Modifications, Interfaces, and Tie-Ins to Existing Equipment and Systems

Common Modifications, Interfaces, and Tie-Ins

41.0804.1.BC01 - Grounding
41.0804.1.BC02 - Site Fire Protection
41.0804.1.BC03 - Site
41.0804.1.BC04 - Unit 1&2 AQCS Power Supply

Unit 1 Modifications, Interfaces, and Tie-Ins

41.0804.1.B101 - AQCS Power Supply
41.0804.1.B102 - Communication
41.0804.1.B103 - Control and Monitoring
41.0804.1.B104 - Buildings and Enclosures
41.0804.1.B105 - Ductwork
41.0804.1.B106 - Fly Ash
41.0804.1.B107 - Induced Draft
41.0804.1.B108 - AQCS Compressed Air
41.0804.1.B109 - Service Water
41.0804.1.B110 - Ammonia Supply
41.0804.1.B111 - Air Preheat
41.0804.1.B112 - Combustion Air

Unit 2 Modifications, Interfaces, and Tie-Ins

41.0804.1.B201 - AQCS Power Supply
41.0804.1.B202 - Communication
41.0804.1.B203 - Control and Monitoring
41.0804.1.B204 - Buildings and Enclosures
41.0804.1.B205 - Ductwork
41.0804.1.B206 - Fly Ash
41.0804.1.B207 - Induced Draft
41.0804.1.B208 - AQCS Compressed Air
41.0804.1.B209 - Service Water
41.0804.1.B210 - Ammonia Supply
41.0804.1.B211 - Air Preheat
41.0804.1.B212 - Combustion Air

Unit 3 Modifications, Interfaces, and Tie-Ins

41.0804.1.B301 - AQCS Power Supply
41.0804.1.B302 - Communication
41.0804.1.B303 - Control and Monitoring
41.0804.1.B304 - Buildings and Enclosures
41.0804.1.B305 - Ductwork

Modifications, Interfaces, and Tie-Ins Description
Common
Grounding

1.0 Introduction

The purpose of this description is to describe the conceptual interface between the Brown Grounding System and the new Air Quality Control System (AQCS) Grounding System; actual interface shall be determined during detailed design.

2.0 Description

2.1 Description of Existing Infrastructure

Existing infrastructure consists of a grounding grid for the plant.

2.2 Description of New Infrastructure

The Grounding System for AQCS facilities shall provide adequate paths to permit the dissipation of ground fault currents and lightning and switching surges.

3.0 Interface

The ground grid for AQCS facilities shall be connected to the existing plant ground grid through multiple parallel paths.

4.0 Terminal Point List

The Grounding System will have the following terminal points:

- Grounding of the existing 13.2 kV FGD switchgear shall be extended along with the power conductors to Common Unit 1 & Unit 2 Switchgear A & B.
- Grounding of the existing 13.2 kV FGD switchgear shall be extended along with the power conductors to Unit 3, 4.16 kV Switchgear A & B transformers, and the Unit 3, 480V SUS transformers A & B..
- The Common Unit 1 & Unit 2 Main Auxiliary Transformer shall have a ground ring and ground rods that shall be tied into the existing ground grid in a minimum of two places.

Modifications, Interfaces, and Tie-Ins Description
Common
Site Fire Protection

1.0 Introduction

The purpose of this description is to describe the conceptual interface between the existing E.W. Brown Fire Protection System and the new Air Quality Control System (AQCS) Fire Protection System. Actual interface shall be determined during detailed design.

2.0 Description

2.1 Description of Existing Infrastructure

The existing Site Fire Protection System is supplied by a 580,000 gallon (364,000 gallon fire water) quench/fire water tank that is filled by the service water system. The service water system draws its water from the nearby Herrington Lake using a common intake structure for Units 1&2 and another intake structure for Unit 3. The quench/fire water system includes two 3,000 gpm fire pumps along with one jockey pump that serves as fire water distribution. Service water also acts as an additional/backup source of fire protection.

2.2 Description of New Infrastructure

The AQCS Fire Protection System will be tied to the existing Fire Protection System. One 100,000 gallon firewater tank will be added north of the emergency quench/fire water tank for fire protection for the new AQCS infrastructure. Sprinkler systems will be supplied for all three pulse jet fabric filters. For additional details on the new equipment, refer to the Site Fire Protection System Description (168908.41.0804.3.BC02).

3.0 Interface

New fire hydrants will be tied in to the existing underground main to the south of the units. The new firewater tank will have an individual line that will tie-in to the existing fire pumps suction header. The tank will also be tied to the existing service water system to be used for initial fill and makeup for the firewater tank.

4.0 Terminal Point List

The Fire Protection System will have the following terminal points:

- New hydrants will be tied-in to the existing underground main near the new AQCS equipment.
- The new firewater tank will be tied-in to the existing fire pump suction header.
- The new firewater tank will be tied-in to the existing service water system for initial fill and makeup.
- An additional tie-in from The existing fire pump discharge header to the underground loop.

Modifications, Interfaces, and Tie-Ins Description
Common
Site

1.0 Introduction

The purpose of this description is to describe the conceptual interface between the existing E. W. Brown Station roads, grading, and drainage and the new Air Quality Control System (AQCS) additions. Actual interface will be determined during detailed design.

2.0 Description

2.1 Description of Existing Infrastructure

Few of the existing main plant roads are expected to be directly impacted by the AQCS modifications at Units 1, 2, and 3, although at least one secondary road will be affected east of Unit 1. The existing main roads and main parking lot areas are asphalt paved, with secondary roads and general work areas gravel surfaced.

The existing plant grading will not be impacted to any significant extent. The Unit 3 PJFF foundation must take into account the locally raised grade near the existing WFGD. A short retaining wall may be required to accommodate the difference in grade between the PJFF foundation and the WFGD foundation. All other impacts to existing grade resulting from the new AQCS additions are expected to be immediately local to new structures and minor in nature.

The existing plant drainage will not be impacted to any significant degree except locally in the immediate areas of new structures. Overall storm management and runoff flow directions and characteristics are expected to be changed only minimally.

2.2 Description of New Infrastructure

The existing plant entrance road along the coal delivery rail spur will remain the primary means of accessing new AQCS installations. If temporarily impacted by construction at Unit 3 the road will be re-established in its current location once construction is complete.

A secondary road between the parking lot north of Unit 1 and the east side of the Unit 1 cooling tower will be interrupted by the new Unit 1 and Unit 2 construction. However, this road will be re-established and incorporated into the Unit 2 ID fan maintenance road upon completion of construction. Access to the Unit 1 cooling tower from the south will be maintained. Supports carrying the ductwork from Unit 3 air heater to the Unit 3 PJFF will be designed to span the road west of Unit 3 and maintain access through that area.

AQCS additions at Units 1 and 2 will significantly reduce the area available for parking northeast of Unit 1. In addition, truck access for PAC and sorbent to Units 1 and 2 will require substantial lanes for access and unloading in the same area. It is estimated that the remaining asphalt-surfaced parking area north of Unit 1 could be reconfigured to provide approximately 60 to 70 parking spaces and still maintain necessary access. It is likely that additional parking spaces will be required to support outages or other periods of significant temporary traffic. It is expected that additional parking, if it is required, could be accommodated in the area north of the common WFGD or other areas northwest of the WFGD. The amount of additional parking areas will be determined during detailed design and permanent new parking considered to take advantage of temporary parking established to support the AQCS modification work.

Driveways from the main roads to access new AQCS structures and buildings will be established upon completion of construction. Turnouts and truck unloading lanes will be added to the existing roads adjacent to new bulk material storage silos to minimize impact on road traffic during deliveries and unloading.

In general new roads will be asphalt paved to match existing roads, although gravel surfacing may be allowed in low or infrequent traffic areas.

Existing storm drain inlets and piping may be relocated due to new installations, but their function and service areas are intended to remain generally unaffected. New culverts will be installed under new roads and driveways to maintain existing surface flow paths. The addition of new impervious surfaces such as roofs will impact runoff quantities in the immediate area of new construction but are not expected to be of a magnitude to impact the overall existing site drainage system. Local additions to existing storm drainage piping may be required as determined during detailed design, but drainage in the areas impacted by new construction are expected for the most part to be negligibly changed.

To the extent practical, interconnecting underground mains and utilities will be left undisturbed, with relocation only as required. If relocated, the function and service of the existing wastewater system component will not be changed.

3.0 Interface

The interface will take place primarily between the existing roads/parking lot as modified or augmented to match new construction and existing intersecting roads. Grading and drainage interfaces will in general be in those same locations along the road and in the parking lot.

4.0 Terminal Point List

The Site System will have the following terminal points:

- Existing storm drainage inlets (locations to be determined during detailed design)
- Existing and new road intersections (locations to be determined during detailed design)

Modifications, Interfaces, and Tie-Ins Description
Common Unit 1 and 2
AQCS Power Supply System

1.0 Introduction

The purpose of this description is to describe the conceptual interface between the Brown Plant Power Supply System and the new Air Quality Control System (AQCS) Power Supply System; actual interface shall be determined during detailed design.

2.0 Description

2.1 Description of Existing Infrastructure

The existing 13.2 kV FGD Medium Voltage System will supply reserve power to the Common Unit 1 & 2 Common 13.2 kV Switchgear A & B.

There will be a 25kV feed to the primary of the Common Unit 1 & 2 AQC Main Auxiliary transformer. The existing Unit 3 Isolated Phase Bus Duct (IPB) will be tapped to provide the interface from the generator to the auxiliary transformer.

2.2 Description of New Infrastructure

The new AQCS AC power supply system shall consist of the following equipment:

- 13.2 kV Switchgear,
- 4.16 kV Switchgear.
- Common Unit 1 & 2 Main Auxiliary Transformer.
- 4.16 kV transformers,
- 480 volt transformers,
- LV switchgear, and motor control centers; and
- DC and Uninterruptible Power Supply (UPS) systems to provide DC power to switchgear and UPS power to the Distributed Control System (DCS).

Cable bus will provide the connections from the main auxiliary transformer to the switchgear, and from the existing 13.2 kV FGD switchgear to the new 13.2 kV switchgear. Cable connections will connect all other electrical loads.

