SOLID WASTE AUTHORITY

YOUR PARTNER FOR
SOLID WASTE SOLUTIONS

May 24, 2010

Trina Vielhauer, Chief
Bureau of Air Regulation
State of Florida Department of Environmental Protection
Twin Towers Office Building
2600 Blair Stone Road
Mail Station 5505
Tallahassee, FL 32399

Mr. Lennon Anderson, Air Program Administrator
Florida Department of Environmental Protection
Southeast District Office
400 North Congress Avenue
West Palm Beach, FL 33401

Re: North County Resource Recovery Facility Refurbishment – Final Design Specifications

Dear Mr. Anderson:

Florida Department of Environmental Protection ("FDEP") issued an Air Construction Permit (permit number 0990234-015AC/PSD-FL-108H) to the Solid Waste Authority of Palm Beach County on September 18, 2009. The permit authorized the refurbishment of the municipal solid waste combustor Units 1 and 2 at the North County Resource Recovery Facility ("NCRRF").

As requested in Condition 2, entitled "Final Design Specifications," of Section 3, entitled "Emissions Unit Specific Conditions," attached are the final design specifications for each control equipment vendor included as part of the contractual agreements and other pertinent information. The information enclosed in this package includes the following:

Section 1 - General

1. Refurbishment scope and description.
2. Drawing No. 100-E4-100-R0 RFC, Plan view of Facility areas where Refurbishment is occurring.
3. Drawing No. 711-M0-100, Revision D2, Air Pollution Control General Arrangement Plan

Section 2 – Boiler Information - Babcock & Wilcox (B&W)

1. B&W proposal, dated September 2007.
2. Drawing B0043891, Revision 4, General Arrangement Refurbishment Project SPB with Detroit Stoker Section Side View S-S.
3. Drawing B0043892, Revision 4, General Arrangement Refurbishment Project SPB with Detroit Stoker Section Side View S1-S1.
4. Drawing B0043893, Revision 4, General Arrangement Refurbishment Project SPB with Detroit Stoker Outside Front View A-A.
5. Drawing B0043894, Revision 4, General Arrangement Refurbishment Project SPB with Detroit Stoker Section Front View B-B.
6. Drawing B0043895, Revision 4, General Arrangement Refurbishment Project SPB with Detroit Stoker Section Side View C-C.
7. Drawing B0043922, Revision 2, General Arrangement Refurbishment Project SPB with Detroit Stoker Section Side View S1-S1 and S1A-S1A.
8. Drawing B0043923, Revision 2, General Arrangement Refurbishment Project SPB with Detroit Stoker Section Side View S2-S2 and S2A-S2A.

Section 3 – Spray Dryer Absorber, Fabric Filter House, Powdered Activated Carbon Injection System - Siemens Power Generation, Inc.

9. Excerpts from the Siemens Energy, Inc. Proposal, dated May 2, 2009, to supply the Spray Dryer Absorber/Fabric Filter and powdered activated carbon (PAC) injection systems.
10. Drawing 209D1169, Revision 8, General Arrangement – Elevations Dry Scrubbing System (Spray Dryer Absorber & Fabric Filter).
11. Drawing 209D1171, Revision 4, General Arrangement – Plan Views Dry Scrubbing System (28'-0" Spray Dryer Absorber).
12. Drawing 209D1173, Revision 5, General Arrangement of Baghouse – Plan View Dry Scrubbing System (For JP-FF-1000) (Spray Dryer Absorber & Fabric Filter).
13. Drawing No. 209D1329-02, Revision 5, Activated Carbon Storage and Delivery System Dry Scrubbing System (Spray Dryer Absorber & Fabric Filter).
14. Drawing No. 711-P0-017, Revision D1, Air Pollution Control Piping & Instrument Diagram Powdered Activated Carbon Injection – Sys. Des. (JP)

Section 4 – Selective Non-catalytic Reduction System - Combustion Components Associates, Inc. (CCA)

15. Excerpts from the SNCR Systems for RDF Fired Boilers for Solid Waste Authority of Palm Beach County, FL, SNCR Proposal No. 09-194, Revision 2, prepared by CCA, dated May 20, 2009.
16. Drawing SWAPB_0901_011, Revision 0, SNCR System Process Flow Diagram.

17. Drawing No. SWAPB_0901_090, Revision 2, General Arrangement - Urea Storage Tank Unit No. 1 & 2
18. Drawing No. SWAPB_0901_034, Revision 1, Distribution Module General Arrangement Lower Level Unit No. 1
19. Drawing No. SWAPB_0901_030, Revision 1, Urea Metering Module General Arrangement Lower Level Unit No. 1

We will update the Department of any substantial changes to the final design specifications presented in the latest documents attached herein that occur during the construction phase.

Please do not hesitate to contact us if you need any additional copies or information.

Very truly yours,

SOLID WASTE AUTHORITY OF PALM BEACH COUNTY, FLORIDA

Mark Hammond
Executive Director

Enclosures

cc: Jeff Koerner FDEP, Tallahassee
R. Schauer, SWA
B. Worobel, SWA
M. Morrison
W. Arvan, PBRRC
L. Richter, MPI-FTL
P. Patton, MPI-WPB Field Office
K. Liang, MPI-WHI

Solid Waste Authority of Palm Beach County
7501 North Jog Road • West Palm Beach, FL 33412

North County Resource Recovery Facility Refurbishment – Final Design Specifications

May 2010

Report Prepared By:

Malcolm Pirnie, Inc.

8201 Peters Road
Suite 3400
Plantation, FL 33324
954-761-3460

3582-069

Contents

MALCOLM PIRNIE

INDEPENDENT ENVIRONMENTAL ENGINEERS, SCIENTISTS AND CONSULTANTS

1

GREEN SEAL

Refurbishment Scope and Description

The Refurbishment of the North County Resource Recovery Facility (Facility) shall consist of the scope described in this Exhibit. The Refurbishment Scope, Description and Minimum Technical Requirements (Technical Requirements) are intended to identify the equipment and systems to be refurbished, and provide specifications to define the type and quality of work to be performed. The Refurbishment shall consist of the design, procurement, demolition, refurbishment, repair, construction, installation, as well as start-up, shakedown, acceptance testing and coordination of all work necessary to complete the scope of work. This work is being performed by BE&K Construction, a wholly owned subsidiary of KBR, Inc. As noted below, portions of the Refurbishment material supply shall be by the original supplier. The Palm Beach Resource Recovery Company (Operator) is the Operator of the Facility and will participate in the review and coordination of the Refurbishment. For the purposes of these Technical Requirements, the Project Team is defined as the Solid Waste Authority of West Palm Beach (Owner), Palm Beach Resource Recovery Corporation (Operator), BE&K (Contractor), Malcolm Pirnie, Inc. (Consultant Engineer), and Babcock &Wilcox power generation group (B&W).

The Owner has procured selected critical components, key to the timely completion of the Refurbishment. B&W is supplying the components as Owner-Furnished equipment as defined in paragraph A below.

The Contractor shall furnish all necessary equipment, supplies, consumables, utilities, tools, and manpower to complete the erection, start-up, and testing of the Refurbished systems.

A. Owner-Furnished Equipment: Boiler Island Components by B&W

The boiler island scope of work consists of the demolition and installation of the following major components supplied by B&W.

- Two Inconel 625-clad furnaces (with front, rear and side walls with upper and lower headers and drains/vents; stoker seals; supply tubes; riser tubes; buckstays; access doors; and new furnace roofs);
- Two superheaters (310HSS and SA210A1) with headers (SA106 Grade B), weld rings, hangers, cross over piping, saturated connections, outlet piping to the main steam stop valve, drains/vents, soot blower protection shields, and pendant lower loop shields;
- Two sets of steam drum internals including 16 steam-water separators (both boilers) and related drum baffles and internals;
- Two sets of boiler trim;
- Two attemperators;
- 12 fuel chutes;

- 12 air swept spouts with air supplies;
- Two spout/transport air fans and associated motors, expansion joints, air flow monitors, ductwork and dampers;
- Two overfire air systems including ductwork, supports, expansion joints, air flow monitors, and dampers;
- 28 overfire PrecisionJet air ports with 18 velocity dampers;
- Eight natural gas auxiliary burners with hoses, igniters, isolation doors, and burner windboxes
- Penthouse casing and new penthouse trolley beam;
- Eight (four per unit) superheater maintenance (dance) floor wall openings;
- Thermocouples integral to the boilers;
- Refractory, insulation, and lagging specification (B&W Boiler Refractory Insulation Lagging (BRIL) Specifications); and
- Undergrate air tempering dampers.

Selected critical components shall be supplied by the Contractor selected by the Owner as balance of plant/facility materials or equipment as defined in paragraph B below.

B. Balance of Plant/Facility Materials or Equipment by the BE&K

The components, equipment and materials to be supplied and/or installed by the Contractor for the Refurbishment related to the balance of the plant/facility consist of:

Electrical/instrumentation and controls

- Two 15kV interrupter switches;
- 11 4160V motor starters;
- One replacement of the 13.8kV metal bus duct to the 13.8kV generator switchgear;
- One re-insulation of 13.8kV switchgear;
- One spare motor control center (MCC) consisting of two sections with a selected number of appropriate spare breakers to be identified by the Operator.
- New 480V MCC's for APC equipment including air compressors
- New 4.16kV MCCs for induced draft (ID) fans;
- One refurbished uninterruptible power supply and AC instrument transformer;
- One distributed control system (DCS) and associated wiring for the boiler building with integral turbine-generator (T-G) system, RDF manufacturing buildings, and water treatment building;
- One fire protection monitoring system;

- Replace the 13.8kV to 480V load center transformers No. 13, 14 with 2500kVa transformer. One fire protection system data logger;
- One fire protection system (FM200TM) for the T-G cable room, DCS, Water Treatment DCS room, and Engineering Work Station (EWS) Rooms to replace existing Halon™ systems;
- One set of protective relays for the main transformer and generator (i.e. Harlow panel);
- One set of boiler laboratory instrumentation with discreet outputs interfaced with the new DCS system;
- One Sensidyne™ combustion gas detection system;
- Two sets of boiler instrumentation
- Two closed circuit televisions for furnace combustion monitoring.

Mechanical:

- Two sets of generating banks (loose tubes and side wall tubes);
- Two sets of feed water piping from flow control valves to steam drums;
- Modification of the main steam piping on each boiler to accommodate new superheater header location;
- Inspection of steam drum saddles and possible replacement of steam drum U-bolts;
- Survey the steam and mud drum on each boiler;
- Two modular economizers;
- Two modular TAHs;
- Two sets of boiler casing including insulation/lagging;
- Four auger feed conveyors;
- Refurbishment of the existing two forced draft fans;
- Refurbishments of the existing two overfire air fans;
- Two spray dryer absorbers;
- Two fabric filter houses;
- Two ID fans and dampers for new air pollution control (APC) equipment;
- Two new flue systems including expansion joints, supports, and hoppers from the boiler to stack;
- One bulk acid storage tank;
- Two bucket elevators;
- Relocate existing APC air compressors
- Four ash diverters; and
- Two bottom ash conveyors (horizontal portions only).

Civil/Architectural:

- One emergency egress from the boiler house control room. The new egress door shall be equipped with a window and exiting to a new stairway leading to ground level;
- One new water treatment area DCS control room;
- Enlarge existing RDF storage building control rooms;
- Two lots structural materials for exterior flue gas supports;
- Manufacturing building tipping floor cap; and
- One overhaul of boiler building elevator (to be performed upon completion of boiler work).

Air Pollution Control System Upgrade:

- The spray dryer absorbers (SDA) shall be demolished and replaced with new scrubbers utilizing the existing foundations and support steel.
- The electrostatic precipitators (ESPs) shall be demolished and structural steel modified to meet the new fabric filter house (FFH) requirements;
- The existing ID fans shall be removed and replaced with new fans and motors and if necessary, the foundations shall be modified to meet the requirements of the new ID fan;
- All ductwork from the TAH to the stack shall be replaced. Existing duct supports shall be reused/replaced as needed to meet design restraints;
- New MCCs, cable trays, and conduits shall be furnished for new equipment;
- Three new 1300 CFM, 480 VAC, air compressor systems shall be supplied to meet the needs of the APC equipment. The air compressor system includes foundation/skid, utilities, MCC, local piping, air compressors with coolers, air dryers, receivers, and tie-in to existing air system.
- New conveyors for the FFHs shall be installed, cross connected to the existing fly ash handling system. The existing ash collecting conveyors shall be modified as required to accommodate the new FFH ash conveying requirements;
- Instrumentation and controls shall connect to the new Distributed Control System (DCS) system;
- Foundations for the urea storage tank and new selective non-catalytic reduction (SNCR) system shall be furnished and installed;
- Foundations and new powdered activated carbon silo and injection system shall be furnished and installed;
- New umbilical hoses shall be supplied for the continuous emissions monitoring system (CEMS); and
- Demonstration and Acceptance Testing shall be performed by the Contractor in accordance with the requirements of the Contract. The environmental testing portion of the Demonstration and Acceptance Test shall be performed consistent with the requirements of

the Florida Department of Environmental Protection (FDEP); 40 CFR Part 60.58b; and Exhibit J to the Contract between the Owner and Contractor.

C. Balance of Plant/Facility Materials or Equipment by the PBRRC

The components, equipment and materials to be supplied, refurbished, and/or installed by the PBRRC for the Refurbishment related to the balance of the plant/facility consist of:

- Refurbish the RDF stokers and ram feeders;
- Refurbish the boiler soot blowers;
- Refurbish the RDF ferrous electro magnets;
- Refurbish the RDF Processing Lines, A, B and C.

CLIENT DRAWING NO. E001-BLDG-9001 REV. 0

1" 1/2 0 1" GRAPHIC SCALE

NOTES:
1. THESE ARE AREAS ON THE PROJECT WITH C1D1 AND C1D2 CLASSIFICATIONS. CONTRACTOR SHALL CHECK WITH THE ENGINEER BEFORE ANY WORK IS PERFORMED IN THESE AREAS.

WAREHOUSE
WAREHOUSE OUTSIDE STORAGE
UREA TRUCK UNLOADING
NOTE 1
EOR-7510 170-E4-102
PLOT PLAN 100-E4-101
VEHICLE MAINT. SHOP
AIR RECEIVER
N 886,973.29
COVERED COMPRESSOR AREA SEE DWG 120-M0-100
EOR-6022 250-E4-102
EOR-6096 250-E4-108
EOR-6098 250-E4-110
BOILER #2 REFURB
EOR-6612 250-E4-126
E 780,011.68
℄ NEW BAGHOUSE & SCRUBBER REFURB SYSTEM # 2 SEE DWG 711-M0-100
CNTRL RM SWGR RM MCC RM EOR-6017 250-E4-115
EOR-6095 250-E4-107
EOR-6097 250-E4-109
BOILER #1 REFURB
EXISTING STACK
WASTE RECEIVING BUILDING
RDF PROCESSING BUILDING
RDF STORAGE
℄ NEW BAGHOUSE & SCRUBBER REFURB SYSTEM # 1 SEE DWG 711-M0-100
RDF/TIPPING AREAS INSTRUMENTATION TABLES
EOR-6390 250-E4-111
EOR-6391 250-E4-112
TIPPING FLOOR
CHARGING LEVEL
EOR-6092 250-E4-104
EOR-6094 250-E4-106
EOR-6611 250-E4-125
E 779,904.60
N 886,958.71
TURBINE BLDG
NEW CONTROL ROOM EGRESS
ACTIVATED CARBON SYSTEM STORAGE SILO & TRANSFER SYSTEM SEE DWG 711-M0-117
EOR-6021 250-E4-101
FAB SHOP
NOTE 1
OBW CONTROL ROOM EOR-6081 250-E4-116
EOR-6091 250-E4-103
EOR-6093 250-E4-105
DCS ROOM (INTERIOR) WATER TREATMENT AREA SEE DWG 170-E4-103
NEW BULK ACID STORAGE TANK SEE DWG 170-M0-100
EXISTING WATER TREATMENT BUILDING
EOR-7110 170-E4-100
EOR-7310 170-E4-101

RELEASED FOR CONSTRUCTION
BY K. Lyons DATE 9/30/09

NO.	DATE	REVISIONS	DWN	CKD	ZONE
0	9/29/09	RELEASED FOR CONSTRUCTION	AJC	RTJ	
A	6/26/09	RELEASED FOR APPROVAL	RTN	HEH	

DRAWN BY R. NEALAND DATE 6/26/09
DESIGNED BY R. NEALAND DATE 6/28/09
CHECKED BY DATE
APPROVED BY DATE

SOLID WASTE AUTHORITY
OF PALM BEACH COUNTY
7501 North Jog Road
West Palm Beach, Florida 33412

BE&K ENGINEERING CO.
A KBR COMPANY
2000 INTERNATIONAL PARK DRIVE
BIRMINGHAM, ALABAMA 35243
CERTIFICATE OF AUTHORIZATION NUMBER: 7910

HAROLD E. WHITE JR. LICENSE NO. 68888 STATE OF FLORIDA PROFESSIONAL ENGINEER SEAL

NORTH COUNTY RESOURCE RECOVERY FACILITY (NCRRF) REFURBISHMENT

OUTSIDE AREA LIMITS
POWER PLAN
PLOT PLAN
FACILITY

SCALE:	CONTRACT	BE&K DRAWING NO.
60'	5003501	100 E4 100
FILE:		CLIENT DRAWING NO. E001-BLDG-9001 REV. 0

SWADBDR PLOT DATE & TIME: Sep 24, 2009 - 1:28pm

REV. D2

CLIENT DRAWING NO. M001-JP-9001

GRAPHIC SCALE 1" 1" 1" ½ 0

N

℄ SDA

BUCKET ELEVATOR JN-CV-904A 711-235-790.00 MOTOR JN-M-904A 711-535-790.10

BUCKET ELEVATOR JN-CV-9048 712-235-790.00 MOTOR JN-M-9048 712-535-790.10

EXISTING ASH SILO

EXISTING LIME SILO

EXISTING LIME SILO

EXISTING STAIRS

EXISTING MCC BLDG

GUTTER ON MCC BLDG TO BE MODIFIED TO CORRECT POSSIBLE INTERFERENCE WITH FFH

EXISTING AC

EXISTING PRECIP COIL'S (TYP)

℄ STACK

KEY PLAN

AIR COMPRESSOR AREA SEE DWG G01-KA-9051 (120-M0-100)

N 886,873.28

E 780,011.68

EXISTING STACK

STACK INLET DUCT No. 2

NEW DUCT SUPPORT

AIR REC.

SIDING

UPPER CONE INSPECTION DOOR

COLLECTION CONVEYOR (MODIFIED)

SDA No. 2 JP-Z-2000 712-100-20.00

℄ BOILER NO. 2, FFH & SDA

SDA No. 2 OUTLET DUCT

DUCT SUPPORT

EXIST. TANK

T/GRTG EL 49'-11"

WALKWAY

JIB CRANE

SDA PENTHOUSE T/FLOOR EL EL 115'-3½"

T/GRTG EL 115'-4¾"

WALKWAY (UPPER)

EXIST. WALKWAY

T/GRTG EL 72'-9"

MODULE 1E

MODULE 2E

MODULE 3E

MODULE 1W

MODULE 2W

MODULE 3W

FABRIC FILTER HOUSE No. 2 JP-FF-2003 712-127-70.00

JIB CRANE

FFH No. 2 OUTLET DUCT

T/GRTG EL 75'-7¾"

DUCT ACCESS PLATFORM T/GRTG EL "HOLD"

LADDER UP TO EL "HOLD"

WALKWAY

T/GRTG EL 71'-2⅜"

EXIST. STAIR TOWER

STORM DRAIN AT GRADE (TYP)

I.D. FAN No. 2 SEE DWG M001-JP-9007 (711-M0-106)

I.D. FAN No. 2 MOTOR

℄ I.D. FANS

EXISTING BRIDGE

EXISTING DUCT SUPPORT

EXISTING ACCESS ROAD

PAC STORAGE SILO SEE DWG M001-JP-9018 (711-M0-117)

EXISTING SHUTTLE CONVEYOR 908A

EXISTING SHUTTLE CONVEYOR 908B

FOR FLYASH CONVEYORS SEE DWG M001-JN-9012 (711-M0-111)

SDA No. 1 JP-D-1000 711-100-20.00

SDA No. 1 OUTLET DUCT

TRENCH

EXISTING SUMP

FFH No. 1 OUTLET DUCT

FOR DUCTWORK FROM THE FFH TO THE STACK SEE DWG M001-JP-9008 (711-M0-107)

I.D. FAN No. 1 SEE DWG M001-JP-9006 (711-M0-105)

I.D. FAN No. 1 MOTOR

STACK INLET DUCT No. 1

NEW DUCT SUPPORT

FABRIC FILTER HOUSE No. 1 JP-FF-1003 711-127-70.00

EXISTING LIME SILO

EXISTING LIME SILO

711-M0-101

PLAN

RELEASED FOR DESIGN
BY P. STOCKBURGER DATE 10/14/09

NO.	DATE	REVISIONS	DRWN	CHKD	APVD
D2	1/29/10	ADD'D HOLDS; REVD DIMS/W.W.	JB		
D1	10/13/09	RELEASED FOR DESIGN	JB		
A1	8/07/09	RELEASED FOR APPROVAL	JB		

DRAWN BY J. BENSON 7/13/09 — CHECKED BY F. KIRKWOOD 10/13/09 — DESIGNED BY J. BENSON 7/13/09 — APPROVED BY

SOLID WASTE AUTHORITY OF PALM BEACH COUNTY
7501 North Jog Road, West Palm Beach, Florida 33412

NORTH COUNTY RESOURCE RECOVERY FACILITY (NCRRF) REFURBISHMENT

AIR POLLUTION CONTROL GENERAL ARRANGEMENT PLAN

BE&K ENGINEERING CO. — A KBR COMPANY, 2000 INTERNATIONAL PARK DRIVE, BIRMINGHAM, ALABAMA 35243, CERTIFICATE OF AUTHORIZATION NUMBER: 7910

SEAL

SCALE: 1/8"=1'-0" — FILE — CONTRACT 5003501 — BE&K DRAWING NO. 711 M0 100 — CLIENT DRAWING NO. M001-JP-9001 — REV. D2

SWADBOR PLOT DATE & TIME: Jan 29, 2010 - 8:08am

MALCOLM PIRNIE

INDEPENDENT ENVIRONMENTAL ENGINEERS, SCIENTISTS AND CONSULTANTS

2

The Babcock & Wilcox Company

a McDermott company

20 South Van Buren Avenue • Barberton, Ohio 44203-0351 USA • (330) 753-4511 • www.babcock.com

Mr. Ray Schauer
Director of Engineering and Public Works
Solid Waste Authority of Palm Beach County
7501 North Jog Road
West Palm Beach, FL 33412

Date: September 27, 2007

Subject: Boiler Refurbishment Material for the North County Resource Recovery Facility – Proposal Number P008352/8354

Dear Mr. Schauer,

The Babcock & Wilcox Company is pleased to provide 6 copies of the subject proposal for the supply of selected boiler material for the refurbishment of two RDF boilers at the North County Resource Recovery Facility, Palm Beach County, Florida.

The proposal covers the scope identified for B&W supply in the Amendment and Restated Operations & Maintenance Agreement signed by the Solid Waste Authority of Palm Beach County and Palm Beach Resource Recovery Corporation on June 20, 2007. Based upon our discussions on September 19, 2007, this scope has been supplemented by the addition of the eight (8) auxiliary fuel burners, penthouse casing and air heater bypass ducts and dampers in order to make interfaces with the future Design/Build contractor more concise.

The Preliminary Price provided in the proposal includes: a) the costs of purchased raw materials and services as of the date of the Proposal and b) all other costs of supplying the boiler material consistent with the supply of the material at the time-of-performance. The Final Fixed Price will be established in accordance with the procedures and timing defined in the pending Memorandum of Understanding between the Authority and B&W, a draft of which is being submit under a separate cover letter with this proposal.

We believe this proposal is fully responsive to our discussions to date, and we look forward to working with you and the Authority to complete the material supply contract and ultimately the successful refurbishment of two RDF boilers.

Should you have any questions regarding the enclosed please let us know.

Best regards,

Michael J. DePero

Michael J. DePero
Project Manager, B&W Service Company
The Babcock & Wilcox Company

Cc with Attachment:

W. J. Arvan – PBRRC
J. S. Kulig – BWSC
J. B. Kitto – BWSC
L. A. Hiner – BWSC
M. Low - BWSC

Proposal – P008352 and P008354

to

Solid Waste Authority of Palm Beach County

for

Boiler Refurbishment Material for the North County Resource Recovery Facility

submitted by

The Babcock & Wilcox Company

Generating Powerful Solutions℠

September 27, 2007

DISCLAIMER FOR USE OF THIRD PARTY INFORMATION

In submission of this bid, B&W has assumed that you have the right to provide, use, copy and distribute all drawings and other documents received by B&W from you either with the request for bid or after the award of the contract and that B&W's use of such drawings and other documents in preparing its bid or completing the contract does not and will not violate the intellectual property rights of any third party.

TABLE OF CONTENTS

Exhibits

1. INTRODUCTION

In 1986, The Babcock & Wilcox Company ("B&W") formed a joint venture with Bechtel – Palm Beach Energy Associates – to design, procure, construct and start-up the North County Resource Recover Facility ("NCRRF") under contract to the Solid Waste Authority of Palm Beach County (the "Authority"). The NCRRF includes the RDF plant with three MSW processing lines and a power plant with two (2) RDF-fired boilers, associated emissions control equipment, power generation equipment and related auxiliaries. The RDF-fired boilers were supplied as B&W contract numbers S-10372 and S-10373.

B&W was also selected to operate and maintain the NCRRF for up to 20 years (the "First Operating Period") through its wholly owned subsidiary, Palm Beach Resource Recovery Corporation ("PBRRC" also the "Operator"). Since the inception of commercial operation in late 1989, PBRRC has served as the NCRRF's operations and maintenance (O&M) contractor.

In order to maximize the value of the NCRRF and continue to effectively serve the residents of Palm Beach County, Florida, the Authority extended the O&M agreement by executing the Amendment and Restated Operating and Maintenance (ARO&M) Agreement with PBRRC dated June 20, 2007. The ARO&M covers twenty years of operation ("Second Operating Period") beginning October 1, 2009. The ARO&M also provides for a refurbishment program ("Refurbishment") to take place at the beginning of the Second Operating period to: 1) address physical deterioration of plant from operation in the highly corrosive waste-to-energy plant environment, 2) replace components which are reaching the end of their useful lives or obsolesce and 3) update selected systems and components to current technology. The goal of Refurbishment is to restore the NCRRF to a condition that permits reliable and cost effective operation for the duration of the Second Operating Period.

Following condition assessment work by both PBRRC and Malcolm Pirnie Inc. ("MPI") in 2004, the Authority, MPI and PBRRC have developed a Refurbishment scope to meet the needs of the Authority. The Refurbishment scope is provided in Schedule 11 of the ARO&M. As part of this Refurbishment scope, selected critical boiler component materials (furnaces, superheaters, combustion systems, and drum internals) are being supplied by B&W to the Authority under a separate material supply contract. These materials will then be installed by a Refurbishment contractor (third party Design/Build contractor) to be selected by the Authority. This general material scope includes:

- 12 fuel chutes with expansion joints.
- 12 air swept spouts with air supplies.
- 2 Inconel 625-clad furnaces (with front, rear, and side walls with upper and lower headers and drain/vents; stoker seals; supply tubes; riser tubes; buck stays; access doors; and new furnace roof).

- 2 over-fire air fans, motors, supports, ducts, expansion joints, air flow monitors, and dampers.
- 12 over-fire air ports.
- 2 superheaters (310HSS and SA210) with headers (SA106B), sootblower protection shields, pendant lower loop shields, hangers, cross over piping, saturated connections, rapper hammers, outlet piping to main steam stop valve, and drain/vents.
- 2 attemperators.
- 2 sets of steam drum internals including 16 steam-water separators (both boilers) and related drum baffles and internals.
- 2 sets of boiler trim.

In order to provided cleaner interfaces with the balance of the Refurbishment material supply not being provided by B&W, the scope has been adjusted by mutual agreement between the Authority and B&W to include:

- 8 natural gas auxiliary burners with hoses, igniters, isolation doors and burner windboxes.
- Penthouse casing and new penthouse trolley beam.
- Air heater bypass ducts and dampers.

The complete and definitive scope being provided in this proposal is provided in Section 3, Scope of Supply. This Scope of Supply is consistent with the Refurbishment technical requirements provided in Schedule 11 of the ARO&M.

As part of the scope being supplied, the original furnace/combustion system is being updated to incorporate a straight-walled furnace with state-of-the-art PrecisionJet™ overfire air system as outlined in Section 2. This system will provide improved combustion efficiency, boiler operability and maintenance while minimizing emissions.

The current intent is for the Authority to provide a purchase order to B&W for the Scope of Supply not later than April 1, 2008. B&W will provide all material for both units to the NCRRF site F.O.B. by March 15, 2010.

In order for B&W to provide the desired fixed price contract to the Authority as requested and avoid the risks of material price escalation, a process is provided for under a separate Memorandum of Understanding which includes three steps: 1) this proposal including preliminary pricing which reflects current material and purchased services costs but other costs escalated to time-of-performance, 2) preliminary engineering by B&W to permit definitive material purchase orders to be issued shortly after signing of the material supply contract between B&W and the Authority, and 3) update of material and purchased service prices to provide the final contract pricing just prior to final contract execution to reflect the then current material and purchased service price quotes with current validity dates.

2. TECHNICAL DESCRIPTION

The following equipment changes have been included to reflect past operating experience of the RDF units at the NCRRF and state-of-the-art advancements in combustion technology.

2.1 Combustion System

A straight-wall furnace with PrecisionJet™ Overfire Air System replaces the original overfire air system design that included a "Combustion Control Zone" or "CCZ" furnace with multiple levels of overfire air (OFA) ports while maintaining the same unit capacity. The CCZ furnace incorporated a pair of arches or bustles in the lower portion of the furnace that include the OFA ports. This combustion technology was then the state-of-the-art in design to enhance mixing and complete combustion for lower heating value, higher moisture fuels such as wood, biomass and refuse derived fuel (RDF). B&W's more recent technology development during the 1990's, including the application of advanced CFD/combustion computer modeling coupled with field testing, has resulted in a new PrecisionJet™ OFA system (without the arches or bustles) that has been demonstrated to optimize emissions of CO and NO_x, decrease maintenance and be easier to operate than the CCZ design.

The PrecisionJet™ system uses fewer levels of OFA with larger ports in an interlaced pattern that allow the larger (higher energy) jets to improve penetration and mixing. This approach to the introduction of the OFA enhances the combustion process, minimizing the CO leaving the furnace and generally reduces NOx formation via deeper staging (i.e. increased OFA with decreased air to the grate). The OFA system is designed to permit separate control of the total flow of OFA and the local velocities at the port locations in order to maximize mixing and produce a more uniform flow and temperature profile across the full furnace volume. In order to provide the required level of flow and mixing control, the OFA fans will also be replaced and upgraded as detailed in the Scope of Supply.

The PrecisionJet™ air system was developed from B&W's extensive chemical recovery boiler air system experience utilizing large air ports in an interlaced arrangement. This type of air system arrangement has been utilized on B&W chemical recovery boilers since 1990 with over 25 installations. This technology was later applied to B&W's biomass power boiler design starting in 2002 and will be designed for the RDF boilers at the NCRRF.

To provide improved unit flue gas and air temperature control, an airheater bypass flue and damper will be added to the air heater system. Improved air temperature control will reduce grate maintenance and improve boiler operations.

2.2 Computational Fluid Dynamic (CFD) Modeling

B&W's proprietary combustion model (COMO^{SM}) will be used to perform a modeling study of the new overfire air system and associated operating conditions. The modeling study will be used to evaluate combustion performance for the proposed designs and identify respective strengths and possible improvements with the design.

The use of a numerical model provides detailed boiler equipment performance predictions that cannot be obtained solely through experience, traditional performance predictions, physical modeling, or field measurements. Experience and traditional performance predictions are not able to predict the three-dimensional distributions of the flow field, gas species, and temperature within a boiler as a model can. Physical modeling cannot account for the extreme temperature variations within boiler equipment and is subject to the physical compromises of a reduced geometric scale. Numerical modeling is not subject to these constraints.

