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TC

Department of Energy
Richland Operations Office
P.O. Box 550
Richland, Washington 99352

March 1, 1995

95-PMDB-028

President
Westinghouse Hanford Company
Richland, Washington

Dear Sir:

PROJECT W-059, B PLANT VENTILATION UPGRADE, FUNCTIONAL DESIGN CRITERIA APPROVAL

RL has reviewed the subject document and comments have been incorporated, therefore it is approved. Enclosed is the approved document. The original approval pages were hand delivered to Mr. Paul Roege of your staff.

If you have any questions please contact Mr. Russell Warren on 376-7330.

Sincerely,

Elizabeth D. Sellers, Director
Nuclear Materials Division

PMD:RNW

Enclosure:
Approved FDC

cc: J. D. Condron, WHC w/encl.
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RELEASE AUTHORIZATION

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This document was reviewed following the procedures described in WHC-CM-3-4 and is:

APPROVED FOR PUBLIC RELEASE

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Kara M. Broz — March 2, 1995

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7. Abstract

This document outlines the essential functions and requirements to be included in the design of the proposed B Plant canyon exhaust system upgrade. The project will provide a new exhaust air filter system and isolate the old filters from the airstream.

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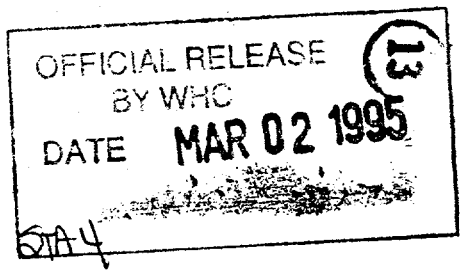

FUNCTIONAL DESIGN CRITERIA
B PLANT CANYON VENTILATION UPGRADE
PROJECT W-059

Issued by:

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September 29, 1994

for the

U.S. DEPARTMENT OF ENERGY
RICHLAND OPERATIONS OFFICE
RICHLAND, WASHINGTON

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Canyon Ventilation Upgrade

REPORT

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B Plant Canyon Ventilation Upgrade

SUBMITTED TO:

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	NAMES	SIGNATURES	DATE
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Table of Contents

1.0 Introduction

1.1 Background

Current situation:

The B Plant canyon facility was constructed in the 1940's and is currently supporting the Waste Encapsulation and Storage Facility (WESF) activities. The B Plant ventilation system functions primarily to maintain a differential pressure between the process cells and the canyon, while maintaining the canyon at a negative pressure relative to atmospheric pressure[3]. This cascading flow of air from clean areas to increasingly contaminated areas is a common design philosophy.[1] Air is drawn from outside the plant into the canyon and from the canyon through openings around the cell block covers into the cells. The air from the cells is collectively exhausted through a wind tunnel to an exhaust filtration system.[2]

The existing exhaust scheme is depicted in Figure 1 Appendix A. The exhaust filtration system consists of a number of High Efficiency Particulate Air (HEPA) filter chambers and a parallel emergency stand-by sand bed filter. The chambers are arranged in parallel with a common inlet plenum. They utilize outlet water seals to "isolate" one from another by preventing an exhaust airflow through the selected chamber. The design of the filter chambers prevents replacement of spent or damaged HEPA filters.

The current arrangement also allows the redirection of exhaust air to less loaded filters or to utilize combinations of chambers as loading occurs. The sand bed filter, originally constructed to serve as the primary filtration source, currently serves as an emergency standby facility. The sand bed filter is less efficient than HEPA filtration and has an airflow rating below that required for normal operations of the plant. The current operating configuration routes exhaust air through D filter chamber with E chamber as a backup.

In the 1970s, a series of events degraded the filtration efficiency of the HEPA chambers. The prime incident involved an inadvertent increase in airflow, from a normal 21,240 l/s (45,000 CFM) to 42,480 l/s (95,000 CFM), resulting in a breach of the C chamber first stage HEPA filter bank. This breach contributed to an increase in the measured radiological activity at the stack.[2]

In March 1979, D filter chamber was brought on-line. In December 1993, E filter chamber became available for use, though D filter at present, remains online as the primary filtration source. Filter chamber F has been constructed adjacent to filter chamber E, but has yet to be loaded with HEPA filters. However, filter chamber E is expected to operate for 20 years, therefore filter chamber F may never be placed into service as the lead filter chamber for the remainder of the facility's life.

1.1 Background (continued)

B Plant currently has no processing mission. In the short term, the plant will execute a Cleanout and Stabilization Plan (CSP) to prepare for transition. CSP will allow the plant to be placed in a minimal long term Surveillance and Maintenance (S&M) mode while waiting for final disposition activities to begin. The plant may remain in this S&M mode for an extended period of time, potentially several decades.

Four specific measures are required in order to reach the end point of the CSP:

- the retired HEPA filters must be isolated from the balance of the plant (this project);
- organic chemicals must be removed from the plant;
- radioactive contamination within the plant must be removed or stabilized; and,
- B Plant must be de-coupled from WESF.

Studies and physical work are already underway to achieve the latter three conditions.

Present Safety Concerns:

The combination of the high radiological inventory in some of the filter chambers and the degraded state of the filters has led to safety concerns. The main concerns, as identified during the B Plant Retired HEPA Filters Engineering Study[4], are:

- Loss of the outlet water seals could result in exposure of the damaged filters to the main exhaust airstream, which could lead to radioactive material being discharged into the environment.
- Ventilation problems caused by the flaking off of damaged filter media could plug the working filters.

Corrective Action:

The objective of the Engineering Study was to identify a method to remove the potential for migration of radioactivity to the facility or stack. The engineering study considered twelve alternative methods to isolate the retired filters. The preferred alternative, to isolate the existing filters and provide a new ACT meets all of the evaluation criteria, is cost competitive, and provides several important advantages over the other choices. The advantages include:

1.1 Background (continued)

- positive assurance against accidental release of the radionuclide inventory
- flexibility for disposition inspection and remediation of the retired filters
- designed to meet current regulatory standards (environmental and testing)
- designed for minimal surveillance and maintenance
- indefinite service life by replacement of components
- designed for the reduced air flow rate associated with S&M

1.2 Scope

This project's prime objective is to remove the potential for migration of radioactivity to the facility or stack and secondarily to reduce operating costs of the plant. Consistent with the Engineering Study[4] and the Functions and Operations Requirements (F&ORs)[6], the scope of the project has been defined as:

- Isolate the existing filters from the B Plant ventilation airflow thereby reducing the risk of radionuclide release contained in the old filters.
- Provide a maintainable filtration system Air Clean-up Train (ACT) to support B Plant from the completion of CSP through the S&M mode.
- Provide for expansion capability to meet air filtration requirements during disposition, as much as reasonable without increasing project cost.

