DESIGN REPORT

DEPARTMENT OF ENERGY

FUELS FROM BIOMASS
SYSTEMS BRANCH

ADVANCED SYSTEM DEMONSTRATION FOR UTILIZATION OF BIOMASS AS AN ENERGY SOURCE

CONTRACT EG-77-R-06-1036

VOLUME III. EQUIPMENT SPECIFICATIONS
BOOK 2

MAY, 1979
REVISED—OCTOBER, 1980

**Wheelabrator
Cleanfuel Corporation**

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MASTER

DESIGN REPORT

TO

DEPARTMENT OF ENERGY

FUELS FROM BIOMASS

SYSTEMS BRANCH

ADVANCED SYSTEMS DEMONSTRATION

FOR UTILIZATION OF BIOMASS

AS AN ENERGY SOURCE

CONTRACT EG-77-R-06-1036

VOLUME III

BOOK 2

EQUIPMENT SPECIFICATIONS

PREPARED BY

WHEELABRATOR CLEANFUEL CORPORATION

MAY, 1979

INTRODUCTORY NOTE

This volume contains all of the equipment specifications relating to specific equipment to be utilized for the proposed Biomass Project.

All supplemental requirements which are common to a number of these specifications were reproduced in Section I. If a supplemental requirement is called for, it is listed (in capital letters) in the final sections of the particular specification or on form AT-1.

All page numbers for this volume are in parenthesis at the bottom of the respective pages. If two numbers are given, the number to the right of the bar (/) is for the immediately following blank page.

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SPECIFICATION

NO. 1801/01

FIELD ERECTED METAL TANKS

FOR
DEPARTMENT OF ENERGY
BIOMASS CO-GENERATION FACILITIES
IN THE
STATE OF MAINE

Prepared by

THE RUST ENGINEERING COMPANY

CONTRACT 21-1899

SPECIFICATION
NO. 1801/01
FIELD ERECTED METAL TANKS

1. INTENT

This Specification is intended to accompany Purchase Inquiry inviting Proposals to furnish Subcontract Services needed in connection with The Bio-mass Co-Generation Facilities in the State of Maine.

2. SCOPE

Vendor shall fabricate, ship, erect and test on Purchaser's foundations the tanks as shown on attached DESIGN DATA SHEETS and as specified and listed herein.

3. SPECIFICATION REFERENCE

a. Unless otherwise specified on DESIGN DATA SHEET, all atmospheric storage tanks shall be designed, fabricated, and erected in accordance with the latest edition of the American Petroleum Institute (API) Standard 650.

b. All plates shall conform to the current edition of the American Society for Testing and Materials, ASTM A 283, Grade C, unless otherwise noted on DESIGN DATA SHEETS. Furnish certified test reports to the Purchaser.

c. All flanges for nozzle shall conform to 150 psi ANSI B16.5 standard series for forged steel slip-on welding flanges. Slip-on flanges shall be installed so that the face of the flange projects over the end of the pipe a distance equal to the pipe thickness plus 1/8 inch minimum. The material shall conform to ASTM A 105. Lap joint flanges are used for special requirements, as noted on DESIGN DATA SHEETS.

d. All shell manholes, and shell nozzles over three inches in diameter, shall have reinforcing plates around the opening in accordance with API Tables.

4. DESIGN REQUIREMENTS

a. Nozzle and manhole arrangement will be determined after issuing the Contract. The attached DESIGN DATA SHEETS give the number and size of nozzles presently contemplated. Vendor shall include in base price all nozzles, manholes, cleanouts, and ladders shown.

b. Some special fittings such as (but not limited to) suction, drain, and overflow nozzles may be required to comply with applicable Rust Standard Details. When these are required, the DESIGN DATA SHEETS include notations indicating these requirements.

- c. All stairs, handrails, ladders and cages shall be designed to meet OSHA standards. Handrails are to be 1½" steel pipe with toe plate. Ladders shall be offset at least four feet from roof manholes. Unless otherwise noted, there shall be a handrail reaching from the ladder to a point three feet beyond the manhole centerline.
- d. Where DESIGN DATA SHEETS call for insulation by others on a vertical tank, an angle ring shall be installed by Vendor 12 feet above bottom of the tank shell. If the height of the tank exceeds 24 feet, additional rings shall be provided at 12 foot maximum intervals.
- e. All tanks shall have a grounding lug attached at lowest point.
- f. No carbon steel shall be welded directly to the body of a stainless steel tank. A 1/8" minimum stainless steel pad shall be welded to the tank and the carbon steel welded to the pad.
- g. All stiffener or compression rings shall be continuously welded on both sides.

5. ERECTION

Erect tanks on foundations provided. The Vendor shall furnish all services required for erection except as noted herein. Anchor bolts will be furnished and installed by others. Painting will be done by others.

6. CLEANING

- a. After erection, the Vendor shall thoroughly clean the tanks. Remove all grease, oil, and other foreign material from inside and outside walls and bottom of the tanks.
- b. All weld tacks used for attaching scaffold brackets, key plates or any other temporary attachments shall be ground off. Any pits resulting from the removal of the said items shall be filled with weld metal and ground smooth.

7. TESTING

After erection and cleaning, the Vendor shall hydrostatically test the tanks as directed by the Engineer. Any leaks or other defects shall be repaired to the satisfaction of the Engineer. It shall be the responsibility of the Vendor to provide blind flanges, bolts and any other material required to make the tanks watertight. Water will be provided for the Vendor's use within 200 feet of each tank. The Engineer shall be notified at least 48 hours in advance of the hydrostatic test.

8. INFORMATION TO BE INCLUDED IN VENDOR'S PROPOSAL

- a. Quote as required by PURCHASE INQUIRY.
- b. Quote separate price for each tank.
- c. Quote total price for all tanks.

d. Quote unit price for each size nozzle (from 2 inch through 24 inch) and 24" manhole.

e. State time to deliver, erect and test tanks.

9. ATTACHMENTS

See ATTACHMENT AT-1 for documents applicable to this Specification.

ATTACHMENT AT-1

The following checked ☒ Supplemental Requirements documents, all dated 062078, become a part of Specification No. 1801/01 . Other documents also checked ☒ hereon are attachments to the Specification. Drawings, Charts, Lists, Sketches, etc., when listed and attached, are specifically applicable to the Specification.

- ☐ BID EVALUATION DATA SHEETS ()
- ☒ DESIGN DATA SHEETS (1) SHEET 101
- ☐ MANUFACTURER'S DATA SHEETS ()
- ☐ FORM E246 NOISE LEVEL DATA REQUEST SHEETS ()
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐ SPECIAL INSTRUCTIONS TO BIDDERS (For Equipment)
- ☐ SPECIAL INSTRUCTIONS TO BIDDERS (For Materials)
- ☒ SUPPLEMENTAL REQUIREMENTS FOR
- ☒ VENDOR DOCUMENTS/EQUIPMENT
 - ☐ VENDOR DOCUMENTS/MATERIALS
 - ☒ EQUIPMENT SHIPPING AND MARKING
 - ☐ EQUIPMENT INSPECTION, TESTS, START-UP
 - ☒ MISCELLANEOUS ITEMS AND GUARANTEES
 - ☐ COUPLINGS AND MECHANICAL DRIVES
 - ☐ ELECTRIC MOTORS BELOW 600V, AC
 - ☐ ELECTRIC MOTORS ABOVE 600V, AC
 - ☐ SPARE PARTS
 - ☐ EQUIPMENT PAINTING
 - ☒ EQUIPMENT PRE-ASSEMBLY, SHOP ASSEMBLY, MODULE CONSTRUCTION
 - ☐ OSHA AND NOISE CONTROL FEDERAL REGULATIONS
 - ☐ ASME CODE DOCUMENTATION
 - ☐ EQUIPMENT MANUFACTURED USING METRIC MEASURING UNITS
- ☒ DRAWINGS/SKETCHES
- RUST ENGINEERING STANDARDS P18-5.2, P18-6.01 and P18-7.0.

**PRESSURE VESSEL & STORAGE TANK
DESIGN DATA SHEET**

CONTRACT NO. 21-1899

SHEET NO. 101

REV. BY DATE

CUSTOMER : BIOMASS WESTBROOK, MAINE

DESCRIPTION : DEMINERALIZED STORAGE TANK

CAPACITY : 384,000 GAL.

ITEM: D D403

NO. REQUIRED: ONE

AREA:

DESIGN CRITERIA

Oper. Press.	psig	ATMOS.	Oper. Temp.	°F	AMB.
Design Press.	psig	ATMOS.	Design Temp.	°F	100
Sp. G. of Contents		1.0	Lethal		NO
Code		API 650	Code Stamp		NO
Postweld H.T.		NO	Radiography		SPOT
Joint Eff.	Shell	85%	Joint Eff.	Heads	—
Corr. Allow.	Shell	1/16"	Corr. Allow.	Heads	—
Corr. Allow.	Bottom	1/16"	Corr. Allow.	Roof	1/16"
Hydro. Test	psig	FULL H ₂ O	Air Test	psig	—
Wind Loading		YES	Seismic Loading		—
	Roof	DOME		Bottom	FLAT
Matrix Shell		A283-C	Matrix Head		—
	Roof	↓		Bottom	A283-C
Jacket		—	Internal Hd.		—
Noz. Necks		A53-B	Noz. Flanges		A105
Mhd. Necks		A283-C	Mhd. Flanges		A283-C
Mhd. Covers		↓	Noz. Binds		—
Internal Pipe		A53-B	Internal Fgs		—
Couplings		—	Handholes		—
Bolts-Studs		A307-B	Nuts		A307-B
Gaskets		COMP. ASB.	Structural		A36
Mhd. Davits		NO	Mhd. Hinges		NO
Platforms		↓	Platform Clips		↓
Ladder-Cage		↓	Ladder Clips		↓
Stair	SPIRAL	YES	Stair Clips		YES
Insulation		BY OTHERS	Insulation Supps.	(4)	↓
Fireproofing		NO	Fireproofing Supps.		NO
Trays		↓	Tray Supports		↓
Briffener Rings		↓	Lining		↓
Vessel Support		CONCRETE	Allow Soil Bearing		—
Surface Prep. Ins.		(5)	Surface Prep. Outs.		NONE
Shop Paint Inside		NONE	Shop Paint Outside		↓
Field Paint Inside		BY OTHERS	Field Paint Outside		BY OTHERS
Jack. Design Press.			Jack Design Temp.		
Jack. Type			Jack Corr. Allow.

SCHEDULE OF APPURTENANCES

NOZZLES	ROD	SIZE	SER.	TYPE	MK.	MISC. FITTINGS	ROD	SIZE	SER.	TYPE	MK.
INLET	1	8"	150	R.F.	A	LLC.	1	3"	(1)	F.F.	F
OUTLET	1	8"			B	ROOF MHD	1	24"	API	STD.	M1
O'FLOW.	(3)	1 1/2"			C	SHELL MHD	1	24"	↓	↓	M2
DRAIN	(2)	1"			D	VENT	1	4"	ROOF	NECK	V
HI/LO LEVEL	2	3"	V	V	E1,2						

NOTES:

- (1) RUST STD. P18-5.2
- (2) ↓ ↓ P18-6.01
- (3) ↓ ↓ P18-7.0
- (4) 3 RINGS L1 1/2 X 1 1/2 X 3/4
- (5) GRIND INSIDE WELDS SMOOTH (NOT FLUSH) FOR EPOXY PHENOLIC COATING BY COATING CONTRACTOR.

DESIGNED BY: WKK DATE: 10/30/78 CHECKED BY: DATE: APPROVED BY: DATE:

The Rust
Engineering Company

TANK STANDARD
4" LEVEL CONTROL CONNECTION

P18-5.1

ORIGINAL ISSUE

1-7-75

LATEST REVISION

NOTE:

SEE TANK DRAWING FOR DIMENSION "H".

1801/01

ORIGINAL ISSUE

1-7-75

LATEST REVISION

SECTION THRU C

ORIGINAL ISSUE

1-7-75

LATEST REVISION

NOZ. SIZE	"A" DIM.	"J" DIM.
4"	1'-2"	7"
6"	1'-5"	8"
8"	1'-8"	8"
10"	1'-11"	9"
12"	2'-2"	9"
14"	2'-5"	10"
16"	2'-8"	10"
18"	2'-11"	10"

NOTE:

NOZZLE, REINF. PL, & ATTACHMENT
TO CONFORM TO API STD. 650.

SPECIFICATION

No. 1802/00

SHOP FABRICATED TANKS AND VESSELS

FOR
DEPARTMENT OF ENERGY
BIOMASS CO-GENERATION FACILITIES
IN THE
STATE OF MAINE

Prepared by
THE RUST ENGINEERING COMPANY

CONTRACT 21-1899

SPECIFICATION
NO. 1802/00
SHOP FABRICATED TANKS AND VESSELS

1. INTENT

This Specification is intended to accompany Purchase Inquiry inviting Proposals to furnish equipment needed in connection with The Biomass Co-Generation Facilities in the State of Maine.

2. SCOPE

Furnish and deliver to job site, shop fabricated tanks and vessels as listed herein and as shown on the attached DESIGN DATA SHEETS.

3. DESIGN REQUIREMENTS

a. Shop fabricated tanks and vessels are divided into the following categories:

- 1) Cylindrical storage tanks.
- 2) Rectangular storage tanks.
- 3) Cylindrical pressure vessels.

b. Each type of tank or vessel is described separately as follows:

- 1) Nonpressure cylindrical tanks shall be fabricated in accordance with the DESIGN DATA SHEETS, using the best modern shop practice and workmanship. Use only welders qualified to do API work. Flat baffles in cylindrical tanks which may be subjected to differential loading caused by full loading on one side and no load on the other side shall be adequately designed. Select adequate stiffener sections at proper spacing for the plate thicknesses.
- 2) Rectangular storage tanks shall comply in every respect with the requirements of the current edition of the American Institute of Steel Construction (AISC) for Welded Construction, with the added stipulation that the side walls and baffles, when required, shall be designed as specified for flat baffles in cylindrical tanks in paragraph 3.b.1) above.
- 3) Cylindrical pressure vessels shall comply in every respect with the requirements of the current edition of the American Society of Mechanical Engineers (ASME) Unfired Pressure Vessel Code, Section VIII, and to the Rust Standard Specification P18-UPV, Unfired Pressure Vessels.

c. In cases when pressure vessels are not specified to be stamped with the official ASME symbol, all of the above requirements shall be fulfilled except those relating to inspection and stamping by an official inspection agency. Purchaser reserves all the rights to inspect and witness tests as stated in P18-UPV.

d. When welding carbon steel to stainless steel, take precautions to prevent alloy dilution of the stainless steel. Permissible filler metal shall be Type 309-15 or 16, or Type 310-15 stainless steel.

e. Where DESIGN DATA SHEET calls for insulation by others on a vertical tank, unless otherwise noted, a 2 inch x 2 inch x 3/16 inch angle ring shall be installed by the Vendor 12 feet above the bottom of the tank shell. If the height of the tank exceeds 24 feet, additional rings shall be provided at 12 foot maximum intervals.

f. All ladders, cages or handrails supplied by Vendor shall comply with OSHA regulations.

g. Each tank shall have a grounding lug welded at point where the tank is attached to the foundation.

4. GENERAL REQUIREMENTS

All tanks and vessels specified herein shall meet the following general requirements:

a. Pertinent design criteria and material specifications together with a sketch showing principal dimensions to each item as shown on DESIGN DATA SHEETS. Adherence to these data is mandatory.

b. Fittings shall be as follows:

1) Unless otherwise specified, all flanged fittings shall conform to ANSI Standard 150 Pound Series with Flat Faces.

2) Some special fittings including (but not limited to) suction, drain, and overflow nozzles may be required to comply with applicable Rust Standard Details. Where these are required, the DESIGN DATA SHEETS include notations indicating these requirements.

c. Preparation for shipment shall be in accordance with recognized good practice. Before shipment, all surfaces shall be free of foreign matter, including slag, loose scale, weld spatter and droppings, dirt, grit, and water.

d. The Purchaser reserves the right to have his representative inspect each vessel and to witness all tests, having at all times the same rights normally accorded inspection, including that of rejecting.

5. INFORMATION TO BE INCLUDED IN PROPOSAL

Supply schedule of nozzle prices from 1-1/2" to 20" pipe sizes to be used for additions and deletions to tank prices.

6. ATTACHMENTS

See ATTACHMENT AT-1 for other documents applicable to this Specification.

ATTACHMENT AT-1

The following checked ☒ Supplemental Requirements documents, all dated 062078, become a part of Specification No. 1802/00. Other documents also checked ☒ hereon are attachments to the Specification. Drawings, Charts, Lists, Sketches, etc., when listed and attached, are specifically applicable to the Specification.

- ☐ BID EVALUATION DATA SHEETS ()
- ☒ DESIGN DATA SHEETS (8) 201 thru 208
- ☐ MANUFACTURER'S DATA SHEETS ()
- ☐ FORM E246 NOISE LEVEL DATA REQUEST SHEETS ()
- ☒ SPECIFICATION P18-UPV, UNFIRED PRESSURE VESSELS
- ☐
- ☐
- ☐
- ☐
- ☐ SPECIAL INSTRUCTIONS TO BIDDERS (For Equipment)
- ☐ SPECIAL INSTRUCTIONS TO BIDDERS (For Materials)
- ☒ SUPPLEMENTAL REQUIREMENTS FOR

- ☐ VENDOR DOCUMENTS/EQUIPMENT
- ☐ VENDOR DOCUMENTS/MATERIALS
- ☐ EQUIPMENT SHIPPING AND MARKING
- ☐ EQUIPMENT INSPECTION, TESTS, START-UP
- ☐ MISCELLANEOUS ITEMS AND GUARANTEES
- ☐ COUPLINGS AND MECHANICAL DRIVES
- ☐ ELECTRIC MOTORS BELOW 600V, AC
- ☐ ELECTRIC MOTORS ABOVE 600V, AC
- ☐ SPARE PARTS
- ☐ EQUIPMENT PAINTING
- ☐ EQUIPMENT PRE-ASSEMBLY, SHOP ASSEMBLY, MODULE CONSTRUCTION
- ☐ OSHA AND NOISE CONTROL FEDERAL REGULATIONS
- ☐ ASME CODE DOCUMENTATION
- ☐ EQUIPMENT MANUFACTURED USING METRIC MEASURING UNITS

☒ DRAWINGS/SKETCHES

RUST TANK STANDARDS: P18-3.0, P18-4.0, P18-5.0, P18-6.01,
P18-6.41 and P18-8.0

**PRESSURE VESSEL & STORAGE TANK
DESIGN DATA SHEET**

CONTRACT NO. 21-1899

SHEET NO. 201

REV. BY DATE

CUSTOMER: BIDMASS WESTBROOK, MAINE

DESCRIPTION: INTERMITTENT BLOWDOWN TANK

CAPACITY: 2115 GAL. (FULL)

ITEM: D-0301

NO. REQUIRED: ONE

AREA: 07

DESIGN CRITERIA

Oper. Press.	psig	ATMOS.	Oper. Temp.	°F	212
Design Press.	psig	375	Design Temp.	°F	440
Sp. G. of Contents		1.0	Lethal		NO
Code		ASME	Code Stamp		YES
Postweld H.T.		NO	Radiography		PARTIAL
Joint Eff.	Shell	8500	Joint Eff.	Heads	100%
Corr. Allow.	Shell	1/8"	Corr. Allow.	Heads	1/8"
Corr. Allow.	Bottom	—	Corr. Allow.	Roof	—
Hydro. Test	psig	563	Air Test	psig	—
Wind Loading		—	Seismic Loading		—
Top Head		ELLIP.	Bottom Head		ELLIP.
Mats. Shell		A515-70	Mats. Heads		A515-70
Roof		—	Bottom		—
Jacket		—	Internal Hd.		—
Noz. Necks		A53-B	Noz. Flanges		A105
Mhd. Necks		MFRS. STD.	Mhd. Flanges		—
Mhd. Covers		↓	Noz. Blinds		—
Internal Pipe		A53-B	Internal Fgs.		—
Couplings		A105	Handholes		—
Bolts-Studs		A193-B7	Nuts		A194-2H
Gaskets		COMP. ASB.	Structural		A36
Mhd. Davits		NO	Mhd. Hinges		NO
Platforms		↓	Platform Clips		↓
Ladder-Cage		↓	Ladder Clips		↓
Stair		↓	Stair Clips		↓
Insulation		BY OTHERS	Insulation Suppls.		YES (2)
Fireproofing		NO	Fireproofing Suppls.		↓
Trays		↓	Tray Supports		↓
Stiffener Rings		↓	Lining		↓
Vessel Support		SKIRT	Allow. Soil Bearing		—
Surface Prep. Ins.		{ (1)	Surface Prep. Outs.		{ (1)
Shop Paint Inside		{	Shop Paint Outside		{
Field Paint Inside		BY OTHERS	Field Paint Outside		BY OTHERS
Jack. Design Press.			Jack Design Temp.		
Jack. Type			Jack Corr. Allow.		

SCHEDULE OF APPURTENANCES

NOZZLES	ROD	SIZE	SER.	TYPE	MK.	MISC. FITTINGS	ROD	SIZE	SER.	TYPE	MK.
TANG. INLET	1	4"	300"	R.F.	A	LLC	1	3"	(4)	F.F.	F
VENT	1	10"			B	ELLIP. MHD	1	14"x18"		M	
COND. OUT.	1	6"			C	SKIRT VENTS	2	10"	HOLES	N	
DRAIN	1	8"			D						
EQUAL.	1	2"	300"	CPLG	E						

NOTES:

- BLAST & 1-CT. INORG. ZINC ON SKIRT ONLY
- 1 1/2" x 1 1/2" x 3/16" AT BOTTOM TANGENT LINE.
- 18" x 3/16" THK. 304L SS. R.
- RUST STD. P18-5.0

DESIGNED BY: WPK

DATE: 10/23/78

CHECKED BY:

DATE:

APPROVED BY:

DATE:

PRESSURE VESSEL & STORAGE TANK DESIGN DATA SHEET

CONTRACT NO. 21-1899

SHEET NO. 202

REV.	BY	DATE
------	----	------

CUSTOMER : BIOMASS WESTEROOK MAINE

DESCRIPTION : CONTINUOUS BLOWDOWN TANK

CAPACITY : 245 GAL. (FULL) ITEM: D 302

NO. REQUIRED:	ONE	AREA:
---------------	-----	-------

AREA:

DESIGN CRITERIA

Oper. Press.	psig	50	Oper. Temp.	°F	300
Design Press.	psig	75	Design Temp.	°F	320
Sp.G. of Contents		1.0	Letnui		NO
Code		ASME	Code Stamp		YES
Postweld H.T.		NO	Radioigraphy		PARTIAL
Joint Eff.	Shell	850 lb	Joint Eff.	Heads	100 lb
Corr. Allow.	Shell	1/8"	Corr. Allow.	Heads	1/8"
Corr. Allow.	Bott.	—	Corr. Allow.	Roof	—
Hydro. Test	psig	210	Air Test	psig	—
Wind Loading		—	Seismic Loading		—
Top Head		F.&D.	Bott. Head		F.&D.
Matrix. Shell		(1) A283-C	Matrix. Heads		(1) A283-C
Roof		—	Bottom		—
Jacket		—	Internal Hd.		—
Noz. Necks		A53-B	Noz. Flanges		A105
Mhd. Necks		MFGS. STD.	Mhd. Flanges		—
Mhd. Covers		↓	Noz. Blinds		—
Internal Pipe		—	Internal F.gs.		—
Couplings		A105	Handholes		—
Bolts-Studs		A193-B7	Nuts		A194-2H
Gaskets		COMP. ASB.	Structural		A36
Mhd. Davits		NO	Mhd. Hinges		NO
Platforms		↓	Platform Clips		↓
Ladder-Cage		↓	Ladder Clips		↓
Stair		↓	Stair Clips		↓
Insulation		BY OTHERS	Insulation Suppts.		YES (2)
Fireproofing		NO	Fireproofing Suppts.		NO
Trays		↓	Tray Suppotts		↓
Stiffener Rings		↓	Lining		↓
Vessel Support		(5) 4-LEGS	Allow. Soil Bearing		—
Surface Prep. Ins.		NONE	Surface Prep. Outs.		— (3)
Shop Paint Inside		↓	Shop Paint Outside		—
Field Paint Inside		↓	Field Paint Outside		BY OTHERS
Jack. Design Press.			Jack Design Temp.		
Jack. Type			Jack Corr. Allow.

SCHEDULE OF APPURTENANCES

[illegible]

NOTES:

- ① OR ASTM A36
- ② $L1\frac{1}{2} \times 1\frac{1}{2} \times \frac{3}{16}$ AT 80T. T.L.
- ③ BLAST & 1-CT. INORG.
ZINC ON LEGS ONLY.
- ④ RUST STD. P18-5.0
- ⑤ RUST STD. P18-8.0
- ⑥ $1\frac{1}{2} \times \frac{3}{16}$ 304 L WEAR PL.

DESIGNED BY: WPK

DATE: 10/23/78

CHECKED BY:

DATE:

APPROVED BY:

DATE:

CONTRACT NO. 21-1899

SHEET NO. 203

REV.	BY	DATE
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CUSTOMER : BIOMASS WESTBROOK MAINE

DESCRIPTION	P.A. DUMP FLASH TANK
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CAPACITY : 2140 GAL. (FULL)

ITEM: D-0703

NO. REQUIRED: ONE

AREA: 07

DESIGN CRITERIA

Oper Press.	psig	ATMOS.	Oper. Temp.	°F	212
Design Press.	psig	25	Design Temp.	°F	300
Sp.G. of Contents		1.0	Lethal		NO
Code		ASME	Code Stamp		YES
Postweld H.T.		NO	Radiography		PARTIAL
Joint Eff.	Shell	85% 1/16"	Joint Eff.	Heads	100% 1/16"
Corr. Allow.	Shell	1/16"	Corr. Allow.	Heads	1/16"
Corr. Allow.	Bott.	—	Corr. Allow.	Roof	—
Hydro. Test	psig	38	Air Test	psig	—
Wind Loading		—	Seismic Loading		—
Top Head		F&D.	Bott. Head		F&D.
Matts: Shell		(1) A283-C	Matts: Heads		(1) A283-C
Roof		—	Bottom		—
Jacker		—	Internal Hd.		—
Noz. Necks		A53-B	Noz. Flanges		A105
Mhd. Necks		MFKS, STD	Mhd. Flanges		—
Mhd. Covers		↓	Noz. Blinds		—
Internal Pipe		—	Internal F.g.s.		—
Couplings		A105	Handholes		—
Bolts-Studs		A307-B	Nuts		A307-B
Gaskets		COMP. ASB.	Structural		A36
Mhd. Davits		NO	Mhd. Hinges		NO
Platforms		↓	Platform Clips		↓
Ladder-Cage		↓	Ladder Clips		↓
Stair		↓	Stair Clips		↓
Insulation		BY OTHERS	Insulation Suppts.		YES (6)
Fireproofing		NO	Fireproofing Suppts.		NO
Trays		↓	Tray Supports		↓
Stiffener Rings		↓	Lining		↓
Vessel Support	(5)	4-LEGS	Allow. Soil Bearing		—
Surface Prep. Ins.		NONE	Surface Prep. Outs.		} (3)
Shop Paint Inside		↓	Shop Paint Outside		} (3)
Field Paint Inside		↓	Field Paint Outside		BY OTHERS
Jack. Design Press.			Jack Design Temp.		
Jack. Type			Jack Corr. Allow.		

SCHEDULE OF APPURTENANCES

[illegible]

NOTES:

- ① OR ASTM A36
- ② 21" WIDE x $\frac{3}{16}$ " THICK
- 304L S.S. WEAR PL.
- ③ BLAST & 1-CT. INORG. ZINC
- LEGS ONLY.
- ④ RUST STD. P18-5.0
- ⑤ RUST STD. P18-8.0
- ⑥ $1\frac{1}{2} \times 1\frac{1}{2} \times \frac{3}{16}$ RING AT
- BOTTOM T. LINE

DESIGNED BY: WPK

DATE: 10/23/78

CHECKED BY:

DATE:

APPROVED BY:

DATE:

**PRESSURE VESSEL & STORAGE TANK
DESIGN DATA SHEET**

CONTRACT NO. 21-1899

SHEET NO. 204

REV. BY DATE

CUSTOMER: BIOMASS WESTBROOK MAINE

DESCRIPTION: CONDENSATE COLLECTION TANK

CAPACITY: 2000 GAL.

ITEM: D 704

NO. REQUIRED: ONE

AREA: 07

DESIGN CRITERIA

Oper. Press.	psig	ATMOS.	Oper. Temp.	°F	212
Design Press.	psig	10	Design Temp.	°F	300
Sp. G. of Contents		1.0	Lethal		NO
Code		ASME	Code Stamp		↓
Postweld H.T.		NO	Radiography		SPOT
Joint Eff.	Shell	85%	Joint Eff.	Heads	100%
Corr. Allow.	Shell	1/16"	Corr. Allow.	Heads	1/16"
Corr. Allow.	Bott.	—	Corr. Allow.	Roof	—
Hydro. Test	psig	15	Air Test	psig	—
Wind Loading		—	Seismic Loading		—
Head &		F. & D.	Bott. Head - Bottom		—
Matls. Shell		(1) A283-C	Matls. Heads		(1) A283-C
Roof		—	Bottom		—
Jacket		—	Internal Hd.		—
Noz. Necks		A53-B	Noz. Flanges		A105
Mhd. Necks		A283-C	Mhd. Flanges		A283-C
Mhd. Covers		↓	Noz. Blinds		—
Internal Pipe		—	Internal F.g.s.		—
Couplings		A105	Handholes		—
Bolts-Studs		A307-B	Nuts		A307-B
Gaskets		COMP. ASB	Structural		A36
Mhd. Davits		NO	Mhd. Hinges		NO
Platforms		—	Platform Clips		—
Ladder-Cage		—	Ladder Clips		—
Stair		—	Stair Clips		—
Insulation		—	Insulation Suppts.		—
Fireproofing		—	Fireproofing Suppts.		—
Trays		—	Tray Supports		—
Stiffener Rings		↓	Lining		↓
Vessel Support		(3) SADDLES	Allow. Soil Bearing		—
Surface Prep. Ins.		NONE	Surface Prep. Outs.		(2)
Shop Paint Inside		↓	Shop Paint Outside		—
Field Paint Inside		↓	Field Paint Outside		BY OTHERS
Jack. Design Press.		—	Jack Design Temp.		—
Jack. Type		—	Jack Corr. Allow.		—

ASME F. & D. HEADS
3/16" MIN. THK.

SCHEDULE OF APPURTENANCES

NOTES:

NOZZLES	ROD	SIZE	SER.	TYPE	MK.	MISC. FITTINGS	ROD	SIZE	SER.	TYPE	MK.	NOTES
COND. INLET	1	6"	150°	R.F.	A	LLC.	2	2"	300°	API	G1, 2	(1) OR ASTM A36
↓	1	4"			B	MHD.	1	24"		API	TYPE M	(2) BLAST CLEAN & 1-CT. INORGANIC ZINC
PUMP SUCT.	1	6"			C	VENT	1	3"		GOUSE	NECK V	(3) RUST STD. P18-3.0
DRAIN	1	3"			D							(4) INSTALL LIFTING LUGS
O'FLOW.	1	4"			E							
COND. INLET	1	6"	↓	↓	F							

DESIGNED BY: WRK DATE: 10/24/78 CHECKED BY: DATE: APPROVED BY: DATE:

PRESSURE VESSEL & STORAGE TANK DESIGN DATA SHEET

CONTRACT NO. 21-1899

SHEET NO. 206

REV.	BY	DATE
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CUSTOMER : BIOMASS ----- WESTBROOK MAINE

DESCRIPTION : 66°Re' SULFURIC ACID STOR. TANK

CAPACITY : 4000 GAL.

ITEM: D 0401

NO. REQUIRED: ONE

AREA:

DESIGN CRITERIA

Oper. Press.	psig	ATMOS.	Oper. Temp	°F	AMB.
Design Press.	psig	15	Design Temp.	°F	100
Sp.G. of Contents		1.836	Letnal		NO
Code		ASME	Code Stamp		YES
Postweld H.T.		NO	Radiography		SPT
Joint Eff.	Shell	85%0	Joint Eff	Heads	100%0
Corr. Allow.	Shell	1/8"	Corr. Allow.	Heads	1/8"
Corr. Allow.	Bot.	—	Corr. Allow.	Roof	—
Hydro. Test	psig	30	Air Test	psig	NO
Wind Loading			Seismic Loading		NO
Heads		F&D	Bot. Head	Bottom	—
Matts: Shell	(1)	A283-C	Matts: Heads	(1)	A283-C
Roof		—	Bottom		—
Jacket		—	Internal Hd.		—
Noz. Necks	(2)	A53-B	Noz. Flanges		A105
Mhd. Necks		A283-C	Mhd. Flanges		A283-C
Mhd. Covers		↓	Noz. Blinds		—
Internal Pipe		—	Internal Fgs.		—
Couplings		—	Handholes		—
Bolts-Studs		A307-B	Nuts		A307-B
Gaskets		COMP. ASB	Structural		A36
Mhd. Davits		NO	Mhd. Hinges		NO
Platforms			Platform Clips		
Ladder-Cage			Ladder Clips		
Stair			Stair Clips		
Insulation			Insulation Suppts.		
Fireproofing			Fireproofing Suppts.		
Trays			Tray Supports		
Stiffener Rings		↓	Lining		↓
Vessel Support	(4)	2-SADDLES	Allow Soil Bearing		—
Surface Prep. Ins.		NONE	Surface Prep. Outs.		3 (3)
Shop Paint Inside		↓	Shop Paint Outside		↓
Field Paint Inside		↓	Field Paint Outside		BY OTHERS
Jack. Design Press.			Jack Design Temp.		
Jack. Type			Jack Corr. Allow.		

SCHEDULE OF APPURTENANCES

[illegible]

NOTES:

- 1) OR ASTM A36
- 2) X.S. SEAMLESS
- 3) BLAST & I-CT. INORG.
ZINC
- 4) RUST STD. PI8-3.0
- 5) INSTALL LIFTING LUGS

DESIGNED BY: WRK

DATE: 11/2/78

CHECKED BY:

DATE:

APPROVED BY:

DATE:

**PRESSURE VESSEL & STORAGE TANK
DESIGN DATA SHEET**

CONTRACT NO. 21-1899
SHEET NO. 207
REV. BY DATE

CUSTOMER: BIOMASS WESTBROOK, MAINE
DESCRIPTION: 50% CAUSTIC STORAGE TANK
CAPACITY: 7000 GAL.
NO. REQUIRED: ONE
ITEM: D0402
AREA:

DESIGN CRITERIA

Oper. Press.	nsig	ATMOS.	Oper. Temp.	°F	AMB.
Design Press.	psig	15	Design Temp.	°F	100
Sp. G. of Contents		1.525	Lethal		NO
Code		ASME	Code Stamp		YES
Postweld H.T.		NO	Radiography		SPOT
Joint Eff.	Shell	85%	Joint Eff.	Heads	100%
Corr. Allow.	Shell	1/8"	Corr. Allow.	Heads	1/8"
Corr. Allow.	Bull.	—	Corr. Allow.	Roof	—
Hydro. Test	psig	30	Air Test	psig	NO
Wind Loading		NO	Seismic Loading		NO
Heads		F&D.	Bolt. Head - Bottom		—
Matls: Shell	(1) A283-C		Matls: Heads	(1) A283-C	
Roof	—		Bottom	—	
Jacket	—		Internal Hd.	—	
Noz. Necks	(2) A53-B		Noz. Flanges	A105	
Mhd. Necks	A283-C		Mhd. Flanges	A283-C	
Mhd. Covers	↓		Noz. Binds	—	
Internal Pipe	—		Internal F.g.s.	—	
Couplings	—		Handholes	—	
Bolts-Studs	A307-B		Nuts	A307-B	
Gaskets	Comp. ASB		Structural	A36	
Mhd. Davits	NO		Mhd. Hinges	NO	
Platforms			Platform Clips		
Ladder-Cage			Ladder Clips		
Stair			Stair Clips		
Insulation			Insulation Suppts.		
Fireproofing			Fireproofing Suppts.		
Trays			Tray Supports		
Stiffener Rings	↓		Lining	↓	
Vessel Support	(4) 2-SADDLES		Allow. Soil Bearing		
Surface Prep. Ins.	NONE		Surface Prep. Outs.	3 (3)	
Shop Paint Inside			Shop Paint Outside	5	
Field Paint Inside	↓		Field Paint Outside	BY OTHERS	
Jack. Design Press.			Jack. Design Temp.		
Jack. Type			Jack. Corr. Allow.

SCHEDULE OF APPURTENANCES

NOTES:

NOZZLES	ROD	SIZE	SER	TYPE	MK	MISC. FITTINGS	ROD	SIZE	SER	TYPE	MK
FILL	1	2"	150	R.F.	A	M.H.D.	1	20"	BOLTED	M	
SPACE	1	2"			B						
VENT	1	3"			C						
DRAIN	1	3"			D						
PUMP NOZ.	1	24"			E						
PUMP NOZ.	1	24"			F						
L.L.G.A.	2	2"	V	V	G, 2						

- 1) OR ASTM A36
- 2) X.S. SEAMLESS
- 3) BLAST & 1-CT. INORG. ZINC
- 4) RUST STD. PIB-3.0
- 5) INSTALL LIFTING LUGS.

DESIGNED BY: WRK DATE: 11/2/78 CHECKED BY: DATE: APPROVED BY: DATE:

PRESSURE VESSEL & STORAGE TANK DESIGN DATA SHEET

CONTRACT NO. 21-1899

SHEET NO. 268

REV.	BY	DATE
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CUSTOMER : BIOMASS - WESTBROOK, MAINE

DESCRIPTION : FILTERED WATER STORAGE TANK

CAPACITY : 4000 GAL.

ITEM: TK 0404

NO. REQUIRED: ONE

AREA:

DESIGN CRITERIA

Oper. Press.	psig	ATMOS.	Oper. Temp.	°F	AMB.
Design Press.	psig	ATMOS.	Design Temp.	°F	100
Sp.G. of Contents		1.0	Leak		NO
Code		API 650	Code Stamp		NO
Postweld H.T.		NO	Radiography		SPOT
Joint Eff.	Shell	85%	Joint Eff.	Heads	—
Corr. Allow.	Shell	1/16"	Corr. Allow.	Heads	—
Corr. Allow.	Bott.	1/16"	Corr. Allow.	Roof	—
Hydro. Test	psig	FULL H ₂ O	Air Test	psig	—
Wind Loading		NO	Seismic Loading		—
Top Head	Roof	OPEN	Bottom		FLAT
Matts. Shell	(3) A283-C		Matts. Head		—
Roof	—		Bottom	(3) A283-C	
Jacket	—		Internal Hd.		—
Noz. Necks	A53-B		Noz. Flanges		A105
Mhd. Necks	—		Mhd. Flanges		—
Mhd. Covers	—		Noz. Blinds		—
Internal Pipe	A53-B		Internal F.g.s.		—
Couplings	—		Handholes		—
Bolts-Studs	—		Nuts		—
Gaskets	—		Structural		A36
Mhd. Davits	NO		Mhd. Hinges		NO
Platforms			Platform Clips		
Ladder-Cage			Ladder Clips		
Stair			Stair Clips		
Insulation			Insulation Supp.s.		
Fireproofing			Fireproofing Supp.s.		
Trays			Tray Supports		
Stiffener Rings	Y		Lining		Y
Vessel Support	CONC. PAD		Allow. Soil Bearing		
Surface Prep. Ins.	3 (4)		Surface Prep. Outs.		3 (5)
Shop Paint Inside	3		Shop Paint Outside		3
Field Paint Inside	NONE		Field Paint Outside		2 OTHERS
Jack. Design Press.			Jack. Design Temp.		
Jack. Type			Jack. Corr. Allow.

SCHEDULE OF APPURTENANCES

[illegible]

NOTES:

- 1) RUST STD. P18-4.0
- 2) RUST STD. P18-6.4I
- 3) OR ASTM A36
- 4) APPLY PLASITE 7111 IN ACCORD. WITH RECOMMENDATION OF MANUFACTURER
- 5) BLAST & 1-CT. INORGANIC ZINC.

DESIGNED BY: WPK

DATE: 11/6/78

CHECKED BY:

DATE:

APPROVED BY:

DATE:

RUST STANDARD

UNFIRED PRESSURE VESSELS (P18-UPV)

1. SCOPE

- a. Furnish and deliver items in accordance with the requirements of the Purchaser's drawings, Purchase Orders and this Standard.
- b. Each item shall be complete in every respect even though every detail necessarily involved may not be specifically indicated or mentioned, but is reasonably necessary to make complete.

2. DESIGN

- a. Design, materials, fabrication, testing, and stamping shall be in strict accordance with the requirements of the current ASME Unfired Pressure Vessel Code, Section VIII, Division 1, as amended by revisions and addenda to date of purchase, and in accordance with the requirements of this Standard.
- b. Supplementary requirements, when not mandatory by the ASME Code, will be as required by the Purchaser's drawings or Purchase Orders, or by this Standard.
- c. The Manufacturer shall check all of the Purchaser's designs for Code compliance and prepare detail design calculations and detail shop drawings for each item. Purchaser's approval of Manufacturer's detail design calculations or detail shop drawings shall not be construed to relieve the Manufacturer from any error in details, quantities or dimensions, from responsibility for deviations from drawings, specifications, or the Purchase Order, nor for departures from additional instructions previously issued by the Purchaser.
- d. The Purchaser's standard details which may accompany principal drawings shall be considered to be a part of the Purchaser's drawings.

3. FABRICATION

- a. All circumferential shell joints shall be located between any internal or external supports or rings. Wherever possible, plate layouts shall be arranged so that no part of any fitting, reinforcing pad, or other internal or external attachment will be located on a shell or head joint; any such condition shall be called to the particular attention of the Purchaser in writing, and the Purchaser's written approval shall be secured before proceeding.
- b. Plate layouts and any internal or external supports or ring locations shall be clearly dimensioned on approval drawings.
- c. All longitudinal and circumferential joints shall be double-butt fusion welded in strict accordance with ASME Code requirements; single butt joints with backing strips will be permitted only where double welded joints cannot be made, and only with the Purchaser's written approval for each specific location.

- d. All welded pads shall be provided with at least one pipe tapped vent hole, and these holes shall be left unplugged.
 - e. Bottom outlet nozzles shall be flush with inside of vessel unless otherwise shown or specified.
 - f. Four vents shall be provided in column skirts. Vents shall be equally spaced and located approximately 2" below skirt attachment weld or juncture of insulation and skirt.
 - g. Where holes are required for bolts in structural or support members, they shall be drilled or punched. Burning of holes for bolting will not be permitted.
 - h. The Manufacturer shall furnish bolting and gaskets for manholes and other covered openings, and shall furnish screwed plugs for all couplings. All bolt holes shall straddle normal centerlines of vessel unless otherwise shown or noted.
 - i. All flange faces, nozzles, lugs, supports, etc., shall be protected from damage and corrosion during shipment.
 - j. The welds attaching each reinforcing pad shall be given an air and soap solution test prior to the standard hydrostatic test.
 - k. Each vessel shall be marked as follows:
 - 1) The main body of each vessel and each demountable section thereof shall be identified by painting on two opposite sides, in clearly visible positions and in letters at least 3" high, the vessel item number and name.
 - 2) - All mating body flanges shall be properly match marked by means of steel dies.
 - 3) If special handling in the moving of a vessel is required, lift points and/or any special instructions deemed necessary shall be clearly marked on the vessel with paint in letters at least 3" high.
 - l. A standard nameplate shall be attached as directed on the design drawing. When no location is given, the nameplate location shall be indicated on the shop drawings by the manufacturer, subject to the Purchaser's approval.
4. APPROVAL
- a. As promptly as possible after receipt of order or letter of intent, the Manufacturer shall submit to the Purchaser the following:
 - 1) One complete set of full size reproducible checked shop drawings showing details of construction, including joint preparations and welding details, stamped "FOR APPROVAL".

2) One complete set of design calculations. If the design calculations are computerized, the following need to be submitted:

a) The name of the program used and its developer if it is a commercially available computer program.

b) A Synopsis of the program outlining the methods used and date of development, if the program is developed by the Vendor.

c) Printout of the input and output for the successful computer run that is used in the design.

b. The above drawings will be examined by the Purchaser for overall dimensions and general construction. One set of prints will be returned to the Manufacturer with changes and corrections, or with approval. The Manufacturer shall revise his drawings, if required, and resubmit reproducible stamped "CERTIFIED FOR CONSTRUCTION", and proceed with fabrication.

c. Shop drawings may not be checked in detail by the Purchaser. Approval of shop drawings by the Purchaser shall not relieve the Manufacturer from compliance with Code requirements, the Purchaser's drawings, Purchase Orders and this Standard.

5. INSPECTION AND TESTING

a. Vessels shall be hydrostatically tested in accordance with requirements of the ASME Code by the Manufacturer at a pressure not less than 1-1/2 times maximum allowable pressure when new and cold. Test gaskets shall be used only on nozzles. Service gaskets and bolting furnished by the Manufacturer shall be used for test on all manholes, blind nozzles, flanged vessel joints and heads, etc., and these joints shall remain tight and shall not be broken after test is completed unless necessary for access after testing.

b. At the option of the Purchaser and supplemental to the inspection of the Manufacturer, a Representative or Agent of the Purchaser may inspect the vessel and witness tests, having at all times the same prerogatives given an Inspector under the ASME Code, including that of rejection.

c. Items requiring inspection by the Purchaser's Representative will be designated by the Purchaser.

d. In all cases the Manufacturer shall maintain permanent records of his welding procedures and welder qualifications, and all pertinent data pertaining to each vessel, including but not limited to the following:

1) Manufacturer's Data Report of Unfired Pressure Vessels, as required by the provisions of the ASME Code.

2) Material mill test reports.

3) Nameplate rubbing.

4) Test charts and all other recorded data.

e. Five complete sets of the above records are required for each vessel, unless otherwise specified in purchase documents. Each set should be in booklet form no larger than 8-1/2" x 11", with each and every sheet bearing the vessel item number and identification by name. In no case shall a record book pertain to more than one vessel.

f. The Manufacturer shall notify the Purchaser one week in advance of start of fabrication of each item and also at least one week in advance of date of each test. Notification shall include reference to the vessel item number and identification by name.

g. Prior to shipment of each vessel, the Manufacturer shall have prepared the five complete sets of records as set forth in paragraphs 5.d. and 5.e. above. These records shall have been notarized and shall be submitted to the Purchaser.

h. Inspection and approval by the Purchaser's Representative shall not relieve the Manufacturer from compliance with Code requirements, Purchase Order, applicable drawings, and this Standard.

i. Shipment of the finished vessel shall not be made until all of the above requirements have been met.

j. The Purchaser may require inspections and tests in addition to those outlined above, in which event the additional requirements will be outlined in the Purchaser's inquiry, drawings or Purchase Order.

6. PREPARATION FOR SHIPMENT

a. Unless otherwise specified, all interior and exterior heat affected areas shall be power tool cleaned in strict accordance with the requirements of the current Steel Structures Painting Council Surface Preparation Specification SSPC-SP3.

b. Surface preparation as described above shall not be performed prior to completion of final inspection and testing procedures.

c. Shop painting shall consist of one outside coat of primer having a minimum dry thickness of 1.6 mils. If necessary, additional coats shall be applied to obtain this minimum thickness.

d. Interior of vessels shall be free of foreign matter, including slag, loose scale, weld spatter and droppings, dirt, grit, and water before shipping.

ORIGINAL ISSUE

1-2-75

LATEST REVISION

FIG. 1

DRUMS 4 FT. DIA. AND UNDER

FIG. 2

DRUMS OVER 4 FT. DIA.

SADDLE DIMENSIONS (INCHES UNLESS NOTED)

DRUM DIA.	A	B	C	D	E	F	G	H	BOLT DIA.	SIZE OF WELD	WT. OF SADDLE	SIZE OF RIB
2'-0	2'-1	19	3-8	1-2	8 1/2	10 1/2	6	3 3/4	3/4	1/4	75	2 3/4 X 3/8
2'-6	2'-6	22			10	12 1/2					95	
3'-0	2'-11	2'-1			11 3/4	15					115	
3'-6	3'-4	2'-4	✓	✓	13 1/4	17	✓	✓	✓		135	✓ ✓
4'-0	3'-10	2'-7	1-2	5-8	15 1/4	20	8	5 1/2	7/8		215	3 1/2 X 1/2
4'-6	4'-3	2'-10			12 3/4	23					245	
5'-0	4'-6	3'-1			14	2'-1					275	
5'-6	5'-1	3'-4			15 1/4	2'-3					305	
6'-0	5'-6	3'-7			16 1/2	2'-5					345	
6'-6	5'-11	3'-10	✓	✓	17 3/4	2'-8	✓	✓		✓	385	✓ ✓
7'-0	6'-5	4'-1	5-8	3/4	19 1/4	2'-10	9	6		5/16	535	4 X 5/8
7'-6	6'-10	4'-4			20 1/2	3'-0			✓		575	
8'-0	7'-3	4'-7			21 3/4	3'-2			1		615	
8'-6	7'-8	4'-10			23	3'-4	✓	✓			665	✓ ✓
9'-0	8'-1	5'-1			2'-0 1/4	3'-7	10	7			725	4 1/2 X 5/8
9'-6	8'-7	5'-4			2'-1 3/4	3'-9					775	
10'-0	9'-0	5'-7			2'-3	4'-0					825	
10'-6	9'-5	5'-10			2'-4 1/4	4'-2					875	
11'-0	9'-10	6'-1			2'-5 1/2	4'-4					935	
11'-6	10'-3	6'-4			2'-6 3/4	4'-6					985	
12'-0	10'-9	6'-7	✓	✓	2'-8 1/4	4'-9	✓	✓	✓	✓	1035	✓ ✓

NOTES:

1. SADDLES SHALL BE SHIPPED LOOSE UNLESS OTHERWISE SPECIFIED.
2. BOLT HOLES ARE 1/4" LARGER THAN BOLT DIAMETERS.
3. ALL JOINTS SHALL BE CONTINUOUS FILLET WELDED, BOTH SIDES.

ORIGINAL ISSUE 1-2-75

LATEST REVISION

NOZ. SIZE	"J" DIM.	"X"
3"	7"	6"
4"	7"	6"
6"	8"	6"
8"	8"	6"
10"	9"	6"
12"	9"	6"
14"	10"	7"
16"	10"	8"
18"	10"	9"
20"	11"	10"
24"	12"	12"
30"	12"	15"

NOTE:

SEE TANK DRAWING FOR NOZZLE SIZE AND DIMENSION "H". NOZZLE, REINF. PL AND ATTACHMENT TO CONFORM TO API STD. 650.

The Rust
Engineering Company

TANK STANDARD
3" LEVEL CONTROL CONN.

P18-5.0

ORIGINAL ISSUE

1-2-75

LATEST REVISION

NOTE: SEE TANK DRAWING FOR DIMENSION "H".

ORIGINAL ISSUE

1-7-75

LATEST REVISION

SECTION THRU C

Ted Duff
Engineering Company

TANK STANDARD
4" BOTTOM DRAIN

P18-6.41

ORIGINAL ISSUE

1-7-75

LATEST REVISION

ORIGINAL ISSUE

1-7-75

LATEST REVISION

O.D. = OUTSIDE DIAMETER OF SHELL OR OF
PAD PL'S WHEN PAD PL'S ARE USED (IN).

	BASE PL.	BOLT CIR. DIM.	BOLT CTRS.	HOLE DIAM.
ANGLE LEGS	B X B X T	BC	C	D
2½" X 2½"	5½" X 5½" X ½"	O.D. - 1"	.707 X BC	1-1/8"
3" X 3"	6" X 6" X ¾"	O.D. - 1"	.707 X BC	1-3/8"
4" X 4"	7" X 7" X ¾"	O.D. - 1"	.707 X BC	1-3/8"
5" X 5"	8" X 8" X 7/8"	O.D. - 1"	.707 X BC	1-5/8"
6" X 6"	9" X 9" X 1"	O.D. - 1"	.707 X BC	1-5/8"

SPECIFICATION

NO. 1803/03

BARK METERING BINS

AREAS 02 & 03

EQUIPMENT NOS.

FE-0237 A, B, C, & D

FE-0313 A, B, C, D, E & F

FOR
DEPARTMENT OF ENERGY
BIOMASS CO-GENERATION FACILITIES
IN THE
STATE OF MAINE

Prepared by
THE RUST ENGINEERING COMPANY
CONTRACT 21-1899

SPECIFICATION
NO. 1803/03
BARK METERING BINS
AREAS 02 & 03

1. INTENT

This Specification is intended to accompany Purchase Inquiry inviting Proposals to furnish equipment which will be needed in connection with Biomass Co-Generation Facilities in the State of Maine.

