year for a total production of 15,000 units as of 8/1/89 (no escalation)

28L Container

		Raw Materials				Materials			Labor				
Task	Description	Plate Wt. ($/Lb)	Bar Wt. ($/Lb)	Forging Wt. ($/Lb)	Total $/Comp.	Exp. $	Tools $	Ship $	Engr. $ (Hrs)	Manuf. $ (Hrs)	Insp. $ (Hrs)	QA $ (Hrs)	
5N.1	Upper Head (UH)	1190 (8.15)	( )	( )	9698				10 (.2)	( )	26 (.5)	10 (.2)	
.2	Pintle (P)	( )	149 (8.15)	( )	1214	1	1		( )	52 (1)	26 (.5)	10 (.2)	
.3	Join P to UH					90			( )	209 (4)	52 (1)	26 (.5)	
.4	Anneal UH							155	( )	640 ( )	26 (.5)	26 (.5)	
.5	Machine UH					55	6		10 (.2)	1568 (30)	183 (3.5)	52 (1)	
.6	Inspect & Clean					5	2		( )	105 (2)	52 (1)	52 (1)	
.7	QA & Document					1			( )	( )	52 (1)	52 (1)	
.8	Package & Ship					12		35	( )	105 (2)	( )	26 (.5)	
									( )	( )	( )	( )	
									( )	( )	( )	( )	
									( )	( )	( )	( )	
									( )	( )	( )	( )	
5N.0	Total UHN				10912	164	9	190	20 (.4)	2679 (39)	417 (8)	254 (4.9)	14,645.00

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W P.O. 5370A163950UB.

Estimated By: A.D. "Dave" Luptak
Date: 9/14/89
Name: [signature]
Title: Sales Adm.

Verified By: [signature]
Date: 9/14/89
Name: Doreen Morton
Title: Secretary

*Approved By: [signature]
Date: 9/14/89
Name: Donna Soich
Title: Corp. Secretary

*Must be a responsible officer of the Company. (Either type or use black ink to complete this form.)

Sample

YMP HLNW CONTAINER FABRICATION PRICE ESTIMATE

Component: Internals Alloy: S30403 Offeror: YW&E Quotation No: 9066

Price per unit for 750 units/year for a total production of 15,000 units as of 8/1/89 (no escalation)

Consolidated 6 PWR fuel assemblies

Task	Description	Raw Materials: Plate Wt. ($/Lb)	Raw Materials: Bar Wt. ($/Lb)	Raw Materials: Forging Wt. ($/Lb)	Raw Materials: Total $/Comp.	Materials: Exp. $	Materials: Tools $	Materials: Ship $	Labor: Engr. $ (Hrs)	Labor: Manuf. $ (Hrs)	Labor: Insp. $ (Hrs)	Labor: QA $ (Hrs)	
6S.1	Form Dividers	250 (1.56)	( )	( )	390		3		10 (.2)	157 (3)	52 (1)	26 (.5)	
.2	Join Dividers	( )	( )	( )			3		10 (.2)	157 (3)	26 (.5)	26 (.5)	
.3	Machine, Straight & Clean						1		5 (.1)	105 (2)	26 (.5)	26 (.5)	
.4	Inspect						1		( )	52 (1)	52 (1)	26 (.5)	
.5	QA & Document					1			( )	26 (.5)	26 (.5)	52 (1)	
.6	Pack & Ship					200		44	( )	52 (1)	26 (.5)	26 (.5)	
									( )	( )	( )	( )	
									( )	( )	( )	( )	
									( )	( )	( )	( )	
									( )	( )	( )	( )	
									( )	( )	( )	( )	
									( )	( )	( )	( )	
6S.0	Total Internals				390	201	8	44	25 (.5)	549 (10.5)	208 (4)	182 (3.5)	1607.00

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W P.O. 5370A163950UB.

Estimated By: [signature] Date: 9/14/89 Name: A. D. "Dave" Luptak Title: Sales Adm.

Verified By: [signature] Date: 9/14/89 Name: Doreen Morton Title: Secretary

*Approved By: [signature] Date: 9/14/89 Name: Donna Soich Title: Corporate Secretary

*Must be a responsible officer of the Company. (Either type or use black ink to complete this form.)

0178

YMP HLNW CONTAINER FABRICATION PRICE ESTIMATE

Component: Internals Alloy: S30403 Offeror: YW&E Quotation No: 9066

Price per unit for 750 units/year for a total production of 15,000 units as of 8/1/89 (no escalation)

3 PWR fuel assemblies

		Raw Materials				Materials			Labor				
Task	Description	Plate Wt. ($/Lb)	Bar Wt. ($/Lb)	Forging Wt. ($/Lb)	Total $/Comp.	Exp. $	Tools $	Ship $	Engr. $ (Hrs)	Manuf. $ (Hrs)	Insp. $ (Hrs)	QA $ (Hrs)	
7S.1	Form Dividers	345 (1.56)	( )	( )	538		3		10 (.2)	314 (6)	52 (1)	26 (.5)	
.2	Join Dividers	( )	( )	( )			3		10 (.2)	209 (4)	26 (.5)	26 (.5)	
.3	Machine, Straight & Clean						1		5 (.1)	105 (2)	26 (.5)	26 (.5)	
.4	Inspect					1	1		( )	52 (1)	52 (1)	26 (.5)	
.5	QA & Document								( )	26 (.5)	26 (.5)	52 (1)	
.6	Pack & Ship					200		50	( )	52 (1)	26 (.5)	26 (.5)	
									( )	( )	( )	( )	
									( )	( )	( )	( )	
									( )	( )	( )	( )	
									( )	( )	( )	( )	
									( )	( )	( )	( )	
									( )	( )	( )	( )	
7S.0	Total Internals				538	201	8	50	25 (.5)	758 (14.5)	208 (4)	182 (3.5)	1970.00

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W P.O. 5370A163950UB.

Estimated By: [signature]
Date: 9/14/89
Name: A.D. "Dave" Luptak
Title: Sales Adm.

Verified By: [signature]
Date: 9/14/89
Name: Doreen Morton
Title: Secretary

*Approved By: [signature]
Date: 9/14/89
Name: Donna Soich
Title: Corporate Secretary

*Must be a responsible officer of the Company. (Either type or use black ink to complete this form.)

YMP HLNW CONTAINER FABRICATION PRICE ESTIMATE

Component: Internals Alloy: S30403 Offeror: YW&E Quotation No: 9066

Price per unit for 750 units/year for a total production of 15,000 units as of 8/1/89 (no escalation)

3 PWR and 4 BWR fuel assemblies

		Raw Materials				Materials			Labor				
Task	Description	Plate Wt. ($/Lb)	Bar Wt. ($/Lb)	Forging Wt. ($/Lb)	Total $/Comp.	Exp. $	Tools $	Ship $	Engr. $ (Hrs)	Manuf. $ (Hrs)	Insp. $ (Hrs)	QA $ (Hrs)	
8S.1	Form Dividers	546 (1.56)	20 (1.60)	( )	884		5		10 (.2)	314 (6)	52 (1)	26 (.5)	
.2	Join Dividers	( )	( )	( )			3		10 (.2)	314 (6)	26 (.5)	26 (.5)	
.3	Machine, Straight & Clean						1		5 (.1)	105 (2)	26 (.5)	26 (.5)	
.4	Inspect					1	1		( )	52 (1)	52 (1)	26 (.5)	
.5	QA & Document								( )	26 (.5)	26 (.5)	52 (1)	
.6	Pack & Ship					200		70	( )	52 (1)	26 (.5)	26 (.5)	
									( )	( )	( )	( )	
									( )	( )	( )	( )	
									( )	( )	( )	( )	
									( )	( )	( )	( )	
									( )	( )	( )	( )	
									( )	( )	( )	( )	
8S.0	Total Internals				884	201	10	70	25 (.5)	863 (16.5)	208 (4)	182 (3.5)	2443.00

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W P.O. 5370A163950UB.

Estimated By: [signature]
Date: 9/14/89
Name: A.D. "Dave" Luptak
Title: Sales Adm.

Verified By: [signature]
Date: 9/14/89
Name: Doreen Morton
Title: Secretary

*Approved By: [signature]
Date: 9/14/89
Name: Donna Soich
Title: Corproate Secretary

*Must be a responsible officer of the Company. (Either type or use black ink to complete this form.)

020

YMP HLNW CONTAINER FABRICATION PRICE ESTIMATE

Component: Internals Alloy: S30403 Offeror: YW&E Quotation No: 9066

Price per unit for 750 units/year for a total production of 15,000 units as of 8/1/89 (no escalation)
10 BWR fuel assemblies

		Raw Materials				Materials			Labor			
Task	Description	Plate Wt. ($/Lb)	Bar Wt. ($/Lb)	Forging Wt. ($/Lb)	Total $/Comp.	Exp. $	Tools $	Ship $	Engr. $ (Hrs)	Manuf. $ (Hrs)	Insp. $ (Hrs)	QA $ (Hrs)
9S.1	Form Dividers	692 (1.56)	( )	( )	1080		3		10 (.2)	209 (4)	52 (1)	26 (.5)
.2	Join Dividers	( )	( )	( )			3		10 (.2)	261 (5)	26 (.5)	26 (.5)
.3	Machine, Straight & Clean						1		5 (.1)	157 (3)	26 (.5)	26 (.5)
.4	Inspect						1		( )	52 (1)	52 (1)	26 (.5)
.5	QA & Document					1			( )	26 (.5)	26 (.5)	52 (1)
.6	Pack & Ship					200		44	( )	52 (1)	26 (.5)	26 (.5)
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
9S.0	Total Internals				1080	201	8	44	25 (.5)	757 (14.5)	208 (4)	182 (3.5)

2505.00

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W P.O. 5370A163950UB.

Estimated By: [signature]
Date: 9/14/89
Name: A. D. "Dave" Luptak
Title: Sales Adm.

Verified By: [signature]
Date: 9/14/89
Name: Doreen Morton
Title: Secretary

*Approved By: [signature]
Date: 9/14/89
Name: Donna Soich
Title: Corporate Secretary

*Must be a responsible officer of the Company. (Either type or use black ink to complete this form.)

021

YMP HLNW CONTAINER FABRICATION PRICE ESTIMATE

Component: Internals Alloy: S30403 Offeror: YW&E Quotation No: 9066

Price per unit for 750 units/year for a total production of 15,000 units as of 8/1/89 (no escalation)

4 PWR fuel assemblies

		Raw Materials				Materials			Labor				
Task	Description	Plate Wt. ($/Lb)	Bar Wt. ($/Lb)	Forging Wt. ($/Lb)	Total $/Comp.	Exp. $	Tools $	Ship $	Engr. $ (Hrs)	Manuf. $ (Hrs)	Insp. $ (Hrs)	QA $ (Hrs)	
10S.1	Form Dividers	416 (1.56)	( )	( )	649		3		10 (.2)	157 (3)	52 (1)	26 (.5)	
.2	Join Dividers	( )	( )	( )			3		10 (.2)	209 (4)	26 (.5)	26 (.5)	
.3	Machine, Straight & Clean						1		5 (.1)	105 (2)	26 (.5)	26 (.5)	
.4	Inspect					1	1		( )	52 (1)	52 (1)	26 (.5)	
.5	QA & Document								( )	26 (.5)	26 (.5)	52 (1)	
.6	Pack & Ship					200		65	( )	52 (1)	26 (.5)	26 (.5)	
									( )	( )	( )	( )	
									( )	( )	( )	( )	
									( )	( )	( )	( )	
									( )	( )	( )	( )	
									( )	( )	( )	( )	
									( )	( )	( )	( )	
10S.0	Total Internals				649	201	8	65	25 (.5)	601 (11.5)	208 (4)	182 (3.5)	1939.00

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W P.O. 5370A163950UB.

Estimated By: [signature]
Date: 9/14/89
Name: [signature]
Title: Sales Adm.

Verified By: [signature]
Date: 9/14/89
Name: Doreen Morton
Title: Secretary

*Approved By: [signature]
Date: 9/14/89
Name: Donna Soich
Title: Corporate Secretary

*Must be a responsible officer of the Company. (Either type or use black ink to complete this form.)

0252

KAISER ROLLMET
A KAISER AEROSPACE & ELECTRONICS COMPANY

1822 DEERE AVENUE, IRVINE, CALIFORNIA 92714
(714) 250-4171 • (213) 924-6314 • FAX# (714) 261-1541

September 8, 1989

Weldco - The Youngstown Welding
& Engineering Company
P. O. Box 2461
Youngstown, OH 44509-0461

Attn: Mr. Dave Luptak

Subj: Nuclear Waste Containers for the Yucca Mountain Project
in support of Babcock & Wilcox/Alliance RFQ RB-Q020-789

Ref: Kaiser Rollmet B&P #6420

Gentlemen:

We have had the opportunity to discuss the underlying assumptions of this effort with Babcock & Wilcox. As a result, we are providing this revised cost estimate. Please note that there are significant differences in the assumptions which facilitate utilizing drawings "as is" without changing the bottom head.

In response to your inquiry, and in support of the above subject, Kaiser Rollmet, a Kaiser Aerospace & Electronics company, is pleased to submit the following proposal for your consideration.

This proposal provides for the conversion of material furnished by you into a finished unit (Ref: Babcock & Wilcox Drawing No. 1196363 Rev. "0").

	Type	Selling Price/Each
OPTION 1: UNS C71500	26S	$6,828
	26L	8,378
	28L	8,974
OPTION 2: UNS N08825	26S	$7,421
	26L	9,160
	28L	9,838

All items are to be manufactured in full compliance with ANSI/ASME NQA-1-1986 Edition and Supplements, Quality Assurance Requirements for Nuclear Facilities including ASME BPVC Section VIII, Div. I.

The following assumptions were made by Kaiser Rollmet in preparing the above quotation:

C

1. Kaiser Rollmet will be able to develop either new or modified equipment and tooling which will eliminate the need to weld on an extraneous gripper. Although Kaiser Rollmet currently welds a gripper piece as its current manufacturing process the large quantity involved in the container project can justify development of an alternative method to hold the workpiece. This has been considered for other Kaiser Rollmet projects, and is considered feasible.

2. Kaiser Rollmet assumes that we will be able to Roll Extrude the circumferential seam weld of the preform even though it is located only about 3" from the end. The rolling on a circumferential weld is a developmental aspect of this approach, which will be evaluated in a subscale development effort anticipated for next year. This assumption will be revisited after this development effort.

3. Kaiser Rollmet assumes that we will be responsible for machining the I.D. and O.D. to improve the tolerance we require, beyond the +/-50 mils wall tolerance indicated on the Drawing. This cost of machining is included in our quotation.

4. Based upon the results of the development effort and tooling design vis-a-vis assumptions #1, #2 and #3, the preform volume may require adjustment. It is presumed to be adequate for this exercise. Adjustment of the preform volume would have minimal effect on Kaiser Rollmet's cost of processing.

5. Blanks are to be supplied in the annealed condition.

6. Welds on the blanks must be ground flush on the O.D. and I.D. surfaces.

7. Babcock & Wilcox "Specification for Use in Making Production Cost Estimates" (Rev. 2, August 7, 1989), in Section 2.3.4 specifies that Annealing is to be performed on the completed container lower unit and upper head using either an inert atmosphere or vacuum. Not provided for are criteria for in-process or intermediate thermal processing. Kaiser Rollmet possesses the ability to process the Type 26S variant in our vacuum furnace (longer vacuum furnaces are not known to Kaiser Rollmet). To preclude exceptional annealing costs, Kaiser Rollmet proposes for the 26L and 28L versions that Nitrogen be utilized in lieu of the "true" inert gases of Argon or Helium. Our proposal is so conditioned.

KAISER ROLLMET

8. Blanks are to be supplied to Kaiser Rollmet after full visual, liquid penetrant, radiographic and ultrasonic inspections are completed. A data package containing the results of each of these tests is to accompany the part itself when delivered to Kaiser Rollmet.

9. This proposal assumes no weld repair cycles are included. In the event this condition arises, responsibility for weld repair is to be account of the supplier.

10. After conversion to finished configuration, all testing required is to be performed by Kaiser Rollmet and is already included in the above cost figures. This includes heat treatment and mechanical testing.

11. Packing or crating for return shipment is included. All items are F.O.B. (our plant) Irvine, California.

Kaiser Rollmet looks forward to the opportunity to meet with you to resolve this abbreviated list of concerns. Please do not hesitate to contact the undersigned for additional clarification.

Best regards,

Larry F. Totzke

Larry F. Totzke
Product Development
Engineer

Copy: S. Gordon, KR

LFT/js

INCO ALLOYS INTERNATIONAL

FACSIMILE MESSAGE FROM: BRIAN PROVAN

INCO ALLOYS INTERNATIONAL, INC.
23200 CHAGRIN BLVD. - BLDG. 2 SUITE 310
BEACHWOOD, OHIO 44122
TELEPHONE: 216-464-8705

DATE: 9/6/89

TO: DAVE LUFTAK
YOUNGSTOWN WELDING

PAGES TO FOLLOW: 2

TO REPLY BY FACSIMILE, TELEPHONE: 216-464-4674

NOTES:

THE FOLLOWING ARE BALPARK PRICES FOR ESTIMATING ONLY. COMPLETE PRICING WOULD REQUIRE REVIEW OF TOTAL SPECIFICATION PACKAGE.

H-377

DAVE LUPTAK — 9/5/89

YWE

INCONEL 825 HR PLATE DESC. ANN
MONEL 450 (70/30) HR PLATE DISC ANN

		825	450 (70/30)
①	1.250" x 45" x Ø3.375"	1379#/PC	1536#/PC
①A	1.750" x 45" x Ø3.375"	1930#/PC	2150#/PC
②	1.250" x 66" x Ø3.375"	2022#/PC	2252#/PC
②A	1.750" x 66" x Ø3.375"	2831#/PC	3153#/PC
③	1.250" x 66 x Ø9.656"	2175#/PC	2422#/PC
③A	1.750" x 66 x Ø9.656"	3044#/PC	3391#/PC
④	3.500" x 32" x 32"	1054#/PC	1174#/PC
⑤	3.500" x 34" x 34"	1190#/PC	1325#/PC
⑥	4.375" x 31" x 31"	1236#/PC	1377#/PC
⑥A	7.250" x 33" x 33" FORGING		

HF ROD RT ANN

⑦	9"Ø x 7¼" MULTS 700 PCS 400 FT	225#/FT	245#/FT

825 — BASE [redacted] 4LB
1.32
[redacted] 600
.15
.05
6.[redacted]/LB
+13% UT

450 (70/30) — 5.70/LB
+13% UT 6.44/LB

[illegible]
[illegible] .60/[illegible] OF [illegible]
1.750" .175
[illegible]

⑦	825	70/30
	5.03	4.38
	1.32	1.17
	6.35	5.55
	.33	.40
	6.68	5.95

+11% → UT

027

7[illegible] 6.6[illegible]

H-377

ROUND

B25 @ $6.68/LB 450 @ $5.95/LB

WITH UT @ $7.41/LB WITH UT @ $6.60/LB

Appendix A-4

Request for Quotation Contents

REQUEST FOR QUOTATION • THIS IS NOT AN ORDER

THE BABCOCK & WILCOX COMPANY

REPLY TO:

☒ ALLIANCE RESEARCH CENTER • 1562 BEESON ST., ALLIANCE, OHIO 44601

☐ LYNCHBURG RESEARCH CENTER • MT. ATHOS • LYNCHBURG, VA. 24505

QUOTATION DUE DA 7/28/89

1. ALLIED INDUSTRIES P.O. BOX 61248, DEPT. TR 2828 CLINTON DRIVE HOUSTON, TX 77208 ATTN: SALES	3. BROWN BOILER AND TANK WORKS, INC. P.O. BOX 871-A 1027 CHESTNUT FRANKLIN, PA 16323 ATTN: SALES
2. BRISTOL METAL PRODUCTS WEAVER PIKE BRISTOL, TN 37620 ATTN: SALES	4. BRUNNER ENGINEERING & MFG. INC. P.O. BOX 1367 850 X STREET BEDFORD, IN 47421 ATTN: SALES

DATE OF INQUIRY	INQUIRY NO.			
7/19/89	RB-Q020-789	ANY ORDER ISSUED AS A RESULT OF THIS INQUIRY WILL BE SUBJECT TO THE TERMS AND CONDITIONS ON THE REVERSE SIDE OF THIS FORM.	YES ☐	NO ☐ SUPPLEMENTAL TERMS CONDITIONS ATTACHED

DESCRIPTION

I. You are requested to submit by July 28, 1989, a proposal to supply the Cost Estimating Data Package for the fabrication of high level nuclear waste containers and their internals in accordance with the attached statement of work and the requirements shown below. Please call me if you have questions at (216)829-7255 or fax (216)823-0639.

II. PROPOSAL REQUIREMENTS

- o PRICE: Babcock & Wilcox requests a price firm through delivery of August 25, 1989.
- o DELIVERY: By August 28, 1989, based on purchase order issue by July 31, 1989.
- o EXCEPTIONS, if any, to the statement of work must be listed with explanations.
- o WARRANTY, certification of data accuracy.
- o A LIST OF CUSTOMERS you have done high level QA projects for and a contact person.
- o EXPERIENCE WIT :
  - The ASME Boiler and Pressure Vessel Code past and present for similar products and materials
  - 10 CFR 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants"
  - RDT F2-2, "Quality Assurance Program Requirements"
  - MIL-Q-9858A, "Quality Program Requirements"
- o NUMBER OF EMPLOYEES as of bid date.
- o ESTIMATED FRACTION OF WORK TO BE SUBLET, itemize sublet operations
- o NAME AND QUALIFICATIONS of person preparing and/or directing preparation of the Cost Estimating Data Package.

001

BUYER P Bruckner

STATEMENT OF WORK - RFQ-RB-0020-789

Cost Estimating Data for Fabricating Production Quantities of High Level Nuclear Waste Containers for the Yucca Mountain Project (YMP).

BACKGROUND

U.S. Congress and the President have determined that the Yucca Mountain site in Nevada is to be characterized to determine its suitability for construction of the first U.S. high-level nuclear waste repository. Work in connection with this site is carried out within the Yucca Mountain Project (YMP). Lawrence Livermore National Laboratory (LLNL) has the responsibility for designing, developing, and projecting the performace of the waste package for the permanent storage of high-level nuclear waste. Babcock & Wilcox (B&W) is involved with the YMP as a subcontractor to LLNL. B&W's role is to recommend and demonstrate a method for fabricating the metallic waste container and a method for performing the final closure of the container after it has been filled with waste.

The plan is to use corrosion-resistant material for the containers in the form of thin-walled monolithic cylinders. Two materials under consideration for use in these containers and their internal support structures are UNS C71500, a copper-nickel alloy, and UNS N08825, a high nickel iron base alloy. The nuclear waste will be in various forms which will require different configurations which are included in this study. This study is to determine the estimated production costs of these containers and their internals.

A substantial portion of the total cost of the proposed Yucca Mountain, Nevada High Level Radioactive Waste Repository will involve the fabrication, closure and certification of the disposal containers. Stringent Quality Assurance (QA) procedures, exceeding typical safety-related, commercial nuclear requirements, must be applied to the manufacture of these containers. Previous disposal container cost estimates were accomplished in a short time span to satisfy pressing programmatic needs, not necessarily utilizing an organized, traceable or dependable method, and not reflecting current material prices, competitive bids from domestic manufacturing organizations, or the necessary QA level. The goal of this study is to present cost estimates with the necessary detail to accomplish the above, with the option of future upgrades when material and labor rates escalate. We therefore require a breakdown of these costs and current prices for the fabrication of these containers.

BASIS OF THE ESTIMATES

These estimates are to be based on the following which are attached:

- Drawings 1188320E0, 1196363E0, and 1196364E0.
- Specification, "HLNWCFCES," Rev. 1, dated July 13, 1989.
- Quality Assurance Outline, "YMP-HLNWCFCEQA," Rev. 1, dated July 12, 1989.

DELIVERABLES

Item 1, 1 Lot Consisting of 20 completed cost estimates, 10 each for C71500 (Tasks 1C.0 - 10C.0) and N08825 alloys (Tasks 1N.0 - 10N.0), entered on attached forms entitled, "YMP HLNW Container Fabrication Price Estimate."

Item 2, 1 Lot Consisting of completed labor basis form.

Item 3, 1 Lot Consisting of completed summary cost form including taxes.

Item 4, 1 Lot Consisting of sublet vendor's quotations.

DESCRIPTION OF COST ESTIMATE FORMS

The estimated prices are to be on a per component piece for a production rate of 750 pieces per year for three-year renegotiable contracts and a possible total production of 15,000 pieces. The price is to include direct costs, adjustments for anticipated reject and rework rates, overhead costs for the item, G&A expense and fee. The prices are to be on a current (8/1/89) fixed price basis without escalation and assumed acceptable flow down clauses, terms and conditions.

The prices reported on these forms are to incorporate the values provided by sublet vendors. Each of their quotations will include the following certification:

"I certify that this quotation to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company."

Estimated By: _____
Date: _____
Name: _____
Title: _____

Verified By: _____
Date: _____
Name: _____
Title: _____

*Approved By: _____
Date: _____
Name: _____
Title: _____

*Must be responsible officer of the Company.
(Either type or use black ink for this quotation and certification.)

When sublet vendors are providing quotations for both materials and services, they are to be requested to provide the same breakdown of cost items as required to complete the attached cost form.

MATERIALS

Material prices are to be quoted for an effective date of August 1, 1989.

The data for the raw materials are to include: product form, plate which will also include sheet and strip, bar and forgings, total weight of each product form, price per pound from the vendor, and the total price per component piece.

Expendable materials are to include the price of filler metals, packaging and all other supplies.

The cost of tooling will include the material and labor costs of making that tooling amortized over the life of the tooling on a price per piece basis.

Shipping is to include the cost of shipping the finished component to Las Vegas, Nevada.

The cost of travel associated with auditing and surveillance of sublet vendors is to be entered as an expendable material cost for quality assurance for that activity.

LABOR

Labor rates are to be based on an effective date of August 1, 1989 and their basis is to be indicated on the form provided.

All labor, including that of sublet vendors, is to be included in one of the four categories of engineering, manufacturing, inspection/testing and quality assurance.

The labor costs for engineering are to be prorated over the total production of 15,000 units with consideration of maintenance activities that are likely to occur for each 3 year contract.

The manufacturing labor is to include associated activities such as storage, packaging, shipping, etc.

Inspection and testing outside of manufacturing process inspections are to include final dimensional, nondestructive and hydrostatic acceptance work.

Included in quality assurance will be the preparation, certification, and submittal of documentation for each piece to be shipped.

TAXES

Taxes, including sales, business, inventory and other taxes unique to prime and sublet vendors locations, are to be added to the total price per piece for each of the components on the attached form.

COST ESTIMATE DATA FORMS

Attached are two sets each for the cost estimate reporting forms for the following components. One completed form for each component is to be delivered. Additional blank copies of the form may be obtained from B&W.

26S - 26" O.D. x .375" wall x 128" long container when loaded and closed.
26L - 26" O.D. x .375" wall x 189.5" long container when loaded and closed.
28L - 28" O.D. x .375" wall x 189.5" long container when loaded and closed.

	Task		
	Alloy C71500	Alloy N08825	Component
1	1C.0	1N.0	26S container lower unit assembly
	2C.0	2N.0	26L container lower unit assembly
	3C.0	3N.0	28L container lower unit assembly
	4C.0	4N.0	26S or 26L container upper head assembly
	5C.0	5N.0	28L container upper head assembly
	6C.0	6N.0	Internals for 6 PWR consolidated fuel assemblies
	7C.0	7N.0	Internals for 3 PWR fuel assemblies
	8C.0	8N.0	Internals for 3 PWR and 4 BWR fuel assemblies
	9C.0	9N.0	Internals for 10 BWR fuel assemblies
	10C.0	10N.0	Internals for 4 PWR fuel assemblies

LABOR RATES

Attached are two copies of forms to be used in indicating the basis for labor rates used in these estimates. One completed form is to be delivered.

TAXES

Attached are two copies of forms to be used in reporting the total cost for each component before taxes, the amount of taxes, tax rate, and the total price with taxes. One completed form is to be delivered.

BASIS FOR LABOR RATES USED FOR YMP HLNW CONTAINER FABRICATION

Offeror: _____ Quotation No.: _____

The labor costs are based on the following factors:

	Used	
	Yes	No
Base Rate	___	___
Shift Differential	___	___
Holidays	___	___
Vacations	___	___
Casual Overtime	___	___
Training	___	___
Social Security	___	___
Workmen's Compensation	___	___
Pension	___	___
Health & Welfare	___	___
Other (Identify)	___	___

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W P.O. _____.

Estimated By: _____ Verified By: _____

Date: _____ Date: _____

Name: _____ Name: _____

Title: _____ Title: _____

*Approved By: _____

Date: _____

Name: _____

Title: _____

*Must be a responsible officer of the Company.

(Either type or use black ink to complete this form.)

TOTAL PRICE AND TAX ESTIMATE FOR YMP ELNW CONTIANER FABRICATION PER PIECE AT 750 PIECES/YEAR AS OF 8/1/89 (NO ESCALATION)

Offeror: _____ Quotation No.: _____

Task	Price Before Taxes, $/Pc.	Taxes: Sales $	Sales Rate	Business $	Business Rate	Inventory $	Inventory Rate	Other $	Other Rate	Price After Taxes $/Pc.
				C71500 Alloy						
1C.0										
2C.0										
3C.0										
4C.0										
5C.0										
6C.0										
7C.0										
8C.0										
9C.0										
10C.0										
				N08825 Alloy						
1N.0										
2N.0										
3N.0										
4N.0										
5N.0										
6N.0										
7N.0										
8N.0										
9N.0										
10N.0										

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W P.O. _____.

Estimated By: _____ Verified By: _____

Date: _____ Date: _____

Name: _____ Name: _____

Title: _____ Title: _____

*Approved By: _____

Date: _____

Name: _____

Title: _____

*Must be a responsible officer of the Company.

(Either type or use black ink to complete this form.)

Attachment A-1.1
General Comments

During the interval between receipt of the bids and the awards of the purchase orders by B&W, the material for the internal structures was changed from C71500 and N08825 to S30403, which resulted in the following changes:

- Drawing 1188320E from Rev. 0 to Rev. 1.
- Specification "HLNWCFCES" from Rev. 1 to Rev. 2.
- Cost estimate forms from "6C.0-10C.0" and "6N.0-10N.0" to "6S.0-10S.0."

Appendix A5

Purchase Order Contents

PG 1 OF 6 H DOMIAN / MMT FILE 6.5.1 PG 2

Babcock & Wilcox
RESEARCH & DEVELOPMENT DIVISION
a McDermott company

PURCHASE ORDER

DATE 08CE89 NUMBER S370A163948UB

REQUISITIONED BY & DATE
93301D220CE0889

CHARGE NUMBER
EXP454743

VENDOR:

INVOICE TO:
BABCOCK & WILCOX COMPANY
RESEARCH & DEVELOPMENT DIVISION
ATTN: ACCOUNTS PAYABLE
1562 BEESON STREET
ALLIANCE OH 44601

SHIP TO:
BABCOCK & WILCOX COMPANY
ALLIANCE RESEARCH CENTER
1562 BEESON STREET
ALLIANCE OH 44601

CORRESPOND TO:
BABCOCK & WILCOX COMPANY
ALLIANCE RESEARCH CENTER
1562 BEESON STREET
ALLIANCE OH 44601
ATTN TO: R. BRUCKNER

SHIP VIA	F.O.B. POINT	FREIGHT TERMS	PAYMENT TERMS
NA		FULL PPD.FRT.ALLOWED	NET30

STATEMENT OF WORK, DRAWINGS 1198329E-1, 1196363 & 64E-0
SPECYFICATION "HLNW CFCES" REV.2 DATED 8-7-89 AND
GA PROGRAM OUTLINE REV. 1, DATED 7-12-89.

DELIVERABLES WILL INCLUDE:
- DESCRIPTION OF COST ESTIMATE FORM,PG. 3 OF 6 IN S.O.W.
- 15 COMPLETED FORMS ENTITLED, "YMP HLNW CONTAINER FABRICATION PRICE ESTIMATE", 5 EACH FOR TASKS 1C.0 TO 5C.0 (ALLOY C71500), TASKS 1N.0 TO 5N.C (ALLOY N08825),AND TASKS 6S.0 TO 10S.C (ALLOY S30403)
- COMPLETED LABOR BASIS FORM
- COMPLETED SUMMARY COST FORM INCLUDING TAXES
- SUBLET VENDOR'S QUOTATIONS

IF APPLICABLE, "ARTICLE 15 ("SHIPMENT PREPARATION AND TENDERING TO BUYER AT SPECIFIED DESTINATION") OF THE TERMS AND CONDITIONS ON THE REVERSE SIDE OF THIS PURCHASE ORDER SHALL NOT APPLY."