Within the fossil power generation industry, B&W has a unique capability in computational fluid dynamics (CFD) and combustion modeling. The substantial investment in computational modeling made by B&W over the past twenty-five years has culminated in COMO^{SM}, our proprietary flow and combustion model. COMO^{SM} uses an unstructured mesh with a mixture of element shapes for greater geometric flexibility, and adaptive mesh refinement to control resolution in regions of high gradients (e.g. turbulent jets, diffusion flames, etc.). It includes advanced capabilities for simulating turbulent flow, energy and radiation, heterogeneous reactions, particles, surface reactions, gas phase reactions, and tube banks. COMO^{SM} includes advanced sub-models for devolatilization, char burning and fuel-nitrogen release. Gas phase chemical kinetics are simulated with any number of species and reactions, using established reaction mechanisms, and including the effect of turbulence on kinetic rates. COMO^{SM} has been used routinely at B&W for over a decade to improve the design and operation of boilers and boiler components.

2.3 Furnace corrosion protection

The furnace will be fully weld overlayed with Inconel™ 625 to the extent defined in the Scope of Supply in order to provide corrosion protection based on the current operating experience. This material selection reflects the last 18 years of operating experience at the NCRRF.

2.4 Superheater

Five (5)additional superheater sections (3 on Unit 2 and 2 on Unit1) will be added to increase the total heat transfer surface and provide for improved superheater steam temperature control. The superheater metallurgy as described in the Scope of Supply has been optimized based on current operating experience and metallurgy. Couplings on each of the superheater sections are also supplied to facilitate replacement of the sections in an expeditious manner.

2.5 Circulation

At the request of the Authority, the circulation system will be revised to allow for adequate circulation margin at 110% of maximum steam capacity (as defined in Schedule 11, Appendix C of the ARO&M). The additional margin will maintain furnace tube temperatures at acceptable ranges over a wider range of operating and fuel conditions to maintain acceptable corrosion rates in the boiler. The circulation modifications are detailed in the Scope of Supply and include both steam drum internals modifications and additional circulation connections (supply & riser tubes).

3. SCOPE OF SUPPLY

The following material scope of supply will be provided to refurbish two refuse-derived fuel (RDF) boilers rated at 324,000 lbs/hr steam flow each and located at the North County Resource Recovery Facility (NCRRF) in West Palm Beach, FL. The subject units are original B&W boiler contracts S-10372 and S-10373. The superheater outlet steam conditions are 750 psig and 750° F. The boiler and economizer design pressures are 925 psig and 975 psig, respectively. The NCRRF will be capable of processing RDF which varies in composition, and ranges between 4,500-7,000 Btu/lb in heat content.

The following drawings will provide a graphical representation of the scope of supply provided and the terminal points, and will provide further definition of the project scope which is defined below.

- B0005369J-00 – Refurbishment of Unit #1 Side View
- B0005370J-00 – Refurbishment of Unit #1 Plan Views
- B0005371J-00 – Refurbishment of Unit #2 Side View
- B0005372J-00 – Refurbishment of Unit #2 Plan Views

3.1 - HEAT TRANSFER COMPONENTS

FURNACE

Two new furnaces will be provided, one per boiler. The furnace dimensions for each boiler are 17'-5" deep from centerline-to-centerline of front and rear wall tubes, and 30'-0" wide from centerline-to-centerline of the side wall tubes. The furnace panels will be membrane construction using SA210A1 carbon steel tubes overlaid with Inconel 625 on the fireside of the panels (180° overlay). The carbon steel tubes are 2.50" OD x 0.203" MWT on 3" tube centers. Exposed tubing at the furnace openings will be 2.375" OD x 0.203" MWT SA210A1 material and overlaid with Inconel 625 around the complete circumference of the tube (360°). The panels will be shop assembled with the required headers and include the following arrangement for each boiler:

Front Wall Panels

Three panels wide (lower furnace)
Approx. 38 ft. long - inlet headers are shop attached
Headers with supply and drain connections
Three panels wide (upper furnace)
Approx. 40 ft. long – no headers

Rear Wall Panels

Three panels wide (lower furnace)
Approx. 40 ft. long - inlet headers are shop attached
Headers with supply and drain connections

Three panels wide (upper furnace) – Includes arch and associated supports
Approx. 20 ft. long – no headers

Side Wall Panels

Two panels wide (lower furnace) – both side walls
Approx. 40 ft. long - inlet headers are shop attached
Headers with supply and drain connections

Two panels wide (upper furnace) – both side walls
Approx. 40 ft. long – outlet headers are shop attached with riser connections

Roof Tubes

Two sets of roof tubes will be provided, one set per boiler. The new roof tubes will be provided from the front wall field weld elevation to the steam drum. The roof tubes from the front wall to the inlet of the new superheater will be provided as membrane panels (three panels wide per boiler) with Inconel 625 cladding on the fireside of the panel. The roof tubes will be loose tubes from the gas inlet side of the superheater to the steam drum. Every third roof tube across the boiler width will be bent out of plane above an adjacent roof tube to accommodate the outlet leg penetrations of the 39 superheater pendant sections. Both the lower and upper level of loose roof tubes will be weld overlaid 360° with Inconel 625.

The carbon steel roof tubes will be 2.50" OD x 0.203" MWT; SA210A1 material with Inconel 625 cladding as defined above.

Penthouse Casing and Trolley Beam

New penthouse enclosure casing and a new penthouse trolley beam will be provided for each boiler.

Stoker Front Plate & Seals

Two sets of boiler to stoker side and rear wall seals and front wall extensions and seals will be provided, one set per boiler. The stoker seals will be Detroit Stoker or equivalent.

Buckstays

Two new sets of buckstays, standoffs, earthquakes ties, and connectors will be provided, one set per boiler. These components will help to facilitate the erection process. The new buckstays will be shop primed and field lagged on both top and bottom.

Doors

Two new sets of doors will be provided, one set per boiler, for the furnace. The table below defines the type of doors and quantities provided. The various door sizes, where not specifically listed, will be comparable to the existing furnace doors.

Door Description	Quantity
Corner Doors	6
Maintenance Beam Doors	5
Decking Doors	2
Furnace Access Doors – 15" x 21"	7
Observation Doors	36
Superheater Pendant Replacement Doors	4

SUPERHEATER

Two (2) convective superheaters will be provided, one per boiler, with 16 tube rows deep in the direction of flue gas flow. The superheaters consist of a side-by-side (parallel) primary and secondary arrangement. The primary superheater contains 20 pendant sections and the secondary superheater contains 19 pendant sections for a total of 39 sections across the boiler width. The tubes are on 3.75" back spacing and 9" side spacing.

Each 16 row pendant superheater section in both the primary and secondary will consist of the following tubes and material:

- **Row 1**: 3.0" OD tube x 0.400" MWT; SA213TP310H stainless steel material
- **Row 2**: 2.75" OD tube x 0.284" MWT; SA213TP310H stainless steel material
- **Rows 3-16**: 3.0" OD tubes x 0.400" MWT; SA210A1 carbon steel material

The new primary and secondary superheater inlet and outlet headers will be 12.75" OD Sch 140 pipe made of SA106B carbon steel material.

Each superheater will be provided with the following accessories:

- Hanger rods
- 39 new rapper hammers (drives to be reused)
- Drain and vent valves (Eight 1.50" drain valves and two 1" vent valves for each boiler)
- Sootblower shields
- Six saturated connection tubes from steam drum to primary superheater inlet header
- Crossover piping with two 1" vent valves

- Outlet piping to main steam sky vent and non return valves. The new piping will include a 12x10 reducer

ATTEMPERATOR

Two (2) new interstage spray attemperators will be provided, one per boiler, to control superheater outlet steam temperature. Each attemperator is 12.75" OD and will be located in the new 12.75" OD crossover piping between the primary and secondary superheaters.

The source of the attemperator spray water will be feed water from the economizer inlet. The existing spray water piping and attemperator valves will be reused. The attemperators will be Graham or equivalent.

STEAM DRUM INTERNALS

Two sets of additional steam drum components, one set per boiler, will be added to the existing steam drum internals. Each set of additional drum components will include eight cyclone steam separators, four riser boxes, new primary scrubber, and a modified baffle plate. These additional components will complement the existing reused internals.

SUPPLY TUBES

Two sets of supply tubes, one set per boiler, will be provided to feed the lower furnace wall headers. Water to the lower wall headers is sourced from the lower drum, but the supply tubes are new only to the cut line located at approximate elevation 99'-0".

RISER TUBES

Two sets of riser tubes, one set per boiler, will be provided from the upper furnace side wall headers to the steam drum.

3.2 - COMBUSTION SYSTEMS

FUEL SYSTEM

Auxiliary Burner System

A total of eight new natural gas auxiliary burners will be provided – four burners per boiler. The burners are 12" diameter with a nominal maximum rating of 25 MKBtu/hr each. Two burners will be located at the same elevation on each boiler side wall. Combustion air will be provided to each burner from the new burner air ducts complete with expansion joints supplied from the new overfire air (OFA) ducts.

Each auxiliary burner will be equipped with the following:

- Ceramic-lined burner isolation damper (door)
- Associated windbox
- Hose
- Ignitor
- Flame scanner
- Piping (20 ft.) to connect to the existing burner valve racks

Fuel Chutes

Twelve fuel chutes, six per boiler, will be located on the front wall of the lower furnace. Each chute will be equipped with vertical and inclined portion of the chute and an expansion joint. The fuel chutes will be Detroit Stoker or equivalent.

Air Swept Spouts

Twelve air swept spouts, six per boiler, will be provided including supply air to each spout. The air will be supplied via new air ducts extending from the new overfire air (OFA) duct to the six air swept spouts located on the furnace front wall. The air swept spouts will be Detroit Stoker or equivalent.

Each air swept spout will include the following:

- Rotating air damper assembly
- Spout adapters
- Mounting plate

Two motors and drive shafts will also be provided, one each per boiler. The six damper assemblies on each unit will be connected to a common shaft and driven by a 1/3 hp motor.

AIR SYSTEM

Overfire Air Fans

Two new overfire air (OFA) fans will be provided, one fan per boiler. Each fan will be provided with a 1000 hp motor and a multi-louver inlet damper with Beck electric actuator. The fans will be Barron Industries (Process Equipment) or equivalent. The specification for each OFA fan is shown in the table below:

OFA FANS	Flow (lbs/hr)	S.P. Rise ("w.g.)	Temp (°F)	Power (BHP)
Normal	296,000	34.0	450	748
Design (Test Block)	325,600	37.4	500	851

Overfire Air Ports

A total of twelve overfire air (OFA) ports will be provided, six air ports per boiler. The six OFA ports on each boiler will be arranged on two elevations with a staggered 2x1 port arrangement on each elevation.

Ducts

Two sets of ducts and associated equipment, one set per boiler, will be provided for the overfire air (OFA) system. The associated equipment for each set of ducts will include:

- OFA fan inlet duct
- OFA fan outlet ducts to boiler OFA ports
- Burner air ducts
- Tubular air heater bypass duct
- Expansion joints
- Dampers and drives
- Two air flow elements
- Duct supports

3.3 - AUXILIARY EQUIPMENT

INSTRUMENTATION

Two sets of boiler instrumentation, one set per boiler, will be provided exclusive of drum instrumentation. The table below summarizes the list of instruments provided for one boiler.

Instrument	Service	Quantity
Thermocouple (with 60 ft. extension wire)	**Pri. & Sec. SH Temperature**	**40**
Thermocouple Junction Box (12-23 points)	**Pri. & Sec. SH Temp. Junction Box**	**2**
Thermocouple and SS Protecting Well	**Primary Superheater Outlet Temp.**	**1**
Thermocouple and SS Protecting Well	**Attemperator Outlet Temperature**	**1**

Instrument	Service	Quantity
Thermocouple and SS Protecting Well	Final Steam Temperature	1
Pressure Transmitter	Furnace Pressure	2
Pressure Transmitter	Overfire Air Fan Outlet Pressure	2
Omega OS1200 Pyrometer	Furnace Temperature	1

VALVES

Two sets of valves, one per boiler, will be provided. Reference the following table for a listing of the valves which will be provided for one boiler.

Valve	Quantity
Furnace Lower Header Drain	9
Primary Superheater Inlet Header Drain	2
Primary Superheater Outlet Header Drain	2
Secondary Superheater Inlet Header Drain	2
Secondary Superheater Outlet Header Drain	2
Superheater Crossover Pipe Vent	2
Main Steam Outlet Pipe Vent	2

3.4 – MISCELLANEOUS

OPERATING & MAINTENANCE MANUALS

Operating & Maintenance manuals for the new combustion control system, overfire air fans, vendor supplied equipment, and boiler standards will be provided.

CONTROL SYSTEM DOCUMENTS

A System Requirement Specification (SRS), Functional Logic Diagrams, and an I/O List will be provided for the new overfire system.

NUMERICAL CFD MODEL STUDY

B&W's proprietary combustion model (COMO^{SM}) will be used to perform a modeling study of the new overfire air system and associated operating conditions. The modeling study will be used to evaluate combustion performance for the proposed designs and identify respective strengths and possible improvements with the designs.

CONSULTING SERVICES

Two Erection Consultants (one per shift/ two shifts per day/ six days per week) will be provided for the duration of installation of both boilers. This proposal is based upon an overall erection schedule which includes:

- four month outage for the first unit,
- one month start-up of first unit, and
- four month outage for the second unit

Should the erection schedule be extended or the erection approach changed which increases the Erection Consultant requirements, then additional Erection Consultant coverage can be provided based upon the published per diem rate in effect at the time of service.

A Start-up consulting service engineer will be provided for the duration of commissioning of both boilers. A control system start-up consultant will be provided for one week per boiler. A performance test consultant will be provided during the performance testing of the boilers.

Material receiving, expediting and quality verification consultant for four months.

OTHER MISCELLANEOUS

- Weld rings for superheater including one spare
- Refractory , insulation and lagging specification (BRIL Book)
- Procedures for start-up of boilers
- Material certifications and QA records
- Jobsite office trailer for one year for B&W personnel (not including hook-up or costs for electric, phones or computers

3.5 – REUSED SCOPE

The following major components, equipment, and materials of the RDF boilers will be reused. The items listed below are for one boiler. This list is not all inclusive.

- Steam drum – 60" diameter
- Steam drum internals (except for those specifically stated above)
- Lower drum – 42" diameter
- Stoker system and hoppers
- Structural steel, top steel, and boiler hanger rods
- Superheater rapper system (except for rapper hammers specifically stated above)
- IK sootblowers for superheater and generating bank
- Existing air ducts as shown on drawing 83034J-00
- G9B sootblowers for economizer
- Burner valve racks
- Maintenance beams and decking

- Air heater return air boxes
- Feed water piping to the flow control valve, and all related valves, connections, and supports
- Safety valves, silencers, and associated piping and supports
- Electromatic Relief Valve (ERV), silencer, and associated piping and supports
- Steam outlet pipe downstream of the main steam stop valve, and all steam outlet pipe pressure connections and transmitters

3.6 – SELECTED ITEMS NOT INCLUDED IN SCOPE

In order to facilitate a clean interface with the balance of the NCRRF Refurbishment, the following items are identified as outside in the Scope of Supply for this proposal. These excluded items cover but are not limited to:

- Installation Services
- Performance Testing
- Environmental Performance Testing
- Commissioning and start-up plan.
- Commissioning and start up of boilers (chemical cleaning, disposal of chemicals, boiler out, steam blows, start-up craft labor, start-up operations labor),
- Weld overlay of furnace panel field joints.
- Reinforcement of existing support steel and associated boiler hanger wall support system.
- Field Hydro of boiler or related pressure parts
- Scrap disposal of existing boilers
- Brick work, Refractory, Insulation, and Lagging (BRIL)
- Long term (greater than 6 month) storage of finished materials

This is not an all inclusive list as many of the Refurbishment materials for the boiler island are outside of B&W's material supply scope (such as the generating bank tubes, the air heater, economizer and boiler casing/flues from the generating bank to the air heater outlet).

3.7 – TERMINAL POINTS

STEAM / WATER

- Saturated steam connections at steam drum
- Inlet to main steam stop valve
- Outlet of second valve on header drains, vents and instrument connections
- Cut line on supply tubes from lower drum

FUEL

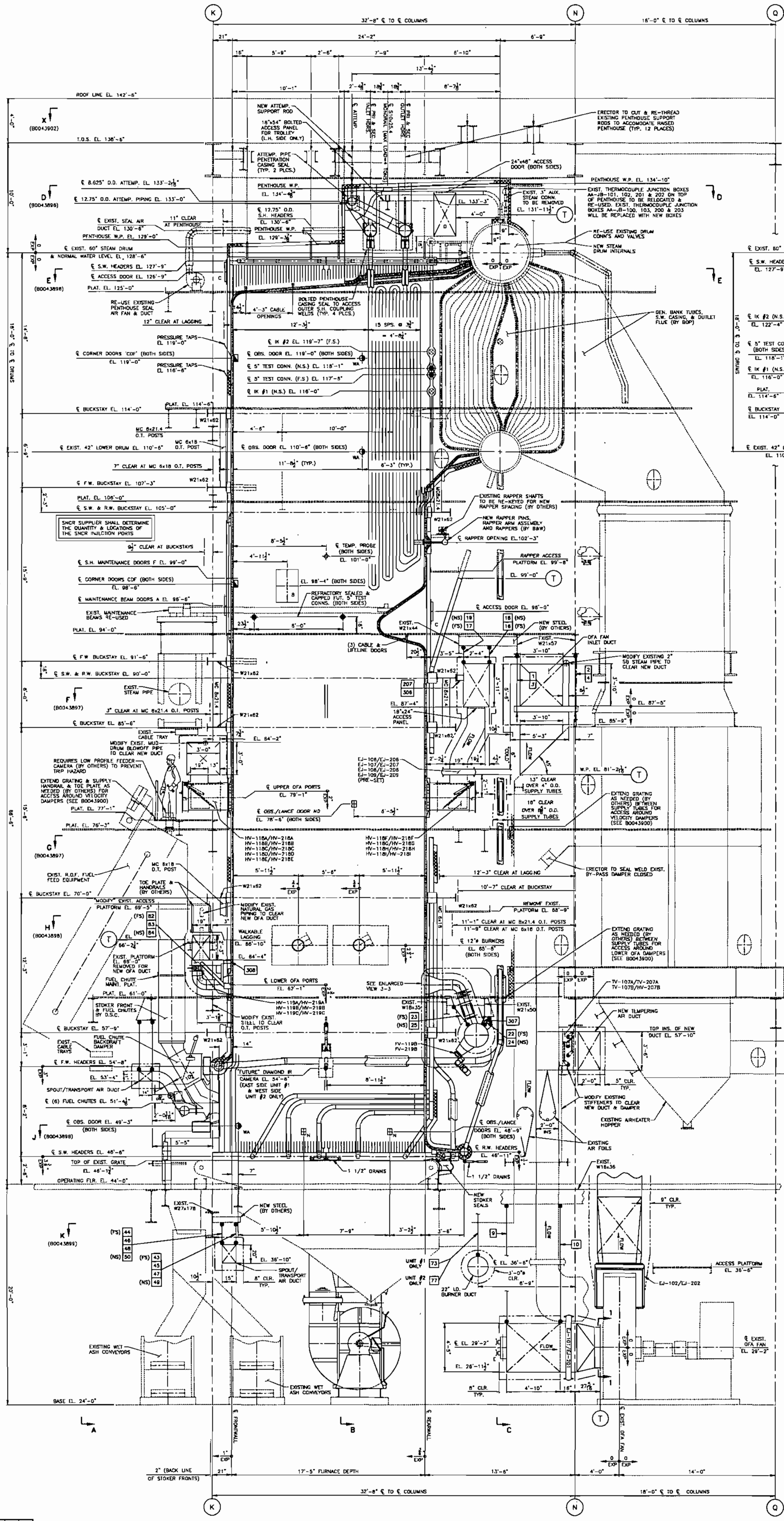
- Inlet of expansion joint on fuel chutes

AIR

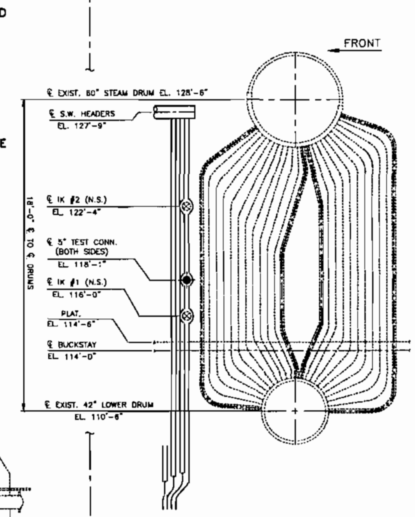
- Inlet flange connection to overfire (OFA) fan

MISCELLANEOUS

- Long Term (greater than 6 months) storage of finished materials
- Thermocouple terminations at junction boxes at the boiler perimeter
- Attachment points at existing hangers and supports
- Attachment points at existing structural steel for new superheater hanger rods



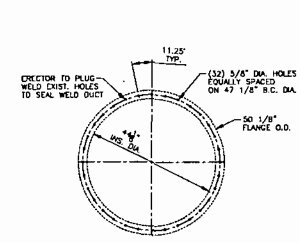
SECTIONAL SIDE VIEW S-S



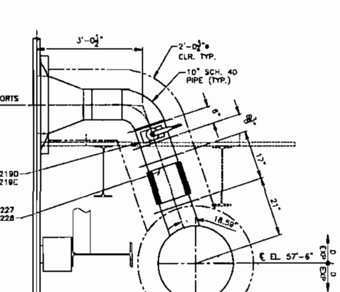
PARTIAL VIEW OF BOILER #2

LOOKING FROM COMMON BAY OUTSIDE VIEW RH SIDEWALL

NOTE:
ROOF TUBE ARRANGEMENT FOR BOTH UNITS ARE IDENTICAL. FOR DRUM FIELD ALTERATION ON 117-0373 SEE DWG. 1694310.



ENLARGED SECTION VIEW 1-1
(EXISTING OFA FAN INLET FLANGE DETAIL)
(SCALE: 3/4"=1'-0")



ENLARGED VIEW 3-3
(LOWER REARWALL OFA DUCT)
(SCALE: 3/4"=1'-0")

NOTES:

1. FOR ADDITIONAL NOTES & SYMBOL NOMENCLATURE SEE DWG. B0043890.
2. LEFT HAND BOILER SHOWN (0835-201J) UNIT #1. RIGHT HAND BOILER (0835-201K) UNIT #2 OPPOSITE EXCEPT FURNACE SIDEWALLS, FURNACE FRONTWALL, FURNACE REARWALL, FURNACE ROOF TUBES, FURNACE RISER TUBES & FURNACE SUPPLY/DOWNCOMER TUBES.
3. FOR GENERATING BANK, BOILER OUTLET, ECONOMIZER & AIRHEATER G/A REFERENCE DRAWING LIST ON PROJECT 0835-224A & 0835-224B SEE NOTES DRAWING B0043921.

REVISIONS

REV	DESCRIPTION		DATE	APPROVAL
1	SEE REVISION TRANSMITTAL DRAWINGS B0043911 & B0043912.	D.R.M./D.E.K.	05/30/08	M.A.DAVIS
2	SEE REVISION TRANSMITTAL DRAWINGS B0043913 & B0043914	D.R.M./D.E.K.	08/22/08	M.A.DAVIS
3	SEE REVISION TRANSMITTAL DRAWINGS B0043915, B0043916 & B0043917.	D.R.M./D.E.K.	01/20/09	M.A.DAVIS
4	ADDED NOTE 3, CORRECTED CUSTOMER INFO IN TITLE BLOCK, ADDED MAX LOAD FOR MONORAIL IN ZONE E-11, REPLACED REMOVABLE WITH BOLTED FOR ACCESS PANELS IN ZONES D-10 & D-11. IDENTIFIED EXIST. 3" AUX. STEAM CONN. TO BE REMOVED IN ZONE F-11, LOCATED FURNACE PRESS. TAPS IN ZONE C-10, ADDED SNCR SUPPLIER NOTE IN ZONE B-9, ADDED NOTE TO MODIFY EXIST. SB STEAM PIPE IN ZONE G-8, REMOVED ARCH SUPPORT IN ZONE E-8 TO SHOW CORRECTLY, ADDED CAPPED TO NOTE IN ZONE D-8, REMOVED CAMERA ELEVATION IN ZONE E-7, ADDED BY OTHERS TO NOTE IN ZONE B-7, CORRECTED BELLOWS & DAMPER LOCATIONS FOR THE LOWER REARWALL OFA IN ZONE E-6 & ENLARGED VIEW 3-3 PER DETAILER INFO. SHOWED GRATE CLOSER IN ZONE B-5. SHOWED SPOUT/TRANSPORT AIR FAN IN ZONE D-4.	D.E.K.	06/24/09	M.A.DAVIS

SOLID WASTE AUTHORITY OF PALM BEACH COUNTY
NORTH COUNTY
RESOURCE RECOVERY FACILITY
NCRRF REFURBISHMENT

Babcock & Wilcox Power Generation Group, Inc.

GENERAL ARRANGEMENT
REFURBISHMENT PROJECT
SPB WITH DETROIT STOKER
SECTIONAL SIDE VIEW S-S

APPR	M.A.DAVIS
DATE	04/14/08
SCALE	3/8"=1'-0"
PROJECT NO.	201J/201K
CDA	A00000
DWG. NO.	B0043891
REV.	J04

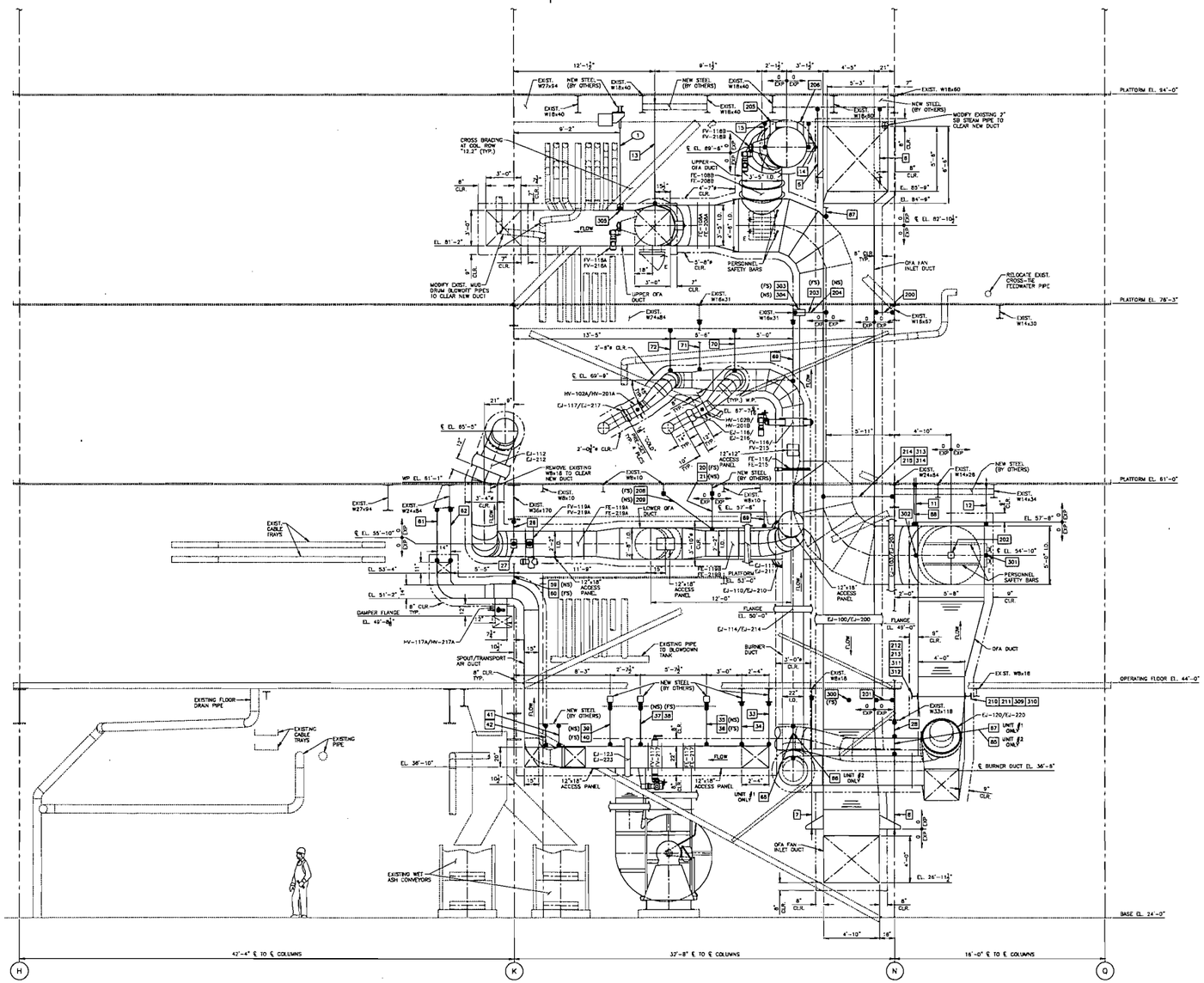
UNIT	USER DEFINED FIELD	ORIG. CONTRACT NO.
UNIT #1 0835-201J	480-0085	117-0372
UNIT #2 0835-201K	480-0086	117-0373

B0043891 04

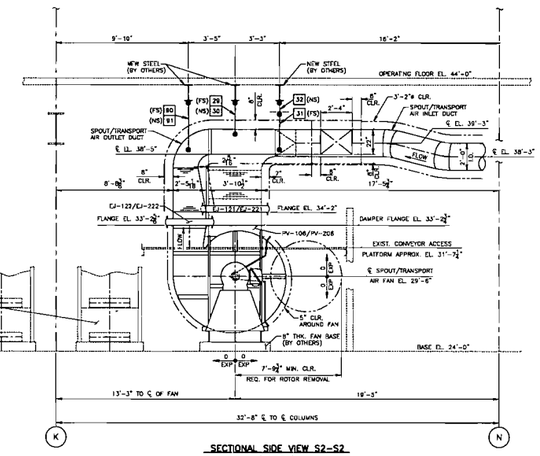
B 80043892

REVISIONS

NO	DESCRIPTION	DATE	APPROVAL
1	SEE REVISION TRANSMITTAL DRAWINGS B0043811 & B0043912.	05/30/08	M.A.DAVIS D.R.M./D.E.K.
2	SEE REVISION TRANSMITTAL DRAWINGS B0043913 & B0043914.	06/23/08	M.A.DAVIS D.R.M./D.E.K.
3	SEE REVISION TRANSMITTAL DRAWINGS B0043915, B0043916 & B0043917.	07/30/08	M.A.DAVIS D.R.M./D.E.K.
4	ADDED NOTE 3, CORRECTED CUSTOMER INFO IN TITLE BLOCK, SHOWED SPOUT/TRANSPORT AIR FAN IN ZONE B-8, ADDED NOTE TO MODIFY EXIST. SB STEAM PIPE IN ZONE I-8, REMOVED BURNER AIR DUCT EXPANSION JOINTS EJ-113 & EJ-213, PER LATEST STRESS INFO.	08/24/08	M.A.DAVIS D.E.K.



SECTIONAL SIDE VIEW S1-S1



SECTIONAL SIDE VIEW S2-S2
(B0043894)

NOTES:

1. FOR ADDITIONAL NOTES & SYMBOL NOMENCLATURE SEE DWG. B0043890.
2. LEFT HAND BOILER SHOWN (0633-201J) UNIT #1. RIGHT HAND BOILER (0835-201K) UNIT #2 OPPOSITE EXCEPT: FURNACE SIDEWALLS, FURNACE FRONTWALL, FURNACE REARWALL, FURNACE ROOF TUBES, FURNACE RISER TUBES & FURNACE SUPPLY/DOWNCOMER TUBES.
3. FOR GENERATING BANK, BOILER OUTLET, ECONOMIZER & AIRHEATER G/A REFERENCE DRAWING LIST ON PROJECT 0835-224A & 0835-224B SEE NOTES DRAWING B0043921.