3.0 Interface

A new IPB tap will have to be installed. The tap for the Common Unit 1 & 2 Main Aux Transformer will be made at the Unit 3 generator IPB. This IPB tap will terminate at the Main Auxiliary Transformer.

4.0 Terminal Point List

The AQCS Power Supply System will have the following terminal points:

- 25kV IPB tap at the existing Unit 3 generator IPB to furnish power to the primary side of the Common Unit 1 & 2 Main Auxiliary Transformer.
- 15 kV cable bus from the existing 13.2 kV FGD switchgear to furnish reserve power to the new Common Unit 1 & 2, 13.2 kV switchgear.

Modifications, Interfaces, and Tie-Ins Description
Unit 1
AQCS Power Supply System

1.0 Introduction

The purpose of this description is to describe the conceptual interface between the Brown Plant Power Supply System and the new Air Quality Control System (AQCS) Power Supply System; actual interface shall be determined during detailed design.

2.0 Description

2.1 Description of Existing Infrastructure

The Existing Unit 1 2,400 V systems consists of the following major components:

One two-winding delta primary, delta secondary 10 MVA Main Auxiliary Transformer. The high voltage rating is 13.2 kV and the low voltage rating is 2.4 kV. The low side of the transformer supplies power to Unit 1 switchgear bus 1A & 1B.

Reserve power is supplied to switchgear bus 1A & 1B by a two-winding 10MVA, 138 kV to 2.4 kV Reserve Auxiliary Transformer .

The de-commissioning of the Unit 2 ID Fan Motors:

The existing Unit 2 ID fan motors will be de-commissioned. One of the Unit 2 ID fan motors will be used to drive a new Unit 1 FD fan. The Unit 2 ID fan motor is a two speed motor. The Unit 2 ID fan motor and speed control equipment will be relocated so that it can drive the new Unit 1 FD fan.

The power source for the new Unit 1 FD fan motor will be the existing Unit 1, 2.4 kV switchgear. The Unit 1 ID fan fed from Unit 1, section 1A11 has been decommissioned. The Unit 1 ID fan motor was rated 900 hp. The new FD fan is rated 2500/800 hp. It is expected that the under normal operating conditions the fan motor will deliver 700 hp to the new FD fan shaft. It expected, but will need to be confirmed during detailed design, that the existing Unit 1, 2.4 kV switchgear feeder breaker is section 1A11 will need minimum modification.

2.2 Description of New Infrastructure

The new AQCS AC power supply system shall consist of the following equipment:

- 5 kV cable and 600V ground cable from Unit 1 existing switchgear to the new Unit 1 FD fan.

3.0 Terminal Point List

The AQCS Power Supply System will have the following terminal points:

- 5 kV cable connection from between existing 2400V switchgear to new FD fan motor.

Modifications, Interfaces, and Tie-Ins Description
Unit 1
Communication

1.0 Introduction

The purpose of this description is to describe the conceptual interface between the Brown Plant Communication systems and the new Air Quality Control System (AQCS) Communication Systems; detailed interface shall be determined during detailed design.

2.0 Description

2.1 Description of Existing Infrastructure

The existing public address system is a multi-channel Gai-Tronics system.

2.2 Description of New Infrastructure

The Communication System shall include a page/party public address system compatible with Gai-Tronics equipment.

3.0 Interface

The AQCS page party system shall connect to the existing Gai-Tronics system equipment.

4.0 Terminal Point List

The Communication System will have the following terminal points:

- Interface of new system to existing.
- 120VAC power.

Modifications, Interfaces, and Tie-Ins Description
Unit 1
Control and Monitoring

1.0 Introduction

The purpose of this description is to describe the conceptual interface between the Brown Plant Control and Monitoring System and the new Air Quality Control System (AQCS) Control and Monitoring; actual interface shall be determined during detailed design.

2.0 Description

2.1 Description of Existing Infrastructure

The existing DCS is a Foxboro I/A Series system.

2.2 Description of New Infrastructure

The AQCS DCS shall provide a means to manually and automatically control AQCS plant components individually and as a coordinated plant system. The system will be an extension of the existing system.

3.0 Interface

The new redundant processors and associated I/O modules will be connected to the existing FGD mesh network.

4.0 Terminal Point List

The AQCS Control and Monitoring System will have the following terminal points:

- Existing Unit 1 Distributed Control System (DCS)
- Existing Unit 1 DCS Operating Work Stations
- AQCS Main 120 VAC UPS panel board
- AQCS General 208/120 VAC panel board
- AQCS Grounding System
- AQCS Equipment
- AQCS Auxiliary Electrical System

Modifications, Interfaces, and Tie-Ins Description
Unit 1
Buildings and Enclosures

1.0 Introduction

The purpose of this description is to describe the conceptual interface between the Brown Plant Buildings and the new Air Quality Control System (AQCS) Buildings and Enclosures. Actual interface will be determined during detailed design. The modifications proposed for Unit1 and Unit 2 are to a great extent common to both, at least insofar as buildings and enclosures. To avoid duplicate documents, this description will cover the modifications, interfaces, and tie-ins for both Unit 1 and Unit 2 buildings and enclosures.

2.0 Description

2.1 Description of Existing Infrastructure

Numerous buildings used for various purposes exist as part of the Unit 1 and Unit 2 facilities, including a common powerhouse structure. The buildings, in general, are composed of both "stick-built" (individually-designed-and-constructed specialty structures) and pre-engineered metal buildings. The buildings consist of a metal panel exterior on a steel frame supported by a concrete foundation. Details, arrangement, and degree of finish depend on the building's intended function, but all structures protect and provide the necessary environmental control for the functions they enclose.

2.2 Description of New Infrastructure

The miscellaneous buildings and structures for the Unit 1 and Unit 2 AQCS modifications will be designed similarly to those existing and will reflect the function and arrangement of the systems they enclose or support. Disregarding the "non-building" equipment which simply require foundations, the new buildings and structures proposed for Unit 1 and Unit 2 are identified as follows:

- Unit 1 and Unit 2 SCR Support Structures
- Common Unit 1/Unit 2 AQCS Electrical Building
- Common Unit 1/Unit 2 Fly Ash Handling Building.

Pre-engineered metal buildings, because of their lower capital cost and versatility, are proposed for both the Electrical and Ash Handling Buildings. These buildings will consist of a fabricated steel frame of a "standard" size and arrangement enclosed by metal panel wall and roof systems. Each building will be insulated, include utilities but no plumbing, have an unfinished interior, and include only heating and ventilation, except where air conditioning is required by the system(s) enclosed.

The two SCR Support Structures are not buildings per se and are required primarily as a support for the FD fan, air heater and SCR Module at each unit. As such both are very specialized structures and must be designed and constructed as stick-built installations. The SCR Support Structure will allow the new SCR, air heater, and FD fan to be "stacked" in a way to minimize equipment interconnection length as well as footprint. The structures will consist of a structural steel superstructure with elevated slab or grating floors under the supported equipment. The superstructure will likely be enclosed with metal panel for weather protection of the enclosed equipment as well as more hospitable conditions for maintenance activities. The enclosed areas will be provided with lighting and ventilation, and possibly heating if equipment requirements so warrant. For purposes of the estimate, two separate structures are assumed, one for Unit 1 and one for Unit 2. Noting the adjacent locations and the closely-aligned construction schedule, consideration should be given at time of detailed design to combining the two structures into one, both as a potential cost savings and for the increased stability an interconnected structure would provide.

All new buildings will be supported on cast-in-place concrete foundations. For purposes of the estimate, these foundations are assumed to be supported on drilled piers. At time of detailed design, consideration should be given to designing shallow footings for the two common pre-engineered buildings to simplify construction. The locations of the new structures are expected to be relatively uncongested and reasonably accessible, making either type of foundation more or less practical if loading allows.

None of the new structures at Unit 1/Unit 2 is expected to be continuously manned. That, together with the close proximity of existing facilities, allows plumbing and sanitary utilities, interior finishes, and interior space conditioning for personnel comfort to be eliminated. However, the structures will be provided with appropriate personnel, vehicle, and equipment maintenance access, and a Life Safety review of egress will be completed for each structure.

3.0 Interface

The SCR Support Structures, Common Unit 1/Unit 2 AQCS Electrical Building, and Common Unit 1/Unit 2 Fly Ash Handling Building will be physically and functionally separate from, with little or no intended interface to, existing structures. Methods of construction for these buildings, especially installation of the new foundations, will be evaluated to minimize any impact of the new structure on those existing, such as the adjacent coal conveyors. Depending on the service required, the new structures may receive drainage, power, or other services from existing site systems and will interface with those systems accordingly.

4.0 Terminal Point List

Specific terminal points for each of the new Unit 1 and Unit 2 buildings and structures will be identified during detailed design.

Modifications, Interfaces, and Tie-Ins Description
Unit 1
Ductwork

1.0 Introduction

The purpose of this description is to describe the conceptual interface between the existing E. W. Brown Plant Flue Gas Exhaust System and the new Air Quality Control System (AQCS) Ductwork System. The actual interface will be determined during detailed design.

2.0 Description

2.1 Description of Existing Infrastructure

The existing combustion air and flue gas exhaust system at the Unit 1 boiler is relatively complex and oriented such that incorporating the existing air heater into the modified AQCS system is extremely difficult. Accordingly, a new FD fan and air heater is intended to be installed at Unit 1 and the existing air heater and FD fan bypassed. Existing ductwork at Unit 1 must be modified and augmented accordingly.

2.2 Description of New Infrastructure

The remote air heater, air preheat coil, and FD fan at Unit 1 require that significant new duct be installed between this new equipment and the existing combustion air plenum at the boiler. Additional new ductwork is required downstream of the existing economizer to the SCR module, through the new PJFF, and then to the inlet of the existing ID fan, which will be reused in place. Ductwork downstream of the existing Unit 1 ID fan will be unchanged with the exception of a bypass installed to allow Unit 1 exhaust to be diverted to the old Unit 3 chimney in case of WFGD outage.