2. SCOPE

- a. Vendor shall design, fabricate, and furnish FOB jobsite, ten (10) bark metering bins complete with variable speed discharge mechanisms.
- b. Provide a Service Engineer, upon sufficient notice from Purchaser, to inspect and approve installation, supervise startup, and instruct Purchaser's personnel. Cost of this service shall be included in Proposal. Vendor shall determine number of days and trips.

3. WORK BY OTHERS

- a. Unload equipment at jobsite.
- b. Furnish foundations.
- c. Furnish all standard electric motors.
- d. Erect equipment.

4. MISCELLANEOUS REQUIREMENTS

a. Equipment Painting

Describe Manufacturer's Standard coating system including surface preparation and thickness of prime and topcoats.

b. Erection

Vendor shall supply erection drawings of such detail and clarity that the bin structures may be quickly fabricated and erected by mechanics with an average degree of skill.

5. DESIGN CONDITIONS

- a. The bark metering bins will be used to control the flow of waste-wood to four bark dryers and to six feed spouts on a 510,000 pounds per hour boiler.

b. The bins will receive bark from a conveyor with 36-inch wide flights. The material will be pulled along the conveyor trough by the chain flights. The metering bins will be lined up below the conveyor trough. The trough will be continuous except at the feed openings to the bins. Each bin along this conveyor line must be filled with material before the next downstream bin will receive any. One flight conveyor will supply four bins and one flight conveyor will supply six bins with wastewood. Each bin will always operate fully loaded with material.

c. The bins will be required to handle a mixture of hogged bark, whole tree chips, hogged wastewood, woodturnings, and sawdust.

d. The material will be hogged (95% minus 1-1/2"; 100% minus 5") before entering the bins.

e. Bulk density will be 14 to 20 pounds per cubic foot.

f. Mixture moisture range will be 30 to 50%.

g. Outfeed rate shall be variable:

4 bins - 600 to 3000 cu ft/hr each

6 bins - 400 to 2000 cu ft/hr each

h. Ambient temperature at bin locations will be 120°F.

6. DESIGN OF EQUIPMENT

a. Each bin shall be designed with negative slopes on three sides.

b. Each bin shall have two variable pitch screws mounted on Schedule 80 pipe or cold drawn mechanical seamless tubing with 1/2 inch thick wall.

c. The second screw shall be driven from the first by a roller chain drive in an oil tight casing. The roller chain shall be selected for an ultimate strength of 7 times the required working load (chain pull).

d. Screw flight thickness shall be 1/2 inch.

e. The power sources shall be Falk slow speed hydraulic motors or high speed hydraulic motors driving Falk reducers, with a suitably designed packaged hydraulic power unit. The drives shall be variable speed with a 5 to 1 speed variation. They shall be remotely controlled with an indication of percent of full speed.

f. The screw flights shall be constructed of carbon steel, welded continuously on both sides to the pipe torque tube.

- g. The drive shafts shall have a minimum diameter of 3.9375 inches. The tail shafts shall have a minimum diameter of 3.4375 inches.
- h. Suitable replaceable dust seals shall be provided between the bin section and the drive section.
- i. Self-aligning roller bearing pillow blocks shall be placed to avoid overhanging drive loads.
- j. Thrust bearings shall be provided at discharge end of screws.
- k. An adjustable shear gate shall be provided at the discharge end of each bin.
- l. Provision shall be made for inspection access to the bin and drive sections.
- m. The screw assemblies shall be designed to withdraw material along the entire length of the screw exposed to the bin interior.
- n. The screw assemblies shall be flanged on both ends to facilitate screw removal without major disassembly of the bin structure. Hinged access doors shall be provided for access to flange bolts and screw removal. The flange bolts shall be ASTM A 325 steel.
- o. The opening in the top of each bin shall be approximately three feet wide to match the flight width of the conveyor feeding it. The top of the bin shall be approximately eight feet above the floor to which the bin is to be anchored. The center of the bin discharge chute shall be 8'-6" from the center of the three foot wide bin opening in the top.
- p. Each bin shall have a live storage area of approximately 120 cubic feet.
- q. The screws shall be located and shall discharge at right angles to the direction of chain travel of the flight conveyor feeding the bins.

7. STRUCTURAL STEEL

- a. All steel shipped under this Specification shall conform to the current revision of ASTM A 36 and shall be delivered and fabricated in accordance with current AISC Specifications. All material shall be straight and free from flaws, imperfections, and rust pitted surfaces.
- b. Unit stresses for connections shall be as adopted by the latest AISC Specifications, unless noted otherwise.
- c. All steel shall be fabricated in strict accordance with approved drawings and shall be equal to the best modern practice and workmanship and as further described by the current revision of the Code of Standard Practice of the AISC. All steel shop work shall be welded together, unless noted otherwise on approval drawings, and all fabricating and

assembling possible shall be done at the shop before shipment. All stressed structural members shall have a minimum thickness of one-fourth inch. Side walls shall have a minimum thickness of 1/4 in. Screw bottom shall be a minimum of 3/8" thick.

d. All members and pieces shall be plainly marked for identification and for location of their position in the structure according to erection drawings.

e. Prior to steel leaving shop, all bolt holes for field connections shall be lined up accurately. All field connections shall be bolted or welded, unless otherwise specified.

8. GUARANTEE

Vendor shall guarantee rates or capacities specified and shall include workmanship and defective parts warranty for a period of one year after start-up.

9. INFORMATION TO BE SUBMITTED WITH PROPOSAL

a. Complete attached BID EVALUATION DATA SHEETS. If drives for all bins quoted are not identical, indicate differences.

b. Submit outline drawing of proposed bin with sufficient data to define the equipment supplied.

c. Quote painting per Rust Specification EZ-01A as an alternate.

10. ATTACHMENTS

See ATTACHMENT AT-1 for other documents applicable to this Specification as attachments thereto.

ATTACHMENT AT-1

The following checked ● Supplemental Requirements documents, all dated 062078, become a part of Specification No. 1803/03 . Other documents also checked ☒ hereon are attachments to the Specification. Drawings, Charts, Lists, Sketches, etc., when listed and attached, are specifically applicable to the Specification.

☒ BID EVALUATION DATA SHEETS (2)

☐ DESIGN DATA SHEETS ()

☐ MANUFACTURER'S DATA SHEETS ()

☐ FORM E246 NOISE LEVEL DATA REQUEST SHEETS ()

☒ RUST COATING SYSTEM NO. EZ-01A

☐

☐

☐

☐ SPECIAL INSTRUCTIONS TO BIDDERS (For Equipment)

☐ SPECIAL INSTRUCTIONS TO BIDDERS (For Materials)

☒ SUPPLEMENTAL REQUIREMENTS FOR

- VENDOR DOCUMENTS/EQUIPMENT
- VENDOR DOCUMENTS/MATERIALS
- EQUIPMENT SHIPPING AND MARKING
- EQUIPMENT INSPECTION, TESTS, START-UP
- MISCELLANEOUS ITEMS AND GUARANTEES
- COUPLINGS AND MECHANICAL DRIVES
- ELECTRIC MOTORS BELOW 600V, AC
- ELECTRIC MOTORS ABOVE 600V, AC
- SPARE PARTS
- EQUIPMENT PAINTING
- EQUIPMENT PRE-ASSEMBLY, SHOP ASSEMBLY, MODULE CONSTRUCTION
- OSHA AND NOISE CONTROL FEDERAL REGULATIONS
- ASME CODE DOCUMENTATION
- EQUIPMENT MANUFACTURED USING METRIC MEASURING UNITS
- VIBRATION PARAMETERS FOR ROTATING EQUIPMENT

☐ DRAWINGS/SKETCHES

COMPANY DEPARTMENT OF ENERGY
 CONTRACT NO. 21-1899
 SPECIFICATION NO. 1803/03
 AREA NO. 02 & 03
 EQUIPMENT NO.

DATE 020179 PAGE 1 OF 2
 BID EVALUATION DATA SHEET
 VENDOR

ITEM	DESCRIPTION
DIMENSIONS AT TOP	
NEGATIVE SLOPE - SIDE WALLS	
BACK WALL	
DIMENSIONS AT BOTTOM	
PLATE THICKNESS - SIDE WALLS	
PLATE THICKNESS - BOTTOM	
NO. OF SCREWS	
SCREW LENGTH	
DIAMETER & PITCH	
FLIGHT THICKNESS	
OVERALL DIMENSIONS LIVE BOTTOM	
PIPE O.D. & WALL THICKNESS	
MAX. OUTPUT RATE/SECTION	
THRUST BRGS. SIZE & MFG.	
ROTARY BRGS. SIZE & MFG.	
SCREW DRIVES - NUMBER	
SCREW MOTORS - TYPE	
HORSEPOWER	
OUTPUT RPM OF SCREWS	
HYDRAULIC SYSTEM	GPM PRESSURE
SPEED CONTROL - TYPE	
SPEED REDUCER (IF REQUIRED)	
SIZE & MFG.	
RATIO	
CLASS OF SERVICE	

COMPANY
CONTRACT NO.
SPECIFICATION NO.
AREA NO.
EQUIPMENT NO.

DEPARTMENT OF ENERGY
21-1899
1803/03
02 & 03

DATE 020179 PAGE 2 OF 2
BID EVALUATION DATA SHEET
VENDOR

ITEM	DESCRIPTION
CHAIN DRIVE TO DRIVEN SCREW:	
CHAIN-SIZE	
SPROCKETS-NO. OF TEETH	
LUBRICATION-TYPE	
BIN DISCHARGE RATE:	
MAXIMUM CFH	
MINIMUM CFH	
WEIGHTS:	
BIN	
SCREWS & CHAIN DRIVE	
HYDRAULIC DRIVE	
TOTAL	
FREIGHT	
PRICE-BIN & SCREWS	
PRICE-HYDRAULIC DRIVES	
TOTAL PRICE/BIN	
TOTAL PRICE FOR 10 BINS	
TOTAL PRICE FOR PAINT	
PER RUST SPECIFICATION EZ-01A	
FOB:	
TERMS:	
DELIVERY:	

PURPOSE

A zinc rich phenoxy system for structural and miscellaneous steel. Suitable for industrial, chemical and paper mill exposure to heavy fumes, splash, and spillage of alkalis, solvents, salts, and water. Not recommended for immersion.

NOTE:

Primer may be applied at air and surface temperature as low as 32°F. Epoxy should not be applied at temperatures below 50°F.

SURFACE PREPARATION

Solvent Clean	SSPC-SP1
Commercial Blast	SSPC-SP6
Anchor pattern profile	1.5 mil average
PRIMER	Dry Mills
Organic zinc rich phenoxy	2.5

TOPCOAT

Epoxy polyamide	3.0
TOTAL DRY MIL THICKNESS	5.5
APPLICATION TEMP. LIMITS	above 50°F
HUMIDITY LIMITS	below 80%
DEW POINT	not within 5 degrees of surface temperature.
DRY TEMP. LIMITS	175°F Continuous 250°F Int.

APPLICABLE REQUIREMENTS

"General Requirements for Standard Coating Systems" (GR-3), attached, are applicable to this system.

GENERAL REQUIREMENTS FOR STANDARD COATING SYSTEMS (GR-3)

1. GENERAL

- a. The Manufacturer's recommendations and requirements shall be considered a part of the specified COATING SYSTEM(S).
- b. The manufacturer of all topcoats must be the same as the manufacturer of the prime coat.
- c. Colors shall be as selected and as shown on schedules. Safety colors shall be in accord with ANSI Standards.

2. REFERENCE STANDARDS AND CODES

Applicable Standards and Codes of the following organizations shall apply to COATING SYSTEMS unless otherwise noted:

- a. SSPC - Steel Structures Painting Council for surface preparation and application.
- b. NACE - National Association of Corrosion Engineers for surface preparation.
- c. ANSI - American National Standards Institute for safety color coding of physical hazards.

REVISION NO. 1, May 3, 1979

SPECIFICATION

NO. 1803/05

BARK SURGE BIN

EQUIPMENT NO. BH-0254

FOR
DEPARTMENT OF ENERGY
BIOMASS CO-GENERATION FACILITIES
IN THE
STATE OF MAINE

Prepared by
THE RUST ENGINEERING COMPANY
CONTRACT 21-1899

SPECIFICATION
NO. 1803/05
BARK SURGE BIN

1. INTENT

This Specification is intended to accompany Purchase Inquiry inviting Proposals to furnish equipment which will be needed in connection with Biomass Co-Generation Facilities in the State of Maine.

2. SCOPE

- a. Vendor shall design, fabricate, and furnish FOB jobsite, a bark surge bin complete with variable speed discharge mechanism.
- b. Provide a Service Engineer, upon sufficient notice from Purchaser, to inspect and approve installation, supervise startup, and instruct Purchaser's personnel. Cost of this service shall be included in Proposal. Vendor shall determine number of days and trips.

3. WORK BY OTHERS

- a. Unload equipment at jobsite.
- b. Furnish foundations.
- c. Furnish all standard electric motors.
- d. Erect equipment.

4. MISCELLANEOUS REQUIREMENTS

a. Equipment Painting

Describe Manufacturer's Standard coating system including surface preparation and thickness of prime and topcoats.

b. Erection

Vendor shall supply erection drawings of such detail and clarity that the bin structure may be quickly erected by mechanics with an average degree of skill.

5. DESIGN CONDITIONS

- a. The bark bin will be used for storage of system surges and for maintaining a controlled feed rate to the bark boiler.
- b. The bark bin will be required to handle a mixture of hogged bark, whole tree chips, hogged wastewood, wood turnings, and sawdust.
- c. The material will be hogged (95% minus 1½"; 100% minus 5") before entering the surge bin.

- d. Bark will be conveyed to the bin at a rate of 85 tph.
- e. Bark density will be 14 to 20 lb/cu ft.
- f. Mixture moisture range will be 30 to 50%.
- g. Outfeed rate shall be variable from 5 to 25 tph from each section, four sections required.
- h. Ambient temperature at bin location will be 120°F.

6. DESIGN OF EQUIPMENT

- a. Bin shall be designed with negative slopes on three (3) bin side walls. All supporting columns shall be located outside of bin walls. Entire bin bottom shall be live, powered by a variable speed drive for accurate metering of material discharge.
- b. Bin Storage Capacity: 2400 cu ft total volume.
- c. Maximum bin discharge rate shall be 100 tph (10,000 cu ft per hr).
- d. Bin discharge mechanism shall be ruggedly designed, of materials which offer wear resistance to sand and grit contained in the bark.
- e. Bin discharge mechanism shall consist of 4 sections with 3 screws in each section. Each section shall be individually driven with a variable speed 5 to 1 ratio power source.
- f. The power sources shall be slow speed hydraulic motors or high speed hydraulic motors driving Falk reducers, with a suitable designed packaged hydraulic power unit. Other drives may be offered if clearly indicated as an alternate and the benefits stated in the Proposal.
- g. If electro-mechanical drives are proposed, the input sprocket for each driven section shall be designed with a shear pin hub. All standard electric motors shall be furnished by others.
- h. The final drive shall be by roller chain and sprockets to the individual screws. The sprockets shall have a Q.D. hub with Keyway attachment to shafts. These drive components shall have a lubrication system.
- i. The screw flights shall have a minimum thickness of 3/8 inch, constructed of carbon steel, welded continuously on both sides to the pipe torque tube.
- j. The pipe torque tube shall be carbon steel Schedule 80 pipe, with the screw deflection limited to 1/4 inch during operation with the bin filled to its maximum capacity.
- k. The drive and tail shafts shall be the same diameter. The shafts shall have a minimum diameter of 3.4375 inch.

- l. Suitable replaceable dust seals shall be provided between the bin section and the drive section.
- m. Self-aligning roller bearing pillow blocks shall be placed to avoid overhanging drive loads.
- n. Thrust bearings shall be provided at discharge end of screws.
- o. An adjustable shear gate shall be provided at discharge end of bin.
- p. Provision to mount (2) bin level transmitters shall be made in the bin wall - one high level and one low level transmitter.
- q. Provision shall be made for inspection access to the bin and drive sections.
- r. Provision shall be made for a $\pm 2'-0"$ x $\pm 2'-0"$ conveyor inlet in the top of the bin.
- s. Bin shall be quoted complete with support steel, access ladders, platforms, spillage seals, level control ports, and inspection openings.
- t. The screw assemblies shall be designed to uniformly lower the bin level throughout the total storage area by either being variable pitch or tapered.
- u. The screw assemblies shall be flanged on both ends to facilitate screw removal without major disassembly of the bin structure. Hinged access doors shall be provided for access to flange bolts. The flange bolts shall be ASTM A 325 steel.
- v. Space required for screw removal must be kept to a minimum. Indicate clearance requirements on outline drawing and submit with Proposal.

7. STRUCTURAL STEEL

- a. All steel shipped under this Specification shall conform to the current revision of ASTM A 36 and shall be delivered and fabricated in accordance with current AISC Specifications. All material shall be straight and free from flaws, imperfections, and rust pitted surfaces.
- b. Unit stresses for connections shall be as adopted by the latest AISC Specifications, unless noted otherwise.
- c. All steel shall be fabricated in strict accordance with approved drawings and shall be equal to the best modern practice and workmanship and as further described by the current revision of the Code of Standard Practice of the AISC. All steel shop work shall be welded together, unless noted otherwise on approval drawings, and all fabricating and assembling possible shall be done at the shop before shipment. All stressed structural members shall have a minimum thickness of one-fourth inch. Side walls shall have a minimum thickness of $\frac{1}{4}$ in. Screw bottom shall be a minimum of $\frac{3}{8}$ " thick.

d. All members and pieces shall be plainly marked for identification and for location of their position in the structure according to erection drawings.

e. Prior to steel leaving shop, all bolt holes for field connections shall be lined up accurately. All field connections shall be bolted or welded, unless otherwise specified.

8. GUARANTEE

Vendor shall guarantee rates or capacities specified and shall include workmanship and defective parts warranty for a period of one year after start-up.

9. INFORMATION TO BE SUBMITTED WITH PROPOSAL

a. Vendor shall quote any recommended drive alternate.

b. Complete attached BID EVALUATION DATA SHEETS. Include DATA SHEETS for each alternate.

c. Submit outline drawing of proposed bin with sufficient data to define the equipment supplied.

d. Quote painting per Rust Specification EZ-01A as an alternate.

10. ATTACHMENTS

See ATTACHMENT AT-1 for other documents applicable to this Specification as attachments thereto.

ATTACHMENT AT-1

The following checked ☒ Supplemental Requirements documents, all dated 062078, become a part of Specification No. 1803/05 . Other documents also checked ☒ hereon are attachments to the Specification. Drawings, Charts, Lists, Sketches, etc., when listed and attached, are specifically applicable to the Specification.

- ☒ BID EVALUATION DATA SHEETS (2)
- ☐ DESIGN DATA SHEETS ()
- ☐ MANUFACTURER'S DATA SHEETS ()
- ☐ FORM E246 NOISE LEVEL DATA REQUEST SHEETS ()
- ☒ COATING SYSTEM EZ-01A
- ☐
- ☐
- ☐
- ☐ SPECIAL INSTRUCTIONS TO BIDDERS (For Equipment)
- ☐ SPECIAL INSTRUCTIONS TO BIDDERS (For Materials)
- ☒ SUPPLEMENTAL REQUIREMENTS FOR
 - VENDOR DOCUMENTS/EQUIPMENT
 - ☐ VENDOR DOCUMENTS/MATERIALS
 - EQUIPMENT SHIPPING AND MARKING
 - EQUIPMENT INSPECTION, TESTS, START-UP
 - MISCELLANEOUS ITEMS AND GUARANTEES
 - COUPLINGS AND MECHANICAL DRIVES
 - ELECTRIC MOTORS BELOW 600V, AC
 - ☐ ELECTRIC MOTORS ABOVE 600V, AC
 - SPARE PARTS
 - EQUIPMENT PAINTING
 - EQUIPMENT PRE-ASSEMBLY, SHOP ASSEMBLY, MODULE CONSTRUCTION
 - OSHA AND NOISE CONTROL FEDERAL REGULATIONS
 - ☐ ASME CODE DOCUMENTATION
 - ☐ EQUIPMENT MANUFACTURED USING METRIC MEASURING UNITS
- ☐ DRAWINGS/SKETCHES

COMPANY
 CONTRACT NO.
 SPECIFICATION NO.
 AREA NO.
 EQUIPMENT NO.

DEPARTMENT OF ENERGY
 21-1899
 1803/05
 03
 BARK SURGE BIN BH-0313

DATE 111378 PAGE 1 OF 2
 BID EVALUATION DATA SHEET
 VENDOR

ITEM	DESCRIPTION
DIMENSIONS AT TOP	
SLOPE ON SIDE WALLS & BACK WALL (NEGATIVE)	
DIMENSIONS AT BOTTOM	
PLATE THICKNESS SIDE WALLS	
TOTAL WEIGHT OF BIN STRUCTURE (EXCLUDE LIVE	
BOTTOM MECHANISM)	
PLATE THICKNESS-BOTTOM	
WILL SHOP DETAILS OF BIN STRUCTURE BE	
FURNISHED WITHOUT ADDITIONAL COST TO	
OWNER?	YES NO
NO. OF SCREWS	
SCREW - LENGTH	
DIAMETER & PITCH	
FLIGHT THICKNESS	
OVERALL DIMENSIONS OF LIVE BOTTOM	
PIPE O.D. & WALL THICKNESS	
MAXIMUM OUTPUT RATE/SECTION	

COMPANY
 CONTRACT NO.
 SPECIFICATION NO.
 AREA NO.
 EQUIPMENT NO.

DEPARTMENT OF ENERGY

21-1899

1803/05

03

BARK SURGE BIN BH-0313

DATE 111378

PAGE 2 OF 2

BID EVALUATION DATA SHEET

VENDOR

ITEM	DESCRIPTION
THRUST BEARING SIZE & MANUFACTURER	
ROTARY BEARING SIZE & MANUFACTURER	
SCREW DRIVES - NUMBER	
TYPE PRIME MOVERS	
HORSEPOWER	
RPM OUTPUT	
HYDRAULIC SYSTEM PRESSURE & GPM	
TYPE SPEED CONTROL	
MANUFACTURER SPEED REDUCER	FALK NO.
SIZE REDUCER	
REDUCTION RATIO	
CHAIN SIZE FROM REDUCER TO SCREWS	
SPROCKET SIZES	
LUBRICATION OF DRIVE	
WEIGHT BIN UPPER STRUCTURE	
WEIGHT LIVE BOTTOM MECHANISM AND DRIVE	
TOTAL WEIGHT	
FREIGHT	
PRICE BIN UPPER STRUCTURE	
PRICE LIVE BOTTOM MECHANISM & CHAIN DRIVES	
PRICE VARIABLE SPEED DRIVES	
FOB	
TERMS	
DELIVERY	

PURPOSE

A zinc rich phenoxy system for structural and miscellaneous steel. Suitable for industrial, chemical and paper mill exposure to heavy fumes, splash, and spillage of alkalis, solvents, salts, and water. Not recommended for immersion.

NOTE:

Primer may be applied at air and surface temperature as low as 32°F. Epoxy should not be applied at temperatures below 50°F.

SURFACE PREPARATION

Solvent Clean	SSPC-SP1
Commercial Blast	SSPC-SP6
Anchor pattern profile	1.5 mil average
PRIMER	Dry Mils
Organic zinc rich phenoxy	2.5

TOPCOAT

Epoxy polyamide 3.0

TOTAL DRY MIL THICKNESS 5.5

APPLICATION TEMP. LIMITS above 50°F

HUMIDITY LIMITS below 80%

DEW POINT—not within 5 degrees of surface temperature.

DRY TEMP. LIMITS 175°F Continuous 250°F Int.

APPLICABLE REQUIREMENTS

"General Requirements for Standard Coating Systems" (GR-3), attached, are applicable to this system.

**GENERAL REQUIREMENTS FOR STANDARD COATING SYSTEMS
(GR-3)**

1. GENERAL

- a. The Manufacturer's recommendations and requirements shall be considered a part of the specified COATING SYSTEM(S).
- b. The manufacturer of all topcoats must be the same as the manufacturer of the prime coat.
- c. Colors shall be as selected and as shown on schedules. Safety colors shall be in accord with ANSI Standards.

2. REFERENCE STANDARDS AND CODES

Applicable Standards and Codes of the following organizations shall apply to COATING SYSTEMS unless otherwise noted:

- a. SSPC - Steel Structures Painting Council for surface preparation and application.
- b. NACE - National Association of Corrosion Engineers for surface preparation.
- c. ANSI - American National Standards Institute for safety color coding of physical hazards.

REVISION NO. 2, Dated 050479

REVISION NO. 1, Dated 012579

SPECIFICATION

NO. 1810/21

DEMINERALIZER SUPPLY PUMPS

EQUIPMENT NOS.: P-0714A, P-0714B

2

FOR

DEPARTMENT OF ENERGY

BIOMASS CO-GENERATION FACILITIES

IN THE

STATE OF MAINE

Prepared by

THE RUST ENGINEERING COMPANY

CONTRACT 21-1899

SPECIFICATION
NO. 1810/21
DEMINERALIZER SUPPLY PUMPS

2

1. INTENT

This Specification is intended to accompany Purchase Inquiry inviting Proposals to furnish equipment needed in connection with The Biomass Co-Generation Facilities in the State of Maine.

2. SCOPE

The Vendor shall design, fabricate, test and deliver FOB to the jobsite, two (2) Centrifugal Supply (Demineralizer System) pumps as described in this Specification and its Attachments.

3. WORK, EQUIPMENT, SERVICES BY OTHERS

Items listed below are to be furnished by others and are not the responsibility of the selected Pump Vendor.

1

- a. Install and furnish all electricals work including motor starter and all wiring.
- b. Design and erect all foundations including all anchor bolts.
- c. Unload pump or pumps, store and install to foundation.

4. STANDARDS AND CODES

- a. The pumps shall be furnished in accordance with the following applicable Standards and/or Codes in effect as of the time of release of this inquiry:

American Society for Testing and Materials (ASTM)

American Iron and Steel Institute (AISI)

American National Standards Institute (ANSI)

American Society of Mechanical Engineers (ASME) including ASME
PTC 8.2 - 1965 - Centrifugal Pumps

National Electrical Manufacturers Association (NEMA)

Standards of the Hydraulic Institute

Occupational Safety and Health Act (OSHA)

- b. All applicable State and local laws, ordinances or regulations.

5. APPLICABLE DOCUMENTS

- a. See ATTACHMENT AT-1 for list of applicable documents.
- b. CENTRIFUGAL PUMP SPECIFICATION Sheet.

6. ALTERNATE AND MISCELLANEOUS REQUIREMENTS

- a. Vendor shall fill in all pertinent information on the CENTRIFUGAL PUMP SPECIFICATION Sheet.
- b. Vendor shall quote alternate if desired with complete explanations.
- c. Vendor shall furnish dimensional drawing of the pumps unit suitable for layout purposes.
- d. Provide lube requirements if required.
- e. Vendor to furnish complete motor data. The Vendor shall supply separate costs of the vertical motor.

7. PROCESS DESCRIPTION

The specified units pump water from the Water Storage Tank through the A.C. Filters, Mixed Bed Demineralizer and into the Demineralized water storage tank. The temperature of the water ranges from 35° to 100°F. The maximum flow capacity of each pump is 850 gpm. The fluid pumped is filtered water or city water.

8. OPERATING CONDITIONS AND DESIGN DATA

a. General

- 1) The design delivery of the pump shall be 850 gpm (Ref. to CENTRIFUGAL PUMP SPECIFICATION Sheet). The pump performance must be stable to 900 gpm at the design speed.
- 2) The discharge head shall be 162 ft. of 50°F water.
- 3) The inlet pressure will normally be 2.0 psig.
- 4) The maximum allowable speed shall be 1770 rpm.
- 5) The minimum accepted efficiency is 72 percent.
- 6) The water temperature can vary from 35°F to 100°F.
- 7) The Vendor shall supply performance curve showing expected performance of the operating range at the design speed. The curve shall show head, capacity, efficiency and horsepower as well as the minimum NPSH requirements.

b. Pump Construction

The pump shall be of a configuration of a vertical in-line unit with bearing support a part of the pump or support housing. The pump thrust shall not be carried by the motor bearings.

1) Casing and Materials

The casing of the pump shall be ductile iron ASTM A 536, Grade 60-40-18 minimum, with 60-45-12 preferred, or equivalent. The flanges shall be 150 lb. flat faced for the inlet and outlet connections. The pump casing shall support loads and moments equivalent to the strength of a Schedule 40 pipe spool piece of the equivalent length of the face to face dimension of the pump flanges. The entire pump assembly and seals shall be removable from the top of the casing by removing the motor-pump coupling assembly. Motor supports and other supports not in contact with the pumped fluid may be of carbon steel. A casing drain shall be provided at the inlet of the pump.

2) Impeller

The impeller shall be of the enclosed type. The impeller shall be of ASTM A 296, Grade CF-8M stainless steel, or equivalent. The impeller must be balanced and keyed to the shaft and held securely by a stainless steel nut and washer. The pump shall have a solid stainless steel shaft of ASTM A 276, S 31600.

3) Seal

The pump shall have a mechanical seal with rubber or an "O" ring mounted seat with a ceramic face operating to a selected manufacturer's "carbon compound" seal ring. All other parts of the seal shall be of AISI 316 stainless steel. The seal installation shall have parts for flushing. A complete description of the seal shall be made in the Bid.

4) Bearings

The stainless shaft shall be supported by two anti-friction Conrad type (single or double row) roller type or spherical anti-friction bearings. The bearing shall be protected by proper seals and slingers where necessary. The bearings shall have a B-10 life of 17,000 hours minimum. The bearings shall be permanently grease lubricated.

5) Motors

a) The vertical motor for driving the pump shall be of the full voltage starting, squirrel cage induction type of NEMA Design "B", or equivalent, unless otherwise specified. Motor shall be furnished with enclosure conforming to NEMA standards for TEFC type and per SUPPLEMENTAL REQUIREMENTS FOR ELECTRIC MOTORS BELOW 600 VOLTS, AC, attached.

b) The motor shall be of the proper size to drive the pump continuously over the specified operating range without the load exceeding 110% of the name plate rating of the motor. The motor shall be 40°C ambient design with 1.15 service factor with Class "B" insulation. The motor shall be designed to operate on 460 volt, 3 phase, 60 Hz, current and as per SUPPLEMENTAL REQUIREMENT in 7)a).

c) The Vendor shall supply complete information on the supplied motor-pump unit and separate cost for the vertical motors. Furnish a separate cost for pump.

9. QUALITY ASSURANCE

a. The pumps shall be tested, or have been tested at the factory for all capacity, head, and water conditions herein specified. Centrifugal test data shall be forwarded to the Purchaser or Engineer, in lieu of or upon completion of the test, for review and approval prior to shipment. The test shall conform to Hydraulic Institute Test Codes or ASME Power Test Code PTC 8.2 - 1965, Centrifugal Pumps. The test should conform to the "Test Tolerances" contained in the above Codes.

b. Pump specified is subject to inspection and test by the Owner or Engineer at the point of manufacture and/or jobsite as may be desired by the Owner or Engineer.

c. This inspection does not relieve the Vendor of responsibility to furnish satisfactory material. It is further understood that the Purchaser has the privilege to waive inspection at the point of manufacture or assembly without prejudicing his right to reject the material or equipment, or any of its component parts, at the destination or during performance testing.

10. PERFORMANCE AND START-UP TEST REQUIREMENTS

a. Service Engineer

1) The Vendor, if requested by the Owner, shall provide a Service Engineer to inspect and approve the installation, supervise start-up, prepare a written start-up report, and instruct and advise Purchaser's personnel on pump operation.

2) Any extra costs to the Purchaser for this service shall be quoted in detail as an alternate or option.

b. Start-Up and Acceptance Tests

After the Vendor has made adjustments he feels necessary for the proper performance of the pump, the system shall be operated at or near normal load without any adjustments for a period of not less than 24 hours. The acceptance test shall then be conducted without any additional adjustments.

11. GUARANTEES

Vendor shall guarantee the pump will meet all requirements contained in this Specification, and with Warranty contained in the "Terms and Conditions" of Purchase Order.

12. ATTACHMENTS

See ATTACHMENT AT-1 for other documents applicable to this Specification as attachments thereto.

ATTACHMENT AT-1

The following checked ● Supplemental Requirements documents, all dated 062078, become a part of Specification No. 1810/21 : Other documents also checked ☒ hereon are attachments to the Specification. Drawings, Charts, Lists, Sketches, etc., when listed and attached, are specifically applicable to the Specification.

- ☐ BID EVALUATION DATA SHEETS ()
- ☐ DESIGN DATA SHEETS ()
- ☐ MANUFACTURER'S DATA SHEETS ()
- ☒ FORM E246 NOISE LEVEL DATA REQUEST SHEETS (1)
- ☐ _____
- ☒ CENTRIFUGAL PUMP SPECIFICATION SHEET
- ☐ _____
- ☐ _____
- ☐ SPECIAL INSTRUCTIONS TO BIDDERS (For Equipment)
- ☐ SPECIAL INSTRUCTIONS TO BIDDERS (For Materials)
- ☒ SUPPLEMENTAL REQUIREMENTS FOR

- VENDOR DOCUMENTS/EQUIPMENT
- VENDOR DOCUMENTS/MATERIALS
- EQUIPMENT SHIPPING AND MARKING
- EQUIPMENT INSPECTION, TESTS, START-UP
- MISCELLANEOUS ITEMS AND GUARANTEES
- COUPLINGS AND MECHANICAL DRIVES
- ELECTRIC MOTORS BELOW 600V, AC
- ELECTRIC MOTORS ABOVE 600V, AC
- SPARE PARTS
- EQUIPMENT PAINTING
- EQUIPMENT PRE-ASSEMBLY, SHOP ASSEMBLY, MODULE CONSTRUCTION
- OSHA AND NOISE CONTROL FEDERAL REGULATIONS
- ASME CODE DOCUMENTATION
- EQUIPMENT MANUFACTURED USING METRIC MEASURING UNITS
- VIBRATION PARAMETERS FOR ROTATING EQUIPMENT

☐ DRAWINGS/SKETCHES

2

1

NOISE LEVEL DATA REQUEST SHEET

THE RUST ENGINEERING COMPANY

Birmingham, Alabama

For Use With
Specification
No. 1810/21

FOR: DOE BIOMASS PROJECT

PROPOSAL
OR JOB NO.: 21-1899

DATE:

AT:

INQUIRY
NO.PURCHASE
ORDER NO.:REQUESTED
BY:TYPE OF
EQPT.: CENTRIFUGAL SUPPLY PUMPS

SERVICE

MANF.:

TAG NO.:

MODEL
SIZE:OPERATING
CONDITIONS:

THE VENDOR/MANUFACTURER/SUBCONTRACTOR SHALL SUPPLY NOISE LEVEL DATA FOR THE STANDARD MODEL OF HIS EQUIPMENT UNLESS OTHERWISE NOTED. THE ORDER OF PREFERENCE OF DATA IS (UNLESS OTHERWISE NOTED):

1. OCTAVE BAND SOUND POWER LEVELS RE 10^{-12} WATTS IN EACH OCTAVE BAND FROM 63 HZ THROUGH 8000 HZ.
2. OCTAVE BAND SOUND PRESSURE LEVELS RE 0.0002 μ BAR AT 3 FEET.
3. A-WEIGHTED SOUND PRESSURE LEVEL RE 0.0002 μ BAR AT 3 FEET.
4. ANY OTHER NOISE LEVEL DATA.

THIS FORM DOES NOT AUTHORIZE EXPENDITURES FOR ANY TESTING TO OBTAIN THE INFORMATION REQUESTED.

☐ PWL ☐ SPL	OCTAVE BAND CENTER FREQUENCIES HZ								dBA	DISTANCE	CONDITION
	63	125	250	500	1000	2000	4000	8000			
☐ STANDARD MODEL NOISE LEVEL(S):											
☐ QUIET MODEL NOISE LEVEL(S)											
☐ GUARANTEED NOISE LEVEL(S)											

SOURCE OF DATA ☐ LAB OR SHOPTEST ☐ FIELD TEST ☐ CALCULATION ☐ OTHER

COST OF GUARANTEE

COST OF TEST IN THE ABSENCE OF ANY INFORMATION

ACOUSTICAL TREATMENT
FOR QUIET MODEL

ADDITIONAL COST FOR QUIET MODEL

SHEET
COMPLETED BY:

DATE:

FIRM:

TITLE:

SIGNATURE:

CENTRIFUGAL PUMP SPECIFICATION

CLIENT DEPARTMENT OF ENERGY - BIOMASS PROJECT		CONTRACT NO. 21-1899	
ADDRESS		BY P.E.R.	DATE 11/16/78
PLANT LOCATION STATE OF MAINE		APPROVED	DATE
ITEM		EQUIP. IDENT. NO. P-0714A & B	
2 PUMPS REQ'D		PUMPING CONDITIONS DEMINERALIZER SUPPLY PUMPS	
FLUID PUMPED SUPPLY WATER TO DEMINERALIZER SYSTEM			
PUMPING TEMP. (PT)	°C	°F	VISCOSITY AT PT CP
SPECIFIC GRAVITY AT PT	1.0		DENSITY AT PT LBS./GAL.
VAPOR PRESSURE AT PT	mmHg	PSI	SOLIDS CONTENT % WT.
PERFORMANCE CHARACTERISTICS			
CAPACITY, USGPM	NORMAL	RATED 850	MINIMUM REQD.
TDM, FEET:	NORMAL	DISCH. PRESSURE 162 ft	
SUCTION PRESSURE, PSIG	RATED 2.0	MAXIMUM	
NPSH, FEET ABS: AVAIL (NORMAL)	(RATED) 37.9 ft.	REQD	BY PUMP CURVE NO.
BHP (NORMAL)	(RATED)	EFFICIENCY (NORMAL)	(RATED) See Spec.
PUMP DESCRIPTION IN-LINE PUMP-VERTICAL MOTORS			
TYPE	SIZE	RPM 1770	ROTATION ☒ CW ☐ CCW
IMPELLER TYPE Enclosed	DIAMETER, IN. (RATED)	(MAX.)	(MIN. BY MFR.)
☐ PACKING TYPE	SIZE	NO. OF RINGS	SEAL CAGE ☐ YES ☐ NO
☐ MECH. SEAL, MFR AND MODEL			
SUCTION ☐ FLGD ☐ SCRD	SIZE 150	LB. ASA	FACING POSITION ☐ CL ☐ SIDE ☐ FACING UP
DISCHARGE ☐ FLGD ☐ SCRD	SIZE 150	LB. ASA	FACING POSITION ☐ TOP CTR ☐ TANGENT ☐ SIDE
BEARINGS (MFR AND TYPE): RADIAL		THRUST	(VERTICAL) THRUST ☐ UP ☐ DOWN
MATERIAL: CASING D. Iron	IMPELLER 316 St. Steel	SHAFT/SLEEVE NONE	
OTHER MATERIAL 316 St. Steel Fitted			
CASING ☐ VENT	NPT	☐ DRAIN	NPT GAGE CONN ☐ SUCTION ☐ DISCHARGE NPT
STUFF BOX: ☐ TAP FOR FLUSH	NPT: ☐ TAP FOR DRAIN	NPT	☐ JACKETED NPT COON: COOL WATER REQD GPM
CASING: NO. OF STAGES	MOUNTING: ☐ CENTERLINE	☐ FOOT	☐ BRACKET ☐ VERTICAL
CASING SPLIT ☐ HORIZ ☐ VERTICAL	TYPE OF VOLUTE ☐ SINGLE ☐ DOUBLE ☐ DIFFUSER		
COVER PLATE ☐ JACKETED	NPT CONN.	☐ GLAND COOLING	NPT CONN. BEARING HOUSING ☐ JACKETED NPT
PUMP BUILT TO ☐ AVS ☐ API STD 610	☐ OTHER	SPECIFICATIONS	
COUPLING TYPE Gear (or) Flex.	MAKE	GUARD	
LUBRICATION Oil	HYDROSTATIC TEST PRESSURE		PSIG
WEIGHT, LB: PUMP	DRIVER VERTICAL MOTOR		
PUMP SERIAL NO.			
PUMP CURVE NO.			
SECTIONAL DWG. NO.			
DRIVER			
☒ ELECTRIC MOTOR	HP	V 2300	PH 3 - CPS 60
MFR	CLASS	GROUP	
☐ STEAM TURBINE	MFR	STEAM	PSIG EXHAUST PSIG
☐ OTHER:	MFR		
REMARKS			
REV NO	REVISION	BY	DATE
1			012579
2			050479
			P.O. NO.
			PRICE

REVISION NO. 2, May 4, 1979
REVISION NO. 1, January 24, 1979

SPECIFICATION

NO. 1810/31

DEMINERALIZED WATER PUMPS

EQUIPMENT NOS.: P-0718A, P-0718B

FOR
DEPARTMENT OF ENERGY
BIOMASS CO-GENERATION FACILITIES
IN THE
STATE OF MAINE

Prepared by
THE RUST ENGINEERING COMPANY
CONTRACT 21-1899

SPECIFICATION
NO. 1810/31
DEMINERALIZED WATER PUMPS

2

1. INTENT

This Specification is intended to accompany Purchase Inquiry inviting Proposals to furnish equipment needed in connection with The Biomass Co-Generation Facilities in the State of Maine.

2. SCOPE

The Vendor shall design, fabricate, test and deliver FOB to the jobsite, two (2) demineralized water in-line pumps as described in this Specification and its Attachments.

1

3. WORK EQUIPMENT, SERVICES BY OTHERS

Items listed below are to be furnished by others and are not the responsibility of the selected Pump Vendor.

1

a. Install and furnish all electrical work including motor starter and all wiring.

1

b. Design and erect all foundations including all anchor bolts.

c. Unload pump or pumps, store and install in pipe or on foundation.

1

4. STANDARDS AND CODES

a. The pumps shall be furnished in accordance with the following applicable standards and/or Codes in effect as of the time of release of this inquiry:

American Society for Testing and Materials (ASTM)

American Iron and Steel Institute (AISI)

American National Standard Institute (ANSI)

American Society of Mechanical Engineers (ASME) including ASME PTC 8.2-1965 - Centrifugal Pumps

National Electrical Manufacturers Association (NEMA)

Standards of the Hydraulic Institute

Occupational Safety and Health Act (OSHA)

b. All applicable State and local laws, ordinances or regulations.

5. APPLICABLE DOCUMENTS

- a. See ATTACHMENT AT-1 for list of applicable documents.
- b. CENTRIFUGAL PUMP SPECIFICATION sheet.

6. ALTERNATE AND MISCELLANEOUS REQUIREMENTS

- a. Vendor shall fill in all pertinent information on the CENTRIFUGAL PUMP SPECIFICATION sheet.
- b. Vendor shall quote alternate if desired with complete explanations.
- c. Vendor shall furnish dimensional drawing of the pumps unit suitable for layout purposes.
- d. Provide lube requirements if required.
- e. Vendor to furnish complete motor data. The Vendor shall supply separate costs of the vertical motor.

7. PROCESS DESCRIPTION

- a. The specified units pump water from grade level through the feed water make-up heater to the Deaerator.
- b. The deaerator has a minimum operating pressure of 40 psig with a maximum design pressure of 75 psig. The maximum flow required of each pump is 1000 gpm. The normal operating flow is 800 gpm.

8. OPERATING CONDITIONS AND DESIGN DATA

a. General

- 1) The design delivery of the pump shall be 1000 gpm (Ref. to CENTRIFUGAL PUMP SPECIFICATION sheet). The pump performance must be stable to 1100 gpm at the design speed.
- 2) The design head shall be 310.0 ft. of 50° water.
- 3) The inlet pressure will be at +10 ft. to 40 ft. of water which is the tank height.
- 4) The maximum allowable speed shall be 3580 rpm.
- 5) The minimum accepted efficiency is 70 percent.
- 6) The water temperature ranges from 35°F to 100°F.
- 7) The Vendor shall supply performance curve showing expected performance of the operating range of pump at the design speed. The curve shall show head, capacity, efficiency and horsepower as well as the minimum NPSH requirements.

b. Pump Construction

The pump shall be of a configuration of a vertical in-line unit with bearing support a part of the pump or support housing. The pump thrust shall not be carried by the motor bearings.

1) Casing and Materials

The casing of the pump shall be ASTM A 296, Grade CF-8M stainless steel, with 150 lb flat faced flanges. The casing shall support loads and moments equivalent to the strength of a Schedule 40 pipe spool piece of length equal to the face to face dimension of the pump flanges. The entire pump assembly and seal shall be removable from the top of the casing by removing the motor-pump coupling assembly. Motor supports and other supports not in contact with the pumped fluid may be of carbon steel. A casing drain shall be provided at the inlet of the pump.

2) Impeller

The impeller shall be of the enclosed type. The impeller shall be of ASTM A 296, Grade CF-8M stainless steel or equivalent. The impeller must be hydraulically balanced and keyed to the shaft and held securely by a AISI 316 stainless steel nut and washer. The pump shall have a solid stainless steel shaft of ASTM A 276, S31600.

3) Seal

The pump shall have a mechanical seal with rubber or an "O" ring mounted seat with a ceramic face operating to a selected manufacturer's "carbon compound" seal ring. All other parts of the seal shall be of AISI 316 stainless steel. The seal installation shall have parts for flushing. A complete description of the seal shall be made in the Bid.

4) Bearings

The stainless shaft shall be supported by two anti-friction Conrad type (single or double row), roller type, or spherical anti-friction bearings. The bearing shall be protected by proper seals and slingers where necessary. The bearings shall have a B-10 life of 17,000 hours minimum. The bearings shall be permanently grease lubricated.

5) Motors

a) The vertical motor for driving the pump shall be of the full voltage starting, squirrel cage induction type of NEMA Design "B" or equivalent, unless otherwise specified. Motor shall be furnished with enclosure conforming to NEMA standards for TEFC type and per SUPPLEMENTAL REQUIREMENTS FOR ELECTRIC MOTORS BELOW 600 VOLTS, AC, attached.

b) The motor shall be of the proper size to drive the pump continuously over the specified operating range without the load exceeding 110% of the name plate rating of the motor. The motor shall be 40°C ambient design with 1.15 service factor with class "B" insulation. The motor shall be designed to operate at 3 phase 60 Hz, 460 volt electric current, and as per SUPPLEMENTAL REQUIREMENT in 7)a) above.

c) The Vendor shall supply complete information on the supplied motor-pump unit and separate cost for the vertical motor.

9. QUALITY ASSURANCE

a. The pumps shall be tested, or shall have been tested at the factory for all capacity, head, and water conditions herein specified. Certified test data shall be forwarded to the Purchaser or Engineer in lieu of, or upon completion of the test, for review and approval prior to shipment. The test shall conform to Hydraulic Institute Test codes or ASME Power Test Code PTC 8.2 - 1965, Centrifugal Pumps. The test should conform to the "Test Tolerances" contained in the above codes.

b. Pumps specified are subject to inspection and test by the Owner or Engineer at the point of manufacture and/or jobsite as may be desired by the Owner or Engineer.

c. This inspection does not relieve the Vendor of responsibility to furnish satisfactory material. It is further understood that the Purchaser has the privilege to waive inspection at the point of manufacture or assembly without prejudicing his right to reject the material or equipment, or any of its component parts, at the destination or during performance testing.

10. PERFORMANCE AND START-UP TEST REQUIREMENTS

a. Service Engineer

1) The Vendor, if requested by the Owner, shall provide a Service Engineer to inspect and approve the installation, supervise start-up, prepare a written start-up report, and instruct and advise Purchaser's personnel on pump operation.

2) Any extra costs to the Purchaser for this service shall be quoted in detail as an alternate or option.

b. Performance Test

After the Vendor has made the adjustments necessary for the proper performance of the pump, the system shall be operated at or near normal load without any adjustments for a period of not less than 24 hours. The acceptance test shall then be conducted without any additional adjustments.

11. GUARANTEES

Vendor shall guarantee the pump will meet all requirements contained in this Specification, and with Warranty contained in the "Terms and Conditions" of Purchase Order.

12. ATTACHMENTS

See ATTACHMENT AT-1 for other documents applicable to this Specification as attachments thereto.

ATTACHMENT AT-1

The following checked ● Supplemental Requirements documents, all dated 062078, become a part of Specification No. 1810/31 . Other documents also checked ☒ hereon are attachments to the Specification. Drawings, Charts, Lists, Sketches, etc., when listed and attached, are specifically applicable to the Specification.

- ☐ BID EVALUATION DATA SHEETS ()
- ☐ DESIGN DATA SHEETS ()
- ☐ MANUFACTURER'S DATA SHEETS ()
- ☒ FORM E246 NOISE LEVEL DATA REQUEST SHEETS (1)
- ☐
- ☒ CENTRIFUGAL PUMP SPECIFICATION SHEET
- ☐
- ☐
- ☐ SPECIAL INSTRUCTIONS TO BIDDERS (For Equipment)
- ☐ SPECIAL INSTRUCTIONS TO BIDDERS (For Materials)
- ☒ SUPPLEMENTAL REQUIREMENTS FOR

- VENDOR DOCUMENTS/EQUIPMENT
- VENDOR DOCUMENTS/MATERIALS
- EQUIPMENT SHIPPING AND MARKING
- EQUIPMENT INSPECTION, TESTS, START-UP
- MISCELLANEOUS ITEMS AND GUARANTEES
- COUPLINGS AND MECHANICAL DRIVES
- ELECTRIC MOTORS BELOW 600V, AC
- ELECTRIC MOTORS ABOVE 600V, AC
- SPARE PARTS
- EQUIPMENT PAINTING
- EQUIPMENT PRE-ASSEMBLY, SHOP ASSEMBLY, MODULE CONSTRUCTION
- OSHA AND NOISE CONTROL FEDERAL REGULATIONS
- ASME CODE DOCUMENTATION
- EQUIPMENT MANUFACTURED USING METRIC MEASURING UNITS
- VIBRATION PARAMETERS FOR ROTATING EQUIPMENT

☐ DRAWINGS/SKETCHES

NOISE LEVEL DATA REQUEST SHEET

THE RUST ENGINEERING COMPANY

Birmingham, Alabama

For Use With
Specification
No. 1810/31

FOR: DOE BIOMASS PROJECT

PROPOSAL
OR JOB NO.: 21-1899

DATE:

AT:

INQUIRY
NO.PURCHASE
ORDER NO.:REQUESTED
BY:TYPE OF
EQPT.: DEAERATOR
CENTRIFUGAL PUMPS

SERVICE

MANF.:

TAG NO.:

MODEL
SIZE:OPERATING
CONDITIONS:

THE VENDOR/MANUFACTURER/SUBCONTRACTOR SHALL SUPPLY NOISE LEVEL DATA FOR THE STANDARD MODEL OF HIS EQUIPMENT UNLESS OTHERWISE NOTED. THE ORDER OF PREFERENCE OF DATA IS (UNLESS OTHERWISE NOTED):

1. OCTAVE BAND SOUND POWER LEVELS RE⁻¹² WATTS IN EACH OCTAVE BAND FROM 63 HZ THROUGH 8000 HZ.
2. OCTAVE BAND SOUND PRESSURE LEVELS RE 0.0002 μ BAR AT 3 FEET.
3. A-WEIGHTED SOUND PRESSURE LEVEL RE 0.0002 μ BAR AT 3 FEET.
4. ANY OTHER NOISE LEVEL DATA.

THIS FORM DOES NOT AUTHORIZE EXPENDITURES FOR ANY TESTING TO OBTAIN THE INFORMATION REQUESTED.

