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A COST ANALYSIS OF THE IDAHO CHEMICAL PROCESSING PLANT

P. L. Robertson
W. G. Stockdale

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CHEMICAL TECHNOLOGY DIVISION

A COST ANALYSIS

OF

THE IDAHO CHEMICAL PROCESSING PLANT

P. L. Robertson
and
W. G. Stockdale

Date Issued JAN 4 1955

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1.0 ABSTRACT

A capital cost breakdown of the Idaho Chemical Processing Plant, a directly maintained remotely operated plant for processing spent enriched uranium fuel assemblies from reactors, is presented. The capital investment in the plant, including design, construction, training, and preoperational costs, an estimate of the direct costs incurred by the Atomic Energy Commission, and a proportional part of the costs of Central Facilities, including the value of the land and improvements thereon when acquired by the Commission, was $31,105,899. The cost of design and construction was $25,212,231, of which $3,773,357 was expended on design and inspection.

2.0 SUMMARY

The cost of the Idaho Chemical Processing Plant has been summarized by three different methods in order to present as broad a view as possible of the various functional parts of the whole.

In Table 1 costs are summarized according to the four main groupings of expenditures, i.e., construction, engineering, preoperational, and customer's incurred expense.

In Table 2 costs are summarized according to direct material and labor with overhead, engineering services, etc., itemized as separate units of costs. This method of presentation is commonly used in preparation of estimates of new construction.

In Table 3 costs are distributed according to process function and functional area.

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Table 1

Summary of Idaho Chemical Processing Plant Costs: Distribution by Contract Expenditure

1. **Construction**		
Bechtel Corporation	$ 20,398,989	
Other contractors and suppliers	1,039,885	
Subtotal		$21,438,874
2. **Engineering Design and Inspection**		
Foster Wheeler Corporation	2,878,093	
ORNL incurred expense for Foster Wheeler Corporation	50,414	
M. A. Neshkian and Company	22,000	
Oak Ridge National Laboratory	822,850	
Subtotal		$ 3,773,357
3. **Training and Preoperational**		
American Cyanamid Company	2,716,316	
Oak Ridge National Laboratory	211,359	
Subtotal		$ 2,927,675
4. **Customer's (AEC) Expense**		
Atomic Energy Commission (direct)	1,140,000	
Percentage of Central Facilities	1,825,993	
Subtotal		$ 2,965,993
Total		$31,105,899

Table 2

Summary of Idaho Chemical Processing Plant Costs: Distribution by Material, Labor, and Overhead Items

	Material	Installation Labor	Total
1. Process Building with Equipment			
Major process equipment (tanks, vessels, pumps, etc., excluding gaseous and liquid waste systems)	$ 591,243	$ 87,488	
Pipe, valves, and fittings	908,307	826,463	
Instruments and controls	351,600	223,388	
Electrical (process)	40,774	52,992	
Special equipment (sample galleries, periscopes, chargers, carriers, radiation detection instruments, etc.)	672,270	89,233	
Process building and services (63,174 ft^2 total floor area, 9,775 ft^2 cell area)	1,024,879	1,486,130	
Subtotal	$ 3,589,073	$ 2,765,694	$ 6,354,767
2. Waste Disposal Building with Equipment			
Liquid waste collection and disposal system (includes collection tanks, two 318,000-gal stainless steel storage tanks, evaporators, piping, etc.)	1,003,041	611,555	
Gaseous waste collection and disposal system (includes dissolver off-gas processing, stacks, ducts, fans, etc.)	617,843	226,099	
Waste disposal building with services (15,687 ft^2 total floor area)	384,888	474,004	
Subtotal	$ 2,005,772	$ 1,311,658	$ 3,317,430

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Table 2 (continued)

	Material	Installation Labor	Total
3. Administration and Laboratory Building with equipment (44,708 ft^2 area)	$ 1,453,009	$ 768,839	$ 2,221,848
4. Fuel Storage Building with equipment (19,319 ft^2 floor area)	641,258	267,298	908,556
5. Service Building with equipment (boilers, compressors, fire pumps, etc.)(9,482 ft^2 floor area)	391,659	301,673	693,332
6. Yard facilities (roads, fencing, electrical substations, guard houses, storage tanks, acid unloading, etc.)	426,713	514,272	940,985
Total direct material and labor	$ 8,507,484	$5,929,434	$14,436,918
Construction overhead including fee			7,001,956
Engineering design and inspection including fee			3,773,357
Total physical plant costs			$25,212,231
Percentage of land cost and improvements thereon to the AEC			1,825,993
Training and preoperational costs			2,927,675
Customer's (AEC) incurred expense			1,140,000
Total			$31,105,899

Table 3

Summary of Idaho Chemical Processing Plant Costs:
Distribution by Process Function and Functional Area

	Feed Preparation (Including Dissolution)	Separation (Extraction-Stripping)	Final Product	Liquid Waste	Gaseous Waste	Off-gas Separation Process	Total
Construction							
Bechtel							
101, Process Building							
Building	$1,728,619	$1,651,998	$ 16,561	$ 281,516	$ 135,790	---	$ 3,814,484
Equipment	2,456,869	2,508,364	168,448	353,518	172,323	---	5,659,522
Total	4,185,488	4,160,362	185,009	635,034	308,113	---	9,474,006
102, Laboratory and Administration Building							
Building	811,951	551,805	105,505	129,129	38,743	$ 116,230	1,753,363
Equipment	598,427	315,133	65,983	63,369	4,925	14,776	1,062,613
Total	1,410,378	866,938	171,488	192,498	43,668	131,006	2,815,976
103, Fuel Storage Building							
Building	1,116,882	---	---	---	---	---	1,116,882
Equipment	246,566	---	---	---	---	---	246,566
Total	1,363,448	---	---	---	---	---	1,363,448
104-5, Waste Disposal System							
Building	---	---	---	607,095	296,569	425,645	1,329,309
Equipment	---	---	---	2,439,118	611,790	619,284	3,670,192
Total	---	---	---	3,046,213	908,359	1,044,929	4,999,501
106, Site Development	373,634	270,535	19,081	204,999	67,434	63,338	999,021
Total							999,021
107, Service Building							
Building	169,264	128,457	8,374	60,786	27,885	30,308	425,074
Equipment	128,205	97,297	6,343	46,041	21,121	22,956	321,963
Total	297,469	225,754	14,717	106,827	49,006	53,264	747,037
Other Contractors and Suppliers							
101, Process Building	9,198	9,198	---	---	---	---	18,396
102, Laboratory and Administration Building	136,262	105,220	9,221	26,052	9,758	29,273	315,786
103, Fuel Storage Building	233	---	---	---	---	---	233
104-5, Waste Disposal System	---	---	---	---	26,210	24,000	50,210
106, Site Development	153,543	111,175	7,841	84,243	27,712	26,028	410,542
107, Service Building	97,447	73,954	4,821	34,995	16,053	17,448	244,718

Table 3 (Continued)

	Feed Preparation (Including Dissolution)	Separation (Extraction-Stripping)	Final Product	Liquid Waste	Gaseous Waste	Off-gas Separation Process	Total
Engineering Design and Inspection							
Foster Wheeler and subcontractors	$1,095,262	$ 793,040	$ 55,934	$ 600,930	$ 197,674	$ 185,667	$ 2,928,507
ORNL design	307,746	222,828	15,716	168,849	55,542	52,169	822,850
M. A. Nishkian and Company	8,760	6,648	433	3,146	1,444	1,569	22,000
Total construction and engineering	$9,438,868	$6,845,652	$484,261	$5,103,786	$1,710,973	$1,628,691	$25,212,231
Training and preoperation							2,927,675
Customer's (AEC) expense							2,965,993
Total cost Idaho Chemical Processing Plant							$31,105,899

3.0 INTRODUCTION

The Idaho Chemical Processing Plant is a directly maintained remotely operated radiochemical processing plant, built to separate and decontaminate enriched U^{235} from irradiated reactor fuel elements. The plant is located at the National Reactor Testing Station near Idaho Falls, Idaho, and is operated by the Phillips Petroleum Company* for the Atomic Energy Commission.

The chemical plant was designed specifically to process partially depleted U^{235} fuel from the Materials Testing Reactor, the Experimental Breeder Reactor, the special Hanford NP irradiation program and to allow for future process expansion for processing enriched fuels from reactors. The chemical process used, the 25 process, consists of the preferential extraction of uranium from an aluminum nitrate—salted solution with methylisobutyl ketone. The extraction cycle is the same for all feeds under consideration; the head end treatment used depends on the dissolution requirements of the fuels.

The plant is a fully integrated facility with the exception of heavy maintenance, storage facilities, and fire protection, these being in an area known as Central Facilities, approximately 3 miles distant, and shared with the other plant sites (reactors) that make up the National Reactor Testing Station. Facilities provided at the plant, besides the processing area, are the analytical laboratory, cafeteria, administrative offices, light-maintenance shops, steam plant, water supply (domestic and fire protection), waste disposal (radioactive and sewage), liquid and gaseous oxygen-nitrogen supply system, reactor fuel storage, security, first aid, and health physics.

The plant was constructed by Bechtel Corporation of San Francisco, from a design supplied by Foster Wheeler Corporation of New York, the architect-engineer. The Chemical Technology Division of Oak Ridge National Laboratory was responsible for supplying to Foster Wheeler Corporation process and building design criteria and operating instructions, checking the construction, and the initial plant operation with irradiated fuels. The American Cyanamid Company was the initial plant operating contractor. The entire project was under the direction of the Division of Engineering and Construction, Idaho Operations Office, Atomic Energy Commission.

In the appendix are selected photographs of the plant made during construction along with plan and cross-sectional drawings of the buildings.

4.0 CONSTRUCTION COSTS

4.1 Basis for Distribution of Construction Costs

Construction costs are tabulated by functions and, in general, reflect the building designations used by the contractor in maintaining his accounts. The functional areas used in this report are: Process Building, Laboratory

*The original operating contractor was the American Cyanamid Company.

[redacted]

and Administration Building, Fuel Storage Building, Waste Disposal System, site development, and Service Building. Costs of certain items of equipment that are physically located in a building, but used by another functional area, have been tabulated with other costs of the functional area. The two major groups of equipment treated thus are: (1) The air washers, supply blowers, and accessory equipment, which are physically located in the Service Building but supply air only to the Process Building and the Laboratory and Administration Building; costs are distributed between the latter two areas; and (2) the liquid waste collection tanks and associated equipment located in the deep end of the Process Building, whose costs have been arbitrarily tabulated with those of the waste system.

Process Building. The Process Building, which houses the bulk of the equipment and controls, is a rectangular structure, largely below ground level, and approximately 240 ft long by 100 ft wide by 90 ft high from subfloor level to the pitch of the roof. In one section the building is approximately 60 ft below ground level. The building encloses a usable floor area of 63,174 ft^2 and a usable volume of 991,851 ft^3. The outside volume is 1,420,212 ft^3. Approximately 400,000 ft^3 of the building, based on outside dimensions, consists of concrete walls for shielding and structural purposes. This is almost 30 percent of the total outside volume. Building costs are given in Table 5.

Structurally the building consists of two levels. One level is of reinforced concrete and the other is of transite and structural steel. All process equipment containing radioactive materials is located within concrete walls. Chemical make-up tanks and auxiliaries are located in the transite-steel section.

The concrete section is divided into two rows of 24 cells total, with operating, service, and access corridors between the two. Outboard from the two cell rows are located the sampling corridors containing the sampling galleries. Directly beneath the sampling corridors are located the cell exhaust ventilation ducts, vessel off-gas, sampler off-gas, and dissolver off-gas lines.

At the south end of the cell rows are located the radioactive waste collection tanks with their auxiliary pumps and pits. These tanks collect waste from process equipment and cell floor drains. This is the deepest part of the building, and the floor drain system is constructed for gravity flow from the cells to the tanks.

The cell floors and the walls, for heights ranging up to 45 ft-6 in., are lined with type 347 stainless steel. The walls of the cells adjacent to the operating corridor are honeycombed with offset pipe sleeves for entrance and exit into the cells of service and control piping and instrumentation. Normal access, when required by personnel, is through labyrinth corridors and doors located at the lowest level, the access corridor. Air flow into the cells is through louvers in the doors, the access corridor serving as a large distribution duct in the building ventilation system.

[redacted]

Three cells, for future dissolver operations, were constructed without monolitic concrete on the walls adjacent to the operating corridors. The concrete thickness for the cell walls was based on shielding requirements of 50-day-cooled feed material. Thickness varies from 5 ft down to 1 ft. Access to equipment in the cells is through hatch openings in the roof, the covers of which are removable by an overhead crane for cells on the west side, and by a mobile A-frame type crane for cells on the east side, in the transite-steel section of the building. Cell walls and roof are concrete and average 5 ft in thickness.

Six cells, E, F, G, H, L, and M, are included in the building for future processes, the area encompassed by these cells being approximately 25 percent of the total cell area. The process equipment, constructed mostly of types 347 and 304ELC stainless steel, is located inside the cells or below ground level.

Laboratory and Administration Building. The Laboratory and Administration Building, adjacent to the Process Building, houses the administrative offices, cafeteria, health physics services, telephone exchange, first aid, laboratories, and a small machine shop. The sample dilution laboratory (Cell X) is located in the Process Building, and costs attributable to it are carried in that account. The Laboratory and Administration Building is of three-floor construction, including basement. The laboratories are housed in the center of the building on the first floor, with the exception of the process improvement laboratory in the basement. The second floor contains the filters and exhaust fans for the hoods and other exhaust systems. The offices and other areas are located around the perimeter of the building. The basement of the building contains the product-loading area and storage vault. The cost of the loading equipment is carried in the Process Building accounts.

The Laboratory and Administration Building is of reinforced concrete construction from footings up to the level of the second floor (approximately 15.5 ft above natural grade). Earth embankment slopes from this level to natural grade. Above the second floor structural steel covered with transite is used.

Fuel Storage Building. The Fuel Storage Building is used for storing and handling, by underwater methods, the feed material to the plant. Irradiated fuel is stored underwater for a time sufficient to allow for decay of radioactive fission products and to accumulate feed for the plant.

The building contains two storage basins, each having a capacity of 475 buckets. The desired spacing is maintained by bumpers on rod dollies and separation of the dolly and racks. The storage buckets are used in the carriers for transporting the slugs. An overhead crane is provided in the building for unloading the carriers from truck beds and transporting them to the unloading pit. In the unloading pit the buckets are unloaded from the carriers underwater and transported by

monorail to their proper location in the storage basins or canal. The unloading pit, canal, and storage basins are so constructed as to provide a minimum of 15 ft of water cover at all times when radioactive material is handled outside the carriers.

The Fuel Storage Building contains sufficient equipment to make it an almost self-contained unit within the general area of the chemical plant. A separate heating and ventilating system is included, with oil storage tank and air cleaning system. An auxiliary generator is installed for emergency power supply. Water is obtained from the main plant source, but is metered and filtered for the Storage Building by separate equipment. Basin water recirculation pumps are housed within the building.

The building is of structural steel covered with transite, and is constructed over concrete basins and pits; floor gratings are located over the basins and canals except for slotted passageways to allow for passage of bucket rods. The gratings clear the maximum level of water by a minimum distance of 1 ft.

Waste Disposal Systems. The Waste Disposal Building houses both liquid and gaseous waste-disposal equipment. It is essentially five units integrated into one building, each unit being for a separate and distinct part of the radioactive-waste handling facilities of the plant. The five main units are:

1. The three holdup waste-storage-tank cells on the north side, containing five 18,400-gal usable-volume tanks for first, second, and third cycle raffinate and general plant waste. Only one tank serves the liquid-waste evaporator directly.

2. The liquid-waste evaporator and tank cells on the east side, consisting of two cells with auxiliary operating areas.

3. The dissolver off-gas processing and storage cells on the west side, consisting of three cells with auxiliary operating areas, which are common to the liquid-waste-evaporation auxiliary areas.

These three sections are all beneath grade and consist of heavy reinforced concrete walls and roof. The tops of the cells are above ground level, with a sloped backfill surrounding, similar to the barricade type of construction used in ammunition storage dumps.

4. The oxygen-nitrogen plant, which supplies the Reactor Testing Station area with oxygen and nitrogen, is located on top of the cell structure, but clears the hatch openings of all cells.

5. The exhaust fans for process cell ventilation, which are located in a wing at the southeast end of the main section, and the process-vessel ventilation equipment, consisting of a filter bank and two high-speed exhausters, the former being located in a cell on west side, and the latter being located in a cell at the extreme southwest

end of the main section. The building is of structural steel covered with transite and houses both the oxygen-nitrogen plant and exhaust fans for cell ventilation.

The cost of the Waste Disposal Building, exclusive of installed equipment, was $1,329,309 or $2.76 per cubic foot. The usable volume of the building is 294,671 ft^3, with an inside floor area of 15,687 ft^2. Pertinent information is given in Table 8.

Costs other than the Waste Disposal Building that are reported under the Waste Disposal System account are:

1. The liquid waste disposal system, including tanks and pumps, with auxiliaries, located in the deep end of the Process Building, radioactive waste lines in the yard, equipment and tanks within the Waste Disposal Building, the tank farm, and the waste disposal well.

2. The gaseous waste system, including the cell ventilation exhaust duct from the point it leaves the Process Building, and all equipment with auxiliaries such as fans, stack, and stack heater.

3. The dissolver off-gas system, including the lines from the point of leaving the Process Building.

4. The process vessel off-gas system, including the lines from the point they exit from the Process Building.

5. The sampler off-gas system, which is physically located in a cell projection on the west side of the Process Building.

6. The burial ground, including road and fence, which is located approximately 7 miles southwest of the plant area proper.

Site Development. The Idaho Chemical Processing Plant covers an area 3,196.7 ft long by 1,120 ft wide, approximately 82 acres, and is enclosed by an 8-ft woven wire fence. Immediately external to this area on the north are located two wells, for plant water supply, and on the west is the plant parking area. The acid unloading facility is located near the Central Facilities area and is directly chargeable to the plant. The burial ground is located approximately 7 miles southwest of the plant area proper.

Within the fence boundary, or the plant area proper, are located the processing area, laboratory and administration area, the Service Building, Waste Disposal Building, Liquid Waste Tank Farm, Stack, Waste Disposal Well, Fuel Storage Building, and miscellaneous buildings and subareas consisting of a substation, guard houses, monitoring building, sewage disposal area, water tanks, oil storage tanks, etc.

[redacted]

There are no facilities within the plant area to house major maintenance shops, warehouses, mobile fire equipment, etc. These are located in what is commonly called Central Facilities and are not included in the construction costs of the chemical plant. Central Facilities services all installations located at the National Reactor Testing Station site, and a proportional part of its costs is carried as part of the cost of the chemical plant over and above the engineering and construction costs.

Costs that are carried under site development are in general those that cannot be directly charged to a process or utility area. Such items of cost are roads and walks, guard houses, water supply wells, substation, fencing and yard lighting, yard lines such as water and fire lines, and sewage disposal. These costs are all tabulated under site development.

Service Building. The Service Building was constructed to house the boilers and equipment for steam generation of the entire plant (excluding the Fuel Storage Building), heating and ventilating equipment for Process and Laboratory and Administration Buildings, emergency electric power unit, pumps for the fire protection system, equipment for the compressed air system, and electrical equipment for Process and Laboratory and Administration buildings. In the original conception of the plant, a Service Building was not planned, major items of service equipment being located in the basement of the Laboratory and Administration Building. Enlargement of the scope of the project led to the abandonment of the original idea and, consequently, owing to the urgency of the entire project for completion, an ideal location for the building was not realized. Service Building construction consists of a structural steel framework, transite siding and roof, with a usable floor area of 9,482 ft^2 and an overall volume of 248,840 ft^3. The building, complete with services, but excluding the cost of installed equipment, was $432,818 or $1.74 per cubic foot, outside dimensions. In this figure are included the costs of various items, in themselves not necessarily a part of the building but included because of the equipment to be installed within the walls of the building. Examples of such items are the concrete foundations, salt pits, and concrete tunnels, connecting the Service Building to the Laboratory and Administration Building, for heating and ventilating ducts and service piping. The breakdown of the cost included in the above figure and various unit costs of the materials used in the building are given in Table 10.

4.2 General Explanatory Remarks for Construction Cost Tables

The following general remarks are made to clarify certain questions that may arise in the use of the tables showing the construction cost breakdown.

1. The basis of costs was the final report by Bechtel Corporation of their statement of operation, dated Jan. 31, 1953.

2. All material costs and subcontractor costs were checked against purchase orders.

[redacted]

3. Subcontractor costs, where only the total price of the subcontract was available, were carried as either a material or a labor cost item, depending upon the type of work involved. Examples: Excavation, subcontracted by Bechtel Corporation, was carried as a labor item; the stack, subcontracted by Bechtel Corporation, was carried as a material item.

4. Credit was made for all excess material purchased, and not used during construction, that was transferred to Central Facilities warehousing or elsewhere and the contractor credited. Full credit was not realized on all items so transferred, but is assumed available as replacement stock at the transfer price from Central Facilities.

5. As far as possible, material items were cataloged, irrespective of where they were originally carried in the final report issued by Bechtel Corporation, into accounts that more nearly represent functional use and not their locations. Examples of such are (1) radioactive waste underground lines that were transferred from site development to the waste disposal account, (2) the air washers and fans transferred from the Service Building and distributed between the Process and Laboratory and Administration Buildings accounts.

6. Where transfers were made as in item 5 or where errors were found in originally cataloging the material and corrected, labor costs and equipment usage costs were also corrected.

7. Unallocated direct and indirect costs itemized in the Bechtel Corporation's report were checked for material items and were cataloged to other accounts if found improperly placed. The nomenclature used in this report for unallocated direct and indirect costs is "overhead."

8. Isolation pay, which was carried as an indirect field office expense by Bechtel Corporation, is carried as an overhead cost in this report. Direct labor charges reflect only direct hourly time spent on the job with normal standby, and not any unique labor costs incurred as a result of the physical location of the site at a distance from towns and cities.

9. Distribution of overhead costs in this report into subaccounts was on the following basis: (1) the indirect costs bearing directly on labor, such as isolation pay and vacation, were proportioned on a labor basis; (2) the indirect costs bearing directly on material, such as warehousing and purchasing, were proportioned on a material basis; and (3) the remainder of the indirect costs were proportioned on a total material-labor-equipment usage basis. The sum of these three is the overhead cost reported here. The following tabulation gives the overhead items and their distribution:

[redacted]

	Material	Labor	Total Material, Labor Equipment Usage
Unallocated Direct Cost			
Temporary buildings			$ 147,246
Temporary services			195,908
Miscellaneous handling	$ 278,918		
Warehouse	184,044		
Clean-up			440,555
Scaffolding	174,110		
Development	144,052		
Miscellaneous services			216,820
Subtotal	781,124		1,000,529
Field Office			
Supervision		$ 124,138	
Engineering			34,981
Survey			95,985
Accounting			27,234
Warehousing	17,403		
Purchasing	31,768		
Clerical			88,577
Equipment rentals and maintenance	365,443		
Small tools	121,582		
Consumable supplies	519,015		
Insurance and taxes		401,057	
Isolation pay		1,156,770	
Travel			24,215
Telephone and telegraph	29,372		
Vacation		12,501	
Other		8,062	114,410
Fee			378,750
Subtotal	1,084,583	1,702,528	764,154
Home Office			
Supervision			31,439
Engineering			48,071
Purchasing	41,827		
Expediting	72,632		
Clerical			57,858
Travel			122,354
Telephone and telegraph	73,531		
Blueprints and supplies			23,717
Vacation allowance			8,836
Other			43,319
Subtotal	187,990		335,594
Total, indirect cost	$2,053,697	$1,702,528	$2,100,277
Grand total			$5,856,502

[redacted]

[redacted]

10. Definitions of building costs used in this study are as follows:

a. Bare building costs include excavation and backfill; foundations (including permanent equipment and machinery foundations); exterior and interior walls, floors, roof, structural framework; doors, hardware; stairways; and anything that can be construed as part of the building shell.

b. Functional building costs include the bare building cost plus sanitary plumbing, building lighting and power, heating and ventilation (excluding air conditioning) and painting. Functional building costs are based on a building ready for occupancy with a minimum of building services supplied; those omitted may or may not be required.

c. Building costs include the costs of the functional building plus additional equipment that can be construed as part of the building costs but only insofar as the particular building under discussion is concerned. For example, "K" plugs are included as part of a process building and would have no counterpart in an administration building. Other items included are cranes and hoists, elevators, compressed air system, fire protection system, cell linings, etc.

d. Complete building costs include everything in the building, such as process equipment and furniture, with the building ready to operate.

11. Costs included in some of the sub-subaccounts may be clarified as follows:

a. Structural steel: includes painting, both labor and material.

b. Miscellaneous iron and steel: includes painting, both labor and material.

c. Compressed air system: includes prorata share of costs for compressors, receivers, coolers, filters, piping, supports, and painting, both labor and material.

d. Plumbing: includes costs of fixtures, piping, supports, insulation, painting, both labor and material.

e. Electrical: includes costs of fixtures, construction, [illegible] conduits, fittings, control centers, panels, supports, and painting, both labor and material.

f. Heating and ventilating: includes prorata share of costs for ducts, fans, blowers, coils, filters, washers, plenums, pumps, tanks, controls, piping, supports, and painting, both labor and material.

[redacted]

[redacted]

g. Piping (all): includes costs of pipe, fittings, valves, supports, insulation, and painting, both labor and material.

h. Electric power: includes costs of conductors, conduits, fittings, control centers, transformers, panels, supports, and switches, both labor and material.

i. Telephone and alarm system: includes costs of conductors, conduit, fittings, supports, junction boxes, instruments, and painting, both labor and material.

j. Asphalt tile: includes aluminum-foil-coated paper laid in all laboratories before placing asphalt tile, both labor and material.

k. Suspended ceilings: includes all structural steel from which ceiling is hung (not structural steel required for building structure itself), both labor and material.

12. Other contractors and suppliers listed in the tables are contractors who had contracts directly with the Atomic Energy Commission. The word "suppliers," as used here, in general refers to the Atomic Energy Commission who furnished some equipment not obtained by Bechtel Corporation. This equipment was mainly office furniture and laboratory supplies.

Construction Photographs of the Plant. The complexity of operations during construction and the use of materials and equipment may not be obvious to a reader who is unfamiliar with construction. Selected photographs made during construction are presented in the appendix for the purpose of conveying some idea of the complexity of the plant.

[redacted]

Table 4

Construction Costs

Summary Sheet

Building 101

	Material Cost	Labor Cost	Equipment Usage	Overhead Cost	Total Cost
A. Building	$1,006,483	$1,486,130	$227,946	$1,093,924	$3,814,483
B. Instruments and Controls	351,600	223,388	9,231	223,962	808,181
C. Pipe, Valves, and Fittings					
1. Service piping (carbon steel)	156,875	132,891	7,726	123,278	420,770
2. Sleeves, pipe (stainless steel)	128,210	107,181	9,279	104,314	348,984
3. Process, pipe (stainless steel)	493,304	446,496	35,347	434,167	1,409,314
4. Air collection system, pipe (stainless steel)	54,812	49,611	3,927	48,241	156,591
5. Drain system, pipe (cast iron and stainless steel)	75,106	90,284	10,642	54,060	230,092
Subtotal	908,307	826,463	66,921	764,060	2,565,751
D. Electric Power, etc. - Process					
1. Process equipment	36,289	47,163	2,526	35,926	121,904
2. Telephone and alarm system	4,485	5,829	312	4,441	15,067
Subtotal	40,774	52,992	2,838	40,367	136,971
E. Process Equipment					
1. Vessels - Cell A	8,903	1,922	222	4,465	15,512
2. Vessels - Cell B	5,402	2,795	322	3,443	11,962
3. Vessels - Cell C	57,331	5,415	621	25,612	88,979
4. Vessels - Cell D	57,653	5,415	621	25,742	89,431
5. Vessels - Cell E	57,653	0	0	23,303	80,956
6. Vessels - Cell J	26,902	4,542	521	12,920	44,885
7. Vessels - Cell K	22,436	1,397	169	9,701	33,703
8. Vessels - Cell N	27,681	9,608	1,103	15,518	53,910
9. Vessels - Cell P	12,560	2,445	283	6,179	21,467
10. Vessels - Cell Q	13,457	3,319	383	6,935	24,094
11. Vessels - Cell S	8,362	2,445	283	4,482	15,572
12. Vessels - Cell T	7,160	698	92	3,213	11,163
13. Vessels - Cell Z	6,961	1,755	190	3,600	12,506
14. Vessels - Cell U	26,221	4,892	560	12,802	44,475
15. Vessels - PA Area	1,715	1,048	123	1,166	4,052

Table 4

Construction Costs

Summary Sheet

Building 101 (continued)

	Material Cost	Labor Cost	Equipment Usage	Overhead Cost	Total Cost
16. Vessels - Cell W	$ 15,630	$ 4,367	$ 506	$ 8,287	$ 28,79[illegible]
17. Vessels - LC Area	6,780	1,397	169	3,373	11,7[illegible]
18. Vessels - Cell Y	14,078	3,319	375	7,183	24,955
19. Vessels - Portable	12,620	0	0	5,101	17,721
20. Vessels - Acid unloading	1,277	174	18	594	2,063
21. Vessels - Vacuum room	2,628	349	36	1,218	4,231
22. Vessels - PM Area	58,340	9,259	1,065	27,754	96,418
Subtotal	451,750	66,561	7,662	212,591	738,564
23. Pumps, etc. - PM Area	26,264	4,374	505	12,674	43,817
24. Pumps, etc. - Cell A	890	149	18	430	1,487
25. Pumps, etc. - Cell B	4,066	676	78	1,962	6,782
26. Pumps, etc. - Cell C	13,686	2,275	263	6,603	22,827
27. Pumps, etc. - Cell D	13,673	2,273	262	6,596	22,804
28. Pumps, etc. - Cell E	13,604	0	0	5,536	19,140
29. Pumps, etc. - Cell J	2,107	349	40	1,016	3,512
30. Pumps, etc. - Cell K	2,889	481	56	1,394	4,820
31. Pumps, etc. - Cell N	4,457	741	86	2,150	7,434
32. Pumps, etc. - Cell P	23,445	3,897	450	11,310	39,102
33. Pumps, etc. - Cell Q	13,592	2,258	261	6,557	22,668
34. Pumps, etc. - Cell S	4,113	682	79	1,984	6,858
35. Pumps, etc. - Cell T	784	130	15	378	1,307
36. Pumps, etc. - Cell U	2,270	377	44	1,095	3,786
37. Pumps, etc. - Cell W	6,264	1,040	120	3,021	10,445
38. Pumps, etc. - Cell Y	1,541	255	29	743	2,568
39. Pumps, etc. - Cell Z	820	136	16	396	1,368
40. Pumps, etc. - High vacuum facility	2,156	358	41	1,040	3,595
41. Pumps, etc. - Acid unloading facility	456	75	8	219	758
42. Pumps, etc. - Cell X	2,416	401	46	1,165	4,028
Subtotal	139,493	20,927	2,417	66,269	229,106
F. Cold Runs	5,354	64,548	272	30,976	101,150
G. Shielding and Special Equipment					
1. Sample galleries 1-11, 15, 12, 13, and 14	206,196	47,124	4,161	104,209	361,690
2. Tracks for galleries 1-11, 15, 12, and 13	8,480	278	48	3,564	12,370
3. Sampling tongs and decappers for galleries 1-11, 15, 12, and 13	42,898	436	0	17,538	60,872

Table 4 (continued)

Construction Costs

Summary Sheet

Building 101 (continued)

	Material Cost	Labor Cost	Equipment Usage	Overhead Cost	Total Cost
G. Shielding and Special Equipment (contd)					
4. Periscopes, drift sights and lights for tongs and cappers on sample galleries 1-11, 15, 12, and 13	$ 43,718	$ 0	$ 0	$ 17,694	$ 61,412
5. Other items for cell sampling, including electric truck, batteries, charger, mechanical lifts, filter handling shields, bottles, caps, etc.	53,855	1,352	71	22,372	77,650
6. Activity sample handling (Cell X, complete)	100,005	22,072	866	49,758	172,701
7. Chargers, carriers, and slug chutes for cell sampling	129,926	4,034	391	54,375	188,726
8. Radiation detection instruments	35,048	1,777	68	14,931	51,824
9. Individual shielding	41,511	9,883	1,584	21,441	74,419
10. Special micro star filters	10,633	2,277	0	5,226	18,136
Subtotal	672,270	89,233	7,189	311,108	1,079,800
Total, Items A, B, C, D, E, F, and G	$3,576,031	$2,830,242	$324,476	$2,743,257	$9,474,006

Table 4 (continued)

Construction Costs

Summary Sheet

Building 102

	Material Cost	Labor Cost	Equipment Usage	Overhead Cost	Total Cost
A. Building	$ 604,228	$597,871	$80,405	$518,994	$1,801,498
B. Furniture and Equipment					
1. First floor	208,032	101,558	10,046	130,289	449,925
2. Second floor	12,629	7,131	793	8,297	28,850
3. Basement	53,078	35,780	3,747	37,320	129,925
4. Cell X (Building 101)	6,624	4,168	363	4,610	15,765
Subtotal	280,363	148,637	14,949	180,516	624,465
C. Analytical, Counters, and Other Equipment	78,379	249	8	31,757	110,393
D. Gadgets, etc. by Oak Ridge National Laboratory	154,264	908	0	62,668	217,840
E. Laboratory Services	19,989	21,174	2,807	17,810	61,780
Total	$1,137,223	$768,839	$98,169	$811,745	$2,815,976

Table 4 (continued)

Construction Costs

Summary Sheet

Building 103

	Material Cost	Labor Cost	Equipment Usage	Overhead Cost	Total Cost
A. Building					
1. Excavation and backfill	$ 0	$ 21,826	$ 7,968	$ 10,648	$ 40,442
2. Concrete	214,648	163,355	51,754	165,153	594,910
3. Other building materials	167,947	39,242	7,527	85,938	300,654
4. Plumbing	1,600	2,904	271	1,970	6,745
5. Heating and ventilating	19,946	5,322	323	10,436	36,027
6. Electric lighting and power	16,657	20,918	786	16,121	54,482
7. Monorail system	27,141	1,132	123	11,450	39,846
8. Overhead crane	26,981	1,122	123	11,359	39,585
9. Recirculating system (water)	16,496	9,457	852	10,940	37,745
10. Painting	3,403	1,517	246	2,074	7,240
Subtotal	494,819	266,795	69,973	326,089	1,157,676
B. Carriers and Chargers	84,527	199	0	34,115	118,841
C. Other Equipment	61,679	304	0	24,948	86,931
Total, Items A, B, and C	$641,025	$267,298	$69,973	$385,152	$1,363,448

Table 4 (continued)

Construction Costs

Summary Sheet

Buildings 104 - 105

	Material Cost	Labor Cost	Equipment Usage	Overhead Cost	Total Cost
A. Building	$ 384,888	$ 474,004	$ 93,433	$ 376,984	$1,329,309
B. Gaseous Disposal System					
1. Dissolver off-gas decontamination system	255,510	103,034	9,242	151,234	519,020
2. Oxygen-nitrogen plant	54,121	16,153	907	29,083	100,264
Subtotal	309,631	119,187	10,149	180,317	619,284
C. Gaseous Waste Disposal System					
1. Cell ventilating system	243,039	61,641	9,320	126,346	440,346
2. Vessel off-gas system	30,783	25,648	7,934	25,068	89,433
3. Dissolver off-gas system	12,780	9,136	3,574	9,849	35,339
4. Sample off-gas system	21,610	10,487	807	13,768	46,672
Subtotal	308,212	106,912	21,635	175,031	611,790
D. Liquid Waste Collection and Disposal System					
1. Waste collection - Building 101	120,812	61,032	19,999	79,203	281,046
2. Waste collection - Building 104	318,599	86,603	9,512	170,347	585,061
3. Waste disposal - Tank Farm	339,978	359,793	85,948	307,112	1,092,831
4. Waste disposal well	11,338	0	13	4,563	15,914
Subtotal	790,727	507,428	115,472	561,225	1,974,852
E. Liquid Waste Evaporator System	212,314	104,127	10,473	137,352	464,266
Total, Items A, B, C, D, and E	$2,005,772	$1,311,658	$251,162	$1,430,909	$4,999,501

Table 4 (continued)

Construction Costs

Summary Sheet

Building 106

	Material Cost	Labor Cost	Equipment Usage	Overhead Cost	Total Cost
A. Improvement to Grounds	$ 10,869	$ 50,008	$ 78,979	$ 35,725	$175,581
B. Miscellaneous Buildings					
1. CPP-609	11,029	22,568	1,144	14,647	49,388
2. CPP-610	2,697	5,522	280	3,584	12,083
3. CPP-701	2,152	4,405	223	2,859	9,639
4. CPP-702	1,665	3,405	173	2,210	7,453
5. CPP-709	5,774	11,818	599	7,670	25,861
6. CPP-710	1,616	3,309	168	2,148	7,241
7. CPP-711	1,962	4,015	204	2,606	8,787
8. CPP-712	2,882	5,899	298	3,829	12,908
9. Well houses No. 1 and No. 2	3,699	7,571	384	4,913	16,567
Subtotal	33,476	68,512	3,473	44,466	149,927
C. Oil Storage Tank D-602	15,689	8,747	1,055	10,336	35,827
D. Water Storage Tank D-601	22,564	12,579	1,517	14,863	51,523
E. Well Pump Accessories	252	140	17	165	574
F. Fire Water Lines and Hydrants	20,932	70,805	14,804	41,663	148,204
G. Other Utility Lines	4,405	14,915	3,118	8,777	31,215
H. Electrical	89,175	64,277	20,954	66,948	241,354
I. Fencing	34,212	27,836	8,816	27,190	98,054
J. Acid Unloading Facility	39,751	6,788	1,078	19,145	66,762
Total	$271,325	$324,607	$133,811	$269,278	$999,021

