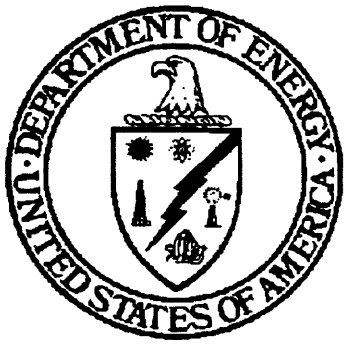
DOE/OR/21548-236
CONTRACT NO. DE-AC05-86OR21548

WSSRAP BUILDINGS CHARACTERIZATION - CHEMICAL CHARACTERIZATION REPORT

Weldon Spring Site Remedial Action Project
Weldon Spring, Missouri

OCTOBER 1991 **REV. 0**



U.S. Department of Energy
Oak Ridge Operations Office
Weldon Spring Site Remedial Action Project

MK-FERGUSON A MORRISON KNUDSEN COMPANY	Rev. No. 0
Weldon Spring Site Remedial Action Project Contract No. DE-AC05-86OR21548	
REPORT TITLE: WSSRAP Buildings Characterization - Chemical Characterization Report	

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DOE/OR/21548-236

Weldon Spring Site Remedial Action Project

WSSRAP Buildings Characterization
Chemical Characterization Report

Revision 0

October 1991

Prepared by

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and
JACOBS ENGINEERING GROUP
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St. Charles, Missouri 63304

for the

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ABSTRACT

The Weldon Spring Buildings Characterization Program has been undertaken by the U.S. Department of Energy in an effort to describe in great detail the physical, chemical and radiological characteristics of the Weldon Spring Chemical Plant. Knowledge of these characteristics is needed to ensure that factors that may complicate the demolition of the buildings, such as worker health and safety impacts or special waste management requirements, are considered during preparation of demolition plans. The chemical characterization was conducted to identify the types of chemical processes that took place in the buildings, and identify what systems and chemical residuals remain in the buildings. In addition, surfaces and process equipment that contained residual contamination were investigated to determine which residuals or contaminated surfaces require special handling or management as a hazardous chemical waste.

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1 INTRODUCTION

This report summarizes the findings of investigations performed on the Weldon Spring Chemical Plant buildings, focusing on chemical characteristics.

The Weldon Spring Chemical Plant (WSCP) contained many complex chemical processing systems, chemical storage and distribution systems, and waste/by-product handling systems. These systems were designed to carry a variety of chemicals and wastes, some of which are hazardous to workers and/or the environment.

The chemical plant was shut down and left in "standby condition" in 1966. The systems were emptied, cleaned to the standard of "visibly clean", neutralized, and left in partially reassembled condition. This standard was achieved for most of the systems, based on this investigation. However, during previous remedial actions at the Weldon Spring Site Remedial Action Project (WSSRAP), several exceptions to the standard of "visibly clean" were observed. Some piping, tanks, and sumps were found to contain product or accumulations of water from leaking roofs. Past investigations also noted that many of the chemical systems were not clearly marked or identified, so the function or contents of the systems can not be readily recognized in the field. This combination of unknown or unquantified conditions was an obstacle to building dismantlement because the hazards that workers might be exposed to could not be controlled or prevented without additional information. The remnants of chemicals and radioactive materials in the piping, reaction vessels, sumps, and pits inside the buildings could also present major complications in the administration of demolition subcontracts, because unanticipated labor, equipment, and materials would be necessary to address previously unidentified residuals during the actual disassembly of the systems. Therefore, detailed and up-to-date information on the chemical systems was necessary to support plans to clean and dismantle the chemical plant buildings.

Historical records were studied to identify the systems and determine the types of materials that were present while the plant was in operation. During construction and operation of the plant, a color coding system was established to identify the content of pipelines in the chemical plant. A pipeline index symbol was used to identify the process and utility piping on the as-built drawings. The original Engineering Standard Specification for Pipeline Identification is reproduced in Section 1. Pipelines were identified during chemical characterization based on color coding, labeling, and by tracing the lines to their

A. SCOPE

This specification covers the identification of process and utility piping.

B. GENERAL

1. 201 HF Area and 202 HF Tank Farm Only

Steel piping in this area only shall be identified with a finish coat of #13655 yellow (Federal Standard No. 595 color) and 2 ft. bands of the following color spaced 4 ft. apart.

Contents	Additional Color
AHF	Red
Aqueous HF	Orange
HF vents	White
HF Safety System	Green

2. All Other Areas

Steel piping shall be painted #16187 gray (Federal Standard No. 595 color). Non-ferrous piping shall not be painted. All piping, insulated, non-insulated, ferrous or non-ferrous shall be identified by both color banding tape and pipe markers of the same background colors shown in paragraph E. A wrap of banding tape shall be used on each side of the pipe marker. The name designation of the pipe marker shall face the direction from which it will be normally viewed.

C. MATERIALS

Banding tape and pipe markers may be obtained from the Mallinckrodt storeroom at no cost.

1. Paint

Type of paint material is covered by another specification.

2. Banding Tape

Pressure sensitive, vinyl-cloth tape shall be W. H. Brady Co. "Pipe Banding Tape", 2 1/4 inches wide, or approved equal.

3. Pipe Markers

Pressure sensitive, vinyl-cloth pipe content labels shall be W. H. Brady Co. "Pipe Markers" or approved equal. Letters shall be one inch high for pipes under 3"ϕ and two inches high for pipes 3"ϕ and above.

D. IDENTIFICATION

1. Location

Banding tape and pipe content markers shall be located at the following places:

a. On long runs, at 20 foot intervals indoors and 50 foot intervals outdoors

b. In each room, a minimum of one marker.

c. At points entering equipment or joining other pipes.

d. At points entering or leaving a room or building.

E. SELECTION CHART

With the piping symbol shown on the Pipeline Index sheet, the correct banding tape color and pipe content marker can be selected from the chart below:

Pipeline Index Symbol	Contents	Background Color	Pipeline Index Symbol	Contents	Background Color
A	Ammonia	Yellow	N	Nitrogen	Aluminum
AN	Al Nitrate	Purple	NA	Nitric Acid	Purple
CH	Lime Slurry	Purple	NAD	NA Drain	Purple
CO	Cutting Oil	Aluminum	NAR	NA Recov.	Purple
CT	Tower Water	Green	NAV	NA Vent	Purple
CW	Service Water	Green	NOK	Clear Aque. Uran.	Purple
CWD	Service Water Drain	Green	OK	Clear Aque. Uran.	Purple
DA	Diss. Ammonia	Yellow	PA	Plant Air	Blue
DS	Uran. Bearing Slurry	Purple	PC	Conveying	Aluminum
DW	DI Water	Green	PW	Potable Water	Green
EG	Brine	Green	R	Uran. Free Slurry	Purple
F	Freon	Green	SA	Sulphuric Acid	Purple
FG	Fuel Gas	Yellow	SC	Carbonate	Purple
FP	Precoat	Purple	SH	Caustic	Purple
FW	Fire Water	Red	SL	Sump Liquor	Purple
HE	Inert Gas	Aluminum	SS	Sanitary Sewer	Green
HL	Hydraulic Oil	Aluminum	SW	Soft Water	Green
HO	H_2 Off-Gas	Yellow	TBP	TBP	Purple
HST	HP Steam	Orange	TBX	Solvent	Purple
HW	Hydraulic Water	Green	TBXV	Solvent Vent	Purple
HXF & HXR	Hexane	Purple	TO	Transformer Oil	Aluminum
IA	Inst. Air	Blue	TS	Treat Solv.	Purple
KH	KOH	Purple	TW	Temp. Water	Green
LC	Condensate	Orange	UNH	Clear Aque. Uran.	Purple
LST	LP Steam	Orange	VA	Vac. Air	Blue
			VC	Vac. Clean	Aluminum
			WW	Wash Water	Green

origin and terminus to identify the systems served by each pipeline. Most of the information available on the WSCP facilities and their operation was very general, and did not provide the necessary level of detail. The information was developed during operation of the chemical plant and, though useful, it was outdated or did not accurately reflect present conditions.

New information was developed under this study to better describe the buildings and the chemical contamination that exists in each building.

This report contains a concise description of each building, and its chemical characteristics based on field investigations preformed under the *Buildings Characterization Work Plan* (MKF and JEG 1991). Under this plan, all accessible areas of the WSCP buildings were investigated. In some cases, the components of the buildings or systems could not be accessed for safety reasons, or because partial dissassembly of the building or system was the only means of gaining access to the system. These situations will be addressed during the building dismantlement projects.

This report is divided into three sections and arranged according to building demolition work packages. The chemical systems housed in each building, the chemicals used during operation of the facilities, observations on special conditions that are present, and analysis of chemical characteristics are described for each building. As-Built drawings, process flow diagrams, or floor plan sketches are included when necessary to illustrate the location or function of various systems.

Many buildings have sumps or pits that have retained or accumulated water during the years that the chemical plant has been idle. Most of the accumulated waste water has been analyzed and found to contain toxic metals above the established hazardous waste thresholds. Under current waste management plans, the waste water is to be managed as a hazardous waste. The characterization data for the sump waste water is summarized in Table 1-1.

TABLE 1-1 RCRA Characteristics of Building Sumps

Building No.	Estimated Volume	RCRA Constituents	Demolition Package
101	10000	Non-RCRA	1
103	2000	Non-RCRA	1
105	1500	Non-RCRA	1
106	50	Hg, Se	1
108	500	Non-RCRA	1
201	4000	Pb, Hg	3
202	13000	Pb	1
301	50000	Pb	3
403	3000	Pb	2
404	5000	Pb, Hg	2
410	500	Pb, Se	2
413	500	As, Pb, Cr, Cd, Se	1
417	500	Pb, Cr	2
431	13000	Cr	2
432	50	Cr	2

2 DEMOLITION PACKAGE 1 BUILDINGS

2.1 Building/Area: Feed Preparation and Sampling Plant Building 101

DESCRIPTION: The feed preparation and sampling plant was designed for sampling and preparation of incoming yellow cake prior to processing in other buildings on site. Drums of feed material were received, weighed, opened, sampled, calcined (as needed), and repackaged in feed hoppers.

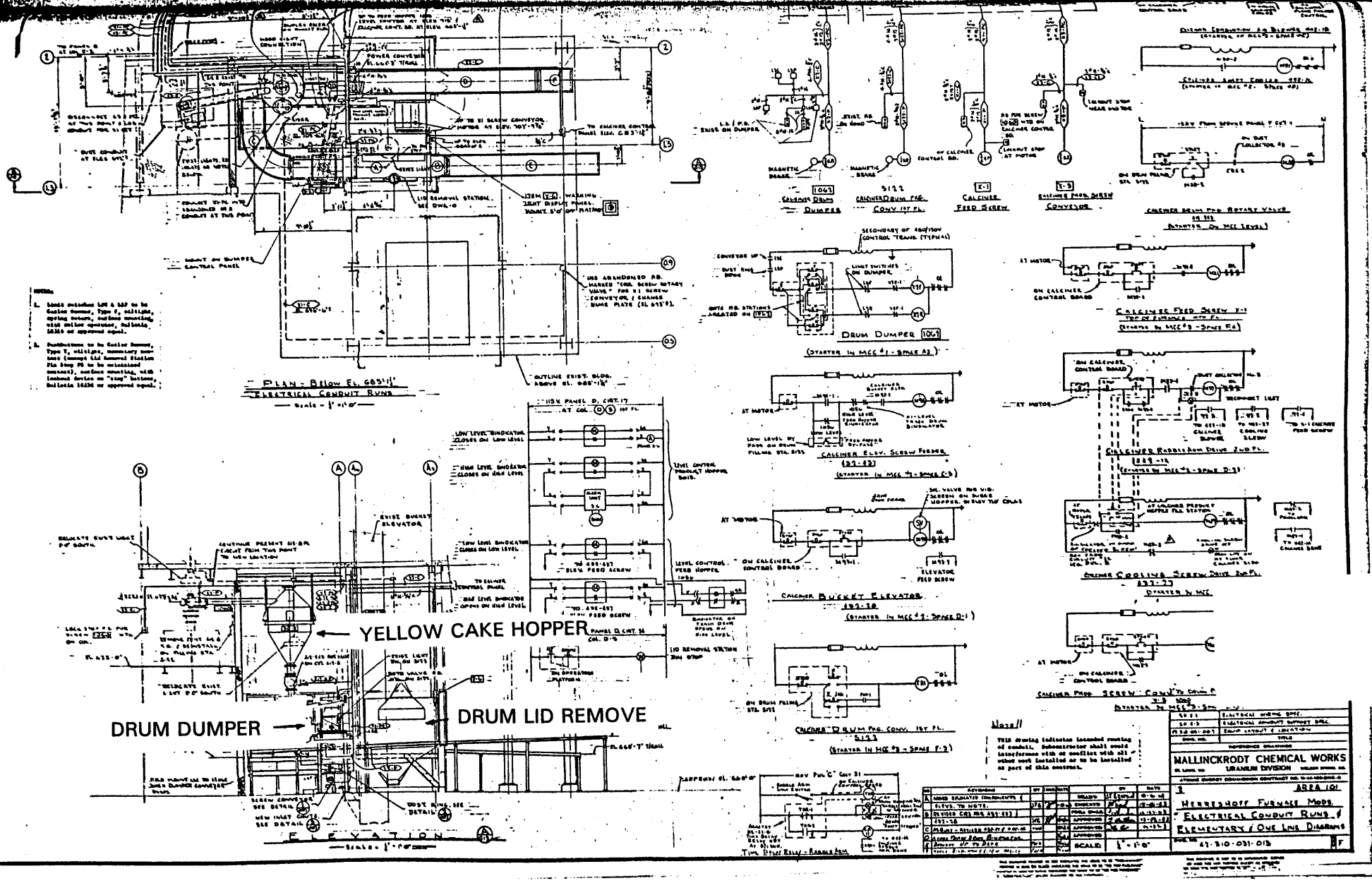
CHEMICAL SYSTEMS: The internals of this building were almost completely removed during plant retrofit activities which took place between 1967 and 1969. The remaining chemical-carrying equipment in this building consists of the calciner, several hoppers, a drum lid remover, and a drum dumper.

A calciner was provided to roast incoming ores, which removed ammonia or organic solvents prior to the acid digestion step in the process. Wastes in the form of sludges, floor sweepings, and off-specification uranium compounds may have been calcined to remove impurities and make the wastes amenable to reprocessing.

An in-house vacuum cleaning system is present in the calciner area. Other Piping remaining in this building was primarily for utilities, i.e. electrical conduit, steam, air, propane, and water.

OBSERVATIONS/ANALYSIS: Resource Conservation Recovery Act (RCRA) hazardous waste residues are not present in this building. Residues of yellow cake and uranium oxides are present in the calciner, hoppers, drum lid removal and drum dumper systems, and the vacuum cleaning system. These residues are easily detected by field geiger counter, and will be removed, encapsulated, or contained to prevent future release to the environment. The level of polychlorinated biphenyls (PCBs) contamination in this building is under the 100 $\mu g/100\ cm^2$ action level.

SUPPORT DOCUMENTS: See the following drawing.


YELLOW CAKE HOPPER
DRUM DUMPER
DRUM LID REMOVE
PLAN - BELOW EL. 665'-11"
ELECTRICAL CONDUIT RUNS
ELEVATION
DRUM DUMPER 104
CALCINER BUCKET ELEVATOR
CALCINER ELEV. SCREW FEEDER
CALCINER FEED SCREW
CALCINER ROBBLE ARM DRIVE
CALCINER COOLING SCREW DRIVE
CALCINER DRUM FEED ROTARY VALVE
CALCINER DRUM FEED CONV. 1ST FL.
CALCINER FEED SCREW CONVEYOR
MALLINCKRODT CHEMICAL WORKS
URANIUM DIVISION
AREA 101
HERRESHOFF FURNACE MOD'S.
ELECTRICAL CONDUIT RUNS & ELEMENTARY & ONE LINE DIAGRAMS
42-810-031-013

2.2 Building/Area: Refinery Tank Farm - Area 102A and B

DESCRIPTION: The refinery tank farm stored bulk chemicals for use in the chemical processes. The chemicals stored included nitric acid, tributyl phosphate, and hexane. These tanks were removed at plant shutdown, and are no longer present.

CHEMICAL SYSTEMS: Chemical systems are not present.

OBSERVATIONS/ANALYSIS: There is one large tank (No. 0056), and another smaller tank (No. 0129) southeast of Building 413 included in area 102A and B. Tank No. 0056 held cooling tower water, and No. 0129 is a retired petroleum fuel tank. The water tank is empty and not suspect for RCRA waste residuals. The fuel tank has been vented to the atmosphere since plant shutdown and is empty. Proper disposition of the tank will be provided for during demolition.

SUPPORT DOCUMENTS: None.

2.3 Building/Area: Digestion and Denitration - Building 103

DESCRIPTION: The digestion of uranium ore, denitration of highly purified uranyl nitrate, and the treatment of raffinate and sump wastes were the functions of Building 103.

CHEMICAL SYSTEMS: Building 103 contained two separate processes. The first process was digestion of uranium ore concentrates (U_3O_8 yellow cake) with 45% nitric acid. The product of digestion was an impure solution of uranyl nitrate ($UO_2(NO_3)_2$), or UNH. Salting agents such as ferric nitrate and aluminum nitrate were added to the digestate to improve extraction efficiency. This acidic solution was sent via overhead pipelines to Building 105 for refinement by solvent extraction and washing with distilled water. After refinement in Building 105, the product, a highly purified form of UNH, was referred to as OK Liquor. The OK Liquor was an aqueous liquid from the water-washing (stripping) phase of the refinement process. Trace amounts of hexane were likely to carry over into the aqueous phase during the stripping process. OK Liquor was returned to Building 103 via overhead pipelines for denitration. In this process, the OK Liquor was boiled to dryness in huge stainless steel kettles. A chemical conversion from UNH to UO_3 (Orange Oxide) took place in these kettles. The vapors, fumes, and mists evolved during this process were highly acidic,

and contained nitric acid and various nitrate compounds (primarily NO_2), with trace amounts of hexane. These vapors were entrained by fume hoods and sent to the nitric acid recovery system, Building 108, again via overhead pipelines.

OBSERVATIONS/ANALYSIS: Only acid/base, salting agents (aluminum and ferric nitrate) and radioactive chemicals were used in this building. Most of the equipment associated with the digestion and denitration process has been removed from Building 103. There are four empty carbon steel tanks present in the sump liquor hold area, and seven empty stainless steel tanks in the feed adjustment/sump liquor concentration area. The internals of the carbon steel tanks have been tested and determined pH neutral, and nonradioactive on internal surfaces. The internals of the stainless steel tanks have been tested and determined pH neutral, and show varying levels of radioactivity on internal surfaces. Short sections of stainless steel piping are present in inaccessible locations in the acid digestion area. This piping appears to be open at both ends, but will be tested for pH once removed by the dismantlement contractor prior to placement in the material staging area (MSA).

Some air handling ductwork is present, and will require cleaning to remove loose radioactive particulate as part of the demolition of this building.

Two locations in this building were found to be in excess of the PCB cleanup threshold for low-contact restricted areas.

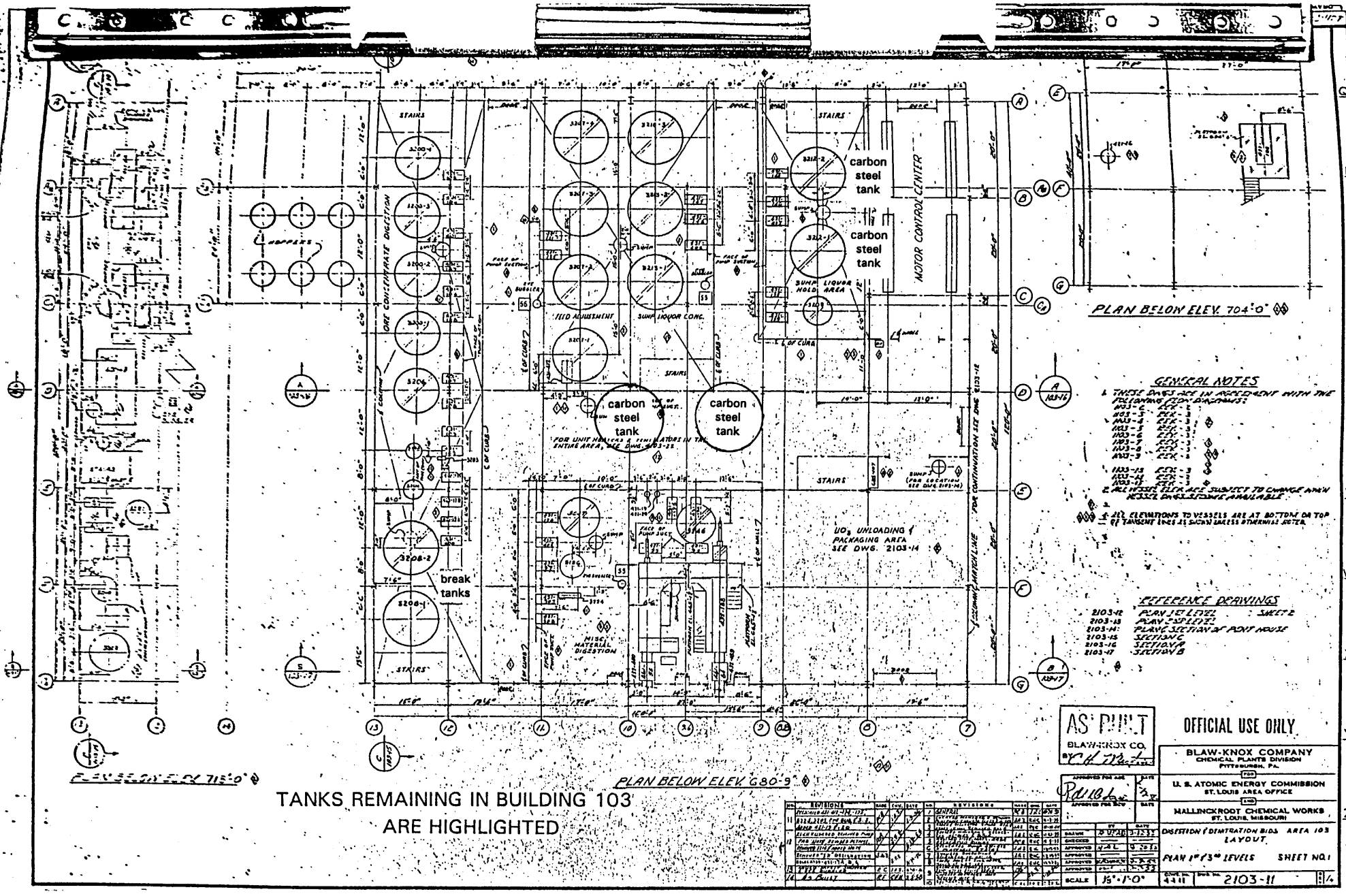
SUPPORTING DOCUMENTS: See the following drawings.

2.4 Building/Area: Lime Storage Building 104

DESCRIPTION: Storage of bulk lime and preparation of lime slurry used in the neutralization of acidic waste liquids.

CHEMICAL SYSTEMS: All systems carried lime ($Ca(OH)_2$) or lime slurry. Piping, several tanks, and two mixing vats are present.

ANALYSIS/OBSERVATIONS: A representative sample of solid lime was dissolved in water to make a 10% solution. The pH of this solution was 8. Free oils remaining in gear boxes will be removed prior to or during demolition. One oil spot in the upper level of



GENERAL NOTES

1. THESE DWGS. ARE IN ACCORDANCE WITH THE FOLLOWING FLOW DIAGRAMS:
   - M03-C
   - M03-3
   - M03-4
   - M03-5
   - M03-6
   - M03-7
   - M03-8
   - M03-9
   - M03-13
   - M03-14
   - M03-15
   - M03-17
2. ALL HEIGHT ELEVATIONS SUBJECT TO CHANGE WHEN MORE DWGS. BECOME AVAILABLE.
3. ALL ELEVATIONS TO VESSELS ARE AT BOTTOM OR TOP OF TANGENT LINES AS SHOWN UNLESS OTHERWISE NOTED.

REFERENCE DRAWINGS

2103-12	PLAN AT LEVEL	SHEET 2
2103-13	PLAN AT LEVEL	
2103-14	PLAN & SECTION OF PENT HOUSE	
2103-15	SECTION C	
2103-16	SECTION A	
2103-17	SECTION B	

TANKS REMAINING IN BUILDING 103 ARE HIGHLIGHTED

AS BUILT
BLAW-KNOX CO.

OFFICIAL USE ONLY

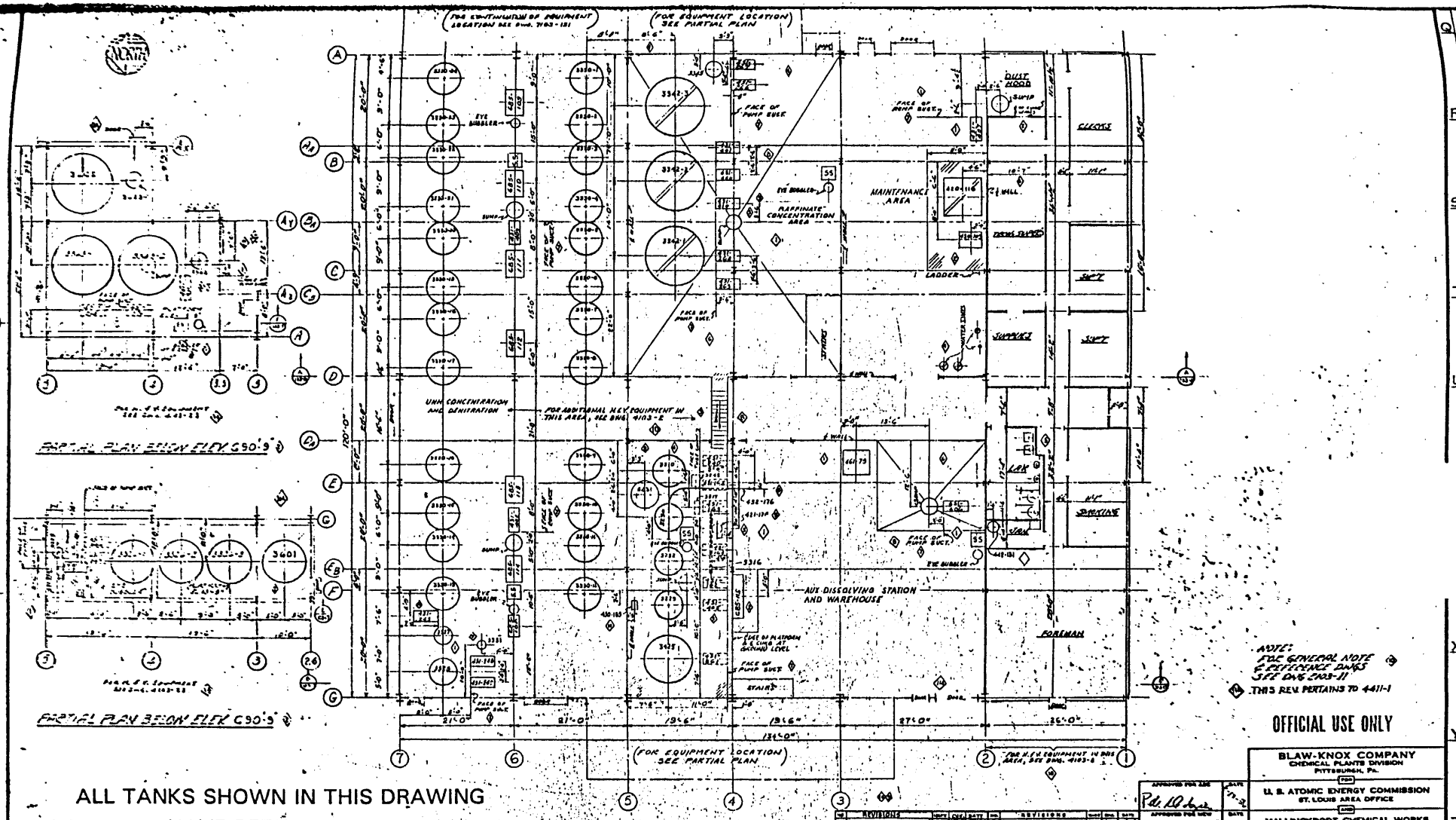
BLAW-KNOX COMPANY
CHEMICAL PLANTS DIVISION
PITTSBURGH, PA.

U. S. ATOMIC ENERGY COMMISSION
ST. LOUIS AREA OFFICE

MALLINCKRODT CHEMICAL WORKS
ST. LOUIS, MISSOURI

DIGESTION & DENITRATION BLDG. AREA 103
LAYOUT
PLAN 1ST & 3RD LEVELS SHEET NO. 1

SCALE 1/8"-1'-0" | DWG. NO. 2103-11



ALL TANKS SHOWN IN THIS DRAWING HAVE BEEN REMOVED

PLAN BELOW ELEV. 680'-9"

AS-BUILT
BLAW-KNOX CO.
BY C. H. Martin

NOTE: ⑭ FOR GENERAL NOTE ⑭ & REFERENCE DWGS SEE DWG 2103-11
⑭ THIS REV PERTAINS TO 4411-1

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REVISIONS						REVISIONS					
NO.		DRWN	CHKD	DATE	APPD	NO.		DRWN	CHKD	DATE	APPD
5	Dwg. No. & Sht. No. Revised; Cr'ds, Elevs. & Dim. Revised; Rel. Dwg. No. Revised; Title Revised	M.F.	T.H.C.	4-11-57	C.H.M.	1	GENERAL	M.F.	T.H.C.	4-11-57	C.H.M.
						2	Location of Equipment Revised	M.F.	M.A.C.	5-3-57	C.H.M.
						3	Cr'ds, Elevs. & Dim. Revised	M.F.	M.A.C.	5-13-57	C.H.M.
						4	Equip. Added, Deleted & Revised	M.F.	M.A.C.	5-13-57	C.H.M.
10	Several Revisions	M.F.	T.H.C.	5-13-57	C.H.M.	5	Several Revisions	M.F.	T.H.C.	5-13-57	C.H.M.
	Location of Equipment Revised					6	Several Revisions	M.F.	T.H.C.	5-13-57	C.H.M.
11	Dwg. No. & Sht. No. Revised	E.C.	T.H.C.	5-13-57	C.H.M.	7	Several Revisions	M.F.	T.H.C.	5-13-57	C.H.M.
12	New Equip. Added	M.F.		5-14-57		8	Several Revisions	M.F.	T.H.C.	5-13-57	C.H.M.
13	As Built	M.F.	T.H.C.	5-13-57		9	Several Revisions	M.F.	T.H.C.	5-13-57	C.H.M.

APPROVED FOR USE	Pat. 10-1-57	DATE	5-13-57
APPROVED FOR USE		DATE	

BLAW-KNOX COMPANY
CHEMICAL PLANTS DIVISION
PITTSBURGH, Pa.

U. S. ATOMIC ENERGY COMMISSION
ST. LOUIS AREA OFFICE

MALLINCKRODT CHEMICAL WORKS
ST. LOUIS, MISSOURI

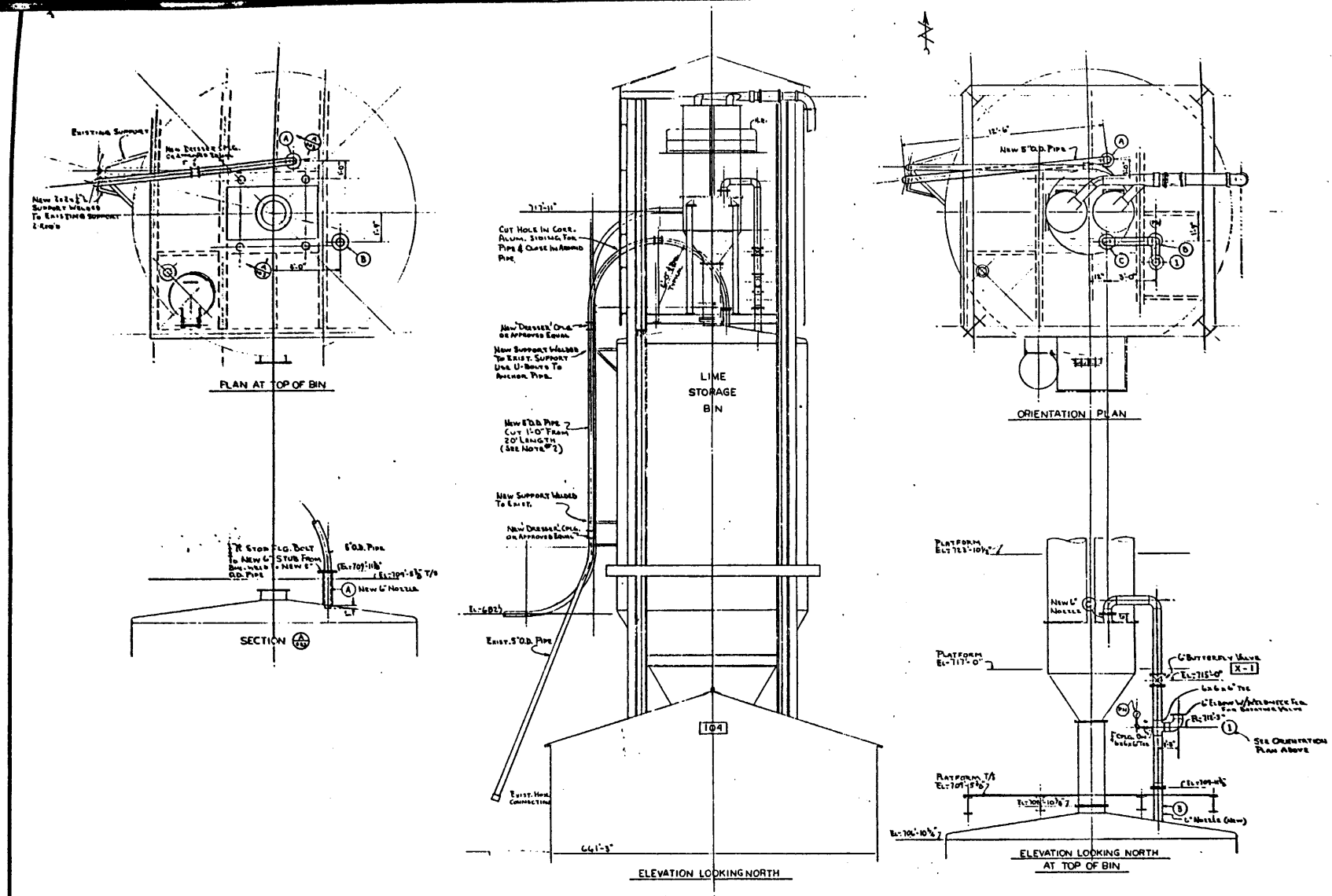
	BY	DATE
DRAWN	R. REN	5-13-57
CHECKED		
APPROVED	M.A.C.	5-13-57
APPROVED		
APPROVED	C.H.M.	5-13-57
APPROVED		

DIGESTION / DENITRATION BLDG. AREA 103 LAYOUT

PLAN 1ST LEVEL SHEET NO. 2

SCALE 1/4"-1'-0" | DWG. NO. 4411 | DWG. NO. 2103-12 | REV. NO.