SOLID WASTE AUTHORITY OF PALM BEACH COUNTY
NORTH COUNTY RESOURCE RECOVERY FACILITY
NCRRF REFURBISHMENT

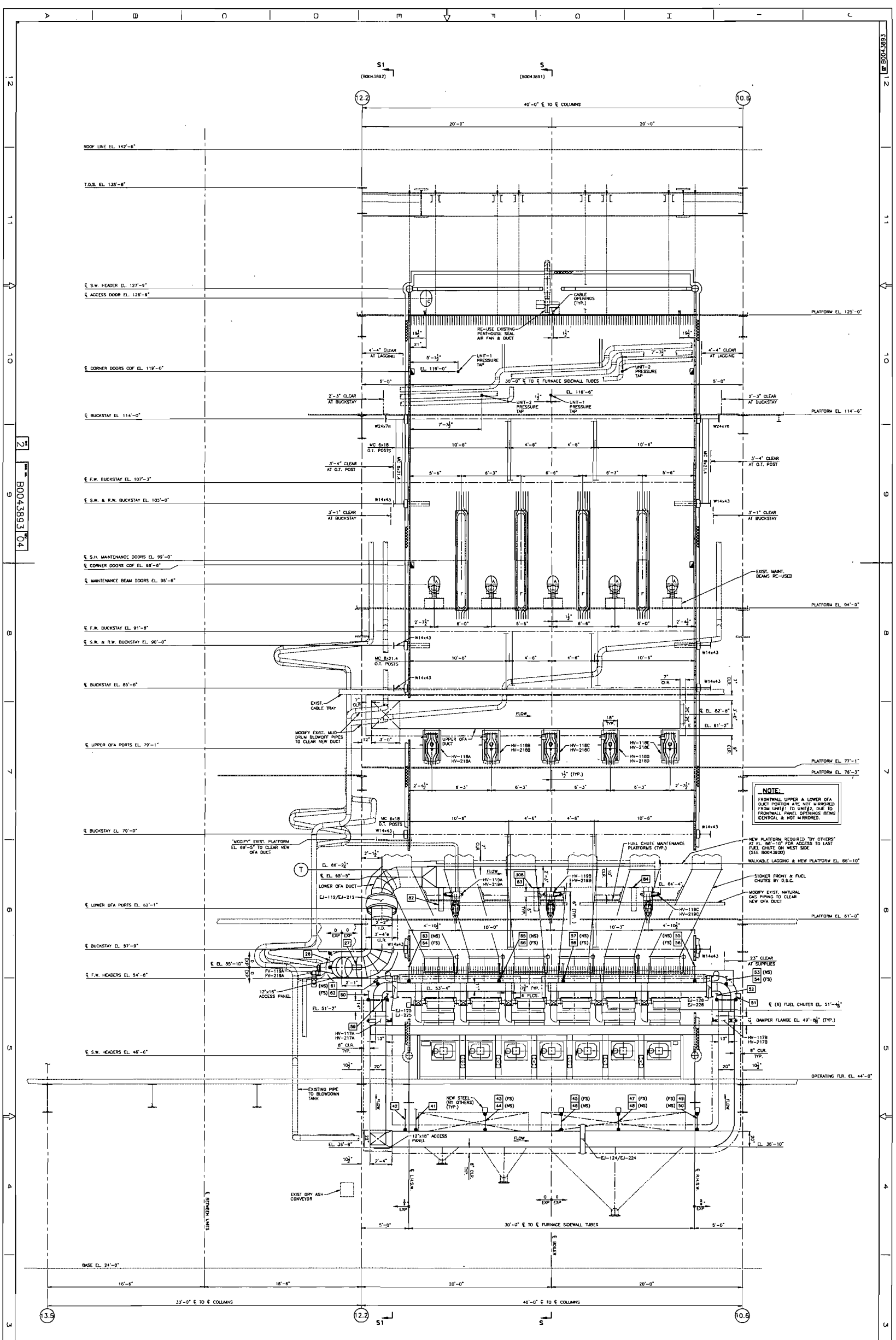
UNIT #1 0633-201J	UNIT #2 0835-201K
User Defined Field 480-0065	User Defined Field 480-0066
MFRS. EQUIPMENT NO. 117-0372	MFRS. EQUIPMENT NO. 117-0373
	P.O. OR MFRS. # AND SHIPPING WAY

QA MANDATORY	Babcock & Wilcox Power Generation Group, Inc.
QA CRITICAL	
MARK	
DATE	05/15/08
SCALE	3/8"=1'-0"
Type PROJECT	
Dist.Contr.	TRUE
Dist.Engr.	TRUE
Dist.MFG.	FALSE

GENERAL ARRANGEMENT
REFURBISHMENT PROJECT
SPB WITH DETROIT STOKER
SECTIONAL SIDE VIEW S1-S1

PROJECT NO. 201J/201K | CON A00000 | DWG. NO. B0043892 | REV. NO. J04

SHT 2 | DWG. NO. B0043892 | REV. 04



OUTSIDE FRONT VIEW A-A

NOTES:

1. FOR ADDITIONAL NOTES & SYMBOL NOMENCLATURE SEE DWG. B0043930.
2. LEFT HAND BOILER SHOWN (0835-201J) UNIT #1 RIGHT HAND BOILER (0835-201K) UNIT #2 OPPOSITE HAND. FURNACE SIDEWALL TUBES SHOWN. REARWALL FURNACE SIDEWALL TUBES & FURNACE SUPPLY/DOWNCOMER TUBES.
3. FOR GENERATING BANK BOILER OUTLET, ECONOMIZER & AIRHEATER G/A REFERENCE DRAWING LIST ON PROJECT 0835-224A & 0835-224B SEE NOTES DRAWING B0043921.

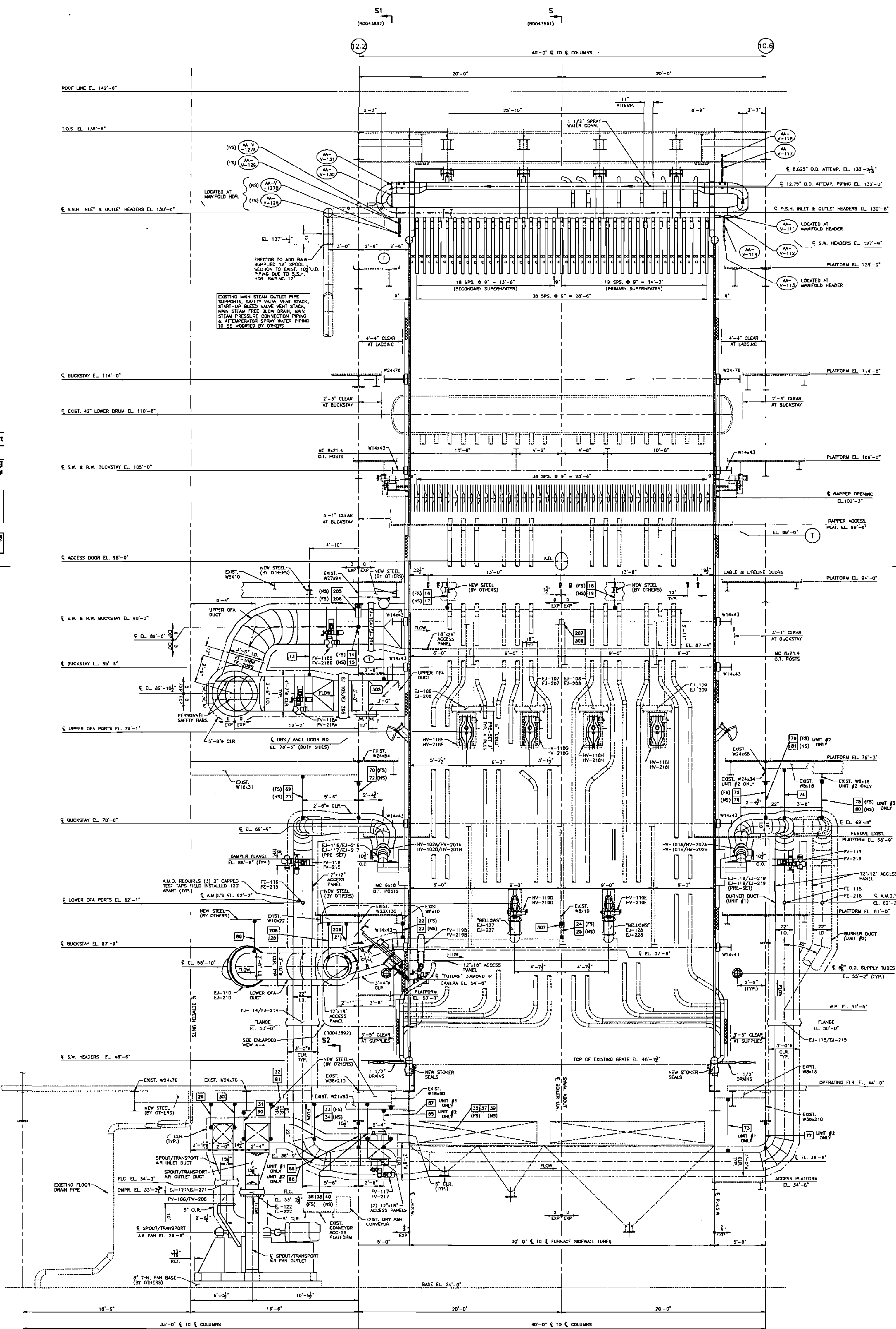
REVISIONS

NO.	DESCRIPTION	DATE	APPROVED
1	SEE REVISION TRANSMITTAL DRAWINGS B0043911 & B0043912.	05/26/06	M.A.ZAND
2	SEE REVISION TRANSMITTAL DRAWINGS B0043913 & B0043914	06/22/06	M.A.ZAND
3	SEE REVISION TRANSMITTAL DRAWINGS B0043915, B0043916 & B0043917. ADDED NOTE 3. CORRECTED DUCTWORK INFO IN TITLE BLOCK. ADDED FURNACE SIDEWALL TUBES SHOWN.	07/06/06	M.A.ZAND
4	REVISED FURNACE CORNER ROOM TYPE & G-5 SHOWN DUE TO CLOSERS IN ZONES F-5, G-5 & H-5.	08/31/06	M.A.ZAND

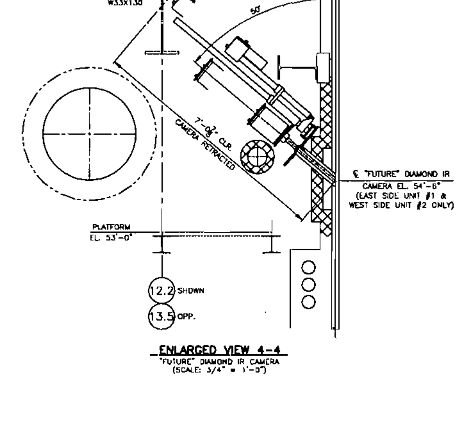
SOLID WASTE AUTHORITY OF PALM BEACH COUNTY
NORTH COUNTY RESOURCE RECOVERY FACILITY
NCRRF REFURBISHMENT

GENERAL ARRANGEMENT
REFURBISHMENT PROJECT
SPB WITH DETROIT STOKER
OUTSIDE FRONT VIEW A-A

UNIT #1	117-0372
UNIT #2	117-0373
SCALE	3/16"=1'-0"
DRAWING NO.	B0043893
SHEET NO.	04
REVISION NO.	4
DRAWN	TMAS
CHECKED	TMAS
DESIGNED	TMAS
DATE	2011/2011K
JOB NO.	A00000
DRAWING NO.	B0043893 04
REVISION	4



SECTIONAL FRONT VIEW B-B



ENLARGED VIEW 4-4
"FUTURE" DIAMOND IR CAMERA
(SCALE: 3/4" = 1'-0")

NOTES:

1. FOR ADDITIONAL NOTES & SYMBOL NOMENCLATURE SEE DWG. B0043890.
2. LEFT HAND BOILER SHOWN (0635-201J) UNIT #1. RIGHT HAND BOILER (0635-201K) UNIT #2 OPPOSITE EXCEPT FURNACE SIDEWALLS, FURNACE FRONTWALL, FURNACE REARWALL, FURNACE ROOF TUBES, FURNACE RISER TUBES & FURNACE SUPPLY/DOWNCOMER TUBES.
3. FOR GENERATING BANK, BOILER OUTLET, ECONOMIZER & AIRHEATER G/A REFERENCE DRAWING LIST ON PROJECT 0635-224A & 0635-224B SEE NOTES DRAWING B0043921.

REVISIONS

REV	DESCRIPTION	DATE	APPROVAL
1	SEE REVISION TRANSMITTAL DRAWINGS B0043911 & B0043912. D.R.M./D.E.K.	05/30/08	M.A.DAVIS
2	SEE REVISION TRANSMITTAL DRAWINGS B0043913 & B0043914. D.R.M./D.E.K.	08/22/08	M.A.DAVIS
3	SEE REVISION TRANSMITTAL DRAWINGS B0043915, B0043916 & B0043917. D.R.M./D.E.K.	01/20/09	M.A.DAVIS
4	ADDED NOTE 3. CORRECTED CUSTOMER INFO IN TITLE BLOCK. REVISED DIRECTION OF RAPPER OPENING TUBE BENDS AT EL 102'-3". CORRECTED BELLOWS & DAMPER LOCATED IN LOWER REARWALL OFA DUCT TO MATCH NEW LOCATION. D.E.K.	08/24/09	M.A.DAVIS

SOLID WASTE AUTHORITY OF PALM BEACH COUNTY
NORTH COUNTY
RESOURCE RECOVERY FACILITY
NCRRF REFURBISHMENT

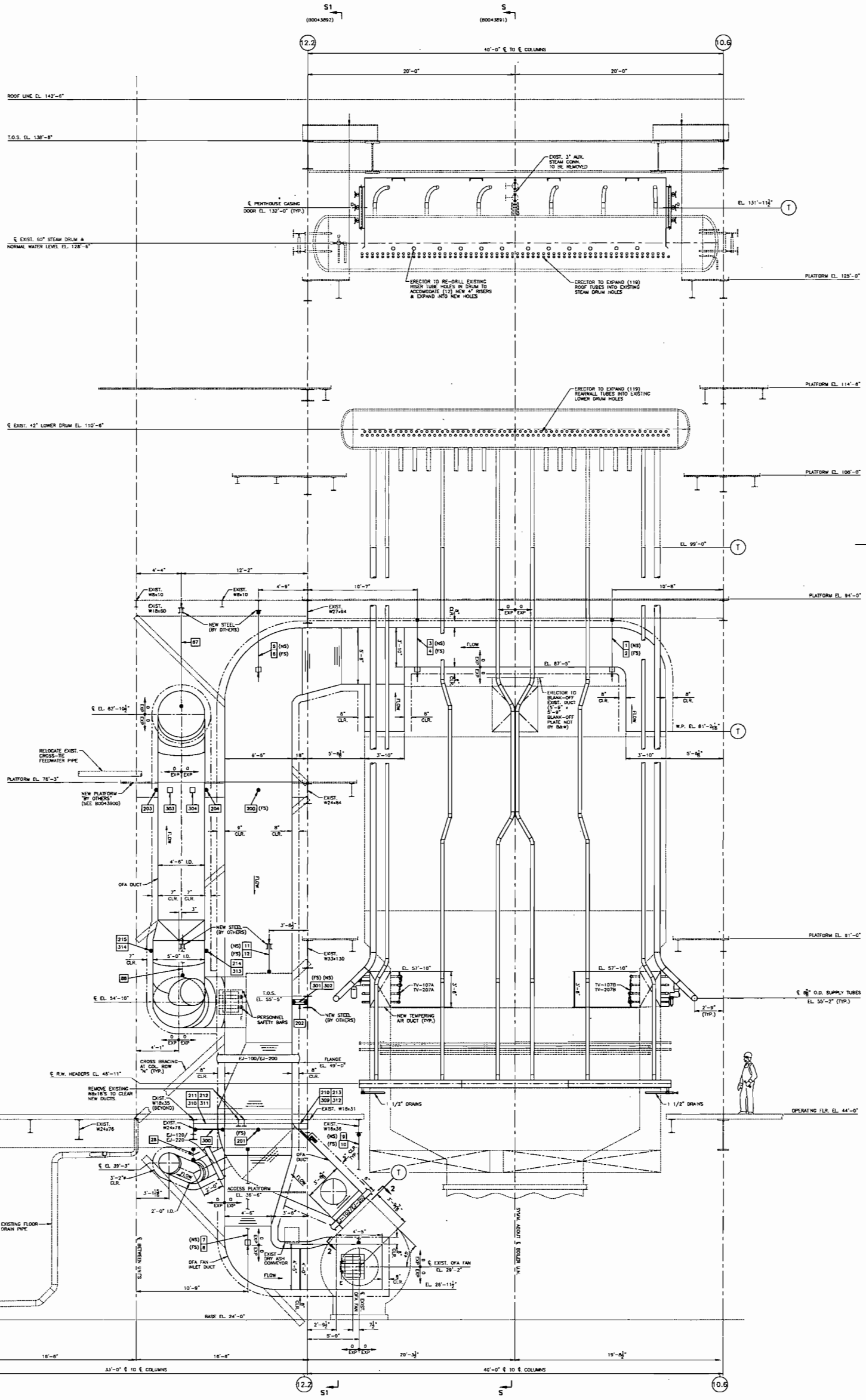
Babcock & Wilcox Power Generation Group, Inc.

GENERAL ARRANGEMENT
REFURBISHMENT PROJECT
SPB WITH DETROIT STOKER
SECTIONAL FRONT VIEW B-B

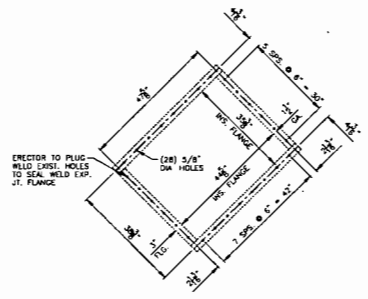
DWN	D.R.McCARTNEY
APPD	M.A.DAVIS
DATE	04/11/08
SCALE	3/8"=1'-0"
Type	PROJECT
PROJECT NO.	201J/201K
CGA	A00000
DWG. NO.	B0043894
REV.	04

UNIT #1 0635-201J	UNIT #2 0635-201K
User Defined Field 460-0085	User Defined Field 460-0086
117-0372	117-0373

DWG. NO. B0043894 REV. 04



SECTIONAL FRONT VIEW C-C



ENLARGED SECTION VIEW 2-2
(EXISTING DFA FAN OUTLET FLANGE DETAIL)
(SCALE: 3/4"=1'-0")

NOTES:
1. FOR ADDITIONAL NOTES & SYMBOL NOMENCLATURE SEE DWG. B0043892.
2. LEFT HAND BOILER SHOWN (0835-2010) UNIT #1. RIGHT HAND BOILER (0835-2010) UNIT #2 OPPOSITE EXCEPT FURNACE SIDEWALLS, FURNACE FRONTWALL, FURNACE REARWALL, FURNACE ROOF, FURNACE FRONTWALL RISER TUBES & FURNACE SUPPLY/DOWNCOMER TUBES.
3. FOR GENERATING BANK, BOILER OUTLET, ECONOMIZER & AIRHEATER G/A REFERENCE DRAWING LIST ON PROJECT 0835-224A & 0835-224B SEE NOTES DRAWING B0043921.

REVISIONS

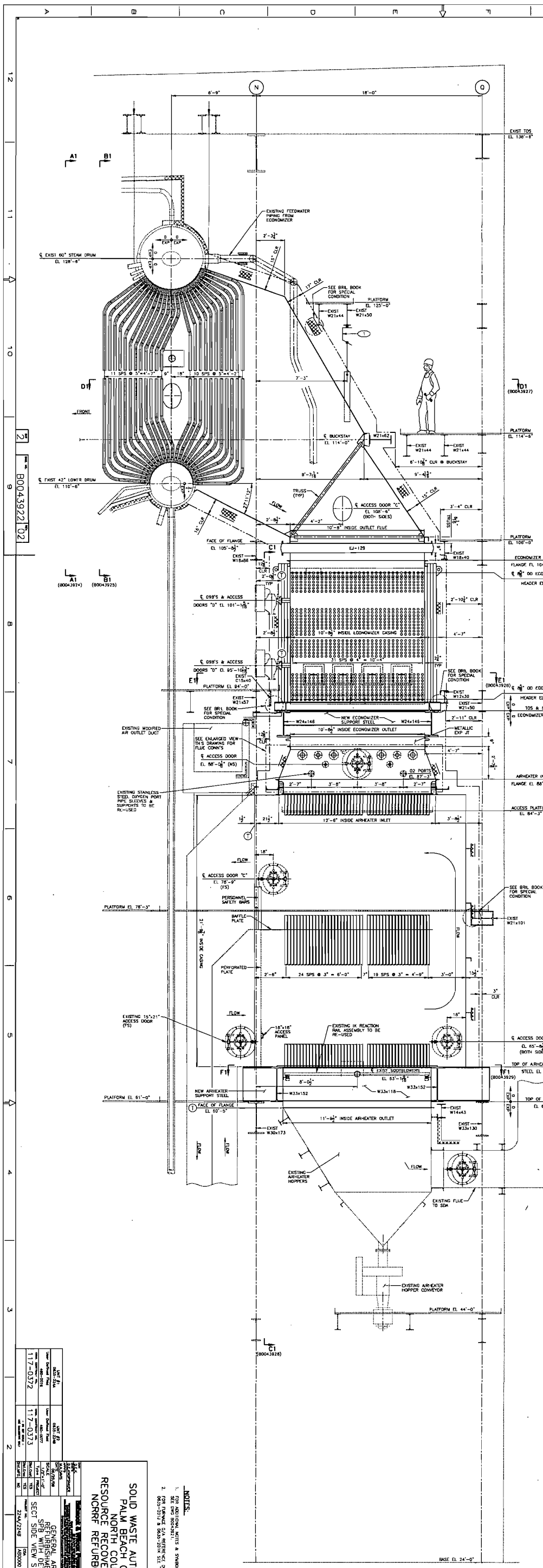
#	DESCRIPTION	DATE	APPROVAL
1	SEE REVISION TRANSMITTAL DRAWING B0043811 & B0043912.	09/30/08	M.A.SHAH D.R.M./D.E.K.
2	SEE REVISION TRANSMITTAL DRAWING B0043813 & B0043814.	06/22/09	M.A.SHAH D.R.M./D.E.K.
3	SEE REVISION TRANSMITTAL DRAWINGS B0043915, B0043916 & B0043917.	07/29/09	M.A.SHAH D.R.M./D.E.K.
4	ADDED NOTE 5. CORRECTED DESCRIPTION INFO. IN TITLE BLOCK. MOVED ACCESS DOOR EL. FROM 132'-0" TO 131'-11¼" PER DETAIL INFO. IN ZONE F-4. PER DETAIL INFO. MOVED SUPPORTS 1 & 2 EAST 7" IN ZONE H-6. ADDED NOTE TO REMOVE EXIST. 3" STEAM CONN. IN ZONE G-11.	09/24/09	M.A.SHAH D.R.M./D.E.K.

SOLID WASTE AUTHORITY OF PALM BEACH COUNTY
NORTH COUNTY RESOURCE RECOVERY FACILITY
NCRRF REFURBISHMENT

UNIT #1 (0835-2010)	UNIT #2 (0835-2010)
User Defined Field: 460-0085	User Defined Field: 460-0086
117-0372	117-0373
Type: PROJECT	Type: PROJECT
Read Only: TRUE	Read Only: TRUE
Delete: FALSE	Delete: FALSE

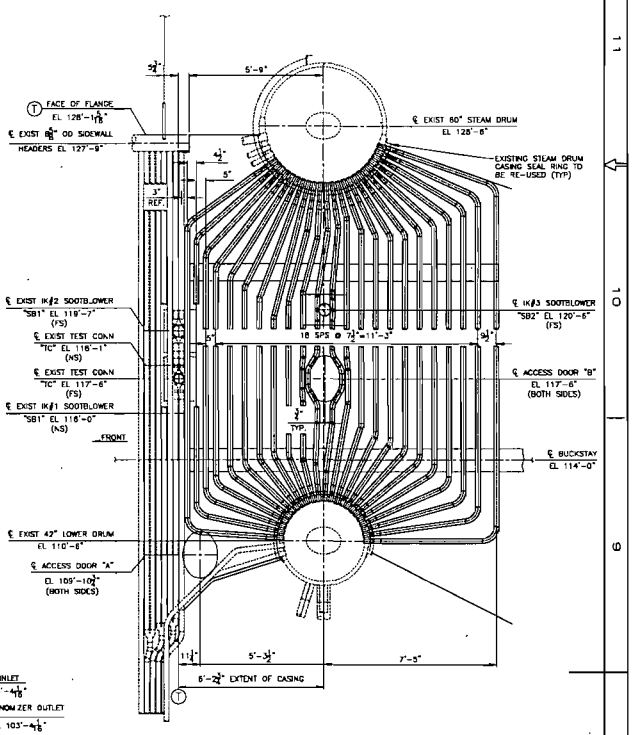
GENERAL ARRANGEMENT
REFURBISHMENT PROJECT
SPB WITH DETROIT STOKER
SECTIONAL FRONT VIEW C-C

PROJECT NO. 2D1U201K
DSN. NO. A00000
DWG. NO. B0043895 SHT. NO. J04



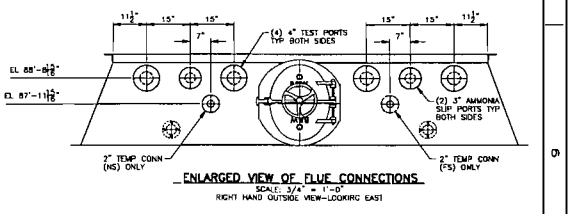
SECTIONAL SIDE VIEW S1-S1

UNIT #1 INSIDE VIEW-LOOKING EAST AT GENERATING TUBES & L.H.S.W.



SECTIONAL SIDE VIEW S1A-S1A

UNIT #1 INSIDE VIEW-LOOKING EAST AT LEFT HAND BOILER SIDEWALL



ENLARGED VIEW OF FLUE CONNECTIONS

SCALE: 3/4" = 1'-0"
RIGHT HAND OUTSIDE VIEW-LOOKING EAST

NOTES:

1. FOR ADDITIONAL NOTES & SYMBOL NOMENCLATURE SEE DWG B0043921.
2. FOR FURNACE G/A REFERENCE, DWG LIST ON PROJECT 0633-201, & 0633-201X SEE "NOTES" DWG B0043890.

REVISIONS			
	DATE	APPROVED
ADDED / EXISTING ATTEMPTER PIPING		
REMOVED "HOLES" FROM BUCKSTAY	02/19/08	MJ ADAMS
REMOVED "HOLE" ON ECONOMIZER OUTLET FLUE & ZONES D-11, D-10, I-9 & I-8 PER LATEST STRESS INFO. RELOCATED ACCESS DOOR "C" LOCATED IN PROXIMITY TO BRL "HOLE" IN ECONOMIZER OUTLET FLUE		
REMOVED "HOLE" ON ECONOMIZER OUTLET FLUE & ZONES D-11, D-10, I-9 & I-8 PER LATEST STRESS INFO. SHOWED EXISTING PLATFORMS AT EL. 81'-0" & EL. 84'-3" IDENTIFIED AS EXISTING ABRHEATER & REACTION RAIL ASSEMBLY TO BE RE-USED. SHOWED EXISTING ABRHEATER & REACTION RAIL REMOVED CLEARANCE DIMENSIONS ON ECONOMIZER IN ZONES C-8 & F-8 PER LATEST VENDOR DRAWING	D.E.K.	
UPDATED & REMOVED "HOLE" ON ECONOMIZER PER LATEST VENDOR DRAWINGS. REVISED CLEARANCE DIMENSIONS IN ZONES F-8 & C-9 & C-7. ADDED ENLARGED VIEW OF FLUE CONNECTIONS TO NOTE IN ZONE B-7, & SUPPORTS TO NOTE IN ZONE B-7.	12/28/09	MJ ADAMS
	D.E.K.	

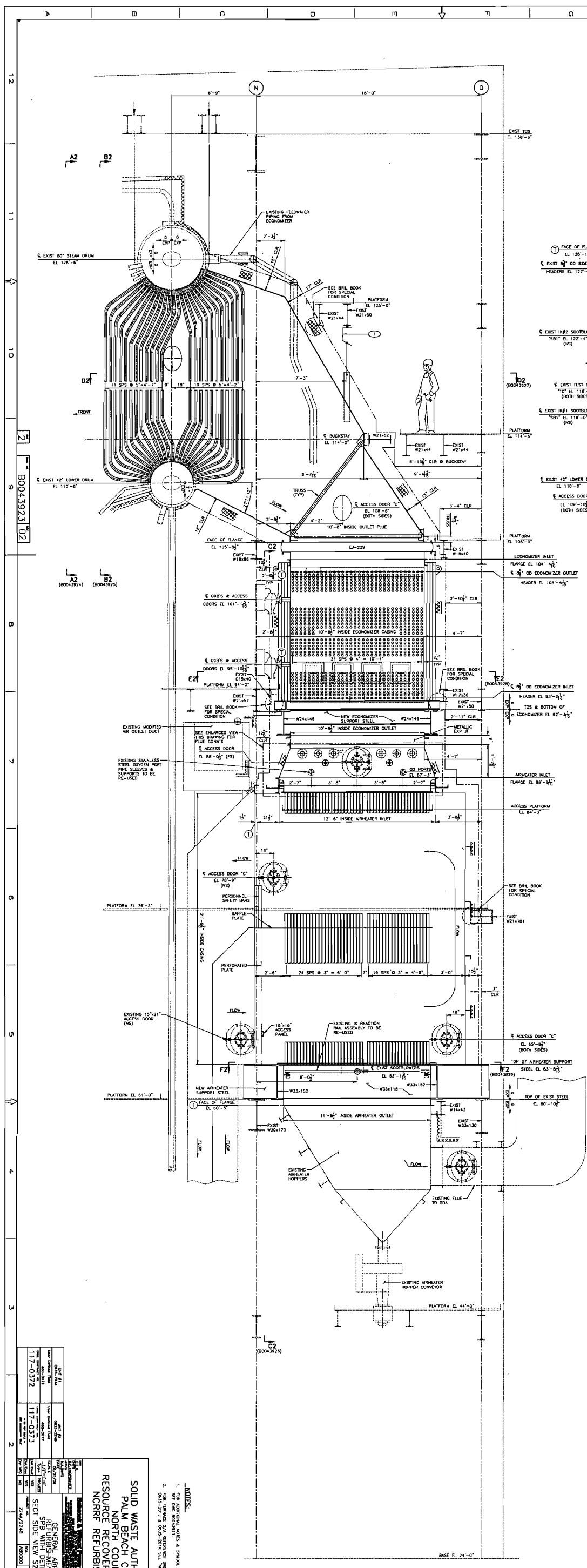
SOLID WASTE AUTHORITY OF PALM BEACH COUNTY
NORTH COUNTY RESOURCE RECOVERY FACILITY
NCRRF REFURBISHMENT

GENERAL ARRANGEMENT
REFURBISHMENT PROJECT
SPB WITH DETROIT STOKER
SECT SIDE VIEW S1-S1 & S1A-S1A

UNIT #1 Detail Plan	UNIT #2 Detail Plan
480-0074	480-0077
117-0372	117-0373
SCALE: 1/2"=1'-0"	
Type: PROJECT	
DELETED: NO	
PROJECT No. 2244/2248	CON ABS000
DWG. No. B0043922	REV. J02

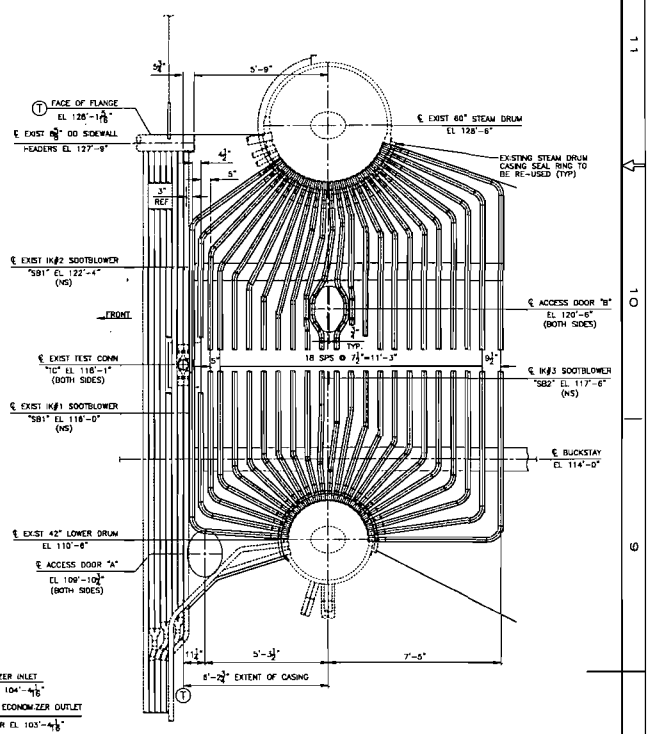
B0043922 J02

B0043922



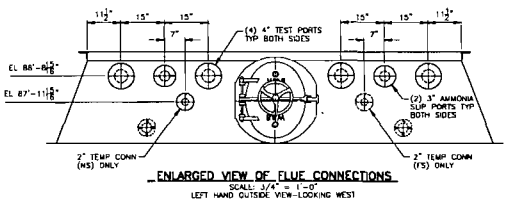
SECTIONAL SIDE VIEW S2-S2

UNIT #2 INSIDE VIEW-LOOKING EAST AT GENERATING TUBES & L.H.S.W.