TOTAL ORDER VALUE: $10,000.00

R. BRUCKNER, SUPERVISOR, PURCHASING
LAST PAGE

ACKNOWLEDGE [illegible] PROMPTLY AND STATE FOR WHEN SHIPMENT CAN BE MADE

97-10C43C

001

AUTHORIZED SIGNATURE

Babcock & Wilcox

RESEARCH & DEVELOPMENT DIVISION
a McDermott company

PURCHASE ORDER PG 1

DATE NUMBER

080889 5370A163948UB

REQUISITIONED BY & DATE

0330 10220080869

CHARGE NUMBER

EXP454743

VENDOR:

INVOICE TO:

BABCOCK & WILCOX COMPANY
RESEARCH & DEVELOPMENT DIVISION
ATTN: ACCOUNTS PAYABLE
1562 BEESON STREET
ALLIANCE OH 44601

SHIP TO:

BABCOCK & WILCOX COMPANY
ALLIANCE RESEARCH CENTER
1562 BEESON STREET
ALLIANCE OH 44601

CORRESPOND TO:

BABCOCK & WILCOX COMPANY
ALLIANCE RESEARCH CENTER
1562 BEESON STREET
ALLIANCE OH 44601
ATTN TO: R. BRUCKNER

SHIP VIA	F.O.B. POINT	FREIGHT TERMS	PAYMENT TERMS
NA		FULL PPD.FRT.ALLOWED	NET30

ITEM	QUANTITY	U/M	DESCRIPTION	PART NUMBER	REQUIRED DATE	UNIT PRICE	EXTENDED PRICE	U/M

****
DELIVER TO H. A. DOMIAN
****

FLOW DOWN CLAUSES
****

BUYER IS REQUIRED TO "PASS THROUGH" OR "FLOW-DOWN" CERTAIN GOVERNMENT CONTRACT CLAUSES TO SELLER. THOSE CLAUSES ARE ATTACHED HERETO AND MADE A PART HEREOF; SELLER MUST DETERMINE APPLICABILITY AND BE RESPONSIBLE FOR COMPLIANCE.

10CFR21
****

THE REQUIREMENTS OF TITLE 10, CHAPTER 1, CODE OF FEDERAL REGULATIONS, PART 21 APPLY TO THIS ORDER. BUYER SHALL BE IMMEDIATELY NOTIFIED WHEN A DEVIATION FROM TECHNICAL REQUIREMENTS OF THE PROCUREMENT DOCUMENTS IS FOUND TO EXIST IN PRODUCTS ALREADY DELIVERED. UPON REQUEST, SELLER SHALL FURTHER PROVIDE THE NECESSARY TECHNICAL INFORMATION OR ANALYSIS TO BUYER, WHICH WILL PERMIT AN EVALUATION OF THE SAFETY IMPLICATIONS. BUYER SHALL BE RESPONSIBLE FOR NOTIFYING THE NUCLEAR REGULATORY COMMISSION, AS REQUIRED.

PRICE: THE PRICE SHOWN IS FIRM THROUGH DELIVERY OF THE WORK.

SCOPE OF SUPPLY

001		EA	COST ESTIMATING DATA PACKAGE IN ACCORDANCE WITH THE ATTACHED	090669090669	1000000 EA

CONT NEXT PAGE

ALL TERMS AND CONDITIONS ON THE REVERSE SIDE HEREOF SHALL APPLY FOR ALL GOODS, SERVICES OR WORKMANSHIP FURNISHED PURSUANT TO THIS PURCHASE ORDER.

ACCEPTANCE DATE

002

AUTHORIZED SIGNATURE

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STATEMENT OF WORK

Cost Estimating Data for Fabricating Production Quantities of High Level Nuclear Waste Containers for the Yucca Mountain Project (YMP).

BACKGROUND

U.S. Congress and the President have determined that the Yucca Mountain site in Nevada is to be characterized to determine its suitability for construction of the first U.S. high-level nuclear waste repository. Work in connection with this site is carried out within the Yucca Mountain Project (YMP). Lawrence Livermore National Laboratory (LLNL) has the responsibility for designing, developing, and projecting the performance of the waste package for the permanent storage of high-level nuclear waste. Babcock & Wilcox (B&W) is involved with the YMP as a subcontractor to LLNL. B&W's role is to recommend and demonstrate a method for fabricating the metallic waste container and a method for performing the final closure of the container after it has been filled with waste.

The plan is to use corrosion-resistant material for the containers in the form of thin-walled monolithic cylinders. Materials under consideration for use are UNS C71500, a copper-nickel alloy, and UNS N08825, a high nickel iron base alloy for the containers and UNS S30403, a stainless steel, for the internals. The nuclear waste will be in various forms which will require different configurations which are included in this study. This study is to determine the estimated production costs of these containers and their internals.

A substantial portion of the total cost of the proposed Yucca Mountain, Nevada High Level Radioactive Waste Repository will involve the fabrication, closure and certification of the disposal containers. Stringent Quality Assurance (QA) procedures, exceeding typical safety-related, commercial nuclear requirements, must be applied to the manufacture of these containers. Previous disposal container cost estimates were accomplished in a short time

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span to satisfy pressing programmatic needs, not necessarily utilizing an organized, traceable or dependable method, and not reflecting current material prices, competitive bids from domestic manufacturing organizations, or the necessary QA level. The goal of this study is to present cost estimates with the necessary detail to accomplish the above, with the option of future upgrades when material and labor rates escalate. We therefore require a breakdown of these costs and current prices for the fabrication of these containers.

BASIS OF THE ESTIMATES

These estimates are to be based on the following which are attached:

- Drawings 1188320E1, 1196363E0, and 1196364E0.
- Specification, "HLNWCFCES," Rev. 2, dated August 7, 1989.
- Quality Assurance Outline, "YMP-HLNWCFCEQA," Rev. 1, dated July 12, 1989.

DELIVERABLES

Item 1, 1 Lot Consisting of 15 completed cost estimates, 5 each for C71500 (Tasks 1C.0 - 5C.0), N08825 (Tasks 1N.0 - 5N.0), and S30403 alloys (Tasks 6S.0 to 10S.0) entered on attached forms entitled, "YMP HLNW Container Fabrication Price Estimate."

Item 2, 1 Lot Consisting of completed labor basis form.

Item 3, 1 Lot Consisting of completed summary cost form including taxes.

Item 4, 1 Lot Consisting of sublet vendor's quotations.

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DESCRIPTION OF COST ESTIMATE FORMS

The estimated prices are to be on a per component piece for a production rate of 750 pieces per year for three-year renegotiable contracts and a possible total production of 15,000 pieces. The price is to include direct costs, adjustments for anticipated reject and rework rates, overhead costs for the item, G&A expense and fee. The prices are to be on a current (8/1/89) fixed price basis without escalation and assumed acceptable flow down clauses, terms and conditions.

The prices reported on these forms are to incorporate the values provided by sublet vendors. Each of their quotations will include the following certification:

"I certify that this quotation to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company."

Estimated By: _____
Date: _____
Name: _____
Title: _____

Verified By: _____
Date: _____
Name: _____
Title: _____

*Approved By: _____
Date: _____
Name: _____
Title: _____

*Must be responsible officer of the Company.
(Either type or use black ink for this quotation and certification.)

When sublet vendors are providing quotations for both materials and services, they are to be requested to provide the same breakdown of cost items as required to complete the attached cost form.

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MATERIALS

Material prices are to be quoted for an effective date of August 1, 1989.

The data for the raw materials are to include: product form, plate which will also include sheet and strip, bar and forgings, total weight of each product form, price per pound from the vendor, and the total price per component piece.

Expendable materials are to include the price of filler metals, packaging and all other supplies.

The cost of tooling will include the material and labor costs of making that tooling amortized over the life of the tooling on a price per piece basis.

Shipping is to include the cost of shipping the finished component to Las Vegas, Nevada.

The cost of travel associated with auditing and surveillance of sublet vendors is to be entered as an expendable material cost for quality assurance for that activity.

LABOR

Labor rates are to be based on an effective date of August 1, 1989 and their basis is to be indicated on the form provided.

All labor, including that of sublet vendors, is to be included in one of the four categories of engineering, manufacturing, inspection/testing and quality assurance.

The labor costs for engineering are to be prorated over the total production of 15,000 units with consideration of maintenance activities that are likely to occur for each 3 year contract.

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The manufacturing labor is to include associated activities such as storage, packaging, shipping, etc.

Inspection and testing outside of manufacturing process inspections are to include final dimensional, nondestructive and hydrostatic acceptance work.

Included in quality assurance will be the preparation, certification, and submittal of documentation for each piece to be shipped.

TAXES

Taxes, including sales, business, inventory and other taxes unique to prime and sublet vendors locations, are to be added to the total price per piece for each of the components on the attached form.

COST ESTIMATE DATA FORMS

Attached are two sets each for the cost estimate reporting forms for the following components. One completed form for each component is to be delivered. Additional blank copies of the form may be obtained from B&W.

26S - 26" O.D. x .375" wall x 128" long container when loaded and closed.
26L - 26" O.D. x .375" wall x 189.5" long container when loaded and closed.
28L - 28" O.D. x .375" wall x 189.5" long container when loaded and closed.

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Task Alloy C71500	Task Alloy N08825	Task Alloy S30403	Component
1C.0	1N.0	--	26S container lover unit assembly
2C.0	2N.0	--	26L container lower unit assembly
3C.0	3N.0	--	28L container lower unit assembly
4C.0	4N.0	--	26S or 26L container upper head assembly
5C.0	5N.0	--	28L container upper head assembly
--	--	6S.0	Internals for 6 PWR consolidated fuel assemblies
--	--	7S.0	Internals for 3 PWR fuel assemblies
--	--	8S.0	Internals for 3 PWR and 4 BWR Fuel assemblies
--	--	9S.0	Internals for 10 BWR fuel assemblies
--	--	10S.0	Internals for 4 PWR fuel assemblies

LABOR RATES

Attached are two copies of forms to be used in indicating the basis for labor rates used in these estimates. One completed form is to be delivered.

TAXES

Attached are two copies of forms to be used in reporting the total cost for each component before taxes, the amount of taxes, tax rate, and the total price with taxes. One completed form is to be delivered.

BABCOCK & WILCOX CO.
Research and Development Division
Alliance Research Center

Specification for Use in Making Production Cost Estimates of High Level Nuclear Waste Containers and Internals for the Yucca Mountain Project (YMP) (HLNWCPCES)*

Rev. 2

August 7, 1989

Prepared By: H A Domian 8/7/89
H. A. Domian

Technically Reviewed and Approved By: D.F.LaCount/GLS 8/7/89
D. F. LaCount

Reviewed By: K K Eggert 8/8/89
Quality Assurance

*High Level Nuclear Waste Container Fabrication Cost Estimate Specification.

1.0 SCOPE

This document provides the requirements for fabricating, cleaning, inspecting, testing, packaging and shipping of high level nuclear waste containers and their internals for the Yucca Mountain Project (YMP) to be used for the purposes of estimating their production costs.

2.0 REQUIREMENTS

2.1 General

These containers are to be fabricated according to Section VIII, Division I (Lethal) of the 1986 Edition of the ASME Boiler and Pressure Vessel Code (Code). A Code stamp according to Par. UG-116 is required.

2.2 Material Requirements

The containers are to be made from one of the following alloys according to Section IIB and C of the Code. R

2.2.1 Copper-Nickel Alloy - C71500

Base Metal	Corresponding Welding Electrode
SB402, UNS C71500	SFA 5.7, ER CuNi

2.2.2 Nickel-Iron-Chromium-Molybdenum-Copper Alloy-N08825

Base Metal	Corresponding Welding Electrode
SB423, UNS N08825	SFA 5.14, UNS N08065, ER NiFeCr-1
SB424, UNS N08825	SFA 5.14, UNS N08065, ER NiFeCr-1
SB425, UNS N08825	SFA 5.14, UNS N08065, ER NiFeCr-1

The internals are to be from the following alloy according to Section IIA of the Code. R

2.2.3 Stainless Steel - S30403

SA240, UNS S30403

2.3 Fabrication Requirements

2.3.1 Forming including spin form (roll extrusion) will be performed according to the Code and normal practices employed for the material.

2.3.2 Welding is to be performed in accordance with the Code. Weld procedure and welder qualification tests are to be performed as required by the Code. Weld repairs on base metal not associated with the welds required in drawings are prohibited.

2.3.3 Machining is to be done so as to minimize residual stresses and damage to the container surfaces.

2.3.4 Annealing is to be performed on the completed container lower unit and upper head using either an inert atmosphere or vacuum. During annealing, the component is to be fully supported to prevent distortion. The following annealing treatments consisting of one hour minimum at the annealing temperature are to be used.

Alloy	Annealing Temperature, °F
C71500	1200-1250
N08825	1700-1750

Annealing after fabrication of the internals is not required.

2.4 Cleanliness

2.4.1 Cleanliness Requirements

2.4.1.1 Compounds and materials which are used on final cleaned surfaces, or which may be introduced into creviced areas of components, shall contain less than 250 ppm sulfur, 250 ppm chloride and 250 ppm fluoride to be acceptable for use. In addition, lead, bismuth, cadmium, arsenic, antimony, tin, and other low melting point metals may not be basic chemical constituents of products used. These requirements apply to but are not limited to cleaning solution, solvents, cutting fluids, and lubricants.

2.4.1.2 Marking materials containing in excess of 250 ppm of any of the following elements: sulfur, chloride, fluoride, arsenic, antimony, bismuth, cadmium, lead, mercury, tin, and zinc shall not be used in contact with container parts.

2.4.1.3 Gross contaminants such as scale, thick oxide, slag, flux, weld spatter, oil, grease, sand, etc., are not acceptable on cleaned container parts.

2.4.1.4 The cleanliness of the work, cleaning and storage areas shall be adequate to assure that the required cleanliness level can be attained and maintained during cleaning, inspection, and packaging.

2.4.2 Cleaning Procedures

2.4.2.1 Pickling or salt bath descaling is prohibited. Descaling, if required to produce a clean surface free of oxidation, is to be done by mechanical

means, such as abrasive blast cleaning, grinding, polishing or buffing. After abrasive blast cleaning of welds, they shall be ground to remove the grit blasted surface prior to liquid penetrant inspection.

2.4.2.2 The surfaces to be welded shall be cleaned according to Par. UW-32 of Section VIII, Division I of the 1986 Edition of the Code. Prior to welding, the weld preparation including an area within two inches of the weld shall be cleaned with acetone and wiped with lint-free paper or cloth.

2.4.2.3 The finished assembly components shall be final cleaned with acetone and wiped with lint-free cloth or paper. The assembly components shall not be heated above 250F for cleaning or drying after machining is completed.

2.5 Inspection Requirements

2.5.1 Dimensional Inspection

All container components are to be 100% dimensionally inspected and recorded. On drawings where weldments are required, the dimensions specified apply after all welding and heat treating have been completed. Unless otherwise noted, detail dimensions are to be maintained after assembly and welding.

2.5.2 Weld Inspection

2.5.2.1 All welds will be 100% visually inspected (VT) in accordance with and meet the acceptance criteria of ASME/ANSI B31.3, 1976 Edition.

2.5.2.2 All fusion welds will be 100% dye penetrant tested (PT) in accordance with the Code, Part UW and meet the acceptance criteria of Appendix 8.

2.5.2.3 All container through-wall welds will be 100% radiographic tested (RT) in accordance with the requirements of the Code, Part UW and meet the acceptance criteria of Par. UW51.

2.5.2.4 All container through-wall welds will be 100% ultrasonic tested (UT) in accordance with the requirements of the Code, Appendix 12 and meet the acceptance criteria of Par. 12-3.

2.5.2.5 If defects or imperfections are found prior to spin forming, welds may be repaired by a qualified and approved weld repair procedure in accordance with the Code. Repair welds after spin forming will not be performed on through-wall welds.

2.6 Container Testing Requirements

The container lower unit is to be hydrostatically tested according to Par. UG-99 of the Code and meet the acceptance criteria for a vessel having a design pressure of 200 psi. The upper head does not have to be hydrostatically tested.

2.7 Marking Requirements

Each assembly will have a unique serial number which will appear on all documentation relative to that component.

2.8 Packaging Requirements

2.8.1 Requirements for Packaging

Each of the components of the container and internals shall be packaged according to the Level C requirements of of ANSI/ASME N5.2.2-1978 which are based on the protection that is necessary during shipping, handling, and storage of the individual components or final assemblies with the modifications/additions in Section 2.8.2.

2.8.2 Level C Packaging Acceptance Criteria

2.8.2.1 Items shall be inspected for cleanliness immediately prior to packaging. If parts fail to meet any of the cleanliness acceptance criteria of Section 2.4.1, the parts shall be recleaned and reinspected to verify cleanliness prior to packaging.

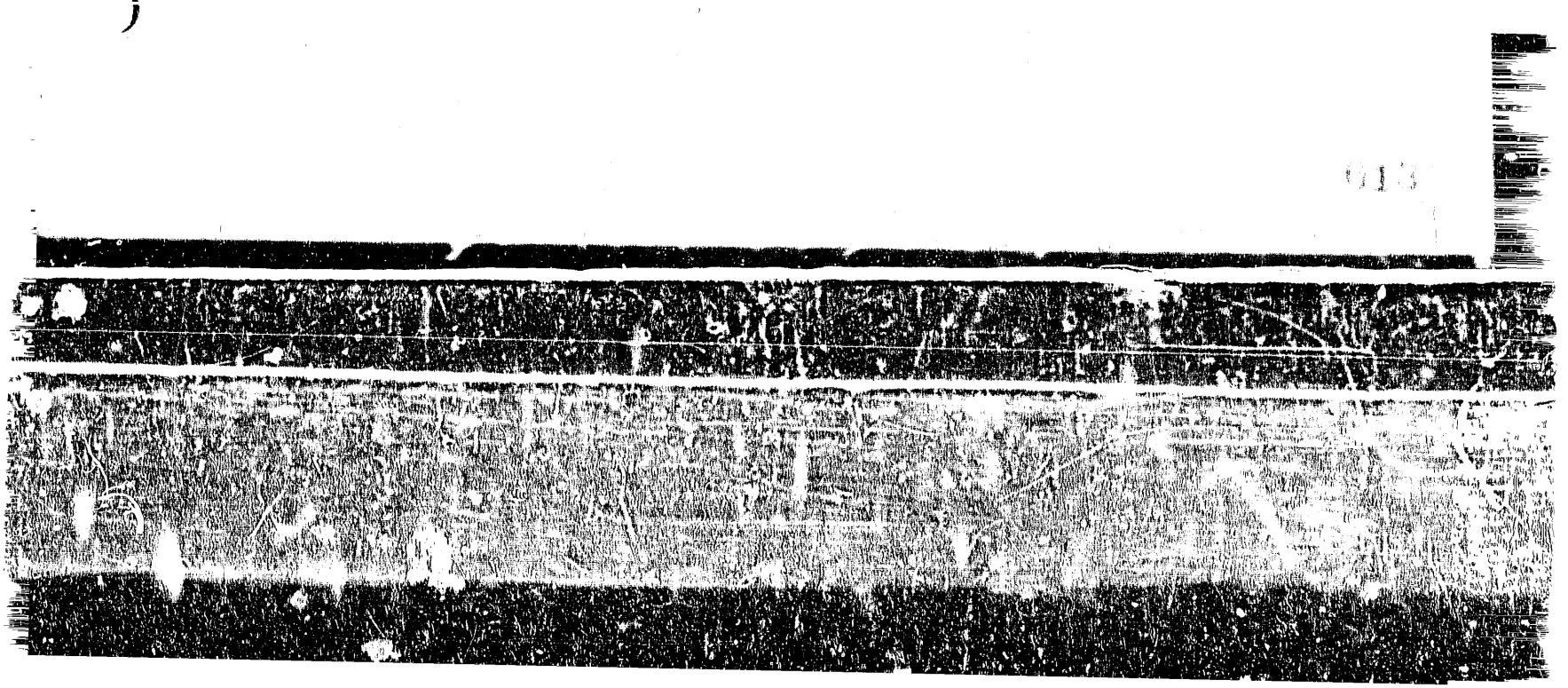
2.8.2.2 Items which are not immediately packaged shall be protected from contamination.

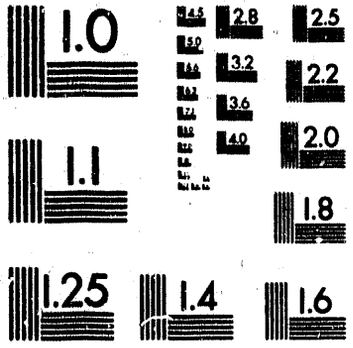
2.8.2.3 Items which require protection from damage during shipping and handling shall be packaged in containers or crates.

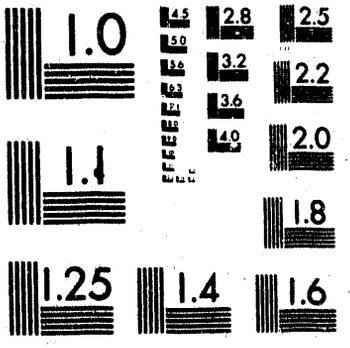
2.8.2.4 Openings into the items having sensitive internal surfaces shall be capped, plugged, or sealed with materials that meet the requirements of Section 2.4.1.

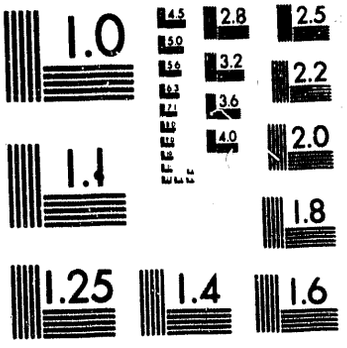
2.8.2.5 Items packed in containers shall be blocked, anchored, braced, or cushioned to prevent physical damage to the item or barrier.

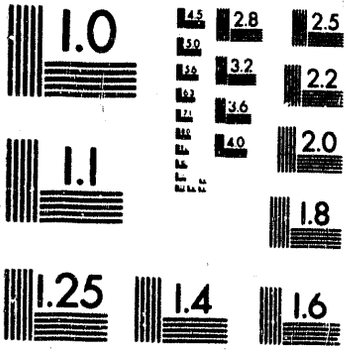
2.8.2.6 Items and their container shall be identified by marking or tagging. See Section 2.4.1.

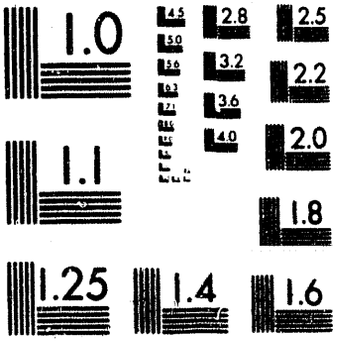












2.8.2.7 Items subject to detrimental corrosion, either internal or external, shall be suitably protected. If dessicant is required, it shall meet the requirements of Section 2.4.1.

2.8.2.8 The assembly shall be wrapped in polyethylene so as to prevent contact with moisture or contamination by salt spray, dust, dirt, lead, sulfur, mercury, halogens and their compounds. The polyethylene shall meet the requirements of Section 2.4.1.

2.8.2.9 The container head and body assembly shall be packed and handled so as to prevent any contamination or damage to its sealing surfaces.

2.9 Storage Requirements

Items shall be shipped in boxes to facilitate ease of handling during shipment and storage. If a receipt inspection is required, the components should be returned to the original as-received, packaged condition prior to storage. Because of the protective wrapping, it is recommended that the components not be completely unpackaged until ready for use/installation. During the final unpackaging, care must be exercised to preclude damage to the components.

2.10 Shipping Requirements

2.10.1 Type of Carrier

The preferred mode for shipping of the containers shall be truck freight. Railroad shipments should be made only if absolutely necessary.

2.10.2 Choice of Carriers and Routes

The trucking company chosen and the route taken should be designated "best way" unless otherwise specified.

2.10.3 Constraints

Stacking of packages will be alloved only with the specific permission of the Buyer.

3.0 QUALITY ASSURANCE

3.1 The following specifications apply to the work performed:

QARS-001 A, Rev. 0, "LLNL Yucca Mountain Project Quality Assurance Requirements Specification for Babcock and Wilcox", Feb. 10, 1989. Subject to audit by the Buyer.

3.2 The following documentation shall be submitted to the Buyer for approval prior to initiation of fabrication activities:

3.2.1 Manufacturing Process Outline

3.2.2 NDE Inspection Procedures

3.2.3 Heat Treating Procedures

3.2.4 Hydrostatic Testing Procedure

3.2.5 Cleaning Procedures

3.2.6 Handling, Shipping, and Storage Procedures

3.2.7 Welder/Welder Operator Qualifications

3.2.8 Weld Procedure Specification

3.2.9 NDE Personnel Qualification Procedure

3.2.10 Material Receipt Inspection

3.2.11 Certificate(s) of accredidation by ASME for Code fabrication stamp(s).

3.2.12 NBBI Certificate of Authorization for Registration.

3.3 The following documentation shall be submitted to the Buyer upon completion of fabrication and constitute the Quality Assurance Data Package. All records will be identified by the appropriate component serial number.

3.3.1 Certificate of Conformance to ASME, Section VIII, Division I, Lethal. Manufacturers Data Report + Rubbing or Photo of Stamping.

3.3.2 Welding Procedure Specification with supporting Procedure Qualification Record(s).

3.3.3 Weld Records.

3.3.4 Visual Inspection Records.

3.3.5 Dye Penetrant Inspection Records.

3.3.6 Radiograph Reader Sheets and Film.

3.3.7 Ultrasonic Process Sheets.

3.3.8 Dimensional Inspection Records.

3.3.9 Heat Treating Records.

3.3.10 Cleaning Inspection Records.

3.3.11 Packaging Inspection Records.

3.3.12 Storage Inspection Records.

3.3.13 Shipping Inspection Records.

3.3.14 All Contractual Variations.

3.3.15 Material Certifications/Test Reports.

3.3.16 NDE Personnel Qualification Records in Accordance with SNT-TC-1A latest edition required by Code.

3.3.17 Fabrication Records.

3.3.18 Copy of AIA Logbook entries for container inspections.

3.4 The following Buyer Witness/Hold Points shall be applicable to the fabrication. work may not proceed past a hold point unless written authorization to proceed is received from the Buyer.

3.4.1 Material Receipt Inspection.

3.4.2 Specified Fit-ups.

3.4.3 Final Inspection Prior to Shipment.

BABCOCK & WILCOX
RESEARCH AND DEVELOPMENT DIVISION
ALLIANCE RESEARCH CENTER

QUALITY PROGRAM OUTLINE

FOR

YUCCA MOUNTAIN PROJECT - HIGH LEVEL NUCLEAR WASTE
CONTAINER FABRICATION COST ESTIMATE QUALITY ASSURANCE

(YMP - HLNWCFCEQA)

REVISION 1

JULY 12, 1989

PREPARED BY _____ 7/12/89
R. R. EVERETT

REVIEWED BY _____ 7/14/89
R. K. GILL

APPROVED BY _____ 7/14/89
G. W. ROBERTS

REVISIONS

Revision 1 - changed all references of Nevada Nuclear Waste Site Investigation (NNWSI) to Yucca Mountain Project (YMP).

1.0 SCOPE

1.1 This document provides the quality assurance requirements in outline form for fabricating YMP containers and their internals and is based on QARS-001A, Rev.0, "LLNL Yucca Mountain Project Quality Assurance Requirements Specification for Babcock & Wilcox," dated Feb. 10, 1989. Although QARS-001A is for use in scientific investigation, the final QA requirements for production are expected to be essentially the same. Therefore, all users are cautioned that this document is for quotation purposes only, and is not to be used for program preparation.

2.0 ORGANIZATION

2.1 The following shall be clearly established and delineated in writing.

2.1.1 organizational structure.

2.1.2 lines of communication.

2.1.3 authority and duties of all persons/organizations who perform activities affecting quality.

2.1.4 authority and duties of persons/organizations performing QA activities which must include:

2.1.4.1 access to work areas.

2.1.4.2 authority and organizational freedom to identify quality problems.

2.1.4.3 authority and organizational freedom to initiate, recommend, or provide solutions.

2.1.4.4 authority and organizational freedom to assure controlled processing pending resolution of problems.

2.2 In order to assure proper control of the QA program, the person responsible for managing the program shall:

2.2.1 be identified.

2.2.2 have appropriate organizational position, responsibility, and authority to exercise proper control over the QA program.

2.2.3 have the authority for the resolution of disputes involving quality including the authority to stop unsatisfactory work.

3.0 QUALITY ASSURANCE PROGRAM

3.1 The Quality Assurance Program shall:

3.1.1 assure that procedures required to implement the program are properly documented, controlled and mandated through a policy statement signed by a responsible official.

3.1.2 apply to all items and activities affecting quality.

3.1.3 have the organizational structure and responsibilities clearly defined.

3.1.4 define external interfaces and responsibilities with other organizations.

3.1.5 define internal interfaces and responsibilities.

3.1.6 take into account the need for special controls, processes, test equipment, tools, and skills.

3.1.7 provide for verification of quality by inspection, test, peer review or a combination thereof.

3.1.8 provide methodology to assure that all prerequisites for a given activity have been accomplished.

3.2 A Quality Assurance Plan shall be developed for this project that:

3.2.1 addresses the QA criteria and specific requirements associated with these criteria.

3.2.2 provides a description of the organization's plan.

3.2.3 provides instructions to implement and apply the QA requirements to the activities of the project.

3.2.4 contains a requirement for customer approval of the plan prior to initiating workscope.

4.0 PERSONNEL SELECTION, INDOCTRINATION, AND TRAINING

4.1 A program shall be established for the selection, indoctrination, and training of personnel performing or verifying activities that:

4.1.1 requires the establishment of position descriptions that set forth minimum personnel qualifications (education & experience) for each position involved in the performance of activities that affect quality.

4.1.2 provides for indoctrination and necessary training of personnel performing activities that affect quality to assure suitable proficiency prior to initiating activities that affect quality.

4.1.3 requires that personnel selected have education and experience commensurate with the minimum requirements of the position.

4.1.4 requires documented verification of relevant education and experience.

4.1.5 requires a documented annual job proficiency evaluation for personnel involved in activities affecting quality.

4.2 A program shall be established for the qualification of non-destructive examination personnel that:

4.2.1 requires qualification to the ASNT Recommended Practice No. SNT-TC-1A, latest edition, and its applicable supplements.

4.2.2 requires written procedures for the control and administration of NDE personnel training, examination, and certification.

4.3 The program shall include a lifetime record retention system for the following records:

4.3.1 personnel qualification evaluation records.

4.3.2 indoctrination records.

4.3.3 training records.

4.3.4 proficiency evaluation records.

5.0 VERIFICATION

5.1 Planning for verification activities shall be accomplished and documented via procedures, instructions, or checklists that provide for the following:

5.1.1 identification of characteristics and activities to be verified.

5.1.2 a description of the method of verification.

5.1.3 identification of the individuals or groups responsible for performing the verification.

5.1.4 acceptance and rejection criteria.

5.1.5 identification of required procedures, drawings, and specification including revision level.

5.1.6 recording identification of the verifier and the results of the verification.

5.2 A documented system of mandatory hold points shall be established to verify activities that:

5.2.1 requires that work may not continue past a hold point without the authorization of the person performing the verification.

5.2.2 requires that the person performing the verification does not report to the immediate supervisor of the person who performed the activity.

5.2.3 requires that if the person performing the activity is not a part of the formal QA organization, then QA shall overview and monitor the verification.

6.0 PROCUREMENT CONTROL GENERAL

6.1 A documented program shall be established to ensure that purchased material, equipment, and services conform to the procurement documents

6.2 Quality assurance participation shall be provided during:

6.2.1 the evaluation and selection of suppliers.

6.2.2 verification of suppliers activities.

6.2.3 receiving inspections.

6.3 If commercial-grade items are identified in the approved design, they shall be identified in the procurement documents by the manufactures's published product description.

6.4 After receipt of a commercial-grade item, it shall be determined and documented that the following conditions have been met:

6.4.1 damage was not sustained during shipment.

6.4.2 the item received was the item ordered.

6.4.3 inspection, testing, or both is accomplished, in accordance with written procedures, to ensure conformance with the manufacturer's published requirements.

6.4.4 documentation, as applicable to the item, was received and is acceptable.

6.5 Alternate commercial-grade items may be supplied if the cognizant organization provides verification that the alternate item will perform the intended function and will meet the requirements applicable to both the replaced item and its application.

7.0 PROCUREMENT PLANNING

7.1 Procurement activities shall be planned and documented prior to the start of the procurement activity to ensure a systematic approach to the process that includes:

7.1.1 what is to be accomplished.

7.1.2 who is to accomplish it.

7.1.3 how it is to be accomplished.

7.1.4 when it is to be accomplished.

7.2 Procurement planning shall result in the documented identification of the methods to be used in procurement activities and shall provide for the integration of the following:

7.2.1 procurement document preparation, review, and change control.

7.2.2 selection of procurement sources.

7.2.3 purchaser control of supplier performance.

7.2.4 verification activities.

7.2.5 notification for hold/witness points.

7.2.6 control of nonconformances.

7.2.7 corrective action.

7.2.8 acceptance of item or service.

7.2.9 QA records.

8.0 SOURCE EVALUATION AND SELECTION

8.1 The selection of suppliers shall be based on the documented evaluation of their capability to provide items or services in accordance with the procurement requirements.

8.2 The program for the evaluation and selection of suppliers shall:

8.2.1 be implemented prior to award of contract.

8.2.2 provide for identification of the purchaser's organizational responsibilities for determining supplier capability.

8.2.3 provide for the selection of a supplier based on one or more of the following:

8.2.3.1 evaluation of the supplier's history of providing identical or similar product that performs satisfactorily and includes current capability.