NOTE: PUBLICATION OR GENERAL DISSEMINATION OF INFORMATION CONTAINED ON THIS DRAWING IS PROHIBITED



GENERAL NOTES

1- 6" VALVE, RELIEF VALVE AND PRESSURE GUAGE HAVE BEEN PURCHASED SEPARATELY

2- 5" O.D. PIPE TO BE OBTAINED FROM #2 WATER PLANT

SJ-4-12	MCW STD. SPEC. PIPING
SJ-3-22	MCW STD. SPEC PIPING
SC-8-1	MCW STD. SPEC. PAINTING

REFERENCE DRAWINGS

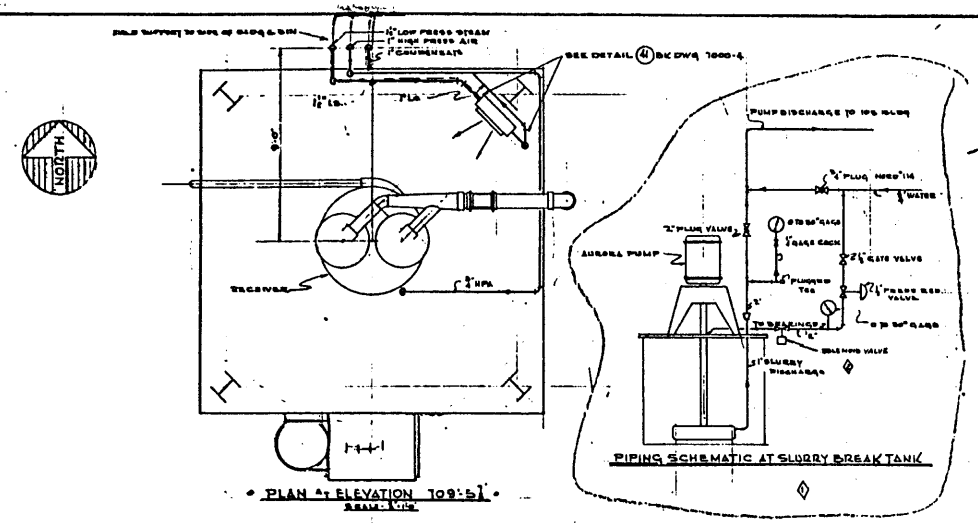
MALLINCKRODT CHEMICAL WORKS
ST. LOUIS, MO. URANIUM DIVISION WELDON SPRING, MO.
ATOMIC ENERGY COMMISSION CONTRACT NO. [illegible]

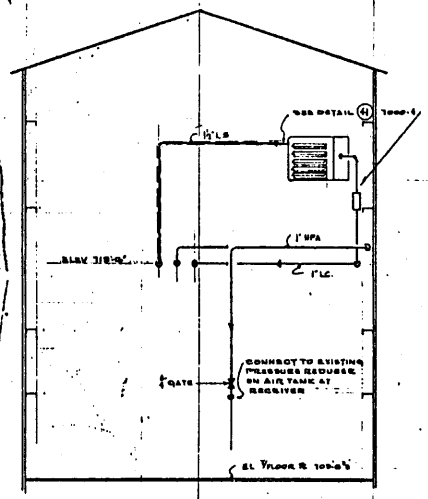
7 | 104

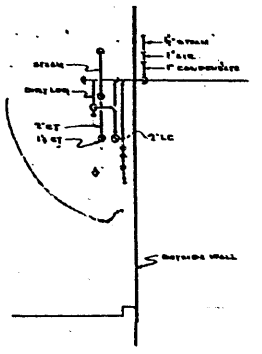
LIME CAR UNLOADING
TRUCK UNLOADING LINE
& VENT LINE

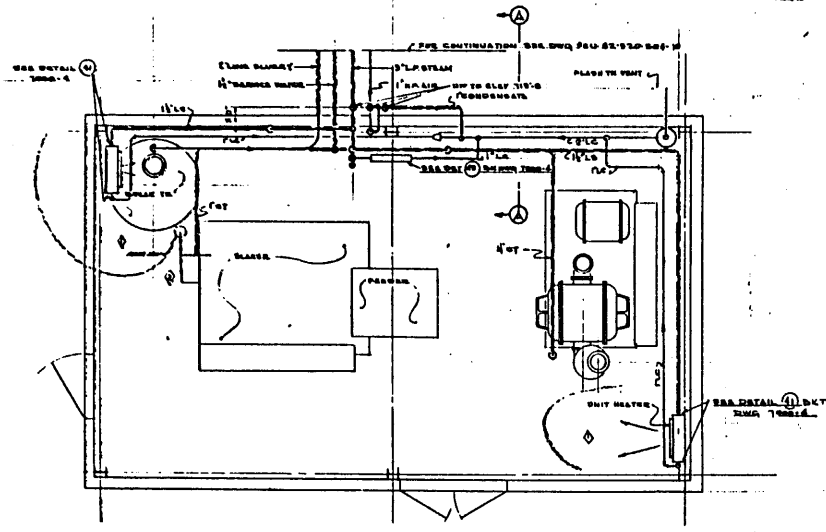
DWG. NO. 22 320 [illegible]

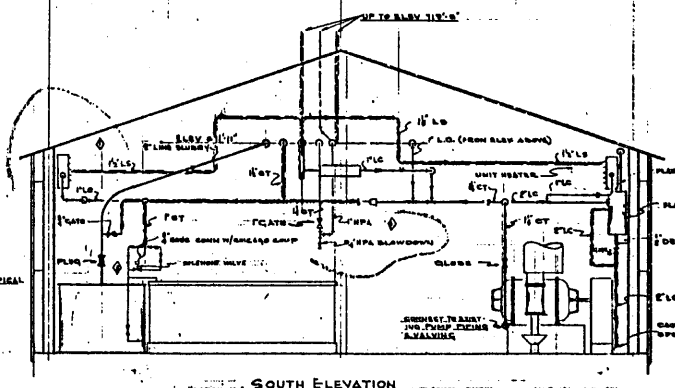
NO.	REVISIONS	BY	CHKD	DATE		BY	DATE
					DRAWN	[illegible]	12-7-62
					CHECKED	[illegible]	[illegible]
					PROJ. ENGR.	[illegible]	[illegible]
					APPROVED		
					APPROVED		
					APPROVED		
					SCALE:	[illegible]	











NOTES

1. STEAM, WATER & CONDENSATE PIPING SHALL CONFORM TO MCW SPECIFICATION 52-8-39
2. HIGH PRESSURE AIR PIPING SHALL CONFORM TO MCW SPECIFICATION 52-8-28
3. SLURRY PIPING SHALL CONFORM TO MCW SPECIFICATION 52-8-38
4. USE 6 ORIFICES FOR HPA IN LINE OF SLURRY IN SLURRY PIPING.
5. FOR DETAIL OF CONDENSATE BLOWDOWN SEE DETAIL 41 BLOWDOWN DWG 7000-4
6. FOR DETAIL OF PIPE THROUGH WALL SEE DETAIL 42 BLDG WALL DWG 7000-4
7. [illegible] CONNECT LINES TO
8. INSULATION WITH VALVES & PIPE SPECIFICATIONS P-6
9. ALL ORIFICE PLATES, RING TYPE, BETWEEN FLANGE JOINTS
10. INSIDE STEAM (L.S.) PIPING GLOBE TYPE STRAINER
11. INSIDE SERVICE WATER (HPA) GLOBE TYPE VALVE
12. INSIDE CONDENSATE (HPA) GLOBE TYPE VALVE
13. VALVES & FITTINGS, NOT REQUIRING INSULATION, & BELOW CEMENT FINISH, TO BE PAINTED WITH A WEATHER PROOF COATING OF JOHNS MANVILLE INSUL-MASTIC NO. 20 SERIES.

14. JACKETING & INSULATION SHALL BE SECURED WITH 3/4" WIDE ALUMINUM STRAPPING & SEALS APPROXIMATELY 6" O.C., A STRAP SHALL BE PLACED AT EACH CIRCUMFERENTIAL LAP.
15. VERTICAL PIPE RUNS SHALL HAVE METAL STOPS SPACED NOT MORE THAN 10 FEET APART. STOPS SHALL BE FURNISHED AND INSTALLED BY INSULATION SUB-CONTRACTOR.
16. INSIDE L.P. STEAM PIPING - SHALL BE JACKETED WITH CANVAS, ALUMINUM JACKETING IN BLDG 103 ONLY - & JACKETED WITH CANVAS IN LINE UNLOADING FACILITY.
17. SLOPE L.S. & L.C. LINES 1/4" PER FT IN DIRECTION OF FLOW.

REVISED AS BUILT

NO.	REVISIONS	MADE BY	CHKD BY	DATE
1	ADDED NOTE "D, E, LOCATED UNIT HEATER			
	ADDED UNIT HEATER & APPURTENANCES			
	ADDED GLOBE VALVE IN 1" HPA LINE ADDED			
	PIPING SCHEMATIC			
2	APPROVED AS NOTED	AA	WT	2-11-59

	BY	DATE
DRAWN	ROLFE	2-10-59
CHECKED		2-10-59
APPROVED		2-11-59
APPROVED		2-11-59
APPROVED		2-11-59
APPROVED		
SCALE	1/8"=1'-0"	

APPROVED FOR USE — DATE
APPROVED FOR MCW — DATE

FRUIN-COLNON CONTRACTING CO. AND UTAH-CONSTRUCTION CO.

U. S. ATOMIC ENERGY COMMISSION
ST. LOUIS AREA OFFICE

MALLINCKRODT CHEMICAL WORKS
ST. LOUIS, MISSOURI

T-A PIPING 104
EXIT LINE UNLOADING & SLURRYING FACILITIES
PLANS, ELEVATIONS & SECTIONS

CONT. NO. FCU-52-570-504-11 SHT. NO. 2

NOTE: THIS DRAWING CONSTITUTES A BID WHEN IT IS SIGNED BY THE BIDDER AND ACCEPTED BY THE OWNER. IT IS PREPARED IN BLUE OR BLACK LINES ON WHITE PAPER. WHEN SIGNED BY THE OWNER IT BECOMES A CONTRACT DRAWING AS NOTED OR ATTACHED TO THE CONTRACT.

PUBLICATION OR GENERAL DISTRIBUTION OF INFORMATION CONTAINED ON THIS DRAWING IS PROHIBITED

Building 104 needs to be wipe tested for PCB contamination. The lower level is not PCB contaminated based on a previous PCB survey.

Supporting Documents: See the following drawings.

2.5 Building/Area: TBP Extraction - Building 105

DESCRIPTION: Building 105 was designed for solvent extraction and purification of uranyl nitrate, using a ~30% mixture of tributyl phosphate in hexane, followed by stripping with distilled water or OK Liquor. Due to safety concerns associated with the use of ether, and the high purity achieved by the hexane/TBP extraction, ether re-extraction was never employed on a production scale.

CHEMICAL SYSTEMS: This building has been gutted. It was one of three buildings that the Department of the Army attempted to decontaminate and retrofit for the production of Agent Orange. No chemical processing equipment remains.

ANALYSIS/OBSERVATIONS: No chemical contamination was found. PCB wipe tests were below the cleanup criteria (<100 $\mu g/100\ cm^2$).

SUPPORTING DOCUMENTS: Not applicable

2.6 Building/Area: Proof Sampler - Building 106

DESCRIPTION: The proof samplers housed automated sampling equipment for taking periodic samples of process sewer and sanitary sewer water prior to discharge from the site. Laboratory personnel analyzed the waste water for uranium content, to ensure that the concentration of uranium in the waste stream did not exceed 1 g/l. Traces of other process chemicals were also measured periodically. There are three proof samplers serving different areas and systems at the chemical plant site. Building 106 sampled the process sewer lines for the refinery area.

CHEMICAL SYSTEMS: The proof sampler stations consist of a reinforced concrete structure, flume, flow orifices, pumps, and auxiliary instrumentation below ground covered

by a small prefabricated steel housing. The above ground structures house a proof sampler enclosed in a cabinet, a storage tank (s.s. vat), and instrumentation.

ANALYSIS/OBSERVATIONS: The tank in Building 106 was empty and no visible residue was present. During plant operation this tank would have contained highly dilute solutions of process chemicals and uranium compounds. This item will be cleaned to pass a radiological survey as part of the demolition.

SUPPORTING DOCUMENTS: None

2.7 Building/Area: Nitric Acid Recovery - Building 108

DESCRIPTION: Recovery of Nitric Acid from the denitration process.

CHEMICAL SYSTEMS: Nitric acid and NO_2 was driven off by heating UNH solution in denitration pots in Building 103. These acidic mists, vapors, or fumes were entrained by exhaust hoods and sent via overhead pipelines to Building 108 for recovery. The nitric acid was condensed by a series of eight Nash Compressors, passed through a liquid separator, absorbed in a scrubbing column, and reconcentrated by refluxing in a second distillation column. The recovered acid was stored in tanks located in area 102. Some UNH and hexane was carried over in the NO_2 vapor, and systems were provided to collect UNH condensate. A flash tank was employed to safely burn off hexane. A seal liquor separator tank held the seal liquor used to maintain the seals on the Nash Compressors. The ferric nitrate tank shown in the as-built drawings was not found in the bermed containment area of Building 108.

OBSERVATIONS/ANALYSIS: This system was suspect for RCRA corrosive waste residuals in the form of HNO^3. The systems are completely open and vented to the atmosphere, which suggests that any hazardous material present would be in the form of dried-on residues. Field sampling showed that the two towers were nonradioactive and pH neutral at accessible points in the system, an indication that this system was neutralized in accordance with the shutdown procedures. A radioactive solid material was found in the filter screens inside a section of piping in the compressor room of Building 108. Samples have been submitted for analysis. It is suspected that the material is throium nitrate, a radioactive/oxidizer. These residues are easily detected by field geiger counter, and will be

removed, encapsulated, or contained to prevent future release to the environment. The seal liquor catch-pans in the compressor room are PCB contaminated above 100 $\mu g/100\ cm^2$.

SUPPORT DOCUMENTS: See the following drawings. A drawing listing incoming and outgoing piping is included.

2.8 Building/Area: Drum Storage - Buildings 109 and 110

DESCRIPTION: Buildings 109 and 110 are canopy-type buildings used as a holding point for incoming drums of feed material. At present, demolition waste and scrap metal are stored under these canopies.

CHEMICAL SYSTEMS: No chemical systems are present.

OBSERVATIONS/ANALYSIS: A PCB wipe test on an oil-soaked patch of concrete in this area was well below the cleanup criteria for PCB contamination.

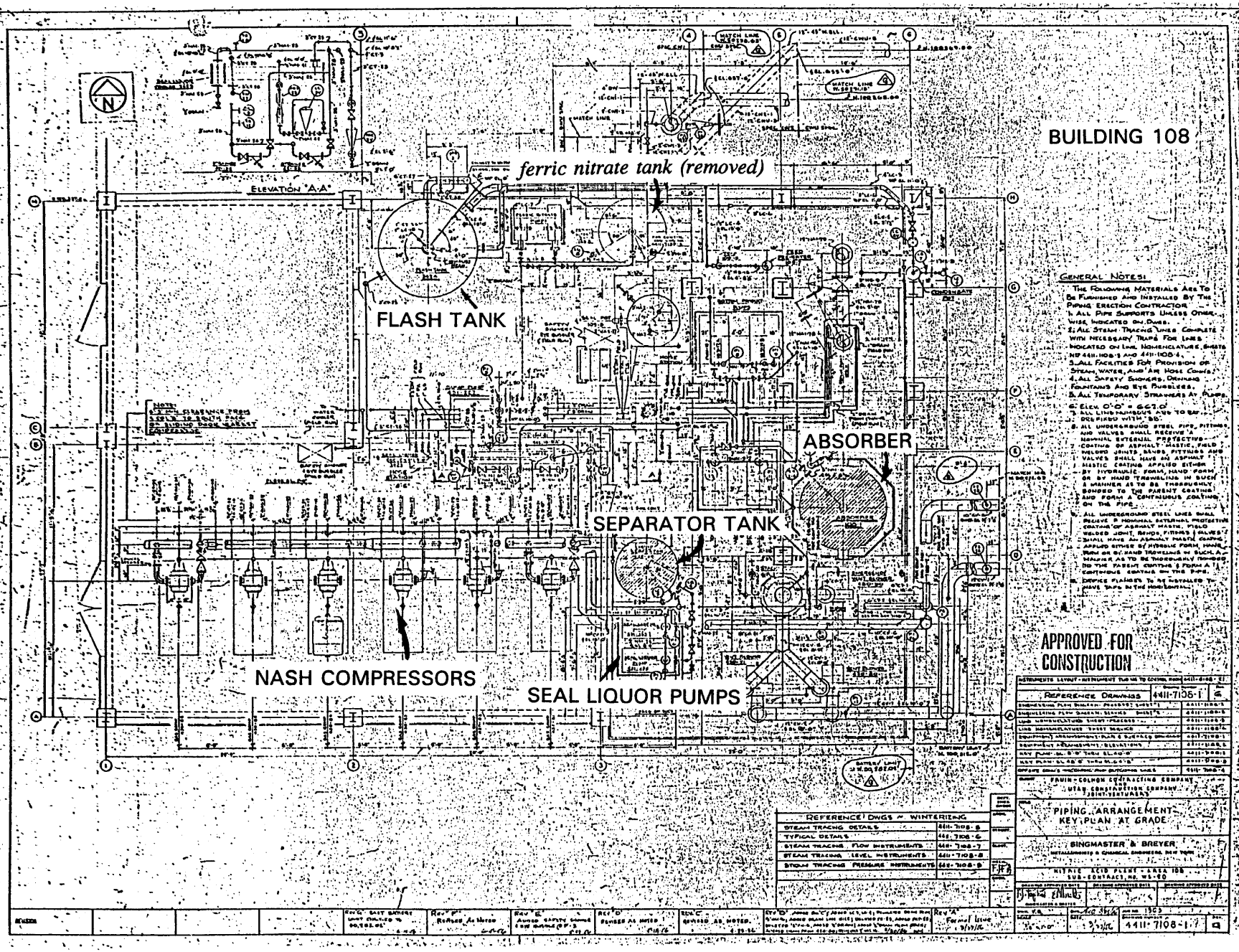
SUPPORTING DOCUMENTS: None.

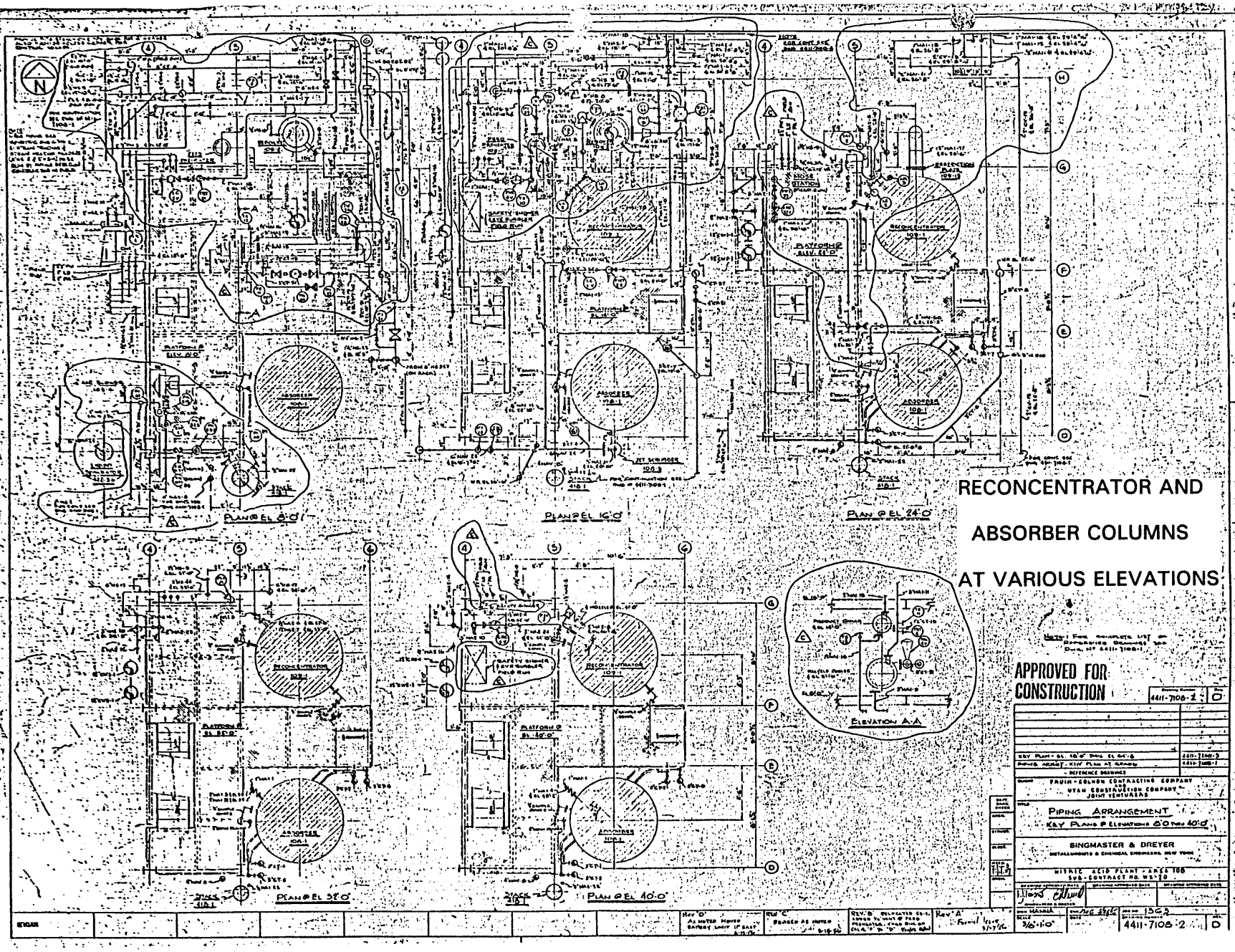
2.9 Building/Area: Green Salt Tank Farm - Area 202

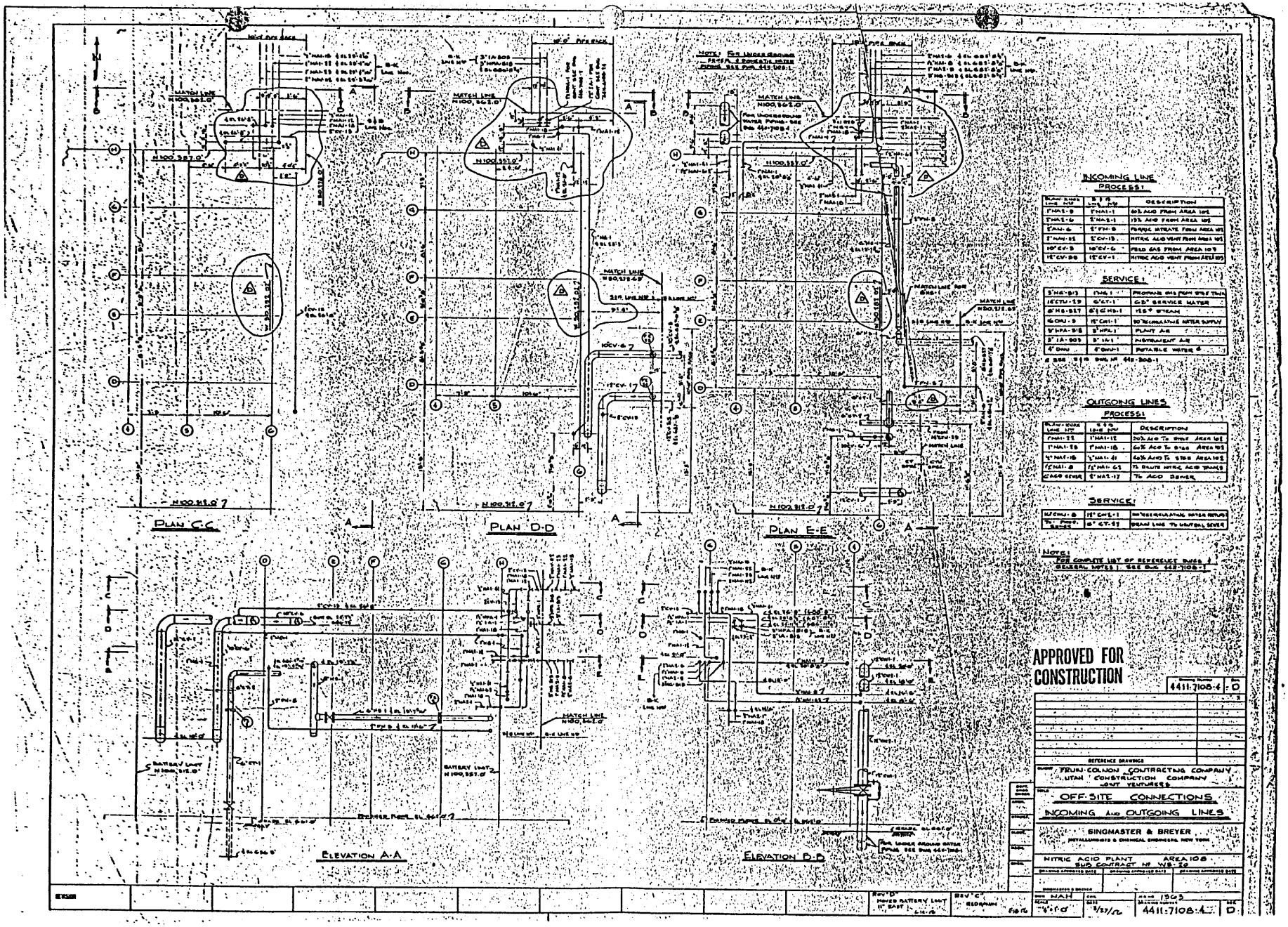
DESCRIPTION: The green salt tank farm provided storage of anhydrous hydrofluoric acid (AHF), 70% hydrofluoric acid and anhydrous ammonia used in the processes in Building 201.

CHEMICAL SYSTEMS: The hydrofluoric acid (HF) tanks are all ~15,000 gal capacity. Five of the tanks were designated for AHF service. These tanks required a temperature-controlled environment and are housed inside Building 202. Freon 22 refrigerant was used in the rooftop air conditioning units. Three 70% HF tanks are located in a bermed containment area south of Building 202. The ammonia tanks were removed at plant shutdown.

OBSERVATIONS/ANALYSIS: All eight HF/AHF tanks were opened for inspection and sampling. Six of the tanks were empty. The inner walls of these six tanks, numbers 0060, 0061, 0063, 0064, 0066, and 0067 showed a pH ranging from 4 to 7; geiger counter readings


BUILDING 108
ferric nitrate tank (removed)
FLASH TANK
ABSORBER
SEPARATOR TANK
NASH COMPRESSORS
SEAL LIQUOR PUMPS
ELEVATION "A-A"
GENERAL NOTES:
APPROVED FOR CONSTRUCTION
REFERENCE DRAWINGS 4411-7108-1
REFERENCE DWGS re WINTERIZING
PIPING ARRANGEMENT KEY PLAN AT GRADE
BINGMASTER & BREYER
NITRIC ACID PLANT - AREA 108
4411-7108-1-1


RECONCENTRATOR AND
ABSORBER COLUMNS
AT VARIOUS ELEVATIONS
APPROVED FOR CONSTRUCTION
PLAN @ EL 8'-0"
PLAN @ EL 16'-0"
PLAN @ EL 24'-0"
PLAN @ EL 32'-0"
PLAN @ EL 40'-0"
ELEVATION A-A
PIPING ARRANGEMENT
KEY PLANS @ ELEVATIONS 8'-0" THRU 40'-0"
SINGMASTER & BREYER
4411-7108-2
D



INCOMING LINE

PROCESS:

BLAW-KNOX LINE NO	S & S LINE NO	DESCRIPTION
1"NA2-8	1"NA1-1	60% ACID FROM AREA 102
2"NA2-6	2"NA2-1	15% ACID FROM AREA 102
2"AN-6	2"FN-8	FERRIC NITRATE FROM AREA 102
2"NAV-22	2"CV-13	NITRIC ACID VENT FROM AREA 102
10"CV-3	10"CV-6	FEED GAS FROM AREA 103
12"CV-38	12"CV-1	NITRIC ACID VENT FROM AREA 103

SERVICE:

3"NG-513	1"NG-1	PROPANE GAS FROM STEEL TANK
14"CTU-29	6"CT-1	65° SERVICE WATER
8"HS-527	8"&6"HS-1	125# STEAM
16"CHU-3	12"CHU-1	90° RECIRCULATING WATER SUPPLY
3"HPA-518	3"HPA-1	PLANT AIR
3"IA-503	3"IA-1	INSTRUMENT AIR
4"DWU	4"DWU-1	POTABLE WATER

SEE S&S DWG NO 44E-308-1

OUTGOING LINES

PROCESS:

BLAW-KNOX LINE NO	S & S LINE NO	DESCRIPTION
1"NA1-22	1"NA1-12	20% ACID TO STEEL AREA 102
1"NA1-28	1"NA1-18	60% ACID TO STEEL AREA 102
1/2"NA1-18	1/2"NA1-41	60% ACID TO STEEL AREA 102
1/2"NA1-8	1/2"NA1-62	TO DILUTE NITRIC ACID TANKS
6"ACID SEWER	2"NA2-17	TO ACID SEWER

SERVICE:

16"CHU-8	12"CHU-1	90° RECIRCULATING WATER RETURN
TO PROC. SEWER	6"CT-22	DRAIN LINE TO NEUTRAL SEWER

NOTE: FOR COMPLETE LIST OF REFERENCE DWGS & GENERAL NOTES, SEE DWG 44E-7108-1

APPROVED FOR CONSTRUCTION

4411-7108-4 D

REFERENCE DRAWINGS

CLIENT: FRUIN-COLNON CONTRACTING COMPANY
UTAH CONSTRUCTION COMPANY
JOINT VENTURERS

TITLE: OFF-SITE CONNECTIONS
INCOMING AND OUTGOING LINES

SINGMASTER & BREYER
METALLURGISTS & CHEMICAL ENGINEERS, NEW YORK

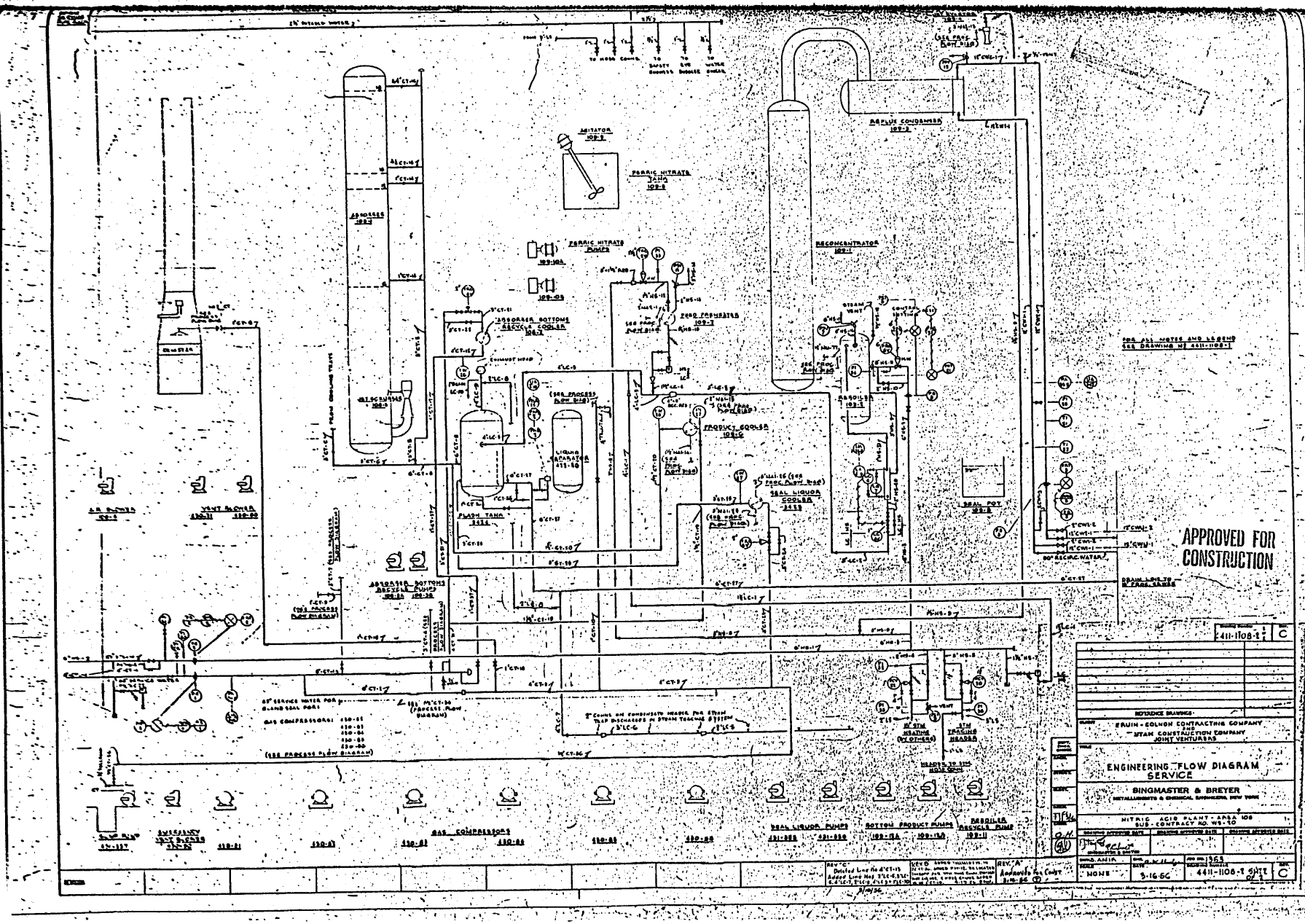
NITRIC ACID PLANT AREA 108
SUB CONTRACT NO WS-20

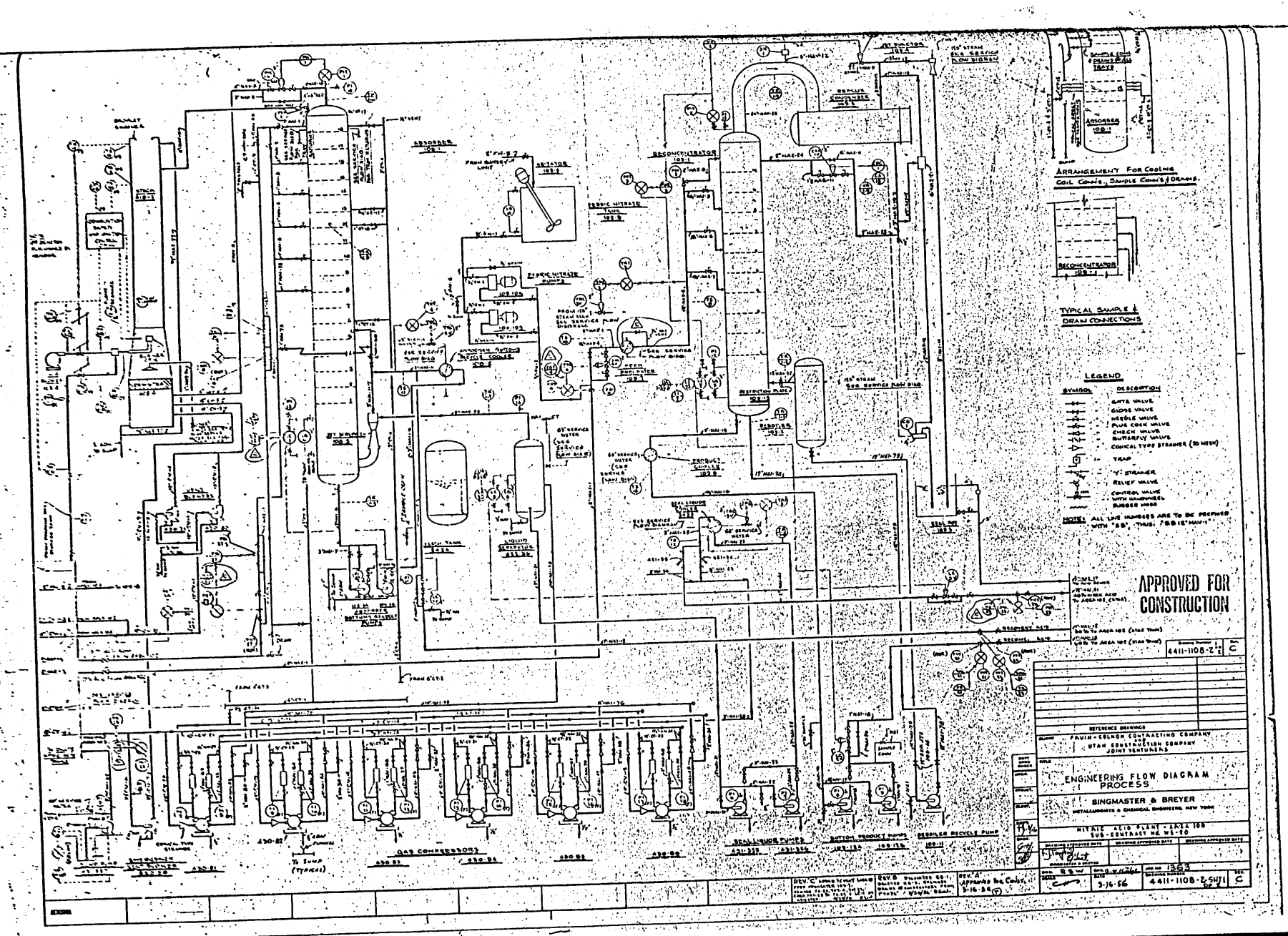
DRAWING APPROVED DATE | DRAWING APPROVED DATE | DRAWING APPROVED DATE

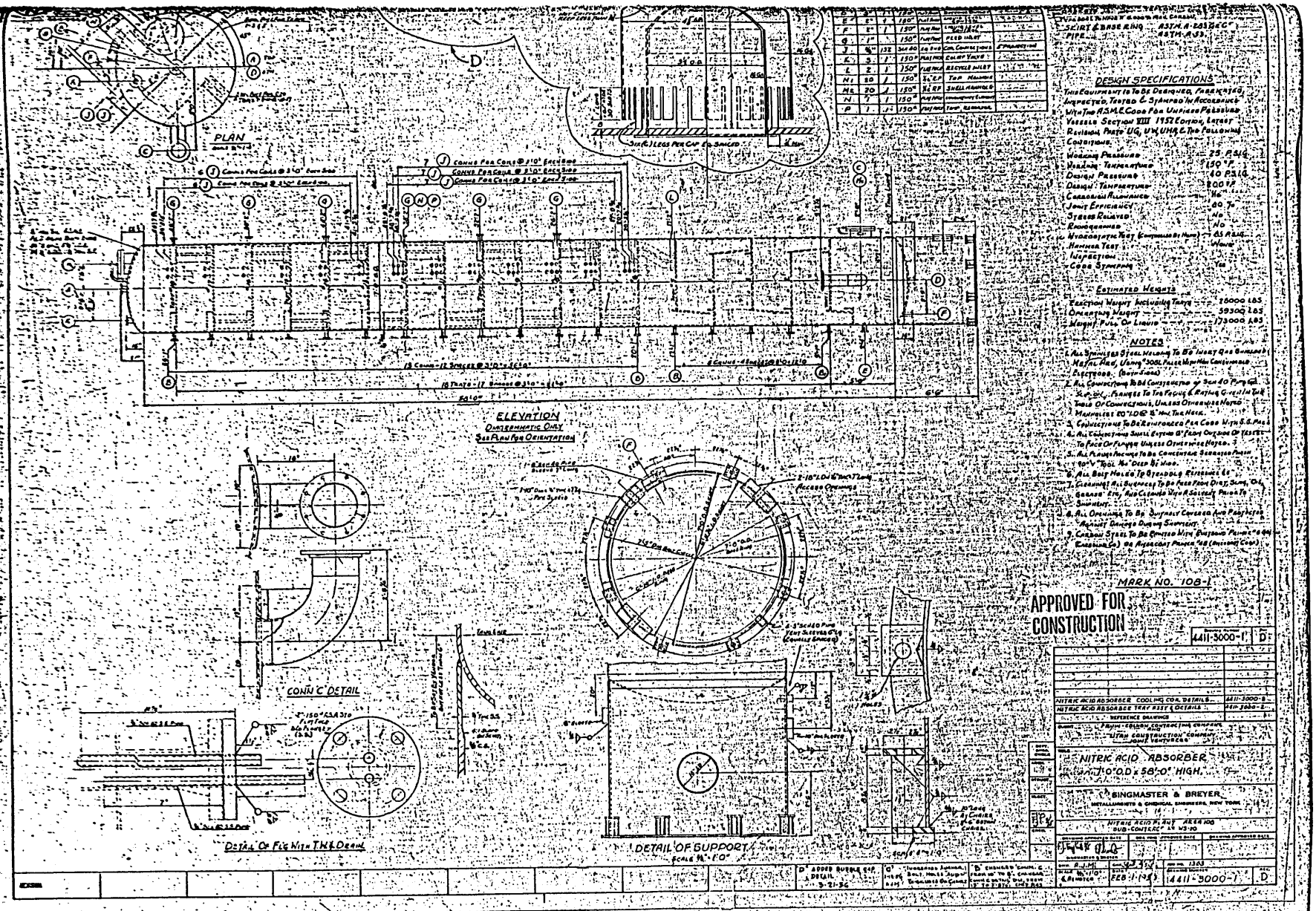
SINGMASTER & BREYER

DWN NAH | CHK | SCALE 1/4"=1'-0" | DATE 3/27/56 | JOB NO 1363 | DRAWING NUMBER 4411-7108-4 | REV D

REV "D" MOVED BATTERY LIMIT 11" EAST | REV "C" REDRAWN


APPROVED FOR CONSTRUCTION
ERUIN - COLMON CONTRACTING COMPANY AND UTAH CONSTRUCTION COMPANY JOINT VENTURERS
ENGINEERING FLOW DIAGRAM SERVICE
SINGMASTER & BREYER
NITRIC ACID PLANT - AREA 108
SUB-CONTRACT NO. WS-20
4411-1108-2
C
NONE
3-16-56
REFERENCE DRAWINGS
FOR ALL NOTES AND LEGEND SEE DRAWING NO 4411-1108-1
PERRIC NITRATE TANK
PERRIC NITRATE PUMPS
RECONCENTRATOR
REFLUX CONDENSER
ABSORBER BOTTOMS RECYCLE COOLER
FEED PREHEATER
PRODUCT COOLER
SEAL LIQUOR COOLER
FLASH TANK
LIQUID SEPARATOR
SEAL POT
ABSORBER BOTTOMS RECYCLE PUMPS
GAS COMPRESSORS
SEAL LIQUOR PUMPS
BOTTOM PRODUCT PUMPS
REBOILER RECYCLE PUMP
VENT BLOWER
AIR BLOWER
DRAIN LINE TO 18" PROC. SEWER
REV. "A" Approved for Const.


ARRANGEMENT FOR COOLING COIL CONN'S, SAMPLE CONN'S & DRAINS.
TYPICAL SAMPLE & DRAIN CONNECTIONS
LEGEND
SYMBOL
DESCRIPTION
GATE VALVE
GLOBE VALVE
NEEDLE VALVE
PLUG COCK VALVE
CHECK VALVE
BUTTERFLY VALVE
CONICAL TYPE STRAINER (30 MESH)
TRAP
"Y" STRAINER
RELIEF VALVE
CONTROL VALVE WITH HANDWHEEL
RUBBER HOSE
NOTE: ALL LINE NUMBERS ARE TO BE PREFIXED WITH "SB", THUS: "SB 12" MAV-1"
APPROVED FOR CONSTRUCTION
4411-1108-2
C
REFERENCE DRAWINGS
FRUIN-COLNON CONTRACTING COMPANY AND UTAH CONSTRUCTION COMPANY JOINT VENTURERS
ENGINEERING FLOW DIAGRAM PROCESS
SINGMASTER & BREYER
METALLURGISTS & CHEMICAL ENGINEERS, NEW YORK
NITRIC ACID PLANT - AREA 108
SUB-CONTRACT NO. WS-20
3-16-56
4411-1108-2 SHT 1 OF 2
C
GAS COMPRESSORS
SEAL LIQUOR PUMPS
BOTTOM PRODUCT PUMPS
REBOILER RECYCLE PUMP
REV. A APPROVED FOR CONST. 3-16-56



SKIRT & BASE RING — ASTM A-285 GR C
PIPE — ASTM A-53

DESIGN SPECIFICATIONS

THIS EQUIPMENT TO BE DESIGNED, FABRICATED, INSPECTED, TESTED & STAMPED IN ACCORDANCE WITH THE A.S.M.E. CODE FOR UNFIRED PRESSURE VESSELS SECTION VIII 1952 EDITION, LATEST REVISION, PARTS UG, UW, UHA & THE FOLLOWING CONDITIONS.

WORKING PRESSURE	25 P.S.I.G.
WORKING TEMPERATURE	150 °F.
DESIGN PRESSURE	40 P.S.I.G.
DESIGN TEMPERATURE	200 °F.
CORROSION ALLOWANCE	NIL
JOINT EFFICIENCY	60 %
STRESS RELIEVED	NO
RADIOGRAPHED	NO
HYDROSTATIC TEST (CONTAINED BY HEAD)	65 P.S.I.G.
HAMMER TEST	WAIVED
INSPECTION	
CODE STAMPING	YES

ESTIMATED WEIGHTS

ERECTION WEIGHT INCLUDING TANK	26000 LBS
OPERATING WEIGHT	59300 LBS
WEIGHT FULL OF LIQUID	173000 LBS

NOTES

1. ALL STRUCTURAL STEEL WELDING TO BE HEAVY GAS SHIELDED METAL ARC, USING "308L" FILLER WIRE AND CONSUMABLE ELECTRODE. (BOTH SIDES)
2. ALL CONNECTIONS TO BE CONSTRUCTED OF SCH 40 PIPE OR S.R.P.E., FLANGES TO THE FACING & RAISING GIVEN IN TABLE OF CONNECTIONS, UNLESS OTHERWISE NOTED.
3. MANHOLES TO "LOOK" THRU THE NECK.
4. CONNECTIONS TO BE REINFORCED PER CODE WITH S.S. PADS.
5. ALL CONNECTING SHELL EDGES TO BE FLUSH WITH OUTSIDE OF VESSEL TO FACE OF FLANGE UNLESS OTHERWISE NOTED.
6. ALL FLANGE FACINGS TO BE CONCENTRIC SERRATED FINISH 100 "V" TOOL No. USED BY MFGR.
7. ALL BOLT HOLES TO STRADDLE REFERENCE LINES.
8. CLEANING: ALL SURFACES TO BE FREE FROM DIRT, SLAG, OIL, GREASE ETC. AND CLEANED WELL & SOLVENT FREE TO SHIPMENT.
9. ALL OPENINGS TO BE SUITABLY COVERED AND PROTECTED AGAINST DAMAGE DURING SHIPMENT.
10. CARBON STEEL TO BE STRIPED WITH BITUMASTIC PAINT #50 (BITUMASTIC CO.) OR MEDIUM PRIMER #88 (MINERAL COLOR)

MARK NO. 108-1

APPROVED FOR CONSTRUCTION

4411-3000-1 D

NITRIC ACID ABSORBER COOLING COIL DETAILS	4411-3000-2
NITRIC ACID ABSORBER TRAY ASSY & DETAILS	4411-3000-3

REFERENCE DRAWINGS

FROM — FOLSOM CONTRACTING COMPANY, INC.
WITH CONSTRUCTION COMPANY — GROUP CONTRACTORS

NITRIC ACID ABSORBER
10'-0" O.D. x 58'-0" HIGH.

SINGMASTER & BREYER
INSTALLATION & CHEMICAL ENGINEERS, NEW YORK

NITRIC ACID PLANT AREA 108
SUB-CONTRACT No. W3-10

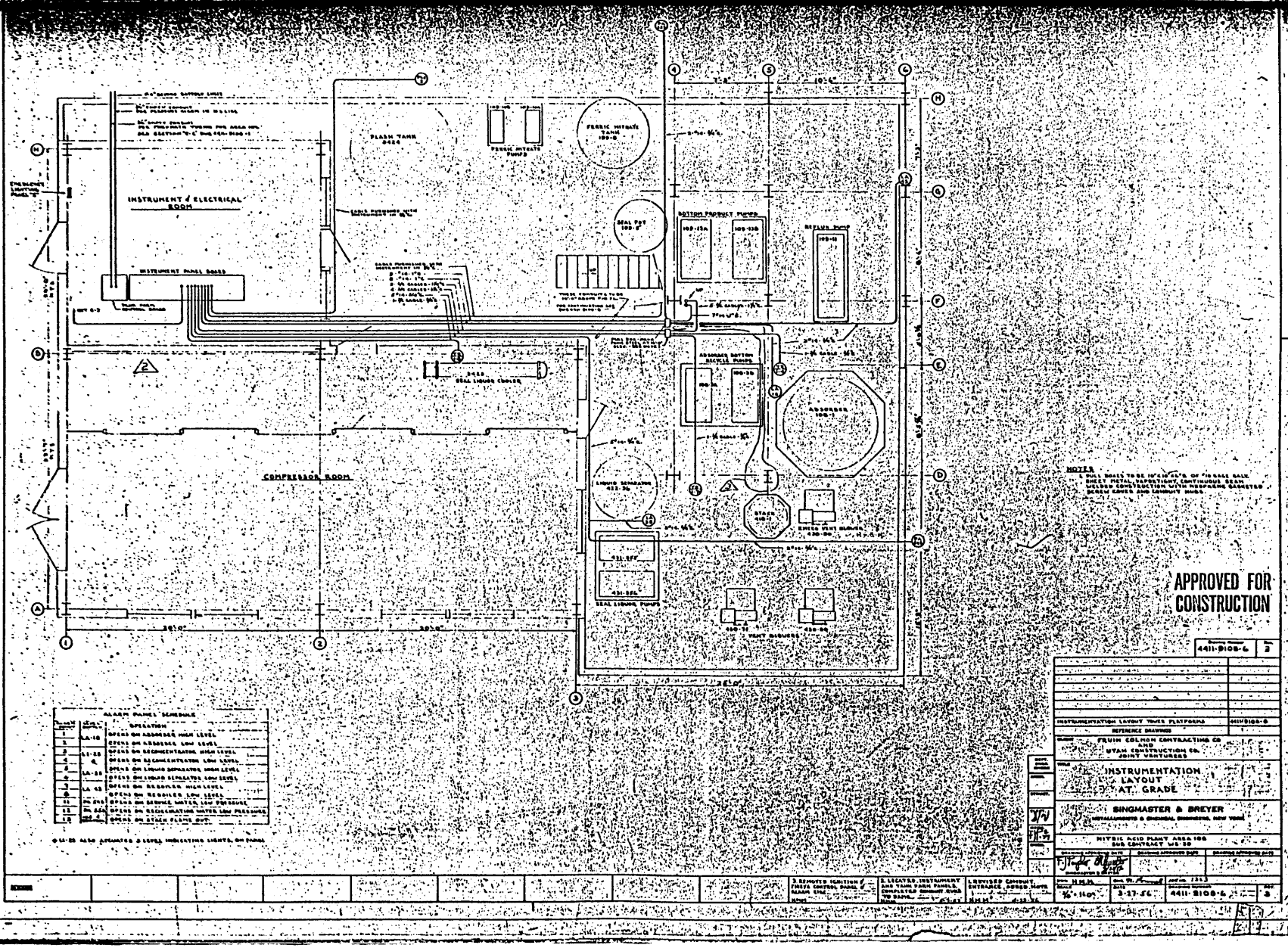
DRAWN BY	R.J.M.	DATE	1-3-51
TRACED BY		DATE	
BLUE PRINTED	FEB 1-1951	DRAWING NUMBER	4411-3000-1
REV. NO.			D

D ADDED BUBBLE & DET. DETAIL 9-21-50

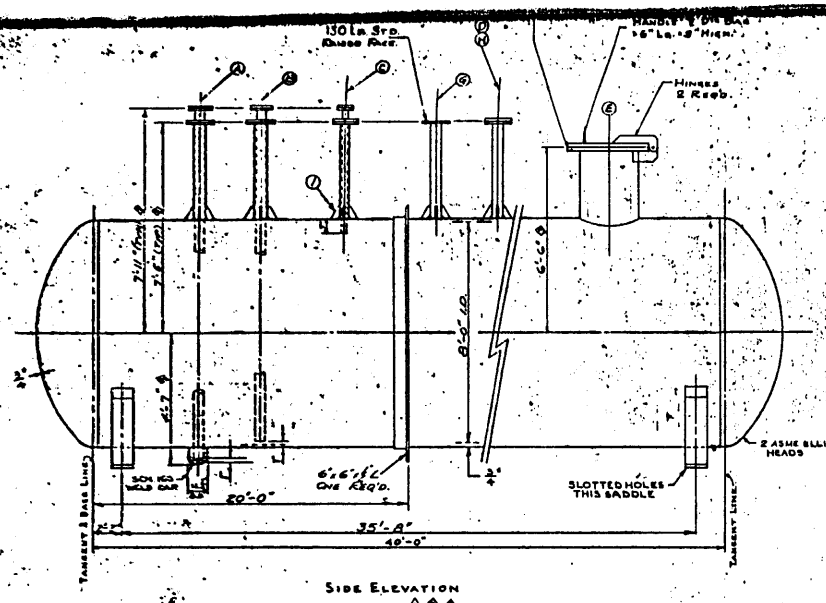
C CHANGED CONN. C FROM 18" TO 8" CONNECTION & DETAIL 1-26-50

B ADDED CONN. C 1-3-50

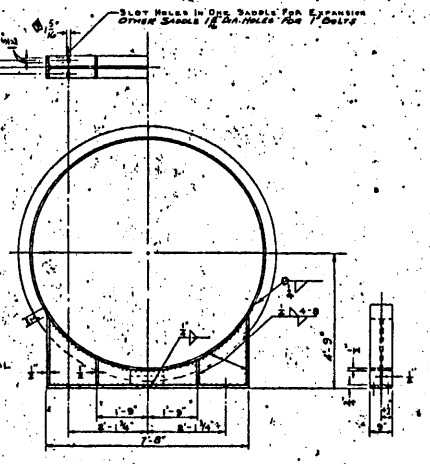
A ADDED CONN. F 12-29-49



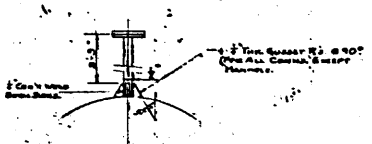
INSTRUMENT & ELECTRICAL ROOM
INSTRUMENT PANEL BOARD
FLASH TANK
FERRIC NITRATE PUMPS
FERRIC NITRATE TANK
SEAL POT
BOTTOM PRODUCT PUMPS
REFLUX PUMP
ABSORBER BOTTOM RECYCLE PUMPS
ABSORBER
SEAL LIQUOR COOLER
COMPRESSOR ROOM
LIQUID SEPARATOR
STACK
EMERG VENT BLOWER
SEAL LIQUOR PUMPS
VENT BLOWERS
NOTES
1. PULL BOXES TO BE 10"x10"x6"S OF #10 GAGE GALV. SHEET METAL, VAPORTIGHT, CONTINUOUS SEAM WELDED CONSTRUCTION WITH NEOPRENE GASKETED SCREW COVER AND CONDUIT HUBS.
APPROVED FOR CONSTRUCTION
ALARM PANEL SCHEDULE
OPERATION
OPENS ON ABSORBER HIGH LEVEL
OPENS ON ABSORBER LOW LEVEL
OPENS ON RECONCENTRATOR HIGH LEVEL
OPENS ON RECONCENTRATOR LOW LEVEL
OPENS ON LIQUID SEPARATOR HIGH LEVEL
OPENS ON LIQUID SEPARATOR LOW LEVEL
OPENS ON REBOILER HIGH LEVEL
OPENS ON REBOILER LOW LEVEL
OPENS ON SERVICE WATER LOW PRESSURE
OPENS ON RECIRCULATING WATER LOW PRESSURE
OPENS ON STACK FLAME OUT
INSTRUMENTATION LAYOUT TOWER PLATFORMS
REFERENCE DRAWINGS
FRUIN COLMON CONTRACTING CO AND UTAH CONSTRUCTION CO. JOINT VENTURERS
INSTRUMENTATION LAYOUT AT GRADE
SINGMASTER & BREYER
NITRIC ACID PLANT AREA 100 SUB CONTRACT WS-30
3. REMOTED IGNITION & FIRE CONTROL PANEL & ALARM SIZE
2. LOCATED INSTRUMENT AND TANK FARM PANELS COMPLETED CONDUIT RUNS TO DAMS
1. REVISED CONDUIT ENTRANCE, ADDED NOTE
3-27-56
4411-9108-6
3



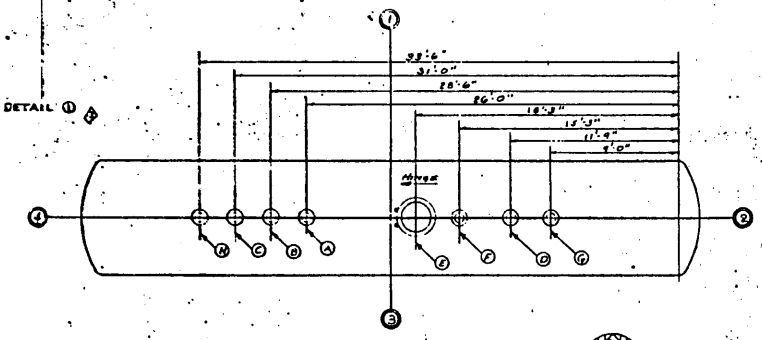
SIDE ELEVATION



END VIEW



DETAIL



ORIENTATION PLAN

A	1	3" NOZZLE WITH 6" OF PIPE	SOUTH
B	1	3" NOZZLE WITH 6" OF PIPE	OUTLET
C	1	3" NOZZLE WITH 6" OF PIPE	INLET
D	1	1½" NOZZLE	VENT
E	1	24" MANWAY	ACCESS
F	1	3" NOZZLE	VENT
G	1	1½" NOZZLE	T.E. CONNECTION
H	1	2" NOZZLE	OUTLET (SEE ITEM 3035-1 ONLY)

FITTING SCHEDULE NOTES:

1. NOZZLE FLANGE DIMENSIONS - ASA 150# STD., LARGE TONGUE & GROOVE, COMPLETE WITH SLIP-ON COMPANION FLG. UNLESS OTHERWISE NOTED. GROOVED FLANGE SHALL BE ATTACHED TO VESSEL & TO DIP PIPE.
2. NOZZLE NECKS SHALL BE SCH. 160.

GENERAL NOTES

CONSTRUCTION — FUSION WELDED

CODE — ASME BOILER & PRESSURE VESSEL CODE, SECTION VIII.

1. DESIGN CONDITIONS - 150# PSIG & FULL VACUUM @ 150°F

RADIOGRAPHING — COMPLETE RADIOGRAPHING REQUIRED.

2. MATERIALS — PLATE - ASTM A285 GR C-FIREBOX GR. ASTM A201 GR A OR B
   - 1. PIPE — ASTM A106
   - FLANGES — ASTM A181
   - BOLTING — ASTM A193-B7
   - STRUCTURALS — ASTM A7
   - GASKETS — TEFLON
   - 2. NOTE: SHELL & HEADS SHALL BE ALUMINUM KILLED (NEON STEEL MARINE ACADEMY) CONTENT OF 0.05% MAX.

TESTING — PER CODE REQUIREMENTS

INSPECTION — CODE APPROVED AGENCY.

STAMPING — ASME (NATIONAL BOARD).

NAME PLATE — BLAW-KNOX COMPANY

PAINT — RUSTBOND PRIMER #6 RED OR "AMERCOAT" PRIMER #18, APPLIED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.

CORROSION ALLOWED - 1/8" ON ALL PRESSURE PARTS.

TOTAL CAPACITY - 16,000 GALS.

WEIGHT-EMPTY — 39,700 LB.
FULL OF WATER — 173,000 LB.
OPERATING — 206,800 LB. MAX.

VESSEL SHALL BE UNIFORMLY HEATED @ 1150°F - 1200°F FOR ONE HOUR. ALLOW TO COOL SLOWLY @ A RATE NOT GREATER THAN 500°F PER HOUR TO 600°F THEN TO ROOM TEMPERATURE IN STILL AIR.

REFERENCE — LOCATION 4411-V-1
APPLICATION 4411-3035-R1

AS BUILT
BLAW-KNOX CO.
BY C. H. Mufson

C	As Built	QC	CHK	4-7-53
B	REVISIONS	DRAWN	CHK	DATE
1	[illegible]	G.C.	[illegible]	3-31-53
2	[illegible]	[illegible]	[illegible]	2-28-53
3	ADDED ORIENTATION	D.E.A.	[illegible]	2-12-53
	ACCESS PART LABEL CALL			
	OUTLET			
4	REMOVED END VIEW THAT			
	WAS ADDED ON REV 3	D.E.A.	F.S.	1-15-53
5	[illegible]	[illegible]	[illegible]	1-6-53

APPROVED FOR AEC	D.W. BROWN	6-15-53
APPROVED FOR BKCO	LESTER G. WEBER	6-15-53

DRAWN	ADAM VAN	3-4-53
CHECKED	[illegible]	3-30-53
APPROVED	[illegible]	4-22-53
APPROVED	[illegible]	[illegible]
APPROVED	[illegible]	[illegible]
SCALE	1/4" = 1'-0"	

BLAW-KNOX COMPANY
CHEMICAL PLANTS DIVISION
PITTSBURGH, PA.

FOR: U. S. ATOMIC ENERGY COMMISSION
ST. LOUIS AREA OFFICE

AND: MALLINCKRODT CHEMICAL WORKS
ST. LOUIS, MISSOURI

GREEN SALT PLANT — AREA 202

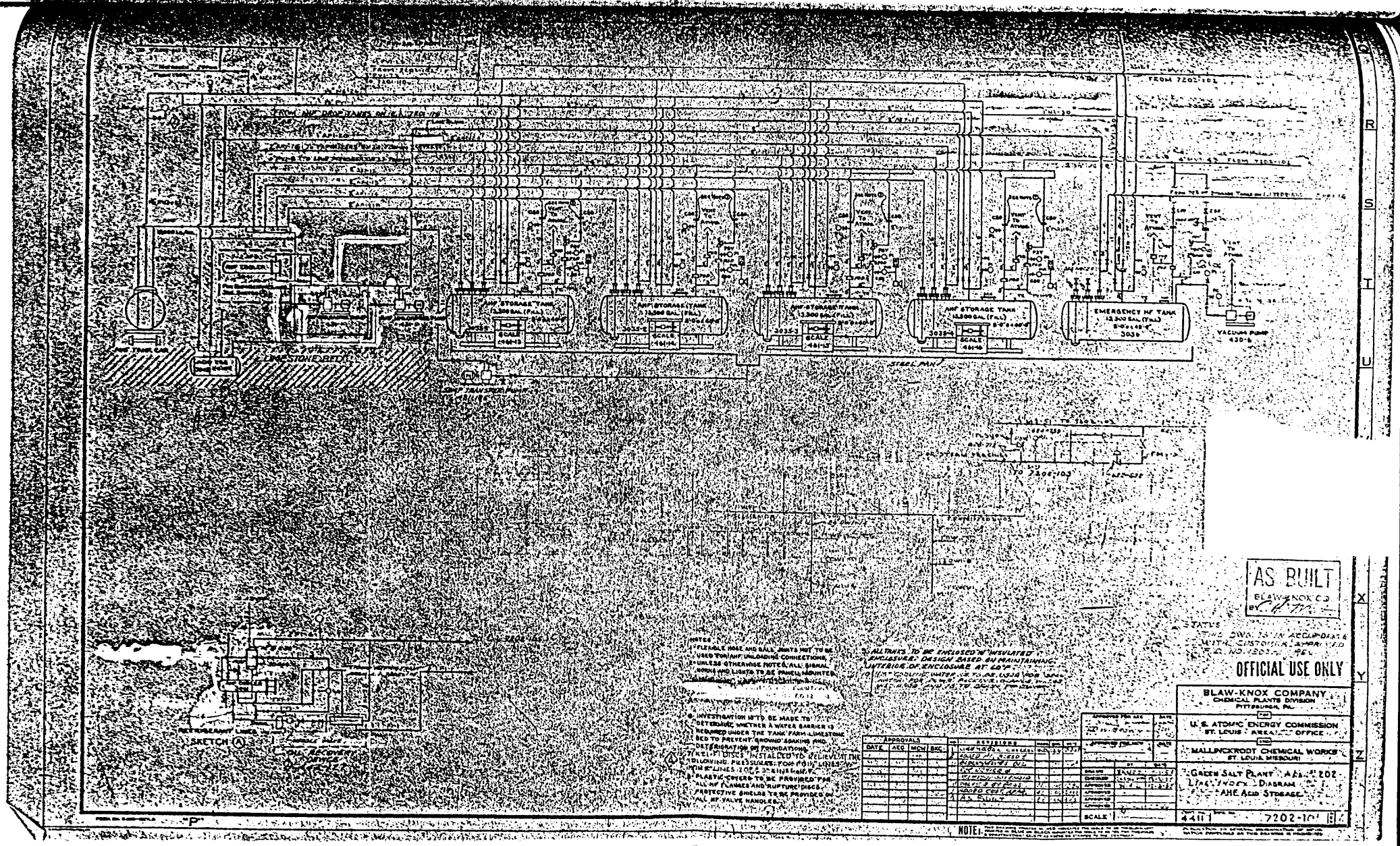
HF STORAGE TANKS

DWG NO 4411 — SPEC NO 3035-1 — G

F.S. 1802-1 & 2

NOTE: [illegible]

PUBLICATION OR GENERAL DISSEMINATION OF DRAWING CONTAINED ON THIS DRAWING IS PROHIBITED


AS BUILT
BLAW-KNOX CO.
STATUS
OFFICIAL USE ONLY
BLAW-KNOX COMPANY
CHEMICAL PLANTS DIVISION
PITTSBURGH, PA.
U.S. ATOMIC ENERGY COMMISSION
ST. LOUIS AREA OFFICE
MALLINCKRODT CHEMICAL WORKS
ST. LOUIS, MISSOURI
GREEN SALT PLANT
LINE INDEX DIAGRAM
AHF ACID STORAGE
7202-101
NOTES
ALL TANKS TO BE ENCLOSED & INSULATED
APPROVALS
REVISIONS
SCALE

were 3x background. Tank 0065, previously used for storage of 70% HF, has a rubber liner and contains a small amount of light green solid residue. A sample has been taken for further analysis, and the results are pending. Field analysis showed that the pH of tank 0065 is <2. Tank 0062, previously used for AHF storage, contains ~5 to 10 gal of free liquid with a pH of 10. It appears that efforts were made to neutralize this tank. A ring of suspected neutralizing agent (i.e. sodium carbonate) was observed at the bottom of the tank. All eight tanks have been vented to the atmosphere for an extended period of time - at least three years.

The freon lines to the refrigeration units have been severed, therefore no freon should be present. A previous investigation showed that this building is not PCB contaminated.

SUPPORTING DOCUMENTS: See the following drawings.

2.10 Building/Area: Steam Plant Boilers - Area 401

DESCRIPTION: Coal-Fired boilers lined with asbestos.

CHEMICAL SYSTEMS: Only the boilers remain.

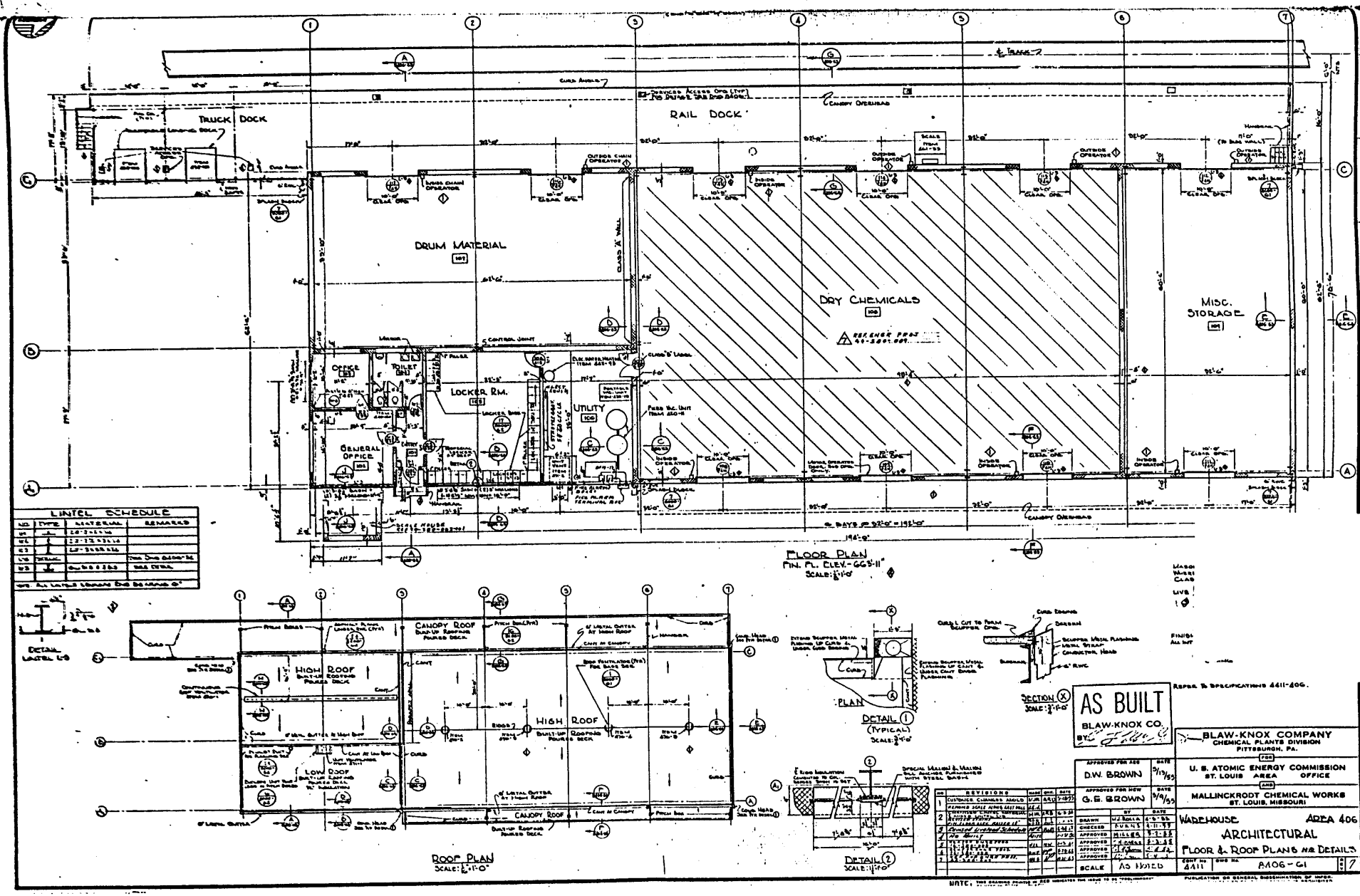
OBSERVATIONS/ANALYSIS: No chemical impacts are present.