SECTIONAL SIDE VIEW S2A-S2A

UNIT #2 INSIDE VIEW-LOOKING EAST AT LEFT HAND BOILER SIDEWALL



ENLARGED VIEW OF FLUE CONNECTIONS

SCALE: 3/4" = 1'-0"
LEFT HAND OUTSIDE VIEW-LOOKING WEST

NOTES:

1. FOR ADDITIONAL NOTES & SYMBOL NOMENCLATURE SEE DWG B004392?
2. FOR DETAILS & REFERENCE DWG LIST ON PROJECT 0633-201.1 & 0633-201.2 SEE "NOTES" DWG B0043890.

SOLID WASTE AUTHORITY OF PALM BEACH COUNTY
NORTH COUNTY RESOURCE RECOVERY FACILITY
NCRRF REFURBISHMENT

Babcock & Wilcox Power Generation Group, Inc.
GENERAL ARRANGEMENT REFURBISHMENT PROJECT SECT WITH NEW STOKER SECT SIDE VIEW S2-S2 & S2A-S2A

UNIT #1 0633-2?4A	UNIT #2 0633-2?4B
User Defined Field 1	User Defined Field 1
117-0372	117-0373
SCALE 1"=1'-0"	SCALE 1"=1'-0"
Size (Drwg) B	Size (Drwg) B
PROJECT NO. 2244/2248	DRAWING NO. B0043923
REV 02	

REVISIONS

NO	DESCRIPTION	DATE	APPROVAL
1	REVISED TUBESHEET TO CASING DIMENSIONS FROM B-PEPAY REVISED TUBESHEET TO CASING DIMENSIONS FROM CONSTANT HANGER PIPE LATEST AT EL 114'-0" AND FROM CONSTANT HANGER PIPE LATEST AT EL 114'-0" AND FROM CONSTANT HANGER PIPE LATEST ZONES F-3 & F-4 ADDED 2 SPACES IN ZONE F-3 & F-4 ECONOMIZER OUTLET FLUE LOCATED & DIMENSIONED O2 PROBE PORTS ADDED IN ZONES D-5 & E-5 REMOVED "BELOW ECONOMIZER OUTLET FLUE & AIRHEATER, REVISED BOILER OUTLET CLEARANCES IN ZONES F-3, F-4, G-3 & G-4 REVISED AIRHEATER CLEARANCE DIMENSION IN ZONE F-3, AT EL 114'-6" & EL 84'-3" REVISED SOOTBLOWER LOCATIONS IN ZONES F-3, F-4, G-3 & G-4 AT EL 114'-6" & EL 84'-3" REVISED SPECIAL BRIL CONDITIONS IN ZONES D-10, C-7, N-8 & ASSEMBLY TO BE RE-USED IN ZONES D-5 & E-5 REVISED AIRHEATER SUPPORT STEEL IN ZONES C-4 & F-4, PER LATEST VENDOR DRAWING	10/26/98	A.JAMES
2	ECONOMIZER & AIRHEATER SUPPORT STEEL IN ZONES C-4 & F-4, PER LATEST VENDOR DRAWING REVISED ECONOMIZER CLEARANCE DIMENSIONS IN ZONES F-4 & G-4 REVISED ECONOMIZER CLEARANCE DIMENSIONS IN ZONES F-3 & G-3 FLUE CONNECTIONS IN ZONES H-8, J-4 & J-6 ADDED & SUPPORTS TO NOTE IN ZONE B-7.	01/19/99	A.JAMES
			D.E.K.

B0043923 02

MALCOLM PIRNIE

INDEPENDENT ENVIRONMENTAL
ENGINEERS, SCIENTISTS
AND CONSULTANTS

3

SIEMENS

May 2, 2009

BE&K Construction Company , LLC
Purchasing Department
2000 International Park Drive
Birmingham, AL 35202-2606

Attention: Mr. Terry Johnson
Purchasing Agent

Reference: Siemens Proposal No. 09-JPJ-4439 Rev. 3
BE & K Inquiry No. BI6030302-MP001/Contract No. 6030302
West Palm Beach, Florida – NCRRF Refurbishment Project

Gentlemen:

We are pleased to submit herein, our Proposal No. 09-JPJ-4439 Rev. 3 covering the supply of Siemens Environmental Dry Scrubbing Equipment for the above referenced project.

A General arrangement drawing, Bid Summary and completed datasheets for the quoted equipment are also enclosed.

Terms and Conditions are under review and not addressed in this revision. We look forward to a mutually agreeable set of commercial terms.

We thank you for the opportunity to quote on your requirements and look forward to being of service to you.

If you have any questions regarding this proposal, please do not hesitate to contact myself at (678) 867-7438.

Yours very truly,

Jon P. Jones
Regional Sales Manager

Siemens Energy, Inc.
Environmental Systems and Services

501 Grant Street, 4th Floor
Pittsburgh, PA 15219-4429

SIEMENS

BE&K Construction Company
West Palm Beach, Florida
Spray Dryer Absorber / Fabric Filter Systems

Siemens Energy, Inc.
Environmental Systems and Services
Proposal No. 09-JPJ-4439 Rev. 3
May 2, 2009

Siemens hereby proposes to furnish the following described equipment and/or services only under the attached Terms and Conditions for the prices set forth and stated in this document which represents the total scope of our proposal.

Purchaser:	BE&K Construction Company
Owner:	Solid Waste Authority of Palm Beach County
Application:	Waste-to-Energy
Location:	West Palm Beach, Florida
FGC Supplier:	Siemens Environmental Systems and Services

Contents:

1.0 SYSTEM DESCRIPTION

1.0.1 Summary

The Spray Dryer Absorber/Fabric Filter (SDA/FF) Dry Scrubbing System is designed to provide 75% SO_2 removal, 95% HCl removal and reduce solid particulate emissions to 10 mg/dscm. A calcium hydroxide slurry ($Ca(OH)_2$) is atomized into the flue gas using a Spray Dryer Absorber (SDA). SO_2 is absorbed by the slurry, while the heat of the flue gas evaporates the slurry water, and cools the flue gas. The cooled flue gas is ducted to a pulse jet fabric filter where solid particulate (fly ash and dried reaction products) are collected. Cooling the flue gas promotes the condensation of heavy metals allowing them to be captured as a solid or aerosol in the fabric filter.

1.1 Process Description - SDA/FF Dry Scrubbing System

1.1.1 Acid Gas Control

Flue gas from the tubular air heater enters the top of each spray dryer absorber. An atomized calcium hydroxide ($Ca(OH)_2$) slurry is used to absorb SO_2 and other acid gases from the flue gas. The slurry is atomized into the flue gas using a multiple insert two fluid nozzles. The SO_2 is absorbed by the atomized slurry droplets. The SO_2 reacts with the $Ca(OH)_2$ to form calcium sulfite ($CaSO_3 \bullet 1/2H_2O$). Some of the calcium sulfite is further oxidized to calcium sulfate ($CaSO_4 \bullet H_2O$).

Evaporation of the slurry water in the droplets occurs simultaneously with these reactions. The absorption of SO_2 continues after the droplet has dried and a solid particle is formed. The flue gas and solid particulate are then ducted to a fabric filter where the solid materials are collected from the flue gas. The efficiency of the process is improved as the spray dryer absorber exit temperature decreases and approaches the adiabatic saturation temperature. A lower exit temperature increases the time required to dry the slurry droplet, thereby increasing the reaction time of the more efficient liquid absorption step. SO_2 adsorption onto the solid surface of the dried reaction products is also enhanced. The moisture aids diffusion of absorbed SO_2 and HCl from the surface allowing more absorption on the surface.

The amount of slurry and dilution water feed to the process is controlled to obtain maximum SO_2 removal, while producing a dry product. The system will be designed to operate at an outlet temperature set point around 280°F. This is approximately 30°F above the flue gas water adiabatic saturation temperature based on the design flue gas moisture content.

1.1.2 Spray Dryer Absorber

Flue gas enters the top of each Spray Dryer Absorber (SDA) through a diverging cone section and into the vessel. See Figure 1.1. Five (5) multiple port two fluid nozzles are used to atomize the slurry into the flue gas. The flue gas and the evaporating slurry droplets pass down the vessel to the hopper. The flue gas makes a 90° turn, exits the SDA, and enters the Pulse Jet Fabric Filter (FF). Some of the entrained fly ash and dried reaction products fall out of the flue gas and are discharged from the SDA hopper.

1.2.1 Gas Distribution

Flue gas enters the top of the spray dryer absorber and passes through a distribution section to evenly distribute the flue gas across the spray dryer absorber cross section at the slurry injection point. The flue gas elbow above the spray dryer absorber will utilize turning vanes. The flue gas distribution section consists of two (2) banks of chevrons. The turning vanes and chevrons will be constructed of abrasion-resistant steel. This design provides a lower system pressure loss than designs that utilize individual vane rings for each nozzle. There are no horizontal surfaces for fly ash to deposit or high-velocity regions subject to fly ash abrasion. The design also results in a greater turndown ratio.

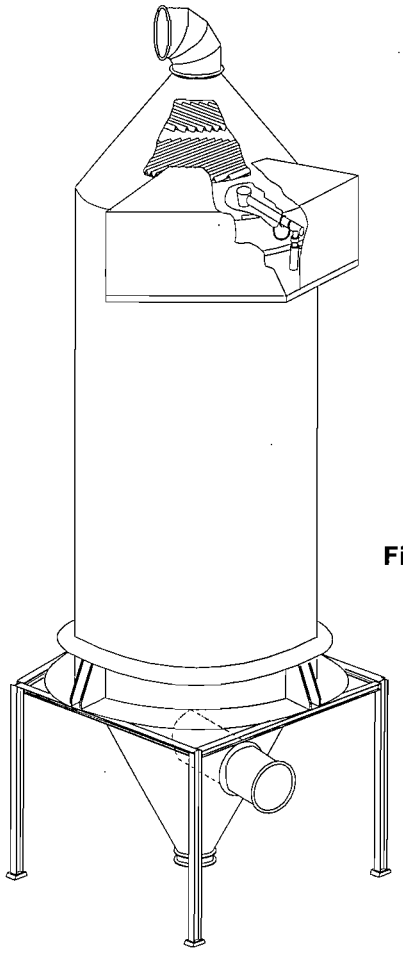


Figure 1.1

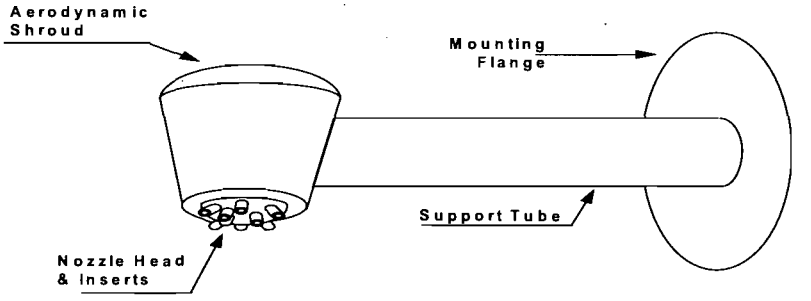


Figure 1.2

1.2.2 Atomizing Nozzles

The SDA will be provided with five (5) operating and one (1) shelf spare multiple port two-fluid nozzle. Each two-fluid nozzle consists of a stainless steel head with multiple, two-fluid nozzle inserts. The easily removable inserts are the only high slurry velocity region in the nozzle. Each nozzle is provided with a supporting lance assembly consisting of a structural tube and an aerodynamic shroud (see Figure 1.2). The lance firmly positions the nozzle in the dryer and the shroud minimizes the external buildup of ash on the nozzle. The nozzle assembly is flange mounted on the SDA, and has quick disconnects for slurry, dilution water and compressed air. The maintenance of a nozzle assembly is far easier and superior to any other technology.

Nozzle operation is checked daily, with the unit operating, through a view port. If a small buildup is noted, it is removed by rapping the back (external) of the nozzle assembly. If a nozzle requires cleaning (approx. 1-2 weeks), it is accomplished with the unit on-line.

A nozzle can be removed and a spare nozzle installed in five to ten minutes. Closing local nozzle atomizing air isolates the nozzle and slurry shutoff valves. The feed lance is unbolted from the wall and removed manually. Then the spare feed lance is placed into the flange and connected.

1.2.3 Access/Nozzle Enclosure

A nozzle platform is provided for nozzle and slurry feed control valve maintenance. The platform includes a checkered plate floor and drains.

1.2.4 Spray Dryer Absorber Process Control

The main control loops for the spray dryer absorber are total slurry feed control, which is designed to maintain the SDA outlet temperature and the control of the mixture of concentrated lime slurry and dilution water, which is designed to maintain the guaranteed SO_2 emission limits. Total flow to the SDA is controlled based on the outlet temperature. The ratio of dilution water/lime slurry is controlled to maintain the required SO_2 removal level.

1.2.5 Total Slurry Flow Control

Temperature is measured at the spray dryer outlet by two redundant thermocouples. The temperature signal provides a feedback signal to the temperature controller. The output from this controller is used as a set point for the SDA Total Flow Controller. This controller modulates the speed of the Lime Slurry Feed Pumps based on a feedback signal from the Total Flow Magnetic Flow Meter.
Alarms are provided to the DCS to indicate high and low spray dryer absorber outlet temperature. A separate low-low temperature alarm is provided for slurry feed shutdown.
Temperature in the spray dryer absorber hopper is also measured by three thermocouples and indicated on the DCS. The hopper temperature is compared to the spray dryer absorber outlet temperature. A large differential between hopper and outlet indicates poor atomization and is alarmed.
SO_2 concentration will be monitored (by Others) at the SDA inlet and FF outlet. The outlet concentration will be used as a feedback signal to the Outlet SO_2 controller. The output from this controller is analogous to ratio of lime slurry to total SDA feed required to meet the design SO_2 removal levels. The ratio is multiplied by the total measured SDA flow rate and used as a set point for the Dilution Water Flow Controller. This controller modulates the Dilution Water Flow Control Valve based on a feedback signal from the Dilution Water Flow Meter .
Total flow to the SDA is controlled by the total Slurry Feed Pump speed. Dilution Water Flow is controlled to a flow value less than the total flow rate. Lime slurry then makes up the difference between total and Lime Slurry flow.
This cascade design provides for a smoother response to system changes compared to a design that controls dilution water on outlet temperature and lime slurry flow based on SO_2 concentration. The SESS design will automatically adjust both lime and slurry flow during a load change based on the SDA outlet temperature.

1.2.6 Atomizing Air Flow Control

The Atomizing Air Flow Controller controls atomizing air flow to each nozzle at a constant rate. Atomizing air flow is measured by a local flow indicating switch. Low atomizing air flow is alarmed on the DCS and is used to stop slurry flow to a nozzle. The control logic determines the number of nozzles on line utilizing the flow switches and determines the maximum flow to the atomizers.

1.3 Absorbent Preparation System

The existing Lime Storage and Slaking System will be reused.

2.0 Equipment Descriptions

2.1 Spray Dryer Absorber

Two (2) Siemens Two-Fluid Nozzle Spray Dryer Absorbers (SDA), 1/4" A36 steel construction for ±35" w.g. pressure., with a conical hopper. Corrosion allowance = 1/16".

2.1.1 Process Conditions (per System)

Condition	Design
Flue Gas Inlet	
lb/hr	574,680
ACFM	220,391
SCFM	129,905
Temperature °F	424
Pressure (in. wg.)	-5
Flue Gas Outlet	
lb/hr	597,156
ACFM	197,124
SCFM	137,937
Temperature °F	280
Flue Gas Residence Time, seconds	11.1
Atomizing Air, scfm	700
Vessel Diameter	28' – 0"
Vessel Active length	56' – 7"

2.1.2 Atomization Equipment

- Five (5) operating two-fluid nozzles complete with shrouded lance assembly and hose connections.
- One (1) shelf spare nozzle and lance assembly
- atomizing air flow controllers and low flow switches

2.1.3 Hopper Accessories

- 4" dia. capped poke holes
- hammer anvils
- air operated impact vibrators (comp. air req'd: 30 scfm at 50 psig).
- 6 ft. dia. live bottom with 24" discharge flange c/w electric motor
- hopper heaters (modular low watt density type heaters to be located in bottom 1/3 of hopper, with Nema 4X junction boxes and RTD's).
- level detector

2.1.4 Supports and Access

A. Support Steel

Structural steel to interface with existing support steel.

B. Doors

- Three (3) 24" dia. nozzle level inspection doors
- One (1) 20" x 54" hinged lower chamber inspection door
- One (1) 24" dia. hinged hopper inspection door
- One (1) 24" dia. outlet duct inspection door.

C. Access Walkways and Platforms

Location:

- nozzle inspection platform, 360° around perimeter of vessel. (Platform constructed of checkered floor plate with gutter at inside perimeter.)
- Lower chamber door access platform
- Hopper access platform
- Interconnecting platform to existing stair tower
- Emergency caged ladder with rest platforms

D. Enclosures

Enclosures provided for the nozzle access platform, constructed of structural steel framing. (Siding and roofing by others). Lighting design only by SESS.
Additional equipment provided includes:

- ventilation fans c/w motors and louvers (corrosion resistant construction)
- man-door (corrosion resistant construction)
- electric hoist and monorail, c/w electric motors
- Support stand for nozzle assembly during maintenance
- Provisions for mounting existing pumps (piping and wiring by others)

Note: The existing hopper enclosure will be re-used.

2.1.5 Instrumentation and Control

Control of Spray Dryer Absorber is from the Owner's DCS.

Local instrumentation and control valves will be supplied for the following:

- measure temperature at Spray Dryer Absorber inlet, outlet, hopper
- alarm hopper high level
- measure and control total slurry flow to Spray Dryer Absorber
- shut off slurry flow
- flush slurry feed/nozzles (manual)
- measure and control atomizing flow to each nozzle
- measure and control hopper heater temperature.
- Measure hopper skin temperature and control hopper heaters

2.2 Fabric Filter

2.2.1 Process Conditions and Sizing

Number of Fabric Filters	2
No. of Modules per Fabric Filter	6
Model Number	Size 1818 Model 312 TA Jet VIP
Bag Diameter	5"
Bag Length	312"
Number of Bags per Module	324
Cloth Area per Module ft.^{2}	11,016
Total Cloth Area ft.^{2}	66,096
	Design
Volume, ACFM	197,124
Temperature °F	280
Air to Cloth Ratio	
Gross Operating	2.98: 1
One module off-line for maintenance	3.58: 1

2.2.2 Module Construction

¼" thick A36 steel housing and hopper all welded and stiffened to withstand ±35" w.g. pressure. Corrosion allowance = 1/16".

A. Housing Features

- ¼" thick laser cut tube sheets, seal welded into the casing.
- 3 ½" double diaphragm valves with integral 120 VAC pilot solenoids in Nema 4 housings, prewired to timers.
- Compressed air reservoir
- Pulse air blowpipe assemblies with variable hole size and nozzles to provide optimum cleaning.
- Flanged outlet stub.
- Walk-in plenum with 20" x 48" hinged oval door (Imtec or equal) to allow access to the clean air side of the tubesheet for bag removal.
- Hi-side inlet with baffles to distribute and reduce dust loading to filter bags.

B. Hopper Features

- Pyramid hopper c/w 65° minimum side slope
- 24" dia hinged access door (Imtec or equal)
- 12" x 12" flanged discharge
- Two (2) 4" dia. capped poke holes
- Two (2) Strike plates
- Level detector
- Two (2) electromagnetic vibrators
- Modular low watt density heaters with Nema 4X junction boxes and RTD's.
- Bottom 48" lined internally with AR steel plate.

2.2.3 Filter Bags and Cages

A. Filter Bags

- Woven Fiberglass with acid resistant finish and PTFE membrane
- 5" dia. x 312" long
- Max. operating temperature 500°F continuous.
- 22 oz/sq.yd.
- Center and bottom wear strips

B. Cages

Cages are two (2) piece design, constructed of 11-gauge carbon steel wire and consist of 16 vertical wires with horizontal rings spaced every 8". No venturi required.

C. Spares

One (1) module spare bags/cages included. Quantity = 324 total for the 2 systems.

D. Precoat Material

One (1) lot of material for initial precoating of filter bags.

2.2.4 Supports and Access

A. Support Steel

Support structure to provide 12 ft. clearance under the hopper discharge flanges. Supports designed with cross bracing to withstand wind load for local conditions and dust load at 90 lbs./cu.ft. bulk density.
12' clearance provided along the FF centerline (below the inlet plenum) to allow access by a front-end loader or similar equipment.

B. Access Facilities.

The following access facilities to be provided for baghouse.

- One (1) 8' – 0" wide upper platform to provide access to collector main doors and pulse cleaning system. Includes structural framing for roof cover (siding by others).
- Two (2) 3' – 0" wide lower platforms to provide access to hopper doors.
- One (1) caged ladder from FF platform to grade level. Rest platform included.
- Interconnecting platform to existing stairs.

C. Enclosure

Enclosure provided for the hopper area, constructed of structural steel framing (siding by others). Additional equipment provided includes:

- Ventilation fans c/w motors and louvers (corrosion resistant construction)
- Man door and equipment door (corrosion resistant construction). Equipment rollup door by TNR Industrial doors or equal and rated for hurricane wind speeds.

D. Jib Crane/Hoist

One (1) common 1-ton jib crane with electric hoist provided to lift equipment to/from upper service platform.

2.2.5 Field Instrumentation

- Solid state timers in NEMA 4 enclosures, one (1) per module. Cycle complete relay included (for input to DCS).
- Magnehelic gauges with tubing and fittings for module differential pressure.
- One (1) differential pressure transmitter across fabric filter.
- One (1) inlet temperature transmitter with thermocouple.
- One (1) low compressed air pressure switch.
- Six (6) triboelectric broken bag detectors, one (1) per module

2.2.6 Fabric Filter Control

The fabric filter will be controlled from the Owner's DCS.

The fabric filter control system will be designed to:

- manually clean a compartment
- provide on/off line cleaning
- automatically clean compartments based on a timer sequence
- automatically clean compartments based on a flange-to-flange Delta P

- isolate a compartment for maintenance

Alarm contacts will be provided for the following:

- high system differential pressure
- high inlet temperature
- high hopper ash level
- low instrument air pressure

2.3 Manifolds/Ducts/Dampers

A. Inlet Manifold

Fabricated of ¼" A36 steel complete with necessary stiffening angles, supports, flange for inlet duct connection, flanged stubs for connection to compartment inlets and tapered to maintain velocity. Corrosion allowance = 1/16".

B. Outlet Manifold

Fabricated of ¼" A36 steel complete with necessary stiffening angles, supports, flange for outlet duct connection, flanged stubs for connection to compartment outlets and tapered to maintain velocity. Corrosion allowance = 1/16".

C. Inlet Dampers

Fabricated butterfly type inlet dampers with carbon steel valve body, drilled flanges, carbon steel shaft, gaskets and seals, flange bearings, manual chain wheel operator, and two (2) limit switches. One (1) per module. Provisions for mechanical lockout are included.

D. Outlet Dampers

Fabricated poppet type outlet dampers, complete with carbon steel housing, air cylinder operator, two (2) speed control valves, one (1) solenoid valve, and two (2) limit switches (shipped loose for field mounting and wiring). One (1) per module. Provisions for mechanical lockout are included.

E. SDA outlet Ductwork

One (1) lot of ductwork from SDA outlet to baghouse inlet. Duct is fabricated from ¼" A36 steel. Complete with flanges, stiffening angles, and supports. Corrosion allowance = 1/16".
Includes one (1) high temperature fabric type expansion joint with mild steel construction, punched flanges, and internal liner.

2.4 Activated Carbon Injection System

2.4.1 Silo Design

One (1) common Activated Carbon Injection System to store, meter, and pneumatically inject powdered activated carbon upstream of each spray dryer absorber. Equipment includes storage silo, three (3) feeder/eductor and blower assemblies (2 operating, 1 spare). Silo, feeder and conveying equipment are preassembled in a 13' – 0" dia Silo. External equipment to be field assembled.

2.4.2 Process Conditions

Absorbent	powdered activated carbon
Storage	2,400 cu. ft. (30 tons)
Feed Range	10 – 100 lb/hr. max. each feeder

2.4.3 Activated Carbon Storage Silo

13' – 0" dia, all-welded storage silo with:

- 60° conical hopper with three (3) flanged discharges and bolted access door
- Live bin bottom c/w electric motor
- Manual isolation slide gate
- Bin vent with fan c/w electric motor
- Level probes: high, low and reorder
- Silo fill panel (Nema 4X stainless steel) c/w weather shield.
- Continuous level meter

2.4.4 Feeder/Eductor System

Three (3) Volumetric screw feeder/eductor/blower assemblies (2 operating, 1 spare) with:

- inlet rotary feed valves c/w electric motors
- Surge hopper with hi/lo level switches
- Volumetric Feeder c/w electric motor
- Venturi eductor with intake funnel, air filter, and blower air check valve
- Positive displacement blower with TEFC motor
- Blower hi/lo pressure switches and gauges
- Intake filter
- Blower inlet/outlet silencers

2.4.5 Field Equipment

- Activated Carbon Feed Lance Assemblies: Flanged carbon feed lance assemblies to direct carbon feed into duct (CFD modeling included).
- Lance Hose Connections: Reinforced flexible hose to connect conveying pipe to carbon lance assembly with quick connect fittings.
- Eductor Hose Connections: Reinforced flexible hose to connect venture eductor with conveying piping with quick connect fittings.

2.4.6 Electrical/Control

- Control of system is from the Owner's DCS.
- Start up and switch over between feeder/eductors is automatic. (Provisions for mechanical lockout during maintenance provided.)

2.4.7 Access and Enclosures

- Handrail to enclose silo roof
- Silo walls are extended to enclose feeders and blowers.
- Ladder access to silo roof from grade
- A grating floor is provided to support feeder assembly and piping is provided below the floor and is accessed via removable grating sections.
- Double door access to equipment enclosure with external platform and stairs
- Enclosure vent fan c/w motor and convection heater.

2.5 Surface Preparation And Painting

2.5.1 Areas To Receive Painting:

- Exposed support and access steel

Above surfaces are prepared to SSPC-SP6 and painted as follows:

- Prime Coat: Interzinc 22 @ 2 – 3 mils DFT
- Intermediate Coat: Intergard 475 @ 5-8 mils DFT
- Finish Coat: Interthane 990 @ 2-3 mils DFT

2.5.2 Areas Not To Receive Paint:

- equipment to be insulated (by others)
- interior of equipment
- stainless steel and galvanized surfaces

2.5.3 Miscellaneous Items:

All purchased mechanical and electrical equipment will receive manufactures standard paint.

3.0 Drawings and Information

3.1 Drawings And Information (Purchaser Approval)

Refer to PR3932-Data Requirements Form.

3.2 Drawings And Information ("Information-Only" Basis)

Refer to PR3932-Data Requirements Form.

3.3 CFD Model

A CFD model is provided for the APC equipment from the tubular air heater discharge flange up to the FF tubesheet.

3.4 Instruction Manuals

Three (3) sets of manuals describing start-up, operation and maintenance procedures will be provided by completion of shipment. Manuals include lubrication schedule and spare parts list.

3.5 Field Services

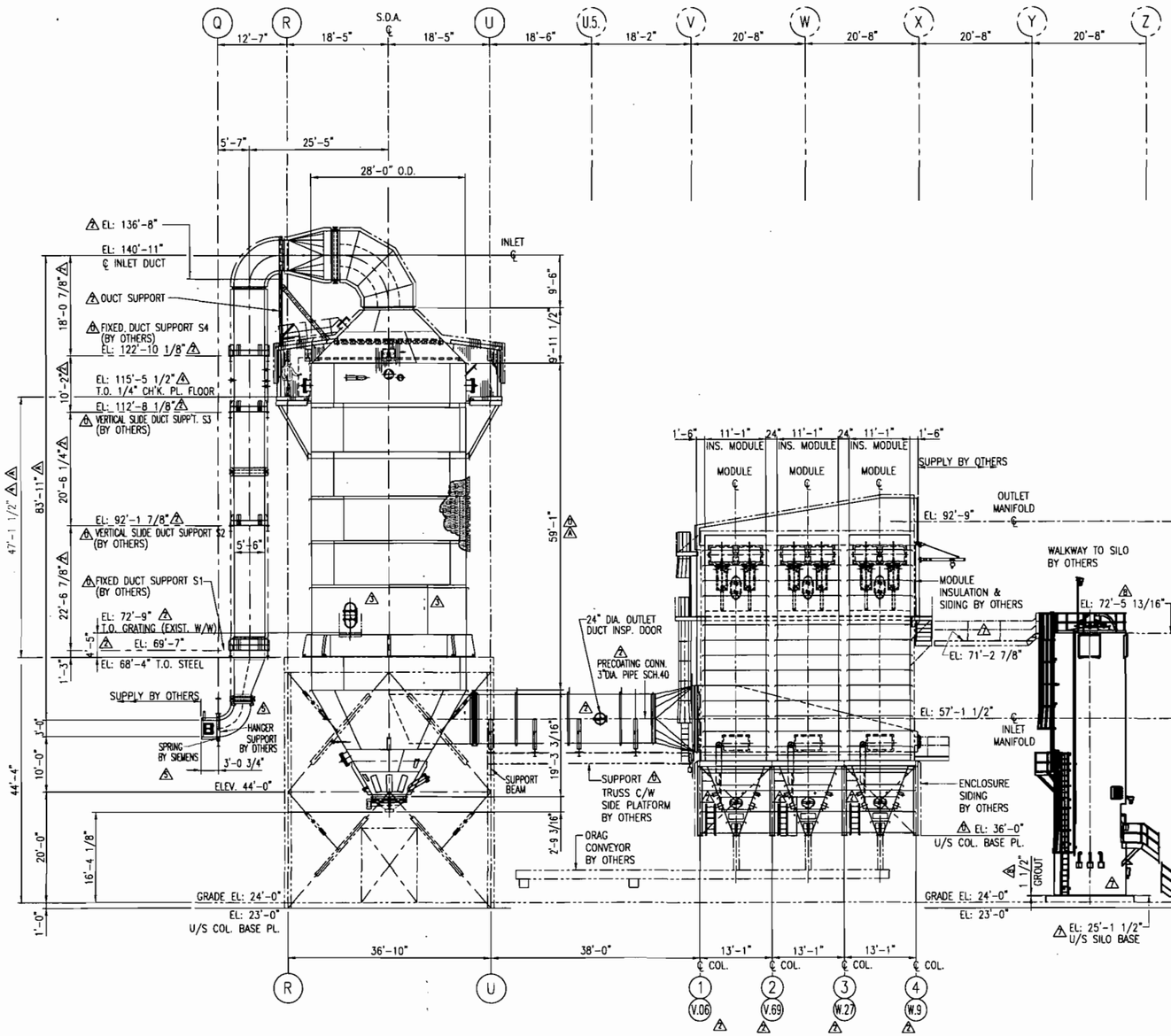
The services of qualified personnel for field assistance on equipment furnished by the FGC Supplier, as follows:

- Forty (40) man days during erection.
- Twenty (20) man days for checkout.
- Twenty (20) man days for start-up.
- Four (4) man days for training.