8.2.3.2 supplier's current quality assurance records supported by documented qualitative and quantitative information that can be objectively evaluated.

8.2.3.3 direct evaluation of the suppliers facilities, personnel, and the implementation of his QA program.

9.0 BID EVALUATION

9.1 The program shall provide for bid evaluation of the following as applicable to the type of procurement:

9.1.1 technical considerations.

9.1.2 QA requirements.

9.1.3 supplier's personnel.

9.1.4 supplier's production capabilities.

9.1.5 supplier's past performance.

9.1.6 alternates.

9.1.7 exceptions.

9.2 The program shall require that unacceptable quality assurance conditions be resolved prior to contract award.

10.0 SUPPLIER PERFORMANCE EVALUATION

10.1 A program to interface with the supplier shall be established that includes the following:

10.1.1 documentation of the understanding of the procurement requirements.

10.1.2 requires the supplier to identify planning techniques and processes to be utilized.

10.1.3 reviewing supplier generated documents.

10.1.4 identifying and processing all change information.

10.1.5 measures to control changes in procurement documents.

10.1.6 a method of document information exchange.

10.1.7 documented verification of the supplier's performance.

10.1.8 control of documents generated by suppliers.

10.1.9 methods for the acceptance of the item that includes one or more of the following:

10.1.9.1 certificate of conformance.

10.1.9.2 source verification.

10.1.9.3 receiving inspection.

10.1.9.4 post installation testing.

10.1.10 methods for the acceptance of the service that includes one or more of the following:

10.1.10.1 technical verification of data produced.

10.1.10.2 surveillance, audit or both.

10.1.10.3 review of objective evidence.

11.0 CONTROL OF SUPPLIER NONCONFORMANCES

11.1 The subcontractor and supplier shall establish a documented method for disposition of items/services that do not meet procurement requirements that includes:

11.1.1 evaluation.

11.1.2 submittal.

11.1.3 disposition.

11.1.4 verification.

11.1.5 records maintenance.

12.0 INSTRUCTIONS, PROCEDURES, PLANS AND DRAWINGS

12.1 The program shall include provisions that requires that activities affecting quality shall be prescribed and performed in accordance with:

12.1.1 controlled documented instructions, plans, procedures, or drawings that include or reference the following:

12.1.1.1 appropriate quantitative or qualitative acceptance criteria.

12.1.1.2 identification of QA records which are generated.

12.1.1.3 independent review to assure technical adequacy and appropriate quality requirements.

13.0 DOCUMENT CONTROL

13.1 The program shall provide that documents containing/specifying quality requirements or prescribing activities affecting quality be controlled and documented during:

13.1.1 preparation.

13.1.2 review.

13.1.3 approval.

13.1.4 issuance.

13.2 The implementation program for document control shall include:

13.2.1 identification of documents.

13.2.2 identification of assignment of responsibility for preparing, reviewing, approving, and issuing documents.

13.2.3 a review of documents prior to release for:

13.2.3.1 technical adequacy.

13.2.3.2 completeness.

13.2.3.3 correctness.

13.2.3.4 inclusion of quality requirements.

13.2.4 a method for the removal or marking of obsolete documents.

13.2.5 a method for assuring that correct documents are available at the location to be used.

13.2.6 a master list to identify the correct and current revision.

13.2.7 coordination of interface documents.

13.2.8 assurance that documents requiring verification are not released prior to verification.

13.2.9 a requirement that major changes be reviewed and approved by the same organization(s) that approved the original.

13.3 Minor changes, such as inconsequential editorial corrections, do not require the same review as the original, however the program must delineate who can authorize such changes.

14.0 IDENTIFICATION AND CONTROL OF ITEMS, SAMPLES AND DATA

14.1 Procedures are required to be implemented to assure the identification and control of material that defines:

14.1.1 responsibilities.

14.1.2 identification methods.

14.1.3 handling methods.

14.1.4 storage methods.

14.1.5 transportation methods.

14.1.6 the records that will be generaced as a result of implementation.

15.0 CONTROL OF MEASURING AND TEST EQUIPMENT

15.1 A control program is required for all M&TE except rulers, tape measures, levels, and other such devices if normal commercial equipment provides adequate accuracy.

15.2 The control program shall:

15.2.1 include all M&TE used to calibrate, measure, gage, test, or inspect.

15.2.2 require the use of written procedures for calibrations.

15.2.3 control the selection of M&TE to assure proper type, range, and accuracy.

15.2.4 require the type range and accuracy be documented.

15.2.5 require a unique identification number for each piece of equipment.

15.2.6 require that the identification number be recorded for each measurement taken.

15.2.7 require that M&TE be calibrated against certified equipment having know valid relationships to NIST or other nationally recognized standards.

15.2.8 require that calibration standards have equal or greater. accuracy than the equipment being calibrated.

15.2.8.1 use of calibration standards with equal accuracy must have a documented basis for acceptance.

15.2.9 require that the method and interval of calibration for each item be defined.

15.2.10 require a label that indicates the due date of the next calibration.

15.2.11 require that out-of-cal equipment be tagged as such.

15.2.12 require a documented evaluation of items previously inspected items when M&TE equipment is found to be out-of-calibration.

15.2.13 require a recalibration if the accuracy of the M&TE is suspect.

15.2.14 require proper handling and storage to maintain accuracy.

15.2.15 require the generation and retention of calibration records for each piece of M&TE including identification of the calibration procedure used.

16.0 HANDLING, SHIPPING, AND STORAGE

16.1 The program shall provide for:

16.1.1 the establishment of measures to control the packaging, handling, storage, shipping, cleaning, and preservation of material and equipment to prevent damage , loss, or deterioration.

16.1.2 the use of specific procedures for critical, sensitive, perishable or exceptionally expensive articles.

16.1.3 the use of special equipment and protective environments when required.

16.1.3.1 when required their existence shall be verified.

16.1.4 the documented inspection and testing at specified intervals of special handling tools and equipment.

16.1.5 training of operators of special handling and lifting equipment.

16.1.6 marking to adequately identify, maintain, and preserve the item.

16.1.7 storage methodology to assure that items are maintained in predetermined physical conditions.

16.1.8 measures to maintain identification during storage.

17.0 CONTROL OF NONCONFORMING ITEMS

17.1 Measures shall be established to control items that do not conform to requirements that include:

17.1.1 a method of legible identification that includes the nonconformance report number.

17.1.2 exceptions if identification of each nonconforming item is not practical.

17.1.3 work stoppage on nonconforming items until completion of the action required.

17.1.4 measures for conditional release if only a portion of an item is in nonconformance which must include customer concurrence.

17.1.5 the establishment of a nonconformance log.

17.1.6 provisions for segregating nonconforming items when practical.

17.1.7 provisions for disposition that include:

17.1.7.1 review and recommendation for disposition of nonconforming characteristics with approved, documented procedures.

17.1.7.2 definition and documentation of responsibility and authority.

17.1.7.3 requirements that personnel performing disposition have demonstrated competence in the area they are evaluating.

17.1.8 provisions for documenting the details of the corrective action taken to correct the nonconformance.

17.1.9 provisions to identify and evaluate repetitive nonconformances.

18.0 CORRECTIVE ACTION

18.1 The system shall include methods to ensure that conditions adverse or potentially adverse to quality are identified promptly and corrected as soon as practical.

18.2 For significant conditions adverse to quality, the system shall include methods that include the documentation of:

18.2.1 identification of the condition.

18.2.2 immediate action taken to remedy the specific condition.

18.2.3 causative factors.

18.2.4 corrective action taken to preclude recurrence.

18.2.5 controls that were reviewed, implemented, monitored and revised.

18.2.6 reporting to immediate and upper levels of management for review and assessment.

18.3 The QA organization shall document concurrence of the adequacy of proposed corrective actions and follow-up action to close out the CAR.

18.4 Corrective action reports shall be periodically analyzed by the QA organization to show quality trends.

18.4.1 results of the analysis shall be forwarded to the customer.

18.5 Copies of all corrective action reports shall be sent to the customer upon issuance and closure.

19.0 QUALITY ASSURANCE RECORDS

19.1 A system to maintain the documented evidence of quality shall be established that requires all records to be legible, identifiable, accurate, complete, reproducible, microfilmable, and retrievable.

19.2 The record system shall:

19.2.1 be defined, implemented, and enforced using written procedures.

19.2.2 contain requirements and responsibilities for transmittal, distribution, retention, maintenance, and disposition.

19.2.3 require the use of black ink only.

19.2.4 prohibit white-outs, erasures, etc.

19.2.5 require that corrections be made by drawing a single line thru the erroneous entry, dating and initialing.

19.3 A document or other item is not defined as a Quality Assurance Record until it satisfies the following:

19.3.1 furnishes evidence of quality and activities affecting quality.

19.3.2 demonstrates implementation of quality programs.

19.3.3 other documents such as plans, correspondence, documentation of telecons, specifications, technical data, maps, papers, photographs, data sheets, and magnetic media.

19.3.4 other material that documents quality regardless of physical form.

19.3.5 complete, approved and will receive no more entries.

19.3.6 has been validated and verified by authorized personnel.

19.4 The system must include the following as a minimum:

19.4.1 operating logs.

19.4.2 results of reviews.

19.4.3 inspections.

19.4.4 tests.

19.4.5 audits.

19.4.6 monitoring of work performance.

19.4.7 material analysis.

19.4.8 qualifications of personnel, procedures, and equipment.

19.5 Records shall be stored in predetermined locations according to written procedures that includes:

19.5.1 provisions to preclude entry of unauthorized personnel.

19.5.2 provisions to preclude deterioration.

19.5.3 a system to correct stored records if necessary.

19.5.4 a unique document identification numbering system.

19.6 Records shall be stored in a single facility that has a National Fire Protection Association (NFPA) 232 two hour fire rating, or dual facilities at locations sufficiently remote from each other to eliminate the chance of exposure to a simultaneous hazard.

20.0 AUDITS

20.1 A system of planned, periodic, internal and external audits shall be established to provide an objective evaluation of the adequacy and the implementation of the QA program.

20.2 The system shall provide that:

20.2.1 audit members are independent of activity being audited.

20.2.2 audit team leader is selected by the QA manager and has the following responsibilities.

20.2.2.1 selects team members.

20.2.2.2 determines audit scope.

20.2.2.3 notifies project personnel of audit.

20.2.2.4 reviews pertinent documentation.

20.2.2.5 ensures team is familiar with project specific requirements.

20.2.3 team members who are not members of QA shall be approved by QA supervisor.

20.2.4 the lead auditor understands:

20.2.4.1 the specific QA requirements imposed.

20.2.4.2 10CFR Chapter 1 Part 60 (Disposal of High Level Radioactive Wastes in Geologic Repositories.

20.2.5 the audit be performed with written procedures using checklists.

20.2.6 the audit report must be:

20.2.6.1 issued within 30 days.

20.2.6.2 include a statement of the effectiveness of the QA program elements audited.

20.2.6.3 be signed by the QA manager prior to distribution.

20.2.7 the audit response must:

20.2.7.1 be given in 30 days.

20.2.7.2 include the root cause.

20.2.7.3 include the schedule for corrective action.

20.2.7.4 include measures to prevent recurrence.

20.2.8 personnel qualifications for lead auditors must be established, maintained, and certified by the employer that include:

20.2.8.1 lead auditor training.

20.2.8.2 examination.

20.2.8.3 audit participations.

20.2.8.4 education and experience.

20.2.9 the certification of lead auditors must be updated and reviewed annually.

BASIS FOR LABOR RATES USED FOR YMP HLNW CONTAINER FABRICATION

Offeror: _____ Quotation No.: _____

The labor costs are based on the following factors:

	Used Yes	No
Base Rate	___	___
Shift Differential	___	___
Holidays	___	___
Vacations	___	___
Casual Overtime	___	___
Training	___	___
Social Security	___	___
Workmen's Compensation	___	___
Pension	___	___
Health & Welfare	___	___
Other (Identify)	___	___

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W P.O. _____.

Estimated By: _____ Verified By: _____

Date: _____ Date: _____

Name: _____ Name: _____

Title: _____ Title: _____

*Approved By: _____

Date: _____

Name: _____

Title: _____

*Must be a responsible officer of the Company.

(Either type or use black ink to complete this form.)

TOTAL PRICE AND TAX ESTIMATE FOR YMP HLNW CONTAINER FABRICATION PER PIECE AT 750 PIECES/YEAR AS OF 8/1/89 (NO ESCALATION)

Offeror: _____ Quotation No.: _____

Task	Price Before Taxes, $/Pc.	Taxes: Sales $	Sales Rate	Business $	Business Rate	Inventory $	Inventory Rate	Other $	Other Rate	Price After Taxes $/Pc.
				C71500 Alloy						
1C.0										
2C.0										
3C.0										
4C.0										
5C.0										
				N08825 Alloy						
1N.0										
2N.0										
3N.0										
4N.0										
5N.0										
				S30403 Alloy						
6S.0										
7S.0										
8S.0										
9S.0										
10S.0										

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W P.O. _____.

Estimated By: _____ Verified By: _____

Date: _____ Date: _____

Name: _____ Name: _____

Title: _____ Title: _____

*Approved By: _____

Date: _____

Name: _____

Title: _____

*Must be a responsible officer of the Company.

(Either type or use black ink to complete this form.

YMP HLNW CONTAINER FABRICA[illegible] PRICE ESTIMATE

Component: Lower Unit (LU) Alloy: C71500 Offeror: _____ Quotation No: _____

Price per unit for 750 units/year for a total production of 15,000 units as of 8/1/89 (no escalation)

26S Container

		Raw Materials				Materials			Labor			
Task	Description	Plate Wt. ($/Lb)	Bar Wt. ($/Lb)	Forging Wt. ($/Lb)	Total $/Comp.	Exp. $	Tools $	Ship $	Engr. $ (Hrs)	Manuf. $ (Hrs)	Insp. $ (Hrs)	QA $ (Hrs)
1C.1	Bottom Head (BH)	( )	( )	( )					( )	( )	( )	( )
.2	Body (B)	( )	( )	( )					( )	( )	( )	( )
.3	Flange Blank (FB)								( )	( )	( )	( )
.4	Join BH to B								( )	( )	( )	( )
.5	Spin Form LU								( )	( )	( )	( )
.6	Join FB to LU								( )	( )	( )	( )
.7	Anneal LU								( )	( )	( )	( )
.8	Machine LU								( )	( )	( )	( )
.9	Inspect & Test								( )	( )	( )	( )
.10	QA & Document								( )	( )	( )	( )
.11	Package & Ship								( )	( )	( )	( )
									( )	( )	( )	( )
1C.0	Total LUC								( )	( )	( )	( )

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W P.O. _____.

Estimated By: _____

Date: _____

Name: _____

Title: _____

Verified By: _____

Date: _____

Name: _____

Title: _____

*Approved By: _____

Date: _____

Name: _____

Title: _____

*Must be a responsible officer of the Company. (Either type or use black ink to complete this form.)

YMP HLNW CONTAINER FABRICATION PRICE ESTIMATE

Component: Lower Unit (LU) Alloy: C71500 Offeror: _____ Quotation No: _____

Price per unit for 750 units/year for a total production of 15,000 units as of 8/1/89 (no escalation)

26L Container

		Raw Materials				Materials			Labor			
Task	Description	Plate Wt. ($/Lb)	Bar Wt. ($/Lb)	Forging Wt. ($/Lb)	Total $/Comp.	Exp. $	Tools $	Ship $	Engr. $ (Hrs)	Manuf. $ (Hrs)	Insp. $ (Hrs)	QA $ (Hrs)
2C.1	Bottom Head (BH)	( )	( )	( )					( )	( )	( )	( )
.2	Body (B)	( )	( )	( )					( )	( )	( )	( )
.3	Flange Blank (FB)								( )	( )	( )	( )
.4	Join BH to B								( )	( )	( )	( )
.5	Spin Form LU								( )	( )	( )	( )
.6	Join FB to LU								( )	( )	( )	( )
.7	Anneal LU								( )	( )	( )	( )
.8	Machine LU								( )	( )	( )	( )
.9	Inspect & Test								( )	( )	( )	( )
.10	QA & Document								( )	( )	( )	( )
.11	Package & Ship								( )	( )	( )	( )
									( )	( )	( )	( )
2C.0	Total LUC								( )	( )	( )	( )

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W P.O. _____.

Estimated By: _____ Verified By: _____ *Approved By: _____

Date: _____ Date: _____ Date: _____

Name: _____ Name: _____ Name: _____

Title: _____ Title: _____ Title: _____

*Must be a responsible officer of the Company. (Either type or use black ink to complete this form.)

YMP HLNW CONTAINER FABRICATION PRICE ESTIMATE

Component: Lower Unit (LU) Alloy: C71500 Offeror: _____ Quotation No: _____

Price per unit for 750 units/year for a total production of 15,000 units as of 8/1/89 (no escalation)

28L Container

Task	Description	Raw Materials				Materials			Labor			
		Plate Wt. ($/Lb)	Bar Wt. ($/Lb)	Forging Wt. ($/Lb)	Total $/Comp.	Exp. $	Tools $	Ship $	Engr. $ (Hrs)	Manuf. $ (Hrs)	Insp. $ (Hrs)	QA $ (Hrs)
3C.1	Bottom Head (BH)	( )	( )	( )					( )	( )	( )	( )
.2	Body (B)	( )	( )	( )					( )	( )	( )	( )
.3	Flange Blank (FB)								( )	( )	( )	( )
.4	Join BH to B								( )	( )	( )	( )
.5	Spin Form LU								( )	( )	( )	( )
.6	Join FB to LU								( )	( )	( )	( )
.7	Anneal LU								( )	( )	( )	( )
.8	Machine LU								( )	( )	( )	( )
.9	Inspect & Test								( )	( )	( )	( )
.10	QA & Document								( )	( )	( )	( )
.11	Package & Ship								( )	( )	( )	( )
									( )	( )	( )	( )
3C.0	Total LUC								( )	( )	( )	( )

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W P.O. _____.

Estimated By: _____
Date: _____
Name: _____
Title: _____

Verified By: _____
Date: _____
Name: _____
Title: _____

*Approved By: _____
Date: _____
Name: _____
Title: _____

*Must be a responsible officer of the Company. (Either type or use black ink to complete this form.)

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YMP HLNW CONTAINER FABRICA[illegible] PRICE ESTIMATE

Component: Upper Head (UH) Alloy: C71500 Offeror: _____ Quotation No: _____

Price per unit for 750 units/year for a total production of 15,000 units as of 8/1/89 (no escalation)

26S or 26L Container

		Raw Materials				Materials			Labor			
Task	Description	Plate Wt. ($/Lb)	Bar Wt. ($/Lb)	Forging Wt. ($/Lb)	Total $/Comp.	Exp. $	Tools $	Ship $	Engr. $ (Hrs)	Manuf. $ (Hrs)	Insp. $ (Hrs)	QA $ (Hrs)
4C.1	Upper Head (UH)	( )	( )	( )					( )	( )	( )	( )
.2	Pintle (P)	( )	( )	( )					( )	( )	( )	( )
.3	Join P to UH								( )	( )	( )	( )
.4	Anneal UH								( )	( )	( )	( )
.5	Machine UH								( )	( )	( )	( )
.6	Inspect & Clean								( )	( )	( )	( )
.7	QA & Document								( )	( )	( )	( )
.8	Package & Ship								( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
4C.0	Total UHC								( )	( )	( )	( )

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W P.O. _____.

Estimated By: _____
Date: _____
Name: _____
Title: _____

Verified By: _____
Date: _____
Name: _____
Title: _____

*Approved By: _____
Date: _____
Name: _____
Title: _____

*Must be a responsible officer of the Company. (Either type or use black ink to complete this form.)

YMP HLNW CONTAINER FABRICATION PRICE ESTIMATE

Component: Upper Head (UH) Alloy: C71500 Offeror: _____ Quotation No: _____

Price per unit for 750 units/year for a total production of 15,000 units as of 8/1/89 (no escalation)

28L Container

		Raw Materials				Materials			Labor			
Task	Description	Plate Wt. ($/Lb)	Bar Wt. ($/Lb)	Forging Wt. ($/Lb)	Total $/Comp.	Exp. $	Tools $	Ship $	Engr. $ (Hrs)	Manuf. $ (Hrs)	Insp. $ (Hrs)	QA $ (Hrs)
5C.1	Upper Head (UH)	( )	( )	( )					( )	( )	( )	( )
.2	Pintle (P)	( )	( )	( )					( )	( )	( )	( )
.3	Join P to UH								( )	( )	( )	( )
.4	Anneal UH								( )	( )	( )	( )
.5	Machine UH								( )	( )	( )	( )
.6	Inspect & Clean								( )	( )	( )	( )
.7	QA & Document								( )	( )	( )	( )
.8	Package & Ship								( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
5C.0	Total UHC								( )	( )	( )	( )

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W P.O. _____.

Estimated By: _____

Date: _____

Name: _____

Title: _____

Verified By: _____

Date: _____

Name: _____

Title: _____

*Approved By: _____

Date: _____

Name: _____

Title: _____

*Must be a responsible officer of the Company. (Either type or use black ink to complete this form.)

YMP HLNW CONTAINER FABRICAT[illegible] PRICE ESTIMATE

Component: Lower Unit (LU) Alloy: N08825 Offeror: _____ Quotation No: _____

Price per unit for 750 units/year for a total production of 15,000 units as of 8/1/89 (no escalation)
26S Container

Task	Description	Raw Materials				Materials			Labor			
		Plate Wt. ($/Lb)	Bar Wt. ($/Lb)	Forging Wt. ($/Lb)	Total $/Comp.	Exp. $	Tools $	Ship $	Engr. $ (Hrs)	Manuf. $ (Hrs)	Insp. $ (Hrs)	QA $ (Hrs)
1N.1	Bottom Head (BH)	( )	( )	( )					( )	( )	( )	( )
.2	Body (B)	( )	( )	( )					( )	( )	( )	( )
.3	Flange Blank (FB)								( )	( )	( )	( )
.4	Join BH to B								( )	( )	( )	( )
.5	Spin Form LU								( )	( )	( )	( )
.6	Join FB to LU								( )	( )	( )	( )
.7	Anneal LU								( )	( )	( )	( )
.8	Machine LU								( )	( )	( )	( )
.9	Inspect & Test								( )	( )	( )	( )
.10	QA & Document								( )	( )	( )	( )
.11	Package & Ship								( )	( )	( )	( )
									( )	( )	( )	( )
1N.0	Total LUN								( )	( )	( )	( )

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W P.O. _____.

Estimated By: _____
Date: _____
Name: _____
Title: _____

Verified By: _____
Date: _____
Name: _____
Title: _____

*Approved By: _____
Date: _____
Name: _____
Title: _____

*Must be a responsible officer of the Company. (Either type or use black ink to complete this form.)

YMP HLNW CONTAINER FABRICATI PRICE ESTIMATE

Component: Lower Unit (LU) Alloy: N08825 Offeror: _____ Quotation No: _____

Price per unit for 750 units/year for a total production of 15,000 units as of 8/1/89 (no escalation)

26L Container

Task	Description	Raw Materials				Materials			Labor			
		Plate Wt. ($/Lb)	Bar Wt. ($/Lb)	Forging Wt. ($/Lb)	Total $/Comp.	Exp. $	Tools $	Ship $	Engr. $ (Hrs)	Manuf. $ (Hrs)	Insp. $ (Hrs)	QA $ (Hrs)
2N.1	Bottom Head (BH)	( )	( )	( )					( )	( )	( )	( )
.2	Body (B)	( )	( )	( )					( )	( )	( )	( )
.3	Flange Blank (FB)								( )	( )	( )	( )
.4	Join BH to B								( )	( )	( )	( )
.5	Spin Form LU								( )	( )	( )	( )
.6	Join FB to LU								( )	( )	( )	( )
.7	Anneal LU								( )	( )	( )	( )
.8	Machine LU								( )	( )	( )	( )
.9	Inspect & Test								( )	( )	( )	( )
.10	QA & Document								( )	( )	( )	( )
.11	Package & Ship								( )	( )	( )	( )
									( )	( )	( )	( )
2N.0	Total LUN								( )	( )	( )	( )

I certify that this estimate to he best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W P.O. _____.

Estimated By: _____
Date: _____
Name: _____
Title: _____

Verified By: _____
Date: _____
Name: _____
Title: _____

*Approved By: _____
Date: _____
Name: _____
Title: _____

*Must be a responsible officer of the Company. (Either type or use black ink to complete this form.)

YMP HLNW CONTAINER FABRICAT[illegible] PRICE ESTIMATE

Component: Lower Unit (LU) Alloy: N08825 Offeror: _____ Quotation No: _____

Price per unit for 750 units/year for a total production of 15,000 units as of 8/1/89 (no escalation)
28L Container

Task	Description	Raw Materials				Materials			Labor			
		Plate Wt. ($/Lb)	Bar Wt. ($/Lb)	Forging Wt. ($/Lb)	Total $/Comp.	Exp. $	Tools $	Ship $	Engr. $ (Hrs)	Manuf. $ (Hrs)	Insp. $ (Hrs)	QA $ (Hrs)
3N.1	Bottom Head (BH)	( )	( )	( )					( )	( )	( )	( )
.2	Body (B)	( )	( )	( )					( )	( )	( )	( )
.3	Flange Blank (FB)								( )	( )	( )	( )
.4	Join BH to B								( )	( )	( )	( )
.5	Spin Form LU								( )	( )	( )	( )
.6	Join FB to LU								( )	( )	( )	( )
.7	Anneal LU								( )	( )	( )	( )
.8	Machine LU								( )	( )	( )	( )
.9	Inspect & Test								( )	( )	( )	( )
.10	QA & Document								( )	( )	( )	( )
.11	Package & Ship								( )	( )	( )	( )
									( )	( )	( )	( )
3N.0	Total LUN								( )	( )	( )	( )

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W P.O. _____.

Estimated By: _____
Date: _____
Name: _____
Title: _____

Verified By: _____
Date: _____
Name: _____
Title: _____

*Approved By: _____
Date: _____
Name: _____
Title: _____

*Must be a responsible officer of the Company. (Either type or use black ink to complete this form.)

YMP HLNW CONTAINER FABRICATION PRICE ESTIMATE

Component: Upper Head (UH) Alloy: N08825 Offeror: _____ Quotation No: _____

Price per unit for 750 units/year for a total production of 15,000 units as of 8/1/89 (no escalation)

26S or 26L Container

		Raw Materials				Materials			Labor			
Task	Description	Plate Wt. ($/Lb)	Bar Wt. ($/Lb)	Forging Wt. ($/Lb)	Total $/Comp.	Exp. $	Tools $	Ship $	Engr. $ (Hrs)	Manuf. $ (Hrs)	Insp. $ (Hrs)	QA $ (Hrs)
4N.1	Upper Head (UH)	( )	( )	( )					( )	( )	( )	( )
.2	Pintle (P)	( )	( )	( )					( )	( )	( )	( )
.3	Join P to UH								( )	( )	( )	( )
.4	Anneal UH								( )	( )	( )	( )
.5	Machine UH								( )	( )	( )	( )
.6	Inspect & Clean								( )	( )	( )	( )
.7	QA & Document								( )	( )	( )	( )
.8	Package & Ship								( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
4N.0	Total UHN								( )	( )	( )	( )

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W P.O. _____.

Estimated By: _____ Verified By: _____ *Approved By: _____

Date: _____ Date: _____ Date: _____

Name: _____ Name: _____ Name: _____

Title: _____ Title: _____ Title: _____

*Must be a responsible officer of the Company. (Either type or use black ink to complete this form.)

YMP HLNW CONTAINER FABRICAT[illegible] PRICE ESTIMATE

Component: Upper Head (UH) Alloy: N08825 Offeror: _____ Quotation No: _____

Price per unit for 750 units/year for a total production of 15,000 units as of 8/1/89 (no escalation)

28L Container

		Raw Materials				Materials			Labor			
Task	Description	Plate Wt. ($/Lb)	Bar Wt. ($/Lb)	Forging Wt. ($/Lb)	Total $/Comp.	Exp. $	Tools $	Ship $	Engr. $ (Hrs)	Manuf. $ (Hrs)	Insp. $ (Hrs)	QA $ (Hrs)
5N.1	Upper Head (UH)	( )	( )	( )					( )	( )	( )	( )
.2	Pintle (P)	( )	( )	( )					( )	( )	( )	( )
.3	Join P to UH								( )	( )	( )	( )
.4	Anneal UH								( )	( )	( )	( )
.5	Machine UH								( )	( )	( )	( )
.6	Inspect & Clean								( )	( )	( )	( )
.7	QA & Document								( )	( )	( )	( )
.8	Package & Ship								( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
5N.0	Total UHN								( )	( )	( )	( )

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W P.O. _____.

Estimated By: _____ Verified By: _____ *Approved By: _____

Date: _____ Date: _____ Date: _____

Name: _____ Name: _____ Name: _____

Title: _____ Title: _____ Title: _____

*Must be a responsible officer of the Company. (Either type or use black ink to complete this form.)

YMP HLNW CONTAINER FABRICAT[illegible] PRICE ESTIMATE

Component: Internals Alloy: S30403 Offeror: _____ Quotation No: _____

Price per unit for 750 units/year for a total production of 15,000 units as of 8/1/89 (no escalation)
Consolidated 6 PWR fuel assemblies .

Task	Description	Raw Materials				Materials			Labor			
		Plate Wt. ($/Lb)	Bar Wt. ($/Lb)	Forging Wt. ($/Lb)	Total $/Comp.	Exp. $	Tools $	Ship $	Engr. $ (Hrs)	Manuf. $ (Hrs)	Insp. $ (Hrs)	QA $ (Hrs)
6S.1	Form Dividers	( )	( )	( )					( )	( )	( )	( )
.2	Join Dividers	( )	( )	( )					( )	( )	( )	( )
.3	Machine, Straight & Clean								( )	( )	( )	( )
.4	Inspect								( )	( )	( )	( )
.5	QA & Document								( )	( )	( )	( )
.6	Pack & Ship								( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
6S.0	Total Internals								( )	( )	( )	( )

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W P.O. _____.

Estimated By: _____
Date: _____
Name: _____
Title: _____

Verified By: _____
Date: _____
Name: _____
Title: _____

*Approved By: _____
Date: _____
Name: _____
Title: _____

*Must be a responsible officer of the Company. (Either type or use black ink to complete this form.)

YMP HLNW CONTAINER FABRICATION PRICE ESTIMATE

Component: Internals Alloy: S30403 Offeror: _____ Quotation No: _____

Price per unit for 750 units/year for a total production of 15,000 units as of 8/1/89 (no escalation)

3 PWR fuel assemblies

		Raw Materials				Materials			Labor			
Task	Description	Plate Wt. ($/Lb)	Bar Wt. ($/Lb)	Forging Wt. ($/Lb)	Total $/Comp.	Exp. $	Tools $	Ship $	Engr. $ (Hrs)	Manuf. $ (Hrs)	Insp. $ (Hrs)	QA $ (Hrs)
7S.1	Form Dividers	( )	( )	( )					( )	( )	( )	( )
.2	Join Dividers	( )	( )	( )					( )	( )	( )	( )
.3	Machine, Straight & Clean								( )	( )	( )	( )
.4	Inspect								( )	( )	( )	( )
.5	QA & Document								( )	( )	( )	( )
.6	Pack & Ship								( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
7S.0	Total Internals								( )	( )	( )	( )

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W P.O. _____.

Estimated By: _____ Verified By: _____ *Approved By: _____

Date: _____ Date: _____ Date: _____

Name: _____ Name: _____ Name: _____

Title: _____ Title: _____ Title: _____

*Must be a responsible officer of the Company. (Either type or use black ink to complete this form.)

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YMP HLNW CONTAINER FABRICATION PRICE ESTIMATE

Component: Internals Alloy: S30403 Offeror: _____ Quotation No: _____

Price per unit for 750 units/year for a total production of 15,000 units as of 8/1/89 (no escalation)
3 PWR and 4 BWR fuel assemblies

		Raw Materials				Materials			Labor			
Task	Description	Plate Wt. ($/Lb)	Bar Wt. ($/Lb)	Forging Wt. ($/Lb)	Total $/Comp.	Exp. $	Tools $	Ship $	Engr. $ (Hrs)	Manuf. $ (Hrs)	Insp. $ (Hrs)	QA $ (Hrs)
8S.1	Form Dividers	( )	( )	( )					( )	( )	( )	( )
.2	Join Dividers	( )	( )	( )					( )	( )	( )	( )
.3	Machine, Straight & Clean								( )	( )	( )	( )
.4	Inspect								( )	( )	( )	( )
.5	QA & Document								( )	( )	( )	( )
.6	Pack & Ship								( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
8S.0	Total Internals								( )	( )	( )	( )

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W P.O. _____.

Estimated By: _____
Date: _____
Name: _____
Title: _____

Verified By: _____
Date: _____
Name: _____
Title: _____

*Approved By: _____
Date: _____
Name: _____
Title: _____

*Must be a responsible officer of the Company. (Either type or use black ink to complete this form.)

