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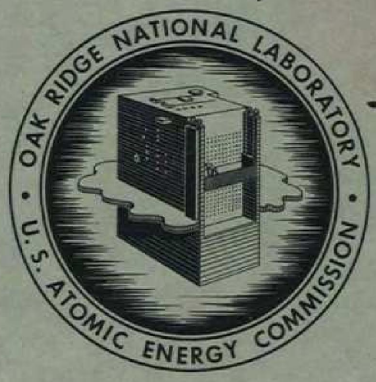
C-84—Reactors-Special
Features of Aircraft Reactors
M-3679 (22nd ed.)

AEC RESEARCH AND DEVELOPMENT REPORT

TERMINATION REPORT FOR CONSTRUCTION OF THE ART FACILITY

W. F. Ferguson
F. R. McQuilkin
G. C. Robinson
R. D. Stulting



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REACTOR PROJECTS DIVISION

TERMINATION REPORT FOR CONSTRUCTION OF THE ART FACILITY

W. F. Ferguson
F. R. McQuilkin
G. C. Robinson
R. D. Stulting

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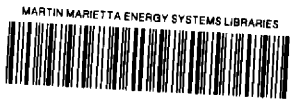

PREFACE

This report presents the status and plans of the ORNL ANP program for the ART operational facility as of the time ART construction activities were suspended in September 1957. Photographs, schedules, cost tabulations, drawing schedules, and records disposition lists have been included so as to complete the termination records.

Companion termination reports on other activities of the Aircraft Reactor Engineering Division's Reactor Construction Department are being issued. These include reports on the ETU and ART reactor construction, the ETU facility construction, and the program for disassembly of the ART reactor.

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CONTENTS

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TERMINATION REPORT FOR CONSTRUCTION OF THE ART FACILITY

W. F. Ferguson, F. R. McQuilkin, G. C. Robinson, and R. D. Stulting

1. GENERAL

The ART facility, ORNL Building 7503, is a modification of the facility used for the Aircraft Reactor Experiment (ARE). Its purpose was to house all equipment and appurtenances required to install and operate a 60-megawatt reflector-moderated circulating-fuel reactor whose basic design is suitable for aircraft use. The facility is located in Okra Valley approximately 0.75 mile southeast of the center of the present ORNL area. Further information concerning the facility and facility site can be found elsewhere.[1]

The program for design and construction of the ART facility was subdivided into six packages. Package I, consisting of additions to Building 7503, construction of the reactor cell, and installation of the required building services, was designed by the K-25 Plant Engineering Division and constructed by V. L. Nicholson Company. Package A, consisting of installation of auxiliary service pipe lines for nitrogen, air, cooling water, helium, lubricating oil, and hydraulic oil, was designed by the ORNL Engineering and Mechanical Division and constructed by V. L. Nicholson Company. Package II, consisting of furnishing and erecting a prefabricated steel building, installation of diesel generators and appurtenances, installation of electrical motor control centers, and installation of the electrical system and air conditioning equipment for the spectrometer room, was designed by the ORNL Engineering and Mechanical Division and constructed by Rentenbach Engineering Company. Package IIIA, consisting of installation of dry air system, installation of lube oil fill and waste system, installation of NaK motor controllers and resistors, installation of louver hydraulic system, and installation of a prefabricated steel building, was designed by the ORNL Engineering and Mechanical Division and constructed by Rentenbach Engineering Company. Package III, consisting of all work outside the reactor cell required to complete the facility, was being designed by the ORNL Engineering and Mechanical Division and was to be installed by ORNL craft personnel. Package IV, which included all work inside the reactor cell, was being designed by the Aircraft Reactor Engineering Division (ARED). It was planned to have this package installed by ORNL forces also.

Authorization of expenditures for the capital portion of the facility installation program was obtained through Budget Directive CL-169 dated March 10, 1955, and Modifications 1, 2, 3, and 4 thereto dated September 7, 1955, October 21, 1955, March 30, 1956, and December 26, 1956, respectively. The basic directive (CL-169) authorized capital expenditures of $1,500,000 and construction activity expenditures of $270,113. The authorized construction activity expenditures level was increased to $275,000 by Modification No. 3. Modification No. 4 established an authorized expenditure level as follows:

Activity	$ 274,326
Capital	1,200,000

Tables A-1 and A-2, which are appended, show the status of expenditures as of September 1957 as authorized by Directive CL-169. Another modification to Directive CL-169 had been requested, which would have extended the completion date for capital work from June 30, 1957, to June 30, 1958.

Lump-sum contract work at the facility was performed under Atomic Energy Commission Contracts AT-(40-1)-1952 and AT-(40-1)-1954. The V. L. Nicholson Company was prime contractor under Contract AT-(40-1)-1952. The contract consisted of all work specified by the Package I and Package A drawings and specifications. Contract AT-(40-1)-1954 included all work specified by the Package II and Package IIIA drawings and specifications. Rentenbach Engineering Company was prime contractor for this contract. Pertinent information pertaining to the aforementioned contracts can be found in the Appendix, Table A-3. A breakdown of contract cost and a list of unit prices estimated from contract cost can be found in Tables A-6, A-7, and A-8.

Approximately $82,000 worth of material was procured for Package III and IV work. It was planned to start installation of Package III items during the latter part of calendar year 1958. Schedules (Table B-1), budget (Table A-4), manpower estimates (Table B-2), and other information pertaining to installation of Packages III

[1] W. B. Cottrell *et al.*, *Aircraft Reactor Test Hazards Summary Report*, ORNL-1835 (Jan. 19, 1955) (classified).

[redacted]

and IV are appended. Table A-5 shows our present evaluation of the adequacy of the budget figures which appear in the Appendix. Plans to complete the facility were canceled during September 1957. After cancellation, operational costs were incurred only in connection with placing the building in standby condition and canceling outstanding facility purchase orders. No capital expenses were incurred after July 1, 1957. Total capital expenditures for fiscal years 1955, 1956, and 1957 were $21,494, $760,051, and $342,108, respectively. Total operational expenditures for fiscal years 1956, 1957, and 1958 were approximately $438,000, $482,000, and $123,000, respectively. A breakdown of capital expenditures can be seen in Table A-1. A breakdown of operational expenses is presented below:

Instrumentation	$105,000
Design engineering	164,000
Field engineering	73,000
Departmental labor	130,000
Procurement	187,000
Lump-sum contracts	300,000
Other costs	84,000

Basic design criteria for the facility can be found in various ART design memos and the ART flowsheets.

Portions of the facility are shown in the following photographs (Figs. 1–24). A narrative description will be presented in other sections of the report.

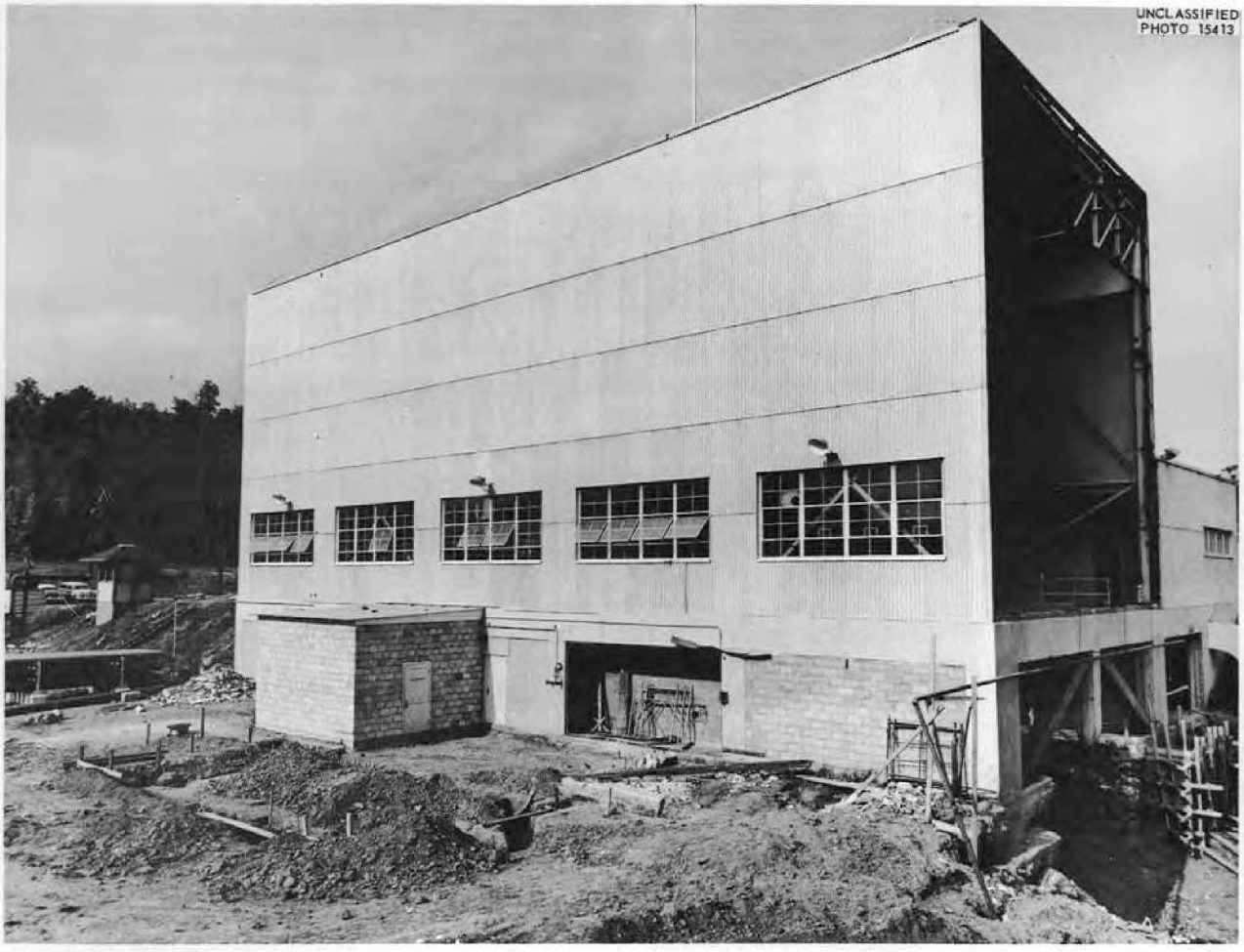

Fig. 1. View of Building 7503 from the Southwest. Photograph taken during the early stages of construction, showing the portion of the building which existed at the start of construction of the ART facility.

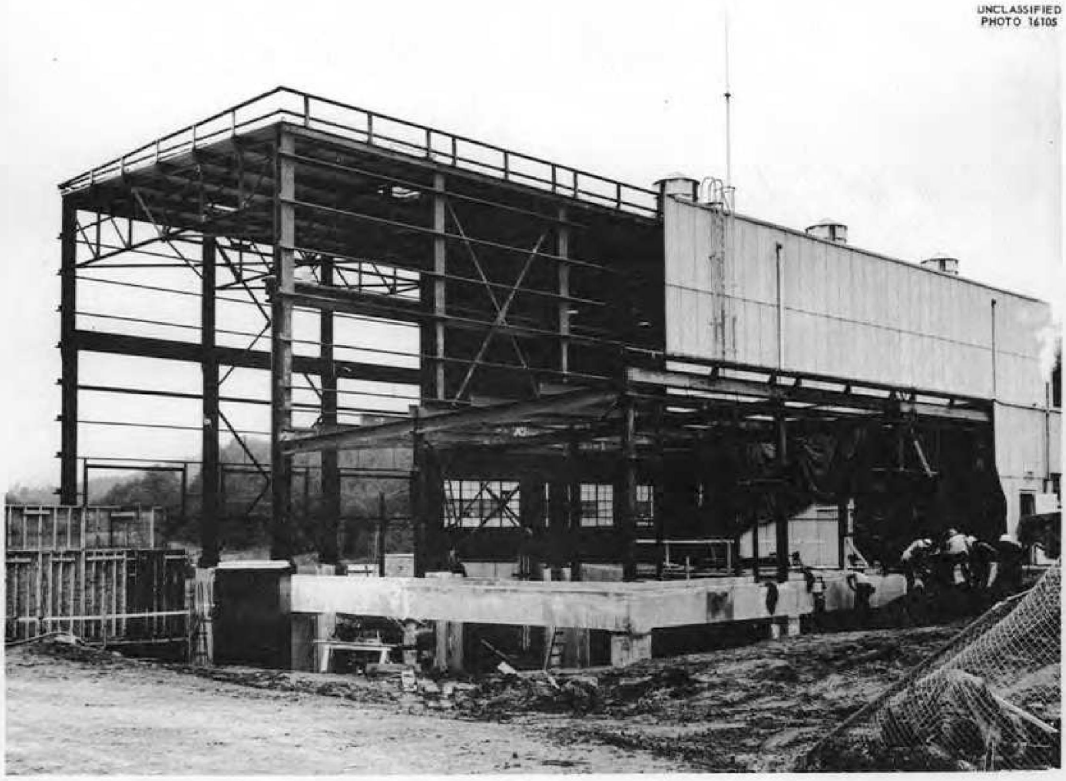

Fig. 2. View of Building 7503 from the Southeast. Photograph taken during the early stages of construction, showing the major portion of the structural steel required for the extension to the existing building.

Fig. 3. View of Excavation, Showing the Highly Compacted Crushed Stone Subbase for the Cell Foundation.

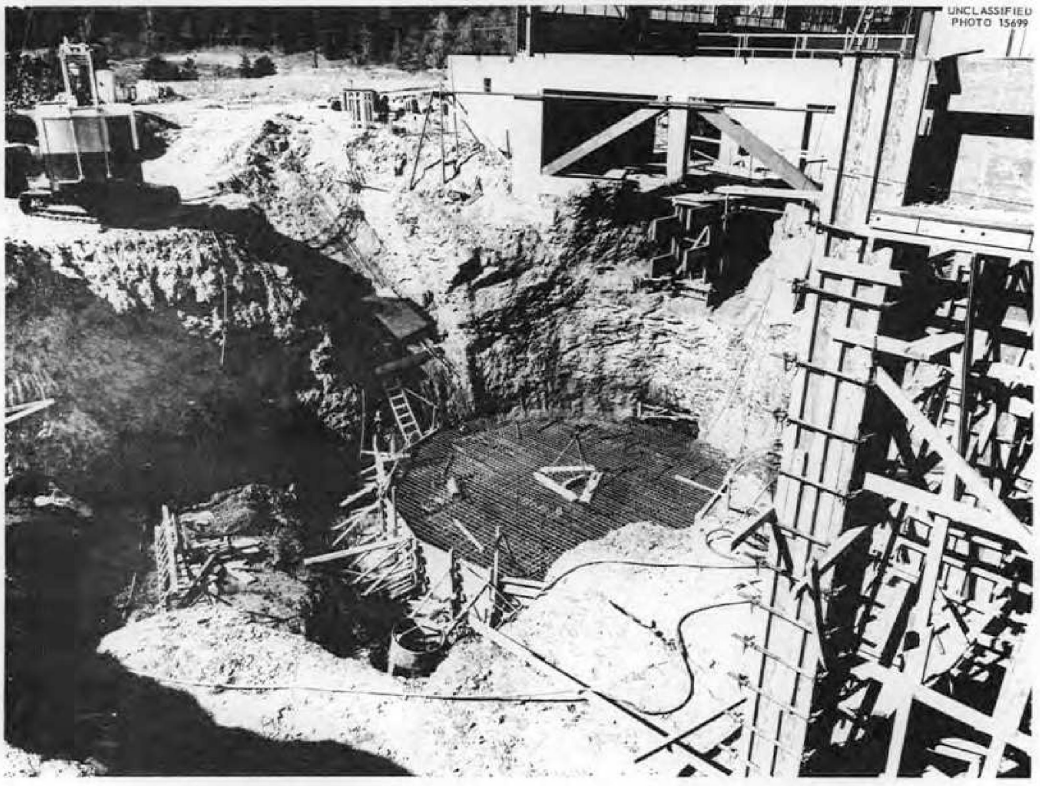

Fig. 4. View of Excavation Showing the Reinforcing Steel for the Cell Foundation.

Fig. 5. View into the Main Air Duct from the West. In the background can be seen the guide vanes which are located at the base of the stack.

Fig. 6. View from the South End of the Crane Bay of the Original Building 7503. In the right background can be seen the adsorber pit. In the left background can be seen the forms for the walls of the spectrometer tunnel.

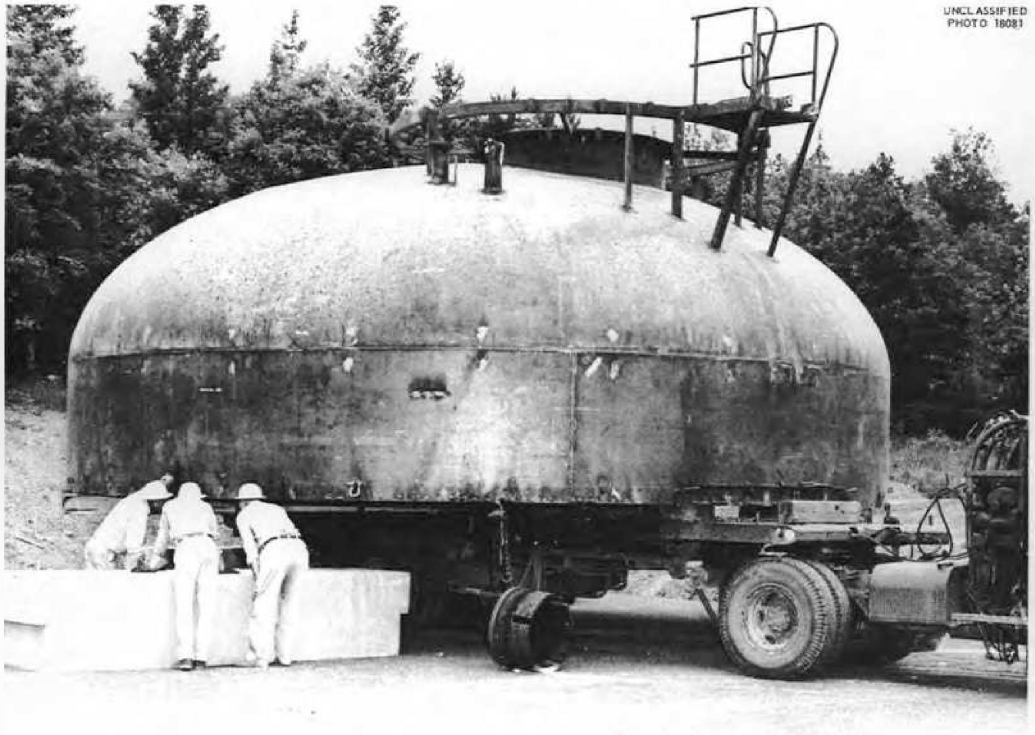

Fig. 7. Top of the Cell Water Vessel. Shown being moved to a storage area north of Building 7503.

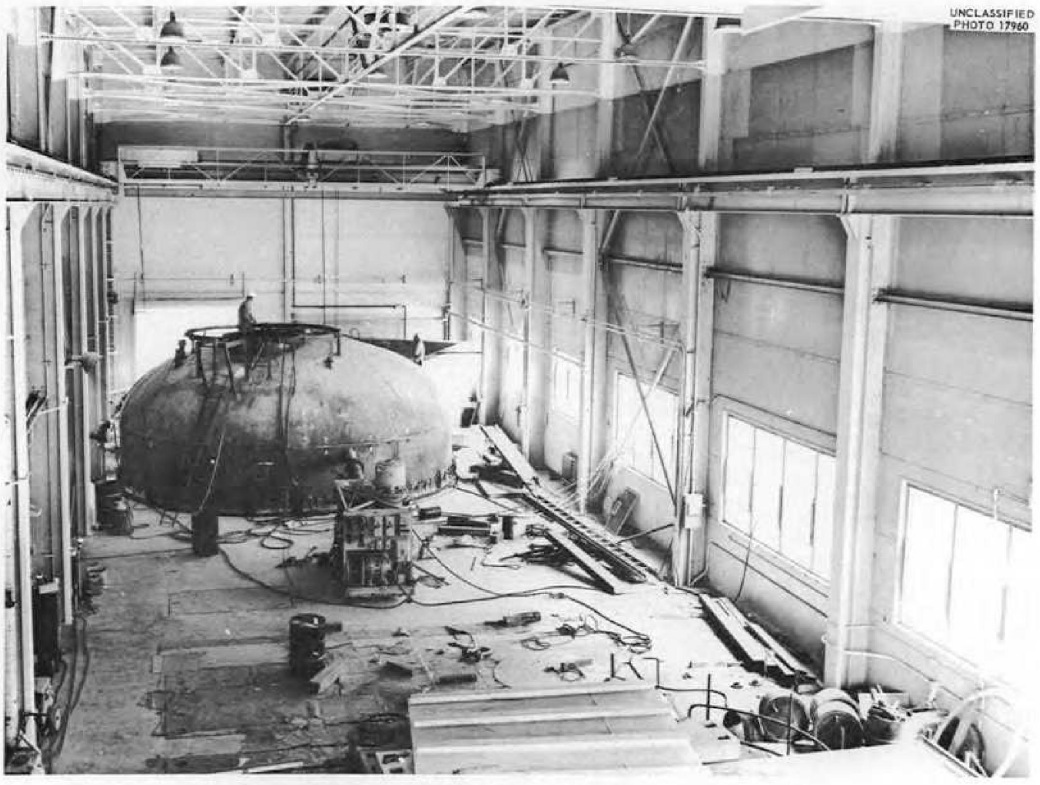

Fig. 8. Crane Bay in Building 7503. View looking south, showing the top of the cell water vessel in place as planned for ART operation.

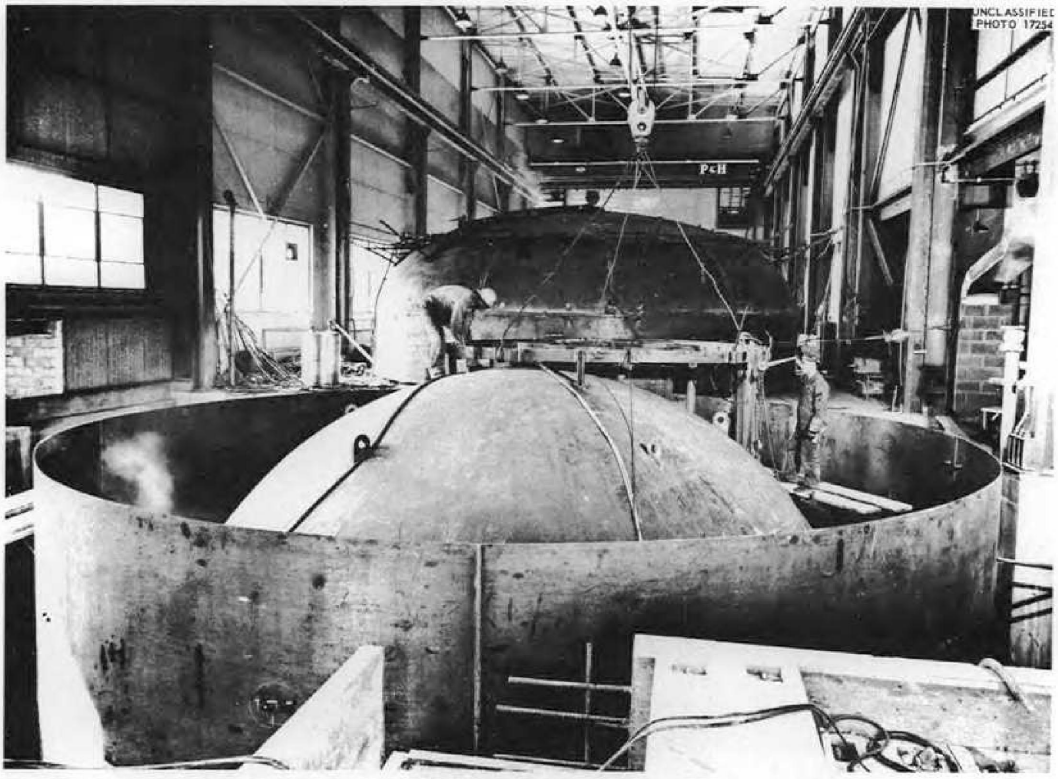

Fig. 9. View Across the Reactor Cell. Photograph showing the pressure vessel in place and the top of the water tank on the floor of the crane bay.

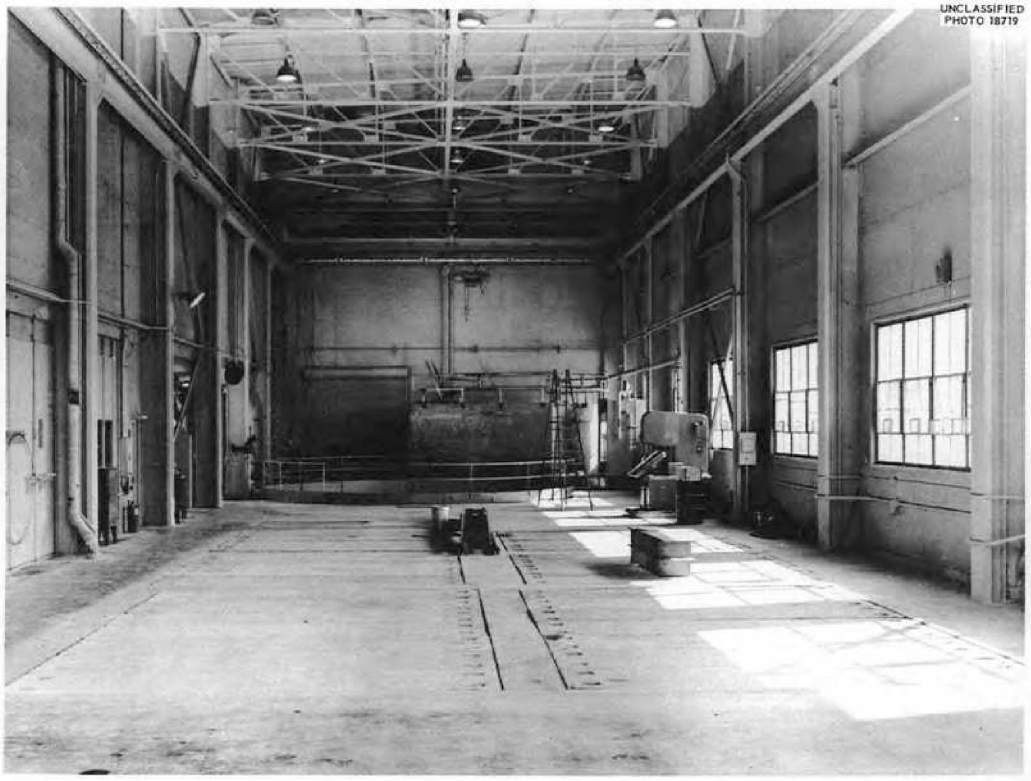

Fig. 10. Crane Bay in Building 7503. View looking south, showing the crane bay as it looks when all the material that is now stored there is removed.

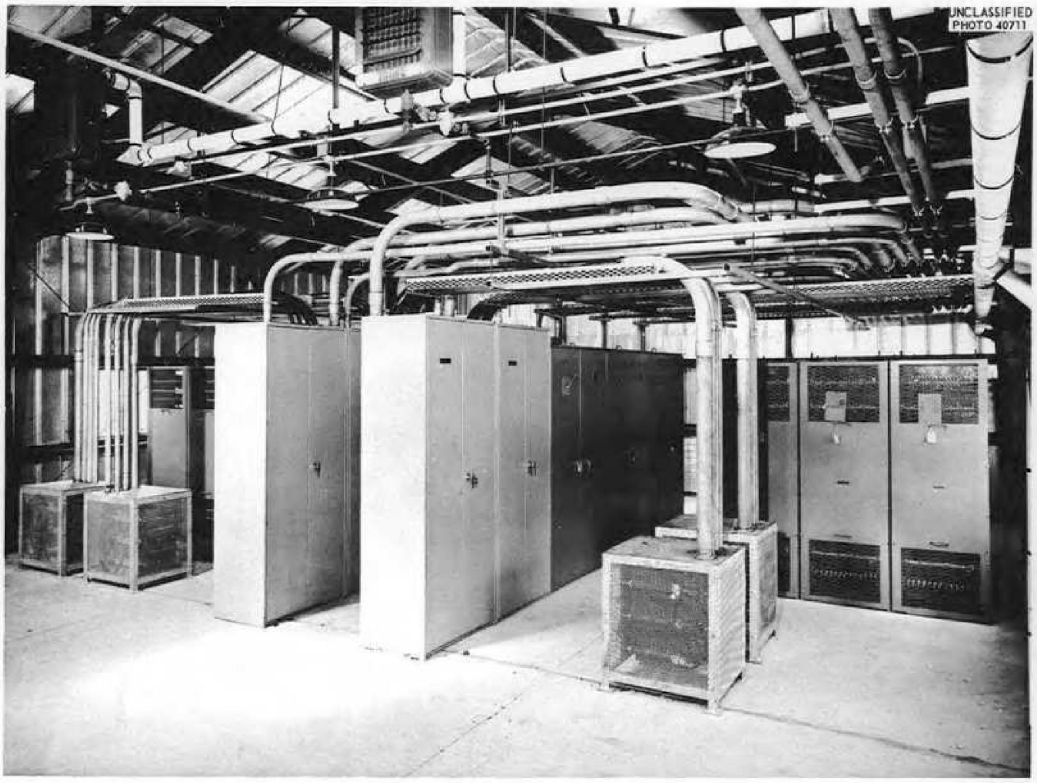

Fig. 11. Controllers for the Wound Rotor Motors. The controllers were installed in the compressor house by the Package IIIA contractor.