Table 4 (continued)

Construction Costs

Summary Sheet

Building 107

	Material Cost	Labor Cost	Equipment Usage	Overhead Cost	Total Cost
A. Excavation and Backfill	$ 0	$ 7,291	$ 5,084	$ 3,834	$ 16,209
B. Concrete	26,360	61,497	6,704	38,803	133,364
C. Other Building Items	111,368	83,196	6,070	82,611	283,245
D. Steam Generating Equipment	69,814	30,832	2,814	42,127	145,587
E. Oil System for Boiler Burners	6,824	3,904	446	5,547	15,721
F. Boiler Feed Water Pumps	6,596	3,252	332	4,144	14,324
G. Feed Water Make-up System	7,266	4,631	570	5,075	17,542
H. Boiler Blow-Down System	1,665	1,111	139	1,190	4,105
I. Boiler Water Treatment System	42,599	19,305	1,813	25,939	89,656
J. Fire Protection System (pumps)	11,930	6,697	766	7,891	27,284
Total	$284,422	$221,716	$24,738	$216,161	$747,037

Table 5

Building 101

	Material Cost	Labor Cost	Equipment Usage	Overhead Cost	Total Cost	Unit	Total Units	Unit Cost
A. Building								
1. Excavation and backfill								
a. Excavation	$ 628	$ 71,660	$ 1,987	$ 32,443	$ 106,718	yd^3	95,207	$ 1.12
b. Backfill	0	30,520	38,176	17,985	86,681	yd^3	70,628	1.23
Subtotal	628	102,180	40,163	50,428	193,399			
2. Concrete								
a. Forms	124,764	484,702	44,584	271,496	925,546	ft^2	220,480	4.20
b. Reinforcing steel	125,023	61,828	11,814	79,233	277,898	lb	1,409,369	0.197
c. Embedded steel	5,274	25,569	950	13,627	45,430			
d. Place	221,613	101,787	23,829	137,296	484,535	yd^3	19,600	24.72
e. Heat	0	21,894	49,243	15,406	86,543	yd^3	19,600	4.42
f. Finish	1,787	197,793	7,486	89,797	296,863	ft^2	146,134	2.03
Subtotal	478,461	893,573	137,916	606,865	2,116,815	yd^3	19,600	108.00
3. Building materials, etc.								
a. Structural steel	47,794	5,637	2,096	21,985	77,512	ton	234	331.39
b. Miscellaneous iron and steel	10,586	28,359	4,467	17,420	60,832			
c. Supports (steel)	31,730	7,799	986	16,356	56,853			
d. Roof and siding	42,338	2,000	0	17,927	62,265	ft^2	32,675	1.91
e. Partitions	1,287	3,261	96	1,983	6,627			
f. Floor coverings	1,719	1,380	0	1,307	4,406			
g. Hardware	17,850	1,775	28	7,977	27,630			
h. Cranes and hoists	21,463	6,261	0	11,428	39,152			
i. CO_2 system	13,844	125	0	5,626	19,595			
j. Compressed air system	22,342	12,618	2,942	14,953	52,855			
k. Plumbing	2,787	3,712	235	2,804	9,538			
l. Electrical	61,161	79,488	4,256	60,549	205,454			
m. Cell lining	120,212	174,308	26,542	129,155	450,217	ft^2	25,422	17.71
n. "K" plugs	2,766	19,671	345	9,927	32,709			
o. Heating and ventilation	97,144	95,622	6,804	82,514	282,084			
p. Painting	32,371	48,361	1,088	34,720	116,540	ft^2	485,185	0.24
Subtotal	527,394	490,377	49,867	436,631	1,504,269			
Total Building 101	$1,006,483	$1,486,130	$227,946	$1,093,924	$3,814,483			

Table 5 (continued)

Building 101

	Material for Panels Cost	Material for Piping Cost	Material for Electrical Cost	Instruments and Control Cost	Total Material Cost	Labor Cost	Equipment Usage	Overhead Cost	Total Cost
B. Instruments and Controls									
1. PM Area	$ 4,711	$ 7,343	$ 3,179	$ 29,982	$ 45,215	$ 31,073	$ 1,284	$ 29,837	$107,409
2. Cell A	978	1,524	660	6,225	9,387	6,456	267	6,196	22,306
3. Cell B	1,421	2,215	959	9,046	13,641	9,382	388	9,004	32,415
4. Cell C	2,755	4,294	1,859	17,532	26,440	18,184	751	17,453	62,828
5. Cell D	2,755	4,294	1,859	17,532	26,440	18,184	751	17,453	62,828
6. Cell E*	2,755	4,294	1,859	17,532	26,440	0	0	9,429	35,869
7. Cell J	2,315	3,609	1,562	14,735	22,221	15,235	630	14,647	52,733
8. Cell K	711	1,108	480	4,523	6,822	4,736	194	4,523	16,275
9. Cell N	4,892	7,623	3,300	31,125	46,940	32,257	1,333	30,974	111,504
10. Cell P	1,246	1,941	841	7,927	11,955	8,198	339	7,881	28,373
11. Cell Q	1,693	2,638	1,142	10,771	16,244	11,147	461	10,711	38,563
12. Cell S	1,246	1,941	841	7,927	11,955	8,198	339	7,881	28,373
13. Cell T	355	554	240	2,261	3,410	2,346	97	2,251	8,104
14. Cell U	2,491	3,883	1,681	15,854	23,909	16,419	678	15,772	56,778
15. Cell W	2,224	3,466	1,501	14,152	21,343	14,654	606	14,077	50,680
16. Cell Y	1,693	2,638	1,142	10,771	16,244	11,147	461	10,711	38,563
17. Cell Z	887	1,382	599	5,642	8,510	5,853	242	5,618	20,223
18. PA Area	531	828	358	3,381	5,098	3,507	145	3,365	12,115
19. LC Area (Building 102)	711	1,108	480	4,523	6,822	4,669	194	4,494	16,179
20. Acid Unloading Area	88	137	59	560	844	581	24	558	2,007
21. High Vacuum Area	177	279	122	1,142	1,720	1,162	47	1,127	4,056
Subtotal, Item B	$36,635	$57,099	$24,723	$233,143	$351,600	$223,388	$ 9,231	$223,962	$808,181

* Material purchased but not installed.

Table 5 (continued)

Building 101

	Material Cost	Labor Cost	Equipment Usage	Overhead Cost	Total Cost
C. Pipe, Valves, and Fittings					
1. Service piping (carbon steel)					
a. Cell A	$ 4,094	$ 3,468	$ 202	$ 3,218	$ 10,982
b. Cell B	5,961	5,050	294	4,685	15,990
c. Cell C	11,546	9,781	569	9,073	30,969
d. Cell D	11,546	9,781	569	9,073	30,969
e. Cell E	1,883	1,595	93	1,479	5,050
f. Cell F	1,883	1,595	93	1,479	5,050
g. Cell G	1,883	1,595	93	1,479	5,050
h. Cell H	1,883	1,595	93	1,479	5,050
i. Cell J	9,695	8,213	477	7,619	26,004
j. Cell K	2,981	2,525	147	2,342	7,995
k. Cell L	2,604	2,206	128	2,046	6,984
l. Cell M	2,604	2,206	128	2,046	6,984
m. Cell N	20,488	17,356	1,009	16,100	54,953
n. Cell P	5,224	4,425	257	4,105	14,011
o. Cell Q	7,075	5,993	348	5,560	18,976
p. Cell R	1,883	1,595	93	1,479	5,050
q. Cell S	5,224	4,425	257	4,105	14,011
r. Cell T	1,412	1,196	70	1,110	3,788
s. Cell U	10,448	8,851	515	8,210	28,024
t. Cell W	9,318	7,894	459	7,323	24,994
u. Cell X	2,243	1,900	110	1,763	6,016
v. Cell Y	7,075	5,993	348	5,560	18,976
w. Cell Z	3,734	3,163	183	2,934	10,014
x. Cell WA	753	638	37	592	2,020
y. Cell WF	753	638	37	592	2,020
z. PM Area	19,701	16,689	970	15,485	52,845
aa. IC Area (Building 102)	2,981	2,525	147	2,342	7,995
Subtotal	$156,875	$132,891	$7,726	$123,278	$420,770

Table 5 (continued)

Building 101

	Material Cost	Labor Cost	Equipment Usage	Overhead Cost	Total Cost
2. Sleeves, pipe (stainless steel)					
a. Cell A	$ 3,269	$ 2,733	$ 241	$ 2,662	$ 8,905
b. Cell B	4,757	3,976	343	3,870	12,946
c. Cell C	9,218	7,706	671	7,502	25,097
d. Cell D	9,218	7,706	671	7,502	25,097
e. Cell E	1,192	997	86	970	3,245
f. Cell F	1,192	997	86	970	3,245
g. Cell G	1,192	997	86	970	3,245
h. Cell H	1,192	997	86	970	3,245
i. Cell J	7,731	6,463	562	6,291	21,047
j. Cell K	2,385	1,994	173	1,941	6,493
k. Cell L	2,077	1,736	151	1,690	5,654
l. Cell M	2,077	1,736	151	1,690	5,654
m. Cell N	16,360	13,676	1,190	13,313	44,539
n. Cell P	4,167	3,483	302	3,390	11,342
o. Cell Q	5,654	4,727	411	4,601	15,393
p. Cell R	1,487	1,243	109	1,210	4,049
q. Cell S	4,167	3,483	302	3,390	11,342
r. Cell T	1,192	997	86	970	3,245
s. Cell U	8,334	6,967	606	6,782	22,689
t. Cell W	7,436	6,216	541	6,051	20,244
u. Cell X	1,192	997	86	970	3,245
v. Cell Y	5,654	4,727	411	4,601	15,393
w. Cell Z	2,975	2,486	216	2,420	8,097
x. Cell WA	897	750	44	721	2,412
y. Cell WF	897	750	44	721	2,412
z. PM Area	15,770	13,183	1,146	12,833	42,932
aa. PA Area	1,782	1,490	130	1,450	4,852
ab. LC Area (Building 102)	2,385	1,994	173	1,941	6,493
ac. Acid unloading facility	295	247	21	240	803
ad. High vacuum facility	590	493	44	480	1,607
ae. Sampling stations, 11	1,476	1,234	110	1,202	4,022
Subtotal	$128,210	$107,181	$9,279	$104,314	$348,984

Table 5 (continued)

Building 101

	Material Cost	Labor Cost	Equipment Usage	Overhead Cost	Total Cost
3. Process, pipe (stainless steel)					
a. Cell A	$ 12,629	$ 11,430	$ 905	$ 11,115	$ 36,079
b. Cell B	19,436	17,592	1,393	17,106	55,527
c. Cell C	35,469	32,103	2,541	31,217	101,330
d. Cell D	35,469	32,103	2,541	31,217	101,330
e. Cell E	0	0	0	0	0
f. Cell F	0	0	0	0	0
g. Cell G	0	0	0	0	0
h. Cell H	0	0	0	0	0
i. Cell J	29,746	26,924	2,131	26,180	84,981
j. Cell K	9,175	8,305	657	8,075	26,212
k. Cell L	0	0	0	0	0
l. Cell M	0	0	0	0	0
m. Cell N	62,946	56,973	4,510	55,400	179,829
n. Cell P	26,342	23,843	1,888	23,185	75,258
o. Cell Q	29,746	26,924	2,131	26,180	84,981
p. Cell R	0	0	0	0	0
q. Cell S	22,889	20,717	1,640	20,145	65,391
r. Cell T	5,722	5,179	410	5,036	16,347
s. Cell U	32,065	29,022	2,298	28,221	91,606
t. Cell W	30,881	27,951	2,213	27,179	88,224
u. Cell X	0	0	0	0	0
v. Cell Y	21,755	19,690	1,559	19,147	62,151
w. Cell Z	11,445	10,359	820	10,073	32,697
x. Cell WA	4,588	4,152	329	4,038	13,107
y. Cell WF	4,588	4,152	329	4,038	13,107
z. PM Area	67,532	61,127	4,839	59,438	192,936
aa. PA Area	6,857	6,206	491	6,035	19,589
ab. LC Area (Building 102)	11,445	10,359	820	10,073	32,697
ac. Acid unloading facility	2,269	2,054	163	1,997	6,483
ad. High vacuum facility	4,588	4,152	329	4,038	13,107
ac. Sampling stations, 11	5,722	5,179	410	5,034	16,345
Subtotal	493,304	446,496	35,347	434,167	1,409,314
4. Air collection system, pipe (stainless steel)					
a. Dissolver off-gas	8,222	7,442	589	7,236	23,489
b. Sampler off-gas	21,925	19,844	1,571	19,296	62,636
c. Vessel off-gas	24,665	22,325	1,767	21,709	70,466
Subtotal	$ 54,812	$ 49,611	$ 3,927	$ 48,241	$ 156,591

Table 5 (continued)

Building 101

	Material Cost	Labor Cost	Equipment Usage	Overhead Cost	Total Cost
5. Drain system, pipe					
a. 2 vent tunnels, 6 headers (cast iron)	$ 347	$ 417	$ 49	$ 249	$ 1,062
b. 2 sample corridors, 6 headers (cast iron)	347	417	49	249	1,062
c. 1 service corridor, 1 header (cast iron)	57	69	8	42	176
Subtotal, 13 headers	751	903	106	540	2,300
d. Cell A, 3 (stainless steel) headers	2,624	3,154	372	1,889	8,039
Cell B, 3 (stainless steel) headers	2,624	3,154	372	1,889	8,039
Cell C, 3 (stainless steel) headers	2,624	3,154	372	1,889	8,039
Cell D, 3 (stainless steel) headers	2,624	3,154	372	1,889	8,039
Cell E, 3 (stainless steel) headers	2,624	3,154	372	1,889	8,039
Cell F, 3 (stainless steel) headers	2,624	3,154	372	1,889	8,039
Cell G, 3 (stainless steel) headers	2,624	3,154	372	1,889	8,039
Cell H, 3 (stainless steel) headers	2,624	3,154	372	1,889	8,039
Cell J, 3 (stainless steel) headers	2,624	3,154	372	1,889	8,039
Cell K, 3 (stainless steel) headers	2,624	3,154	372	1,889	8,039
Cell L, 3 (stainless steel) headers	2,624	3,154	372	1,889	8,039
Cell M, 3 (stainless steel) headers	2,624	3,154	372	1,889	8,039
Cell N, 6 (stainless steel) headers	5,248	6,309	744	3,777	16,078
Cell P, 3 (stainless steel) headers	2,624	3,154	372	1,889	8,039
Cell Q, 2 (stainless steel) headers	1,749	2,102	248	1,258	5,357
Cell R, 1 (stainless steel) headers	874	1,051	124	629	2,678
Cell S, 2 (stainless steel) headers	1,749	2,102	248	1,258	5,357
Cell T, 1 (stainless steel) headers	874	1,051	124	629	2,678
Cell U, 3 (stainless steel) headers	2,624	3,154	372	1,889	8,039
Cell V, 1 (stainless steel) headers	874	1,051	124	629	2,678
Cell W, 3 (stainless steel) headers	2,624	3,154	372	1,889	8,039
Cell X, 4 (stainless steel) headers	3,495	4,202	495	2,515	10,707
Cell Y, 3 (stainless steel) headers	2,624	3,154	372	1,889	8,039
Cell Z, 1 (stainless steel) headers	874	1,051	124	629	2,678
e. High Vacuum Area, 2 (stainless steel)	1,749	2,102	248	1,258	5,357
f. Service corridor, 3 (stainless steel)	2,624	3,154	372	1,889	8,039
g. Access corridor, 11 (stainless steel)	9,637	11,588	1,361	6,936	29,522
h. LC Area (Building 102), 3 (stainless steel)	2,624	3,154	372	1,889	8,039
Subtotal, 85 headers	74,355	89,381	10,536	53,520	227,792
Subtotal, Item 5	75,106	90,284	10,642	54,060	230,092
Subtotal, Item C	$908,307	$826,463	$66,921	$764,060	$2,565,751

Table 5 (continued)

Building 101

	Material Cost	Labor Cost	Equipment Usage	Overhead Cost	Total Cost
D. Electric Power					
1. Process equipment					
a. Cell B, 1 Lapp pump	$ 479	$ 623	$ 33	$ 474	$ 1,609
b. Cell C, 5 agitators	2,388	3,103	166	2,364	8,021
c. Cell D, 5 agitators	2,388	3,103	166	2,364	8,021
d. Cell K, 3 agitators	1,433	1,863	100	1,419	4,815
e. Cell P, 9 pumps	4,297	5,584	299	4,254	14,434
f. Cell Q, 7 pumps	3,342	4,344	233	3,309	11,228
g. Cell S, 6 pumps	2,867	3,726	200	2,838	9,631
h. Cell T, 1 pump	479	623	33	474	1,609
i. Cell W, 2 pumps	954	1,240	66	944	3,204
j. Cell X, 2 blowers	954	1,240	66	944	3,204
k. Cell WA, 2 pumps and 2 agitators	1,909	2,481	133	1,890	6,413
l. Cell WF, 2 pumps and 2 agitators	1,909	2,481	133	1,890	6,413
m. Acid unloading facility, 1 pump	479	623	33	474	1,609
n. High vacuum facility, 2 pumps	954	1,240	66	944	3,204
o. Air collection system, 2 blowers	954	1,240	66	944	3,204
p. LC Area, 2 pumps*	954	1,240	66	944	3,204
q. PM Area, 9 pumps and 11 agitators	9,549	12,409	667	9,456	32,081
Subtotal (1)	36,289	47,163	2,526	35,926	121,904
2. Telephone and alarm system	4,485	5,829	312	4,441	15,067
Subtotal (2)	4,485	5,829	312	4,441	15,067
Subtotal, Item D	$40,774	$52,992	$2,838	$40,367	$136,971

*Physical location in Building 102.

Table 5 (continued)

Building 101

	Fabrication and Freight Cost	Packings, etc. Cost	Pounds Total Weight	Vessel Materials Cost	Fabrication and Materials Cost	Labor for Installation Cost	Equipment Usage	Overhead Cost	Total Installed Cost
E. Process Equipment									
1. Vessels (Cell A)									
a. A-101	$ 1,207	$15	50	$ 66	$ 1,273	$ 138	$ 16	$ 322	$ 1,749
b. A-102	257	0	66	87	359	183	21	425	988
c. A-103	519	0	20	26	545	55	7	128	735
d. A-104	1,315	0	80	107	1,422	222	26	515	2,185
e. A-105	605	0	25	33	638	72	8	163	881
f. A-106	257	15	66	87	359	183	21	425	988
g. A-108	250	15	66	87	352	183	21	425	981
h. A-151	1,207	0	50	66	1,273	138	16	322	1,749
i. A-300	811	0	110	146	957	305	35	709	2,006
j. A-301	702	0	50	66	768	138	16	322	1,244
k. A-350	811	0	110	146	957	305	35	709	2,006
Subtotal	7,941	45	693	917	8,903	1,922	222	4,465	15,512
2. Vessels (Cell B)									
a. B-100	182	0	113	149	331	221	25	211	788
b. B-101	356	0	90	119	475	176	20	303	974
c. B-102	182	0	83	110	292	162	19	186	659
d. B-103	182	0	83	110	292	162	19	186	659
e. B-104	182	0	90	119	301	176	20	192	689
f. B-105	182	0	90	119	301	176	20	192	689
g. B-106	182	0	90	119	301	176	20	192	689
h. B-107	182	0	88	117	299	170	19	190	678
i. B-110	375	0	113	149	524	220	25	334	1,103
j. B-111	199	0	90	119	318	176	20	203	717
k. B-112	199	0	83	110	309	162	19	196	686
l. B-113	199	0	83	110	309	162	19	197	687
m. B-114	199	0	83	110	309	162	19	197	687
n. B-115	199	0	83	110	309	162	19	197	687
o. B-116	199	0	83	110	309	162	19	197	687
p. B-117	307	0	88	116	423	170	20	270	883
Subtotal	$ 3,506	$ 0	1,433	$1,896	$ 5,402	$2,795	$322	$3,443	$11,962

Table 5 (continued)

Building 101

	Fabrication and Freight Cost	Packings, etc. Cost	Pounds Total Weight	Vessel Materials Cost	Fabrication and Materials Cost	Labor for Installation Cost	Equipment Usage	Overhead Cost	Total Installed Cost
3. Vessels (Cell C)									
a. C-101	$ 2,007	$ 0	2,000	$ 2,646	$ 4,653	$ 623	$ 72	$ 2,077	$ 7,425
b. C-102	1,754	0	1,000	1,323	3,077	311	36	1,375	4,799
c. C-103	1,563	0	626	829	2,392	195	22	1,068	3,677
d. C-104	1,632	0	626	829	2,461	195	22	1,099	3,777
e. C-105	1,258	0	650	860	2,118	203	23	945	3,289
f. C-106	1,438	0	1,100	1,455	2,893	343	40	1,291	4,567
g. C-107	1,270	0	610	807	2,077	192	22	927	3,218
h. C-108	846	0	150	198	1,044	47	5	466	1,562
i. C-109	1,367	0	550	728	2,095	171	20	935	3,221
j. C-110	257	15	66	87	359	21	2	161	543
k. C-111	257	15	66	87	359	21	2	161	543
l. C-114	148	15	66	87	250	21	2	113	386
m. C-151	2,006	0	2,000	2,646	4,652	623	72	2,077	7,424
n. C-152	1,754	0	1,000	1,323	3,077	311	36	1,376	4,800
o. C-153	1,563	0	626	829	2,392	195	22	1,068	3,677
p. C-154	1,632	0	626	829	2,461	195	23	1,099	3,778
q. C-155	1,258	0	650	860	2,118	203	23	945	3,289
r. C-156	1,438	0	1,100	1,455	2,893	343	38	1,293	4,567
s. C-160	257	15	66	87	359	21	2	161	543
t. C-164	148	15	66	87	250	21	2	113	386
u. C-300	2,850	0	1,130	1,495	4,345	351	41	1,939	6,676
v. C-301	1,032	0	345	456	1,488	107	12	666	2,273
w. C-302	1,032	0	345	456	1,488	107	12	666	2,273
x. C-350	2,850	0	1,130	1,495	4,345	351	41	1,939	6,676
y. C-351	1,032	0	345	456	1,488	107	12	666	2,273
z. C-352	1,032	0	345	456	1,488	107	12	666	2,273
aa. C-812	142	0	--	--	142*	6	1	64	213
ab. C-816	142	0	--	--	142*	6	1	64	213
ac. C-819	142	0	--	--	142*	6	1	64	213
ad. C-862	142	0	--	--	142*	6	1	64	213
ae. C-866	141	0	--	--	141*	6	1	64	212
Subtotal	$34,390	$75	17,284	$22,866	$57,331	$5,415	$621	$25,612	$88,979

*Purchased complete.

Table 5 (continued)

Building 101

	Fabrication and Freight Cost	Packings, etc. Cost	Pounds Total Weight	Vessel Materials Cost	Fabrication and Materials Cost	Labor for Installation Cost	Equipment Usage	Overhead Cost	Total Installed Cost
4. Vessels (Cell D)									
a. D-101	$ 2,006	$ 0	2,000	$ 2,646	$ 4,652	$ 623	$ 72	$ 2,078	$ 7,425
b. D-102	1,754	0	1,000	1,323	3,077	311	36	1,375	4,799
c. D-103	1,563	0	626	829	2,392	195	22	1,068	3,677
d. D-104	1,632	0	626	829	2,461	195	22	1,099	3,777
e. D-105	1,258	0	650	860	2,118	203	23	945	3,289
f. D-106	1,438	0	1,100	1,455	2,893	343	40	1,292	4,568
g. D-107	1,270	0	610	807	2,077	192	22	927	3,218
h. D-108	846	0	150	198	1,044	47	5	466	1,562
i. D-109	1,367	0	550	728	2,095	171	20	934	3,220
j. D-110	257	15	66	87	359	21	2	160	542
k. D-111	257	15	66	87	359	21	2	160	542
l. D-114	478	15	66	87	580	21	2	257	860
m. D-151	2,006	0	2,000	2,646	4,652	623	72	2,078	7,425
n. D-152	1,754	0	1,000	1,323	3,077	311	36	1,375	4,799
o. D-153	1,563	0	626	829	2,392	195	22	1,068	3,677
p. D-154	1,632	0	626	829	2,461	195	23	1,099	3,778
q. D-155	1,258	0	650	860	2,118	203	23	945	3,289
r. D-156	1,438	0	1,100	1,455	2,893	343	38	1,292	4,566
s. D-160	257	15	66	87	359	21	2	160	542
t. D-164	141	15	66	87	243	21	2	108	374
u. D-300	2,850	0	1,130	1,495	4,345	351	41	1,941	6,678
v. D-301	1,032	0	345	456	1,488	107	12	664	2,271
w. D-302	1,032	0	345	456	1,488	107	12	664	2,271
x. D-350	2,850	0	1,130	1,495	4,345	351	41	1,941	6,678
y. D-351	1,032	0	345	456	1,488	107	12	664	2,271
z. D-352	1,032	0	345	456	1,488	107	12	664	2,271
aa. D-812	142	0	--	--	142*	6	1	64	213
ab. D-816	142	0	--	--	142*	6	1	64	213
ac. D-819	142	0	--	--	142*	6	1	64	213
ad. D-862	142	0	--	--	142*	6	1	64	213
ae. D-866	141	0	--	--	141*	6	1	62	210
Subtotal	$34,712	$75	17,284	$22,866	$57,653	$5,415	$621	$25,742	$89,431

*Purchased complete.

Table 5 (continued)

Building 101

	Fabrication and Freight Cost	Packings, etc. Cost	Pounds Total Weight	Vessel Materials Cost	Fabrication and Materials Cost	Labor for Installation Cost	Equipment Usage	Overhead Cost	Total Installed Cost
5. Vessels (Cell E)									
a. E-101	$ 2,006	$ 0	2,000	$ 2,646	$ 4,652	$ 0	$ 0	$ 1,882	$ 6,534
b. E-102	1,754	0	1,000	1,323	3,077	0	0	1,244	4,321
c. E-103	1,563	0	626	829	2,392	0	0	967	3,359
d. E-104	1,632	0	626	829	2,461	0	0	995	3,456
e. E-105	1,258	0	650	860	2,118	0	0	855	2,973
f. E-106	1,438	0	1,100	1,455	2,893	0	0	1,170	4,063
g. E-107	1,270	0	610	807	2,077	0	0	839	2,916
h. E-108	846	0	150	198	1,044	0	0	422	1,466
i. E-109	1,367	0	550	728	2,095	0	0	846	2,941
j. E-110	257	15	66	87	359	0	0	144	503
k. E-111	257	15	66	87	359	0	0	144	503
l. E-114	478	15	66	87	580	0	0	233	813
m. E-151	2,006	0	2,000	2,646	4,652	0	0	1,882	6,534
n. E-152	1,754	0	1,000	1,323	3,077	0	0	1,244	4,321
o. E-153	1,563	0	626	829	2,392	0	0	967	3,359
p. E-154	1,632	0	626	829	2,461	0	0	995	3,456
q. E-155	1,258	0	650	860	2,118	0	0	855	2,973
r. E-156	1,438	0	1,100	1,455	2,893	0	0	1,170	4,063
s. E-160	257	15	66	87	359	0	0	144	503
t. E-164	141	15	66	87	243	0	0	99	342
u. E-300	2,850	0	1,130	1,495	4,345	0	0	1,757	6,102
v. E-301	1,032	0	345	456	1,488	0	0	601	2,089
w. E-302	1,032	0	345	456	1,488	0	0	601	2,089
x. E-350	2,850	0	1,130	1,495	4,345	0	0	1,757	6,102
y. E-351	1,032	0	345	456	1,488	0	0	601	2,089
z. E-352	1,032	0	345	456	1,488	0	0	601	2,089
aa. E-812	142	0	--	--	142*	0	0	58	200
ab. E-816	142	0	--	--	142*	0	0	58	200
ac. E-819	142	0	--	--	142*	0	0	58	200
ad. E-862	142	0	--	--	142*	0	0	58	200
ae. E-866	141	0	--	--	141*	0	0	56	197
Subtotal	$34,712	$75	17,284	$22,866	$57,653	$ 0	$ 0	$23,303	$80,956

*Purchased complete.

Table 5 (continued)

Building 101

	Fabrication and Freight Costs	Packings, etc. Cost	Pounds Total Weight	Vessel Material Cost	Fabrication and Material Cost	Labor for Installation Cost	Equipment Usage	Overhead Cost	Total Installed Cost
6. Vessels (Cell J)									
a. J-100	$ 179	$ 0	178	$ 234	$ 413	$ 109	$ 12	$ 199	$ 733
b. J-101	179	0	178	234	413	109	12	199	733
c. J-102	303	0	220	289	592	134	15	284	1,025
d. J-103	237	0	185	243	480	113	14	230	837
e. J-104	237	0	185	243	480	113	14	230	837
f. J-105	303	0	220	289	592	134	15	284	1,025
g. J-106	179	0	178	234	413	109	12	199	733
h. J-107	179	0	178	234	413	109	12	199	733
i. J-108	179	0	178	234	413	109	12	199	733
j. J-109	179	0	178	234	413	109	12	199	733
k. J-110	179	0	178	234	413	109	12	199	733
l. J-111	179	0	178	234	413	109	12	199	733
m. J-112	179	0	178	234	413	109	12	199	733
n. J-113	1,140	211	550	723	2,074	336	39	996	3,445
o. J-115	1,449	217	185	243	1,909	113	14	917	2,953
p. J-116	1,594	0	800	1,051	2,645	487	56	1,271	4,459
q. J-117	1,140	0	550	723	1,863	336	39	895	3,133
r. J-118	179	0	178	234	413	109	12	199	733
s. J-119	303	0	220	289	592	134	15	284	1,025
t. J-120	237	0	185	243	480	113	14	230	837
u. J-123	893	211	130	171	1,275	79	9	612	1,975
v. J-130	3,745	0	1,160	1,524	5,269	704	82	2,527	8,582
w. J-300	937	0	345	453	1,390	210	24	668	2,292
x. J-301	937	0	340	447	1,384	208	24	664	2,280
y. J-302	937	0	340	447	1,384	208	24	664	2,280
z. J-114	298	0	49	65	363	30	3	174	570
Subtotal	$16,480	$639	7,444	$9,783	$26,902	$4,542	$521	$12,920	$44,885

Table 5 (continued)

Building 101

	Fabrication and Freight Costs	Packings, etc. Cost	Pounds Total Weight	Vessel Material Cost	Fabrication and Material Cost	Labor for Installation Cost	Equipment Usage	Overhead Cost	Total Installed Cost
7. Vessels (Cell K)									
a. K-100	$ 979	$ 0	550	$ 728	$ 1,707	$ 155	$ 19	$ 738	$ 2,619
b. K-101	884	0	500	661	1,545	141	17	666	2,369
c. K-102	349	0	30	40	389	9	1	168	567
d. K-103	349	0	30	40	389	9	1	168	567
e. K-104	9,547	0	2,100	2,778	12,325	590	73	5,333	18,321
f. K-105	884	0	500	661	1,545	141	17	666	2,369
g. K-106	490	0	550	728	1,218	155	19	527	1,919
h. K-300	2,392	0	700	926	3,318	197	22	1,435	4,972
Subtotal	15,874	0	4,960	6,562	22,436	1,397	169	9,701	33,703
8. Vessels (Cell N)									
a. N-100	182	0	255	337	519	196	23	291	1,029
b. N-101	298	0	240	316	614	185	21	344	1,164
c. N-102	276	0	240	316	592	185	21	332	1,130
d. N-103	182	0	240	316	498	185	21	279	983
e. N-104	182	0	240	316	498	185	21	279	983
f. N-105	182	0	240	316	498	185	21	279	983
g. N-106	182	0	240	316	498	185	21	279	983
h. N-107	182	0	254	336	518	195	22	290	1,025
i. N-110	182	0	255	337	519	196	23	291	1,029
j. N-111	298	0	240	316	614	185	21	344	1,164
k. N-112	276	0	240	316	592	185	21	332	1,130
l. N-113	182	0	240	316	498	185	21	279	983
m. N-114	182	0	240	316	498	185	21	279	983
n. N-115	182	0	240	316	498	185	21	279	983
o. N-116	182	0	240	316	498	185	21	279	983
p. N-117	182	0	254	336	518	195	22	290	1,025
q. N-118	149	0	120	159	308	92	11	173	584
r. N-120	182	0	255	337	519	196	23	291	1,029
s. N-121	298	0	240	316	614	185	21	344	1,164
t. N-122	276	0	240	316	592	185	21	332	1,130
u. N-123	182	0	240	316	498	185	21	279	983

Table 5 (continued)

Building 101

	Fabrication and Freight Costs	Packings, etc. Cost	Pounds Total Weight	Vessel Material Cost	Fabrication and Material Cost	Labor for Installation Cost	Equipment Usage	Overhead Cost	Total Installed Cost
8. Vessels (Cell N)(contd)									
v. N-124	$ 182	$ 0	240	$ 316	$ 498	$ 185	$ 21	$ 279	$ 983
w. N-125	182	0	240	316	498	185	21	279	983
x. N-126	182	0	240	316	498	185	21	279	983
y. N-127	182	0	254	336	518	195	22	290	1,025
z. N-128	149	0	120	159	308	92	11	173	584
aa. N-130	182	0	255	337	519	196	23	291	1,029
ab. N-131	298	0	240	316	614	185	21	344	1,164
ac. N-132	276	0	240	316	592	185	21	332	1,130
ad. N-133	182	0	240	316	498	185	21	279	983
ae. N-134	182	0	240	316	498	185	21	279	983
af. N-135	182	0	240	316	498	185	21	279	983
ag. N-136	182	0	240	316	498	185	21	279	983
ah. N-137	182	0	254	336	518	195	22	290	1,025
ai. N-138	149	0	120	159	308	92	11	173	584
aj. N-140	182	0	255	337	519	196	23	291	1,029
ak. N-141	298	0	240	316	614	185	21	344	1,164
al. N-142	276	0	240	316	592	185	21	332	1,130
am. N-143	182	0	240	316	498	185	21	279	983
an. N-144	182	0	240	316	498	185	21	279	983
ao. N-145	182	0	240	316	498	185	21	279	983
ap. N-146	182	0	240	316	498	185	21	279	983
aq. N-147	182	0	254	336	518	195	22	290	1,025
ar. N-148	149	0	120	159	308	92	11	173	584
as. N-150	182	0	255	337	519	196	23	291	1,029
at. N-151	298	0	240	316	614	185	21	344	1,164
au. N-152	276	0	240	316	592	185	21	332	1,130
av. N-153	182	0	240	316	498	185	21	279	983
aw. N-154	182	0	240	316	498	185	21	279	983
ax. N-155	182	0	240	316	498	185	21	279	983
ay. N-156	182	0	240	316	498	185	21	279	983
az. N-157	182	0	254	336	518	195	22	290	1,025
ba. N-158	149	0	120	159	308	92	11	173	584
bb. N-170	319	15	66	89	423	50	11	242	726
bc. N-108	149	0	120	159	308	92	11	173	584
Subtotal	$11,209	$ 15	12,440	$16,457	$27,681	$9,608	$1,103	$15,518	$53,910

Table 5 (continued)

Building 101

	Fabrication and Freight Costs	Packings, etc. Cost	Pounds Total Weight	Vessel Material Cost	Fabrication and Material Cost	Labor for Installation Cost	Equipment Usage	Overhead Cost	Total Installed Cost
9. Vessels (Cell P)									
a. P-100	$ 282	$ 0	22	$ 29	$ 311	$ 29	$ 3	$ 153	$ 496
b. P-101	237	0	151	200	437	200	23	215	875
c. P-102	1,341	1,150	525	695	3,186	696	81	1,568	5,531
d. P-103	223	0	23	30	253	31	4	124	412
e. P-104	217	211	18	24	452	24	3	222	701
f. P-105	223	0	23	30	253	31	4	124	412
g. P-106	1,144	1,362	385	509	3,015	510	56	1,505	5,086
h. P-107	217	0	18	24	241	24	3	96	364
i. P-108	286	0	23	30	316	31	4	155	506
j. P-109	284	0	23	30	314	31	4	154	503
k. P-110	1,192	217	160	212	1,621	212	25	798	2,656
l. P-111	257	15	66	87	359	86	10	177	632
m. P-115	228	0	63	83	311	83	10	153	557
n. P-301	1,033	0	345	458	1,491	457	53	735	2,736
Subtotal	7,164	2,955	1,845	2,441	12,560	2,445	283	6,179	21,467
10. Vessels (Cell Q)									
a. Q-100	224	0	21	28	252	48	6	130	436
b. Q-101	192	0	80	106	298	183	21	153	655
c. Q-102	889	289	140	185	1,363	321	37	703	2,424
d. Q-103	210	0	23	30	240	53	6	123	422
e. Q-104	217	0	18	24	241	41	5	124	411
f. Q-105	210	0	23	30	240	53	6	123	422
g. Q-106	798	290	105	139	1,227	240	28	632	2,127
h. Q-107	217	0	18	24	241	41	5	124	411
i. Q-108	210	0	23	30	240	53	6	123	422
j. Q-109	207	0	23	30	237	53	6	122	418
k. Q-110	1,089	217	65	86	1,392	149	17	717	2,275
l. Q-111	257	15	66	87	359	151	17	185	712
m. Q-114	1,204	217	75	99	1,520	172	20	784	2,496
n. Q-115	1,184	217	160	212	1,613	366	42	832	2,853
o. Q-116	446	0	115	152	598	263	30	308	1,199
p. Q-117	589	0	55	73	662	126	15	341	1,144
q. Q-301	607	0	50	66	673	115	13	347	1,148
r. Q-302	607	0	50	66	673	115	13	347	1,148
s. Q-303	937	0	340	451	1,388	776	90	717	2,971
Subtotal	$10,294	$1,245	1,450	$1,918	$13,457	$3,319	$383	$6,935	$24,094

Table 5 (continued)

Building 101

	Fabrication and Freight Costs	Packings, etc. Cost	Pounds Total Weight	Vessel Material Cost	Fabrication and Material Cost	Labor for Installation Cost	Equipment Usage	Overhead Cost	Total Installed Cost
11. Vessels (Cell S)									
a. S-100	$ 224	$ 0	21	$ 28	$ 252	$ 75	$ 9	$ 135	$ 471
b. S-101	192	0	80	106	298	286	33	160	777
c. S-102	889	290	140	185	1,364	505	58	731	2,658
d. S-103	223	0	23	30	253	82	10	136	481
e. S-104	217	0	18	24	241	64	7	129	441
f. S-105	223	0	23	30	253	82	10	129	474
g. S-106	798	290	105	139	1,227	370	42	657	2,296
h. S-107	217	0	18	24	241	64	7	129	441
i. S-108	223	0	23	30	253	82	10	136	481
j. S-109	223	0	23	30	253	82	10	136	481
k. S-110	1,089	217	65	86	1,392	232	27	753	2,404
l. S-111	257	15	66	87	359	236	27	192	814
m. S-114	1,300	0	--	--	1,300*	107	12	697	2,116
n. S-301	608	0	50	68	676	178	21	362	1,237
Subtotal	6,683	812	655	867	8,362	2,445	283	4,482	15,572
12. Vessels (Cell T)									
a. T-100	1,551	0	900	1,191	2,742	279	36	1,230	4,287
b. T-101	974	0	550	728	1,702	171	22	763	2,658
c. T-102	829	0	400	529	1,358	124	17	610	2,109
d. T-103	829	0	400	529	1,358	124	17	610	2,109
Subtotal	4,183	0	2,250	2,977	7,160	698	92	3,213	11,163
13. Vessels (Cell Z)									
a. Z-101	476	0	195	258	734	188	20	379	1,321
b. Z-102	476	0	195	258	734	188	20	379	1,321
c. Z-103	476	0	195	258	734	188	20	379	1,321
d. Z-104	476	0	195	258	734	188	20	379	1,321
e. Z-105	476	0	195	258	734	188	20	379	1,321
f. Z-106	476	0	195	258	734	188	20	379	1,321
g. Z-107	476	0	195	258	734	188	20	379	1,321
h. Z-108	476	0	195	258	734	188	20	379	1,321
i. Z-109	476	0	195	258	734	188	20	379	1,321
j. Z-120	253	15	66	87	355	63	10	189	617
Subtotal	$4,537	$ 15	1,821	$2,409	$6,961	$1,755	$190	$3,600	$12,506

*Purchased complete.

