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DRAFT

REMEDIAL ACTION WORK PLAN

FOR

RADON CONTROL SYSTEM (RCS) PHASE 1 OPERATION

REVISION 1

JUNE 2001

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

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1 RCS PHASE 1 OPERATION

1.1 Purpose / Scope of RCS Phase 1 Operation

The Radon Control System (RCS) is designed to provide Best Available Technology (BAT) control of particulate radionuclide and radon emissions from Silos 1 and 2 and from facilities related to the Silos 1 and 2 Accelerated Waste Retrieval (AWR) Project.

The purpose of Phase 1 operation of the RCS is to reduce radon concentrations in the headspaces of Silos 1 and 2 prior to construction activities above the Silo domes. The criterion for Phase 1 operation is to maintain the radiation field on the surface of the domes of Silos 1 and 2 below 10mrem/hour in order to allow Phase 1 construction. Construction activities dependant upon RCS Phase 1 operation include construction of the waste retrieval superstructure, penetration of the Silo 1 and 2 domes, and installation of the risers for connection of Silos 1 and 2 to the waste retrieval equipment enclosures.

1.2 Description of RCS Phase 1 Operation

The design, operation, and control of the RCS are specified in detail in the Silos 1 and 2 Accelerated Waste Retrieval Remedial Design (RD) Package. Appropriate information from the RD Package is summarized in the remainder of Section 1 of this RA Work Plan.

The process flow and emission control equipment for the RCS are depicted in detail on Process Flow Diagram (PFD) drawings in the Appendix to this RA Work Plan.

The RCS process employs air conditioning, dehumidification, carbon adsorption, and HEPA filtration to minimize emissions of radon and other contaminants. The RCS System is designed to ultimately provide ventilation and air emission control for the following sources:

- Silo 1 and Silo 2
- Silo Waste Retrieval System
- Decant Sump Waste Retrieval System
- Transfer Tank Area (TTA) Tanks
- TTA Waste Retrieval System, and
- Final Remediation Facility (outside the scope of the AWR Project)

RCS Phase 1 process is designed to treat air ventilated from the headspace in Silos 1 and 2 for radon removal. The purpose of this treatment is to reduce headspace radon concentrations, and thereby radiation exposure rates above the silo domes, to allow construction activities in the immediate vicinity of the domes. The primary treatment of the air involves the adsorption of radon in the active carbon adsorption beds.

The RCS process flow for Phase 1 operation starts with the vacuuming of up to 1,000 cfm of air from Silos 1 and 2 headspace. During Phase 1, temporary flexible hoses will be

routed over the silo berm to connect the Silo 1 and 2 headspaces to the RCS. This air is transferred through one of the redundant roughing filters for particulate removal and then to one of the redundant Desiccant Dryer Systems. In the Desiccant Dryer System the air is cooled and dehumidified to enhance the dynamic adsorption capacity of the activated carbon. The air is then transferred to the Carbon Bed System to remove radon. Four Carbon Beds, capable of treating up to 500 cfm each, are available. From the Carbon Beds the air is passed through one of the redundant HEPA filter to one of the redundant recycle/exhaust blowers, which is the mechanism used to move the air through the RCS system. Finally the treated air is either returned to the silos or, as necessary to maintain negative headspace pressure, discharged through the exhaust stack. The treated air returned to the silos is used for "sweep ventilation" purposes.

The RCS will operate in this mode to reduce radon concentration levels inside the silo headspaces to levels that will allow safe access for work activities in the silo area. The design flowrate for the ducting system for the ventilation of Silos 1 and 2 is based upon withdrawing up to 500 cfm from each silo during Phase 1 operations. To the extent practical, the system will be operated in a 'recycle' mode where all or most of the air is withdrawn from the Silo circulated through the RCS, and discharged back into the Silo. The airflow discharged to the environment through the exhaust stack will be minimized to the amount necessary to maintain negative pressure (e.g., during dome penetration and riser installation) and to provide effective operation and control of the system.

The RCS design also includes the flexibility to reduce flow from one silo in order to increase the amount of air exhausted from the other silo in service. This capability may be used during silo penetration and riser installation. During initial penetration of the dome of one of the silos, the flows will be adjusted as necessary, and some flow will be exhausted from the stack, to assure the necessary negative pressure is maintained in the silo being penetrated.

Phase 1 operation of the RCS will be established prior to accomplishing initial penetration of the Silo domes. During penetration and modification of the manways, the RCS will be operated to maintain negative pressure in the headspace and assure airflow into the silo through the manways. In this manner, potential emissions to the environment will be directed through the RCS for treatment.

1.3 Control of RCS Phase 1 Operation

The philosophy for control of RCS Phase 1 operation focuses upon controlling two key process parameters: system operating pressure and radon emissions.

Detailed discussion and design of process controls for the RCS, including Piping and Instrumentation Diagram (P&ID) drawings, detailed descriptions of instrumentation and control equipment, setpoints, alarms and alarm responses, is provided in the Remedial Design Package for the Silos 1 and 2 Accelerated Waste Retrieval Project. This detailed information is summarized in the following sections.

The RCS Process has been designed so that its operation can be monitored and controlled remotely through the use a Programmable Logic Controller (PLC) / Human-Machine Interface (HMI) computer. An emergency diesel generator is located on a pad just north of the RCS. If main power is lost, the emergency generator will automatically start up to provide uninterrupted power to the RCS. All valves, dampers, and other controls will operate normally under back-up power.

The PLC programming is designed to:

- Automatically monitor and control the unit operations within the RCS operating equipment to ensure correct operating conditions are maintained,
- Automatically switch between redundant process trains when operational, maintenance, or mechanical problems occur,
- Initiate carbon bed isolation and/or recirculation mode upon detection of an out-of-parameter radon level from radon monitoring instrumentation,
- Enunciate warning status alarms to inform operational personnel that conditions exist within acceptable design parameters, but outside desired operating conditions, and
- Enunciate emergency status alarms and automatically initiate system shutdown if conditions exist that are outside design parameters (e.g. unrelieved high-pressure in silos)

1.3.1 In-line Radon Controllers

The In-line Radon Monitors are located in the ductwork prior to the Desiccant Dryer System and downstream of each of the four Carbon Beds to track the efficiency of the Carbon Bed System to remove radon. The individual carbon bed radon monitors are also used to control the flow of ventilated air to the Carbon Bed. In the event that an out-of-parameter high alarm condition is detected, the adjusting of the opposed blade damper on the inlet side of the carbon bed will automatically reduce the airflow through the affected bed. If the performance of the bed continues to degrade and an out-of-parameter high-high alarm is activated, the affected carbon bed discharge damper will close, taking it off-line. The HMI screen will provide information to the operator on the radon levels, the position of valves and any out-of parameter alarm conditions.

1.3.2 Process Pressure Controllers

The RCS Process has been designed so that equipment and associated ductwork that handle untreated air operates under negative pressure. The Process Pressure Controllers are used to monitor and control pressures throughout the RCS Process to ensure it operates within design parameters.

Pressure Controllers monitor differential pressures around processing equipment, (e.g. desiccant dryers, carbon beds and HEPA filters), inside storage tanks (e.g. silos 1 and 2, Hold-up Tanks and Transfer Tanks) and the recycle exhaust fans pressure. Differential Pressures around process equipment is primarily used to monitor for high pressures, which could indicate blockage of air through the equipment. Differential Pressures inside storage silos and tanks are primarily used to control air flows into and out of the silos using the opposed blade dampers. (For more detail, see Section 1.3.3) Differential Pressure on the recycle/exhaust fan is used to control the operation of the make-up air and stack opposed blade dampers.

The HMI screen will provide information to the operator on the component differential pressures, automatic positioning of the opposed blade dampers and out-of-parameter alarm conditions. These out-of-parameter alarms can be critical since they can shutdown individual process equipment and the entire RCS process. .

1.3.3 Process Flow Controllers

The Process Flow Controllers are located throughout the RCS Process, starting at each silo, one each of the four Carbon Beds, on the Make-up Air duct, on the Stack Exhaust duct and on the Recycle duct. The PLC/HMI uses information provided from the flow controllers to balance and control air flow through the RCS Process. The silo flow controller is used to adjust the flow of air to and from each silo by operating the opposed blade dampers during normal operation. The carbon bed flow controllers are used to balance flow through the operation carbon beds. The flow controller on the Make-up Air and Stack are used to monitor fresh air into the system and processed air exhausted from the system. The recycle flow controller is used to control the operation flow of air returned to the silos and operation of the recycle/exhaust fan.

The HMI screen will provide information to the operator on the volume of air, along with automatic positioning of the opposed blade dampers.

1.3.4 Air Moisture Monitors

In order to maintain the effectiveness of the activated carbon to remove radon, the humidity or moisture content of the air entering the carbon bed is a critical component. For this reason, Air Moisture Monitors will be installed to monitor the moisture content of the air leaving the silos, the air leaving the desiccant system and the air leaving the carbon bed. The HMI screen will provide information to the operator on the air moisture content and high level alarms to alert the operator of out-of-parameter conditions. Monitoring of moisture content at these locations will ensure that excess moisture is detected, and that corrective action is initiated, to minimize effect on the radon removal efficiency of the carbon beds.

High moisture in the air discharged from the desiccant unit may indicate that it is not operating properly require that flow be switched to the other desiccant unit. High moisture on the carbon bed discharge indicates that a carbon bed may need to be isolated and dried to regain its efficiency.

1.3.5 Temperature Monitors

As with the air moisture content, the air temperature effects the efficiency of radon adsorption by the activated carbon. Temperature Monitors have been designed for installation in the RCS Process to monitor the air temperature leaving the silos, leaving the desiccant dryer system and leaving the carbon beds. The HMI screen will provide information to the operator on the air temperature and high level alarms to alert the operator of out-of-parameter conditions. Monitoring of temperature at these locations will ensure that out of specification temperature is detected, and that corrective action is initiated, to minimize effect on the radon removal efficiency of the carbon beds.

1.3.6 Pressure Control in the Silos 1 and 2 Headspace

During Phase 1, the headspace air is withdrawn from Silos 1 and 2 and transferred to the RCS for treatment. The desired pressure condition is maintained by using an induced-draft, automatically, controlled fan and damper system.

The dampers and the associated instrumentation used for control of Silo pressure are depicted on Figure 1-1. The primary dampers consist of a silo supply damper, a silo exhaust damper, a make-up air damper, and an exhaust stack damper. A pressure differential transmitter provides indication of the pressure inside the silos to the Human Machine Interface (HMI).

During normal pressure operations (range ≅ 0 to −1.0 inches WG), flow from the silos through the silo exhaust damper will be monitored against the desired setpoint for the exhaust flow transmitter. The supply and exhaust flows will be closely controlled to ensure that the exhaust flow rate from the silos will be greater than the supply flow rate, which will maintain a negative pressure within the silos. Offset flow control will be overridden in the event of pressures outside the operating range, either high or low.

When a pressure above the target operating range is detected in the silo, the silo supply damper will begin to close immediately. If pressure outside of the operating range remains after the silo supply damper has closed completely, thus resulting in an 'exhaust-only' mode of operation, the opening of the silo exhaust damper will continue to increase until the operating range is recovered. If the pressure reaches or exceeds the high-high set point for the pressure differential transmitter (> 0.20 inches WG), then bypass dampers will automatically open fully to increase flow to the RCS and provide additional pressure relief.