SUPPORTING DOCUMENTS: None.

2.11 Building/Area: Warehouse - Building 406

DESCRIPTION: This building was used for storage of dry chemicals, recycled and special feed materials, intermediate products, and miscellaneous materials.

CHEMICAL SYSTEMS: A vacuum cleaner system clean-out line is located in the rear railcar unloading platform. This line is embedded in concrete, and will be addressed during foundation removal. There are no other chemical systems in this building.



TRUCK DOCK
RAIL DOCK
DRUM MATERIAL
DRY CHEMICALS
MISC. STORAGE
OFFICE
TOILET
LOCKER RM.
UTILITY
GENERAL OFFICE
FLOOR PLAN
FIN. FL. ELEV.-663'-11"
LINTEL SCHEDULE
CANOPY ROOF
HIGH ROOF
LOW ROOF
ROOF PLAN
DETAIL 1 (TYPICAL)
DETAIL 2
SECTION X
AS BUILT
BLAW-KNOX CO.
BLAW-KNOX COMPANY
CHEMICAL PLANTS DIVISION
PITTSBURGH, PA.
U. S. ATOMIC ENERGY COMMISSION
ST. LOUIS AREA OFFICE
MALLINCKRODT CHEMICAL WORKS
ST. LOUIS, MISSOURI
WAREHOUSE AREA 406
ARCHITECTURAL
FLOOR & ROOF PLANS AND DETAILS
D.W. BROWN
G.E. BROWN
AS NOTED
8406-61

OBSERVATIONS/ANALYSIS: PCB contamination was detected on the floor in the restroom.

SUPPORTING DOCUMENTS: See the following drawings.

2.12 Building/Area: Electrical Substation - Building 412

DESCRIPTION: This building housed the switch gear and a bank of batteries for auxiliary power for the substation. The transformers associated with this substation, and the wet cell batteries were previously removed.

CHEMICAL SYSTEMS: There are no chemical systems in this building.

OBSERVATIONS/ANALYSIS: No chemical impacts were noted.

SUPPORTING DOCUMENTS: None.

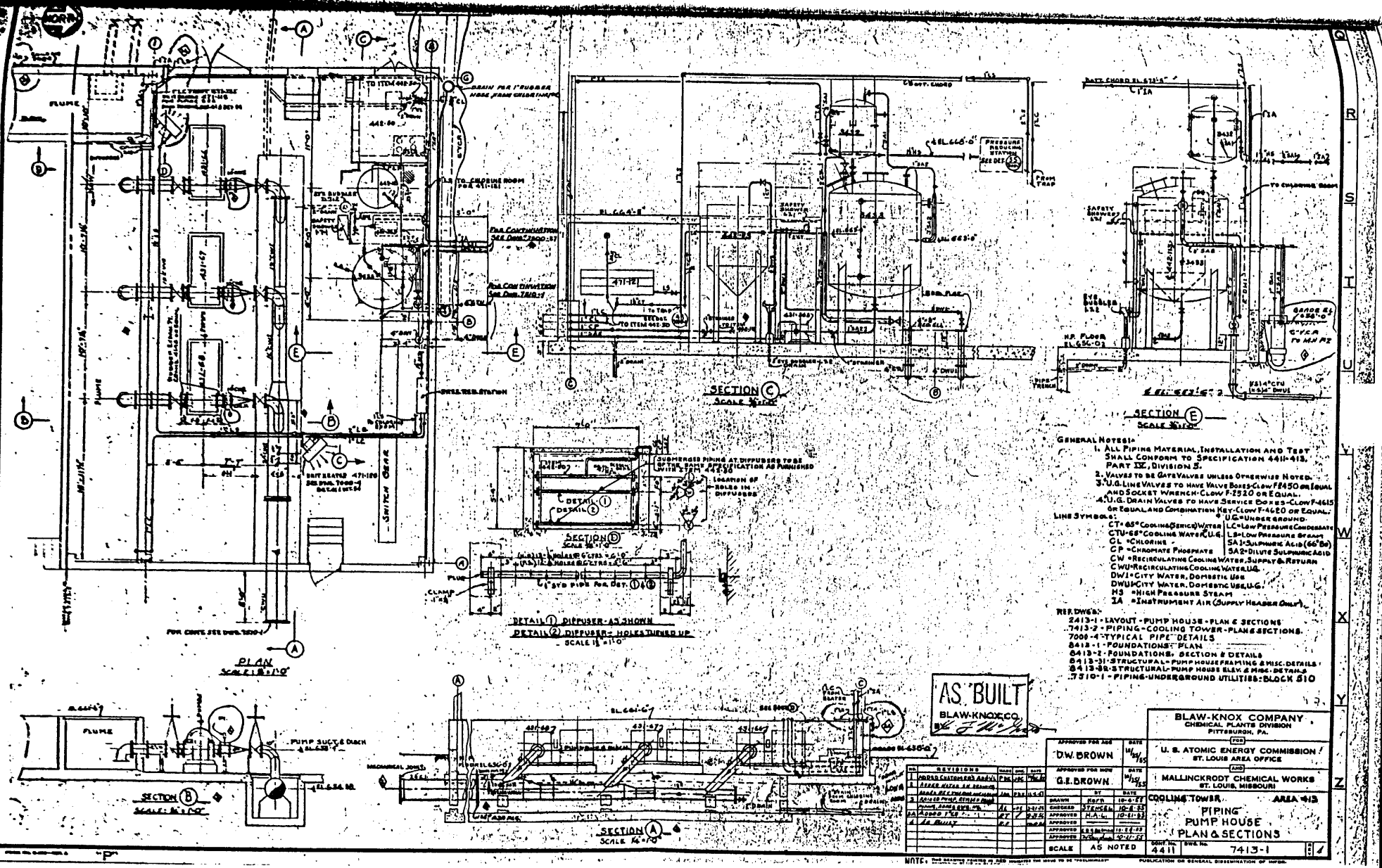
2.13 Building/Area: Cooling Tower and Pump House Building 413

DESCRIPTION: The cooling tower was a heat sink for water that was used in various buildings to maintain proper operating temperatures, and to operate heat transfer equipment, such as condensers. The pump house circulated the water in the cooling tower, and was the location of chemical treatment of the cooling tower water. The cooling towers are constructed of wood.

CHEMICAL SYSTEMS: The pump house once contained tanks of compressed chlorine gas for chlorination of the cooling tower water. No chlorine gas tanks remain. An acid mixing tank is present. There are no other chemical systems in this building.

OBSERVATIONS/ANALYSIS: The acid mix tank was found to be pH neutral. One PCB wipe test location was >100 $\mu g/100$ cm^2. The wood used to construct the cooling towers is tainted with arsenic above the toxicity characteistic leaching procedure (TCLP) extract limit, 5.0 mg/L.

SUPPORTING DOCUMENTS: See the following drawings.



GENERAL NOTES:

1. ALL PIPING MATERIAL, INSTALLATION AND TEST SHALL CONFORM TO SPECIFICATION 4411-413, PART IX, DIVISION 5.
2. VALVES TO BE GATE VALVES UNLESS OTHERWISE NOTED.
3. U.G. LINE VALVES TO HAVE VALVE BOXES-CLOW F8450 OR EQUAL AND SOCKET WRENCH-CLOW F-2520 OR EQUAL.
4. U.G. DRAIN VALVES TO HAVE SERVICE BOXES-CLOW F-4615 OR EQUAL AND COMBINATION KEY-CLOW F-4620 OR EQUAL.

* U.G.=UNDER GROUND.

LINE SYMBOLS:

CT=85° COOLING (SERVICE) WATER
CTU=68° COOLING WATER U.G.
CL =CHLORINE
CP =CHROMATE PHOSPHATE
CW =RECIRCULATING COOLING WATER, SUPPLY & RETURN
CWU=RECIRCULATING COOLING WATER U.G.
DWI=CITY WATER, DOMESTIC USE
DWUI=CITY WATER, DOMESTIC USE U.G.
HS =HIGH PRESSURE STEAM
IA =INSTRUMENT AIR (SUPPLY HEADER ONLY)
LC=LOW PRESSURE CONDENSATE
LP=LOW PRESSURE STEAM
SA1=SULPHURIC ACID (66° Be)
SA2=DILUTE SULPHURIC ACID

REF. DWGS:

2413-1 - LAYOUT - PUMP HOUSE - PLAN & SECTIONS
7413-2 - PIPING - COOLING TOWER - PLAN & SECTIONS.
7000-4 - TYPICAL PIPE DETAILS
8413-1 - FOUNDATIONS - PLAN
8413-2 - FOUNDATIONS - SECTION & DETAILS
8413-31 - STRUCTURAL - PUMP HOUSE FRAMING & MISC. DETAILS
8413-33 - STRUCTURAL - PUMP HOUSE ELEV. & MISC. DETAILS
7510-1 - PIPING - UNDERGROUND UTILITIES - BLOCK 510

NO.	REVISIONS	NAME	APPD.	DATE
1	ORDER CHANGE NO. 4			
2	ORDER CHANGE NO. 5			
3	ORDER CHANGE NO. 6			
4	ADDED 1" CW	RT		9-25-58
A	AS BUILT			

	BY	DATE
DRAWN	KRCH	10-6-55
CHECKED	STENGEL	10-6-55
APPROVED	H.A.L.	10-11-55
APPROVED		
APPROVED	A.S.B. for [illegible]	10-11-55
APPROVED	[illegible]	10-11-55
SCALE	AS NOTED	

APPROVED FOR AGE: D.W. BROWN — DATE 11/22/55
APPROVED FOR MW: G.E. BROWN — DATE 10/11/55

BLAW-KNOX COMPANY
CHEMICAL PLANTS DIVISION
PITTSBURGH, PA.

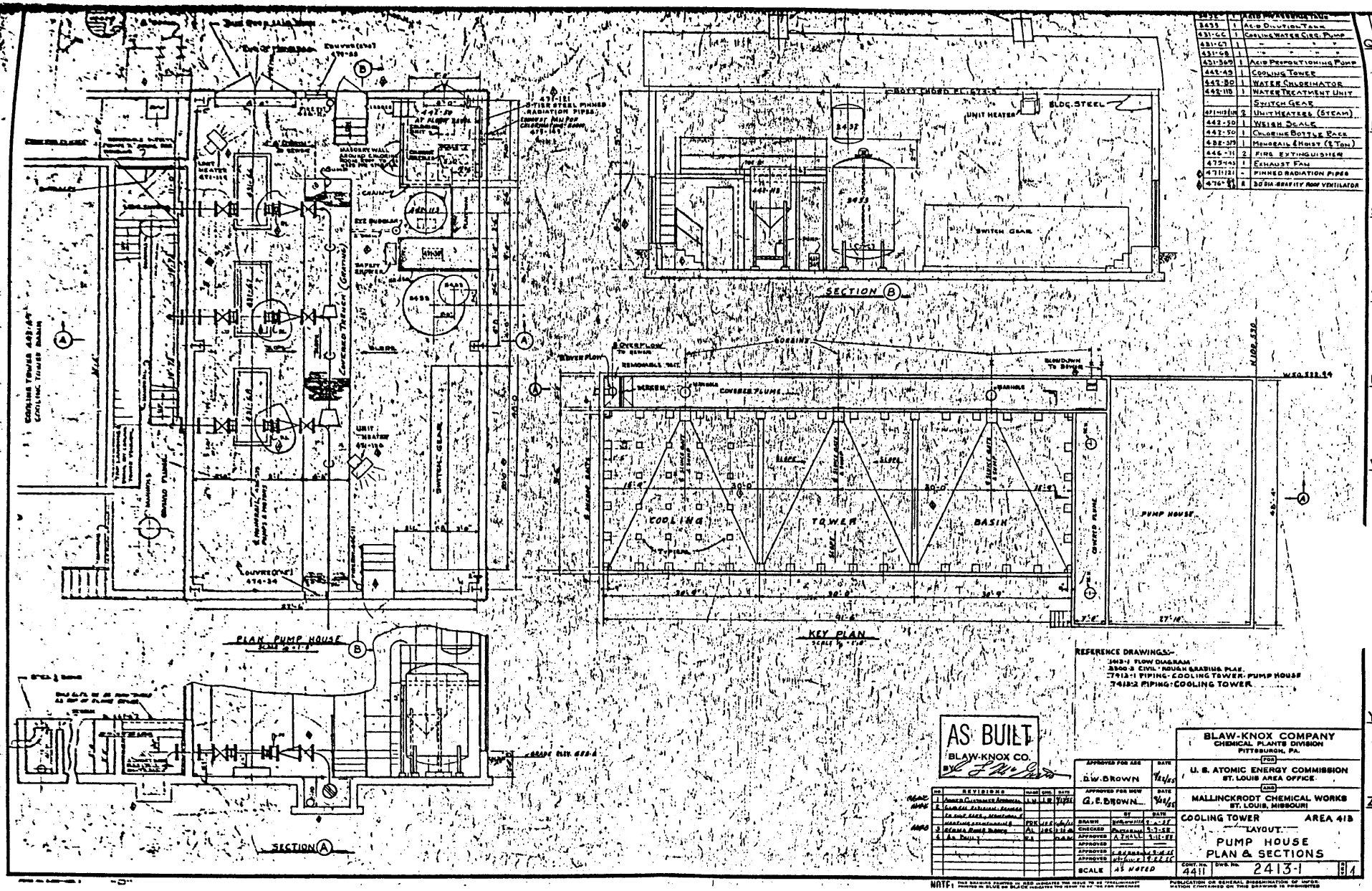
FOR
U. S. ATOMIC ENERGY COMMISSION
ST. LOUIS AREA OFFICE
AND
MALLINCKRODT CHEMICAL WORKS
ST. LOUIS, MISSOURI

COOLING TOWER AREA 413

PIPING PUMP HOUSE PLAN & SECTIONS

CONT. No. 4411 — DWG. No. 7413-1

NOTE: THIS DRAWING TENDERED AS AND MARKED THE ISSUE TO BE "PRELIMINARY" — PUBLICATION OR GENERAL DISSEMINATION OF INFORMATION



3632	1	ACID PROPORTIONING TANK
3633	1	ACID DILUTION TANK
431-GC	1	COOLING WATER CIRC. PUMP
431-GT	1	" " " "
431-GB	1	" " " "
431-369	1	ACID PROPORTIONING PUMP
442-49	1	COOLING TOWER
442-30	1	WATER CHLORINATOR
442-118	1	WATER TREATMENT UNIT
		SWITCH GEAR
471-118 (IN)	2	UNIT HEATERS (STEAM)
442-50	1	WEIGH SCALE
442-30	1	CHLORINE BOTTLE RACK
432-319	1	MONORAIL & HOIST (5 TON)
446-11	2	FIRE EXTINGUISHERS
473-145	1	EXHAUST FAN
471-1121	-	FINNED RADIATION PIPES
476-[illegible]	8	30 DIA-GRAVITY ROOF VENTILATOR

REFERENCE DRAWINGS:-
2413-1 FLOW DIAGRAM
2500-3 CIVIL - ROUGH GRADING PLAN
7912-1 PIPING - COOLING TOWER - PUMP HOUSE
7912-2 PIPING - COOLING TOWER

AS BUILT
BLAW-KNOX CO.
BY L. F. McGuire

NO.	REVISIONS	CLASS	BY	DATE
1	ADDED CUSTOMER REQUIRED [illegible]	L.W.	L.B.	7/25/61
2	[illegible]			
	[illegible]			
	[illegible]			
3	REVISED PUMP HOUSE	PDK	LEE	6/1/61
4	AS BUILT	W.A.	L.B.S.	11-16-61

	APPROVED FOR A&E	DATE
	D.W. BROWN	7/24/61
	APPROVED FOR B&W	DATE
	G.E. BROWN	7/26/61
	BY	DATE
DRAWN	[illegible]	5-4-61
CHECKED	PDK/LEE	5-5-61
APPROVED	A. THULL	5-11-61
APPROVED		
APPROVED	[illegible]	[illegible]
APPROVED	[illegible]	[illegible]
SCALE	AS NOTED	

BLAW-KNOX COMPANY
CHEMICAL PLANTS DIVISION
PITTSBURGH, PA.
FOR
U. S. ATOMIC ENERGY COMMISSION
ST. LOUIS AREA OFFICE
AND
MALLINCKRODT CHEMICAL WORKS
ST. LOUIS, MISSOURI

COOLING TOWER AREA 418
LAYOUT
PUMP HOUSE
PLAN & SECTIONS

CONT. No. 4411 DWG. No. 2413-1 SH. 1

NOTE: THIS DRAWING PRINTED IN RED INDICATES THE ISSUE TO BE PRELIMINARY PRINTED IN BLUE OR BLACK INDICATES THE ISSUE TO BE FOR PURCHASE

PUBLICATION OR GENERAL DISSEMINATION OF INFORMATION CONTAINED ON THIS DRAWING IS PROHIBITED

2.14 Building/Area: Scrap Classification and Equipment Stores - Building 414 Maintenance

DESCRIPTION: This building is now used as a maintenance and storage building.

CHEMICAL SYSTEMS: One empty above ground fuel oil tank is located outside Building 414.

OBSERVATIONS/ANALYSIS: The fuel oil tank is empty except for ~5 gal of solids composed of soil and fuel oil. PCB levels are below the cleanup criteria.

SUPPORTING DOCUMENTS: None.

2.15 Building/Area: Propane Gas Plant - Building 428

DESCRIPTION: Propane gas storage and distribution.

CHEMICAL SYSTEMS: Two 30,000 gal propane tanks, compressors, valves and metering systems are present.

OBSERVATIONS/ANALYSIS: The propane tanks are open to the atmosphere at the bottom valves. PCB levels are below the cleanup criteria.

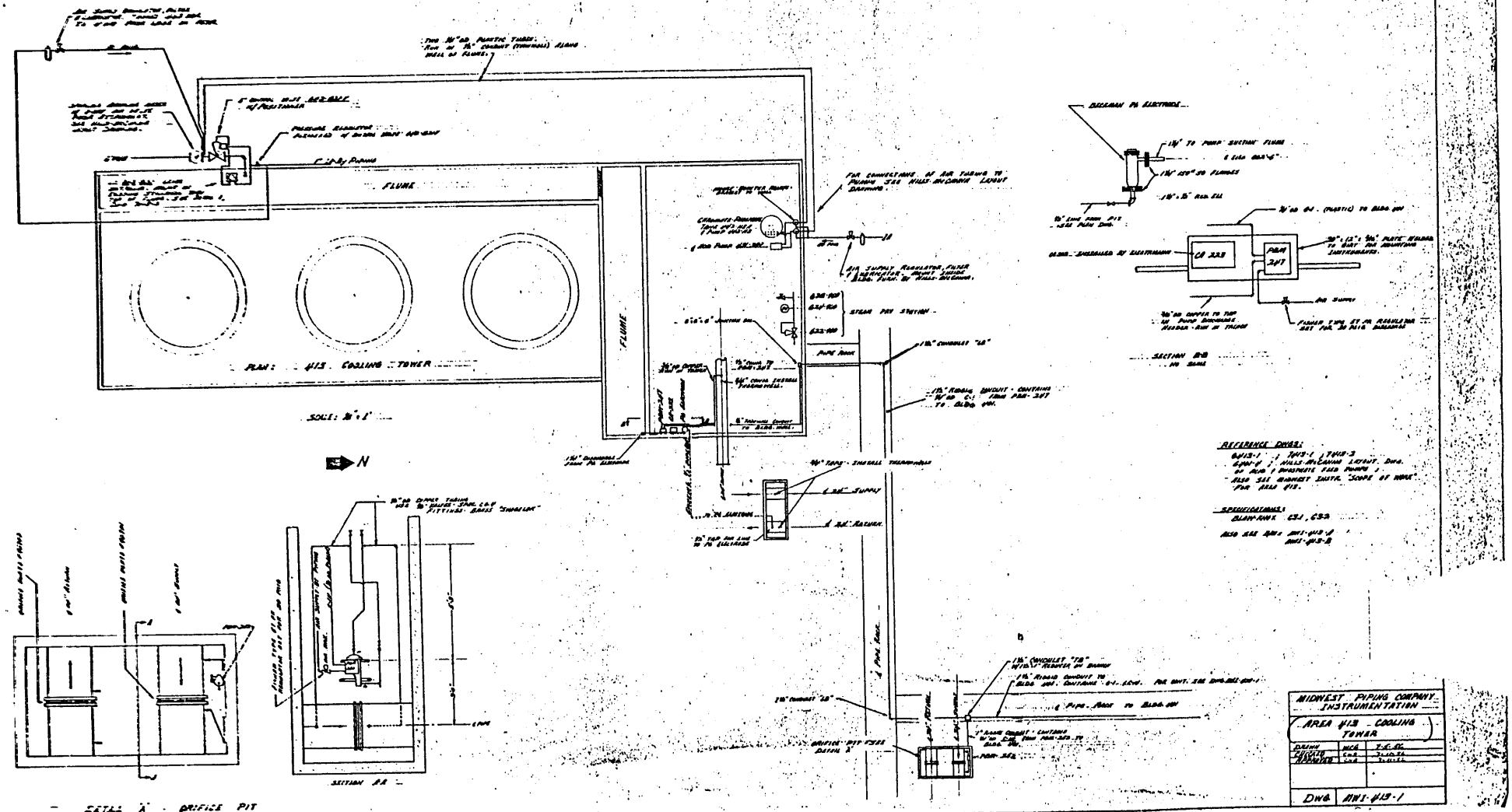
SUPPORTING DOCUMENTS: See the following drawings.

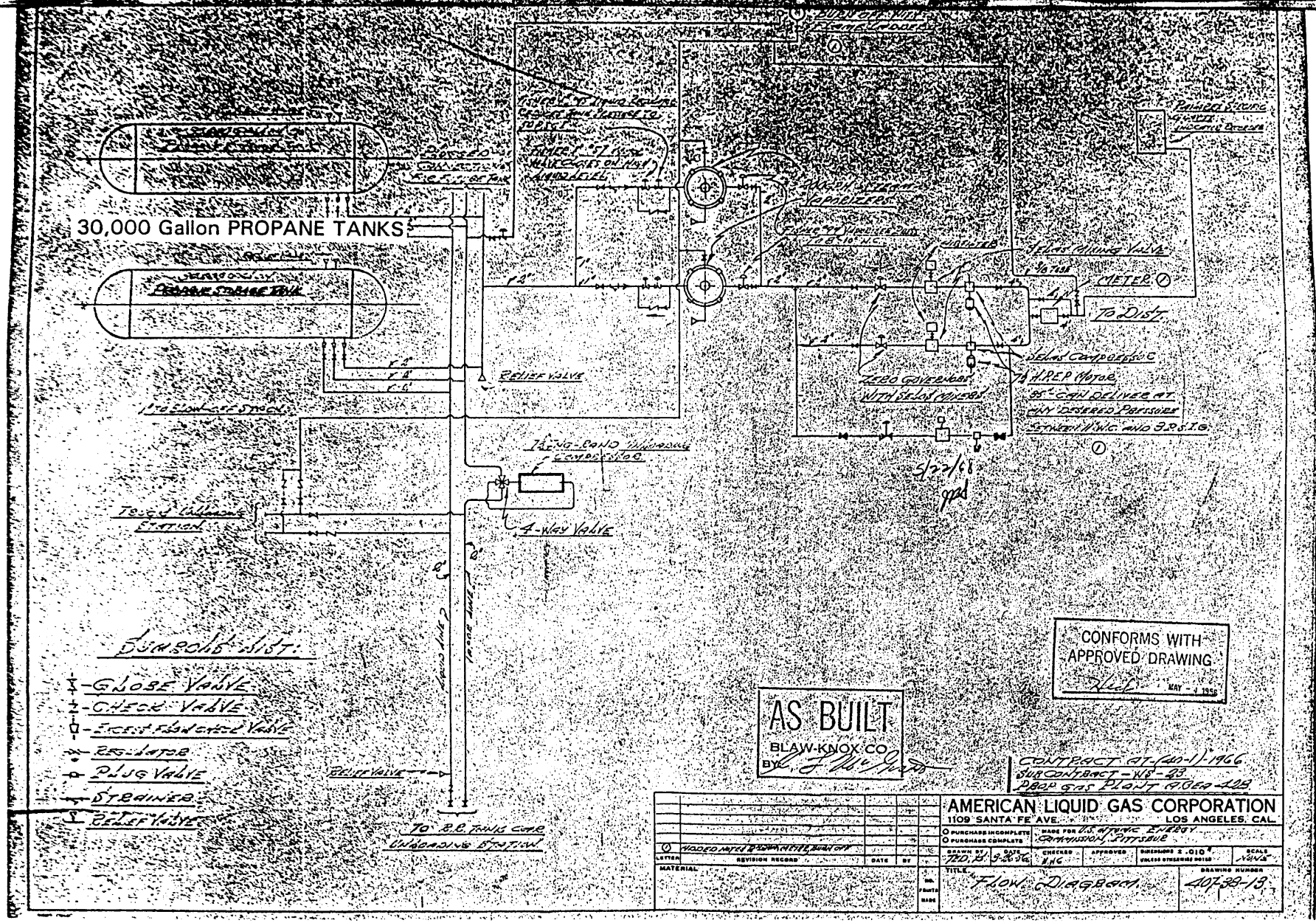
2.16 Building/Area: Reserve Water Facilities - Building 429

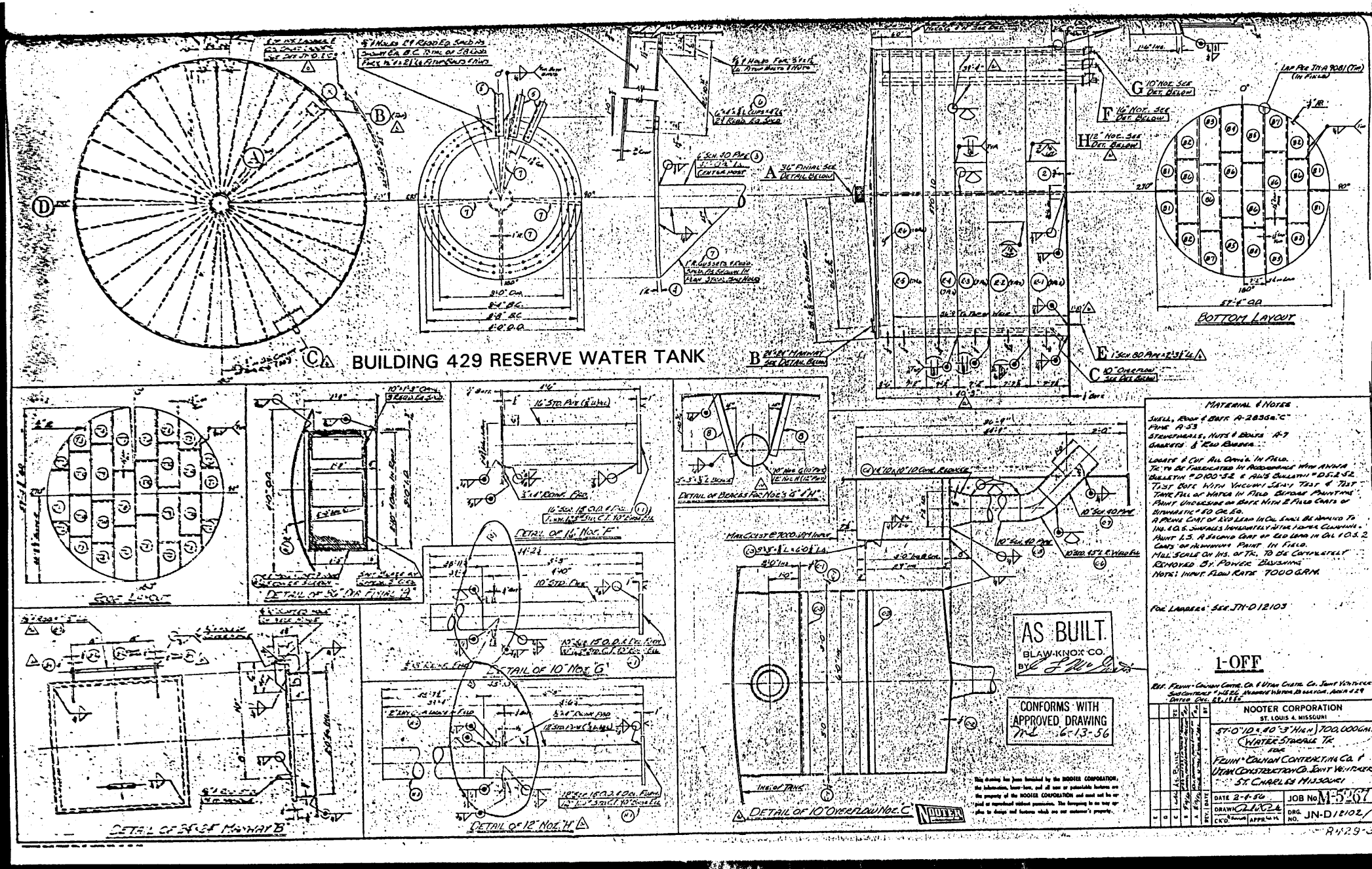
DESCRIPTION: The reserve water facilities are comprised of a large water storage tank and pumping station.

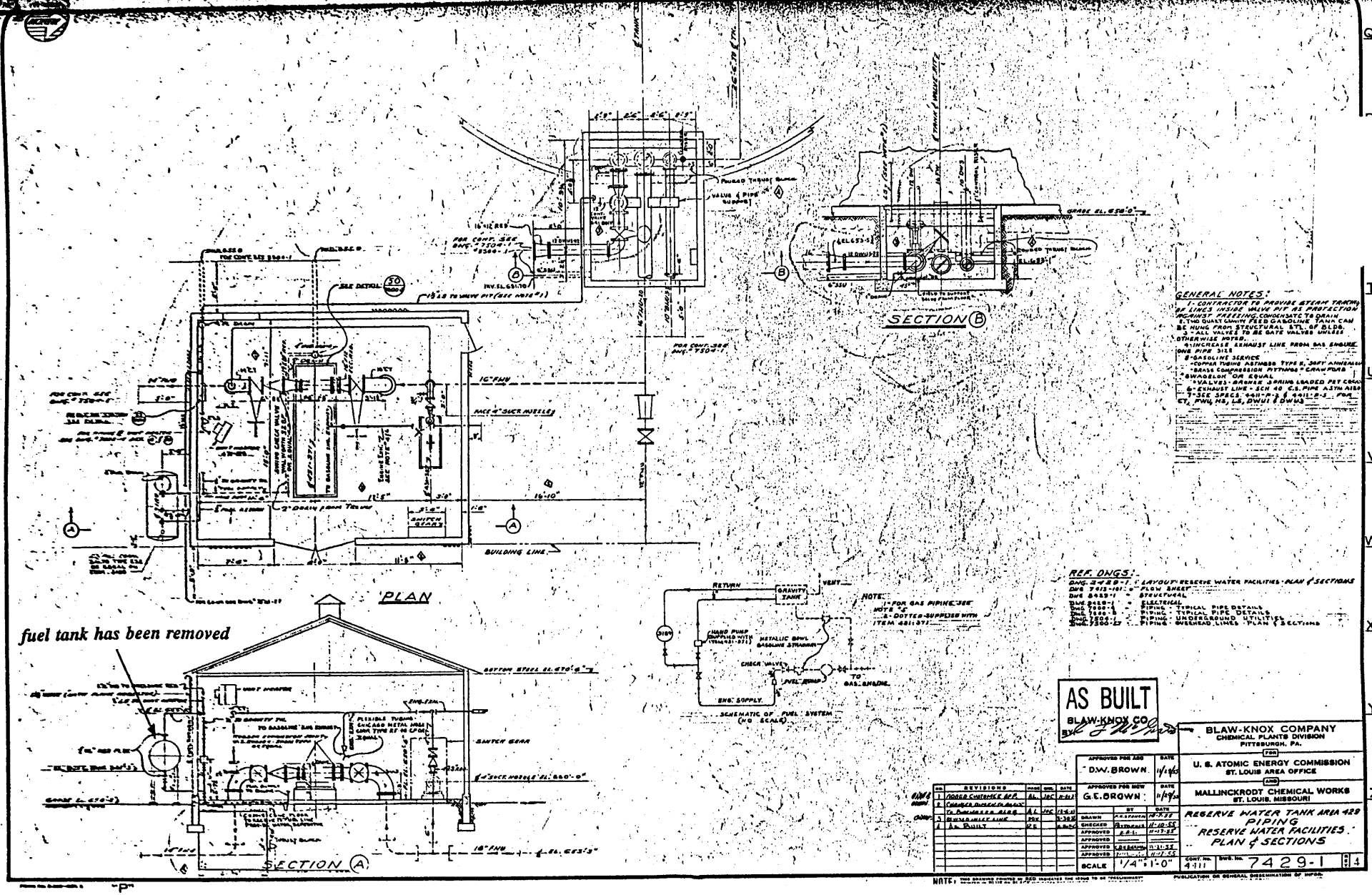
CHEMICAL SYSTEMS: There are no chemical systems associated with the water facilities.

OBSERVATIONS/ANALYSIS: No oil spill areas were observed, and no other chemical impacts were noted.


