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7. Abstract

The Sodium Storage Facility Conceptual Design Report provides conceptual design for construction of a new facility for storage of the 260,000 gallons of sodium presently in the FFTF plant. The facility will accept the molten sodium transferred from the FFTF sodium systems, and store the sodium in a solid state under an inert cover gas until such time as a Sodium Reaction Facility is available for final disposal of the sodium.

8. RELEASE STAMP

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Conceptual Design Report

Sodium Storage Facility
Fast Flux Test Facility
Project F-031

Prepared for
Westinghouse Hanford Company

October 1994

For the U.S. Department of Energy
Contract DE-AC06-87RL10900

Prepared by
Meier Associates, Inc., P.S.
for
ICF Kaiser Hanford Company

Project No. F-031 CDR

Conceptual Design Report

Sodium Storage Facility
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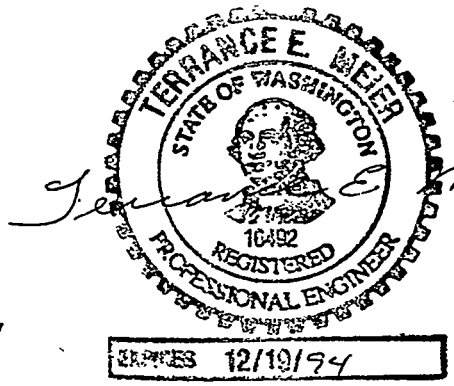

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Prepared by
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Westinghouse Hanford Company

ICF Kaiser Hanford Company has prepared the estimate and schedule and has provided management oversight for this document. ICF Kaiser Hanford Company has not participated in the preparation of the technical content of this document. ICF Kaiser Hanford Company takes no responsibility for and makes no representations or warranties as to the accuracy or sufficiency of the technical presentation included herein.

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Facilities Transition Projects Department

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Reference: DOE Order 4700.1

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APPENDICES

ABBREVIATIONS

ASTM	American Society of Testing Materials
CAA	Clean Air Act
CFM	Cubic Feet per Minute
DOE	Department of Energy
DOP	Dioctylphthalate
EA	Environmental Assessment
EPDM	Ethylene Propylene Diene Terpolymer
FDC	Functional Design Criteria
FFTF	Fast Flux Test Facility
FSF	Fuel Storage Facility
GFE	Government Furnished Equipment
GPT	General Plant Telephone
HEPA	High Efficiency Particulate Air
HLAN	Hanford Local Area Network
HVAC	Heating Ventilating and Cooling
IDS	Interim Decay Storage
IES	Illumination Engineering Society
NEPA	National Environmental Policy Act
NFPA	National Fire Protection Association
NPT	National Pipe Thread
PA	Public Address
PAX	Private Automatic Exchange
RCRA	Resource Conservation and Recovery Act
SCR	Silicon Control Rectifier
SEPA	State Environmental Policy Act
SSF	Sodium Storage Facility
TWRS	Tank Waste Remediation System
WAC	Washington Administrative Code

CONCEPTUAL DESIGN REPORT

SODIUM STORAGE FACILITY
FAST FLUX TEST FACILITY
PROJECT F-031

I. INTRODUCTION

Project F-031, Sodium Storage Facility (SSF) is a line item project for the Fast Flux Test Facility (FFTF). The FFTF is a 400-Megawatt (MW) thermal liquid metal cooled test reactor located on the Department of Energy (DOE) Hanford site in Southeastern Washington. On April 1, 1992, the DOE directed that FFTF be placed in "hot" standby with the coolant flow maintained at 400°F. On December 15, 1993, DOE directed that FFTF be placed in a radiologically and industrially safe shutdown condition.

Transition to the shutdown condition requires that the FFTF sodium coolant be removed from the various systems throughout the FFTF and stored in an interim facility. The SSF will store this sodium inventory in a solid state under an inert cover gas until such time as a Sodium Reaction Facility is available for final disposal of the sodium.

The approximate quantity of sodium to be removed from the FFTF systems and stored is:

Secondary System	66,000 gallons
Primary System	140,000 gallons
Interim Decay Storage (IDS)	23,000 gallons
Fuel Storage Facility (FSF)	31,000 gallons
	260,000 gallons

In addition to the sodium, approximately 600 gallons of NaK (sodium-potassium eutectic mixture) will be mixed into the sodium during the shut down process.

The cost estimate summary and conceptual project schedule are in appendices C and D respectively.

II. SUMMARY

The scope of this project is to design and construct a facility to store radioactive and non-radioactive sodium that is to be removed from the FFTF. Four existing storage tanks will be utilized that are capable of storing the estimated 260,000 gallons of sodium. These tanks were originally built for the Clinch River Breeder Reactor Plant and have been stored in an outdoor laydown yard near the Hanford 300 Area since

1985. There are three 80,000 gallon tanks and one 52,000 gallon tank of government furnished equipment (GFE) that can be utilized for this project.

The tanks will be moved approximately 9 miles from the laydown yard and installed on new foundations in the SSF. The SSF building provides shielding and weather protection for the tanks and installed equipment.

Transfer of the sodium is expected to take approximately 18 months and transfer of the sodium to a future reaction facility is expected to take approximately 2 years. Storage of the sodium in a frozen state in the tanks will require minimal operation and maintenance support. The design and construction of the SSF will use conventional technology and will not disrupt current and projected activities at the FFTF site.

Project F-031 is a fiscal year 1995 line item. Total estimated construction costs of the project are $10.4 million; other project costs are $-0-. The total project cost is $10.4 million.

III. JUSTIFICATION

Construction and operation of the SSF is a crucial activity to achieving a timely and cost effective shutdown on FFTF. Completion of sodium drain from the plant will result in a major reduction in mortgage costs for the FFTF (estimated at $35M per year). As a result, efforts are focused on accelerating this facility to the maximum extent possible within budgetary and regulatory constraints.

The sodium coolant will be maintained within the FFTF systems prior to drain, and within the SSF as product material until an evaluation is completed in June 1998, which will determine the final sodium disposition and form. Current planning is that the sodium will be converted to sodium hydroxide for use at Hanford by the Tank Waste Remediation System (TWRS) Pretreatment Program for caustic washing of high level waste tank sludges. In the event the 1998 evaluation determines the sodium hydroxide use at TWRS is not viable, the sodium will have to be converted to an acceptable stable form for disposal as waste. Because of this current uncertainty in the final regulatory status of the sodium, the SSF will be designed to meet the storage requirements of RCRA, as implemented by WAC 173-303, "Dangerous Waste Regulations." If the sodium is later determined to be waste, no facility modifications will be required to meet storage requirements.

IV. DESCRIPTION OF PROJECT SCOPE

A. UTILITIES (600)

The SSF will not require steam, potable water, fire protection water, process water, or sanitary sewer services. Storm water will be collected from the roof

using exterior rain water gutters and piped to an existing underground process sewer drain piping system approved for this use. The source of electrical power will be from an existing 13.8 KV power source in Manhole No. 4, which is located about 25 feet from the southwest corner of the SSF.

B. SPECIAL EQUIPMENT AND PROCESS SYSTEMS (700)

Waste sodium is regulated pursuant to the RCRA as implemented by WAC 173-303, "Dangerous Waste Regulations". This regulation requires that the interim sodium storage tanks and enclosure be designed and constructed to meet RCRA requirements. The facility and its systems will be designed to the requirements of DOE Order 6430.1A.

Functional requirements are:

1.0 Architecture

The Uniform Building Code, NFPA 101, and WAC 173-303-310 are the primary codes that dictate facility requirements relative to life safety and the type of structure for the SSF. The size and location of the building is established by:

- The size of the four existing tanks identified for use to store the sodium removed from the FFTF.
- Uniform Fire Code requirements relative to the clear spacing required between sodium storage tanks and the facility walls.
- Uniform Fire Code requirements for the minimum distance (25 feet) from adjacent structures.

The SSF shall have a design life of 40 years for the roof and 20 years for the structure and contents with routine maintenance. The size of the SSF meets the requirements of the Uniform Building Code, Chapter 5.

Sketches ES-F031-A-1 and S-1 (see Appendix L) show the architectural aspects of the SSF.

1.1 Design Criteria

The architectural design criteria for the SSF is stated in the Functional Design Criteria, WHC-SD-FF-FDC-009, and is as follows:

- The storage tanks shall be a minimum of 10 feet away from any other tank, wall, or major equipment item.
- A secondary containment sump shall be provided that is capable of containing the contents of one of the 80,000 gallon sodium storage tanks.
- Access for operation and maintenance shall assure that worker radiation exposure is below limits stated in WHC-CM-4-9.
- Access and egress requirements shall be in accordance with NFPA 101.
- Space shall be provided for instrumentation, electrical, and alarm panels.

1.2 Walls

Shielding requirements dictate the type of walls proposed. A shielding analysis indicates that 18 inches of concrete is required to limit exposure in uncontrolled areas to the design level of .05 mrem per hour in accordance with WHC-CM-4-9. Cast-in-place concrete walls meet this criteria and provide an enclosure that prevents the intrusion of water and dust into the facility.

1.3 Floors

1.3.1 Sump Floor and Cover

The concrete floor of the SSF supports the steel secondary containment sump that is capable of containing the contents of one of the 80,000 gallon sodium storage tanks.

The cover of the sump, which serves as the lower floor, will be diamond plate that extends around each tank and is attached to all exterior walls. The surface is continuous and provides a safe walking and work area around each tank. The metal decking will stop 2 inches away from the face of the insulation around each vertical tank to allow space for liquid sodium to flow into the sump. The horizontal tank will have 1-inch diameter holes directly below it spaced 9 inches center to center. These holes will allow liquid sodium to flow into the sump below.

The sump floor will be carbon steel bearing on a concrete slab foundation. All concrete that has the potential of coming in contact

with sodium will be lined with carbon steel. The liner is required to extend 2'-0 above the sump cover to assure that liquid sodium will not contact any concrete surface.

1.3.2 Mezzanine Floor

The floor level of the sodium storage tank area can only be accessed from a mezzanine level above the sodium storage tanks. Operational procedures do not require nor desire personnel access to the base of the tanks due to the level of radiation present.

Access to operating valves, sodium level probes, HEPA filters, and a vacuum pump will be located on a shielded mezzanine that is directly over the top of all the tanks.

A mezzanine floor that meets shielding requirements of a Category 3 controlled area per WHC-CM-4-9 can be constructed using metal decking supporting a concrete slab that has a minimum thickness of 6 inches of concrete to limit radiation exposure to less than 10 mrem/hr.

Steel beams and girders support the mezzanine floor and transfer vertical and horizontal loads to the structure.

Walls are required around the mezzanine to limit radiation exposure from the tanks to personnel working on the mezzanine. The height of these walls is set by the radiation shine angle.

Access and egress from the mezzanine will be from stairwells located outside of the SSF shielded walls at each end of the mezzanine. The stairwell shall meet life safety code requirements for access and egress as stated in NFPA 101.

Framing for the stairwells will be structural steel and will be enclosed using pre-engineered metal building wall panels.

1.4 Roofs

The roof of the SSF can be any fire resistive material. Pre-cast concrete twin tees are recommended as the least cost roof structural system. Rigid insulation and a single-ply EPDM roofing membrane, placed on the top surface, provides a weathertight system that meets the design life requirement of 40 years with routine maintenance. The roof will be sloped to drain through

downspouts into a process sewer line. The rain gutter and downspouts will have electrical heat tracing to prevent freezing.

The roof of the stairwell enclosures will be a pre-engineered metal roof panel that is a common product used in the pre-engineered metal building industry. It is the least cost method to enclose a space that can provide a design life of 40 years with minimum maintenance.

1.5 Doors

Personnel access and egress from the SSF is limited to lockable grade level entries to the stairwells. These access points will be hollow metal doors with pressed metal frames and hardware that meet exiting requirements of NFPA 101.

Equipment access to the mezzanine level will be provided by using a steel rolling door at that level with a 1/2-ton jib crane mounted on the door jamb designed for this use. This will allow plant personnel to lift objects from grade and transfer them to the mezzanine level.

2.0 Structural

The structural design criteria for the SSF, as stated in the Functional Design Criteria WHC-SD-FF-FDC-009, is the Hanford structural design criteria, SDC 4.1. In addition, the SSF will be designed in accordance with the following structural codes:

- American Concrete Institute, ACI 318 and 349
- American Institute of Steel Construction, Manual of Steel Construction, 9th Edition

Sketches ES-F031-A-1 and S-1 (see Appendix L) represent the structural system of the SSF.

2.1 Design Criteria

Hanford structural design criteria, SDC 4.1, establishes the Safety Class design loads and design procedures for this structure.

The facility structural system based on Safety Class is as follows:

- The exterior load bearing and shear walls, roof, and foundation are classified as Safety Class 3, but will be designed for Safety Class 2 seismic and wind loads.

- The foundation for each sodium storage tank and its anchorage to the foundation is classified as Safety Class 2.

- The structural system supporting the mezzanine is classified as Safety Class 3, but will be designed for Safety Class 2 seismic and wind loads.

- Drip pans in the tunnel are classified as Safety Class 3.

- The sodium sump and cover are classified as Safety Class 3.

- Pipe supports for sodium transfer piping are classified as Safety Class 3.

2.2 Structural Systems

The structure is a single rectangular shape, 90 feet by 93 feet, and approximately 41 feet high. The walls are monolithic, 18-inch thick cast-in-place concrete that function as shear walls and load bearing walls. They transfer all horizontal loads induced by wind or seismic forces to the foundation system.

The structural elements of the roof are pre-cast concrete, twin tee members that span approximately 45 feet. These members transfer horizontal loads to the shear walls through diaphragm action. Vertical roof loads are transferred to the exterior cast-in-place concrete walls and to an inverted tee, pre-cast concrete beam located along the center line of the building. This pre-cast beam is supported by pre-cast concrete columns spaced approximately 30 feet center to center. The mezzanine level concrete floor and walls are supported by steel beams and columns.

The structural system of the exterior stairwells will be standard structural steel framing with diagonal bracing for structural stability.

All of the sodium storage tanks will be supported on a monolithic concrete mat foundation that distributes their weight uniformly over the entire area of the SSF base. Each sodium storage tank will be anchored to transfer seismic forces to the mat foundation.

3.0 Mechanical

Sketch S-F031-M-1 (see Appendix L) represents the mechanical system aspects of the SSF.

3.1 Design Criteria

The mechanical system design criteria for the SSF as stated in the Functional Design Criteria WHC-SD-FF- FDC-009 is as follows:

- Smoke detection shall be provided, and shall be interlocked with the ventilation system to shutdown ventilation equipment upon detection of smoke.
- The building does not need to be held at a negative pressure.
- A manual emergency ventilation system shutdown switch shall be located outside of the facility near each access door.
- The building shall use mechanical ventilation to keep the building inside temperature below 120°F in the summer and above 32°F in the winter. The ambient temperature extremes are -23°F to 106°F.

3.2 Heating, Ventilating, and Cooling

The building heating, ventilating, and cooling design criteria for the Hanford site does not apply for the SSF due to the 32°F winter, 120°F summer tolerance in the building. The outdoor temperature limits for calculating heating and cooling loads for the electrical rooms in the SSF are 9°F winter and 106°F dry bulb, 67°F wet bulb, summer.

3.2.1 Heating

3.2.1.1 Sodium Storage Tank Area

The Sodium Storage tank area of the building will require approximately 110KW of heat to maintain the minimum required temperature of 32°F when the sodium storage tank heaters are not activated. Two 55KW, 4,000 cfm upflow furnaces located on the shielded mezzanine deck will provide the heat required. Heated air is distributed and circulated from each furnace by ducts with nozzles blowing air on to the mezzanine and down into the tank area. Each unit will have a separate low voltage control and be interlocked with

the emergency shutdown of the ventilation system. Access for furnace maintenance will be from the mezzanine deck within the shielded walls.

3.2.1.2 Stairwells

A 3KW unit heater is recommended as the heat source in the west stairwell where the fire alarm panel is located. Heat is not required in the east stairwell.

3.2.1.3 Electrical Panel Rooms

Electrical panel rooms are located outside of the 18-inch thick concrete walls because of shielding requirements. Air conditioning is required in the electrical panel room located at grade level and the instrumentation panel room located on the mezzanine level in the west stairwell. The internal temperature setpoints for the rooms will be 65°F for heating and 78°F for cooling with the thermostat located in the upstairs electrical room. An 18,000 BTUH split system heat pump with 5KW of resistance auxiliary heat, located in the electrical panel room, will provide conditioned air via a ducted system between the two rooms.

3.2.2 Ventilating

3.2.2.1 Sodium Storage Tank Area

A practical value for a minimum ventilation air flow rate in the SSF is a continuous 400 cfm, which is the anticipated leakage rate of the outside air intake cowls. This air will be supplied by a make-up air cowl located above each furnace. A relief duct with a backdraft damper, located in the roof near the center of the SSF will exhaust the air.

3.2.2.2 Stairwells

A 1,000 cfm supply cabinet fan and relief louver will be installed in each stairwell to maintain ambient conditions in the stairwell when the interior temperature exceeds 90°F.

3.3.3 Cooling

3.3.3.1 Sodium Storage Tank Area and Stairwells

The only cooling that is required in the sodium storage tank area and stairwells is to maintain ambient conditions at less than 120°F. A motorized face and bypass damper will be added to the make-up air duct of each furnace located on the mezzanine level. The damper will open to 100% providing outside air to cool the facility when the space internal temperature exceeds 90°F. The relief will be barometrically vented in the center of the building.

3.3.3.2 Electrical and Instrumentation Panel Rooms

Cooling is required for an electrical panel room located at grade level and an instrumentation panel room located on the mezzanine level in the west stairwell. The internal temperature setpoints for the rooms will be 65°F for heating and 78°F for cooling with the thermostat located in the instrument panel room located at the mezzanine level. An 18,000 BTUH split system heat pump with 5KW of resistance auxiliary heat, located in the electrical panel room, will provide conditioned air via a ducted system between the two rooms.

3.3 Plumbing

Domestic water and sewer plumbing is not required for the SSF.

3.4 Fire Protection

Wet fire protection systems are not allowed in the SSF. In the event a sodium fire occurs, the sodium sump cover and catch pans are designed to limit the presence of available oxygen for combustion. Smoke detectors, installed in the SSF and transfer tunnel, will alarm upon the detection of smoke and shut down the HVAC system.

The SSF structure will be located more than 25 feet from any other significant structure and portable NaX fire extinguishers will be strategically located for fighting fires.

4.0 Process Systems

4.1 Design Criteria

The process system design criteria for the SSF is stated in the Functional Design Criteria, WHC-SD-FF- FDC-009.

Sketches ES-F031-P-1, P-2, P-3, P-4 and P-5 (see Appendix L) represent the process systems of the SSF. Additional information on the process system is included in Appendix K.

4.1.1 Operational Overview

The purpose of the SSF is to receive liquid sodium from the FFTF, store the sodium in the frozen state for some period of time, and then reheat and melt the sodium for transfer to a future Sodium Reaction Facility. Sodium resides in the FFTF in essentially four systems; the FFTF primary coolant system, the FFTF secondary coolant system, the interim decay storage (IDS), and the Fuel Storage Facility (FSF). This sodium will be transferred to four tanks in the SSF. The primary system sodium is radioactive (predominantly Na-22). Furthermore, operational considerations will result in a mixing of the primary and secondary sodium so the combined primary and secondary volumes will be radioactive to some extent. This will require shielding the tanks to reduce the radiation fields in the SSF.

Sodium transfers from the FFTF will be accomplished in the following manner:

1. The receiving tank and interconnecting piping will be preheated to about 400°F by electrical heaters, the supply tank is already assumed to be at temperature. When the proper temperatures have been established, the sodium will be transferred from the supply tank or system to the receiving tank by a combination of pressure/ vacuum transfer.

2. The receiving tank, located in the SSF, will be evacuated as much as practical using a vacuum pump located in the SSF. The supply tank will be pressurized in the range of 35 psig to 45 psig using the existing FFTF argon piping.

3. The gas system valves will be closed and the sodium valves opened, allowing the sodium to flow from one tank to the other. The transfers will occur as a batch operation, with more than

one cycle necessary to completely fill one of the SSF storage tanks (the smallest is 52,000 gallons). For instance, the T-44 inventory is about 25,000 gallons. The estimated sodium flow rate is on the order of 60 gpm. Thus, it will take nearly 7 hours to transfer the T-44 volume, excluding the time for other operations such as heat-up and level measurement.

4. After an SSF tank is filled, the inert gas system will be used to establish the desired cover gas pressure, and the tank and its contents will be allowed to cool to ambient, freezing the sodium inside it. Originally, the inert gas will be argon, supplied from the FFTF argon system. Future modifications will replace the argon system with a lower pressure nitrogen system that will maintain an inert nitrogen cover gas within the FFTF and the SSF.

4.2 Sodium Storage and Transfer System

The following provides a description of the sodium wetted portion of the SSF piping. This description addresses the equipment, piping, and instrumentation and controls associated with the sodium wetted system. This system is depicted on piping and instrumentation drawings (P&IDs) ES-F031-P-1, ES-F031-P-2 and ES-F031-P-3 and the piping plans ES-F031-P-4 and ES-F031-P-5. These sketches are included in Appendix L.

4.2.1 Sodium Storage and Transfer System Equipment

The sodium wetted system consists of the sodium wetted piping, valves, and equipment that form part of the SSF. The major pieces of equipment associated with the sodium wetted system include the sodium storage tanks and the heating systems for these tanks.

4.2.1.1 Sodium Storage Tanks

The sodium storage tanks for the SSF are provided as GFE. These tanks were originally designed for use in the Clinch River Breeder Reactor Plant. Three of the tanks are vertical tanks, 28'-0" inside diameter by 24'-8' high (including the support skirt), that were to be used as sodium dump tanks. The fourth tank is a horizontal tank, 18' outside diameter by 31' long, that was originally intended for use as a primary sodium storage tank. All the tanks are carbon steel with a number of nozzles and complicated internal equipment. Some modifications may be required for the internal equipment and/or nozzle connections. These modifications will be made to the

tanks prior to relocation to the SSF. All nozzles will be fitted with the required reducers and/or adapters to provide a connection of the size and material type indicated on the contract drawings. The nozzle connections used as part of this design are summarized below:

SSF Connection Summary

Tank No	Nozzle No	Service	Connection Size (NPS)	Nozzle Mat'l
T-1, 2, 3	N1	Sodium Fill / Drain	2" Sch 40	304 SS
T-1, 2, 3	N3	Blanket Gas/ Pressure Relief	2" Sch 40	304SS
T-1, 2, 3	N10	Anti-Siphon	1" Sch 40	304 SS
T-4	N1	Sodium Fill / Drain	2" Sch 40	304 SS
T-4	N2	Blanket Gas/ Pressure Relief	2" Sch 40	304 SS
T-4	N5	Anti-Siphon	1" Sch 40	304 SS

At this time, the recommended modifications to the internals of tanks T-1, T-2, and T-3 are limited to modification and extension of the sodium fill line. There are no required modifications to the internal of tank T-4.

The tanks will be insulated with 4 inches of calcium silicate insulation covered with fiberglass cloth to assure that the insulation surface temperatures do not exceed 140°F as required for personnel protection. Several options for insulating the tanks were considered as part of this conceptual design. Insulation candidates included a refractory fiber blanket type (CeraBlanket), calcium silicate, and fiberglass. The calcium silicate was selected as the insulating material based on cost and ease of installation. Other options, including using an inner layer of either CeraBlanket or calcium silicate and an outer layer of fiberglass, should be evaluated during the detailed design.

4.2.1.2 Tank Heating System

The tanks are required to be heated up to 400°F prior to transferring sodium into them. They will also require heating to 400°F when the

stored sodium is remelted prior to transfer to a future sodium reaction facility. Various methods of heating the tanks were considered as part of this conceptual design. Methods evaluated included forced convection heating (via a manifold arrangement supplying hot air to the exterior of the storage vessels) and electrical heat tracing. As a result of the trade-off study, the electrical heat tracing was selected as the optimum method. The heat tracing system consists of Incoloy sheathed, mineral insulated (MI) heating cable arranged in zones. The cables are attached to a stainless steel mesh which is held in place on the tank walls by stainless steel bands. The vertically distributed zones allow progressive heating of the sodium from a free surface. The total heating capacity on a tank is about 60 kw, which will allow the heat-up of a sodium filled tank to be accomplished in the design goal of 30 days.

4.2.2 Sodium Transfer Piping

There are three locations from which the sodium in FFTF will be transferred; the Fuel Storage Facility (FSF), the Primary Sodium Storage Vessel (T-43), and the Secondary Sodium Storage Vessel (Tank T-44). The tie-in point for the SSF will be made in line 2"-GCA-81517, at a location near the intersection of the Heat Transport system (HTS) Service Building - West column lines "K" and "17". The existing line will be cut and a new line leading to the SSF will be installed. This tie-in point will allow transfer of all the secondary system sodium from the secondary system storage tank to the SSF. Transfer of the primary system sodium will be made by installing a cross-connection between the FFTF primary and secondary systems. Installation of this cross connection will be completed by the Operating Contractor.

There is presently no connection between the FSF and the FFTF secondary system. Additional piping between the FSF and an existing capped 2" line outside the northwest quadrant of the containment vessel (PP-81530) will be provided as part of this project as shown on drawing ES-F031-P-5. This line will allow batch transfer of the FSF sodium to the SSF or to the secondary storage tank and then to the SSF.

The routing of the piping within the SSF is shown on drawing ES-F031-P-4. The sodium and gas lines from FFTF enter the SSF through an underground tunnel on the north side of the SSF and are routed up the north wall. The sodium line turns south at an elevation that will allow it to be routed under the working level mezzanine at the top of the storage tanks. Near the northeast

corner of the mezzanine; there is a connection for transfers to the future Sodium Reaction Facility. This connection consists of an isolation valve and a pipe which runs to the south wall of the facility. The sodium transfer line continues south along the east edge of the mezzanine.

A set of valves, designated the sodium transfer valves, are located on the east edge of the mezzanine in the branches off the north-south line. These valves are positioned to provide a flow path to the selected tank during filling operations. The entire line along the east side slopes back to T-44. After a transfer is complete, a total of about 50 gallons of sodium will drain back to T-44. The branch lines run west under the mezzanine to the top of the storage tanks. A tank isolation valve is located near the top of each tank.

An anti-siphon connection is provided between the gas and sodium lines on each tank. During transfer, the valve in this line will be opened, allowing the sodium line to communicate with the tank gas volume. This connection will prevent siphoning of the sodium in the SSF tank back to the FFTF facility should a piping leak develop in the transfer line at an elevation below the SSF tank level.

For the purposes of this conceptual design, the tanks and their nozzles were considered to be Safety Class 2. The remainder of the piping (including the tank isolation valves) was assumed to be Safety Class 3. All the sodium piping will be designed, analyzed, fabricated, installed, and tested in accordance with ANSI B 31.1. The design pressure range shall be 50 psig positive to full vacuum (assume 14.7 psig negative). The design temperature range shall be 32°F to 450°F.

Sodium piping will be installed with a 1/8" per foot slope to assure draining of any residual sodium. Where possible, the pipe will drain to the SSF tanks. If it is not possible to drain to the SSF tanks, the pipe will drain back to the FFTF secondary sodium storage tank. Carbon steel drip pans are installed in the tunnel between FFTF and the SSF to keep any leaking sodium from contacting the concrete. Also, due to the temporary nature of the piping, drip pans are not required under the new piping from the FSF to the tie-in point (PP-81530) or between the tunnel and the tie-in point in Cell 431.

The sodium piping will be 2" NPS, schedule 40, type 304 stainless steel pipe meeting the requirements of ASTM A-376. Piping shall be procured pickled and passivated and with end caps installed to assure pipe cleanliness. Westinghouse-Hanford cleanliness

specifications shall be adhered to during fabrication, installation, and testing. Previous systems had been installed with 304 and 316 stainless steel pipe. Considering the relatively low temperatures and short operating life, 304 or 304L stainless steel is preferred. All fittings will be socket weld type. All sodium wetted valves will be GFE. All valve connections will be butt welded.

In this conceptual design, the sodium transfer valves are located east of the mezzanine. Permanent reach rods will be installed through the east mezzanine wall to operate these valves. The tank sodium isolation valves will be operated by temporary reach rods. Holes will be made in the mezzanine floor. Normally, the holes will be plugged (for shielding purposes). When operation of the tank isolation valves is needed, the plugs will be removed and the valves operated using a tool (temporary reach rod). An evaluation of the applicability of pneumatically or electrically operated valves should be considered as part of the detailed design effort.

All valves in the sodium wetted system will be manually operated, bellows sealed, wye pattern, globe valves. These valves are provided as GFE for installation during construction.

All sodium piping will be heat traced to assure that the lines can be maintained up to 400°F using MI cable. Each sodium valve will be provided with a heater and control for the valve body and a separate heater and control for the valve bonnet. The pipe insulation will be a minimum of 2-1/2 inches to maintain skin temperatures at less than 140°F at pipe temperatures of 400°F.

4.2.3 Sodium Transfer System Instrumentation and Controls

The instrumentation and controls (I&Cs) associated with the sodium wetted system include temperature and level measurement and control. Pressure measurement and control is addressed as part of the cover gas system. All temperatures will be measured externally using type K thermocouples located to assure that they are indicating representative pipe, valve, or tank metal temperatures and are not being influenced by the heaters themselves. The level measurement system is GFE and consists of a flexible transducer that is lowered into a thimble (a stainless steel tube) that extends inside the tank and a portable indicating device.

The sodium transfer system temperature control will be accomplished at the SSF control panel located in the instrumentation room on the west side of the SSF. As noted above, the tank heaters are

arranged in vertical zones. Each zone has its own controller and SCR power supply to provide proportional heating control. The vertical arrangement will assure that the reheating of the sodium can be made from a free surface. Proportional control will also be provided for the sodium pipe and valve heaters.

4.3 Inert Gas, Vacuum, and Pressure Relief System

The following provides a description of the Inert Gas, Vacuum, and Pressure Relief (cover gas) system. The cover gas system provides three functions; the ability to pull a vacuum on the sodium tanks and piping prior to transferring sodium, the ability to provide an inert cover gas (initially argon and later, after decommissioning of the FFTF, nitrogen) in the tanks and piping at a slight positive pressure, and the ability to provide overpressure protection of the tanks. This description addresses the equipment, piping, and instrumentation and controls associated with the cover gas system. This system is depicted on P&IDs ES-F031-P-1, P-2, and P-3, and piping arrangement drawing ES-F031-P-4. These sketches are included in Appendix L.

4.3.1 Cover Gas System Equipment

The major pieces of equipment associated with the cover gas system include the inert gas supply system, the vacuum pump, and the pressure relief and exhaust system filters.

4.3.1.1 Inert Gas Supply

The inert argon gas supply system exists in the FFTF. The tie-in point will be into line HCD-82444 in Cell 431. The existing system will provide argon gas to the SSF system. Pressure control will be provided by pressure control valves as discussed in the cover gas control system description below.

4.3.1.2 Vacuum System

The vacuum system pump will be GFE. The vacuum pump will be installed in the SSF building so that the vacuum line length is minimized. It is connected to the gas/vacuum line which runs along the east side of the mezzanine. The connection to the vacuum pump will be made using a Seaton-Wilson type quick disconnect.

4.3.1.3 HEPA Filters

Gas can be exhausted from the facility from three places; the vacuum pump exhaust, the storage tank vent lines, or the storage tank pressure relief lines. No HEPA filtration will be provided on the vacuum pump exhaust. Instead, the Operating Contractor will provide HEPA filtration on the inlet to the vacuum pump. This filter is not part of Project F-031. A separate HEPA filter bank will be provided for the tank vent and pressure relief system. The HEPA filter will be sized to provide less than design pressure drop across the filter at the highest flow rate encountered (approximately 40 scfm). The HEPA filter assembly consists of a prefilter and two stages of HEPA filtration in a nuclear grade housing which meet the requirements of ANSI-N509 and have been tested in accordance with ANSI-N510. The filters will be tested before installation and again after they are installed by the Operating Contractor. Test ports for DOP testing of the HEPA filters using portable test equipment are provided as part of the housing.

4.3.2 Cover Gas System Piping

4.3.2.1 Inert Gas/Vacuum Piping

The tie-in point for the inert gas will be into line HCD-82444 in FFTF Cell 431. A single pipe is routed from the tie-in point through an underground tunnel to the SSF. The gas (argon) line is routed to a regulator station on the north wall of the mezzanine. Branches off a north-south header near the east end of the mezzanine are provided to each tank. These branches are used for both gas supply and vacuum. Gas isolation valves are provided at each tank. The inert gas/vacuum piping will be designed, analyzed, fabricated, installed, and tested in accordance with ANSI B 31.1.

The gas supply line has a connection to the relief header which allows the tanks to be vented through a HEPA filter. It also has a connection to a vacuum pump located on the mezzanine which is used to evacuate the tank prior to sodium transfer.

All inert gas piping will be 1" NPS, Schedule 40 type 304 stainless steel pipe meeting the requirements of ASTM specification A-376. Piping shall be procured pickled and passivated and with end caps installed to assure pipe cleanliness. Westinghouse-Hanford cleanliness specifications shall be adhered to during fabrication, installation, and testing. All fittings will be socket weld type. The inert gas piping is not required to be sloped, heat traced, or

insulated except for the section on each tank up to and including the rupture disk. Screens or other means of preventing personnel contact will be provided for gas piping near the top of the tanks that might be hotter than 140°F.

The design pressure range for the gas/vacuum piping shall be 50 psig positive to full vacuum (assume 14.7 psig negative). The design temperature shall be 32°F to 450°F.

All inert gas system valves will be GFE.

4.3.2.2 Pressure Relief Piping

Overpressure protection is provided for the tanks by a combination of rupture disks and pressure relief valves. The pressure relief valves are provided to prevent backflow of air into the tank in the event of a release of tank overpressure. The rupture disk is installed upstream (closer to the tank) so that verification of the pressure relief valve set pressure or other maintenance activities can be performed without exposing the inside of the tank to air. Finally, a block valve which will be locked in the open position will be provided upstream of the rupture disk so that the tank can be isolated if the rupture disk needs to be replaced. The pressure relief valves to be used in the facility will be 1 inch NPS inlet, 2 inch NPS outlet, and will exhaust about 40 scfm at 50 psig. All pressure relief valves will be GFE. The rupture disks are 2" NPS inlet and outlet and are also GFE.

The exhausts from the relief valves are routed to a 6 inch diameter header that runs along the ceiling of the SSF to the HEPA filter housing located on the west end of the mezzanine. The exhaust from the HEPA is routed directly up through the roof of the SSF. No continuous emissions monitoring of the effluent gas is required.

4.3.3 Cover Gas System Instrumentation and Controls

The I&C associated with the cover gas system include pressure and differential pressure measurement and control. Differential pressure measurement is provided across the HEPA filters.

Control of the inert gas pressure supplied to the tanks will be by a manually-adjusted pressure regulator/backpressure regulator arrangement located on the north wall of the mezzanine in the SSF. To maintain and inert cover gas on the tanks, the pressure regulator will be set to approximately 5 psig. The backpressure regulator will

be set to a slightly higher value (say 7 psig) so that any small build-up in pressure (due to temperature changes for instance) can be relieved. A manual bypass around the regulators is also provided.

The ASME Code overpressure protection is, of course, provided by the tank pressure relief valves. A restricting orifice is installed directly upstream of this pressure regulator station to limit the inert gas flow to less than the capacity of a single relief valve.

5.0 Electrical Systems

5.1 Design Criteria

The electrical design criteria as stated in the Functional Design Criteria WHC-SD-FF-FDC-009 is as follows:

- Electrical power shall be provided to the building to service both 120 VAC and 480/277 VAC loads.
- Electrical power shall be obtained from the 400 Area 451-A substation (13.8 KV tap in manhole No. 4) to a new secondary substation (480 VAC).
- The SSF shall be provided with one Private Automatic Exchange (PAX) line from the FFTF and one general phone line from the existing 400 Area telephone system. The connection point to the 400 Area system is on the exterior of the 4713B maintenance building.
- Oxygen detection monitors shall be provided in the SSF that sound an alarm in the absence of enough oxygen to sustain life (19.5%). These oxygen monitors shall also provide an alarm in the FFTF control room.
- Public address speakers tied into the FFTF system shall be installed in the SSF.
- Smoke detection devices shall be provided in the SSF that shut down the HVAC system, provide local alarms, and send alarm signals to the 400 Area fire station and FFTF control room.

Sketch ES-F031-E-1 (see Appendix L) represent the electrical system of the SSF.

5.2 Power

A 13.8KV power source for the SSF can be obtained from manhole No. 4 located about 25 feet from the southwest corner of the SSF. A new 150 KVA , 13.8KV to 480 VAC transformer will be installed adjacent to the SSF. Power from this transformer will be routed underground into a 400 amp, 480 VAC, 3-phase, 42 breaker panel located in an electrical equipment room in the west stairwell. A 15 KVA, 480 VAC to 120/240 VAC transformer will supply power to a 60 Amp, single phase, 8 breaker panel for receptacle use.

The electrical design loads estimated for the SSF are as follows and include pipe trace heating, tank heaters, mechanical ventilation, lighting, instrumentation, and alarm systems.

	KW
Tank Heating (one tank)	60
Cover Heat Loss (one tank)	25
Sodium Transfer Pipe Heating	10
Instrumentation and Controls	5
HVAC Systems	128
Lighting and Receptacles	16
Vacuum Pump (one pump)	4
Startup Loads and Contingency	60
TOTAL DESIGN LOADS	308

5.3 Lighting

Lighting systems shall be designed in accordance with Illumination Engineering Society (IES) requirements. All of the lighting in the SSF will be controlled through lighting contactors that will be switched by three-way switches in the stairwells for stairwell and mezzanine areas. The sodium storage area lighting switch is located at the mezzanine level adjacent to the shielded access door and stairway to the tank area.

5.3.1 Sodium Storage Tank Area

The sodium storage tank area lighting level will meet IES lighting handbook criteria of 10 foot candles for storage areas. 150 watt metal halide wall packs installed on the back side of the mezzanine shielded walls will illuminate the area around the exterior of the tanks. The interior area around the tanks is illuminated by two 75 watt metal halide wall packs located on opposite faces of the center column.

5.3.2 Mezzanine Level

The mezzanine lighting level will meet IES lighting handbook criteria of 25 foot candles for warehouse work space. Standard fluorescent light fixtures will be used to meet this criteria.

5.3.3 Access and Egress Stairwells

Stairwell lighting levels will meet IES lighting handbook criteria of 10 foot candles and NFPA 101 criteria for exit ways. Fluorescent light fixtures with emergency ballasts will be installed in each stairwell in locations to provide the illumination level required.

5.3.4 Emergency Exit Lighting

Exiting pathways will be continually illuminated by lighting fixtures and exit signs located to provide the illumination levels required by NFPA 101. Wall-mounted emergency lights with battery packs will be strategically located to provide the minimum illumination levels required in the event of a power failure.

5.4 Communications

5.4.1 Telephone

The 400 Area General Plant Telephone (GPT) system is an extension of the telephone system serving the Hanford Site. One GPT line will be extended from a connection point near the 4713B maintenance building to the SSF west stairwell. This line will provide voice communications between the SSF and stations outside the SSF. GPT extensions will be installed on the mezzanine and in the electrical and instrument control rooms.

5.4.2 Private Automatic Exchange System (PAX)

One PAX line from the existing 400 Area PAX system will be installed in the west stairwell. PAX extension outlets will be installed in the electrical equipment room, instrument control room, and on the mezzanine level. This system provides a communication link within the FFTF complex.

5.4.3 Public Address System (PA)

The PA system provides for evacuation alarms, public announcements, personnel paging, and personnel direction for plant opera-

tions within the FFTF complex. It also provides take cover and evacuate alarms.

PA system speakers to be located in each stairwell, one on the north and south wall of the sodium storage tanks area and one on the mezzanine level to assure that personnel in any accessible space can hear an audible alarm.

5.4.3 HLAN

An HLAN network line is not required in the SSF facility.

5.5 Alarms

5.5.1 Evacuation Alarm

Site evacuation alarms are received over the PA system speakers.

5.5.2 Sodium Smoke Alarm

A smoke detection system will be installed in the SSF in accordance with NFPA 72 requirements. The smoke detectors will activate the fire alarm in the building, shut down the HVAC equipment, send an alarm signal to the 400 Area fire station via a radio signal, and activate an FFTF control room alarm via a hard wired system.

5.5.3 Oxygen Alarm

Oxygen monitors will be installed near the base of the sodium storage tanks and confined spaces. Additional sensors will be located along the pathways in the SSF to assure that personnel will not enter into an oxygen depleted area. If low oxygen levels are detected, an alarm will be activated in the SSF. In addition, an oxygen monitor alarm will be activated in the FFTF control room via a hard wired system.

5.5.4 HVAC Manual Shutdown

A manual emergency ventilation system shutdown switch will be located outside of the SSF near each entry. An alarm will be activated if the HVAC manual shutdown switch is used.

C. DEMOLITION (810)

The location of the SSF limits the length of sodium transfer piping and has space for a future Sodium Reactor Facility directly adjacent to the southwest portion of the FFTF. Existing electrical duct banks that are primary electrical feeders for the FFTF limit the space available for the SSF and place it directly over an abandoned concrete mat foundation. This foundation was originally constructed to mount heat exchanger equipment for Closed Loops 3 and 4 of the FFTF. These heat exchangers were never installed and the foundation abandoned. This foundation must be removed and an underground connecting tunnel from the FFTF be modified to interface with the SSF. The underground tunnel will be utilized to route sodium transfer piping and inert gas piping.

Several active underground utility systems are affected by the location of the SSF. These include the following:

- An existing underground fire alarm line along the west side of the SSF will be removed.
- A cathodic protection system along the west side of the SSF will be rerouted.
- Drywell No. 6 will be removed and drywell No. 5 abandoned. The SSF roof drains will be connected into an existing process drain line that has sufficient depth to gravity drain rain water collected from the SSF.

D. DESIGN COMPLIANCE

The design and construction of the SSF will comply with all applicable codes, standards, and regulations listed in the Functional Design Criteria for Project F-031.

V. METHOD OF PERFORMANCE

A. ARCHITECT-ENGINEER WORK

The definitive design, engineering services during construction, acceptance inspection services, and project management support will be provided by an Architect-Engineer for the duration of the project.

B. PROCUREMENT

The FFTF has an inventory of existing valves and equipment that can be used in the sodium transfer piping system in the SSF. These components will be used to the maximum extent possible. The GFE are:

- Three 80,000 gallon tanks
- One 52,000 gallon tank
- Liquid metal process valves
- Inert gas system process valves
- Rupture disks
- Level probes
- Vacuum pump

The remainder of the equipment or products required for the SSF will be purchased and installed by the fixed price Contractor.

C. CONSTRUCTION WORK BY ON-SITE CONSTRUCTION CONTRACTOR

All construction work inside the FFTF, including work in the transfer tunnel, will be completed by the on-site construction contractor.

The on-site construction contractor will also complete all sodium storage tank modification work and modifications to the FFTF sodium piping and transfer system necessary to provide an interface point for work to be performed by a fixed price contractor.

D. CONSTRUCTION WORK BY FIXED PRICE CONSTRUCTION CONTRACTOR

Construction of the SSF will be completed using a fixed price construction contract.

E. WORK BY OPERATING CONTRACTOR

The operating contractor will provide overall project management during the design and construction phase of the project using an integrated management team concept. Roles and responsibilities of the team will be defined in a project management plan.

VI. REQUIREMENTS AND ASSESSMENTS

A. SAFEGUARDS AND SECURITY

Existing safeguards and security measures will not be impacted by this project. No new measures beyond the current practices will be required.

B. HEALTH AND SAFETY

1.0 Impact on Existing Safety Measures

The design and construction of the SSF will incorporate operational and construction safety procedures in compliance with Hanford and recognized codes and standards requirements. A human factors evaluation will be performed as a part of the definitive design in accordance with DOE Order 5480.10.

2.0 New Safety Requirements Resulting from this Project

Routine construction hazards will exist during the site preparation and construction activities. Field operations and construction will be conducted in compliance with recognized safety codes and standards. Administrative safety procedures in effect in the 400 Area will be followed.

3.0 Accommodations for the physically handicapped

The Functional Design Criteria for Project F-031, WHC-SD-FDC-009, Part 5.1.5 states that accommodations for the physically handicapped to the SSF is not required.

4.0 Radiation hazards and expected exposure levels

Radiation hazards and expected exposure levels will be in accordance with WHC-CM-4-9.

Construction contractors will be required to take reasonable precautions for protection of the health and safety of their employees, subcontractors, operating contractor, and U.S. Department of Energy (DOE) personnel. This includes providing continuous access to the construction areas by emergency vehicles and personnel, and ensuring that emergency evacuation routes are unobstructed.

C. DECONTAMINATION AND DECOMMISSIONING

Sodium transfer from the FFTF to the SSF or the transfer of sodium from the SSF to a future Sodium Reaction Facility will not result in any radiological contamination of any components of the SSF, except for the internals of the sodium transfer system.

Decontamination and decommissioning measures are not required for this project because the facility can be decommissioned using standard demolition procedures for cast-in-place concrete structures.

D. PROVISIONS FOR FALLOUT SHELTERS

Project F-031 is not required to include provisions for fallout shelters.

E. MAINTENANCE AND OPERATIONS REQUIREMENTS

Routine maintenance and operations for the SSF will include the following:

- DOP testing on HEPA filters
- Smoke detector calibrations
- Oxygen monitor calibrations
- Test relief valves to ASME Section XI

F. AUTOMATED DATA PROCESSING EQUIPMENT

No automated data processing equipment will be provided for this project.

G. QUALITY ASSURANCE AND SAFETY CLASSIFICATION

1.0 Quality Assurance

Project activities for contractors involved in design, procurement, construction, and acceptance will be governed by DOE Order 5700.6C, "Quality Assurance." Minimum project quality attributes are included in the project FDC and will be incorporated into the project specific Quality Assurance Program Plan (QAPP). The QAPP will indicate the project critical characteristics, corresponding safety classification assignments, and programmatic controlling documents.