☐ PWL ☐ SPL

OCTAVE BAND CENTER FREQUENCIES HZ

63

125

250

500

1000

2000

4000

8000

dBA

DISTANCE

CONDITION

☐ STANDARD
MODEL NOISE
LEVEL(S):☐ QUIET
MODEL NOISE
LEVEL(S)☐ GUARANTEED
NOISE LEVEL(S)

SOURCE OF DATA

☐ LAB OR SHOPTEST☐ FIELD TEST☐ CALCULATION☐ OTHER

COST OF GUARANTEE

COST OF TEST IN THE ABSENCE OF ANY INFORMATION

ACOUSTICAL TREATMENT
FOR QUIET MODEL

ADDITIONAL COST FOR QUIET MODEL

SHEET
COMPLETED BY:

DATE:

FIRM:

TITLE:

(472)

SIGNATURE:

CENTRIFUGAL PUMP SPECIFICATION VENDOR TO COMPLETE DATA

CLIENT DOE BIOMASS PROJECT				CONTRACT NO. 21-1899			
ADDRESS				BY P.R. DATE 11-15-78			
PLANT LOCATION STATE OF MAINE				APPROVED DATE			
ITEM				EQUIP. IDENT. NO. P-0718A & B			
DEMINERALIZE WATER PUMP				PUMPING CONDITIONS			
FLUID PUMPED DEMINERALIZED WATER							
PUMPING TEMP. (PT) °C 50 °F				VISCOSITY AT PT CP			
SPECIFIC GRAVITY AT PT 1.0				DENSITY AT PT LBS./GAL.			
VAPOR PRESSURE AT PT mmHg PSI				SOLIDS CONTENT % WT.			
PERFORMANCE CHARACTERISTICS							
CAPACITY, USGPM 600		NORMAL 1000		RATED 800 at 310		MINIMUM REQD. 600	
TDH, FEET: NORMAL		RATED 240		DISCH. PRESSURE 310 FT		PSIG 134.2	
SUCTION PRESSURE, PSIG		RATED +10 Ft.		MAXIMUM + 40 FT.			
NPSH, FEET ABS: AVAIL (NORMAL)		(RATED)		REQD		BY PUMP CURVE NO.	
BHP (NORMAL)		(RATED)		EFFICIENCY (NORMAL)		(RATED) SEE SPEC.	
PUMP DESCRIPTION IN-LINE PUMP-VERTICAL MOTOR							
TYPE		SIZE		RPM 3580		ROTATION ☒ CW ☐ CCW	
IMPELLER TYPE ENCLOSED		DIAMETER, IN. (RATED)		(MAX.)		(MIN. BY MFR.)	
☐ PACKING TYPE		SIZE		NO. OF RINGS		SEAL CAGE ☐ YES ☐ NO	
☒ MECH. SEAL, MFR AND MODEL							
SUCTION ☐ FLGD ☐ SCRD		SIZE		150 LB. ASA		FACING	
DISCHARGE ☐ FLGD ☐ SCRD		SIZE		150 LB. ASA		FACING	
BEARINGS (MFR AND TYPE): RADIAL		THRUST		(VERTICAL) THRUST ☐ UP ☐ DOWN			
MATERIAL: CASING 316 St. Stl.		IMPELLER 316 St. Stl.		SHAFT/SLEEVE NONE			
OTHER MATERIAL 316 St. Stl. Trim							
CASING ☐ VENT		NPT		☐ DRAIN		NPT	
STUFF BOX: ☐ TAP FOR FLUSH		NPT: ☒ TAP FOR DRAIN		NPT		☐ JACKETED	
CASING: NO. OF STAGES 1		MOUNTING: ☐ CENTERLINE		☐ FOOT		☐ BRACKET	
CASING SPLIT ☐ HORIZ ☐ VERTICAL		TYPE OF VOLUTE ☐ SINGLE		☐ DOUBLE		☐ DIFFUSER	
COVER PLATE ☐ JACKETED		NPT CONN.		☐ GLAND COOLING		NPT CONN.	
PUMP BUILT TO ☐ AVS ☐ API STD 610 ☐ OTHER		SPECIFICATIONS					
COUPLING TYPE GEAR OF FLEX		MAKE		GUARD			
LUBRICATION OIL		HYDROSTATIC TEST PRESSURE		PSIG			
WEIGHT, LB: PUMP		DRIVER VERTICAL MOTOR					
PUMP SERIAL NO.							
PUMP CURVE NO.							
SECTIONAL DWG. NO.							
DRIVER							
☐ ELECTRIC MOTOR		HP		V		PH	
MFR		CLASS		GROUP		CPS	
☐ STEAM TURBINE		MFR		STEAM		PSIG	
☐ OTHER:		MFR		EXHAUST		PSIG	
REFER TO DRAWINGS 04-28-012 and 07-28-005 (NOT PART OF SPEC.)							
REMARKS PUMPS FROM DEMINERALIZER TANK - THRU FEED WATER HEATER TO DEAERATOR.							
REV. NO. REVISION BY DATE APPD. DATE VENDOR							
1				012479			
2				050479		P.O. NO.	
						PRICE	

REVISION NO. 1, May 4, 1979

SPECIFICATION

NO. 1810/32

ASH SLUICE WATER PUMPS

EQUIPMENT NOS. P-1001A & P-1001B

FOR
DEPARTMENT OF ENERGY
BIOMASS CO-GENERATION FACILITIES
IN THE
STATE OF MAINE

Prepared by
THE RUST ENGINEERING COMPANY
CONTRACT 21-1899

SPECIFICATION
NO. 1810/32
ASH SLUICE WATER PUMPS

1. INTENT

This Specification is intended to accompany Purchase Inquiry inviting Proposals to furnish equipment needed in connection with The Biomass Co-Generation Facilities in the State of Maine.

2. SCOPE

The Vendor shall design, fabricate, test and deliver FOB to the jobsite, two (2) Water Recovery pumps as specified in this Specification and its attachments.

3. WORK, EQUIPMENT, SERVICES BY OTHERS

Items listed below are to be furnished by others and are not the responsibility of the selected Pump Vendors.

- a. Furnish and install all electrical work including pump motor unit, motor starter, and all wiring. The Vendor shall quote his motor costs separately.
- b. Design and erect all foundations including all anchor bolts.
- c. Unload pump or pumps, store and install on foundation.

4. STANDARDS AND CODES

- a. The pumps shall be furnished in accordance with the following applicable standards and/or Codes in effect as of time of release of this inquiry:

American Society for Testing and Materials (ASTM)

American Iron & Steel Institute (AISI)

American National Standard Institute (ANSI)

American Society of Mechanical Engineers (ASME) including ASME
PTC 8.2-1965 Centrifugal Pumps

National Electrical Manufacturers Association (NEMA)

Standards of the Hydraulic Institute

Occupational Safety and Health Act (OSHA)

- b. All applicable State and local laws, ordinances or regulations.

5. APPLICABLE DOCUMENTS

- a. See ATTACHMENT AT-1 for list of applicable documents.
- b. CENTRIFUGAL PUMP SPECIFICATION Sheet.

6. ALTERNATE AND MISCELLANEOUS REQUIREMENTS

- a. Vendor shall fill in all pertinent information on the CENTRIFUGAL PUMP SPECIFICATION SHEET.
- b. Vendor shall quote alternate, if desired, with complete explanations.
- c. Vendor shall furnish dimensional drawing of the pump unit suitable for layout purposes.
- d. Provide lube requirements if required.
- e. Vendor shall quote electric motors as an alternate. Complete motor data shall be included.

7. PROCESS DESCRIPTION

The Water Recovery Pumps recover water from the ash pond and conveys it to the surge tank (TK-1002). The ash pond receives ash and other non-combustible (sand, silt, grit) material from the Biomass Boiler and associated equipment. The heavy material settles in the ash pond while the clear water is recovered.

8. OPERATING CONDITIONS AND DESIGN DATA

a. General

- 1) The design delivery of the pump shall be 650 gpm (Ref. to CENTRIFUGAL PUMP SPECIFICATION Sheet). The pump performance must be stable to 700 gpm at the design speed.
- 2) The design head shall be 100.0 ft. of 35° - 75°F water.
- 3) The inlet pressure will be at +3 ft. to 10 ft. of water approximately.
- 4) The maximum allowable speed shall be 1780 rpm.
- 5) The minimum acceptable efficiency is 55 percent.
- 6) The Vendor shall supply performance curve showing expected performance of the operating range of pump at the design speed. The curve shall show head, capacity, efficiency and horsepower as well as the minimum NPSH requirements.

b. Pump Construction

The pump shall be of configuration of an end suction single stage centrifugal pump.

1) Casing Material

a) The casing of the pump shall be of abrasion-resistant cast iron of ASTM A 532, Class I-D (Designation N1-H1 CR), or equivalent material, with a hardness of above 300 BHN. The pump wearplate may be ASTM A 532, Class 1-A (Designation N1-CR HC).

b) The casing shall be end suction with top centerline discharge with 125 ANSI pound drilling flanges with slotted hole configuration acceptable.

2) Impeller

The impeller shall be of the enclosed type. The impeller shall be of ASTM A 532, Class I-D (Designation N1-H1CR), or equivalent material. The impeller shall have front shroud and rear hub secondary vanes to pump and restrict slurry or foreign material from getting between the shroud and casing and/or hub and casing. The impeller shall be fixed to the shaft by threads of the opposite rotation as the impeller. The impeller design shall be suitable for slurry applications.

3) Seal

a) The pump shall have a combination dynamic (water or air buffer permissible) type packing or stuffing box arrangement. The dynamic seal section shall incorporate an impeller of Ni-resist or approved stainless steels suitable for the application. The buffered clean water requirement shall not exceed 5 gpm if required. If an air buffered dynamic system is used the sealing impeller must provide the air buffering pressure. The packing section shall consist of minimum of five packing rings, preferably teflon, and grease or water lubricated. No water shall be permitted to leak over the shaft to the bearing housing.

b) The shaft seal under the packing shall be made from AISI 410 or 420 and hardened to a minimum of 350 to 400 BHN. The sleeve shall have a minimum of 32 microinch finish. The Bidder shall supply complete information on the seal system.

4) Pump Shaft

The pump shaft shall be of AISI 1045 steel and sized to minimize deflections. The first wet lateral critical vibration shall be 120 percent above the operating speed.

5) Bearings

The pump liquid end and bearing cartridge assembly shall be centrally supported by a cast iron bearing pedestal with wide feet and large access opening to the stuffing box. The shaft shall be supported by antifriction Conrad type (single or double row),

roller type, tapered roller or spherical bearings. The bearings shall be protected by a dirt and dust proof seal compound arrangement. The seal arrangement can be a labyrinth and clearance module arrangement buffered by grease or oil. A single lip seal is unsatisfactory. The bearing shall be oil or grease lubricated and have a minimum B-10 life of 30,000 hours. If oil is specified, a proper sight glass shall be furnished to facilitate inspection and operation.

6) Baseplate

The pump-motor assembly shall be mounted on a cast or welded steel baseplate supplied by the Pump Vendor. The baseplate shall be suitable for grouting.

7) Coupling

A coupling shall be furnished for the motor-pump unit. The coupling shall be supplied as per SUPPLEMENTAL REQUIREMENTS FOR COUPLINGS AND MECHANICAL DRIVES attached.

8) Motors

a) The motor for driving the pump shall be of the full voltage starting, squirrel cage induction type, and shall comply with applicable ANSI Specifications. Motor shall be furnished with enclosure conforming to NEMA standards for TEFC type and per SUPPLEMENTAL REQUIREMENTS FOR ELECTRIC MOTORS BELOW 600 VOLTS, AC, attached.

b) The motor shall be of the proper size to drive the pump continuously over the specified operating range without the load exceeding 110% of the name plate rating of the motor. The motor shall be 40°C ambient design with 1.15 service factor with class "B" insulation. The motor shall be designed to operate on 3 phase 60 Hz, 460 volt, electric current, and as per SUPPLEMENTAL REQUIREMENT in 8.a. above.

c) The Vendor shall supply complete information on his required motors. A separate cost for pump shall be furnished.

9. QUALITY ASSURANCE

a. The pumps shall be tested, or shall have been tested at the factory, for all capacity, head, and flow conditions herein specified. Certified test data shall be forwarded to the Purchaser or Engineer, in lieu of or upon completion of the test, for review and approval prior to shipment. The test shall conform to Hydraulic Institute Test codes or ASME Power Test Code PTC 8.2 - 1965, Centrifugal Pump. The test should conform to the "Test Tolerances" contained in the above codes.

b. Pump specified is subject to inspection and test by the Owner or engineer at the point of manufacture and/or jobsite as may be desired by the Owner or Engineer.

c. This inspection does not relieve the Vendor of responsibility to furnish satisfactory material. It is further understood that the Purchaser has the privilege to waive inspection at the point of manufacture or assembly without prejudicing his right to reject the material or equipment, or any of its component parts, at the destination or during performance testing.

10. PERFORMANCE AND START-UP TEST REQUIREMENTS

a. Service Engineer

1) The Vendor, if requested by the Owner, shall provide a Service Engineer to inspect and approve the installation, supervise start-up, prepare a written start-up report, and instruct and advise Purchaser's personnel on pump operation.

2) Any extra costs to the Purchaser for this service shall be quoted in detail as an alternate or option.

b. Start-Up and Performance Tests

After the Vendor has made adjustments he feels necessary for the proper performance of the pumps, the system shall be operated at or near normal load without any adjustments for a period of not less than 24 hours. The acceptance test shall then be conducted without any additional adjustments.

11. GUARANTEES

Vendor shall guarantee that the pumps will meet all requirements contained in this Specification, and with Warranty contained in the "Terms and Conditions" of Purchase Order.

12. ATTACHMENTS

See ATTACHMENT AT-1 for other documents applicable to this Specification as attachments thereto.

ATTACHMENT AT-1

The following checked ☒ Supplemental Requirements documents, all dated 062078, become a part of Specification No. 1810/32 . Other documents also checked ☒ hereon are attachments to the Specification. Drawings, Charts, Lists, Sketches, etc., when listed and attached, are specifically applicable to the Specification.

- ☐ BID EVALUATION DATA SHEETS ()
- ☐ DESIGN DATA SHEETS ()
- ☐ MANUFACTURER'S DATA SHEETS ()
- ☒ FORM E246 NOISE LEVEL DATA REQUEST SHEETS (1)
- ☒ CENTRIFUGAL PUMP SPECIFICATION SHEET
- ☐
- ☐
- ☐
- ☐ SPECIAL INSTRUCTIONS TO BIDDERS (For Equipment)
- ☐ SPECIAL INSTRUCTIONS TO BIDDERS (For Materials)
- ☒ SUPPLEMENTAL REQUIREMENTS FOR

- VENDOR DOCUMENTS/EQUIPMENT
 - VENDOR DOCUMENTS/MATERIALS
 - EQUIPMENT SHIPPING AND MARKING
 - EQUIPMENT INSPECTION, TESTS, START-UP
 - MISCELLANEOUS ITEMS AND GUARANTEES
 - COUPLINGS AND MECHANICAL DRIVES
 - ELECTRIC MOTORS BELOW 600V, AC
 - ELECTRIC MOTORS ABOVE 600V, AC
 - SPARE PARTS
 - EQUIPMENT PAINTING
 - EQUIPMENT PRE-ASSEMBLY, SHOP ASSEMBLY, MODULE CONSTRUCTION
 - OSHA AND NOISE CONTROL FEDERAL REGULATIONS
 - ASME CODE DOCUMENTATION
 - EQUIPMENT MANUFACTURED USING METRIC MEASURING UNITS
 - VIBRATION PARAMETERS FOR ROTATING EQUIPMENT
- DRAWINGS/SKETCHES

NOISE LEVEL DATA REQUEST SHEET THE RUST ENGINEERING COMPANY Birmingham, Alabama	For Use With Specification No. 1810/32																																																								
FOR: DOE BIOMASS PROJECT		PROPOSAL OR JOB NO.: 21-1899																																																								
AT:		DATE: PURCHASE ORDER NO.:																																																								
REQUESTED BY:																																																										
TYPE OF EQPT.: WATER RECOVERY PUMPS		PUMP WATER FROM ASH PIT TO TANK SERVICE TK-T002																																																								
MANF.:		TAG NO.:																																																								
MODEL SIZE:		OPERATING CONDITIONS:																																																								
<p>THE VENDOR/MANUFACTURER/SUBCONTRACTOR SHALL SUPPLY NOISE LEVEL DATA FOR THE STANDARD MODEL OF HIS EQUIPMENT UNLESS OTHERWISE NOTED. THE ORDER OF PREFERENCE OF DATA IS (UNLESS OTHERWISE NOTED):</p> <ol style="list-style-type: none"> 1. OCTAVE BAND SOUND POWER LEVELS RE 10^{-12} WATTS IN EACH OCTAVE BAND FROM 63 HZ THROUGH 8000 HZ. 2. OCTAVE BAND SOUND PRESSURE LEVELS RE 0.0002 μBAR AT 3 FEET. 3. A-WEIGHTED SOUND PRESSURE LEVEL RE 0.0002 μBAR AT 3 FEET. 4. ANY OTHER NOISE LEVEL DATA. <p>THIS FORM DOES NOT AUTHORIZE EXPENDITURES FOR ANY TESTING TO OBTAIN THE INFORMATION REQUESTED.</p>																																																										
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CUSTOMER	DOE BIOMASS PROJECT	CONTRACT NO.	21-1899
ADDRESS		BY	
PLANT LOCATION	STATE OF MAINE	DATE	Rev. 1-050479
ITEM	ASH SLUICE WATER PUMPS	EQUIP. IDENT. NO.	P-1001A & B

2 PUMPS REQUIRED

PUMPING CONDITIONS

FLUID PUMPED	WATER FROM ASH PIT TO SURGE TANK		
PUMPING TEMP. (PT)	35 TO 75	°F	VISCOSITY AT PT CP
SPECIFIC GRAVITY AT PT	1.0		DENSITY AT PT 62.3 LBS/CU. FT
VAPOR PRESSURE AT PT	mmHg	PSI	SOLIDS CONTENT % WT.

PERFORMANCE CHARACTERISTICS

CAPACITY, USGPM	NORMAL	500	RATED	650	MINIMUM REQD.
TDH, FEET:	100 NORMAL	RATED	DISCH. PRESSURE	43.3	PSIG
SUCTION PRESSURE, PSIG	RATED	3 ft.	MAXIMUM	10 ft. water	
NPSH, FEET ABS. AVAIL (NORMAL)	ATM	(RATED)	REQD	BY PUMP CURVE NO.	
BHP (NORMAL)	(RATED)		EFFICIENCY (NORMAL)	See Spec (RATED)	

PUMP DESCRIPTION

TYPE	SIZE	RPM	1780	ROTATION	☐ CW ☐ CCW
IMPELLER TYPE	CLOSED	DIAMETER, IN. (RATED)	(MAX.)	(MIN. BY MFR.)	
☐ PACKING TYPE	SEE SPEC.	SIZE	NO. OF RINGS	5	SEAL CAGE ☒ YES ☐ NO
☐ MECH. SEAL, MFR AND MODEL					
SUCTION ☒ FLGD ☐ SCRD	SIZE	125	LB. ASA	FACING	INLET
DISCHARGE ☒ FLGD ☐ SCRD	SIZE	125	LB. ASA	FACING	
BEARINGS (MFR AND TYPE):	RADIAL	THRUST	SEE SPEC.	(VERTICAL) THRUST	☐ UP ☐ DOWN
MATERIAL: CASING	NI-HICR (SEE SPEC)	IMPELLER	NI-HICR	SHAFT/SLEEVE	AISI 410-420
OTHER MATERIAL					

CASING	☐ VENT	NPT	☐ DRAIN	NPT	GAGE CONN	☐ SUCTION ☐ DISCHARGE	NPT
STUFF BOX:	☒ TAP FOR FLUSH	NPT	☐ TAP FOR DRAIN	NPT	☐ JACKETED	NPT COON: COOL WATER REQD GPM	
CASING: NO. OF STAGES		MOUNTING:	☐ CENTERLINE ☐ FOOT ☐ BRACKET ☐ VERTICAL				
CASING SPLIT	☐ HORIZ ☒ VERTICAL	TYPE OF VOLUTE	☒ SINGLE ☐ DOUBLE ☐ DIFFUSER				
COVER PLATE	☐ JACKETED	NPT CONN.	☐ GLAND COOLING	NPT CONN.	BEARING HOUSING	☐ JACKETED	NPT
PUMP BUILT TO	☐ AVS ☐ API STD 610 ☐ OTHER	SEE SPEC.	SPECIFICATIONS				
COUPLING TYPE	GEAR	MAKE		GUARD			
LUBRICATION	GREASE OR OIL	HYDROSTATIC TEST PRESSURE		PSIG			

WEIGHT, LB: PUMP		DRIVER	
PUMP SERIAL NO.			
PUMP CURVE NO.			
SECTIONAL DWG. NO.			

SEE SPEC.

DRIVER

☒ ELECTRIC MOTOR	HP	V	PH	CPS
MFR		CLASS		GROUP
☐ STEAM TURBINE	MFR	STEAM	PSIG	EXHAUST
☐ OTHER:	MFR			

SPECIAL INSTRUCTIONS OR FEATURES

EQUIPMENT P-1001 A&B WATER RECOVERY PUMP

REV NO.	REVISION	BY	DATE	APPD.	DATE	VENDOR
1			050479			
						P.O. NO.
						PRICE

REVISION NO. 1, May 2, 1979

SPECIFICATION

NO. 1812/01

BOILER FEED PUMPS

EQUIPMENT NOS. P-0701A, P-0701B

FOR

DEPARTMENT OF ENERGY

BIOMASS CO-GENERATION FACILITIES

in the

STATE OF MAINE

Prepared by

THE RUST ENGINEERING COMPANY

CONTRACT 21-1899

SPECIFICATION
NO. 1812/01
BOILER FEED PUMPS

1. INTENT

This Specification is intended to accompany Purchase Inquiry inviting Proposals to furnish equipment needed in connection with The Biomass Co-Generation Facilities in the State of Maine.

2. SCOPE

The Vendor shall design, fabricate, deliver FOB jobsite, two (2) boiler feed pumps suitable for the service and operating conditions specified herein. The Vendor shall furnish the following equipment and/or services:

- a. Feed pumps
- b. Baseplates
- c. Couplings
- d. Coupling guards
- e. Per diem for Start-Up Engineer's services
- f. Special maintenance tools
- g. Lubricating oil system for each pump.

3. WORK, EQUIPMENT, SERVICES BY OTHERS

The Purchaser will supply the following equipment and/or services:

- a. Foundations
- b. Installation
- c. Drives - one (1) motor, one (1) turbine
- d. Drive controls
- e. Cooling water supply and piping
- f. Connecting piping and valves
- g. Minimum flow control system
- h. Lubricating oil supply system

4. STANDARDS AND CODES APPLICABLE

a. The following listed Standards and Codes in effect as of date of purchase, and any subsections thereof, as applicable, shall govern design and selection of equipment and materials supplied:

ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWS	American Welding Society
OSHA	Occupational Safety and Health Act of 1970

b. Modifications for Governmental Rules, Regulations, and Codes or for Owner's special requirements shall be made only if they exceed the requirements of paragraph 4.a.

5. MISCELLANEOUS REQUIREMENTS AND ALTERNATES

a. Tests

1) The pumps shall be operated at the factory at full rated speed for checking mechanical balance. The Purchaser reserves the right to witness all tests, and notice shall be given the Purchaser prior to test. See SUPPLEMENTAL REQUIREMENTS FOR EQUIPMENT INSPECTION, TESTS, START-UP attached.

2) The Vendor shall quote, as an option, a complete pump performance tests with test curves for Head-Capacity and NPSH-Capacity to be submitted to the Purchaser for approval before shipment.

b. Coatings

Vendor shall submit for the approval of the Purchaser, a description of his coating system to include the surface preparation methods used, the types of coating materials applied, the number of coats, and the dry mil thickness of the coatings.

6. DESCRIPTION OF PROCESS AND EQUIPMENT

The Specification describes two (2) boiler feed pumps. One will be driven by a steam turbine, the second by a direct connected motor. The pumps will take their suction from an elevated deaerator and will feed one Biomass boiler having a nominal steam production of 550,000 lb/hr plus plant desuperheater requirements. Each pump will be protected at minimum flow by an automatic, back to the deaerator, recirculation control valve. The pumps will be installed indoors. It is desirable to have both pumps run at the motor speed to facilitate maintenance and spare parts requirement. Feed flow control will be by pump discharge control valve.

7. DESIGN DATA AVAILABLE

Each pump shall be designed and guaranteed to operate at the following conditions:

Fluid Pumped	Boiler Feed Water
Temperature	287°F
Specific Gravity	0.925
Suction Pressure - psig	62
Discharge Pressure - psig	1924
Total Dynamic Head - ft	4650
Discharge Flow - gpm	1320
NPSH Available - ft	60
Desuperheater Flow - gpm	200
Desuperheater Discharge Head - psi	600

8. DESIGN REQUIREMENTS

- a. The pumps shall be barrel type construction with welded suction and discharge flanges.
- b. The pumps Head-Capacity curve shall be continuously rising from rated flow to minimum flow. Pump shut off pressure of the pumps shall be no less than 120 percent, or no more than 130 percent of rated discharge pressure.
- c. Minimum flow control will be by the Purchaser. The pumps will be protected against overheating at shut-off by an automatic recirculation control valve in the pump discharge line.
- d. The pumps shall be constructed of the following materials:

Casing	4 - 6% Chrome
Impellers	11-13% Chrome
Wear Rings	11-13% Chrome
Shaft	11-13% Chrome
Diffusers	4 - 6% Chrome
Shaft Sleeves	11-13% Chrome
Balancing Disc	17% Chrome
- e. Each pump shall be supplied with mechanical seals.
- f. Shaft sleeves shall be prevented from rotating on the shafts and shall be sealed to prevent leakage between the shaft and the sleeves.
- g. Radial bearings shall be journal type with babbitt lined renewable sleeves. Kingsbury type thrust bearing shall be arranged for forced feed lubrication. Bearing metal thermocouples shall be supplied for each journal bearing and thrust bearing.
- h. A forced feed lubrication system shall be supplied for each boiler feed pump. The turbine driven pump lubrication system shall be sized to also furnish lubricating oil to the turbine driver. Each system shall consist of the following items:

- AC electric motor driven main oil pump
- Auxiliary oil pump with DC motor
- Single oil cooler
- Single oil filter
- Oil relief valves

Oil piping and fittings
Oil reservoir - with drain sump and drain valve
Oil System instrumentation

- 1) The oil reservoir shall be protected internally with a corrosion resistant coating.
 - 2) The lubricating oil piping shall be of welded construction and shall be pickled and passivated after fabrication.
 - 3) The oil cooler shall have a minimum water side design pressure of 75 psig. The cooling water design temperature is 95°F. The oil cooler shall utilize 90-10 copper-nickel tubes.
 - 4) Two double pole, double throw oil pressure switches shall be provided. One pressure switch shall permit starting of the feedwater pump on rising pressure and shall trip the feedwater pump on falling pressure. The second pressure switch shall trip the auxiliary oil pump on rising pressure and shall start the auxiliary oil pump on falling pressure. The pressure switches shall have adjustable set points and widely adjustable differential to prevent the auxiliary oil pump from cycling.
 - 5) An oil temperature switch shall be included in the thrust bearing oil return line for Purchaser's alarm.
 - 6) Oil pressure gauges shall be supplied for the inlet and outlet of the oil filter.
 - 7) Oil temperature gauges shall be provided for the oil to the cooler, oil from the cooler, oil from the thrust bearing, and oil from each radial bearing.
- i. Thrust shall be maintained by balanced impellers or by a balancing disc. Transient thrusts shall be absorbed by the thrust bearing. The thrust bearing shall be sized to take the entire pump thrust if the internal balancing device should fail.
 - j. A flexible coupling shall be supplied for each pump with pump half mounted. An OSHA approved suitable coupling guard shall be furnished. Spare should be available for ease of maintenance of inboard shaft seal.
 - k. A fabricated steel baseplate shall be supplied with drip lip and drain connection for mounting pump and Purchaser's driver.
 - l. The turbine-driven pump shall be suitable for operation at 15% above the rated speed to allow for turbine overspeed.
 - m. One complete set of special tools and wrenches necessary for operation and maintenance of the boiler feed pump shall be furnished.
 - n. Price for one spare rotating element, complete with bearings and sleeves, shall be furnished.

9. PERFORMANCE AND START-UP

a. Pump performance curves, at variable speed, shall be furnished in the Proposal for head capacity and horsepower. Proposal shall state the operating clearances on which performance is based. These clearances shall be such that they can be maintained in the service specified.

b. The Vendor's Proposal shall include, on a per diem bases, the services of a competent Engineer to inspect and approve installation, supervise start-up, and instruct the Purchaser's personnel.

10. GUARANTEES

The Vendor shall guarantee the performance of his equipment with respect to the following items:

- a. Capacity
- b. TDH
- c. Temperature
- d. NPSH required
- e. Efficiency
- f. Brake horsepower

11. ATTACHMENTS

See ATTACHMENT AT-1 for other documents applicable to this Specification as attachments thereto.

ATTACHMENT AT-1

The following checked ● Supplemental Requirements documents, all dated 062078 , become a part of Specification No. 1812/01 . Other documents also checked ☒ hereon are attachments to the Specification. Drawings, Charts, Lists, Sketches, etc., when listed and attached, are specifically applicable to the Specification.

- ☒ BID EVALUATION DATA SHEETS ()
- ☐ DESIGN DATA SHEETS ()
- ☐ MANUFACTURER'S DATA SHEETS ()
- ☒ FORM E246 NOISE LEVEL DATA REQUEST SHEETS ()
- ☐
- ☐
- ☐
- ☐
- ☐ SPECIAL INSTRUCTIONS TO BIDDERS (For Equipment)
- ☐ SPECIAL INSTRUCTIONS TO BIDDERS (For Materials)
- ☒ SUPPLEMENTAL REQUIREMENTS FOR
 - VENDOR DOCUMENTS/EQUIPMENT
 - VENDOR DOCUMENTS/MATERIALS
 - EQUIPMENT SHIPPING AND MARKING
 - EQUIPMENT INSPECTION, TESTS, START-UP
 - MISCELLANEOUS ITEMS AND GUARANTEES
 - COUPLINGS AND MECHANICAL DRIVES
 - ELECTRIC MOTORS BELOW 600V, AC
 - ELECTRIC MOTORS ABOVE 600V, AC
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 - EQUIPMENT PAINTING
 - EQUIPMENT PRE-ASSEMBLY, SHOP ASSEMBLY, MODULE CONSTRUCTION
 - OSHA AND NOISE CONTROL FEDERAL REGULATIONS
 - ASME CODE DOCUMENTATION
 - EQUIPMENT MANUFACTURED USING METRIC MEASURING UNITS
- ☐ DRAWINGS/SKETCHES

COMPANY BIOMASS
 CONTRACT NO. 21-1899
 SPECIFICATION NO. 1812/01
 AREA NO.
 EQUIPMENT NO. BOILER FEED PUMP

DATE 082978 PAGE 1 OF 4
 Rev. 1 - 050279
 BID EVALUATION DATA SHEET
 VENDOR

ITEM	DESCRIPTION			
PROPOSAL NUMBER				
DATE OF PROPOSAL				
REPRESENTATIVE				
LOCATION				
PHONE				
	TURBINE DRIVEN		MOTOR DRIVEN	
1. OPERATING CONDITIONS	GUARANTEE	OPERATING	GUARANTEE	OPERATING
A. DISCHARGE FLOW - GPM	1190	1040	1190	1040
B. TOTAL DYNAMIC HEAD - FT	4650		4650	
C. NPSH REQUIRED - FT				
D. HORSEPOWER - HP				
E. SPEED - RPM				
F. EFFICIENCY - %				
G. SHUTOFF HEAD - FT				
H. MINIMUM FLOW - GPM				
I. COOLING WATER @ 80°F - GPM				
J. DESUPERHEATER DISCHARGE HEAD - FT				
K. DESUPERHEATER DISCHARGE FLOW - GPM				

COMPANY BIOMASS
 CONTRACT NO. 21-1899
 SPECIFICATION NO. 1812/01
 AREA NO.
 EQUIPMENT NO. BOILER FEED PUMP

DATE 082978 PAGE 2 OF 4
 BID EVALUATION DATA SHEET
 VENDOR

ITEM	DESCRIPTION
2. MATERIALS	(ASTM DESIGNATIONS)
A. CASING	
B. IMPELLERS	
C. WEAR RINGS	
D. SHAFT	
E. DIFFUSERS	
F. SHAFT SLEEVES	
G. BALANCING DISC	
H. INNER CASING	
3. CONSTRUCTION	
A. NO. OF STAGES	
B. SHAFT DIAMETER	
- @ COUPLING	IN
- @ IMPELLER	IN.
- @ SLEEVE	IN.
C. SHAFT SPAN	IN.
D. TYPE OF FIRST STAGE	
E. VELOCITY RECOVERY	
F. SUCTION SIZE - RATING	
G. DISCHARGE SIZE - RATING	
H. INTERSTAGE TAP SIZE - RATING	
I. AXIAL BALANCE	
J. THRUST BEARINGS	
K. RADIAL BEARINGS	
L. IMPELLER DIAMETER	

COMPANY BIOMASS
 CONTRACT NO. 21-1899
 SPECIFICATION NO. 1812/01
 AREA NO.
 EQUIPMENT NO. BOILER FEED PUMP

DATE 082978

PAGE 3 OF 4

BID EVALUATION DATA SHEET

VENDOR

ITEM	DESCRIPTION
M. COUPLING SIZE, MANUFACTURER	
N. COUPLING GUARD	
4. LUBE OIL SYSTEM	
A. SPECIFICATION OF OIL REQUIRED	
B. OIL FLOW - GPM	
C. OIL PRESSURE - PSIG	
D. OIL TEMPERATURE - °F	
E. PIPING INCLUDED	
F. PIPING CONSTRUCTION	
G. IS PIPING PICKLED & PASSIATED?	
H. PRESSURE GAGES SUPPLIED	
I. THERMOMETERS SUPPLIED	
5. WEIGHTS	
A. PUMP & COUPLING	
B. BASEPLATE	
C. ROTATING ELEMENT	
6. DELIVERY	
A. APPROVAL DRAWINGS	WK. FROM P.O.
B. DELIVERY	WK. FROM DRAWING APPROVAL
7. MECHANICAL SEALS	
MAKE, MODEL, TYPE	
MATERIALS OF CONSTRUCTION

NOISE LEVEL DATA REQUEST SHEET

THE RUST ENGINEERING COMPANY

Birmingham, Alabama

For Use With
Specification No.
1812/01

FOR: DEPARTMENT OF ENERGY

PROPOSAL
OR JOB NO.: 21-1899

DATE:

BIOMASS CO-GENERATION FACILITY

AT: in the STATE OF MAINE

INQUIRY
NO.PURCHASE
ORDER NO.:REQUESTED
BY:TYPE OF
EQPT.: BOILER FEED PUMP

SERVICE

MANF.:

TAG NO.:

MODEL
SIZE:OPERATING
CONDITIONS:

THE VENDOR/MANUFACTURER/SUBCONTRACTOR SHALL SUPPLY NOISE LEVEL DATA FOR THE STANDARD MODEL OF HIS EQUIPMENT UNLESS OTHERWISE NOTED. THE ORDER OF PREFERENCE OF DATA IS (UNLESS OTHERWISE NOTED):

1. OCTAVE BAND SOUND POWER LEVELS RE 10^{-12} WATTS IN EACH OCTAVE BAND FROM 63 HZ THROUGH 8000 HZ.
2. OCTAVE BAND SOUND PRESSURE LEVELS RE 0.0002 μ BAR AT 3 FEET.
3. A-WEIGHTED SOUND PRESSURE LEVEL RE 0.0002 μ BAR AT 3 FEET.
4. ANY OTHER NOISE LEVEL DATA.

THIS FORM DOES NOT AUTHORIZE EXPENDITURES FOR ANY TESTING TO OBTAIN THE INFORMATION REQUESTED.

☐ PWL ☐ SPL	OCTAVE BAND CENTER FREQUENCIES HZ								dBA	DISTANCE	CONDITION
	63	125	250	500	1000	2000	4000	8000			
☐ STANDARD MODEL NOISE LEVEL(S):											
☐ QUIET MODEL NOISE LEVEL(S)											
☐ GUARANTEED NOISE LEVEL(S)											

SOURCE OF DATA ☐ LAB OR SHOPTEST ☐ FIELD TEST ☐ CALCULATION ☐ OTHER

COST OF GUARANTEE

COST OF TEST IN THE ABSENCE OF ANY INFORMATION

ACOUSTICAL TREATMENT
FOR QUIET MODEL

ADDITIONAL COST FOR QUIET MODEL

SHEET
COMPLETED BY:

DATE:

FIRM:

TITLE:

SIGNATURE:

REVISION NO. 1, MAY 4, 1979

SPECIFICATION

NO. 1812/31

CONDENSATE TRANSFER PUMPS

EQUIPMENT NOS.: P-0719A, & B

FOR
DEPARTMENT OF ENERGY
BIOMASS CO-GENERATION FACILITIES
IN THE
STATE OF MAINE

Prepared by
THE RUST ENGINEERING COMPANY
CONTRACT 21-1899

SPECIFICATION
NO. 1812/31
CONDENSATE TRANSFER PUMPS

1. INTENT

This Specification is intended to accompany Purchase Inquiry inviting Proposals to furnish equipment needed in connection with The Biomass Co-Generation Facilities in the State of Maine.

2. SCOPE

The Vendor shall design, fabricate, test and deliver FOB to the jobsite, two (2) centrifugal condensate pumps as described in this Specification and its attachments.

3. WORK, EQUIPMENT, SERVICES BY OTHERS

The following services and materials will not be done or supplied by the Pump Vendor:

- a. Install and furnish all electrical work including pump motor unit, motor starter and all wiring. The Vendor shall quote their motor costs as an alternate.
- b. Design and erect all foundations including all anchor bolts.
- c. Unload pump or pumps, store and install to foundation.

4. STANDARDS AND CODES

- a. The pumps shall be furnished in accordance with the following applicable standards and/or Codes in effect as of the time of release of this inquiry:

American Society for Testing and Materials (ASTM)

American National Standard Institute (ANSI)

American Society of Mechanical Engineers (ASME) including ASME
PTC 8.2 - 1965 - Centrifugal Pumps

National Electrical Manufacturers Association (NEMA)

Standards of the Hydraulic Institute

Occupational Safety and Health Act. (OSHA)

- b. All applicable State and local laws, ordinances or regulations.

5. APPLICABLE DOCUMENTS

- a. See ATTACHMENT AT-1 for list of applicable documents.
- b. CENTRIFUGAL PUMP SPECIFICATION Sheet.

6. ALTERNATE AND MISCELLANEOUS REQUIREMENTS

- a. Vendor shall fill in all pertinent information on the CENTRIFUGAL PUMP SPECIFICATION Sheet.
- b. Vendor shall quote alternate if desired with complete explanation.
- c. Vendor shall furnish dimensional drawing of the pumps unit suitable for layout purposes.
- d. Provide lube requirements if required.
- e. Vendor to furnish complete motor data required if motors are supplied.

7. PROCESS DESCRIPTION

- a. The pumps transfer condensate from the Condensate Receiver D-0708 to the Deaerator D-0701. The pumps will be mounted at elevation 0 to 2 ft. The condensate receiver D-0708 or collection tank is approximately at elevation 75 ft. The inlet to the deaerator is at approximately 120 ft. level.
- b. The deaerator has a minimum operating pressure of 40 psig with a maximum design pressure of 75 psig. The maximum flow required is 250 gpm. The normal operating flow is 170 gpm.

8. OPERATING CONDITIONS AND DESIGN DATA

a. General

- 1) The design delivery of the pump shall be 250 gpm (Ref. to CENTRIFUGAL PUMP SPECIFICATION Sheet). The pump performance must be stable to 100 gpm at the design speed.
- 2) The design head shall be 300.0 ft of 212° condensate water.
- 3) The inlet pressure will normally be 7.75 psig.
- 4) The maximum allowable speed shall be 3580 rpm.
- 5) The minimum accepted efficiency is 66 percent.

6) The Vendor shall supply a performance curve showing expected performance of the operating range of pump at the design speed. The curve shall show head, capacity, efficiency and horsepower as well as the minimum NPSH requirements.

b. Pump Construction

The pump shall be of configuration of an end suction centrifugal pump.

1) Casing And Material

The casing of the pump shall be ductile iron with an 150 lb. flat face flanges for inlet and outlet connections. The casing shall be end suction with top centerline discharge and shall permit disassembly from the rear without disturbing suction and discharge piping. A 316 stainless steel (or equivalent) wearing ring shall be furnished on the ductile iron case. The ductile iron to be A 536, Grade 60-40-18, minimum.

2) Impeller

The impeller shall be of the enclosed type. The impeller shall be of AISI 316 stainless steel or equivalent. The impeller must be hydraulically balanced and keyed to the shaft and held securely by a stainless steel nut and washer. The pump shall have a solid stainless AISI-316 stainless shaft.

3) Seal

The pump shall have a mechanical seal with rubber or an "O" ring mounted seat with a ceramic face operating to a selected manufacturer's "carbon compound" seal ring. All other parts of the seal shall be of AISI 316 stainless steel. The seal shall be balanced. A complete description of the seal shall be made in the Bid.

4) Bearings

The stainless shaft shall be supported by two anti-friction conrad type (single or double row) roller type or spherical anti-friction bearings. The bearing shall be protected by proper seals and slingers where necessary. The bearings shall have a B-10 life of 17,000 hours minimum. The bearings shall be oil lubricated. A sight glass to facilitate inspection and operation shall be provided.

5) Baseplate

The pump-motor assembly shall be mounted on a baseplate supplied by the pump Vendor. The baseplate shall be suitable for grouting.

6) Coupling

A coupling shall be furnished for the motor-pump unit. The coupling shall be supplied as per SUPPLEMENTAL REQUIREMENT FOR COUPLINGS AND MECHANICAL DRIVES attached.

7) Motors

- a) The motor for driving the pump shall be of the full voltage starting, squirrel cage induction type and shall comply with applicable ANSI Specifications. Motor shall be furnished with enclosure conforming to NEMA standards for TEFC type and per SUPPLEMENTAL REQUIREMENTS FOR ELECTRIC MOTORS BELOW 600 VOLTS, AC, attached.
- b) The motor shall be of the proper size to drive the pump continuously over the specified operating range without the load exceeding 110% of the name plate rating of the motor. The motor shall be 40°C ambient design with 1.15 service factor with class "B" insulation. The motor shall be designed to operate on 460 V, 3 phase, 60 Hz electric current, and as per SUPPLEMENTAL REQUIREMENT in 7.a. above.
- c) The Vendor shall supply complete information on the supplied motor. A separate cost for pump.

9. QUALITY ASSURANCE

- a. The pumps shall be tested, or have been tested at the factory for all capacity, head, and water conditions herein specified. Certified test data shall be forwarded to the Purchaser or Engineer in lieu of, or upon completion of, the test for review and approval prior to shipment. The test shall conform to Hydraulic Institute Test codes or ASME Power Test Code PTC 8.2 - 1965, Centrifugal Pumps. The test should conform to the "Test Tolerances" contained in the above codes.
- b. Pump specified is subject to inspection and test by the Owner or Engineer at the point of manufacture and/or jobsite as may be desired by the Owner or Engineer.
- c. This inspection does not relieve the Vendor of responsibility to furnish satisfactory material. It is further understood that the Purchaser has the privilege to waive inspection at the point of manufacturer or assembly without prejudicing his right to reject the material or equipment, or any of its component parts, at the destination or during performance testing.

10. PERFORMANCE AND START-UP TEST REQUIREMENTS

a. Service Engineer

The Vendor, as desired by the Owner, shall provide a Service Engineer, upon sufficient advance notice from the Purchaser, to inspect and approve installation, supervise start-up, prepare a written start-up report, and instruct and advise Purchaser's personnel.

b. Any extra costs to the Purchaser for this service shall be quoted in detail as an alternate or option.

c. After the Vendor has made adjustments he feels necessary for the proper performance of the pump, the system shall be operated at or near normal load without any adjustments for a period of not less than 24 hours. The acceptance test shall then be conducted without any additional adjustments.

11. GUARANTEES

Vendor shall guarantee the pump will meet all requirements contained in the Specification, and with Warranty contained in the "Terms and Conditions" of Purchase Order.

12. ATTACHMENTS

See ATTACHMENT AT-1 for other documents applicable to this Specification as attachments thereto.

ATTACHMENT AT-1

The following checked Supplemental Requirements documents, all dated 062078, become a part of Specification No. 1812/31 . Other documents also checked ☒ hereon are attachments to the Specification. Drawings, Charts, Lists, Sketches, etc., when listed and attached, are specifically applicable to the Specification.

- ☐ BID EVALUATION DATA SHEETS ()
- ☐ DESIGN DATA SHEETS ()
- ☐ MANUFACTURER'S DATA SHEETS ()
- ☒ FORM E246 NOISE LEVEL DATA REQUEST SHEETS (1)
- ☐
- ☒ CENTRIFUGAL PUMP SPECIFICATION SHEET
- ☐
- ☐
- ☐ SPECIAL INSTRUCTIONS TO BIDDERS (For Equipment)
- ☐ SPECIAL INSTRUCTIONS TO BIDDERS (For Materials)
- ☒ SUPPLEMENTAL REQUIREMENTS FOR

- VENDOR DOCUMENTS/EQUIPMENT
- VENDOR DOCUMENTS/MATERIALS
- EQUIPMENT SHIPPING AND MARKING
- EQUIPMENT INSPECTION, TESTS, START-UP
- MISCELLANEOUS ITEMS AND GUARANTEES
- COUPLINGS AND MECHANICAL DRIVES
- ELECTRIC MOTORS BELOW 600V, AC
- ELECTRIC MOTORS ABOVE 600V, AC
- SPARE PARTS
- EQUIPMENT PAINTING
- EQUIPMENT PRE-ASSEMBLY, SHOP ASSEMBLY, MODULE CONSTRUCTION
- OSHA AND NOISE CONTROL FEDERAL REGULATIONS
- ASME CODE DOCUMENTATION
- EQUIPMENT MANUFACTURED USING METRIC MEASURING UNITS

- VIBRATION PARAMETERS FOR ROTATING EQUIPMENT
- ☐ DRAWINGS/SKETCHES

NOISE LEVEL DATA REQUEST SHEET

THE RUST ENGINEERING COMPANY
Birmingham, Alabama

For Use With
Specification
No. 1812/31.

FOR: DOE BIOMASS PROJECT	PROPOSAL OR JOB NO.: 21-1899	DATE:
AT:	INQUIRY NO.:	PURCHASE ORDER NO.:
REQUESTED BY:		
TYPE OF EQPT.: CENTRIFUGAL PUMP	SERVICE	
MANF.:	TAG NO.:	
MODEL SIZE:	OPERATING CONDITIONS:	

THE VENDOR/MANUFACTURER/SUBCONTRACTOR SHALL SUPPLY NOISE LEVEL DATA FOR THE STANDARD MODEL OF HIS EQUIPMENT UNLESS OTHERWISE NOTED. THE ORDER OF PREFERENCE OF DATA IS (UNLESS OTHERWISE NOTED):

1. OCTAVE BAND SOUND POWER LEVELS RE 10^{-12} WATTS IN EACH OCTAVE BAND FROM 63 HZ THROUGH 8000 HZ.
2. OCTAVE BAND SOUND PRESSURE LEVELS RE 0.0002 μ BAR AT 3 FEET.
3. A-WEIGHTED SOUND PRESSURE LEVEL RE 0.0002 μ BAR AT 3 FEET.
4. ANY OTHER NOISE LEVEL DATA.

THIS FORM DOES NOT AUTHORIZE EXPENDITURES FOR ANY TESTING TO OBTAIN THE INFORMATION REQUESTED.

☐ PWL ☐ SPL	OCTAVE BAND CENTER FREQUENCIES HZ								dBA	DISTANCE	CONDITION
	63	125	250	500	1000	2000	4000	8000			
☐ STANDARD MODEL NOISE LEVEL(S):											
☐ QUIET MODEL NOISE LEVEL(S):											
☐ GUARANTEED NOISE LEVEL(S):											

SOURCE OF DATA ☐ LAB OR SHOPTEST ☐ FIELD TEST ☐ CALCULATION ☐ OTHER

COST OF GUARANTEE

COST OF TEST IN THE ABSENCE OF ANY INFORMATION

ACOUSTICAL TREATMENT
FOR QUIET MODEL

ADDITIONAL COST FOR QUIET MODEL

SHEET COMPLETED BY:	DATE:	FIRM:
TITLE:		SIGNATURE:

CENTRIFUGAL PUMP SPECIFICATION

(VENDOR TO COMPLETE DATA.)

CLIENT BIOMASS PROJECT		CONTRACT NO. 21-1899	
ADDRESS		BY DATE 110678	
PLANT LOCATION STATE OF MAINE		APPROVED DATE	
ITEM		EQUIP. IDENT. NO. P-0719A&B	
CONDENSATE TRANSFER PUMPS		PUMPING CONDITIONS	
FLUID PUMPED CONDENSATE			
PUMPING TEMP. (PT) °C 212 °F MAX.		VISCOSITY AT PT CP	
SPECIFIC GRAVITY AT PT 1.0		DENSITY AT PT LBS./GAL.	
VAPOR PRESSURE AT PT mmHg PSI		SOLIDS CONTENT % WT.	
PERFORMANCE CHARACTERISTICS			
CAPACITY, USGPM		MINIMUM REQD.	
NORMAL 220 RATED 300			
TDM, FEET: NORMAL 220 RATED 300		DISCH. PRESSURE PSIG	
SUCTION PRESSURE, PSIG 29.3 RATED		MAXIMUM	
NPSH, FEET ABS: AVAIL (NORMAL) (RATED)		REQD BY PUMP CURVE NO.	
BHP (NORMAL) 20-25 (RATED)		EFFICIENCY (NORMAL) SEE SPEC. (RATED)	
PUMP DESCRIPTION			
TYPE	SIZE	RPM	ROTATION ☐ CW ☐ CCW
IMPELLER TYPE Enclosed	DIAMETER, IN. (RATED) (MAX.) (MIN. BY MFR.)		
☐ PACKING TYPE	SIZE	NO. OF RINGS	SEAL CAGE ☐ YES ☐ NO
☐ MECH. SEAL, MFR AND MODEL PER SPEC			
SUCTION ☐ FLGD ☐ SCRD	SIZE	150 LB. ASA	FACING POSITION ☒ CL ☐ SIDE ☐ FACING UP
DISCHARGE ☐ FLGD ☐ SCRD	SIZE	150 LB. ASA	FACING POSITION ☐ TOP CTR ☒ TANGENT ☐ SIDE
BEARINGS (MFR AND TYPE): RADIAL		THRUST	VERTICAL THRUST ☐ UP ☐ DOWN
MATERIAL: CASING D. IRON		IMPELLER 316 ST. STL.	SHAFT/SLEEVE NONE
OTHER MATERIAL 316 ST. STL. TRIM			
CASING ☐ VENT NPT	☐ DRAIN NPT	GAGE CONN	☐ SUCTION ☐ DISCHARGE NPT
STUFF BOX: ☐ TAP FOR FLUSH NPT: ☐ TAP FOR DRAIN NPT		☐ JACKETED	NPT COON: COOL WATER REQD GPM
CASING: NO. OF STAGES	MOUNTING: ☐ CENTERLINE ☐ FOOT ☐ BRACKET ☐ VERTICAL		
CASING SPLIT ☐ HORIZ ☐ VERTICAL	TYPE OF VOLUTE ☐ SINGLE ☐ DOUBLE ☐ DIFFUSER		
COVER PLATE ☐ JACKETED NPT CONN.	☐ GLAND COOLING NPT CONN.	BEARING HOUSING ☐ JACKETED NPT	
PUMP BUILT TO ☐ AVS ☐ API STD 610 ☐ OTHER		SPECIFICATIONS	
COUPLING TYPE GEAR (or) FLEX.	MAKE	GUARD	
LUBRICATION OIL	HYDROSTATIC TEST PRESSURE		PSIG
WEIGHT, LB: PUMP	DRIVER		
PUMP SERIAL NO.			
PUMP CURVE NO.			
SECTIONAL DWG. NO.			
DRIVER			
☒ ELECTRIC MOTOR	HP	V	PH CPS
MFR	CLASS	GROUP	
☐ STEAM TURBINE	MFR	STEAM	PSIG EXHAUST PSIG
☐ OTHER: MFR			
REFER TO DWG'S 07-28-005			
21-1899			
ESTIMATES			
REMARKS +68 FT FROM COND. COLLECTION TANK			
120 FT PUMP MTGS TO TOP DEAERATOR TANK (24 FT FRICTION ASSUMED)			
PRESSURE IN TANK MAX 75 psig - MIN 40 psig			
REV NO	REVISION	BY	DATE APPD. DATE VENDOR
1			050479
			P.O. NO.
			PRICE

REVISION NO. 1, Dated 012579

SPECIFICATION

NO. 1812/32

CONDENSATE HOTWELL PUMPS

EQUIPMENT NOS. P-0403A, M-0403B
P-0403B, M-0403B
P-0403C, M-0403C

FOR
DEPARTMENT OF ENERGY
BIOMASS CO-GENERATION FACILITIES
IN THE
STATE OF MAINE

Prepared by
THE RUST ENGINEERING COMPANY
CONTRACT 21-1899

1. INTENT

This Specification is intended to accompany Purchase Inquiry inviting Proposals to furnish equipment needed in connection with The Biomass Co-Generation Facilities in the State of Maine.

2. SCOPE

The Vendor shall design, fabricate, test and deliver FOB to the jobsite, three (3) centrifugal condensate pumps as described herein this Specification.

