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7. Abstract


The Engineering Study focuses on the operability, reliability, future demands and code compliance of the existing primary and annulus ventilation systems for the waste tanks in the Double Shell Farms 241-AN, -AP, -AW, and -SY, as well as the annulus ventilation for Double Shell Farms 241-AY and -AZ. In addition, the Project also includes the ventilation systems for Single Shell Farm 241-SX, Single Shell Tank 241-A-105, and Double Contained Receiver Tanks 244-A, -BX, -S, -TX, and -U.

The Study reviews various alternative designs for the ventilation system and selects a preferred alternative. The Study also recommends the replacement of the existing ventilation system with a new system which incorporates the recommended preferred alternative.


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# DOUBLE SHELL TANK VENTILATION UPGRADES

PROJECT W-314B

ENGINEERING STUDY

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**DOUBLE-SHELL TANK VENTILATION UPGRADES**
**PROJECT W-314B**
**ENGINEERING STUDY**

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# DOUBLE SHELL TANK VENTILATION UPGRADES
# PROJECT W-314B
# ENGINEERING STUDY

## 1.0 INTRODUCTION

### 1.1 BACKGROUND AND SCOPE

The mission of the Tank Waste Remediation System (TWRS) program is to store, treat, and immobilize highly radioactive tank waste in an environmentally sound, safe, and cost-effective manner. The U.S. Department of Energy (DOE) established this program to manage the 177 underground waste storage tanks at the Hanford site (See Appendix C, Sketch (SK)-1 for a Tank Farm Location Overview). The TWRS program includes all activities related to receiving, storing, operating and maintaining, treating, and disposing of all liquid wastes.

Numerous external audits and internal self-assessments of Hanford's Tank Farms have revealed that they require extensive restoration in order to meet the overall TWRS mission goals and support safe operation and maintenance activities. Due to their age and years of little or no upkeep, many Tank Farm infrastructure systems and components have either: exceeded their design life and can be expected to fail in the near-term; have deteriorated beyond repair and must be replaced to ensure continued reliable operation; have already failed and have not been serviced; or operate outside current environmental, health, and safety regulations. Deteriorating infrastructure and a poorly defined physical baseline are expected to increase long-term operation and support costs and possibly limit the number of viable alternatives for retrieval, pretreatment and disposal of tank waste.

In order to help correct the Tank Farm deficiencies, the Tank Farm Restoration and Safe Operations effort (Project W-314) has been established as a cornerstone of the overall TWRS program. The goal of this project is to improve the reliability of safety related systems, minimize onsite health and safety hazards, and support waste retrieval and disposal activities by restoring and/or upgrading existing Tank Farm facilities and systems. Subprojects have been defined within the overall scope of Project W-314 to accomplish the necessary restoration upgrades for the Tank Farms' instrumentation, ventilation, electrical distribution, waste transfer, and support systems. One of these subprojects, W-314B, Double Shell Tank Ventilation Upgrades, is intended to restore the tank ventilation systems to an acceptable design basis and to resolve environmental, health, and safety concerns.

This engineering study was performed to identify and evaluate alternatives to satisfy the operability, reliability, future demands, and code compliance requirements for the tank ventilation systems. Based upon this evaluation, the study recommends a set of actions to correct the tank



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ventilation system deficiencies. A rough order of magnitude cost estimate and estimated schedule for implementing the recommended alternatives is also provided. As the project title implies, the W-314B scope is focused primarily on the double shell tanks (DSTs). However, this study also addresses ventilation upgrades for single shell tanks (SSTs) with active ventilation, except 241-C Farm and all double contained receiver tanks (DCRTs). Specifically, this study addresses the tank ventilation systems for:

- DST Farms 241-AN, -AP, -AW, and -SY (primary and annulus systems)
- DST Farms 241-AY and -AZ (annulus systems only)
- SST Farm 241-SX
- SST Tank 241-A-105
- DCRTs 244-A, -BX, -S, -TX, and -U

A brief description of the affected tank ventilation systems is provided in the following paragraphs:

Double Shell Tanks

A total of twenty-eight DSTs are located within the selected tank farms. These DSTs were constructed between 1968 and 1986. Each of the DSTs are constructed with a 75 foot diameter carbon steel primary tank within a 80 foot diameter carbon steel lined, reinforced concrete secondary tank with a carbon steel domed top (see SK-2). The waste is stored in the primary tank. This configuration permits any leaks to be detected in the annulus area between the primary and secondary tanks (see SK-3).

A typical DST tank farm utilizes two ventilation systems. The primary system (K1) ventilates the primary tanks containing the wastes (see SK-4). The secondary system (K2) ventilates the annulus areas of the DSTs. The K1 and K2 systems are separate systems, but each typically consists of ductwork connecting the tanks to a dual exhauster system. Each exhauster system consists of a moisture removal device, a heater, two high-efficiency particulate air (HEPA) filter banks in series, a fan, and a stack. During normal operation, the primary tanks and annulus areas are maintained at a negative pressure by the exhaust system. It should be noted that both the K1 and K2 systems have a potential for releasing radioactive and/or non-radioactive toxic materials to the environment. However, the K1 system has a much greater potential for a hazardous release since the K2 system would not be exposed to these materials except in the case of a primary tank leak. Both of the K1 and K2 systems collect ventilation condensate in underground seal pots which ultimately drain back to the DSTs.

Single Shell Tanks

The 241-SX Farm, containing 15 SSTs, was constructed in 1953 to 1954, and SST A-105 located in the 241-A tank farm, which contains six tanks, was constructed from 1954 to 1955. Each tank has the capacity to hold one million gallons and is 75 feet in diameter. The tanks are constructed of reinforced



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concrete with the sides and bottoms lined with steel and a domed top (see SK-5). During the 1970's and 1980's an effort was made to reduce the volume of liquid contained in these tanks by evaporation, thereby reducing the potential environmental impacts if the tanks were to leak. The evaporation process left moist sludge and saltcake in the tanks. Sludge consists of the solids (mostly hydrous metal oxides) precipitated from the neutralization of the acid wastes before being transferred to the single shell tanks. Saltcake consists of the various salts formed from the evaporation of water from the alkaline waste. Supernatant and interstitial liquids also exist in the tanks. Water is periodically added to some single shell tanks for cooling purposes due to a temperature rise caused from chemical and radionuclide reactions. However, the single shell tanks in this project use forced air ventilation to provide the necessary cooling to control the internal tank heat (see SK-6 & 7). Each exhauster used with these SST contains, in order of flow: a preheater to lower relative humidity in the airstream, a rough filter to screen large particles from the HEPA filters, two banks of HEPA filters in series, a fan to pull air through the system, a damper to regulate airflow, a stack to direct the exhaust air, a sampler unit in the stack to collect a record sample of radioactive particulates discharged in the effluent, as well as a CAM which detect radioactive particulates in the exhaust and to alarm if preset limits are exceeded. The CAM shuts down the exhauster at a preset high limit.

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The 241-SX system ventilates all of SX Farm except tanks 241-SX-113 and -115. The system includes three parallel banks of HEPA filters (two operating, one standby) to allow for gross flow adjustments as tanks are added to or removed from the system, and to permit change-out of a filter bank without prolonged shutdown of the exhauster. Airflow is maintained at about 300 to 500 $ft^3$/min. per tank, for a total of about 3,200 cfm. Seven air inlets allow air to sweep through the tanks: two are valved and five must be manually sealed if the exhauster is not running. On Tanks 101 through 106, breather filters provide minimal inlet air. The air inlets provide the only air entry paths to the tanks when the exhausters are running.

The 241-A Farm ventilation system consists of portable exhauster (P-17) and HEPA filtered air inlet mounted on Tank A-105. Although active ventilation is required only for A-105, the old underground vent header connects all six tanks. This allows a minimal airflow through the other five tanks. The exhauster is 7000 cfm unit which is necessarily throttled to approximately 2,300 cfm to prevent exceeding the flow limits of the inlet filter. A temporary exhauster is used during routine exhauster filter changes.

Double Contained Receiver Tanks

The double contained receiver tanks (DCRTs) were constructed between 1975 and 1979. The DCRTs serve as holding tanks for transferring waste between tanks and between tank farms. The tanks are housed in underground reinforced concrete structures (see SK-8 & 9). The void space between the tank and the structure is referred to as the annulus. The DCRT ventilation systems

ventilate the annulus space surrounding the tanks as well as the tanks by drawing air from the outside into the annulus area and from the annulus area into and then out of the tank to a filtration and fan unit (see SK-10).

Waste Types

Various types of wastes are stored in the underground storage tanks. They include high-level solvent extraction waste from the Plutonium-Uranium Extraction Facility; neutralized current acid waste (NCAW); concentrated product from the evaporation of dilute complexed waste, concentrated complexant, and low-level wastes (LLW) that include dilute noncomplexed waste, double-shell slurry feed, and noncomplexed waste. The existing primary ventilation systems are required to limit the release of radioactive materials to the atmosphere, safely vent flammable gases, and provide cooling. The annulus ventilation systems provide a means of detecting leaks in the DST primary tanks, as well as cooling, and corrosion control for the annulus area.

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Ventilation System Scope

The physical boundaries for the ventilation systems examined by this study are defined as follows:

The scope begins with, and includes, the ventilation inlet to the tanks and all other miscellaneous infiltration routes of incoming air. The scope ends at the stack where the exhaust air exits to the atmosphere. The mechanical scope includes all ductwork, stacks, drains and seal pots, filtration and air cleaning devices, fans, etc. which lie within the general boundaries previously described.

The ventilation electrical scope begins at, and includes, the existing Motor Control Centers (and routing power from existing transformers to additional Motor Control centers as needed) and extends to all of the ventilation equipment and instrumentation.

The ventilation instrumentation scope includes all instrumentation required to monitor and operate the ventilation system including the stack isokinetic samplers/recorders, tank pressure sensing/indicating devices, and ignitable/hazardous gas monitoring. Also included within the scope are any new instrumentation deemed necessary to monitor the exhaust air. The instrumentation scope also includes the local ventilation associated alarms and the local instrumentation enclosures. Project W-314A (Tank Farm Integrated Instrumentation Upgrades) will specify and provide the ventilation system's remote alarms and/or monitoring devices deemed necessary by that project. Future interfacing with Project W-314A may result in consolidating various instrumentation and electrical enclosures. Not included in the instrumentation scope of this study are the tank temperature devices, tank level devices, and compressor stations which supply air for the instrumentation/controls.

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## 1.2 PURPOSE

Project W-314B directly supports the first two Environmental Management Program Goals established by the DOE's Assistant Secretary for Environmental Restoration and Waste Management (i.e., "manage and eliminate urgent risks and inherent threats", and "provide a safe workplace free from accidents, injuries and adverse health effects"). It also supports the Secretary of Energy's TWRS Safety Initiatives ("infrastructure upgrades" and "improved worker safety/conduct of operations") and is an important element in the renegotiated Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement), which establishes legally enforceable milestones for the completion of tank ventilation systems upgrades. Furthermore, this effort will help ensure that the Hanford Tank Farms will be able to support safe, near-term, storage and subsequent retrieval for treatment and disposal of liquid wastes. The capital improvements provided by this project will improve the margin of safety for the Tank Farms operations and bring the affected Tank Farm ventilation systems into compliance with applicable Federal, state, and local regulations. Secondary benefits will be realized after project completion in the form of reduced down-time, as well as reduced risk of personnel and environmental exposure to radioactive and hazardous material releases. The following subsections provide information about the existing ventilation systems in reference to nonconformance with the governing codes and regulations, their remaining expected service life, existing safety issues, and possible impacts resulting from the retrieval mission during the processing and/or removal of the waste stored in the USTs.

### 1.2.1 Codes and Regulations

Specifically, the existing ventilation systems are not in conformance with the following codes and regulations:

a. The National Emission Standards for Hazardous Air Pollutants (NESHAP) is specified in the 40 Series Code of Federal Regulations (CFRs), Part 61, Subpart H (National Emission Standards for Emissions of Radionuclides Other Than Radon From Department of Energy Facilities). The NESHAP regulation limits the radionuclide emissions from the entire Hanford Site to a 10 mrem/year exposure to any member of the offsite public. NESHAP requires that if any one emission point could potentially cause any member of the public to be exposed to greater than 0.1 mrem/year, then that emission point must be measured continuously per the methods and standards specified in the these regulations. The existing stack sampling and monitoring systems do not measure the emissions per the specified methods and standards.[1]

b. Although the following is not a noncompliance issue, it is included as a measure of the existing ventilation systems against codes and standards accepted as the best method of performance throughout the DOE complex and industry for attaining a safe and reliable ventilation system. DOE Order 6430.1A, Section 1550-2.5.5, and ASME N-510 requires

in-place testing of air cleaning devices (HEPA filters). Many of the existing systems lack adequate upstream mixing and sampling capabilities, provisions for downstream sampling of multiple banks, insertion or sampling ports, etc. Also many of the ventilation systems do not meet the seismic guidelines established in UCRL 15910 (Design and Evaluation Guidelines for Department of Energy Facilities Subjected to Natural Phenomena Hazards) for new construction or major modifications. The goal of these guidelines is to assure that DOE facilities are constructed to safely withstand the effects of natural Phenomena such as earthquakes, extreme winds and flooding.

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### 1.2.2 Remaining Service Life

Many of the ventilation systems have already exceeded their intended design life, and all will exceed their design life prior to completion of the tanks' storage mission. The following data summarizes the estimated life expectancy (based on adjusted ASHRAE values) of the major ventilation components in the subject tank farms[1]. Each tank farm is listed below with the ventilation system's approximate construction date, the major ventilation components, and the estimated remaining service life in plus or minus years relative to 1993.

**AN Tank Farm** (1980-81)
(Primary and Annulus)

| Component | Remaining Service Life |
|---|---|
| Ductwork | 11 |
| Filter Plenums | 18 |
| Fans | 7 |

**AP Tank Farm** (1983-84)
(Primary and Annulus)

| Component | Remaining Service Life |
|---|---|
| Ductwork | 6 |
| Filter Plenums | 14 |
| Fans | 10 |

**AW Tank Farm** (1978-80)
(Primary and Annulus)

| Component | Remaining Service Life |
|---|---|
| Ductwork | 9 |
| Filter Plenums | 9 |
| Fans | 5 |

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**SY Tank Farm** (1974-76)
(Primary and Annulus)

| Component | Remaining Service Life |
|---|---|
| Ductwork | -3 |
| Filter Plenums | 5 |
| Fans | 1 |

**AZ Tank Farm** (1971-77)
(Annulus)

| Component | Remaining Service Life |
|---|---|
| Ductwork | -6 |
| Filter Plenums | 2 |
| Fans | -2 |

**AY Tank Farm** (1968-70)
(Annulus)

| Component | Remaining Service Life |
|---|---|
| Ductwork | -9 |
| Filter Plenums | -1 |
| Fans | -5 |

**SX Tank Farm** (1953-54)
(Primary)

| Component | Remaining Service Life |
|---|---|
| Ductwork | -24 |
| Filter Plenums | -16 |
| Fans | -14 |

**A Tank Farm** (1954-55)
(Primary)

| Component | Remaining Service Life |
|---|---|
| Portable exhauster (installed 1971) | -2 |

**244-A DCRT** (1974-76)
(Primary and Annulus)

| Component | Rem ining Service Life |
|---|---|
| Ductwork | 12 |
| Filter Plenums | 12 |
| Fans | 7 |

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**244-BX DCRT** (1978-79)
(Primary and Annulus)

| Component | Remaining Service Life |
|---|---|
| Ductwork | 16 |
| Filter Plenums | 16 |
| Fans | 11 |

**244-S DCRT** (1978-81)
(Primary and Annulus)

| Component | Remaining Service Life |
|---|---|
| Ductwork | 16 |
| Filter Plenums | 16 |
| Fans | 11 |

**244-TX DCRT** (1978-79)
(Primary and Annulus)

| Component | Remaining Service Life |
|---|---|
| Ductwork | 16 |
| Filter Plenums | 16 |
| Fans | 11 |

**244-U DCRT** (1978-79)
(Primary and Annulus)

| Component | Remaining Service Life |
|---|---|
| Ductwork | 16 |
| Filter Plenums | 16 |
| Fans | 11 |

The large number of existing ventilation equipment problems, i.e., inlet radial dampers for the 241-AW K2 system needs to be replaced, the K2-5-2 exhauster fan in the 241-AN tank farm needs to be repaired, the fan motor on the 101-AY exhauster and the fan bearings on 102-AY annulus exhauster needs to be replaced, etc., and the estimated remaining service life indicates that some major components already need replacement, some may need replacement in the near future, and they all will need to be replaced prior to the completion of the retrieval mission. There are plans to temporarily replace some components prior to completion of this project due to their inoperability and state of disrepair. Reference Document 1 establishes a Priority 1 need for replacement of these ventilation systems based on the current condition of the systems, component age, safety, and future needs.

### 1.2.3 Safety Issues

The following paragraphs describe the prime safety concerns with the existing ventilation systems.

a. The possibility exists for flammable gas concentrations to reach the lower explosive limit (LEL) when the tank farms are not properly ventilated. This could occur during an extended shut down for maintenance and/or repairs.

b. Ventilation system exhaust stack flows are required to be monitored for radionuclides per 40 CFR 61 Appendix H, to ensure that established safe radionuclide emission limits are not exceeded. The existing sampling and monitoring systems for radionuclides are noncompliant with 40 CFR 61 Appendix H which can lead to inaccurate data being accumulated to verify compliance with NESHAP's safe offsite exposure limit.

c. The majority of the existing ventilation systems do not have the ability to control or monitor for hazardous chemical emissions, therefore Hanford cannot statistically report the quantity or identity of these emissions being exhausted into the atmosphere. The tank farm with the most monitoring equipment is the SY Farm, specifically Tank 101-SY. However, only the quantity of hydrogen, ammonia and volatile organic compounds (VOCs) produced in this tank are monitored, although the exhausted air contains many other compounds which are not monitored. Actual characterization of the air being expelled by the ventilation systems in this study have not been performed in sufficient detail to allow a comprehensive comparison of the exhausted air constituents to the regulatory lists, such as WAC-173-460. Without this information, the exposure of site workers to possible hazardous compounds being exhausted are relatively unknown. Many of the tank farm work procedures require the workers to utilize fresh air breathing equipment when entering the tank farms. Many reports of site workers smelling strong fumes, having nausea and/or headaches after working in or around the tank farms have been recorded[8].

d. The method by which the DSTs obtain their supply of ventilation intake air presents a potentially serious safety problem during the winter months. In-leakage through various openings provide the primary ventilation system the necessary intake of air. The formation of hoar frost, ice, or snow can cover these openings, causing loss of control of the tank's internal negative pressure. This creates a potential for tank damage. Immediate actions are required to rectify this situation when it occurs. Shutdown of the ventilation systems due to low air flow and/or a high negative tank pressure will cause the loss of radionuclide tank confinement.

e. When the ventilation systems are not operating, loss of radionuclide confinement occurs. Without the constant negative pressure in the tanks, the escape of radionuclides will occur from the tanks through the normal infiltration routes.

f. Most of the older ventilation systems do not provide the necessary access or equipment for testing to the American National Standard for the Testing of Nuclear Air Treatment Systems ASTM N-510. The newest of the tank farms (241-AP) does comply with this standard, and some of the older systems have been retrofitted as best as they could be. The inability to properly test the



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ventilation systems per ASME N-510 results in the inability to verify that the radionuclide filtration units are functioning as required. In the noncompliant systems, continuous air monitors are the only indication that the system is not functioning properly. Unfortunately this indication or alarm occurs after the radionuclides begin to exit the stack resulting in a radiological release to the atmosphere and surrounding area.

g. Many of the existing ventilation systems do not provide as low as reasonably achievable (ALARA) exposure conditions for the workers who must maintain, test, and operate those systems. The existing systems' designs are not conducive to installing additional sheilding without hampering maintenance activities. A new system built by today's standards will have the ALARA concept integrated throughout its design. The installation of this design will aide in maintaining worker exposures as low as reasonably achievable.

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h. The existing DST ventilation systems cannot adequately handle tank farm upset conditions created by situations such as the 242-A Evaporator having an off-normal operating condition where it must immediately send hot waste back to the tank farm. In the past, this action has caused the ventilation system to shut down due to the additional heat and moisture added to the exhaust stream.[4] Another problem occurs when additional air is allowed to flow into the tanks due to maintenance or repair activities such as through open risers. The current ventilation systems cannot maintain the required negative pressure by increasing their output flow rates, therefore other mitigating activities must be performed. This additional activity results in a higher cost for the original repair and additional radiation exposure to the workers.

i. Relatively short exhaust stack heights present onsite toxicological concerns for workers due to lack of dispersion of the vapors being exhausted. (Reference Defense Waste Management Division letter of January 1, 1990, Government Operations Business Unit evaluation transmitted March 2, 1990, Radiological Analysis letter June 1988).

### 1.2.4 Retrieval Issues

The following items are future retrieval mission impacts to the DST ventilation system.

a. The DST ventilation system capabilities must be compatible with the mixer pump installation process and its operation, i.e. aerosols, opening of tank risers, etc. The existing systems cannot maintain sufficient negative pressure with the risers open. The existing system may not be compatible with the mixer pump operation if additional aerosols are introduced to the vapor space. Project W-211 (Initial Tank Retrieval System) is currently funding a study which will provide information on how the vapor in the tank's vapor space will be affected during the operation of mixer pumps.

b. Changes in the composition of the DST fluid will occur throughout the retrieval mission, resulting in various head space vapor compositions. The

effects of this on the existing ventilation system are not significant as long as the system's radionuclide removal capability is not exceeded, and the composition of the vapors being released do not cause a toxilogical health concern. The changes in composition will greatly affect the design of a new system due to the codes and regulations which require toxic mitigation of the exhausted air.

c. Variable temperatures of the DST vapor to be exhausted from the tank's head space will occur due to operation of a mixer pump, mixing or blending of the chemical contents of the tank, and differing radionuclide concentration with varying amounts of decay heat. The variable temperatures can cause operational problems with the existing systems, i.e., the moisture de-entrainer may not perform adequately, the relative humidity could be difficult to control, etc.

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## 2.0 SUMMARY

The purpose of this study is to review the existing tank ventilation systems listed in Section 1.1 of this document, focusing on the operability, reliability, future demands (e.g. retrieval of wastes from the DSTs) and code compliance of the existing systems. This study also provides a recommendation on which course of action should be pursued by WHC as the Hanford Site Operations and Engineering Contractor on behalf of DOE.

The condition of the existing ventilation system's major components currently range from 24 years past their expected service life to a remaining service life of 16 years. The remaining service life of the ventilation system provides an indication of their condition. However, the poor condition of the older ventilation systems supports the correlation between remaining service life and condition. Many of the systems are in a state of disrepair and/or are incapable of performing satisfactorily to the current ventilation needs and standards. The existing ventilation systems will most likely not remain operable until their retirement when the tank farm retrieval mission is accomplished nor be capable of performing adequately during that mission. A detailed description of the existing ventilation system's poor condition can be found in Reference 1.

The study recommends complete replacement of the ventilation systems as listed in Section 3.1. A partial replacement/upgrade of the existing systems is not practical, and in some cases not physically possible, due to continuous operation requirements, design characteristics, the condition of the system, etc. Each of the ventilation systems shall utilize an identical array of components. The size (horsepower, wattage, flow rate, etc.) of the components will vary from farm to farm depending on the tank farm criteria and design factors. Where necessary, the study used the maximum flow rates listed in Section 5.1.5 as a basis for deriving component sizes, however, actual component sizing shall be determined during the future conceptual and design phases of this project. The new ventilation system will be required to be tested and ready for service prior to the removal of the existing ventilation systems and the isolation of selected below grade components.

The preferred ventilation system alternatives were selected and agreed upon by the participants of the W-314B Sunshine Session. The participants included representatives from Tank Farm Operations, Safety, Project Definition, Projects, Permitting, DOE-RL, Washington Department of Health (WDOH), Washington State Department of Ecology (Ecology), Westinghouse Savannah River Company, Los Alamos National Laboratory, and offsite consultants. The advantages and disadvantages of the various ventilation alternatives were discussed during facilitated sessions and the preferred alternative was selected based on its overall performance, programmatic and operational impacts, safety considerations, environmental impacts and permitting requirements, and "other pertinent decisional data", i.e., unknown vapor constituents and the flexibility of the system. See Section 6.0 for a



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detailed comparison of the alternatives. See Appendix B, Figure 9 for a schematic layout of the preferred ventilation system.

## 2.1 Preferred Alternative Ventilation System Descriptions

Primary Tank Ventilation (DSTs, SSTs, & DCRTs)

Air will be conveyed to each primary tank, within the farm, from a dual (parallel) intake filtration train (normal operations will consist of using one side with the second side in stand-by as a backup, but both sides may be operated at the same time when a large amount of air is required for unusual conditions, i.e., a open riser for special in-tank work). The dual intake consists of a double plenum with louvered intakes, air heaters, prefilters, HEPA filters, and isolation valves (see Appendix B, Figures 3 & 3A). The isolation valves are connected to a common underground duct with branches that extend to each primary tank. Each branch has a control valve which can isolate or vary the air flow to its respective tank. An additional branch with an isolation valve is connected to the common duct to provide an off-normal/emergency air inlet.

Air will be exhausted from each primary tank, within the farm, through underground ductwork via branch lines connected to a common duct. Each branch will contain a chevron moisture separator positioned vertically and directly above the tank outlet. An additional branch with an isolation valve, connected to the common duct, will provide a connection for an off-normal/emergency portable exhauster (portable exhauster is not included in project scope). The common duct will be connected to a dual exhaust train (normal operations consists of using one side with the second side in stand-by as a backup, but both sides may be operated at the same time when a large amount of air is required for unusual conditions). The dual train consists of isolation valves, moisture separators with backwash capability, condensers, high efficiency mist eliminator (HEME), heaters, metal HEPA filters, fiber HEPA filters, high efficiency gas adsorber (HEGA), ammonia charcoal adsorber, high efficiency 95% filters, variable speed exhaust fans, and one common stack connected to each side of the dual exhaust train (see Appendix B, Figures 1, 3A and 8). The stack shall contain monitoring/sampling instrumentation for radionuclides, ammonia, hydrogen, and volatile organic compounds (VOC).

Annulus Ventilation System (DSTs)

Air will be conveyed to each DST's annulus, within the farm, from a dual intake filtration train (normal operations will consist of using one side with the second side in stand-by as a backup, but both sides may be operated at the same time when a large amount of air is required for unusual conditions). The dual intake consists of a double plenum with louvered intakes, air heaters, prefilters, HEPA filters and isolation valves (see Appendix B, Figures 3 and 3A). The isolation valves are connected to a common underground duct with branches that extend to the annulus of each tank. Each branch has a control valve which can isolate or vary the air flow to its respective tank. An



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additional branch with an isolation valve is connected to the common duct to provide an off-normal/emergency air inlet.

Air will be exhausted from each DST's annulus through underground ductwork via branch lines connected to a common duct. Each branch connects a tank's annulus area to a common exhaust duct, and each branch contains a radiation monitor for detecting a primary tank leak. An additional branch with an isolation valve, connected to the common duct, provides a connection for an off-normal/emergency portable exhauster (portable exhauster is not included in project scope). The common duct is connected to a dual exhaust train consisting of isolation valves, moisture eliminators, heaters, prefilters, HEPA filters, variable speed exhaust fans and a common stack (see Appendix B, Figures 3A, 5 and 8). The stack contains monitoring/sampling instrumentation for radionuclides.

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## 2.2 Estimated Project Cost

The preferred alternative total estimated cost (TEC), i.e., design, engineering, inspection, procurement, construction, and project management, is $320,500,000. The estimated total project cost (TPC), i.e., TEC, permitting, safety analysis costs, etc., is $440,000,000. See Appendix D for cost summaries and estimates.

## 2.3 Additional Information

Appendix F contains a listing of items which should be studied, acknowledged, or additional information for the developers of future W-314B documentation. The follow-up on some of the items listed in this appendix could result in significantly changing the project scope and cost. For example, the need to maintain a forced air ventilation system on Tank 241-A-105 and on the thirteen currently ventilated tanks of the 241-SX farm may change with time. These tanks are ventilated to remove the heat generated by the waste they store. Studies show that the quantity of heat being produced in these tanks becomes less with the passing of time. There is a possibility, that if the quantity of heat being produced continues to decrease, the need for cooling the tanks by forced air ventilation and/or upgrading these systems will no longer be necessary resulting in a substantial cost savings. Another item listed in Appendix F, which could result in a significant change and cost savings for Project W-314B, will be Project W-314C's (Waste Transfer System Upgrade) design configuration and construction completion date. This project has the potential for eliminating the need for the some or all of the DCRTs. If the DCRTs are removed from service and isolated, then the need for upgrading their ventilation system will no longer be necessary.

The installation of the preferred alternative alleviates the various concerns, i.e., code and regulations, safety, and retrieval, (listed in Sections 1.2.1, 1.2.3 and 1.2.4), with the existing ventilation systems. Appendix H is a duplicate list of those concerns and provides details on how or why the preferred alternative alleviates those concerns.

## 3.0 RECOMMENDATIONS AND CONCLUSIONS

### 3.1 RECOMMENDATIONS

This study recommends complete replacement of the existing ventilation systems with the systems described by the preferred alternative. The following is a list of the ventilation systems recommended for replacement by this project:

| Facility | Primary System | Annulus System |
|---|---|---|
| 241-AN | X | X |
| 241-AP | X | X |
| 241-AW | X | X |
| 241-SY | X | X |
| 241-AY* | | X |
| 241-AZ* | | X |
| 241-A-105 | X | |
| 241-SX | X | |
| 244-A | X | X |
| 244-BX | X | X |
| 244-S | X | X |
| 244-TX | X | X |
| 244-U | X | X |

* The Primary ventilation on 241-AY and AZ will be upgraded by Project W-030, "Tank Farm Ventilation Upgrade".

### 3.2 CONCLUSIONS

Replacing the existing ventilation systems with the preferred alternative will provide the selected facilities with a reliable, safe, and code compliant system. The new ventilation systems should provide dependable service for the duration of the DST retrieval mission and until closure of the tank farms. The new system will enhance safe operation of the facilities by mitigating the current potential release of toxic emissions and maintaining concentrations of continuously released flammable vapors below their lower flammable limit (LFL). Radionuclide control and monitoring will be improved due to the addition of inlet HEPA filters and code compliant monitoring. Also the new systems will be built per ASME N-509 and AG-1 criteria, and be testable per ASME N-510 standards to ensure the HEPA filters are functioning properly. Operation of the ventilation systems will be improved since the new system provides positive flow and pressure control by design, along with lower personnel exposures to radiation and toxic emissions by incorporation of ALARA concepts into the design.

Selection of the preferred alternative involved comparing all of the various alternatives with their respective positive and negative impacts in the areas of mechanical attributes, programmatic and operational impacts,



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safety considerations, environmental impacts and permitting requirements, costs, and other decisional data. The preferred alternative provides the best overall system with the most positive impacts and the least negative impacts and meets all of the necessary functional criteria.

## 4.0 UNCERTAINTIES

The following is a list of the major uncertainties which could cause a significant cost impact. Many of the following items are also listed in Appendix F, "Additional Information For Future W-314B Documents", along with some less significant uncertainties.

a. The greatest uncertainty which could significantly affect the recommendation of the preferred alternative is that characterization of the vapor which will be exhausted over the life of the ventilation system is relatively unknown and undeterminable at this time. Project W-236A, "Multi-Function Waste Tank Facility," which will be providing two new tank farms for storing similar wastes, has developed a list of compounds which will require mitigation from the new tanks' ventilation exhaust stream using a worst case scenario. For the purposes of this study, Project W-314B assumes that the same compounds will require mitigation from the existing tanks' exhaust streams. The major impact of this uncertainty is that the preferred alternative may be providing more or less than adequate mitigation components than are really necessary. The preferred alternative partially compensates for this uncertainty by providing modular mitigation components which can be removed or modified as required (i.e., Installed charcoal adsorber is designed to remove compound "X", but compound "X" is no longer in the exhaust due to the tank contents being changed. However, a new compound "Y" exists and requires mitigation. A new charcoal adsorber designed for removal of "Y" can be purchased and installed in the location of the original adsorber.) WHC is currently pursuing vapor characterization of the USTs and as more characterization information becomes available, it shall be utilized in the preparation of the conceptual and definitive designs for this project.

b. Another uncertainty involves the assumption that 10% of the soil excavated will be contaminated requiring removal, packaging and burial based on past project costs and experience. The engineering study cost estimate applies a 30% contingency for this uncertainty. The associated costs for excavation can be found in Appendix D.

c. The study assumes that all ductwork will be double contained. If it can be determined that single wall ductwork is acceptable for the inlet supply, or any other portion of ductwork, then a cost savings would be incurred.



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d. There is a possibility that SST 241-A-105 and the 241-SX Farm will not require active ventilation for the purpose of heat removal in the near future. If it is determined that heat removal is not required, then the scope for upgrading these ventilation systems can be deleted from Project W-314B. Deleting these two ventilation systems from Project W-314B's scope would be a very significant project cost reduction (approximately. $44,000,000).

e. It is uncertain if future waste transfers will utilize the existing five DCRT facilities (244-A, -BX, -S, -TX, -U). Project W-314C (Waste Transfer System Upgrade) may delete the need for the DCRTs by installing a new network of piping and facilities for transferring tank waste. If the DCRTs are removed from service and isolated, then the need for upgrading their ventilation system will not be required and a very significant project cost savings will occur (approximately $72,500,000).

f. The study assumes that a dual filtration train (inlet and exhaust trains) will perform as follows: Normal operating conditions will consist of one train active with the second train in stand-by as a backup, but both sides may be operated at the same time when a large amount of air is required for unusual or when upset conditions exist. The study also assumes that when both trains are operating, a third back-up train will <u>not</u> be required. If in the development of the safety documentation, the above scenario creates and unacceptable risk, then the estimated project cost could significantly be increased to resolve the unacceptable risk.

g. This study assumes that buildings are required to house the primary and annulus exhaust trains, motor control centers, uninteruptable power system (UPS),instrumentation, and local readouts. The facilities will be arranged to allow access to the equipment for maintenance. Each building will include heating, ventilation, and air conditioning (HVAC), fire protection, lighting, security, and human factors considerations in accordance with DOE Order 6430.1A, General Design Criteria. Based on the preliminary safety analysis for the similar ventilation building being provided by Project W-030, it is assumed that the safety class of the W-314B buildings is 3 over 2, meaning that the structures must meet Design Basis Accident criteria for seismic, wind, and missile events. If Project W-314B's safety documentation stipulate different safety and hazard classifications than the other similar projects' safety analysis, the estimated project cost could significantly be increased or decreased.

h. This study assumes Project W-314D (Tank Farm Electrical Upgrades) will provide back-up power per WHC-SD-GN-DGS-303 ("Backup Electric Power System Definitions and Design Criteria") to Project W-314B's electrical distribution panels approximately two years after the completion of W-314B. The study assumes that it will receive a temporary waiver from DOE Order 6430.1A power requirements and will be allowed to operate from a normal power source and without back-up power until Project W-314D is completed. Project W-314B's electrical design and installation from the



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distribution panels to the loads shall meet DOE Order 6430.1A requirements. If Project W-314D does not install back-up power, or the waiver is not approved, and Project W-314B is required to install a back-up power source, the estimated project cost will significantly increase. There is also the possibility that future safety documentation may provide a lower safety classification than the assumed safety class 2. If the documentation supports a lower safety classification than a substantial project cost reduction should occur.

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# 5.0 DESCRIPTION OF ALTERNATIVES AND SOLUTIONS

## 5.1 CRITERIA

### 5.1.1 Design Life

The ventilation system shall have a design life of 40 years, assuming the completion of the high and low level waste vitrification processing by year 2028 (a TPA milestone) and the flexibility to remain operable to year 2040. Replaceable equipment and components may have a shorter design life based upon availability, ease of maintenance, and economic considerations.

### 5.1.2 Instrumentation and Control

Stack effluent continuous air monitors and record air samplers shall be installed on both the primary tank and annulus ventilation exhaust systems to detect and measure radioactive releases to the atmosphere. The primary stack instrumentation shall also include sampling and monitoring for hazardous chemical releases. Alarms shall be provided for low flow or loss of sample airflow to the monitors. These alarms shall be separate and distinct from those for high radiation. Stack particulate air sampling shall be continuous and representative of the airflow in the system, provided by the near-isokinetic air sampling system. Selected instrumentation and interlock systems shall be provided for detection of leaks, pressure, and radiation, and to effect safe shutdown or to maintain safe operation of systems, as required. Instrumentation shall be designed for "fail safe operation" in the event of an air or electrical outage so that alarms are activated on signal failure. Radiation monitoring instruments shall have the "fail safe" feature of alarm on loss of ability to detect radiation. Any outdoor alarms that are required to be visual shall have high-intensity strobe indicators. Sampling and monitoring for radioactive and hazardous emissions shall be in accordance with DOE, Environmental Protection Agency (EPA), Federal, State, local, and WHC requirements as listed in Section 9.0. Additionally, radiation monitors shall be required in the DSTs annulus ventilation exhaust ductwork, downstream of each tank's annulus outlet, to detect leaks from the primary tanks. Radiation monitoring capabilities shall also be provided on steam, water, and/or air lines that come in contact with a radioactive environment or have potential for contamination.

Instrumentation for the testing and operation of the filtration units will be designed and installed per the applicable sections of ASME N-509, N-510 and ASME AG-1 American National Standards.

### 5.1.3 Primary and Secondary Tank Ventilation System

Continuous tank ventilation is required. Redundancy of components shall be required to ensure a vacuum is continuously maintained in the primary and secondary tanks during maintenance, component failures and repairs. The filtration efficiency for radionuclide particles must meet ASME N-510 testing

requirements, WAC 173-480, and Code of Federal Regulations 40 CFR 61. Also, any toxic air pollutants in the exhaust stream must be remediated to an acceptable level as required per WAC 173-460 and 40 CFR 61.

All equipment components shall be arranged to facilitate maintenance, repair, calibration with provisions for access, decontamination, shielding, removal, lubrication, and testing. Filter change systems concepts shall facilitate confinement during filter changes. Filter enclosures shall be designed with unobstructed access to openings for minimal personnel exposure during filter changes.

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Active winter protection for ventilation components are required including instrumentation, duct work, drains, and seal pots. All underground piping and ductwork with the potential for conveying liquid shall be encased in secondary piping and be provided with leak detection capability in order to collect and detect any leakage from the primary piping.

Each design alternative shall employ a method to prevent achieving negative pressures which could lead to the collapse of the primary and secondary tanks.

Energy conservation shall be considered in the selection of components using the criteria given in DOE Order 6430.1A, Section 0110-12 with the objective to minimize consumption of nonrenewable energy sources and to encourage the use of renewable energy sources.

### 5.1.4 Safety

The hazards which need special consideration are the confinement and/or mitigation of hazardous airborne particulate and gasses, radiation exposure, and industrial hazards to personnel. The ventilation systems shall provide confinement for the hazardous airborne particulate and gasses within acceptable levels. See Appendix A for a list of chemicals and radionuclides which require mitigation and/or control to comply with the regulatory emission limits. Radiation exposure shall be mitigated by employing the ALARA policy which incorporates shielding and design configuration to lower personnel — exposure. Shielding shall be provided in accordance with the exposure limits of WHC-CM-4-9 and WHC-CM-1-6, DOE Order 5400.5, RL Order RL 5480.11A and ALARA. Releases of radioactive material and nonradioactive hazardous material shall not exceed the criteria given in WHC-CM-7-5. Release of radioactivity from the facility shall not exceed 5,000 times the Derived Concentration Guidelines (DCGs) specified in DOE Order 5400.5, Chapter III at the point of discharge during abnormal operating conditions. The tank farms are considered Moderate Hazard Facilities[12]. The integrity of the ventilation system components and structures important to safety must withstand the seismic events and other natural phenomena criteria described in Hanford Plant Standard (HPS), Standard Design Criteria, SDC-4.1.

### 5.1.5 Specific Tank Criteria by Farm

The following data provides tank-specific criteria taken from the appropriate Safety Analysis Report for each tank farm. This study's alternatives shall ensure that maximum and/or minimum values are not exceeded.

**Specific Tank Farms:**

a. <u>AN Tank Farm</u>[4]

**Primary Tanks:**
Number of tanks = 7
Maximum pressure = 60 in. water gauge
Maximum vacuum = 6 in. water gauge
Maximum Tank wall temperature = 200°F.
Tank construction material = ASTM A 537 Class 1

**Waste characteristics:**
Temperature = 350°F Max. entering tank, less than 200°F in storage
Heat generation rate = 100,000 Btu/h/tank maximum
ph = 8 to 14
Specific gravity = 2.0 maximum

**Primary Ventilation Requirements**
Maximum ventilation = 1000 scfm (total for 7 tanks)

**Annulus Ventilation Requirements**
Maximum ventilation = 6125 scfm (total for 7 tanks)

b. <u>AW Tank Farm</u>[4]

**Tanks:**
Number of tanks = 6
Maximum pressure = 60 in. water gauge
Maximum vacuum = 6 in. water gauge
Maximum Tank wall temperature = 200°F.
Tank construction material = ASTM A 537 Class 1

**Waste characteristics:**
Temperature = 350°F Max. entering tank, less than 200°F in storage
Heat generation rate = 100,000 Btu/h/tank maximum
ph = 8 to 14
Specific gravity = 2.0 maximum

**Primary Ventilation Requirements**
Maximum ventilation = 1000 scfm (total for 6 tanks)

**Annulus Ventilation Requirements**
Maximum ventilation = 4800 scfm (total for 6 tanks)



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c. <u>AP Tank Farm</u>[4]

**Tanks:**
Number of tanks = 8
Maximum pressure = 60 in. water gauge
Maximum vacuum = 12 in. water gauge
Maximum Tank wall temperature = 300°F.
Tank construction material = ASTM A 537 Class 1

**Waste characteristics:**
Temperature = 350°F Max. entering tank, less than 200°F in storage
Heat generation rate = 100,000 Btu/h/tank maximum
ph = 8 to 14
Specific gravity = 2.0 maximum

**Primary Ventilation Requirements**
Maximum ventilation = 1000 scfm (total for 8 tanks)

**Annulus Ventilation Requirements**
Maximum ventilation = 8600 scfm (total for 8 tanks)

d. <u>SY Tank Farm</u>[4]

**Tanks:**
Number of tanks = 3
Maximum pressure = 60 in. water gauge
Maximum vacuum = 6 in. water gauge
Maximum Tank wall temperature = 250°F.
Tank construction material = ASTM A 515 Grade 60

**Waste characteristics:**
Temperature = 350° Max. entering tank, less than 250°F in storage
Heat generation rate = 50,000 Btu/h/tank maximum
ph = 8 to 14
Specific gravity = 1.7 maximum

**Primary Ventilation Requirements**
Maximum ventilation = 1000 scfm (total for 3 tanks)

**Annulus Ventilation Requirements**
Maximum ventilation = 750 scfm (total for 3 tanks)

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e. <u>AY Tank Farm</u>[2]

Number of tanks = 2
**Annulus Ventilation Requirements**
Maximum ventilation = 3500 scfm/tank
Current ventilation flow rate = 800 scfm/tank
Maximum vacuum = 6 in. water gauge
Maximum heat removal = 120,000 Btu/hr.

f. <u>AZ Tank Farm</u>[2]

Number of tanks = 2
**Annulus Ventilation Requirements**
Maximum ventilation = 3500 scfm/tank
Current ventilation flow rate = 800 scfm/tank
Maximum vacuum = 6 in. water gauge
Maximum heat removal = 120,000 Btu/hr.

g. <u>SX Tank Farm</u>[3]

**Tanks:**
Number of tanks = 15 (13 with active ventilation req'd)
Maximum pressure = 60 in. water gauge
Maximum vacuum = 7 in. water gauge

**Waste characteristics:**
Maximum Temperature = 350°F.

**Primary Ventilation Requirements**
Ventilation flow rate = 300-500 scfm per tank (13 tanks req'd)

h. <u>A Tank Farm</u>[3]

**Tanks:**
Number of tanks = 6 (1 with active ventilation req'd)
Maximum-pressure = 60 in. water gauge
Maximum vacuum = 7 in. water gauge

**Waste characteristics:**
Maximum Temperature = 350°F.

**Primary Ventilation Requirements**
Ventilation flow rate = 2300 scfm (tank A-105 only)

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i. DCRT Facilities[5]

**Number of Facilities** = 5
Number of tanks/Facility = 1
Maximum pressure = 60 in. water gauge
Maximum vacuum = 6 in. water gauge

**Waste characteristics:**
Maximum Temperature = 250°F.
Specific gravity = 1.8

**Primary Ventilation Requirements**
Ventilation flow rate = 125 scfm/tank

**Annulus Ventilation Requirements**
Ventilation is performed by the primary system

## 5.2 ASSUMPTIONS

Listed below are the assumptions utilized in the preparation of this engineering study.

a. The vapor being exhausted from the tanks shall require mitigation of radiological and hazardous constituents based on the requirements of similar tank farm Projects W-030 and W-236A. See Appendix A for a list of constituents assumed to require mitigation.[6,7]

b. It is assumed that heat added to the tank contents above the tank design heat load criteria during retrieval efforts or operations will be mitigated by design of the responsible project, i.e. Project W-211 anticipates installing mixer pumps which create additional heat loading of 1,526,400 Btu/hr. during the initial mixing process.[9,10] Project W-211 must reduce the unacceptable heat loading in their project/design.

c. Existing air lift circulators will not need to be operated in the DST farms except for tank 102-AW, therefore only the 241-AW farm ventilation will have to compensate for the additional air introduced into the 102-AW tank by its air circulators.

d. All new seal pots, drains, and ducts will be double contained for hazardous liquid storage and drainage.

e. Project W-314A (Tank Farm Integrated Instrumentation Upgrade) will determine which remote indications of alarms, controls, and monitoring are required and will include them in that project.

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f. Stack effluent stack monitoring and sampling will be performed by a generic/universal system currently being designed by WHC for installation on all ventilation stacks which have a potential to release radioactive particles to the atmosphere. It is also assumed that the generic/universal design will be completed in time to be incorporated into W-314B's design media.

g. It is assumed that the design/operational criteria located in the current ventilation systems respective Safety Analysis Report (SARs) is correct and adequate to be used as design criteria for this project.

h. It is assumed that the control of the ventilation system is based on a specified tank pressure and the airflow may vary as needed to maintain that pressure.

i. A double contained catch tank with leak detection will be required for each 241-A and -SX Farm to contain the condensate from the ventilation system and will require periodic disposal as mixed waste. It is also assumed that the condensate from the remaining farms will be drained back to a designated waste tank within each farm.

j. The air flow paths for the new DCRT ventilation system shall remain the same as the existing system, see Section 1.1 for flow path description.

k. The study assumes that metal HEPA filters will be approved for use at Hanford and that ASME AG-1 will approve of their use prior to construction of this project. If this assumption does not materialize, approved fiber HEPAs will replace the metal HEPAs during definitive design.

l. The study assumes that a dual filtration train (inlet and exhaust trains) will perform as follows: Normal operating conditions will consist of one train active with the second train in stand-by as a backup, but both sides may be operated at the same time when a large amount of air is required for unusual or when upset conditions exist. The study also assumes that when both trains are operating, a third back-up train will <u>not</u> be required.

m. The study assumes the scrubbers require a chemically engineered fluid, to act as the absorbent.

n. The study assumes retrieval of waste in the DSTs will utilize mixer pumps and the retrieval of waste in the SSTs (SX and A Farms) will provide a compatible ventilation system if necessary.

o. This study assumes that buildings are required to house the primary and annulus exhaust trains, motor control centers, uninteruptable power system (UPS),instrumentation, and local readouts. The facilities will be arranged to allow access to the equipment for maintenance. Each building will include heating, ventilation, and air conditioning (HVAC), fire protection, lighting, security, and human factors considerations in accordance with DOE Order 6430.1A, General Design Criteria. Based on the preliminary safety analysis[11] for the similar ventilation building being provided by Project W-030, it is assumed that the safety class of the buildings is 3 over 2, meaning that the structures must meet Design Basis Accident criteria for seismic, wind, and missile events. See Appendix G for a listing of required buildings.

p. This study assumes that 30 feet is an adequate height for new exhaust stacks.

q. This study assumes Project W-314D (Tank Farm Electrical Upgrades) will provide Back-up power as per WHC-SD-GN-DGS-303 to Project W-314B's electrical distribution panels within approximately two years after the completion of W-314B. The study assumes that it will receive a temporary waiver from DOE Order 6430.1A power requirements and will be allowed to operate from a normal power source, without back-up power, until Project W-314D is completed. Project W-314B's electrical design and installation from the distribution panels to the loads shall meet DOE Order 6430.1A requirements.

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## 5.3 ALTERNATIVES

**General:** For the purpose of defining and evaluating ventilation system alternatives, the ventilation system is broken into distinct sections, i.e., exhaust train, inlet train, etc. Various alternatives are supplied for each section of the system and evaluated in the following text. The evaluation in this section consists of describing the function of the components and their advantages and disadvantages associated with them. Note that each alternative meets its respective design criteria in Section 5.1 and incorporates the assumptions listed in Section 5.2.

The following is a summary listing of ventilation sections and their alternatives:

- **PRIMARY TANK EXHAUST TRAIN ALTERNATIVES** (Section 5.3.1)

  Alternative 1: Passive Adsorption/Filtration (Page 28)
  Alternative 2: Active Absorption (Page 33)

- **PRIMARY AND DST ANNULUS INLET ALTERNATIVES** (Section 5.3.2)

  Alternative 1: Common Inlet Station (Page 35)
  Alternative 2: Individual Tank Inlet Stations (Page 38)

- **DST ANNULUS EXHAUST TRAIN** (Section 5.3.3)

  Alternative 1: Standard HEPA Filtered Exhaust (Page 39)

- **PRIMARY & DST ANNULUS DUCTWORK ALTERNATIVES** (Section 5.3.4)

  Alternative 1: Direct Buried Ductwork (Page 40)
  Alternative 2: Below Grade, Concrete Enclosed Ductwork (Page 41)
  Alternative 3: Above Grade Ductwork (Page 42)

- **PRIMARY & DST ANNULUS FAN AND STACK ALTERNATIVES** (Section 5.3.5)

  Alternative 1: Stack to Exhaust Train Inlet Recirculation (Page 43)
  Alternative 2: Stack to Fan Inlet Recirculation (Page 45)
  Alternative 3: No Recirculation and Variable Speed Fan (Page 46)

### 5.3.1 Primary Tank Exhaust Train Alternatives

The function of the primary tank exhaust train is to mitigate the radioactive and hazardous chemicals entrained in the ventilation system's exhaust stream to, or below, the regulatory emission limits. Each of the following alternatives provide adequate mitigation. One primary exhaust train will be used per DST farm, SST farm, and each DCRT as listed in Section 3.1.



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#### 5.3.1.1 Alternative 1: Passive Adsorption/Filtration (See Figure 1)

The primary tank exhaust train system will utilize a dual exhaust train. Each exhaust train is comprised of the following components:

- Chevron moisture separator at each tank outlet/duct inlet
- Moisture separator with back-flush capabilities
- Condenser with closed loop Chiller System
- High Efficiency Mist Eliminator (HEME) with washing capability
- Air heating coils
- High-Efficiency Metal Fiber filter (HEMF) with wash capability
- HEPA filter
- High Efficiency Gas Adsorber (HEGA) with regeneration station
- Impregnated Charcoal Adsorber
- High-Efficiency 95% Filter
- Test sections (located as required)

##### 5.3.1.1.1 Function, Advantages and Disadvantages

**Function and Advantages:**

- Chevron Separator: The chevron, located at the tank outlet/inlet to the exhaust riser will prevent large droplets, splashes, and large particles from entering the exhaust ductwork. Eliminating these from the ductwork will slow down the build-up of salts and sludge in the ductwork. It will also reduce the loading on the downstream moisture separator and increase the duration between back-flushes for the separator.

- Moisture separator with back-flush capability: The separator removes the entrained liquid from the air stream. It also serves as a prefilter for the rest of the exhaust train by removing large particulate. With the back-flush capability, it will require little maintenance and will not have to be replaced when dirty as a fiber prefilter does. The moisture separator filtering capability also will reduce the loading on the downstream filtration components.

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- Condenser: The purpose of the condenser is to cool the airstream to $\leq 40^{\circ}F$. This will remove most of the moisture in the airstream and significant quantities of contaminants. Preliminary calculations (outlined in Reference 8) indicate that over 80% of the ammonia and acetone and 50% of the butanol can be removed from a saturated airstream entering the condenser at 140° F. The ability/efficiency of removing tritiated water, moisture, volatile organics, and inorganics will be dependent upon the temperature, humidity, and composition of the air stream to be treated by these systems. The design of the condenser is critical to the effective operation of the rest of the system.

- High-Efficiency Mist Eliminator (HEME): The HEME is designed to remove entrained liquids from the airstream. The filter media is made from plastic/glass fibers. Generally, these HEMEs, as an additional benefit, will also remove up to 99% of all particles over 1 micron and remove some soluble contaminants.

- Heater: The purpose of the heater is to elevate the airstream temperature above the dew point of the incoming airstream. This prevents problems caused by moisture or liquid droplets inherent with HEPA filters and activated carbon adsorbers downstream of the heater unit. An intrinsically safe (spark proof) heater is needed due to the potential for concentration of flammable gases.

- High Efficiency Metal Fiber Filter (HEMF) with wash capability: The HEMF provides filtration of 99.97% of all particulate 0.3 microns and larger in the airstream. This filter is "blow-out" proof at the negative pressures capable of being produced by this ventilation system. This filter will help protect and reduce the particle loading on the more fragile, but code compliant HEPA filter located downstream. It also has a high particle collection (holding) capacity. The filter is capable of being cleaned when dirty, instead of having to be replaced. From experience, a manufacturer of the HEMF claims that when filters were returned to the factory for cleaning (a practice no longer necessary since they can be purchased with a built-in washing capability), the filters could be cleaned 20 to 30 times before a replacement was necessary. The manufacturer also states that the majority of the damage was from the handling of the filter medium during the cleaning process. Therefore, these filters are considered to have a long service life and will reduce waste.

- High Efficiency Particulate Air (HEPA) filter: The HEPA has a removal efficiency of at least 99.97% for 0.3 microns and larger of aerosol and is used to remove the particulate from the gas stream. HEPAs are the standard "best available radiological control technology" (BARCT) for radiological particulate.

- High Efficiency Gas Adsorber (HEGA): The HEGA will mitigate the volatile organics from the airstream by adsorbing them on activated sites of the carbon media. The affinity of the contaminants to the carbon is dependent on the properties of the carbon and the molecular weight and bonding properties of the contaminants. The affinities are called adsorption isotherms and are stated in kilograms of contaminant per kilogram of carbon. The following are representative values of isotherms for activated carbon:

  Acetone: 0.05 kg Acetone/kg Carbon
  Butanol: 0.15 kg Butanol/kg Carbon
  NPH: 0.30 kg NPH/kg Carbon

  From these isotherms, it can be determined that the carbon, if not regenerated, would have to be replaced relatively often. Therefore a regenerative system is included in this alternative. The HEGA is regenerated in place by an on-line regenerative activated carbon system which utilizes a hot gas to remove the organics from the activated sites. The removed organics will be stored as hazardous waste. Regenerating the carbon will reduce the overall waste and replacement cost of new charcoal. The use of carbon for the adsorption of volatile organics is a common "best available control technology for toxins" (T-BACT) approach and the regenerative system is the most cost effective option available.

- Impregnated Charcoal Adsorber: This component uses an activated carbon impregnated with a reactant coating for the removal of ammonia. The efficiencies of these units have been documented at close to 95% with an adsorption/reactant isotherm of approximately 20%. The impregnated charcoal adsorber will provide adequate mitigation of ammonia, ensuring compliance with the regulatory emission standards.

- High-Efficiency 95% Filter: This filter is located after the charcoal adsorber and is used to catch the fine charcoal dust escaping from the adsorber, especially on system start-up when a dust release from the charcoal adsorbers is imminent. Filtering out the dust will protect the stack sampling and monitoring equipment. Some ventilation systems use a HEPA filter after a charcoal adsorber, however the 95% filter provides adequate filtration, costs less, and requires less maintenance and testing.

- Test Sections: Test sections are installed to provide a point for testing and assures that the airstream is evenly distributed across the face of the filters. An evenly distributed airstream is a must for proper aerosol testing of the HEPA filters.

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- The exhaust train is a dual (parallel) system with one train actively filtering and mitigating the exhaust airstream, while the other train provides a back-up in case the first train must be taken off-line for repairs or maintenance. The system also has the capability to operate both trains together if an upset or unusual condition occurs requiring additional air flow to maintain a negative pressure (radiological confinement) in the tanks.

**Disadvantages:**

- Chevron: The chevron may require periodic removal of accumulated debris (i.e., dissolved solids, which have built-up over an extended period of time). Therefore, the chevron must be designed and installed so that it can be cleaned.

- Moisture Separator: The back washing of the separator will generate additional liquid mixed waste. This waste will be returned to a designated existing tank, except for the single shell tank farms, where a catch tank will have to be provided. The waste from the catch tank will have to be occasionally pumped out and disposed of as mixed waste.

- Condenser: The condensate from the condenser will be returned to a designated existing tank, except for the single shell tank farms, where a catch tank will have to be provided. The waste from the catch tank will have to be occasionally pumped out and disposed of as mixed waste. Some additional liquid waste is generated, depending on the solubility of the airstream contaminants with the condensate.

- HEME: The most significant concerns with the HEME unit are plugging and the need to keep the filter media wetted to allow the capture of the particles. A high level of solids and liquid aerosols, a function of vapor space characteristics and the airstream velocity, can plug the HEME, requiring frequent high-pressure water washing. If a relatively dry airstream is used, water must be added to the HEME media to facilitate removal of contaminants.

- HEMF: The washing of the HEMF will generate additional liquid mixed waste. This waste will be returned to a designated existing tank, except for the single shell tank farms, where a catch tank will have to be provided. The waste from the catch tank will have to be occasionally pumped out and disposed of as mixed waste.

- HEGA: Although the HEGA can be regenerated, the number of times that it can be regenerated is limited. Therefore, the eventual disposal of the charcoal as a hazardous, or possibly mixed, waste is a significant concern and cost impact.

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HEGA design parameters will specify maximum allowable concentrations of organics in the airstream. These concentrations are based on the "heat of adsorption" to prevent combustion of the charcoal. Therefore, the airstream organic concentrations may require the monitoring of, and the control of, the airstream composition.

The regeneration of the HEGA and the installation of a regeneration station adds operational and maintenance complexity to a passive system. Also, once the waste is removed from the HEGA, it will need to be disposed of as a hazardous, or possibly a mixed waste.

- Impregnated Charcoal Adsorber: This adsorber will periodically need replacement. The removed charcoal requires packaging and disposal as hazardous, or possibly mixed waste which is a significant concern and cost impact.

- Exhaust Train: One disadvantage, in relationship to the assembled exhaust train, is its large overall size. Space availability in some tank farms is limited.

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**5.3.1.1.2 Other Programmatic and Operational Impacts**

- This exhaust train alternative mitigates radioactive, organic and inorganic effluents from the gas stream, allowing personnel to perform work within some tank farms with less personnel protective equipment.

- The impregnated charcoal adsorber and HEGA requires separate testing from that of the HEPA filters. Training personnel to perform maintenance and testing on these adsorbers will be required.

**5.3.1.1.3 Other Safety Considerations and Impacts**

- A fire hazard analysis will need to be performed to determine if a fire suppression system is required. The use of charcoal adsorbers in the system drives the need for performing this analysis.

- The system is equipped with a valved tee pipe connection on the ductwork to permit an off-normal operating condition portable exhauster to be attached to the exhaust system in the event both exhaust trains are out of service, maintaining tank confinement.

- Data acquisition points installed in the ductwork permits psychometric measurements to be collected and evaluated. The psychometric data can be used to determine airflow, dry bulb and wet bulb temperature of the gas stream. This data will allow operational personnel to analyze normal or abnormal trends in the ventilation system.

- The installation of valves at the inlet and outlet of the tank allows the option of isolating the tanks from each other if necessary, and control of the airflow and pressure.

- Increased radiation exposure time for maintenance personnel may be incurred because this system has more components to test and maintain than the existing system.

#### 5.3.1.1.4 Other Environmental Impacts and Permitting Requirements

An environmental advantage of this system is the substantial removal of organic and inorganics from the airstream which are currently being exhausted to the atmosphere.

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### 5.3.1.2 Alternative 2: Active Absorption (See Figure 2)

The primary tank exhaust system will utilize a dual exhaust train. Each exhaust train is comprised of the following components:

- Chevron moisture separator at each tank outlet/duct inlet
- Scrubber with Recirculation Pump
- Condenser with closed loop Chiller System
- High Efficiency Mist Eliminator with washing capability (HEME)
- Air heating coils
- High-Efficiency Metal Fiber filter (HEMF) with wash capability
- HEPA filter
- High Efficiency Gas Adsorber (HEGA) with regeneration station
- High-Efficiency 95% Filter
- Test sections (located as required)

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#### 5.3.1.2.1 Function, Advantages, and Disadvantages

Note that the only difference between this alternative and the previous alternative's list of components is the addition of a scrubber, and the deletion of a moisture separator and the impregnated charcoal adsorber. Therefore, only the function, advantages, and disadvantages of the scrubber will be addressed below. Section 5.3.1.1 can be reviewed for the function, advantages and disadvantages for the remaining components.

**Function and Advantages:**

- The main function of the scrubber in this system is for the mitigation of ammonia. The scrubber will also remove some other contaminants depending on their solubility in the scrubber fluid. A large portion of the airstream particulate will be captured in the scrubber's fluid. Scrubbers are considered the normal T-BACT for the removal of ammonia. Scrubbers have the ability to scrub both high temperature and high humidity airstreams.

**Disadvantages:**

- The scrubber increases moisture to the airstream, efficiency falls rapidly for particles less than one micron in size, and freeze protection is required. The power requirements of the electric heater would need to be increased due to the added moisture from the scrubber in the airstream. Although the fluid in the scrubber is recirculated by a pump, addition of make-up fluid is required to replace the fluid which leaves the scrubber as humidity in the airstream. The make-up fluid and the scrubber fluid continually require monitoring for proper chemical composition. The scrubber's fluid will require periodic replacement. The fluid which is removed will be classified as mixed waste and therefore, will require disposal. The scrubber, make-up fluid supply tank, and the mixed waste disposal station will require a secondary confinement (usually a concrete pad with dike walls) to ensure that all spills and leaks are contained, thereby preventing the soil from becoming contaminated.

#### 5.3.1.2.2 Programmatic and Operational Impacts

The operation of the scrubber requires daily monitoring, i.e., sampling, of the condition of the scrubber fluid. Scrubbers inherently requires substantial monitoring and controls to ensure proper operation.

#### 5.3.1.2.3 Safety Considerations and Impacts

Transportation of the liquid mixed waste to the disposal site is a potential risk for a hazardous/radioactive accidental spill. Maintenance personnel handling the radioactive/hazardous liquid waste will need to follow

special safety precautions since the waste will be radioactive and high in ammonia content.

#### 5.3.1.2.4 Environmental Impacts and Permitting Requirements

The operation of the scrubber will create additional liquid waste which will need disposal.

### 5.3.2 Primary and DST Annulus Inlet Alternatives

The following alternatives provide filtered inlet systems to convey an airstream into the primary tanks and the annulus area. Note that the DCRT system consists of only one inlet system which supplies air to both the annulus area and primary tank. The alternatives assume that the DCRT's airstream flow path will be unchanged from the existing flow path.

#### 5.3.2.1 Alternative 1: Common Inlet Station (Figures 3 and 3a)

The common inlet stations consist of dual inlet trains for both the annulus and primary systems at each tank farm. There will be two dual inlet stations (one for the annulus and one for the primary) per DST farm, and one dual inlet station per SST farm and each DCRT listed in section 3.1.

The airstream supply inlet station components are as follows:

- Louver
- Air heater
- Prefilters
- HEPA filters with test sections
- Control/isolation dampers to control the amount of air to the tanks.
- Isolation valves to allow the changing of filters
- Off-normal operating condition inlet air bypass

The ductwork can be extended into the tank and equipped with either diffusers or slotted ductwork which function as diffusers for better circulation (see Figure 5a). The existing airstream infiltration paths will require sealing, i.e , gasketting, liquid sealants, mechanical devices (pipe caps, flanges, etc.), thereby providing a positive inlet control capability.

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5.3.2.1.1 Function, Advantages, and Disadvantages

**Function and Advantages:**

- The common inlet station function is to provide a positive means of control of supply inlet air to the tanks and exhaust train. This control provides components which will prevent dust, debris, and radioactive particles from entering the ventilation systems inlet airstream. The installation of filters on the inlet ductwork and sealing the existing air infiltration routes serves two purposes: For the annulus system, the filtered inlet is needed to ensure that an alarm from the leak detection monitors is indeed an indication of a leak from the primary tank into the annulus and not outside radioactive particles being drawn into the ventilation system through the ductwork inlet. For the primary system, the filtered inlet provides radiological confinement when the ventilation system is not in operation and the systems pressure goes positive.

- This alternative allows simultaneous testing of the HEPA filters at one location.

- When rime icing occurs, a central location for the filters would be a benefit from the stand point of removing the ice buildup at one point instead of multiple locations.

- The HEPA-filtered inlet will protect the environment from the release of contaminants in the event the tanks become positive relative to the atmosphere.

- Heating and or cooling of the inlet air is an option that be could be added later if desired.

**Disadvantages:**

- A significant amount of ductwork and supports will be required to supply air to all the tanks from one location.

- Maintenance will be increased on the HEPA filtered inlet compared to existing conditions where no HEPA filters are installed.

- The addition of an inlet plenum will add to the congestion of the tank farms.

**5.3.2.1.2 Other Programmatic and Operational Impacts**

- The addition of inlet HEPA filters, heaters, and controls will require an additional preventative maintenance program.

- Additional solid waste will be generated due to the inlet HEPA filters.

- Permits flexibility in control of the tank pressure and airflow requirements.

- Protects personnel from radioactive releases if the tanks become positive relative to the atmosphere.

**5.3.2.1.3 Other Safety Considerations and Impacts**

- The HEPA-filtered inlets will prevent the release of radioactive contaminants to the environment in the event of tank pressurization.

- The quantity of airflow and the tank pressure will be controlled, permitting flexibility should increased or reduced airflow or pressure be required in certain tanks.

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**5.3.2.1.4 Other Environmental Impacts and Permitting Requirements**

The addition of inlet HEPA filters will increase the amount of solid waste generated, however, the HEPA filters will protect the environment from the possibility of radioactive releases in the event the tanks become positive relative to the atmosphere.

**5.3.2.1.5 Other Decisional Data**

The need for controlling the airflow into the tanks is based on the current practice that the primary tank airflow is infiltrated through cover blocks and flanges on the risers. Excessive negative pressure in the tanks has been experienced due to blockage of the infiltration air path at the cover blocks, caused by dust build up, ice, and snow in the winter. Airflow balancing is currently achieved by installing and removing duct tape at the infiltration points. Providing inlet stations and sealing the current air infiltration routes will allow for controlling the airflow and pressure at the tanks.

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#### 5.3.2.2 Alternative 2: Individual Tank Inlet Stations (See Figure 6)

Another method for introducing air into the primary tanks and annulus is to locate an inlet station at each tank. The components for this alternative are the same as Alternative 1 and are described in Section 5.3.2.1. The following will only describe the usage of individual inlet stations and not the function of the components. Each Station will consist of dual inlet trains and each train will be comprised of the following components:

- Louver
- Air heater
- Prefilters
- HEPA filters with test sections
- Control/isolation dampers to control the amount of air to the tanks.
- Isolation valves to allow the changing of filters
- Off-normal operating condition inlet air bypass

##### 5.3.2.2.1 Functions, Advantages and Disadvantages

**Functions and Advantages:**

- The function of individual inlet stations is to provide intake air for the each tank/annulus.
- The inlet station will be relatively small and compact.
- The airflow to each tank will be monitored and can be maintained at different parameters from the other tanks if desired.

**Disadvantages:**

- The cost of installing, controlling, monitoring, maintenance, spare parts, testing, and disposal of HEPA filters would be significant due to the large number of stations required.
- The installation of an individual inlet station per tank may present a problem in overcrowded tank farms.

##### 5.3.2.2.2 Other Programmatic and Operational Impacts

- The number of manhours required to monitor and maintain the individual stations will be significant.

- A large task force will be required to remove rime icing from all of the inlet filters (when weather conditions induce this condition) to prevent the total ventilation system from shutting down due to high negative tank pressures and low airflow.

**5.3.2.2.3 Other Safety Considerations and Impacts**

Personnel would be subjected to increased radiation exposure due to the amount of time required to test and maintain the multitude of inlet stations.

**5.3.2.2.4 Other Environmental Impacts and Permitting Requirements**

The large quantity of HEPA filters required overall will increase the amount of waste to be disposed of at the SST and DST farms.

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**5.3.3 DST Annulus Exhaust Train**

**General:**

The purpose of the DST annulus exhaust train is to detect radiation and maintain radiological confinement, should a leak in the primary tank occur. It also minimizes corrosion, and removes excessive heat within the annulus. Only one type of DST annulus exhaust train is described in this section since its design and function requirements are met by using standard HEPA filtration units which are specified by the National codes and standards.

**5.3.3.1 Standard HEPA Filtered Exhaust (See Figure 5)**

The annulus exhaust system utilizes a dual exhaust train. The exhaust trains are comprised of the following components:

- Constant Air Monitors (CAMs), located between tank outlets and the common header
- Moisture separator
- Air heater
- Prefilters
- Test section, one stage of HEPA filters, test section, a second stage of HEPA filters, test section.

**5.3.3.1.1 Functions**

- The annulus ventilation system will detect radiation and maintain radiological confinement if a primary tank leak occurs, and will minimize corrosion to the tank liner, and remove heat within the annulus.

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- The CAMs located in the branch ductwork (between the tank outlet and the connection to common ductwork header) provides leak detection for the primary tanks for both above and below liquid level breaches in the tank. It should be noted that liquid leaks are also capable of being detected by existing leak detection devices placed below the primary tanks, and that the CAMs are providing redundant leak detection for fluid leaks.

- The moisture separator removes the entrained moisture from the airstream, thereby protecting the HEPA filters from excessive moisture.

- The Air heater prevents the relative humidity from exceeding 70 percent which protects the HEPA filters against becoming saturated and possibly causing them to fail.

- Prefilters will lessen the loading on the HEPA filters, thereby minimizing the rate of HEPA filter replacement.

- The HEPA filters have a removal efficiency of at least 99.97% for 0.3 microns of aerosol and are used to remove particulate from the gas stream. If a leak in the primary tank occurs, the annulus exhaust system will filter out the radioactive particulate through HEPA filters.

### 5.3.4 Primary and DST Annulus Ductwork Alternatives

The function of the ductwork is to convey the airstream from the inlet station(s) to the tanks and from the tanks to the exhaust trains. Ductwork can be installed either below or above grade. All ductwork is required to meet ASME N509, ASME N 510 and Safety Class II requirements. Ductwork which is installed below grade can be directly buried, or encased in a concrete enclosed trench.

#### 5.3.4.1 Alternative 1: Direct Buried Ductwork

This alternative involves excavating a trench, placing the double contained ductwork in the trench, and then backfilling the trench with soil.

##### 5.3.4.1.1 Advantages and Disadvantages

**Advantages:**

- Ductwork that is directly buried will shield personnel from radiation in the airstream.

- Ductwork that is directly buried will not be subjected to possible damage from traffic within the farms, and does not hinder traffic within the farm.

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**Disadvantages:**

- Ductwork that is directly buried will be required to be cathodically protected, increasing installation and maintenance costs.
- Direct buried ductwork requires a leak detection system which increases the installation and maintenance costs.
- Exterior visual inspection of the ductwork is limited to those portions above grade.
- Excavation in existing farms will be very expensive if large amounts of soil contamination and/or underground congestion are encountered.

**5.3.4.1.2 Other Programmatic and Operational Impacts**

Monitoring and testing of the leak detection system will be required.

**5.3.4.1.3 Safety Considerations and Impacts**

Excavation during construction must be closely monitored to ensure exposure of workers to unforseen hazards does not occur.

**5.3.4.1.4 Environmental Impacts and Permitting Requirements**

Some of the soil to be excavated during construction may require disposal as radioactive and/or mixed waste.

**5.3.4.2 Alternative 2: Below Grade, Concrete Enclosed Ductwork**

This alternative consists of double contained ductwork inside a concrete lined trench with a removable concrete top. The ductwork conveys the ventilation airstream from the inlet station(s) to the tanks and from the tanks to the exhaust trains.

**5.3.4.2.1 Advantages and Disadvantages**

**Advantages:**

- Encased ductwork allows access to the ductwork for inspection, data acquisition and repairs if necessary.
- Encased ductwork can protect personnel from exposure to radiation. It is not subjected to damage from traffic, nor does it hinder traffic within the farm.
- Encased ductwork will not require cathodic protection.

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**Disadvantages:**

- Since it will be virtually impossible to guarantee that the concrete lid/trench joint will remain water-tight, drainage points will be required at selected locations within the encased trench to remove water which may accumulate.
- Excavation in the existing farms would be required to install the trenches.
- Insulation of the ductwork may be necessary to prevent condensation on the interior of ductwork.

**5.3.4.2.2 Other Programmatic and Operational Impacts**

- The excavation and construction of the concrete trenches will be very expensive.
- Periodic inspection of the concrete lid/trench joint for water-tightness by operations will be required along with water removal if leakage has occurred.

**5.3.4.2.3 Other Safety Considerations and Impacts**

The placement of concrete enclosed trenches in the tank farms will induce load limits (maximum designed live load limit) on the traffic which will travel across the trenches. Heavy loads being transported across the trenches must be controlled to prevent an unsafe condition from occurring.

**5.3.4.2.4 Environmental Impacts and Permitting Requirements**

Some of the soil to be excavated during construction may require disposal as radioactive and/or mixed waste.

**5.3.4.3 Alternative 3: Above Grade Ductwork**

This alternative places the ductwork above ground and on supports. The function of the ductwork is to convey the airstream from the inlet station(s) to the tanks and from the tanks to the exhaust trains.

**5.3.4.3.1 Advantages and Disadvantages**

**Advantages:**

- Ductwork will be accessible for inspection and data acquisition points will be easily accessible. Excavation will not be required except for the foundations of the supports, the concrete shielding and the connections to the tanks.

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**Disadvantages:**

- Ductwork which is installed above grade is subject to possible damage from traffic within the farms.
- Shielding for the primary ventilation ductwork will be required to reduce radiation exposure to tank farm workers.
- Insulation may be necessary to limit condensation on the interior of the ductwork.

**5.3.4.3.2 Other Programmatic and Operational Impacts**

The ductwork and shielding above grade require space that may hinder movement within the tank farms.

**5.3.4.3.3 Other Safety Considerations and Impacts**

A timely off-normal operating condition evacuation of the tank farms may be impeded due to congestion caused by above ground ductwork.

**5.3.4.3.4 Other Environmental Impacts and Permitting Requirements**

There will be little or no soil from excavation that will require disposal.

**5.3.5 Primary and DST Annulus Fan and Stack Alternatives**

The following alternatives propose two basic methods of varying the ventilation system's airstream flow and pressure to provide flexibility for varying field conditions. Alternatives one and two propose an airstream recirculation method, and Alternative 3 proposes the utilization of variable speed fans. The recirculation method allows the airstream to recirculate back through the fan or exhaust train without being discharged to the atmosphere. Varying the quantity of the airstream being recirculated will vary the system's flow and pressure. The variable speed fan method involves varying the electrical frequency to the fan's motor to change fan speed, thereby changing the system's flow and pressure. All alternatives convey the airstream to a single stack per system. The stacks will be equipped with the "generic Hanford radiation monitoring and sampling system" (currently under development), monitors for VOCs and ammonia, and a CAM with an alarm.

