PROPOSAL 2007-06-14G-1500-200

1,500 HORSEPOWER / 51,750 PPH / 200 PSIG DESIGN

WET SOFTWOOD BIOMASS FIRED STEAM PLANT

FOR

Partners Concepts Development Inc. (PCDI)

1555 Glory Road
Green Bay, WI 54304
United States of America

ATTENTION: Daniel Hilliard
Tissue Technology LLC Project
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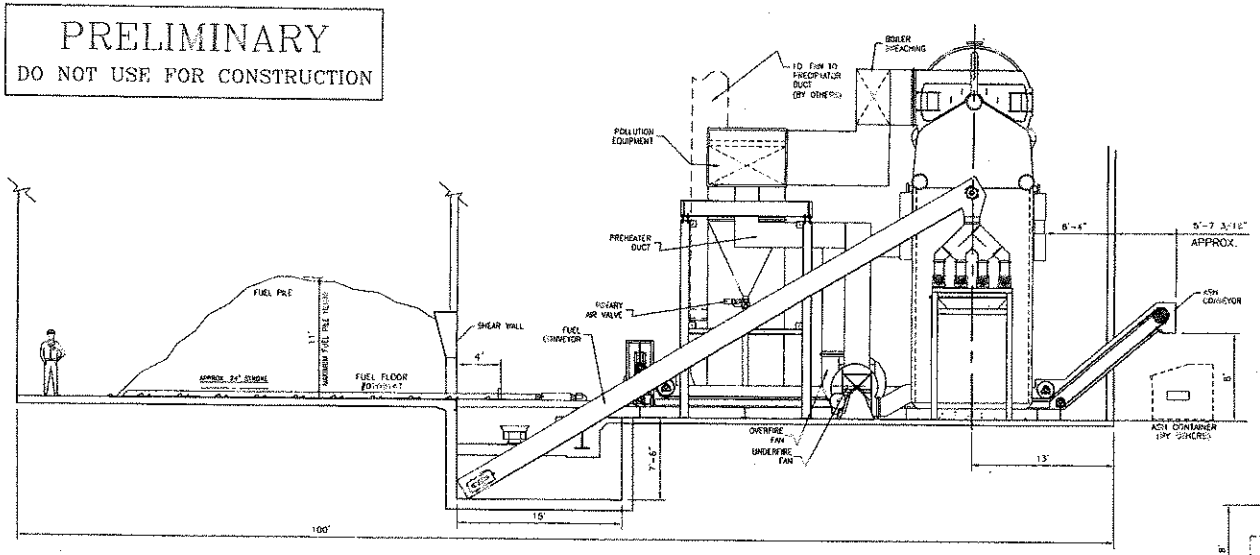
GENERAL SPECIFICATIONS

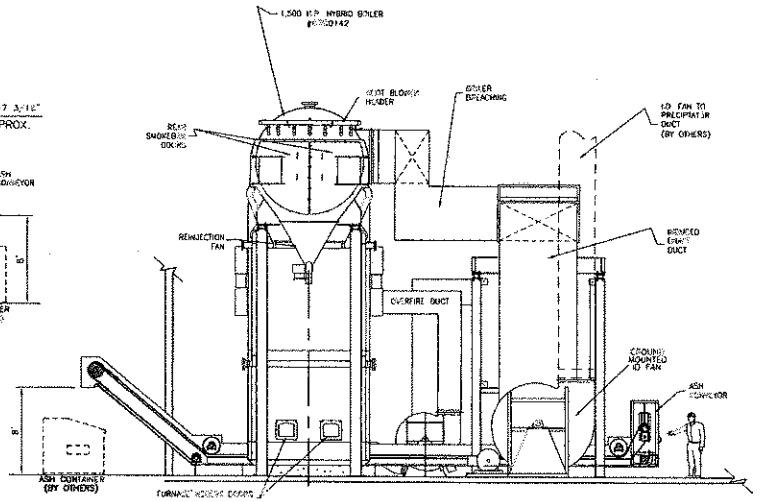
1.	Scope of Equipment:	One (1) substoichiometric, combination wet softwood biomass and sludge fuel gasifier, combustor and heat recovery system fed from metering bins.
2.	Gasifier Fuel Requirements:	1-1/2" x 2-1/2" x 5/8" or less in size, 50% or less in moisture content and a BTU content of 4,347 BTU/lb (minimum).
3.	Approximate Fuel Usage at Maximum Firing Rate, Per Unit:	~16,501 lbs. per hour @ 50% moisture content. (~71,731,500 BTU/Hr input)
4.	Boiler Rating, Per Unit:	1,500 Boiler horsepower, 51,750 PPH gross steam output from and @ 212°F.
5.	Boiler Pressure:	200 PSI design pressure. Safety valves shall be set @ 200 PSI.
6.	Boiler Design:	High Pressure Hybrid, Model #HY-9000-200-RG (Fire Tube/Water tube design) Built in accordance with the ASME Code.