3. WORK, EQUIPMENT, SERVICES BY OTHERS

The following services and materials will not be done or supplied by the Pump Vendor.

a. Install and furnish all electrical work including pump motor unit, motor starter and all wiring. The Vendor shall quote his motor cost as an alternate.

b. Design and erect all foundations including all anchor bolts.

c. Unload pump or pumps, store and install to foundation.

4. STANDARDS AND CODES

a. The pumps shall be furnished in accordance with the following applicable Standards and/or Codes in effect as of the time of release of this inquiry:

American Society for Testing and Materials (ASTM)

American National Standards Institute (ANSI)

American Society of Mechanical Engineers (ASME) including
ASME PTC 8.2 - 1965 - Centrifugal Pumps

National Electrical Manufacturers Association (NEMA)

Standards of the Hydraulic Institute

Occupational Safety and Health Act (OSHA)

b. All applicable State and local laws, ordinances or regulations.

5. APPLICABLE DOCUMENTS AND DRAWING

a. See ATTACHMENT AT-1 for list of applicable documents.

b. CENTRIFUGAL PUMP SPECIFICATION Sheet

c. Drawing 04-29-010

6. ALTERNATE AND MISCELLANEOUS REQUIREMENTS

- a. Vendor shall fill in all pertinent information on the CENTRIFUGAL PUMP SPECIFICATION Sheet attached.
- b. Vendor shall quote alternate, if desired, with complete explanations.
- c. Vendor shall furnish dimensional drawing of the pumps unit suitable for layout purposes.
- d. Provide lube requirements if required.
- e. Complete motor data required if motor is supplied.

7. PROCESS DESCRIPTION

- a. The maximum flow of steam is 200,000 lbs/hr with an annual average of 60,000 lbs/hr for the system. An additional low requirement is 30,000 lb/hr flow.
- b. The above steam flow requires two (2) 200 gpm design flow condensate pumps, minimum. The pumps are to overcome an estimated 40 psig pressure required at the steam jet air ejector plus an approximate 100 ft. elevation head and a 10 ft. estimated friction head loss.
- c. There is an estimated 7'-4" clearance between flow level and hotwell. The pumps shall be designed to mount at floor level allowing for additional suction head. The minimum operating pressure of the hotwell is 1 in. Hg. vacuum. A level control should be used on the hotwell on the level giving an additional 3 ft. minimum hotwell water height. It is expected to locate the pump approximately 6.5 feet below the hotwell.

8. OPERATING CONDITIONS AND DESIGN DATA

- a. The design delivery of each pump shall be 200 gpm (ref. to CENTRIFUGAL PUMP SPECIFICATION Sheet). The pump performance must be stable to 60 gpm at the design speed.
- b. The design head shall be 215.7 ft of 75°F condensate water.
- c. The maximum allowable speed shall be 3580 rpm.
- d. The minimum accepted efficiency is 65 percent.
- e. A pump performance curve shall be supplied showing expected performance at the operating range and design speed. The curve shall show head, capacity, efficiency and horsepower as well as the minimum NPSH requirements.
- f. The pump inducer-impeller must be capable of sustaining a suction specific speed at the design flow of 14,000 without any cavitation or drop in head.
- g. The maximum possible temperature limits of water is 212°F.

9. PUMP CONSTRUCTION REQUIREMENTS

a. General

The pumps shall be of configuration of an end suction centrifugal pump.

b. Casing and Material

The casing of the pumps shall be ductile iron with 150 lb flat face flanges for inlet and outlet connections. The casing shall be end suction with top centerline discharge and shall permit disassembly from the rear without disturbing suction and discharge piping. A 316 stainless steel (or equivalent) wearing ring shall be furnished on the ductile iron case. The ductile iron to be A 536, Grade 60-40-18 minimum.

c. Impeller

The impeller shall be of the enclosed type with either a separate attached or an integral inducer type. Both the impeller and inducers or inducer-impeller shall be of AISI 316 stainless steel, or equivalent. The impeller must be hydraulically balanced and keyed to the shaft and held securely by a stainless steel nut and washer. The pumps shall have a solid stainless AISI 316 stainless shaft.

d. Seal

The pumps shall have a mechanical seal with rubber or an "O" ring mounted seat with a ceramic face operating to a selected manufacturer's "carbon compound" seal ring. All other parts of the seal shall be of AISI 316 stainless steel. The seal shall be balanced. A complete description of the seal shall be made in the Proposal.

e. Bearings

The stainless shaft shall be supported by two anti-friction Conrad type (single or double row) roller type or spherical anti-friction bearings. The bearing shall be protected by proper seals and slingers where necessary. The bearings shall have a B-10 life of 17,000 hours minimum. The bearings shall be oil lubricationed with sight glass to facilitate inspection and operation shall be provided.

f. Baseplate

The pump-motor assembly shall be mounted on a baseplate supplied by the Pump Vendor. The baseplate shall be suitable for grouting.

g. Coupling

A coupling shall be furnished for the motor-pump unit. The coupling shall be supplied as per the SUPPLEMENTAL REQUIREMENTS FOR COUPLINGS AND MECHANICAL DRIVES, attached.

h. Motors

1) The motor for driving each pump shall be of the full voltage starting, squirrel cage induction type and shall comply with applicable ANSI Specifications. Motor shall be furnished with enclosure conforming to NEMA standards for TEFC type and per SUPPLEMENTAL REQUIREMENTS FOR ELECTRIC MOTORS BELOW 600 VOLTS, AC, attached.

2) The motor shall be of the proper size to drive the pump continuously over the specified operating range without the load exceeding 110% of the name plate rating of the motor. The motor shall be 40°C ambient design with 1.15 service factor with Class "B" insulation. The motor shall be designed to operate on 460 volt, 3 phase, 60 Hz current, or as per above SUPPLEMENTAL REQUIREMENT.

3) The Vendor shall supply complete information on the supplied motors. A separate cost for each pump shall also be given.

10. QUALITY ASSURANCE

a. The pumps shall be tested or have been tested at the factory for all capacity, head, and water conditions herein specified. Certified test data shall be forwarded to the Purchaser or Engineer in lieu of, or upon completion of the test, for their review and approval prior to shipment. The test shall conform to Hydraulic Institute Test Codes or ASME Power Test Code PTC 8.2 - 1965, Centrifugal Pumps. The test should conform to the "Test Tolerances" contained in the above Codes.

b. Pumps specified are subject to inspection and test by the Owner or Engineer at the point of manufacture and/or jobsite as may be desired by the Owner or Engineer.

c. This inspection does not relieve the Vendor of responsibility to furnish satisfactory material. It is further understood that the Purchaser has the privilege to waive inspection at the point of manufacture or assembly without prejudicing his right to reject the material or equipment, or any of its component parts, at the destination, or during performance testing.

11. PERFORMANCE AND START-UP TEST REQUIREMENTS

a. Service Engineer

The Vendor, if desired by the Owner, shall provide a Service Engineer, upon sufficient advance notice from the Purchaser, to inspect and approve installation, supervise start-up, prepare a written start-up report, and instruct and advise Purchaser's personnel.

b. Any extra costs to the Purchaser for this service shall be quoted in detail as an alternate or option.

c. After the Vendor has made adjustments he feels necessary for the proper performance of the pump, the system shall be operated at or near normal load without any adjustments for a period of not less than 24 hours. The acceptance test shall then be conducted without any additional adjustments.

12. GUARANTEES

Vendor shall guarantee that the pumps will meet all requirements contained in this Specification, and with Warranty contained in the "Terms and Conditions" of Purchase Order.

13. ATTACHMENTS

See ATTACHMENT AT-1 for other documents applicable to this Specification as attachments thereto.

ATTACHMENT AT-1

The following checked ☒ Supplemental Requirements documents, all dated 062078, become a part of Specification No. 1812/32 . Other documents also checked ☒ hereon are attachments to the Specification. Drawings, Charts, Lists, Sketches, etc., when listed and attached, are specifically applicable to the Specification.

- ☐ BID EVALUATION DATA SHEETS ()
- ☐ DESIGN DATA SHEETS ()
- ☐ MANUFACTURER'S DATA SHEETS ()
- ☒ FORM E246 NOISE LEVEL DATA REQUEST SHEETS ()
- ☒ CENTRIFUGAL PUMP SPECIFICATION SHEET (1)
- ☐
- ☐
- ☐
- ☐ SPECIAL INSTRUCTIONS TO BIDDERS (For Equipment)
- ☐ SPECIAL INSTRUCTIONS TO BIDDERS (For Materials)
- ☒ SUPPLEMENTAL REQUIREMENTS FOR

- VENDOR DOCUMENTS/EQUIPMENT
- VENDOR DOCUMENTS/MATERIALS
- EQUIPMENT SHIPPING AND MARKING
- EQUIPMENT INSPECTION, TESTS, START-UP
- MISCELLANEOUS ITEMS AND GUARANTEES
- COUPLINGS AND MECHANICAL DRIVES
- ELECTRIC MOTORS BELOW 600V, AC
- ELECTRIC MOTORS ABOVE 600V, AC
- SPARE PARTS
- EQUIPMENT PAINTING
- EQUIPMENT PRE-ASSEMBLY, SHOP ASSEMBLY, MODULE CONSTRUCTION
- OSHA AND NOISE CONTROL FEDERAL REGULATIONS
- ASME CODE DOCUMENTATION
- EQUIPMENT MANUFACTURED USING METRIC MEASURING UNITS
- VIBRATION PARAMETERS FOR ROTATING EQUIPMENT

☐ DRAWINGS/SKETCHES

NOISE LEVEL DATA REQUEST SHEET

THE RUST ENGINEERING COMPANY

Birmingham, Alabama

For use with
Specification
No. 1812/32
Rev. 1-012579

FOR: DOE BIOMASS PROJECT

PROPOSAL
OR JOB NO.: 21-1899

DATE:

AT:

INQUIRY
NO.

PURCHASE
ORDER NO.:

REQUESTED
BY:

TYPE OF
EQPT.: CONDENSATE HOTWELL PUMP

SERVICE

MANF.:

TAG NO.:

MODEL
SIZE:

OPERATING
CONDITIONS:

THE VENDOR/MANUFACTURER/SUBCONTRACTOR SHALL SUPPLY NOISE LEVEL DATA FOR THE STANDARD MODEL OF HIS EQUIPMENT UNLESS OTHERWISE NOTED. THE ORDER OF PREFERENCE OF DATA IS (UNLESS OTHERWISE NOTED):

1. OCTAVE BAND SOUND POWER LEVELS RE⁻¹² WATTS IN EACH OCTAVE BAND FROM 63 HZ THROUGH 8000 HZ.
2. OCTAVE BAND SOUND PRESSURE LEVELS RE 0.0002 μ BAR AT 3 FEET.
3. A-WEIGHTED SOUND PRESSURE LEVEL RE 0.0002 μ BAR AT 3 FEET.
4. ANY OTHER NOISE LEVEL DATA.

THIS FORM DOES NOT AUTHORIZE EXPENDITURES FOR ANY TESTING TO OBTAIN THE INFORMATION REQUESTED.

☐ PWL ☐ SPL	OCTAVE BAND CENTER FREQUENCIES HZ								dBA	DISTANCE	CONDITION
	63	125	250	500	1000	2000	4000	8000			
☐ STANDARD MODEL NOISE LEVEL(S)											
☐ QUIET MODEL NOISE LEVEL(S)											
☐ GUARANTEED NOISE LEVEL(S)											

SOURCE OF DATA ☐ LAB OR SHOP TEST ☐ FIELD TEST ☐ CALCULATION ☐ OTHER

COST OF GUARANTEE

COST OF TEST IN THE ABSENCE OF ANY INFORMATION

ACOUSTICAL TREATMENT
FOR QUIET MODEL

ADDITIONAL COST FOR QUIET MODEL

SHEET
COMPLETED BY:

DATE:

FIRM:

TITLE:

SIGNATURE:

CENTRIFUGAL PUMP SPECIFICATION

VENDOR TO COMPLETE

CLIENT	DEPARTMENT OF ENERGY - BIOMASS PROJECT		CONTRACT NO.	21-1899			
ADDRESS			BY	P.E.R.	DATE 110678		
PLANT LOCATION	STATE OF MAINE		APPROVED	DATE			
ITEM	CONDENSATE PUMPS		EQUIP. IDENT. NO.				
3 PUMPS REQ'D			PUMPING CONDITIONS				
FLUID PUMPED CONDENSATE WATER FROM HOTWELL							
PUMPING TEMP. (PT)		°C 75 °F	VISCOSITY AT PT		CP		
SPECIFIC GRAVITY AT PT		1.0	DENSITY AT PT		62.3 LBS./GAL.		
VAPOR PRESSURE AT PT		mmHg PSI	SOLIDS CONTENT		% WT.		
PERFORMANCE CHARACTERISTICS							
CAPACITY, USGPM	200	NORMAL	RATED	--	MINIMUM REQ'D. 60.00		
TDH, FEET:	NORMAL --	RATED --	DISCH. PRESSURE 215.7 ft.		PSIG 93.4		
SUCTION PRESSURE, PSIG		--	RATED 9.6 ft.		MAXIMUM 9.6-10.6		
NPSH, FEET ABS: AVAL (NORMAL)		(RATED)	REQ'D		BY PUMP CURVE NO.		
BHP (NORMAL) 20 approx.		(RATED)	EFFICIENCY (NORMAL) See Spec (RATED)				
PUMP DESCRIPTION							
TYPE	SIZE		RPM 3570	ROTATION ☐ CW ☐ CCW			
IMPELLER TYPE	DIAMETER, IN. (RATED)		(MAX.)	(MIN. BY MFR.)			
☐ PACKING TYPE	SIZE		NO. OF RINGS	SEAL CAGE ☐ YES ☐ NO			
☐ MECH. SEAL, MFR AND MODEL (per Spec.)							
SUCTION ☐ FLGD ☐ SCRD	SIZE	150 LB. ASA	FACING	POSITION ☒ CL ☐ SIDE ☐ FACING UP			
DISCHARGE ☐ FLGD ☐ SCRD	SIZE	150 LB. ASA	FACING	POSITION ☐ TOP CTR ☒ TANGENT ☐ SIDE			
BEARINGS (MFR AND TYPE): RADIAL		THRUST		VERTICAL THRUST ☐ UP ☐ DOWN			
MATERIAL: CASING D. Iron		IMPELLER St. Stl. 316		SHAFT/SLEEVE None			
OTHER MATERIAL 316 St. Stl. Trim							
CASING ☐ VENT	NPT	☒ DRAIN	NPT	GAGE CONN	☐ SUCTION ☐ DISCHARGE NPT		
☒ TAP FOR FLUSH	NPT	☒ TAP FOR DRAIN	NPT	☐ JACKETED	NPT COOL: COOL WATER REQ'D GPM		
CASING: NO. OF STAGES		MOUNTING: ☐ CENTERLINE ☐ FOOT ☐ BRACKET ☐ VERTICAL					
CASING SPLIT ☐ HORIZ ☒ VERTICAL		TYPE OF VOLUTE ☒ SINGLE ☐ DOUBLE ☐ DIFFUSER					
COVER PLATE ☐ JACKETED NPT CONN.		☐ GLAND COOLING NPT CONN.		BEARING HOUSING ☐ JACKETED NPT			
PUMP BUILT TO ☐ AVS ☐ API STD 610 ☐ OTHER		SPECIFICATIONS					
COUPLING TYPE Gear (or) Flexible		MAKE		GUARD			
LUBRICATION Oil		HYDROSTATIC TEST PRESSURE		PSIG			
WEIGHT, LB: PUMP		DRIVER					
PUMP SERIAL NO.							
PUMP CURVE NO.							
SECTIONAL DWG. NO.							
DRIVER							
☒ ELECTRIC MOTOR		HP	V	PH 3	CPS 60		
MFR		CLASS		GROUP			
☐ STEAM TURBINE MFR		STEAM		PSIG	EXHAUST PSIG		
☐ OTHER MFR							
REMARKS VENDOR TO COMPLETE DATA.							
REV NO	REVISION		BY	DATE	APPD.	DATE	VENDOR
1	No. pumps req'd			012579			
							P.O. NO.
							PRICE

Blank

(516a)

SPECIFICATON

NO. 1812/41

FUEL OIL PUMP AND HEATER SET

For

DEPARTMENT OF ENERGY

BIOMASS CO-GENERATION FACILITIES

in the

STATE OF MAINE

Prepared by

THE RUST ENGINEERING COMPANY

CONTRACT 21-1899

SPECIFICATION
NO. 1812/41
FUEL OIL PUMP AND HEATER SET

1. INTENT

This Specification is intended to accompany Purchase Inquiry inviting Proposals to furnish equipment needed in connection with The Biomass Co-Generation Facilities in the State of Maine.

2. SCOPE

The Vendor shall furnish and deliver to the job site, one (1) triplex pump and heater set, as specified herein.

3. SPECIFICATION REFERENCE

The oil heaters shall meet all applicable standards as of date of purchase, of the American Society of Mechanical Engineers (ASME), American Society for Testing and Materials (ASTM), and all applicable state and local laws, ordinances and regulations.

4. MISCELLANEOUS REQUIREMENTS

a. Inspection

1) Equipment is subject to inspection by the Rust Engineering Company's Representative and/or the Owner's Representative at the point of manufacture or fabrication, including all Sub-Vendors plants. Notify ten (10) days prior to start of fabrication, and again ten (10) days in advance of readiness for final inspection, the Inspection Department, Rust Engineering Company, P. O. Box 101, Birmingham, Alabama 35201 telephone 205-254-4000. The notification shall include complete order number, project identification, destination, whether all of or what part of the equipment will be ready person to contact, and location of Vendor's plant.

2) The Purchaser's inspection does not relieve the Vendor of the responsibility to furnish satisfactory material and equipment. It is furthermore understood that waiver of inspection by Purchaser at point of manufacture or fabrication is without prejudice to his right to reject unsatisfactory material and equipment at the destination.

b. Protective Coating

Equipment shall be given Vendor's Standard Protective Coating.

c. Protection of Openings

All openings shall be capped with wooden or metal closures with edges taped or sealed against dust infiltration.

d. Service Engineer

Provide a Service Engineer, upon sufficient advance notice from the Owner, to inspect and approve installation, supervise start-up, prepare a written start-up report, and instruct and advise Owner's personnel. Cost of this service shall be quoted separately.

5. DESIGN REQUIREMENTS

a. General

1) The set shall be shop assembled, piped and wired with all the essential components mounted on a steel fabricated base of the drip pan type. The set shall consist of three (3) half size pumps, three (3) half size steam heaters. The motor starters will be by Purchaser. The unit shall be complete in all details and ready to receive plant service connections after being set on the foundation by others.

2) Each pump and each steam heater is to deliver a minimum of 40 gpm No. 6 fuel oil at 250 psig discharge pressure and heat from 100°F to 240°F when supplied with steam at 130 psig and 400°F.

3) Unit shall be suitable for indoor installation.

b. Details of Equipment

The unit shall consist of at least the following minimum equipment:

1) Three (3) steam oil heaters in accordance with ASME (and TEMA "C" or "R") code requirements complete with thermal relief valves. Heaters shall be furnished with ASME Code stamp. Each heater to handle 40 gpm flow.

2) The heaters shall be completely insulated and jacketed to retain thermal efficiency and to render a pleasing and professional appearance.

3) The heaters shall have a pressure drop on the oil side which shall not exceed 10 psi. Heaters shall be designed for a minimum fouling factor of 0.005" on the oil side and 0.0005" on the steam side. Heaters to be "U" tube type. Tubes shall be stainless steel. Overall "U" for the heater shall not be greater than 30 Btu/ft²/°F.

4) Three (3) condensate non-freeze traps complete with strainer, shut-off valve and blow-off valve. No bypass.

5) Each heater shall be furnished with automatic temperature regulators with wye strainer and 3 valve bypass.

6) Shell side and tube side relief valves.

7) Three oil pumps complete with motors, mounted and coupled to pump coupling guards. Motors will be TEFC "U" frame. Each pump to handle 40 gpm of No. 6 fuel oil.

- 8) Three regulating type relief valves for pump protection. (Or pop type with separate pressure regulator valve.)
- 9) One (1) Duplex suction strainer.
- 10) Two (2) Duplex discharge strainers.
- 11) Oil pump suction pressure gauges.
- 12) Oil pump discharge gauges.
- 13) Pipe, valves and fittings as required for a completely assembled unit.
- 14) Three (3) thermometers.

c. Electrical Requirements

- 1) Electrical motors shall be as required by SUPPLEMENTAL REQUIREMENTS FOR ELECTRIC MOTORS BELOW 600V AC, attached.
- 2) Control wiring to be #14 copper, stranded, Type MTW 90°C or better.
- 3) Vendor to furnish suggested elementary diagram and complete wiring diagrams of control panels furnished with equipment.

6. PROCEDURES FOR QUALITY ASSURANCE

All equipment specified is subject to inspection and test by the Owner or Engineer as per paragraph 4.a. herein.

7. WARRANTY

Vendor shall warrant that all equipment furnished shall be free from defects in material, workmanship, and design for a period of one year from the date of satisfactory completion of installation and acceptance by Owner. Vendor guarantees to repair or replace, at its own expense the equipment or any part thereof, found to be defective during said one-year period. All replacement parts shall be warranted for one year from date of replacement.

8. INFORMATION TO BE INCLUDED IN PROPOSAL

- a. Quote as required by Purchase Inquiry.
- b. Quote in accordance with SUPPLEMENTAL REQUIREMENTS, but in case of conflict, this Specification shall govern.

9. ATTACHMENTS

See ATTACHMENT AT-1 for other documents applicable to this Specification as attachments thereto.

ATTACHMENT AT-1

The following checked ☒ Supplemental Requirements documents, all dated 062078, become a part of Specification No. 1812/41. Other documents also checked ☒ hereon are attachments to the Specification. Drawings, Charts, Lists, Sketches, etc., when listed and attached, are specifically applicable to the Specification.

- ☒ BID EVALUATION DATA SHEETS (3)
- ☐ DESIGN DATA SHEETS ()
- ☐ MANUFACTURER'S DATA SHEETS ()
- ☒ FORM E246 NOISE LEVEL DATA REQUEST SHEETS ()
- ☐
- ☐
- ☐
- ☐
- ☐ SPECIAL INSTRUCTIONS TO BIDDERS (For Equipment)
- ☐ SPECIAL INSTRUCTIONS TO BIDDERS (For Materials)
- ☒ SUPPLEMENTAL REQUIREMENTS FOR
 - VENDOR DOCUMENTS/EQUIPMENT
 - VENDOR DOCUMENTS/MATERIALS
 - EQUIPMENT SHIPPING AND MARKING
 - EQUIPMENT INSPECTION, TESTS, START-UP
 - MISCELLANEOUS ITEMS AND GUARANTEES
 - COUPLINGS AND MECHANICAL DRIVES
 - ELECTRIC MOTORS BELOW 600V, AC
 - ELECTRIC MOTORS ABOVE 600V, AC
 - SPARE PARTS
 - EQUIPMENT PAINTING
 - EQUIPMENT PRE-ASSEMBLY, SHOP ASSEMBLY, MODULE CONSTRUCTION
 - OSHA AND NOISE CONTROL FEDERAL REGULATIONS
 - ASME CODE DOCUMENTATION
 - EQUIPMENT MANUFACTURED USING METRIC MEASURING UNITS
- ☐ DRAWINGS/SKETCHES

COMPANY BIOMASS
 CONTRACT NO. 21-1899
 SPECIFICATION NO. 1812/41
 AREA NO.
 EQUIPMENT NO. FUEL OIL PUMP & HEATER SET

DATE 083078

PAGE 1 OF 3

BID EVALUATION DATA SHEET

VENDOR

ITEM	DESCRIPTION
MANUFACTURER	
FOB POINT (CITY & STATE)	
PROPOSAL NUMBER	
DATE OF PROPOSAL	
REPRESENTATIVE	
LOCATION	
TELEPHONE NUMBER	
1. OIL HEATERS (EACH)	
a) OIL FLOW - GPM	
b) OIL INLET TEMP. °F	
c) STEAM FLOW - LB/HR	
d) STEAM INLET PRESSURE - PSIG	
e) STEAM INLET TEMP. °F	
f) OIL OUTLET TEMP. °F	
g) OVERALL HEATER LENGTH - FT.	
h) WITHDRAWAL SPACE - FT.	
i) OIL VELOCITY - FPS	
j) OIL PRESSURE DROP - PSI	
k) SHELL MATERIAL	
l) SHELL SIDE DESIGN PRESSURE	
m) SHELL SIDE DESIGN TEMP.	

COMPANY BIOMASS
 CONTRACT NO. 21-1899
 SPECIFICATION NO. 1812/41
 AREA NO.
 EQUIPMENT NO. FUEL OIL PUMP & HEATER SET

DATE 083078

PAGE 2 OF 3

BID EVALUATION DATA SHEET

VENDOR

ITEM	DESCRIPTION
n) TUBE MATERIAL	
o) TUBE SIDE DESIGN PRESSURE	
p) TUBE SIDE DESIGN TEMP. - °F	
q) TUBE DIA. AND GAUGE - (BUG)	
r) TOTAL NUMBER OF TUBES	
s) NUMBER OF TUBE PASSES	
t) TOTAL SQ FT HEATING SURFACE	
u) SHELL SIDE RELIEF VALVE	
v) TUBE SIDE RELIEF VALVE	
w) TEMPERATURE CONTROLLER	
x) TEMPERATURE CONTROL VALVE	
y) FOULING FACTOR - TUBE SIDE	
z) FOULING FACTOR - SHELL SIDE OVERALL	
HEAT TRANSFER	
aa) CORP. BTU/FT ² /°F	
2. PUMPS	
a) MANUFACTURER	
b) MODEL NUMBER	
c) COUPLINGS	
d) COUPLING GUARD

NOISE LEVEL DATA REQUEST SHEET THE RUST ENGINEERING COMPANY Birmingham, Alabama	For Use With Specification No. 1812/41
FOR: BIOMASS CO-GENERATION FACILITIES	PROPOSAL OR JOB NO.: 21-1899	DATE:
AT: STATE OF MAINE	INQUIRY NO.:	PURCHASE ORDER NO.:
REQUESTED BY:		
TYPE OF EQPT.: FUEL OIL PUMP AND HEATER SET	SERVICE	
MANF.:	TAG NO.:	
MODEL SIZE:	OPERATING CONDITIONS:	
THE VENDOR 'MANUFACTURER' SUBCONTRACTOR SHALL SUPPLY NOISE LEVEL DATA FOR THE STANDARD MODEL OF HIS EQUIPMENT UNLESS OTHERWISE NOTED. THE ORDER OF PREFERENCE OF DATA IS (UNLESS OTHERWISE NOTED): <ol style="list-style-type: none"> 1. OCTAVE BAND SOUND POWER LEVELS RE 10^{-12} WATTS IN EACH OCTAVE BAND FROM 63 HZ THROUGH 8000 HZ. 2. OCTAVE BAND SOUND PRESSURE LEVELS RE 0.0002 μBAR AT 3 FEET. 3. A-WEIGHTED SOUND PRESSURE LEVEL RE 0.0002 μBAR AT 3 FEET. 4. ANY OTHER NOISE LEVEL DATA. THIS FORM DOES NOT AUTHORIZE EXPENDITURES FOR ANY TESTING TO OBTAIN THE INFORMATION REQUESTED.		
☐ PWL ☐ SPL	OCTAVE BAND CENTER FREQUENCIES HZ	CONDITION
	63 125 250 500 1000 2000 4000 8000 dBA DISTANCE	
☐ STANDARD MODEL NOISE LEVEL(S):		
☐ QUIET MODEL NOISE LEVEL(S)		
☐ GUARANTEED NOISE LEVEL(S)		
SOURCE OF DATA ☐ LAB OR SHOPTEST ☐ FIELD TEST ☐ CALCULATION ☐ OTHER		
COST OF GUARANTEE		
COST OF TEST IN THE ABSENCE OF ANY INFORMATION		
ACOUSTICAL TREATMENT FOR QUIET MODEL		
ADDITIONAL COST FOR QUIET MODEL		
SHEET COMPLETED BY:	DATE:	FIRM:
TITLE:		SIGNATURE:

REVISION NO. 1, MAY 4, 1979

SPECIFICATION

NO. 1817/12

COOLING TOWER VERTICAL
RECIRCULATING PUMPS

EQUIPMENT NOS.: P-0502A; P-0502B

FOR
DEPARTMENT OF ENERGY
BIOMASS CO-GENERATION FACILITIES
IN THE
STATE OF MAINE

Prepared by
THE RUST ENGINEERING COMPANY
CONTRACT 21-1899

SPECIFICATION
NO. 1817/12
COOLING TOWER VERTICAL RECIRCULATING PUMPS

1. INTENT

This Specification is intended to accompany Purchase Inquiry inviting Proposals to furnish equipment needed in connection with The Biomass Co-Generation Facilities in the State of Maine.

2. SCOPE

The Vendor shall design, fabricate, test and deliver FOB to the jobsite, two (2) vertical pumps as specified herein and on the attached VERTICAL TURBINE PUMP DATA SHEETS.

3. WORK, MATERIALS, & SERVICES BY OTHERS

The following services and materials will not be done by the Pump Vendor but will be done by others:

- a. Install and furnish all electrical work, motor starter and all wiring.
- b. Design and erect all foundations, including all anchor bolts.
- c. Unload vertical pump, store and install pump.

4. STANDARDS AND CODES APPLICABLE

- a. The pumps shall be furnished in accordance with the following applicable Standards and/or Codes in effect as of the time of release of this inquiry:

American Society for Testing and Materials (ASTM)
American National Standards Institute (ANSI)
American Society of Mechanical Engineers (ASME) including
Power Test Code PTC 8.2-1965 Centrifugal Pumps
National Electrical Manufacturers Association (NEMA)
Standards of the Hydraulic Institute
Occupational Safety & Health Act (OSHA)

- b. All applicable Federal, State, and local laws, ordinances or regulations.

5. APPLICABLE DOCUMENTS

- a. See ATTACHMENT AT-1 for list of attached documents applicable to this Specification.
- b. VERTICAL TURBINE PUMP DATA SHEET

6. ALTERNATE & MISCELLANEOUS REQUIREMENTS

- a. Vendor shall fill in all information on the VERTICAL TURBINE PUMP DATA SHEET.
- b. Vendor shall quote alternate if desired with complete explanations.
- c. Vendor shall furnish dimensional drawing of the pump unit suitable for layout purposes.
- d. Provide lube requirements for stuffing box if necessary. The bowl bearing is to be water lubricated.
- e. Vendor shall furnish complete motor data.

7. PROCESS DESCRIPTION

The vertical turbine pumps pump water from the Cooling Tower (CT-1001) direct to the Turbine Condenser (T-1001). The water to treated to a pH of 7. The pump must overcome a preliminary calculated 35 ft. static head and an estimated 25 ft. friction head at rated flow.

8. OPERATING CONDITIONS AND DESIGN DATA

a. General

- 1) The pumps shall deliver 10,250 gpm at the design point.
- 2) The design head is 76 ft. total preliminary (does not allow for inlet, column and discharge head losses).
- 3) Maximum allowable speed: 1180 rpm.
- 4) The minimum accepted efficiency is 82 percent.
- 5) The performance curve showing expected performance at point other than the design conditions shall be submitted. The curve shall show head, capacity, efficiency and horsepower based on bowl performance and shall cover the complete operating range of the pump from zero capacity to the maximum capacity. Curve to state anticipated column friction and shaft horsepower at the design point.
- 6) Specific speed: 4955 (approx).
- 7) Liquid: Water at 91°F (design) at suction bell.
- 8) Completed VERTICAL TURBINE PUMP DATA SHEET shall be part of this paragraph 8 requirements.

b. Pump Construction

1) Type

The pump shall be of the vertical turbine type (Francis or mixed flow) of one stage with an open lineshaft. The pump shall have surface discharge.

2) Discharge Head

a) The surface discharge head having flanged discharge opening with flat faced, 125 lb. ANSI drilling. The top diameter of the discharge head shall be of such diameter as to match the motor base and allow for complete pump removal. The discharge head may also be fabricated of welded steel. The discharge head mounting base shall be a round flange type with accurately machined surfaces. Adequate openings for easy access to the stuffing box shall be provided.

b) Tapped drain opening shall be provided in the discharge head. The discharge head shall include a cast iron stuffing box complete with bronze bushing, grease seal, gland, packing, and water slinger.

3) Pump Bowls

The pump bowl bowls shall be of flange type made of a minimum of class 30, close grained, cast iron. Flanges shall be of sufficient cross section to prevent deflection and shall be reinforced with ribs.

4) Impellers

The impellers shall be of enclosed type (Francis) where efficiency and good practice dictates. For higher specific speed mixed-flow pump semi-open impellers shall be permissible. The impeller (or impellers when specified) shall be of bronze equivalent to SAE 65 (zinc free). The impeller shall be securely fastened to the impeller shaft with tapered split collets or locknuts. The impeller shall be statically balanced.

5) Pump Shaft

The pump shaft shall be AISI 410, or materials of 12 percent chromium or equivalent to ASTM A 296-CA15. The material may be rolled or forged. The shaft shall be supported by bearing above and below each impeller. The size of shaft shall be sized so that the combined stress is less than 10,000 psi.

6) Lineshaft - (Open-Lineshaft)

a) The extended lineshaft, when required, shall be turned and polish carbon steel of a size that conforms to the requirements of Deep Well Vertical Turbine Pump, ANSI B58.1-1971. The lineshaft shall be coupled with stainless steel couplings and shall have a left hand thread for operational tightness. The shaft shall be provided a non-corrosive stainless steel sleeve at the location of each guide bearing. The section of pump shaft passing through the stuffing box shall be of stainless steel with AISI 410 or 416 acceptable.

b) The lineshaft shall be designed so that no harmful torsionals or lateral critical speed are in the operating range.

7) Stuffing Box

The stuffing box shall be made of cast iron or cast stainless steel and contain approved rings of packing. Seal water connections if required shall be through drilled taped holes. Stuffing box shall be designed to accept mechanical seals if future conversion is desired.

8) Lineshaft Bearing

The lineshaft bearing shall be designed for vertical turbine pump service to be lubricated by the liquid being pumped. The bearing shall be held in the column by the supplier's proven design. The bearing may be either bronze or fluted-rubber. The shaft sleeve shall be of stainless steel.

9) Bowl and Suction Bearings

Sleeve bearings of SAE 660 bronze or equivalent shall be provided in each bowl and the suction bell. Bowl bearings shall be lubricated by the pump liquid. Suction bell bearings shall be packed permanently with a non-soluble grease and fitted with a stainless steel or bronze protecting collar or seal.

10) Discharge Column Pipe

The Discharge Column Pipe shall be standard weight black steel conforming to specifications for Deep Well Vertical Turbine Pumps, ANSI B58.1-1971, and shall be connected by standard flanges.

11) Suction Bell

The suction bell and or pump inlet shall have a minimum of 4 vertical vanes to prevent prerotation of the fluid at the inlet to impeller.

12) Suction Strainer

A galvanized basket strainer shall be furnished having a net inlet area of not less than four (4) times the suction inlet area to the impeller section.

13) Motors

a) The motor for driving the pump shall be of the full voltage starting, vertical hollow shaft, squirrel cage induction type and shall comply with applicable ANSI Specifications and SUPPLEMENTAL REQUIREMENTS FOR ELECTRIC MOTORS ABOVE 600 VOLTS AC, attached. Motor shall be furnished with enclosure conforming to NEMA standards for Weather Protected Type I. The connection to the pump shaft shall be through a non-reverse ratchet type coupling or self-release coupling in the motor.

The motor shall be of the proper size to drive the pump continuously over the specified operating range without the load exceeding 110% of the name plate rating of the motor. The motor shall be 40°C ambient design with Class "B" insulation and a 1.15 service factor. The motor shall be designed to operate on 2300 V, 3 phase, 60 Hz, current or per SUPPLEMENTAL REQUIREMENT herein referred to.

b) A thrust bearing of ample capacity to carry the weight of all rotating parts plus the hydraulic thrust shall be incorporated into the motor as an integral part of it. The bearing shall be of such size that the average life rating is no less than 5 years continuous operation. The Vendor shall supply complete information on the supplied motor.

c) The motor must have space heaters with the current characteristics 115 V, 1 phase, 60 Hz.

c. Installation Information

- 1) Sump Depth - Mounting Base Depth of Pit: 12'-6" (depth of pit).
- 2) Maximum Pump Length (bottom of base mounting to lip of Bellmouth): 11'-3".
- 3) Maximum liquid operating height above bellmouth: 8'-3".
- 4) Minimum liquid operating height above bellmouth: 6'-3".
- 5) Floor clearance (lip of bellmouth to floor): 14"
- 6) Refer to Fig. 1 for further information.

9. QUALITY ASSURANCE

a. The pumps shall be tested or have been tested at the factory for all capacity, head, and water conditions herein specified. Certified test data shall be forwarded to the Purchaser or Engineer in lieu of or upon completion of the tests for review and approval prior to shipment. The test shall conform to Hydraulic Institute Test Codes or ASME Power Test Code PTC 8.2-1965, Centrifugal Pumps. The Test should conform to the "Test Tolerances" contained in the above codes.

b. Pumps specified are subject to inspection and test by the Owner or Engineer at the point of manufacture and/or jobsite as may be desired by the Owner or Engineer.

c. This inspection does not relieve the Vendor of responsibility to furnish satisfactory material. It is further understood that the Owner has the privilege to waive inspection at the point of manufacture or assembly without prejudicing his right to reject the material or equipment, or any of its component parts, at the destination or during performance testing.

10. PERFORMANCE AND START-UP TEST REQUIREMENTS

a. Service Engineer

1) The Vendor, if desired by the Owner, shall provide a Service Engineer, upon sufficient advance notice from the Purchaser, to inspect and approve installation, supervise start-up, prepare a written start-up report, and instruct and advise Owner's personnel.

2) Any extra costs to the Purchaser for this service shall be quoted in detail as an alternate or option.

b. Performance Tests

After the Vendor has made adjustments he feels necessary for the proper performance of the pump, the system shall be operated at or near normal load without any adjustments for a period of not less than 24 hours. The acceptance tests shall then be conducted without any additional adjustments.

11. GUARANTEES

Vendor shall guarantee the pump will meet all requirements contained in this Specification, and with Warranty contained in the "Terms and Conditions" of the Purchase Order.

12. ATTACHMENTS

See ATTACHMENT AT-1 for other documents applicable to this Specification as attachments thereto.

ATTACHMENT AT-1

The following checked ● Supplemental Requirements documents, all dated 062078, become a part of Specification No. 1817/12 . Other documents also checked ☒ hereon are attachments to the Specification. Drawings, Charts, Lists, Sketches, etc., when listed and attached, are specifically applicable to the Specification.

- ☐ BID EVALUATION DATA SHEETS ()
- ☐ DESIGN DATA SHEETS ()
- ☐ MANUFACTURER'S DATA SHEETS ()
- ☒ FORM E246 NOISE LEVEL DATA REQUEST SHEETS (1)
- ☒ VERTICAL TURBINE PUMP DATA SHEETS
- ☐
- ☐
- ☐
- ☐ SPECIAL INSTRUCTIONS TO BIDDERS (For Equipment)
- ☐ SPECIAL INSTRUCTIONS TO BIDDERS (For Materials)
- ☒ SUPPLEMENTAL REQUIREMENTS FOR
 - VENDOR DOCUMENTS/EQUIPMENT
 - VENDOR DOCUMENTS/MATERIALS
 - EQUIPMENT SHIPPING AND MARKING
 - EQUIPMENT INSPECTION, TESTS, START-UP
 - MISCELLANEOUS ITEMS AND GUARANTEES
 - COUPLINGS AND MECHANICAL DRIVES
 - ELECTRIC MOTORS BELOW 600V, AC
 - ELECTRIC MOTORS ABOVE 600V, AC
 - SPARE PARTS
 - EQUIPMENT PAINTING
 - EQUIPMENT PRE-ASSEMBLY, SHOP ASSEMBLY, MODULE CONSTRUCTION
 - OSHA AND NOISE CONTROL FEDERAL REGULATIONS
 - ASME CODE DOCUMENTATION
 - EQUIPMENT MANUFACTURED USING METRIC MEASURING UNITS
 - VIBRATION PARAMETERS FOR ROTATING EQUIPMENT
- ☒ DRAWINGS/SKETCHES

Fig. 1 VERTICAL TURBINE PUMP

NOISE LEVEL DATA REQUEST SHEET
THE RUST ENGINEERING COMPANY
 Birmingham, Alabama

For Use with
 Specification
 No. 1817/12

FOR: DOE BIOMASS PROJECT	PROPOSAL OR JOB NO.: 21-1899	DATE:
AT:	INQUIRY NO.	PURCHASE ORDER NO.:

REQUESTED
BY:

TYPE OF EQPT.: VERTICAL TURBINE PUMP	SERVICE
MANF.:	TAG NO.:
MODEL SIZE:	OPERATING CONDITIONS:

THE VENDOR/MANUFACTURER/SUBCONTRACTOR SHALL SUPPLY NOISE LEVEL DATA FOR THE STANDARD MODEL OF HIS EQUIPMENT UNLESS OTHERWISE NOTED. THE ORDER OF PREFERENCE OF DATA IS (UNLESS OTHERWISE NOTED).

1. OCTAVE BAND SOUND POWER LEVELS RE 10^{-12} WATTS IN EACH OCTAVE BAND FROM 63 HZ THROUGH 8000 HZ.
2. OCTAVE BAND SOUND PRESSURE LEVELS RE 0.0002 μ BAR AT 3 FEET.
3. A-WEIGHTED SOUND PRESSURE LEVEL RE 0.0002 μ BAR AT 3 FEET.
4. ANY OTHER NOISE LEVEL DATA.

THIS FORM DOES NOT AUTHORIZE EXPENDITURES FOR ANY TESTING TO OBTAIN THE INFORMATION REQUESTED.

☐ PWL ☐ SPL	OCTAVE BAND CENTER FREQUENCIES HZ								dBA	DISTANCE	CONDITION
	63	125	250	500	1000	2000	4000	8000			
☐ STANDARD MODEL NOISE LEVEL(S):											
☐ QUIET MODEL NOISE LEVEL(S):											
☐ GUARANTEED NOISE LEVEL(S):											

SOURCE OF DATA ☐ LAB OR SHOP TEST ☐ FIELD TEST ☐ CALCULATION ☐ OTHER

COST OF GUARANTEE

COST OF TEST IN THE ABSENCE OF ANY INFORMATION

ACOUSTICAL TREATMENT
FOR QUIET MODEL

ADDITIONAL COST FOR QUIET MODEL

SHEET COMPLETED BY:	DATE:	FIRM:
TITLE:	(534)	SIGNATURE:

VERTICAL TURBINE PUMP DATA SHEET

Data Required: The following data must be filled in and included with the Proposal.

GENERAL DATA

Rated Capacity:	GPM	<u>10,250</u>
Design Rated Head (including column friction):	Ft.	<u>76</u>
Speed:	RPM	<u>1180</u>
Pump Efficiency (including shaft and column friction losses,) at rated capacity (see Spcc):	%	<u> </u>
Pump Horsepower (including shaft and column friction losses,) at rated capacity:	HP	<u> </u>
Minimum NPSH at design requirement:	Ft.	<u> </u>
Minimum submergency required over suction inlet:	Ft.	<u> </u>
Est. Total Pump Downthrust (Max. & Operating):	Lbs.	<u> </u>
Total Maximum Side Thrust	Lbs.	<u> </u>
Impeller Shaft Diameter:	In.	<u> </u>
Lineshaft Diameter:	In.	<u> </u>
Column Pipe Diameter (Nominal):	In.	<u> </u>
Length of Column:	Ft.	<u> </u>
Weight of Pump, less driver:	Lb.	<u> </u>

MATERIALS: (Specify: By name and code as AISI, ASTM, others)

Pump Bowl: _____

Pump Impeller: _____

Suction Bell Bearings: _____

Bowl Bearing: _____

Pump Shaft: _____

Line Shaft: _____

Column Wear Rings: _____

Suction Bell: _____

Other: _____

MOTOR DATA

Manufacturer: _____

Motor Rating: _____ HP _____

Full Load Speed: _____ RPM _____

Type: Vertical - NEMA 1 Enclosure (Ref. Spec) _____

Type Thrust Bearing and Lubrication _____

Maximum Downthrust Capacity: _____ Lbs. _____

Voltage: _____

Cycles: _____

Phase: _____

Weight of Motor: _____ Lbs. _____

Weight of Pump and Motor: _____ Lbs. _____

Starting Current (In Rush) _____ Amps _____

Enclosure, Type: _____

Type Insulation (Class "B" unless noted) _____

Temperature Rise (40°C Ambient, with 1.15 S. Factor) _____

Space Heaters (Current Characteristics) _____

REVISION NO. 1, May 4, 1979

SPECIFICATION

NO. 1817/20

HIGH PRESSURE ASH SLUICE PUMPS

EQUIPMENT NOS. P-1003A, P-1003B & P-1003C

FOR
DEPARTMENT OF ENERGY
BIOMASS CO-GENERATION FACILITIES
IN THE
STATE OF MAINE

Prepared by
THE RUST ENGINEERING COMPANY

CONTRACT 21-1899

SPECIFICATION
NO. 1817/20
HIGH PRESSURE ASH SLUICE PUMPS

1. INTENT

This Specification is intended to accompany Purchase Inquiry inviting Proposals to furnish equipment needed in connection with The Biomass Co-Generation Facilities in the State of Maine.

2. SCOPE

The Vendor shall design, fabricate, test and deliver FOB to the jobsite, two (2) high pressure water pumps as described in this Specification and its attachments.

3. WORK, EQUIPMENT, SERVICES BY OTHERS

Items listed below are to be furnished by others and are not the responsibility of the selected Pump Vendor:

- a. Install and furnish all electrical work including pump motor, motor starter and all wiring. The Vendor shall submit motor quotations as an alternate to the base bid.
- b. Design and erect all foundations including all anchor bolts.
- c. Unload pump or pumps, store and install on foundation.

4. STANDARDS AND CODES

- a. The pumps shall be furnished in accordance with the following applicable standards and/or Codes in effect as of the time of release of this inquiry:

American Society for Testing and Materials (ASTM)

American Iron and Steel Institute (AISI)

American National Standard Institute (ANSI)

American Society of Mechanical Engineers (ASME) including ASME
PTC 8.2 - 1965 - Centrifugal Pumps

National Electrical Manufacturers Association (NEMA)

Standards of the Hydraulic Institute

Occupational Safety and Health Act (OSHA)

- b. All applicable State and local laws, ordinances or regulations.

5. APPLICABLE DOCUMENTS

- a. See ATTACHMENT AT-1 for list of applicable documents.
- b. CENTRIFUGAL PUMP SPECIFICATION Sheet.

6. ALTERNATE AND MISCELLANEOUS REQUIREMENTS

- a. Vendor shall fill in all pertinent information on the CENTRIFUGAL PUMP SPECIFICATION Sheet.
- b. Vendor shall quote alternate if desired with complete explanation.
- c. Vendor shall furnish dimensional drawing of the pump units suitable for layout purposes.
- d. Provide lube requirements.
- e. Vendor shall quote electric motors as an alternate. Complete motor data shall be included in Proposal.

7. PROCESS DESCRIPTION

The high pressure water pumps convey the water from the surge tanks (TK-1002A & B) to the ash ejectors EJ-0619, EJ-0607 and to the sand ash hopper and to the ash ponds.

8. OPERATING CONDITIONS AND DESIGN DATA

a. General

- 1) The design delivery of the pumps shall be 850 gpm (ref. to CENTRIFUGAL PUMP SPECIFICATION Sheet). The pump performance must be stable to 900 gpm at the design speed.
- 2) The design head shall be 600 ft. of 35 to 75°F water.
- 3) The inlet pressure will normally be a +10 to +25 ft. of H₂O head.
- 4) The maximum allowable speed shall be 3580 rpm.
- 5) The minimum accepted efficiency is 74 percent.
- 6) The Vendor shall supply a performance curve showing expected performance of the operating range of pump at the design speed. The curve shall show head, capacity, efficiency and horsepower as well as the minimum NPSH requirements.

b. Pump Construction

The pump shall be of a 2 stage, back to back (or opposed impeller) horizontally split design. The inlet and outlet flanges shall be in the lower part of the casing.

1) Casing and Material

a) The casing shall be made of gray iron castings of ASTM A 48, Class 30B. The casing shall be horizontally split with the inlet and discharge cast as part of the lower section of the pump and run perpendicular to the axis of the pump shaft. The pump feet or mounting pads shall be under each bearing housing. The casing should be tested and approved for pressure not less than 550 psig.

b) The flanges shall conform to 250 pound ANSI drilling and be flat faced. The wearing rings shall be of AISI 410 or 420 stainless steel or equivalent. The casing shall have tapped vent holes at the necessary bleed locations.

2) Impellers

The impellers shall be of ASTM A 296, Grade CA-15 or CA-15M, or equivalent. The impeller shall be keyed or shrunk to the shaft.

3) Pump Shaft

The pump shaft shall be AISI 1035 or 1040 steel or equivalent. The shaft sleeves and nuts shall be of AISI 410 or 420 stainless steel. The sleeves under the glands shall be hardened to a minimum of 300 BHN and shall have a finish of 32 micro inches or less. The first wet lateral critical vibration shall be a minimum of 120 percent of the operating speed.

4) Seals

The stuffing box shall be of ASTM A 296, Grade CA-15, or equivalent stainless steel. The glands shall have at least 5 rings of sealing and be water lubricated.

5) Bearings

The shaft shall be supported by anti-friction conrad (single or double row) rollers, spherical or angular contact types of bearings. The bearings shall have a B-10 life of 20,000 hours minimum. The bearing shall be oil lubricated. A sight glass shall be provided to facilitate inspection and operation.

6) Baseplate

The pump-motor assembly shall be mounted on a cast or fabricated steel baseplate supplied by the pump Vendor. The baseplate shall be suitable for grouting.

7) Coupling

A coupling shall be furnished for the motor-pump unit. The coupling shall be supplied as per SUPPLEMENTAL REQUIREMENT FOR COUPLINGS AND MECHANICAL DRIVES attached.

8) Motors

a) The motor for driving the pump shall be of the full voltage starting, squirrel cage induction type and shall comply with all applicable NEMA specifications. Motor shall be furnished with enclosure conforming to NEMA standards for TEFC type and per SUPPLEMENTAL REQUIREMENTS FOR ELECTRIC MOTORS ABOVE 600 VOLTS, AC attached.

b) The motor shall be of the proper size to drive the pump continuously over the specified operating range without the load exceeding 110% of the name plate rating of the motor. The motor shall be 40°C ambient design with 1.15 service factor with class "B" insulation. The motor shall be designed to operate on 4160 V, 3 phase, 60 Hz electric current, as per SUPPLEMENTAL REQUIREMENT in 8)a) above.

c) The Vendor shall supply complete information on the supplied motor. A separate cost for pump shall be given.

9. QUALITY ASSURANCE

a. The pumps shall be tested at the factory for all capacity, head, and flow conditions herein specified. Certified test data shall be forwarded to the Purchaser or Engineer in lieu of, or upon completion of, the test for review and approval prior to shipment. The test shall conform to Hydraulic Institute Test codes or ASME Power Test Code PTC 8.2 - 1965, Centrifugal Pumps. The test should conform to the "Test Tolerances" contained in the above codes.

b. Pump specified is subject to inspection and test by the Owner or Engineer at the point of manufacture and/or jobsite as may be desired by the Owner or Engineer.

c. This inspection does not relieve the Vendor of responsibility to furnish satisfactory material. It is further understood that the Purchaser has the privilege to waive inspection at the point of manufacture or assembly without prejudicing his right to reject the material or equipment, or any of its component parts, at the destination or during performance testing.

10. PERFORMANCE AND START-UP TEST REQUIREMENTS

a. Service Engineer

1) The Vendor, if requested by the Owner, shall provide a Service Engineer to inspect and approve the installation, supervise start-up, prepare a written start-up report, and instruct and advise Purchaser's personnel on pump operation.

2) Any extra costs to the Purchaser for this service shall be quoted in detail as an alternate or option.

b. Tests

After the Vendor has made adjustments he feels necessary for the proper performance of the pump, the system shall be operated at or near normal load without any adjustments for a period of not less than 24 hours. The acceptance test shall then be conducted without any additional adjustments.

11. GUARANTEES

Vendor shall guarantee the pump will meet all requirements contained in this Specification, and with Warranty contained in the "Terms and Conditions" of Purchase Order.

12. ATTACHMENTS

See ATTACHMENT AT-1 for other documents applicable to this Specification as attachments thereto.

ATTACHMENT AT-1

The following checked ☒ Supplemental Requirements documents, all dated 062078, become a part of Specification No. 1817/20. — Other documents also checked ☒ hereon are attachments to the Specification. Drawings, Charts, Lists, Sketches, etc., when listed and attached, are specifically applicable to the Specification.