**5.3.5.1 Alternative 1: Stack to Exhaust Train Inlet Recirculation (See Figure 6)**

The recirculation ductwork will allow the airstream to flow from the stack, through a HEPA filter and control valve, to the inlet side of the exhaust train. The negative pressure at the inlet of the exhaust train in relationship to the positive pressure in the stack will cause a portion of the

stack airstream to be diverted to the exhaust train. The quantity of the airstream being diverted will be controlled by the valve in the recirculation ductwork. The recirculation loop will be below the sampling and monitoring equipment in the stack and therefore will not affect their operation and data output.

**5.3.5.1.1 Advantages and Disadvantages**

**Advantages:**

- The exhaust train will maintain its design volumetric airflow when the flow is a reduced from the tanks.
- Fan can maintain design airflow without having sheaves changed or dampers adjusted.
- This alternative uses a relatively inexpensive constant speed fan motor.

**Disadvantages:**

- The HEPA filter will require aerosol testing, instrumentation, replacement, and disposal which contributes to the total operational costs.
- The configuration for the HEPA filtered recirculation ductwork with its supports will require additional space.

**5.3.5.1.2 Other Programmatic and Operational Impacts**

- The recirculation loop will provide Operations with a variable airflow and pressure ventilation system, but will require monitoring of the interface between operational demands and the system's flow and pressure parameters.
- Periodic maintenance on the control valve will be required.

**5.3.5.1.3 Other Safety Considerations and Impacts**

The recirculation loop will protect against excessive negative pressures in the tanks, should the inlet airstream flow to the tanks be reduced, without shutting down the ventilation system. Radiological confinement will be maintained within the tanks and ventilation system.

**5.3.5.1.4 Other Environmental Impacts and Permitting Requirements**

Additional solid waste will be generated when the HEPA filter requires replacement.



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#### 5.3.5.2 Alternative 2: Stack to Fan Inlet Recirculation (See Figure 7)

The recirculation ductwork will allow the airstream to flow from the stack, through a control valve, to the inlet side of the exhaust fan. The negative pressure at the fan inlet in relationship to the positive pressure in the stack will cause a portion of the stack airstream to be diverted to the fan inlet airstream. The quantity of the airstream being diverted will be controlled by the valve in the recirculation ductwork. The recirculation loop will be below the sampling and monitoring equipment in the stack and therefore will not affect their operation and data output.

##### 5.3.5.2.1 Advantages and Disadvantages

**Advantages:**

- Fan can maintain design airflow without having sheaves changed or dampers adjusted.
- This alternative uses a relatively inexpensive constant speed fan motor.

**Disadvantages:**

- Does not allow for the full design airflow through the exhaust train when the flow is reduced from the tanks.
- The recirculation ductwork and its supports will require additional space.

##### 5.3.5.2.2 Other Programmatic and Operational Impacts

- Periodic maintenance on the control valve will be required.
- The recirculation loop will provide Operations with a variable airflow and pressure ventilation system, but will require monitoring of the interface between operational demands and the system's flow and pressure parameters.

##### 5.3.5.2.3 Safety Considerations and Impacts

The recirculation loop will protect against excessive negative pressures in the tanks, should the inlet airstream flow to the tanks be reduced, without shutting down the ventilation system. Radiological confinement will be maintained within the tanks and ventilation system.

##### 5.3.5.2.4 Environmental Impacts and Permitting Requirements

There are no environmental impacts or permitting requirements associated with this alternative.

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#### 5.3.5.3 Alternative 3: No Recirculation and Variable Speed Fan (Figure 8)

This alternative will utilize a variable speed fan to achieve a variable airstream flow rate and/or pressure. The fan will be directly coupled to a variable speed motor. Motor speed will be controlled by a variable frequency drive. The variable frequency drive will respond to the demands of the ventilation system by changing fan speed, thereby changing the airstream flow rate and/or pressure. A control valve will be placed after the fan to provide a positive shut off and eliminate back flow to the exhaust train when in stand-by.

##### 5.3.5.3.1 Advantages and Disadvantages

**Advantages:**

- Variable speed fans are considered energy efficient.
- Small fan speed adjustments can be performed with variable speed fans.
- Variable speed fans are relatively easy to install.

**Disadvantages:**

- Variable speed fans are relatively expensive.
- The frequency drive unit is temperature sensitive and its environment must be controlled. The drive unit is usually placed in a temperature controlled structure.
- Does not allow for the full design airflow through the exhaust train when the flow is reduced from the tanks.

##### 5.3.5.3.2 Other Programmatic and Operational Impacts

- The drive unit requires relatively frequent maintenance to ensure reliable operation.
- Controlling the frequency drive unit's environment will require Operations to perform periodic maintenance on the equipment/structure which provides a suitable environment for the drive unit.

#### 5.3.5.3.3 Other Safety Consideration and Impacts

The relatively frequent maintenance required for this system provides a potential for increased radiation exposure to maintenance workers.

#### 5.3.5.2.4 Environmental Impacts and Permitting Requirements

There are no environmental impacts or permitting requirements associated with this alternative.

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## 6.0 DISCUSSION OF PREFERRED ALTERNATIVES

6.1 (Sections 6.1 and 6.2 are intentionally left blank so that the third digit of Section 6.3's numbers and Section 5.3's numbers are the same for a specific alternative., i.e., Section 6.3.1 compares the same alternatives described in Section 5.3.1)

6.2 (Intentionally left blank, see 6.1. above)

## 6.3 PREFERRED ALTERNATIVES

The following subsections provide a comparison of the alternatives previously described in Section 5.3. (Note: The ventilation system is divided into four sections and alternatives are provided for each of those sections). A general comparison statement of the alternatives provides information for the major differences. Additional information which facilitates understanding the advantages, or the disadvantages, of selecting one alternative over another is provided. Each alternative's advantages and disadvantages are compiled on charts to provide an easy method of comparing the alternatives. After the charts, the preferred alternative will be described and a general explanation of why it is preferred. The last paragraph in Section 6.3 will put the preferred alternatives together and describe the complete ventilation system.

### 6.3.1 Primary Tank Exhaust Train Alternative Comparisons

The primary exhaust train function is to provide the necessary mitigation and filtering of the exhaust airstream prior to its release to the atmosphere. There are two alternatives provided which perform this function. The main difference between them are the components used for the removal of ammonia. The first alternative utilizes a bed of impregnated charcoal to adsorb the ammonia from the airstream. The second alternative uses a liquid scrubber to absorb the ammonia in its fluid. These two components occupy different locations within their respective exhaust train even though their main purpose is the same. The difference in locations and the type of component will affect the performance of the other components. The following charts summarize the advantages and disadvantages of each exhaust train alternative. The charts were developed during the last "Sunshine Session" which reviewed each alternative's advantages and disadvantages and agreed by general consensus on the selection of a preferred alternative. The advantages and disadvantages listed are functional, programmatic, operational, safety, environmental, permitting, and other decisional impacts.

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## PRIMARY TANK EXHAUST TRAIN ALTERNATIVE COMPARISONS

### ADVANTAGES

| Alternative 1: Passive Adsorption/Filtration | Alternative 2: Active Absorption |
|---|---|
| More adaptable for the specific characteristics of the SSTs, DCRTs, and DSTs than Alternative 2. | The scrubber reduces the loading on the downstream components. |
| Doesn't generate as much liquid waste as Alternative 2. | Good for ammonia removal. |
| Good for ammonia removal. | There are methods at Hanford for disposing/storing mixed liquid waste. |
| Handling charcoal easier/safer than handling the chemicals for the scrubber. | |
| Has an immediate start-up capability. | |
| Physically smaller system than Alternative 2. | |
| | |

PRIMARY TANK EXHAUST TRAIN ALTERNATIVE COMPARISONS

DISADVANTAGES

| Alternative 1: Passive Adsorption/Filtration | Alternative 2: Active Absorption |
|---|---|
| Waste charcoal may require long term storage if classified as mixed waste due to radiological contamination. | Generates large quantities of liquid mixed wastes which will require storage/disposal. |
| Will require an available long-term supply of impregnated charcoal. | Will require a chemical supply for obtaining the proper scrubber fluid mixture. |
| Requires fire detection for charcoal beds. | Will require verification/sampling of chemical scrubber fluid. |
| | Requires more maintenance than Alternative 1. |
| | Requires more equipment, controls, pumps, and operator interaction than Alternative 1. |
| | Physically larger system than Alternative 1. |
| | Scrubber and fluid storage tanks will require a collection tray/spill and leak confinement. |
| | Requires more freeze protection than Alternative 1. |
| | As the scrubber operates, the radioactive particles continue to accumulate, resulting in higher radiation levels in the scrubber which requires increased safety precautions when servicing the system. |
| | Requires more shielding than Alternative 1. |
| | More technical uncertainties associated with scrubber and more design/engineering costs. |
| | Does not have an immediate start-up capability. |

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#### 6.3.1.1 Primary Tank Exhaust Train Preferred Alternative

Although both alternatives provide acceptable performance per the criteria, Alternative 1, Passive Adsorption/Filtration was selected as the preferred alternative during the "Sunshine Session". The major reasons for selecting Alternative 1 are listed below.

- Alternative 1 is easier to control and operate since it is a passive system versus Alternative 2's active system which requires continual monitoring and adjustment of the scrubbers fluid.
- Alternative 1 has less potential safety/hazard risks associated with its operation and maintenance than Alternative 2.
- Alternative 1 has an immediate start-up capability where Alternative 2 does not. The immediate start-up capability is important when the ventilation system needs to switch from the operating exhaust train to the stand-by train in an off-normal operating condition situation.
- Alternative 2 generates liquid mixed waste which induces more handling, storage, disposal problems, especially in the SST farms, than Alternative 1's disposal of charcoal.

### 6.3.2 Primary and DST Annulus Inlet Alternative Comparisons

The primary and DST annulus inlet alternatives supply the tank ventilation systems with a controlled and filtered airstream. The airstream is controlled in both alternatives by sealing the existing infiltration routes and providing an airstream inlet station. Both alternatives use HEPA filters in the incoming airstream to prevent debris and radioactive particulate from entering the ventilation system, thereby lowering the exhaust trains' filtration loading. It is also important for the annulus inlet station to filter out the radioactive particles because the exhausted airstream is monitored for radioactivity in order to determine if a primary tank leak has developed.

This study provides two alternatives which satisfy the required functions of the ventilation inlet station(s). They are: Alternative 1, "Common Inlet Station" and Alternative 2, "Individual Inlet Stations". Both alternatives utilize the same components, but they differ in size due to the different flow requirements. The "common inlet station" Alternative 1, consists of dual inlet trains for both the annulus and primary systems at each tank farm. The ventilation's airstream is supplied via a common header and branched ductwork, whereas the "individual tank inlet stations," Alternative 2, provides a primary and annulus ventilation inlet station for each tank. These inlet stations are located at, or as close as possible to, each tank. The following charts summarize the advantages and disadvantages of each inlet station alternative. The charts were developed during the last "Sunshine Session" which reviewed each alternative's advantages and disadvantages and agreed on

the selection of a preferred alternative. The advantages and disadvantages listed are functional, programmatic, operational, safety, environmental, permitting, and other decisional impacts.

**PRIMARY AND DST ANNULUS INLET ALTERNATIVE COMPARISONS**

**ADVANTAGES**

| Alternative 1: Common Inlet Station | Alternative 2: Individual Tank Inlet Stations |
|---|---|
| Less maintenance | Less Ductwork |
| Less I & C | Air balancing easily achieved and more stable |
| Less electrical runs | More well known system experience |
| Fewer winter problems (ice, etc.) | |
| Less congestion in farm at grade level | |
| Less HEPA testing | |
| | |

**PRIMARY AND DST ANNULUS INLET ALTERNATIVE COMPARISONS**

**DISADVANTAGES**

| Alternative 1: Common Inlet Station | Alternative 2: Individual Tank Inlet Stations |
|---|---|
| More ductwork | More electrical runs |
| Air balancing more difficult and less stable | More I & C |
| Less experience with system | Multiple winter related problems |
| | Adds more obstructions around tanks |
| | More HEPA testing |
| | More Maintenance |
| | |



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#### 6.3.2.1 Primary and DST Annulus Inlet Preferred Alternative

Alternative 1, Common Inlet Station, was selected as the preferred alternative. The major reasons for selecting Alternative 1 are listed below.

- The common inlet station will require substantially less maintenance and testing than alternative 2.
- Alternative 2 would significantly add to the grade-level congestion at the tank farms.

### 6.3.3 Primary and DST Annulus Ductwork Alternative Comparisons

The function of the ductwork is to convey the airstream from the inlet station(s) to the tanks and from the tanks to the exhaust trains. There are three alternatives included in this study which can perform this function. The alternatives are: Alternative 1, "Direct Buried Ductwork", Alternative 2, "Below Grade, Concrete Enclosed Ductwork," and Alternative 3, "Above Grade Ductwork." The difference between these alternative are: The direct buried ductwork is ductwork which is placed in an excavated trench and recovered with soil. The second alternative's below grade, concrete enclosed ductwork is placed in a concrete trench having a floor, two walls, and a removable concrete top (lid). The top of the concrete lid is at, or barely above, grade level. The majority of third alternative's ductwork is placed above grade and is supported by structural supports. The following charts summarize the advantages and disadvantages of each inlet station alternative. The charts were developed during the last "Sunshine Session" which reviewed each alternative's advantages and disadvantages and agreed on the selection of a preferred alternative. The advantages and disadvantages listed are functional, programmatic, operational, safety, environmental, permitting, and other decisional impacts.

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PRIMARY & DST ANNULUS DUCTWORK ALTERNATIVE COMPARISONS

**ADVANTAGES**

| **Alternative 1: Direct Buried Ductwork** | **Alternative 2: Below Grade, Concrete Enclosed Ductwork** | **Alternative 3: Above Grade Ductwork** |
|---|---|---|
| Inherent shielding for radiation | Inherent shielding for radiation | Minimum cathodic protection is required |
| Does not add to the ground-level congestion | Does not add to the ground-level congestion | Requires the least excavation |
| Protected from traffic accidents, missiles, lightning, etc. | Protected from traffic accidents, missiles, lightning, etc. | Lower initial costs |
| No special drainage problems | Accessible ductwork, but not as accessible as Alternative 3 | No special drainage problems |
| | Easier to access for inspection and maintenance than Alternative 1 | The easier to inspect and maintain than the other alternatives |
| | Trench can be used for I & C and electrical runs | No valve pits |
| | | The least D & D costs |
| | | |
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PRIMARY & DST ANNULUS DUCTWORK ALTERNATIVE COMPARISONS

DISADVANTAGES

| Alternative 1: Direct Buried Ductwork | Alternative 2: Below Grade, Concrete Enclosed Ductwork | Alternative 3: Above Grade Ductwork |
|---|---|---|
| More costly D & D | Most Costly D & D | |
| Difficult to inspect and maintain | Requires trench lid removal for inspection/maintenance | Not inherently shielded, requires large quantity of shielding to be installed |
| High initial cost | Highest initial cost | Adds ground level interferences/ congestion |
| No direct access | Accessible, but not as accessible as Alternative 3 | Risk of damage from passing traffic, missiles, lightning, etc. |
| Requires cathodic protection and special coatings | Will require drainage if trench/lid joint leaks | Requires insulation |
| High risk of encountering contaminated soil during excavation | High risk of encountering contaminated soil during excavation | |
| Requires valve pits for valve/damper access | Requires valve pits or trench lid removal for valve/damper access | |
| Not easily accessed for future modifications | Requires periodic painting/sealing of the exposed concrete lid. | |
| | | |
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#### 6.3.3.1 Primary and DST Annulus Ductwork Preferred Alternative

Alternative 1, Direct Buried Ductwork, was selected as the preferred alternative during the "Sunshine Session". The major reasons for selecting Alternative 1 are listed below:

- Alternative 3 was not selected because it adds significant congestion to the tank farms and is not protected from physical damage (traffic accidents mainly), whereas, Alternatives 1 and 2 both eliminate these concerns.

- Alternative 1 was chosen over Alternative 2 for two main reasons: One reason is that Alternative 1 is significantly less expensive to install. The second reason is that Alternative 2 requires more maintenance (ensuring the lid/trench joint remains water-tight, the potential removal of water if it does leak, and periodic sealing/painting the exposed lid surface) than Alternative 1.

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### 6.3.4 Primary and DST Annulus Fan and Stack Alternative Comparisons

The primary and DST annulus fan's function is to provide the negative pressure for the ventilation system and thereby maintain radiological and hazardous gas confinement to the tanks and ventilation system. The stack's function is to convey the exiting airstream into the atmosphere. There are three alternatives provided and all will perform these functions. Alternative 1, "Stack to Exhaust Train Inlet Recirculation," provides the above functions, but also provides an airstream recirculation path which can be controlled to vary the airflow through, and/or pressure in, the tanks. Alternative 2, "Stack to Fan Inlet Recirculation," provides the same functions as alternative 1 and also utilizes a recirculation path to accomplish the variable flow and/or pressure. The difference between these two alternatives are: Alternative 1 recirculates part of the airstream to the exhaust train inlet (before filtration components) and has an in-line HEPA filter installed to help maintain confinement when the ventilation system is off. Alternative 2 recirculates part of the airstream to the inlet of the fan (after the filtration components) and does not require an in-line HEPA filter. Alternative 3, "No recirculation and Variable Speed Fan" provides the ability to vary the airflow and/or the pressure by varying the fan speed. The fan speed is controlled by a variable frequency drive unit. The following charts summarize the advantages and disadvantages of each inlet station alternative. The charts were developed during the last "Sunshine Session" which reviewed each alternative's advantages and disadvantages and agreed on the selection of a preferred alternative. The advantages and disadvantages listed are functional, programmatic, operational, safety, environmental, permitting, and other decisional impacts.

PRIMARY & DST ANNULUS FAN AND STACK ALTERNATIVE COMPARISONS

ADVANTAGES

| Alternative 1: Stack to Exhaust Train Inlet Recirculation | Alternative 2: Stack to Fan Inlet Recirculation | Alternative 3: No Recirculation and Variable Speed Fan |
|---|---|---|
| Easier to balance than Alternative 2 | No HEPA, therefore no HEPA waste, testing, or maintenance | No HEPA, therefore no HEPA waste, testing, or maintenance |
| Potential additional cleaning of airstream | Less ductwork | No additional ductwork |
| Maintains flow through exhaust train | Least expensive | More energy efficient |
| Can be used as a breather system if ventilation system is off | | Capable of small fan speed adjustments for finer control of airstream |
| | | Doesn't add to the congestion around the exhaust train |
| | | |
| | | |

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PRIMARY & DST ANNULUS FAN AND STACK ALTERNATIVE COMPARISONS

DISADVANTAGES

| Alternative 1: Stack to Fan Inlet Recirculation | Alternative 2: Stack to Exhaust Train Inlet Recirculation | Alternative 3: No Recirculation and Variable Speed Fan |
|---|---|---|
| Adds more congestion in area than Alternative 2 | More difficult to balance than Alternatives 1 or 3 | Temperature sensitive |
| Generates more waste | Adds more congestion at exhaust train than Alternative 3 | Environment sensitive |
| Requires more I & C than Alternative 2 | Requires more ductwork than Alternative 3 | More expensive than Alternative 2 |
| Requires more maintenance and testing than Alternative 2 or 3 | | Requires more maintenance than Alternative 2 |
| Requires the most ductwork | | |
| | | |
| | | |

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### 6.3.4.1 Primary and DST Annulus Fan and Stack Preferred Alternative

Alternative 3, "No Recirculation and Variable Speed Fan" was selected as the preferred alternative. The major reasons for selecting alternative 3 are listed below:

- Alternative 3 is the most energy efficient and provides the best control of the system.
- Alternative 3 does not add to the congestion around the exhaust train, therefore will allow maintenance workers better access to perform their duties.

## 7.0 NO ACTION ALTERNATIVE

If no action is taken, the new TPA milestones addressing infrastructure upgrades cannot be met. For instance, major milestone "M-43-00, Complete Tank Farm Upgrades, June 2005" addresses a broad range of upgrades including "M-43-02, Project W-314B, Double Shell Ventilation Upgrade." TPA milestones have also been established for providing Project W-314B deliverables to regulatory agencies in 1994, and requiring DOE-HQ to request congressional funding in 1995 to support W-314B design/construction.

Other adverse conditions resulting from not taking action include operation of ventilation systems which are not compliant with the Code of Federal Regulations and continued deterioration and operation of facilities.

More detailed impacts of taking no action or delaying the project are as follows:

a. The tank farm ventilation systems will remain non-compliant with 40 CFR 61, Subpart H, which require a more accurate report for the quantity of emissions being released than the existing equipment can produce.

b. Continued piece-meal repairs and replacements will be required, causing additional operating costs and employee exposure to radiation. For example, in January 1994 there were a total of 123 work packages written for just the 200E area ventilation exhausters included in this study. Some of the more significant work packages which reflect the condition of the existing systems are described below.

<u>DST 241-AP (constructed 1983-84)</u>

- Repair annulus exhaust fan motor control for K2-5-1
- Fab and install new damper arm for exhauster K1-5-2
- Intermittent tripping of exhaust fan K1-5-2
- Repair exhauster heater K1-2-1 controller (high delta T)
- K2 (annulus) stack vacuum pump (BETA CAM) will not run continuously

<u>DST 241-AW (constructed 1978-80)</u>

- Replace rusted off stack tube on K-1 (primary) Exhaust Stack
- Trouble shoot and repair de-entrainer on K1-1-2 exhauster
- Repair K1-5-1 exhaust heater power
- Replace inlet radial dampers in K2 (annulus) system

<u>DST 241-AN (constructed 1980-81)</u>

- Repair Exhauster k2-2-1 Heater
- Replace fan dampers on K2-5-1 annulus exhauster
- Trouble shoot and repair K2-5-2 exhauster fan
- Install drain lines on exhausters K1-5-1 & K-2

<u>DST 241-AY (constructed 1968-70)</u>

- Replace fan motor and sheaves on 101-AY exhauster



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- Replace 102-AY annulus exhauster fan bearings
- Repair annulus exhauster heater controller
- Install aerosol test port on 101 AY exhausters

DST 241-AZ (constructed 1968-70)
- Replace 241-AZ annulus ventilation control
- Repair broken 241-AZ flow sensing line

DCRT 244-A (constructed 1974-76)
- Repair hole in exhauster bank B by replacing ductwork
- Modify stack drain
- Repair Rotameter

Many of the above items are an indication that the ventilation systems are, or may become, unreliable due to their years in service and require more frequent repairs in the future if not replaced.

c. Continued difficulty in maintaining the existing systems within their operating parameters, especially during winter months. For example, the current method of controlling the intake air flow is by removing duct tape or adding duct tape to some of the air infiltration routes until the desired tank differential pressure is achieved. If the weather changes over night from dry to snow, Operations has to respond by sending workers into the farms to adjust the intake air flow rate. If enough snow and ice accumulate over the infiltration routes, the ventilation system shuts down and loss of contamination control occurs until the snow and ice are removed to allow air infiltration to the tank.

d. A potential impact to the DST and SST retrieval mission schedule could occur if the ventilation system is shut down for repairs, because any retrieval process which involves that farm will be put on hold until the ventilation system is operative. With many of the existing systems being unreliable due to age, increased ventilation shutdown occurrences should be anticipated.

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## 8.0 REFERENCES

Reference Title and Description


1. "An Engineering Review of Tank Farm Ventilation Systems," March 1993, Los Alamos Technical Associates, Inc.

2. SD-HS-SAR-010, "Aging Waste Facility Safety Analysis Report"

3. SD-WM-SAR-006, "Single Shell Tank Isolation Safety Analysis Report"

4. SD-WM-SAR-016, "Double Shell Tank Farm (241-AN, AW, AP, and SY) Safety Analysis Report"

5. SD-WM-SAR-032, "Safety Analysis Report Salt Well Receiver Facilities"

6. WHC Internal Memo 7F530-DLM-93-002, "Project W-061, Vapor Characteristics Assumptions", August 18, 1993

7. DSI, "MWTF (Project W-236A) Organic Off Gas," from B. D. Groth to R. F. Meisinger, dated October 4, 1993

8. "Proceedings of Waste Management 1993," published by W. M. Symposia Inc., 1993

9. WHC-SD-W211-PSE-001, "Preliminary Safety Evaluation for the 101-SY Initial Tank Retrieval System, Project W-211", August 1993

10. WHC-SD-WM-ER-214, "Pump Heat Thermal Analyses for Tank 101-SY During Retrieval Operation for the Current Ventilation System"

11. WHC-SD-W030-PSAR-001, "Preliminary Safety Analysis Report for Tank Farm Ventilation Upgrade, Project W-030", September 1991

12 UCRL 15910, "Design and Evaluation Guidelines for the Department of Energy Facilities Subjected to Natural Phenomena Hazards", June 1990


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## 9.0 GENERAL LISTING OF CODES AND REGULATIONS

The latest edition of standards and guides shall be used

**U.S. CODE OF FEDERAL REGULATIONS**

- 10 CFR 1921, "National Environmental Policy Act"
- 10 CFR 20, "Standards for Protection Against Radiation"
- 29 CFR 1910, "Occupational Safety and Health Standards"
- 36 CFR 800, "Protection of Historical and Cultural Properties"
- 40 CFR 52, Appendix E, "Performance Specifications and Specification Test Procedures for Monitoring Systems For Effluent Stream Gas Volumetric Flow Rate"
- 40 CFR 60, Appendix A, "Reference Methods"
- 40 CFR 61, Subpart H, "National Emission Standards for Emissions of Radionuclides other than Radon from Department of Energy (DOE) Facilities"
- 40 CFR 122, "National Pollutant Discharge Elimination System
- 40 CFR 260, "Hazardous Waste Management System: General"
- 40 CFR 261, "Identification and Listing of Hazardous Waste"
- 40 CFR 264, "Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities"
- 40 CFR 265, "Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities"
- 50 CFR 402, "Interagency Cooperation - Endangered Species Act."

**U.S. DEPARTMENT OF ENERGY-HEADQUARTERS**

- Department of Energy Order 5400.5, "Radiation Protection of the Public and the Environment," 1990
- Department of Energy Order 5480.1B, "Environmental, Safety, and Health Program for Department of Energy Operations," 1986
- Department of Energy Order 5480.4, "Environmental Protection, Safety, and Health Protection Standards," 1984



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- Department of Energy Order 5480.5, "Safety of Nuclear Facilities," 1986
- Department of Energy Order 5480.7A, "Fire Protection," 1993
- Department of Energy Order 5480.11, "Radiation Protection for Occupational Workers," 1988
- Department of Energy Order 5480.19, "Conduct of Operations Requirements for DOE Facilities," 1990
- Department of Energy Order 5480.22, "Technical Safety Requirements," 1992
- Department of Energy Order 5480.23, "Nuclear Safety Analysis Reports," 1992
- Department of Energy Order 5484.1, "Environmental Protection, Safety, and Health Protection Information Reporting Requirements," 1981
- Department of Energy Order 5632.6, "Physical Protection of DOE Property and Unclassified Facilities," 1988
- Department of Energy Order 5700.6C, "Quality Assurance," 1991
- Department of Energy Order 5820.2A, "Radioactive Waste Management," 1988
- Department of Energy Order 6430.1A, "General Design Criteria," 1989
- Department of Energy, DOE/EH-0173T, "Environmental Regulatory Guide for Radionuclide Effluent Monitoring and Environmental Surveillance"
- Department of Energy, DOE/EP-0108, "Standard for Fire Protection of DOE Electronic Computer/Data Processing System"
- "A Guide to Reducing Radiation Exposure to As Low As Reasonably Achievable (ALARA), DOE/EV/1830.T5, U.S. Department of Energy." prepared by DOE

**U.S. DEPARTMENT OF ENERGY RICHLAND OPERATIONS OFFICE**

- Department of Energy-Richland Operations Order RL 4320.2C, "Site Selection," 1990
- Department of Energy-Richland Operations Order RLIP 5300.1C, "Telecommunications Management," 1992




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- Department of Energy-Richland Operations Order RLIP 5480.4C, "Environmental Protection, Safety, and Health Protection Standards for RL", 1992
- Department of Energy-Richland Operations Order RLIP 5480.7, "Fire Protection", 1990
- Department of Energy-Richland Operations Order RLIP 5480.11, "Radiation Protection for Occupational Workers," 1991
- Department of Energy-Richland Operations Order RLIP 5480.21, "Unreviewed Safety Questions," 1992
- Department of Energy-Richland Operations Order RLIP 5480.22, "Technical Safety Requirements," 1992
- Department of Energy-Richland Operations Order RL 6430.1C, "Hanford Plant Standards (HPS) Program," 1990
- "Preparation and Control of Engineering and Fabrication Drawings," HPS, SDC-1.3, Revision 6
- "Design Load for Structures," SDC-4.1, Revision 11, "Hanford Plant Standards"
- "Heating, Ventilating, and Air Conditioning," HPS, SDC-5.1, Revision 7
- "Interior Electric Power and Lighting Systems," HPS, SDC-7.5, Revision 25
- "Standard Specification for Compressor-Supplied Breathing Air Systems," HPS-156-M, Revision 2, "Hanford Plant Standards"
- "Standard Specification for Fire- and Moisture-Resistant Nuclear Grade HEPA Filters," HPS-157-M, Revision 1, "Hanford Plant Standards"
- "Standard Specification for Hydrogen Fluoride- and Caustic-Resistant Nuclear Grade HEPA Filters," HPS-158-M, Revision 1, "Hanford Plant Standards"
- "Standard Specification for Fire-, Moisture-, and Chemical-Resistant Nuclear Grade HEPA Filters," HPS-159-M, Revision 1, "Hanford Plant Standards"
- "Standard Specification for Fire- and Moisture-Resistant, High Temperature and High Humidity Nuclear Grade HEPA Filters," HPS-160-M, Revision 1, "Hanford Plant Standards"

- "Standard Specification for Self-Contained Fire- and Moisture-Resistant Nuclear Grade HEPA Filters," HPS-161-M, Revision 0, "Hanford Plant Standards"

- "Standard Specification for Self-Contained Fire-, Moisture-, and Chemical-Resistant Nuclear Grade HEPA Filters," HPS-162-M, Revision 0, "Hanford Plant Standards"

- "Standard Specification for Fire Specification for Self-Contained High Temperature and High Humidity Nuclear Grade HEPA Filters," HPS-163-M, Revision 0, "Hanford Plant Standards"

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WESTINGHOUSE HANFORD COMPANY

- "Management Requirements and Procedures Manual," Document Number WHC-CM-1-3
- "WHC Radiological Control Manual," Document Number WHC-CM-1-6
- "Hazardous Materials Packaging and Shipping," Document Number WHC-CM-2-14
- "Industrial Safety Manual," Document Number WHC-CM-4-3, Volumes 1, 2, 3, and 4
- "Radiological Design," Document Number WHC-CM-4-9
- "ALARA Program Manual," Document Number WHC-CM-4-11
- "Nuclear Criticality Safety," Document Number WHC-CM-4-29
- "Security Manual," Document Number WHC-CM-4-33
- "Fire Protection Program Manual" Document Number WHC-CM-4-41
- "Nonreactor Facility Safety Analysis Manual," Document Number WHC-CM-4-46
- "Standard Engineering Practices," Document Number WHC-CM-6-1
- "Environmental Compliance," Document Number WHC-CM-7-5
- "In-Place Efficiency Testing of Gaseous Effluent HEPA Filter System," Hanford Works Standard (HWS), HWS-10278
- "Jumper Fabrication," Document Number HS-BS-0084, Revision B
- "Hanford Radioactive Solid Waste Packaging, Storage, and Disposal Requirements," Document Number WHC-EP-0063, 1988
- "Backup Electric Power System Definitions and Design Criteria," Document Number WHC-SD-GN-DGS-303, Revision 0
- "Design Loads for Underground High Level Waste Tanks and Associated Underground Piping," Document Number WHC-SD-GN-DGS-30008, Revision 0
- "Operational Waste Volume Projection," Document Number WHC-SD-WM-ER-029, Revision 17
- "Double Shell Waste Tank In-tank Corrosion Monitoring Program," Document Number WHC-SD-WM-EV-054, Revision 0



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- "Best Available Technology Economically Achievable Guidance Document for the Hanford Site Waste Management Systems Engineering," Document Number WHC-EP-0137, Revision 0


**INDUSTRY STANDARDS AND CODES**


- "Code Requirements for Nuclear Safety Related Concrete Structures", American Concrete Institute, ACI-349, 1990
- "Design Criteria for Decommissioning of Nuclear Fuel Reprocessing Plants," ANSI N300-1975
- "National Electrical Safety Code," ANSI C2 Handbook-1993
- "Uniform Fire Code," ICBO, 1991
- "Storage/Retrieval (S/R) Machines and Associated Equipment," ANSI/ASME B30.13-1991
- "Chemical Plant and Petroleum Refinery Piping," ANSI/ASME B31.3-1990
- "Hooks," ANSI/ASME B30.10-1987
- "Methods for the Calculations of the Articulation Index", ANSI S3.5-1969
- "Sampling Airborne Radioactive Material in Nuclear Facilities", ANSI N13.1-1969 (R1982)


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- "Specifications and Performance of On-Site Instrumentation for Continuously Monitoring Radioactivity in Effluents," ANSI N4 2.18-1980, (R1991)

- "Nuclear Power Plant Air Cleaning Units and Components," ASME N509-1989

- American Society of Mechanical Engineers (ASME) "Boiler and Pressure Vessel Code," Section III, Nuclear Power Plant Components, Division 1, 1992.

- American Society of Mechanical Engineers (ASME) "Boiler and Pressure Vessel Code," Section III, Nuclear Power Plant Components, Division 2, 1992

- "Software Quality Assurance Plans," ANSI/IEEE 730-1989

- "Method of Testing Air Cleaning Devices Used in General Ventilation for Removing Particulate Matter," American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE) 52-1976

- Institute of Electrical and Electronic Engineers, "Application of the Single-Failure Criteria by Nuclear Power Generating Station Safety Systems, ANSI/IEEE 379-1988

- Institute of Electrical and Electronic Engineers, "IEEE Recommended Practice for Off-normal operating condition and Standby Power," ANSI/IEEE 446-1987

- Institute of Electrical and Electronic Engineers, "Criteria for Independence of Class IE Equipment and Circuits, ANSI/IEEE 384-1981

- Institute of Electrical and Electronic Engineers, "IEEE Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations", ANSI/IEEE 323-1984 (R1991)

- Institute of Electrical and Electronic Engineers, "Recommended Practice for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations", ANSI/IEEE 344-1987

- International Commission on Radiological Protection, "Cost-Benefit Analysis in the Optimization of Radiation Protection," Publication 37, 1983

- American Society of Heating, Refrigeration, and Air-Conditioning Engineers, "ASHRAE Handbook/1993 Fundamentals"


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- National Association of Corrosion Engineers (NACE) Standard RP0169-92 "Recommended Practice Control of External Corrosion on Underground or Submerged Metallic Piping Systems"
- "National Electrical Code," NFPA 70, 1993
- "Life Safety Code," NFPA 101, 1991
- "Installation of Sprinkler Systems," NFPA 13, 1991
- "Off-normal operating condition and Standby Power Systems," NFPA 110, 1985
- "National Fire Codes," NFPA, 1993
- "Safeguarding Building Construction and Demolition," NFPA 241, 1992
- "Lightning Protection Code," NFPA-780, 1992
- "Seismic Design and Evaluation Guidelines for the Department of Energy High-Level Waste Storage Tanks and Appurtenances," Brookhaven National Laboratory, BNL 52361, 1993
- "Design and Evaluation Guidelines for Department of Energy Facilities Subjected to Natural Phenomena Hazards," University of California Research Labs, UCRL-15910, 1990
- Munson, L. H., "Health Physics Manual of Good Practices for Reducing Radiation Exposure to Levels that are As Low As Reasonably Achievable (ALARA)," Pacific Northwest Laboratory 6577, 1988
- MIL-STD-1472D, Section 5.7.5, Standard Console Design
- United States Environmental Protection Agency Document PB87-13439, "Technical Resource Document for the Storage and Treatment of Hazardous Waste in Tank Systems"


**STATE REGULATIONS**


- "Radiation Protection - Air Emissions" Chapter 246-247, Washington Administrative Code, 1992
- "Public Water Supplies," Chapter 248-54, Washington Administrative Code, 1992
- "Dangerous Waste Regulations," Chapter 173-303, Washington Administrative Code, 1992

- "State Waste Discharge Permit Program," Chapter 173-216, Washington Administrative Code, 1992
- "General Regulations for Air Pollution Sources", Chapter 173-400, Washington Administrative Code, as amended
- "Controls for New Sources of Toxic Air Pollutants", Chapter 173-460, Washington Administrative Code, as amended
- "State Environmental Policy Act", Chapter 197-11, Washington Administrative Code, as amended

In addition to the above standards, applicable Hanford standards, Occupational Safety and Health Administration standards, the national consensus codes, and standards developed by such organizations as the ASME, American Society of Testing Materials, ANSI, American Concrete Institute, American Institute of Steel Construction, Instrument Society of America, American Water Works Association, and IEEE shall be used as determined by subsequent design phases.

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# APPENDIX A
# ESTIMATED MAXIMUM CONCENTRATIONS

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VAPOR/GAS CONSTITUENTS OF CONCERN*

| VAPOR/GAS CONSTITUENT | CONCENTRATION IN VAPOR PHASE** |
|---|---|
| Acetone | 1.43E5 ug/$m^3$ |
| 1-Butanol | 3.92E6 ug/$m^3$ |
| Carbon Tetrachloride | 1.71 ug/$m^3$ |
| Benzene | 225 ug/$m^3$ |
| 2-Hexanone (MBK) | 5733 ug/$m^3$ |
| Tributyl Phosphate | 1.96E5 ug/$m^3$ |
| n-paraffin hydrocarbons ($C_{10}$-$C_{14}$) | 221.9E6 ug/$m^3$ |
| 4- Methyl-2-Pentanone (MIBK) | 4.04E5 ug/$m^3$ |
| Ammonia | 1.95 lb/day generation rate |
| Hydrogen | 1.69 lb/day generation rate |
| | |

* Information copied from Reference Number 7
** Values/quantities for one tank

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| FUTURE MAXIMUM RADIONUCLIDE COMPOSITION* | | | | | |
|---|---|---|---|---|---|
| Isotope | Ci/gal | Isotope | Ci/gal | Isotope | Ci/gal |
| $^{3}H$ | 3.63 E-05 | $^{113}Sn$ | 7.12 E-06 | $^{147}Pm$ | 1.12E+01 |
| $^{14}C$ | 2.54 E-06 | $^{115m}Cd$ | 2.48 E-09 | $^{148m}Pm$ | 3.73 E-09 |
| $^{55}Fe$ | 3.97 E-02 | $^{119m}Sn$ | 1.53 E-03 | $^{151}Sm$ | 2.36 E-01 |
| $^{59}Ni$ | 3.84 E-05 | $^{121m}Sn$ | 2.99 E-05 | $^{152}Eu$ | 7.74 E-04 |
| $^{60}Co$ | 1.21 E-03 | $^{123}Sn$ | 8.17 E-04 | $^{153}Gd$ | 3.26 E-06 |
| $^{63}Ni$ | 4.44 E-03 | $^{126}Sn$ | 1.30 E-04 | $^{154}Eu$ | 9.48 E-02 |
| $^{79}Se$ | 1.10 E-06 | $^{124}Sb$ | 9.87 E-09 | $^{155}Eu$ | 1.16 E-01 |
| $^{89}Sr$ | 1.84 E-05 | $^{126}Sb$ | 1.83 E-05 | $^{160}Tb$ | 3.12 E-08 |
| $^{90}Sr$ | -1.18 E + 01 | $^{126m}Sb$ | 1.30 E-04 | $^{234}U$ | 1.36 E-06 |
| $^{90}Y$ | 1.18 E + 01 | $^{125}Sb$ | 4.97 E-01 | $^{235}U$ | 5.56 E-08 |
| $^{91}Y$ | 2.05 E-04 | $^{125m}Te$ | 1.21 E-01 | $^{236}U$ | 1.34 E-07 |
| $^{93m}Nb$ | 1.63 E-04 | $^{127}Te$ | 8.34 E-04 | $^{238}U$ | 1.05 E-06 |
| $^{93}Zr$ | 3.65 E-04 | $^{127e}Te$ | 8.47 E-04 | $^{237}Np$ | 5.63 E-05 |
| $^{95}Zr$ | 7.80 E-04 | $^{129}Te$ | 1.06 E-10 | $^{238}Pu$ | 2.17 E-04 |
| $^{95}Nb$ | 1.60 E-03 | $^{129m}Te$ | 1.63 E-10 | $^{239}Pu$ | 3.97 E-04 |
| $^{99}Tc$ | 2.64 E-03 | $^{129}I$ | 4.60 E-09 | $^{240}Pu$ | 1.53 E-04 |
| $^{103}Ru$ | 8.42 E-08 | $^{134}Cs$ | 3.40 E-01 | $^{241}Pu$ | 7.28 E-03 |
| $^{103m}Ru$ | 7.59 E-08 | $^{135}Cs$ | 7.08 E-05 | $^{242}Pu$ | 3.70 E-08 |
| $^{106}Ru$ | 1.41 E + 00 | $^{137}Cs$ | 1.44 E + 01 | $^{241}Am$ | 1.63 E-01 |
| $^{106}Rh$ | 1.41 E + 00 | $^{137m}Ba$ | 1.36 E + 01 | $^{242}Am$ | 1.17 E-04 |
| $^{107}Pd$ | 1.15 E - 05 | $^{141}Ce$ | 3.19 E-09 | $^{243}Am$ | 1.91 E-05 |
| $^{110m}Ag$ | - 4.50 E-04 | $^{144}Pr$ | 8.42 E + 00 | $^{242}Cm$ | 1.41 E-04 |
| $^{113m}Cd$ | 4.11 E-03 | $^{144}Pr$ | 8.42 E + 00 | $^{244}Cm$ | 3.53 E-03 |
| $^{113m}In$ | 7.12 E-06 | $^{144m}Pr$ | 1.01 E-01 | | |
| Total activity (Ci/gal) | | 8.42 E + 01 | | | |
| Decay heat (W/gal) | | 2.40 E-01 | | | |

NOTE: Radionuclide composition values given in this table are based on a "normal" overall waste loading of 0.26-lb nonvolatile oxides/gal. Ci/gal represent tank liquid contents, and vapor space contents are being characterized to establish the maximum hazardous vapor concentrations.

*Information copied from WHC-SD-W236-FDC-001, Rev. 0. Data is subject to change as more characterization becomes available and actual retrieval dilutions become known. Refer to current Tank Farm SARs for existing radionuclide composition.



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# APPENDIX B

## ENGINEERING STUDY FIGURES

FIG. 1 PRIMARY TANK EXHAUST TRAIN - PASSIVE ADSORPTION/FILTRATION - ALTERNATIVE 1

FIG. 2 PRIMARY TANK EXHAUST TRAIN - ACTIVE ABSORPTION - ALTERNATIVE 2

FIG. 3 PRIMARY AND DST ANNULUS INLET - COMMON INLET STATIONS - ALTERNATIVE 1

FIG. 3A DOUBLE SHELL TANK SHOWING SUPPLY AND EXHAUST DUCTWORK

FIG. 4 PRIMARY AND DST ANNULUS INLET - INDIVIDUAL TANK INLET STATIONS - ALTERNATIVE 2

FIG. 5 DST ANNULUS EXHAUST TRAIN - STANDARD HEPA FILTERED EXHAUST - ALTERNATIVE 1

FIG. 6 PRIMARY AND DST ANNULUS FAN AND STACK - STACK TO EXHAUST TRAIN INLET RECIRCULATION - ALTERNATIVE 1

FIG. 7 PRIMARY AND DST ANNULUS FAN AND STACK - STACK TO FAN INLET RECIRCULATION - ALTERNATIVE 2

FIG. 8 PRIMARY AND DST ANNULUS FAN AND STACK - NO RECIRCULATION AND VARIABLE SPEED FAN - ALTERNATIVE 3

FIG. 9 PREFERRED VENTILATION SYSTEMS

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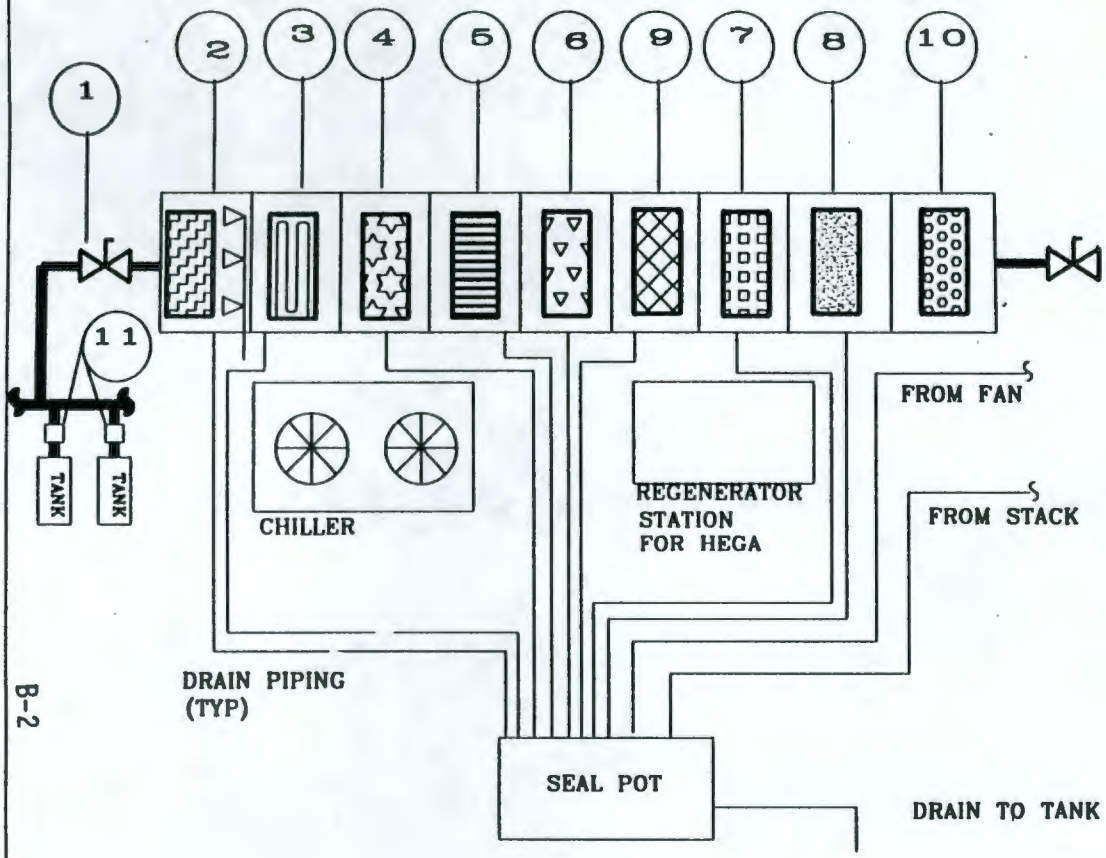



| | EQUIPMENT INDETIFICATION FOR PRIMARY EXHAUST TRAIN |
|---|---|
| 1 | BUTTERFLY VALVE FOR ISOLATION OF EXHAUST TRAIN |
| 2 | MOISTURE SEPARATOR WITH BACKFLUSH CAPABILITY |
| 3 | CONDENSER/CHILLER |
| 4 | HIGH EFFICIENCY MIST ELIMINATOR (HEME) WITH WASH CAPABILITY |
| 5 | AIR HEATER |
| 6 | METAL HEPA FILTER WITH BACKWASH CAPABILITY |
| 7 | HIGH EFFICIENCY GAS ADSORBER (HEGA) FOR ORGANICS |
| 8 | IMPREGNATED CHARCOAL ADSORBER FOR AMMONIA AND INORGANICS |
| 9 | HIGH EFFICIENCY PARTICULATE AIR (HEPA FILTER) |
| 10 | 95% EFFICIENCY AIR FILTER |
| 11 | CHEVRON |

NOTES:

COMPONENTS 2 THROUGH 10 SHALL BE DESIGNED TO BE MODULAR SECTIONS, AND BE CAPABLE OF REMOVAL AND REPLACED WITH DUCTWORK WHERE REQUIRED.

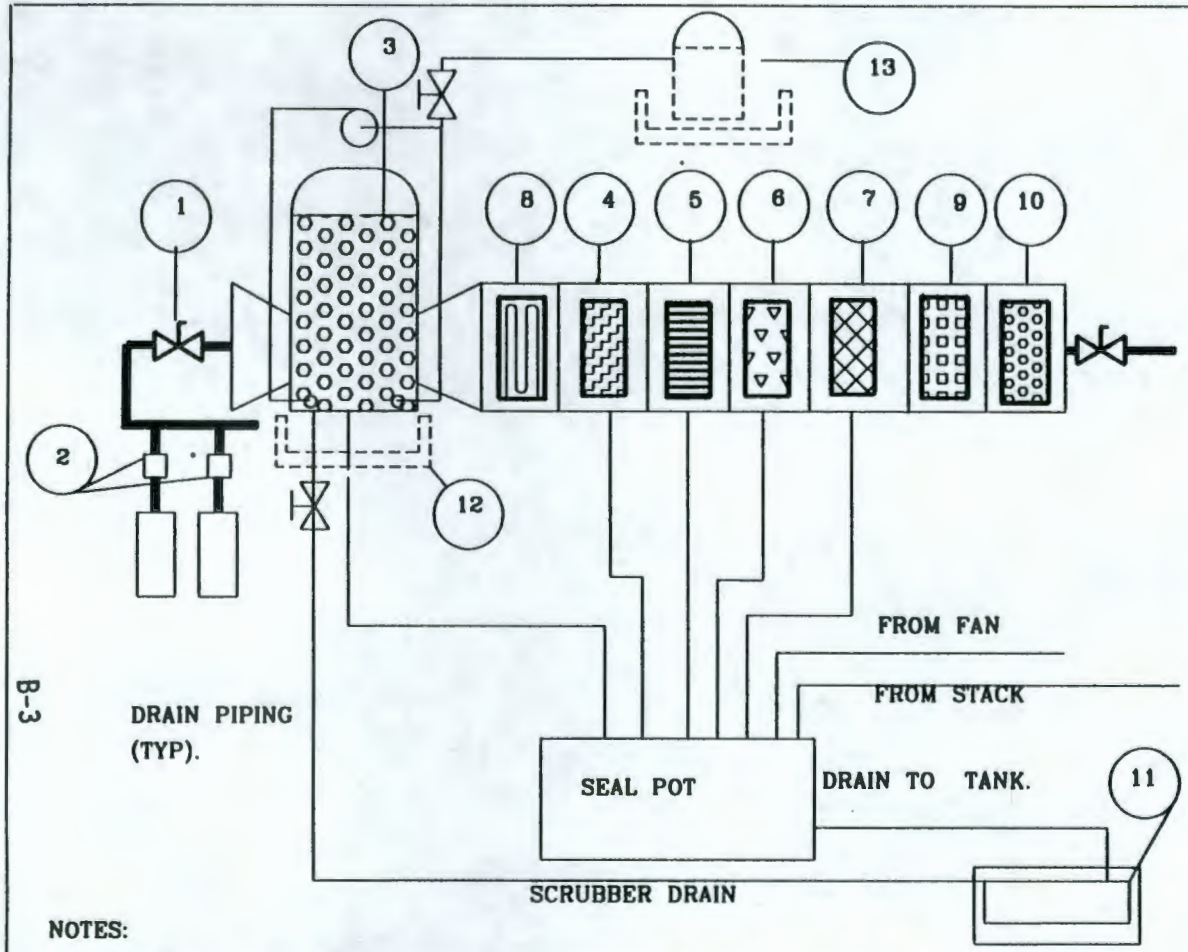
DESIGN OF SYSTEM PRESSURE PARAMETERS SHALL CONSIDER THE REMOVAL OF VENTILATION COMPONENTS WHEN FAN SELECTION AND CONTROL METHODS ARE BEING EVALUATED.

ALL CONDENSATE AND WASTE WATER SHALL BE ROUTED TO A DESIGNATED TANK. (EXCEPT SST SYSTEM SHALL BE DRAINED TO A NEW HOLDING TANK)

AEROSOL TEST SECTIONS INSTALLED UPSTREAM AND DOWNSTREAM OF ALL HEPA FILTERS. NOT SHOWN FOR CLARITY.

PRIMARY TANK EXHAUST TRAIN–PASSIVE ADSORPTION/FILTRATION–ALTERNATIVE 1

FIG. 1




| EQUIPMENT IDENTIFICATION FOR PRIMARY EXHAUST TRAIN | |
|---|---|
| 1 | BUTTERFLY VALVE FOR ISOLATION OF EXHAUST TRAIN. |
| 2 | CHEVRON SEPARATOR |
| 3 | SCRUBBER WITH RECIRCULATION PUMP. |
| 4 | HIGH EFFICIENCY MIST ELIMINATOR (HEME) WITH WASH CAPABILITY. |
| 5 | AIR HEATER |
| 6 | METAL HEPA FILTER WITH BACKWASH CAPABILITY |
| 7 | HIGH EFFICIENCY PARTICULATE AIR (HEPA FILTER) |
| 8 | CONDENSER/CHILLER |
| 9 | HIGH EFFICIENCY GAS ADSORBER (HEGA) FOR ORGANICS |
| 10 | 95% HIGH EFFICIENCY AIR FILTER |
| 11 | DOUBLE CONTAINED COLLECTION TANK WITH LEAK DETECTION AND FLUID LEVEL INSTRUMENTATION. |
| 12 | SCRUBBER CATCH BASIN FOR SPILLS AND LEAKS. |
| 13 | SCRUBBER FLUID MAKE-UP AND STORAGE TANK WITH BASIN, LEAK DETECTION, AND FLUID LEVEL INSTRUMENTATION. |

NOTES:

COMPONENTS 4 THROUGH 10 SHALL BE DESIGNED TO BE MODULAR SECTIONS, AND BE CAPABLE OF REMOVAL AND REPLACED WITH DUCTWORK WHERE REQUIRED.

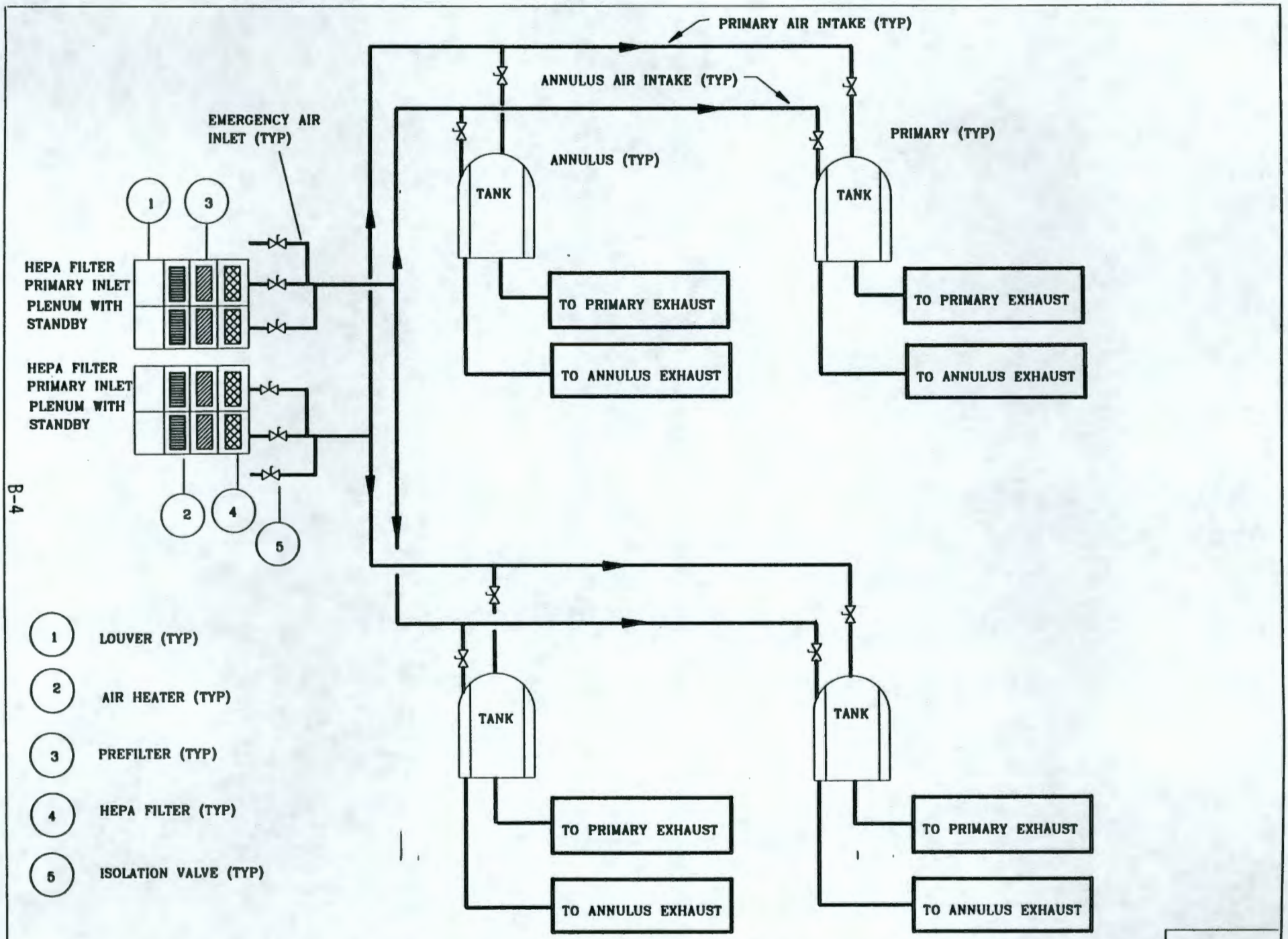
DESIGN OF SYSTEM PRESSURE PARAMETERS SHALL CONSIDER THE REMOVAL OF VENTIALTION COMPONENTS WHEN FAN SELECTION AND CONTROL METHODS ARE BEING EVALUATED.

ALL CONDENSATE AND WASTE WATER SHALL BE ROUTED TO A COLLECTION TANK .

AEROSOL TEST SECTIONS INSTALLLED UPSTREAM AND DOWNSTREAM OF ALL HEPA FILTERS. NOT SHOWN FOR CLARITY.

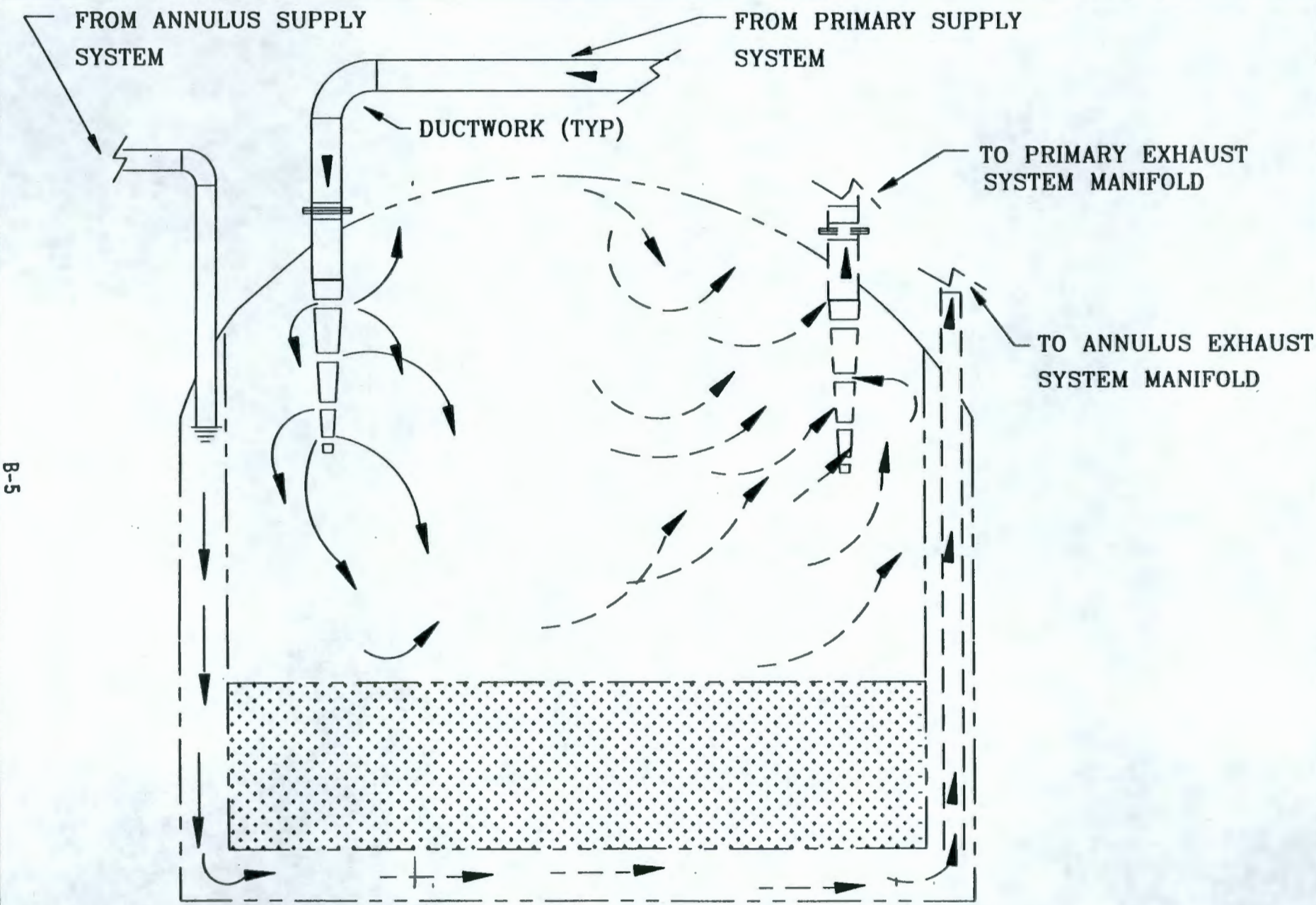
PRIMARY TANK EXHAUST TRAIN–ACTIVE ABSORPTION– ALTERNATIVE 2.

FIG 2



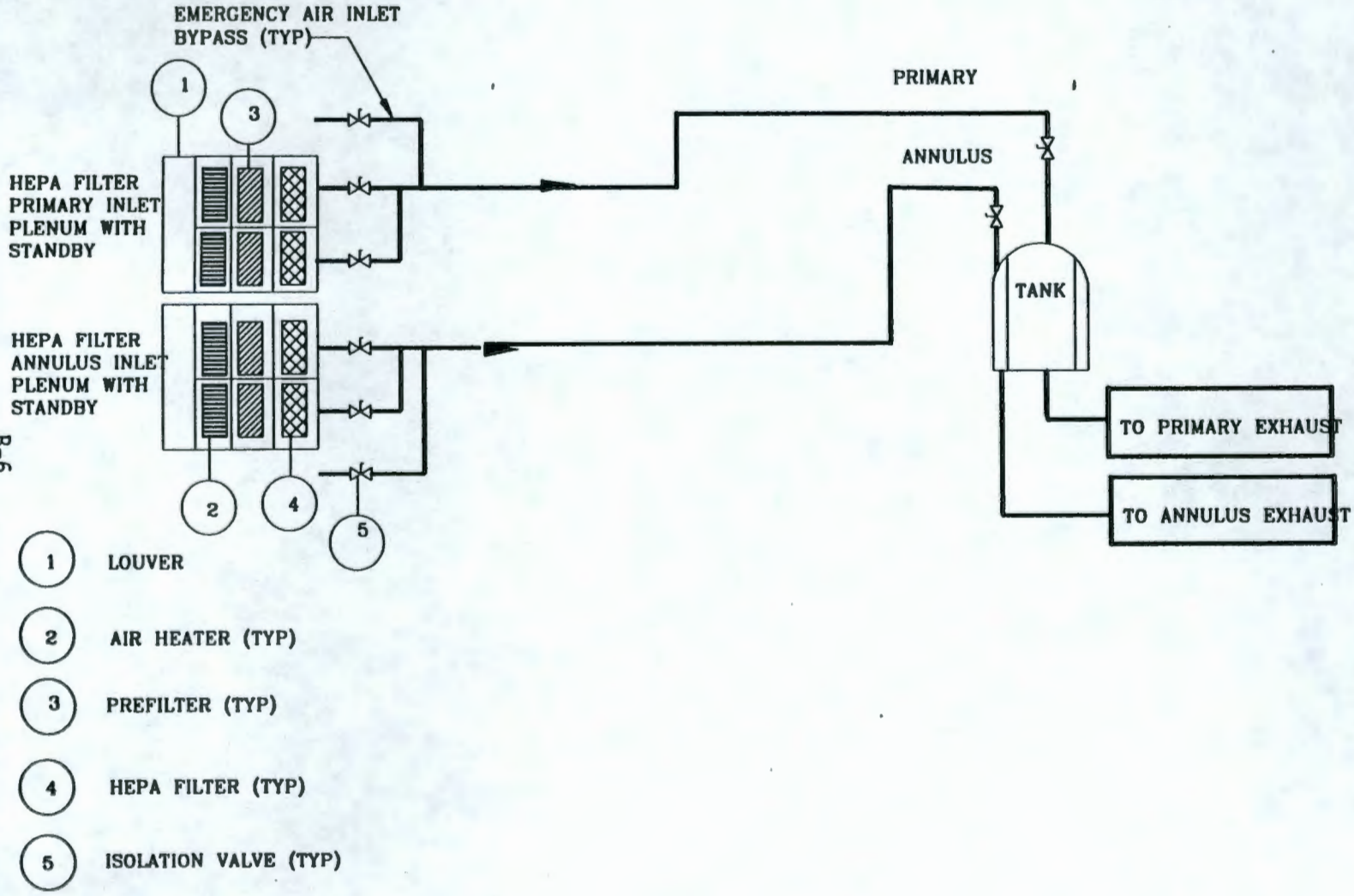

PRIMARY AND DST ANNULUS INLET-COMMON INLET STATIONS-ALTERNATIVE 1

FIG.3



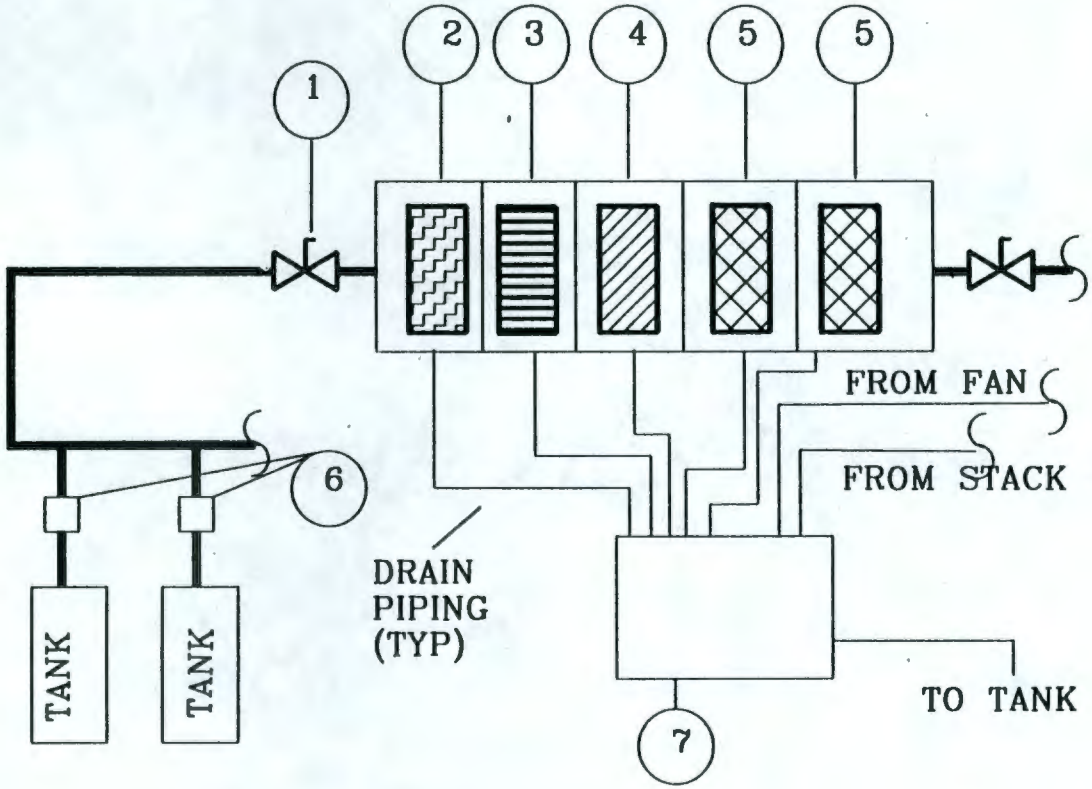

DOUBLE SHELL TANK SHOWING SUPPLY AND EXHAUST DUCTWORK.
A PORTION OF ALTERNATIVE ONE,SEE FIGURE 3 FOR CONTINUATION.

FIGURE 3A




PRIMARY AND DST ANNULUS INLET -INDIVIDUAL TANK INLET STATIONS- ALTERNATIVE 2.

FIG. 4




| EQUIPMENT IDENTIFICATION FOR ANNULUS EXHAUST TRAIN | |
|---|---|
| 1 | BUTTERFLY VALVE FOR ISOLATION OF EXHAUST TRAIN |
| 2 | MOISTURE SEPARATOR |
| 3 | AIR HEATER |
| 4 | PREFILTER |
| 5 | HIGH EFFICIENCY PARTICULATE AIR (HEPA) FILTER |
| 6 | CONTINUOUS AIR MONITOR (CAM) |
| 7 | SEAL POT |

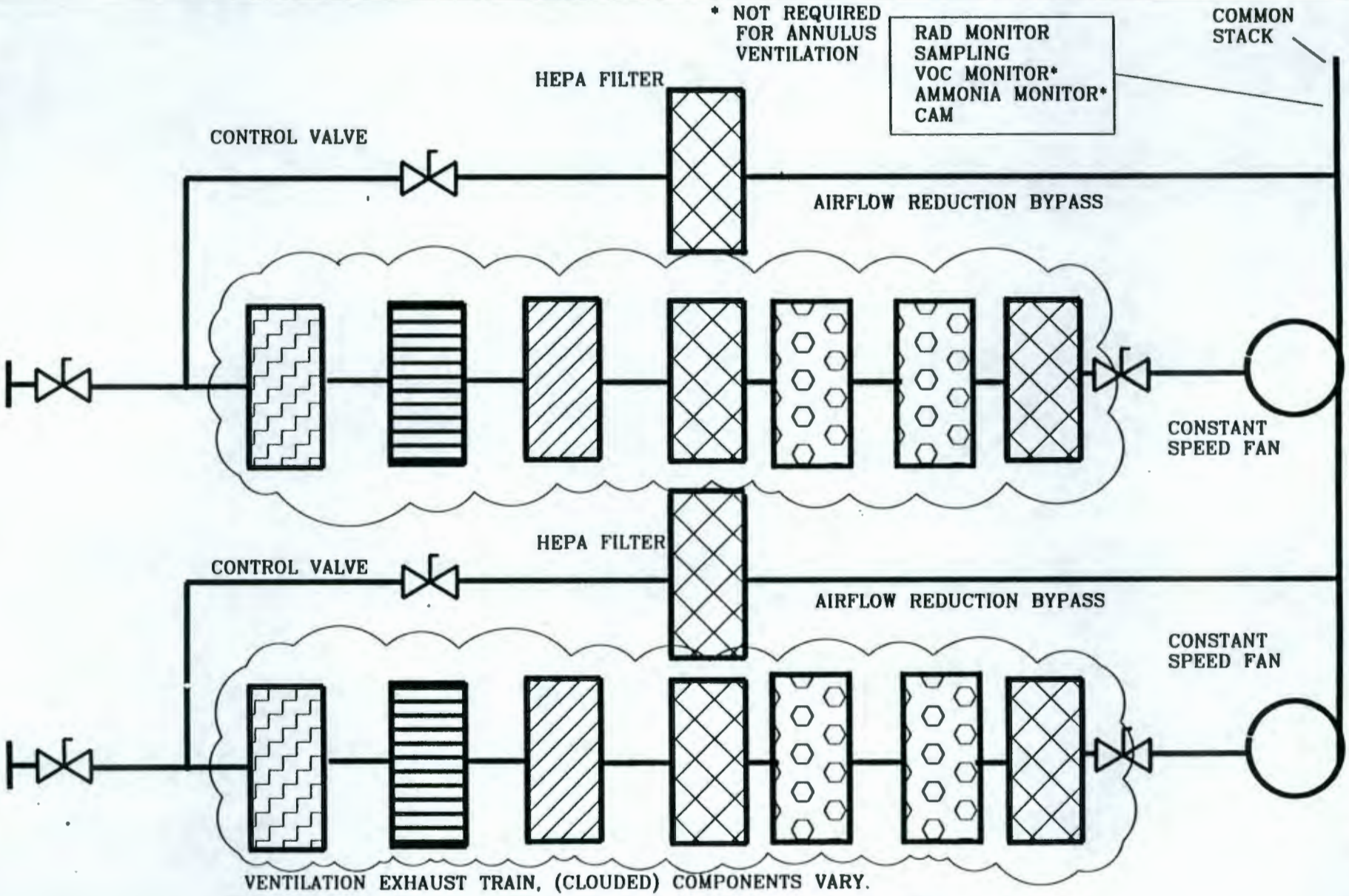
NOTES:

ALL CONDENSATE AND WASTE WATER SHALL BE ROUTED TO A DESIGNATED TANK

AEROSOL TEST SECTIONS INSTALLED UPSTREAM AND DOWNSTREAM OF ALL HEPA FILTERS. NOT SHOWN FOR CLARITY.

DST ANNULUS EXHAUST TRAIN
STANDARD HEPA FILTERED EXHAUST–ALTERNATIVE 1

FIG. 5




VENTILATION EXHAUST TRAIN, (CLOUDED) COMPONENTS VARY.

ILLUSTRATION IS FOR DEPICTING AIRFLOW REDUCTION BYPASS ONLY.