The scope of Phase II work begins at the outlet of a new FD fan located at the base of the Unit 1 SCR support structure. Duct is routed through the new air preheat coil and cold side of the new Unit 1 air heater and then along the north side of the existing Unit 1/Unit 2 powerhouse to a connection cut into existing combustion air plenum inside the powerhouse. Return exhaust duct is routed from a connection cut into the existing ductwork downstream of the Unit 1 economizer to the remainder of the new ACQS train, including the SCR and PJFF. New duct is then routed from the PJFF outlet and cut into the existing ductwork above Unit 1 ID fan. The existing exhaust ductwork downstream of the ID fan to the common wet FGD inlet remains unchanged, except for a crosstie installed between Unit 1 and Unit 2 exhaust ductwork. Dampers will be installed in the Unit 1 and Unit 2 ductwork, as well as the crosstie, to allow treated exhaust gas from either Unit 1 or Unit 2 to be directed to the Unit 3 chimney if the WFGD is inoperative. Ductwork to and from the Unit 1 boiler will be “stacked” with similar ductwork serving Unit 2 to make best use of available space immediately north of the existing building.

Partial or complete demolition of existing structures along the north side of the building will be required to install the stacked ductwork. Support for the stacked ductwork will be integrated into a single steel structure supported by new foundations at grade. New ductwork will be provided with expansion joints to maintain gas tight structural support throughout the equipment operating system flow and temperature range.

Additional ductwork will also be added to allow partial bypass of the economizer. This will be a smaller series of ducts, including controlling dampers, connecting the duct upstream and downstream of the existing Unit 1 economizer. This ductwork is expected to be located completely within the limits of the existing building and final routing will be determined at time of detailed design.

3.0 Interface

Five major interfaces between new and existing ductwork will be required by the Phase II AQCS modifications.

- Combustion air supply ductwork will connect to the combustion air plenum below the existing air heater elevation within the powerhouse building. The north side of the plenum will be removed and two separate branches of the air supply duct will be routed to the remaining plenum either side of the boiler.
- New exhaust ductwork will be connected to existing duct downstream of the existing economizer and routed through the center area vacated by removal of the north side of the plenum. The new duct will penetrate the north wall of the powerhouse building and be routed to the new SCR.
- Treated exhaust gas leaving the PJFF will be routed through new ductwork to the existing ductwork above the inlet to the existing Unit 1 ID fan. The new ductwork will mate either to portion of the existing ductwork or be routed directly to the fan inlet, as determined during detailed design.
- A short crosstie duct will be installed between the existing Unit 1 ductwork downstream of the ID fan and new exhaust ductwork at Unit 2. Isolation dampers will be installed in existing and new ductwork to allow exhaust gas from either Unit 1 or Unit 2 to be discharged directly to the old Unit 3 chimney via existing ductwork downstream of Unit 2.
- Economizer bypass duct will connect upstream and downstream of the existing Unit 1 economizer, allowing partial and controlled bypass of the economizer.

All new ductwork will be supported as required to allow for expansion and contraction. Independent duct supports will be used at new duct routed near the new SCR and PJFF. Multiple-duct supports will be provided for the new duct just north of the powerhouse. Ductwork will be of carbon steel construction and unlined, since temperatures and conditions upstream of the wet scrubber will not require corrosion-resistant liners. Expansion joints, slide plates, and anchor points will be provided where required to ensure gastight operation under all operating temperatures without inducing unacceptable stresses into the interfacing equipment.

4.0 Terminal Point List

The new Unit 1 Ductwork terminal points list is summarized as follows, pending final confirmation at time of detailed design:

- FD fan outlet (one required)
- Air preheat coil inlet (one required)
- Air preheat coil outlet (one required)
- Air heater air side inlet (one required)
- Air heater air side outlet (one required)
- Combustion air plenum (two required)
- Economizer outlet (two required)
- SCR inlet (one required)
- SCR outlet (one required)
- Air heater gas side inlet (one required)
- Air heater gas side outlet (one required)
- PJFF inlet (one required)
- PJFF outlet (one required)
- Existing ID fan inlet (one required)
- Crosstie to Unit 2 ductwork (one required)
- Economizer bypass (upstream and downstream of economizer, number to be confirmed during detailed design).

Modifications, Interfaces, and Tie-Ins Description
Unit 1
Fly Ash

1.0 Introduction

The purpose of this description is to describe the conceptual interface between the Brown Ash Systems and the new Air Quality Control System (AQCS) Fly Ash System. Actual interfaces will be determined during detailed design.

2.0 Description

2.1 Description of Existing Infrastructure

At time of this report, a dry landfill for onsite ash storage is under construction at E. W. Brown. It is intended that ash from the three units at Brown will be transported dry to this landfill via a new pneumatic ash system to be installed as part of the Phase II AQCS modifications. The current fly ash handling system will be completely replaced by the new system and the existing system will have no impact on the new one.

2.2 Description of New Infrastructure

A new PJFF system, including PAC and sorbent injection, will be installed at Unit 1 as part of the Phase II construction. The ash collected from the Unit 1 PJFF and any other new Unit 1 pickup points will be transferred via a separate new pneumatic system. The new system will consist of blowers and supporting equipment located in the Common Unit 1/Unit 2 Fly Ash Handling Building and a new pipeline from the PJFF area to new ash storage silos. The new silos will be common to all three units and located adjacent to the landfill serving all three units. Ash reaching the storage silos will be conditioned and placed in trucks for transport to the working face of the landfill, deposition, and compaction.

3.0 Interface

The system proposed as part of the Phase II modifications would be completely independent of and have no interface with the existing fly ash handling system

4.0 Terminal Points List

The Unit 1 Fly Ash System will have the following terminal points:

- Lines running from the PJFF will connect to the common fly ash storage silos at a target box atop the silo.

Modifications, Interfaces, and Tie-Ins Description
Unit 1
Induced Draft

1.0 Introduction

The purpose of this description is to describe the conceptual interface between the existing Brown Induced Draft System and the new Induced Draft System; actual interface will be determined during detailed design.

2.0 Description

2.1 Description of Existing Infrastructure

The existing Induced Draft System consists of one induced draft (ID) fan to maintain furnace draft pressure and to overcome the draft system resistance. The ID fan is driven by a single-speed 5,000 hp, 900 rpm motor and inlet vanes are used for flow control. The existing draft system consists of the boiler, air heaters, cold-side electrostatic precipitator (CS-ESP) system, ID fan, a wet flue gas desulfurization (WFGD) system common to all Brown units, and associated ductwork, dampers, and other supporting equipment. A vent to the old Unit 1 stack is also available at the outlet of the CS-ESP system due to NFPA 85 requirements for common equipment such as the WFGD system.

2.2 Description of New Infrastructure

The new Induced Draft System will utilize the existing ID fan and its drive system designed to maintain furnace draft pressure and to overcome the resistance of the new draft system. The new draft system would consist of the existing boiler, a new gas-side economizer bypass, a new selective catalytic reduction (SCR) system, a new air heater, a new pulse jet fabric filter (PJFF) system, the existing ID fan, the existing common WFGD system, and associated new and existing ductwork, dampers, and other supporting equipment. The vent to the old Unit 1 stack would also be included.

3.0 Interface

The inlet of the new flue gas draft system would begin at the connection to the existing economizer outlet inside the existing boiler building. From this ductwork connection the existing air heaters would be bypassed and this new ductwork would travel to the new SCR system.

The inlet of the economizer gas-side bypass will be connected to the existing boiler back pass above the economizer section inlet. The outlet will be connected to the new ductwork at the economizer outlet that will bypass the existing air heaters. The drives for the modulating dampers in the economizer bypass ducts would require new power feeds and connections to the existing distributed control system (DCS) to allow control of the

flue gas temperature entering the new SCR system. Modulating dampers in the main gas path upstream of where the economizer bypass enters back into the main gas path may also be required to aid in controlling SCR gas inlet temperatures. The drives for these dampers would also require new power feeds and connections to the existing DCS.

The existing ID fan will be connected to the new ductwork at the outlet of the new PJFF system (the end of the new flue gas draft system) and the existing ductwork from the outlet of the abandoned CS-ESP system containing the vent to the old Unit 1 stack. The ID fan outlet ductwork entering the existing common WFGD system would remain intact. The existing ID fan would continue to control furnace pressure with the new draft system.

4.0 Terminal Point List

The Unit 1 Induced Draft System terminal points list is summarized as follows, pending final confirmation at time of detailed design:

- Existing economizer outlet (new ductwork to SCR system)
- Boiler back pass above economizer section inlet
- Ductwork inlet of new SCR system
- New economizer gas-side bypass damper modulating drives DCS controls
- New economizer gas-side bypass damper modulating drives low voltage power feeds
- New economizer gas-side outlet ductwork damper modulating drives DCS controls
- New economizer gas-side outlet ductwork damper modulating drives low voltage power feeds
- Inlet of existing ID fan (new ductwork at PJFF system outlet)
- Outlet of abandoned CS-ESP system containing vent to old Unit 1 stack (new ductwork at PJFF system outlet)

Modifications, Interfaces, and Tie-Ins Description
Unit 1
AQCS Compressed Air

1.0 Introduction

The purpose of this description is to describe the conceptual interface between the existing E.W. Brown Air Systems and the new Air Quality Control System (AQCS) Compressed Air System. Actual interface shall be determined during detailed design.

2.0 Description

2.1 Description of Existing Infrastructure

The existing air systems provide station air and control air to the existing plant infrastructure.

2.2 Description of New Infrastructure

The AQCS Compressed Air Systems will provide the clean, dry, oil free compressed air at an adequate pressure and adequate capacity for the pulse jet fabric filter, sonic horns, actuators, controls, instrumentation, and other air users in the AQCS addition.

3.0 Interface

A cross tie will be provided between the existing air systems and the new AQCS Compressed Air Systems. A cross-tie with the existing Station Air System will be provided by tying in before the new air filter/dryer skid. In addition, a cross tie with the existing Control Air System will be provided by tying in after the AQCS compressed air receiver. Each cross-tie will be furnished with manual isolation valve.

4.0 Terminal Point List

The AQCS Compressed Air System will have the following terminal points:

- The AQCS Compressed Air System will tie in to the Station Air System near the existing cross-tie with the Control Air System.
- The AQCS Compressed Air System will tie in to the Control Air near the cross-existing cross-tie with the Station Air System.

Modifications, Interfaces, and Tie-Ins Description
Unit 1
Service Water

1.0 Introduction

The purpose of this description is to describe the conceptual interface between the E.W. Brown Service Water System and the new Air Quality Control System (AQCS) Service Water System. Actual interface shall be determined during detailed design.