- ☐ BID EVALUATION DATA SHEETS ()
- ☐ DESIGN DATA SHEETS ()
- ☐ MANUFACTURER'S DATA SHEETS ()
- ☒ FORM E246 NOISE LEVEL DATA REQUEST SHEETS (1)
- ☒ CENTRIFUGAL PUMP SPECIFICATION SHEET
- ☐
- ☐
- ☐
- ☐ SPECIAL INSTRUCTIONS TO BIDDERS (For Equipment)
- ☐ SPECIAL INSTRUCTIONS TO BIDDERS (For Materials)
- ☒ SUPPLEMENTAL REQUIREMENTS FOR
 - VENDOR DOCUMENTS/EQUIPMENT
 - VENDOR DOCUMENTS/MATERIALS
 - EQUIPMENT SHIPPING AND MARKING
 - EQUIPMENT INSPECTION, TESTS, START-UP
 - MISCELLANEOUS ITEMS AND GUARANTEES
 - COUPLINGS AND MECHANICAL DRIVES
 - ELECTRIC MOTORS BELOW 600V, AC
 - ELECTRIC MOTORS ABOVE 600V, AC
 - SPARE PARTS
 - EQUIPMENT PAINTING
 - EQUIPMENT PRE-ASSEMBLY, SHOP ASSEMBLY, MODULE CONSTRUCTION
 - OSHA AND NOISE CONTROL FEDERAL REGULATIONS
 - ASME CODE DOCUMENTATION
 - EQUIPMENT MANUFACTURED USING METRIC MEASURING UNITS
 - VIBRATION PARAMETERS FOR ROTATING EQUIPMENT
- ☐ DRAWINGS/SKETCHES

NOISE LEVEL DATA REQUEST SHEET
THE RUST ENGINEERING COMPANY
 Birmingham, Alabama

For Use With
 Specification
 No. 1817/20

FOR: DOE BIOMASS PROJECT		PROPOSAL OR JOB NO.: 21- 1899		DATE:								
AT:		INQUIRY NO.		PURCHASE ORDER NO.:								
REQUESTED BY:												
TYPE OF EQPT.: HIGH PRESSURE WATER PUMP			PUMP WATER FROM TANK TK-1002 TO SERVICE EDUCTOR P-1003A & P-1003B									
MANF.:			TAG NO.:									
MODEL SIZE:			OPERATING CONDITIONS:									
<p>THE VENDOR/MANUFACTURER/SUBCONTRACTOR SHALL SUPPLY NOISE LEVEL DATA FOR THE STANDARD MODEL OF HIS EQUIPMENT UNLESS OTHERWISE NOTED. THE ORDER OF PREFERENCE OF DATA IS (UNLESS OTHERWISE NOTED):</p> <ol style="list-style-type: none"> 1. OCTAVE BAND SOUND POWER LEVELS RE⁻¹² WATTS IN EACH OCTAVE BAND FROM 63 HZ THROUGH 8000 HZ. 2. OCTAVE BAND SOUND PRESSURE LEVELS RE 0.0002 μBAR AT 3 FEET. 3. A-WEIGHTED SOUND PRESSURE LEVEL RE 0.0002 μBAR AT 3 FEET. 4. ANY OTHER NOISE LEVEL DATA. <p>THIS FORM DOES NOT AUTHORIZE EXPENDITURES FOR ANY TESTING TO OBTAIN THE INFORMATION REQUESTED.</p>												
☐ PWL ☐ SPL		OCTAVE BAND CENTER FREQUENCIES HZ										
		63	125	250	500	1000	2000	4000	8000	dBA	DISTANCE	CONDITION
☐ STANDARD MODEL NOISE LEVEL(S):												
☐ QUIET MODEL NOISE LEVEL(S)												
☐ GUARANTEED NOISE LEVEL(S)												
SOURCE OF DATA ☐ LAB OR SHOPTEST ☐ FIELD TEST ☐ CALCULATION ☐ OTHER												
COST OF GUARANTEE												
COST OF TEST IN THE ABSENCE OF ANY INFORMATION												
ACOUSTICAL TREATMENT FOR QUIET MODEL												
ADDITIONAL COST FOR QUIET MODEL												
SHEET COMPLETED BY:						DATE:						
						FIRM:						
TITLE:						(544)						
						SIGNATURE:						

CENTRIFUGAL PUMP SPECIFICATION

CUSTOMER U.S. DEPARTMENT OF ENERGY - BIOMASS PROJECT		CONTRACT NO. 21-1899	
ADDRESS		BY	
PLANT LOCATION STATE OF MAINE		DATE Rev. 1-050479	
ITEM HIGH PRESSURE ASH SLUICE PUMPS		EQUIP. IDENT. NO. P-1003A, B & C	
3 PUMPS REQUIRED		PUMPING CONDITIONS	
FLUID PUMPED WATER			
PUMPING TEMP. (PT) 35 to 75°F		VISCOSITY AT PT CP	
SPECIFIC GRAVITY AT PT 1.0		DENSITY AT PT 62.3 LBS/FT³	
VAPOR PRESSURE AT PT mmHg PSI		SOLIDS CONTENT % WT.	
PERFORMANCE CHARACTERISTICS			
CAPACITY, USGPM NORMAL 350		RATED 850 GPM MINIMUM REQD. 550 GPM	
TDH, FEET: NORMAL		RATED 600 FT DISCH. PRESSURE 259 PSIG (MAX. 368 PSIG)	
SUCTION PRESSURE, MIN.		RATED 10 FT. MAXIMUM +25 FT.	
NPSH, FEET ABS: AVAIL (NORMAL)		(RATED) REQD BY PUMP CURVE NO.	
BHP (NORMAL) (RATED)		EFFICIENCY (NORMAL) (RATED) SEE SPEC.	
PUMP DESCRIPTION			
HORIZONTAL		FROM DRIVE	
2 STG - SPLIT		SIZE	RPM 3550 ROTATION ☒ CW ☐ CCW
IMPELLER TYPE ENCLOSED		DIAMETER, IN. (RATED) (MAX.) (MIN. BY MFR.)	
☐ PACKING TYPE SPECIFY		SIZE	NO. OF RINGS 5 MIN. SEAL CAGE ☒ YES ☐ NO
☐ MECH. SEAL, MFR AND MODEL			
SUCTION ☐ FLGD ☐ SCRD	SIZE	250 LB. ASA	FACING DRIVE POSITION ☐ CL ☒ SIDE ☐ FACING UP
DISCHARGE ☐ FLGD ☐ SCRD	SIZE	250 LB. ASA	FACING DRIVE POSITION ☐ TOP CTR ☐ TANGENT ☒ SIDE
BEARINGS (MFR AND TYPE): RADIAL		THRUST	(VERTICAL) THRUST ☐ UP ☐ DOWN
MATERIAL: CASING ASTM A-48 CLASS 30B		IMPELLER CA-15	SHAFT/SLEEVE AISI 410-420 ST. STL.
OTHER MATERIAL			
CASING ☐ VENT ☐ NPT ☒ DRAIN	NPT	GAGE CONN	☐ SUCTION ☐ DISCHARGE NPT
STUFF BOX: ☒ TAP FOR FLUSH	NPT: ☐ TAP FOR DRAIN	NPT	☐ JACKETED NPT COOL. COOL WATER REQD GPM
CASING: NO. OF STAGES 2	MOUNTING: ☐ CENTERLINE ☐ FOOT ☐ BRACKET ☐ VERTICAL		
CASING SPLIT ☒ HORIZ ☐ VERTICAL	TYPE OF VOLUTE ☐ SINGLE ☐ DOUBLE ☐ DIFFUSER		
COVER PLATE ☐ JACKETED NPT CONN.	☐ GLAND COOLING NPT CONN.	BEARING HOUSING ☐ JACKETED NPT	
PUMP BUILT TO ☐ AVS ☐ API STD 610 ☐ OTHER SPECIFICATIONS			
COUPLING TYPE GEAR	MAKE	GUARD	
LUBRICATION OIL	HYDROSTATIC TEST PRESSURE (MIN.) 540		PSIG
WEIGHT, LB: PUMP		DRIVER	
PUMP SERIAL NO.			
PUMP CURVE NO.			
SECTIONAL DWG. NO.			
DRIVER			
☒ ELECTRIC MOTOR	HP	V	PH CPS
MFR	CLASS		GROUP
☐ STEAM TURBINE	MFR	STEAM	PSIG EXHAUST PSIG
☐ OTHER: MFR			
SPECIAL INSTRUCTIONS OR FEATURES			
PUMP WATER FROM SURGE TANK TO ASH EJECTOR E-J-0619A			
REV NO.	REVISION	BY	DATE
1			050479
	(545/546)		
			P.O. NO.
			PRICE

Blank

(547a)

REVISION NO. 1, May 3, 1979

SPECIFICATION

NO. 1817/61

SUMP PUMPS

EQUIPMENT NOS.

P-0234 A, B, C, D & E
P-0241 A & B

FOR
DEPARTMENT OF ENERGY
BIOMASS CO-GENERATION FACILITIES
IN THE
STATE OF MAINE

Prepared by
THE RUST ENGINEERING COMPANY
CONTRACT 21-1899

SPECIFICATION
NO. 1817/61
SUMP PUMPS

1. INTENT

This Specification is intended to accompany Purchase Inquiry inviting Proposals to furnish equipment which will be needed in connection with Biomass Co-Generation Facilities in the State of Maine.

2. SCOPE

Vendor shall furnish and deliver FOB to jobsite, five (5) sump pumps complete as specified herein.

3. WORK BY OTHERS

- a. Unload equipment at jobsite.
- b. Furnish foundations.
- c. Install equipment.
- d. Furnish motor controls.

4. EQUIPMENT PAINTING

Describe Manufacturer's standard coating system including surface preparation and thickness of prime and topcoats.

5. DESIGN OPERATING CONDITIONS

- a. The pits for the truck scales and the rail car scale shall have sump pumps. Pumps shall also be provided in the pit at the rail car unloading station and in the tunnel under the bark pile.
- b. The pumps shall be capable of handling the sand, grit, dirt, and pieces of bark which is normally expected in these locations.
- c. Pumps shall be capable of passing solids up to 2 inches in diameter.
- d. Pumps shall be capable of handling water at 50 gpm and 35' TDH.
- e. Sump sizes will be 3'-0" x 3'-0" x 4'-0" deep.

6. EQUIPMENT DESIGN REQUIREMENTS

- a. Five identical sump pumps shall be required complete with motors but without the controls required for automatic operation.
- b. Pumps shall conform to the following specifications:

- 1) Cast iron motor bracket and back plate.
- 2) Cast iron impeller.
- 3) Cast iron pump case.
- 4) Extended motor shaft.
- 5) No submerged bearings.
- 6) Motors shall be 460 volts, 3 phase, 60 Hertz, and suitable for continuous duty.

e. Two submersible pumps to operate under the same conditions are also required.

7. ASSEMBLY AND TESTING

Units shall be furnished assembled, complete as possible, and pretested to minimize field installation required.

8. GUARANTEE

The Vendor shall guarantee that the equipment specified, when properly installed and maintained, will operate in accordance with the ratings specified for a period of 18 months after shipping, or 12 months after starting, whichever expires first, and that should any failure occur as a result of defective workmanship, material or design, the Vendor shall make all repairs or replacements necessary to correct said defects at no cost to Purchaser.

9. INFORMATION TO BE INCLUDED IN PROPOSAL

- a. Quote as required by Purchase Inquiry.
- b. Quote in accordance with SUPPLEMENTAL REQUIREMENTS, but in case of conflict, this Specification shall govern.
- c. Include with Proposal, physical layout dimensions, weight, and foundation requirements.
- d. Complete attached BID EVALUATION DATA SHEET.

10. ATTACHMENTS

See ATTACHMENT AT-1 for other documents applicable to this Specification as attachments thereto.

ATTACHMENT AT-1

The following checked ☒ Supplemental Requirements documents, all dated 062078, become a part of Specification No. 1817/61 . Other documents also checked ☒ hereon are attachments to the Specification. Drawings, Charts, Lists, Sketches, etc., when listed and attached, are specifically applicable to the Specification.

- ☒ BID EVALUATION DATA SHEETS (2)
- ☐ DESIGN DATA SHEETS ()
- ☐ MANUFACTURER'S DATA SHEETS ()
- ☐ FORM E246 NOISE LEVEL DATA REQUEST SHEETS ()
- ☐
- ☐
- ☐
- ☐
- ☐ SPECIAL INSTRUCTIONS TO BIDDERS (For Equipment)
- ☐ SPECIAL INSTRUCTIONS TO BIDDERS (For Materials)
- ☒ SUPPLEMENTAL REQUIREMENTS FOR

- VENDOR DOCUMENTS/EQUIPMENT
- VENDOR DOCUMENTS/MATERIALS
- EQUIPMENT SHIPPING AND MARKING
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- ASME CODE DOCUMENTATION
- EQUIPMENT MANUFACTURED USING METRIC MEASURING UNITS
- VIBRATION PARAMETERS FOR ROTATING EQUIPMENT

☐ DRAWINGS/SKETCHES

COMPANY
CONTRACT NO.
SPECIFICATION NO.
AREA NO.
EQUIPMENT NO.

DEPARTMENT OF ENERGY
21-1899
1817/61
02
SUMP PUMPS P-0234A, B, C, D & E VENDOR

DATE 113078 PAGE 1 OF 2
Rev. 1-050379
BID EVALUATION DATA SHEET

ITEM	DESCRIPTION
TYPE & MODEL	
GPM & THD	
MAXIMUM LUMP SIZE PASSAGE	
LUBRICATION	
BRAKE HP	
MOTOR	INCL. NOT INCL.
- TYPE	
- HP & RPM	
PUMP HOUSING - TYPE	
- MATERIAL	
SHAFT - SIZE & MATERIAL	
IMPELLER - TYPE	
- SIZE	
- MATERIAL	
INTAKE - SIZE	
DISCHARGE - SIZE	
SUCTION STRAINER - DESCRIPTION	
PUMP WEIGHT	LBS. EACH
PRICE	EACH
FREIGHT	<u>EACH</u>
TOTAL	EACH
FOB:	
TERMS:	
DELIVERY:	

COMPANY	DEPARTMENT OF ENERGY	DATE	113078	PAGE 2 OF 2
CONTRACT NO.	21-1899	Rev. 1-050379		
SPECIFICATION NO.	1817/61	BID EVALUATION DATA SHEET		
AREA NO.	02			
EQUIPMENT NO.	SUMP PUMPS P-0241A & B	VENDOR		

ITEM	DESCRIPTION
TYPE & MODEL	
GPM & THD	
MAXIMUM LUMP SIZE PASSAGE	
LUBRICATION	
BRAKE HP	
MOTOR	INCL. NOT INCL.
- TYPE	
- HP & RPM	
PUMP HOUSING - TYPE	
- MATERIAL	
SHAFT - SIZE & MATERIAL	
IMPELLER - TYPE	
- SIZE	
- MATERIAL	
INTAKE - SIZE	
DISCHARGE - SIZE	
SUCTION STRAINER - DESCRIPTION	
PUMP WEIGHT	LBS. EACH
PRICE	EACH
FREIGHT	EACH
TOTAL	EACH
FOB:	
TERMS:	
DELIVERY:	

REVISION NO. 1, MAY 5, 1979

SPECIFICATION

NO. 1820/05

BLOWDOWN HEAT EXCHANGER

EQUIPMENT NUMBER E-0706

FOR
DEPARTMENT OF ENERGY
BIOMASS CO-GENERATION FACILITIES
IN THE
STATE OF MAINE

Prepared by
THE RUST ENGINEERING COMPANY
CONTRACT 21-1899

SPECIFICATION
NO. 1820/05
BLOWDOWN HEAT EXCHANGER

1. INTENT

This Specification is intended to accompany Purchase Inquiry inviting Proposals to furnish equipment needed in connection with the Biomass Co-Generation Facilities in the State of Maine.

2. SCOPE

a. Heat Exchanger

Design, fabricate, and deliver to the Biomass plant site, one (1) continuous blowdown heat exchanger; complete with accessories as outlined herein.

b. Accessories to be Included

In addition to those recommended by the Manufacturer, the following accessories shall also be included:

- 1) Inlet thermalwells and thermometers
- 2) Outlet thermalwells and thermometers

3. CODES AND STANDARDS

The heat exchanger and associated equipment shall be designed and fabricated in accordance with the latest edition and addenda as of the date of purchase, of the following Codes and Standards where applicable:

American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Pressure Vessels, Section VIII

Heat Exchanger Institute (HEI)

American National Standards Institute (ANSI)

American Welding Society (AWS)

4. DESCRIPTION OF UNIT

The blowdown heat exchanger will be placed in the drain line of the continuous blowdown tank. Water from the continuous blowdown tank at 298°F and 50 psig will be used to heat the incoming 50°F feedwater.

5. PERFORMANCE DATA

Performance of the blowdown heat exchanger shall be based on the following data:

- a. Maximum blowdown rate 25 gal/min.
- b. Design blowdown rate 14 gal/min.
- c. Temperature of blowdown 298°F.
- d. Pressure of blowdown 50 psig.
- e. Maximum blowdown pressure drop 10 psig.
- f. Demineralized feedwater flow 200 gal/min. design.
- g. Temperature of feedwater 50°F.
- h. Pressure of demineralized feedwater 100 psig.
- i. Maximum allowable feedwater pressure drop 10 psig.

6. DESIGN CONDITIONS

The blowdown heat exchanger shall be designed to meet the following limitations:

- a. Design pressure shell side 225 psi.
Test pressure 338 psi.
Design temperature 450°F.
- b. Tube side design pressure 150 psig.
Test pressure 275.
Design temperature 450°F.
- c. Construction of the heat exchanger shall be 316 stainless steel for use with demineralized water.

7. GUARANTEE

The Vendor shall guarantee heat exchanger to meet the requirements of the DESIGN CONDITIONS, paragraph 6, herein.

8. INFORMATION REQUIRED WITH PROPOSAL

- a. Material price delivered.
- b. Total shipping weight.
- c. Months required for delivery.
- d. Drawing showing arrangement, size, load, and overall dimensions.

9. ATTACHMENTS

See ATTACHMENT AT-1 for other documents applicable to this Specification as attachments thereto.

ATTACHMENT AT-1

The following checked ● Supplemental Requirements documents, all dated 062078, become a part of Specification No. 1820/05. Other documents also checked ☒ hereon are attachments to the Specification. Drawings, Charts, Lists, Sketches, etc., when listed and attached, are specifically applicable to the Specification.

- ☐ BID EVALUATION DATA SHEETS ()
- ☐ DESIGN DATA SHEETS ()
- ☐ MANUFACTURER'S DATA SHEETS ()
- ☐ FORM E246 NOISE LEVEL DATA REQUEST SHEETS ()
- ☒ HEAT EXCHANGER SPECIFICATION SHEET
- ☐
- ☐
- ☐
- ☐ SPECIAL INSTRUCTIONS TO BIDDERS (For Equipment)
- ☐ SPECIAL INSTRUCTIONS TO BIDDERS (For Materials)
- ☒ SUPPLEMENTAL REQUIREMENTS FOR
 - VENDOR DOCUMENTS/EQUIPMENT
 - VENDOR DOCUMENTS/MATERIALS
 - EQUIPMENT SHIPPING AND MARKING
 - EQUIPMENT INSPECTION, TESTS, START-UP
 - MISCELLANEOUS ITEMS AND GUARANTEES
 - COUPLINGS AND MECHANICAL DRIVES
 - ELECTRIC MOTORS BELOW 600V, AC
 - ELECTRIC MOTORS ABOVE 600V, AC
 - SPARE PARTS
 - EQUIPMENT PAINTING
 - EQUIPMENT PRE-ASSEMBLY, SHOP ASSEMBLY, MODULE CONSTRUCTION
 - OSHA AND NOISE CONTROL FEDERAL REGULATIONS
 - ASME CODE DOCUMENTATION
 - EQUIPMENT MANUFACTURED USING METRIC MEASURING UNITS
 - VIBRATION PARAMETERS FOR ROTATING EQUIPMENT
- ☐ DRAWINGS/SKETCHES

HEAT EXCHANGER SPECIFICATION SHEET

IDENT		BIOMASS PROJECT		CONTRACT NO. 21-1899	
ADDRESS				REFERENCE NO.	
PLANT LOCATION		STATE OF MAINE		PROPOSAL NO.	
				DATE Rev. 1-050479	
SERVICE OF UNIT		Blowdown Heat Exchanger		EQUIP. IDENT. NO. E-0706	
SIZE		TYPE		(HORIZ.) (VERT.)	
SQ. FT. SURF./UNIT (GROSS) (EFF.)		SHELL/UNIT		SQ. FT. SURF./SHELL (GROSS) (EFF.)	
PERFORMANCE OF ONE UNIT					
FLUID CIRCULATED		SHELL SIDE		TUBE SIDE	
TOTAL FLUID ENTERING		Demineralized Water		Boiler Blowdown	
VAPOR		200 GPM		14 GPM	
LIQUID		200 GPM		14 GPM	
STEAM					
NON-CONDENSIBLES					
FLUID VAPORIZED OR CONDENSED					
STEAM CONDENSED					
SPECIFIC GRAVITY					
VISCOSITY		CP @ °F		CP @ °F	
MOLECULAR WEIGHT					
SPECIFIC HEAT		BTU/LB.°F		BTU/LB.°F	
THERMAL CONDUCTIVITY		BTU/HR.FT.°F		BTU/HR.FT.°F	
LATENT HEAT		BTU/LB		BTU/LB	
TEMPERATURE IN		50 °F		298 °F	
TEMPERATURE OUT		64 °F		100 °F	
OPERATING PRESSURE		PSIG		PSIG	
NO. PASSES PER SHELL		1			
VELOCITY		FT/SEC		1 FT/SEC	
PRESSURE DROP		PSI		PSI	
FOULING RESISTANCE (MIN.)					
HEAT EXCHANGED-BTU/HR		MTD CORRECTED.°F			
TRANSFER RATE-SERVICE		CLEAN			
CONSTRUCTION OF ONE SHELL					
DESIGN PRESSURE		225 PSIG		150 PSIG	
TEST PRESSURE		338 PSIG		225 PSIG	
DESIGN TEMPERATURE		450 °F		450 °F	
TUBES 316 S/S NO.		O.D. 3/8" BWG 24 LENGTH		PITCH	
SHELL 316 S/S I.D.		O.D.		SHELL COVER (INTEG) (REMOV)	
CHANNEL OR BONNET 316 S/S				CHANNEL COVER	
TUBESHEET-STATIONARY 316 S/S				TUBESHEET-FLOATING	
BAFFLES-CROSS 316 S/S TYPE SEG				FLOATING HEAD COVER	
BAFFLES-LONG TYPE				IMPINGEMENT PROTECTION	
TUBE SUPPORTS					
TUBE TO TUBESHEET JOINT					
GASKETS					
CONNECTIONS-SHELL SIDE IN 3" OUT 3" RATING NPT					
CHANNEL SIDE IN 2" OUT 2" RATING NPT					
CORROSION ALLOWANCE-SHELL SIDE		TUBE SIDE			
CODE REQUIREMENTS ASME VIII				TEMA CLASS -	
REMARKS					

Blank

(558a)

REVISION NO. 1, May 2, 1979

SPECIFICATION

NO. 1823/41

FUEL OIL PUMP AND HEATER SET

AREA 9

FOR

DEPARTMENT OF ENERGY
BIOMASS CO-GENERATION FACILITIES
IN THE
STATE OF MAINE

Prepared by
THE RUST ENGINEERING COMPANY
CONTRACT 21-1899

SPECIFICATION
NO. 1823/41
FUEL OIL PUMP AND HEATER SET

1. INTENT

This Specification is intended to accompany Purchase Inquiry inviting Proposals to furnish equipment needed in connection with The Biomass Co-Generation Facilities in the State of Maine.

2. SCOPE

The Vendor shall design, fabricate, assemble, and deliver FOB to the jobsite, one (1) duplex fuel oil pump and heater set capable of satisfying the process and mechanical requirements specified herein. The Vendor's scope of supply shall include the following items:

- a. Suction Strainer.
- b. Pumps.
- c. Heaters.
- d. Discharge strainer.
- e. Interconnecting piping.
- f. Instrumentation.
- g. Structural steel base.
- h. Insulation and lagging.
- i. Motors.

3. WORK, EQUIPMENT, SERVICES BY OTHERS

The Purchaser will furnish the following items:

- a. Foundations.
- b. Anchor bolts.
- c. Installation.
- d. External piping.
- e. External wiring.

4. STANDARDS AND CODES

a. The following listed Standards and Codes in effect as of date of purchase and any subsections thereof as applicable, shall govern design and selection of equipment and material supplied:

ASME	American Society of Mechanical Engineers Pressure Vessel Code
ANSI	American National Standards Institute Code for Pressure Piping
TEMA	Tubular Exchanger Manufacturers Association Standards for Class "C" Heat Exchangers

b. County, State and Federal Regulations and Codes, in effect as of date of purchase, shall be complied with.

c. Modifications for local Governmental Rules, Regulations and Codes or for Owner's special requirements shall be made only if they exceed the requirements of paragraph 4.a. above.

5. DESCRIPTION OF THE PROCESS AND EQUIPMENT

The No. 6 Fuel Oil System will consist of an existing storage tank, and suction heater which will supply fuel oil to a new Biomass Boiler. The normal flow will be from the day tank, through the existing suction heater, to the new pump and heater set, to the Biomass Power Boiler.

6. DESIGN DATA

The equipment specified herein shall be designed and guaranteed to meet the following operating conditions:

a. Fuel Oil

Type -	No. 6
Sp. Gr. -	.922 to 1.022
Viscosity -	6000 to 100,000 ssu @ 60°F
	500 to 3,000 ssu @ 120°F
	60 to 100 ssu @ 230°F

b. Heating Steam

150 psig and 400°F - 450°F

c. Pump and Heater Set

1) Capacity: 95 gpm

- 2) Inlet temperature: 100°F
- 3) Suction lift: 10" Hg
- 4) Outlet temperature: 220°F
- 5) Discharge pressure: 225 psig

7. DESIGN REQUIREMENTS

The pump and heater set shall be a duplex design, completely shop assembled on a common structural steel base. The base plate shall have a lip with suitable drain connection for containing oil spills. Unit shall be designed for indoor service.

a. Two (2) full capacity pumps shall be furnished, arranged for either pump to serve as the standby. The pumps shall be of the positive displacement screw type with steel casings. Pump rotors shall be of alloy steel or hardened cast iron. Shaft sealing shall be by mechanical packing in deep boxes. Pumps shall be hydrostatically tested for 150% of rated working pressure. Pumps will be driven by Vendor's standard 1200 rpm motors. Reducer gears, if required, shall be by the Vendor. Each pump shall be furnished with the following accessories:

- 1) Flexible coupling and guard. Coupling between pump and gear reducer shall be mounted by the Vendor.
- 2) Discharge pressure relief valve.
- 3) Discharge pressure gauge with isolation valve and diaphragm seal.

b. Two (2) full capacity steam heaters, each designed to raise the temperature of the fuel oil from 100°F to 220°F, at a flow rate of 95 gallons per minute. Heaters shall be arranged so that either heater is a full capacity standby for the other. Pressure drop shall be kept to a minimum, preferably below 5 psi. The heaters shall be the straight tube type designed for oil in tube operation. Provisions shall be made so tubes can be rodded out.

c. One (1) suction strainer and one (1) discharge strainer, both of the duplex type, designed for full capacity with one basket out of service, shall be furnished. Strainers shall be of the type as manufactured by Andale, Kraissl, Zurn, or equal, with cast steel bodies. Baskets shall be stainless steel or monel having a minimum of 300% of connecting pipe area with 1/16" diameter holes on the suction strainer and 1/32" diameter

holes on the discharge strainer. Transfer valves shall be furnished for switching without flow interruption. Each strainer shall be furnished with the following accessories:

Differential pressure gauges with diaphragm seals across the inlet and outlet.

d. Piping shall be seamless carbon steel, ASTM A 53, Grade B, or equal. Fittings 2" and smaller shall be 3000 pound forged steel, socket weld, ASTM A 105, Grade II, or equal. Fittings 2-1/2" and larger shall be seamless carbon steel, ASTM A 234, Grade WPB, or equal. Piping shall be standard weight except that fuel oil piping 2" and smaller, on the discharge side of the pumps, shall be schedule 80. Pipe connections 2-1/2" and larger shall be butt weld or 150 pound flanged, except that flanges on the discharge side of the pumps shall be 300 pound. Valves 2" and smaller shall be 600 pound forged steel, or equal. Valves 2" and smaller shall be 600 pound forged steel, or equal. Valves 2-1/2" and larger shall be flanged 150 pound cast steel, except that valves on the discharge side of the pumps shall be 300 pound flanged cast steel. Shut off valves shall be gate valves. Control valves shall be of globe style.

e. The following accessories in addition to those required for the pumps and strainers shall be furnished:

- 1) Oil pressure controller with valved bypass, diaphragm seal and isolation valve on oil pressure sensing line.
- 2) Oil temperature controller with strainer and valved bypass.
- 3) Condensate traps with strainers and valved bypass, one for each heater.
- 4) Oil inlet and outlet thermometers.
- 5) Two (2) heating steam pressure gauges with isolation valves, one on either side of the control valve.
- 6) Oil pressure relief valve for each heater.
- 7) Piping terminal points of the pump and heater set aligned on the base.
- 8) Oil pump discharge gauge and final oil pressure gauge.

f. Design for a overall heat transfer coefficient (u) equal to 60. Heater shall be designed for a fouling factor of .005" on the oil side and .0005" on the steam side.

g. The heater shall be completely insulated and jacketed to retain the thermal efficiency, provide personnel protection, and present a pleasing and professional appearance.

8. GUARANTEE

The Vendor shall guarantee all equipment to meet the performance conditions stated in paragraph 6 of this Specification.

9. VENDOR INFORMATION REQUIREMENTS

The proposal shall include the following information in addition to that required in the BID EVALUATION DATA SHEETS:

- a. Layout drawings showing principal dimensions, and location and size of Purchaser's connections.
- b. Schematic drawing showing proposed equipment, piping, strainers, instruments and valves with terminal points indicated.
- c. Standard TEMA data sheets on heaters.

10. ATTACHMENTS

See ATTACHMENT AT-1 for other documents applicable to this Specification as attachments thereto.

ATTACHMENT AT-1

The following checked ☒ Supplemental Requirements documents, all dated 062078, become a part of Specification No. 1823/41. Other documents also checked ☒ hereon are attachments to the Specification. Drawings, Charts, Lists, Sketches, etc., when listed and attached, are specifically applicable to the Specification.

☒ BID EVALUATION DATA SHEETS (4)

☐ DESIGN DATA SHEETS ()

☐ MANUFACTURER'S DATA SHEETS ()

☐ FORM E246 NOISE LEVEL DATA REQUEST SHEETS ()

☐☐☐☐☐

☐ SPECIAL INSTRUCTIONS TO BIDDERS (For Equipment)

☐

SPECIAL INSTRUCTIONS TO BIDDERS (For Materials)

☒ SUPPLEMENTAL REQUIREMENTS FOR

- VENDOR DOCUMENTS/EQUIPMENT
- VENDOR DOCUMENTS/MATERIALS
- EQUIPMENT SHIPPING AND MARKING
- EQUIPMENT INSPECTION, TESTS, START-UP
- MISCELLANEOUS ITEMS AND GUARANTEES
- COUPLINGS AND MECHANICAL DRIVES
- ELECTRIC MOTORS BELOW 600V, AC
- ELECTRIC MOTORS ABOVE 600V, AC
- SPARE PARTS
- EQUIPMENT PAINTING
- EQUIPMENT PRE-ASSEMBLY, SHOP ASSEMBLY, MODULE CONSTRUCTION
- OSHA AND NOISE CONTROL FEDERAL REGULATIONS
- ASME CODE DOCUMENTATION
- EQUIPMENT MANUFACTURED USING METRIC MEASURING UNITS

☐ DRAWINGS/SKETCHES

COMPANY **DOE Biomass Project**
 CONTRACT NO. 21-1899
 SPECIFICATION NO. 1823/41
 AREA NO.
 EQUIPMENT NO. FUEL OIL PUMP AND HEATER

DATE 102778

PAGE 1 OF 4

BID EVALUATION DATA SHEET

VENDOR

ITEM	DESCRIPTION
I. PUMP AND HEATER SET	
A. DESIGN	
1. CAPACITY	GPM
2. INLET TEMPERATURE	°F
3. OUTLET TEMPERATURE	°F
4. SUCTION PRESSURE	PSIG
5. DISCHARGE PRESSURE	PSIG
B. PUMPS	
1. MANUFACTURER	
2. TYPE, MODEL, SIZE	
3. CAPACITY	GPM
4. SUCTION PRESSURE	PSIG
5. DISCHARGE PRESSURE	PSIG
6. BHP @ RATING	BHP
7. PUMP SPEED	RPM
8. MOTOR SPEED	RPM
9. MOTOR HORSEPOWER	HP
10. CASING MATERIAL	
11. ROTOR MATERIAL	
12. ACCESSORIES	

COMPANY DOE Biomass Project
 CONTRACT NO. 21-1899
 SPECIFICATION NO. 1823/41
 AREA NO.
 EQUIPMENT NO. FUEL OIL PUMP AND HEATER

DATE 102778: PAGE 2 OF 4

BID EVALUATION DATA SHEET

VENDOR

ITEM	DESCRIPTION
C. HEATERS	
1. MANUFACTURER	
2. TYPE, MODEL, SIZE	
3. STEAM REQUIRED @ RATING	#/HR
4. PRESSURE DROP @ RATING	PSI
5. SHELL MATERIAL	
6. TUBE MATERIAL	
7. TUBESHEET MATERIAL	
8. DESIGN PRESSURE	
a. TUBE SIDE	PSIG
b. SHELL SIDE	PSIG
9. ACCESSORIES	
D. SUCTION STRAINER	
1. MANUFACTURER	
2. TYPE, MODEL, SIZE	
3. CAPACITY	GPM
4. PRESSURE DROP @ RATING	PSI
5. FREE AREA	sq
6. HOLE DIAMETER	INCH
7. BASKET MATERIAL	
8. BODY MATERIAL	
9. PRESSURE RATING	

COMPANY DOE Biomass Project
 CONTRACT NO. 21-1899
 SPECIFICATION NO. 1823/41
 AREA NO.
 EQUIPMENT NO. FUEL OIL PUMP AND HEATER

DATE 102778

PAGE 3 OF 4

BID EVALUATION DATA SHEET

VENDOR

ITEM	DESCRIPTION
E. DISCHARGE STRAINER	
1. MANUFACTURER	
2. TYPE, MODEL, SIZE	
3. CAPACITY	GPM
4. PRESSURE DROP @ RATING	PSI
5. FREE AREA	
6. HOLE DIAMETER	
7. BASKET MATERIAL	
8. BODY MATERIAL	
9. PRESSURE RATING	
10. ACCESSORIES	
F. OIL TEMPERATURE CONTROLLER	
1. MANUFACTURER	
2. TYPE, MODEL, SIZE	
G. OIL PRESSURE CONTROLLER	
1. MANUFACTURER	
2. TYPE, MODEL, SIZE	
H. RELIEF VALVES	
1. PUMP DISCHARGE TYPE	
SIZE	
2. HEATER DISCHARGE TYPE	
SIZE	

COMPANY DOE Biomass Project
 CONTRACT NO. 21-1899
 SPECIFICATION NO. 1823/41
 AREA NO.
 EQUIPMENT NO. FUEL OIL PUMP AND HEATER

DATE 102778 PAGE 4 OF 4
 BID EVALUATION DATA SHEET
 VENDOR

ITEM	DESCRIPTION
I. DIMENSIONS AND WEIGHTS	
1. LENGTH	INCH
2. WIDTH	INCH
3. HEIGHT	INCH
4. OIL INLET SIZE	INCH
5. OIL OUTLET SIZE	INCH
6. TOTAL WEIGHT	LB
7. TUBE REMOVAL REQUIREMENTS	INCH
II. DELIVERY	
A. DRAWINGS	WK. FROM P.O.
B. EQUIPMENT	WK. FROM P.O.
III. PRICE	
PUMP AND HEATER SET	
1. EQUIPMENT	\$
2. FREIGHT	\$
3. TOTAL	\$

REVISION NO. 1, MAY 2, 1979

SPECIFICATION

NO. 1825/21

CONDENSER FOR TURBINE

EQUIPMENT NO. CD-0402

FOR
DEPARTMENT OF ENERGY
BIOMASS CO-GENERATION FACILITIES
IN THE
STATE OF MAINE

Prepared by
THE RUST ENGINEERING COMPANY
CONTRACT 21-1899

(571)

SPECIFICATION
NO. 1825/21
CONDENSER FOR TURBINE

1. INTENT

This Specification is intended to accompany Purchase Inquiry inviting Proposals to furnish equipment needed in connection with The Biomass Co-Generation Facilities in the State of Maine.

2. SCOPE

a. General

Vendor shall design, fabricate and deliver one shop assembled, steam surface condenser complete with air removal auxiliaries, inlet expansion joint, and accessories as specified herein.

b. Accessories

1) Vendor shall furnish the following accessories:

- a) One air-leakage meter of approved type
- b) Gauge glasses for hotwell
- c) Vacuum relief valve sized per HEI.

2) Vendor shall furnish any necessary connections and openings for instruments and gauges supplied by Purchaser. These will consist of the following minimum instruments and gauges:

- a) Mercury column vacuum gauge
- b) Thermometers for exhaust steam at condenser inlet, condensate in hotwell, and condensing water inlets and outlets
- c) Air ejector cooling water inlet and outlet

3. WORK, EQUIPMENT, SERVICES BY OTHERS

- a. Drawings of foundations and supporting structure
- b. Foundations
- c. Foundation bolts, washers, anchor plates, and grouting
- d. Labor and material for unloading, handling, and installation of equipment
- e. All piping, valves, and fittings including those between condenser and auxiliaries

- f. All electrical wiring and motor controls
- g. All instruments and gauges, except hotwell gauge.
- h. All supplies and operating personnel necessary for start-up
- i. All necessary openings into building through which equipment is to be passed

4. STANDARDS AND CODES APPLICABLE

Equipment design and construction shall conform to current standards of The Heat Exchange Institute, Hydraulic Institute, and The National Electrical Manufacturers Association.

5. MISCELLANEOUS REQUIREMENTS AND ALTERNATES

- a. Unit shall be shop assembled. Vendor shall list all items which are shipped unassembled.
- b. Exposed surfaces shall be thoroughly cleaned and external surfaces painted with one coat of shop paint before leaving factory, except that machined surfaces shall be suitably protected against corrosion.
- c. Parts shall be skidded, boxed, or otherwise suitably prepared for shipment to protect equipment against damage while in transit.
- d. Vendor shall submit, with his proposal, complete specification for equipment, approximate dimensions and weights, and descriptive material which adequately describes the proposed design of the principal parts of unit.

6. DESIGN REQUIREMENTS

a. General

- 1) Turbine capability 25,000 kW nominal
- 2) Type Double automatic extraction condensing
- 3) Turbine pressure and temperature 1450 psig, 925°F

b. Condenser Conditions Of Service

- 1) Steam condensed, max design normal operating range 200,000 lb/hr
30,000 - 100,000 lb/hr
- 2) Heat rejected to circulating water at design flow 950 Btu/lb
- 3) Absolute pressure 1 in. Hg min
6.0 in. Hg max

4)	Inlet circulating water temperature, °F.	91 Max, 50°F Min
5)	Circulating water gpm (maximum)	20,000 Max, 10,000 Min
6)	Circulating water velocity in tubes, Ft/Sec.	Eight Max
7)	Circulating water source	Treated Cooling Tower
8)	Cleanliness factor	90 percent W/O Mech. Clng.
9)	Oxygen in condensate	0.01 cc per liter
10)	Condenser surface	Vendor to state
11)	Number of passes	1
12)	Tube diameter, in. O.D.	3/4
13)	Tube wall thickness, gage	18 BWG
14)	Tube length, effective, ft.	Not more than 22
15)	Tube material	Stainless steel in ejector section with remainder of tube 90-10 Cupro-Nickel
16)	Tubes furnished by condenser manufacturer	Shop installed
17)	Tube sheet material	Steel - ASTM A 285, Gr. C
18)	Type of water box	Non-Divided
19)	Water box and cover material	Steel ASTM Spec. A 516
20)	Water box design pressure	75 psi
21)	Hotwell capacity	2-minutes storage
22)	Turbine exhaust connection	Flanged
23)	Condenser expansion joint	Stainless Steel, suitable for welding to condenser
24)	Turbine exhaust dimensions	10' perpendicular to turbine Axis by 5' parallel with turbine axis
25)	Condenser setting	Referred to turbine axis is perpendicular

26) Elevations and dimensional limitations:

- a) Turbine room floor elevation (Later)
- b) Turbine exhaust connection elevation (Later)
- c) Basement floor elevation (Later)

c. Condenser Specifications

1) Type and Arrangement

Condenser shall be horizontal, radial-surface type, with internal air cooling section(s) and auxiliaries as hereinafter specified. All parts of condenser unit shall be of a design and construction that has proved its durability, reliability, and continuous efficiency in units of similar size and service.

2) Condenser Shell

a) Shell shall be constructed of ASTM A 516, steel plate for low temperature use conforming to Heat Exchange Institute Standards. Design shall be adequate for conditions under which unit shall be operated and shall remain tight under high vacuum. Shell shall be hydrostatically field tested in accordance with Heat Exchange Institute Standards.

b) Suitable supporting feet shall be provided. There shall be openings for admission or removal of steam, air, vents, and returns as well as for inspection, if necessary. Where impingement on tubes may cause erosion, steel plate baffles shall be supplied.

c) Suitable means shall be incorporated in the design to allow for expansion differential between shell and tubes.

3) Water Boxes

Water boxes shall be steel plate conforming to Heat Exchange Institute Standards, with suitable flanges and bolt drilling conforming to ANSI 150# standard. Water boxes shall be semicylindrical or rectangular. Condenser water inlet(s) and outlet(s) and other openings shall be sized and located in accordance with engineering design. Water boxes shall be provided with eyebolts or lugs for lifting purposes and provisions shall be made for separating the joint between tube sheet and water box. A sufficient number of inspection openings (at least 4 openings per side) shall be provided at each end of condenser of suitable size and location to provide access for inspection of tube ends. Water boxes shall be designed for specified maximum pressure and hydrostatically tested in accordance with Heat Exchange Institute Standards.

4) Tube Support Plates

Tube support plate material shall conform to Heat Exchange Institute Standards. Plates shall be of sufficient number and of proper spacing to provide adequate support for tubes. Holes for tubes shall be drilled and chamfered. Alignment of support plates shall be arranged to drain tubes by gravity and to assure support against vibration forces.

5) Tube Sheets

Tube sheets shall conform to Heat Exchange Institute Standards. They shall be bolted to condenser shell independently of water boxes to permit removal of water boxes without disturbing tube sheets. Tube sheets shall be drilled and prepared to receive tubes.

6) Tubes

Tubes shall be of seamless drawn metal, as specified, conforming with appropriate ASTM Specification, latest revision. Inlet ends of tubes shall be rolled and belled into tube sheets. Outlet ends shall be rolled.

7) Hotwell

A hotwell, with capacity as specified, of the same material as shell, shall be furnished and connected to bottom of condenser. All necessary openings and water level gauge glass(es) shall be provided on hotwell.

8) Hotwell Level Control (By Others)

Separate pairs of connections shall be supplied for transmitter recorder and controller.

9) Supports

Condenser shall be installed by bolting an expansion joint to turbine exhaust flange connection to shell by combination strength and seal weld. Condenser shall be supported independently from the turbine to relieve condenser load from turbine exhaust flange. All supports by Vendor.

10) Miscellaneous

Vendor shall provide drilled, tapped, and plugged openings on condenser for all instruments as required by Purchaser. Vendor shall supply all special tools necessary for erection of condenser.

7. AIR REMOVAL EQUIPMENT

a. Steam Jet Air Ejectors:

1) Type and Arrangement

Steam jet air ejector shall be a multi-stage, multi-element unit with stages mounted on surface type inter- and after-condensers with provisions for isolating either element. Ejector shall be equipped with the following accessories:

- a) Steam strainer in each steam header to primary and secondary jets, not in the main header
- b) Manually operated throttling valve
- c) Interconnecting steam piping to a common connection, including stop valve for each stage, and connection for steam pressure gauge in each header to each set of jets
- d) Condensate drain controlled loop seal for inter-condenser
- e) Drain trap for after-condenser
- f) Indicating meter
- g) Necessary relief valves

2) Size and Capacity

Each pump element of the ejector unit shall have sufficient capacity to remove normal air leakage from a commercially tight system with the second element acting as a spare. Each element shall be designed to handle the capacity recommended in the current edition of The Heat Exchange Institute "Standards for Steam Surface Condensers".

3) Design

- a) Ejector unit shall be designed, constructed, and tested in conformance with the current edition of The Heat Exchange Institute "Standards for Steam Jet Ejectors". Ejector elements shall be designed to operate on an initial steam condition of 140 psig and 425°F minimum. Steam piping, valves, and fittings shall be suitable for a steam pressure of 200 psi and 700°F maximum.
- b) Units shall be capable of operation at one-inch Hg absolute under rated conditions.

c) Inter- and after-condensers shall be designed to use condensate from the main condenser as the cooling medium. Condensers shall be designed for minimum recirculating water flow.

b. Rapid Evacuator(s)

1) Type and Arrangement

Rapid evacuator(s) shall be a single-stage, single-element (steam jet) ejector and shall be used to evacuate turbine and condenser steam space when starting the unit.

2) Capacity

Capacity shall be as recommended in the current edition of The Heat Exchange Institute "Standards for Steam Surface Condensers".

3) Design

Evacuator(s) shall be designed to operate at normal steam conditions of 140 psi saturated, and 200 psi and 700°F maximum.

8. QUALITY ASSURANCE

a. Material used in the construction of all apparatus shall be of first-class quality and free from all defects which would cause any unsightly or unworkmanlike appearance.

b. All equipment shall be of modern design and construction that has proved its durability, reliability, and efficiency.

9. SUPERVISION OF INSTALLATION

Vendor shall furnish services of a competent Erection Superintendent to supervise installation and initial start-up of equipment furnished under this Specification. Purchaser shall give at least two weeks' notice of the date such service shall be required.

10. ATTACHMENTS

See AT-1 attached for other documents applicable to this specification.

ATTACHMENT AT-1

The following checked ☒ Supplemental Requirements documents, all dated 062078, become a part of Specification No. 1825/21. Other documents also checked ☒ hereon are attachments to the Specification. Drawings, Charts, Lists, Sketches, etc., when listed and attached, are specifically applicable to the Specification.

☒ BID EVALUATION DATA SHEETS (8)

☐ DESIGN DATA SHEETS ()

☐ MANUFACTURER'S DATA SHEETS ()

☐ FORM E246 NOISE LEVEL DATA REQUEST SHEETS ()

☐☐☐☐

☐ SPECIAL INSTRUCTIONS TO BIDDERS (For Equipment)

☐ SPECIAL INSTRUCTIONS TO BIDDERS (For Materials)

☐ SUPPLEMENTAL REQUIREMENTS FOR

- VENDOR DOCUMENTS/EQUIPMENT
- VENDOR DOCUMENTS/MATERIALS
- EQUIPMENT SHIPPING AND MARKING
- EQUIPMENT INSPECTION, TESTS, START-UP
- MISCELLANEOUS ITEMS AND GUARANTEES
- COUPLINGS AND MECHANICAL DRIVES
- ELECTRIC MOTORS BELOW 600V, AC
- ELECTRIC MOTORS ABOVE 600V, AC
- SPARE PARTS
- EQUIPMENT PAINTING
- EQUIPMENT PRE-ASSEMBLY, SHOP ASSEMBLY, MODULE CONSTRUCTION
- OSHA AND NOISE CONTROL FEDERAL REGULATIONS
- ASME CODE DOCUMENTATION
- EQUIPMENT MANUFACTURED USING METRIC MEASURING UNITS

☐ DRAWINGS/SKETCHES

COMPANY BIOMASS
 CONTRACT NO. 21-1899
 SPECIFICATION NO. 1825/21
 AREA NO.
 EQUIPMENT NO. CONDENSER

DATE 102478 PAGE 1 OF 8

BID EVALUATION DATA SHEET.