ONE BYPASS ON EACH TRAIN (2 REQ'D)

PRIMARY AND DST ANNULUS FAN AND STACK–STACK TO EXHAUST TRAIN INLET RECIRCULATION–ALTERNATIVE 1

FIG. 6

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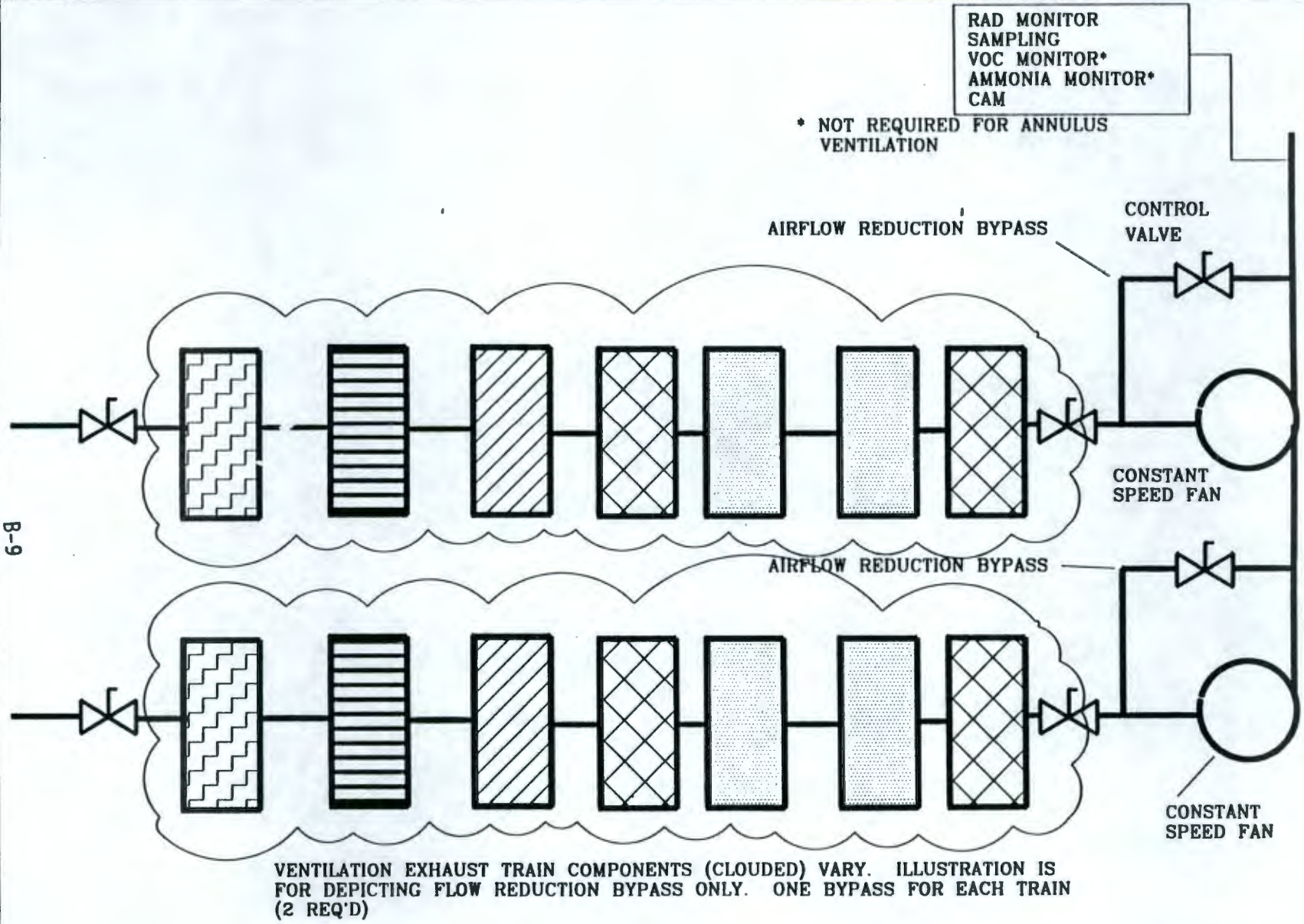
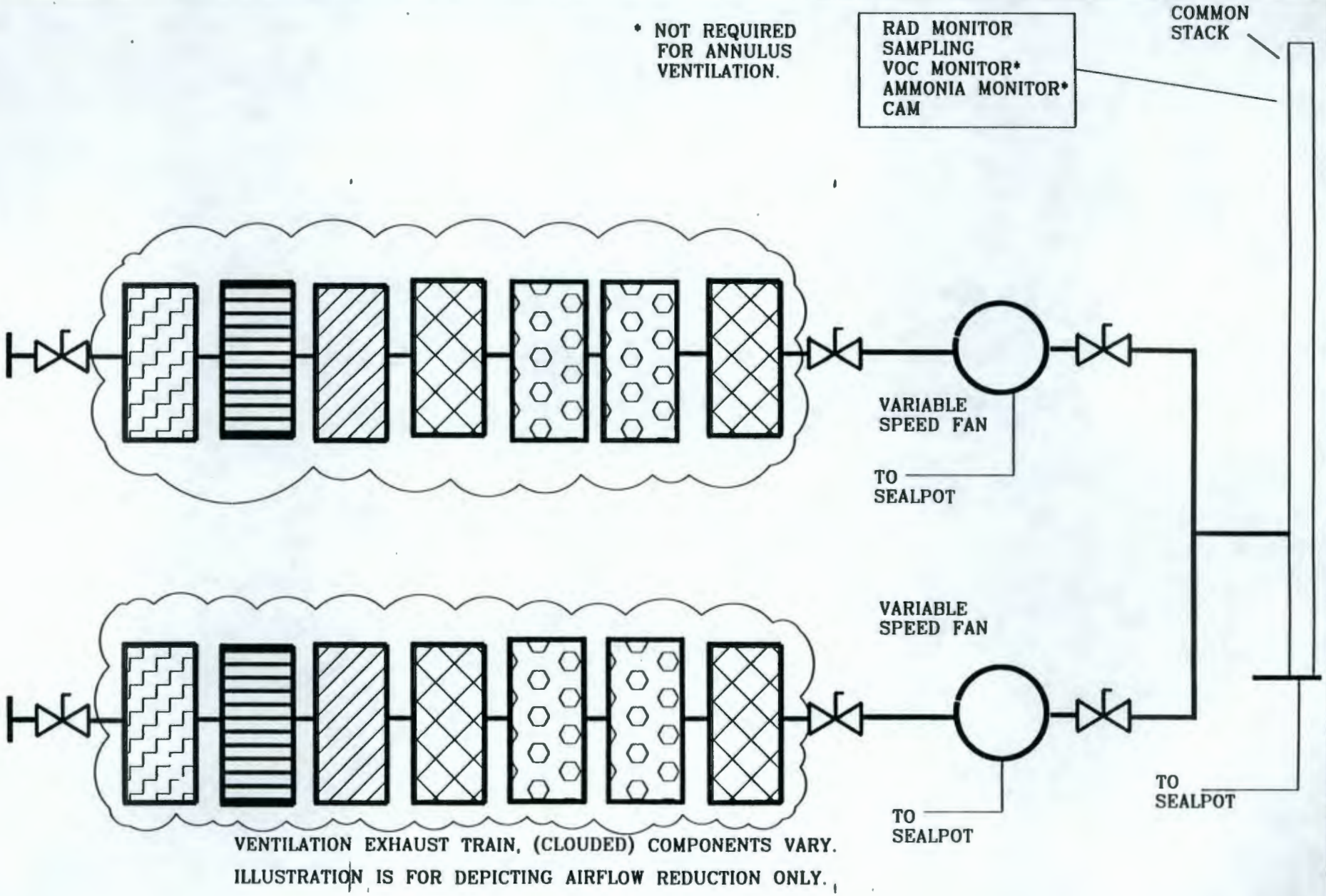


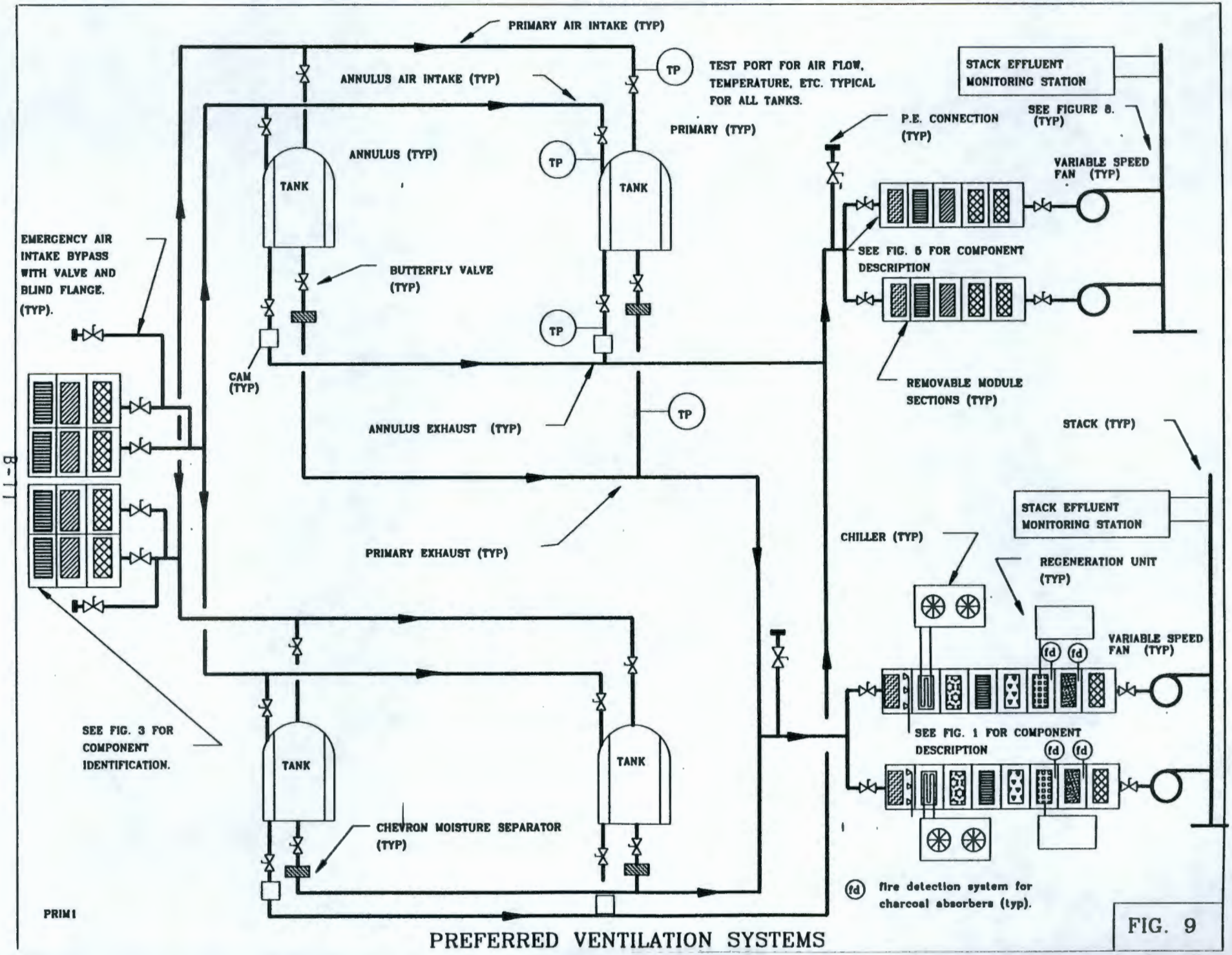

PRIMARY AND DST ANNULUS FAN AND STACK–
STACK TO FAN INLET RECIRCULATION–ALTERNATIVE 2

FIG. 7




PRIMARY AND DST ANNULUS FAN AND STACK–NO RECIRCULATION AND VARIABLE SPEED FAN–ALTERNATIVE 3

FIG. 8




PREFERRED VENTILATION SYSTEMS

FIG. 9

# APPENDIX C

## ENGINEERING STUDY SKETCHES


| | |
|---|---|
| SK-1 | 200 East and West Area Tank Farm Locations |
| SK-2 | Schematic Drawing of Double Shell Tanks at Hanford |
| SK-3 | Existing Tank Ventilation Details |
| SK-4 | Typical Primary Tank Exhaust System |
| SK-5 | Single Shell, High Level Waste Tank Designs |
| SK-6 | Typical Single Shell Tank |
| SK-7 | Existing SX Tank Valve and Duct Arrangements |
| SK-8 | 244-S DCRT Layout |
| SK-9 | Typical DCRT Layout |
| SK-10 | Typical DCRT Ventilation Schematic |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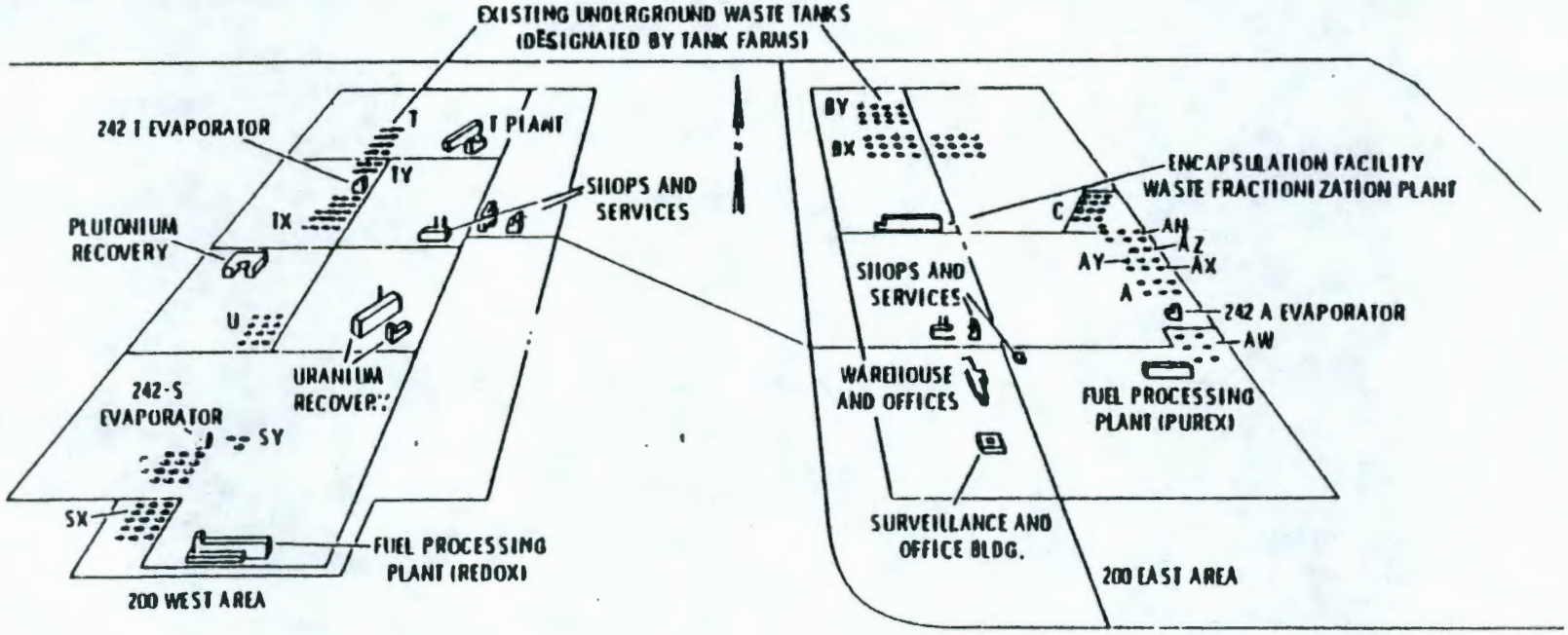
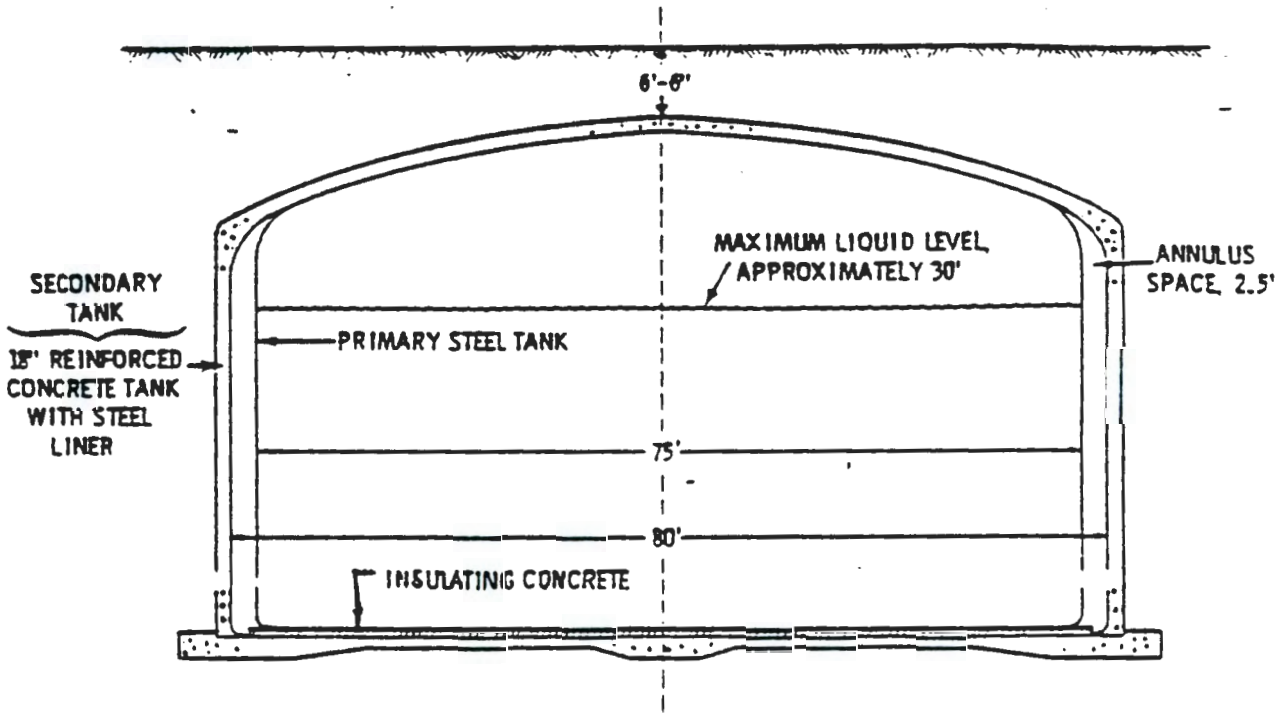
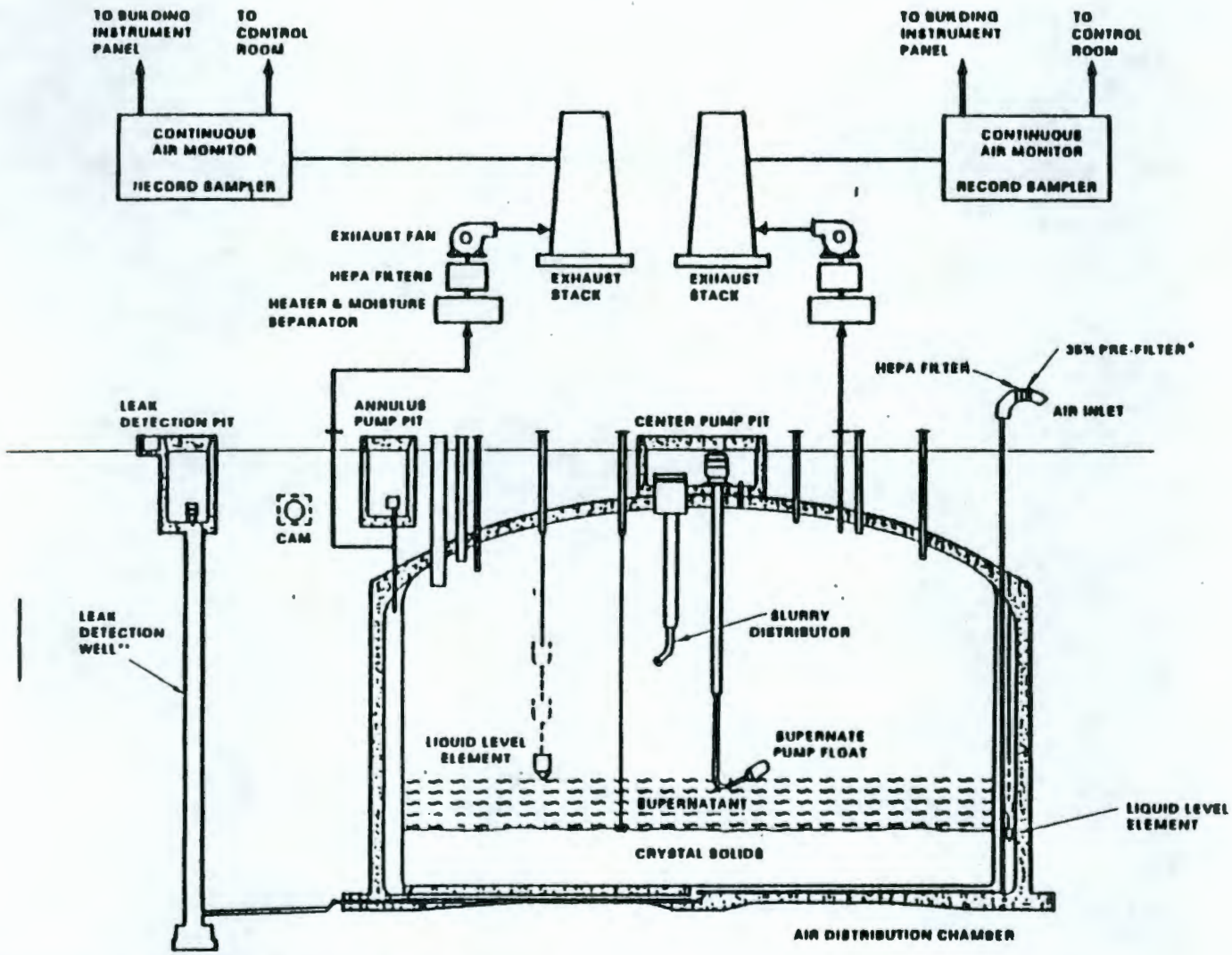



SK-1 200 East and West Area Tank Farm Locations




SK-2 Schematic Drawing of Double Shell Tanks at Hanford




*AP TANK FARM HAS HEATERS ON INTAKE, FOUR INLET STATIONS FOR EIGHT TANKS

**AP HAS TWO LEAK DETECTION WELLS, ONE WELL FOR FOUR TANKS

SK-3 Existing Tank Ventilation Details

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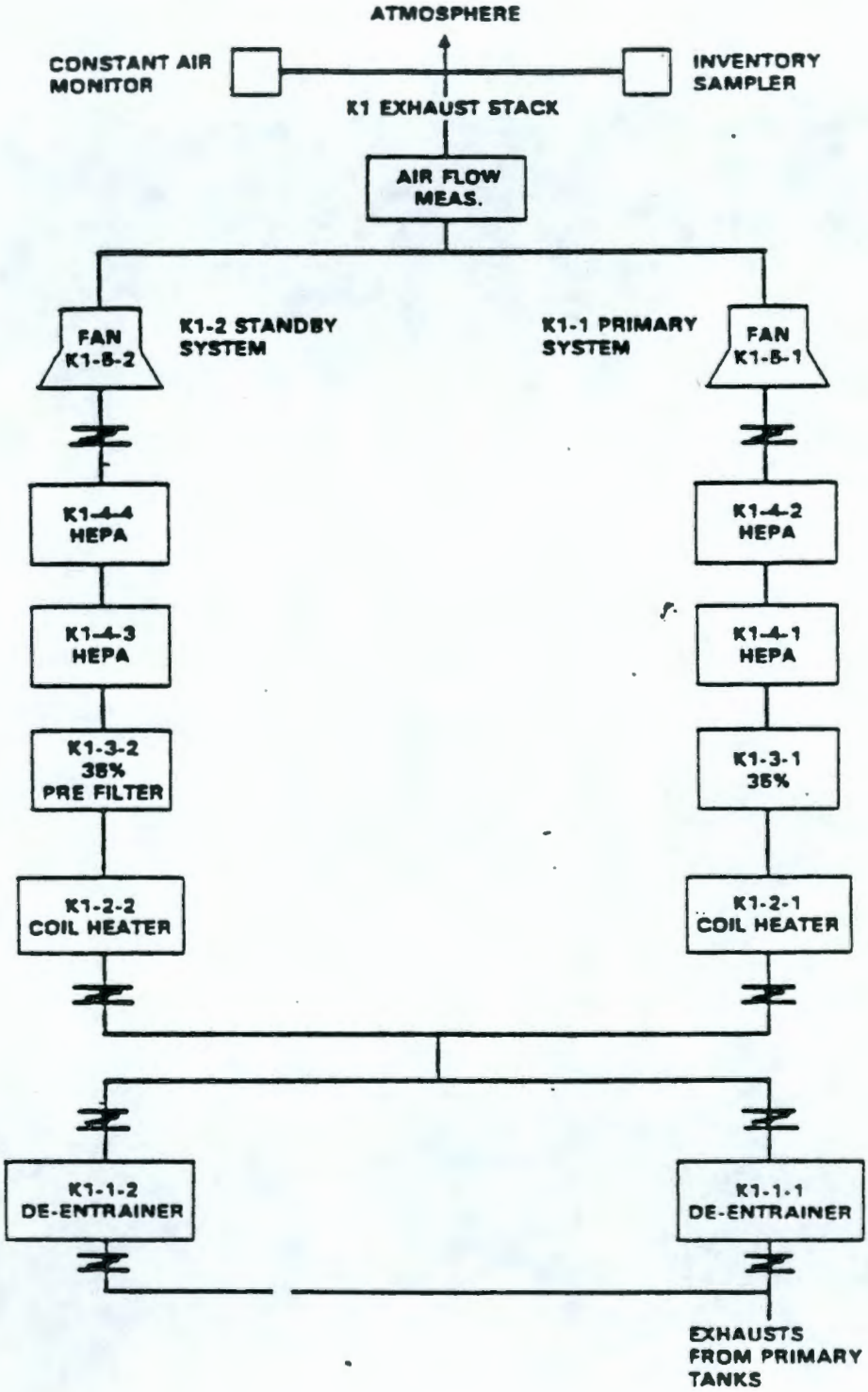
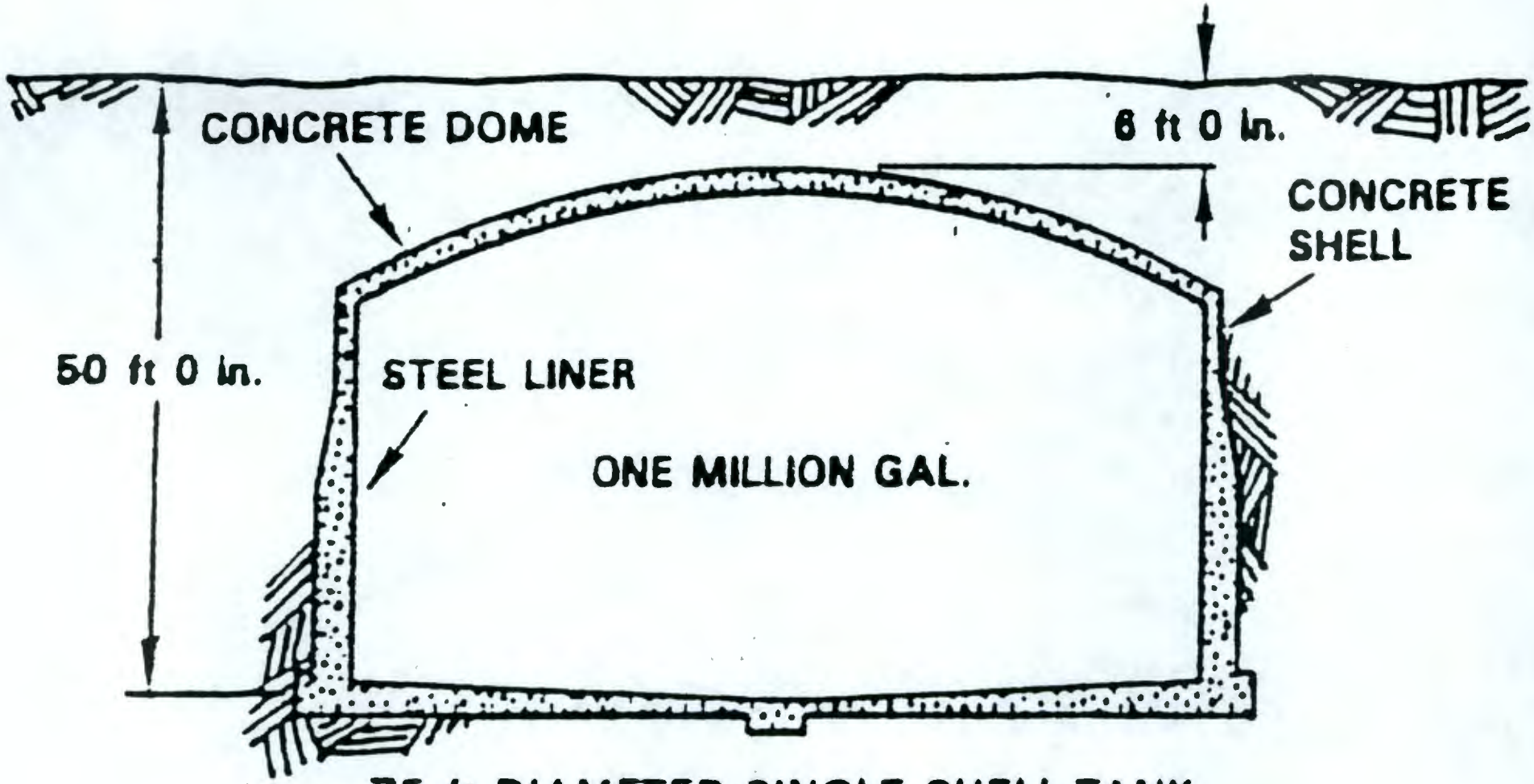
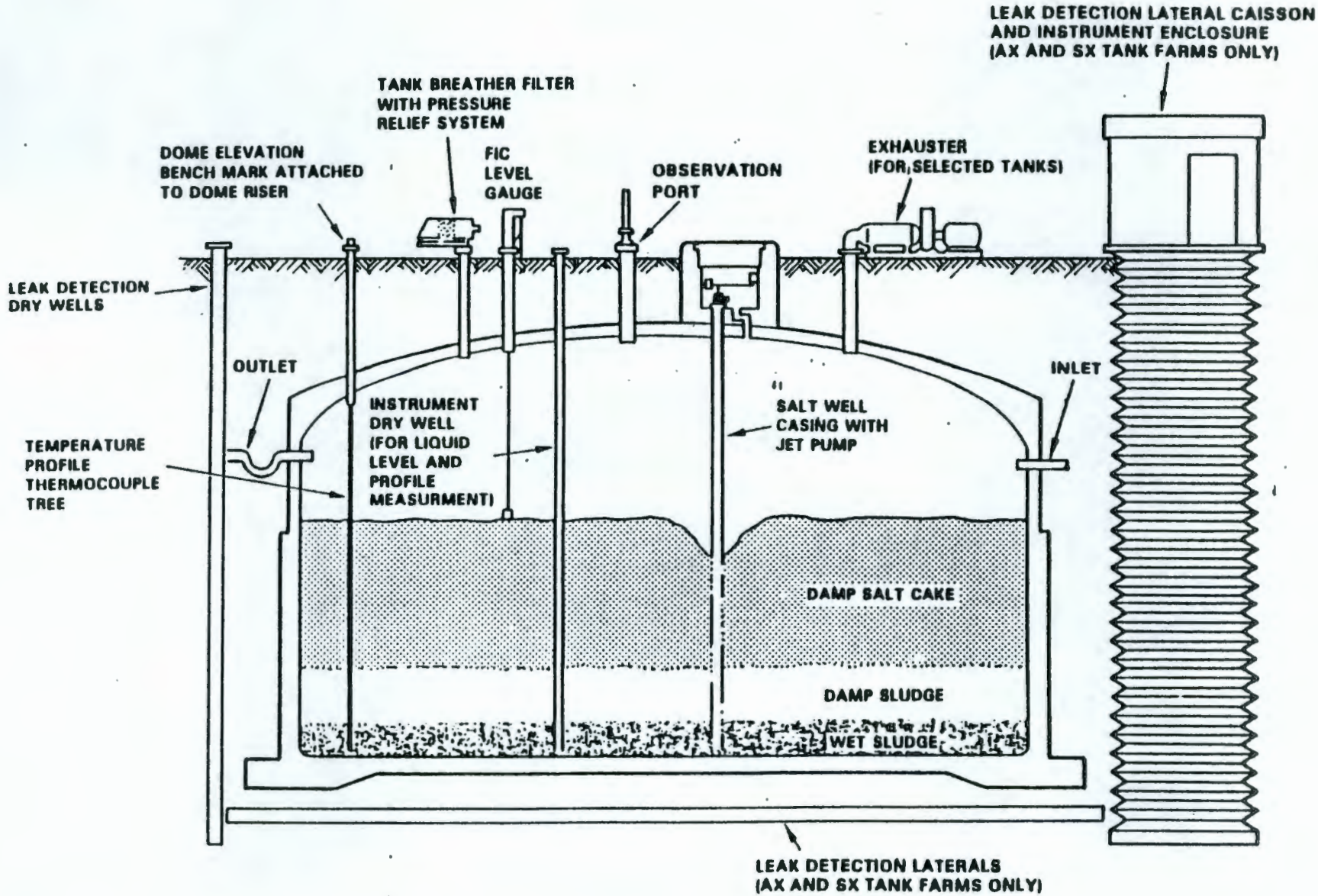



SK-4 Typical Primary Tank Exhaust System




75-ft-DIAMETER SINGLE-SHELL TANK
(A, AX, AND SX FARMS)

SK-5 Single Shell, High Level Waste Tank Designs




SK-6 Typical Single Shell Tank

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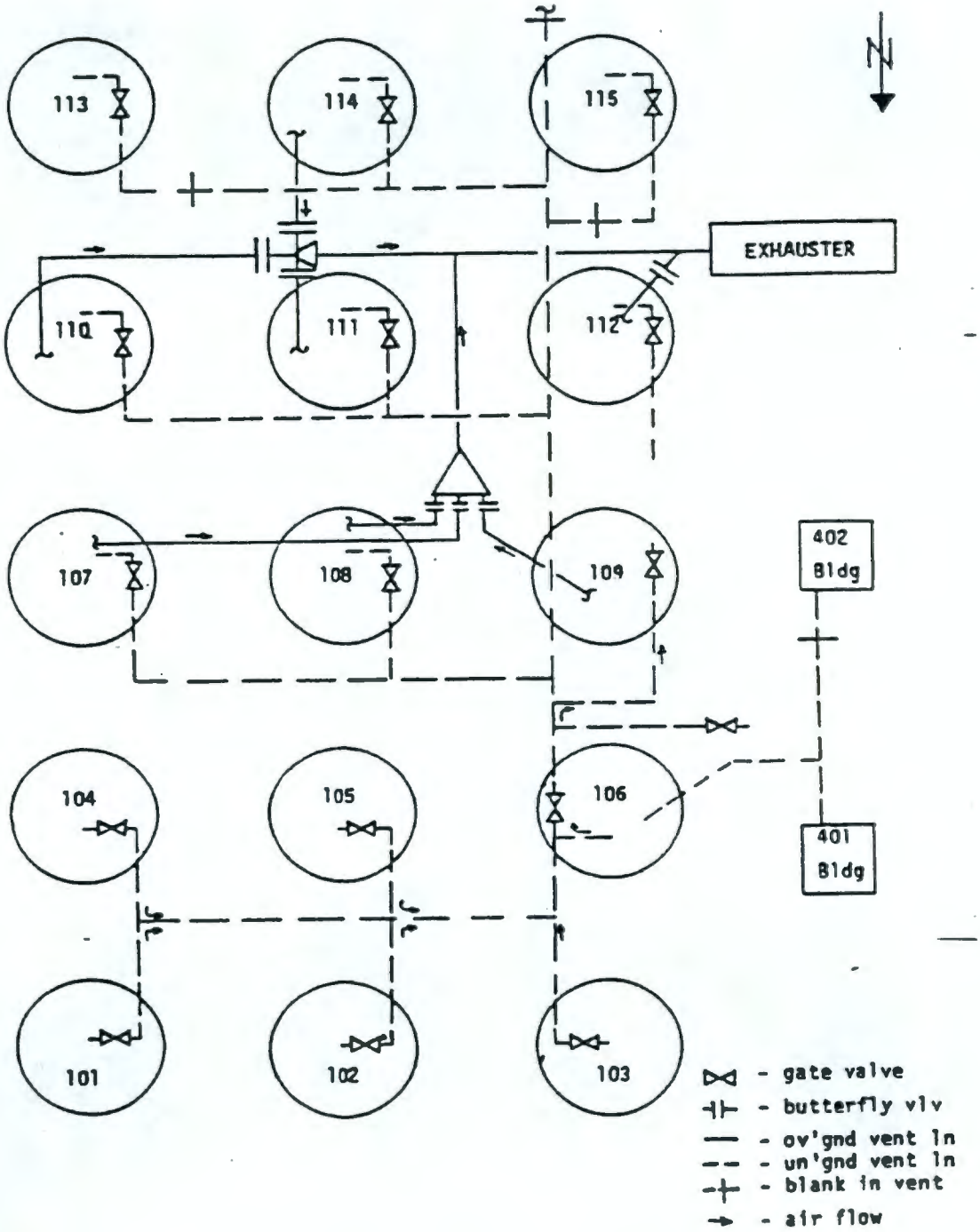


SK-7 Existing SX Tank Valve and Duct Arrangements

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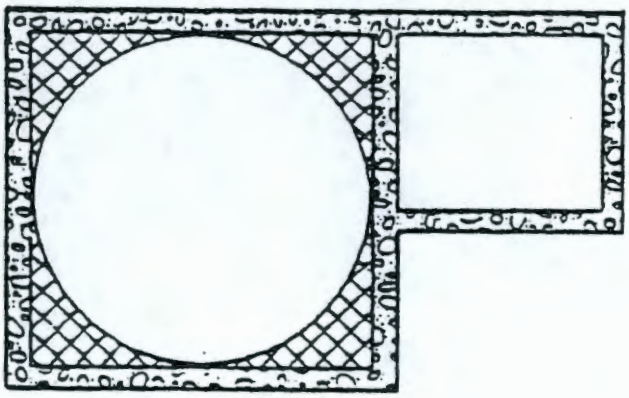
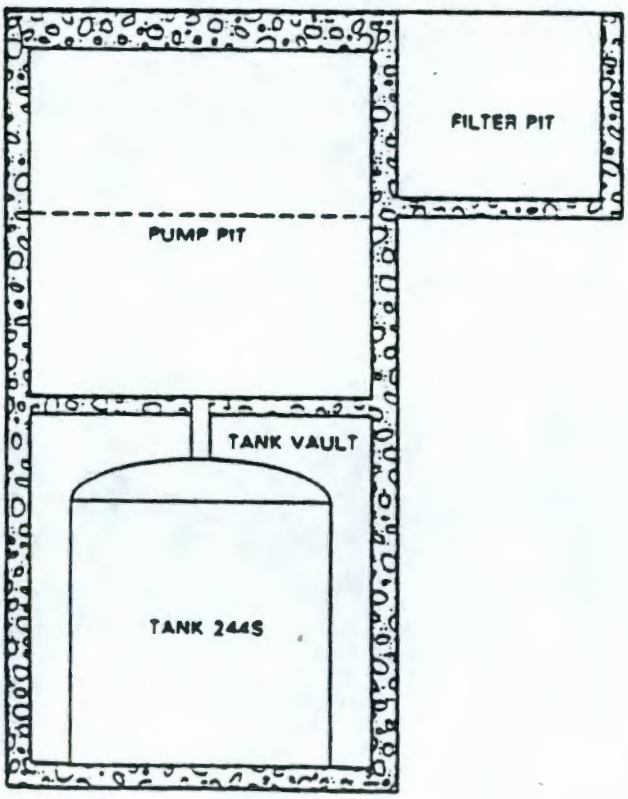


PLAN VIEW




SECTION

SK-8 244-S DCRT Layout

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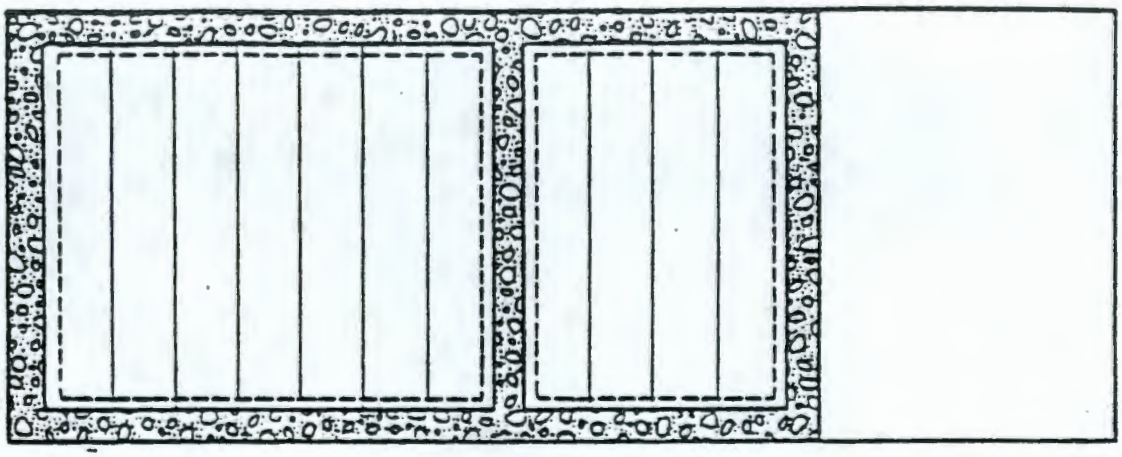
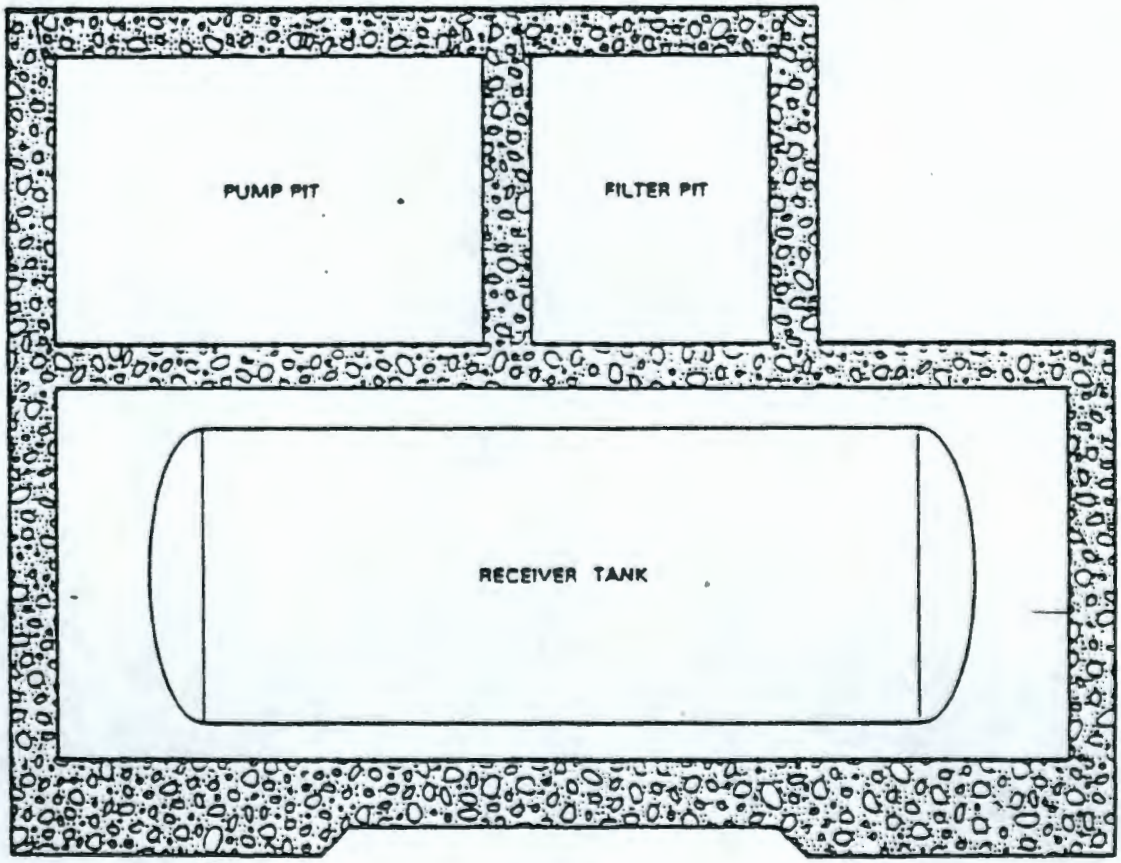


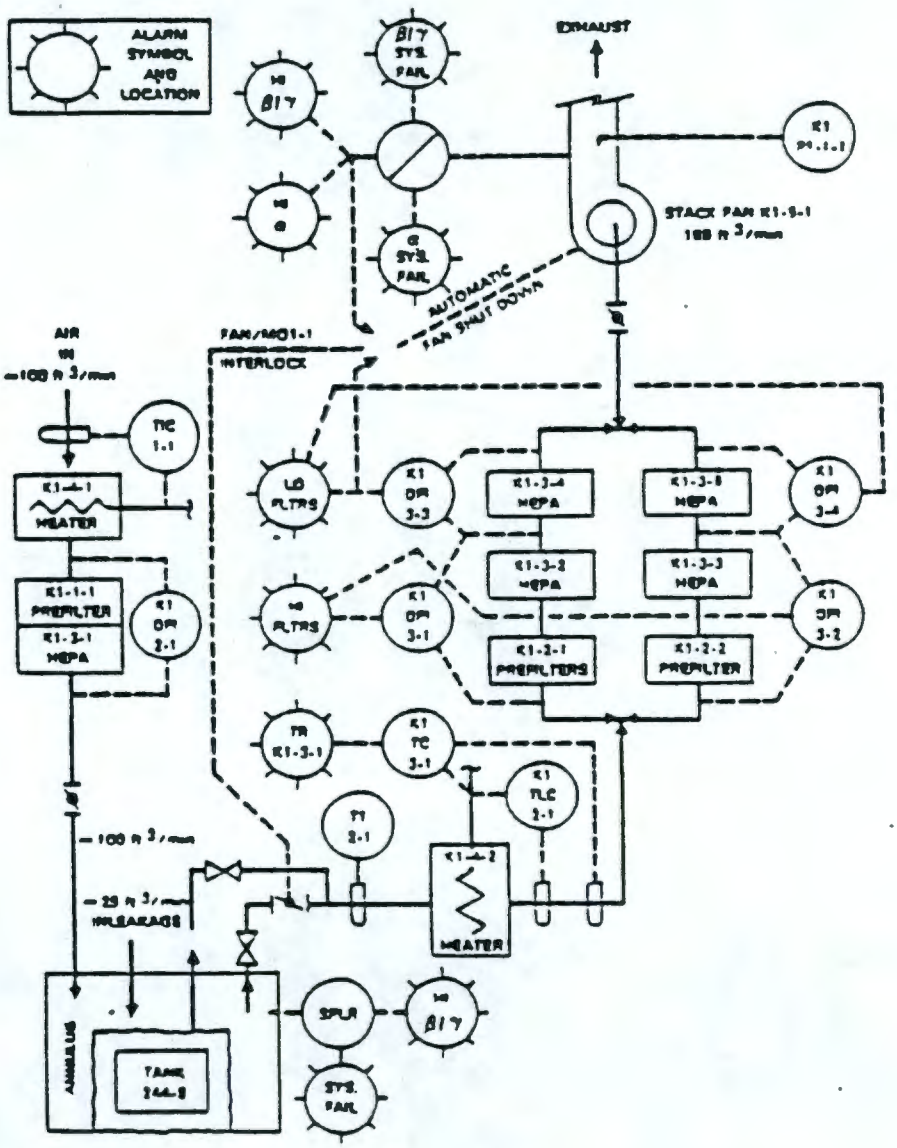
PLAN VIEW




SECTION

SK-9 Typical DCRT Layout

9413221.1138




SK-10 Typical DCRT Ventilation Schematic

# APPENDIX D

# ENGINEERING STUDY COST ESTIMATES

9413221.1139

## SUMMARY OF TOTAL ESTIMATED COSTS
Preferred alternative

| Facility | Primary System | Annulus System | Total Estimated Cost |
|---|---|---|---|
| 241-AN | X | X | $50,000,000 |
| 241-AP | X | X | $52,100,000 |
| 241-AW | X | X | $45,900,000 |
| 241-SY | X | X | $27,000,000 |
| 241-AY | | X | $14,500,000 |
| 241-AZ | | X | $14,500,000 |
| 241-A-105 | X | | $14,500,000 |
| 241-SX | X | | $30,000,000 |
| 244-A | X | | $14,500,000 |
| 244-BX | X | | $14,500,000 |
| 244-S | X | | $14,500,000 |
| 244-TX | X | | $14,500,000 |
| 244-U | X | | $14,500,000 |
| | | TOTAL | $320,500,000 |

## ALTERNATIVE COST COMPARISONS

The following is a listing of the various alternatives and their respective estimated costs for the 241-AP Tank Farm. It is assumed that estimating the AP Tank Farm would provide a representational cost comparison between the various alternatives and comparable costs would be indicative for the remaining tank farms.

### I. PRIMARY TANK EXHAUST TRAIN ALTERNATIVES

| Alternative | Reference Section | Estimated Cost |
|---|---|---|
| 1 | 5.3.1.1 | 5,100,000 |
| 2 | 5.3.1.2 | 6,200,000 |

### II. PRIMARY AND DST ANNULUS INLET ALTERNATIVES

| Alternative | Reference Section | Estimated Cost |
|---|---|---|
| 1 | 5.3.2.1 | 800,000 |
| 2 | 5.3.2.2 | 6,100,000 |

### II. DST ANNULUS EXHAUST TRAIN ALTERNATIVES

| Alternative | Reference Section | Estimated Cost |
|---|---|---|
| 1 | 5.3.3.1 | 970,000 |

### III. PRIMARY AND DST ANNULUS DUCTWORK ALTERNATIVES

| Alternative | Reference Section | Estimated Cost |
|---|---|---|
| 1 | 5.3.4.1 | 28,500,000 |
| 2 | 5.3.4.2 | 40,700,000 |
| 3 | 5.3.4.3 | 27,200,000 |

### IV. PRIMARY AND DST ANNULUS FAN AND STACK ALTERNATIVES

| Alternative | Reference Section | Estimated Cost |
|---|---|---|
| 1 | 5.3.5.1 | 2,700,000 |
| 2 | 5.3.5.2 | 2,400,000 |
| 3 | 5.3.5.3 | 2,400,000 |

9413221.1141

# PREFERRED ALTERNATIVE BACK-UP ESTIMATES

9413221.1142

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W-314
FILE NO. W314SCY2

** IEST - INTERACTIVE ESTIMATING **
241-AN DOUBLE SHELL TANK VENTILATION UPGRADE
STUDY ESTIMATE
DOE_R01 - PROJECT COST SUMMARY


DATE 02/11/94 13:48:50
BY GDR

| COST CODE | DESCRIPTION | ESCALATED TOTAL COST | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|
| 000 | ENGINEERING | 8,730,000 | 30 | 2,620,000 | 11,350,000 |
| 550 | OTHER STRUCTURES | 7,370,000 | 30 | 2,210,000 | 9,580,000 |
| 700 | SPECIAL EQUIP/PROCESS SYSTEMS | 22,330,000 | 30 | 6,700,000 | 29,030,000 |
| | (ADJUSTED TO MEET DOE 5100.4) | 70,000 | | -30,000 | 40,000 |
| | TOTAL ESTIMATED CONSTRUCTION COST | 38,500,000 | | 11,500,000 | 50,000,000 |
| 900 | OTHER PROJECT COSTS | 14,410,000 | 30 | 4,320,000 | 18,730,000 |
| | (ADJUSTED TO MEET DOE 5100.4) | -10,000 | | -20,000 | -30,000 |
| | TOTAL PROJECT COST | 52,900,000 | 30 | 15,800,000 | 68,700,000 |

TYPE OF ESTIMATE: STUDY ESTIMATE FEBRUARY 11, 1994

ARCHITECT ENGINEER: D.W. Alleman

OPERATING CONTRACTOR: J.S. Howell

REMARKS:

(ROUNDED/ADJUSTED TO THE NEAREST " 10,000 / 100,000 " - PERCENTAGES NOT RECALCULATED TO REFLECT ROUNDING)

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W-314
FILE NO. W314SCY2

** IEST - INTERACTIVE ESTIMATING **
241-AN DOUBLE SHELL TANK VENTILATION UPGRADE
STUDY ESTIMATE
DOE_R02 - WORK BREAKDOWN STRUCTURE SUMMARY


DATE 02/11/94 13:48:51
BY GDR

| WBS | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| 110000 | DEFINITIVE DESIGN | 4921000 | 0 | 4921000 | 22.35 | 1099844 | 6020844 | 30 | 1806253 | 7827097 |
| 120000 | ENGINEERING/INSPECTION | 1968000 | 0 | 1968000 | 37.81 | 744101 | 2712101 | 30 | 813630 | 3525731 |
| SUBTOTAL 12 | ENGINEERING/INSPECTION | 1968000 | 0 | 1968000 | 37.81 | 744101 | 2712101 | 30 | 813630 | 3525731 |
| SUBTOTAL 1 | ENGINEERING | 6889000 | 0 | 6889000 | 26.77 | 1843945 | 8732945 | 30 | 2619883 | 11352828 |
| 310001 | AIR EXHAUST FOR ANNULUS | 5834732 | 0 | 5834732 | 31.27 | 1824521 | 7659253 | 30 | 2297776 | 9957028 |
| 310002 | AIR EXHAUST FOR PRIMARY | 4769714 | 0 | 4769714 | 31.27 | 1491489 | 6261203 | 30 | 1878362 | 8139564 |
| 310100 | AIR INTAKE FOR ANNULUS | 1822503 | 0 | 1822503 | 31.27 | 569897 | 2392400 | 30 | 717719 | 3110120 |
| 310200 | AIR INTAKE FOR PRIMARY | 1270329 | 0 | 1270329 | 31.27 | 397231 | 1667560 | 30 | 500268 | 2167829 |
| 313001 | SITE WORK | 475500 | 0 | 475500 | 31.27 | 148689 | 624189 | 30 | 187257 | 811446 |
| 313002 | VENTILATION BUILDING | 3749460 | 0 | 3749460 | 31.27 | 1172456 | 4921916 | 30 | 1476575 | 6398491 |
| 313004 | CONTROL ROOM | 858000 | 0 | 858000 | 31.27 | 268297 | 1126297 | 30 | 337889 | 1464186 |
| 313005 | STACK RAD MONITOR | 528000 | 0 | 528000 | 31.27 | 165106 | 693106 | 30 | 207932 | 901037 |
| SUBTOTAL 313 | VENTILATION BUILDING | 5610960 | 0 | 5610960 | 31.27 | 1754548 | 7365508 | 30 | 2209653 | 9575160 |
| SUBTOTAL 31 | FA CONST-ONSITE E/C | 19308238 | 0 | 19308238 | 31.27 | 6037686 | 25345924 | 30 | 7603778 | 32949701 |
| 330000 | BURIAL FEES - INTAKE STATIONS | 187920 | 0 | 187920 | 31.27 | 58763 | 246683 | 30 | 74005 | 320687 |
| 330001 | BURIAL FEES - EXHAUST STATIONS | 187920 | 0 | 187920 | 31.27 | 58763 | 246683 | 30 | 74005 | 320687 |
| SUBTOTAL 33 | BURIAL FEES | 375840 | 0 | 375840 | 31.27 | 117526 | 493366 | 30 | 148010 | 641374 |
| SUBTOTAL 3 | CONSTRUCTION | 19684078 | 0 | 19684078 | 31.27 | 6155212 | 25839290 | 30 | 7751788 | 33591075 |
| 400000 | WHC PROJECT MANAGEMENT | 2952000 | 0 | 2952000 | 30.75 | 907740 | 3859740 | 30 | 1157922 | 5017662 |
| SUBTOTAL 4 | PROJECT INTEGRATION | 2952000 | 0 | 2952000 | 30.75 | 907740 | 3859740 | 30 | 1157922 | 5017662 |
| 500000 | OTHER PROJECT COST | 11023000 | 0 | 11023000 | 30.75 | 3389573 | 14412573 | 30 | 4323772 | 18736344 |
| SUBTOTAL 5 | OTHER PROJECT COST | 11023000 | 0 | 11023000 | 30.75 | 3389573 | 14412573 | 30 | 4323772 | 18736344 |
| PROJECT TOTAL | | 40,548,078 | 0 | 40,548,078 | 30.33 | 12,296,470 | 52,844,548 | 30 | 15,853,365 | 68,697,909 |

1. DOCUMENTS AND DRAWINGS

DOCUMENTS: ENGINEERING STUDY WHC-SD-W061,ES-001, AND PROJECT W-061 VENTILATION DESIGN ,ALTERNATIVES DATED SEPTEMBER 15, 1993.

DRAWINGS: NONE

2. MATERIAL PRICES

UNIT COSTS REPRESENT CURRENT PRICES FOR SPECIFIED MATERIAL.

3. LABOR RATES

CURRENT KEH BASE CRAFT RATES, AS ISSUED BY KEH FINANCE (EFFECTIVE 10-01-92), INCLUDE FRINGE BENEFITS, LABOR INSURANCE, TAXES AND TRAVEL WHERE APPLICABLE, PER HANFORD SITE STABILIZATION AGREEMENT, APPENDIX A (EFFECTIVE 9-2-91). NON CRAFT HOURLY RATES ARE BASED ON THE 1993 FISCAL YEAR BUDGET LIQUIDATION RATES AS ISSUED BY KEH FINANCE (EFFECTIVE 10-01-92).

4. GENERAL REQUIREMENTS/TECHNICAL SERVICES/OVERHEADS

A.) ONSITE CONSTRUCTION FORCES GENERAL REQUIREMENTS, TECHNICAL SERVICES AND CRAFT OVERHEAD COSTS ARE INCLUDED AS A COMPOSITE PERCENTAGE BASED ON THE KEH ESTIMATING FACTOR/BILLING SCHEDULE, REVISION 14, DATED OCTOBER 01, 1992. THE TOTAL COMPOSITE PERCENTAGE APPLIED TO ONSITE CONSTRUCTION FORCES LABOR, FOR THIS PROJECT, IS 93% FOR SHOP WORK AND 134% FOR FIELD WORK, WHICH IS REFLECTED IN THE "OH&P/B&I" COLUMN OF THE ESTIMATE DETAIL.

5. ESCALATION

ESCALATION PERCENTAGES WERE CALCULATED BY THE HANFORD MATERIAL & LABOR ESCALATION STUDY, DATED FEBRUARY 1993.

6. ROUNDING

U.S. DEPARTMENT OF ENERGY - DOE ORDER 5100.4 PAGE J-2 SUBPARAGRAPH (M), REQUIRES ROUNDING OF ALL GENERAL PLANT PROJECTS (GPP'S) AND LINE ITEM (LI) COST ESTIMATES. REFERENCE: DOE 5100.4, FIGURE I-11, DATED 10-31-84.

7. REMARKS

A.) DEFINITIVE DESIGN COSTS ARE BASED ON 25% OF DIRECT CONSTRUCTION COST.
B.) CONSTRUCTION ENGINEERING/INSPECTION COSTS ARE BASED ON 10% OF DIRECT CONSTRUCTION COST.
C.) WHC PROJECT MANAGEMENT COSTS ARE BASED ON 15% OF DIRECT CONSTRUCTION COST.
D.) ASSUMED THAT 10% OF ALL EXCAVATED DIRT WOULD BE CONTAMINATED AND WOULD HAVE TO BE REMOVED, BARRELED AND BURIED.
E.) ALL DUCTS ARE TO BE FABRICATED FROM STAINLESS STEEL.
F.) ALL CONSTRUCTION IS TO BE BY THE ONSTIE CONTRACTOR.
G.) ESTIMATE ASSUMES DUCT TO BE BURIED IN A 4' DEEP HAND DUG TRENCH.
H.) ESTIMATE CONTAINS COST FOR A TEA3 FILTER TRAIN ON THE PRIMARY EXHAUST.
I.) ESTIMATE CONTAINS COST FOR A TEA2 FILTER TRAIN ON THE ANNULUS EXHAUST.
J.) OPC COSTS ARE 56% OF DIRECT CONSTRUCTION COSTS, BASED ON C-106 TANK PROJECTS.

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W-314
FILE NO. W314SCY2

** IEST - INTERACTIVE ESTIMATING **
241-AN DOUBLE SHELL TANK VENTILATION UPGRADE
STUDY ESTIMATE
DOE_R04 - COST CODE ACCOUNT SUMMARY


DATE 02/11/94 13:48:53
BY GDR

| COST CODE/WBS | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| 000 | ENGINEERING | | | | | | | | | |
| 110000 | DEFINITIVE DESIGN | 4921000 | 0 | 4921000 | 22.35 | 1099844 | 6020844 | 30 | 1806253 | 7827097 |
| 120000 | ENGINEERING/INSPECTION | 1968000 | 0 | 1968000 | 37.81 | 744101 | 2712101 | 30 | 813630 | 3525731 |
| TOTAL 000 | ENGINEERING | 6889000 | 0 | 6889000 | 26.77 | 1843945 | 8732945 | 30 | 2619883 | 11352828 |
| 550 | OTHER STRUCTURES | | | | | | | | | |
| 313001 | SITE WORK | 475500 | 0 | 475500 | 31.27 | 148689 | 624189 | 30 | 187257 | 811446 |
| 313002 | VENTILATION BUILDING | 3749460 | 0 | 3749460 | 31.27 | 1172456 | 4921916 | 30 | 1476575 | 6398491 |
| 313004 | CONTROL ROOM | 858000 | 0 | 858000 | 31.27 | 268297 | 1126297 | 30 | 337889 | 1464186 |
| 313005 | STACK RAD MONITOR | 528000 | 0 | 528000 | 31.27 | 165106 | 693106 | 30 | 207932 | 901037 |
| TOTAL 550 | OTHER STRUCTURES | 5610960 | 0 | 5610960 | 31.27 | 1754548 | 7365508 | 30 | 2209653 | 9575160 |
| 700 | SPECIAL EQUIP/PROCESS SYSTEMS | | | | | | | | | |
| 310001 | AIR EXHAUST FOR ANNULUS | 5834732 | 0 | 5834732 | 31.27 | 1824521 | 7659253 | 30 | 2297776 | 9957028 |
| 310002 | AIR EXHAUST FOR PRIMARY | 4769714 | 0 | 4769714 | 31.27 | 1491489 | 6261203 | 30 | 1878362 | 8139564 |
| 310100 | AIR INTAKE FOR ANNULUS | 1822503 | 0 | 1822503 | 31.27 | 569897 | 2392400 | 30 | 717719 | 3110120 |
| 310200 | AIR INTAKE FOR PRIMARY | 1270329 | 0 | 1270329 | 31.27 | 397231 | 1667560 | 30 | 500268 | 2167829 |
| 330000 | BURIAL FEES - INTAKE STATIONS | 187920 | 0 | 187920 | 31.27 | 58763 | 246683 | 30 | 74005 | 320687 |
| 330001 | BURIAL FEES - EXHAUST STATIONS | 187920 | 0 | 187920 | 31.27 | 58763 | 246683 | 30 | 74005 | 320687 |
| 400000 | WHC PROJECT MANAGEMENT | 2952000 | 0 | 2952000 | 30.75 | 907740 | 3859740 | 30 | 1157922 | 5017662 |
| TOTAL 700 | SPECIAL EQUIP/PROCESS SYSTEM | 17025118 | 0 | 17025118 | 31.18 | 5308404 | 22333522 | 30 | 6700057 | 29033577 |
| 900 | OTHER PROJECT COSTS | | | | | | | | | |
| 500000 | OTHER PROJECT COST | 11023000 | 0 | 11023000 | 30.75 | 3389573 | 14412573 | 30 | 4323772 | 18736344 |
| TOTAL 900 | OTHER PROJECT COSTS | 11023000 | 0 | 11023000 | 30.75 | 3389573 | 14412573 | 30 | 4323772 | 18736344 |
| PROJECT TOTAL | | 40,548,078 | 0 | 40,548,078 | 30.33 | 12,296,470 | 52,844,548 | 30 | 15,853,365 | 68,697,909 |

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W-314
FILE NO. W314SCY2

** IEST - INTERACTIVE ESTIMATING **
241-AN DOUBLE SHELL TANK VENTILATION UPGRADE
STUDY ESTIMATE
DOE_R05 - ESTIMATE SUMMARY BY CSI DIVISION


DATE 02/11/94 13:48:54
BY GDR

| CSI | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| ENGINEERING | | | | | | | | | | |
| 00 | TECHNICAL SERVICES | 6889000 | 0 | 6889000 | 26.77 | 1843945 | 8732945 | 30 | 2619883 | 11352828 |
| TOTAL ENGINEERING | | 6,889,000 | 0 | 6,889,000 | 26.77 | 1,843,945 | 8,732,945 | 30 | 2,619,883 | 11,352,828 |
| CONSTRUCTION | | | | | | | | | | |
| 01 | GENERAL REQUIRMENTS | 2172818 | 0 | 2172818 | 31.27 | 679442 | 2852260 | 30 | 855678 | 3707936 |
| 02 | SITEWORK | 649618 | 0 | 649618 | 31.27 | 203134 | 852752 | 30 | 255826 | 1108578 |
| 13 | SPECIAL CONSTRUCTION | 5610960 | 0 | 5610960 | 31.27 | 1754548 | 7365508 | 30 | 2209653 | 9575160 |
| 15 | MECHANICAL | 10669113 | 0 | 10669113 | 31.27 | 3336232 | 14005345 | 30 | 4201603 | 18206948 |
| 16 | ELECTRICAL | 581569 | 0 | 581569 | 31.27 | 181856 | 763425 | 30 | 229028 | 992453 |
| 19 | PROJECT MANAGEMENT | 2952000 | 0 | 2952000 | 30.75 | 907740 | 3859740 | 30 | 1157922 | 5017662 |
| 20 | OTHER PROJECT COSTS | 11023000 | 0 | 11023000 | 30.75 | 3389573 | 14412573 | 30 | 4323772 | 18736344 |
| TOTAL CONSTRUCTION | | 33,659,078 | 0 | 33,659,078 | 31.05 | 10,452,525 | 44,111,603 | 30 | 13,233,482 | 57,345,081 |
| PROJECT TOTAL | | 40,548,078 | 0 | 40,548,078 | 30.33 | 12,296,470 | 52,844,548 | 30 | 15,853,365 | 68,697,909 |

REFERENCE: ESTIMATE BASIS SHEET — PAGE 3 OF 7
COST CODE ACCOUNT SUMMARY — PAGE 4 OF 7

THE U.S. DEPARTMENT OF ENERGY - RICHLAND ORDER 5700.3 "COST ESTIMATING, ANALYSIS AND STANDARDIZATION" DATED 3-27-85, PROVIDES GUIDELINES FOR ESTIMATE CONTINGENCIES. THE GUIDELINE FOR A STUDY ESTIMATE SHOULD HAVE AN OVERALL RANGE OF 20% TO 30% .

CONTINGENCY IS EVALUATED AT THE THIRD COST CODE LEVEL AND SUMMARIZED AT THE PRIMARY AND SECONDARY COST CODE LEVEL OF THE DETAILED COST ESTIMATE.

APPLIED A 30% CONTINGENCY TO THE PROJECT FOR THIS STUDY ESTIMATE DUE TO THE DEFINITIVE DESIGN, CONSTRUCTION ENGINEERING/INSPECTION, WHC PROJECT MANAGEMENT, AND OPC COSTS WERE BASED ON A PERCENTAGE OF DIRECT CONSTRUCTION, AND THE LIMITED AMOUNT OF DETAIL FOR THIS ENGINEERING STUDY.

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W-314
FILE NO. W314SCY2

** IEST - INTERACTIVE ESTIMATING **
241-AN DOUBLE SHELL TANK VENTILATION UPGRADE
STUDY ESTIMATE
DOE_R07 - ONSITE INDIRECT COSTS BY WBS


DATE 02/11/94 13:48:56
BY GDR

| WBS | DESCRIPTION | ESTIMATE SUBTOTAL | CONTRACT % | ADMINISTRATION TOTAL | BID PACK PREP. | OTHER INDIRECTS | TOTAL INDIRECTS |
|---|---|---|---|---|---|---|---|
| 110000 | DEFINITIVE DESIGN | 4921000 | 0.00 | 0 | 0 | 0 | 0 |
| 120000 | ENGINEERING/INSPECTION | 1968000 | 0.00 | 0 | 0 | 0 | 0 |
| 310001 | AIR EXHAUST FOR ANNULUS | 5834732 | 0.00 | 0 | 0 | 0 | 0 |
| 310002 | AIR EXHAUST FOR PRIMARY | 4769714 | 0.00 | 0 | 0 | 0 | 0 |
| 310100 | AIR INTAKE FOR ANNULUS | 1822503 | 0.00 | 0 | 0 | 0 | 0 |
| 310200 | AIR INTAKE FOR PRIMARY | 1270329 | 0.00 | 0 | 0 | 0 | 0 |
| 313001 | SITE WORK | 475500 | 0.00 | 0 | 0 | 0 | 0 |
| 313002 | VENTILATION BUILDING | 3749460 | 0.00 | 0 | 0 | 0 | 0 |
| 313004 | CONTROL ROOM | 858000 | 0.00 | 0 | 0 | 0 | 0 |
| 313005 | STACK RAD MONITOR | 528000 | 0.00 | 0 | 0 | 0 | 0 |
| 330000 | BURIAL FEES - INTAKE STATIONS | 187920 | 0.00 | 0 | 0 | 0 | 0 |
| 330001 | BURIAL FEES - EXHAUST STATIONS | 187920 | 0.00 | 0 | 0 | 0 | 0 |
| 400000 | WHC PROJECT MANAGEMENT | 2952000 | 0.00 | 0 | 0 | 0 | 0 |
| 500000 | OTHER PROJECT COST | 11023000 | 0.00 | 0 | 0 | 0 | 0 |
| PROJECT TOTAL | | 40,548,078 | | 0 | 0 | 0 | 0 |

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W-314B
FILE NO. W314SCZ2

** IEST - INTERACTIVE ESTIMATING **
241-AP TANK FARM VENTILATION UPGRADE
STUDY ESTIMATE
DOE_R01 - PROJECT COST SUMMARY


DATE 02/11/94 07:02:44
BY GDR

| COST CODE | DESCRIPTION | ESCALATED TOTAL COST | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|
| 000 | ENGINEERING | 9,100,000 | 30 | 2,730,000 | 11,830,000 |
| 550 | OTHER STRUCTURES | 7,790,000 | 30 | 2,340,000 | 10,130,000 |
| 700 | SPECIAL EQUIP/PROCESS SYSTEMS | 23,160,000 | 30 | 6,950,000 | 30,110,000 |
| 900 | OTHERCOST | 14,770,000 | 30 | 4,430,000 | 19,200,000 |
| | (ADJUSTED TO MEET DOE 5100.4) | -20,000 | | 50,000 | 30,000 |
| | PROJECT TOTAL | 54,800,000 | 30 | 16,500,000 | 71,300,000 |

TYPE OF ESTIMATE STUDY ESTIMATE FEBRUARY 11, 1994

ARCHITECT ENGINEER

OPERATING CONTRACTOR

REMARKS:

241-AP TANK FARM VENTILATION UPGRADE

(ROUNDED/ADJUSTED TO THE NEAREST " 10,000 / 100,000 " - PERCENTAGES NOT RECALCULATED TO REFLECT ROUNDING)

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W-314B
FILE NO. W314SCZ2

** IEST - INTERACTIVE ESTIMATING **
241-AP TANK FARM VENTILATION UPGRADE
STUDY ESTIMATE
DOE_R02 - WORK BREAKDOWN STRUCTURE SUMMARY


DATE 02/11/94 07:02:46
BY GDR

| WBS | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| 110000 | DEFINITIVE DESIGN | 5129000 | 0 | 5129000 | 22.35 | 1146332 | 6275332 | 30 | 1882599 | 8157931 |
| 120000 | ENGINEERING/INSPECTION | 2052000 | 0 | 2052000 | 37.81 | 775861 | 2827861 | 30 | 848358 | 3676220 |
| SUBTOTAL 12 | ENGINEERING/INSPECTION | 2052000 | 0 | 2052000 | 37.81 | 775861 | 2827861 | 30 | 848358 | 3676220 |
| SUBTOTAL 1 | ENGINEERING | 7181000 | 0 | 7181000 | 26.77 | 1922193 | 9103193 | 30 | 2730957 | 11834151 |
| 310001 | SITE WORK | 475500 | 0 | 475500 | 31.27 | 148689 | 624189 | 30 | 187257 | 811446 |
| 310002 | VENTILATION BUILDING | 4075500 | 0 | 4075500 | 31.27 | 1274409 | 5349909 | 30 | 1604973 | 6954882 |
| 310003 | STACK RAD MONITOR | 528000 | 0 | 528000 | 31.27 | 165106 | 693106 | 30 | 207932 | 901037 |
| 310004 | CONTROL ROOM | 858000 | 0 | 858000 | 31.27 | 268297 | 1126297 | 30 | 337889 | 1464186 |
| 310005 | FILTER TRAIN FOR ANNULUS INTAKE | 204117 | 0 | 204117 | 31.27 | 63827 | 267944 | 30 | 80383 | 348328 |
| 310006 | FILTER TRAIN FOR PRIMARY INTAKE | 105817 | 0 | 105817 | 31.27 | 33089 | 138906 | 30 | 41672 | 180578 |
| 310007 | FILTER TRAIN FOR PRIMARY EXHAUST | 2282549 | 0 | 2282549 | 31.27 | 713753 | 2996302 | 30 | 898890 | 3895193 |
| 310008 | FILTER TRAIN FOR ANNULUS EXHAUST | 383239 | 0 | 383239 | 31.27 | 119839 | 503078 | 30 | 150923 | 654001 |
| 310009 | BURIED DUCTS FOR ANNULUS INTAKE | 1535416 | 0 | 1535416 | 31.27 | 480125 | 2015541 | 30 | 604662 | 2620203 |
| 310010 | BURIED DUCTS FOR PRIMARY INTAKE | 841855 | 0 | 841855 | 31.27 | 263248 | 1105103 | 30 | 331531 | 1436634 |
| 310011 | BURIED DUCTS FOR PRIMARY EXHAUST | 2703282 | 0 | 2703282 | 31.27 | 845315 | 3548597 | 30 | 1064579 | 4613179 |
| 310012 | BURIED DUCTS FOR ANNULUS EXHAUST | 5817988 | 0 | 5817988 | 31.27 | 1819284 | 7637272 | 30 | 2291182 | 9928456 |
| 310013 | ANNULUS EXHAUST FAN/STACK | 238314 | 0 | 238314 | 31.27 | 74520 | 312834 | 30 | 93850 | 406685 |
| 310014 | PRIMARY EXHAUST FAN/STACK | 143924 | 0 | 143924 | 31.27 | 45005 | 188929 | 30 | 56679 | 245607 |
| SUBTOTAL 31 | FA CONST-ONSITE E/C | 20193501 | 0 | 20193501 | 31.27 | 6314506 | 26508007 | 30 | 7952402 | 34460415 |
| 330000 | CONSTRUCTION-O/C | 321970 | 0 | 321970 | 31.27 | 100680 | 422650 | 30 | 126795 | 549445 |
| SUBTOTAL 33 | CONSTRUCTION-O/C | 321970 | 0 | 321970 | 31.27 | 100680 | 422650 | 30 | 126795 | 549445 |
| SUBTOTAL 3 | CONSTRUCTION | 20515471 | 0 | 20515471 | 31.27 | 6415186 | 26930657 | 30 | 8079197 | 35009860 |
| 400000 | WHC PROJECT MANAGEMENT | 3077000 | 0 | 3077000 | 30.75 | 946178 | 4023178 | 30 | 1206953 | 5230131 |
| SUBTOTAL 4 | PROJECT INTE RATION | 3077000 | 0 | 3077000 | 30.75 | 946178 | 4023178 | 30 | 1206953 | 5230131 |
| 500000 | OTHER COST | 11337000 | 0 | 11337000 | 30.27 | 3431710 | 14768710 | 30 | 4430613 | 19199323 |
| SUBTOTAL 5 | OTHER PROJECT COST | 11337000 | 0 | 11337000 | 30.27 | 3431710 | 14768710 | 30 | 4430613 | 19199323 |

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W-314B
FILE NO. W314SCZ2

** IEST - INTERACTIVE ESTIMATING **
241-AP TANK FARM VENTILATION UPGRADE
STUDY ESTIMATE
DOE_R02 - WORK BREAKDOWN STRUCTURE SUMMARY


DATE 02/11/94 07:02:46
BY GDR

| WBS | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| PROJECT TOTAL | | 42,110,471 | 0 | 42,110,471 | 30.20 | 12,715,267 | 54,825,738 | 30 | 16,447,720 | 71,273,465 |

1. DOCUMENTS AND DRAWINGS
==========
DOCUMENTS: DOUBLE SHELL TANK VENTILATION UPGRADES, PROJECT W324B, ENGINEERING STUDY.

DRAWINGS: SKETCHES

2. MATERIAL PRICES
==========
UNIT COSTS REPRESENT CURRENT PRICES FOR SPECIFIED MATERIAL.

3. LABOR RATES
==========
CURRENT KEH BASE CRAFT RATES, AS ISSUED BY KEH FINANCE (EFFECTIVE 10-01-93), INCLUDE FRINGE BENEFITS, LABOR INSURANCE, TAXES AND TRAVEL WHERE APPLICABLE, PER HANFORD SITE STABILIZATION AGREEMENT, APPENDIX A (EFFECTIVE 09-06-93). NON CRAFT HOURLY RATES ARE BASED ON THE 1994 FISCAL YEAR BUDGET LIQUIDATION RATES AS ISSUED BY KEH FINANCE (EFFECTIVE 10-01-93).