The specific technical and quality programmatic requirements, materials certifications, qualification and certification of personnel, inspections, examinations and testing, and applicable quality assurance records will be established during the definitive design

and included in the design documents. Product specifications will require controls to exclude misrepresented products.

2.0 Safety Classification

The safety classification of systems in the SSF will be Safety Class 2 or less. Specific safety class requirements are identified and discussed in Part IV.

A preliminary safety evaluation (PSE) was completed by the Operating Contractor (WHC-SD-FF-PSE-002).

A fire hazard analysis (FHA) will be performed in accordance with WHC-CM-4-46 during definitive design.

H. ENVIRONMENTAL COMPLIANCE

Environmental compliance with the requirements of the National Environmental Policy Act of 1969 (NEPA), the Resource Conservation and Recovery Act of 1976 (RCRA), as implemented by the WAC 173-303, the Clean Air Act and Amendments of 1990 (CAA), and the State Environmental Policy Act (SEPA) is required for the SSF. A brief description of each requirement is provided below.

1. NEPA

An Environmental Assessment (EA) was determined by the DOE to be the appropriate level of NEPA review for the FFTF shutdown activities. The SSF is included in the shutdown activities addressed by the EA. The EA was prepared and submitted to DOE on March 31, 1994, and was recently resubmitted to incorporate comments received from the DOE. The Finding of No Significant Impact (FONSI) must be received prior to initiation of construction.

2. CAA

An increase in radionuclide emissions as a result of these planned activities may be regulated by the National Emission Standards for Hazardous Air Pollutants (NESHAPs) (radioactive only), 40 CFR 51 Subpart H, and Radioactive Air Emissions Program (RAEP), WAC 246-247, Radiation Protection - Air Emissions, and 40 CFR 51 Subpart H. No significant increases in air emissions are anticipated as a result of operation of the SSF. The NOC must receive approval from the State of Washington Department of Health (DOH)

and the U.S. Environmental Protection Agency (EPA) prior to initiation of construction.

Fugitive emissions (especially dust) from construction/operational activities associated with the SSF will be controlled in accordance with normal practices, per Benton-Franklin Clean Air Authority.

3. RCRA

Because of the uncertainty in the final sodium regulatory designation (as discussed in Section III), the SSF will be designed and constructed to meet RCRA requirements, as implemented by the WAC 173-303. A request will be submitted to the State of Washington Department of Ecology for expansion of Hanford Facility's interim status treatment, storage and/or disposal capacity to address the SSF. This process requires submittal of a Notice of Intent (NOI) to Ecology and includes a 150 day public review period. Following the public review period, a Part A permit application will be submitted to Ecology. These documents are currently being prepared. The process is expected to take approximately nine months and must be completed prior to initiation of construction.

4. SEPA

SEPA is the state or local equivalent of NEPA that requires evaluation of environmental impacts associated with a project prior to approval of a license or state permit. If another state approval is required (e.g., under CAA or RCRA), a SEPA checklist is required. Based on the information provided in the checklist, the agency will determine if a State EIS is required or will issue a determination of nonsignificance. The SEPA checklist for the SSF is currently being prepared and will be submitted to the state with the NOI discussed above.

5. Other Regulatory Requirements

A Cultural Resources Review for the FFTF Shutdown Projects, which included the SSF, has been completed. No sensitive cultural resources in the area sited for the SSF were identified. On May 20, 1994, a biological survey of the SSF proposed construction site was conducted. The survey focused on plant and animal species listed as threatened, endangered, candidate, sensitive, or monitored by the State of Washington. The survey concluded that no adverse impacts to such species would occur from the proposed action.

I. PERMITS

The environmental permitting issues associated with sodium removal are currently under development.

VII. IDENTIFICATION AND ANALYSIS OF UNCERTAINTIES

Uncertainties identified during the conceptual design that will require analysis in the definitive design phase are:

1. Tanks T-1, T-2, and T-3 currently have fill lines inside the tanks that have offsets in them. An evaluation of the effects of solidifying and remelting the sodium on the loads and stresses in these lines should be performed as part of the detailed design efforts.

2. This conceptual design is based on the assumption that continuous monitoring is not required. An evaluation of the requirement for continuous emissions monitoring is currently being performed. Although unanticipated, if continuous monitoring is required, a significant cost impact may result.

3. The definitive design should consider installation of redundant heaters and control instrumentation for the storage tanks, particularly inside the skirts of the vertical vessels. Difficulty in personnel access and potentially higher radiation fields would make maintenance efforts after filling the tank difficult, expensive, and would not be in accordance with ALARA practices.

4. The thermal coefficient of expansion of solid sodium is much greater than that of steel. This means that the sodium will contract more than the steel after it has solidified and may result in gaps between the sodium and the tank walls. The effect of this gap on heat transfer will be evaluated in more depth during definitive design. Issues of concern are:

   - The effect of the gap on the time required to remelt the sodium.
   - A higher temperature differential (and thermal growth) between the tank walls and the center of the tank may result in excessive strain in the internal fill lines.

5. An abandoned 6 inch process sewer line adjacent to the SSF is being used to collect and dispose of water collected from the SSF roof. It must be confirmed that the process waste disposal system can accept this water.

6. The location of all underground utilities must be verified.

7. An exception to the HVAC design criteria requiring 1 cfm/sq. ft. ventilation rate as stated in the FDC has been taken during the conceptual design. This exception must be approved by DOE.

8. The Safety Class rating for the SSF and its piping systems must be verified during definitive design.

9. Uniform fire code requirements related to sodium liquid level control for tank filling, manual pull stations, and explosion control will be verified during definitive design. Exemptions from the fire code may be required.

10. Any modifications made to the pressure boundary of the existing ASME code stamped tanks will be made in accordance with ASME code requirements to maintain the current code stamp for each tank.

VIII. REFERENCES

1. Functional Design Criteria, Sodium Storage Facility, Project 95L-EXF-028, Sub Project 03-F-031, prepared by Westinghouse Hanford Company, Document No. WHC-SD-FF-FDC-009, Rev. O, June 10, 1994.

2. U.S. Department of Energy (DOE) Orders
DOE 5700.6C, "Quality Assurance"
DOE 6430.1A, "General Design Criteria"

3. Westinghouse Hanford Company Manuals
WHC-CM-4-9, "Radiological Design"
WHC-CM-4-46, "Nonreactor Facility Safety Analysis"

4. Washington Administrative Code
WAC 173-303, "Dangerous Waste Regulation"

IX. CODES AND STANDARDS

The SSF will be designed to the following codes as a minimum.

1. GENERAL REQUIREMENTS
Uniform Building Code
Uniform Fire Code
Uniform Mechanical Code
Uniform Plumbing Code

2. AMERICAN SOCIETY OF MECHANICAL ENGINEERS
ASME B31.1 Power Piping

3. AMERICAN INSTITUTE OF STEEL CONSTRUCTION
   Manual of Steel Construction, 9th Edition

4. AMERICAN CONCRETE INSTITUTE
   - ACI 318 Building Code Requirements for Reinforced Concrete
   - ACI 349 Code Requirements for Nuclear Safety Related Concrete Structures

5. NATIONAL FIRE PROTECTION ASSOCIATION
   - NFPA 30 Flammable Combustionable Liquids
   - NFPA 70 National Electric Code
   - NFPA 72 Installation, Maintenance, and Use of Protective Signaling Systems
   - NFPA 101 Life Safety Code

6. HANFORD PLANT STANDARDS
   - HWS 2152 FFTF Piping Specification
   - SDC-4.1 Design Loads for Facilities
   - SDC-7.5 Interior Power and Lighting Systems
   - SDC-7.8 Standard Electrical Design Criteria for Fire Alarm Systems

7. ILLUMINATION ENGINEERING SOCIETY OF AMERICA
   Lighting Handbook

APPENDIX A

WORK BREAKDOWN STRUCTURE

Appendix A
Work Breakdown Structure

WBS	DESCRIPTION
1.	Engineering
1.1	Definitive Design (DD)
1.1.1	A/E DD
1.1.2	WHC DD
1.2	Engineering Inspection (E/I)
1.2.1	A/E E/I
1.2.2	WHC E/I
3.	Construction
3.1	On-Site Construction Contractor (ICF KH CF)
3.2	Off-Site Construction Contractor (ICF KH CM)
3.2.1	Unit Price CM
3.2.2	Fixed Price CM
4.0	Project Management (WHC)
5.0	Contingency

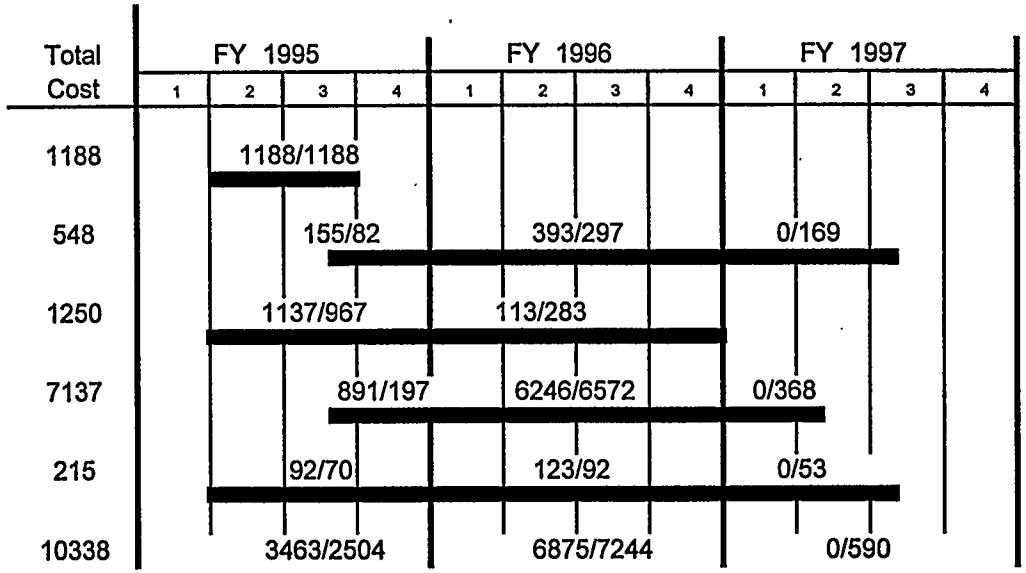
APPENDIX B

BUDGET AUTHORIZATION/ BUDGET OUTLAY SCHEDULE

PROJECT F-031

SODIUM STORAGE FACILITY

BA/BO SCHEDULE



DATE: 10/13/94
ICF KH PM: NK SNYDER
WHC PE: DR SHANK
PAGE B-1

APPENDIX C

COST ESTIMATE SUMMARY

ESTIMATE APPROVAL SHEET

NUCLEAR MISSIONS DIVISION

Job No.: F-031

Estimate Date: October 1994

Project Manager	10/12/94 Date
N/A Engineering Manager	Date
N/A Construction Manager (CF and/or CM)	Date
Projects Department Manager	10/13/94 Date
Info copy pages 1-4 of 9 to MEW Division Manager	10/13/94 TW Date

KAISER ENGINEERS HANFORD
WESTINGHOUSE HANFORD COMPANY
JOB NO. F031/ER4673
FILE NO. F031BAA1

** IEST - INTERACTIVE ESTIMATING **
FFTF SODIUM STORAGE FACILITY (SSF)
CONCEPTUAL ESTIMATE
DOE_R01 - PROJECT COST SUMMARY

DATE 10/13/94 11:58:40
BY HERB R. 372-0661

COST CODE	DESCRIPTION	ESCALATED TOTAL COST	CONTINGENCY %	CONTINGENCY TOTAL	TOTAL DOLLARS
000	ENGINEERING	1,630,000	20	330,000	1,960,000
	(ADJUSTED TO MEET DOE 5100.4)	(30,000)		70,000	40,000
		1,600,000		400,000	2,000,000
600	UTILITIES	60,000	20	10,000	70,000
700	SPECIAL EQUIP/PROCESS SYSTEMS	6,760,000	20	1,350,000	8,110,000
810	DEMOLITION	160,000	20	30,000	190,000
	(ADJUSTED TO MEET DOE 5100.4)	20,000		10,000	30,000
		7,000,000	20	1,400,000	8,400,000
	TOTAL ESTIMATED CONSTRUCTION COST (TECC)	8,600,000		1,800,000	10,400,000
900	OTHER PROJECT COST	0	0	0	0

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TYPE OF ESTIMATE CONCEPTUAL ESTIMATE 10/13/94

ARCHITECT ENGINEER H Chadwick

OPERATING CONTRACTOR

REMARKS: SEE ESTIMATE BASIS FOR REMARKS & ASSUMPTIONS

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

WBS	DESCRIPTION	ESTIMATE SUBTOTAL	ONSITE INDIRECTS	SUB TOTAL	ESCALATION %	ESCALATION TOTAL	SUB TOTAL	CONTINGENCY %	CONTINGENCY TOTAL	TOTAL DOLLARS
111000	ENG'RING & DEFIN. DESIGN-TI & II	972000	0	972000	1.88	18274	990274	20	198055	1188328
120000	ENGINEERING/INSPECTION-TITLE III	430000	0	430000	6.29	27047	457047	20	91409	548456
SUBTOTAL 1	ENGINEERING	1402000	0	1402000	3.23	45321	1447321	20	289464	1736784
310000	FORCE ACCOUNT CONSTR - ONSITE E/C	20874	0	20874	3.98	831	21705	20	4341	26046
313200	CF. SODIUM PIPE INSTN	198851	0	198851	3.98	7914	206765	20	41353	248118
313300	CF. ARGON SUPPLY & COVER GAS	55234	0	55234	3.98	2198	57432	20	11486	68919
313400	CF. ELECTRICAL/INSTRUMENTATION	72056	0	72056	3.98	2868	74924	20	14985	89909
313500	CF. PROCESS SEWER TIEIN S1380/W8420	11187	0	11187	3.98	445	11632	20	2326	13959
313600	CF. PROCESS SEWER DW.#5 TO S1380	30383	0	30383	3.98	1209	31592	20	6318	37911
313700	CF. SODIUM STORAGE TK MODIFICAT'NS	613036	0	613036	3.98	24399	637435	20	127487	764922
SUBTOTAL 31	FORCE ACCOUNT - ON-SITE E/C	1001621	0	1001621	3.98	39864	1041485	20	208296	1249784
321000	DEMOLITION & TANK FOUNDATIONS	455197	0	455197	5.73	26083	481280	20	96255	577536
322000	HAUL & SET SODIUM STORAGE TANKS	258500	0	258500	5.73	14812	273312	20	54662	327974
323000	CONSTRUCTION SODIUM STORAGE BLDG	1757208	0	1757208	5.73	100688	1857896	20	371580	2229474
323100	SSF - HEAT, VENT & COOLING	71299	0	71299	5.73	4085	75384	20	15077	90461
323200	SSF - SODIUM PIPING	95874	0	95874	5.73	5494	101368	20	20274	121641
323300	SSF - ARGON & VENT PIPING	237833	0	237833	5.73	13628	251461	20	50292	301753
323400	SSF - ELECTRICAL/INSTRUMENTATION	1060640	0	1060640	5.73	60775	1121415	20	224283	1345698
323900	SSF - TANK INSULATION	461922	0	461922	5.73	26468	488390	20	97678	586068
329000	CONSTRUCTION MANAGEMENT	1226600	0	1226600	5.73	70284	1296884	20	259377	1556261
SUBTOTAL 32	CONSTRUCTION-FIXED PRICE	5625073	0	5625073	5.73	322317	5947390	20	1189478	7136866
330000	OPERATING CONTRACTOR FURNISHED MATL	0	0	0	0.00	0	0	0	0	0
SUBTOTAL 3	CONSTRUCTION	6626694	0	6626694	5.47	362181	6988875	20	1397774	8386650
400000	PROJECT INTEGRATION	170063	0	170063	5.23	8894	178957	20	35791	214749
500000	OTHER PROJECT COST --- EXCLUDED	0	0	0	0.00	0	0	0	0	0
PROJECT TOTAL		8,198,757	0	8,198,757	5.08	416,396	8,615,153	20	1,723,029	10,338,183

C-3

WHC-SD-FF-CDR-006 Rev. 0

1. DOCUMENTS AND DRAWINGS

DOCUMENTS: PROJECT F-031 CONCEPTUAL DESIGN REPORT (PRE-RELEASE CPY)

DRAWINGS: CDR ENGINEERING SKETCHES ES-F031-C1,-A1,-S1,-M1,-E1,-P1,-P2,-P3,-P4,-P5.

2. MATERIAL PRICES

UNIT COSTS REPRESENT CURRENT PRICES FOR SPECIFIED MATERIAL. VENDOR INFORMATION WAS OBTAINED FOR THE FOLLOWING ITEMS:
S/S PIPE, FITTINGS & ACCESSORIES
TANK RIGGING & HAULING
PRE-CAST CONCRETE

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 121% 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 MANAGEMENT OF THE FIXED PRICE CONTRACTS, ARE INCLUDED IN WBS 32900.
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 -50%, MATERIAL -10%, EQUIPMENT USAGE -10%, EQUIPMENT -10%, SUBCONTRACTS -10%.

5. ESCALATION

ESCALATION RATES ARE CALCULATED FROM THE HANFORD MATERIAL & LABOR ESCALATION STUDY, DATED FEBRUARY 1994.
ACTIVITY MID-POINT DATES REFLECT DATA FROM THE FFTF MASTER SHUT-DOWN SCHEDULE WHC-SD-FF-SSP-050, JUNE 25, 1994.

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. PROCUREMENT SPEC FOR SODIUM PIPE TO INCLUDE "PICKELED & PASSIVATED WITH END PROTECTORS".
B. CHEMICAL PIPE CLEANING COSTS, IF REQUIRED, ARE EXCLUDED.
C. INERT GASES NEEDED FOR TESTING AND CORROSION PROTECTION AT THE SODIUM STORAGE FACILITY ARE PROVIDED BY OPERATIONS AT NO COST TO THE PROJECT.

7. REMARKS CONT'D.

D. ASSUME FREE DUMPING OF CONSTRUCTION TRASH AND CONCRETE AT CENTRAL LAND FILL.
E. GOVERNMENT FURNISHED EQUIPMENT IS PROVIDED FROM FACILITY SPARES BY FFTF OPERATIONS AT NO COST TO PROJECT.
F. PERMITTING, PRELIMINARY AND FINAL SAFETY ANALYSIS REPORT COSTS ARE EXCLUDED. COST OF ENVIRONMENTAL ASSESSMENT, AND/OR ENVIRONMENTAL IMPACT STATEMENT ARE EXCLUDED. WHC COSTS, UNLESS NOTED IN THE DOE R_08 REPORT, ARE EXCLUDED.
G. ASSUME WHC HAS WAIVED ASME B&PV CODE SECTION III, DIV 1 AND 2 REQUIREMENTS FOR THE SODIUM STORAGE TANK INTERNAL AND EXTERNAL MODIFICATIONS. STRESS RELIEVING, IF REQUIRED, IS EXCLUDED.
H. ALL PIPE FABRICATION AND INSTALLATION WILL COMPLY WITH ASME PP CODE B31.1. NDT IS LIMITED TO VT & PT.
I. SITE SPECIFIC SOFTWARE DEVELOPMENT COST FOR THE PLC SYSTEM IS EXCLUDED.
J. ASSUME 6" PROCESS SEWER LINES (WBS 313500 AND 313600) ARE LESS THAN TEN FEET DEEP.
K. SCOPE FOR STORAGE TANK MODIFICATIONS ARE BASED ON DATA PROVIDED BY WHC-FFTF OPERATIONS VIA CC:MAIL.
L. "OTHER PROJECT COST" AS IDENTIFIED IN RLID 5700.3 SECTION 8.2-1 ARE EXCLUDED.
M. THE COST FOR TITLE I, II & III (ENGINEERING & INSPECTION) IS BASED ON THE FOLLOWING HISTORICAL RATES:

TITLE I & II	18 PERCENT OF CM AND CF CONSTRUCTION
TITLE III	8 PERCENT OF CM AND CF CONSTRUCTION

COST CODE/WBS	DESCRIPTION	ESTIMATE SUBTOTAL	ONSITE INDIRECTS	SUB TOTAL	ESCALATION %	ESCALATION TOTAL	SUB TOTAL	CONTINGENCY %	CONTINGENCY TOTAL	TOTAL DOLLARS
000	ENGINEERING									
111000	ENG'RING & DEFIN. DESIGN-TI & II	972000	0	972000	1.88	18274	990274	20	198055	1188328
120000	ENGINEERING/INSPECTION-TITLE III	430000	0	430000	6.29	27047	457047	20	91409	548456
400000	PROJECT INTEGRATION	170063	0	170063	5.23	8894	178957	20	35791	214749
TOTAL 000	ENGINEERING	1572063	0	1572063	3.45	54215	1626278	20	325255	1951533
600	UTILITIES									
310000	FORCE ACCOUNT CONSTR - ONSITE E/C	20874	0	20874	3.98	831	21705	20	4341	26046
313500	CF. PROCESS SEWER TIEIN S1380/W8420	11187	0	11187	3.98	445	11632	20	2326	13959
313600	CF. PROCESS SEWER DW.#5 TO S1380	30383	0	30383	3.98	1209	31592	20	6318	37911
TOTAL 600	UTILITIES	62444	0	62444	3.98	2485	64929	20	12985	77916
700	SPECIAL EQUIP/PROCESS SYSTEMS									
313200	CF. SODIUM PIPE INSTN	198851	0	198851	3.98	7914	206765	20	41353	248118
313300	CF. ARGON SUPPLY & COVER GAS	55234	0	55234	3.98	2198	57432	20	11486	68919
313400	CF. ELECTRICAL/INSTRUMENTATION	72056	0	72056	3.98	2868	74924	20	14985	89909
313700	CF. SODIUM STORAGE TK MODIFICAT'NS	613036	0	613036	3.98	24399	637435	20	127487	764922
321000	DEMOLITION & TANK FOUNDATIONS	299965	0	299965	5.73	17188	317153	20	63430	380584
322000	HAUL & SET SODIUM STORAGE TANKS	258500	0	258500	5.73	14812	273312	20	54662	327974
323000	CONSTRUCTION SODIUM STORAGE BLDG	1757208	0	1757208	5.73	100688	1857896	20	371580	2229474
323100	SSF - HEAT, VENT & COOLING	71299	0	71299	5.73	4085	75384	20	15077	90461
323200	SSF - SODIUM PIPING	95874	0	95874	5.73	5494	101368	20	20274	121641
323300	SSF - ARGON & VENT PIPING	237833	0	237833	5.73	13628	251461	20	50292	301753
323400	SSF - ELECTRICAL/INSTRUMENTATION	1060640	0	1060640	5.73	60775	1121415	20	224283	1345698
323900	SSF - TANK INSULATION	461922	0	461922	5.73	26468	488390	20	97678	586068
329000	CONSTRUCTION MANAGEMENT	1226600	0	1226600	5.73	70284	1296884	20	259377	1556261
330000	OPERATING CONTRACTOR FURNISHED MATL	0	0	0	0.00	0	0	0	0	0
TOTAL 700	SPECIAL EQUIP/PROCESS SYSTEM	6409018	0	6409018	5.47	350801	6759819	20	1351964	8111782
810	DEMOLITION									

COST CODE/WBS	DESCRIPTION	ESTIMATE SUBTOTAL	ONSITE INDIRECTS	SUB TOTAL	ESCALATION %	ESCALATION TOTAL	SUB TOTAL	CONTINGENCY %	CONTINGENCY TOTAL	TOTAL DOLLARS
321000	DEMOLITION & TANK FOUNDATIONS	155232	0	155232	5.73	8895	164127	20	32825	196952
TOTAL 810	DEMOLITION	155232	0	155232	5.73	8895	164127	20	32825	196952
900	OTHER PROJECT COST									
500000	OTHER PROJECT COST --- EXCLUDED	0	0	0	0.00	0	0	0	0	0
TOTAL 900	OTHER PROJECT COST	0	0	0	0.00	0	0	0	0	0
PROJECT TOTAL		8,198,757	0	8,198,757	5.08	416,396	8,615,153	20	1,723,029	10,338,183

CSI	DESCRIPTION	ESTIMATE SUBTOTAL	ONSITE INDIRECTS	SUB TOTAL	ESCALATION %	ESCALATION TOTAL	SUB TOTAL	CONTINGENCY %	CONTINGENCY TOTAL	TOTAL DOLLARS
ENGINEERING										
00	TECHNICAL SERVICES	1572063	0	1572063	3.45	54215	1626278	20	325255	1951533
	TOTAL ENGINEERING	1,572,063	0	1,572,063	3.45	54,215	1,626,278	20	325,255	1,951,533
CONSTRUCTION										
00	TECHNICAL SERVICES	1226600	0	1226600	5.73	70284	1296884	20	259377	1556261
02	SITEWORK	241874	0	241874	5.43	13131	255005	20	51000	306008
03	CONCRETE	1179246	0	1179246	5.73	67571	1246817	20	249363	1496180
05	METALS	706300	0	706300	5.73	40471	746771	20	149354	896125
07	MOISTURE AND THERMAL	54898	0	54898	5.73	3146	58044	20	11609	69652
08	DOORS,WINDOWS AND G	20350	0	20350	5.73	1166	21516	20	4303	25819
09	FINISHES	39878	0	39878	5.73	2285	42163	20	8433	50596
10	SPECIALTIES	264429	0	264429	5.73	15152	279581	20	55916	335496
14	CONVEYING SYSTEMS	5500	0	5500	5.73	315	5815	20	1163	6978
15	MECHANICAL	1730708	0	1730708	4.86	84053	1814761	20	362952	2177713
16	ELECTRICAL	1156911	0	1156911	5.58	64607	1221518	20	244304	1465822
	TOTAL CONSTRUCTION	6,626,694	0	6,626,694	5.47	362,181	6,988,875	20	1,397,774	8,386,650
	PROJECT TOTAL	8,198,757	0	8,198,757	5.08	416,396	8,615,153	20	1,723,029	10,338,183

REFERENCE: ESTIMATE BASIS SHEET — PAGE 3 & 4 OF 9
COST CODE ACCOUNT SUMMARY — PAGE 5 & 6 OF 9

THE U.S. DEPARTMENT OF ENERGY - RLID 5700.3 "COST ESTIMATING, ANALYSIS AND STANDARDIZATION" DATED 04-25-94, PROVIDES GUIDELINES FOR ESTIMATE CONTINGENCIES. THE GUIDELINE FOR A CONCEPTUAL ESTIMATE SHOULD HAVE AN OVERALL RANGE OF 15 TO 25 PERCENT.

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

ENGINEERING: A MID-RANGE CONTINGENCY IS CONSIDERED APPROPRIATE FOR THIS PROJECT. THE ENGINEERING ESTIMATE IS BASED ON HISTORICAL IN-HOUSE DATA.

AVERAGE ENGINEERING CONTINGENCY 20%

CONSTRUCTION: A MID-RANGE CONSTRUCTION CONTINGENCY IS APPROPRIATE FOR THIS PROJECT. THE CONSTRUCTION ESTIMATE IS BASED ON WELL DEVELOPED CONCEPTUAL DATA WITH FEW UNCERTANTIES. PORTIONS OF THE ESTIMATE CONSIDERED AT RISK RELATES TO HEAT TRACING (NUMBER OF CIRCUITS) AND SODIUM PIPE EXPANSION JOINTS (NONE IDENTIFIED). ADDITIONAL UNCERTAINTIES ARE IDENTIFIED AND ANALYSED IN VII OF THE CONCEPTUAL DESIGN REPORT.

AVERAGE CONSTRUCTION CONTINGENCY 20%

AVERAGE PROJECT CONTINGENCY 20%

WBS	DESCRIPTION	ESTIMATE SUBTOTAL	CONTRACT %	ADMINISTRATION TOTAL	BID PACK PREP.	OTHER INDIRECTS	TOTAL INDIRECTS
111000	ENG'RING & DEFIN. DESIGN-TI & II	972000	0.00	0	0	0	0
120000	ENGINEERING/INSPECTION-TITLE III	430000	0.00	0	0	0	0
310000	FORCE ACCOUNT CONSTR - ONSITE E/C	20874	0.00	0	0	0	0
313200	CF. SODIUM PIPE INSTN	198851	0.00	0	0	0	0
313300	CF. ARGON SUPPLY & COVER GAS	55234	0.00	0	0	0	0
313400	CF. ELECTRICAL/INSTRUMENTATION	72056	0.00	0	0	0	0
313500	CF. PROCESS SEWER TIEIN S1380/W8420	11187	0.00	0	0	0	0
313600	CF. PROCESS SEWER DW.#5 TO S1380	30383	0.00	0	0	0	0
313700	CF. SODIUM STORAGE TK MODIFICAT'NS	613036	0.00	0	0	0	0
321000	DEMOLITION & TANK FOUNDATIONS	455197	0.00	0	0	0	0
322000	HAUL & SET SODIUM STORAGE TANKS	258500	0.00	0	0	0	0
323000	CONSTRUCTION SODIUM STORAGE BLDG	1757208	0.00	0	0	0	0
323100	SSF - HEAT, VENT & COOLING	71299	0.00	0	0	0	0
323200	SSF - SODIUM PIPING	95874	0.00	0	0	0	0
323300	SSF - ARGON & VENT PIPING	237833	0.00	0	0	0	0
323400	SSF - ELECTRICAL/INSTRUMENTATION	1060640	0.00	0	0	0	0
323900	SSF - TANK INSULATION	461922	0.00	0	0	0	0
329000	CONSTRUCTION MANAGEMENT	1226600	0.00	0	0	0	0
330000	OPERATING CONTRACTOR FURNISHED MATL	0	0.00	0	0	0	0
400000	PROJECT INTEGRATION	170063	0.00	0	0	0	0
500000	OTHER PROJECT COST --- EXCLUDED	0	0.00	0	0	0	0
PROJECT TOTAL		8,198,757		0	0	0	0

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB-CONTRACT	EQUIP-MENT	OH&P / B & I	TOTAL DOLLARS
111000	ENG'RING & DEFIN. DESIGN-TI & II										
111000.00	TECHNICAL SERVICES										
111000.0000000	DEFINITIVE DESIGN TITLE I&II ASSUME ICF-KH/TASK ORDER CONTRACT USE 18% x $5.4 MM	000	1 LS	0	0	0	0	972000	0	0	972000
SUBTOTAL	TECHNICAL SERVICES			0	0	0	0	972,000	0	0	972,000
TOTAL	COST CODE 00000 WBS 111000 (ESCALATION 1.88% - CONTINGENCY 20.00 %)			0	0	0	0	972,000	0	0	972,000
TOTAL WBS 111000 ENG'RING & DEFIN. DESIGN-TI & II				0	0	0	0	972,000	0	0	972,000

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB-CONTRACT	EQUIP-MENT	OH&P / B & I	TOTAL DOLLARS
120000	ENGINEERING/INSPECTION-TITLE III										
120000.00	TECHNICAL SERVICES										
120000.0000000	ENGINEERING/INSPECTION T-III USE 8% x 5.4 MM INCLUDES GROUND RADAR SURVEY & REPORTS	000	1 LS	0	0	0	0	430000	0	0	430000
SUBTOTAL	TECHNICAL SERVICES			0	0	0	0	430,000	0	0	430,000
TOTAL	COST CODE 00000 WBS 120000 (ESCALATION 6.29% - CONTINGENCY 20.00 %)			0	0	0	0	430,000	0	0	430,000
TOTAL WBS 120000 ENGINEERING/INSPECTION-TITLE III				0	0	0	0	430,000	0	0	430,000

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB-CONTRACT	EQUIP-MENT	OH&P / B & I	TOTAL DOLLARS
310000	FORCE ACCOUNT CONSTR - ONSITE E/C										
310000.16	ELECTRICAL										
310000.1600000	13.8KV TIE-IN AT ELECT M.H. #4 ALLOW:	600	1 LS	24	797	0	1500	0	0	964	3261
310000.1600005	FIRE ALARM INTERFACE INSTALL 4#14-3/4"GRS TO FFTF CONTROL RM FA ANNUNCIATOR PNL LOC'N & DIST UNKNOWN---ALLOW	600	1 LS	100	3319	0	1500	0	0	4016	8835
310000.1600010	PAX SYSTEM/ALARM ANNOUNCIATN INTERFACE	600	1 LS	80	2655	0	500	0	0	3213	6368
SUBTOTAL	ELECTRICAL			204		0		0		8,193	
	GENERAL FOREMAN 5.00 %			10	6,771 338		3,500		0		18,464 338
	CONSUMABLES 6.00 %						210				210
	SALES TAX 7.80 %						289		0		289
	WAREHOUSING 31.30 %						1161				1161
	OH&P (ON MARKUPS ONLY)									409	409
TOTAL	COST CODE 60016			214		0		0		8,602	
	WBS 310000				7,109		5,160		0		20,872
	(ESCALATION 3.98% - CONTINGENCY 20.00 %)										
TOTAL WBS 310000 FORCE ACCOUNT CONSTR - ONSITE E/C				214		0		0		8,602	
					7,109		5,160		0		20,872

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB-CONTRACT	EQUIP-MENT	OH&P / B & I	TOTAL DOLLARS
313200	CF. SODIUM PIPE INSTN										
313200.15	MECHANICAL										
313200.1500000	********** FSF SODIUM TP-001 TO -002 81XX1 **********	700	0	0	0	0	0	0	0	0	0
313200.1500005	2" SCH40S T304L SMLS PIPE PICKELED & PASSIVATED W/ END CAPS TYPICAL FOR ALL NA PIPE	700	400 LFT	400	14404	0	5200	0	0	17429	37033
313200.1500010	2" 3000# T304L SW FITGS 90 ELL	700	16 EA	8	288	0	1040	0	0	348	1676
313200.1500015	2" BELLOWS VLV H4-30298 ASSUME BW ENDS FBO	700	1 EA	2	72	0	0	0	0	87	159
313200.1500020	2" SCH 40S T304L BUTT WELDS PT ROOT	700	24 EA	96	3457	0	0	0	0	4183	7640
313200.1500022	2" SCH 40S T304L KEYHOLE BUTT WELDS RT ROOT	700	2 EA	80	2881	0	0	0	0	3486	6367
313200.1500025	2" SCH 40S T304L SOCK WELDS PT CAP	700	32 EA	128	4609	0	0	0	0	5577	10186
313200.1500030	2 1/2" TK CALCIUM SILICATE PIPE INSULATION	700	600 =FT	210	7222	0	6000	0	0	8739	21961
313200.1500040	SMALL BORE HGRS & SPTS	700	40 EA	160	5762	0	2000	0	0	6972	14734
313200.1500050	PNEUMATIC TEST W/INERT GAS (AR OR GN FURNISHED BY OPERATIONS)	700	1 LS	40	1440	0	0	0	0	1742	3182
313200.1500100	********** T44 SODIUM TP-003 TO SSF 81XX1 **********	700	0	0	0	0	0	0	0	0	0
313200.1500105	2" SCH40S T304L SMLS PIPE	700	200 LFT	200	7202	0	2600	0	0	8714	18516
313200.1500110	2" 3000# T304L SW FITGS 90 ELL	700	6 EA	3	108	0	390	0	0	131	629
313200.1500120	2" SCH 40S T304L BUTT WELDS PT ROOT	700	10 EA	40	1440	0	0	0	0	1742	3182
313200.1500125	2" SCH 40S T304L SOCK WELDS PT CAP	700	12 EA	48	1728	0	0	0	0	2091	3819
313200.1500130	2 1/2" TK CALCIUM SILICATE PIPE INSULATION	700	300 =FT	105	3611	0	3000	0	0	4369	10980
313200.1500135	SMALL BORE FIELD HANGERS & SUPPORTS	700	16 EA	64	2201	0	800	0	0	2663	5664

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB-CONTRACT	EQUIP-MENT	OH&P / B & I	TOTAL DOLLARS
313200.1500150	PNEUMATIC TEST W/INERT GAS (AR OR GN FURNISHED BY OPERATIONS)	700	1 LS	40	1440	0	0	0	0	1742	3182
SUBTOTAL	MECHANICAL			1,624		0		0		70,015	
					57,865		21,030		0		148,910
	SWP 25.00%			406	14466						14466
	GENERAL FOREMAN 5.00 %			101	3616						3616
	CONSUMABLES 6.00 %						1261				1261
	SALES TAX 7.80 %						1738		0		1738
	WAREHOUSING 31.30 %						6977				6977
	OH&P (ON MARKUPS ONLY)									21880	21880
TOTAL	COST CODE 70015			2,131		0		0		91,895	
	WBS 313200				75,947		31,007		0		198,850
	(ESCALATION 3.98% - CONTINGENCY 20.00 %)										
TOTAL WBS 313200 CF. SODIUM PIPE INSTN				2,131		0		0		91,895	
					75,947		31,007		0		198,850

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB-CONTRACT	EQUIP-MENT	OH&P / B & I	TOTAL DOLLARS
313300	CF. ARGON SUPPLY & COVER GAS										
313300.15	MECHANICAL										
313300.1500300	********** ARGON SUPPLY & COVER GAS 82XX1 **********	700	0	0	0	0	0	0	0	0	0
313300.1500305	1" SCH40S T304L SMLS PIPE	700	200 LFT	200	7202	0	1600	0	0	8714	17516
313300.1500310	1" 3000# T304L SW FITGS 90 ELL	700	10 EA	20	720	0	200	0	0	871	1791
313300.1500320	1" 300# SO ORFICE FLG W/RO PL	700	1 SET	2	72	0	500	0	0	87	659
313300.1500322	1"x 3/4" 3000# T304L T-O-LE	700	1 EA	1	36	0	90	0	0	44	170
313300.1500325	1" BELLOWS VLV H4-30298 ASSUME BW ENDS FBO	700	1 EA	2	72	0	0	0	0	87	159
313300.1500330	1" 300# B & G SET (ORFICE)	700	1 EA	2	72	0	0	0	0	87	159
313300.1500335	1" SCH40S T304L BUTT WELDS PT ROOT	700	22 EA	88	3169	0	0	0	0	3834	7003
313300.1500340	1" SCH40S T304L SOCK WELDS PT CAP	700	12 EA	48	1728	0	0	0	0	2091	3819
313300.1500342	1"x 3/4" O-LET WELD PT CAP	700	1 EA	4	144	0	90	0	0	174	408
313300.1500350	FIELD HANGERS & SUPPORTS	700	20 EA	80	2881	0	1000	0	0	3486	7367
313300.1500355	PRESSURE TEST	700	1 LS	32	1152	0	50	0	0	1394	2596
SUBTOTAL	MECHANICAL			479		0		0		20,869	
					17,248		3,530		0		41,647
	SWP 25.00%			119	4312						4312
	GENERAL FOREMAN 5.00 %			29	1078						1078
	CONSUMABLES 6.00 %						211				211
	SALES TAX 7.80 %						291		0		291
	WAREHOUSING 31.30 %						1171				1171
	OH&P (ON MARKUPS ONLY)									6521	6521
TOTAL	COST CODE 70015			628		0		0		27,390	
	WBS 313300				22,638		5,204		0		55,233
	(ESCALATION 3.98% - CONTINGENCY 20.00 %)										
TOTAL WBS 313300 CF. ARGON SUPPLY & COVER GAS				628		0		0		27,390	
					22,638		5,204		0		55,233

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB-CONTRACT	EQUIP-MENT	OH&P / B & I	TOTAL DOLLARS
313400	CF. ELECTRICAL/INSTRUMENTATION										
313400.16	ELECTRICAL										
313400.1642001	FEEDER - 1/2" GRS W/ CONDUCTORS	700	600 LF	107	3634	0	987	0	0	4397	9018
313400.1642037	LINEAR BEAM SMOKE DETECTOR PB-2400	700	2 EA	7	238	0	3299	0	0	288	3825
313400.1683501	HEAT TRACE FEEDER W/CONDUCTORS	700	800 LF	98	3328	0	1036	0	0	4027	8391
313400.1683517	HEAT TRACE TC W/COND & WIRE	700	8 EA	120	4075	0	3016	0	0	4931	12022
313400.1683519	HEAT TRACE CONTROLLER USED CHROMALOX	700	1 EA	10	340	0	4850	0	0	411	5601
313400.1683520	HEAT TRACE 480V, POWER KIT/END KIT	700	4 EA	5	170	0	296	0	0	206	672
313400.1683522	HEAT TRACE 480V, 8 WATTS PER L.F.	700	600 LF	60	2038	0	5400	0	0	2466	9904
313400.1683524	HEAT TRACE VALVE BODY & BONNET 480V-8 WATTS PER LFT	700	2 EA	1	34	0	54	0	0	41	129
313400.1683600	CRAFT SUPPORT FOR ATP/OTP	700	1 LS	40	1358	0	0	0	0	1643	3001
SUBTOTAL	ELECTRICAL			448		0		0		18,410	
					15,215		18,938		0		52,563
	SWP 25.00%			112	3803						3803
	GENERAL FOREMAN 5.00 %			28	950						950
	CONSUMABLES 6.00 %						1136				1136
	SALES TAX 7.80 %						1565		0		1565
	WAREHOUSING 31.30 %						6283				6283
	OH&P (ON MARKUPS ONLY)									5753	5753
TOTAL	COST CODE 70016			588		0		0		24,163	
	WBS 313400				19,969		27,923		0		72,056
	(ESCALATION 3.98% - CONTINGENCY 20.00 %)										
TOTAL WBS 313400 CF. ELECTRICAL/INSTRUMENTATION				588		0		0		24,163	
					19,969		27,923		0		72,056

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB-CONTRACT	EQUIP-MENT	OH&P / B & I	TOTAL DOLLARS
313500	CF. PROCESS SEWER TIEIN S1380/W8420										
313500.02	SITEWORK										
313500.0200000	MACH EXCAVATION/STRUC B'FILL SITE RESTORATION	600	100 CYD	100	2949	0	0	0	0	3568	6517
313500.0200005	6" PVC SEWER PIPE INCLUDING TIE-IN AT W8420 & TIE-IN AT MH	600	68 LFT	34	1224	0	1020	0	0	1481	3725
SUBTOTAL	SITEWORK			134		0		0		5,049	
					4,173		1,020		0		10,242
	GENERAL FOREMAN 5.00 %			6	208						208
	CONSUMABLES 6.00 %						61				61
	SALES TAX 7.80 %						84		0		84
	WAREHOUSING 31.30 %						338				338
	OH&P (ON MARKUPS ONLY)									252	252
TOTAL	COST CODE 60002			140		0		0		5,301	
	WBS 313500				4,381		1,503		0		11,187
	(ESCALATION 3.98% - CONTINGENCY 20.00 %)										
TOTAL WBS 313500 CF. PROCESS SEWER TIEIN S1380/W8420				140		0		0		5,301	
					4,381		1,503		0		11,187

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB-CONTRACT	EQUIP-MENT	OH&P / B & I	TOTAL DOLLARS
313600	CF. PROCESS SEWER DW.#5 TO S1380										
313600.02	SITEWORK										
313600.0200000	MACH EXCAVATION/STRUC B'FILL	600	280 CYD	280	8257	0	0	0	0	9991	18248
313600.0200005	SITE RESTORATION 6" PVC SEWER PIPE INCLUDING TIE-IN AT S1380 & DRY WELL #5	600	175 LFT	88	3169	0	2625	0	0	3834	9628
				368		0		0		13,825	
SUBTOTAL	SITEWORK				11,426		2,625		0		27,876
	GENERAL FOREMAN 5.00 %			18	571						571
	CONSUMABLES 6.00 %						157				157
	SALES TAX 7.80 %						217		0		217
	WAREHOUSING 31.30 %						870				870
	OH&P (ON MARKUPS ONLY)									691	691
				386		0		0		14,516	
TOTAL	COST CODE 60002 WBS 313600 (ESCALATION 3.98% - CONTINGENCY 20.00 %)				11,997		3,870		0		30,384
				386		0		0		14,516	
TOTAL WBS 313600 CF. PROCESS SEWER DW.#5 TO S1380					11,997		3,870		0		30,384

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB-CONTRACT	EQUIP-MENT	OH&P / B & I	TOTAL DOLLARS
313700	CF. SODIUM STORAGE TK MODIFICAT'NS										
313700.15	MECHANICAL										
313700.1510000	80,000 GAL SODIUM STORAGE TANK INTERNAL & EXTERNAL MODIFICATIONS	700	3 EA	4884	175873	0	15000	0	0	212806	403679
313700.1520000	52,500 GAL SODIUM STORAGE TANK INTERNAL & EXTERNAL MODIFICATIONS	700	1 EA	916	32985	0	3000	0	0	39912	75897
313700.1520005	SET-UP 300 AREA FIELD SHOP, CHANGE ROOM & TEMP FACILITY	700	1 EA	1000	29740	0	20000	0	0	35985	85725
SUBTOTAL	MECHANICAL			6,800	238,598	0	38,000	0	0	288,703	565,301
	GENERAL FOREMAN 5.00 %			340	11929						11929
	CONSUMABLES 6.00 %						2280				2280
	SALES TAX 7.80 %						3141		0		3141
	WAREHOUSING 31.30 %						12607				12607
	OH&P (ON MARKUPS ONLY)									14435	14435
TOTAL	COST CODE 70015 WBS 313700 (ESCALATION 3.98% - CONTINGENCY 20.00 %)			7,140	250,527	0	56,029	0	0	303,138	609,695
313700.16	ELECTRICAL										
313700.1600000	UTILITIES SUPPORT TO RAISE/LOWER 13.8 KV OV'HD PWR LINE XING (1 LOCN) 5M 8HRS	700	1 EA	40	1440	0	0	0	0	1742	3182
SUBTOTAL	ELECTRICAL			40	1,440	0	0	0	0	1,742	3,182
	GENERAL FOREMAN 5.00 %			2	72					87	72 87
	OH&P (ON MARKUPS ONLY)										
TOTAL	COST CODE 70016 WBS 313700 (ESCALATION 3.98% - CONTINGENCY 20.00 %)			42	1,512	0	0	0	0	1,829	3,341
TOTAL WBS 313700 CF. SODIUM STORAGE TK MODIFICAT'NS				7,182	252,039	0	56,029	0	0	304,967	613,036