VENDOR

ITEM	DESCRIPTION
ONE PASS, DIVIDED WATER BOX	
MANUFACTURER	
NAME	
LOCATION	
CONDENSER SURFACE (TOTAL EFFECTIVE)	SQ FT
NUMBER OF WATER PASSES	ONE
DESIGN BASIS, OPERATING CONDITIONS AND PERFORMANCE	
NATURE AND SOURCE OF CIRCULATING WATER	TREATED SURFACE WATER
DUTY (NET HEAT TRANSFERRED TO CIRCULATING WATER)	950 BTU/LB STEAM
CIRCULATING WATER QUANTITY	20,000 @ 200,000 #/HR. STEAM FLOW 12,000 @ 50,000 #/HR. STEAM FLOW
CIRCULATING WATER INLET TEMPERATURE	91°F AT 200,000 #/HR 84°F AT 50,000 #/HR
CLEANLINESS FACTOR	90 PERCENT
CIRCULATING WATER VELOCITY IN TUBES	FPS
ABSOLUTE PRESSURE (TO BE MEASURED AT POINT SPECIFIED IN HEAT EXCHANGE INSTITUTE STANDARDS)	IN. HG
DEAERATION MAXIMUM FREE OXYGEN IN CONDENSATE	CC PER LITER

COMPANY BIOMASS
 CONTRACT NO. 21-1899
 SPECIFICATION NO. 1825/21
 AREA NO.
 EQUIPMENT NO. CONDENSER

DATE 102478 PAGE 2 OF 8
 BID EVALUATION DATA SHEET
 VENDOR

ITEM	DESCRIPTION
CIRCULATING WATER	FT
FRICITION LOSS THROUGH CLEAN TUBES AND WATER BOXES	
SUPPLEMENTARY VACUUM PERFORMANCE CURVES FROM 30,000 LB/HR - 200,000 LB/HR STEAMFLOW AT WATER INLET TEMPERATURES OF 60°F, 70°F, 80°F, AND 95°F	
TUBES	
APPROXIMATE NUMBER	
APPROXIMATE SIZE	3/4 INCH OD
APPROXIMATE GAUGE	18 BWG
LENGTH EFFECTIVE	
OVERALL	FT
MATERIAL	
METHOD OF CONNECTION	
INLET END	
OUTLET END	
FURNISHED BY	
INSTALLED BY	
TUBE ARRANGEMENT	
WATER BOXES	
MATERIAL	
NON-DIVIDED	
DESIGN PRESSURE	PSI
TEST PRESSURE	PSI
NUMBER AND SIZE	
INLET NOZZLES	
OUTLET NOZZLES	

COMPANY BIOMASS
 CONTRACT NO. 21-1899
 SPECIFICATION NO. 1825/21
 AREA NO.
 EQUIPMENT NO. CONDENSER

DATE 102478

PAGE 3 OF 8

BID EVALUATION DATA SHEET

VENDOR

ITEM	DESCRIPTION
MATERIAL	
THICKNESS	
NO. OF SECTIONS	
METHOD OF CONNECTING SECTIONS	
PROVISION FOR TUBE EXPANSION	
NO. AND SIZE AIR OFF-TAKE CONNECTIONS	
HOTWELL	
TYPE CAPACITY	
MATERIAL	
THICKNESS	
NO. OF SECTIONS	
METHOD OF CONNECTING TO SHELL	
TUBE SHEETS	
NUMBER AND SIZE THICKNESS	
MATERIAL	
TUBE SUPPORT PLATES	
NUMBER	
THICKNESS	
MATERIAL	

COMPANY BIOMASS
 CONTRACT NO. 21-1899
 SPECIFICATION NO. 1825/21
 AREA NO.
 EQUIPMENT NO. CONDENSER

DATE 102478 PAGE 4 OF 8

BID EVALUATION DATA SHEET

VENDOR

ITEM	DESCRIPTION
STEAM INLET NECK AND EXHAUST CONNECTION	
MATERIAL	
THICKNESS	
CONNECTION TO SHELL (FLANGED OR WELDED) TO TURBINE	
(FLANGED OR WELDED)	
HEIGHT, TOP OF WATER BOX FLANGE TO TURBINE EXHAUST, INCLUDING EXPANSION JOINT	
PROVISION FOR VERTICAL EXPANSION (EXPANSION JOINT)	
EXPANSION JOINT	
TYPE	
MATERIAL	
HEIGHT	
ENDS (FLANGED OR WELDED)	
APPROXIMATE WEIGHTS, CONDENSER WITH TUBES	
DRY	LB
IN SERVICE	LB
STEAM SPACE ONLY FILLED WITH WATER	LB
PRELIMINARY DRAWING(S)	0
DESCRIPTIVE BULLETIN(S) OR SPECIFICATION(S)	

COMPANY BIOMASS
 CONTRACT NO. 21-1899
 SPECIFICATION NO. 1825/21
 AREA NO.
 EQUIPMENT NO. STEAM JET EJECTORS

DATE 1024/78 PAGE 5 OF 8
 BID EVALUATION DATA SHEET
 VENDOR

ITEM	DESCRIPTION
MANUFACTURER	
NAME	
LOCATION	
NO. OF EJECTOR UNITS PER CONDENSER	
SIZE AND TYPE	
NO. OF ELEMENTS	
NO. OF STAGES	
MOUNTED ON SURFACE INTER- AND	
AFTER-CONDENSERS	
OPERATING CONDITIONS AND PERFORMANCE	
STEAM CONDITIONS	
MAX INITIAL PRESSURE	PSI
TOTAL PRESSURE	°F
MIN OPERATING PRESSURE (AT NOZZLES)	PSI
TOTAL TEMPERATURE	°F
STEAM CONSUMPTION PER ELEMENT	LB/HR
CAPACITY PER ELEMENT	
AT ABSOLUTE SUCTION	IN. HG
PRESSURE OF	
SUCTION TEMPERATURE,	°F
AIR-VAPOR MIXTURE	LB/HR
SATURATED AT	
CAPACITY IN FREE DRY LEAKAGE	SCFM
CAPACITY IN TOTAL AIR-VAPOR MIXTURE PER HOUR	LB
CURVE(S) OF APPROX CAPACITY VS SUCTION PRESSURE	

COMPANY BIOMASS
 CONTRACT NO. 21-1899
 SPECIFICATION NO. 1825/21
 AREA NO.
 EQUIPMENT NO. STEAM JET EJECTORS

DATE 102478 PAGE 6 OF 8

BID EVALUATION DATA SHEET

VENDOR

ITEM	DESCRIPTION
CONDENSER DATA	
SURFACE, SQ FT	
INTER-CONDENSER	
AFTER-CONDENSER	
TUBE SIZE	IN. OD
GAUGE NO.	BWG
LENGTH	
EFFECTIVE	
OVERALL	
COOLING WATER	
RAW WATER	
CONDENSATE	
MIN FLOW REQUIRED	GPM
MAX. DESIGN FLOW	GPM
FRICTION LOSS AT MAX. DESIGN FLOW OF WATER	FT
WATER BOXES	
MAX. WORKING PRESSURE	PSI
MATERIALS	
STEAM CHESTS (NOZZLE HEADS)	
SUCTION CHAMBERS (BODIES)	
CONDENSER SHELL	
WATER BOXES	
NOZZLES	
DIFFUSERS	
TUBE SHEETS	
TUBES	
FITTINGS AND ACCESSORIES INCLUDED	
AIR LEAKAGE METER	
OTHER	

COMPANY BIOMASS
 CONTRACT NO. 21-1899
 SPECIFICATION NO. 1825/21
 AREA NO.
 EQUIPMENT NO. RAPID EVACUATORS

DATE 102478 PAGE 8 OF 8

BID EVALUATION DATA SHEET

VENDOR

ITEM	DESCRIPTION
MANUFACTURER	
NAME	
LOCATION	
STEAM OPERATED, NO. PER CONDENSER	
SIZE	
OPERATING CONDITIONS AND PERFORMANCE	
DRY AIR CAPACITY	LB/HR
	AT _____ IN. Hg SUCTION PRESSURE
STEAM CONSUMPTION	LB/HR
	AT _____ PSI OF
MAX. DESIGN STEAM CONDITIONS	PSI
	OF
AIR CONSUMPTION	SCFM
	AT _____ PSI
WATER CONSUMPTION	GPM
	AT _____ PSI
APPROXIMATE WEIGHT, EACH	LB
PRELIMINARY DRAWING(S)	
DESCRIPTIVE BULLETIN(S) OR SPECIFICATION(S)	

SPECIFICATION

NO. 1826/03

AIR DRYER

FOR

DEPARTMENT OF ENERGY
BIOMASS CO-GENERATION FACILITIES
IN THE
STATE OF MAINE

Prepared by

THE RUST ENGINEERING COMPANY

CONTRACT 21-1899

SPECIFICATION
NO. 1826/03
AIR DRYER

1. INTENT

This Specification is intended to accompany Purchase Inquiry inviting Proposals to furnish equipment needed in connection with The Biomass Co-Generation Facilities in the State of Maine.

2. SCOPE

The Vendor shall furnish and deliver to the jobsite a heatless air dryer system as specified herein, and the services of a start-up Engineer. The Vendor's scope of supply shall include:

- a. Twin tower air dryer mounted on skid.
- b. Controls.
- c. Prefilters (ship separate).
- d. Afterfilters (ship separate).
- e. Alarms (cycle failure).
- f. Desiccant.
- g. Instrumentation.
- h. Interconnecting piping and wiring (air dryer only).

3. WORK, EQUIPMENT, SERVICES BY OTHERS

The Purchaser will furnish the following items:

- a. Foundation.
- b. Anchor bolts.
- c. Installation.
- d. External piping and wiring.

4. STANDARDS AND CODES

The Vendor shall be responsible for the acceptability of all equipment supplied by him to all applicable Standards and Codes current at the date of purchase. All pressure vessels shall receive the ASME Code stamp and National Board of Registration.

5. MISCELLANEOUS REQUIREMENTS

- a. The Vendor shall quote furnishing the services of a Service Engineer at a per diem rate as an addition to the base bid:

1) To check and approve the installation of air dryer system prior to operation.

2) To start-up and test the air dryer system initially and make all necessary adjustments to insure unit conforms to guarantee requirements.

3) To train operators in proper operation and care of the unit.

b. The Vendor shall supply any and all special tools necessary for operation and maintenance of the air dryer system.

6. DESCRIPTION OF THE PROCESS

Ambient air will be compressed for process and instrument use by reciprocal oil lubricated compressors. From the compressors, the air passes through existing receivers to the prefilters and then the air dryer where the moisture is removed. The air discharged by the dryer passes through an afterfilter to a new receiver.

7. DESIGN DATA AVAILABLE

The air dryer shall be designed and guaranteed based on the following parameters:

a. Gas - Air

b. Inlet Flow Rate - 230 scfm (14.7 psia, 60°F)

c. Operating Pressure - 100 psig at inlet

d. Temperatures:

Inlet - 110°F

e. Inlet Relative Humidity - 100%

f. Specific Heat at Constant Pressure - 0.24 Btu/lb/°F

g. Design Pressure - 150 psig

8. DESIGN REQUIREMENTS

a. The air dryer system shall be designed to satisfy the following air flow constraints:

1) Dew point of air from the dryer shall be -40°F or less at 100 psig.

2) The pressure drop across the dryer and filters shall not be greater than 10 psi.

3) The air velocity within the dryer bed shall not exceed 70 feet per minute.

- b. The air dryer system shall be designed for continuous duty in a paper mill environment.
- c. The pressure vessels shall bear the ASME stamp for unfired pressure vessels.
- d. The desiccant shall be activated alumina.
- e. The control system shall be fully automatic. The control cabinet shall be shop mounted and shall include the necessary timing motors, contacts, switches, lights, etc. Pilot lights shall be provided to indicate when the dryer is energized, and which tower is being activated. Pilot lights and contacts for alarms shall be provided to indicate if a cycle has been interrupted. All electrical enclosures shall be to NEMA 12 standards for Dust-Tight Industrial Use.
- f. Twin inlet filters to the dryer shall remove any oils, dust, dirt, and entrained water droplets. Maximum total oil or hydrocarbon content, exclusive of noncondensibles, shall not exceed 1 ppm under normal operating conditions leaving the inlet filter.
- g. Twin outlet filters shall be of one micron rating to remove any entrained dust particles including powdered desiccant.
- h. Desiccant fill and drain ports shall be arranged and sized so as to permit quick and easy desiccant change without disturbing piping and to assure limits on bed height.
- i. Desiccant chambers to include cleanable stainless steel outlet filters to prevent desiccant carryover. Filters to be removable without disturbing desiccant bed.
- j. For the heatless dryer system, provide adjustment and means of measurement for system purge quantity.
- k. Instrumentation shall include the following:
 - 1) Purge rate flow meter
 - 2) Pressure gauges on each tower dryer
- l. The dryer interconnecting piping to ANSI Standards and wiring shall come installed and ready for service and shall include:
 - 1) All necessary piping and fittings
 - 2) All necessary valves and check valves
 - 3) Relief valves for each tower
- m. The air dryer system shall be fabricated and finished of materials resistant to corrosion both from internal sources and external weathering. The air dryer system will be located indoors.

9. GUARANTEES

The Vendor shall guarantee that the air dryer will deliver the process air at the conditions specified herein based on the inlet conditions to the dryer specified herein. Parts and materials are to be guaranteed for 12 months after start-up.

10. INFORMATION FROM VENDOR

The Proposal shall include:

- a. Recommend spare parts list with current selling prices.
- b. If the Proposal is subject to price escalation, a clear explanation of the price escalation shall be provided.

11. ATTACHMENTS

See ATTACHMENT AT-1 for other documents applicable to this Specification as attachments thereto.

ATTACHMENT AT-1

The following checked ☉ Supplemental Requirements documents, all dated 062078, become a part of Specification No. 1826/03 . Other documents also checked ☒ hereon are attachments to the Specification. Drawings, Charts, Lists, Sketches, etc., when listed and attached, are specifically applicable to the Specification.

☒ BID EVALUATION DATA SHEETS (4)

☐ DESIGN DATA SHEETS ()

☐ MANUFACTURER'S DATA SHEETS ()

☐ FORM E246 NOISE LEVEL DATA REQUEST SHEETS ()

☐☐☐☐

☐ SPECIAL INSTRUCTIONS TO BIDDERS (For Equipment)

☐ SPECIAL INSTRUCTIONS TO BIDDERS (For Materials)

☒ SUPPLEMENTAL REQUIREMENTS FOR

- VENDOR DOCUMENTS/EQUIPMENT
- VENDOR DOCUMENTS/MATERIALS
- EQUIPMENT SHIPPING AND MARKING
- EQUIPMENT INSPECTION, TESTS, START-UP
- MISCELLANEOUS ITEMS AND GUARANTEES
- COUPLINGS AND MECHANICAL DRIVES
- ELECTRIC MOTORS BELOW 600V, AC
- ELECTRIC MOTORS ABOVE 600V, AC
- SPARE PARTS
- EQUIPMENT PAINTING
- EQUIPMENT PRE-ASSEMBLY, SHOP ASSEMBLY, MODULE CONSTRUCTION
- OSHA AND NOISE CONTROL FEDERAL REGULATIONS
- ASME CODE DOCUMENTATION
- EQUIPMENT MANUFACTURED USING METRIC MEASURING UNITS

☐ DRAWINGS/SKETCHES

COMPANY DOE BIOMASS PROJECT
 CONTRACT NO. 21-1899
 SPECIFICATION NO. 1826/03
 AREA NO.
 EQUIPMENT NO. AIR DRYER

DATE 103078 PAGE 1 OF 4
 BID EVALUATION DATA SHEET
 VENDOR

ITEM	DESCRIPTION
GUARANTEED OPERATION	
OUTLET CAPACITY (14.7 psia, 60°F)	SCFM
OUTLET PRESSURE	PSIG
INLET PRESSURE	PSIG
INLET TEMPERATURE	°F
INLET RELATIVE HUMIDITY	%
OUTLET DEW POINT	
TEMPERATURE	°F
AT PRESSURE (LINE)	PSIG
TOWER VELOCITY	FT/MIN.
OUTLET AIR TEMPERATURE	°F
DESIGN CONDITIONS	
PRESSURE	PSIG
TEMPERATURE	°F
CODE	
CODE STAMP	

COMPANY DOE BIOMASS PROJECT
 CONTRACT NO. 21-1899
 SPECIFICATION NO. 1826/03
 AREA NO.
 EQUIPMENT NO. AIR DRYER

DATE 103078 PAGE 2 OF 4

BID EVALUATION DATA SHEET

VENDOR

ITEM	DESCRIPTION
REACTIVATION AIR SOURCE	
REACTIVATION AIR RATE	ACFM
REACTIVATION AIR PRESSURE	PSIG
CONTROL	
CYCLE DURATION	
SERVICE	MIN.
REACTIVATING	MIN.
ELECTRICAL ENCLOSURES -	
TYPE DESICCANT -	
WEIGHT OF DESICCANT/TOWER	LB
CROSS SECTION OF EACH TOWER	FT ²

COMPANY DOE BIOMASS PROJECT
 CONTRACT NO. 21-1899
 SPECIFICATION NO. 1826/03
 AREA NO.
 EQUIPMENT NO. AIR DRYER

DATE 103078 PAGE 3 OF 4

BID EVALUATION DATA SHEET

VENDOR

ITEM	DESCRIPTION
INLET FILTERS	
TYPE	
MAKE	
PRESSURE DROP	PSI
OIL REMOVAL GUARANTEE	
OUTLET FILTER	
TYPE	
MAKE	
PRESSURE DROP	PSI
SIZE	MICRONS
MOISTURE REMOVAL/24 HOURS	LB
DESICCANT CAPACITY USED/CYCLE	%
WEIGHT (OVERALL)	LB

COMPANY DOE BIOMASS PROJECT
CONTRACT NO. 21-1899
SPECIFICATION NO. 1826/03
AREA NO.
EQUIPMENT NO. AIR DRYER

DATE 103078 **PAGE 4 OF 4**

BID EVALUATION DATA SHEET

VENDOR

ITEM	DESCRIPTION
RELIEF VALVES	
NUMBER	
TYPE	
MAKE	
CAPACITY	
PRESSURE SETTING	PSIG
PRESSURE GAUGES	
NUMBER	
TYPE	
MAKE	
RANGE	PSI
TOWERS	
MATERIAL	
CONSTRUCTION	
BED SUPPORT MATERIAL	

REVISION NO. 1, MAY 3, 1979

SPECIFICATION

NO. 1826/54

WOOD CHIP DRYERS

EQUIPMENT NOS. DR-0239 A THRU D

FOR

DEPARTMENT OF ENERGY

BIOMASS CO-GENERATION FACILITIES

IN THE

STATE OF MAINE

Prepared by

THE RUST ENGINEERING COMPANY

CONTRACT 21-1899

SPECIFICATION
NO. 1826/54
WOOD CHIP DRYERS

1. INTENT

This Specification is intended to accompany Purchase Inquiry inviting Proposals to furnish equipment needed in connection with the Biomass Co-Generation Facilities in the State of Maine.

2. SCOPE

The Vendor shall design, fabricate, supply and deliver FOB to the job-site a wood chip drying system as specified herein. The Vendor shall supply the following equipment and/or services:

- a. Wood chip dryers.
- b. Inlet flow dampers.
- c. Inlet wood chip feeders/airlock.
- d. Outlet wood chip airlock.
- e. Steam smothering system.
- f. Insulation clips.
- g. Stone trap and air lock.
- h. Start-up services.

3. WORK AND EQUIPMENT BY OTHERS

The Purchaser will supply the following equipment and/or services:

- a. Foundations
- b. Installation
- c. Insulation and lagging.
- d. Controls

4. DESCRIPTION OF PROCESS AND EQUIPMENT

Flue gas from a 550,000 lb/hr steam generating wood and oil fired boiler is to be cleaned by a mechanical collector to remove the majority of the char and sand. This flue gas will then be used in a direct contact wood chip drying system to reduce the moisture content of the feed wood chips and lower the gas exit temperature to a nominal 200°F. The flue gas will then pass through a second mechanical collector to remove combustible material entrained in the flue gas. Final gas clean-up will be accomplished in an electrostatic precipitator.

5. OPERATING CONDITIONS

The wood chip drying system shall be designed to operate under the following range of conditions:

- a. Wood Chip Feed Rate: 300 - 1000 Bone Dry Tons/Day
- b. Wood Chip Moisture: 40% - 65%
- c. Dryer Exit Temperature: Less than 220°F
- d. Flue Gas: From 100% wood, oil or combination of wood and oil
- e. Flue Gas Temperature to Dryers: 320°F - 400°F
- f. Wood Chips Size: 1-1/2 inches and under
- g. Gas Quantity: 854,000 lb/hr leaving the dryer

6. DESIGN REQUIREMENTS

The Dryer System shall be designed to meet the following design conditions:

- a. A means shall be provided to adjust bark retention time in the dryer to achieve maximum drying conditions.
- b. Drier shall be complete with inlet and outlet rotary air lock feed and reject valves, plus a stone and oversize particle reject rotary air lock. These 3 valves shall be of the same design, type and size. Details of valve design shall be furnished with the Proposal.
- c. Dryer shall be shop fabricated to minimize field erection.
- d. Dryer shall be designed for a negative operation pressure of 30 in. wg.
- e. Dryer shall be designed to permit no air infiltration. All welds shall be continuous.
- f. Bids will only be considered from manufacturer with experience with flue gas operating units of the size indicated for at least one year.
- g. A suitable fire suppression system using 50 psig steam shall be provided to protect the dryers in the event flue gas exit temperature increases by 60°F over normal exit temperature.

7. PERFORMANCE GUARANTEE

Vendor shall guarantee the following performance:

- a. Capacity

b. Exit temperature

c. Pressure drop

8. PROPOSAL INFORMATION FROM VENDOR

Vendor shall provide the following operational information with the Proposal:

a. Performance on 50% and 60% moisture bark.

b. Pressure drop both 50% and 60% moisture bark.

c. Capacity on 50% and 60% moisture bark.

d. Predicted wood chip moisture exiting the dryer with 50% and 60% moisture woods.

9. ATTACHMENTS

See ATTACHMENT AT-1 for other documents applicable to this Specification as attachments thereto.

ATTACHMENT AT-1

The following checked ☉ Supplemental Requirements documents, all dated 062078, become a part of Specification No. 1826/54. Other documents also checked ☒ hereon are attachments to the Specification. Drawings, Charts, Lists, Sketches, etc., when listed and attached, are specifically applicable to the Specification.

☐ BID EVALUATION DATA SHEETS ()

☐ DESIGN DATA SHEETS ()

☐ MANUFACTURER'S DATA SHEETS ()

☐ FORM E246 NOISE LEVEL DATA REQUEST SHEETS ()

☐☐☐☐

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☒ SUPPLEMENTAL REQUIREMENTS FOR

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- MISCELLANEOUS ITEMS AND GUARANTEES
- COUPLINGS AND MECHANICAL DRIVES
- ELECTRIC MOTORS BELOW 600V, AC
- ELECTRIC MOTORS ABOVE 600V, AC
- SPARE PARTS
- EQUIPMENT PAINTING
- EQUIPMENT PRE-ASSEMBLY, SHOP ASSEMBLY, MODULE CONSTRUCTION
- OSHA AND NOISE CONTROL FEDERAL REGULATIONS
- ASME CODE DOCUMENTATION
- EQUIPMENT MANUFACTURED USING METRIC MEASURING UNITS

☐ DRAWINGS/SKETCHES

REVISION NO. 1, May 3, 1979

SPECIFICATION

NO. 1832/22

SCALPING SCREENS FOR CHIPS AND BARK

EQUIPMENT NOS.

S-0221

S-0222

FOR

DEPARTMENT OF ENERGY

BIOMASS CO-GENERATION FACILITIES

IN THE

STATE OF MAINE

Prepared by

THE RUST ENGINEERING COMPANY

CONTRACT 21-1899

(605)

SPECIFICATION
NO. 1832/22
SCALPING SCREENS FOR CHIPS AND BARK
AREA 02

1. INTENT

This Specification is intended to accompany Purchase Inquiry inviting Proposals to furnish equipment which will be needed in connection with Bio-mass Co-Generation Facilities in the State of Maine.

2. SCOPE

Vendor shall furnish equipment, complete as specified herein.

3. WORK BY OTHERS

- a. Unload equipment at job site.
- b. Furnish foundations.
- c. Furnish all standard electric motors.
- d. Install equipment.

4. EQUIPMENT PAINTING

Describe Manufacturer's Standard Coating System including surface preparation and thickness of prime and topcoats.

5. DESCRIPTION/DESIGN REQUIREMENTS FOR SCALPING SCREEN

a. Chip and Bark Scalping Screens

1) Number Required: Two

2) Material to be Screened:

Whole tree chips (principally unbarked hardwood chips)
Hogged bark
Hogged wastewood from sawmills
Wood turnings from furniture plants

3) Weight of Material to be Screened: 17-20 lbs/cu ft

b. Design Requirements

1) Screens shall be rotating disc type which will allow oversize material to transfer across rotating discs and discharge into hog feed chute. All other material shall fall between the discs and bypass the hog.

2) One screen shall receive bark and chips at a rate of 300 TPH from a 48" wide belt @ 300 fpm belt speed. Oversize material = plus 6".

3) The other screen shall receive material at a rate of 104 TPH from a 48" wide belt @ 120 fpm belt speed. Oversize material = plus 1½". The second screen shall have two different disc spacings. Discs shall be spaced to allow material 1½ inches and smaller to fall through the first section. Discs shall be spaced to allow material over 1½ inches and under 2 inches to fall through the second section. Material 2 inches and over will discharge at the end of the screen. Disc spacing will be altered in the field if required to split the flow of plus 1½ inch material into two hogs. The first hog will receive material falling through the second section of discs. The second hog will receive material discharging from the end of the second section of discs.

6. GUARANTEE

Vendor shall guarantee rates or capacities specified and shall include workmanship and defective parts warranty for a period of one year after start-up.

7. ATTACHMENTS

See ATTACHMENT AT-1 for other documents applicable to this Specification.

ATTACHMENT AT-1

The following checked ☒ Supplemental Requirements documents, all dated 062078, become a part of Specification No. 1832/22. Other documents also checked ☒ hereon are attachments to the Specification. Drawings, Charts, Lists, Sketches, etc., when listed and attached, are specifically applicable to the Specification.

☒ BID EVALUATION DATA SHEETS (4)

☐ DESIGN DATA SHEETS ()

☐ MANUFACTURER'S DATA SHEETS ()

☐ FORM E246 NOISE LEVEL DATA REQUEST SHEETS ()

☐☐☐☐☐

☐ SPECIAL INSTRUCTIONS TO BIDDERS (For Equipment)

☐ SPECIAL INSTRUCTIONS TO BIDDERS (For Materials)

☒ SUPPLEMENTAL REQUIREMENTS FOR

- ☒ VENDOR DOCUMENTS/EQUIPMENT
- ☐ VENDOR DOCUMENTS/MATERIALS
- ☒ EQUIPMENT SHIPPING AND MARKING
- ☒ EQUIPMENT INSPECTION, TESTS, START-UP
- ☒ MISCELLANEOUS ITEMS AND GUARANTEES
- ☒ COUPLINGS AND MECHANICAL DRIVES
- ☒ ELECTRIC MOTORS BELOW 600V, AC
- ☐ ELECTRIC MOTORS ABOVE 600V, AC
- ☒ SPARE PARTS
- ☒ EQUIPMENT PAINTING
- ☒ EQUIPMENT PRE-ASSEMBLY, SHOP ASSEMBLY, MODULE CONSTRUCTION
- ☒ OSHA AND NOISE CONTROL FEDERAL REGULATIONS
- ☐ ASME CODE DOCUMENTATION
- ☐ EQUIPMENT MANUFACTURED USING METRIC MEASURING UNITS

☐ DRAWINGS/SKETCHES

COMPANY DEPARTMENT OF ENERGY
 CONTRACT NO. 21-1899
 SPECIFICATION NO. 1832/22
 AREA NO. 02 WOOD HANDLING
 EQUIPMENT NO. SCALPING SCREEN FOR
 CHIPS AND BARK (300 TPH)

DATE 091178 PAGE 1 OF 4

BID EVALUATION DATA SHEET

VENDOR

ITEM	DESCRIPTION
MAX. SCREEN CAPACITY	TPH
NO. OF DISC SHAFTS	
SHAFT DIAMETER	
O.D. OF DISCS	
DISC THICKNESS	
NO. OF DISCS PER SHAFT	
CLEARANCE BETWEEN DISCS	
DISC SHAFT SPEED	RPM
NO. OF DRIVES	
HP PER DRIVE	
REDUCER(S)	
MAKE & MODEL	
RATIO	
SERVICE FACTOR	
SHAFT TO SHAFT CHAIN DRIVE	YES NO
CHAIN SIZE	
OIL TIGHT CASING	YES NO
CHAIN GUARD	YES NO
LENGTH OF SCREENING SURFACE	
WIDTH OF SCREENING SURFACE	
SCREEN WEIGHT EXCLUDING REDUCERS	
PRICING:	
SCREEN	
ESTIMATED FREIGHT	
SERVICE ENGINEER	

COMPANY	DEPARTMENT OF ENERGY
CONTRACT NO.	21-1899
SPECIFICATION NO.	1832/22
AREA NO.	02 WOOD HANDLING
EQUIPMENT NO.	SCALPING SCREEN FOR CHIPS AND BARK (300 TPH)

DATE 091178

PAGE 2 OF 4

BID EVALUATION DATA SHEET

VENDOR[illegible]

COMPANY
 CONTRACT NO.
 SPECIFICATION NO.
 AREA NO.
 EQUIPMENT NO.

DEPARTMENT OF ENERGY
 21-1899
 1832/22
 02 WOOD HANDLING
 SCALPING SCREEN FOR
 CHIPS AND BARK (104 TPH)

DATE 091178 PAGE 3 OF 4

Rev. 1-050379
 BID EVALUATION DATA SHEET

VENDOR

ITEM	DESCRIPTION
MAX. SCREEN CAPACITY	TPH
NO. OF DISC SHAFTS	
SHAFT DIAMETER	
O.D. OF DISCS	
DISC THICKNESS	
NO. OF DISCS PER SHAFT	1st SECTION 2nd SECTION
CLEARANCE BETWEEN DISCS	1st SECTION 2nd SECTION
DISC SHAFT SPEED	RPM
NO. OF DRIVES	
HP PER DRIVE	
REDUCER(S)	
MAKE & MODEL	
RATIO	
SERVICE FACTOR	
SHAFT TO SHAFT CHAIN DRIVE	YES NO
CHAIN SIZE	
OIL TIGHT CASING	YES NO
CHAIN GUARD	YES NO
LENGTH OF SCREENING SURFACE	1st SECTION 2nd SECTION
WIDTH OF SCREENING SURFACE	
SCREEN WEIGHT EXCLUDING REDUCERS	
PRICING:	
SCREEN	
ESTIMATED FREIGHT	
SERVICE ENGINEER	

SPECIFICATION

NO. 1833/12

SAND - CHAR CLASSIFIER

FOR
DEPARTMENT OF ENERGY
BIOMASS CO-GENERATION FACILITIES
IN THE
STATE OF MAINE

Prepared by
THE RUST ENGINEERING COMPANY
CONTRACT 21-1899

SPECIFICATION
NO. 1833/12
SAND-CHAR CLASSIFIER

1. INTENT

This Specification is intended to accompany Purchase Inquiry inviting Proposals to furnish equipment needed in connection with The Biomass Co-Generation Facilities in the State of Maine.

2. SCOPE

The Vendor shall design, furnish, fabricate and deliver FOB jobsite, four (4) sand-char screen type separators capable of satisfying the process and mechanical requirements specified herein. The Vendor shall supply the following equipment and/or services:

- a. Four (4) screen type separators.
- b. Covered housings as completely sealed as possible.
- c. Inlet and outlets flanged for bolted connections.
- d. Screen, 304 SS, 14 mesh.
- e. Drive or vibrator mechanism; couplings or V-belt sheaves to be machined and mounted on classifier and machined for fit on drive motor.
- f. Support brackets.
- g. Motors

3. WORK, EQUIPMENT, SERVICES BY OTHERS

The Purchaser will supply the following equipment and/or services:

- a. Foundations and anchor bolts
- b. Installation
- c. Instrumentation and control
- d. Connecting piping

4. STANDARDS AND CODES APPLICABLE

- a. The following listed Standards and Codes in effect as of date of purchase, and any subsections thereof, as applicable, shall govern design and selection of equipment and materials supplied:

ASME	American Society of Mechanical Engineers
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
AWS	American Welding Society
IEEE	Institute of Electrical and Electronic Engineers

5. MISCELLANEOUS REQUIREMENTS

The coating system on exterior surfaces only shall be per the attached COATING SYSTEM NO. Z-01-A.

6. PROCESS DESCRIPTION

The sand, char, and ash collected from the flue gases of a waste wood fired boiler by a mechanical dust collector will discharge by gravity onto the classifiers for separation into reinjected char and disposable ash and sand.

7. DESIGN DATA

The classifiers shall be designed based on the following data:

Feed Material:	Sand, Ash, Char
Feed Material Density, lb/cu.ft.	40 - 45
Material Shape:	Sand - Irregular, jagged Ash - Cenospheres Char - Flakes
Flowability:	Material can bridge in hoppers
% Moisture in Material:	< 5
Temperature of Material, °F:	300 - 350
Material Angle of Repose:	Approximately 45°
Other Material Characteristics:	Abrasive
Size Feed Material:	90% > 10 mesh 50% > 100 mesh 10.3% > 14 mesh
Material Flow to Each Screen, lb/hr:	1100

8. DESIGN REQUIREMENTS

- a. Number of Units - 4; each capable of screening a minimum of 1100 pounds per hour.
- b. Screen to be 14 mesh, 304 stainless steel.
- c. Separators to be designed for 24 hours per day, 7 days per week operation.
- d. Vibrating type separator to be designed for 460 volt input.
- e. Vendor to furnish drives for rotary or reciprocating type separators with separator half of coupling or sheave machined and mounted on separator drive shaft.
- f. Separator to be sealed as much as practicable except for inlet and outlets.

- g. Inlet and outlets shall be furnished with Schedule 40 pipe flanges for bolted connection.
- h. Housing shall be of material suitable for this service.
- i. Units to be furnished with support buckets for mounting on Purchaser's structural steel.

9. INFORMATION REQUIRED FROM VENDOR

Proposal shall include the following information in addition to that required in the BID EVALUATION DATA SHEETS:

- a. Outline proposal drawing.
- b. Manufacturer's literature for such accessories as bearings, couplings, V-belt drives, etc.
- c. Technical literature concerning equipment to be furnished.

10. GUARANTEES

- a. The Vendor shall have a specific statement in his Proposal outlining his equipment performance guarantees and warranties. Vendor shall state the time period of the warranty for each item which shall include all workmanship, materials, and equipment provided by Vendor.
- b. The Vendor has the sole responsibility and must guarantee that the equipment furnished will perform as specified.
- c. Vendor shall be responsible for incorporating in his design the latest modifications which have been found necessary and desirable based on operating experience with similar equipment. The equipment shall be the most advanced design possible based upon knowledge available at the time of manufacture.

11. ATTACHMENTS

See ATTACHMENT AT-1 for other documents applicable to this Specification as attachments thereto.

ATTACHMENT AT-1

The following checked ☒ Supplemental Requirements documents, all dated 062078, become a part of Specification No. 1833/12 . Other documents also checked ☒ hereon are attachments to the Specification. Drawings, Charts, Lists, Sketches, etc., when listed and attached, are specifically applicable to the Specification.

- ☒ BID EVALUATION DATA SHEETS (2)
- ☐ DESIGN DATA SHEETS ()
- ☐ MANUFACTURER'S DATA SHEETS ()
- ☒ FORM E246 NOISE LEVEL DATA REQUEST SHEETS (1)
- ☒ COATING SYSTEM NO. Z-01-A
- ☐
- ☐
- ☐
- ☐ SPECIAL INSTRUCTIONS TO BIDDERS (For Equipment)
- ☐ SPECIAL INSTRUCTIONS TO BIDDERS (For Materials)
- ☒ SUPPLEMENTAL REQUIREMENTS FOR
 - VENDOR DOCUMENTS/EQUIPMENT
 - VENDOR DOCUMENTS/MATERIALS
 - EQUIPMENT SHIPPING AND MARKING
 - EQUIPMENT INSPECTION, TESTS, START-UP
 - MISCELLANEOUS ITEMS AND GUARANTEES
 - COUPLINGS AND MECHANICAL DRIVES
 - ELECTRIC MOTORS BELOW 600V, AC
 - ELECTRIC MOTORS ABOVE 600V, AC
 - SPARE PARTS
 - EQUIPMENT PAINTING
 - EQUIPMENT PRE-ASSEMBLY, SHOP ASSEMBLY, MODULE CONSTRUCTION
 - OSHA AND NOISE CONTROL FEDERAL REGULATIONS
 - ASME CODE DOCUMENTATION
 - EQUIPMENT MANUFACTURED USING METRIC MEASURING UNITS
 - VIBRATION PARAMETERS FOR ROTATING EQUIPMENT
- ☐ DRAWINGS/SKETCHES

COMPANY DOE BIOMASS PROJECT
 CONTRACT NO. 21-1899
 SPECIFICATION NO. 1833/12
 AREA NO.
 EQUIPMENT NO. SAND-CHAR CLASSIFIER

DATE 120678 PAGE 1 OF 2

BID EVALUATION DATA SHEET

VENDOR

ITEM	DESCRIPTION
NOMENCLATURE AND SIZE	
MODEL NO.	
CAPACITY	LB/HR
SCREEN MESH	
MATERIALS OF CONSTRUCTION	
HOUSING	
TOP COVER	
SUPPORTS	
NOZZLES	
SCREEN	
SHAFTS	
SEPARATOR SIZE	
LENGTH	INCHES
WIDTH	INCHES
HEIGHT	INCHES
SEPARATOR WEIGHT	LB
DRIVE ASSEMBLY	
TYPE	
SEPARATOR COUPLING OR SHEAVE	
MACHINED AND MOUNTED?	
MOTOR COUPLING OR SHEAVE MACHINED?	
MOUNT PROVIDED FOR MOTOR?	
VIBRATOR DESIGNED FOR 460 V?	
MOTOR REQUIRED	HP RPM

COMPANY DOE BIOMASS PROJECT
 CONTRACT NO. 21-1899
 SPECIFICATION NO. 1833/12
 AREA NO.
 EQUIPMENT NO. SAND-CHAR CLASSIFIER

DATE 120678

PAGE 2 OF 2

BID EVALUATION DATA SHEET

VENDOR

ITEM	DESCRIPTION
IS SPEED REDUCER REQUIRED?	
INCLUDED?	
TYPE AND SIZE BEARINGS	
LUBRICATION REQUIRED	
INLET AND OUTLETS FLANGED?	
DRAWING SCHEDULE	
DELIVERY	
PRICE FOB SHIPPING POINT	
FREIGHT	
TOTAL PRICE	
TERMS	
ESCALATION

NOISE LEVEL DATA REQUEST SHEET THE RUST ENGINEERING COMPANY Birmingham, Alabama	For Use With Specification No. 1833/12									
FOR: DOE BIOMASS PROJECT	PROPOSAL OR JOB NO.: 21-1899	DATE: 120678									
AT:	INQUIRY NO.	PURCHASE ORDER NO.:									
REQUESTED BY:											
TYPE OF EQPT.: SCREEN SEPARATOR	SERVICE SAND-CHAR										
MANF.:	TAG NO.:										
MODEL SIZE:	OPERATING CONDITIONS:										
THE VENDOR/MANUFACTURER/SUBCONTRACTOR SHALL SUPPLY NOISE LEVEL DATA FOR THE STANDARD MODEL OF HIS EQUIPMENT UNLESS OTHERWISE NOTED. THE ORDER OF PREFERENCE OF DATA IS (UNLESS OTHERWISE NOTED): 1. OCTAVE BAND SOUND POWER LEVELS RE 10^{-12} WATTS IN EACH OCTAVE BAND FROM 63 HZ THROUGH 8000 HZ. 2. OCTAVE BAND SOUND PRESSURE LEVELS RE 0.0002 μ BAR AT 3 FEET. 3. A-WEIGHTED SOUND PRESSURE LEVEL RE 0.0002 μ BAR AT 3 FEET. 4. ANY OTHER NOISE LEVEL DATA. THIS FORM DOES NOT AUTHORIZE EXPENDITURES FOR ANY TESTING TO OBTAIN THE INFORMATION RE- QUESTED.											
☐ PWL ☐ SPL	OCTAVE BAND CENTER FREQUENCIES HZ								dBA	DISTANCE	CONDITION
	63	125	250	500	1000	2000	4000	8000			
☐ STANDARD MODEL NOISE LEVEL(S):											
☐ QUIET MODEL NOISE LEVEL(S):											
☐ GUARANTEED NOISE LEVEL(S):											
SOURCE OF DATA ☐ LAB OR SHOP TEST ☐ FIELD TEST ☐ CALCULATION ☐ OTHER											
COST OF GUARANTEE											
COST OF TEST IN THE ABSENCE OF ANY INFORMATION											
ACOUSTICAL TREATMENT FOR QUIET MODEL											
ADDITIONAL COST FOR QUIET MODEL											
SHEET COMPLETED BY:						DATE:					
FIRM:											
TITLE:						SIGNATURE:					

COATING SYSTEM NO. Z-01-A

PURPOSE

An Inorganic zinc single-coat system designed to withstand temperatures up to 800°F for breeching and stack exteriors.

APPLICABLE REQUIREMENTS

"General Requirements for Standard Coating Systems" (GR-3, attached, are applicable to this system.

SURFACE PREPARATION

Near white blast
Anchor pattern profile

SSPC-SP10

SSPC-SP10
1.5 mil average

PRIMER

Dry Mils

Inorganic zinc silicate 2.0

TOTAL DRY MIL THICKNESS 2.0

APPLICATION TEMP. LIMITS above 350°F

HUMIDITY LIMITS below 90%

DRY TEMP. LIMITS 800°F Continuous

GENERAL REQUIREMENTS FOR STANDARD COATING SYSTEMS (GR-3)

1. GENERAL

- a. The Manufacturer's recommendations and requirements shall be considered a part of the specified COATING SYSTEM(S).
- b. The manufacturer of all topcoats must be the same as the manufacturer of the prime coat.
- c. Colors shall be as selected and as shown on schedules. Safety colors shall be in accord with ANSI Standards.

2. REFERENCE STANDARDS AND CODES

Applicable Standards and Codes of the following organizations shall apply to COATING SYSTEMS unless otherwise noted:

- a. SSPC - Steel Structures Painting Council for surface preparation and application.
- b. NACE - National Association of Corrosion Engineers for surface preparation.
- c. ANSI - American National Standards Institute for safety color coding of physical hazards.

SPECIFICATION

NO. 1842/31

CHLORINATION EQUIPMENT

FOR

DEPARTMENT OF ENERGY
BIOMASS CO-GENERATION FACILITIES
IN THE
STATE OF MAINE

Prepared by
THE RUST ENGINEERING COMPANY
CONTRACT 21-1899

SPECIFICATION
NO. 1842/31
CHLORINATION EQUIPMENT

1. INTENT

This Specification is intended to accompany Purchase Inquiry inviting Proposals to furnish equipment needed in connection with The Biomass Co-Generation*Facilities in the State of Maine.

2. SCOPE

a. Furnish and deliver FOB jobsite the chlorination equipment as specified herein.

b. The chlorination equipment shall consist of a vacuum type chlorinator, chlorine solution injector, vacuum regulator, pressure relief valve, injector water pressure gauge, chlorine leak detector, chlorine analyzer, chlorine diffuser, control panel, instruments, timers, controls, piping, valves, one ton container scale and handling equipment and any other accessories required for a safe and proper operation under all conditions of service herein specified.

c. Start-up services shall be provided and quoted by the Vendor on a per diem basis.

3. WORK, EQUIPMENT, SERVICES BY OTHERS

a. Foundations for chlorinator, chlorine cylinders and for apparatus and accessories.

b. Water pressure supply to chlorine solution injector.

c. One ton chlorine cylinders.

d. Waste sumps and waste pipe network.

e. Electric power supply to chlorination equipment.

f. Instrument control air at 50 psig to one point on Vendors control panel.

4. CODE REQUIREMENTS

a. The following listed Standards and Codes, in effect as of date of purchase, shall govern the design, fabrication, testing and selection of equipment and material furnished:

ASME American Society of Mechanical Engineers

CI	Chlorine Institute, Inc.
ASTM	American Society for Testing and Materials
HI	Hydraulic Institute
OSHA	Occupational Safety and Health Standards
NEMA	National Electrical Manufacturers Association
IEEE	Institute of Electrical and Electronic Engineers
SSPC	Steel Structures Painting Council

b. County, State and Federal Regulations and Codes in effect as of date of purchase, shall be complied with.

5. MISCELLANEOUS REQUIREMENTS AND ALTERNATES

a. Protective Coatings shall be quoted per SUPPLEMENTAL REQUIREMENTS FOR EQUIPMENT PAINTING attached.

b. Design and construction of chlorination equipment and accessories shall conform with the recommendations of the Chlorine Institute.

c. Heavy duty racks for the one ton chlorine cylinders shall be quoted in the base bid as a separate item. The racks shall be sufficient for the number of one ton containers recommended to be on hand.

d. A monorail, electric hoist with manual push trolley and lifting beam, and all items required for handling the one ton chlorine cylinders shall be quoted as a separate item in the base bid. Hoisting equipment shall have a minimum lift capacity of two tons and shall be designed to allow one man operation.

e. A scale for weighing the one ton chlorine cylinders or any other equipment substituting for this function shall be quoted as a separate item in the base bid.

6. PROCESS DESCRIPTION

a. The chlorination equipment will be used to control microorganism growth and biological fouling (bacterial, slime, algae) in a cooling tower circulating water system including tower, main surface condenser, auxiliary heat exchangers, piping and equipment as employed in The Biomass Conversion Steam Electric Generating Unit. The makeup water to the cooling tower will be filtered water withdrawn from the Presumpscot River.

b. The chlorination equipment shall be provided with the necessary controls required for either continuous or intermittent chlorine solution feed. The intermittent chlorination is projected for four times daily and 60 minutes each time. Both the continuous and the intermittent chlorine feed shall be automatically controlled.

c. A continuous running sample shall be used for controlling the chlorine feed. This sample will be taken from the hotwater return header to the tower and it will be run through the Vendor's chlorine analyzer/recorder/controller. Optimum chlorine residual shall be determined as plant operating experience is gained and with the assistance of the chlorine levels recorded in the continuously analyzed sample above.

d. Chlorine delivery shall be permissive in the automatic mode (continuous or intermittent) providing that at least one circulating water pump is running. Automatic shutoff of injector valve(s) shall occur when both circulating cooling water pumps are off.

7. DESIGN DATA AVAILABLE

a. The chlorination equipment shall be designed for the following conditions:

1) Circulating cooling water flow:	20,500 gpm
2) Chlorine source:	One ton liquid chlorine cylinders
3) Method of application:	Solution feed
4) Chlorine schedule capability:	Intermittent and continuous
5) Chlorine solution application:	Cooling tower basin
6) Water temperature at point of application:	50° to 95° F
7) Continuous chlorine feed capability:	3 mg/L
8) Intermittent chlorine feed capability:	Per par. 6.b.
9) Depth cooling tower basin:	5'-6"
10) Chlorine residual in hotwater return:	0.5 mg/L
11) Equipment will be designed for indoor installation with temperature control to maintain indoor temperature above 40°F.	

b. Approximate distance from chlorine solution injector to diffuser is 50 ft; approximate distance from chlorinator to solution injector is 30 ft; and the distance from the one ton cylinder to the chlorinator is 25 ft.

8. DESIGN REQUIREMENTS

a. The Vendor shall furnish all equipment, components and specialties required to make a complete chlorination system including but not limited to the following:

- 1) One 720 lb/day capacity chlorinator. The chlorinator shall be furnished completely wired, piped, assembled and skid mounted together with the residual chlorine analyzer/recorder/controller, chlorine detector, and control panel.
- 2) Adjustable program control and or sequential timers for automatic timing of each cycle. Each cycle shall include priming of system, chlorine delivery and system flushing.
- 3) Selector switches to provide for "Automatic/Manual/Off" for continuous and for intermittent operation.
- 4) Indicating lights and alarms showing operation mode.
- 5) Electrical interlocking of chlorine solution feed with Purchaser's circulating water pumps.
- 6) Interconnecting piping, fittings and valves including chlorine gas line from one ton cylinder to chlorinator and to injector; solution feed from injector to diffuser; sampling tubing and valving and any other required to make a complete system.
- 7) One rubber lined (or equivalent) adjustable orifice injector complete with suction line check valve and isolating valves on the water pressure supply, chlorine gas suction, and chlorine solution discharge side of the injector.
- 8) One chlorine solution diffuser to be installed in the cooling tower basin. The diffuser shall be made of Schedule 80 PVC pipe or equivalent material and it shall be provided complete with isolating valve (root valve), flanges, supports and accessories for installation in the cooling tower concrete basin. The diffuser shall be designed to provide uniform distribution of the solution feed in the circulating water.

b. The Vendor shall furnish an unused set of all special tools required for the operation, maintenance, and adjustment of all equipment furnished. The set of tools shall be packaged in a substantial container suitable for permanent storage.

c. The chlorine analyzer shall include recording, indicating and controlling of residual chlorine in the circulating water system. The analyzer shall have a recording and indicating range of 0 to 5 mg/L. The analyzer shall have an accuracy of 0.01 mg/L and shall not be affected by turbidity, color, manganese, iron, ammonia, nitrate, or nitrites in the sample. The analyzer shall be furnished complete with sample pump, automatic temperature compensator, sample pressure gauge,

pulse pump(s), motor(s), rate setting knob(s); and two year supply of reagents, recording charts, and ink. The analyzer shall include adjustable high and low chlorine alarms and spare contacts for remote alarm to Purchaser's central control panel.

d. The chlorine leak detector shall be capable to verify any leak in the one ton cylinders or in the chlorinator areas. The leak detector shall be furnished with audible and visual alarm for local indication, spare contacts for remote alarm, and alarm reset button. The detector shall be capable of sensing ground level concentrations of 1 ppm chlorine by volume in air and higher levels. The leak detector shall be furnished complete with all accessories such as air sample blower, two years supply of electrolyte, 1 inch PVC pipe for sample inlet and vent, six packages of activated carbon for recharging the air filter, and any other components necessary to make a complete system.

9. QUALITY ASSURANCE

a. All equipment specified is subject to inspection and test by the Purchaser or Engineer as per SUPPLEMENTAL REQUIREMENTS FOR EQUIPMENT INSPECTION, TESTS, START-UP attached.

b. A complete electrical and functional verification of the control panel, chlorinator and components shall be conducted under shop simulated test conditions before shipment to the jobsite.

c. After equipment is placed in service, the Vendor's field representative shall test the performance of the equipment at various chlorine injection rates up to and including the maximum delivery rate specified. Equipment shall be tested both on an intermittent and continuous operating basis in order to demonstrate the capability of the equipment to meet all conditions of this Specifications.

d. All tests shall be performed in accordance with the 1968 chlorine Institute Pamphlet No. 6. Upon completion of the tests, certified copies of the performance results shall be furnished to the Purchaser.

10. GUARANTEES

a. The chlorination equipment shall be guaranteed to perform satisfactorily under all specified conditions under DESIGN DATA AVAILABLE, paragraph 7 herein.

b. Vendor shall guarantee that all equipment furnished shall be free from defects in material, workmanship, and design for a period of one year from the date of satisfactory completion of installation and acceptance by Purchaser. Vendor guarantees to repair or replace, at its own expense, the equipment or any part thereof, found to be defective during said one-year period. All replacement parts shall be warranted for one year from date of replacement.

c. The chlorinator and controls shall provide "fail safe" operation under all operating conditions.

11. ATTACHMENTS

See ATTACHMENTS AT-1 for other documents applicable to this Specification as attachments thereto.

ATTACHMENT AT-1

The following checked ☒ Supplemental Requirements documents, all dated 062078, become a part of Specification No. 1842/31. Other documents also checked ☒ hereon are attachments to the Specification. Drawings, Charts, Lists, Sketches, etc., when listed and attached, are specifically applicable to the Specification.

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☐ DESIGN DATA SHEETS ()

☐ MANUFACTURER'S DATA SHEETS ()

☐ FORM E246 NOISE LEVEL DATA REQUEST SHEETS ()

☐☐☐☐☐

☐ SPECIAL INSTRUCTIONS TO BIDDERS (For Equipment)

☐

☐ SPECIAL INSTRUCTIONS TO BIDDERS (For Materials)

☒

☒ SUPPLEMENTAL REQUIREMENTS FOR

- ☒ VENDOR DOCUMENTS/EQUIPMENT
- ☐ VENDOR DOCUMENTS/MATERIALS
- ☒ EQUIPMENT SHIPPING AND MARKING
- ☒ EQUIPMENT INSPECTION, TESTS, START-UP
- ☒ MISCELLANEOUS ITEMS AND GUARANTEES
- ☐ COUPLINGS AND MECHANICAL DRIVES
- ☒ ELECTRIC MOTORS BELOW 600V, AC
- ☐ ELECTRIC MOTORS ABOVE 600V, AC
- ☒ SPARE PARTS
- ☒ EQUIPMENT PAINTING
- ☐ EQUIPMENT PRE-ASSEMBLY, SHOP ASSEMBLY, MODULE CONSTRUCTION
- ☒ OSHA AND NOISE CONTROL FEDERAL REGULATIONS
- ☐ ASME CODE DOCUMENTATION
- ☐ EQUIPMENT MANUFACTURED USING METRIC MEASURING UNITS

☐ DRAWINGS/SKETCHES

COMPANY DOE BIOMASS PROJECT
 CONTRACT NO. 21-1899
 SPECIFICATION NO. 1842/31
 AREA NO.
 EQUIPMENT NO. CHLORINATION

DATE 111778 PAGE 1 OF 2
 BID EVALUATION DATA SHEET
 VENDOR

ITEM	DESCRIPTION
1. MANUFACTURER	
2. GENERAL	
A. PROPOSAL NUMBER	
B. DATE OF PROPOSAL	
C. LOCATION OF MANUFACTURER	
D. REPRESENTATIVE	
E. REPRESENTATIVE'S ADDRESS	
F. PHONE	
3. CHLORINATOR	
A. MODEL NO.	
B. CAPACITY, LB/24 HR	
C. HOUSING - DESCRIBE	
4. CHLORINE ANALYZER/CONTROLLER	
A. MODEL NO.	
B. TYPE	
C. DESCRIBE	
5. CHLORINE DETECTOR	
A. MODEL NO.	
B. TYPE	
C. DESCRIBE	

COMPANY DOE BIOMASS PROJECT
 CONTRACT NO. 21-1899
 SPECIFICATION NO. 1842/31
 AREA NO.
 EQUIPMENT NO. CHLORINATION

DATE 111778 PAGE 2 OF 2
 BID EVALUATION DATA SHEET
 VENDOR

ITEM	DESCRIPTION
6. CONTROL PANEL	
DESCRIBE	
7. AUTOMATION	
DESCRIBE	
8. INTERLOCKING	
DESCRIBE	
9. CHLORINE SOLUTION FEED	
A. INJECTOR SIZE	
B. MATERIALS	
C. VALVES FURNISHED	
10. CHLORINE DIFFUSOR	
A. TYPE	
B. MATERIAL	
C. VALVES	
D. ACCESSORIES	
11. CHLORINE CYLINDER SCALE	
A. MODEL	
B. CAPACITY	
12. MONORAIL - HOIST	
DESCRIBE	
13. CHLORINE CYLINDERS RACK	
DESCRIBE	

REVISION NO. 1, MAY 3, 1979

SPECIFICATION

NO. 1855/31

SWING HAMMER TYPE HOG

EQUIPMENT NOS. CR-0201, CR-0224 A&B

FOR

DEPARTMENT OF ENERGY
BIOMASS CO-GENERATION FACILITIES

IN THE
STATE OF MAINE

Prepared by
THE RUST ENGINEERING COMPANY

CONTRACT 21-1899

SPECIFICATION
NO. 1855/31
SWING HAMMER TYPE HOG

1. INTENT

This Specification is intended to accompany Purchase Inquiry inviting Proposals to furnish equipment which will be needed in connection with Biomass Co-Generation Facilities in the State of Maine.

2. SCOPE

Vendor shall furnish equipment, complete as specified herein.

3. WORK BY OTHERS

- a. Unload equipment at job site
- b. Furnish foundations
- c. Furnish all standard electric motors
- d. Erect equipment
- e. Furnish rotating disc screen

4. EQUIPMENT PAINTING

Describe Manufacturer's Standard Coating System including surface preparation and thickness of prime and topcoats.