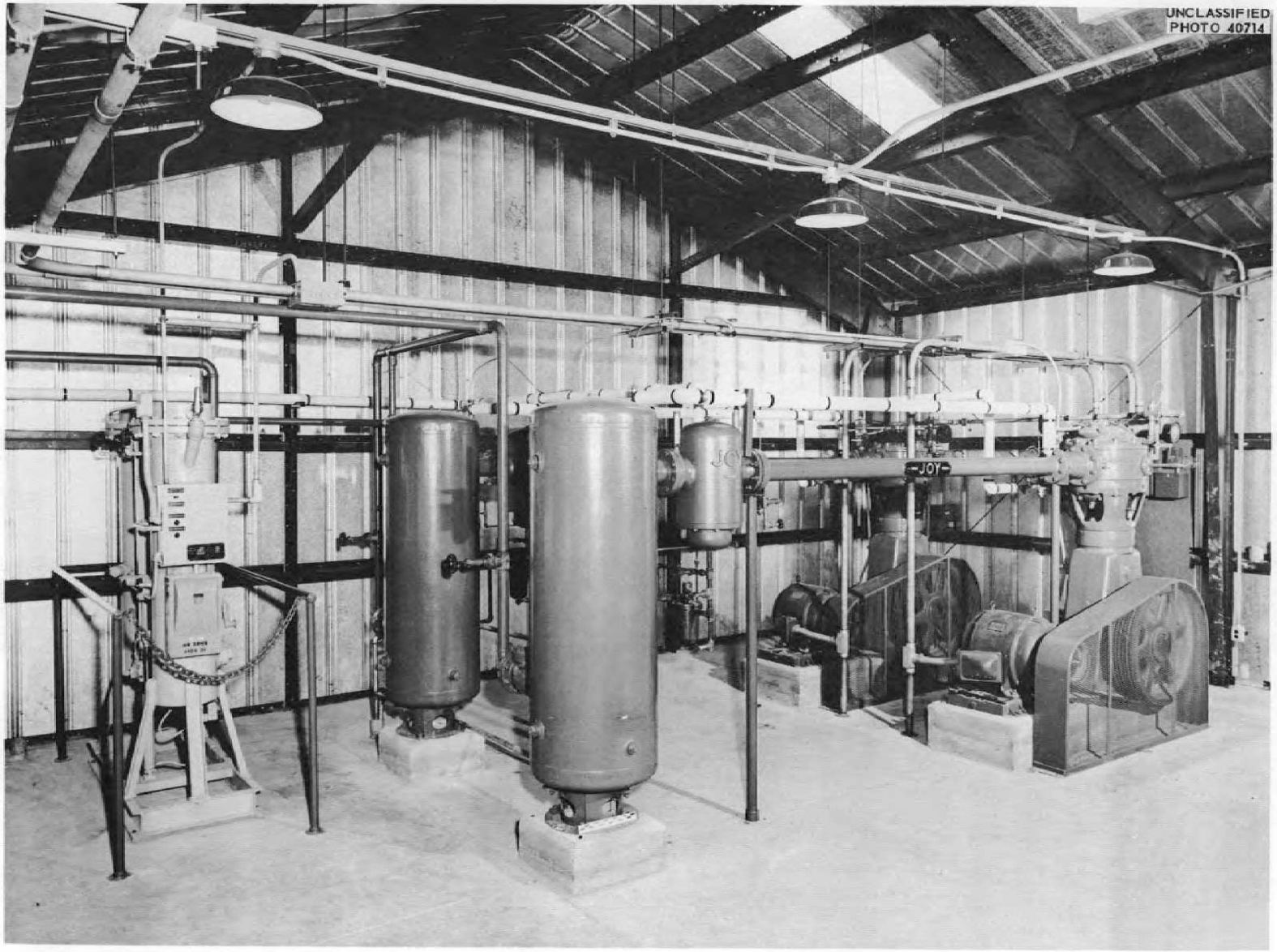

Fig. 12. Dry Air Plant. This equipment is located in the compressor house.

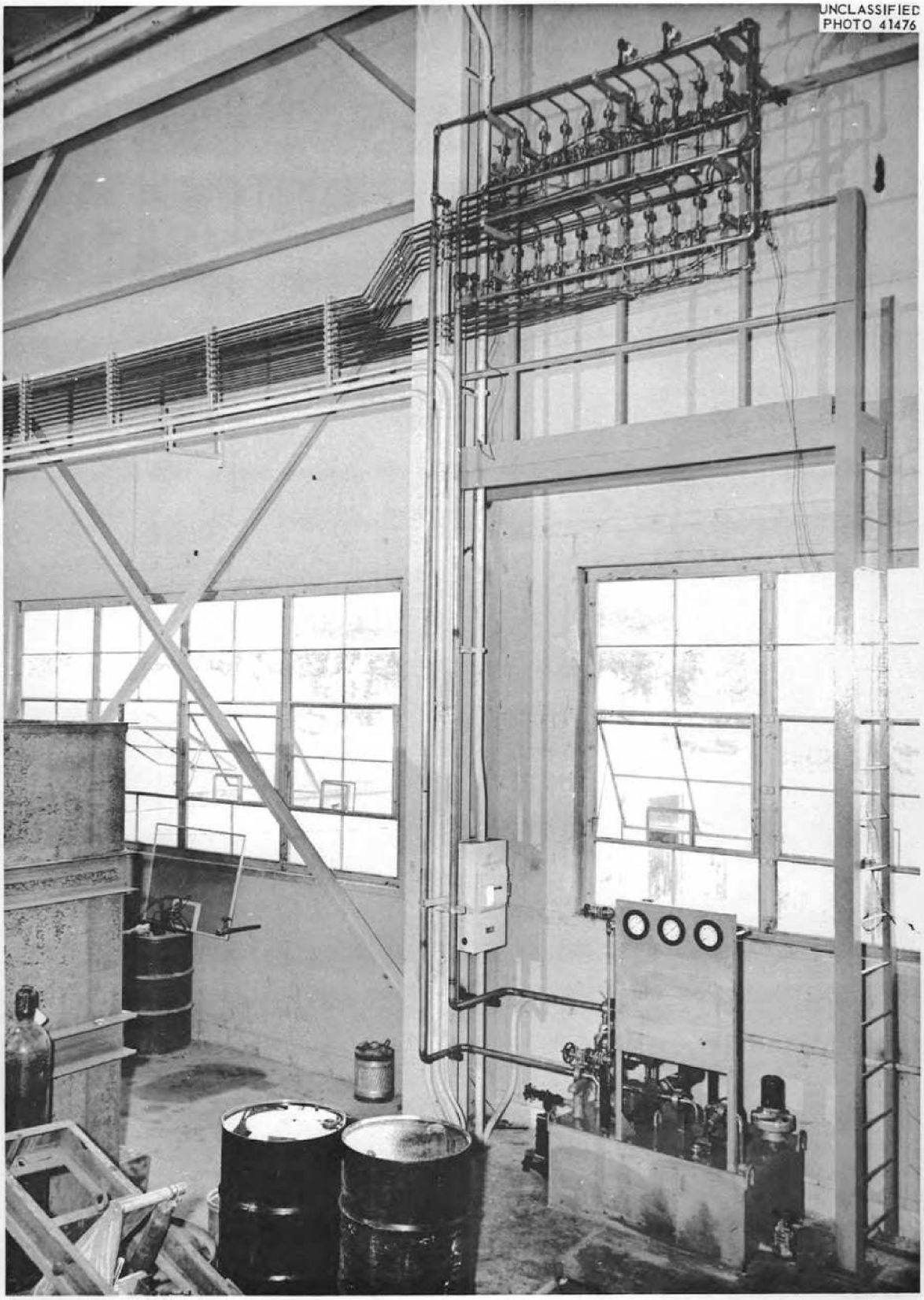

Fig. 13. Hydraulic System for Operating the Louvers. Photograph showing the pumping unit and a portion of the hydraulic system. This equipment is located in the crane bay.

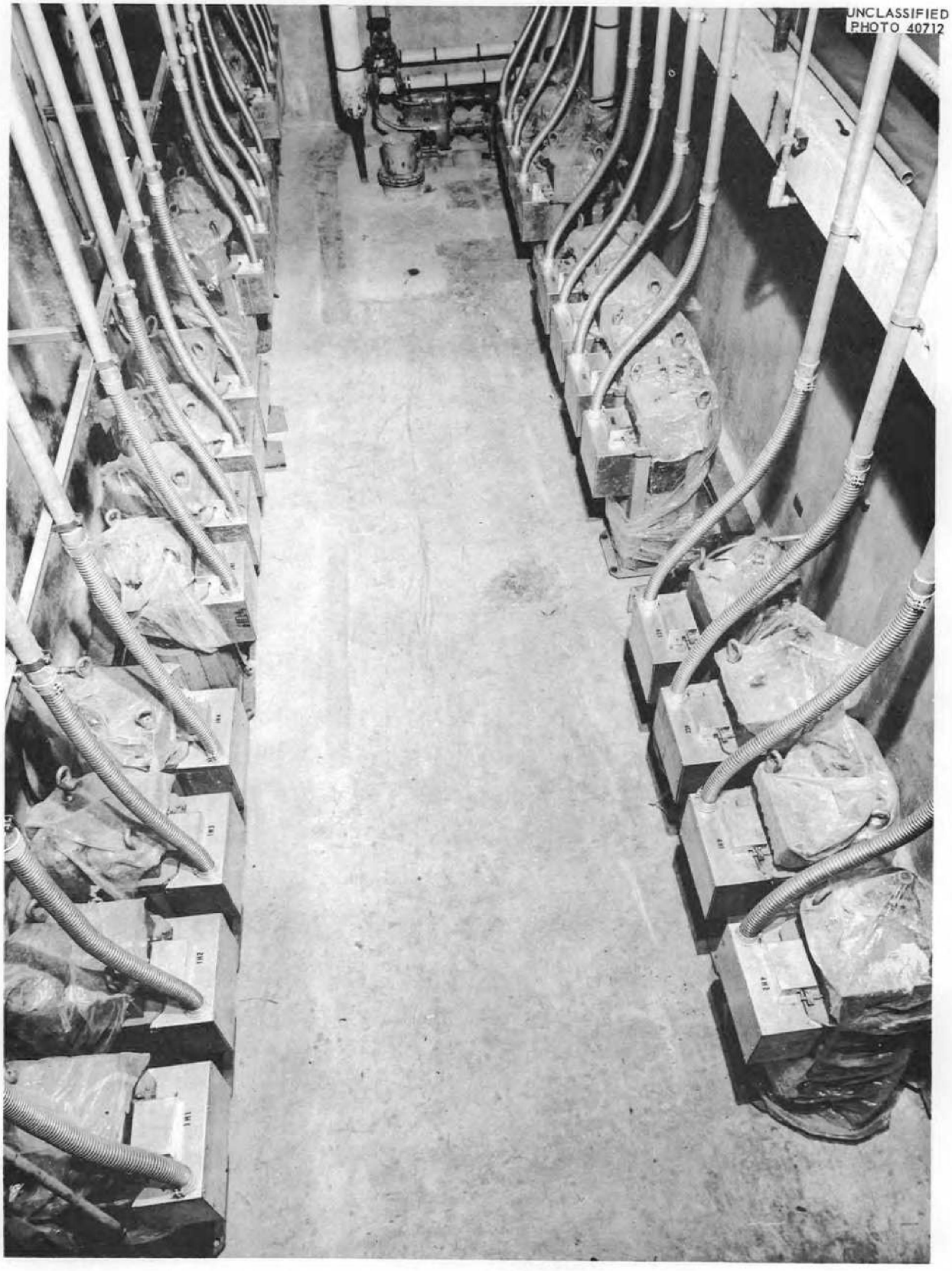

Fig. 14. The Regulator Pit in the North Basement. Some of the induction voltage regulators are shown.

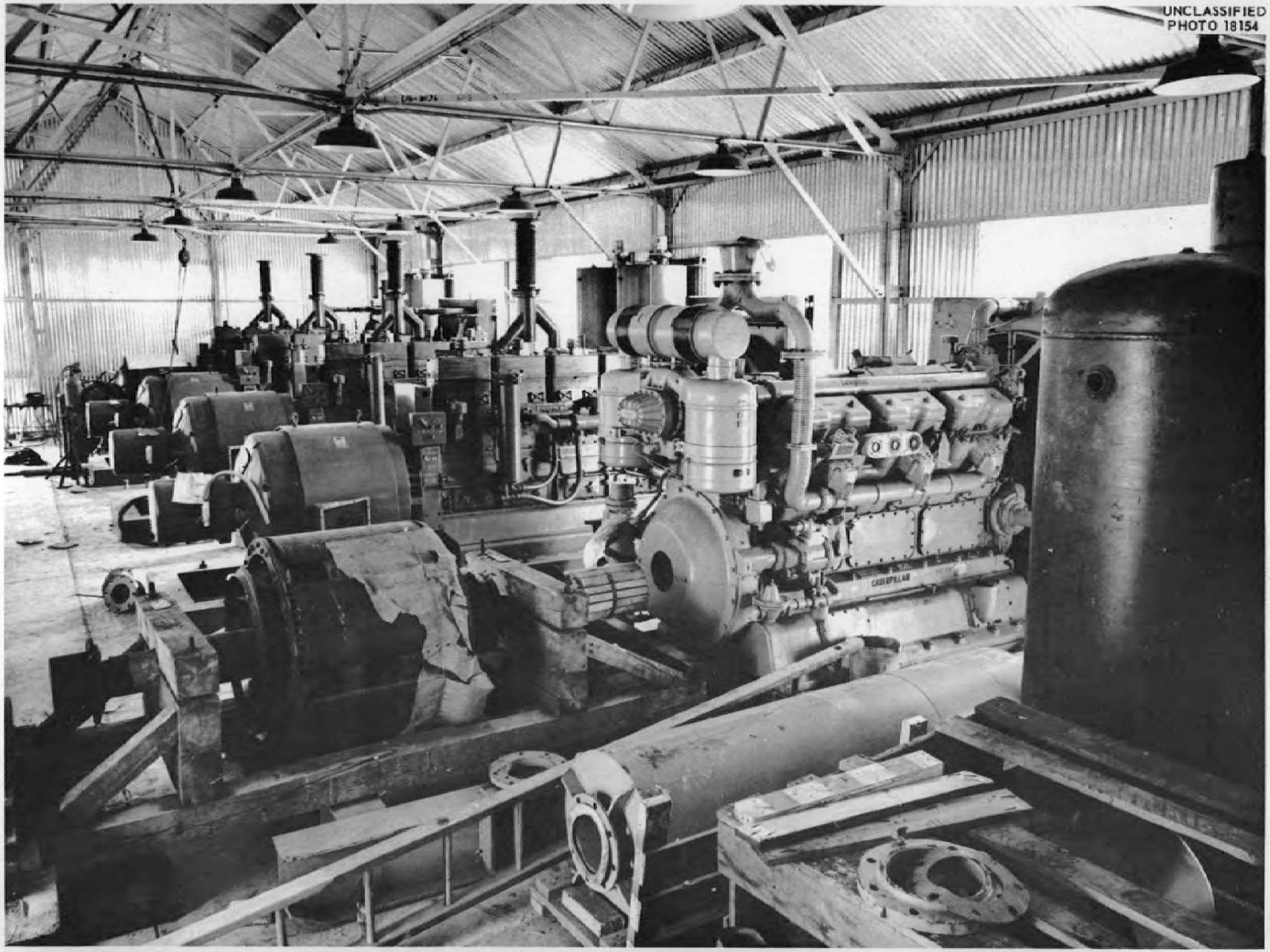

Fig. 15. View Inside the Diesel Generator House. The five diesel generator units are shown during installation.

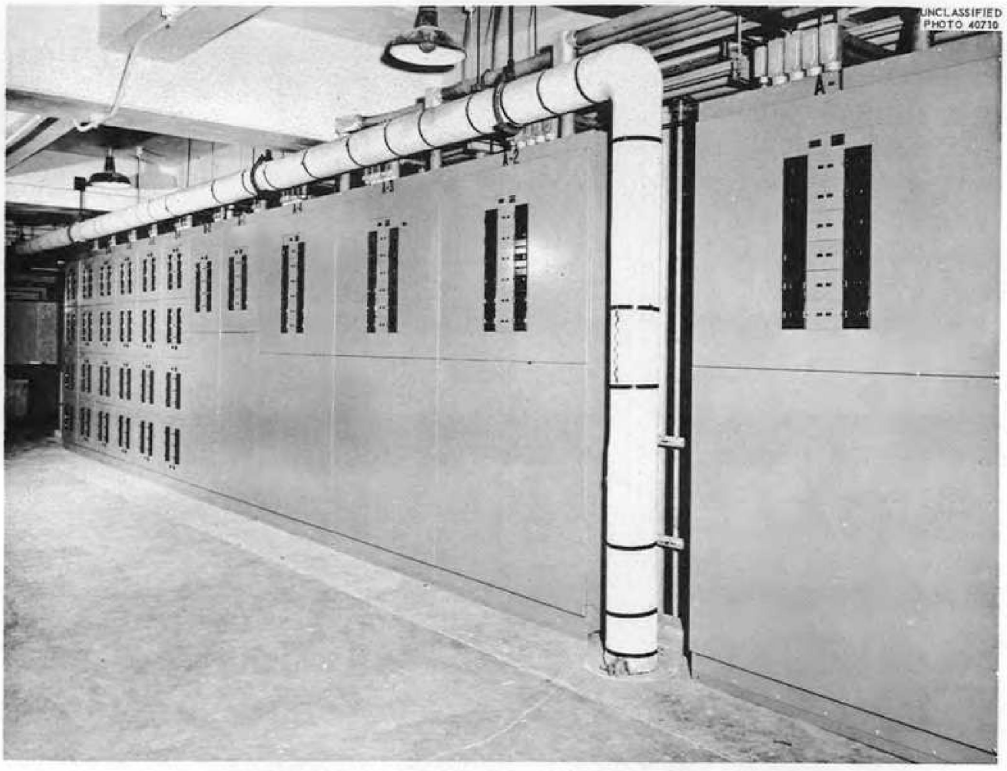

Fig. 16. Some of the Electrical Distribution Centers. These panels are located in the north basement.

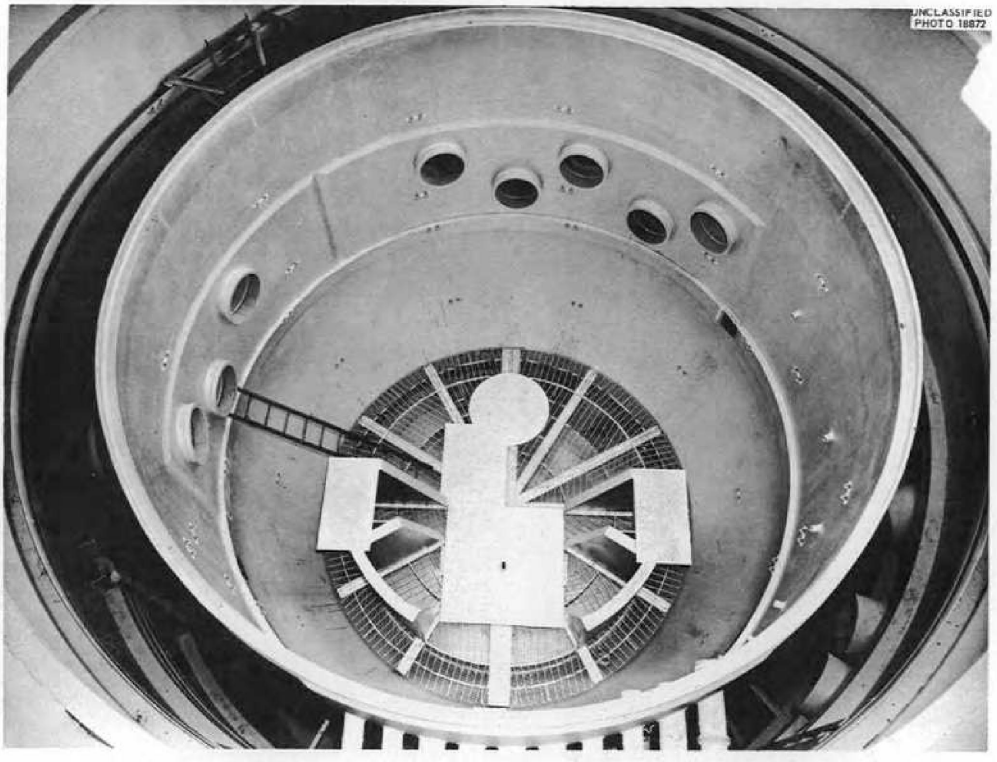

Fig. 17. Inside of the Pressure Vessel in the Reactor Cell. This photograph shows the present status of the cell. The large openings in the wall of the pressure vessel are the junction panel sleeves for the instrumentation. The pipes in the foreground are NaK sleeves and expansion joints. The small openings at the right are the spectrometer sleeves.

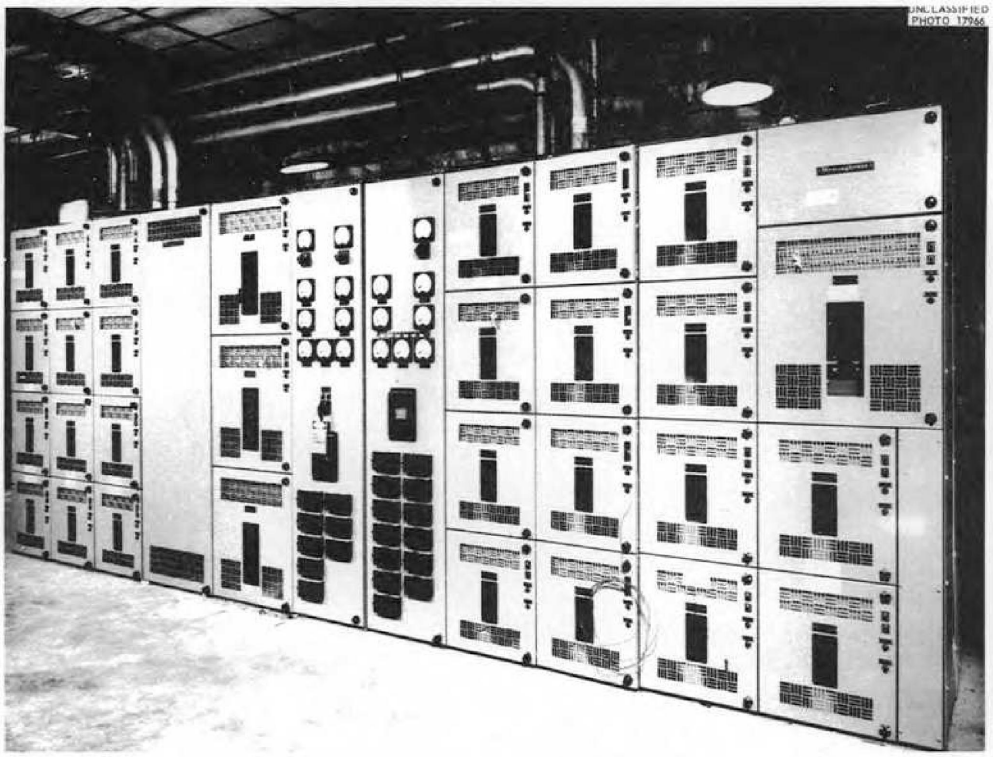

Fig. 18. The 480-Volt Main Switchgear. This installation is located in the switch house. The five cubicles on the right are fed from the diesel generator power system. The six cubicles on the left are fed from the TVA power system.

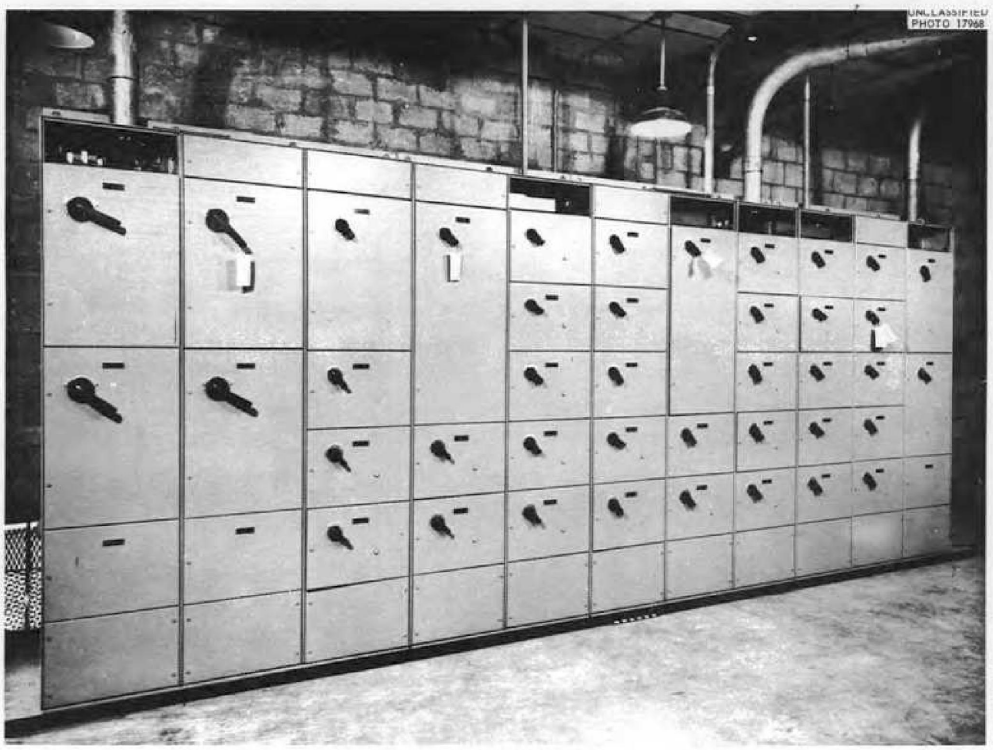

Fig. 19. 440-Volt Motor Control Center. One of two sections located in the switch house.

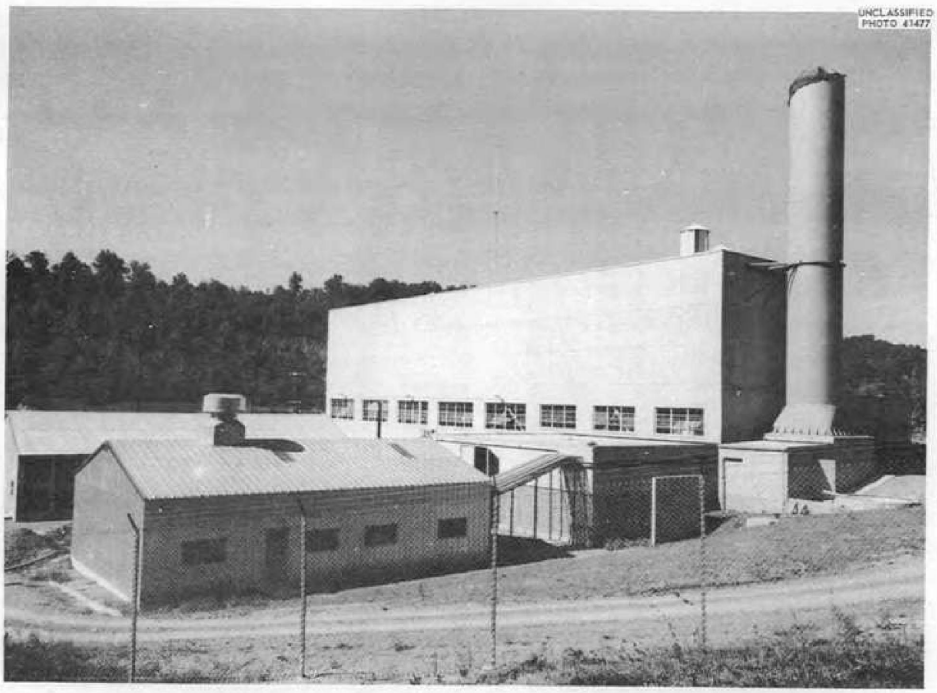

Fig. 20. View of the ART Facility from the Southwest. Photograph showing the present status of the facility. The metal building in the background is the diesel generator house. The compressor house is in the foreground.

Fig. 21. View of the ART Facility from the Northwest. Photograph showing the status of the facility in August 1957. In the right foreground can be seen the diesel oil storage tank. On the right of the main building can be seen the nitrogen storage facility, the 1500-kva substation, and the diesel generator building. On the left can be seen the process water tank. The 750-kva substation, which cannot be seen in this picture, is directly behind the water tank.