The project specifically excludes any activities associated with remediation of the existing filter facilities, including removal of the existing spent HEPA filter elements. However, the project must ensure that the design, construction and operation of the proposed ACT and the isolation barriers do not restrict the option for eventual remediation of the B Plant facility, inclusive of the existing HEPA filters.

1.3 Justification

The present design does not provide a reliable system which can operate in the long term to prevent a release of radionuclides from the retired filters to the environment. B Plant cannot be placed safely into an unmanned surveillance (S&M) mode without a more reliable method of isolating these filters.

The retired filters may contain as much as 750,000 curies of radioactive Strontium (^{90}Sr) and Cesium (^{137}Cs). These filters have lost some of their mechanical integrity making them unreliable as a barrier to release. The outlet water seals currently used to prevent airflow through the filters require daily surveillance, and must be refilled every one to two months due to evaporation. The in service filter is subject to plugging by pieces which could break off from retired filters.

1.4 Site Location

The installations and equipment provided by this project will be located in 200 East on the Hanford site, specifically, south of Building 221-B[5].

The precise location for the new ACT shall be chosen to minimize impact on existing services. Initial surveys suggest that an area south of Instrument Building 291-BB is the area most free of above-ground pipework, and should be considered, as shown in Figure 1, Appendix A.

The Architect-Engineer (A-E) shall perform a survey, to include a thorough inspection of drawings and a field check of the proposed area to identify all services and utilities which will require modification due to the construction and operation of the new facility

1.5 Project Interfaces

The new ACT will directly utilize existing duct systems, exhaust fans, and the exhaust stack. Existing monitoring and control systems shall be employed if they assist in the operation of the new ACT. New monitoring signals which require remote indication and alarming shall be routed via the Facility Process Monitoring and Control (FPMCS) Output/Input Unit (OIU) in the Instrument Building 291-BK.

Existing power will be utilized for all process power requirements including damper actuators, controls and monitors required to operate the ACT. All power supplies including those supplied to non-process related items (e.g., lighting and fire protection) will be designed and coordinated by the A-E.

2.0 Project Criteria

2.1 Functional Requirements

2.1.1 Purpose:

The project will provide isolation of the retired filters from the balance of the plant in order to reach the end point criteria of the B Plant CSP. With the isolation of the retired filters, a new maintainable filtration system will be provided to serve the
B Plant facility.

2.1.2 General:

The project shall segregate the existing filter facility from the vent system by supplying and installing a means of permanently sealing the ventilation ducts currently serving the existing filters. Isolation of the existing filter facility shall not impose any restrictions on future remediation or decommissioning options.

2.1.2 General: (continued)

The ACT shall be designed to filter potentially contaminated air from B Plant for release to the atmosphere using existing fans, stack (291-B), and monitoring equipment.

The A-E shall consider relative cost and dose estimates for both remote and contact handling of filters.

2.1.3 Specifics:

- The project shall provide a filtration system consisting of at least two redundant systems, each with a minimum capacity of 50% of the maximum airflow design requirement for B Plant (see Section 2.2).

- Each system shall be capable of operating independently to provide continuous ventilation during maintenance and filter change-out activities. Ducts shall be sized and arranged to maintain transport velocities at high enough levels to prevent settling of particulate contaminants.

- The ACT shall be designed to operate in an unmanned mode. Control systems shall support surveillance from a remote location.

- The confinement function of the ACT shall be considered Safety Class 2, including the inlet duct and the ACT housing, through the final stage of filtration. The ACT shall be designed to meet the criteria defined in ANSI/ASME 509 and DOE Order 6430.1A.

- The facility shall be designed to allow the in-situ testing of final filters. The testing requirements shall be as set out for HEPA filters in ANSI/ASME N510 and DOE 6430.1A Section 1550-2.5.5.

- Following completion of the ACT design, the A-E shall perform an analysis of the effect of the new filter system on B Plant ventilation characteristics. The A-E shall submit calculations showing the predicted air velocities, flow rates, pressure differentials, and exhaust fan operating conditions to the Operating Contractor.

- The ACT shall be designed to allow individual removal of filter elements.

- The ACT design, will incorporate features (e.g. blanked off duct branches, space to install additional support facilities and adequate construction and maintenance access) to facilitate the future connection of additional filter facilities, to the degree that this can be accomplished without increasing project cost.

2.1.3 Specifics: (continued)

- Air stream characterization: The dust levels and radionuclide concentration levels cannot be accurately predicted. However, no work activities are anticipated inside the canyon during the operation of this system, therefore dust loading will be primarily due to atmospheric dust, and radionuclide loading on the filters will be very gradual.

2.2 Performance Requirements

2.2.1 General

The systems to be provided by this project are to comply with all requirements imposed by federal and state agencies on treatment, storage, disposal facilities and non-reactor nuclear facilities. Specifically, the requirements of the applicable sections of the following laws, orders and criteria, including cited references shall be complied with:

- Resource Conservation and Recovery Act (RCRA)
- Washington Administrative Code (WAC) Chapter 173-303, "Dangerous Waste Regulations"
- Department of Energy Order 6430.1A, "General Design Criteria"
- Hanford Site Radioactive Solid Waste Acceptance Criteria, WHC-EP-0063

The proposed new filter system provided by this project shall be designed for a flowrate of potentially contaminated air as specified in Appendix B, with the capability to maintain the minimum flow rate during servicing.

2.2.2 Specifics

- The new ACT shall be designed to handle the conditions as shown in Appendix B.
- The ductwork and filter housings of the new ACT shall be designed to withstand pressures as shown in Appendix B.
- The actual maximum operating pressure and corresponding leak test pressure shall be determined by the A-E per analysis on Section 2.1.3.
- The ACT shall be designed to provide at least an overall 20 year service life. The design shall allow for indefinite extension of service life through the replacement of components.
- Installed systems shall be designed to minimize surveillance and maintenance requirements.

2.2.2 Specifics (continued)

- The isolation barrier shall be designed to withstand a pressure differential of 1.0 times the maximum design pressure as determined by an analysis of the modified system (Section 2.1.3). The design leak rate will be determined by the Preliminary Safety Analysis Report (PSAR).

- The system shall operate reliably for periods of up to six months without preventative maintenance, calibration or manual adjustments. In the interest of simplicity and cost, however, those operating controls which are not necessary to protect safety, the environment or the system (e.g., equipment selector swtiches or airflow adjustment dampers) may be local/manual.