YMP HLNW CONTAINER FABRICA[illegible]N PRICE ESTIMATE

Component: Internals Alloy: S30403 Offeror: _____ Quotation No: _____

Price per unit for 750 units/year for a total production of 15,000 units as of 8/1/89 (no escalation)
10 BWR fuel assemblies

		Raw Materials				Materials			Labor			
Task	Description	Plate Wt. ($/Lb)	Bar Wt. ($/Lb)	Forging Wt. ($/Lb)	Total $/Comp.	Exp. $	Tools $	Ship $	Engr. $ (Hrs)	Manuf. $ (Hrs)	Insp. $ (Hrs)	QA $ (Hrs)
9S.1	Form Dividers	( )	( )	( )					( )	( )	( )	( )
.2	Join Dividers	( )	( )	( )					( )	( )	( )	( )
.3	Machine, Straight & Clean								( )	( )	( )	( )
.4	Inspect								( )	( )	( )	( )
.5	QA & Document								( )	( )	( )	( )
.6	Pack & Ship								( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
9S.0	Total Internals								( )	( )	( )	( )

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W P.O. _____.

Estimated By: _____
Date: _____
Name: _____
Title: _____

Verified By: _____
Date: _____
Name: _____
Title: _____

*Approved By: _____
Date: _____
Name: _____
Title: _____

*Must be a responsible officer of the Company. (Either type or use black ink to complete this form.)

YMP HLNW CONTAINER FABRICATION PRICE ESTIMATE

Component: Internals Alloy: S30403 Option: _____ Quotation No: _____

Price per unit for 750 units/year for a total production of 15,000 units as of 8/1/89 (no escalation)

4 PWR fuel assemblies

Task	Description	Raw Materials				Materials			Labor			
		Plate Wt. ($/Lb)	Bar Wt. ($/Lb)	Forging Wt. ($/Lb)	Total $/Comp.	Exp. $	Tools $	Ship $	Engr. $ (Hrs)	Manuf. $ (Hrs)	Insp. $ (Hrs)	QA $ (Hrs)
10S.1	Form Dividers	( )	( )	( )					( )	( )	( )	( )
.2	Join Dividers	( )	( )	( )					( )	( )	( )	( )
.3	Machine, Straight & Clean								( )	( )	( )	( )
.4	Inspect								( )	( )	( )	( )
.5	QA & Document								( )	( )	( )	( )
.6	Pack & Ship								( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
									( )	( )	( )	( )
10S.0	Total Internals								( )	( )	( )	( )

I certify that this estimate to the best of my knowledge is accurate, supported by appropriate documentation and in accordance with standard practices of this Company and B&W P.O. _____.

Estimated By: _____
Date: _____
Name: _____
Title: _____

Verified By: _____
Date: _____
Name: _____
Title: _____

*Approved By: _____
Date: _____
Name: _____
Title: _____

*Must be a responsible officer of the Company. (Either type or use black ink to complete this form.)

Appendix B. Quality Assurance and Quality Control Analysis, Kaiser Engineers

ICF KAISER ENGINEERS

ICF KAISER ENGINEERS, INC.
1800 HARRISON ST., OAKLAND, CA 94612
P.O. BOX 23210, OAKLAND, CA 94623
415/268-6000

October 27, 1989

Leslie J. Jardine
Technical Project Officer
Yucca Mountain Project
Lawrence Livermore National Laboratory
Post Office Box 5514
Livermore, California 94551

Subject: Evaluation of Quality Assurance and Quality Control Costs of Proposed Yucca Mountain Project Waste Containers.

Dear Les:

Enclosed is the Kaiser Engineers economic evaluation of the cost of meeting the Yucca Mountain Project quality requirements for the fabrication of waste containers. The evaluation consists of an independent estimate of the quality costs for container production based upon a working knowledge of the Yucca Mountain Project Quality Assurance Plan (NNWSI/89-9, Rev 2).

In addition, the costs developed by the Kaiser evaluation are compared with the cost estimates for quality assurance and quality control developed by three vendors supporting Babcock & Wilcox Co.

Please direct questions regarding this evaluation to the author.

Sincerely yours,

Charles E. Williams
Group Senior Vice President
Advanced Technology Division

CEW/AAM/pw

QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC)

Allen A. Madson
ICF Kaiser Engineers

Table of Contents

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QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC)

This evaluation deals with the Quality Assurance (QA) and Quality Control (QC) related costs for the proposed Yucca Mountain Project (YMP) nuclear waste package container production. Quality Assurance (QA) is the name given to the program that assures conformance with specified requirements. Ideally, this provides a high level of certainty that products with zero defects are produced. Quality Control (QC) is the name given to inspection, approval, or rejection of containers during the production process. Quality Control is a subset of the Quality Assurance Program.

An independent estimate of QA/QC related costs has been developed based upon a vendor organization model and a container production scenario. The functions required by the YMP Quality Assurance Program were identified and estimated. In addition, estimates of QA/QC related costs by three independent vendors were compared and evaluated.

1.0 SUMMARY OF COSTS ATTRIBUTABLE TO QUALITY REQUIREMENTS

Based upon the model developed, a steady state cost of $5,798 per container for quality related requirements is projected. This is approximately 9 percent of the average vendor total estimated container cost: $1,228 (1.9%) for quality assurance and $4,570 (7.0%) for quality control.

Vendors estimates of quality related costs range from 2.0 to 5.5 percent of their total container cost.

2.0 QUALITY ASSURANCE BACKGROUND

The Yucca Mountain Project Quality Assurance Program was developed in response to quality assurance requirements imposed on the Yucca Mountain Project by the Office of Civilian Radioactive Waste Management (OCRWM), the U.S. Department of Energy (DOE), and the U.S. Nuclear Regulatory Commission (NRC).

The Yucca Mountain Project (YMP) quality assurance program satisfies the requirements of 10 CFR Part 60, Subpart G, and the Quality Assurance Plan (NNWSI 88-9, Rev 2) of the YMP Project Office. This QA program is based upon the American National Standards Institute (ANSI)/American Society of Mechanical Engineers (ASME) Standard NQA-1-1986b, "Quality Assurance Program Requirements for Nuclear Facilities" (NQA-1). NQA-1 was chosen as the basic document for the YMP quality assurance program because the Department of Energy (DOE) ORDER 5700.6B, "Quality Assurance" has endorsed NQA-1 as the preferred standard for quality assurance requirements for the nuclear area. Many of the amplifications to the requirements set forth in the Basic Requirements and Supplements of NQA-1 were added from the NRC review plan for high level nuclear waste repositories and from NUREGs that have been adopted as requirements documents for the geologic repository program.

2.1 QA Specification Check List

Three vendors prepared fabrication cost estimates based upon a quality assurance specification that invoked the applicable portions of the LLNL YMP Quality Assurance Program. A quality specification check list was developed from the QA specification to indicate to the vendors the scope of the requirements applicable to a container supplier. The check list consisted of a series of statements itemizing the requirements of the QA program. The check list was to enable the vendors to more readily evaluate the completeness of the QA program required. The check list is included elswhere in this report.

2.2 Selection of Vendors

One factor used to select vendors was the vendors familiarity with quality assurance programs. Vendors were requested to provide their past and present experience with the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code for similar products and materials.

Each vendor also provided relevant experience with the following quality standards: a) 10 CFR Part 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," b) RDT F2-2, "Quality Assurance Program Requirements," and c) MIL-Q-9858A, "Quality Program Requirements."

3.0 QUALITY ASSURANCE/QUALITY CONTROL MODEL

Previous cost estimates have been based upon an assumed percentage applied to developed construction or production costs. This estimate is based upon a model of QA/QC organization and functions in order to produce an independent estimate of the quality related costs required to produce a licensable waste container.

3.1 Quality Assurance Phases

The model is phased over three major periods of the production process, oriented to the quality assurance process rather than traditional manufacturing. The three phases are Prevention, Appraisal, and Failures. A graphical presentation of these phases is shown in Figure B-1, "Assumed Relationship of QA Phases." The phases are adapted from those described in the 3rd edition of the "Quality Control Handbook" edited by J.M. Juran, et al. The three phases are discussed below.

3.1.1 Prevention

This is the cost of the initial and continued implementation of the QA program. It includes the QA program development, procedure application to the production processes, maintenance of the QA program, maintenance of measurement and test equipment (M&TE), cost of additional hold points, training, records, etc. The cost for this period is high early in the production process as the QA program is developed. As the production process matures this cost should decrease.

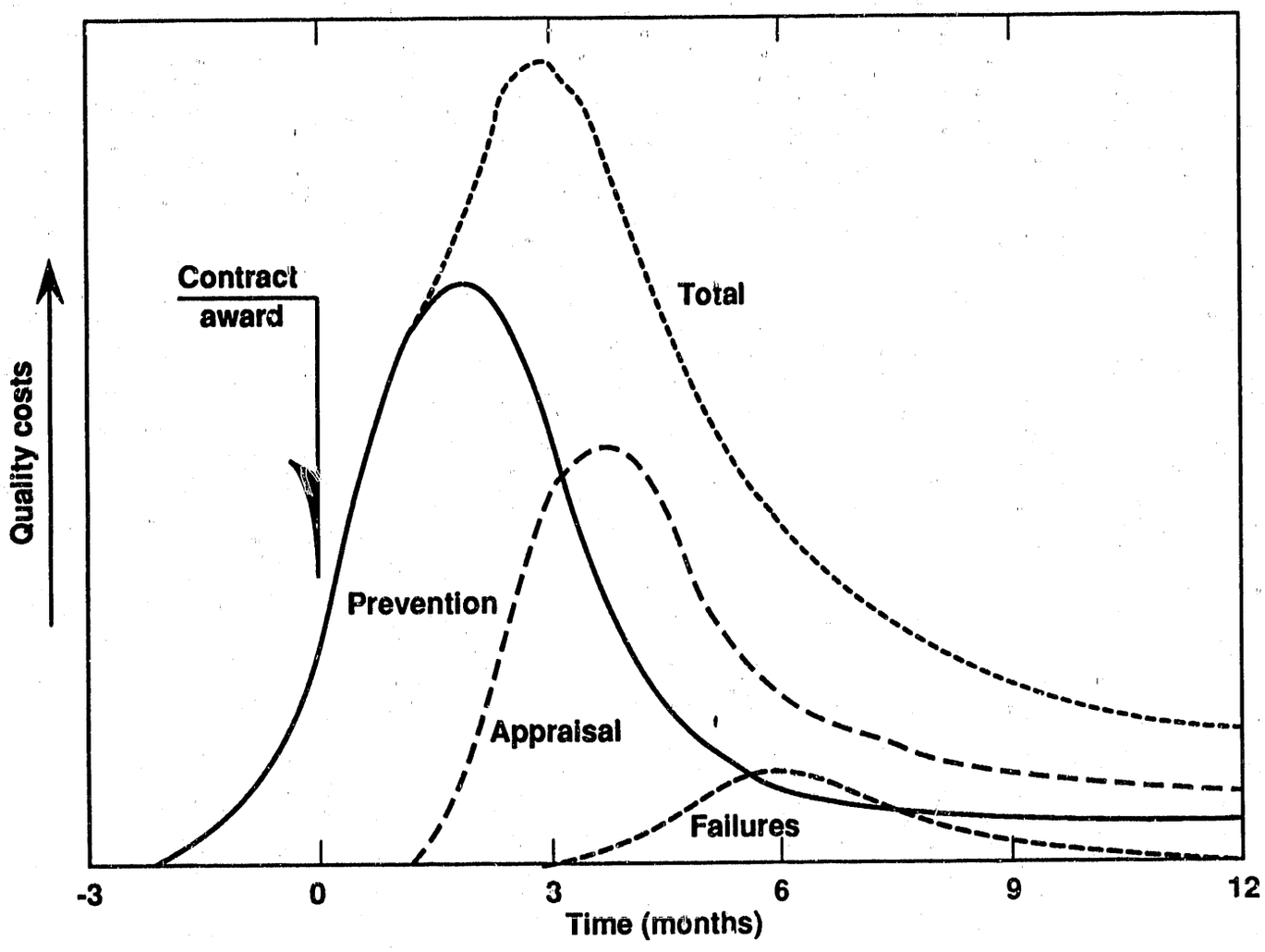


Figure B-1. Assumed Relationship of QA Phases

jb-004-u-7886-1

As illustrated in Figure B-1, Prevention phase credit has been assumed for a portion of a QA program already in place at the qualified vendor. This cost is not included in the YMP project costs. The Prevention phase cost in the model is distributed over the first three months of the contract when the administrative aspects of the QA program are being established by the vendor.

3.1.2 Appraisal

Appraisal includes the cost of evaluating and monitoring the effectiveness of the vendors QA program. The internal/external audit and surveillance program and quality control (QC) related costs are also included in this category. Quality assurance related costs for this phase are expected to be low initially but will increase as the production process gets underway. This cost should decrease as the process matures.

Appraisal costs begin and peak in the second quarter of the the 1st year as the audit and surveillance program is implemented. QC costs increase during this phase as production ramps up. During this 2nd quarter costs associated with Failures also increase.

3.1.3 Failures

Failures costs includes: the cost of the disposition of defective materials, the cost of processes to reduce defects, and the costs of inspections. Early production can be expected to produce a higher rate of container rejects than steady-state production. This cost would decrease as the production process matures.

The Failures costs peak in the third quarter of the year. The QC costs increase in proportion to the increase in container production.

3.1.4 Steady State

The final period is mature, steady-state production. During this period the QA related costs are at their lowest level, reflecting the maturity of the production process. The QA program procedures are routine and personnel are proficient in the processes required.

QA program costs are constant; Prevention and Appraisal costs decrease to steady-state, and Failures costs continue to decrease. The QC costs tend to increase in proportion to the container production rate but QC unit costs decrease due to improved proficiency.

3.1.5 Model Assumptions

A number of basic assumptions have been developed and are listed below:

1. The target goal of the quality program is to produce less than one percent rejects.
2. Vendor production staff is less than one hundred employees.
3. Vendor measurement and test equipment (M&TE) are calibrated by a qualified outside contractor.
4. Secretarial/clerical/computer support is included in the quality costs.
5. The vendor production facility operates 250 days/year, one shift/day, 8 hours/shift.
6. The vendor obtains independent metals analysis via a qualified outside laboratory.
7. Labor rates are assumed and used as presented in Table B-1 without escalation.
8. There are no changes in the waste container fabrication or inspection requirements for the duration covered by this model.
9. The production process is completely developed. There are no research and development requirements.

Table B-1 Assumed Labor Rates

Grade Level	Hourly Rate	Multiplier	Chargeable Rate
1	$54.34	2.4	$130.42
2	30.29	2.4	72.70
3	22.35	2.4	53.64
4	18.54	2.4	44.50
5	14.87	2.4	35.69
6	11.21	2.4	26.90

The labor rates for this estimate are taken from LLNL rate tables in use during FY 1989 for Laboratory employees. Standard salaries were used to determine hourly rates. Mid-levels of the salary rate code were also used to match Laboratory categories to the six grade levels of the model. A multiplier of 2.4 was applied to the base rates to obtain full markups.

The labor rates of the model average $41.14/hr for quality assurance and quality control functions. The average labor rate used by the three vendors is $48.50/hr (the lowest is $43.50/hr).

3.2 Waste Container Production Scenario

A production scenario is assumed to develop the rationale for application of the labor distribution to the container production. The scenario is based upon a container production as shown in Figure B-2, "Assumed 1st Year Container Production."

One container (0.08 per week) is fabricated during the first quarter (Program Development). Fifty containers (4 per week) are fabricated and shipped during the second quarter (Qualification Production). The third quarter production is gradually increased to the design maximum (4 containers per day). During this quarter (Production Demonstration) 125 containers are fabricated and shipped (10 per week).

The fourth quarter (Full Production) is the first full capacity, steady state run of the production process. A production rate of 4 containers/day is sustained for the full quarter. This production rate is 133 percent of the specified production rate to accommodate equipment down time for repairs, tooling changes, and a contingency reserve. A total of 250 containers are produced during this quarter (20/week).

3.3 The Vendor Organization

A visual representation of that part of a vendors organization with cost impact resulting from quality assurance and quality control requirements is shown in Figure B-3, "Assumed Vendor Organization." This organization chart contains only the functions that have impact on total quality costs.

The vendor organization labor costs are modeled on the basis of six salary levels: 1) Manager, 2)Supervisor, 3)Foreman, 4)Lead Worker, 5)Worker, and 6)Support. Note that although the number of positions are identified, it is the function that is modeled. In some cases more than one person may be performing the function.

There is only one salary level classified as Manager. At the next salary level there are four supervisors: Procurement, Fabrication, Engineering, and Quality Assurance. Under the Procurement supervisor there are two foreman, one each for Receiving and Shipping.

The Fabrication supervisor is supported by seven foremen: Machining, Forming, Welding, Heat Treatment, Cleaning, Packaging, and Inspection. The Inspection foreman is supported by two Leads; Inspection, and Examination & Test. The Inspection lead performs the inspection tasks which do not require special process controls such as visual, dimensional, cleaning, and packaging inspections. The Examination and Test lead performs the more complex tasks such as dye penetrant, radiographic, ultrasonic, and hydrostatic tests. The Examination & Test lead is supported by a salary level five inspector because of the higher level of skill required for special process examination. The Inspection level three and its lower level support is considered a Quality Control operation.

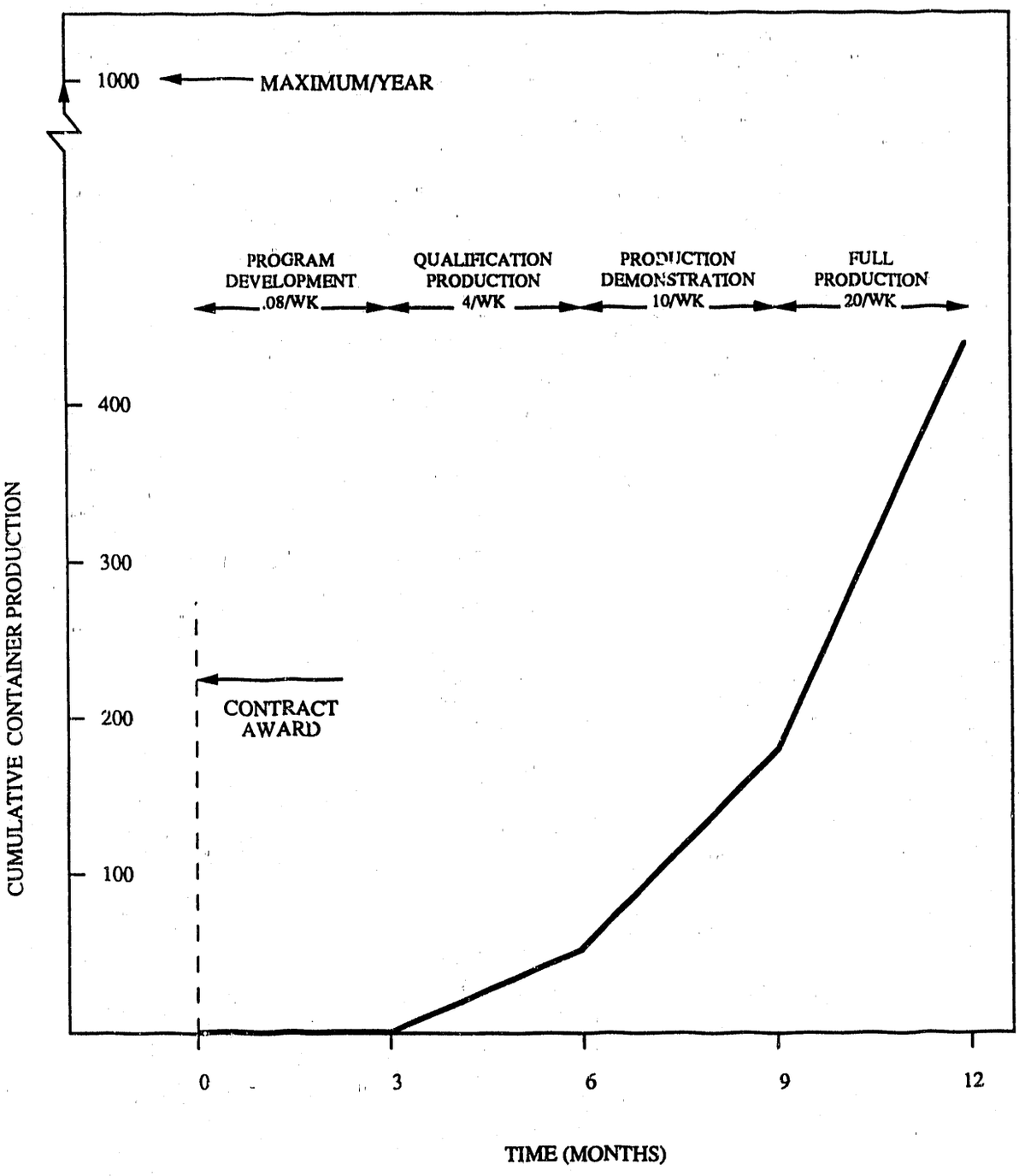


Figure B-2. Assumed 1st Year Container Production

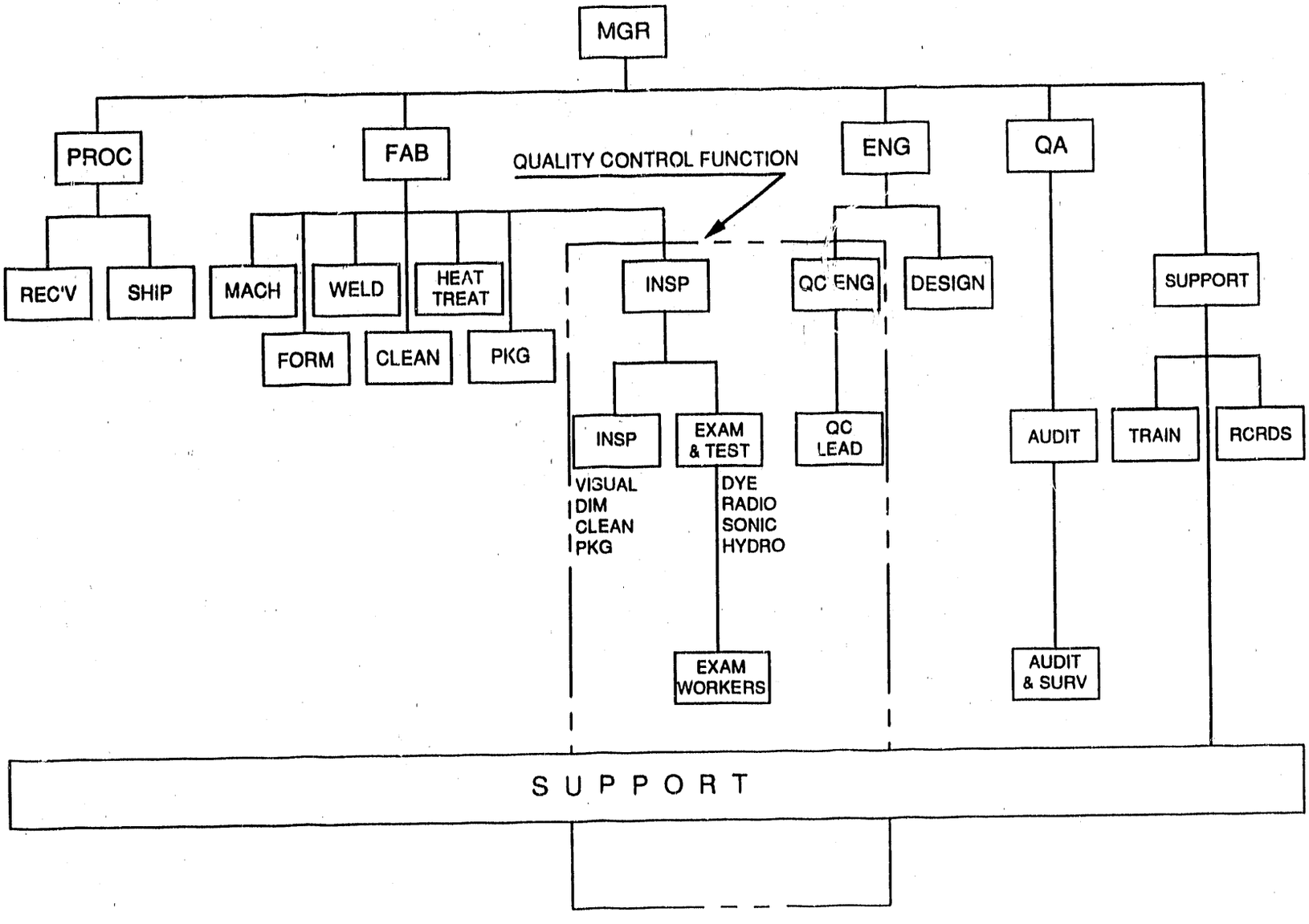


Figure B-3. Assumed Vendor Organization

The Engineering supervisor is supported by two foremen: QC Engineering, and Design. The QC Engineering staff includes a lead worker. QC Engineering is a Quality Control cost.

The Quality Assurance supervisor is supported by a QA lead and QA workers. A designated Support foreman reports directly to the Manager and is supported two leads; Training, and Records. The Support foreman also directs the secretarial and clerical support staff. Refer to Figure B-3 for an illustration of this organization.

3.3.1 Quality Assurance Functions

The model accounts for the individuals/groups who perform a quality assurance function and the number of hours per week each spends performing that function. This evaluation is made for each of the three quality phases of the manufacturing process described in Section 3.1. All of the individual/group time is not accounted for because other work would be expected in the manufacturing plant. The results of this evaluation are shown in Table B-2, "Organizational Labor Distribution - Quality Assurance," The rationale for the labor distribution is included in the table.

Table B-2 Organizational Labor Distribution - Quality Assurance

Level/Function	Prevention (mh/wk)	Appraisal (mh/wk)	Failures (mh/wk)
1/MANAGER	8.0	6.0	2.0

The managers primary function is to establish and maintain the company's commitment to the quality program. His time is spent reviewing and approving those procedures and reports developed by his supervisors.

2/SUPERVISOR (FAB)	24.0	20.0	5.0

The fabrication supervisor insures the incorporation of the quality program into the production procedures that standardize the processes. He must oversee the changes to the processes that result from the Appraisal and Failures phases.

2/SUPERVISOR (ENG)	20.0	10.0	2.0

This supervisor must implement the quality program for the engineering that supports fabrication (shop drawings, tooling designs, etc.) His time is distributed early in the program.

2/SUPERVISOR (PROC)	15.0	10.0	5.0

The procurement supervisor implements the quality program for the container materials acquisition. An assumption has also been made that he also oversees the shipping operation to the job-site.

2/SUPERVISOR (QA)	40.0	40.0	20.0

This supervisor manages the quality assurance program. He is the focal point for ensuring that the program is correctly interpreted and implemented. This position is a key contact point with YMPO. He is full time on the program until the production process matures.

Table B-2 (Continued)

Level/Function	Prevention (mh/wk)	Appraisal (mh/wk)	Failures (mh/wk)
3/FABRICATION FOREMEN	60.0	96.0	72.0

This supervisory level is required to evaluate and approve the documentation that make up the quality records. This does not include the inspection and test foremen. The labor hours are based upon six foremen spending 10 hours/week in the Prevention phase, 16 hours/week in the Appraisal phase, and 12 hours/week in the Failures phase.

3/DESIGN 5.0 10.0 20.0

This lead engineering function performs the record keeping necessary to assure that the engineering documents conform to the requirements of the quality assurance plan. For each series of container a complete design package is required to accompany the shipment. Most of this activity occurs during the Failures phase.

3/RECEIVING 10.0 10.0 10.0

This function involves the organization of the paperwork associated with material certifications and the metals sampling to verify that the materials conform to the requirements of the purchase orders.

3/SUPPORT 40.0 30.0 20.0

This function reports directly to the manager and is the focal point for problem solving of quality assurance problems in the areas of training, records, and the secretarial and clerical staff required for support of the QA program.

3/SHIPPING 10.0 15.0 20.0

This function deals with the problems of transporting the fabricated waste containers to the job-site. The containers must be under a chain-of-custody control between the vendor and the receiving warehouse.

3/AUDIT SUPPORT 40.0 40.0 20.0

This function represents the effort that will be required from ten level-3 employees to support an audit by the operating contractor selected to run the proposed repository. This audit is expected to occur once in the Prevention and Appraisal phases, and then at six month intervals. Level-3 employees have been selected as being representative of the employee distribution participating in audits.

4/TRAINING COORDINATION 40.0 30.0 8.0

The training coordinator directs preparation of the training modules that are required for the quality program. The actual modules are prepared by the line organization, but the coordinator ensures that there is a consistency of format. A major function of the position is to maintain the personnel qualification and training records.

4/FORMING 5.0 5.0 20.0

This function includes recording of the rolling and spinning processes to produce those portions of the fabrication record.

Table B-2 (Continued)

Level/Function	Prevention (mh/wk)	Appraisal (mh/wk)	Failures (mh/wk)
4/LEAD AUDITOR	40.0	40.0	40.0

The lead auditor along with the QA supervisor is qualified to lead and conduct audits. At least one internal audit/month of the vendor will be conducted in addition to two surveillances/month. In addition, one or two audits/year of the calibration and analytical laboratories will be conducted. Each audit requires approximately 160 man-hours; each surveillance requires approximately 20 man-hours. These estimates include the documentation and reports required to close out the audits and surveillances.

4/RECORDS	60.0	80.0	120.0

There are a myriad of records that need to be maintained. For each container there are inspection reports (weld, dimensional, heat treatment. packaging, cleaning, etc), material certifications, fabrication records, copies of logbook entries, and more that must be not only maintained as records, but must be provided to the job-site along with the container. Each container will be accompanied by a sizable document package.

4/MACHINING	5.0	10.0	20.0

This function involves the sampling operation for independent metals analysis by an outside laboratory. It also includes the recording of the specific material used in the fabrication of each container.

4/WELDING	5.0	10.0	20.0

This function consists of recording the weld records, the weld procedure, and supporting qualification records.

4/CLEANING	5.0	5.0	10.0

This function records the cleaning process that will be subject to inspection.

4/PACKAGING	5.0	5.0	10.0

This function records the packaging process.

5/AUDITOR	10.0	40.0	40.0

Addition audit and surveillance support is need to accomplish the appraisal functions. In addition there are periodic (weekly) reports that are generated by the audit function (e.g., QA progress reports, evaluation results, nonconformance reports, etc).

5/SURVEILLANCE	5.0	30.0	40.0

This function requires additional manpower to accomplish the required surveillances. This position also supports the audit schedule.

6/QA SUPPORT	68.0	81.0	79.0

This function is added to the total labor on the basis of an additional 15 percent of the total labor hours for each quality phase.

3.3.2 Quality Control Functions

The Quality Control functions include all the required inspections and testing: dimensional inspections, visual inspections (VT), dye penetrant testing (PT), radiographic inspections (RT), ultrasonic tests (UT), hydrostatic tests, cleaning process inspections, and all packaging and shipping inspections. During the Prevention phase QC personnel develop procedures and data forms. During the Appraisal phase, QC personnel train and perform detailed inspections. During the Failure phase, QC personnel continue to improve inspection processes, procedures, and proficiency. During Steady State production inspection efficiency peaks with an overall efficiency improvement of 10 percent assumed for the cost estimate. The labor distribution and its rationale is presented in Table B-3.

Table B-3 Organizational Labor Distribution - Quality Control

Level/Function	Prevention (mh/wk)	Appraisal (mh/wk)	Failures (mh/wk)
3/INSPECTION FOREMEN	5.0	32.0	80.0

In addition to the supervision of the inspection department, this function includes the evaluation that is required for the radiographic and ultrasonic inspections. These inspections require that an evaluation be made by a senior member of the inspection team. The foreman performs this function. Each evaluation and its report is modeled as requiring 8 hours total per container. As production increases it is expected that the reports would become more routine requiring less time for their preparation.

3/QC ENGINEERING	5.0	40.0	40.0

This function revises the fabrication design to reflect information developed during the manufacturing process. Only procedures are developed during the Prevention phase, most of the effort occurs during the Appraisal and Failures phases. There is also an incentive to reduce to cost of fabrication by increasing the reliability of the equipment and tooling.

4/DIMENSION INSPECT	5.0	16.0	40.0

The man-hours are based upon a four man-hour inspection requirement times the number of containers produced per week for the time period.

4/VISUAL INSPECTION	5.0	8.0	20.0

This function is based on a two man-hour inspection per container.

4/DYE PENETRANT	5.0	32.0	80.0

This function is based on an eight man-hour inspection per container.

4/RADIOGRAPHIC INSPECT	10.0	64.0	160.0

The function is evaluated to require 16 man-hours per container.

Table B-3 (Continued)

Level/Function	Prevention (mh/wk)	Appraisal (mh/wk)	Failures (mh/wk)
4/ULTRASONIC INSPECT	10.0	56.0	140.0
This function is modeled at 14 man-hours per container.			
4/HYDRO-TEST	5.0	16.0	40.0
This function is evaluated to require four man-hours per container.			
4/CLEANING INSPECTION	2.0	8.0	20.0
This function is modeled to require two man-hours per container.			
4/PACKAGING INSPECTION	2.0	8.0	20.0
This function is evaluated to require two man-hours per container.			
4/QC ENG SUPPORT	5.0	40.0	40.0
This function provides the liaison with the fabrication department and is evaluated as requiring the same labor effort as the QC engineering function.			
5/EXAM SUPPORT	30.0	168.0	420.0
For the more complex examinations (dye penetrant, hydro-test, radiographic, and ultrasonic) an additional level of support is evaluated as required. The labor distribution adds this salary level to those examinations per the assignment of the fourth level labor.			
6/QC SUPPORT	13.0	73.0	165.0
This function is added to the total labor on the basis of an additional 15 percent of the total labor hours for each quality phase.			