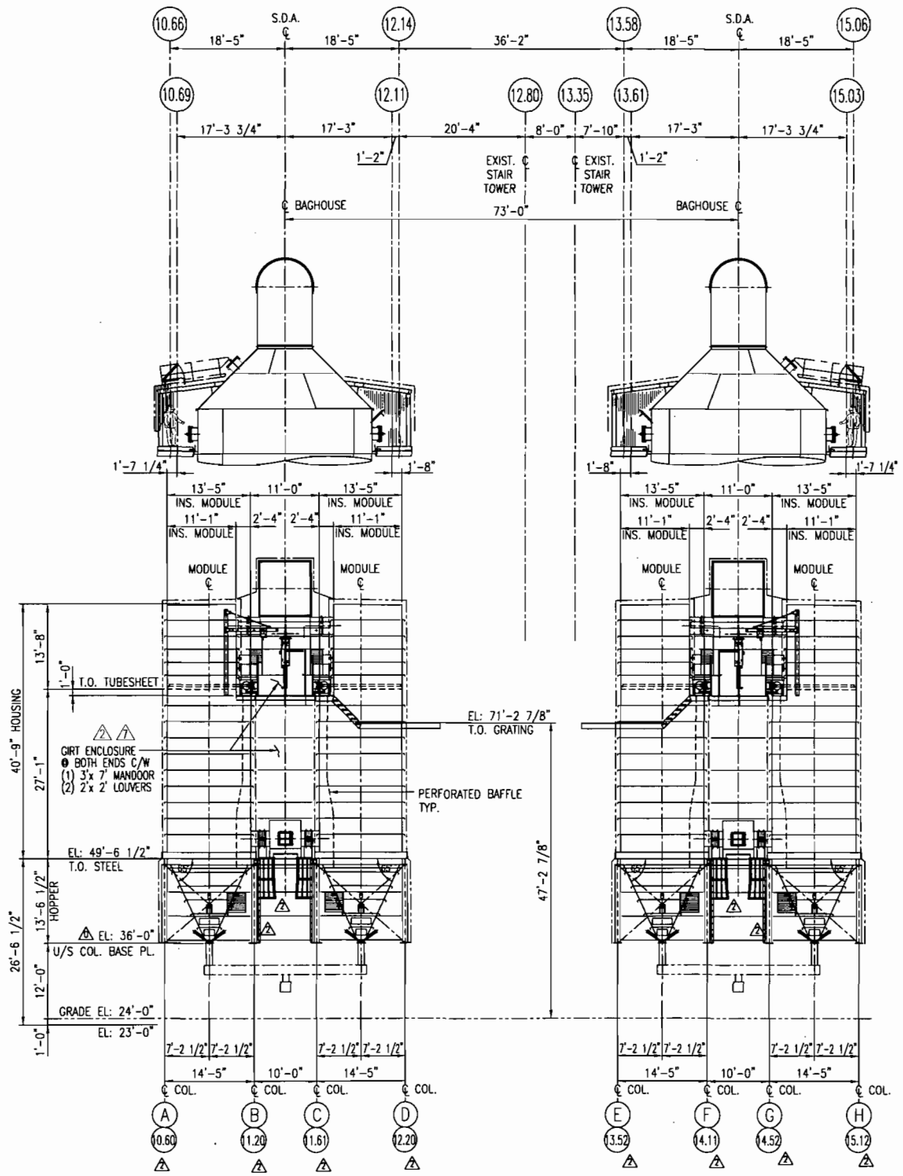
All travel and living expenses are included. A credit of ($1,000.00) per day will be applied for unused time.

Should malfunction or delay in satisfactory start-up of the proposed equipment occur in excess of the above period, caused by reasons other than the fault of the Vendor, such delays will be charged at the per diem rates attached.

209D1169



LOOKING EAST ELEVATION
(FROM DRAWING 209D1168)



LOOKING NORTH ELEVATION
(FROM DRAWING 209D1168)
NOTE: PAC SILO NOT SHOWN FOR CLARITY

NOTE:

USE THIS DRAWING IN CONJUNCTION WITH PLAN VIEW DWG.209D1168 AND THERMAL EXPANSION SCHEME DWG.209D1175.

PROJ. No. 7192

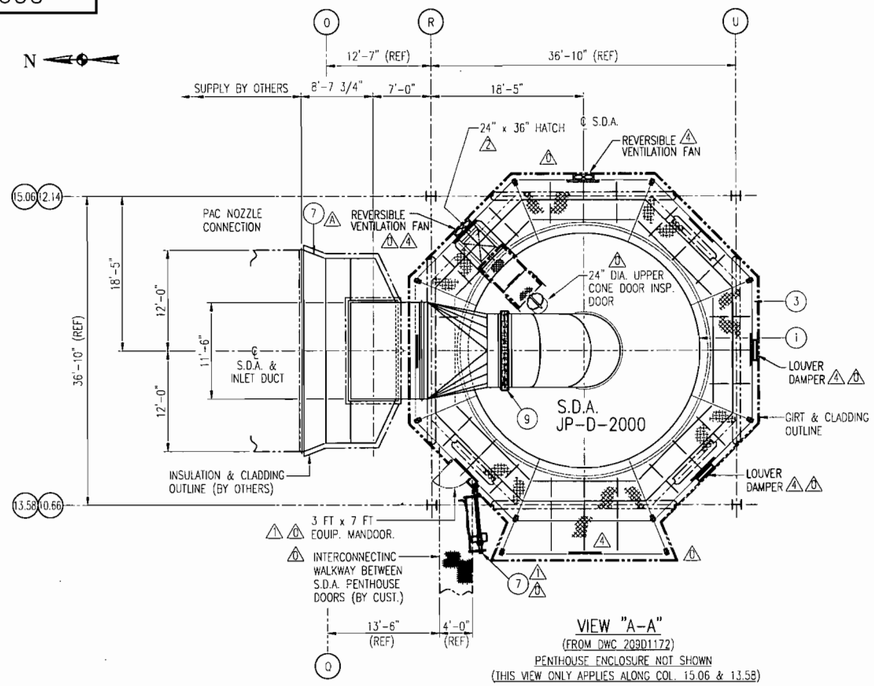
NO.	REVISION	DWN.	CHK.	DATE
A	2'-6" ADDED TO VESSEL ACTIVE LENGTH	RDD	E.S.	26JUN09
0	SEAL INLET & OUTLET DUCT SUPPORT ADDED (BY OTHERS) 1/2) BAGHOUSES SUPPORT BASE PLATE ELEVATION TO BE 36'-0"	D.Z.	E.S.	22JUL09
1	PAC SILO UPPER DOOR PLATFORM & STAIR ADDED, ROLL-UP DOOR DELETED - ADDED DUCT TRANSITION JOHN CRANE - ADDED EXPANSION JOINT - ROOF DOOR REVISED - ADDED DUCT SUPPORT S5 - REVISED AS NOTED - DELETED ITEMS (R2-4), AND REVISED ITEMS (R2-4)	D.Z.	E.S.	18SEP09
2		M.P.S.	E.S.	20OCT09
3	REVISED S.D.A. ACCESS DOOR LOCATION	NT	E.S.	29OCT09
4	PENTHOUSE FLOOR ELEVATION WAS 115'-4 7/8"	P.S.	E.S.	OCT.30/09
5	REVISED INLET DUCT & LADDER (ITEM 2-7A) DELETED	NTS	E.S.	DEC.02/09
6	S.D.A. OUTLET DUCT SUPPORT CHANGED	S.W.	K.C.	DEC.14/09
7	SILO HEIGHT & INTERCONNECTING W/W REVISED	RDD	E.S.	JAN.12/10
7	ADDED (1) 3'x 7' MANDOOR & (QTY.2) 2'x 2' LlouvERS, TYPICAL EACH END	HSB	E.S.	JAN.25/10
8	SILO HEIGHT REVISED. GROUT REVISED.	RDD	E.S.	JAN.26/10

NOTE
FABRICATION, MANUFACTURING, OR DETAILING MAY PROCEED ONLY WHEN DRAWING IS ISSUED OR AUTHORIZED FOR SUCH PURPOSES

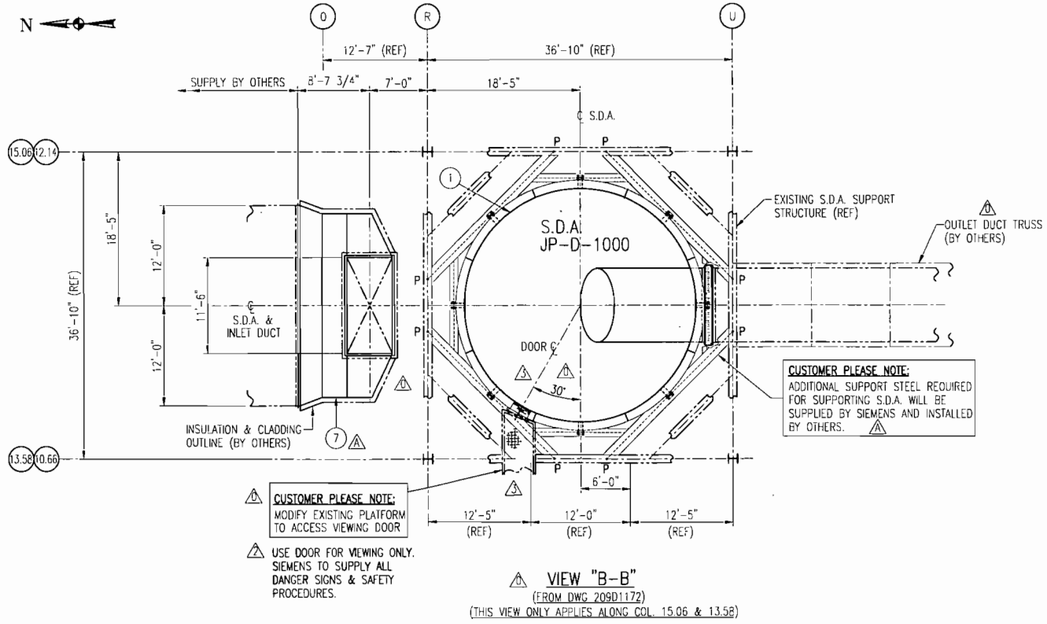
DRN. BY DAZHEN	DATE 26MAY09	SOLID WASTE AUTHORITY OF PALM BEACH COUNTY LOCATION: WEST PALM BEACH, FLORIDA	SIEMENS Power Generation, Inc
CHKD. BY E.S.	DATE 12JUN09		Environmental Systems & Services
APPVD. BY	DATE	GENERAL ARRANGEMENT – ELEVATIONS DRY SCRUBBING SYSTEM (SPRAY DRYER ABSORBER & FABRIC FILTER)	DRAWING NUMBER 209D1169
SCALE 3/32" = 1'-0"			REV. NO. 8
CERTIFIED BY: E.S.	DATE: 05AUG09		

$FILE$

209D1171



VIEW "A-A"
(FROM DWG 209D1172)
PENTHOUSE ENCLOSURE NOT SHOWN
(THIS VIEW ONLY APPLIES ALONG COL. 15.06 & 13.58)



CUSTOMER PLEASE NOTE:
ADDITIONAL SUPPORT STEEL REQUIRED FOR SUPPORTING S.D.A. WILL BE SUPPLIED BY SIEMENS AND INSTALLED BY OTHERS.

CUSTOMER PLEASE NOTE:
MODIFY EXISTING PLATFORM TO ACCESS VIEWING DOOR

USE DOOR FOR VIEWING ONLY. SIEMENS TO SUPPLY ALL DANGER SIGNS & SAFETY PROCEDURES.

VIEW "B-B"
(FROM DWG 209D1172)
(THIS VIEW ONLY APPLIES ALONG COL. 15.06 & 13.58)

S.D.A. PROCESS CONDITIONS:
(BASED ON MCR-D CONDITION)

ABSORBENT	POWDERED ACTIVATED CARBON
STORAGE	2,400 CU. FT. (30 TONS)
FEED RANGE	10-100 LB/HR (MAX) PER FEEDER
FLUE GAS INLET:	
LOADING	611,076 lb/hr
ACTUAL VOLUME	240,106 ACFM
STANDARD VOLUME	139,475 SCFM
GAS TEMPERATURE	437° F
PRESSURE	-5" WG
FLUE GAS OUTLET:	
LOADING	645,612 lb/hr
ACTUAL VOLUME	215,193 SCFM
STANDARD VOLUME	150,581 SCFM
GAS TEMPERATURE	280° F
FLUE GAS RESIDENCE TIME	11.1 SECONDS
ATOMIZING AIR	700 SCFM
VESSEL DIAMETER	28'-0"
VESSEL ACTIVE LENGTH	62'-4"

GENERAL NOTES:

1. DIMENSIONS NOT TO BE USED UNLESS CERTIFIED BY SIEMENS ENGINEERING DEPARTMENT.
2. MODULE TO BE SHIPPED ASSEMBLED FOR FIELD INSTALLATION BY OTHERS ITEMS LISTED IN BILL OF MATERIAL ARE SHIPPED LOOSE FOR FIELD INSTALLATION BY OTHERS.
3. ALL WORK SHOWN ON THIS DRAWING SHALL BE FABRICATED AND ERECTED IN ACCORDANCE WITH THE LATEST ISSUE OF A.I.S.C. MANUAL OF STEEL CONSTRUCTION.
4. ALL WELDING SHALL BE IN ACCORDANCE WITH THE APPLICABLE SECTIONS OF THE LATEST ISSUE OF A.W.S. STRUCTURAL WELDING CODE USING E-70XX ELECTRODES.
5. BOLTED STRUCTURAL CONNECTIONS SHALL BE MADE WITH 3/4" DIA. A325 HIGH STRENGTH BOLTS UNLESS NOTED OTHERWISE. ALL A325 BOLTED CONNECTIONS SHALL BE PROVIDED WITH ONE (1) WASHER UNDER THE TURNED ELEMENT, HIGH STRENGTH BOLTS TO BE INSTALLED BY TURN OF NUT METHOD OR CALIBRATED WRENCH METHOD.
6. ALL BOLTS, NUTS, WASHERS TO BE SUPPLIED BY FABRICATOR.
7. USE THIS DWG IN CONJUNCTION WITH DWG 209D1172 & 209D1173. FOR FOUNDATION LAYOUT & LOADING REFER DWG 209D1170.
8. SURFACE PREPARATION AND PAINTING:
   AREAS TO RECEIVE PAINTING: EXPOSED SUPPORT AND ACCESS STEEL
   ALL ABOVE SURFACES ARE PREPARED TO SSPC-SP6 AND PAINTED
   - PRIME COAT: INTERZINC 22 @ 2-3 MILS DFT
   - INTERMIDIATE COAT: INTERGARD 475 @ 5-8 MILS DFT
   - FINISH COAT: INTERHTANE 990 @ 2-3 MILS DFT

   AREAS NOT TO RECEIVE PAINT: EQUIPMENT TO BE INSULATED (BY OTHER);
   - INTERIOR OF EQUIPMENT; STAINLESS STEEL AND GALVANIZED SURFACES.

   ALL PURCHASED MECHANICAL AND ELECTRICAL EQUIPMENT WILL RECEIVE
   - MANUFACTURES STANDARD PAINT.

REFERENCE DRAWINGS:

- GENERAL ARRG'T - ELEVATION: DWG 209D1172
- FOUNDATION PLAN & LOADINGS: DWG 209D1170

APPLIED VERTICAL (UNFACTORED) TO EACH EXISTING S.D.A. BEAM

P = 190 kips CONSIST OF:
- DEAD LOAD: 27.0 kips
- DUST WALL: 38.0 kips
- DUST HOPPER: 56.2 kips
- VERTICAL WIND LOAD: 68.8 kips

BILL OF MATERIAL (SPRAY DRYER ABSORBER)

ITEM	REQ'D	DESCRIPTION	REMARKS
1	1	TWO-FLUID NOZZLE SPRAY DRYER ABSORBER, ALL WELDED AIRTIGHT AND STIFFENED TO WITHSTAND ±35" W.G. 1/4" A36 STEEL CONSTRUCTION WITH CONICAL HOPPER.	
2	1 LOT	SUPPORT STEEL MODIFICATION TO PROVIDE 24'-1 5/16" CLEARANCE UNDER HOPPER FLANGE (RE-USE EXISTING STRUCTURE)	
3	1 LOT	360° NOZZLE INSPECTION PLATFORM c/w GUTTER ON INSIDE PERIMETER. PLATFORM FLOOR CONSTRUCTED OF 1/4" TH'K CHECKER PLATE.	
4	1 LOT	INSPECTION PLATFORM ENCLOSURE. CONSTRUCTED OF STRUCTURAL STEEL FRAMING c/w VENTILATION FANS w/ MOTORS & LOUVERS (CORROSION RESISTANT CONST'N), MAN DOOR (CORROSION RESISTANT CONST'N), SUPPORT STAND FOR NOZZLE ASSEMBLY OURING MAINTENANCE.	
5	1 LOT	LOWER CHAMBER DOOR ACCESS PLATFORM	
6	1 LOT	HOPPER SERVICE ACCESS PLATFORM	
7	1 LOT	S.D.A. INLET DUCTWORK: FROM TUBULAR AIR HEATER DISCHARGE FLANGE TO THE S.D.A. INLET FLANGE. DUCTWORK IS 1/4" A36 STEEL SUPPORTED OF EXISTING BUILDING c/w TEST PORT & INSTRUMENT CONN'S.	
8	1 LOT	S.D.A. OUTLET DUCTWORK: FROM S.D.A. OUTLET TO BAGHOUSE INLET. DUCTWORK IS 1/4" A36 STEEL c/w FLANGES, STIFFENING ANGLES & SUPPORTS.	
9	1	EXPANSION JOINT @ INLET ELBOW 8'-9" DIA.	
10	1	EXPANSION JOINT @ OUTLET DUCT 8'-10" DIA.	
11	2	EXPANSION JOINT @ INLET DUCT 11'-6" x 5'-6"	
12	1 LOT	ACTIVATED CARBON INJECTION SYSTEM TO INCLUDE: 13'-0" DIA. ALL WELDED ACTIVATED CARBON STORACE SILO: • 60° CONICAL HOPPER WITH (3) FLANCED DISCHARCES & BOLTED ACCESS DOOR • MANUAL ISOLATION SLIDE GATE • BIN VENT • LEVEL PROBES: HIGH & LOW • SILO FILL PANEL (NEMA 4X STAINLESS STEEL) c/w WEATHER SHIELD • CONTINUOUS LEVEL PROBE FEEDER/EDUCTOR SYSTEM: (3) VOLUMETRIC SCREW FEEDER/EDUCTOR/BLOWER ASSEMBLIES (2) OPERATION (1) SPARE c/w: • INLET ROTARY FEED VALVES c/w ELECTRIC MOTORS • SURCE HOPPER WITH HI-LO LEVEL SWITCHES • VOLUMETRIC FEEDER c/w ELECTRIC MOTOR • VENTURI EDUCTOR WITH INTAKE FUNNEL, AIR FILTER & BLOWER AIR CHECK VALVE • POSITIVE DISPLACEMENT BLOWER WITH TEFC MOTOR • BLOWER WITH EDUCTOR VACUUM TRANSMITTER • INTAKE FILTER • BLOWER INLET & OUTLET SILENCERS FIELD EQUIPMENT: • ACTIVATED CARBON FEED LANCE ASSEMBLIES: FLANGED CARBON FEED LANCE ASSEMBLIES TO DIRECT CARBON FEED INTO DUCT (CFC MODELING INCLUDED) • LANCE HOSE CONNECTIONS: REINFORCED FLEXIBLE HOSE TO CONNECT CONVEYING PIPE TO CARBON LANCE ASSEMELY WITH QUICK CONNECT FITTINGS • EDUCTOR HOSE CONNECTIONS: REINFORCED FLEXIBLE HOSE TO CONNECT VENTURE EDUCTOR WITH CONVEYING PIPING WITH QUICK CONNECT FITTINGS ELECTRICAL/CONTROL: • CONTROL OF SYSTEM IS FROM THE OWNER'S DCS ACCESS & ENCLOSURES: • HANDRAIL TO ENCLOSE SILO ROOF • SILO WALLS ARE EXTENDED TO ENCLOSE FEEDERS & BLOWERS • LADDER ACCESS TO SILO ROOF FROM CRADE • GRATING FLOOR PROVIDED TO SUPPORT FEEDER ASSEMBLY & PIPING IS PROVIDED BELOW THE FLOOR AND IS ACCESSED VIA REMOVEABLE GRATING SECTIONS • ENCLOSURE VENT FAN c/w MOTOR	SHOWN ON 209D1170
13	1	6'-0" DIA. LIVE BOTTOM W/ 24" DIA. DISCHARGE FL'GE & ELECTRIC MOTOR	
14	1 LOT	MODULAR LOW WATT DENSITY TYPE HOPPER HEATERS c/w NEMA 4X JUNCTION BOXES AND RTD'S	
15	1 LOT	LOCAL INSTRUMENTATION & CONTROL VALVE WILL BE SUPPLIED FOR: • MEASURE TEMPERATURE AT S.D.A. INLET, OUTLET & HOPPER • ALARM @ HOPPER HIGH LEVEL • MEASURE AND CONTROL TOTAL SLURRY FLOW TO S.D.A. • SHUT-OFF SLURRY FLOW • FLUSH SLURRY FEED & NOZZLES (AUTOMATIC) • MEASURE AND CONTROL ATOMIZING FLOW TO EACH NOZZLE • MEASURE AND CONTROL HOPPER HEATER TEMPERATURE	NOT SHOWN
16	1 LOT	WALL BRKT TIE ROD JIB CRANE: (1) TON CAPACITY, 8 FT SPAN / ELECTRIC CHAIN HOIST: 460/3/60; PREMIUM EFFICIENCY w/ 1.15 SERVICE FACTOR & CLASS F INSULATION BASED ON 40°C AMBIENT & NEMA TYPE B, ENCLOSURES TENV; CAST IRON AND SEVERE DUTY CHEMICAL ENVIRONMENT, MOTOR TO BE w/ HEATERS; SPEED 32 FPM; CAPACITY (1) TON; LIFT (120) FT	

EQUIPMENT NUMBERS

S.D.A. A-1 JP-D-1000
S.D.A. A-2 JP-D-2000
BIN ACTIVATOR S.D.A. A-1 JP-Z-1072
BIN ACTIVATOR S.D.A. A-1 JP-Z-2072

PROJ. No. 7192

NO.	REVISION	DWN	CHK	DATE
A	INLET DUCTING & PROCESS CONDITIONS REV'D. BEAM POINT LOADS ADDED. "WHEELABRATOR" REFERENCE CHANGED TO "SIEMENS".	ROD	E.S.	24JUN09
0	OUTLET DUCT TRUSS ADDED (BY CUSTOMER). DAMPERS/FANS SHOWN. EXPANSION JOINTS REVISED. EQUIPMENT NUMBERS ADDED. PENTHOUSE EQUIPMENT DOOR & JIB CRANE ADDED. PROCESS CONDITIONS REV'D. CUSTOMER'S INTERCONNECTING WALKWAY ADDED. HATCH & DOOR ADDED.	ROD	E.S.	22JUL09
1	JIB CRANE & MANDOOR RELOCATED. EQUIPMENT DOOR REMOVED	ROD	E.S.	22JUL09
2	REVISED AS NOTED	NT	E.S.	21OCT09
3	REVISED ACCESS DOOR LOCATION	NT	E.S.	29OCT09
4	REVISED PENTHOUSE	P.C.	E.S.	NOV.03/09

NOTE
FABRICATION, MANUFACTURING, OR DETAILING MAY PROCEED ONLY WHEN DRAWING IS ISSUED OR AUTHORIZED FOR SUCH PURPOSES.

DRN. BY ROD	DATE 12JUNE09
CHKD. BY E.S.	DATE 12JUNE09
APPVD. BY	DATE
SCALE 1/8" = 1'-0"	
CERTIFIED	
BY: E.S.	DATE: 05AUG09

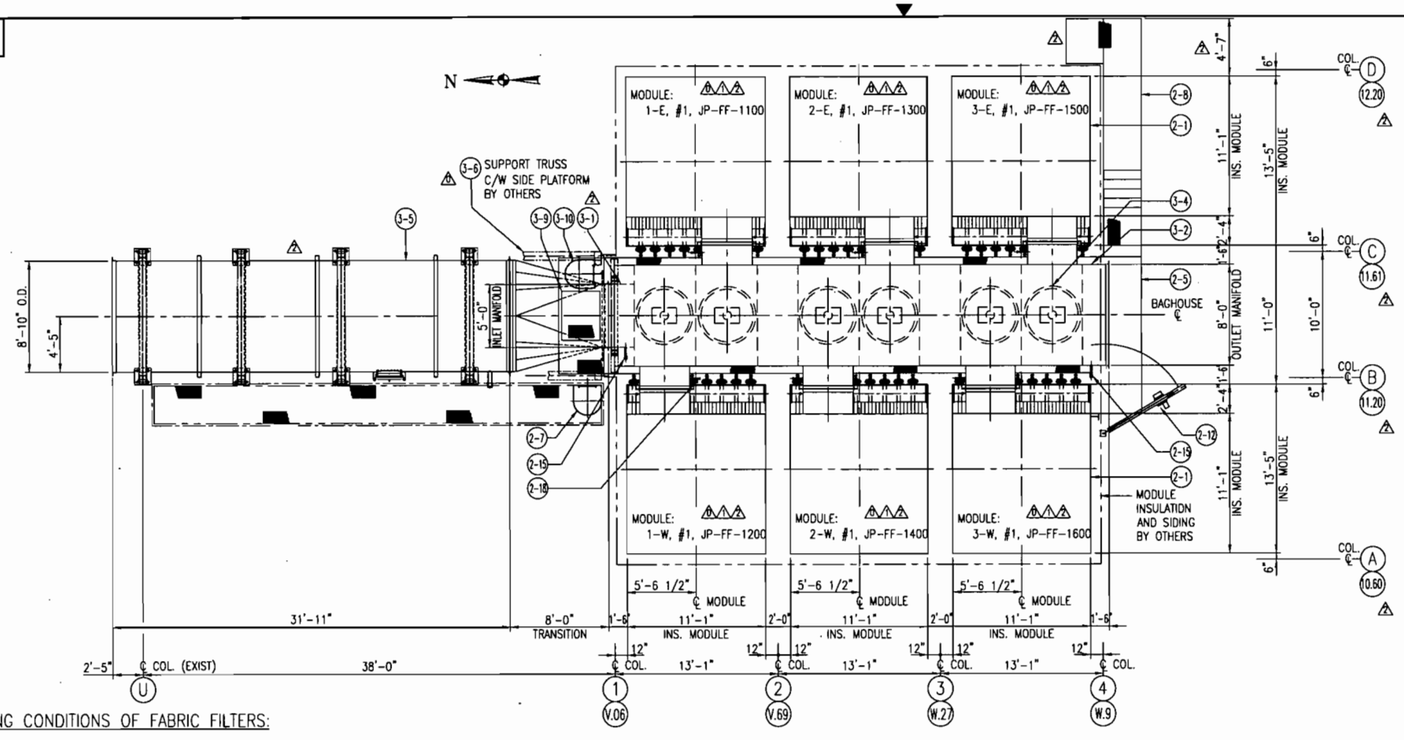
SOLID WASTE AUTHORITY OF PALM BEACH COUNTY
LOCATION: WEST PALM BEACH, FLORIDA

GENERAL ARRANGEMENT - PLAN VIEWS
DRY SCRUBBING SYSTEM
(28'-0" SPRAY DRYER ABSORBER)

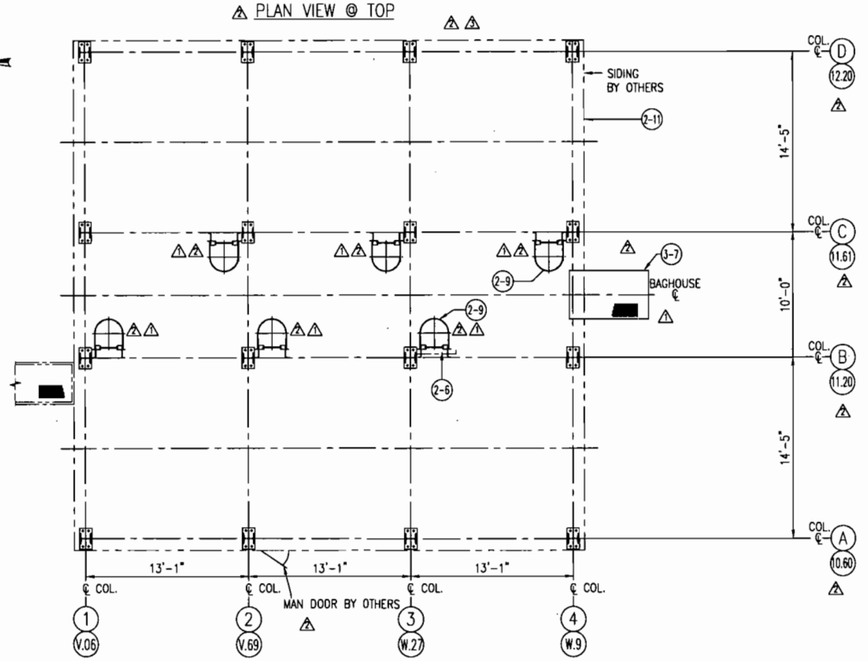
SIEMENS *Power Generation, Inc*
Environmental Systems & Services

DRAWING NUMBER 209D1171
REV. NO. 4

209D1173



⚠ PLAN VIEW @ TOP



⚠⚠ PLAN VIEW @ HOPPER LEVEL

M.C.R. – D OPERATING CONDITIONS OF FABRIC FILTERS:

GAS VOLUME ..... 215,193 ACFM
NUMBER OF BAGS PER MODULE 324
CLOTH AREA PER MODULE ..... 11,016 SF
TOTAL CLOTH AREA ..... 66,096 SF

GAS TEMPERATURE ..... 280°F
AIR TO CLOTH RATIO:
GROSS OPERATING ..... 3.25 : 1
ONE MODULE OFF LINE ..... 3.90 : 1

POWER SUPPLY: 460/3/60 FOR MOTORS AND HOPPER HEATERS
120/1/60 FOR CONTROL
CLEAN, OIL FREE REGULATED COMPRESSED AIR SOURCE:
–40° F DEW POINT, 125 SCFM AT 35 PSIG

GENERAL NOTES:

1. DIMENSIONS NOT TO BE USED UNLESS CERTIFIED BY SIEMENS ENGINEERING DEPARTMENT.
2. MODULE TO BE SHIPPED ASSEMBLED FOR FIELD INSTALLATION BY OTHERS ITEMS LISTED IN BILL OF MATERIAL ARE SHIPPED LOOSE FOR FIELD INSTALLATION BY OTHERS.
3. ALL WORK SHOWN ON THIS DRAWING SHALL BE FABRICATED AND ERECTED IN ACCORDANCE WITH THE LATEST ISSUE OF A.I.S.C. MANUAL OF STEEL CONSTRUCTION.
4. ALL WELDING SHALL BE IN ACCORDANCE WITH THE APPLICABLE SECTIONS OF THE LATEST ISSUE OF A.W.S. STRUCTURAL WELDING CODE USING E–70XX ELECTRODES.
5. BOLTED MAIN STRUCTURAL CONNECTIONS SHALL BE MADE WITH 7/8" DIA. A325 GALVANIZED HIGH STRENGTH BOLTS UNLESS NOTED OTHERWISE. ALL A325 BOLTED CONNECTIONS SHALL BE PROVIDED WITH ONE (1) WASHER UNDER THE TURNED ELEMENT, HIGH STRENGTH BOLTS TO BE INSTALLED BY TURN OF NUT METHOD OR CALIBRATED WRENCH METHOD.
6. ALL BOLTS, NUTS, WASHERS TO BE SUPPLIED BY FABRICATOR.
7. USE THIS DWG IN CONJUNCTION WITH G.A. – ELEVATIONS DWG.209D1174 AND THERMAL EXPANSION SCHEME DWG.209D1175. FOR FOUNDATION LAYOUT & LOADING REFER DWG.209D1170.
8. SURFACE PREPARATION AND PAINTING:
   AREAS TO RECEIVE PAINTING: EXPOSED SUPPORT AND ACCESS STEEL
   ALL ABOVE SURFACE ARE PREPARED TO SSPC–SP6 AND PAINTED
   PRIME COAT: INTERZINC 22 @ 2–3 MILS DFT
   INTERMEDIATE COAT: INTERGARD 475 @ 5–8 MILS DFT
   FINISH COAT: INTERHTANE 990 @ 2–3 MILS DFT
   AREAS NOT TO RECEIVE PAINT: EQUIPMENT TO BE INSULATED (BY OTHER); INTERIOR OF EQUIPMENT; STAINLESS STEEL AND GALVANIZED SURFACES.
   ALL PURCHASED MECHANICAL AND ELECTRICAL EQUIPMENT WILL RECEIVE MANUFACTURES STANDARD PAINT.
9. STEEL MATERIAL SPECIFICATIONS:
   STRUCTURAL STEEL – WIDE FLANGE SECTIONS (W) AND STRUCTURAL TEES (WT) SHALL CONFORM TO ASTM A992, GRADE 50 UNLESS NOTED. CHANNELS (C), I BEAMS (S) AND OTHER ROLLED SHAPES, ANGLES (L), PLATES & DETAIL MATERIAL SHALL BE ASTM A36
   STEEL PIPE – ASTM A53 GRADE B
   STRUCTURAL TUBING – ASTM A500, GRADE B
   WELDING ELECTRODES – AWS D1.1 E70XX
   HIGH STRENGTH BOLTS – ASTM A325–N, 7/8" DIA. MECHANICALLY GALVANIZED ASTM B695 CLASS, 50. UNLESS NOTED