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB-CONTRACT	EQUIP-MENT	OH&P / B & I	TOTAL DOLLARS
321000	DEMOLITION & TANK FOUNDATIONS										
321000.02	SITEWORK										
321000.0200002	DENTAL EXCAVATION TO STOCKPILE	700	1280 CYD	0	0	0	0	6400	0	640	7040
321000.0200004	DENTAL BACKFILL & STRUCT COMPACT FROM STOCKPILE	700	500 CYD	0	0	0	0	4000	0	400	4400
321000.0200006	DISPOSE EXCESS -STOCKPILE TO FREE DISPOSAL @ CENTRAL LANDFILL	700	780 CYD	0	0	0	0	3900	0	390	4290
321000.0200010	EQUIPMENT MOVE-IN/OUT	700	1 LS	0	0	0	0	5000	0	500	5500
SUBTOTAL	SITEWORK			0	0	0	0	19,300	0	1,930	21,230
TOTAL	COST CODE 70002 WBS 321000 (ESCALATION 5.73% - CONTINGENCY 20.00 %)			0	0	0	0	19,300	0	1,930	21,230
321000.02	SITEWORK										
321000.0200000	DEMO 2'TK CONC FDN, EQT PEDS & CNDT SEE ITEM ANALYSIS ASSUME FREE DUMP AT CENTRAL LAND FILL	810	7200 CFT	0	0	0	0	141120	0	14112	155232
SUBTOTAL	SITEWORK			0	0	0	0	141,120	0	14,112	155,232
TOTAL	COST CODE 81002 WBS 321000 (ESCALATION 5.73% - CONTINGENCY 20.00 %)			0	0	0	0	141,120	0	14,112	155,232
321000.03	CONCRETE										
321000.0300004	FINE GRADE & SCREED	700	10000 SFT	110	2891	0	0	0	0	1446	4337
321000.0300005	EDGE FORMS 2'HIGH	700	780 SFT	195	5799	0	3900	0	0	3290	12989
321000.0300006	REBAR #5 @ 6" E.W./T&B PLUS 5% LAP,DOWELS & TEMP STEEL	700	82900 LBS	0	0	0	0	41450	0	4145	45595
321000.0300008	4000# CONC IN PLACE PUMP	700	704 CYD	352	10468	0	42240	0	0	9458	62166
321000.0300010	MTL TROWEL FINISH W/ HARDENER	700	9500 SFT	95	2825	0	190	0	0	1432	4447
321000.0300015	TK & STRUCT ANCHOR BOLTS DRILL & EPOXY GROUT THRU	700	200 EA	800	28808	0	3000	0	0	14704	46512

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB-CONTRACT	EQUIP-MENT	OH&P / B & I	TOTAL DOLLARS
	TANK & COLM FLGS - BW CAPS & SEAL WELD										
321000.0300020	LINER PL EMBEDMENTS FB 3x1/4 W/STUD ANCHORS FIELD FAB & INST	700	1530 LFT	306	11019	0	4590	0	0	5969	21578
SUBTOTAL	CONCRETE			1,858		0		41,450		40,444	
					61,810		53,920		0		197,624
	SALES TAX 7.80 %						4205		0		4205
	OH&P (ON MARKUPS ONLY)									420	420
TOTAL	COST CODE 70003			1,858		0		41,450		40,864	
	WBS 321000				61,810		58,125		0		202,250
	(ESCALATION 5.73% - CONTINGENCY 20.00 %)										
321000.05	METALS										
321000.0500005	3/16" TK CARBON STEEL SUMP LINER (49,000 LBS)	700	6400 SFT	0	0	0	64000	0	0	6400	70400
321000.0500010	3/16" TK CARBON STEEL LINER AT TUNNEL EXTENSION (400 LBS)	700	50 SFT	0	0	0	500	0	0	50	550
SUBTOTAL	METALS			0		0		0		6,450	
					0		64,500		0		70,950
	SALES TAX 7.80 %						5031		0		5031
	OH&P (ON MARKUPS ONLY)									503	503
TOTAL	COST CODE 70005			0		0		0		6,953	
	WBS 321000				0		69,531		0		76,484
	(ESCALATION 5.73% - CONTINGENCY 20.00 %)										
TOTAL WBS 321000 DEMOLITION & TANK FOUNDATIONS				1,858		0		201,870		63,859	
					61,810		127,656		0		455,196

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB-CONTRACT	EQUIP-MENT	OH&P / B & I	TOTAL DOLLARS
322000	HAUL & SET SODIUM STORAGE TANKS										
322000.10	SPECIALTIES										
322000.1000000	HAUL & SET SODIUM STORAGE TANKS SEE ITEM ANALYSIS	700	1 LS	0	0	0	0	220000	0	22000	242000
322000.1000005	LOAD TEST & CERTIFY RIGGING HDWR FOR HORZ & VERT TANKS INCLUDES TRANSPORT, SAND-BLAST, NDT, TEST & PAINT	700	1 LS	0	0	0	0	15000	0	1500	16500
SUBTOTAL	SPECIALTIES			0	0	0	0	235,000	0	23,500	258,500
TOTAL	COST CODE 70010 WBS 322000 (ESCALATION 5.73% - CONTINGENCY 20.00 %)			0	0	0	0	235,000	0	23,500	258,500
TOTAL WBS 322000 HAUL & SET SODIUM STORAGE TANKS				0	0	0	0	235,000	0	23,500	258,500

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB-CONTRACT	EQUIP-MENT	OH&P / B & I	TOTAL DOLLARS
323000	CONSTRUCTION SODIUM STORAGE BLDG										
323000.02	SITEWORK										
323000.0200000	DENTAL EXCAVATION AT TUNNEL PORTAL	700	2 LS	32	944	400	0	0	0	512	1856
323000.0200002	HAND EXCAVATION AT TUNNEL PORTAL	700	2 LS	48	1416	0	0	0	0	708	2124
323000.0200004	STRUCT B'FILL & COMPACT AT TUNNEL PORTAL	700	2 LS	48	1416	400	0	0	0	748	2564
323000.0200006	FINE GRADE & SCREED AT ENTRY PORTALS	700	760 SFT	8	210	0	0	0	0	105	315
323000.0200100	TRENCH EXC & B'FILL - ROOF DRAINS TO 6"DRAIN LINE 12-15 FT DEEP - SHIELD/SHORE	700	40 LFT	160	4718	0	600	0	0	2419	7737
323000.0200105	6" PVC SCH40 PIPE - ROOF DRAINS TO 6" 'ABANDONED' DRAIN LINE	700	40 LFT	20	590	0	600	0	0	355	1545
323000.0200200	TRENCH EXC & B'FILL-MH#4 TO XFRMR PAD & BUILDING	700	65 LFT	65	1917	650	0	0	0	1024	3591
323000.0200300	EXCAVATE, INST CATHODIC PROTECTION CABLE & B'FILL	700	100 LFT	50	1660	1000	0	0	0	930	3590
323000.0200305	THERMITE WELD CATHODIC PROTECTION CABLE	700	2 EA	4	133	0	100	0	0	77	310
323000.0200400	CUT & ABANDON FA CNDT & WIRE	700	1 LS	2	66	0	0	0	0	33	99
323000.0200405	ABANDON DRYWELL #5 & #6 IN PLACE	700	1 LS	0	0	0	0	0	0	0	0
SUBTOTAL	SITEWORK			437	13,070	2,450	1,300	0	0	6,911	23,731
	SALES TAX 7.80 %						101		0		101
	OH&P (ON MARKUPS ONLY)									10	10
TOTAL	COST CODE 70002			437	13,070	2,450	1,401	0	0	6,921	23,842
	WBS 323000										
	(ESCALATION 5.73% - CONTINGENCY 20.00 %)										
323000.03	CONCRETE										
323000.0300000	********** BUILDING CONCRETE **********	700	0	0	0	0	0	0	0	0	0
323000.0300002	4000# TUNNEL PORTAL & HEADWALL CONCRETE	700	12 CYD	0	0	0	0	3000	0	300	3300

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB-CONTRACT	EQUIP-MENT	OH&P / B & I	TOTAL DOLLARS
	FORM, REBAR, PLACE, STRIP & FINISH										
323000.0300005	WALL FORMS --- ASSUME 4 USES	700	32900 SFT	8225	244612	0	49350	0	0	127241	421203
323000.0300008	BLOCK-OUTS FOR MECH & ELECT TRADES	700	1 LS	40	1190	0	200	0	0	615	2005
323000.0300010	REBAR #5 @ 12" E.W./E.F PLUS 8% LAP,DOWELS & TEMP STEEL	700	68500 LBS	0	0	0	0	37675	0	3768	41443
323000.0300015	4000# CONC IN PLACE PUMP	700	900 CYD	900	26766	0	54000	0	0	18783	99549
323000.0300025	COLUMN FORMS ---2 USES	700	1000 SFT	500	14870	0	2500	0	0	7685	25055
323000.0300027	COLUMN REBAR USE 200LBS/CYD SHOP FAB & TIE	700	3800 LBS	0	0	0	2280	0	0	228	2508
323000.0300030	COLUMN 4000# CONC IN PLACE PUMP	700	19 CYD	38	1130	0	1045	0	0	670	2845
323000.0300035	PATCH & SACK EXTERIOR CONC MIN FINISH	700	16500 SFT	1650	43362	0	16500	0	0	23331	83193
323000.0300040	PATCH INTERIOR CONC NO FINISH	700	16500 SFT	825	21681	0	16500	0	0	12491	50672
323000.0300100	36" DP PRECAST/PRESTRESSED INVERTED TEE's & 24"x10'BDLE TEE's CENTRAL PREMIX -RON S	700	1 LS	0	0	0	0	75000	0	7500	82500
323000.0300105	OVERHEAD CAULK & SEAL ROOF	700	1200 LFT	0	0	0	0	2400	0	240	2640
323000.0300200	********** MEZZANINE & SHIELD WALL CONCRETE **********	700	0	0	0	0	0	0	0	0	0
323000.0300205	6" TK CONCRETE ON MTL DECK MTL TROWEL FINISH & HARDENER PUMP MUD	700	3100 SFT	0	0	0	0	31000	0	3100	34100
323000.0300300	WALL FORMS --- ASSUME 2 USES	700	3150 SFT	788	23435	0	4725	15750	0	13765	57675
323000.0300305	REBAR #5 @ 6" E.W./E.F PLUS 8% LAP,DOWELS & TEMP STEEL	700	9800 LBS	0	0	0	3430	0	0	343	3773
323000.0300310	4000# CONC IN PLACE - PUMP	700	35 CYD	105	3123	0	2275	0	0	1789	7187
323000.0300315	PATCH & SACK CONC MIN FINISH	700	3150 SFT	473	12430	0	3150	0	0	6530	22110
323000.0300349	********** RELIEF DUCT ENCSMT **********	700	0	0	0	0	0	0	0	0	0
323000.0300350	ONE USE WALL FORMS BUILT IN PLACE	700	200 SFT	74	2201	0	2000	0	0	1301	5502
323000.0300355	#5 REBAR (ALLOW 100#/CYD)	700	200 LBS	0	0	0	70	0	0	7	77

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB-CONTRACT	EQUIP-MENT	OH&P / B & I	TOTAL DOLLARS
323000.0300360	4000# CONC IN PLACE PUMP	700	2 CYD	6	178	0	110	0	0	100	388
323000.0300365	PATCH & SACK CONC MIN FINISH	700	200 SFT	30	788	0	200	0	0	414	1402
323000.0300400	********** ENTRY PORTAL CONCRETE 2PLCS **********	700	0	0	0	0	0	0	0	0	0
323000.0300410	6" EDGE FORM.	700	116 LFT	29	862	0	580	0	0	489	1931
323000.0300415	REBAR #5 @ 12"E.W./T.B. PLUS 5% LAP,DOWELS & TEMP STEEL	700	1700 LBS	0	0	0	0	595	0	60	655
323000.0300420	4000# CONC IN PLACE	700	20 CYD	20	595	0	1100	0	0	408	2103
323000.0300425	STL TROWEL FIN W/HARDENER	700	780 SFT	0	0	0	195	780	0	98	1073
323000.0300430	MISC ANCHOR BOLTS & EXP JT MTL ALLOW	700	1 LS	0	0	0	0	200	0	20	220
323000.0300500	6" TK SUSPENDED SLAB W/MTL PAN ALLOW	700	340 SFT	0	0	0	0	6800	0	680	7480
323000.0300600	********** MISC CONCRETE **********	700	0	0	0	0	0	0	0	0	0
323000.0300650	PRECAST PADMOUNT XFMR FDN ABT 4'x5' W/15"x42" CABLE OPNG	700	1 LS	2	59	0	250	0	0	55	364
323000.0300655	PRECAST SLAB FOR 1 1/2T HEAT PUMP	700	1 LS	1	30	0	75	0	0	23	128
323000.0370610	30"SQ PRECAST SPLASH BLOCKS	700	2 EA	2	53	0	50	0	0	32	135
SUBTOTAL	CONCRETE			13,708		0		173,200		232,066	
					397,365		160,585		0		963,216
	SALES TAX 7.80 %						12525		0		12525
	OH&P (ON MARKUPS ONLY)									1252	1252
TOTAL	COST CODE 70003			13,708		0		173,200		233,318	
	WBS 323000				397,365		173,110		0		976,994
	(ESCALATION 5.73% - CONTINGENCY 20.00 %)										
323000.05	METALS										
323000.0500000	********** LOWER LEVEL DECK STEEL & FIRE BARRIER **********	700	1 LS	0	0	0	0	0	0	0	0

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB-CONTRACT	EQUIP-MENT	OH&P / B & I	TOTAL DOLLARS
323000.0500005	3/16" TK CARBON STEEL SUMP LINER (17,700 LBS)	700	2310 SFT	0	0	0	23100	0	0	2310	25410
323000.0500010	3" SCH 40 PIPE STUB COLUMNS ABT 15" LONG	700	110 EA	110	3506	0	1760	0	0	1929	7195
323000.0500015	8"WF13 x 15'+- LONG (15,600 LBS)	700	80 EA	160	5099	0	15600	0	0	4110	24809
323000.0500020	CKR PL W/1x3/16 GRATING NOM 3'x5'PANELS, BAND EDGES GRTG 8#+CKR PL 2#/SFT (60,000LBS)	700	6000 SFT	900	28683	0	60000	0	0	20342	109025
323000.0500022	LAYOUT & FIELD DRILL 1" DIA HOLES IN CKR PL UNDER HORZ TANK	700	2500 EA	375	11951	0	0	0	0	5976	17927
323000.0500025	3/16" COUNTERFLASHING W/EXP BOLTS AT 24" C/C	700	360 LFT	108	3442	0	1440	0	0	1865	6747
323000.0500030	3/16" FORMED SUMP LINER EX-PANSION JOINT	700	180 LFT	180	5737	0	0	0	0	2869	8606
323000.0500035	3"x3"x1/4" LEDGER ANGLE W/ EXPANSION BOLTS	700	180 LFT	45	1434	0	900	0	0	807	3141
323000.0500100	********** MEZZANINE FRAMING STEEL **********	700	1 LS	0	0	0	0	0	0	0	0
323000.0500105	14WF74# x 25' COLUMNS (4000LBS)	700	2 EA	20	637	0	4000	0	0	719	5356
323000.0500110	12WF53# x 25' COLUMNS (6000LBS)	700	4 EA	40	1275	0	6000	0	0	1238	8513
323000.0500112	33WF133# x 30'BMS (8,400LBS)	700	2 EA	20	637	0	6400	0	0	959	7996
323000.0500115	30WF108# x 42.5' BMS (18,600LBS)	700	4 EA	64	2040	0	14000	0	0	2420	18460
323000.0500120	27WF94# x 30' BMS (11,500LBS)	700	4 EA	64	2040	0	8800	0	0	1900	12740
323000.0500125	18WF40# x 15' BMS (3,200LBS)	700	4 EA	48	1530	0	2400	0	0	1005	4935
323000.0500130	8WF31# x 15' BMS (6,000LBS) X-TRA SEISMIC BRACING	700	4 EA	48	1530	0	4800	0	0	1245	7575
323000.0500135	18WF40# x 24' BMS (18,000LBS)	700	18 EA	180	5737	0	18000	0	0	4669	28406
323000.0500140	3" 22GA MTL DECK	700	3200 SFT	0	0	0	9600	0	0	960	10560
323000.0500145	8'x8'x1 1/2" ACCESS PANELS 250# MAX PCS (4000LBS)	700	3 EA	120	3824	0	9000	0	0	2812	15636

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB-CONTRACT	EQUIP-MENT	OH&P / B & I	TOTAL DOLLARS
323000.0500150	FIELD CUT NOZZLE OPENINGS 4'x18'x1 1/2" ACCESS PANELS 250# MAX PCS (4400LBS)	700	1 EA	40	1275	0	3300	0	0	968	5543
323000.0500200	FIELD CUT NOZZLE OPENINGS **********	700	0	0	0	0	0	0	0	0	0
	MISCELLANEOUS METALWORK **********										
323000.0500205	FABRICATED LADDER W/CAGE & LANDING (2400LBS)	700	1 EA	40	1275	0	4800	0	0	1118	7193
323000.0500210	FABRICATED STAIR W/LANDING & HANDRAILS 10 RISERS	700	1 EA	24	765	0	4800	0	0	863	6428
323000.0500215	FABRICATED STAIR 2 LANDINGS & HANDRAILS,4"COLM,37 RISERS	700	1 EA	48	1530	0	18500	0	0	2615	22645
323000.0500300	**********	700	0	0	0	0	0	0	0	0	0
	ENTRY PORTAL FRAMING **********										
323000.0500305	6"WF15.5 x 42'COLMNS (4000LBS)	700	6 EA	60	1912	0	4200	0	0	1376	7488
323000.0500310	8"WF10 x 10'BMS (1200LBS)	700	12 EA	120	3824	0	1800	0	0	2092	7716
323000.0500315	DBLE 8"C 11.5# x 19'BMS (900LBS)	700	2 EA	20	637	0	900	0	0	409	1946
323000.0500320	8"C 11.5# x 10'GIRTS (1200LBS)	700	10 EA	60	1912	0	1200	0	0	1076	4188
323000.0500322	8"C 11.5# x 19'GIRTS (2200LBS)	700	10 EA	60	1912	0	2200	0	0	1176	5288
323000.0500325	ALLOW FOR DIAGONALS & MISC FRAMING (3000LBS)	700	1 LS	80	2550	0	3000	0	0	1575	7125
323000.0500330	COMPOSITE SIDING PANELS W/ ACCESSORIES	700	5000 SFT	1250	39838	0	50000	0	0	24919	114757
323000.0500335	COMPOSITE ROOFING PANELS W/ ACCESSORIES	700	800 SFT	200	6374	0	8000	0	0	3987	18361
323000.0500340	FABRICATED STAIR 2 LANDINGS & HANDRAILS,4"COLM,25 RISERS	700	2 EA	96	3060	0	25000	0	0	4030	32090
323000.0500345	FABRICATED STAIR 1 LANDING & HANDRAILS,25 RISERS	700	2 EA	96	3060	0	24000	0	0	3930	30990
323000.0500350	BILCO OR = ROOF HATCH W/ LADDER	700	1 EA	40	1275	0	3500	0	0	988	5763
SUBTOTAL	METALS			4,716	150,301	0	341,000	0	0	109,257	600,558
	SALES TAX 7.80 %						26598		0		26598

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB-CONTRACT	EQUIP-MENT	OH&P / B & I	TOTAL DOLLARS
	OH&P (ON MARKUPS ONLY)									2659	2659
TOTAL	COST CODE 70005			4,716		0		0		111,916	
	WBS 323000				150,301		367,598		0		629,815
	(ESCALATION 5.73% - CONTINGENCY 20.00 %)										
323000.07	MOISTURE AND THERMAL										
323000.0700000	UL LISTED OR FM APPROVED R19 INSULATION & 60 MIL EPDM MEMBRANE W/20 YR ROOF WARRANTY	700	81 SQ	0	0	0	0	40500	0	4050	44550
323000.0700005	PREFORMED 16GA GALV GUTTER W/HDWR (6#/FT~600LBS)	700	96 LFT	38	1249	0	0	768	0	701	2718
323000.0700010	PREFORMED 16GA GALV DNSPOUT 6"x4" W/HDWR (5#/FT~400LBS	700	80 LFT	32	1052	0	0	640	0	590	2282
323000.0700020	JACKS, CANT STRIP & FLASHING AT ROOF PENETRATIONS VARIOUS SIZES	700	10 EA	80	2379	0	1500	0	0	1340	5219
SUBTOTAL	MOISTURE AND THERMAL			150		0		41,908		6,681	
					4,680		1,500		0		54,769
	SALES TAX 7.80 %						117		0		117
	OH&P (ON MARKUPS ONLY)									11	11
TOTAL	COST CODE 70007			150		0		41,908		6,692	
	WBS 323000				4,680		1,617		0		54,897
	(ESCALATION 5.73% - CONTINGENCY 20.00 %)										
323000.08	DOORS,WINDOWS AND G										
323000.0800000	3-0/7-0 1 1/2HR HM CORE ENTRY DOORS W/PRSD STL FRMS, & HDWR, NFPA 101 & UL LISTED	700	5 EA	0	0	0	0	7500	0	750	8250
323000.0800002	3-0/7-0 SHIELDED ENTRY DOORS W/PRSD STL FRMS, & HDWR, NFPA 101 & UL LISTED NFPA & UL APPLICABLE????	700	2 EA	0	0	0	0	6000	0	600	6600
323000.0800005	6-0/7-0 1 1/2HR HM CORE ENTRY DOORS W/PRSD STL FRMS, & HDWR, NFPA 101 & UL LISTED	700	1 EA	0	0	0	0	3000	0	300	3300
323000.0800010	6-0/7-0 MANUAL ROLL-UP DOOR W/PRSD STL FRM & HDWR	700	1 EA	0	0	0	0	2000	0	200	2200
SUBTOTAL	DOORS,WINDOWS AND G			0		0		18,500		1,850	
					0		0		0		20,350

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB-CONTRACT	EQUIP-MENT	OH&P / B & I	TOTAL DOLLARS
TOTAL	COST CODE 70008			0		0		18,500		1,850	
	WBS 323000				0		0		0		20,350
	(ESCALATION 5.73% - CONTINGENCY 20.00 %)										
323000.09	FINISHES										
323000.0900000	ALLOW FOR INTERIOR PARTNS, DRYWALL, PAINT & MISC FINISH WORK	700	1 LS	0	0	0	0	5000	0	500	5500
323000.0900005	SHOP COAT ZINC RICH PRIMER INCLUDED WITH SHOP FAB OF STRUCTURAL AND MISC MTLWK	700	26000 SFT	0	0	0	0	0	0	0	0
323000.0900010	GLOSS ENAMEL FOR EXTERIOR & INTERIOR METALS PER PDCA ARCH MANUAL TOUCH-UP PRIMER	700	1 LS	40	1036	0	250	0	0	543	1829
323000.0900015	GLOSS ENAMEL FOR EXTERIOR & INTERIOR METALS PER PDCA ARCH MANUAL 2 COATS VINYL ENAMEL-3MILS	700	260 CFT	520	13463	0	10400	0	0	7772	31635
SUBTOTAL	FINISHES			560		0		5,000		8,815	
					14,499		10,650		0		38,964
	SALES TAX 7.80 %						830		0		830
	OH&P (ON MARKUPS ONLY)									83	83
TOTAL	COST CODE 70009			560		0		5,000		8,898	
	WBS 323000				14,499		11,480		0		39,877
	(ESCALATION 5.73% - CONTINGENCY 20.00 %)										
323000.10	SPECIALTIES										
323000.1000000	PORTABLE ALKALI METAL FIRE EXTINGUISHERS SPECIFIC SIZE & QTY TBD ALLOW	700	1 LS	0	0	0	5000	0	0	500	5500
SUBTOTAL	SPECIALTIES			0		0		0		500	
					0		5,000		0		5,500
	SALES TAX 7.80 %						390		0		390
	OH&P (ON MARKUPS ONLY)									39	39
TOTAL	COST CODE 70010			0		0		0		539	
	WBS 323000				0		5,390		0		5,929

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB-CONTRACT	EQUIP-MENT	OH&P / B & I	TOTAL DOLLARS
	(ESCALATION 5.73% - CONTINGENCY 20.00 %)										
323000.14	CONVEYING SYSTEMS										
323000.1400000	WALL MOUNTED 1/2 TON JIB CRANE W/38'LIFT MANUAL HOIST & 6' ARM.	700	1 EA	0	0	0	0	5000	0	500	5500
SUBTOTAL	CONVEYING SYSTEMS			0	0	0	0	5,000	0	500	5,500
TOTAL	COST CODE 70014			0	0	0	0	5,000	0	500	5,500
	WBS 323000										
	(ESCALATION 5.73% - CONTINGENCY 20.00 %)										
TOTAL WBS 323000 CONSTRUCTION SODIUM STORAGE BLDG				19,571	579,915	2,450	560,597	243,608	0	370,636	1,757,207

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB-CONTRACT	EQUIP-MENT	OH&P / B & I	TOTAL DOLLARS
323100	SSF - HEAT, VENT & COOLING										
323100.15	MECHANICAL	700	0	0	0	0	0	0	0	0	0
323100.1510000	********** HEATING, VENTILATION & COOLING **********	700	2 EA	32	1052	0	10000	0	0	1526	12578
323100.1510005	4000CFM UPFLOW AIR HANDLER W/55KW HEATING COILS, 2" TK PLEATED FILTER & FABRICATED INLET PLENUM & LO-VOLT STAT	700	2 EA	4	131	0	500	0	0	116	747
323100.1510010	18" SQ MOTORIZED INLET AIR DAMPERS	700	8 EA	16	526	0	2000	0	0	463	2989
323100.1510015	18" SQ MOTORIZED RETURN AIR DAMPERS	700	500 LBS	75	2465	0	375	0	0	1270	4110
323100.1510020	18"SQx18 GA GALV INTAKE AIR DUCT	700	2 EA	4	131	0	200	0	0	86	417
323100.1510022	18"SQ GALV INTAKE AIR HOODS	700	3500 LBS	525	17257	0	2625	0	0	8891	28773
323100.1510025	14"SQx18GA GALV DISTRIBUTION DUCT (4 x 60')+(2 x 25')+(2 x 20'	700	250 LBS	38	1249	0	188	0	0	643	2080
323100.1510026	8"DIAx18GA GALV RELIEF AIR DUCT (4 x 15')	700	4 EA	6	197	0	400	0	0	139	736
323100.1510028	8"DIA BAROMETRIC AIR RELIEF VALVE	700	240 LBS	36	1183	0	180	0	0	610	1973
323100.1510030	GALV DUCT ACCESSORIES	700	300 LBS	45	1479	0	225	0	0	762	2466
323100.1510035	LINED 30" SQ x 24 GA GALV DUCT (RELIEF DUCT)	700	1 EA	2	66	0	250	0	0	58	374
323100.1510040	30" SQ GALV EXHAUST HOOD	700	1 EA	2	66	0	250	0	0	58	374
323100.1510045	30" SQ BACKDRAFT DAMPER	700	2 EA	32	1052	0	500	0	0	576	2128
323100.1510050	1000CFM WALL MTD SUPPLY AIR FAN W/MAN ADJ INTAKE AIR LOUVERS, INTEGRAL STAT & THERMAL CUT-OFF	700	2 EA	32	1052	0	400	0	0	566	2018
323100.1510055	24" SQ EXHAUST AIR RELIEF LOUVER W/BACKDRAFT DAMPER	700	1 EA	80	2630	0	1500	0	0	1465	5595
323100.1510060	1 1/2 TON SPLIT SYSTEM HEAT PUMP W/3KW AUX HEAT, LIQUID & SUCTION LINES, DUCT & DAMPERS	700	1 EA	1	33	0	200	0	0	37	270
323100.1510065	WALL MTD 3KW UNIT HEATER W/ INTEGRAL T-STAT & THERMMAL										

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB-CONTRACT	EQUIP-MENT	OH&P / B & I	TOTAL DOLLARS
323100.1510070	CUT-OFF START-UP, BALANCING & TEST REPORT	700	40 HRS	40	1315	0	0	0	0	658	1973
SUBTOTAL	MECHANICAL			970		0		0		17,924	
					31,884		19,793		0		69,601
	SALES TAX 7.80 %						1543		0		1543
	OH&P (ON MARKUPS ONLY)									154	154
TOTAL	COST CODE 70015			970		0		0		18,078	
	WBS 323100				31,884		21,336		0		71,299
	(ESCALATION 5.73% - CONTINGENCY 20.00 %)										
TOTAL WBS 323100 SSF - HEAT, VENT & COOLING				970		0		0		18,078	
					31,884		21,336		0		71,299

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB-CONTRACT	EQUIP-MENT	OH&P / B & I	TOTAL DOLLARS
323200	SSF - SODIUM PIPING										
323200.15	MECHANICAL										
323200.1500000	********** SODIUM SSF TUNNEL TO TKS 1-4 81XX1 THRU 81X11 **********	700	0	0	0	0	0	0	0	0	0
323200.1500005	2" SCH40S T304L SMLS PIPE	700	360 LFT	360	12964	0	4680	0	0	6950	24594
323200.1500010	2" 3000# T304L SW FITGS 90 ELL	700	20 EA	10	360	0	1300	0	0	310	1970
323200.1500015	2" 3000# T304L SW FITGS TEE	700	10 EA	5	180	0	850	0	0	175	1205
323200.1500020	3"xSML BORE SCH40S C.RDCRS BW ENDS	700	16 EA	8	288	0	320	0	0	176	784
323200.1500025	2" BELLOWS VLV H4-30298 ASSUME BW ENDS FBO	700	10 EA	20	720	0	0	0	0	360	1080
323200.1500028	1" BELLOWS VLV H4-30298 ASSUME BW ENDS FBO	700	4 EA	8	288	0	0	0	0	144	432
323200.1500030	3" SCH40S T304L BUTT WELDS PT ROOT	700	16 EA	96	3457	0	0	0	0	1729	5186
323200.1500032	2" SCH40S T304L BUTT WELDS PT ROOT	700	62 EA	248	8930	0	0	0	0	4465	13395
323200.1500034	2" 3000# T304L SOCK WELDS PT CAP	700	70 EA	280	10083	0	0	0	0	5042	15125
323200.1500040	2 1/2" TK CALCIUM SILICATE PIPE INSULATION	700	540 =FT	189	6500	0	5400	0	0	3790	15690
323200.1500045	SMALL BORE FIELD HGRS & SPTS	700	40 EA	160	5762	0	2000	0	0	3081	10843
323200.1500050	PNEUMATIC TEST W/INERT GAS (AR OR GN FURNISHED BY OPERATIONS)	700	1 LS	80	2881	0	0	0	0	1441	4322
SUBTOTAL	MECHANICAL			1,464		0		0		27,663	
					52,413		14,550		0		94,626
	SALES TAX 7.80 %						1134		0		1134
	OH&P (ON MARKUPS ONLY)									113	113
TOTAL	COST CODE 70015			1,464		0		0		27,776	
	WBS 323200				52,413		15,684		0		95,874
	(ESCALATION 5.73% - CONTINGENCY 20.00 %)										

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB-CONTRACT	EQUIP-MENT	OH&P / B & I	TOTAL DOLLARS
TOTAL WBS 323200 SSF - SODIUM PIPING				1,464		0		0		27,776	
					52,413		15,684		0		95,874

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB-CONTRACT	EQUIP-MENT	OH&P / B & I	TOTAL DOLLARS
323300	SSF - ARGON & VENT PIPING										
323300.15	MECHANICAL	700	0	0	0	0	0	0	0	0	0
323300.1500000	********** RELIEF VENT HEADER 82XX1, 82XX2, 82XX3, 82XX4 **********	700	200 LF	212	7634	0	17000	0	0	5517	30151
323300.1500005	6"SCH 10S T304L ERW PIPE	700	10 EA	17	612	0	1300	0	0	436	2348
323300.1500010	6"SCH 10S T304L ERW BW FITGS - 90 LR ELL	700	3 EA	5	180	0	660	0	0	156	996
323300.1500015	6"SCH 10S T304L ERW BW FITGS - TEE	700	4 EA	7	252	0	240	0	0	150	642
323300.1500020	6"SCH 10S T304L ERW BW FITGS - CAP	700	1 EA	1	36	0	60	0	0	24	120
323300.1500022	6"x 1" S-O-LET	700	4 EA	2	72	0	400	0	0	76	548
323300.1500024	6"x 2" S-O-LET	700	1 EA	2	72	0	130	0	0	49	251
323300.1500025	10"SCH 10S T304L ERW BW FITGS - CAP (VENT/RAIN CAP)	700	40 EA	480	17285	0	0	0	0	8643	25928
323300.1500030	6"SCH 10S T304L BW W/PT ROOT	700	1 EA	2	72	0	0	0	0	36	108
323300.1500032	1" O-LET WELD W/PT ROOT	700	4 EA	16	576	0	0	0	0	288	864
323300.1500034	2" O-LET WELD W/PT ROOT	700	1 EA	80	2881	0	12000	0	0	2641	17522
323300.1500040	2 STAGE 24"x24" T304L HEPA FILTER HOUSING W/PREFILTER & TEST SECTIONS, ANSI N509,510 REQTS & TESTING. C/S SUPPORT	700	1 LS	0	0	0	1000	0	0	100	1100
323300.1500042	24"x24" PRE-TESTED HEPA FILTERS	700	1 LS	12	432	0	10	0	0	217	659
323300.1500043	DOP TEST HEPA FILTERS AFTER INSTALLATION	700	3 EA	12	432	0	750	0	0	291	1473
323300.1500044	MAGNAHELIC DIFF PRESS IND W/ MANIFOLD & TRIM PDI-201,-203	700	10 EA	80	2881	0	1000	0	0	1541	5422
323300.1500050	6" FIELD FAB HANGERS & SPTS	700	1 LS	0	0	0	0	0	0	0	0
323300.1500055	PRESS TEST DUCT: ASSUME NO TEST REQD	700	60 LF	60	2161	0	780	0	0	1159	4100
323300.1500102	2" SCH40S T304L SMLS PIPE	700	8 EA	4	144	0	520	0	0	124	788
323300.1500105	2" 3000# T304L SW FITGS 90 ELL										

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB-CONTRACT	EQUIP-MENT	OH&P / B & I	TOTAL DOLLARS
323300.1500110	2" 3000# T304L SW FITGS UNIONS	700	4 EA	2	72	0	260	0	0	62	394
323300.1500115	2" 3000# T304L SOCK WELD PT CAP	700	26 EA	104	3745	0	0	0	0	1873	5618
323300.1500200	2" SCH40S T304L SMLS PIPE NOTE: SAFETY CLASS 2 FOR 15200 THRU 15250	700	20 LF	20	720	0	260	0	0	386	1366
323300.1500202	1" SCH40S T304L SMLS PIPE	700	2 LF	0	0	0	16	0	0	2	18
323300.1500204	3/4" SCH40S T304L SMLS PIPE	700	2 LF	0	0	0	16	0	0	2	18
323300.1500205	2" SCH40S T304L BW FITG 90 ELL	700	4 EA	2	72	0	260	0	0	62	394
323300.1500206	2" SCH40S T304L BW FITS TEE	700	4 EA	2	72	0	340	0	0	70	482
323300.1500208	3/4" SCH40S T304L T-O-LET	700	12 EA	6	216	0	600	0	0	168	984
323300.1500210	2"x1" SCH160S T304L SWAGE NIP BBE	700	4 EA	2	72	0	200	0	0	56	328
323300.1500215	2" WYE BELLOWS VLVS, BW ENDS MAN OPR FBO	700	4 EA	8	288	0	0	0	0	144	432
323300.1500217	VALVE STEM EXTENSIONS DETAILS TBD ALLOW	700	33 EA	396	14260	0	1650	0	0	7295	23205
323300.1500219	3/4" 2000# THRD BALL VLVS 316SS BALL & TRIM, TFE SEAT & SEAL FBO	700	4 EA	8	288	0	0	0	0	144	432
323300.1500220	2" RUPTURE DISK ASSY F W/WN TOP & BOTTOM HOLDERS PSE-101,-104 FBO	700	4 EA	8	288	0	0	0	0	144	432
323300.1500225	2"x 1" NPS IN/OUT SAFETY CL 2 RELIEF VALVES PSV-101,-104 FBO	700	4 EA	8	288	0	0	0	0	144	432
323300.1500230	2" SCH40 S/S BW PT ROOT	700	32 EA	128	4609	0	0	0	0	2305	6914
323300.1500232	1 & 3/4" S/S BUTT & O-LET WELDS PT ROOT	700	16 EA	32	1152	0	0	0	0	576	1728
323300.1500235	2 1/2" TK CALCIUM SILICATE PIPE INSULATION	700	30 =FT	11	378	0	300	0	0	219	897
323300.1500240	0-150 PSIG 3 1/2" PRESS INDICATOR W/TRIM, SNUBBER & ISOLATION VLV PI-100,-104	700	4 EA	16	576	0	480	0	0	336	1392

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB-CONTRACT	EQUIP-MENT	OH&P / B & I	TOTAL DOLLARS
323300.1500270	2" S/S SEATON-WILSON FEMALE ZERO LK QD CPLG 818-765-8160 VINCE --WHITAKER CONTROLS NORTH HOLLYWOOD, CA	700	1 EA	2	72	0	12000	0	0	1236	13308
323300.1500275	INST SKID MTD VACUUM PUMP P-X FBO	700	1 EA	80	2881	0	0	0	0	1441	4322
323300.1500280	PNEUMATIC TEST W/INERT GAS (AR OR GN FURNISHED BY OPERATIONS)	700	1 LS	80	2881	0	0	0	0	1441	4322
323300.1500300	********** ARGON SUPPLY & COVER GAS 82XX1 THRU 82XX7 **********	700	0	0	0	0	0	0	0	0	0
323300.1500305	1"-SCH40S T304L SMLS PIPE	700	320 LFT	320	11523	0	2560	0	0	6018	20101
323300.1500310	1" 3000# T304L SW FITG 90 ELL	700	30 EA	15	540	0	600	0	0	330	1470
323300.1500313	1"x1" 3000# T304L SW FITG RDCR	700	4 EA	2	72	0	84	0	0	44	200
323300.1500314	1"x3/4" T-O-L	700	2 EA	1	36	0	180	0	0	36	252
323300.1500317	1" 3000# T304L SW FITG TEE	700	18 EA	9	324	0	378	0	0	200	902
323300.1500318	1" 300# SW ORIFICE FLG W/RO PL RO-500	700	1 EA	1	36	0	300	0	0	48	384
323300.1500319	1" 300# B & G SET (ORIFICE)	700	1 EA	1	36	0	0	0	0	18	54
323300.1500320	1" BELLOWS VLV H4-30298 ASSUME BW ENDS FBO	700	9 EA	18	648	0	0	0	0	324	972
323300.1500322	1" IPS FISHER SERIES 98H PRESSURE RELIEF VALVES PCV-401,-402 S/S BODY & INTERNALS & DIAPHRAGH	700	2 EA	4	144	0	2564	0	0	328	3036
323300.1500325	1" SCH 40 BUTT WELDS PT ROOT	700	20 EA	80	2881	0	0	0	0	1441	4322
323300.1500330	1" SCH 40 SOCK WELDS PT ROOT	700	98 EA	392	14116	0	0	0	0	7058	21174
323300.1500332	1" 3000# O-LET WELDS PT ROOT	700	2 EA	8	288	0	0	0	0	144	432
323300.1500335	SMALL BORE HGRS & SPTS	700	54 EA	216	7778	0	2700	0	0	4159	14637
323300.1500340	0-150 PSIG 3 1/2" PRESS INDICATOR W/TRIM, SNUBBER &	700	2 EA	8	288	0	240	0	0	168	696

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB-CONTRACT	EQUIP-MENT	OH&P / B & I	TOTAL DOLLARS
	ISOLATION VLV PI-300,-400										
323300.1500345	PRESS TEST	700	1 LS	64	2305	0	0	0	0	1153	3458
SUBTOTAL	MECHANICAL			3,046		0		0		61,023	
					109,667		61,838		0		232,528
	SALES TAX 7.80 %						4823		0		4823
	OH&P (ON MARKUPS ONLY)									482	482
TOTAL	COST CODE 70015			3,046		0		0		61,505	
	WBS 323300				109,667		66,661		0		237,833
	(ESCALATION 5.73% - CONTINGENCY 20.00 %)										
TOTAL WBS 323300 SSF - ARGON & VENT PIPING				3,046		0		0		61,505	
					109,667		66,661		0		237,833

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB-CONTRACT	EQUIP-MENT	OH&P / B & I	TOTAL DOLLARS
323400	SSF - ELECTRICAL/INSTRUMENTATION										
323400.16	ELECTRICAL										
323400.1610001	20A 3W FEEDER - 1/2" GRS 3 #12 THHN CONDUCTORS	700	5400 LF	698	23704	0	8880	0	0	13034	45618
323400.1610003	40A 3W FEEDER - 3/4" GRS WIT 3 #8 THHN CONDUCTORS	700	10 LF	1	34	0	21	0	0	22	77
323400.1610005	85A 3W FEEDER - 1" GRS 3 #4 THHN CONDUCTORS	700	10 LF	2	68	0	34	0	0	41	143
323400.1610038	420A 4W FEEDER - 4"PVC GRS 4 #600 MCM THHN CONDUCTORS	700	40 LF	34	1155	0	2244	0	0	1360	4759
323400.1614821	3 - 4" PVC DUCT BANK - FP INCLUDES: HAND EXC, CONC, FORM, CND, BACKFILL, STBLN	700	100 LF	168	5705	0	1385	0	0	2836	9926
323400.1622515	#2 EPR GRND 1/C CU 15KV	700	360 LF	8	272	0	601	0	0	349	1222
323400.1629215	#2 15KV TERM	700	6 EA	16	543	0	310	0	0	341	1194
323400.1632314	8' 2LAMP INDUST FLUOR FXTR	700	10 EA	22	747	0	1538	0	0	914	3199
323400.1632324	8' 2LAMP INDUST FLUOR FXTR W/EM BATTERY	700	2 EA	6	204	0	517	0	0	288	1009
323400.1632334	8' 2LAMP INDUST FLUOR FXTR W/EM BATTERY	700	7 EA	24	815	0	1896	0	0	1084	3795
323400.1633204	100W Surface MH Fixt w/Lamp	700	2 EA	2	68	0	743	0	0	324	1135
323400.1633205	175W Surface MH Fixt w/Lamp	700	16 EA	17	577	0	5944	0	0	2608	9129
323400.1635051	EXIT LIGHT UNIVERSAL MT	700	6 EA	7	238	0	1088	0	0	530	1856
323400.1635103	EMERGENCY BATTERY UNITS BATTERY & 2 HEAD	700	9 EA	12	408	0	1439	0	0	739	2586
323400.1636001	SP Sw W/Box SpecGr MTLPlt	700	3 EA	2	68	0	35	0	0	41	144
323400.1636003	3W Sw W/Box SpecGr MtlPlt	700	2 EA	1	34	0	25	0	0	24	83
323400.1636203	ELECTRICALLY HELD LTG CONT	700	2 EA	7	238	0	658	0	0	358	1254
323400.1637001	DupIvy SpecRecp20A W/Box&Plt	700	22 EA	12	408	0	226	0	0	254	888
323400.1637013	WP SpecRecp20A W/Box&Plt GFI	700	5 EA	4	136	0	147	0	0	113	396
323400.1641001	FEEDER - 1/2" GRS W/ CONDUCTORS	700	1500 LF	194	6588	0	2467	0	0	3622	12677
323400.1641311	INTERIOR TELEPHONE JACK W/BOX & PLATE	700	4 EA	2	68	0	37	0	0	42	147
323400.1641504	PAGING SPEAKER	700	5 EA	4	136	0	585	0	0	288	1009
323400.1641506	EVACUATION ALARM HORN	700	3 EA	8	272	0	796	0	0	427	1495
323400.1642001	FEEDER - 1/2" GRS W/ CONDUCTORS	700	2000 LF	258	8762	0	3289	0	0	4820	16871
323400.1642015	FA CONSOLE W/ POWER SUPPLY & BATT. PACK 30 ZONE	700	1 EA	31	1053	0	6097	0	0	2860	10010
323400.1642020	RADIO TRANSMITTER/ANTENNA & INTERFACE 8 ZONE	700	1 EA	16	543	0	5200	0	0	2297	8040