3.4 Model Cost Estimate

A summary of the quality related costs developed with the model is presented in Table B-4. These cost figures were developed with the man-loading information of subsection 3.3 (Tables B-2 and B-3) and the labor rates presented in Table B-1.

The costs were developed using a Lotus-123 spreadsheet (Lotus-123 is a registered trademark of Lotus Development Corporation). Details of the construction of the spreadsheet are presented in the following Table B-5, "Spreadsheet Construction."

TABLE B-4 - QUALITY COSTS DEVELOPED BY THE MODEL

ORG & LEV	BILLABLE HR RATE	POSITION	FUNCTION	REPORT	QA PHASES (HR/WK) PREV	APPR	FAIL	STEADY	QA PHASE COST PER WEEK PREVENTION	APPRAISAL	FAILURE	STEADY ST
A	B	C	D	E	F	G	H	I	J	K	L	M
				QUALITY ASSURANCE COSTS (LESS QUALITY CONTROL)								
QA 1	$130.42	MGR	BOSS	BOARD	8	6	2	2	$1,043	$782	$261	$235
QA 2	$72.70	SUPER	ENG	1 MGR	20	10	2	2	$1,454	$727	$145	$131
QA 2	$72.70	SUPER	FAB	1 MGR	24	20	5	5	$1,745	$1,454	$363	$327
QA 2	$72.70	SUPER	PROC	1 MGR	15	10	5	5	$1,090	$727	$363	$327
QA 2	$72.70	SUPER	QA	1 MGR	40	40	20	18	$2,908	$2,908	$1,454	$1,309
QA 3	$53.64	FOREMAN	DESIGN	2 ENG	5	10	20	18	$268	$536	$1,073	$966
QA 3	$53.64	FOREMAN	FAB	2 FAB	60	96	72	65	$3,218	$5,149	$3,862	$3,476
QA 3	$53.64	FOREMAN	RECEIV	2 PROC	10	10	10	9	$536	$536	$536	$483
QA 3	$53.64	FOREMAN	SUPPORT	1 MGR	40	30	20	18	$2,146	$1,609	$1,073	$966
QA 3	$53.64	FOREMAN	SHIP	2 PROC	10	15	20	18	$536	$805	$1,073	$966
QA 3	$53.64	FOREMAN	AUDIT SUP	1 AUDIT	40	40	20	18	$2,146	$2,146	$1,073	$966
QA 4	$44.50	LEAD	AUDIT	2 QA	40	40	40	36	$1,780	$1,780	$1,780	$1,602
QA 4	$44.50	LEAD	CLEAN	3 CLEAN	5	5	10	9	$222	$222	$445	$400
QA 4	$44.50	LEAD	FORM	3 FORM	5	5	20	18	$222	$222	$890	$801
QA 4	$44.50	LEAD	MACH	3 MACH	5	10	20	18	$222	$445	$890	$801
QA 4	$44.50	LEAD	PKG	3 PKG	5	5	10	9	$222	$222	$445	$400
QA 4	$44.50	LEAD	RECORDS	3 SUPP	60	80	120	108	$2,670	$3,560	$5,340	$4,806
QA 4	$44.50	LEAD	TRAIN	3 SUPP	40	30	8	7	$1,780	$1,335	$356	$320
QA 4	$44.50	LEAD	WELD	3 WELD	5	10	20	18	$222	$445	$890	$801
QA 5	$35.69	WORKER	AUDIT	4 AUDIT	10	40	40	36	$357	$1,428	$1,428	$1,285
QA 5	$35.69	WORKER	SURV	4 AUDIT	5	30	40	36	$178	$1,071	$1,428	$1,285
		QA WEEKLY TOTALS			452	542	524	472	$24,968	$28,110	$25,167	$22,650
QA 6	$26.90	QA WEEKLY SUPPORT			68	81	79	71	$1,824	$2,187	$2,115	$1,903
		QA WEEKLY SUMMATION			520	623	603	542	$26,792	$30,297	$27,281	$24,553
		QA COST PER CONTAINER			6498	156	60	27	$334,901	$7,574	$2,728	$1,228

FILE: EST-QA.WK1

TABLE B-4 - QUALITY COSTS DEVELOPED BY THE MODEL

ORG & LEV	BILLABLE HR RATE	POSITION	FUNCTION	REPORT	QA PHASES (HR/WK) PREV	APPR	FAIL	STEADY	QA PHASE COST PER WEEK PREVENTION	APPRAISAL	FAILURE	STEADY ST
A	B	C	D	E	F	G	H	I	J	K	L	M
					QUALITY CONTROL COSTS							
QC 3	$53.64	FOREMAN	INSP/TST	2 FAB	5	32	80	144	$268	$1,716	$4,291	$7,724
QC 4	$44.50	LEAD	CLEAN	3 INSP	2	8	20	36	$89	$356	$890	$1,602
QC 4	$44.50	LEAD	DIMEN	3 INSP	5	16	40	72	$222	$712	$1,780	$3,204
QC 4	$44.50	LEAD	DYE	3 INSP	5	32	80	144	$222	$1,424	$3,560	$6,407
QC 4	$44.50	LEAD	HYDRO	3 INSP	5	16	40	72	$222	$712	$1,780	$3,204
QC 4	$44.50	LEAD	PKG	3 INSP	2	8	20	36	$89	$356	$890	$1,602
QC 4	$44.50	LEAD	RADIO	3 INSP	10	64	160	288	$445	$2,848	$7,119	$12,815
QC 4	$44.50	LEAD	SONIC	3 INSP	10	56	140	252	$445	$2,492	$6,229	$11,213
QC 4	$44.50	LEAD	VISUAL	3 INSP	5	8	20	36	$222	$356	$890	$1,602
QC 3	$53.64	FOREMAN	QC ENG	2 ENG	5	40	40	72	$268	$2,146	$2,146	$3,862
QC 4	$44.50	LEAD	QC ENG	3 QC	5	40	40	72	$222	$1,780	$1,780	$3,204
QC 5	$35.69	WORKER	EXAM	4 EXAM	30	168	420	756	$1,071	$5,996	$14,989	$26,980
		QC WEEKLY TOTALS			89	488	1100	1980	$3,787	$20,893	$46,344	$83,418
QC 6	$26.90	QC WEEKLY SUPPORT			13	73	165	297	$359	$1,969	$4,439	$7,990
		QC WEEKLY SUMMATION			102	561	1265	2277	$4,147	$22,862	$50,783	$91,409
		QC COSTS PER CONTAINER			1279	140	127	114	$51,831	$5,716	$5,078	$4,570
				SUMMATION OF QUALITY ASSURANCE & QUALITY CONTROL COSTS								
		GRAND TOTAL WEEKLY COSTS			622	1185	1868	2819	$30,939	$53,159	$78,064	$115,962
		TOTAL COSTS PER CONTAINER			7777	296	187	141	$386,732	$13,290	$7,806	$5,798

FILE: EST-QA.WK1

Table B-5 Spreadsheet Construction

The columns of the spreadsheet were set up as follows:

Column	Description	Relationship
	Quality Assurance Costs	
A	Organization and salary level	
B	Billable hourly rate	
C	Position (reflecting salary level)	
D	Organizational function	
E	Reporting relationship	
F	QA Phase - Prevention (Hrs/Wk)	
G	QA Phase - Appraisal (Hrs/Wk)	
H	QA Phase - Failures (Hrs/Wk)	
I	QA Period - Steady State (Hrs/Wk)	I = H x 0.9

The reduction of the hours in the steady state period reflect the more efficient application of the program.

J	Prevention ($/Wk)	J = B x F
K	Appraisal ($/Wk)	K = B x G
L	Failures ($/Wk)	L = B x H
M	Steady State ($/Wk)	M = B x I

The weekly totals direct labor costs were summed from the columns. The weekly support hours were calculated on the basis 15 percent of the total direct hours. Values for the cost per container were obtained by normalization to the weekly container output for the phase or period (from Fig. B-2).

Quality Control Costs

The quality control inspection hours were generated from the estimated man-hours per inspection times the number of containers produced in that phase or period (from Fig. B-2). For the steady state period, man-hours required for each inspection were reduced by 10 percent to account for increased efficiency in the inspection processes.

Total Quality Costs

The total QA/QC related costs and cost per container are summations of the quality assurance and quality control values.

3.4.1 Model Cost Estimate Analysis

The steady state cost of quality (QA and QC) is calculated on the basis of the input for the forth quarter. The model reports total quality costs per container of $5,798 of which 79 percent ($4,570) is attributable to quality control. This cost represents the cost of quality for a manufacturing process that has successfully implemented a quality assurance program: the quality program/fabrication process has matured, production goals and required quality levels have been achieved, and learning curves have significantly contributed to quality improvement.

This steady state cost represents 8.9 percent of the average vendor total waste container cost. This is higher than the quality related costs developed by the three vendors (2.0 to 5.5 percent). The disagreement is attributed to the effort required to comply with the Yucca Mountain Project quality requirements versus the ASME Boiler and Pressure Vessel Code, Section VIII, common to vendor industry fabricators. The vendors did not submit binding, fixed cost contract proposals.

3.4.2 Methodology Uncertainty/Sensitivity

The overall uncertainty of the cost estimate of total quality related costs (QA and QC) is estimated to be twenty percent.

Sensitivity of the model to variations in labor rates and quality control inspection durations were evaluated by varying the input parameters. A ten percent variation in the labor rates produces, as expected, a ten percent variation (+/- $580) in total quality costs (QA and QC). While use of LLNL labor rates may not reflect costs than would be representative of the rest of the U.S., the selection of a 2.4 multiplier is evaluated as being appropriate for a vendor who must commit sizable equipment and resources early in the contract life.

The labor rates used in the model average $41.14/hr for QA and QC. The labor rates used by the vendors for QA and QC range from $43.50/hr to $52/hr. With the average vendor QA/QC rate (48.50/hr), the QA/QC cost per container would increase to $6,836 (10.4 percent of the average vendor container cost).

The man-hour estimate for the inspection and test functions has the highest degree of uncertainty. The inspection and test durations and staffing could change significantly with automation. A ten percent variation in the man-hours of the quality control inspections produces a 7.9 percent variation in total quality costs (+/- $457).

No cost allowance has been provided for material scrap on the basis that less than one percent of the containers that fail inspections would be scrapped. The containers which fail QC inspections are assumed to be reworked.

No cost allowance has been provided for metallurgical analysis or maintenance of M&TE. These costs would be expected to be no more than $2,000/month.

4.0 PRICE ESTIMATE EVALUATION

This section presents an evaluation of the vendor price estimates for quality assurance and quality control (inspection). The results of the model are also compared with the averages of the vendor values. A summary of vendor quality related costs is presented in Table B-6 for the three container types selected.

Table B-6 Vendor Quality Cost Summary (Per Container)

Vendor	QC	%	QA	%	Total	%
Container Type 1 - (26-in OD x 126-in LG, for High-Level Waste)						
Copper-Nickel Alloy - C71500						
A	$ 930	2.1	$ 250	0.6	$1,180	2.6
B	$2,260	4.7	$ 392	0.8	$2,652	5.5
C	$1,775	2.9	$1,038	1.7	$2,813	4.6
Nickel-Iron-Chromium-Molybdenum-Copper Alloy - N08825						
A	$ 930	1.6	$ 250	0.4	$1,180	2.0
B	$2,263	4.2	$ 392	0.7	$2,655	4.8
C	$1,775	2.9	$1,038	1.7	$2,813	4.6
Container Type 2 - (26-in OD x 187.5-in LG, 6-PWR Assy, Fuel Rods)						
Copper-Nickel Alloy - C71500						
A	$1,380	2.4	$ 360	0.6	$1,740	3.0
B	$2,524	4.2	$ 436	0.7	$2,960	4.9
C	$1,983	2.8	$1,220	1.7	$3,203	4.5
Nickel-Iron-Chromium-Molybdenum-Copper Alloy - N08825						
A	$1,380	1.9	$ 360	0.5	$1,740	2.4
B	$2,524	3.6	$ 436	0.6	$2,960	4.3
C	$1,983	2.7	$1,220	1.7	$3,203	4.4
Container Type 3 - (28-in OD x 187.5-in LG, for 10-BWR Assy)						
Copper-Nickel Alloy - C71500						
A	$1,380	2.1	$ 360	0.5	$1,740	2.7
B	$2,524	4.0	$ 436	0.7	$2,960	4.6
C	$1,983	2.5	$1,220	1.5	$3,203	4.0
Nickel-Iron-Chromium-Molybdenum-Copper Alloy - N08825						
A	$1,380	1.7	$ 360	0.4	$1,740	2.1
B	$2,524	3.4	$ 436	0.6	$2.960	4.0
C	$1,983	2.5	$1,220	1.5	$3.203	4.0

As illustrated, the vendor estimated quality assurance related costs range from 0.4 to 1.7 percent of their total container cost, while quality control related costs range from 1.6 to 4.7 percent. The total quality related costs range from 2.0 to 5.5 percent of their total container cost. Note that these costs appear to be independent of their total container costs, because the same costs are estimated for most container types.

A better comparison of the QA/QC estimates of the three vendors is made by examining the detail of the individual components making up one selected container. A typical waste container, the 26-inch diameter container for consolidated fuel rods from six PWR assemblies, is used to compare the QA/QC related costs. This comparison is shown in Table B-7, "Quality Cost Detail for One Container." For each vendor the quality control and quality assurance estimates are the same for each of the two metal alloys evaluated. The QA/QC related values for the stainless inserts are also identical except for Vendor B where the inserts vary slightly depending upon their configuration.

Table B-7 Quality Cost Detail for One Container

VENDOR	UNIT	QC	HRS	QA	HRS	TOTALS	
A	Upper Head	$225	4.5	$50	1.0	$275	5.5
B	Upper Head	$305	7.0	$44	1.0	$349	8.0
C	Upper Head	$417	8.0	$254	4.9	$671	12.9
A	Lower Body	$755	15.1	$200	4.0	$955	19.1
B	Lower Body	$1,958	45.0	$348	8.0	$2,306	53.0
C	Lower Body	$1,358	26.0	$784	15.0	$2.142	41.0
A	Internals	$400	8.0	$110	2.2	$520	10.2
B	Internals	$261	6.0	$44	1.0	$305	7.0
C	Internals	$208	4.0	$182	3.5	$390	7.5
A	Container	$1.380	27.6	$360	7.2	$1,740	34.8
B	Container	$2,524	58.0	$436	10.0	$2,960	68.0
C	Container	$1,983	38.0	$1,220	23.4	$3,203	61.4
AVERAGE	Container	$1.962	41.2	$672	13.5	$2,634	54.7
	MODEL	$4,171	99.0	$1,133	23.6	$5,304	122.6

The quantities generated with the model are the direct hours and costs. The 15 percent support hours and costs are not included for this comparison.

Vendor C has the most recent experience working with NQA-1 requirements and the QA hours reported agree closely with the independent model. The YMP QA Plan requirements for administrative procedures, processes, approvals, and records exceed the requirements of NQA-1.

Inspection (quality control) man-hours generated with the model are a factor of more than two (2X) higher than the average of vendor estimates. This can be attributed to either conservative inspection estimates in the model, or to low estimates by the vendors.

The higher estimate is preferred in this report because the higher estimate is based upon a deterministic derivation, and because of the critical dependency of waste containment upon the demonstrable integrity of the container materials and closures through in-process inspections and post-fabrication, non-destructive examinations.

Appendix C. Discussion of Results, Lawrence Livermore National Laboratory

Contents

LLNL considers the container cost estimate process conducted by B&W to be a sound economic study, especially under the terms of the workscope submitted by B&W to the vendors. This workscope was well thought out considering that a well-established container design did not exist, and orders were not forthcoming in the near future. This latter factor, no near-term orders, most likely affected the amount of detail included in the estimates by the vendors, which consequently affected the final container costs. Although the bottom line estimates among vendors are good, the variations in cost details are indicative of uncertainty in the estimation process. B&W was very creative in the development of the vendor list and demonstrated their expertise in development of the process manufacturing steps. This process resulted in a structured estimate for a certifiable container. Although the roll-and-weld plus thermal/mechanical treatment is the container fabrication process selected for this study, other process recommended by B&W could also be appropriate for the production of containers (see "Trade-offs" section below). The process assumed for this container production cost study reflects work performed by B&W over the past few years in container fabrication process development,[1] and was judged by B&W to be conservative in terms of the current state-of-the art. Thus, until a definite container design is established, these independent estimates are tentative.

To facilitate escalations and changes in the future, LLNL took the vendor data sheets and reconfigured them into a spreadsheet format to calculate total container costs. There were also some minor arithmatical errors in the data sheets which were corrected in the spreadsheets. This spreadsheet configuration is discussed below.

Container Fabrication Spreadsheets

Information from all three vendors for three container types and two metals is presented in this appendix (see Attachment C1). Information is provided for four categories: raw material, materials (e.g., expendable and tooling), labor, and component totals. Raw material costs ($/lb) have been calculated by dividing the component costs by the component weights.

The three container types selected are as follows:

1. A 26-inch-diameter high-level waste container (intended to hold vitrified waste from the Defense Waste Processing Facility or the West Valley Demonstration Project).
2. A 26-inch-diameter container intended to hold consolidated fuel rods from six PWR fuel assemblies.
3. A 28-inch-diameter container intended to hold ten intact BWR fuel assemblies.

The individual vendor tables are organized identically: first a summary of the three container types for each material; then the detailed information of the production processes. The detail addresses C71500 material first, then N08825 material, and finally the stainless internals (S30403). The detailed information is first presented as a summary of components of the container; then the details of production of individual components. The values immediately below the dashed lines are the summary values of the operations required for that component production. These operations are identified in a Description column.

A component detail is entered in the spreadsheet only once, but its summary values may be utilized often. Thus the same stainless internals are used in more than one container summary. The detailed vendor information includes stainless internals for five configurations, however, only two were selected to represent the containers of the estimate. The internals selected represent the upper cost range for most configuraitons.

Each of the four tables in this appendix were developed using a Lotus-123 spreadsheet. (Lotus-123 is a registered trademark of the Lotus Development Corporation). A code of accounts was established for each of the production operations. The account code is read as follows: The first two digits indicate the nominal diameter in inches. The next two characters indicate the container length: S = short, L = long, SL = either. A zero is used in the fourth position if not letter indicator is needed. The fifth character indicates the vendor: A, B, or C. The sixth character is reserved to indicate a complete container: C = C71500 material, N = N08825 material. The seventh character indicates the type of internal structure used in the complete container: 6 = fuel rods consolidated from 6-PWR assemblies, 9 = 10-BWR fuel assemblies.

The eighth and ninth characters of the account code are unique to each component and the raw material used for fabrication as follows:

1C – 26-inch diameter short lower unit (C71500 material, 1N for N08825 material, typical)
2C – 26-inch dia long lower unit
3C – 28-inch dia long lower unit
4C – 26-inch dia upper head;
5C – 28-inch dia upper head;
6S – Stainless internals, 6 PWR ass'y fuel rods (26-inch dia)
7S – Stainless internals, 3 PWR ass'y (26-inch dia)
8S – Stainless internals, 3PWR/4BWR ass'y (28-inch dia)
9S – Stainless internals; 10-BWR assembly (28-inch dia)
10S – Stainless internals; 4 Pwr ass'y (28-inch dia)

The tenth and eleventh characters are the sequence of operation of the production process; with the double zero operation at the top, immediately below the dashed line, the summation of the process.

Implementing Procedure Assumptions

For the purpose of obtaining the container costs estimate data, the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, (ASME BPV Code), was selected as the basis of container fabrication. This assumption was made for convenience, since it is well-used and accepted in the tank-manufacturing industry, and more responses to the RFP would be expected from prospective vendors (than if the YMP QA specifications were used). This assumption definitely has affected the cost data received, and a comparison of the ASME BPV Code with the YMP QA specifications is required to assess the impact of this assumption on the container costs reported.

In general, it can be concluded that the reported container costs are low because of the selection of the ASME BPV Code as a standard instead of Ref. 2. This is apparent in the case of Vendor C (Weldco), which has been qualified to actually perform work under Ref. 2, and thus, has a working understanding of the budgetary requirements associated with implementing the YMP QA specification.

Cost of Inertia Welded Container

The assumed final closure method for the containers is the repository reference inertia welding process. Reference 3 presents details of the repository preliminary conceptual designs for the container welding hot cell. Choice of the inertia welding process dictated from the container design include a holding flange on the lower unit and holding flats on the top head. Fabrication of containers with these necessary details is more expensive than fabrication of a simple right-circular cylindrical design. Referring to the detailed cost breakdown structure presented in Table A-1, the following manufacturing steps would definitely be affected for the lower unit:

"Step 3" (S.3):	Fabricate the lower unit flange blank;
"Step 6" (S.6):	Join the flange blank to the lower unit;
"Step 8" (S.8):	Machine the lower unit;
"Step 10" (S.10):	QA and documentation.

For the upper head, the following fabrication steps would be affected:

"Step 5" (S.5):	Machine the upper head;
"Step 7" (S.7):	QA and documentation.

The total estimated costs (Table C-1) of the two inertia-welding-process features were calculated using the following relationship.

Lower unit flange:

$$S.3 + S.6 + S.8 + \frac{S.3 + S.6 + S.8}{\text{Sum of S.1 to S.11}} (S.10)$$

Plus upper head flange:

$$S.5 + \frac{S.5}{\text{Sum of S.1 to S.8}} (S.7)$$

Trade-offs

An example of fabrication trade-offs that will affect the container costs are related to the following: lower unit manufacture by either (1) roll-and weld construction with final anneal heat treatment (ROLL-WELD); or (2) by the process assumed in this study, which is roll-and-weld construction followed by thermal and mechanical processing cycles and a final anneal heat treatment (ROLL-WELD/THERMO-MECH).

The ROLL-WELD/THERMO-MECH process has more manufacturing steps and, thus, is more expensive than the ROLL-WELD to produce. However, cost savings can be gained in the nondestructive evaluation (NDE) of the final product. If the ROLL-WELD/THERMO-MECH process is successful in providing recrystallized welds, as desired, then it is possible that the NDE process steps for certification of the container longitudinal and girth welds may be reduced at a substantial cost savings.

The goal of the container fabrication process development activity[1] was to develop a manufacturing process for the container that would approach a microstructure of a completely wrought unit such as that made by back-extruding a billet to make a one-end closed cylinder that is subsequently cold-worked and annealed. For this study, it was assumed that the ROLL-WELD/THERMO-MECH would be more cost-effective than a back-extension fabrication process, and would produce a like container microstructure.

Other processes recommended by B&W in phase I of the container fabrication process development activity, in general, appeared not to be economical from the standpoint of fabrication of a limited number of parts, mostly because of the very large cost initially incurred for development of the required tooling. On a production basis, however, the following processes identified by B&W may prove to be more cost-

effective than ROLL-WELD/THERMO-MECH for the manufacture of YMP containers, especially after the first five years of production:

- Closed-end extrusion for fabrication of a integral lower unit. This process utilizes a forged billet and substantial tooling.
- Deep Drawing for fabrication of a two-piece lower unit: Two half-length closed-end cylinders are deep drawn. A lower unit is made by cutting-off one end to make the upper head, and then girth-welding the remaining open-cylinder to the other closed-end cylinder. The weld and heat-affected-zone regions can be thermally/mechanically processed (in a similar way that was planned for the ROLL-WELD/THERMO-MECH process) by utilization of alternating cycles as required of "ironing" (wall-thinning) and heat treatment. The deep drawing process utilizes plate, and has very little material wastage.
- Centrifical Casting for fabrication of a seamless body preform (heavy wall cylinder). This preform is girth-welded to a bottom head, and is then thermally/mechanically processed as necessary to produce a container with a wrought-like microstructure.

Cost of 304L Containers

There was no directive from DOE to obtain vendor estimates for containers fabricated from AISI-304L stainless steel. However, since 304L is an SCP reference material, and an earlier estimate was provided in the MRS Systems Study,[4] it was of interest to approximate the cost of containers fabricated from this material using the current economic analysis. The cost of AISI-304L containers estimated by B&W using vendor data for Alloy 825 is shown in Table C-2. These costs were estimated based on the following assumptions:

1. Raw material costs of 304L = 0.365 × cost of alloy 825. This is based on $2.17/lb for 304L and $5.94/lb Alloy 825.
2. Fabrication costs are lower than either those for CDA 715 and Alloy 825 such that expendable and labor costs (ELC) for 304L = CDA715-ELC – (825-ELC – CDA715-ELC). These estimated costs are calculated in Table C-2.

References

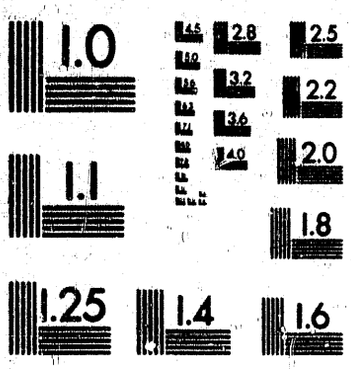
1. H.A. Domian et al., *Fabrication Development for High-Level Nuclear Waste Containers for the Tuff Repository, Phase I Final Report,* Lawrence Livermore National Laboratory, Livermore, CA, UCRL-15965 (1989).
2. *LLNL Yucca Mountain Project Quality Assurance Requirements Specification for Babcock and Wilcox,* QARS-001A, Revision 0 (February 10, 1989).
3. D. Bem, T. Sinagra, D. Miller, *Selected Physical Characteristics of Waste-Handling Equipment,* Bechtel National, Inc., San Francisco, CA, Report R210M003 (May 1989).
4. T. A. Nelson, E. W. Russell, et al., *Yucca Mountain Project Waste Package Design for MRS System Studies,* Lawrence Livermore National Laboratory, Livermore, CA, UCID-21700 (1989).

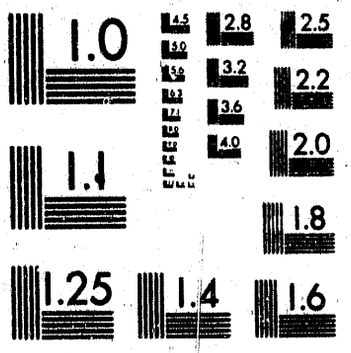
Table C–1. Estimated cost container design features dictated by inertia-welding process.

Container configuration	Cost for lower flange plus upper flats ($) Vendor		
	A	B	C
		CDA 715 Alloy	
26S and 26L	4,399	4,798	7,539
28L	5,108	4,982	8,254
		Alloy 825	
26S and 26L	6,750	5,313	7,550
28L	8,137	5,307	8,268

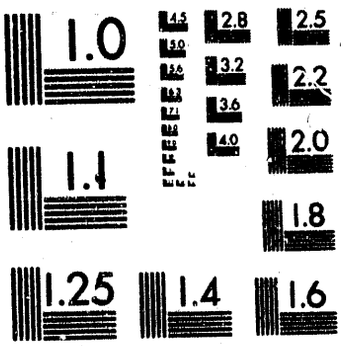
Table C–2. Estimated cost of AISI 304L containers ($/container).

Container configuration	Vendor		
	A	B	C
26S	30,527	31,946	38,813
26L	35,140	36,902	44,296
28L	39,063	38,802	50,238





MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A



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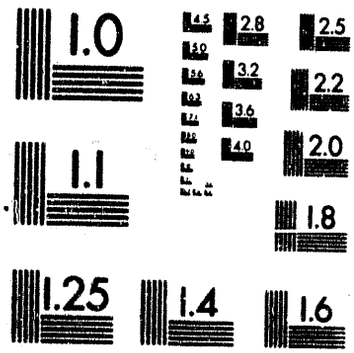

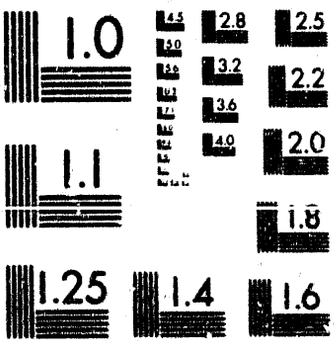

Attachment C-1
LLNL/KE Generated Cost Summary Spreadsheets

TABLE C-3 CONTAINER FRABRICATION PRICE ESTIMATE - ALL VENDORS

FOR INFORMATION ONLY

	DESCRIPTION	RAW MATERIAL WT	$/LB	$/COMP	MATERIALS EXPEND	TOOLS	SHIP	LABOR ENGINEERING COST	HRS	MANUFACTURING COST	HRS	INSPECTION COST	HRS	Q/A COST	HRS	COMPONENT TOTALS HRS	COST	REMARKS
C71500 MAT'L (70/30 Copper/Nickel Alloy)																		
VENDOR - A	CONTAINER-HLW 26S	3667	$7.03	$25,775	$9,201	$213	$599	$720	9.6	$7,125	142.5	$930	18.6	$250	5.0	176	$44,813	HLW Container (DWPF,WVDP)
VENDOR - B	CONTAINER-HLW 26S	3037	$9.03	$27,432	$12,886	$320	$1,100	$218	5.0	$3,547	81.5	$2,260	52.0	$392	9.0	148	$48,155	HLW Container (DWPF,WVDP)
VENDOR - C	CONTAINER-HLW 26S	4381	$7.17	$31,395	$3,256	$29	$1,684	$60	1.2	$21,273	220.5	$1,775	34.0	$1,038	19.9	276	$60,510	HLW Container (DWPF,WVDP)
VENDOR - A	CONTAINER-6PWR 26L	5115	$6.23	$31,890	$12,503	$337	$834	$885	11.8	$9,900	198.0	$1,380	27.6	$360	7.2	245	$58,089	Fuel Container 26-in OD (6 PWR,CONS)
VENDOR - B	CONTAINER-6PWR 26L	5137	$6.85	$35,172	$15,594	$320	$1,100	$218	5.0	$4,743	109.0	$2,524	58.0	$436	10.0	182	$60,107	Fuel Container 26-in OD (6 PWR,CONS)
VENDOR - C	CONTAINER-6PWR 26L	5347	$6.89	$36,862	$3,823	$37	$2,093	$85	1.7	$25,158	263.0	$1,983	38.0	$1,220	23.4	326	$71,261	Fuel Container 26-in OD (6 PWR,CONS)
VENDOR - A	CONTAINER-10BWR 28L	5883	$6.06	$35,637	$13,966	$390	$928	$885	11.8	$11,925	238.5	$1,380	27.6	$360	7.2	285	$65,471	Fuel Container 28-in OD (10 BWR)
VENDOR - B	CONTAINER-10BWR 28L	5532	$6.84	$37,815	$16,404	$320	$1,100	$218	5.0	$4,917	113.0	$2,524	58.0	$436	10.0	186	$63,734	Fuel Container 28-in OD (10 BWR)
VENDOR - C	CONTAINER-10BWR 28L	6361	$6.55	$41,644	$4,110	$38	$2,336	$85	1.7	$28,267	275.5	$1,983	38.0	$1,220	23.4	339	$79,683	Fuel Container 28-in OD (10 BWR)
N08825 MAT'L (High Nickel Austenitic Steel)																		
VENDOR - A	CONTAINER-HLW 26S	3336	$11.30	$37,707	$10,675	$213	$599	$720	9.6	$7,925	158.5	$930	18.6	$250	5.0	192	$59,019	HLW Container (DWPF,WVDP)
VENDOR - B	CONTAINER-HLW 26S	2766	$11.92	$32,962	$13,692	$320	$1,100	$218	5.0	$3,547	81.5	$2,263	52.0	$392	9.0	148	$54,494	HLW Container (DWPF,WVDP)
VENDOR - C	CONTAINER-HLW 26S	3938	$7.88	$31,022	$3,256	$26	$1,639	$60	1.2	$22,946	220.5	$1,775	34.0	$1,038	20.4	276	$61,762	HLW Container (DWPF,WVDP)
VENDOR - A	CONTAINER-6PWR 26L	4702	$9.32	$43,827	$14,351	$337	$834	$885	11.8	$10,850	217.0	$1,380	27.6	$360	7.2	264	$72,824	Fuel Container 26-in OD (6 PWR,CONS)
VENDOR - B	CONTAINER-6PWR 26L	4795	$9.07	$43,472	$16,657	$320	$1,100	$218	5.0	$4,656	107.0	$2,524	58.0	$436	10.0	180	$69,383	Fuel Container 26-in OD (6 PWR,CONS)
VENDOR - C	CONTAINER-6PWR 26L	4831	$7.53	$36,370	$3,823	$37	$2,003	$85	1.7	$27,267	259.5	$1,983	38.0	$1,220	23.4	323	$72,788	Fuel Container 26-in OD (6 PWR,CONS)
VENDOR - A	CONTAINER-10BWR 28L	5450	$9.13	$49,757	$16,024	$390	$933	$885	11.8	$12,975	259.5	$1,380	27.6	$360	7.2	306	$82,704	Fuel Container 28-in OD (10 BWR)
VENDOR - B	CONTAINER-10BWR 28L	5139	$9.02	$46,348	$17,579	$320	$1,100	$218	5.0	$4,743	109.0	$2,524	58.0	$436	10.0	182	$73,268	Fuel Container 28-in OD (10 BWR)
VENDOR - C	CONTAINER-10BWR 28L	5833	$7.11	$41,448	$4,110	$38	$2,246	$85	1.7	$29,467	275.5	$1,983	38.0	$1,220	23.4	339	$80,597	Fuel Container 28-in OD (10 BWR)