4. GENERAL REQUIREMENTS/TECHNICAL SERVICES/OVERHEADS
==========
A.) ONSITE CONSTRUCTION FORCES GENERAL REQUIREMENTS, TECHNICAL SERVICES AND CRAFT OVERHEAD COSTS ARE INCLUDED AS A COMPOSITE PERCENTAGE BASED ON THE KEH ESTIMATING FACTOR/BILLING SCHEDULE, REVISION 16, DATED OCTOBER 01, 1993. THE TOTAL COMPOSITE PERCENTAGE APPLIED TO ONSITE CONSTRUCTION FORCES LABOR, FOR THIS PROJECT, IS 93% FOR SHOP WORK AND 134% FOR FIELD WORK, WHICH IS REFLECTED IN THE "OH&P/B&I" COLUMN OF THE ESTIMATE DETAIL.

5. ESCALATION
==========
ESCALATION PERCENTAGES WERE CALCULATED BY THE HANFORD MATERIAL & LABOR ESCALATION STUDY, DATED FEBRUARY 1993.

6. ROUNDING
==========
U.S. DEPARTMENT OF ENERGY - DOE ORDER 5100.4 PAGE 1-32 SUBPARAGRAPH (M), REQUIRES ROUNDING OF ALL GENERAL PLANT PROJECTS (GPP'S) AND LINE ITEM (LI) COST ESTIMATES. REFERENCE: DOE 5100.4, FIGURE 1-11, DATED 10-31-84.

7. REMARKS
==========
A.) COSTS ARE BASED ON THE PREFERRED ALTERNATIVES.

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W-314B
FILE NO. W314SCZ2

** IEST - INTERACTIVE ESTIMATING **
241-AP TANK FARM VENTILATION UPGRADE
STUDY ESTIMATE
DOE_R04 - COST CODE ACCOUNT SUMMARY


DATE 02/11/94 07:02:49
BY GDR

| COST CODE/WBS | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| 000 | ENGINEERING | | | | | | | | | |
| 110000 | DEFINITIVE DESIGN | 5129000 | 0 | 5129000 | 22.35 | 1146332 | 6275332 | 30 | 1882599 | 8157931 |
| 120000 | ENGINEERING/INSPECTION | 2052000 | 0 | 2052000 | 37.81 | 775861 | 2827861 | 30 | 848358 | 3676220 |
| TOTAL 000 | ENGINEERING | 7181000 | 0 | 7181000 | 26.77 | 1922193 | 9103193 | 30 | 2730957 | 11834151 |
| 550 | OTHER STRUCTURES | | | | | | | | | |
| 310001 | SITE WORK | 475500 | 0 | 475500 | 31.27 | 148689 | 624189 | 30 | 187257 | 811446 |
| 310002 | VENTILATION BUILDING | 4075500 | 0 | 4075500 | 31.27 | 1274409 | 5349909 | 30 | 1604973 | 6954882 |
| 310003 | STACK RAD MONITOR | 528000 | 0 | 528000 | 31.27 | 165106 | 693106 | 30 | 207932 | 901037 |
| 310004 | CONTROL ROOM | 858000 | 0 | 858000 | 31.27 | 268297 | 1126297 | 30 | 337889 | 1464186 |
| TOTAL 550 | OTHER STRUCTURES | 5937000 | 0 | 5937000 | 31.27 | 1856501 | 7793501 | 30 | 2338051 | 10131551 |
| 700 | SPECIAL EQUIP/PROCESS SYSTEMS | | | | | | | | | |
| 310005 | FILTER TRAIN FOR ANNULUS INTAKE | 204117 | 0 | 204117 | 31.27 | 63827 | 267944 | 30 | 80383 | 348328 |
| 310006 | FILTER TRAIN FOR PRIMARY INTAKE | 105817 | 0 | 105817 | 31.27 | 33089 | 138906 | 30 | 41672 | 180578 |
| 310007 | FILTER TRAIN FOR PRIMARY EXHAUST | 2282549 | 0 | 2282549 | 31.27 | 713753 | 2996302 | 30 | 898890 | 3895193 |
| 310008 | FILTER TRAIN FOR ANNULUS EXHAUST | 383239 | 0 | 383239 | 31.27 | 119839 | 503078 | 30 | 150923 | 654001 |
| 310009 | BURIED DUCTS FOR ANNULUS INTAKE | 1535416 | 0 | 1535416 | 31.27 | 480125 | 2015541 | 30 | 604662 | 2620203 |
| 310010 | BURIED DUCTS FOR PRIMARY INTAKE | 841855 | 0 | 841855 | 31.27 | 263248 | 1105103 | 30 | 331531 | 1436634 |
| 310011 | BURIED DUCTS FOR PRIMARY EXHAUST | 2703282 | 0 | 2703282 | 31.27 | 845315 | 3548597 | 30 | 1064579 | 4613179 |
| 310012 | BURIED DUCTS FOR ANNULUS EXHAUST | 5817988 | 0 | 5817988 | 31.27 | 1819284 | 7637272 | 30 | 2291182 | 9928456 |
| 310013 | ANNULUS EXHAUST FAN/STACK | 238314 | 0 | 238314 | 31.27 | 74520 | 312834 | 30 | 93850 | 406685 |
| 310014 | PRIMARY EXHAUST FAN/STACK | 143924 | 0 | 143924 | 31.27 | 45005 | 188929 | 30 | 56679 | 245607 |
| 330000 | CONSTRUCTION-O/C | 321970 | 0 | 321970 | 31.27 | 100680 | 422650 | 30 | 126795 | 549445 |
| 400000 | WHC PROJECT MANAGEMENT | 3077000 | 0 | 3077000 | 30.75 | 946178 | 4023178 | 30 | 1206953 | 5230131 |
| TOTAL 700 | SPECIAL EQUIP/PROCESS SYSTEM | 17655471 | 0 | 17655471 | 31.18 | 5504863 | 23160334 | 30 | 6948099 | 30108440 |
| 900 | OTHERCOST | | | | | | | | | |
| 500000 | OTHER COST | 11337000 | 0 | 11337000 | 30.27 | 3431710 | 14768710 | 30 | 4430613 | 19199323 |
| TOTAL 900 | OTHERCOST | 11337000 | 0 | 11337000 | 30.27 | 3431710 | 14768710 | 30 | 4430613 | 19199323 |

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W-314B
FILE NO. W314SCZ2

** IEST - INTERACTIVE ESTIMATING **
241-AP TANK FARM VENTILATION UPGRADE
STUDY ESTIMATE
DOE_R04 - COST CODE ACCOUNT SUMMARY


DATE 02/11/94 07:02:49
BY GDR

| COST CODE/WBS | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| PROJECT TOTAL | | 42,110,471 | 0 | 42,110,471 | 30.20 | 12,715,267 | 54,825,738 | 30 | 16,447,720 | 71,273,465 |

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W-314B
FILE NO. W314SCZ2

** IEST - INTERACTIVE ESTIMATING **
241-AP TANK FARM VENTILATION UPGRADE
STUDY ESTIMATE
DOE_R05 - ESTIMATE SUMMARY BY CSI DIVISION


DATE 02/11/94 07:02:50
BY GDR

| CSI | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| ENGINEERING | | | | | | | | | | |
| 00 | TECHNICAL SERVICES | 7181000 | 0 | 7181000 | 26.77 | 1922193 | 9103193 | 30 | 2730957 | 11834151 |
| TOTAL ENGINEERING | | 7,181,000 | 0 | 7,181,000 | 26.77 | 1,922,193 | 9,103,193 | 30 | 2,730,957 | 11,834,151 |
| CONSTRUCTION | | | | | | | | | | |
| 01 | GENERAL REQUIRMENTS | 2312969 | 0 | 2312969 | 31.27 | 723265 | 3036234 | 30 | 910869 | 3947107 |
| 02 | SITEWORK | 587201 | 0 | 587201 | 31.27 | 183617 | 770818 | 30 | 231247 | 1002064 |
| 13 | SPECIAL CONSTRUCTION | 5937000 | 0 | 5937000 | 31.27 | 1856501 | 7793501 | 30 | 2338051 | 10131551 |
| 15 | MECHANICAL | 10890944 | 0 | 10890944 | 31.27 | 3405597 | 14296541 | 30 | 4288962 | 18585507 |
| 16 | ELECTRICAL | 787357 | 0 | 787357 | 31.27 | 246206 | 1033563 | 30 | 310068 | 1343631 |
| 19 | PROJECT MANAGEMENT | 3077000 | 0 | 3077000 | 30.75 | 946178 | 4023178 | 30 | 1206953 | 5230131 |
| 20 | OTHER COST | 11337000 | 0 | 11337000 | 30.27 | 3431710 | 14768710 | 30 | 4430613 | 19199323 |
| TOTAL CONSTRUCTION | | 34,929,471 | 0 | 34,929,471 | 30.90 | 10,793,074 | 45,722,545 | 30 | 13,716,763 | 59,439,314 |
| PROJECT TOTAL | | 42,110,471 | 0 | 42,110,471 | 30.20 | 12,715,267 | 54,825,738 | 30 | 16,447,720 | 71,273,465 |

REFERENCE: ESTIMATE BASIS SHEET — PAGE 3 OF 9
COST CODE ACCOUNT SUMMARY — PAGE 4 OF 9

THE U.S. DEPARTMENT OF ENERGY - RICHLAND ORDER 5700.3 "COST ESTIMATING, ANALYSIS AND STANDARDIZATION" DATED 3-27-85, PRO"IDES GUIDELINES FOR ESTIMATE CONTINGENCIES. THE GUIDELINE FOR A STUDY ESTIMATE SHOULD HAVE AN OVERALL RANGE OF 15 TO 50 % .

CONTINGENCY IS EVALUATED AT THE THIRD COST CODE LEVEL AND SUMMARIZED AT THE PRIMARY AND SECONDARY COST CODE LEVEL OF THE DETAILED COST ESTIMATE.

APPLIED A 30% CONTINGENCY TO THE PROJECT DUE TO THE LIMITED INFORMATION AVAILABLE FOR THIS EFFORT.

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W-314B
FILE NO. W314SCZ2

** IEST - INTERACTIVE ESTIMATING **
241-AP TANK FARM VENTILATION UPGRADE
STUDY ESTIMATE
DOE_R07 - ONSITE INDIRECT COSTS BY WBS


DATE 02/11/94 07:02:52
BY GDR

| WBS | DESCRIPTION | ESTIMATE SUBTOTAL | CONTRACT % | ADMINISTRATION TOTAL | BID PACK PREP. | OTHER INDIRECTS | TOTAL INDIRECTS |
|---|---|---|---|---|---|---|---|
| 110000 | DEFINITIVE DESIGN | 5129000 | 0.00 | 0 | 0 | 0 | 0 |
| 120000 | ENGINEERING/INSPECTION | 2052000 | 0.00 | 0 | 0 | 0 | 0 |
| 310001 | SITE WORK | 475500 | 0.00 | 0 | 0 | 0 | 0 |
| 310002 | VENTILATION BUILDING | 4075500 | 0.00 | 0 | 0 | 0 | 0 |
| 310003 | STACK RAD MONITOR | 528000 | 0.00 | 0 | 0 | 0 | 0 |
| 310004 | CONTROL ROOM | 858000 | 0.00 | 0 | 0 | 0 | 0 |
| 310005 | FILTER TRAIN FOR ANNULUS INTAKE | 204117 | 0.00 | 0 | 0 | 0 | 0 |
| 310006 | FILTER TRAIN FOR PRIMARY INTAKE | 105817 | 0.00 | 0 | 0 | 0 | 0 |
| 310007 | FILTER TRAIN FOR PRIMARY EXHAUST | 2282549 | 0.00 | 0 | 0 | 0 | 0 |
| 310008 | FILTER TRAIN FOR ANNULUS EXHAUST | 383239 | 0.00 | 0 | 0 | 0 | 0 |
| 310009 | BURIED DUCTS FOR ANNULUS INTAKE | 1535416 | 0.00 | 0 | 0 | 0 | 0 |
| 310010 | BURIED DUCTS FOR PRIMARY INTAKE | 841855 | 0.00 | 0 | 0 | 0 | 0 |
| 310011 | BURIED DUCTS FOR PRIMARY EXHAUST | 2703282 | 0.00 | 0 | 0 | 0 | 0 |
| 310012 | BURIED DUCTS FOR ANNULUS EXHAUST | 5817988 | 0.00 | 0 | 0 | 0 | 0 |
| 310013 | ANNULUS EXHAUST FAN/STACK | 238314 | 0.00 | 0 | 0 | 0 | 0 |
| 310014 | PRIMARY EXHAUST FAN/STACK | 143924 | 0.00 | 0 | 0 | 0 | 0 |
| 330000 | CONSTRUCTION-O/C | 321970 | 0.00 | 0 | 0 | 0 | 0 |
| 400000 | WHC PROJECT MANAGEMENT | 3077000 | 0.00 | 0 | 0 | 0 | 0 |
| 500000 | OTHER COST | 11337000 | 0.00 | 0 | 0 | 0 | 0 |
| PROJECT TOTAL | | 42,110,471 | | 0 | 0 | 0 | 0 |

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W-314 ER 4978
FILE NO. W314SDA2

** IEST - INTERACTIVE ESTIMATING **
AW FARM DOUBLE SHELL TANK EXHAUST UPGRADE
STUDY ESTIMATE
DOE_R01 - PROJECT COST SUMMARY


DATE 02/11/94 07:04:05
BY GDR KDE

| COST CODE | DESCRIPTION | ESCALATED TOTAL COST | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|
| 000 | ENGINEERING | 8,090,000 | 30 | 2,430,000 | 10,520,000 |
| 550 | OTHER STRUCTURES | 6,940,000 | 30 | 2,080,000 | 9,020,000 |
| 700 | SPECIAL EQUIP/PROCESS SYSTEMS | 20,570,000 | 30 | 6,170,000 | 26,740,000 |
| 900 | OTHER PROJECT COSTS | 13,070,000 | 30 | 3,920,000 | 16,990,000 |
| | (ADJUSTED TO MEET DOE 5100.4) | 30,000 | | 0 | 30,000 |
| | PROJECT TOTAL | 48,700,000 | 30 | 14,600,000 | 63,300,000 |

TYPE OF ESTIMATE STUDY ESTIMATE FEBRUARY 11, 1994

ARCHITECT ENGINEER

OPERATING CONTRACTOR

REMARKS:

241-AW TANK FARM VENTILATION UPGRADE

(ROUNDED/ADJUSTED TO THE NEAREST " 10,000 / 100,000 " - PERCENTAGES NOT RECALCULATED TO REFLECT ROUNDING)

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W-314 ER 4978
FILE NO. W314SDA2

** IEST - INTERACTIVE ESTIMATING **
AW FARM DOUBLE SHELL TANK EXHAUST UPGRADE
STUDY ESTIMATE
DOE_R02 - WORK BREAKDOWN STRUCTURE SUMMARY


DATE 02/11/94 07:04:07
BY GDR KDE

| WBS | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| 110000 | DEFINITIVE DESIGN | 4556000 | 0 | 4556000 | 22.35 | 1018266 | 5574266 | 30 | 1672280 | 7246546 |
| 120000 | ENGINEERING/INSPECTION | 1823000 | 0 | 1823000 | 37.81 | 689276 | 2512276 | 30 | 753683 | 3265959 |
| SUBTOTAL 12 | ENGINEERING/INSPECTION | 1823000 | 0 | 1823000 | 37.81 | 689276 | 2512276 | 30 | 753683 | 3265959 |
| SUBTOTAL 1 | ENGINEERING | 6379000 | 0 | 6379000 | 26.77 | 1707542 | 8086542 | 30 | 2425963 | 10512505 |
| 310001 | AIR EXHAUST FOR ANNULUS | 5190014 | 0 | 5190014 | 31.27 | 1622918 | 6812932 | 30 | 2043880 | 8856810 |
| 310002 | AIR EXHAUST FOR PRIMARY | 4558551 | 0 | 4558551 | 31.27 | 1425460 | 5984011 | 30 | 1795202 | 7779212 |
| 310100 | AIR INTAKE FOR ANNULUS | 1682485 | 0 | 1682485 | 31.27 | 526114 | 2208599 | 30 | 662579 | 2871178 |
| 310200 | AIR INTAKE FOR PRIMARY | 1189254 | 0 | 1189254 | 31.27 | 371879 | 1561133 | 30 | 468341 | 2029475 |
| 313001 | SITE WORK | 475500 | 0 | 475500 | 31.27 | 148689 | 624189 | 30 | 187257 | 811446 |
| 313002 | VENTILATION BUILDING | 3423420 | 0 | 3423420 | 31.27 | 1070503 | 4493923 | 30 | 1348177 | 5842100 |
| 313004 | CONTROL ROOM | 858000 | 0 | 858000 | 31.27 | 268297 | 1126297 | 30 | 337889 | 1464186 |
| 313005 | STACK RAD MONITOR | 528000 | 0 | 528000 | 31.27 | 165106 | 693106 | 30 | 207932 | 901037 |
| SUBTOTAL 313 | VENTILATION BUILDING | 5284920 | 0 | 5284920 | 31.27 | 1652595 | 6937515 | 30 | 2081255 | 9018769 |
| SUBTOTAL 31 | FA CONST-ONSITE E/C | 17905224 | 0 | 17905224 | 31.27 | 5598966 | 23504190 | 30 | 7051257 | 30555444 |
| 330000 | CONSTRUCTION-O/C | 324800 | 0 | 324800 | 31.27 | 101565 | 426365 | 30 | 127909 | 554274 |
| SUBTOTAL 33 | CONSTRUCTION-O/C | 324800 | 0 | 324800 | 31.27 | 101565 | 426365 | 30 | 127909 | 554274 |
| SUBTOTAL 3 | CONSTRUCTION | 18230024 | 0 | 18230024 | 31.27 | 5700531 | 23930555 | 30 | 7179166 | 31109718 |
| 400000 | WHC PROJECT MANAGEMENT | 2735000 | 0 | 2735000 | 30.75 | 841013 | 3576013 | 30 | 1072804 | 4648816 |
| SUBTOTAL 4 | PROJECT INTEGRATION | 2735000 | 0 | 2735000 | 30.75 | 841013 | 3576013 | 30 | 1072804 | 4648816 |
| 500000 | OTHER PROJECT COST | 9997000 | 0 | 9997000 | 30.75 | 3074078 | 13071078 | 30 | 3921323 | 16992401 |
| SUBTOTAL 5 | OTHER PROJECT COST | 9997000 | 0 | 9997000 | 30.75 | 3074078 | 13071078 | 30 | 3921323 | 16992401 |
| PROJECT TOTAL | | 37,341,024 | 0 | 37,341,024 | 30.32 | 11,323,164 | 48,664,188 | 30 | 14,599,256 | 63,263,440 |

1. DOCUMENTS AND DRAWINGS

DOCUMENTS: ENGINEERING STUDY WHC-SD-W061-ES-001, AND PROJECT W-061 VENTILATION DESIGN,ALTERNATIVES DATED SEPTEMBER 15, 1993.

DRAWINGS: NONE

2. MATERIAL PRICES

UNIT COSTS REPRESENT CURRENT PRICES FOR SPECIFIED MATERIAL.

3. LABOR RATES

CURRENT KEH BASE CRAFT RATES, AS ISSUED BY KEH FINANCE (EFFECTIVE 10-01-92), INCLUDE FRINGE BENEFITS, LABOR INSURANCE, TAXES AND TRAVEL WHERE APPLICABLE, PER HANFORD SITE STABILIZATION AGREEMENT, APPENDIX A (EFFECTIVE 9-2-91). NON CRAFT HOURLY RATES ARE BASED ON THE 1993 FISCAL YEAR BUDGET LIQUIDATION RATES AS ISSUED BY KEH FINANCE (EFFECTIVE 10-01-92).

4. GENERAL REQUIREMENTS/TECHNICAL SERVICES/OVERHEADS

A.) ONSITE CONSTRUCTION FORCES GENERAL REQUIREMENTS, TECHNICAL SERVICES AND CRAFT OVERHEAD COSTS ARE INCLUDED AS A COMPOSITE PERCENTAGE BASED ON THE KEH ESTIMATING FACTOR/BILLING SCHEDULE, REVISION 14, DATED OCTOBER 01, 1992. THE TOTAL COMPOSITE PERCENTAGE APPLIED TO ONSITE CONSTRUCTION FORCES LABOR, FOR THIS PROJECT, IS 93% FOR SHOP WORK AND 134% FOR FIELD WORK, WHICH IS REFLECTED IN THE "OH&P/B&I" COLUMN OF THE ESTIMATE DETAIL.

5. ESCALATION

ESCALATION PERCENTAGES WERE CALCULATED BY THE HANFORD MATERIAL & LABOR ESCALATION STUDY, DATED FEBRUARY 1993.

6. ROUNDING

U.S. DEPARTMENT OF ENERGY - DOE ORDER 5100.4 PAGE J-2 SUBPARAGRAPH (M), REQUIRES ROUNDING OF ALL GENERAL PLANT PROJECTS (GPP'S) AND LINE ITEM (LI) COST ESTIMATES. REFERENCE: DOE 5100.4, FIGURE I-11, DATED 10-31-84.

7. REMARKS

A.) DEFINITIVE DESIGN COSTS ARE BASED ON 25% OF DIRECT CONSTRUCTION COST.
B.) CONSTRUCTION ENGINEERING/INSPECTION COSTS ARE BASED ON 10% OF DIRECT CONSTRUCTION COST.
C.) WHC PROJECT MANAGEMENT COSTS ARE BASED ON 15% OF DIRECT CONSTRUCTION COST.
D.) ASSUMED THAT 10% OF ALL EXCAVATED DIRT WOULD BE CONTAMINATED AND WOULD HAVE TO BE REMOVED, BARRELED AND BURIED.
E.) ALL DUCTS ARE TO BE FABRICATED FROM STAINLESS STEEL.
F.) ALL CONSTRUCTION IS TO BE BY THE ONSTIE CONTRACTOR.
G.) ESTIMATE ASSUMES DUCT TO BE BURIED IN A 4' DEEP HAND DUG TRENCH.
H.) ESTIMATE CONTAINS COST FOR A TEA3 FILTER TRAIN ON THE PRIMARY EXHAUST.
I.) ESTIMATE CONTAINS COST FOR A TEA2 FILTER TRAIN ON THE ANNULUS EXHAUST.
J.) OPC COSTS ARE 56% OF DIRECT CONSTRUCTION COST, BASED ON THE C-106 TANK PROJECTS.

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W-314 ER 4978
FILE NO. W314SDA2

** IEST - INTERACTIVE ESTIMATING **
AW FARM DOUBLE SHELL TANK EXHAUST UPGRADE
STUDY ESTIMATE
DOE_R04 - COST CODE ACCOUNT SUMMARY


DATE 02/11/94 07:04:08
BY GDR KDE

| COST CODE/WBS | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| 000 | ENGINEERING | | | | | | | | | |
| 110000 | DEFINITIVE DESIGN | 4556000 | 0 | 4556000 | 22.35 | 1018266 | 5574266 | 30 | 1672280 | 7246546 |
| 120000 | ENGINEERING/INSPECTION | 1823000 | 0 | 1823000 | 37.81 | 689276 | 2512276 | 30 | 753683 | 3265959 |
| TOTAL 000 | ENGINEERING | 6379000 | 0 | 6379000 | 26.77 | 1707542 | 8086542 | 30 | 2425963 | 10512505 |
| 550 | OTHER STRUCTURES | | | | | | | | | |
| 313001 | SITE WORK | 475500 | 0 | 475500 | 31.27 | 148689 | 624189 | 30 | 187257 | 811446 |
| 313002 | VENTILATION BUILDING | 3423420 | 0 | 3423420 | 31.27 | 1070503 | 4493923 | 30 | 1348177 | 5842100 |
| 313004 | CONTROL ROOM | 858000 | 0 | 858000 | 31.27 | 268297 | 1126297 | 30 | 337889 | 1464186 |
| 313005 | STACK RAD MONITOR | 528000 | 0 | 528000 | 31.27 | 165106 | 693106 | 30 | 207932 | 901037 |
| TOTAL 550 | OTHER STRUCTURES | 5284920 | 0 | 5284920 | 31.27 | 1652595 | 6937515 | 30 | 2081255 | 9018769 |
| 700 | SPECIAL EQUIP/PROCESS SYSTEMS | | | | | | | | | |
| 310001 | AIR EXHAUST FOR ANNULUS | 5190014 | 0 | 5190014 | 31.27 | 1622918 | 6812932 | 30 | 2043880 | 8856810 |
| 310002 | AIR EXHAUST FOR PRIMARY | 4558551 | 0 | 4558551 | 31.27 | 1425460 | 5984011 | 30 | 1795202 | 7779212 |
| 310100 | AIR INTAKE FOR ANNULUS | 1682485 | 0 | 1682485 | 31.27 | 526114 | 2208599 | 30 | 662579 | 2871178 |
| 310200 | AIR INTAKE FOR PRIMARY | 1189254 | 0 | 1189254 | 31.27 | 371879 | 1561133 | 30 | 468341 | 2029475 |
| 330000 | CONSTRUCTION-O/C | 324800 | 0 | 324800 | 31.27 | 101565 | 426365 | 30 | 127909 | 554274 |
| 400000 | WHC PROJECT MANAGEMENT | 2735000 | 0 | 2735000 | 30.75 | 841013 | 3576013 | 30 | 1072804 | 4648816 |
| TOTAL 700 | SPECIAL EQUIP/PROCESS SYSTEM | 15680104 | 0 | 15680104 | 31.18 | 4888949 | 20569053 | 30 | 6170715 | 26739765 |
| 900 | OTHER PROJECT COSTS | | | | | | | | | |
| 500000 | OTHER PROJECT COST | 9997000 | 0 | 9997000 | 30.75 | 3074078 | 13071078 | 30 | 3921323 | 16992401 |
| TOTAL 900 | OTHER PROJECT COSTS | 9997000 | 0 | 9997000 | 30.75 | 3074078 | 13071078 | 30 | 3921323 | 16992401 |
| PROJECT TOTAL | | 37,341,024 | 0 | 37,341,024 | 30.32 | 11,323,164 | 48,664,188 | 30 | 14,599,256 | 63,263,440 |

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W-314 ER 4978
FILE NO. W314SDA2.

** IEST - INTERACTIVE ESTIMATING **
AW FARM DOUBLE SHELL TANK EXHAUST UPGRADE
STUDY ESTIMATE
DOE_R05 - ESTIMATE SUMMARY BY CSI DIVISION


DATE 02/11/94 07:04:10
BY GDR KDE

| CSI | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| ENGINEERING | | | | | | | | | | |
| 00 | TECHNICAL SERVICES | 6379000 | 0 | 6379000 | 26.77 | 1707542 | 8086542 | 30 | 2425963 | 10512505 |
| TOTAL ENGINEERING | | 6,379,000 | 0 | 6,379,000 | 26.77 | 1,707,542 | 8,086,542 | 30 | 2,425,963 | 10,512,505 |
| CONSTRUCTION | | | | | | | | | | |
| 01 | GENERAL REQUIRMENTS | 1989358 | 0 | 1989358 | 31.27 | 622073 | 2611431 | 30 | 783429 | 3394858 |
| 02 | SITEWORK | 576422 | 0 | 576422 | 31.27 | 180248 | 756670 | 30 | 227000 | 983670 |
| 13 | SPECIAL CONSTRUCTION | 5284920 | 0 | 5284920 | 31.27 | 1652595 | 6937515 | 30 | 2081255 | 9018769 |
| 15 | MECHANICAL | 9845687 | 0 | 9845687 | 31.27 | 3078747 | 12924434 | 30 | 3877330 | 16801764 |
| 16 | ELECTRICAL | 533637 | 0 | 533637 | 31.27 | 166868 | 700505 | 30 | 210152 | 910657 |
| 19 | PROJECT MANAGEMENT | 2735000 | 0 | 2735000 | 30.75 | 841013 | 3576013 | 30 | 1072804 | 4648816 |
| 20 | OTHER PROJECT COSTS | 9997000 | 0 | 9997000 | 30.75 | 3074078 | 13071078 | 30 | 3921323 | 16992401 |
| TOTAL CONSTRUCTION | | 30,962,024 | 0 | 30,962,024 | 31.06 | 9,615,622 | 40,577,646 | 30 | 12,173,293 | 52,750,935 |
| PROJECT TOTAL | | 37,341,024 | 0 | 37,341,024 | 30.32 | 11,323,164 | 48,664,188 | 30 | 14,599,256 | 63,263,440 |

REFERENCE: ESTIMATE BASIS SHEET — PAGE 3 OF 7
COST CODE ACCOUNT SUMMARY — PAGE 4 OF 7

THE U.S. DEPARTMENT OF ENERGY - RICHLAND ORDER 5700.3 "COST ESTIMATING, ANALYSIS AND STANDARDIZATION" DATED 3-27-85, PROVIDES GUIDELINES FOR ESTIMATE CONTINGENCIES. THE GUIDELINE FOR A STUDY ESTIMATE SHOULD HAVE AN OVERALL RANGE OF 20% TO 30% .

CONTINGENCY IS EVALUATED AT THE THIRD COST CODE LEVEL AND SUMMARIZED AT THE PRIMARY AND SECONDARY COST CODE LEVEL OF THE DETAILED COST ESTIMATE.

APPLIED A 30% CONTINGENCY TO THE PROJECT FOR THIS STUDY ESTIMATE DUE TO THE DEFINITIVE DESIGN, CONSTRUCTION ENGINEERING/INSPECTION, WHC PROJECT MANAGEMENT, AND OPC COSTS WERE BASED ON A PERCENTAGE OF DIRECT CONSTRUCTION, AND THE LIMITED AMOUNT OF DETAIL FOR THIS ENGINEERING STUDY.

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W-314 ER 4978
FILE NO. W314SDA2

** IEST - INTERACTIVE ESTIMATING **
AW FARM DOUBLE SHELL TANK EXHAUST UPGRADE
STUDY ESTIMATE
DOE_R07 - ONSITE INDIRECT COSTS BY WBS


DATE 02/11/94 07:04:11
BY GDR KDE

| WBS | DESCRIPTION | ESTIMATE SUBTOTAL | CONTRACT % | ADMINISTRATION TOTAL | BID PACK PREP. | OTHER INDIRECTS | TOTAL INDIRECTS |
|---|---|---|---|---|---|---|---|
| 110000 | DEFINITIVE DESIGN | 4556000 | 0.00 | 0 | 0 | 0 | 0 |
| 120000 | ENGINEERING/INSPECTION | 1823000 | 0.00 | 0 | 0 | 0 | 0 |
| 310001 | AIR EXHAUST FOR ANNULUS | 5190014 | 0.00 | 0 | 0 | 0 | 0 |
| 310002 | AIR EXHAUST FOR PRIMARY | 4558551 | 0.00 | 0 | 0 | 0 | 0 |
| 310100 | AIR INTAKE FOR ANNULUS | 1682485 | 0.00 | 0 | 0 | 0 | 0 |
| 310200 | AIR INTAKE FOR PRIMARY | 1189254 | 0.00 | 0 | 0 | 0 | 0 |
| 313001 | SITE WORK | 475500 | 0.00 | 0 | 0 | 0 | 0 |
| 313002 | VENTILATION BUILDING | 3423420 | 0.00 | 0 | 0 | 0 | 0 |
| 313004 | CONTROL ROOM | 858000 | 0.00 | 0 | 0 | 0 | 0 |
| 313005 | STACK RAD MONITOR | 528000 | 0.00 | 0 | 0 | 0 | 0 |
| 330000 | CONSTRUCTION-O/C | 324800 | 0.00 | 0 | 0 | 0 | 0 |
| 400000 | WHC PROJECT MANAGEMENT | 2735000 | 0.00 | 0 | 0 | 0 | 0 |
| 500000 | OTHER PROJECT COST | 9997000 | 0.00 | 0 | 0 | 0 | 0 |
| PROJECT TOTAL | | 37,341,024 | | 0 | 0 | 0 | 0 |

9413221.1166

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W-314B
FILE NO. W314SDB2

** IEST - INTERACTIVE ESTIMATING **
241-SY.DOUBLE SHELL TANK VENTILATION UPGRADE
STUDY ESTIMATE
DOE_R01 - PROJECT COST SUMMARY


DATE 02/11/94 07:14:07
BY GDR

| COST CODE | DESCRIPTION | ESCALATED TOTAL COST | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|
| 000 | ENGINEERING | 4,720,000 | 30 | 1,420,000 | 6,140,000 |
| 550 | OTHER STRUCTURES | 6,510,000 | 30 | 1,950,000 | 8,460,000 |
| 700 | SPECIAL EQUIP/PROCESS SYSTEMS | 9,540,000 | 30 | 2,860,000 | 12,400,000 |
| 900 | OTHER PROJECT COSTS | 7,650,000 | 30 | 2,300,000 | 9,950,000 |
| | (ADJUSTED TO MEET DOE 5100.4) | -20,000 | | -30,000 | -50,000 |
| | PROJECT TOTAL | 28,400,000 | 30 | 8,500,000 | 36,900,000 |

TYPE OF ESTIMATE STUDY ESTIMATE FEBRUARY 11, 1994

ARCHITECT ENGINEER

OPERATING CONTRACTOR

REMARKS:

241-SY TANK FARM VENTILATION UPGRADE

(ROUNDED/ADJUSTED TO THE NEAREST " 10,000 / 100,000 " - PERCENTAGES NOT RECALCULATED TO REFLECT ROUNDING)

9413221.1167

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W-314B
FILE NO. W314SDB2

** IEST - INTERACTIVE ESTIMATING **
241-SY DOUBLE SHELL TANK VENTILATION UPGRADE
STUDY ESTIMATE
DOE_R02 - WORK BREAKDOWN STRUCTURE SUMMARY


DATE 02/11/94 07:14:09
BY GDR

| WBS | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| 110000 | DEFINITIVE DESIGN | 2660000 | 0 | 2660000 | 22.35 | 594510 | 3254510 | 30 | 976353 | 4230863 |
| 120000 | ENGINEERING/INSPECTION | 1064000 | 0 | 1064000 | 37.81 | 402298 | 1466298 | 30 | 439890 | 1906188 |
| SUBTOTAL 12 | ENGINEERING/INSPECTION | 1064000 | 0 | 1064000 | 37.81 | 402298 | 1466298 | 30 | 439890 | 1906188 |
| SUBTOTAL 1 | ENGINEERING | 3724000 | 0 | 3724000 | 26.77 | 996808 | 4720808 | 30 | 1416243 | 6137051 |
| 310001 | AIR EXHAUST FOR ANNULUS | 1043879 | 0 | 1043879 | 31.27 | 326421 | 1370300 | 30 | 411089 | 1781389 |
| 310002 | AIR EXHAUST FOR PRIMARY | 3267825 | 0 | 3267825 | 31.27 | 1021849 | 4289674 | 30 | 1286902 | 5576575 |
| 310100 | AIR INTAKE FOR ANNULUS | 620922 | 0 | 620922 | 31.27 | 194162 | 815084 | 30 | 244525 | 1059609 |
| 310200 | AIR INTAKE FOR PRIMARY | 585807 | 0 | 585807 | 31.27 | 183182 | 768989 | 30 | 230697 | 999685 |
| 313001 | SITE WORK | 475500 | 0 | 475500 | 31.27 | 148689 | 624189 | 30 | 187257 | 811446 |
| 313002 | VENTILATION BUILDING | 3097380 | 0 | 3097380 | 31.27 | 968551 | 4065931 | 30 | 1219779 | 5285710 |
| 313004 | CONTROL ROOM | 858000 | 0 | 858000 | 31.27 | 268297 | 1126297 | 30 | 337889 | 1464186 |
| 313005 | STACK RAD MONITOR | 528000 | 0 | 528000 | 31.27 | 165106 | 693106 | 30 | 207932 | 901037 |
| SUBTOTAL 313 | VENTILATION BUILDING | 4958880 | 0 | 4958880 | 31.27 | 1550643 | 6509523 | 30 | 1952857 | 8462379 |
| SUBTOTAL 31 | FA CONST-ONSITE E/C | 10477313 | 0 | 10477313 | 31.27 | 3276257 | 13753570 | 30 | 4126070 | 17879637 |
| 330000 | BURIAL FEES - INTAKE STATIONS | 80550 | 0 | 80550 | 31.27 | 25188 | 105738 | 30 | 31721 | 137459 |
| 330001 | BURIAL FEES - EXHAUST STATIONS | 80550 | 0 | 80550 | 31.27 | 25188 | 105738 | 30 | 31721 | 137459 |
| SUBTOTAL 33 | BURIAL FEES | 161100 | 0 | 161100 | 31.27 | 50376 | 211476 | 30 | 63442 | 274918 |
| SUBTOTAL 3 | CONSTRUCTION | 10638413 | 0 | 10638413 | 31.27 | 3326633 | 13965046 | 30 | 4189512 | 18154555 |
| 400000 | WHC PROJECT MANAGEMENT | 1596000 | 0 | 1596000 | 30.75 | 490770 | 2086770 | 30 | 626031 | 2712801 |
| SUBTOTAL 4 | PROJECT INTEGRATION | 1596000 | 0 | 1596000 | 30.75 | 490770 | 2086770 | 30 | 626031 | 2712801 |
| 500000 | OTHER PROJECT COST | 5852000 | 0 | 5852000 | 30.75 | 1799490 | 7651490 | 30 | 2295447 | 9946937 |
| SUBTOTAL 5 | OTHER PROJECT COST | 5852000 | 0 | 5852000 | 30.75 | 1799490 | 7651490 | 30 | 2295447 | 9946937 |
| PROJECT TOTAL | | 21,810,413 | 0 | 21,810,413 | 30.32 | 6,613,701 | 28,424,114 | 30 | 8,527,233 | 36,951,344 |

1. DOCUMENTS AND DRAWINGS
==========
DOCUMENTS: ENGINEERING STUDY WHC-SD-W061-ES-001, AND PROJECT W-061 VENTILATION DESIGN ALTERNATIVES DATED SEPTEMBER 15, 1993.

DRAWINGS: NONE

2. MATERIAL PRICES
==========
UNIT COSTS REPRESENT CURRENT PRICES FOR SPECIFIED MATERIAL.

3. LABOR RATES
==========
CURRENT KEH BASE CRAFT RATES, AS ISSUED BY KEH FINANCE (EFFECTIVE 10-01-92), INCLUDE FRINGE BENEFITS, LABOR INSURANCE, TAXES AND TRAVEL WHERE APPLICABLE, PER HANFORD SITE STABILIZATION AGREEMENT, APPENDIX A (EFFECTIVE 9-2-91). NON CRAFT HOURLY RATES ARE BASED ON THE 1993 FISCAL YEAR BUDGET LIQUIDATION RATES AS ISSUED BY KEH FINANCE (EFFECTIVE 10-01-92).

4. GENERAL REQUIREMENTS/TECHNICAL SERVICES/OVERHEADS
==========
A.) ONSITE CONSTRUCTION FORCES GENERAL REQUIREMENTS, TECHNICAL SERVICES AND CRAFT OVERHEAD COSTS ARE INCLUDED AS A COMPOSITE PERCENTAGE BASED ON THE KEH ESTIMATING FACTOR/BILLING SCHEDULE, REVISION 14, DATED OCTOBER 01, 1992. THE TOTAL COMPOSITE PERCENTAGE APPLIED TO ONSITE CONSTRUCTION FORCES LABOR, FOR THIS PROJECT, IS 93% FOR SHOP WORK AND 134% FOR FIELD WORK, WHICH IS REFLECTED IN THE "OH&P/B&I" COLUMN OF THE ESTIMATE DETAIL.

5. ESCALATION
==========
ESCALATION PERCENTAGES WERE CALCULATED BY THE HANFORD MATERIAL & LABOR ESCALATION STUDY, DATED FEBRUARY 1993.

6. ROUNDING
==========
U.S. DEPARTMENT OF ENERGY - DOE ORDER 5100.4 PAGE J-2 SUBPARAGRAPH (M), REQUIRES ROUNDING OF ALL GENERAL PLANT PROJECTS (GPP'S) AND LINE ITEM (LI) COST ESTIMATES. REFERENCE: DOE 5100.4, FIGURE I-11, DATED 10-31-84.

7. REMARKS
==========
A.) DEFINITIVE DESIGN COSTS ARE BASED ON 25% OF DIRECT CONSTRUCTION COST.
B.) CONSTRUCTION ENGINEERING/INSPECTION COSTS ARE BASED ON 10% OF DIRECT CONSTRUCTION COST.
C.) WHC PROJECT MANAGEMENT COSTS ARE BASED ON 15% OF DIRECT CONSTRUCTION COST.
D.) ASSUMED THAT 10% OF ALL EXCAVATED DIRT WOULD BE CONTAMINATED AND WOULD HAVE TO BE REMOVED, BARRELED AND BURIED.
E.) ALL DUCTS ARE TO BE FABRICATED FROM STAINLESS STEEL.
F.) ALL CONSTRUCTION IS TO BE BY THE ONSTIE CONTRACTOR.
G.) ESTIMATE ASSUMES DUCT TO BE BURIED IN A 4' DEEP HAND DUG TRENCH.
H.) ESTIMATE CONTAINS COST FOR A TEA3 FILTER TRAIN ON THE PRIMARY EXHAUST.
I.) ESTIMATE CONTAINS COST FOR A TEA2 FILTER TRAIN ON THE ANNULUS EXHAUST.
J.) OPC COST ARE 56% OF DIRECT CONSTRUCTION COSTS, BASED ON THE C-106 TANK PROJECTS.

9413221.1169

AISER ENGINEERS HANFORD
/ESTINGHOUSE HANFORD COMPANY
IOB NO. W-314B
ILE NO. W314SDB2

** IEST - INTERACTIVE ESTIMATING **
241-SY DOUBLE SHELL TANK VENTILATION UPGRADE
STUDY ESTIMATE
DOE_R04 - COST CODE ACCOUNT SUMMARY


DATE 02/11/94 07:14:11
BY GDR

| OST ODE/WBS | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| 00 | ENGINEERING | | | | | | | | | |
| 10000 | DEFINITIVE DESIGN | 2660000 | 0 | 2660000 | 22.35 | 594510 | 3254510 | 30 | 976353 | 4230863 |
| 20000 | ENGINEERING/INSPECTION | 1064000 | 0 | 1064000 | 37.81 | 402298 | 1466298 | 30 | 439890 | 1906188 |
| TOTAL 000 | ENGINEERING | 3724000 | 0 | 3724000 | 26.77 | 996808 | 4720808 | 30 | 1416243 | 6137051 |
| 50 | OTHER STRUCTURES | | | | | | | | | |
| 513001 | SITE WORK | 475500 | 0 | 475500 | 31.27 | 148689 | 624189 | 30 | 187257 | 811446 |
| 513002 | VENTILATION BUILDING | 3097380 | 0 | 3097380 | 31.27 | 968551 | 4065931 | 30 | 1219779 | 5285710 |
| 513004 | CONTROL ROOM | 858000 | 0 | 858000 | 31.27 | 268297 | 1126297 | 30 | 337889 | 1464186 |
| 513005 | STACK RAD MONITOR | 528000 | 0 | 528000 | 31.27 | 165106 | 693106 | 30 | 207932 | 901037 |
| TOTAL 550 | OTHER STRUCTURES | 4958880 | 0 | 4958880 | 31.27 | 1550643 | 6509523 | 30 | 1952857 | 8462379 |
| 00 | SPECIAL EQUIP/PROCESS SYSTEMS | | | | | | | | | |
| 510001 | AIR EXHAUST FOR ANNULUS | 1043879 | 0 | 1043879 | 31.27 | 326421 | 1370300 | 30 | 411089 | 1781389 |
| 510002 | AIR EXHAUST FOR PRIMARY | 3267825 | 0 | 3267825 | 31.27 | 1021849 | 4289674 | 30 | 1286902 | 5576575 |
| 510100 | AIR INTAKE FOR ANNULUS | 620922 | 0 | 620922 | 31.27 | 194162 | 815084 | 30 | 244525 | 1059609 |
| 510200 | AIR INTAKE FOR PRIMARY | 585807 | 0 | 585807 | 31.27 | 183182 | 768989 | 30 | 230697 | 999685 |
| 530000 | BURIAL FEES - INTAKE STATIONS | 80550 | 0 | 80550 | 31.27 | 25188 | 105738 | 30 | 31721 | 137459 |
| 530001 | BURIAL FEES - EXHAUST STATIONS | 80550 | 0 | 80550 | 31.27 | 25188 | 105738 | 30 | 31721 | 137459 |
| 00000 | WHC PROJECT MANAGEMENT | 1596000 | 0 | 1596000 | 30.75 | 490770 | 2086770 | 30 | 626031 | 2712801 |
| TOTAL 700 | SPECIAL EQUIP/PROCESS SYSTEM | 7275533 | 0 | 7275533 | 31.16 | 2266760 | 9542293 | 30 | 2862686 | 12404977 |
| 00 | OTHER PROJECT COSTS | | | | | | | | | |
| 500000 | OTHER PROJECT COST | 5852000 | 0 | 5852000 | 30.75 | 1799490 | 7651490 | 30 | 2295447 | 9946937 |
| TOTAL 900 | OTHER PROJECT COSTS | 5852000 | 0 | 5852000 | 30.75 | 1799490 | 7651490 | 30 | 2295447 | 9946937 |
| ROJECT TOTAL | | 21,810,413 | 0 | 21,810,413 | 30.32 | 6,613,701 | 28,424,114 | 30 | 8,527,233 | 36,951,344 |

AISER ENGINEERS HANFORD
/ESTINGHOUSE HANFORD COMPANY
IOB NO. W-314B
ILE NO. W314SDB2

** IEST - INTERACTIVE ESTIMATING **
241-SY DOUBLE SHELL TANK VENTILATION UPGRADE
STUDY ESTIMATE
DOE_R05 - ESTIMATE SUMMARY BY CSI DIVISION


DATE 02/11/94 07:14:13
BY GDR

| CSI | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| NGINEERING | | | | | | | | | | |
| 00 | TECHNICAL SERVICES | 3724000 | 0 | 3724000 | 26.77 | 996808 | 4720808 | 30 | 1416243 | 6137051 |
| TOTAL ENGINEERING | | 3,724,000 | 0 | 3,724,000 | 26.77 | 996,808 | 4,720,808 | 30 | 1,416,243 | 6,137,051 |
| CONSTRUCTION | | | | | | | | | | |
| 01 | GENERAL REQUIRMENTS | 999338 | 0 | 999338 | 31.27 | 312494 | 1311832 | 30 | 393548 | 1705378 |
| 02 | SITEWORK | 272800 | 0 | 272800 | 31.27 | 85304 | 358104 | 30 | 107432 | 465536 |
| 13 | SPECIAL CONSTRUCTION | 4958880 | 0 | 4958880 | 31.27 | 1550643 | 6509523 | 30 | 1952857 | 8462379 |
| 15 | MECHANICAL | 4106771 | 0 | 4106771 | 31.27 | 1284187 | 5390958 | 30 | 1617287 | 7008245 |
| 16 | ELECTRICAL | 300624 | 0 | 300624 | 31.27 | 94005 | 394629 | 30 | 118388 | 513017 |
| 19 | PROJECT MANAGEMENT | 1596000 | 0 | 1596000 | 30.75 | 490770 | 2086770 | 30 | 626031 | 2712801 |
| 20 | OTHER PROJECT COSTS | 5852000 | 0 | 5852000 | 30.75 | 1799490 | 7651490 | 30 | 2295447 | 9946937 |
| TOTAL CONSTRUCTION | | 18,086,413 | 0 | 18,086,413 | 31.06 | 5,616,893 | 23,703,306 | 30 | 7,110,990 | 30,814,293 |
| PROJECT TOTAL | | 21,810,413 | 0 | 21,810,413 | 30.32 | 6,613,701 | 28,424,114 | 30 | 8,527,233 | 36,951,344 |

REFERENCE: ESTIMATE BASIS SHEET — PAGE 3 OF 7
COST CODE ACCOUNT SUMMARY — PAGE 4 OF 7

THE U.S. DEPARTMENT OF ENERGY - RICHLAND ORDER 5700.3 "COST ESTIMATING, ANALYSIS AND STANDARDIZATION" DATED 3-27-85, PROVIDES GUIDELINES FOR ESTIMATE CONTINGENCIES. THE GUIDELINE FOR A STUDY ESTIMATE SHOULD HAVE AN OVERALL RANGE OF 20% TO 30% .

CONTINGENCY IS EVALUATED AT THE THIRD COST CODE LEVEL AND SUMMARIZED AT THE PRIMARY AND SECONDARY COST CODE LEVEL OF THE DETAILED COST ESTIMATE.

APPLIED A 30% CONTINGENCY TO THE PROJECT FOR THIS STUDY ESTIMATE DUE TO THE DEFINITIVE DESIGN, CONSTRUCTION ENGINEERING/INSPECTION, WHC PROJECT MANAGEMENT, AND OPC COSTS WERE BASED ON A PERCENTAGE OF DIRECT CONSTRUCTION, AND THE LIMITED AMOUNT OF DETAIL FOR THIS ENGINEERING STUDY.

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W-314B
FILE NO. W314SDB2

** IEST - INTERACTIVE ESTIMATING **
241-SY DOUBLE SHELL TANK VENTILATION UPGRADE
STUDY ESTIMATE
DOE_R07 - ONSITE INDIRECT COSTS BY WBS


DATE 02/11/94 07:14:15
BY GDR

| WBS | DESCRIPTION | ESTIMATE SUBTOTAL | CONTRACT % | ADMINISTRATION TOTAL | BID PACK PREP. | OTHER INDIRECTS | TOTAL INDIRECTS |
|---|---|---|---|---|---|---|---|
| 110000 | DEFINITIVE DESIGN | 2660000 | 0.00 | 0 | 0 | 0 | 0 |
| 120000 | ENGINEERING/INSPECTION | 1064000 | 0.00 | 0 | 0 | 0 | 0 |
| 310001 | AIR EXHAUST FOR ANNULUS | 1043879 | 0.00 | 0 | 0 | 0 | 0 |
| 310002 | AIR EXHAUST FOR PRIMARY | 3267825 | 0.00 | 0 | 0 | 0 | 0 |
| 310100 | AIR INTAKE FOR ANNULUS | 620922 | 0.00 | 0 | 0 | 0 | 0 |
| 310200 | AIR INTAKE FOR PRIMARY | 585807 | 0.00 | 0 | 0 | 0 | 0 |
| 313001 | SITE WORK | 475500 | 0.00 | 0 | 0 | 0 | 0 |
| 313002 | VENTILATION BUILDING | 3097380 | 0.00 | 0 | 0 | 0 | 0 |
| 313004 | CONTROL ROOM | 858000 | 0.00 | 0 | 0 | 0 | 0 |
| 313005 | STACK RAD MONITOR | 528000 | 0.00 | 0 | 0 | 0 | 0 |
| 330000 | BURIAL FEES - INTAKE STATIONS | 80550 | 0.00 | 0 | 0 | 0 | 0 |
| 330001 | BURIAL FEES - EXHAUST STATIONS | 80550 | 0.00 | 0 | 0 | 0 | 0 |
| 400000 | WHC PROJECT MANAGEMENT | 1596000 | 0.00 | 0 | 0 | 0 | 0 |
| 500000 | OTHER PROJECT COST | 5852000 | 0.00 | 0 | 0 | 0 | 0 |
| PROJECT TOTAL | | 21,810,413 | | 0 | 0 | 0 | 0 |

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W-314B
FILE NO. W314SDC2

** IEST - INTERACTIVE ESTIMATING **
241 AY FARM ANNULUS EXHAUST UPGRADE
STUDY ESTIMATE
DOE_R01 - PROJECT COST SUMMARY


DATE 02/11/94 13:41:36
BY GDR

| COST CODE | DESCRIPTION | ESCALATED TOTAL COST | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|
| 000 | ENGINEERING | 2,530,000 | 30 | 760,000 | 3,290,000 |
| 550 | OTHER STRUCTURES | 4,370,000 | 30 | 1,310,000 | 5,680,000 |
| 700 | SPECIAL EQUIP/PROCESS SYSTEMS | 4,240,000 | 30 | 1,270,000 | 5,510,000 |
| | (ADJUSTED TO MEET DOE 5100.4) | 60,000 | | -40,000 | 20,000 |
| | TOTAL ESTIMATED CONSTRUCTION COST | 11,200,000 | | 3,300,000 | 14,500,000 |
| 900 | OTHER PROJECT COSTS | 4,170,000 | 30 | 1,250,000 | 5,420,000 |
| | (ADJUSTED TO MEET DOE 5100.4) | 30,000 | | -50,000 | -20,000 |
| | TOTAL PROJECT COST | 15,400,000 | 30 | 4,500,000 | 19,900,000 |

TYPE OF ESTIMATE: STUDY ESTIMATE — FEBRUARY 11, 1994

ARCHITECT ENGINEER: [illegible]

OPERATING CONTRACTOR: [illegible]

REMARKS:

(ROUNDED/ADJUSTED TO THE NEAREST " 10,000 / 100,000 " - PERCENTAGES NOT RECALCULATED TO REFLECT ROUNDING)

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W-314B
FILE NO. W314SDC2

** IEST - INTERACTIVE ESTIMATING **
241 AY FARM ANNULUS EXHAUST UPGRADE
STUDY ESTIMATE
DOE_R02 - WORK BREAKDOWN STRUCTURE SUMMARY


DATE 02/11/94 13:41:39
BY GDR

| WBS | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| 110000 | DEFINITIVE DESIGN | 1429000 | 0 | 1429000 | 21.90 | 312951 | 1741951 | 30 | 522585 | 2264536 |
| 120000 | ENGINEERING/INSPECTION | 571000 | 0 | 571000 | 37.30 | 212983 | 783983 | 30 | 235195 | 1019178 |
| SUBTOTAL 12 | ENGINEERING/INSPECTION | 571000 | 0 | 571000 | 37.30 | 212983 | 783983 | 30 | 235195 | 1019178 |
| SUBTOTAL 1 | ENGINEERING | 2000000 | 0 | 2000000 | 26.30 | 525934 | 2525934 | 30 | 757780 | 3283714 |
| 310001 | AIR EXHAUST FOR ANNULUS | 1704783 | 0 | 1704783 | 30.87 | 526266 | 2231049 | 30 | 669315 | 2900364 |
| 310100 | AIR INTAKE FOR ANNULUS | 644984 | 0 | 644984 | 30.87 | 199106 | 844090 | 30 | 253227 | 1097316 |
| 313001 | SITE WORK | 475500 | 0 | 475500 | 31.27 | 148689 | 624189 | 30 | 187257 | 811446 |
| 313002 | VENTILATION BUILDING | 1730520 | 0 | 1730520 | 31.27 | 541134 | 2271654 | 30 | 681496 | 2953150 |
| 313004 | CONTROL ROOM | 858000 | 0 | 858000 | 31.27 | 268297 | 1126297 | 30 | 337889 | 1464186 |
| 313005 | STACK RAD MONITOR | 264000 | 0 | 264000 | 31.27 | 82553 | 346553 | 30 | 103966 | 450519 |
| SUBTOTAL 313 | VENTILATION BUILDING | 3328020 | 0 | 3328020 | 31.27 | 1040673 | 4368693 | 30 | 1310608 | 5679301 |
| SUBTOTAL 31 | FA CONST-ONSITE E/C | 5677787 | 0 | 5677787 | 31.10 | 1766045 | 7443832 | 30 | 2233150 | 9676981 |
| 330000 | BURIAL FEES | 37677 | 0 | 37677 | 30.87 | 11631 | 49308 | 30 | 14792 | 64100 |
| SUBTOTAL 33 | BURIAL FEES | 37677 | 0 | 37677 | 30.87 | 11631 | 49308 | 30 | 14792 | 64100 |
| SUBTOTAL 3 | CONSTRUCTION | 5715464 | 0 | 5715464 | 31.10 | 1777676 | 7493140 | 30 | 2247942 | 9741081 |
| 400000 | WHC PROJECT MANAGEMENT | 857000 | 0 | 857000 | 30.27 | 259414 | 1116414 | 30 | 334924 | 1451338 |
| SUBTOTAL 4 | PROJECT INTEGRATION | 857000 | 0 | 857000 | 30.27 | 259414 | 1116414 | 30 | 334924 | 1451338 |
| 500000 | OTHER PROJECT COST | 3200000 | 0 | 3200000 | 30.27 | 968640 | 4168640 | 30 | 1250592 | 5419232 |
| SUBTOTAL 5 | OTHER PROJECT COST | 3200000 | 0 | 3200000 | 30.27 | 968640 | 4168640 | 30 | 1250592 | 5419232 |
| PROJECT TOTAL | | 11,772,464 | 0 | 11,772,464 | 30.00 | 3,531,664 | 15,304,128 | 30 | 4,591,238 | 19,895,365 |

1. DOCUMENTS AND DRAWINGS

DOCUMENTS: ENGINEERING STUDY WHC-SD-W061-ES-001, AND PROJECT W-061 VENTILATION DESIGN ALTERNATIVES DATED SEPTEMBER 15, 1993.

DRAWINGS: NONE

2. MATERIAL PRICES

UNIT COSTS REPRESENT CURRENT PRICES FOR SPECIFIED MATERIAL.

3. LABOR RATES

CURRENT KEH BASE CRAFT RATES, AS ISSUED BY KEH FINANCE (EFFECTIVE 10-01-92), INCLUDE FRINGE BENEFITS, LABOR INSURANCE, TAXES AND TRAVEL WHERE APPLICABLE, PER HANFORD SITE STABILIZATION AGREEMENT, APPENDIX A (EFFECTIVE 9-2-91). NON CRAFT HOURLY RATES ARE BASED ON THE 1993 FISCAL YEAR BUDGET LIQUIDATION RATES AS ISSUED BY KEH FINANCE (EFFECTIVE 10-01-92).

4. GENERAL REQUIREMENTS/TECHNICAL SERVICES/OVERHEADS

A.) ONSITE CONSTRUCTION FORCES GENERAL REQUIREMENTS, TECHNICAL SERVICES AND CRAFT OVERHEAD COSTS ARE INCLUDED AS A COMPOSITE PERCENTAGE BASED ON THE KEH ESTIMATING FACTOR/BILLING SCHEDULE, REVISION 14, DATED OCTOBER 01, 1992. THE TOTAL COMPOSITE PERCENTAGE APPLIED TO ONSITE CONSTRUCTION FORCES LABOR, FOR THIS PROJECT, IS 93% FOR SHOP WORK AND 134% FOR FIELD WORK, WHICH IS REFLECTED IN THE "OH&P/B&I" COLUMN OF THE ESTIMATE DETAIL.

5. ESCALATION

ESCALATION PERCENTAGES WERE CALCULATED BY THE HANFORD MATERIAL & LABOR ESCALATION STUDY, DATED FEBRUARY 1993.

6. ROUNDING

U.S. DEPARTMENT OF ENERGY - DOE ORDER 5100.4 PAGE J-2 SUBPARAGRAPH (M), REQUIRES ROUNDING OF ALL GENERAL PLANT PROJECTS (GPP'S) AND LINE ITEM (LI) COST ESTIMATES. REFERENCE: DOE 5100.4, FIGURE I-11, DATED 10-31-84.

7. REMARKS

A.) DEFINITIVE DESIGN COSTS ARE BASED ON 25% OF DIRECT CONSTRUCTION COST.
B.) CONSTRUCTION ENGINEERING/INSPECTION COSTS ARE BASED ON 10% OF DIRECT CONSTRUCTION COST.
C.) WHC PROJECT MANAGEMENT COSTS ARE BASED ON 15% OF DIRECT CONSTRUCTION COST.
D.) ASSUMED THAT 10% OF ALL EXCAVATED DIRT WOULD BE CONTAMINATED AND WOULD HAVE TO BE REMOVED, BARRELED AND BURIED.
E.) ALL DUCTS ARE TO BE FABRICATED FROM STAINLESS STEEL.
F.) ALL CONSTRUCTION IS TO BE BY THE ONSTIE CONTRACTOR.
G.) ESTIMATE ASSUMES DUCT TO BE BURIED IN A 4' DEEP HAND DUG TRENCH.
H.) ESTIMATE CONTAINS COST FOR A TEA2 FILTER TRAIN ON THE ANNULUS EXHAUST.
I.) OPC COST ARE 56% OF DIRECT CONSTRUCTION, BASED ON THE C-106 TANK PROJECTS.
J.) AN ALLOWANCE FOR BURNOUT IS INCLUDED IN ESTIMATE, PER KEH PE.

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W-314B
FILE NO. W314SDC2

** IEST - INTERACTIVE ESTIMATING **
241 AY FARM ANNULUS EXHAUST UPGRADE
STUDY ESTIMATE
DOE_R04 - COST CODE ACCOUNT SUMMARY


DATE 02/11/94 13:41:40
BY GDR

| COST CODE/WBS | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| 000 | ENGINEERING | | | | | | | | | |
| 110000 | DEFINITIVE DESIGN | 1429000 | 0 | 1429000 | 21.90 | 312951 | 1741951 | 30 | 522585 | 2264536 |
| 120000 | ENGINEERING/INSPECTION | 571000 | 0 | 571000 | 37.30 | 212983 | 783983 | 30 | 235195 | 1019178 |
| TOTAL 000 | ENGINEERING | 2000000 | 0 | 2000000 | 26.30 | 525934 | 2525934 | 30 | 757780 | 3283714 |
| 550 | OTHER STRUCTURES | | | | | | | | | |
| 313001 | SITE WORK | 475500 | 0 | 475500 | 31.27 | 148689 | 624189 | 30 | 187257 | 811446 |
| 313002 | VENTILATION BUILDING | 1730520 | 0 | 1730520 | 31.27 | 541134 | 2271654 | 30 | 681496 | 2953150 |
| 313004 | CONTROL ROOM | 858000 | 0 | 858000 | 31.27 | 268297 | 1126297 | 30 | 337889 | 1464186 |
| 313005 | STACK RAD MONITOR | 264000 | 0 | 264000 | 31.27 | 82553 | 346553 | 30 | 103966 | 450519 |
| TOTAL 550 | OTHER STRUCTURES | 3328020 | 0 | 3328020 | 31.27 | 1040673 | 4368693 | 30 | 1310608 | 5679301 |
| 700 | SPECIAL EQUIP/PROCESS SYSTEMS | | | | | | | | | |
| 310001 | AIR EXHAUST FOR ANNULUS | 1704783 | 0 | 1704783 | 30.87 | 526266 | 2231049 | 30 | 669315 | 2900364 |
| 310100 | AIR INTAKE FOR ANNULUS | 644984 | 0 | 644984 | 30.87 | 199106 | 844090 | 30 | 253227 | 1097316 |
| 330000 | BURIAL FEES | 37677 | 0 | 37677 | 30.87 | 11631 | 49308 | 30 | 14792 | 64100 |
| 400000 | WHC PROJECT MANAGEMENT | 857000 | 0 | 857000 | 30.27 | 259414 | 1116414 | 30 | 334924 | 1451338 |
| TOTAL 700 | SPECIAL EQUIP/PROCESS SYSTEM | 3244444 | 0 | 3244444 | 30.71 | 996417 | 4240861 | 30 | 1272258 | 5513118 |
| 900 | OTHER PROJECT COSTS | | | | | | | | | |
| 500000 | OTHER PROJECT COST | 3200000 | 0 | 3200000 | 30.27 | 968640 | 4168640 | 30 | 1250592 | 5419232 |
| TOTAL 900 | OTHER PROJECT COSTS | 3200000 | 0 | 3200000 | 30.27 | 968640 | 4168640 | 30 | 1250592 | 5419232 |
| PROJECT TOTAL | | 11,772,464 | 0 | 11,772,464 | 30.00 | 3,531,664 | 15,304,128 | 30 | 4,591,238 | 19,895,365 |

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W-314B
FILE NO. W314SDC2

** IEST - INTERACTIVE ESTIMATING **
241 AY FARM ANNULUS EXHAUST UPGRADE
STUDY ESTIMATE
DOE_R05 - ESTIMATE SUMMARY BY CSI DIVISION


DATE 02/11/94 13:41:42
BY GDR

| CSI | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| ENGINEERING | | | | | | | | | | |
| 00 | TECHNICAL SERVICES | 2000000 | 0 | 2000000 | 26.30 | 525934 | 2525934 | 30 | 757780 | 3283714 |
| TOTAL ENGINEERING | | 2,000,000 | 0 | 2,000,000 | 26.30 | 525,934 | 2,525,934 | 30 | 757,780 | 3,283,714 |
| CONSTRUCTION | | | | | | | | | | |
| 01 | GENERAL REQUIRMENTS | 341445 | 0 | 341445 | 30.87 | 105403 | 446848 | 30 | 134054 | 580903 |
| 02 | SITEWORK | 62200 | 0 | 62200 | 30.87 | 19201 | 81401 | 30 | 24420 | 105821 |
| 13 | SPECIAL CONSTRUCTION | 3328020 | 0 | 3328020 | 31.27 | 1040673 | 4368693 | 30 | 1310608 | 5679301 |
| 15 | MECHANICAL | 1876045 | 0 | 1876045 | 30.87 | 579135 | 2455180 | 30 | 736554 | 3191734 |
| 16 | ELECTRICAL | 107754 | 0 | 107754 | 30.87 | 33264 | 141018 | 30 | 42306 | 183322 |
| 19 | PROJECT MANAGEMENT | 857000 | 0 | 857000 | 30.27 | 259414 | 1116414 | 30 | 334924 | 1451338 |
| 20 | OTHER PROJECT COSTS | 3200000 | 0 | 3200000 | 30.27 | 968640 | 4168640 | 30 | 1250592 | 5419232 |
| TOTAL CONSTRUCTION | | 9,772,464 | 0 | 9,772,464 | 30.76 | 3,005,730 | 12,778,194 | 30 | 3,833,458 | 16,611,651 |
| PROJECT TOTAL | | 11,772,464 | 0 | 11,772,464 | 30.00 | 3,531,664 | 15,304,128 | 30 | 4,591,238 | 19,895,365 |

REFERENCE: ESTIMATE BASIS SHEET PAGE 3 OF 7
COST CODE ACCOUNT SUMMARY PAGE 4 OF 7

THE U.S. DEPARTMENT OF ENERGY - RICHLAND ORDER 5700.3 "COST ESTIMATING, ANALYSIS AND STANDARDIZATION" DATED 3-27-85, PROVIDES GUIDELINES FOR ESTIMATE CONTINGENCIES. THE GUIDELINE FOR A STUDY ESTIMATE SHOULD HAVE AN OVERALL RANGE OF 20% TO 30% .

CONTINGENCY IS EVALUATED AT THE THIRD COST CODE LEVEL AND SUMMARIZED AT THE PRIMARY AND SECONDARY COST CODE LEVEL OF THE DETAILED COST ESTIMATE.

APPLIED A 30% CONTINGENCY TO THE PROJECT FOR THIS STUDY ESTIMATE DUE TO THE DEFINITIVE DESIGN, CONSTRUCTION ENGINEERING/INSPECTION, WHC PROJECT MANAGEMENT, AND OPC COSTS WERE BASED ON A PERCENTAGE OF DIRECT CONSTRUCTION, AND THE LIMITED AMOUNT OF DETAIL FOR THIS ENGINEERING STUDY.

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KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W-314B
FILE NO. W314SDC2

** IEST - INTERACTIVE ESTIMATING **
241 AY FARM ANNULUS EXHAUST UPGRADE
STUDY ESTIMATE
DOE_R07 - ONSITE INDIRECT COSTS BY WBS


DATE 02/11/94 13:41:43
BY GDR

| WBS | DESCRIPTION | ESTIMATE SUBTOTAL | CONTRACT % | ADMINISTRATION TOTAL | BID PACK PREP. | OTHER INDIRECTS | TOTAL INDIRECTS |
|---|---|---|---|---|---|---|---|
| 110000 | DEFINITIVE DESIGN | 1429000 | 0.00 | 0 | 0 | 0 | 0 |
| 120000 | ENGINEERING/INSPECTION | 571000 | 0.00 | 0 | 0 | 0 | 0 |
| 310001 | AIR EXHAUST FOR ANNULUS | 1704783 | 0.00 | 0 | 0 | 0 | 0 |
| 310100 | AIR INTAKE FOR ANNULUS | 644984 | 0.00 | 0 | 0 | 0 | 0 |
| 313001 | SITE WORK | 475500 | 0.00 | 0 | 0 | 0 | 0 |
| 313002 | VENTILATION BUILDING | 1730520 | 0.00 | 0 | 0 | 0 | 0 |
| 313004 | CONTROL ROOM | 858000 | 0.00 | 0 | 0 | 0 | 0 |
| 313005 | STACK RAD MONITOR | 264000 | 0.00 | 0 | 0 | 0 | 0 |
| 330000 | BURIAL FEES | 37677 | 0.00 | 0 | 0 | 0 | 0 |
| 400000 | WHC PROJECT MANAGEMENT | 857000 | 0.00 | 0 | 0 | 0 | 0 |
| 500000 | OTHER PROJECT COST | 3200000 | 0.00 | 0 | 0 | 0 | 0 |
| PROJECT TOTAL | | 11,772,464 | | 0 | 0 | 0 | 0 |

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W-314B
FILE NO. W314SDD2

** IEST - INTERACTIVE ESTIMATING **
241 AZ FARM ANNULUS EXHAUST UPGRADE
STUDY ESTIMATE
DOE_R01 - PROJECT COST SUMMARY


DATE 02/11/94 13:47:10
BY GDR

| COST CODE | DESCRIPTION | ESCALATED TOTAL COST | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|
| 000 | ENGINEERING | 2,530,000 | 30 | 760,000 | 3,290,000 |
| 550 | OTHER STRUCTURES | 4,370,000 | 30 | 1,310,000 | 5,680,000 |
| 700 | SPECIAL EQUIP/PROCESS SYSTEMS | 4,240,000 | 30 | 1,270,000 | 5,510,000 |
| | (ADJUSTED TO MEET DOE 5100.4) | 60,000 | | -40,000 | 20,000 |
| | TOTAL ESTIMATED CONSTRUCTION COST | 11,200,000 | | 3,300,000 | 14,500,000 |
| 900 | OTHER PROJECT COSTS | 4,170,000 | 30 | 1,250,000 | 5,420,000 |
| | (ADJUSTED TO MEET DOE 5100.4) | 30,000 | | -50,000 | -20,000 |
| | TOTAL PROJECT COST | 15,400,000 | 30 | 4,500,000 | 19,900,000 |

TYPE OF ESTIMATE: STUDY ESTIMATE FEBRUARY 11, 1994

ARCHITECT ENGINEER: Dobbelaere A.W. Alexander

OPERATING CONTRACTOR: T.A. Howell

REMARKS:

(ROUNDED/ADJUSTED TO THE NEAREST " 10,000 / 100,000 " - PERCENTAGES NOT RECALCULATED TO REFLECT ROUNDING)

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W-314B
FILE NO. W314SDD2

** IEST - INTERACTIVE ESTIMATING **
241 A2 FARM ANNULUS EXHAUST UPGRADE
STUDY ESTIMATE
DOE_R02 - WORK BREAKDOWN STRUCTURE SUMMARY


DATE 02/11/94 13:47:11
BY GDR

| WBS | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| 110000 | DEFINITIVE DESIGN | 1429000 | 0 | 1429000 | 21.90 | 312951 | 1741951 | 30 | 522585 | 2264536 |
| 120000 | ENGINEERING/INSPECTION | 571000 | 0 | 571000 | 37.30 | 212983 | 783983 | 30 | 235195 | 1019178 |
| SUBTOTAL 12 | ENGINEERING/INSPECTION | 571000 | 0 | 571000 | 37.30 | 212983 | 783983 | 30 | 235195 | 1019178 |
| SUBTOTAL 1 | ENGINEERING | 2000000 | 0 | 2000000 | 26.30 | 525934 | 2525934 | 30 | 757780 | 3283714 |
| 310001 | AIR EXHAUST FOR ANNULUS | 1704783 | 0 | 1704783 | 30.87 | 526266 | 2231049 | 30 | 669315 | 2900364 |
| 310100 | AIR INTAKE FOR ANNULUS | 644984 | 0 | 644984 | 30.87 | 199106 | 844090 | 30 | 253227 | 1097316 |
| 313001 | SITE WORK | 475500 | 0 | 475500 | 31.27 | 148689 | 624189 | 30 | 187257 | 811446 |
| 313002 | VENTILATION BUILDING | 1730520 | 0 | 1730520 | 31.27 | 541134 | 2271654 | 30 | 681496 | 2953150 |
| 313004 | CONTROL ROOM | 858000 | 0 | 858000 | 31.27 | 268297 | 1126297 | 30 | 337889 | 1464186 |
| 313005 | STACK RAD MONITOR | 264000 | 0 | 264000 | 31.27 | 82553 | 346553 | 30 | 103966 | 450519 |
| SUBTOTAL 313 | VENTILATION BUILDING | 3328020 | 0 | 3328020 | 31.27 | 1040673 | 4368693 | 30 | 1310608 | 5679301 |
| SUBTOTAL 31 | FA CONST-ONSITE E/C | 5677787 | 0 | 5677787 | 31.10 | 1766045 | 7443832 | 30 | 2233150 | 9676981 |
| 330000 | BURIAL FEES | 37677 | 0 | 37677 | 30.87 | 11631 | 49308 | 30 | 14792 | 64100 |
| SUBTOTAL 33 | BURIAL FEES | 37677 | 0 | 37677 | 30.87 | 11631 | 49308 | 30 | 14792 | 64100 |
| SUBTOTAL 3 | CONSTRUCTION | 5715464 | 0 | 5715464 | 31.10 | 1777676 | 7493140 | 30 | 2247942 | 9741081 |
| 400000 | WHC PROJECT MANAGEMENT | 857000 | 0 | 857000 | 30.27 | 259414 | 1116414 | 30 | 334924 | 1451338 |
| SUBTOTAL 4 | PROJECT INTEGRATION | 857000 | 0 | 857000 | 30.27 | 259414 | 1116414 | 30 | 334924 | 1451338 |
| 500000 | OTHER PROJECT COST | 3200000 | 0 | 3200000 | 30.27 | 968640 | 4168640 | 30 | 1250592 | 5419232 |
| SUBTOTAL 5 | OTHER PROJECT COST | 3200000 | 0 | 3200000 | 30.27 | 968640 | 4168640 | 30 | 1250592 | 5419232 |
| PROJECT TOTAL | | 11,772,464 | 0 | 11,772,464 | 30.00 | 3,531,664 | 15,304,128 | 30 | 4,591,238 | 19,895,365 |

1. DOCUMENTS AND DRAWINGS

DOCUMENTS: ENGINEERING STUDY WHC-SD-W061-ES-001, AND PROJECT W-061 VENTILATION DESIGN, ALTERNATIVES DATED SEPTEMBER 15, 1993.

DRAWINGS: NONE

2. MATERIAL PRICES

UNIT COSTS REPRESENT CURRENT PRICES FOR SPECIFIED MATERIAL.

3. LABOR RATES

CURRENT KEH BASE CRAFT RATES, AS ISSUED BY KEH FINANCE (EFFECTIVE 10-01-92), INCLUDE FRINGE BENEFITS, LABOR INSURANCE, TAXES AND TRAVEL WHERE APPLICABLE, PER HANFORD SITE STABILIZATION AGREEMENT, APPENDIX A (EFFECTIVE 9-2-94). NON CRAFT HOURLY RATES ARE BASED ON THE 1993 FISCAL YEAR BUDGET LIQUIDATION RATES AS ISSUED BY KEH FINANCE (EFFECTIVE 10-01-92).

4. GENERAL REQUIREMENTS/TECHNICAL SERVICES/OVERHEADS

A.) ONSITE CONSTRUCTION FORCES GENERAL REQUIREMENTS, TECHNICAL SERVICES AND CRAFT OVERHEAD COSTS ARE INCLUDED AS A COMPOSITE PERCENTAGE BASED ON THE KEH ESTIMATING FACTOR/BILLING SCHEDULE, REVISION 14, DATED OCTOBER 01, 1992. THE TOTAL COMPOSITE PERCENTAGE APPLIED TO ONSITE CONSTRUCTION FORCES LABOR, FOR THIS PROJECT, IS 93% FOR SHOP WORK AND 134% FOR FIELD WORK, WHICH IS REFLECTED IN THE "OH&P/B&I" COLUMN OF THE ESTIMATE DETAIL.