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB-CONTRACT	EQUIP-MENT	OH&P / B & I	TOTAL DOLLARS
	F.A. MASTER BOX										
323400.1642023	F.A. LOCATOR LIGHT W/CONDUIT & WIRE	700	1 EA	2	68	0	92	0	0	64	224
323400.1642030	MANUAL FIRE ALARM STATION	700	1 EA	1	34	0	65	0	0	40	139
323400.1642033	FIRE ALARM GONG	700	5 EA	7	238	0	975	0	0	485	1698
323400.1642037	LINEAR BEAM SMOKE DETECTOR PB-2400	700	12 EA	31	1053	0	19796	0	0	8340	29189
323400.1644017	#1/0 Bare Cu Strd	700	40 LF	1	34	0	37	0	0	28	99
323400.1644040	GROUND PLATE	700	1 EA	1	34	0	10	0	0	18	62
323400.1644043	CONNECT TO BLDG STEEL	700	1 EA	3	102	0	13	0	0	46	161
323400.1644072	5/8" Grnd Rod Clamp	700	2 EA	0	0	0	4	0	0	2	6
323400.1647301	3 KW 1Ph UnitHtr	700	1 EA	2	68	0	279	0	0	139	486
323400.1661141	30/3 HD Fu/SN 600V N1 SW	700	4 EA	5	170	0	629	0	0	320	1119
323400.1661142	60/3 HD Fu/SN 600V N1 SW	700	4 EA	5	170	0	728	0	0	359	1257
323400.1661151	30/3 HD Fu/SN 600V N3R SW	700	1 EA	1	34	0	265	0	0	120	419
323400.1662110	60A MB PANELBOARD 1 PHASE 240V W/8 EA- 1P C.B.	700	1 EA	14	475	0	675	0	0	460	1610
323400.1662717	PANELBOARD 480V MCB 3PH NEMA 1 400A 42P	700	1 EA	31	1053	0	4756	0	0	2324	8133
323400.1662728	HVAC MCC	700	1 EA	42	1426	0	6500	0	0	3170	11096
323400.1664010	15 KVA Xfmr 480-240/1	700	1 EA	6	204	0	738	0	0	377	1319
323400.1664603	XFMR - 5KV or 15KV W/TAPS 277/480V SECONDARY, 3PH 4W SILICON FILLED PAD MOUNTED 300 KVA (Means)	700	1 EA	57	1936	0	21450	0	0	9354	32740
323400.1668701	480V 0-10 HP MOTOR CONNECTION	700	6 EA	14	475	0	82	0	0	223	780
323400.1668703	480V 20-25 HP MOTOR CONNECTION	700	4 EA	12	408	0	120	0	0	211	739
323400.1668706	MANUAL HVAC SHUT DOWN SW'S	700	2 EA	21	713	0	650	0	0	545	1908
323400.1668801	480V 0-10 HP MOTOR FEEDER, (0.75"GRS W/#12)	700	450 LF	52	1766	0	730	0	0	998	3494
323400.1668803	480V 20-25 HP MOTOR FEEDER, (1.00"GRS W/# 8)	700	600 LF	79	2683	0	1466	0	0	1660	5809
323400.1668841	480V 0-10 HP MOTOR FEEDER, (0.75"GRS PVC W/#12)	700	20 LF	3	102	0	63	0	0	66	231
323400.1683402	HEAT PANELBOARD 480V MCB 3PH NEMA 1 400A 20 EA 2P40	700	1 EA	35	1189	0	4151	0	0	2136	7476
323400.1683404	40A 3W FEEDER - 3/4" GRS WIT 3 #8 THHN CONDUCTORS	700	200 LF	28	951	0	317	0	0	507	1775

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB-CONTRACT	EQUIP-MENT	OH&P / B & I	TOTAL DOLLARS
323400.1683501	HEAT TRACE FEEDER W/CONDUCTORS	700	6150 LF	756	25674	0	7964	0	0	13455	47093
323400.1683517	HEAT TRACE TC W/COND & WIRE	700	47 EA	705	23942	0	17720	0	0	16665	58327
323400.1683518	HEAT TRACE CONTROLLER USED CHROMALOX	700	1 EA	50	1698	0	24250	0	0	10379	36327
323400.1683520	HEAT TRACE 480V, POWER KIT/END KIT	700	47 EA	56	1902	0	3478	0	0	2152	7532
323400.1683522	HEAT TRACE 480V, 8 WATTS PER L.F.	700	360 LF	36	1223	0	3240	0	0	1785	6248
323400.1683524	HEAT TRACE VALVE 480V, 8 WATTS PER L.F.	700	18 EA	7	238	0	486	0	0	290	1014
323400.1683525	HEAT TRACE VALVE BONNET 480V, 8 WATTS PER L.F.	700	18 EA	7	238	0	486	0	0	290	1014
323400.1683601	HEAT BLANKET FEEDER W/CONDUCTORS	700	19200 LF	2552	86666	0	24864	0	0	44612	156142
323400.1683620	TANK HEAT 480V, POWER USED CHROMALOX BLANKET W/ BUILT-IN TYPE K TC	700	4 EA	128	4347	0	19200	0	0	9419	32966
323400.1683621	TANK HEAT CONTROLLER USED CHROMALOX	700	4 EA	160	5434	0	77600	0	0	33214	116248
323400.1684301	INSTRUMENTS CND W/CONDUCTORS	700	1200 LF	159	5400	0	1554	0	0	2782	9736
323400.1684400	PRESSURE TRANSMITTER	700	4 EA	28	951	0	7200	0	0	3260	11411
323400.1684402	PRESSURE SENSOR	700	4 EA	28	951	0	7200	0	0	3260	11411
323400.1684449	FEEDER - 1/2" GRS W/ CONDUCTORS	700	200 LF	20	679	0	253	0	0	373	1305
323400.1684500	OXYGEN MONITOR	700	2 EA	64	2173	0	16000	0	0	7269	25442
323400.1684600	THERMOCOUPLE TREE 24'	700	3 EA	48	1630	0	102000	0	0	41452	145082
323400.1684602	THERMOCOUPLE TREE 20'	700	1 EA	16	543	0	30000	0	0	12217	42760
323400.1684702	PLC CONTROL SYSTEM (SOFTWARE DEVELOPMENT FOR PLC SYSTEM BY OPNS)	700	1 EA	24	815	0	20000	0	0	8326	29141
323400.1684710	CRAFT SUPPORT FOR ATP/OTP	700	1 LS	400	13584	0	0	0	0	5434	19018
SUBTOTAL	ELECTRICAL			7,253	246,318	0	474,288	0	0	288,242	1,008,848
	SALES TAX 7.80 %						36994		0		36994
	OH&P (ON MARKUPS ONLY)									14797	14797
TOTAL	COST CODE 70016 WBS 323400			7,253	246,318	0	511,282	0	0	303,039	1,060,640

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB-CONTRACT	EQUIP-MENT	OH&P / B & I	TOTAL DOLLARS
	(ESCALATION 5.73% - CONTINGENCY 20.00 %)										
TOTAL WBS 323400 SSF - ELECTRICAL/INSTRUMENTATION				7,253		0		0		303,039	
					246,318		511,282		0		1,060,640

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB-CONTRACT	EQUIP-MENT	OH&P / B & I	TOTAL DOLLARS
323900	SSF - TANK INSULATION										
323900.15	MECHANICAL	700	0	0	0	0	0	0	0	0	0
323900.1590000	********** VESSEL INSULATION **********										
323900.1590002	4" TK CALCIUM SILICATE INSU ON 18'DIA VESSEL HEADS W/FIBERGLASS CLOTH COVER	700	911 SFT	0	0	0	0	43619	0	4362	47981
323900.1590005	4" TK CALCIUM SILICATE INSUL ON 18'DIA SHELL (23.5'T/T) W/FIBERGLASS CLOTH COVER	700	1378 SFT	0	0	0	0	33444	0	3344	36788
323900.1590010	4" CALCIUM SILICATE INSUL W/FIBERGLASS CLOTH COVER ON 28' DIA VESSEL HEADS 3 TKS	700	6447 SFT	0	0	0	0	308682	0	30868	339550
323900.1590015	4" CALCIUM SLICATE INSULTN ON 28'VESSEL SHELL (8.0 T/T)	700	2161 SFT	0	0	0	0	52447	0	5245	57692
323900.1590020	4" CALCIUM SILICATE INSULTN ON 28' DIA SKIRTS (9.5' T/F) INSIDE & OUTSIDE	700	5015 SFT	0	0	0	0	121714	0	12171	133885
323900.1590025	25% QUANTITY DISCOUNT ON INSULATION S/C	700	1 LS	0	0	0	0	-139976	0	-13998	-153974
SUBTOTAL	MECHANICAL			0	0	0	0	419,930	0	41,992	461,922
TOTAL	COST CODE 70015 WBS 323900 (ESCALATION 5.73% - CONTINGENCY 20.00 %)			0	0	0	0	419,930	0	41,992	461,922
TOTAL WBS 323900 SSF - TANK INSULATION				0	0	0	0	419,930	0	41,992	461,922

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB-CONTRACT	EQUIP-MENT	OH&P / B & I	TOTAL DOLLARS
329000	CONSTRUCTION MANAGEMENT										
329000.00	TECHNICAL SERVICES										
329000.0000000	PROJECT MANAGEMENT BID PACKAGE 1 @ $25K 1 @ $15K	700	1 LS	0	0	0	0	40000	0	0	40000
329000.0000005	PROJECT MANAGEMENT 11%CONTRACT MANAGEMENT ADMIN 4%PROJ MGMT & PLAN'G SPT	700	1 LS	0	0	0	0	810000	0	0	810000
329000.0000010	PROJECT MANAGEMENT G & A RATE $95K + 6.4% x 4.4 MM	700	1 LS	0	0	0	0	376600	0	0	376600
SUBTOTAL	TECHNICAL SERVICES			0	0	0	0	1,226,600	0	0	1,226,600
TOTAL	COST CODE 70000 WBS 329000 (ESCALATION 5.73% - CONTINGENCY 20.00 %)			0	0	0	0	1,226,600	0	0	1,226,600
TOTAL WBS 329000 CONSTRUCTION MANAGEMENT				0	0	0	0	1,226,600	0	0	1,226,600

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB-CONTRACT	EQUIP-MENT	OH&P / B & I	TOTAL DOLLARS
330000	OPERATING CONTRACTOR FURNISHED MATL										
330000.15	MECHANICAL										
330000.1500010	ISOLATION & SAFETY RELIEF VALVES, RUPTURE DISKS & HOLDERS, TANKS, LEVEL PROBES & VAC PUMP	700	0 LS	0	0	0	0	0	0	0	0
330000.1500011	FURNISHED AT NO COST BY OPNS	700	0 LS	0	0	0	0	0	0	0	0
SUBTOTAL	MECHANICAL			0	0	0	0	0	0	0	0
TOTAL	COST CODE 70015			0	0	0	0	0	0	0	0
	WBS 330000										
	(ESCALATION 5.73% - CONTINGENCY 20.00 %)										
TOTAL WBS 330000 OPERATING CONTRACTOR FURNISHED MATL				0	0	0	0	0	0	0	0

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB-CONTRACT	EQUIP-MENT	OH&P / B & I	TOTAL DOLLARS
400000	PROJECT INTEGRATION										
400000.00	TECHNICAL SERVICES										
400000.0000000	PROJECT INTEGRATION	000	1 LS	0	0	0	0	170063	0	0	170063
	PROJ MGMT 2500HR $121,025										
	LINE MGMT 728 35,242										
	SECTY SPT 728 13,796										
SUBTOTAL	TECHNICAL SERVICES			0	0	0	0	170,063	0	0	170,063
TOTAL	COST CODE 00000			0	0	0	0	170,063	0	0	170,063
	WBS 400000										
	(ESCALATION 5.23% - CONTINGENCY 20.00 %)										
TOTAL WBS 400000 PROJECT INTEGRATION				0	0	0	0	170,063	0	0	170,063

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB-CONTRACT	EQUIP-MENT	OH&P / B & I	TOTAL DOLLARS
500000	OTHER PROJECT COST --- EXCLUDED										
500000.00	TECHNICAL SERVICES										
500000.0000000	OTHER PROJECT COST COST DATA NOT AVAILABLE FROM CUSTOMER - EXCLUDE ALL OPC's LISTED IN RLID 5700.3-8.2-1	900	1 LS	0	0	0	0	0	0	0	0
SUBTOTAL	TECHNICAL SERVICES			0	0	0	0	0	0	0	0
TOTAL	COST CODE 90000 WBS 500000 (ESCALATION 5.73% - CONTINGENCY 20.00 %)			0	0	0	0	0	0	0	0
TOTAL WBS 500000 OTHER PROJECT COST --- EXCLUDED				0	0	0	0	0	0	0	0

ACCOUNT NUMBER	DESCRIPTION	COST CODE	QUANTITY	MANHOURS	LABOR	EQUIP USAGE	MATERIAL	SUB-CONTRACT	EQUIP-MENT	OH&P / B & I	TOTAL DOLLARS
REPORT TOTAL				45,433	1,476,090	2,450	1,433,920	3,899,071	0	1,387,224	8,198,757

KAISER ENGINEERS
HANFORD

ESCALATION ANALYSIS SCHEDULE

PROJECT NO./WORK ORDER NO. F03I/ER4673

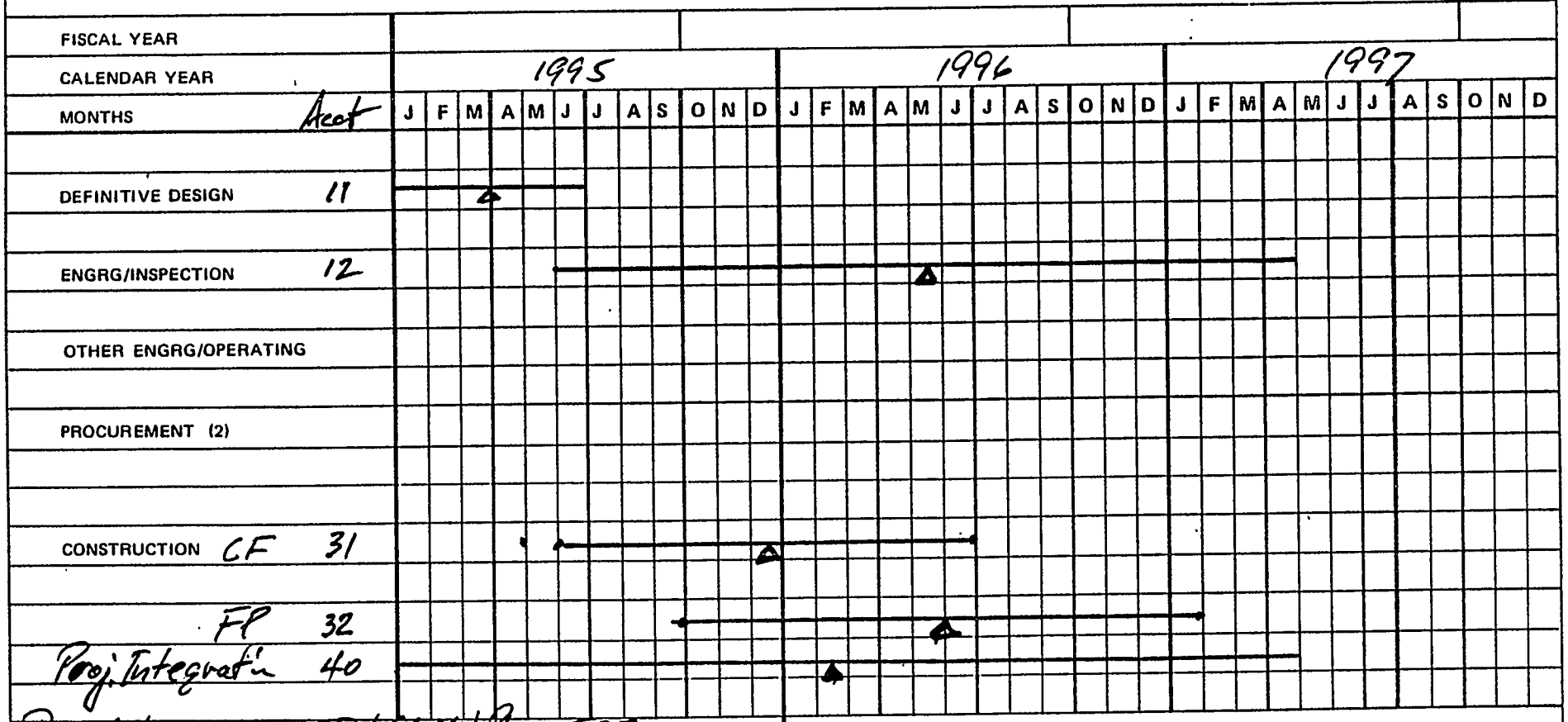
TITLE FFTF Sodium Storage Fac

PREPARED BY Hank R. DATE 10-13-94

REQUESTED BY _____

APPROVED BY _____ DATE _____

Tasks are shown as forecasted work and do not represent approved schedules nor manpower assignments.



Proj. Integration 15 Feb 96 Mid Pt = 5.23

ENGINEERING ESCALATION

DD 1 Apr '95 Mid Point = 1.88% (App. H)

EI 15 May '96 Mid Point = 6.29%

(1) CONSTRUCTION AND PROCUREMENT ESCALATION

CF 15 Dec '95 Mid Point = 3.98% (App H)

FP 1 Jun '96 Mid Point = 5.73%

KEH-291 (6-82)

(1) To be provided by Estimating Department.

(2) May/May Not be required to be broken out separately

APPENDIX H
BY PERCENT

ENGINEERING LABOR
USE FOR OCT-94

1994											0.31	0.62
1995	0.94	1.25	1.57	1.88	2.20	2.52	2.84	3.16	3.48	3.83	4.17	4.52
1996	4.87	5.23	5.58	5.93	6.29	6.64	7.00	7.36	7.72	8.06	8.41	8.76
1997	9.10	9.45	9.80	10.15	10.50	10.86	11.21	11.57	11.92	12.27	12.62	12.97
1998	13.32	13.67	14.03	14.38	14.74	15.10	15.46	15.81	16.18	16.60	17.03	17.46
1999	17.89	18.33	18.76	19.20	19.63	20.07	20.52	20.96	21.40	21.83	22.26	22.69
2000	23.12	23.55	23.99	24.42	24.86	25.30	25.74	26.18	26.62	27.07	27.51	27.96
2001	28.41	28.86	29.32	29.77	30.23	30.69	31.14	31.61	32.07			

APPENDIX G

BY PERCENT

COMPOSITE LABOR & MATERIAL
USE FOR OCT-94

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1994											0.28	0.56
1995	0.84	1.12	1.40	1.69	1.97	2.25	2.54	2.83	3.11	3.40	3.69	3.98
1996	4.27	4.56	4.85	5.14	5.44	5.73	6.03	6.32	6.62	6.92	7.21	7.51
1997	7.81	8.11	8.42	8.72	9.02	9.33	9.63	9.94	10.24	10.58	10.91	11.25
1998	11.59	11.93	12.26	12.60	12.95	13.29	13.63	13.98	14.32	14.65	14.98	15.31
1999	15.64	15.97	16.31	16.64	16.97	17.31	17.65	17.99	18.32	18.65	18.98	19.32
2000	19.65	19.98	20.32	20.65	20.99	21.33	21.67	22.01	22.35	22.66	23.00	23.34
2001	23.66	23.97	24.29	24.61	24.92	25.24	25.56	25.88	26.20			

VENDOR INFORMATION SHEET

VENDOR - LIBERTY SUPPLY

ADDRESS - PASCO

PHONE - 586-1166

PERSON - GEE

ITEM	QUANTITY	DESCRIPTION	UNIT PRICE	TOTAL PRICE
1	AR	T304L SMLS PIPE		
		1" S40S	6.27	
		2" S40S	12.40	
		6" ERW S10S	84.77	
2	AR	T304L ERW FITGS		
		6" 90	95.40	
		6" TEE	164.30	
		6" CAP	42.40	
		10" CAP	100.70	
		+30% MIMIMUM FOR SMLS		
3		3000# T304L SW FITGS		
		1" 90	16.78	
		2"	60.66	
		1" TEE	20.29	
		2"	83.30	
		2" RDCR	25.35	
4		T304L FS O-LETS		
		2"	ABT 130	
		1"	ABT 90	

VENDOR INFORMATION SHEET

VENDOR - N..F. LAMPSON

ADDRESS - PASCO

PHONE - 509-372-0661

PERSON - PAUL PARRISH

ITEM	QUANTITY	DESCRIPTION	UNIT PRICE	TOTAL PRICE
1	1LS	ORDER-OF-MAGNITUDE QUOTE TRANSPORT & SET SODIUM STORAGE TANKS SEE LETTER IN FILE		APPROX $220K
2	1LS	TRANSPORT, TEST & CERTIFY, PAINT RIGGING HARDWARE & SPREADERS FOR HORZ & VERT TANK LIFTING VIA PHONE		ABT $15K

VENDOR INFORMATION SHEET

VENDOR - CENTRAL PREMIX

ADDRESS - SPOKANE

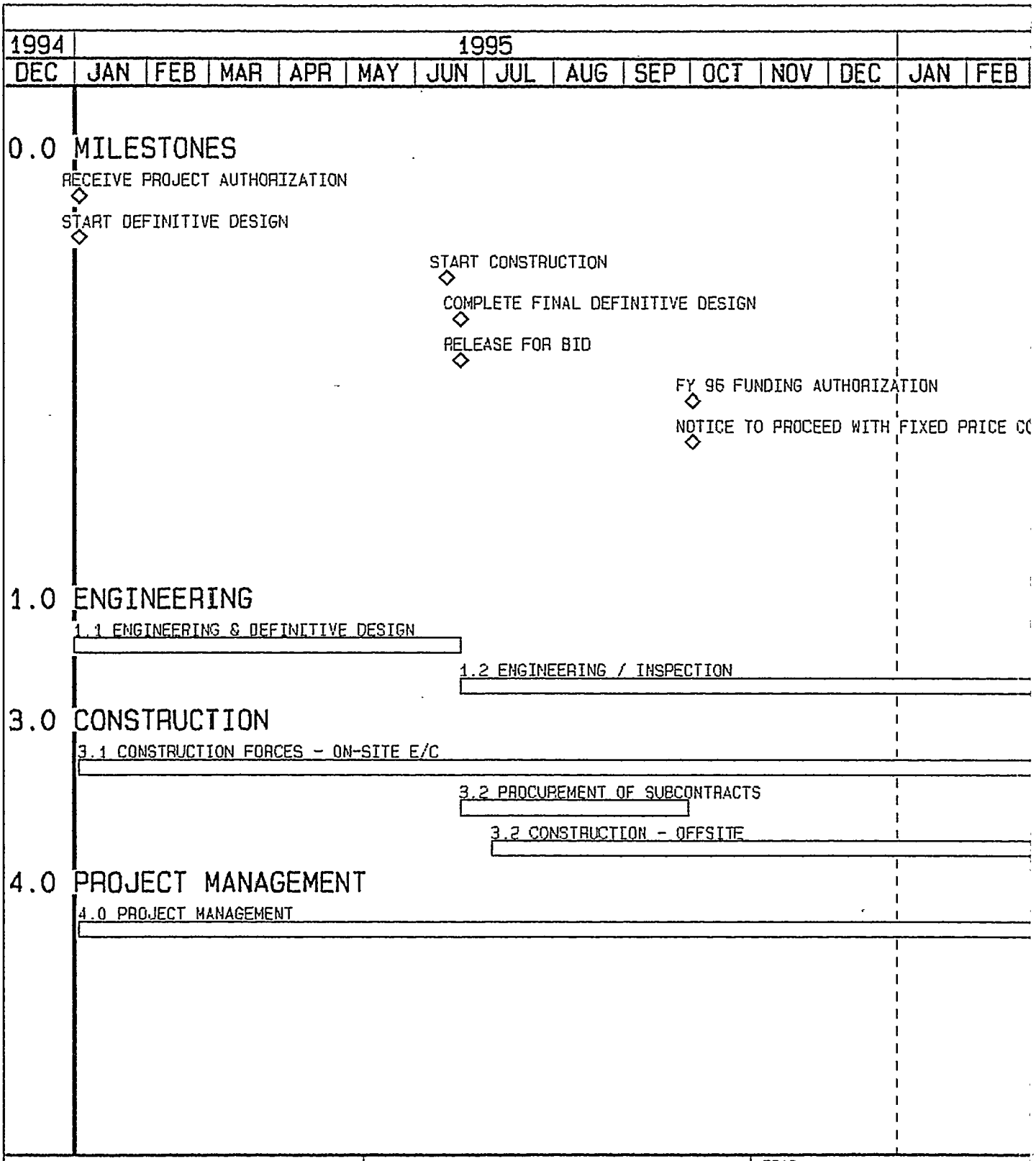
PHONE - 509-534-6221

PERSON - RON SCHLERF

ITEM	QUANTITY	DESCRIPTION	UNIT PRICE	TOTAL PRICE
1	1LS	PRE-CAST DOUBLE TEES & INVERTED BNS INSTD		$ 75K
2		CAULKING		2.00/LFT
		INCLUDES RO BLOCK-OUTS & 250 HRS CRANE		

APPENDIX D

CONCEPTUAL PROJECT SCHEDULE



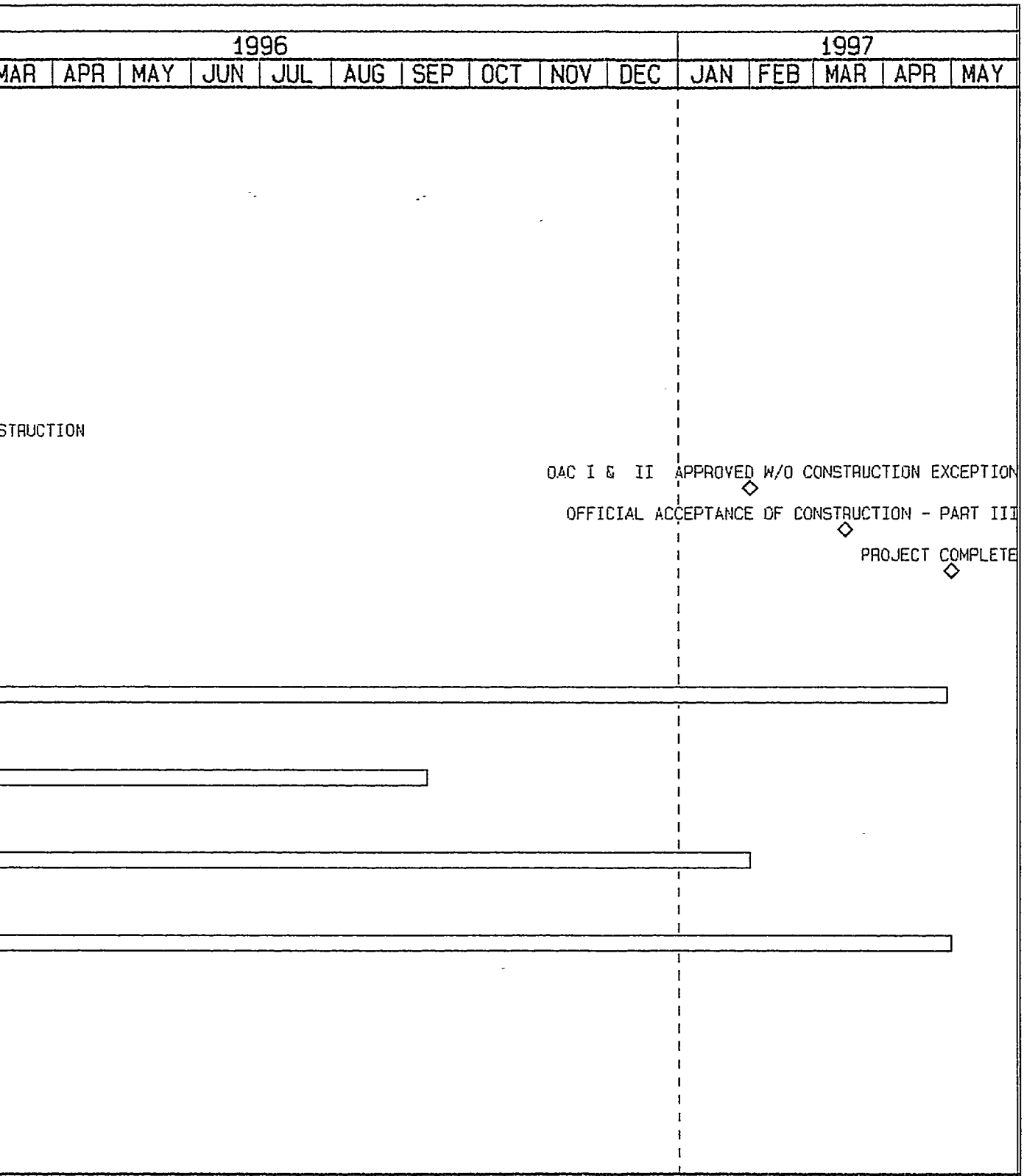
Plot Date 22DEC94
Data Date 1JAN95
Project Start 1JAN95
Project Finish 30APR97 *
D-1
(c) Primavera Systems, Inc.

Summary Bar/Early Dates
Critical Designator
Progress Bar
Milestone/Flag Activity

BJH

F316

WHC-SD-FF-
SODIUM ST
F-031 CONCEPTU



Sheet 1 of 1

CDR-006 REV. 0
ORAGE FACILITY
AL PROJ SCHED/REV.0

ICF KAISER HANFORD COMPANY

Date	Revision	Checked	Approved
	APPROVED ORIGINAL ON FILE		

APPENDIX E

OUTLINE SPECIFICATION

Appendix E
Outline Specification

DIVISION 2 - SITEWORK

Section 02050 - Demolition

1. Remove existing concrete mat foundation and embedded conduit
2. Remove Drywell No.6.
3. Relocate cathodic protection line.

Section 02200 - Earthwork

1. Compacted load bearing and non-load bearing backfill.

Section 02444 - Chain Link Fence

1. Temporary construction fencing.

Section 02700 - Piped Utilities

1. Underground roof drain piping: AWWA C900, Class 150 PVC pipe.

DIVISION 3 - CONCRETE

Section 03300 - Cast In Place Concrete

1. Concrete: F'c = 3,000 to 4,000 psi at 28 days.
2. Reinforcing steel bars: ASTM A 615, deformed, grade 60.
3. Nonshrink grout

Section 03400 - Precast Concrete

1. Precast concrete twin tee roof beams.
2. Precast concrete beams and columns.

DIVISION 5 - METALS

Section 05120 Structural Steel

1. Rolled steel shapes, plates and bars: ASTM A 36.
2. Steel tubing: ASTM A 500.
3. Steel pipe: ASTM A 53.
4. Bolts: ASTM A 325 and A 307.

Section 05400 - Cold Formed Metal Framing

1. Non-load bearing galvanized metal studs

Section 05500 - Metal Fabrications

1. Steel stairs and railing.
2. Steel ladders and cages.

Section 05300 - Metal Decking

1. Metal Decking: 24 gauge.

DIVISION 7 - THERMAL AND MOISTURE PROTECTION

Section 07200 - Insulation

1. Perlite fesco board: ASTM C 728.
2. Rigid insulation: iscocyanurate/perlite composite. Products shall meet Factory Mutual Class 1 and UL Class A ratings.
3. Fiberglass batt insulation: Flame spread less than 25 and UL listed.
4. Vinyl faced fiberglass insulation: ASTM C991, Type1 with a vapor retarder conforming to ASTM E96.

Section 07530 - Membrane Roofing

1. EPDM single-ply roof membrane: 40 mil, firestone rubbergard roofing system, fully adhered.

Section 07600 - Flashing and Sheet Metal

1. Electro galvanized metal flashing, scuppers, and downspouts.

DIVISION 8 - DOORS AND WINDOWS

Section 08100 - Hollow Metal Doors and Frames

1. Hollow metal doors: 1-3/4 thick, SDI Grade II, Level B, Model 2.

2. Pressed metal frames: 16 gauge.

Section 08345 - Overhead Coiling Doors and Operators

1. Overhead coiling doors: Overhead door Series 625.

Section 08700 - Finished Hardware

1. Exiting hardware: Von Duprin.

DIVISION 9 - FINISHES

Section 09250 - Gypsum Wallboard

1. Fire retardant board: 5/8 inch thick, type "X.

Section 09900 - Painting

1. Gloss enamel for exterior and interior metals per PDCA Architectural Manual.

DIVISION 10 - SPECIALITIES

Section 10520 - Portable Fire Extinguishers

1. Fire extinguishers: NAX, UL listed.

DIVISION 13 - SPECIAL CONSTRUCTION

Section 13120 - Pre-Engineered Metal Building Components

1. Metal siding and roof panels: Painted, 26 gauge, galvanized steel G90 coating. Roof system shall carry a UL wind uplift Class 90 rating.

2. Girts and Purlins: Galvanized or prime painted cold rolled shapes.

DIVISION 15 - MECHANICAL

Section 15024 - Process Welding

1. Welding shall be in accordance with ANSI B31.1.

2. System shall be pneumatically tested.

Section 15190 - Mechanical Identification

1. Equipment and valves shall be identified in accordance with Westinghouse-Hanford standards.

Section 15260 - Piping Insulation and Heat Tracing

1. Piping shall be heat traced with mineral insulated (MI) cable arranged in a spiral wrap.

2. Each pipe section between valves shall be provided with a separate control system.

3. Valves shall be provided with two heat trace circuits, one for the valve body and another for the valve bonnet.

4. Pipe shall be insulated with 2-1/2" of preformed calcium silicate insulation and covered with fiberglass cloth.

Section 15400 - Piping Systems

1. All piping shall comply with Westinghouse-Hanford specification HCD.

2. Pipe and piping subassemblies shall be maintained clean for liquid metal service.

Section 15481 - Inert Gas Supply

1. The inert gas supply system is GFE.

Section 15483 - Vacuum System

1. The vacuum pump shall be GFE. Vacuum piping shall comply with Westinghouse-Hanford specification HCD.

Section 15500 - Heating, Ventilating, and Air Conditioning

1. Air Handling Units - 4,000 cfm supply air flow at 1" WC ESP. Minimum of 55 KW staged heat, 480 volt, 3 phase. Filters to be 2", 35% efficient pleated filters.

2. Split System Heat Pump Units - 1.5 tons cooling condensing unit at 106°F entering condenser air temperature. 600 cfm supply air flow at 1" WC ESP. 18,000 BTUs heating with 5 KW auxiliary heat. Filters to be 2", 35% efficient pleated filters.

Section 15800 - Air Distribution

1. Unit Heaters - 3 KW electric unit heater with integral thermostat and wall mounting bracket. 480 volt, 3 phase.

2. Supply Fans - 1,000 cfm cabinet supply air fan at .5" WC ESP. Filters to be 2", 35% efficient pleated filters, 110 volt, 1 phase.

3. Relief Cowls - 8,000 cfm relief cowl with curb and backdraft damper.

4. Intake Cowls - 4,000 cfm outside ventilation air intake cowls with curbs and backdraft dampers.

5. Motorized Control Dampers - 4,000 cfm motorized return/outside ventilation air bypass dampers. Bypass damper motors to be 120 volt. Dampers to be standard leakage.

6. Relief Louvers - 1,000 cfm relief louvers at 800 fpm with backdraft dampers.

Section 15887 - HEPA Filter Housings

1. HEPA filter housing shall meet the requirements of ANSI N509 and ANSI N510.

2. HEPA filter housing shall be sized for one 12" by 12" filter train.

3. HEPA filters shall be DOP tested by Operating Contractor prior to installation.

Section 15890 - Ductwork

1. Ducting shall be 304 or 304L stainless steel to ASTM A-167 with a minimum wall thickness of 16 gauge with longitudinal seam lap or butt joint seal welded.

Section 15900 - Temperature Controls

1. Air Handling Unit - Air handling unit thermostat shall be a 2-stage heat, single-stage cool (ventilation) low voltage thermostat with an operating range of 32° to 120°F.

2. Split System Heat Pump - Thermostat shall be a heat/cool thermostat for heat pump service. Heat setting shall be 65°F and the cooling setting shall be 78°F.

3. Supply Fans - Operated by a line voltage close on rise thermostat. The thermostat shall have an operating range of 50° to 100°F.

DIVISION 16 - ELECTRICAL

Section 16110 - Raceways, Fittings, Boxes, and Supports

1. Rigid metal conduit.

2. Electrical metallic conduit.

3. NEMA 1 junction boxes.

Section 16120 - Wire Cables and Connectors

1. 600 volt conductors, copper, stranded.

Section 16140 - Wiring Devices

1. 15 amp, 125 volt, duplex receptacles.

2. 15 amp, 120 to 277 volt toggle switches.

Section 16300 - Medium Voltage Distribution

1. 15 KV cable.

2. Transformers to be oil-filled, outdoor, rated 150 KVA, 13.8 KV delta to 480Y/277 volts and have full capacity taps. Unit substations to have air-filled terminal compartments for incoming 13.8 KV and outgoing 400A lines.

Section 16440 - Disconnect Switches

1. Nonfused or fused, heavy duty, rated 600 volts, ampere ratings as required, NEMA 1 enclosures.

Section 16450 - Grounding

1. Building grounding to stem wall rebar and columns.

Section 16460 - Transformers

1. Dry Type Transformers: 480 volt delta primary to 120/240 volt secondary with full capacity taps.

Section 16470 - Panelboards, Circuit Breakers

1. Power Panelboards: Rated 277/480 volts, 3 phase, 4 wire, main breaker, 42 pole, with bolt-in breakers.

2. Convenience Panelboards: 1 phase, 3 wire, rated 120/240 volts, main breakers, 42 poles, with bolt-in breakers.

Section 16500 - Lighting

1. 277 volts with high power factor ballasts. Vaportight and corrosion resistant, as required.

   a. High intensity discharge (HID), metal halide, rated 75 or 150 watts, as required.

   b. 225 watt fluorescent.

   c. Exterior, wall-mounted flood, 250 watts HID, low-pressure sodium, photocell controlled.

   d. Wall-mounted battery packs.

   e. Exit fixtures.

Section 16720 - Fire Alarm and Detection Systems

1. Fire Alarm System: Single stroke 6-inch gongs, linear beam type smoke detectors. System to include outside indicator lights, main control panel, and control room annunciator.

2. Alarms: Extend the FFTF "PA" system to the SSF for the "Evacuation" and "take cover" alarms.

3. Oxygen Monitoring System: Units with remote sensors to analyze oxygen concentrations for a minimum of eight locations for personnel safety, alarms in the SSF, and annunciator in the FFTF control room.

Section 16750 - Telecommunications

1. Telephones: Private automatic exchange telephone system with two line switch for both intra-plant and outside calls. System complete with paging/public address speakers.

Section 16903 - Facility Control Panel Functional Description

1. Facility control panel (FCP) shall contain the temperature controls, power supplies, indicators, and alarms necessary for controlling the heating of the SSF piping and tanks.

2. Proportional temperature control and SCR power modulation shall be provided.

Section 16995 - Pressure Safety Devices

1. All pressure safety devices shall be provided as GFE.

2. All pressure safety devices shall be installed in accordance with ANSI B31.1.

APPENDIX F

ENERGY CONSERVATION REPORT AND ANALYSIS

A Energy Conservation Report was not prepared for Project F-031. Paragraph 0110-12.8.1, General of DOE 6430.1A, states that an "Energy Conversation Report" shall be developed for each building and building addition where total energy consumption is expected to exceed 500 million BTU per year or if the building is larger than 10,000 gross square feet.

The SSF is expected to consume less than the 500 million BTU per year and is less than 10,000 gross square feet.

APPENDIX G

PRELIMINARY SAFETY EVALUATION

Reference WHC-SD-FF-PSE-002, Rev. 0

APPENDIX H

ECONOMIC ANALYSIS AND LIFE CYCLE COST ANALYSIS

An Economic and Life Cycle Cost Analysis was not prepared for Project F-031. Paragraph 0110-12.7.4, the waiver of design analysis requirements of DOE 6430.1A, outlines the criteria for a design analysis waiver that will be requested for the SSF.

The Sodium Storage Facility has unique construction features due to requirements of transporting liquid sodium and the storage of frozen sodium. The HVAC system is unique to the SSF and is used only for freeze protection and forced air cooling. The only conditioned spaces are electrical equipment rooms.

The HVAC system selected will have no significant additional first cost and no significant annual maintenance costs when compared to other types of HVAC systems.

APPENDIX I

PHYSICALLY HANDICAPPED ASSESSMENT

The Functional Design Criteria for Project F-031 states that a physically handicapped assessment is not required.

APPENDIX J

PLANT FORCES WORK REVIEW

No work by the Operating Contractor is anticipated, therefore a Plant Forces Work Review is not required.

Reference: WHC-CM-6-2, PM-6, Rev. 1
Appendix PM-6-A

APPENDIX K

PROCESS DESIGN INFORMATION

Appendix K
Process Design Information

Table of Contents

HANFORD/MEIER ASSOCIATES

Sodium Storage Facility
Project No. 03-F-031

LINE INDEX

AREA: ES-F031-P-1 &2 | REV. D

LINE				^INSULATION			LINE EXTREMITIES		OPERATING		DESIGN		PNEUM ^TEST	FLUID		
SRV	SIZE	SPEC	NUMBER	TYPE	THK	TRACING	FROM	TO	TEMP DEG. F	PRES PSIG	TEMP DEG. F	PRES PSIG	PRES PSIG	SERVICE	STATE	REMARKS
Gas	2"	HCD	82XX1	Cal-Sil		Electric	PSE-104	6"-DUCT-82XX1	400	48	450	150	188	Argon	Gas	insul. to/incl. PSE
Gas	2"	HCD	82XX2	Cal-Sil		Electric	PSE-103	6"-DUCT-82XX1	400	48	450	150	188	Argon	Gas	insul. to/incl. PSE
Gas	2"	HCD	82XX3	Cal-Sil		Electric	PSE-102	6"-DUCT-82XX1	400	48	450	150	188	Argon	Gas	insul. to/incl. PSE
Gas	2"	HCD	82XX4	Cal-Sil		Electric	PSE-101	6"-DUCT-82XX1	400	48	450	150	188	Argon	Gas	insul. to/incl. PSE
Gas	6"	DUCT	82XX1	N/A			T-1,2,3,4	F-2	70	10" wc	120	10" wc	N/A	Argon	Gas	
Liquid	2"	HCD	81XX1	Cal-Sil	2-1/2"	Electric	FSF	2"-GCA-81530	400		450	150	188	Sodium	Liquid	
Liquid	2"	HCD	81XX2	Cal-Sil	2-1/2"	Electric	2"-GCA-81517	T-1,2,3,4	400		450	150	188	Sodium	Liquid	
Liquid	2"	HCD	81XX3	Cal-Sil	2-1/2"	Electric	2"-HCD-81XX2	T-1, N-1	400		450	150	188	Sodium	Liquid	
Liquid	1"	HCD	81XX4	Cal-Sil	2-1/2"	Electric	T-1, N-10	2-HCD-81XX3	400		450	150	188	Sodium	Liquid	
Liquid	2"	HCD	81XX5	Cal-Sil	2-1/2"	Electric	2"-HCD-81XX2	T-2, N-1	400		450	150	188	Sodium	Liquid	
Liquid	1"	HCD	81XX6	Cal-Sil	2-1/2"	Electric	T-2, N-10	2"-HCD-81XX5	400		450	150	188	Sodium	Liquid	
Liquid	2"	HCD	81XX7	Cal-Sil	2-1/2"	Electric	2"-HCD-81XX2	T-3, N-1	400		450	150	188	Sodium	Liquid	
Liquid	1"	HCD	81XX8	Cal-Sil	2-1/2"	Electric	T-3, N-10	2"-HCD-81XX7	400		450	150	188	Sodium	Liquid	
Liquid	2"	HCD	81XX9	Cal-Sil	2-1/2"	Electric	2"-HCD-81XX2	T-4, N-1	400		450	150	188	Sodium	Liquid	
Liquid	1"	HCD	81X10	Cal-Sil	2-1/2"	Electric	T-4,N-5	2"-HCD-81XX9	400		450	150	188	Sodium	Liquid	
Liquid	2"	HCD	81X11	Cal-Sil	2-1/2"	Electric	2"-HCD-81XX2	Blind Flange	400		450	150	188	Sodium	Liquid	
Gas	1"	HCD	82X11	N/A			1"-HCD-82444	T-1,2,3,4	70		450	150	188	Argon	Gas	
Gas	1"	HCD	82X12	N/A			2"-HCD-82X11	T-1, N3	70		450	150	188	Argon	Gas	
Gas	1"	HCD	82X13	N/A			2"-HCD-82X11	T-2, N3	70		450	150	188	Argon	Gas	
Gas	2"	HCD	82X14	N/A			2"-HCD-82X11	P-X	70		450	150	188	Argon	Gas	
Gas	1"	HCD	82X15	N/A			2"-HCD-82X11	T-3, N3	70		450	150	188	Argon	Gas	
Gas	1"	HCD	82X16	N/A			2"-HCD-82X11	T-4, N2	70		450	150	188	Argon	Gas	
Gas	1"	HCD	82X17	N/A			2"-HCD-82X11	6"-DUCT-82XX1	70		450	150	188	Argon	Gas	

HANFORD/MEIER ASSOCIATES
SODIUM STORAGE FACILITY
PROJECT NO. 03-F-031

MERRICK & COMPANY
Project No. 360-1186

EQUIPMENT LIST

TAG #	DESCRIPTION	GOVERNMENT FURNISHED	CONTRACTOR FURNISHED
F-2	HEPA FILTER		YES
T-44	SECONDARY SODIUM STORAGE VESSEL	YES	
T-1	SODIUM STORAGE TANK	YES	
T-2	SODIUM STORAGE TANK	YES	
T-3	SODIUM STORAGE TANK	YES	
T-4	SODIUM STORAGE TANK	YES	
P-X	VACUUM PUMP	YES	

HANFORD/MEIER ASSOCIATES
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MERRICK & COMPANY
Project No. 360-1186