The RCS will be automatically shutdown if the pressure inside the silo exceeds 0.45 inches WG. In the event of a shutdown of the RCS, opposed blade-modulating dampers for silo exhaust and exhaust stack will receive a signal from the PLC to open to 100% to allow for diffusion through the RCS to the stack. The make-up air damper and the silo supply damper will receive a signal to close upon system shutdown. When normal operating pressures within the silos have been re-established following a pressure upset, control of the RCS will be returned to the offset flow control system.

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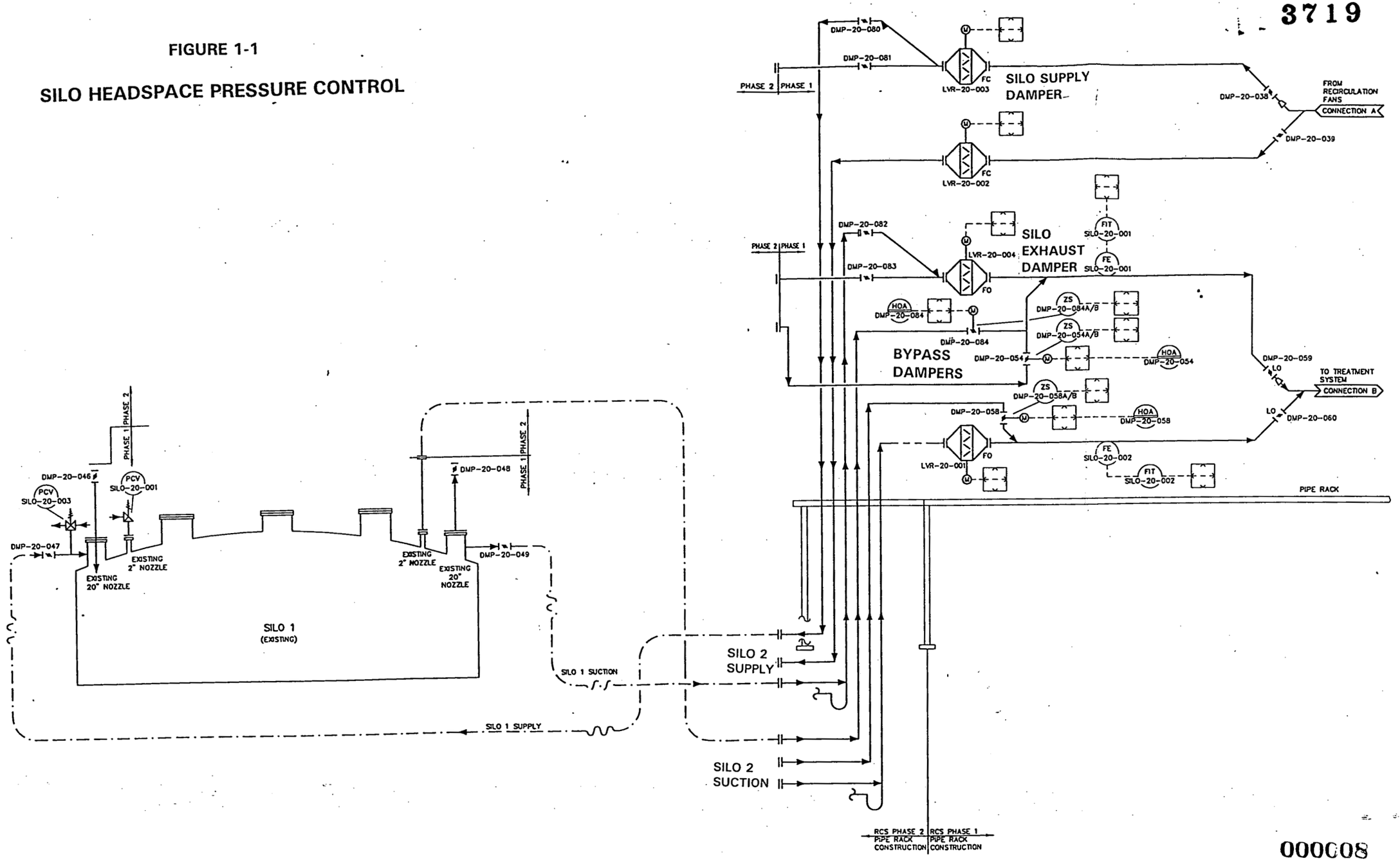
FIGURE 1-1

SILO HEADSPACE PRESSURE CONTROL



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TITLE	
RADON CONTROL SYSTEM PHASE 1 SCHEMATIC	
SIZE D	SCALE NONE
DWG. NO. SKFMD046	

FILENAME: SKFMD046.DWG

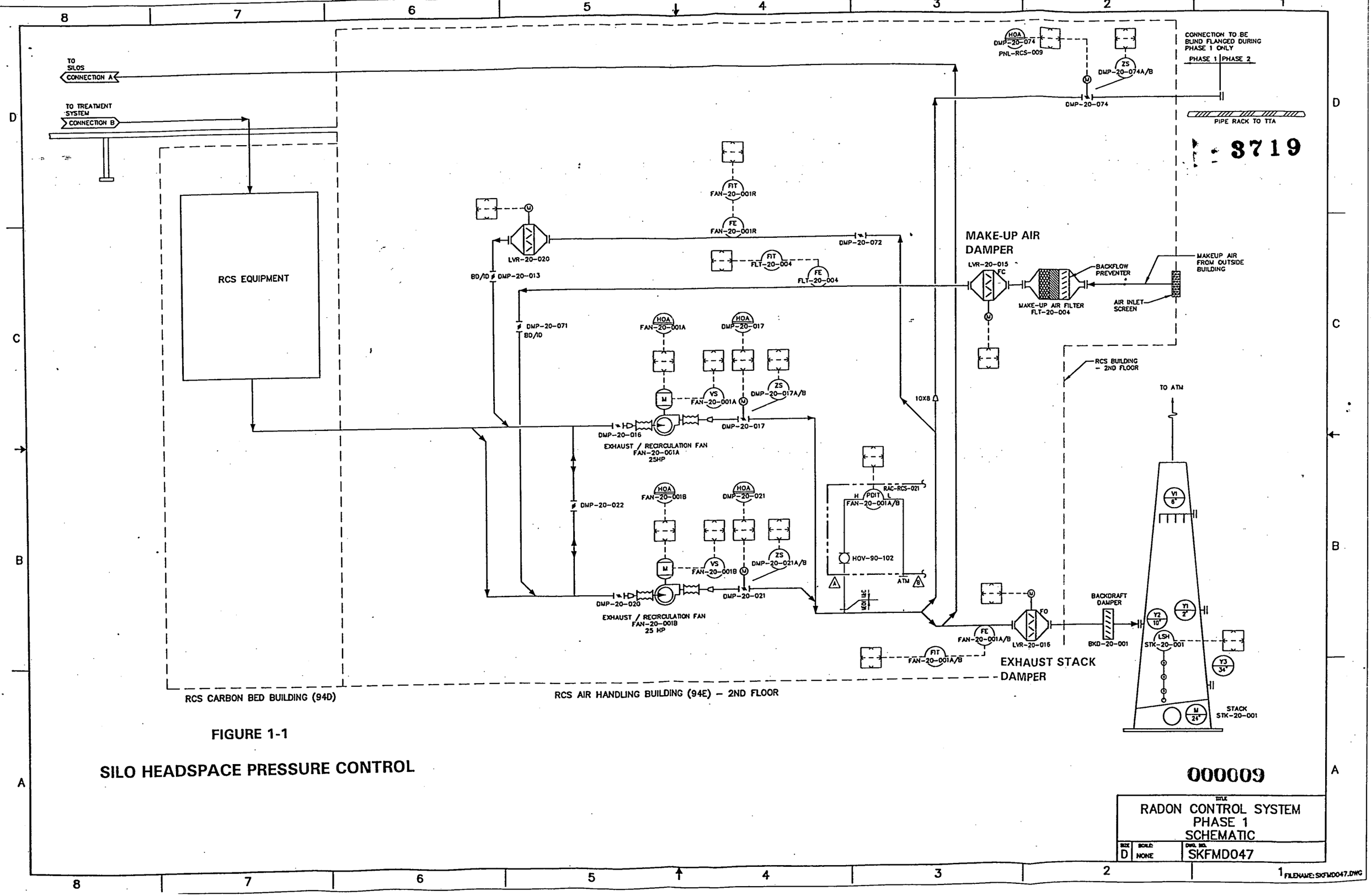
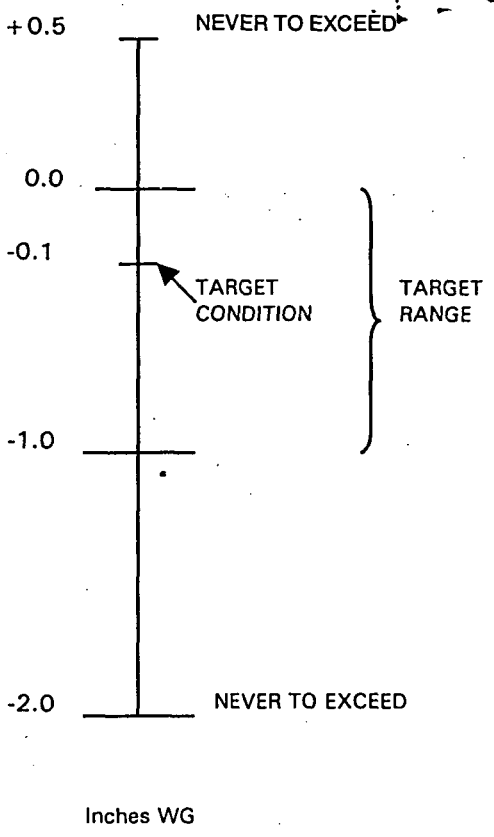


FIGURE 1-1

SILO HEADSPACE PRESSURE CONTROL

As shown in the Target Headspace Pressure diagram, the allowable pressure range for the silo headspaces is between 0.5 and −2.0 inches WG. The targeted range of headspace pressure range during normal operation is 0.0 to −1.0 inch WG. The target operating pressure during Phase 1 will be −0.1 inches WG. The target pressure may be adjusted to a setpoint nearer atmospheric pressure if the structural nature of the silos (large crack areas = high infiltration rate) necessitates. Normal operations will occur within the targeted range.



Setpoints for the subsequent phases of operation (Phases 2A, 2B, 2C, and 3) will be optimized during Full-scale Mock-up System activities conducted on Silo 4 during Phase 1 RCS operations.

If the pressure in the silos decreases below the low end of the operating range (-1 inch WG), the RCS will again operate using a master/slave pressure control scheme. If a negative pressure below −1 inch WG occurs, then the silo supply damper will begin to open to 100% capacity. If unrelieved vacuum outside of operating range remains after complete opening of the silo supply damper, the silo exhaust damper will begin to close until the operating range is recovered.

Additionally, an emergency vacuum/pressure relief device is provided for the silos. If a vacuum pressure beyond −2 inches WG occurs in the silo, it will result in the opening of a vacuum relief valve that is located on the silo. Likewise, if a positive pressure of 2 inches WG occurs in the silo, it will result in the immediate opening of a pressure relief valve to mitigate this condition.

1.3.7 Desiccant Dryer Unit

The exhausted air from the silos proceeds to one of the redundant Desiccant Dryer Units, where the air is conditioned to enhance the dynamic adsorption capacity of the activated carbon. Each desiccant drying system consists of a pre-cooling coil, regenerative desiccant wheel, post-cooling coil, closed loop reactivation system and a condensate collection and transfer system. The Desiccant Dryer system is designed to provide air at a target relative humidity (RH) of 15% and target temperature of 36°F . The pre-cooling coil cools and dehumidifies the ventilation air prior to entering the desiccant wheel where the air is dehumidified. The temperature of the air exiting the wheel will be 98°F, so it flows

through a post-cooling coil where the air is cooled to the target temperature before exiting the desiccant drying system

The desiccant wheel has a closed-loop reactivation system for regeneration of the desiccant. This reactivation system includes a blower, heater, and condensing coil.