- Equipment and system configuration shall be compatible with the local environment. Notably, weather conditions may include temperatures from -23°C (-10°F) to 43°C (110°F), high winds, rain, snow, dust, and strong sunlight [6].

3.0 Process Criteria

3.1 Instrumentation and Control

3.1.1 Functional Requirements

In accordance with DOE Order 6430.1A clause 1550-99.0.1, adequate instrumentation and controls shall be provided to assess ventilation system performance, allow the necessary control of system operation, support unmanned surveillances for the retired filters and provide instrumentation and controls for any new equipment installed. As a minimum, those local and remote instruments and controls identified on Table 4-1 of ANSI/ASME N509 shall be provided. Additionally, the following instrumentation and controls shall be provided:

- Liquid level detection and alarms for the ACT, if required - local and remote

- Radiation detectors to monitor prefilters and primary filters - local and remote. The purpose of these instruments is to give warning as radiation levels approach allowable dose limits for filter change operations. The radiation elements shall be configured to allow removal and calibration with minimal radiological exposure, and without opening the filter housing.

3.1.2 Interface Requirements

Signals for remote indication shall be run to the Facility Process Monitoring and Control (FPMCS) Output/Input Unit (OIU) located in Building 291-BK. Measurements requiring remote monitoring shall include:

3.1.2 Interface Requirements (continued)

- air filter radiation monitors
- differential pressure
- temperature
- liquid level

Hardware, software and communications signals shall be compatible with the existing B Plant FPMCS. The A/E shall coordinate with the facility during final design for compatibility and conventions.

3.1.3 Hardware Requirements

All instrumentation hardware shall be compatible with existing B Plant devices, subject to availability, to facilitate maintenance.

3.1.4 General Requirements

- The range and accuracy of the instruments shall be commensurate with their duties.
- Instruments shall be installed with facilities to permit calibration and testing. For example, differential pressure transmitters and switches shall include manifolds to facilitate isolate, equalize and test functions.
- Instrumentation shall be identified in accordance with current B Plant practices. In particular, instrument loop numbers shall be allocated by B Plant.
- All instrumentation shall be Safety Class 3 (final determination by Safety Analysis Report). These instruments must fail to their alarm state (e.g. dp instruments must fail to high dp).
- Instrument and monitoring systems shall indicate to the operator when a failure has occurred.

3.2 Piping and Vessels

3.2.1 Functional Requirements

Exposed pipework and vessels shall be insulated and heated if necessary to prevent both freezing, and undue heat loss.

Inspection, testing and maintenance operations on pipework and vessels shall be capable of being carried out during ACT operation, where practical.

3.2.1 Functional Requirements (continued)

Pipework and vessels that carry, or may potentially contact radioactive fluids (such as duct drains) shall be designed to ensure the materials remain contained during the facility Design Basis Accident (DBA) specified in the Preliminary Safety Evaluation (PSE), as well as under all expected construction, operating and maintenance conditions.

Liquid detection and drainage equipment shall be installed in areas of the facility where potential fluid ponding problems exist. If such areas exist, the designer must provide for collection and disposal means, as the facility low level waste system will be out of service.

Pipe and ductwork shall be equipped with vents and drains as necessary to allow for complete draining of the system. Piping and ductwork upstream of the final filters shall be Safety Class 2 for containment/confinement; Safety Class 3 downstream of the final filters (final determination by Safety Analysis Report).

3.3 General Chemical Process

Not applicable. It is not expected that the proposed new ACT will give rise to any chemical processes.

3.4 General Mechanical Process

3.4.1 Functional Requirements

Mechanical items essential to main confinemenet upstream of the final filters shall be designed per requirements for Safety Class 2 (non-safety class system) equipment as defined in DOE 6430.1A section 1300-3.2; Safety Class 3 downstream.

Operational equipment not designed to have the same service life as the rest of the facility, shall be designed to be easily maintained and/or replaced without creating significant impact on plant operations.

Mechanical equipment shall be provided with a suitable operating environment.

If the ACT is designed for remote handling during filter changeouts (Section 2.1.2), the required operational equipment shall be designed to be manually actuated rather than power operated where practical.

4.0 Facility Criteria

4.1 Architectural and Civil/Structural

Architectural and Civil design shall be in accordance with DOE Order 6430.1A and SDC 4.1, Hanford Plant Standard, Design Criteria, Design Loads for Facilities. Excavation work shall comply with 29 CFR 1926. Welding of structural steel shall conform to AWS D1.1. Handicap access is not required for this facility.

4.2 Heating, Ventilation and Air Conditioning

The ACT will require a ventilated containment area for use during filter change out and certain maintenance operations. Provision shall be made during design for installation and ventilation of permanent or temporary containment areas for maintenance.

Where a HVAC system is installed to ventilate potentially contaminated areas, it shall be designed in accordance with ASME/ANSI N509, and DOE Order 6430.1A.

4.3 Utilities

4.3.1 Steam

The ACT shall be designed so that steam is not required.

4.3.2 Water

Water requirements are to be determined by the A-E during ACT design.

Any upgrades to the water supply and distribution system if required will be coordinated by the A/E and included in the design and cost estimate.

4.3.3 Sewage

Sewage requirements if any will be coordinated by the A-E.

4.3.4 Electrical

All systems shall comply with NFPA 70, National Electrical Code (NEC) and ANSI C2 National Electrical Safety Code.

All electrical and electronic equipment shall be designed or protected as necessary to eliminate power surges, drop outs, lightening interferences, static electricity or radio frequency interference.

Wire runs shall be made in conduit or trays. Trays shall have 100% spare cable capacity. Wire runs shall provide installed spare wiring with the percent of spare capacity determined during design.

4.3.4 Electrical (continued)

Instrument and power wiring shall be routed separately and properly shielded where required. Safety and emergency wiring shall be routed separately where practicable.

Electrical motors and components shall be compatible with anticipated operating conditions (e.g. inside/outside).

All electrical equipment and connections in areas with potential for radioactive contamination shall be sealed or otherwise protected from ingress of radioactive/hazardous materials and decontamination/wash fluids.

Power redundancy is required only if necessary to maintain confinement.

4.3.5 Lighting

Consideration shall be given to installation of area lighting for maintenance and repair operations that may need to be carried out in areas of poor natural illumination or during hours of darkness.

Lighting installations shall conform to DOE 6430.1A General Design Criteria Manual, section 1650 for exterior applications and Section 1655 for interior applications.