FLUME
PLAN: 413 COOLING TOWER
SCALE: 3/8" = 1'
N
SECTION BB
SECTION AA
DETAIL 'A' ORIFICE PIT
REFERENCE DWGS:
SPECIFICATIONS:
MIDWEST PIPING COMPANY
INSTRUMENTATION
AREA 413 - COOLING TOWER
DWG MWI-413-1


30,000 Gallon PROPANE TANKS
PROPANE STORAGE TANK
RELIEF VALVE
TO BLOW-OFF STACK
4-WAY VALVE
VAPORIZERS
SELAS MIXING VALVE
METER
TO DIST.
SELAS COMPRESSOR
ZERO GOVERNORS WITH SELAS MIXERS
H.P.E.P. MOTOR
35" CAN DELIVER AT ANY DESIRED PRESSURE BETWEEN 11" W.C. AND 3 P.S.I.G.
5/22/68
SYMBOLS LIST:
GLOBE VALVE
CHECK VALVE
EXCESS FLOW CHECK VALVE
REGULATOR
PLUG VALVE
STRAINER
RELIEF VALVE
LIQUID LINE
VAPOR LINE
RELIEF VALVE
TO R.R. TANK CAR UNLOADING STATION
CONFORMS WITH APPROVED DRAWING
MAY - 1 1956
AS BUILT
BLAW-KNOX CO
BY
CONTRACT AT-(40-1)-1966
SUBCONTRACT - WS-23
PROP GAS PLANT A.BEA-428
AMERICAN LIQUID GAS CORPORATION
1109 SANTA FE AVE. LOS ANGELES, CAL.
PURCHASE INCOMPLETE
PURCHASE COMPLETE
MADE FOR U.S. ATOMIC ENERGY COMMISSION, PITTSBURG
DRAWN BY TED. H.
DATE 3-26-56
CHECKED H.H.C.
APPROVED
DIMENSIONS ± .010" UNLESS OTHERWISE NOTED
SCALE NONE
TITLE FLOW DIAGRAM
DRAWING NUMBER 407-38-13
LETTER
REVISION RECORD
DATE
BY
MATERIAL
NO. PRINTS MADE


BUILDING 429 RESERVE WATER TANK
BOTTOM LAYOUT
ROOF LAYOUT
DETAIL OF 36" DIA FINIAL "A"
DETAIL OF 16" NOZ. "F"
DETAIL OF 10" NOZ. "G"
DETAIL OF 12" NOZ. "H"
DETAIL OF 24"x24" MANWAY "B"
DETAIL OF 10" OVERFLOW NOZ. "C"
DETAIL OF BRACES FOR NOZ'S "G" & "H"
MATERIAL & NOTES
SHELL, ROOF & BOTT. A-283 GR. "C"
PIPE A-53
STRUCTURALS, NUTS & BOLTS A-7
GASKETS & RED RUBBER
LOCATE & CUT ALL OPNG'S IN FIELD.
TK. TO BE FABRICATED IN ACCORDANCE WITH AWWA BULLETIN #D100-52 & AWS BULLETIN #D5.2-52
TEST BOTT. WITH VACUUM SEAM TEST & TEST TANK FULL OF WATER IN FIELD BEFORE PAINTING
PAINT UNDERSIDE OF BOTT. WITH 2 FIELD COATS OF BITUMASTIC #50 OR EQ.
A PRIME COAT OF RED LEAD IN OIL SHALL BE APPLIED TO INS. & O.S. SURFACES IMMEDIATELY AFTER FIRST CLEANING.
PAINT I.S. A SECOND COAT OF RED LEAD IN OIL & O.S. 2 COATS OF ALUMINUM PAINT IN FIELD.
MILL SCALE ON INS. OF TK. TO BE COMPLETELY REMOVED BY POWER BRUSHING
NOTE: INPUT FLOW RATE 7000 GPM.
FOR LADDERS SEE JN-D12103
AS BUILT
BLAW-KNOX CO.
BY
CONFORMS WITH APPROVED DRAWING
6-13-56
1-OFF
NOOTER CORPORATION
ST. LOUIS 4, MISSOURI
57'-0" ID x 40'-3" HIGH 700,000 GAL. WATER STORAGE TK.
FOR
FRUIN-COLNON CONTRACTING CO. & UTAH CONSTRUCTION CO. JOINT VENTURER
ST. CHARLES MISSOURI
DATE 2-4-56
JOB No. M-5267
DRG. NO. JN-D12102
NOOTER


PLAN
SECTION (A)
SECTION (B)
fuel tank has been removed
GENERAL NOTES:
REF. DWGS:
AS BUILT
BLAW-KNOX CO.
BLAW-KNOX COMPANY
CHEMICAL PLANTS DIVISION
PITTSBURGH, PA.
U. S. ATOMIC ENERGY COMMISSION
ST. LOUIS AREA OFFICE
MALLINCKRODT CHEMICAL WORKS
ST. LOUIS, MISSOURI
RESERVE WATER TANK AREA 429
PIPING
RESERVE WATER FACILITIES
PLAN & SECTIONS
SCALE 1/4"=1'-0"
CONT. No. 4111
DWG. No. 7429-1

SUPPORTING DOCUMENTS: See the following drawings.

2.17 Building/Area: Fire Training - Building 439

DESCRIPTION: Building 439 is a small steel building used for the training of fire fighters. Vats of waste oil, old tires and other items were burned in this building in order to hone the skills of the on-site fire brigade.

CHEMICAL SYSTEMS: There are no chemical systems associated with the fire training facilities.

OBSERVATIONS/ANALYSIS: PCB levels are below the cleanup criteria. Two outdoor steel containers contain rainwater and miscellaneous non-chemical debris.

SUPPORTING DOCUMENTS: None.

2.18 Building/Area: Cylinder Storage - Building 441

DESCRIPTION: Storage of compressed gas cylinders.

CHEMICAL SYSTEMS: There are no chemical systems associated with the cylinder storage.

OBSERVATIONS/ANALYSIS: No oil spill areas were observed, and no other chemical impacts were noted.

SUPPORTING DOCUMENTS: None.

3 DEMOLITION PACKAGE 2 BUILDINGS

3.1 Building/Area: Chemical Pilot Plant/Scrap Recovery - Building 403

DESCRIPTION: The chemical pilot plant was designed for performing pilot-scale studies of the processes used to convert yellow cake (U_3O_8) to green salt (UF_4). There are two separate sections of the building. A solvent extraction section was partitioned from the digestion/denitration section by a concrete block firewall, as these operations are incompatible for fire safety reasons. A thorium process was developed in this building during the later years of the chemical plant operation. After full scale uranium production was established, scrap recovery operations were conducted in Building 403.

CHEMICAL SYSTEMS:

A pilot scale fluidized bed reduction and hydrofluorination reactor remains in place in the north section of Building 403. A salt bath on the first floor was used to perform denitration of thorium nitrate on a pilot scale.

Ethylene glycol was used as a coolant for various systems in Building 403. Two large pipes running the entire length of the building supplied ethylene glycol, which was chilled in a refrigeration unit located in Building 401.

Utility piping consists of cooling water, steam, air, hydrogen, nitrogen, city water and gas. Much of this piping has been severed during overhead piping removal. Valves are open on these lines.

Process piping consisted of hydrofluoric acid lines, a caustic line (from the bulk storage tank), lime/acidic waste-water neutralization lines, and off-gas lines.

The building contains several drum dumpers, screw conveyors, dust collection systems and ductwork, a pulverizer, combination furnace and mixer, mixing tanks, digestion tanks, flash tanks, feed hoppers, and a bank of pulsed column solvent extractors.

A series of sumps are present, but they are not interconnected by below grade piping, and the system does not connect with the process sewer system. The sumps are apparently for

collection of water from general housekeeping procedures, and for cleaning up leaks and spills. A sump cleanout system consisting of steam jets and overhead slurry lines is present in the north section of the building.

An in-house vacuum cleaning system is present.

A tank labelled "KOH Caustic Potash" is present outside to the north of the building. It is empty, and free of residual caustic material.

There is a 110 ft tall discharge stack (fume scrubber) on the east side of the building that was not cleaned out during shut down. This stack and associated blower must be cleaned and neutralized during dismantlement.

LIST OF CHEMICALS USED IN BUILDING 403:

Lime (calcium hydroxide)
Hydrogen
Nitrogen
Anhydrous hydrofluoric acid
Hydrofluoric acid, various concentrations
Uranium oxides
Uranium tetrafluoride
Uranyl nitrate
Potassium hydroxide/sodium hydroxide
Hydraulic oil
Propane
Ethylene glycol
Thorium nitrate
Thorium oxides
Hexane/tributyl phosphate
Nitric acid
Salt bath chemicals

OBSERVATIONS/ANALYSIS: Uranium oxides and green salt residues are present in the green salt fluidized bed reactor, and brown oxide fluidized bed reactor.

The salt bath for the thorium system was inaccessible at the time this investigation was conducted, and special arrangements will be made for disassembling and cleaning.

One location had a mercury contamination problem, which will be addressed prior to demolition.

Piping systems in this building have been vented. Flanges and valves at low points were left open, so no free liquids are present. Spot tests conducted on the internals of the tanks and piping systems (at accessible points) were determined pH neutral.

Radioactive residue on external surfaces of process piping and equipment in this building should be removed prior to placement on the material staging area (MSA).

All radioactive residuals in this building can easily be detected by a field geiger counter.

Unreacted hydrofluoric acid (HF) liquid is not expected to be present anywhere in this building, due to its characteristics. It appears that most of the systems have been open to the atmosphere, therefore it is not likely that unreacted HF exists.

Sump pump-out lines are suspect for radioactive contamination. The waste water contained in the sumps has trace amounts of lead, making this liquid a hazardous waste.

The pulse columns in the south end of the building contain radioactive residue.

Lubricants tainted with polychlorinated biphenyls (PCBs) are present at several locations identified during sampling, and this situation will be addressed prior to demolition of Building 403.

Dust collection, air handling, in-house vacuum cleaning systems, and ductwork systems contain radioactive dust, thorium, and uranium compounds.

PCB contamination was above 100 $\mu g/100\ cm^2$ in four out of the five locations tested for surface PCB contamination.

SUPPORTING DOCUMENTS: See the following drawings.

Wet and Dry Chemical Pilot Plant Layout 1st Floor (TBP Extraction Area and General Arrangement of Digestion/Denitration Systems)

AREA LOCATION

REFERENCE DRAWINGS

2403-1 BLDG ARRGT PLAN - GROUND FLOOR
2403-2 BLDG ARRGT PLAN - 2ND & 3RD OP LEVEL
2403-3 TYPICAL BLDG SECTS "S" "T" "U" "V" "W"
2403-4 CRUSH. & GRDG. GROUND FLOOR PLAN
2403-5 CRUSH. & GRDG - 2ND OPER. LEVEL PLAN
2403-6 CR & GR. - 3RD OP. LEVEL PLAN
2403-7 CRUSH & GRDG. - SECTION "K"
2403-8 CRUSH & GRDG. - SECTION "L & M"
2403-9 CHEM. WET PROC. - GR. FL. & 2ND OP. LEVEL PLANS
2403-10 CHEM. WET PROC. - SECTION "N"
2403-11 CHEM. WET PROC. - SECTION "J"

2403-24 T.B.P. EXTR. - GROUND FLOOR PLAN
2403-25 T.B.P. EXTR. - 2ND & 3RD OP. LEV. PLANS
2403-26 T.B.P. EXTR. - SECTIONS, C & D

GENERAL NOTES

1- BRACKETED ITEM NUMBERS DENOTE EXISTING EQUIPMENT - [ ]
2- ALL DRINKING FOUNTAINS IN EXTRACTION AREAS (T.B.P.) SHALL BE G.E. TYPE R3815C OR EQUAL - EXPLOSION PROOF, CLASS [illegible]

No.	QUAN	DIGESTION PROCESSING FLOW DIAGRAM 1403-5 & 13
3151	1	HOLD TANK
[illegible]	2	HOLD [illegible]
3488	1	FLOOR SUMP
3504	1	FLOOR SUMP

No.	QUAN	DIGESTION PROCESSING CONTINUED
431-31	1	TRANSPORT LINE BOOSTER PUMP
[illegible]	1	[illegible] EDUCTOR
431-[illegible]	1	SUMP PUMP
432-08	1	SIX WAY HOIST

No.	QUAN	T.B.P. EXTRACTION FLOW DIAGRAM 1403-6 10 & 11
3082-[illegible]	2	WASH SOLUTION STORAGE TANK
3084-[illegible]	2	MIXED ORGANIC STORAGE TANKS
3085	1	DILUENT STORAGE TANK
3086	1	AQUEOUS FEED TANK
3087	1	PULSE COLUMN
3089	1	PULSE COLUMN
30[illegible]	1	N.O.K. SCRUB COLUMN
3090	1	RAFFINATE STORAGE TANK
3091	1	WASH WATER STORAGE TANK
3092	1	NOK STORAGE TANK
3094	1	DECANTER
[illegible]	2	HOLD & SAMPLE TANK
3097	1	SUMP TANK
3098	1	ORGANIC EXTRACT HOLD TANK
3100	1	
3102	1	
31[illegible]	1	HOUSE CONDENSER
31[illegible]		
31[illegible]	1	[illegible] & DILUENT TANK
3166	1	DECANTER
3477	1	ENTRAINMENT SEPARATOR
3478	1	FLOOR SUMP
34[illegible]	1	N.O.K. SCRUB TANK
3462	1	RAFFINATE SCRUB TANK
34[illegible]	1	
3464		
3465	1	MIXING BELL
346[illegible]	1	
3447	1	DECANTER D1
3448	1	DECANTER D2
3469	1	DECANTER D3
34[illegible]	1	DECANTER D4
31[illegible]	1	STRIPPED SOLVENT COLUMN
34[illegible]	1	RAFFINATE SCRUB COLUMN
31[illegible]	1	[illegible] COOLER
42[illegible]		
431-[illegible]	1	[illegible] PUMP
431-41	1	MIXED ORGANIC PUMP
[illegible]	1	DILUENT PUMP
43[illegible]	1	AQUEOUS FEED PUMP
[illegible]	1	DISPOSAL PUMP
431-4[illegible]	1	[illegible]
431-4[illegible]	1	ORGANIC [illegible] TRANSFER PUMP
431-[illegible]	1	N.O.K. SCRUB COLUMN PUMP

No	QUAN	T.B.P. EXTRACTION CONTINUED
431-44		RAFFINATE FEED PUMP
431-45	1	RAFFINATE SCRUB COLUMN PUMP
431-445	1	N.O.K. RECYCLE PUMP
431-446	1	AQUEOUS EXTRACTION PUMP
431-447	1	AQUEOUS EXTRACTION PUMP
431-448	1	AQUEOUS EXTRACTION PUMP
431-449	1	ORGANIC EXTRACT PUMP
431-450	1	ORGANIC EXTRACT PUMP
431-451	1	ORGANIC EXTRACT PUMP
431-452		EXTRACTION PUMP
431-453	1	ORGANIC RECYCLE PUMP
431-454	1	WASH WATER TRANSFER PUMP
431-455	1	N.O.K. TRANSFER PUMP
431-456	1	RAFFINATE TRANSFER PUMP
431-457	1	MUD EDUCTOR
431-46	1	PULSE MECHANISM
431-4[illegible]	1	PULSE MECHANISM
431-46		[illegible] FEED PUMP
431-4[illegible]	1	EXTRACT PUMP
3518	1	[illegible] TANK
431-47	1	MISC. WASTE TRANSFER PUMP

NO.	QUAN	ETHER EXTRACTION FLOW DIAGRAM 1403-7 & 12
3105	1	AQUEOUS FEED TANK
3106	1	AQUEOUS FEED HEAD TANK
3107	1	PRIMARY COLUMN
3108	1	SPRAY COLUMN
3109	1	SPRAY COLUMN
3110	1	ETHER HOLD TANK
3111	1	ETHER HOLD TANK
3112	1	ETHER STORAGE TANK
3113-[illegible]	2	RAFFINATE STRIPPERS
3114	1	N.O.K. STRIPPERS
3115	1	RAFFINATE STORAGE TANK
3116	1	N.O.K. STORAGE TANK
3117	1	N.O.K. CONCENTRATION TANK
3118	1	HOUSE CONDENSER
3119	1	PRIMARY COLUMN FEED COOLER
3120	1	REFLUX WATER COOLER
3121	1	DEIONIZED WATER COOLER
3122	1	STRIPPER CONDENSER
3124	1	ETHER FEED COOLER
3125	1	ETHER FEED TANK
3127	1	EXTRACTOR
3128	1	WASHING SPRAY COLUMN
3129	1	SPRAY COLUMN
3130	1	O.K. STRIPPER
3131	1	O.K. STORAGE TANK
3136	1	DE-ETHERIZATION SUMP
3134	1	ETHER COOLER
3137		
3138		
3133-[illegible]	2	FINAL STRIPPERS
3167	1	WATER ENTRAINMENT SEPARATOR
3168	1	WATER ENTRAINMENT SEPARATOR
34[illegible]	1	N.O.K. CONCENTRATOR [illegible]
3479	1	FLOOR SUMP
[illegible]	2	DEIONIZED WATER COOLERS
3491	1	WASH WATER STRIPPER
3492	1	WASH WATER HOLD TANK
350[illegible]	1	DECANTER
35[illegible]	1	DEIONIZED WATER [illegible]
430-[illegible]	1	[illegible]
430-[illegible]	1	[illegible]
431-[illegible]	1	AQUEOUS FEED TRANSFER [illegible]
431-4[illegible]	1	AQUEOUS FEED PUMP
431-[illegible]		PRIMARY COLUMN REFLUX [illegible]

NO.	QUAN	ETHER EXTRACTION CONTINUED
431-49	1	ETHER FEED PUMP
431-50	1	ETHER TRANSFER PUMP
431-51	1	RAFFINATE TRANSFER PUMP
431-52	1	N.O.K. TRANSFER PUMP
431-53	1	ETHER FEED PUMP
431-54	1	
431-55	1	O.K. TRANSFER PUMP
431-57	1	DE-ETHERIZATION PUMP
431-58	1	STRIPPER TRANSFER PUMP
431-59	1	EXTRACTOR PUMP
431-457	1	WASH WATER TRANSFER PUMP
431-463	1	MUD EDUCTOR
431-465	1	THAYER HEATER
431-466	1	THAYER HEATER
431-467	1	THAYER HEATER
431-468	1	THAYER HEATER

AS BUILT
BLAW-KNOX CO.
BY C.H. Martin

LEGEND

FH FIRE HOSE RACK
SS SAFETY SHOWER
EB EYE BATH
CR DRINKING FOUNTAIN - SEE NOTE 2.

RE-ISSUED FOR CUSTOMER APPROVAL

APPROVED FOR AEC: D.W. BROWN	DATE: 6-28-[illegible]
APPROVED FOR MCW: W. [illegible] UTNAGE	DATE: 6-28-54
APPROVED FOR AEC: G.H. HILTON	DATE: 8-23-[illegible]
APPROVED FOR MCW: [illegible]	DATE: 3-19-[illegible]

NO.	REVISIONS	MADE	CHK.	DATE
7	AS BUILT	RF	CHM	4-7-58
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1	[illegible]	[illegible]	[illegible]	[illegible]
2	[illegible]	[illegible]	[illegible]	[illegible]
3	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]			
[illegible]	[illegible]			
[illegible]	NIT LARGE SCALE [illegible]			
[illegible]	NOTE 2 ADDED [illegible]			
[illegible]	[illegible]			
[illegible]	[illegible]			

	BY	DATE
DRAWN		
CHECKED		
APPROVED		
APPROVED		
APPROVED		
APPROVED		

SCALE [illegible]

BURNS AND ROE INC.
INDUSTRIAL DIVISION
BALTIMORE MD.

FOR

BLAW-KNOX COMPANY
CHEMICAL PLANTS DIVISION
PITTSBURGH, PA.

FOR

U. S. ATOMIC ENERGY COMMISSION
ST. LOUIS AREA OFFICE

AND

MALLINCKRODT CHEMICAL WORKS
ST. LOUIS, MISSOURI

WET & DRY CHEM. PILOT PLANT AREA 403
LAYOUT
BUILDING ARRANGEMENT PLAN
1ST FLOOR

CONT. NO. [illegible] DWG. NO. 2403-1

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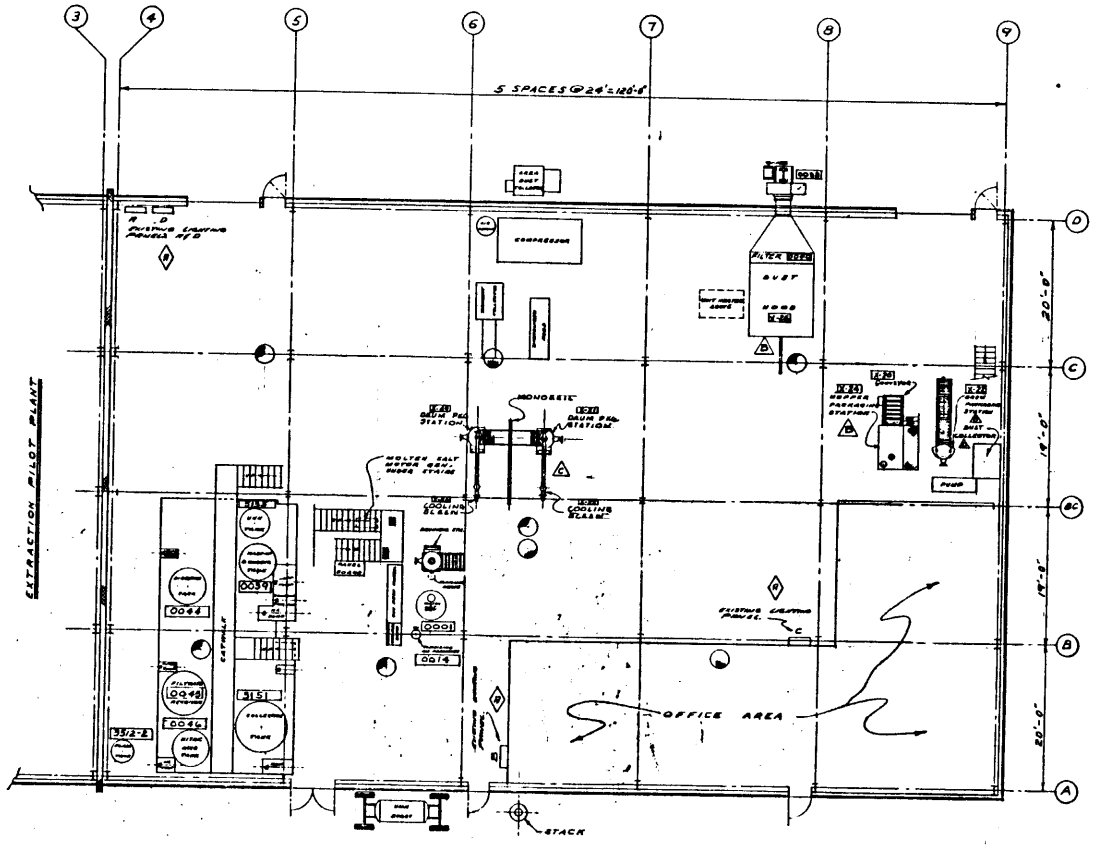
PUBLICATION OR GENERAL DISSEMINATION OF INFORMATION CONTAINED ON THIS DRAWING IS PROHIBITED

FORM No. E-305 - REV. 2

"P"



REVISED AS BUILT
DATE 5-17-60

92-420-018	UO₂ & UF₄ FLUID BEDS
85-420-021-2A	GEN. ARRANG'T. 2ND & 3RD FL.
" " 49 99 06	TANK AREA - ELECTRICAL
" " 38 76 71	TANK AREA - PIPING
" " 21 72	TANK AREA FUME DUCT
" " -11	STRUCTURAL - TANK AREA
" " -9	DIGEST TANK
" " -8	NITRIC ACID STORAGE TANK
" " -7	MAKE-UP & CONCENTRATION TANK
" " -6	FILTRATE RECEIVING TANK
" " -5	TANK AREA ELEV. SECT. "B-B"
" " -4	TANK AREA ELEV. SECT. "A-A"
" " -2	GEN. ARRANG'T. TANK AREA 1ST FLOOR
DWG. NO.	TITLE

REFERENCE DRAWINGS

MALLINCKRODT CHEMICAL WORKS
ST. LOUIS, MO. URANIUM DIVISION WELDON SPRING, MO.

ATOMIC ENERGY COMMISSION CONTRACT NO. W-16-100-ENG-6

NO.	REVISIONS	BY	CHK	DATE
A	ADDED LIGHTING PANEL	PL	[illegible]	4-25-58
B	ADDED TANK EQUIPMENT C-4 & C-5	WH	[illegible]	5-21-58
C	ADDED NEW EQUIPMENT FROM DWG. PROJECT 92-420-018	CJ	[illegible]	6-13-58
D	REVISED AS BUILT	JJ	[illegible]	5-17-60

	BY	DATE
DRAWN	[illegible]	4-25-58
CHECKED	[illegible]	5-21-58
PROJ. ENGR.	[illegible]	6-13-58
APPROVED	[illegible]	6-13-58
APPROVED	[illegible]	6-13-58
APPROVED	[illegible]	6-13-58
SCALE:	1/8"=1'-0"	

AREA 403

WET & DRY CHEMICAL PILOT PLANT

GENERAL ARRANGEMENT 1ST FLOOR

DWG. NO. 85-420-021-1 D

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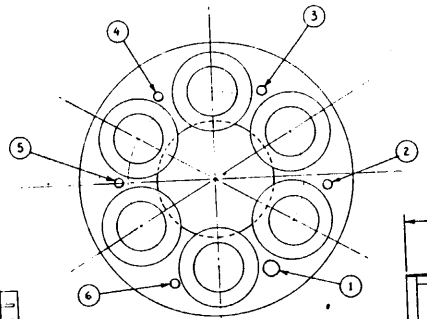
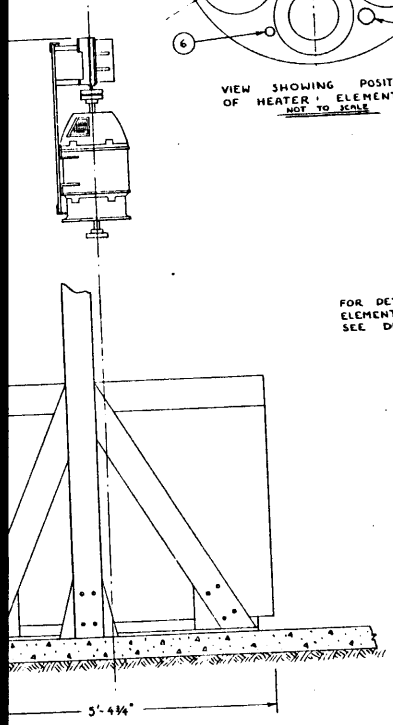
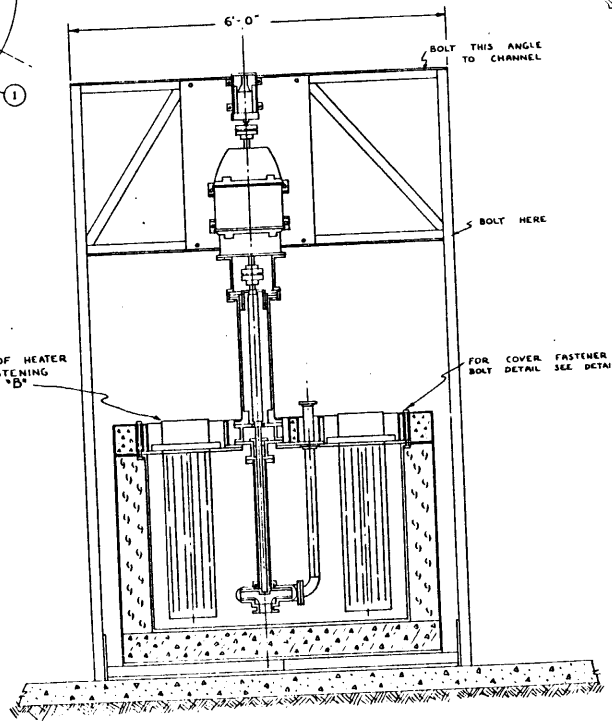


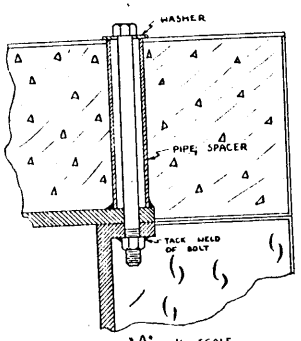
VIEW SHOWING POSITIONS OF HEATER ELEMENTS
NOT TO SCALE



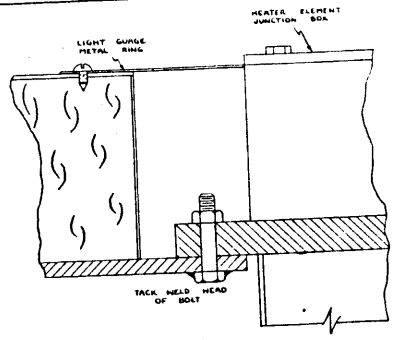


NOTE :

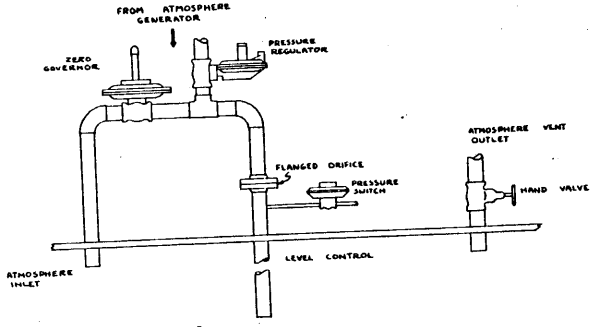
POT DEPTH SHOWN NOT TO SCALE - TRUE DEPTH 34"
HEATER LENGTH " " " " " " LENGTH 33"
OVERALL HEIGHT " " " " " " HEIGHT 10'-4½"
SUBMERGED VERTICAL SECTION OF PUMP NOT TO SCALE



DETAIL "A" - ½ SCALE



DETAIL "B" - ½ SCALE



DETAIL "C" - NOT TO SCALE

SCHEMATIC OF INTER-PIPING AND VALVING FOR ATMOSPHERE INLET, OUTLET AND SALT LEVEL CONTROL

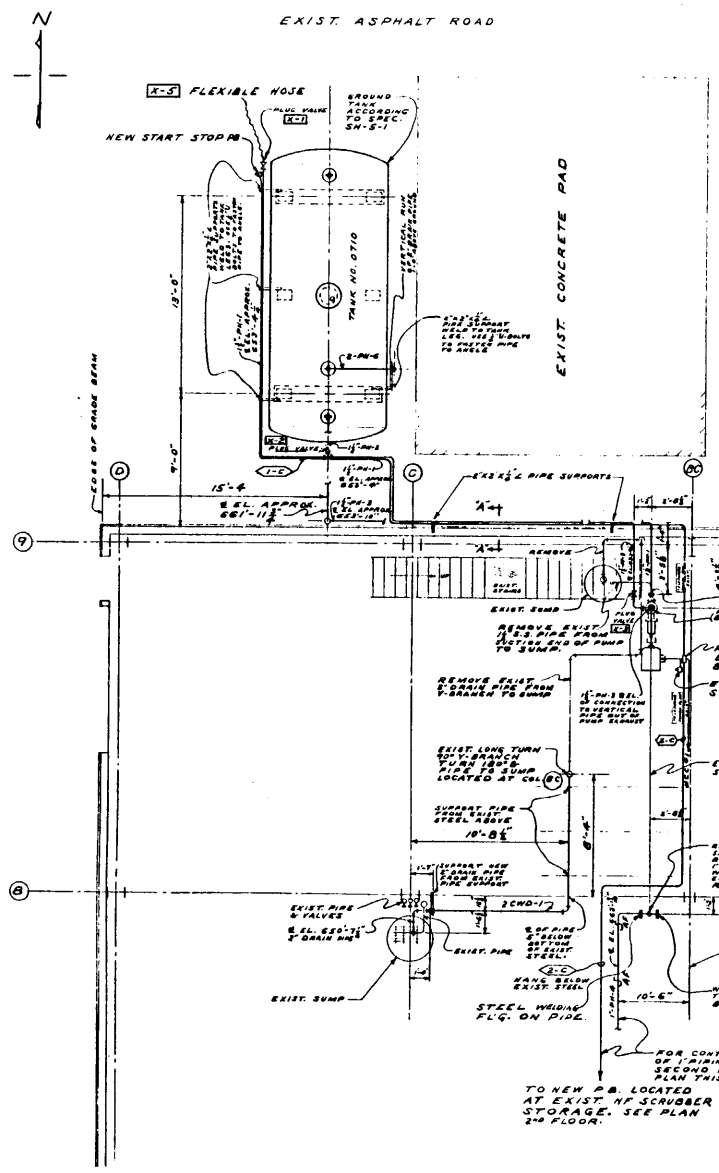
MOLTEN SALT HEATER SYSTEM
FOR MALLINCKRODT CHEMICAL COMPANY - A.E.C.
P.O. # U-53036-L

F-58

The Brandwine Equipment Company
2683 Big Bend boulevard
St Louis 17, Missouri
Telephone Sterling 1-6432

REVISIONS :
6-2-58 changed detail "B" (CRR)
6-3-58 added detail "C" (CRR)
6-12-58 changed detail "C" (CRR)

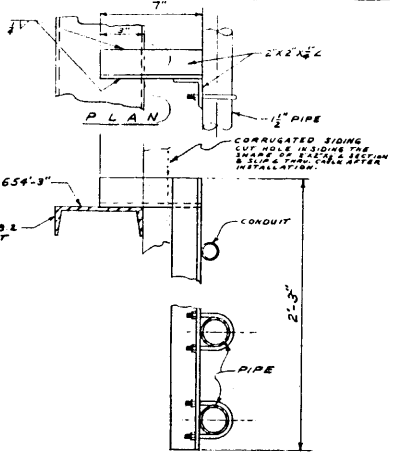
DRAWN BY : C.R.R.
SCALE : 1" = 1'
DATE : 4-7-58



PLAN 1ST FLOOR

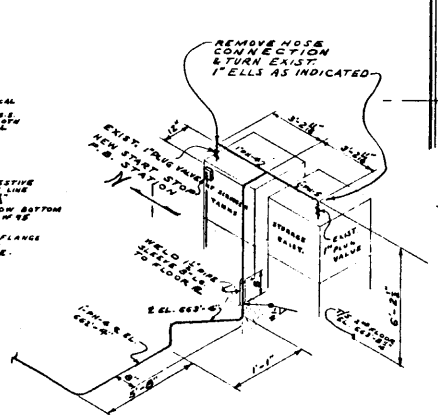
FINISHED FLOOR EL. 650'-0"

SCALE: 1/4" = 1'-0"



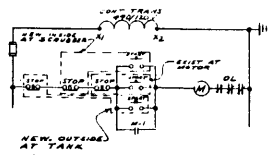
ELEVATION SECTION "A-A"

PIPE SUPPORTS



DETAILED PIPING SKETCH

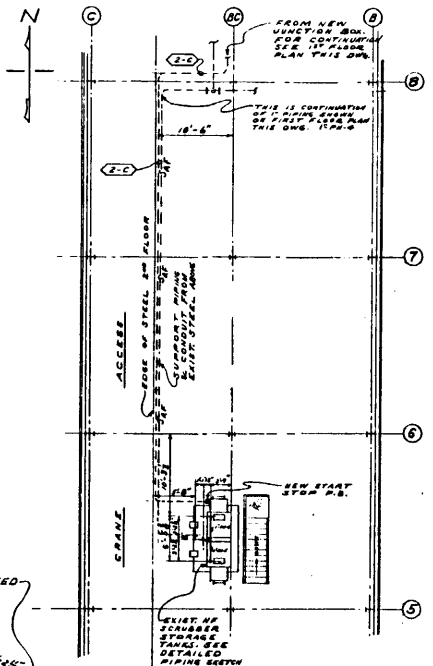
SCRUBBER STORAGE TANKS



#31-470 SUMP PUMP

ELEMENTARY DIAGRAM

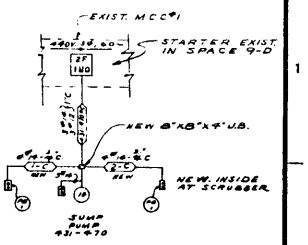
EXIST. ADD PUSH BUTTONS AS SHOWN



PLAN 2ND FLOOR

T/S EL. 663'-8 11/16"

SCALE: 1/4" = 1'-0"



ONE LINE DIAGRAM

EXIST. ADD PUSH BUTTONS AS SHOWN

(*) HEAVY DUTY PUSH BUTTON STATION, OILTIGHT, NEMA TYPE 4, INCLUDING 1 NORMALLY CONTACT "START" & 1 "STOP", LEGEND PLATE, CUTLER HAMMER BUL. 10250 OR APPROVED EQUAL.

NOTE

ALL PIPE LINES TO SLOPE 1/4" PER FT. TOWARD PUMP

SU-3-31	STEEL PIPING
SU-4-12	CARBON ST. PIPING CONST.
SU-3-22	STEEL PIPING MAT'L
Q-97-2	PIPING SUPPORTS
SC-8-1	VINYL COATING SYSTEM
SD-1-1	PIPE LINE IDENTIFICATION
SH-4-1	ELEC. WIRING
SH-4-5	CONDUIT SUPPORTS
SH-5-1	GROUNDING
12-420-033	KOH HOLD TANK DETAILS
DWG. NO.	TITLE
REFERENCE DRAWINGS	

MALLINCKRODT CHEMICAL WORKS

URANIUM DIVISION

ST. LOUIS, MO. WELDON SPRING, MO.