1.3.7.1 Roughing Filter

Prior to the exhausted air entering the Desiccant Dryer System, the air passes through a redundant 95%-efficient roughing filter for particulate removal.

1.3.7.2 Chiller Unit

Chilled water cooling streams for the cooling coils within the desiccant drying system are provided by a set of redundant 50-ton reciprocating chillers located outside the RCS Building on the equipment pad. The chillers are equipped with an expansion tank, air vents, air separators, and chilled water supply pumps to transfer the cooling media to and from the cooling coils within the desiccant dryer systems.

1.3.8 Carbon Bed System

The carbon adsorption system consists of four insulated carbon steel vessels, approximately 16-feet by 11-feet by 11-feet, which contains a total of 160,000 pounds of carbon (40,000 pounds per vessel). Each carbon adsorption vessel is capable of treating up to 500 cfm. Each carbon bed is physically isolated in an individual room.

The four carbon beds are operated in parallel, connected to the 10-inch main duct headers by 8-inch branch duct connections on both the inlet and outlet of the beds. Each bed is aligned with a dedicated inlet and outlet damper for flow control and isolation. Modulating dampers and flow elements provided on the inlet of each bed allow flow to each bed to be reduced or increased on the basis of operations.

1.3.9 Carbon Bed Drying System

In the event a carbon bed needs to be dried to regain carbon bed performance, the RCS has the capability to isolate the individual bed from the others. A take-off stream ranging between 125 and 250 cfm from the recirculation fans will be heated using an inline process heater and passed through the affected carbon beds using an induced draft fan. From this fan the drying air stream is transferred to the RCS for treatment in the carbon beds that remain on line or if the bed is allowed to sit until the radon has decayed adequately, there exists the capability to discharge through the HEPA filters.

1.3.10 Recycle/Exhaust HEPA Filter

The treated air stream from the carbon adsorption system, along with make-up air and recycle fan air, travels next to one of the redundant HEPA filtration unit for particulate

removal. The HEPA filtration system employs "bag-in/bag/out" technology to minimize the potential of releases during filter changes.

1.3.11 Recycle/Exhaust Fan

After the air exits the operating HEPA filter unit, the treated air stream enters the operating redundant recycle/exhaust fan. The recycle/exhaust fans are single-stage, variable speed, and centrifugal-type fans. The exhaust stack and make-up air dampers will operate to provide a constant flow to the silos by maintaining a constant differential pressure in the exhaust header. From this fan the treated air stream is redistributed to the silos or exhausted through the monitored exhaust stack.

1.3.12 Condensate Collection System

Condensate is collected from four locations during RCS Phase 1 operation. These locations are:

- Desiccant Dryer System
- Low-Point Traps on each Silo Flexible Exhaust Duct
- Gravity Drain Trap on combined Silo Exhaust Duct
- Exhaust Stack Sump

The discharge from each of these locations is one of two 3,000-gallon capacity hold-up tanks. The condensate holdup tanks are vented to the RCS process through automatic dampers, which are controlled by tank pressure sensors. These tanks are also equipped with vacuum control valves to let air into the tanks when a vacuum pressure is reached.

1.3.12.1 Condensate Transfer System

Redundant pumps perform the transfer of condensate from the hold-up tanks. During RCS Phase I operation condensate will be sampled and transferred to the FEMP AWWT facility after verification that the liquid meets the AWWT acceptance criteria. the only contaminant expected to be present in the condensate is radon, which will be allowed to decay prior to sampling. For this reason, there is little potential that the condensate will not meet the AWWT acceptance criteria. In the unlikely event that a batch of condensate was to exceed the acceptance criteria, it would be transferred to an available tank (e.g., a filtrate tank) for storage pending transfer to one of the TTA tanks for use as sluicing water during waste retrieval.

1.3.13 RCS Building Ventilation

The building heating and ventilation system for the interior space of the RCS Building is a once-through system. The heating and ventilation system is comprised of separate supply and exhaust systems. The ducted supply air system draws outside air into the building by a Building Supply Fan. Electric duct heater heats the supply air when the outside temperature falls below design conditions of 40°F.

Redundant Building Exhaust Fans ventilate the interior space of the RCS Building. The fans and ducting system maintain the RCS Building at a negative pressure. The RCS Building system is manually balanced. The direction of airflow is from area of low potential contamination to areas of higher potential contamination.

A separate exhaust air register is supplied to each carbon bed area to extract ventilation air in the event of a leak of radon into the carbon bed rooms. This air is transferred to the RCS process for treatment via the carbon bed drying line.

1.4 Environmental Control

The methods and controls used to minimize the environmental impacts resulting from RCS Phase 1 operations are documented in detail in the Operational Environmental Control Plan for the AWR Project, contained in Section 5 of the Remedial Design Package. The following detailed information is documented in detail in the Remedial Design Package and summarized in this section:

- Applicable or Relative and Appropriate Requirements (ARAR) Compliance Matrix
- Radon Control System Performance Calculations
- Storm Water Drainage Plan
- Waste Handling Work Plan
- Silos Projects Environmental Monitoring Plan

1.4.1 Air Emissions Control

To meet the requirements of air emission ARARs, the RCS is designed to provide Best Available Technology (BAT) control, as defined by Ohio Revised Code (ORC) Section 3704.01(F), for radionuclide particulate and radon emissions. The process flow and major pieces of equipment are illustrated on the PFD drawings contained in the Appendix to this RA Work Plan. Flow rates and mass balance data for each of the phases of RCS operation are provided in the Remedial Design Package.

The stack receives the treated RCS ventilation stream from sources associated with the AWR Project and from the building exhaust for the RCS Building. The stack is a 150-foot tapered carbon steel stack that is approximately 6 feet 4 inches at the base and tapers to approximately 3 feet at the top.

The stack is equipped with continuous sampling of the stack exhaust for particulate radionuclides in compliance with Title 40 of the Code of Federal Regulations (CFR), Part 61, Subpart H, and DOE Order 5400.5, Section IV.6.B. In addition, the stack exhaust is continuously monitored for radon. The monitor consists of a probe assembly and a sampling and monitoring rack which are inserted in the stack at an elevation of approximately 61 feet, which corresponds to roughly eight stack diameters downstream of the last flow disturbance in the stack. The probe assembly measures stack flow and sends a signal to the sample rack flow controller. The sample rack flow controller controls the sampling pump in order to matche the flow rate in the sample nozzle with that in the stack. The sample rack also includes a coincidence counter for analyzing the radiation

from the sample collected on a filter paper. The air stream flows through the filter paper is directed through a continuous radon monitor that measures the concentration of radon in the stack effluent. Analytical instruments will be provided for separately distinguishing radon daughters from other alpha and beta emitting radionuclides.

Monitoring data is continuously collected and analyzed by a local computer, then transferred to the AWR Project Control Trailer for display and recordkeeping. Alarm circuits are available to alert the AWR Control Room operator if an out-of-specification condition exists in the stack. In the event that an out-of-parameter condition is detected, an alarm is enunciated and appropriate action is automatically initiated, such as switching the HEPA filters being used, recirculating the process flow to the silos, reducing the airflow in the RCS, or shutting down the RCS. Operating controls for the entire system are included in the AWR Control Room. These controls are presented in greater detail in the RD Package.

In addition to the automatic actions taken by the control system, the system calls—using telemetry—a designated number to alert the on-call responsible person that an out-of-parameter condition exists.

Detailed analysis of radon emissions during Phase 1 operation of the RCS is documented in the Radon Control System Performance Calculations included in the RD Package. These calculations include dispersion to predict the onsite and offsite impact of maximum emissions from the RCS. These data are summarized below.

Stack Exhaust	0.85 pCi/l
Onsite Weekly Average	6.32E-06 pCi/l
Fence-line Annual Average	1.89E-06 pCi/l

To ensure that applicable offsite emission limits (annual average 0.5 pCi/l radon above background; 10mrem/year offsite EDE excluding radon) and onsite worker protection standards are not exceeded, setpoints have been calculated to initiate shutdown of the RCS well before the most limiting criterion is reached. These setpoints will be fine-tuned during initial RCS phase 1 operation. The initial high-high setpoint for the radon stack monitor has been calculated to automatically initiate shutdown at half of the concentration which would equate to 0.2 WL onsite during worst case meteorological conditions. Modeling indicates what the fence line impact of this stack concentration would be 0.0128 pCi/l, or 2.5% of the 0.5 pCi/l criterion. Similarly, the initial hi-high setpoint for the particulate monitor has been calculated to initiate shutdown at a level significantly below the NESHAP Subpart H criterion. Modeling indicates that constant emissions at the high-high setpoint ($5X10^{-12}$ μCi/ml) would result in a maximum EDE of 0.028 mrem/yr (less than 0.3% of the NESHAP Subpart H standard.

Data from the continuous stack monitors, as well as data from ambient air monitors, will be used to demonstrate that emissions from the AWR operations are within specified criteria. For example, the radon emissions measured by the continuous radon monitor in the RCS stack will be used to calculate the resulting radon concentration at offsite receptors to demonstrate that the 0.5pCi/l annual average above background criterion has

been met. These modeled values will be compared to ambient concentrations measured at fence-line air monitors to provide validation of the modeling results.

As described in detail in the AWR Project RD Package, enhancements have been implemented to the existing site monitoring program to address air, direct radiation, and project wastewater (i.e., slurry wastewater and decontamination wastewater) monitoring for the AWR Project. These enhancements have been designed to focus on monitoring Silos 1 and 2 headspaces, environmental radon levels in the vicinity of the silos, as well as radon levels at the site fenceline.

Data from selected radon monitors will be accessible via a secure Internet address. The data will include the date and time of the most recent transmission, location, and latest radon concentration. This data will be sent from the monitoring instrumentation without review or validation. Data review and validation will be conducted in a manner consistent with the current methods used under the IEMP Fluor Fernald Inc. radon monitoring program.

Data from the ambient radon and particulate monitors will be reported in the IEMP quarterly status and the Integrated Site Environmental Report (ISER). In addition, other project-specific data may be reported as necessary in IEMP quarterly status reports and the ISER to explain significant changes in the data from the fenceline IEMP environmental monitoring program.

1.4.2 Wastewater Control

Criteria for transfer of wastewater from AWR operations to the Advanced Wastewater Treatment (AWWT) facility are identified in Table 1. Wastewater generated from RCS Phase 1 operation will be limited to liquid condensed from the gas steam generated at the RCS. This condensate will be transferred to one of two 3000-gallon shielded hold-up tanks, and held up for up to 40 days to allow radon to decay to levels acceptable for transfer. After the radon has decayed to an acceptable level, the condensate will be sampled to assure that it meets the criteria for transfer to the Advanced Wastewater Treatment (AWWT) facility and pumped to the existing High Nitrate Tank for holding pending transfer to the AWWT.

In addition to the criteria identified in Table 1, no listed or characteristic hazardous waste, nor wastewater containing concentrations of RCRA metals (e.g., lead) above the RCRA toxicity characteristic (TC) limits, may be discharged to the AWWT without appropriate pretreatment.