Emergency and evacuation lighting (where installed) shall have a backup power supply to ensure continued operation during power outages.

4.4 Communications Systems

The only verbal communication hardware required for this project shall be the provision of a telephone (or telephones) at the ACT location.

The transmittal of instrument signals to remote stations via the existing FPMCS is discussed in Section 3.1.2.

4.5 Automatic Data Processing

No automatic data processing will be required with this project other than that carried out by existing equipment for multiplexing the ACT signals to a remote location. Signals requiring transmittal to remote stations shall interface with the existing facility as described in Section 3.1.2.

4.6 Energy Conservation

The proposed new ACT may require additional energy supplies for heating and lighting as it is expected to be an above ground stand alone facility. Lighting and HVAC in the ACT shall follow energy conservation guidelines in DOE 6430.1A sections 0110-12, 1595-10 and
1595-11 as applicable.

4.7 Maintenance

The facilities and equipment provided by this project shall be designed to minimize the exposure of operations and maintenance personnel to radioactive and hazardous substances. ALARA (As Low As Reasonably Achievable) principles shall be a main consideration during evaluation of design options.

The ACT shall be designed to simplify all maintenance and operation activities and to minimize system down time. To these ends consideration shall be given to the following:

- use of interchangeable parts
- any component shall be replaceable within two 8-hour shifts
- use of standard parts currently available on the Hanford site
- in-service maintenance including filter change out
- the flexibility to remove part of the facility from service while still providing reduced filtration capacity
- inspection and waste disposal access
- use of standard tools for maintenance
- provision of work areas (permanent or temporary) for all scheduled maintenance operations
- provision of shielding as needed to reduce maintenance dose rates to ALARA

5.0 General Requirements

5.1 Safety

5.1.1 Criticality

The potential for criticality does not exist as no or negligible quantities of fissionable material are processed or stored in the facility. Accordingly no provisions need to be designed for prevention of criticality excursions.

5.1.2 Safety Analysis

The retired HEPA filters containing substantial amounts of radionuclides (Primarily Cesium-137 and Strontium-90) must be managed to limit the risk of accidents that could affect the health and safety of operators, the public and the environment. The retired filters shall be isolated from the ventilation system and protected against any atmospheric release of radionuclides. The design shall limit the risk of such a release to acceptable levels as determined by the Preliminary Safety Analysis Report (PSAR) and the Final Safety Analysis Report (FSAR). These reports will be prepared by the Operating Contractor.

5.1.2.1 Unacceptable Safety Consequences

The project design objective shall be that no single credible component failure shall result in Unacceptable Safety Consequences including the following:

- Explosion
- Fire (other than localized minor fire, such as might be caused by shorting of electrical components)
- Radiation exposure of personnel outside the filter housing in excess of 10 mrem/hr[6] whole body, i.e., at 30 cm from surface.
- Maximum personnel exposure during filter changes in excess of 100 mrem[6] Expected Dose Equivalent (EDE).
- Exposure of personnel to toxic chemicals in excess of Threshold Limit Values (TLVs) established by the American Conference of Governmental Industrial Hygienists
- Accidental release of radioactivity (airborne or liquid) to the environment in the event of airflow through a deteriorated retired filter element

During the conceptual design phase, the effects of component failure, including control and monitoring and utility failure (such as power sources, air, and vacuum supplies, etc.), shall be evaluated for unacceptable consequences, and this evaluation shall be documented as the preliminary safety evaluation.

5.1.2.2 Safety Classes

The isolation barrier shall be designed to Safety Class 2 standards. The new filter system shall be designed to Safety Class 2 standards for confinement function, up through the final filter stage; Safety Class 3 downstream.

5.1.2.2 Safety Classes (continued)

The safety classification of the components will be determined by the Preliminary Safety Evaluation (PSE) and verified during the development of the PSAR.

5.1.3 Contamination Control

The facility shall be designed and constructed so that all construction maintenance and operation activities can be performed while keeping contamination levels to ALARA standards. The design shall incorporate the relevant aspects of WHC-SD-GN-DGS-30011, Radiological Design Guide.

The design shall provide airlocks for access to areas of high contamination potential which require routine personnel access.

5.1.4 Shielding

The ACT shall be designed and constructed so that all construction, maintenance and operation activities can be performed while keeping radiation dose rates within ALARA standards.

Where there is a potential for significant operator dose, shielding shall be installed per WHC-SD-GN-DGS-30011, to limit the predicted dose rates during normal operation to not more than 10mrem/hr (30 cm) outside the filter housing.

Shielding shall take into account access requirements for installation, maintenance and repair activities, and shall be designed along the principles of WHC-SD-GN-DGS-30011.

The occupancy assumptions are:

- less than 1 hour / week - external to the facility
- less than 10 hours/year - for filter changes

5.1.5 Industrial Safety

The Occupational Safety and Health Administration (OSHA) regulations contained in 29 CFR 1926 and 29 CFR 1910 are applicable to the permanent isolation of the existing non-replaceable HEPA filter systems, and its replacement with an ACT filter system.

Engineering and construction design shall be in accordance with pertinent sections of the following codes and standards. Industrial Safety design issues are covered in WHC-CM-4-3, Industrial Safety Manual. Areas to be addressed include, but not necessarily limited to, the following:

5.1.5 Industrial Safety (continued)

- Personal Protective Equipment - must be in compliance with ANSI Z87.1-1968. Occupational and Educational Eye and Face Protection.

- Respiratory Protection - must be in compliance with 29 CFR 1910.134 which basically parallels ANSI Z88.2-1980.

- Breathing Air - must be in compliance with ANSI/GCA G-7.1, 1989 standards. Minimum grade "D" air must be supplied and used with supplied air respirators. The maximum allowable concentration of carbon dioxide in this air is 10 parts per million (ppm).

- Emergency Shower and Eyewasher Units - must be in compliance with ANSI Z358.1-1981 "Standard for Emergency Eyewash and Shower Equipment".

- Construction - must be in compliance with 29 CFR 1926 and DOE Order 6430.1A General Design Criteria.

5.1.6 Fire Protection

5.1.6.1 Functional Requirements

Fire Protection shall be designed in accordance with DOE Order 5480.7A (Fire Protection). Fire extinguisher and other fire protection and suppression systems shall be located at the facility as required by DOE Order 6430.1A General Design Criteria (DOE 1989).

Fire alarms shall be arranged to notify the Hanford Fire Department of all fire alarm signals. Non-combustible construction materials shall be used where practicable.