ATOMIC ENERGY COMMISSION CONTRACT NO. W-15-105-ENG-9

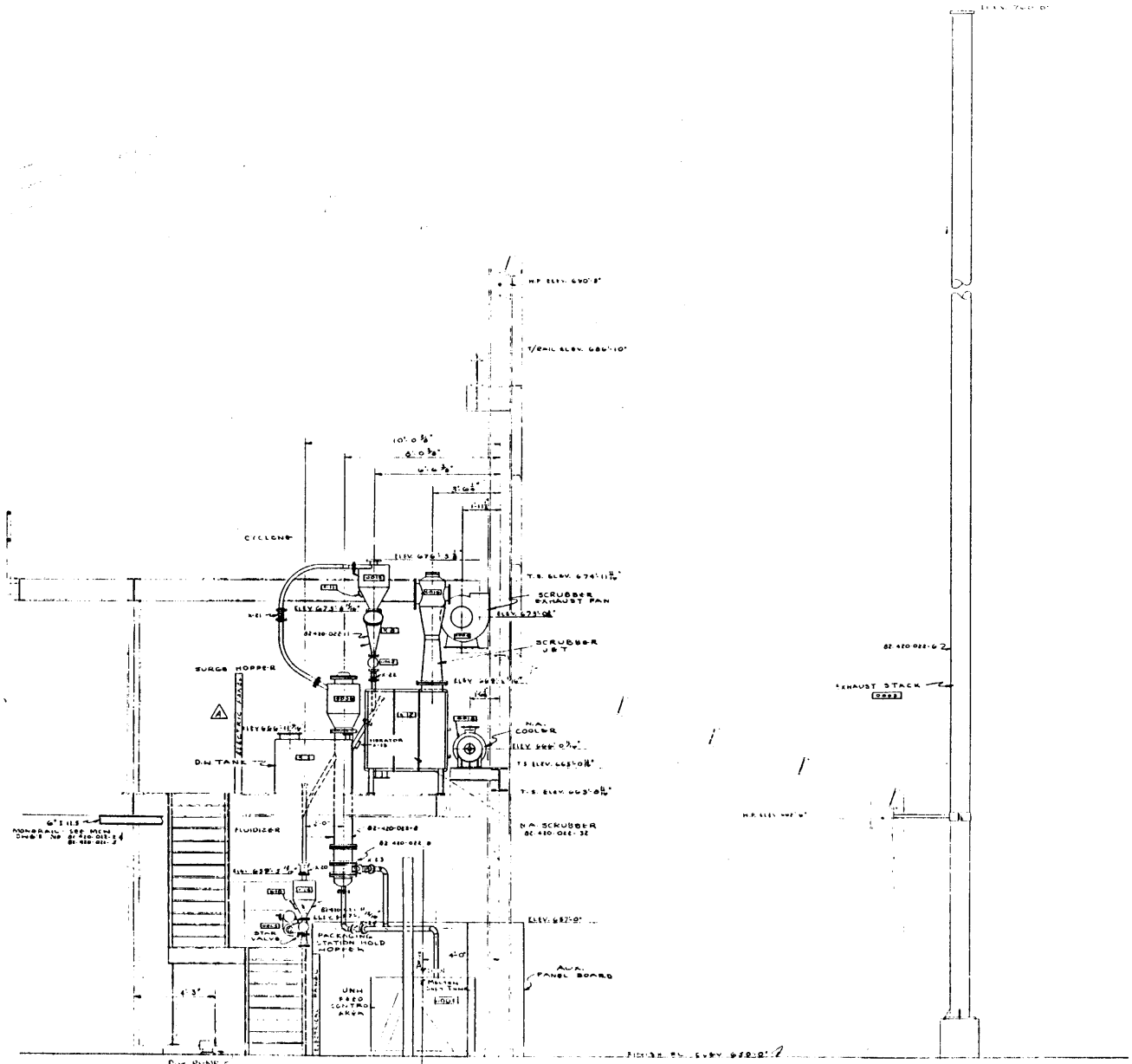
NO.	REVISIONS	BY	CHKD	DATE

	BY	DATE
DRAWN	ROTH	2-18-61
CHECKED	[illegible]	2-21-61
PROJ. ENGR.	[illegible]	2-24-61
APPROVED	[illegible]	2-27-61
APPROVED	[illegible]	3-14-61
APPROVED	[illegible]	3/20/61
SCALE:	AS NOTED	

7-9 AREA 403

KOH HOLD TANK PLAN LOCATION PIPING & ELECTRICAL

DWG. NO. 12-420-033-1



ELEVATION LOOKING NORTH

SCALE: 1/8"=1'-0"

NO.	REVISIONS	BY	CHKD	DATE
A	ADDED EXIST. PANEL & DUCT	JW		5-2-58
B	MOLTEN SALT REVISIONS	JW		5-2-58
C	NO CHANGE	JW		5-2-58

	BY	DATE
DRAWN		
CHECKED		5-2-58
PROJ. ENGR.		5-2-58
APPROVED		5-2-58
APPROVED		5-2-58
APPROVED		
SCALE:	AS NOTED	

ISSUED AS BUILT DATE 5-9-60

DWG. NO. | TITLE

REFERENCE DRAWINGS

MALLINCKRODT CHEMICAL WORKS
ST. LOUIS MO URANIUM DIVISION WELDON SPRING MO
ATOMIC ENERGY COMMISSION CONTRACT NO. W 14-108 ENG-6

2 AREA 4C3
FLUID BED DENITRATOR
PILOT PLANT W.S.
ELEVATION LOOKING NORTH
AT COLUMN LINE "5"

DWG. NO. HP-420-022-4 | 8

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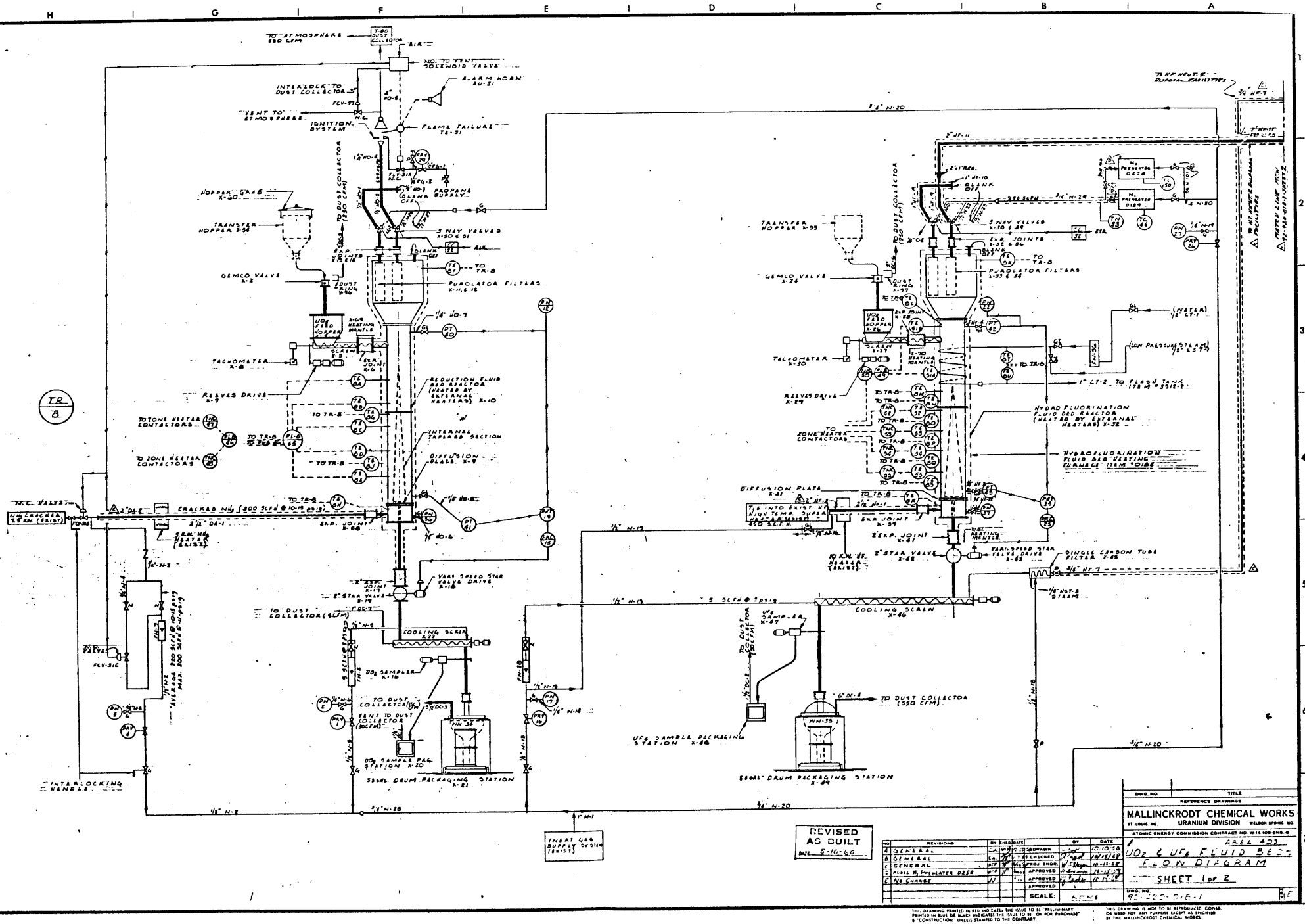

NO.	REVISIONS	BY	CHKD	DATE
A	GENERAL	LA	WD	7/30/58
B	GENERAL	LA	JF	9/5/58
C	GENERAL	JCP	JF	10/15/58
D	ADDED H2 PREHEATER D258	VFP	JF	10/15/58
E	NO CHANGE	JW		5/10/60

	BY	DATE
DRAWN	[illegible]	10/10/58
CHECKED	JW	10/15/58
PROJ. ENGR.	[illegible]	10-15-58
APPROVED	[illegible]	10-15-58
APPROVED	[illegible]	10-15-58
APPROVED		

SCALE: NONE

DWG. NO. | TITLE

REFERENCE DRAWINGS

MALLINCKRODT CHEMICAL WORKS
ST. LOUIS, MO. URANIUM DIVISION WELDON SPRING, MO.
ATOMIC ENERGY COMMISSION CONTRACT NO. W-14-108-ENG-9

AREA 403

UO_2 & UF_4 FLUID BED FLOW DIAGRAM

SHEET 1 of 2

DWG. NO. 97-403-21E-1

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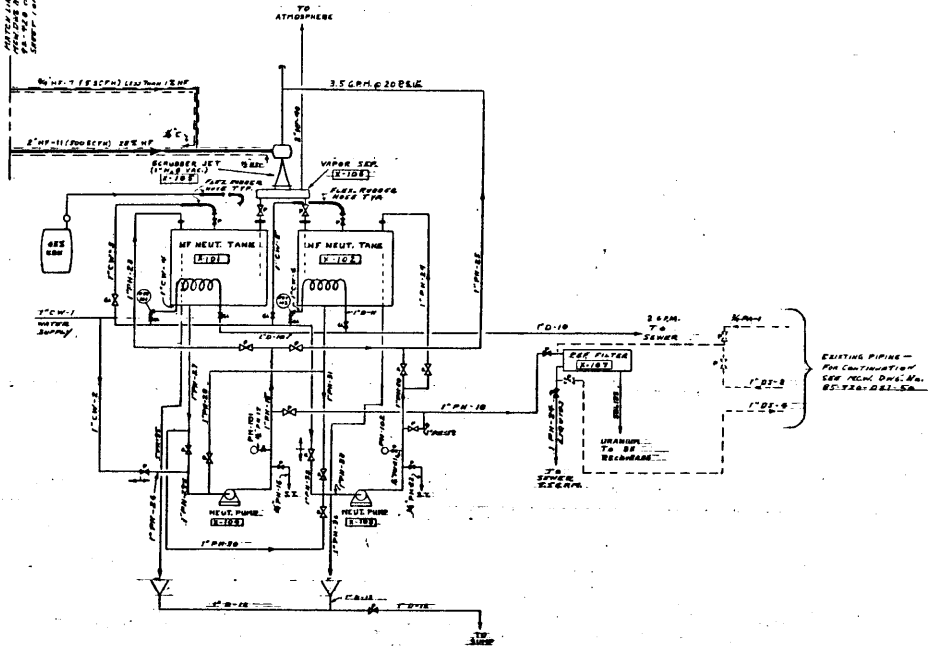

REVISED AS BUILT
DATE 5-10-60

DWG. NO.	TITLE
REFERENCE DRAWINGS	

MALLINCKRODT CHEMICAL WORKS
ST. LOUIS, MO. URANIUM DIVISION WELDON SPRING, MO.
ATOMIC ENERGY COMMISSION CONTRACT NO. W-14-108-ENG-8

NO.	REVISIONS	BY	CHKD	DATE
A	NO CHANGE	JJ		5/10

	BY	DATE
DRAWN	PEARSON	3/10/59
CHECKED	[illegible]	3/11/59
PROJ. ENGR.	[illegible]	3/11/59
APPROVED	[illegible]	3/11/59
APPROVED	[illegible]	3/11/59
APPROVED		
SCALE:	NO SCALE	

APEA 403

UO_2 & UF_4 FLUID BEDS
FLOW DIAGRAM
SHEET 2 OF 2

DWG. NO. 92-420-018-1 REV. A

THIS DRAWING PRINTED IN RED, INDICATES THIS ISSUE TO BE PRELIMINARY. PRINTED IN BLUE OR BLACK INDICATES THE ISSUE TO BE OF NOT PURCHASE & CONSTRUCTION. UNLESS STAMPED TO THE CONTRARY.
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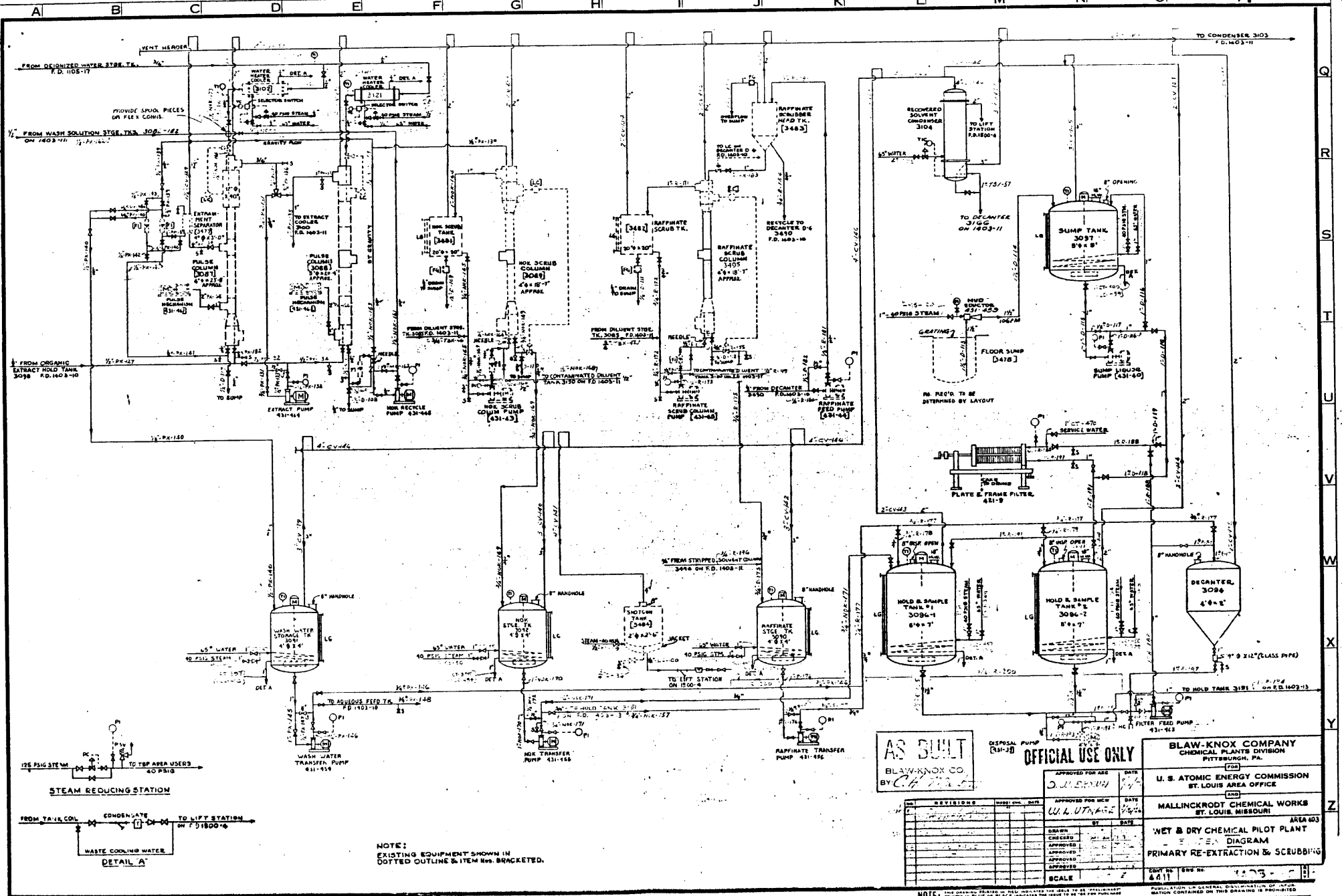
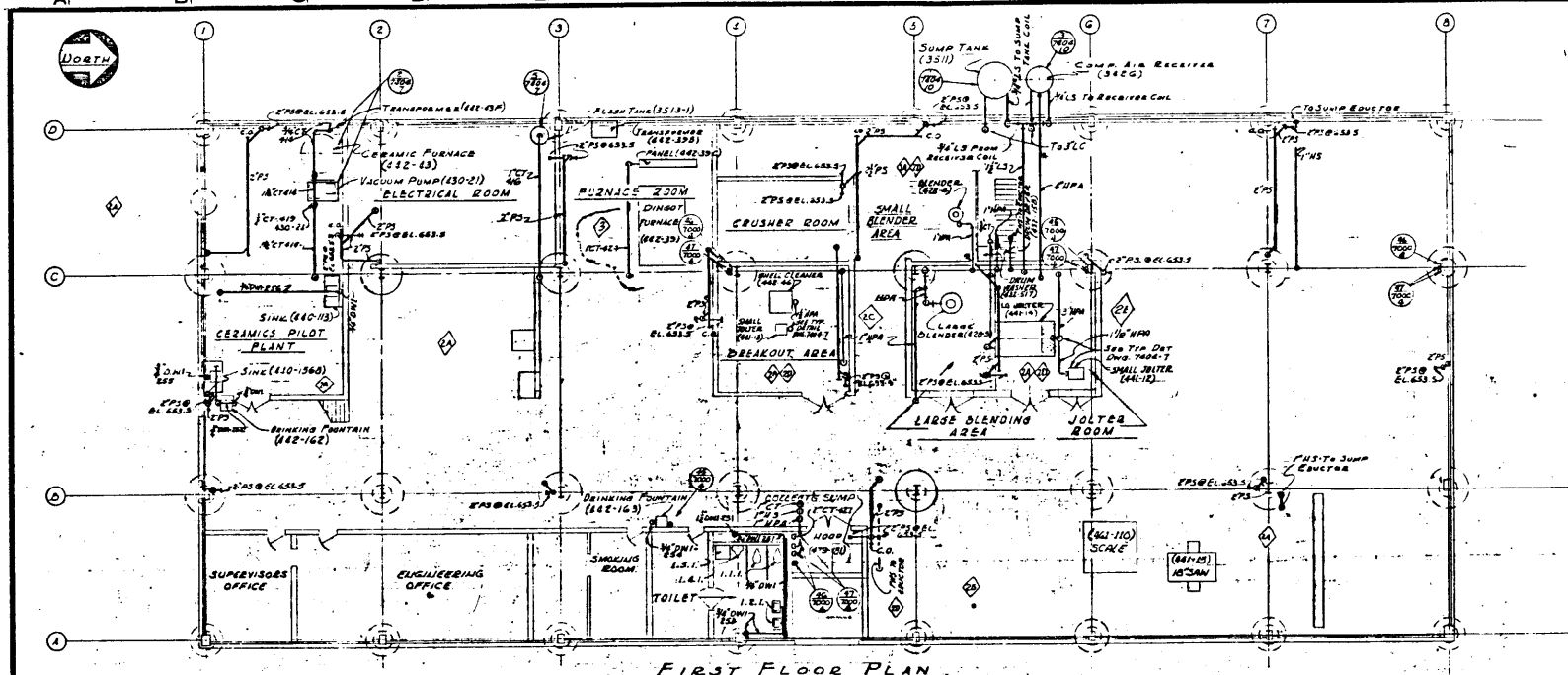
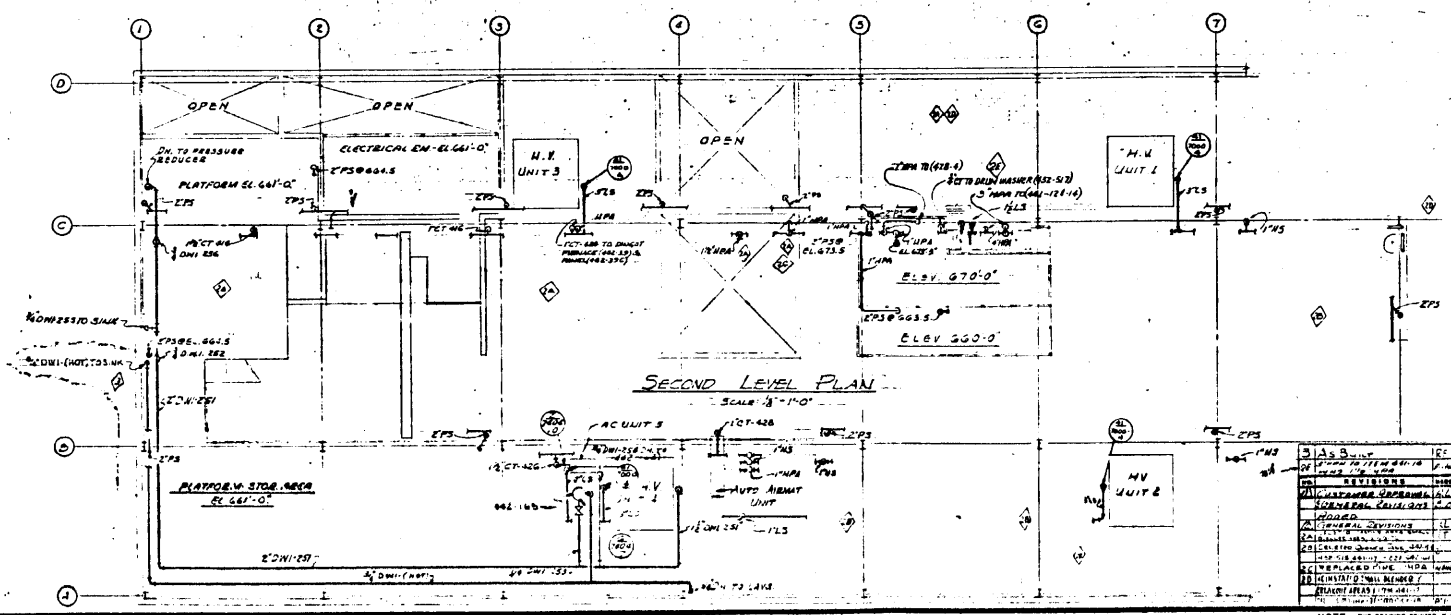


TO CONDENSER 3103
FROM DEIONIZED WATER STGE. TK.
FROM WASH SOLUTION STGE. TK.
PROVIDE SPOOL PIECES OR FLEX CONNS.
EXTRACT HOLD TANK 3098
EXTRACT PUMP 431-464
NOK RECYCLE PUMP 431-465
NOK SCRUB COLUMN PUMP [431-43]
RAFFINATE SCRUB COLUMN PUMP [431-45]
RAFFINATE FEED PUMP [431-44]
RECOVERED SOLVENT CONDENSER 3104
TO LIFT STATION
TO DECANTER 3166
SUMP TANK 3097
FLOOR SUMP [3478]
SUMP LIQUOR PUMP [431-40]
PLATE & FRAME FILTER 421-9
HOLD & SAMPLE TANK #1 3096-1
HOLD & SAMPLE TANK #2 3096-2
DECANTER 3094
WASH WATER STORAGE TK 3091
NOK STGE. TK 3092
SHOTGUN TANK [3484]
RAFFINATE STGE TK 3090
WASH WATER TRANSFER PUMP 431-459
NOK TRANSFER PUMP 431-455
RAFFINATE TRANSFER PUMP 431-456
FILTER FEED PUMP 431-463
DISPOSAL PUMP [431-38]
TO HOLD TANK 3191
STEAM REDUCING STATION
125 PSIG STEAM
TO TBP AREA USERS 40 PSIG
DETAIL "A"
FROM TANK COIL
CONDENSATE
TO LIFT STATION
WASTE COOLING WATER
NOTE:
EXISTING EQUIPMENT SHOWN IN DOTTED OUTLINE & ITEM Nos. BRACKETED.
AS BUILT
BLAW-KNOX CO.
BY:
OFFICIAL USE ONLY
BLAW-KNOX COMPANY
CHEMICAL PLANTS DIVISION
PITTSBURGH, PA.
FOR
U. S. ATOMIC ENERGY COMMISSION
ST. LOUIS AREA OFFICE
AND
MALLINCKRODT CHEMICAL WORKS
ST. LOUIS, MISSOURI
AREA 403
WET & DRY CHEMICAL PILOT PLANT
DIAGRAM
PRIMARY RE-EXTRACTION & SCRUBBING
CONT. No. 4411
SCALE
NOTE:
PUBLICATION OR GENERAL DISSEMINATION OF INFORMATION CONTAINED ON THIS DRAWING IS PROHIBITED



FIRST FLOOR PLAN

SCALE: 1/8"=1'-0"



SECOND LEVEL PLAN

SCALE: 1/8"=1'-0"

NOTE

1. WHERE STEAM LINE BRANCHES DROP FROM HEADER, PROVIDE DRIP AT BOTTOM OF RISER OR AT EQUIPMENT AS REQUIRED.
2. ALL BRANCH PIPING SHOWN ON THIS PLAN SHALL CONNECT TO HEADERS OR EXTEND AND CONNECT TO OTHER LINES AS SHOWN ON REFERENCE DRAWINGS.
3. ALL STEAM AND AIR BRANCHES SHALL COME OFF THE TOP OF HEADERS.

NOTE

FOR GENERALS NOTES AND LEGEND SEE DRAWING # 7404-4

REFERENCE DRAWINGS

7404-1	7404-5
7404-3	7404-6
7404-4	7404-7
	7404-8

AS BUILT
BLAW-KNOX CO.
BY: C. H. Martin

BURNS AND ROE INC.
INDUSTRIAL DIVISION
BALTIMORE, MD.

FOR

BLAW-KNOX COMPANY
CHEMICAL PLANTS DIVISION
PITTSBURGH, PA.

FOR

U. S. ATOMIC ENERGY COMMISSION
ST. LOUIS AREA OFFICE

AND

MALLINCKRODT CHEMICAL WORKS
ST. LOUIS, MISSOURI

METALS PILOT PLANT AREA 404
PIPING
AIR, GAS, WATER, STEAM AND VACUUM
PLAN

3	AS BUILT		
2E	[illegible]		
2D	REVISIONS		
2C	CUSTOMER APPROVAL		
2B	GENERAL REVISIONS		
2A	[illegible]		
2B	[illegible]		
2C	REPLACED PIPE HPA		
2D	REINSTATED SMALL BLENDER		
	BREAKOUT AREAS		

APPROVED FOR AEC	D. W. BROWN	9-20-56
APPROVED FOR MCW	L. G. WEBER	9-20-56

	BY	DATE
DRAWN	[illegible]	9-18-56
CHECKED	[illegible]	9-18-56
APPROVED	[illegible]	9-18-56
APPROVED		
APPROVED	[illegible]	10-2-56
APPROVED	[illegible]	10-2-56

SCALE 1/8"=1'-0"

CONT. No. 441 | DWG. No. 7404-2 | REV. 3

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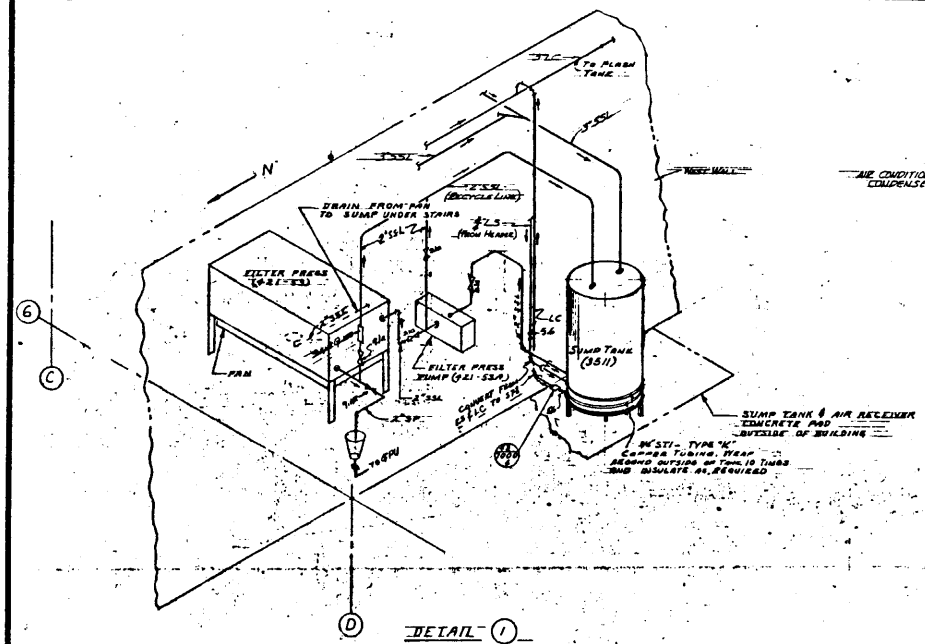
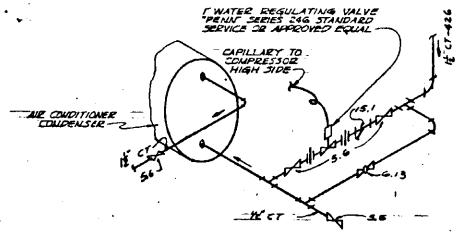
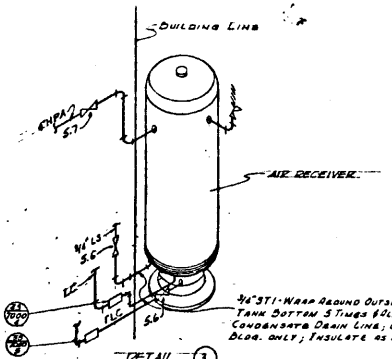
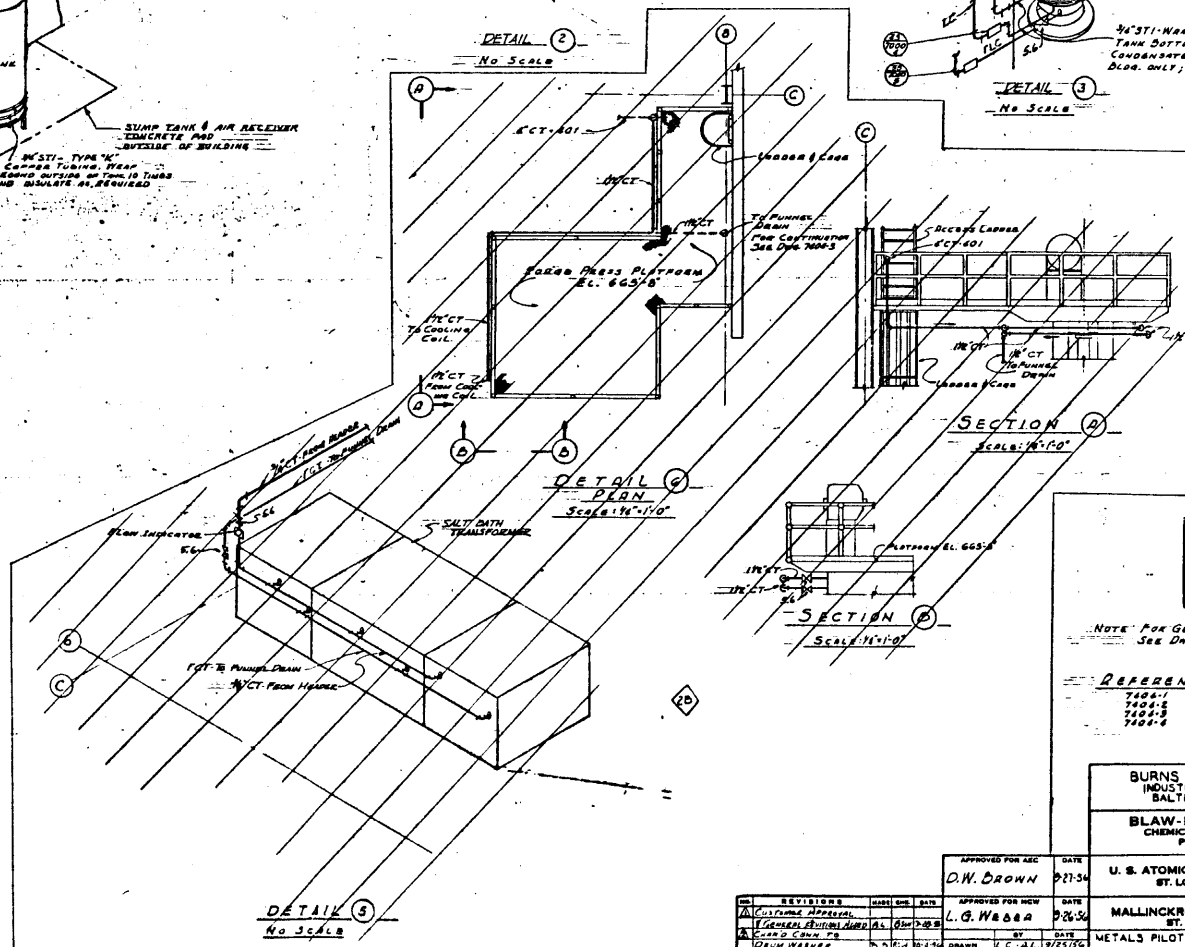
FORM No. 5-306-REV. 3 "P"

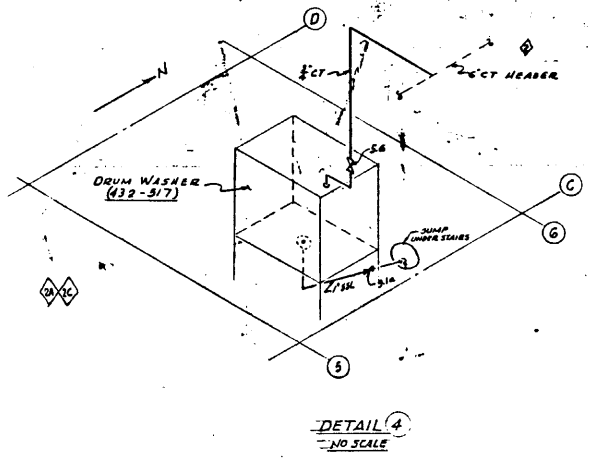
DRAWING NO. 4411 - 7404-10











AS BUILT
BLAW-KNOX CO.
BY C.H. Martin

NOTE: For General Notes & Legend See Dwg. 7404-6

Reference Drawings

7404-1	7404-6
7404-2	7404-8
7404-3	7404-7
7404-4	

BURNS AND ROE, INC.
INDUSTRIAL DIVISION
BALTIMORE 4, MD.