2.0 Description

2.1 Description of Existing Infrastructure

The existing Service Water System withdraws river water from Herrington Lake through the screenhouse intake structure and provides cooling, wash, makeup, fire protection, quench, seal, and sluicing water to all E.W. Brown station users. The screenhouse intake structure includes low pressure and high pressure service water pumps and traveling water screens.

2.2 Description of New Infrastructure

The Service Water System will extend existing service water systems for hose stations, makeup, and seal water for equipment in the AQCS areas. Existing service water quality will be sufficient to protect the AQCS systems.

3.0 Interface

A service water connection shall be supplied between existing Service Water System and AQCS Service Water System. A possible connection would be to use one of the existing fly ash sluice water lines. The fly ash sluice water lines will be abandoned during the AQC additions and may be reused. Actual interface will be determined in detailed design.

4.0 Terminal Point List

The AQCS Service Water System will have the following terminal points:

- The AQCS Service Water for Unit 1 will tie in at an appropriate pipeline connection point on the existing low pressure service water header or main branch.

Modifications, Interfaces, and Tie-Ins Description
Unit 1
Ammonia Supply

1.0 Introduction

The purpose of this description is to describe the conceptual interface between the E.W. Brown common Ammonia Storage System and the new Unit 1 Ammonia Supply System. Actual interfaces will be determined during detailed design.

2.0 Description

2.1 Description of Existing Infrastructure

The common Ammonia Storage System is currently being designed as a part of the Unit 3 SCR system. The common Ammonia Storage System consists of the following equipment:

- Ammonia tanker truck unloading stations.
- Two 34,000 gallon anhydrous ammonia storage tanks.
- Two full capacity ammonia pumps.
- A common supply header to Units 1, 2 and 3 SCRs.

2.2 Description of New Infrastructure

Unit 1 Ammonia Supply System will consist of the following equipment:

- One ammonia injection skid, the skid includes two full capacity mass flow meters and ammonia flow control valve trains.
- Two full capacity ammonia dilution air blowers for Unit 1 SCR reactor.
- Two full capacity air pre-heaters for Unit 1 SCR reactor.

Unit 1 Ammonia Supply equipment will be located as follows.

- Unit 1 ammonia injection skid will be located at the same area as the Unit 1 dilution air blowers and air pre-heaters.
- Unit 1 ammonia dilution air blowers and air pre-heaters will be located at Unit 1 SCR reactor area. The actual location will be determined during detailed design.

3.0 Interface

Unit 1 Ammonia Supply System will cross tie with the common Ammonia Storage System at the interface at Unit 3. The actual interface location will be determined

during detailed design. The ammonia supply piping will then run to Unit 1 and Unit 2 SCRs.

The steam supplied to the Unit 1 ammonia dilution air pre-heaters will cross tie with the existing station auxiliary steam header. The actual interface location will be determined during detailed design.

4.0 Terminal Point List

Unit 1 Ammonia Supply System will have the following terminal points:

- The ammonia supply header for Unit 1 and Unit 2 will be tied into the ammonia supply header at Unit 3.
- Unit 1 auxiliary steam supply will be tied into the existing auxiliary steam header.

Modifications, Interfaces, and Tie-Ins Description
Unit 1
Air Preheat System

1.0 Introduction

The purpose of this description is to describe the conceptual interface between the E.W. Brown existing Air Preheat System and the new Air Preheat System. Actual interface shall be determined during detailed design.

2.0 Description

2.1 Description of Existing Infrastructure

The existing Air Preheat System is inside the existing Unit 1 boiler building in close proximity to the existing forced draft (FD) fans and air heaters. It uses hot air recirculation fans to preheat the incoming combustion air by taking in hot air downstream of the air heaters and recirculating it back into the cooler air stream at the air heater air inlet.

2.2 Description of New Infrastructure

The new Air Preheat system will be a hot water based system to match Unit 2. It will include a new hot water air preheat coil, 2 new 100% hot water preheat coil pumps, new recirculation piping, and all associated valves and accessories to use hot water from the existing Deaerator and send it to the new hot water air preheat coil outside and to the northeast of the Unit 1 boiler building.

3.0 Interface

On the hot water side, connections shall be supplied at the inlet and outlet of the existing Deaerator and the inlet and outlet of the new hot water air preheat coil. On the combustion air side connections shall be supplied between the new FD fan outlet and air heater air inlet ductwork.

4.0 Terminal Point List

The new Air Preheat System will have the following terminal points:

- The new Air Preheat System will tie into the existing Unit 1 Deaerator discharge line for the suction of hot water to the new preheat coil pumps.
- The new Air Preheat System will tie into the existing Unit 1 Deaerator inlet line for the return of hot water from the new Air Preheat System.
- The new Air Preheat System will tie into the new ductwork immediately upstream of the air side of the new air heater for preheating the incoming combustion air.

Modifications, Interfaces, and Tie-Ins Description
Unit 1
Combustion Air

1.0 Introduction

The purpose of this description is to describe the conceptual interface between the existing Brown Combustion Air System and the new Combustion Air System; actual interface will be determined during detailed design.

2.0 Description

2.1 Description of Existing Infrastructure

The existing Combustion Air System consists of two forced draft (FD) fans to maintain the furnace windbox pressure, excess oxygen concentration, and to overcome the combustion air draft system resistance. The FD fans are driven by single-speed motors with fluid drives allowing for variable speed flow control. The power rating of each FD motor is approximately 350 hp and the input speed to the fluid drives is approximately 1180 rpm. Inlet vanes are used as a secondary means of flow control. The entire combustion air draft system consists of the FD fans, air heaters, hot air recirculation fans, boiler, and associated ductwork, dampers, and other supporting equipment.

2.2 Description of New Infrastructure

The new Combustion Air System will consist of a new single FD fan and inlet silencer. The FD fan would be designed to maintain the current furnace windbox pressure, current excess oxygen concentration, and to overcome the new combustion air draft system resistance. The inlet silencer would minimize noise levels surrounding the FD fan. The new FD fan would require approximately 1,000 hp to attain its maximum rated capability. However, one of the existing two-speed motor from one of the abandoned Unit 2 ID fans has been chosen for the drive motor to minimize equipment cost and since excess capacity is available in the existing 2400 volt system. These two-speed motors have a power rating of 800 and 2,500 hp at nominal speeds of 600 and 900 rpm, respectively. The two-speed motor would be used for gross flow control and the inlet vanes would be used for precise flow control. The new draft system would consist of a new FD fan inlet silencer, new FD fan, new hot water air preheat coil, new air heater, and associated new and existing ductwork, dampers, and other supporting equipment.

3.0 Interface

The inlet of the new combustion air draft system begins with ambient air. From the ambient air intake the FD fan silencer would be the first piece of equipment in the combustion air path. The combustion air would then immediately enter the FD fan.

The outlet of the new FD fan will be connected to the new ductwork at the inlet of the new air preheat coil. The air preheat coil would be close coupled to the air inlet of the air heater. At the air heater air outlet ductwork would travel to the existing Unit 1 hot-side combustion air ductwork.

The two-speed motor for the FD fan is expected to be supplied with new medium voltage power feeds from the existing Unit 1 switchgear. The inlet vane actuators, other damper actuators, and lube oil skid will be supplied with new low voltage power feeds and connections to the existing DCS to allow control of furnace windbox pressure and excess oxygen concentrations and monitoring of FD fan operation. The new lube oil skid for the FD fan would be cooled by ambient air.

4.0 Terminal Point List

The Unit 1 Combustion Air System terminal points list is summarized as follows, pending final confirmation at time of detailed design:

- Atmosphere
- New air preheat coil inlet
- New air preheat coil outlet
- New air heater air side air inlet
- New air heater air side air outlet
- Ductwork inlet of the existing combustion air system (hot-side)
- New FD fan DCS controls to inlet vane actuators
- New FD fan medium voltage power feed to two-speed motor
- New FD fan low voltage power feeds to lube oil skids, damper actuators, and other accessories

Modifications, Interfaces, and Tie-Ins Description
Unit 2
AQCS Power Supply System

1.0 Introduction

The purpose of this description is to describe the conceptual interface between the Brown Plant Power Supply System and the new Air Quality Control System (AQCS) Power Supply System; actual interface shall be determined during detailed design.

2.0 Description

2.1 Description of Existing Infrastructure

The Existing Unit 2, 2.4 kV systems consists of the following major components:

One two-winding delta primary, delta secondary 10 MVA Main Auxiliary Transformer. The high voltage rating is 17.1 kV and the low voltage rating is 2.4 kV. The low side of the transformer supplies power to Unit 2 switchgear bus 2A & 2B.

Reserve power is supplied to switchgear bus 2A & 2B by a two-winding 10MVA, 138 kV to 2.4 kV Reserve Auxiliary Transformer .

The de-commissioning of the Unit 2 ID Fan Motors:

The existing Unit 2 ID fan motors will be de-commissioned. One of the Unit 2 ID fan motors will be used to drive a new Unit 2 FD fan. The Unit 2 ID fan motor is a two speed motor. The Unit 2 ID fan motor and speed control equipment will be relocated so that it can drive the new Unit 2 FD fan. The power source for the new Unit 2 FD fan motor will be the existing Unit 2, 2.4 kV switchgear. The Unit 2 ID fan fed from Unit 2, section 13 now feeds ID Fan 2-1 which will be de-commissioned. The section 13 feeder will supply power to what will become the Unit 2 FD fan motor. It expected, but will need to be confirmed during detailed design, that the existing Unit 2, 2.4 kV switchgear feeder breaker is section 13 will need no modification. The only change will be the abandonment of the existing cable and the new cable routed and terminated at the location of the new FD fan.

2.2 Description of New Infrastructure

The new AQCS AC power supply system shall consist of the following equipment:

- 5 kV cable and 600V ground cable from Unit 2 existing switchgear to the new Unit 2 FD fan.

3.0 Terminal Point List

The AQCS Power Supply System will have the following terminal points:

- 5 kV cable connection from between existing 2400V switchgear to new FD fan motor.