1.4.3 Secondary Waste Management

Potential secondary waste streams resulting from RCS Phase 1 operation will consist of filter elements and miscellaneous waste streams, such as PPE, generated during operation and maintenance activities. The management of secondary waste is described in detail in the Waste Handling Work Plan included in the RD Package for the AWR Project. All

TABLE 1

CRITERIA FOR AWR LIQUID DISCHARGE TO AWWT

METALS PARAMETER	DISCHARGE LIMIT (kg/day)	DISCHARGE LIMIT (lb/day)	RADIONUCLIDE PARAMETER	DISCHARGE LIMIT (pCi/L)
Arsenic (As)	0.14	0.3	Actinium-227 (^{227}Ac)	10
Barium (Ba)	2.7	6.0	Lead-210 (^{210}Pb)	30
Cadmium (Cd)	0.006	0.013	Polonium-210 (^{210}Po)	80
Chromium (Cr)	0.14	0.3	Protactinium-231 (^{231}Pa)	10
Lead (Pb)	0.03	0.07	Radium-226 (^{226}Ra)	100
Mercury (Hg)	0	0	Radium-228 (^{228}Ra)	100
Selenium (Se)	0.03	0.06	Thorium-228 (^{228}Th)	400
Silver (Ag)	0.0014	0.003	Thorium-230 (^{230}Th)	300
Iron (Fe)	0.3	0.06	Thorium 232 (^{232}Th)	5 ppm
			Uranium-234 (^{234}U)	5 ppm
			Uranium-234/236 ($^{235/236}U$)	
			Uranium-238 (^{238}U)	
MAXIMUM FLOW				5 gpm (7,200 gpd)
TOTAL SUSPENDED SOLIDS (TSS)				1,000 ppm

Secondary waste will be segregated, characterized, packaged, and dispositioned in accordance with site procedures. Based upon the Final Design, a Project Waste Identification and Disposition (PWID) Report will be prepared in accordance with procedure EW-1021, *Preparation of the Project Waste Identification and Disposition (PWID) Report.* The PWID will document the anticipated waste streams, generation rates, and Fluor Fernald-approved disposition for secondary waste resulting from AWR operations. As waste is generated, the volumes of each waste stream will be tracked against the PWID, and the PWID will be updated.

2 RCS PHASE I PRE-OPERATIONAL ACTIVITIES

Construction turnover of the RCS processing equipment will occur after the verification of construction completion and the testing of twelve (12) distinct Construction Turnover Packages. These turnover packages will consist of facilities and processes that are required for the operation of the RCS Phase 1 System. Verification of construction completion will include physical examination to certify that the facilities and associated equipment have been installed per the design documents. The testing of the RSC Phase 1 System will be conducted in two phases:

2.1 Construction Acceptance Testing (CAT)

Each component (valves, instruments, pipes and equipment) in a Construction Turnover Package will be individually tested. Typical CAT testing includes hydrotesting, meggering, valve stroking, motor rotation, instrument calibration and control system loop checks. CAT Checklist Sheets that list all of the components in a Package will be used to document completion of all CAT activities.

2.2 Integrated Construction Acceptance Testing (ICAT) and Systems Operability Testing (SOT)

Integrated Construction Acceptance Testing (ICAT) will be conducted in two phases, Package ICAT and System ICAT/SOT.

2.2.1 Integrated Construction Acceptance Testing (ICAT)

After all CAT tests have been completed on a Turnover Package, a Package ICAT will be performed. The intent of the Package ICAT is to test the performance of all components of Construction Turnover Package in a running/dynamic mode to verify control logic, interlocks, alarms, set points, etc. Turnover Packages will be tested in a closed loop configuration using non-contaminated surrogate material where required.

During the Package ICAT's, Technical Start-up personnel will conduct the tests with Operations and Maintenance personnel participating as observers.

2.2.2 ICAT/System Operability Testing (SOT)

After all of the Package ICATs have been successfully completed, a System ICAT/SOT will be performed. The purpose of the System ICAT/SOT is to test the combined Turnover Packages that comprise the RCS Phase 1 System to verify the overall performance against the specified process design parameters and to verify the Standard Operating Procedures (SOP's). Similar to the Package ICAT, the System ICAT/SOT will be conducted in a closed loop configuration (not attached to the Silos) using non-contaminated materials as required.

During the ICAT/SOT, Operations and Maintenance personnel will conduct the testing with Technical Start-up personnel acting as advisors.

2.3 Operational Readiness Review

At the completion of the physical testing of the RCS Processing System, a management review will be conducted. The purpose of this review is, but not limited to the following:

1. Ensure that the operations and support personnel have been trained and have a level of knowledge to safely and effectively operate the RCS process.

2. Ensure there are adequate and correct procedures for normal and emergency operations. Also that procedures include safety limits for operating the process.

3. Ensure design limits and parameters are known and available to operations and support personnel.

4. Ensure that personnel are knowledgeable of potential problems in the operating of processing equipment and how to respond to these situations.

5. Ensure that personnel understand duties and responsibilities of their assigned position.

6. Ensure that a system exist to ensure any changes to the process are made after review and approval of appropriate personnel.

7. Ensure that adequate personnel staffing are available to operate and support the operation of the RCS process.

8. Ensure that interface between RCS processing personnel and personnel not directly involved in the operation is addressed and implemented.

Once this assessment is completed, approval will be given to start Phase 1 operation of the RCS process.

3 FULL SCALE MOCKUP SYSTEM

The Full Scale Mockup System (FSMS) is a system of components, installed at Silo 4 to provide operator training and operability testing of the Silos Waste Retrieval System (SWRS) and other critical AWR operations. The FSMS is comprised of the following major features:

- FSMS Surrogate tank
- RCS Blower Skid
- Equipment Deck
- Transfer piping
- Diverter Valves
- Surrogate Dewatering Tank
- Dewatering Pump and Duplex Filter
- Sluicers
- Sluicer Enclosure
- Slurry Pump
- Slurry Pump Enclosure
- EMMA™
- EMMA™ Enclosure
- Conditioning and transfer System (CATS)
- High-pressure Pump Skid
- Silo retrieval End-Effector (SREE)
- Silo Debris Retrieval System (SDRS)

Additional detail concerning the design of the FSMS equipment is provided on the AWR Project Remedial Design Package.

The FSMS will be utilized for two distinct phases of testing. Full-Scale Mockup (FSM) refers to the operability testing that will take place prior to initiating waste retrieval operations to demonstrate the operability of critical aspects of AWR project operations in a non-radioactive environment.

FSM operability testing will:

- Demonstrate effective operation of critical systems;
- Collect lessons learned and necessary operational data to support development of final procedures, operating parameters, setpoints, etc.;
- Identify necessary pre-operational process, equipment, or procedure modifications; and
- Provide necessary information to support detailed planning and schedule development, to be documented in the Remedial Action Work Plan for Waste Retrieval Operation, for initiation of waste retrieval.

After completion of FSM operability testing, tie-ins between the FSMS and the remainder of the AWR system will be removed. The FSMS will remain as a stand-alone system and

will be continue to be utilized for process optimization, troubleshooting, and operator training throughout AWR Project operations.

3.1 Criteria for FSM Testing

The following are the critical aspects of AWR operations to be successfully demonstrated prior to proceeding with implementation of the startup process.

- Silo Integrity – The retrieval operation has been demonstrated not to put any load on the silo walls or dome, with the exception of RCS Phase 1 connections and the Silo lighting and camera system. The FSM will demonstrate that operating procedures, equipment, and equipment control functions will prevent degradation of silo integrity.

- Retrieval Operation– All components of the retrieval system have been demonstrated to function as designed, and not to add unnecessary complexity to operation, or maintenance requirements. The sluicing system and EMMA™ arm will be tested both individually and together as an integrated system.

- Discrete Object Removal – Successful removal of discrete objects from Silo 4 has been demonstrated using the arm and Debris Retrieval System (DRS).

- Water Management – Necessary water balance data has been collected under various operating modes to allow operating procedures to be fine-tuned as necessary to minimize generation of excess water for treatment and discharge.

- Contamination Control – Adequate spray decontamination has been demonstrated using both spray rings and the arm spray nozzle. Adequate ventilation flow has been demonstrated during both insertion and removal events.

- Maintainability – Equipment reliability and in-place maintainability has been demonstrated.

- Headspace Pressure And Emission Control – The ability to maintain negative headspace pressure during all operating modes has been demonstrated, including the ability to manage the effects of equipment ingress and egress. The ability to maintain the specified air velocities across openings when doors, louvers, etc are in the positions corresponding to the various operating modes has been demonstrated. Airflow data demonstrates that necessary total exhaust flows are within design parameters.

- Control System Architecture – Operation of the control system has been demonstrated to be adequate to meet all operation, safety, and environmental control criteria.

- Transfer System Design - All components of the Transfer System have been demonstrated to function as designed.

3.2 Integration of FSM with Waste Retrieval Start-up

The integration of FSM testing with initiation of waste retrieval operations is illustrated by Exhibit 3-1. Once the operability of the critical aspects of the AWR project has been demonstrated, the results of FSM testing will be utilized to support development of a detailed plan and schedule for initiation of waste retrieval operations. Elements to be addressed in this planning will include:

- Final development and fine-tuning of final procedures, operating parameters, setpoints to address lessons learned through FSM testing.
- Completion of any pre-operational process, equipment, and procedure modifications identified as a result of FSM testing.
- Additional process optimization testing using the FSMS in parallel with startup and operations
- Implementation and completion of readiness and startup activities.

The results and significant lessons learned from the FSM operability demonstration, and resulting plan for initiating waste retrieval operation, will be summarized in the RA Work Plan for Waste Retrieval Operation. The RA Work Plan for Waste Retrieval Operation will also propose milestones for waste retrieval.

3.3 Path Forward

The path forward for the AWR Project is currently being reevaluated. This reevaluation includes analysis of operational and technical design issues including the necessary scope of the Full Scale Mockup program. Based upon the results of this evaluation, a Full Scale Mockup strategy document will be prepared to document details on the scope of FSM testing to demonstrate operability of key equipment, and the criteria for determining that such demonstrations are adequate to justify start-up of actual AWR equipment. This document will be provided to OEPA and U.S. EPA for review prior to initiation of FSM operations.

EXHIBIT 3-1

STRATEGY FOR PLANNING AND IMPLEMENTING WASTE RETRIEVAL

	SCHEDULE IN RCS PHASE 1 RAWP ---------->	<-SCHEDULE IN WASTE RETRIEVAL RAWP BASED UPON ---> CRITICAL FSMS RESULTS
FSMS CONSTRUCTION	X----------X	
FSMS CAT / ICAT	X-------X	
FSMS OPERATION I. OPERABILITY DEMONSTRATION	◆----------X	
II. PROCESS OPTIMIZATION / TROUBLESHOOTING	X----------	----------
EVALUATION OF CRITICAL RESULTS / LESSONS LEARNED; DEVELOPMENT OF PLAN & SCHEDULE FOR WASTE RETRIEVAL	X--------X	
RAWP FOR WASTE RETRIEVAL SUBMIT TO EPA	◆	
EPA APPROVAL		X
PRE-op PROCESS, EQUIPMENT AND DOCUMENTATION MODIFICATION	X----------	----------X
READINESS PROCESS	X----------	----------X
STARTUP OF WASTE RETRIEVAL		◆

◆ - Proposed RA Work Plan milestone

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4 MILESTONES

The path forward for the AWR Project is currently being reevaluated. This reevaluation includes analysis of aspects such as contract mechanisms, operational and technical design issues and resulting schedule impacts. A number of Transition Teams have been chartered to address key aspects of the AWR Project in the transition from the current contract approach. A key product of these evaluations will be a revised baseline schedule for completing the construction, start up, and operation phases of the AWR Project. Based upon this schedule, the dates for initiation of FSM testing, and for submittal of the draft RAWP for Waste Retrieval Operations, will be reevaluated. The resulting milestones will be incorporated into a revised RD/RA Schedule to be submitted to U. S. EPA and OEPA for review and approval by October 1, 2001.