EQUIPMENT NUMBERS

BAGHOUSE F.F.H. #1, JP–FF–1000

BILL OF MATERIAL

ITEM	REQ'D	DESCRIPTION	REMARKS
		FABRIC FILTER (BAGHOUSE)	
2–1	6	MODULE. 1/4" THICK A36 HOUSING & HOPPER ALL WELDED AND STIFFENED TO WITHSTAND ±35" W.G. PRESSURE. (1/16" CORROSION ALLOWANCE) HOUSING FEATURES: 1/4" THICK LASER CUT TUBE SHEETS. 3 1/2" DOUBLE DIAPHRAGM VALVES W/ INTEGRAL 120 VAC PILOT SOLENOIDS IN NEMA 4 HSG. (PREWIRED TO TIMERS). COMPRESSED AIR RESERVOIR, PULSE AIR BLOWPIPE. FLANGED OUTLET STUB. WALK IN PLENUM W/ 20" x 48" HINGED OVAL DOOR (IMTEC OR EQUAL). HI–SIDE INLET W/ BAFFLE (SOLID SECTION CHT400) HOPPER FEATURES: PYRAMID W/ 65° MINIMUM SIDE SLOPE. 24" DIA. ACCESS DOOR (IMTEC OR EQUAL). 12" x 12" FLG. DISCH. (2) 4"DIA CAPPED POKE HOLES. (2) STRIKE PL. LEVEL DETECTOR (2) ELECTRO. VIBRATORS LOW WATT DENSITY HEATER W/ NEMA 4X JUNCTION BOXES AND RTD's. BOTTOM 48" LINED INTERNALLY W/ AR STEEL PLATE (3/16" THICK MIN. BHN320)	
2–2	2106	FILTER BAGS. WOVEN FIBERGLASS WITH ACID RESISTANT FINISH AND PTFE MEMBRANE. 5" DIA. x 312" LG. MAX. OPERATING TEMP. 500° F CONTINUOUS. 22 oz/sq.yd. CENTER AND BOTTOM WEAR STRIPS	INCLUDE 162 SPARES BAGS NOT SHOWN
2–3	1944	CAGES. (2) PIECE DESIGN, CONSTRUCTED OF 11 GA. CARBON STEEL WIRE AND CONSIST 16 VERTICAL WIRES W/ HORIZONTAL RINGS SPACED EVERY 6"	NOT SHOWN
2–4	1 LOT	SUPPORT STEEL	
2–5	1 LOT	SERVICE PLATFORM. 8'–0" WIDE TO PROVIDE ACCESS TO MAIN DOOR AND PULSE CLEANING SYSTEM. INCLUDES STRUCTURAL FRAMING FOR ROOF COVER	ROOF COVER SIDING BY OTHERS
⚠ 2–6	6 LOT	HOPPER LEVEL PLATFORM. TO PROVIDE ACCESS INLET DAMPER.	DELETED
2–7	1	CAGED LADDER. FROM SERVICE PLATFORM TO OUTLET DUCT'S PLATFORM	
⚠ 2–7A	1	CAGED LADDER. FROM OUTLET DUCT'S PLATFORM TO GRADE LEVEL	DELETED
2–8	1 LOT	INTERCONNECTING PLATFORM. TO EXISTING STAIRS	
⚠ 2–9	6	CAGED LADDER. FROM HOPPER LEVEL PLATFORM TO GRADE LEVEL ⚠	
2–10	6	PLATFORM W/ LADDER. ACCESS TO MODULE	
2–11	1 LOT	ENCLOSURE. STRUCTURAL STEEL FRAMING FOR HOPPER AREA. INCLUDES: VENT. FANS C/W MOTORS & LOUVERS (CORROSION RESISTANT CONSTRUCTION) ⚠ ⚠ ⚠	SIDING BY OTHERS EQP. ROLLUP DOOR DELETED, ONE (1) MAN DOOR BY OTHERS
2–12	1	WALL BRACKET TIE ROD JIB CRANE: (1) TON CAPACITY, 8 FT SPAN / ELECTRIC CHAIN HOIST: 460/3/60; PREMIUM EFFICIENCY W/ 1.15 SERVICE FACTOR & CLASS F INSULATION BASED ON 40°C AMBIENT & NEMA TYPE B, ENCLOSURES TENV; CAST IRON AND SEVERE DUTY CHEMICAL ENVIRONMENT, MOTOR TO BE W/ HEATERS; SPEED 32 FPM; CAPACITY (1) TON; LIFT (60) FT	
2–13	6	SOLID STATE TIMER. IN NEMA 4 ENCLOSURES. W/ CYCLE COMPLETE RELAY (FOR INPUT TO DCS)	
2–14	6	MAGNEHELIC GAUGE. W/ TUBING & FITTINGS FOR MODULE DIFFER. PRESSURE	
2–15	2	PRESSURE TRANSMITTER. (1) @ INLET MANIFOLD & (1) @ OUTLET MANIFOLD.	
2–16	–		
2–17	1	LOW COMPRESSED AIR PRESSURE SWITCH.	NOT SHOWN
2–18	6	TRIBOELECTRIC BROKEN BAG DETECTORS.	
2–19	6	LEVEL DETECTOR	
2–20	12	ELECTROMAGNETIC VIBRATOR	
		MANIFOLDS / DUCTS / DAMPERS	
3–1	1 LOT	INLET MANIFOLD. 1/4" THICK A36 STEEL W/ STIFFENERS, SUPPORTS, FLANGE FOR INLET DUCT CONN. AND FLANGED STUBS FOR CONN COMPARTMENT INLET (1/16" CORROSION ALLOWANCE)	
3–2	1 LOT	OUTLET MANIFOLD. 1/4" THICK A36 STEEL W/ STIFFENERS, SUPPORTS, FLANGE FOR OUTLET DUCT CONN. & FLANGED STUBS FOR CONN COMPARTMENT OUTLET (1/16" CORROSION ALLOWANCE)	
3–3	6	INLET DAMPER. 30" x 54" BUTTERFLY TYPE W/ CARBON STEEL BODY, DRIIL FLANGES, CARBON STEEL SHAFT, GASKETS AND SEALS, FLANGE GEARINGS, MANUAL CHAIN WHEEL OPERATOR AND (2) LIMIT SWITCHES. PROVISIONS FOR MECHANICAL LOCKOUT ARE INCLUDED.	
3–4	6	OUTLET DAMPER. 50" DIA. FABRICATED POPPET TYPE W/ CARBON STEEL HOUSING AIR CYLINDER OPERATOR, (2) SPEED CONTROL VALVES, (1) SOLENOID VALVE, AND (2) LIMIT SWITCHES (SHIPPED LOOSE FOR FIELD MOUNTING AND WIRING), PROVISIONS FOR MECHANICAL LOCKOUT ARE INCLUDED.	
3–5	1 LOT	DUCTWORK. FROM SDA OUTLET TO INLET MANIFOLD OF BAGHOUSE. 1/4" THICK A36 STEEL W/ STIFFENERS AND FLANGE.	
3–6	1 LOT	DUCT SUPPORT TRUSS C/W SIDE PLATFORM (SUPPLIED BY OTHERS)	
3–7	1	INLET MANIFOLD ACCESS PLATFORM	
⚠ 3–8	1	LADDER TO INLET MANIFOLD ACCESS PLATFORM	DELETED
3–9	1	OUTLET MANIFOLD ACCESS PLATFORM	
⚠ 3–10	1	LADDER TO OUTLET MANIFOLD ACCESS PLATFORM	

BAGHOUSE (JP–FF) INSULATION & LAGGING SPECS:

(INSULATION & LAGGING BY OTHERS) ⚠

1. INSULATION MATERIALS:
   2" THICK MINERAL WOOL BOARD TWO (2) THICK STAGGERED SECTIONS TOTAL OF 4" THICK, ATTACH INSULATION TO WELDED PINS AND SECURE IN PLACE W/ 2" S.Q. SPEED WASHER ATTACHED TO WELDED PINS.
2. LAGGING:
   PANEL EXTERIOR SHEETS SHALL BE 3004 ALCLAD ALLOY, STUCCO EMBOSSED, 7.2" PITCH BY 1 1/2" DEEP BOX RIBBED ALUMINUM CONFORMING TO ASTM B209. THE ALUMINUM SHALL BE A MINIMUM OF 0.040" THICK, EXCEPT FOR ALL HORIZONTAL SURFACES ON TOP OF THE DUCTWORK SUBJECT TO POTENTIAL WORK PERSONNEL TRAFFIC, WHICH SHALL BE A MINIMUM OF 0.050" THICK.
   AT ANY LOCATIONS WHERE THERE IS INSUFFICIENT ROOM FOR BOX RIBBED LAGGING TO BE USED, FLAT ALUMINUM SHEETS MAY BE USED, PROVIDED THE OVERLAPS, SEALS AND FASTENING CAN OCCUR.
3. INTERFACING:
   THE ALUMINUM FOIL FACING SHALL HAVE A MINIMUM THICKNESS OF 0.0025".
4. WIRE MESH:
   WIRE MESH FOR PANEL FABRICATION SHALL BE 16 GA.(MIN) CARBON STEEL WELDED WIRE MESH 2" x 2 5/8" MESH SIZE PREFERRED. GALVANIZED WIRE SHALL NOT BE USED.
   ROAD MESH FOR INNER INSULATION SUPPORT SHALL BE WELDED STEEL WIRE REINFORCEMENT CONFORMING TO ASTM A185, PLAIN TYPE; IN FLAT SHEETS OR COILED ROLLS; UNFINISHED. ROAD MESH SHALL BE 13 GA. 6" x 6". EXPANDED METAL SHALL BE FLATTENED CARBON STEEL, CONFORMING TO ASTM F1267.

PROJ. No. 7192

NO.	REVISION	DWN / CHK	DATE
0	-SDA OUTLET DUCT SUPPORT TRUSS ADDED (BY OTHERS) -(2) BAGHOUSES EQUIPMENT NUMBER ADDED	D.Z. / E.S.	22JUL09
1	-EQP ROLLUP DOOR DELETED -(2) BAGHOUSES MODULES' NUMBERING SYSTEM REV'D	D.Z. / E.S.	03SEP09
2	DELETED ITEMS (2)–12, AND REVISED ITEMS (2)–11 DELETED ITEM 3–8, ADDED COL.(4), REVISED QUANTITIES ITEM 3–5.	N.T. / E.S.	21OCT09
3	ONE (1) DOOR DELETED	NT / E.S.	13NOV09
4	ITEM #2–7A DELETED	S.W. / E.S.	02DEC09
5	S.D.A. OUTLET DUCT SUPPORT CHANGED	S.W. / H.C.	14DEC09

NOTE
FABRICATION, MANUFACTURING, OR DETAILING MAY PROCEED ONLY WHEN DRAWING IS ISSUED OR AUTHORIZED FOR SUCH PURPOSES.

DRN. BY DAZHEN	DATE 26MAY09	
CHKD. BY E.S.	DATE 12JUN09	
APPVD. BY	DATE	
SCALE 3/16" = 1'–0"		
CERTIFIED		
BY: E.S.	DATE: 05AUG09	

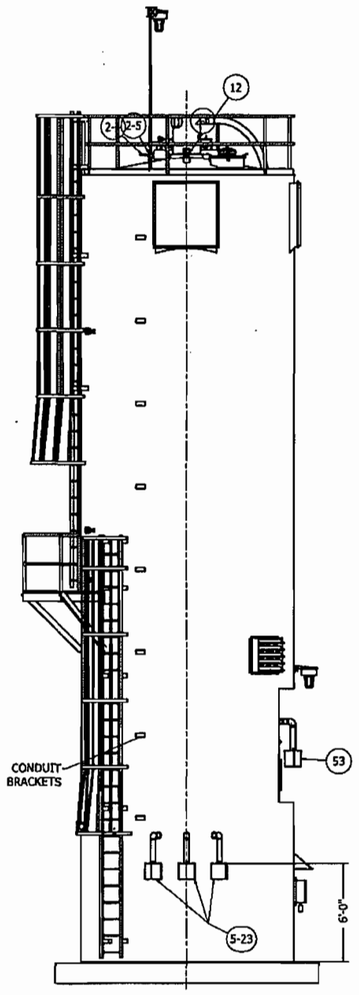
SOLID WASTE AUTHORITY OF PALM BEACH COUNTY
LOCATION: WEST PALM BEACH, FLORIDA

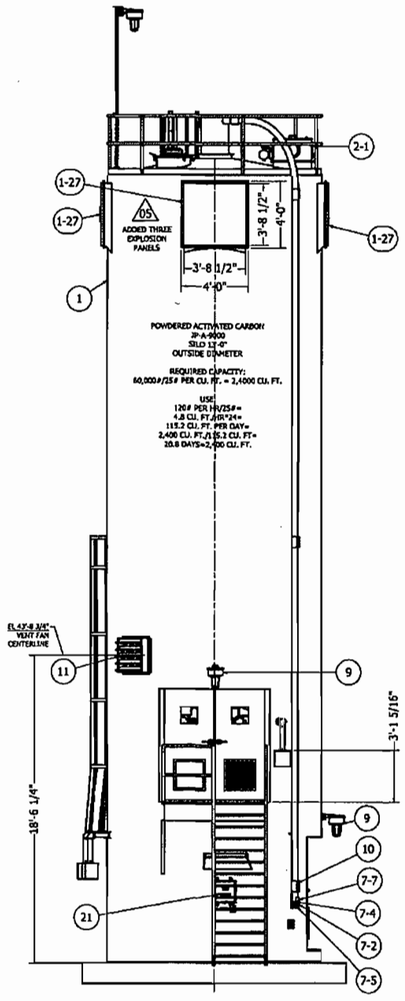
GENERAL ARRANGEMENT OF BAGHOUSE – PLAN VIEW
DRY SCRUBBING SYSTEM (FOR JP–FF–1000)
(SPRAY DRYER ABSORBER & FABRIC FILTER)

SIEMENS *Power Generation, Inc*
Environmental Systems & Services

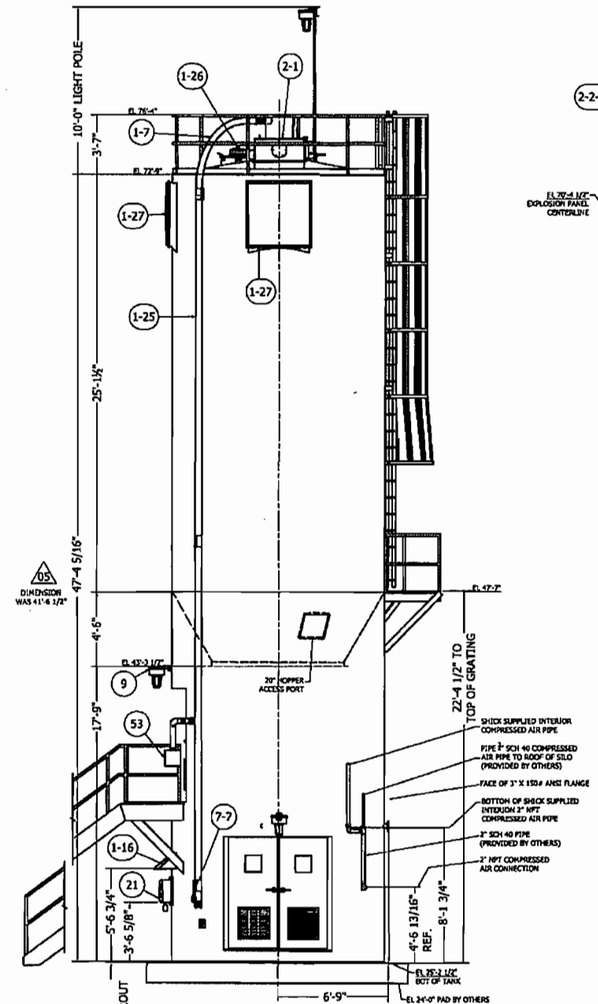
DRAWING NUMBER: 209D1173
REV. NO.: 5

$FILE$

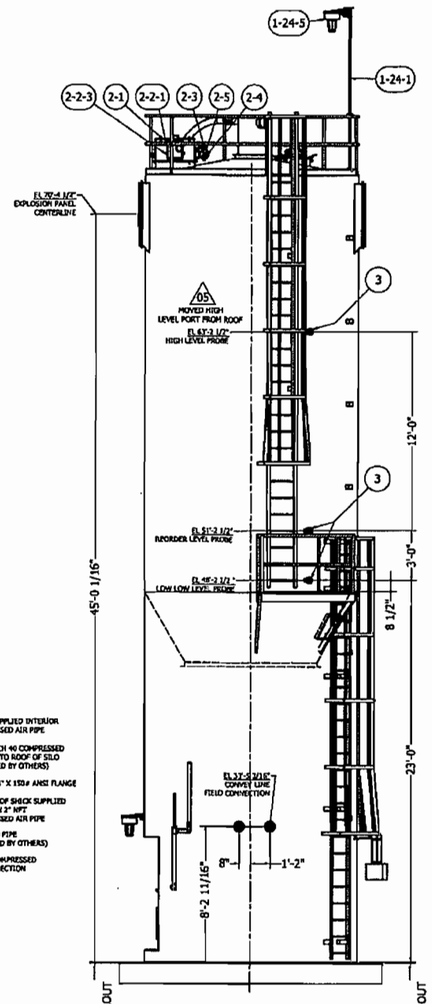




SOUTH ELEVATION
SCALE 1:32



EAST ELEVATION
SCALE 1:32



PROJ. No. 7192

AUTOMATED DRY & LIQUID INGREDIENT HANDLING SYSTEMS
4340 OLARY BLVD., KANSAS CITY, MISSOURI 64130
TEL - (816) 861-1224 FAX - (816) 861-1601 WWW.DHOI.USA.COM

DRJ			1"	1/4" = 1'-0"
10-19-09		29172R-M01		29172E-M01

AUTODESK INVENTOR VERSION 2009

NO.	REVISION	DRN BY	DATE
01	ADDED NOTES FROM CLIENT	DRJ	7-1-09
02	CHANGED SILO ORIENTATIONS	DRJ	8-13-09
03	ADDED TAG AND MODEL NUMBERS TO PARTS LIST	DRJ	9-14-09
04	ADDED PSL-4002, & PSL-4004, FINALIZED GA	DRJ	10-15-09
05	CERTIFIED DRAWINGS	DRJ	10-19-09

NOTE
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DRN. BY DRJ	DATE 10-19-09
CHKD. BY	DATE
APPVD. BY	DATE
SCALE 1/2" = 1'-0"	
CERTIFIED	
BY:	DATE:

SOLID WASTE AUTHORITY OF WEST PALM BEACH COUNTY
LOCATION: WEST PALM BEACH, FLORIDA

ACTIVATED CARBON STORAGE AND DELIVERY SYSTEM
DRY SCRUBBING SYSTEM
(SPRAY DRYER ABSORBER & FABRIC FILTER)

SIEMENS Power Generation, Inc
Environmental Systems & Services

DRAWING NUMBER: 209D1329-02

APP. NO. 05

CLIENT DRAWING NO. P001-JP-9003 REV. D1

1" 1/2 0 1" GRAPHIC SCALE

NOTES:

1. FOR GENERAL PIPNG NOTES SEE DWG. P001-JP-1001.
2. SESS = SIEMENS ENVIRONMENTAL SYSTEMS & SERVICES.
3. HOSE CONNECTION FOR BACK-UP COMPRESSED AIR SUPPLY TO AERATION DISK.
4. PAC LINES ARE SCHEDULE 40 C.S.

CONTROL NOTES:

1. SEE SESS DOCUMENT 209D1329 FOR CONROL LOGIC.

BE&K • SESS

1" 5 SCFM, 100 PSIG KB-V9041

90 PSIG PCV 9000

BIN VENT FILTER JP-F-9001 711-403-575.00

POWDERED ACTIVATED CARBON SILO JP-A-9000 711-691-565.00

FROM PAC SILO TRUCK FILL

PAC SILO FILL LOCAL CONTROL PANEL PNL JP-PNL-9000*

PAC SILO HIGH LEVEL LAH 9000B

PAC SILO STUB CONNECTED ZI 9002

PAC SILO ALARM SILENCE DS 9000

PAC SILO ALARM HORN SA 9000

TTMM OTIS

HOLD

1" BA650S NOTE 3 KB-V9039

SET @ 10 PSI NOTE 3

AERATION DISK

ISOLATION GATE NO.1 JP-HV-1004 711-703-810.00

ISOLATION GATE NO.2 JP-HV-2004 712-703-810.00

ISOLATION GATE NO.3 JP-HV-9004 711-703-845.00

INLET FILTER/SILENCER

AERATION DISK BLOWER 10 HP JP-B-9002 711-388-576.00 JP-B-9002 711-535-576.10

ATMOS

1 MIN DELAY

PAC FEED HOPPER NO.1 JP-H-1007 711-457-825.00

PAC ROTARY VALVE NO.1 1/2 HP JP-RV-1005 711-391-820.00 JP-RV-1005 711-535-820.10

PAC FEED HOPPER NO.2 JP-H-2007 712-457-655.00

PAC ROTARY VALVE NO.2 1/2 HP JP-RV-2005 712-391-850.00 JP-RV-2005 712-535-850.10

PAC FEED HOPPER NO.3 JP-H-9007 711-457-855.00

PAC ROTARY VALVE NO.3 1/2 HP JP-RV-9005 711-391-850.00 JP-RV-9005 711-535-850.10

TRAIN 1 TRAIN 2 TRAIN 3

AA-FC-118 BOILER STEAM FLOW 316041E (11-D) 651-P0-008

PAC VOLUMETRIC FEEDER NO.1 (VFD) 3/4 HP JP-AG-1007 711-235-830.00 JP-AG-1007 711-547-830.10

AA-FC-218 BOILER STEAM FLOW

PAC VOLUMETRIC FEEDER NO.2 (VFD) 3/4 HP JP-AG-2007 712-235-860.00 JP-AG-2007 712-547-860.10

PAC VOLUMETRIC FEEDER NO.3 (VFD) 3/4 HP JP-AG-9007 711-235-860.00 JP-AG-9007 711-547-860.10

TO CEMS

VENT

FDR3 → BLR1 FDR3 OFF FDR3 → BLR2

INLET FILTER/SILENCER

PAC INJECTION BLOWER NO.1 15 HP JP-B-1009 711-388-835.00 JP-B-1009 711-535-835.10

PAC EDUCATOR NO.1 JP-ED-1009 711-328-840.00

220 SCFM, 15 LB/HR PAC
220 SCFM, 60 LB/HR PAC

PAC EDUCTOR NO.2 JP-ED-2009 712-328-870.00

PAC INJECTION BLOWER NO.2 15 HP JP-B-2009 712-388-865.00 JP-B-2009 712-535-865.10

OUTLET SILENCER

PAC EDUCTOR NO.3 JP-ED-1009 711-328-870.00

0 SCFM, 0 LB/HR PAC
220 SCFM, 60 LB/HR PAC

PAC INJECTION BLOWER NO.3 15 HP JP-B-9009 711-388-865.00 JP-B-9009 711-535-865.10

SPACE HEATER c/w THERMOSTAT 10 KW JP-B-9000 711-449-580.00

EXHAUST FAN 3/4 HP, 1800 RPM JP-B-9000 711-388-582.00 JP-B-9000 711-535-582.10

PAC SILO AREA SKIRT MOUNTED

SESS BE&K KB-V9045 1/2"

TO SOA NO.1 INLET DUCT OWG.P001-JP-1001 (711-P0-014)

PAC-L1001-SP-3"

PAC DIVERTER VALVE NO.1 JP-HV-1023 711-436-843.00

FROM HS-9007B

KB-V9044 KB-V9043 1/2"

SILO WALL

PAC-L2002-SP-3"

TO SDA NO.2 INLET DUCT DWG. NONE

PAC DIVERTER VALVE NO.2 JP-HV-2023 712-436-880.00

FROM HS-9007B

KB-V9042 1/2"

PAC DIVERTER VALVE NO.3 (SPARE) JP-HV-9023 711-436-880.00

FROM HS-9007B

KB-L9095-JND-1"

40 SCFM @ 100 PSIG

FROM AIR COMPRESSOR SYSTEM DWG. P001-KB-9005 (120-P0-003)

S.P. 100 PSI

1/2" KB-V9036 BA650S

1" BA650S KB-V9040

2" BA650S KB-V9037

• SESS BE&K

KB-L9013-JND-2"

RELEASED FOR DESIGN
BY K. Lyons DATE 9/29/09
STAFF: DATE: 9/27/09
INST.: DATE: 9/28/09
MECH.: DATE: 9/29/09
DEPT. MGR.: DATE: 9/30/09

NO.	DATE	REVISIONS	DRN	CKD	ZONE
01	9/30/09	RELEASED FOR DESIGN	DJT		
A1	8/26/09	RELEASED FOR APPROVAL			

DRAWN BY DATE
DESIGNED BY JW 7/12/09
CHECKED BY DATE
APPROVED BY DATE 9/30/09

SOLID WASTE AUTHORITY OF PALM BEACH COUNTY
7501 North Jog Road
West Palm Beach, Florida 33412

BE&K ENGINEERING CO.
A KBR COMPANY
2000 INTERNATIONAL PARK DRIVE
BIRMINGHAM, ALABAMA 35243
CERTIFICATE OF AUTHORIZATION NUMBER: 7910

SEAL

NORTH COUNTY RESOURCE RECOVERY FACILITY (NCRRF) REFURBISHMENT

AIR POLLUTION CONTROL PIPING & INSTRUMENT DIAGRAM POWDERED ACTIVATED CARBON INJECTION - SYS. DES. (JP)

SCALE:	CONTRACT	SEAK DRAWING NO.
NONE	5003501	711 P0 017
FILE:		CLIENT DRAWING NO. P001-JP-9003 REV. D1

SWADBDR PLOT DATE & TIME: Sep 29, 2009 - 10:56am

MALCOLM PIRNIE

INDEPENDENT ENVIRONMENTAL ENGINEERS, SCIENTISTS AND CONSULTANTS

4

Confidential Proposal

SNCR Proposal No. 09-194 REV 2

SNCR Systems for RDF Fired Boilers for Solid Waste Authority of Palm Beach County, FL

Prepared for

BE&K Engineering, LLC
2000 International Park Drive
Birmingham, AL 35243

BE&K Inquiry Number, BI5003501-MP006

Prepared by

Combustion Components Associates
884 Main Street
Monroe, CT 06468

May 20, 2009

Contents

APPENDICES

Appendix A – Bid Summary and Filled-In Data Sheets, Preliminary Schedule

Inquiry No.: BI5003501-MP006 Bid Summary

Equipment Data Sheets (2 pages, filled-in)

Data Submittal Schedule (2 pages, with comments)

Preliminary Schedule by CCA

SNCR Site License Agreement

Appendix B – CCA Equipment Drawings

P & ID - SNCR System - Water Boost Pressure Module

P & ID - SNCR System - Urea Circulation Module

P & ID - SNCR System - Mixed Chemical Control Module, Unit 1 and Unit 2

P & ID - SNCR System - Injector Distribution Module, Unit 1 and Unit2, Lower & Upper

SNCR Urea Injector

P&ID - Urea Storage Tank

1.0 Summary

In response to BE&K's Inquiry Number BI5003501-MP006, Combustion Components Associates, Inc. (CCA) is pleased to submit this quotation to supply two (2) Selective Non-Catalytic Reduction (SNCR) systems for two (2) Refuse Derived Fuel (RDF) fired boilers at the Solid Waste Authority of Palm Beach County, Florida. CCA has extensive experience designing, supplying and optimizing SNCR systems. We have provided SNCR system for boilers ranging from 160,000 pph steam to 260 MWe. This experience ranges from grate-fired boilers to utility boilers. In addition, CCA is a licensed implementor of the Fuel Tech NOxOut™[1] process. This provides CCA the right to utilize the Fuel Tech patents and access to the Fuel Tech technical experience.

CCA provides complete NOx reduction systems including both in-furnace and post combustion emission control technologies. We have provided SNCR systems on 16 boilers. In addition, we have our own mobile emission test equipment to perform baseline testing and optimization of combustion systems and NOx control systems. We have the capability to perform CFD modeling to predict process performance and determine injector locations. We have our own manufacturing plant located in Florida.

This proposal conforms to the subject inquiry in all ways with exception for those items provided for in Section 7 (Exceptions and Clarifications) of this proposal.

CCA offers this proposal with guarantees as a complete SNCR system. The final design of the SNCR system and components may differ from this offering in quantity or arrangement based on the results of CFD modeling using the data provided in the inquiry. CCA will be responsible for all costs associated with additional SNCR equipment, including the quantity and configuration of SNCR injectors, if such changes are required by the CFD model results.

1.1 Revision 1 (May 12, 2009) Details

This revision incorporates changes that have been discussed to date via email and includes the equipment and price changes given in our Addendum (Rev 1 dated May 4, 2009). In addition to pricing revisions shown in Appendix A (Bid Summary), the significant revisions include:

- Provides for low speed (1725 rpm) pumps on urea, water, and mixing modules.
- Replaces urea control valves on mixing modules with metering pumps.
- Adds spare metering pump on mixing modules.
- Increases technical field support to 25 days per boiler including 24-hour coverage during certain periods.
- An option for immersion heater on Chemical Storage Tank.
- An option for second in-line heater on urea circulation module.
- Added option for automatic switchover to spare pump on mixing module.

[1] NOxOut is a Trademark of Fuel Tech, Inc.

- Added option for additional CCA testing support.
- Revised recommended spares list.
- Deducted VFD price (provided in Addendum) from metering pump price.
- Add cancellation charge and warranty clauses that were previously transmitted by email.

1.2 Revision 2 (May 19, 2009) Details

This revision incorporates the following changes that have been discussed and agreed upon by CCA and BE&K:

- Section 3.0, Table 2 (and also in Appendix A, Equipment Data Sheets), the atomizing air flow has been changed to 270 scfm max/230 scfm design.
- Section 7.0, item 1, the 1st paragraph was modified regarding liquidated damages and product deficiencies.
- Section 7.0, item 2, the period of time was changed.
- Section 7.0, item 4 was changed to include all companies involved in the project. Also, a sentence was added regarding disclosure of information under Florida law.
- Section 7.0, item 6 was deleted in that we accept the term of 2% per week liquidated damages as given in the RFQ.
- Section 7.0, item 9 was modified to reflect a higher limitation of liability for CCA. The price of the equipment for Unit 1 and 2 shown in Appendix A Bid Summary was also changed in relation to this change.
- Section 7.0, item 11 was deleted.
- Section 7.0, item 12 was added to replace Section 8.7.
- Section 8.2, validity period for spare parts pricing was added.
- Section 8.5, validity period for the proposal was extended.
- Section 8.7 was deleted (replaced by item 12 in Section 7.0).
- A new paragraph was added to Section 1.0, Proposal Summary stating CCA's responsibility for equipment changes due to CFD modeling results.
- Revised SNCR site license agreement per Buyer's comments and included revised agreement in Appendix A.

2.0 Boiler Description

The RDF-fired boilers were manufactured by B&W and have a design steam flow rate of 324 Klb/hr at 925 psig drum pressure and 750°F steam temperature. Each boiler is designed to burn 900 tons per day of RDF.

Table 1 and the Equipment Data Sheets shown in Appendix A outline the existing boiler operating conditions and serve as the design basis of this proposal.