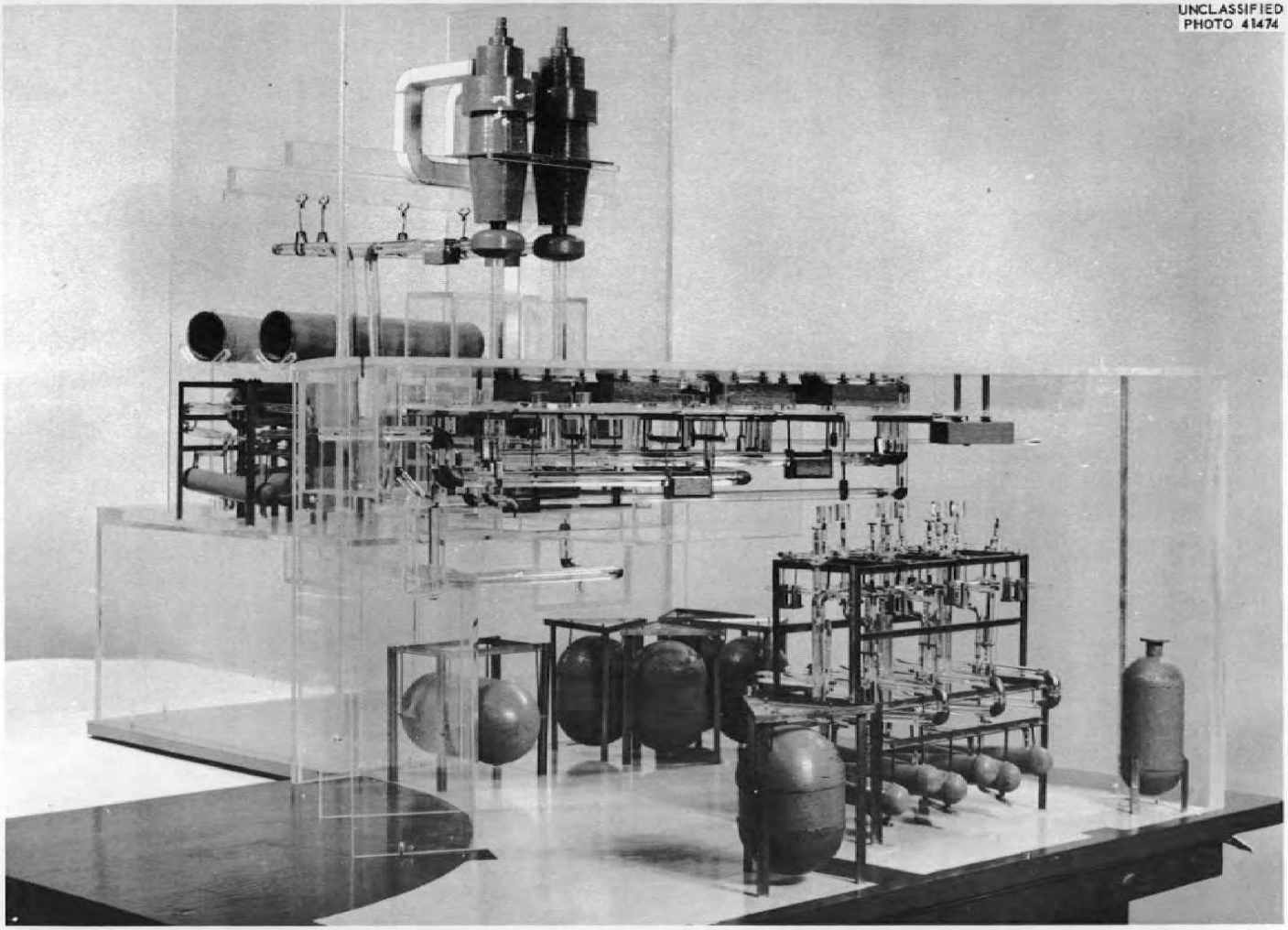

Fig. 22. Model of the Heat Dump System. Elevation view looking southeast at the radiator pit. The circular pattern in the lower left corner represents the cell; the special equipment room is in the background. The air duct, which had not been assembled, was to be located in the upper right corner above the radiator pit. The tank at the right is the drain tank for the radiator drain pans. The five vertical tanks are the main and auxiliary NaK dump tanks. The horizontal tank is the special NaK dump tank. The equipment structure to the left of the drain tank is the NaK purification system for the main and auxiliary coolant system and consists of the cold traps, plug indicators, flowmeters, valves, and piping. The rack was to be revised to omit the plug indicators. In the ceiling of the radiator pit are the main and auxiliary NaK piping, with the flowmeters and the heat-barrier-door operators. This represents a portion of the work which was to be accomplished by ORNL forces.

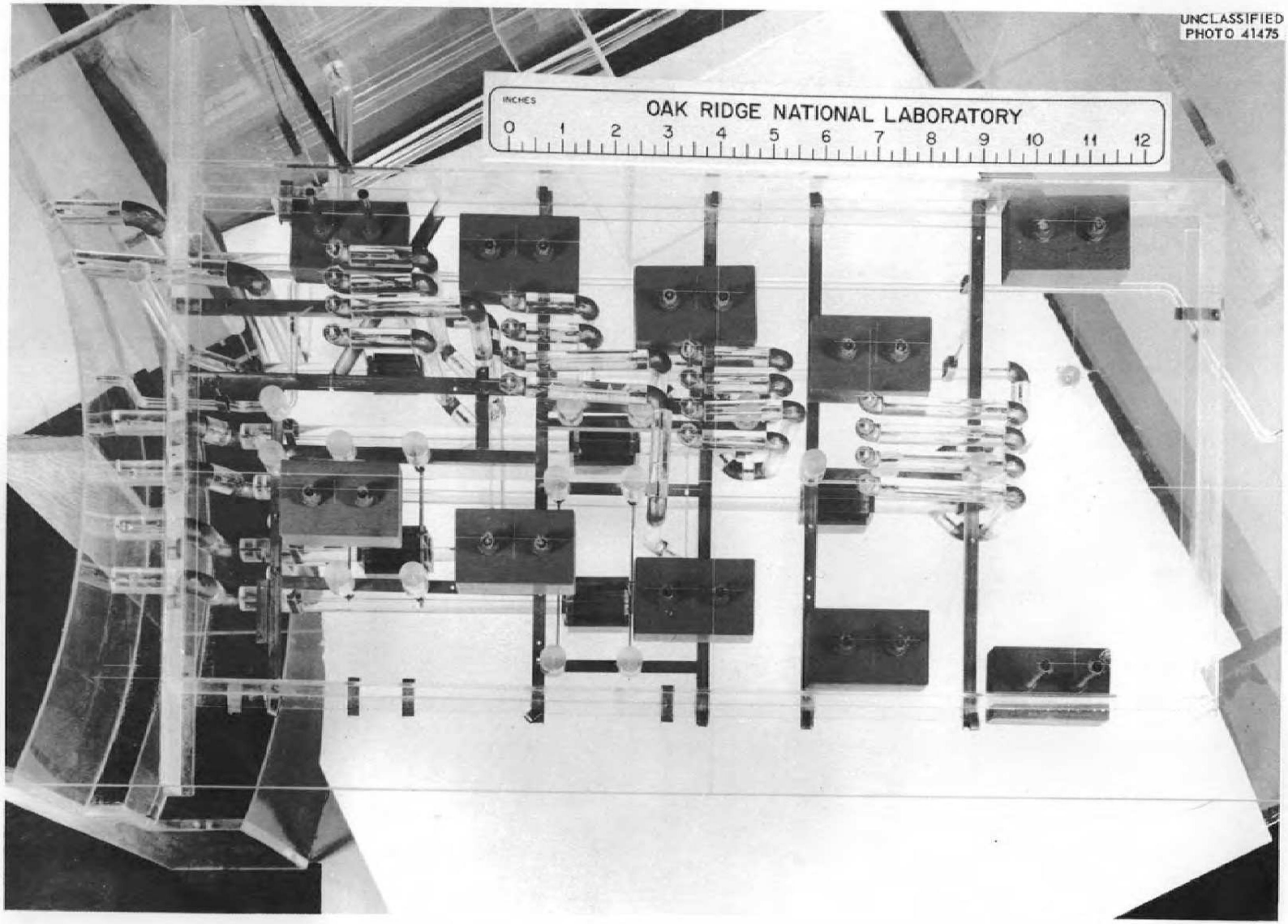

Fig. 23. Model of the Heat Dump System. View looking down into the radiator pit with the air duct removed. The cell wall is at the left; the NaK piping and off-gas penetrations may be seen. The smaller boxes represent the NaK flowmeters and the larger boxes represent the heat-barrier-door operators. The hot NaK piping penetrations for routing to the radiators are located between the heat-barrier-door operators.

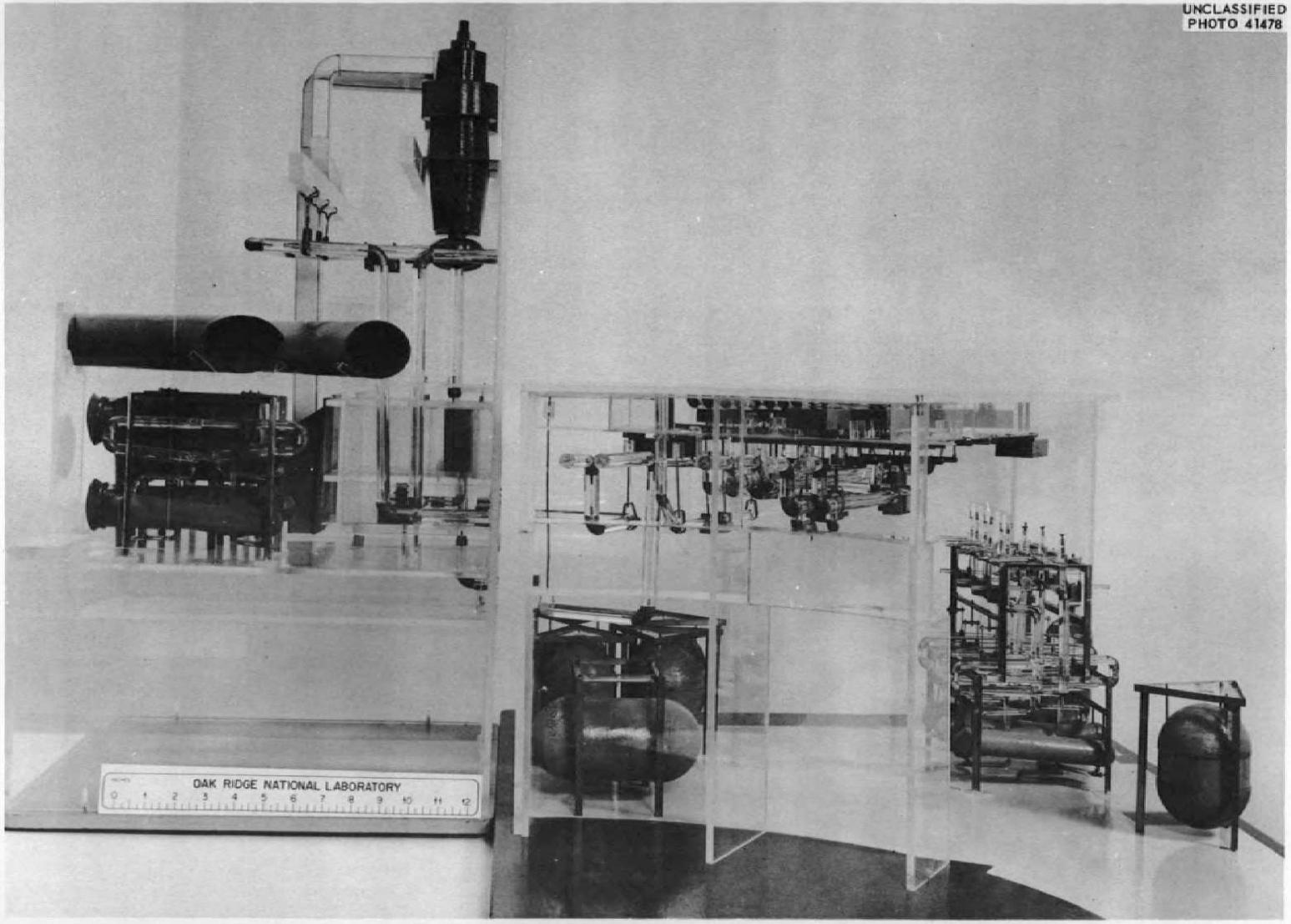

Fig. 24. Model of the Heat Dump System. View looking south from the cell into the radiator pit at the right and the special equipment room at the left. The special NaK pump and motor, along with the motor cooling duct, are located at the top. The two large tubes at the center of the special equipment room are the spectrometer tubes. Below the tubes in the foreground is located the special NaK purification system. The special heat dump annulus and main blowers, with transition and duct, are located in the background.

2. BUILDING

Existing Building

The ART facility, Building 7503, is a modification of a facility which was used for the Aircraft Reactor Experiment (ARE). The ARE facility consisted of a building 106 ft 6 in. by 82 ft 9 in. which is located at a site 0.75 mile southeast of the center of the present ORNL area and about 0.24 mile northeast of the homogeneous reactor experiment (HRT) facility. Further information concerning the facility site can be found elsewhere.[2]

The ARE building and auxiliary services were designed by the Austin Company, Engineers and Builders, of Cleveland, Ohio. A list of pertinent drawings and specifications concerning the ARE facility design can be found in the Appendix (Table C-1).

Additions

Building and Grounds Extension. – Roads, security fences, and grounds were altered to accommodate the ART facility in accordance with Package I design drawings. This design was furnished by the K-25 Plant Engineering Division. Drawings pertinent to these alterations can be found listed in the Package I drawing tabulation (Table C-2).

An extension of 52 ft was added to the south end of the existing ARE building. At floor elevation (852 ft) this extension included an enlargement of the locker room facility, an office 20 ft 6 in. by 17 ft 6 in. for the Health Physics Division, an office 20 ft 6 in. by 20 ft 6 in. for crafts foremen, approximately 485 sq ft of shop space, and space for the reactor pressure vessel and water vessel. This extension also included: at elevation 840 ft a room for the Solid State Division, a laboratory for the Chemical Technology Division, a conference room, and a spectrometer equipment room for the Applied Nuclear Physics Division; at elevation 831 ft a control tunnel for routing facilities into the cell; at elevation 835 ft 5 in. a facility for the main air duct; at elevation 820 ft a radiator pit for housing NaK dump tanks and purification equipment; at elevation 832 ft a spectrometer tunnel where the cell spectrometer tubes terminate; and at elevation 828 ft 7 in. a room for housing the special heat dump equipment.

In addition to the building extension, the structural steel of the crane bay in the existing building was modified to withstand the reactor weight. The existing 10-ton crane was modified to a $6\frac{2}{3}$-ton crane plus a monorail with a 3-ton electrical hoist. An additional 30-ton crane was added in order to install the reactor.

Pertinent drawings and specifications concerning the additions to the 7503 building are tabulated in the list of Package I drawings and specifications which is in the Appendix (Table C-2).

Cell. – The cell is located in the south portion of the crane bay, immediately adjacent to the penthouse and special equipment room. It was intended to house the ART reactor, the fuel fill and drain tank, the fuel recovery tank, and other associated equipment. It would therefore have served as the final barrier and containment in the event of reactor or component failure.

Basic criteria for the cell are found in Design Memos 3-B-1 through 3-B-6.

Design criteria for the cell are found in Construction Design Memo 7503-5 and in Package I drawings and specifications. Detail design and stress analysis were done by the Chicago Bridge & Iron Company, subcontractor for the cell under the Package I contract.

Construction as described by Chicago Bridge & Iron Company's drawings was essentially completed. The water tank and pressure vessel heads have been removed and are stored across the road from Building 7503 in order to permit unimpeded access to the cell during installation of cell equipment.

Tests performed on the cell were as follows:

1. Following stress relief of the pressure vessel, a hydrostatic test at 315 psia was performed on the pressure vessel. Leaks were discovered on the junction panel nozzles. All eight junction panel sleeves were removed, and modified two-piece sleeves were welded into the pressure vessel. In order to obtain a better bond between the junction panel sleeves and the 4-in. plate of the vessel, a weld detail similar to a slip joint flange pipe weld was used.
2. A Freon air test at 15 psig with a General Electric halide leak detector was then performed on the pressure vessel. No leaks were observed.
3. A hydrostatic test at 315 psia was performed on the pressure vessel. No leaks were observed.

[2] W. B. Cottrell *et al.*, *Aircraft Reactor Test Hazards Summary Report*, ORNL-1835 (Jan. 19, 1955) (classified).

4. The water was then removed from the pressure vessel to the water tank. Leaks found in the water tank were repaired.

5. The testing of the water tank described in (4) also served to provide a buoyant load on the pressure vessel, thus stressing the pressure vessel support skirt.

6. A vacuum leak test was then performed on the pressure vessel. Eight days were required to pump down to approximately 10 microns. A leak on a temporary plug caused considerable trouble in pumping down. A pressure rise test was performed for 32 hours with no pressure change observed. Temporary connections, junction panel and coolant sleeves, and main plate seams in order were probed several times; no leaks were observed on a Consolidated Engineering Corp. leak detector. An over-all leak rate was then determined by utilizing the water tank as a hood for containing helium and comparing the over-all leakage with a standard leak (14.7 micron cubic feet per hour) on the Consolidated Engineering leak detector. Backgrounds before the test run and after pumping down the signal from the standard leak were the same. The signal from the standard leak (corresponding to 14.7 micron cubic feet per hour) peaked at 5.8 on the "ten" scale with 100-second response. Background was 0.2 to 0.3 on the "one" scale. Therefore it was felt that a leak of the order of 5 micron cubic feet per hour should have been detected with ease. The maximum acceptable leakage rate permitted by the Package I specifications was 32 micron cubic feet per hour.

The only modifications which were anticipated for the cell are as follows:

1. attachment of an aluminum conical vessel to the pressure vessel head to facilitate shielding studies,
2. minor modifications to the pressure vessel floor structure to permit better access to the fuel fill and drain tank,
3. possible replacement of the cell crane with a higher capacity unit and provision for remote control,
4. possible replacement of the dump tank support mechanism.

Final attachment of the water tank and pressure vessel heads was planned to be done in a fashion similar to Chicago Bridge & Iron Company's procedures. Clips, wedges, platform brackets, and fittings were loaned to ORNL in order to expedite the welding of the final girth seam.

After attachment of the NaK piping anchor cones and junction panels it was planned to perform a vacuum leak test of all untested welds in order to ensure the required integrity for the cell and the containment piping with a maximum leak rate of 0.002 cc per second. A helium "sniffer" test, as well as a possible pressure test, of the final pressure vessel girth seam and the manhole closure weld was also planned. Six of the eight junction panels were being designed by the Instrumentation and Controls Division as nitrogen-buffered pressure vessels for the passage of leads for instrumentation and electrical power. The pressure vessels were to be welded to the junction panel flanges. Buffering of these vessels was required since the hermetic seals in the vessel end plates could not meet the required leakage rates. The remaining two junction panels were being designed by the ARED Design Department for the passage of tubing and pipe. These panels were to consist of heavy plates welded to the pressure vessel junction panel flanges, to which the pipes and tubes which pierce it were to be welded.

Expansion joints, which were being procured by ARED, were to be welded between the junction panel pressure vessel and water tank sleeves in order to exclude water. A soap air test at 15 psig was planned for these welds.

Switch House. – The switch house was added to the west side of the existing building. It houses the main 480-volt switchgear and also two 440-volt motor centers. Facility Drawing D-AF-110 shows the single-line diagram for this equipment. The switch house and switchgear were a portion of Package I work. The motor control centers were a portion of Package II.

Diesel Generator House. – The diesel generator house, which was a portion of Package II, is a facility which houses the five diesel generator sets and the required auxiliaries. This is a Braden building with dimensions of 72 × 30 ft.

Compressor House. – The compressor house is a 32 × 48-ft Butler building which houses the dry air plant and the NaK pump motor controllers and resistors. This facility was a portion of the Package II contract work.

Vent House. – The vent house is a 15 × 15 ft concrete block room which is located at the southwest corner of the building. It was proposed to house monitoring and sampling stations for the off-gas and vent systems.

Blower House. – The blower house is a concrete block structure, 44 × 36 ft, which is located on the west side of the crane bay adjacent to the southwest corner of the main building. It was intended to serve the following functions:

1. housing of the four main process air blowers and motors, the two main annulus blowers and motors, and the instrument and control tunnel exhaust blower and motor,
2. intake air plenum for the above blowers,
3. filtering of intake air by passage of the air through fine-mesh screen located in the blower house walls,
4. principal access to the radiator pit.

The blower house principal floor level, at elevation 838 ft, was recessed below the outside ground elevation to provide adequate space for the main process air blowers. Solid concrete block wing walls were extended out from the north and south blower house walls to serve as radiation shields. It was also planned to stack pit plugs around the blower house adjacent to the wing walls in order to complete the necessary radiation shielding.

3. UTILITIES

Electrical

The electrical service to Building 7503 consists of a single 13,800-volt 3-phase line which originates at the ORNL substation and also feeds the 7500 area and the Tower Shielding area. 7503 Facility Drawing D-AF-110 shows the single-line diagram of the system. Construction design memos specifying detail design criteria and detail design drawings are listed in the Appendix (Table E-1).

The existing building auxiliary service consists of a 750-kva 13,800/480-volt outdoor transformer bank feeding two distribution panels which were provided for the ARE. The single-line diagram D-AF-110 and Construction Design Memo 7503-35 indicate the addition of a transformer secondary breaker and rearrangement of the distribution panel feeds in order to provide for a process main blower load. No detail design has been prepared for this arrangement.

The distribution panels supply the building lighting, 110-volt convenience receptacles, 440-volt power receptacles, air conditioning units, 10- and 30-ton cranes, exhaust and vent fans, unit heaters, sump pump, space coolers, and roll-up door. The single-line diagram for the distribution panels is shown on 7503 Facility Drawing D-AF-119. The detail construction drawings are tabulated in the Appendix and were prepared by the Austin Company for the original construction; by the ORNL Engineering and Mechanical Division for revisions for the ARE; by the K-25 Engineering Division for alterations and additions to Building 7503, Package I; and by the ORNL Engineering and Mechanical Division for additions to Building 7503, Package II. The 7503 Facility Drawings D-AF-117 through D-AF-125, D-AF-127, and D-AF-129 are as-built details, representing a consolidation of all construction drawings and dismantling operations.

The lighting for areas except the service area and adjacent offices, the southwest basement entrance, and portions of the crane bay is arranged for manual throwover to a 100-kva transformer fed from the diesel generator power as described in Section 4.

Criteria for additions to the lighting system consist of main control room, auxiliary control room, and information room lighting as described in Construction Design Memo 7503-43, and provisions for automatic throwover for control rooms and other emergency operation areas.

Alterations and dismantling operations were performed by the Package I and Package II contractors. Design of additions and rearrangements for the main blower feed were scheduled for completion by January 1, 1958. Construction was scheduled for completion by March 1, 1958.

Water

Water is supplied to Okra Valley and subsequently to Building 7503 from the ORNL potable water system. Original design of the supply header was made by the Austin Company. (See Appendix for drawings.) Modifications have recently been made to the Austin Company design by tying the Building 7503 6-in. supply header to the 10-in. process line and bypassing the 750-gal storage tank, which is situated atop the ridge separating Bethel and Okra Valleys, thereby tying the 10-in. process line directly to the 12-in. line which connects to the south tank farm. These changes are estimated by the ORNL Engineering and Mechanical Division to improve water supply to both Buildings 7500 and 7503 and to result in a maximum capacity of 650 gpm with 1.9 ft of residual

head at the top of the process water tank at Building 7503.

Distribution of potable water within the building was originally designed by the Austin Company and installed in the original construction of Building 7503, then known as Test Facilities Building No. 22. Subsequent modifications to this system were designed by the K-25 Plant Engineering Division and the ORNL Engineering and Mechanical Division and installed in Package I and II construction. Drawings of these modifications are tabulated in the Appendix.

Included in the uses of the potable water system which has been constructed are the following: (1) men's locker room, (2) women's rest room, (3) water coolers, (4) fire hydrants, (5) service taps, (6) space coolers for penthouse, (7) 7503 cell water tank supply, (8) adsorber, (9) air compressors, (10) hot water system, and (11) cooling water for air conditioners. As may be noted from the foregoing listing, some of the uses tied to the potable water system are not sanitary but process functions. Only those process uses which required a boost in the normally available water pressure or are a part of the cell containment system have been tied to the process water system. Flow Diagram D-2-02-054-1466 by the ARED Design Department delineates the various usages intended for the sanitary and process water systems and shows the separation of the systems. The process water system will be discussed in detail in a following section.

No additional services were anticipated for the sanitary water system. Construction of this system is complete except for the addition of a flow measuring station in the vent house for the supply to the charcoal adsorber pit.

Steam

Saturated steam at 250 psig is supplied from the ORNL Steam Plant to Building 7503 through a 6-in. header which also serves Building 7500. A steam reducing station drops the pressure to 50 psig prior to entry into Building 7503. This header was originally designed and constructed by the ORNL Engineering and Mechanical Division. The loop over the building entrance road which was in this header was subsequently removed in accordance with K-25 Plant Engineering design in Package I construction in order to provide unimpeded access to the building.

The distribution system within the building was originally designed by the Austin Company and constructed by the V. L. Nicholson Company as Test Facilities Building No. 22. In accordance with this design, steam at 50 psig is used for heating potable water. Steam reduced to 15 psig is used for building heating through the use of unit heaters, finned pipe, and air conditioning steam coils.

The building 15-psi system was expanded to serve other heating units in Package I construction in accordance with design by the K-25 Plant Engineering Division and the ORNL Engineering and Mechanical Division and in Package II construction in accordance with design by the ORNL Engineering and Mechanical Division.

No further permanent additions or alterations to the steam system were anticipated except for (1) possible modifications resulting from a possible redesign of the air conditioning system for the main control room and instrument shop, (2) possible modifications to the piping for the office area air conditioners to remove interferences with auxiliary control room trays, and (3) replacement of a defective steam coil in the basement heating unit.

The unit heaters from the health physics and the craft foreman's and field engineers' offices will be temporarily used in the diesel generator house for winter protection of the diesel generators.

4. PROCESS AUXILIARIES

Electrical

Two independent electrical systems, fed from separate sources, were provided to satisfy electrical reliability requirements for feeds to the process auxiliary equipment. The existing 13,800-volt 3-phase line originating at the ORNL substation provided one power source, and diesel generator units installed locally provided the second power source. 7503 Facility Drawing D-AF-110 shows the single-line diagram of the systems. Construction design memos specifying design criteria and detail design drawings are listed in the Appendix (Table E-1).

The added generating and substation equipment was located adjacent to the west side of the building in order to minimize the length of load cables and reduce interferences in the basement area.

The additions to the original 13,800-volt system consist of an overhead line extension to a 1500-kva

13,800/480-volt 3-phase oil-type transformer, and an underground cable connection to a switchgear unit.

The design requirement for the power system feeding from the ORNL substation was established as 1200 kva. All equipment was designed on this basis except for the 1500-kva transformer obtained from K-25 surplus. A lightning flashover was experienced on the transformer primary leads above the oil level on July 17, 1957. The leads were taped and the equipment was re-energized; however, installation of additional primary lead supports and station-type lightning arresters was planned to increase the expected reliability of the equipment.

The diesel power system consists of five 300-kw 0.8-pf 480-volt 3-phase diesel-driven generator units connected to a switchgear unit and arranged for parallel operation. Four diesel generator units and the associated controls were specified on ORNL Requisition D-15936 and were procured from the Buda Division, Allis-Chalmers Mfg. Co., on Purchase Order W8X-18089. One unit was transferred from Y-12 surplus; it was specified on Equipment Specification ES1-574526 and procured from Caterpillar Tractor Company on Purchase Order W35Y-31315. The diesel generator units were installed in Package II. Caterpillar Tractor Company supplied an oversize generator rated 1000 kw, 0.8 pf, in order to meet equipment specification requirements for starting with a large inductive load. Additional information on the diesel generators and auxiliaries for both types of units is tabulated on bid proposal data sheets.

Auxiliary equipment consists of a 5000-gal fuel-oil storage tank, a fuel transfer pump and 100-gal day tank for each unit, a 32-volt battery and charger for starting each Buda unit, and an air compressor and receiver for starting the Caterpillar unit.

Diesel starting control is provided at the units. All other control is located on the five control panels located in the switch house. Equipment on each panel consists of generator and exciter metering, voltage regulator, exciter field rheostat, governor switch and indicating lights, synchronizing switch, engine shutdown device, and annunciator alarm device. Synchronizing is accomplished manually by use of a synchroscope, indicating lights, and metering located on a swinging panel, or automatically by synchronizing relay (GE Type GES) and automatic synchronizing selector switch.

The switchgear unit that is supplied from the 13,800-volt line consists of a 1600-ampere transformer breaker, a 1500-ampere bus, two 1600-ampere main blower breakers, a current-limiting reactor to limit fault currents to 25,000 amperes, and other load breakers as shown on Facility Drawing D-AF-110. The switchgear unit that is supplied from the diesel-driven generator units consists of five generator load breakers and other load breakers as shown on D-AF-110. Switchgear units were installed in Package I. The loads were arranged on the power systems in such a way that each system would supply the process auxiliary equipment required for shutdown in the event the other power system failed. Interconnections between the systems were held to a minimum, and all precautions were taken to eliminate any possibility of one faulted system affecting the other system. Construction Design Memo 7503-35 outlines changes to the electrical equipment feeding the fuel dump tank NaK system in order to provide for a fast throwover of the power system and changes to the interlocking scheme for the diesel main blower breakers. These changes have not been made in the equipment.