The following milestones are proposed for implementation of the activities described in this RA Work Plan:

ACTIVITY	MILESTONE
Submit revised AWR Project RD/RA Schedule to U.S. EPA	October 1, 2001
Initiation of Radon Control System (RCS) Phase 1 Operation	To be specified in RD/RA Schedule
Initiation of Full Scale Mockup (FSM) operability demonstration	To be specified in RD/RA Schedule
Submit draft Remedial Action Work Plan for Waste Retrieval Operation, including a summary of key FSM results and lessons learned, and plan/schedule for initiating waste retrieval, to U.S. EPA.	To be specified in RD/RA Schedule

APPENDIX

PROCESS FLOW DIAGRAMS

20FMD003 – Radon Control System Process Flow Diagram, Silo 2

20FMD004 – Radon Control System Process Flow Diagram, Silo 1

20FMD009 – Radon Control System Process Flow Diagram, Dryers & Air Handling

20FMD007 – Radon Control System Process Flow Diagram, Carbon Beds

20FMD008 – Radon Control System Process Flow Diagram, Hold-up Tanks & Condensate

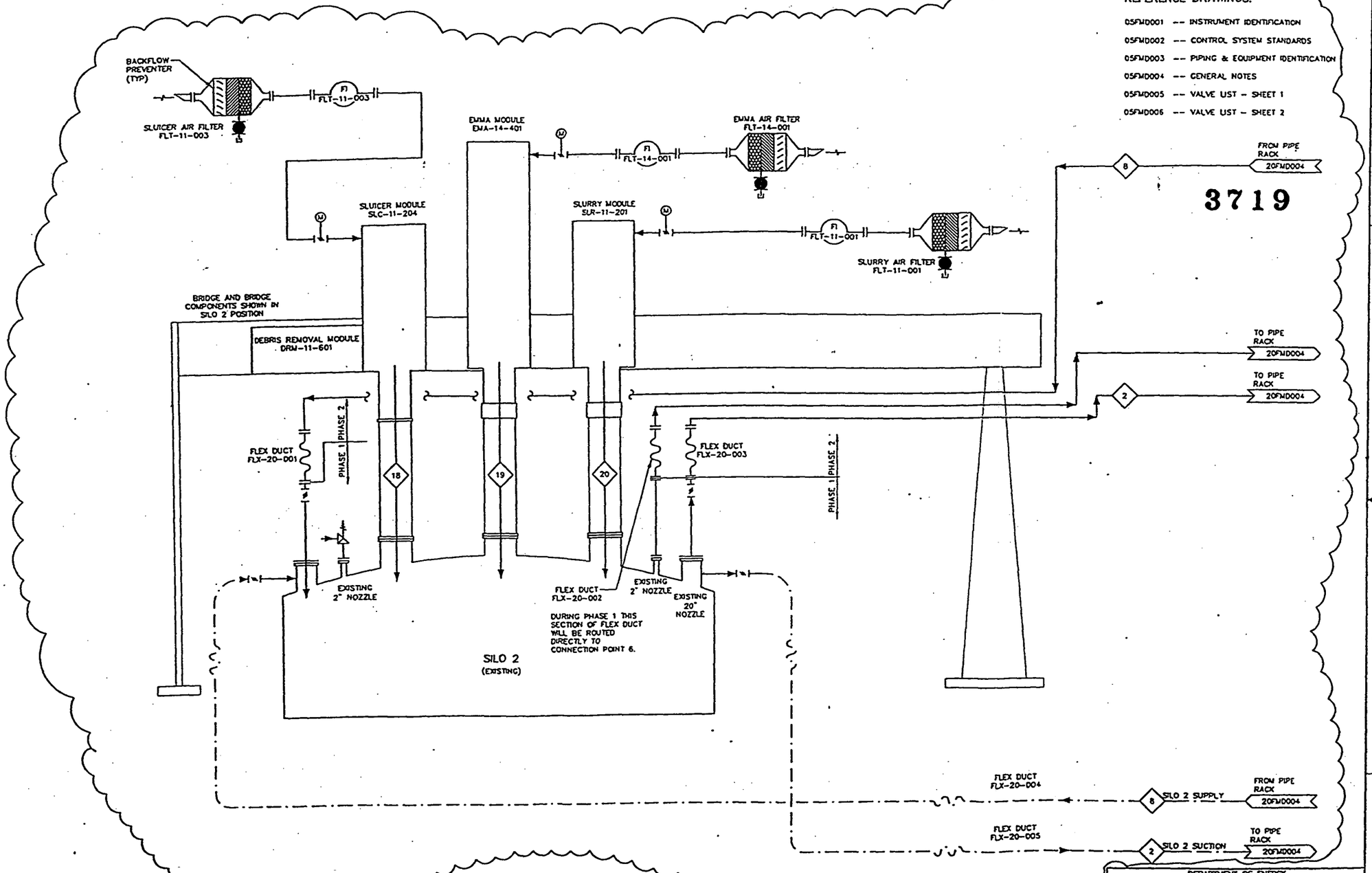
20FMD010 – Radon Control System Process Flow Diagram, Exhaust & Recirc Fans

77FMD003 – Misc Facilities HVAC System HVAC Flow diagram, RCS Bldg Ventilation – 1st Floor

77FMD005 – Misc Facilities HVAC System HVAC Flow diagram, RCS Bldg Ventilation – 2nd Floor

REFERENCE DRAWINGS:

05FMD001 -- INSTRUMENT IDENTIFICATION
05FMD002 -- CONTROL SYSTEM STANDARDS
05FMD003 -- PIPING & EQUIPMENT IDENTIFICATION
05FMD004 -- GENERAL NOTES
05FMD005 -- VALVE LIST - SHEET 1
05FMD006 -- VALVE LIST - SHEET 2



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1	9/07/00	BJD	SWH	KDR	CERTIFIED FOR CONSTRUCTION
0	11/12/99	BJD	KR		PRELIMINARY DESIGN SUBMITTAL

PE: KENNETH D. RICKETT, P.E. NO. E-64418, 5/15/00, REVISION 2

		DATE
DRAWN BY	B J DAVIS	01/07/00
DESIGNED BY	B J DAVIS	01/07/00
CHECKED BY	S W HUNGATE	01/07/00
APPROVED BY	KENNETH RICKETT	01/07/00
APPROVED BY	JOHN LAWSON	01/07/00

DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
SILOS 1 AND 2 ACCELERATED WASTE RETREVAL PROJECT
FERNALD, OHIO
FDF CONTRACT NO. FSC 824

FOSTER WHEELER
FOSTER WHEELER ENVIRONMENTAL CORPORATION

TITLE: RADON CONTROL SYSTEM PROCESS FLOW DIAGRAM SILO 2

SIZE	SCALE	DWG. NO.	REV
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FILENAME: 20FMD003.DW

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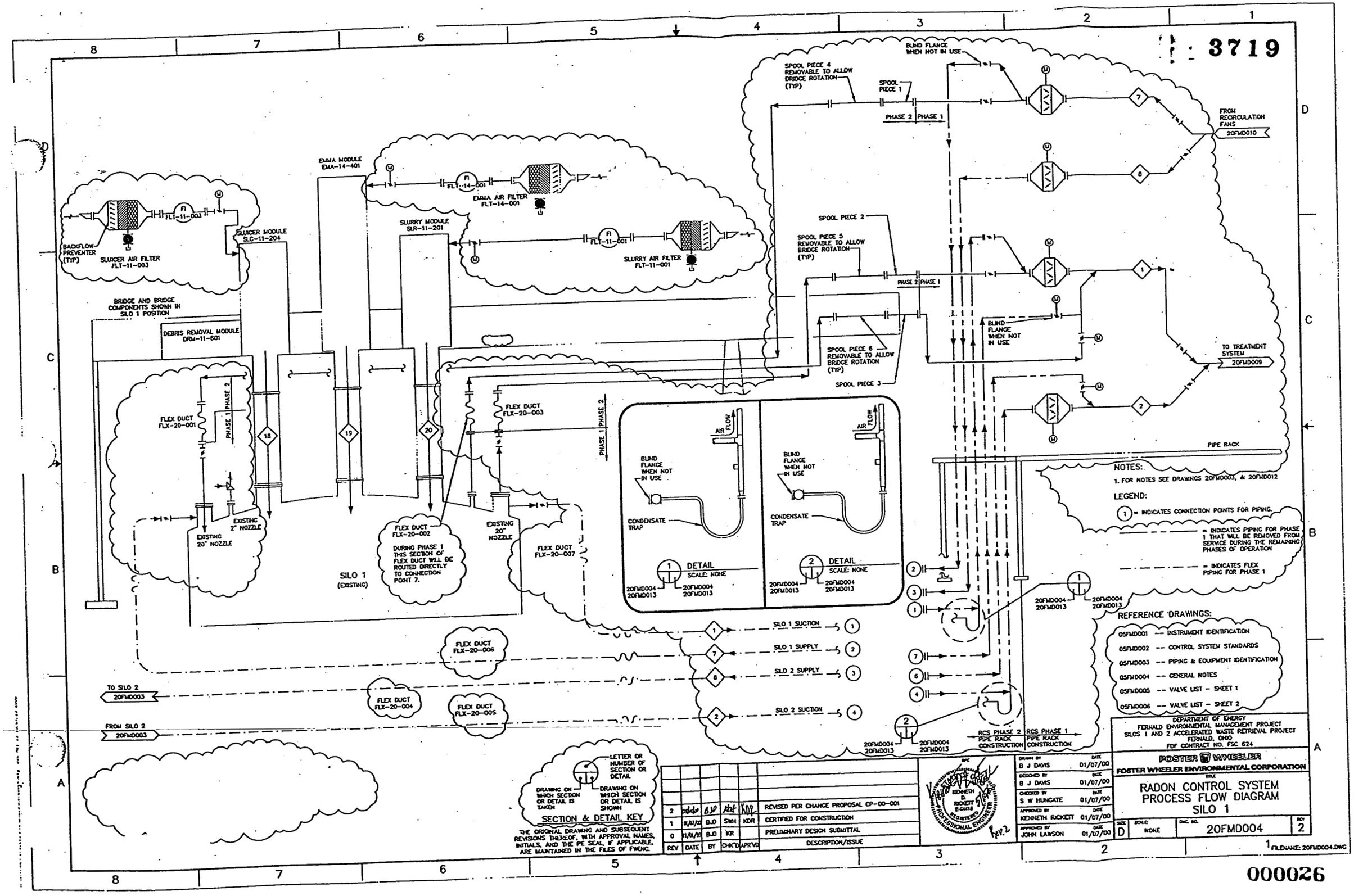
BACKFLOW PREVENTER (TYP)
SLUICER AIR FILTER FLT-11-003
FI FLT-11-003
SLUICER MODULE SLC-11-204
EMMA MODULE EMA-14-401
FI FLT-14-001
EMMA AIR FILTER FLT-14-001
SLURRY MODULE SLR-11-201
FI FLT-11-001
SLURRY AIR FILTER FLT-11-001
BRIDGE AND BRIDGE COMPONENTS SHOWN IN SILO 1 POSITION
DEBRIS REMOVAL MODULE DRM-11-601
FLEX DUCT FLX-20-001
PHASE 1 PHASE 2
EXISTING 2" NOZZLE
EXISTING 20" NOZZLE
FLEX DUCT FLX-20-002
DURING PHASE 1 THIS SECTION OF FLEX DUCT WILL BE ROUTED DIRECTLY TO CONNECTION POINT 7.
EXISTING 20" NOZZLE
FLEX DUCT FLX-20-003
FLEX DUCT FLX-20-007
SILO 1 (EXISTING)
FLEX DUCT FLX-20-006
FLEX DUCT FLX-20-004
FLEX DUCT FLX-20-005
TO SILO 2 20FMD003
FROM SILO 2 20FMD003
SILO 1 SUCTION
SILO 1 SUPPLY
SILO 2 SUPPLY
SILO 2 SUCTION
BLIND FLANGE WHEN NOT IN USE
AIR FLOW
CONDENSATE TRAP
DETAIL 1 SCALE: NONE
DETAIL 2 SCALE: NONE
20FMD004 20FMD013
SPOOL PIECE 4 REMOVABLE TO ALLOW BRIDGE ROTATION (TYP)
SPOOL PIECE 1
PHASE 2 PHASE 1
SPOOL PIECE 2
SPOOL PIECE 5 REMOVABLE TO ALLOW BRIDGE ROTATION (TYP)
SPOOL PIECE 6 REMOVABLE TO ALLOW BRIDGE ROTATION (TYP)
SPOOL PIECE 3
FROM RECIRCULATION FANS 20FMD010
TO TREATMENT SYSTEM 20FMD009
PIPE RACK
RCS PHASE 2 PIPE RACK CONSTRUCTION
RCS PHASE 1 PIPE RACK CONSTRUCTION
NOTES:
1. FOR NOTES SEE DRAWINGS 20FMD003, & 20FMD012
LEGEND:
1 = INDICATES CONNECTION POINTS FOR PIPING.
= INDICATES PIPING FOR PHASE 1 THAT WILL BE REMOVED FROM SERVICE DURING THE REMAINING PHASES OF OPERATION
= INDICATES FLEX PIPING FOR PHASE 1
REFERENCE DRAWINGS:
05FMD001 -- INSTRUMENT IDENTIFICATION
05FMD002 -- CONTROL SYSTEM STANDARDS
05FMD003 -- PIPING & EQUIPMENT IDENTIFICATION
05FMD004 -- GENERAL NOTES
05FMD005 -- VALVE LIST - SHEET 1
05FMD006 -- VALVE LIST - SHEET 2
LETTER OR NUMBER OF SECTION OR DETAIL
DRAWING ON WHICH SECTION OR DETAIL IS TAKEN
DRAWING ON WHICH SECTION OR DETAIL IS SHOWN
SECTION & DETAIL KEY
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REV DATE BY CHK'D APPRV'D DESCRIPTION/ISSUE
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1 8/31/99 BJD SWH KDR CERTIFIED FOR CONSTRUCTION
0 11/9/98 BJD KR PRELIMINARY DESIGN SUBMITTAL
KENNETH D. RICKETT E-64418 REGISTERED PROFESSIONAL ENGINEER
DRAWN BY B J DAVIS DATE 01/07/00
DESIGNED BY B J DAVIS DATE 01/07/00
CHECKED BY S W HUNGATE DATE 01/07/00
APPROVED BY KENNETH RICKETT DATE 01/07/00
APPROVED BY JOHN LAWSON DATE 01/07/00
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
SILOS 1 AND 2 ACCELERATED WASTE RETRIEVAL PROJECT
FERNALD, OHIO
FDF CONTRACT NO. FSC 624
FOSTER WHEELER
FOSTER WHEELER ENVIRONMENTAL CORPORATION
TITLE
RADON CONTROL SYSTEM
PROCESS FLOW DIAGRAM
SILO 1
SIZE D SCALE NONE DWG. NO. 20FMD004 REV 2
FILENAME: 20FMD004.DWG