5. ESCALATION

ESCALATION PERCENTAGES WERE CALCULATED BY THE HANFORD MATERIAL & LABOR ESCALATION STUDY, DATED FEBRUARY 1993.

6. ROUNDING

U.S. DEPARTMENT OF ENERGY - DOE ORDER 5100.4 PAGE J-2 SUBPARAGRAPH (M), REQUIRES ROUNDING OF ALL GENERAL PLANT PROJECTS (GPP'S) AND LINE ITEM (LI) COST ESTIMATES. REFERENCE: DOE 5100.4, FIGURE I-11, DATED 10-31-84.

7. REMARKS

A.) DEFINITIVE DESIGN COSTS ARE BASED ON 25% OF DIRECT CONSTRUCTION COST.
B.) CONSTRUCTION ENGINEERING/INSPECTION COSTS ARE BASED ON 10% OF DIRECT CONSTRUCTION COST.
C.) WHC PROJECT MANAGEMENT COSTS ARE BASED ON 15% OF DIRECT CONSTRUCTION COST.
D.) ASSUMED THAT 10% OF ALL EXCAVATED DIRT WOULD BE CONTAMINATED AND WOULD HAVE TO BE REMOVED, BARRELED AND BURIED.
E.) ALL DUCTS ARE TO BE FABRICATED FROM STAINLESS STEEL.
F.) ALL CONSTRUCTION IS TO BE BY THE ONSTIE CONTRACTOR.
G.) ESTIMATE ASSUMES DUCT TO BE BURIED IN A 4' DEEP HAND DUG TRENCH.
H.) ESTIMATE CONTAINS COST FOR A TEA2 FILTER TRAIN ON THE ANNULUS EXHAUST.
I.) OPC COST ARE 56% OF DIRECT CONSTRUCTION, BASED ON THE C-106 TANK PROJECTS.
J.) AN ALLOWANCE FOR BURNOUT IS INCLUDED IN ESTIMATE, PER KEH PE.

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W-314B
FILE NO. W314SDD2

** IEST - INTERACTIVE ESTIMATING **
241 AZ FARM ANNULUS EXHAUST UPGRADE
STUDY ESTIMATE
DOE_R04 - COST CODE ACCOUNT SUMMARY


DATE 02/11/94 13:47:13
BY GDR

| COST CODE/WBS | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| 000 | ENGINEERING | | | | | | | | | |
| 110000 | DEFINITIVE DESIGN | 1429000 | 0 | 1429000 | 21.90 | 312951 | 1741951 | 30 | 522585 | 2264536 |
| 120000 | ENGINEERING/INSPECTION | 571000 | 0 | 571000 | 37.30 | 212983 | 783983 | 30 | 235195 | 1019178 |
| TOTAL 000 | ENGINEERING | 2000000 | 0 | 2000000 | 26.30 | 525934 | 2525934 | 30 | 757780 | 3283714 |
| 550 | OTHER STRUCTURES | | | | | | | | | |
| 313001 | SITE WORK | 475500 | 0 | 475500 | 31.27 | 148689 | 624189 | 30 | 187257 | 811446 |
| 313002 | VENTILATION BUILDING | 1730520 | 0 | 1730520 | 31.27 | 541134 | 2271654 | 30 | 681496 | 2953150 |
| 313004 | CONTROL ROOM | 858000 | 0 | 858000 | 31.27 | 268297 | 1126297 | 30 | 337889 | 1464186 |
| 313005 | STACK RAD MONITOR | 264000 | 0 | 264000 | 31.27 | 82553 | 346553 | 30 | 103966 | 450519 |
| TOTAL 550 | OTHER STRUCTURES | 3328020 | 0 | 3328020 | 31.27 | 1040673 | 4368693 | 30 | 1310608 | 5679301 |
| 700 | SPECIAL EQUIP/PROCESS SYSTEMS | | | | | | | | | |
| 310001 | AIR EXHAUST FOR ANNULUS | 1704783 | 0 | 1704783 | 30.87 | 526266 | 2231049 | 30 | 669315 | 2900364 |
| 310100 | AIR INTAKE FOR ANNULUS | 644984 | 0 | 644984 | 30.87 | 199106 | 844090 | 30 | 253227 | 1097316 |
| 330000 | BURIAL FEES | 37677 | 0 | 37677 | 30.87 | 11631 | 49308 | 30 | 14792 | 64100 |
| 400000 | WHC PROJECT MANAGEMENT | 857000 | 0 | 857000 | 30.27 | 259414 | 1116414 | 30 | 334924 | 1451338 |
| TOTAL 700 | SPECIAL EQUIP/PROCESS SYSTEM | 3244444 | 0 | 3244444 | 30.71 | 996417 | 4240861 | 30 | 1272258 | 5513118 |
| 900 | OTHER PROJECT COSTS | | | | | | | | | |
| 500000 | OTHER PROJECT COST | 3200000 | 0 | 3200000 | 30.27 | 968640 | 4168640 | 30 | 1250592 | 5419232 |
| TOTAL 900 | OTHER PROJECT COSTS | 3200000 | 0 | 3200000 | 30.27 | 968640 | 4168640 | 30 | 1250592 | 5419232 |
| PROJECT TOTAL | | 11,772,464 | 0 | 11,772,464 | 30.00 | 3,531,664 | 15,304,128 | 30 | 4,591,238 | 19,895,365 |

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W-314B
FILE NO. W314SDD2

** IEST - INTERACTIVE ESTIMATING **
241 AZ FARM ANNULUS EXHAUST UPGRADE
STUDY ESTIMATE
DOE_R05 - ESTIMATE SUMMARY BY CSI DIVISION


DATE 02/11/94 13:47:15
BY GDR

| CSI | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| ENGINEERING | | | | | | | | | | |
| 00 | TECHNICAL SERVICES | 2000000 | 0 | 2000000 | 26.30 | 525934 | 2525934 | 30 | 757780 | 3283714 |
| TOTAL ENGINEERING | | 2,000,000 | 0 | 2,000,000 | 26.30 | 525,934 | 2,525,934 | 30 | 757,780 | 3,283,714 |
| CONSTRUCTION | | | | | | | | | | |
| 01 | GENERAL REQUIRMENTS | 341445 | 0 | 341445 | 30.87 | 105403 | 446848 | 30 | 134054 | 580903 |
| 02 | SITEWORK | 62200 | 0 | 62200 | 30.87 | 19201 | 81401 | 30 | 24420 | 105821 |
| 13 | SPECIAL CONSTRUCTION | 3328020 | 0 | 3328020 | 31.27 | 1040673 | 4368693 | 30 | 1310608 | 5679301 |
| 15 | MECHANICAL | 1876045 | 0 | 1876045 | 30.87 | 579135 | 2455180 | 30 | 736554 | 3191734 |
| 16 | ELECTRICAL | 107754 | 0 | 107754 | 30.87 | 33264 | 141018 | 30 | 42306 | 183322 |
| 19 | PROJECT MANAGEMENT | 857000 | 0 | 857000 | 30.27 | 259414 | 1116414 | 30 | 334924 | 1451338 |
| 20 | OTHER PROJECT COSTS | 3200000 | 0 | 3200000 | 30.27 | 968640 | 4168640 | 30 | 1250592 | 5419232 |
| TOTAL CONSTRUCTION | | 9,772,464 | 0 | 9,772,464 | 30.76 | 3,005,730 | 12,778,194 | 30 | 3,833,458 | 16,611,651 |
| PROJECT TOTAL | | 11,772,464 | 0 | 11,772,464 | 30.00 | 3,531,664 | 15,304,128 | 30 | 4,591,238 | 19,895,365 |

REFERENCE: ESTIMATE BASIS SHEET — PAGE 3 OF 7
COST CODE ACCOUNT SUMMARY — PAGE 4 OF 7

THE U.S. DEPARTMENT OF ENERGY - RICHLAND ORDER 5700.3 "COST ESTIMATING, ANALYSIS AND STANDARDIZATION" DATED 3-27-85, PROVIDES GUIDELINES FOR ESTIMATE CONTINGENCIES. THE GUIDELINE FOR A STUDY ESTIMATE SHOULD HAVE AN OVERALL RANGE OF 20% TO 30% .

CONTINGENCY IS EVALUATED AT THE THIRD COST CODE LEVEL AND SUMMARIZED AT THE PRIMARY AND SECONDARY COST CODE LEVEL OF THE DETAILED COST ESTIMATE.

APPLIED A 30% CONTINGENCY TO THE PROJECT FOR THIS STUDY ESTIMATE DUE TO THE DEFINITIVE DESIGN, CONSTRUCTION ENGINEERING/INSPECTION, WHC PROJECT MANAGEMENT, AND OPC COSTS WERE BASED ON A PERCENTAGE OF DIRECT CONSTRUCTION, AND THE LIMITED AMOUNT OF DETAIL FOR THIS ENGINEERING STUDY.

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W-3148
FILE NO. W314SDD2

** IEST - INTERACTIVE ESTIMATING **
241 AZ FARM ANNULUS EXHAUST UPGRADE
STUDY ESTIMATE
DOE_R07 - ONSITE INDIRECT COSTS BY WBS


DATE 02/11/94 13:47:16
BY GDR

| WBS | DESCRIPTION | ESTIMATE SUBTOTAL | CONTRACT % | ADMINISTRATION TOTAL | BID PACK PREP. | OTHER INDIRECTS | TOTAL INDIRECTS |
|---|---|---|---|---|---|---|---|
| 110000 | DEFINITIVE DESIGN | 1429000 | 0.00 | 0 | 0 | 0 | 0 |
| 120000 | ENGINEERING/INSPECTION | 571000 | 0.00 | 0 | 0 | 0 | 0 |
| 310001 | AIR EXHAUST FOR ANNULUS | 1704783 | 0.00 | 0 | 0 | 0 | 0 |
| 310100 | AIR INTAKE FOR ANNULUS | 644984 | 0.00 | 0 | 0 | 0 | 0 |
| 313001 | SITE WORK | 475500 | 0.00 | 0 | 0 | 0 | 0 |
| 313002 | VENTILATION BUILDING | 1730520 | 0.00 | 0 | 0 | 0 | 0 |
| 313004 | CONTROL ROOM | 858000 | 0.00 | 0 | 0 | 0 | 0 |
| 313005 | STACK RAD MONITOR | 264000 | 0.00 | 0 | 0 | 0 | 0 |
| 330000 | BURIAL FEES | 37677 | 0.00 | 0 | 0 | 0 | 0 |
| 400000 | WHC PROJECT MANAGEMENT | 857000 | 0.00 | 0 | 0 | 0 | 0 |
| 500000 | OTHER PROJECT COST | 3200000 | 0.00 | 0 | 0 | 0 | 0 |
| PROJECT TOTAL | | 11,772,464 | | 0 | 0 | 0 | 0 |

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W314B
FILE NO. W314SDE2

** IEST - INTERACTIVE ESTIMATING **
241-A TANK FARM PRIMARY VENTILATION UPGRADE
STUDY ESTIMATE (FOR ONE TANK)
DOE_R01 - PROJECT COST SUMMARY


DATE 02/11/94 13:43:16
BY GDR

| COST CODE | DESCRIPTION | ESCALATED TOTAL COST | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|
| 000 | ENGINEERING | 2,450,000 | 30 | 730,000 | 3,180,000 |
| 550 | OTHER STRUCTURES | 3,970,000 | 30 | 1,190,000 | 5,160,000 |
| 700 | SPECIAL EQUIP/PROCESS SYSTEMS | 4,330,000 | 30 | 1,300,000 | 5,630,000 |
| | (ADJUSTED TO MEET DOE 5100.4) | 50,000 | | -20,000 | 30,000 |
| | TOTAL ESTIMATED CONSTRUCTION COST | 10,800,000 | | 3,200,000 | 14,000,000 |
| 900 | OTHER COST | 4,010,000 | 30 | 1,200,000 | 5,210,000 |
| | (ADJUSTED TO MEET DOE 5100.4) | -10,000 | | 0 | -10,000 |
| | TOTAL PROJECT COST | 14,800,000 | 30 | 4,400,000 | 19,200,000 |

TYPE OF ESTIMATE STUDY ESTIMATE FEBRUARY 11, 1994

ARCHITECT ENGINEER

OPERATING CONTRACTOR

REMARKS:

(ROUNDED/ADJUSTED TO THE NEAREST " 10,000 / 100,000 " - PERCENTAGES NOT RECALCULATED TO REFLECT ROUNDING)

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W314B
FILE NO. W314SDE2

** IEST - INTERACTIVE ESTIMATING **
241-A TANK FARM PRIMARY VENTILATION UPGRADE
STUDY ESTIMATE (FOR ONE TANK)
DOE_R02 - WORK BREAKDOWN STRUCTURE SUMMARY


DATE 02/11/94 13:43:19
BY GDR

| WBS | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| 110000 | DEFINITIVE DESIGN | 1376000 | 0 | 1376000 | 22.35 | 307536 | 1683536 | 30 | 505061 | 2188597 |
| 120000 | ENGINEERING/INSPECTION | 554000 | 0 | 554000 | 37.81 | 209467 | 763467 | 30 | 229040 | 992508 |
| SUBTOTAL 12 | ENGINEERING/INSPECTION | 554000 | 0 | 554000 | 37.81 | 209467 | 763467 | 30 | 229040 | 992508 |
| SUBTOTAL 1 | ENGINEERING | 1930000 | 0 | 1930000 | 26.79 | 517003 | 2447003 | 30 | 734101 | 3181105 |
| 310006 | SUPPLY AIR INTAKE FOR PRIMARY | 131122 | 0 | 131122 | 31.27 | 41001 | 172123 | 30 | 51637 | 223761 |
| 310007 | PRIMARY EXHAUST | 2059559 | 0 | 2059559 | 31.27 | 644024 | 2703583 | 30 | 811075 | 3514658 |
| 310010 | AIR INTAKE FOR PRIMARY | 43985 | 0 | 43985 | 31.27 | 13754 | 57739 | 30 | 17322 | 75061 |
| 310011 | BURNOUT | 92086 | 0 | 92086 | 31.27 | 28795 | 120881 | 30 | 36264 | 157146 |
| 310014 | PRIMARY EXHAUST FAN/STACK | 148604 | 0 | 148604 | 31.27 | 46468 | 195072 | 30 | 58522 | 253594 |
| 313001 | SITE WORK | 475500 | 0 | 475500 | 31.27 | 148689 | 624189 | 30 | 187257 | 811446 |
| 313002 | VENTILATION BUILDING | 1429560 | 0 | 1429560 | 31.27 | 447023 | 1876583 | 30 | 562975 | 2439558 |
| 313004 | CONTROL ROOM | 858000 | 0 | 858000 | 31.27 | 268297 | 1126297 | 30 | 337889 | 1464186 |
| 313005 | STACK RAD MONITOR | 264000 | 0 | 264000 | 31.27 | 82553 | 346553 | 30 | 103966 | 450519 |
| SUBTOTAL 31 | FA CONST-ONSITE E/C | 5502416 | 0 | 5502416 | 31.27 | 1720604 | 7223020 | 30 | 2166907 | 9389929 |
| SUBTOTAL 3 | CONSTRUCTION | 5502416 | 0 | 5502416 | 31.27 | 1720604 | 7223020 | 30 | 2166907 | 9389929 |
| 400000 | WHC PROJECT MANAGEMENT | 825000 | 0 | 825000 | 30.75 | 253688 | 1078688 | 30 | 323606 | 1402294 |
| SUBTOTAL 4 | PROJECT INTEGRATION | 825000 | 0 | 825000 | 30.75 | 253688 | 1078688 | 30 | 323606 | 1402294 |
| 500000 | OTHER COST | 3081000 | 0 | 3081000 | 30.27 | 932619 | 4013619 | 30 | 1204086 | 5217704 |
| SUBTOTAL 5 | OTHER PROJECT COST | 3081000 | 0 | 3081000 | 30.27 | 932619 | 4013619 | 30 | 1204086 | 5217704 |
| PROJECT TOTAL | | 11,338,416 | 0 | 11,338,416 | 30.20 | 3,423,914 | 14,762,330 | 30 | 4,428,700 | 19,191,032 |

1. DOCUMENTS AND DRAWINGS
==========
DOCUMENTS: DRAFT COPY OF PROJECT W-061, VENTILATION DESIGN ALTERNATIVES.

DRAWINGS: NONE

2. MATERIAL PRICES
==========
UNIT COSTS REPRESENT CURRENT PRICES FOR SPECIFIED MATERIAL.

3. LABOR RATES
==========
CURRENT KEH BASE CRAFT RATES, AS ISSUED BY KEH FINANCE (EFFECTIVE 10-01-93), INCLUDE FRINGE BENEFITS, LABOR INSURANCE, TAXES AND TRAVEL WHERE APPLICABLE, PER HANFORD SITE STABILIZATION AGREEMENT, APPENDIX A (EFFECTIVE 09-06-93). NON CRAFT HOURLY RATES ARE BASED ON THE 1994 FISCAL YEAR BUDGET LIQUIDATION RATES AS ISSUED BY KEH FINANCE (EFFECTIVE 10-01-93).

4. GENERAL REQUIREMENTS/TECHNICAL SERVICES/OVERHEADS
==========
A.) ONSITE CONSTRUCTION FORCES GENERAL REQUIREMENTS, TECHNICAL SERVICES AND CRAFT OVERHEAD COSTS ARE INCLUDED AS A COMPOSITE PERCENTAGE BASED ON THE KEH ESTIMATING FACTOR/BILLING SCHEDULE, REVISION 16, DATED OCTOBER 01, 1993. THE TOTAL COMPOSITE PERCENTAGE APPLIED TO ONSITE CONSTRUCTION FORCES LABOR, FOR THIS PROJECT, IS 93% FOR SHOP WORK AND 134% FOR FIELD WORK, WHICH IS REFLECTED IN THE "OH&P/B&I" COLUMN OF THE ESTIMATE DETAIL.

5. ESCALATION
==========
ESCALATION PERCENTAGES WERE CALCULATED BY THE HANFORD MATERIAL & LABOR ESCALATION STUDY, DATED FEBRUARY 1993.

6. ROUNDING
==========
U.S. DEPARTMENT OF ENERGY - DOE ORDER 5100.4 PAGE I-32 SUBPARAGRAPH (M), REQUIRES ROUNDING OF ALL GENERAL PLANT PROJECTS (GPP'S) AND LINE ITEM (LI) COST ESTIMATES. REFERENCE: DOE 5100.4, FIGURE I-11, DATED 10-31-84.

7. REMARKS
==========
A.) DEFINITIVE DESIGN COSTS ARE BASED ON 25% OF DIRECT CONSTRUCTION COST.
B.) CONSTRUCTION ENGINEERING/INSPECTION COSTS ARE BASED ON 10% OF DIRECT CONSTRUCTION COST.
C.) WHC PROJECT MANAGEMENT COSTS ARE BASED ON 15% OF DIRECT CONSTRUCTION COST.
D.) ALL CONSTRUCTION BY ONSITE FORCES.
E.) ALL ABOVE GROUND DUCTS ARE INSULATED.
F.) ESTIMATE CONTAINS COST FOR A FIG.#1 FILTER TRAIN.

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W314B
FILE NO. W314SDE2

** IEST - INTERACTIVE ESTIMATING **
241-A TANK FARM PRIMARY VENTILATION UPGRADE
STUDY ESTIMATE (FOR ONE TANK)
DOE_R04 - COST CODE ACCOUNT SUMMARY


DATE 02/11/94 13:43:20
BY GDR

| COST CODE/WBS | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| 000 | ENGINEERING | | | | | | | | | |
| 110000 | DEFINITIVE DESIGN | 1376000 | 0 | 1376000 | 22.35 | 307536 | 1683536 | 30 | 505061 | 2188597 |
| 120000 | ENGINEERING/INSPECTION | 554000 | 0 | 554000 | 37.81 | 209467 | 763467 | 30 | 229040 | 992508 |
| TOTAL 000 | ENGINEERING | 1930000 | 0 | 1930000 | 26.79 | 517003 | 2447003 | 30 | 734101 | 3181105 |
| 550 | OTHER STRUCTURES | | | | | | | | | |
| 313001 | SITE WORK | 475500 | 0 | 475500 | 31.27 | 148689 | 624189 | 30 | 187257 | 811446 |
| 313002 | VENTILATION BUILDING | 1429560 | 0 | 1429560 | 31.27 | 447023 | 1876583 | 30 | 562975 | 2439558 |
| 313004 | CONTROL ROOM | 858000 | 0 | 858000 | 31.27 | 268297 | 1126297 | 30 | 337889 | 1464186 |
| 313005 | STACK RAD MONITOR | 264000 | 0 | 264000 | 31.27 | 82553 | 346553 | 30 | 103966 | 450519 |
| TOTAL 550 | OTHER STRUCTURES | 3027060 | 0 | 3027060 | 31.27 | 946562 | 3973622 | 30 | 1192087 | 5165709 |
| 700 | SPECIAL EQUIP/PROCESS SYSTEMS | | | | | | | | | |
| 310006 | SUPPLY AIR INTAKE FOR PRIMARY | 131122 | 0 | 131122 | 31.27 | 41001 | 172123 | 30 | 51637 | 223761 |
| 310007 | PRIMARY EXHAUST | 2059559 | 0 | 2059559 | 31.27 | 644024 | 2703583 | 30 | 811075 | 3514658 |
| 310010 | AIR INTAKE FOR PRIMARY | 43985 | 0 | 43985 | 31.27 | 13754 | 57739 | 30 | 17322 | 75061 |
| 310011 | BURNOUT | 92086 | 0 | 92086 | 31.27 | 28795 | 120881 | 30 | 36264 | 157146 |
| 310014 | PRIMARY EXHAUST FAN/STACK | 148604 | 0 | 148604 | 31.27 | 46468 | 195072 | 30 | 58522 | 253594 |
| 400000 | WHC PROJECT MANAGEMENT | 825000 | 0 | 825000 | 30.75 | 253688 | 1078688 | 30 | 323606 | 1402294 |
| TOTAL 700 | SPECIAL EQUIP/PROCESS SYSTEM | 3300356 | 0 | 3300356 | 31.14 | 1027730 | 4328086 | 30 | 1298426 | 5626514 |
| 900 | OTHER COST | | | | | | | | | |
| 500000 | OTHER COST | 3081000 | 0 | 3081000 | 30.27 | 932619 | 4013619 | 30 | 1204086 | 5217704 |
| TOTAL 900 | OTHER COST | 3081000 | 0 | 3081000 | 30.27 | 932619 | 4013619 | 30 | 1204086 | 5217704 |
| PROJECT TOTAL | | 11,338,416 | 0 | 11,338,416 | 30.20 | 3,423,914 | 14,762,330 | 30 | 4,428,700 | 19,191,032 |

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W314B
FILE NO. W314SDE2

** IEST - INTERACTIVE ESTIMATING **
241-A TANK FARM PRIMARY VENTILATION UPGRADE
STUDY ESTIMATE (FOR ONE TANK)
DOE_R05 - ESTIMATE SUMMARY BY CSI DIVISION


DATE 02/11/94 13:43:22
BY GDR

| CSI | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| ENGINEERING | | | | | | | | | | |
| 00 | TECHNICAL SERVICES | 1930000 | 0 | 1930000 | 26.79 | 517003 | 2447003 | 30 | 734101 | 3181105 |
| TOTAL ENGINEERING | | 1,930,000 | 0 | 1,930,000 | 26.79 | 517,003 | 2,447,003 | 30 | 734,101 | 3,181,105 |
| CONSTRUCTION | | | | | | | | | | |
| 01 | GENERAL REQUIRMENTS | 136071 | 0 | 136071 | 31.27 | 42549 | 178620 | 30 | 53586 | 232207 |
| 13 | SPECIAL CONSTRUCTION | 3027060 | 0 | 3027060 | 31.27 | 946562 | 3973622 | 30 | 1192087 | 5165709 |
| 15 | MECHANICAL | 2153930 | 0 | 2153930 | 31.27 | 673533 | 2827463 | 30 | 848239 | 3675703 |
| 16 | ELECTRICAL | 185355 | 0 | 185355 | 31.27 | 57960 | 243315 | 30 | 72995 | 316310 |
| 19 | PROJECT MANAGEMENT | 825000 | 0 | 825000 | 30.75 | 253688 | 1078688 | 30 | 323606 | 1402294 |
| 20 | (Description not available) | 3081000 | 0 | 3081000 | 30.27 | 932619 | 4013619 | 30 | 1204086 | 5217704 |
| TOTAL CONSTRUCTION | | 9,408,416 | 0 | 9,408,416 | 30.90 | 2,906,911 | 12,315,327 | 30 | 3,694,599 | 16,009,927 |
| PROJECT TOTAL | | 11,338,416 | 0 | 11,338,416 | 30.20 | 3,423,914 | 14,762,330 | 30 | 4,428,700 | 19,191,032 |

REFERENCE: ESTIMATE BASIS SHEET PAGE 3 OF 7
COST CODE ACCOUNT SUMMARY PAGE 4 OF 7

THE U.S. DEPARTMENT OF ENERGY - RICHLAND ORDER 5700.3 "COST ESTIMATING, ANALYSIS AND STANDARDIZATION" DATED 3-27-85, PROVIDES GUIDELINES FOR ESTIMATE CONTINGENCIES. THE GUIDELINE FOR A STUDY ESTIMATE SHOULD HAVE AN OVERALL RANGE OF 20 TO 30%.

CONTINGENCY IS EVALUATED AT THE THIRD COST CODE LEVEL AND SUMMARIZED AT THE PRIMARY AND SECONDARY COST CODE LEVEL OF THE DETAILED COST ESTIMATE.

APPLIED A 30% CONTINGENCY TO THE PROJECT FOR THIS STUDY ESTIMATE DUE TO THE DEFINITIVE DESIGN, CONSTRUCTION ENGINEERING/INSPECTION, AND WHC PROJECT MANAGEMENT COSTS WERE BASED ON A PERCENTAGE OF DIRECT CONSTRUCTION, AND THE LIMITED AMOUNT OF DETAIL FOR THIS ENGINEERING STUDY.

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W314B
FILE NO. W314SDE2

** IEST - INTERACTIVE ESTIMATING **
241-A TANK FARM PRIMARY VENTILATION UPGRADE
STUDY ESTIMATE (FOR ONE TANK)
DOE_R07 - ONSITE INDIRECT COSTS BY WBS


DATE 02/11/94 13:43:24
BY GDR

| WBS | DESCRIPTION | ESTIMATE SUBTOTAL | CONTRACT % | ADMINISTRATION TOTAL | BID PACK PREP. | OTHER INDIRECTS | TOTAL INDIRECTS |
|---|---|---|---|---|---|---|---|
| 110000 | DEFINITIVE DESIGN | 1376000 | 0.00 | 0 | 0 | 0 | 0 |
| 120000 | ENGINEERING/INSPECTION | 554000 | 0.00 | 0 | 0 | 0 | 0 |
| 310006 | SUPPLY AIR INTAKE FOR PRIMARY | 131122 | 0.00 | 0 | 0 | 0 | 0 |
| 310007 | PRIMARY EXHAUST | 2059559 | 0.00 | 0 | 0 | 0 | 0 |
| 310010 | AIR INTAKE FOR PRIMARY | 43985 | 0.00 | 0 | 0 | 0 | 0 |
| 310011 | BURNOUT | 92086 | 0.00 | 0 | 0 | 0 | 0 |
| 310014 | PRIMARY EXHAUST FAN/STACK | 148604 | 0.00 | 0 | 0 | 0 | 0 |
| 313001 | SITE WORK | 475500 | 0.00 | 0 | 0 | 0 | 0 |
| 313002 | VENTILATION BUILDING | 1429560 | 0.00 | 0 | 0 | 0 | 0 |
| 313004 | CONTROL ROOM | 858000 | 0.00 | 0 | 0 | 0 | 0 |
| 313005 | STACK RAD MONITOR | 264000 | 0.00 | 0 | 0 | 0 | 0 |
| 400000 | WHC PROJECT MANAGEMENT | 825000 | 0.00 | 0 | 0 | 0 | 0 |
| 500000 | OTHER COST | 3081000 | 0.00 | 0 | 0 | 0 | 0 |
| PROJECT TOTAL | | 11,338,416 | | 0 | 0 | 0 | 0 |

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W-314B
FILE NO. W314SDF2

** IEST - INTERACTIVE ESTIMATING **
241-SX FARM VENTILATION UPGRADE
STUDY ESTIMATE - PRIMARY EXHAUST
DOE_R01 - PROJECT COST SUMMARY


DATE 02/11/94 13:42:01
BY GDR

| COST CODE | DESCRIPTION | ESCALATED TOTAL COST | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|
| 000 | ENGINEERING | 5,210,000 | 30 | 1,560,000 | 6,770,000 |
| 550 | OTHER STRUCTURES | 4,370,000 | 30 | 1,310,000 | 5,680,000 |
| 700 | SPECIAL EQUIP/PROCESS SYSTEMS | 13,430,000 | 30 | 4,030,000 | 17,460,000 |
| | (ADJUSTED TO MEET DOE 5100.4) | -10,000 | | 0 | -10,000 |
| | TOTAL ESTIAMTED CONSTRUCTION COST | 23,000,000 | | 6,900,000 | 29,900,000 |
| 900 | OTHER PROJECT COSTS | 8,650,000 | 30 | 2,600,000 | 11,250,000 |
| | (ADJUSTED TO MEET DOE 5100.4) | 50,000 | | 0 | 50,000 |
| | TOTAL PROJECT COST | 31,700,000 | 30 | 9,500,000 | 41,200,000 |

| | | |
|---|---|---|
| TYPE OF ESTIMATE | STUDY ESTIMATE | FEBRUARY 11, 1994 |
| ARCHITECT ENGINEER | Derstelle O.W. Oberm | |
| OPERATING CONTRACTOR | R.J. Howell | |

REMARKS:

(ROUNDED/ADJUSTED TO THE NEAREST " 10,000 / 100,000 " - PERCENTAGES NOT RECALCULATED TO REFLECT ROUNDING)

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W-314B
FILE NO. W314SDF2

** IEST - INTERACTIVE ESTIMATING **
241-SX FARM VENTILATION UPGRADE
STUDY ESTIMATE - PRIMARY EXHAUST
DOE_R02 - WORK BREAKDOWN STRUCTURE SUMMARY


DATE 02/11/94 13:42:03
BY GDR

| WBS | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| 110000 | DEFINITIVE DESIGN | 2965000 | 0 | 2965000 | 21.90 | 649335 | 3614335 | 30 | 1084301 | 4698636 |
| 120000 | ENGINEERING/INSPECTION | 1160000 | 0 | 1160000 | 37.30 | 432680 | 1592680 | 30 | 477804 | 2070484 |
| SUBTOTAL 12 | ENGINEERING/INSPECTION | 1160000 | 0 | 1160000 | 37.30 | 432680 | 1592680 | 30 | 477804 | 2070484 |
| SUBTOTAL 1 | ENGINEERING | 4125000 | 0 | 4125000 | 26.23 | 1082015 | 5207015 | 30 | 1562105 | 6769120 |
| 310002 | AIR EXHAUST FOR PRIMARY | 6099036 | 0 | 6099036 | 30.87 | 1882772 | 7981808 | 30 | 2394542 | 10376350 |
| 310200 | AIR INTAKE FOR PRIMARY | 2157672 | 0 | 2157672 | 30.87 | 666073 | 2823745 | 30 | 847123 | 3670869 |
| 313001 | SITE WORK | 475500 | 0 | 475500 | 31.27 | 148689 | 624189 | 30 | 187257 | 811446 |
| 313002 | VENTILATION BUILDING | 1730520 | 0 | 1730520 | 31.27 | 541134 | 2271654 | 30 | 681496 | 2953150 |
| 313004 | CONTROL ROOM | 858000 | 0 | 858000 | 31.27 | 268297 | 1126297 | 30 | 337889 | 1464186 |
| 313005 | STACK RAD MONITOR | 264000 | 0 | 264000 | 31.27 | 82553 | 346553 | 30 | 103966 | 450519 |
| SUBTOTAL 313 | VENTILATION BUILDING | 3328020 | 0 | 3328020 | 31.27 | 1040673 | 4368693 | 30 | 1310608 | 5679301 |
| SUBTOTAL 31 | FA CONST-ONSITE E/C | 11584728 | 0 | 11584728 | 30.98 | 3589518 | 15174246 | 30 | 4552273 | 19726520 |
| 330000 | BURIAL FEES | 275152 | 0 | 275152 | 30.87 | 84939 | 360091 | 30 | 108027 | 468119 |
| SUBTOTAL 33 | BURIAL FEES | 275152 | 0 | 275152 | 30.87 | 84939 | 360091 | 30 | 108027 | 468119 |
| SUBTOTAL 3 | CONSTRUCTION | 11859880 | 0 | 11859880 | 30.98 | 3674457 | 15534337 | 30 | 4660300 | 20194639 |
| 400000 | WHC PROJECT MANAGEMENT | 1740000 | 0 | 1740000 | 30.27 | 526698 | 2266698 | 30 | 680009 | 2946707 |
| SUBTOTAL 4 | PROJECT INTEGRATION | 1740000 | 0 | 1740000 | 30.27 | 526698 | 2266698 | 30 | 680009 | 2946707 |
| 500000 | OTHER PROJECT COST | 6641532 | 0 | 6641532 | 30.27 | 2010392 | 8651924 | 30 | 2595577 | 11247501 |
| SUBTOTAL 5 | OTHER PROJECT COST | 6641532 | 0 | 6641532 | 30.27 | 2010392 | 8651924 | 30 | 2595577 | 11247501 |
| PROJECT TOTAL | | 24,366,412 | 0 | 24,366,412 | 29.93 | 7,293,562 | 31,659,974 | 30 | 9,497,991 | 41,157,967 |

1. DOCUMENTS AND DRAWINGS

DOCUMENTS: ENGINEERING STUDY WHC-SD-W061-ES-001, AND PROJECT W-061 VENTILATION DESIGN ALTERNATIVES DATED SEPTEMBER 15, 1993.

DRAWINGS: NONE

2. MATERIAL PRICES

UNIT COSTS REPRESENT CURRENT PRICES FOR SPECIFIED MATERIAL.

3. LABOR RATES

CURRENT KEH BASE CRAFT RATES, AS ISSUED BY KEH FINANCE (EFFECTIVE 10-01-92), INCLUDE FRINGE BENEFITS, LABOR INSURANCE, TAXES AND TRAVEL WHERE APPLICABLE, PER HANFORD SITE STABILIZATION AGREEMENT, APPENDIX A (EFFECTIVE 9-2-91). NON CRAFT HOURLY RATES ARE BASED ON THE 1993 FISCAL YEAR BUDGET LIQUIDATION RATES AS ISSUED BY KEH FINANCE (EFFECTIVE 10-01-92).

4. GENERAL REQUIREMENTS/TECHNICAL SERVICES/OVERHEADS

A.) ONSITE CONSTRUCTION FORCES GENERAL REQUIREMENTS, TECHNICAL SERVICES AND CRAFT OVERHEAD COSTS ARE INCLUDED AS A COMPOSITE PERCENTAGE BASED ON THE KEH ESTIMATING FACTOR/BILLING SCHEDULE, REVISION 14, DATED OCTOBER 01, 1992. THE TOTAL COMPOSITE PERCENTAGE APPLIED TO ONSITE CONSTRUCTION FORCES LABOR, FOR THIS PROJECT, IS 93% FOR SHOP WORK AND 134% FOR FIELD WORK, WHICH IS REFLECTED IN THE "OH&P/B&I" COLUMN OF THE ESTIMATE DETAIL.

5. ESCALATION

ESCALATION PERCENTAGES WERE CALCULATED BY THE HANFORD MATERIAL & LABOR ESCALATION STUDY, DATED FEBRUARY 1993.

6. ROUNDING

U.S. DEPARTMENT OF ENERGY - DOE ORDER 5100.4 PAGE J-2 SUBPARAGRAPH (M), REQUIRES ROUNDING OF ALL GENERAL PLANT PROJECTS (GPP'S) AND LINE ITEM (LI) COST ESTIMATES. REFERENCE: DOE 5100.4, FIGURE I-11, DATED 10-31-84.

7. REMARKS

A.) DEFINITIVE DESIGN COSTS ARE BASED ON 25% OF DIRECT CONSTRUCTION COST.
B.) CONSTRUCTION ENGINEERING/INSPECTION COSTS ARE BASED ON 10% OF DIRECT CONSTRUCTION COST.
C.) WHC PROJECT MANAGEMENT COSTS ARE BASED ON 15% OF DIRECT CONSTRUCTION COST.
D.) ASSUMED THAT 10% OF ALL EXCAVATED DIRT WOULD BE CONTAMINATED AND WOULD HAVE TO BE REMOVED, BARRELED AND BURIED.
E.) ALL DUCTS ARE TO BE FABRICATED FROM STAINLESS STEEL.
F.) ALL CONSTRUCTION IS TO BE BY THE ONSTIE CONTRACTOR.
G.) ESTIMATE ASSUMES DUCT TO BE BURIED IN A 4' DEEP HAND DUG TRENCH.
H.) ESTIMATE CONTAINS COST FOR A TEA3 FILTER TRAIN ON THE PRIMARY EXHAUST.
I.) OPC COST ARE 56% OF DIRECT CONSTRUCTION, BASED ON THE C-106 TANK PROJECTS.
J.) AN ALLOWANCE FOR BURNOUT IS INCLUDED IN ESTIMATE, PER KEH PE.

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W-314B
FILE NO. W314SDF2

** IEST - INTERACTIVE ESTIMATING **
241-SX FARM VENTILATION UPGRADE
STUDY ESTIMATE - PRIMARY EXHAUST
DOE_R04 - COST CODE ACCOUNT SUMMARY


DATE 02/11/94 13:42:05
BY GDR

| COST CODE/WBS | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| 000 | ENGINEERING | | | | | | | | | |
| 110000 | DEFINITIVE DESIGN | 2965000 | 0 | 2965000 | 21.90 | 649335 | 3614335 | 30 | 1084301 | 4698636 |
| 120000 | ENGINEERING/INSPECTION | 1160000 | 0 | 1160000 | 37.30 | 432680 | 1592680 | 30 | 477804 | 2070484 |
| TOTAL 000 | ENGINEERING | 4125000 | 0 | 4125000 | 26.23 | 1082015 | 5207015 | 30 | 1562105 | 6769120 |
| 550 | OTHER STRUCTURES | | | | | | | | | |
| 313001 | SITE WORK | 475500 | 0 | 475500 | 31.27 | 148689 | 624189 | 30 | 187257 | 811446 |
| 313002 | VENTILATION BUILDING | 1730520 | 0 | 1730520 | 31.27 | 541134 | 2271654 | 30 | 681496 | 2953150 |
| 313004 | CONTROL ROOM | 858000 | 0 | 858000 | 31.27 | 268297 | 1126297 | 30 | 337889 | 1464186 |
| 313005 | STACK RAD MONITOR | 264000 | 0 | 264000 | 31.27 | 82553 | 346553 | 30 | 103966 | 450519 |
| TOTAL 550 | OTHER STRUCTURES | 3328020 | 0 | 3328020 | 31.27 | 1040673 | 4368693 | 30 | 1310608 | 5679301 |
| 700 | SPECIAL EQUIP/PROCESS SYSTEMS | | | | | | | | | |
| 310002 | AIR EXHAUST FOR PRIMARY | 6099036 | 0 | 6099036 | 30.87 | 1882772 | 7981808 | 30 | 2394542 | 10376350 |
| 310200 | AIR INTAKE FOR PRIMARY | 2157672 | 0 | 2157672 | 30.87 | 666073 | 2823745 | 30 | 847123 | 3670869 |
| 330000 | BURIAL FEES | 275152 | 0 | 275152 | 30.87 | 84939 | 360091 | 30 | 108027 | 468119 |
| 400000 | WHC PROJECT MANAGEMENT | 1740000 | 0 | 1740000 | 30.27 | 526698 | 2266698 | 30 | 680009 | 2946707 |
| TOTAL 700 | SPECIAL EQUIP/PROCESS SYSTEM | 10271860 | 0 | 10271860 | 30.77 | 3160482 | 13432342 | 30 | 4029701 | 17462045 |
| 900 | OTHER PROJECT COSTS | | | | | | | | | |
| 500000 | OTHER PROJECT COST | 6641532 | 0 | 6641532 | 30.27 | 2010392 | 8651924 | 30 | 2595577 | 11247501 |
| TOTAL 900 | OTHER PROJECT COSTS | 6641532 | 0 | 6641532 | 30.27 | 2010392 | 8651924 | 30 | 2595577 | 11247501 |
| PROJECT TOTAL | | 24,366,412 | 0 | 24,366,412 | 29.93 | 7,293,562 | 31,659,974 | 30 | 9,497,991 | 41,157,967 |

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W-3148
FILE NO. W314SDF2

** IEST - INTERACTIVE ESTIMATING **
241-SX FARM VENTILATION UPGRADE
STUDY ESTIMATE - PRIMARY EXHAUST
DOE_R05 - ESTIMATE SUMMARY BY CSI DIVISION


DATE 02/11/94 13:42:07
BY GDR

| CSI | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| ENGINEERING | | | | | | | | | | |
| 00 | TECHNICAL SERVICES | 4125000 | 0 | 4125000 | 26.23 | 1082015 | 5207015 | 30 | 1562105 | 6769120 |
| | TOTAL ENGINEERING | 4,125,000 | 0 | 4,125,000 | 26.23 | 1,082,015 | 5,207,015 | 30 | 1,562,105 | 6,769,120 |
| CONSTRUCTION | | | | | | | | | | |
| 01 | GENERAL REQUIRMENTS | 2041671 | 0 | 2041671 | 30.87 | 630263 | 2671934 | 30 | 801580 | 3473515 |
| 02 | SITEWORK | 463062 | 0 | 463062 | 30.87 | 142947 | 606009 | 30 | 181803 | 787812 |
| 13 | SPECIAL CONSTRUCTION | 3328020 | 0 | 3328020 | 31.27 | 1040673 | 4368693 | 30 | 1310608 | 5679301 |
| 15 | MECHANICAL | 5633383 | 0 | 5633383 | 30.87 | 1739025 | 7372408 | 30 | 2211722 | 9584131 |
| 16 | ELECTRICAL | 393744 | 0 | 393744 | 30.87 | 121549 | 515293 | 30 | 154587 | 669880 |
| 19 | PROJECT MANAGEMENT | 1740000 | 0 | 1740000 | 30.27 | 526698 | 2266698 | 30 | 680009 | 2946707 |
| 20 | OTHER PROJECT COSTS | 6641532 | 0 | 6641532 | 30.27 | 2010392 | 8651924 | 30 | 2595577 | 11247501 |
| | TOTAL CONSTRUCTION | 20,241,412 | 0 | 20,241,412 | 30.69 | 6,211,547 | 26,452,959 | 30 | 7,935,886 | 34,388,847 |
| | PROJECT TOTAL | 24,366,412 | 0 | 24,366,412 | 29.93 | 7,293,562 | 31,659,974 | 30 | 9,497,991 | 41,157,967 |

REFERENCE: ESTIMATE BASIS SHEET — PAGE 3 OF 7
COST CODE ACCOUNT SUMMARY — PAGE 4 OF 7

THE U.S. DEPARTMENT OF ENERGY - RICHLAND ORDER 5700.3 "COST ESTIMATING, ANALYSIS AND STANDARDIZATION" DATED 3-27-85, PROVIDES GUIDELINES FOR ESTIMATE CONTINGENCIES. THE GUIDELINE FOR A STUDY ESTIMATE SHOULD HAVE AN OVERALL RANGE OF 20% TO 30% .

CONTINGENCY IS EVALUATED AT THE THIRD COST CODE LEVEL AND SUMMARIZED AT THE PRIMARY AND SECONDARY COST CODE LEVEL OF THE DETAILED COST ESTIMATE.

APPLIED A 30% CONTINGENCY TO THE PROJECT FOR THIS STUDY ESTIMATE DUE TO THE DEFINITIVE DESIGN, CONSTRUCTION ENGINEERING/INSPECTION, WHC PROJECT MANAGEMENT, AND OPC COSTS WERE BASED ON A PERCENTAGE OF DIRECT CONSTRUCTION, AND THE LIMITED AMOUNT OF DETAIL FOR THIS ENGINEERING STUDY.

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W-314B
FILE NO. W314SDF2

** IEST - INTERACTIVE ESTIMATING **
241-SX FARM VENTILATION UPGRADE
STUDY ESTIMATE - PRIMARY EXHAUST
DOE_R07 - ONSITE INDIRECT COSTS BY WBS


DATE 02/11/94 13:42:09
BY GDR

| WBS | DESCRIPTION | ESTIMATE SUBTOTAL | CONTRACT % | ADMINISTRATION TOTAL | BID PACK PREP. | OTHER INDIRECTS | TOTAL INDIRECTS |
|---|---|---|---|---|---|---|---|
| 110000 | DEFINITIVE DESIGN | 2965000 | 0.00 | 0 | 0 | 0 | 0 |
| 120000 | ENGINEERING/INSPECTION | 1160000 | 0.00 | 0 | 0 | 0 | 0 |
| 310002 | AIR EXHAUST FOR PRIMARY | 6099036 | 0.00 | 0 | 0 | 0 | 0 |
| 310200 | AIR INTAKE FOR PRIMARY | 2157672 | 0.00 | 0 | 0 | 0 | 0 |
| 313001 | SITE WORK | 475500 | 0.00 | 0 | 0 | 0 | 0 |
| 313002 | VENTILATION BUILDING | 1730520 | 0.00 | 0 | 0 | 0 | 0 |
| 313004 | CONTROL ROOM | 858000 | 0.00 | 0 | 0 | 0 | 0 |
| 313005 | STACK RAD MONITOR | 264000 | 0.00 | 0 | 0 | 0 | 0 |
| 330000 | BURIAL FEES | 275152 | 0.00 | 0 | 0 | 0 | 0 |
| 400000 | WHC PROJECT MANAGEMENT | 1740000 | 0.00 | 0 | 0 | 0 | 0 |
| 500000 | OTHER PROJECT COST | 6641532 | 0.00 | 0 | 0 | 0 | 0 |
| PROJECT TOTAL | | 24,366,412 | | 0 | 0 | 0 | 0 |

9413221.1202

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W-314B
FILE NO. W314S062

** IEST - INTERACTIVE ESTIMATING **
244-A TANK FARM VENTILATION UPGRADE
STUDY ESTIMATE - PRIMARY EXHAUST
DOE_R01 - PROJECT COST SUMMARY


DATE 02/11/94 13:47:29
BY GDR

| COST CODE | DESCRIPTION | ESCALATED TOTAL COST | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|
| 000 | ENGINEERING | 2,550,000 | 30 | 760,000 | 3,310,000 |
| 550 | OTHER STRUCTURES | 3,970,000 | 30 | 1,190,000 | 5,160,000 |
| 700 | SPECIAL EQUIP/PROCESS SYSTEMS | 4,700,000 | 30 | 1,410,000 | 6,110,000 |
| | (ADJUSTED TO MEET DOE 5100.4) | -20,000 | | 40,000 | 20,000 |
| | TOTAL ESTIMATED CONSTRUCTION COST | 11,200,000 | | 3,400,000 | 14,600,000 |
| 900 | OTHER PROJECT COSTS | 4,200,000 | 30 | 1,260,000 | 5,460,000 |
| | (ADJUSTED TO MEET DOE 5100.4) | 0 | | -60,000 | -60,000 |
| | TOTAL PROJECT COST | 15,400,000 | 30 | 4,600,000 | 20,000,000 |

TYPE OF ESTIMATE: STUDY ESTIMATE FEBRUARY 11, 1994

ARCHITECT ENGINEER: Debbie A.W. Aberson

OPERATING CONTRACTOR: D. Howell

REMARKS:

(ROUNDED/ADJUSTED TO THE NEAREST " 10,000 / 100,000 " - PERCENTAGES NOT RECALCULATED TO REFLECT ROUNDING)

9413221.1203

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W-314B
FILE NO. W314SDG2

** IEST - INTERACTIVE ESTIMATING **
244-A TANK FARM VENTILATION UPGRADE
STUDY ESTIMATE - PRIMARY EXHAUST
DOE_R02 - WORK BREAKDOWN STRUCTURE SUMMARY


DATE 02/11/94 13:47:31
BY GDR

| WBS | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| 110000 | DEFINITIVE DESIGN | 1434000 | 0 | 1434000 | 22.35 | 320499 | 1754499 | 30 | 526350 | 2280849 |
| 120000 | ENGINEERING/INSPECTION | 574000 | 0 | 574000 | 37.81 | 217029 | 791029 | 30 | 237309 | 1028338 |
| SUBTOTAL 12 | ENGINEERING/INSPECTION | 574000 | 0 | 574000 | 37.81 | 217029 | 791029 | 30 | 237309 | 1028338 |
| SUBTOTAL 1 | ENGINEERING | 2008000 | 0 | 2008000 | 26.77 | 537528 | 2545528 | 30 | 763659 | 3309187 |
| 310002 | AIR EXHAUST FOR PRIMARY | 2475894 | 0 | 2475894 | 31.27 | 774213 | 3250107 | 30 | 975031 | 4225138 |
| 310200 | AIR INTAKE FOR PRIMARY | 236439 | 0 | 236439 | 31.27 | 73934 | 310373 | 30 | 93112 | 403485 |
| 313001 | SITE WORK | 475500 | 0 | 475500 | 31.27 | 148689 | 624189 | 30 | 187257 | 811446 |
| 313002 | VENTILATION BUILDING | 1429560 | 0 | 1429560 | 31.27 | 447023 | 1876583 | 30 | 562975 | 2439558 |
| 313004 | CONTROL ROOM | 858000 | 0 | 858000 | 31.27 | 268297 | 1126297 | 30 | 337889 | 1464186 |
| 313005 | STACK RAD MONITOR | 264000 | 0 | 264000 | 31.27 | 82553 | 346553 | 30 | 103966 | 450519 |
| SUBTOTAL 313 | VENTILATION BUILDING | 3027060 | 0 | 3027060 | 31.27 | 946562 | 3973622 | 30 | 1192087 | 5165709 |
| SUBTOTAL 31 | FA CONST-ONSITE E/C | 5739393 | 0 | 5739393 | 31.27 | 1794709 | 7534102 | 30 | 2260230 | 9794332 |
| 330000 | BURIAL FEES | 10394 | 0 | 10394 | 31.27 | 3250 | 13644 | 30 | 4093 | 17737 |
| SUBTOTAL 33 | BURIAL FEES | 10394 | 0 | 10394 | 31.27 | 3250 | 13644 | 30 | 4093 | 17737 |
| SUBTOTAL 3 | CONSTRUCTION | 5749787 | 0 | 5749787 | 31.27 | 1797959 | 7547746 | 30 | 2264323 | 9812069 |
| 400000 | WHC PROJECT MANAGEMENT | 860000 | 0 | 860000 | 30.75 | 264450 | 1124450 | 30 | 337335 | 1461785 |
| SUBTOTAL 4 | PROJECT INTEGRATION | 860000 | 0 | 860000 | 30.75 | 264450 | 1124450 | 30 | 337335 | 1461785 |
| 500000 | OTHER PROJECT COST | 3213000 | 0 | 3213000 | 30.75 | 987998 | 4200998 | 30 | 1260299 | 5461297 |
| SUBTOTAL 5 | OTHER PROJECT COST | 3213000 | 0 | 3213000 | 30.75 | 987998 | 4200998 | 30 | 1260299 | 5461297 |
| PROJECT TOTAL | | 11,830,787 | 0 | 11,830,787 | 30.33 | 3,587,935 | 15,418,722 | 30 | 4,625,616 | 20,044,338 |

1. DOCUMENTS AND DRAWINGS

DOCUMENTS: ENGINEERING STUDY WHC-SD-W061-ES-001, AND PROJECT W-061 VENTILATION DESIGN ALTERNATIVES DATED SEPTEMBER 15, 1993.

DRAWINGS: NONE

2. MATERIAL PRICES

UNIT COSTS REPRESENT CURRENT PRICES FOR SPECIFIED MATERIAL.

3. LABOR RATES

CURRENT KEH BASE CRAFT RATES, AS ISSUED BY KEH FINANCE (EFFECTIVE 10-01-92), INCLUDE FRINGE BENEFITS, LABOR INSURANCE, TAXES AND TRAVEL WHERE APPLICABLE, PER HANFORD SITE STABILIZATION AGREEMENT, APPENDIX A (EFFECTIVE 9-2-91). NON CRAFT HOURLY RATES ARE BASED ON THE 1993 FISCAL YEAR BUDGET LIQUIDATION RATES AS ISSUED BY KEH FINANCE (EFFECTIVE 10-01-92).

4. GENERAL REQUIREMENTS/TECHNICAL SERVICES/OVERHEADS

A.) ONSITE CONSTRUCTION FORCES GENERAL REQUIREMENTS, TECHNICAL SERVICES AND CRAFT OVERHEAD COSTS ARE INCLUDED AS A COMPOSITE PERCENTAGE BASED ON THE KEH ESTIMATING FACTOR/BILLING SCHEDULE, REVISION 14, DATED OCTOBER 01, 1992. THE TOTAL COMPOSITE PERCENTAGE APPLIED TO ONSITE CONSTRUCTION FORCES LABOR, FOR THIS PROJECT, IS 93% FOR SHOP WORK AND 134% FOR FIELD WORK, WHICH IS REFLECTED IN THE "OH&P/B&I" COLUMN OF THE ESTIMATE DETAIL.

5. ESCALATION

ESCALATION PERCENTAGES WERE CALCULATED BY THE HANFORD MATERIAL & LABOR ESCALATION STUDY, DATED FEBRUARY 1993.

6. ROUNDING

U.S. DEPARTMENT OF ENERGY - DOE ORDER 5100.4 PAGE J-2 SUBPARAGRAPH (M), REQUIRES ROUNDING OF ALL GENERAL PLANT PROJECTS (GPP'S) AND LINE ITEM (LI) COST ESTIMATES. REFERENCE: DOE 5100.4, FIGURE I-11, DATED 10-31-84.

7. REMARKS

A.) DEFINITIVE DESIGN COSTS ARE BASED ON 25% OF DIRECT CONSTRUCTION COST.
B.) CONSTRUCTION ENGINEERING/INSPECTION COSTS ARE BASED ON 10% OF DIRECT CONSTRUCTION COST.
C.) WHC PROJECT MANAGEMENT COSTS ARE BASED ON 15% OF DIRECT CONSTRUCTION COST.
D.) ASSUMED THAT 10% OF ALL EXCAVATED DIRT WOULD BE CONTAMINATED AND WOULD HAVE TO BE REMOVED, BARRELED AND BURIED.
E.) ALL DUCTS ARE TO BE FABRICATED FROM STAINLESS STEEL.
F.) ALL CONSTRUCTION IS TO BE BY THE ONSTIE CONTRACTOR.
G.) ESTIMATE ASSUMES DUCT TO BE BURIED IN A 4' DEEP HAND DUG TRENCH.
H.) ESTIMATE CONTAINS COST FOR A TEA3 FILTER TRAIN ON THE PRIMARY EXHAUST.
I.) OPC COST ARE 56% OF DIRECT CONSTRUCTION, BASED ON THE C-106 TANK PROJECTS.
J.) AN ALLOWANCE FOR BURNOUT IS INCLUDED IN THE ESTIMATE, PER KEH PE.

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W-314B
FILE NO. W314SDG2

** IEST - INTERACTIVE ESTIMATING **
244-A TANK FARM VENTILATION UPGRADE
STUDY ESTIMATE - PRIMARY EXHAUST
DOE_R04 - COST CODE ACCOUNT SUMMARY


DATE 02/11/94 13:47:32
BY GDR

| COST CODE/WBS | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| 000 | ENGINEERING | | | | | | | | | |
| 110000 | DEFINITIVE DESIGN | 1434000 | 0 | 1434000 | 22.35 | 320499 | 1754499 | 30 | 526350 | 2280849 |
| 120000 | ENGINEERING/INSPECTION | 574000 | 0 | 574000 | 37.81 | 217029 | 791029 | 30 | 237309 | 1028338 |
| TOTAL 000 | ENGINEERING | 2008000 | 0 | 2008000 | 26.77 | 537528 | 2545528 | 30 | 763659 | 3309187 |
| 550 | OTHER STRUCTURES | | | | | | | | | |
| 313001 | SITE WORK | 475500 | 0 | 475500 | 31.27 | 148689 | 624189 | 30 | 187257 | 811446 |
| 313002 | VENTILATION BUILDING | 1429560 | 0 | 1429560 | 31.27 | 447023 | 1876583 | 30 | 562975 | 2439558 |
| 313004 | CONTROL ROOM | 858000 | 0 | 858000 | 31.27 | 268297 | 1126297 | 30 | 337889 | 1464186 |
| 313005 | STACK RAD MONITOR | 264000 | 0 | 264000 | 31.27 | 82553 | 346553 | 30 | 103966 | 450519 |
| TOTAL 550 | OTHER STRUCTURES | 3027060 | 0 | 3027060 | 31.27 | 946562 | 3973622 | 30 | 1192087 | 5165709 |
| 700 | SPECIAL EQUIP/PROCESS SYSTEMS | | | | | | | | | |
| 310002 | AIR EXHAUST FOR PRIMARY | 2475894 | 0 | 2475894 | 31.27 | 774213 | 3250107 | 30 | 975031 | 4225138 |
| 310200 | AIR INTAKE FOR PRIMARY | 236439 | 0 | 236439 | 31.27 | 73934 | 310373 | 30 | 93112 | 403485 |
| 330000 | BURIAL FEES | 10394 | 0 | 10394 | 31.27 | 3250 | 13644 | 30 | 4093 | 17737 |
| 400000 | WHC PROJECT MANAGEMENT | 860000 | 0 | 860000 | 30.75 | 264450 | 1124450 | 30 | 337335 | 1461785 |
| TOTAL 700 | SPECIAL EQUIP/PROCESS SYSTEM | 3582727 | 0 | 3582727 | 31.15 | 1115847 | 4698574 | 30 | 1409571 | 6108145 |
| 900 | OTHER PROJECT COSTS | | | | | | | | | |
| 500000 | OTHER PROJECT COST | 3213000 | 0 | 3213000 | 30.75 | 987998 | 4200998 | 30 | 1260299 | 5461297 |
| TOTAL 900 | OTHER PROJECT COSTS | 3213000 | 0 | 3213000 | 30.75 | 987998 | 4200998 | 30 | 1260299 | 5461297 |
| PROJECT TOTAL | | 11,830,787 | 0 | 11,830,787 | 30.33 | 3,587,935 | 15,418,722 | 30 | 4,625,616 | 20,044,338 |

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W-314B
FILE NO. W314SDG2

** IEST - INTERACTIVE ESTIMATING **
244-A TANK FARM VENTILATION UPGRADE
STUDY ESTIMATE - PRIMARY EXHAUST
DOE_R05 - ESTIMATE SUMMARY BY CSI DIVISION


DATE 02/11/94 13:47:34
BY GDR

| CSI | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| ENGINEERING | | | | | | | | | | |
| 00 | TECHNICAL SERVICES | 2008000 | 0 | 2008000 | 26.77 | 537528 | 2545528 | 30 | 763659 | 3309187 |
| | TOTAL ENGINEERING | 2,008,000 | 0 | 2,008,000 | 26.77 | 537,528 | 2,545,528 | 30 | 763,659 | 3,309,187 |
| CONSTRUCTION | | | | | | | | | | |
| 01 | GENERAL REQUIRMENTS | 251981 | 0 | 251981 | 31.27 | 78795 | 330776 | 30 | 99232 | 430008 |
| 02 | SITEWORK | 16327 | 0 | 16327 | 31.27 | 5105 | 21432 | 30 | 6429 | 27862 |
| 13 | SPECIAL CONSTRUCTION | 3027060 | 0 | 3027060 | 31.27 | 946562 | 3973622 | 30 | 1192087 | 5165709 |
| 15 | MECHANICAL | 2390898 | 0 | 2390898 | 31.27 | 747634 | 3138532 | 30 | 941560 | 4080091 |
| 16 | ELECTRICAL | 63521 | 0 | 63521 | 31.27 | 19863 | 83384 | 30 | 25015 | 108399 |
| 19 | PROJECT MANAGEMENT | 860000 | 0 | 860000 | 30.75 | 264450 | 1124450 | 30 | 337335 | 1461785 |
| 20 | OTHER PROJECT COSTS | 3213000 | 0 | 3213000 | 30.75 | 987998 | 4200998 | 30 | 1260299 | 5461297 |
| | TOTAL CONSTRUCTION | 9,822,787 | 0 | 9,822,787 | 31.05 | 3,050,407 | 12,873,194 | 30 | 3,861,957 | 16,735,151 |
| | PROJECT TOTAL | 11,830,787 | 0 | 11,830,787 | 30.33 | 3,587,935 | 15,418,722 | 30 | 4,625,616 | 20,044,338 |

REFERENCE: ESTIMATE BASIS SHEET — PAGE 3 OF 7
COST CODE ACCOUNT SUMMARY — PAGE 4 OF 7

THE U.S. DEPARTMENT OF ENERGY - RICHLAND ORDER 5700.3 "COST ESTIMATING, ANALYSIS AND STANDARDIZATION" DATED 3-27-85, PROVIDES GUIDELINES FOR ESTIMATE CONTINGENCIES. THE GUIDELINE FOR A STUDY ESTIMATE SHOULD HAVE AN OVERALL RANGE OF 20% TO 30% .

CONTINGENCY IS EVALUATED AT THE THIRD COST CODE LEVEL AND SUMMARIZED AT THE PRIMARY AND SECONDARY COST CODE LEVEL OF THE DETAILED COST ESTIMATE.

APPLIED A 30% CONTINGENCY TO THE PROJECT FOR THIS STUDY ESTIMATE DUE TO THE DEFINITIVE DESIGN, CONSTRUCTION ENGINEERING/INSPECTION, WHC PROJECT MANAGEMENT, AND OPC COSTS WERE BASED ON A PERCENTAGE OF DIRECT CONSTRUCTION, AND THE LIMITED AMOUNT OF DETAIL FOR THIS ENGINEERING STUDY.

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W-314B
FILE NO. W314SDG2

** IEST - INTERACTIVE ESTIMATING **
244-A TANK FARM VENTILATION UPGRADE
STUDY ESTIMATE - PRIMARY EXHAUST
DOE_R07 - ONSITE INDIRECT COSTS BY WBS


DATE 02/11/94 13:47:35
BY GDR

| WBS | DESCRIPTION | ESTIMATE SUBTOTAL | CONTRACT % | ADMINISTRATION TOTAL | BID PACK PREP. | OTHER INDIRECTS | TOTAL INDIRECTS |
|---|---|---|---|---|---|---|---|
| 110000 | DEFINITIVE DESIGN | 1434000 | 0.00 | 0 | 0 | 0 | 0 |
| 120000 | ENGINEERING/INSPECTION | 574000 | 0.00 | 0 | 0 | 0 | 0 |
| 310002 | AIR EXHAUST FOR PRIMARY | 2475894 | 0.00 | 0 | 0 | 0 | 0 |
| 310200 | AIR INTAKE FOR PRIMARY | 236439 | 0.00 | 0 | 0 | 0 | 0 |
| 313001 | SITE WORK | 475500 | 0.00 | 0 | 0 | 0 | 0 |
| 313002 | VENTILATION BUILDING | 1429560 | 0.00 | 0 | 0 | 0 | 0 |
| 313004 | CONTROL ROOM | 858000 | 0.00 | 0 | 0 | 0 | 0 |
| 313005 | STACK RAD MONITOR | 264000 | 0.00 | 0 | 0 | 0 | 0 |
| 330000 | BURIAL FEES | 10394 | 0.00 | 0 | 0 | 0 | 0 |
| 400000 | WHC PROJECT MANAGEMENT | 860000 | 0.00 | 0 | 0 | 0 | 0 |
| 500000 | OTHER PROJECT COST | 3213000 | 0.00 | 0 | 0 | 0 | 0 |
| PROJECT TOTAL | | 11,830,787 | | 0 | 0 | 0 | 0 |

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W-314B
FILE NO. W314SDH2

** IEST - INTERACTIVE ESTIMATING **
244-BX TANK FARM VENTILATION UPGRADE
STUDY ESTIMATE - PRIMARY EXHAUST
DOE_R01 - PROJECT COST SUMMARY


DATE 02/11/94 13:44:37
BY GDR

| COST CODE | DESCRIPTION | ESCALATED TOTAL COST | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|
| 000 | ENGINEERING | 2,550,000 | 30 | 760,000 | 3,310,000 |
| 550 | OTHER STRUCTURES | 3,970,000 | 30 | 1,190,000 | 5,160,000 |
| 700 | SPECIAL EQUIP/PROCESS SYSTEMS | 4,700,000 | 30 | 1,410,000 | 6,110,000 |
| | (ADJUSTED TO MEET DOE 5100.4) | -20,000 | | 40,000 | 20,000 |
| | TOTAL ESTIMATED CONSTRUCTION COST | 11,200,000 | | 3,400,000 | 14,600,000 |
| 900 | OTHER PROJECT COSTS | 4,200,000 | 30 | 1,260,000 | 5,460,000 |
| | (ADJUSTED TO MEET DOE 5100.4) | 0 | | -60,000 | -60,000 |
| | TOTAL PROJECT COST | 15,400,000 | 30 | 4,600,000 | 20,000,000 |

TYPE OF ESTIMATE: STUDY ESTIMATE FEBRUARY 11, 1994

ARCHITECT ENGINEER: Dale Butler G.W. Abram

OPERATING CONTRACTOR: J.R. Howell

REMARKS:

(ROUNDED/ADJUSTED TO THE NEAREST " 10,000 / 100,000 " - PERCENTAGES NOT RECALCULATED TO REFLECT ROUNDING)

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W-314B
FILE NO. W314SDH2

** IEST - INTERACTIVE ESTIMATING **
244-BX TANK FARM VENTILATION UPGRADE
STUDY ESTIMATE - PRIMARY EXHAUST
DOE_R02 - WORK BREAKDOWN STRUCTURE SUMMARY


DATE 02/11/94 13:44:39
BY GDR

| WBS | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| 110000 | DEFINITIVE DESIGN | 1434000 | 0 | 1434000 | 22.35 | 320499 | 1754499 | 30 | 526350 | 2280849 |
| 120000 | ENGINEERING/INSPECTION | 574000 | 0 | 574000 | 37.81 | 217029 | 791029 | 30 | 237309 | 1028338 |
| SUBTOTAL 12 | ENGINEERING/INSPECTION | 574000 | 0 | 574000 | 37.81 | 217029 | 791029 | 30 | 237309 | 1028338 |
| SUBTOTAL 1 | ENGINEERING | 2008000 | 0 | 2008000 | 26.77 | 537528 | 2545528 | 30 | 763659 | 3309187 |
| 310002 | AIR EXHAUST FOR PRIMARY | 2475894 | 0 | 2475894 | 31.27 | 774213 | 3250107 | 30 | 975031 | 4225138 |
| 310200 | AIR INTAKE FOR PRIMARY | 236439 | 0 | 236439 | 31.27 | 73934 | 310373 | 30 | 93112 | 403485 |
| 313001 | SITE WORK | 475500 | 0 | 475500 | 31.27 | 148689 | 624189 | 30 | 187257 | 811446 |
| 313002 | VENTILATION BUILDING | 1429560 | 0 | 1429560 | 31.27 | 447023 | 1876583 | 30 | 562975 | 2439558 |
| 313004 | CONTROL ROOM | 858000 | 0 | 858000 | 31.27 | 268297 | 1126297 | 30 | 337889 | 1464186 |
| 313005 | STACK RAD MONITOR | 264000 | 0 | 264000 | 31.27 | 82553 | 346553 | 30 | 103966 | 450519 |
| SUBTOTAL 313 | VENTILATION BUILDING | 3027060 | 0 | 3027060 | 31.27 | 946562 | 3973622 | 30 | 1192087 | 5165709 |
| SUBTOTAL 31 | FA CONST-ONSITE E/C | 5739393 | 0 | 5739393 | 31.27 | 1794709 | 7534102 | 30 | 2260230 | 9794332 |
| 330000 | BURIAL FEES | 10394 | 0 | 10394 | 31.27 | 3250 | 13644 | 30 | 4093 | 17737 |
| SUBTOTAL 33 | BURIAL FEES | 10394 | 0 | 10394 | 31.27 | 3250 | 13644 | 30 | 4093 | 17737 |
| SUBTOTAL 3 | CONSTRUCTION | 5749787 | 0 | 5749787 | 31.27 | 1797959 | 7547746 | 30 | 2264323 | 9812069 |
| 400000 | WHC PROJECT MANAGEMENT | 860000 | 0 | 860000 | 30.75 | 264450 | 1124450 | 30 | 337335 | 1461785 |
| SUBTOTAL 4 | PROJECT INTEGRATION | 860000 | 0 | 860000 | 30.75 | 264450 | 1124450 | 30 | 337335 | 1461785 |
| 500000 | OTHER PROJECT COST | 3213000 | 0 | 3213000 | 30.75 | 987998 | 4200998 | 30 | 1260299 | 5461297 |
| SUBTOTAL 5 | OTHER PROJECT COST | 3213000 | 0 | 3213000 | 30.75 | 987998 | 4200998 | 30 | 1260299 | 5461297 |
| PROJECT TOTAL | | 11,830,787 | 0 | 11,830,787 | 30.33 | 3,587,935 | 15,418,722 | 30 | 4,625,616 | 20,044,338 |

1. DOCUMENTS AND DRAWINGS

DOCUMENTS: ENGINEERING STUDY WHC-SD-W061-ES-001, AND PROJECT W-061 VENTILATION DESIGN ALTERNATIVES DATED SEPTEMBER 15, 1993.

DRAWINGS: NONE

2. MATERIAL PRICES

UNIT COSTS REPRESENT CURRENT PRICES FOR SPECIFIED MATERIAL.

3. LABOR RATES

CURRENT KEH BASE CRAFT RATES, AS ISSUED BY KEH FINANCE (EFFECTIVE 10-01-92), INCLUDE FRINGE BENEFITS, LABOR INSURANCE, TAXES AND TRAVEL WHERE APPLICABLE, PER HANFORD SITE STABILIZATION AGREEMENT, APPENDIX A (EFFECTIVE 9-2-91). NON CRAFT HOURLY RATES ARE BASED ON THE 1993 FISCAL YEAR BUDGET LIQUIDATION RATES AS ISSUED BY KEH FINANCE (EFFECTIVE 10-01-92).

4. GENERAL REQUIREMENTS/TECHNICAL SERVICES/OVERHEADS

A.) ONSITE CONSTRUCTION FORCES GENERAL REQUIREMENTS, TECHNICAL SERVICES AND CRAFT OVERHEAD COSTS ARE INCLUDED AS A COMPOSITE PERCENTAGE BASED ON THE KEH ESTIMATING FACTOR/BILLING SCHEDULE, REVISION 14, DATED OCTOBER 01, 1992. THE TOTAL COMPOSITE PERCENTAGE APPLIED TO ONSITE CONSTRUCTION FORCES LABOR, FOR THIS PROJECT, IS 93% FOR SHOP WORK AND 134% FOR FIELD WORK, WHICH IS REFLECTED IN THE "OH&P/B&I" COLUMN OF THE ESTIMATE DETAIL.

5. ESCALATION

ESCALATION PERCENTAGES WERE CALCULATED BY THE HANFORD MATERIAL & LABOR ESCALATION STUDY, DATED FEBRUARY 1993.

6. ROUNDING

U.S. DEPARTMENT OF ENERGY - DOE ORDER 5100.4 PAGE J-2 SUBPARAGRAPH (M), REQUIRES ROUNDING OF ALL GENERAL PLANT PROJECTS (GPP'S) AND LINE ITEM (LI) COST ESTIMATES. REFERENCE: DOE 5100.4, FIGURE 1-11, DATED 10-31-84.

7. REMARKS

A.) DEFINITIVE DESIGN COSTS ARE BASED ON 25% OF DIRECT CONSTRUCTION COST.
B.) CONSTRUCTION ENGINEERING/INSPECTION COSTS ARE BASED ON 10% OF DIRECT CONSTRUCTION COST.
C.) WHC PROJECT MANAGEMENT COSTS ARE BASED ON 15% OF DIRECT CONSTRUCTION COST.
D.) ASSUMED THAT 10% OF ALL EXCAVATED DIRT WOULD BE CONTAMINATED AND WOULD HAVE TO BE REMOVED, BARRELED AND BURIED.
E.) ALL DUCTS ARE TO BE FABRICATED FROM STAINLESS STEEL.
F.) ALL CONSTRUCTION IS TO BE BY THE ONSTIE CONTRACTOR.
G.) ESTIMATE ASSUMES DUCT TO BE BURIED IN A 4' DEEP HAND DUG TRENCH.
H.) ESTIMATE CONTAINS COST FOR A TEA3 FILTER TRAIN ON THE PRIMARY EXHAUST.
I.) OPC COST ARE 56% OF DIRECT CONSTRUCTION, BASED ON THE C-106 TANK PROJECTS.
J.) AN ALLOWANCE FOR BURNOUT IS INCLUDED IN THE ESTIMATE, PER KEH PE.

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W-314B
FILE NO. W314SDH2

** IEST - INTERACTIVE ESTIMATING **
244-BX TANK FARM VENTILATION UPGRADE
STUDY ESTIMATE - PRIMARY EXHAUST
DOE_R04 - COST CODE ACCOUNT SUMMARY


DATE 02/11/94 13:44:41
BY GDR

| COST CODE/WBS | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| 000 | ENGINEERING | | | | | | | | | |
| 110000 | DEFINITIVE DESIGN | 1434000 | 0 | 1434000 | 22.35 | 320499 | 1754499 | 30 | 526350 | 2280849 |
| 120000 | ENGINEERING/INSPECTION | 574000 | 0 | 574000 | 37.81 | 217029 | 791029 | 30 | 237309 | 1028338 |
| TOTAL 000 | ENGINEERING | 2008000 | 0 | 2008000 | 26.77 | 537528 | 2545528 | 30 | 763659 | 3309187 |
| 550 | OTHER STRUCTURES | | | | | | | | | |
| 313001 | SITE WORK | 475500 | 0 | 475500 | 31.27 | 148689 | 624189 | 30 | 187257 | 811446 |
| 313002 | VENTILATION BUILDING | 1429560 | 0 | 1429560 | 31.27 | 447023 | 1876583 | 30 | 562975 | 2439558 |
| 313004 | CONTROL ROOM | 858000 | 0 | 858000 | 31.27 | 268297 | 1126297 | 30 | 337889 | 1464186 |
| 313005 | STACK RAD MONITOR | 264000 | 0 | 264000 | 31.27 | 82553 | 346553 | 30 | 103966 | 450519 |
| TOTAL 550 | OTHER STRUCTURES | 3027060 | 0 | 3027060 | 31.27 | 946562 | 3973622 | 30 | 1192087 | 5165709 |
| 700 | SPECIAL EQUIP/PROCESS SYSTEMS | | | | | | | | | |
| 310002 | AIR EXHAUST FOR PRIMARY | 2475894 | 0 | 2475894 | 31.27 | 774213 | 3250107 | 30 | 975031 | 4225138 |
| 310200 | AIR INTAKE FOR PRIMARY | 236439 | 0 | 236439 | 31.27 | 73934 | 310373 | 30 | 93112 | 403485 |
| 330000 | BURIAL FEES | 10394 | 0 | 10394 | 31.27 | 3250 | 13644 | 30 | 4093 | 17737 |
| 400000 | WHC PROJECT MANAGEMENT | 860000 | 0 | 860000 | 30.75 | 264450 | 1124450 | 30 | 337335 | 1461785 |
| TOTAL 700 | SPECIAL EQUIP/PROCESS SYSTEM | 3582727 | 0 | 3582727 | 31.15 | 1115847 | 4698574 | 30 | 1409571 | 6108145 |
| 900 | OTHER PROJECT COSTS | | | | | | | | | |
| 500000 | OTHER PROJECT COST | 3213000 | 0 | 3213000 | 30.75 | 987998 | 4200998 | 30 | 1260299 | 5461297 |
| TOTAL 900 | OTHER PROJECT COSTS | 3213000 | 0 | 3213000 | 30.75 | 987998 | 4200998 | 30 | 1260299 | 5461297 |
| PROJECT TOTAL | | 11,830,787 | 0 | 11,830,787 | 30.33 | 3,587,935 | 15,418,722 | 30 | 4,625,616 | 20,044,338 |

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W-314B
FILE NO. W314SDH2

** IEST - INTERACTIVE ESTIMATING **
244-BX TANK FARM VENTILATION UPGRADE
STUDY ESTIMATE - PRIMARY EXHAUST
DOE_R05 - ESTIMATE SUMMARY BY CSI DIVISION


DATE 02/11/94 13:44:43
BY GDR

| CSI | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| ENGINEERING | | | | | | | | | | |
| 00 | TECHNICAL SERVICES | 2008000 | 0 | 2008000 | 26.77 | 537528 | 2545528 | 30 | 763659 | 3309187 |
| TOTAL ENGINEERING | | 2,008,000 | 0 | 2,008,000 | 26.77 | 537,528 | 2,545,528 | 30 | 763,659 | 3,309,187 |
| CONSTRUCTION | | | | | | | | | | |
| 01 | GENERAL REQUIRMENTS | 251981 | 0 | 251981 | 31.27 | 78795 | 330776 | 30 | 99232 | 430008 |
| 02 | SITEWORK | 16327 | 0 | 16327 | 31.27 | 5105 | 21432 | 30 | 6429 | 27862 |
| 13 | SPECIAL CONSTRUCTION | 3027060 | 0 | 3027060 | 31.27 | 946562 | 3973622 | 30 | 1192087 | 5165709 |
| 15 | MECHANICAL | 2390898 | 0 | 2390898 | 31.27 | 747634 | 3138532 | 30 | 941560 | 4080091 |
| 16 | ELECTRICAL | 63521 | 0 | 63521 | 31.27 | 19863 | 83384 | 30 | 25015 | 108399 |
| 19 | PROJECT MANAGEMENT | 860000 | 0 | 860000 | 30.75 | 264450 | 1124450 | 30 | 337335 | 1461785 |
| 20 | OTHER PROJECT COSTS | 3213000 | 0 | 3213000 | 30.75 | 987998 | 4200998 | 30 | 1260299 | 5461297 |
| TOTAL CONSTRUCTION | | 9,822,787 | 0 | 9,822,787 | 31.05 | 3,050,407 | 12,873,194 | 30 | 3,861,957 | 16,735,151 |
| PROJECT TOTAL | | 11,830,787 | 0 | 11,830,787 | 30.33 | 3,587,935 | 15,418,722 | 30 | 4,625,616 | 20,044,338 |

REFERENCE: ESTIMATE BASIS SHEET — PAGE 3 OF 7
COST CODE ACCOUNT SUMMARY — PAGE 4 OF 7

THE U.S. DEPARTMENT OF ENERGY - RICHLAND ORDER 5700.3 "COST ESTIMATING, ANALYSIS AND STANDARDIZATION" DATED 3-27-85, PROVIDES GUIDELINES FOR ESTIMATE CONTINGENCIES. THE GUIDELINE FOR A STUDY ESTIMATE SHOULD HAVE AN OVERALL RANGE OF 20% TO 30% .