VALVE LIST

SIZE	TAG #	DESCRIPTION	GOV. FURN.	CONTR. FURN.	SAFETY CLASS
1"	82-V-XX1	Y-pattern angle, bellows, 600#, BW, 304H/316H	YES		3
1"	82-V-XX2	Y-pattern angle, bellows, 600#, BW, 304H/316H	YES		3
1"	82-V-XX3	Y-pattern angle, bellows, 600#, BW, 304H/316H	YES		3
1"	82-V-XX4	Y-pattern angle, bellows, 600#, BW, 304H/316H	YES		3
1"X2"	PSV-101	safety relief, conv., closed bonnet, BW, SS	YES		3
1"X2"	PSV-102	safety relief, conv., closed bonnet, BW, SS	YES		3
1"X2"	PSV-103	safety relief, conv., closed bonnet, BW, SS	YES		3
1"X2"	PSV-104	safety relief, conv., closed bonnet, BW, SS	YES		3
					3
2"	81-V-XX1	Y-pattern angle, bellows, 600#, BW, 304H/316H	YES		
2"	81-V-XX3	Y-pattern angle, bellows, 600#, BW, 304H/316H	YES		
2"	81-V-XX4	Y-pattern angle, bellows, 600#, BW, 304H/316H	YES		
2"	81-V-XX5	Y-pattern angle, bellows, 600#, BW, 304H/316H	YES		3
1"	81-V-XX6	Y-pattern angle, bellows, 600#, BW, 304H/316H	YES		3
2"	81-V-XX7	Y-pattern angle, bellows, 600#, BW, 304H/316H	YES		
2"	81-V-XX8	Y-pattern angle, bellows, 600#, BW, 304H/316H	YES		3
1"	81-V-XX9	Y-pattern angle, bellows, 600#, BW, 304H/316H	YES		3
2"	81-V-X10	Y-pattern angle, bellows, 600#, BW, 304H/316H	YES		
2"	81-V-X11	Y-pattern angle, bellows, 600#, BW, 304H/316H	YES		3
1"	81-V-X12	Y-pattern angle, bellows, 600#, BW, 304H/316H	YES		3
2"	81-V-X13	Y-pattern angle, bellows, 600#, BW, 304H/316H	YES		
2"	81-V-X14	Y-pattern angle, bellows, 600#, BW, 304H/316H	YES		3
1"	81-V-X15	Y-pattern angle, bellows, 600#, BW, 304H/316H	YES		3
2"	81-V-X16	Y-pattern angle, bellows, 600#, BW, 304H/316H	YES		
1"	82-V-XX5	Y-pattern angle, bellows, 600#, BW, 304H/316H	YES		3
2"	82-V-XX6	Y-pattern angle, bellows, 600#, BW, 304H/316H	YES		3
1"	82-V-XX7	Y-pattern angle, bellows, 600#, BW, 304H/316H	YES		3
2"	82-V-XX8	Y-pattern angle, bellows, 600#, BW, 304H/316H	YES		3
1"	82-V-XX9	Y-pattern angle, bellows, 600#, BW, 304H/316H	YES		3
2"	82-V-X10	Y-pattern angle, bellows, 600#, BW, 304H/316H	YES		3
1"	82-V-X11	Y-pattern angle, bellows, 600#, BW, 304H/316H	YES		3
2"	82-V-X12	Y-pattern angle, bellows, 600#, BW, 304H/316H	YES		3
1"	82-V-X13	Y-pattern angle, bellows, 600#, BW, 304H/316H	YES		3
2"	82-V-X14	Y-pattern angle, bellows, 600#, BW, 304H/316H	YES		3
3/4"	N/A	Plug, bellows sealed, 2000#, threaded, 304/316SS	YES		3
3/4"	N/A	Plug, bellows sealed, 2000#, threaded, 304/316SS	YES		3
3/4"	N/A	Plug, bellows sealed, 2000#, threaded, 304/316SS	YES		3
3/4"	N/A	Plug, bellows sealed, 2000#, threaded, 304/316SS	YES		3

Revision D

October 3, 1994

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MEIER ASSOCIATES INC.
HANFORD - FAST FLUX TEST FACILITY
SODIUM STORAGE FACILITY

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MERRICK PROJECT NO. 360-1186
REVISION C

TAG NUMBER	SERVICE	P&ID	LOCATION	NOTES
LI -100	SODIUM STORAGE TANK LEVEL		MOVABLE	GOVERNMENT FURNISHED
LW -100	SODIUM STORAGE TANK, T-1	P-2	T-1	LEVEL SENSOR WELL
LW -101	SODIUM STORAGE TANK, T-2	P-3	T-2	LEVEL SENSOR WELL
LW -102	SODIUM STORAGE TANK, T-3	P-3	T-3	LEVEL SENSOR WELL
LW -103	SODIUM STORAGE TANK, T-4	P-3	T-4	LEVEL SENSOR WELL
PI -100	SODIUM STORAGE TANK, T-1	P-2	T-1	PRESSURE GAUGE
PI -101	SODIUM STORAGE TANK, T-2	P-3	T-2	PRESSURE GAUGE
PI -102	SODIUM STORAGE TANK, T-3	P-3	T-3	PRESSURE GAUGE
PI -103	SODIUM STORAGE TANK, T-4	P-3	T-4	PRESSURE GAUGE
PSV -101	SODIUM STORAGE TANK T-1	P-2	T-1	RELIEF VALVE
PSV -102	SODIUM STORAGE TANK T-2	P-3	T-2	RELIEF VALVE
PSV -103	SODIUM STORAGE TANK T-3	P-3	T-3	RELIEF VALVE
PSV -104	SODIUM STORAGE TANK T-4	P-3	T-4	RELIEF VALVE
PSE -101	SODIUM STORAGE TANK, T-1	P-2	T-1	RUPTURE DISK ASSEMBLY
PSH -101	PSE-101 RUPTURE DISK BURST	P-2	PSE-101	PRESSURE SWITCH
PAH -101	PSE-101 RUPTURE DISK BURST	P-2	CONTROL PNL	HIGH PRESSURE ALARM
PSE -102	SODIUM STORAGE TANK, T-2	P-3	T-2	RUPTURE DISK ASSEMBLY
PSH -102	PSE-102 RUPTURE DISK BURST	P-3	PSE-102	PRESSURE SWITCH
PAH -102	PSE-102 RUPTURE DISK BURST	P-3	CONTROL PNL	HIGH PRESSURE ALARM
PSE -103	SODIUM STORAGE TANK, T-3	P-3	T-3	RUPTURE DISK ASSEMBLY
PSH -103	PSE-103 RUPTURE DISK BURST	P-3	PSE-103	PRESSURE SWITCH
PAH -103	PSE-103 RUPTURE DISK BURST	P-3	CONTROL PNL	HIGH PRESSURE ALARM
PSE -104	SODIUM STORAGE TANK, T-4	P-3	T-4	RUPTURE DISK ASSEMBLY
PSH -104	PSE-104 RUPTURE DISK BURST	P-3	PSE-104	PRESSURE SWITCH
PAH -104	PSE-104 RUPTURE DISK BURST	P-3	CONTROL PNL	HIGH PRESSURE ALARM
PI -110	SODIUM STORAGE TANK, T-1	P-2	CONTROL PNL	
PT -110	SODIUM STORAGE TANK, T-1	P-2	T-1	
PI -111	SODIUM STORAGE TANK, T-2	P-3	CONTROL PNL	
PT -111	SODIUM STORAGE TANK, T-2	P-3	T-2	
PI -112	SODIUM STORAGE TANK, T-3	P-3	CONTROL PNL	
PT -112	SODIUM STORAGE TANK, T-3	P-3	T-3	
PI -113	SODIUM STORAGE TANK, T-4	P-3	CONTROL PNL	
PT -113	SODIUM STORAGE TANK, T-4	P-3	T-4	
PDI -201	SODIUM STORAGE TANKS PREFILTER	P-2	F-2	DIFF PRESS INDICATOR
PDI -202	TANK VENTS 1ST STAGE HEPA FILTER	P-2	F-2	DIFF PRESS INDICATOR
PDI -203	TANK VENTS 2ND STAGE HEPA FILTER	P-2	F-2	DIFF PRESS INDICATOR
PI -300	VACUUM PUMP SUCTION HEADER	P-3	HCD-XXXXX	
RO -400	ARGON BLANKET GAS SUPPLY	P-2	HCD-82XX1	3
PI -400	ARGON BLANKET GAS SUPPLY	P-2	HCD-82XX1	PRESSURE GAUGE
PCV -401	ARGON BLANKET GAS SUPPLY	P-2	HCD-82XX1	PRESSURE REGULATOR
PCV -402	ARGON BLANKET GAS SUPPLY	P-2	HCD-82XX1	BACK PRESSURE REG
RO -500	ARGON BLEED TO RELIEF HEADER	P-2	HCD-82X17	RESTRICTION ORIFICE
PSV -52619	SECONDARY SODIUM STORAGE VSL	P-2	T-44	EXISTING RELIEF VALVE
PSV -52620	SECONDARY SODIUM STORAGE VSL	P-2	T-44	EXISTING RELIEF VALVE
PSE -52645	SECONDARY SODIUM STORAGE VSL	P-2	T-44	EXISTING RUPTURE DISK

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TAG NUMBER	SERVICE	P&ID	LOCATION	NOTES
PSE -52646	SECONDARY SODIUM STORAGE VSL	P-2	T-44	EXISTING RUPTURE DISK
TW -100	TANK T-1 TEMPERATURE WELL	P-2	T-1	EXISTING THERMOWELL
TE -100A	TANK T-1 TEMP @ LEVEL = 2"	P-2	T-1	TYPE K THERMOCOUPLE
TI -100A	TANK T-1 TEMP @ LEVEL = 2"	P-2	CONTROL PNL	
TE -100B	TANK T-1 TEMP @ LEVEL = 20"	P-2	T-1	TYPE K THERMOCOUPLE
TI -100B	TANK T-1 TEMP @ LEVEL = 20"	P-2	CONTROL PNL	
TE -100C	TANK T-1 TEMP @ LEVEL = 38"	P-2	T-1	TYPE K THERMOCOUPLE
TI -100C	TANK T-1 TEMP @ LEVEL = 38"	P-2	CONTROL PNL	
TE -100D	TANK T-1 TEMP @ LEVEL = 56"	P-2	T-1	TYPE K THERMOCOUPLE
TI -100D	TANK T-1 TEMP @ LEVEL = 56"	P-2	CONTROL PNL	
TE -100E	TANK T-1 TEMP @ LEVEL = 74"	P-2	T-1	TYPE K THERMOCOUPLE
TI -100E	TANK T-1 TEMP @ LEVEL = 74"	P-2	CONTROL PNL	
TE -100F	TANK T-1 TEMP @ LEVEL = 92"	P-2	T-1	TYPE K THERMOCOUPLE
TI -100F	TANK T-1 TEMP @ LEVEL = 92"	P-2	CONTROL PNL	
TE -100G	TANK T-1 TEMP @ LEVEL = 110"	P-2	T-1	TYPE K THERMOCOUPLE
TI -100G	TANK T-1 TEMP @ LEVEL = 110"	P-2	CONTROL PNL	
TE -100H	TANK T-1 TEMP @ LEVEL = 128"	P-2	T-1	TYPE K THERMOCOUPLE
TI -100H	TANK T-1 TEMP @ LEVEL = 128"	P-2	CONTROL PNL	
TE -100I	TANK T-1 TEMP @ LEVEL = 146"	P-2	T-1	TYPE K THERMOCOUPLE
TI -100I	TANK T-1 TEMP @ LEVEL = 146"	P-2	CONTROL PNL	
TE -100J	TANK T-1 TEMP @ LEVEL = 164"	P-2	T-1	TYPE K THERMOCOUPLE
TI -100J	TANK T-1 TEMP @ LEVEL = 164"	P-2	CONTROL PNL	
TE -100K	TANK T-1 TEMP @ LEVEL = 182"	P-2	T-1	TYPE K THERMOCOUPLE
TI -100K	TANK T-1 TEMP @ LEVEL = 182"	P-2	CONTROL PNL	
TE -100L	TANK T-1 TEMP @ LEVEL = 200"	P-2	T-1	TYPE K THERMOCOUPLE
TI -100L	TANK T-1 TEMP @ LEVEL = 200"	P-2	CONTROL PNL	
TE -100M	TANK T-1 TEMP @ LEVEL = 218"	P-2	T-1	TYPE K THERMOCOUPLE
TI -100M	TANK T-1 TEMP @ LEVEL = 218"	P-2	CONTROL PNL	
TE -100N	TANK T-1 TEMP @ LEVEL = 236"	P-2	T-1	TYPE K THERMOCOUPLE
TI -100N	TANK T-1 TEMP @ LEVEL = 236"	P-2	CONTROL PNL	
TE -100O	TANK T-1 TEMP @ LEVEL = 254"	P-2	T-1	TYPE K THERMOCOUPLE
TI -100O	TANK T-1 TEMP @ LEVEL = 254"	P-2	CONTROL PNL	
TW -101	TANK T-2 TEMPERATURE WELL	P-3	T-2	EXISTING THERMOWELL
TE -101A	TANK T-2 TEMP @ LEVEL = 2"	P-3	T-2	TYPE K THERMOCOUPLE
TI -101A	TANK T-2 TEMP @ LEVEL = 2"	P-3	CONTROL PNL	
TE -101B	TANK T-2 TEMP @ LEVEL = 20"	P-3	T-2	TYPE K THERMOCOUPLE
TI -101B	TANK T-2 TEMP @ LEVEL = 20"	P-3	CONTROL PNL	
TE -101C	TANK T-2 TEMP @ LEVEL = 38"	P-3	T-2	TYPE K THERMOCOUPLE
TI -101C	TANK T-2 TEMP @ LEVEL = 38"	P-3	CONTROL PNL	
TE -101D	TANK T-2 TEMP @ LEVEL = 56"	P-3	T-2	TYPE K THERMOCOUPLE
TI -101D	TANK T-2 TEMP @ LEVEL = 56"	P-3	CONTROL PNL	
TE -101E	TANK T-2 TEMP @ LEVEL = 74"	P-3	T-2	TYPE K THERMOCOUPLE
TI -101E	TANK T-2 TEMP @ LEVEL = 74"	P-3	CONTROL PNL	
TE -101F	TANK T-2 TEMP @ LEVEL = 92"	P-3	T-2	TYPE K THERMOCOUPLE
TI -101F	TANK T-2 TEMP @ LEVEL = 92"	P-3	CONTROL PNL	
TE -101G	TANK T-2 TEMP @ LEVEL = 110"	P-3	T-2	TYPE K THERMOCOUPLE
TI -101G	TANK T-2 TEMP @ LEVEL = 110"	P-3	CONTROL PNL	
TE -101H	TANK T-2 TEMP @ LEVEL = 128"	P-3	T-2	TYPE K THERMOCOUPLE
TI -1001H	TANK T-2 TEMP @ LEVEL = 128"	P-3	CONTROL PNL	
TE -101I	TANK T-2 TEMP @ LEVEL = 146"	P-3	T-2	TYPE K THERMOCOUPLE
TI -101I	TANK T-2 TEMP @ LEVEL = 146"	P-3	CONTROL PNL	
TE -101J	TANK T-2 TEMP @ LEVEL = 164"	P-3	T-2	TYPE K THERMOCOUPLE

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TAG NUMBER	SERVICE	P&ID	LOCATION	NOTES
TI -101J	TANK T-2 TEMP @ LEVEL = 164"	P-3	CONTROL PNL	
TE -101K	TANK T-2 TEMP @ LEVEL = 182"	P-3	T-2	TYPE K THERMOCOUPLE
TI -101K	TANK T-2 TEMP @ LEVEL = 182"	P-3	CONTROL PNL	
TE -101L	TANK T-2 TEMP @ LEVEL = 200"	P-3	T-2	TYPE K THERMOCOUPLE
TI -101L	TANK T-2 TEMP @ LEVEL = 200"	P-3	CONTROL PNL	
TE -101M	TANK T-2 TEMP @ LEVEL = 218"	P-3	T-2	TYPE K THERMOCOUPLE
TI -101M	TANK T-2 TEMP @ LEVEL = 218"	P-3	CONTROL PNL	
TE -101N	TANK T-2 TEMP @ LEVEL = 236"	P-3	T-2	TYPE K THERMOCOUPLE
TI -101N	TANK T-2 TEMP @ LEVEL = 236"	P-3	CONTROL PNL	
TE -101O	TANK T-2 TEMP @ LEVEL = 254"	P-3	T-2	C/
TI -101O	TANK T-2 TEMP @ LEVEL = 254"	P-3	CONTROL PNL	
TW -102	TANK T-3 TEMPERATURE WELL	P-3	T-3	EXIXTING THERMOWELL
TE -102A	TANK T-3 TEMP @ LEVEL = 2"	P-3	T-3	TYPE K THERMOCOUPLE
TI -102A	TANK T-3 TEMP @ LEVEL = 2"	P-3	CONTROL PNL	
TE -102B	TANK T-3 TEMP @ LEVEL = 20"	P-3	T-3	TYPE K THERMOCOUPLE
TI -102B	TANK T-3 TEMP @ LEVEL = 20"	P-3	CONTROL PNL	
TE -102C	TANK T-3 TEMP @ LEVEL = 38"	P-3	T-3	TYPE K THERMOCOUPLE
TI -102C	TANK T-3 TEMP @ LEVEL = 38"	P-3	CONTROL PNL	
TE -102D	TANK T-3 TEMP @ LEVEL = 56"	P-3	T-3	TYPE K THERMOCOUPLE
TI -102D	TANK T-3 TEMP @ LEVEL = 56"	P-3	CONTROL PNL	
TE -102E	TANK T-3 TEMP @ LEVEL = 74"	P-3	T-3	TYPE K THERMOCOUPLE
TI -102E	TANK T-3 TEMP @ LEVEL = 74"	P-3	CONTROL PNL	
TE -102F	TANK T-3 TEMP @ LEVEL = 92"	P-3	T-3	TYPE K THERMOCOUPLE
TI -102F	TANK T-3 TEMP @ LEVEL = 92"	P-3	CONTROL PNL	
TE -102G	TANK T-3 TEMP @ LEVEL = 110"	P-3	T-3	TYPE K THERMOCOUPLE
TI -102G	TANK T-3 TEMP @ LEVEL = 110"	P-3	CONTROL PNL	
TE -102H	TANK T-3 TEMP @ LEVEL = 128"	P-3	T-3	TYPE K THERMOCOUPLE
TI -1002H	TANK T-3 TEMP @ LEVEL = 128"	P-3	CONTROL PNL	
TE -102I	TANK T-3 TEMP @ LEVEL = 146"	P-3	T-3	TYPE K THERMOCOUPLE
TI -102I	TANK T-3 TEMP @ LEVEL = 146"	P-3	CONTROL PNL	
TE -102J	TANK T-3 TEMP @ LEVEL = 164"	P-3	T-3	TYPE K THERMOCOUPLE
TI -102J	TANK T-3 TEMP @ LEVEL = 164"	P-3	CONTROL PNL	
TE -102K	TANK T-3 TEMP @ LEVEL = 182"	P-3	T-3	TYPE K THERMOCOUPLE
TI -102K	TANK T-3 TEMP @ LEVEL = 182"	P-3	CONTROL PNL	
TE -102L	TANK T-3 TEMP @ LEVEL = 200"	P-3	T-3	TYPE K THERMOCOUPLE
TI -102L	TANK T-3 TEMP @ LEVEL = 200"	P-3	CONTROL PNL	
TE -102M	TANK T-3 TEMP @ LEVEL = 218"	P-3	T-3	TYPE K THERMOCOUPLE
TI -102M	TANK T-3 TEMP @ LEVEL = 218"	P-3	CONTROL PNL	
TE -102N	TANK T-3 TEMP @ LEVEL = 236"	P-3	T-3	TYPE K THERMOCOUPLE
TI -102N	TANK T-3 TEMP @ LEVEL = 236"	P-3	CONTROL PNL	
TE -102O	TANK T-3 TEMP @ LEVEL = 254"	P-3	T-3	TYPE K THERMOCOUPLE
TI -102O	TANK T-3 TEMP @ LEVEL = 254"	P-3	CONTROL PNL	
TW -103	TANK T-4 TEMPERATURE WELL	P-3	T-4	EXISTING THERMOWELL
TE -103A	TANK T-4 TEMP @ LEVEL = 2"	P-3	T-4	TYPE K THERMOCOUPLE
TI -103A	TANK T-4 TEMP @ LEVEL = 2"	P-3	CONTROL PNL	
TE -103B	TANK T-4 TEMP @ LEVEL = 20"	P-3	T-4	TYPE K THERMOCOUPLE
TI -103B	TANK T-4 TEMP @ LEVEL = 20"	P-3	CONTROL PNL	
TE -103C	TANK T-4 TEMP @ LEVEL = 38"	P-3	T-4	TYPE K THERMOCOUPLE
TI -103C	TANK T-4 TEMP @ LEVEL = 38"	P-3	CONTROL PNL	
TE -103D	TANK T-4 TEMP @ LEVEL = 56"	P-3	T-4	TYPE K THERMOCOUPLE
TI -103D	TANK T-4 TEMP @ LEVEL = 56"	P-3	CONTROL PNL	

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TAG NUMBER	SERVICE	P&ID	LOCATION	NOTES
TE -103E	TANK T-4 TEMP @ LEVEL = 74"	P-3	T-4	TYPE K THERMOCOUPLE
TI -103E	TANK T-4 TEMP @ LEVEL = 74"	P-3	CONTROL PNL	
TE -103F	TANK T-4 TEMP @ LEVEL = 92"	P-3	T-4	TYPE K THERMOCOUPLE
TI -103F	TANK T-4 TEMP @ LEVEL = 92"	P-3	CONTROL PNL	
TE -103G	TANK T-4 TEMP @ LEVEL = 110"	P-3	T-4	TYPE K THERMOCOUPLE
TI -103G	TANK T-4 TEMP @ LEVEL = 110"	P-3	CONTROL PNL	
TE -103H	TANK T-4 TEMP @ LEVEL = 128"	P-3	T-4	TYPE K THERMOCOUPLE
TI -1003H	TANK T-4 TEMP @ LEVEL = 128"	P-3	CONTROL PNL	
TE -103I	TANK T-4 TEMP @ LEVEL = 146"	P-3	T-4	TYPE K THERMOCOUPLE
TI -103I	TANK T-4 TEMP @ LEVEL = 146"	P-3	CONTROL PNL	
TE -103J	TANK T-4 TEMP @ LEVEL = 164"	P-3	T-4	TYPE K THERMOCOUPLE
TI -103J	TANK T-4 TEMP @ LEVEL = 164"	P-3	CONTROL PNL	
TE -103K	TANK T-4 TEMP @ LEVEL = 182"	P-3	T-4	TYPE K THERMOCOUPLE
TI -103K	TANK T-4 TEMP @ LEVEL = 182"	P-3	CONTROL PNL	
TE -103L	TANK T-4 TEMP @ LEVEL = 200"	P-3	T-4	TYPE K THERMOCOUPLE
TI -103L	TANK T-4 TEMP @ LEVEL = 200"	P-3	CONTROL PNL	
TE -110A	TANK T-1 HEATING ZONE A	P-2	T-1	TYPE K THERMOCOUPLE
TIC -110A	TANK T-1 HEATING ZONE A	P-2	CONTROL PNL	INDICATING CONTROLLER
TY -110A	TANK T-1 HEATING ZONE A	P-2	CONTROL PNL	POWER CONTROLLER
TE -110B	TANK T-1 HEATING ZONE B	P-2	T-1	TYPE K THERMOCOUPLE
TIC -110B	TANK T-1 HEATING ZONE B	P-2	CONTROL PNL	INDICATING CONTROLLER
TY -110B	TANK T-1 HEATING ZONE B	P-2	CONTROL PNL	POWER CONTROLLER
TE -110C	TANK T-1 HEATING ZONE C	P-2	T-1	TYPE K THERMOCOUPLE
TIC -110C	TANK T-1 HEATING ZONE C	P-2	CONTROL PNL	INDICATING CONTROLLER
TY -110C	TANK T-1 HEATING ZONE C	P-2	CONTROL PNL	POWER CONTROLLER
TE -110D	TANK T-1 HEATING ZONE D	P-2	T-1	TYPE K THERMOCOUPLE
TIC -110D	TANK T-1 HEATING ZONE D	P-2	CONTROL PNL	INDICATING CONTROLLER
TY -110D	TANK T-1 HEATING ZONE D	P-2	CONTROL PNL	POWER CONTROLLER
TE -110E	TANK T-1 HEATING ZONE E	P-2	T-1	TYPE K THERMOCOUPLE
TIC -110E	TANK T-1 HEATING ZONE E	P-2	CONTROL PNL	INDICATING CONTROLLER
TY -110E	TANK T-1 HEATING ZONE E	P-2	CONTROL PNL	POWER CONTROLLER
TE -110F	TANK T-1 HEATING ZONE F	P-2	T-1	TYPE K THERMOCOUPLE
TIC -110F	TANK T-1 HEATING ZONE F	P-2	CONTROL PNL	INDICATING CONTROLLER
TY -110F	TANK T-1 HEATING ZONE F	P-2	CONTROL PNL	POWER CONTROLLER
TE -110G	TANK T-1 HEATING ZONE G	P-2	T-1	TYPE K THERMOCOUPLE
TIC -110G	TANK T-1 HEATING ZONE G	P-2	CONTROL PNL	INDICATING CONTROLLER
TY -110G	TANK T-1 HEATING ZONE G	P-2	CONTROL PNL	POWER CONTROLLER
TE -110H	TANK T-1 HEATING ZONE H	P-2	T-1	TYPE K THERMOCOUPLE
TIC -110H	TANK T-1 HEATING ZONE H	P-2	CONTROL PNL	INDICATING CONTROLLER
TY -110H	TANK T-1 HEATING ZONE H	P-2	CONTROL PNL	POWER CONTROLLER
TE -110I	TANK T-1 HEATING ZONE I	P-2	T-1	TYPE K THERMOCOUPLE
TIC -110I	TANK T-1 HEATING ZONE I	P-2	CONTROL PNL	INDICATING CONTROLLER
TY -110I	TANK T-1 HEATING ZONE I	P-2	CONTROL PNL	POWER CONTROLLER
TE -110J	TANK T-1 HEATING ZONE J	P-2	T-1	TYPE K THERMOCOUPLE
TIC -110J	TANK T-1 HEATING ZONE J	P-2	CONTROL PNL	INDICATING CONTROLLER
TY -110J	TANK T-1 HEATING ZONE J	P-2	CONTROL PNL	POWER CONTROLLER
TE -110K	TANK T-1 HEATING ZONE K	P-2	T-1	TYPE K THERMOCOUPLE
TIC -110K	TANK T-1 HEATING ZONE K	P-2	CONTROL PNL	INDICATING CONTROLLER
TY -110K	TANK T-1 HEATING ZONE K	P-2	CONTROL PNL	POWER CONTROLLER
TE -110L	TANK T-1 HEATING ZONE L	P-2	T-1	TYPE K THERMOCOUPLE
TIC -110L	TANK T-1 HEATING ZONE L	P-2	CONTROL PNL	INDICATING CONTROLLER
TY -110L	TANK T-1 HEATING ZONE L	P-2	CONTROL PNL	POWER CONTROLLER

PROJECT 03-F-031
MEIER ASSOCIATES INC.
HANFORD - FAST FLUX TEST FACILITY
SODIUM STORAGE FACILITY

INSTRUMENT INDEX
MERRICK PROJECT NO. 360-1186
REVISION C

TAG NUMBER	SERVICE	P&ID	LOCATION	NOTES
TE -111A	TANK T-2 HEATING ZONE A	P-3	T-2	TYPE K THERMOCOUPLE
TIC -111A	TANK T-2 HEATING ZONE A	P-3	CONTROL PNL	INDICATING CONTROLLER
TY -111A	TANK T-2 HEATING ZONE A	P-3	CONTROL PNL	POWER CONTROLLER
TE -111B	TANK T-2 HEATING ZONE B	P-3	T-2	TYPE K THERMOCOUPLE
TIC -111B	TANK T-2 HEATING ZONE B	P-3	CONTROL PNL	INDICATING CONTROLLER
TY -111B	TANK T-2 HEATING ZONE B	P-3	CONTROL PNL	POWER CONTROLLER
TE -111C	TANK T-2 HEATING ZONE C	P-3	T-2	TYPE K THERMOCOUPLE
TIC -111C	TANK T-2 HEATING ZONE C	P-3	CONTROL PNL	INDICATING CONTROLLER
TY -111C	TANK T-2 HEATING ZONE C	P-3	CONTROL PNL	POWER CONTROLLER
TE -111D	TANK T-2 HEATING ZONE D	P-3	T-2	TYPE K THERMOCOUPLE
TIC -111D	TANK T-2 HEATING ZONE D	P-3	CONTROL PNL	INDICATING CONTROLLER
TY -111D	TANK T-2 HEATING ZONE D	P-3	CONTROL PNL	POWER CONTROLLER
TE -111E	TANK T-2 HEATING ZONE E	P-3	T-2	TYPE K THERMOCOUPLE
TIC -111E	TANK T-2 HEATING ZONE E	P-3	CONTROL PNL	INDICATING CONTROLLER
TY -111E	TANK T-2 HEATING ZONE E	P-3	CONTROL PNL	POWER CONTROLLER
TE -111F	TANK T-2 HEATING ZONE F	P-3	T-2	TYPE K THERMOCOUPLE
TIC -111F	TANK T-2 HEATING ZONE F	P-3	CONTROL PNL	INDICATING CONTROLLER
TY -111F	TANK T-2 HEATING ZONE F	P-3	CONTROL PNL	POWER CONTROLLER
TE -111G	TANK T-2 HEATING ZONE G	P-3	T-2	TYPE K THERMOCOUPLE
TIC -111G	TANK T-2 HEATING ZONE G	P-3	CONTROL PNL	INDICATING CONTROLLER
TY -111G	TANK T-2 HEATING ZONE G	P-3	CONTROL PNL	POWER CONTROLLER
TE -111H	TANK T-2 HEATING ZONE H	P-3	T-2	TYPE K THERMOCOUPLE
TIC -111H	TANK T-2 HEATING ZONE H	P-3	CONTROL PNL	INDICATING CONTROLLER
TY -111H	TANK T-2 HEATING ZONE H	P-3	CONTROL PNL	POWER CONTROLLER
TE -111I	TANK T-2 HEATING ZONE I	P-3	T-2	TYPE K THERMOCOUPLE
TIC -111I	TANK T-2 HEATING ZONE I	P-3	CONTROL PNL	INDICATING CONTROLLER
TY -111I	TANK T-2 HEATING ZONE I	P-3	CONTROL PNL	POWER CONTROLLER
TE -111J	TANK T-2 HEATING ZONE J	P-3	T-2	TYPE K THERMOCOUPLE
TIC -111J	TANK T-2 HEATING ZONE J	P-3	CONTROL PNL	INDICATING CONTROLLER
TY -111J	TANK T-2 HEATING ZONE J	P-3	CONTROL PNL	POWER CONTROLLER
TE -111K	TANK T-2 HEATING ZONE K	P-3	T-2	TYPE K THERMOCOUPLE
TIC -111K	TANK T-2 HEATING ZONE K	P-3	CONTROL PNL	INDICATING CONTROLLER
TY -111K	TANK T-2 HEATING ZONE K	P-3	CONTROL PNL	POWER CONTROLLER
TE -111L	TANK T-2 HEATING ZONE L	P-3	T-2	TYPE K THERMOCOUPLE
TIC -111L	TANK T-2 HEATING ZONE L	P-3	CONTROL PNL	INDICATING CONTROLLER
TY -111L	TANK T-2 HEATING ZONE L	P-3	CONTROL PNL	POWER CONTROLLER
TE -112A	TANK T-3 HEATING ZONE A	P-3	T-3	TYPE K THERMOCOUPLE
TIC -112A	TANK T-3 HEATING ZONE A	P-3	CONTROL PNL	INDICATING CONTROLLER
TY -112A	TANK T-3 HEATING ZONE A	P-3	CONTROL PNL	POWER CONTROLLER
TE -112B	TANK T-3 HEATING ZONE B	P-3	T-3	TYPE K THERMOCOUPLE
TIC -112B	TANK T-3 HEATING ZONE B	P-3	CONTROL PNL	INDICATING CONTROLLER
TY -112B	TANK T-3 HEATING ZONE B	P-3	CONTROL PNL	POWER CONTROLLER
TE -112C	TANK T-3 HEATING ZONE C	P-3	T-3	TYPE K THERMOCOUPLE
TIC -112C	TANK T-3 HEATING ZONE C	P-3	CONTROL PNL	INDICATING CONTROLLER
TY -112C	TANK T-3 HEATING ZONE C	P-3	CONTROL PNL	POWER CONTROLLER
TE -112D	TANK T-3 HEATING ZONE D	P-3	T-3	TYPE K THERMOCOUPLE
TIC -112D	TANK T-3 HEATING ZONE D	P-3	CONTROL PNL	INDICATING CONTROLLER
TY -112D	TANK T-3 HEATING ZONE D	P-3	CONTROL PNL	POWER CONTROLLER
TE -112E	TANK T-3 HEATING ZONE E	P-3	T-3	TYPE K THERMOCOUPLE
TIC -112E	TANK T-3 HEATING ZONE E	P-3	CONTROL PNL	INDICATING CONTROLLER
TY -112E	TANK T-3 HEATING ZONE E	P-3	CONTROL PNL	POWER CONTROLLER

PROJECT 03-F-031
MEIER ASSOCIATES INC.
HANFORD - FAST FLUX TEST FACILITY
SODIUM STORAGE FACILITY

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MERRICK PROJECT NO. 360-1186
REVISION C

TAG NUMBER	SERVICE	P&ID	LOCATION	NOTES
TE -112F	TANK T-3 HEATING ZONE F	P-3	T-3	TYPE K THERMOCOUPLE
TIC -112F	TANK T-3 HEATING ZONE F	P-3	CONTROL PNL	INDICATING CONTROLLER
TY -112F	TANK T-3 HEATING ZONE F	P-3	CONTROL PNL	POWER CONTROLLER
TE -112G	TANK T-3 HEATING ZONE G	P-3	T-3	TYPE K THERMOCOUPLE
TIC -112G	TANK T-3 HEATING ZONE G	P-3	CONTROL PNL	INDICATING CONTROLLER
TY -112G	TANK T-3 HEATING ZONE G	P-3	CONTROL PNL	POWER CONTROLLER
TE -112H	TANK T-3 HEATING ZONE H	P-3	T-3	TYPE K THERMOCOUPLE
TIC -112H	TANK T-3 HEATING ZONE H	P-3	CONTROL PNL	INDICATING CONTROLLER
TY -112H	TANK T-3 HEATING ZONE H	P-3	CONTROL PNL	POWER CONTROLLER
TE -112I	TANK T-3 HEATING ZONE I	P-3	T-3	TYPE K THERMOCOUPLE
TIC -112I	TANK T-3 HEATING ZONE I	P-3	CONTROL PNL	INDICATING CONTROLLER
TY -112I	TANK T-3 HEATING ZONE I	P-3	CONTROL PNL	POWER CONTROLLER
TE -112J	TANK T-3 HEATING ZONE J	P-3	T-3	TYPE K THERMOCOUPLE
TIC -112J	TANK T-3 HEATING ZONE J	P-3	CONTROL PNL	INDICATING CONTROLLER
TY -112J	TANK T-3 HEATING ZONE J	P-3	CONTROL PNL	POWER CONTROLLER
TE -112K	TANK T-3 HEATING ZONE K	P-3	T-3	TYPE K THERMOCOUPLE
TIC -112K	TANK T-3 HEATING ZONE K	P-3	CONTROL PNL	INDICATING CONTROLLER
TY -112K	TANK T-3 HEATING ZONE K	P-3	CONTROL PNL	POWER CONTROLLER
TE -112L	TANK T-3 HEATING ZONE L	P-3	T-3	TYPE K THERMOCOUPLE
TIC -112L	TANK T-3 HEATING ZONE L	P-3	CONTROL PNL	INDICATING CONTROLLER
TY -112L	TANK T-3 HEATING ZONE L	P-3	CONTROL PNL	POWER CONTROLLER
TE -113A	TANK T-4 HEATING ZONE A	P-3	T-4	TYPE K THERMOCOUPLE
TIC -113A	TANK T-4 HEATING ZONE A	P-3	CONTROL PNL	INDICATING CONTROLLER
TY -113A	TANK T-4 HEATING ZONE A	P-3	CONTROL PNL	POWER CONTROLLER
TE -113B	TANK T-4 HEATING ZONE B	P-3	T-4	TYPE K THERMOCOUPLE
TIC -113B	TANK T-4 HEATING ZONE B	P-3	CONTROL PNL	INDICATING CONTROLLER
TY -113B	TANK T-4 HEATING ZONE B	P-3	CONTROL PNL	POWER CONTROLLER
TE -113C	TANK T-4 HEATING ZONE C	P-3	T-4	TYPE K THERMOCOUPLE
TIC -113C	TANK T-4 HEATING ZONE C	P-3	CONTROL PNL	INDICATING CONTROLLER
TY -113C	TANK T-4 HEATING ZONE C	P-3	CONTROL PNL	POWER CONTROLLER
TE -113D	TANK T-4 HEATING ZONE D	P-3	T-4	TYPE K THERMOCOUPLE
TIC -113D	TANK T-4 HEATING ZONE D	P-3	CONTROL PNL	INDICATING CONTROLLER
TY -113D	TANK T-4 HEATING ZONE D	P-3	CONTROL PNL	POWER CONTROLLER
TE -113E	TANK T-4 HEATING ZONE E	P-3	T-4	TYPE K THERMOCOUPLE
TIC -113E	TANK T-4 HEATING ZONE E	P-3	CONTROL PNL	INDICATING CONTROLLER
TY -113E	TANK T-4 HEATING ZONE E	P-3	CONTROL PNL	POWER CONTROLLER
TE -113F	TANK T-4 HEATING ZONE F	P-3	T-4	TYPE K THERMOCOUPLE
TIC -113F	TANK T-4 HEATING ZONE F	P-3	CONTROL PNL	INDICATING CONTROLLER
TY -113F	TANK T-4 HEATING ZONE F	P-3	CONTROL PNL	POWER CONTROLLER
TE -113G	TANK T-4 HEATING ZONE G	P-3	T-4	TYPE K THERMOCOUPLE
TIC -113G	TANK T-4 HEATING ZONE G	P-3	CONTROL PNL	INDICATING CONTROLLER
TY -113G	TANK T-4 HEATING ZONE G	P-3	CONTROL PNL	POWER CONTROLLER
TE -113H	TANK T-4 HEATING ZONE H	P-3	T-4	TYPE K THERMOCOUPLE
TIC -113H	TANK T-4 HEATING ZONE H	P-3	CONTROL PNL	INDICATING CONTROLLER
TY -113H	TANK T-4 HEATING ZONE H	P-3	CONTROL PNL	POWER CONTROLLER
TE -113I	TANK T-4 HEATING ZONE I	P-3	T-4	TYPE K THERMOCOUPLE
TIC -113I	TANK T-4 HEATING ZONE I	P-3	CONTROL PNL	INDICATING CONTROLLER
TY -113I	TANK T-4 HEATING ZONE I	P-3	CONTROL PNL	POWER CONTROLLER
TE -113J	TANK T-4 HEATING ZONE J	P-3	T-4	TYPE K THERMOCOUPLE
TIC -113J	TANK T-4 HEATING ZONE J	P-3	CONTROL PNL	INDICATING CONTROLLER
TY -113J	TANK T-4 HEATING ZONE J	P-3	CONTROL PNL	POWER CONTROLLER

PROJECT 03-F-031
MEIER ASSOCIATES INC.
HANFORD - FAST FLUX TEST FACILITY
SODIUM STORAGE FACILITY

INSTRUMENT INDEX
MERRICK PROJECT NO. 360-1186
REVISION C

TAG NUMBER	SERVICE	P&ID	LOCATION	NOTES
TE -113K	TANK T-4 HEATING ZONE K	P-3	T-4	TYPE K THERMOCOUPLE
TIC -113K	TANK T-4 HEATING ZONE K	P-3	CONTROL PNL	INDICATING CONTROLLER
TY -113K	TANK T-4 HEATING ZONE K	P-3	CONTROL PNL	POWER CONTROLLER
TE -113L	TANK T-4 HEATING ZONE L	P-3	T-4	TYPE K THERMOCOUPLE
TIC -113L	TANK T-4 HEATING ZONE L	P-3	CONTROL PNL	INDICATING CONTROLLER
TY -113L	TANK T-4 HEATING ZONE L	P-3	CONTROL PNL	POWER CONTROLLER
TE-43002	SECONDARY SODIUM STORAGE VSL	P-2	T-44	EXISTING THERMOCOUPLE
TT-43002	SECONDARY SODIUM STORAGE VSL	P-2	CONTROL PNL	EXISTING TRANSMITTER
TI-43002	SECONDARY SODIUM STORAGE VSL	P-2	CONTROL PNL	EXISTING INDICATOR

MERRICK

PRESSURE CONTROL VALVES PILOTS AND REGULATORS

DATE 9/29/94 SHEET 1 of 1
DATA SHEET # PCV1
BY RLO CHK'D

REVISION	DATE	BY

CLIENT Hanford - Fast Flux Test Facility
PROJECT Sodium Storage Facility
LOCATION Richland, Washington
CONTRACT # / TASK 360-1186

GENERAL	1	TAG NUMBER		PCV-401	PCV-402					
	2	SERVICE		Argon Blanket Gas Supply	Blanket Gas Relief Regulator					
	3	LINE NO./VESSEL NO.		1"-HCD-82XX1	1"HCD-82XX1					
	4	LINE SIZE/SCHED. NO.		1" Sch 40	1" Sch 40					
	5	FUNCTION		Press. Regulator	Back Press Reg.					
BODY	6	TYPE OF BODY		Globe	Globe					
	7	BODY SIZE	PORT SIZE	1" Reduced	1" Full					
	8	GUIDING	NO. OF PORTS	One	One					
	9	END CONN. & RATING		150# RF	150# RF					
	10	BODY MATERIAL		Stnls. Steel	Stnls. Steel					
	11	PACKING MATERIAL								
	12	LUBRICATOR	ISO. VALVE							
	13	SEAL TYPE								
	14	TRIM FORM		Quick Opening	Quick Opening					
	15	TRIM MATERIAL		SS	SS					
	16	SEAT MATERIAL		TFE	TFE					
	17	REQUIRED SEAT TIGHTNESS		Class VI	Class VI					
	18	MAX. ALLOW SOUND LEVEL dBA								
ACTUATOR/PILOT	19	TYPE OF ACTUATOR		Diaphragm	Diaphragm					
	20	PILOT								
	21	SUPPLY TO PILOT								
	22	SELF CONT.	EXT. CONN.	Yes	Yes					
	23	DIAPHRAM MATERIAL		Neoprene	Neoprene					
	24	DIAPHRAM RATING		250 PSIG	100 PSIG					
	25	SPRING RANGE		0-15 PSIG	0-15 PSIG					
	26	SET POINT		5 PSIG	7 PSIG					
	27									
ACCESS.	28	FILT. REG.	SUPPLY GAGE							
	29	LINE STRAINER								
	30	HOUSING VENT								
	31	INTERNAL RELIEF								
	32									
	33			LIQUID		STEAM				GAS SCFM
FLUID DATA	34	FLOW UNITS		Argon		Argon				
	35	FLUID		40	0.5	40	4.6			
	36	QUANT. MAX.	C_v	5	0.06					
	37	QUANT. OPER.	C_v		0.95					
	38	VALVE C_v	VALVE FL	170	165	7	7			
	39	NORM. INLET PRESS.	ΔP	200		10				
	40	MAX. INLET PRESS.		200		7				
	41	MAX. SHUT OFF	ΔP	150	80	150	80			
	42	TEMP. MAX.	OPERATING	1.38	40	1.38	40			
	43	OPER. SP. GR.	MOL. WT.							
	44	OPER. VISC.	% FLASH							
	45	% SUPERHEAT	% SOLIDS							
	46	VAPOR PRESS.	CRIT. PRESS.							
	47	PREDICTED SOUND LEVEL dBA								
	48	MANUFACTURER								
	49	MODEL NO.								

NOTES:

PRD-012

RELIEF VALVES

MERRICK

DATE 8-26-94 SHEET 1 of 2
DATA SHEET # PSV1
BY RLO CHK'D

REVISION	DATE	BY
1	9/29/94	RLO

CLIENT Hanford - Fast Flux Test Facility
PROJECT Sodium Storage Facility
LOCATION Richland, Washington
CONTRACT # / TASK 360-1186 ⚠1

			PSV-101	PSV-102	PSV-103
GENERAL	1	TAG NUMBER	Storage Tank T-1	Storage Tank T-2	Storage Tank T-3
	2	SERVICE			
	3	ACCOUNT NO.	T-1	T-2	T-3
	4	LINE NO./VESSEL NO.	Full	Full	Full
	5	FULL NOZZLE/SEMI-NOZZLE	Conventional	Conventional	Conventional
	6	CONV. BELLOWS, PILOT OPER	Closed	Closed	Closed
	7	BONNET OPEN/CLOSED	P-1	P-2	P-2 ⚠1
	8	FLOW SHEET			
CONN.	9	SIZE: INLET / OUTLET	1" / 2"	1" / 2"	1" / 2"
	10	FLANGE RATING OR SCREWED	BWE / BWE	BWE / BWE	BWE / BWE
	11	TYPE OF FACING			
MATERIALS	12	BODY	316 SS	316 SS	316 SS ⚠1
	13	SEAT AND DISC	316 SS	316 SS	316 SS
	14	RESILIENT SEAT SEAL	N/A	N/A	N/A
	15	GUIDE AND RINGS	Stnls. Steel	Stnls. Steel	Stnls. Steel
	16	SPRING	CS-CAD Plated	CS-CAD Plated	CS-CAD Plated
	17	BELLOWS	None	None	None
	18				
ACCESSORIES	19	CAP: SCREWED OR BOLTED	Screwed	Screwed	Screwed
	20	LEVER: PLAIN OR PACKED	Plain	Plain	Plain
	21	TEST GAUGE			
	22				
	23				
BASIS	24	CODE	ASME UPV	ASME UPV	ASME UPV
	25	SIZING BASIS	RO Capacity	RO Capacity	RO Capacity
	26	RELIEVES TO	HEPA Filter	HEPA Filter	HEPA Filter
	27				
FLUID DATA	28	FLUID	Argon	Argon	Argon
	29	REQUIRED CAPACITY	40 SCFM	40 SCFM	40 SCFM
	30	SP GR @ 60 °F / O.T.	1.38	1.38	1.38
	31	MOLECULAR WEIGHT	40	40	40
	32	OPER. PRESSURE, PSIG	0	0	0
	33	SET PRESSURE, PSIG	48 PSIG	48 PSIG	48 PSIG
	34	OPER. TEMPERATURE, °F	70 °F	70 °F	70 °F
	35	RELIEVING TEMPERATURE, °F	70°F	70°F	70°F
	36	BACK PRESSURE: CONSTANT, PSIG	Atmos.	Atmos.	Atmos.
	37	ADDITIONAL BUILD-UP, PSI			
	38	ALLOWABLE OVERPRESSURE, %	10%	10%	10%
	39	LATENT HEAT OF VAPOR			
	40	RATIO OF SPECIFIC HEATS	1.67	1.67	1.67
	41	VISCOSITY FACTOR			
	42	LIQUID VISCOSITY, Cp			
	43	CORROSIVE/EROSIVE DUE TO			
	44	COMPRESSIBILITY FACTOR	1.0	1.0	1.0
SELECTION	45	MAXIMUM VALVE CAPACITY	119 SCFM	119 SCFM	119 SCFM
	46	CALCULATED AREA, SQ. IN.	0.037	0.037	0.037
	47	SELECTED AREA, SQ. IN.	0.110	0.110	0.110
	48	ORIFICE DESIGNATION	D	D	D
	49				
⚠1	50	MODEL NUMBER	Note 1	Note 1	Note 1 ⚠1

⚠1 NOTES: 1. Valve is Government Furnished Equipment (GFE). ⚠1

ISD-58

RELIEF VALVES

MERRICK

DATE 9/29/94 SHEET 2 of 2
DATA SHEET # PSV1
BY RLO CHK'D

REVISION	DATE	BY

CLIENT Hanford - Fast Flux Test Facility
PROJECT Sodium Storage Facility
LOCATION Richland, Washington
CONTRACT #/ TASK 360-1186

GENERAL	1	TAG NUMBER	PSV-104		
	2	SERVICE	Storage Tank T-4		
	3	ACCOUNT NO.			
	4	LINE NO./VESSEL NO.	T-4		
	5	FULL NOZZLE/SEMI-NOZZLE	Full		
	6	CONV. BELLOWS, PILOT OPER	Conventional		
	7	BONNET OPEN/CLOSED	Closed		
	8	FLOW SHEET	P-2		
CONN.	9	SIZE: INLET / OUTLET	1" / 2"		
	10	FLANGE RATING OR SCREWED	BWE / BWE		
	11	TYPE OF FACING			
MATERIALS	12	BODY	316 SS		
	13	SEAT AND DISC	316 SS		
	14	RESILIENT SEAT SEAL	N/A		
	15	GUIDE AND RINGS	Stnls. Steel		
	16	SPRING	CS - CAD Plated		
	17	BELLOWS	None		
	18				
ACCESSORIES	19	CAP: SCREWED OR BOLTED	Screwed		
	20	LEVER: PLAIN OR PACKED	Plain		
	21	TEST GAUGE			
	22				
	23				
BASIS	24	CODE	ASME UPV		
	25	SIZING BASIS	RO Capacity		
	26	RELIEVES TO	HEPA Filter		
	27				
FLUID DATA	28	FLUID	Argon		
	29	REQUIRED CAPACITY	40 SCFM		
	30	SP GR @ 60°F / O.T.	1.38		
	31	MOLECULAR WEIGHT	40		
	32	OPER. PRESSURE, PSIG	0		
	⇒	SET PRESSURE, PSIG	48 PSIG		
	34	OPER. TEMPERATURE, °F	70°F		
	35	RELIEVING TEMPERATURE, °F	70°F		
	36	BACK PRESSURE: CONSTANT, PSIG	Atmos.		
	37	ADDITIONAL BUILD-UP, PSI			
	38	ALLOWABLE OVERPRESSURE, %	10%		
	39	LATENT HEAT OF VAPOR			
	40	RATIO OF SPECIFIC HEATS	1.67		
	41	VISCOSITY FACTOR			
	42	LIQUID VISCOSITY, Cp			
	43	CORROSIVE/EROSIVE DUE TO			
	44	COMPRESSIBILITY FACTOR	1.0		
SELECTION	45	MAXIMUM VALVE CAPACITY.	119 SCFM		
	46	CALCULATED AREA, SQ. IN.	0.037		
	47	SELECTED AREA, SQ. IN.	0.110		
	48	ORIFICE DESIGNATION	D		
	49				
	50	MODEL NUMBER	Note 1		

NOTES: 1. Valve is Government Furnished Equipment (GFE).