PRELIMINARY

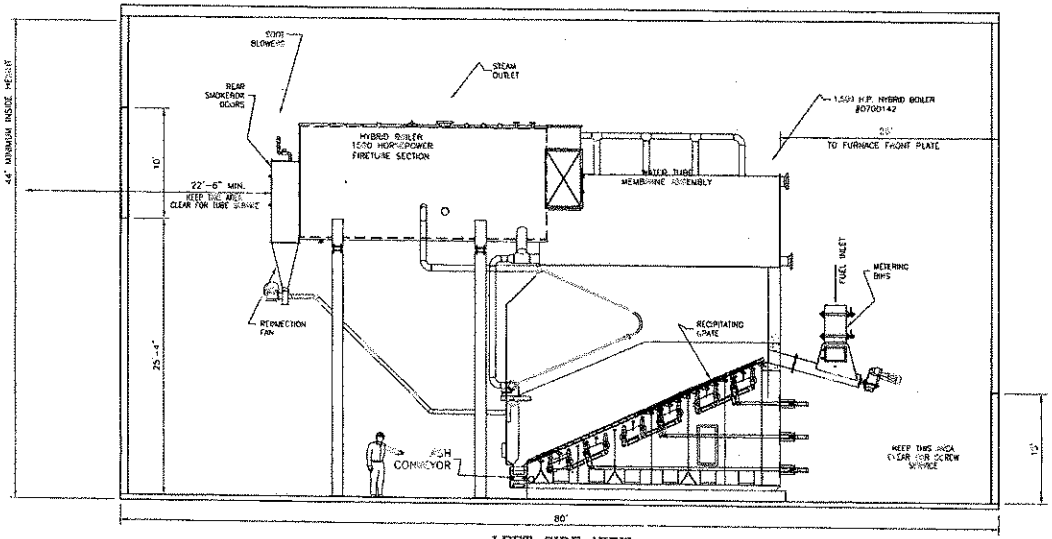
DO NOT USE FOR CONSTRUCTION



FRONT VIEW

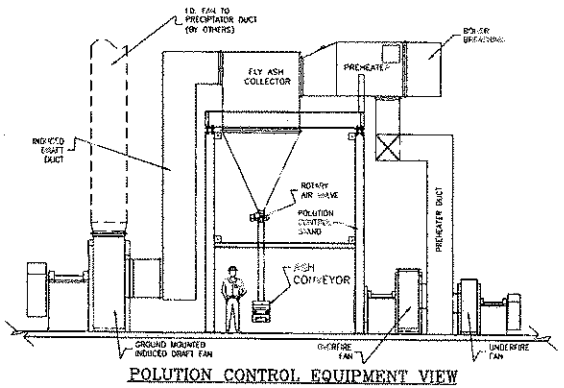


REAR VIEW



LEFT SIDE VIEW

(POLUTION CONTROL EQUIPMENT NOT SHOWN FOR CLARITY)



POLUTION CONTROL EQUIPMENT VIEW

NOTE:
MINIMUM INSIDE CLEAR HEIGHT TO BE 44'-0"