CONTINGENCY IS EVALUATED AT THE THIRD COST CODE LEVEL AND SUMMARIZED AT THE PRIMARY AND SECONDARY COST CODE LEVEL OF THE DETAILED COST ESTIMATE.

APPLIED A 30% CONTINGENCY TO THE PROJECT FOR THIS STUDY ESTIMATE DUE TO THE DEFINITIVE DESIGN, CONSTRUCTION ENGINEERING/INSPECTION, WHC PROJECT MANAGEMENT, AND OPC COSTS WERE BASED ON A PERCENTAGE OF DIRECT CONSTRUCTION, AND THE LIMITED AMOUNT OF DETAIL FOR THIS ENGINEERING STUDY.

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W-314B
FILE NO. W314SDH2

** IEST - INTERACTIVE ESTIMATING **
244-BX TANK FARM VENTILATION UPGRADE
STUDY ESTIMATE - PRIMARY EXHAUST
DOE_R07 - ONSITE INDIRECT COSTS BY WBS


DATE 02/11/94 13:44:45
BY GDR

| WBS | DESCRIPTION | ESTIMATE SUBTOTAL | CONTRACT % | ADMINISTRATION TOTAL | BID PACK PREP. | OTHER INDIRECTS | TOTAL INDIRECTS |
|---|---|---|---|---|---|---|---|
| 110000 | DEFINITIVE DESIGN | 1434000 | 0.00 | 0 | 0 | 0 | 0 |
| 120000 | ENGINEERING/INSPECTION | 574000 | 0.00 | 0 | 0 | 0 | 0 |
| 310002 | AIR EXHAUST FOR PRIMARY | 2475894 | 0.00 | 0 | 0 | 0 | 0 |
| 310200 | AIR INTAKE FOR PRIMARY | 236439 | 0.00 | 0 | 0 | 0 | 0 |
| 313001 | SITE WORK | 475500 | 0.00 | 0 | 0 | 0 | 0 |
| 313002 | VENTILATION BUILDING | 1429560 | 0.00 | 0 | 0 | 0 | 0 |
| 313004 | CONTROL ROOM | 858000 | 0.00 | 0 | 0 | 0 | 0 |
| 313005 | STACK RAD MONITOR | 264000 | 0.00 | 0 | 0 | 0 | 0 |
| 330000 | BURIAL FEES | 10394 | 0.00 | 0 | 0 | 0 | 0 |
| 400000 | WHC PROJECT MANAGEMENT | 860000 | 0.00 | 0 | 0 | 0 | 0 |
| 500000 | OTHER PROJECT COST | 3213000 | 0.00 | 0 | 0 | 0 | 0 |
| PROJECT TOTAL | | 11,830,787 | | 0 | 0 | 0 | 0 |

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W-314B
FILE NO. W314SD12

** IEST - INTERACTIVE ESTIMATING **
244-S TANK FARM VENTILATION UPGRADE
STUDY ESTIMATE - PRIMARY EXHAUST
DOE_R01 - PROJECT COST SUMMARY


DATE 02/11/94 13:49:13
BY GDR

| COST CODE | DESCRIPTION | ESCALATED TOTAL COST | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|
| 000 | ENGINEERING | 2,550,000 | 30 | 760,000 | 3,310,000 |
| 550 | OTHER STRUCTURES | 3,970,000 | 30 | 1,190,000 | 5,160,000 |
| 700 | SPECIAL EQUIP/PROCESS SYSTEMS | 4,700,000 | 30 | 1,410,000 | 6,110,000 |
| | (ADJUSTED TO MEET DOE 5100.4) | -20,000 | | 40,000 | 20,000 |
| | TOTAL ESTIMATED CONSTRUCTION COST | 11,200,000 | | 3,400,000 | 14,600,000 |
| 900 | OTHER PROJECT COSTS | 4,200,000 | 30 | 1,260,000 | 5,460,000 |
| | (ADJUSTED TO MEET DOE 5100.4) | 0 | | -60,000 | -60,000 |
| | TOTAL PROJECT COST | 15,400,000 | 30 | 4,600,000 | 20,000,000 |

| | | |
|---|---|---|
| TYPE OF ESTIMATE | STUDY ESTIMATE | FEBRUARY 11, 1994 |
| ARCHITECT ENGINEER | | |
| OPERATING CONTRACTOR | | |

REMARKS:

(ROUNDED/ADJUS ED TO THE NEAREST " 10,000 / 100,000 " - PERCENTAGES NOT RECALCULATED TO REFLECT ROUNDING)

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W-314B
FILE NO. W314SD12

** IEST - INTERACTIVE ESTIMATING **
244-S TANK FARM VENTILATION UPGRADE
STUDY ESTIMATE - PRIMARY EXHAUST
DOE_R02 - WORK BREAKDOWN STRUCTURE SUMMARY


DATE 02/11/94 13:49:14
BY GDR

| WBS | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| 110000 | DEFINITIVE DESIGN | 1434000 | 0 | 1434000 | 22.35 | 320499 | 1754499 | 30 | 526350 | 2280849 |
| 120000 | ENGINEERING/INSPECTION | 574000 | 0 | 574000 | 37.81 | 217029 | 791029 | 30 | 237309 | 1028338 |
| SUBTOTAL 12 | ENGINEERING/INSPECTION | 574000 | 0 | 574000 | 37.81 | 217029 | 791029 | 30 | 237309 | 1028338 |
| SUBTOTAL 1 | ENGINEERING | 2008000 | 0 | 2008000 | 26.77 | 537528 | 2545528 | 30 | 763659 | 3309187 |
| 310002 | AIR EXHAUST FOR PRIMARY | 2475894 | 0 | 2475894 | 31.27 | 774213 | 3250107 | 30 | 975031 | 4225138 |
| 310200 | AIR INTAKE FOR PRIMARY | 236439 | 0 | 236439 | 31.27 | 73934 | 310373 | 30 | 93112 | 403485 |
| 313001 | SITE WORK | 475500 | 0 | 475500 | 31.27 | 148689 | 624189 | 30 | 187257 | 811446 |
| 313002 | VENTILATION BUILDING | 1429560 | 0 | 1429560 | 31.27 | 447023 | 1876583 | 30 | 562975 | 2439558 |
| 313004 | CONTROL ROOM | 858000 | 0 | 858000 | 31.27 | 268297 | 1126297 | 30 | 337889 | 1464186 |
| 313005 | STACK RAD MONITOR | 264000 | 0 | 264000 | 31.27 | 82553 | 346553 | 30 | 103966 | 450519 |
| SUBTOTAL 313 | VENTILATION BUILDING | 3027060 | 0 | 3027060 | 31.27 | 946562 | 3973622 | 30 | 1192087 | 5165709 |
| SUBTOTAL 31 | FA CONST-ONSITE E/C | 5739393 | 0 | 5739393 | 31.27 | 1794709 | 7534102 | 30 | 2260230 | 9794332 |
| 330000 | BURIAL FEES | 10394 | 0 | 10394 | 31.27 | 3250 | 13644 | 30 | 4093 | 17737 |
| SUBTOTAL 33 | BURIAL FEES | 10394 | 0 | 10394 | 31.27 | 3250 | 13644 | 30 | 4093 | 17737 |
| SUBTOTAL 3 | CONSTRUCTION | 5749787 | 0 | 5749787 | 31.27 | 1797959 | 7547746 | 30 | 2264323 | 9812069 |
| 400000 | WHC PROJECT MANAGEMENT | 860000 | 0 | 860000 | 30.75 | 264450 | 1124450 | 30 | 337335 | 1461785 |
| SUBTOTAL 4 | PROJECT INTEGRATION | 860000 | 0 | 860000 | 30.75 | 264450 | 1124450 | 30 | 337335 | 1461785 |
| 500000 | OTHER PROJECT COST | 3213000 | 0 | 3213000 | 30.75 | 987998 | 4200998 | 30 | 1260299 | 5461297 |
| SUBTOTAL 5 | OTHER PROJECT COST | 3213000 | 0 | 3213000 | 30.75 | 987998 | 4200998 | 30 | 1260299 | 5461297 |
| PROJECT TOTAL | | 11,830,787 | 0 | 11,830,787 | 30.33 | 3,587,935 | 15,418,722 | 30 | 4,625,616 | 20,044,338 |

1. DOCUMENTS AND DRAWINGS

DOCUMENTS: ENGINEERING STUDY WHC-SD-W061-ES-001, AND PROJECT W-061 VENTILATION DESIGN ALTERNATIVES DATED SEPTEMBER 15, 1993.

DRAWINGS: NONE

2. MATERIAL PRICES

UNIT COSTS REPRESENT CURRENT PRICES FOR SPECIFIED MATERIAL.

3. LABOR RATES

CURRENT KEH BASE CRAFT RATES, AS ISSUED BY KEH FINANCE (EFFECTIVE 10-01-92), INCLUDE FRINGE BENEFITS, LABOR INSURANCE, TAXES AND TRAVEL WHERE AP.LICABLE, PER HANFORD SITE STABILIZATION AGREEMENT, APPENDIX A (EFFECTIVE 9-2-91). NON CRAFT HOURLY RATES ARE BASED ON THE 1993 FISCAL YEAR BUDGET LIQUIDATION RATES AS ISSUED BY KEH FINANCE (EFFECTIVE 10-01-92).

4. GENERAL REQUIREMENTS/TECHNICAL SERVICES/OVERHEADS

A.) ONSITE CONSTRUCTION FORCES GENERAL REQUIREMENTS, TECHNICAL SERVICES AND CRAFT OVERHEAD COSTS ARE INCLUDED AS A COMPOSITE PERCENTAGE BASED ON THE KEH ESTIMATING FACTOR/BILLING SCHEDULE, REVISION 14, DATED OCTOBER 01, 1992. THE TOTAL COMPOSITE PERCENTAGE APPLIED TO ONSITE CONSTRUCTION FORCES LABOR, FOR THIS PROJECT, IS 93% FOR SHOP WORK AND 134% FOR FIELD WORK, WHICH IS REFLECTED IN THE "OH&P/B&I" COLUMN OF THE ESTIMATE DETAIL.

5. ESCALATION

ESCALATION PERCENTAGES WERE CALCULATED BY THE HANFORD MATERIAL & LABOR ESCALATION STUDY, DATED FEBRUARY 1993.

6. ROUNDING

U.S. DEPARTMENT OF ENERGY - DOE ORDER 5100.4 PAGE J-2 SUBPARAGRAPH (M), REQUIRES ROUNDING OF ALL GENERAL PLANT PROJECTS (GPP'S) AND LINE ITEM (LI) COST ESTIMATES. REFERENCE: DOE 5100.4, FIGURE I-11, DATED 10-31-84.

7. REMARKS

A.) DEFINITIVE DESIGN COSTS ARE BASED ON 25% OF DIRECT CONSTRUCTION COST.
B.) CONSTRUCTION ENGINEERING/INSPECTION COSTS ARE BASED ON 10% OF DIRECT CONSTRUCTION COST.
C.) WHC PROJECT MANAGEMENT COSTS ARE BASED ON 15% OF DIRECT CONSTRUCTION COST.
D.) ASSUMED THAT 10% OF ALL EXCAVATED DIRT WOULD BE CONTAMINATED AND WOULD HAVE TO BE REMOVED, BARRELED AND BURIED.
E.) ALL DUCTS ARE TO BE FABRICATED FROM STAINLESS STEEL.
F.) ALL CONSTRUCTION IS TO BE BY THE ONSTIE CONTRACTOR.
G.) ESTIMATE ASSUMES DUCT TO BE BURIED IN A 4' DEEP HAND DUG TRENCH.
H.) ESTIMATE CONTAINS COST FOR A TEA3 FILTER TRAIN ON THE PRIMARY EXHAUST.
I.) OPC COST ARE 56% OF DIRECT CONSTRUCTION, BASED ON THE C-106 TANK PROJECTS.
J.) AN ALLOWANCE FOR BURNOUT IS INCLUDED IN THE ESTIMATE, PER KEH PE.

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W-314B
FILE NO. W314SD12

** IEST - INTERACTIVE ESTIMATING **
244-S TANK FARM VENTILATION UPGRADE
STUDY ESTIMATE - PRIMARY EXHAUST
DOE_R04 - COST CODE ACCOUNT SUMMARY


DATE 02/11/94 13:49:15
BY GDR

| COST CODE/WBS | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| 000 | ENGINEERING | | | | | | | | | |
| 110000 | DEFINITIVE DESIGN | 1434000 | 0 | 1434000 | 22.35 | 320499 | 1754499 | 30 | 526350 | 2280849 |
| 120000 | ENGINEERING/INSPECTION | 574000 | 0 | 574000 | 37.81 | 217029 | 791029 | 30 | 237309 | 1028338 |
| TOTAL 000 | ENGINEERING | 2008000 | 0 | 2008000 | 26.77 | 537528 | 2545528 | 30 | 763659 | 3309187 |
| 550 | OTHER STRUCTURES | | | | | | | | | |
| 313001 | SITE WORK | 475500 | 0 | 475500 | 31.27 | 148689 | 624189 | 30 | 187257 | 811446 |
| 313002 | VENTILATION BUILDING | 1429560 | 0 | 1429560 | 31.27 | 447023 | 1876583 | 30 | 562975 | 2439558 |
| 313004 | CONTROL ROOM | 858000 | 0 | 858000 | 31.27 | 268297 | 1126297 | 30 | 337889 | 1464186 |
| 313005 | STACK RAD MONITOR | 264000 | 0 | 264000 | 31.27 | 82553 | 346553 | 30 | 103966 | 450519 |
| TOTAL 550 | OTHER STRUCTURES | 3027060 | 0 | 3027060 | 31.27 | 946562 | 3973622 | 30 | 1192087 | 5165709 |
| 700 | SPECIAL EQUIP/PROCESS SYSTEMS | | | | | | | | | |
| 310002 | AIR EXHAUST FOR PRIMARY | 2475894 | 0 | 2475894 | 31.27 | 774213 | 3250107 | 30 | 975031 | 4225138 |
| 310200 | AIR INTAKE FOR PRIMARY | 236439 | 0 | 236439 | 31.27 | 73934 | 310373 | 30 | 93112 | 403485 |
| 330000 | BURIAL FEES | 10394 | 0 | 10394 | 31.27 | 3250 | 13644 | 30 | 4093 | 17737 |
| 400000 | WHC PROJECT MANAGEMENT | 860000 | 0 | 860000 | 30.75 | 264450 | 1124450 | 30 | 337335 | 1461785 |
| TOTAL 700 | SPECIAL EQUIP/PROCESS SYSTEM | 3582727 | 0 | 3582727 | 31.15 | 1115847 | 4698574 | 30 | 1409571 | 6108145 |
| 900 | OTHER PROJECT COSTS | | | | | | | | | |
| 500000 | OTHER PROJECT COST | 3213000 | 0 | 3213000 | 30.75 | 987998 | 4200998 | 30 | 1260299 | 5461297 |
| TOTAL 900 | OTHER PROJECT COSTS | 3213000 | 0 | 3213000 | 30.75 | 987998 | 4200998 | 30 | 1260299 | 5461297 |
| PROJECT TOTAL | | 11,830,787 | 0 | 11,830,787 | 30.33 | 3,587,935 | 15,418,722 | 30 | 4,625,616 | 20,044,338 |

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W-314B
FILE NO. W314SD12

** IEST - INTERACTIVE ESTIMATING **
244-S TANK FARM VENTILATION UPGRADE
STUDY ESTIMATE - PRIMARY EXHAUST
DOE_R05 - ESTIMATE SUMMARY BY CSI DIVISION


DATE 02/11/94 13:49:17
BY GDR

| CSI | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| ENGINEERING | | | | | | | | | | |
| 00 | TECHNICAL SERVICES | 2008000 | 0 | 2008000 | 26.77 | 537528 | 2545528 | 30 | 763659 | 3309187 |
| | TOTAL ENGINEERING | 2,008,000 | 0 | 2,008,000 | 26.77 | 537,528 | 2,545,528 | 30 | 763,659 | 3,309,187 |
| CONSTRUCTION | | | | | | | | | | |
| 01 | GENERAL REQUIRMENTS | 251981 | 0 | 251981 | 31.27 | 78795 | 330776 | 30 | 99232 | 430008 |
| 02 | SITEWORK | 16327 | 0 | 16327 | 31.27 | 5105 | 21432 | 30 | 6429 | 27862 |
| 13 | SPECIAL CONSTRUCTION | 3027060 | 0 | 3027060 | 31.27 | 946562 | 3973622 | 30 | 1192087 | 5165709 |
| 15 | MECHANICAL | 2390898 | 0 | 2390898 | 31.27 | 747634 | 3138532 | 30 | 941560 | 4080091 |
| 16 | ELECTRICAL | 63521 | 0 | 63521 | 31.27 | 19863 | 83384 | 30 | 25015 | 108399 |
| 19 | PROJECT MANAGEMENT | 860000 | 0 | 860000 | 30.75 | 264450 | 1124450 | 30 | 337335 | 1461785 |
| 20 | OTHER PROJECT COSTS | 3213000 | 0 | 3213000 | 30.75 | 987998 | 4200998 | 30 | 1260299 | 5461297 |
| | TOTAL CONSTRUCTION | 9,822,787 | 0 | 9,822,787 | 31.05 | 3,050,407 | 12,873,194 | 30 | 3,861,957 | 16,735,151 |
| | PROJECT TOTAL | 11,830,787 | 0 | 11,830,787 | 30.33 | 3,587,935 | 15,418,722 | 30 | 4,625,616 | 20,044,338 |

REFERENCE: ESTIMATE BASIS SHEET — PAGE 3 OF 7
COST CODE ACCOUNT SUMMARY — PAGE 4 OF 7

THE U.S. DEPARTMENT OF ENERGY - RICHLAND ORDER 5700.3 "COST ESTIMATING, ANALYSIS AND STANDARDIZATION" DATED 3-27-85, PROVIDES GUIDELINES FOR ESTIMATE CONTINGENCIES. THE GUIDELINE FOR A STUDY ESTIMATE SHOULD HAVE AN OVERALL RANGE OF 20% TO 30% .

CONTINGENCY IS EVALUATED AT THE THIRD COST CODE LEVEL AND SUMMARIZED AT THE PRIMARY AND SECONDARY COST CODE LEVEL OF THE DETAILED COST ESTIMATE.

APPLIED A 30% CONTINGENCY TO THE PROJECT FOR THIS STUDY ESTIMATE DUE TO THE DEFINITIVE DESIGN, CONSTRUCTION ENGINEERING/INSPECTION, WHC PROJECT MANAGEMENT, AND OPC COSTS WERE BASED ON A PERCENTAGE OF DIRECT CONSTRUCTION, AND THE LIMITED AMOUNT OF DETAIL FOR THIS ENGINEERING STUDY.

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W-314B
FILE NO. W314SD12

** IEST - INTERACTIVE ESTIMATING **
244-S TANK FARM VENTILATION UPGRADE
STUDY ESTIMATE - PRIMARY EXHAUST
DOE_R07 - ONSITE INDIRECT COSTS BY WBS


DATE 02/11/94 13:49:18
BY GDR

| WBS | DESCRIPTION | ESTIMATE SUBTOTAL | CONTRACT % | ADMINISTRATION TOTAL | BID PACK PREP. | OTHER INDIRECTS | TOTAL INDIRECTS |
|---|---|---|---|---|---|---|---|
| 110000 | DEFINITIVE DESIGN | 1434000 | 0.00 | 0 | 0 | 0 | 0 |
| 120000 | ENGINEERING/INSPECTION | 574000 | 0.00 | 0 | 0 | 0 | 0 |
| 310002 | AIR EXHAUST FOR PRIMARY | 2475894 | 0.00 | 0 | 0 | 0 | 0 |
| 310200 | AIR INTAKE FOR PRIMARY | 236439 | 0.00 | 0 | 0 | 0 | 0 |
| 313001 | SITE WORK | 475500 | 0.00 | 0 | 0 | 0 | 0 |
| 313002 | VENTILATION BUILDING | 1429560 | 0.00 | 0 | 0 | 0 | 0 |
| 313004 | CONTROL ROOM | 858000 | 0.00 | 0 | 0 | 0 | 0 |
| 313005 | STACK RAD MONITOR | 264000 | 0.00 | 0 | 0 | 0 | 0 |
| 330000 | BURIAL FEES | 10394 | 0.00 | 0 | 0 | 0 | 0 |
| 400000 | WHC PROJECT MANAGEMENT | 860000 | 0.00 | 0 | 0 | 0 | 0 |
| 500000 | OTHER PROJECT COST | 3213000 | 0.00 | 0 | 0 | 0 | 0 |
| PROJECT TOTAL | | 11,830,787 | | 0 | 0 | 0 | 0 |

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W-314B
FILE NO. W314SDJ2

** IEST - INTERACTIVE ESTIMATING **
244-TX TANK FARM VENTILATION UPGRADE
STUDY ESTIMATE - PRIMARY EXHAUST
DOE_R01 - PROJECT COST SUMMARY


DATE 02/11/94 13:44:58
BY GDR

| COST CODE | DESCRIPTION | ESCALATED TOTAL COST | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|
| 000 | ENGINEERING | 2,550,000 | 30 | 760,000 | 3,310,000 |
| 550 | OTHER STRUCTURES | 3,970,000 | 30 | 1,190,000 | 5,160,000 |
| 700 | SPECIAL EQUIP/PROCESS SYSTEMS | 4,700,000 | 30 | 1,410,000 | 6,110,000 |
| | (ADJUSTED TO MEET DOE 5100.4) | -20,000 | | 40,000 | 20,000 |
| | TOTAL ESTIMATED CONSTRUCTION COST | 11,200,000 | | 3,400,000 | 14,600,000 |
| 900 | OTHER PROJECT COSTS | 4,200,000 | 30 | 1,260,000 | 5,460,000 |
| | (ADJUSTED TO MEET DOE 5100.4) | 0 | | -60,000 | -60,000 |
| | TOTAL PROJECT COST | 15,400,000 | 30 | 4,600,000 | 20,000,000 |

TYPE OF ESTIMATE: STUDY ESTIMATE FEBRUARY 11, 1994

ARCHITECT ENGINEER: Deloitte & Touche

OPERATING CONTRACTOR: T.J. Howell

REMARKS:

(ROUNDED/ADJUSTED TO THE NEAREST " 10,000 / 100,000 " - PERCENTAGES NOT RECALCULATED TO REFLECT ROUNDING)

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W-314B
FILE NO. W314SDJ2

** IEST - INTERACTIVE ESTIMATING **
244-TX TANK FARM VENTILATION UPGRADE
STUDY ESTIMATE - PRIMARY EXHAUST
DOE_R02 - WORK BREAKDOWN STRUCTURE SUMMARY


DATE 02/11/94 13:44:59
BY GDR

| WBS | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| 110000 | DEFINITIVE DESIGN | 1434000 | 0 | 1434000 | 22.35 | 320499 | 1754499 | 30 | 526350 | 2280849 |
| 120000 | ENGINEERING/INSPECTION | 574000 | 0 | 574000 | 37.81 | 217029 | 791029 | 30 | 237309 | 1028338 |
| SUBTOTAL 12 | ENGINEERING/INSPECTION | 574000 | 0 | 574000 | 37.81 | 217029 | 791029 | 30 | 237309 | 1028338 |
| SUBTOTAL 1 | ENGINEERING | 2008000 | 0 | 2008000 | 26.77 | 537528 | 2545528 | 30 | 763659 | 3309187 |
| 310002 | AIR EXHAUST FOR PRIMARY | 2475894 | 0 | 2475894 | 31.27 | 774213 | 3250107 | 30 | 975031 | 4225138 |
| 310200 | AIR INTAKE FOR PRIMARY | 236439 | 0 | 236439 | 31.27 | 73934 | 310373 | 30 | 93112 | 403485 |
| 313001 | SITE WORK | 475500 | 0 | 475500 | 31.27 | 148689 | 624189 | 30 | 187257 | 811446 |
| 313002 | VENTILATION BUILDING | 1429560 | 0 | 1429560 | 31.27 | 447023 | 1876583 | 30 | 562975 | 2439558 |
| 313004 | CONTROL ROOM | 858000 | 0 | 858000 | 31.27 | 268297 | 1126297 | 30 | 337889 | 1464186 |
| 313005 | STACK RAD MONITOR | 264000 | 0 | 264000 | 31.27 | 82553 | 346553 | 30 | 103966 | 450519 |
| SUBTOTAL 313 | VENTILATION BUILDING | 3027060 | 0 | 3027060 | 31.27 | 946562 | 3973622 | 30 | 1192087 | 5165709 |
| SUBTOTAL 31 | FA CONST-ONSITE E/C | 5739393 | 0 | 5739393 | 31.27 | 1794709 | 7534102 | 30 | 2260230 | 9794332 |
| 330000 | BURIAL FEES | 10394 | 0 | 10394 | 31.27 | 3250 | 13644 | 30 | 4093 | 17737 |
| SUBTOTAL 33 | BURIAL FEES | 10394 | 0 | 10394 | 31.27 | 3250 | 13644 | 30 | 4093 | 17737 |
| SUBTOTAL 3 | CONSTRUCTION | 5749787 | 0 | 5749787 | 31.27 | 1797959 | 7547746 | 30 | 2264323 | 9812069 |
| 400000 | WHC PROJECT MANAGEMENT | 860000 | 0 | 860000 | 30.75 | 264450 | 1124450 | 30 | 337335 | 1461785 |
| SUBTOTAL 4 | PROJECT INTEGRATION | 860000 | 0 | 860000 | 30.75 | 264450 | 1124450 | 30 | 337335 | 1461785 |
| 500000 | OTHER PROJECT COST | 3213000 | 0 | 3213000 | 30.75 | 987998 | 4200998 | 30 | 1260299 | 5461297 |
| SUBTOTAL 5 | OTHER PROJECT COST | 3213000 | 0 | 3213000 | 30.75 | 987998 | 4200998 | 30 | 1260299 | 5461297 |
| PROJECT TOTAL | | 11,830,787 | 0 | 11,830,787 | 30.33 | 3,587,935 | 15,418,722 | 30 | 4,625,616 | 20,044,338 |

1. DOCUMENTS AND DRAWINGS

DOCUMENTS: ENGINEERING STUDY WHC-SD-W061-ES-001, AND PROJECT W-061 VENTILATION DESIGN ALTERNATIVES DATED SEPTEMBER 15, 1993.

DRAWINGS: NONE

2. MATERIAL PRICES

UNIT COSTS REPRESENT CURRENT PRICES FOR SPECIFIED MATERIAL.

3. LABOR RATES

CURRENT KEH BASE CRAFT RATES, AS ISSUED BY KEH FINANCE (EFFECTIVE 10-01-92), INCLUDE FRINGE BENEFITS, LABOR INSURANCE, TAXES AND TRAVEL WHERE APPLICABLE, PER HANFORD SITE STABILIZATION AGREEMENT, APPENDIX A (EFFECTIVE 9-2-91). NON CRAFT HOURLY RATES ARE BASED ON THE 1993 FISCAL YEAR BUDGET LIQUIDATION RATES AS ISSUED BY KEH FINANCE (EFFECTIVE 10-01-92).

4. GENERAL REQUIREMENTS/TECHNICAL SERVICES/OVERHEADS

A.) ONSITE CONSTRUCTION FORCES GENERAL REQUIREMENTS, TECHNICAL SERVICES AND CRAFT OVERHEAD COSTS ARE INCLUDED AS A COMPOSITE PERCENTAGE BASED ON THE KEH ESTIMATING FACTOR/BILLING SCHEDULE, REVISION 14, DATED OCTOBER 01, 1992. THE TOTAL COMPOSITE PERCENTAGE APPLIED TO ONSITE CONSTRUCTION FORCES LABOR, FOR THIS PROJECT, IS 93% FOR SHOP WORK AND 134% FOR FIELD WORK, WHICH IS REFLECTED IN THE "OH&P/B&I" COLUMN OF THE ESTIMATE DETAIL.

5. ESCALATION

ESCALATION PERCENTAGES WERE CALCULATED BY THE HANFORD MATERIAL & LABOR ESCALATION STUDY, DATED FEBRUARY 1993.

6. ROUNDING

U.S. DEPARTMENT OF ENERGY - DOE ORDER 5100.4 PAGE J-2 SUBPARAGRAPH (M), REQUIRES ROUNDING OF ALL GENERAL PLANT PROJECTS (GPP'S) AND LINE ITEM (LI) COST ESTIMATES. REFERENCE: DOE 5100.4, FIGURE I-11, DATED 10-31-84.

7. REMARKS

A.) DEFINITIVE DESIGN COSTS ARE BASED ON 25% OF DIRECT CONSTRUCTION COST.
B.) CONSTRUCTION ENGINEERING/INSPECTION COSTS ARE BASED ON 10% OF DIRECT CONSTRUCTION COST.
C.) WHC PROJECT MANAGEMENT COSTS ARE BASED ON 15% OF DIRECT CONSTRUCTION COST.
D.) ASSUMED THAT 10% OF ALL EXCAVATED DIRT WOULD BE CONTAMINATED AND WOULD HAVE TO BE REMOVED, BARRELED AND BURIED.
E.) ALL DUCTS ARE TO BE FABRICATED FROM STAINLESS STEEL.
F.) ALL CONSTRUCTION IS TO BE BY THE ONSTIE CONTRACTOR.
G.) ESTIMATE ASSUMES DUCT TO BE BURIED IN A 4' DEEP HAND DUG TRENCH.
H.) ESTIMATE CONTAINS COST FOR A TEA3 FILTER TRAIN ON THE PRIMARY EXHAUST.
I.) OPC COST ARE 56% OF DIRECT CONSTRUCTION, BASED ON THE C-106 TANK PROJECTS.
J.) AN ALLOWANCE FOR BURNOUT IS INCLUDED IN THE ESTIMATE, PER KEH PE.

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W-314B
FILE NO. W314SDJ2

** IEST - INTERACTIVE ESTIMATING **
244-TX TANK FARM VENTILATION UPGRADE
STUDY ESTIMATE - PRIMARY EXHAUST
DOE_R04 - COST CODE ACCOUNT SUMMARY


DATE 02/11/94 13:45:01
BY GDR

| COST CODE/WBS | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| 000 | ENGINEERING | | | | | | | | | |
| 110000 | DEFINITIVE DESIGN | 1434000 | 0 | 1434000 | 22.35 | 320499 | 1754499 | 30 | 526350 | 2280849 |
| 120000 | ENGINEERING/INSPECTION | 574000 | 0 | 574000 | 37.81 | 217029 | 791029 | 30 | 237309 | 1028338 |
| TOTAL 000 | ENGINEERING | 2008000 | 0 | 2008000 | 26.77 | 537528 | 2545528 | 30 | 763659 | 3309187 |
| 550 | OTHER STRUCTURES | | | | | | | | | |
| 313001 | SITE WORK | 475500 | 0 | 475500 | 31.27 | 148689 | 624189 | 30 | 187257 | 811446 |
| 313002 | VENTILATION BUILDING | 1429560 | 0 | 1429560 | 31.27 | 447023 | 1876583 | 30 | 562975 | 2439558 |
| 313004 | CONTROL ROOM | 858000 | 0 | 858000 | 31.27 | 268297 | 1126297 | 30 | 337889 | 1464186 |
| 313005 | STACK RAD MONITOR | 264000 | 0 | 264000 | 31.27 | 82553 | 346553 | 30 | 103966 | 450519 |
| TOTAL 550 | OTHER STRUCTURES | 3027060 | 0 | 3027060 | 31.27 | 946562 | 3973622 | 30 | 1192087 | 5165709 |
| 700 | SPECIAL EQUIP/PROCESS SYSTEMS | | | | | | | | | |
| 310002 | AIR EXHAUST FOR PRIMARY | 2475894 | 0 | 2475894 | 31.27 | 774213 | 3250107 | 30 | 975031 | 4225138 |
| 310200 | AIR INTAKE FOR PRIMARY | 236439 | 0 | 236439 | 31.27 | 73934 | 310373 | 30 | 93112 | 403485 |
| 330000 | BURIAL FEES | 10394 | 0 | 10394 | 31.27 | 3250 | 13644 | 30 | 4093 | 17737 |
| 400000 | WHC PROJECT MANAGEMENT | 860000 | 0 | 860000 | 30.75 | 264450 | 1124450 | 30 | 337335 | 1461785 |
| TOTAL 700 | SPECIAL EQUIP/PROCESS SYSTEM | 3582727 | 0 | 3582727 | 31.15 | 1115847 | 4698574 | 30 | 1409571 | 6108145 |
| 900 | OTHER PROJECT COSTS | | | | | | | | | |
| 500000 | OTHER PROJECT COST | 3213000 | 0 | 3213000 | 30.75 | 987998 | 4200998 | 30 | 1260299 | 5461297 |
| TOTAL 900 | OTHER PROJECT COSTS | 3213000 | 0 | 3213000 | 30.75 | 987998 | 4200998 | 30 | 1260299 | 5461297 |
| PROJECT TOTAL | | 11,830,787 | 0 | 11,830,787 | 30.33 | 3,587,935 | 15,418,722 | 30 | 4,625,616 | 20,044,338 |

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W-314B
FILE NO. W314SDJ2

** IEST - INTERACTIVE ESTIMATING **
244-TX TANK FARM VENTILATION UPGRADE
STUDY ESTIMATE - PRIMARY EXHAUST
DOE_R05 - ESTIMATE SUMMARY BY CSI DIVISION


DATE 02/11/94 13:45:02
BY GDR

| CSI | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| ENGINEERING | | | | | | | | | | |
| 00 | TECHNICAL SERVICES | 2008000 | 0 | 2008000 | 26.77 | 537528 | 2545528 | 30 | 763659 | 3309187 |
| TOTAL ENGINEERING | | 2,008,000 | 0 | 2,008,000 | 26.77 | 537,528 | 2,545,528 | 30 | 763,659 | 3,309,187 |
| CONSTRUCTION | | | | | | | | | | |
| 01 | GENERAL REQUIRMENTS | 251981 | 0 | 251981 | 31.27 | 78795 | 330776 | 30 | 99232 | 430008 |
| 02 | SITEWORK | 16327 | 0 | 16327 | 31.27 | 5105 | 21432 | 30 | 6429 | 27862 |
| 13 | SPECIAL CONSTRUCTION | 3027060 | 0 | 3027060 | 31.27 | 946562 | 3973622 | 30 | 1192087 | 5165709 |
| 15 | MECHANICAL | 2390898 | 0 | 2390898 | 31.27 | 747634 | 3138532 | 30 | 941560 | 4080091 |
| 16 | ELECTRICAL | 63521 | 0 | 63521 | 31.27 | 19863 | 83384 | 30 | 25015 | 108399 |
| 19 | PROJECT MANAGEMENT | 860000 | 0 | 860000 | 30.75 | 264450 | 1124450 | 30 | 337335 | 1461785 |
| 20 | OTHER PROJECT COSTS | 3213000 | 0 | 3213000 | 30.75 | 987998 | 4200998 | 30 | 1260299 | 5461297 |
| TOTAL CONSTRUCTION | | 9,822,787 | 0 | 9,822,787 | 31.05 | 3,050,407 | 12,873,194 | 30 | 3,861,957 | 16,735,151 |
| PROJECT TOTAL | | 11,830,787 | 0 | 11,830,787 | 30.33 | 3,587,935 | 15,418,722 | 30 | 4,625,616 | 20,044,338 |

REFERENCE: ESTIMATE BASIS SHEET — PAGE 3 OF 7
COST CODE ACCOUNT SUMMARY — PAGE 4 OF 7

THE U.S. DEPARTMENT OF ENERGY - RICHLAND ORDER 5700.3 "COST ESTIMATING, ANALYSIS AND STANDARDIZATION" DATED 3-27-85, PROVIDES GUIDELINES FOR ESTIMATE CONTINGENCIES. THE GUIDELINE FOR A STUDY ESTIMATE SHOULD HAVE AN OVERALL RANGE OF 20% TO 30% .

CONTINGENCY IS EVALUATED AT THE THIRD COST CODE LEVEL AND SUMMARIZED AT THE PRIMARY AND SECONDARY COST CODE LEVEL OF THE DETAILED COST ESTIMATE.

APPLIED A 30% CONTINGENCY TO THE PROJECT FOR THIS STUDY ESTIMATE DUE TO THE DEFINITIVE DESIGN, CONSTRUCTION ENGINEERING/INSPECTION, WHC PROJECT MANAGEMENT, AND OPC COSTS WERE BASED ON A PERCENTAGE OF DIRECT CONSTRUCTION, AND THE LIMITED AMOUNT OF DETAIL FOR THIS ENGINEERING STUDY.

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W-314B
FILE NO. W314SDJ2

** IEST - INTERACTIVE ESTIMATING **
244-TX TANK FARM VENTILATION UPGRADE
STUDY ESTIMATE - PRIMARY EXHAUST
DOE_R07 - ONSITE INDIRECT COSTS BY WBS


DATE 02/11/94 13:45:04
BY GDR

| WBS | DESCRIPTION | ESTIMATE SUBTOTAL | CONTRACT % | ADMINISTRATION TOTAL | BID PACK PREP. | OTHER INDIRECTS | TOTAL INDIRECTS |
|---|---|---|---|---|---|---|---|
| 110000 | DEFINITIVE DESIGN | 1434000 | 0.00 | 0 | 0 | 0 | 0 |
| 120000 | ENGINEERING/INSPECTION | 574000 | 0.00 | 0 | 0 | 0 | 0 |
| 310002 | AIR EXHAUST FOR PRIMARY | 2475894 | 0.00 | 0 | 0 | 0 | 0 |
| 310200 | AIR INTAKE FOR PRIMARY | 236439 | 0.00 | 0 | 0 | 0 | 0 |
| 313001 | SITE WORK | 475500 | 0.00 | 0 | 0 | 0 | 0 |
| 313002 | VENTILATION BUILDING | 1429560 | 0.00 | 0 | 0 | 0 | 0 |
| 313004 | CONTROL ROOM | 858000 | 0.00 | 0 | 0 | 0 | 0 |
| 313005 | STACK RAD MONITOR | 264000 | 0.00 | 0 | 0 | 0 | 0 |
| 330000 | BURIAL FEES | 10394 | 0.00 | 0 | 0 | 0 | 0 |
| 400000 | WHC PROJECT MANAGEMENT | 860000 | 0.00 | 0 | 0 | 0 | 0 |
| 500000 | OTHER PROJECT COST | 3213000 | 0.00 | 0 | 0 | 0 | 0 |
| PROJECT TOTAL | | 11,830,787 | | 0 | 0 | 0 | 0 |

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W-314B
FILE NO. W314SDK2

** IEST - INTERACTIVE ESTIMATING **
244-U TANK FARM VENTILATION UPGRADE
STUDY ESTIMATE - PRIMARY EXHAUST
DOE_R01 - PROJECT COST SUMMARY


DATE 02/11/94 13:43:38
BY GDR

| COST CODE | DESCRIPTION | ESCALATED TOTAL COST | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|
| 000 | ENGINEERING | 2,550,000 | 30 | 760,000 | 3,310,000 |
| 550 | OTHER STRUCTURES | 3,970,000 | 30 | 1,190,000 | 5,160,000 |
| 700 | SPECIAL EQUIP/PROCESS SYSTEMS | 4,700,000 | 30 | 1,410,000 | 6,110,000 |
| | (ADJUSTED TO MEET DOE 5100.4) | -20,000 | | 40,000 | 20,000 |
| | TOTAL ESTIMATED CONSTRUCTION COST | 11,200,000 | | 3,400,000 | 14,600,000 |
| 900 | OTHER PROJECT COSTS | 4,200,000 | 30 | 1,260,000 | 5,460,000 |
| | (ADJUSTED TO MEET DOE 5100.4) | 0 | | -60,000 | -60,000 |
| | TOTAL PROJECT COST | 15,400,000 | 30 | 4,600,000 | 20,000,000 |

TYPE OF ESTIMATE STUDY ESTIMATE FEBRUARY 11, 1994

ARCHITECT ENGINEER

OPERATING CONTRACTOR

REMARKS:

(ROUNDED/ADJUSTED TO THE NEAREST " 10,000 / 100,000 " - PERCENTAGES NOT RECALCULATED TO REFLECT ROUNDING)

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W-314B
FILE NO. W314SDK2

** IEST - INTERACTIVE ESTIMATING **
244-U TANK FARM VENTILATION UPGRADE
STUDY ESTIMATE - PRIMARY EXHAUST
DOE_R02 - WORK BREAKDOWN STRUCTURE SUMMARY


DATE 02/11/94 13:43:40
BY GDR

| WBS | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| 110000 | DEFINITIVE DESIGN | 1434000 | 0 | 1434000 | 22.35 | 320499 | 1754499 | 30 | 526350 | 2280849 |
| 120000 | ENGINEERING/INSPECTION | 574000 | 0 | 574000 | 37.81 | 217029 | 791029 | 30 | 237309 | 1028338 |
| SUBTOTAL 12 | ENGINEERING/INSPECTION | 574000 | 0 | 574000 | 37.81 | 217029 | 791029 | 30 | 237309 | 1028338 |
| SUBTOTAL 1 | ENGINEERING | 2008000 | 0 | 2008000 | 26.77 | 537528 | 2545528 | 30 | 763659 | 3309187 |
| 310002 | AIR EXHAUST FOR PRIMARY | 2475894 | 0 | 2475894 | 31.27 | 774213 | 3250107 | 30 | 975031 | 4225138 |
| 310200 | AIR INTAKE FOR PRIMARY | 236439 | 0 | 236439 | 31.27 | 73934 | 310373 | 30 | 93112 | 403485 |
| 313001 | SITE WORK | 475500 | 0 | 475500 | 31.27 | 148689 | 624189 | 30 | 187257 | 811446 |
| 313002 | VENTILATION BUILDING | 1429560 | 0 | 1429560 | 31.27 | 447023 | 1876583 | 30 | 562975 | 2439558 |
| 313004 | CONTROL ROOM | 858000 | 0 | 858000 | 31.27 | 268297 | 1126297 | 30 | 337889 | 1464186 |
| 313005 | STACK RAD MONITOR | 264000 | 0 | 264000 | 31.27 | 82553 | 346553 | 30 | 103966 | 450519 |
| SUBTOTAL 313 | VENTILATION BUILDING | 3027060 | 0 | 3027060 | 31.27 | 946562 | 3973622 | 30 | 1192087 | 5165709 |
| SUBTOTAL 31 | FA CONST-ONSITE E/C | 5739393 | 0 | 5739393 | 31.27 | 1794709 | 7534102 | 30 | 2260230 | 9794332 |
| 330000 | BURIAL FEES | 10394 | 0 | 10394 | 31.27 | 3250 | 13644 | 30 | 4093 | 17737 |
| SUBTOTAL 33 | BURIAL FEES | 10394 | 0 | 10394 | 31.27 | 3250 | 13644 | 30 | 4093 | 17737 |
| SUBTOTAL 3 | CONSTRUCTION | 5749787 | 0 | 5749787 | 31.27 | 1797959 | 7547746 | 30 | 2264323 | 9812069 |
| 400000 | WHC PROJECT MANAGEMENT | 860000 | 0 | 860000 | 30.75 | 264450 | 1124450 | 30 | 337335 | 1461785 |
| SUBTOTAL 4 | PROJECT INTEGRATION | 860000 | 0 | 860000 | 30.75 | 264450 | 1124450 | 30 | 337335 | 1461785 |
| 500000 | OTHER PROJECT COST | 3213000 | 0 | 3213000 | 30.75 | 987998 | 4200998 | 30 | 1260299 | 5461297 |
| SUBTOTAL 5 | OTHER PROJECT COST | 3213000 | 0 | 3213000 | 30.75 | 987998 | 4200998 | 30 | 1260299 | 5461297 |
| PROJECT TOTAL | | 11,830,787 | 0 | 11,830,787 | 30.33 | 3,587,935 | 15,418,722 | 30 | 4,625,616 | 20,044,338 |

1. DOCUMENTS AND DRAWINGS

DOCUMENTS: ENGINEERING STUDY WHC-SD-W061-ES-001, AND PROJECT W-061 VENTILATION DESIGN ALTERNATIVES DATED SEPTEMBER 15, 1993.

DRAWINGS: NONE

2. MATERIAL PRICES

UNIT COSTS REPRESENT CURRENT PRICES FOR SPECIFIED MATERIAL.

3. LABOR RATES

CURRENT KEH BASE CRAFT RATES, AS ISSUED BY KEH FINANCE (EFFECTIVE 10-01-92), INCLUDE FRINGE BENEFITS, LABOR INSURANCE, TAXES AND TRAVEL WHERE APPLICABLE, PER HANFORD SITE STABILIZATION AGREEMENT, APPENDIX A (EFFECTIVE 9-2-91). NON CRAFT HOURLY RATES ARE BASED ON THE 1993 FISCAL YEAR BUDGET LIQUIDATION RATES AS ISSUED BY KEH FINANCE (EFFECTIVE 10-01-92).

4. GENERAL REQUIREMENTS/TECHNICAL SERVICES/OVERHEADS

A.) ONSITE CONSTRUCTION FORCES GENERAL REQUIREMENTS, TECHNICAL SERVICES AND CRAFT OVERHEAD COSTS ARE INCLUDED AS A COMPOSITE PERCENTAGE BASED ON THE KEH ESTIMATING FACTOR/BILLING SCHEDULE, REVISION 14, DATED OCTOBER 01, 1992. THE TOTAL COMPOSITE PERCENTAGE APPLIED TO ONSITE CONSTRUCTION FORCES LABOR, FOR THIS PROJECT, IS 93% FOR SHOP WORK AND 134% FOR FIELD WORK, WHICH IS REFLECTED IN THE "OH&P/B&I" COLUMN OF THE ESTIMATE DETAIL.

5. ESCALATION

ESCALATION PERCENTAGES WERE CALCULATED BY THE HANFORD MATERIAL & LABOR ESCALATION STUDY, DATED FEBRUARY 1993.

6. ROUNDING

U.S. DEPARTMENT OF ENERGY - DOE ORDER 5100.4 PAGE J-2 SUBPARAGRAPH (H), REQUIRES ROUNDING OF ALL GENERAL PLANT PROJECTS (GPP'S) AND LINE ITEM (LI) COST ESTIMATES. REFERENCE: DOE 5100.4, FIGURE I-11, DATED 10-31-84.

7. REMARKS

A.) DEFINITIVE DESIGN COSTS ARE BASED ON 25% OF DIRECT CONSTRUCTION COST.
B.) CONSTRUCTION ENGINEERING/INSPECTION COSTS ARE BASED ON 10% OF DIRECT CONSTRUCTION COST.
C.) WHC PROJECT MANAGEMENT COSTS ARE BASED ON 15% OF DIRECT CONSTRUCTION COST.
D.) ASSUMED THAT 10% OF ALL EXCAVATED DIRT WOULD BE CONTAMINATED AND WOULD HAVE TO BE REMOVED, BARRELED AND BURIED.
E.) ALL DUCTS ARE TO BE FABRICATED FROM STAINLESS STEEL.
F.) ALL CONSTRUCTION IS TO BE BY THE ONSTIE CONTRACTOR.
G.) ESTIMATE ASSUMES DUCT TO BE BURIED IN A 4' DEEP HAND DUG TRENCH.
H.) ESTIMATE CONTAINS COST FOR A TEA3 FILTER TRAIN ON THE PRIMARY EXHAUST.
I.) OPC COST ARE 56% OF DIRECT CONSTRUCTION, BASED ON THE C-106 TANK PROJECTS.
J.) AN ALLOWANCE FOR BURNOUT IS INCLUDED IN THE ESTIMATE, PER KEH PE.

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W-314B
FILE NO. W314SDK2

** IEST - INTERACTIVE ESTIMATING **
244-U TANK FARM VENTILATION UPGRADE
STUDY ESTIMATE - PRIMARY EXHAUST
DOE_R04 - COST CODE ACCOUNT SUMMARY


DATE 02/11/94 13:43:41
BY GDR

| COST CODE/WBS | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| 000 | ENGINEERING | | | | | | | | | |
| 110000 | DEFINITIVE DESIGN | 1434000 | 0 | 1434000 | 22.35 | 320499 | 1754499 | 30 | 526350 | 2280849 |
| 120000 | ENGINEERING/INSPECTION | 574000 | 0 | 574000 | 37.81 | 217029 | 791029 | 30 | 237309 | 1028338 |
| TOTAL 000 | ENGINEERING | 2008000 | 0 | 2008000 | 26.77 | 537528 | 2545528 | 30 | 763659 | 3309187 |
| 550 | OTHER STRUCTURES | | | | | | | | | |
| 313001 | SITE WORK | 475500 | 0 | 475500 | 31.27 | 148689 | 624189 | 30 | 187257 | 811446 |
| 313002 | VENTILATION BUILDING | 1429560 | 0 | 1429560 | 31.27 | 447023 | 1876583 | 30 | 562975 | 2439558 |
| 313004 | CONTROL ROOM | 858000 | 0 | 858000 | 31.27 | 268297 | 1126297 | 30 | 337889 | 1464186 |
| 313005 | STACK RAD MONITOR | 264000 | 0 | 264000 | 31.27 | 82553 | 346553 | 30 | 103966 | 450519 |
| TOTAL 550 | OTHER STRUCTURES | 3027060 | 0 | 3027060 | 31.27 | 946562 | 3973622 | 30 | 1192087 | 5165709 |
| 700 | SPECIAL EQUIP/PROCESS SYSTEMS | | | | | | | | | |
| 310002 | AIR EXHAUST FOR PRIMARY | 2475894 | 0 | 2475894 | 31.27 | 774213 | 3250107 | 30 | 975031 | 4225138 |
| 310200 | AIR INTAKE FOR PRIMARY | 236439 | 0 | 236439 | 31.27 | 73934 | 310373 | 30 | 93112 | 403485 |
| 330000 | BURIAL FEES | 10394 | 0 | 10394 | 31.27 | 3250 | 13644 | 30 | 4093 | 17737 |
| 400000 | WHC PROJECT MANAGEMENT | 860000 | 0 | 860000 | 30.75 | 264450 | 1124450 | 30 | 337335 | 1461785 |
| TOTAL 700 | SPECIAL EQUIP/PROCESS SYSTEM | 3582727 | 0 | 3582727 | 31.15 | 1115847 | 4698574 | 30 | 1409571 | 6108145 |
| 900 | OTHER PROJECT COSTS | | | | | | | | | |
| 500000 | OTHER PROJECT COST | 3213000 | 0 | 3213000 | 30.75 | 987998 | 4200998 | 30 | 1260299 | 5461297 |
| TOTAL 900 | OTHER PROJECT COSTS | 3213000 | 0 | 3213000 | 30.75 | 987998 | 4200998 | 30 | 1260299 | 5461297 |
| PROJECT TOTAL | | 11,830,787 | 0 | 11,830,787 | 30.33 | 3,587,935 | 15,418,722 | 30 | 4,625,616 | 20,044,338 |

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W-314B
FILE NO. W314SDK2

** IEST - INTERACTIVE ESTIMATING **
244-U TANK FARM VENTILATION UPGRADE
STUDY ESTIMATE - PRIMARY EXHAUST
DOE_R05 - ESTIMATE SUMMARY BY CSI DIVISION


DATE 02/11/94 13:43:43
BY GDR

| CSI | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| ENGINEERING | | | | | | | | | | |
| 00 | TECHNICAL SERVICES | 2008000 | 0 | 2008000 | 26.77 | 537528 | 2545528 | 30 | 763659 | 3309187 |
| TOTAL ENGINEERING | | 2,008,000 | 0 | 2,008,000 | 26.77 | 537,528 | 2,545,528 | 30 | 763,659 | 3,309,187 |
| CONSTRUCTION | | | | | | | | | | |
| 01 | GENERAL REQUIRMENTS | 251981 | 0 | 251981 | 31.27 | 78795 | 330776 | 30 | 99232 | 430008 |
| 02 | SITEWORK | 16327 | 0 | 16327 | 31.27 | 5105 | 21432 | 30 | 6429 | 27862 |
| 13 | SPECIAL CONSTRUCTION | 3027060 | 0 | 3027060 | 31.27 | 946562 | 3973622 | 30 | 1192087 | 5165709 |
| 15 | MECHANICAL | 2390898 | 0 | 2390898 | 31.27 | 747634 | 3138532 | 30 | 941560 | 4080091 |
| 16 | ELECTRICAL | 63521 | 0 | 63521 | 31.27 | 19863 | 83384 | 30 | 25015 | 108399 |
| 19 | PROJECT MANAGEMENT | 860000 | 0 | 860000 | 30.75 | 264450 | 1124450 | 30 | 337335 | 1461785 |
| 20 | OTHER PROJECT COSTS | 3213000 | 0 | 3213000 | 30.75 | 987998 | 4200998 | 30 | 1260299 | 5461297 |
| TOTAL CONSTRUCTION | | 9,822,787 | 0 | 9,822,787 | 31.05 | 3,050,407 | 12,873,194 | 30 | 3,861,957 | 16,735,151 |
| PROJECT TOTAL | | 11,830,787 | 0 | 11,830,787 | 30.33 | 3,587,935 | 15,418,722 | 30 | 4,625,616 | 20,044,338 |

REFERENCE: ESTIMATE BASIS SHEET PAGE 3 OF 7
COST CODE ACCOUNT SUMMARY PAGE 4 OF 7

THE U.S. DEPARTMENT OF ENERGY - RICHLAND ORDER 5700.3 "COST ESTIMATING, ANALYSIS AND STANDARDIZATION" DATED 3-27-85, PROVIDES GUIDELINES FOR ESTIMATE CONTINGENCIES. THE GUIDELINE FOR A STUDY ESTIMATE SHOULD HAVE AN OVERALL RANGE OF 20% TO 30% .

CONTINGENCY IS EVALUATED AT THE THIRD COST CODE LEVEL AND SUMMARIZED AT THE PRIMARY AND SECONDARY COST CODE LEVEL OF THE DETAILED COST ESTIMATE.

APPLIED A 30% CONTINGENCY TO THE PROJECT FOR THIS STUDY ESTIMATE DUE TO THE DEFINITIVE DESIGN, CONSTRUCTION ENGINEERING/INSPECTION, WHC PROJECT MANAGEMENT, AND OPC COSTS WERE BASED ON A PERCENTAGE OF DIRECT CONSTRUCTION, AND THE LIMITED AMOUNT OF DETAIL FOR THIS ENGINEERING STUDY.

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W-314B
FILE NO. W314SDK2

** IEST - INTERACTIVE ESTIMATING **
244-U TANK FARM VENTILATION UPGRADE
STUDY ESTIMATE - PRIMARY EXHAUST
DOE_R07 - ONSITE INDIRECT COSTS BY WBS


DATE 02/11/94 13:43:44
BY GDR

| WBS | DESCRIPTION | ESTIMATE SUBTOTAL | CONTRACT % | ADMINISTRATION TOTAL | BID PACK PREP. | OTHER INDIRECTS | TOTAL INDIRECTS |
|---|---|---|---|---|---|---|---|
| 110000 | DEFINITIVE DESIGN | 1434000 | 0.00 | 0 | 0 | 0 | 0 |
| 120000 | ENGINEERING/INSPECTION | 574000 | 0.00 | 0 | 0 | 0 | 0 |
| 310002 | AIR EXHAUST FOR PRIMARY | 2475894 | 0.00 | 0 | 0 | 0 | 0 |
| 310200 | AIR INTAKE FOR PRIMARY | 236439 | 0.00 | 0 | 0 | 0 | 0 |
| 313001 | SITE WORK | 475500 | 0.00 | 0 | 0 | 0 | 0 |
| 313002 | VENTILATION BUILDING | 1429560 | 0.00 | 0 | 0 | 0 | 0 |
| 313004 | CONTROL ROOM | 858000 | 0.00 | 0 | 0 | 0 | 0 |
| 313005 | STACK RAD MONITOR | 264000 | 0.00 | 0 | 0 | 0 | 0 |
| 330000 | BURIAL FEES | 10394 | 0.00 | 0 | 0 | 0 | 0 |
| 400000 | WHC PROJECT MANAGEMENT | 860000 | 0.00 | 0 | 0 | 0 | 0 |
| 500000 | OTHER PROJECT COST | 3213000 | 0.00 | 0 | 0 | 0 | 0 |
| PROJECT TOTAL | | 11,830,787 | | 0 | 0 | 0 | 0 |

# ALTERNATIVE COMPARISON BACK-UP ESTIMATES

9413221.237

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W314B ER 4978
FILE NO. W314SCA2

** IEST - INTERACTIVE ESTIMATING **
PRIMARY TANK EXHAUST TRAIN ALTERNATIVES
STUDY ESTIMATE REF. 5.3.1.1
DOE_R01 - PROJECT COST SUMMARY


DATE 02/11/94 07:12:39
BY GDR

| COST CODE | DESCRIPTION | ESCALATED TOTAL COST | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|
| 000 | ENGINEERING | 900,000 | 30 | 270,000 | 1,170,000 |
| 700 | SPECIAL EQUIP/PROCESS SYSTEMS | 3,050,000 | 30 | 910,000 | 3,960,000 |
| | (ADJUSTED TO MEET DOE 5100.4) | -50,000 | | 20,000 | -30,000 |
| | PROJECT TOTAL | 3,900,000 | 30 | 1,200,000 | 5,100,000 |

TYPE OF ESTIMATE: STUDY ESTIMATE FEBRUARY 11, 1994

ARCHITECT ENGINEER: Deputy A.W. Alberson

OPERATING CONTRACTOR: T.J. Howell

REMARKS:

PRIMARY TANK EXHAUST TRAIN ALTERNATIVES

ALTERNATIVE #1 "PASSIVE ADSORPTION/FILTRATION"

REF: 5.3.1.1.

(ROUNDED/ADJUSTED TO THE NEAREST " 10,000 / 100,000 " - PERCENTAGES NOT RECALCULATED TO REFLECT ROUNDING)

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W314B ER 4978
FILE NO. W314SCA2

** IEST - INTERACTIVE ESTIMATING **
PRIMARY TANK EXHAUST TRAIN ALTERNATIVES
STUDY ESTIMATE REF. 5.3.1.1
DOE_R02 - WORK BREAKDOWN STRUCTURE SUMMARY


DATE 02/11/94 07:12:41
BY GDR

| WBS | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| 110000 | DEFINITIVE DESIGN | 505100 | 0 | 505100 | 22.35 | 112890 | 617990 | 30 | 185397 | 803387 |
| 120000 | ENGINEERING/INSPECTION | 202040 | 0 | 202040 | 37.81 | 76391 | 278431 | 30 | 83529 | 361961 |
| SUBTOTAL 1 | ENGINEERING | 707140 | 0 | 707140 | 26.77 | 189281 | 896421 | 30 | 268926 | 1165348 |
| 310007 | PRIMARY EXHAUST CONSTRUCTION | 2020397 | 0 | 2020397 | 31.27 | 631778 | 2652175 | 30 | 795653 | 3447828 |
| SUBTOTAL 31 | FA CONST-ONSITE E/C | 2020397 | 0 | 2020397 | 31.27 | 631778 | 2652175 | 30 | 795653 | 3447828 |
| SUBTOTAL 3 | CONSTRUCTION | 2020397 | 0 | 2020397 | 31.27 | 631778 | 2652175 | 30 | 795653 | 3447828 |
| 400000 | WHC PROJECT MANAGEMENT | 303060 | 0 | 303060 | 30.75 | 93191 | 396251 | 30 | 118875 | 515126 |
| SUBTOTAL 4 | PROJECT INTEGRATION | 303060 | 0 | 303060 | 30.75 | 93191 | 396251 | 30 | 118875 | 515126 |
| PROJECT TOTAL | | 3,030,597 | 0 | 3,030,597 | 30.17 | 914,250 | 3,944,847 | 30 | 1,183,454 | 5,128,302 |

1. DOCUMENTS AND DRAWINGS

DOCUMENTS: DRAFT COPY OF PROJECT W-061 VENTILATION DESIGN ALTERNATIVES.

DRAWINGS: NONE

2. MATERIAL PRICES

UNIT COSTS REPRESENT CURRENT PRICES FOR SPECIFIED MATERIAL.

3. LABOR RATES

CURRENT KEH BASE CRAFT RATES, AS ISSUED BY KEH FINANCE (EFFECTIVE 10-01-93), INCLUDE FRINGE BENEFITS, LABOR INSURANCE, TAXES AND TRAVEL WHERE APPLICABLE, PER HANFORD SITE STABILIZATION AGREEMENT, APPENDIX A (EFFECTIVE 09-06-93). NON CRAFT HOURLY RATES ARE BASED ON THE 1994 FISCAL YEAR BUDGET LIQUIDATION RATES AS ISSUED BY KEH FINANCE (EFFECTIVE 10-01-93).

4. GENERAL REQUIREMENTS/TECHNICAL SERVICES/OVERHEADS

A.) ONSITE CONSTRUCTION FORCES GENERAL REQUIREMENTS, TECHNICAL SERVICES AND CRAFT OVERHEAD COSTS ARE INCLUDED AS A COMPOSITE PERCENTAGE BASED ON THE KEH ESTIMATING FACTOR/BILLING SCHEDULE, REVISION 16, DATED OCTOBER 01, 1993. THE TOTAL COMPOSITE PERCENTAGE APPLIED TO ONSITE CONSTRUCTION FORCES LABOR, FOR THIS PROJECT, IS 93% FOR SHOP WORK AND 134% FOR FIELD WORK, WHICH IS REFLECTED IN THE "OH&P/B&I" COLUMN OF THE ESTIMATE DETAIL.

5. ESCALATION

ESCALATION PERCENTAGES WERE CALCULATED BY THE HANFORD MATERIAL & LABOR ESCALATION STUDY, DATED FEBRUARY 1993.

6. ROUNDING

U.S. DEPARTMENT OF ENERGY - DOE ORDER 5100.4 PAGE I-32 SUBPARAGRAPH (M), REQUIRES ROUNDING OF ALL GENERAL PLANT PROJECTS (GPP'S) AND LINE ITEM (LI) COST ESTIMATES. REFERENCE: DOE 5100.4, FIGURE I-11, DATED 10-31-84.

7. REMARKS

A.) DEFINITIVE DESIGN COSTS ARE BASED ON 25% OF DIRECT CONSTRUCTION COST.
B.) CONSTRUCTION ENGINEERING/INSPECTION COSTS ARE BASED ON 10% OF DIRECT CONSTRUCTION COST.
C.) WHC PROJECT MANAGEMENT COSTS ARE BASED ON 15% OF DIRECT CONSTRUCTION COST.
D.) ALL CONSTRUCTION BY ONSITE FORCES.
E.) ALL ABOVE GROUND DUCTS ARE INSULATED.
F.) ESTIMATE CONTAINS COST FOR A FIG.#1 FILTER TRAIN.

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W314B ER 4978
FILE NO. W314SCA2

** IEST - INTERACTIVE ESTIMATING **
PRIMARY TANK EXHAUST TRAIN ALTERNATIVES
STUDY ESTIMATE REF. 5.3.1.1
DOE_R04 - COST CODE ACCOUNT SUMMARY


DATE 02/11/94 07:12:42
BY GDR

| COST CODE/WBS | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| 000 | ENGINEERING | | | | | | | | | |
| 110000 | DEFINITIVE DESIGN | 505100 | 0 | 505100 | 22.35 | 112890 | 617990 | 30 | 185397 | 803387 |
| 120000 | ENGINEERING/INSPECTION | 202040 | 0 | 202040 | 37.81 | 76391 | 278431 | 30 | 83529 | 361961 |
| TOTAL 000 | ENGINEERING | 707140 | 0 | 707140 | 26.77 | 189281 | 896421 | 30 | 268926 | 1165348 |
| 700 | SPECIAL EQUIP/PROCESS SYSTEMS | | | | | | | | | |
| 310007 | PRIMARY EXHAUST CONSTRUCTION | 2020397 | 0 | 2020397 | 31.27 | 631778 | 2652175 | 30 | 795653 | 3447828 |
| 400000 | WHC PROJECT MANAGEMENT | 303060 | 0 | 303060 | 30.75 | 93191 | 396251 | 30 | 118875 | 515126 |
| TOTAL 700 | SPECIAL EQUIP/PROCESS SYSTEM | 2323457 | 0 | 2323457 | 31.20 | 724969 | 3048426 | 30 | 914528 | 3962954 |
| PROJECT TOTAL | | 3,030,597 | 0 | 3,030,597 | 30.17 | 914,250 | 3,944,847 | 30 | 1,183,454 | 5,128,302 |

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPAN
JOB NO. W314B ER 4978
FILE NO. W314SCA2

** IEST - INTERACTIVE ESTIMATING **
PRIMARY TANK EXHAUST TRAIN ALTERNATIVES
STUDY ESTIMATE REF. 5.3.1.1
DOE_R05 - ESTIMATE SUMMARY BY CSI DIVISION


DATE 02/11/94 07:12:44
BY GDR

| CSI | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| ENGINEERING | | | | | | | | | | |
| 00 | TECHNICAL SERVICES | 707140 | 0 | 707140 | 26.77 | 189281 | 896421 | 30 | 268926 | 1165348 |
| | TOTAL ENGINEERING | 707,140 | 0 | 707,140 | 26.77 | 189,281 | 896,421 | 30 | 268,926 | 1,165,348 |
| CONSTRUCTION | | | | | | | | | | |
| 15 | MECHANICAL | 1958530 | 0 | 1958530 | 31.27 | 612432 | 2570962 | 30 | 771289 | 3342251 |
| 16 | ELECTRICAL | 61867 | 0 | 61867 | 31.27 | 19346 | 81213 | 30 | 24364 | 105577 |
| 19 | PROJECT MANAGEMENT | 303060 | 0 | 303060 | 30.75 | 93191 | 396251 | 30 | 118875 | 515126 |
| | TOTAL CONSTRUCTION | 2,323,457 | 0 | 2,323,457 | 31.20 | 724,969 | 3,048,426 | 30 | 914,528 | 3,962,954 |
| PROJECT TOTAL | | 3,030,597 | 0 | 3,030,597 | 30.17 | 914,250 | 3,944,847 | 30 | 1,183,454 | 5,128,302 |

REFERENCE: ESTIMATE BASIS SHEET PAGE 3 OF 7
COST CODE ACCOUNT SUMMARY PAGE 4 OF 7

THE U.S. DEPARTMENT OF ENERGY - RICHLAND ORDER 5700.3 "COST ESTIMATING, ANALYSIS AND STANDARDIZATION" DATED 3-27-85, PROVIDES GUIDELINES FOR ESTIMATE CONTINGENCIES. THE GUIDELINE FOR A STUDY ESTIMATE SHOULD HAVE AN OVERALL RANGE OF 20 TO 30%.

CONTINGENCY IS EVALUATED AT THE THIRD COST CODE LEVEL AND SUMMARIZED AT THE PRIMARY AND SECONDARY COST CODE LEVEL OF THE DETAILED COST ESTIMATE.

APPLIED A 30% CONTINGENCY TO THE PROJECT FOR THIS STUDY ESTIMATE DUE TO THE DEFINITIVE DESIGN, CONSTRUCTION ENGINEERING/INSPECTION, AND WHC PROJECT MANAGEMENT COSTS WERE BASED ON A PERCENTAGE OF DIRECT CONSTRUCTION, AND THE LIMITED AMOUNT OF DETAIL FOR THIS ENGINEERING STUDY.

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W314B ER 4978
FILE NO. W314SCA2

** IEST - INTERACTIVE ESTIMATING **
PRIMARY TANK EXHAUST TRAIN ALTERNATIVES
STUDY ESTIMATE REF. 5.3.1.1
DOE_R07 - ONSITE INDIRECT COSTS BY WBS


DATE 02/11/94 07:12:46
BY GDR

| WBS | DESCRIPTION | ESTIMATE SUBTOTAL | CONTRACT ADMINISTRATION % | CONTRACT ADMINISTRATION TOTAL | BID PACK PREP. | OTHER INDIRECTS | TOTAL INDIRECTS |
|---|---|---|---|---|---|---|---|
| 110000 | DEFINITIVE DESIGN | 505100 | 0.00 | 0 | 0 | 0 | 0 |
| 120000 | ENGINEERING/INSPECTION | 202040 | 0.00 | 0 | 0 | 0 | 0 |
| 310007 | PRIMARY EXHAUST CONSTRUCTION | 2020397 | 0.00 | 0 | 0 | 0 | 0 |
| 400000 | WHC PROJECT MANAGEMENT | 303060 | 0.00 | 0 | 0 | 0 | 0 |
| PROJECT TOTAL | | 3,030,597 | | 0 | 0 | 0 | 0 |

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W314B ER 4978
FILE NO. W314SCB2

** IEST - INTERACTIVE ESTIMATING **
PRIMARY TANK EXHAUST TRAIN ALTERNATIVES
STUDY ESTIMATE REF.5.3.1.2.
DOE_R01 - PROJECT COST SUMMARY


DATE 02/11/94 13:40:44
BY GDR

| COST CODE | DESCRIPTION | ESCALATED TOTAL COST | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|
| 000 | ENGINEERING | 1,080,000 | 30 | 320,000 | 1,400,000 |
| 700 | SPECIAL EQUIP/PROCESS SYSTEMS | 3,680,000 | 30 | 1,100,000 | 4,780,000 |
| | (ADJUSTED TO MEET DOE 5100.4) | 40,000 | | -20,000 | 20,000 |
| | PROJECT TOTAL | 4,800,000 | 30 | 1,400,000 | 6,200,000 |

TYPE OF ESTIMATE: STUDY ESTIMATE FEBRUARY 11, 1994

ARCHITECT ENGINEER

OPERATING CONTRACTOR

REMARKS:

(ROUNDED/ADJUSTED TO THE NEAREST " 10,000 / 100,000 " - PERCENTAGES NOT RECALCULATED TO REFLECT ROUNDING)

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W314B ER 4978
FILE NO. W314SCB2

** IEST - INTERACTIVE ESTIMATING **
PRIMARY TANK EXHAUST TRAIN ALTERNATIVES
STUDY ESTIMATE REF.5.3.1.2.
DOE_R02 - WORK BREAKDOWN STRUCTURE SUMMARY


DATE 02/11/94 13:40:46
BY GDR

| WBS | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| 110000 | DEFINITIVE DESIGN | 610000 | 0 | 610000 | 22.35 | 136335 | 746335 | 30 | 223901 | 970236 |
| 120000 | ENGINEERING/INSPECTION | 244000 | 0 | 244000 | 37.81 | 92256 | 336256 | 30 | 100877 | 437133 |
| SUBTOTAL 1 | ENGINEERING | 854000 | 0 | 854000 | 26.77 | 228591 | 1082591 | 30 | 324778 | 1407369 |
| 310001 | PRIMARY EXHAUST CONSTRUCTION | 2437870 | 0 | 2437870 | 31.27 | 762322 | 3200192 | 30 | 960057 | 4160249 |
| SUBTOTAL 31 | FA CONST-ONSITE E/C | 2437870 | 0 | 2437870 | 31.27 | 762322 | 3200192 | 30 | 960057 | 4160249 |
| SUBTOTAL 3 | CONSTRUCTION | 2437870 | 0 | 2437870 | 31.27 | 762322 | 3200192 | 30 | 960057 | 4160249 |
| 400000 | WHC PROJECT MANAGEMENT | 366000 | 0 | 366000 | 30.75 | 112545 | 478545 | 30 | 143564 | 622109 |
| SUBTOTAL 4 | PROJECT INTEGRATION | 366000 | 0 | 366000 | 30.75 | 112545 | 478545 | 30 | 143564 | 622109 |
| PROJECT TOTAL | | 3,657,870 | 0 | 3,657,870 | 30.17 | 1,103,458 | 4,761,328 | 30 | 1,428,399 | 6,189,727 |

1. DOCUMENTS AND DRAWINGS
==========
DOCUMENTS: DRAFT COPY OF PROJECT W-061 VENTILATION DESIGN ALTERNATIVES.

DRAWINGS: NONE

2. MATERIAL PRICES
==========
UNIT COSTS REPRESENT CURRENT PRICES FOR SPECIFIED MATERIAL.

3. LABOR RATES
==========
CURRENT KEH BASE CRAFT RATES, AS ISSUED BY KEH FINANCE (EFFECTIVE 10-01-93), INCLUDE FRINGE BENEFITS, LABOR INSURANCE, TAXES AND TRAVEL WHERE APPLICABLE, PER HANFORD SITE STABILIZATION AGREEMENT, APPENDIX A (EFFECTIVE 09-06-93). NON CRAFT HOURLY RATES ARE BASED ON THE 1994 FISCAL YEAR BUDGET LIQUIDATION RATES AS ISSUED BY KEH FINANCE (EFFECTIVE 10-01-93).

4. GENERAL REQUIREMENTS/TECHNICAL SERVICES/OVERHEADS
==========
A.) ONSITE CONSTRUCTION FORCES GENERAL REQUIREMENTS, TECHNICAL SERVICES AND CRAFT OVERHEAD COSTS ARE INCLUDED AS A COMPOSITE PERCENTAGE BASED ON THE KEH ESTIMATING FACTOR/BILLING SCHEDULE, REVISION 16, DATED OCTOBER 01, 1993. THE TOTAL COMPOSITE PERCENTAGE APPLIED TO ONSITE CONSTRUCTION FORCES LABOR, FOR THIS PROJECT, IS 93% FOR SHOP WORK AND 134% FOR FIELD WORK, WHICH IS REFLECTED IN THE "OH&P/B&I" COLUMN OF THE ESTIMATE DETAIL.