ISD-58

MERRICK

RUPTURE DISCS

DATA SHEET PSE1
PAGE 1 of 2
PROJECT 360-1186
ACCOUNT
DATE 8-26-94
BY RLO

CLIENT Hanford - Fast Flux Test Facility
PROJECT Sodium Storage Facility
LOCATION Richland, Washington
REVISIONS 1 9/29/94 BY RLO 2 BY 3 BY 4 BY
MANUFACTURER SOURCE: QUOTE OF

GENERAL	1	TAG NUMBER		PSE-101	PSE-102	PSE-103
	2	SERVICE		Storage Tank T-1	Storage Tank T-2	Storage Tank T-3
	3	ACCOUNT NO.				
	4	LINE NO./VESSEL NO.		T-1	T-2	T-3
	5	FLOW SHEET		P-1	P-2	P-2
	6	NUMBER REQUIRED		One	One	One
MATERIALS — DISC	7	MODEL NUMBER Type		Reverse Buckling	Reverse Buckling	Reverse Buckling
	8	SIZE		2"	2"	2"
	9	MATERIAL		304 SS	304 SS	304 SS
	10	COATING INLET | OUTLET				
	11	QUANTITY PER ASSEMBLY		Three	Three	Three
VACSUP	12	MODEL NUMBER				
	13	MATERIAL		304 SS	304 SS	304 SS
	14	QUANTITY PER ASSEMBLY				
	15	ATTACHED TO DISC		Yes	Yes	Yes
DISC HOLDER	16	ASSEMBLY NUMBER				
	17	BASE (INLET) MATERIAL		304 SS	304 SS	304 SS
	18	HOLDDOWN (OUTLET) MATERIAL		304 SS	304 SS	304 SS
	19	LINING: INLET | OUTLET				
	20	MATING FLG. RATING & FACING		2"-300# Greylok	2"-300# Greylok	2"-300# Greylok
	21	I.D. OF CONNECTING PIPING		2" Sch 40	2" Sch 40	2" Sch 40
	22	1/4" NPT TAP IN HOLDDOWN		Yes	Yes	Yes
ACCESSORIES	23	STUDS, NUTS		Yes	Yes	Yes
	24	PREASSEMBLY SCREWS		Yes	Yes	Yes
	25	EXCESS FLOW VALVE		Yes	Yes	Yes
	26	PRESSURE GAUGE				
	27	BAFFLE PLATE OR MUFFLED PLUG				
	28	JACK SCREWS				
	29	COMP. FLGS | DR & TAP FOR JK. SC.		Yes	Yes	Yes
	30	COMP. FLGS: SIZE, RATE, FCG | I.D.		2"-300#RJ | Sch 40	2"-300#RJ | Sch 40	2"-300#RJ | Sch 40
	31					
BASIS	32	CODE		ASME UPV	ASME UPV	ASME UPV
	33	BASIS OF SELECTION		RO Capacity	RO Capacity	RO Capacity
	34	PRIMARY SECONDARY RELIEF		Primary	Primary	Primary
FLUID DATA	35	FLUID		Argon	Argon	Argon
	36	REQUIRED CAPACITY		40 SCFM	40 SCFM	40 SCFM
	37	SP GR AT O.T.		1.38	1.38	1.38
	38	MOLECULAR WEIGHT		40	40	40
	39	CORROSIVE AGENTS				
	40	OPER. PRESS | TEMP °F		Vac-25 | 70-400	Vac-25 | 70-400	Vac-25 | 70-400
	41	DESIRED BURST PRESS. PSIG		48	48	48
	42	CONSTANT BACK PRESS. PSIG		Atmos.	Atmos.	Atmos.
	43	VACUUM:: OPER | MAX		0-20"Hg. | Full	0-20"Hg | Full	0-20"Hg | Full
	44	PRESS. STATIC PULSATING		Static	Static	Static
SEL.	45	CORROSION DUE TO				
	46	ESTIMATED BURST PRESS. AT 72°F				
	47	BURST PRESSURE RANGE				
	48	MODEL NUMBER		Starza P/N 2012	Starza P/N 2012	Starza P/N 2012

NOTES:
1. Rupture Disc Assembly is Government Furnished Equipment (GFE).

RUPTURE DISCS

MERRICK

DATA SHEET PSE1
PAGE 2 of 2
PROJECT 360-1186
ACCOUNT
DATE 9/29/94
BY RLD

CLIENT Hanford - Fast Flux Test Facility
PROJECT Sodium Storage Facility
LOCATION Richland, Washington
REVISIONS 1 ____ BY ____ 2 ____ BY ____ 3 ____ BY ____ 4 ____ BY ____
SOURCE: QUOTE OF
MANUFACTURER

GENERAL	1	TAG NUMBER	PSE-104		
	2	SERVICE	Storage Tank T-4		
	3	ACCOUNT NO.			
	4	LINE NO./VESSEL NO.	T-4		
	5	FLOW SHEET	P-2		
	6	NUMBER REQUIRED	One		
MATERIALS — DISC	7	~~MODEL NUMBER~~ Type	Reverse Buckling		
	8	SIZE	2"		
	9	MATERIAL	304 SS		
	10	COATING INLET / OUTLET			
	11	QUANTITY PER ASSEMBLY	Three		
VACSUP	12	MODEL NUMBER			
	13	MATERIAL	304 SS		
	14	QUANTITY PER ASSEMBLY			
	15	ATTACHED TO DISC	Yes		
DISC HOLDER	16	ASSEMBLY NUMBER			
	17	BASE (INLET) MATERIAL	304 SS		
	18	HOLDDOWN (OUTLET) MATERIAL	304 SS		
	19	LINING: INLET / OUTLET			
	20	MATING FLG. RATING & FACING	2"-300# Greylok		
	21	I.D. OF CONNECTING PIPING	2" Sch 40		
	22	1/4" NPT TAP IN HOLDDOWN	Yes		
ACCESSORIES	23	STUDS. NUTS	Yes		
	24	PREASSEMBLY SCREWS	Yes		
	25	EXCESS FLOW VALVE	Yes		
	26	PRESSURE GAUGE			
	27	BAFFLE PLATE OR MUFFLED PLUG			
	28	JACK SCREWS			
	29	COMP. FLGS / DR & TAP FOR JK. SC.	Yes		
	30	COMP. FLGS: SIZE. RATE. FCG / I.D.	2"-300# RJ Sch 40		
	31				
BASIS	32	CODE	ASME UPV		
	33	BASIS OF SELECTION	RO Capacity		
	34	PRIMARY SECONDARY RELIEF	Primary		
FLUID DATA	35	FLUID	Argon		
	36	REQUIRED CAPACITY	40 SCFM		
	37	SP GR AT O.T.	1.38		
	38	MOLECULAR WEIGHT	40		
	39	CORROSIVE AGENTS			
	40	OPER PRESS / TEMP °F	Vac-25 / 70-400		
	41	DESIRED BURST PRESS. PSIG	48		
	42	CONSTANT BACK PRESS. PSIG	Atmos		
	43	VACUUM:: OPER / MAX	0-20"Hg / Full		
	44	PRESS. STATIC PULSATING	Static		
SEL.	45	CORROSION DUE TO			
	46	ESTIMATED BURST PRESS. AT 72°F			
	47	BURST PRESSURE RANGE			
	48	MODEL NUMBER	Starza P/N 2012		

NOTES:
1. Rupture Disc Assembly is Government Furnished Equipment (GFE).

BASED ON ISA S20

FORM N-725/A03880441

MERRICK — THERMOCOUPLES

DATE 8-26-94 SHEET of
DATA SHEET # TE1
BY RLO CHK'D

REVISION	DATE	BY
1	9/29/94	RLO

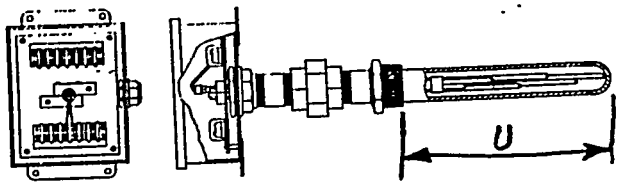
CLIENT Hanford - Fast Flux Test Facility
PROJECT Sodium Storage Facility
LOCATION Richland Washington
CONTRACT # / TASK 360-1186

1 ☒ COMPLETE ASSEMBLY ☐ OTHER
ELEMENT
2 TYPE K ☐ BEADED INSULATORS
☒ SHEATHED 1/4" O.D., MATL 316SS
☐ PKD CONN NPT, MATL
☒ FIXED ☐ ADJ
3 HOLDDOWN: ☐ STD ☐ SPG LOAD
4 NO T/C: ☐ SINGLE ☐ DUPLEX Multipoint
5 JUNCTION TYPE:
☐ EXP ☒ GROUND ☐ UNGROUND ☐ ENCLOSED

HEAD
7 ☐ SCREWED COVER OTHER Terminal Box
8 MATERIAL Aluminum CONDUIT CONN 1½"
9 NIPPLE SIZE DIM "N" ☐ UNION
WELL (Existing) By Others
10 MATERIAL: ☐ 304SS ☐ 316SS
OTHER:
11 CONSTR: ☐ TAPERED ☐ STRAIGHT ☐ RED. TIP
☐ DRILLED ☐ BUILT-UP ☐ CLSD END
12 DIMENSIONS: ☐ MFR STD O.D. I.D.
13 CONN PROCESS: To Well ☐ SCRD NPT
☐ WELD IN FOR I.D. SOCKET
FLANGE: SIZE RATING & TYPE
NOZZLE
3"-150# Greylok Fitting

6 MODEL NO.

Multicouples



REV	TAG NO.	ACCT. NO.	WELL DIM. "U"	WELL DIM. "T"	ELEM LENGTH	ISA TYPE	GAUGE	SERVICE (NOTE CORROSIVE AND EROSIVE SERVICE)	NOTES
	TE-100A-O		24'		Note 1	E	Mfg. Std.	Sodium Storage Tank T-1	1
	TE-101A-O		24'		Note 1	E	Mfg. Std.	Sodium Storage Tank T-2	1
	TE-102A-O		24'		Note 1	E	Mfg. Std.	Sodium Storage Tank T-3	1
	TE-103A-O		20'		Note 2	E	Mfg. Std.	Sodium Storage Tank T-4	2

NOTES:
1. Fifteen point multipoint thermocouple with one thermocouple at bottom and 18" spacing between each thermocouple point up to 252" above the bottom.
2. Twelve point mutipoint thermocouple w/one TC @ bottom and 18" spacing between each TC point up to 198" above the bottom.

FORM N-718a/A07880621

HANFORD/MEIER ASSOCIATES
SODIUM STORAGE FACILITY
PROJECT NO. 03-F-031

MERRICK & COMPANY
Project No. 360-1186

HEATER LIST

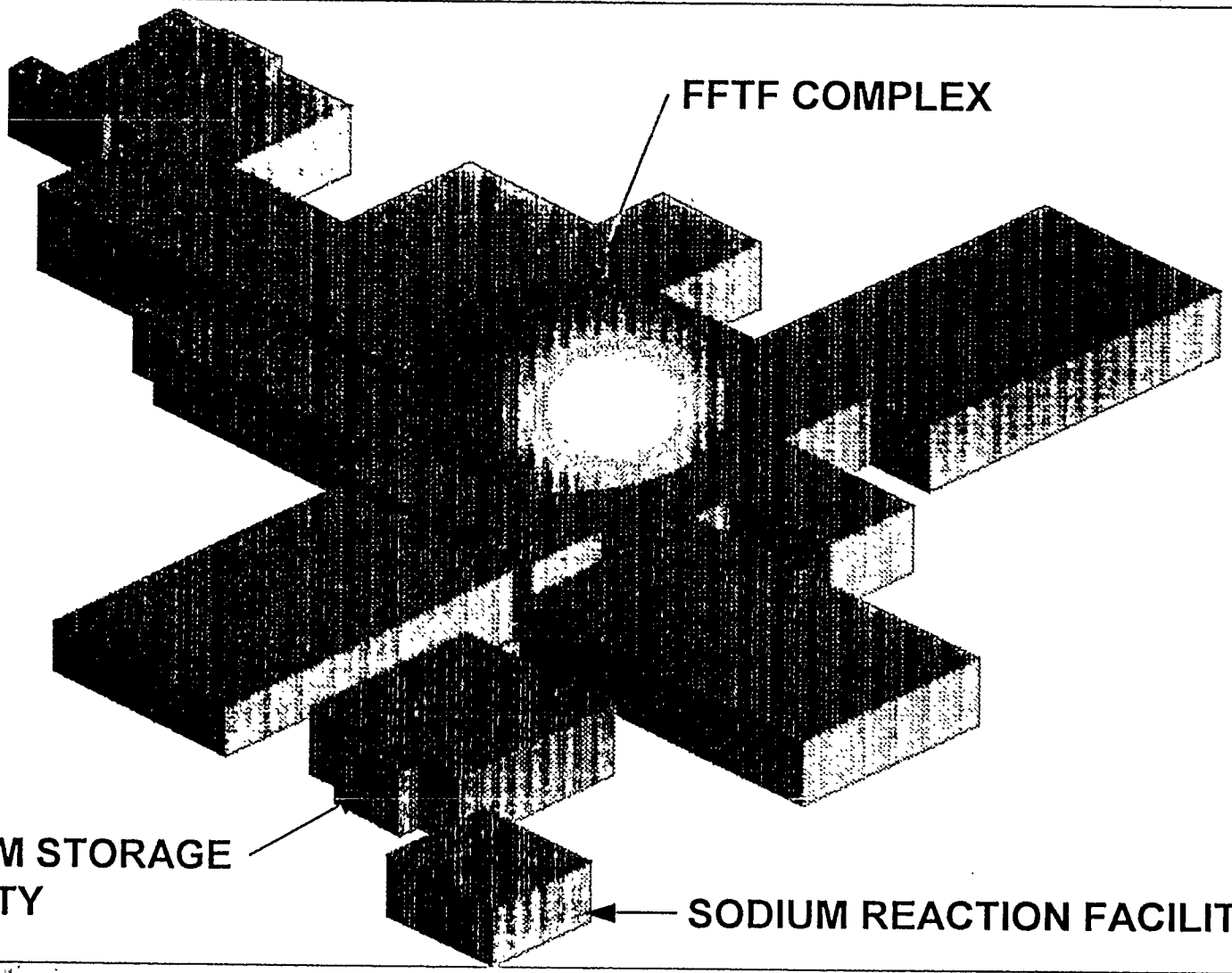
TAG #	DESCRIPTION	HEATER SIZE (KW)	HEATER TYPE
H-T1A	TANK T-1 ZONE A, BOTTOM HEAD LOWER		MI CABLE HEATER MAT
H-T1B	TANK T-1 ZONE B, BOTTOM HEAD MIDDLE		MI CABLE HEATER MAT
H-T1C	TANK T-1 ZONE C, BOTTOM HEAD UPPER		MI CABLE HEATER MAT
H-T1D	TANK T-1 ZONE D, BOTTOM 2' OF SHELL		MI CABLE HEATER MAT
H-T1E	TANK T-1 ZONE E, SECOND 2' OF SHELL		MI CABLE HEATER MAT
H-T1F	TANK T-1 ZONE F, THIRD 2' OF SHELL		MI CABLE HEATER MAT
H-T1G	TANK T-1 ZONE G, TOP 2' OF SHELL		MI CABLE HEATER MAT
H-T1H	TANK T-1 ZONE H, TOP HEAD LOWER SECTION		MI CABLE HEATER MAT
H-T2A	TANK T-2 ZONE A, BOTTOM HEAD LOWER		MI CABLE HEATER MAT
H-T2B	TANK T-2 ZONE B, BOTTOM HEAD MIDDLE		MI CABLE HEATER MAT
H-T2C	TANK T-2 ZONE C, BOTTOM HEAD UPPER		MI CABLE HEATER MAT
H-T2D	TANK T-2 ZONE D, BOTTOM 2' OF SHELL		MI CABLE HEATER MAT
H-T2E	TANK T-2 ZONE E, SECOND 2' OF SHELL		MI CABLE HEATER MAT
H-T2F	TANK T-2 ZONE F, THIRD 2' OF SHELL		MI CABLE HEATER MAT
H-T2G	TANK T-2 ZONE G, TOP 2' OF SHELL		MI CABLE HEATER MAT
H-T2H	TANK T-2 ZONE H, TOP HEAD LOWER SECTION		MI CABLE HEATER MAT
H-T3A	TANK T-3 ZONE A, BOTTOM HEAD LOWER		MI CABLE HEATER MAT
H-T3B	TANK T-3 ZONE B, BOTTOM HEAD MIDDLE		MI CABLE HEATER MAT
H-T3C	TANK T-3 ZONE C, BOTTOM HEAD UPPER		MI CABLE HEATER MAT
H-T3D	TANK T-3 ZONE D, BOTTOM 2' OF SHELL		MI CABLE HEATER MAT
H-T3E	TANK T-3 ZONE E, SECOND 2' OF SHELL		MI CABLE HEATER MAT
H-T3F	TANK T-3 ZONE F, THIRD 2' OF SHELL		MI CABLE HEATER MAT
H-T3G	TANK T-3 ZONE G, TOP 2' OF SHELL		MI CABLE HEATER MAT
H-T3H	TANK T-3 ZONE H, TOP HEAD LOWER SECTION		MI CABLE HEATER MAT
H-T4A	TANK T4 ZONE A, 0 - 2' ABOVE BOTTOM		MI CABLE HEATER MAT
H-T4B	TANK T4 ZONE B, 2'- 4' ABOVE BOTTOM		MI CABLE HEATER MAT
H-T4C	TANK T4 ZONE C, 4'- 6' ABOVE BOTTOM		MI CABLE HEATER MAT
H-T4D	TANK T4 ZONE D, 6'- 8' ABOVE BOTTOM		MI CABLE HEATER MAT
H-T4E	TANK T4 ZONE E, 8'- 10' ABOVE BOTTOM		MI CABLE HEATER MAT
H-T4F	TANK T4 ZONE F, 10'- 12' ABOVE BOTTOM		MI CABLE HEATER MAT
H-T4G	TANK T4 ZONE G, 12'- 14' ABOVE BOTTOM		MI CABLE HEATER MAT
H-T4H	TANK T4 ZONE H, 14'- 16' ABOVE BOTTOM		MI CABLE HEATER MAT
H-P81XX1	LINE 2"- HRD-81XX1		MI CABLE TRACER
H-P81XX2-A	LINE 2"- HRD-81XX2 ZONE A		MI CABLE TRACER
H-P81XX2-B	LINE 2"- HRD-81XX2 ZONE B		MI CABLE TRACER
H-P81XX2-C	LINE 2"- HRD-81XX2 ZONE C TO VALVE V-81XX3		MI CABLE TRACER
H-P81XX2-D	LINE 2"- HRD-81XX2 ZONE C TO VALVES V-81XX4,		MI CABLE TRACER
	V-81XX7, V-81X10, V-81X13		MI CABLE TRACER
H-P81XX3	LINE 2"- HCD-81XX3 TO TANK T-1		MI CABLE TRACER
H-P81XX5	LINE 2"- HCD-81XX5 TO TANK T-2		MI CABLE TRACER
H-P81XX7-A	LINE 2"- HCD-81XX7 ZONE A		MI CABLE TRACER
H-P81XX7-B	LINE 2"- HCD-81XX7 ZONE B TO TANK T-3		MI CABLE TRACER
H-P81XX9	LINE 2"- HCD-81XX9 TO TANK T-4		MI CABLE TRACER
H-P82XX1	RELIEF LINE FROM T-4 TO PSE-104		MI CABLE TRACER
H-P82XX2	RELIEF LINE FROM T-3 TO PSE-103		MI CABLE TRACER
H-P82XX3	RELIEF LINE FROM T-2 TO PSE-102		MI CABLE TRACER
H-P82XX4	RELIEF LINE FROM T-1 TO PSE-101		MI CABLE TRACER

H-V81XX1A	VALVE V-81XX1 BODY		MI CABLE TRACER
H-V81XX2A	VALVE V-81XX2 BODY		MI CABLE TRACER
H-V81XX3A	VALVE V-81XX3 BODY		MI CABLE TRACER
H-V81XX4A	VALVE V-81XX4 BODY		MI CABLE TRACER
H-V81XX5A	VALVE V-81XX5 BODY		MI CABLE TRACER
H-V81XX6A	VALVE V-81XX6 BODY		MI CABLE TRACER
H-V81XX7A	VALVE V-81XX7 BODY		MI CABLE TRACER
H-V81XX8A	VALVE V-81XX8 BODY		MI CABLE TRACER
H-V81XX9A	VALVE V-81XX9 BODY		MI CABLE TRACER
H-V81X10A	VALVE V-81X10 BODY		MI CABLE TRACER
H-V81X11A	VALVE V-81X11 BODY		MI CABLE TRACER
H-V81X12A	VALVE V-81X12 BODY		MI CABLE TRACER
H-V81X13A	VALVE V-81X13 BODY		MI CABLE TRACER
H-V81X14A	VALVE V-81X14 BODY		MI CABLE TRACER
H-V81X15A	VALVE V-81X15 BODY		MI CABLE TRACER
H-V82XX1A	VALVE V-52XX1 BODY		MI CABLE TRACER
H-V82XX2A	VALVE V-52XX2 BODY		MI CABLE TRACER
H-V82XX3A	VALVE V-52XX3 BODY		MI CABLE TRACER
H-V82XX4A	VALVE V-52XX4 BODY		MI CABLE TRACER
H-V81XX1B	VALVE V-81XX1 BONNET		MI CABLE TRACER
H-V81XX2B	VALVE V-81XX2 BONNET		MI CABLE TRACER
H-V81XX3B	VALVE V-81XX3 BONNET		MI CABLE TRACER
H-V81XX4B	VALVE V-81XX4 BONNET		MI CABLE TRACER
H-V81XX5B	VALVE V-81XX5 BONNET		MI CABLE TRACER
H-V81XX6B	VALVE V-81XX6 BONNET		MI CABLE TRACER
H-V81XX7B	VALVE V-81XX7 BONNET		MI CABLE TRACER
H-V81XX8B	VALVE V-81XX8 BONNET		MI CABLE TRACER
H-V81XX9B	VALVE V-81XX9 BONNET		MI CABLE TRACER
H-V81X10B	VALVE V-81X10 BONNET		MI CABLE TRACER
H-V81X11B	VALVE V-81X11 BONNET		MI CABLE TRACER
H-V81X12B	VALVE V-81X12 BONNET		MI CABLE TRACER
H-V81X13B	VALVE V-81X13 BONNET		MI CABLE TRACER
H-V81X14B	VALVE V-81X14 BONNET		MI CABLE TRACER
H-V81X15B	VALVE V-81X15 BONNET		MI CABLE TRACER
H-V82XX1B	VALVE V-52XX1 BONNET		MI CABLE TRACER
H-V82XX2B	VALVE V-52XX2 BONNET		MI CABLE TRACER
H-V82XX3B	VALVE V-52XX3 BONNET		MI CABLE TRACER
H-V82XX4B	VALVE V-52XX4 BONNET		MI CABLE TRACER

APPENDIX L

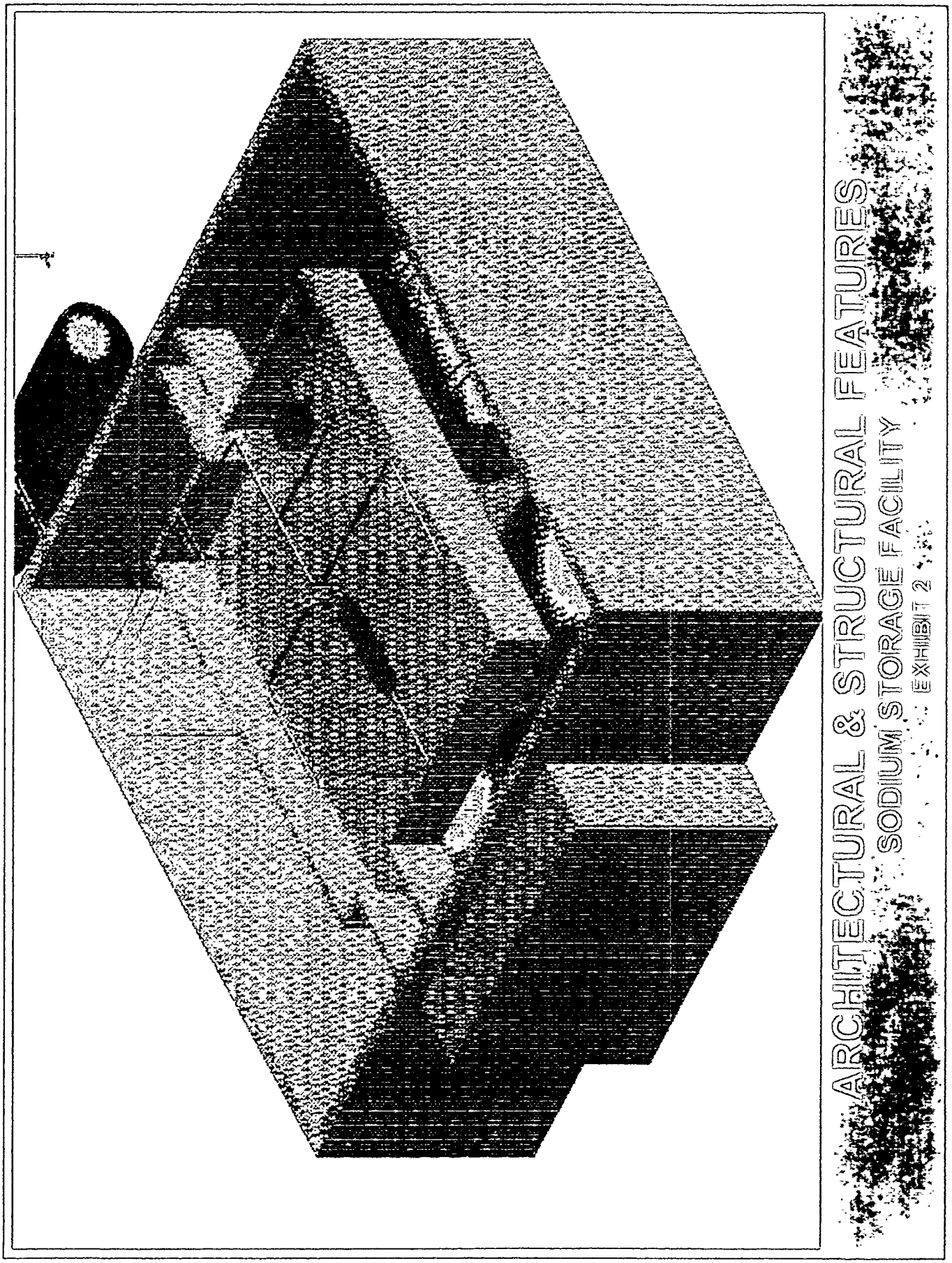
SKETCHES

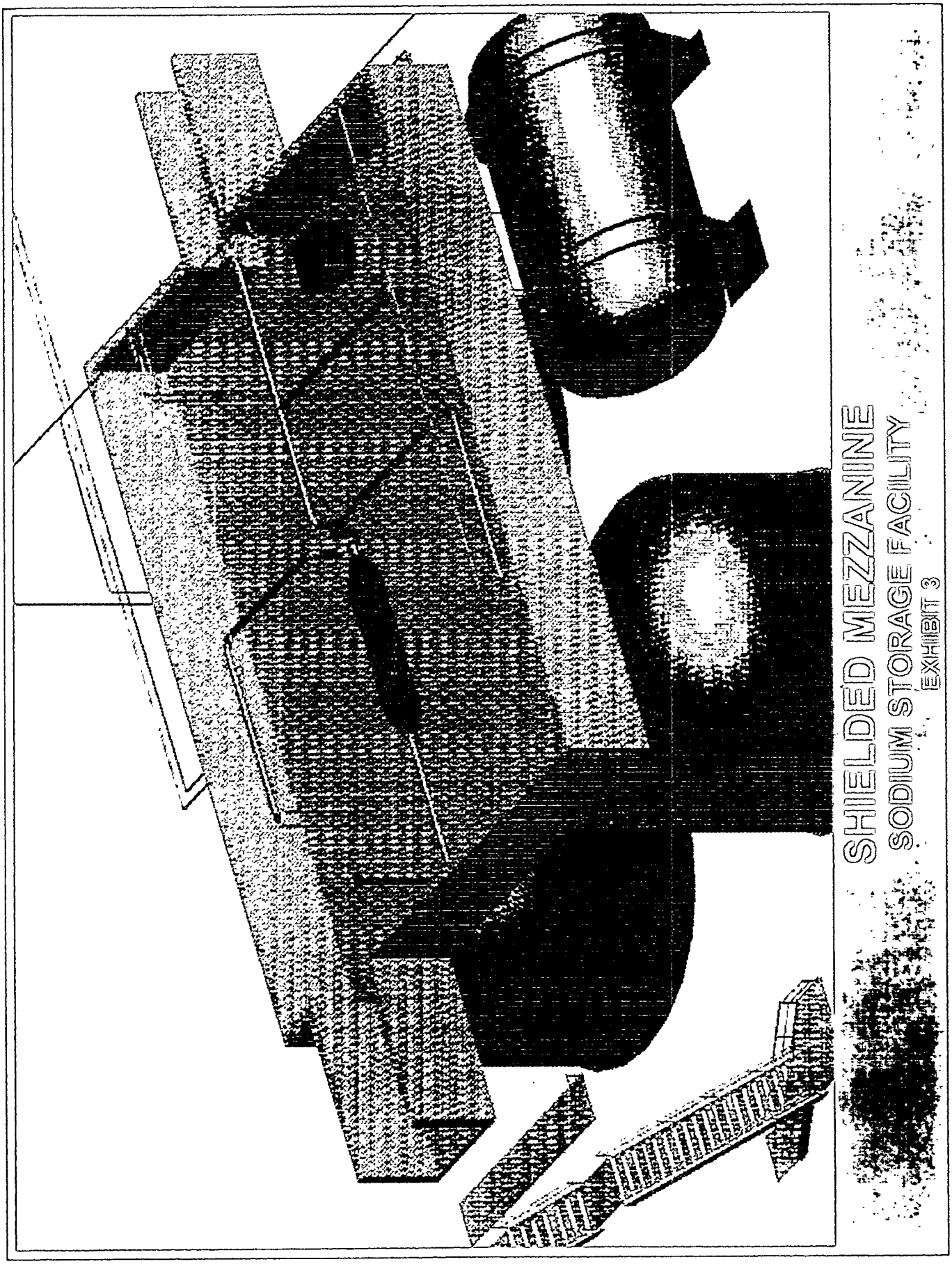
Exhibits 1 through 4 are graphic representations of the Sodium Storage Facility and its sodium storage systems.

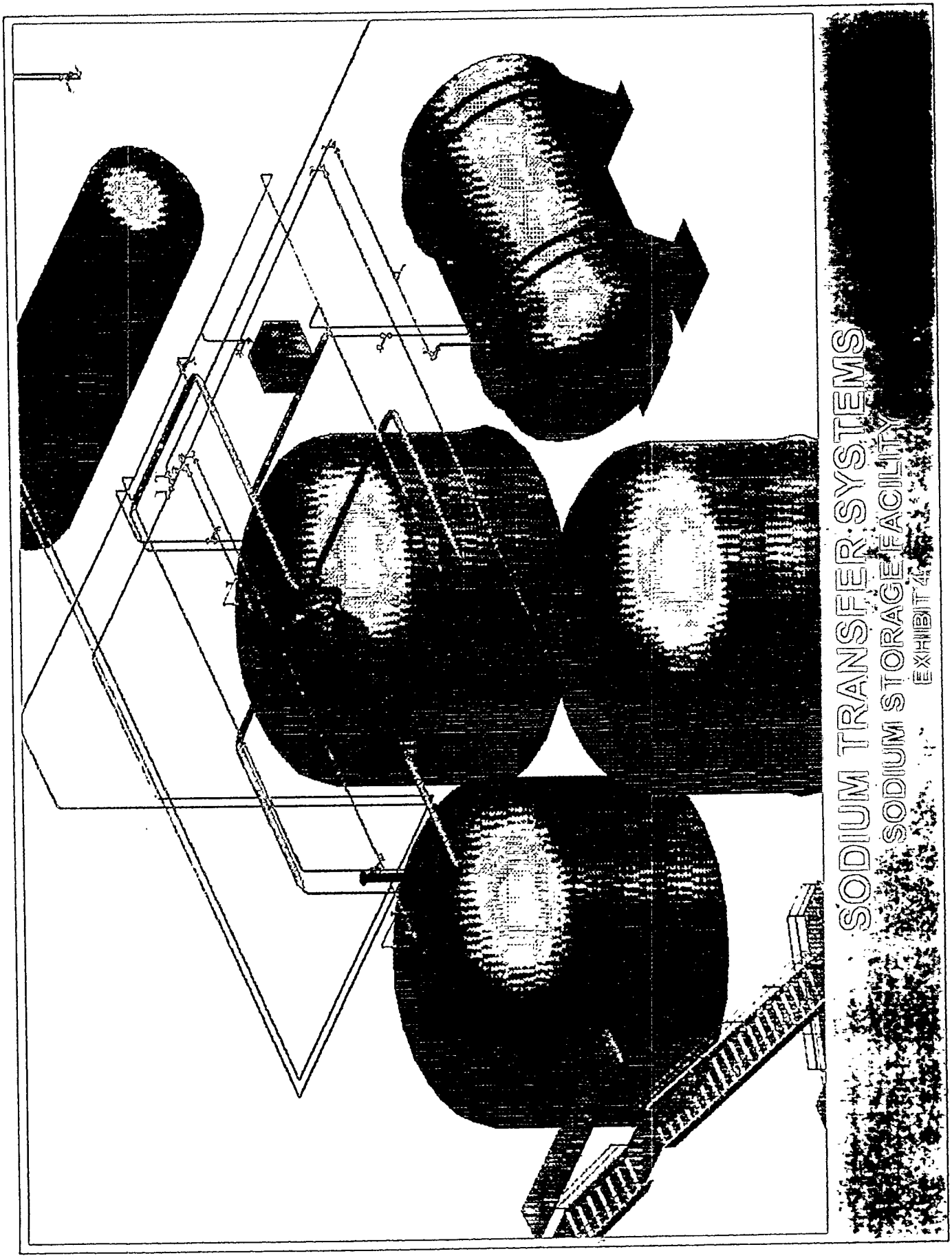


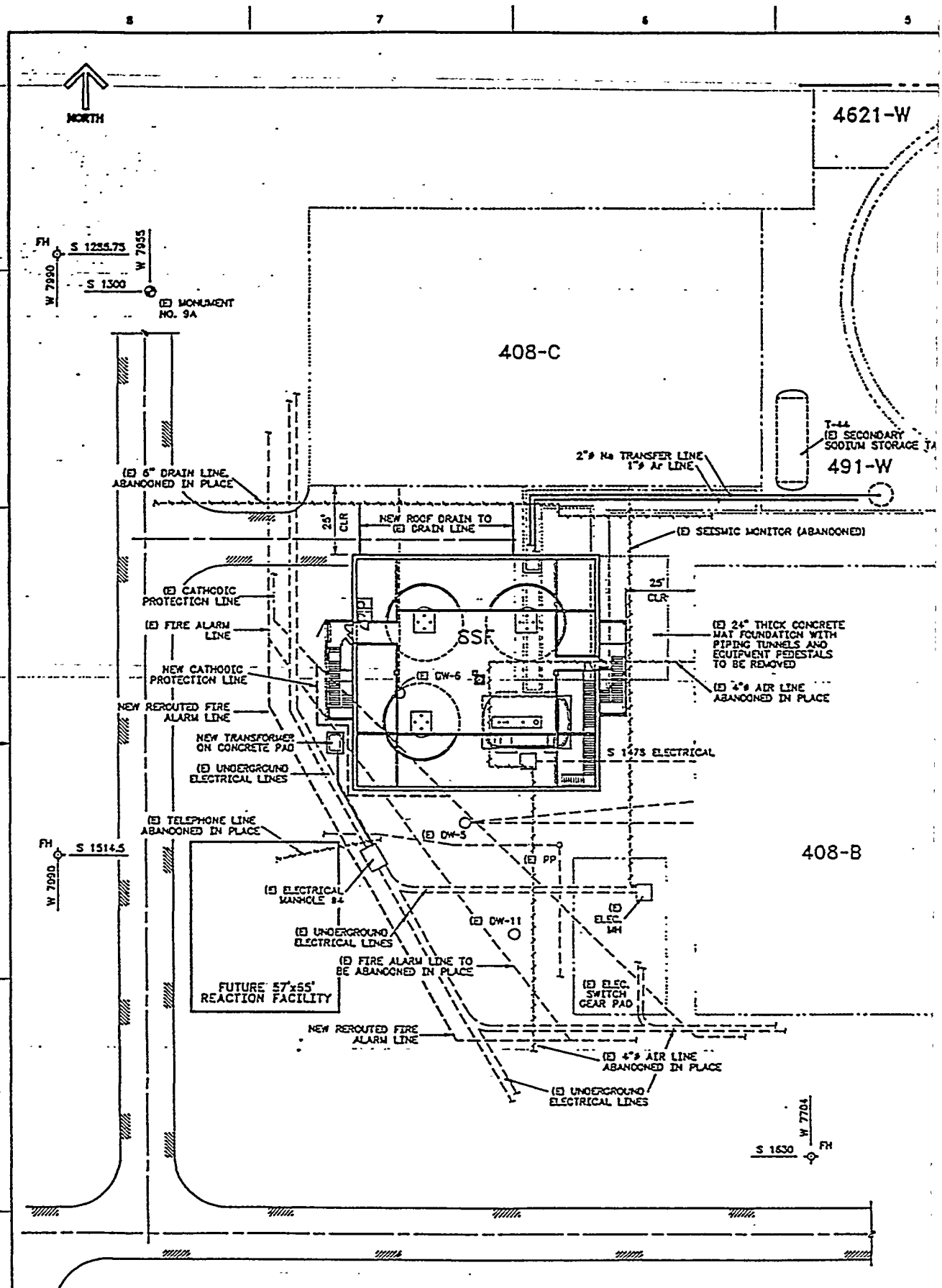
NEW SODIUM STORAGE AND SODIUM REACTION FACILITIES

EXHIBIT

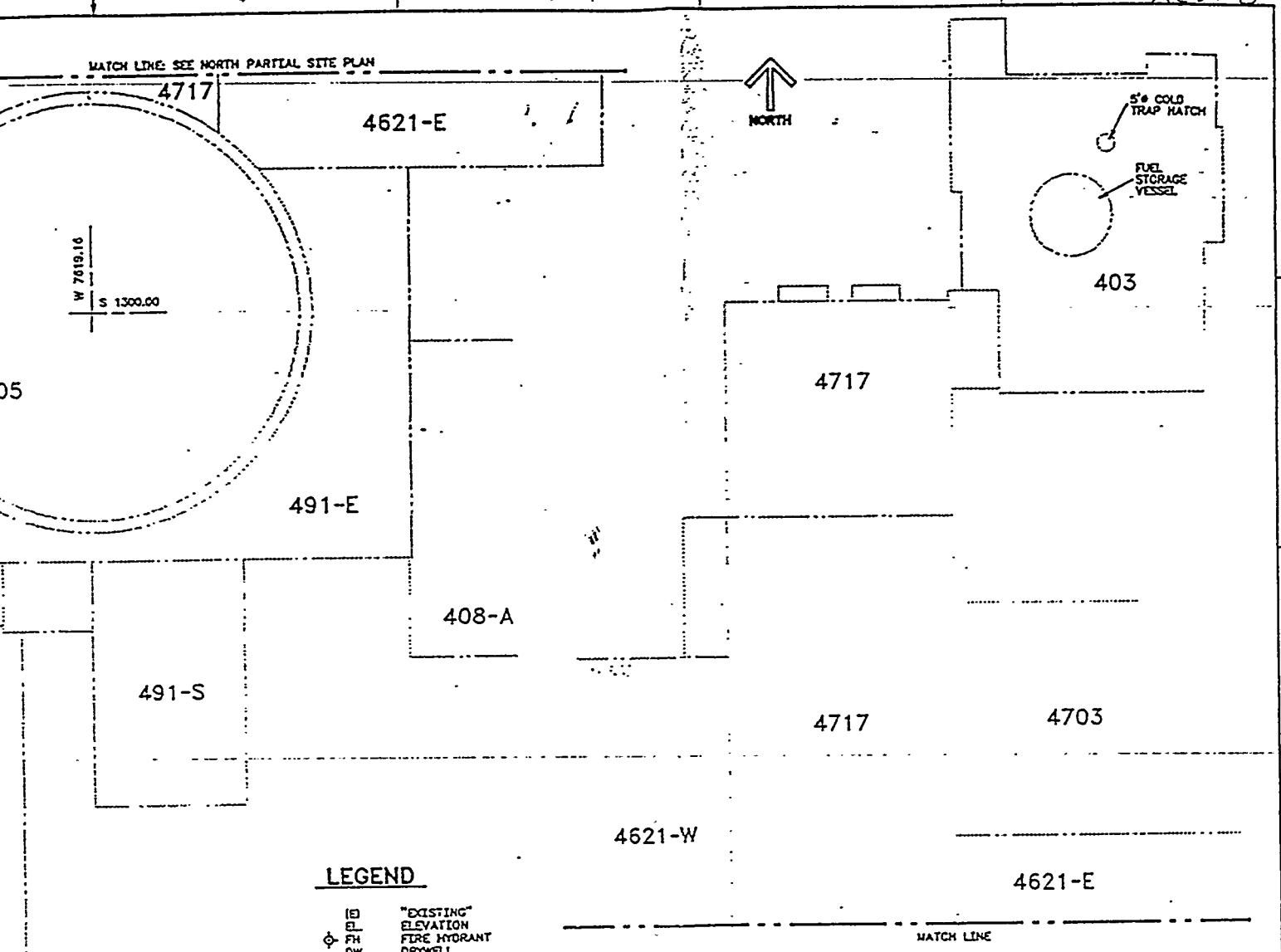

ARCHITECTURAL & STRUCTURAL FEATURES
SODIUM STORAGE FACILITY
EXHIBIT 2


SHIELDED MEZZANINE
SODIUM STORAGE FACILITY
EXHIBIT 3


SODIUM TRANSFER SYSTEMS
SODIUM STORAGE FACILITY
EXHIBIT 4



PARTIAL SITE PLAN
SCALE: 1" = 20'



LEGEND

(E)	"EXISTING"
El	ELEVATION
FH	FIRE HYDRANT
DW	DRYWELL
CLR	"CLEAR"
ELEC	ELECTRICAL
MH	MANHOLE
PP	POWER POLE
————	UNDERGROUND LINE (ABANDONED)
————	UNDERGROUND LINE
//////	EDGE OF (E) ASPHALT PAVING

NORTH PARTIAL SITE PLAN

SCALE: 1" = 20'

DRAWING LIST

DRAWING NO.	INDEX NO.	DRAWING TITLE
ES-F031-C-1	0000,0110	SITE PLAN, DRAWING LIST
ES-F031-A-1	0800,0801	FLOOR PLAN, SECTIONS, ELEVATION, DETAILS
ES-F031-S-1	0900,0901	FOUNDATION PLAN, FLOOR FRAMING PLAN
ES-F031-M-1	8900	MECHANICAL PLAN, SECTIONS, DETAILS
ES-F031-E-1	7301,7401	ELECTRICAL PLANS, DETAILS
ES-F031-P-1	2501	LEGEND AND SYMBOLS SHEET
ES-F031-P-2	2501,7004	P&ID, TANKAGE
ES-F031-P-3	2501,7004	P&ID, TANKAGE
ES-F031-P-4	2501,8552	PIPE ARRANGEMENT, TANKAGE
ES-F031-P-5	8552	TRANSFER PIPING ARRANGEMENT

Pg. L-5

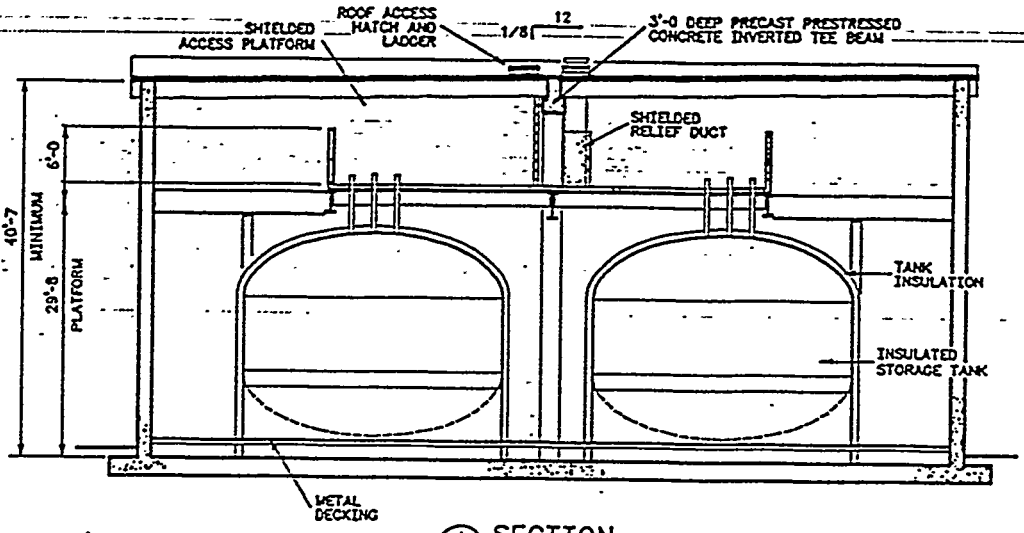
U.S. DEPARTMENT OF ENERGY
RICHLAND OPERATIONS OFFICE
METER ASSOCIATES INC., P.S.