TABLE C-4 CONTAINER FABRICATION PRICE ESTIMATE - VENDOR - A

FOR INFORMATION ONLY

		RAW MATERIAL			MATERIALS			LABOR								COMPONENT TOTALS		Estimate sums up to the shaded top line to total value for each component/container type.
								ENGINEERING		MANUFACTURING		INSPECTION		Q/A				
	DESCRIPTION	WT	$/LB	$/COMP	EXPEND	TOOLS	SHIP	COST	HRS	COST	HRS	COST	HRS	COST	HRS	HRS	COST	REMARKS
	C71500 MAT'L																	
26S0AC00000	CONTAINER-HLW 26S	3667	$7.03	$25,775	$9,201	$213	$599	$720.0	9.6	$7,125	142.5	$930	18.6	$250	5.0	176	$44,813	HLW Container (DWPF,WVDP)
26L0AC60000	CONTAINER-6PWR 26L	5115	$6.23	$31,890	$12,503	$337	$834	$885.0	11.8	$9,900	198.0	$1,380	27.6	$360	7.2	245	$58,089	Fuel Container 26-in OD (6 PWR,CONS)
28L0AC90000	CONTAINER-10BWR 28L	5883	$6.06	$35,637	$13,966	$390	$928	$885.0	11.8	$11,925	238.5	$1,380	27.6	$360	7.2	285	$65,471	Fuel Container 28-in OD (10 BWR)
	N08825 MAT'L																	
26S0AN00000	CONTAINER-HLW 26S	3336	$11.30	$37,707	$10,675	$213	$599	$720.0	9.6	$7,925	158.5	$930	18.6	$250	5.0	192	$59,019	HLW Container (DWPF,WVDP)
26L0AN60000	CONTAINER-6PWR 26L	4702	$9.32	$43,827	$14,351	$337	$834	$885.0	11.8	$10,850	217.0	$1,380	27.6	$360	7.2	264	$72,824	Fuel Container 26-in OD (6 PWR,CONS)
28L0AN90000	CONTAINER-10BWR 28L	5450	$9.13	$49,757	$16,024	$390	$933	$885.0	11.8	$12,975	259.5	$1,380	27.6	$360	7.2	306	$82,704	Fuel Container 28-in OD (10 BWR)
	C71500 MAT'L																	
26S0AC00000	CONTAINER-HLW 26S	3667	$7.03	$25,775	$9,201	$213	$599	$720.0	9.6	$7,125	142.5	$930	18.6	$250	5.0	176	$44,813	HLW Container (DWPF,WVDP)
26S0A001C00	LOWER UNIT (LU)	2451	$6.93	$16,987	$8,993	$198	$403	$585.0	7.8	$5,625	112.5	$705	14.1	$200	4.0	138	$33,696	Container 26-in OD, LOWER UNIT
26S0A004C00	UPPER HEAD (UH)	1216	$7.23	$8,788	$208	$15	$196	$135.0	1.8	$1,500	30.0	$225	4.5	$50	1.0	37	$11,117	Container 26-in OD, UPPER HEAD
26S0A001C00	LOWER UNIT (LU) 26S	2451	$6.93	$16,987	$8,993	$198	$403	$585.0	7.8	$5,625	112.5	$705	14.1	$200	4.0	138	$33,696	HLW Container, LOWER UNIT
26S0A001C01	BOTTOM HD (BH)	895	$6.85	$6,131	$0	$5	$6	$75.0	1.0	$400	8.0	$50	1.0	$5	0.1	10	$6,672	NOTE 9 (RAW MAT'L)
26S0A001C02	BODY	1373	$6.24	$8,568	$480	$18	$20	$75.0	1.0	$1,400	28.0	$50	1.0	$5	0.1	30	$10,616	NOTE 1 (EXPEND)
26S0A001C03	FLANGE RING	183	$12.50	$2,288	$0	$0	$2	$7.5	0.1	$200	4.0	$5	0.1	$5	0.1	4	$2,508	NOTE 3 (RAW MAT'L)
26S0A001C04	JOIN BH TO BODY	-	-	-	$280	$10	-	$75.0	1.0	$1,500	30.0	$50	1.0	$10	0.2	32	$1,925	NOTE 2 (EXPEND)
26S0A001C05	SPIN FORM BODY	-	-	-	$6,828	$0	$125	$75.0	1.0			$50	1.0	$10	0.2	2	$7,088	
26S0A001C06	JOIN FLANGE TO BODY	-	-	-	$60	$5		$75.0	1.0	$275	5.5	$50	1.0	$5	0.1	8	$470	
26S0A001C07	ANNEAL LU	-	-	-	$100	$10		$37.5	0.5	$250	5.0	$50	1.0	$5	0.1	7	$453	
26S0A001C08	MACH FLANGE & THROAT	-	-	-	$25	$10	$0	$15.0	0.2	$400	8.0	$50	1.0	$5	0.1	9	$505	
26S0A001C09	INSP/TEST/CLEAN	-	-	-	$770	$30	$0	$150.0	2.0	$800	16.0	$300	6.0	$50	1.0	25	$2,100	NOTE 5 (INSP),NOTE 7 (TOOLS)
26S0A001C10	QA & DOCUMENT	-	-	-										$100	2.0	2	$100	
26S0A001C11	PKG & SHIP	-	-	-	$450	$10	$250			$400	8.0	$50	1.0			9	$1,160	NOTE 6 (MANUF), NOTE 8 (EXPEND)
26S0A001C12	ADD'L TOOLING	-	-	-		$100										0	$100	
26SLA004C00	UPPER HEAD (UH)	1216	$7.23	$8,788	$208	$15	$196	$135.0	1.8	$1,500	30.0	$225	4.5	$50	1.0	37	$11,117	Container 26-in OD, UPPER HEAD
26SLA004C01	MAKE UH	1039	$6.84	$7,107			$60	$37.5	0.5							1	$7,205	
26SLA004C02	MAKE PINTLE	177	$9.50	$1,681			$11	$37.5	0.5	$100	2.0	$25	0.5			3	$1,855	NOTE 1 (RAW MAT'L)
26SLA004C03	JOIN PINTLE TO HEAD	-	-	-	$13	$15		$7.5	0.1	$200	4.0	$25	0.5			5	$261	
26SLA004C04	ANNEAL UH ASSY	-	-	-	$75			$7.5	0.1	$200	4.0	$50	1.0			5	$333	
26SLA004C05	MACH FLANGE	-	-	-	$10			$37.5	0.5	$800	16.0	$25	0.5			17	$873	
26SLA004C06	INSP/CLEAN UH	-	-	-	$10			$7.5	0.1	$100	2.0	$50	1.0			3	$168	
26SLA004C07	QA & DOCUMENT	-	-	-										$50	1.0	1	$50	
26SLA004C08	PKG & SHIP	-	-	-	$100		$125			$100	2.0	$50	1.0			3	$375	

TABLE C-4 CONTAINER FABRICATION PRICE ESTIMATE - VENDOR - A

FOR INFORMATION ONLY

		RAW MATERIAL			MATERIALS			LABOR								COMPONENT TOTALS		Estimate sums up to the shaded top line to total value for each component/container type.
								ENGINEERING		MANUFACTURING		INSPECTION		Q/A				
	DESCRIPTION	WT	$/LB	$/COMP	EXPEND	TOOLS	SHIP	COST	HRS	COST	HRS	COST	HRS	COST	HRS	HRS	COST	REMARKS
26L0AC60000	CONTAINER-6PWR 26L	$11[illegible]	[illegible]	$31,890	$12,503	$337	$834	$885.0	11.8	$9,900	198.0	$1,380	27.6	$360	7.2	245	$58,089	Fuel Container 26-in OD (6 PWR,CONS)
26L0A002C00	LOWER UNIT (LU)	3225	$6.76	$21,795	$11,113	$198	$563	$585.0	7.8	$6,675	133.5	$755	15.1	$200	4.0	160	$41,884	Fuel Container 26-in OD, LOWER UNIT
26L0A004C00	UPPER HEAD (UH)	1216	$7.23	$8,788	$208	$15	$196	$135.0	1.8	$1,500	30.0	$225	4.5	$50	1.0	37	$11,117	Container 26-in OD, UPPER HEAD
26L0A006S00	SS INTERNALS-6 PWR	674	$1.94	$1,307	$1,182	$124	$75	$165.0	2.2	$1,725	34.5	$400	8.0	$110	2.2	47	$5,088	Stainless for 6 PWR Assy-Consolidated
26L0A002C00	LOWER UNIT (LU) 26L	3225	$6.76	$21,795	$11,113	$198	$563	$585.0	7.8	$6,675	133.5	$755	15.1	$200	4.0	160	$41,884	Fuel Container 26-in OD, LOWER UNIT
26L0A002C01	BOTTOM HD (BH)	895	$6.85	$6,131		$5	$6	$75.0	1.0	$400	8.0	$50	1.0	$5	0.1	10	$6,672	NOTE 9 (RAW MAT'L)
26L0A002C02	BODY	2147	$6.23	$13,376	$750	$18	$30	$75.0	1.0	$2,050	41.0	$50	1.0	$5	0.1	43	$16,354	NOTE 1 (EXPEND)
26L0A002C03	FLANGE RING	183	$12.50	$2,288	$0	$0	$2	$7.5	0.1	$200	4.0	$5	0.1	$5	0.1	4	$2,508	NOTE 3 (RAW MAT'L)
26L0A002C04	JOIN BH TO BODY	-	-	-	$280	$10		$75.0	1.0	$1,500	30.0	$50	1.0	$10	0.2	32	$1,925	NOTE 2 (EXPEND)
26L0A002C05	SPIN FORM BODY	-	-	-	$8,378		$175	$75.0	1.0			$50	1.0	$10	0.2	2	$8,688	
26L0A002C06	JOIN FLANGE TO BODY	-	-	-	$60	$5		$75.0	1.0	$275	5.5	$50	1.0	$5	0.1	8	$470	
26L0A002C07	ANNEAL LU	-	-	-	$115	$10		$37.5	0.5	$300	6.0	$50	1.0	$5	0.1	8	$518	
26L0A002C08	MACH FLANGE & THROAT	-	-	-	$30	$10		$15.0	0.2	$450	9.0	$50	1.0	$5	0.1	10	$560	
26L0A002C09	INSP/TEST/CLEAN	-	-	-	$950	$30	$0	$150.0	2.0	$1,000	20.0	$350	7.0	$50	1.0	30	$2,530	NOTE 5 (INSP),NOTE 7 (TOOLS)
26L0A002C10	QA & DOCUMENT	-	-	-										$100	2.0	2	$100	
26L0A002C11	PKG & SHIP	-	-	-	$550	$10	$350			$500	10.0	$50	1.0			11	$1,460	NOTE 6 (MANUF), NOTE 8 (EXPEND)
26L0A002C12	ADD'L TOOLING	-	-	-		$100										0	$100	
28L0AC[illegible]00	CONTAINER-10BWR 28L	5883	$6.06	$35,637	$13,966	$390	$928	$885.0	11.8	$11,925	238.5	$1,380	27.6	$360	7.2	285	$65,471	Fuel Container 28-in OD (10 BWR Assy)
28L0A003C00	LOWER UNIT (LU) 28L	3564	$6.75	$24,052	$12,084	$198	$610	$585.0	7.8	$7,825	156.5	$755	15.1	$200	4.0	183	$46,309	Fuel Container 28-in OD, LOWER UNIT
28L0A005C00	UPPER HEAD (UH) 28L	1350	$7.19	$9,705	$208	$15	$211	$135.0	1.8	$1,600	32.0	$225	4.5	$50	1.0	39	$12,149	Fuel Container 28-in OD, UPPER HEAD
28L0A009S00	SS INTERNALS-10 BWR	969	$1.94	$1,880	$1,674	$177	$107	$165.0	2.2	$2,500	[illegible].0	$400	8.0	$110	2.2	62	$7,013	Stainless internals for 10 BWR Assy
28L0A003C00	LOWER UNIT (LU) 28L	3564	$6.75	$24,052	$12,084	$198	$610	$585.0	7.8	$7,825	[illegible].5	$755	15.1	$200	4.0	183	$46,309	Fuel Container 28-in OD, LOWER UNIT
28L0A003C01	BOTTOM HD (BH)	1027	$6.85	$7,035		$5	$8	$75.0	1.0	$500	10.0	$50	1.0	$5	0.1	12	$7,678	NOTE 9 (RAW MAT'L)
28L0A003C02	BODY	2297	$6.29	$14,310	$900	$18	$35	$75.0	1.0	$2,400	48.0	$50	1.0	$5	0.1	50	$17,793	NOTE 1 (EXPEND)
28L0A003C03	FLANGE RING	240	$11.28	$2,707	$0	$0	$2	$7.5	0.1	$250	5.0	$5	0.1	$5	0.1	5	$2,977	NOTE 3 (RAW MAT'L)
28L0A003C04	JOIN BH TO BODY	-	-	-	$310	$10		$75.0	1.0	$1,750	35.0	$50	1.0	$10	0.2	37	$2,205	NOTE 2 (EXPEND)
28L0A003C05	SPIN FORM BODY	-	-	-	$8,974		$190	$75.0	1.0			$50	1.0	$10	0.2	2	$9,299	
28L0A003C06	JOIN FLANGE TO BODY	-	-	-	$70	$5		$75.0	1.0	$325	6.5	$50	1.0	$5	0.1	9	$530	
28L0A003C07	ANNEAL LU	-	-	-	$120	$10		$37.5	0.5	$350	7.0	$50	1.0	$5	0.1	9	$573	
28L0A003C08	MACH FLANGE & THROAT	-	-	-	$35	$10		$15.0	0.2	$500	10.0	$50	1.0	$5	0.1	11	$615	
28L0A003C09	INSP/TEST/CLEAN	-	-	-	$1,075	$30	$0	$150.0	2.0	$1,250	25.0	$350	7.0	$50	1.0	35	$2,905	NOTE 5 (INSP),NOTE 7 (TOOLS)
28L0A003C10	QA & DOCUMENT	-	-	-										$100	2.0	2	$100	
28L0A003C11	PKG & SHIP	-	-	-	$600	$10	$375			$500	10.0	$50	1.0			11	$1,535	NOTE 6 (MANUF), NOTE 8 (EXPEND)
28L0A003C12	ADD'L TOOLING	-	-	-		$100										0	$100	

TABLE C-4 CONTAINER FABRICATION PRICE ESTIMATE - VENDOR - A

FOR INFORMATION ONLY

		RAW MATERIAL			MATERIALS			LABOR								COMPONENT TOTALS		Estimate sums up to the shaded top line to total value for each component/container type.
								ENGINEERING		MANUFACTURING		INSPECTION		Q/A				
	DESCRIPTION	WT	$/LB	$/COMP	EXPEND	TOOLS	SHIP	COST	HRS	COST	HRS	COST	HRS	COST	HRS	HRS	COST	REMARKS
28L0A005C00	UPPER HEAD (UH) 28L	1350	$7.19	$9,705	$208	$15	$211	$135.0	1.8	$1,690	32.0	$225	4.5	$50	1.0	39	$12,149	Fuel Container 28-in OD, UPPER HEAD
28L0A005C01	MAKE UH	117	$6.84	$8,023			$65	$37.5	0.5							1	$8,126	
28L0A005C02	MAKE PINTLE	17	$9.50	$1,682			$11	$37.5	0.5	$100	2.0	$25	0.5			3	$1,856	NOTE 1 (RAW MAT'L)
28L0A005C03	JOIN PINTLE TO HEAD	-	-	-	$13	$15		$7.5	0.1	$200	4.0	$25	0.5			5	$26	
28L0A005C04	ANNEAL UH ASSY	-	-	-	$75			$7.5	0.1	$200	4.0	$50	1.0			5	$333	
28L0A005C05	MACH FLANGE	-	-	-	$10			$37.5	0.5	$900	18.0	$25	0.5			19	$973	
28L0A005C06	INSP/CLEAN UH	-	-	-	$10			$7.5	0.1	$100	2.0	$50	1.0			3	$168	
28L0A005C07	QA & DOCUMENT	-	-	-										$50	1.0	1	$50	
28L0A005C08	PKG & SHIP	-	-	-	$100		$135			$100	2.0	$50	1.0			3	$385	
	N08825 MAT'L																	
26S0AN00000	CONTAINER-HLW 26S	3336	$11.30	$37,707	$10,675	$213	$59	$720.0	9.6	$7,925	158.5	$930	18.6	$250	5.0	192	$59,019	HLW Container (DWPF,WVDP)
26S0A001N00	LOWER UNIT (LU)	2241	$11.19	$25,076	$10,451	$198	$403	$585.0	7.8	$6,375	127.5	$705	14.1	$200	4.0	153	$43,993	High-level waste container, LOWER UNIT
26SLA004N00	UPPER HEAD (UH)	1095	$11.54	$12,631	$224	$15	$196	$135.0	1.8	$1,550	31.0	$225	4.5	$50	1.0	38	$15,026	Container 26-in OD, UPPER HEAD
26S0A001N00	LOWER UNIT (LU) 26S	2241	$11.19	$25,076	$10,451	$198	$403	$585.0	7.8	$6,375	127.5	$705	14.1	$200	4.0	153	$43,993	High-level waste container, LOWER UNIT
26S0A001N01	BOTTOM HD (BH)	815	$11.76	$9,585	$0	$5	$6	$75.0	1.0	$400	8.0	$50	1.0	$5	0.1	10	$10,126	NOTE 9 (RAW MAT'L)
26S0A001N02	BODY	1251	$8.70	$10,863	$810	$18	$20	$75.0	1.0	$1,750	35.0	$50	1.0	$5	0.1	37	$13,611	NOTE 1 (EXPEND)
26S0A001N03	FLANGE RING	175	$26.33	$4,608	$0	$0	$2	$7.5	0.1	$250	5.0	$5	0.1	$5	0.1	5	$4,878	NOTE 3 (RAW MAT'L)
26S0A001N04	JOIN BH TO BODY	-	-	-	$740	$10		$75.0	1.0	$1,800	36.0	$50	1.0	$10	0.2	38	$2,685	NOTE 2 (EXPEND)
26S0A001N05	SPIN FORM BODY	-	-	-	$7,421	$0	$125	$75.0	1.0			$50	1.0	$10	0.2	2	$7,681	
26S0A001N06	JOIN FLANGE TO BODY	-	-	-	$135	$5		$75.0	1.0	$325	6.5	$50	1.0	$5	0.1	9	$595	
26S0A001N07	ANNEAL LU	-	-	-	$100	$10		$37.5	0.5	$250	5.0	$50	1.0	$5	0.1	7	$453	
26S0A001N08	MACH FLANGE & THROAT	-	-	-	$25	$10	$0	$15.0	0.2	$400	8.0	$50	1.0	$5	0.1	9	$505	
26S0A001N09	INSP/TEST/CLEAN	-	-	-	$770	$30	$0	$150.0	2.0	$800	16.0	$300	6.0	$50	1.0	25	$2,100	NOTE 5 (INSP),NOTE 7 (TOOLS)
26S0A001N10	QA & DOCUMENT	-	-	-										$100	2.0	2	$100	
26S0A001N11	PKG & SHIP	-	-	-	$450	$10	$250			$400	8.0	$50	1.0			9	$1,160	NOTE 6 (MANUF), NOTE 8 (EXPEND)
26S0A001N12	ADD'L TOOLING	-	-	-		$100										0	$100	
26SLA004N00	UPPER HEAD (UH)	1095	$11.54	$12,631	$224	$15	$196	$135.0	1.8	$1,550	31.0	$225	4.5	$50	1.0	38	$15,026	Container 26-in OD, UPPER HEAD
26SLA004N01	MAKE UH	940	$11.74	$11,036			$60	$37.5	0.5							1	$11,134	
26SLA004N02	MAKE PINTLE	155	$10.29	$1,595			$11	$37.5	0.5	$100	2.0	$25	0.5			3	$1,769	NOTE 1 (RAW MAT'L)
26SLA004N03	JOIN PINTLE TO HEAD	-	-	-	$29	$15		$7.5	0.1	$250	5.0	$25	0.5			6	$327	
26SLA004N04	ANNEAL UH ASSY	-	-	-	$75			$7.5	0.1	$200	4.0	$50	1.0			5	$333	
26SLA004N05	MACH FLANGE	-	-	-	$10			$37.5	0.5	$800	16.0	$25	0.5			17	$873	
26SLA004N06	INSP/CLEAN UH	-	-	-	$10			$7.5	0.1	$100	2.0	$50	1.0			3	$168	
26SLA004N07	QA & DOCUMENT	-	-	-										$50	1.0	1	$50	
26SLA004N08	PKG & SHIP	-	-	-	$100		$125			$100	2.0	$50	1.0			3	$375	

TABLE C-4 CONTAINER FABRICATION PRICE ESTIMATE - VENDOR - A

FOR INFORMATION ONLY

		RAW MATERIAL			MATERIALS			LABOR								COMPONENT TOTALS		Estimate sums up to the shaded top line to total value for each component/container type.
								ENGINEERING		MANUFACTURING		INSPECTION		Q/A				
	DESCRIPTION	WT	$/LB	$/COMP	EXPEND	TOOLS	SHIP	COST	HRS	COST	HRS	COST	HRS	COST	HRS	HRS	COST	REMARKS
26L0AN60000	CONTAINER-6PWR 26L	4702	$9.32	$43,827	$14,351	$337	$834	$885.0	11.8	$10,850	217.0	$1,380	27.6	$360	7.2	264	$72,824	Fuel Container 26-in OD (6 PWR CONS)
26L0A002N00	LOWER UNIT (LU)	2933	$10.19	$29,889	$12,945	$198	$563	$585.0	7.8	$7,575	151.5	$755	15.1	$200	4.0	178	$52,710	Fuel Container 26-in OD, LOWER UNIT
26L0A004N00	UPPER HEAD (UH)	1095	$11.54	$12,631	$224	$15	$196	$135.0	1.8	$1,550	31.0	$225	4.5	$50	1.0	38	$15,026	Container 26-in OD, UPPER HEAD
26L0A006S00	SS INTERNALS-6 PWR	674	$1.94	$1,307	$1,182	$124	$75	$165.0	2.2	$1,725	34.5	$400	8.0	$110	2.2	47	$5,088	Stainless for 6 PWR Assy-Consolidated
26L0A002N00	LOWER UNIT (LU) 26L	2933	$10.19	$29,889	$12,945	$198	$563	$585.0	7.8	$7,575	151.5	$755	15.1	$200	4.0	178	$52,710	Fuel Container 26-in OD, LOWER UNIT
26L0A002N01	BOTTOM HD (BH)	31[illegible]	$11.71	$9,544		$5	$6	$75.0	1.0	$400	8.0	$50	1.0	$5	0.1	10	$10,085	NOTE 9 (RAW MAT'L)
26L0A002N02	BODY	1933	$8.29	$16,025	$1,265	$18	$30	$75.0	1.0	$2,550	51.0	$50	1.0	$5	0.1	53	$20,018	NOTE 1 (EXPEND)
26L0A002N03	FLANGE RING	185	$23.35	$4,320	$0	$0	$2	$7.5	0.1	$250	5.0	$5	0.1	$5	0.1	5	$4,590	NOTE 3 (RAW MAT'L)
26L0A002N04	JOIN BH TO BODY	-	-	-	$740	$10		$75.0	1.0	$1,800	36.0	$50	1.0	$10	0.2	38	$2,685	NOTE 2 (EXPEND)
26L0A002N05	SPIN FORM BODY	-	-	-	$9,160	$0	$175	$75.0	1.0			$50	1.0	$10	0.2	2	$9,470	
26L0A002N06	JOIN FLANGE TO BODY	-	-	-	$135	$5		$75.0	1.0	$325	6.5	$50	1.0	$5	0.1	9	$595	
26L0A002N07	ANNEAL LU	-	-	-	$115	$10		$37.5	0.5	$300	6.0	$50	1.0	$5	0.1	8	$518	
26L0A002N08	MACH FLANGE & THROAT	-	-	-	$30	$10		$15.0	0.2	$450	9.0	$50	1.0	$5	0.1	10	$560	
26L0A002N09	INSP/TEST/CLEAN	-	-	-	$950	$30		$150.0	2.0	$1,000	20.0	$350	7.0	$50	1.0	30	$2,530	NOTE 5 (INSP),NOTE 7 (TOOLS)
26L0A002N10	QA & DOCUMENT	-	-	-										$100	2.0	2	$100	
26L0A002N11	PKG & SHIP	-	-	-	$550	$10	$350			$500	10.0	$50	1.0			11	$1,460	NOTE 6 (MANUF), NOTE 8 (EXPEND)
26L0A002N12	ADD'L TOOLING	-	-	-		$100										0	$100	
28L0AN90000	CONTAINER-10BWR 28L	5450	$9.13	$49,757	$16,024	$390	$933	$885.0	11.8	$12,975	259.5	$1,380	27.6	$360	7.2	306	$82,704	Fuel Container 28-in OD (10 BWR Assy)
28L0A003N00	LOWER UNIT (LU) 28L	3265	$10.38	$33,879	$14,136	$198	$610	$585.0	7.8	$8,825	176.5	$755	15.1	$200	4.0	203	$59,188	Fuel Container 28-in OD, LOWER UNIT
28L0A005N00	UPPER HEAD (UH) 28L	1216	$11.51	$13,998	$214	$15	$216	$135.0	1.8	$1,650	33.0	$225	4.5	$50	1.0	40	$16,503	Fuel Container 28-in OD, UPPER HEAD
28L0A009S00	SS INTERNALS-10 BWR	969	$1.94	$1,880	$1,674	$177	$107	$165.0	2.2	$2,500	50.0	$400	8.0	$110	2.2	62	$7,013	Stainless internals for 10 BWR Assy
28L0A003N00	LOWER UNIT (LU) 28L	3265	$10.38	$33,879	$14,136	$198	$610	$585.0	7.8	$8,825	176.5	$755	15.1	$200	4.0	203	$59,188	Fuel Container 28-in OD, LOWER UNIT
28L0A003N01	BOTTOM HD (BH)	935	$11.71	$10,949		$5	$8	$75.0	1.0	$500	10.0	$50	1.0	$5	0.1	12	$11,592	NOTE 9 (RAW MAT'L)
28L0A003N02	BODY	2090	$6.85	$17,326	$1,518	$18	$35	$75.0	1.0	$3,000	60.0	$50	1.0	$5	0.1	62	$22,027	NOTE 1 (EXPEND)
28L0A003N03	FLANGE RING	240	$23.35	$5,604		$0	$2	$7.5	0.1	$250	5.0	$5	0.1	$5	0.1	5	$5,874	NOTE 3 (RAW MAT'L)
28L0A003N04	JOIN BH TO BODY	-	-	-	$800	$10		$75.0	1.0	$2,100	42.0	$50	1.0	$10	0.2	44	$3,045	NOTE 2 (EXPEND)
28L0A003N05	SPIN FORM BODY	-	-	-	$9,838		$190	$75.0	1.0			$50	1.0	$10	0.2	2	$10,163	
28L0A003N06	JOIN FLANGE TO BODY	-	-	-	$150	$5		$75.0	1.0	$375	7.5	$50	1.0	$5	0.1	10	$660	
28L0A003N07	ANNEAL LU	-	-	-	$120	$10		$37.5	0.5	$350	7.0	$50	1.0	$5	0.1	9	$573	
28L0A003N08	MACH FLANGE & THROAT	-	-	-	$35	$10		$15.0	0.2	$500	10.0	$50	1.0	$5	0.1	11	$615	
28L0A003N09	INSP/TEST/CLEAN	-	-	-	$1,075	$30		$150.0	2.0	$1,250	25.0	$350	7.0	$50	1.0	35	$2,905	NOTE 5 (INSP),NOTE 7 (TOOLS)
28L0A003N10	QA & DOCUMENT	-	-	-										$100	2.0	2	$100	
28L0A003N11	PKG & SHIP	-	-	-	$600	$10	$375			$500	10.0	$50	1.0			11	$1,535	NOTE 6 (MANUF), NOTE 8 (EXPEND)
28L0A003N12	ADD'L TOOLING	-	-	-		$100										0	$100	

TABLE C-4 CONTAINER FABRICATION PRICE ESTIMATE - VENDOR - A

		RAW MATERIAL			MATERIALS			LABOR								COMPONENT TOTALS		Estimate sums up to the shaded top line to total value for each component/container type.
								ENGINEERING		MANUFACTURING		INSPECTION		Q/A				
	DESCRIPTION	WT	$/LB	$/COMP	EXPEND	TOOLS	SHIP	COST	HRS	COST	HRS	COST	HRS	COST	HRS	HRS	COST	REMARKS
28L0A005N00	UPPER HEAD (UH) 28L	1216	$11.51	$13,998	$214	$15	$216	$135.0	1.8	$1,650	33.0	$225	4.5	$50	1.0	40	$16,503	Fuel Container 28-in OD, UPPER HEAD
28L0A005N01	MAKE UH	1061	$11.69	$12,403			$70	$37.5	0.5							1	$12,511	
28L0A005N02	MAKE PINTLE	155	$10.29	$1,595			$11	$37.5	0.5	$100	2.0	$25	0.5			3	$1,760	NOTE 1 (RAW MAT'L)
28L0A005N03	JOIN PINTLE TO HEAD	-	-	-	$29	$15		$7.5	0.1	$250	5.0	$25	0.5			6	$327	
28L0A005N04	ANNEAL UH ASSY	-	-	-	$75			$7.5	0.1	$200	4.0	$50	1.0			5	$333	
28L0A005N05	MACH FLANGE	-	-	-	$10			$37.5	0.5	$900	18.0	$25	0.5			19	$973	
28L0A005N06	INSP/CLEAN UH	-	-	-				$7.5	0.1	$100	2.0	$50	1.0			3	$158	
28L0A005N07	QA & DOCUMENT	-	-	-										$50	1.0	1	$50	
28L0A005N08	PKG & SHIP	-	-	-	$100		$135			$100	2.0	$50	1.0			3	$385	
	STAINLESS INTERNALS																	
26L0A006S00	SS INTERNALS-6 PWR	674	$1.94	$1,307	$1,182	$124	$75	$165.0	2.2	$1,725	34.5	$400	8.0	$110	2.2	47	$5,088	Stainless for 6 PWR Assy-Consolidated
26L0A006S01	FORM DIVIDERS	674	$1.94	$1,307	$1,137	$59	$75	$75.0	1.0			$100	2.0	$50	1.0	4	$2,803	NOTES 1(EXPEND), 2(SHIP), 3(TOOLS)
26L0A006S02	JOIN DIVIDERS	-	-	-	$20	$50		$75.0	1.0	$1,350	27.0	$150	3.0	$50	1.0	32	$1,695	
26L0A006S03	MACH/STRAIGHT/CLEAN	-	-	-	$10	$10				$325	6.5	$50	1.0			8	$395	
26L0A006S04	INSPECT	-	-	-	$5	$5		$15.0	0.2			$100	2.0			2	$125	
26L0A006S05	QA & DOCUMENT	-	-	-										$10	0.2	0	$10	
26L0A006S06	PKG & SHIP	-	-	-	$10					$50	1.0					1	$60	
28L0A009S00	SS INTERNALS-10 BWR	969	$1.94	$1,880	$1,674	$177	$107	$165.0	2.2	$2,500	50.0	$400	8.0	$110	2.2	62	$7,013	Stainless internals for 10 BWR Ass'y
28L0A009S01	FORM DIVIDERS	969	$1.94	$1,880	$1,629	$92	$107	$75.0	1.0			$100	2.0	$50	1.0	4	$3,933	NOTES 1(EXPEND), 2(SHIP), 3(TOOLS)
28L0A009S02	JOIN DIVIDERS	-	-	-	$20	$65		$75.0	1.0	$2,050	41.0	$150	3.0	$50	1.0	46	$2,410	
28L0A009S03	MACH/STRAIGHT/CLEAN	-	-	-	$10	$15				$400	8.0	$50	1.0			9	$475	
28L0A009S04	INSPECT	-	-	-	$5	$5		$15.0	0.2			$100	2.0			2	$125	
28L0A009S05	QA & DOCUMENT	-	-	-										$10	0.2	0	$10	
28L0A009S06	PKG & SHIP	-	-	-	$10					$50	1.0					1	$60	
26L0A007S00	SS INTERNALS-3 PWR	421	$1.94	$817	$777	$129	$45	$165.0	2.2	$1,225	24.5	$400	8.0	$110	2.2	37	$3,668	Stainless internals for 3 PWR Ass'y
26L0A007S01	FORM DIVIDERS	421	$1.94	$817	$732	$64	$45	$75.0	1.0			$100	2.0	$50	1.0	4	$1,883	NOTES 1(EXPEND), 2(SHIP), 3(TOOLS)
26L0A007S02	JOIN DIVIDERS	-	-	-	$20	$50		$75.0	1.0	$900	18.0	$150	3.0	$50	1.0	23	$1,245	
26L0A007S03	MACH/STRAIGHT/CLEAN	-	-	-	$10	$10				$275	5.5	$50	1.0			7	$345	
26L0A007S04	INSPECT	-	-	-	$5	$5		$15.0	0.2			$100	2.0			2	$125	
26L0A007S05	QA & DOCUMENT	-	-	-										$10	0.2	0	$10	
26L0A007S06	PKG & SHIP	-	-	-	$10					$50	1.0					1	$60	

TABLE C-4 CONTAINER FABRICATION PRICE ESTIMATE - VENDOR - A

FOR INFORMATION ONLY

		RAW MATERIAL			MATERIALS			LABOR								COMPONENT TOTALS		Estimate sums up to the shaded top line to total value for each component/container type.
								ENGINEERING		MANUFACTURING		INSPECTION		Q/A				
	DESCRIPTION	WT	$/LB	$/COMP	EXPEND	TOOLS	SHIP	COST	HRS	COST	HRS	COST	HRS	COST	HRS	HRS	COST	REMARKS
28L0A008S00	SS INTERNALS-3P/4BWR	801	$2.24	$1,794	$45	$90	$40	$165.0	2.2	$2,600	52.0	$405	8.1	$110	2.2	65	$5,249	Stainless internals, 3 PWR/4 BWR Assy
28L0A008S01	FORM DIVIDERS	801	$2.24	$1,794		$10	$40	$75.0	1.0	$525	10.5	$5	0.1	$50	1.0		$2,499	NOTES 1(EXPEND), 2(SHIP), 3(TOOLS)
28L0A008S02	JOIN DIVIDERS	-		-	$20	$65		$75.0	1.0	$1,650	33.0	$250	5.0	$50	1.0		$2,110	NOTE 4 (RAW MAT'L)
28L0A008S03	MACH/STRAIGHT/CLEAN	-	-	-	$10	$10				$375	7.5	$50	1.0				$445	
28L0A008S04	INSPECT	-	-	-	$5	$5		$15.0	0.2			$100	2.0				$125	
28L0A008S05	QA & DOCUMENT	-	-	-										$10	0.2		$10	
28L0A008S06	PKG & SHIP	-	-	-	$10					$50	1.0						$60	
28L0A010S00	SS INTERNALS-4 PWR	506	$1.94	$982	$885	$88	$56	$165.0	2.2	$1,475	29.5	$400	8.0	$110	2.2	42	$4,161	Stainless internals for 4 PWR Assy
28L0A010S01	FORM DIVIDERS	506	$1.94	$982	$840	$28	$56	$75.0	1.0			$100	2.0	$50	1.0		$2,131	NOTES 1(EXPEND), 2(SHIP), 3(TOOLS)
28L0A010S02	JOIN DIVIDERS	-	-	-	$20	$45		$75.0	1.0	$1,150	23.0	$150	3.0	$50	1.0		$1,490	
28L0A010S03	MACH/STRAIGHT/CLEAN	-	-	-	$10	$10				$275	5.5	$50	1.0				$345	
28L0A010S04	INSPECT	-	-	-	$5	$5		$15.0	0.2			$100	2.0				$125	
28L0A010S05	QA & DOCUMENT	-	-	-										$10	0.2		$10	
28L0A010S06	PKG & SHIP	-	-	-	$10					$50	1.0						$60	

LOWER UNIT NOTES

1. Includes rolling costs and weldwire.
2. Includes weldwire.
3. Seamless flange blank quoted cut from plate; less expensive alternatives are being investigated.
4. This line is used for annealing of the blanks prior to shipment to the extruder. The annealing performed by the extruder is included in Task 5.
5. Radiography & UT is included in this price. Radiography is performed twice; first when (the) blank is assembled, and second when spun part is returned. X-rays are subcontracted; reading and interpretation are performed by our QA. We perform our own UT examination.
6. Includes cleaning costs.
7. Includes test fixture.
8. Wooden box and protective jacket costs.
9. Hogged out plate considered for head. Forging price not available at time of quote. Weight, therefore, includes full disk prior to machining.