5. ESCALATION
==========
ESCALATION PERCENTAGES WERE CALCULATED BY THE HANFORD MATERIAL & LABOR ESCALATION STUDY, DATED FEBRUARY 1993.

6. ROUNDING
==========
U.S. DEPARTMENT OF ENERGY - DOE ORDER 5100.4 PAGE I-32 SUBPARAGRAPH (M), REQUIRES ROUNDING OF ALL GENERAL PLANT PROJECTS (GPP'S) AND LINE ITEM (LI) COST ESTIMATES. REFERENCE: DOE 5100.4, FIGURE I-11, DATED 10-31-84.

7. REMARKS
==========
A.) DEFINITIVE DESIGN COSTS ARE BASED ON 25% OF DIRECT CONSTRUCTION COST.
B.) CONSTRUCTION ENGINEERING/INSPECTION COSTS ARE BASED ON 10% OF DIRECT CONSTRUCTION COST.
C.) WHC PROJECT MANAGEMENT COSTS ARE BASED ON 15% OF DIRECT CONSTRUCTION COST.
D.) ALL DUCTS ARE TO BE FABRICATED FROM STAINLESS STEEL.
E.) ALL CONSTRUCTION BY ONSITE FORCES.
F.) ALL ABOVE GROUND DUCTS ARE INSULATED.
G.) ESTIMATE CONTAINS COST FOR A TEA5 FILTER TRAIN.

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W314B ER 4978
FILE NO. W314SCB2

** IEST - INTERACTIVE ESTIMATING **
PRIMARY TANK EXHAUST TRAIN ALTERNATIVES
STUDY ESTIMATE REF.5.3.1.2.
DOE_R04 - COST CODE ACCOUNT SUMMARY


DATE 02/11/94 13:40:48
BY GDR

| COST CODE/WBS | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| 000 | ENGINEERING | | | | | | | | | |
| 110000 | DEFINITIVE DESIGN | 610000 | 0 | 610000 | 22.35 | 136335 | 746335 | 30 | 223901 | 970236 |
| 120000 | ENGINEERING/INSPECTION | 244000 | 0 | 244000 | 37.81 | 92256 | 336256 | 30 | 100877 | 437133 |
| TOTAL 000 | ENGINEERING | 854000 | 0 | 854000 | 26.77 | 228591 | 1082591 | 30 | 324778 | 1407369 |
| 700 | SPECIAL EQUIP/PROCESS SYSTEMS | | | | | | | | | |
| 310001 | PRIMARY EXHAUST CONSTRUCTION | 2437870 | 0 | 2437870 | 31.27 | 762322 | 3200192 | 30 | 960057 | 4160249 |
| 400000 | WHC PROJECT MANAGEMENT | 366000 | 0 | 366000 | 30.75 | 112545 | 478545 | 30 | 143564 | 622109 |
| TOTAL 700 | SPECIAL EQUIP/PROCESS SYSTEM | 2803870 | 0 | 2803870 | 31.20 | 874867 | 3678737 | 30 | 1103621 | 4782358 |
| PROJECT TOTAL | | 3,657,870 | 0 | 3,657,870 | 30.17 | 1,103,458 | 4,761,328 | 30 | 1,428,399 | 6,189,727 |

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W314B ER 4978
FILE NO. W314SCB2

** IEST - INTERACTIVE ESTIMATING **
PRIMARY TANK EXHAUST TRAIN ALTERNATIVES
STUDY ESTIMATE REF.5.3.1.2.
DOE_R05 - ESTIMATE SUMMARY BY CSI DIVISION


DATE 02/11/94 13:40:50
BY GDR

| CSI | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| ENGINEERING | | | | | | | | | | |
| 00 | TECHNICAL SERVICES | 854000 | 0 | 854000 | 26.77 | 228591 | 1082591 | 30 | 324778 | 1407369 |
| | TOTAL ENGINEERING | 854,000 | 0 | 854,000 | 26.77 | 228,591 | 1,082,591 | 30 | 324,778 | 1,407,369 |
| CONSTRUCTION | | | | | | | | | | |
| 15 | MECHANICAL | 2363811 | 0 | 2363811 | 31.27 | 739164 | 3102975 | 30 | 930892 | 4033867 |
| 16 | ELECTRICAL | 74059 | 0 | 74059 | 31.27 | 23158 | 97217 | 30 | 29165 | 126382 |
| 19 | PROJECT MANAGEMENT | 366000 | 0 | 366000 | 30.75 | 112545 | 478545 | 30 | 143564 | 622109 |
| | TOTAL CONSTRUCTION | 2,803,870 | 0 | 2,803,870 | 31.20 | 874,867 | 3,678,737 | 30 | 1,103,621 | 4,782,358 |
| PROJECT TOTAL | | 3,657,870 | 0 | 3,657,870 | 30.17 | 1,103,458 | 4,761,328 | 30 | 1,428,399 | 6,189,727 |

REFERENCE: ESTIMATE BASIS SHEET PAGE 3 OF 7
COST CODE ACCOUNT SUMMARY PAGE 4 OF 7

THE U.S. DEPARTMENT OF ENERGY - RICHLAND ORDER 5700.3 "COST ESTIMATING, ANALYSIS AND STANDARDIZATION" DATED 3-27-85, PROVIDES GUIDELINES FOR ESTIMATE CONTINGENCIES. THE GUIDELINE FOR A STUDY ESTIMATE SHOULD HAVE AN OVERALL RANGE OF 20 TO 30%.

CONTINGENCY IS EVALUATED AT THE THIRD COST CODE LEVEL AND SUMMARIZED AT THE PRIMARY AND SECONDARY COST CODE LEVEL OF THE DETAILED COST ESTIMATE.

APPLIED A 30% CONTINGENCY TO THE PROJECT FOR THIS STUDY ESTIMATE DUE TO THE DEFINITIVE DESIGN, CONSTRUCTION ENGINEERING/INSPECTION, AND WHC PROJECT MANAGEMENT COSTS WERE BASED ON A PERCENTAGE OF DIRECT CONSTRUCTION, AND THE LIMITED AMOUNT OF DETAIL FOR THIS ENGINEERING STUDY.

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W314B ER 4978
FILE NO. W314SCB2

** IEST - INTERACTIVE ESTIMATING **
PRIMARY TANK EXHAUST TRAIN ALTERNATIVES
STUDY ESTIMATE REF.5.3.1.2.
DOE_R07 - ONSITE INDIRECT COSTS BY WBS


DATE 02/11/94 13:40:51
BY GDR

| WBS | DESCRIPTION | ESTIMATE SUBTOTAL | CONTRACT ADMINISTRATION % | CONTRACT ADMINISTRATION TOTAL | BID PACK PREP. | OTHER INDIRECTS | TOTAL INDIRECTS |
|---|---|---|---|---|---|---|---|
| 110000 | DEFINITIVE DESIGN | 610000 | 0.00 | 0 | 0 | 0 | 0 |
| 120000 | ENGINEERING/INSPECTION | 244000 | 0.00 | 0 | 0 | 0 | 0 |
| 310001 | PRIMARY EXHAUST CONSTRUCTION | 2437870 | 0.00 | 0 | 0 | 0 | 0 |
| 400000 | WHC PROJECT MANAGEMENT | 366000 | 0.00 | 0 | 0 | 0 | 0 |
| PROJECT TOTAL | | 3,657,870 | | 0 | 0 | 0 | 0 |

9413221.1252

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W314B/ER3888
FILE NO. W314SCC2

** IEST - INTERACTIVE ESTIMATING **
PRIMARY AND DST ANNULUS INLET ALTERNATIVES
STUDY ESTIMATE REF. SECTION NO.5.3.2.1.
DOE_R01 - PROJECT COST SUMMARY


DATE 02/11/94 07:32:09
BY GDR

| COST CODE | DESCRIPTION | ESCALATED TOTAL COST | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|
| 000 | ENGINEERING | 140,000 | 30 | 40,000 | 180,000 |
| 700 | SPECIAL EQUIP/PROCESS SYSTEMS | 470,000 | 30 | 140,000 | 610,000 |
| | (ADJUSTED TO MEET DOE 5100.4) | -10,000 | | 20,000 | 10,000 |
| | PROJECT TOTAL | 600,000 | 30 | 200,000 | 800,000 |

TYPE OF ESTIMATE STUDY ESTIMATE FEBRUARY 11, 1994

ARCHITECT ENGINEER

OPERATING CONTRACTOR

REMARKS:

PRIMARY & DST ANNULUS INLET ALTERNATIVES

ALTERNATIVE #1 "COMMON INLET STATION"

REF. 5.3.2.1.

(ROUNDED/ADJUSTED TO THE NEAREST " 10,000 / 100,000 " - PERCENTAGES NOT RECALCULATED TO REFLECT ROUNDING)

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W314B/ER3888
FILE NO. W314SCC2

** IEST - INTERACTIVE ESTIMATING **
PRIMARY AND DST ANNULUS INLET ALTERNATIVES
STUDY ESTIMATE REF. SECTION NO.5.3.2.1.
DOE_R02 - WORK BREAKDOWN STRUCTURE SUMMARY


DATE 02/11/94 07:32:10
BY GDR

| WBS | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| 110000 | DEFINITIVE DESIGN | 77000 | 0 | 77000 | 22.35 | 17210 | 94210 | 30 | 28263 | 122472 |
| 120000 | ENGINEERING / INSPECTION | 31000 | 0 | 31000 | 37.81 | 11721 | 42721 | 30 | 12816 | 55537 |
| SUBTOTAL 12 | ENGINEERING/INSPECTION | 31000 | 0 | 31000 | 37.81 | 11721 | 42721 | 30 | 12816 | 55537 |
| SUBTOTAL 1 | ENGINEERING | 108000 | 0 | 108000 | 26.79 | 28931 | 136931 | 30 | 41079 | 178009 |
| 310005 | SUPPLY AIR INTAKE FOR ANNULUS | 204117 | 0 | 204117 | 31.27 | 63827 | 267944 | 30 | 80383 | 348328 |
| 310006 | SUPPLY AIR INTAKE FOR PRIMARY | 105817 | 0 | 105817 | 31.27 | 33089 | 138906 | 30 | 41672 | 180578 |
| SUBTOTAL 31 | FA CONST-ONSITE E/C | 309934 | 0 | 309934 | 31.27 | 96916 | 406850 | 30 | 122055 | 528906 |
| SUBTOTAL 3 | CONSTRUCTION | 309934 | 0 | 309934 | 31.27 | 96916 | 406850 | 30 | 122055 | 528906 |
| 400000 | WHC PROJECT MANAGEMENT | 46000 | 0 | 46000 | 30.75 | 14145 | 60145 | 30 | 18044 | 78189 |
| SUBTOTAL 4 | PROJECT INTEGRATION | 46000 | 0 | 46000 | 30.75 | 14145 | 60145 | 30 | 18044 | 78189 |
| PROJECT TOTAL | | 463,934 | 0 | 463,934 | 30.17 | 139,992 | 603,926 | 30 | 181,178 | 785,104 |

1. DOCUMENTS AND DRAWINGS

DOCUMENTS: ENGINEERING STUDY WHC-SD-W061-ES-001, AND PROJECT W-061 VENTILATION DESIGN ALTERNATIVES DATED SEPT. 15, 1993.

DRAWINGS:

2. MATERIAL PRICES

UNIT COSTS REPRESENT CURRENT PRICES FOR SPECIFIED MATERIAL.

3. LABOR RATES

CURRENT KEH BASE CRAFT RATES, AS ISSUED BY KEH FINANCE (EFFECTIVE 10-01-92), INCLUDE FRINGE BENEFITS, LABOR INSURANCE, TAXES AND TRAVEL WHERE APPLICABLE, PER HANFORD SITE STABILIZATION AGREEMENT, APPENDIX A (EFFECTIVE 9-2-919. NON CRAFT HOURLY RATES ARE BASED ON THE 1993 FISCAL YEAR BUDGET LIQUIDATION RATES AS ISSUED BY KEH FINANCE (EFFECTIVE 10-01-92).

4. GENERAL REQUIREMENTS/TECHNICAL SERVICES/OVERHEADS

A.) ONSITE CONSTRUCTION FORCES GENERAL REQUIREMENTS, TECHNICAL SERVICES AND CRAFT OVERHEAD COSTS ARE INCLUDED AS A COMPOSITE PERCENTAGE BASED ON THE KEH ESTIMATING FACTOR/BILLING SCHEDULE, REVISION 14, DATED OCTOBER 01, 1992. THE TOTAL COMPOSITE PERCENTAGE APPLIED TO ONSITE CONSTRUCTION FORCES LABOR, FOR THIS PROJECT, IS 93% FOR SHOP WORK AND 134% FOR FIELD WORK, WHICH IS REFLECTED IN THE "OH&P/B&I" COLUMN OF THE ESTIMATE DETAIL.

5. ESCALATION

ESCALATION PERCENTAGES WERE CALCULATED BY THE HANFORD MATERIAL & LABOR ESCALATION STUDY, DATED FEBRUARY 1993.

6. ROUNDING

U.S. DEPARTMENT OF ENERGY - DOE ORDER 5100.4 PAGE J-2 SUBPARAGRAPH (M), REQUIRES ROUNDING OF ALL GENERAL PLANT PROJECTS (GPP'S) AND LINE ITEM (LI) COST ESTIMATES. REFERENCE: DOE 5100.4, FIGURE I-11, DATED 10-31-84.

7. REMARKS

A.) DEFINITIVE DESIGN COSTS ARE BASED ON 25% OF DIRECT CONSTRUCTION COST.
B.) CONSTRUCTION ENGINEERING/INSPECTION COSTS ARE BASED ON 10% OF DIRECT CONSTRUCTION COST.
D.) WHC PROJECT MANAGEMENT COSTS ARE BASED ON 15% OF DIRECT CONSTRUCTION COST.
E.) ALL CONSTRUCTION IS TO BE BY THE ONSITE CONTRACTOR.

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W314B/ER3888
FILE NO. W314SCC2

** IEST - INTERACTIVE ESTIMATING **
PRIMARY AND DST ANNULUS INLET ALTERNATIVES
STUDY ESTIMATE REF. SECTION NO.5.3.2.1.
DOE_R04 - COST CODE ACCOUNT SUMMARY


DATE 02/11/94 07:32:12
BY GDR

| COST CODE/WBS | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| 000 | ENGINEERING | | | | | | | | | |
| 110000 | DEFINITIVE DESIGN | 77000 | 0 | 77000 | 22.35 | 17210 | 94210 | 30 | 28263 | 122472 |
| 120000 | ENGINEERING / INSPECTION | 31000 | 0 | 31000 | 37.81 | 11721 | 42721 | 30 | 12816 | 55537 |
| TOTAL 000 | ENGINEERING | 108000 | 0 | 108000 | 26.79 | 28931 | 136931 | 30 | 41079 | 178009 |
| 700 | SPECIAL EQUIP/PROCESS SYSTEMS | | | | | | | | | |
| 310005 | SUPPLY AIR INTAKE FOR ANNULUS | 204117 | 0 | 204117 | 31.27 | 63827 | 267944 | 30 | 80383 | 348328 |
| 310006 | SUPPLY AIR INTAKE FOR PRIMARY | 105817 | 0 | 105817 | 31.27 | 33089 | 138906 | 30 | 41672 | 180578 |
| 400000 | WHC PROJECT MANAGEMENT | 46000 | 0 | 46000 | 30.75 | 14145 | 60145 | 30 | 18044 | 78189 |
| TOTAL 700 | SPECIAL EQUIP/PROCESS SYSTEM | 355934 | 0 | 355934 | 31.20 | 111061 | 466995 | 30 | 140099 | 607095 |
| PROJECT TOTAL | | 463,934 | 0 | 463,934 | 30.17 | 139,992 | 603,926 | 30 | 181,178 | 785,104 |

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W314B/ER3888
FILE NO. W314SCC2

** IEST - INTERACTIVE ESTIMATING **
PRIMARY AND DST ANNULUS INLET ALTERNATIVES
STUDY ESTIMATE REF. SECTION NO.5.3.2.1.
DOE_R05 - ESTIMATE SUMMARY BY CSI DIVISION


DATE 02/11/94 07:32:14
BY GDR

| CSI | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| ENGINEERING | | | | | | | | | | |
| 00 | TECHNICAL SERVICES | 108000 | 0 | 108000 | 26.79 | 28931 | 136931 | 30 | 41079 | 178009 |
| | TOTAL ENGINEERING | 108,000 | 0 | 108,000 | 26.79 | 28,931 | 136,931 | 30 | 41,079 | 178,009 |
| CONSTRUCTION | | | | | | | | | | |
| 15 | MECHANICAL | 184663 | 0 | 184663 | 31.27 | 57744 | 242407 | 30 | 72722 | 315130 |
| 16 | ELECTRICAL | 125271 | 0 | 125271 | 31.27 | 39172 | 164443 | 30 | 49333 | 213776 |
| 19 | PROJECT MANAGEMENT | 46000 | 0 | 46000 | 30.75 | 14145 | 60145 | 30 | 18044 | 78189 |
| | TOTAL CONSTRUCTION | 355,934 | 0 | 355,934 | 31.20 | 111,061 | 466,995 | 30 | 140,099 | 607,095 |
| | PROJECT TOTAL | 463,934 | 0 | 463,934 | 30.17 | 139,992 | 603,926 | 30 | 181,178 | 785,104 |

REFERENCE: ESTIMATE BASIS SHEET PAGE 3 OF 7
COST CODE ACCOUNT SUMMARY PAGE 4 OF 7

THE U.S. DEPARTMENT OF ENERGY - RICHLAND ORDER 5700.3 "COST ESTIMATING, ANALYSIS AND STANDARDIZATION" DATED 3-27-85, PROVIDES GUIDELINES FOR ESTIMATE CONTINGENCIES. THE GUIDELINE FOR A STUDY ESTIMATE SHOULD HAVE AN OVERALL RANGE OF 15 TO 35 % .

CONTINGENCY IS EVALUATED AT THE THIRD COST CODE LEVEL AND SUMMARIZED AT THE PRIMARY AND SECONDARY COST CODE LEVEL OF THE DETAILED COST ESTIMATE.

APPLIED A 30% CONTINGENCY TO THE PROJECT FOR THIS STUDY ESTIMATE DUE TO THE DEFINITIVE DESIGN, CONSTRUCTION ENGINEERING/INSPECTION, AND WHC PROJECT MANAGEMENT COSTS WERE BASED ON A PERCENTAGE OF DIRECT CONSTRUCTION, AND THE LIMITED AMOUNT OF DETAIL FOR THIS ENGINEERING STUDY.

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W314B/ER3888
FILE NO. W314SCC2

** IEST - INTERACTIVE ESTIMATING **
PRIMARY AND DST ANNULUS INLET ALTERNATIVES
STUDY ESTIMATE REF. SECTION NO.5.3.2.1.
DOE_R07 - ONSITE INDIRECT COSTS BY WBS


DATE 02/11/94 07:32:16
BY GDR

| WBS | DESCRIPTION | ESTIMATE SUBTOTAL | CONTRACT % | ADMINISTRATION TOTAL | BID PACK PREP. | OTHER INDIRECTS | TOTAL INDIRECTS |
|---|---|---|---|---|---|---|---|
| 110000 | DEFINITIVE DESIGN | 77000 | 0.00 | 0 | 0 | 0 | 0 |
| 120000 | ENGINEERING / INSPECTION | 31000 | 0.00 | 0 | 0 | 0 | 0 |
| 310005 | SUPPLY AIR INTAKE FOR ANNULUS | 204117 | 0.00 | 0 | 0 | 0 | 0 |
| 310006 | SUPPLY AIR INTAKE FOR PRIMARY | 105817 | 0.00 | 0 | 0 | 0 | 0 |
| 400000 | WHC PROJECT MANAGEMENT | 46000 | 0.00 | 0 | 0 | 0 | 0 |
| PROJECT TOTAL | | 463,934 | | 0 | 0 | 0 | 0 |

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W314B/ER3888
FILE NO. W314SCD2

** IEST - INTERACTIVE ESTIMATING **
PRIMARY AND DST ANNULUS INLET ALTERNATIVES
STUDY ESTIMATE - REF. 5.3.2.2.
DOE_R01 - PROJECT COST SUMMARY


DATE 02/11/94 07:07:19
BY GDR

| COST CODE | DESCRIPTION | ESCALATED TOTAL COST | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|
| 000 | ENGINEERING | 1,540,000 | 30 | 460,000 | 2,000,000 |
| 700 | SPECIAL EQUIP/PROCESS SYSTEMS | 3,150,000 | 30 | 950,000 | 4,100,000 |
| | (ADJUSTED TO MEET DOE 5100.4) | 10,000 | | -10,000 | 0 |
| | PROJECT TOTAL | 4,700,000 | 30 | 1,400,000 | 6,100,000 |

TYPE OF ESTIMATE STUDY ESTIMATE FEBRUARY 11, 1994

ARCHITECT ENGINEER

OPERATING CONTRACTOR

REMARKS:

PRIMARY AND DST ANNULUS INLET ALTERNATIVES

ALTERNATIVE #2 "INDIVIDUAL TANK INLET STATIONS"

REF. 5.3.2.2.

(ROUNDED/ADJUSTED TO THE NEAREST " 10,000 / 100,000 " - PERCENTAGES NOT RECALCULATED TO REFLECT ROUNDING)

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W314B/ER3888
FILE NO. W314SCD2

** IEST - INTERACTIVE ESTIMATING **
PRIMARY AND DST ANNULUS INLET ALTERNATIVES
STUDY ESTIMATE - REF. 5.3.2.2.
DOE_R02 - WORK BREAKDOWN STRUCTURE SUMMARY


DATE 02/11/94 07:07:21
BY GDR

| WBS | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| 110000 | DEFINITIVE DESIGN | 600000 | 0 | 600000 | 22.35 | 134100 | 734100 | 30 | 220230 | 954330 |
| 120000 | ENGINEERING/INSPECTION | 240000 | 0 | 240000 | 37.81 | 90744 | 330744 | 30 | 99223 | 429967 |
| SUBTOTAL 12 | ENGINEERING/INSPECTION | 240000 | 0 | 240000 | 37.81 | 90744 | 330744 | 30 | 99223 | 429967 |
| SUBTOTAL 1 | ENGINEERING | 840000 | 0 | 840000 | 26.77 | 224844 | 1064844 | 30 | 319453 | 1384297 |
| 310100 | AIR INTAKE FOR ANNULUS | 1070271 | 0 | 1070271 | 31.27 | 334675 | 1404946 | 30 | 421483 | 1826428 |
| 310200 | AIR INTAKE FOR PRIMARY | 1021140 | 0 | 1021140 | 31.27 | 319311 | 1340451 | 30 | 402135 | 1742586 |
| 311000 | BURNOUT ANNULUS TIE-IN | 103941 | 0 | 103941 | 31.27 | 32502 | 136443 | 30 | 40933 | 177376 |
| 312000 | BURNOUT PRIMARY TIE-IN | 207925 | 0 | 207925 | 31.27 | 65018 | 272943 | 30 | 81883 | 354826 |
| SUBTOTAL 31 | FA CONST-ONSITE E/C | 2403277 | 0 | 2403277 | 31.27 | 751506 | 3154783 | 30 | 946434 | 4101216 |
| SUBTOTAL 3 | CONSTRUCTION | 2403277 | 0 | 2403277 | 31.27 | 751506 | 3154783 | 30 | 946434 | 4101216 |
| 400000 | WHC PROJECT MANAGEMENT | 360000 | 0 | 360000 | 30.75 | 110700 | 470700 | 30 | 141210 | 611910 |
| SUBTOTAL 4 | PROJECT INTEGRATION | 360000 | 0 | 360000 | 30.75 | 110700 | 470700 | 30 | 141210 | 611910 |
| PROJECT TOTAL | | 3,603,277 | 0 | 3,603,277 | 30.17 | 1,087,050 | 4,690,327 | 30 | 1,407,097 | 6,097,423 |

1. DOCUMENTS AND DRAWINGS

DOCUMENTS: ENGINEERING STUDY WHC-SD-W061-ES-001, AND PROJECT W-061 VENTILATION DESIGN ALTERNATIVES DATED SEPTEMBER 15, 1993.

DRAWINGS:

2. MATERIAL PRICES

UNIT COSTS REPRESENT CURRENT PRICES FOR SPECIFIED MATERIAL.

3. LABOR RATES

CURRENT KEH BASE CRAFT RATES, AS ISSUED BY KEH FINANCE (EFFECTIVE 10-01-92), INCLUDE FRINGE BENEFITS, LABOR INSURANCE, TAXES AND TRAVEL WHERE APPLICABLE, PER HANFORD SITE STABILIZATION AGREEMENT, APPENDIX A (EFFECTIVE 9-2-91). NON CRAFT HOURLY RATES ARE BASED ON THE 1993 FISCAL YEAR BUDGET LIQUIDATION RATES AS ISSUED BY KEH FINANCE (EFFECTIVE 10-01-92).

4. GENERAL REQUIREMENTS/TECHNICAL SERVICES/OVERHEADS

A.) ONSITE CONSTRUCTION FORCES GENERAL REQUIREMENTS, TECHNICAL SERVICES AND CRAFT OVERHEAD COSTS ARE INCLUDED AS A COMPOSITE PERCENTAGE BASED ON THE KEH ESTIMATING FACTOR/BILLING SCHEDULE, REVISION 14, DATED OCTOBER 01, 1992. THE TOTAL COMPOSITE PERCENTAGE APPLIED TO ONSITE CONSTRUCTION FORCES LABOR, FOR THIS PROJECT, IS 93% FOR SHOP WORK AND 134% FOR FIELD WORK, WHICH IS REFLECTED IN THE "OH&P/B&I" COLUMN OF THE ESTIMATE DETAIL.

5. ESCALATION

ESCALATION PERCENTAGES WERE CALCULATED BY THE HANFORD MATERIAL & LABOR ESCALATION STUDY, DATED FEBRUARY 1993.

6. ROUNDING

U.S. DEPARTMENT OF ENERGY - DOE ORDER 5100.4 PAGE J-2 SUBPARAGRAPH (M), REQUIRES ROUNDING OF ALL GENERAL PLANT PROJECTS (GPP'S) AND LINE ITEM (LI) COST ESTIMATES. REFERENCE: DOE 5100.4, FIGURE I-11, DATED 10-31-84.

7. REMARKS

A.) DEFINITIVE DESIGN COSTS ARE BASED ON 25% OF DIRECT CONSTRUCTION COST.
B.) CONSTRUCTION ENGINEERING/INSPECTION COSTS ARE BASED ON 10% OF DIRECT CONSTRUCTION COST.
C.) WHC PROJECT MANAGEMENT COSTS ARE BASED ON 15% OF DIRECT CONSTRUCTION COST.
D.) ESTIMATE INCLUDES A REDUNDANT INTAKE FOR EACH TANK, FOR THE ANNULUS AND THE PRIMARY INTAKE.
E.) EACH INTAKE HAS A BYPASS TO INSURE AIR INTAKE IF THE FILTER GETS PLUGED.
F.) ALL DUCTS ARE TO BE FABRICATED FROM STAINLESS STEEL.
G.) ALL CONSTRUCTION IS TO BE BY THE ONSTIE CONTRACTOR.

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W314B/ER3888
FILE NO. W314SCD2

** IEST - INTERACTIVE ESTIMATING **
PRIMARY AND DST ANNULUS INLET ALTERNATIVES
STUDY ESTIMATE - REF. 5.3.2.2.
DOE_R04 - COST CODE ACCOUNT SUMMARY


DATE 02/11/94 07:07:23
BY GDR

| COST CODE/WBS | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| 000 | ENGINEERING | | | | | | | | | |
| 110000 | DEFINITIVE DESIGN | 600000 | 0 | 600000 | 22.35 | 134100 | 734100 | 30 | 220230 | 954330 |
| 120000 | ENGINEERING/INSPECTION | 240000 | 0 | 240000 | 37.81 | 90744 | 330744 | 30 | 99223 | 429967 |
| 400000 | WHC PROJECT MANAGEMENT | 360000 | 0 | 360000 | 30.75 | 110700 | 470700 | 30 | 141210 | 611910 |
| TOTAL 000 | ENGINEERING | 1200000 | 0 | 1200000 | 27.96 | 335544 | 1535544 | 30 | 460663 | 1996207 |
| 700 | SPECIAL EQUIP/PROCESS SYSTEMS | | | | | | | | | |
| 310100 | AIR INTAKE FOR ANNULUS | 1070271 | 0 | 1070271 | 31.27 | 334675 | 1404946 | 30 | 421483 | 1826428 |
| 310200 | AIR INTAKE FOR PRIMARY | 1021140 | 0 | 1021140 | 31.27 | 319311 | 1340451 | 30 | 402135 | 1742586 |
| 311000 | BURNOUT ANNULUS TIE-IN | 103941 | 0 | 103941 | 31.27 | 32502 | 136443 | 30 | 40933 | 177376 |
| 312000 | BURNOUT PRIMARY TIE-IN | 207925 | 0 | 207925 | 31.27 | 65018 | 272943 | 30 | 81883 | 354826 |
| TOTAL 700 | SPECIAL EQUIP/PROCESS SYSTEM | 2403277 | 0 | 2403277 | 31.27 | 751506 | 3154783 | 30 | 946434 | 4101216 |
| PROJECT TOTAL | | 3,603,277 | 0 | 3,603,277 | 30.17 | 1,087,050 | 4,690,327 | 30 | 1,407,097 | 6,097,423 |

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W314B/ER3888
FILE NO. W314SCD2

** IEST - INTERACTIVE ESTIMATING **
PRIMARY AND DST ANNULUS INLET ALTERNATIVES
STUDY ESTIMATE - REF. 5.3.2.2.
DOE_R05 - ESTIMATE SUMMARY BY CSI DIVISION


DATE 02/11/94 07:07:24
BY GDR

| CSI | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| ENGINEERING | | | | | | | | | | |
| 00 | TECHNICAL SERVICES | 1200000 | 0 | 1200000 | 27.96 | 335544 | 1535544 | 30 | 460663 | 1996207 |
| TOTAL ENGINEERING | | 1,200,000 | 0 | 1,200,000 | 27.96 | 335,544 | 1,535,544 | 30 | 460,663 | 1,996,207 |
| CONSTRUCTION | | | | | | | | | | |
| 01 | GENERAL REQUIRMENTS | 836805 | 0 | 836805 | 31.27 | 261669 | 1098474 | 30 | 329542 | 1428016 |
| 15 | MECHANICAL | 1377485 | 0 | 1377485 | 31.27 | 430740 | 1808225 | 30 | 542467 | 2350692 |
| 16 | ELECTRICAL | 188987 | 0 | 188987 | 31.27 | 59097 | 248084 | 30 | 74425 | 322508 |
| TOTAL CONSTRUCTION | | 2,403,277 | 0 | 2,403,277 | 31.27 | 751,506 | 3,154,783 | 30 | 946,434 | 4,101,216 |
| PROJECT TOTAL | | 3,603,277 | 0 | 3,603,277 | 30.17 | 1,087,050 | 4,690,327 | 30 | 1,407,097 | 6,097,423 |

REFERENCE: ESTIMATE BASIS SHEET PAGE 3 OF 7
COST CODE ACCOUNT SUMMARY PAGE 4 OF 7

THE U.S. DEPARTMENT OF ENERGY - RICHLAND ORDER 5700.3 "COST ESTIMATING, ANALYSIS AND STANDARDIZATION" DATED 3-27-85, PROVIDES GUIDELINES FOR ESTIMATE CONTINGENCIES. THE GUIDELINE FOR A STUDY ESTIMATE SHOULD HAVE AN OVERALL RANGE OF 15% TO 35% .

CONTINGENCY IS EVALUATED AT THE THIRD COST CODE LEVEL AND SUMMARIZED AT THE PRIMARY AND SECONDARY COST CODE LEVEL OF THE DETAILED COST ESTIMATE.

APPLIED A 30% CONTINGENCY TO THE PROJECT FOR THIS STUDY ESTIMATE DUE TO THE DEFINITIVE DESIGN, CONSTRUCTION ENGINEERING/INSPECTION, AND WHC PROJECT MANAGEMENT COSTS WERE BASED ON A PERCENTAGE OF DIRECT CONSTRUCTION, AND THE LIMITED AMOUNT OF DETAIL FOR THIS ENGNIEERING STUDY.

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W314B/ER3888
FILE NO. W314SCD2

** IEST - INTERACTIVE ESTIMATING **
PRIMARY AND DST ANNULUS INLET ALTERNATIVES
STUDY ESTIMATE - REF. 5.3.2.2.
DOE_R07 - ONSITE INDIRECT COSTS BY WBS


DATE 02/11/94 07:07:26
BY GDR

| WBS | DESCRIPTION | ESTIMATE SUBTOTAL | CONTRACT % | ADMINISTRATION TOTAL | BID PACK PREP. | OTHER INDIRECTS | TOTAL INDIRECTS |
|---|---|---|---|---|---|---|---|
| 110000 | DEFINITIVE DESIGN | 600000 | 0.00 | 0 | 0 | 0 | 0 |
| 120000 | ENGINEERING/INSPECTION | 240000 | 0.00 | 0 | 0 | 0 | 0 |
| 310100 | AIR INTAKE FOR ANNULUS | 1070271 | 0.00 | 0 | 0 | 0 | 0 |
| 310200 | AIR INTAKE FOR PRIMARY | 1021140 | 0.00 | 0 | 0 | 0 | 0 |
| 311000 | BURNOUT ANNULUS TIE-IN | 103941 | 0.00 | 0 | 0 | 0 | 0 |
| 312000 | BURNOUT PRIMARY TIE-IN | 207925 | 0.00 | 0 | 0 | 0 | 0 |
| 400000 | WHC PROJECT MANAGEMENT | 360000 | 0.00 | 0 | 0 | 0 | 0 |
| PROJECT TOTAL | | 3,603,277 | | 0 | 0 | 0 | 0 |

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KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W314B/ER3888
FILE NO. W314SCE2

** IEST - INTERACTIVE ESTIMATING **
DST ANNULUS EXHAUST TRAIN ALTERNATIVES
STUDY ESTIMATE - REF. SECTION NO. 5.3.3.1
DOE_R01 - PROJECT COST SUMMARY


DATE 02/11/94 10:06:33
BY GDR

| COST CODE | DESCRIPTION | ESCALATED TOTAL COST | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|
| 000 | ENGINEERING | 245,000 | 30 | 74,000 | 319,000 |
| 700 | SPECIAL EQUIP/PROCESS SYSTEMS | 503,000 | 30 | 151,000 | 654,000 |
| | (ADJUSTED TO MEET DOE 5100.4) | 2,000 | | -5,000 | -3,000 |
| | PROJECT TOTAL | 750,000 | 30 | 220,000 | 970,000 |

TYPE OF ESTIMATE STUDY ESTIMATE FEBRUARY 11, 1994

ARCHITECT ENGINEER

OPERATING CONTRACTOR

REMARKS:

(ROUNDED/ADJUSTED TO THE NEAREST " 1,000 / 10,000 " - PERCENTAGES NOT RECALCULATED TO REFLECT ROUNDING)

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W314B/ER3888
FILE NO. W314SCE2

** IEST - INTERACTIVE ESTIMATING **
DST ANNULUS EXHAUST TRAIN ALTERNATIVES
STUDY ESTIMATE - REF. SECTION NO. 5.3.3.1
DOE_R02 - WORK BREAKDOWN STRUCTURE SUMMARY


DATE 02/11/94 13:42:33
BY GDR

| WBS | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| 110000 | DEFINITIVE DESIGN | 96000 | 0 | 96000 | 22.35 | 21456 | 117456 | 30 | 35237 | 152693 |
| 120000 | ENGINEERING/INSPECTION | 38300 | 0 | 38300 | 37.81 | 14481 | 52781 | 30 | 15834 | 68616 |
| SUBTOTAL 12 | ENGINEERING/INSPECTION | 38300 | 0 | 38300 | 37.81 | 14481 | 52781 | 30 | 15834 | 68616 |
| SUBTOTAL 1 | ENGINEERING | 134300 | 0 | 134300 | 26.76 | 35937 | 170237 | 30 | 51071 | 221309 |
| 310008 | ANNULUS EXHAUST | 383239 | 0 | 383239 | 31.27 | 119839 | 503078 | 30 | 150923 | 654001 |
| SUBTOTAL 31 | FA CONST-ONSITE E/C | 383239 | 0 | 383239 | 31.27 | 119839 | 503078 | 30 | 150923 | 654001 |
| SUBTOTAL 3 | CONSTRUCTION | 383239 | 0 | 383239 | 31.27 | 119839 | 503078 | 30 | 150923 | 654001 |
| 400000 | WHC PROJECT MANAGEMENT | 57500 | 0 | 57500 | 30.75 | 17681 | 75181 | 30 | 22554 | 97736 |
| SUBTOTAL 4 | PROJECT INTEGRATION | 57500 | 0 | 57500 | 30.75 | 17681 | 75181 | 30 | 22554 | 97736 |
| PROJECT TOTAL | | 575,039 | 0 | 575,039 | 30.16 | 173,457 | 748,496 | 30 | 224,548 | 973,046 |

1. DOCUMENTS AND DRAWINGS

DOCUMENTS: ENGINEERING STUDY WHC-SD-W061-ES-001, AND PROJECT W-061 VENTILATION DESIGN ALTERNATIVES DATED SEPTEMBER 15, 1993.

DRAWINGS:

2. MATERIAL PRICES

UNIT COSTS REPRESENT CURRENT PRICES FOR SPECIFIED MATERIAL.

3. LABOR RATES

CURRENT KEH BASE CRAFT RATES, AS ISSUED BY KEH FINANCE (EFFECTIVE 10-01-92), INCLUDE FRINGE BENEFITS, LABOR INSURANCE, TAXES AND TRAVEL WHERE APPLICABLE, PER HANFORD SITE STABILIZATION AGREEMENT, APPENDIX A (EFFECTIVE 9-2-91). NON CRAFT HOURLY RATES ARE BASED ON THE 1993 FISCAL YEAR BUDGET LIQUIDATION RATES AS ISSUED BY KEH FINANCE (EFFECTIVE 10-01-92).

4. GENERAL REQUIREMENTS/TECHNICAL SERVICES/OVERHEADS

A.) ONSITE CONSTRUCTION FORCES GENERAL REQUIREMENTS, TECHNICAL SERVICES AND CRAFT OVERHEAD COSTS ARE INCLUDED AS A COMPOSITE PERCENTAGE BASED ON THE KEH ESTIMATING FACTOR/BILLING SCHEDULE, REVISION 14, DATED OCTOBER 01, 1992. THE TOTAL COMPOSITE PERCENTAGE APPLIED TO ONSITE CONSTRUCTION FORCES LABOR, FOR THIS PROJECT, IS 93% FOR SHOP WORK AND 134% FOR FIELD WORK, WHICH IS REFLECTED IN THE "OH&P/B&I" COLUMN OF THE ESTIMATE DETAIL.

5. ESCALATION

ESCALATION PERCENTAGES WERE CALCULATED BY THE HANFORD MATERIAL & LABOR ESCALATION STUDY, DATED FEBRUARY 1993.

6. ROUNDING

U.S. DEPARTMENT OF ENERGY - DOE ORDER 5100.4 PAGE J-2 SUBPARAGRAPH (M), REQUIRES ROUNDING OF ALL GENERAL PLANT PROJECTS (GPP'S) AND LINE ITEM (LI) COST ESTIMATES. REFERENCE: DOE 5100.4, FIGURE I-11, DATED 10-31-84.

7. REMARKS

A.) DEFINITIVE DESIGN COSTS ARE BASED ON 25% OF DIRECT CONSTRUCTION COST.
B.) CONSTRUCTION ENGINEERING/INSPECTION COSTS ARE BASED ON 10% OF DIRECT CONSTRUCTION COST.
C.) WHC PROJECT MANAGEMENT COSTS ARE BASED ON 15% OF DIRECT CONSTRUCTION COST.
D.) ALL CONSTRUCTION IS TO BE BY THE ONSTIE CONTRACTOR.

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W314B/ER3888
FILE NO. W314SCE2

** IEST - INTERACTIVE ESTIMATING **
DST ANNULUS EXHAUST TRAIN ALTERNATIVES
STUDY ESTIMATE - REF. SECTION NO. 5.3.3.1
DOE_R04 - COST CODE ACCOUNT SUMMARY


DATE 02/11/94 13:42:34
BY GDR

| COST CODE/WBS | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| 000 | ENGINEERING | | | | | | | | | |
| 110000 | DEFINITIVE DESIGN | 96000 | 0 | 96000 | 22.35 | 21456 | 117456 | 30 | 35237 | 152693 |
| 120000 | ENGINEERING/INSPECTION | 38300 | 0 | 38300 | 37.81 | 14481 | 52781 | 30 | 15834 | 68616 |
| 400000 | WHC PROJECT MANAGEMENT | 57500 | 0 | 57500 | 30.75 | 17681 | 75181 | 30 | 22554 | 97736 |
| TOTAL 000 | ENGINEERING | 191800 | 0 | 191800 | 27.96 | 53618 | 245418 | 30 | 73625 | 319045 |
| 700 | SPECIAL EQUIP/PROCESS SYSTEMS | | | | | | | | | |
| 310008 | ANNULUS EXHAUST | 383239 | 0 | 383239 | 31.27 | 119839 | 503078 | 30 | 150923 | 654001 |
| TOTAL 700 | SPECIAL EQUIP/PROCESS SYSTEM | 383239 | 0 | 383239 | 31.27 | 119839 | 503078 | 30 | 150923 | 654001 |
| PROJECT TOTAL | | 575,039 | 0 | 575,039 | 30.16 | 173,457 | 748,496 | 30 | 224,548 | 973,046 |

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W314B/ER3888
FILE NO. W314SCE2

** TEST - INTERACTIVE ESTIMATING **
DST ANNULUS EXHAUST TRAIN ALTERNATIVES
STUDY ESTIMATE - REF. SECTION NO. 5.3.3.1
DOE_R05 - ESTIMATE SUMMARY BY CSI DIVISION


DATE 02/11/94 13:42:36
BY GDR

| CSI | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| ENGINEERING | | | | | | | | | | |
| 00 | TECHNICAL SERVICES | 191800 | 0 | 191800 | 27.96 | 53618 | 245418 | 30 | 73625 | 319045 |
| | TOTAL ENGINEERING | 191,800 | 0 | 191,800 | 27.96 | 53,618 | 245,418 | 30 | 73,625 | 319,045 |
| CONSTRUCTION | | | | | | | | | | |
| 15 | MECHANICAL | 321602 | 0 | 321602 | 31.27 | 100565 | 422167 | 30 | 126650 | 548817 |
| 16 | ELECTRICAL | 61637 | 0 | 61637 | 31.27 | 19274 | 80911 | 30 | 24273 | 105184 |
| | TOTAL CONSTRUCTION | 383,239 | 0 | 383,239 | 31.27 | 119,839 | 503,078 | 30 | 150,923 | 654,001 |
| | PROJECT TOTAL | 575,039 | 0 | 575,039 | 30.16 | 173,457 | 748,496 | 30 | 224,548 | 973,046 |

REFERENCE: ESTIMATE BASIS SHEET PAGE 3 OF 7
COST CODE ACCOUNT SUMMARY PAGE 4 OF 7

THE U.S. DEPARTMENT OF ENERGY - RICHLAND ORDER 5700.3 "COST ESTIMATING, ANALYSIS AND STANDARDIZATION" DATED 3-27-85, PROVIDES GUIDELINES FOR ESTIMATE CONTINGENCIES. THE GUIDELINE FOR A STUDY ESTIMATE SHOULD HAVE AN OVERALL RANGE OF 15% TO 35% .

CONTINGENCY IS EVALUATED AT THE THIRD COST CODE LEVEL AND SUMMARIZED AT THE PRIMARY AND SECONDARY COST CODE LEVEL OF THE DETAILED COST ESTIMATE.

APPLIED A 30% CONTINGENCY TO THE PROJECT FOR THIS STUDY ESTIMATE DUE TO THE DEFINITIVE DESIGN, CONSTRUCTION ENGINEERING/INSPECTION, AND WHC PROJECT MANAGEMENT COSTS WERE BASED ON A PERCENTAGE OF DIRECT CONSTRUCTION, AND THE LIMITED AMOUNT OF DETAIL FOR THIS ENGNIEERING STUDY.

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W314B/ER3888
FILE NO. W314SCE2

** IEST - INTERACTIVE ESTIMATING **
DST ANNULUS EXHAUST TRAIN ALTERNATIVES
STUDY ESTIMATE - REF. SECTION NO. 5.3.3.1
DOE_R07 - ONSITE INDIRECT COSTS BY WBS


DATE 02/11/94 13:42:37
BY GDR

| WBS | DESCRIPTION | ESTIMATE SUBTOTAL | CONTRACT ADMINISTRATION % | CONTRACT ADMINISTRATION TOTAL | BID PACK PREP. | OTHER INDIRECTS | TOTAL INDIRECTS |
|---|---|---|---|---|---|---|---|
| 110000 | DEFINITIVE DESIGN | 96000 | 0.00 | 0 | 0 | 0 | 0 |
| 120000 | ENGINEERING/INSPECTION | 38300 | 0.00 | 0 | 0 | 0 | 0 |
| 310008 | ANNULUS EXHAUST | 383239 | 0.00 | 0 | 0 | 0 | 0 |
| 400000 | WHC PROJECT MANAGEMENT | 57500 | 0.00 | 0 | 0 | 0 | 0 |
| PROJECT TOTAL | | 575,039 | | 0 | 0 | 0 | 0 |

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W314B/ER3888
FILE NO. W314SCF2

** IEST - INTERACTIVE ESTIMATING **
PRIMARY & DST ANNULUS DUCTWORK ALTERNATIVES
STUDY ESTIMATE - REF. SECTION NO. 5.3.4.1.
DOE_R01 - PROJECT COST SUMMARY


DATE 02/11/94 13:44:02
BY GDR

| COST CODE | DESCRIPTION | ESCALATED TOTAL COST | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|
| 000 | ENGINEERING | 7,180,000 | 30 | 2,150,000 | 9,330,000 |
| 700 | SPECIAL EQUIP/PROCESS SYSTEMS | 14,730,000 | 30 | 4,420,000 | 19,150,000 |
| | (ADJUSTED TO MEET DOE 5100.4) | -10,000 | | 30,000 | 20,000 |
| | PROJECT TOTAL | 21,900,000 | 30 | 6,600,000 | 28,500,000 |

TYPE OF ESTIMATE STUDY ESTIMATE FEBRUARY 11, 1994

ARCHITECT ENGINEER Dobbs Hyd A.W. Aberu

OPERATING CONTRACTOR D.S. Howell

REMARKS:

(ROUNDED/ADJUSTED TO THE NEAREST " 10,000 / 100,000 " - PERCENTAGES NOT RECALCULATED TO REFLECT ROUNDING)

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KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W314B/ER3888
FILE NO. W314SCF2

** IEST - INTERACTIVE ESTIMATING **
PRIMARY & DST ANNULUS DUCTWORK ALTERNATIVES
STUDY ESTIMATE - REF. SECTION NO. 5.3.4.1.
DOE_R02 - WORK BREAKDOWN STRUCTURE SUMMARY


DATE 02/11/94 13:44:03
BY GDR

| WBS | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| 110000 | DEFINITIVE DESIGN | 2805000 | 0 | 2805000 | 22.35 | 626918 | 3431918 | 30 | 1029575 | 4461493 |
| 120000 | ENGINEERING/INSPECTION | 1122000 | 0 | 1122000 | 37.81 | 424228 | 1546228 | 30 | 463868 | 2010097 |
| SUBTOTAL 12 | ENGINEERING/INSPECTION | 1122000 | 0 | 1122000 | 37.81 | 424228 | 1546228 | 30 | 463868 | 2010097 |
| SUBTOTAL 1 | ENGINEERING | 3927000 | 0 | 3927000 | 26.77 | 1051146 | 4978146 | 30 | 1493443 | 6471590 |
| 310009 | BURIED DUCT FOR ANNULUS INTAKE | 1535416 | 0 | 1535416 | 31.27 | 480125 | 2015541 | 30 | 604662 | 2620203 |
| 310010 | BURIED DUCT FOR PRIMARY INTAKE | 841855 | 0 | 841855 | 31.27 | 263248 | 1105103 | 30 | 331531 | 1436634 |
| 310011 | BURIED DUCTS FOR PRIMARY EXHAUST | 2703282 | 0 | 2703282 | 31.27 | 845315 | 3548597 | 30 | 1064579 | 4613179 |
| 310012 | BURIED DUCT FOR ANNULUS EXHAUST | 5817988 | 0 | 5817988 | 31.27 | 1819284 | 7637272 | 30 | 2291182 | 9928456 |
| SUBTOTAL 31 | FA CONST-ONSITE E/C | 10898541 | 0 | 10898541 | 31.27 | 3407972 | 14306513 | 30 | 4291954 | 18598472 |
| 330000 | BURIAL FEES | 321969 | 0 | 321969 | 31.27 | 100680 | 422649 | 30 | 126795 | 549443 |
| SUBTOTAL 33 | CONSTRUCTION-O/C | 321969 | 0 | 321969 | 31.27 | 100680 | 422649 | 30 | 126795 | 549443 |
| SUBTOTAL 3 | CONSTRUCTION | 11220510 | 0 | 11220510 | 31.27 | 3508652 | 14729162 | 30 | 4418749 | 19147915 |
| 400000 | WHC PROJECT MANAGEMENT | 1683000 | 0 | 1683000 | 30.75 | 517523 | 2200523 | 30 | 660157 | 2860679 |
| SUBTOTAL 4 | PROJECT INTEGRATION | 1683000 | 0 | 1683000 | 30.75 | 517523 | 2200523 | 30 | 660157 | 2860679 |
| PROJECT TOTAL | | 16,830,510 | 0 | 16,830,510 | 30.17 | 5,077,321 | 21,907,831 | 30 | 6,572,349 | 28,480,184 |

1. DOCUMENTS AND DRAWINGS

DOCUMENTS: ENGINEERING STUDY WHC-SD-W061-ES-001, AND PROJECT W-061 VENTILATION DESIGN ALTERNATIVES DATED SEPTEMBER 15, 1993.

DRAWINGS:

2. MATERIAL PRICES

UNIT COSTS REPRESENT CURRENT PRICES FOR SPECIFIED MATERIAL.

3. LABOR RATES

CURRENT KEH BASE CRAFT RATES, AS ISSUED BY KEH FINANCE (EFFECTIVE 10-01-92), INCLUDE FRINGE BENEFITS, LABOR INSURANCE, TAXES AND TRAVEL WHERE APPLICABLE, PER HANFORD SITE STABILIZATION AGREEMENT, APPENDIX A (EFFECTIVE 9-2-91). NON CRAFT HOURLY RATES ARE BASED ON THE 1993 FISCAL YEAR BUDGET LIQUIDATION RATES AS ISSUED BY KEH FINANCE (EFFECTIVE 10-01-92).

4. GENERAL REQUIREMENTS/TECHNICAL SERVICES/OVERHEADS

A.) ONSITE CONSTRUCTION FORCES GENERAL REQUIREMENTS, TECHNICAL SERVICES AND CRAFT OVERHEAD COSTS ARE INCLUDED AS A COMPOSITE PERCENTAGE BASED ON THE KEH ESTIMATING FACTOR/BILLING SCHEDULE, REVISION 14, DATED OCTOBER 01, 1992. THE TOTAL COMPOSITE PERCENTAGE APPLIED TO ONSITE CONSTRUCTION FORCES LABOR, FOR THIS PROJECT, IS 93% FOR SHOP WORK AND 134% FOR FIELD WORK, WHICH IS REFLECTED IN THE "OH&P/B&I" COLUMN OF THE ESTIMATE DETAIL.

5. ESCALATION

ESCALATION PERCENTAGES WERE CALCULATED BY THE HANFORD MATERIAL & LABOR ESCALATION STUDY, DATED FEBRUARY 1993.

6. ROUNDING

U.S. DEPARTMENT OF ENERGY - DOE ORDER 5100.4 PAGE J-2 SUBPARAGRAPH (M), REQUIRES ROUNDING OF ALL GENERAL PLANT PROJECTS (GPP'S) AND LINE ITEM (LI) COST ESTIMATES. REFERENCE: DOE 5100.4, FIGURE 1-11, DATED 10-31-84.

7. REMARKS

A.) DEFINITIVE DESIGN COSTS ARE BASED ON 25% OF DIRECT CONSTRUCTION COST.
B.) CONSTRUCTION ENGINEERING/INSPECTION COSTS ARE BASED ON 10% OF DIRECT CONSTRUCTION COST.
C.) WHC PROJECT MANAGEMENT COSTS ARE BASED ON 15% OF DIRECT CONSTRUCTION COST.
D.) ASSUMED THAT 10% OF ALL EXCAVATED DIRT WOULD BE CONTAMINATED AND WOULD HAVE TO BE REMOVED, BARRELED AND BURIED.
E.) ALL DUCTS ARE TO BE FABRICATED FROM STAINLESS STEEL.
F.) ALL CONSTRUCTION IS TO BE BY THE ONSTIE CONTRACTOR.

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W314B/ER3888
FILE NO. W314SCF2

** IEST - INTERACTIVE ESTIMATING **
PRIMARY & DST ANNULUS DUCTWORK ALTERNATIVES
STUDY ESTIMATE - REF. SECTION NO. 5.3.4.1.
DOE_R04 - COST CODE ACCOUNT SUMMARY


DATE 02/11/94 13:44:05
BY GDR

| COST CODE/WBS | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| 000 | ENGINEERING | | | | | | | | | |
| 110000 | DEFINITIVE DESIGN | 2805000 | 0 | 2805000 | 22.35 | 626918 | 3431918 | 30 | 1029575 | 4461493 |
| 120000 | ENGINEERING/INSPECTION | 1122000 | 0 | 1122000 | 37.81 | 424228 | 1546228 | 30 | 463868 | 2010097 |
| 400000 | WHC PROJECT MANAGEMENT | 1683000 | 0 | 1683000 | 30.75 | 517523 | 2200523 | 30 | 660157 | 2860679 |
| TOTAL 000 | ENGINEERING | 5610000 | 0 | 5610000 | 27.96 | 1568669 | 7178669 | 30 | 2153600 | 9332269 |
| 700 | SPECIAL EQUIP/PROCESS SYSTEMS | | | | | | | | | |
| 310009 | BURIED DUCT FOR ANNULUS INTAKE | 1535416 | 0 | 1535416 | 31.27 | 480125 | 2015541 | 30 | 604662 | 2620203 |
| 310010 | BURIED DUCT FOR PRIMARY INTAKE | 841855 | 0 | 841855 | 31.27 | 263248 | 1105103 | 30 | 331531 | 1436634 |
| 310011 | BURIED DUCTS FOR PRIMARY EXHAUST | 2703282 | 0 | 2703282 | 31.27 | 845315 | 3548597 | 30 | 1064579 | 4613179 |
| 310012 | BURIED DUCT FOR ANNULUS EXHAUST | 5817988 | 0 | 5817988 | 31.27 | 1819284 | 7637272 | 30 | 2291182 | 9928456 |
| 330000 | BURIAL FEES | 321969 | 0 | 321969 | 31.27 | 100680 | 422649 | 30 | 126795 | 549443 |
| TOTAL 700 | SPECIAL EQUIP/PROCESS SYSTEM | 11220510 | 0 | 11220510 | 31.27 | 3508652 | 14729162 | 30 | 4418749 | 19147915 |
| PROJECT TOTAL | | 16,830,510 | 0 | 16,830,510 | 30.17 | 5,077,321 | 21,907,831 | 30 | 6,572,349 | 28,480,184 |

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W314B/ER3888
FILE NO. W314SCF2

** IEST - INTERACTIVE ESTIMATING **
PRIMARY & DST ANNULUS DUCTWORK ALTERNATIVES
STUDY ESTIMATE - REF. SECTION NO. 5.3.4.1.
DOE_R05 - ESTIMATE SUMMARY BY CSI DIVISION


DATE 02/11/94 13:44:07
BY GDR

| CSI | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| ENGINEERING | | | | | | | | | | |
| 00 | TECHNICAL SERVICES | 5610000 | 0 | 5610000 | 27.96 | 1568669 | 7178669 | 30 | 2153600 | 9332269 |
| TOTAL ENGINEERING | | 5,610,000 | 0 | 5,610,000 | 27.96 | 1,568,669 | 7,178,669 | 30 | 2,153,600 | 9,332,269 |
| CONSTRUCTION | | | | | | | | | | |
| 01 | GENERAL REQUIRMENTS | 2312968 | 0 | 2312968 | 31.27 | 723265 | 3036233 | 30 | 910869 | 3947105 |
| 02 | SITEWORK | 587201 | 0 | 587201 | 31.27 | 183617 | 770818 | 30 | 231247 | 1002064 |
| 15 | MECHANICAL | 7900341 | 0 | 7900341 | 31.27 | 2470436 | 10370777 | 30 | 3111233 | 13482012 |
| 16 | ELECTRICAL | 420000 | 0 | 420000 | 31.27 | 131334 | 551334 | 30 | 165400 | 716734 |
| TOTAL CONSTRUCTION | | 11,220,510 | 0 | 11,220,510 | 31.27 | 3,508,652 | 14,729,162 | 30 | 4,418,749 | 19,147,915 |
| PROJECT TOTAL | | 16,830,510 | 0 | 16,830,510 | 30.17 | 5,077,321 | 21,907,831 | 30 | 6,572,349 | 28,480,184 |

REFERENCE: ESTIMATE BASIS SHEET — PAGE 3 OF 7
COST CODE ACCOUNT SUMMARY — PAGE 4 OF 7

THE U.S. DEPARTMENT OF ENERGY - RICHLAND ORDER 5700.3 "COST ESTIMATING, ANALYSIS AND STANDARDIZATION" DATED 3-27-85, PROVIDES GUIDELINES FOR ESTIMATE CONTINGENCIES. THE GUIDELINE FOR A STUDY ESTIMATE SHOULD HAVE AN OVERALL RANGE OF 15% TO 35% .

CONTINGENCY IS EVALUATED AT THE THIRD COST CODE LEVEL AND SUMMARIZED AT THE PRIMARY AND SECONDARY COST CODE LEVEL OF THE DETAILED COST ESTIMATE.

APPLIED A 30% CONTINGENCY TO THE PROJECT FOR THIS STUDY ESTIMATE DUE TO THE DEFINITIVE DESIGN, CONSTRUCTION ENGINEERING/INSPECTION, AND WHC PROJECT MANAGEMENT COSTS WERE BASED ON A PERCENTAGE OF DIRECT CONSTRUCTION, AND THE LIMITED AMOUNT OF DETAIL FOR THIS ENGNIEERING STUDY.

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W314B/ER3888
FILE NO. W314SCF2

** IEST - INTERACTIVE ESTIMATING **
PRIMARY & DST ANNULUS DUCTWORK ALTERNATIVES
STUDY ESTIMATE - REF. SECTION NO. 5.3.4.1.
DOE_R07 - ONSITE INDIRECT COSTS BY WBS


DATE 02/11/94 13:44:08
BY GDR

| WBS | DESCRIPTION | ESTIMATE SUBTOTAL | CONTRACT % | ADMINISTRATION TOTAL | BID PACK PREP. | OTHER INDIRECTS | TOTAL INDIRECTS |
|---|---|---|---|---|---|---|---|
| 110000 | DEFINITIVE DESIGN | 2805000 | 0.00 | 0 | 0 | 0 | 0 |
| 120000 | ENGINEERING/INSPECTION | 1122000 | 0.00 | 0 | 0 | 0 | 0 |
| 310009 | BURIED DUCT FOR ANNULUS INTAKE | 1535416 | 0.00 | 0 | 0 | 0 | 0 |
| 310010 | BURIED DUCT FOR PRIMARY INTAKE | 841855 | 0.00 | 0 | 0 | 0 | 0 |
| 310011 | BURIED DUCTS FOR PRIMARY EXHAUST | 2703282 | 0.00 | 0 | 0 | 0 | 0 |
| 310012 | BURIED DUCT FOR ANNULUS EXHAUST | 5817988 | 0.00 | 0 | 0 | 0 | 0 |
| 330000 | BURIAL FEES | 321969 | 0.00 | 0 | 0 | 0 | 0 |
| 400000 | WHC PROJECT MANAGEMENT | 1683000 | 0.00 | 0 | 0 | 0 | 0 |
| PROJECT TOTAL | | 16,830,510 | | 0 | 0 | 0 | 0 |

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W314B/ER3888
FILE NO. W314SCG2

** IEST - INTERACTIVE ESTIMATING **
PRIMARY & DST ANNULUS DUCTWORK ALTERNATIVES
STUDY ESTIMATE - REF. 5.3.4.2.
DOE_R01 - PROJECT COST SUMMARY


DATE 02/11/94 13:47:56
BY GDR

| COST CODE | DESCRIPTION | ESCALATED TOTAL COST | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|
| 000 | ENGINEERING | 10,240,000 | 30 | 3,070,000 | 13,310,000 |
| 700 | SPECIAL EQUIP/PROCESS SYSTEMS | 21,060,000 | 30 | 6,320,000 | 27,380,000 |
| | (ADJUSTED TO MEET DOE 5100.4) | 0 | | 10,000 | 10,000 |
| | PROJECT TOTAL | 31,300,000 | 30 | 9,400,000 | 40,700,000 |

TYPE OF ESTIMATE: STUDY ESTIMATE FEBRUARY 11, 1994

ARCHITECT ENGINEER: Dobbs & P.W. Aberson

OPERATING CONTRACTOR: T.H. Howell

REMARKS:

(ROUNDED/ADJUSTED TO THE NEAREST " 10,000 / 100,000 " - PERCENTAGES NOT RECALCULATED TO REFLECT ROUNDING)

WHC-SD-WM-ES-604 REV. 0

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W314B/ER3888
FILE NO. W314SCG2

** IEST - INTERACTIVE ESTIMATING **
PRIMARY & DST ANNULUS DUCTWORK ALTERNATIVES
STUDY ESTIMATE - REF. 5.3.4.2.
DOE_R02 - WORK BREAKDOWN STRUCTURE SUMMARY


DATE 02/11/94 13:47:57
BY GDR

| WBS | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| 110000 | DEFINITIVE DESIGN | 4000000 | 0 | 4000000 | 22.35 | 894000 | 4894000 | 30 | 1468200 | 6362200 |
| 120000 | ENGINEERING/INSPECTION | 1600000 | 0 | 1600000 | 37.81 | 604960 | 2204960 | 30 | 661488 | 2866448 |
| SUBTOTAL 12 | ENGINEERING/INSPECTION | 1600000 | 0 | 1600000 | 37.81 | 604960 | 2204960 | 30 | 661488 | 2866448 |
| SUBTOTAL 1 | ENGINEERING | 5600000 | 0 | 5600000 | 26.77 | 1498960 | 7098960 | 30 | 2129688 | 9228648 |
| 310100 | SUPPLY AIR INTAKE FOR ANNULUS | 5513945 | 0 | 5513945 | 31.27 | 1724210 | 7238155 | 30 | 2171446 | 9409602 |
| 310200 | SUPPLY AIR INTAKE FOR PRIMARY | 2506439 | 0 | 2506439 | 31.27 | 783763 | 3290202 | 30 | 987060 | 4277264 |
| 311000 | ANNULUS EXHAUST DUCT SYS. | 5513945 | 0 | 5513945 | 31.27 | 1724210 | 7238155 | 30 | 2171446 | 9409602 |
| 312000 | PRIMARY EXHAUST DUCT SYS. | 2506439 | 0 | 2506439 | 31.27 | 783763 | 3290202 | 30 | 987060 | 4277264 |
| SUBTOTAL 31 | FA CONST-ONSITE E/C | 16040768 | 0 | 16040768 | 31.27 | 5015946 | 21056714 | 30 | 6317012 | 27373732 |
| SUBTOTAL 3 | CONSTRUCTION | 16040768 | 0 | 16040768 | 31.27 | 5015946 | 21056714 | 30 | 6317012 | 27373732 |
| 400000 | WHC PROJECT MANAGEMENT | 2400000 | 0 | 2400000 | 30.75 | 738000 | 3138000 | 30 | 941400 | 4079400 |
| SUBTOTAL 4 | PROJECT INTEGRATION | 2400000 | 0 | 2400000 | 30.75 | 738000 | 3138000 | 30 | 941400 | 4079400 |
| PROJECT TOTAL | | 24,040,768 | 0 | 24,040,768 | 30.17 | 7,252,906 | 31,293,674 | 30 | 9,388,100 | 40,681,780 |

1. DOCUMENTS AND DRAWINGS

DOCUMENTS: ENGINEERING STUDY WHC-SD-W061-ES-001, AND PROJECT W-061 VENTILATION DESIGN ALTERNATIVES DATED SEPT. 15, 1993.

DRAWINGS:

2. MATERIAL PRICES

UNIT COSTS REPRESENT CURRENT PRICES FOR SPECIFIED MATERIAL.

3. LABOR RATES

CURRENT KEH BASE CRAFT RATES, AS ISSUED BY KEH FINANCE (EFFECTIVE 10-01-92), INCLUDE FRINGE BENEFITS, LABOR INSURANCE, TAXES AND TRAVEL WHERE APPLICABLE, PER HANFORD SITE STABILIZATION AGREEMENT, APPENDIX A (EFFECTIVE 9-2-91). NON CRAFT HOURLY RATES ARE BASED ON THE 1993 FISCAL YEAR BUDGET LIQUIDATION RATES AS ISSUED BY KEH FINANCE (EFFECTIVE 10-01-92).

4. GENERAL REQUIREMENTS/TECHNICAL SERVICES/OVERHEADS

A.) ONSITE CONSTRUCTION FORCES GENERAL REQUIREMENTS, TECHNICAL SERVICES AND CRAFT OVERHEAD COSTS ARE INCLUDED AS A COMPOSITE PERCENTAGE BASED ON THE KEH ESTIMATING FACTOR/BILLING SCHEDULE, REVISION 14, DATED OCTOBER 01, 1992. THE TOTAL COMPOSITE PERCENTAGE APPLIED TO ONSITE CONSTRUCTION FORCES LABOR, FOR THIS PROJECT, IS 93% FOR SHOP WORK AND 134% FOR FIELD WORK, WHICH IS REFLECTED IN THE "OH&P/B&I" COLUMN OF THE ESTIMATE DETAIL.

5. ESCALATION

ESCALATION PERCENTAGES WERE CALCULATED BY THE HANFORD MATERIAL & LABOR ESCALATION STUDY, DATED FEBRUARY 1993.

6. ROUNDING

U.S. DEPARTMENT OF ENERGY - DOE ORDER 5100.4 PAGE J-2 SUBPARAGRAPH (M), REQUIRES ROUNDING OF ALL GENERAL PLANT PROJECTS (GPP'S) AND LINE ITEM (LI) COST ESTIMATES. REFERENCE: DOE 5100.4, FIGURE 1-11, DATED 10-31-84.

7. REMARKS

A.) DEFINITIVE DESIGN COSTS ARE BASED ON 25% OF DIRECT CONSTRUCTION COST.
B.) CONSTRUCTION ENGINEERING/INSPECTION COSTS ARE BASED ON 10% OF DIRECT CONSTRUCTION COST.
C.) WHC PROJECT MANAGEMENT COSTS ARE BASED ON 15% OF DIRECT CONSTRUCTION COST.
D.) ALL ABOVE GROUND DUCTS ARE INSULATED ON THE PRIMARY AND ANNULUS INTAKE.
E.) ALL EXHAUST DUCTS FOR THE PRIMARY AND ANNULUS ARE IN THE CONCRETE TRENCH.
F.) ALL DUCTS ARE TO BE FABRICATED FROM STAINLESS STEEL.
G.) ALL CONSTRUCTION IS TO BE BY THE ONSITE CONTRACTOR.

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W314B/ER3888
FILE NO. W314SCG2

** IEST - INTERACTIVE ESTIMATING **
PRIMARY & DST ANNULUS DUCTWORK ALTERNATIVES
STUDY ESTIMATE - REF. 5.3.4.2.
DOE_R04 - COST CODE ACCOUNT SUMMARY


DATE 02/11/94 13:47:59
BY GDR

| COST CODE/WBS | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| 000 | ENGINEERING | | | | | | | | | |
| 110000 | DEFINITIVE DESIGN | 4000000 | 0 | 4000000 | 22.35 | 894000 | 4894000 | 30 | 1468200 | 6362200 |
| 120000 | ENGINEERING/INSPECTION | 1600000 | 0 | 1600000 | 37.81 | 604960 | 2204960 | 30 | 661488 | 2866448 |
| 400000 | WHC PROJECT MANAGEMENT | 2400000 | 0 | 2400000 | 30.75 | 738000 | 3138000 | 30 | 941400 | 4079400 |
| TOTAL 000 | ENGINEERING | 8000000 | 0 | 8000000 | 27.96 | 2236960 | 10236960 | 30 | 3071088 | 13308048 |
| 700 | SPECIAL EQUIP/PROCESS SYSTEMS | | | | | | | | | |
| 310100 | SUPPLY AIR INTAKE FOR ANNULUS | 5513945 | 0 | 5513945 | 31.27 | 1724210 | 7238155 | 30 | 2171446 | 9409602 |
| 310200 | SUPPLY AIR INTAKE FOR PRIMARY | 2506439 | 0 | 2506439 | 31.27 | 783763 | 3290202 | 30 | 987060 | 4277264 |
| 311000 | ANNULUS EXHAUST DUCT SYS. | 5513945 | 0 | 5513945 | 31.27 | 1724210 | 7238155 | 30 | 2171446 | 9409602 |
| 312000 | PRIMARY EXHAUST DUCT SYS. | 2506439 | 0 | 2506439 | 31.27 | 783763 | 3290202 | 30 | 987060 | 4277264 |
| TOTAL 700 | SPECIAL EQUIP/PROCESS SYSTEM | 16040768 | 0 | 16040768 | 31.27 | 5015946 | 21056714 | 30 | 6317012 | 27373732 |
| PROJECT TOTAL | | 24,040,768 | 0 | 24,040,768 | 30.17 | 7,252,906 | 31,293,674 | 30 | 9,388,100 | 40,681,780 |

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W314B/ER3888
FILE NO. W314SCG2

** IEST - INTERACTIVE ESTIMATING **
PRIMARY & DST ANNULUS DUCTWORK ALTERNATIVES
STUDY ESTIMATE - REF. 5.3.4.2.
DOE_R05 - ESTIMATE SUMMARY BY CSI DIVISION


DATE 02/11/94 13:48:00
BY GDR

| CSI | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| ENGINEERING | | | | | | | | | | |
| 00 | TECHNICAL SERVICES | 8000000 | 0 | 8000000 | 27.96 | 2236960 | 10236960 | 30 | 3071088 | 13308048 |
| TOTAL ENGINEERING | | 8,000,000 | 0 | 8,000,000 | 27.96 | 2,236,960 | 10,236,960 | 30 | 3,071,088 | 13,308,048 |
| CONSTRUCTION | | | | | | | | | | |
| 01 | GENERAL REQUIRMENTS | 1971900 | 0 | 1971900 | 31.27 | 616612 | 2588512 | 30 | 776552 | 3365068 |
| 03 | CONCRETE | 1076252 | 0 | 1076252 | 31.27 | 336544 | 1412796 | 30 | 423838 | 1836634 |
| 15 | MECHANICAL | 12992616 | 0 | 12992616 | 31.27 | 4062790 | 17055406 | 30 | 5116622 | 22172030 |
| TOTAL CONSTRUCTION | | 16,040,768 | 0 | 16,040,768 | 31.27 | 5,015,946 | 21,056,714 | 30 | 6,317,012 | 27,373,732 |
| PROJECT TOTAL | | 24,040,768 | 0 | 24,040,768 | 30.17 | 7,252,906 | 31,293,674 | 30 | 9,388,100 | 40,681,780 |

REFERENCE: ESTIMATE BASIS SHEET PAGE 3 OF 7
COST CODE ACCOUNT SUMMARY PAGE 4 OF 7

THE U.S. DEPARTMENT OF ENERGY - RICHLAND ORDER 5700.3 "COST ESTIMATING, ANALYSIS AND STANDARDIZATION" DATED 3-27-85, PROVIDES GUIDELINES FOR ESTIMATE CONTINGENCIES. THE GUIDELINE FOR A STUDY ESTIMATE SHOULD HAVE AN OVERALL RANGE OF 15 TO 35 % .

CONTINGENCY IS EVALUATED AT THE THIRD COST CODE LEVEL AND SUMMARIZED AT THE PRIMARY AND SECONDARY COST CODE LEVEL OF THE DETAILED COST ESTIMATE.

APPLIED A 30% CONTINGENCY TO THE PROJECT FOR THIS STUDY ESTIMATE DUE TO THE DEFINITIVE DESIGN, CONSTRUCTION ENGINEERING/INSPECTION, AND WHC PROJECT MANAGEMENT COSTS WERE BASED ON A PERCENTAGE OF DIRECT CONSTRUCTION, AND THE LIMITED AMOUNT OF DETAIL FOR THIS ENGINEERING STUDY.

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W314B/ER3888
FILE NO. W314SCG2

** IEST - INTERACTIVE ESTIMATING **
PRIMARY & DST ANNULUS DUCTWORK ALTERNATIVES
STUDY ESTIMATE - REF. 5.3.4.2.
DOE_R07 - ONSITE INDIRECT COSTS BY WBS


DATE 02/11/94 13:48:03
BY GDR

| WBS | DESCRIPTION | ESTIMATE SUBTOTAL | CONTRACT % | ADMINISTRATION TOTAL | BID PACK PREP. | OTHER INDIRECTS | TOTAL INDIRECTS |
|---|---|---|---|---|---|---|---|
| 110000 | DEFINITIVE DESIGN | 4000000 | 0.00 | 0 | 0 | 0 | 0 |
| 120000 | ENGINEERING/INSPECTION | 1600000 | 0.00 | 0 | 0 | 0 | 0 |
| 310100 | SUPPLY AIR INTAKE FOR ANNULUS | 5513945 | 0.00 | 0 | 0 | 0 | 0 |
| 310200 | SUPPLY AIR INTAKE FOR PRIMARY | 2506439 | 0.00 | 0 | 0 | 0 | 0 |
| 311000 | ANNULUS EXHAUST DUCT SYS. | 5513945 | 0.00 | 0 | 0 | 0 | 0 |
| 312000 | PRIMARY EXHAUST DUCT SYS. | 2506439 | 0.00 | 0 | 0 | 0 | 0 |
| 400000 | WHC PROJECT MANAGEMENT | 2400000 | 0.00 | 0 | 0 | 0 | 0 |
| PROJECT TOTAL | | 24,040,768 | | 0 | 0 | 0 | 0 |

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W314B/ER3888
FILE NO. W314SCH2

** IEST - INTERACTIVE ESTIMATING **
PRIMARY AND DST ANNULUS DUCTWORK ALTERNATIVES
STUDY ESTIMATE - REF. SECTION NO. 5.3.4.3.
DOE_R01 - PROJECT COST SUMMARY


DATE 02/11/94 13:46:49
BY GDR

| COST CODE | DESCRIPTION | ESCALATED TOTAL COST | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|
| 000 | ENGINEERING | 6,840,000 | 30 | 2,050,000 | 8,890,000 |
| 700 | SPECIAL EQUIP/PROCESS SYSTEMS | 14,030,000 | 30 | 4,210,000 | 18,240,000 |
| | (ADJUSTED TO MEET DOE 5100.4) | 30,000 | | 40,000 | 70,000 |
| | PROJECT TOTAL | 20,900,000 | 30 | 6,300,000 | 27,200,000 |

| | | |
|---|---|---|
| TYPE OF ESTIMATE | STUDY ESTIMATE | FEBRUARY 11, 1994 |
| ARCHITECT ENGINEER | | |
| OPERATING CONTRACTOR | | |

REMARKS:

(ROUNDED/ADJUSTED TO THE NEAREST " 10,000 / 100,000 " - PERCENTAGES NOT RECALCULATED TO REFLECT ROUNDING)

9413221.1288

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W314B/ER3888
FILE NO. W314SCH2

** IEST - INTERACTIVE ESTIMATING **
PRIMARY AND DST ANNULUS DUCTWORK ALTERNATIVES
STUDY ESTIMATE - REF. SECTION NO. 5.3.4.3.
DOE_R02 - WORK BREAKDOWN STRUCTURE SUMMARY


DATE 02/11/94 13:46:51
BY GDR

| WBS | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| 110000 | DEFINITIVE DESIGN | 2672000 | 0 | 2672000 | 22.35 | 597192 | 3269192 | 30 | 980758 | 4249950 |
| 120000 | ENGINEERING/INSPECTION | 1068000 | 0 | 1068000 | 37.81 | 403811 | 1471811 | 30 | 441543 | 1913354 |
| SUBTOTAL 12 | ENGINEERING/INSPECTION | 1068000 | 0 | 1068000 | 37.81 | 403811 | 1471811 | 30 | 441543 | 1913354 |
| SUBTOTAL 1 | ENGINEERING | 3740000 | 0 | 3740000 | 26.76 | 1001003 | 4741003 | 30 | 1422301 | 6163304 |
| 310100 | SUPPLY AIR INTAKE FOR ANNULUS | 1510074 | 0 | 1510074 | 31.27 | 472201 | 1982275 | 30 | 594682 | 2576957 |
| 310200 | SUPPLY AIR INTAKE FOR PRIMARY | 881865 | 0 | 881865 | 31.27 | 275759 | 1157624 | 30 | 347287 | 1504912 |
| 311000 | PRIMARY EXHAUST | 2557214 | 0 | 2557214 | 31.27 | 799640 | 3356854 | 30 | 1007057 | 4363912 |
| 312000 | ANNULUS EXHAUST | 5739882 | 0 | 5739882 | 31.27 | 1794860 | 7534742 | 30 | 2260422 | 9795166 |
| SUBTOTAL 31 | FA CONST-ONSITE E/C | 10689035 | 0 | 10689035 | 31.27 | 3342460 | 14031495 | 30 | 4209448 | 18240947 |
| SUBTOTAL 3 | CONSTRUCTION | 10689035 | 0 | 10689035 | 31.27 | 3342460 | 14031495 | 30 | 4209448 | 18240947 |
| 400000 | WHC PROJECT MANAGEMENT | 1603000 | 0 | 1603000 | 30.75 | 492923 | 2095923 | 30 | 628777 | 2724699 |
| SUBTOTAL 4 | PROJECT INTEGRATION | 1603000 | 0 | 1603000 | 30.75 | 492923 | 2095923 | 30 | 628777 | 2724699 |
| PROJECT TOTAL | | 16,032,035 | 0 | 16,032,035 | 30.17 | 4,836,386 | 20,868,421 | 30 | 6,260,526 | 27,128,950 |

1. DOCUMENTS AND DRAWINGS

DOCUMENTS: ENGINEERING STUDY WHC-SD-W061-ES-001, AND PROJECT W-061 VENTILATION DESIGN ALTERNATIVES DATED SEPT. 15, 1993.