Table 5 (continued)

Building 101

	Fabrication and Freight Cost	Packings, etc. Cost	Pounds Total Weight	Vessel Material Cost	Fabrication and Material Cost	Labor for Installation Cost	Equipment Usage	Overhead Cost	Total Installed Cost
14. Vessels (Cell U)									
a. U-101	$ 173	$ 0	248	$ 328	$ 501	$ 129	$ 16	$ 245	$ 891
b. U-102	309	0	203	269	578	105	12	281	976
c. U-103	173	0	203	269	442	105	12	216	775
d. U-104	173	0	203	269	442	105	12	216	775
e. U-105	173	0	203	269	442	105	12	216	775
f. U-106	173	0	203	269	442	105	12	216	775
g. U-107	173	0	203	269	442	105	12	216	775
h. U-108	246	0	210	278	524	109	12	258	903
i. U-111	173	0	248	328	501	129	16	245	891
j. U-112	309	0	203	269	578	105	12	281	976
k. U-113	173	0	203	269	442	105	12	216	775
l. U-114	173	0	203	269	442	105	12	216	775
m. U-115	173	0	203	269	442	105	12	216	775
n. U-116	173	0	203	269	442	105	12	216	775
o. U-117	173	0	203	269	442	105	12	216	775
p. U-118	246	0	210	278	524	109	12	258	903
q. U-121	173	0	248	328	501	129	16	245	891
r. U-122	309	0	203	269	578	105	12	281	976
s. U-123	173	0	203	269	442	105	12	216	775
t. U-124	173	0	203	269	442	105	12	216	775
u. U-125	173	0	203	269	442	105	12	216	775
v. U-126	173	0	203	269	442	105	12	216	775
w. U-127	173	0	203	269	442	105	12	216	775
x. U-128	246	0	210	278	524	109	12	258	903
y. U-129	3,192	200	1,725	2,280*	5,672	895	102	2,769	9,438
z. U-130	3,192	200	1,725	2,280*	5,672	895	102	2,769	9,438
aa. U-300	1,086	0	480	633	1,719	249	28	836	2,832
ab. U-301	1,086	0	480	633	1,719	249	28	836	2,832
Subtotal	13,335	400	9,438	12,486	26,221	4,892	560	12,802	44,475
15. Vessels (PA Area)									
a. PA-207	225	6	41	54	285	178	22	195	680
b. PA-208	226	6	41	54	286	178	21	195	680
c. PA-701	233	0	40	53	286	173	20	194	673
d. PA-703	233	0	40	53	286	173	20	194	673
e. PA-705	233	0	40	53	286	173	20	194	673
f. PA-711	233	0	40	53	286	173	20	194	673
Subtotal	$ 1,383	$ 12	242	$ 320	$ 1,715	$1,048	$123	$ 1,166	$ 4,052

*Includes $200 for extra head.

Table 5 (continued)

Building 101

	Fabrication and Freight Cost	Packings, etc. Cost	Pounds Total Weight	Vessel Material Cost	Fabrication and Material Cost	Labor for Installation Cost	Equipment Usage	Overhead Cost	Total Installed Cost
16. Vessels (Cell W)									
a. W-101	$ 173	$ 0	236	$ 313	$ 486	$ 154	$ 19	$ 258	$ 917
b. W-102	308	0	203	268	576	131	15	306	1,028
c. W-103	173	0	203	268	441	131	15	234	821
d. W-104	173	0	203	268	441	131	15	234	821
e. W-105	173	0	203	268	441	131	15	234	821
f. W-106	173	0	203	268	441	131	15	234	821
g. W-107	173	0	203	268	441	131	15	234	821
h. W-108	246	0	210	279	525	137	16	278	956
i. W-111	173	0	236	313	486	154	19	258	917
j. W-112	308	0	203	268	576	131	15	306	1,028
k. W-113	173	0	203	268	441	131	15	234	821
l. W-114	173	0	203	268	441	131	15	234	821
m. W-115	173	0	203	268	441	131	15	234	821
n. W-116	173	0	203	268	441	131	15	234	821
o. W-117	173	0	203	268	441	131	15	234	821
p. W-118	246	0	210	279	525	137	16	278	956
q. W-121	173	0	236	313	486	154	19	258	917
r. W-122	308	0	203	268	576	131	15	306	1,028
s. W-123	173	0	203	268	441	131	15	234	821
t. W-124	173	0	203	268	441	131	15	234	821
u. W-125	173	0	203	268	441	131	15	234	821
v. W-126	173	0	203	268	441	131	15	234	821
w. W-127	173	0	203	268	441	131	15	234	821
x. W-128	246	0	210	279	525	137	16	278	956
y. W-129	1,935	0	1,750	2,319	4,254	1,136	131	2,251	7,772
Subtotal	6,711	0	6,742	8,919	15,630	4,367	506	8,287	28,790
17. Vessels (LC Area)									
a. LC-100	294	6	18	24	324	15	2	161	502
b. LC-110	294	6	18	24	324	15	2	161	502
c. LC-120	255	718	57	75	1,048	49	6	521	1,624
d. LC-121	352	0	134	177	529	116	14	263	922
e. LC-122	319	0	130	172	491	112	14	244	861
f. LC-145	825	211	600	794	1,830	519	63	911	3,323
g. LC-155	825	211	600	794	1,830	519	63	911	3,323
h. LC-130	280	45	60	79	404	52	5	201	662
Subtotal	$3,444	$1,197	1,617	$2,139	$ 6,780	$1,397	$169	$3,373	$11,719

Table 5 (continued)

Building 101

	Fabrication and Freight Cost	Packings, etc. Cost	Pounds Total Weight	Vessel Material Cost	Fabrication and Material Cost	Labor for Installation Cost	Equipment Usage	Overhead Cost	Total Installed Cost
18. Vessels (Cell Y)									
a. Y-101	$ 289	$ 0	236	$ 312	$ 601	$ 153	$ 17	$ 307	$ 1,078
b. Y-102	228	0	210	278	506	136	15	258	915
c. Y-103	289	0	236	312	601	153	17	307	1,078
d. Y-104	228	0	210	278	506	136	15	258	915
e. Y-111	289	0	236	312	601	153	17	307	1,078
f. Y-112	228	0	210	278	506	136	15	258	915
g. Y-113	289	0	236	312	601	153	17	307	1,078
h. Y-114	228	0	210	278	506	136	15	258	915
i. Y-121	289	0	236	312	601	153	17	307	1,078
j. Y-122	228	0	210	278	506	136	15	258	915
k. Y-123	289	0	236	312	601	153	17	307	1,078
l. Y-124	228	0	210	278	506	136	15	258	915
m. Y-131	289	0	236	312	601	153	17	307	1,078
n. Y-132	228	0	210	278	506	136	15	258	915
o. Y-133	289	0	236	312	601	153	17	307	1,078
p. Y-134	228	0	210	278	506	136	15	258	915
q. Y-140	1,846	0	950	1,257	3,103	615	71	1,583	5,372
r. Y-150	397	0	255	337	734	166	21	374	1,295
s. Y-300	935	0	340	450	1,385	226	27	706	2,344
Subtotal	7,314	0	5,113	6,764	14,078	3,319	375	7,183	24,955
19. Vessels (portable)									
a. DD-1	2,103	0	--	--	2,103*	0	0	850	2,953
b. DD-2	2,103	0	--	--	2,103*	0	0	850	2,953
c. DD-3	2,103	0	--	--	2,103*	0	0	850	2,953
d. DD-4	2,103	0	--	--	2,103*	0	0	850	2,953
e. DD-5	2,103	0	--	--	2,103*	0	0	850	2,953
f. DD-6	2,105	0	--	--	2,105*	0	0	851	2,956
Subtotal	12,620	0	--	--	12,620	0	0	5,101	17,721
20. Vessels (acid unloading)									
LE-101	$ 1,277	$ 0	--	--	$ 1,277	$ 174	$ 18	$ 594	$ 2,063**

*Purchased complete.
**Vessel of carbon steel.

Table 5 (continued)

Building 101

	Fabrication and Freight Cost	Packings, etc. Cost	Pounds Total Weight	Vessel Material Cost	Fabrication and Material Cost	Labor for Installation Cost	Equipment Usage	Overhead Cost	Total Installed Cost
21. Vessels (vacuum room)									
a. VT-100	$ 1,103	$211	--	$ --	$ 1,314*	$ 175	$ 18	$ 609	$ 2,116
b. VT-101	1,103	211	--	--	1,314*	174	18	609	2,115
Subtotal	2,206	422	--	--	2,628	349	36	1,218	4,231
22. Vessels (PM Area)									
a. PM-100	1,556	0	2,000	2,647	4,203	964	108	1,998	7,273
b. PM-101	132	0	140	185	317	68	8	150	543
c. PM-102	980	0	400	529	1,509	193	22	718	2,442
d. PM-103	980	0	400	529	1,509	193	22	718	2,442
e. PM-104	980	0	400	529	1,509	193	22	718	2,442
f. PM-105	980	0	400	529	1,509	193	22	718	2,442
g. PM-106	980	0	400	529	1,509	193	22	718	2,442
h. PM-107	980	0	400	529	1,509	193	22	718	2,442
i. PM-108	893	0	1,400	1,852	2,745	675	78	1,310	4,808
j. PM-110	945	0	1,400	1,852	2,797	675	78	1,329	4,879
k. PM-111	809	0	1,200	1,587	2,396	579	67	1,141	4,183
l. PM-112	809	0	1,200	1,587	2,396	579	67	1,141	4,183
m. PM-113	821	0	700	926	1,747	337	39	830	2,953
n. PM-114	132	0	120	159	291	57	7	139	494
o. PM-117	932	19	450	595	1,546	217	25	735	2,523
p. PM-119	510	0	450	595	1,105	217	25	525	1,872
q. PM-121	1,254	19	1,700	2,249	3,522	819	94	1,676	6,111
r. PM-123	992	0	800	1,058	2,050	386	44	974	3,454
s. PM-124	811	0	600	794	1,605	289	33	763	2,690
t. PM-126	834	0	450	595	1,429	217	25	680	2,351
u. PM-127	802	0	400	529	1,331	193	22	633	2,179
v. PM-129	752	0	400	529	1,281	193	22	611	2,107
w. PM-130	752	0	400	529	1,281	193	22	611	2,107
x. PM-131	1,401	0	400	529	1,930	193	22	919	3,064
y. PM-133	834	0	450	595	1,429	217	25	680	2,351
z. PM-134	670	0	400	529	1,199	193	22	571	1,985

*Purchased complete .

Table 5 (continued)

Building 101

	Fabrication and Freight Cost	Packings, etc. Cost	Pounds Total Weight	Vessel Material Cost	Fabrication and Material Cost	Labor for Installation Cost	Equipment Usage	Overhead Cost	Total Installed Cost
22. Vessels (PM Area)(contd)									
aa. PM-136	$ 628	$ 0	250	$ 331	$ 959	$ 120	$ 14	$ 455	$ 1,548
ab. PM-137	1,334	19	300	397	1,750	144	17	833	2,744
ac. PM-139	952	0	250	331	1,283	120	14	611	2,028
ad. PM-140	893	14	250	331	1,238	120	14	588	1,960
ae. PM-142	619	0	250	331	950	120	14	452	1,536
af. PM-143	325	0	30	40	365	15	2	175	557
ag. PM-144	325	0	30	40	365	15	2	175	557
ah. PM-701	230	0	15	20	250	7	1	119	377
ai. PM-706	238	0	18	24	262	9	1	125	397
aj. PM-708	238	0	18	24	262	9	1	125	397
ak. PM-710	238	0	18	24	262	9	1	125	397
al. PM-713	268	0	20	26	294	9	1	139	443
am. PM-714	238	0	18	24	262	9	1	125	397
an. PM-715	270	0	20	26	296	9	1	139	445
ao. PM-716	238	0	18	24	262	9	1	125	397
ap. PM-717	270	0	20	26	296	9	1	139	445
aq. PM-718	238	0	18	24	262	9	1	125	397
ar. PM-720	270	0	20	26	296	9	1	139	445
as. PM-721	270	0	20	26	296	9	1	139	445
at. PM-722	237	0	15	20	257	7	1	122	387
au. PM-723	237	0	15	20	257	7	1	122	387
av. PM-724	237	0	15	20	257	7	1	122	387
aw. PM-725	237	0	15	20	257	7	1	122	387
ax. PM-726	237	0	15	20	257	7	1	122	387
ay. PM-727	397	-	--	--	397	15	2	189	603
az. PM-729	397	-	--	--	397	15	2	189	603
ab. PM-730	397	-	--	--	397	15	2	189	603
Subtotal	$32,979	$ 71	19,118	$25,290	$58,340	$9,259	$1,065	$27,754	$96,418

Table 5 (continued)

Building 101

	Material Cost	Labor Cost	Equipment Usage	Overhead Cost	Total Cost
23. Pumps, etc. (PM Area)					
a. Pumps PM 208, 21, 34 and, 37 (4)	$ 1,848	$ 307	$ 36	$ 892	$ 3,083
b. Pumps PM 200 and 220 (2)	1,458	243	28	704	2,433
c. Pumps for weigh tank trucks (3)	918	153	18	443	1,532
d. Weigh tank trucks (3)	3,405	567	65	1,643	5,680
e. Mixers for weigh tank trucks (4)	1,757	293	34	848	2,932
f. Motors for weigh tank trucks (3)	165	28	3	80	276
g. Mixers, PM 108, 17, 21, 24, 27, 37, and 40 (7)	3,080	513	59	1,486	5,138
h. Steam jet exhausts (cast iron) (2)	125	21	2	60	208
i. Strainers (stainless steel) (5)	294	49	6	142	491
j. Micro metallic filters (2)	934	156	18	451	1,559
k. Sparkler filters (6)	11,821	1,968	227	5,704	19,720
l. Drum cart and tipper (2)	150	25	3	72	250
m. Ammonia hand pumps (2)	60	10	1	29	100
n. Blower PM 242 (1)	249	41	5	120	415
Subtotal	26,264	4,374	505	12,674	43,817
24. Pumps, etc. (Cell A)					
a. Funnels (stainless steel)	130	22	3	63	218
b. Steam jet syphons (stainless steel)	319	53	6	154	532
c. S and K jets (stainless steel)	294	49	6	142	491
d. Aluminum nitrate	147	25	3	71	246
Subtotal	890	149	18	430	1,487
25. Pumps, etc. (Cell B)					
a. Funnels (stainless steel)	189	31	4	91	315
b. Steam jet syphons (stainless steel)	464	77	9	224	774
c. S and K jets (stainless steel)	427	71	8	206	712
d. Aluminum nitrate	215	36	4	104	359
e. Lapp pump	2,771	461	53	1,337	4,622
Subtotal	$ 4,066	$ 676	$ 78	$ 1,962	$ 6,782

Table 5 (continued)

Building 101

	Material Cost	Labor Cost	Equipment Usage	Overhead Cost	Total Cost
26. Pumps, etc. (Cell C)					
a. Funnels (stainless steel)	$ 366	$ 61	$ 7	$ 177	$ 611
b. Steam jet syphons (stainless steel)	900	150	17	434	1,501
c. S and K jets (stainless steel)	829	138	16	400	1,383
d. Porostone air filter (1)	27	5	0	13	45
e. Mixers C 402, 6, 9, 52, and 56 (5)	11,148	1,853	215	5,378	18,594
f. Aluminum nitrate	416	68	8	201	693
Subtotal	13,686	2,275	263	6,603	22,827
27. Pumps, etc. (Cell D)					
a. Funnels (stainless steel)	366	61	7	177	611
b. Steam jet syphons (stainless steel)	900	150	17	434	1,501
c. S and K jets (stainless steel)	829	138	16	400	1,383
d. Porostone air filter (1)	27	5	0	13	45
e. Mixers D 402, 6, 9, 52, and 56 (5)	11,135	1,850	214	5,372	18,571
f. Aluminum nitrate	416	69	8	200	693
Subtotal	13,673	2,273	262	6,596	22,804
28. Pumps, etc. (Cell E)					
a. Funnels (stainless steel)	366	0	0	149	515
b. Steam jet syphons (stainless steel)	900	0	0	366	1,266
c. S and K jets (stainless steel)	829	0	0	337	1,166
d. Porostone air filter (1)	27	0	0	12	39
e. Mixers E 402, 6, 9, 52, and 56 (5)	11,066	0	0	4,503	15,569
f. Aluminum nitrate	416	0	0	169	585
Subtotal	13,604	0	0	5,536	19,140
29. Pumps, etc. (Cell J)					
a. Funnels (stainless steel)	309	51	6	149	515
b. Steam jet syphons	755	125	14	364	1,258
c. S and K jets (stainless steel)	695	115	13	335	1,158
d. Aluminum nitrate	348	58	7	168	581
Subtotal	$2,107	$ 349	$ 40	$1,016	$ 3,512

Table 5 (continued)

Building 101

	Material Cost	Labor Cost	Equipment Usage	Overhead Cost	Total Cost
30. Pumps, etc. (Cell K)					
a. Funnels (stainless steel)	$ 95	$ 16	$ 2	$ 46	$ 159
b. Steam jet syphons (stainless steel)	231	38	5	112	386
c. S and K jets (stainless steel)	213	35	4	103	355
d. Mixers K-100, 2, and 3 (3)	1,319	220	26	637	2,202
e. Aluminum nitrate	107	18	2	52	179
f. Pumps PA 212 and 13 (2)	924	154	17	444	1,539
Subtotal	2,889	481	56	1,394	4,820
31. Pumps, etc. (Cell N)					
a. Funnels (stainless steel)	649	108	13	313	1,083
b. Steam jet syphons (stainless steel)	1,597	266	31	770	2,664
c. S and K jets (stainless steel)	1,471	245	28	710	2,454
d. Aluminum nitrate	740	122	14	357	1,233
Subtotal	4,457	741	86	2,150	7,434
32. Pumps, etc. (Cell P)					
a. Funnels (stainless steel)	165	27	3	79	274
b. Steam jet syphons (stainless steel)	406	67	8	196	677
c. S and K jets (stainless steel)	374	62	7	180	623
d. Lapp pumps (2)	5,551	923	107	2,678	9,259
e. Lapp pump (1) remote heads (3)	12,706	2,112	243	6,129	21,190
f. Milton Roy pumps (6)	4,054	674	78	1,956	6,762
g. Aluminum nitrate	189	32	4	92	317
Subtotal	23,445	3,897	450	11,310	39,102
33. Pumps, etc. (Cell Q)					
a. Funnels (stainless steel)	225	37	4	108	374
b. Steam jet syphons (stainless steel)	552	92	11	267	922
c. S and K jets (stainless steel)	509	85	10	246	850
d. Lapp pumps (2)	5,551	922	106	2,677	9,256
e. Milton Roy pumps (4)	2,972	494	57	1,434	4,957
f. Lapp pump (1) remote head (1)	3,528	586	68	1,702	5,884
g. Aluminum nitrate	255	42	5	123	425
Subtotal	$13,592	$2,258	$261	$ 6,557	$22,668

Table 5 (continued)

Building 101

	Material Cost	Labor Cost	Equipment Usage	Overhead Cost	Total Cost
34. Pumps, etc. (Cell S)					
a. Funnels (stainless steel)	$ 165	$ 27	$ 3	$ 79	$ 274
b. Steam jet syphons (stainless steel)	406	67	8	196	677
c. S and K jets (stainless steel)	374	62	7	180	623
d. Milton Roy pumps (4)	2,979	494	57	1,437	4,967
e. Aluminum nitrate	189	32	4	92	317
Subtotal	4,113	682	79	1,984	6,858
35. Pumps, etc. (Cell T)					
a. Pump T-200 (1)	460	76	9	221	766
b. Funnels (stainless steel)	47	8	1	23	79
c. Steam jet syphons (stainless steel)	116	19	2	56	193
d. S and K jets (stainless steel)	107	18	2	52	179
e. Aluminum nitrate	54	9	1	26	90
Subtotal	784	130	15	378	1,307
36. Pumps, etc. (Cell U)					
a. Funnels (stainless steel)	331	55	6	160	552
b. Steam jet syphons (stainless steel)	813	135	16	392	1,356
c. S and K jets (stainless steel)	749	124	15	361	1,249
d. Aluminum nitrate	377	63	7	182	629
Subtotal	2,270	377	44	1,095	3,786
37. Pumps, etc. (Cell W)					
a. Funnels (stainless steel)	295	49	6	143	493
b. Steam jet syphons (stainless steel)	726	121	14	350	1,211
c. S and K jets (stainless steel)	669	111	13	323	1,116
d. Aluminum nitrate	337	56	6	162	561
e. Lapp pumps PA 209 and 10 (2)	4,237	703	81	2,043	7,064
Subtotal	$ 6,264	$ 1,040	$ 120	$ 3,021	$ 10,445

Table 5 (continued)

Building 101

	Material Cost	Labor Cost	Equipment Usage	Overhead Cost	Total Cost
38. Pumps, etc. (Cell Y)					
a. Funnels (stainless steel)	$ 225	$ 37	$ 4	$ 108	$ 374
b. Steam jet syphons (stainless steel)	552	91	10	266	919
c. S and K jets (stainless steel)	509	84	10	245	848
d. Aluminum nitrate	255	43	5	124	427
Subtotal	1,541	255	29	743	2,568
39. Pumps, etc. (Cell Z)					
a. Funnels (stainless steel)	120	20	2	58	200
b. Steam jet syphons (stainless steel)	294	49	6	142	491
c. S and K jets (stainless steel)	271	45	5	131	452
d. Aluminum nitrate	135	22	3	65	225
Subtotal	820	136	16	396	1,368
40. Pumps, etc. (high vacuum facility)					
Pumps VT 200 and 201 (2)	2,156	358	41	1,040	3,595
41. Pumps, etc. (acid unloading facility)					
Pump for vessel LE-201 (1)	456	75	8	219	758
42. Pumps, etc. (Cell X)					
a. Hood exhaust fans (2)	956	159	18	461	1,594
b. Gaskets and cement	46	8	0	22	76
c. Filters, etc. (12)	1,414	234	28	682	2,358
Subtotal	2,416	401	46	1,165	4,028
Subtotal (23 to 42)	139,493	20,927	2,417	66,269	229,106
Subtotal, Item E	$ 591,243	$87,488	$10,079	$ 278,860	$ 967,670
F. Cold Runs	$ 5,354	$64,548	$ 272	$ 30,976	$ 101,150

Table 5 (continued)

Building 101

	Material Cost	Labor Cost	Equipment Usage	Overhead Cost	Total Cost
G. Shielding and Special Equipment					
1. Sample Galleries 1-11, 15, 12, 13, and 14					
a. Cell A	$ 14,204	$ 3,706	$ 326	$ 7,382	$ 25,618
b. Cell B	9,902	2,583	227	5,145	17,857
c. Cell C	17,577	4,587	403	9,133	31,700
d. Cell D	21,220	5,538	486	11,026	38,270
e. Cell E	20,600	118	44	8,403	29,165*
f. Cell J	17,613	4,597	404	9,152	31,766
g. Cell K	5,896	1,538	135	3,063	10,632
h. Cell N	12,517	3,263	287	6,503	22,570
i. Cell P	7,011	1,828	160	3,642	12,641
j. Cell Q	9,385	2,448	215	4,876	16,924
k. Cell S	5,557	1,450	127	2,887	10,021
l. Cell U	11,944	3,119	274	6,207	21,544
m. Cell W	11,799	3,077	270	6,130	21,276
n. Cell Y	19,258	5,026	441	10,007	34,732
o. Cell Z	6,930	386	22	2,970	10,308**
p. Cell WA	7,392	1,930	170	3,842	13,334
q. Cell WF	7,391	1,930	170	3,841	13,332
Subtotal	206,196	47,124	4,161	104,209	361,690
2. Track for Galleries 1-11, 15, 12, and 13					
a. Cell A	443	15	2	186	646
b. Cell B	443	15	2	186	646
c. Cell C	934	32	7	394	1,367
d. Cell D	1,516	52	7	637	2,212
e. Cell E	293	0	0	119	412***
f. Cell J	793	27	5	334	1,159
g. Cell K	264	9	2	111	386
h. Cell N	260	9	2	110	381
i. Cell P	309	10	2	130	451
j. Cell Q	412	14	2	173	601
k. Cell S	242	8	2	102	354
l. Cell U	531	18	3	223	775
m. Cell W	530	18	3	223	774
n. Cell Y	856	29	5	360	1,250
o. Cell WA	327	11	2	138	478
p. Cell WF	327	11	2	138	478
Subtotal	$ 8,480	$ 278	$ 48	$ 3,564	$ 12,370

* Sample Gallery No. 9 not erected - stored in Cell F.
** Sample Gallery No. 14 made of stainless steel and installed inside cell.
*** Track not installed - stored in Cell F.

Table 5 (continued)

Building 101

	Material Cost	Labor Cost	Equipment Usage	Overhead Cost	Total Cost
3. Sampling tongs and decappers for Sample Galleries 1-11, 15, 12, and 13					
a. Cell A	$ 1,463	$ 16	$ 0	$ 599	$ 2,078
b. Cell B	1,464	16	0	599	2,078
c. Cell C	4,644	50	0	1,900	6,594
d. Cell D	5,046	54	0	2,064	7,164
e. Cell E	2,523	0	0	1,021	3,544*
f. Cell J	3,785	41	0	1,548	5,374
g. Cell K	1,262	14	0	516	1,792
h. Cell N	2,523	27	0	1,032	3,582
i. Cell P	2,523	27	0	1,032	3,582
j. Cell Q	3,784	41	0	1,548	5,373
k. Cell S	1,262	13	0	517	1,792
l. Cell U	2,523	27	0	1,032	3,582
m. Cell W	2,524	28	0	1,033	3,585
n. Cell Y	2,524	28	0	1,033	3,585
o. Cell WA	2,524	27	0	1,032	3,583
p. Cell WF	2,524	27	0	1,032	3,583
Subtotal	42,898	436	0	17,538	60,872
4. Periscopes, drift sights and lights for tongs, and cappers on Galleries 1-11, 15, 12, and 13					
a. Cell A	1,492	0	0	604	2,096
b. Cell B	1,492	0	0	604	2,096
c. Cell C	4,732	0	0	1,915	6,647
d. Cell D	5,143	0	0	2,081	7,224
e. Cell E	2,572	0	0	1,041	3,613**
f. Cell J	3,858	0	0	1,561	5,419
g. Cell K	1,286	0	0	520	1,806
h. Cell N	2,571	0	0	1,041	3,612
i. Cell P	2,571	0	0	1,041	3,612
j. Cell Q	3,858	0	0	1,561	5,419
k. Cell S	1,285	0	0	520	1,805
l. Cell U	2,572	0	0	1,041	3,613
m. Cell W	2,572	0	0	1,041	3,613
n. Cell Y	2,572	0	0	1,041	3,613
o. Cell WA	2,571	0	0	1,041	3,612
p. Cell WF	2,571	0	0	1,041	3,612
Subtotal	$ 43,718	$ 0	$ 0	$ 17,694	$ 61,412

* Tongs and decappers not installed.
** Periscopes, drift sights, and lights not installed.

Table 5 (continued)

Building 101

	Material Cost	Labor Cost	Equipment Usage	Overhead Cost	Total Cost
5. Other items for cell sampling, including electric truck, batteries, charger, mechanical lifts, filter, handling shields, bottles, caps, etc.					
a. Cell A	$ 737	$ 28	$ 1	$ 310	$ 1,076
b. Cell B	737	28	2	310	1,077
c. Cell C	8,850	137	8	3,640	12,635
d. Cell D	10,325	194	10	4,261	14,790
e. Cell E	7,782	0	0	3,150	10,932
f. Cell J	1,907	72	4	803	2,786
g. Cell K	636	24	1	268	929
h. Cell N	2,542	97	5	1,070	3,714
i. Cell P	2,542	96	5	1,070	3,714
j. Cell Q	3,813	146	8	1,604	5,571
k. Cell S	1,271	48	2	535	1,856
l. Cell U	1,271	48	2	535	1,856
m. Cell W	1,271	48	3	535	1,857
n. Cell Y	2,542	97	5	1,070	3,714
o. Cell Z	2,542	96	5	1,070	3,713
p. Cell WA	2,542	97	5	1,070	3,713
q. Cell WF	2,545	96	5	1,071	3,717
Subtotal	53,855	1,352	71	22,372	77,650
6. Activity sample handling (Cell X complete)					
a. High activity sample handling shielding	60,750	13,409	526	30,228	104,913
b. Dilution area equipment (7 units)	16,921	3,735	147	8,419	29,222
c. Polargraph table (1)	1,980	437	17	985	3,419
d. Sodium lamps (6) and control cabinet	487	108	4	242	841
e. Internal lighting for dilution cells	736	163	6	366	1,271
f. Shields for volumetric flask and beaker	3,595	792	31	1,788	6,206
g. Beaker cleaning mechanism	1,650	364	14	821	2,849
h. Zinc bromide (600 gal)	7,447	1,644	66	3,706	12,863
i. Centrifuge (1)	88	20	1	44	153
j. Bottle disposal carriers (3) with buckets	6,017	1,329	52	2,994	10,392
k. Glass funnels (12)	334	71	2	165	572
Subtotal	$100,005	$22,072	$ 866	$ 49,758	$172,701

Table 5 (continued)

Building 101

	Material Cost	Labor Cost	Equipment Usage	Overhead Cost	Total Cost
7. Chargers, carriers, and slug chutes for cell sampling					
a. Slug chute slide valves (6)	$ 11,370	$ 450	$ 60	$ 4,808	$ 16,688
b. Lead brick for slide valves (7695 lb)	1,795	150	30	799	2,774
c. Pipe for slug chutes (10-in. stainless steel) (360 ft)	17,338	1,020	90	7,466	25,914
d. Fabrication of 10-in. stainless steel pipe above	5,636	0	0	2,281	7,917
e. Flanges for slug chutes (10-in. stainless steel) (12)	1,392	300	15	691	2,398
f. NP slug-chargers (4)	5,200	360	60	2,275	7,895
g. Slug-charger operating gear	1,450	0	0	587	2,037
h. MTR carrier (1)	14,535	300	90	6,041	20,966
i. Yoke and hook for Cell A pig (1)	180	15	4	81	280
j. EBR charger pallet (1)	320	30	8	145	503
k. Crane shackle (1)	153	15	4	70	242
l. Charging racks for Cell A	18,586	358	30	7,679	26,653
m. Carriers (16)	51,971	1,036	0	21,452	74,459
Subtotal	$129,926	$ 4,034	$ 391	$ 54,375	$188,726
Distribute Item 7 as follows:					
Cell A	$ 20,243	$ 440	$ 46	$ 8,390	$ 29,119
Cell B	1,004	22	0	416	1,442
Cell C	24,659	1,035	115	10,446	36,255
Cell D	26,670	1,077	115	11,276	39,138
Cell E	22,703	720	115	9,526	33,064
Cell J	2,599	56	0	1,075	3,730
Cell K	866	18	0	358	1,242
Cell N	3,465	74	0	1,432	4,971
Cell P	3,465	74	0	1,432	4,971
Cell Q	5,197	111	0	2,148	7,456
Cell S	1,733	37	0	716	2,486
Cell U	1,732	37	0	716	2,485
Cell W	1,733	37	0	716	2,486
Cell Y	3,465	74	0	1,432	4,971
Cell Z	3,464	74	0	1,432	4,970
Cell WA	3,464	74	0	1,432	4,970
Cell WF	3,464	74	0	1,432	4,970
Subtotal	$129,926	$ 4,034	$ 391	$ 54,375	$188,726

Table 5 (continued)

Building 101

	Material Cost	Labor Cost	Equipment Usage	Overhead Cost	Total Cost
8. Radiation detection instruments					
a. Strip chart potentiometers (8) (Minneapolis-Honeywell)	$ 3,734	$ 189	$ 7	$ 1,591	$ 5,521
b. Variable-speed transmitters (4)	238	12	0	101	351
c. Remote monitrons (26)	11,556	586	22	4,923	17,087
d. Filtrons (8)	3,920	199	9	1,670	5,798
e. Mobile air monitors (8)	15,600	791	30	6,646	23,067
Subtotal	35,048	1,777	68	14,931	51,824
9. Individual shielding					
a. Service corridor					
Steel beams (5) and columns (2) (16.5 tons)	4,630	804	495	2,400	8,329
Shielding castings (182)	9,021	3,640	400	5,286	18,347
b. Pump blisters for pumps (3) PA 201 - 4, 209, and 210	27,860	5,439	689	13,755	47,743
Subtotal	41,511	9,883	1,584	21,441	74,419
10. Special micro star filters					
a. Filters (6) for vessels C 103 and 153 (2 spares)	3,988	1,139	0	2,075	7,202
b. Filters (6) for vessels D 103 and 153 (2 spares)	3,988	1,138	0	2,075	7,201
c. Filters (4) for vessels E 103 and 153	2,657	0	0	1,076	3,733
Subtotal	10,633	2,277	0	5,226	18,136
Subtotal, Item G	672,270	89,233	7,189	311,108	1,079,800
Total, Items, A,B,C,D,E,F, and G	$3,576,031	$2,830,242	$324,476	$2,743,257	$9,474,006

Table 5 (continued)

Building 101

Additional Charges for Accounts Other than Bechtel

Brought forward from Bechtel account, Table 5, p. 55	$9,474,006
Furniture (Atomic Energy Commission)	510
Equipment (Atomic Energy Commission)	17,886
Total construction and other charges to Process Building account	$9,492,402

Table 5 (continued)

Building 101

Areas and Volumes

Function	Inside Area, Ft^2	Inside Volume, Ft^3	Outside Volume, Ft^3
1. Chemical make-up area	19,517	406,395	
2. Foul weather entry	672	13,117	
3. Operating corridor	5,588	51,686	
4. Sample corridor (2)	3,558	32,916	
5. Service corridor	5,187	39,457	
6. Vent and pipe corridor (2)	4,636	31,551	
7. High vacuum pump room	48	464	
8. North entrance room	60	540	
9. Plenum room	84	840	
10. Shielded passageway (service corridor)	161	1,300	
11. Access corridor	5,961	42,807	
12. Access pits to Cells L, M, N, U, W, Y, and B	417	3,207	
13. Access and pump pit (access corridor)	309	2,929	
14. Ramp (access corridor to laboratory basement)	221	2,865	
15. Control room for waste tanks	949	9,355	
16. Pump room for waste tank	120	2,460	
17. Waste tank room	1,155	47,537	
18. Pipe trench	1,370	21,759	
19. Sample off-gas filter room	400	4,000	
20. Sample off-gas blower room	300	2,550	
21. Cells (for breakdown see next page)	9,775	247,575	
22. Stairs and stairwells	952	10,504	
23. Corridors	1,734	16,037	
Total	63,174	991,851	1,420,212

Table 5 (continued)

Building 101

Areas and Volumes of Cells

	Inside Area, Ft^2	Inside Volume, Ft^3	Outside Volume, Ft^3
1. Cell A	285	4,560	
2. Cell B	285	4,845	
3. Cells C, D, E, F, G, H, and J	2,660	73,150	
4. Cell K	575	16,962	
5. Cells L and M	544	19,856	
6. Cell N	1,083	40,613	
7. Cell P, net	138	5,855	
8. Cell Q, net	139	8,380	
9. Cell R	297	5,123	
10. Cell S	184	5,765	
11. Cell T	729	6,743	
12. Cell U	485	13,082	
13. Cell V	756	6,993	
14. Cell W	587	17,009	
15. Cell X	513	4,725	
16. Cell Y	368	10,772	
17. Cell Z	147	3,142	
Total	9,775	247,575	1,420,212
1. Cost for bare building	$ 41.26	$ 2.63	$ 1.84
2. Cost for building with services and equipment	$ 60.38	$ 3.85	$ 2.69

Table 6

Building 102

	Material Cost	Labor Cost	Equipment Usage	Overhead Cost	Total Cost	Unit	Total Units	Unit Cost
A. Building								
1. Excavation*	$ 0	$ 15,269	$ 4,011	$ 7,270	$ 26,550	yd^3	17,047	$ 1.56
2. Backfill	0	6,038	9,480	3,779	19,297	yd^3	16,677	1.16
Subtotal	0	21,307	13,491	11,049	45,847			
3. Concrete								
a. Forms	72,970	136,233	14,349	91,767	315,319	ft^2	76,686	4.11
b. Reinforced and embedded steel	21,083	29,709	3,580	22,144	76,516	lb	466,600	0.16398
c. Placed	52,966	23,316	4,027	32,172	112,481	yd^3	3,686	30.51
d. Heat	0	19,082	22,139	11,047	52,268	yd^3	3,686	14.18
e. Finish	512	45,558	3,869	20,969	70,908	ft^2	42,025	1.69
Subtotal	147,531	253,898	47,964	178,099	627,492	yd^3	3,686	170.24
4. Structural steel	64,919	26,174	4,742	38,337	134,172	ton	362	370.61
5. Miscellaneous iron and steel	5,799	11,910	421	7,693	25,823			
6. Stair railing, etc.	1,810	1,796	75	1,538	5,219			
7. Roof and siding*	32,513	2,740	23	14,307	49,583	ft^2	21,722	2.28
8. Painting	1,746	18,342	448	8,935	29,471	ft^2	153,044	0.1925
9. Plumbing								
a. Circulating pumps(2) (Building 107)	361	192	60	258	871			
b. Storage tank (3000 gal)(1) (Building 107)	926	240	115	540	1,821			
c. Hot water storage tank (1)	1,048	212	120	582	1,962			
d. Toilet compartments (1 lot)	771	284	21	454	1,530			
e. Drinking fountains (8)	896	360	36	545	1,837			
f. Wall lavortories (28)	1,680	1,400	112	1,346	4,538			
g. Water closets (14)	588	350	56	419	1,413			
h. Wall urinals (6)	300	300	28	265	893			
i. Wall showers (10)	300	450	14	322	1,086			
j. Safety showers (16)	400	800	14	512	1,726			
k. Shower cabinets (2)	140	100	10	105	355			
l. Service sinks (2)	90	100	14	86	290			
m. Floor drains (19)	399	950	56	592	1,997			
n. Fire hose cabinets (6)	1,500	450	30	835	2,815			
o. Fire hose racks(3)	225	150	12	163	550			
p. Pipe, valves, fittings, insulation and supports	7,426	36,675	1,669	19,293	65,063			
Subtotal	$ 17,050	$ 43,013	$ 2,367	$ 26,317	$ 88,747			

*Subcontracted by others from Bechtel.