#	BY	DATE	REASON FOR CHANGE

HURST BOILER & WELDING CO., INC.
COOLIDGE, GEORGIA 31738
PH. 229-346-3545 FAX. 229-346-5874

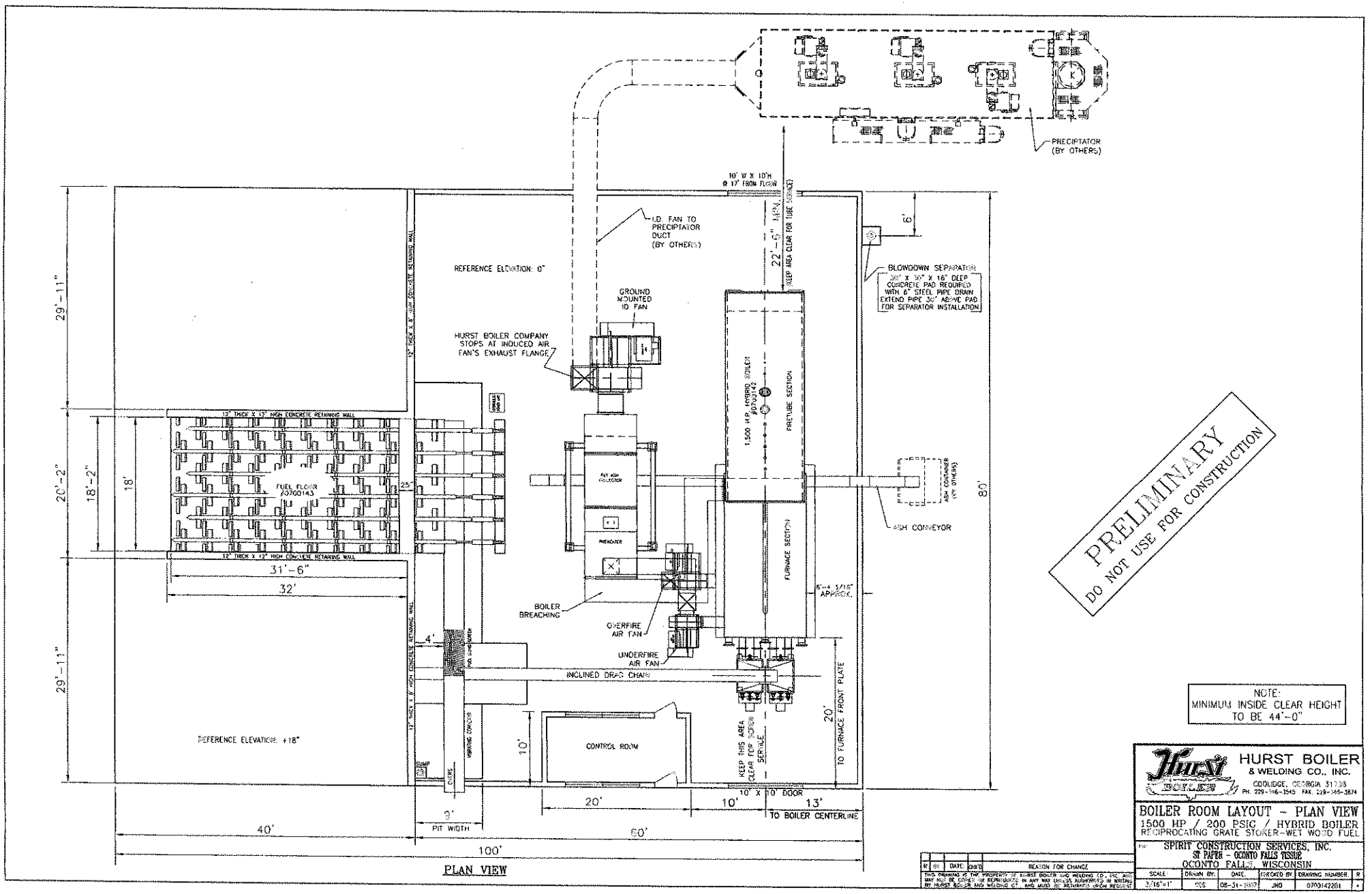
BOILER ROOM LAYOUT - ELEVATION VIEWS

1500 HP / 200 PSIG / HYBRID BOILER

RECIPROCATING GRATE STOKER-WET WOOD FUEL

FOR: SPIRIT CONSTRUCTION SERVICES, INC.
SI PAPER - OCONTO FALLS MILL
OCONTO FALLS, WISCONSIN

SCALE	DRAWN BY	DATE	CHECKED BY	DRAWING NUMBER	#
3/16"=1'	CJS	08-31-2007	JHG	SP30142-P34	1



PLAN VIEW

PRELIMINARY
DO NOT USE FOR CONSTRUCTION

NOTE:
MINIMUM INSIDE CLEAR HEIGHT TO BE 44'-0"