DRAWINGS:

2. MATERIAL PRICES

UNIT COSTS REPRESENT CURRENT PRICES FOR SPECIFIED MATERIAL.

3. LABOR RATES

CURRENT KEH BASE CRAFT RATES, AS ISSUED BY KEH FINANCE (EFFECTIVE 10-01-92), INCLUDE FRINGE BENEFITS, LABOR INSURANCE, TAXES AND TRAVEL WHERE APPLICABLE, PER HANFORD SITE STABILIZATION AGREEMENT, APPENDIX A (EFFECTIVE 9-2-91). NON CRAFT HOURLY RATES ARE BASED ON THE 1993 FISCAL YEAR BUDGET LIQUIDATION RATES AS ISSUED BY KEH FINANCE (EFFECTIVE 10-01-92).

4. GENERAL REQUIREMENTS/TECHNICAL SERVICES/OVERHEADS

A.) ONSITE CONSTRUCTION FORCES GENERAL REQUIREMENTS, TECHNICAL SERVICES AND CRAFT OVERHEAD COSTS ARE INCLUDED AS A COMPOSITE PERCENTAGE BASED ON THE KEH ESTIMATING FACTOR/BILLING SCHEDULE, REVISION 14, DATED OCTOBER 01, 1992. THE TOTAL COMPOSITE PERCENTAGE APPLIED TO ONSITE CONSTRUCTION FORCES LABOR, FOR THIS PROJECT, IS 93% FOR SHOP WORK AND 134% FOR FIELD WORK, WHICH IS REFLECTED IN THE "OH&P/B&I" COLUMN OF THE ESTIMATE DETAIL.

5. ESCALATION

ESCALATION PERCENTAGES WERE CALCULATED BY THE HANFORD MATERIAL & LABOR ESCALATION STUDY, DATED FEBRUARY 1993.

6. ROUNDING

U.S. DEPARTMENT OF ENERGY - DOE ORDER 5100.4 PAGE J-2 SUBPARAGRAPH (M), REQUIRES ROUNDING OF ALL GENERAL PLANT PROJECTS (GPP'S) AND LINE ITEM (LI) COST ESTIMATES. REFERENCE: DOE 5100.4, FIGURE I-11, DATED 10-31-84.

7. REMARKS

A.) DEFINITIVE DESIGN COSTS ARE BASED ON 25% OF DIRECT CONSTRUCTION COST.
B.) CONSTRUCTION ENGINEERING/INSPECTION COSTS ARE BASED ON 10% OF DIRECT CONSTRUCTION COST.
C.) WHC PROJECT MANAGEMENT COSTS ARE BASED ON 15% OF DIRECT CONSTRUCTION COST.
D.) ALL ABOVE GROUND DUCTS ARE INSULATED.
E.) ALL DUCTS ARE TO BE FABRICATED FROM STAINLESS STEEL.
F.) ALL CONSTRUCTION IS TO BE BY THE ONSITE CONTRACTOR.

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W314B/ER3888
FILE NO. W314SCH2

** IEST - INTERACTIVE ESTIMATING **
PRIMARY AND DST ANNULUS DUCTWORK ALTERNATIVES
STUDY ESTIMATE - REF. SECTION NO. 5.3.4.3.
DOE_R04 - COST CODE ACCOUNT SUMMARY


DATE 02/11/94 13:46:52
BY GDR

| COST CODE/WBS | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| 000 | ENGINEERING | | | | | | | | | |
| 110000 | DEFINITIVE DESIGN | 2672000 | 0 | 2672000 | 22.35 | 597192 | 3269192 | 30 | 980758 | 4249950 |
| 120000 | ENGINEERING/INSPECTION | 1068000 | 0 | 1068000 | 37.81 | 403811 | 1471811 | 30 | 441543 | 1913354 |
| 400000 | WHC PROJECT MANAGEMENT | 1603000 | 0 | 1603000 | 30.75 | 492923 | 2095923 | 30 | 628777 | 2724699 |
| TOTAL 000 | ENGINEERING | 5343000 | 0 | 5343000 | 27.96 | 1493926 | 6836926 | 30 | 2051078 | 8888003 |
| 700 | SPECIAL EQUIP/PROCESS SYSTEMS | | | | | | | | | |
| 310100 | SUPPLY AIR INTAKE FOR ANNULUS | 1510074 | 0 | 1510074 | 31.27 | 472201 | 1982275 | 30 | 594682 | 2576957 |
| 310200 | SUPPLY AIR INTAKE FOR PRIMARY | 881865 | 0 | 881865 | 31.27 | 275759 | 1157624 | 30 | 347287 | 1504912 |
| 311000 | PRIMARY EXHAUST | 2557214 | 0 | 2557214 | 31.27 | 799640 | 3356854 | 30 | 1007057 | 4363912 |
| 312000 | ANNULUS EXHAUST | 5739882 | 0 | 5739882 | 31.27 | 1794860 | 7534742 | 30 | 2260422 | 9795166 |
| TOTAL 700 | SPECIAL EQUIP/PROCESS SYSTEM | 10689035 | 0 | 10689035 | 31.27 | 3342460 | 14031495 | 30 | 4209448 | 18240947 |
| PROJECT TOTAL | | 16,032,035 | 0 | 16,032,035 | 30.17 | 4,836,386 | 20,868,421 | 30 | 6,260,526 | 27,128,950 |

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W314B/ER3888
FILE NO. W314SCH2

** IEST - INTERACTIVE ESTIMATING **
PRIMARY AND DST ANNULUS DUCTWORK ALTERNATIVES
STUDY ESTIMATE - REF. SECTION NO. 5.3.4.3.
DOE_R05 - ESTIMATE SUMMARY BY CSI DIVISION


DATE 02/11/94 13:46:53
BY GDR

| CSI | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| ENGINEERING | | | | | | | | | | |
| 00 | TECHNICAL SERVICES | 5343000 | 0 | 5343000 | 27.96 | 1493926 | 6836926 | 30 | 2051078 | 8888003 |
| TOTAL ENGINEERING | | 5,343,000 | 0 | 5,343,000 | 27.96 | 1,493,926 | 6,836,926 | 30 | 2,051,078 | 8,888,003 |
| CONSTRUCTION | | | | | | | | | | |
| 01 | GENERAL REQUIRMENTS | 1654511 | 0 | 1654511 | 31.27 | 517365 | 2171876 | 30 | 651562 | 2823440 |
| 03 | CONCRETE | 241651 | 0 | 241651 | 31.27 | 75564 | 317215 | 30 | 95165 | 412380 |
| 05 | METALS | 550860 | 0 | 550860 | 31.27 | 172254 | 723114 | 30 | 216934 | 940048 |
| 15 | MECHANICAL | 8242013 | 0 | 8242013 | 31.27 | 2577277 | 10819290 | 30 | 3245787 | 14065079 |
| TOTAL CONSTRUCTION | | 10,689,035 | 0 | 10,689,035 | 31.27 | 3,342,460 | 14,031,495 | 30 | 4,209,448 | 18,240,947 |
| PROJECT TOTAL | | 16,032,035 | 0 | 16,032,035 | 30.17 | 4,836,386 | 20,868,421 | 30 | 6,260,526 | 27,128,950 |

REFERENCE: ESTIMATE BASIS SHEET — PAGE 3 OF 7
COST CODE ACCOUNT SUMMARY — PAGE 4 OF 7

THE U.S. DEPARTMENT OF ENERGY - RICHLAND ORDER 5700.3 "COST ESTIMATING, ANALYSIS AND STANDARDIZATION" DATED 3-27-85, PROVIDES GUIDELINES FOR ESTIMATE CONTINGENCIES. THE GUIDELINE FOR A STUDY ESTIMATE SHOULD HAVE AN OVERALL RANGE OF 15 TO 35 % .

CONTINGENCY IS EVALUATED AT THE THIRD COST CODE LEVEL AND SUMMARIZED AT THE PRIMARY AND SECONDARY COST CODE LEVEL OF THE DETAILED COST ESTIMATE.

APPLIED A 30% CONTINGENCY TO THE PROJECT FOR THIS STUDY ESTIMATE DUE TO THE DEFINITIVE DESIGN, CONSTRUCTION ENGINEERING/INSPECTION, AND WHC PROJECT MANAGEMENT COSTS WERE BASED ON A PERCENTAGE OF DIRECT CONSTRUCTION, AND THE LIMITED AMOUNT OF DETAIL FOR THIS ENGINEERING STUDY.

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W314B/ER388B
FILE NO. W314SCH2

** IEST - INTERACTIVE ESTIMATING **
PRIMARY AND DST ANNULUS DUCTWORK ALTERNATIVES
STUDY ESTIMATE - REF. SECTION NO. 5.3.4.3.
DOE_R07 - ONSITE INDIRECT COSTS BY WBS


DATE 02/11/94 13:46:55
BY GDR

| WBS | DESCRIPTION | ESTIMATE SUBTOTAL | CONTRACT % | ADMINISTRATION TOTAL | BID PACK PREP. | OTHER INDIRECTS | TOTAL INDIRECTS |
|---|---|---|---|---|---|---|---|
| 110000 | DEFINITIVE DESIGN | 2672000 | 0.00 | 0 | 0 | 0 | 0 |
| 120000 | ENGINEERING/INSPECTION | 1068000 | 0.00 | 0 | 0 | 0 | 0 |
| 310100 | SUPPLY AIR INTAKE FOR ANNULUS | 1510074 | 0.00 | 0 | 0 | 0 | 0 |
| 310200 | SUPPLY AIR INTAKE FOR PRIMARY | 881865 | 0.00 | 0 | 0 | 0 | 0 |
| 311000 | PRIMARY EXHAUST | 2557214 | 0.00 | 0 | 0 | 0 | 0 |
| 312000 | ANNULUS EXHAUST | 5739882 | 0.00 | 0 | 0 | 0 | 0 |
| 400000 | WHC PROJECT MANAGEMENT | 1603000 | 0.00 | 0 | 0 | 0 | 0 |
| PROJECT TOTAL | | 16,032,035 | | 0 | 0 | 0 | 0 |

9413221.1294

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W314B
FILE NO. W314SCI2

** IEST - INTERACTIVE ESTIMATING **
PRIMARY & DST ANNULUS FAN & STACK ALTERNATIVES
STUDY ESTIMATE - REF. SECTION NO. 5.3.5.1.
DOE_R01 - PROJECT COST SUMMARY


DATE 02/11/94 07:05:56
BY GDR

| COST CODE | DESCRIPTION | ESCALATED TOTAL COST | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|
| 000 | ENGINEERING | 680,000 | 30 | 200,000 | 880,000 |
| 700 | SPECIAL EQUIP/PROCESS SYSTEMS | 1,390,000 | 30 | 420,000 | 1,810,000 |
| | (ADJUSTED TO MEET DOE 5100.4) | 30,000 | | -20,000 | 10,000 |
| | PROJECT TOTAL | 2,100,000 | 30 | 600,000 | 2,700,000 |

TYPE OF ESTIMATE STUDY ESTIMATE FEBRUARY 11, 1994

ARCHITECT ENGINEER

OPERATING CONTRACTOR

REMARKS:

PRIMARY AND DST ANNULUS FAN AND STACK ALTERNATIVES

ALT. #1 "STACK TO EXHAUST TRAIN INLET RECIRCULATION"

REF. 5.3.5.1.

(ROUNDED/ADJUSTED TO THE NEAREST " 10,000 / 100,000 " - PERCENTAGES NOT RECALCULATED TO REFLECT ROUNDING)

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W314B
FILE NO. W314SCI2

** IEST - INTERACTIVE ESTIMATING **
PRIMARY & DST ANNULUS FAN & STACK ALTERNATIVES
STUDY ESTIMATE - REF. SECTION NO. 5.3.5.1.
DOE_R02 - WORK BREAKDOWN STRUCTURE SUMMARY


DATE 02/11/94 07:05:58
BY GDR

| WBS | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| 110000 | DEFINITIVE DESIGN | 265000 | 0 | 265000 | 22.35 | 59228 | 324228 | 30 | 97268 | 421496 |
| 120000 | ENGINEERING / INSPECTION | 106000 | 0 | 106000 | 37.81 | 40079 | 146079 | 30 | 43824 | 189902 |
| SUBTOTAL 12 | ENGINEERING/INSPECTION | 106000 | 0 | 106000 | 37.81 | 40079 | 146079 | 30 | 43824 | 189902 |
| SUBTOTAL 1 | ENGINEERING | 371000 | 0 | 371000 | 26.77 | 99307 | 470307 | 30 | 141092 | 611398 |
| 310001 | ANNULUS EXHAUST BY PASS | 616949 | 0 | 616949 | 31.27 | 192920 | 809869 | 30 | 242961 | 1052830 |
| 310002 | PRIMARY EXHAUST BY PASS | 442716 | 0 | 442716 | 31.27 | 138437 | 581153 | 30 | 174346 | 755499 |
| SUBTOTAL 31 | FA CONST-ONSITE E/C | 1059665 | 0 | 1059665 | 31.27 | 331357 | 1391022 | 30 | 417307 | 1808329 |
| SUBTOTAL 3 | CONSTRUCTION | 1059665 | 0 | 1059665 | 31.27 | 331357 | 1391022 | 30 | 417307 | 1808329 |
| 400000 | WHC PROJECT MANAGEMENT | 159000 | 0 | 159000 | 31.27 | 49719 | 208719 | 30 | 62616 | 271335 |
| SUBTOTAL 4 | PROJECT INTEGRATION | 159000 | 0 | 159000 | 31.27 | 49719 | 208719 | 30 | 62616 | 271335 |
| PROJECT TOTAL | | 1,589,665 | 0 | 1,589,665 | 30.22 | 480,383 | 2,070,048 | 30 | 621,015 | 2,691,062 |

1. DOCUMENTS AND DRAWINGS

DOCUMENTS:

DRAWINGS:

2. MATERIAL PRICES

UNIT COSTS REPRESENT CURRENT PRICES FOR SPECIFIED MATERIAL. VENDOR INFORMATION WAS OBTAINED FOR THE FOLLOWING ITEMS:

3. LABOR RATES

CURRENT KEH BASE CRAFT RATES, AS ISSUED BY KEH FINANCE (EFFECTIVE 10-01-93), INCLUDE FRINGE BENEFITS, LABOR INSURANCE, TAXES AND TRAVEL WHERE APPLICABLE, PER HANFORD SITE STABILIZATION AGREEMENT, APPENDIX A (EFFECTIVE 09-06-93). NON CRAFT HOURLY RATES ARE BASED ON THE 1994 FISCAL YEAR BUDGET LIQUIDATION RATES AS ISSUED BY KEH FINANCE (EFFECTIVE 10-01-93).

4. GENERAL REQUIREMENTS/TECHNICAL SERVICES/OVERHEADS

A.) ONSITE CONSTRUCTION FORCES GENERAL REQUIREMENTS, TECHNICAL SERVICES AND CRAFT OVERHEAD COSTS ARE INCLUDED AS A COMPOSITE PERCENTAGE BASED ON THE KEH ESTIMATING FACTOR/BILLING SCHEDULE, REVISION 16, DATED OCTOBER 01, 1993. THE TOTAL COMPOSITE PERCENTAGE APPLIED TO ONSITE CONSTRUCTION FORCES LABOR, FOR THIS PROJECT, IS 93% FOR SHOP WORK AND 134% FOR FIELD WORK, WHICH IS REFLECTED IN THE "OH&P/B&I" COLUMN OF THE ESTIMATE DETAIL.

B.) ONSITE CONTRACT ADMINISTRATION AND CONSTRUCTION MANAGEMENT COSTS, ASSOCIATED WITH THE OVERALL MANAGEMENT OF THE FIXED PRICE CONTRACTS, ARE INCLUDED AS A COMPOSITE PERCENTAGE AND LUMP SUM ALLOWANCE (FOR BID PACKAGE PREP) BASED ON THE ESTIMATING FACTOR/BILLING SCHEDULE. THE TOTAL COMPOSITE PERCENTAGE AND LUMP SUM ALLOWANCE ARE APPLIED AGAINST THE TOTAL FIXED PRICE CONTRACT AMOUNT WHICH IS REFLECTED ON THE KEH SUMMARY REPORT DOER07, INCLUDED WITH THIS ESTIMATE. (FINAL ESTIMATES MAY BE PARTIALLY MANLOADED AND INCLUDED WITHIN THE ESTIMATE DETAIL)

C.) FIXED PRICE CONTRACTOR OVERHEAD, PROFIT, BOND AND INSURANCE COSTS HAVE BEEN APPLIED AT THE FOLLOWING PERCENTAGES AND ARE REFLECTED IN THE "OH&P/B&I" COLUMN OF THE ESTIMATE DETAIL:
LABOR - 0% MATERIAL - 0% EQUIPMENT USAGE - 0% EQUIPMENT - 0% SUBCONTRACTS - 0%

5. ESCALATION

ESCALATION PERCENTAGES WERE CALCULATED BY THE HANFORD MATERIAL & LABOR ESCALATION STUDY, DATED FEBRUARY 1993.

6. ROUNDING

U.S. DEPARTMENT OF ENERGY - DOE ORDER 5100.4 PAGE I-32 SUBPARAGRAPH (M), REQUIRES ROUNDING OF ALL GENERAL PLANT PROJECTS (GPP'S) AND LINE ITEM (LI) COST ESTIMATES. REFERENCE: DOE 5100.4, FIGURE I-11, DATED 10-31-84.

7. REMARKS

A.) DEFINITIVE DESIGN COSTS ARE BASED ON 25% OF DIRECT CONSTRUCTION.
B.) ENGINEERING AND INSPECTION COSTS ARE BASED ON 10% OF DIRECT CONSTRUCTION.
C.) WESTINGHOUSE PROJECT MANAGEMENT COSTS ARE BASED ON 15% OF DIRECT CONSTRUCTION.

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W314B
FILE NO. W314SC12

** IEST - INTERACTIVE ESTIMATING **
PRIMARY & DST ANNULUS FAN & STACK ALTERNATIVES
STUDY ESTIMATE - REF. SECTION NO. 5.3.5.1.
DOE_R04 - COST CODE ACCOUNT SUMMARY


DATE 02/11/94 07:06:02
BY GDR

| COST CODE/WBS | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| 000 | ENGINEERING | | | | | | | | | |
| 110000 | DEFINITIVE DESIGN | 265000 | 0 | 265000 | 22.35 | 59228 | 324228 | 30 | 97268 | 421496 |
| 120000 | ENGINEERING / INSPECTION | 106000 | 0 | 106000 | 37.81 | 40079 | 146079 | 30 | 43824 | 189902 |
| 400000 | WHC PROJECT MANAGEMENT | 159000 | 0 | 159000 | 31.27 | 49719 | 208719 | 30 | 62616 | 271335 |
| TOTAL 000 | ENGINEERING | 530000 | 0 | 530000 | 28.12 | 149026 | 679026 | 30 | 203708 | 882733 |
| 700 | SPECIAL EQUIP/PROCESS SYSTEMS | | | | | | | | | |
| 310001 | ANNULUS EXHAUST BY PASS | 616949 | 0 | 616949 | 31.27 | 192920 | 809869 | 30 | 242961 | 1052830 |
| 310002 | PRIMARY EXHAUST BY PASS | 442716 | 0 | 442716 | 31.27 | 138437 | 581153 | 30 | 174346 | 755499 |
| TOTAL 700 | SPECIAL EQUIP/PROCESS SYSTEM | 1059665 | 0 | 1059665 | 31.27 | 331357 | 1391022 | 30 | 417307 | 1808329 |
| PROJECT TOTAL | | 1,589,665 | 0 | 1,589,665 | 30.22 | 480,383 | 2,070,048 | 30 | 621,015 | 2,691,062 |

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W314B
FILE NO. W314SC12

** IEST - INTERACTIVE ESTIMATING **
PRIMARY & DST ANNULUS FAN & STACK ALTERNATIVES
STUDY ESTIMATE - REF. SECTION NO. 5.3.5.1.
DOE_R05 - ESTIMATE SUMMARY BY CSI DIVISION


DATE 02/11/94 07:06:04
BY GDR

| CSI | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| ENGINEERING | | | | | | | | | | |
| 00 | TECHNICAL SERVICES | 530000 | 0 | 530000 | 28.12 | 149026 | 679026 | 30 | 203708 | 882733 |
| | TOTAL ENGINEERING | 530,000 | 0 | 530,000 | 28.12 | 149,026 | 679,026 | 30 | 203,708 | 882,733 |
| CONSTRUCTION | | | | | | | | | | |
| 15 | MECHANICAL | 382715 | 0 | 382715 | 31.27 | 119675 | 502390 | 30 | 150717 | 653107 |
| 16 | ELECTRICAL | 676950 | 0 | 676950 | 31.27 | 211682 | 888632 | 30 | 266590 | 1155222 |
| | TOTAL CONSTRUCTION | 1,059,665 | 0 | 1,059,665 | 31.27 | 331,357 | 1,391,022 | 30 | 417,307 | 1,808,329 |
| | PROJECT TOTAL | 1,589,665 | 0 | 1,589,665 | 30.22 | 480,383 | 2,070,048 | 30 | 621,015 | 2,691,062 |

REFERENCE: ESTIMATE BASIS SHEET — PAGE 3 OF 7
COST CODE ACCOUNT SUMMARY — PAGE 4 OF 7

THE U.S. DEPARTMENT OF ENERGY - RICHLAND ORDER 5700.3 "COST ESTIMATING, ANALYSIS AND STANDARDIZATION" DATED 3-27-85, PROVIDES GUIDELINES FOR ESTIMATE CONTINGENCIES. THE GUIDELINE FOR A STUDY ESTIMATE SHOULD HAVE AN OVERALL RANGE OF 15 TO 50 % .

CONTINGENCY IS EVALUATED AT THE THIRD COST CODE LEVEL AND SUMMARIZED AT THE PRIMARY AND SECONDARY COST CODE LEVEL OF THE DETAILED COST ESTIMATE.

APPLIED A 30% CONTINGENCY TO PROJECT DUE TO THE LIMITED INFORMATION AVAILABLE.

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W314B
FILE NO. W314SCI2

** IEST - INTERACTIVE ESTIMATING **
PRIMARY & DST ANNULUS FAN & STACK ALTERNATIVES
STUDY ESTIMATE - REF. SECTION NO. 5.3.5.1.
DOE_R07 - ONSITE INDIRECT COSTS BY WBS


DATE 02/11/94 07:06:05
BY GDR

| WBS | DESCRIPTION | ESTIMATE SUBTOTAL | CONTRACT % | ADMINISTRATION TOTAL | BID PACK PREP. | OTHER INDIRECTS | TOTAL INDIRECTS |
|---|---|---|---|---|---|---|---|
| 110000 | DEFINITIVE DESIGN | 265000 | 0.00 | 0 | 0 | 0 | 0 |
| 120000 | ENGINEERING / INSPECTION | 106000 | 0.00 | 0 | 0 | 0 | 0 |
| 310001 | ANNULUS EXHAUST BY PASS | 616949 | 0.00 | 0 | 0 | 0 | 0 |
| 310002 | PRIMARY EXHAUST BY PASS | 442716 | 0.00 | 0 | 0 | 0 | 0 |
| 400000 | WHC PROJECT MANAGEMENT | 159000 | 0.00 | 0 | 0 | 0 | 0 |
| PROJECT TOTAL | | 1,589,665 | | 0 | 0 | 0 | 0 |

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KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W314B
FILE NO. W314SCJ2

** IEST - INTERACTIVE ESTIMATING **
PRIMARY & DST ANNULUS FAN AND STACK ALTERNATIVE
STUDY ESTIMATE - REF. SECTION NO. 5.3.5.2.
DOE_R01 - PROJECT COST SUMMARY


DATE 02/11/94 13:42:51
BY GDR

| COST CODE | DESCRIPTION | ESCALATED TOTAL COST | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|
| 000 | ENGINEERING | 600,000 | 30 | 180,000 | 780,000 |
| 700 | SPECIAL EQUIP/PROCESS SYSTEMS | 1,230,000 | 30 | 370,000 | 1,600,000 |
| | (ADJUSTED TO MEET DOE 5100.4) | -30,000 | | 50,000 | 20,000 |
| | PROJECT TOTAL | 1,800,000 | 30 | 600,000 | 2,400,000 |

TYPE OF ESTIMATE STUDY ESTIMATE FEBRUARY 11, 1994

ARCHITECT ENGINEER

OPERATING CONTRACTOR

REMARKS:

(ROUNDED/ADJUSTED TO THE NEAREST " 10,000 / 100,000 " - PERCENTAGES NOT RECALCULATED TO REFLECT ROUNDING)

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W314B
FILE NO. W314SCJ2

** IEST - INTERACTIVE ESTIMATING **
PRIMARY & DST ANNULUS FAN AND STACK ALTERNATIVE
STUDY ESTIMATE - REF. SECTION NO. 5.3.5.2.
DOE_R02 - WORK BREAKDOWN STRUCTURE SUMMARY


DATE 02/11/94 13:42:53
BY GDR

| WBS | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| 110000 | DEFINITIVE DESIGN | 234000 | 0 | 234000 | 22.35 | 52299 | 286299 | 30 | 85890 | 372189 |
| 120000 | ENGINEERING / INSPECTION | 94000 | 0 | 94000 | 37.81 | 35541 | 129541 | 30 | 38862 | 168404 |
| SUBTOTAL 12 | ENGINEERING/INSPECTION | 94000 | 0 | 94000 | 37.81 | 35541 | 129541 | 30 | 38862 | 168404 |
| SUBTOTAL 1 | ENGINEERING | 328000 | 0 | 328000 | 26.78 | 87840 | 415840 | 30 | 124752 | 540593 |
| 310001 | ANNULUS EXHAUST BY PASS | 517646 | 0 | 517646 | 31.27 | 161868 | 679514 | 30 | 203854 | 883368 |
| 310002 | PRIMARY EXHAUST BY PASS | 419767 | 0 | 419767 | 31.27 | 131261 | 551028 | 30 | 165309 | 716337 |
| SUBTOTAL 31 | FA CONST-ONSITE E/C | 937413 | 0 | 937413 | 31.27 | 293129 | 1230542 | 30 | 369163 | 1599705 |
| SUBTOTAL 3 | CONSTRUCTION | 937413 | 0 | 937413 | 31.27 | 293129 | 1230542 | 30 | 369163 | 1599705 |
| 400000 | WHC PROJECT MANAGEMENT | 141000 | 0 | 141000 | 31.27 | 44091 | 185091 | 30 | 55527 | 240618 |
| SUBTOTAL 4 | PROJECT INTEGRATION | 141000 | 0 | 141000 | 31.27 | 44091 | 185091 | 30 | 55527 | 240618 |
| PROJECT TOTAL | | 1,406,413 | 0 | 1,406,413 | 30.22 | 425,060 | 1,831,473 | 30 | 549,442 | 2,380,916 |

1. DOCUMENTS AND DRAWINGS

DOCUMENTS:

DRAWINGS:

2. MATERIAL PRICES

UNIT COSTS REPRESENT CURRENT PRICES FOR SPECIFIED MATERIAL. VENDOR INFORMATION WAS OBTAINED FOR THE FOLLOWING ITEMS:

3. LABOR RATES

CURRENT KEH BASE CRAFT RATES, AS ISSUED BY KEH FINANCE (EFFECTIVE 10-01-93), INCLUDE FRINGE BENEFITS, LABOR INSURANCE, TAXES AND TRAVEL WHERE APPLICABLE, PER HANFORD SITE STABILIZATION AGREEMENT, APPENDIX A (EFFECTIVE 09-06-93). NON CRAFT HOURLY RATES ARE BASED ON THE 1994 FISCAL YEAR BUDGET LIQUIDATION RATES AS ISSUED BY KEH FINANCE (EFFECTIVE 10-01-93).

4. GENERAL REQUIREMENTS/TECHNICAL SERVICES/OVERHEADS

A.) ONSITE CONSTRUCTION FORCES GENERAL REQUIREMENTS, TECHNICAL SERVICES AND CRAFT OVERHEAD COSTS ARE INCLUDED AS A COMPOSITE PERCENTAGE BASED ON THE KEH ESTIMATING FACTOR/BILLING SCHEDULE, REVISION 16, DATED OCTOBER 01, 1993. THE TOTAL COMPOSITE PERCENTAGE APPLIED TO ONSITE CONSTRUCTION FORCES LABOR, FOR THIS PROJECT, IS 93% FOR SHOP WORK AND 134% FOR FIELD WORK, WHICH IS REFLECTED IN THE "OH&P/B&I" COLUMN OF THE ESTIMATE DETAIL.

B.) ONSITE CONTRACT ADMINISTRATION AND CONSTRUCTION MANAGEMENT COSTS, ASSOCIATED WITH THE OVERALL MANAGEMENT OF THE FIXED PRICE CONTRACTS, ARE INCLUDED AS A COMPOSITE PERCENTAGE AND LUMP SUM ALLOWANCE (FOR BID PACKAGE PREP) BASED ON THE ESTIMATING FACTOR/BILLING SCHEDULE. THE TOTAL COMPOSITE PERCENTAGE AND LUMP SUM ALLOWANCE ARE APPLIED AGAINST THE TOTAL FIXED PRICE CONTRACT AMOUNT WHICH IS REFLECTED ON THE KEH SUMMARY REPORT DOER07, INCLUDED WITH THIS ESTIMATE. (FINAL ESTIMATES MAY BE PARTIALLY MANLOADED AND INCLUDED WITHIN THE ESTIMATE DETAIL)

C.) FIXED PRICE CONTRACTOR OVERHEAD, PROFIT, BOND AND INSURANCE COSTS HAVE BEEN APPLIED AT THE FOLLOWING PERCENTAGES AND ARE REFLECTED IN THE "OH&P/B&I" COLUMN OF THE ESTIMATE DETAIL:
LABOR - 0% MATERIAL - 0% EQUIPMENT USAGE - 0% EQUIPMENT - 0% SUBCONTRACTS - 0%

5. ESCALATION

ESCALATION PERCENTAGES WERE CALCULATED BY THE HANFORD MATERIAL & LABOR ESCALATION STUDY, DATED FEBRUARY 1993.

6. ROUNDING

U.S. DEPARTMENT OF ENERGY - DOE ORDER 5100.4 PAGE 1-32 SUBPARAGRAPH (M), REQUIRES ROUNDING OF ALL GENERAL PLANT PROJECTS (GPP'S) AND LINE ITEM (LI) COST ESTIMATES. REFERENCE: DOE 5100.4, FIGURE 1-11, DATED 10-31-84.

7. REMARKS

A.) DEFINITIVE DESIGN COSTS ARE BASED ON 25% OF DIRECT CONSTRUCTION.
B.) ENGINEERING AND INSPECTION COSTS ARE BASED ON 10% OF DIRECT CONSTRUCTION.
C.) WESTINGHOUSE PROJECT MANAGEMENT COSTS ARE BASED ON 15% OF DIRECT CONSTRUCTION.

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W314B
FILE NO. W314SCJ2

** IEST - INTERACTIVE ESTIMATING **
PRIMARY & DST ANNULUS FAN AND STACK ALTERNATIVE
STUDY ESTIMATE - REF. SECTION NO. 5.3.5.2.
DOE_R04 - COST CODE ACCOUNT SUMMARY


DATE 02/11/94 13:42:54
BY GDR

| COST CODE/WBS | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| 000 | ENGINEERING | | | | | | | | | |
| 110000 | DEFINITIVE DESIGN | 234000 | 0 | 234000 | 22.35 | 52299 | 286299 | 30 | 85890 | 372189 |
| 120000 | ENGINEERING / INSPECTION | 94000 | 0 | 94000 | 37.81 | 35541 | 129541 | 30 | 38862 | 168404 |
| 400000 | WHC PROJECT MANAGEMENT | 141000 | 0 | 141000 | 31.27 | 44091 | 185091 | 30 | 55527 | 240618 |
| TOTAL 000 | ENGINEERING | 469000 | 0 | 469000 | 28.13 | 131931 | 600931 | 30 | 180279 | 781211 |
| 700 | SPECIAL EQUIP/PROCESS SYSTEMS | | | | | | | | | |
| 310001 | ANNULUS EXHAUST BY PASS | 517646 | 0 | 517646 | 31.27 | 161868 | 679514 | 30 | 203854 | 883368 |
| 310002 | PRIMARY EXHAUST BY PASS | 419767 | 0 | 419767 | 31.27 | 131261 | 551028 | 30 | 165309 | 716337 |
| TOTAL 700 | SPECIAL EQUIP/PROCESS SYSTEM | 937413 | 0 | 937413 | 31.27 | 293129 | 1230542 | 30 | 369163 | 1599705 |
| PROJECT TOTAL | | 1,406,413 | 0 | 1,406,413 | 30.22 | 425,060 | 1,831,473 | 30 | 549,442 | 2,380,916 |

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W314B
FILE NO. W314SCJ2

** IEST - INTERACTIVE ESTIMATING **
PRIMARY & DST ANNULUS FAN AND STACK ALTERNATIVE
STUDY ESTIMATE - REF. SECTION NO. 5.3.5.2.
DOE_R05 - ESTIMATE SUMMARY BY CSI DIVISION


DATE 02/11/94 13:42:56
BY GDR

| CSI | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| ENGINEERING | | | | | | | | | | |
| 00 | TECHNICAL SERVICES | 469000 | 0 | 469000 | 28.13 | 131931 | 600931 | 30 | 180279 | 781211 |
| TOTAL ENGINEERING | | 469,000 | 0 | 469,000 | 28.13 | 131,931 | 600,931 | 30 | 180,279 | 781,211 |
| CONSTRUCTION | | | | | | | | | | |
| 15 | MECHANICAL | 260463 | 0 | 260463 | 31.27 | 81447 | 341910 | 30 | 102573 | 444483 |
| 16 | ELECTRICAL | 676950 | 0 | 676950 | 31.27 | 211682 | 888632 | 30 | 266590 | 1155222 |
| TOTAL CONSTRUCTION | | 937,413 | 0 | 937,413 | 31.27 | 293,129 | 1,230,542 | 30 | 369,163 | 1,599,705 |
| PROJECT TOTAL | | 1,406,413 | 0 | 1,406,413 | 30.22 | 425,060 | 1,831,473 | 30 | 549,442 | 2,380,916 |

REFERENCE: ESTIMATE BASIS SHEET PAGE 3 OF 7
COST CODE ACCOUNT SUMMARY PAGE 4 OF 7

THE U.S. DEPARTMENT OF ENERGY - RICHLAND ORDER 5700.3 "COST ESTIMATING, ANALYSIS AND STANDARDIZATION" DATED 3-27-85, PROVIDES GUIDELINES FOR ESTIMATE CONTINGENCIES. THE GUIDELINE FOR A STUDY ESTIMATE SHOULD HAVE AN OVERALL RANGE OF 15 TO 50 % .

CONTINGENCY IS EVALUATED AT THE THIRD COST CODE LEVEL AND SUMMARIZED AT THE PRIMARY AND SECONDARY COST CODE LEVEL OF THE DETAILED COST ESTIMATE.

APPLIED A 30% CONTINGENCY TO PROJECT DUE TO THE LIMITED INFORMATION AVAILABLE.

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W314B
FILE NO. W314SCJ2

** IEST - INTERACTIVE ESTIMATING **
PRIMARY & DST ANNULUS FAN AND STACK ALTERNATIVE
STUDY ESTIMATE - REF. SECTION NO. 5.3.5.2.
DOE_R07 - ONSITE INDIRECT COSTS BY WBS


DATE 02/11/94 13:42:58
BY GDR

| WBS | DESCRIPTION | ESTIMATE SUBTOTAL | CONTRACT % | ADMINISTRATION TOTAL | BID PACK PREP. | OTHER INDIRECTS | TOTAL INDIRECTS |
|---|---|---|---|---|---|---|---|
| 110000 | DEFINITIVE DESIGN | 234000 | 0.00 | 0 | 0 | 0 | 0 |
| 120000 | ENGINEERING / INSPECTION | 94000 | 0.00 | 0 | 0 | 0 | 0 |
| 310001 | ANNULUS EXHAUST BY PASS | 517646 | 0.00 | 0 | 0 | 0 | 0 |
| 310002 | PRIMARY EXHAUST BY PASS | 419767 | 0.00 | 0 | 0 | 0 | 0 |
| 400000 | WHC PROJECT MANAGEMENT | 141000 | 0.00 | 0 | 0 | 0 | 0 |
| PROJECT TOTAL | | 1,406,413 | | 0 | 0 | 0 | 0 |

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W314B
FILE NO. W314SCK2

** IEST - INTERACTIVE ESTIMATING **
PRIMARY & DST ANNULUS FAN AND STACK ALTERNATIVE
STUDY ESTIMATE - REF. SECTION NO. 5.3.5.3.
DOE_R01 - PROJECT COST SUMMARY


DATE 02/11/94 13:41:08
BY GDR

| COST CODE | DESCRIPTION | ESCALATED TOTAL COST | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|
| 000 | ENGINEERING | 600,000 | 30 | 180,000 | 780,000 |
| 700 | SPECIAL EQUIP/PROCESS SYSTEMS | 1,230,000 | 30 | 370,000 | 1,600,000 |
| | (ADJUSTED TO MEET DOE 5100.4) | -30,000 | | 50,000 | 20,000 |
| | PROJECT TOTAL | 1,800,000 | 30 | 600,000 | 2,400,000 |

TYPE OF ESTIMATE STUDY ESTIMATE FEBRUARY 11, 1994

ARCHITECT ENGINEER

OPERATING CONTRACTOR

REMARKS:

(ROUNDED/ADJUSTED TO THE NEAREST " 10,000 / 100,000 " - PERCENTAGES NOT RECALCULATED TO REFLECT ROUNDING)

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W314B
FILE NO. W314SCK2

** IEST - INTERACTIVE ESTIMATING **
PRIMARY & DST ANNULUS FAN AND STACK ALTERNATIVE
STUDY ESTIMATE - REF. SECTION NO. 5.3.5.3.
DOE_R02 - WORK BREAKDOWN STRUCTURE SUMMARY


DATE 02/11/94 13:41:09
BY GDR

| WBS | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| 110000 | DEFINITIVE DESIGN | 234000 | 0 | 234000 | 22.35 | 52299 | 286299 | 30 | 85890 | 372189 |
| 120000 | ENGINEERING / INSPECTION | 94000 | 0 | 94000 | 37.81 | 35541 | 129541 | 30 | 38862 | 168404 |
| SUBTOTAL 12 | ENGINEERING/INSPECTION | 94000 | 0 | 94000 | 37.81 | 35541 | 129541 | 30 | 38862 | 168404 |
| SUBTOTAL 1 | ENGINEERING | 328000 | 0 | 328000 | 26.78 | 87840 | 415840 | 30 | 124752 | 540593 |
| 310013 | ANNULUS EXHAUST FAN/STACK | 516935 | 0 | 516935 | 31.27 | 161645 | 678580 | 30 | 203574 | 882155 |
| 310014 | PRIMARY EXHAUST FAN/STACK | 422545 | 0 | 422545 | 31.27 | 132130 | 554675 | 30 | 166403 | 721077 |
| SUBTOTAL 31 | FA CONST-ONSITE E/C | 939480 | 0 | 939480 | 31.27 | 293775 | 1233255 | 30 | 369977 | 1603232 |
| SUBTOTAL 3 | CONSTRUCTION | 939480 | 0 | 939480 | 31.27 | 293775 | 1233255 | 30 | 369977 | 1603232 |
| 400000 | WHC PROJECT MANAGEMENT | 141000 | 0 | 141000 | 31.27 | 44091 | 185091 | 30 | 55527 | 240618 |
| SUBTOTAL 4 | PROJECT INTEGRATION | 141000 | 0 | 141000 | 31.27 | 44091 | 185091 | 30 | 55527 | 240618 |
| PROJECT TOTAL | | 1,408,480 | 0 | 1,408,480 | 30.22 | 425,706 | 1,834,186 | 30 | 550,256 | 2,384,443 |

1. DOCUMENTS AND DRAWINGS
==========
DOCUMENTS:

DRAWINGS:

2. MATERIAL PRICES
==========
UNIT COSTS REPRESENT CURRENT PRICES FOR SPECIFIED MATERIAL. VENDOR INFORMATION WAS OBTAINED FOR THE FOLLOWING ITEMS:

3. LABOR RATES
==========
CURRENT KEH BASE CRAFT RATES, AS ISSUED BY KEH FINANCE (EFFECTIVE 10-01-93), INCLUDE FRINGE BENEFITS, LABOR INSURANCE, TAXES AND TRAVEL WHERE APPLICABLE, PER HANFORD SITE STABILIZATION AGREEMENT, APPENDIX A (EFFECTIVE 09-06-93). NON CRAFT HOURLY RATES ARE BASED ON THE 1994 FISCAL YEAR BUDGET LIQUIDATION RATES AS ISSUED BY KEH FINANCE (EFFECTIVE 10-01-93).

4. GENERAL REQUIREMENTS/TECHNICAL SERVICES/OVERHEADS
==========
A.) ONSITE CONSTRUCTION FORCES GENERAL REQUIREMENTS, TECHNICAL SERVICES AND CRAFT OVERHEAD COSTS ARE INCLUDED AS A COMPOSITE PERCENTAGE BASED ON THE KEH ESTIMATING FACTOR/BILLING SCHEDULE, REVISION 16, DATED OCTOBER 01, 1993. THE TOTAL COMPOSITE PERCENTAGE APPLIED TO ONSITE CONSTRUCTION FORCES LABOR, FOR THIS PROJECT, IS 93% FOR SHOP WORK AND 134% FOR FIELD WORK, WHICH IS REFLECTED IN THE "OH&P/B&I" COLUMN OF THE ESTIMATE DETAIL.
B.) ONSITE CONTRACT ADMINISTRATION AND CONSTRUCTION MANAGEMENT COSTS, ASSOCIATED WITH THE OVERALL MANAGEMENT OF THE FIXED PRICE CONTRACTS, ARE INCLUDED AS A COMPOSITE PERCENTAGE AND LUMP SUM ALLOWANCE (FOR BID PACKAGE PREP) BASED ON THE ESTIMATING FACTOR/BILLING SCHEDULE. THE TOTAL COMPOSITE PERCENTAGE AND LUMP SUM ALLOWANCE ARE APPLIED AGAINST THE TOTAL FIXED PRICE CONTRACT AMOUNT WHICH IS REFLECTED ON THE KEH SUMMARY REPORT DOER07, INCLUDED WITH THIS ESTIMATE. (FINAL ESTIMATES MAY BE PARTIALLY MANLOADED AND INCLUDED WITHIN THE ESTIMATE DETAIL)
C.) FIXED PRICE CONTRACTOR OVERHEAD, PROFIT, BOND AND INSURANCE COSTS HAVE BEEN APPLIED AT THE FOLLOWING PERCENTAGES AND ARE REFLECTED IN THE "OH&P/B&I" COLUMN OF THE ESTIMATE DETAIL:
LABOR - 0% MATERIAL - 0% EQUIPMENT USAGE - 0% EQUIPMENT - 0% SUBCONTRACTS - 0%

5. ESCALATION
==========
ESCALATION PERCENTAGES WERE CALCULATED BY THE HANFORD MATERIAL & LABOR ESCALATION STUDY, DATED FEBRUARY 1993.

6. ROUNDING
==========
U.S. DEPARTMENT OF ENERGY - DOE ORDER 5100.4 PAGE 1-32 SUBPARAGRAPH (M), REQUIRES ROUNDING OF ALL GENERAL PLANT PROJECTS (GPP'S) AND LINE ITEM (LI) COST ESTIMATES. REFERENCE: DOE 5100.4, FIGURE 1-11, DATED 10-31-84.

7. REMARKS
==========
A.) DEFINITIVE DESIGN COSTS ARE BASED ON 25% OF DIRECT CONSTRUCTION.
B.) ENGINEERING AND INSPECTION COSTS ARE BASED ON 10% OF DIRECT CONSTRUCTION.
C.) WESTINGHOUSE PROJECT MANAGEMENT COSTS ARE BASED ON 15% OF DIRECT CONSTRUCTION.

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KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W314B
FILE NO. W314SCK2

** IEST - INTERACTIVE ESTIMATING **
PRIMARY & DST ANNULUS FAN AND STACK ALTERNATIVE
STUDY ESTIMATE - REF. SECTION NO. 5.3.5.3.
DOE_R04 - COST CODE ACCOUNT SUMMARY


DATE 02/11/94 13:41:11
BY GDR

| COST CODE/WBS | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| 000 | ENGINEERING | | | | | | | | | |
| 110000 | DEFINITIVE DESIGN | 234000 | 0 | 234000 | 22.35 | 52299 | 286299 | 30 | 85890 | 372189 |
| 120000 | ENGINEERING / INSPECTION | 94000 | 0 | 94000 | 37.81 | 35541 | 129541 | 30 | 38862 | 168404 |
| 400000 | WHC PROJECT MANAGEMENT | 141000 | 0 | 141000 | 31.27 | 44091 | 185091 | 30 | 55527 | 240618 |
| TOTAL 000 | ENGINEERING | 469000 | 0 | 469000 | 28.13 | 131931 | 600931 | 30 | 180279 | 781211 |
| 700 | SPECIAL EQUIP/PROCESS SYSTEMS | | | | | | | | | |
| 310013 | ANNULUS EXHAUST FAN/STACK | 516935 | 0 | 516935 | 31.27 | 161645 | 678580 | 30 | 203574 | 882155 |
| 310014 | PRIMARY EXHAUST FAN/STACK | 422545 | 0 | 422545 | 31.27 | 132130 | 554675 | 30 | 166403 | 721077 |
| TOTAL 700 | SPECIAL EQUIP/PROCESS SYSTEM | 939480 | 0 | 939480 | 31.27 | 293775 | 1233255 | 30 | 369977 | 1603232 |
| PROJECT TOTAL | | 1,408,480 | 0 | 1,408,480 | 30.22 | 425,706 | 1,834,186 | 30 | 550,256 | 2,384,443 |

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W314B
FILE NO. W314SCK2

** IEST - INTERACTIVE ESTIMATING **
PRIMARY & DST ANNULUS FAN AND STACK ALTERNATIVE
STUDY ESTIMATE - REF. SECTION NO. 5.3.5.3.
DOE_R05 - ESTIMATE SUMMARY BY CSI DIVISION


DATE 02/11/94 13:41:13
BY GDR

| CSI | DESCRIPTION | ESTIMATE SUBTOTAL | ONSITE INDIRECTS | SUB TOTAL | ESCALATION % | ESCALATION TOTAL | SUB TOTAL | CONTINGENCY % | CONTINGENCY TOTAL | TOTAL DOLLARS |
|---|---|---|---|---|---|---|---|---|---|---|
| ENGINEERING | | | | | | | | | | |
| 00 | TECHNICAL SERVICES | 469000 | 0 | 469000 | 28.13 | 131931 | 600931 | 30 | 180279 | 781211 |
| TOTAL ENGINEERING | | 469,000 | 0 | 469,000 | 28.13 | 131,931 | 600,931 | 30 | 180,279 | 781,211 |
| CONSTRUCTION | | | | | | | | | | |
| 15 | MECHANICAL | 262530 | 0 | 262530 | 31.27 | 82093 | 344623 | 30 | 103387 | 448010 |
| 16 | ELECTRICAL | 676950 | 0 | 676950 | 31.27 | 211682 | 888632 | 30 | 266590 | 1155222 |
| TOTAL CONSTRUCTION | | 939,480 | 0 | 939,480 | 31.27 | 293,775 | 1,233,255 | 30 | 369,977 | 1,603,232 |
| PROJECT TOTAL | | 1,408,480 | 0 | 1,408,480 | 30.22 | 425,706 | 1,834,186 | 30 | 550,256 | 2,384,443 |

REFERENCE: ESTIMATE BASIS SHEET — PAGE 3 OF 7
COST CODE ACCOUNT SUMMARY — PAGE 4 OF 7

THE U.S. DEPARTMENT OF ENERGY - RICHLAND ORDER 5700.3 "COST ESTIMATING, ANALYSIS AND STANDARDIZATION" DATED 3-27-85, PROVIDES GUIDELINES FOR ESTIMATE CONTINGENCIES. THE GUIDELINE FOR A STUDY ESTIMATE SHOULD HAVE AN OVERALL RANGE OF 15 TO 50 % .

CONTINGENCY IS EVALUATED AT THE THIRD COST CODE LEVEL AND SUMMARIZED AT THE PRIMARY AND SECONDARY COST CODE LEVEL OF THE DETAILED COST ESTIMATE.

APPLIED A 30% CONTINGENCY TO PROJECT DUE TO THE LIMITED INFORMATION AVAILABLE.

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. W314B
FILE NO. W314SCK2

** IEST - INTERACTIVE ESTIMATING **
PRIMARY & DST ANNULUS FAN AND STACK ALTERNATIVE
STUDY ESTIMATE - REF. SECTION NO. 5.3.5.3.
DOE_R07 - ONSITE INDIRECT COSTS BY WBS


DATE 02/11/94 13:41:15
BY GDR

| WBS | DESCRIPTION | ESTIMATE SUBTOTAL | CONTRACT % | ADMINISTRATION TOTAL | BID PACK PREP. | OTHER INDIRECTS | TOTAL INDIRECTS |
|---|---|---|---|---|---|---|---|
| 110000 | DEFINITIVE DESIGN | 234000 | 0.00 | 0 | 0 | 0 | 0 |
| 120000 | ENGINEERING / INSPECTION | 94000 | 0.00 | 0 | 0 | 0 | 0 |
| 310013 | ANNULUS EXHAUST FAN/STACK | 516935 | 0.00 | 0 | 0 | 0 | 0 |
| 310014 | PRIMARY EXHAUST FAN/STACK | 422545 | 0.00 | 0 | 0 | 0 | 0 |
| 400000 | WHC PROJECT MANAGEMENT | 141000 | 0.00 | 0 | 0 | 0 | 0 |
| PROJECT TOTAL | | 1,408,480 | | 0 | 0 | 0 | 0 |

# APPENDIX E

## SCHEDULES

1. Project W-314B Schedule

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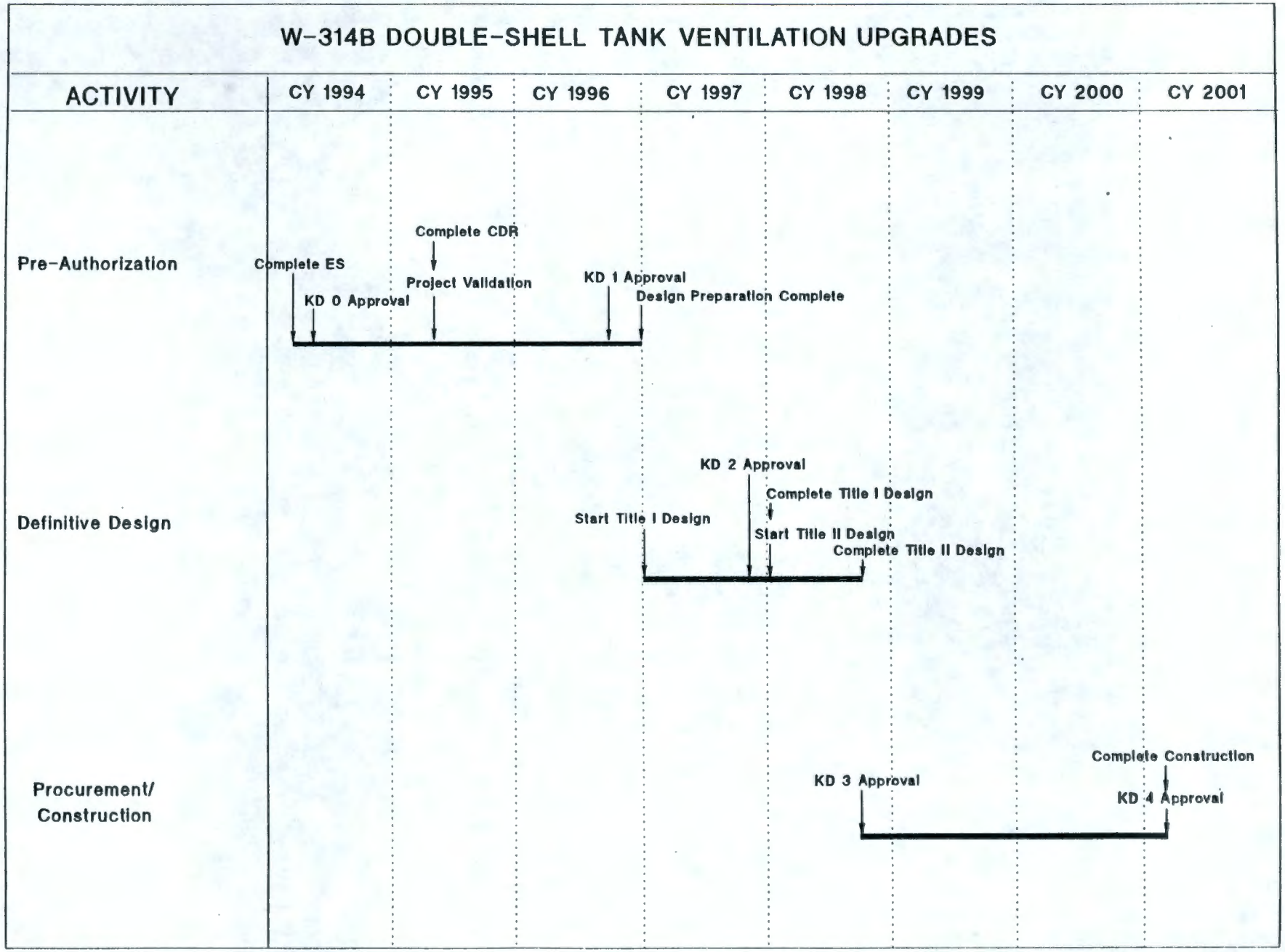


W-314\Gal\Schel2 gal\01\12\94\jld

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# APPENDIX F

## ADDITIONAL INFORMATION FOR FUTURE W-314B DOCUMENTS

The following items are additional information or possible areas for further study and incorporation into future W-314B documentation. These items were identified during a "Sunshine Session" review of the W-314B Engineering Study draft.

- During CDR, resolve the question "For the DSTs, should the annulus pressure be more negative than the primary tank?"
- During CDR, consider the use of 95% filters instead of HEPA filters on the primary and annulus inlets, which should result in a cost savings.
- During CDR, consider using single wall (not double contained) inlet supply ducts.
- During CDR, evaluate utilizing different airstream flow rates for lower emmisions, more cooling, smaller components, better leak detection (annulus), etc.
- During CDR, evaluate the quantity of existing power availability (at tank farm transformers) to ensure that the existing ventilation system can operate concurrently with the new facility and the operational testing of the new ventilation system.
- During CDR, obtain the latest and most accurate vapor space characterization feasible to prevent under or over design of the mitigation components.
- During CDR, perform stack height analysis.
- During CDR, consider a central facility for cleaning backwashable components versus backwashing in place.
- During CDR, evaluate using multiple ventilation buildings versus a single building (as assumed by this study), for cost and operational efficiency.
- During CDR, review the assumptions listed in Section 5.2 for their validity.
- During CDR, verify that SST 241-A-105 and 241-SX Farm still require ventilation for the purpose of heat removal. If heat removal is not required, the scope for upgrading its ventilation system should possibly be transferred to Project W-314F (SST Ventilation Systems Upgrade).
- During CDR, verify all five DCRTs are still required for the transferring tank waste. Project W-314C (Waste Transfer System Upgrade) may permanently remove several of the DCRTs from active service.
- During CDR, verify the existing instrument air systems have the capacity to support Project W-314B equipment.

- During CDR, study whether a removable cross-connection spool piece should be provided between the annulus and primary exhaust ductwork. The spool would be installed if a primary tank leak should occur and allow the exhausted annulus airstream contaminants to be removed by the primary exhaust train.

- During CDR, investigate if each exhaust filter train should have a separate stack and monitoring system versus one stack and monitoring system for a dual exhaust filter train.

- Action: Coordination, between the W-314 subprojects and with the other tank farm related projects, i.e., Project W-211, is essential for eliminating redesigns and rework, and can result in cost savings by integrating designs and construction, sharing common facilities and utilities, etc.

- Reminder: the current trend is to reduce the Hanford site boundaries. This could impact permitting in relationship to acceptable offsite release calculations.

- Reminder, the selection of the variable speed fan is acceptable only if the inlet airstream flow rate is controllable.

- Pursue a waiver of DOE Order 6430.1A to allow the use of a high efficiency metal particulate airfilter, thereby reducing costs.

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# APPENDIX G

# PRELIMINARY VENTILATION BUILDING LIST

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The following is a preliminary list of buildings, with the equipment to be housed by each. Cost estimates are based on the exhaust train flow size and comparisons to the 241-AZ-702 ventilation building to be supplied by Project W-030. The possibility of further combining systems into single buildings will be explored during conceptual design.

241-AN Ventilation Building: Primary exhaust train (1000 scfm), annulus exhaust train (6125 scfm), instrumentation and local readouts, MCC. Estimated cost $14,300,000.

241-AP Ventilation Building: Primary exhaust train (1000 scfm), annulus exhaust train (8600 scfm), instrumentation and local readouts, MCC. Estimated cost $15,100,000.

241-AW Ventilation Building: Primary exhaust train (1000 scfm), annulus exhaust train (4800 scfm), instrumentation and local readouts, MCC. Estimated cost $13,400,000.

241-SY Ventilation Building: Primary exhaust train (1000 scfm), annulus exhaust train (750 scfm), instrumentation and local readouts, MCC. Estimated cost $12,600,000.

241-AY Ventilation Building: Annulus exhaust train (7000 scfm), instrumentation and local readouts, MCC. Estimated cost $8,500,000.

241-AZ Ventilation Building: Annulus exhaust train (7000 scfm), instrumentation and local readouts, MCC. Estimated cost $8,500,000.

241-A Ventilation Building: Primary exhaust train (2300 scfm), instrumentation and local readouts, MCC. Estimated cost $7,700,000.

241-SX Ventilation Building: Primary exhaust train (6500 scfm), instrumentation and local readouts, MCC. Estimated cost $8,500,000.

244-A Ventilation Building: Primary exhaust train (125 scfm), instrumentation and local readouts, MCC. Estimated cost $7,700,000.

244-BX Ventilation Building: Primary exhaust train (125 scfm), instrumentation and local readouts, MCC. Estimated cost $7,700,000.

244-S Ventilation Building: Primary exhaust train (125 scfm), instrumentation and local readouts, MCC. Estimated cost $7,700,000.

244-TX Ventilation Building: Primary exhaust train (125 scfm), instrumentation and local readouts, MCC. Estimated cost $7,700,000.

244-U Ventilation Building: Primary exhaust train (125 scfm), instrumentation and local readouts, MCC. Estimated cost $7,700,000.

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# APPENDIX H

## LISTING OF CONCERNS AND THE PREFERRED ALTERNATIVE

The following is a list of concerns with the existing ventilation systems and are previously listed in this study. Below each concern is a statement (identified by an "A." before each statement) of how the preferred alternative addresses that concern.

**Reference Section 1.2.1 Codes and Regulations**

1. The National Emission Standards for Hazardous Air Pollutants (NESHAP) is specified in the 40 Series Code of Federal Regulations (CFRs), Part 61, Subpart H (National Emission Standards for Emissions of Radionuclides Other Than Radon From Department of Energy Facilities). The NESHAP regulation limits the radionuclide emissions from the entire Hanford Site to a 10 mrem/year exposure to any member of the offsite public. NESHAP requires that if any one emission point could potentially cause any member of the public to be exposed to greater than 0.1 mrem/year, then that emission point must be measured continuously per the methods and standards specified in the these regulations. The existing stack sampling and monitoring systems do not measure the emissions per the specified methods and standards.[1]

A. The design of the new "generic" samplers, to be used site-wide at Hanford, was initiated as a response to the above Code violation. The design and installation of this new sampler will provide a code compliant sampling system.

2. Although the following is not a noncompliance issue, it is included as a measure of the existing ventilation systems against codes and standards accepted as the best method of performance throughout the DOE complex and industry for attaining a safe and reliable ventilation system. DOE Order 6430.1A Section 1550-2.5.5 and ASME N-510 requires in-place testing of air cleaning devices (HEPA filters). Many of the existing systems lack adequate upstream mixing and sampling, provisions for downstream sampling of multiple banks, insertion or sampling ports, etc. Also many of the ventilation systems do not meet the seismic guidelines established in UCRL 15910 (Design and Evaluation Guidelines for Department of Energy Facilities Subjected to Natural Phenomena Hazards) for new construction or major modifications. The goal of these guidelines is to assure that DOE facilities are constructed to safely withstand the effects of natural Phenomena such as earthquakes, extreme winds and flooding.

A. DOE Order 6430.1A is a mandatory requirement for new construction and therefore the design will resolve the above issues.

**1.2.3 Safety Issues**

a. The possibility exists for flammable gas concentrations to reach the lower explosive limit (LEL) when the tank farms are not properly ventilated. This could occur during an extended shut down for maintenance and/or repairs.

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A. The main reason the existing systems demonstrate the above concern are because of their age. Therefore, the installation of a new system will provide less down time for maintenance and repairs than a system which is approaching its expected service life or have exceeded it.

**b.** Ventilation system exhaust stack flows are required to be monitored for radionuclides per 40 CFR 61 Appendix H, to ensure that established safe radionuclide emission limits are not exceeded. The existing sampling and monitoring systems for radionuclides are noncompliant with 40 CFR 61 Appendix H which can lead to inaccurate data being accumulated to verify compliance with NESHAP's safe offsite exposure limit.

A. The installation and design of the new "generic" monitoring and sampling system alleviates the above concern.

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**c.** The majority of the existing ventilation systems do not have the ability to control or monitor for hazardous chemical emissions, therefore Hanford cannot statistically report the quantity or identity of these emissions being exhausted into the atmosphere. The tank farm with the most monitoring equipment is the SY Farm, specifically Tank 101-SY. However, only the quantity of hydrogen, ammonia and volatile organic compounds (VOCs) produced in this tank are monitored, although the exhausted air contains many other compounds which are not monitored. Actual characterization of the air being expelled by the ventilation systems in this study have not been performed in sufficient detail to allow a comprehensive comparison of the exhausted air constituents to the regulatory lists, such as WAC-173-460. Without this information, the exposure of site workers to possible hazardous compounds being exhausted are relatively unknown. Many of the tank farm work procedures require the workers to utilize fresh air breathing equipment when entering the tank farms. Many reports of site workers smelling strong fumes, having nausea and/or headaches after working in or around the tank farms have been recorded[8].

A. The preferred alternative has the ability of mitigating the major known hazardous emissions to a safe exposure limit. This study, in Appendix G, suggests that better characterization be pursued so that this information be incorporated into the conceptual design.

**d.** The method by which the DSTs obtain their supply of ventilation intake air presents a potentially serious safety problem during the winter months. In-leakage through various openings provide the primary ventilation system the necessary intake of air. The formation of hoar frost, ice, or snow can cover these openings, causing loss of control of the tank's internal negative pressure. This creates a potential for tank damage. Immediate actions are required to rectify this situation when it occurs. Shutdown of the ventilation systems due to low air flow and/or a high negative tank pressure will cause the loss of radionuclide tank confinement.

A. The preferred alternative provides dedicated inlet stations where the accumulation of hoar frost, ice, and snow can be controlled and eliminates the current method of supplying air to the ventilation system through the existing infiltration routes .

**e.** When the ventilation systems are not operating, loss of radionuclide confinement occurs. Without the constant negative pressure in the tanks, the

escape of radionuclides will occur from the tank through the normal infiltration routes.

A. The installation of the preferred alternative requires the sealing of the infiltration routes and provides HEPA filtration on the inlet and exhaust ducting which will provide radionuclide confinement when the ventilation systems are not in operation.

f. Most of the older ventilation systems do not provide the necessary access or equipment for testing to the American National Standard for the Testing of Nuclear Air Treatment Systems ASTM N-510. The newest of the tank farms (241-AP) does comply with this standard, and some of the older systems have been retrofitted as best as they could be. The inability to properly test the ventilation systems per ASME N-510 results in the inability to verify that the radionuclide filtration units are functioning as required. In the noncompliant systems, continuous air monitors are the only indication that the system is not functioning properly. Unfortunately this indication or alarm occurs after the radionuclides begin to exit the stack resulting in a radiological release to the atmosphere and surrounding area.

A. The design and installation of the preferred alternative will provide systems capable of meeting the above, and other appropriate codes, regulations, and standards and will provide the reliability and testability of the ventilation system.

g. Many of the existing ventilation systems do not provide as low as reasonably achievable (ALARA) exposure conditions for the workers who must maintain, test, and operate those systems. The existing systems' designs are not conducive to installing additional sheilding without hampering maintenance activities. A new system built by today's standards will have the ALARA concept integrated throughout its design. The installation of this design will aide in maintaining worker exposures as low as reasonably achievable.

A. Lowering the exposure of workers was a consideration for selecting the preferred alternative. Also the future design of the preferred alternative will be required to include the best methods of lowering exposure rates.

h. The existing DST ventilation systems cannot adequately handle tank farm upset conditions created by situations such as the 242-A Evaporator having an off-normal operating condition where it must immediately send hot waste back to the tank farm. In the past, this action has caused the ventilation system to shut down due to the additional heat and moisture added to the exhaust stream.[4] Another problem occurs when additional air is allowed to flow into the tanks due to maintenance or repair activities such as through open risers. The current ventilation systems cannot maintain the required negative pressure by increasing their output flow rates, therefore other mitigating activities must be performed. This additional activity results in a higher cost for the original repair and additional radiation exposure to the workers.

A. The preferred alternative will have the ability to handle upset conditions where temporary additional airflow is required by simultaneous operation the dual inlet and exhaust trains.

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i. Relatively short exhaust stack heights present onsite toxicological concerns for workers due to lack of dispersion of the vapors being exhausted. (Reference Defense Waste Management Division letter of January 1, 1990, Government Operations Business Unit evaluation transmitted March 2, 1990, Radiological Analysis letter June 1988).

A. The preferred alternative installs taller stacks (30' versa 15') for better dispersion than the existing stacks. Also, the hazardous mitigation capability of the alternative will negate the toxicological concerns.

### 1.2.4 Retrieval issues

a. The DST ventilation system capabilities must be compatible with the mixer pump installation process and its operation, i.e. aerosols, opening of tank risers, etc. The existing systems cannot maintain sufficient negative pressure with the risers open. The existing system may not be compatible with the mixer pump operation if additional aerosols are introduced to the vapor space. Project W-211 (Initial Tank Retrieval System) is currently funding a study which will provide information on how the vapor in the tank's vapor space will be affected during the operation of mixer pumps.

A. The preferred alternative is capable of adequately functioning with higher aerosols and higher airstream flows due to the HEME and simultaneous operation of the trains. Project W-314B's design effort will also utilize the information from the study to ensure a compatable ventilation system is developed.

b. Changes in the composition of the DST fluid will occur throughout the retrieval mission, resulting in various head space vapor compositions. The effects of this on the existing ventilation system are not significant as long as the system's radionuclide removal capability is not exceeded, and the composition of the vapors being released do not cause a toxilogical health concern. The changes in composition will greatly affect the design of a new system due to the codes and regulations which require toxic mitigation of the exhausted air.

A. The preferred alternative design is flexible and can be updated as more accurate characterization becomes available.

c. Variable temperatures of the DST vapor to be exhausted from the tank's head space will occur due to operation of a mixer pump, mixing or blending of the chemical contents of the tank, and differing radionuclide concentration with varying amounts of decay heat. The variable temperatures can cause operational problems with the existing systems, i.e., the moisture de-entrainer may not perform adequately, the relative humidity could be difficult to control, etc.

A. The preferred alternative is temperature tolerant within the maximum temperature criteria given because it has the capability to cool and/or heat the airstream to the proper parameters as it flows through the exhaust train.

9413221.1324

Date Received: 2/16/94 KMB

# INFORMATION RELEASE REQUEST

Reference: WHC-CM-3-4

Complete for all Types of Release

**Purpose**

[] Speech or Presentation
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- [] Summary
- [] Abstract
- [] Visual Aid

(Check only one suffix)

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[] Poster Session
[] Videotape

[] Reference
[X] Technical Report
[] Thesis or Dissertation
[] Manual
[] Brochure/Flier
[] Software/Database
[] Controlled Document
[] Other

ID Number (include revision, volume, etc.): WHC-SD-WM-ES-284 Rev. 0

List attachments.

Date Release Required: 2/18/94

Title: Double Shell Tank Ventilation Upgrades, Project W-314B, Engineering Study

Unclassified Category: UC-

Impact Level: N/A

New or novel (patentable) subject matter? [X] No [] Yes
If "Yes", has disclosure been submitted by WHC or other company?
[] No [] Yes Disclosure No(s).

Information received from others in confidence, such as proprietary data, trade secrets, and/or inventions?
[X] No [] Yes (Identify)

Copyrights? [X] No [] Yes
If "Yes", has written permission been granted?
[] No [] Yes (Attach Permission)

Trademarks?
[X] No [] Yes (Identify)

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Group or Society Sponsoring

Date(s) of Conference or Meeting

City/State

Will proceedings be published? [] Yes [] No
Will material be handed out? [] Yes [] No

Title of Journal

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|---|---|---|---|---|---|
| Classification/Unclassified Controlled Nuclear Information | [] | [X] | | | |
| Patent - General Counsel | [] | [X] | NOT REQ'D PER S.W. BERGLIN TELECON OF 2-14-94 | | |
| Legal - General Counsel | [] | [X] | WITH D.L. McGREW | D L McGrew | 2-14-94 |
| Applied Technology/Export Controlled Information or International Program | [] | [X] | | | |
| WHC Program/Project | [X] | [] | J.L. HOMAN | James L Homan | 2-15-94 |
| Communications | [] | [X] | | | |
| RL Program/Project | [X] | [] | R.W. Brown | R.W. Brown | 2/16/94 |
| Publication Services | [X] | [] | BG LAUZON | B G Lauzon | 2/16/94 |
| Other Program/Project | [] | [X] | | | |

Information conforms to all applicable requirements. The above information is certified to be correct.

| | Yes | No |
|---|---|---|
| References Available to Intended Audience | [] | [X] |
| Transmit to DOE-HQ/Office of Scientific and Technical Information | [] | [X] |

Author/Requestor (Printed/Signature) Date: D.L. McGREW D L McGrew 2-14-94

Intended Audience: [] Internal [] Sponsor [X] External

Responsible Manager (Printed/Signature) Date: J. L. Homan J L Homan 2-15-94

INFORMATION RELEASE ADMINISTRATION APPROVAL STAMP

Stamp is required before release. Release is contingent upon resolution of mandatory comments.

APPROVED FOR RELEASE OFFICIAL DOCUMENT Date 2/16/94

Date Cancelled

Date Disapproved

9413221.1325

BD-7600-062 (08/91) WEF074

Part 1

# DISTRIBUTION SHEET

| To | From | Page 1 of 1 |
|---|---|---|
| Distribution | D. L. McGrew | Date |
| Project Title/Work Order | | EDT No. 603862 |
| W-314B Double Shell Tank Ventilation Upgrades | | ECN No. N/A |

| Name | MSIN | Text With All Attach. | Text Only | Attach./ Appendix Only | EDT/ECN Only |
|---|---|---|---|---|---|
| A. W. Akerson | E6-23 | X | | | |
| J. A. Andersen | H5-09 | X | | | |
| T. E. Arndt | L5-07 | X | | | |
| K. A. Boes | R3-27 | X | | | |
| D. E. Bowers | S6-01 | X | | | |
| G. J. Carr | R3-10 | X | | | |
| K. A. Colosi | R3-27 | X | | | |
| G. L. Crawford | R1-30 | X | | | |
| G. M. Crummel | R1-51 | X | | | |
| J. B. Fisler | H5-09 | X | | | |
| R. C. Garrison | H5-38 | X | | | |
| M. L. Grygiel | B1-58 | X | | | |
| J. M. Henderson | S4-55 | X | | | |
| J. L. Homan | H5-09 | X | | | |
| T. G. Howell | G6-02 | X | | | |
| J. J. Huston | S1-54 | X | | | |
| J. Janus | G6-18 | X | | | |
| R. J. Kidder | H4-64 | X | | | |
| J. J. Klos | T4-07 | X | | | |
| J. R. Kriskovich | S2-24 | X | | | |
| G. L. Lamphere | G6-06 | X | | | |
| K. W. Leliefeld | R2-88 | X | | | |
| D. L. McGrew | R3-27 | X | | | |
| F. J. Muller | R3-27 | X | | | |
| J. E. Navarro | R3-73 | X | | | |
| M. J. Ostrom | H5-72 | X | | | |
| S. R. Pierce | R1-51 | X | | | |
| H. A. Plagge | G6-04 | X | | | |
| J. V. Prather | R3-82 | X | | | |
| M. J. Ramos | R3.27 | X | | | |
| R. E. Raymond | R2-54 | X | | | |
| L. D. Rakestraw | G6-04 | X | | | |
| J. R. Robertson | H6-30 | X | | | |
| L. Ruffin | R1-51 | X | | | |
| G. J. Rust | T4-01 | X | | | |
| A. B. Sidpara | R3-72 | X | | | |
| M. A. Smith-Fewell | H5-09 | X | | | |
| C. E. Sowa | H6-25 | X | | | |
| R. J. Swan | H6-30 | X | | | |
| J. D. Thomson | R1-30 | | | | X |
| K. R. Welsch | H6-26 | X | | | |
| C. M. Winkler | L4-75 | X | | | |

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