Table 6 (continued)

Building 102

	Material Cost	Labor Cost	Equipment Usage	Overhead Cost	Total Cost
10. Floor coverings					
a. Asphalt tile	$ 12,144	$ 1,589	$ 0	$ 5,595	$ 19,328
b. Ceramic tile	158	1,829	8	880	2,875
Subtotal	12,302	3,418	8	6,475	22,203
11. Freight elevator*	12,106	192	0	4,956	17,254
12. Partitions					
a. Suspended ceiling*	48,189	0	0	19,585	67,774*
b. Movable steel (includes refinishing)	98,498	19,905	706	48,404	167,513
c. Concrete block (includes plaster and tile)*	3,416	0	0	1,388	4,804*
d. Toilet compartments	493	101	4	423	841
e. Doors					
1. Steel	2,367	479	17	1,163	4,026
2. Fire (8)	2,054	414	15	1,009	3,492
3. Motor operated (1)	593	120	4	291	1,008
4. Vault (2)	3,243	655	23	1,593	5,514
5. Wood	521	105	4	256	886
6. Folding (plastic)(2)	145	29	1	71	246
7. Hardware	1,453	294	10	714	2,471
8. Glass	824	180	6	410	1,420
Subtotal	161,796	22,282	790	75,127	259,995
13. Electrical					
a. Lighting	37,873	81,469	3,527	51,979	174,848
b. Power	10,061	21,643	937	13,809	46,450
c. Telephone and alarm system	3,847	8,276	358	5,280	17,761
Subtotal	51,781	111,388	4,822	71,068	239,059
14. Heating and ventilating					
a. For building					
1. Roof ventilators (8)	792	681	44	629	2,146
2. Power roof ventilators (3)	824	708	46	653	2,231
3. Exhaust fans G-215, 216, and 218 (3)	2,447	2,097	135	1,934	6,613
4. Exhausters (24-in.)(2)	246	210	14	193	663

*Subcontracted by others from Bechtel.

Table 6 (continued)

Building 102

	Material Cost	Labor Cost	Equipment Usage	Overhead Cost	Total Cost
14. Heating and ventilating (contd)					
a. For building (contd)					
5. Return air grills (28)	$ 3,782	$ 3,245	$ 209	$ 2,993	$ 10,229
6. Ceiling diffusers (8)	305	262	17	242	826
7. Booster heater with accessories (1)	2,359	2,023	131	1,866	6,379
8. Testing equipment for heating and ventilating	483	414	27	382	1,306
9. Fans with motors G-601 and 602 (2) (Building 107)	5,355	4,597	297	4,240	14,489
10. Standby gas engine (1) (Building 107)	839	718	46	662	2,265
11. Gas tanks (2) (Building 107)	69	58	4	53	184
12. Condensate pump (1)(Building 107)	158	136	9	126	429
13. Fan alarm controls (1 set) (Building 107)	23	21	1	19	64
14. Plenum panels, heater coils, spray pumps, louvers, screens, and dampers (Building 107)(1 lot)	15,988	13,718	886	12,654	43,246
15. Steel plenum for fans G-601 and 602 (2) (Building 107)	1,238	1,064	69	982	3,353
16. Pipe, valves, fittings, insulation, and supports	3,494	2,998	194	2,766	9,452
17. Duct work, including painting and supports	22,685	19,470	1,255	17,959	61,369
Subtotal	61,087	52,420	3,384	48,353	165,244
b. Air conditioning system					
1. Carrier a-c unit with controls, etc.(1)	10,692	9,174	592	8,462	28,920
2. Heating coil (1)	68	58	4	54	184
3. Booster heater (1)	81	69	4	64	218
4. Thermostat (1)	32	28	2	26	88
5. Finned radiators (36)	682	585	38	540	1,845
6. Radiator traps (1/2) (36)	248	213	14	196	671
7. Pipes, valves, fittings, insulation, and supports	268	230	15	212	725
8. Duct work, including insulation and painting	2,113	1,814	116	1,672	5,715
Subtotal	$ 14,184	$12,171	$ 785	$ 11,226	$ 38,366

Table 6 (continued)

Building 102

	Material Cost	Labor Cost	Equipment Usage	Overhead Cost	Total Cost
14. Heating and ventilating (contd)					
c. Hood exhaust system					
1. Exhaust fans (10) with guards	$ 7,804	$ 6,696	$ 432	$ 6,176	$ 21,108
2. Flexible connections (20)	726	622	40	574	1,962
3. Filters (24 in. x 24 in. x 11 1/2 in.) (56)	2,760	2,368	153	2,184	7,465
4. Filter plenums (10)	5,756	4,938	319	4,555	15,568
5. Draft gauges with connections (10)	552	474	31	437	1,494
6. Duct work, including painting and supports	2,006	1,722	110	1,588	5,426
Subtotal	19,604	16,820	1,085	15,514	53,023
Total for heating and ventilating	94,875	81,411	5,254	75,093	256,633
Total for Items 1 through 14 (Building)	604,228	597,871	80,405	518,994	1,801,498
B. Furniture and Equipment					
1. First floor					
a. LB-12					
1. Hoods (8-ft stainless steel)(4)	9,864	832	32	4,333	15,061
2. Sink combination (5-ft stainless steel)(1)	478	22	4	204	708
3. Tables with cabinets (6 ft)(4)	1,256	32	0	520	1,808
4. Wall pipe racks with 12-ft shelf each (20 ft) (2)	1,708	503	7	970	3,188
5. Center pipe rack with 6-ft shelf (14 ft) (1)	655	175	2	337	1,169
6. Service piping (in racks)	3,617	11,957	1,160	6,921	23,655
7. Drain piping (in racks)	702	1,825	351	1,138	4,016
8. Storage cases (2)	362	6	0	149	517
9. Laboratory stools (4)	84	0	0	34	118
Subtotal	$ 18,726	$ 15,352	$ 1,556	$ 14,606	$ 50,240

Table 6 (continued)

Building 102

	Material Cost	Labor Cost	Equipment Usage	Overhead Cost	Total Cost
1. First floor (contd)					
b. LB-20					
1. Hoods (8-ft stainless steel)(2)	$ 4,932	$ 416	$ 16	$ 2,166	$ 7,530
2. Sink combination (5-ft stainless steel)(1)	478	22	4	204	708
3. Tables with cabinets (8 ft)(2)	696	20	0	289	1,005
4. Tables with cabinets (6 ft)(2)	628	16	0	260	904
5. Wall pipe racks with 12-ft shelf each (20 ft) (2)	1,708	503	7	970	3,188
6. Center pipe rack with 8-ft shelf (8 ft) (1)	436	98	1	190	725
7. Service piping (in racks)	3,217	10,634	1,031	6,155	21,037
8. Drain piping (in racks)	468	1,217	234	759	2,678
9. Storage cases (2)	362	6	0	149	517
10. Laboratory stools (4)	84	0	0	34	118
Subtotal	13,009	12,932	1,293	11,176	38,410
c. LB-28A (air conditioned)					
1. Mass spectrometers (2)	73,238	870	0	29,929	104,037
2. Service piping	535	1,768	171	1,023	3,497
3. Drain piping	234	608	117	379	1,338
4. Storage cases (2)	362	6	0	149	517
5. Laboratory stools (2)	42	0	0	17	59
Subtotal	74,411	3,252	288	31,497	109,448
d. LB-9A (shower room)					
Bench (3 ft) (1)	11	4	0	6	21
e. LB-14 (Women's shower room)					
Bench (3 ft) (1)	11	4	0	6	21
f. LB-32 (air conditioned)					
1. Hood (6 ft) (1)(stainless steel)	2,015	176	6	887	3,084
2. Tables with cabinets (6 ft)(5)	1,570	40	0	650	2,260
3. Wall pipe rack with 20 ft-6 in. shelf (20 ft) (1)	931	251	3	485	1,670
4. Wall pipe rack with 12-ft shelf (18 ft)(1)	777	224	3	432	1,436

Table 6 (continued)

Building 102

	Material Cost	Labor Cost	Equipment Usage	Overhead Cost	Total Cost
1. First floor (contd)					
f. LB-32 (air conditioned)(contd)					
5. Service piping (in racks)	$ 2,547	$ 8,421	$ 816	$ 4,874	$ 16,658
6. Drain piping (in racks)	234	608	117	379	1,338
7. Storage cases (2)	362	6	0	149	517
8. Laboratory stools (4)	84	0	0	34	118
Subtotal	8,520	9,726	945	7,890	27,081
g. LB-40 (air conditioned)					
1. Hoods (6-ft stainless steel)(2)	4,030	352	12	1,775	6,169
2. Sink combination (5-ft stainless steel)(1)	478	22	4	204	708
3. Tables with cabinets (6 ft)(4)	1,256	32	0	520	1,808
4. Center pipe rack with 12-ft shelf (18 ft)(1)	900	224	3	432	1,559
5. Service piping (in racks)	1,204	3,982	386	2,305	7,877
6. Drain piping (in racks)	351	912	176	569	2,008
7. Storage cases (5)	905	15	0	371	1,291
8. Laboratory stools (4)	84	0	0	34	118
Subtotal	9,208	5,539	581	6,210	21,538
h. LB-44A (air conditioned)					
1. Wall pipe rack with 2 ft-6 in. shelf (1)	115	44	1	82	242
2. Service piping (in racks)	202	668	65	386	1,321
3. Drain piping (in racks)	211	547	105	341	1,204
4. Storage cases (4)	724	12	0	297	1,033
5. Laboratory stools (2)	42	0	0	17	59
Subtotal	1,294	1,271	171	1,123	3,859
i. LB-43					
1. Work benches (10 ft) (4)	1,692	24	0	693	2,409
2. Sink combination (5-ft stainless steel) (1)	478	22	4	204	708
3. Wall pipe racks with 20-ft shelf each (20 ft)(2)	1,817	503	6	970	3,296
4. Service piping (in racks)	2,682	8,866	860	5,132	17,540

Table 6 (continued)

Building 102

	Material Cost	Labor Cost	Equipment Usage	Overhead Cost	Total Cost
1. First floor (contd)					
i. LB-43 (contd)					
5. Drain piping (in racks)	$ 211	$ 547	$ 105	$ 341	$ 1,204
6. Storage cases (6)	1,086	18	0	445	1,549
7. Laboratory stools (8)	168	0	0	68	236
Subtotal	8,134	9,980	975	7,853	26,942
j. LB-23					
1. Hoods (8-ft stainless steel)(8)	19,728	1,664	64	8,665	30,121
2. Sink combination (5-ft stainless steel) (3)	1,434	66	12	608	2,120
3. Tables with cabinets (6 ft) (8)	2,512	64	0	1,041	3,617
4. Wall pipe racks with 20-ft shelf each (20 ft) (2)	1,817	503	6	970	3,296
5. Center pipe racks (No shelf) (16 ft) (2)	1,312	405	5	780	2,502
6. Center pipe rack with 12-ft shelf (12 ft) (1)	654	153	2	295	1,104
7. Service piping (in racks)	5,630	18,610	1,805	10,772	36,817
8. Drain piping (in racks)	1,522	3,954	761	2,466	8,703
9. Storage cases (5)	905	15	0	371	1,291
10. Laboratory stools (12)	252	0	0	102	354
Subtotal	35,766	25,434	2,655	26,070	89,925
k. LB-31 (air conditioned)					
1. Tables (4 ft) (10)	870	20	0	359	1,249
2. Chemstone shelves (22 ft) (2)	450	36	0	196	682
Subtotal	1,320	56	0	555	1,931
l. LB-11					
1. Hoods (8-ft stainless steel)(2)	4,932	416	16	2,166	7,530
2. Sink combination (5-ft stainless steel)(1)	478	22	4	204	708
3. Tables with cabinets (8 ft) (2)	695	20	0	290	1,005
4. Wall pipe racks with 2 ft-6 in. shelf (18 ft) (1)	713	224	3	432	1,372
5. Center pipe rack with 8-ft shelf (8 ft)(1)	436	98	1	190	725
6. Service piping (in racks)	1,743	5,762	559	3,335	11,399

Table 6 (continued)

Building 102

	Material Cost	Labor Cost	Equipment Usage	Overhead Cost	Total Cost
l. First floor (contd)					
1. LB-11 (contd)					
7. Drain piping (in racks)	$ 468	$ 1,217	$ 234	$ 759	$ 2,678
8. Lead sample wells (ORNL)(3)	11,438	170	0	4,688	16,296
9. Storage cases (2)	362	6	0	149	517
10. Laboratory stools (4)	84	0	0	34	118
Subtotal	21,349	7,935	817	12,247	42,348
m. LB-17					
1. Sink combination (5-ft stainless steel)(2)	956	44	8	407	1,415
2. Tables with cabinets (6 ft)(2)	628	16	0	260	904
3. Wall pipe racks with 11-ft shelf each (11 ft)(2)	999	279	4	538	1,820
4. Service piping (in racks)	1,474	4,872	472	2,820	9,638
5. Drain piping (in racks)	234	608	117	379	1,338
6. Laboratory stools (2)	42	0	0	17	59
Subtotal	4,333	5,819	601	4,421	15,174
n. LB-28B (darkroom)					
1. Sink combination (2-ft stainless steel) (1)	264	14	3	113	394
2. Table (2 ft) (1)	44	2	0	19	65
3. Service piping	15	49	5	29	98
4. Drain piping	24	61	12	39	136
Subtotal	347	126	20	200	693
o. LB-44B (darkroom)					
1. Sink combination (2-ft stainless steel)(1)	264	14	3	114	395
2. Table with cabinets (6 ft)(1)	314	8	0	130	452
3. Wall pipe rack with 8-ft shelf (8 ft)(1)	363	98	1	190	652
4. Service piping (in rack)	400	1,323	128	766	2,617
5. Drain piping (in rack)	24	61	12	39	136
6. Laboratory stools (2)	42	0	0	17	59
Subtotal	$ 1,407	$ 1,504	$ 144	$ 1,256	$ 4,311

Table 6 (continued)

Building 102

	Material Cost	Labor Cost	Equipment Usage	Overhead Cost	Total Cost
1. First floor (contd)					
p. LB-90 (clothing issue)					
1. Table and shelf combinations (6 ft) (2)	$ 2,314	$ 84	$ 0	$ 968	$ 3,366
2. Table and shelf combinations (8 ft) (1)	650	44	0	280	974
Subtotal	2,964	128	0	1,248	4,340
q. LB-10 (women's locker room)					
1. Lockers (steel)(25)	570	280	0	343	1,193
2. Benches (6 ft)(2)	44	12	0	23	79
Subtotal	614	292	0	366	1,272
r. LB-100 (men's locker room)					
1. Lockers (steel)(265)	6,042	2,120	0	3,296	11,458
2. Benches (14 ft)(12)	566	84	0	263	913
Subtotal	6,608	2,204	0	3,559	12,371
2. Second floor					
a. LA-25					
1. Sink combination (5-ft stainless steel)(1)	478	22	4	204	708
2. Service piping	34	111	11	64	220
3. Drain piping	53	137	26	85	301
4. Laboratory stool (1)	21	0	0	8	29
Subtotal	586	270	41	361	1,258
b. LA-17					
1. Sink combination (5-ft stainless steel)(1)	478	22	4	204	708
2. Service piping	34	111	11	64	220
3. Drain piping	53	137	26	85	301
4. Laboratory stool (1)	21	0	0	8	29
Subtotal	586	270	41	361	1,258

Table 6 (continued)

Building 102

	Material Cost	Labor Cost	Equipment Usage	Overhead Cost	Total Cost
2. Second floor (contd)					
c. LA-21 (waiting room)					
Bench (10 ft)(1)	$ 35	$ 6	$ 0	$ 17	$ 58
d. LA-18 (storage for cafeteria)					
Shelving (90 ft)	126	36	0	66	228
e. LA-22, 26, and 46 (cafeteria)					
1. Portable food carts (3)					
2. Sink (kitchen)(1)					
3. Preparation table with shelves (1)					
4. Sink (service)(1)					
5. Compartment sink and table (2)(1)					
6. Dishwashing machine (1)					
7. Dish shelf (1)					
8. Fry kettles (electric)(2)					
9. Toasters (electric)(2)					
10. Fry kettle stand (1)					
11. Back counter (1)					
12. Griddle (electric)(1)					
13. Ice cream cabinet and shelf (1)					
14. Cafeteria counter (1)					
15. Display shelf units (2)					
16. Salad cold pan (1)					
17. Food warmer (electric)(1)					
18. Beverage cold pan (1)					
19. Coffee urn (1)					
20. Sliding tray counter (1)					
Subtotal (Items 1 - 20)	9,258	1,362	21	4,499	15,640*
21. Portable tumbler tray carts (2)	420	10	0	174	604
22. Refrigerator (1)**					
23. Cash register (1)**					
24. Water cooler (1)**					
25. Tables and chairs **					
26. Drain piping	948	2,464	475	1,538	5,425
27. Service piping	670	2,213	215	1,281	4,379
Subtotal	$11,296	$6,549	$ 711	$7,492	$26,048

* Unable to break down---purchased lump sum.
** Furnished by the Atomic Energy Commission and cost included under additional charges for accounts other than Building 102.

Table 6 (continued)

Building 102

	Material Cost	Labor Cost	Equipment Usage	Overhead Cost	Total Cost
3. Basement					
a. Works laboratory					
1. Hoods (6 ft)(1 stainless steel, 5 transite)(6)	$ 10,100	$ 1,025	$ 40	$ 4,509	$ 15,674
2. Hoods (8-ft stainless steel)(4)	9,839	832	32	4,322	15,025
3. Sink combinations (4 ft-6 in.)(4)	1,620	144	16	719	2,499
4. Tables with cabinets(6 ft)(14)	4,396	112	0	1,821	6,329
5. Tables with cabinets (4 ft)(4)	944	24	0	391	1,359
6. Wall pipe racks with 6-ft shelf (12 ft)(2)	1,009	301	4	580	1,894
7. Center pipe racks with 10-ft shelf (18 ft)(2)	1,746	454	6	875	3,081
8. Center pipe racks with 12-ft shelf (18 ft)(2)	1,800	224	3	432	2,459
9. Service piping (in racks)	6,434	21,268	2,063	12,310	42,075
10. Drain piping (in racks)	2,678	7,809	1,313	4,715	16,515
11. Storage cases (7)	2,436	21	0	992	3,449
12. Laboratory stools (15)	315	0	0	127	442
Subtotal	43,317	32,214	3,477	31,793	110,801
b. LC Area					
1. Hoods (6-ft stainless steel)(2)	4,030	352	12	1,775	6,169
2. Service piping (on wall)	804	2,659	258	1,539	5,260
3. Shelving (clothing)(120 ft)	211	27	0	96	334
Subtotal	5,045	3,038	270	3,410	11,763
c. Storeroom facility					
1. Burroughs bin assemblies (44)	3,800	264	0	1,641	5,705
2. Storage cabinets (36 in. x 18 in. x 78 in.) (3)	199	24	0	90	313
3. Shelving sections (3 ft)(30)	717	240	0	386	1,343
Subtotal	$ 4,716	$ 528	$ 0	$ 2,117	$ 7,361

Table 6 (continued)

Building 102

	Material Cost	Labor Cost	Equipment Usage	Overhead Cost	Total Cost
4. Cell X (Building 101)					
a. Hoods (8-ft stainless steel)(2)	$ 4,932	$ 416	$ 16	$ 2,166	$ 7,530
b. Wall pipe rach (no shelf)(16 ft)(1)	618	203	3	390	1,214
c. Service piping (in rack)	1,074	3,549	344	2,054	7,021
Subtotal	6,624	4,168	363	4,610	15,765
Subtotal, Item B	280,363	148,637	14,949	180,516	624,465
C. Analytical, Counter and Other Equipment					
1. RCA electronic power generator (1)(LB-44)	891	160	8	428	1,487
2. Grating spectrograph (3 meter)(1)(LB-44)	16,820	0	0	6,793	23,613
3. Microphotometer (Leeds and Northup)(1)(LB-46)	6,438	0	0	2,600	9,038
4. Developing machine with apparatus (LB-44B)	2,967	8	0	1,201	4,176
5. Measuring plate with 2 magnifiers (2)(LB-46)	85	0	0	34	119
6. Galvanometers for spectrograph (3)(LB-44)	350	0	0	141	491
7. Spectrophotometers with apparatus (2)(LB-23)	4,944	4	0	1,998	6,946
8. Wheelco temperature controls (3)(LB-23)	558	0	0	225	783
9. Vibrating-reed electrometer (1)(LB-12)	1,500	0	0	606	2,106
10. Variacs (12)(LB-23)	222	0	0	90	312
11. Burettes (12)(LB-11, 12, and 23)	675	0	0	273	948
12. Portable potentiometers (LB-23)(4)	1,060	0	0	428	1,488
13. Lead pigs for beta counters (4)(LB-31)	687	0	0	277	964
14. Methane-flow proportional counters (3)(LB-31)	2,850	0	0	1,151	4,001
15. Model Q1020 scalers (4)(LB-31)	1,331	0	0	538	1,869
16. Austin hand and foot counters (6)(LB-43)	28,050	20	0	11,336	39,406
17. Alpha hand counters (3)(LB-43)	5,850	9	0	2,366	8,225
18. Lead brick (2 in. x 4 in x 8 in.)(7800 lb) (300)(Cell X, Building 101)	1,919	42	0	792	2,753
19. Trays for hoods (stainless steel)(6)(LB-11, 12)	1,122	6	0	456	1,584
20. Portable testing kit (1)(LB-43)	60	0	0	24	84
Subtotal, Item C	$ 78,379	$ 249	$ 8	$ 31,757	$ 110,393

Table 6 (continued)

Building 102

	Material Cost	Labor Cost	Equipment Usage	Overhead Cost	Total Cost
D. Gadgets, etc. by Oak Ridge National Laboratory					
1. Polarographs (2)(Cell X, Building 101)	$ 3,731	$ 20	$ 0	$ 1,515	$ 5,266
2. High-pressure ion chamber (1)(LB-12)	2,141	0	0	865	3,006
3. Fluorophotometers (2)(LB-11)	8,750	0	0	3,534	12,284
4. Volumetric set-up for uranium analysis (LB-23)(2)	4,792	0	0	1,935	6,727
5. Fusion devices for fluorophotometers (LB-11)(2)	3,268	0	0	1,320	4,588
6. Automatic titrators (2)(LB-23)	16,981	0	0	6,858	23,839
7. Pelletizers (4)(LB-11)	392	0	0	158	550
8. Spark units for spectrograph (2)(LB-44)	1,867	0	0	754	2,621
9. Arc unit for spectrograph (1)(LB-44)	1,074	0	0	434	1,508
10. Engineering for 8 filtrons	2,915	0	0	1,177	4,092
11. Engineering for 8 air monitors	638	0	0	258	896
12. Engineering for 26 monitrons	6,792	0	0	2,743	9,535
13. Waste water monitoring system (CPP-709)	34,852	240	0	14,172	49,264
14. Coccon disc die (1)(LB-44)	100	0	0	40	140
15. Air samplers (Type 5)(6)(LB-43)	816	30	0	342	1,188
16. Burette (positive feed)(1)(LB-23)	1,791	0	0	723	2,514
17. Stirring units (12)(LB-23)	600	0	0	242	842
18. Laundry monitors (2)(LB-43)	7,711	0	0	3,114	10,825
19. Platinum buttons (3 g size)(500)(LB-11)	4,742	0	0	1,915	6,657
20. Plates for alpha counters (1 15/16 in. diam x 1/32 in stainless steel)(10,000)(LB-23	1,710	0	0	691	2,401
21. Gold buttons for fluorophotometer (500) (LB-11)	1,866	0	0	754	2,620
22. Decapping and bottle disposal unit for high activity handling (Cell X, Building 101)	9,738	90	0	3,969	13,797
23. Modification to one centrifuge and accessories (Cell X, Building 101)	491	10	0	202	703
24. Finger for dilution tongs (Cell X, Building 101)	260	2	0	106	368
25. Titration equipment (top section)(LB-23)	1,579	6	0	640	2,225
26. Polarograph tongs (pipette)(1)(Cell X, Building 101)	330	0	0	133	463
27. Assembly of polarograph cell and accessories (1)(Cell X, Building 101)	2,388	14	0	970	3,372
28. Mica window preamplifier for vertical lead shield (1)(off-gas, Building 104)	65	0	0	26	91
29. Acid titration equipment (1) (Cell X, Building 101)	6,852	35	0	2,781	9,668

Table 6 (continued)

Building 102

	Material Cost	Labor Cost	Equipment Usage	Overhead Cost	Total Cost
30. Sample disposal hood (1)(west sample gallery, Building 101)	$ 976	$ 4	$ 0	$ 396	$ 1,376
31. Filter disc cutters (2)(LB-12)	486	0	0	196	682
32. Lead and aluminum sandwiches for Geiger-Mueller counters (LB-31)	125	0	0	50	175
33. Ice baths for centrifuge (12)(LB-12)	189	0	0	76	265
34. Air-driven stirrers (6)(LB-12)	716	0	0	289	1,005
35. Alpha counting chambers (6)(LB-31)	1,212	0	0	489	1,701
36. Monitron cable (1000 ft)(LB-43	650	210	0	347	1,207
37. Jet tips for sampler K606 (2)(west sample gallery, Building 101)	214	0	0	86	300
38. Lucite carriers for fluorometric plates (12)(LB-11)	889	0	0	359	1,248
39. Rotating covering applicator (1)(LB-12)	106	0	0	43	149
40. Lucite carriers for alpha plates (12) (LB-12)	600	0	0	242	842
41. Assemblies of parallel "T" filters for polarograph (2)(Cell X, Building 101)	338	14	0	142	494
42. Manifold covers for RF heater fusion device (2)(LB-11)	216	12	0	92	320
43. Positive delivery pipetters (2)(Cell X, Building 101)	7,114	0	0	2,873	9,987
44. Pistol grip pipetters (2)(Cell X, Building 101)	140	0	0	57	197
45. Specific gravity pipetters (2)(Cell X, Building 101)	3,155	0	0	1,274	4,429
46. Spare decapper inserts (25)(east and west sample galleries, Building 101)	66	0	0	27	93
47. Bottles for polarograph (6)(Cell X, Building 101)	127	0	0	51	178
48. Reconditioned sampler tongs and decappers (1 lot)	7,105	200	0	2,954	10,259
49. Brown converters (5)(LB-45)	608	21	0	254	883
Subtotal, Item D	154,264	908	0	62,668	217,840
E. Laboratory Services					
1. Oxygen system					
a. Oxygen header (4 bottle)(1)	145	51	0	79	275
b. Pipe, valves, fittings, and supports	525	2,162	215	1,202	4,104
Subtotal	$ 670	$ 2,213	$ 215	$ 1,281	$ 4,379

Table 6, (continued)

Building 102

	Material Cost	Labor Cost	Equipment Usage	Overhead Cost	Total Cost
2. Propane gas system					
a. Tanks (1,144 gal)(2)	$ 997	$ 46	$ 10	$ 425	$ 1,478
b. Pipe, valves, fittings, and supports	804	2,659	258	1,539	5,260
Subtotal	1,801	2,705	268	1,964	6,738
3. Demineralized water system					
a. Demineralizer unit (1)	4,802	1,125	336	2,473	8,736
b. Degasifier unit (1)	1,127	264	79	580	2,050
c. Storage tank (1)	435	102	30	224	791
d. Circulating pumps (2)	876	205	61	451	1,593
e. Pipe, valves, fittings, and supports	1,205	3,982	386	2,305	7,878
Subtotal	8,445	5,678	892	6,033	21,048
4. Vacuum system					
a. Nash pumps (2) LC 200 and 201	1,190	279	83	613	2,165
b. Pipe, valves, fittings, and supports	1,074	3,549	344	2,054	7,021
Subtotal	2,264	3,828	427	2,667	9,186
5. Distilled water system					
a. Barnstead still (1)	1,799	422	126	926	3,273
b. Aluminum tank (100 gal)(1)	420	99	30	217	766
c. Pipe, valves, fittings, and supports	1,339	4,427	429	2,563	8,758
Subtotal	3,558	4,948	585	3,706	12,797
6. Compressed air system	3,251	1,802	420	2,159	7,632
Subtotal, Item E	19,989	21,174	2,807	17,810	61,780
Total, Items A,B,C,D, and E	$1,137,223	$768,839	$98,169	$811,745	$2,815,976

Table 6 (continued)

Building 102

Additional Charges for Accounts Other than Bechtel

Brought forward from Bechtel Account, Table 6, p. 74	$2,815,976
Furniture - Chemical Processing Plant (Atomic Energy Commission)	24,796
Furniture - American Cyanamid, Idaho Falls Office (Atomic Energy Commission)	11,321
Equipment - Chemical Processing Plant (Atomic Energy Commission)	250,805
Equipment - American Cyanamid, Idaho Falls Office (Atomic Energy Commission)	28,864
Total construction and other charges to Laboratory Building account	$3,131,762

Table 6 (continued)

Building 102

Areas and Volumes

Function	Inside: First Floor Area, Ft^2	Inside: First Floor Volume, Ft^3	Inside: Second Floor Area, Ft^2	Inside: Second Floor Volume, Ft^3	Inside: Basement Area, Ft^2	Inside: Basement Volume, Ft^3	Inside: Total Area, Ft^2	Inside: Total Volume, Ft^3	Outside: Volume, Ft^3
1. Elevator shaft	88	1,232(1)	88	902(1)	89	1,243(1)	265	1,243(1)	
2. Stair wells	275	3,844(2)	275	4,814(2)	370	5,176(2)	920	13,834(2)	
3. Corridors	3,162	26,248	2,301	19,186	568	7,952	6,031	53,386	
4. Fan room			5,941	69,803(1)			5,941	69,803(1)	
5. Storage	566	5,268	88	820	2,160	30,240	2,814	36,328	
6. Sanitary facilities	884	11,332	229	2,128			1,113	13,460	
7. First aid and infirmary			582	5,409(3)			582	5,409(3)	
8. Cafeteria			2,400	22,320(1)			2,400	22,320(1)	
9. Offices	2,752	25,593(14)	2,339	22,558(12)	1,081	12,518(6)	6,172	60,669(32)	
10. Lockers and clothing	3,155	44,174(3)			121	1,691(1)	3,276	45,865(4)	
11. Entry	222	3,112(1)					222	3,112(1)	
12. Laboratories	4,365	44,958(8)			1,651	15,685(1)	6,016	60,643(9)	
13. Dark rooms	86	889(2)					86	889(2)	
14. Counting room	274	2,819(1)					274	2,819(1)	
15. Instrument shop	828	8,532(1)					828	8,532(1)	
16. Guard station					110	1,540(1)	110	1,540(1)	
17. LC Area					773	10,878(1)	773	10,878(1)	
18. Vault					216	2,920(1)	216	2,920(1)	
19. Telephone and alarm equipment					741	10,380(1)	741	10,380(1)	
20. Maintenance shop and equipment					5,928	82,992(1)	5,928	82,992(1)	
Total	16,657	178,001	14,243	147,940	13,808	183,215	44,708	509,156	846,464
1. Cost for bare building							$ 28.64	$ 2.36	$1.42
2. Cost for building with services and equipment							$ 40.29	$ 3.54	$2.13

Table 7

Building 103

	Material Cost	Labor Cost	Equipment Usage	Overhead Cost	Total Cost	Unit	Total Units	Unit Cost
A. Building								
1. Excavation	$ 0	$ 18,310	$ 1,966	$ 8,396	$ 28,702*	yd^3	26,093	$ 1.10
2. Backfill	0	3,516	5,972	2,252	11,740	yd^3	15,632	0.75
Subtotal	0	21,826	7,968	10,648	40,442			
3. Concrete								
a. Forms	38,830	92,817	9,334	58,091	199,072	ft^2	74,181	2.68
b. Reinforcing steel	49,204	19,243	3,663	28,800	100,910	lb	817,535	0.1234
c. Place	126,478	18,914	8,544	60,304	214,240	yd^3	4,136	51.80
d. Heat	0	9,578	28,597	7,548	45,723	yd^3	4,136	11.05
e. Finish	136	22,803	1,616	10,410	34,965	ft^2	49,471	0.71
Subtotal	214,648	163,355	51,754	165,153	594,910	yd^3	4,136	143.84
4. Building materials								
a. Structural steel	73,161	18,554	6,587	38,467	136,769	ton	255	536.77
b. Miscellaneous iron and steel	34,844	19,969	798	23,018	78,629			
c. Roofing and siding	53,969	583	112	21,987	76,651*	ft^2	29,840	2.57
d. Partitions, including doors and hardware	5,973	136	30	2,466	8,605			
Subtotal	167,947	39,242	7,527	85,938	300,654			
5. Plumbing								
a. Septic tank (1)	186	137	21	142	486			
b. Water meter (1)	82	51	0	55	188			
c. Toilet compartment (1)	111	140	7	106	364			
d. Closet combination (1)	40	53	0	38	131			
e. Lavoratory (1)	30	41	0	29	100			
f. Drinking fountains (2)	54	79	0	55	188			
g. Emergency showers (2)	24	39	0	26	89			
h. Hose racks with 50-ft hose each (3)	171	123	0	121	415			
i. Pipe, valves, fittings, insulation, and supports	902	2,241	243	1,398	4,784			
Subtotal	$ 1,600	$ 2,904	$ 271	$ 1,970	$ 6,745			

*Subcontracted to others by Bechtel.