NO.	BY	DATE	CHK'D	REASON FOR CHANGE

HURST BOILER & WELDING CO., INC.
COOLIDGE, GEORGIA 31038
PH. 229-346-3345 FAX. 229-346-3874

BOILER ROOM LAYOUT - PLAN VIEW
1500 HP / 200 PSIG / HYBRID BOILER
RECIPROCATING GRATE STOKER-WET WOOD FUEL

FOR: SPIRIT CONSTRUCTION SERVICES, INC.
ST PAPER - OCONTO FALLS TISSUE
OCONTO FALLS, WISCONSIN

SCALE:	DRAWN BY:	DATE:	CHECKED BY:	DRAWING NUMBER:	R
3/16"=1'	CCS	08-31-2007	JHD	0700142201	1

2.1 GASIFIER

Substoichiometric wood fuel gasifier to include a heavy duty combustion chamber, refractory and insulation shipped loose, will be furnished to combust the solid fuel as specified. The unit will be complete with the following:

1. Two dual (2) screw metering bins complete with AC-type variable speed controller and bin level indicator (Sonac) to control owner's fuel conveyor.

2. One (1) sloped, reciprocating grate type stoker, to include:

   -Heavy-duty, sloped reciprocating grate conveyor to be mechanically driven by timer based controls allowing for the ultimate flexibility in handling fuels of different qualities and consistencies.

   -Fuel feed conveyor housing with flanged end opening for easy screw removal and thermocouple with quenching system to prevent burn back.

   -Reciprocating grates cast of iron/chrome alloy.

   -One (1) heavy-duty ash removal drag chain conveyor (dry) with trough, housing and drag chain to exterior of building at a sufficient height to load an ash dumpster. Maximum 10' from boiler room wall. Ash receptacle by others.

3. Substoichiometric combustion air system to include:

   -One (1) belt driven blower with TEFC motor and OSHA belt guard.

   -Prefabricated combustion air ductwork for interconnection of blower to under grate zone and gasifier air preheater (see Section 2.5, Item 2).

   -Zoned, under grate plenum.

   -One (1) combustion air blower incorporates welded steel housing, flanged outlet, flanged inlet, high efficiency impeller wheel and variable frequency AC drive for improved control of combustion airflow. This fan is designed to modulate with steam demand.

4. Gasification chamber casing to include:

   -Furnace front of *1/2"* steel plate.

-Furnace sides and rear of *1/4"* reinforced steel plate.

-Chamber lining (to be field installed) of:

-9" refractory wall and radiant arch with a service temperature of: 3000° F. The refractory walls are constructed using a proprietary refractory compound. A very high density, low clay, high alumna content ram-able refractory.

-2" "M" block, service temperature of: 1900° F.

-2" mineral wool, service temperature: 1200° F.

-refractory anchor brick that include a two-part clipping system of stainless steel. This allows the refractory and the casing to independently expand and contract thereby greatly reducing refractory maintenance.

5. Two (2) air-cooled observation ports with heat shields and site glasses.

6. Cast iron over fire access doors with heat shields and lockable handles.

7. Under grate access doors.

8. Skids and support assembly.

2.2 GAS BURNER

Combustion air system to include:

1. One (1) prefabricated zoned over fire combustion air plenum encircling the entire combustion casing with nozzles that penetrate the casing interior and manually adjustable dampers.

2. Prefabricated combustion air ductwork for interconnection of blower to zoned air plenum and combustion air preheater (see Section 2.5, Item 2).

3. One (1) combustion air blower incorporates welded steel housing, flanged outlet, flanged inlet, high efficiency impeller wheel and variable frequency AC drive for improved control of combustion airflow. This fan is designed to automatically modulate in response to the O_2 sensor system mounted in the rear smoke box of the boiler vessel.

4. Combustion chamber casing to include:

   -Furnace front of *1/2"* steel plate.

   -Furnace sides and rear of *1/4"* reinforced steel plate.

   -Chamber lining (to be field installed) of:

      -9" refractory wall and radiant arch with a service temperature of: 3000° F. The refractory walls are constructed using a proprietary refractory compound. A very high density, low clay, high alumna content ram-able refractory.

      -2" "M" block, service temperature of: 1900° F.

      -2" mineral wool, service temperature: 1200° F.

      -refractory anchor brick that include a two-part clipping system of stainless steel. This allows the refractory and the casing to independently expand and contract thereby greatly reducing refractory maintenance.

5. Over fire inspection/access doors with lockable handles.

2.3 PRESSURE VESSEL

Hurst Hybrid boiler with water wall radiant section designed for efficient heat recovery from wet biomass fuel combustion, and support structure. The unit shall be built in strict accordance with the ASME Code and stamps and be *rated at no less than 6 square feet of heating surface per boiler horsepower output.*

The generator (fire tube) section includes:

1. Front and rear smoke boxes complete with twin hinged airtight doors. The doors on the Hurst boiler are internally insulated and incorporate an abrasion resistant shield on the interior of the doors.