SITE PLAN, DRAWING LIST, LEGEND

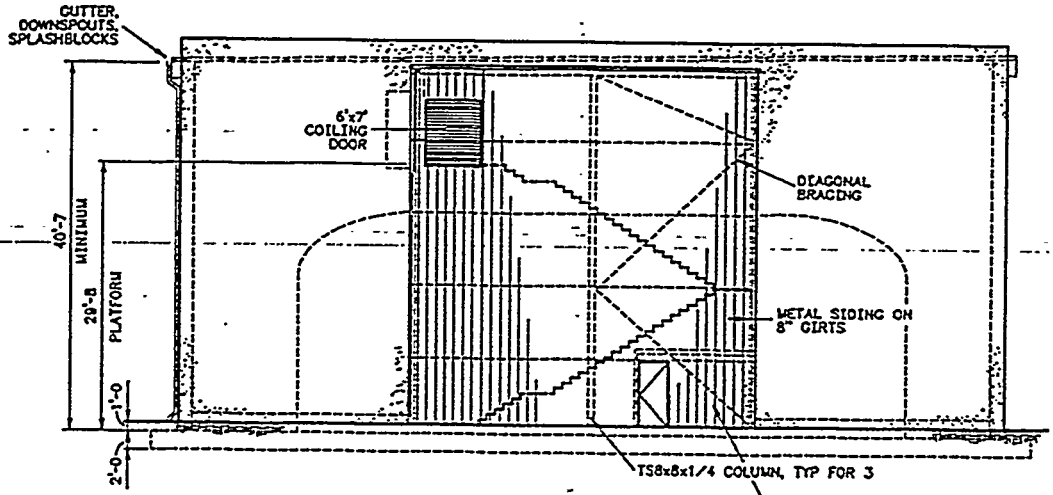
F-031: SODIUM STORAGE FACILITY

F | SSF | 0110 | ES-F031-C-1 | 0

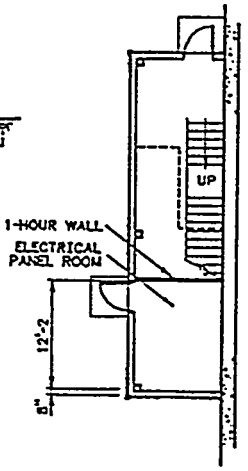
SHEET 1 OF 1



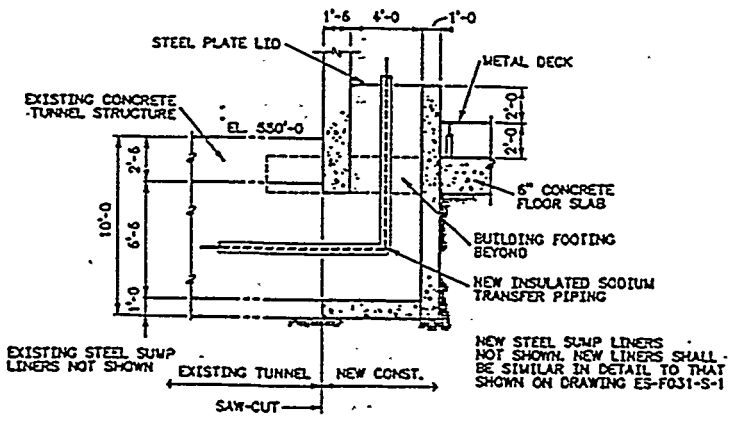
A SECTION
1/8" = 1'-0



WEST ELEVATION
SCALE: 1/8" = 1'-0
EAST ELEVATION SIMILAR

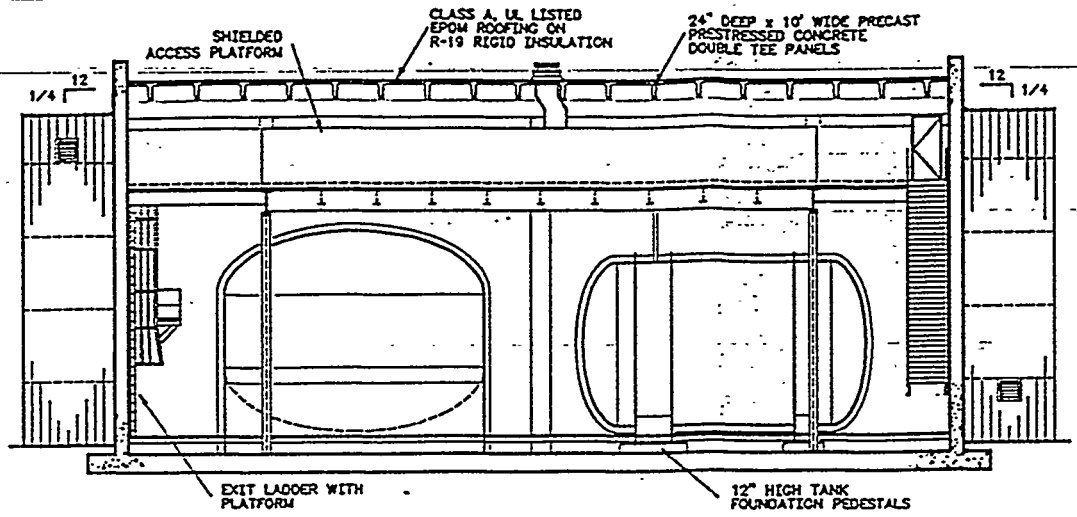


WEST ENTRY
SCALE: 1/8" = 1'-0
PLAN AT GRADE

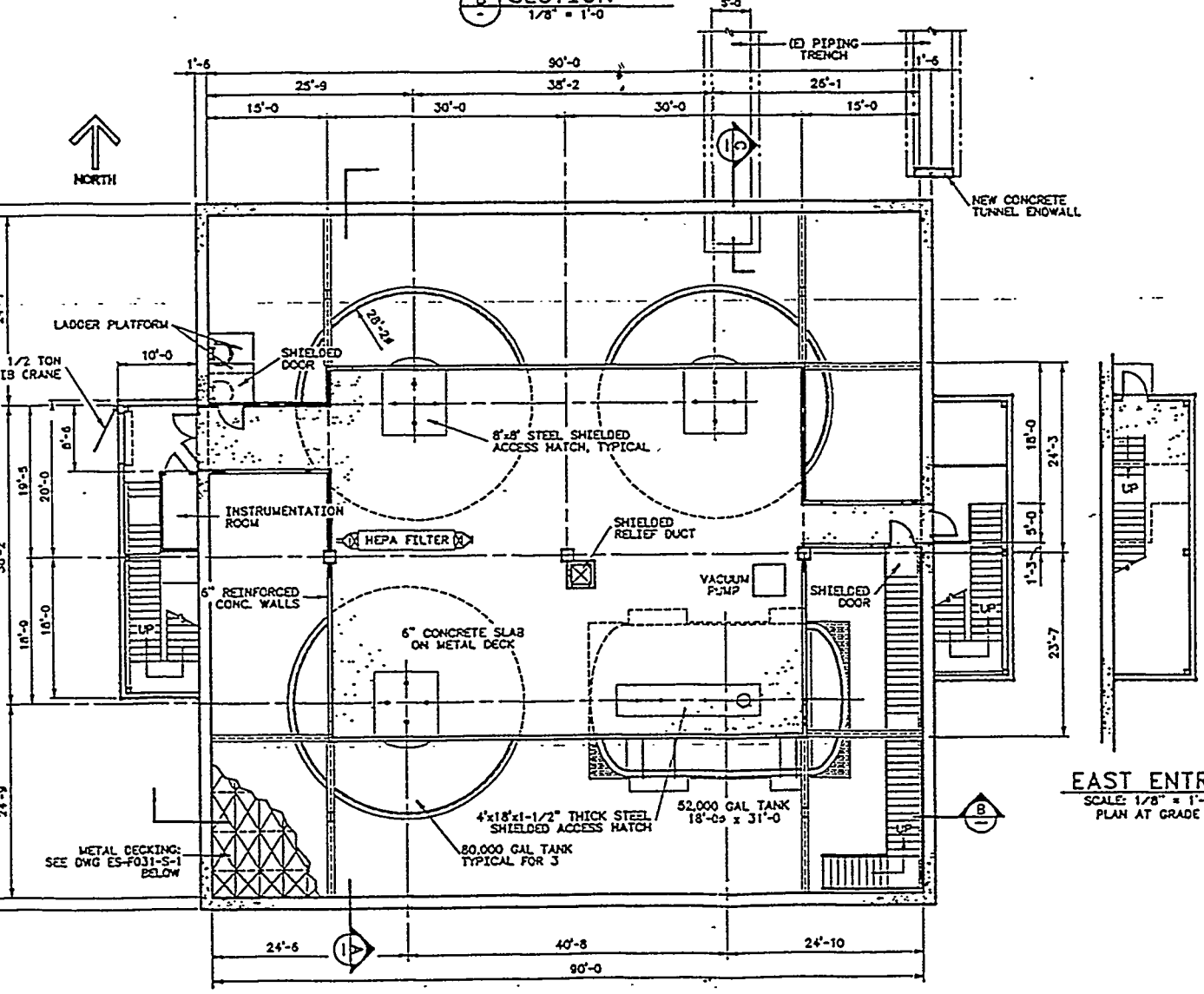


C SECTION
1/4" = 1'-0
ES-F031-S-1

WHC-SD-FF-CDR-006
Rev. 0



B SECTION
1/8" = 1'-0

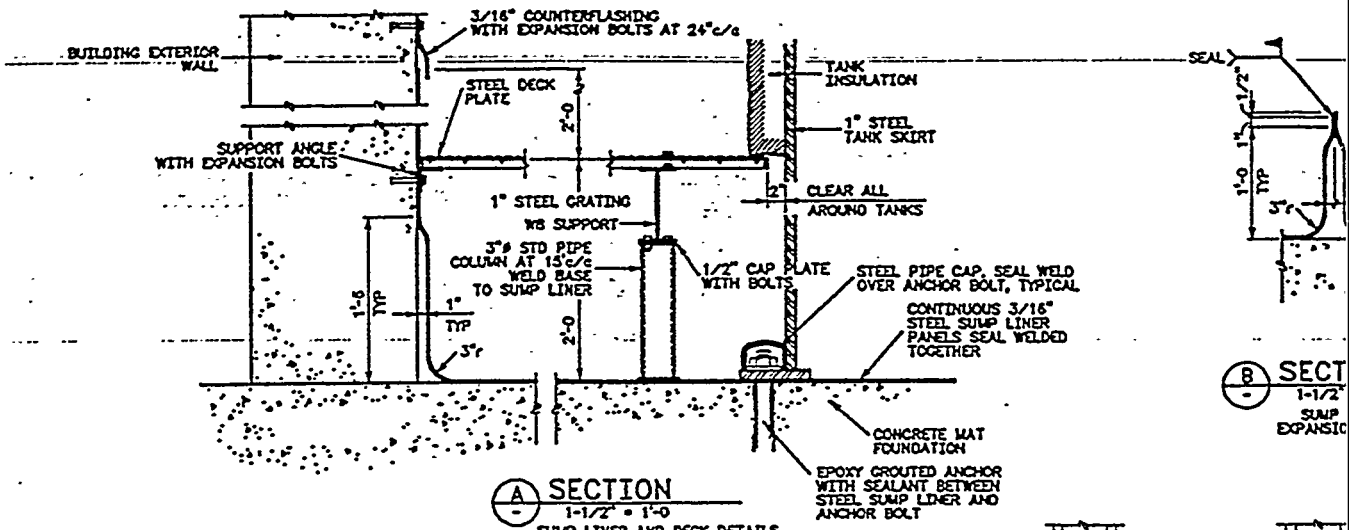


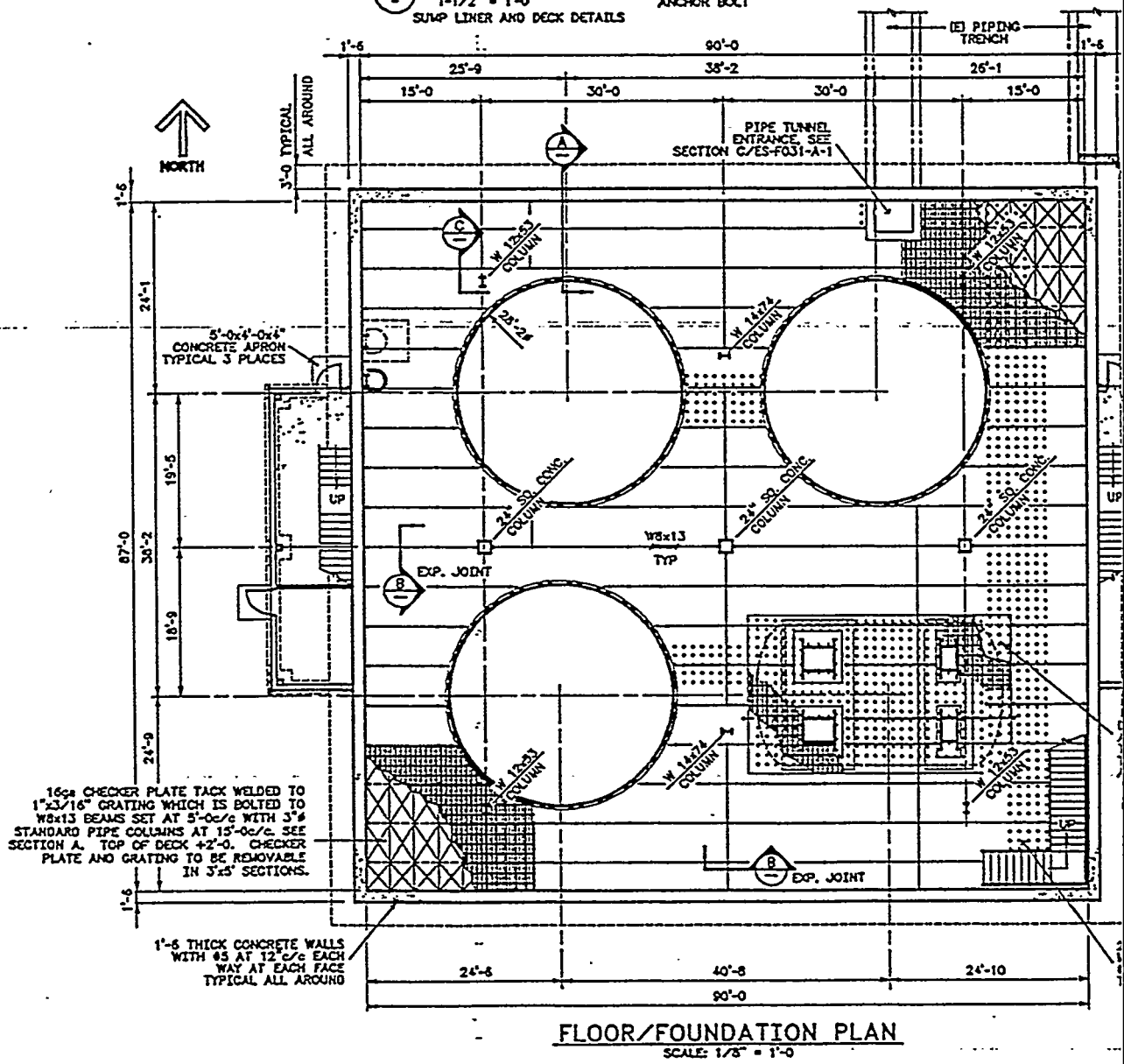
MEZZANINE FLOOR PLAN
SCALE: 1/8" = 1'-0

EAST ENTRY
SCALE: 1/8" = 1'-0
PLAN AT GRADE

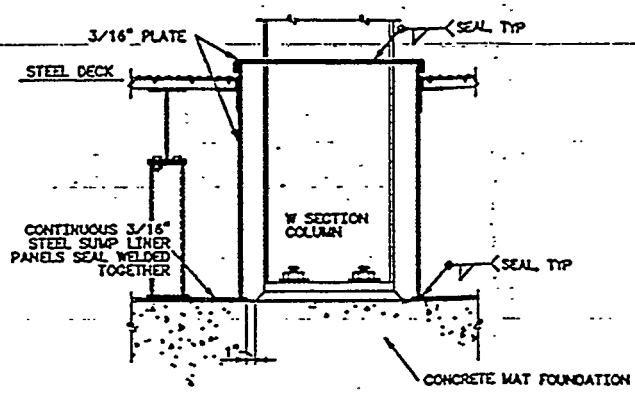
Ps. L-6

	U.S. DEPARTMENT OF ENERGY RICHLAND OPERATIONS OFFICE MEIER ASSOCIATES INC., P.S.	
	FLOOR PLAN, SECTIONS, ELEVATION, DETAILS	
	F-031: SODIUM STORAGE FACILITY	
F SSF	ES-F031-A-1	0


3/16" COUNTERFLASHING WITH EXPANSION BOLTS AT 24"c/c
BUILDING EXTERIOR WALL
STEEL DECK PLATE
SUPPORT ANGLE WITH EXPANSION BOLTS
TANK INSULATION
1" STEEL TANK SKIRT
2" CLEAR ALL AROUND TANKS
1" STEEL GRATING
W8 SUPPORT
3"ø STD PIPE COLUMN AT 15'c/c WELD BASE TO SUMP LINER
1/2" CAP PLATE WITH BOLTS
STEEL PIPE CAP. SEAL WELD OVER ANCHOR BOLT, TYPICAL
CONTINUOUS 3/16" STEEL SUMP LINER PANELS SEAL WELDED TOGETHER
CONCRETE MAT FOUNDATION
EPOXY GROUTED ANCHOR WITH SEALANT BETWEEN STEEL SUMP LINER AND ANCHOR BOLT
SEAL
A SECTION
1-1/2" = 1'-0
SUMP LINER AND DECK DETAILS
B SECT
1-1/2"
SUMP EXPANSIO


NORTH
(E) PIPING TRENCH
PIPE TUNNEL ENTRANCE, SEE SECTION G/ES-F031-A-1
5'-0x4'-0x6" CONCRETE APRON TYPICAL 3 PLACES
W 12x53 COLUMN
W 14x74 COLUMN
24" SQ. CONC. COLUMN
W8x13 TYP
EXP. JOINT
16ga CHECKER PLATE TACK WELDED TO 1"x3/16" GRATING WHICH IS BOLTED TO W8x13 BEAMS SET AT 5'-0c/c WITH 3"ø STANDARD PIPE COLUMNS AT 15'-0c/c. SEE SECTION A. TOP OF DECK +2'-0. CHECKER PLATE AND GRATING TO BE REMOVABLE IN 3'x5' SECTIONS.
1'-6 THICK CONCRETE WALLS WITH #5 AT 12"c/c EACH WAY AT EACH FACE TYPICAL ALL AROUND
90'-0
FLOOR/FOUNDATION PLAN
SCALE: 1/8" = 1'-0

WHC-SD-FF-CDR-006 REV. 0



LEGEND

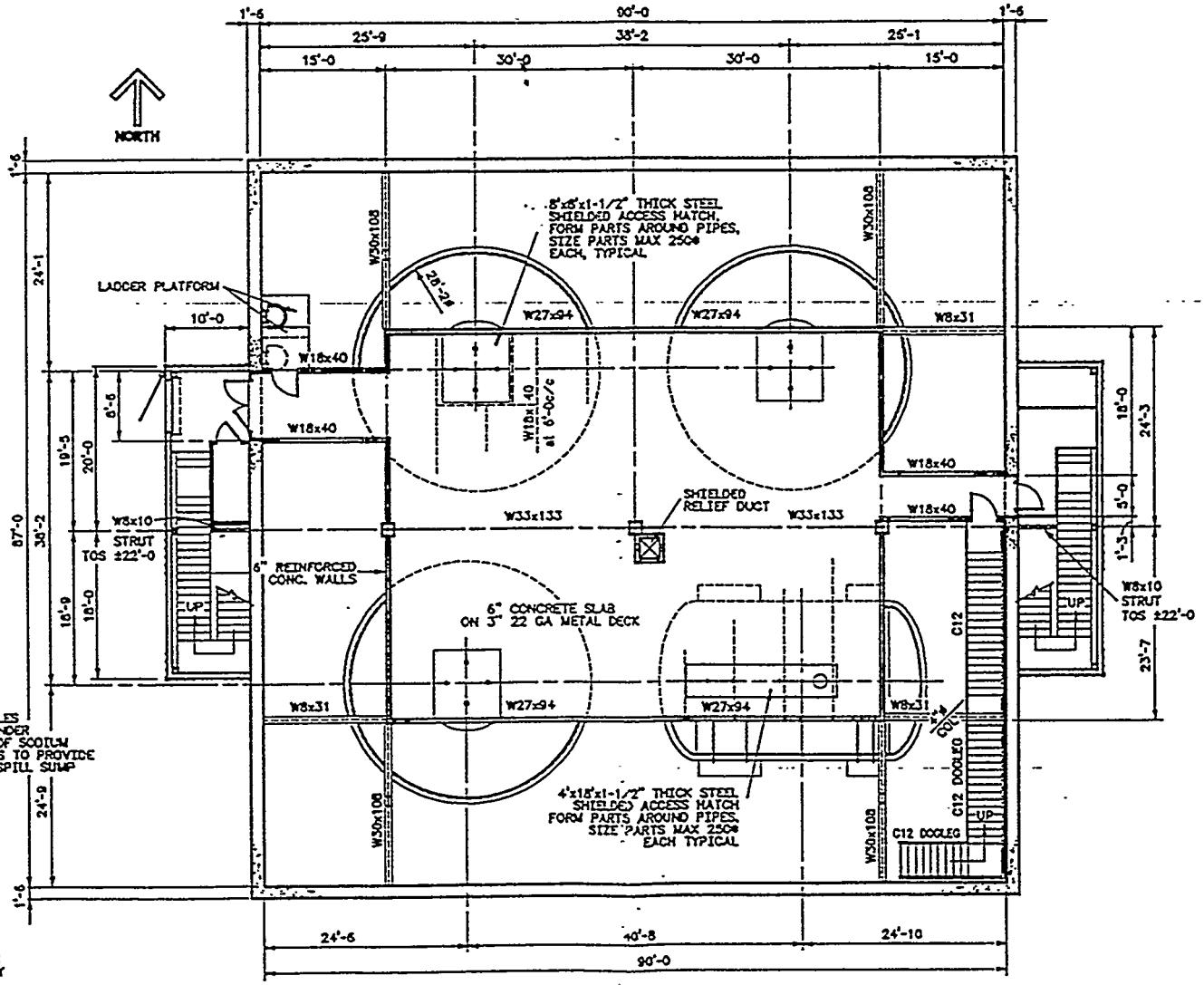
TOS	TOP OF STEEL
TOC	TOP OF CONCRETE
UNO	UNLESS NOTED OTHERWISE
SQ.	SQUARE
CONC.	CONCRETE
EXP.	EXPANSION

CONTINUOUS 3/16" STEEL SUMP LINER PANELS SEAL WELDED TOGETHER

CONCRETE MAT FOUNDATION

C SECTION
1-1/2" = 1'-0

DETAILS AT CONCRETE COLUMNS ARE SIMILAR, WITH COUNTERFLASHING DETAILS SIMILAR TO THAT SHOWN IN SECTION A



MEZZANINE FRAMING PLAN
SCALE: 1/8" = 1'-0

TOC +27'-5
TOS +26'-8 UNO

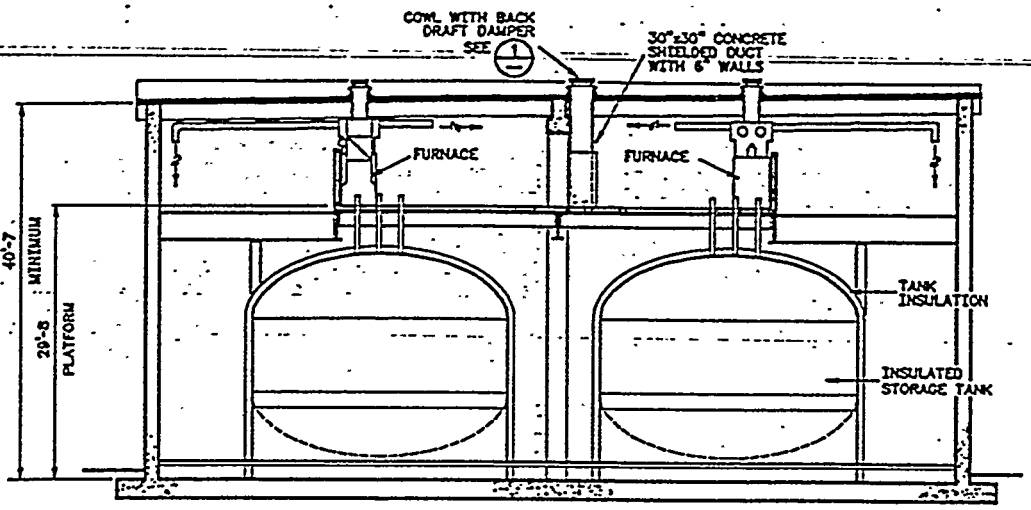
P5, L-7

W CONCRETE NNEL ENDWALL

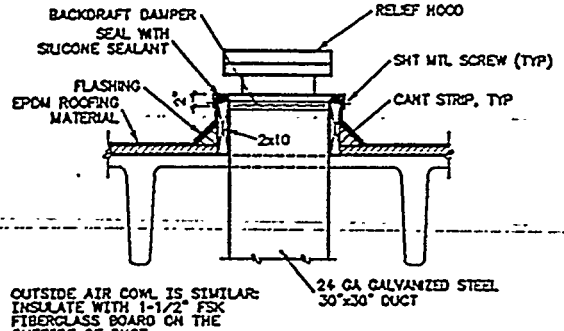
NG WITH 1"ø HOLES c/c EACH WAY UNDER AND WITHIN 3' OF SODIUM SFER PIPING RUNS TO PROVIDE S TO BUILDING SPILL SUMP

HICK CONCRETE FOUNDATION WITH 5'c/c EACH WAY ND BOTTOM

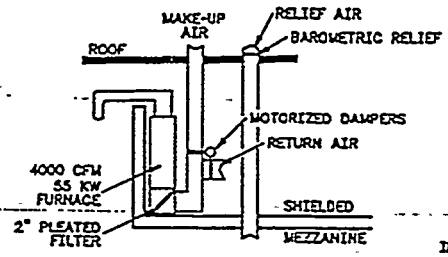
				U.S. DEPARTMENT OF ENERGY RICHLAND OPERATIONS OFFICE	
				MEIER ASSOCIATES INC., P.S.	
				FOUNDATION PLAN, FLOOR FRAMING PLAN	
				F-031: SODIUM STORAGE FACILITY	
ES-F031-C-1	186551	5L:IBM:AC02:12.0:SS	N	WHC	SHOWN
				F SSF 0001	ES-F031-S-1 0
				SHEET 1 OF 1	



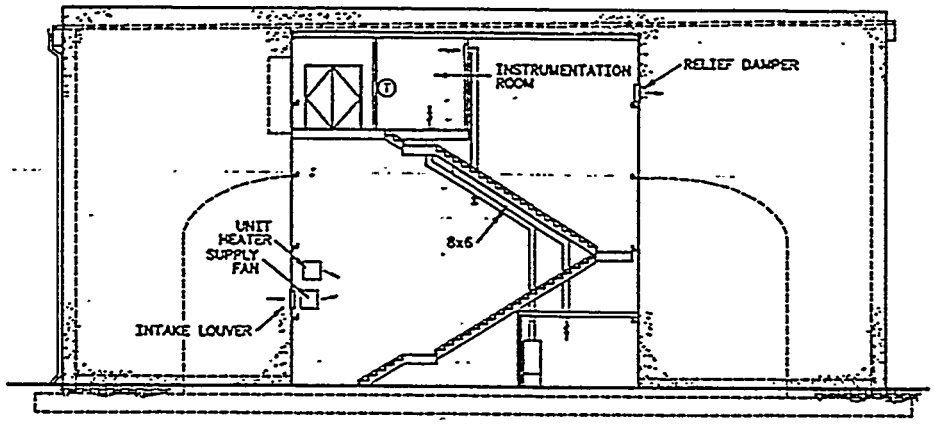
A/- SECTION
1/8" = 1'-0



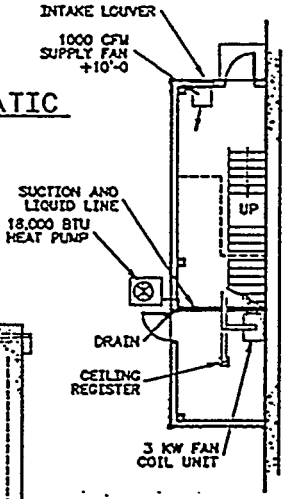
1/- DETAIL
3/4" = 1'-0



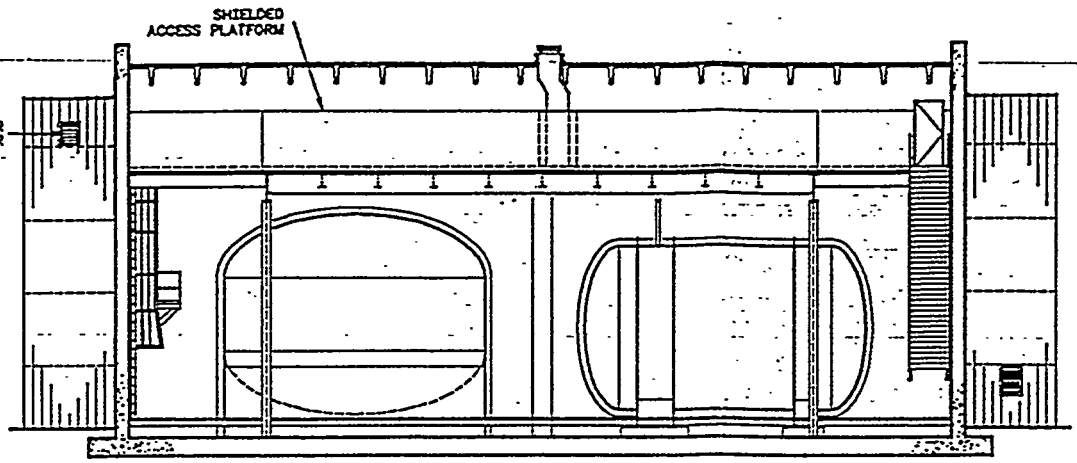
HEAT & VENTILATION SCHEMATIC
NOT TO SCALE



C/- SECTION
1/8" = 1'-0

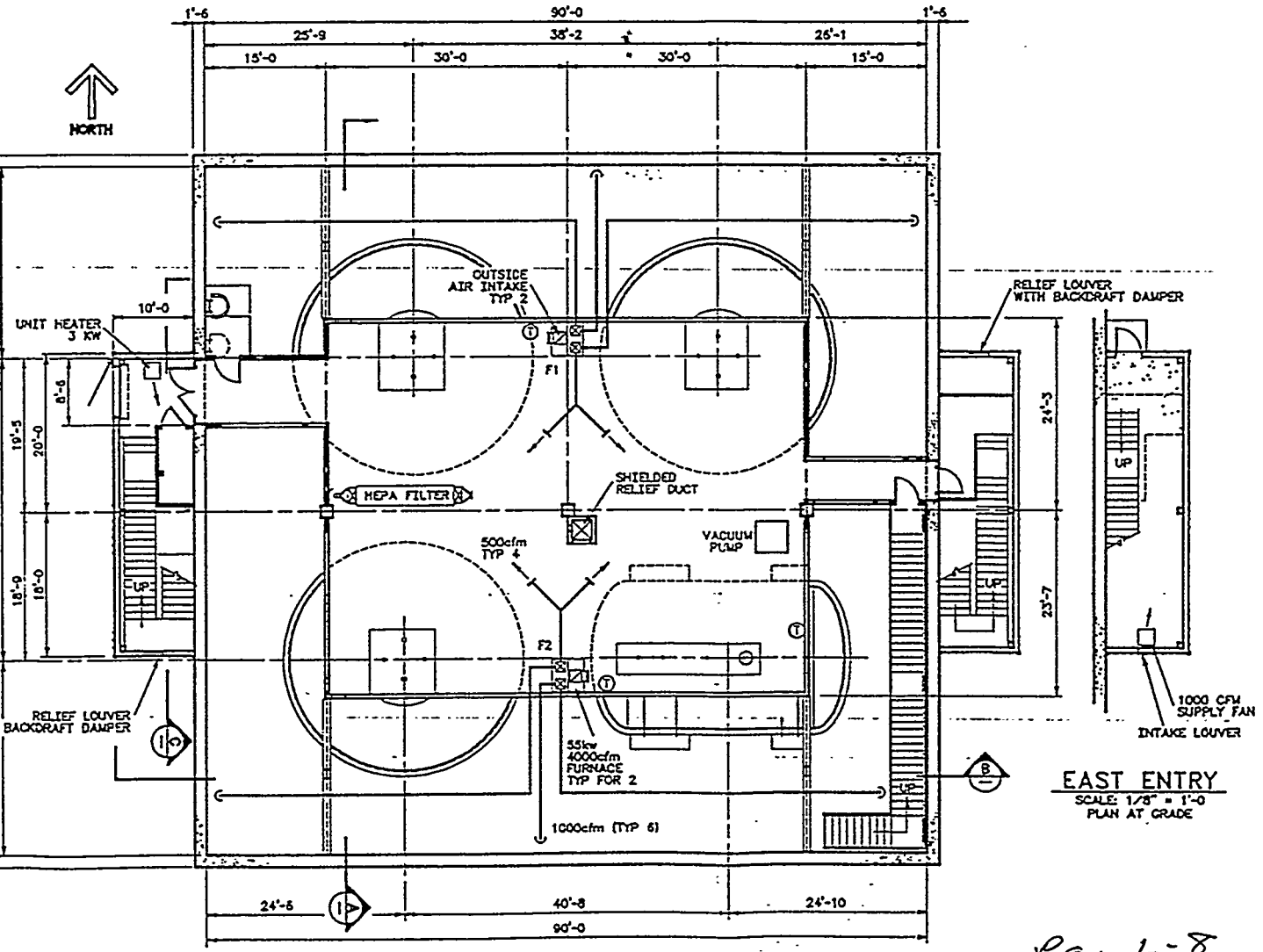


WEST ENTRY
SCALE: 1/8" = 1'-0
PLAN AT GRADE



LEGEND
F1 FURNACE #1
F2 FURNACE #2
T THERMOSTAT

B SECTION
1/8" = 1'-0



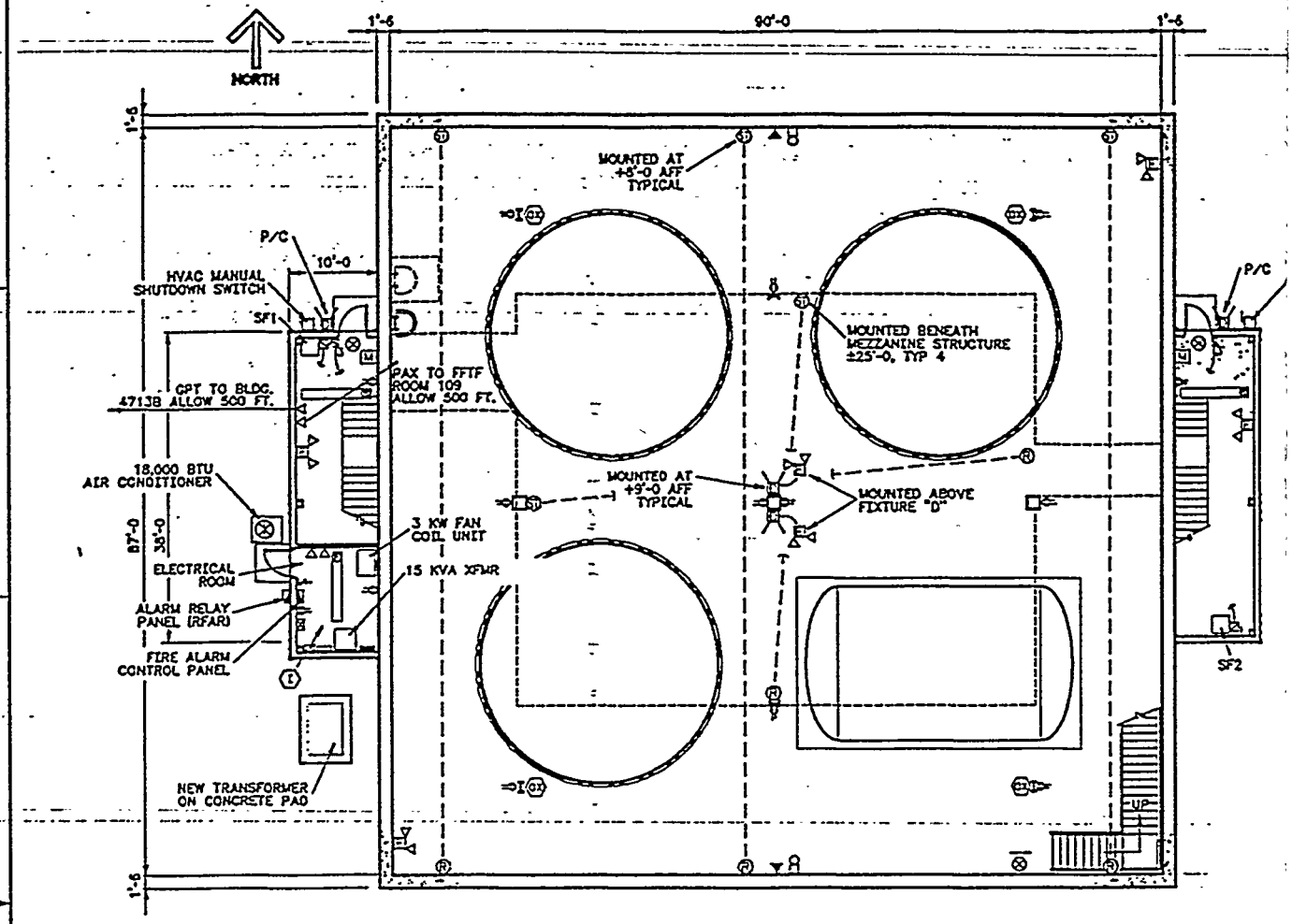
EAST ENTRY
SCALE: 1/8" = 1'-0
PLAN AT GRADE

MEZZANINE MECHANICAL PLAN
SCALE: 1/8" = 1'-0

Pg. L-8

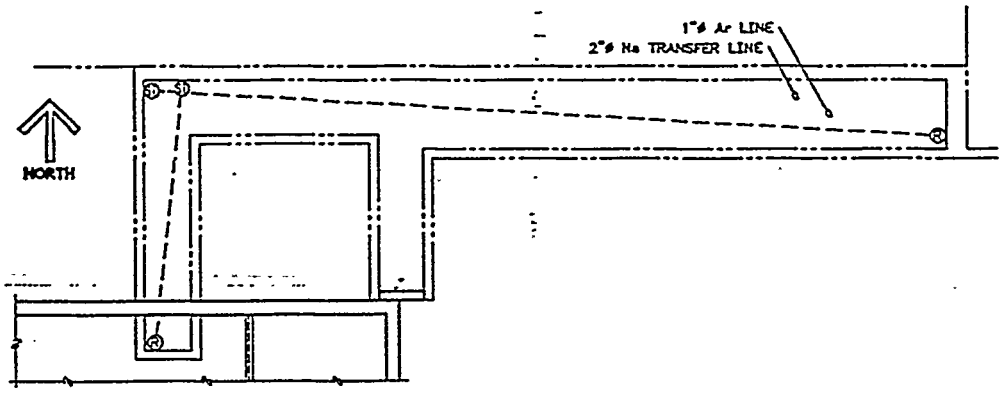
	U.S. DEPARTMENT OF ENERGY RICHLAND OPERATIONS OFFICE WEIER ASSOCIATES INC., P.S.
	MECHANICAL PLAN, SECTIONS, DETAILS
	F-031: SODIUM STORAGE FACILITY
F SSF 8900	ES-F031-M-1 0
SCALE SHOWN	

ES-F031-C-1 | 1866M1 | 5L:IBM:AC02:12.0-SS | WHC



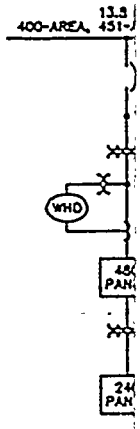
ELECTRICAL PLAN

SCALE: 1/8" = 1'-0
PLAN AT GRADE



PIPE TRENCH ELECTRICAL PLAN

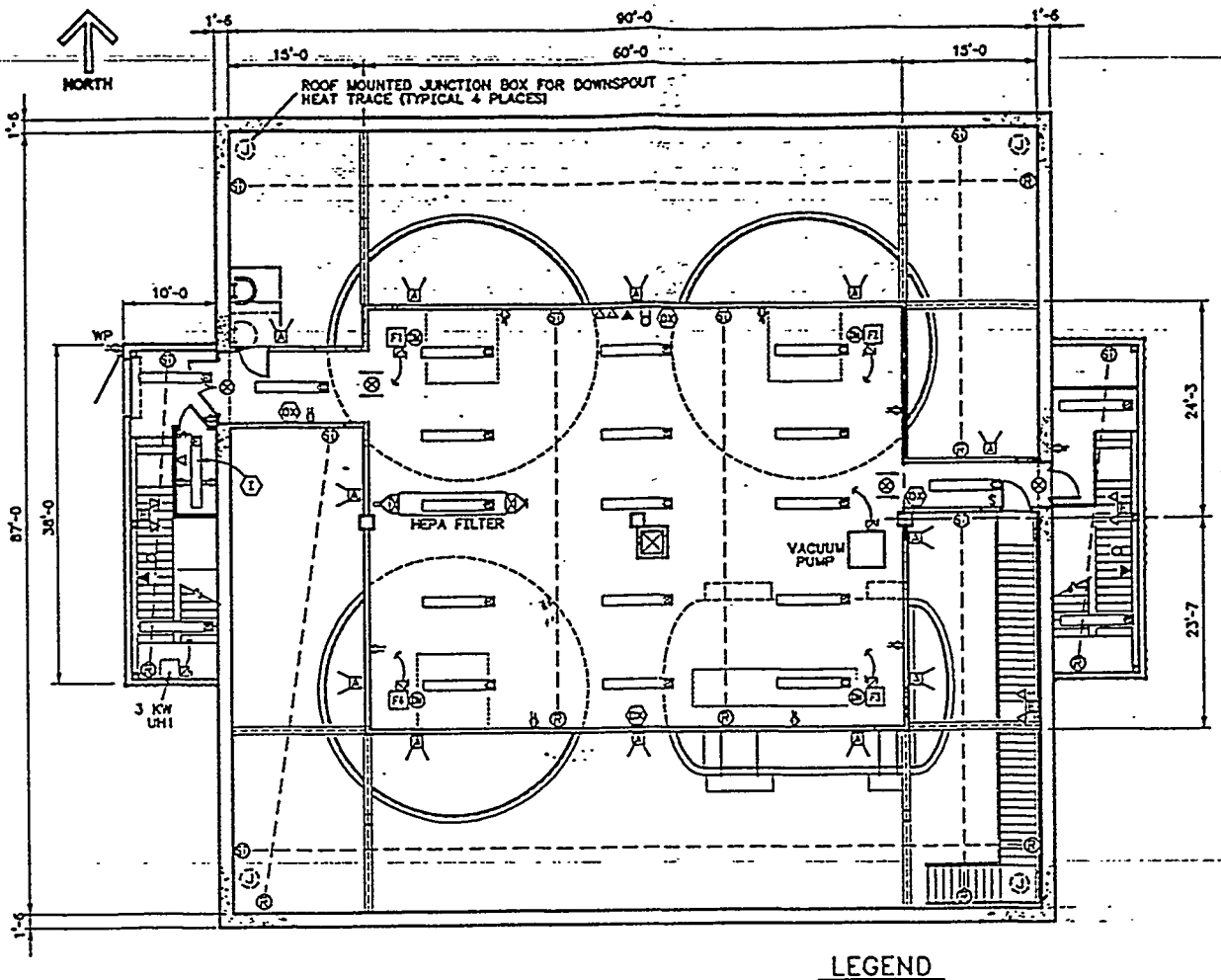
SCALE: 1/8" = 1'-0



ONE-LINE

WHC-SD-FF-CDR-006

Rev. 0

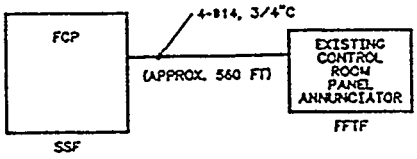


MEZZANINE ELECTRICAL PLAN

SCALE: 1/8" = 1'-0

SYMBOL	DESCRIPTION
A	150 WATT METAL HALIDE WALL PACK
B	225 WATT FLUORESCENT, SURFACE MOUNTED
C	225 WATT FLUORESCENT W/ EMERGENCY BALLAST, SURFACE MOUNTED
D	75 WATT METAL HALIDE WALL PACK
E	EMERGENCY BATTERY PACK LIGHT FIXTURE
F	80 WATT FLUORESCENT W/ EMERGENCY BALLAST, SURFACE MOUNTED

LIGHTING FIXTURE SCHEDULE



FIRE ALARM REMOTE INDICATOR BLOCK DIAGRAM

LEGEND

AFF	ABOVE FINISH FLOOR
FCP	FIRE ALARM CONTROL PANEL
RFAR	RADIO FIRE ALARM REPEATER
P/C	PHOTOCELL CONTROL
	DAMPER MOTOR
	FUSED DISCONNECT SWITCH
	WALL SWITCH (S_3 = 3-WAY)
	DUPLEX OUTLET
OX	OXYGEN MONITOR
I	IONIZATION TYPE SMOKE DETECTOR
ST R	LINEAR BEAM SMOKE DETECTOR ST = TRANSMITTER R = RECEIVER
	EXIT LIGHT
	LIGHT FIXTURE
	FLUORESCENT LIGHT FIXTURE
	POWER PANELBOARD 120/240V, 1PH
	POWER PANELBOARD 480Y/277V, 3PH
	LIGHTING CONTACTOR
	FIRE ALARM MANUAL PULL STATION
	EMERGENCY BATTERY PACK LIGHT FIXTURE
	PUBLIC ADDRESS, PAX SPEAKER/ EVACUATION HORN
	TELEPHONE CONNECTION (PAX OR CPT)
	FIRE ALARM GONG

Q3, L-9

AC MANUAL
UTDOWN SWITCH

UBSTATION

EXISTING FEEDER BREAKER

TAP AT MH-4

13.8-480Y/277V
3 PH, 4-WIRE
150 KVA XFMR

480-240/120V
1 PH, 3-WIRE
15 KVA XFMR

DIAGRAM

U.S. DEPARTMENT OF ENERGY
RICHLAND OPERATIONS OFFICE
WEIER ASSOCIATES INC., P.S.