Table 7 (continued)

Building 103

	Material Cost	Labor Cost	Equipment Usage	Overhead Cost	Total Cost
6. Heating and ventilating					
a. Heating units (500,000 Btu)(2)	$ 5,239	$ 384	$ 32	$ 2,306	$ 7,961
b. Automatic self-cleaning filters (2)	1,480	114	4	652	2,250
c. Adjustable louvers (2)	350	74	4	175	603
d. Registers and grills (12)	124	48	0	70	242
e. Diffusers (18)	383	120	0	205	708
f. Duct work, including insulation and paint	6,001	3,049	54	3,713	12,817
g. Thermostats (2)	47	31	0	32	110
h. Oil tank (12 ft x 24 ft)(480 bbl)(1)D-501	1,946	312	59	945	3,262
i. Insulation for above oil tank	1,717	0	0	700	2,417*
j. Immersion heater for above oil tank (5 kw)(1)	45	24	0	28	97
k. Vent for above oil tank (4 in.)(1)	28	12	0	16	56
l. Fuel oil unloading pump, (1)P-304	1,073	104	12	485	1,674
m. Burner fuel pumps, P-303 and 303A(2)	330	88	6	173	597
o. Pipe, valves, fittings, insulation, and supports	1,183	962	152	936	3,233
Subtotal	19,946	5,322	323	10,436	36,027
7. Electrical					
a. Lighting system for building	5,887	7,392	278	5,697	19,254
b. Power system for building	4,914	6,171	232	4,756	16,073
c. Emergency lighting system	1,330	1,669	63	1,286	4,348
d. Alarm system	295	371	14	285	965
e. Outside lighting system	3,047	3,826	144	2,949	9,966
f. Grounding system	1,184	1,489	55	1,148	3,876
Subtotal	16,657	20,918	786	16,121	54,482
8. Monorail system	27,141	1,132	123	11,450	39,846
9. Crane (17 ton)	26,981	1,122	123	11,359	39,585
10. Basin transfer pit and canal recirculating system					
a. Chlorinator (1)	1,222	81	0	526	1,829
b. Pumps, P-301 and 301A(2)	1,332	91	0	574	1,997
c. Filters with apparatus (2)	5,200	226	0	2,189	7,615
d. Slurry feeder (1)	1,100	85	0	478	1,663

Table 7 (continued)

Building 103

	Material Cost	Labor Cost	Equipment Usage	Overhead Cost	Total Cost
10. Basin, transfer pit, and canal recirculating system (contd)					
e. Screen (1)	$ 290	$ 42	$ 0	$ 134	$ 466
f. Tank with agitator (1)	1,519	61	0	638	2,218
g. Pipe, valves, fittings, and supports	5,833	8,871	852	6,401	21,957
Subtotal	16,496	9,457	852	10,940	37,745
11. Painting	3,403	1,517	246	2,074	7,240
Subtotal, Item A	494,819	266,795	69,973	326,089	1,157,676
B. Carriers and Chargers					
1. Straddle carriers (2)	18,850	67	0	7,632	26,549
2. NP slug chargers (4)	29,680	60	0	11,968	41,708
3. MTR slug chargers (3)	35,997	72	0	14,515	50,584
Subtotal, Item B	84,527	199	0	34,115	118,841
C. Other Equipment					
1. Howe scales with recording equipment (1 set)	2,864	178	0	1,227	4,269
2. Underwater viewing mechanism with level (1)	3,835	42	0	1,560	5,437
3. Slug-handling tongs (7)	3,355	4	0	1,352	4,711
4. Slug tong extension piece (1)	93	0	0	37	130
5. MTR slug buckets (120)	7,934	30	0	3,205	11,169
6. Galvanized bucket yokes (1000)	43,490	50	0	17,522	61,062
7. Sample bottles (5 gal)(6)	108	0	0	45	153
Subtotal, Item C	61,679	304	0	24,948	86,931
Total, Items A, B, and C	$641,025	$267,298	$ 69,973	$385,152	$1,363,448

Table 7 (continued)

Building 103

Additional Charges for Accounts Other than Bechtel

Brought forward from Bechtel Account, Table 7, p. 79	$1,363,448
Furniture (Atomic Energy Commission)	233
Total construction and other charges to Storage Building account	$1,363,681

Table 7 (continued)

Building 103

Areas and Volumes

Function	Inside Area, Ft^2	Inside Volume, Ft^3	Inside Volume, Ft^3 to top of Weirs	Inside Gallons Capacity	Outside Volume, Ft^3
1. Crane bay	5,901	192,144			
2. Canal	1,822	16,088			
3. Basin no. 2	2,440	21,542			
4. Basin no. 3	2,440	21,542			
5. Heater room for basin no. 2	332	5,308			
6. Heater room for basin no. 3	332	5,308			
7. Lean-to	178	2,564			
Subtotal	13,445	264,496			
8. Storage basin no. 2	2,160	40,361	39,697	296,932	
9. Overflow pit for basin no. 2	8	55			
10. Storage basin no. 3	2,160	40,361	39,410	294,785	
11. Overflow pit for basin no. 3	8	53			
12. Canal	1,297	26,366	25,750	192,611	
13. Canal overflow pit	2	8			
14. Pump suction pit	70	1,438			
15. Transfer pit (3 sections)	169	4,239	3,871	28,956	
Subtotal	5,874	112,881			
Total	19,319	377,377	108,728	813,284	624,780
1. Cost for bare building	$48.45	$ 2.48			$ 1.50
2. Cost for building with services and equipment	$59.92	$ 3.07			$ 1.85

Table 8

Buildings 104-105

	Material Cost	Labor Cost	Equipment Usage	Overhead Cost	Total Cost	Unit	Total Units	Unit Cost
A. Building								
1. Excavation and backfill								
a. Excavation	$ 0	$ 34,058	$ 1,872	$ 15,405	$ 51,335	yd^3	30,206	$ 1.70
b. Backfill	0	8,234	9,978	4,815	23,027	yd^3	28,989	0.79
Subtotal	0	42,292	11,850	20,220	74,362			
2. Concrete								
a. Forms	9,053	182,912	22,907	87,850	302,722	ft^2	121,199	2.50
b. Reinforcing steel	80,216	43,828	14,162	53,445	191,651	lb	1,323,073	0.1448
c. Embedded steel	349	18,479	1,737	8,582	29,147			
d. Place	126,363	28,504	6,681	64,322	225,870	yd^3	7,200	31.37
e. Heat	0	4,987	27,310	5,352	37,649	yd^3	7,200	5.23
f. Finish	279	44,007	262	19,771	64,319	ft^2	50,685	1.27
Subtotal	216,260	322,717	73,059	239,322	851,358			118.24
3. Building materials, etc.								
a. Structural steel	38,729	3,418	1,104	17,234	60,485	ton	69	875.33
b. Embedded steel	5,906	5,671	356	4,947	16,880			
c. Roof and siding	20,257	2,876	34	9,436	32,603	ft^2	12,372	2.64
d. Partitions	2,306	2,547	23	2,066	6,942			
e. Miscellaneous hardware	6,969	3,217	32	4,242	14,460			
f. "K" plugs	0	16,708	0	7,451	24,159			
g. Cell linings	23,093	14,164	809	15,702	53,768	ft^2	4,455	12.07
h. Plumbing	1,257	762	118	860	2,997			
i. Heating and ventilation	31,065	16,419	2,731	20,135	70,350			
j. Cranes and hoists	2,290	756	0	1,258	4,304			
k. Compressed air system	6,432	3,605	841	4,292	15,170			
l. Electric light and power	10,654	17,688	1,257	12,320	41,919			
m. Painting	19,670	21,164	1,219	17,499	59,552	ft^2	179,316	0.33
Subtotal	168,628	108,995	8,524	117,442	403,589			
Subtotal, Item A	$384,888	$474,004	$93,433	$376,984	$1,329,309			

Table 8 (continued)

Buildings 104-105

	Material Cost	Labor Cost	Equipment Usage	Overhead Cost	Total Cost
B. Gaseous disposal system					
1. Dissolver off-gas decontamination system					
a. Pipe, valves, and fittings					
1. Drains	$ 253	$ 664	$ 41	$ 399	$ 1,357
2. Service	7,935	5,545	1,355	6,125	20,960
3. Sleeves	10,834	3,333	153	5,904	20,224
4. Process (stainless steel)	44,233	31,176	5,575	33,415	114,399
b. Cold runs	286	24,123	375	10,918	35,702
c. Electrical	8,402	9,918	892	7,907	27,119
d. Instruments and controls					
1. Panels	2,570	1,108	4	1,529	5,211
2. Instruments	23,136	9,970	35	13,759	46,900
3. Pipe, valves, and fittings	17,995	7,754	28	10,702	36,479
4. Conduit, fittings, and cable	7,712	3,323	12	4,586	15,633
e. Shielding	2,919	107	6	1,223	4,255
f. Process equipment					
1. Calrod heating units (58) for vessels WN102-3, 141-4, 148, and 9	3,137	1,238	13	1,816	6,204
2. Valve box (1), etc., for middle cell	784	114	8	367	1,273
3. Puregas units (6) (WN141-4, 148 and 9)	13,932	182	8	5,688	19,810
4. Sample bottles (14)	388	14	0	162	564
5. Electric heating units (7) (WL301-2, 315, 21, 23, 31, and 32)	4,906	210	9	2,068	7,193
6. Lectro dryer (1)	9,050	221	9	3,741	13,021
7. Pump (1) WL207 (vacuum)	632	173	12	332	1,149
8. Pumps (2) WL204 and 5 (caustic)	863	334	21	498	1,716
9. Compressors (2) WL202 and 3	4,618	361	19	2,020	7,018
10. Pump (1) (vacuum)	830	145	9	399	1,383
11. Dryer (1) (air) WN134	1,487	160	17	672	2,336
12. Filters (2) for WN212	272	76	3	144	495
13. Lectro breathers (2) PWN1313 and 23	446	44	0	199	689
14. Vessel (1) stainless steel WN100	13,382	163	105	5,469	19,119
15. Vessel (1) stainless steel WN101	13,382	163	105	5,469	19,119

Table 8 (continued)

Buildings 104-105

	Material Cost	Labor Cost	Equipment Usage	Overhead Cost	Total Cost
f. Process equipment (contd)					
16. Vessel (1) stainless steel WN102	$ 4,004	$ 96	$ 19	$ 1,657	$ 5,776
17. Vessel (1) stainless steel WN103	4,005	96	14	1,656	5,771
18. Vessel (1) stainless steel WN110	1,097	71	11	474	1,653
19. Vessel (1) stainless steel WN114	5,573	83	16	2,281	7,953
20. Vessel (1) stainless steel WN115	3,693	69	14	1,519	5,295
21. Vessel (1) stainless steel WN116	5,565	87	14	2,280	7,946
22. Vessel (1) stainless steel WN117	3,700	97	12	1,533	5,342
23. Vessel (1) stainless steel WN118	2,123	89	12	894	3,118
24. Vessel (1) stainless steel WN119	2,123	89	12	894	3,118
25. Vessel (1) stainless steel WN125	1,620	77	8	687	2,392
26. Vessel (1) stainless steel WN130	1,343	73	8	574	1,998
27. Vessel (1) stainless steel WN131	6,411	340	101	2,742	9,594
28. Vessel (1) stainless steel WN132	6,413	340	101	2,743	9,597
29. Vessel (1) stainless steel WN133	648	64	8	290	1,010
30. Vessel (1) stainless steel WN307	3,208	187	18	1,376	4,789
31. Vessel (1) stainless steel WN322	3,208	187	18	1,376	4,789
32. Vessel (1) stainless steel WN324	3,179	176	21	1,360	4,736
33. Vessel (1) stainless steel WN326	3,179	176	21	1,360	4,736
34. Vessel (1) stainless steel WN605	34	18	0	27	79
Subtotal	255,510	103,034	9,242	151,234	519,020
2. Oxygen-nitrogen plant					
a. Pipe, valves, and fittings					
1. Drains	169	442	27	268	906
2. Service	3,122	2,162	539	2,282	8,105
3. Sleeves	5,098	1,568	73	2,758	9,497
b. Instruments and controls	1,914	825	3	1,138	3,880
c. Electrical	2,101	2,480	223	1,978	6,782
d. Equipment as follows*					
1. Caustic solution mixing tank (1)					
2. Caustic solution pumps (2)					
3. Caustic solution scrub tower (1)					
4. Air purge bottle and air drying battery (1)					
5. Double rectification liquid O_2-H_2 column (1) with thaw-out kettle	39,963	8,533	42	19,889	68,427

*Unable to break down price on each piece of equipment (items 1 - 11) as it was bought lump sum.

Table 8 (continued)

Building 104-105

	Material Cost	Labor Cost	Equipment Usage	Overhead Cost	Total Cost
d. Equipment (contd)					
6. Liquid O_2 pump (1)					
7. Refrigeration machine (1)					
8. O_2-H_2 gas analyzing apparatus (1)					
9. Ten-cylinder O_2 charging manifolds (2)					
10. 3,000-liter O_2 storage tank (1)					
11. Ten-liter O_2 transport containers (2)					
12. H_2 manifolds (2)	$ 1,754	$ 143	$ 0	$ 770	$ 2,667
Subtotal	54,121	16,153	907	29,083	100,264
Subtotal, Item B	309,631	119,187	10,149	180,317	619,284
C. Gaseous Waste Disposal System					
1. Cell ventilating system					
a. Service piping	13,346	9,573	2,208	9,892	35,019
b. Electrical	13,983	23,216	1,649	16,170	55,018
c. Instruments and controls	848	365	2	505	1,720
d. Stack	114,610	173	1,019	46,306	162,108
e. Stack heater	20,741	1,899	64	9,200	31,904
f. Duct (between Buildings 101 and 104)	45,677	21,793	3,425	28,491	99,386
g. Duct insulation	9,915	1,006	892	4,540	16,353
h. 4-in. vents (2) for tanks D-501 and 501-A	58	9	0	28	95
i. Fuel pumps (2) P-502 and 502-A	1,493	226	4	702	2,425
j. Emergency gas engine (1)	2,205	333	6	1,036	3,580
k. 550-gal tank (1) D-502	286	43	3	135	467
l. Fans (2) D-501 and 502 with 75-hp motors	19,877	3,005	48	9,341	32,271
Subtotal	243,039	61,641	9,320	126,346	440,346
2. Vessel off-gas system					
a. Pipe, valves, and fittings					
1. Drains	34	88	5	56	183
2. Sleeves (stainless steel)	6,373	1,960	90	3,666	12,089
3. Process (stainless steel)	3,401	2,434	353	2,610	8,798
4. Process (stainless steel)(between Buildings 101 and 104)	8,256	14,479	7,087	10,591	40,413
b. Electrical	3,329	5,528	393	3,850	13,100
c. Instruments and controls	191	82	1	113	387
d. Filter units (12)	730	42	0	313	1,085

Table 8 (continued)

Buildings 104-105

	Material Cost	Labor Cost	Equipment Usage	Overhead Cost	Total Cost
2. Vessel off-gas system (contd)					
e. Filter box (1) (Building 104)	$ 3,097	$ 557	$ 5	$ 1,496	$ 5,155
f. Blowers (2) SL-200 and 201	5,372	478	0	2,373	8,223
Subtotal	30,783	25,648	7,934	25,068	89,433
3. Dissolver off-gas system					
a. Pipe, valves, and fittings					
1. Sleeves	3,186	980	45	1,891	6,102
2. Process (stainless steel)	497	350	63	419	1,329
3. Process (stainless steel) (between 101 and 104)	4,048	6,949	3,401	5,118	19,516
b. Electrical	333	553	39	385	1,310
c. Instruments and controls	138	59	1	83	281
d. Jet WL-503	175	45	5	90	315
e. Filter WL-116 (stainless steel)	3,531	121	11	1,476	5,139
f. Reactivation blower	872	79	9	387	1,347
Subtotal	12,780	9,136	3,574	9,849	35,339
4. Sample off-gas system					
a. Pipe, valves, and fittings					
1. Drains	34	88	5	73	200
2. Sleeves (stainless steel)	6,373	1,960	90	3,621	12,044
3. Process (stainless steel)	2,485	1,752	313	1,929	6,479
b. Electrical	3,329	5,528	393	3,850	13,100
c. Instruments and controls	191	82	1	113	387
d. Filter units (12)	761	42	0	325	1,128
e. Filter box (1) (Building 101)	3,107	557	5	1,499	5,168
f. Blowers (2) SL-209 and 209-A	5,330	478	0	2,358	8,166
Subtotal	21,610	10,487	807	13,768	46,672
Subtotal, Item C	$308,212	$106,912	$ 21,635	$175,031	$611,790

Table 8 (continued)

Buildings 104-105

	Material Cost	Labor Cost	Equipment Usage	Overhead Cost	Total Cost
D. Liquid Waste Collection and Disposal System					
1. Waste collection, Building 101					
a. Vessels WG-100-1, WH-100-1 (4)	$ 33,344	$ 1,527	$ 829	$ 14,191	$ 49,891
b. Pumps (4)	5,342	1,779	156	2,960	10,237
c. Mixers (4)	2,940	983	86	1,631	5,640
d. Jets (3)	1,831	610	54	1,015	3,510
e. Pipe, valves, and fittings					
1. Service	1,645	1,172	275	1,217	4,309
2. Sleeves (stainless steel)	1,275	392	18	832	2,517
3. Process (stainless steel)	8,914	6,644	396	7,534	23,488
4. Process (stainless steel) (Buildings 101-104)	20,721	36,485	17,858	26,656	101,720
f. Shielding and sampling					
1. Galleries 12 and 13	24,764	2,781	108	11,217	38,870
2. Gadgets for galleries 12 and 13	11,158	70	0	4,521	15,749
g. Instruments and controls	8,878	8,589	219	7,429	25,115
Subtotal	120,812	61,032	19,999	79,203	281,046
2. Waste collection, Building 104					
a. Vessels WL-101-2, WM-100-2 (5)	162,896	7,120	3,864	69,159	243,039
b. Vessel WM-302 (1)	3,276	69	37	1,354	4,736
c. Pipe, valves, and fittings					
1. Sleeves	8,922	2,745	126	5,223	17,016
2. Drains	590	1,547	95	938	3,170
3. Service	11,515	8,201	1,922	8,510	30,148
4. Process (stainless steel)	67,494	50,305	2,994	51,906	172,779
d. Shielding and sampling					
1. Galleries 1 and 2	34,006	3,824	149	15,404	53,383
2. Gadgets for galleries 1 and 2	16,736	56	0	6,759	23,551

Table 8 (continued)

Building 104-105

	Material Cost	Labor Cost	Equipment Usage	Overhead Cost	Total Cost	Unit	Total Units	Unit Cost
2. Waste collection, Building 104 (contd)								
e. Instruments and controls	$ 13,164	$ 12,736	$ 325	$ 11,014	$ 37,239			
Subtotal	318,599	86,603	9,512	170,347	585,061			
3. Waste disposal, tank farm								
a. Excavation and backfill								
1. Excavation	0	45,598	739	20,423	66,760	yd^3	77,514	$ 0.86
2. Backfill	0	13,821	30,506	9,659	53,986	yd^3	73,058	0.74
b. Concrete								
1. Forms	37,258	116,818	7,166	67,916	229,158	ft^2	42,524	5.40
2. Reinforcing steel	21,439	12,715	9,269	15,359	58,782	lb	704,639	0.08
3. Embedded steel	7,854	18,358	349	11,388	37,949			
4. Place	43,670	22,340	8,414	28,499	102,923	yd^3	3,060	33.63
5. Heat	0	5,292	25,461	5,277	36,030	yd^3	3,060	11.78
6. Finish	0	14,286	566	6,437	21,289	ft^2	4,783	4.45
Subtotal (concrete)	110,221	189,809	31,225	134,876	486,131			158.86
c. Pipe, valves, and fittings								
1. Sleeves	2,549	785	36	1,379	4,749			
2. Service	3,290	2,343	549	2,432	8,614			
3. Process (stainless steel)	50,939	37,966	2,260	37,689	128,854			
d. Instruments and controls	8,573	8,293	211	7,172	24,249			
e. Electrical (yard lighting)	998	1,658	118	1,155	3,929			
f. Vessels WM-180 and 181	146,298	58,960	0	85,161	290,419			
Vessels WM-300 and 301	17,110	560	304	7,166	25,140			
Subtotal	339,978	359,793	85,948	307,112	1,092,831			
4. Waste disposal well	11,338	0	13	4,563	15,914			
Subtotal, Item D	$790,727	$507,428	$115,472	$561,225	$1,974,852			

Table 8 (continued)

Buildings 104-105

	Material Cost	Labor Cost	Equipment Usage	Overhead Cost	Total Cost
E. Liquid Waste Evaporator System					
1. Equipment					
a. Vessel WL-106	$ 10,782	$ 427	$ 232	$ 4,636	$ 16,077
b. Vessel WL-107	10,782	427	232	4,636	16,077
c. Vessel WL-108	2,645	105	57	1,198	4,005
d. Vessel WL-112	21,709	860	469	9,253	32,291
e. Vessel WL-100	1,457	57	31	696	2,241
f. Vessel WL-301	10,640	421	228	4,576	15,865
g. Vessel WL-302	2,277	90	49	1,043	3,459
h. Vessel WL-109	2,449	97	53	1,115	3,714
i. Vessel WL-113	11,157	442	240	4,794	16,633
j. Vessel WL-300	8,088	321	172	3,498	12,079
k. Pumps (2)	640	212	19	357	1,228
2. Sampling equipment	2,835	362	14	1,304	4,515
3. Instruments and controls	20,410	19,745	503	17,076	57,734
4. Cold runs	160	9,114	93	4,140	13,507
5. Electrical	667	1,105	78	770	2,620
6. Pipe, valves, and fittings					
a. Drains	608	1,592	97	965	3,262
b. Service	30,919	21,898	5,197	22,803	80,817
c. Sleeves (stainless steel)	19,119	5,882	270	10,546	35,817
d. Process (stainless steel)	54,970	40,970	2,439	43,946	142,325
Subtotal, Item E	212,314	104,127	10,473	137,352	464,266
Total, Items A,B,C,D, and E	$2,005,772	$1,311,658	$251,162	$1,430,909	$4,999,501

Table 8 (continued)

Buildings 104-105

Additional Charges for Accounts Other than Bechtel

Brought forward from Bechtel account, Table 8, p. 89	$4,999,501
Hazardous operating materials storage	18,000
Bottle gas storage facility	6,000
Chemical processing plant burial ground access road	20,274
Chemical processing plant burial ground fence and trench	5,936
Subtotal (storage and burial ground)	50,210
Total construction and other charges to Waste Disposal account	$5,049,711

Table 8 (continued)

Buildings 104-105

Areas and Volumes

Function		Inside Area, Ft^2	Inside Volume, Ft^3	Outside Volume, Ft^3
1. Blower room		576	6,912	
2. Filter room		408	4,896	
3. South WN cell		223	7,812	
4. Middle WN cell		487	17,052	
5. North WN cell		686	22,638	
6. Access corridor		1,300	14,956	
7. Pipe corridor		1,300	12,377	
8. Operating corridor		1,300	16,706	
9. Sample corridor		680	6,800	
10. Cells for Vessels WL-101 and WL-102		1,312	20,984	
11. Cells for Vessels WM-101 and WM-102		1,312	20,894	
12. Cell for Vessel WM-100		731	11,696	
13. Evaporator room		396	12,672	
14. Separator and condenser room		945	33,547	
15. Stair well		65	2,396	
16. Service shaft		32	1,184	
17. Switch gear room		506	7,590	
18. Oxygen-nitrogen room		1,344	21,160	
19. Hydrogen room		126	1,401	
20. Exhaust fan room		1,958	50,908	
Total		15,687	294,671	481,614
1. Cost for bare building	($1,057,090)	$67.39	$3.59	$2.19
2. Cost for building with services	($1,329,309)	$84.74	$4.51	$2.76

Table 9

Building 106

	Material Cost	Labor Cost	Equipment Usage	Overhead Cost	Total Cost	Ft^2 Floor Area (Inside)	Ft^3 Volume (Inside)	Cost per Ft^2	Cost per Ft^3
A. Improvement to Grounds									
1. Roads and paving	$ 7,973	$14,766	$24,268	$12,574	$ 59,581				
2. Surfacing	0	2,522	5,759	1,784	10,065				
3. Excavation and grading	63	25,036	48,370	16,732	90,201				
4. Walks and curbing (230 yd^3)	2,833	7,684	582	4,635	15,734				
Subtotal, Item A	10,869	50,008	78,979	35,725	175,581				
B. Miscellaneous Buildings									
1. CPP-609									
a. Structural	7,456	15,935	808	10,341	34,540				
b. Heating	538	1,101	56	715	2,410				
c. Plumbing	690	1,413	72	917	3,092				
d. Light and power	1,855	3,794	192	2,464	8,305				
e. Equipment	490	325	16	210	1,041				
Subtotal	11,029	22,568	1,144	14,647	49,388	911	8,782	54.21	5.62
2. CPP-610									
a. Structural	1,861	4,086	208	2,652	8,807				
b. Light and power	467	956	48	620	2,091				
c. Heating	124	254	13	165	556				
d. Equipment	245	226	11	147	629				
Subtotal	2,697	5,552	280	3,584	12,083	330	955	36.62	12.65
3. CPP-701									
a. Structural	1,792	3,668	186	2,381	8,027				
b. Heating	168	344	17	223	752				
c. Lighting	135	276	14	179	604				
d. Equipment	57	117	6	76	256				
Subtotal	2,152	4,405	223	2,859	9,639	161	1,369	59.87	7.04
4. CPP-702									
a. Structural	1,326	2,711	138	1,760	5,935				
b. Heating	168	344	17	223	752				
c. Lighting	171	350	18	227	766				
Subtotal	$ 1,665	$ 3,405	$ 173	$ 2,210	$ 7,453	161	1,369	$ 46.29	$ 5.44

Table 9 (continued)

Building 106

	Material Cost	Labor Cost	Equipment Usage	Overhead Cost	Total Cost	Ft^2 Floor Area (Inside)	Ft^3 Volume (Inside)	Cost per Ft^2	Cost per Ft^3
5. CPP-709									
a. Structural	$ 4,080	$ 8,351	$ 423	$ 5,420	$ 18,274				
b. Heating	135	277	14	179	605				
c. Light and power	936	1,916	97	1,243	4,192				
d. Equipment	623	1,274	65	828	2,790				
Subtotal	5,774	11,818	599	7,670	25,861	170	1,360	$152.12	$19.01
6. CPP-710									
a. Structural	1,212	2,482	126	1,611	5,431				
b. Heating	204	418	21	271	914				
c. Light and power	184	377	19	245	825				
d. Equipment	16	32	2	21	71				
Subtotal	1,616	3,309	168	2,148	7,241	161	1,369	44.98	5.29
7. CPP-711									
a. Structural	1,769	3,620	184	2,350	7,973				
b. Heating	124	254	13	165	556				
c. Light and power	69	141	7	91	308				
Subtotal	1,962	4,015	204	2,606	8,787	161	1,369	54.58	6.42
8. CPP-712									
a. Structural	2,643	5,409	273	3,511	11,836				
b. Heating	170	348	18	226	762				
c. Lighting	69	142	7	92	310				
Subtotal	2,882	5,899	298	3,829	12,908	161	1,369	80.17	9.43
9. Well houses No. 1 and No. 2									
a. Structural	2,759	5,646	286	3,664	12,355				
b. Heating	210	430	22	279	941				
c. Light and power	730	1,495	76	970	3,271				
Subtotal	3,699	7,571	384	4,913	16,567	322	2,738	51.45	6.05
Subtotal for miscellaneous buildings	$33,476	$68,512	$3,473	$44,466	$149,927				
C. Oil Storage Tank D-602, 5800 barrels capacity	$15,689	$ 8,747	$1,055	$10,336	$ 35,827				

Table 9 (continued)

Building 106

	Material Cost	Labor Cost	Equipment Usage	Overhead Cost	Total Cost
D. Water Storage Tank D-601 15,000 barrels capacity	$ 22,564	$ 12,579	$ 1,517	$ 14,863	$ 51,523
E. Well Pump Accessories	252	140	17	165	574
F. Fire Water Lines and 15 Hydrants	20,932	70,805	14,804	41,663	148,204
G. Other Utility Lines	4,405	14,915	3,118	8,777	31,215
H. Electrical					
1. Equipment for light and power	19,918	14,366	4,683	14,963	53,930
2. Pole lines for light and power	35,179	25,357	8,266	26,411	95,213
3. Underground lines	25,616	18,460	6,018	19,227	69,321
4. Control and alarm system	8,462	6,094	1,987	6,347	22,890
Subtotal, Item H	89,175	64,277	20,954	66,948	241,354
I. Fencing, complete (16,180 ft)	31,746	25,887	8,199	25,287	91,119
Concrete for posts (205 yd^3)	2,466	1,949	617	1,903	6,935
Subtotal, Item I	34,212	27,836	8,816	27,190	98,054
J. Acid Unloading Facility (Located near Central Facilities)					
1. Concrete (30 yd^3)	1,782	540	104	975	3,401
2. Structural steel supports	2,390	268	91	1,105	3,854
3. Steel platforms, handrails, etc.	1,465	411	70	782	2,728
4. Painting	622	470	30	451	1,573
5. Pipe, valves, fittings, and supports	6,529	2,852	303	3,894	13,578
6. Ball joints (3-in. stainless steel)(2)	812	105	20	377	1,314
7. Hose (3-in. pieces stainless steel)(4)	1,184	80	21	517	1,802
8. Instrumentation	938	878	10	734	2,520
9. Safety shower, complete	368	193	9	229	799
10. Crushed limestone	61	21	12	38	132
11. Tank (10 ft x 34 ft stainless steel) NA-801, weight 19,000 lb (1)	23,600	970	408	10,043	35,021
Subtotal, Item J	39,751	6,788	1,078	19,145	66,762
Total, Items A,B,C,D,E,F,G,H,I, and J	$271,325	$324,607	$133,811	$269,278	$999,021

Table 9 (continued)

Building 106

Additional Charges for Accounts Other than Bechtel

Brought forward from Bechtel account, Table 9, p. 94	$ 999,021
Roads	45,000
Top soiling and seeding	15,000
Communications and alarms	38,700
Feeder power line	10,000
Substation	205,000
Sewage disposal plant	38,600
Water supply	58,242
Total construction and other charges	$1,409,563

Table 10

Building 107

	Material Cost	Labor Cost	Equipment Usage	Overhead Cost	Total Cost	Unit	Total Units	Cost per Unit
A. Excavation and Backfill								
1. Excavation	$ 0	$ 4,385	$ 3,050	$ 2,300	$ 9,735	yd^3	3,863	$ 2.52
2. Backfill	0	2,906	2,034	1,534	6,474	yd^3	3,159	2.05
Subtotal, Item A	0	7,291	5,084	3,834	16,209			
B. Concrete								
1. Forms	5,245	22,565	3,589	12,585	43,984	ft^2	14,014	3.14
2. Reinforcing steel	1,418	20,906	1,779	10,099	34,202	lb	92,362	0.37
3. Place	16,349	14,962	1,109	13,378	45,798	yd^3	1,189	38.52
4. Finish	3,348	3,064	227	2,741	9,380	ft^2	4,500	2.08
Subtotal, Item B	26,360	61,497	6,704	38,803	133,364	yd^3	1,189	112.16
C. Other Building Items								
1. Structural steel	29,762	10,031	2,343	16,718	58,854	ton	162	363.97
2. Miscellaneous iron and steel	3,925	5,353	572	4,033	13,883	ton	10	1,388.30
3. Roof and siding	29,487	1,988	0	12,750	44,225	ft^2	27,800	1.59
4. Partitions	4,943	1,083	0	2,471	8,497			
5. Doors and hardware	2,466	561	0	1,243	4,270			
6. Electric lighting								
a. Lighting control centers (2)	4,460	1,120	102	2,402	8,084			
b. Breakers for control centers (2)	94	112	8	90	304			
c. Transformers (10 KVA)(2)	335	94	12	186	627			
d. Lighting panels (4)	529	420	4	403	1,356			
e. Lighting fixtures	1,771	980	48	1,183	3,982			
f. Wire and cable	3,865	14,316	601	7,942	26,724			
g. Conduit and fittings	2,723	10,140	345	5,584	18,792			
h. Miscellaneous lighting material	528	471	16	429	1,444			
Subtotal (Item 6)	14,305	27,653	1,136	18,219	61,313			
7. Electric power								
a. Emergency control center (1)	1,487	790	29	975	3,281			
b. Power panel board (1)	160	92	4	108	364			

Table 10 (continued)

Building 107

	Material Cost	Labor Cost	Equipment Usage	Overhead Cost	Total Cost	Unit	Total Units	Cost per Unit
7. Electric power (contd)								
c. Panel breaker (1)	$ 158	$ 63	$ 4	$ 95	$ 320			
d. Junction boxes (6)	331	180	5	218	734			
e. Wire and cable	7,748	17,612	751	11,040	37,151			
f. Conduit and fittings	4,485	10,206	413	6,386	21,490			
g. Miscellaneous power materials	1,124	1,015	24	915	3,078			
Subtotal	15,493	29,958	1,230	19,737	66,418			
8. Plumbing								
a. Electric hot water heater (12 gal)(1)	63	43	4	44	154			
b. Closet combination (1)	43	56	3	41	143			
c. Lavatory (1)	41	48	3	37	129			
d. Septic tank (1)	331	168	29	212	740			
e. Metal toilet compartments	486	142	22	261	911			
f. Floor drains, pipe, fittings, and supports	1,247	2,463	397	1,649	5,756			
Subtotal	2,211	2,920	458	2,244	7,833			
9. Heating and ventilating								
a. Heating units (2) G624 and 625	4,345	290	54	1,894	6,583			
b. Louvers (2 ft x 8 ft)(2)	150	18	6	70	244			
c. Power roof vents (48 in.) (3)	2,958	225	38	1,302	4,523			
d. Pipe, fittings, insulation, valves, and supports	1,255	1,992	219	1,400	4,866			
Subtotal	8,708	2,525	317	4,666	16,216			
10. Painting	68	1,124	14	530	1,736	ft^2	11,222	$ 0.15469
Subtotal, Item C	111,368	83,196	6,070	82,611	283,245			
D. Steam Generating Equipment								
1. Steam boilers with burners (2)(22,500 lb/hr)	50,258	15,915	817	27,276	94,266			
2. Gas outfit for spark igniters	255	80	4	138	477			
3. Vapor filter (18 in.O.D.)(1)	353	113	6	193	665			

Table 10 (continued)

Building 107

	Material Cost	Labor Cost	Equipment Usage	Overhead Cost	Total Cost	Unit	Total Units	Cost per Unit
4. Steel breeching and stack	$ 3,687	$ 1,166	$ 60	$ 1,998	$ 6,911			
5. Instrumentation	3,096	980	50	1,680	5,806			
6. Piping, fittings, valves, and supports	8,354	11,397	1,850	8,783	30,384			
7. Insulation	2,170	661	0	1,168	3,999			
8. Testing and start-up	1,641	520	27	891	3,079			
Subtotal, Item D	69,814	30,832	2,814	42,127	145,587	lb/hr	45,000	$ 3.24
E. Oil System for Boiler Burners								
1. Burner pumps (2) P604 and 604A	1,217	399	21	683	2,320			
2. Fuel pumps (2) P606 and 606A	1,973	623	32	1,069	3,697			
3. Gauges (4)	57	4	0	7	68			
4. Fuel oil heaters E603 (2)	676	214	11	366	1,267			
5. Fin tube suction heater (1) E602	748	237	12	405	1,402			
6. Piping, fittings, valves, and supports	1,671	2,280	370	1,757	6,078			
7. Insulation	482	147	0	260	889			
Subtotal, Item E	6,824	3,904	446	4,547	15,721			
F. Boiler Water Feed Pumps								
1. Byron Jaxon pumps (2) with 20-horsepower motors, P-605 and P-605A	5,034	1,592	85	2,729	9,440			
2. Instrumentation	207	67	0	114	388			
3. Piping, valves, fittings, and supports	1,114	1,520	247	1,171	4,052			
4. Insulation	241	73	0	130	444			
Subtotal, Item F	6,596	3,252	332	4,144	14,324			
G. Feed Water Make-Up System								
1. Deaerater (1) E-601	2,548	1,036	53	1,776	5,413			
2. Instrumentation	2,129	445	23	762	3,359			
3. Piping, fittings, valves, and supports	2,227	3,040	494	2,342	8,103			
4. Insulation	362	110	0	195	667			
Subtotal, Item G	7,266	4,631	570	5,075	17,542			

Table 10 (continued)

Building 107

	Material Cost	Labor Cost	Equipment Usage	Overhead Cost	Total Cost
H. Boiler Blow-Down System					
1. Tank (3 ft-6 in. x 5 ft-6 in.)	$ 962	$ 298	$ 16	$ 512	$ 1,788
2. Instrumentation	25	16	0	27	68
3. Piping, fittings, valves, and supports	557	760	123	586	2,026
4. Insulation	121	37	0	65	223
Subtotal, Item H	1,665	1,111	139	1,190	4,105
I. Boiler Water Treatment System					
1. Permutit water treatment materials	30,020	9,504	489	16,289	56,302
2. Chlorinator W and T (1)	856	271	14	465	1,606
3. Milton Roy chemical pump (1)	328	104	5	178	615
4. Fin tube boiler feed cooler (1)	366	116	6	199	687
5. Water meter (1)	1,396	442	23	757	2,618
6. Instrumentation	1,224	388	20	664	2,296
7. Test and start-up	1,393	440	22	755	2,610
8. Piping, fittings, valves, and supports	5,569	7,599	1,234	5,855	20,257
9. Insulation	1,447	441	0	777	2,665
Subtotal, Item I	42,599	19,305	1,813	25,939	89,656
J. Fire Protection System - Pumps					
1. Gas engine driven pump (1)	4,930	1,564	80	2,681	9,255
2. Electric driven pumps (3)	4,215	1,333	69	2,284	7,901
3. Piping, fittings, valves, and supports	2,785	3,800	617	2,926	10,128
Subtotal, Item J	11,930	6,697	766	7,891	27,284
Total, Items A,B,C,D,E,F,G,H,I, and J	$284,422	$221,716	$24,738	$216,161	$747,037

Table 10 (continued)

Building 107

Additional Charges for Accounts Other than Bechtel

Brought forward from Bechtel account, Table 10, p. 99	$ 747,037
Furniture	253
Equipment	15,330
Boiler plant additon	
Design	17,600
Inspection	4,400
Construction (lump sum contract)	221,135
Additions (classified area installation)	8,000
Total construction and other charges to Service Building account	$1,013,755

Table 10 (continued)

Building 107

Areas and Volumes

Function	Inside Area, Ft^2	Inside Volume, Ft^3	Outside Volume, Ft^3
	9,482	187,026	248,840
1. Cost for bare building	$29.64	$1.50	$1.13
2. Cost of building with services	$45.65	$2.31	$1.74

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5.0 ENGINEERING DESIGN AND INSPECTION

Design and engineering of the Idaho Cehmical Processing Plant was performed by The Foster Wheeler Corporation, New York, with process and building design criteria being furnished by the Chemical Technology Division of Oak Ridge National Laboratory.