Design of contaminated areas requiring fire protection shall incorporate features for handling contaminated fire water run off.

The overall facility design and in particular the fire protection systems shall be developed in consultation with the WHC fire consultant/fire safety officer.

Fire suppression and detection, if installed, will be monitored by the Fire Alarm Control Panel in Building 291 BD.

5.1.7 Traffic Safety

This facility will not affect existing vehicular traffic. The designer shall consider requirements for pedestrian access during construction, operation and maintenance.

5.2 Environmental Protection and Compliance

All design, planning and field construction for implementation of this project shall follow the requirements of WHC-CM-7-5, Section 2, "Air Quality," Paragraph 2.5, Radioactive Airborne Emissions from Existing Stationary Sources. This includes compliance to federal, state and local requirements (40 CFR 61, WAC 173-400, WAC 246-247 and Benton-Franklin Counties Clean Air Authority Regulation 1).

The A-E shall contact the Operating Contractor's Regulatory Permitting Group to identify the applicable environmental requirements. All required permit applications will be prepared by the Operating Contractor in conjunction with the Design Contractor.

5.2.1 Radioactive Materials and Wastes

The design shall minimize the use of components or materials containing hazardous constituents which could become mixed waste if contaminated.

The retired HEPA filters containing substantial amounts of radionuclides (primarily Cesium-137 and Strontium-90) must be managed in a manner which ensures no undue risk of accidents that could affect the health and/or safety of operators, the public and the environment. All radioactively contaminated wastes shall be collected, characterized, and treated suitable for disposition.

The ACT and duct barriers shall be designed so that the release of radioactive and hazardous materials during routine operations does not exceed the administrative control limits. The design shall incorporate all provisions and features mandated by applicable regulations for the storage, treatment, disposal, or transport of radioactive materials.

5.2.2 Hazardous Materials and Wastes

Within the B Plant facilities, the management of materials and wastes that have hazardous characteristics or contain listed hazardous materials is subject to the rules and regulations specified in WHC-CM-7-3, Effluent Monitoring Program and RCRA.

Design shall include adequate provision for the safe collection, storage, and ultimate treatment of hazardous waste by an approved method that will minimize hazardous waste disposal needs. The design shall incorporate features that prevent the inadvertent mixing or release of hazardous materials that are potentially incompatible or could result in toxic or hazardous products or byproducts.

5.2.2 Hazardous Materials and Wastes (continued)

All waste-handling systems shall be designed and constructed to accomplish their minimum intended purpose using the necessary criteria and comply with the following documents:

WHC-CM-1-6	Radiological Control Manual
WHC-CM-4-11	ALARA Program Manual
WHC-CM-7-5	Environmental Compliance
WHC-SD-GN-DGS-30011	Radiological Design Guide

5.2.3 Waste Minimization Requirement

Design activities shall consider the amounts and characteristics of waste that the ACT and duct barriers will generate and the design shall minimize that generation to the maximum practical extent.

5.2.4 Waste Treatment

All radioactive and nonradioactive waste shall be collected, sampled, characterized, and treated suitable for disposition.

The design shall incorporate all provisions and features mandated by the required regulations for the safe handling, storage, usage, treatment, recovery, monitoring and control, disposal, or transport of all hazardous materials and wastes. The design shall comply with effluent release limits specified in WHC-CM-7-5, Environmental Compliance, for hazardous and radioactive substances.

5.2.5 Process Effluent Disposal

Not applicable.

5.2.6 Air and Water Quality

The design shall comply with the requirements of WHC-CM-7-5, Section 2, "Air Quality," Paragraph 2.5, Radioactive Airborne Emissions from Existing Stationary Sources.

Airborne discharge from HEPA filters shall be monitored on a regular basis, and shall be in compliance with the Clean Air Act amendment of 1990 and the Title V permit conditions, once in place. Existing stack monitoring equipment will remain in service.

Water quality monitoring program shall be in compliance with the Clean Water Restoration Act, as amended, set forth limits for the discharge of pollutants to waterways.

5.3 Safeguards and Security

Not applicable.

5.4 Natural Forces

New walls, structures, equipment etc. installed in support of this project shall meet the civil and seismic design requirements as specified in HPS-SDC-4.1.

5.5 Design Format

Design drawing format shall follow the requirements specified in HPS-SDC-1.3 and WHC-CM-6-1, EP1.3. It should be noted that WHC-CM-6-3 may also be used as a guideline.

New legends and codes shall comply with existing legends and codes employed at B Plant. Equipment piece numbers, line numbers, valve numbers etc, shall be obtained from B Plant Operations to assure continuity with current identification practices.

All existing definitive design drawings associated with this project shall be reviewed per field conditions, verified and updated at the interfaces with the project. These drawings include HVAC, electrical, mechanical, instrumentation, structural, civil, piping, etc, which reflect all or portions of systems modified or referenced by this project. Cross reference traceability shall be provided from new (project) drawings to old.

In addition to drawings, the detailed design shall provide and justify proposed alarms and setpoints, and operating and maintenance instructions.

5.6 Quality Assurance

Quality Assurance/Control activities for all contractors involved in design, construction and acceptance testing shall be executed in accordance with the project specific Quality Assurance Program Plan (QAPP). The QAPP shall be developed during the conceptual design and approved/released prior to definitive design. This QAPP shall be used by the design contractor to develop verification criteria in design documents (i.e drawings, specifications, test procedures); by all contractors to define quality requirements/responsibilities on the project.

5.6 Quality Assurance (continued)

Acceptance testing shall include a demonstration of filter changes and radiation element removal and replacement.

The QAPP shall comply with the quality criteria of DOE Order 5700.6C "Quality Assurance."

The basis for establishing Quality Assurance Program requirements is Safety Classification as defined in Management Requirements and Procedures (MRP) 5.46, "Safety Classification of Systems, Components and Structures." The safety classification of items provides a graded approach to application of design and quality requirements. This graded approach assigns requirements to items commensurate with the function of each system, component and structure in preventing or mitigating the consequences of hazards and postulated design basis accidents. The overall safety classification for this project will be defined in the preliminary safety document prepared for this project.

The Quality Assurance requirements shall be in accordance with pertinent sections of the following documents:

ASME NQA-1	Quality Assurance Program Requirements for Nuclear Facilities.
WHC-CM-3-5	Document Control and Records Management Manual.
WHC-CM-4-2	Quality Assurance Manual
WHC-CM-6-1	Standard Engineering Practice
WHC-CM-6-2	Projects Management
WHC-CM-6-12	Projects Department Procedures
WHC-CM-1-3	Management Requirements and Procedures
MRP 5.43	"Impact Levels."
MRP 5.46	"Safety Classification of Systems, Components, and Structures

5.7 Remediation

5.7.1 U. S. Department of Energy Regulations

During the ACT design, consideration shall be given to incorporating features to ease final decontamination and disassembly.