Modifications, Interfaces, and Tie-Ins Description
Unit 2
Communication

1.0 Introduction

The purpose of this description is to describe the conceptual interface between the Brown Plant Communication systems and the new Air Quality Control System (AQCS) Communication Systems; detailed interface shall be determined during detailed design.

2.0 Description

2.1 Description of Existing Infrastructure

The existing public address system is a multi-channel Gai-Tronics system.

2.2 Description of New Infrastructure

The Communication System shall include a page/party public address system compatible with Gai-Tronics equipment.

3.0 Interface

The AQCS page party system shall connect to the existing Gai-Tronics system equipment.

4.0 Terminal Point List

The Communication System will have the following terminal points:

- Interface of new system to existing.
- 120VAC power.

Modifications, Interfaces, and Tie-Ins Description
Unit 2
Control and Monitoring

1.0 Introduction

The purpose of this description is to describe the conceptual interface between the Brown Plant Control and Monitoring System and the new Air Quality Control System (AQCS) Control and Monitoring; actual interface shall be determined during detailed design.

2.0 Description

2.1 Description of Existing Infrastructure

The existing DCS is a Foxboro I/A Series system.

2.2 Description of New Infrastructure

The AQCS DCS shall provide a means to manually and automatically control AQCS plant components individually and as a coordinated plant system. The system will be an extension of the existing system.

3.0 Interface

The new redundant processors and associated I/O modules will be connected to the existing FGD mesh network.

4.0 Terminal Point List

The AQCS Control and Monitoring System will have the following terminal points:

- Existing Unit 2 Distributed Control System (DCS)
- Existing Unit 2 DCS Operating Work Stations
- AQCS Main 120 VAC UPS panel board
- AQCS General 208/120 VAC panel board
- AQCS Grounding System
- AQCS Equipment
- AQCS Auxiliary Electrical System

Modifications, Interfaces, and Tie-Ins Description
Unit 2
Buildings and Enclosures

1.0 Introduction

The purpose of this description is to describe the conceptual interface between the Brown Plant Buildings and the new Air Quality Control System (AQCS) Buildings and Enclosures. Actual interface will be determined during detailed design. The modifications proposed for Unit 1 and Unit 2 are to a great extent common to both, at least insofar as buildings and enclosures. Accordingly, the modifications, interfaces, and tie-ins for Unit 2 were combined with those of Unit 1 and are documented in file 168908.41.0804.B104. See that document for information regarding Brown Unit 2 buildings and enclosures.

Modifications, Interfaces, and Tie-Ins Description
Unit 2
Ductwork

1.0 Introduction

The purpose of this description is to describe the conceptual interface between the existing E. W. Brown Plant Flue Gas Exhaust System and the new Air Quality Control System (AQCS) Ductwork System. The actual interface will be determined during detailed design.

2.0 Description

2.1 Description of Existing Infrastructure

To provide a similar arrangement at Unit 2 as proposed at Unit 1, a new FD fan (with a reconditioned existing Unit 2 ID fan motor) and air heater are intended to be installed at Unit 2 and the existing air heater, air preheat coil, and FD fan bypassed. Existing ductwork at Unit 2 must be modified and augmented accordingly.

2.2 Description of New Infrastructure

The remote air heater, air preheat coil, and FD fan at Unit 2 require that significant new duct be installed between this new equipment and the existing combustion air plenum at the boiler. Additional new ductwork is required downstream of the existing economizer to the SCR module, through the new PJFF and ID fan, to a connection point on the existing Unit 2 ductwork downstream of the existing Unit 2 ID fans, which will be removed and their motors reconditioned for reuse. A crosstie between Unit 1 and Unit 2 exhaust duct will also be installed along this new duct. Existing ductwork downstream of the connection point will be unchanged, both the duct routed to the common WFGD and the bypass ductwork to the old Unit 3 chimney.

The scope of Phase II work begins at the outlet of a new FD fan located at the base of the Unit 2 SCR support structure. Duct is routed through the new air preheat coil and cold side of the new Unit 2 air heater and then along the north side of the existing Unit 1/Unit 2 powerhouse to a connection cut into existing combustion ductwork downstream of the old FD fan inside the powerhouse. Return exhaust duct is routed from a connection cut into the existing combustion air ductwork downstream of the Unit 2 economizer to the remainder of the new ACQS train, including the SCR, PJFF, and ID fan. New duct is then routed from the ID fan outlet to a connection point cut into the existing ductwork downstream of the location of the existing Unit 2 ID fans. The existing exhaust ductwork downstream of that connection to either the common wet FGD inlet or the old Unit 3 chimney remains unchanged. A crosstie will be installed between existing Unit 1 exhaust duct and new Unit 2 exhaust ductwork. Dampers will be installed in the Unit 1 and Unit

2 ductwork, as well as the crosstie, to allow exhaust gas from either Unit 1 or Unit 2 to be directed to the Unit 3 chimney if the WFGD is inoperative.

Ductwork to and from the Unit 2 boiler will be "stacked" with similar ductwork serving Unit 1 to make best use of available space immediately north of the existing building. Partial or complete demolition of existing structures along the north side of the building will be required to install the stacked ductwork. Support for the stacked ductwork will be integrated into a single steel structure supported by new foundations at grade. New ductwork will be provided with expansion joints to maintain gas tight structural support throughout the equipment operating system flow and temperature range.

Additional ductwork will also be added to allow partial bypass of the economizer. This will be a smaller series of ducts, including controlling dampers, connecting the duct upstream and downstream of the existing Unit 2 economizer. This ductwork is expected to be located if practical within the limits of the existing building and final routing will be determined at time of detailed design.

3.0 Interface

Five major interfaces between new and existing ductwork will be required by the Phase II AQCS modifications.

- Combustion air supply ductwork will connect to the combustion air ductwork downstream of the existing FD fan within the powerhouse building. The existing FD fan will be bypassed.
- New exhaust ductwork will be connected to existing duct downstream of the Unit 2 economizer. The new duct will penetrate the north wall of the powerhouse building and be routed to the new SCR.
- Treated exhaust gas leaving the new ID fan will be routed through new ductwork to the existing ductwork above the current location of the existing Unit 2 ID fans.
- A short crosstie duct will be installed between the existing Unit 1 ductwork downstream of the ID fan and new Unit 2 exhaust ductwork upstream of the connection point. Isolation dampers will be installed in existing and new ductwork to allow exhaust gas from either Unit 1 or Unit 2 to be discharged directly to the old Unit 3 chimney via existing ductwork downstream of the connection point.
- Economizer bypass duct will connect upstream and downstream of the existing Unit 2 economizer, allowing partial and controlled bypass of the economizer.

All new ductwork will be supported as required to allow for expansion and contraction. Independent duct supports will be used at new duct routed near the new SCR, PJFF, and ID fan. Multiple-duct supports will be provided for the new duct just north of the powerhouse. Ductwork will be of carbon steel construction and unlined, since temperatures and conditions upstream of the wet scrubber will not require corrosion-resistant liners. Expansion joints, slide plates, and anchor points will be provided where required to ensure gastight operation under all operating temperatures without inducing unacceptable stresses into the interfacing equipment.

4.0 Terminal Point List

The new Unit 2 Ductwork terminal points list is summarized as follows, pending final confirmation at time of detailed design:

- FD fan outlet (one required)
- Air preheat coil inlet (one required)
- Air preheat coil outlet (one required)
- Air heater air side inlet (one required)
- Air heater air side outlet (one required)
- Combustion air plenum (one required)
- Economizer outlet (two required)
- SCR inlet (one required)
- SCR outlet (one required)
- Air heater gas side inlet (one required)
- Air heater gas side outlet (one required)
- PJFF inlet (one required)
- PJFF outlet (one required)
- New ID fan inlet (one required)
- New ID fan outlet (one required)
- Connection to existing Unit 2 exhaust ductwork (one required)
- Crosstie to Unit 1 ductwork (one required)
- Economizer bypass (upstream and downstream of economizer, number to be confirmed during detailed design).

Modifications, Interfaces, and Tie-Ins Description
Unit 2
Fly Ash

1.0 Introduction

The purpose of this description is to describe the conceptual interface between the Brown Ash Systems and the new Air Quality Control System (AQCS) Fly Ash System. Actual interfaces will be determined during detailed design.

2.0 Description

2.1 Description of Existing Infrastructure

At time of this report, a dry landfill for onsite ash storage is under construction at E. W. Brown. It is intended that ash from the three units at Brown will be transported dry to this landfill via a new pneumatic ash system to be installed as part of the Phase II AQCS modifications. The current fly ash handling system will be completely replaced by the new system and the existing system will have no impact on the new one.

2.2 Description of New Infrastructure

A new PJFF system, including PAC and sorbent injection, will be installed at Unit 2 as part of the Phase II construction. The ash collected from the Unit 2 PJFF and any other new Unit 2 pickup points will be transferred via a separate new pneumatic system. The new system will consist of blowers and supporting equipment located in the Common Unit 1/Unit 2 Fly Ash Handling Building and a new pipeline from the PJFF area to new ash storage silos. The new silos will be common to the three units and located adjacent to the landfill serving all three units. Ash reaching the storage silos will be conditioned and placed in trucks for transport to the working face of the landfill, deposition, and compaction.

3.0 Interface

The system proposed as part of the Phase II modifications would be completely independent of and have no interface with the existing fly ash handling system

4.0 Terminal Points List

The Unit 2 Fly Ash System will have the following terminal points:

- Lines running from the PJFF will connect to the common fly ash storage silos at a target box atop the silos.

Modifications, Interfaces, and Tie-Ins Description
Unit 2
Induced Draft

1.0 Introduction

The purpose of this description is to describe the conceptual interface between the existing Brown Induced Draft System and the new Induced Draft System; actual interface will be determined during detailed design.

2.0 Description

2.1 Description of Existing Infrastructure

The existing Induced Draft System consists of two induced draft (ID) fans to maintain furnace draft pressure and to overcome the draft system resistance. The ID fans are driven by two-speed motors with 600 and 900 rpm nominal speed capabilities and corresponding power ratings of 800 and 2,500 hp. Inlet vanes are used for flow control. The existing draft system consists of the boiler, air heaters, cold-side electrostatic precipitator (CS-ESP) system, ID fans, a wet flue gas desulfurization (WFGD) system common to all Brown units, and associated ductwork, dampers, and other supporting equipment. A vent to the old Unit 3 stack is also available at the outlet of the ID fans that splits off from the ductwork to the common WFGD system. This bypass vent is in place due to NFPA 85 requirements for common equipment such as the WFGD system and to allow Unit 2 to operate while the WFGD system is offline.