Preliminary work was started on design criteria by Oak Ridge National Laboratory in April, 1950. The Foster Wheeler Corporation began preliminary design and engineering the latter part of May, 1950. The design and engineering effort expanded rapidly by both Foster Wheeler and Oak Ridge National Laboratory and reached a peak in March, 1951, then tapered off gradually and was essentially completed in April, 1952—a period of two years. Engineering inspection of construction and the correction of drawings to the "as-built" state required another year, bringing the engineering effort to a close April, 1953. The total manhours expended on design, engineering, and inspection was 581,739 and costs were $3,751,357, or an average of $6.45 per hour. An additional contract was later awarded M. A. Neshkian and Company, in the amount of $22,000 for design, engineering, and inspection, to enlarge the existing steam plant capacity with a 22,500-lb/hr unit, including building addition and all other equipment; this cost is included in this study.

Complete engineering resulted in a total of 1543 "as-built" drawings, excluding the boiler plant addition. To obtain this, 2,284 construction drawings and sketches were prepared, not including preliminary sketches and drawings to which no number was assigned or vessel and equipment drawings by vendors. Roughly, 2,500 reports and memoranda were prepared during design and engineering, not including correspondence, design specifications sheets, or purchase requisitions. There were approximately 950 purchase requisitions written, resulting in orders to approximately 540 vendors.

Engineering costs were affected to a great extent by the geographic location of firms concerned. What percentage this may have amounted to is hard to determine, but is not felt to be a unique cost, incurred only in this job. The main design and engineering force of Foster Wheeler Corporation was located in New York. Early in the design work, a small force of their engineers and draftsmen were located in Oak Ridge to aid Oak Ridge National Laboratory in the preparation of criteria. As the work progressed, Oak Ridge National Laboratory engineers were stationed in New York at the offices of Foster Wheeler Corporation to expedite the work of checking drawings and transmitting design information. As construction proceeded, both Foster Wheeler Corporation and Oak Ridge National Laboratory stationed personnel at the site in Idaho to further expedite transmittal of design information to the contractor. During this period of design, Bechtel Corporation, which was responsible for the actual purchase of material, established field offices in Oak Ridge and New York to work closely with engineering personnel in obtaining approval of purchased equipment by either Foster Wheeler Corporation and/or Oak Ridge National Laboratory. Some material was purchased directly from the site under field requisitions and from the home

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office of [redacted] in [redacted]. [redacted] ing and Construction, Idaho Operations Office, Atomic Energy Commission, maintained close liaison with both the New York and Oak Ridge sites.

Pertinent information covering the engineering design and inspection period is given in Tables 11 through 17.

Table 11

Foster Wheeler Corporation

Direct cost reimbursable by AEC	$2,712,000
Fee	148,000
Subtotal	2,860,000
Cost of Government-supplied material	18,093
Subtotal	2,878,093
Cost of Foster Wheeler design forces, excluding labor and overhead incurred at ORNL and not included in their design cost	50,414
Total	$2,928,507
Cost per manhour including fee, Government-supplied material, and ORNL incurred expense	6.06
Cost per manhour including fee and Government-supplied material only	5.96
Cost per manhour including fee only	5.92
Cost per "as-built" drawing	$ 1,898

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Table 12

Design Costs; Foster Wheeler Corporation

Date	Nontechnical Manhours					
	Petroleum Refinery	Accounting Department	Drafting	Construction Department	Personnel Department	Total
1950						
May	---	---	---	---	---	---
June	53	---	---	---	---	53
July	34	---	---	---	---	34
August	103	---	---	---	5	108
September	308	152	30	---	---	490
October	556	308	146	---	---	1,010
November	662	281	270	---	---	1,173
December	900	288	494	---	---	1,682
1951						
January	1,000	408	727	3	---	2,138
February	1,159	268	675	---	---	2,102
March	1,972	426	692	1	---	3,091
April	1,727	254	995	4	---	2,980
May	1,820	424	1,070	---	---	3,314
June	1,660	386	995	---	---	3,041
July	1,540	357	955	---	---	2,852
August	1,744	406	1,122	---	---	3,272
September	1,905	558	1,393	---	---	3,856
October	1,506	403	1,256	---	---	3,165
November	1,345	409	1,054	---	---	2,808
December	1,768	549	618	2	---	2,937
1952						
January	1,625	498	500	---	---	2,623
February	1,346	413	377	---	---	2,136
March	1,303	403	365	---	---	2,071
Total	25,996	7,191	13,734	10	5	46,936

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Table 12 (continued)

Technical Manhours

Date	Order Dept.	Condenser Dept.	Petroleum Refinery (All eng.)	Supervision	Drafting	Construction Department (Eng. and Drafting)	Total
1950							
May	---	---	42	---	---	---	42
June	50	---	156	106	80	---	392
July	13	---	719	37	872	---	1,641
August	14	---	1,251	39	3,556	10	4,870
September	14	---	2,255	2	4,928	111	7,310
October	6	22	2,357	213	6,649	162	9,409
November	11	---	2,456	195	10,944	320	13,926
December	24	51	4,405	330	12,190	14	17,014
1951							
January	24	---	4,507	260	13,423	2	18,216
February	20	3	5,834	219	11,919	---	17,995
March	43	---	8,030	348	12,880	9	21,310
April	41	---	6,350	266	10,159	---	16,816
May	45	---	6,945	281	9,960	---	17,231
June	39	---	5,940	240	7,315	---	13,534
July	35	---	5,448	221	6,046	---	11,750
August	30	---	4,625	188	7,300	---	12,143
September	48	---	5,419	290	5,454	1,907	13,118
October	30	---	4,159	182	4,945	2,814	12,139
November	28	---	3,006	195	3,566	2,856	9,651
December	32	---	3,544	63	2,553	2,800	8,992
1952							
January	---	---	3,459	---	2,183	2,770	8,412
February	---	---	3,239	---	1,760	2,600	7,599
March	---	---	2,999	---	1,689	2,450	7,138
Total	547	76	87,145	3,675	140,380	18,825	250,648

Summary of Manpower through December 31, 1952

Considered 99.5% accurate ; including Foster Wheeler forces in the field.

Engineering	125,148
Drafting, including subcontractors'*	302,166
Inspection	44,183
Miscellaneous	11,258
Total	482,755

*Morgan, etc., 123,791 manhours; Byrne Associates, 2,254 manhours

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Table 13

Design Costs: Oak Ridge National Laboratory

Date	Manhours			Total Costs
	Technical Engineers	Technical Drafting	Total	
1950				
April	360*	---	360*	$ 4,083*
May	860*	---	860*	5,802*
June	824*	---	824*	6,300*
July	1,600	---	1,600	13,408
August	1,728	---	1,728	14,480
September	1,800	---	1,800	15,084
October	1,872	---	1,872	15,687
November	2,200	---	2,200	18,435
December	2,000	---	2,000	16,759
1951				
January	4,173	376	4,513	29,105
February	4,205	366	4,571	33,828
March	4,928	1,016	5,944	40,961
April	4,764	1,266	6,030	44,542
May	5,345	1,312	6,657	47,062
June	5,076	1,180	6,256	45,376
July	5,137	483	5,620	35,907
August	4,417	563	4,980	49,113
September	4,206	248	4,454	39,262
October	4,774	236	5,010	37,117
November	4,352	236	4,588	36,474
December	4,194	269	4,463	38,005
1952				
January	4,012	104	4,116	36,229
February	3,536	100	3,636	34,879
March	3,500	100	3,600	32,549
April	2,288	---	2,288	26,746
May	1,620	---	1,620	17,805
June	958	---	958	14,192
July	607	---	607	4,992
August	840	---	840	7,402
September	792	---	792	8,743
October	920	---	920	10,883
November	932	---	932	8,211
December	1,020	---	1,020	11,275
1953				
January	1,020	---	1,020	12,011
February	1,020	---	1,020	12,726
March	749	---	749	8,290
April	544	---	544	5,312
Total	91,129	7,855	98,984	$822,850

*Not included in totals: 2,044 manhours, technical engineers, total cost $16,185.

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Table 13 (continued)

Breakdown of Total Expense

Material (includes travel)	$134,526
Labor	343,808
Overhead	344,516
Total	$822,850
Average labor cost per manhour, including nontechnical costs but excluding nontechnical manhours	$ 3.473
Overall cost per manhour, including nontechnical costs but excluding nontechnical manhours	$ 8.313

Table 14

Distribution of Engineers during Design

Area or Service*	Foster Wheeler	ORNL	Total	Percent of Total
Supervision	3	1	4	4.8
Process Bldg., 101	11	7	18	21.5
Laboratory and Administration Bldg., 102	2	1	3	3.5
Fuel Storage Bldg., 103	2	1	3	3.6
Liquid waste and Bldg.,104	4	3	7	8.3
Gaseous waste, Bldg. 105	3	3	6	7.1
Site development	3	--	3	3.6
Service Bldg., 107	3	--	3	3.6
Instruments	5	3	8	9.6
Heating and ventilating	3	2	5	5.9
Drawing and materials control	6	1	7	8.3
Special gadgets	2	2	4	4.8
Vessels	4	1	5	5.9
Architectural	1	1	2	2.3
Miscellaneous (pumps, compressors, accountability, analytical, manual preparation, inspection)	2	3	5	5.9
Total	55	29	84	100.0

*In a number of instances, areas of work overlapped; in such cases the personnel concerned are included in more than one area.

[redacted]

Table 15

Percentage of Design Computed at Various Dates

	Design	Plot Plan	SF Storage Basin	Process Design	Chemical Process Bldg. and Equipment	Laboratory and Administration Building	Liquid Waste Disposal	Gaseous Waste Disposal	Service Building	Burial Ground	Dissolver Off-gas Recovery	Gross Area Site Development	Nitric Acid Storage Area
Date Started	5/50	6/50	6/50	6/50	6/50	6/50	8/50	7/50	7/50	6/50	2/51	---	3/51
1950													
July	1	5	10	5	5	5	---	1	---	1	---	---	---
August	No report available												
September	19	40	70	15	20	20	10	10	---	---	---	---	---
October	27	60	80	25	30	30	13	18	---	---	---	---	---
November	34	40	90	26	50	50	16	18	40	50	---	---	---
December*	34	57	92	35	18	17	---	10	20	50	---	---	---
1951													
January	34	65	95	50	26	32	10	15	31	50	---	23	---
February	No report available												
March	57	75	100	80	49	57	28	20	50	50	---	57	---
April	70	80	---	85	63	84	32	36	70	75	---	74	15
May	82	90	---	92	83	94	44	44	82	80	5	83	30
June	87	92	---	95	88	97	60	93	92		15	92	48
July	92	93	---	97	93	98	74	95	93		20	92	67
August	94.5	95	---	98	95	99	83	97	96		35	94	90
September	97	97	---	99	98.5	99.8	93	98	96.5		52	97	98.5
October	98	100	---	99.9	99.5	99.9	95	99.5	99.5		66	99	100
November	99	---	---	99.9	100	100	99	100	99.8		44	99.8	---
December	100	---	---	100	---	---	100	---	100		58	100	---
1952													
January	---	---	---	---	---	---	---	---	---		65	---	---
February	---	---	---	---	---	---	---	----	---		75	---	---
March	---	---	---	---	---	---	---	---	---		80	---	---
April	---	---	---	---	---	---	---	---	---		95	---	---
Date Completed	12/51	10/51	3/51	12/51	11/51	11/51	12/51	11/51	12/51	---	5/52	12/51	10/51

*Complete re-estimate made of scope of project.

[redacted]

Table 16

Distribution of As-Built Drawings*

Area and Area Code	B	C	E	F	G	P	S	V	Total
Process Bldg., 101	16	67	20	61	---	204	129	---	497
Laboratory and Administration Bldg., 102	35	339	14	13	---	76	3	1	541
Fuel Storage Bldg., 103	15	---	10	10	---	8	---	---	43
Waste Disposal Bldgs., 104,105	13	136	23	55	---	88	35	7	357
Site development, 106	6	4	18	7	16	27	4	---	82
Service Bldg., 107	8	---	4	1	---	1	---	---	14
Nitric acid unloading	---	---	1	3	---	2	3	---	9
Total	93	606	90	150	16	406	174	8	1,543

Codes to column headings:

B - Building, architectural, plumbing, heating and ventilating
C - Controls, instruments, instrument piping, control boards
E - Electrical power, lighting, electrical, supports
F - Foundations, piling trenches, underground flues, fire proofing
G - General, plot plans, insulation, instrument enclosures
P - Piping, flowsheets, sewer piping, hangers, supports
S - Structural steel other than buildings and not including heating and ventilating
V - Vessels, tanks, etc.

*This table gives the actual count of as-built drawings and arranged according to code numbers used by the architect-engineer. In all probability, there are errors in code assignment of numbers to the drawings. Drawings prepared by other than Foster Wheeler Corporation, the architect-engineer, are not included.

[redacted]

Table 17

Distribution of Construction Drawings

Area and Area Code	Number of Foster Wheeler Drawings						
	Construction	Bill of Material	Line List	Vessels	Sketches	Miscellaneous	Total
Process Bldg., 101	441	11	98	170	375	0	1,502
Laboratory and Administration Bldg., 102	87	6	14	0	0	0	107
Fuel Storage Bldg., 103	37	1	1	0	0	0	39
Liquid waste and Bldg. 104	180	8	22	?	?	0	210
Dissolver off-gas system, 105	129	4	7	20	25	0	189
Site development, 106	77	6	8	0	0	0	91
Service Bldg., 107	16	3	1	0	0	0	20
Nitric acid storage	7	1	1	0	0	0	9
Miscellaneous	0	0	0	0	0	39	39
Total	974	40	152	190	400	39	1,795

	Number of ORNL Drawings				
	Schematic Instrument	Flow Sheets	Flow Diagram	Machine and Structural	Total
Process Bldg., 101	44	31	49	283	407
Laboratory and Administration Bldg., 102		4		19	19
Dissolver off-gas system, 105	—	4	—	—	4
Total	44	35	49	365	489

[redacted]

6.0 TRAINING AND PREOPERATIONAL COSTS

The training and preoperational costs incurred by American Cyanamid Company and Oak Ridge National Laboratory amounted to $2,927,675. This money was spent in training operating personnel, calibration of instruments, testing of equipment, both process and laboratory, preparation of manuals, procurement of operating supplies, evaluation procedures, and operating the plant with nonirradiated uranium at various capacities.

American Cyanamid Company was selected by the Atomic Energy Commission during the early part of 1951 as the operating contractor for the plant. In February, 1951, location of technical men at Oak Ridge National Laboratory for training was started. This group materially assisted ORNL personnel in the preparation of manuals. In October, 1951, all American Cyanamid Company personnel was shifted to the plant site in Idaho.

The costs incurred by Oak Ridge National Laboratory and chargeable to training and preoperation were for similar effort expended as described above with the exception of training.

In this section a detailed breakdown of training and preoperational costs is presented.

[redacted]

[redacted]

Table 18

Preoperational Cost: Oak Ridge National Laboratory

Date	Technical Manhours	Total Cost
1951		
February	192	$ 954
March	680	2,108
April	612	1,558
May	108	438
June	1,456	6,770
July	600	1,356
August	512	1,288
September	525	1,338
October	428	1,267
November	---	233
December	---	---
1952		
January	---	167
February	---	249
March	1,440	6,628
April	1,456	6,856
May	1,512	11,803
June	1,744	16,427
July	1,325	14,430
August	1,294	17,167
September	1,728	14,131
October	2,808	22,174
November	1,980	18,218
December	1,210	16,197
1953		
January	1,123	10,154
February	1,363	10,623
March	2,038	15,640
April	1,456	13,185
Total	27,590	$211,359

Breakdown of total cost

Material (including travel)	$ 35,643
Labor	87,858
Overhead	87,858
Total	$211,359

Average cost of labor per manhour $ 3.184

[redacted]

[redacted]

Table 19

American Cyanamid Incurred Costs*

Spare parts, maintenance and operating supplies, and laboratory supplies	$ 465,700
Training costs to July 1, 1952	1,454,500
Preoperational costs (7/1/52 - 10/31/52)	728,100
ORNL charges (billed to American Cyanamid)	68,016**
Total	$2,716,316

* Information contained in attachment to letter, dated July 23, 1952, to F. L. Culler from A. C. Johnson, Atomic Energy Commission, Idaho Falls.

** Dollars given in above reference = $29,300. ORNL records show reimbursable amount to be $68,016.

Manpower Distribution*

Summary. Prior to July 1, 1952, the American Cyanamid Company expended 797 man-months in inspection, testing, and startup of the Chemical Processing Plant. Data compiled from time distribution records, activity reports, and interviews with department heads show that 607 man-months were contributed by salaried personnel and 190 by hourly employees. There were essentially no hourly personnel in 1951, but the ratio of hourly to salaried personnel has increased rapidly since January, 1952.

A man-month breakdown by departments is shown in Table 20. A thorough breakdown by job classifications is given in Tables 22 through 33.

*The inspection, testing, and preoperational work in final preparation for commencing chemical runs in the plant, though primarily the responsibility of Oak Ridge National Laboratory, was performed jointly by American Cyanamid and the Laboratory. This section (declassified February 8, 1954) was originally published as document ID0-14,127-ACCO, "Personnel Distribution for Startup of the C.P. Plant," August 8, 1952, by G. H. Kumler. It is reproduced here in its entirety, being changed only to agree with the style of this report for uniformity. It was not necessary to add to or subtract from this report, except for comments in summarizing the work of both the American Cyanamid Company and Oak Ridge National Laboratory.

[redacted]

Table 20

Summary Breakdown of Time Contributed
by American Cyanamid Personnel to Plant Startup

Department	Man-months			
	1951	1952 (to July 1)		
	Salaried	Salaried	Hourly	Total
Operating				
At ORNL	67			67
At IDO	41	116	81	238
Chemical	41	164		205
Maintenance	56	66	109	231
SF Accountability	12	12		24
Health Physics	10	22	—	32
Total	227	380	190	797

Discussion. The American Cyanamid Company manpower effort in the preparatory and startup phases of the Chemical Processing Plant was affected to a large degree by revisions in the construction schedule. If the plant had been completed in October, 1951, as originally scheduled, the American Cyanamid manpower expenditure would have been reduced considerabily from the 797 man-months indicated.

The detailed man-month breakdown in Tables 22 through 33 includes only that time spent by American Cyanamid personnel in testing, inspection, and plant startup. The work is broken down into classifications used by the Cyanamid time accounting system. Time that falls into the following classifications is not included: accounting, general administration, clerical, personnel, training, STR planning, SIR planning, time off with and without pay, illness, vacations, and holidays, and plant operation.

An overall picture of American Cyanamid activity before July 1, 1952, is given in Table 21. As shown in this table, considerable emphasis has been placed on preparation of manuals concerning the startup and operation of the Chemical Processing Plant. A total of 219 man-months have been contributed to manual preparation between February, 1951, and July, 1952.

[redacted]

Table 21

Concentration of American Cyanamid Manpower Effort
From February 1, 1951 to July 1, 1952

Period	Concentration of Effort	Applicability to this Report
February, 1951, to October, 1951 (at ORNL)	Training	Not applicable
	Preparation of manuals	Applicable
	Radiation surveys	Not applicable
	Laboratory Analyses	Not applicable
October, 1951 to January, 1952	Training	Not applicable
	Preparation of manuals	Applicable
	SF startup preparations	Applicable
	SF operation	Not applicable
	Procurement of materials and supplies	Applicable
January, 1952, to July, 1952	Training	Not applicable
	Preparation of manuals	Applicable
	Calibration of Vessels	Applicable
	Calibration of instruments	Applicable
	Water runs	Applicable
	Setting up laboratories	Applicable
	Piping inspections and testing	Applicable
	Installation of equipment	Applicable
	Procurement of supplies	Applicable
	SF operation	Not applicable
	Run sheet preparation	Applicable
	Evaluation of laboratory procedures	Applicable

[redacted]

[redacted]

Explanation of Work Classifications. A breakdown of the types of work represented by the Cyanamid accounting system work classifications used in Tables 22 through 33 is shown below. These classifications are considered applicable to this report.

Classification	Types of Work
Construction assistance	Calibration of vessels Calibration of instruments Cleaning of process equipment Testing of process equipment Inspection of process equipment
Startup	Manual preparation Procurement of supplies Water runs Setting up laboratories Run sheet preparation Chemical runs
Quality control	Preparation of synthetic solutions Evaluation of procedures
Maintenance during calibration of chemical laboratory equipment	Calibration of laboratory equipment

Explanation of Startup Work Performed by American Cyanamid Departments. Before January 1, 1952, more than half of the Operating Department manpower effort at the plant site was spent in starting up the SF Storage Building. This work, which included inspection and testing of the SF facilities, was completed on November 9, 1951, when the first NP fuel elements arrived and the building went into operation. Some work was done on the operating and equipment manuals, and planning for the chemical runs was started.

Between January 1, 1952, and July 1, 1952, the following types of work were performed:

Preparation of operating and equipment manuals
Calibration of process vessles
Materials-of-construction tests on process equipment and piping
Inspections of process piping
Water runs to test process equipment
Purges of process equipment
Detergent cleaning of process equipment
Rinsing of process equipment
Preparing operating run sheets
Preparing operating supply requirements

[redacted]

[redacted]

Chemical Department. Prior to January, 1952, the Chemical Department was mainly concerned with preparation of manuals and writing of laboratory procedures. In 1952 this work was continued; and, in addition, time was spent in setting up the laboratories, procuring laboratory materials, and evaluating laboratory procedures.

Maintenance Department. The Maintenance Department was occupied with a large variety of functions. They opened a storeroom in 1952 and several man-months were devoted to its operation.

The Plant Engineering Section was concerned with procurement of spare parts, and general planning for future plant operations. Some drafting was done in connection with alterations and new installations.

The Instruments Section devoted most of its time to construction assistance, including calibration of instruments, instrument adjustments, and modification of instrument lines. Assistance was rendered by this section to the Operating Department during preoperational water runs and cleaning.

The Maintenance Section spent time on inspection and testing of equipment, alteration of facilities, and assistance to the Operating Department during water runs and cleaning.

SF Accountability Department. The SF Accountability time applicable to this survey was divided between preparation of manuals and calibration of process vessels. Part of the manual preparation work was done by American Cyanamid personnel at the Oak Ridge National Laboratory in 1951.

Health Physics Department. In 1951 very few health physicists reported to Idaho, and little work directly connected with the Chemical Processing Plant was done. However, four man-months were devoted to procurement and expediting. In 1952 this work was continued, and manual preparation and procedure write-ups were started.

Breakdown of Costs for 1951 (2/1/51 to 1/1/52).

Table 22

Time Contributed by Salaried Personnel of Operating Department at ORNL

Phase	Man-months
Supervision	8
Startup (preparation of operating and equipment manuals)	59
Total	67

[redacted]

Table 23

Time Contributed by Salaried Personnel of Operating Department at IDO Site

Phase	Man-months		
	Construction Assistance	Startup*	Total
General supervision		7	7
SF storage	1/2	18-1/2	19
Dissolving and feed preparation		5	5
Extraction and stripping	1/2	6-1/2	7
Liquid waste disposal	1	1-1/2	2-1/2
Off-gas process		1/2	1/2
Total	2	39	41

* Includes approximately 5 man-months on preparation of operating manuals.

Table 24

Time Contributed by Salaried Personnel of Chemical Department at IDO Site

Phase	Man-months*
General supervision	6
Ionic laboratory	24
Mass spectrometer laboratory	6
Spectrochemical laboratory	4
Special assignment	1
Total	41

* Includes approximately 20 man-months of manual preparation.

[redacted]

Table 25

Time Contributed by Salaried Personnel of Maintenance Department at IDO Site

Phase	Man-months
General supervision	18-1/2
Drafting	6-1/2
Instrument	18
Maintenance	12-1/2
Stores	1/2
Total	56

Table 26

Time Contributed by Salaried Personnel of SF Accountability Department at IDO Site

Phase	Man-months
Startup (manual preparation)	9
Construction assistance (calibration)	3
Total	12

Table 27

Time Contributed by Salaried Personnel of Health Physics Department at IDO Site

Phase	Man-months
Supervision	6
Startup (manual preparation)	4
Total	10

[redacted]

[redacted]

Breakdown of Costs for 1952 (1/1/52 to 7/1/52) at IDO.

Table 28

Time contributed by Technical Personnel of Operating Department

Phase	Man-months		
	Construction Assistance	Startup*	Total
General supervision		14	14
Overhead	1/2	9	9-1/2
SF storage		3	3
Solvent recovery	1-1/2	3	4-1/2
Dissolving and feed preparation	10-1/2	20	30-1/2
Extraction and stripping	13-1/2	18	31-1/2
Final product preparation	1	1	2
Liquid waste disposal	2	9	11
Off-gas process		10	10
Total	29	87	116

* Includes approximately 39 man-months on preparation of operating manuals.

Table 29

Time Contributed by Nontechnical (Hourly) Personnel of Operating Department

Phase	Man-months		
	Construction Assistance	Startup	Total
Overhead	1/2	3-1/2	4
SF storage		5-1/2	5-1/2
Solvent recovery	1	1-1/2	2-1/2
Dissolving and feed preparation	16	14	30
Extraction and stripping	16-1/2	15	31-1/2
Final product preparation	1	1	2
Liquid waste disposal		5	5
Off-gas process		1/2	1/2
Total	35	46	81

[redacted]

[redacted]

Table 30

Time Contributed by Salaried Personnel of Chemical Department

Phase	Man-months			
	Startup*	Quality Control	Maintenance Calibration of Chemical Laboratory Equipment	Total
General supervision	6			6
Overhead	23-1/2			23-1/2
Ionic laboratory	84-1/2	2	1	87-1/2
Mass spectrometry laboratory	23			23
Spectrochemical laboratory	18			18
Special assignment	5	1	—	6
Total	160	3	1	164

* Includes approximately 55 man-months of manual preparation.

Table 31

Time Contributed by Maintenance Department

Phase	Man-months		
	Salaried*	Hourly	Total
General supervision	15-1/2		15-1/2
Drafting	5		5
Instrument	24	60-1/2	84-1/2
Maintenance	17	48	65
Stores	4-1/2	1/2	5
Total	66	109	175

* Includes approximately 8 man-months of manual preparation.

[redacted]

[redacted]

Table 32

Time Contributed by Salaried Personnel of SF Accountability Department

Phase	Man-months
Startup (manual preparation)	8
Construction assistance (calibration)	4
Total	12

Table 33

Time Contributed by Salaried Personnel of Health Physics Department

Phase	Man-months
Supervision	10
Startup (manual preparation)	12
Total	22

[redacted]

[redacted]

7.0 CUSTOMER'S (ATOMIC ENERGY COMMISSION) EXPENSE

All too often in estimating costs, the fact that the customer for a facility has an incurred expense, over and above that of land cost, is overlooked. For that reason, this section is included.

The information contained in this section was supplied by the Division of Engineering and Construction, Idaho Operations Office, and is an estimate of their expenses which they believe applicable. The normal accounting system of the Idaho Operations Office does not allocate funds to specific projects.

Customer's expense chargeable against the Idaho Chemical Processing Plant amounts to $2,965,993, of which $1,140,000 is an estimated direct operating expense. The remainder, $1,825,993, is 25 percent of the book value of the land and improvements thereon when acquired from the Navy in July, 1949, and improvements made thereafter by the Atomic Energy Commission. Most of the latter costs are in Central Facilities and general services, such as area roads, power lines, and mobile fire fighting equipment, that are used by all installations at the National Reactor Testing Station. In projecting the Chemical Processing Plant to another site, similar facilities would have to be furnished or carried as a direct expense against the projected site.

Tables 34 and 35 present a breakdown of the Customer's Expense prorated against the Idaho Chemical Processing Plant.

Table 34

Idaho Operations Office Estimated Direct Expense for Chemical Processing Plant*

Engineering	$ 110,000
Construction	60,000
Safety and fire protection	16,000
Technical operations	60,000
Health physics	100,000
Security	90,000
Fire protection (fire department)	117,000
Medical and first aid	38,000
Accounting and auditing	75,000
General administration and overhead	225,000
Bus operation	244,000
Cafeteria operation	15,000
Total	$1,140,000

*From attachment to letter dated July 23, 1952, from Allan C. Johnson, Director, Division of Engineering and Construction, Idaho Operations Office, to F. L. Culler.

[redacted]

[redacted]

Table 35

Common Facilities in Central Facilities Area
and Site Used for Construction and/or Operation
of Some of or All Reactors and Chemical Processing Plant

Facility	Cost
Existing Naval facilities, July, 1949	$1,851,450
Conversion Naval facilities	399,000
Utility distribution lines, Central Facilities	120,000
Equipment yard	38,000
Bus terminal facilities	40,000
Water supply, Central Facilities	110,000
Sewage plant, Central Facilities	125,000
Fire protection loop	48,000
Roads and parking areas, National Reactor Testing Station, Central Facilities	210,000
Tank farm	87,000
Materials yard	30,000
Cafeteria	220,000
Warehouse No. 2	258,000
Warehouse No. 1	242,100
Railroad spurs	65,000
Communications building	108,000
Incinerator	48,000
Fire station	72,000
Heating plant, warehouses No. 1 and No. 2	46,000
Vehicular inspection station	143,000
Heavy equipment repair shop	318,000
Laundry	120,000
Machine shop	290,000
Design, National Reactor Testing Station, Central Facilities	71,253
Soil exploration tests	300,000
Soil stabilization	29,000
Radio systems	32,000
Central substation	386,200
Major transmission lines	463,000
Reconstruction Scoville substation	219,400
Transmission line, Goshen to National Reactor Testing Station	300,000
Miscellaneous minor construction	390,000
Lead shop	45,000
Chemical storage facility	50,000
Total	$7,303,973
25 percent (Idaho Chemical Processing Plant)	$1,825,993

[redacted]

[redacted]

Table 36

Existing Naval Facilities, July 1949,
at the National Reactor Station
when Acquired by the Atomic Energy Commission

	Building	Cost
No. 8	Machine shop	$ 5,600.00
9	Flammable-oil storehouse	2,800.00
13	Gatehouse	2,600.00
17	Civilian passenger car garage	2,600.00
22	Civilian quarters (ABCD)	20,000.00
23	Civilian quarters (ABCD)	20,000.00
A	Officers' quarters	7,500.00
B-f	Civilian quarters at $7,745.65 each	30,000.00
G	Civilian quarters	7,500.00
L-z	Civilian quarters at $9,511.30 each	112,500.00
AA-BB	Civilian quarters at $9,511.30 each	15,000.00
HIJK	Civilian quarters at $12,400.00 each	20,000.00
Aa	Officers' passenger car garage	1,200.00
M-1	Marine barracks	45,000.00
20	Sewage pump house	2,600.00
2	Reservoir and pump house	25,000.00
S-45	Fresh water well No. 2	21,000.00
S-48	S-54 fuel oil tank buildings, ABCDFG at $107.00	700.00
S-55	S-56 fuel oil tank building, HI and JK at $192.00	300.00
S-57	Fuel oil tank building, L-M	150.00
S-58	Fuel oil tank building, M-1	2,200.00
S-59	Fuel oil tank building, N-O	150.00
S-60	Fuel oil tank building, P	100.00
S-61	S-66 fuel oil tank buildings, Q-R, S-T, U-V, Y-Z, and AA-BB	900.00
S-67	Fuel oil building No. 1	300.00
S-68	Gasoline tank No. 1	800.00
S-69	Diesel oil tank No. 1	400.00
S-70	Fuel oil tank No. 2	100.00
S-71	Gasoline tank No. 2	100.00
S-72	Fuel oil tank building No. 11	800.00
S-73	Fuel oil tank building No. 14	100.00
S-74	Fuel oil tank building No. 18	300.00
S-75	Diesel oil tank No. 19	800.00
S-76	S-77 fuel oil tanks No. 22 and No. 23 at $266.00	500.00
3	Pump house No. 2, fresh water	2,600.00
12	Pump house No. 1, fresh water	3,000.00
S-44	Fresh water well No. 1	23,500.00
S-46	Fresh water well No. 3	300.00
S-78	Electric substation	22,000.00
S-47	Fresh water well No. 4	300.00
5	Civilian passenger garage	1,400.00
7	Office	16,000.00
10	Civilian latrine and lavatory	4,400.00

[redacted]

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Table 36 [redacted]

Building		Cost
No. 16	Inert materials warehouse	$ 40,000.00
18	Storage service building	18,000.00
19	Diesel generator building	55,000.00
A-1	Bomb-proof storage	58,000.00
A-3	Magazine, storage	4,400.00
A-4	Magazine, fuse and primer	1,600.00
A-5	Magazine, powder	9,000.00
A-6,A-8	Magazine, powder at $24,292,000	23,000.00
S-36	Tower, control and observation	1,200.00
1	Fire station and low shed	48,000.00
A-2	Projectile storage	8,000.00
4	Dog kennels	600.00
37-39	Observation towers at $600.00	----
21	Commissary	1,400.00
14	Riggers' shop	1,300.00
S-40	Septic tank	15,400.00
11	Substation and heating plant	43,000.00
15	Fresh water elevated tank	12,700.00
S-35	Temporary storehouse	50.00
S-41	Equipment storehouse	3,000.00
S-42	Flag pole	400.00
Utility Systems		
	Telephone cable distribution system	3,000.00
	Street and fence lighting system	23,000.00
	Sewage system	111,000.00
	Fuel oil distribution system	2,200.00
	Fresh water distribution system	93,000.00
	Steam heating distribution system	22,000.00
	Electrical distribution system	52,000.00
Roads, oiled and graveled		450,000.00
Railroads		
	4,900 ft of transfer track	----
	8,745 ft of standard rail	260,000.00
Fencing		
	Magazine disposal plant fence	600.00
	Housing area fence, 1,300 ft	200.00
	Emplacement boundary fence 5,532 ft	27,000.00
	Snow fence	2,300.00
Other Improvements		
	Range survey and map	27,500.00
	Sidewalks	1,700.00
	Parking areas	1,700.00
	Compressed air distribution system	3,300.00
	Fire alarm system	3,800.00
	Total	$1,851,450.00

[redacted]

8.0 APPENDIX

Photographs of various parts of the plant made during construction convey some idea of the complexity of operations during construction and the use of materials and equipment. Figures 1 through 20 are included here for this purpose. Figures 21 through 26 are diagrammatic sketches showing arrangement of buildings and equipment.