The design will follow the principles outlined in DOE Order 6430.1A, Sections 0205 and 1300-11.2.

5.7.2 Miscellaneous Design Features

The construction and design of the ACT shall keep equipment exposed to contamination to a minimum, consistent with the design function of the plant.

5.7.2 Miscellaneous Design Features (continued)

Consideration should be given to modifications to allow it to support other activities at the site (eg. decommissioning).
Equipment located inside process boundaries will become contaminated and there is a potential for non-enclosed equipment to become internally contaminated. The system design shall incorporate the following features to aid decontamination, decommissioning and future use:

- Smooth surfaces, coatings or liners (in accordance with DOE Order 6430.1A) shall be considered for walls floors and ceilings of areas subject to contamination.
- Internal crevices, corners, ledges and protrusions shall be minimized.
- Welds in ventilation ducts shall be ground smooth.
- Surfaces should be shaped to prevent liquid collection/hold up and to allow wash-down with a minimum quantity of decontamination fluid.
- Surface coatings shall be compatible with decontamination agents, and consideration made for possible coating degradation over time. Surface finishes shall be a two coat system using different colors to permit identification of damaged top coats.
- Sloping and trap free piping and ductwork systems should be used.
- Materials of construction should be resistant to radiation, process solution, and decontamination agents.
- Space should be left around the facility for temporary movement and storage of material during decommissioning.
- The isolation barrier will be designed to isolate the retired filters from the balance of the plant in order to minimize hazards during construction/surveillance and costs associated with an extended inactive period leading to D&D.

5.8 Operating Personnel and Service

5.8.1 Normal Operation

The system shall be designed to operate without the presence of personnel. Daily surveillance and logging will be performed remotely through the FPMCS.

5.8.2 Maintenance

Maintenance of the proposed filter system will give rise to additional operations, particularly during filter change out or wash down. During such times, support is likely to be required from:

- Operations
- Facility management
- Planning/engineering dept
- Maintenance
- Radwaste

The support required for spent filter change-out and/or wash down is expected to be significantly less than that required at present to monitor and maintain the water seals.

5.8.3 Decommissioning Support

The new ACT is expected to provide a support role during the termination of upstream facilities prior to its own decommissioning.

The dismantling of the proposed ACT is expected to be considerably simpler than that of the existing filter chambers, since the standard procedure for removal and disposal of the spent filters will remove a large part of the facilities radioactive inventory.

5.9 Testing

The testing and acceptance of the air filter system shall be in accordance with ASME N509 and ASME N510. The A-E shall insure that all required testing apparatus connections are specified and included to support the referenced testing.

If a building is provided for the ACT installation, the A-E shall incorporate into the design recognized industry testing for the facility type and installation.

6.0 Codes and Standards

The latest editions of standards and guides shall be used through preparation of the definitive design.

Air Conditioning and Refrigeration Institute

ARI 850	Commercial and Industrial Air Filter Equipment

American Concrete Institute

ACI-318	Building Code Requirements for Reinforced Concrete

American Conference of Governmental Industrial Hygienists

ACGIH	Industrial Ventilation
ACGIH TLVs	Threshold Limit Values and Biological Exposure Indices

American National Standards Institute

ANSI C2	National Electrical Safety Code
ANSI N45.2	Quality Assurance Program Requirements for Nuclear Facilities
ANSI/ASME NQA-1	Quality Assurance Program Requirements for Nuclear Facilities
ANSI N509	Standard for Nuclear Power Plant Air Cleaning Units and Components
ANSI N510	Standard for Testing Nuclear Air Cleaning Systems
ANSI Z87.1	Occupational and Educational Eye and Face Protection
ANSI Z88.2	Practices for Respiratory Protection
ANSI Z358.1	Standard for Emergency Eyewash Shower Equipment
ANSI/CGA G-7.1	Compressed Gas Association Commodity Specification

American Society of Heating, Refirgeration and Air Conditioning Engineers

ASHRAE 1991	Applications Handbook
ASHRAE 1983	Design of Smoke Control Systems for Buildings
ASHRAE 1992	Systems and Equipment Handbook
ASHRAE 1993	Fundamentals Handbook
ASHRAE STD 15	Safety Code for Mechanical Refrigeration
ASHRAE STD 55-81	Thermal Envelope
ASHRAE STD 62	Ventilation for Acceptable Indoor Air Quality
ASHRAE STD 90	Energy Conservation

American Society of Mechanical Engineers

ASME N509 (ANSI)	Nuclear Power Plant Air Cleaning Units and Components
ASME N510 (ANSI)	Testing of Nuclear Air Cleaning System

American Welding Society

AWS D1.1	Structural Welding Code - Steel

6.0 Codes and Standards (continued)

Associated Air Balance Council

AABC VOLUME A-82	National Standards for Total System Balance Air Distribution-Hydronic Systems-Sound-Vibration-Field Surveys for Energy Audits

Code of Federal Regulations

29 CFR 1910	Occupational Safety and Health Standards
29 CFR 1926	Safety and Health Regulations for Construction
40 CFR 61	National Emission Standard for Hazardous Air Pollutants

Congressional Acts

RCRA	Resource Conservation and Recovery Act
CAA	Clean Air Act Amendments of 1990
CWA	Clean Water Restoration Act
NEPA	National Environmental Policy Act

County Regulations

Regulation 1	Benton-Franklin Counties Clean Air Authority

DOE Orders

DOE Order 4700.1	Project Management System
DOE Order 5400.1	Environmental Policy Statement
DOE Order 5400.5	Radiation Protection of the Public and the Environment
DOE Order 5480.4	Environmental Protection, Safety, and Health Protection Standards
DOE Order 5480.5	Safety of Nuclear Facilities
DOE Order 5480.6	Radiological Control
DOE Order 5480.7A	Fire Protection
DOE Order 5700.6C	Quality Assurance
DOE Order 6430.1A	General Design Criteria Manual
DOE-STD-1020	Natural Phenomena Hazards Design and Evaluation Guidelines for Department of Energy Facilities (DRAFT, Formerly UCRL-15910)
DOE STD-1021-92	Natural Phenomena PC SCC
DOE-STD-1027-92	Safety Analysis
DOE-STD-3009-93	Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Safety Analysis Reports, November 1993 (DRAFT)