2.2 Description of New Infrastructure

The new Induced Draft System will consist of a new single ID fan designed to maintain furnace draft pressure and to overcome the resistance of the new draft system. The new ID fan would be driven by a single-speed motor of approximately 7,900 hp and inlet vanes would be used for flow control. The new draft system would consist of the existing boiler, a new gas-side economizer bypass, a new selective catalytic reduction (SCR) system, a new air heater, a new pulse jet fabric filter (PJFF) system, the new ID fan, the existing common WFGD system, and associated new and existing ductwork, dampers, and other supporting equipment. The bypass vent to the old Unit 3 stack would also be included

3.0 Interface

The inlet of the new flue gas draft system would begin at the connection to the existing economizer outlet inside the existing boiler building. From this ductwork connection the existing air heaters would be bypassed and this new ductwork would travel to the new SCR system.

The inlet of the economizer gas-side bypass will be connected to the existing boiler back pass above the economizer section inlet. The outlet will be connected to the new ductwork at the economizer outlet that will bypass the existing air heaters. The drives for the modulating dampers in the economizer bypass ducts would require new power feeds and connections to the existing distributed control system (DCS) to allow control of the flue gas temperature entering the new SCR system. Modulating dampers in the main gas path upstream of where the economizer bypass enters back into the main gas path may also be required to aid in controlling SCR gas inlet temperatures. The drives for these dampers would also require new power feeds and connections to the existing DCS.

The new ID fan will be connected to the new ductwork at the outlet of the new PJFF system and the inlet to the new ductwork entering the existing ductwork to the old Unit 3 bypass stack and to the common WFGD system. The new single-speed motor for the ID fan will be supplied with new medium voltage power feeds. The inlet vane actuators, other damper actuators, and lube oil skid will be supplied with new low voltage power feeds and connections to the existing DCS to allow control of furnace pressure and monitoring of ID fan operation. The new lube oil skid for the ID fan would be cooled by ambient air.

4.0 Terminal Point List

The Unit 2 Induced Draft System terminal points list is summarized as follows, pending final confirmation at time of detailed design:

- Existing economizer outlet
- Boiler back pass above economizer section inlet
- Ductwork inlet of new SCR system
- New economizer gas-side bypass damper modulating drives DCS controls
- New economizer gas-side bypass damper modulating drives low voltage power feeds
- New economizer gas-side outlet ductwork damper modulating drives DCS controls
- New economizer gas-side outlet ductwork damper modulating drives low voltage power feeds
- Ductwork outlet of the new PJFF system
- Ductwork inlet of the existing common WFGD system and old Unit 3 bypass stack
- New ID fan DCS controls to inlet vane actuators
- New ID fan medium voltage power feed to single-speed motor
- New ID fan low voltage power feeds to lube oil skids, damper actuators, and other accessories

Modifications, Interfaces, and Tie-Ins Description
Unit 2
AQCS Compressed Air

1.0 Introduction

The purpose of this description is to describe the conceptual interface between the existing E.W. Brown Air Systems and the new Air Quality Control System (AQCS) Compressed Air System. Actual interface shall be determined during detailed design.

2.0 Description

2.1 Description of Existing Infrastructure

The existing air systems provide station air and control air to the existing plant infrastructure.

2.2 Description of New Infrastructure

The AQCS Compressed Air Systems will provide the clean, dry, oil free compressed air at an adequate pressure and adequate capacity for the pulse jet fabric filter, sonic horns actuators, controls, instrumentation, and other air users in the AQCS addition.

3.0 Interface

A cross tie will be provided between the existing air systems and the new AQCS Compressed Air Systems. A cross-tie with the existing Station Air System will be provided by tying in before the new air filter/dryer skid. In addition, a cross tie with the existing Control Air System will be provided by tying in after the AQCS compressed air receiver. Each cross-tie will be furnished with manual isolation valves.

4.0 Terminal Point List

The AQCS Compressed Air System will have the following terminal points:

- The AQCS Compressed Air System will tie in to the Station Air System near the existing cross-tie with the Control Air System.
- The AQCS Compressed Air System will tie in to the Control Air System near the cross-existing cross-tie with the Station Air System.

Modifications, Interfaces, and Tie-Ins Description
Unit 2
Service Water

1.0 Introduction

The purpose of this description is to describe the conceptual interface between the E.W. Brown Service Water System and the new Air Quality Control System (AQCS) Service Water System. Actual interface shall be determined during detailed design.

2.0 Description

2.1 Description of Existing Infrastructure

The existing Service Water System withdraws river water from Herrington Lake through the screenhouse intake structure and provides cooling, wash, makeup, fire protection, quench, seal, and sluicing water to all E.W. Brown station users. The screenhouse intake structure includes low pressure and high pressure service water pumps and traveling water screens.

2.2 Description of New Infrastructure

The Service Water System will extend existing service water systems for hose stations, makeup, and seal water for equipment in the AQCS areas. Existing service water quality will be sufficient to protect the AQCS systems.

3.0 Interface

A service water connection shall be supplied between existing Service Water System and AQCS Service Water System. A possible connection would be to use one of the existing fly ash sluice water lines. The fly ash sluice water lines will be abandoned during the AQC additions and may be reused. Actual interface will be determined in detailed design.

4.0 Terminal Point List

The AQCS Service Water System will have the following terminal points:

- The AQCS Service Water for Unit 2 will tie in at an appropriate pipeline connection point on the existing low pressure service water header or main branch.

Modifications, Interfaces, and Tie-Ins Description
Unit 2
Ammonia Supply

1.0 Introduction

The purpose of this description is to describe the conceptual interface between the E.W. Brown common Ammonia Storage System and the new Unit 2 Ammonia Supply System. Actual interfaces will be determined during detailed design.

2.0 Description

2.1 Description of Existing Infrastructure

The common Ammonia Storage System is currently being designed as a part of the Unit 3 SCR system. The common Ammonia Storage System consists of the following equipment:

- Ammonia tanker truck unloading stations.
- Two 34,000 gallon anhydrous ammonia storage tanks.
- Two full capacity ammonia pumps.
- A common supply header to Units 1, 2 and 3 SCRs.

2.2 Description of New Infrastructure

Unit 2 Ammonia Supply System will consist of the following equipment:

- One ammonia injection skid, the skid includes two full capacity mass flow meters and ammonia flow control valve trains.
- Two full capacity ammonia dilution air blowers for Unit 2 SCR reactor.
- Two full capacity air pre-heaters for Unit 2 SCR reactor.

Unit 2 Ammonia Supply equipment will be located as follows.

- Unit 2 ammonia injection skid will be located at the same area as the dilution air blowers and air pre-heaters.
- Unit 2 Ammonia dilution air blowers and air pre-heaters will be located at Unit 2 SCR reactor area. The actual location will be determined during detailed design.

3.0 Interface

Unit 2 Ammonia Supply System will cross tie with the common Ammonia Storage System at the interface at Unit 3. The actual interface location will be determined

during detailed design. The ammonia supply piping will then run to Unit 1 and Unit 2 SCRs.

The steam supplied to the Unit 2 ammonia dilution air pre-heaters will cross tie with the existing station auxiliary steam header. The actual interface location will be determined during detailed design.

4.0 Terminal Point List

Unit 2 Ammonia Supply System will have the following terminal points:

- The ammonia supply header for Unit 1 and Unit 2 will be tied into the ammonia supply header at Unit 3.
- Unit 2 auxiliary steam supply will be tied into the existing auxiliary steam header.

Modifications, Interfaces, and Tie-Ins Description
Unit 2
Air Preheat System

1.0 Introduction

The purpose of this description is to describe the conceptual interface between the E.W. Brown existing Air Preheat System and the new Air Preheat System. Actual interface shall be determined during detailed design.

2.0 Description

2.1 Description of Existing Infrastructure

The existing Air Preheat System is inside the existing Unit 2 boiler on the main floor. It uses air preheating coils to heat the incoming combustion air by taking in hot water from the Deaerator and circulating it through the preheat coils and then returning the water to the Deaerator.

2.2 Description of New Infrastructure

The new Air Preheat system will be a hot water based system to match the existing Unit 2 system. It will include a new hot water air preheat coil, 2 new 100% capacity hot water preheat coil pumps, new recirculation piping, and all associated valves and accessories to extract hot water from the existing Deaerator and send it to the new hot water air preheat coil outside and to the northeast of the Unit 1 boiler building.

3.0 Interface

On the hot water side, connections shall be supplied at the inlet and outlet of the existing Deaerator and the inlet and outlet of the new hot water air preheat coil. On the combustion air side connections shall be supplied between the new FD fan outlet and air heater air inlet ductwork.

4.0 Terminal Point List

The new Air Preheat System will have the following terminal points:

- The new Air Preheat System will tie into the existing Unit 1 Deaerator discharge line for the suction of hot water to the new preheat coil pumps.
- The new Air Preheat System will tie into the existing Unit 1 Deaerator inlet line for the return of hot water from the new Air Preheat System.
- The new Air Preheat System will tie into the new ductwork immediately upstream of the air side of the new air heater for preheating incoming combustion air.

Modifications, Interfaces, and Tie-Ins Description
Unit 2
Combustion Air

1.0 Introduction

The purpose of this description is to describe the conceptual interface between the existing Brown Combustion Air System and the new Combustion Air System; actual interface will be determined during detailed design.

2.0 Description

2.1 Description of Existing Infrastructure

The existing Combustion Air System consists of two forced draft (FD) fans to maintain the furnace windbox pressure, excess oxygen concentration, and to overcome the combustion air draft system resistance. The FD fans are driven by single-speed motors with fluid drives allowing for variable speed flow control. The power rating of each FD motor is approximately 1,500 hp and the maximum speed to the fluid drives output to the FD fans is approximately 1160 rpm. These FD fans are currently not operating near design conditions since they were designed to operate Unit 2 as a forced draft unit. Unit 2 is now a balanced draft unit. The entire combustion air draft system consists of the FD fans, hot water air preheat coils, air heaters, boiler, and associated ductwork, dampers, and other supporting equipment.