Table 1
Existing Boiler Data

Boiler Design Data		
Steam Capacity	lb/hr	324,000
Drum Pressure, MAWP	psig	925
Final Steam Operating Pressure	psig	750
Final Steam Temperature	deg F	750
RDF Fuel Firing Capacity	tons/day	900
RDF Fuel HHV	Btu/lb	4,500 -7,000
Flue Gas CO, Predicted	ppmvd	<50
Flue Gas CO, Guaranteed	ppmvd	400
Boiler System NOx Emissions		
NOx Emissions, Predicted, without SNCR	ppmvd	220
NOx Emissions, Guaranteed, without SNCR	ppmvd	250
	lb/MMBtu	0.48
NOx Emissions, Guaranteed, SNCR	ppmvd	150
Maximum Ammonia Slip	ppmv	10

(1) All concentrations in table for NOx and CO are expressed as ppmdv corrected to 7% O2.
(2) NOx emission measurements based on four-hour block average.
(3) Ammonia slip measured at inlet to 10 fan.
(4) CO 400 ppmdv 1 hour maximum, 200 ppmdv 24 hour average.

3.0 Proposed Approach

SNCR is a process in which an aqueous urea reagent is injected into the combustion gases in the upper furnace reacting with the NOx from the combustion process to form nitrogen and water vapor. Urea is readily available and requires no special safety precautions for handling.

Fundamental thermodynamic and kinetic studies of the NO_X-urea reaction chemistry took place during the period 1976-1981 under the sponsorship of the Electric Power Research Institute (EPRI) who patented this work. Whereas the investigation indicated multiple chemical reactions and some traces of by-products, the predominant overall reaction is:

$$CO(NH_2)_2 + 2NOx + \tfrac{1}{2}O_2 = 2N_2 + CO_2 + 2H_2O$$

Urea + Nitrogen Oxide + Oxygen = Nitrogen + Carbon Dioxide + Water

The above chemical reaction indicates that one mole of urea is required to react with two moles of NO_X. Results of test data indicate that greater reagent quantities must be injected to achieve desired removal efficiency. Most of the excess reagents degrade to nitrogen and carbon dioxide; some trace quantities of ammonia and carbon monoxide may form.

The relationship between NO_X removal efficiency and reagent utilization has been tied together by a variable known as the Normalized Stoichiometric Ratio (NSR).

The NSR is defined as follows:

$$NSR = \frac{\text{Actual Molar Ratio of Reagent to Inlet } NO_X}{\text{Stoichiometric Molar Ratio of Reagent to Inlet } NO_X}$$

The relationship between reagent utilization NSR and NO_X removal efficiency is as follows:

$$\text{Reagent Utilization, \%} = \frac{NO_X \text{ Removal Efficiency, \%}}{NSR}$$

A typical SNCR system incorporates a reagent storage and delivery system to automatically inject the reagent into the combustion gases of the boiler. Concentrated urea solution is delivered by truck to the job site and transferred into the Chemical Storage Tank.

The concentrated urea solution in the Chemical Storage Tank is circulated by a reagent circulation skid through an in-line electric heater to prevent crystal formation. The urea circulates to the mixed chemical control skids located near the injectors. The circulation loop continues through the mixed chemical control skids and returns urea to the tank

through a back pressure control valve. The back pressure control valve maintains urea pressure at the mixing skids.

For the proposed project at Solid Waste Authority of Palm Beach County, the reagent circulation loop will serve both boilers. The urea circulation skid is equipped with two (2) pumps, each sized for 100% capacity based on both boilers operating at MCR.

The Mixed Chemical Control Skid provides for the metering and mixing of the urea and dilution water. The feed rate of urea solution is automatically controlled through an auto/manual NO_X control station that uses a feed-forward boiler load signal and a feedback stack NO_X signal. The NO_X control station output signal is sent to the Chemical Control Valve which automatically adjusts the amount of reagent injected into the boiler.

The concentrated urea solution is mixed with dilution water downstream of the Chemical Control Valve. In addition to providing intimate mixing when diluting the concentrated urea solution, the mixed chemical control skid provides the required reagent flow at the injectors. The degree of dilution is generally affected by the location of the injector(s) and the temperature and gas velocity profiles in the boiler. The net effect of the dilution is to assure more efficient contact between the NO_X and the reagent in the boiler, thus increasing NO_X removal efficiency.

Dilution water is river or plant service water and is supplied to the mixed chemical control skid by a water boost pressure skid. Dilution water requirements are optimized during start-up. The dilution water rate to the injectors is automatically controlled through the mixed chemical pressure control valve on the mixed chemical control skid, thus limiting the total diluted chemical flow to the injectors. This design maintains the ideal droplet size throughout the injection range. Expected dilution water requirements are provided in Table 2.

Injectors atomize the urea reagent as it enters the boiler and mixes with the boiler flue gas. Injectors utilize 100 psi air as the atomizing medium. The pressure of the atomizing air is controlled by an air pressure regulator valve at each injector module. The reagent reacts with the NO_X in the flue gas to form nitrogen, carbon dioxide and water. Purge or cooling air and/or water is required for maintaining the injectors clear and cool when the injectors are off-line.

Included in the proposal and identified separately is the cost of a urea SNCR site license fee. This fee is paid by CCA to Fuel Tech, the original developer of the SNCR technology and patent holders in conjunction with EPRI.

The following conditions were used to determine the preliminary sizing of the SNCR system:

Table 2
CCA SNCR Preliminary Design Data

Assumptions		
Furnace Exist Gas Temperature (FEGT)	Deg F	1800-2100
Proposed Design Basis		
NOx Emissions without SNCR	ppmvd 7% O2	250
CO Emissions without SNCR	ppmvd 7% O2	400 max (1 hour) 200 avg
Urea Concentration	%	50
Urea Flow @ MCR (per boiler)	gph	39
Dilution Water Flow @ MCR (per boiler)	gph	1300
Atomizing Air Flow @ MCR (per boiler)	scfm	270 scfm max 230 scfm design
No. of SNCR Injectors, Total (per boiler)	-	18
Injector Arrangement	-	2 elevations 8 injectors upper 10 injectors lower
Emissions Predicted / Guarantee		
NOx Emissions, Predicted	ppmvd 7% O2	
NOx Emissions, Guarantee	ppmvd 7% O2	150
Maximum Ammonia Slip, Guarantee	ppmv	10

4.0 Scope of Supply

The scope of work proposed by CCA is provided below.

4.1 Baseline Testing and Site Visit

CCA will perform a site visit to meet with BE&K and the Buyer to determine the location of the SNCR equipment (pump skids, etc.) and confirm boundary conditions and utilities.

4.2 CFD Modeling

CCA will develop a computational mesh and input/boundary conditions for the boiler furnace configuration as it currently exists. A detailed CFD simulation based on information compiled and summarized by CCA will be performed. CCA uses the Fluent software code for CFD simulations. The model geometry will include from the grate to the furnace exit. The model results will be validated using the baseline field data. Three-dimensional maps of major pollutant species concentrations, velocity field and temperature, as well as boundary/wall maps of heat flux and deposition will be prepared. CCA will then model various SNCR injector locations and process conditions to optimize the location and elevations of the injectors. For the purposes of this proposal, we have assumed that two levels of injectors will be required with separate injection mixing control zone operation. We have assumed that there will be 10 injectors on the lower zone and 8 injectors on the upper zone. The model results will include descriptions of SNCR droplet trajectories and properties such as temperature and composition along with NH3 slip predictions. The final solutions will be used as a tool for the final injection velocity, droplet size and injector locations. CFD models will be done for 60% and 100% load.

A report will be issued describing the CFD results. CCA will present the results to BE&K and the owner.

4.3 Process Engineering

Based upon the baseline data, the site visit and the CFD model results, CCA will prepare a process flow diagram. The process flow diagram will define the dilution water rate, the urea flow rate, and atomizing air requirements. The process flow diagram will be used to specify the SNCR system equipment.

CCA will also provide a Process Control Narrative describing the control function and I/O requirements of the SNCR system. This information will be used by BE&K and the Buyer to program control of the SNCR system into the existing boiler DCS.

4.4 Equipment Supply

CCA proposes to supply the following equipment to provide for a complete SNCR system. Quantities shown are for two (2) boilers total.

4.4.1 Water Boost Pressure Module (WBP) – Quantity 1

The WBP module is a self-contained, high-flow, high-head pressure control and delivery system designed to supply filtered dilution water to the mixed chemical control (MCC) skid. The function of the WBP module is to provide on-demand control of the dilution water and act as the primary boost and control system for delivering the dilute urea reagent to the injection zones via the MCC. Through the use of back pressure controllers and multistage pumps, this system is designed to maintain a constant supply of dilution water at the design pressure in response to changing process demands. In addition, the WBP skid filters the plant supplied dilution water through the use of an in-line duplex strainer to insure trouble-free operation of the injectors.

The WBP module contains two (2) full-flow multistage, 1725 rpm SS centrifugal pumps, in-line duplex strainer, back pressure control valves and pressure and flow instrumentation necessary for local/remote control of the WBP. This module is fully assembled and shop tested and supplied on a stainless steel, free-standing containment base. The electrical components of the WBP meet NEMA 12 rating and are assembled per the applicable NFPA, NEC and IEEE electrical codes and standards. All wetted components and materials are manufactured of 304 or 316 stainless steel with the exception of the duplex strainer which is bronze.

Typical Size:	4.0' W x 7.0' L x 6.0' H
Approximate weight:	1,200 lbs.

Reference Drawing "P & ID - SNCR System - Water Boost Pressure Module" shown in Appendix B.

4.4.2 Urea Circulation Module (UCM) – Quantity 1

The Urea Circulation Module (UCM) is a self-contained, high-flow, high-head delivery system designed to supply filtered urea reagent to the mixed chemical control (MCC) skid. The UCM serves multiple functions for the SNCR process. Primarily, the UCM provides urea to the MCC skid at the proper pressure. Through the use of a back pressure regulator and multistage pumps, this system is designed to maintain a constant supply of urea at the design pressure in response to changing process demands. The UCM also filters the urea from the storage tank using an in-line duplex strainer to insure trouble-free operation of the injectors. In addition, the UCM also provides supplemental heating to make up for line heating losses and to maintain the reagent above its crystallization temperature. The UCM maintains a continuous circulation of the stored reagent and promotes mixing in the storage tank to minimize cold zones in the tank.

The UCM contains two full-flow multistage, 1725 rpm SS centrifugal pumps, in-line duplex strainer, in-line electric heater, back pressure control valve and pressure and flow instrumentation necessary for local/remote control of the UCM. This module is fully assembled and shop tested and is supplied on a stainless steel free-standing containment base. The electrical components of the UCM meet NEMA 4X rating and are assembled per the applicable NFPA, NEC and IEEE electrical codes and standards. All wetted components and materials are manufactured of 304 or 316 stainless steel. The UCM serves as the local/remote control and monitoring station for the reagent circulation system. It provides for built-in redundancy to ensure continuous and uninterrupted operation.

The UCM includes a circulation back pressure control valve. The back pressure control loop regulates the urea pressure for the supply to the mixed chemical control skid in order to maintain the proper flow rate and pressure. The valve station maintains a sufficient chemical pressure upstream of the MCC to allow for proper maintenance of urea flow. The valve station is specifically sized for each application. The system is a pre-fabricated piping spool piece consisting of a stainless steel back pressure control valve, manual isolation valves, manual bypass valve, local pressure indicator, stainless steel piping, fittings, etc.

Typical Size:	4.0'W x 8.0'L x 6.0'H
Approximate weight:	1,500 lbs.

Reference Drawing "P & ID - SNCR System - Urea Circulation Module" shown in Appendix B.

4.4.3 Mixed Chemical Control Skid (MCC) – Quantity 2 (one per boiler)
The Mixed Chemical Control Skid (MCC) is the primary module used to precisely meter and independently control the concentration of urea reagent and water to each zone of injection in the boiler. This module, through the use of independent chemical flow control and zone pressure control valves integrated with the SNCR controls, provides an increased level of process control needed for optimum SNCR performance. This module is designed to interface and respond to control demands received from the SNCR controls (either a PLC or through the plant DCS). The MCC automatically adjusts reagent flows and activates or deactivates injection zones or control zone mass flows in response to changes in NOx level, boiler load, fuel or firing configurations. The controls will utilize the FEGT data from the existing temperature data provided to the DCS. Each zone sub-module of the MCC is designed to be operated and controlled independently. This feature allows for isolating each sub-module for maintenance without severely impacting process performance or overall NOx reductions.

The MCC is designed for two (2) independent zone sub-modules. The standard unit includes a stainless steel, free-standing base with integrated containment basis, instrument air pressure switches and instrument air regulator. Each zone metering sub-

module includes local indicators of system status, automatic motor operated valves to control the water, urea and water flush operation, water pressure control valve, 1725 rpm SS urea metering pump, inline static mixer, manual isolation valves, check valves and local pressure indication.

The MCC is also equipped with a spare metering pump, including flush line with automatic valve. The spare pump arrangement allows for the supply of urea to either the upper or lower injector elevation via a manual valve arrangement. See section 4.7 of this proposal for automatic pump switchover option.

Typical Size: 4.0'W x 9.0'L x 6.0'H
Approximate weight: 1,200 lbs.

Reference Drawing "P & ID - SNCR System - Mixed Chemical Control Module" for Unit 1 and Unit 2, shown in Appendix B.

4.4.4 Injector Distribution Module (IDM) – Quantity 8 (four per boiler)
The Injector Distribution Modules (IDM) are placed just prior to the injectors (typically at the same elevation) and are used as a guide and check for proper injector performance. Air for atomization and cooling is introduced through this module. Each IDM accommodates multiple injectors, grouped by zone. For each injector, the module provides urea flow and pressure indication with manual trim valve and isolation valve and an atomizing air pressure regulator with pressure indication and manual isolation valve. Each IDM includes an atomizing air pressure switch and automatic solenoid valve to control cooling air. Each panel will be shop assembled and mounted to a freestanding stainless steel base with a pipe-manifold assembly for easy accessibility and for ease of installation

This proposal provides for two (2) 4-zone IDM's for the upper SNCR injection zone and two (2) 5-zone IDM's for the lower zone SNCR injection for each boiler.

Typical Size: 2.0'W x 4.0'L x 6.0'H each
Approximate weight: 500 lbs.

Reference Drawing "P & ID - SNCR System - Injector Distribution Module" for Unit 1 and Unit 2, Lower Level and Upper Level, shown in Appendix B.

NOTE: The life of the atomizing air pressure regulators is dependent upon the quality of the service air. Rust, oil and water will decrease the life to less than the warranty period.

4.4.5 Injector Assembly – Quantity 36 (Eighteen per boiler)
Each injector will be appropriately sized and characterized for proper flows and pressures that are required to achieve the necessary NOx reductions. The injectors are made completely of 316L stainless steel. The nozzle tip will be 316L stainless steel supplied with a ceramic coating for wear protection. The injector cooling shield is typically 3/4" Inconel tubing or 316 stainless steel with ceramic coating (0.750" OD and 0.065" wall thickness). The inner atomization tube is typically 3/8" tubing with an adapter to accept different injector tips; standard injector length is 2.5 feet.

The injector tip is sized for a 0.05 opening in the membrane wall. Reference Drawing "P09-194-001Urea Injector" shown in Appendix B.

Each assembly includes an air atomized injector, adapter for insertion adjustment, coupler to attach to boiler support, quick-connects and 4-ft' long steel-braided flex hoses for both the chemical and atomizing air connections.

4.5 Field Support and Training

This proposal provides for a total of fifty (50) days of on-site technical support, including 24-hour coverage during certain periods. The preliminary breakdown of technical support for the purposes of this proposal is shown in Table 3. The labor breakdown is an estimate that may change as required by the project, e.g. 24-hour coverage may be needed during start-up instead of checkout or split between both within the proposed hours and number of trips.

Table 3
Breakdown of Field Support

Task	No. of CCA Engineers On-Site	No. of Trips to Site	Total Days On-Site for 2 Boilers
Supervisory Assistance	1	2	15
Start-up Assistance	1	2	20
Check-out Assistance	2	4	15
Total Days on Site, 10-hour coverage			**35**
Total Days On-Site, 24-hour coverage			**15**
Total Man-days included in proposal			65
Training	1	1	3

4.5.1 Supervisory Assistance
CCA will provide installation support and supervision of CCA supplied equipment.

4.5.2 Start-up Assistance

CCA will provide support for SNCR optimization. Per the specification, "all testing will be performed by a qualified testing consultant to be contracted by the Purchaser". CCA will provide a final report within 30 days after completion of the optimization.

4.5.3 Check-out Assistance

CCA will assist with checkout of the CCA-supplied equipment following installation and during startup.

4.5.4 Operator Training

CCA will provide one engineer on-site to provide operator training. This proposal includes the cost for one engineer, one trip, and a total of 24 hours (3-days) on-site. This training may include classroom instruction in the operation and maintenance of the SNCR system or hands-on operational training and walk-downs of the actual installation, at the preference of BE&K and the Buyer. Training will include twenty (20) copies of training materials with descriptions of the supplied equipment and the general operation of the SNCR system.

4.5.5 Spare Parts for Commissioning

During the installation support and combustion optimization phase of this project, CCA will have available on-site the following spares to support commissioning and startup of the CCA-supplied equipment. The price of these spares is included in the "Cost for Check-out Assistance" shown in the Bid Summary (Appendix A).

Item	Quantity
Injector air pressure regulators	6
Injector flex hoses	2
Injector hose quick disconnects	4
Rotometers	2
Injectors tips	8
Injector inner tubes	4
Injector cooling shields	4

4.6 Optional Chemical Storage Tank

As requested by the specification, CCA proposes, as an option, to supply the Chemical Storage Tank.

The proposed tank is a 25,000 gallon vertical tank constructed with VE8300 Vinyl Ester resin throughout. The resin will have a MEKP cure system. The corrosion barrier will be approximately 100 mils thick and will be constructed of chopped FRP with a single Nexus veil. The tank will have a white gel coat exterior with an ultraviolet inhibitor.

The tank will be designed per the "SUPPLEMENTAL REQUIREMENTS FOR SITE CONDITIONS FOR EQUIPMENT" as revised and received on May 8, 2009.

The proposed tank includes the following features:

- 2- 24 inch manways at top and lower side
- Ladder with cage
- Heating blanket system to maintain 100 deg F with ambient 35 deg F.
- NEMA 4 control panel, 480v/3ph/60hz
- Lifting lugs
- Hold down lugs
- Fill, Return and Supply manual valves
- Level transmitter isolation valve
- Level transmitter
- Thermocouple, Thermowell and Temperature transmitter
- Return and Supply flexible hoses
- Connections (FRP)
  - 2-inch 150 lb flanged siphon outlet
  - 2-inch 150 lb fill pipe to top of tank with internal drop tube and pipe supports
  - 3-inch vent at top of tank with gooseneck
  - 3-inch 150 lb flanged overflow
  - 1/2 inch 150 lb flanged connection at bottom for level transmitter
  - 1-inch 150 lb flanged connection at bottom for thermowell
  - 1-1/2 inch 150 lb flanged return connection at bottom of tank

The price for the optional Chemical Storage Tank is not included in the base pricing but is listed as an option price.

4.6.1 – Option For Immersion Heaters – Tank heating blankets can be replaced with two (2) 3.5kW immersion heaters. Price is shown as an option.

4.6.2 – Option for Second In-Line Urea Circulation Heater – Tank heating blankets can be replaced with a second in-line heater on urea circulation module.

4.7 Option for Mixing Module Pump Automation

The base proposal provides for manual switchover from main pump to spare pump on the chemical mixing module. This option provides for the supply of automatic valves on the outlet of the spare metering pump for remote selection of upper elevation or lower elevation injectors. The price for this option is not included in the base pricing but is listed as an option price.

4.8 Option for CCA Field Testing

The base proposal provides for all field testing of the SNCR system by others. CCA can provide for all optimization testing if necessary and provides the following options:

1 Tech Option: One (1) CCA technician with equipment to perform ammonia slip tests at the economizer outlet during optimization testing. The price for this option is provided on a per diem basis in the Bid Summary.

Mobile Lab Option: Two (2) CCA technicians and a CCA mobile laboratory to perform emissions testing at the ID fan outlet (NOx, CO, CO2, O2) and ammonia slip tests at the economizer outlet during optimization testing. The price for this option is provided on a per diem basis in the Bid Summary.

5.0 Work by Others

Per the specification, CCA has assumed that BE&K or the Buyer will perform the following tasks as part of the SNCR installation:

1. Provide site access for CCA to meet with BE&K and the owner to discuss equipment locations and utilities.
2. Building or environmental permits and fees.
3. Installation of all equipment supplied by CCA (CCA will provide installation instructions and on-site supervision).
4. Unloading and storage of the equipment at the job site.
5. Asbestos, lead paint, chromium refractory material or any other hazardous material removal and disposal.
6. Make the boiler loads available for CCA to complete the boiler optimizations within the proposed time schedule.
7. Third party testing.
8. Utilities outlined in the proposal.
9. 50% Urea chemical.

6.0 Quality Statement

Combustion Components Associates, Inc. has established processes and standards in place to ensure a total quality and safety environment. It is important to note that CCA has brought into compliance over 20,000 MW of capacity in the U.S. and Europe and has always strived to aim for the highest quality standards. Our quality assurance standards are outlined below.

Each project is assigned a project manager. He/she is responsible for the total execution of the job including client correspondence, schedule, and budgets. The phases of the project may be divided up between other individuals to execute various portions of the project such as CFD modeling, design engineering, installation supervision, and start-up. The project manager checks all design work. If the project manager does the design work, a second individual in the corporation will review and sign off on the project manager's work. This ensures that all projects are designed to company standards and verified by a second individual.

CCA utilizes subcontractors for manufacture of all components. CCA's subcontracting strategy is to assure that we select subcontractors with pre-approved quality assurance and safety programs and have performed work successfully in the client's plants. At least two manufacturing facilities are capable of manufacturing all of CCA's components. This ensures that CCA is not bound at any one time to one particular manufacturer. Based on the schedule and other considerations, CCA selects the most appropriate manufacturer for the particular project. All of these manufacturing facilities have CCA's standards to manufacture the components to. Each of these manufacturing facilities maintains stock of raw materials for our major components. Upon completion of the manufacturing for any project, the project manager or a designated individual from the company will visit the manufacturing facility to verify they are consistent with the engineering drawings. Photographs of the components are taken and put on file.

CCA performs installation supervision. This is generally periodic inspection during the installation phase as well as an audit of the contractors quality process and procedures, however if necessary, a full time engineer can be placed on-site to ensure the work is done in accordance with CCA standards.

7.0 Exceptions & Clarifications

After a thorough review of the BE&K Inquiry Number BI5003501-MP006, we have provided the following exceptions and clarifications.

Items 1-8 and item 12 reference the "Terms and Conditions of Purchase" provided in the inquiry document "BI5003501-MP006.doc" dated 03/05/2009.

1. We request that the following paragraphs be included in any order or contract resulting from this proposal:

   SELLER'S LIMITATION OF LIABILITY. SELLER SHALL NOT BE LIABLE FOR ANY SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES EXCEPT FOR LIQUIDATED DAMAGES PROVIDED FOR IN THIS CONTRACT, WHETHER BASED ON BREACH OF CONTRACT OR WARRANTY, NEGLIGENCE, OR ANY OTHER MATTER RELATING TO THIS CONTRACT. THE SELLER'S MAXIMUM LIABILITY SHALL IN NO CASE EXCEED THE TOTAL CONTRACT VALUE OR, FOR INSURED MATTERS, THE AMOUNT OF SUCH INSURANCE.

   LIMITATION AND DISCLAIMER OF WARRANTIES. CCA shall not be liable under the warranties hereunder unless Buyer promptly notifies CCA in writing of the alleged deficiency in the product or service and offers CCA a reasonable opportunity to cure such deficiency, or if a product deficiency in a CCA supplied product is a result of damage or destruction, including any occurring due to improper installation, testing or repair (including any repair not by CCA agents or employees or otherwise not consented to in writing by CCA), misuse, neglect, or alteration.

   THESE WARRANTIES ARE IN LIEU OF AND CCA DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, WRITTEN OR ORAL, INCLUDING THOSE MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR OTHERWISE, AND MAY BE MODIFIED BY CCA ONLY IN A WRITING SIGNED BY CCA IN WHICH IT INTENDS TO BE FOUND.

2. With reference to paragraph 15 (CANCELLATION), we request that the following sentence be amended as shown:

   "Seller will preserve and protect, *for a period of 60 days following cancellation,* the Goods on hand, work in progress, supplier data, and completed work, both in its own and in its suppliers' facilities, in accordance with Buyer or Buyer's Agent's instructions."

3. With reference to paragraph 18 (TAXES), we take exception to paying any sales and use taxes associated with this project. Sales and use taxes are not included in the price of this proposal.

4. With reference to paragraph 19 (CONFIDENTIALITY), we request that the following paragraph be added:

   "Combustion Components Associates, Inc. (CCA) possesses certain ideas and information, hereinafter referred to as the "Confidential Information", that are proprietary and confidential to CCA. Confidential Information that may be disclosed by CCA to Solid Waste Authority of Palm Beach, BE&K Construction Company, Malcolm Pirnie, or Babcock & Wilcox Company, hereinafter collectively referred to as the "Recipient", will be identified as such either verbally or in writing within five (5) days of disclosure. The Confidential Information shall treated and protected by the Recipient as confidential and will not be disclosed to any third party without the prior written consent of CCA and may be disclosed within the Recipient's organization only on a need-to-know basis. If Recipient receives a public records request under Florida Statute Chapter 119, et seq, and CCA wishes to protect such information from disclosure, CCA shall defend against such production and shall indemnify Recipient from any claims or damages (including attorneys fees and costs) which Recipient may suffer as a result of refusing to disclose such information. Recipient agrees not to use the Confidential Information in any way or to manufacture or produce any product embodying Confidential Information without written agreement from CCA. The Confidential Information shall not be deemed proprietary and the Recipient shall have no obligation with respect to such information where the information: (a) was known to Recipient prior to receiving any of the Confidential Information from CCA; (b) has become publicly known through no wrongful act of the Recipient; (c) was received by Recipient without breach of this Agreement from a third party without restriction as to the use and disclosure of the information; (d) was independently developed by Recipient without use of the Confidential Information. Recipient agrees that CCA shall be entitled to equitable relief, including injunction and specific performance, in the event of any breach of the provisions of this Agreement. Such remedies shall not be deemed to be the exclusive remedies for a breach of this Agreement but shall be in addition to all other remedies available at law or equity. No delay by CCA in exercising any right, power or privilege under this Agreement shall operate as a waiver thereof nor shall any single or partial exercise thereof preclude any other or further exercise of any right, power or privilege hereunder. This Agreement related to CCA Confidential Information shall survive termination of any order or contract between CCA and the Recipient and for a period of 5 years after the date of termination of any order or contract regardless of the cause of such termination".

5. With reference to paragraph 22 of the R*equest for Quotation* (LIQUIDATED DAMAGES), we request that the following sentence be modified as shown:

   "Drawings - $300 per late day per identified drawing with ~~no cap~~ *up to total damages of 10% of the Purchase Order value, inclusive of all change orders"*.

6. Deleted in Revision 2.

7. With reference to paragraph 23 (INTELLECTUAL PROPERTY), we request that the following sentence be deleted:

   "Any proprietary designs, know-how, software, development tools, processes, source code, programs, or systems owned or controlled by Seller prior to the date of this Purchase Order which are incorporated or embedded into the Custom Goods ("Seller Intellectual Property") shall remain the intellectual property of Seller, and Seller agrees to grant and does herein grant to Buyer and Buyer's Agent and any Owner or their assignees a non-exclusive, worldwide, transferable, fully-paid and perpetual license to use the Seller Intellectual Property in connection with use of the Custom Goods."

8. With reference to paragraph 23 (INTELLECTUAL PROPERTY), we request that the following sentence be added:

   "Included in the purchase of the CCA SNCR system is a one-time site SNCR license fee. In addition to the right to use the urea process, the fee will entitle the enduser to use, at its discretion, all future improvements to the SNCR process. The site license fee is determined by the total heat input of the boiler. A site license agreement must be signed upon acceptance of this proposal".

Items 9-11 reference inquiry document "PR448 SNCR System for NOx Control Specification Rev A0.pdf".

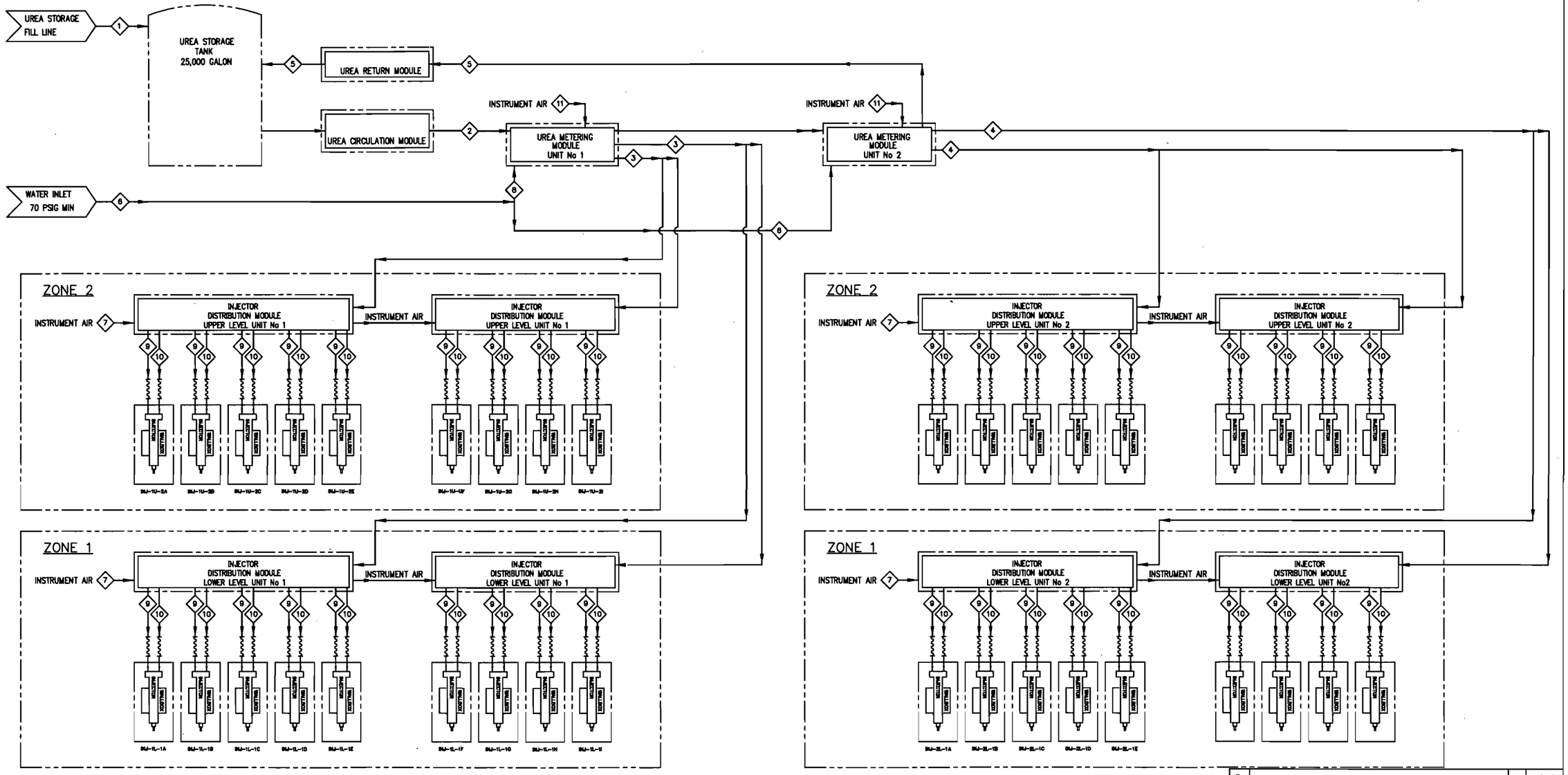
9. With reference to paragraph 8.2.3, we request the following modified to read:

   If a Vendor deficiency is confirmed, the entire cost, including freight and all labor, of modifying, repairing, or replacing any equipment, materials, or components in order to meet the quoted performance guarantee shall be borne by the Vendor up to a maximum liability of 75% of the contract value for efforts to meet the quoted NOx emission and ammonia slip guarantees or up to a maximum liability of 10% of the contract value for efforts to meet the urea flow rate guarantees. The maximum liability associated with urea flow rate guarantees would be prorated against the six (6) guarantee conditions, e.g. the limit of liability would be capped at 5% if 3 out of the 6 flow rate guarantee points were not met. The remedy for any deficiency is at the discretion of the Vendor. Any work or required downtime of the equipment shall be at the Owner's convenience, consistent with the plant's operation."