Each switchgear unit supplies a control center consisting of removable units located in the switch house. The control centers which were installed in Package II were to provide power to the smaller process auxiliary loads. The equipment as shown on the single-line diagram, Facility Drawing D-AF-110, includes minor changes to existing equipment. The electric heater distribution centers, induction regulators, and Powerstats are fed from these control centers. ORNL Drawings D-26430 and D-26431 show the single-line diagram of the heater circuits. All equipment except heaters, heater leads, and control circuits was installed in Package IIIA. Heater information is tabulated in ORNL Drawing B-26432.

Process auxiliary equipment presently connected to switchgear and control centers consists of main blowers, main annulus blowers, process water booster pumps, control tunnel blower, and diesel auxiliary equipment. A 100-kva 480/120–208-volt lighting transformer is supplied from the diesel power system and connects to manual transfer switches to provide lighting during a fault of any equipment serving the normal lighting panels. Power conduit is provided for equipment to be located in the special equipment room,

penthouse area, and compressor house. Wound-rotor-motor resistors and controller units for the main and auxiliary NaK pumps are installed in the compressor house. Cable trays for instrument and control service are installed in the control tunnel. Additional cable trays for instrumentation and heater cable are specified on preliminary Instrumentation and Controls Drawings D-SK-RC6-4 through 9, D-RC6-7-6H, and D-RC6-7-6J.

Water

Process water for Building 7503 is taken from the potable water system as described by Flow Diagrams D-2-02-054-1453 and D-2-02-054-1466 by the ARED Design Department. Basic criteria were initially outlined by Design Memos 1-E-1, 6-B-2, and 9-C-5. Design criteria were established by Construction Design Memos 7503-21 and 7503-37 for design of the system by the ORNL Engineering and Mechanical Division.

The extent of design construction and testing to date is described for the most part by Package A drawings and specifications. In general, installed equipment within Package A includes main supply headers, isolation valves, and process water pumps. Preliminary design was prepared for the installation of the process water filter in Package III.

The completion of the system external to the cell was planned as a portion of Package III, for which the ORNL Engineering and Mechanical Division was assigned design and construction responsibility. The ARED Design Department was assigned the responsibility for design and procurement of the system inside the cell as a portion of Package IV; construction was assigned to the ORNL Engineering and Mechanical Division.

The Instrumentation and Controls Division had responsibility for design and procurement of instrument components within the system and coresponsibility with the ORNL Engineering and Mechanical Division for installation.

In addition to normal hydrostatic testing, the portion of the water system in communication with the cell was planned to be stringently vacuum leak tested in order to ensure adequate containment. The sum of the leak rates for all auxiliary systems which are a part of the containment system has been restricted to 0.002 cc per second.

Air

Compressed air facilities have been provided in Building 7503 for the following purposes: (1) instrument air for use outside the cell, (2) laboratories for chemistry and solid-state physics, (3) heat barrier door operators, (4) back flow damper operators, and (5) cooling air for NaK purification systems. The compressors and driers that were installed according to ORNL Engineering and Mechanical Division design for use with the ARE have been dismantled and removed. However, it was planned to use a portion of the existing headers in Package III design.

Original design criteria were established by Design Memo 1-G-1 and schematically shown on Flow Diagram D-2-02-054-1468. Construction Design Memo 7503-26 provided the design criteria.

Headers and isolation valves for pressure reducing stations located in the auxiliary equipment pit were installed in Package A in accordance with ORNL Engineering and Mechanical Division design.

The portion of the system which was constructed in Package IIIA, in accordance with ORNL Engineering and Mechanical Division design, includes the following items: (1) two vertical, carbon-ring 150 scfm at 150 psig Joy compressors, (2) two after coolers, (3) two receivers, (4) one 100 scfm at 125 psig, −20°F dew point temperature air drier, and (5) headers, including isolation valves. The ORNL Engineering and Mechanical Division has had the responsibility for completion of design, procurement, and construction of this system for Package III except for instrumentation, for which the Instrumentation and Controls Division had responsibility for design and procurement and coresponsibility with the ORNL Engineering and Mechanical Division for installation.

Diesel Fuel

Diesel fuel oil facilities were planned for Building 7503 to permit continuous operation of the five 300-hp diesel generator sets located in the diesel generator house.

A 5000-gal storage tank, having sufficient capacity for 24 hours of operation, a supply header, and valving were designed by K-25 Plant Engineering and installed in Package I.

The remainder of the system, consisting of a day tank, transfer pump, and associated piping for each diesel generator set, was designed by the ORNL Engineering and Mechanical Division and installed in Package II.

This system was completed except for change-out of the day tank vent lines to improve venting.

Nitrogen

Nitrogen facilities were planned for Building 7503 to provide an oxygen-free atmosphere for the cell and junction panels and for instrumentation use.

Basic criteria were originated in Design Memo 1-H-1 and schematically shown on ARED Design Department Flow Sheet D-2-02-054-1465. Design criteria were provided by Construction Design Memo 7503-17.

The existing ARE helium reserve banks were incorporated in the nitrogen system in accordance with Package A design by the ORNL Engineering and Mechanical Division. Package A design and construction also included distribution headers and valving.

Completion of the system outside the cell was scheduled in Package III, the ORNL Engineering and Mechanical Division having the design, procurement, and construction responsibility. Design of the system inside the cell was assigned to the ARED Design Department under Package IV. Construction of the system within the cell was assigned to the ORNL Engineering and Mechanical Division. Instrumentation components were to be designed and procured by the Instrumentation and Controls Division and were to be installed jointly with the ORNL Engineering and Mechanical Division.

Vacuum leak testing was planned for the "cell containment" portion of the system.

Modifications to the nitrogen reserve banks would be required in order to permit hydrostatic testing and leak testing of welding done in Package A.

Helium

The helium system for Building 7503 was intended to serve as the principal gas system for instrumentation.

Basic criteria for the system were furnished in Design Memo 1-B-1 and Flow Diagram D-2-02-054-1463. Design criteria for the system are contained in Construction Design Memo 7503-18.

The extent of design and construction is described by Package A drawings and specifications which were prepared by the ORNL Engineering and Mechanical Division.

The completion of this system for both design and construction was scheduled in two packages. The ORNL Engineering and Mechanical Division was to have the responsibility for design, procurement, and construction of the system external to the cell under Package III and was to have construction responsibility for the system inside the cell under Package IV. ARED was to have design and procurement responsibility for the system inside the cell under Package IV. The Instrumentation and Controls Division had design and procurement responsibility for all instrumentation items within this system and was to have coresponsibility with the ORNL Engineering and Mechanical Division for construction.

In addition to the normal testing for this type of system, the "cell containment" portion was scheduled to receive the most stringent vacuum leak test possible using a Consolidated Engineering Corp. leak detector.

Lube Oil

Two lubricating oil systems were planned for Building 7503, one to supply lubricating oil for the reactor pumps and the other for the NaK pumps.

Basic criteria for these systems are found in Design Memos 1-D-1, 1-D-2, and 1-D-3 and Flow Diagrams E-2-02-054-1461 and E-2-02-054-1462. At the time of this report the flow diagrams were in the process of being revised. Design criteria for these systems are found in Construction Design Memo 7503-27.

The extent of design and construction is described by Package A and Package IIIA drawings and specifications, which were prepared by the ORNL Engineering and Mechanical Division.

Completion of these systems for both design and construction was scheduled in two packages. The ORNL Engineering and Mechanical Division was to have the responsibility for design, procurement, and construction of both systems external to the cell under Package III and was to have construction responsibility for the reactor lube oil system within the cell under Package IV. Preliminary drawings of the reactor lube oil system were prepared by the ARED Design Department under Package IV.

The Instrumentation and Controls Division had design and procurement responsibility for all instrumentation items within these systems and was to have coresponsibility with the ORNL Engineering and Mechanical Division for construction.

In addition the normal testing for this type of system, both of these systems were scheduled to receive the most stringent vacuum leak test possible with a Consolidated Engineering leak detector.

Waste Oil

A waste oil system was devised to permit temporary storage of radioactive lubricating oils at Building 7503 prior to final burial or other disposition.

Basic criteria for this system are found in Design Memos 1-D-1, 1-D-2, and 1-D-3 and Flow Diagram E-2-02-054-1461. Design criteria for this system are found in Construction Design Memo 7503-27.

The general design and construction of this system are described by Package IIIA drawings and specifications, which were prepared by the ORNL Engineering and Mechanical Division.

The fill and vent lines were asphalt-coated and the ditch was backfilled; however, the 500-gal storage tank has been removed and is being stored in the building.

Although no definite permissible leak rate was established for this system, the Operations Group felt that a leak rate of approximately 30 micron cubic feet per hour would be permissible.

The piping was hydrostatically tested with Freon at 300 psig and tested with a halide torch. No leaks were found.

The pressure vessel was hydrostatically tested at 193.5 psig with water and was leak tested by the vendor with a 45-psig Freon air test, using a halide torch. No leaks were found.

After installation of the tank and piping, vacuum leak testing of the system was initiated, a Consolidated Engineering leak detector being used. By means of a standard leak, it was established that a leak of the order of 5 micron cubic feet per hour could be found, with, however, the poor response time of 6 minutes at the extremity of the system. Probing with helium revealed only a leak on the ½-in. nitrogen pipe to the tank, which had been damaged in shipment. Nevertheless, a "leak-up" test indicated a system leakage of approximately 80 micron cubic feet per hour. A "leak-up" test of the vent line and fill line independently showed leakage rates of 1 and 70 micron cubic feet per hour, respectively. At the time of termination of the test, the location of the leak in the fill line had not been determined.

Hydraulic Oil

The criteria for the hydraulic system for actuation of the ART louver operators are described in detail by Design Memo 5-D-3. Design criteria for this system are found in Construction Design Memo 7503-38.

American Foundry & Furnace Company designed, constructed, and tested the louvers and the operators for the louvers in accordance with Specification JS-P3-18.

Hicks & Ingle Company designed, constructed, and tested the louver hydraulic pumping unit in accordance with the "Specification for Louver Hydraulic Pumping Unit" as a part of the Package IIIA specifications.

Design, construction, and testing of the interconnecting piping, which has been installed, are described by Package IIIA drawings and specifications, which were prepared by the ORNL Engineering and Mechanical Division.

The remainder of the design, construction, and testing of the system was scheduled as the responsibility of the ORNL Engineering and Mechanical Division.

Rerouting of the lines to the special louver operators was planned in order to ensure that the lines would not pass through areas hotter than 167°F. The existing lines pass through the main duct annulus, which may have a temperature as high as 300°F.

It was planned that couplings would be welded to the oil filters on the hydraulic pumping unit and that valves would be attached to permit venting during system startup.

Instrumentation and power connections for the system were scheduled as joint design and construction efforts by the Instrumentation and Controls Division and the ORNL Engineering and Mechanical Division.

Penthouse Cooling

The penthouse cooling system has as its purpose the maintaining of a temperature no greater than 167°F in the penthouse to permit the use of electric motors, solenoid valves, etc., in this area.

The system consists of two air-circulating, water-cooled finned heat exchangers serving as heat dumps and forming closed air loops with the penthouse. Design criteria for this system are found in Construction Design Memo 7503-13.

The extent of design and construction to date is described by Package I drawings and specifications. In general the two cooling circuits external to the penthouse are complete except for final closure and testing of the containment cabinets.

Design and construction of this system within the penthouse were the responsibility of the ORNL Engineering and Mechanical Division under Package III.

5. PROCESS

Off-Gas and Vent

The off-gas and vent systems serve to contain radioactively dangerous gases from pumps, lube oil packages, NaK dump tanks, reactor, fuel dump tank, etc., and also serve to distribute the gases either to a point of dilution in the main air duct or to the retention point for decay, the charcoal adsorber pit.

Basic criteria for these systems are found in Design Memos 7-A-1, 7-A-2, 7-B-1, and 7-B-2 and Flow Diagram D-2-02-054-1464 by the ARED Design Department.

The construction completed to date is a vent line from the auxiliary equipment room to the radiator pit for the lube oil packages shown on Package A drawings and a branch vent line for the waste oil tank shown on Package IIIA drawings.

Drawings of the charcoal adsorber piping were prepared by the ORNL Engineering and Mechanical Division for Package III installation. Although specifications were prepared for "outside" shop fabrication of the charcoal adsorber piping, the ORNL Engineering and Mechanical Division had indicated a preference for fabrication to be done by the ORNL shops. It was planned to revise the drawings to show thermocouple wells and equipment for vacuum testing.

The remainder of these systems outside the cell was scheduled for design and construction in Package III by the ORNL Engineering and Mechanical Division. The remainder of these systems inside the cell was scheduled for design by the ARED Design Department and construction by the ORNL Engineering and Mechanical Division in Package IV. Instrumentation items were to be designed by the Instrumentation and Controls Division and jointly installed by this Division and the ORNL Engineering and Mechanical Division.

Installation design of these systems within the vent house was dependent upon development of information on the instrumentation items, which was to be delayed as a result of higher priority ETU work.

Vacuum leak testing was a requirement for these systems outside the cell and was expected to be extremely time-consuming and troublesome as a result of the very low leak rates that would be acceptable. It had been planned to exercise the utmost care in cleaning and fabricating the system. Complete procedures covering materials, cleaning, fabrication, and testing were to be prepared by the ORNL Engineering and Mechanical Division.

Air

The process air system was intended to serve as the heat sink for the ART.

Basic criteria for this system are found in Design Memos 5-A-1, 5-A-2, 5-A-3, 5-C-1, 5-D-1, 5-D-3, and 5-E-1 and flow diagram E-2-02-054-1467 by ARED Design Department. Design criteria for this system are furnished by Construction Design Memos 7503-6, -10, -13, -15, -29, and -36.

The extent of construction to date is described by Package I drawings by K-25 Plant Engineering. In general the following items have been constructed: blower house, main duct (except at radiators), stack, installation of two main blowers with backflow dampers, and the setting of two main annulus blowers.

Items which have been specified and procured by ARED and their respective specification numbers are as follows: (1) main blowers and backflow dampers, JS-P3-16, (2) special main blowers and special annulus blowers with backflow dampers, JS-P3-28, and (3) main and special louver dampers, JS-P3-18.

Design and procurement of the main annulus blowers were accomplished under Package I.

All other mechanical and structural items required for this system were scheduled for design, procurement, and installation by the ORNL Engineering and Mechanical Division in Package III. The Instrumentation and Controls Division had responsibility for design and procurement of all instrumentation and joint responsibility with the ORNL Engineering and Mechanical Division for installation under Package III. A tabulation of drawings completed or scheduled for this system is found in the Appendix (Table D-1).

Coolant

The coolant in the ART served as an intermediate heat exchange medium between the reactor, together with its dump tank, and the ultimate heat sink, the atmosphere.

Basic criteria for these systems are found under Section 5 of the Design Memo Book and on Flow Diagram F-2-02-054-1470. Design criteria for these systems are found in Construction Design Memos 7503-15, -23, -29, -30, and -32.

No construction has been done on this system.

Design and procurement of components within the system were the responsibility of ARED. The ORNL Engineering and Mechanical Division had the design and construction responsibility for installation of the components and their associated piping as a part of Package III work. The Instrumentation and Controls Division was responsible for design and procurement of instrumentation items and jointly responsible with the ORNL Engineering and Mechanical Division for installation under Package III work. A tabulation of the drawings completed or scheduled for this system is found in the Appendix.

Fabrication, cleaning, welding, and testing procedures were to be the responsibility of the ORNL Engineering and Mechanical Division.

The installation and testing of this system were expected to be extremely time-consuming. Vacuum leak testing was a requirement in order to ensure that leakage for the cell and the systems forming an integral portion of the containment, including therefore these systems, would not exceed 0.002 cc per second. In addition it was believed that the extremely crowded condition of the equipment in the penthouse and duct areas would present difficult and time-consuming problems not only upon installation but also during change-out of any equipment such as radiators or pumps.

As would be expected in a development program of this nature, space allocation prior to the final development of all equipment presented a difficult problem. In particular the space requirements of the coolant purification equipment, the instrumentation, and the coolant radiators were found to be considerably greater than they were initially anticipated to be. Furthermore the attempt to minimize coolant inventory prevented obtaining sufficient pipe flexibility except by permitting the coolant pumps and radiators to float free on constant spring hangers, thereby complicating installation and dismantling procedures as well as promoting an even more crowded condition.

Fluid Enricher

The fluid enricher was designed and procured by ARED and was being stored at Building 7503 prior to installation in the cell under Package IV work by the ORNL Engineering and Mechanical Division.

Basic criteria for this system are found in Design Memo 4-1-1 and on Flow Diagram E-2-02-054-1469 by the ARED Engineering Department.

APPENDIX A. COST AND BUDGET

Table A-1. ART Facility – Building 7503 Capital Expenditures

Item	Engineering	Direct	Indirect	Contingency	Total
Section I – UCNC Participation					
30-ton crane		$ 47,645			$ 47,645
Diesel generator		128,323	$ 178		128,501
Diesel generator move		1,369	632		2,001
Blowers		64,528			64,528
Blower installation		551	78		629
Transformer		5,983	112		6,095
Pipe cleaning		205	103		308
Weld inspection		783	392		1,175
Additional switchgear and completion of controls for existing switchgear		15,958	1,042		17,000
Transformer load metering and additional lightning protection		3,823	225		4,048
Additional cable trays		12,766	1,318		14,084
Control rooms lighting with automatic throwover		6,350	588		6,938
Additional 440-v receptacles		1,529	191		1,720
Instrument rooms air conditioning		4,222	528		4,750
Communications conduit		1,540	210		1,750
Engineering	$62,383		29,746		92,129
Contingency				$9,400	9,400
Subtotal	$62,383	$ 295,575	$35,343	$9,400	$ 402,701
Section II – Contractors					
Package I		557,175			557,175
Package A		50,351			50,351
Package II		71,558			71,558
Package IIIA		118,215			118,215
Subtotal		$ 797,299			$ 797,299
Total	$62,383	$1,092,874	$35,343	$9,400	$1,200,000

Table A-2. ART Facility – Building 7503 Unexpended Capital Funds

As of September 1, 1957

Additional switchgear and completion of controls for existing switchgear		$17,000
Transformer load metering and additional lightning protection		4,048
Additional cable trays		
Basement		10,026
Auxiliary equipment room		4,058
Phase II blower installation work		569
Blowers		10,000*
Control rooms lighting with automatic throwover		6,938
Additional 440-v receptables		1,720
Instrument rooms air conditioning		4,750
Communications conduit		1,750
Engineering		6,086
Contingency		9,400
	Total	$76,345

*Committed.

Table A-3. ART Facility – Lump-Sum Contract Information

Contract Cost Summary		
Total lump-sum contract cost		$1,096,390.42
Contract AT-(40-1)-1952		881,852.25
Package I, Phase I	$607,526.68	
Package I, Phase II	274,325.67	
Package A	50,351.62	
Contract AT-(40-1)-1954		214,538.17
Package II	71,557.67	
Package IIIA	142,980.50	
Contract AT-(40-1)-1952 Summary		
Total contract cost		881,852.25
Package I, Phase I	557,175.06	
Package I, Phase II	274,325.57	
Package A	50,351.62	

Table A-3 (continued)

Contract AT-(40-1)-1952 Summary

Package I		
Initial total contract cost	765,835.00	
Phase I, construction of additions to Building 7503	501,462.00	
Phase II, construction of 7503 cell (operational)	264,373.00	
Final total contract cost		831,500.63
Phase I	557,175.06	
Phase II	274,325.57	
Total number of contract deviations	45	
Official starting date	8–23–55	
Official scheduled completion date	8–1–56	
Actual completion date	10–9–56	
Contract liquidated damages rate		
Phase I	$100/day	
Phase II	$300/day	
Liquidated damages charged	None*	
Prime contractor	V. L. Nicholson Co.	
Major subcontractors		
Electrical	Davis-Longsworth Electric Corp.	
Mechanical	John F. Humphrey Co.	
Cell installation	Chicago Bridge & Iron Co.	
Designed by	K-25 Plant Engineering Div.	
Approximate number of drawings	118	
Package A		
Initial contract price	$50,351.62	
Final contract price		$ 50,351.62
Official starting date	4–10–56	
Official scheduled completion date	6–29–56	
Actual completion date	9–26–56	
Prime contractor	V. L. Nicholson Co.	

Table A-3 (continued)

Contract AT-(40-1)-1952 Summary

Major subcontractors	
Electrical	Davis-Longsworth Electric Corp.
Mechanical	John F. Humphrey Co.
Designed by	ORNL Engineering Dept.
Approximate number of drawings	18

Contract AT-(40-1)-1954 Summary

Total contract cost		214,538.17
Package II	$ 71,557.67	
Package IIIA	142,980.50	
Package II		
Initial contract price	58,400.00	
Final contract price		71,557.67
Total number of contract deviations	8	
Official starting date	1-25-56	
Official scheduled completion dates		
Part 1	6-22-56	
Part 2	1-27-57	
Actual completion date		
Part 1	6-22-56	
Part 2	2-22-56	
Liquidated damages rate	$100/day	
Liquidated damages charged	None**	
Contractor	Rentenbach Engineering Co.	
Major subcontractors		
Electrical	Broadway Electric Service	
Mechanical	Hicks & Ingle Co.	
Designed by	ORNL Engineering Dept.	
Approximate number of drawings	15	

Table A-3 (continued)

Contract AT-(40-1)-1954 Summary

Package IIIA		
Initial contract price	$114,434.00	
Final contract price		$ 142,980.50
Capital expenditures	118,394.71	
Operational expenditures	24,585.79	
Total number of deviations	6	
Official starting date.	12–7–56	
Official scheduled completion dates		
Initial	4–25–57	
Final	8–21–57	
Actual completion date	8–20–57	
Liquidated damages rate	$100/day	
Liquidated damages charged	None	
Contractor	Rentenbach Engineering Co.	
Major subcontractors		
Electrical	Broadway Electric Service	
Mechanical	Hicks & Ingle Co.	
Designed by	ORNL Engineering Dept.	
Approximate number of drawings	34	

*Liquidated damages charge not invoked because of contract deviations plus equipment delivery delays resulting from Westinghouse strike.

**Liquidated damages charge not invoked because government-furnished diesel generators were damaged in shipment, causing extensive equipment delivery delay. Contract extension was granted for excessive amount of time beyond the contractor's control required for performance of the specified diesel tests.

Table A-4. ART Facility – Budget Estimate, Fiscal Years 1958 and 1959

	1958				1959			
	Labor	Expense[a]	Material	Total	Labor	Expense[a]	Material	Total
Utilities			$ 16,000	$ 16,000			$ 19,000	$ 19,000
ARE disassembly maintenance	$ 1,100	$ 800	100	2,000	$ 500	$ 400	100	1,000
Road improvements[b]					9,000	6,000	10,000	25,000
Work Order A-16655[c]			121,500	121,500[d]	9,000	6,000	5,000	20,000
Work Order A-16630	92,200	64,044	91,113	247,357	44,500	31,500	39,000	115,000
Work Order A-16636					51,500	36,500	14,000	102,000
Work Order A-16639	32,000	23,000	34,000	89,000	21,000	15,000	8,000	44,000
Shakedown testing					14,500	10,500	10,000	35,000
Contingency	17,000	12,000	14,000	43,000	16,500	11,500	10,000	38,000
Engineering[e]								
Design – Work Order A-16652	46,000	32,320	5,000	83,320	22,000	15,500	2,500	40,000
Field – Work Order A-16669	10,000	6,000		16,000	10,000	6,000		16,000
Subtotal	$198,300	$138,164	$281,713	$618,177	$198,500	$138,900	$117,600	$455,000
Department labor	50,000	35,000	1,000	86,000	50,000	35,000	1,000	86,000
Instrumentation	15,001	10,000	133,999	159,000	68,800	44,800	527,400	641,000
Health physics instrumentation	3,500	2,500	9,000	15,000	9,000	6,000	5,000	20,000
7503 building communication system							8,000[f]	8,000
Total	$266,801	$185,664	$425,712	$878,177	$326,300	$224,700	$659,000	$1,210,000

[a] Expense was estimated as being about 70% of labor except for instrumentation, which is 65%.

[b] This amount was to cover half the estimated road expense. The balance was to be included as a construction project.

[c] This work order was closed, and the money was deviated to the major purchase order budget. The major purchase order budget also included $50,000 for louvers, $19,000 for NaK piping and fittings, $43,000 for NaK tanks, $25,000 for cold traps originally budgeted for fiscal year 1957, and $4,000 for NaK pipe and fittings budgeted for fiscal year 1958.

[d] Covers costs of $60,000 for NaK drain valves, $53,000 for half the fluid sump drive unit, and $8,000 for thermal testing of louvers.

[e] To be done by the Engineering and Mechanical Div.

[f] Covers $765.00 installation charge and rent of $650.35 per month.

Table A-5. ART Facility – Summary of Budget Evaluation

Identification	Schedule			Adequacy of February Budget Estimate*			
	Unshielded	Shielded	Operation	Fiscal Year			
				1958	1959	1960	Total**
As budgeted 2–11–57		12–8–58	6–1–59	Low	OK	NR	Low
Official 3–5–57		11–15–59	7–1–60	OK	High	NE	Low
Acceleration July 1957	2–1–59	4–1–59	7–1–60	OK	Low	NE	Low

*NR: not required; NE: not estimated.

**The February budget assumed the reactor would be manifolded, shielded, and ready for installation in the 7503 cell; consequently, no requirements for any such work were included. In addition, it is now apparent that provision for lead shielding of the off-gas system is grossly inadequate in the February budget. Also it should be noted that this evaluation is made without benefit of budget information from the Instrumentation and Controls Div. since February 1, 1957.

Table A-6. ART Facility – Contract Cost Breakdown

Item No.	Item	Amount	Item Weight (%)	Material	Labor
		Package I[a]			
		Phase I			
1.0	Excavating and grading	$ 26,752.54	5.156	$ 3,252.54	$23,400.00
1.1	Crushed stone paving	5,300.00	1.021	2,430.00	2,870.00
2.0	Demolition	3,280.00	0.632		3,280.00
3.0	Concrete	70,487.09	13.585	37,487.09	33,000.00
3.1	Reinforcing steel	21,025.79	4.052	14,405.79	6,620.00
4.0	Masonry	3,550.00	0.684	1,540.00	1,910.00
5.0	Structural steel	42,573,85	8.205	29,053.85	13,520.00
6.0	Corrugated and flat asbestos	13,640.00	2.629	6,420.00	7,220.00
7.0	Gypsum roof deck	4,880.00	0.941	1,989.00	1,891.00
8.0	Roofing and sheet metal	7,842.64	1.512	3,992.64	3,850.00
9.0	Steel sash	510.00	0.098	400.00	110.00
10.0	Glass, glazing, caulking	530.00	0.102	230.00	200.00
11.0	Metal partitions	8,550.00	1.648	5,660.00	2,890.00
12.0	Hollow metal doors and frames	2,810.00	0.542	1,920.00	890.00
13.0	Rolling steel doors	7,370.00	1.420	5,330.00	2,040.00
14.0	Finish hardware	1,340.00	0.258	890.00	450.00
15.0	Misc. metal	25,154.47	4.848	17,054.47	8,100.00
16.0	Field painting	6,400.00	1.233	4,220.00	2,180.00

Table A-6 (continued)

Item No.	Item	Amount	Item Weight (%)	Material	Labor
		Package I[a]			
		Phase I			
17.0	Carpentry and millwork	1,454.03	0.280	584.03	870.00
18.0	Steel wire fencing	2,410.00	0.464	1,230.00	1,180.00
19.0	Cranes	18,870.00	3.637	12,450.00	6,420.00
20.0	Stack	11,870.00	2.251	7,680.00	4,000.00
21.0	Air duct	36,200.00	6.977	26,600.00	9,600.00
22.0	Plumbing, heating, and piping	45,341.11	8.740	30,541.11	14,900.00
23.0	Electrical work	105,957.59	20.423	77,257.59	28,700.00
		Phase II, Part A			
3.0	Concrete	11,808.04	2.276	6,348.04	5,460.00
3.1	Reinforcing steel	3,710.39	0.715	2,760.39	950.00
5.0	Structural steel	6,093.06	1.174	4,293.06	1,800.00
15.0	Misc. metal	2,330.00	0.449	1,582.00	748.00
16.0	Field painting	1,150.11	0.222	440.00	710.00
21.0	Air duct	18,180.00	3.504	11,330.00	5,850.00
22.0	Plumbing, heating, and piping	1,105.20	0.213	690.20	415.00
23.0	Electrical work	566.17	0.109	296.17	270.00
	Total pay item A[b]	$518,851.97	100.000		
		Phase II, Part B			
3.0	Concrete foundation	7,520.00	2.834	4,720.00	2,800.00
19.0	Crane	2,100.00	0.791	1,418.00	682.00
23.0	Electrical work	473.00	0.178	273.00	200.00
24.0	Cell pressure vessels	255,300.00	96.197	85,200.00	70,100.00
	Total pay item B[c]	$265,393.00	100.000		

Table A-6 (continued)

Item No.	Item	Amount	Item Weight (%)	Material	Labor
		Package A[d]			
	Subcontractor's cost (misc. fabricated metal, including bottle racks and bulkhead)				
	Bottle racks	520.20		140.20	380.00
	Pipe supports	256.00		100.00	156.00
	Bulkhead	1,315.10		350.10	965.00
	Angle plate	15.00		6.00	9.00
	Unistrut for auxiliary equipment room	934.50		424.50	510.00
	Hook hangers in auxiliary equipment room	270.00		90.00	180.00
	Trapeze hangers in auxiliary equipment room	248.30		48.30	200.00
	Sleeves	88.50		18.50	70.00
	Subtotal	$ 3,647.60		$ 1,177.60	$ 2,470.00
	Lube oil (OL lines)	3,227.10		1,257.10	1,970.00
	Air supply (CL lines)	1,699.46		637.46	1,062.00
	Helium supply (GL lines)	2,233.62		1,031.62	1,202.00
	Nitrogen supply (ML lines)	2,966.35		1,311.35	1,655.00
	Water (WL lines)	8,579.73		4,352.73	4,227.00
	Vent (VL lines)	584.70		284.70	300.00
	Gas and cooling lines	199.12		99.12	100.00
	Instrument trays	3,957.90		2,457.90	1,500.00
	Unistrut	3,781.86		1,746.86	2,035.00
	Testing material, including water inhibitor and Freon	2,207.50		207.50	2,000.00
	Total	$ 33,084.94		$14,563.94	$18,521.00
		Package II			
1	Excavating and grading	1,752.00	3	584.00	1,168.00
2	Concrete	4,672.00	8	2,336.00	2,336.00
3	Setting generators	1,168.00	2	0.00	1,168.00
4	Generator house	8,760.00	15	7,592.00	1,168.00
5	Piping – underground	1,168.00	2	584.00	584.00
6	Piping – aboveground	1,168.00	2	584.00	584.00
7	Air conditioning	6,424.00	11	5,256.00	1,168.00

Table A-6 (continued)

Item No.	Item	Amount	Item Weight (%)	Material	Labor
		Package II			
8	Electrical – spectrometer room and tunnel	1,168.00	2	584.00	584.00
9	Electrical control center	16,936.00	29	15,768.00	1,168.00
10	Electrical – generator house, aboveground	11,096.00	19	7,008.00	4,088.00
11	Electrical – generator house, underground	4,088.00	7	2,920.00	1,168.00
	Total	$ 58,400.00	100		
		Package IIIA			
1	Excavating and grading	1,144.34	1	0.00	1,144.34
2	Concrete	3,433.02	3	2,288.68	1,144.34
3	Compressor house	8,010.38	7	6,866.04	1,144.34
4	Air compressor and drier	14,876.42	13	14,876.42	0.00
5	Mechanical work	6,866.04	6	3,433.02	3,433.02
6	Electrical – motor control centers	27,464.16	24	26,319.82	1,144.34
7	Electrical – voltage regulators and Powerstats	11,443.40	10	9,154.72	2,288.68
8	Electrical – conduit, cables, and trays	20,598.12	18	12,587.74	8,010.38
9	Electrical – transformers	8,010.38	7	6,866.04	1,144.34
10	Electrical – compressor house	12,587.74	11	8,010.38	4,577.36
	Total	$114,434.00	100		
		Other Major Package IIIA Costs[e]			
1	Waste oil piping and tank	2,796.80		1,748.00	1,048.80
2	Waste oil fill system piping	698.00		524.00	174.00
3	Louver hydraulic system	11,362.00		5,244.00	6,118.00
4	Louver hydraulic pumping unit	3,865.79		3,265.79	600.00

Footnotes for Table A-6.