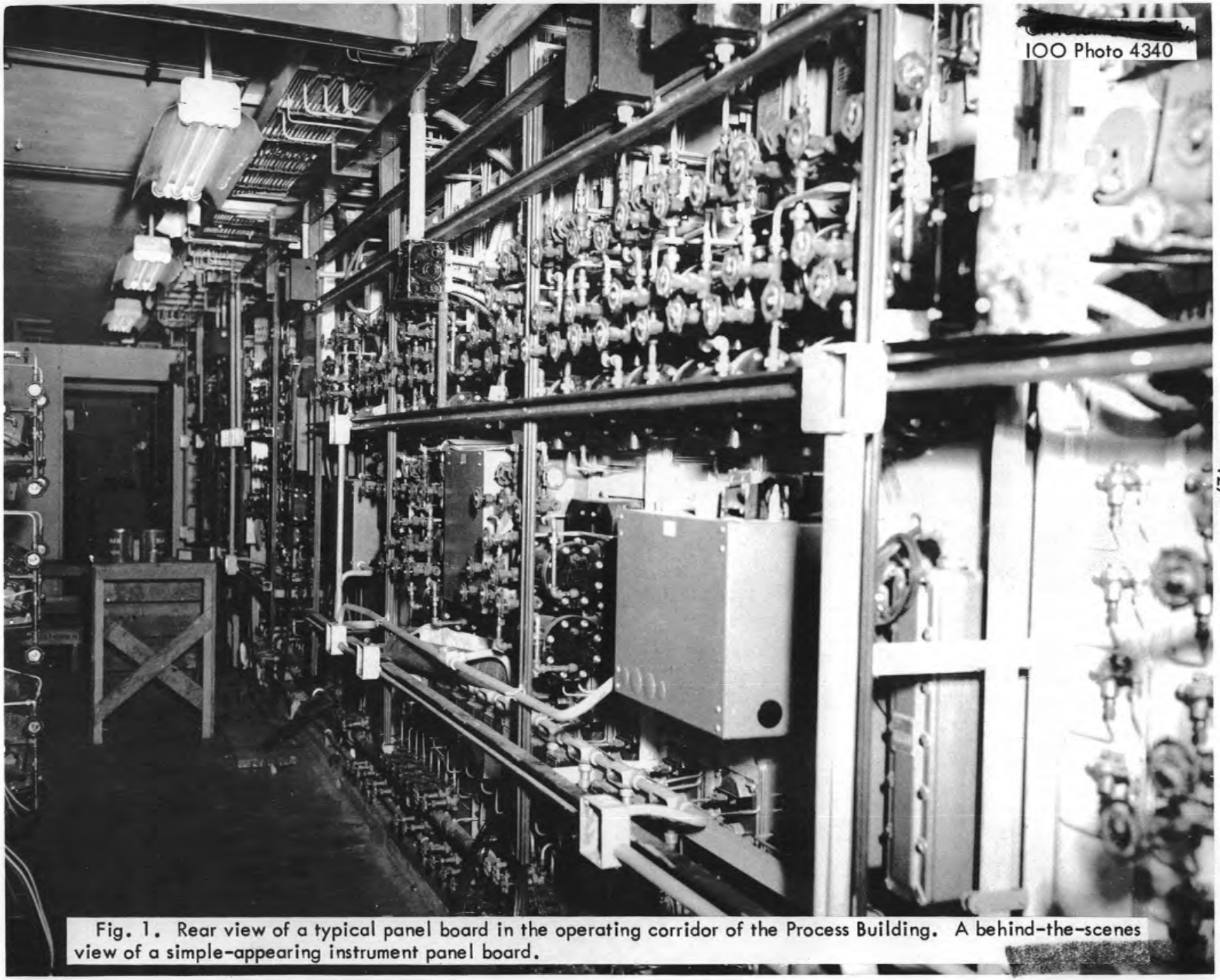


Fig. 1. Rear view of a typical panel board in the operating corridor of the Process Building. A behind-the-scenes view of a simple-appearing instrument panel board.

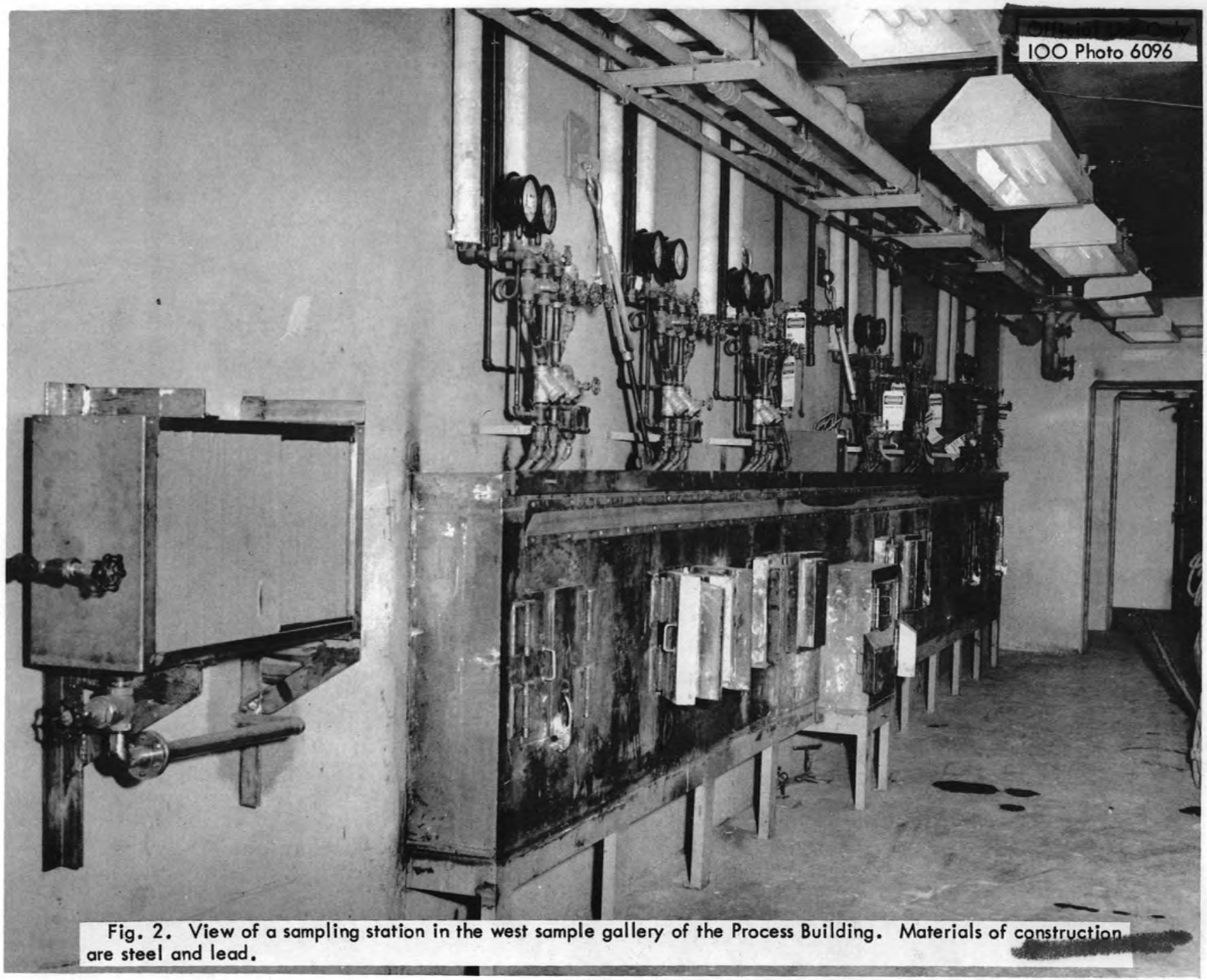


Fig. 2. View of a sampling station in the west sample gallery of the Process Building. Materials of construction are steel and lead.

Fig. 3. View of Cell X of the Process Building showing the high-activity sample handling cave. The cave is constructed of concrete with lead doors. The viewing window is of zinc bromide solution.

[redacted]

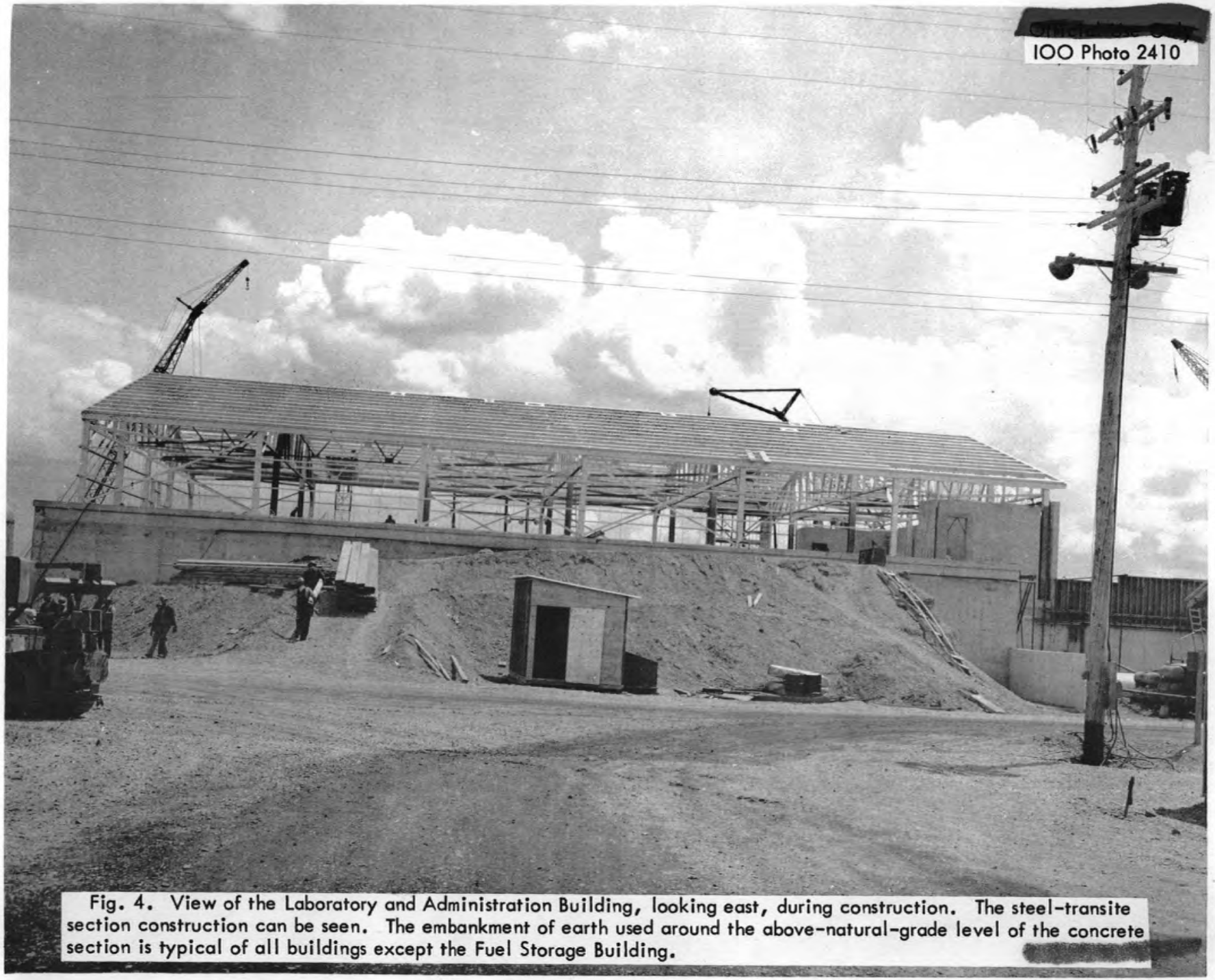


Fig. 4. View of the Laboratory and Administration Building, looking east, during construction. The steel-transite section construction can be seen. The embankment of earth used around the above-natural-grade level of the concrete section is typical of all buildings except the Fuel Storage Building.

Fig. 5. View of the works laboratory located in the basement of the Laboratory and Administration Building.

Fig. 6. General view of the cafeteria in the Laboratory and Administration Building.

Fig. 7. View of the Fuel Storage Building, looking south, showing the guard house and surrounding restricted fence.

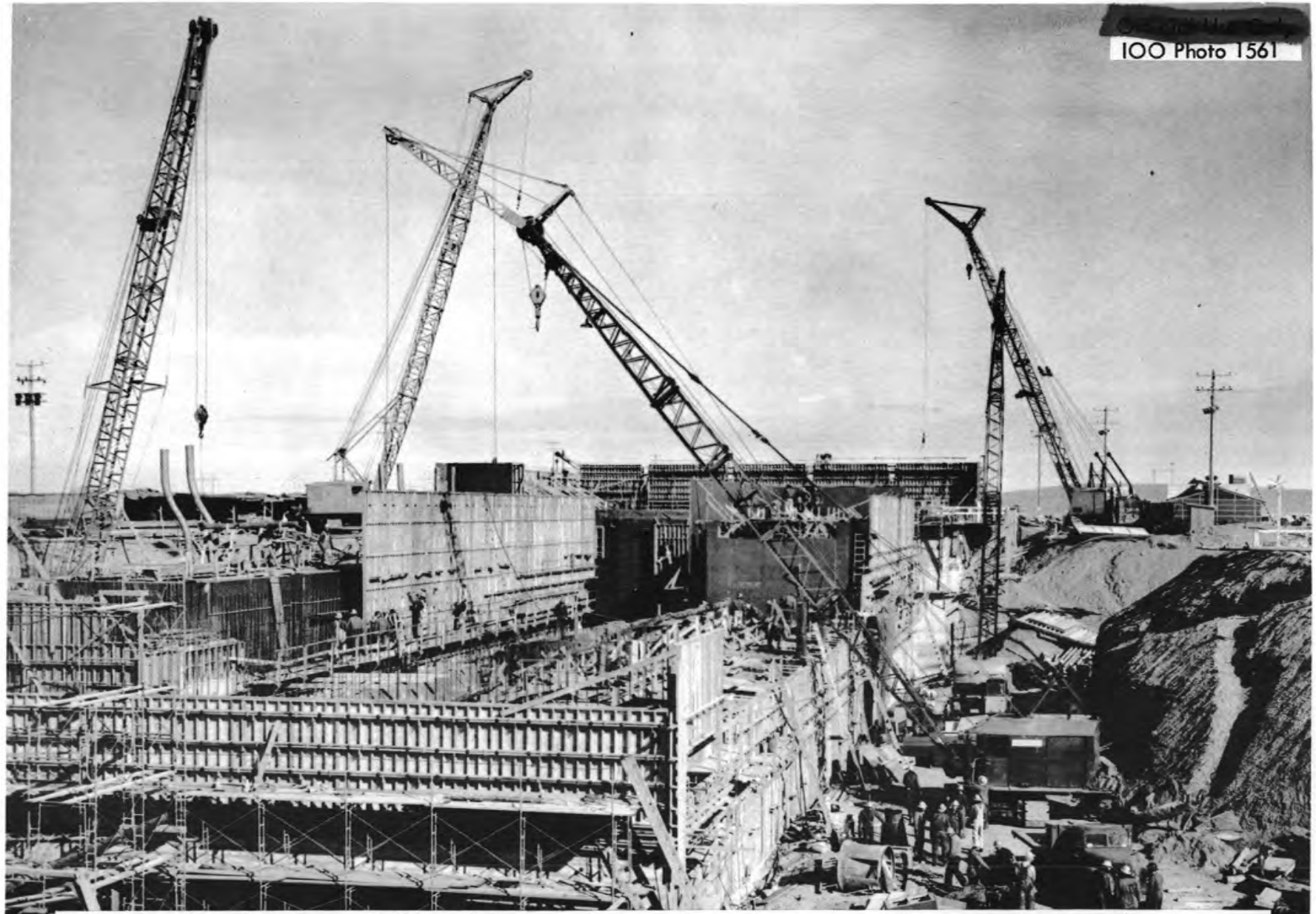


Fig. 8. View of the Process Building, looking north, taken during the pouring of the concrete for the cells and corridors. What is seen here is beneath ground level in the completed plant. The vast number of forms, the heavy reinforcing, the scaffolding, and the heavy construction equipment necessary to complete the relative simple item of concrete is apparent. Not seen in this photograph is the complexity of work involved in the placing of pipe sleeves in the forms for transferring fluids from one cell to another. Six dissolver slug chutes can be seen left of center. February 26, 1951.

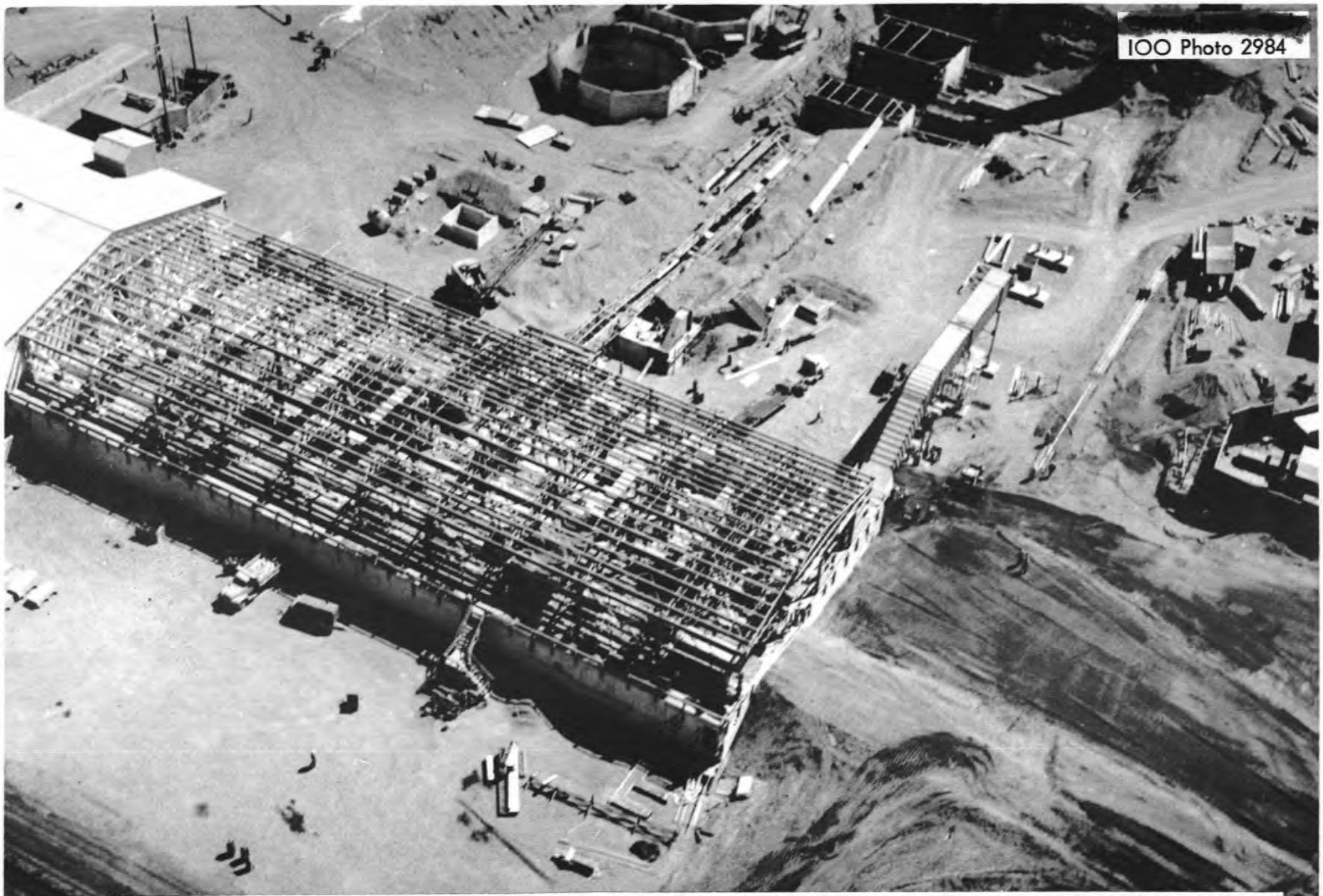


Fig. 9. Aerial view of the Process Building during construction. This view shows the steel section of the building before it was covered with transite. The start of operation of backfilling around the upper section of concrete with dirt can be seen at the end of the building. In the top half of the photograph are located the cell ventilation ducts going toward the Waste Disposal Building just under construction and the underground radioactive liquid waste lines pushing toward the same building. At the top center are the large liquid waste storage tanks well underway. The transite covered building to the left is the Laboratory and Administration Building.

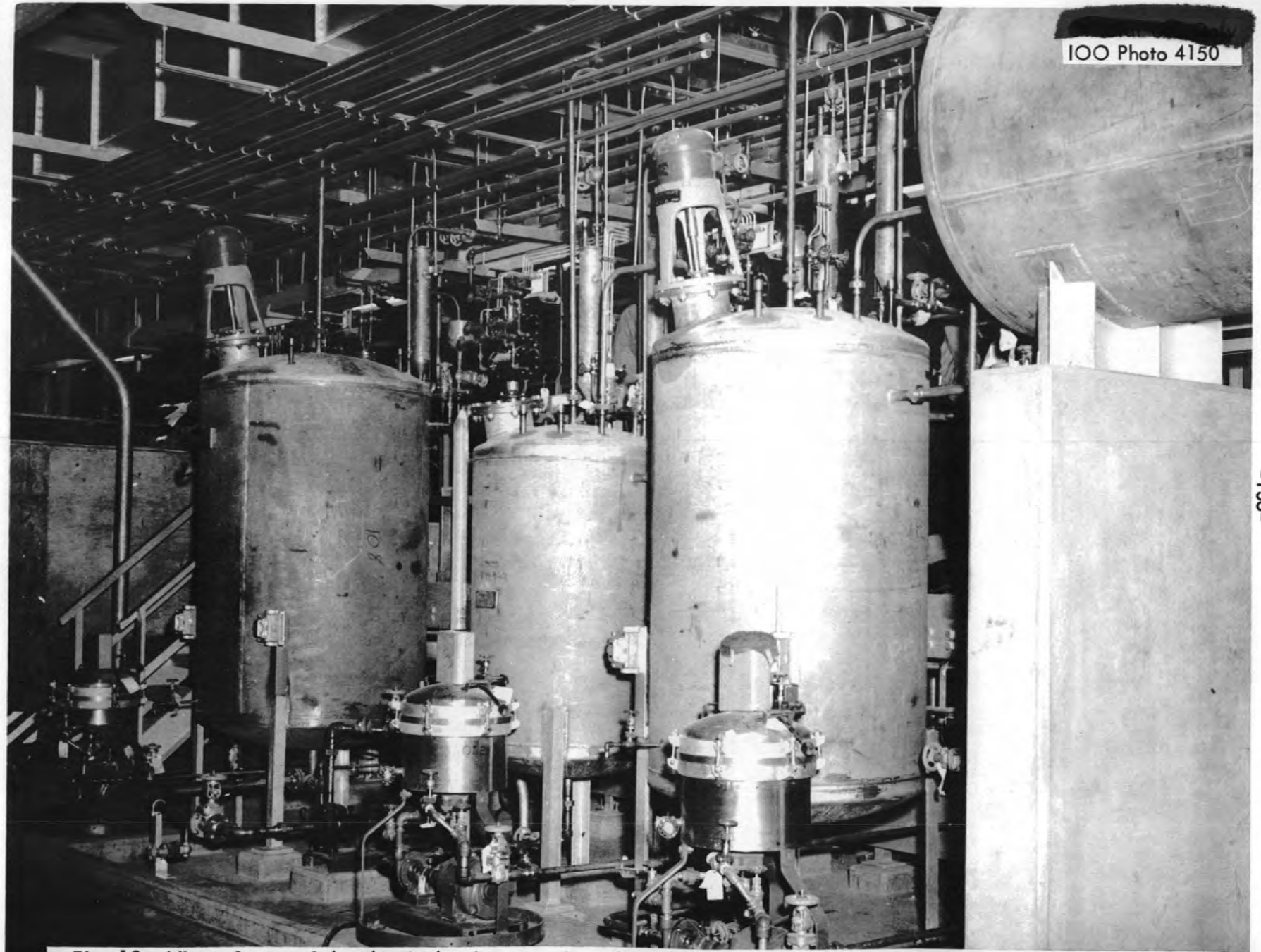


Fig. 10. View of some of the chemical make-up tanks and pumps in the make-up area of the Process Building. The make-up area is above the cells and in the steel-transite section of the building.

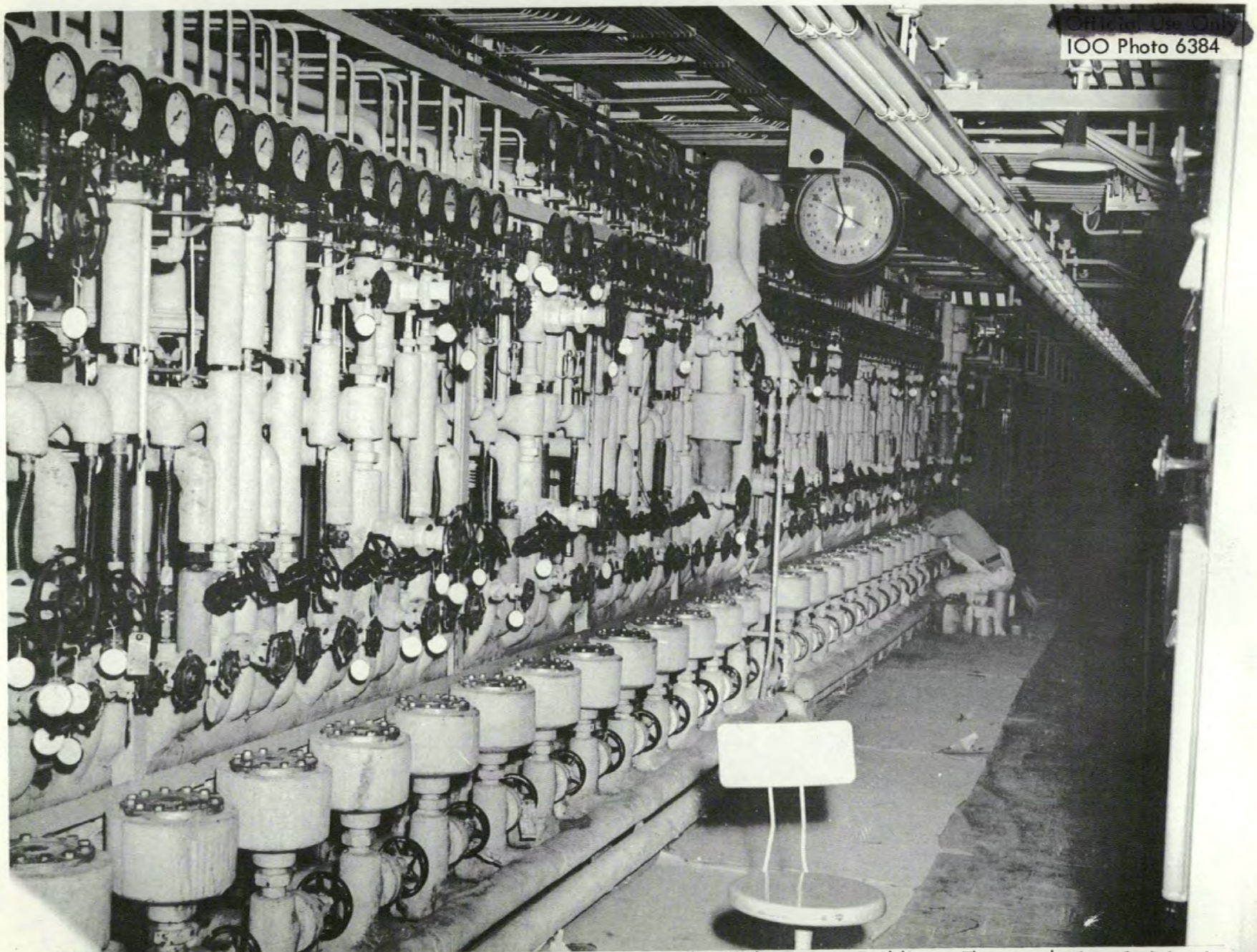


Fig. 11. View of the cell faces as seen from the operating corridor of the Process Building. The complexity of piping is apparent and does not lend itself to low labor costs.

Fig. 12. View inside the Fuel Storage Building showing the scales and crane assembly for the transfer pit. The slot in the metal grating under the monorail is visible.

Fig. 13. View of the Waste Disposal Building under construction. An idea of the quantity of reinforcing rod that is embedded in the concrete walls can be obtained. The tower on the extreme right is the heater for heating the cell ventilating exhaust before it enters the stack.

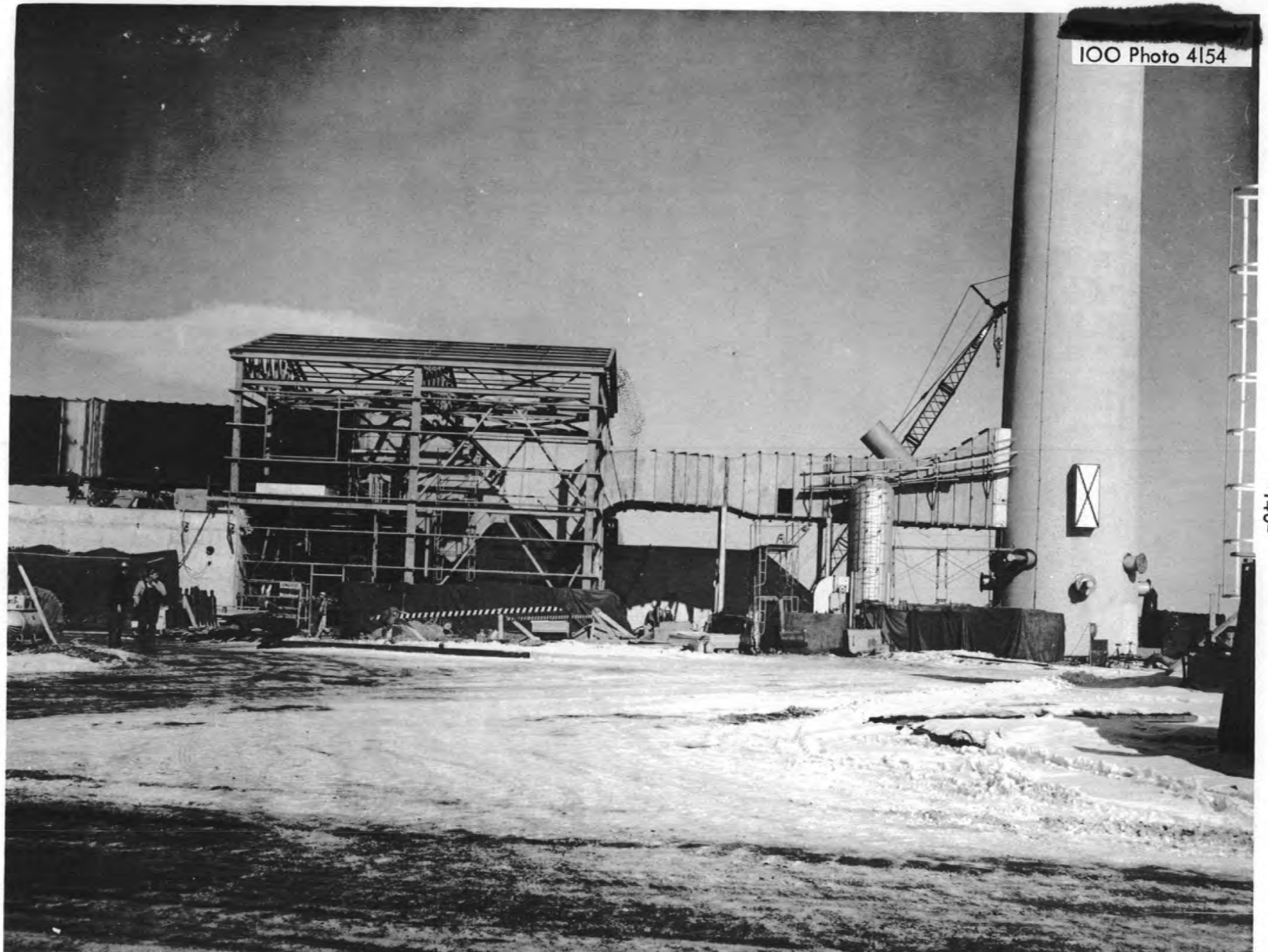


Fig. 14. View of the Waste Disposal Building showing the location of the cell exhaust fans (within the steel section), the heater, and the base of the stack.

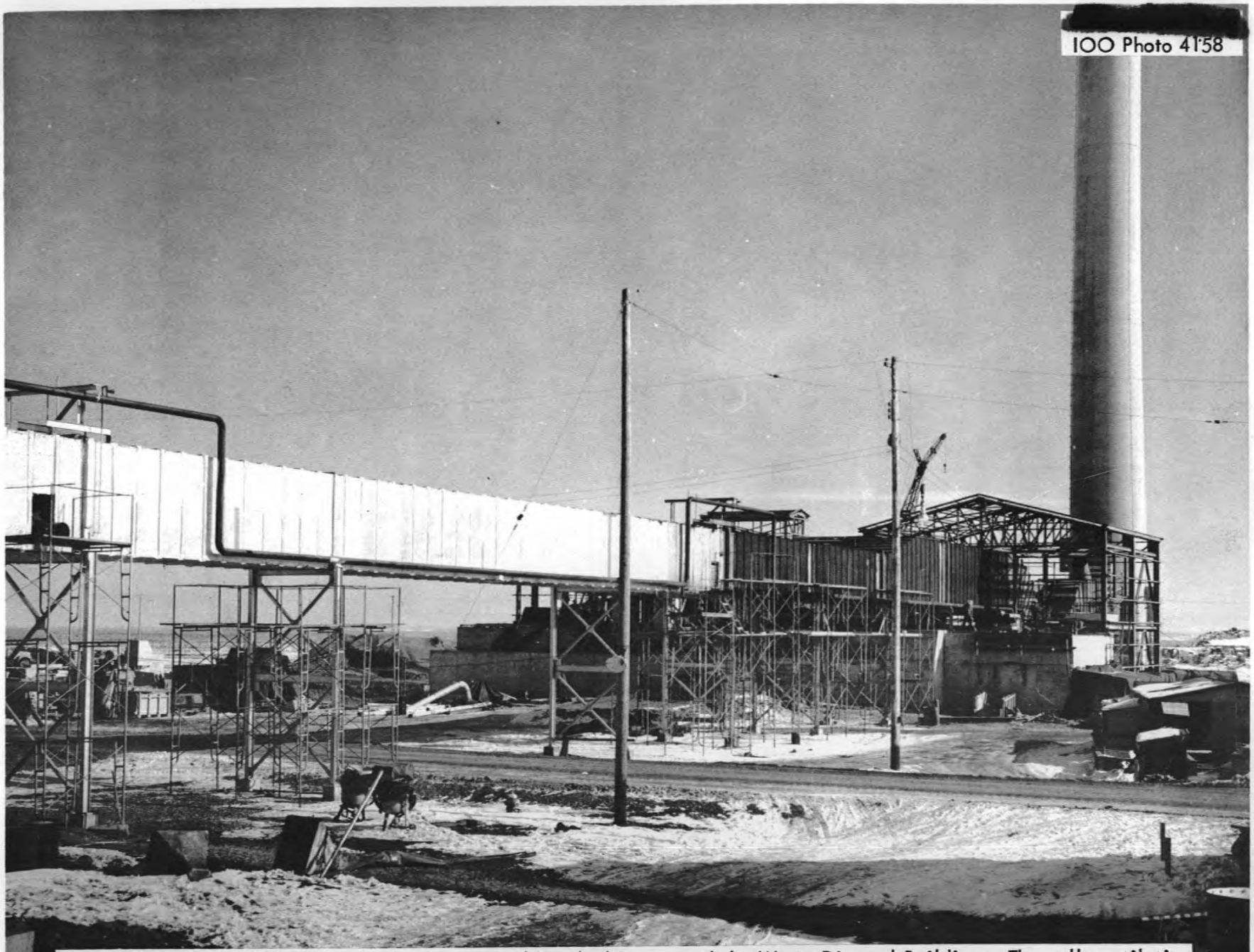


Fig. 15. View taken alongside the Process Building looking toward the Waste Disposal Building. The cell ventilation exhaust duct between the two buildings is shown. The distance between the two buildings is approximately 400 ft.

Fig. 16. View of the footings of the radioactive waste storage tanks showing the excavation required. In the background is the Process Building under construction.

[redacted]

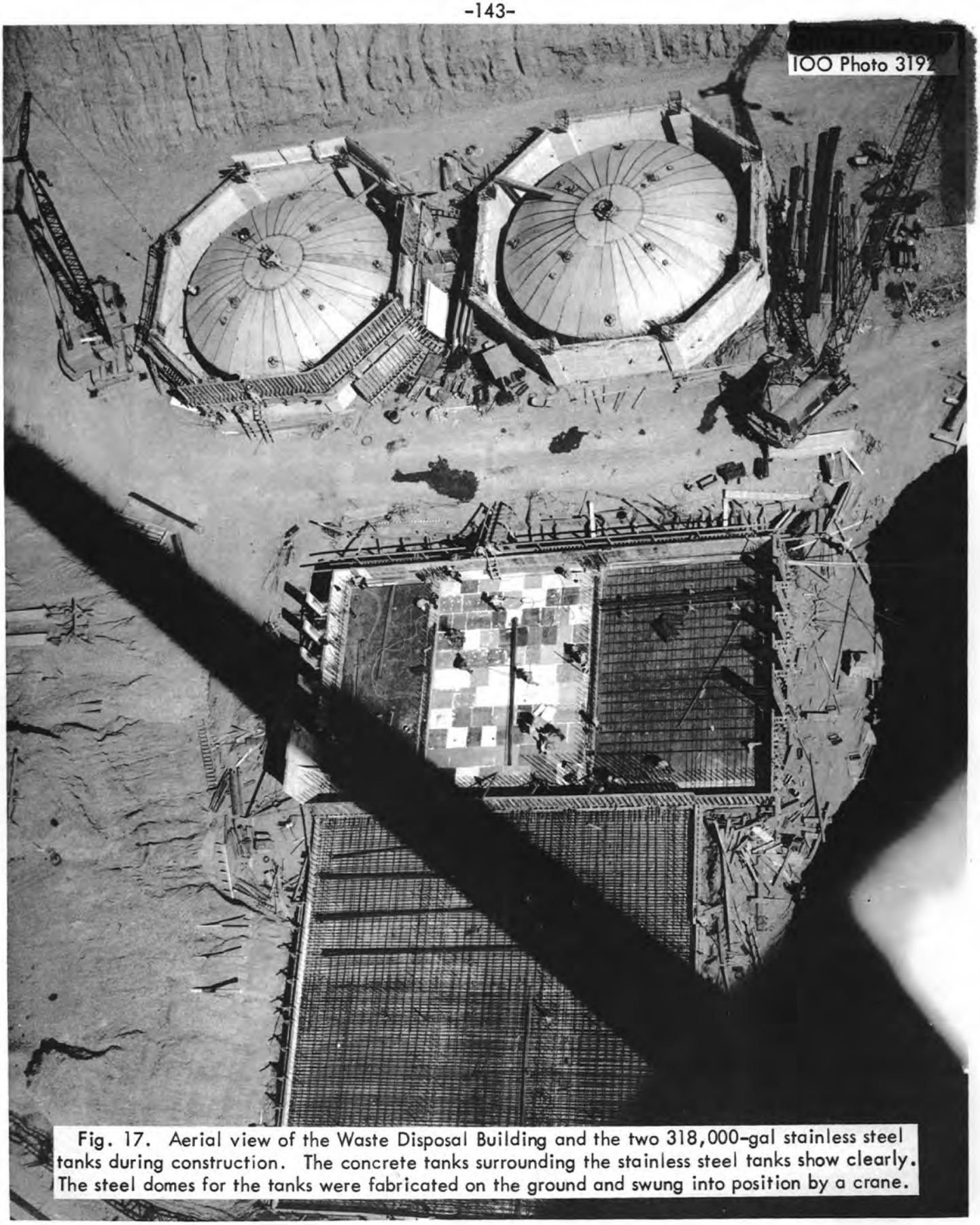


Fig. 17. Aerial view of the Waste Disposal Building and the two 318,000-gal stainless steel tanks during construction. The concrete tanks surrounding the stainless steel tanks show clearly. The steel domes for the tanks were fabricated on the ground and swung into position by a crane.