BLAW-KNOX COMPANY
CHEMICAL PLANTS DIVISION
PITTSBURGH, PA.

FOR: U. S. ATOMIC ENERGY COMMISSION
ST. LOUIS AREA OFFICE

AND: MALLINCKRODT CHEMICAL WORKS
ST. LOUIS, MISSOURI

METALS PILOT PLANT AREA 404

PIPING
DETAILS

APPROVED FOR AEC	D.W. Brown	DATE	9-27-56
APPROVED FOR MCW	L.G. Weber	DATE	9-26-56
DRAWN	L.C. A.L.	BY	DATE 9/25/56
CHECKED	GSW	BY	DATE 9/25/56
APPROVED	[illegible]	BY	DATE 10/26/56
APPROVED			
APPROVED	CC Mayfield 9-26		
APPROVED	C.H. Martin 9-26		
SCALE	AS SHOWN		

CONT. No. 4411 DWG. No. 7404-10 SH. 3

No.	REVISIONS	MADE	CHD.	DATE
1	Customer Approval			
2	General Revisions Added	AL	GSW	7-25-56
2A	Cage & Chain Fig.			
	Drum Washer	DS	GSW	10-2-56
2A	Deleted Drumwasher 432-517	RT	KCB	12-26-56
2B	Cooling Tower From Sta.	AMS	[illegible]	
2C	Realigned Drumwasher 432-517	PS	RT	1-21-57
3	As Built	RT	CHM	5-1-57

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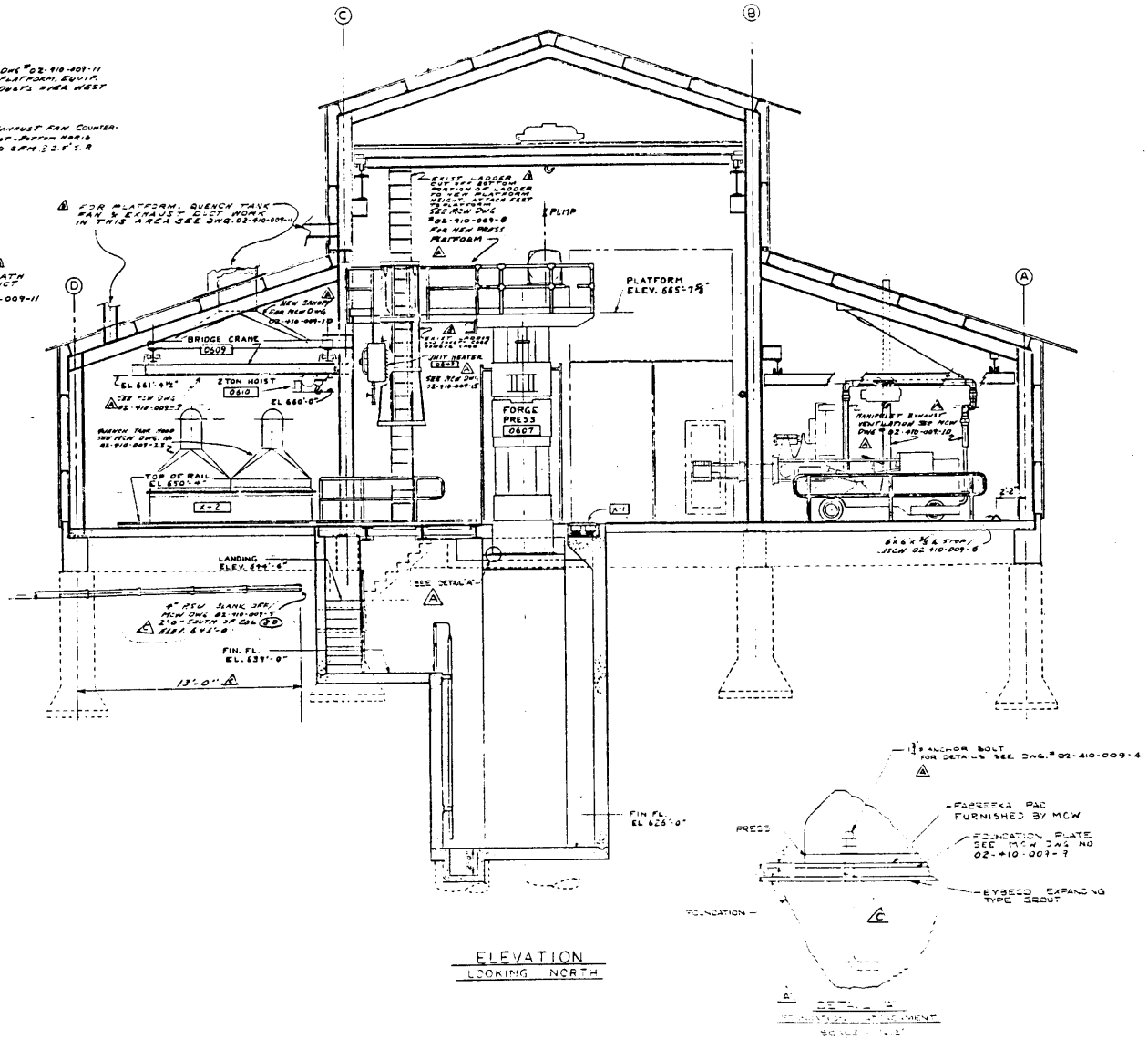
FORM No. B-888-REV. 3 "P"



ELEVATION
LOOKING NORTH

DETAIL "A"
FOUNDATION ARRANGEMENT
SCALE 1/4"=1'-0"

02-410-009-23	Quench Tank Hood
-22	Main Piping Arrangement
-21	Rev. to Existing Equip. & Vent Ducts
-20	Escape Door and Salt Bath Shield
-19	Electrical Conduit Runs
-18	Elec. Elem. Diagrams and Wiring Diagrams
-17	Electrical One Line Diagrams
-16	Press Hydraulic Circuit
-15	Piping Details
-14	Piping Elevations
-13	Piping Plan
-12	Pulpit & Shield, and Sling Revisions
-11	New Platform, Equip. Layout & Ducts
-10	Manipulet Exhaust Vent & Salt Bath Vent
-9	Bridge Crane Inst. and Strongback
-8	New Access Platform & Modified Press Platform
-7	Area Preparation - Electrical
-6	Press Pit Steel & Fl. Plate & Misc. Steel
-5	Waterproofing Det., Salt Bath Pit, Quench Tank, Pad & Floor Rev.
-4	Press Pit Design
-3	General Arrangement - Elevation
-2	General Arrangement - Plan

REVISED AS BUILT 9/27/61 ACP

DWG. NO.	TITLE
9-8-1	ENG. STND. FOR LADDERS
9-8-1	ENG. STND. FOR HANDRAILS

REFERENCE DRAWINGS

MALLINCKRODT CHEMICAL WORKS
ST. LOUIS, MO. URANIUM DIVISION WELDON SPRING, MO.
ATOMIC ENERGY COMMISSION CONTRACT NO. W-14-108-ENG-8

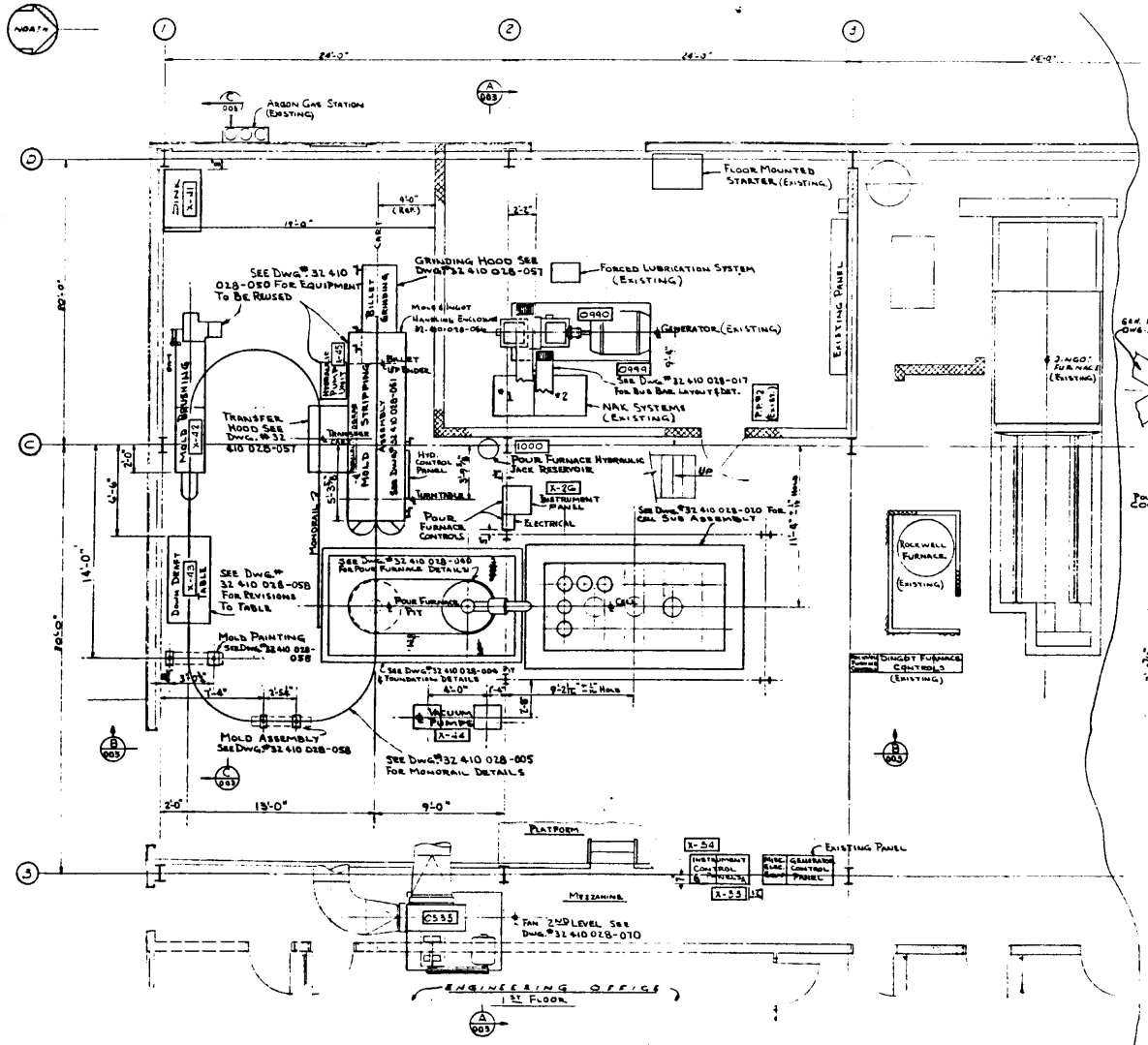
AREA 404

FORGING FACILITIES

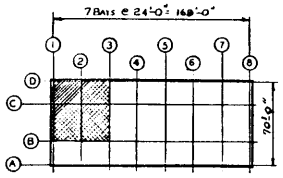
GENERAL ARRANGEMENT
ELEVATION

DWG. NO. 02-410-009-3 C

NO	REVISIONS	BY	CHKD	DATE		BY	DATE
	[illegible]				DRAWN	[illegible]	[illegible]
	[illegible]				CHECKED	[illegible]	[illegible]
	[illegible]				PROJ. ENGR	[illegible]	[illegible]
C	[illegible]	[illegible]		[illegible]	APPROVED	[illegible]	[illegible]
					APPROVED		
					APPROVED		
					SCALE	1/4"=1'-0"	



FLOOR PLAN ELEV.-650'-0"



PLOT PLAN
BLDG. 404

NOTE-ELEVATION REFERENCE POINT LOCATED ON COLUMN C-2 ELEVATION-655'-0"

ALL DIMENSIONS ARE FROM BASE OF COLUMNS

NO.	REVISIONS	BY	CHKD	DATE

	BY	DATE
DRAWN		
CHECKED		
PROJ. ENGR.		
APPROVED		
APPROVED		
APPROVED		

SCALE: 1/4" = 1'-0"

DWG. NO.	TITLE
32 410 028-805	GEN. ARR. ELEVATIONS
32 410 028-001	FLOW DIAGRAM

REFERENCE DRAWINGS

MALLINCKRODT CHEMICAL WORKS
ST. LOUIS, MO. URANIUM DIVISION WELDON SPRING, MO.

ATOMIC ENERGY COMMISSION CONTRACT NO. W-7-100-ENG. 6

2 | 404

ELECTROLYTIC PROTOTYPE GENERAL ARRANGMENT PLAN

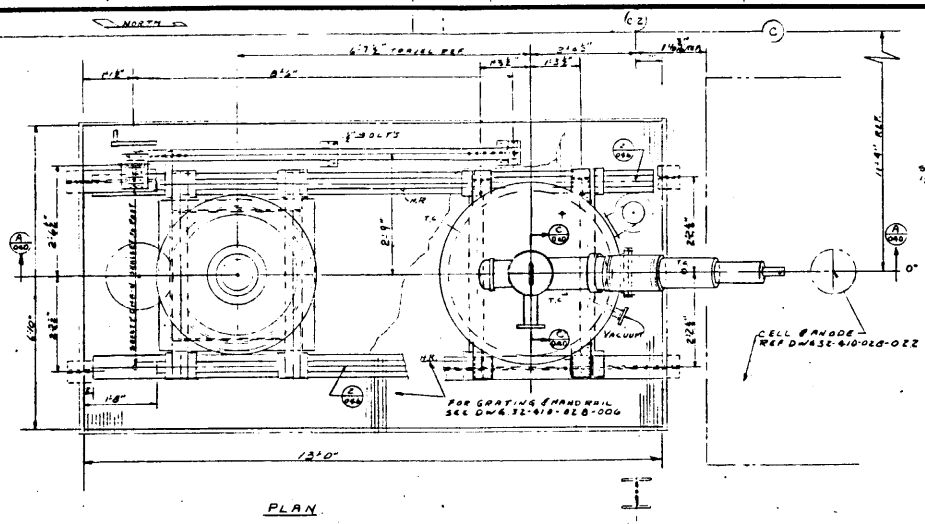
DWG. NO. 32 410 028-002

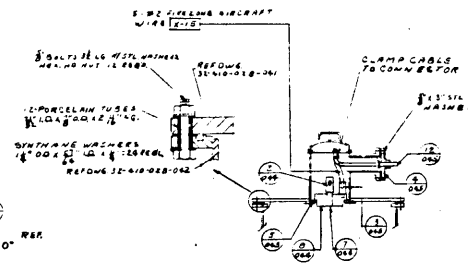
098 GRAPHITE THREAD DETAILS
097 GRAPHITE THREAD DETAILS
096 DETAILS
095 SUB-ASSEMBLIES
094 ROTOR SHAFT ASSEMBLY
093 ROTOR SHAFT FINISH ARM
092 BEARING HOUSING ASSEMBLY
091 STATOR ASSEMBLY
090 COLLECTOR ASSEMBLY
089 UPPER GEN. ASSEMBLY
088 MODIFICATION TO 301
087 FABRICATION
086 DUST WORK
085 PIPING & INSTRUMENTATION
084 GENERATOR MAINTENANCE
083 GENERATOR EQUIPMENT
082 FAN LUBRICATING EQUIPMENT & HOSES
081 GEN. CABINET - DETAILS
080 GEN. CABINET - DIMENSIONS
079 WIRING
078 MOTOR GEN. ROOM VENTILATION
077 MISC. FLATWORK
076 MACHINE SHOP MATERIAL LIST & DATA
075 DUST COLLECTION DUCTWORK PLAN & ELEV.
074 EQUIPMENT & DUCT PORT HOODS
073 MISCELLANEOUS DUCT WORK DETAILS
072 VENT. DUCTWORK PLAN & ELEV. & DETAILS
071 NOT USED
070 ELECTRICAL LIGHTING & CONTROL PANEL DETAILS
069 ELECTRICAL CONDUIT RUNS
068 ELECTRICAL DUCT LINE & EQUIPMENT DETAIL
067 LUBRICATION SCHEMATIC
066 NOT USED
065 MOLD HANDLING PIPING SCHEMATIC
064 PIPING LEGEND
063 PIPING ARRGT. PLAN
062 CRUCIBLE SPLIT MOLD CLAMPS
061 POUR FURNACE TRUCK & TRACK MECH.
060 MOLD TRANSFER & INGOT GRIND MACHINE
059 MOLD & INGOT HANDLING EQUIPMENT ASSEM.
058 MOLD STRIP. INGOT GRINDING TABLE
057 MOLD STRIP. INGOT UPENDER
056 MOLD STRIP. MOLD & TRANSFER HOOD IP.
055 POUR STRIP/CLEAN
054 MOLD STRIPPING & INGOT GRINDING SYSTEM
053 MOLD STRIPPING AREA PREPARATION
052 NOT USED
051 POUR TUBE COVER - FT. DEVICE
050 POUR FURNACE TRUCK & TRACK MECH.
049 POUR FURNACE & REPAIR (SPLIT) ARRT CONN.
048 POUR FURNACE - GENERAL DETAILS
047 POUR FURNACE BODY & CARRIAGE
046 POUR FURNACE MOLD TOP HEATING SECTION
045 POUR FURNACE & FURNACE TOP
044 POUR FURNACE GEN. ARR.
043 NOT USED
042 BOTTOM OPENING BASKET
041 ELEC. CONN.
040 ANODE INSULATION ASSEMBLY
039 FEED HOPPER & FEED DETAILS
038 FEED CHUTE & FEED CONN. RING
037 GRAPHITE FEED BASKET DETAILS
036 GRAPHITE ANODE DETAILS
035 ELECTROLYTIC CELL - CELL LINER ASSEMBLY
034 ELEC. CELL - CELL LINER I.D. & GRAPHITE DETAILS
033 ELEC. CELL - PIPE DET. DETAILS
032 ELEC. CELL - PIPE DET. COVERS & DETAILS
031 ELEC. CELL - TOP INSUL. DET.
030 ELEC. CELL - BASE & CONTAINER INSUL. DET.
029 ELEC. CELL - BASE ASSEMBLY
028 ELEC. CELL - SUB ASSEMBLY - SECTIONS
027 ELEC. CELL - SUB ASSEMBLY - PLAN
026 FAN CUTTING BLADES LAYOUT
025 MOTOR CONTROL LINE DIAGRAMS
024 BUS BAR LAYOUT & DETAILS
023 M. G. SET INSTRU. CONTROL PANEL & CONN. RUNS
022 GENERATOR LAYOUT & INSTRUCTION
021 AREA PREP. RELOCATIONS - ELEC. EQUIP.
020 AREA PREP. ELECTRICAL EQUIP. REMOVAL
019 AREA PREP. EQUIP. REMOVAL - ELEC.
018 AREA PREP. EQUIP. REMOVAL - PLAN
017 NOT USED
016 STRUC. STRUCTURAL DETAILS
015 STRUCTURAL PLATFORM & HANDRAIL DET.
014 FOUNDATION DETAILS

ASSEMBLY SEQUENCE
1. Install cell in accordance with instructions MCW Dwg. 32-410-028-022.
2. Install anode jack support structure and shim as needed level within 1/16".
3. Set tapered section of feed chutes over studs with gaskets.
4. Set bottom flange for feed chutes over studs with gaskets and tighten nuts.
5. Lower feed chutes in place and screw into tightest position allowed by orientation of feed screw.
6. Shim between support angle and feed chute seat for 0.250" ± .005" gap for Belleville washer installation.
7. Release bottom flange and jack up feed chute and insert Belleville washers and pins at support seats and release jack.
8. Tighten nuts on feed chute bottom flange to compress gaskets.
9. Install clamp seat.
10. Place anode clamps in place.
11. Install jack seats.
12. Set cooling rings in place in Weber 48 cement grout seat.
13. Tap cooling rings into position so that the ring ℄ matches and the cooling ring plane verticle.
14. Seal weld cooling ring as shown.
15. Install feed hopper, screw, and drive.
16. Install anodes with the anode seal slipped on over the first anode section (the jack seat will have to be removed for this) and hold with electrical clamp.
17. Install jacks on jack seats with jack ℄ on ℄ of anode pin hole.
18. Install cooling ring ducts.
19. Hang cathode head shirts.
1027
BUFF-NORTON MODEL 1808 INVELD SCREW JACK W/ SPEC. AL. TRAPAZOID END GR APPROVED EQUAL.
1025
BOSTON TWP 12GC-220 GEAR REDUCER @ 288 RPM & 245 IN-LBS TORQUE. 1½ HP DC MOTOR 0-70 1.730 GPM
1025
#8 B.P.CH. 150 ROLLER CHAIN
1025
LINK-BELT 101-18 SHEAR PIN SPROCKET FOR ⅜" PITCH 150 CHAIN W. 40 TEETH SPROCKET W. 1⅜" DIA. BORE & ½" KEYWAY. 1⅜" DIA. SHEAR PIN NECA.
1026
GRAPHITE ANODE - SEE MCW 32-410-028-010
1026
FEED GASKET, ASBESTOS SEPTA MCW 32-410-028-011
1027
FEED CHUTE SEAT
1027
SUPPORT & IN ANODE JACK SUPPORT STRUCTURAL FEED CELL BOLT HOLES
1027
NEOPRENE FLEX CONNECTION BETWEEN FEED SCREW TUBE & FEED SCREW JOHNSCRUB
1032
ELECTROLYTIC CELL MCW DWG 32-4 0-028-025 & -026
SECTION A
SCALE: ½" = 1'-0"
SECTION B
SCALE: ½" = 1'-0"
MALLINCKRODT CHEMICAL WORKS
ST. LOUIS, MO. URANIUM DIVISION WELDON SPRING, MO.
ATOMIC ENERGY COMMISSION CONTRACT NO. W-16-108-ENG-8
DRAWN
CHECKED
PROJ. ENGR.
APPROVED
APPROVED
APPROVED
SCALE: NOTED
DWG. NO. 32-4-0-028-32

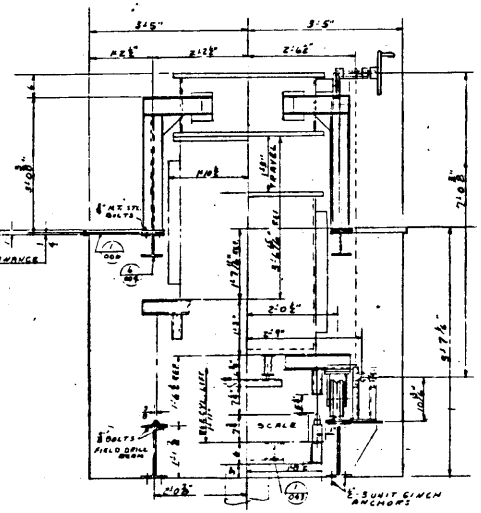
Pour Furnace Installation Sequence:

1. Assemble "Pour Furnace Mold Top Heating Section".
2. Set "Lithoform Insulator", detail 3-065, in groove of "Furnace Top Section" and fasten "Ball Joint Support Plate" in place.
3. Assemble and bolt "Pour Furnace Top" and "Pour Furnace Mold Top Heating Sections" together. Tighten bolts evenly so that interface between flanges has an 0.030 inch maximum variance. Check that an electrical continuity is present between flanges with an ohmmeter.
4. Set graphite "Ball Joint", detail 3-066, in place. "Ball Joint" to be assembled with hole in ball vertical and locking ring finger tight.
5. Screw 6" O.D. graphite tube, detail 1-066, into female half of "Temperature Compensating Coupling" and tighten.
6. Screw graphite "Connector Block", detail 4-066, into other end of 6" O.D. graphite tube, detail 3-066, and tighten.
7. Slip 1-1/2" O.D. graphite tube, detail 3-064, through 6" O.D. graphite tube, detail 1-066, and screw into graphite "Connector Block", detail 4-064, and tighten.
8. Slip one "Pour Tube Insulators", detail 2-065, and one "Pour Tube Insulator", detail 3-065 onto 1-1/2" O.D. graphite tube, detail 3-064.
9. Screw graphite "Connector Block", detail 2-066, to other end of 1-1/2" O.D. graphite tube, detail 3-064. Tighten "Connector Block" as much as possible while keeping centerline of smooth threaded hole aligned with centerline of smooth threaded hole in opposite end "Connector Block", detail 4-064.
10. While holding "Pour Tube Insulator", detail 3-065, carefully slip assembly into "Furnace Top" and loosely fasten "Temperature Compensating Coupling".
11. Screw 1-1/2" O.D. graphite tube, detail 3-064, into "Connector Block", detail 4-064. Do not tighten. Rotate "Pour Tube Assembly" until 1-1/2" O.D. graphite tube, detail 3-064, is vertical. Tighten "Temperature Compensating Coupling". Remove 1-1/2" O.D. graphite tube, detail 3-064.
12. Using care, slip flanged section of tube assembly over 6" O.D. graphite tube, detail 1-066, and screw onto threaded end of "Temperature Compensating Coupling". Tighten.
13. Slip "Lithoform Insulator Pins" through 1" diameter threaded tubes, insert socket head set screws and snug up evenly so that contact is just made with 6" O.D. graphite tube, detail 1-066.
14. Slip "Ceramic Insulator Tube", Item X-16, over tube and end secure with "Keeper Plate and Screw".
15. Assemble electrical connections per detail C-060, push "Insulator Blocks" on for back into 6" O.D. graphite tube as possible and fill void with Fiberfrax Fiber.
16. Assemble and remove pipe caps.
17. Set "Scale Platform and Lift", detail 1-063, and Scale Assembly Item No. S-13 on hydraulic cylinder, Item No. 1000 and bolt in place.
18. Lay Furnace Tracks, detail 3-066, in place and loosely fasten.
19. Set "Furnace Section" on tracks and roll to south end of pit.
20. Set "Furnace Assembly" into position over center of hydraulic cylinder and level lower gasket surface of "Pour Furnace Mold Top Heating Section" while centering the "Refractory Tube", Item X-16, in the "Cell Pour Tube Hole" by shimming under "Furnace Body Supports". Bolt in place.
21. Loosen "Guide Pins" on "Scale Platform and Lift", detail 1-063. Move "Furnace Bottom" over lift pins and raise unit with hydraulic cylinder until flanges are approximately 0.030" apart. "Center Furnace Section" with "Furnace Top Assembly" and shim under lift pins so that gap between flanges of furnace halves has a maximum variance of 0.015". Tighten "Lift Pin Bolts".
22. Lower "Furnace Bottom" onto tracks, level and space tracks so that "Furnace Bottom" transverses pit length easily. Bolt tracks in place.
23. Install Furnace "Transfer Mechanism".
24. Loosen and install truck stops at limiting points of "Furnace Bottom" travel.

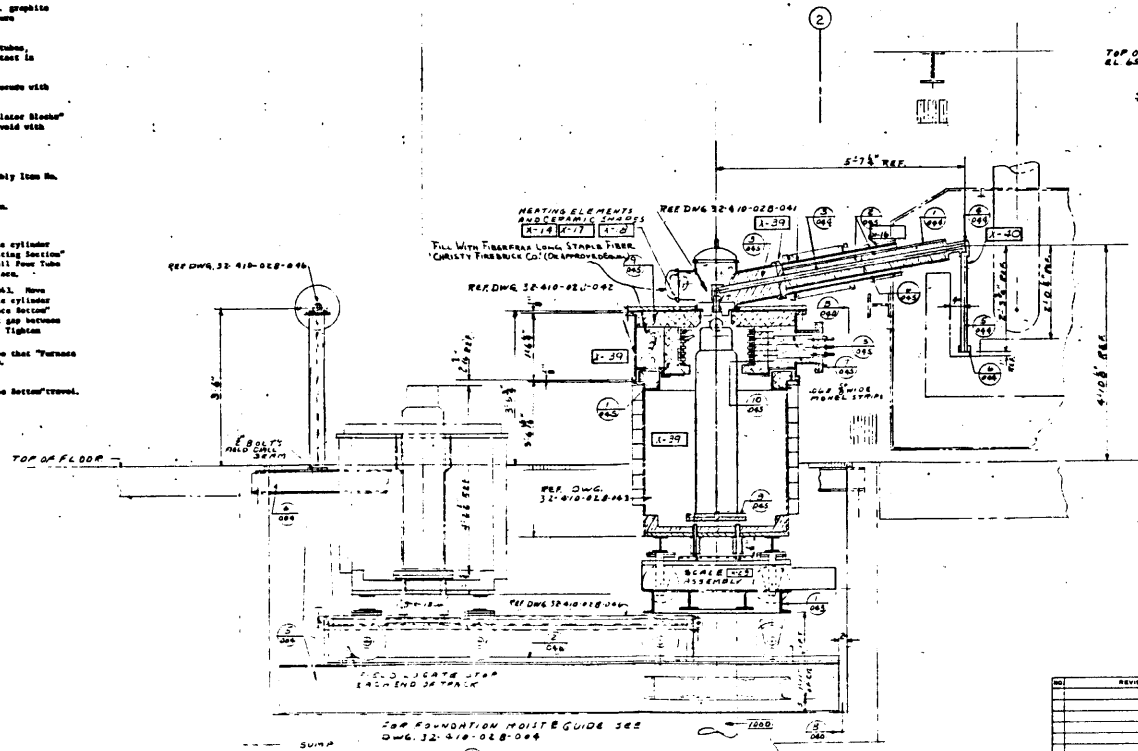




SECTION SHOWING HEATING CONNECTION PER FURNACE TOP



VIEW SHOWING SUPPORT & TRANSFER MECHANISM



SECTION SHOWING ASSEMBLY

32-610-028	GUIDE: FOUNDATION DETAILS
-030	SIGN ARRANGEMENT PLAN
-039	CRANE & TRANSFER MECHANISM
-041	REFRACTOR & HEATING ELEMENTS
-042	GRAPHITE DETAILS
-063	BODY & CRADLE
-062	MOLD TOP HEATING SECTION
32-610-JIA-061	CABLE & FURNACE TOP
DWG. NO.	TITLE

REFERENCE DRAWINGS

MALLINCKRODT CHEMICAL WORKS
URANIUM DIVISION
ST. LOUIS, MO. — WELDON SPRING, MO.
ATOMIC ENERGY COMMISSION CONTRACT NO. W-16-108-ENG-8

NO.	REVISIONS	BY	CHK'D	DATE

	BY	DATE
DRAWN		2-5
CHECKED		
PROJ. ENGR.		
APPROVED		
APPROVED		
APPROVED		
SCALE: 1" =		

404

ELECTROLYTIC PROTOTYPE POUR FURNACE GEN. ARRANGEMENT

DWG. NO. 32-610-028-040

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3 - "CONSTRUCTION" UNLESS STAMPED TO THE COMPANY

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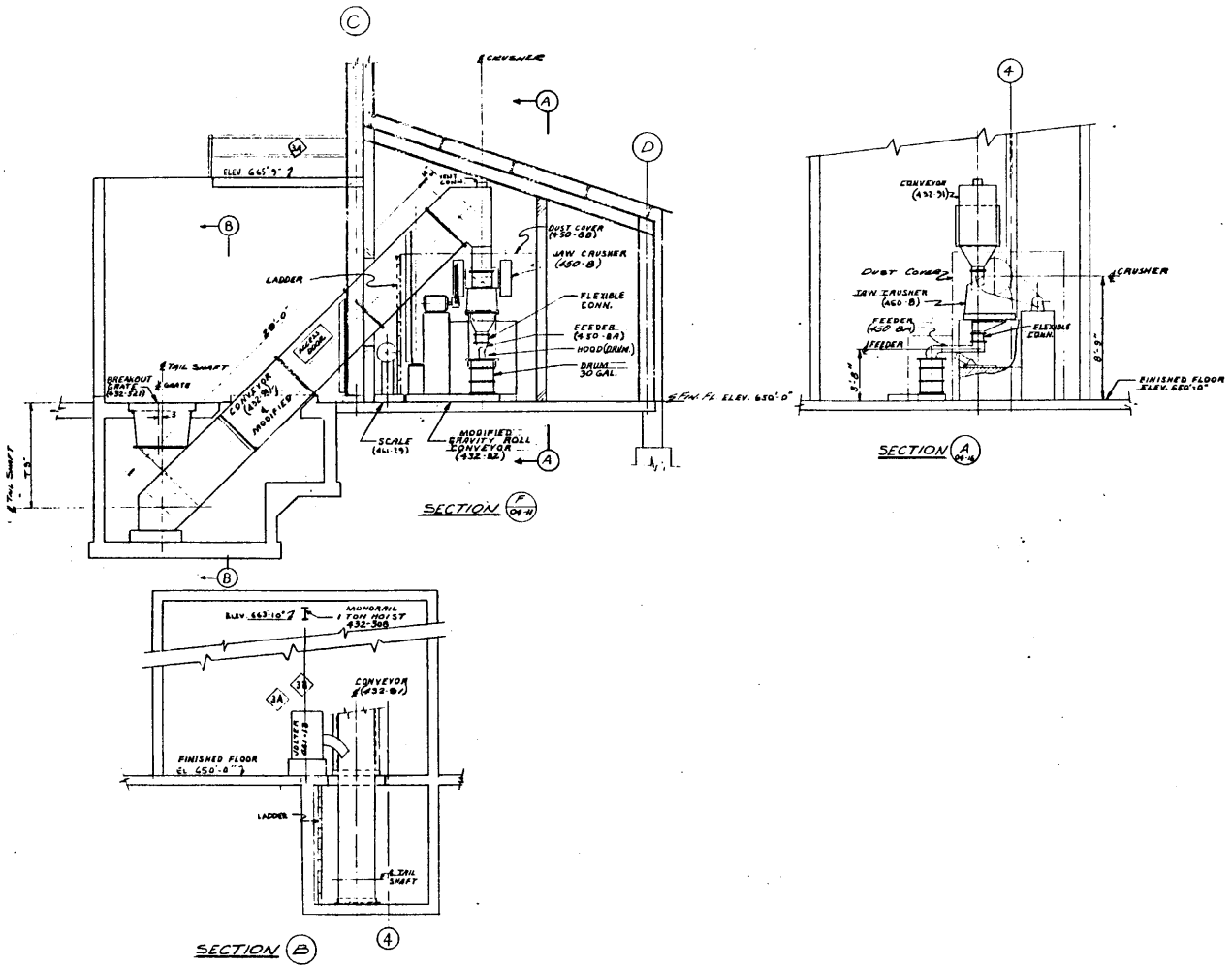

AS BUILT
BLAW-KNOX CO.
BY

NOTE: SEE A-404-10 FOR NOTES AND REFERENCE DWGS.