[a] Includes all modifications approved prior to Jan. 27, 1956.

[b] Pay item A represents capital cost.

[c] Pay item B represents activity cost.

[d] Breakdown of Package A cost:

Cost of labor and material	$33,084.94
3% sales tax	436.91
7% FICA and insurance	1,296.47
Travel pay	1,723.50
Subtotal	$36,541.82
10% overhead	3,654.18
Subtotal	$40,196.00
Insulation (subcontract)	915.00
Subtotal	$41,111.00
10% profit	4,111.00
Subtotal	$45,222.00
Prime contractor's overhead and profit	5,129.62
Total	$50,351.62

[e] These prices include mechanical work and test work only for contract modifications.

Table A-7. ART Facility – Estimated Unit Price Data – Major Equipment[a]

Item No.	Item	Unit	Material	Labor	Total
1	Diesel generator building, Braden type, 30′ × 72′	Square foot	$ 3.60	$ 0.50	$ 4.10
1A	Excavation and concrete for above	Square foot	1.35	1.61	2.96
2	Compressor house, Butler type, 30′ × 48′[b]	Square foot	4.75	0.80	5.50
2A	Excavation and concrete for above	Square foot	1.70	1.85	3.55
3	Diesel generator units, 300-kw, with controls and appurtenances; no conduit and cable	Each	32,500.00	864.00[c]	33,364.00
4	Air compressor, carbon ring, 150 scfm at 125 psig	Each	8,520.00	200.00[d]	8,720.00
5	Air dryer, 100 scfm, −20°F dew point, for operation at 125 psig pressure	Each	4,100.00	150.00	4,250.00
6	Switchgear, 440-v, consisting of three circuit breakers per section	Section	8,600.00	150.00	8,750.00[e]
7	Motor control centers, consisting of four 200-amp, six 100-amp, nine 30-amp, five 15-amp, seven 50-amp, three 70-amp, and five 2-amp circuit breakers; five size 2 and eleven size 1 contractors; one manual throwover switch and one automatic throwover switch per section	Section	13,158.00	572.00	13,730.00
8	30-ton crane	Each	47,645.00	2,700.00	50,345.00
9	3-ton hoist with monorail	Each	5,700.00	350.00	6,050.00
10	1-ton hoist with monorail	Each	1,410.00	200.00	1,610.00
11	Rolling door, electrically operated, 26′ × 32′	Each	5,330.00	1,200.00	6,530.00
12	Electrical distribution panel, set on alignment only[f]	Each	1,460.00	64.00	1,524.00
13	250-hp blower and motor	Each	16,000.00	2,000.00	18,000.00
14	Louver hydraulic pumping unit	Each	3,265.00	600.00	3,865.00
15	Contaminated oil storage tank, 500-gal code vessel	Each	1,300.00	100.00	1,400.00
16	1500-kva transformer, 13800/480 v (including 400 ft of transmission lines, lightning protection, fused disconnect switch, and four potheads)	Each	1,729.00[g]	798.00	2,527.00
17	Unit heaters, Trane Co. Type C coils, Series 8, 120,000 Btu/hr	Each	134.00	80.00	214.00
18	Cooling unit, Trane 212, with 8-row water coil	Each	1,317.00	220.00	1,537.00
19	Stack, steel	Ton	440.00	230.00	670.00

Table A-7 (continued)

Item No.	Item	Unit	Material	Labor	Total
20	Air duct, structural steel plate	Pound	.16	.08	.24
21	Stainless steel, type 304, 16 gage[b]	Pound	.38	.09	.47
22	Insulation, block[b]	Board foot	.31	.12	.43
23	Pressure vessel	Pound	.40	.25	.65
24	Water vessel	Pound	.25	.15	.40
25	Concrete (additional concrete required for cell and water vessel foundation changes)[i]	Cubic yard			75.00
26	Junctions, panel (openings in cell and water vessel)[j]	Each			1,750.00
27	4" pipe sleeves in cell and water vessel[j]	Each			290.00
28	6" pipe sleeves in cell and water vessel[j]	Each			330.00
29	8" pipe sleeves in cell and water vessel[j]	Each			450.00
30	Spot radiographs of pressure vessel weld joints[j]	Each			20.00
31	Soil exploration borings[j]	Linear foot			15.00
32	Air conditioner, 10-ton self contained unit	Unit	5,256.00	1,168.00	6,424.00

[a] The above prices were estimated from Building 7503 contract costs and include contractors' costs and overhead.

[b] This building has heavier structural steel than the diesel house to support pipe and conduit.

[c] Labor price includes setting of diesel generator only.

[d] Labor price is only for setting and aligning unit.

[e] This price is estimated from a total price for 11 sections.

[f] See ORNL Dwg D-26435 top description. Fourteen units of this equipment were installed by Package IIIA contractor.

[g] This does *not* include cost of transformer.

[h] Main Air Duct Liner.

[i] Includes reinforcing steel.

[j] Contract unit price for additions

Table A-8. ART Facility – Estimated Unit Price Data – Minor Equipment[a]

Item No.	Item	Unit	Material	Labor	Total
1	Excavation	Cubic yard			$ 5.00
2	Rock excavation	Cubic yard			10.00
3	Backfill	Cubic yard			6.00
4	Concrete (no reinforcing steel)	Cubic yard	$ 14.00	$ 6.00	20.00
5	Concrete, trowel-finishing and curing	Cubic yard	.05	.95	1.00
6	Concrete, winter protection	Cubic yard	1.50	1.50	3.00
7	Concrete, test cylinders	Each	25.00	25.00	50.00
8	Forms	Square foot	.46	.60	1.06
9	Reinforcing steel	Ton	180.00	75.00	255.00
10	Structural steel	Pound	.34	.07	.41
11	Concrete, joints	Linear foot	.40	.80	1.20
12	Concrete, reinforced pipe, 12″	Linear foot	1.60	1.70	3.30
13	Copper water seal	Linear foot	.10	.80	.90
14	Grout	Cubic yard	10.00	15.00	25.00
15	Crushed stone backfill	Cubic yard			6.00
16	Concrete block, 6″ × 6″ × 4″	Each	.20	.18	.38
16A	Concrete block, 8″ × 8″ × 16″	Each	.30	.30	.60
17	Transite siding	Square foot	.25	.27	.52
18	Wire mesh – concrete reinforcing	Square foot	.03	.05	.08
19	Storm fence, 8 ft high	Linear foot	.45	1.90	2.35
20	Storm fence – gate post for 12′ gate and fittings	Each	35.00	7.00	42.00
21	Storm fence – 12′ gate	Each	96.00	18.00	114.00
22	Executive chair	Each			56.00
23	Tableside arm chair	Each			46.00
24	Library table with drawer	Each			102.40
25	2″ sched 40 black pipe	Foot	.44	.44	.88
26	2″ gate valve, flanged, std	Each	31.00	5.00	36.00
27	2″ 90° ell, butt welded, std	Each	1.76	1.76	3.52
28	2″ 45° ell, butt welded, std	Each	1.38	1.38	2.76
29	2″ tee, butt welded, std	Each	6.70	6.70	13.40
30	2″ flange, butt welded, std	Each	3.06	3.06	6.12
31	2″ coupling, butt weld, std	Each	2.92	2.92	5.84
32	2″ screwed cap, std	Each	1.58	1.58	3.16
33	2″ 2000-lb butt weld 90° ell	Each	2.30	2.30	4.60
34	2″ 2000-lb butt weld 45° ell	Each	2.76	2.76	5.52

Table A-8 (continued)

Item No.	Item	Unit	Material	Labor	Total
35	2″ 2000-lb butt weld cap	Each	3.02	3.02	6.04
36	2″ screwed coupling	Each	1.60	1.60	3.20
37	1″ sched 40 black pipe	Foot	.35	.35	.70
38	1″ 2000-lb socket weld 90° ell	Each	1.08	1.08	2.16
39	1″ 2000-lb socket weld 45° ell	Each	1.29	1.29	2.58
40	1″ 2000-lb socket weld cap	Each	1.36	1.36	2.72
41	1″ 2000-lb socket weld coupling	Each	1.22	1.22	2.44
42	1″ × ½″ std tee	Each	3.69	3.69	7.38
43	¾″ 2000-lb socket weld 90° ell	Each	.86	.86	1.76
44	¾″ 2000-lb socket weld 45° ell	Each	1.05	1.05	2.10
45	¾″ 2000-lb socket weld cap	Each	1.12	1.12	2.24
46	¾″ 2000-lb socket weld coupling	Each	.90	.90	1.80
47	1½″ sched 40 black pipe	Foot	.37	.37	.74
48	1½″ sched 40 socket weld 90° ell, std	Each	1.81	1.81	3.62
49	1½″ sched 40 socket weld tee, std	Each	5.62	5.40	11.02
50	1½″ sched 40 socket weld cap, std	Each	1.77	1.77	3.54
51	1½″ 2000-lb socket weld 90° ell	Each	1.82	1.82	3.64
52	1½″ 2000-lb socket weld 45° ell	Each	2.18	2.18	4.36
53	1½″ 2000-lb socket weld cap	Each	1.96	1.96	3.92
54	1½″ 2000-lb socket weld coupling	Each	.93	.93	1.86
55	1¼″ sched 40 black pipe	Foot	.32	.32	.64
56	1¼″ sched 40 welded tee, std, 1¼″ × ¾″ × ¾″	Each	5.17	5.17	10.34
57	1″ sched 160 black pipe	Foot	.80	.80	1.60
58	1″ 4000-lb socket weld 90° ell	Each	1.72	1.92	3.64
59	1″ 4000-lb socket weld 45° ell	Each	1.96	2.08	4.04
60	1″ 4000-lb socket weld cap	Each	1.51	1.71	3.22
61	1″ 4000-lb socket weld coupling	Each	.60	.90	1.50
62	1″ sched 80 black pipe	Foot	.40	.40	.80
63	½″ sched 80 black pipe	Foot	.26	.26	.52
64	1″ 3000-lb socket weld 90° ell	Each	1.44	1.44	2.88
65	1″ 3000-lb socket weld 45° ell	Each	1.44	1.44	2.88
66	4″ sched 40 black pipe	Foot	1.21	1.21	2.42
67	4″ gate valve, std	Each	125.00	35.00	160.00
68	4″ sched 40 screwed cap, std	Each	1.25	.85	2.10

Table A-8 (continued)

Item No.	Item	Unit	Material	Labor	Total
69	4" sched 40 butt weld 90° ell	Each	6.44	6.44	12.88
70	4" sched 40 butt weld tee	Each	17.43	17.43	34.86
71	4" sched 40 screwed flange	Each	5.54	5.54	11.08
72	4" backing ring	Each	1.00	1.00	2.00
73	½" sched 40 black pipe	Foot	.23	.23	.46
74	½" 2000-lb socket weld 90° ell	Each	.76	.76	1.52
75	½" 2000-lb socket weld 45° ell	Each	.91	.91	1.82
76	½" 2000-lb socket weld cap	Each	.62	.62	1.24
77	½" 2000-lb socket weld coupling	Each	.40	.40	.80
78	6" sched 40 black pipe	Foot	2.08	2.08	4.16
79	6" × 3" galvanized reducer	Each	28.56	25.00	53.56
80	6" × 3" galvanized tee	Each	33.32	30.00	63.32
81	6" sched 40 galvanized pipe	Foot	2.85	2.85	5.70
82	6" sched 40 black butt weld 90° ell	Each	13.32	13.32	26.64
83	6" sched 40 black butt weld tee	Each	37.54	30.00	67.54
84	6" × 2½" sched 40 black butt weld tee	Each	46.93	42.00	88.93
85	6" × 2" concentric sched 40 black butt weld reducer	Each	9.13	9.13	18.26
86	6" backing ring	Each	1.50	1.50	3.00
87	Gate valve, 150 lb	Each	86.03	35.00	121.03
88	¾" sched 40 black pipe	Foot	.13	.13	.26
89	¾" sched 40 socket weld cap, std	Each	.81	.81	1.62
90	¾" sched 40 socket weld ¾" × 1¼" tee, std	Each	3.69	3.69	7.38
91	¾" check valve, 150 lb	Each	3.91	3.91	7.82
92	¾" gate valve, 150 lb	Each	4.71	4.71	9.42
93	¾" globe valve, 150 lb	Each	4.31	4.31	8.62
94	¾" × ⅝" reducer, socket weld	Each	.17	3.00	3.17
95	¾" type K copper tubing	Foot	.60	.80	1.40
96	¾" sweat 90° ell	Each	.22	.25	.47
97	¾" sweat 45° ell	Each	.22	.25	.47
98	¾" sweat tee	Each	.30	.32	.62
99	¾" sweat cap	Each	.20	.22	.42
100	¾" sweat coupling	Each	.20	.22	.42
101	⅜" type K copper tubing	Foot	.27	.47	.74
102	⅜" sweat tee	Each	.16	.18	.34
103	⅜" × ½" sweat tee	Each	.37	.39	.76

Table A-8 (continued)

Item No.	Item	Unit	Material	Labor	Total
104	3/8" 90° ell, sweat	Each	.13	.15	.28
105	3/8" sweat coupling	Each	.10	.18	.28
106	3/8" × 3/4" reducer	Each	.21	.25	.46
107	3/8" sweat 45° ell	Each	.13	.16	.29
108	3/8" sweat cap	Each	.11	.15	.26
109	1/2" type K copper tubing	Foot	.34	.54	.88
110	1/2" sweat 90° ell	Each	.13	.16	.29
111	1/2" sweat tee	Each	.21	.25	.46
112	1/2" sweat 45° ell	Each	.13	.16	.29
113	1/2" sweat coupling	Each	.18	.20	.38
114	1/2" sweat cap	Each	.16	.19	.35

[a]Estimated from Building 7503 contract costs. These prices cover direct labor and material only.

APPENDIX B. SCHEDULES AND MANPOWER

Table B-1. ART Facility Schedule Summary

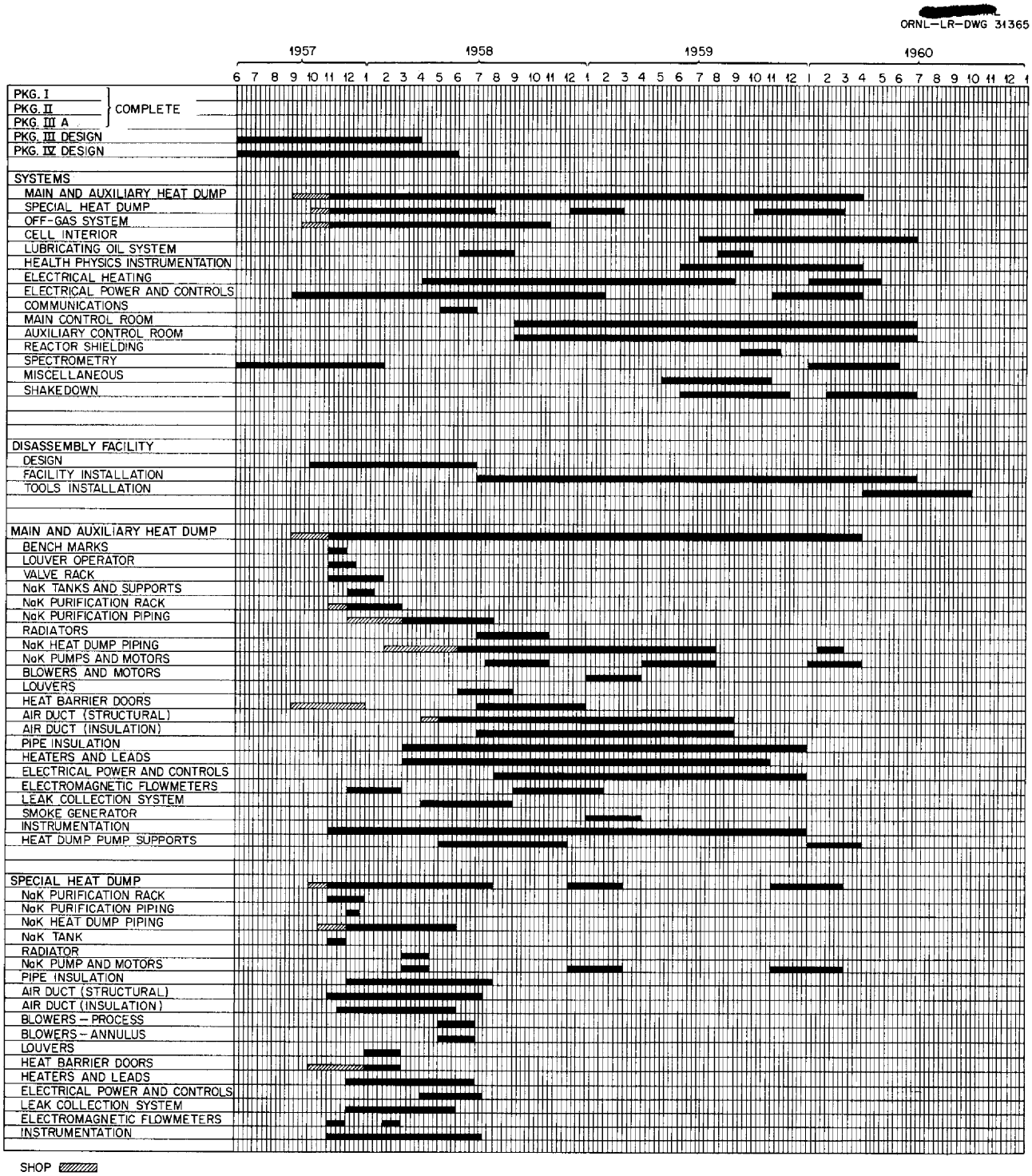

Table B-2. ART Facility Manpower Estimate

July 1957 Estimate

Summary	Manhours
Supervision	4,030
Inspection	1,800
Technician	2,000
Field engineer	4,200
Engineering	15,920
Craft	46,472
Total	74,422
Breakdown of manhours by work orders	
Work Order A-16630	
Supervision	2,400
Inspection	1,800
Technician	2,000
Craft	28,600
Work Order A-16636	
Supervision	100
Craft	1,030
Work Order A-16639	
Supervision	1,280
Craft	9,600
Work Order A-500962	
Supervision	10
Craft	142
Work Order A-500288	
Supervision	0
Craft	60
Work Order A-9391	
Supervision	240
Craft	7,040
Breakdown of manhours by crafts	
Inconel welder	4,200
Pipefitter	11,200
Millwright	2,500
Electrician	9,600
Welder (misc.)	4,175
Breakdown of manhours by crafts	
Sheet metal	2,390
Rigger	3,675
Lead burner	700
Insulator	3,100
Machinist	1,000
Painter	250
Labor	2,780
Misc. (movie projectionist, transportation, auto. mechanic, refrigeration, utility mechanic, etc.)	902

Table B-2 (continued)

February 1957 Estimate

Summary	Manhours	
	Fiscal Year 1958	Fiscal Year 1959
Work Order A-16630	28,875	10,950
Work Order A-16636		20,940
Work Order A-16639	11,000	7,250
Work Order A-16652	11,250	5,500
Work Order A-16669	4,100	4,100
Hot testing of louvers	900	
Containment (pinch valves, etc.)	2,820	1,200
Contingency	5,860	5,700
Shakedown		5,000
Road improvement		3,000
Total	64,805	63,640
Breakdown of summary		
Primary coolant system	11,650	7,500
Special heat dump	5,300	
Off-gas and vent systems	5,180	
Cooling air system	5,180	3,450
Cell interior		17,700
Auxiliary piping	1,220	
Cell heads		3,240
Temporary reactor handling facility	0	0
Station modifications	345	
Electrical heating and power	11,000	7,250
Design engineering	11,250	5,500
Field engineering	4,100	4,100
Hot testing of louvers	900	
Containment (pinch valves, etc.)	2,820	1,200
Contingency	5,860	5,700
Shakedown		5,000
Road improvement		3,000

APPENDIX C. FACILITY DRAWINGS – INSTALLATION COMPLETED

Table C-1. ARE Facility – AE Drawings

Installation completed

Drawing No.	Issue Date	ORNL LR DWG No.	Title
		Drawings Prepared by the Austin Company	
22-0 Rev. C	6–27–52	13761	Drawing Index
		Architectural	
22-A-1 Rev. D	6–27–52	13762	First Floor and Basement
22-A-2 Rev. D	6–27–52	13763	Roof Plan and Details
22-A-3 Rev. D	6–27–52	13764	West and South Elevations
22-A-4 Rev. C	6–27–52	13765	North and East Elevations
22-A-5 Rev. C	6–27–52	13766	Cross Section
22-A-6 Rev. B	6–27–52	13767	Wall Sections
22-A-7 Rev. B	6–27–52	13768	Wall Sections
22-A-8 Rev. B	6–27–52	13769	Wall Sections
22-A-9 Rev. D	6–27–52	13770	Toliet Room and Partition Layout
22-A-10 Rev. B	6–27–52	13771	Partition Details
22-A-11 Rev. C	6–27–52	13772	Door and Hardware Schedule
22-A-12 Rev. D	6–27–52	13773	Room Finish and Stair Details
22-A-13 Rev. C	6–27–52	13774	Miscellaneous Details
22-A-14 Rev. B	6–27–52	13775	Crane and Ladder No. 1 Details
22-A-15 Rev. B	6–27–52	13776	Interior Elevations and Details
		Structural	
22-S1 Rev. C	6–27–52	13777	Roof Framing Plan and Sections
22-S2 Rev. B	6–27–52	13778	Framing Details
22-S3 Rev. B	6–27–52	13779	Truss, Column Schedule and Details
22-F1 Rev. F	6–27–52	13780	Foundation Plan and Details
22-F2 Rev. D	6–27–52	13781	First Floor Framing Plan and Details
22-F3 Rev. D	6–27–52	13782	Girder and Miscellaneous Details
		Plumbing	
22-100 Rev. D	6–27–52	13783	Mechanical Plot Plan
22-101 Rev. C	6–27–52	13784	Water Line Details
22-102 Rev. D	6–27–52	13785	Toliet Room Plumbing
22-103 Rev. E	6–27–52	13786	Basement Plan and Section
22-104 Rev. C	6–27–52	13787	Septic Tank and Disposal Field
		Heating and Ventilating	
22-200 Rev. D	6–27–52	13788	Heating and Ventilating
22-201 Rev. D	6–27–52	13789	Steam Piping
22-202 Rev. D	6–27–52	13790	Basement Steam Piping
		Electrical	
22-300 Rev. B	6–27–52	13791	13.8 KV Transmission Line Plan
22-301 Rev. C	6–27–52	13792	Transformer Step Down Station, Elevation and Sections
22-302 Rev. B	6–27–52	13793	13.8 KV Transmission Line Pole Line Structure Details
22-303 Rev. B	6–27–52	13794	13.8 KV Transmission Line Bill of Material
22-304 Rev. D	6–27–52	13795	Basement Lighting Plan and Single Line Diagram

Table C-1 (continued)

Drawing No.	Issue Date	ORNL LR DWG No.	Title
		Drawings Prepared by the Austin Company	
		Electrical	
22-305 Rev. D	6-27-52	13796	First Floor Lighting Plan
22-306 Rev. D	6-27-52	13797	Power Plans
22-307 Rev. B	6-27-52	13798	Miscellaneous Sections and Details
		Yard Work	
22-Y1 Rev. E	6-27-52	13802	Plot Plan
		Drawings Prepared by the ORNL Engineering and Mechanical Division*	
E-9345 Rev. 1	4-18-52		Drawing Index
		Civil	
D-9350 Rev. 0	1-16-52		Retention Pond Plan
D-9351 Rev. 0	1-16-52		Retention Pond Plan and Sections
D-9352 Rev. 0	1-16-52		Retention Pond Influent Sewer Plan and Profile
D-9353 Rev. 0	1-16-52		Retention Pond Air Valve and Valve Pit Sections and Details
D-9354 Rev. 0	1-16-52		Retention Pond Across Road Plan and Profile
D-9355 Rev. 0	1-16-52		Parking Area Plan Sections and Details
D-9356 Rev. 0	1-16-52		Process Sewer – Plan and Profile Seeding Plan
		Structural	
C-9323			Foundation Pad for Process Water Tank
D-9336 Rev. 2	2-20-56		Concrete Foundation Plan and Details
E-9337 Rev. 8	10-17-52		Basement Floor Plan
E-9338 Rev. 3	4-18-52		First Floor Plan
E-9339 Rev. 4	10-27-52		Transverse Section Thru Building
E-9340 Rev.8	10-27-52		Pit Sections
E-9341 Rev. 1	3-3-52		Pit Sections
E-9342 Rev. 0	1-16-52		Concrete Beam and Girder Details
D-9343 Rev. 1	2-14-52		Stair From Basement to Control Pit Plan and Details
D-9346 Rev. 0	1-16-52		Test Pits Roof Slabs
D-9347 Rev. 1	3-11-52		Heat Exchanger Pit Roof Slabs Plan and Details
D-9348 Rev. 0	2-5-52		Test Pits Roof Slabs
D-9349 Rev. 2	2-17-52		Sleeve Details
D-9357 Rev. 0	2-5-52		Test Pits Roof Slabs
D-9366 Rev. 2	4-15-52		Guard House, Plan, Elev. and Sect.
C-17122 Rev. 0	5-19-53		Test Pit Roof Slab Details
		Mechanical	
D-9331 Rev. 1	2-20-52		Water Supply Storm and Process Drain Plan and Sections
D-9332 Rev. 1	2-20-52		Process Water Sections and Details
D-9333 Rev. 0	1-16-51		Wood Louver and Piping Details
D-9334 Rev. 0	11-6-51		Air Conditioner for Instrument and Counting Rooms
D-9335 Rev. 0	11-6-51		Basement Heating and Ventilating

Table C-1 (continued)

Drawing No.	Issue Date	ORNL LR DWG No.	Title
			Drawings Prepared by the ORNL Engineering and Mechanical Division*
			Mechanical
D-14607 Rev. 0	11-1-52		Air Conditioning Control Room
D-14608 Rev. 0	11-1-52		Air Conditioning Control Room Sections and Details
			Electrical
E-9358 Rev. 1	3-3-52		Lighting and Power Plan
E-9359 Rev. 1	3-3-52		First Floor Power Plan
E-9360 Rev. 1	3-3-52		Sections and Diagrams
D-10438 Rev. 3	12-2-52		Three Line Diagram Operational Power
D-10439 Rev. 4	12-5-52		Basement Operational Power Layout
D-10442 Rev. 1	12-13-52		Sections and Details Operational Power Sh. No. 2
D-10443 Rev. 0	9-3-52		Elevotions and Details Operational Power Sh. No. 3
D-10444 Rev. 1	12-20-52		Control Room Lighting
D-12280 Rev. 0	4-18-52		Basement Emergency Lighting and Guard House Facilities

*Only drawings of current interest are listed.