[redacted]

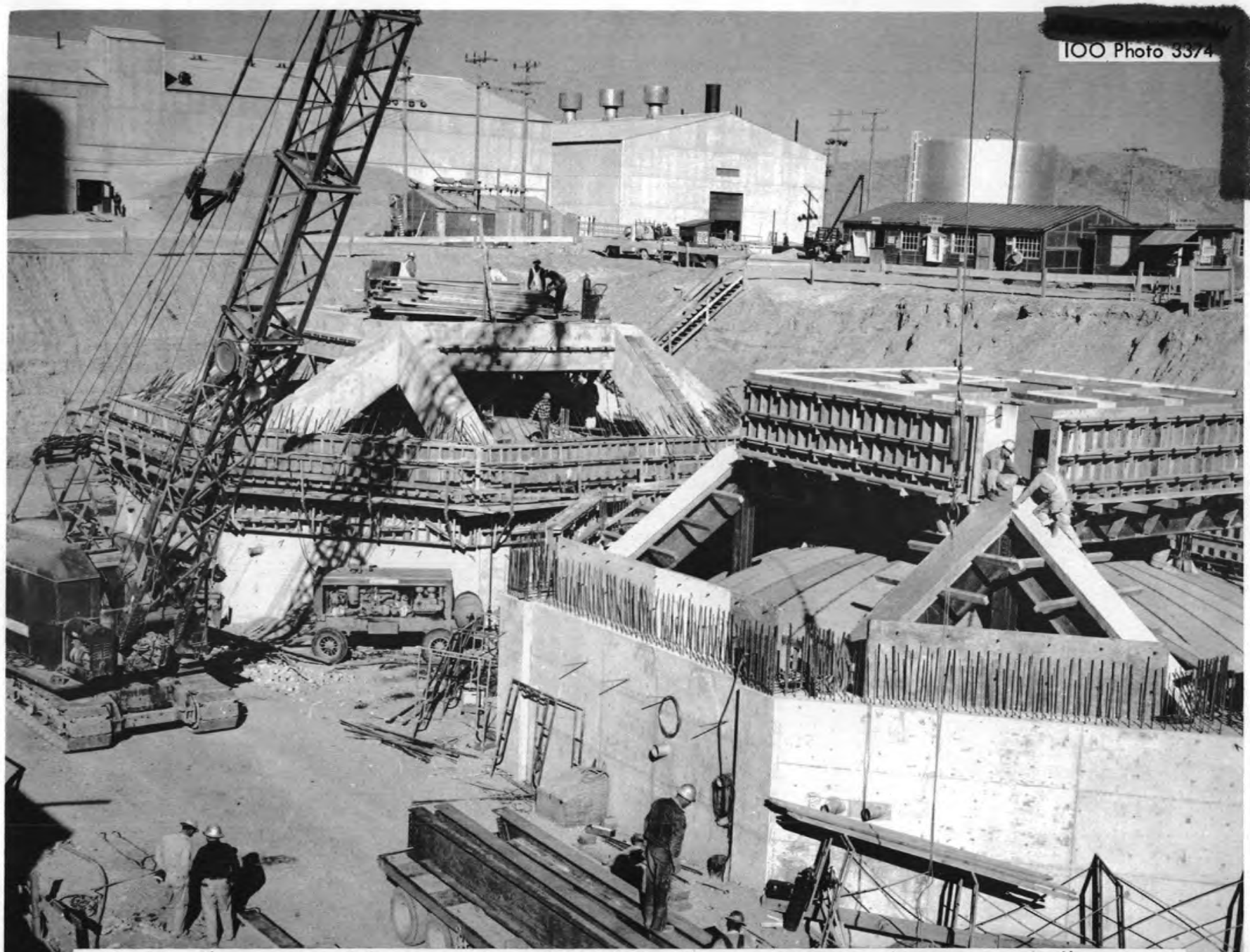


Fig. 18. Close-up view of the construction activities during the process of forming the concrete umbrella roof over the waste storage tanks. This concrete is the most expensive used in the project.

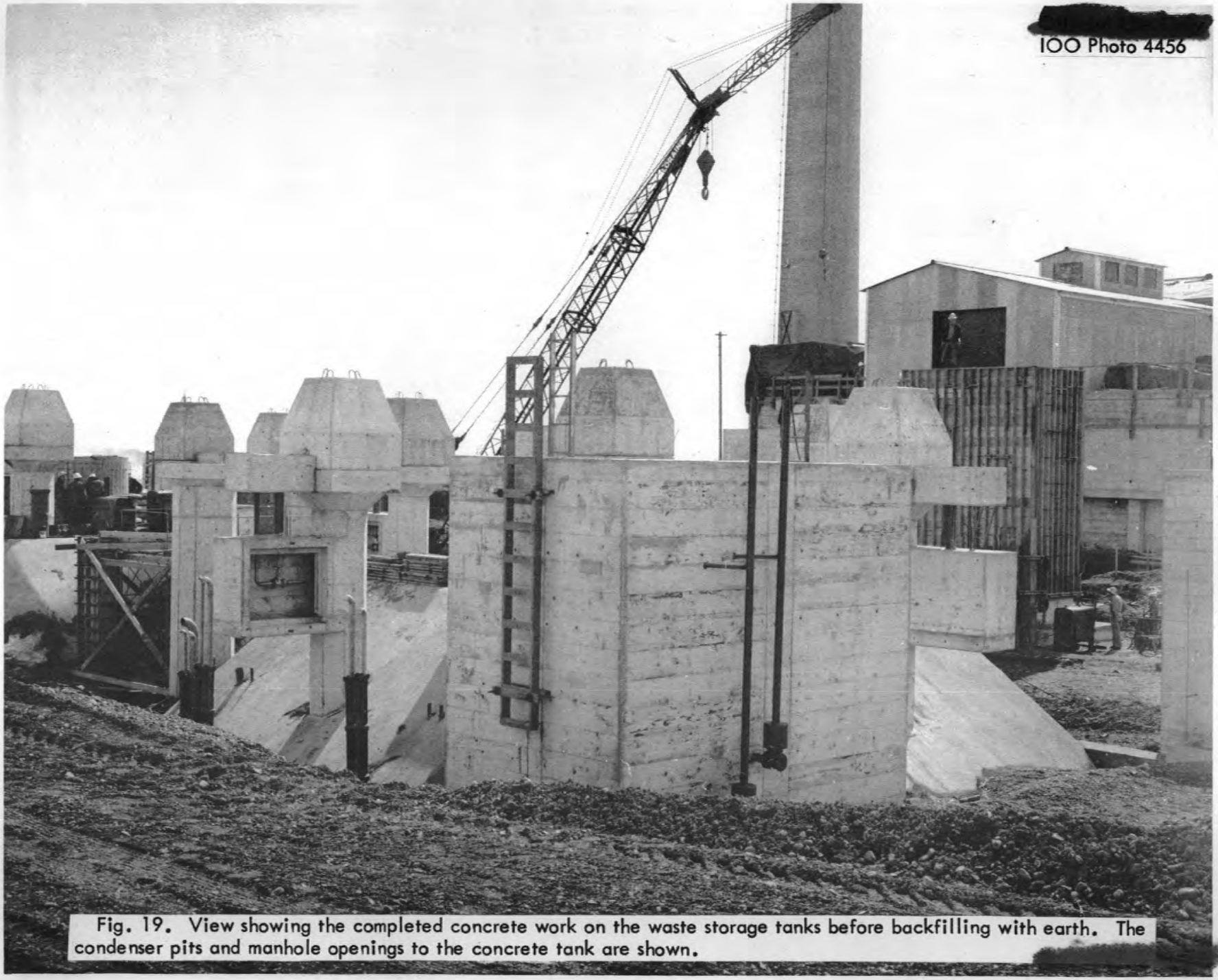


Fig. 19. View showing the completed concrete work on the waste storage tanks before backfilling with earth. The condenser pits and manhole openings to the concrete tank are shown.

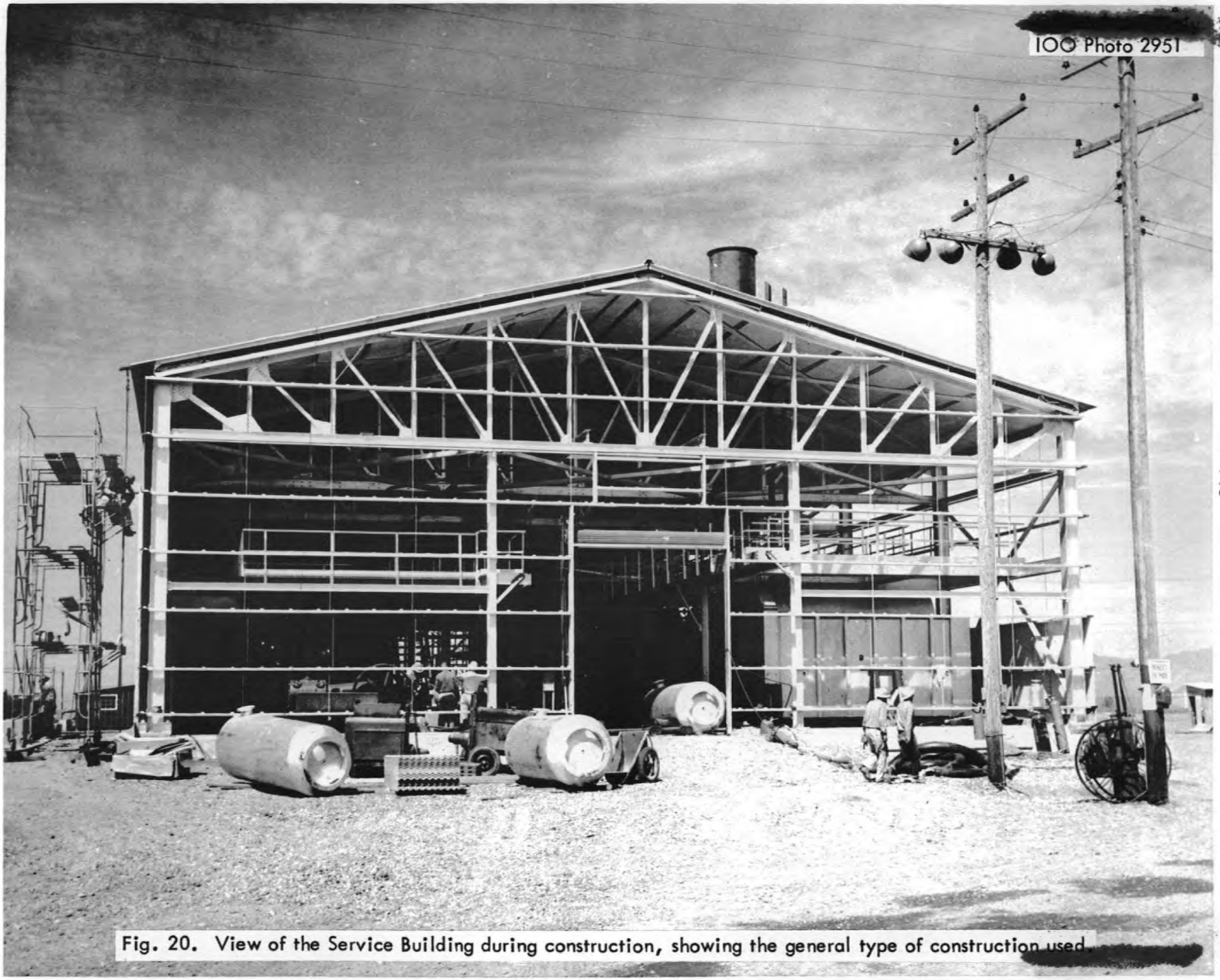


Fig. 20. View of the Service Building during construction, showing the general type of construction used.

[redacted]

Dwg. 20626

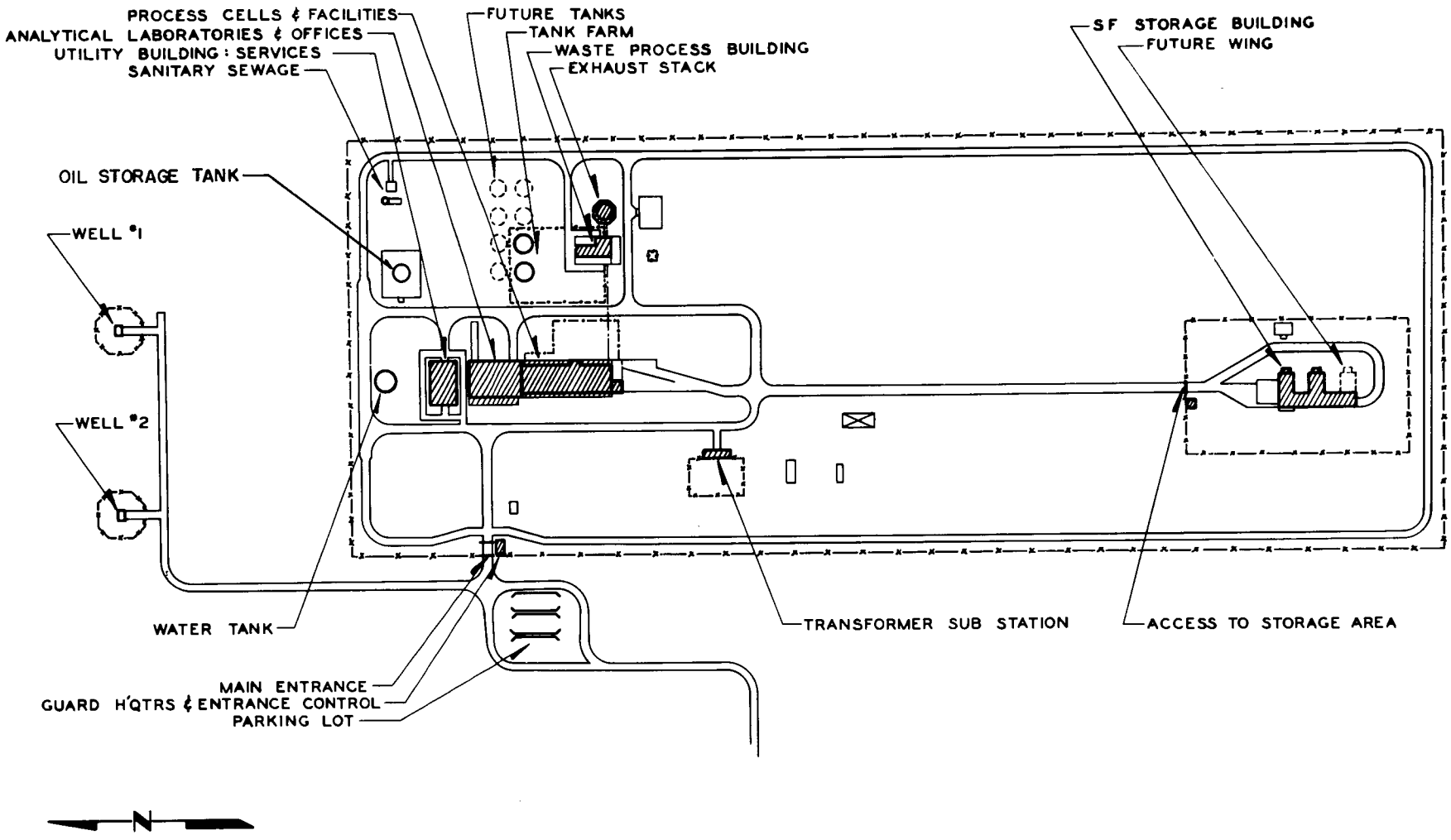


Figure 21

PLOT PLAN FOR CHEMICAL PROCESSING AREA AT IDAHO SITE

[redacted]

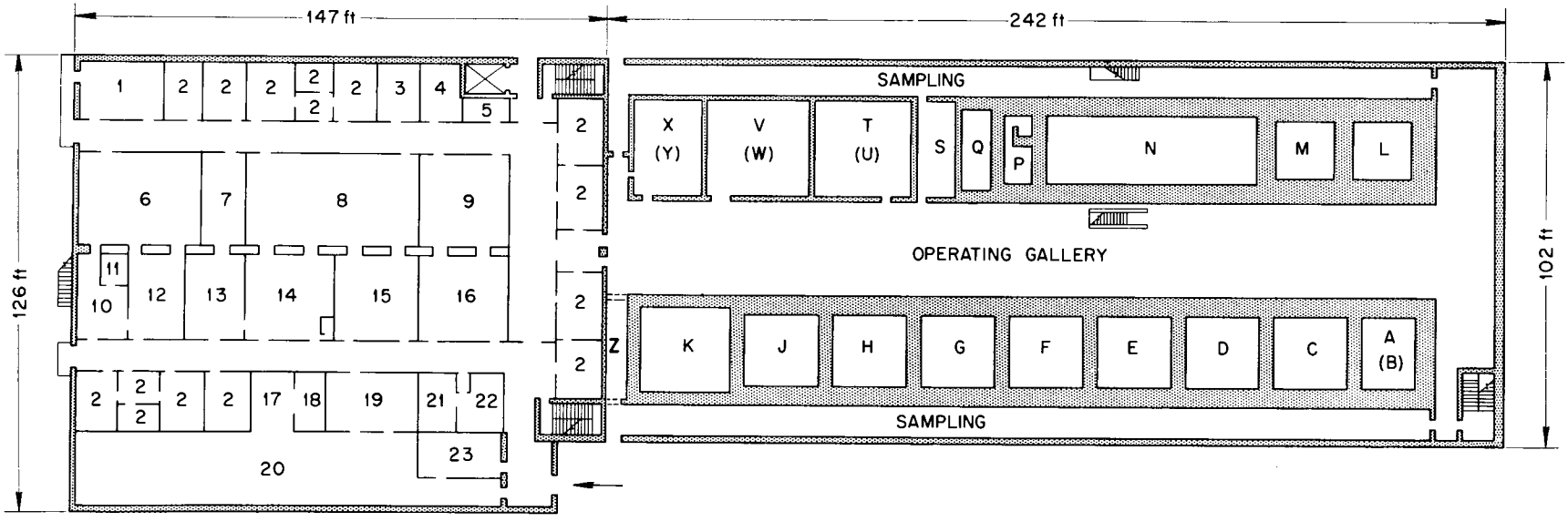
[redacted]

Figure 22

BUILDING 602, LABORATORY AND ADMINISTRATION

1 STOCK
2 OFFICES
3 DISH WASH
4 HEALTH PHYSICS
5 EMERGENCY WASH
6 INSTRUMENT LAB.
7 COUNTING ROOM
8 WARM LAB.
9 SAMPLE DILUTION
10 OPTICAL LAB.
11 DARK ROOM
12 CHEM. SPEC. PREPARATION
13 MASS-SPEC. PREPARATION
14 MASS SPECTROMETER
15 COLD LAB.
16 WARM MISCELLANEOUS
17 DRYING ROOM
18 MEN'S SHOWER
19 MEN'S WASH ROOM
20 LOCKER ROOM
21 WOMEN'S WASH ROOM
22 LOCKER ROOM
23 CLOTHING

N



BUILDING 601 PROCESS CANYON

A EBR MAKE-UP } 2 LEVELS
B EBR STORAGE } 2 LEVELS
C NP-MTR MAKE-UP
D NP-MTR MAKE-UP
E NP-MTR MAKE-UP
F SPARE
G SPARE
H SPARE
J HOT SALVAGE
K SOLV. RECOVERY
L RALA
M RALA
N NP-MTR STORAGE
P 1st CYCLE EXTRAC.
Q 2nd CYCLE EXTRAC.
R UPPER PART OF "S"
S 3rd CYCLE EXTRAC.
T SOLVENT PUMP ROOM } 2 LEVELS
U 1st CYCLE AQ. RAFF. TREAT. } 2 LEVELS
V DECONTAMINATION } 2 LEVELS
W 1st CYCLE SOLV. RAFF. TREAT. } 2 LEVELS
X SAMPLE DILUTION } 2 LEVELS
Y 2nd AND 3rd CYCLE RAFF. TREAT. } 2 LEVELS
Z 3rd CYCLE PROD. STORAGE

[redacted]

[redacted]

Dwg. 20655

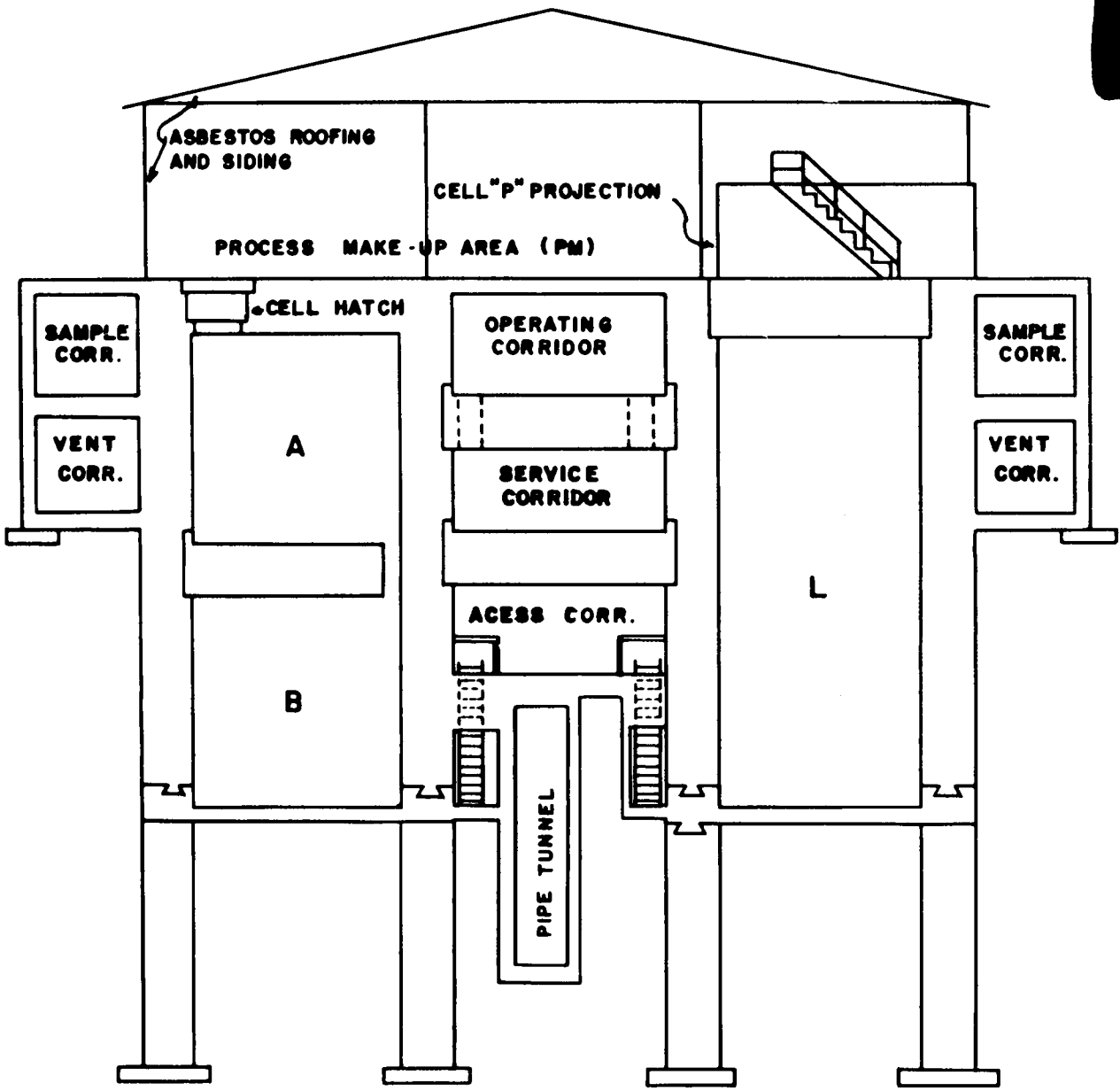


Figure 23

CROSS SECTION PROCESS BLDG. CPP 601

LOOKING NORTH FROM END OF CELL CANYONS

[redacted]

ORNL-LR-Dwg. 4460

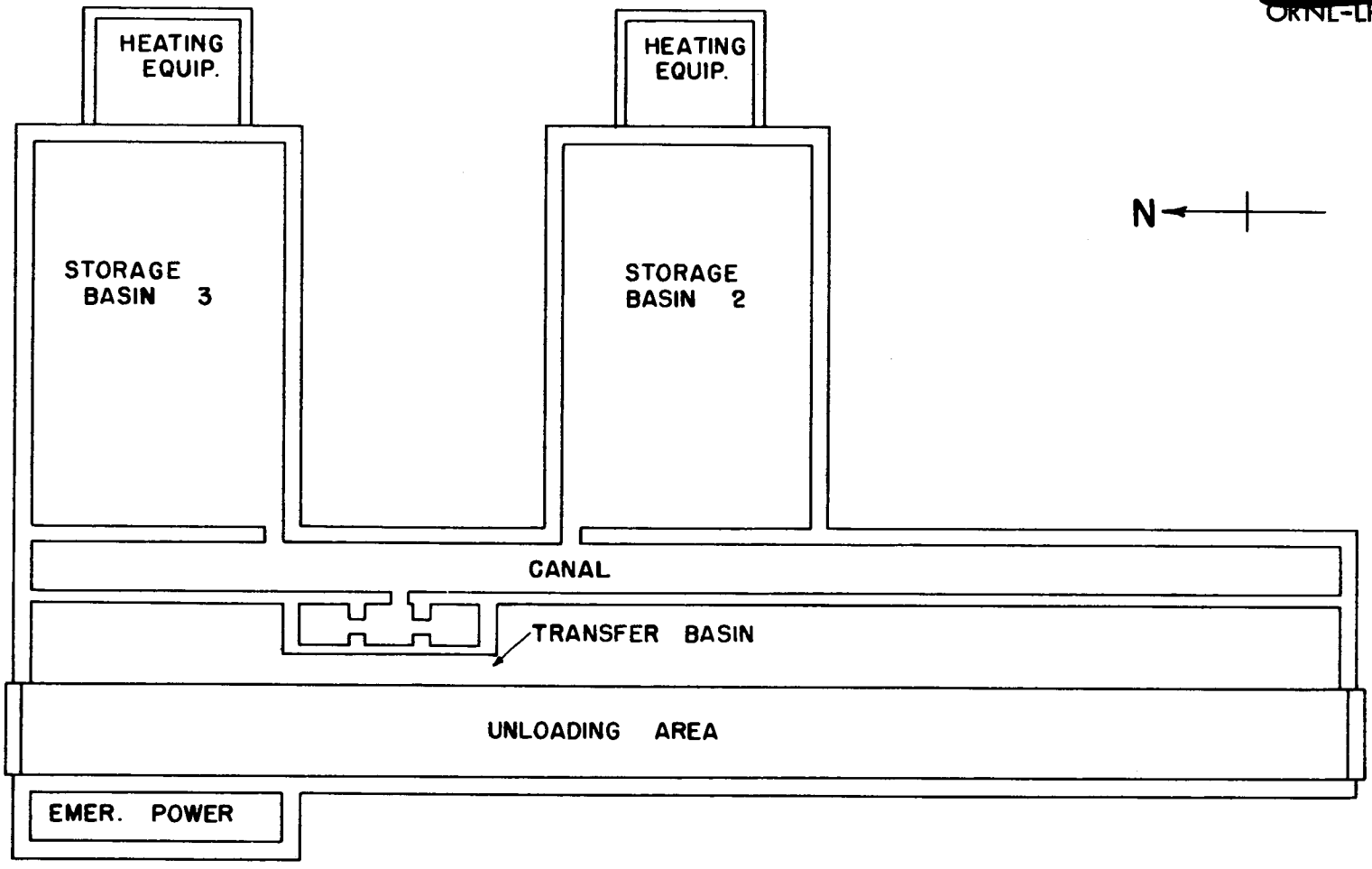


Figure 24

SF STORAGE BUILDING

[redacted]

Dwg. 19374

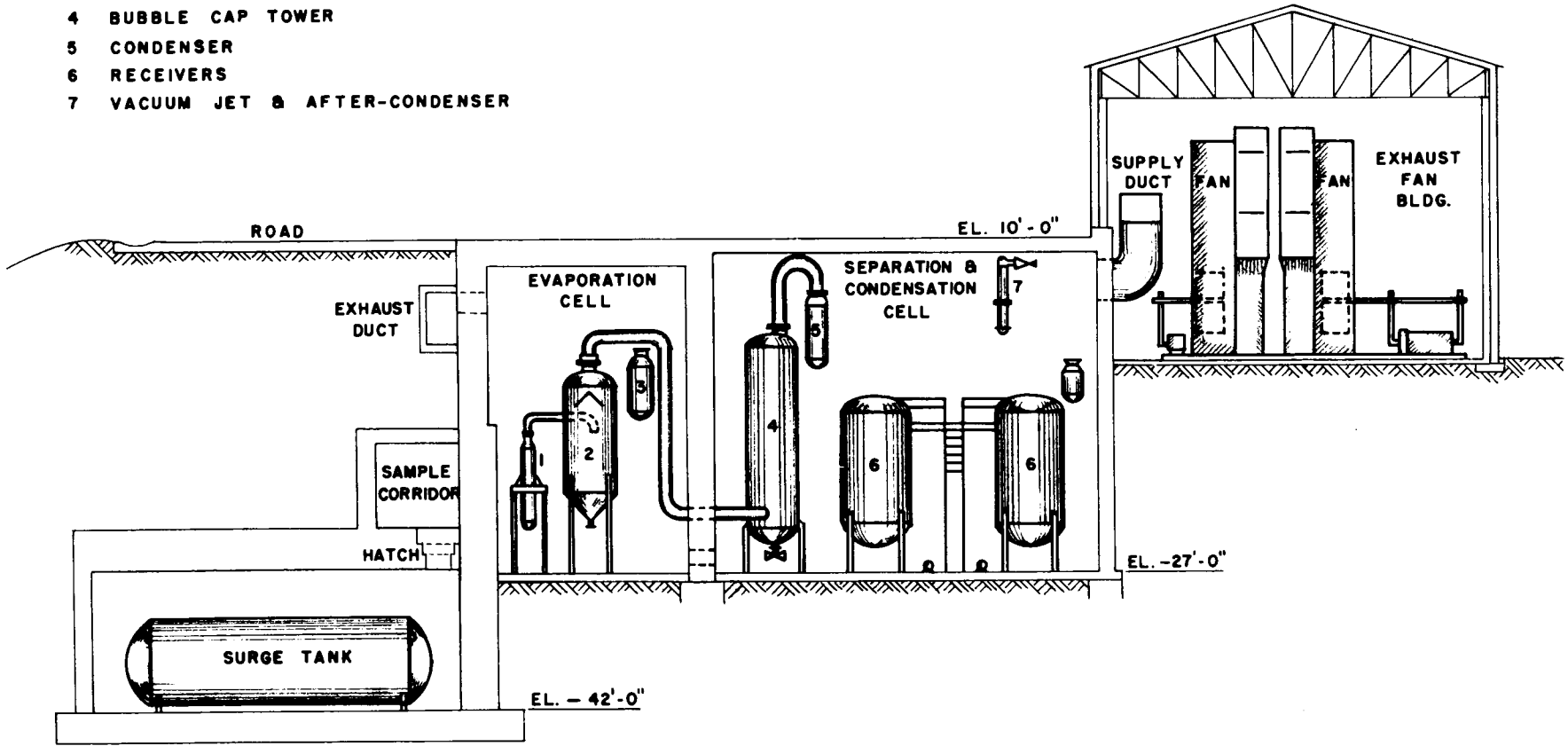


Figure 25

SECTION THROUGH WASTE DISPOSAL BUILDING

LOOKING EAST

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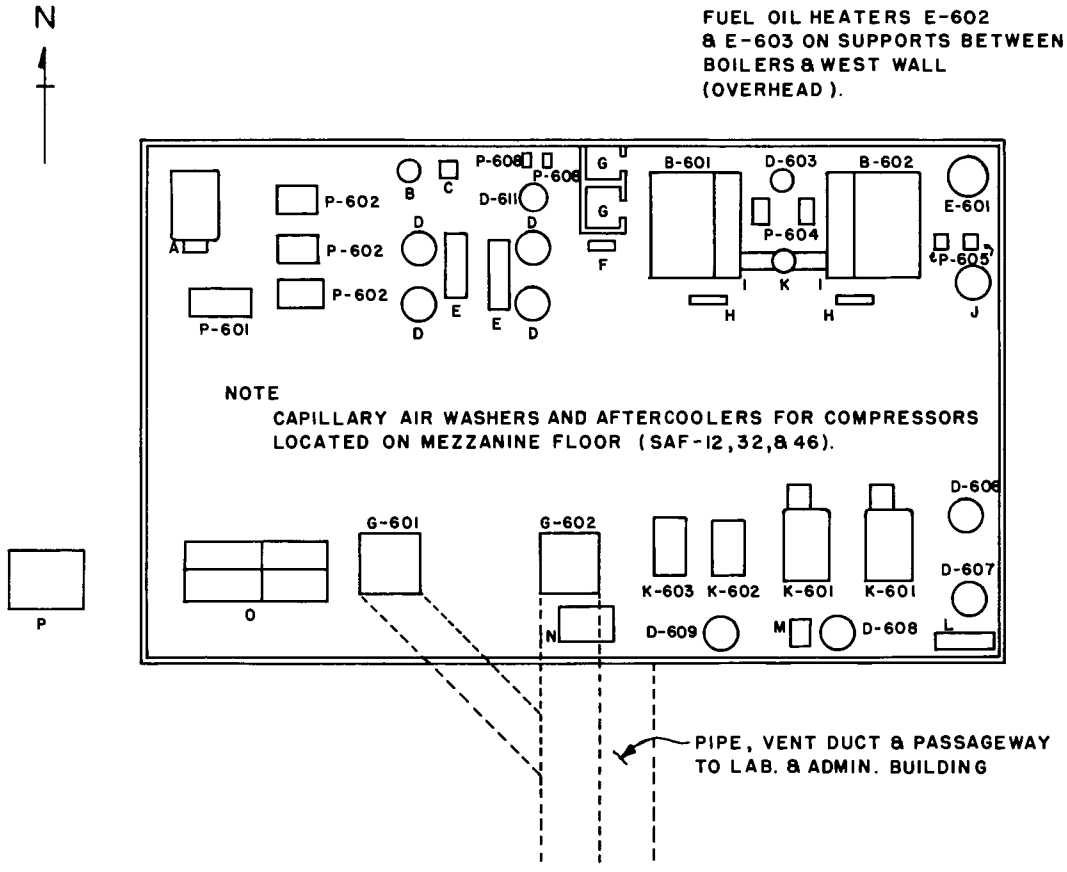

SERVICE BUILDING

Figure 26

LEGEND

A 250 KW EMERGENCY GENERATOR
B BRINE TANK
C BRINE PUMP
D WATER SOFTENER
E SUMP (ELEVATED)
F CHLORINATING UNIT
G OFFICE
H CONTROL PANEL
I DRUM
J PHOSPH. TANK
K STACK BREECHING
L KEMP AIR DRYER
M 30 X 72 PREFILTER
N DIESEL (EMERGENCY STANDBY FOR G-602)
O ELEC. SWT. GEAR & CONTROL FOR 101 & 102
P SUBSTATION

B-601 BOILER
B-602 BOILER

D-603 BLOW DOWN TANK FOR BOILERS
D-606 4' X 12' AIR RECEIVERS
D-607 " " "
D-608 " " "
D-609 " " "
D-611 3000 GAL. WATER TANK

E-601 DEAERATOR

G-601 BLOWER 45000 cfm W/60 H.P. ELEC. MOTOR
G-602 " " " " " " "

K-601 W/75 HP MOTOR 0-50
K-602 GAS ENGINE DRIVEN COMP. 0-50 psi
K-603 ELEC. DRIVEN (40 HP) COMP. 100 psi

P-601 GAS ENGINE DRIVEN EMERGENCY FIRE PUMP
P-602 FIRE PUMP
P-604 FUEL OIL TO BURNER PUMPS
P-605 FEED WATER PUMPS
P-608 CIRCULATING WATER [redacted]