5. DESCRIPTION/DESIGN REQUIREMENTS FOR SWING HAMMER

a. Swing Hammer Type Hog

- 1) Number Required: Three
- 2) Material To Be Hogged:

Whole tree chips (principally unbarked hardwood chips)
Bark
Wastewood from sawmills
Wood turnings from furniture plants

- 3) Particle Size Required After Hogging:

100% minus 6"	- 45 TPH hog	Equipment No.	CR-0201
100% minus 5"	} 30 TPH Hogs	"	" CR-0224A
		"	" CR-0224B
95% minus 1½"			

b. Hogging Capacity Required

45 tons per hour (maximum) - one hog

30 tons per hour (maximum) each - two hogs, one used for standby

c. Feed To Hog (By Others)

Rotating disc screen which will allow over size material transfer across rotating discs and discharge into hog feed chute.

6. GUARANTEE

Vendor shall guarantee rates or capacities specified and shall include workmanship and defective parts warranty for a period of one year after start-up.

7. ATTACHMENTS

See ATTACHMENT AT-1 for other documents applicable to this Specification.

ATTACHMENT AT-1

The following checked ● Supplemental Requirements documents, all dated 062078 , become a part of Specification No. 1855/31 . Other documents also checked ☒ hereon are attachments to the Specification. Drawings, Charts, Lists, Sketches, etc., when listed and attached, are specifically applicable to the Specification.

☒ BID EVALUATION DATA SHEETS (4)

☐ DESIGN DATA SHEETS ()

☐ MANUFACTURER'S DATA SHEETS ()

☐ FORM E246 NOISE LEVEL DATA REQUEST SHEETS ()

☐☐☐☐☐

☐ SPECIAL INSTRUCTIONS TO BIDDERS (For Equipment)

☐

☐ SPECIAL INSTRUCTIONS TO BIDDERS (For Materials)

☒ SUPPLEMENTAL REQUIREMENTS FOR

- VENDOR DOCUMENTS/EQUIPMENT
- VENDOR DOCUMENTS/MATERIALS
- EQUIPMENT SHIPPING AND MARKING
- EQUIPMENT INSPECTION, TESTS, START-UP
- MISCELLANEOUS ITEMS AND GUARANTEES
- COUPLINGS AND MECHANICAL DRIVES
- ELECTRIC MOTORS BELOW 600V, AC
- ELECTRIC MOTORS ABOVE 600V, AC
- SPARE PARTS
- EQUIPMENT PAINTING
- EQUIPMENT PRE-ASSEMBLY, SHOP ASSEMBLY, MODULE CONSTRUCTION
- OSHA AND NOISE CONTROL FEDERAL REGULATIONS
- ASME CODE DOCUMENTATION
- EQUIPMENT MANUFACTURED USING METRIC MEASURING UNITS

☐ DRAWINGS/SKETCHES

COMPANY
 CONTRACT NO.
 SPECIFICATION NO.
 AREA NO.
 EQUIPMENT NO.

DEPARTMENT OF ENERGY
 21-1899
 1855/31
 WOOD HANDLING
 SWING HAMMER TYPE HOG - 45 TON

DATE 090878 PAGE 1 OF 4

BID EVALUATION DATA SHEET

VENDOR

ITEM	DESCRIPTION
SIZE	
NUMBER OF REDUCTION ELEMENTS	
WEIGHT OF REDUCTION ELEMENTS	
ROTATION OF CUTTING EDGES	YES NO
RESURFACING OF CUTTING EDGES	YES NO
SIZE OF FEED OPENING	
SIZE OF DISCHARGE OPENING	
ROTOR DIAMETER	
ROTOR LENGTH	
WEIGHT OF ROTATING MASS	
ROTOR SHAFT DIAMETER	
BEARING B-10 LIFE	
TYPE OF BEARING LUBRICATION	
FLYWHEEL REQUIRED	YES NO
METAL CATCHER	YES NO
RECOMMENDED MOTOR	HP RPM
MAX. HOGGING CAPACITY	TONS PER HOUR
PRICING:	
HOG	
COUPLING & COUPLING GUARD	
BED PLATE FOR HOG & MOTOR	
MOTOR	BY OTHERS
ESTIMATED FREIGHT	
TOTAL	
WEIGHT (637)	HOG= BED PLATE=

COMPANY DEPARTMENT OF ENERGY
 CONTRACT NO. 21-1899
 SPECIFICATION NO. 1855/31
 AREA NO. WOOD HANDLING
 EQUIPMENT NO. SWING HAMMER TYPE HOG - 45 TON

DATE 090878

PAGE 2 OF 4

BID EVALUATION DATA SHEET

VENDOR

ITEM

DESCRIPTION

F.O.B.

TERMS

DELIVERY

COMPANY DEPARTMENT OF ENERGY
 CONTRACT NO. 21-1899
 SPECIFICATION NO. 1855/31
 AREA NO. WOOD HANDLING
 EQUIPMENT NO. SWING HAMMER TYPE HOG - 30 TON

DATE 090878 PAGE 3 OF 4

BID EVALUATION DATA SHEET

ITEM	DESCRIPTION
SIZE	
NUMBER OF REDUCTION ELEMENTS	
WEIGHT OF REDUCTION ELEMENTS	
ROTATION OF CUTTING EDGES	YES NO
RESURFACING OF CUTTING EDGES	YES NO
SIZE OF FEED OPENING	
SIZE OF DISCHARGE OPENING	
ROTOR DIAMETER	
ROTOR LENGTH	
WEIGHT OF ROTATING MASS	
ROTOR SHAFT DIAMETER	
BEARING B-10 LIFE	
TYPE OF BEARING LUBRICATION	
FLYWHEEL REQUIRED	YES NO
METAL CATCHER	YES NO
RECOMMENDED MOTOR	HP RPM
MAX. HOGGING CAPACITY	TONS PER HOUR
PRICING:	
HOG	
COUPLING & COUPLING GUARD	
BED PLATE FOR HOG & MOTOR	
MOTOR	BY OTHERS
ESTIMATED FREIGHT	
TOTAL	
WEIGHT (639)	HOG= BED PLATE=

SPECIFICATION

NO. 1858/07

RAILROAD TRACK SCALE

EQUIPMENT NO. WT-0233

For

DEPARTMENT OF ENERGY
BIOMASS CO-GENERATION FACILITIES
IN THE
STATE OF MAINE

Prepared by

THE RUST ENGINEERING COMPANY

CONTRACT 21-1899

SPECIFICATION
NO. 1858/07
RAILROAD TRACK SCALE
AREA. 02

1. INTENT

This Specification is intended to accompany Purchase Inquiry inviting Proposals to furnish equipment which will be needed in connection with Biomass Co-Generation Facilities in the State of Maine.

2. SCOPE

Vendor shall furnish equipment, complete as specified herein.

3. WORK BY OTHERS

- a. Unload equipment at job site.
- b. Furnish foundations
- c. Erect equipment

4. EQUIPMENT PAINTING

Describe Manufacturer's standard coating system including surface preparation and thickness of prime and topcoats.

5. DESCRIPTION/DESIGN REQUIREMENTS FOR RAILROAD TRACK SCALE

a. Railroad Track Scale

1) Base Quote:

One single unit for two draft weighing - 85 tons
Weigh Length of 12'-6".
Pitless type

2) Alternate Quote:

Two units for single draft weighing - 170 tons.
Weigh lengths of 12'-6" and 25'
Pitless type

- b. Each scale shall be equipped with digital indicator, printed weight recording equipment and any other recommended optional equipment.

6. GUARANTEE

Vendor shall guarantee rates or capacities specified and shall include workmanship and defective parts warranty for a period of one year after start-up.

7. ATTACHMENTS

See ATTACHMENT AT-1 for other documents applicable to this Specification.

ATTACHMENT AT-1

The following checked ☒ Supplemental Requirements documents, all dated 062078, become a part of Specification No. 1858/07. Other documents also checked ☒ hereon are attachments to the Specification. Drawings, Charts, Lists, Sketches, etc., when listed and attached, are specifically applicable to the Specification.

- ☐ BID EVALUATION DATA SHEETS ()
- ☐ DESIGN DATA SHEETS ()
- ☐ MANUFACTURER'S DATA SHEETS ()
- ☐ FORM E246 NOISE LEVEL DATA REQUEST SHEETS ()
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐ SPECIAL INSTRUCTIONS TO BIDDERS (For Equipment)
- ☐ SPECIAL INSTRUCTIONS TO BIDDERS (For Materials)
- ☒ SUPPLEMENTAL REQUIREMENTS FOR

- ☒ VENDOR DOCUMENTS/EQUIPMENT
- ☐ VENDOR DOCUMENTS/MATERIALS
- ☒ EQUIPMENT SHIPPING AND MARKING
- ☒ EQUIPMENT INSPECTION, TESTS, START-UP
- ☒ MISCELLANEOUS ITEMS AND GUARANTEES
- ☐ COUPLINGS AND MECHANICAL DRIVES
- ☒ ELECTRIC MOTORS BELOW 600V, AC
- ☐ ELECTRIC MOTORS ABOVE 600V, AC
- ☒ SPARE PARTS
- ☒ EQUIPMENT PAINTING
- ☒ EQUIPMENT PRE-ASSEMBLY, SHOP ASSEMBLY, MODULE CONSTRUCTION
- ☐ OSHA AND NOISE CONTROL FEDERAL REGULATIONS
- ☐ ASME CODE DOCUMENTATION
- ☐ EQUIPMENT MANUFACTURED USING METRIC MEASURING UNITS

- ☐ DRAWINGS/SKETCHES

SPECIFICATION

NO. 1858/11

WOODYARD MOTOR TRUCK SCALE

EQUIPMENT NO. WT 0232 'A & B

For

DEPARTMENT OF ENERGY

BIOMASS CO-GENERATION FACILITIES

IN THE

STATE OF MAINE

Prepared by

THE RUST ENGINEERING COMPANY

CONTRACT 21-1899

SPECIFICATION
NO. 1858/11
WOODYARD MOTOR TRUCK SCALE
AREA 02

L. INTENT

This Specification is intended to accompany Purchase Inquiry inviting Proposals to furnish equipment which will be needed in connection with Biomass Co-Generation Facilities in the State of Maine.

2. SCOPE

Vendor shall furnish equipment, complete as specified herein.

3. WORK BY OTHERS

- a. Unload equipment at job site.
- b. Furnish foundations
- c. Furnish all standard electric motors
- d. Erect equipment

4. EQUIPMENT PAINTING

Describe Manufacturer's standard coating system including surface preparation and thickness of prime and topcoats.

5. DESCRIPTION/DESIGN REQUIREMENTS FOR MOTOR TRUCK SCALE

a. Woodyard Motor Truck Scale

- 1) Number required: 2
- 2) Type: Load cell, electronic
- 3) Capacity: 60 tons
- 4) Platform size: 10' x 60'

b. Features

- 1) Solid state digital indicator for wall mounting
- 2) Motion detector
- 3) 8 bands of designating figures 0 through 9.
- 4) Automatic printer
- 5) Electric time and date stamp.

6) Surge voltage protection

7) Line voltage regulators (Option that may not be required).

c. Start-up Assistance

Cost of Service to be included.

6. GUARANTEE

Vendor shall guarantee rates or capacities specified and shall include workmanship and defective parts warranty for a period of one year after start-up.

7. ATTACHMENTS

See ATTACHMENT AT-1 for other documents applicable to this Specification.

ATTACHMENT AT-1

The following checked ☒ Supplemental Requirements documents, all dated 062078, become a part of Specification No. 1858/11. Other documents also checked ☒ hereon are attachments to the Specification. Drawings, Charts, Lists, Sketches, etc., when listed and attached, are specifically applicable to the Specification.

☒ BID EVALUATION DATA SHEETS (2)

☐ DESIGN DATA SHEETS ()

☐ MANUFACTURER'S DATA SHEETS ()

☐ FORM E246 NOISE LEVEL DATA REQUEST SHEETS ()

☐☐☐☐

☐ SPECIAL INSTRUCTIONS TO BIDDERS (For Equipment)

☐ SPECIAL INSTRUCTIONS TO BIDDERS (For Materials)

☒ SUPPLEMENTAL REQUIREMENTS FOR

- ☒ VENDOR DOCUMENTS/EQUIPMENT
- ☐ VENDOR DOCUMENTS/MATERIALS
- ☒ EQUIPMENT SHIPPING AND MARKING
- ☒ EQUIPMENT INSPECTION, TESTS, START-UP
- ☒ MISCELLANEOUS ITEMS AND GUARANTEES
- ☐ COUPLINGS AND MECHANICAL DRIVES
- ☒ ELECTRIC MOTORS BELOW 600V, AC
- ☐ ELECTRIC MOTORS ABOVE 600V, AC
- ☒ SPARE PARTS
- ☒ EQUIPMENT PAINTING
- ☒ EQUIPMENT PRE-ASSEMBLY, SHOP ASSEMBLY, MODULE CONSTRUCTION
- ☒ OSHA AND NOISE CONTROL FEDERAL REGULATIONS
- ☐ ASME CODE DOCUMENTATION
- ☐ EQUIPMENT MANUFACTURED USING METRIC MEASURING UNITS

☐ DRAWINGS/SKETCHES

COMPANY DEPARTMENT OF ENERGY
 CONTRACT NO. 21-1899
 SPECIFICATION NO. 1858/11
 AREA NO. WOOD HANDLING
 EQUIPMENT NO. WOODYARD MOTOR TRUCK SCALE

DATE 090878 PAGE 1 OF 2

BID EVALUATION DATA SHEET

VENDOR

ITEM	DESCRIPTION
PLATFORM SIZE	WIDTH X LENGTH
GROSS CAPACITY	TONS
IS WEIGHBRIDGE STEEL FURNISHED?	YES NO
WEIGHT OF WEIGHBRIDGE STEEL	LBS
DISPLAY INCREMENTS?	LBS
HEIGHT OF NUMBERS - DIGITAL DISPLAY	
MOTION DETECTOR	INCL. NOT INCL.
BANKS OF DESIGNATING FIGURES	NUMBER QUOTED
AUTOMATIC PRINTER	TYPE
ELECTRIC TIME & DATE STAMP	TYPE
SURGE VOLTAGE PROTECTION	INCL. NOT INCL.
LINE VOLTAGE REGULATORS	\$ ADDITIONAL PER SCALE
ARE LEVERS WELDED STEEL, CAST STEEL, OR CAST IRON?	
CAPACITY OF EACH WEIGHBRIDGE SECTION	TONS
SIZE OF BRIDGE DECK BEAMS	
TOTAL WEIGHT OF EQUIPMENT	LBS
EXCLUDING WEIGHBRIDGE STEEL	
PRICE OF SCALE	
SERVICE ENGINEER:	
NO. OF DAYS INCLUDED	
NO. OF TRIPS INCLUDED	
TOTAL WEIGHT OF EQUIPMENT	
ESTIMATED FREIGHT	
TOTAL PRICE OF EQUIPMENT	

REVISION NO. 1, May 3, 1979

SPECIFICATION

NO. 1858/31

BELT CONVEYOR SCALE

EQUIPMENT NO. WT-0231

FOR

DEPARTMENT OF ENERGY
BIOMASS CO-GENERATION FACILITIES

IN THE

STATE OF MAINE

Prepared by

THE RUST ENGINEERING COMPANY

CONTRACT 21-1899

SPECIFICATION
NO. 1858/31
BELT CONVEYOR SCALE

1. INTENT

This Specification is intended to accompany Purchase Inquiry inviting Proposals to furnish equipment which will be needed in connection with Biomass Co-Generation Facilities in the State of Maine.

2. SCOPE

Vendor shall furnish equipment, complete as specified herein.

3. WORK BY OTHERS

- a. Unload equipment at job site.
- b. Furnish foundations
- c. Furnish all standard electric motors
- d. Erect equipment
- e. Furnish Scale Conveyor

4. EQUIPMENT PAINTING

Describe Manufacturer's standard coating system including surface preparation and thickness of prime and topcoats.

5. DESCRIPTION/DESIGN REQUIREMENTS FOR CONVEYOR SCALE

a. Conveyor Scale

- 1) Number Required: One
- 2) Material to be weighed: Whole tree chips, bark, and woodwaste
17 lbs. per cubic foot 50% moisture

b. Design Requirements

- 1) Guaranteed Accuracy of $\pm 1/2\%$
- 2) Calibration: Electronic or static weight.
- 3) Suspension Linkage: 2-Idler or 4-Idler mounting
- 4) Remote totalizer.
- 5) Totalizer indicating tenths of ton at scale head.

6) Belt speed compensation

7) Instrumentation for transmitting 4 to 20 milliamp, dc analog signal to electronic recorder.

8) NEMA 4 enclosures

9) Continuous service.

10) 460 volt, 3 phase, 60 Hertz power supply.

c. Scale Conveyor (By Others)

36" BW @ 240 FPM

104 TPH

Gravity Takeup

35° Idlers

+ 441 Long

6. GUARANTEE

Vendor shall guarantee rates or capacities specified and shall include workmanship and defective parts warranty for a period of one year after start-up.

7. ATTACHMENTS

See ATTACHMENT AT-1 for other documents applicable to this Specification.

ATTACHMENT AT-1

The following checked ☒ Supplemental Requirements documents, all dated 062078 , become a part of Specification No. 1858/31 . Other documents also checked ☒ hereon are attachments to the Specification. Drawings, Charts, Lists, Sketches, etc., when listed and attached, are specifically applicable to the Specification.

☒ BID EVALUATION DATA SHEETS (1)

☐ DESIGN DATA SHEETS ()

☐ MANUFACTURER'S DATA SHEETS ()

☐ FORM E246 NOISE LEVEL DATA REQUEST SHEETS ()

☐☐☐☐☐

☐ SPECIAL INSTRUCTIONS TO BIDDERS (For Equipment)

☐ SPECIAL INSTRUCTIONS TO BIDDERS (For Materials)

☒ SUPPLEMENTAL REQUIREMENTS FOR

- VENDOR DOCUMENTS/EQUIPMENT
- VENDOR DOCUMENTS/MATERIALS
- EQUIPMENT SHIPPING AND MARKING
- EQUIPMENT INSPECTION, TESTS, START-UP
- MISCELLANEOUS ITEMS AND GUARANTEES
- COUPLINGS AND MECHANICAL DRIVES
- ELECTRIC MOTORS BELOW 600V, AC
- ELECTRIC MOTORS ABOVE 600V, AC
- SPARE PARTS
- EQUIPMENT PAINTING
- EQUIPMENT PRE-ASSEMBLY, SHOP ASSEMBLY, MODULE CONSTRUCTION
- OSHA AND NOISE CONTROL FEDERAL REGULATIONS
- ASME CODE DOCUMENTATION
- EQUIPMENT MANUFACTURED USING METRIC MEASURING UNITS

☐ DRAWINGS/SKETCHES

COMPANY DEPARTMENT OF ENERGY
 CONTRACT NO. 21-1899
 SPECIFICATION NO. 1858/31
 AREA NO. WOOD HANDLING
 EQUIPMENT NO. BELT CONVEYOR SCALES

DATE 090878 PAGE 1 OF 1
 BID EVALUATION DATA SHEET
 VENDOR

ITEM	DESCRIPTION
TYPE	
MODEL NUMBER	
GUARANTEED ACCURACY	
TYPE CALIBRATION EQUIPMENT INCLUDED	
ESTIMATED TIME REQUIRED FOR CALIBRATION	
RECOMMENDED FREQUENCY OF RE-CALIBRATION	
NO. OF IDLERS MOUNTED ON SUSPENSION LINKAGE	
LOCAL TOTALIZER INCLUDED	YES NO
REMOTE TOTALIZER INCLUDED	YES NO
INSTRUMENTATION FOR 4-20 MILLAMP DC ANALOG	
SIGNAL INCLUDED.	YES NO
BELT SPEED COMPENSATION INCLUDED	YES NO
NEMA 4 CABINETS INCLUDED	YES NO
COST OF SCALE	
FREIGHT	
WEIGHT	
COST OF SERVICE ENGINEER:	
DAYS INCLUDED	
TRIPS INCLUDED	

E. DIVISION 19 -- ENVIRONMENTAL CONTROL

			<u>Page</u>
1.	1951/14	PRIMARY MULTIPLE TUBE MECHANICAL DUST COLLECTOR FOR WOOD WASTE BOILER	659
2.	1951/15	SECONDARY MULTIPLE TUBE MECHANICAL DUST COLLECTOR FOR WOOD WASTE BOILER	669
3.	1954/01	ELECTROSTATIC PRECIPITATOR	679
4.	1975/01	WATER COOLING TOWER	707

REVISION NO. 1, May 3, 1979

SPECIFICATION

NO. 1951/14

PRIMARY MULTIPLE TUBE MECHANICAL
DUST COLLECTOR
FOR WOOD WASTE BOILER

EQUIPMENT NO. DC-0601

FOR

DEPARTMENT OF ENERGY

BIOMASS CO-GENERATION FACILITIES

IN THE

STATE OF MAINE

Prepared by

THE RUST ENGINEERING COMPANY

CONTRACT 21-1899

SPECIFICATION
NO. 1951/14
PRIMARY MULTIPLE TUBE MECHANICAL DUST COLLECTOR
FOR WOOD WASTE BOILER

1. INTENT

This Specification is intended to accompany Purchase Inquiry inviting Proposals to furnish equipment needed in connection with The Biomass Co-Generation Facilities in the State of Maine.

2. SCOPE

Vendor shall design, fabricate and ship FOB jobsite, all of the component parts for a primary multiple tube mechanical dust collector as described herein and in the attached SUPPLEMENTAL REQUIREMENTS. The Vendor shall furnish the following:

- a. Dust collector, including collecting tubes, inlet guide vanes, and outlet tubes.
- b. Hoppers, including access doors and poke holes.
- c. Support brackets to set collector on beam or column supports.
- d. Sectionalization dampers and operators if required for alternate operations.

3. WORK, EQUIPMENT, SERVICES BY OTHERS

The Purchaser will furnish the following items:

- a. Foundations, platforms and supports for support or service of equipment.
- b. Motors (unless normally included with equipment), starters, and wiring.
- c. Insulation and lagging.
- d. Instrumentation and Controls.
- e. Flues, expansion joints, and breeching.

4. STANDARDS AND CODES APPLICABLE

Equipment shall be constructed of new first class engineered materials and shall conform to all applicable Federal, State and local laws, Standards, Codes and regulations, current at the time of purchase, of the:

- a. American Society of Mechanical Engineers (ASME)
- b. American Society for Testing and Materials (ASTM)

- c. American National Standards Institute (ANSI)
- d. National Electrical Manufacturers Association (NEMA).
- e. Occupational Health and Safety Act (OSHA)
- f. Industrial Gas Cleaning Institute (IGCI)

g. The collector shall be designed in accordance with current AISC specifications and the Uniform Building Code-1976. The design wind load per UBC-1976 utilizing 35 lb/ft² basic wind pressure column per Table 23F. The earthquake zone is No. 2. Design live loads for all platforms and walkways shall be 100 psf.

5. MISCELLANEOUS REQUIREMENTS

The coating system on exterior surface only, shall be per the attached COATING SYSTEM NO. Z-01-A.

6. PROCESS DESCRIPTION

a. The exhaust gases from the bark and wood waste boiler will enter the dust collector under negative pressure from an induced draft fan located downstream. A bark drying system with bypass capability will be installed downstream of the new primary dust collector. The induced draft fan will be sized to include the collector pressure drop. Pressure drop will be a consideration in the bid evaluation.

b. Downstream of the bark drying system will be secondary mechanical cyclone dust collectors followed by an electrostatic precipitator and induced draft fan.

7. DESIGN DATA

The collector for the bark boiler shall be designed based on the following data:

a. <u>Boiler Data</u>	<u>With Bark Drying</u>	<u>Without Bark Drying</u>
1) Steam Production (Lb/hr)	510,000	510,000
2) Steam Temperature (°F)	925	925
3) Steam Pressure (psig)	1,500	1,500
4) Boiler Efficiency (%)	72	68
5) Excess Air (%)	50	50
6) Heat Input (Btu/hr x 10 ⁶)	696	696

b.	<u>Fuel Data</u>	With Bark	Without Bark
		<u>Drying</u>	<u>Drying</u>
	Bark and Wood Fired (lb/hr)	138,950 (40% H ₂ O)	166,700 (50% H ₂ O)
c.	<u>Flue Gas Data</u>		
1)	Flow Rate (AWCFM x 10 ³)	315	330
2)	Temperature (°F)	350	350
3)	Moisture (% by vol.)	21.6	28.5
d.	<u>Emission Data</u>		
1)	Dust to Mechanical Collector from Boiler (gr/SDCF)	4.31	4.31
2)	Dust from Mechanical Collector	1.29	1.29
3)	Approximate Bulk Density (lb/ft ³)	25	25
4)	Standard conditions are at 70°F and 29.92 in. Hg.		

8. DESIGN REQUIREMENTS

a. Number of units: one (1). Minimum efficiency 70%. Draft loss, minimum 2.5" w.c. at normal operations and maximum 3.5" w.c.

b. Collector designed for -25" WC; constructed of minimum 3/16" carbon steel; gas tight; and shall be furnished complete including as a minimum, the following:

- 1) All internals, no recovery vanes in clean gas tubes. Collecting tubes, inlet vanes, and clean gas tubes to be replaceable.
- 2) Any actuators, drives, motors, etc., required for regulation of pressure drop.
- 3) Manholes as needed to insure access to all areas of the collector and its internals and hoppers.
- 4) Flanged inlets, outlets, and hopper bottoms.
- 5) Collecting tubes shall have a minimum of 9 inch diameter and a maximum 14 inch diameter, shall have a minimum wall thickness of 1/4", and shall be minimum 300 Brinell hardness cast iron.

- 6) Clean gas tubes shall be constructed of minimum 10 gauge carbon steel. The front row shall have wear shields for protection from abrasion.
- 7) Plenums, if required, to insure proper gas distribution for efficient operation (Vendor has sole responsibility for proper gas distribution). Tube sheets shall be minimum 3/8" carbon steel.
- 8) Hoppers shall have a minimum of 60° valley angle and shall be constructed of minimum 3/16" carbon steel and properly stiffened. Vendor design shall be for three (3) hoppers.
- 9) Insulating clips shall be provided on the collector with maximum 12" spacing.
- 10) Collector shall be as completely shop assembled as possible. If shipment must be made in subsections, they shall be match marked and fitted with clips for easy erection. The amount of field assembly and welding shall be described in the Proposal.
- 11) Hopper rodding ports shall be provided at each hopper outlet and shall consist of 4" Schedule 40 carbon steel pipe with screwed steel caps.
- 12) Collector to be side inlet, side outlet.

9. GUARANTEES

- a. The Vendor shall have a specific statement in his Proposal outlining his equipment performance guarantees and warranties. Vendor shall state the time period of the warranty for each item which shall include all workmanship, materials and equipment provided by Vendor.
- b. The Vendor has the sole responsibility and must guarantee that the equipment furnished will perform as specified and will reduce emissions from the bark and wood fired boiler to 1.29 grains maximum per SDCF. The Vendor shall meet the above conditions when the collector system is treating from 300,000 acfm to 350,000 acfm of bark boiler flue gas at the design conditions stated in paragraph 7. The Vendor's equipment shall meet these performance requirements on a continuous basis.
- c. Tests to determine if the guaranteed outlet emissions are met will be conducted by the customer using the procedures outlined in the Federal Register, Vol. 36, No. 247, Part II, dated December 23, 1971, and entitled "Standards of Performance for New Stationary Sources." The Vendor will be allowed to witness these tests. Five performance tests at maximum boiler load will be conducted. For acceptance three tests must be less than or equal to 1.29 grains/SCFD. Fifteen percent of the contract price will be withheld until acceptance tests are successfully completed.
- d. Vendor shall be responsible for incorporating in his design the latest modifications which have been found necessary and desirable based on operating experience with similar equipment. The facilities are to be the most advanced design possible based upon knowledge available at the time of manufacture.

10. INFORMATION FROM VENDOR TO BE INCLUDED IN PROPOSAL

The Vendor shall furnish as a part of his Proposal:

- a. Complete information for each unit as required in the attached SPECIAL INSTRUCTIONS TO BIDDERS.
- b. Complete description of proposed equipment.
- c. Technical literature concerning equipment to be furnished.
- d. All information necessary for the Purchaser to purchase all motors and the I.D. fan.
- e. General arrangement drawings sufficient for preliminary layout purposes.
- f. Collector efficiency curves and draft loss curves for complete range of gas flows as previously specified shall be furnished as part of the Performance Guarantee.
- g. Price for each item complete as specified herein.
- h. Exceptions which bidders wish to make to the Specification, including any alternate Proposals.
- i. Installation list of collectors on similar application (including materials of construction) and of similar size. Include dates of installation.

11. ATTACHMENTS

See ATTACHMENT AT-1 for other documents applicable to this Specification as attachments thereto.

ATTACHMENT AT-1

The following checked ☒ Supplemental Requirements documents, all dated 062078, become a part of Specification No. 1951/14. Other documents also checked ☒ hereon are attachments to the Specification. Drawings, Charts, Lists, Sketches, etc., when listed and attached, are specifically applicable to the Specification.

☒ BID EVALUATION DATA SHEETS (2)

☐ DESIGN DATA SHEETS ()

☐ MANUFACTURER'S DATA SHEETS ()

☐ FORM E246 NOISE LEVEL DATA REQUEST SHEETS ()

☒ COATING SYSTEM NO. Z-01-A

☐☐☐☐

☐ SPECIAL INSTRUCTIONS TO BIDDERS (For Equipment)

☐ SPECIAL INSTRUCTIONS TO BIDDERS (For Materials)

☒ SUPPLEMENTAL REQUIREMENTS FOR

- ☒ VENDOR DOCUMENTS/EQUIPMENT
- ☐ VENDOR DOCUMENTS/MATERIALS
- ☒ EQUIPMENT SHIPPING AND MARKING
- ☒ EQUIPMENT INSPECTION, TESTS, START-UP
- ☒ MISCELLANEOUS ITEMS AND GUARANTEES
- ☐ COUPLINGS AND MECHANICAL DRIVES
- ☐ ELECTRIC MOTORS BELOW 600V, AC
- ☐ ELECTRIC MOTORS ABOVE 600V, AC
- ☒ SPARE PARTS
- ☐ EQUIPMENT PAINTING
- ☒ EQUIPMENT PRE-ASSEMBLY, SHOP ASSEMBLY, MODULE CONSTRUCTION
- ☒ OSHA AND NOISE CONTROL FEDERAL REGULATIONS
- ☐ ASME CODE DOCUMENTATION
- ☐ EQUIPMENT MANUFACTURED USING METRIC MEASURING UNITS

☐ DRAWINGS/SKETCHES

COMPANY DOE BIOMASS PROJECT
 CONTRACT NO. 21-1899
 SPECIFICATION NO. 1951/14
 AREA NO. WOOD & BARK BOILER
 EQUIPMENT NO. PRIMARY MECHANICAL DUST COLLECTOR

DATE 110178 PAGE 1 OF 2

BID EVALUATION DATA SHEET

ITEM	DESCRIPTION
DUCT COLLECTOR NOMENCLATURE AND	
DESCRIPTION:	
FLANGED INLET, OUTLET, AND HOPPERS?	
DIMENSIONS (Ht is overall, Ht incl. hoppers)	WIDE X DEEP X HT
WEIGHT	
NUMBER OF TUBES	WIDE X DEEP
DESCRIPTION OF COLLECTING TUBES	
DESCRIPTION OF INLET GUIDE VANES	
DESCRIPTION OF CLEAN GAS TUBES	
WEAR SHIELDS: TYPE & MATERIALS CONSTRUCTION	
RECOVERY VANES?	
MATERIALS OF CONSTRUCTION - HOUSING	
- HOPPERS	
-TUBE SHEETS	
DESCRIPTION OF SUPPORT BRACKETS	
NUMBER OF HOPPERS	
CAPACITY OF EACH HOPPER - FT ³	
SIZE HOPPER DISCHARGE; VALLEY ANGLE	
PRESSURE DROP ACROSS COLLECTOR INCHES-H ₂ O	W/DRYING ;W/O DRYING
EXPECTED EFFICIENCY - PARTICULATES	W/DRYING ;W/O DRYING
GUARANTEED EFFICIENCY - PARTICULATES	W/DRYING ;W/O DRYING
INSULATION CLIPS: TYPE & SPACING	
MAXIMUM PRESSURE COLLECTOR	+ IN WC
WILL WITHSTAND	- IN WC

1951/14

COATING SYSTEM NO. Z-01-A

PURPOSE

An inorganic zinc single-coat system designed to withstand temperatures up to 800°F for breeching and stack exteriors.

APPLICABLE REQUIREMENTS

"General Requirements for Standard Coating Systems" (GR-3, attached, are applicable to this system.

SURFACE PREPARATION

Near white blast
Anchor pattern profile

SSPC-SP10

SSPC SP10
1.5 mil average

PRIMER

Dry Mills

Inorganic zinc silicate 2.0

TOTAL DRY MIL THICKNESS 2.0

APPLICATION TEMP. LIMITS above 350°F

HUMIDITY LIMITS below 90%

DRY TEMP. LIMITS 800°F Continuous

GENERAL REQUIREMENTS FOR STANDARD COATING SYSTEMS (GR-3)

1. GENERAL

- a. The Manufacturer's recommendations and requirements shall be considered a part of the specified COATING SYSTEM(S).
- b. The manufacturer of all topcoats must be the same as the manufacturer of the prime coat.
- c. Colors shall be as selected and as shown on schedules. Safety colors shall be in accord with ANSI Standards.

2. REFERENCE STANDARDS AND CODES

Applicable Standards and Codes of the following organizations shall apply to COATING SYSTEMS unless otherwise noted:

- a. SSPC - Steel Structures Painting Council for surface preparation and application.
- b. NACE - National Association of Corrosion Engineers for surface preparation.
- c. ANSI - American National Standards Institute for safety color coding of physical hazards.

REVISION NO. 1, MAY 2, 1979

SPECIFICATION

NO. 1951/15

SECONDARY MECHANICAL DUST COLLECTOR

FOR WOOD WASTE BOILER

EQUIPMENT NOS. DC-0602 A,B,C, & D

FOR
DEPARTMENT OF ENERGY
BIOMASS CO-GENERATION FACILITIES
IN THE
STATE OF MAINE

Prepared by
THE RUST ENGINEERING COMPANY
CONTRACT 21-1899

SPECIFICATION
NO. 1951/15
SECONDARY MECHANICAL DUST COLLECTOR
FOR WOOD WASTE BOILER

1. INTENT

This Specification is intended to accompany Purchase Inquiry inviting Proposals to furnish equipment needed in connection with The Biomass Co-Generation Facilities in the State of Maine.

2. SCOPE

Vendor shall design, fabricate and ship FOB jobsite, all of the component parts for a secondary mechanical dust collector as described herein and in the attached SUPPLEMENTAL REQUIREMENTS. The Vendor shall furnish the following:

- a. Dust collector, large diameter cyclone type with flanged side entry centrifugal inlet, top outlet, and surge hopper or surge pot under collector cone bottom.
- b. Access doors and poke holes.
- c. Support brackets to set collector on beam or column supports.
- d. Outlet plenum if more than one cyclone is required. Plenum to have flanged top outlet.
- e. Interior of cyclone barrel section to be lined with hex mesh steel and abrasion resistant refractory or troweled surface.

3. WORK, EQUIPMENT, SERVICES BY OTHERS

The Purchaser will furnish the following items:

- a. Foundations, platforms and supports for support or service of equipment.
- b. Motors (unless normally included with equipment), starters, and wiring.
- c. Insulation and lagging.
- d. Instrumentation and Controls.
- e. Flues, expansion joints, and breeching.

4. STANDARDS AND CODES APPLICABLE

Equipment shall be constructed of new first class engineered materials and shall conform to all applicable (as of date of purchase) Federal, State and local laws, Standards, Codes, and Regulations of the:

- a. American Society of Mechanical Engineers (ASME)
- b. American Society for Testing and Materials (ASTM)

- c. American National Standards Institute (ANSI)
- d. National Electrical Manufacturers Association (NEMA)
- e. Occupational Health and Safety Act (OSHA)
- f. Industrial Gas Cleaning Institute (IGCI)
- g. The collector shall be designed in accordance with current AISC specifications and the Uniform Building Code-1976. The design wind load per UBC-1976 utilizing 35 lb/ft² basic wind pressure column per Table 23F. The earthquake zone is No. 2. Design live loads for all platforms and walkways shall be 100 psf.

5. MISCELLANEOUS REQUIREMENTS

The coating system on exterior surface only, shall be per the attached COATING SYSTEM NO. Z-01-A.

6. PROCESS DESCRIPTION

- a. The exhaust gases from four bark dryers will enter the secondary dust collectors under negative pressure. An electrostatic precipitator will be installed downstream of the secondary collector followed by the induced draft fan. The system will be provided a by-pass around the dryers. Each dryer shall have its own cyclone(s).
- b. The induced draft fan will be sized to include the collector pressure drop. Pressure drop will be a consideration in the bid evaluation.

7. DESIGN DATA

The collector for the bark dryers shall be designed based on the following data:

a. Boiler Data

1)	Steam Production (lb/hr)	510,000
2)	Steam Temperature (°F)	925
3)	Steam Pressure (psig)	1,500
4)	Boiler Efficiency (%)	72
5)	Excess Air (%)	50
6)	Heat Input (Btu/hr x 10 ⁶)	696

b. Fuel Data

Bark Fired (lb/hr)	138,950 (40% H ₂ O)
--------------------	--------------------------------

c.	<u>Flue Gas Data</u>	<u>Per Dryer</u>	<u>Total Four Dyers</u>
1)	Flow Rate (AWCFM x 10 ³)	67.5	270
2)	Temperature (°F)	200	200
3)	Density (lb/ft ³)	0.0576	0.0576
4)	Moisture (% by vol.)	21.6	21.6
d.	<u>Emission Data</u>		
1)	Dust to Mechanical Collectors from dryers (grains/SDCF)	4.31	4.31
2)	Dust from Mechanical Collectors to precipitator (grains/SDCF)	≤ 1.30	≤ 1.30
3)	Approximate Bulk Density (lb/ft ³)	25	25
4)	Standard conditions are at 70°F and 29.92 in Hg.		

8. DESIGN REQUIREMENTS

a. Number of units: By Vendor. Minimum efficiency 95%. Draft loss, minimum 4.0" w.c. at normal operations and maximum 6.0" w.c.

b. Collector designed for -25" WC; constructed of minimum 1/4" carbon steel, gas tight; and shall be furnished complete including as a minimum, the following:

- 1) All internals, if required, to be replaceable.
- 2) Barrels of cyclones to be lined.
- 3) Manholes as needed to insure access to all areas of the collector and its hoppers.
- 4) Flanged inlets, outlets, and hopper bottoms.
- 5) Outlet plenums required if more than one cyclone per dryer.
- 6) Hoppers shall have a minimum of 60° valley angle and shall be constructed of minimum 1/4" carbon steel and properly stiffened.

7) Insulation clips shall be provided on the collector with maximum 12" spacing.

8) Collector shall be as completely shop assembled as possible. If shipment must be made in subsections, they shall be match marked and fitted with clips for easy erection. The amount of field assembly and welding shall be described in the Proposal.

9) Hopper rodding ports shall be provided at each hopper outlet and shall consist of 4" Schedule 40 carbon steel pipe with screwed steel caps.

10) Collector to be side inlet, top outlet.

9. GUARANTEES

a. The Vendor shall have a specific statement in his Proposal outlining his equipment performance guarantees and warranties. Vendor shall state the time period of the warranty for each item which shall include all workmanship, materials and equipment provided by Vendor.

b. The Vendor has the sole responsibility and must guarantee that the equipment furnished will perform as specified and will reduce emissions from the bark dryers to 1.30 grains maximum per SDCF. The Vendor shall meet the above conditions when the collector system is treating from 250,000 acfm to 300,000 acfm of bark dryer flue gas at the design conditions stated in paragraph 7. The Vendor's equipment shall meet these performance requirements on a continuous basis.

c. Tests to determine if the guaranteed outlet emissions are met will be conducted by the customer using the procedures outlined in the Federal Register, Vol. 36, No. 247, Part II, dated December 23, 1971, and entitled "Standards of Performance for New Stationary Sources." The Vendor will be allowed to witness these tests. Five performance tests at maximum boiler load will be conducted. For acceptance three tests must be less than or equal to 1.30 grains/SCFD. Fifteen percent of the contract price will be withheld until acceptance tests are successfully completed.

d. Vendor shall be responsible for incorporating in his design the latest modifications which have been found necessary and desirable based on operating experience with similar equipment. The facilities are to be the most advanced design possible based upon knowledge available at the time of manufacture.

10. INFORMATION FROM VENDOR

The Vendor shall furnish as a part of his Proposal:

a. Complete information for each unit as required in the attached SPECIAL INSTRUCTIONS TO BIDDERS.

- b. Complete description of proposed equipment.
- c. Technical literature concerning equipment to be furnished.
- d. All information necessary for the Purchaser to purchase all motors and the I.D. fan.
- e. General arrangement drawings sufficient for preliminary layout purposes.
- f. Collector efficiency curves and draft loss curves for complete range of gas flows as previously specified shall be furnished as part of the Performance Guarantee.
- g. Price for each item complete as specified herein.
- h. Exceptions which bidders wish to make to the Specification, including any alternate Proposals.
- i. Installation list of collectors on similar application (including materials of construction) and of similar size. Include dates of installation.

11. ATTACHMENTS

See ATTACHMENT AT-1 for other documents applicable to this Specification as attachments thereto.

ATTACHMENT AT-1

The following checked ☒ Supplemental Requirements documents, all dated 062078, become a part of Specification No. 1951/15 . Other documents also checked ☒ hereon are attachments to the Specification. Drawings, Charts, Lists, Sketches, etc., when listed and attached, are specifically applicable to the Specification.

☒ BID EVALUATION DATA SHEETS (2)

☐ DESIGN DATA SHEETS ()

☐ MANUFACTURER'S DATA SHEETS ()

☐ FORM E246 NOISE LEVEL DATA REQUEST SHEETS ()

☒ COATING SYSTEM NO. Z-01-A

☐☐☐

☐ SPECIAL INSTRUCTIONS TO BIDDERS (For Equipment)

☐ SPECIAL INSTRUCTIONS TO BIDDERS (For Materials)

☒ SUPPLEMENTAL REQUIREMENTS FOR

- VENDOR DOCUMENTS/EQUIPMENT
- VENDOR DOCUMENTS/MATERIALS
- EQUIPMENT SHIPPING AND MARKING
- EQUIPMENT INSPECTION, TESTS, START-UP
- MISCELLANEOUS ITEMS AND GUARANTEES
- COUPLINGS AND MECHANICAL DRIVES
- ELECTRIC MOTORS BELOW 600V, AC
- ELECTRIC MOTORS ABOVE 600V, AC
- SPARE PARTS
- EQUIPMENT PAINTING
- EQUIPMENT PRE-ASSEMBLY, SHOP ASSEMBLY, MODULE CONSTRUCTION
- OSHA AND NOISE CONTROL FEDERAL REGULATIONS
- ASME CODE DOCUMENTATION
- EQUIPMENT MANUFACTURED USING METRIC MEASURING UNITS

☐ DRAWINGS/SKETCHES

COMPANY DOE BIOMASS PROJECT
 CONTRACT NO. 21-1899
 SPECIFICATION NO. 1951-15
 AREA NO. WOOD AND BARK BOILER
 EQUIPMENT NO. SECONDARY MECHANICAL DUST COLLECTOR

DATE 110178 PAGE 1 OF 2
 Rev. 1-050279
 BID EVALUATION DATA SHEET

VENDOR

ITEM	DESCRIPTION
DUCT COLLECTOR NOMENCLATURE AND	
DESCRIPTION:	
FLANGED INLET, OUTLET, AND HOPPERS?	
DIMENSIONS (HT IS OVERALL, HT INCL. HOPPERS)	INSIDE DIAMETER X HT
WEIGHT	
NUMBER OF CYCLONES PER DRYER	
MATERIALS OF CONSTRUCTION - BARREL AND CONE	
SURGE HOPPERS	
- OUTLET TUBE	
- OUTLET PLENUM	
DESCRIPTION OF SUPPORT BRACKETS	
CAPACITY OF EACH HOPPER - FT ³	
SIZE HOPPER DISCHARGE: VALLEY ANGLE	;
PRESSURE DROP ACROSS COLLECTOR INCHES - H ₂ O	
EXPECTED EFFICIENCY - PARTICULATES, %	
GUARANTEED EFFICIENCY - PARTICULATES, %	
INSULATION CLIPS: TYPE & SPACING	
MAXIMUM PRESSURE COLLECTOR WILL WITHSTAND	+ IN WC ; - IN WC
INSULATION CLIPS INCLUDED? (676)	

COMPANY DOE BIOMASS PROJECT
CONTRACT NO. 21-1899
SPECIFICATION NO. 1951-15
AREA NO. WOOD AND BARK BOILER
EQUIPMENT NO. SECONDARY MECHANICAL DUST
 COLLECTOR

DATE 110178
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PAGE 2 OF 2

BID EVALUATION DATA SHEET

VENDOR

ITEM	DESCRIPTION
ACCESS DOORS: DESCRIPTION	
NUMBER	
LOCATION	
POKE HOLES: NUMBERS & LOCATION	
NUMBER OF SECTIONS SHIPPED	
INTERNALS SHOP ASSEMBLED?	
CLIPS INCLUDED FOR FIELD ERECTION?	
WELDING REQUIRED	
EFFICIENCY & DRAFT LOSS CURVES INCL.?	
DRAWING SCHEDULE	
SHIPPING SCHEDULE	
PRICE	
ESTIMATED FREIGHT	
FOB	
TERMS	
(677)	

COATING SYSTEM NO. Z-01-A

PURPOSE

An inorganic zinc single-coat system designed to withstand temperatures up to 800°F for breeching and stack exteriors.

APPLICABLE REQUIREMENTS

"General Requirements for Standard Coating Systems" (GR-3, attached, are applicable to this system.

SURFACE PREPARATION

Near white blast
Anchor pattern profile

SSPC-SP10

SSPC-SP10
1.5 mil average

PRIMER

Dry Mills

Inorganic zinc silicate 2.0

TOTAL DRY MIL THICKNESS 2.0

APPLICATION TEMP. LIMITS above 350°F

HUMIDITY LIMITS below 90%

DRY TEMP. LIMITS 800°F Continuous

GENERAL REQUIREMENTS FOR STANDARD COATING SYSTEMS (GR-3)

1. GENERAL

- a. The Manufacturer's recommendations and requirements shall be considered a part of the specified COATING SYSTEM(S).
- b. The manufacturer of all topcoats must be the same as the manufacturer of the prime coat.
- c. Colors shall be as selected and as shown on schedules. Safety colors shall be in accord with ANSI Standards.

2. REFERENCE STANDARDS AND CODES

Applicable Standards and Codes of the following organizations shall apply to COATING SYSTEMS unless otherwise noted:

- a. SSPC - Steel Structures Painting Council for surface preparation and application.
- b. NACE - National Association of Corrosion Engineers for surface preparation.
- c. ANSI - American National Standards Institute for safety color coding of physical hazards.

REVISION NO. 1, MAY 2, 1979

SPECIFICATION

NO. 1954/01

ELECTROSTATIC PRECIPITATOR

EQUIPMENT NO. EP-0603

FOR
DEPARTMENT OF ENERGY
BIOMASS CO-GENERATION FACILITIES
IN THE
STATE OF MAINE

Prepared by
THE RUST ENGINEERING COMPANY
CONTRACT 21-1899
(679)

SPECIFICATION
NO. 1954/01
ELECTROSTATIC PRECIPITATOR

1. INTENT

This Specification is intended to accompany Purchaser Inquiry inviting Proposals to furnish equipment and services needed in connection with The Biomass Co-Generation Facilities in the State of Maine.

2. SCOPE

a. Vendor shall design, supply, fabricate, deliver, unload and erect an electrostatic precipitator, including field supervision, labor, tools, facilities, and equipment necessary to erect and place system into operation.

b. It is the Vendor's responsibility to offer a precipitator design, which includes the optimum arrangement of parallel and series fields, such that the performance requirements of this Specification are met. The Vendor shall take into consideration potential breakdown of equipment components and the resulting requirement for isolating the affected portion for repairs and/or maintenance, while the remaining portion of the equipment will operate within the performance parameters listed elsewhere in this Specification.

c. As specified, the equipment to be furnished, and work to be performed, shall include, but is not limited to the following:

- 1) Electrostatic precipitator complete with all auxiliary equipment including inlet and outlet plenums.
- 2) Supports and trough hoppers (one hopper per two fields in direction of gas flow).
- 3) Access platforms and stairways, gutters and downspouts.
- 4) Thermal Insulation, including aluminum Lagging.
- 5) Painting, including finish coating and field touch-up.
- 6) Special tools and devices for operation and maintenance.
- 7) Receiving, unloading, handling and erection of all furnished materials and equipment.
- 8) Start-up supervision and operator training services.
- 9) Operation and Maintenance Manuals.
- 10) Test crew and equipment to conduct performance tests.
- 11) Drawings.

d. The installation shall be complete and operable, with all necessary appurtenances, materials, or accessories required, whether or not specifically called for or shown on drawings.

3. WORK OR ITEMS TO BE FURNISHED BY OTHERS

All items or services not listed, but which are required for the proper execution of the project shall be furnished by the Vendor.

a. Foundations.

b. Low voltage electrical wiring external to the Vendor proposed equipment, terminating at Vendor supplied externally located terminal or junction boxes.

c. Flange connections to electrostatic precipitator inlet and outlet nozzles, but no gaskets or erection bolts.

d. Electrical motors and starters, except those which are an integral part of the Vendor proposed equipment. Vendor shall supply list of requirements with proposal.

e. Flue fabrication and erection.

f. Compressed air as required for operation. Vendor shall state quantity.

g. Area lighting as required for operation and safety.

h. Steam and/or water as required for operation. Vendor shall state quantity.

i. Ash Removal System.

j. Electrical service for erection purposes at 480 volts, 60 Hz, 3 phase; and 120 volts, 60 Hertz, single phase. One distribution box will be furnished at construction site ground level only. Vendor shall be responsible for his own distribution system and temporary lighting. Vendor shall furnish estimates of power requirements with his bid proposal.

k. Potable water at one source located at construction site ground level.

l. Shut-off and flow control dampers.

m. A room for the housing of precipitator control equipment.

4. STANDARDS AND CODES APPLICABLE

The following listed Standards and Codes, in effect as of date of purchase except as noted otherwise, and any subsections thereof, as applicable, shall govern design and selection of equipment and material supplied:

a. Equipment Design

1) American National Standards Institute (ANSI).

- 2) The American Society of Mechanical Engineers (ASME).
- 3) American Society for Testing and Materials (ASTM).
- 4) Industrial Gas Cleaning Institute.
- 5) Environmental Protection Agency (EPA).
- 6) Factory Mutual Standards.
- 7) National Electric Code.
- 8) The National Electrical Manufacturers Association (NEMA).
- 9) Occupational Safety and Health Act of 1970 (OSHA), as amended.

b. Structural Design

Structural design and construction shall conform to current American Institute of Steel Construction Specifications. Wind loads shall be per the Uniform Building Code, 1976, Table 23-F, 35 psf column. Earthquake loadings shall be per Uniform Building Code for Zone 2. Design live loads for all platforms and walkways shall be 100 psf.

c. Electrical

Ratings, tests, and guarantees of all electrical equipment shall be in accordance with the rulings and standards of the Institute of Electrical and Electronic Engineers. Apparatus, supplies and devices are to be made in accordance with NEMA and IEEE standards.

d. Welding

Structural Welding Code, AWS D1.1-75, American Welding Society (AWS).

5. DRAWINGS BY VENDOR

a. All Vendor drawings and plans, including piping, instrumentation, electrical schematic and wiring diagrams shall be submitted for approval of general design, dimensions, and apparent suitability. No changes in or deviations from approved drawings shall be permitted without written approval.

b. Approval of drawings shall not in any way relieve the Vendor of the responsibility for performance of the work specified herein.

c. See also SUPPLEMENTAL REQUIREMENTS FOR VENDOR DOCUMENTS/EQUIPMENT and for MATERIALS, attached to this Specification.

6. MISCELLANEOUS REQUIREMENTS AND ALTERNATES

a. Subcontractor or Supplier Listing

1) Vendor shall submit as part of his bid proposal a list of Subcontractors and/or Suppliers of major equipment components including, but not limited to, the following:

HV transformer-rectifiers
ESP power and voltage control equipment
Collection electrode plates
Discharge electrode system
Electrode rapping system

2) No Subcontractor's or Supplier's equipment shall be furnished without prior approval of Purchaser or Engineer.

b. Shop Cleaning and Painting

1) General

The Vendor will supply a complete protective coating system for all parts covered by this Specification, with the exception of the precipitator electrode system. Surface preparation, prime coating, finish coating, and field touch-up will be in accordance with The Rust Engineering Company Specification 0988/01, included with this Specification.