UPPER HEAD NOTE

1. Pintle is quoted as an estimated solid bar price, machined. If time permitted, an extruded bar shape could be less costly and (have a) lower machining cost. Alternatively, a forging made to the rough pintle shape could also be attractive.

INTERNALS NOTES

1. "Expend" price includes roll forming raw material to shape. Roll forming is selected due to the consistant shape and camber we would expect from this process.
2. Internals to ship inside cans.
3. Tooling cost for "Form Dividers" is for the first 750 sets of internals only. Therefore, the tooling costs would be substantially reduced for maintenance of existing tools. Therefore, we estimate a $10.00 charge per can for quantities over 750, with the balance of the tooling per size eliminated for this item.
4. The 3 PWR/4 BWR Fuel Assembly design cannot be roll-formed by our vendor. Therefore, we estimate breaking costs and a higher cost per pound for material since a flat rolled sheet must be utilized rather than a coil (to) produce (the internals).

TABLE C-5 CONTAINER FABRICATION PRICE ESTIMATE - VENDOR - B

FOR INFORMATION ONLY

		RAW MATERIAL			MATERIALS			LABOR								COMPONENT TOTALS		Estimate sums up to the shaded top line to total value for each component/container type.
								ENGINEERING		MANUFACTURING		INSPECTION		Q/A				
	DESCRIPTION	WT	$/LB	$/COMP	EXPEND	TOOLS	SHIP	COST	HRS	COST	HRS	COST	HRS	COST	HRS	HRS	COST	REMARKS
	C71500 MAT'L																	
26S0BC00000	CONTAINER-HLW 26S	3037	$9.03	$27,432	$12,886	$320	$1,100	$218	5.0	$3,547	81.5	$2,263	52.0	$392	9.0	148	$48,158	HLW Container (DWPF,WVDP)
26L0BC60000	CONTAINER-6PWR 26L	5137	$6.85	$35,172	$15,594	$320	$1,100	$218	5.0	$4,743	109.0	$2,524	58.0	$436	10.0	182	$60,107	Fuel Container 26-in OD (6 PWR,CONS)
28L0BC90000	CONTAINER-10BWR 28L	5532	$6.84	$37,815	$16,404	$320	$1,100	$218	5.0	$4,917	113.0	$2,524	58.0	$436	10.0	186	$63,734	Fuel Container 28-in OD (10 BWR)
	N08825 MAT'L																	
26S0BN00000	CONTAINER-HLW 26S	2766	$11.92	$32,962	$13,692	$320	$1,100	$218	5.0	$3,547	81.5	$2,263	52.0	$392	9.0	148	$54,494	HLW Container (DWPF,WVDP)
26L0BN60000	CONTAINER-6PWR 26L	4795	$9.07	$43,472	$16,657	$320	$1,100	$218	5.0	$4,656	107.0	$2,524	58.0	$436	10.0	180	$69,383	Fuel Container 26-in OD (6 PWR,CONS)
28L0BN90000	CONTAINER-10BWR 28L	5139	$9.02	$46,348	$17,579	$320	$1,100	$218	5.0	$4,743	109.0	$2,524	58.0	$436	10.0	182	$73,268	Fuel Container 28-in OD (10 BWR)
	C71500 MAT'L																	
26S0BC00000	CONTAINER-HLW 26S	3037	$9.03	$27,432	$12,886	$320	$1,100	$218	5.0	$3,547	81.5	$2,263	52.0	$392	9.0	148	$48,158	HLW Container (DWPF,WVDP)
26S0B001C00	LOWER UNIT (LU)	2204	$8.13	$17,911	$12,286	$220	$1,100	$131	3.0	$2,176	50.0	$1,958	45.0	$348	8.0	106	$36,130	Container 26-in OD, LOWER UNIT
26S0B004C00	UPPER HEAD (UH)	833	$11.43	$9,521	$600	$100	$0	$87	2.0	$1,371	31.5	$305	7.0	$44	1.0	42	$12,028	Container 26-in OD, UPPER HEAD
26S0B001C00	LOWER UNIT (LU) 26S	2204	$8.13	$17,911	$12,286	$220	$1,100	$131	3.0	$2,176	50.0	$1,958	45.0	$348	8.0	106	$36,130	HLW Container, LOWER UNIT
26S0B001C01	BOTTOM HD (BH)	670	$11.57	$7,752		$110		$131	3.0	$522	12.0	$174	4.0			19	$8,689	
26S0B001C02	BODY	1381	$5.32	$7,347	$1,200					$218	5.0	$87	2.0			7	$8,852	
26S0B001C03	FLANGE RING	153	$18.38	$2,812												0	$2,812	
26S0B001C04	JOIN BH TO BODY	-	-	-	$800					$435	10.0	$87	2.0			12	$1,322	
26S0B001C05	SPIN FORM BODY	-	-	-	$9,286											0	$9,286	
26S0B001C06	JOIN FLANGE TO BODY	-	-	-	$300					$348	8.0	$87	2.0			10	$735	
26S0B001C07	ANNEAL LU	-	-	-												0	$0	INCLUDED IN SPIN FORM
26S0B001C08	MACH FLANGE & THROAT	-	-	-		$110				$522	12.0	$131	3.0			15	$763	
26S0B001C09	INSP/TEST/CLEAN	-	-	-	$500							$1,392	32.0			32	$1,892	
26S0B001C10	QA & DOCUMENT	-	-	-										$348	8.0	8	$348	
26S0B001C11	PKG & SHIP	-	-	-	$200		$1,100			$131	3.0					3	$1,431	
26SLB004C00	UPPER HEAD (UH)	833	$11.43	$9,521	$600	$100	$0	$87	2.0	$1,371	31.5	$305	7.0	$44	1.0	42	$12,028	Container 26-in OD, UPPER HEAD
26SLB0C4C01	MAKE UH	670	$11.57	$7,752				$87	2.0	$696	16.0	$87	2.0			20	$8,622	
26SLB004C02	MAKE PINTLE	163	$10.85	$1,769												0	$1,769	
26SLB004C03	JOIN PINTLE TO HEAD	-	-	-	$300					$174	4.0	$87	2.0			6	$561	
26SLB004C04	ANNEAL UH ASSY	-	-	-	$100					$44	1.0					1	$144	
26SLB004C05	MACH FLANGE	-	-	-		$100				$348	8.0					8	$448	
26SLB004C06	INSP/CLEAN UH	-	-	-						$22	0.5	$131	3.0			4	$153	
26SLB0C4C07	QA & DOCUMENT	-	-	-										$44	1.0	1	$44	
26SLB004C08	PKG & SHIP	-	-	-	$200					$87	2.0					2	$287	

TABLE C-5 CONTAINER FABRICATION PRICE ESTIMATE - VENDOR - B

FOR INFORMATION ONLY

		RAW MATERIAL			MATERIALS			LABOR								COMPONENT TOTALS		Estimate sums up to the shaded top line to total value for each component/container type.
								ENGINEERING		MANUFACTURING		INSPECTION		Q/A				
	DESCRIPTION	WT	$/LB	$/COMP	EXPEND	TOOLS	SHIP	COST	HRS	COST	HRS	COST	HRS	COST	HRS	HRS	COST	REMARKS
26L0BC60000	CONTAINER-6PWR 26L	3137	$6.85	$35,172	$15,594	$320	$1,100	$218	5.0	$4,743	109.0	$2,524	58.0	$436	10.0	182	$60,107	Fuel Container 26-in OD (6 PWR,CONS)
26L0B002C00	LOWER UNIT (LU)	2984	$7.39	$22,061	$14,794	$220	$1,100	$131	3.0	$2,263	52.0	$1,958	45.0	$348	8.0	108	$42,875	Fuel Container 26-in OD, LOWER UNIT
26L0B004C00	UPPER HEAD (UH)	833	$11.43	$9,521	$600	$100	$0	$87	2.0	$1,371	31.5	$305	7.0	$44	1.0	42	$12,028	Container 26-in OD, UPPER HEAD
26L0B006S00	SS INTERNALS-6 PWR	1320	$2.72	$3,590	$200	$0	$0	$0	0.0	$1,109	25.5	$261	6.0	$44	1.0	33	$5,204	Stainless for 6 PWR Assy-Consolidated
26L0B002C00	LOWER UNIT (LU) 26L	2984	$7.39	$22,061	$14,794	$220	$1,100	$131	3.0	$2,263	52.0	$1,958	45.0	$348	8.0	108	$42,875	Fuel Container 26-in OD, LOWER UNIT
26L0B002C01	BOTTOM HD (BH)	670	$11.57	$7,752		$110		$131	3.0	$522	12.0	$174	4.0			19	$8,689	
26L0B002C02	BODY	2161	$5.32	$11,497	$1,600					$218	5.0	$87	2.0			7	$13,402	
26L0B002C03	FLANGE RING	153	$18.38	$2,812												0	$2,812	
26L0B002C04	JOIN BH TO BODY	-	-	-	$800					$522	12.0	$87	2.0			14	$1,409	
26L0B002C05	SPIN FORM BODY	-	-	-	$11,394											0	$11,394	
26L0B002C06	JOIN FLANGE TO BODY	-	-	-	$300					$348	8.0	$87	2.0			10	$735	
26L0B002C07	ANNEAL LU	-	-	-												0	$0	INCLUDED IN SPIN FORM
26L0B002C08	MACH FLANGE & THROAT	-	-	-		$110				$522	12.0	$131	3.0			15	$763	
26L0B002C09	INSP/TEST/CLEAN	-	-	-	$500							$1,392	32.0			32	$1,892	
26L0B002C10	QA & DOCUMENT	-	-	-										$348	8.0	8	$348	
26L0B002C11	PKG & SHIP	-	-	-	$200		$1,100			$131	3.0					3	$1,431	
28L0BC90000	CONTAINER-10BWR 28L	5532	$6.84	$37,815	$16,404	$320	$1,100	$218	5.0	$4,917	113.0	$2,524	58.0	$436	10.0	186	$63,734	Fuel Container 28-in OD (10 BWR Assy)
28L0B003C00	LOWER UNIT (LU) 28L	3210	$7.39	$23,713	$15,604	$220	$1,100	$131	3.0	$2,263	52.0	$1,958	45.0	$348	8.0	108	$45,337	Fuel Container 28-in OD, LOWER UNIT
28L0B005C00	UPPER HEAD (UH) 28L	893	$11.44	$10,215	$600	$100	$0	$87	2.0	$1,545	35.5	$305	7.0	$44	1.0	46	$12,896	Fuel Container 28-in OD, UPPER HEAD
28L0B009S00	SS INTERNALS-10 BWR	1429	$2.72	$3,887	$200	$0	$0	$0	0.0	$1,109	25.5	$261	6.0	$44	1.0	33	$5,501	Stainless internals for 10 BWR Assy
28L0B003C00	LOWER UNIT (LU) 28L	3210	$7.39	$23,713	$15,604	$220	$1,100	$131	3.0	$2,263	52.0	$1,958	45.0	$348	8.0	108	$45,337	Fuel Container 28-in OD, LOWER UNIT
28L0B003C01	BOTTOM HD (BH)	719	$11.57	$8,319		$110		$131	3.0	$522	12.0	$174	4.0			19	$9,256	
28L0B003C02	BODY	2327	$5.32	$12,380	$1,600					$218	5.0	$87	2.0			7	$14,285	
28L0B003C03	FLANGE RING	164	$18.38	$3,014												0	$3,014	
28L0B003C04	JOIN BH TO BODY	-	-	-	$800					$522	12.0	$87	2.0			14	$1,409	
28L0B003C05	SPIN FORM BODY	-	-	-	$12,204											0	$14,204	
28L0B003C06	JOIN FLANGE TO BODY	-	-	-	$300					$348	8.0	$87	2.0			10	$735	
28L0B003C07	ANNEAL LU	-	-	-												0	$0	INCLUDED IN SPIN FORM
28L0B003C08	MACH FLANGE & THROAT	-	-	-		$110				$522	12.0	$131	3.0			15	$763	
28L0B003C09	INSP/TEST/CLEAN	-	-	-	$500							$1,392	32.0			32	$1,892	
28L0B003C10	QA & DOCUMENT	-	-	-										$348	8.0	8	$348	
28L0B003C11	PKG & SHIP	-	-	-	$200		$1,100			$131	3.0					3	$1,431	

TABLE C-5 CONTAINER FABRICATION PRICE ESTIMATE - VENDOR - B

FOR INFORMATION ONLY

		RAW MATERIAL			MATERIALS			LABOR								COMPONENT TOTALS		Estimate sums up to the shaded top line to total value for each component/container type.
								ENGINEERING		MANUFACTURING		INSPECTION		Q/A				
	DESCRIPTION	WT	$/LB	$/COMP	EXPEND	TOOLS	SHIP	COST	HRS	COST	HRS	COST	HRS	COST	HRS	HRS	COST	REMARKS
28L0B005C00	UPPER HEAD (UH) 28L	893	$11.44	$10,215	$600	$100	$0	$87	2.0	$1,545	35.5	$305	7.0	$44	1.0	46	$12,896	Fuel Container 28-in OD, UPPER HEAD
28L0B005C01	MAKE UH	730	$11.57	$8,446				$87	2.0	$783	18.0	$87	2.0			22	$9,403	
28L0B005C02	MAKE PINTLE	163	$10.85	$1,769												0	$1,769	
28L0B005C03	JOIN PINTLE TO HEAD	-	-	-	$300					$174	4.0	$87	2.0			6	$561	
28L0B005C04	ANNEAL UH ASSY	-	-	-	$100					$44	1.0					1	$144	
28L0B005C05	MACH FLANGE	-	-	-		$100				$435	10.0					10	$535	
28L0B005C06	INSP/CLEAN UH	-	-	-						$22	0.5	$131	3.0			4	$153	
28L0B005C07	QA & DOCUMENT	-	-	-										$44	1.0	1	$44	
28L0B005C08	PKG & SHIP	-	-	-	$200					$87	2.0					2	$287	
	N08825 MAT'L																	
26S0BN00000	CONTAINER-HLW 26S	2766	$11.92	$32,962	$13,692	$320	$1,100	$218	5.0	$3,547	81.5	$2,263	52.0	$392	9.0	148	$54,494	HLW Container (DWPF,WVDP)
26S0B001N00	LOWER UNIT (LU)	2008	$11.70	$23,494	$13,092	$220	$1,100	$131	3.0	$2,176	50.0	$1,958	45.0	$348	8.0	106	$42,519	High-level waste container, LOWER UNIT
26SLB004N00	UPPER HEAD (UH)	758	$12.49	$9,468	$600	$100	$0	$87	2.0	$1,371	31.5	$305	7.0	$44	1.0	42	$11,975	Container 26-in OD, UPPER HEAD
26S0B001N00	LOWER UNIT (LU) 26S	2008	$11.70	$23,494	$13,092	$220	$1,100	$131	3.0	$2,176	50.0	$1,958	45.0	$348	8.0	106	$42,519	High-level waste container, LOWER UNIT
26S0B001N01	BOTTOM HD (BH)	610	$12.93	$7,887		$110		$131	3.0	$522	12.0	$174	4.0			19	$8,824	
26S0B001N02	BODY	1258	$9.76	$12,278	$1,200					$218	5.0	$87	2.0			7	$13,783	
26S0B001N03	FLANGE RING	140	$23.28	$3,329												0	$3,329	
26S0B001N04	JOIN BH TO BODY	-	-	-	$800					$435	10.0	$87	2.0			12	$1,322	
26S0B001N05	SPIN FORM BODY	-	-	-	$10,092											0	$10,092	
26S0B001N06	JOIN FLANGE TO BODY	-	-	-	$300					$348	8.0	$87	2.0			10	$735	
26S0B001N07	ANNEAL LU	-	-	-												0	$0	INCLUDED IN SPIN FORM
26S0B001N08	MACH FLANGE & THROAT	-	-	-		$110				$522	12.0	$131	3.0			15	$763	
26S0B001N09	INSP/TEST/CLEAN	-	-	-	$500							$1,392	32.0			32	$1,892	
26S0B001N10	QA & DOCUMENT	-	-	-										$348	8.0	11	$348	
26S0B001N11	PKG & SHIP	-	-	-	$200		$1,100			$131	3.0					3	$1,431	
26SLB004N00	UPPER HEAD (UH)	758	$12.49	$9,468	$600	$100	$0	$87	2.0	$1,371	31.5	$305	7.0	$44	1.0	42	$11,975	Container 26-in OD, UPPER HEAD
26SLB004N01	MAKE UH	610	$12.93	$7,887				$87	2.0	$696	16.0	$87	2.0			20	$8,757	
26SLB004N02	MAKE PINTLE	148	$10.68	$1,581												0	$1,581	
26SLB004N03	JOIN PINTLE TO HEAD	-	-	-	$300					$174	4.0	$87	2.0			6	$561	
26SLB004N04	ANNEAL UH ASSY	-	-	-	$100					$44	1.0					1	$144	
26SLB004N05	MACH FLANGE	-	-	-		$100				$348	8.0					8	$448	
26SLB004N06	INSP/CLEAN UH	-	-	-						$22	0.5	$131	3.0			4	$153	
26SLB004N07	QA & DOCUMENT	-	-	-										$44	1.0	1	$44	
26SLB004N08	PKG & SHIP	-	-	-	$200					$87	2.0					2	$287	
26L0BN60000	CONTAINER-6PWR 26L	4795	$9.07	$43,472	$16,657	$320	$1,100	$218	5.0	$4,656	107.0	$2,524	58.0	$436	10.0	180	$69,783	Fuel Container 26-in OD (6 PWR,CONS)
26L0B002N00	LOWER UNIT (LU)	2717	$11.19	$30,414	$15,857	$220	$1,100	$131	3.0	$2,176	50.0	$1,958	45.0	$348	8.0	106	$52,204	Fuel Container 26-in OD, LOWER UNIT
26SLBA04N00	UPPER HEAD (UH)	758	$12.49	$9,468	$600	$100	$0	$87	2.0	$1,371	31.5	$305	7.0	$44	1.0	42	$11,975	Container 26-in OD, UPPER HEAD
26L0B006S00	SS INTERNALS-6 PWR	1320	$2.72	$3,590	$200	$0	$0	$0	0.0	$1,109	25.5	$261	6.0	$44	1.0	33	$5,204	Stainless for 6 PWR Assy-Consolidated

TABLE C-5 CONTAINER FABRICATION PRICE ESTIMATE - VENDOR - B

FOR INFORMATION ONLY

		RAW MATERIAL			MATERIALS			LABOR								COMPONENT TOTALS		Estimate sums up to the shaded top line to total value for each component/container type.
								ENGINEERING		MANUFACTURING		INSPECTION		Q/A				
	DESCRIPTION	WT	$/LB	$/COMP	EXPEND	TOOLS	SHIP	COST	HRS	COST	HRS	COST	HRS	COST	HRS	HRS	COST	REMARKS
26L0B002N00	LOWER UNIT (LU) 26L	2717	$11.19	$30,414	$15,857	$220	$1,100	$131	3.0	$2,176	50.0	$1,958	45.0	$348	8.0	106	$52,204	Fuel Container 26-in OD, LOWER UNIT
26L0B002N01	BOTTOM HD (BH)	610	$12.93	$7,887		$110		$131	3.0	$522	12.0	$174	4.0			19	$8,824	
26L0B002N02	BODY	1967	$9.67	$19,198	$1,600					$218	5.0	$87	2.0			7	$21,103	
26L0B002N03	FLANGE RING	140	$23.78	$3,329												0	$3,329	
26L0B002N04	JOIN BH TO BODY	-	-	-	$800					$435	10.0	$87	2.0			12	$1,322	
26L0B002N05	SPIN FORM BODY	-	-	-	$12,457											0	$12,457	
26L0B002N06	JOIN FLANGE TO BODY	-	-	-	$300					$348	8.0	$87	2.0			10	$735	
26L0B002N07	ANNEAL LU	-	-	-												0	$0	INCLUDED IN SPIN FORM
26L0B002N08	MACH FLANGE & THROAT	-	-	-		$110				$522	12.0	$131	3.0			15	$763	
26L0B002N09	INSP/TEST/CLEAN	-	-	-	$500							$1,392	32.0			32	$1,892	
26L0B002N10	QA & DOCUMENT	-	-	-										$348	8.0	8	$348	
26L0B002N11	PKG & SHIP	-	-	-	$200		$1,100			$131	3.0					3	$1,431	
28L0BN90000	CONTAINER-10BWR 28L	5139	$9.02	$46,348	$17,579	$320	$1,100	$2,8	5.0	$4,743	104.0	$2,524	58.0	$436	10.0	182	$73,268	Fuel Container 28-in OD (10 BWR Assy)
28L0D003N00	LOWER UNIT (LU) 28L	2907	$11.15	$32,411	$16,779	$220	$1,100	$131	3.0	$2,263	52.0	$1,958	45.0	$348	8.0	108	$55,210	Fuel Container 28-in OD, LOWER UNIT
28L0B005N00	UPPER HEAD (UH) 28L	803	$12.52	$10,050	$600	$100	$0	$87	2.0	$1,371	31.5	$305	7.0	$44	1.0	42	$12,557	Fuel Container 28-in OD, UPPER HEAD
28L0B009S00	SS INTERNALS-10 BWR	1429	$2.72	$3,887	$200	$0	$0	$0	0.0	$1,109	25.5	$261	6.0	$44	1.0	33	$5,501	Stainless internals for 10 BWR Assy
28L0B003N00	LOWER UNIT (LU) 28L	2907	$11.15	$32,411	$16,779	$220	$1,100	$131	3.0	$2,263	52.0	$1,958	45.0	$348	8.0	108	$55,210	Fuel Container 28-in OD, LOWER UNIT
28L0B003N01	BOTTOM HD (BH)	655	$12.93	$8,469		$110		$131	3.0	$522	12.0	$174	4.0			19	$9,406	
28L0B003N02	BODY	2112	$9.67	$20,613	$1,600					$218	5.0	$87	2.0			7	$22,518	
28L0B003N03	FLANGE RING	140	$23.78	$3,329												0	$3,329	
28L0B003N04	JOIN BH TO BODY	-	-	-	$800					$522	12.0	$87	2.0			14	$1,409	
28L0B003N05	SPIN FORM BODY	-	-	-	$13,379											0	$13,379	
28L0B003N06	JOIN FLANGE TO BODY	-	-	-	$300					$348	8.0	$87	2.0			10	$735	
28L0B003N07	ANNEAL LU	-	-	-												0	$0	INCLUDED IN SPIN FORM
28L0B003N08	MACH FLANGE & THROAT	-	-	-		$110				$522	12.0	$131	3.0			15	$763	
28L0B003N09	INSP/TEST/CLEAN	-	-	-	$500							$1,392	32.0			32	$1,892	
28L0B003N10	QA & DOCUMENT	-	-	-										$348	8.0	8	$348	
28L0B003N11	PKG & SHIP	-	-	-	$200		$1,100			$131	3.0					3	$1,431	
28L0B005N00	UPPER HEAD (UH) 28L	803	$12.52	$10,050	$600	$100	$0	$87	2.0	$1,371	31.5	$305	7.0	$44	1.0	42	$12,557	Fuel Container 28-in OD, UPPER HEAD
28L0B005N01	MAKE UH	655	$12.93	$8,469				$87	2.0	$696	16.0	$87	2.0			20	$9,339	
28L0B005N02	MAKE PINTLE	148	$10.68	$1,581												0	$1,581	
28L0B005N03	JOIN PINTLE TO HEAD	-	-	-	$300					$174	4.0	$87	2.0			6	$561	
28L0B005N04	ANNEAL UH ASSY	-	-	-	$100					$44	1.0					1	$144	
28L0B005N05	MACH FLANGE	-	-	-		$100				$348	8.0					8	$448	
28L0B005N06	INSP/CLEAN UH	-	-	-						$22	0.5	$131	3.0			4	$153	
28L0B005N07	QA & DOCUMENT	-	-	-										$44	1.0	1	$44	
28L0B005N08	PKG & SHIP	-	-	-	$200					$87	2.0					2	$287	

TABLE C-5 CONTAINER FABRICATION PRICE ESTIMATE - VENDOR - B

FOR INFORMATION ONLY

	DESCRIPTION	RAW MATERIAL WT	RAW MATERIAL $/LB	RAW MATERIAL $/COMP	MATERIALS EXPEND	MATERIALS TOOLS	MATERIALS SHIP	LABOR ENGINEERING COST	LABOR ENGINEERING HRS	LABOR MANUFACTURING COST	LABOR MANUFACTURING HRS	LABOR INSPECTION COST	LABOR INSPECTION HRS	LABOR Q/A COST	LABOR Q/A HRS	COMPONENT TOTALS HRS	COMPONENT TOTALS COST	Estimate sums up to the shaded top line to total value for each component/container type. REMARKS
	STAINLESS INTERNALS																	
26L0B006S00	SS INTERNALS-6 PWR	1320	$2.72	$3,590	$200	$0	$0	$0	0.0	$1,109	25.5	$261	6.0	$44	1.0	33	$5,204	Stainless for 6 PWR Assy-Consolidated
26L0B006S01	FORM DIVIDERS	1320	$2.72	$3,590						$522	12.0	$87	2.0			14	$4,199	
26L0B006S02	JOIN DIVIDERS	-	-	-	$100					$261	6.0					6	$361	
26L0B006S03	MACH/STRAIGHT/CLEAN	-	-	-						$261	6.0					6	$261	
26L0B006S04	INSPECT	-	-	-								$174	4.0			4	$174	
26L0B006S05	QA & DOCUMENT	-	-	-										$44	1.0	1	$44	
26L0B006S06	PKG & SHIP	-	-	-	$100					$65	1.5					2	$165	
28L0B009S00	SS INTERNALS-10 PWR	1429	$2.72	$3,887	$200	$0	$0	$0	0.0	$1,109	25.5	$261	6.0	$44	1.0	33	$4,501	Stainless internals for 10 BWR Ass'y
28L0B009S01	FORM DIVIDERS	1429	$2.72	$3,887						$522	12.0	$87	2.0			14	$4,496	
28L0B009S02	JOIN DIVIDERS	-	-	-	$100					$261	6.0					6	$361	
28L0B009S03	MACH/STRAIGHT/CLEAN	-	-	-						$261	6.0					6	$261	
28L0B009S04	INSPECT	-	-	-								$174	4.0			4	$174	
28L0B009S05	QA & DOCUMENT	-	-	-										$44	1.0	1	$44	
28L0B009S06	PKG & SHIP	-	-	-	$100					$65	1.5					2	$165	
26L0B007S00	SS INTERNALS-3 PWR	330	$2.72	$898	$150	$0	$0	$0	0.0	$435	10.0	$152	3.5	$44	1.0	15	$1,679	Stainless internals for 3 PWR Ass'y
26L0B007S01	FORM DIVIDERS	330	$2.72	$898						$174	4.0	$65	1.5			6	$1,137	
26L0B007S02	JOIN DIVIDERS	-	-	-	$50					$130	3.0					3	$180	
26L0B007S03	MACH/STRAIGHT/CLEAN	-	-	-						$87	2.0					2	$87	
26L0B007S04	INSPECT	-	-	-								$87	2.0			2	$87	
26L0B007S05	QA & DOCUMENT	-	-	-										$44	1.0	1	$44	
26L0B007S06	PKG & SHIP	-	-	-	$100					$44	1.0					1	$144	
28L0B008S00	SS INTERNALS-3P/4BWR	659	$2.72	$1,792	$200	$0	$0	$0	0.0	$1,109	25.5	$392	9.0	$44	1.0	36	$3,537	Stainless internals, 3 PWR/4 BWR Assy
28L0B008S01	FORM DIVIDERS	659	$2.72	$1,792						$522	12.0	$131	3.0			15	$2,445	
28L0B008S02	JOIN DIVIDERS	-	-	-	$100					$261	6.0	$87	2.0			8	$448	
28L0B008S03	MACH/STRAIGHT/CLEAN	-	-	-						$261	6.0					6	$261	
28L0B008S04	INSPECT	-	-	-								$174	4.0			4	$174	
28L0B008S05	QA & DOCUMENT	-	-	-										$44	1.0	1	$44	
28L0B008S06	PKG & SHIP	-	-	-	$100					$65	1.5					2	$165	
28L0B010S00	SS INTERNALS-4 PWR	440	$2.72	$1,197	$200	$0	$0	$0	0.0	$480	11.0	$152	3.5	$44	1.0	16	$2,073	Stainless internals for 4 PWR Ass'y
28L0B010S01	FORM DIVIDERS	440	$2.72	$1,197						$218	5.0	$65	1.5			7	$1,480	
28L0B010S02	JOIN DIVIDERS	-	-	-	$100					$131	3.0					3	$231	
28L0B010S03	MACH/STRAIGHT/CLEAN	-	-	-						$87	2.0					2	$87	
28L0B010S04	INSPECT	-	-	-								$87	2.0			2	$87	
28L0B010S05	QA & DOCUMENT	-	-	-										$44	1.0	1	$44	
28L0B010S06	PKG & SHIP	-	-	-	$100					$44	1.0					1	$144	