2. The fire tubes located in the first pass with the second pass of fire tubes reduced in diameter from the first pass to constrict the cooling "hot" gas and improve heat exchange.

3. Steam, water inspection and blow down openings.

4. Lugs for connecting support structure.

The radiant (water tube) section includes:

1. *1/2"* front plate and rear plate.

2. The water tubes are 2-1/2" in diameter providing superior water flow and eliminating "hot spots" found in other designs.

3. Support assembly for attaching to combustion chamber casing.

4. Blow down openings on each lower drum.

5. Flanged inspection openings on the end of each drum.

Both the generator and radiant sections of the Hybrid boiler are insulated with 2" of high-density mineral wool and clad with 22 gauge "Paint-Grip" zinc coated steel jacket material and galvanized screws for attachment and joining.

Overall thermal design of the Hybrid boiler vessel is computed and analyzed to insure that the highest possible efficiency is maintained throughout the system's operating range.

The boiler system shall be designed to provide 4:1 turndown rate with 35% M.C. biomass fuel.

2.4 BOILER TRIM AND LIMIT CONTROLS

1. Relief valves per ASME Code.

2. Boiler bottom blow down valves:
   -Two (2) in generator section, quick-opening.
   -Two (2) in radiant section, quick-opening.
   -One (1) slow opening.

3. Surface blow down valves consisting of one (1) needle and one (1) gate.

4. Main steam valves, one (1) gate, "PP" spool piece and one (1) non-return.

5. Chemical feed valves consisting of one (1) gate and two (2) check valves.

6. Steam pressure gauge with pigtail and gauge cock.

7. Modulating boiler feed water system to include: one (1) globe valve and two (2) check valves, globe valve and valve actuator with 3-way manual bypass. (+8,754.00)

8. Quick fill valves consisting of one (1) check and one (1) gate.

9. Water limits include:
   -Primary Low Water: Probe type with tricocks, gauge glass and pump controller.
   -Secondary Low Water: Probe type.
   -Primary High Water: Probe type.

10. Pressure limits include:
    -Operating limit.
    -High-pressure limit.
    -Low-pressure limit.
    -4-20 milliamp pressure transmitter for fuel feed / combination air modulation.

11. Boiler fire tube soot blowers, fixed zone with necessary compressed air piping, header, timer-actuated valves, compressed air accumulator tank and drain valve. The supply of compressed air to the compressed air accumulator tank by others. Each unit will require 10 scfm of dry compressed air @ 100 PSI minimum.

12. One (1) Steam Flow Meter with piping, totalizer and transmitter.

13. One (1) auxiliary natural gas fired burner mounting ring with refractory lined plug to facilitate the addition of a back-up burner at a later date.

14. Access Platforms (BY OTHERS):
Platforms and ladders will be provided to access:
-Rear smoke box.
-Fuel feed valves.
-Water columns.
-Main steam valves.

15. One (1) blow down separator built in accordance with ASME Code to include:
-Blow down inlet
-Drain
-Vent
-Exhaust stack to vent above building roofline.

16. Necessary pipe and fittings for the installation of the above trim is priced as. Optional, see Section 4.1.

2.5 POLLUTION CONTROL AND INDUCED DRAFT EQUIPMENT

HURST BOILER & WELDING CO., INC. GUARANTEES THIS PLANT NOT TO EXCEED THE EMISSION RATE OF 0.3 LBS PARTICULATE AND 0.3 LBS CO PER MILLION BTU INPUT OR STATE ALLOWABLE, WHICHEVER IS GREATER.

Note: Secondary pollution control equipment, connecting duct work, monitoring equipment, etc., as may be required for this application, shall be provided and installed by others.

Pollution control and induced draft system consisting of:

1. Flanged flue gas ducting, prefabricated of angle iron reinforced 3/16" steel plate, designed to prevent pulsation and vibration cracking, for routing flue gas from air heater to gasification/combustion air preheater.

2. One (1) gasifier/combustion air preheater, tubular, air-air, vertical orientation with mechanical rotary air lock and discharge chute to clients ash receptacle.