DOE Directives

DOE/EH-0173T	Environmental Regulatory Guide for Radiological Effluents Monitoring and Environmental Surveillance

6.0 Codes and Standards (continued)

Hanford Plant Standards

SDC 4.1	Design Criteria - Design Loads for Facilities
SDC 1.3	Preparation and Control of Engineering and Fabrication Drawings

National Fire Protection Association

NFPA 70	National Electrical Code (NEC)
NFPA 90A	Air Conditioning and Ventilation Systems
NFPA 91	Blower and Exhaust Systems

Sheet Metal and Air Conditioning Contractors National Association

SMACNA	HVAC Duct Design Manual
SMACNA	HVAC Duct Construction Standards - Metal and Flexible
SMACNA	Round Industrial Duct Construction Standards

Washington Administrative Code

WAC173-303	Dangerous Waste Regulations
WAC173-400	General Regulations for Air Pollution Sources
WAC173-401	Air Operating Permit
WAC246-247	Radiation Protection - Air Emissions

WHC Controlled Manuals

WHC-CM-1-3	Management Requirements and Procedures
WHC-CM-1-6	Radiological Control Manual
WHC-CM-3-5	Document Control and Records Management Manual
WHC-CM-4-2	Quality Assurance Manual
WHC-CM-4-3	Industrial Safety Manual
WHC-CM-4-11	ALARA Program Manual
WHC-CM-4-46	Non-Reactor Safety Analysis
WHC-CM-6-1	Standard Engineering Practice
WHC-CM-6-2	Project Management
WHC-CM-6-12	Projects Department Procedures
WHC-CM-7-3	Effluent Monitoring Program
WHC-CM-7-5	Environmental Compliance

WHC Engineering Practice

WHC-EP-0063	Hanford Site Radioactive Solid Waste Acceptance Criteria

7.0 References

1. C. A. Burchsted, A.B. Fuller, and J.E.Kahn, Nuclear Air Cleaning Handbook, Oak Ridge National Laboratory, ERDA-76-21, 1978.

2. B Plant Filter Problems, Rockwell International, internal letter, #60423-79-025, B. C. Mehta to R. J. Thompson, February 28, 1979.

3. Engineering Study - B Plant Radiological Effluent/Containment Upgrades, Project W-024H (WHC-SD-W024-ES-001, Rev. 0)., February 14, 1990.

4. B Plant Retired HEPA Filters Engineering Study, J. Bennett, A. V. Roberts, BNFL Denver, RT/DN/2061/001, March 1994.

5. Approved Site Evaluation Form for a HEPA Building at B Plant, 200 East Area, File #2E-94-23, July 12, 1994.

6. Functions and Requirements for B Plant Canyon Exhaust Filter Replacement, P. E. Roege, WHC-SD-W059-FRD-001, Rev. 1, September 1994.

7. Radiological Design Guide, R. A. Evans, WHC-SD-GN-DGS-30011, Rev 0, September, 1994.

Apendices

A Area Layouts

Fig. 1 Site Plan
Fig. 2 Conceptual ACT Layout

B Air Conditions[6]