2.2 Description of New Infrastructure

The new Combustion Air System will consist of a new single FD fan and inlet silencer. The FD fan would be designed to maintain the current furnace windbox pressure, current excess oxygen concentration, and to overcome the new combustion air draft system resistance. The inlet silencer would minimize noise levels surrounding the FD fan. The new FD fan would require approximately 1,500 hp to attain its maximum rated capability in the current balanced draft configuration of Unit 2. However, one of the existing two-speed motor from one of the abandoned ID fans has been chosen for the drive motor to minimize equipment cost and since excess capacity is available in the existing 2400 volt system. These two-speed motors have a power rating of 800 and 2,500 hp at nominal speeds of 600 and 900 rpm, respectively. The two-speed motor will be used for gross flow control and the inlet vanes would be used for precise flow control. The new draft system would consist of a new FD fan inlet silencer, new FD fan, new hot water air preheat coil, new air heater, and associated new and existing ductwork, dampers, and other supporting equipment.

3.0 Interface

The inlet of the new combustion air draft system begins with ambient air. From the ambient air intake the FD fan silencer would be the first piece of equipment in the combustion air path. The combustion air would then immediately enter the FD fan.

The outlet of the new FD fan will be connected to the new ductwork at the inlet of the new air preheat coil. The air preheat coil would be close coupled to the air inlet of the air heater. At the air heater air outlet ductwork would travel to the existing Unit 2 hot-side combustion air ductwork.

The two-speed motor for the FD fan is expected to be supplied with new medium voltage power feeds form the existing Unit 2 switchgear. The inlet vane actuators, other damper actuators, and lube oil skid will be supplied with new low voltage power feeds and connections to the existing DCS to allow control of furnace windbox pressure and excess oxygen concentrations and monitoring of FD fan operation. The new lube oil skid for the FD fan would be cooled by ambient air.

4.0 Terminal Point List

The Unit 2 Combustion Air System terminal points list is summarized as follows, pending final confirmation at time of detailed design:

- Atmosphere
- New air preheat coil inlet
- New air preheat coil outlet
- New air heater air side air inlet
- New air heater air side air outlet
- Ductwork inlet of the existing combustion air system (hot-side)
- New FD fan DCS controls to inlet vane actuators
- New FD fan medium voltage power feed to two-speed motor
- New FD fan low voltage power feeds to lube oil skids, damper actuators, and other accessories

Modifications, Interfaces, and Tie-Ins Description
Unit 3
AQCS Power Supply System

1.0 Introduction

The purpose of this description is to describe the conceptual interface between the. Brown Plant Power Supply System and the new Air Quality Control System (AQCS) Power Supply System; actual interface shall be determined during detailed design.

2.0 Description

2.1 Description of Existing Infrastructure

The existing FGD 13,200V systems consists of the following major components:

- One two-winding delta primary, delta secondary Main Auxiliary Transformer (UAT-3C). The high voltage rating shall be 25kV and the low voltage rating 13.2 kV to serve the Unit 3, 13.2 kV switchgear buses A & B.

The existing 13,200V system also consists of the following major components:

- Two (2) 13.2 kV metal-clad, single-ended switchgear with a main breaker on each bus connecting it to the Main Auxiliary Transformer UAT-3C and a secondary main breaker connecting the switchgear bus to the Unit 1 Generator terminals through a triggered current limiter.

- 13,200V medium voltage circuit breakers.

The existing 13,200V system:

- The existing 13.2 kV FGD metal-clad, switchgear OAPO1E-A-SWGR contains a spare 1200A feeder breaker. This breaker will be used to supply primary power to the new Unit 3 AQC 480V SUS XFMR A and AQC 4160V Switchgear XFMR A. During detailed design the extent of the modification will need to be accessed. It is likely that the current transformers may have to be replaced as well as the feeder protection.

- The existing 13.2 kV FGD metal-clad, switchgear OAPO1E-B-SWGR contains an equipped space that will accept a new 13.2 kV, 1200A feeder breaker. The equipped space in section B5 should be utilized as the protective device is designed for transformer feeder protection. The current transformers may also require replacement. The extent of modifications will be determined during detailed design. This new

breaker will be used to supply primary power to the new Unit 3 AQC 480V SUS XFMR B and AQC 4160V Switchgear XFMR B.

15 kV cable will be used to make the connection from the feeder breakers to the primary side of the transformers. It is expected that this cable will be routed through newly installed tray and conduit.

2.2 Description of New Infrastructure

The new AQCS AC power supply system shall consist of the following equipment:

- Modification to the existing 13.2 kV FGD switchgear A as described above.
- The addition of a new 13.2 kV breaker to the existing FGD switchgear B as described above.
- 15 kV cable and raceway from 13.2 kV switchgear A & B to feed 480V SUS and 4.16 kV SWGR transformers
- 480 volt transformers, switchgear, and motor control centers
- DC and Uninterruptible Power Supply (UPS) systems to provide DC power to switchgear and UPS power to the Distributed Control System (DCS).

3.0 Terminal Point List

The AQCS Power Supply System will have the following terminal points:

- 15 kV cable and raceway connecting the existing 13.2 kV switchgear to the new SUS and SWGR transformers.

Modifications, Interfaces, and Tie-Ins Description
Unit 3
Communication

1.0 Introduction

The purpose of this description is to describe the conceptual interface between the Brown Plant Communication systems and the new Air Quality Control System (AQCS) Communication Systems; detailed interface shall be determined during detailed design.

2.0 Description

2.1 Description of Existing Infrastructure

The existing public address system is a multi-channel Gai-Tronics system.

2.2 Description of New Infrastructure

The Communication System shall include a page/party public address system compatible with Gai-Tronics equipment.

3.0 Interface

The AQCS page party system shall connect to the existing Gai-Tronics system equipment.

4.0 Terminal Point List

The Communication System will have the following terminal points:

- Interface of new system to existing.
- 120VAC power.

Modifications, Interfaces, and Tie-Ins Description
Unit 3
Control and Monitoring

1.0 Introduction

The purpose of this description is to describe the conceptual interface between the Brown Plant Control and Monitoring System and the new Air Quality Control System (AQCS) Control and Monitoring; actual interface shall be determined during detailed design.

2.0 Description

2.1 Description of Existing Infrastructure

The existing DCS is Foxboro I/A Series system.

2.2 Description of New Infrastructure

The AQCS DCS shall provide a means to manually and automatically control AQCS plant components individually and as a coordinated plant system. The system will be an extension of the existing system.

3.0 Interface

The new redundant processors and associated I/O modules will be connected to the existing FGD mesh network.

4.0 Terminal Point List

The AQCS Control and Monitoring System will have the following terminal points:

- Existing Unit 3 Distributed Control System (DCS)
- Existing Unit 3 DCS Operating Work Stations
- AQCS Main 120 VAC UPS panel board
- AQCS General 208/120 VAC panel board
- AQCS Grounding System
- AQCS Equipment
- AQCS Auxiliary Electrical System

Modifications, Interfaces, and Tie-Ins Description
Unit 3
Buildings and Enclosures

1.0 Introduction

The purpose of this description is to describe the conceptual interface between the Brown Plant Buildings and the new Air Quality Control System (AQCS) Buildings and Enclosures. Actual interface will be determined during detailed design.

2.0 Description

2.1 Description of Existing Infrastructure

Numerous buildings used for various purposes exist as part of the Unit 3 and common WFGD facilities. The buildings, in general, are composed of both "stick-built" (individually-designed-and-constructed specialty structures) and pre-engineered metal buildings. The buildings consist of a metal panel exterior on a steel frame supported by a concrete foundation. Details, arrangement, and degree of finish depend on the building's intended function, but all structures protect and provide the necessary environmental control for the functions they enclose.

2.2 Description of New Infrastructure

The miscellaneous buildings and structures for the Unit 3 AQCS modifications will be designed similarly to those existing and will reflect the function and arrangement of the systems they enclose or support. Disregarding the "non-building" equipment which simply require foundations, the new buildings and structures proposed for Unit 3 are identified as follows:

- Unit 3 AQCS Electrical Building
- Unit 3 Fly Ash Handling Building.

Pre-engineered metal buildings, because of their lower capital cost and versatility, are proposed for both the Electrical and Ash Handling Buildings. These buildings will consist of a fabricated steel frame of a "standard" size and arrangement enclosed by metal panel wall and roof systems. Each building will be insulated, include utilities but no plumbing, have an unfinished interior, and include only heating and ventilation, except where air conditioning is required by the system(s) enclosed.

Both new buildings will be supported on cast-in-place concrete foundations. For purposes of the estimate, the foundations are assumed to be supported on drilled piers. At time of detailed design, consideration should be given to designing shallow footings for both buildings to simplify construction. The locations of the new structures are

expected to be relatively uncongested and reasonably accessible, making either type of foundation more or less practical if loading allows.

Neither new structure at Unit 3 is expected to be continuously manned. That, together with the close proximity of existing facilities, allows plumbing and sanitary utilities, interior finishes, and interior space conditioning for personnel comfort to be eliminated. However, the structures will be provided with appropriate personnel, vehicle, and equipment maintenance access, and a Life Safety review of egress will be completed for each structure.

3.0 Interface

An existing warehouse lies within the footprint of the proposed AQCS modifications at Unit 3 and that building will have to be demolished or relocated. Otherwise, the Unit 3 AQCS Electrical and Fly Ash Handling Buildings will be physically and functionally separate from, with little or no intended interface to, existing structures. Methods of construction for these buildings, especially installation of the new foundations, will be evaluated to minimize any impact of the new structure on those existing, such as the adjacent WFGD. Depending on the service required, the new structures may receive drainage, power, or other services from existing site systems and will interface with those systems accordingly.

4.0 Terminal Point List

Specific terminal points for each of the new Unit 3 buildings and structures will be identified during detailed design.

Modifications, Interfaces, and Tie-Ins Description
Unit 3
Ductwork

1.0 Introduction

The purpose of this description is to describe the conceptual interface between the existing E. W. Brown Plant Flue Gas Exhaust System and the new Air Quality Control System (AQCS) Ductwork System. The actual interface will be determined during detailed design.