2) Electrical Equipment

Finish paint for control panels and electrical equipment shall be Manufacturer's standard for indoor service. Panel color shall be ANSI 255.1, No. G1 light gray.

3) Vendor is required to submit with his proposal a detailed itemization of the parts and portions of equipment subject to protective coating.

7. DESCRIPTION OF THE PROCESS OR EQUIPMENT OPERATIONS

a. The precipitator will serve to remove solid particulate matter entrained in the gases emanating from the bark and wood dryers on a new wood waste fired power boiler serving a kraft pulp mill utilizing wood waste as fuel, with #6 oil as emergency stand-by. The dryers utilize the boiler flue gases for drying and are provided with a by-pass system. Mechanical cyclone dust collectors precede the precipitator.

b. The precipitator shall be of the horizontal gas flow type. The shell shall be constructed of steel. All equipment, with the exception of the electrical control cubicles, shall be designed for in-door operation with special consideration for the corrosive atmosphere normally associated with a pulp mill.

8. DESIGN DATA AVAILABLE

a. The equipment will be subject to the following environmental conditions at jobsite:

- 1) Location: State of Maine within 50 miles of the Atlantic Coast.
- 2) Ambient Temperature Range: +85 to -30°F

b. The wood waste fired boiler is of the combination fuel type and burns oil and wood waste. The wood waste will be distributed with air swept spouts.

- 1) The flue gas path will be: furnace, superheater, convection section, economizer, tubular air preheater, mechanical dust collector, bark dryers, mechanical cyclone dust collectors, electrostatic precipitator, induced draft fan, chimney. (Dryers have a bypass.)
- 2) The boiler is rated at a nominal steam production of 510,000 lbs/hr. @ 1500 psig when firing wood waste with a heating value of 4175 Btu/lb; 50% moisture without drying, and 40% moisture with drying.

9. DESIGN REQUIREMENTS

a. Intent

- 1) This Specification is descriptive of the requirements but does not attempt to enumerate all details of accessories, appurtenances and auxiliary equipment. Such details shall be provided by the Vendor in his proposal, and shall be approved by the Engineer. The intent of Proposal Document and Specifications is to require the furnishing and delivery of a workable apparatus complete and capable of performing as specified.
- 2) The Engineer will give due consideration to the selection of basic applications design parameter, selection of excess capacity, arrangement and number of separately isolatable gas chambers, arrangement and number of series fields, number of electrically isolatable bus sections and the general history of operational reliability offered by the Vendor proposed system.
- 3) The precipitator, all auxiliary equipment, and all components which are part of the Vendor's bid proposal shall be constructed of new, first class engineered materials.
- 5) The Engineer will also evaluate the proposals submitted on the basis of operating costs of the equipment offered, and its energy conservation efficiency. An adjustment factor based on costs of energy consumption will be used.

b. Design Conditions

The precipitator shall be designed and guaranteed to operate under the following conditions, including the ranges specified hereunder. Gas volumes have been established stoichiometrically and do not contain safety margins or allowances for potential differences due to measurement by pitot tube. Vendor to state his design gas volume and temperature range as basis for guaranty conditions in BID EVALUATION DATA SHEETS.

	<u>DESIGN PARAMETER</u>	<u>WITH DRYING</u>	<u>WITHOUT DRYING</u>
1)	Flue gas flow, ACFM	270,000 ACFM	330,000
2)	Flue gas temperature, °F	200	350
3)	Range of moisture contents of gas: (vol %):	21.6	28.5
4)	Average gas pressure, i.w.g.	30.0	20.0
5)	Particulate loading to precipitator (gr/SCFD):	1.30	1.29
6)	Particulate loading from precipitator (gr/SCFD):	0.039	Vendor to state but must be max. 0.039 grains/scfd
7)	The electrostatic precipitator shall be designed for a -35 inch WG pressure.		

c. Performance Requirements

The precipitator shall operate such that throughout the above design conditions and the range of operating conditions as shown, and also during periods of soot blowing, the following performance will be met on a continuous basis:

- 1) Maximum particulate loading in gases leaving the particulate control equipment shall be guaranteed not to exceed (STP-14.7 psia and 70°F) 0.039 grains/scfd during all combinations of operating conditions.
- 2) The gas velocity distribution in the precipitator at a cross-sectional area immediately preceeding the first active collecting devices, more specifically three (3) inches upstream of the leading edge of the first collecting electrodes, shall conform to the following minimum standards:
 - a) That 85 percent of flow measurements be within ± 25 percent of the arithmetic mean gas velocity.
 - b) That 100 percent of flow measurements be within ± 40 percent of the arithmetic mean gas velocity.

c) That no gases by-pass any of the activated parts of the treatment zones in the collection equipment.

3) Vendor shall submit guaranteed performance curves with his Proposal which show the relationship of his proposed performance efficiency vs. gas flow for firing modes of 100% bark and wood waste firing for three collection system conditions:

- a) Complete system fully operative.
- b) One chamber by-passed (out of operation).
- c) The first field in one chamber out of operation.

d. Details

The Vendor shall design, furnish, fabricate, deliver, and erect equipment as specified, complete with, but not necessarily limited to the following accessories and appurtenances as required.

1) One electrostatic precipitator, consisting of at least two separate parallel chambers, each chamber having a number of series electrostatic precipitator fields, separately energized by HV-transformer-rectifiers and controls. Each chamber will be equipped with trough hoppers for collection of precipitated ash and wood dust. The precipitator shall include all supporting steel work required so that sufficient clearance is provided under the hoppers for materials handling equipment and personnel movement (at least ten feet). Also included shall be all platforms, stairways, hand-rails, rappers, electrical energizing equipment, controls and pressurization and ventilation equipment.

2) Vendor shall submit detailed description of the provisions he has incorporated in his design for thermal expansion of the system.

3) Thermal insulation and lagging for electrostatic precipitator walls, roof, and hoppers.

4) Hopper rappers or vibrators, and hopper heaters.

5) All necessary gutters and downspouts.

6) Fabrication and delivery of all structural steel supports and accessories for all equipment furnished herein, including but not necessarily limited to the following:

a) All "Structural Steel" as defined in AISC Code of Standard Practice.

b) All steel stairs, including stringers and treads, nosings, landings, bracing and struts.

c) All handrails to be 1-1/2" dia., Sch. 40 pipe (post and rails) with posts spaced at 7'-0" maximum centers.

d) Toe plate shall be 1/4" x 4".

- e) All metal stair treads, walkways, and platforms are to be grating of Borden Type W/B, or approved equal, hot dipped galvanized. Stairs and walkways shall be a minimum of 2'-6" wide.
- f) All metal ladders and ladder safety cages, having protective coating finish as specified* for exposed structural steel members.
- g) All floor frames and platform supports of ASTM A 36 steel with protective coating as specified.*
- h) All metal decking for floors with protective coating as specified.*
- i) All shims required for connections.
- j) All shop and field connection bolts in accordance with AISC Code of Standard Practice, Section 2, including allowance for waste specified therein. All shop and field connection bolts are to be ASTM A 325 high strength mechanically galvanized per ASTM B 454, Class 50.

*See Specification 0988/01 included with this Specification.

- 6) Vendor shall provide one (1) complete set of all special tools or special devices required for the operation, maintenance and disassembly of any item of equipment furnished under this Specification.
- 7) The Vendor shall provide a comprehensive written recommendation for servicing and maintenance of all equipment furnished. See SUPPLEMENTAL REQUIREMENTS FOR VENDOR DOCUMENTS/EQUIPMENT attached hereto.

e. Precipitator Details

1) Shell

a) Vendor shall offer for his bid a design which includes steel plate construction for the complete precipitator shell, including side walls, front walls, hoppers and roof as required to withstand the stresses caused by thermal differentials and external pressures as specified, and to support the design loads of the precipitator components, plus the live and wind loads.

b) The shell wall shall be gas tight.

2) Access

a) A minimum of one access door shall be provided to each of the precipitator fields. At the first field between each successive field, and following the last field, internal walkways shall be provided to allow access to the electrode system.

- b) A minimum of two access doors shall be provided for each trough hopper.
- c) Access doors shall also be provided in inlet and outlet plenums.
- d) Insulator compartments shall be provided with at least two access doors each.
- e) Access doors shall be well engineered to prevent damage by corrosion. The Vendor may elect to supply double wall doors or an additional inner door to retard potential corrosion. Door latches shall be designed to insure long service life and ease of operation, even when subjected to influences of corrosive action. Doors shall prevent any in leakage of air.

3) Hoppers

- a) The hoppers shall be constructed of minimum 1/4 in. ASTM A 36 plate with suitable external stiffeners and access doors.
- b) The hoppers shall have flanged outlets and rappers, if required, as specified by the Vendor. Instrument connections shall be provided for determining level in each hopper. Instruments by others.
- c) Vendor shall submit a description of measures which will prevent secondary combustion and/or explosions of material collected in the hoppers. This shall consist of suggestions to the Engineer for suitable dust removal equipment connections to hoppers. A bid which does not contain such descriptions will be considered non-responsive to the Specifications.

4) Collecting Electrodes

Vendor shall supply with his bid proposal a statement indicating the fabrication tolerances for flatness and bend, and the alignment tolerances permitted in the final installation.

5) Discharge Electrodes

Vendor shall describe in detail the suspension system, insulator supports and element fastening system used. Vendor shall supply with his bid proposal a statement indicating the alignment tolerances permitted in the final installation.

6) Rappers

Vendor shall describe in detail the system and controls he proposes to furnish. This shall include a performance history and values of rapping forces he expects to be achieved over the control range.

7) Electrical Equipment

The precipitator shall be furnished with electrical power equipment consisting of HV-transformer-rectifiers and controls.

a) Transformer Rectifier

1') Each transformer-rectifier shall be housed and submerged in a common steel tank, filled with a non-flammable insulating liquid (such as silicone-based liquid), which does not contain environmentally hazardous substances. PCB's shall not exceed 100 ppm or 1/4 lb per tank, and the Vendor shall supply a test certificate.

2') The tank shall be equipped with HV bushings, a junction box located above the normal liquid level and containing all LV connections, a liquid level indicator with alarm contact, a contact-making thermometer, a drain valve at lower extremity, a filler connection, liquid cooling radiators external to the tank wall. (Ribbed tank walls are not acceptable.) The transformer tank and cooling radiators shall be hot dipped galvanized and in addition, coated as specified for equipment in Specification No. 0988/01.

3') The rectifier shall be of the silicon diode type and shall include surge protective devices.

4') HV grounding and disconnect switching shall be provided of the open air blade type located in a protective enclosure box external to the tank and on top of the tank cover plate, and this shall feature an observation window to ascertain continuing reliability of contact.

5') The design of the transformer-rectifier shall take into consideration the capacitative load of the precipitator and a form factor shall be applied such that the rated dc load can be obtained, provided sparking does not limit power input.

6') Vendor shall specify precautions or steps necessary to be taken to protect against transformer liquid spills. These steps shall conform to all fire codes and insurance regulations.

b) Controls

Each HV-Power unit shall be provided with its own control equipment housed in a free-standing cubicle of NEMA 3 construction. This shall include:

1') Automatic voltage control equipment of the SCR type. Vendor shall describe in his bid proposal features such as response time, response sensitivity, adjustment features for range of operations.

2') Current limiting device, such that the rated primary current of the unit cannot be exceeded by 10 percent.

3') Manual control features.

4') Instrumentation as follows:

Primary current meter
Primary volt meter
Secondary dc-current meter
Secondary dc-volt meter (real)

5') Circuit protective devices and failure alarms.

6') Local Precipitator Control Panels - Control panels shall be furnished with all devices completely wired to terminal blocks. All pushbuttons, pilot lights, and selector switches shall be heavy-duty, oil-tight units as manufactured by General Electric, or approved equal. When a control function requires a pushbutton and pilot light, a combination pushbutton indicating light shall be supplied. All control relays shall be heavy-duty, machine tool relays. All terminal blocks shall be Square D, Type S Melamine only, or approved equal. All internal control wire shall be one conductor, No. 14 stranded, 19 strand 90°C. Flamenol machine tool wire, shall be 600 volt, General Electric Type S1-58175, or approved equal. All control panel wiring shall be neatly arranged with all wires color coded, properly identified and grouped.

7') Provisions for Remote Precipitator Control and Instrumentation shall be supplied.

c) Vendor shall furnish and install complete permanent equipment grounding to Purchaser supplied connection at base of precipitator supporting steel.

d) Vendor shall supply HV-connections from transformer-rectifiers to discharge electrode system. Vendor shall describe system including conductor protection. Bus duct to be coated internally and externally as specified for exposed parts.

e) Solenoids - Solenoids shall be continuous duty-industrial type with 120 volt, ac operating coil. Without exception, all coils shall be Class "F" or Class "H" insulation, encapsulated insofar as possible. Solenoids to have a manual override plunger such as ASCO LMX8210A2MO, or equal.

f) Power will be supplied at 480 volts, 3 phase, 60 Hz.

8) Safety Interlock

All access doors to the precipitator shall be provided with a safety interlock system, featuring cross connection with the precipitator power equipment circuit breakers and the HV-disconnect switching.

9) Heat Insulation

a) Thermal insulation and lagging shall be provided for the insulator housing, precipitator roof, exterior walls and hoppers plus the complete inlet and outlet nozzles. Precipitator roof lagging shall be capable of supporting operating and maintenance personnel and equipment. All lagging shall be properly flashed to exclude entry of any free moisture into the insulation.

b) Insulation material shall be a semi-rigid light-weight fiberglass board that will not slump, compact, crumble or break, and must have a minimum R value of 11.0. Thickness shall not exceed 4". Installation shall be in strict accordance with insulation Manufacturer's recommendation.

c) Lagging for all surfaces except the roof top shall be a combination of 0.050 "flat plate and 0.040"-4" pitch ribbed aluminum. Aluminum shall be type 3004 with 7072 cladding.

10. QUALITY ASSURANCE

a. The Vendor shall incorporate into his design the latest modifications, materials, and equipment which have been found necessary and desirable, based upon operating experience of his similar type furnished equipment, for operation 24 hours a day, 7 days a week, and 50 weeks per year.

b. See also requirements of SUPPLEMENTAL REQUIREMENTS FOR EQUIPMENT INSPECTIONS, TESTS, START-UP, attached to this Specification.

11. PERFORMANCE AND START-UP TESTS

a. Test Crew and Engineer

The Vendor shall provide the services of the necessary test crew, including one certified Engineer, and all test equipment required for the execution of the performance tests as specified herein.

b. Tests

1) Prior to placing the specified particulate control equipment into service, but after completion of all erection and assembly work associated with the gas containment of the system, the Vendor shall perform an air velocity distribution test at a point representing the cross-sectional area at the precipitator inlet. Maximum air flow will be governed by the limits of the induced draft fan operating on ambient air.

2) After the equipment is placed into service, a number of performance tests shall be conducted by the Vendor to determine if the equipment is performing in accordance with the Specifications.

a) Compliance with Specifications requires successful completion of two test series of three tests each.

b) The first test series shall be conducted within a 90 day period after equipment start-up, and the second test series approximately 180 days after successful completion of the first test series.

3) The test equipment shall have been previously calibrated to the Engineer's satisfaction.

4) The acceptance test shall be conducted within $\pm 10\%$ of the specified maximum design gas flow. Each efficiency determined by the test shall be corrected to the specified gas flow by the following rearrangement of the Deutsch equation:

$$E_c = 1 - e^x \quad x = \sqrt{(V_t/V_c)} \ln (1 - E_t)$$

Where:

E_c = Test efficiency corrected to the specified volume (expressed as a decimal).

E_t = Test efficiency (expressed as a decimal)

e = Base of Napierian Logarithus.

V_t = Gas volume measurement during test, actual cfm.

V_c = Gas volume specified, actual cfm.

5) The acceptance test shall include a minimum of three (3) and a maximum of five (5) individual efficiency determinations. Commencement of individual efficiency determinations shall be spaced at minimum intervals of 24 hours. If the first three corrected test efficiencies, E_c , agree within ± 1 and $1/2$ percent of their average, the official test efficiency shall be the average of these three. If any of the first three corrected test efficiencies deviates by more than ± 1 and $1/2$ percent from their average, two (2) additional efficiency determinations shall be made. The official test efficiency shall then be the average of the highest four (4) of all five (5) corrected test efficiencies.

6) Before each series of tests, the precipitator shall have been operating normally without any special adjustments, cleaning or maintenance for a period of at least 7 consecutive days. The first performance tests shall be run after at least 30 days of operation.

7) If the final acceptance test indicates that the specified and guaranteed performance of the equipment has not been met, the cost of all corrective measures and subsequent EPA or substitute tests as approved by the participants shall be borne by the Vendor until final settlement has been made.

8) All tests shall be made in accordance with EPA Standards of Performance for new Stationary Sources, Federal Register, Volume 36, dated December 23, 1971, Methods 2, 4, and 5, as amended. The test procedures, including a description of equipment used and all data sheets and calculations applicable shall be submitted to the Engineer for approval at least 14 days prior to commencement of testing.

9) The determination of special data outside the scope of the Test Codes shall be made only with the written agreement of all parties to the tests regarding methods of measurement and computation, all of which shall be completely described in the test report. These changes or modifications shall be made without compromising the accuracy of the test results.

10) The Vendor shall be responsible for locating all instrument test connections so that they will be acceptable to all parties and in compliance with applicable codes.

c. Corrective Measures

1) General

a) If corrective measures to the precipitator are undertaken to meet specified or guaranteed overall collection efficiency, all associated outages shall be prearranged with the Owner. Such outages shall be kept to a minimum.

b) Outages which are specifically incurred for the purpose of such corrective measures to the precipitator unit shall be classified as either Short Outages or Extended Outages, and shall be in accordance with requirements specified herein.

c) Time limitations for Short Outages and Extended Outages shall be as specified below. Wherever possible, corrective measures to the precipitator unit shall be taken during other outages not specifically incurred for this purpose, in which case the time spent will not apply toward these time limitations.

2) Short Outages

Short Outages are defined as those specifically incurred for the purpose of corrective measures as specified under Section "General", above, which do not exceed 48 hours continuous duration. The outages shall normally be scheduled at Owner's convenience, and shall include time required for precipitator cool down.

3) Extended Outages

Extended Outages are defined as those specifically incurred for the purposes of corrective measures as specified under Section "General" above, which exceed 48 hours continuous duration. These outages shall be prearranged with the Owner at least two (2) weeks in advance, at which time Vendor shall give the Owner adequate assurance that both labor and materials will be adequate to complete the corrective measures within the requested Outage.

4) Time

Total cumulative time for both short outages and extended outages will not exceed 25 days.

12. GUARANTEES

- a. The Vendor shall guarantee that the equipment furnished will comply with all requirements of the Specification. The Vendor shall guarantee that there will be no malfunctioning which decreases the performance of the equipment or its availability below that specified.
- b. Vendor shall furnish with his bid proposal a statement to the effect that all equipment and materials are new and the best and most suitable for the service required.
- c. Vendor shall furnish with his bid proposal a statement to the effect that the performance of the precipitator will at all times meet with the requirements set forth in paragraph 9.c.1) and 9.c.2) of this Specification. This performance shall apply also during boiler soot blowing at all levels of boiler operation.
- d. Vendor shall furnish with his bid proposal a statement to the effect that the system will be gas tight and free of any leaks.
- e. Performance guarantees for the system shall contain no qualifications requiring pretreatment of either the flue gases or any fuel falling within the specified range.
- f. Vendor shall furnish with his bid proposal a statement to the effect that the gas velocity distribution at the face of the actual precipitator will conform to the requirements specified in paragraph 9.c.2) of this Specification.

13. APPLICABLE DOCUMENTS

RUST SPECIFICATION NO. 0988/01, PROTECTIVE COATING SYSTEMS FOR METALS.

14. ATTACHMENTS

See ATTACHMENT AT-1 for other documents applicable to this Specification as attachments thereto.

ATTACHMENT AT-1

The following checked ☒ Supplemental Requirements documents, all dated 062078, become a part of Specification No. 1954/01 . Other documents also checked ☒ hereon are attachments to the Specification. Drawings, Charts, Lists, Sketches, etc., when listed and attached, are specifically applicable to the Specification.

- ☒ BID EVALUATION DATA SHEETS (11) -
- ☐ DESIGN DATA SHEETS ()
- ☐ MANUFACTURER'S DATA SHEETS ()
- ☐ FORM E246 NOISE LEVEL DATA REQUEST SHEETS ()
- ☐
- ☐
- ☐
- ☐
- ☐ SPECIAL INSTRUCTIONS TO BIDDERS (For Equipment)
- ☐ SPECIAL INSTRUCTIONS TO BIDDERS (For Materials)
- ☒ SUPPLEMENTAL REQUIREMENTS FOR
 - VENDOR DOCUMENTS/EQUIPMENT
 - VENDOR DOCUMENTS/MATERIALS
 - EQUIPMENT SHIPPING AND MARKING
 - EQUIPMENT INSPECTION, TESTS, START-UP
 - MISCELLANEOUS ITEMS AND GUARANTEES
 - COUPLINGS AND MECHANICAL DRIVES
 - ELECTRIC MOTORS BELOW 600V, AC
 - ELECTRIC MOTORS ABOVE 600V, AC
 - SPARE PARTS
 - EQUIPMENT PAINTING
 - EQUIPMENT PRE-ASSEMBLY, SHOP ASSEMBLY, MODULE CONSTRUCTION
 - OSHA AND NOISE CONTROL FEDERAL REGULATIONS
 - ASME CODE DOCUMENTATION
 - EQUIPMENT MANUFACTURED USING METRIC MEASURING UNITS
- ☐ DRAWINGS/SKETCHES

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 AREA NO. POWER BOILER
 EQUIPMENT NO. POLLUTION CONTROL EQUIPMENT

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 Rev. 1-050279
 BID EVALUATION DATA SHEET
 VENDOR

ITEM	DESCRIPTION
A. VENDOR	
1) PROPOSAL NUMBER	
2) DATE OF PROPOSAL	
3) VENDOR LOCATION	
4) REPRESENTATIVE	
5) REPRESENTATIVE'S ADDRESS	
6) PHONE	
VENDOR IS REQUIRED TO FILL IN ALL DATA NOT ACCEPTABLE.	SHEETS: REFERRAL TO VENDOR'S PROPOSAL IS
B. ELECTROSTATIC PRECIPITATOR	
1) PERFORMANCE	
a. GAS VOLUME, DESIGN	W/DRYING : W/O DRYING
b. GAS TEMPERATURE	200°F 350°F
c. GAS PRESSURE	-30 IWG
d. PRESSURE DROP	W/DRYING ; W/O DRYING
e. INLET DUST LOAD GRS./SCFD	1.30 ; 1.29
f. OUTLET DUST LOAD GRS./SCFD*	0.039 ;
g. EFFICIENCY	9% ;
2) ESP DESIGN	
a. NUMBER CHAMBERS	
b. NUMBER SERIES MECH. FIELDS	
c. NUMBER SERIES ELECT. FIELDS	
d. TOTAL NUMBER GAS DUCTS	
e. DISTANCE BETWEEN COLLECTING ELECTRODES (SPACING)	
*GUARANTEED (696)	

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ITEM	DESCRIPTION
f. EFFECTIVE CE HEIGHT	
g. LENGTH EACH SERIES FIELD	
h. TOTAL EFFECTIVE TREATMENT LENGTH	
i. TREATMENT VELOCITY AT RATED GAS VOLUME B.1)a. ABOVE	
j. TREATMENT TIME AT RATED GAS VOLUME	
k. TOTAL EFFECTIVE COLLECTING ELECTRODE AREA	
l. RATIO OF CE AREA TO GAS VOLUME	
m. RATIO OF EFFECTIVE TREATMENT LENGTH TO CE HEIGHT	
n. EFFECTIVE LENGTH OF DISCHARGE ELECTRODES	
o. MAX. LENGTH OF INDIVIDUAL DE ELEMENT WITHOUT SUSPENSION	
p. MAX. SQUARE FEET OF CE RAPPED AT ANY ONE TIME	
q. MAX. COMBINED LENGTH OF DE RAPPED AT ANY ONE TIME	
r. PRECIPITATION CURRENT AVAILABLE 1ST FIELD MA/FT ² CE	
2ND FIELD MA/FT ² CE	
3RD FIELD MA/FT ² CE	
4TH FIELD MA/FT ² CE	
3) ESP DETAILS STRUCTURAL	
a. OVERALL DIMENSIONS EXCLUSIVE OF SUPPORT STEEL	
1. WIDTH	
2. HEIGHT	
3. LENGTH	
b. HEIGHT OF SUPPORT STEEL	
c. SHELL CONSTRUCTION	
1. MATERIAL	
2. WALL THICKNESS	

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ITEM	DESCRIPTION
3. INNER ROOF THICKNESS	
4. OUTER ROOF THICKNESS	
d. INSULATOR COMPARTMENT	YES NO
e. PENTHOUSE	YES NO
f. HOPPERS	
1. NUMBER (TOTAL)	
2. VALLEY ANGLE	
3. OUTLET FLANGE SIZE	
4. HOPPER MATERIAL	
5. PLATE THICKNESS	
g. GAS DISTRIBUTION DEVICES	
1. IN INLET	YES NO
2. TYPE AND THICKNESS	
3. IN OUTLET	YES NO
4. TYPE AND THICKNESS	
5. ARE DIST. DEVICES RAPED	YES NO
h. THERMAL EXPANSION	
1. IS PROVISION MADE AT	
PRECIPITATOR SUPPORT	YES NO
2. TYPE	
i. PROTECTIVE COATING	
1. PRIMER FOR STRUCT. PARTS	
2. TYPE OF PRIMER	
j. ACCESS DOORS	
1. TYPE	(698)

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VENDOR

ITEM	DESCRIPTION
2. SIZE OPENING	
3. NUMBER IN SHELL WALL	
4. NUMBER IN HOPPERS	
5. NUMBER IN INSULATOR	
COMPARTMENTS	
6. NUMBER IN INLET AND OUTLET	
PLENUMS (DUCTS)	
7. INTERLOCK PROVIDED	YES NO
4) ESP HEAT INSULATION	
a. SHELL WALL	
1. TYPE	
2. THICKNESS	
3. LAGGING TYPE	
4. LAGGING THICKNESS	
b. ROOF	
1. TYPE	
2. THICKNESS	
3. LAGGING TYPE	
4. LAGGING THICKNESS	
5. FLUSHING AND DOWNSPOUTS	YES NO
c. HOPPERS	
1. TYPE	
2. THICKNESS	
3. LAGGING TYPE	
4. LAGGING TYPE THICKNESS	(699)

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VENDOR

ITEM	DESCRIPTION	
d. HEAT INSULATION PROVIDED OVER		
ACCESS DOORS	YES	NO
5) ACCESS		
a. INTERNAL ACCESS WALKWAY		
BETWEEN FIELDS	YES	NO
b. ACCESS TO TOP OF ELECTRODE SYST.	YES	NO
c. STAIRWAY TO TOP OF ESP	YES	NO
d. CAGED LADDER TO TOP OF ESP	YES	NO
e. TYPE STAIR THREAD		
f. MATERIAL		
g. TYPE PLATFORMS MATERIAL		
h. TYPE HANDRAILS MATERIAL		
i. TOE PLATE PROVIDED	YES	NO
6) DISCHARGE ELECTRODES SYSTEM		
a. TYPE OF ELEMENT		
b. TOTAL NO. OF ASSEMBLIES OR		
NO. OF WIRES		
c. MATERIAL		
d. THICKNESS OR DIMENSION		
e. SUSPENSION		
1. TOP		
2. BOTTOM		
3. TYPE SPACER SYSTEM		
f. EACH BUS SYSTEM SUSPENDED		
FROM 2 OR 4 SUPPORTS		

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ITEM	DESCRIPTION
g. TYPE SUPPORT INSULATOR	
h. INSULATOR PURGED	YES NO
i. INSULATOR HEATED	YES NO
7) COLLECTING ELECTRODE SYSTEM	
a. TYPE OF ELEMENT	
b. NO. OF ELEMENTS PER ASSEMBLY	
c. GAS DYNAMIC DEVICES	
d. MATERIAL	
f. UPPER SUSPENSION	
g. LOWER SPACING	
8) RAPPERS	
a. TYPE CE RAPPERS	
b. NO. CE RAPPERS	
c. LOCATION CE RAPPERS	
d. ENERGY TYPE: EL., PNEU. ETC.	
e. TYPE DE RAPPERS	
f. NO. DE RAPPERS	
g. LOCATION DE RAPPERS	
h. ENERGY TYPE: EL., PNEU. ETC.	
i. GAS DIST. PLATE RAPPER TYPE	
j. NO. -"-	
k. ENERGY TYPE: ELL, PNEU. ETC.	
l. HOPPER RAPPER TYPE	
m. NO. OF HOPPER RAPPERS	
n. ENERGY TYPE: EL., PNEU. ETC.	

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VENDOR

ITEM	DESCRIPTION			
9) VENTILATING SYSTEM				
a. NO. OF FANS				
b. NO. OF HEATERS				
c. AIR FLOW PER INSULATOR				
d. LOCATION OF VENTILATING SYSTEM				
10) ELECTRICAL				
a. TRANSFORMER-RECTIFIERS				
1. TOTAL NUMBER				
2. ARRANGEMENT	FIELD 1	FIELD 2	FIELD 3	FIELD 4
TYPE				
MAKE (MFG.)				
NUMBER				
RATING: NOMINAL kVA OUTPUT				
ACTUAL kVA OUTPUT				
NOMINAL MA/DC RMS				
ACTUAL MA/DC RMS				
NOMINAL V/DC RMS				
3. MAX. DESIGN TEMP. RISE				
4. INSULATING LIQUID				
5. RECTIFIER TYPE				
6. DIODE PIV				
7. LOCATION OF T/R'S				
8. GROUND SWITCHING	YES	NO		
b. H.V. CONDUCTOR				
1. TYPE				

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VENDOR

ITEM	DESCRIPTION
2. ENCLOSURE	
3. ENCLOSURE MATERIAL	
4. THICKNESS	
5. PROTECTIVE COATING	
6. SUPPORT INSULATORS TYPE	
c. T/R CONTROLS	
1. TYPE	
2. MAKE (MFG.)	
3. TYPE AVC	
4. TYPE ENCLOSURE (NEMA)	
5. HEIGHT	
6. WIDTH	
7. DEPTH	
8. VENTILATION	
9. TEMPERATURE RISE	
10. TYPE CURRENT LIMIT	
11. TYPE CONTROL ADJUSTMENT	
12. TYPE INSTRUMENTATION	
d. RAPPER CONTROLS	
1. TYPE	
2. MAKE	
3. NUMBER CABINETS	
4. TYPE ENCLOSURE (NEMA)	
5. HEIGHT	
6. WIDTH	

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VENDOR

ITEM	DESCRIPTION				
2) ELECTRICAL MOTORS FUR. BY PURCHASER	SERVICE	NO.	HP	SPEED	FRAME NO.
D. ENERGY DATA					
1) ESP ENERGIZATION					
a) TOTAL CONNECTED LOAD kVA					
b) EXPECTED OPERATING LOAD kW					
2) INSULATOR HEATERS TOTAL kW					
3) VENTILATING FANS TOTAL kW					
4) HOPPER HEATERS TOTAL kW					
5) RAPPERS					
a. TOTAL CONNECTED LOAD kW					
b. EXPECTED OPERATING LOAD kW					
c. TOTAL CONNECTED CFM					
d. EXPECTED MAX. OPER. CFM					
e. AIR PRESSURE REQUIRED					
6) PRESSURE DROP OVER ESP					
7) WATER REQUIREMENT					
1. NORMAL FLOW GPM					
2. PRESSURE					

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ITEM	DESCRIPTION
E. PRICING	MATERIAL ERECTION
1. ELECT. PRECIPITATOR, INCL. INLET &	
OUTLET PLENUM, ACCESS PLATFORMS,	
LADDERS, STAIRS, ETC.	
2. COMPLETE INSULATION	
3. ERECTION SUPERVISION	
4. START-UP SERVICE & TESTING	
5. STRUCTURAL SUPPORTING STEEL	
6. ROOF ENCLOSURE	
7. FREIGHT FOB JOBSITE	
8. LUMP SUM COMPLT. SYSTEM	
F. DELIVERY	
1. COMPLETION OF DESIGN AND	
ENGINEERING TRANSMITTALS	
2. DELIVERY FOB JOBSITE	
3. COMPLETION OF ERECTION	

SPECIFICATION

NO. 1975/01

WATER COOLING TOWER

FOR
DEPARTMENT OF ENERGY
BIOMASS CO-GENERATION FACILITIES
IN THE
STATE OF MAINE

Prepared by
THE RUST ENGINEERING COMPANY

CONTRACT 21-1899

(707)

SPECIFICATION
NO. 1975/01
WATER COOLING TOWER

1. INTENT

This Specification is intended to accompany Purchase Inquiry inviting Proposals to furnish equipment and services needed in connection with The Biomass Co-Generation Facilities in the State of Maine.

2. SCOPE

- a. Furnish and deliver FOB jobsite the water cooling tower as specified herein.
- b. The tower shall be an induced mechanical draft cross flow type and it shall be erected by the Vendor on Purchaser's concrete basin. The cooling tower will be used for cooling circulated water from the main surface condenser and other heat exchangers used at this installation.
- c. Furnish field personnel as required for technical direction of installation, start-up and as required during performance tests.
- d. Furnish detailed drawings consisting of:
 - 1) Plan and elevation drawings showing all construction dimensions and details, including drawings for concrete basin.
 - 2) Stress analysis and diagrams
 - 3) Foundation bolts size and layout
 - 4) Performance curves
- e. Unloading, hauling and hoisting of cooling tower components; including installation of electric motors. (Electrical wiring by others.)

3. WORK, EQUIPMENT, SERVICES BY PURCHASER

- a. Concrete basin, sumps and stairway foundation.
- b. Foundation bolts and washers.
- c. Piping and fittings external to the tower up to tower inlet flanges.
- d. Electric motors for tower fans.

- e. Electrical wiring conduit and fittings, including motor starters and control apparatus to each motor. All lighting and electrical wiring and conduit.
- f. Supplies and labor for acceptance test and preliminary operation.
- g. Sprinkling system for tower fire protection.

4. STANDARDS AND CODES APPLICABLE

Current editions or revisions of the following Codes and Standards, as of date of purchase, shall apply:

a. Cooling Tower Institute (CTI) Specifications

CTI Bulletin - STD 103
CTI Bulletin - WMS 112

b. Building Code

Structural design and construction shall conform to the current standards of The American Institute of Steel Construction (AISC) with wind loadings in accordance with National Building Code.

c. Plastics Materials

Standards recommended by The Society of The Plastics Industry shall cover the fabrication and testing of plastic or fiberglass reinforced plastic materials.

d. Wood Preservative Treatment

Pressure preservative treatments as specified in The American Wood Preserver's Association (AWPA) Standard C.1 and C.2 for Pacific Coast Douglas Fir waterborne preservatives shall also apply to treatment of redwood. AWPA Standard P.5 shall also apply.

e. County, State and Federal Regulations and Codes, in effect as of date of purchase, shall be complied with.

5. MISCELLANEOUS REQUIREMENTS AND ALTERNATES

a. Protective Coatings

Manufacturer's standard coating system for gear boxes, drive shaft, bearing housings, fan cylinders etc. are acceptable; however, Vendor shall describe coating system used. All other protective coatings utilized by the Vendor shall be fully described.

b. Erection

The tower shall be erected by Vendor on foundations furnished by Purchaser. Furnish all labor, tools, and services required for erection, except as stated herein. The Vendor shall furnish the dimensional and construction drawings for the concrete basin over which the tower will be installed.

c. Tower Components

Cooling tower components shall be precut and prefabricated to the maximum extent possible.

d. Alternates

- 1) Alternates submitted by the Vendor shall be separately priced, clearly defined, and shall include sufficient information to allow Purchaser to evaluate with Base Bid.
- 2) All hardware in stainless steel in lieu of naval bronze.
- 3) Fire protection sprinkler system installed with tower.
- 4) Treated Douglas fir in lieu of redwood.
- 5) Recommendations and costs for equipment to reduce plume.
- 6) Secondary access to fan deck in addition to Vendor's standard.
- 7) See also paragraph 8.c.5) herein.
- 8) Surfaces of structural steel supporting mechanical equipment, torque tube, balancing valves, fan hubs and gear reducer prepared in accordance with SSPC-10 and epoxy coal tar coated in lieu of hot deep galvanized.
- 9) Lube oil assembly of stainless steel 300 series in lieu of standard copper tubing.

6. SYSTEM DESCRIPTION

Cold water from the cooling tower basin is pumped through the main surface condenser and through other heat exchangers used in the Biomass Conversion Steam Electric Generating Unit. Hot water carrying the heat from the condenser and from the heat exchangers is circulated to the upper portion of the cooling tower. The temperature of the circulated water is reduced in the tower by inducing evaporation of a portion of the circulated water. Evaporation losses, and other losses such as windage and blow down that occur in the cooling tower, are replaced with make-up water.

7. DESIGN DATA AVAILABLE

a. The cooling tower will be installed at grade elevation at a plant located in Westbrook, Maine. Grade elevation at this location is 60 feet above Mean Sea Level.

b. The cooling tower shall be designed for the following:

1) Circulating water flow, gpm	20,500
2) Inlet water temperature, °F	110
3) Outlet water temperature, °F	90
4) Design wet bulb, °F	73
5) Approach, °F	17
6) Drift loss, % circulating water	0.02 max

7) Wind loading, lb/sf

According to National
Building Code

8) Direction and velocity of
Prevailing wind:

c. Make-up water to the cooling tower will be filtered river water or city water. The projected physical-chemical characteristics of the concentrated cooling tower water is as follows:

1) pH, units	8 to 8.5
2) Conductivity, micromhos at 25°C	900
3) Total dissolved solids, mg/l	250
4) Total suspended solids	10
5) Color, units	20
6) Total hardness, mg/l	90
7) Sulfates, mg/l	100
8) Chlorides, mg/l	50
9) Bicarbonate, mg/l	100
10) Silica, mg/l	40

d. The circulating water will be treated as follows:

- 1) Chlorine feed (shock or continuous) for micro-organism growth control.
- 2) Organo-phosphonate feed for scale and corrosion control.

e. The cooling tower shall consist of not more than two cells. Each cell shall be capable of operating or to be repaired independently of the other.

f. The cooling tower shall be so arranged that additional cells may be added without reducing the operating efficiency or the operation of the original tower.

g. All cooling tower safety requirements shall be in accordance with OSHA.

8. DESIGN REQUIREMENTS

a. Structural Design

1) All members and connections shall be designed to withstand the maximum loads imposed, and in accordance with CTI STD-103, Part II, Framework Design Data. Columns, when necessary, shall be firmly secured to the foundation by epoxy coated anchor castings and all framework connections shall be fitted with shear rings.

Unanchored posts shall extend the full depth of the 5'-6" deep basin. Diagonals shall be located and designed to resist both tension and compression loads, thus increasing the effectiveness of each diagonal. Fiberglass reinforced polyester or PVC coated iron or steel moldings with integral plugs shall be used in the joint assemblies. Structural ceramic or FRP rings shall be used in connector ring joint.

- 2) The fan deck shall be designed to support a uniform live load of 60 pounds per square foot.
- 3) A heavy duty redwood handrail with knee and kick boards shall extend around the periphery of the top of the tower.
- 4) Access from basin curb level to fan deck shall be provided at one end of the tower by a redwood stairway. Suitable access shall be provided to drift eliminators, distribution system, and basin.
- 5) The cooling tower shall be located on a concrete basin specified by Vendor and supplied by Purchaser.

b. Materials

- 1) Framework shall be Erdalith treated clear and select heart redwood, but Douglas fir may be quoted as an alternate.
- 2) All wooden members of the cooling tower shall be Erdalith treated clear and select redwood and preservative pressure treated.
- 3) Tower siding shall consist of plain or corrugated cement asbestos, 3/8" thick. Casing panels shall be held in position by Vendor's standard methods, and joints shall be sealed completely watertight.
- 4) The Vendor shall provide a fiberglass reinforced polyester molded-segment, or clear all-heart redwood fan cylinder with velocity recovery extension for each fan, to develop full fan performance and protect operating personnel. The evase' super-structure elevation and construction shall be recommended by the Vendor. Fan stacks shall be self-supporting, with no bolts protruding into the interior. Fan screens not necessary where fan stack exceeds the height of a man and his extended arm cannot reach the blade.
- 5) Distribution system shall be Vendor's standard. If plastic or ceramic is used, specify complete material characteristics. If wood is used, system shall consist of Erdalith treated clear and select redwood throughout. Distributors of nonclogging design shall be located to ensure uniform water distribution. Crossover headers of wood shall be supported on redwood saddles which shall encompass one third of the pipe diameter. The longitudinal header shall be of steel pipe. Entrance connections to the header shall be ANSI 125 pound flanged for connection to Owner's riser.

- 6) Filling assemblies and supports shall be Vendor's standard. If plastic, specify complete material characteristics.
- 7) Inlet louvers shall consist of 3/8" cement asbestos panels.
- 8) Transverse partition walls separating adjacent cells shall extend from fan deck down to one foot below basin curb level. All partitions shall be treated fir plywood, stiffened with studs as required. A hinged door with SS hardware in each partition shall be provided.
- 9) Drift eliminators shall be Vendor's standard. If plastic, specify complete material characteristics. Eliminator sections above distribution system header shall be removable in easily handled sections.
- 10) Fan deck shall be constructed of Erdalith treated clear and select redwood, tongue and groove, surfaced and end matched.
- 11) All hardware shall be naval bronze. Quote alternate for stainless steel.
- 12) An access door shall be provided on each end of the tower with a supported walkway connecting the two ends for inspection.

c. Mechanical Equipment

- 1) Fan(s) shall employ cast aluminum or 304 stainless steel blades. If fiberglass is Vendor's standard, specify complete material characteristics. Blades shall be of adjustable pitch design with hot dip galvanized steel hub. The combination center disc and main hub shall be a single welded, galvanized steel assembly. Main hub shall bolt to inner hub, which shall be keyed to reducer shaft. Fan(s) shall be statically and dynamically balanced at the factory and shall be provided with a vibration limit switch to remove power from the fan motor when excessive vibration occurs. Fans shall be designed to operate either in forward or reverse direction.
- 2) Vibration cut-out switch shall require manual reset before the driver can be started and include the following:
 - a) NEMA 4 enclosure.
 - b) External reset device. It shall not be necessary to disassemble switch for calibrating or setting.
 - c) Capability of being set at some known, predetermined increment above the normal vibration level.
 - d) Non-trip capability due to acceleration of the machinery during start.
 - e) Spare set of contacts and conduit connection to permit alarming motor shutdown.

- 3) Speed reducers shall comply with AGMA Bulletin latest revision. Oil level in the reducers shall be visibly indicated.
- 4) Drive shafts between motor and reducer shall be Vendor's standard. The drive shaft shall be of non-lubricated design, fabricated from Type 304 stainless steel. Flexible couplings of non-lubricated design (Dodge Paraflex, or equal) shall be provided at each end of shaft. Each unit shall be dynamically balanced at the factory prior to shipment. Shaft and coupling guards shall be supplied by Vendor.
- 5) Electrical motors shall be specified by Vendor but supplied by Purchaser if they are of standard horizontal footmounted design. Purchaser intends to use a single-speed, reversing-type motor. In the event of special motor requirements, Vendor shall furnish such. Quote alternate for two speed motor.
- 6) Mechanical equipment supports for the reducer and motor shall consist of a unitized welded assembly of structural steel members (galvanized after fabrication) to ensure a rigid base for adequate support and positioning of motor.
- 7) Accessibility shall be provided for maintenance of all mechanical equipment.

9. QUALITY ASSURANCE

- a. All equipment specified is subject to inspection and test by the Purchaser or Engineer as per SUPPLEMENTAL REQUIREMENTS FOR EQUIPMENT INSPECTION, TESTS, START-UP attached.
- b. Final inspection shall be when sub-assemblies of large equipment are complete, or whenever a complete piece of equipment is assembled. This final inspection is to include, but not be limited to, actual operation of equipment wherever possible.

10. GUARANTEES

a. Performance

The cooling tower shall be guaranteed by the Vendor to perform satisfactorily for conditions as specified in paragraph 7, "Design Data Available", under the operating condition as outlined in ASME Power Test Code 23-1958, "Atmospheric Water Cooling Equipment".

b. Equipment

Vendor shall guarantee that all equipment furnished shall be free from defects in material, workmanship, and design for a period of one year from the date of satisfactory completion of installation and acceptance by Purchaser. Vendor guarantees to repair or replace, at its own expense, the equipment or any part thereof, found to be defective during said one-year period. All replacement parts shall be warranted for one year from date of replacement.

ATTACHMENT AT-1

11. ATTACHMENTS

The following checked ☒ Supplemental Requirements documents, all dated 1975/01, are also checked ☒. See ATTACHMENT AT-1 for other documents applicable to this Specification as attachments thereto. ☒ Drawings, Charts, Lists, Sketches, etc. ☒ specifically applicable to this Specification.

☒ DID EVALUATION REPORT

☐ DESIGN DATA SHEET

☐ MANUFACTURER'S DATA SHEET

☐ TEST DATA SHEET

☐ TEST REPORT

☐ TEST PLAN

☐ TEST PROCEDURE

☐ TEST RESULTS

☐ TEST SUMMARY

☐ TEST CONCLUSIONS

☐ TEST RECOMMENDATIONS

☐ TEST COMMENTS

☐ TEST SIGNATURE

☐ TEST DATE

☐ TEST LOCATION

☐ TEST EQUIPMENT

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ATTACHMENT AT-1

The following checked ☒ Supplemental Requirements documents, all dated 062078, become a part of Specification No. 1975/01 . Other documents also checked ☒ hereon are attachments to the Specification. Drawings, Charts, Lists, Sketches, etc., when listed and attached, are specifically applicable to the Specification.

- ☒ BID EVALUATION DATA SHEETS (6)
- ☐ DESIGN DATA SHEETS ()
- ☐ MANUFACTURER'S DATA SHEETS ()
- ☐ FORM E246 NOISE LEVEL DATA REQUEST SHEETS ()
- ☐
- ☐
- ☐ SPECIAL INSTRUCTIONS TO BIDDERS (For Equipment)
- ☐ SPECIAL INSTRUCTIONS TO BIDDERS (For Materials)
- ☒ SUPPLEMENTAL REQUIREMENTS FOR
 - VENDOR DOCUMENTS/EQUIPMENT
 - VENDOR DOCUMENTS/MATERIALS
 - EQUIPMENT SHIPPING AND MARKING
 - EQUIPMENT INSPECTION, TESTS, START-UP
 - MISCELLANEOUS ITEMS AND GUARANTEES
 - COUPLINGS AND MECHANICAL DRIVES
 - ELECTRIC MOTORS BELOW 600V, AC
 - ELECTRIC MOTORS ABOVE 600V, AC
 - SPARE PARTS
 - EQUIPMENT PAINTING
 - EQUIPMENT PRE-ASSEMBLY, SHOP ASSEMBLY, MODULE CONSTRUCTION
 - OSHA AND NOISE CONTROL FEDERAL REGULATIONS
 - ASME CODE DOCUMENTATION
 - EQUIPMENT MANUFACTURED USING METRIC MEASURING UNITS
- ☐ DRAWINGS/SKETCHES

COMPANY DOE BIOMASS PROJECT
 CONTRACT NO. 21-1899
 SPECIFICATION NO. 1975/01
 AREA NO.
 EQUIPMENT NO. COOLING TOWER

DATE 103178 PAGE 1 OF 6
 BID EVALUATION DATA SHEET
 VENDOR

ITEM	DESCRIPTION
1. MANUFACTURER	
2. GENERAL	
A. PROPOSAL NUMBER	
B. DATE OF PROPOSAL	
C. LOCATION OF MANUFACTURER	
D. REPRESENTATIVE	
E. REPRESENTATIVE'S ADDRESS	
F. PHONE	
3. DESIGN CONDITIONS	
A. CAPACITY, GPM	
B. INLET TEMP. °F	
C. OUTLET TEMP. °F	
D. WET BULB TEMP. °F	
E. DRIFT LOSS %	
F. TYPE TOWER	
4. STRUCTURAL DETAILS	
A. OVERALL L X W X H	
B. INSIDE BASIN L X W	
C. NATIONAL BUILDING CODE	
D. DRY WEIGHT LBS	
E. WET WEIGHT LBS	
F. NO. OF CELLS	
(717)	

COMPANY DOE BIOMASS PROJECT
 CONTRACT NO. 21-1899
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BID EVALUATION DATA SHEET

VENDOR

ITEM	DESCRIPTION
5. MATERIALS	
A. FRAMEWORK MATERIAL	
(1) SIZE	
(2) RING JOINT CONNECTORS	
(3) SHEAR RINGS	
(4) PLUGS	
(5) ANCHOR CONNECTORS	
(6) BOLTS & NAILS	
B. CASING - MATERIAL	
(1) FASTENING METHOD	
(2) SEALING	
C. FAN CYLINDER - MATERIAL	
(1) HEIGHT	
(2) DIAMETER	
D. FAN DECK - MATERIAL	
(1) LIVELOAD, PSF	
(2) HANDRAIL	
(3) KICKBOARDS	
E. DRIFT ELIMINATORS	
(1) MATERIAL	
(2) NO. PASSES	
(3) SPACERS	
(4) SUPPORT	

COMPANY DOE BIOMASS PROJECT
 CONTRACT NO. 21-1899
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 AREA NO.
 EQUIPMENT NO. COOLING TOWER

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BID EVALUATION DATA SHEET

VENDOR

ITEM	DESCRIPTION
F. DISTRIBUTION SYSTEM	
(1) TYPE	
(2) FLOW CONTROL VALVE	
EACH CELL NO. & SIZE	
(3) CLEANOUT VALVE	
(4) NOZZLES	
(5) RISER CONNECTION	
(6) LATERALS	
G. FILLING ASSEMBLIES	
(1) LATERAL - FILL	
(2) MATERIAL - SUPPORTS	
(3) REPLACEMENT PROCEDURE	
H. INLET LOUVERS	
(1) MATERIAL	
(2) ATTACHMENT	
(3) ADJUSTABLE	
I. PARTITION WALLS	
(1) COVERAGE, AS SPECIFIED	
(2) MATERIAL	
J. STAIRWAY	
(1) MATERIAL	
(2) ACCESS PROVIDED	
K. HOT WATER BASIN RECOMMENDED SIZE	
(719)	

COMPANY DOE BIOMASS PROJECT
 CONTRACT NO. 21-1899
 SPECIFICATION NO. 1975/01
 AREA NO.
 EQUIPMENT NO. COOLING TOWER

DATE 103178. PAGE 4 OF 6

BID EVALUATION DATA SHEET

VENDOR

ITEM	DESCRIPTION
6. MECHANICAL EQUIPMENT	
A. FANS	
(1) BLADE MATERIAL	
(2) HUB MATERIAL	
(3) DIAMETER FT	
(4) NO. BLADES EACH	
(5) MANUFACTURER	
(6) FAN SPEED, RPM	
(7) PER FAN AIR DELIVERY	ACFM
(8) TOTAL FAN EFFICIENCY %	
(9) HP REQUIRED	
(10) VIBRATION SWITCH	
(11) MOTOR RPM	
(12) NO. OF FANS/CELL	
(13) TOTAL NO. FANS	
B. REDUCERS	
(1) TYPE	
(2) MANUFACTURER	
(3) SERVICE FACTOR	
(4) REVERSIBLE	
(5) HOUSING MATERIAL	
(6) SHAFT MATERIAL	
(720)	

COMPANY DOE BIOMASS PROJECT
 CONTRACT NO. 21-1899
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 AREA NO.
 EQUIPMENT NO. COOLING TOWER

DATE 103178 PAGE 5 OF 6
 BID EVALUATION DATA SHEET
 VENDOR

ITEM	DESCRIPTION
C. DRIVE SHAFT	
(1) TYPE OF LUBRICATION	
(2) MATERIAL	
(3) COUPLINGS (TOW)	
D. EQUIPMENT SUPPORT	
(1) FOR REDUCER & MOTOR	
(2) MATERIAL	
7. PRICING.	
A. MATERIALS INCL. TAXES AND FREIGHT	
B. ERECTION	
C. TOTAL	
D. FIRM	
E. TERMS OF PAYMENT	
F. DELIVERY TIME:	
MATERIAL:	
ERECTED	
8. ALTERNATES	
A. FIRE PROTECTION SYSTEM	
(1) DESCRIPTION	
(2) PRICE	
B. TWO SPEED FAN MOTORS	
(1) DESCRIPTION	
(2) PRICE	(721)