Table C-2. ART Facility – AE Drawings

Installation Completed

Drawing No.	Title
	Drawings Prepared by the K-25 Plant Engineering Division
	Structural, Architectural, and Topographical
D-KS-19040A1 Rev. 4	Bldg. 7503 Alterations – First Floor Plan
D-KS-19040A2 Rev. 6	Bldg. 7503 Alterations – Basement Plan
D-KS-19040A3 Rev. 2	Bldg. 7503 Alterations – West Elevation
D-KS-19040A4 Rev. 1	Bldg. 7503 Alterations – East Elevation
D-KS-19040A5 Rev. 2	Bldg. 7503 Alterations – North and South Elevations
D-KS-19040A6 Rev. 2	Bldg. 7503 Alterations – Roof Plan and Details
D-KS-19040A7 Rev. 3	Bldg. 7503 Alterations – Longitudinal Cross Section
D-KS-19040A8 Rev. 4	Bldg. 7503 Alterations – Transverse Cross Sections
D-KS-19040A9 Rev. 0	Bldg. 7503 Alterations – Wall Section and Window Details
D-KS-19040A10 Rev. 1	Bldg. 7503 Alterations – Wall Sections
D-KS-19040A11 Rev. 2	Bldg. 7503 Alterations – Wall Sections
D-KS-19040A12 Rev. 2	Bldg. 7503 Alterations – Locker Room and Partition Details
D-KS-19040A13 Rev. 0	Bldg. 7503 Alterations – Laboratory and Furniture Details
D-KS-19040A14 Rev. 3	Bldg. 7503 Alterations – Blower House Details
D-KS-19040A15 Rev. 4	Bldg. 7503 Alterations – Door and Hardware Schedule
D-KS-19040A16 Rev. 1	Bldg. 7503 Alterations – Stair Details
D-KS-19040A17 Rev. 0	Bldg. 7503 Alterations – Interior Elevations and Details
D-KS-19040A18 Rev. 2	Bldg. 7503 Alterations – Miscellaneous Details
D-KS-19040A19 Rev. 2	Bldg. 7503 Alterations – Miscellaneous Details
D-KT-19040B1 Rev. 1	Bldg. 7503 Alterations – Existing Utilities
D-KT-19040B2 Rev. 0	Bldg. 7503 Alterations – Existing Contours
D-KT-19040B3 Rev. 4	Bldg. 7503 Alterations – Sidewalk and Sections
D-KT-19040B4 Rev. 0	Bldg. 7503 Alterations – Sections
D-KT-19040B5 Rev. 1	Bldg. 7503 Alterations – Sections
D-KT-19040B6 Rev. 0	Bldg. 7503 Alterations – Fence Details
D-KS-19040C1 Rev. 1	Bldg. 7503 Alterations – Roof Framing and Wall Elevations
D-KS-19040C2 Rev. 0	Bldg. 7503 Alterations – Framing Details
D-KS-19040C3 Rev. 0	Bldg. 7503 Alterations – Structural Cross Section and Details
D-KS-19040C4 Rev. 0	Bldg. 7503 Alterations – Revision to Existing 10-Ton Crane
D-KS-19040C5 Rev. 1	Bldg. 7503 Alterations – Swivel Bearing Details for 7503 Cell Crane
D-KS-19040C6 Rev. 5	Bldg. 7503 Alterations – First Floor Framing and Foundation Plan Elev. 852'-0"
D-KS-19040C7 Rev. 4	Bldg. 7503 Alterations – Foundation Plane – Elev. 817'-0" to 832'-0"
D-KS-19040C8 Rev. 4	Bldg. 7503 Alterations – Foundation Plans – Elev. 841'-0"
D-KS-19040C9 Rev. 4	Bldg. 7503 Alterations – Concrete Details, Sheet 1
D-KS-19040C10 Rev. 3	Bldg. 7503 Alterations – Concrete Details, Sheet 2
D-KS-19040C11 Rev. 3	Bldg. 7503 Alterations – Concrete Details, Sheet 3
D-KS-19040C12 Rev. 3	Bldg. 7503 Alterations – Concrete Details, Sheet 4
D-KS-19040C13 Rev. 2	Bldg. 7503 Alterations – Concrete Details, Penthouse
D-KS-19040C14 Rev. 1	Bldg. 7503 Alterations – Concrete Details, Concrete at Water Tank
D-KS-19040C15 Rev. 1	Bldg. 7503 Alterations – Concrete Details at Cols. B6 and C7
D-KS-19040C16 Rev. 1	Bldg. 7503 Alterations – Concrete Details – Concrete at Water Tank
D-KS-19040D1 Rev. 1	Bldg. 7503 Alterations – Structural Framing, Blower House
D-KS-19040D2 Rev. 5	Bldg. 7503 Alterations – Details – Blower House

Table C-2 (continued)

Installation completed

Drawing No.	Title
	Drawings Prepared by the K-25 Plant Engineering Division
	Structural, Architectural, and Topographical
D-KS-19040D3 Rev. 2	Bldg. 7503 Alterations – Air Duct Details, Sheet 1
D-KS-19040D4 Rev. 4	Bldg. 7503 Alterations – Air Duct Details, Sheet 2
D-KS-19040D5 Rev. 3	Bldg. 7503 Alterations – Air Duct Details, Sheet 3
D-KS-19040D6 Rev. 2	Bldg. 7503 Alterations – Air Duct Details, Sheet 4
D-KS-19040D7 Rev. 3	Bldg. 7503 Alterations – Air Duct Support Details
D-KS-19040D8 Rev. 0	Bldg. 7503 Alterations – Stack Details
D-KS-19040E1 Rev. 0	Bldg. 7503 Alterations – Foundation Plan and Structural Framing – Switch House
D-KS-19040G1 Rev. 0	Bldg. 7503 Alterations – North Wall Framing – Building Revisions
D-KS-19040G2 Rev. 0	Bldg. 7503 Alterations – Crane Bay – Plan and Sections Building Revisions
D-KS-19040G3 Rev. 0	Bldg. 7503 Alterations – Crane Bay Sections and Details Building Revisions
D-KS-19040G4 Rev. 2	Bldg. 7503 Alterations – Retaining Wall and Floor Slab Building Revisions
D-KS-19040H1 Rev. 4	Bldg. 7503 Alterations – Miscellaneous Details
D-KS-19040H2 Rev. 5	Bldg. 7503 Alterations – Miscellaneous Details
D-KS-19040H3 Rev. 1	Bldg. 7503 Alterations – Entrance and Access Platform 30 Ton Crane
D-KS-19040S1 Rev. 0	Bldg. 7503 Alterations – First Floor Security Area
D-KS-19040S2 Rev. 0	Bldg. 7503 Alterations – Basement Security Area
D-KS-19041A1 Rev. 2	7503 Cell – Plan and Section
D-KS-19041A2 Rev. 3	7503 Cell – Sections and Details
D-KS-19041A3 Rev. 2	7503 Cell – Sections and Details
D-KS-19041A4 Rev. 2	7503 Cell – Internal Equipment and Loads
	Piping
D-KP-19040A Rev. 5	Plumbing Changes – Basement Floor
D-KP-19040B Rev. 7	Plumbing Changes – Ground Floor
D-KP-19040C Rev. 4	Plumbing Changes Sections and Details
D-KP-19040D Rev. 5	Plumbing Changes Sections and Details
D-KP-19040E Rev. 4	Outdoor Piping
D-KP-19040F Rev. 4	Drainage Plan and Details
D-KP-19040H Rev. 1	Air Duct Liner – Cooling Air
D-KP-19040J Rev. 1	Heating and Ventilating Plan
D-KP-19040K Rev. 3	Heating and Ventilating
D-KP-19040L Rev. 2	Heating and Ventilating Sections
D-KP-19040M Rev. 0	Heating and Ventilating Sections
D-KP-19040N Rev. 0	Heating and Ventilating Steam
D-KP-19040P Rev. 1	Heating and Ventilating Steam
D-KP-19040R Rev. 2	Heating and Ventilating Inst. Tunnel and Vent House
D-KP-19040T Rev. 2	Penthouse Cooling
D-KP-19040U Rev. 1	Radiator Pit Exhaust
	Electrical
D-KE-19040A Rev. 3	Switchyard, Switchhouse Plan and Elevations
D-KE-19040B Rev. 2	Pole Line Details
D-KE-19040C Rev. 0	Grounding Plan

Table C-2 (continued)

Installation completed

Drawing No.	Title
	Drawings Prepared by the K-25 Plant Engineering Division
	Electrical
D-KE-19040D Rev. 1	Switchgear Layout and Details
D-KE-19040E Rev. 1	One Line Diagram, Auxiliary Power System
D-KE-19040F Rev. 2	One Line Diagram, Process Power System
D-KE-19040G Rev. 1	First Floor Lighting and Receptacle Layout
D-KE-19040H Rev. 5	Basement Floor Lighting and Receptacles Layout
D-KE-19040J Rev. 3	First Floor Auxiliary Power Plan
D-KE-19040K Rev. 4	Basement Floor Auxiliary Power Plan
D-KE-19040M Rev. 0	Cell Lighting and Receptacles Details
D-KE-19040N Rev. 1	Cable Tray and Duct Run – Basement Floor – for Special Equipment Room
	Drawings Prepared by the ORNL Engineering and Mechanical Division
D-23884 Rev. 3	Spectrometer Room and Tunnel – Building 7503 – Part Basement Plan at Elevation 840'-0"
D-23885 Rev. 3	Spectrometer Room and Tunnel – Building 7503 – Spectrometer Room, Section and Details
D-23886 Rev. 1	Spectrometer Room and Tunnel – Building 7503 – Spectrometer Sections and Details
D-23887 Rev. 4	Spectrometer Room and Tunnel – Building 7503 – Access Stairs and Details
D-23929 Rev. 1	Additions to Adsorber Tank – Baffle Plates and Plugs – Details
D-23132 Rev. 1	Bldg. 7503 Additions – Package "A" – Water and Air Piping to Auxiliary Equipment Room
D-23133 Rev. 1	Bldg. 7503 Additions – Package "A" – Auxiliary Equipment Room – Plan
D-23134 Rev. 1	Bldg. 7503 Additions – Package "A" – Auxiliary Equipment Room Piping – Sections
D-23135 Rev. 1	Bldg. 7503 Additions – Package "A" – Control Tunnel Piping – Plan and Details
D-23136 Rev. 1	Bldg. 7503 Additions – Package "A" – Control Tunnel Pipe Rack – Details
D-23137 Rev. 0	Bldg. 7503 Additions – Package "A" – Control Tunnel West Wall – Instrument Trays – Details
D-23138 Rev. 1	Bldg. 7503 Additions – Package "A" – Control Tunnel Piping and Instrument Tray – Sections
D-23139 Rev. 1	Bldg. 7503 Additions – Package "A" – Piping to Penthouse Plan and Sections
D-23140 Rev. 1	Bldg. 7503 Additions – Package "A" – Control Tunnel East Wall – Instrument Trays – Details
D-23141 Rev. 1	Bldg. 7503 Additions – Package "A" – Nitrogen and Helium Supply Systems, Plan and Sections
D-23142 Rev. 1	Bldg. 7503 Additions – Package "A" – Nitrogen and Helium Supply Systems, Sections and Details
D-22842 Rev. 0	Duct Access for Radiation Inspection
D-23145 Rev. 0	Revision of Concrete and Duct Details
D-23143 Rev. 1	Package "A" – Gas Piping Pit Area – Plan and Sections
D-23144 Rev. 0	Package "A" – Gas Piping Pit Area – Sections and Plans
D-23146 Rev. 0	Package "A" – Control Tunnel Bulkhead – Assembly and Details
D-23147 Rev. 1	Package "A" – Piping Schedule
D-23148 Rev. 0	Package "A" – Control Tunnel Piping Bend Details
D-23149 Rev. 0	Package "A" – Piping Details for Auxiliary Equipment Room and Control Tunnel Entrance

Table C-2 (continued)

Installation completed

Drawing No.	Title
	Drawings Prepared by the ORNL Engineering and Mechanical Division
D-24829 Rev. 1	Package "A" – Lube Oil Piping to Special Equipment Room
D-24833 Rev. 0	Revision of Duct Details
D-24835 Rev. 0	Air Duct Supports and Guides
D-24836 Rev. 0	Revision of Penthouse Details
D-25810 Rev. 0	Alterations to A/C and Vent. Equipment – Plans and Details
D-25811 Rev. 0	Modifications to Tunnel Ventilation – Sh. 1 of 2
D-25812 Rev. 0	Modifications to Tunnel Ventilation – Sh. 2 of 2
D-25467 Rev. 0	Plan and Details of Blower House Floor and Equipment Pads
D-25470 Rev. 0	Plan and Details of Fire Doors between Switch House and Generator House
D-25473 Rev. 0	Details of Isolators, Motor and Damper Bases
D-26087 Rev. 0	Electrical Services – Ventilating and Air Conditioning Equipment
D-26099 Rev. 0	Blower House Conduit Plan
	Drawings Prepared by ARED
A-AF-49 Rev. 2	7503 Cell Sleeve Location
A-AF-111 Rev. 0	Modifications of Load Support for Unit No. 2
A-AF-112 Rev. 0	Revised Loading of Cell Floor Structure
A-AF-109 Rev. 0	7503 Area Fence Plan
E-2-02-054-5122 Rev. 0	Assembly Dump Tank Support
D-2-02-054-5123 Rev. 0	Bracket – Dump Tank Support
C-2-02-054-5124 Rev. 0	Connecting Rod – Dump Tank Support
B-2-02-054-5125 Rev. 0	Mounting Block – Dump Tank Support
A-AF-104 Rev. 0	Duct Detail
A-AF-101 Rev. 0	Duct Wind Load Support Plate No. 2
A-AF-103 Rev. 0	Sectional View of Weirs
A-AF-72 Rev. 1	7503 Cell Clearance Stops
A-AF-82 Rev. 0	Second Method for Tensile Loading Adsorber Tank Straps
A-AF-113 Rev. 0	Adsorber Pit Repair Measures
D-26429 Rev. 0	Guard Portal Power
A-AF-107 Rev. 0	852'-0" Elevation Floor Expansion Seals

Table C-3. ART Facility – Manufacturer's Drawings

Installation completed

Item	Manufacturer	Document No.	Title
Blower house louvers	Airolite Co.	609-C-426	Louver Type 609-A Louvers in Doors 10B and 11B
		609-C-427	Louver Type 609-A 24 × 24
		609-D-178	Louver Type 609-A Blower-house Bldg.
Building	Bristol Steel & Iron Works	Sheet A1, A2, B1, E1–E3, S3, 12–26	(Prepared for Austin Co. for ARE Project)
Cell (pressure vessel and water tank)	Chicago Bridge & Iron Co.	Contract 69761 Dwg X	X-Ray Data
		Contract 69761 Dwg H	Heat Numbers
		Contract 69761 Dwg A	(Design Dwg.)
		Contract 69761 Dwg C	Proposed Construction of Clearance Stop Supports 7503 Cell
		Contract 69761,2 Dwg F	Foundation Plan for 7503 Cell Pressure Vessel and Water Tank
		Contract 69761,2 Dwg ER	Field Stress Relieving Procedure
		Contract 69761,2 Dwg (1)	General Plan 24′ × 12′ T. L. Blimp
		Contract 69761,2 Dwg (2)	Shell, Top and Bottom Heads 24′ × 12′ Blimp
		Contract 69761,2 Dwg (3)	Skirt and Base Plate for 24′ × 12′ T. L. Blimp
		Contract 69761,2 Dwg (4)	Pipe Sleeves and Expansion Joints
		Contract 69761,2 Dwg (5)	Platform 24′ × 12′ Blimp
		Contract 69761,2 Dwg (6)	Piece Details for Internal Support
		Contract 69761 Dwg (7)	Internal Grating and Load Supports
		Contract 69761 Dwg (8)	Unit No. 1 Supports
		Contract 69761 Dwg (9)	Crane Support 24′-0″ i.d. × 12′-0″ T. L. Blimp
		Contract 69761 Dwg (10)	12″ Channel and Clearance Stops 12′ × 12′ T. L. Blimp
		Contract 69761 Dwg (12)	Dump Tank Support Assembly for 24′ × 12′ T. L. Blimp
		Contract 69761 Dwg (13)	Revision of Equipment Supports for 24′ × 12′ T. L. Blimp
		Contract 69762 Dwg (1)	General Plan – Water Tank and Cell
		Contract 69762 Dwg (2)	Water Tank Shell
		Contract 69762 Dwg (3)	Platform Water Tank
		Contract 69762 Dwg (5)	Water Tank Stiffeners – Welding Procedure
		Contract 69761 Bill of Material Sheets 1–9, 25, 26, 38, 39, 41	
		Contract 69762 Bill of Material Sheets 1–5, 15, 17–23	
Cell hoist	Industrial Crane & Hoist Corp.	D26599 Sheet 1	Rev. 2 Layout and Erection of 1 Ton Swivel Crane

Table C-3 (continued)

Installation completed

Item	Manufacturer	Document No.	Title
Compressor building	Butler Manufacturing Co.	7-507 GDB-A1	Solid Paneled Building
		7-507 GDB-A3	End Wall Variations
		7-507 GAB-A6	Sidewall Variations for Bldgs. 20′ thru 50′ Wide 10′ – 12′ – 14′ High
		7-503 GAC-B1	Side Wall
		7-503 GDB-C1	Roof Plan
		7-503 GDB-D1	Cross Section
		7-507 GBD-C2	Foundation Details and Section for 32′, 36′, and 50′ Wide Bldgs. (6″ Curbs)
		7-503 GDC-A1	Paneled End Wall with Sash Variations
		7-503 GDB-E1	Rigid Door Frames
		7-503 GDB-E2	Details End Wall
	The Hughes Company	RF3-6	32′ × 48′ × 12′ RF3-6 Butler Bldg.
Compressor house louvers and ventilator	American Warming & Ventilating Co.	1060	Felt Edged Wall Shutter
		1291	F-200 Shutter with Screen
	The Swartwout Co.	4057-1051-B	Powered Valvent Type "P" Base
Crane 30-ton building crane[a]	Harnischfeger Corp.	8F 1037	30 Ton Hook
		16E 889	Bridge Bumper
		16E 1025-S	Motor Base Trolley Drive
		16F 1388	Bracket Motor Reducer
		22A 1303-S2	Trolley Frame
		28A 6739	Front Footwalk
		28E 5951	Girder 36″ WF Beam
		28E 5964	26″ I Beam Bridge Shafting
		29A 1565	Feed Rail Bridge Conductors
		29E 625	Runway Rail Check
		31A 3105-54 Sheet 1	Bridge Truck Welding Drawing
		31A 3105-54 Sheet 2	Bridge Truck Welding Drawing
		31A 3137	Special 3-Motor Cage
		78E 531	Collector Support
		79E 867	Limit Switch Application
		100A 2216-S	Hoist Assembly
		100E 1157	Bottom Block Assembly
		100E 1667	Truck Assembly Horizontal Drive
		100E 2562	Controller Support Assembly
		100F 329	Cross Shaft Bracket Assembly
		105A 573	Trolley Layout
		910E 10	Trolley Axle Assembly
		914A 36	Trolley Drive Gear Case Assembly
		914A 37	Gear Case Assembly

Table C-3 (continued)

Installation completed

Item	Manufacturer	Document No.	Title
Crane 30-ton building crane[a]	Harnischfeger Corp.	Bulletin C-7-1	Care and Operation of P and H Electric Overhead Crane
		Bulletin H5-2	Instruction Book – Repair Parts Manual
10-ton building crane	Harnischfeger Corp.	Repair Parts Manual	
		Manual (P and H Proposal ME-3450)	
		328 A 256-S6	Platform
		328 E 587-S4	Bridge (Platform and Cage)
		328 E 72-S43	Bridge Shafting (Motor Drive)
		331 E 150-S18	End Truck (Platform)
		3100 E 678-S1	Trolley Duct Assembly
	Industrial Crane & Hoist Corp.	D-26599 Sheet 2	Revision Drawing of Existing 10 Ton Crane
Controls for heating, ventilating, and air conditioning	Barber-Coleman Co.[b]	BC-705	(Wiring Diagram for Control Room Air Conditioning)
		F-4248-1	Installation Instructions for DYDK Remote Bulb Thermostat
		F-3538	Installation Instructions far ADFD Proportioning Valve Operator
		F-2062	Installation Instructions for CYBG Valve Operator
		F-3114	Installation Instructions for FYDA 2 Wire Line Voltage Room Thermostat
		F-1704-2	Installatian Instruction for EYCC Damper Control Motor
		F-3618	Installation Instructions for GYDT Room Microtherm
		F-1685-2	Installation Instructions for CYCH Spring Return Cantrol Motor
	Minneapolis-Honeywell Regulator Co.	68-55070	Heating Control – Solid State Physics Room Water Control for Penthouse Cooler Unit Heater Control
		95-1172	T915 and L956 Temperature Controller Pages 1–8
		95-1257B	Thermostats Pages 1–4
		90-501	Electric Motorized Valves Pages 1–12
Diesel fuel oil system	The Buda Co.	OG-2412-R	Fuel Oil Piping Schematic
		OG-2416-R	Layout of Fuel Day Tank, Accessories
	Buffalo Tank Corp.[b]	N-2665	(5000 Gallon Fuel Oil Tank)
Diesel generator building	Braden Steel Corp.	Sheet 1 of 7	Plan and Elevation
		Sheet 2 of 7	Foundation Plan

Table C-3 (continued)

Installation completed

Item	Manufacturer	Document No.	Title
Diesel generator building	Braden Steel Corp.	Sheet 1X of 7	30 × 72 × 12 Generator Bldg.
		Sheet 2X	30 × 72 × 12 Generator Bldg.
	Wilson-Weesner-Wilkinson Co.	6-3-132	Foundation – Bar List
Doors and door hardware	Overly Manufacturing Co.	Order No. 10530 Sheets 1-3	
		56108 Shop Drawing No. 25	Kalamein Doors
	Moeschl-Edwards Corrugating Co.	4973	V. L. Nicholson Company – Building 7503
	Russell & Erwin Div., American Hardware Corp.	Bill of Material	Schedule of Finishing Hardware
Dry air system	Automatic Switch Co.	Bul. 8210A	Diaphram Valve
		HVA-40-779	Diaphram Valve
	Joy Manufacturing Co.	MIX-3048	Parts Catalog, Aftercooler
		MIX-3048	Parts Catalog, Stationary Compr.
		W 11755	Installation for WGO9L Compressor
		W 10851	Setting for Aftercooler
		W 8142	Automatic Condensate Trap
		X-14005-44	Start-Stop Control Panel
		W-11496	Foundation for Compressor
		W-11736	Air Receiver
		PD 8592	Special Water Piping
		WD 8388	Auto Start & Stop
			Operation & Maintenance Manual
	C. M. Kemp Mfg. Co.	32436	100-EA ORIAD Dryer, Gen. Arrangement
		Bul. D-200	ORIAD Dryer Installation & Maintenance Manual
Electrical system Diesel generators and controls[c]	The Buda Co.	OG-885-L R-A	Starter Data for Leece-Neville DE-11908
		OG-2407-E	Installation Outline
		OG-2409-X Sheet 1	Wiring Diagram
		OG-2409-W Sheet 2	Wiring Diagram
		OG-2409 Sheet 3	Wiring Diagram
		OG-2409 Sheet 4	Wiring Diagram
		OG-2414-W	Engine Wiring Diagram
		OA-3208-X	Muffler, Burgess Model "5DG"
		DL-6657-R	Fuel Tank Assembly
		4033875-X	Battery
		4404712-X	Flexible Exhaust Hose Assembly
		4406646-L	Auxiliary Fuel Pump
		4460075-R Sheet 1	Generator Switchboard Electrical Specifications

Table C-3 (continued)

Installation completed

Item	Manufacturer	Document No.	Title
Electrical system Diesel generators and controls[c]	The Buda Co.	4460075-R Sheet 2	Generator Switchboard Electrical Specifications
		4460075-R Sheet 3	Generator Switchboard Electrical Specificatians
		4460101-X	Battery Rack Assembly
		4460102-X R-A	Switchboard Mechanical Drawing
		4460103-L	Battery Charger
		4460108-L	A. C. Magnetic Starter
		Contract W8X-18089	Instruction Manual and Parts Catalog
	Caterpillar Tractor Co.	Form 30920	D397 Diesel Electric Set Parts Catalog
		Form 117-30338	Attachments for Your Caterpillar Diesel
		1 L 4898	Installation Dim. for R. L. Harris
	Electric Machinery Mfg. Co.	K-53766	Connection Diagram
		B-53846	Bill of Material
		B-53860	Schematic Control Circuit of Switchboard Panel & Engine Starting Equipment
		H-55450	Switchboard Outline
	General Electric Co.	GEJ-2052C	Electrical Interlocks for CR2810 Magnetic Contactors
		GEI-28767A	Synchronizing Relay Instructions
Coolant wound rotor motors	Cutler-Hammer, Inc.	A57-1084	Dimensions of Enclosed Multiple Grid Resistor
		AO57-1106	60 HP Auxiliary Coolant Motor Controller Dimensions of Enclosed Multiple Grid Resistor
		BO39-15213	125 HP Coolant Motor Controllers Floor Type Case – NEMA (Dripproof) Removable Swinging Backs
		161647 D6	Connections for Wound Rotor Motor Controller [(125 HP) Main Coolont Pump]
		162524 D6	60 HP Aux. Coolant Motor Controller Wiring Diagram
		125 HP	Motor Control Manual
		60 HP	Motor Control Manual
Distribution panels	General Electric Co.	432 D 226	Control Centers
Lighting	Electro Silv-A-King Corp.	Catalog X240 (A1A File 31-F-2)	Fluorescent Reflector 2 Row
		Form No. 7-554	Standard Dome Reflector
		Form No. 15-554	High Bay Mounting Unit
Main blowers	General Electric Co.	GEM-15G	1C9143 SG Resistors – Main Blowers
		558C486	Secondary Control
		918A488	Outline for Magnetic Automatic Secondary Control Panel – Main Blowers

Table C-3 (continued)

Installation completed

Item	Manufacturer	Document No.	Title
Electrical system	General Electric Co.	573B336AA Sheet 1	Motor Control Center No. 3
Motor control centers		573B336AA Sheet 2	Motor Control Center No. 3
		573B336AB Sheet 1	Motor Control Center No. 4
		573B336AB Sheet 2	Motor Control Center No. 4
		572B232 Sheet 1	Unit Starter FVNP Sizes 1 and 2
		572B238 Sheet 1	Unit Starter FVNR Size 3
		572B244 Sheet 1	Unit Starter FVNR Size 4
		576B111 Sheet 1	CR-7091-V Unit Feeder – ATB, HC1
		576B112 Sheet 1	CR-7091-V Unit Feeder – AT
		572B532AA	Vertical Section Details DA-7092 Motor Control Center
		T5137843	Recommend Incoming Line Connections
Miscellaneous	General Electric Co.	947A226AA	Type NLAB Lighting Panelboards
		947A226AB	Panel Board Outline and Schedule
		947A226AC	G. E. Panel PP2
	Harnishfeger Corp.	101A513	Elementary Diagram
		101A512	Wiring Diagram
		29F2203	Main Line Conductors and Supply
	C. M. Kemp Mfg. Co.	D404	Oriad Dryer Control Circuit
	Louis Allis Co.	ED SK11-262	General Dimensions of Wound Rotor Motor 125 hp
		ED SK11730	Outline LC-1052 SPL – Proposed Construction
		ED SK11759	Outline LC-1700 Special Proposed Construction
		ED SK11875	General Dimensions of Wound Rotor Motor 125 hp
		ED SK 12083	General Dimensions of Wound Rotor Motor 60 hp
	Marcus Transformer Co., Inc.		Performance Data, Transformer No. 2670 100 kw
		MTF-4464	Dimensional Dwg – 100 KVA Transformer 100 kw
	Master Electric Co.	Bulletin No. 18190A	
	Superior Electric Co.	EP 3257	Outline Powerstats Installation and Operating Instructions
	Square D Co.	PBC-6583	Building 7503, Oak Ridge, Tennessee
		PBC-6584	Building 7503, Oak Ridge, Tennessee
	Westinghouse Electric Corp.	AT-2B-500	Standard Foundation Plan Low Voltage Metal Enclosed Switchgear

Table C-3 (continued)