Pressures

APPENDIX A

Area Layouts

2 pages

FIGURE 1

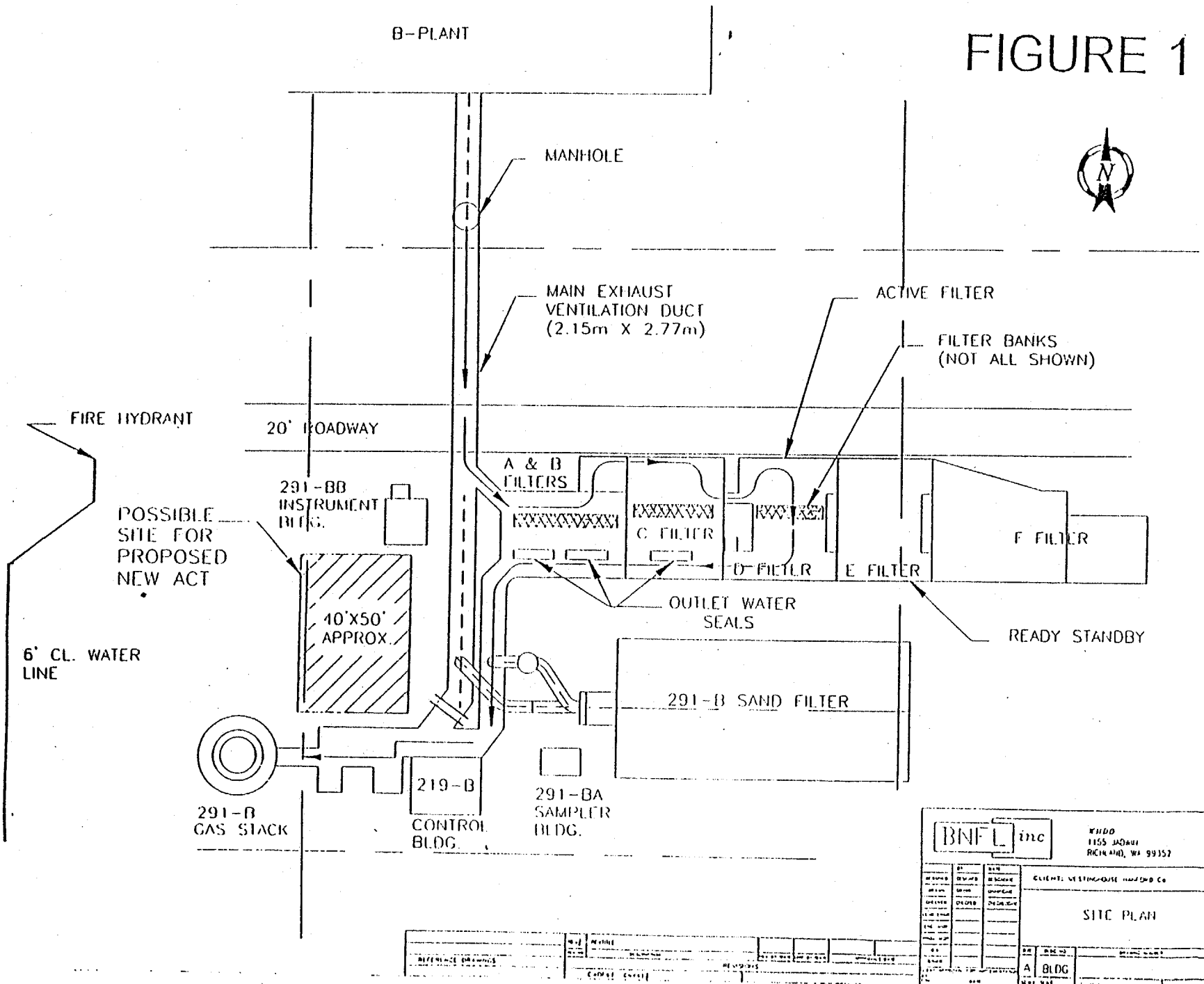
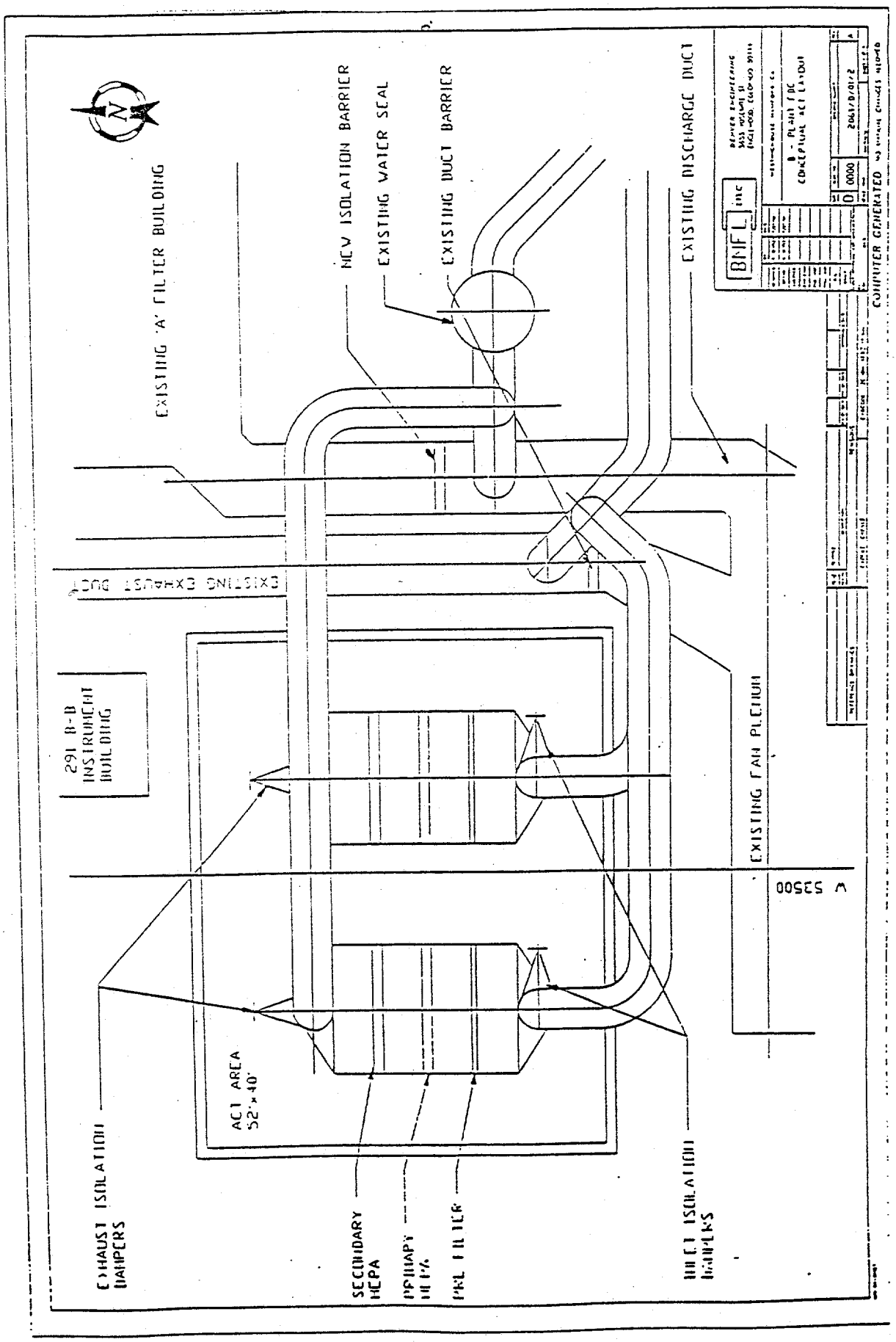

B-PLANT
MANHOLE
MAIN EXHAUST VENTILATION DUCT (2.15m X 2.77m)
ACTIVE FILTER
FILTER BANKS (NOT ALL SHOWN)
FIRE HYDRANT
20' ROADWAY
A & B FILTERS
291-BB INSTRUMENT BLDG.
POSSIBLE SITE FOR PROPOSED NEW ACT
C FILTER
D FILTER
E FILTER
F FILTER
OUTLET WATER SEALS
READY STANDBY
40'X50' APPROX.
6" CL. WATER LINE
291-B SAND FILTER
291-B GAS STACK
219-B CONTROL BLDG.
291-BA SAMPLER BLDG.
BNFL inc
SITE PLAN
A BLDG

FIGURE 2


EXISTING 'A' FILTER BUILDING
NEW ISOLATION BARRIER
EXISTING WATER SEAL
EXISTING DUCT BARRIER
EXISTING DISCHARGE DUCT
291 B-B INSTRUMENT BUILDING
EXISTING EXHAUST DUCT
EXISTING FAN PLENUM
ACI AREA 52'x40'
EXHAUST ISOLATION DAMPERS
SECONDARY HEPA
PRIMARY HEPA
PRE FILTER
INLET ISOLATION DAMPERS
BNFL INC
B - PLANT FDC
CONCEPTUAL ACI LAYOUT
COMPUTER GENERATED

APPENDIX B

Air Conditions

Pressures

1 page

Maximum Airflow	7080 l/s (15,000 cfm)
Normal airflow	4720 - 7080 l/s (10,000 - 15,000 cfm)
Minimal airflow	3540 l/s (7,500 cfm)
Maximum relative humidity	100%
Minimum relative humidity	0%
Maximum air temperature	43°C (110°F)
Minimum air temperature	-23°C (-10°F)

Maximum operating pressure	1.50 kPa (6 in wg vacuum) *
Expected leak test pressure	1.50 kPa (6 in wg vacuum) *
Maximum design pressure	5.25 kPa (21 in wg vacuum)

*Pressures based upon operating experience of the existing system. The designer must determine the appropriate design pressures based upon his analysis of the modified system design (see Section 2.1.3).