ELECTRICAL PLANS, DETAILS

F-031: SODIUM STORAGE FACILITY

F | SSF | 1981 | ES-F031-E-1 | 0

SHOWN | ? | 1 of 1

ES-F031-C-1

18666E1 | 5LIIBM:ACD2:12.0-SS | WHC

APPROVED 10/5/94

8 | 7 | 6 | 5

F

E

D

C

B

A

LEGEND:

- ALPHABETICAL OR NUMERICAL DESIGNATION
- SHEET WHERE DETAIL OR SECTION IS SHOWN
- SHEET WHERE DETAIL OR SECTION IS TAKEN
- INDICATES ALL ON THE SAME SHEET
- NEW PIPING & VESSELS (DOUBLE LINE – HVY. WT.)
- NEW PIPING (SINGLE LINE)
- HIDDEN LINE (OR) UNDERGROUND LINE
- EXISTING
- INSTRUMENT ELECTRICAL LEADS
- INSULATED AND ELECTRICAL HEAT TRACED
- BELLOWS SEALED VALVE
- BELLOWS SEALED VALVE WITH REACH ROD
- TYPICAL VALVE HEAT TRACED
- TIE-IN POINT TO EXISTING SYSTEM

ISA INSTRUMENTAT

- LETTER OR I
- ITEM NUMBER

COMPLETE GENERAL IDENTIFICATIONS

SHADED (▪) = IMPOSSIBLE COMBINATIONS
BLANK = IMPROBABLE COMBINATIONS

PROCESS VARIABLE OR ACTUATION	FIRST LETTER (1)	CONTROLLER DEVICES: RECORDING	INDICATING	BLIND (NON-INDICATING)	INTEGRAL REGULATING VALVES	LOOP CONTROL VALVES	SAFETY RELIEF VALVES	RESTRICTING ORIFICE	RELAY, CONVERTING AND COMPUTING	MEASURE: RECORDING	INDICATING	INDICATING RECORDING
		-RC	-IC	-C	-CV	-V	-SV	-O	-Y	-R	-I	-IR
		SECOND AND THIRD COMBINATION OF FIRST, SE										
SPEED	S								ST		SI	
ANALYZER	A	ARC	AIC		▪	AV	▪			AR	AI	AIR
TEMPERATURE	T	TRC	TIC	TC	TCV	TV	TSV		TY	TR	TI	TIR
FLOW	F	FRC	FIC	FC	FCV	FV	FSV	FO	FY	FR	FI	FIR
LEVEL	L	LRC	LIC	LC	LCV	LV			LY	LR	LI	LIR
PRESSURE	P	PRC	PIC	PC	PCV	PV	PSV		PY	PR	PI	PIR
HAND	H		HIC	HC	HCV	HV				▪	▪	▪
DIFF PRESSURE	PD	PDRC	PDIC	PDC	PDCV	PDV	PDSV			PDR	PDI	PDIR
MULTIVARIABLE	U	URC		UC		UV				UR	UI	
GROUND PRESENCE	Y		YIC	YC						YR	YI	
POSITION	Z										ZI	
VOLTAGE	E										EI	
CURRENT	I										II	

NOTE: No 1: EXCEPTIONS TO TABLE ARE:
1. RO FOR RESTRICTING ORIFICE
2. PSC FOR RUPTURE DISK

4 | 3 | 2 | 1

F

E

D

C

B

A

SYMBOLS

TION

TION OF LETTERED

			TRANSMITTING DEVICES		ALARMING DEVICES					
SWITCH	PRIMARY ELEMENT	WELLS	TRANSMITTING	INDICATING TRANSMITTING	ALARM	HIGH ALARM	LOW ALARM	HIGH OR LOW ALARM	HIGH SHUT-DOWN	LOW SHUT-DOWN
-S	-E	-V	-T	-IT	-A	-AH	-AL	-AHL	-SH	-SL
SS	SE					SAH	SAL			
AS	AE	•	AT	AIT	AA	AAH	AAL	AAHL	ASH	ASL
TS	TE	TV	TT	TIT	TA	TAH	TAL	TAHL	TSH	TSL
FS	FE	•	FT	FIT	FA	FAH	FAL	FAHL	FSH	FSL
LS		•	LT	LIT	LA	LAH	LAL	LAHL	LSH	LSL
PS	PE	•	PT	PIT	PA	PAH	PAL	PAHL	PSH	PSL
XS		•		•		•	•	•	•	•
PDS	PDE		PDT	PDIT	PDA	PDAH	PDAL	PDAHL	PDSH	PDSL
US	UE				UA	UAH	UAL	UAHL	USH	USL
TS	TE		TT		TA					
ZS			ZT		ZA					
ES			ET		EA	EAH	EAL			
IS			IT		IT	IAH	IAL			

LINE NO. CODE SYSTEM

2" – HCQ – XXXXX

- XXXXX — LINE NUMBER
- HCQ — SERVICE
- HCQ — PIPING SPECIFICATION
- 2" — PIPE SIZE

PIPING SPECIFICATION

FIRST LETTER

H – 150#

G – 300#

SECOND LETTER

C – ITIC AUSTEN STAINLESS STEEL

THIRD LETTER

APPLICABLE CODE

A – ASME SEC III, CLASS 1

D – ANSI B31.1

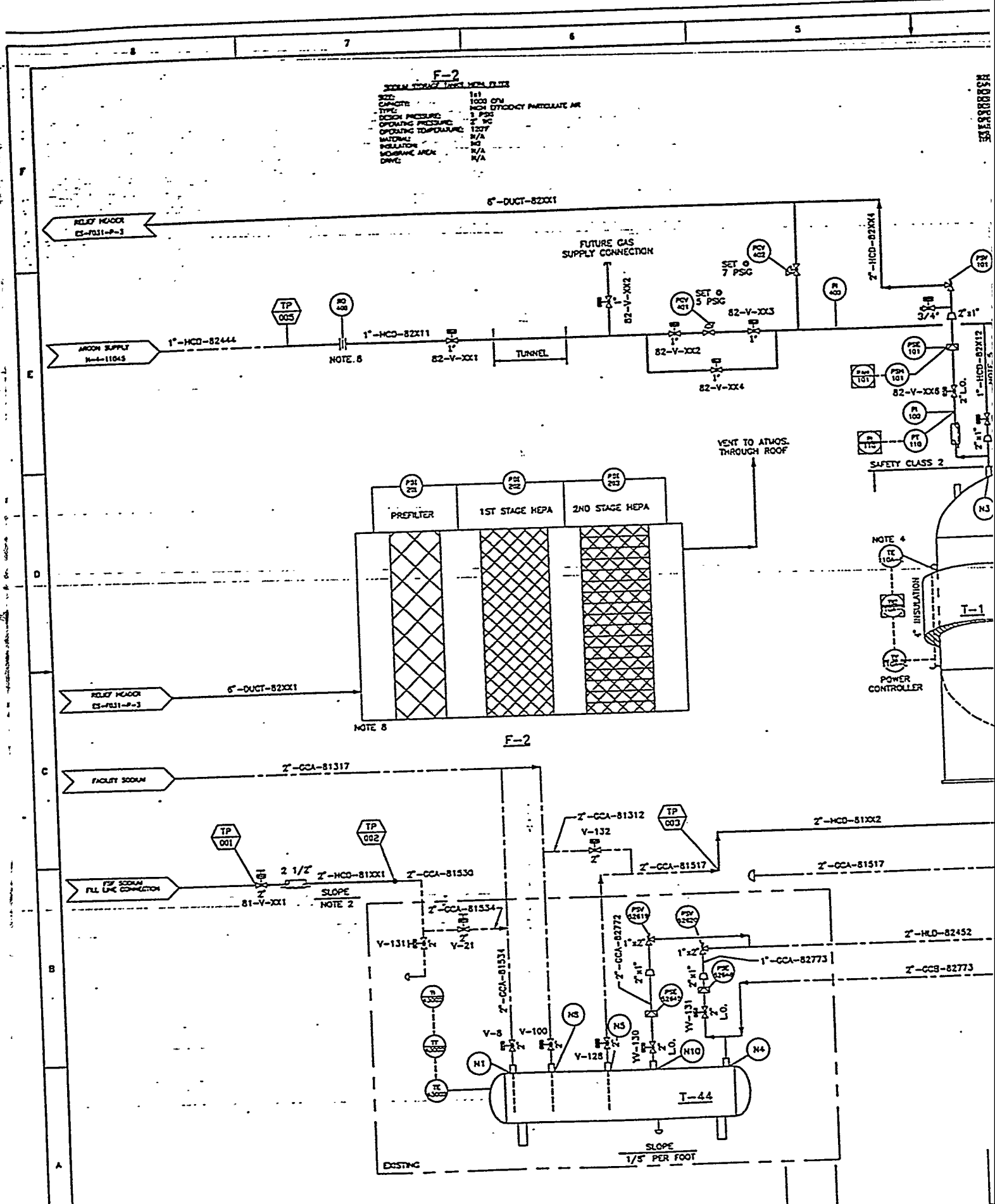
LINE SERVICE ABBREVIATIONS

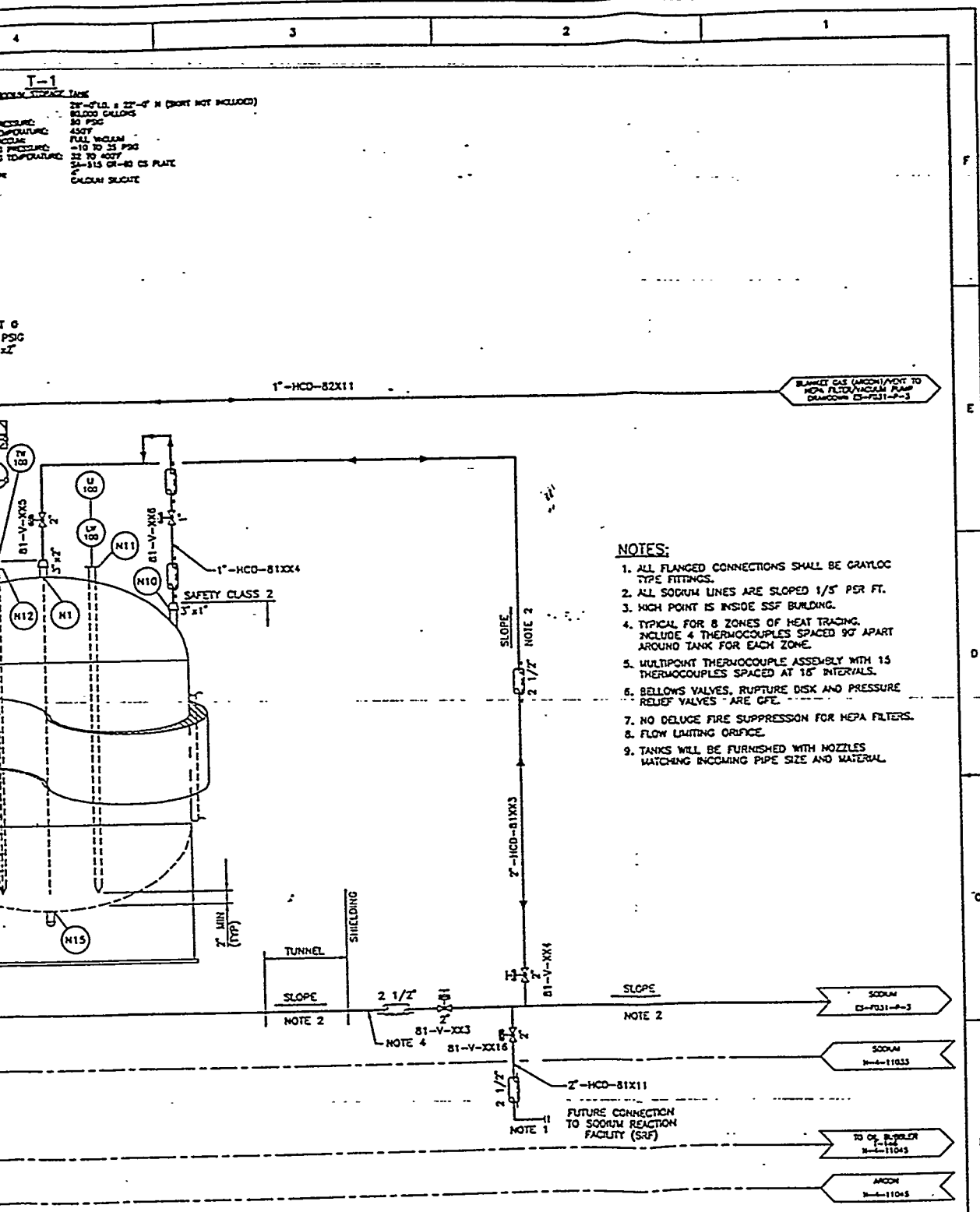
81 – SODIUM

82 – GAS/VACUUM

Pg. L-10

		U.S. DEPARTMENT OF ENERGY RICHLAND OPERATIONS OFFICE WEIER ASSOCIATES INC., P.S.	
		LEGEND AND SYMBOLS SHEET	
0	ISSUED FOR CONCEPTUAL DESIGN	SODIUM STORAGE FACILITY	
		F – 1	ES-F031-P-1 0
		NONE	360-1186 1 of 1
	1186P1.DWG	29:18M:AC02:12.0-SS	


F-2
6"-DUCT-82XX1
RELIEF HEADER
FUTURE GAS SUPPLY CONNECTION
SET @ 7 PSIG
SET @ 5 PSIG
2"-HCD-82XX4
ARGON SUPPLY
1"-HCD-82444
1"-HCD-82X11
NOTE 8
82-V-XX1
TUNNEL
82-V-XX2
82-V-XX3
82-V-XX4
82-V-XX5
1"-HCD-82X12
2"-L.O.
SAFETY CLASS 2
VENT TO ATMOS. THROUGH ROOF
PREFILTER
1ST STAGE HEPA
2ND STAGE HEPA
NOTE 8
F-2
NOTE 4
4" INSULATION
T-1
POWER CONTROLLER
FACILITY SODIUM
2"-CCA-81317
TP 001
TP 002
TP 003
2 1/2"
2"-HCD-81XX1
2"-CCA-81530
FSF SODIUM FILL LINE CONNECTION
81-V-XX1
SLOPE
NOTE 2
2"-CCA-81534
2"-CCA-81312
V-132
2"-HCD-81XX2
2"-CCA-81517
Y-131
Y-21
2"-CCA-82772
1"-CCA-82773
2"-HLD-82452
2"-CCB-82773
V-8
V-100
V-125
Y-130
Y-131
L.O.
N1
N3
N5
N10
N4
T-44
SLOPE 1/5" PER FOOT
EXISTING



NOTES:

1. ALL FLANGED CONNECTIONS SHALL BE GRAYLOC TYPE FITTINGS.
2. ALL SODIUM LINES ARE SLOPED 1/8" PER FT.
3. HIGH POINT IS INSIDE SSF BUILDING.
4. TYPICAL FOR 8 ZONES OF HEAT TRACING. INCLUDE 4 THERMOCOUPLES SPACED 90° APART AROUND TANK FOR EACH ZONE.
5. MULTIPOINT THERMOCOUPLE ASSEMBLY WITH 15 THERMOCOUPLES SPACED AT 16" INTERVALS.
6. BELLOWS VALVES, RUPTURE DISK AND PRESSURE RELIEF VALVES ARE GFE.
7. NO DELUGE FIRE SUPPRESSION FOR HEPA FILTERS.
8. FLOW LIMITING ORIFICE.
9. TANKS WILL BE FURNISHED WITH NOZZLES MATCHING INCOMING PIPE SIZE AND MATERIAL.

0	ISSUED FOR CONCEPTUAL DESIGN		

U.S. DEPARTMENT OF ENERGY
RICHLAND OPERATIONS OFFICE
MEIER ASSOCIATES INC., P.S.

P&ID.
TANKAGE

F-031: SODIUM STORAGE FACILITY

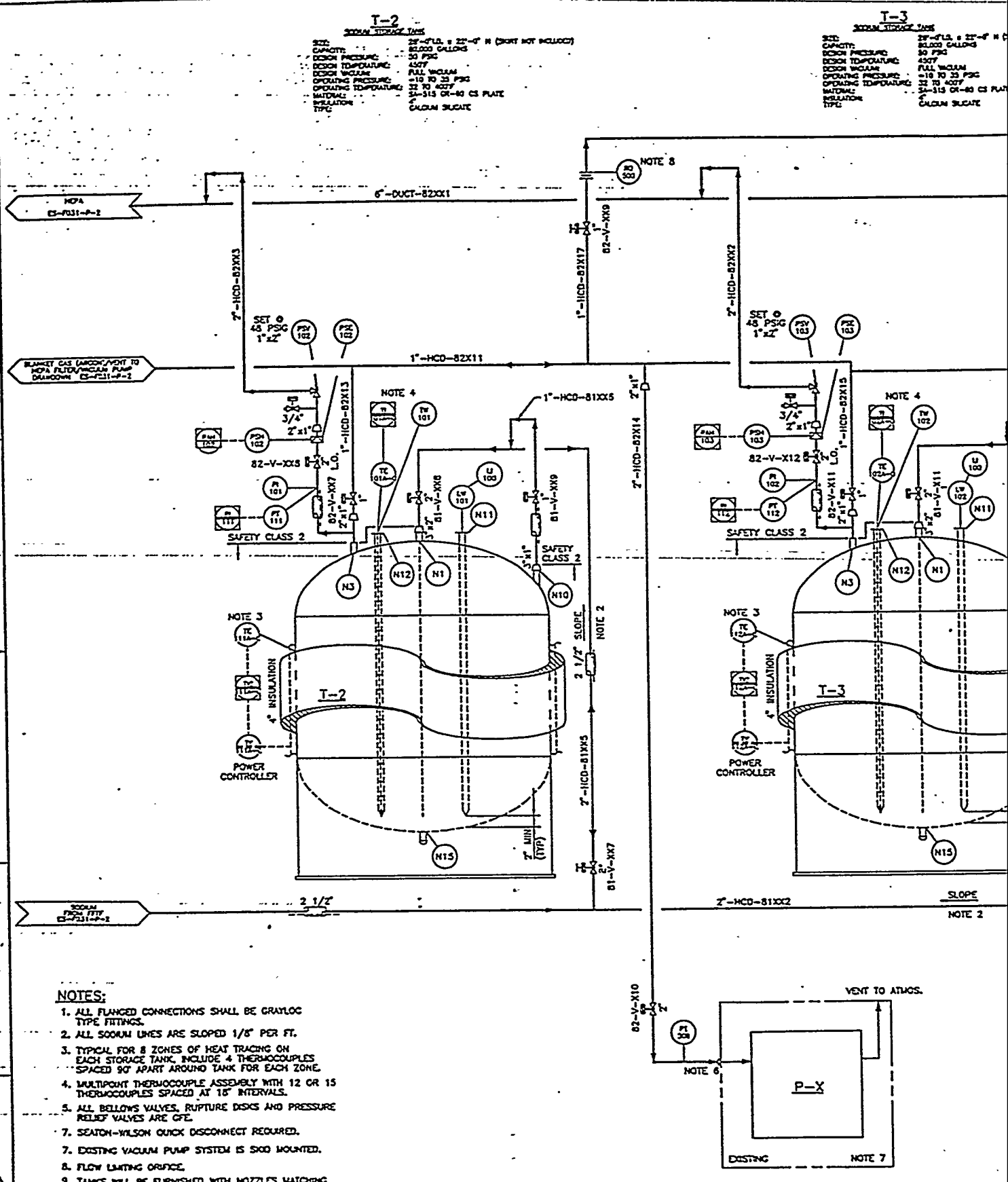
SIZE	DWG NO.	REV NO.
F	ES-F031-P-2	0

NONE | 360-1186 | SHT 1 OF 1

1186P2.DWG | SLIBM:ACD2:12 0:55 | N | WHC | 2 PLOT SCALE: 1=1 | KEHCAD | 1

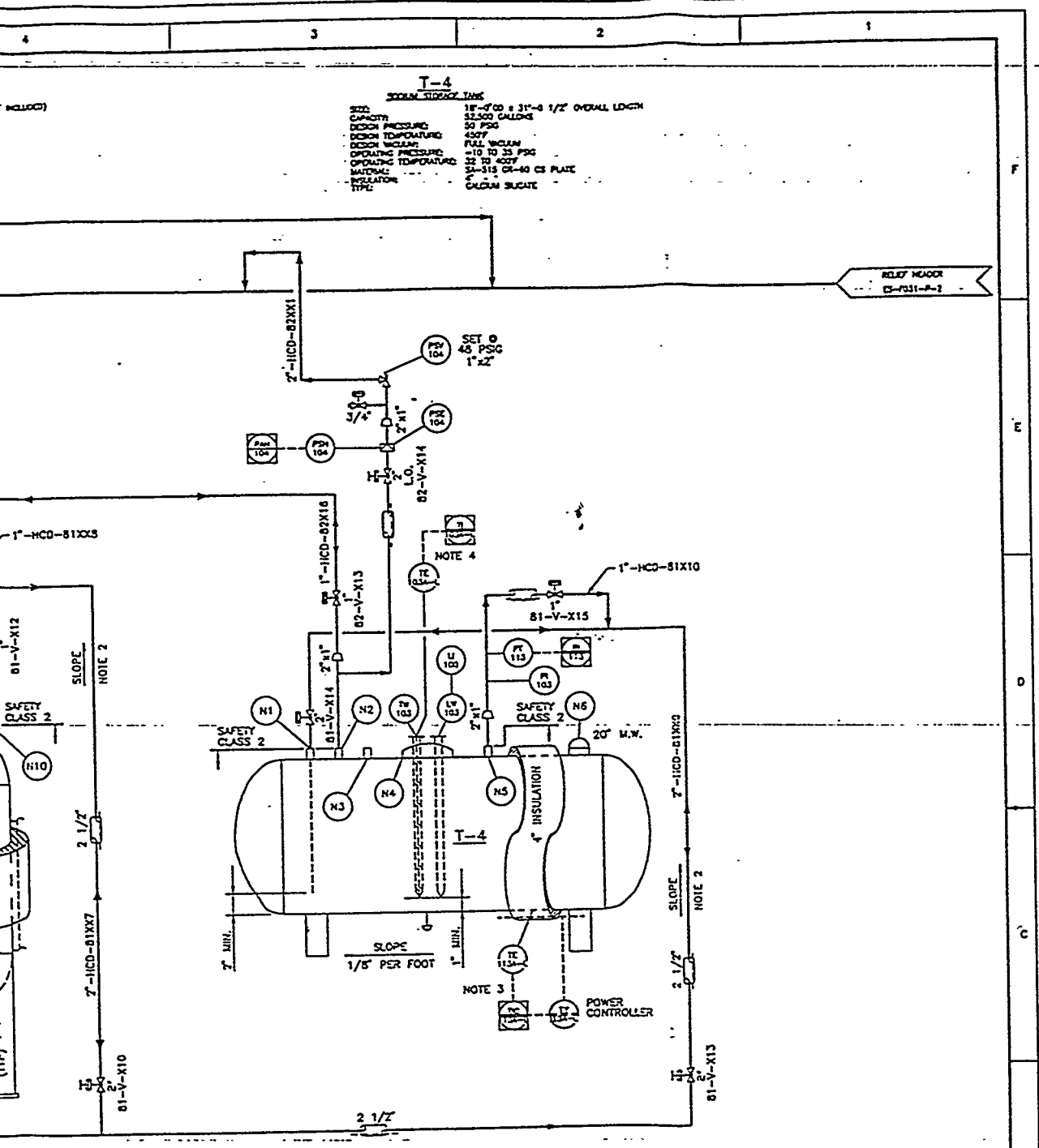
ES-F031-C-1

Pg. L-11

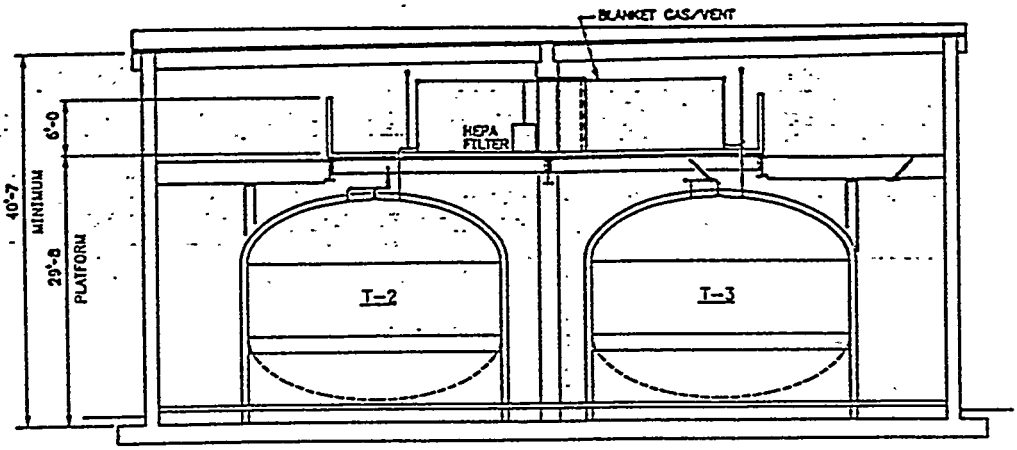


NOTES:

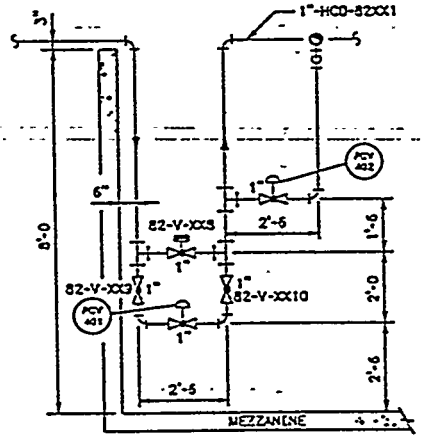
1. ALL FLANGED CONNECTIONS SHALL BE GRAYLOC TYPE FITTINGS.
2. ALL SODIUM LINES ARE SLOPED 1/8" PER FT.
3. TYPICAL FOR 8 ZONES OF HEAT TRACING ON EACH STORAGE TANK, INCLUDE 4 THERMOCOUPLES SPACED 90° APART AROUND TANK FOR EACH ZONE.
4. MULTIPOINT THERMOCOUPLE ASSEMBLY WITH 12 OR 15 THERMOCOUPLES SPACED AT 18" INTERVALS.
5. ALL BELLOWS VALVES, RUPTURE DISKS AND PRESSURE RELIEF VALVES ARE GFE.
7. SEATON-WILSON QUICK DISCONNECT REQUIRED.
7. EXISTING VACUUM PUMP SYSTEM IS SKID MOUNTED.
8. FLOW LIMITING ORIFICE.
9. TANKS WILL BE FURNISHED WITH NOZZLES MATCHING INCOMING PIPE SIZE AND MATERIAL.



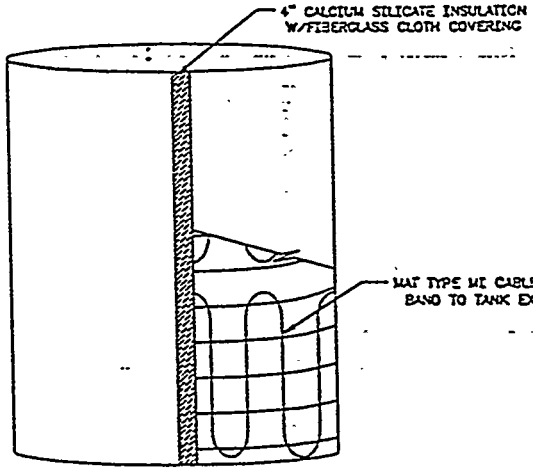
				U.S. DEPARTMENT OF ENERGY RICHLAND OPERATIONS OFFICE MEIER ASSOCIATES INC., P.S.	
				P&ID, TANKAGE	
				F-031: SODIUM STORAGE FACILITY	
0	ISSUED FOR CONCEPTUAL DESIGN			F SSF 3321 2024 ES-F031-P-3	0
				NONE 360-1186 1 of 1	
				1186P3.DWG SLIBM-ACD2-12.0-SS	



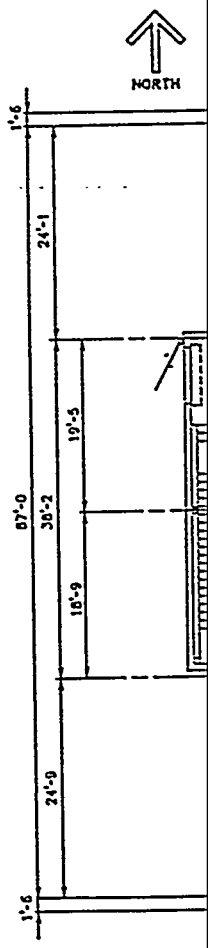
A SECTION
1/8" = 1'-0

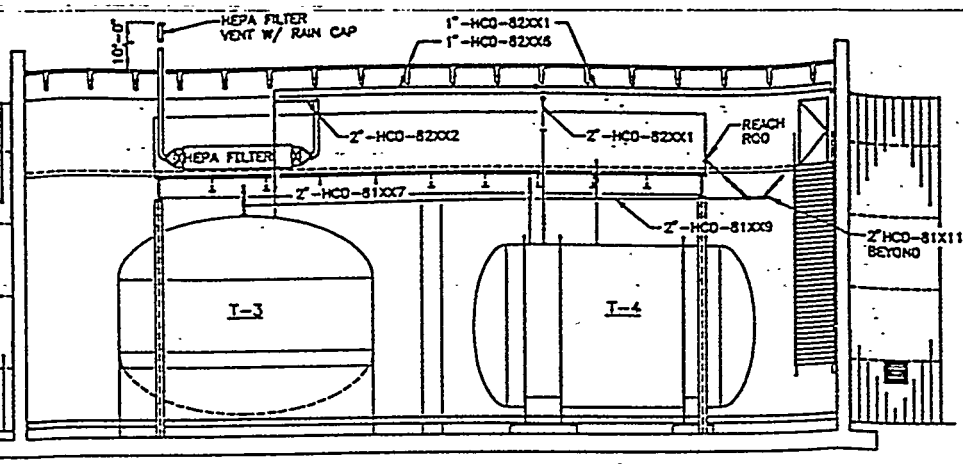


1 DETAIL
1/2" = 1'-0

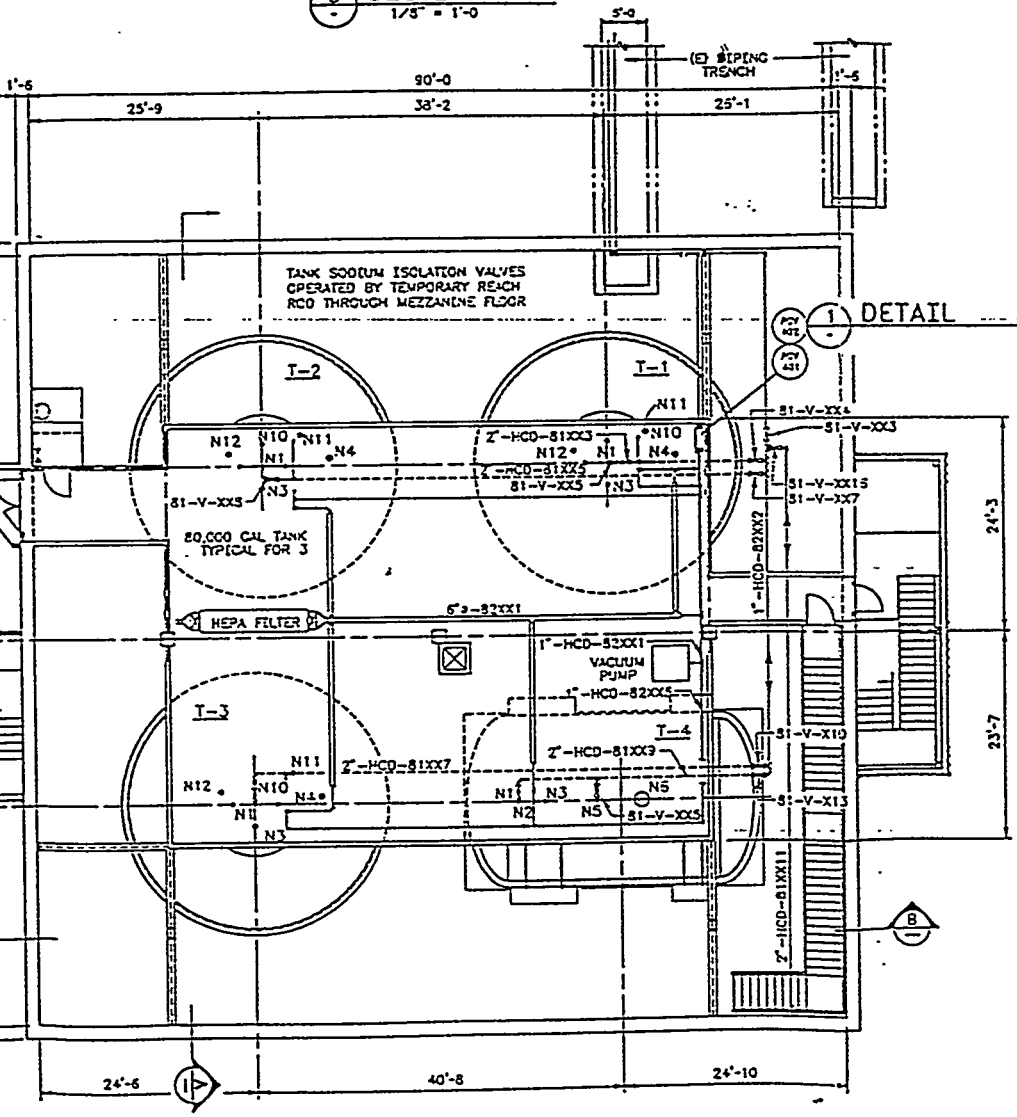


TYPICAL TANK HEATER & INSULATION DETAIL
SCALE: NONE





B SECTION
1/8" = 1'-0

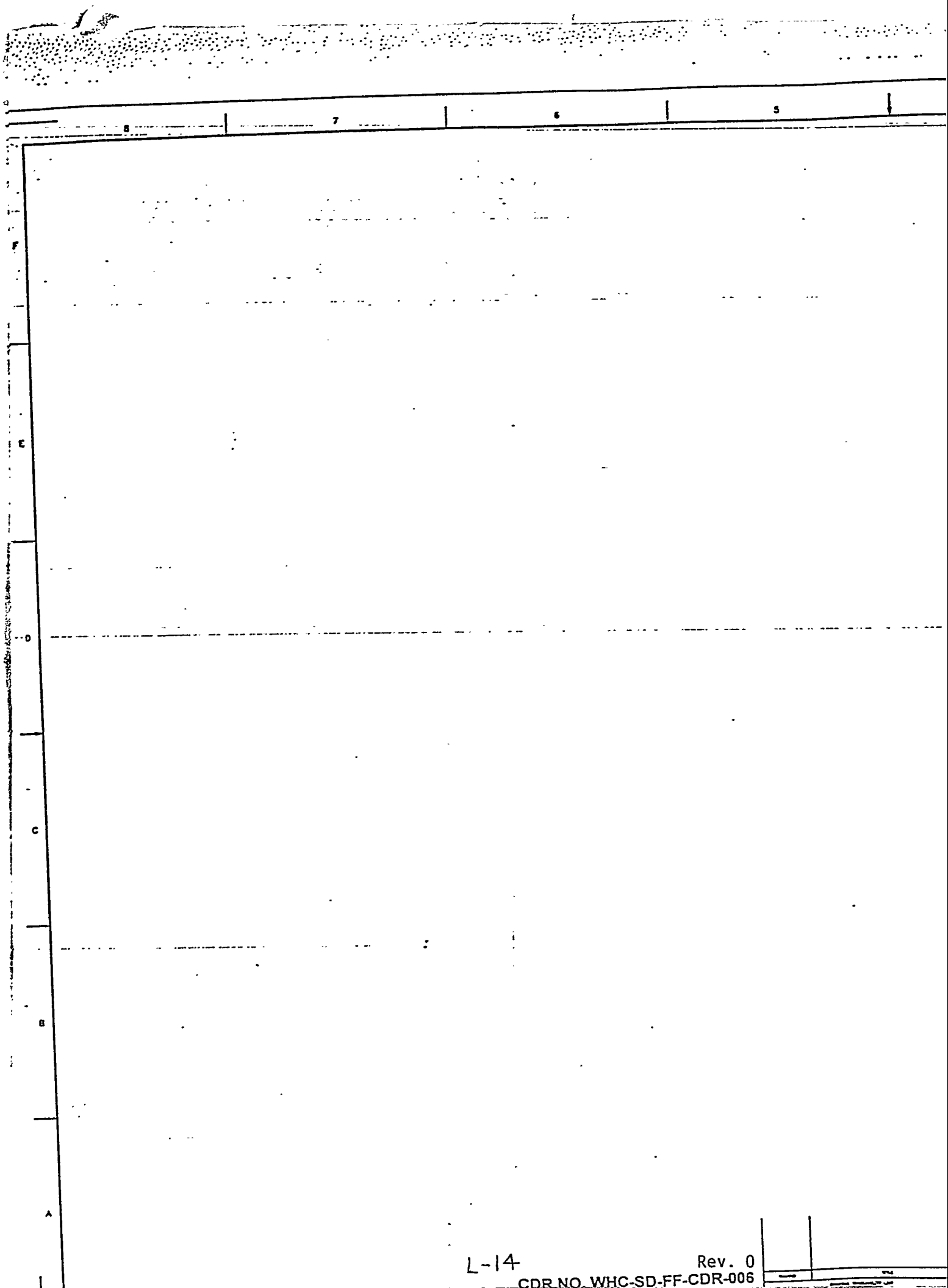


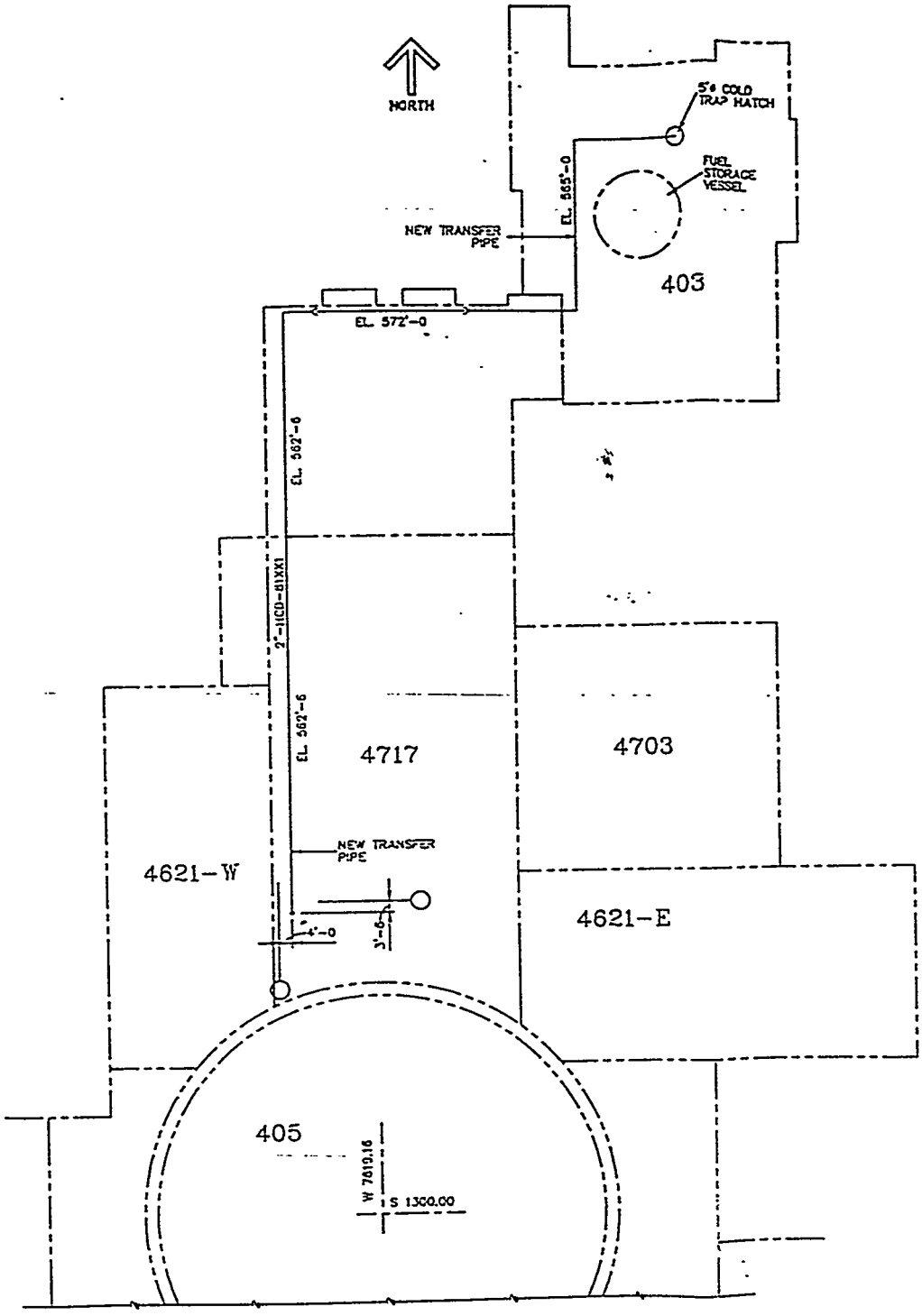
MEZZANINE PIPING PLAN
SCALE: 1/8" = 1'-0

Ps. 2-13

		U.S. DEPARTMENT OF ENERGY RICHLAND OPERATIONS OFFICE MEIER ASSOCIATES INC., P.S.	
		PIPING ARRANGEMENT TANKAGE	
		F-031: SODIUM STORAGE FACILITY	
		F SSF ES-F031-P-4	0
		SHOWN 360-1155	1 of 1

0 ISSUED FOR CONSTRUCTION 10/5/94


8
7
6
5
F
E
D
C
B
A



TRANSFER PIPING PLAN
SCALE: 1" = 20'

Pg. L-14

0	ISSUED FOR CONCEPTUAL DESIGN		

U.S. DEPARTMENT OF ENERGY
RICHLAND OPERATIONS OFFICE
METER ASSOCIATES INC., P.S.

TRANSFER
PIPING ARRANGEMENT

F-031: SODIUM STORAGE FACILITY

F	SSF	8332	ES-F031-P-5	0