10. With reference to the "Data Submittal Schedule", we request that the date required for approval submittals be changed from 4 weeks to 6 weeks.

11. Deleted in revision 2.

12. With reference to paragraph 15 (CANCELLATION), we request that the following sentence be modified as shown: "No cancellation, fee, charge or payment will be owed by the Buyer or Buyer's Agent to Seller, and Seller will be owed only for the direct costs plus reasonable profits of any completed and satisfactory performance to the date of cancellation...".



UNIT No 1

UNIT No 2

	1	2	UNIT No 1 3	UNIT No 1	UNIT No 2 4	UNIT No 2	5	6	7	8	9	10	11
FLUID	UREA	UREA	ZONE 1 MIXED CHEM	ZONE 2 MIXED CHEM	ZONE 1 MIXED CHEM	ZONE 2 MIXED CHEM	UREA	DILUTION WATER	INST. AIR	DILUTION WATER	MIXED CHEMICAL	INSTRUMENT AIR	INST. AIR
DESIGN FLOW	9000 GPH	720 GPH	41 GPH	41 GPH	41 GPH	41 GPH	638 GPH	3240 GPH	135 SCFM	1620 GPH	90 GPH	15 SCFM	5 SCFH
TEMPERATURE, DEG F	110°F	100°F	60	60	60	60	100°F	80°F	60°F	60°F	60°F	80°F	80°F
PRESSURE, PSIG	7	58 PSIG	75 PSIG	75 PSIG	75 PSIG	75 PSIG	35 PSIG	30 PSIG	80 PSIG	100 PSIG	60 PSIG	50 PSIG	80 PSIG
DENSITY, LBS/GAL	9.5	9.5	8.1	8.1	8.1	8.1	9.5	8.0	NA	8.0	8.1	N/A	NA
NOTES	FILL	SUPPLY	ZONE 1 IDM1L4&5	ZONE 2 IDM1U4&5	ZONE 1 IDM2L4&5	ZONE 1 IDM2U4&5	RETURN	TOTAL 2 UNITS	ATOMIZING AIR	PER ZONE	PER INJECTOR	PER INJECTOR	CONTROL VALVES

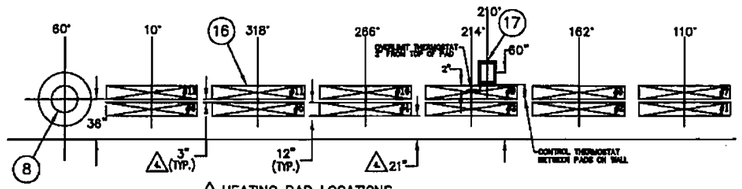
Solid Waste Authority of Palm Beach
North County Resource Recovery Facility Refurbishment

REV.	DESCRIPTION	BY	DATE
D	RE-ISSUED FOR FABRICATION	JAD	08/31/09
D	REVISED DRAWING No. & INJECTOR COUNT RE- ISSUED FOR APPROVAL	JAD	07/08/09
C	RE- ISSUED FOR APPROVAL	JAD	06/18/09
B	REDRAWN ISSUED FOR INFORMATION	JAD	06/16/09
A	ISSUED FOR INFORMATION AND BID PURPOSES	JND	03/27/09

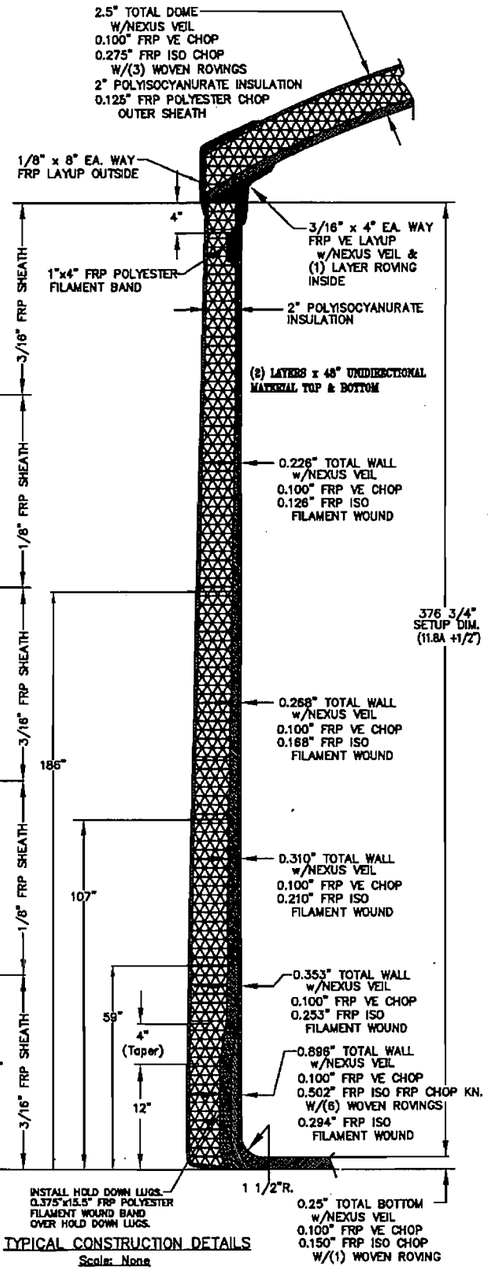
COMBUSTION COMPONENTS ASSOCIATES, INC.
884 MAIN STREET, MONROE CT, 06468
TEL: (203) 268-3139 FAX: (203) 261-7697

TITLE: SNCR SYSTEM PROCESS FLOW DIAGRAM

DRAWN BY	DATE	SCALE	DWG NO.	REV.
JS	06/01/09	NONE	SWAPB_0901_011	0
APP'D BY	DATE	CUSTOMER		
.	.	Solid Waste Authority of Palm Beach		D

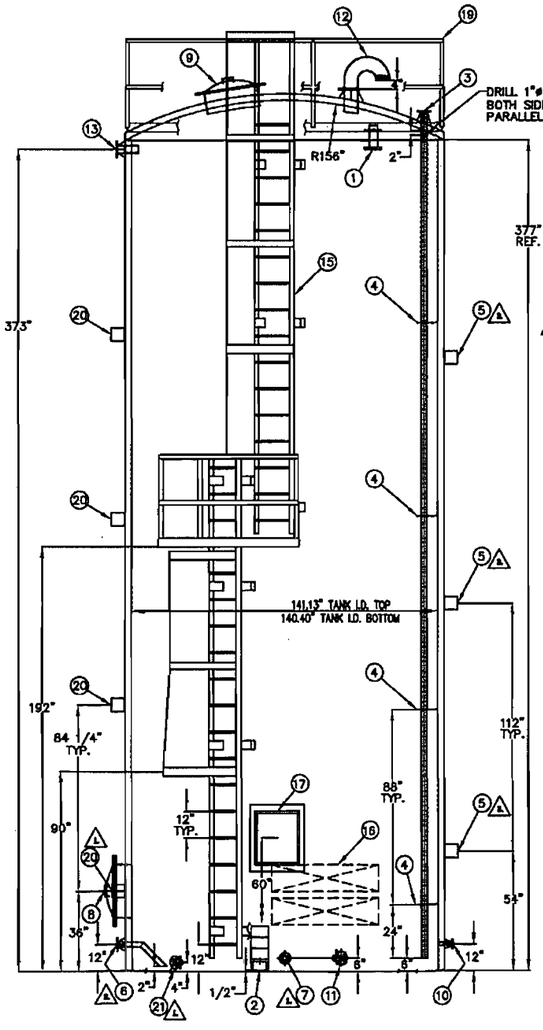


HEATING PAD LOCATIONS
Scale: None

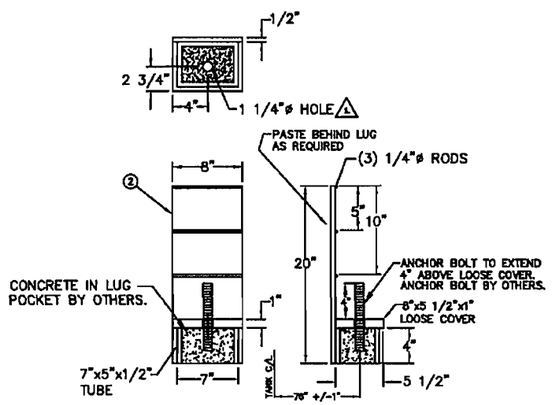


TYPICAL CONSTRUCTION DETAILS
Scale: None

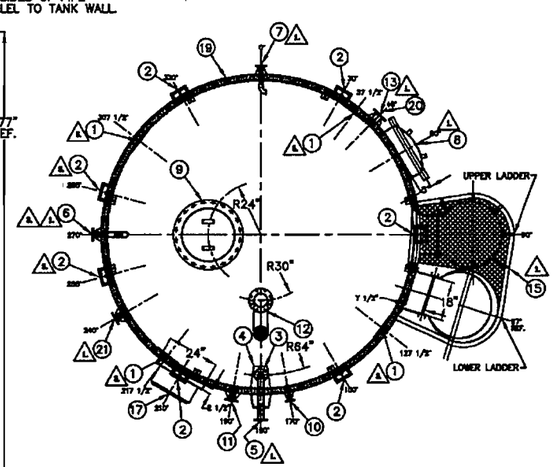
JV-T-9030



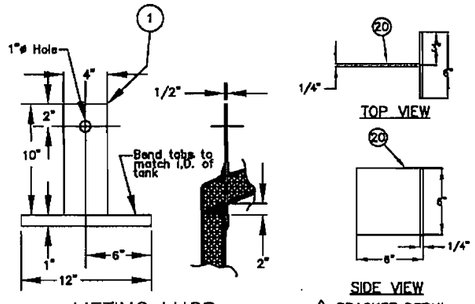
ELEVATION VIEW
(SEE PLAN VIEW FOR TRUE ORIENTATION)



HOLD DOWN LUG DETAIL



PLAN VIEW
(TRUE ORIENTATION)



LIFTING LUGS

BRACKET DETAIL

ITEM	QTY	ACCESSORY SCHEDULE	REF.	INTERNAL LAYUP		EXTERNAL LAYUP
	1	4	LIFTING LUGS – #304 STAINLESS STEEL		3/8"x28"x18"		
1	2	7	HOLD DOWN LUGS – #304 STAINLESS STEEL				
	3	1	2"ø FRP FLANGED & GUSSETED NOZZLE – FILL		1.322"x7x7"		1.322"x7x7"
		1	2"ø INTERNAL DOWNPIPE – FIBERCAST DL2030 – APPROX. 271" LONG				
		--	DELETED				
		--	DELETED				
		--	DELETED				
	4	6	INTERNAL PIPE SUPPORT BRACKETS – 6" x 6" x 10" LONG		3/16x3x3 EA SIDE		
1	5	3	#304 S.S. PLATE BRACKETS – 6"x6"x1/4" – OVERFLOW PIPE SUPPORTS		1.457"x14"x15"		
	6	1	2"ø FRP FLANGED & GUSSETED NOZZLE w/SIPHON EXT. – OUTLET		1.472"x7x7"		1.322"x7x7"
	7	1	1 1/2"ø FRP FLANGED & GUSSETED NOZZLE – RETURN		1.372"x7x7"		1.322"x7x7"
1		1	1 1/2"ø FRP 90 DEGREE ELBOW				1.322"x7x7"
	8	1	24"ø FRP MANWAY SIDE, BOLTED COVER ASSEMBLY 1 1/4" TH. FLG., 5/16" HUB		1.322"x7x22"		1.322"x7x7"
		1	GASKET 1/8" THICK EPDM FULL FACED				
		1	COVER FRP DOMED 32" O.D. 1 1/4" TH. FLG. & 5/16" DOME w/(2) HANDLES, APPROX. 35#				
		20	5/8"-11 S.S.N.H. BOLTS, NUTS & (2) WASHERS				
	9	1	24"ø FRP MANWAY TOP, BOLTED COVER ASSEMBLY 3/8" THICK FLANGE		1.372"x7x7"		1.322"x7x7"
		1	GASKET 1/8" THICK EPDM FULL FACED				
		1	COVER FRP DOMED 32" O.D. 3/8" THICK FLANGE, w/(2) HANDLES, APPROX. 35#				
		20	3/8"-11 S.S.N.H. BOLTS, NUTS & (2) WASHERS				
	10	1	1"ø FRP FLANGED & GUSSETED NOZZLE – THERMOWELL		1.372"x7x7"		1.322"x7x7"
	11	1	2"ø FRP FLANGED & GUSSETED NOZZLE – LEVEL		1.472"x7x7"		1.322"x7x7"
	12	1	6"ø FRP FLANGED & GUSSETED NOZZLE – VENT		1.322"x7x7"		1.322"x7x7"
		1	GASKET 1/8" THICK EPDM FULL FACED				
		8	7/8"-9 S.S. H.H. BOLTS, NUTS & (2) WASHERS				
		1	6"ø FRP FLANGED GOOSENECK VENT w/S.S. SCREEN 2x2 MESH w/FLEX OPEN AREA				
	13	1	3"ø FRP FLANGED & GUSSETED NOZZLE – OVERFLOW		1.322"x7x7"		1.322"x7x7"
	14	--					
	15	1	ALUMINUM LADDER/CAGE/LANDING PLATFORM ASSY.				
		27	#304 STAINLESS STEEL STUD PLATES				
	16	12	HEAT PADS HTF-2380-60 (600 WATT, 480 VOLT)				
	17	1	CONTROL BOX (NEMA IV) – 20" x 24" x 8"				
1		1	FRP CONTROL BOX BRACKET – 24" x 20" x 2 1/2"				0.27"x7x7"
	18	--					
	19	1	ALUMINUM HANDRAIL ASSY. – (2) RAILS, TOEBOARD & SAFETY GATE				
		8	#304 STAINLESS STEEL STUD PLATES				
1	20	6	#304 S.S. PLATE BRACKETS – 6"x6"x1/4" – OVERFLOW PIPE SUPPORTS		1.322"x14"x22"		
1	21	1	2"ø FRP FLANGED & GUSSETED NOZZLE – DRAIN		1.472"x7x7"		1.322"x7x7"

1 MAX. SEISMIC OVERTURN MOMENT: 640,193.22 IN. LBS.
MAX. SEISMIC BASE SHEAR: 3,527.59 LBS.
MAX. WIND OVERTURN MOMENT: 3,562,980.80 IN. LBS.
MAX. WIND BASE SHEAR: 19,007.86 LBS.

MATERIAL & GENERAL NOTES

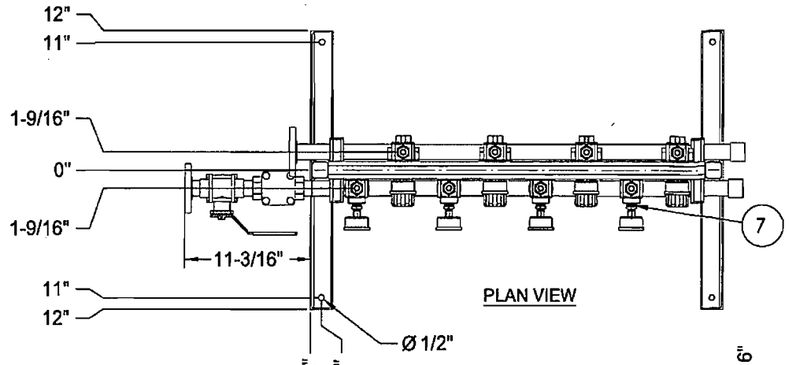
-RESIN: VE8300 VINYL ESTER RESIN THROUGHOUT – MEKP CURE
-VEIL: NEXUS VEIL FILAMENT WIND 78° (90° = HOOP)
-EXTERIOR FINISH: WHITE GEL COAT w/U.V. INHIBITOR.
-VESSEL DESIGNED FOR A SPECIFIC GRAVITY OF 1.136, OUTDOORS & 0 PSF SNOW LOAD.
-SEISMIC LOADS ARE PER 2006 IBC WHERE Sa=0.076, S1=0.029, I=1.25 AND SITE CLASS B.
-WIND LOADS ARE PER 2006 IBC WITH 140 MPH WIND LOAD, EXPOSURE C AND Iw=1.15.
-VESSEL DESIGNED FOR ATMOSPHERIC PRESSURE AT AMBIENT TEMPERATURE.
-VESSEL DESIGNED IN ACCORDANCE WITH ASTM D 3299 WHERE APPLICABLE. ITEMS NOT ADDRESSED BY ASTM D 3299 ARE DESIGNED IN ACCORDANCE WITH GPI STANDARDS OR OUR SUPPLIERS STANDARDS.
-CONTENTS: 50% UREA @ 1.136 SPECIFIC GRAVITY .
-NOMINAL CAPACITY: 25,000 GALLONS (NOMINAL).
-TANK WEIGHT EMPTY: 10,000lbs. (approx.) – LESS LADDER, CAGE & HANDRAIL
-ALL HARDWARE TO BE 18-8 S.S. UNLESS SPECIFIED OTHERWISE.
-TRUE ORIENTATION SHOWN IN PLAN VIEW ONLY FOR CLARITY.
-SEE GPI HANDLING & INSTALLATION INSTRUCTIONS & GENERAL OPERATING INSTRUCTIONS.
-ALL CUT EDGES MUST BE SEALED WITH RESIN SO NO GLASS FIBERS ARE EXPOSED & ALL VOIDS ARE FILLED.
-ALL STANDARD NOZZLES HAVE A 150# BOLT PATTERN PER ANSI B16.5, 50 PSI RATING, WITH HOLES STRADDLING THE CENTER LINES.
-ALL STANDARD FLANGED FITTINGS ARE TO EXTEND 4" FROM FLANGE FACE TO CLOSEST POINT ON TANK UNLESS SPECIFIED OTHERWISE.
1 -SHIPPING ORIENTATION: HORIZONTAL 307 1/2° DOWN.
-HEAT TRACING DESIGNED TO MAINTAIN CONTENTS AT 100° F. WITH A MINIMUM AMBIENT TEMPERATURE OF 10° F.

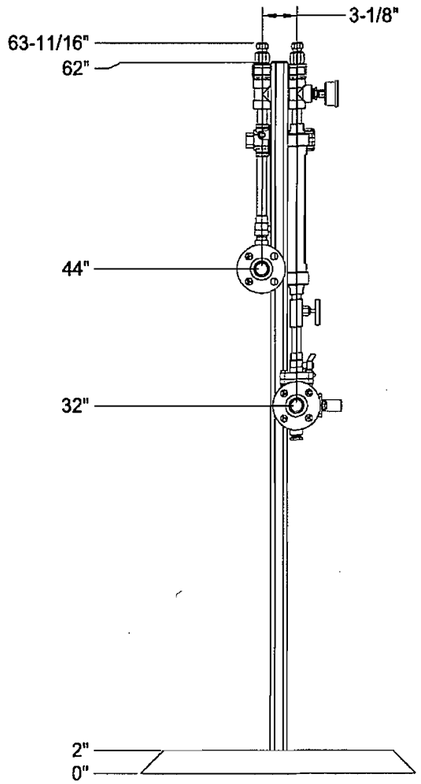
REV.	DESCRIPTION	BY	DATE
2	REVISED ELEVATION OF TANK HEATER ELEMENTS	JAD	11/18/09
1	REVISED PER CUSTOMER COMMENTS	JAD	10/21/09
0	ISSUED FOR FABRICATION	JND	09/09/09
A	ISSUED FOR INFORMATION AND APPROVAL PURPOSES	JND	07/20/09

COMBUSTION COMPONENTS ASSOCIATES, INC.
884 MAIN STREET, MONROE CT, 06468
TEL: (203) 268-3139 FAX: (203) 261-7697

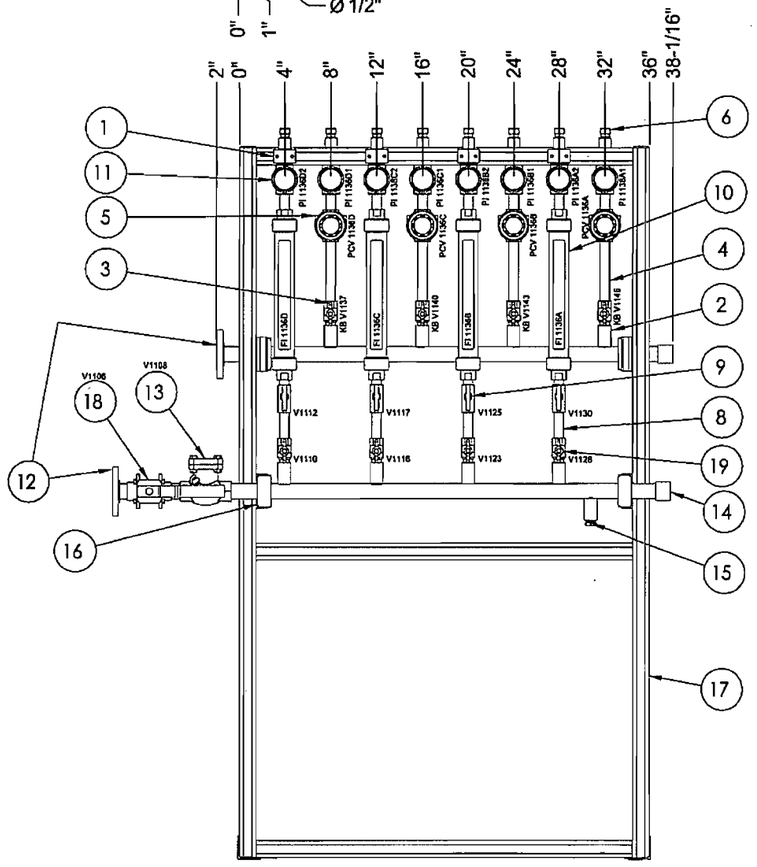
TITLE: GENERAL ARRANGEMENT UREA STORAGE TANK UNIT No 1 & 2

DRAWN BY	DATE	SCALE	DWG NO.	REV.
.	.	.	SWAPB_0901_090	2
APP'D BY	DATE	CUSTOMER		
.	.	Solid Waste Authority of Palm Beach		D

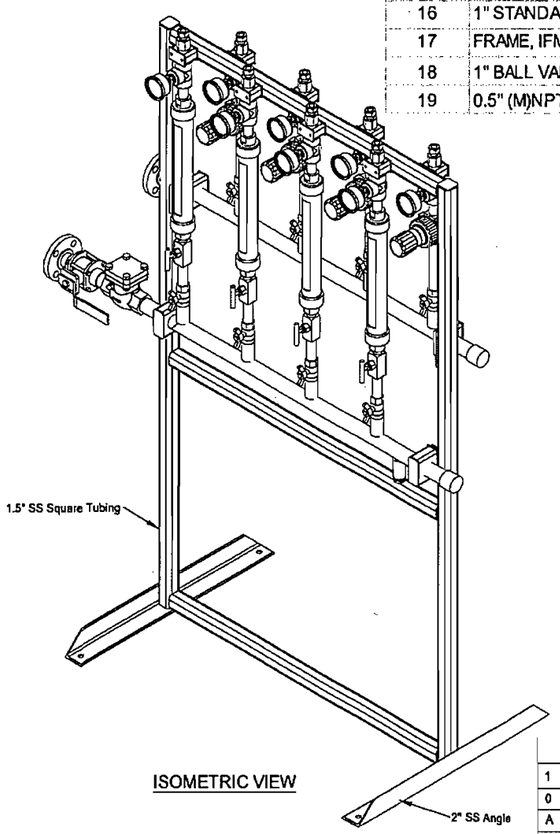




SIDE VIEW



FRONT VIEW



ISOMETRIC VIEW

ITEM NO.	DESCRIPTION	QTY
1	0.5" STANDARD PIPE CLAMP	8
2	0.5" FULL COUPLING, 3000#, 304SS	9
3	0.5" (M)NPT x 0.5" (F)NPT BALL VALVE, BRASS	4
4	0.5" x 6" LENGTH PIPE NIPPLE, 304SS SCH 40	4
5	0.5" COMPACT REGULATOR, (F)NPT	4
6	0.5" (F)NPT x 0.5" TUBE CONNECTION ADAPTER	8
7	0.5" TEE, NPT, 3000#, 304SS	8
8	0.5" x 3" LENGTH PIPE NIPPLE, 304SS SCH 40	4
9	0.5" SS NEEDLE VALVE, (F)NPT	4
10	0.5" SS KOBOLD ROTOMETER	4
11	PRESSURE GAUGE, 2.5" DIAL, 1/4" NPT BACK MOUNT	8
12	1" 150# RFSO FLANGE, 150#, 304SS	2
13	1" ALOYCO SWING CHECK VALVE, SW, 304SS	1
14	1" (F)NPT PIPE CAP, 304SS	2
15	0.5" (M)NPT PIPE PLUG, 150#, 304SS	1
16	1" STANDARD PIPE CLAMP	4
17	FRAME, IFM-4, SEE DRAWING # IFP-4	-
18	1" BALL VALVE, SW, SS, 3-PC	1
19	0.5" (M)NPT x 0.5" (F)NPT BALL VALVE, SS	4

JV-D-1136

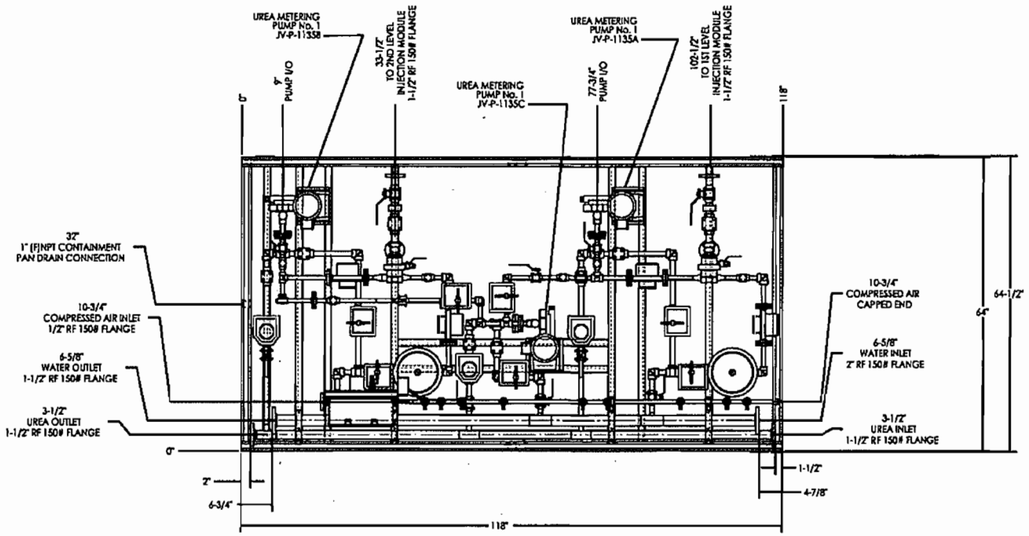
NOTES:
1.) ALL DIMENSIONS ARE SHOWN IN INCHES.
2.) HEADERS ARE 1" FEEDING 0.5" PIPE LINES.
3.) ALL WELDS TO BE PER ASME 31.3

REV.	DESCRIPTION	BY	DATE
1	REVISED AS BUILT	BDJ	12/09/09
0	ISSUED FOR FABRICATION	BDJ	08/13/09
A	ISSUED FOR INFORMATION AND APPROVAL PURPOSES	JND	07/20/09

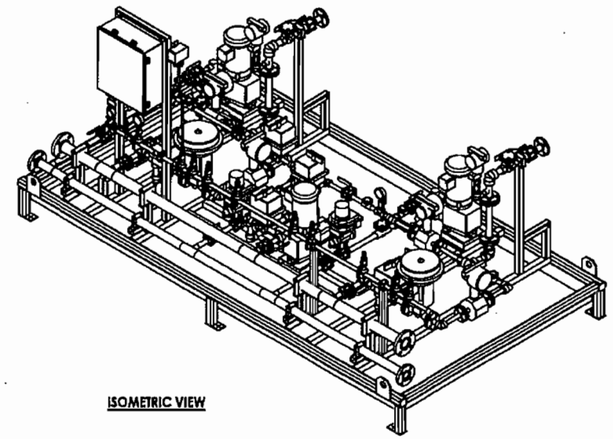
COMBUSTION COMPONENTS ASSOCIATES, INC.
864 MAIN STREET, MONROE CT, 06468
TEL: (203) 268-3139 FAX: (203) 261-7697

TITLE: DISTRIBUTION MODULE
GENERAL ARRANGEMENT
LOWER LEVEL UNIT No 1

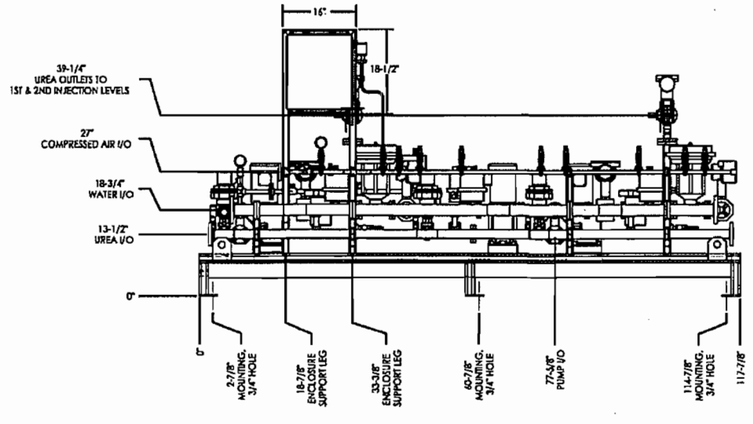
DRAWN BY	DATE	SCALE	DWG NO.	REV.
MDM	07/16/09	DNS	SWAPB 0901 034	1
APPVD BY	DATE	CUSTOMER		
XXX	XX/XX/XX	Solid Wasle Authority of Palm Beach		D



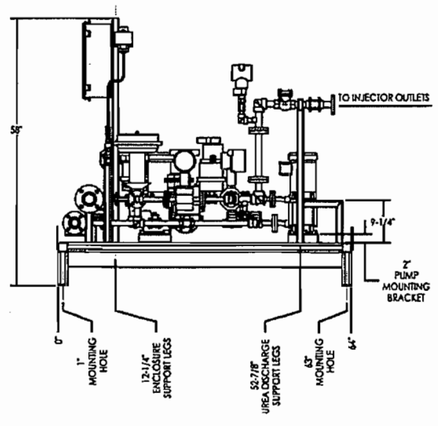
TOP VIEW



ISOMETRIC VIEW



FRONT VIEW



RIGHT SIDE VIEW

BOILER # 1
UREA METERING MODULE
JV-Z-1135

NOTES:

1. ALL DIMENSIONS ARE IN INCHES.
2. UNIT WILL BE SHIPPED ASSEMBLED AS SHOWN ON THESE DRAWINGS
3. OPEN FLANGE AND VALVE ENDS TO BE COVERED WITH PLASTIC CAPS PRIOR TO SHIPPING.
4. PLUGS TO BE INSTALLED IN ALL DRAIN VALVES PRIOR TO SHIPPING.
5. TEMPORARY BRACING MAY BE INSTALLED BY FABRICATOR FOR SHIPPING.
6. MATERIAL OF CONSTRUCTION: 304 STAINLESS STEEL

REV	DESCRIPTION	BY	DATE
1	REVISED AS BUILT	RJJ	12/09/09
0	ISSUED FOR CONSTRUCTION	RJJ	06/11/09
A	ISSUED FOR INFORMATION AND APPROVAL PURPOSES	JVD	01/20/09

AS PER MECHANICAL DATA - INDICATED WHEN IS NOT TO BE USED FOR MANUFACTURE REQUIREMENT OF DISCLOSURE TO OTHERS FOR ANY PURPOSE WHICH IS NOT IN WRITING FROM USER OF COMBUSTION COMPONENTS ASSOCIATES, INC.

COMBUSTION COMPONENTS ASSOCIATES, INC.
884 MAIN STREET, MONROE CT, 06468
PH: (203) 268-3130 FAX: (203) 261-7607

TITLE: GENERAL ARRANGEVENT
UREA METERING MODULE
UNIT NO. 1

DRAWN BY	DATE	SCALE	DWG NO	REV
KGS	07/14/2009	1:12	SWAPB 0901 030	1
CHECKED BY	DATE	SYSTEM #		
XXX	XX/XX/XXXX		Solid Waste Authority of Palm Beach	D