Installation completed

Item	Manufacturer	Document No.	Title
Electrical system Miscellaneous	Westinghouse Electric Corp.	AT-50D033	Indoor Metal Enclosed Switchgear, 480 Volt, 3ϕ, 60 Cycle – Bill of Material
		AT-50D034	Indoor Metal Enclosed Switchgear, 480 Volt, 3 Phase, 60 Cycle – Outline
		AT-50D035	Indoor Metal Enclosed Switchgear, 480 Volt, 3 Phase, 60 Cycle – Section and Details
		AT-50D036	Indoor Metal Enclosed Switchgear, 480 Volt, 3 Phase, 60 Cycle – Schematic Diagram
		AT-50D037	Indoor Metal Enclosed Switchgear, 480 Volt, 3 Phase, 60 Cycle – Units 1, 2, and 3 Wiring Diagram
		AT-50D038	Indoor Metal Enclosed Switchgear, 480 Volt, 3 Phase, 60 Cycle – Units 4, 5 Wiring Diagram
		AT-50D039	Indoor Metal Enclosed Switchgear, 480 Volt, 3 Phase, 60 Cycle – Unit 6, Wiring Diagram
		AT-50D040	Indoor Metal Enclosed Switchgear, 480 Volt, 3 Phase, 60 Cycle – Units 7, 8 – Wiring Diagram
		AT-50D041	Indoor Metal Enclosed Switchgear, 480 Volt, 3 Phase, 60 Cycle – Units 9, 10 – Wiring Diagram
		AT-50D095	Wiring Diagram Unit 1A
		Preventive Maintenance Instruction Book	Indoor Low Voltage Metal Enclosed Switchgear
Fencing	Chattanooga Cyclone Fence	WDX-340-D	Standord Property Protection Fence
		WDX-341	Property Protection Gates
Heating, ventilating, and air conditioning[b]	Air Conditioning Products Co.	Model 611	Air-Flo Ceiling Shutter
	American Blower Corp.	PRM 10517-1	Utility Blower 122DV
		PRM 10517-2	Utility Blower 122BY
	H. H. W. Bergmann Co.	772	Standard Back Pressure Damper
	G. C. Breidert Co.	48-11-S1H-1A	Type B Breidert Air-X-Hauster with Motor and Fan Assembly
	Buffalo Forge Co.	5W-20797	Standard Duty Gravity Type Automatic Shutters
		5W-23008 R-A	Heavy Duty – Design "A" NV Breezo Fan
	Crane Co.	A-7431 R-M	Screwed Brass Pop Safety Valve
	Joy Manufacturing Co.	X 740-76	21" Fan Assembly Model 29-1/4-21-1750

Table C-3 (continued)

Installation completed

Item	Manufacturer	Document No.	Title
Heating, ventilating, and air conditioning[b]	Kewaunee Mfg. Co.	2107-1,2	Open Front Hood Superstructure
	The Lunkenheumer Co.	D1883B	Iron Body Bronze Mounted O. S. and Y King-Clip Valves
	Spence Engineering Co.		Operating Instruction for Spence Type ED Pressure Regulator
		Form 304A 3-50	Trouble Shooting Instructions
		Form 303A 4-50	Parts Price List Type E Main Valve
		Form 303B 4-50	Parts Price List Type D Pilot
	The Trane Co.	B-4410/4268	34SC Self Contained Unit
		C-4410/4151	Filter and Frame Assembly for Internal Fresh Air Opening 34SC Unit
		B-4410/2920	Discharge Chamber Assembly and Installation Detail 33SC Unit
		C-4410/4091	Coil Assembly 7-1/2 × 29 1-Row for 33SC Unit
		D-1804/1921	Coil Arrangement Vertical Climate Changer Coil Supply – Left
		B-1804/1158	No. 2-12A Vertical Climate Changer No Drain Pan
		0-2823/8015	1-1/4″ Steel Wall-Fin Heater
		B-4600/671	Type H Unit Heater
	Westinghouse Electric Corp.	Section 91-400	Speedheater Vertical Unit Heaters Renewal Parts Data and Lubrication Maintenance Instructions
	Worthington Corp.	Model SCY-1040	Package Air Conditioners
	York Corp.	Instruction 11-0-4	Service Manual Yorkaire Conditioners Model 352
Leak detectors	Consolidated Engineering Corp.	Operation and Maintenance Manual	
Louver operator hydraulic unit	Hicks & Ingle Co.	D-SK-JW-1	Louver Operators Hydraulic Pumping Unit
	Magnetrol, Inc.	D-1150	Installation Dimensions Tandem Models A-150F & A-150F-EP
	Mansfield & Green		Type A Twin Seal Check Valve
	Rochester Manufacturing Co., Inc.	1748 Assembly	3″ Industrial Thermometer
	Cuno Engineering Corp.	Series-1B	Micro-Klean Filter
	Tuthill Pump Co.	186	Pump Dimensions
	Penberthy Injector Co.	Cat. No. 36	Direct Reading Liquid Level Gauge
Lube oil waste system	A. O. Smith Corp.	Bul. 130A	Barrel Filling Meter & Strainer

Table C-3 (continued)

Installation completed

Item	Manufacturer	Document No.	Title
Partitions	The Mills Co.	55-1517 Sheet 1	Partitions – 1-1/2″ Semi-Flush
		55-1517 Sheet 2	
	Henry Weis Mfg. Co., Inc.	6B 6041	Building 7503 – X-10 Area
Plumbing; sanitary and process sewers[b]	American District Steam Co.	Bulletin No. 35-75C Pages 1-6	Storage Water Heaters U-Tube Type
	American Radiator & Standard Sanitary Corp.	F-370 R	F370-61 18 × 15 Lavatory
		P-7700A	Service Sink
		R-5001	Double Faucet
		P-7782	S Trap
		HK-16090	3/8″ Gas Cock
	The Deming Co.	19766-ALT	Dimension Sheet Fig. 4608 Size Unit No. 4 Sump Pump
	Fulton Sylphon Div., Robertshaw-Fulton Controls Co.		Instructions for Installing Temperature Regulators
	Sarco Co.	Tag No. 2113	Installation Instructions for Sarco Water Blenders, Type MB
	Speakman Co.	S 2397	Emergency Type Shower Head
	Westinghouse Electric Corp.	Model WS5B	Electric Water Cooler
Process air duct	John F. Humphrey Co.	1	Air Line Duct
		2	Air Line Duct
		3	Air Line Duct
Stack	Chicago Bridge & Iron Co.	Contract 69763 Dwg (1)	10′ϕ × 71′-0″ High Steel Stack for Bldg. 7503 Alterations
		Contract 69763 Dwg (2)	Supports for 10′ϕ × 71′-0″ High Steel Stack
Steel, reinforcing	Wilson-Weesner-Wilkinson Co.	5-9-267	Plan Wall and Sections for Alterations of Bldg. 7503
		5-9-267-S	Control Tunnel for Alterations for Bldg. 7503
		5-9-268	Footings and Columns for Alterations – Bldg. 7503
		5-9-269	Walls and Sections
		5-9-274	Tank Wall, Control Tunnel and Blower House Foundation
		5-9-275	Grade Beam Walls and Sections for Alterations Bldg. 7503
		5-9-288	Spectrometer Tunnel for Alterations – Bldg. 7503
		5-10-295	Spectrometer Tunnel for Alterations – Bldg. 7503
		5-10-300	Slab, Wall and Sections for Alterations – Bldg. 7503
		5-10-304	Absorber Pit Detail for Alteration to Bldg. 7503
		5-10-315	Foundation Plan and Details

Table C-3 (continued)

Installation completed

Item	Manufacturer	Document No.	Title
Steel, reinforcing	Wilson-Weesner-Wilkinson Co.	5-10-348	Stack Elevations and Sections – 7503
		5-11-352	Slab Elevations and Sections for Bldg. 7503
		5-12-361	Elevations and Floor Slabs
		5-12-369	Blower House, Ramp – Steps, Elevation and Sections
		5-12-387	Plug Details
		6-1-28	Elevation for Alterations – 7503
		6B-6041	Toliet Partitions
		6-2-77	Venthouse and Retaining Walls
		6-2-84	New Cell Tank Wall
Steel, structural	Tucker Steel Corp.	Schedule B1	Field Bolt Schedule
		1 of 20	Columns for Cell Building
		2 of 20	Columns for Cell Building
		3 of 20	Columns for Cell Building
		4 of 20	Columns for Cell Building
		5 of 20	Trusses for Cell Building
		6 of 20	Trusses for Cell Building
		7 of 20	Bracing for Cell Building
		8 of 20	Crane Girders and Purlins for Cell Building
		9 of 20	Purlins and Frames for Cell Building
		10 of 20	Girts and Purlins for Cell Building
		11 of 20	Low Bay Columns – Beams Purlins and Bracing
		12 of 20	Low Bay – Purlins and Girts
		13 of 20	Low Bay – Door Frames and Girts
		14 of 20	Blower House – Beams and Columns
		15 of 20	(7503 Cell and Addition to Bldg. 7503)
		16 of 20	Louver Frames for Blower House
		17 of 20	Structural Steel for Switch House
		18 of 20	(7503 Cell and Addition to Bldg. 7503)
		19 of 20	Structural Steel at El. 851'-7" Bay 5–6
		20 of 20	Beams and Frames at Cell
		D-1 of 6	Guides and Supports for Air Duct
		D-2 of 6	Air Duct Details
		D-3 of 6	Air Duct Details
		D-4 of 6	Air Duct Details
		D-5 of 6	Air Duct Details
		D-6 of 6	Air Duct Details
		E1	(7503 Cell and Addition to Bldg. 7503)
		E2	(7503 Cell and Addition to Bldg. 7503)
		E3	Blower House Erection Plan

Table C-3 (continued)

Installation completed

Item	Manufacturer	Document No.	Title
Steel, structural	Tucker Steel Corp.	E4	Switch House Erection Plan
		E5	Alterations to Existing Building
		E6	Craneway Erection Plan
		E7	Alterations to Existing Building
		E8	Anchor Bolt Details
		E9	Erection Plan at Elev. 852′
		E10	Support for Spectrometer Tunnel Monorail
		E11	Spectrometer Tubes
		E12	Erection Plan for STI and Handrails
		E13	Handrails at Spectrometer Tunnel
		E14	Erection Plan – Stairs ST2, ST3 and Handrails
		E15	Erection Plan at 841′-0″
		E16	Track Layout and Anchor Bolt Plan
		E17	Layout and Anchor Bolt Plan for Track
		E18	Plan of Air Duct Supports and Guides
		E19	Air Duct Layout
		E20	Air Duct Layout
		E21	Penthouse Erection Plan
		M1	Anchor Bolts, Angles and Absorber Pit Steel
		M2	Miscellaneous Metal Items
		M3	Doors for Blower House
		M4	Ladder – Canopy and Pit Frames
		M5	Monorail Beams and Stairs
		M6	
		M7	Pipe Handrails
		M8	Handrails and Hatch Covers
		M9	Platforms and Ladder for Crane
		M10	Vent Frames and Angle Frames for Concrete
		M11	Metal Decks for Concrete Slabs
		M12	Metal Decks for Concrete Slabs
		M13	Plate and Angle Track Details
		M14	Plate and Angle Track Details
		M15	Vent House Floor Framing and Miscellaneous Items for Pent House
		M16	Miscellaneous Items
		M17	Details of Isolators, Motor and Damper Bases
		M18	Additional Material – Pkg. I
		T1	Spectrometer Tubes and Miscellaneous Metal Items

[a] See electrical system for wiring diagram of 30-ton crane.

[b] Filed under John F. Humphrey Co.

[c] See diesel fuel oil system for details of oil supply.

APPENDIX D. FACILITY DRAWINGS – INSTALLATION NOT STARTED

Table D-1. ART Facility – AE Drawings

Installation not started

Drawing No.	Revision	Title	Status
		Package I	
D-22842	0	Duct Access for Radiator Inspection	Issued; complete
D-23145	0	Revision of Concrete and Duct Details	Issued; complete
D-23157	1	Location of Anchor Bolts – El. 858'-1" Penthouse	Issued; complete
D-23884	3	Part Basement Plan at El. 840'-0"	Issued; complete
D-23885	3	Spectrometer Room – Sections & Details	Issued; complete
D-23886	1	Spectrometer Tunnel – Sections & Details	Issued; complete
D-23887	4	Access Stair Details	Issued; complete
D-23929	1	Additions to Adsorber Tank Baffle Plates & Plugs – Details	Issued; complete
D-24833	0	Air Duct Detail Revisions	Issued; complete
D-24835	0	Air Duct Supports and Guides	Issued; complete
D-24836	0	Revisions Penthouse Details	Issued; complete
D-25467	0	Plan & Details of Blower House Floor Slab & Equipment Pads	Issued; complete
D-25470	0	Plan and Detail of Fire Doors Between Switch House & Diesel Generator House	Issued; complete
D-25473	0	Details of Isolators, Motor and Damper Bases	Issued; complete
D-25810	0	Alterations to A/C & Vent. Equip. Plan & Details	Issued; complete
D-25811	0	Modifications to Tunnel Ventilation – Sht 1 of 2	Issued; complete
D-25812	0	Modifications to Tunnel Ventilation – Sht 2 of 2	Issued; complete
D-26087	0	Electrical Services – Vent. & Air Cond. Equip.	Issued; complete
D-26099	0	Blower House Conduit Plan	Issued; complete
D-26429	0	Guard Portal Tower	Issued; complete

Table D-1 (continued)

Drawing No.	Revision	Title	Status
		Package II	
D-23118	2	Air Conditioning Spectrometer Room	Issued; complete
D-23718	0	Location Plan	Issued; complete
D-23937	0	Diesel Generator Housing Floor Plan – Sect. & Elev.	Issued; complete
D-23938	1	Diesel Generator Housing Foundation & Anchor Bolt Plan & Details	Issued; complete
D-24623	1	Diesel Generator House Piping	Issued; complete
D-24624	2	Drawing Index	Issued; revision needed
D-25261	2	Spectrometer Room & Tunnel Lighting & Receptacle Plan	Issued; complete
D-25262	2	Diesel House Lighting & Conduit Plan	Issued; complete
D-25263	2	Switch House Control Plan	Issued; complete
D-25264	2	Control Centers No. 3 & 4	Issued; complete
D-25272	0	Arrg't. & Wiring Diagrams for Air Compressor & Caterpillar Unit	Issued; complete
D-25273	1	Building Layout – Ground Floor	Issued; complete
		Package A	
D-23132	1	Water & Air Piping to Auxiliary Equip. Room	Issued; complete
D-23133	0	Auxiliary Equipment Room – Plan	Issued; revision needed; information needed
D-23134	1	Auxiliary Equipment Room Piping – Sections	Issued; revision needed; information needed
D-23135	2	Control Tunnel Piping – Plan & Details	Issued; revision needed; information needed
D-23136	1	Control Tunnel Pipe Rack – Details	Issued; complete
D-23137	0	Control Tunnel West Wall – Instr. Trays – Details	Issued; complete
D-23138	2	Control Tunnel Piping & Instr. Tray Sections	Issued; revision needed; information needed
D-23139	1	Piping to Penthouse Plan & Sections	Issued; revision needed; information needed
D-23140	1	Control Tunnel East Wall – Instr. Trays – Details	Issued; complete
D-23141	1	Nitragen & Helium Supply Systems – Plan & Sections	Issued; complete

Table D-1 (continued)

Drawing No.	Revision	Title	Status
D-23142	1	Nitrogen & Helium Supply Systems – Sections & Detail	Issued; complete
D-23143	1	Gas Piping Pit Area Plan & Sections	Issued; revision needed; information needed
D-23144	0	Gas Piping Pit Area Sections & Details	Issued; revision needed; information needed
D-23146	0	Control Tunnel Bulkhead – Assembly & Details	Issued; complete
D-23147	0	Piping Schedule	Issued; revision needed; information needed
D-23148	1	Control Tunnel Piping Bend Details	Issued; revision needed; information needed
D-23149	1	Piping Details for Auxiliary Equipment Room & Control Tunnel Entrance	Issued; revision needed; information needed
D-24829	1	Lube Oil Piping to Special Equipment Room	Issued; revision needed; information needed
		Package IIIA	
D-24866	1	Primary Louver & Louver Oper. Mechanism Installation – Sheet 2	Issued; revision needed
D-26430	0	Process Heating Wiring Diagram Sheet No. 1	Issued; revision needed
D-26431	0	Process Heating Wiring Diagram Sheet No. 2	Issued; revision needed
D-26433	1	Process Heating Cable Troughs	Issued; revision needed
D-26435	1	Process Heating Control Center	Issued; complete
D-26436	0	D.C. System Power Panel & Lighting Controls	Issued; complete
D-26437	0	Partial Power Plan Basement	Issued; complete
D-26438	1	Process Heating Regulator Location Plan	Issued; complete
D-26439	0	Plan & Detail – Powerstat Rack	Issued; complete
D-26440	1	Power Plan & Section Compressor House	Issued; complete
D-26441	0	Process Heating Regulator Details	Issued; complete
D-26444	0	Process Heating & Regulator Details & Resistor Support	Issued; complete
D-26447	0	Conduit Support & Details Blower House	Issued; complete
D-26448	1	Conduit Support & Details Compressor House	Issued; complete
D-26449	0	Lighting Plan & Power Elev. Compressor House	Issued; complete
D-27184	0	Compressor House Locality Map	Issued; complete

Table D-1 (continued)

Drawing No.	Revision	Title	Status
D-27185	0	Compressor House Grading Plan & Sections	Issued; complete
D-28628	0	Lube Oil Waste Storage Tank	Issued; complete
D-28629	0	Lube Oil Waste System Misc. Details	Issued; complete
D-28631	0	Oil Fill Drums & Piping	Issued; revision needed; information needed
D-28632	0	500 Gal. Waste Oil Tank Installation & Piping	Issued; complete
D-28633	2	Plan of Waste Oil Piping & Service Piping	Issued; complete
D-28636	1	Louver Hydraulic System Valve Panel	Issued; complete
D-28637	1	Louver Hydraulic System Flange & Orifice Assembly & Details	Issued; complete
D-28638	1	Louver Hydraulic System Piping Sheet No. 1	Issued; revision needed; information needed
D-28639	0	Louver Hydraulic System Valve Panel Froming	Issued; complete
D-28640	1	Louver Hydraulic System Piping Sheet II	Issued; revision needed; information needed
D-28641	0	Drawing Index	Issued; revision needed
D-28649	2	Compressor House – Foundation & Anchor Bolt Plan & Details	Issued; complete
D-28650	0	Compressor House – Floor Plan Sect. & Elev.	Issued; complete
D-28651	1	Compressor House Mechanical Details	Issued; complete
D-29547	0	Control Rm. Wall & Switch House Door	Issued; complete
		Package III	
D-23130	0	Penthouse & Radiator Pit Field Check – Dimen. & Elev.	Issued; complete
D-24618	1	Cell Sleeve Location & Nomenclature	Issued; complete
D-24840			No drawing title assigned
D-24841	0	Penthouse Equipment & Location Plan Elev. 859'-1¾" Pump Hangers	Issued; complete
D-24842	0	Penthouse Temporary Pump Supports Sturctural Steel Plan & Sections	Issued; complete
D-24843		Penthouse Equipment Location Plan Elevation 851'-0" Pump & Door Operations	Preliminary prints

Table D-1 (continued)

Drawing No.	Revision	Title	Status
D-24844		Radiator Pit Equipment & Location Plan Elevation 847'-0" Section "A–A"	Preliminary prints
D-24845		Radiator Pit Bottom Lobyrinth & Bottom Door Operator Location Plan Elevations 835'-1" & 835'-3"	Preliminary prints
D-24846		Penthouse & Radiator Pit Equipment Location Section "B–B" Sheet No. 1	Preliminary prints
D-24847		Penthouse & Radiator Pit Equipment Location Section "C–C" Sheet No. 2	Preliminary prints
D-24848		Radiator Pit Equipment Location Sections "D–D" & "E–E" Sheet No. 3	Preliminary prints
D-24849	0	Pump Hanger Support – Plan Structural Steel Framing	Issued; complete
D-24850	0	Structural Steel Details Sheet No. 1	Issued; complete
D-24851	0	Structural Steel Details Sheet No. 2	Issued; complete
D-24852	0	Heat Dump Pump Support Channel Lug Details	Issued; complete
E-24853		Penthouse Main & Auxiliary Pumps Service Piping Plan & Sect.	Preliminary prints; information needed
D-24854		Penthouse Main & Auxiliary Pumps Service Piping Sect.	Preliminary prints; information needed
D-24855		Penthouse Main & Auxiliary Pumps Service Piping Sections & Details	Preliminary prints; information needed
D-24856	0	Penthouse Air Cooling System for Pump Motors Duct Plan & Sections	Issued; complete
D-24857		Radiator Pit Thermocouples Downstream Air From Main Radiators Assembly & Details	To check
D-24858		Radiator Pit Operator Structural Steel Supports Sheet No. 1	To check
D-24859		Radiator Pit Operator Structural Steel Supports Sheet No. 2	To check
D-24860		Main & Auxiliary Pump Insulation Sections	Drawing not started
D-24861	0	Penthouse Temporory Pump Supports Structural Steel Anchor Bolt Location & Details	Issued; complete
D-24862	0	Penthouse Temporary Pump Supports Structural Steel Details Sheet No. 1	Issued; complete
D-24863	0	Penthouse Temporary Pump Structural Steel Details & Sections Sheet No. 2	Issued; complete

Table D-1 (continued)

Drawing No.	Revision	Title	Status
D-24864		Thermocouple Downstream Air From Auxiliary Radiator	Drawing not started
D-24865	0	Primary Louver & Louver Operating Mechanism Installation Sheet 1	Issued; complete
D-24867	0	Primary Louver Operating Mechanism Covers, Supports, Details & Assembly	Issued; complete
D-24868	0	Primary Louver Operating Mechanism Bldg Alterations	Issued; complete
D-24869	0	Louver Hydraulic System Power Cylinder & Clamp Piping & Details	Issued; revised; revision for approval
D-24881	0	Charcoal Adsorber Piping Plan	Issued; revision needed; information needed
D-24882	0	Charcoal Adsorber Piping Sections	Issued; revision needed; information needed
D-24883	0	Charcoal Adsorber Piping Section "B–B" & Details	Issued; revision needed; information needed
D-24884	0	Charcoal Adsorber Piping Section "A–A" & Details	Issued; revision needed; information needed
D-24885	0	Charcoal Adsorber Piping Details – Sheet No. 1	Issued; revision needed; information needed
D-24886	0	Charcoal Adsorber Piping Details – Sheet No. 2	Issued; revision needed; information needed
D-24898	0	Clamp for Louver Operator Assembly & Details	Issued; complete
D-24899	0	Clamp for Louver Operator Details	Issued; complete
E-24900	3	Supports for Heat Dump Pump Motor	Issued; revised; revision for approval
E-24901	1	Double Spring Chamber Assembly & Details for Heat Dump Pump Motor Support	Issued; revised; revision for approval
D-24902	1	Spring Chamber Adjustment Block Assembly & Details for Supports for Heat Dump Pump Motor	Issued; revised; revision for approval
D-24903	2	Miscellaneous Details – Sheet No. 1 for Supports for Heat Dump Pump Motor	Issued; revised; revision for approval
D-24904	1	Miscellaneous Details – Sheet No. 2 for Supports for Heat Dump Pump Motor	Issued; revised; revision for approval
D-24905	2	Miscellaneous Details – Sheet No. 3 for Supports for Heat Dump Pump Motor	Issued; revised; revision for approval
D-24906	2	Miscellaneous Details – Sheet No. 4 for Supports for Heat Dump Pump Motor	Issued; revised; revision for approval

Table D-1 (continued)

Drawing No.	Revision	Title	Status
D-24907	0	Triple Spring Chamber Assembly & Details for Heat Dump Pump Motor Assembly	Issued; complete
E-24908	0	Auxiliary Pump Support Assembly	Issued; complete
D-24909	0	Auxiliary Pump Support Miscellaneous Details – Sheet No. 1	Issued; complete
D-24910		Operators A, B, C, D, E, F, & G for Heat Barrier Doors Assembly	To check
D-24911		Operator for Heat Barrier Doors Detail Sheet No. 1 of 7	To check
D-24912		Operator for Heat Barrier Doors Detail Sheet No. 2 of 7	To check
D-24913		Operator for Heat Barrier Doors Detail Sheet No. 3 of 7	To check
D-24914		Operator for Heat Barrier Doors Detail Sheet No. 4 of 7	To check
D-24915	1	Main Heat Barrier Doors – Upstream Assembly & Horizontal Sections	Revision for approval*
D-24916	1	Main Heat Barrier Doors – Downstream Horizontal Sections & Details	Revision for approval*
D-24917	1	Main Heat Barrier Doors – Downstream Assembly & Details	Revision for approval*
D-24918			No drawing title assigned
D-24919	1	Auxiliary Heat Barrier Doors Upstream Assembly & Detail Sections	Revision for approval*
D-24920	1	Auxiliary Heat Barrier Doors Upstream Horizontal Sections	Revision for approval*
D-24921	1	Auxiliary Heat Barrier Doors Downstream Assembly & Details	Revision for approval*
D-24922	1	Auxiliary Heat Barrier Doors Downstream Horizontal Sections	Revision for approval*
D-24923	1	Main & Auxiliary Heat Barrier Doors Upstream & Downstream Miscellaneous Sections & Details	Revision for approval*
D-24924	1	Auxiliary Heat Barrier Doors Upstream & Downstream Miscellaneous Sections & Details	Revision for approval*
D-24925	1	Auxiliary Heat Barrier Doors Upstream 18 Ga. Door Cover Plates – Details	Revision for approval*

*Revision back 4–12 depending on notch calc.