3. Flanged flue gas ducting, prefabricated of angle iron reinforced 3/16" steel plate, designed to prevent pulsation and vibration cracking, for routing flue gas from boiler to multi cyclone.

4. One (1) primary dry mechanical multiple cyclone flyash arrestor with cyclones, 9" diameter, each mounted on ¼" steel tube sheets. The body of the collector will be fabricated of 3/16" steel plate, reinforced with angle iron and flat bar. The unit will have flanged inlet, outlet and hopper connections. The collection hopper will be fabricated of 3/16" steel plate with flanged bottom outlet for connection of the air lock valve, hopper vibrator and access door. One (1) mechanical rotary air lock discharge valve, high temperature service and discharge chute to ash conveyor. Receptacle by others.

5. Flanged flue gas ducting, prefabricated of angle iron reinforced 3/16" steel plate, designed to prevent pulsation and vibration cracking, for routing flue gas from multi cyclone into induced draft fan.

6. Centrifugal type induced draft fan designed for combustion air service complete with high efficiency radial tip wheel to reduce required motor horsepower and remain as clean as possible. The fan will be fabricated of heavy gauge steel plate with pillow block roller bearings (located outside hot gas stream), heavy-duty shaft with heat slinger, TEFC drive motor, variable frequency drive, belt drive and OSHA belt guard. This fan will be floor mounted.

Note: HBC shall design the control for the draft fan motor variable frequency drive to assure the boiler remains negatively pressurized (Low Draft Limit).

7. HBC shall provide a flange on its ID Fan outlet for flanged transition from ID fan outlet flange to secondary pollution control, secondary pollution control and exhaust stack shall be provided by others. Purchaser supplied transition to Purchasers secondary pollution control device and exhaust stack shall be provided by others.

The entire exhaust gas system will be designed to minimize vibration and noise. The use of inlet boxes with properly designed dampers and radial tip wheel fans insure that noise levels will not exceed acceptable standards.

Exhaust monitoring/reporting equipment, controls and installation, as may be required, shall be provided by others.

2.6 ELECTRICAL CONTROL SYSTEM

An integrated, control system housed in a freestanding, pre-wired panel for automatic operation to include:

1. Control panel fabricated of 10 gauge steel plate (NEMA 12 enclosure), primed and painted interior and exterior with main disconnect, cooling, as required, with air-air exchanger and lock-out / tag-out compliance.

2. One (1) programmable logic controller with power supply, rack, communication modules and input/output modules.

3. One (1) Pentium-based cabinet mounted computer with network and modem remote annunciation capabilities and operator interface software for automatic control of operating steam pressure, temperatures, fuel flow and combustion airflow.

   The control system incorporates a 4-20 milliamp steam pressure transmitter to sense changes in steam flow by measuring variations in boiler pressure and regulates the fuel feed and combustion air flow accordingly by adjusting the frequency of the metering bin and the combustion air fans' variable frequency drives.

   An oxygen-sensing device will be located in the boiler's rear smoke box and will measure variations in the percentage of excess oxygen in the combustion gases. The system's target is +/- 6% O_2 for optimized combustion characteristics. As changes in the percentage occur due to inconsistent moisture content, fuel density, fuel BTU content or consistency of the fuel quality, the device measures these changes in millisecond increments and signal the control's ladder logic to bias the fuel/combustion air (over fire) ratio by adjusting the variable frequency drive of the forced draft blower motor thus providing the most efficient combustion.

4. Variable frequency drives for the stoker drive, under fire air fan, over fire air fan and induced draft fan motors with input line reactors and communication to the processor.

5. Circuit breakers for all motors furnished by Hurst Boiler & Welding Co., Inc.

6. Motor starters for all motors furnished by Hurst Boiler & Welding Co., Inc.

7. Local motor disconnects are provided at each motor.

8. Furnace draft consistency will be maintained by constantly monitoring the draft and regulating the induced draft fan motor's variable frequency drive as required by the draft controller.

9. Instrumentation with 4-20 milliamp transmitters to indicate and control the following will be furnished:

   -Steam pressure (PSIG above or below set point).

   -Steam flow (pounds per hour above and below set point).

   -Water level.

   -Furnace draft (+ water column inches).

10. Thermocouple with high temperature limit to monitor gasifier temperature.

11. Limits will be provided to shut down the steam plant in the event of a system failure as follows:

   -Primary low water limit (automatic reset).

   -Secondary low water limit (manual reset).

   -Primary high water limit (automatic reset)

   -High boiler steam pressure (automatic reset).