NOTES:
1. FOR GENERAL NOTES SEE DRAWING 05FMD004.
2. FOR MASS BALANCE TABLES SEE DRAWINGS 20FMD001 & 20FMD002.
3. DESICCANT DRYING SYSTEM INCLUDES PRECOOLING COIL, DESICCANT WHEEL, POST-COOLING COIL, CLOSED LOOP REACTIVATION SYSTEM, CONDENSATE COLLECTION TRANSFER SYSTEM, AND INSTRUMENTATION.

REFERENCE DRAWINGS:
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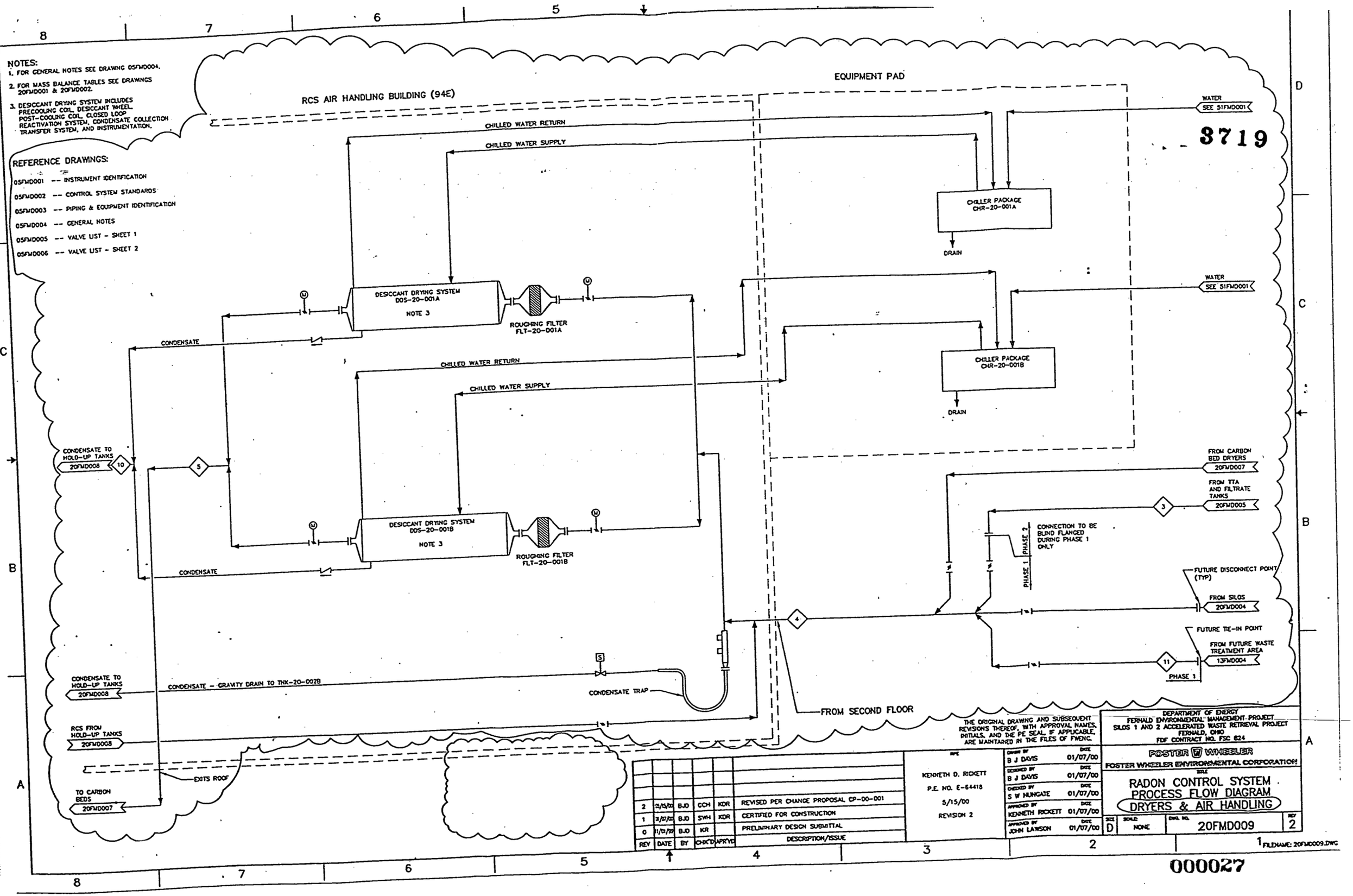
05FMD002 -- CONTROL SYSTEM STANDARDS
05FMD003 -- PIPING & EQUIPMENT IDENTIFICATION
05FMD004 -- GENERAL NOTES
05FMD005 -- VALVE LIST - SHEET 1
05FMD006 -- VALVE LIST - SHEET 2



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KENNETH D. RICKETT
P.E. NO. E-64418
5/15/00
REVISION 2

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APPROVED BY	KENNETH RICKETT	DATE 01/07/00
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DEPARTMENT OF ENERGY
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SILOS 1 AND 2 ACCELERATED WASTE RETRIEVAL PROJECT
FERNALD, OHIO
FDF CONTRACT NO. FSC 824

FOSTER WHEELER
FOSTER WHEELER ENVIRONMENTAL CORPORATION

TITLE
RADON CONTROL SYSTEM
PROCESS FLOW DIAGRAM
DRYERS & AIR HANDLING

SIZE D | SCALE: NONE | DWG. NO. 20FMD009 | REV 2

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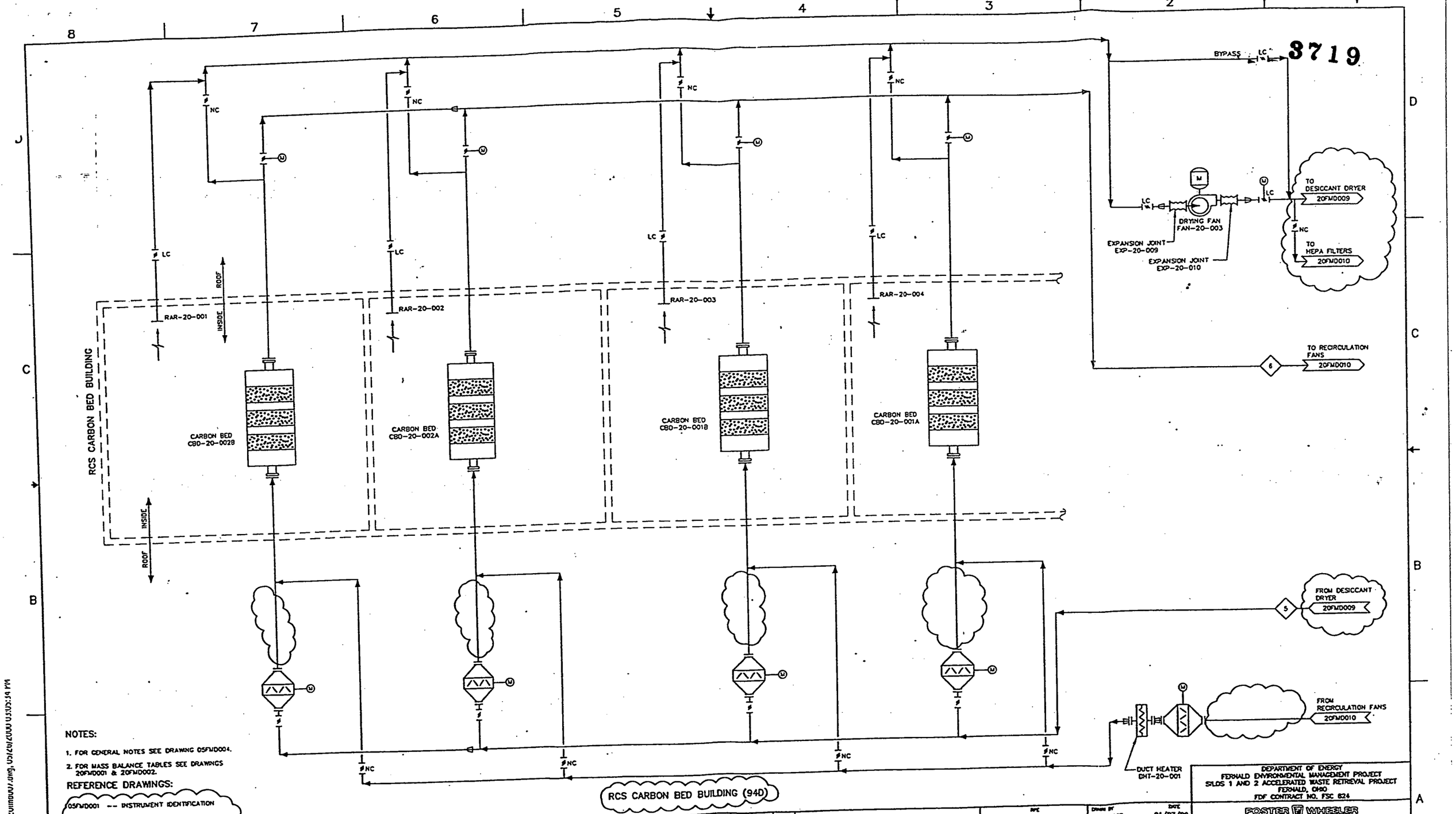