Table D-1 (continued)

Drawing No.	Revision	Title	Status
D-24926	0	Radiator Pit Duct Floor Supports at Elevation 835'-8½" Plan & Miscelloneous Sections	Issued; revision needed
D-24927	0	Radiator Pit Duct Floor Supports Elev. 835'-8½" Structural Steel Details Sheet No. 1	Issued; revision needed
D-24928	0	Radiator Pit Duct Floor Supports Elev. 835'-8½" Detail Sheet No. 2	Issued; revision needed
D-24929	0	Radiator Pit Duct Floor Supports Elev. 835'-8½" Detail Sheet No. 3	Issued; revision needed
D-24930		Radiator Pit Duct Floor & Floor Skin Plan Elevations 835'-8¾" & 835'-11 3/16"	Drawing not started
D-24931		Radiator Pit Duct Floor & Duct Floor Skins Miscellaneous Details & Material Listing	Preliminary prints
D-24932		Radiator Pit Miscellaneous Assembly Sections & Details Duct Floor Elev. 835'-8¾"	Preliminary prints
D-24933		Radiator Pit Duct Floor Plates No. 1 Thru No. 8 Details Elev. 835'-8"	Drawing not started
D-24934		Radiator Pit Partition Installation No. 1 Thru No. 4 Inclusive Plan & Misc. Details	To check
D-24935		Radiator Pit Partition No. 1 Assembly & Details	To check
D-24936		Radiator Pit Partition No. 2 Assembly & Details	To check
D-24937		Radiator Pit Partition No. 3 Assembly & Details	To check
D-24938		Radiator Pit Portition No. 4 Assembly & Details	To check
D-24939		Duct Roof Support Structural Steel Plan	Preliminary prints
D-24940		Duct Roof Support Structural Details Sheet No. 1	To check
D-24941		Duct Roof Supports Elevation 848'-1¼" Structurol Steel Details Sheet No. 2	To check
D-24942		Duct Roof Support Structural Steel Details Sheet No. 3	Preliminary prints
D-24943		Radiator Pit Duct Roof Plates & Skin Plan Elevation 848'-1¾"	Preliminary prints
D-24944		Duct Roof Plates Elevation 848'-7¾" Detail Sheet	Drawing not started
D-24945	0	Radiator Pit Main Radiator Wind Load Tension Linkage Plan & Details	Issued; revision needed

Table D-1 (continued)

Drawing No.	Revision	Title	Status
D-24946	0	Auxiliary Radiator Wind Load Tension Linkage Plan & Details	Issued; revision needed
D-24947		Main, Auxiliary, & Special Heat Barrier Door Operators, Compressed Air System Flow Sheet	Preliminary prints
D-24948		Vertical Tension Bar Assembly & Details	To check
D-24949		Radiator Pit North Wall of Duct Structure & Insulation Details	Drawing not started
D-24950		North Wall of Duct Structure	Drawing not started
D-24951		Radiator Pit South Wall of Duct Structure & Insulation Details	Drawing not started
D-24952		South Wall of Duct Structure Details	Drawing not started
D-24953		Radiator Pit Auxiliary Ceiling Elevation 844'-8" Plan & Details	Preliminary prints
D-24954		Radiator Pit Auxiliary Ceiling Elev. 844'-8" Detoils	Preliminary prints
D-24955		Radiator Pit Auxiliary Horizontal Separator Elevation 842'-0" Details	Preliminary prints
D-24956		Radiator Pit Auxiliary Horizontal Separator Elevation 842'-0" Details	Preliminary prints
D-24957		Radiator Pit Auxiliary Floor Elevation 839'-4" Plon & Details	Preliminary prints
D-24958		Radiator Pit Auxiliary Floor Elevation 839'-4" Details Sheet No. 1	To check
D-24959		Radiator Pit Auxiliary Floor Elevation 839'-4" Details Sheet No. 2	Preliminary prints
D-24960		Special Equipment Room Bulkhead Details	Preliminary prints
D-24961	0	Piping & Equipment Support Steel for Special Equipment Room	Issued; revision needed; information needed
D-24962	0	Special Heat Dump Annulus Duct – Sheet I	Issued; revision needed
D-24963	1	Special Heat Dump Annulus Duct – Sheet II	Issued; revision needed
D-24964		Special Heat Dump Radiator Installation	Preliminary prints
D-24965		Special Heat Dump Radiator Installation Details	Preliminary prints
D-24966			No drawing title assigned
D-24967		Special Heat Dump Insulated Duct – Heat Barrier Door Seals	Preliminary prints
D-24968		Special Heat Dump Insulated Duct – Interior Plan I	Preliminary prints
D-24969		Special Heat Dump Insulated Duct – Interior Plan II	Preliminary prints

Table D-1 (continued)

Drawing No.	Revision	Title	Status
D-24970		Special Heat Dump Insulated Duct – Section "A–A"	Preliminary prints
D-24971	0	Special Heat Dump Insulated Duct Heat Barrier Door Closure Plates	Issued; revision needed
D-24972	0	Special Heat Dump Insulated Duct Radiator Access Panel	Issued; revision needed
D-24973	0	Special Heat Dump Insulated Duct Turning Blade	Issued; revision needed
D-24974		Special Heat Dump Louver Installation	Preliminary prints
D-24975			No drawing title assigned
D-24976		Special Heat Dump – Heat Barrier Door Operator Installation	Preliminary prints
D-24977		Special Heat Dump – Main Blower Support Steel	Preliminary prints
D-24978		Special Heat Dump – Annulus Blower Support Steel	Preliminary prints
D-24979			No drawing title assigned
D-24980			No drawing title assigned
D-24981		Special Heat Dump Piping – Detail Sheet I	Void
D-24982		Special Heat Dump Piping – Detail Sheet II	Void
D-24983		Special Heat Dump Piping – Detail Sheet III	Void
D-24984	0	Special Heat Dump Pump Motor Cooling Duct	Issued; revision needed
D-24985	0	Special Heat Dump Insulated Duct Plan	Issued; revision needed
D-24986	0	Special Heat Dump Insulated Duct Inlet End Elev.	Issued; revision needed
D-24987	0	Special Heat Dump Insulated Duct Outlet End Elev.	Issued; revision needed
D-24988	1	Special Heat Dump Insulated Duct Northside Elevation	Issued; revision needed
D-24989			No drawing title assigned
D-24990			No drawing title assigned
D-24991			No drawing title assigned
D-24992			No drawing title assigned
D-24993			No drawing title assigned
D-24994			No drawing title assigned
D-24995			No drawing title assigned

Table D-1 (continued)

Drawing No.	Revision	Title	Status
D-24996			No drawing title assigned
D-24997	0	Radiator Pit Tank KT-4 Support	Issued; revision needed; information needed
D-24998		Special Heat Dump Insulated Duct Heat Barrier Door No. 1	Preliminary prints
D-24999		Special Heat Dump Insulated Duct Heat Barrier Door No. 2	Preliminary prints
D-25472	0	Details to Fan Unit Connection to Duct	Issued; complete
D-26132	1	Special Equip. Room Piping Plan at Elev. 834'-0"	Issued; revision needed
D-26133	1	Special Equipment Room Section "B–B"	Issued; revision needed
E-26140		Inconel Piping in Radiator Pit Plan I	Preliminary prints
D-26142		Special Equipment Room Piping Plan at Elev. 847'-0"	Issued; revision needed
D-26143	1	Special Equipment Room Section "A–A"	Issued; revision needed
D-26145	0	Inconel Piping Insulation Details	Issued; complete
D-26146	1	Special Heot Dump Piping in Duct Annulus	Issued; revision needed
D-26149		Auxiliary Equipment Rack in Radiator Pit	Void
D-27527	1	Special Heat Dump Pump, Motor & Radiator Assembly	Issued; revision needed; information needed
D-27528	0	Special Equipment Room Diaphragm	Issued; complete
D-27530	0	Special Heat Dump Pump Installation	Issued; revision needed
D-28600		Inconel Piping Details – Line No. KLA-1h	Preliminary prints
D-28601	0	Inconel Piping Details – Line No. KLA-1c	Issued; revision needed
D-28602		Inconel Piping Details – Line No. KLA-2h	Preliminary prints
D-28603	0	Inconel Piping Details – Line No. KLA-2c	Issued; revision needed
D-28604		Inconel Piping Details – Line No. KLA-3h	Preliminary prints
D-28605	0	Inconel Piping Details – Line No. KLA-3c	Issued; revision needed
D-28606		Inconel Piping Details – Line No. KLB-1h	Preliminary prints
D-28607	0	Inconel Piping Details – Line No. KLB-1c	Issued; revision needed
D-28608		Inconel Piping Details – Line No. KLB-2h	Preliminary prints
D-28609	0	Inconel Piping Details – Line No. KLB-2c	Issued; revision needed
D-28610		Inconel Piping Details – Line No. KLB-3h	Preliminary prints

Table D-1 (continued)

Drawing No.	Revision	Title	Status
D-28611	0	Inconel Piping Details – Line No. KLB-3c	Issued; revision needed
D-28612		Line Number XL-1	Preliminary prints
D-28613		Line Number XL-2	Preliminary prints
D-28614		Main Radiator Assembly	Preliminary prints
D-28615		Auxiliary Radiator KRA-3 Assembly	Preliminary prints
D-28616		Auxiliary Radiator KRB-3 Assembly	Preliminary prints
D-28617	0	Inconel Piping in Penthouse	Issued; revision needed
D-28618	0	Coolant Transfer Dolly Plans & Details	Issued; complete
D-28619		Pipe Installation Schedule	Drawing not started
D-28642			No drawing title assigned
D-28643			No drawing title assigned
D-28644			No drawing title assigned
D-28645			No drawing title assigned
D-28646			No drawing title assigned
D-28647			No drawing title assigned
D-28648			No drawing title assigned
D-28652		Cell Bulkheads No. 1 Piping Connection & Details	Information needed
D-28653		Cell Bulkheads No. 3 Piping Connection & Details	Information needed
D-28656		Radiator Pit Main Radiator Wind Seal Assembly Elevation & Section	To check
D-28657		Radiator Pit Main Radiator Wind Details Detail Sheet No. 1	To check
D-28658		Duct Roof Wind Seals	Drawing not started
D-28659		Radiator Pit Drain Pans Main Radiator Pit Plan	Preliminary prints
D-28660		Radiator Pit Drain Pans Details Pans No. 1 Thru No. 8 Elevation 836′-1 13/16″	Drawing not started
D-28661		Duct Roof Plates Elevation 848′-1 3/4″ Detail Sheet No. 2	Drawing not started
D-28662		Duct Roof Plates Elevation 848′-1 3/4″ Detail Sheet No. 3	Drawing not started

Table D-1 (continued)

Drawing No.	Revision	Title	Status
D-28663		Duct Roof Skins Elevation 848'-1¾" Detail Sheet No. 1	Drawing not started
D-28664		Duct Roof Skins Elevation 848'-1¾" Detail Sheet No. 2	Drawing not started
D-28665		Auxiliary Radiator Wind Seal Assembly Installation	Preliminary prints
D-28666		Auxiliary Radiator Wind Seal Detail Sheet No. 1	To check
D-28667		Penthouse Wind Seal & Sections	Issued for approval
D-28668		Radiator Pit Auxiliary Radiator Wind Seal Detail Sheet No. 2	To check
D-28669		Radiator Pit Duct Roof Plates & Duct Roof Skins Miscellaneous Sections & Details	Preliminary prints
D-28670	0	Penthouse Plan of Top Labyrinth Assembly	Issued; complete
D-28671	0	Penthouse Top Labyrinth – Sections	Issued; complete
D-28672		Radiator Pit Bottom Labyrinth Sections & Details Sheet No. 1	To check
D-28673		Radiator Pit Bottom Labyrinth Sections & Details Sheet No. 2	To check
D-28674		Operator for Heat Barrier Doors Detail Sheet 5 of 7	Preliminary prints
D-29300		Operator Head A_1, B_1, C_1, & D_1, for Heat Barrier Doors Subassembly	Preliminary prints
D-29301		Operator Universal A_2, B_2, C_2, & D_2 for Heat Barrier Doors Subassemby	Preliminary prints
D-29302		Operator Frame for Heat Barrier Doors Subassembly	Preliminary prints
D-29303		Operator for Heat Barrier Doors Detail Sheet 6 of 7	Preliminary prints
D-29304		Operator for Heat Barrier Doors Detail Sheet 7 of 7	Preliminary prints
D-29305		Radiator Pit Partition Details Sheet No. 1	To check
D-29306		Radiator Pit Partition Details Sheet No. 2	To check
D-29307		Radiator Pit Partition Details Sheet No. 3	To check
D-29308		Radiator Pit Partition Details Sheet No. 4	To check
D-29309		Radiator Pit Partition Details Sheet No. 5	To check
D-29310		Radiator Pit Partition Details Sheet No. 6	To check
D-29311		Radiator Pit Partitions Details Sheet No. 7	To check
D-29312		Radiator Pit Partition Details Sheet No. 8	To check
D-29313		Top Door Operators & Mounting Sections "L–L" & "M–M"	To check

Table D-1 (continued)

Drawing No.	Revision	Title	Status
D-29314		Radiator Pit Bottom Door Operator Lacation	To check
D-29315		Radiator Pit Duct Floor Plates No. 9 Thru No. 16 Elevation 835'-8 3/4"	Preliminary prints
D-29316		Radiator Pit Duct Floor Plates Elevation 835'-8 3/4" Plates No. 17 Thru No. 24	Preliminary prints
D-29317		Radiator Pit Duct Floor Skin Elevation 835'-11 13/16" Details of Skins No. 1 Thru No. 21	Preliminary prints
D-29318		Radiator Pit Duct Floor Skin Elevation 835'-11 13/16" Details of Skins No. 22 Thru No. 36	Preliminary prints
D-29319		Auxiliary Floor & Ceiling Plan	Drawing not started
D-29320		Auxiliary Floor & Ceiling Detail	Drawing not started
D-29321		Auxiliary Floor & Ceiling Detail	Drawing not started
D-29322		Auxiliary Floor & Ceiling Detail	Drawing not started
D-29323		Duct Roof Supports Elevation 848'-1 3/4" Structural Steel Details Sheet No. 4	Drawing not started
D-29324		Radiator Pit Sequence of Installation Auxiliary Radiator Pit	Preliminary prints
D-29327	0	Main Radiators Modifications for Wind Seals	Issued; complete
D-29450		Inconel Piping in Radiator Pit Coolant System – Valve Racks	Drawing not started
D-29451		Coolant Valve Hook-Up for Units A-2, A-3, & B-1 Radiator Pit	Drawing not started
D-29452		Coolant Valve Hook-Up for Units A-1, A-4, B-2, B-3, & B-4 Radiator Pit	Drawing not started
E-29453		Inconel Piping in Radiator Pit – Plan II	Drawing not started
E-29454		Inconel Piping in Radiator Pit – Plan III	Drawing not started
D-29455		Inconel Piping in Radiator Pit – Section "A–A"	Drawing not started
D-29456		Inconel Piping in Radiator Pit – Section "B–B"	Drawing not started
D-29457		Inconel Piping in Radiator Pit – Section "C–C"	Drawing not started
D-29458		Inconel Piping in Radiator Pit – Section "D–D"	Drawing not started
D-29459		Inconel Piping in Radiator Pit – Section "E–E"	Drawing not started
D-29460		Inconel Piping in Radiator Pit – Section "F–F"	Drawing not started
D-29461		Inconel Piping in Radiator Pit – Support Steel	Preliminary prints

Table D-1 (continued)

Drawing No.	Revision	Title	Status
D-29462		Inconel Piping in Radiator Pit – Hanger	Preliminary prints
D-29463		Inconel Piping in Radiator Pit Section "G–G" & Valve Support Bracket	Drawing not started
D-29464		Radiator Pit Drain Pan Sump Tank	Preliminary prints
30452			No drawing title assigned
30453			No drawing title assigned
30454			No drawing title assigned
30455			No drawing title assigned
30456			No drawing title assigned
30457			No drawing title assigned
30458			No drawing title assigned
30459			No drawing title assigned
30460			No drawing title assigned
30461			No drawing title assigned
30462			No drawing title assigned
30463			No drawing title assigned
A-30464		Annulus Back-Flow Damper	Issued for approval
D-30465		Main Annulus Back-Flow Dampers Plan & Details	Issued for approval
D-30466		Regulator Pit Drainage System	Issued for approval

Table D-2. ART Facility – Manufacturer's Drawings

Installation not started – equipment at Building 7503

Item	Manufacturer	Document No.	Title
Moin blower	Joy Manufacturing Co.	91095	Neoprene Strip
		91189	Sole Plate
		400019	Sole Plate
		400032	Shim – Motor
		400033	Shim – Fan
		A-71979	Anchor Bolts
		A-90789	Special Back Flow Damper
		A-400000	Base
		A-400002	Floating Tubular Shaft
		A-400003	Adapter – Round to Square
		A-400008	Transition Adapter
		A-400009	Transition Adapter
		A-400010	Transition Adapter
		A-400020	Intoke Section
		A-400031	Base Assembly
		FF-5004	Installation Layout, Fan Model AR600-360 D 1225
		FF-5005	Plan View of Fan Installation, Joy Axivane Mod AR600-360 D 1225
		S-931	Rotor Assembly
		SK-30334	Separator for Fans
		U-706-29	Joy Axivane Fan Model IR292-140D628
		X709-29	Axivane Fan
		X806-19	Shaft & Rotor Assembly
Main annulus blower	Joy Manufacturing Co.	X740-76	21″ Fan Assembly Model $29\frac{1}{4}$-21-1750
		X740-75	21″ Fan Assembly Model $29\frac{1}{4}$-21-1750
			No. 0 to No. 16 Blade Settings
Special main blower	Joy Manufacturing Co.	X772-94	Axivane Fan – Model $25\frac{1}{4}$-$17\frac{1}{2}$-3450 – Two Stage – 40 HP
		FF-3479	Installation Layout Fan Model $25\frac{1}{4}$-$17\frac{1}{2}$-3450
		FF-3518	Expansion Joint for $25\frac{1}{4}$ Dia. Fan
			Pressure, HP–Flow Curves

Table D-2 (continued)

Installation not started – equipment at Building 7503

Item	Manufacturer	Document No.	Title
Special annulus blower	Joy Manufacturing Co.	A93378	Blow Back Damper
		FF-3476	Installation Layout for Fan Model 18-14-3450
		FF-3517	Expansion Joint for 18″ Dia. Fan
		X801-203	14″ Fan Assembly Model 18-14-3450
			Pressure, HP–Flow Curves
Lube oil supply pump	Imo–De Laval Products Div., De Laval Steam Turbine Co.	Bul. L313A-B	Series A313A Pump
Lube oil waste storage	Richmond Engineering Co.	B-57-113	48″ O.D. × 72″ O.A. Horizontal U.G. Waste Oil Storage Tank

Table D-3. ART Facility – Manufacturer's Drawings

Installation not started – equipment not at Building 7503

Item	Manufacturer	Document No.	Title
Cell	Badger Fire Extinguisher Co.	BC 8940	Expansion Joint
Electrical – 30-hp wound rotor motor	Allen-Bradley Co.	Y-38654	Connection Diagram
		Y-12836-D	Dimension Diagram
	The Louis Allis Co.	ED SK 12294	General Dimensions Wound Rotor Motor
Inconel tanks	Process Engineering, Inc.	PB-5717	Furnace Circuit Drain Tank
		PB-5190	Standard Tank
		PB-5192	Furnace Circuit Drain Tank
		PB-5193	Detail – Bosses
Lube oil package units	Bowser, Inc.	E-17650 Series	Type K Lube Oil Package
		E-17651 Series	Type R Lube Oil Package

Table D-3 (continued)

Installation not started – equipment not at Building 7503

Item	Manufacturer	Document No.	Title
Primary and special louvers	American Foundry & Furnace Co.	SF-7831-A	Special Duct Dampers, Main Channel
		SF-7838-A	Primary Duct Dampers, Main, By-Pass, and Aux. Channels
		SF-7842-A	Special Duct Dampers, Main, By-Pass Channels
		SF-8206-D (Sheets 1–85)	Special Duct Dampers
		SF-8255-D (Sheets 1–156)	Primary Duct Dampers
		SF-8268-D (Sheets 1–107)	Primary Duct Dampers
			Summary of Test Calculations
	Joy Manufacturing Co.	SK-61111	Basic Floor Plan – Test Lab – Damper Hot Test (Primary & Special)
Main radiatars	York Corp.	71 Series	Main Radiator
Special radiator	The Griscom-Russell Co.	EE-190	Special "RU" K-Fin
		E-3679	Special "RU" K-Fin
			Stress Calculations
Valves	Black, Sivalls & Bryson, Inc.	B-70-CCC-121-10	Outlet Connection
		D-70-CCC-001-13	Hot Fluid Value – Type 1700
		B-70-CCC-100-15	End Connection
		D-70-CCC-001-16	Hot Fluid Valve, Type 1700
	Hoke, Inc.	1402	Bellows Valve, High Temp.
		1404	Bellows Valve, High Temp.

APPENDIX E. FACILITY DOCUMENTS

Table E-1. ART Facility – Construction Design Memos

Number	Title
7503-1	Documents Required by ORNL for Bldg. 7503, Package I Design and Construction
ART-2	ART Addition to ARE Building 7503
ART-3	Alterations to 7503 Building to Accommodate ART Facility Extension
ART-4	Crane Service for Building 7503
7503-5	7503 Cell
7503-6	Blower Shed
7503-7	Cell Drainage
7503-8	Vent Systems
7503-9	Electrical Power System for 7503 Building
7503-10	7503 Stack
7503-11	Control and Instrument Tunnel
7503-12	Vent House
7503-13	Main Heat Dump Air Duct and Radiator Pit
7503-14	Documents Required by ARED for 7503 Test Facility, Package II Design and Construction
7503-15	Main and Auxiliary NaK System
7503-16	Motor-Driven Generator Station for 7503 Building
7503-17	Nitrogen System for Building 7503
7503-18	Helium System for Building 7503
7503-19	Vent System Piping and Charcoal Absorber Piping
7503-20	Hydraulic Drive System 6′ Outside of Cell
7503-21	Cell Cooling Water Circuits External to Cell
7503-22	Electrical Distribution and Auxiliary Equipment for 7503 Building
7503-23	Circulating Cold Traps
7503-24	Auxiliary Piping to 7503 Cell
7503-25	Spectrometer Room and Tunnel, Electrical
7503-26	Dry Air System
7503-27	Process Lube Oil Systems
7503-28	Spectrometer Room and Tunnel Heating and Air Conditioning
7503-29	Drain Tank Cooling System
7503-30	Heat Barrier Doors
7503-31	Air Control Requirements for Building 7503
7503-32	Heat Barrier Doors for Special Equipment Room Duct
7503-33	Fire Protection in Building 7503
7503-34	Spectrometer Tube Spool Pieces for Special Equipment Room
7503-35	Electrical Distribution, and Process and Auxiliary Equipment – Package III

Table E-1 (continued)

Number	Title
7503-36	Main Annulus Blowers Blowback Louvers and Actuators
7503-37	Cooling Water System for Cell Control Instruments
7503-38	Hydraulic System for Heat Dump Louvers
7503-39	Smoke Generator
7503-40	Drainage for Regulator Pit
7503-41	Auxiliary Control Room Wall
7503-42	Door for Switchhouse
7503-43	Main Control Room, Auxiliary Control Room, and Information Room Lighting

Table E-2. ART Facility – Records Disposition

I. To ORNL Engineering Department

- A. K-25 original tracings – as built
- B. 7503 facility AF sketch tracings
- C. Contract specifications (1 set)

II. To ORNL Mechanical Department

- A. AE drawings for completed construction
- B. Manufacturer's drawings for installed equipment
- C. Manufacturer's reproducible drawings for installed equipment
- D. Equipment specifications and correspondence for installed equipment

III. To Laboratory Records

- A. Contract documents
  1. Contracts and specifications
  2. Original contract drawings
  3. Deviation requests and associated drawings
  4. Correspondence – AEC, Chicago Bridge & Iron Co., and contractors
  5. Minutes of meetings with contractors
  6. Test reports
  7. Progress reports and pay estimates
- B. Drawing record books

IV. To ARED Records

- A. Construction design memos
- B. AF sketches (selected copies)
- C. Process and process auxiliary design data
- D. Equipment drawings and specifications tabulation
- E. ARE dismantling information
- F. Cost and budget information
- G. Schedules
- H. Procurement status tabulation
- I. Record of items removed from Building 7503
- J. Photographs
- K. Specifications, drawings, and correspondence for uninstalled material
- L. Administrative information

V. Destroy

- A. Drawing transmittals
- B. Superseded drawings
- C. AE drawing sepias
- D. Design meeting minutes – with ORNL Engineering and Mechanical Division
- E. Operations Manual Committee information
- F. Reproducibles for correspondence, specifications, and Construction Design Memos

Table E-3. ART Facility – AF Drawing List

Drawing No.	Title
B-AF-1	Reactor Cell – Layout Plan at Elevation 846'-0"
B-AF-2	Reactor Cell Layout Section SK-2
C-AF-3	Pit Plug Shielding Scheme-I
A-AF-4	7503 Cell Layout Plan at Elevation
A-AF-5	7503 Cell Layout Plan at Elevation 846'-0"
A-AF-6	7503 Cell Layout Plan at Elevation 829'-0"
A-AF-7	7503 Cell Layout Section SK-7
E-AF-8	7503 Cell Layout Plan at Elevation 866'-0"
A-AF-9	7503 Cell Drainage
A-AF-10 Rev 1	Blower Shed Plan View
A-AF-11	Blower Shed Elevation
E-AF-12	7503 Cell Layout Plan at Elevation 829'-0"
E-AF-13	Possible Control & Instrument Tunnel Layout
E-AF-14	Possible Junction Panel Layout
A-AF-15	Adsorber Tank Location
A-AF-16	Adsorber Tank
A-AF-17	Power Distribution Building 7503
A-AF-18	250 Volt DC Power System
A-AF-19	Electro-Heating Units (PR-141445)
A-AF-20	Vent Stack Location
A-AF-21	Vent Stack Profile
B-AF-22	Design of Stack Turning Vanes
A-AF-23	Junction Panel – Longitudinal Section
D-AF-24	Air Duct Outline
C-AF-25	Section AA of Drawing D-AF-24
A-AF-26	Vent House and Trench
D-AF-27	Layout of Equipment Support and Lower Floor Cell
E-AF-28	7503 Cell Plan and Sections
D-AF-29	Radiator Pit and Tanks
E-AF-30 Rev 1	7503 Cell Plan & Sections (Unclassified) (Added elec equipment)
A-AF-31	Trench Within Vent House
AFA-32	Layout Bldg 7503 – Basement
AFA-33	Layout Bldg 7503 – 1st Floor
B-AF-34	Radiator Header Tube & Manifold Layout
B-AF-35	Piping Details

Table E-3 (continued)

Drawing No.	Title
S-AF-36	Piping Layout
C-AF-39	Ozalid "Streamliner" Installation Details
D-AF-40	Helium & Nitrogen Systems Flow Diagrams
S-AF-41	Charcoal Adsorber for Off-Gas System
B-AF-43	Cell Cooling Water Systems
A-AF-44	Interference Area 14'-4½" from Vertical Axis of Cell
A-AF-45	Main Power System Schematic, Bldg 7503
B-AF-46	Auxiliary Power Distribution Schematic, Bldg 7503
A-AF-48	Schematic of Typical Cold Trap Piping
A-AF-49	7503 Cell Sleeve Location
A-AF-50	Adsorber Tank Sleeve Locations
A-AF-51	Location for Louver Actuators
A-AF-52	Temporary Bridge Across Steam Line
B-AF-53	Junction Panel Layout
A-AF-54	Vent House Layout
A-AF-55	Steam Pipe Support
A-AF-56	Viscosity vs Temp Ucon LB-300-X
A-AF-57	Vent House Piping
A-AF-58	Lazy Rod for Vent House Manual Valves
A-AF-59	Acoustic Box for Worthington Compressor Bldg 7503
A-AF-60	Case I First Floor Plan
A-AF-61	Case I Basement Floor Plan
A-AF-62	Case II First Floor Plan
A-AF-63	Case II Basement Floor Plan
A-AF-64	Case III First Floor Plan
A-AF-65	Case III Basement Floor Plan
A-AF-66	10-Ton Crane Coverage
A-AF-67	Proposed Cell Sleeve Installation
A-AF-68	Proposed Cell Sleeve Installation
A-AF-69	Nitrogen System Schematic
A-AF-70	Edge Preparation 7503 Cell Water Tank
A-AF-71	7503 Cell Evacuation Line
A-AF-72	7503 Cell Clearance Stage
B-AF-73	Max. North Position of 30-Ton Crane Hook
A-AF-74	Sleeve Location – Stack Elevation 851'-3"
A-AF-75	Method for Loading Tension Straps on Adsorber Tank

Table E-3 (continued)

Drawing No.	Title
A-AF-76	Calibration of Blackhawk Unit for Stressing Tension Straps
A-AF-78	Alt. Method for Tensile Loading Straps for Adsorber Tank
A-AF-79	Control Tunnel to Radiator Pit Opening
D-AF-81	Bldg 7503 Alterations Foundation Plans Elev. 817'-0" to 832'-0"
A-AF-82	Second Method for Tensile Loading Adsorber Tank Straps
B-AF-83	Project 7503 – Control & Information Rooms Layout (a modification of E-2-02-054-3022)
A-AF-84	Ventilation Alterations First Floor Plan
A-AF-85	Ventilation Alterations Basement Floor Plan
A-AF-86	Section – East Elev. of New Hounch on Col. 9-C
A-AF-87	Fire Protection Basement Floor Plan
A-AF-88	Transformer Area Site Work
A-AF-89	Special Drain & Vent Lines
A-AF-90	Sleeve for Drain & Vent Lines
A-AF-91	As-Built Spectrometer Sleeve Location
A-AF-92	Access Opening and Expansion Joint for Joy Fans
C-AF-93	As-Built 7503 Cell Sleeve Locations
B-AF-94	Blower Layout & Identification
A-AF-95	Plan 7503 Cell Floor Structure
A-AF-96	As-Installed East Wall of Control Room, Bldg 7503
D-AF-97	Plan & Details of Stairwell Enclosure & Relocation of Doors
B-AF-98	Oil Fill & Drain System
A-AF-99	Ladder for Leak Detection of 7503 Cell
A-AF-100	Ladder for Leak Detection 7503 Cell
A-AF-101	Duct Wind Load Support Plate No. 2
A-AF-102	Pressure Vessel to Pump Wagon Adapter
A-AF-103	Sectional View of Weirs
A-AF-104	Duct Detail
D-AF-105	Schematic Diag – Package II
A-AF-106	Cooling Water System for Cell Control Instrumentation
A-AF-107	852'-0" Elev. Floor Expansion Seals
B-AF-108	Control Rod Test Schematic (From unnumbered dwg of same title by Carl Shuford dated 4–12–56, as altered by GCR during 5–17 meeting)
A-AF-109	7503 Area Fence Plan
D-AF-110	Schematic Diagram Package III
A-AF-111	Modification of Load Support for Unit No. 2

Table E-3 (continued)

Drawing No.	Title
A-AF-112	Revised Loading of Cell Floor Structure
A-AF-113	Adsorber Pit Repair Measures
A-AF-114	Equipment Removal
A-AF-116	Stacked Block Removal
D-AF-117	Lighting Plan First Floor Bldg 7503
D-AF-118	Lighting Plan Basement Floor Bldg 7503
D-AF-119	Auxiliary Power System One Line Diagram – Bldg 7503
D-AF-120	Receptacle Plan First Floor Bldg 7503
D-AF-121	Miscellaneous Lighting Details – Bldg 7503
D-AF-122	Receptable Plan Basement Floor Bldg 7503
A-AF-123	Filling System for Lube Oil
D-AF-124	Auxiliary Power Conduit Plan – Basement Floor Bldg 7503
D-AF-125	Auxiliary Power Conduit Plan – First Floor Bldg 7503
A-AF-126	Coolant Fill Drums
D-AF-127	Wiring & Schematic Diograms of East & West Space Coolers, Sump Pump & Circulating Pump Bldg 7503
A-AF-128	Vent Line Sample Station
D-AF-129	Circuit Directories for Power & Lighting Panels
A-AF-130	Basement Demolition Bldg 7503
A-AF-131	As-Built Dimensions Cell Floor Structure
C-AF-132	Pump Pit Ventilation
A-AF-133	Schematic Back Flow Damper Operator Test
A-AF-134	Auxiliary Control Room Wall
A-AF-135	Switch House Door
D-AF-136	Bldg 7507 Compressor House Mechanical Details
D-AF-137	Compressor House Rearrangement Resulting from 3 Resistors per ϕ for 125 hp 60 hp & 30 hp motors
A-AF-138	Hydraulic Pipe Crimper
A-AF-139	Casing Head Packer
A-AF-140	Vent Shaft Shed Roof
A-AF-142	"K" Fill & Drain Tanks Reflux Condenser Dimensions
A-AF-143	Radiator Crate
A-AF-144	Vent Systems Vacuum Hood Testing
A-AF-145	Bldg 7503 Stack Cover

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