2.0 Description

2.1 Description of Existing Infrastructure

The existing flue gas exhaust system downstream of the Unit 3 economizer outlet consists of an SCR module (currently in installation at the time of this report), both the original and two add-on electrostatic precipitators (ESP), air heaters, and ID fans, with ductwork downstream of the ID fans combined upstream of the inlet to the wet scrubbers. Ductwork downstream of the ESPs is elevated and supported by exposed above-grade steel framing and individual concrete foundations. Ductwork is provided with expansion joints to maintain gas tight structural support throughout the equipment operating system flow and temperature range.

The ductwork downstream of the existing ESPs and upstream of the existing ID fans contains ductwork connected to the old Unit 3 chimney. This ductwork provides a NFPA 85 vent for Unit 3 should the WFGD require bypassing.

2.2 Description of New Infrastructure

The modifications proposed at Unit 3 in the Phase II AQCS study consist primarily in replacing the existing ESPs with a new PJFF. Both the existing SCR module and ID fans will remain in place and operational, as well as the WFGD downstream. New ductwork is therefore required downstream of the existing air heaters, through a new PJFF, and to the existing ID fans. Existing ductwork to the common WFGD downstream of the ID fans will be unchanged.

The scope of Phase II work begins at the outlet of the existing Unit 3 air heaters. New ductwork is routed beneath the new SCR, turning west to the inlet of a PJFF located south of the WFGD. New exhaust duct is routed from the PJFF outlet to the inlets of the existing ID fans, which will be reused in place. The existing exhaust ductwork downstream of the ID fans to the common wet FGD inlet remains unchanged.

The existing ductwork between the ESPs and the ID fans is not required for normal operation of Unit 3 once the Phase II AQCS modifications are complete. However, that

ductwork does provide a NFPA 85 vent for Unit 3 to the old Unit 3 chimney. Retaining necessary portions of that duct would allow the vent to remain available with minimal new ductwork. Dampers will be installed in the existing ductwork to isolate the ductwork to the vent during operation. Remaining portions of the existing ductwork not required to maintain the vent could be demolished or abandoned in place, with blanks installed as required for isolation outside the duct run to the vent.

3.0 Interface

Essentially three new interfaces between new and existing ductwork at Unit 3 will be required. The individual interfaces are described as follows.

- New ductwork will connect to existing flanged connections on each of two 50% trains of ductwork downstream of the existing air heaters in the Unit 3 boiler building. The new duct will join and be routed to the new PJFF. The new ductwork will bypass the existing ESPs.
- Ductwork will exit the outlet at the PJFF and bifurcate in route to both inlet flanges of the ID fans.
- Ductwork above the ID fan inlets will be tied to the existing ductwork leading the NFPA 85 vent on the old chimney. Isolation dampers will be installed to close the duct to the vent during normal operation.

All new ductwork will be supported independently or on other new structures where existing ductwork supports cannot be incorporated. Ductwork will be of carbon steel construction and unlined, since temperatures and conditions upstream of the wet scrubber will not require corrosion-resistant liners. Expansion joints, slide plates, and anchor points will be provided where required to ensure gastight operation under all operating temperatures without inducing unacceptable stresses into the interfacing equipment.

4.0 Terminal Point List

The Unit 3 Ductwork terminal points list is summarized as follows, pending final confirmation at time of detailed design:

- Flange in ductwork downstream of the Unit 3 air heaters (two required)
- PJFF inlet (one required)
- PJFF outlet (one required)
- ID fan inlets (two required)
- NFPA 85 vent inlet (one required)

Modifications, Interfaces, and Tie-Ins Description
Unit 3
Fly Ash

1.0 Introduction

The purpose of this description is to describe the conceptual interface between the Brown Ash Systems and the new Air Quality Control System (AQCS) Fly Ash System. Actual interfaces will be determined during detailed design.

2.0 Description

2.1 Description of Existing Infrastructure

At time of this report, a dry landfill for onsite ash storage is under construction at E. W. Brown. It is intended that ash from the three units at Brown will be transported dry to this landfill via a new pneumatic ash system to be installed as part of the Phase II AQCS modifications. The current fly ash handling system will be completely replaced by the new system and the existing system will have no impact on the new one.

2.2 Description of New Infrastructure

A new PJFF system, including PAC injection, will be installed at Unit 3 as part of the Phase II construction. The ash collected from the Unit 3 PJFF and any other new Unit 3 pickup points will be transferred via a separate new pneumatic system. The new system will consist of blowers and supporting equipment located in the Unit 3 Fly Ash Handling Building and a new pipeline from the PJFF area to new ash storage silos. The new silos will be common to the three units and located adjacent to the landfill serving all three units. Ash reaching the storage silos will be conditioned and placed in trucks for transport to the working face of the landfill, deposition, and compaction.

3.0 Interface

The system proposed as part of the Phase II modifications would be completely independent of and have no interface with the existing fly ash handling system

4.0 Terminal Points List

The Unit 3 Fly Ash System will have the following terminal points:

- Lines running from the PJFF will connect to the common fly ash storage silos at a target box atop the silos.

Modifications, Interfaces, and Tie-Ins Description
Unit 3
Induced Draft

1.0 Introduction

The purpose of this description is to describe the conceptual interface between the existing Brown Induced Draft System and the new Induced Draft System; actual interface will be determined during detailed design.

2.0 Description

2.1 Description of Existing Infrastructure

The existing Induced Draft System consists of two induced draft (ID) fans to maintain furnace draft pressure and to overcome the draft system resistance. The ID fans are driven by two-speed motors with 720 and 900 rpm nominal speed capabilities and corresponding power ratings of 6,300 and 10,750 hp. Inlet vanes are used for flow control. The existing draft system consists of the boiler, air heaters, cold-side electrostatic precipitator (CS-ESP) system, ID fans, a wet flue gas desulfurization (WFGD) system common to all Brown units, and associated ductwork, dampers, and other supporting equipment. A vent to the old Unit 3 stack is also available at the outlet of the CS-ESP system due to NFPA 85 requirements for common equipment such as the WFGD system.

2.2 Description of New Infrastructure

The new Induced Draft System will utilize the existing ID fans and their drive systems designed to maintain furnace draft pressure and to overcome the resistance of the new draft system. The new draft system would consist of the existing boiler, an existing selective catalytic reduction (SCR) system, the existing air heaters, a new pulse jet fabric filter (PJFF) system, the existing ID fans, the existing common WFGD system, and associated new and existing ductwork, dampers, and other supporting equipment. The vent to the old Unit 3 stack would also be included.

3.0 Interface

The inlet of the new flue gas draft system would begin at the connection to the existing air heater outlet outside the existing boiler building. From this ductwork connection the existing CS-ESPs would be bypassed and this new ductwork would travel to the new PJFF system.

The existing ID fans will be connected to the new ductwork at the outlet of the new PJFF system (the end of the new flue gas draft system) and the existing ductwork from the outlet of the abandoned CS-ESP system containing the vent to the old Unit 3 stack. The

ID fan outlet ductwork entering the existing common WFGD system would remain intact. The existing ID fans would continue to control furnace pressure with the new draft system.

4.0 Terminal Point List

The Unit 3 Induced Draft System terminal points list is summarized as follows, pending final confirmation at time of detailed design:

- Ductwork outlet of existing air heaters (new ductwork to PJFF system)
- Ductwork inlet of the existing ID fans (new ductwork at PJFF system outlet)
- Outlet of abandoned CS-ESP system containing vent to old Unit 1 stack (new ductwork at PJFF system outlet)

Modifications, Interfaces, and Tie-Ins Description
Unit 3
AQCS Compressed Air

1.0 Introduction

The purpose of this description is to describe the conceptual interface between the existing E.W. Brown Air Systems and the new Air Quality Control System (AQCS) Compressed Air System. Actual interface shall be determined during detailed design.

2.0 Description

2.1 Description of Existing Infrastructure

The existing air systems provide station air and control air to the existing plant infrastructure.

2.2 Description of New Infrastructure

The AQCS Compressed Air Systems will provide the clean, dry, oil free compressed air at an adequate pressure and adequate capacity for the pulse jet fabric filter, actuators, controls, instrumentation, and other air users in the AQCS addition.

3.0 Interface

A cross tie will be provided between the existing air systems and the new AQCS Compressed Air Systems. A cross-tie with the existing Station Air System will be provided by tying in before the new air filter/dryer skid. In addition, a cross tie with the existing Control Air System will be provided by tying in after the AQCS compressed air receiver. Each cross-tie will be furnished with manual isolation valves.

4.0 Terminal Point List

The AQCS Compressed Air System will have the following terminal points:

- The AQCS Compressed Air System will tie in to the Station Air System near the existing cross-tie with the Control Air System.
- The AQCS Compressed Air System will tie in to the Control Air System near the cross-existing cross-tie with the Station Air System.

Modifications, Interfaces, and Tie-Ins Description
Unit 3
Service Water

1.0 Introduction

The purpose of this description is to describe the conceptual interface between the E.W. Brown Service Water System and the new Air Quality Control System (AQCS) Service Water System. Actual interface shall be determined during detailed design.

2.0 Description

2.1 Description of Existing Infrastructure

The existing Service Water System withdraws river water from Herrington Lake through the screenhouse intake structure and provides cooling, wash, makeup, fire protection, quench, seal, and sluicing water to all E.W. Brown station users. The screenhouse intake structure includes low pressure and high pressure service water pumps and traveling water screens.

2.2 Description of New Infrastructure

The Service Water System will extend existing service water systems for hose stations, makeup, and seal water for equipment in the AQCS areas. The Service Water System will also be used for wet unloading of fly ash at the common Fly Ash Handling System. Existing service water quality will be sufficient to protect the AQCS systems.

3.0 Interface

A service water connection shall be supplied between existing Service Water System and AQCS Service Water System. A possible connection would be to use one of the existing fly ash sluice lines. The fly ash sluice water lines will be abandoned during the AQC additions and may be reused. Actual interface will be determined in detailed design.

4.0 Terminal Point List

The AQCS Service Water System will have the following terminal points:

- The AQCS Service Water for Unit 3 will tie in at an appropriate pipeline connection point on the existing low pressure service water header or main branch.