NOTES:

1. FOR GENERAL NOTES SEE DRAWING 05FMD004.
2. FOR MASS BALANCE TABLES SEE DRAWINGS 20FMD001 & 20FMD002.

REFERENCE DRAWINGS:

05FMD001 -- INSTRUMENT IDENTIFICATION
05FMD002 -- CONTROL SYSTEM STANDARDS
05FMD003 -- PIPING & EQUIPMENT IDENTIFICATION
05FMD004 -- GENERAL NOTES
05FMD005 -- VALVE LIST - SHEET 1
05FMD006 -- VALVE LIST - SHEET 2

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APPROVED BY	KENNETH RICKETT	DATE 01/07/00
APPROVED BY	JOHN LAWSON	DATE 01/07/00

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SILOS 1 AND 2 ACCELERATED WASTE RETRIEVAL PROJECT
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FDF CONTRACT NO. FSC 624

FOSTER WHEELER
FOSTER WHEELER ENVIRONMENTAL CORPORATION

TITLE
RADON CONTROL SYSTEM
PROCESS FLOW DIAGRAM
CARBON BEDS

SIZE D | SCALE: NONE | DWG. NO. 20FMD007 | REV 2

FILENAME: 20FMD007.DWG

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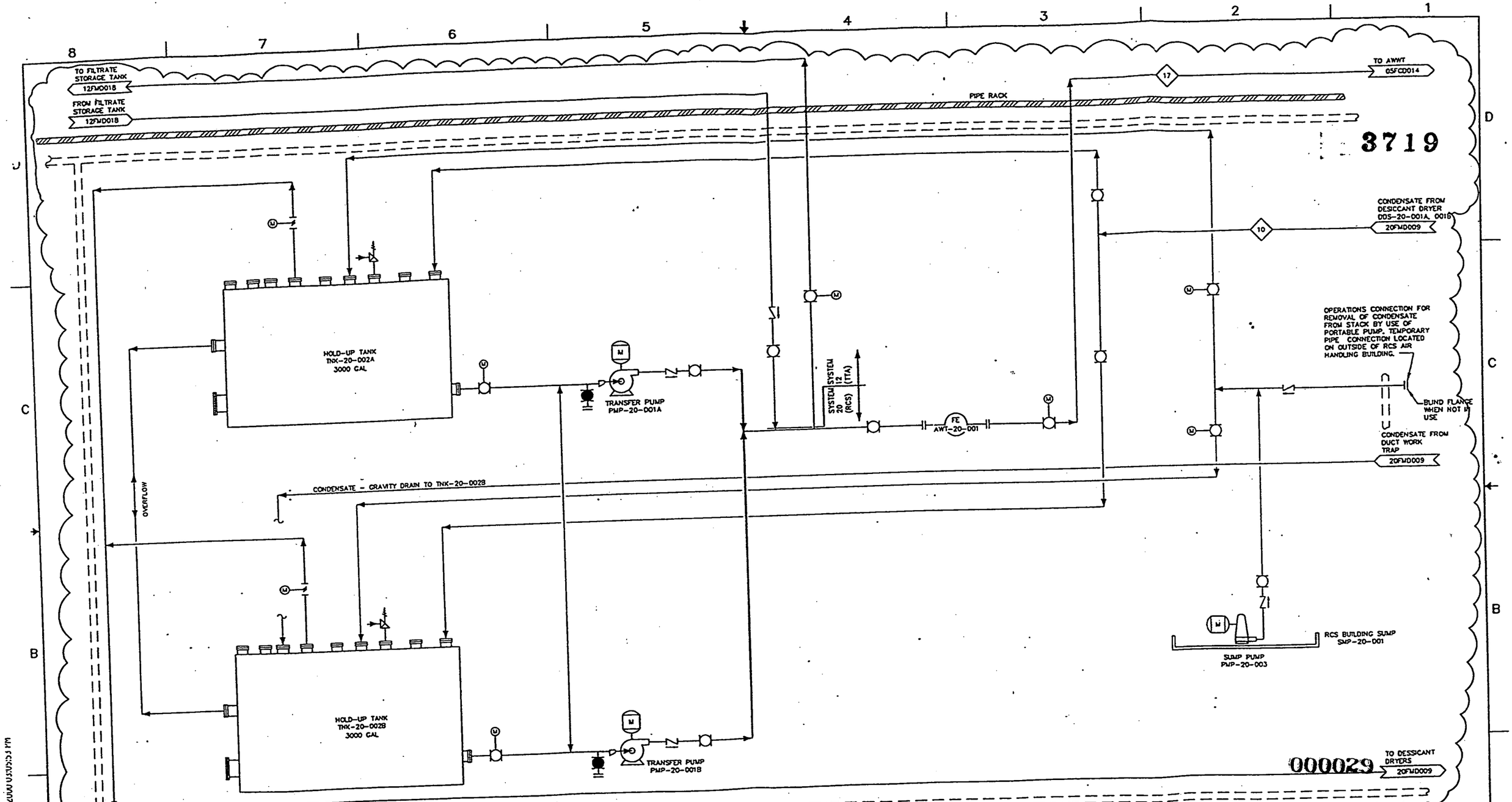

NOTES:

1. FOR GENERAL NOTES SEE DRAWING 05FMD004.
2. FOR MASS BALANCE TABLES SEE DRAWINGS 20FMD001 & 20FMD002.
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05FMD001 -- CONTROL SYSTEM STANDARDS
05FMD001 -- PIPING & EQUIPMENT IDENTIFICATION
05FMD001 -- GENERAL NOTES
05FMD001 -- VALVE LIST - SHEET 1
05FMD001 -- VALVE LIST - SHEET 2

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APPROVED BY	JOHN LAWSON	01/07/00

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FERNALD, OHIO
FDF CONTRACT NO. FSC 824

FOSTER WHEELER
FOSTER WHEELER ENVIRONMENTAL CORPORATION

TITLE
RADON CONTROL SYSTEM
PROCESS FLOW DIAGRAM
HOLD-UP TANKS & CONDENSATE

SIZE D | SCALE NONE | DWG. NO. 20FMD008 | REV 2

FILENAME: 20FMD008.DWG

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TO SILOS 20FMD004

TO CARBON BED DUCT HEATER DHT-20-001 20FMD007

FROM DRYING FAN 20FMD007

FROM CARBON BEDS 20FMD007

HEPA FILTER FLT-20-002A

HEPA FILTER FLT-20-002B

EXPANSION JOINT EXP-20-001

EXHAUST / RECIRCULATION FAN FAN-20-001A

EXPANSION JOINT EXP-20-002

EXPANSION JOINT EXP-20-003

EXHAUST / RECIRCULATION FAN FAN-20-001B

EXPANSION JOINT EXP-20-004

CONNECTION TO BE BLIND FLANGED DURING PHASE 1 ONLY

PHASE 1 | PHASE 2

TO TTA 20FMD006

PIPE RACK TO TTA

MAKEUP AIR FROM OUTSIDE BUILDING

BACKFLOW PREVENTER

MAKE-UP AIR FILTER FLT-20-004

AIR INLET SCREEN

RCS BUILDING - 2ND FLOOR

TO ATM

SAMPLE

SAMPLE RETURN

CONTINUOUS EMISSIONS MONITORING BUILDING

BACKDRAFT DAMPER

FROM VENTILATION SYSTEM 77FMD005

STACK STK-20-001

BLIND FLANGE WHEN NOT IN USE

CONNECTION FOR REMOVAL OF CONDENSATE FROM STACK BY USE OF PORTABLE PUMP BY OPERATIONS. TEMPORARY PIPE TO BE CONNECTED TO OUTSIDE OF RCS AIR HANDLING BUILDING.

RCS AIR HANDLING BUILDING (94E) – 2ND FLOOR

000030

NOTES:

1. FOR GENERAL NOTES SEE DRAWING 05FMD004.
2. FOR MASS BALANCE TABLES SEE DRAWINGS 20FMD001 & 20FMD002.

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- 05FMD005 -- VALVE LIST – SHEET 1
- 05FMD006 -- VALVE LIST – SHEET 2

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2	05/15/00	BJD	GCH	KDR	REVISED PER CHANGE PROPOSAL CP-00-001
1	01/07/00	BJD	SWH	KDR	CERTIFIED FOR CONSTRUCTION
0	11/01/99	BJD	KR		PRELIMINARY DESIGN SUBMITTAL

PE: KENNETH D. RICKETT, P.E. NO. E-64418, 5/15/00, REVISION 2

		DATE
DRAWN BY	B J DAVIS	01/07/00
DESIGNED BY	B J DAVIS	01/07/00
CHECKED BY	S W HUNGATE	01/07/00
APPROVED BY	KENNETH RICKETT	01/07/00
APPROVED BY	JOHN LAWSON	01/07/00

DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
SILOS 1 AND 2 ACCELERATED WASTE RETRIEVAL PROJECT
FERNALD, OHIO
FDF CONTRACT NO. FSC 624