   -Low boiler steam pressure (automatic reset).

   -High furnace temperature (automatic reset).

   -Low draft (automatic reset).

The master control panel is factory wired, tested and equipped with incoming control voltage overload protection, interlocking circuit devices and terminal strip termination of all control circuits.

2.8 MIXED BIOMASS FUEL HANDLING SYSTEM

One (1) HBC biomass fuel handling system designed to receive a pre-mixed flow of woody biomass (maximum 30% M.C. and minimum 60% content by weight) and sludge (per specifications, not to exceed 40% content by weight) to include:

1. Floor sections to include:

   -Six (6) "tree" sections, each constructed of 6" x 6" heavy wall square tubing with 3/8" x 4" x 7" angle iron flighting (wedges) on ~3'-6" centers.
   -UHMW bearings, 0.5" thk, pre-mounted on 18' wide x 33' long x 3/8" thk steel plate for floor mounting of reciprocating floor sections with stationary wedges of 3/8" x 3" x 5" angle iron, six (6) sets of roller-type floor section hold-downs with grease fittings and twelve (12) UHMW lined hold-downs.
   -Six (6) heavy-duty hydraulic cylinders, 6" x 24" x 2.5" with caps and fixed clevis mount, pre-mounted on reciprocating floor sections. All necessary hoses and fittings required for installation included.
   -Concrete drawings and steel beam embedment necessary for the installation of the reciprocating floor shall be provided by the reciprocating floor manufacturer.
   -The floor will be segregated with at least one section containing clean wood for starting/stopping/bleeding.

2. Hydraulic power units to include:

   -One (1) hydraulic power unit to include a (2) 30 hp variable volume piston pump with fluid coolers.
   -One (1) 0-5,000 psig liquid filled pressure gauge(s) with shut off valve(s).
   -One (1) air bleeder valve(s)
   -One (1) two station aluminum manifold(s) with integral pressure relief valves.
   -Two (2) each, 3 position, 4-way, closed center, 120 VAC soft shift directional control valves.
   -One (1) 10 micron return filter(s) with visual indicator.
   -Hydraulic oil necessary for operation shall be obtained locally and provided.

3. Cross-over, vibrating conveyor with sizing screen, trough, stands and motor, approx. 40' long.

4. Two (2) incline conveyors, one to act as back up, from cross-over conveyor to metering bin/fuel feed valve(s) to include:

   -Two (2) drag chain-type conveyors, ~60' long, to include:
   -3/16" plate construction
   -TEFC electric motor and shaft mounted gearbox

-Heavy duty shafts to include flange bearings with waste pack type seals
-Unit to be completely shop fitted, dismantled for shipping and assembled in the field.

5. Extended metering bin with transitions from drag chain conveyor to bins.

Note: It will be necessary for the installing contractor to provide the conveyor inlet and outlet transitions, including materials. (It is not possible to fabricate these components in the shop considering the adjustments that may be required to accommodate irregularities in concrete.) A small bin will be necessary where the vibrating conveyor transfers fuel to the inclined conveyor. Simple transitions must be fabricated and installed between the vibrating conveyor, the inclined conveyor and the metering bin. All transitions shall be reverse repose to prevent bridging. HBC will only be supplying the transition from the inclined conveyor to the stoker. All other transitions shall be by others.

The fuel system electrical controls shall be incorporated, by the purchaser, into the main control system and shall be displayed on the control screen.

The fuel handling operational sequence shall be as follows:

1. A "sonic" bin level indicator with a time delay on/off adjustment is used to start and stop the boiler metering bin fill sequence. As fuel is fed to the boiler, the fuel level in the metering bin gradually drops past the "sonic" sensor and the delay "on" is activated. After a preset time, the bin fill cycle is started by actuating the inclined conveyor.

2. After a 3-4 second delay, the incline conveyor is actuated on.

3. After another 3-4 second delay, both the vibrating conveyor and the reciprocating floor are actuated on.

4. During this time, the metering bin fill sequence becomes "satisfied" and the time delayed "off" sequence is initiated.

5. The vibrating conveyor and reciprocating floor are stopped and then the incline is stopped.

Delaying the stops and starts of all fuel moving equipment helps prevent bottlenecking, reduces the chances of "burn back" and bridging from occurring in the conveyors and transitions. It also allows each of the conveyor components hands-off points to clear at the beginning and end of each metering bin fill cycle.