TABLE C-6 CONTAINER FABRICATION PRICE ESTIMATE - VENDOR - C

		RAW MATERIAL			MATERIALS			LABOR								COMPONENT TOTALS		Estimate sums up to the shaded top line to total value for each component/container type.
								ENGINEERING		MANUFACTURING		INSPECTION		Q/A				
	DESCRIPTION	WT	$/LB	$/COMP	EXPEND	TOOLS	SHIP	COST	HRS	COST	HRS	COST	HRS	COST	HRS	HRS	COST	REMARKS
	C71500 MAT'L																	
26S0CC00000	CONTAINER-HLW 26S	4381	$7.17	$31,395	$3,256	$29	$1,684	$60	1.2	$21,273	220.5	$1,775	34.0	$1,038	19.9	276	$60,510	HLW Container (DWPF,WVDP)
26L0CC60000	CONTAINER-6PWR 26L	5347	$6.89	$36,862	$3,823	$37	$2,093	$85	1.7	$25,158	253.0	$1,983	38.0	$1,220	23.4	316	$71,261	Fuel Container 26-in OD (6 PWR,CONS)
28L0CC90000	CONTAINER-10BWR 28L	6361	$6.55	$41,644	$4,110	$38	$2,336	$85	1.7	$28,267	275.5	$1,983	38.0	$1,220	23.4	339	$79,683	Fuel Container 28-in OD (10 BWR)
	N08825 MAT'L																	
26S0CN00000	CONTAINER-HLW 26S	3938	$7.88	$31,022	$3,256	$26	$1,639	$50	1.2	$22,946	220.5	$1,775	34.0	$1,038	20.4	276	$61,762	HLW Container (DWPF,WVDP)
26L0CN60000	CONTAINER-6PWR 26L	4831	$7.53	$36,370	$3,823	$37	$2,003	$65	1.7	$27,267	259.5	$1,983	38.0	$1,220	23.4	323	$72,788	Fuel Container 26-in OD (6 PWR,CONS)
28L0CN90000	CONTAINER-10BWR 28L	5833	$7.11	$41,448	$4,110	$38	$2,246	$85	1.7	$29,467	275.5	$1,983	38.0	$1,220	23.4	339	$80,597	Fuel Container 28-in OD (10 BWR)
	C71500 MAT'L																	
26S0CC00000	CONTAINER-HLW 26S	4381	$7.17	$31,395	$3,256	$29	$1,684	$60	1.2	$21,273	220.5	$1,775	34.0	$1,038	19.9	276	$60,510	HLW Container (DWPF,WVDP)
26S0C001C00	LOWER UNIT (LU)	3045	$7.13	$21,696	$3,097	$21	$1,512	$40	0.8	$18,910	184.5	$1,358	26.0	$784	15.0	226	$47,418	Container 26-in OD, LOWER UNIT
26S0C004C00	UPPER HEAD (UH)	1336	$7.26	$9,699	$159	$8	$172	$20	0.4	$2,363	36.0	$417	8.0	$254	4.9	49	$13,092	Container 26-in OD, UPPER HEAD
26S0C001C00	LOWER UNIT (LU) 26S	3045	$7.13	$21,696	$3,097	$21	$1,512	$40	0.8	$18,910	184.5	$1,358	26.0	$784	15.0	226	$47,418	HLW Container, LOWER UNIT
26S0C001C01	BOTTOM HD (BH)	1377	$7.09	$9,763				$10	0.2	$821	15.7	$52	1.0	$52	1.0	18	$10,698	
26S0C001C02	BODY	1536	$7.09	$10,890	$332	$2		$10	0.2	$2,196	42.0	$209	4.0	$78	1.5	48	$13,717	
26S0C001C03	FLANGE RING	132	$7.90	$1,043	$40	$1		$10	0.2	$904	17.3	$52	1.0	$78	1.5	20	$2,128	
26S0C001C04	JOIN BH TO BODY	-	-	-	$572	$2				$1,778	34.0	$157	3.0	$52	1.0	38	$2,561	
26S0C001C05	SPIN FORM BODY	-	-	-	$20		$970			$7,510	?	$157	3.0	$105	2.0	5	$8,762	SUBCONTRACT
26S0C001C06	JOIN FLANGE TO BODY	-	-	-	$1,064	$2		$5	0.1	$1,542	29.5	$157	3.0	$105	2.0	35	$2,875	
26S0C001C07	ANNEAL LU	-	-	-	$110	$2	$300	$5	0.1	$1,400	10.0	$157	3.0	$105	2.0	15	$2,079	
26S0C001C08	MACH FLANGE & THROAT	-	-	-	$45	$6				$627	12.0	$52	1.0	$26	0.5	14	$756	
26S0C001C09	INSP/TEST/CLEAN	-	-	-	$113	$6				$209	4.0	$261	5.0	$105	2.0	11	$894	
26S0C001C10	QA & DOCUMENT	-	-	-	$1		$2					$52	1.0	$52	1.0	2	$107	
26S0C001C11	PKG & SHIP	-	-	-	$700		$240			$523	10.0	$52	1.0	$26	0.5	12	$1,541	
26S0C001C12	ANNEAL & CLEAN				$100					$1,400	10.0					10	$1,500	PRIOR TO SPIN FORM
26SLC004C00	UPPER HEAD (UH)	1336	$7.26	$9,699	$159	$8	$172	$20	0.4	$2,363	36.0	$417	8.0	$254	4.9	49	$13,092	Container 26-in OD, UPPER HEAD
26SLC004C01	MAKE UH	1174	$7.26	$8,523				$10	0.2			$26	0.5	$10	0.2	1	$8,569	
26SLC004C02	MAKE PINTLE	162	$7.26	$1,176	$1	$1				$52	1.0	$26	0.5	$10	0.2	2	$1,266	
26SLC004C03	JOIN PINTLE TO HEAD	-	-	-	$90					$209	4.0	$52	1.0	$26	0.5	6	$377	
26SLC004C04	ANNEAL UH ASSY	-	-	-			$140			$480	?	$26	0.5	$26	0.5	1	$672	
26SLC004C05	MACH FLANGE	-	-	-	$50	$5		$10	0.2	$1,412	27.0	$183	3.5	$52	1.0	32	$1,712	
26SLC004C06	INSP/CLEAN UH	-	-	-	$5	$2				$105	2.0	$52	1.0	$52	1.0	4	$216	
26SLC004C07	QA & DOCUMENT	-	-	-	$1							$52	1.0	$52	1.0	2	$105	
26SLC004C08	PKG & SHIP	-	-	-	$12		$32			$105	2.0			$26	0.5	3	$175	

TABLE C-6 CONTAINER FABRICATION PRICE ESTIMATE - VENDOR - C

		RAW MATERIAL			MATERIALS			LABOR								COMPONENT TOTALS		Estimate sums up to the shaded top line to total value for each component/container type.
								ENGINEERING		MANUFACTURING		INSPECTION		Q/A				
	DESCRIPTION	WT	$/LB	$/COMP	EXPEND	TOOLS	SHIP	COST	HRS	COST	HRS	COST	HRS	COST	HRS	HRS	COST	REMARKS
26L0CC60000	CONTAINER-6PWR 26L	5347	$6.89	$36,862	$3,823	$37	$2,093	$85	1.7	$25,158	233.0	$1,983	38.0	$1,220	23.4	316	$71,261	Fuel Container 26-in OD (6 PWR,CONS)
26L0C002C00	LOWER UNIT (LU)	3761	-	$26,773	$3,463	$21	$1,877	$40	0.8	$22,246	207.0	$1,358	26.0	$784	15.0	249	$56,562	Fuel Container 26-in OD, LOWER UNIT
26L0C004C00	UPPER HEAD (UH)	1336	-	$9,699	$159	$8	$172	$20	0.4	$2,363	36.0	$417	8.0	$254	4.9	49	$13,092	Container 26-in OD, UPPER HEAD
26L0C006S00	SS INTERNALS-6 PWR	250	-	$390	$201	$8	$44	$25	0.5	$549	10.0	$208	4.0	$182	3.5	18	$1,607	Stainless for 6 PWR Assy-Consolidated
26L0C002C00	LOWER UNIT (LU) 26L	3761	$7.12	$26,773	$3,463	$21	$1,877	$40	0.8	$22,246	207.0	$1,358	26.0	$784	15.0	249	$56,562	Fuel Container 26-in OD, LOWER UNIT
26L0C002C01	BOTTOM HD (BH)	1377	$7.09	$9,763				$10	0.2	$821	15.7	$52	1.0	$52	1.0	18	$10,698	
26L0C002C02	BODY	2252	$7.00	$15,967	$498	$2		$10	0.2	$3,293	63.0	$209	4.0	$78	1.5	69	$20,057	
26L0C002C03	FLANGE RING	132	$7.90	$1,043	$40	$1		$10	0.2	$904	17.3	$52	1.0	$78	1.5	20	$2,128	
26L0C002C04	JOIN BH TO BODY	-	-	-	$572	$2				$1,778	34.0	$157	3.0	$52	1.0	38	$2,561	
26L0C002C05	SPIN FORM BODY	-	-	-	$20		$1,200			$9,216	?	$157	3.0	$105	2.0	5	$10,698	SUBCONTRACT
26L0C002C06	JOIN FLANGE TO BODY	-	-	-	$1,064	$2		$5	0.1	$1,625	31.0	$157	3.0	$105	2.0	36	$2,958	
26L0C002C07	ANNEAL LU	-	-	-	$110	$2	$375	$5	0.1	$1,625	10.0	$157	3.0	$105	2.0	15	$2,379	
26L0C002C08	MACH FLANGE & THROAT	-	-	-	$45	$6				$627	12.0	$52	1.0	$26	0.5	14	$756	
26L0C002C09	INSP/TEST/CLEAN	-	-	-	$113	$6				$209	4.0	$261	5.0	$105	2.0	11	$694	
26L0C002C10	QA & DOCUMENT	-	-	-	$1		$2					$52	1.0	$52	1.0	2	$107	
26L0C002C11	PKG & SHIP	-	-	-	$900		$300			$523	10.0	$52	1.0	$26	0.5	12	$1,801	
26L0C002C12	ANNEAL & CLEAN				$100					$1,625	10.0					10	$1,725	PRIOR TO SPIN FORM
28L0CC90000	CONTAINER-10BWR 28L	6361	$6.55	$41,644	$4,110	$38	$2,336	$85	1.7	$28,267	275.5	$1,983	38.0	$1,220	23.4	339	$79,683	Fuel Container 28-in OD (10 BWR Assy)
28L0C003C00	LOWER UNIT (LU) 28L	4182	-	$29,768	$3,745	$21	$2,102	$40	0.8	$24,951	222.0	$1,358	26.0	$784	15.0	264	$62,769	Fuel Container 28-in OD, LOWER UNIT
28L0C005C00	UPPER HEAD (UH) 28L	1487	-	$10,796	$164	$9	$190	$20	0.4	$2,559	39.0	$417	8.0	$254	4.9	52	$14,409	Fuel Container 28-in OD, UPPER HEAD
28L0C009S00	SS INTERNALS-10 BWR	692	-	$1,080	$201	$8	$44	$25	0.5	$757	14.5	$208	4.0	$182	3.5	23	$2,505	Stainless internals for 10 BWR Assy
28L0C003C00	LOWER UNIT (LU) 28L	4182	$7.12	$29,768	$3,745	$21	$2,102	$40	0.8	$24,951	222.0	$1,358	26.0	$784	15.0	264	$62,769	Fuel Container 28-in OD, LOWER UNIT
28L0C003C01	BOTTOM HD (BH)	1615	$7.09	$11,450				$10	0.2	$889	17.0	$52	1.0	$52	1.0	19	$12,453	
28L0C003C02	BODY	2422	$7.09	$17,172	$498	$2		$10	0.2	$3,450	66.0	$209	4.0	$78	1.5	72	$21,419	
28L0C003C03	FLANGE RING	145	$7.90	$1,146	$44	$1		$10	0.2	$993	19.0	$52	1.0	$78	1.5	22	$2,324	
28L0C003C04	JOIN BH TO BODY	-	-	-	$629	$2				$1,934	37.0	$157	3.0	$52	1.0	41	$2,774	
28L0C003C05	SPIN FORM BODY	-	-	-	$20		$1,350			$9,871	?	$157	3.0	$105	2.0	5	$11,503	SUBCONTRACT
28L0C003C06	JOIN FLANGE TO BODY	-	-	-	$1,170	$2		$5	0.1	$1,778	34.0	$157	3.0	$105	2.0	39	$3,217	
28L0C003C07	ANNEAL LU	-	-	-	$110	$2	$420	$5	0.1	$2,260	10.0	$157	3.0	$105	2.0	15	$3,059	
28L0C003C08	MACH FLANGE & THROAT	-	-	-	$50	$6				$680	13.0	$52	1.0	$26	0.5	15	$814	
28L0C003C09	INSP/TEST/CLEAN	-	-	-	$123	$6				$261	5.0	$261	5.0	$105	2.0	12	$756	
28L0C003C10	QA & DOCUMENT	-	-	-	$1		$2					$52	1.0	$52	1.0	2	$107	
28L0C003C11	PKG & SHIP	-	-	-	$1,000		$330			$575	11.0	$52	1.0	$26	0.5	13	$1,983	
28L0C003C12	ANNEAL & CLEAN				$100					$2,260	10.0					10	$2,360	PRIOR TO SPIN FORM

TABLE C-6 CONTAINER FABRICATION PRICE ESTIMATE - VENDOR - C

		RAW MATERIAL			MATERIALS			LABOR								COMPONENT TOTALS		Estimate sums up to the shaded top line to total value for each component/container type.
								ENGINEERING		MANUFACTURING		INSPECTION		Q/A				
	DESCRIPTION	WT	$/LB	$/COMP	EXPEND	TOOLS	SHIP	COST	HRS	COST	HRS	COST	HRS	COST	HRS	HRS	COST	REMARKS
28L0C005C00	UPPER HEAD (UH) 28L	1487	$7.26	$10,796	$164	$9	$190	$20	0.4	$2,559	39.0	$417	8.0	$254	4.9	52	$14,409	Fuel Container 28-in OD, UPPER HEAD
28L0C005C01	MAKE UH	1325	$7.26	$9,620				$10	0.2			$26	0.5	$10	0.2	1	$9,666	
28L0C005C02	MAKE PINTLE	162	$7.26	$1,176	$1	$1				$52	1.0	$26	0.5	$10	0.2	2	$1,266	
28L0C005C03	JOIN PINTLE TO HEAD	-	-	-	$90					$209	4.0	$52	1.0	$26	0.5	6	$377	
28L0C005C04	ANNEAL UH ASSY	-	-	-			$155			$520		$26	0.5	$26	0.5	1	$727	
28L0C005C05	MACH FLANGE	-	-	-	$55	$6		$10	0.2	$1,568	30.0	$183	3.5	$52	1.0	35	$1,874	
28L0C005C06	INSP/CLEAN UH	-	-	-	$5	$2				$105	2.0	$52	1.0	$52	1.0	4	$216	
28L0C005C07	QA & DOCUMENT	-	-	-	$1							$52	1.0	$52	1.0	2	$105	
28L0C005C08	PKG & SHIP	-	-	-	$12		$35			$105	2.0			$26	0.5	3	$178	
	N08825 MAT'L																	
26S0CN00000	CONTAINER-HLW 26S	3938	-	$31,022	$3,256	$20	$1,639	$60	1.2	$22,946	20.5	$1,775	34.0	$1,038	20.4	276	$61,76	HLW Container (DWPF,WVDP)
26S0C001N00	LOWER UNIT (LU)	2735	-	$21,218	$3,097	$18	$1,472	$40	0.8	$20,463	184.5	$1,358	26.0	$784	15.5	227	$48,450	High-level waste container, LOWER UNIT
26SLC004N00	UPPER HEAD (UH)	1203	-	$9,804	$159	$8	$167	$20	0.4	$2,483	36.0	$417	8.0	$254	4.9		$13,312	Container 26-in OD, UPPER HEAD
26S0C001N00	LOWER UNIT (LU) 26S	2735	$7.76	$21,218	$3,097	$18	$1,4 2	$40	0.8	$20,463	184 5	$1,358	26.0	$784	15.5	2 7	$48,450	High-level waste container, LOWER UNIT
26S0C001N01	BOTTOM HD (BH)	1236	$7.71	$9,530				$10	0.2	$821	15.7	$52	1.0	$52	1.0	18	$10,465	
26S0C001N02	BODY	1379	$7.71	$10,632	$332	$2		$10	0.2	$2,196	42.0	$209	4.0	$78	1.5	48	$13,459	
26S0C001N03	FLANGE RING	120	$8.80	$1,056	$40	$1		$10	0.2	$904	17.3	$52	1.0	$78	1.5	20	$2,141	
26S0C001N04	JOIN BH TO BODY	-	-	-	$572	$2				$1,778	34.0	$157	3.0	$52	1.5	39	$2,561	
26S0C001N05	SPIN FORM BODY	-	-	-	$20		$900			$8,163	?	$157	3.0	$105	2.0	5	$9,345	SUBCONTRACT
26S0C001N06	JOIN FLANGE TO BODY	-	-	-	$1,064	$2		$5	0.1	$1,542	29.5	$157	3.0	$105	2.0	35	$2,875	
26S0C001N07	ANNEAL LU	-	-	-	$110	$2	$330	$5	0.1	$1,850	10.0	$157	3.0	$105	2.0	15	$2,55	
26S0C001N08	MACH FLANGE & THROAT	-	-	-	$45	$3				$627	12.0	$52	1.0	$20	0.5	14	$753	
26S0C001N09	INSP/TEST/CLEAN	-	-	-	$113	$6				$209	4.0	$261	5.0	$105	2.0	11	$694	
26S0C001N10	QA & DOCUMENT	-	-	-	$1		$2					$52	1.0	$52	1.0	2	$107	
26S0C001N11	PKG & SHIP	-	-	-	$700		$240			$323	10.0	$52	1.0	$26	0.5	12	$1,541	
26S0C001N12	CLEAN & ANNEAL	-	-	-	$100					$1,850	10.0					10	$1,950	PRIOR TO SPIN FORM
26SLC004N00	UPPER HEAD (UH)	1203	$8.15	$9,804	$159	$8	$167	$20	0.4	$2,483	36.0	$417	8.0	$254	4.9	49	$13,312	Container 2.-in OD, UPPER HEAD
26SLC004N01	MAKE UH	1054	$8.15	$8,590				$10	0.2			$26	0.5	$10	0.2	1	$8,636	
26SLC004N02	MAKE PINTLE	149	$8.15	$1,214	$1	$1				$52	1.0	$26	0.5	$10	0.2	2	$1,304	
26SLC004N03	JOIN PINTLE TO HEAD	-	-	-	$90					$209	4.0	$52	1.0	$26	0.5	6	$377	
26SLC004N04	ANNEAL UH ASSY	-	-	-			$135			$600		$26	0.5	$26	0.5	1	$787	
26SLC004N05	MACH FLANGE	-	-	-	$50	$5		$10	0.2	$1,412	27.0	$183	3.5	$52	1.0	32	$1,712	
26SLC004N06	INSP/CLEAN UH	-	-	-	$5	$2				$105	2.0	$52	1.0	$52	1.0	4	$216	
26SLC004N07	QA & DOCUMENT	-	-	-	$1							$52	1.0	$52	1.0	2	$105	
26SLC004N08	PKG & SHIP	-	-	-	$12		$32			$105	2.0			$26	0.5	3	$175	
26L0CN60000	CONTAINER-6PWR 26L	4831	$7.53	$36,376	$3,823	$37	$2,003	$85	1.7	$27,267	259.5	$1,983	38.0	$1,220	23.4	323	$72,788	Fuel Container 26-in OD (6 PWR,CONS)
26L0C002N00	LOWER UNIT (LU)	3378		$26,176	$3,463	$21	$1,792	$40	0.8	$24,235	213.0	$1,358	26.0	$784	15.0	255	$57,569	Fuel Container 26-in OD, LOWER UNIT
26SLCA04N00	UPPER HEAD (UH)	1203		$9,804	$159	$8	$167	$20	0.4	$2,483	36.0	$417	8.0	$254	4.9	49	$13,312	Container 26-in OD, UPPER HEAD
26L0C006S00	SS INTERNALS-6 PWR	250		$390	$201	$8	$44	$25	0.5	$549	10.5	$208	4.0	$182	3.5	19	$1,607	Stainless for 6 PWR Assy-Consolidated

TABLE C-6 CONTAINER FABRICATION PRICE ESTIMATE - VENDOR - C

FOR INFORMATION ONLY

		RAW MATERIAL			MATERIALS			LABOR								COMPONENT TOTALS		Estimate sums up to the shaded top line to total value for each component/container type.
								ENGINEERING		MANUFACTURING		INSPECTION		Q/A				
	DESCRIPTION	W/T	$/LB	$/COMP	EXPEND	TOOLS	SHIP	COST	HRS	COST	HRS	COST	HRS	COST	HRS	HRS	COST	REMARKS
26L0C002N00	LOWER UNIT (LU) 26L	3378	$7.75	$26,176	$3,469	$21	$1,792	$40	0.8	$24,235	213.0	$1,358	26.0	$784	15.0	253	$57,869	Fuel Container 26-in OD, LOWER UNIT
26L0C002N01	BOTTOM HD (BH)	1236	$7.71	$9,530				$10	0.2	$821	15.7	$52	1.0	$52	1.0	18	$10,465	
26L0C002N02	BODY	2022	$7.71	$15,590	$498	$2		$10	0.2	$3,293	63.0	$209	4.0	$78	1.5	69	$19,680	
26L0C002N03	FLANGE RING	120	$8.80	$1,056	$40	$1		$10	0.2	$904	17.3	$52	1.0	$78	1.5	20	$2,141	
26L0C002N04	JOIN BH TO BODY	-	-	-	$572	$2				$1,778	34.0	$157	3.0	$52	1.0	38	$2,561	
26L0C002N05	SPIN FORM BODY	-	-	-	$20		$1,115	$5	0.1	$10,075	?	$157	3.0	$105	2.0	5	$11,477	SUBCONTRACT
26L0C002N06	JOIN FLANGE TO BODY	-	-	-	$1,064	$2		$5	0.1	$1,625	31.0	$157	3.0	$105	2.0	42	$2,958	
26L0C002N07	ANNEAL LU	-	-	-	$110	$2	$375			$2,190	10.0	$157	3.0	$105	2.0	15	$2,939	
26L0C002N08	MACH FLANGE & THROAT	-	-	-	$45	$6				$627	12.0	$52	1.0	$26	0.5	14	$756	
26L0C002N09	INSP/TEST/CLEAN	-	-	-	$113	$6				$209	4.0	$261	5.0	$105	2.0	11	$694	
26L0C002N10	QA & DOCUMENT	-	-	-	$1		$2					$52	1.0	$52	1.0	2	$107	
26L0C002N11	PKG & SHIP	-	-	-	$900		$300			$523	10.0	$52	1.0	$26	0.5	12	$1,801	
26L0C002N12	CLEAN & ANNEAL	-	-	-	$100					$2,190	10.0					10	$2,290	PRIOR TO SPIN FORM
28L0CN00-0	CONTAINER-10BWR 28L	5833	$7.11	$41,449	$4,110	$38	$2,246	$85	1.7	$29,467	275.5	$1,983	38.0	$1,220	23.4	339	$80,397	Fuel Container 28-in OD (10 BWR Assy)
28L0C003N00	LOWER UNIT (LU) 28L	3802		$29,456	$3,745	$21	$2,012	$40	0.8	$26,031	222.0	$1,358	26.0	$784	15.0	264	$63,447	Fuel Container 28-in OD, LOWER UNIT
28L0C005N00	UPPER HEAD (UH) 28L	1339		$10,912	$164	$9	$190	$20	0.4	$2,679	39.0	$417	8.0	$254	4.9	52	$14,645	Fuel Container 28-in OD, UPPER HEAD
28L0C009S00	SS INTERNALS-10 BWR	692		$1,080	$201	$8	$44	$25	0.5	$757	14.5	$208	4.0	$182	3.5	23	$2,505	Stainless internals for 10 BWR Assy
28L0C003N00	LOWER UNIT (LU) 28L	3802	$7.75	$29,456	$3,745	$21	$2,012	$40	0.8	$26,031	222.0	$1,358	26.0	$784	15.0	264	$63,447	Fuel Container 28-in OD, LOWER UNIT
28L0C003N01	BOTTOM HD (BH)	1495	$7.71	$11,526				$10	0.2	$889	17.0	$52	1.0	$52	1.0	19	$12,529	
28L0C003N02	BODY	2175	$7.71	$16,769	$498	$2		$10	0.2	$3,450	66.0	$209	4.0	$78	1.5	72	$21,016	
28L0C003N03	FLANGE RING	132	$8.80	$1,161	$44	$1		$10	0.2	$993	19.0	$52	1.0	$78	1.5	22	$2,339	
28L0C003N04	JOIN BH TO BODY	-	-	-	$629	$2				$1,934	37.0	$157	3.0	$52	1.0	41	$2,774	
28L0C003N05	SPIN FORM BODY	-	-	-	$20		$1,260			$10,821	?	$157	3.0	$105	2.0	5	$12,363	SUBCONTRACT
28L0C003N06	JOIN FLANGE TO BODY	-	-	-	$1,170	$2		$5	0.1	$1,778	34.0	$157	3.0	$105	2.0	39	$3,217	
28L0C003N07	ANNEAL LU	-	-	-	$110	$2	$420	$5	0.1	$2,390	10.0	$157	3.0	$105	2.0	15	$3,189	
28L0C003N08	MACH FLANGE & THROAT	-	-	-	$50	$6				$680	13.0	$52	1.0	$26	0.5	15	$814	
28L0C003N09	INSP/TEST/CLEAN	-	-	-	$113	$6				$261	5.0	$261	5.0	$105	2.0	12	$756	
28L0C003N10	QA & DOCUMENT	-	-	-	$1		$2					$52	1.0	$52	1.0	2	$107	
28L0C003N11	PKG & SHIP	-	-	-	$1,000		$330			$575	11.0	$52	1.0	$26	0.5	13	$1,983	
28L0C003N12	CLEAN & ANNEAL	-	-	-	$100					$2,260	10.0					10	$2,360	
28L0C005N00	UPPER HEAD (UH) 28L	1339	$8.15	$10,912	$164	$9	$190	$20	0.4	$2,679	39.0	$417	8.0	$254	4.9	52	$14,645	Fuel Container 28-in OD, UPPER HEAD
28L0C005N01	MAKE UH	1190	$8.15	$9,698				$10	0.2			$26	0.5	$10	0.2	1	$9,744	
28L0C005N02	MAKE PINTLE	149	$8.15	$1,214	$1	$1				$52	1.0	$26	0.5	$10	0.2	2	$1,304	
28L0C005N03	JOIN PINTLE TO HEAD	-	-	-	$90					$209	4.0	$52	1.0	$26	0.5	6	$377	
28L0C005N04	ANNEAL UH ASSY	-	-	-			$155			$640		$26	0.5	$26	0.5	1	$847	
28L0C005N05	MACH FLANGE	-	-	-	$55	$6		$10	0.2	$1,568	30.0	$183	3.5	$52	1.0	35	$1,874	
28L0C005N06	INSP/CLEAN UH	-	-	-	$5	$2				$105	2.0	$52	1.0	$ 2	1.0	4	$216	
28L0C005N07	QA & DOCUMENT	-	-	-	$1							$52	1.0	$52	1.0	2	$105	
28L0C005N08	PKG & SHIP	-	-	-	$12		$35			$105	2.0			$26	0.5	3	$178	

TABLE C-6 CONTAINER FABRICATION PRICE ESTIMATE - VENDOR - C

		RAW MATERIAL			MATERIALS			LABOR								COMPONENT TOTALS		Estimate sums up to the shaded top line to total value for each component/container type.
								ENGINEERING		MANUFACTURING		INSPECTION		Q/A				
	DESCRIPTION	WT	$/LB	$/COMP	EXPEND	TOOLS	SHIP	COST	HRS	COST	HRS	COST	HRS	COST	HRS	HRS	COST	REMARKS
	STAINLESS INTERNALS																	
26L0C006S00	SS INTERNALS-6 PWR	250	$1.56	$390	$201	$8	$44	$25	0.5	$549	10.5	$208	4.0	$182	3.5	19	$1,607	Stainless for 6 PWR Assy-Consolidated
26L0C006S01	FORM DIVIDERS	250	$1.56	$390		$3		$10	0.2	$157	3.0	$52	1.0	$26	0.5	5	$638	
26L0C006S02	JOIN DIVIDERS	-	-	-		$3		$10	0.2	$157	3.0	$26	0.5	$26	0.5	4	$222	
26L0C006S03	MACH/STRAIGHT/CLEAN	-	-	-		$1		$5	0.1	$105	2.0	$26	0.5	$26	0.5	3	$163	
26L0C006S04	INSPECT	-	-	-		$1				$52	1.0	$52	1.0	$26	0.5	3	$131	
26L0C006S05	QA & DOCUMENT	-	-	-	$1					$26	0.5	$26	0.5	$52	1.0	2	$105	
26L0C006S06	PKG & SHIP	-	-	-	$200		$44			$52	1.0	$26	0.5	$26	0.5	2	$348	
28L0C009S00	SS INTERNALS-10 BWR	692	$1.56	$1,080	$201	$8	$44	$25	0.5	$757	14.5	$208	4.0	$182	3.5	23	$2,505	Stainless internals for 10 BWR Ass'y
28L0C009S01	FORM DIVIDERS	692	$1.56	$1,080		$3		$10	0.2	$209	4.0	$52	1.0	$26	0.5	6	$1,380	
28L0C009S02	JOIN DIVIDERS	-	-	-		$3		$10	0.2	$261	5.0	$26	0.5	$26	0.5	6	$326	
28L0C009S03	MACH/STRAIGHT/CLEAN	-	-	-		$1		$5	0.1	$157	3.0	$26	0.5	$26	0.5	4	$215	
28L0C009S04	INSPECT	-	-	-		$1				$52	1.0	$52	1.0	$26	0.5	3	$131	
28L0C009S05	QA & DOCUMENT	-	-	-	$1					$26	0.5	$26	0.5	$52	1.0	2	$105	
28L0C009S06	PKG & SHIP	-	-	-	$200		$44			$52	1.0	$26	0.5	$26	0.5	2	$348	
26L0C007S00	SS INTERNALS-3 PWR	345	$1.56	$538	$201	$8	$50	$25	0.5	$758	14.5	$208	4.0	$182	3.5	22	$1,970	Stainless internals for 3 PWR Ass'y
26L0C007S01	FORM DIVIDERS	345	$1.56	$538		$3		$10	0.2	$314	6.0	$52	1.0	$26	0.5	8	$943	
26L0C007S02	JOIN DIVIDERS	-	-	-		$3		$10	0.2	$209	4.0	$26	0.5	$26	0.5	5	$274	
26L0C007S03	MACH/STRAIGHT/CLEAN	-	-	-		$1		$5	0.1	$105	2.0	$26	0.5	$26	0.5	3	$163	
26L0C007S04	INSPECT	-	-	-	$1	$1				$52	1.0	$52	1.0	$26	0.5	3	$192	
26L0C007S05	QA & DOCUMENT	-	-	-						$26	0.5	$26	0.5	$52	1.0	2	$104	
26L0C007S06	PKG & SHIP	-	-	-	$200		$50			$52	1.0	$26	0.5	$26	0.5	2	$354	
28L0C008S00	SS INTERNALS-3P/4BWR	566	$1.56	$884	$201	$10	$70	$25	0.5	$863	16.5	$208	4.0	$182	3.5	25	$2,443	Stainless internals, 3 PWR/4 BWR Assy
28L0C008S01	FORM DIVIDERS	546	$1.56	$852		$5		$10	0.2	$3.4	6.0	$52	1.0	$26	0.5	8	$1,259	
28L0C008S02	JOIN DIVIDERS	20	$1.60	$32		$3		$10	0.2	$314	6.0	$26	0.5	$26	0.5	7	$411	
28L0C008S03	MACH/STRAIGHT/CLEAN	-	-	-		$1		$5	0.1	$105	2.0	$26	0.5	$26	0.5	3	$163	
28L0C008S04	INSPECT	-	-	-	$1	$1				$52	1.0	$52	1.0	$26	0.5	3	$132	
28L0C008S05	QA & DOCUMENT	-	-	-						$26	0.5	$26	0.5	$52	1.0	2	$104	
28L0C008S06	PKG & SHIP	-	-	-	$200		$70			$52	1.0	$26	0.5	$26	0.5	2	$374	
28L0C010S00	SS INTERNALS-4 PWR	416	$1.56	$649	$201	$8	$65	$25	0.5	$601	11.5	$208	4.0	$182	3.5	20	$1,939	Stainless internals for 4 PWR Ass'y
28L0C010S01	FORM DIVIDERS	416	$1.56	$649		$3		$10	0.2	$157	3.0	$52	1.0	$26	0.5	5	$897	
28L0C010S02	JOIN DIVIDERS	-	-	-		$3		$10	0.2	$209	4.0	$26	0.5	$26	0.5	5	$274	
28L0C010S03	MACH/STRAIGHT/CLEAN	-	-	-		$1		$5	0.1	$105	2.0	$26	0.5	$26	0.5	3	$163	
28L0C010S04	INSPECT	-	-	-	$1	$1				$52	1.0	$52	1.0	$26	0.5	3	$132	
28L0C010S05	QA & DOCUMENT	-	-	-						$26	0.5	$26	0.5	$52	1.0	2	$104	
28L0C010S06	PKG & SHIP	-	-	-	$200		$65			$52	1.0	$26	0.5	$26	0.5	2	$369	

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