FOSTER WHEELER
FOSTER WHEELER ENVIRONMENTAL CORPORATION

TITLE: RADON CONTROL SYSTEM PROCESS FLOW DIAGRAM EXHAUST & RECIRC FANS

SIZE: D | SCALE: NONE | DWG. NO. 20FMD010 | REV 2

FILENAME: 20FMD010.D

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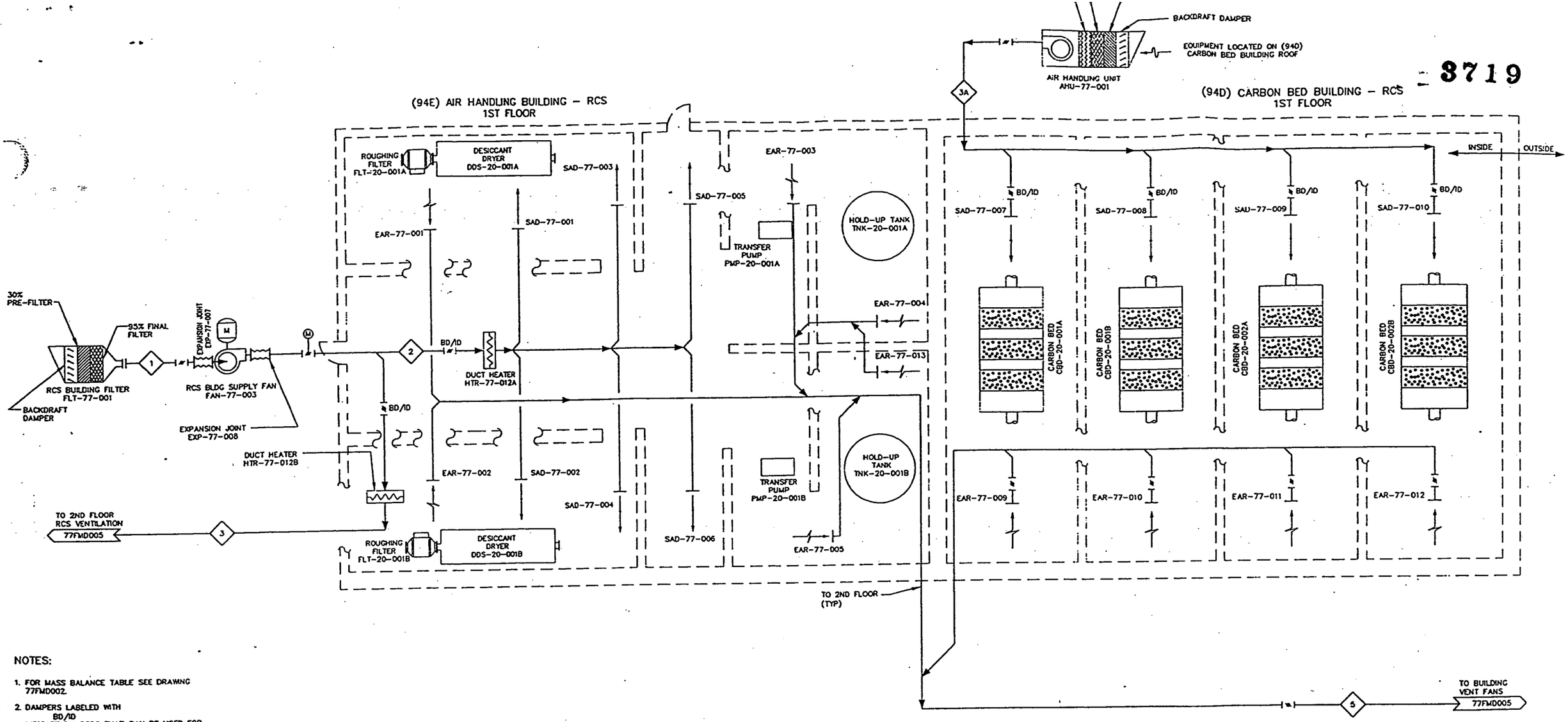


NOTES:

1. FOR MASS BALANCE TABLE SEE DRAWING 77FMD002.
2. DAMPERS LABELED WITH BD/ID INDICATE DAMPERS THAT CAN BE USED FOR BALANCING OR ISOLATION AS CONDITIONS DICTATE.
3. DAMPERS LABELED WITH LC BD/ID INDICATE DAMPERS THAT ARE TO BE LOCKED CLOSED DURING PHASE 1 OPERATION AND USED FOR BALANCING OR ISOLATION AS CONDITIONS DICTATE DURING ALL OTHER PHASES.

RENCE DRAWINGS:

- MD001 -- INSTRUMENT IDENTIFICATION
- 05FMD002 -- CONTROL SYSTEM STANDARDS
- 05FMD003 -- PIPING & EQUIPMENT IDENTIFICATION
- 05FMD004 -- GENERAL NOTES
- MD005 -- VALVE LIST - SHEET 1
- 006 -- VALVE LIST - SHEET 2

THE ORIGINAL DRAWING AND SUBSEQUENT REVISIONS THEREOF, WITH APPROVAL NAMES, INITIALS, AND THE PE SEAL IF APPLICABLE, ARE MAINTAINED IN THE FILES OF FWENC.

REV	DATE	BY	CHK'D	APRV'D	DESCRIPTION/ISSUE
0	08/10/00	BJD	KDR	LDR	CERTIFIED FOR CONSTRUCTION

STATE OF OHIO KENNETH D. RICKETT E-64418 REGISTERED PROFESSIONAL ENGINEER

DRAWN BY	B J Davis	DATE 08/10/00
DESIGNED BY	B J Davis	DATE 08/10/00
CHECKED BY	Kenneth D. Rickett	DATE 08/10/00
APPROVED BY	Kenneth D. Rickett	DATE 08/10/00
APPROVED BY	John Lawson	DATE 8/10/00

DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
SILOS 1 AND 2 ACCELERATED WASTE RETRIEVAL PROJECT
FERNALD, OHIO
FDF CONTRACT NO. FSC 624

FOSTER WHEELER
FOSTER WHEELER ENVIRONMENTAL CORPORATION

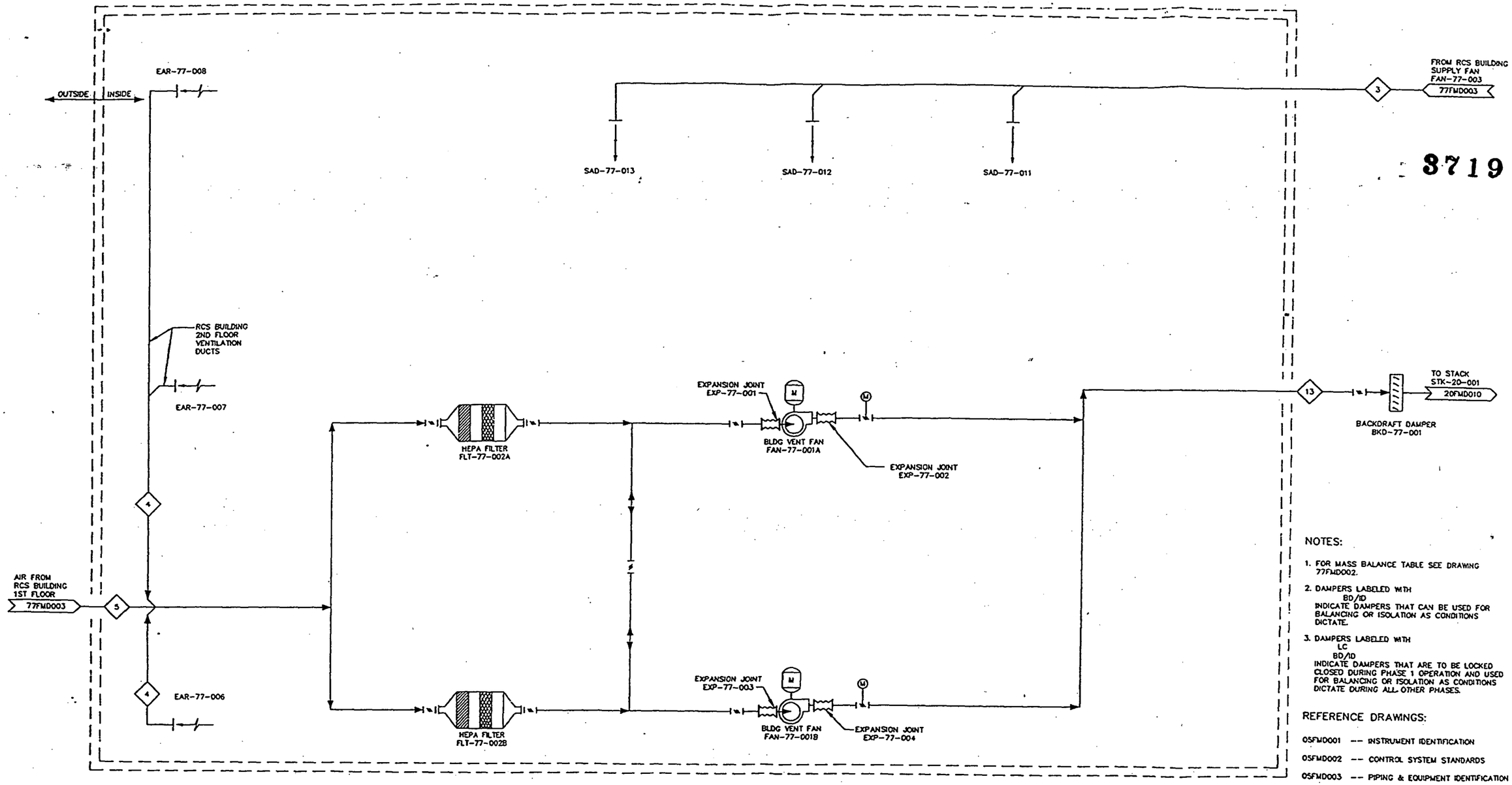
TITLE
MISC FACILITIES HVAC SYSTEM
HVAC FLOW DIAGRAM
RCS BLDG VENTILATION-1ST FL

SIZE	SCALE	DWG. NO.	REV
D	NONE	77FMD003	0

8 7 6 5 4 3 2 1

3719

000031



8719

(94E) AIR HANDLING BUILDING – RCS
2ND FLOOR

NOTES:

1. FOR MASS BALANCE TABLE SEE DRAWING 77FMD002.
2. DAMPERS LABELED WITH BD/ID INDICATE DAMPERS THAT CAN BE USED FOR BALANCING OR ISOLATION AS CONDITIONS DICTATE.
3. DAMPERS LABELED WITH LC BD/ID INDICATE DAMPERS THAT ARE TO BE LOCKED CLOSED DURING PHASE 1 OPERATION AND USED FOR BALANCING OR ISOLATION AS CONDITIONS DICTATE DURING ALL OTHER PHASES.

REFERENCE DRAWINGS:

05FMD001 -- INSTRUMENT IDENTIFICATION
05FMD002 -- CONTROL SYSTEM STANDARDS
05FMD003 -- PIPING & EQUIPMENT IDENTIFICATION
05FMD004 -- GENERAL NOTES
05FMD005 -- VALVE LIST – SHEET 1
05FMD006 -- VALVE LIST – SHEET 2

THE ORIGINAL DRAWING AND SUBSEQUENT REVISIONS THEREOF, WITH APPROVAL NAMES, INITIALS, AND THE PE SEAL, IF APPLICABLE, ARE MAINTAINED IN THE FILES OF FWENC.

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE
0	08/10/00	BJD	KDR	KDR	CERTIFIED FOR CONSTRUCTION

PE: STATE OF OHIO, KENNETH D. RICKETT, E-64418, REGISTERED PROFESSIONAL ENGINEER

		DATE
DRAWN BY	B.J. Davis	08/8/00
DESIGNED BY	B.J. Davis	08/10/00
CHECKED BY	Kenneth D. Rickett	08/10/00
APPROVED BY	Kenneth D. Rickett	08/10/00
APPROVED BY	Josh Larson	8/10/00

DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
SILOS 1 AND 2 ACCELERATED WASTE RETRIEVAL PROJECT
FERNALD, OHIO
FDF CONTRACT NO. FSC 624

FOSTER WHEELER
FOSTER WHEELER ENVIRONMENTAL CORPORATION

TITLE
MISC FACILITIES HVAC SYSTEM
HVAC FLOW DIAGRAM
RCS BLDG VENTILATION–2ND FL

SIZE	SCALE	DWG. NO.	REV
D	NONE	77FMD005	0

000032