No.	REVISIONS	MADE	CHK	DATE
1	GENERAL REVISIONS			
	ADDED ENGR'G. NOTE			
	& REC. APPROVAL	K.J.		6-6-56
2	CUSTOMER'S COMMENTS			
	ADDED	L.C.	[illegible]	7-14-56
3	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]
4	[illegible]	K.F.	R.B.	11-11-56
5	[illegible]	[illegible]	[illegible]	[illegible]
6	A & B Mount	R.F.	C.R.M.	2-1-57

	APPROVED FOR A&C	DATE
	D.W. BROWN	7-17-56
	APPROVED FOR M&W	DATE
	L.G. WEBER	7-16-56

	BY	DATE
DRAWN	[illegible]	6-27-56
CHECKED	[illegible]	7-13-56
APPROVED	[illegible]	7-2-56
APPROVED	L.G. WEBER	7-6-56
APPROVED		
APPROVED	[illegible]	7-2-56
SCALE	1/4" = 1'-0"	

BURNS AND ROE INC
INDUSTRIAL DIVISION
BALTIMORE 4 MD.

for

BLAW-KNOX COMPANY
CHEMICAL PLANTS DIVISION
PITTSBURGH, PA.

FOR

U. S. ATOMIC ENERGY COMMISSION
ST. LOUIS AREA OFFICE

AND

MALLINCKRODT CHEMICAL WORKS
ST. LOUIS, MISSOURI

METALS PILOT PLANT AREA 404
MECHANICAL EQUIPMENT

BREAKOUT AREA SECTIONS

CONT. No. 1411 | DWG. No. 2404 16 | 4

NOTE: THIS DRAWING PRINTED IN [illegible] INDICATES THIS ISSUE IS OR PRELIMINARY PRINTED IN BLUE OR BLACK INDICATES THIS ISSUE IS OR FOR PURCHASE & CONSTRUCTION EXCEPT AS NOTED OR STAMPED TO THE CONTRARY

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3.2 Building/Area: Metallurgical Pilot Plant - Building 404

DESCRIPTION: The Metallurgical Pilot Plant was designed for pilot-scale testing of methods and processes used for uranium metal production. Pilot-scale versions of some of the Building 301 Metal Plant's production-scale systems are present in Building 404.

CHEMICAL SYSTEMS: A large metal vat is present in the south end of the building. It is partially filled with non-chemical debris. This vat was once a reactor lined with graphite blocks. It was one of two prototype systems housed in Building 404 for the electrolytic conversion of UO_2 to uranium metal. The other electrolytic cell appears to be intact, and is located at the north end of the building. A blender and bomb filling station is located in the center of the building. In this station, UF_4 and metallic magnesium were blended and loaded into a MgF_2 lined reaction bomb. Sodium/potassium alloy (NaK) was used in a system in Building 404, however its purpose is not known. A slag breakout/slag grinder and conveyor system is also present. A sump slurry neutralization/precipitation vat is located outside of Building 404 on the west side of the building. Sump slurry pump-out lines carried waste water and sediments from the sumps to the precipitation vat.

ANALYSIS/OBSERVATIONS:

Only radioactive residues are present.

No NaK was observed in the NaK system. No metallic magnesium was observed. The neutralization/precipitation tank was empty and open to the elements (rain and snow). PCB contamination above the 100 $\mu g/100\ cm^2$ cleanup level was found in only one of five sample locations.

SUPPORTING DOCUMENTS: See the following drawings.

3.3 Building/Area: Pilot Plant Auxiliaries - Building/Area 405

DESCRIPTION: The pilot plant auxiliary facilities included several bag houses for controlling dust in the two pilot plant buildings. Building 405 appears to have been a research support building, with an office area and storage space for spare pilot plant equipment. An open storage pad area is also present.

CHEMICAL SYSTEMS: Large bag houses for dust collection from Buildings 403 and 404.

OBSERVATIONS/ANALYSIS: The bag houses were emptied and cleaned out during plant shut down. These units are radiologically contaminated. Three of five samples taken for PCB analysis were >100 $\mu g/100cm^2$. No other chemical concerns were observed that would impact demolition.

SUPPORTING DOCUMENTS: None.

3.4 Building/Area: Laboratory - Building 407

DESCRIPTION: The laboratory provided facilities for the following purposes:

1. Testing of raw materials.
2. Production control analysis.
3. Testing of final products.
4. Assistance in solving production problems.
5. Testing associated with pilot plant operations.
6. Development projects.

CHEMICAL SYSTEMS:

This building does not contain process related equipment or piping. There are two metal heat treating devices which may require special cleaning prior to placement in the material staging area. They may contain residual heat treating chemicals, among the debris that was thrown inside them.

The piping in the laboratory building is almost exclusively utility piping; primarily water, steam, air, fuel gas, ethylene glycol brine, and vacuum lines.

A rooftop dust collector served the down-draft tables in several areas of the building.

Specially configured fume hoods were provided to support the use of perchloric acid in analytical procedures.

Lead piping, especially sink traps are installed in many of the sinks.

Elemental mercury was used extensively in the laboratory building, and extensive mercury contamination has occurred as a result.

OBSERVATIONS/ANALYSIS: Hg spills are extensive, and must be cleaned prior to building demolition when benches are removed. Radiologically contaminated equipment and debris is present throughout; in particular, lab hoods are full of debris and extremely radioactive.

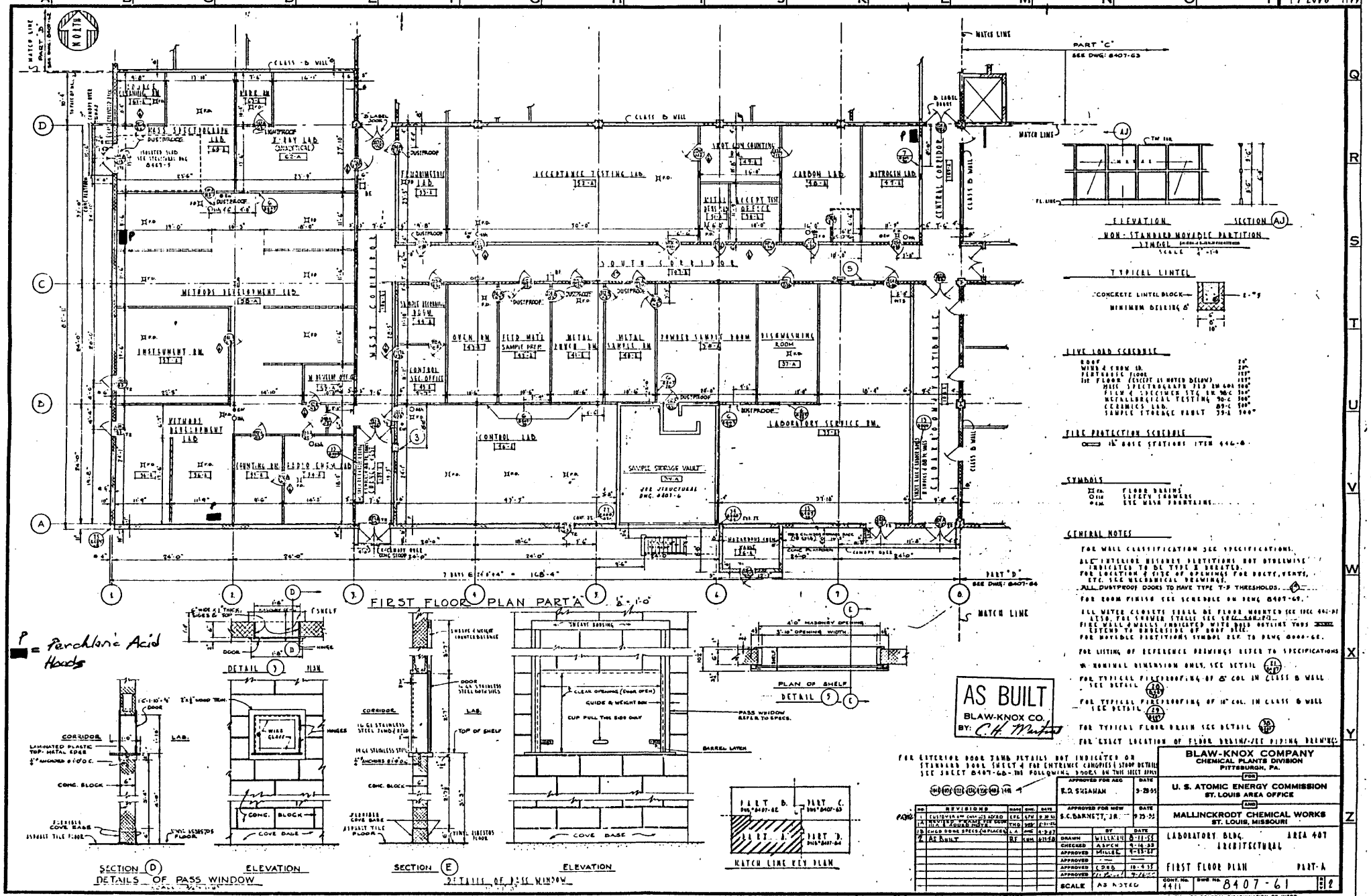
The exhaust stacks tied to the perchloric acid ($HClO_4$) hoods are very conspicuous on the roof of the laboratory building. Each hood has its own ejector stack, which is made of aluminum and fitted with a water sprayer. The ejectors are approximately 11 ft tall above roof level. The configuration of the perchloric acid ventilation system is shown in the attached drawing. It appears that the vent pipes are oriented vertically to prevent condensation from being retained in the piping, and the fans did not come in contact with the perchloric acid off gases.

There are 14 perchloric acid hoods in the laboratory building. As part of the demolition of the laboratory, the perchloric acid hoods will each be steam cleaned and tested to assure that any residual perchlorate compounds that may be present are removed. A specific procedure for this effort will be incorporated in the *Safe Work Plan* based on National Fire Protection Association (NFPA) 45, *Standard on Fire Protection for Laboratories Using Chemicals*, Chapter 6-12 and A-6-12.2.

Due to the possibility of shock sensitive residues in the lead piping, special safety measures will be needed during demolition and material handling. These procedures may entail the use of blast shields or remote shearing devices. Sampling was not attempted because a safe and effective means of collecting samples was not available.

Penthouse A contained PCB transformers and requires thorough decontamination.

Essentially all other items which posed a chemical hazard were removed during chemical consolidation projects.



FIRST FLOOR PLAN PART "A"
ACCEPTANCE TESTING LAB.
CARBON LAB.
NITROGEN LAB.
SOUTH CORRIDOR
METHODS DEVELOPMENT LAB.
INSTRUMENT RM.
OVEN RM.
FEED MAT'L SAMPLE PREP.
METAL PRUSH RM.
METAL SAMPLE RM.
POWDER SAMPLE ROOM
DISHWASHING ROOM
CONTROL LAB.
LABORATORY SERVICE RM.
SAMPLE STORAGE VAULT
CENTRAL CORRIDOR
WEST CORRIDOR
CLOAKROOM TESTIBULE
MATCH LINE
PART "C"
SEE DWG: 8407-63
PART "D"
SEE DWG: 8407-64
ELEVATION
SECTION AJ
NON-STANDARD MOVABLE PARTITION SYMBOL
TYPICAL LINTEL
CONCRETE LINTEL BLOCK
MINIMUM BEARING 8"
LIVE LOAD SCHEDULE
FIRE PROTECTION SCHEDULE
SYMBOLS
FLOOR DRAINS
SAFETY SHOWERS
EYE WASH FOUNTAINS
GENERAL NOTES
FOR WALL CLASSIFICATION SEE SPECIFICATIONS.
ALL INTERIOR MASONRY PARTITIONS NOT OTHERWISE INDICATED TO BE TYPE II DURATED.
FOR LOCATION & SIZE OF OPENINGS FOR DUCTS, VENTS, ETC. SEE MECHANICAL DRAWINGS.
ALL DUSTPROOF DOORS TO HAVE TYPE T-5 THRESHOLDS.
FOR ROOM FINISH SEE SCHEDULE ON DRWG 8407-69.
FOR LISTING OF REFERENCE DRAWINGS REFER TO SPECIFICATIONS
FOR TYPICAL FIREPROOFING OF 8" COL IN CLASS B WALL SEE DETAIL
FOR TYPICAL FIREPROOFING OF 10" COL. IN CLASS B WALL SEE DETAIL
FOR TYPICAL FLOOR DRAIN SEE DETAIL
FOR EXACT LOCATION OF FLOOR DRAINS-SEE PIPING DRAWINGS
P = Perchloric Acid Hoods
DETAIL 3
PLAN
SECTION D
ELEVATION
DETAILS OF PASS WINDOW
SECTION E
ELEVATION
DETAILS OF PASS WINDOW
PLAN OF SHELF
DETAIL 5
MATCH LINE KEY PLAN
AS BUILT
BLAW-KNOX CO.
BY: C.H. Martin
BLAW-KNOX COMPANY
CHEMICAL PLANTS DIVISION
PITTSBURGH, PA.
U. S. ATOMIC ENERGY COMMISSION
ST. LOUIS AREA OFFICE
MALLINCKRODT CHEMICAL WORKS
ST. LOUIS, MISSOURI
LABORATORY BLDG. AREA 407
ARCHITECTURAL
FIRST FLOOR PLAN PART-A
SCALE AS NOTED
CONT. No. 4411
DWG. No. 8407-61
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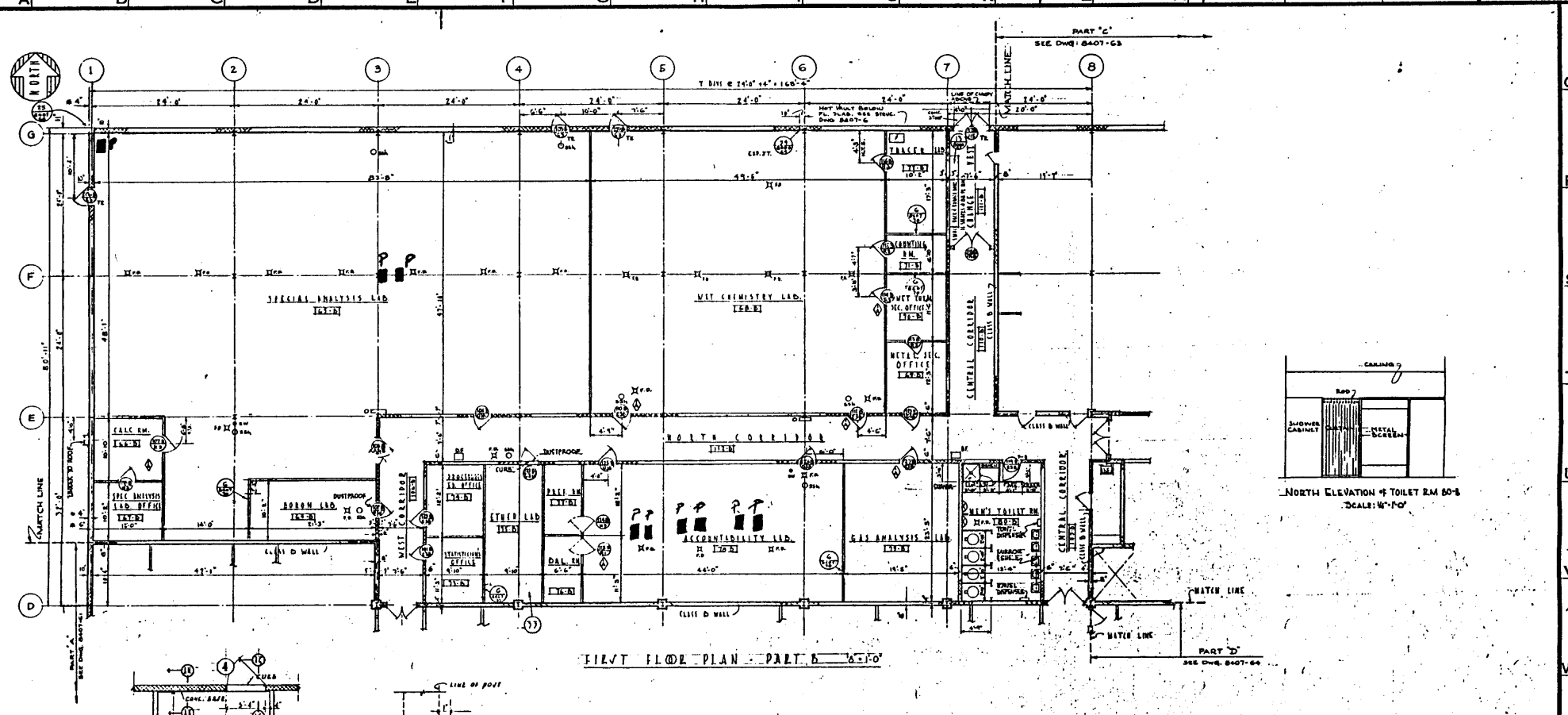
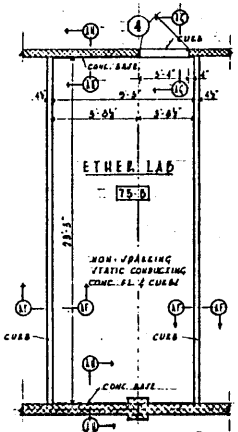
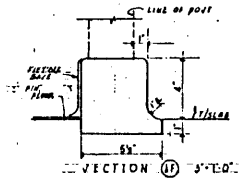


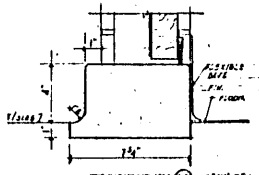
NORTH ELEVATION of TOILET RM 80-B
SCALE: ½"-1'-0"



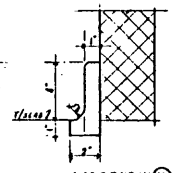
DETAIL PLAN



SECTION 5"-1'-0"



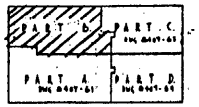
SECTION 5"-1'-0"



SECTION 5"-1'-0"

P = Perchloric Acid Hoods

CONC. CURB



MATCH LINE KEY PLAN

AS BUILT
BLAW-KNOX CO.
BY C.H. Martin

* NOTE: FOR EXTERIOR SIDE JAMB DETAILS NOT INDICATED ON STANDARD SIDES SHEET 6 FOR ENTRANCE CANOPIES ETC. DETAILS SEE BWG. 8407-G
THE FOLLOWING SIDES ON THIS SHEET APPLY
SIDE B SIDE C SIDE D SIDE E

FOR GENERAL NOTES AND TYPICAL LISTS SEE BWG. 8407-61
CHECK NOTE ON BWG. 8407-61

NO.	REVISIONS	BY	CHK	DATE
1	EQUIPMENT AND DRAWING ADDED	B.R.G.	GFM	10-4-55
1A	ENGG. DOORS, SPECS ON LIMS	L.A.B.	BWG	11-21-55
1B	As Built	E.F.	CHK	6-11-56

	APPROVED FOR A&E	DATE
	E. D. SULLIVAN	9-13-55
	APPROVED FOR MCW	DATE
	E.C. BARNETT, JR.	9-19-55

BLAW-KNOX COMPANY
CHEMICAL PLANTS DIVISION
PITTSBURGH, PA.
FOR
U. S. ATOMIC ENERGY COMMISSION
ST. LOUIS AREA OFFICE
AND
MALLINCKRODT CHEMICAL WORKS
ST. LOUIS, MISSOURI

	BY	DATE
DRAWN	WILLMAN	6-11-55
CHECKED	ASPEN	9-16-55
APPROVED	MILLER	9-13-55
APPROVED	—	—
APPROVED	E.D.S.	10-4-55
APPROVED	[illegible]	9-26-56
SCALE	AS NOTED	

LABORATORY BLDG. AREA 407
ARCHITECTURAL
FIRST FLOOR PLAN PART-B
CONT. NO. 4411 BWG. NO. 8407-62 SH. 2

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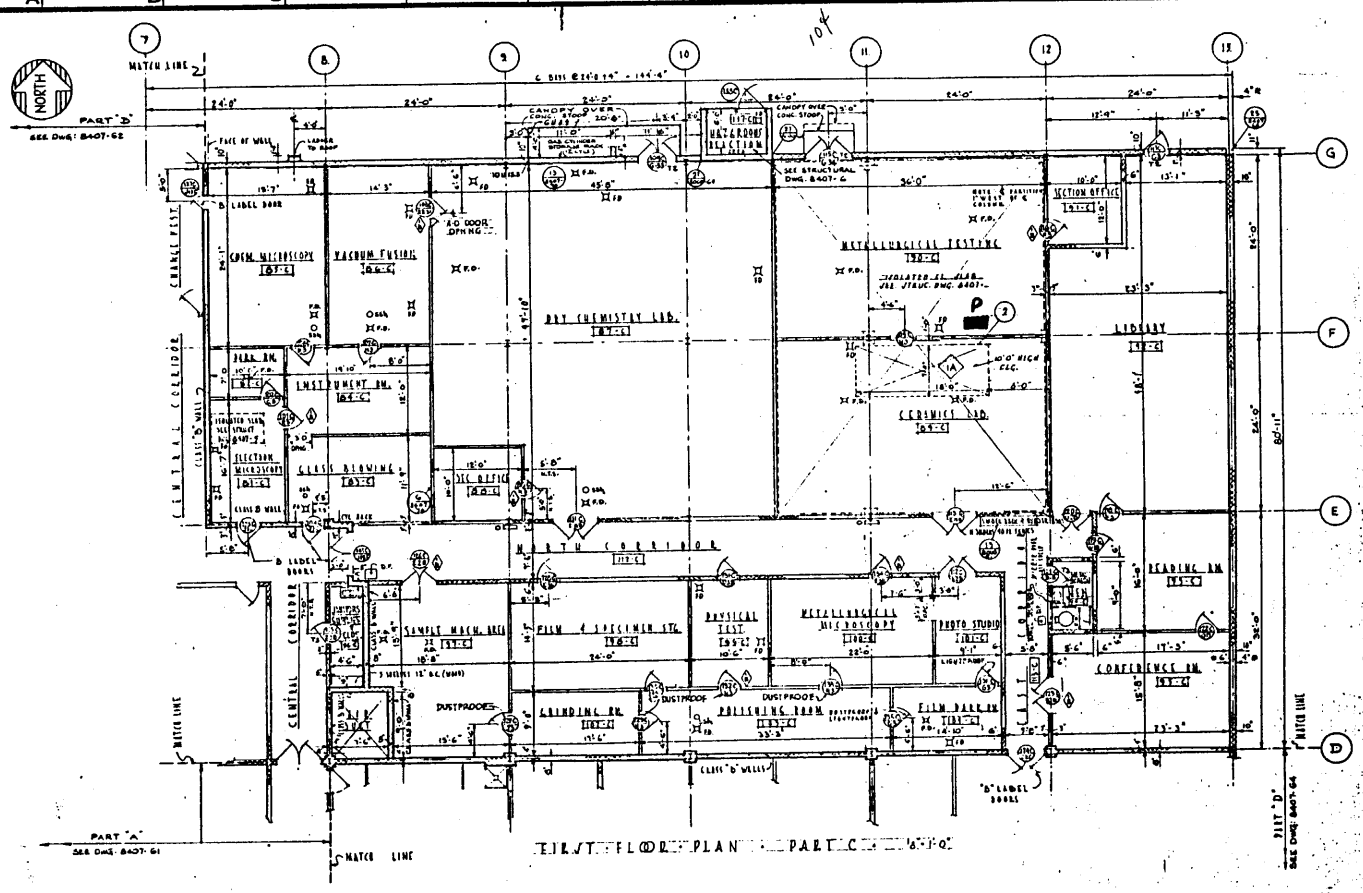
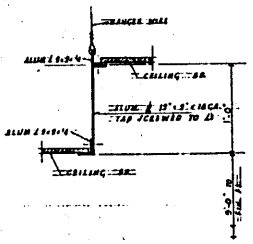
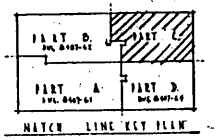
FORM No. B-888-REV 3 "P"





DETAIL (2) 1½"=1'-0"
TYPICAL FOR HIGH CLG.

P = Perchloric Acid Hood Location



MATCH LINE KEY PLAN

AS BUILT
BLAW-KNOX CO.
BY: C.H. Martin

FOR EXTERIOR DOOR JAMB DETAILS NOT INDICATED ON STANDARD DOOR SHEET & FOR ENTRANCE CANOPIES & STOOP DETAILS, SEE DWG: 8407-68
THE FOLLOWING DOORS ON THIS SHEET APPLY - (DTC) (HSC) (HTC)
SEE SHEET: 8407-6 FOR DETAIL OF DOOR (104)

(104) - SEE DWG: 8407-61 FOR GENERAL NOTES & TYPICAL LINTEL SEE DWG: 8407-61

NO.	REVISIONS	MADE	CHK	DATE
1	CLOTHES LIN. HOOKS ADDED	LAE	EJC	4-6-55
2 A	ENLARGED RAISED CEILING	LAE	JWT	4-12-55
1 B	ADD'L DOOR SPACE (REPLACES)	L.A.	JWT	4-9-57
2	AS BUILT	RF	CHM	4-21-58

APPROVED FOR AEC	DATE
D. D. SULLIVAN	9-29-55
APPROVED FOR MCW	DATE
J. C. BARNETT, JR.	9-29-55

	BY	DATE
DRAWN	LCHR	8-11-55
CHECKED	ASPEN	9-16-55
APPROVED	MILLER	9-23-55
APPROVED	—	—
APPROVED	LOUIS	10-4-55
APPROVED	[illegible]	9-26-58
SCALE	AS NOTED	

BLAW-KNOX COMPANY
CHEMICAL PLANTS DIVISION
PITTSBURGH, PA.
FOR
U. S. ATOMIC ENERGY COMMISSION
ST. LOUIS AREA OFFICE
AND
MALLINCKRODT CHEMICAL WORKS
ST. LOUIS, MISSOURI
LABORATORY BLDG. AREA 407
ARCHITECTURAL
FIRST FLOOR PLAN PART 'C'
CONT. No. 4411
DWG. No. 8407-63
SHEET 2

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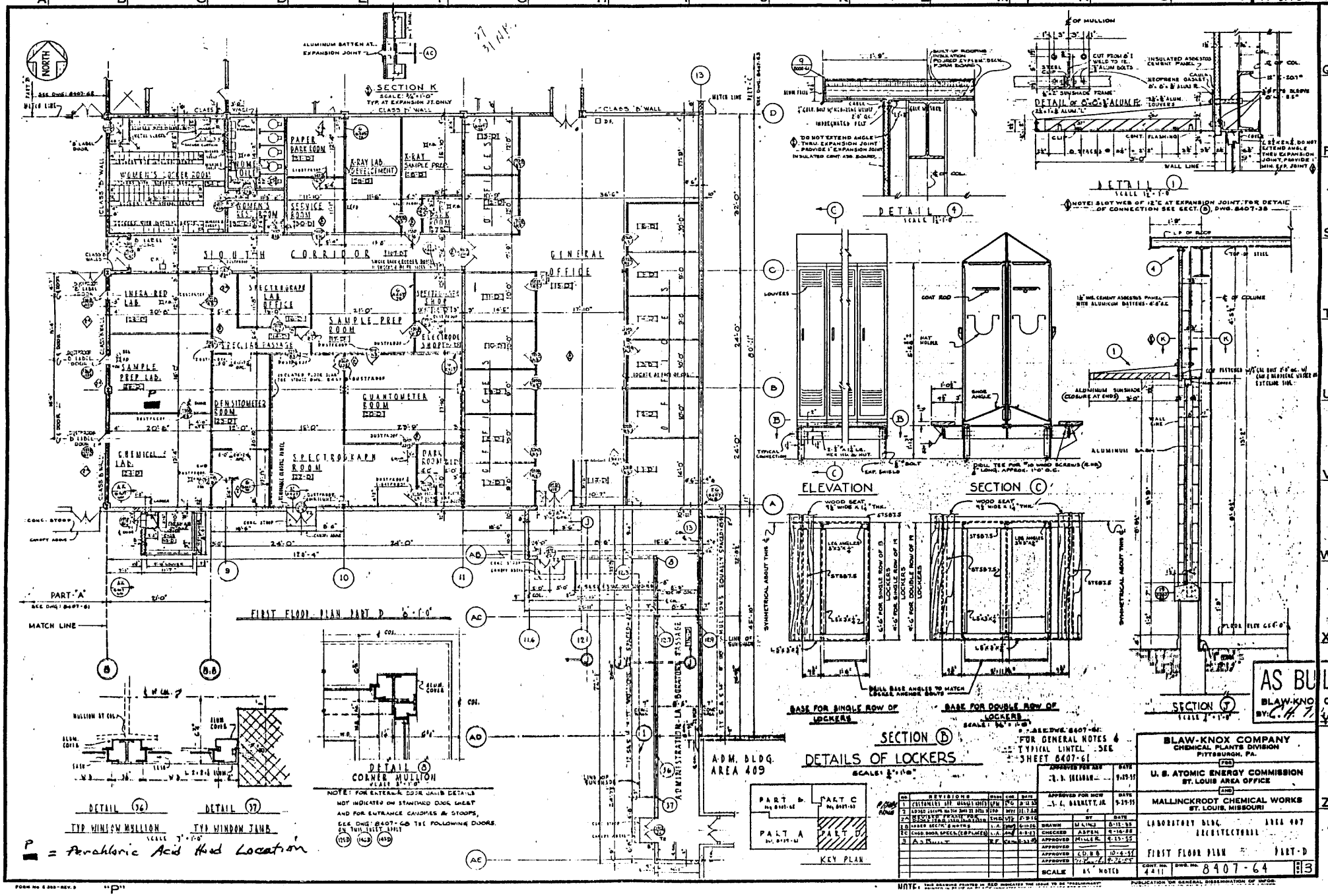
FORM NO. B-300-REV. 8



BLAW-KNOX COMPANY
CHEMICAL PLANTS DIVISION
PITTSBURGH, PA.

FOR
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ST. LOUIS, MISSOURI

LABORATORY BLDG. AREA 407
ARCHITECTURAL
FIRST FLOOR PLAN PART D

CONT. No. 4411 DWG. No. 8407-64 SH. 3

NO.	REVISIONS	BY	DATE
1	CONTAINERS OFF DRAWN JOINTS	[illegible]	8-11-55
2	LOCKER LAYOUT REVISED	[illegible]	9-19-55
3	AS BUILT	[illegible]	4-24-56

	BY	DATE
APPROVED FOR AEC	[illegible]	9-19-55
APPROVED FOR MCW	[illegible]	9-19-55
DRAWN	M. KING	8-11-55
CHECKED	ASPEN	9-16-55
APPROVED	MILLER	9-19-55
APPROVED	C. D. B.	10-4-55
APPROVED	[illegible]	9-26-55
SCALE	AS NOTED	

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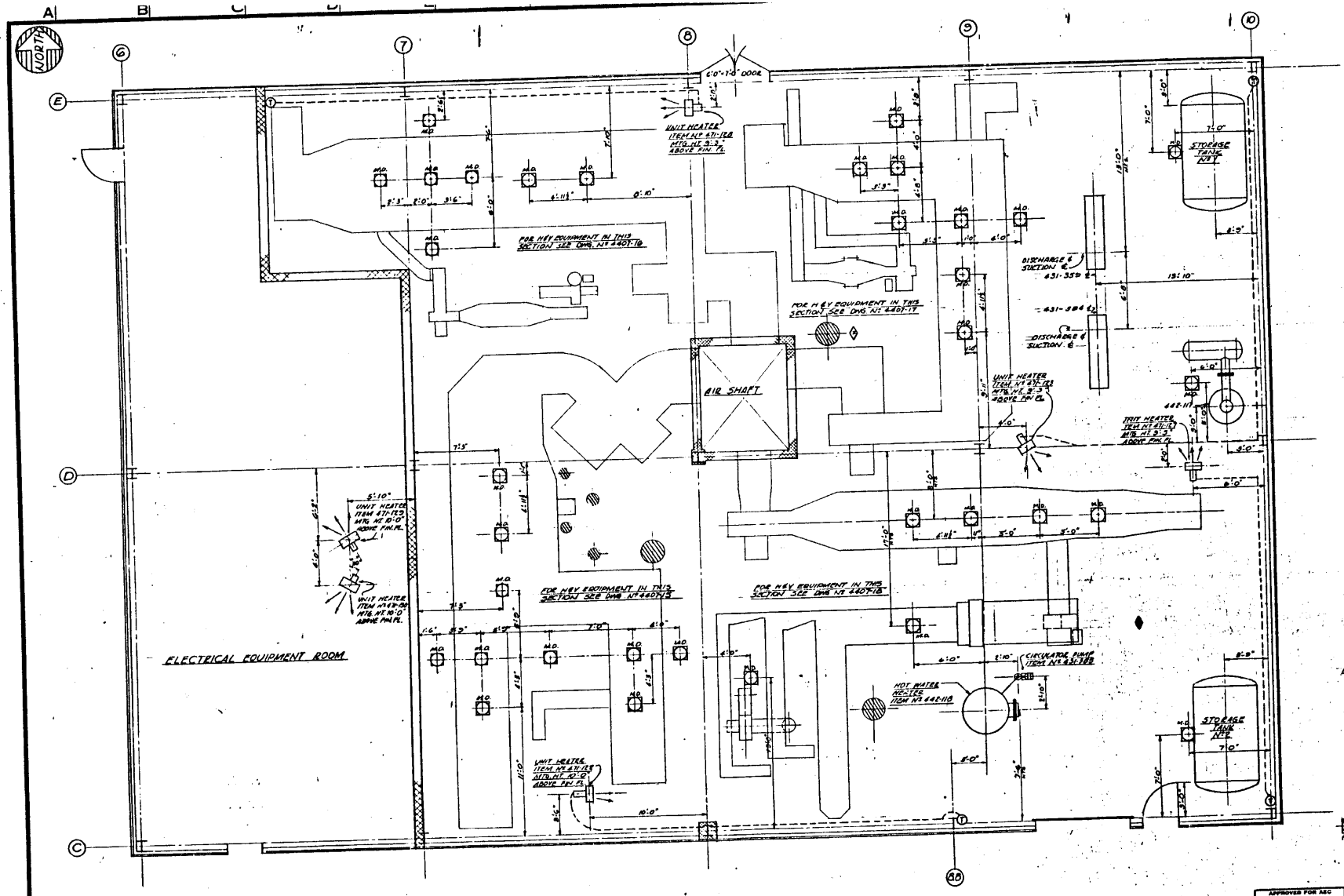
PUBLICATION OR GENERAL DISSEMINATION OF INFOR-

FORM No. E 2003 - REV. 3



NOTES

1- FOR GENERAL NOTES & DWG. REFERENCES SEE DWG. Nº 4407-4

AS BUILT
BLAW-KNOX CO.
BY: C. H. [illegible]

NO.	REVISIONS	MADE	CHK.	DATE
1	[illegible]	HJS	CLE	10-29-56
2	ADD 24" ø DUCT	CLE	KMK	11-9-55
3	AS BUILT	RF	[illegible]	11-11-56

APPROVED FOR AEC	D. W. BROWN	DATE 10-28-56
APPROVED FOR MCW	K. J. CAPLAN	DATE 10-28-56
DRAWN	SEOKA	10-20-56
CHECKED	ENGSTROM	10-22-55
APPROVED	R. L. BAYLE	10-22-56
APPROVED		
APPROVED	[illegible]	10-26-55
APPROVED	[illegible]	10-26-55
SCALE	1/4" = 1'-0"	

BLAW-KNOX COMPANY
CHEMICAL PLANTS DIVISION
PITTSBURGH, PA.

FOR

U. S. ATOMIC ENERGY COMMISSION
ST. LOUIS AREA OFFICE

AND

MALLINCKRODT CHEMICAL WORKS
ST. LOUIS, MISSOURI

LABORATORY BLDG AREA 407
MECHANICAL EQUIPMENT
EQUIPMENT ARRANGEMENT-PENTHOUSE PLAN

CONT. No. 4411 DWG. No. 4407-27 SHEET 3

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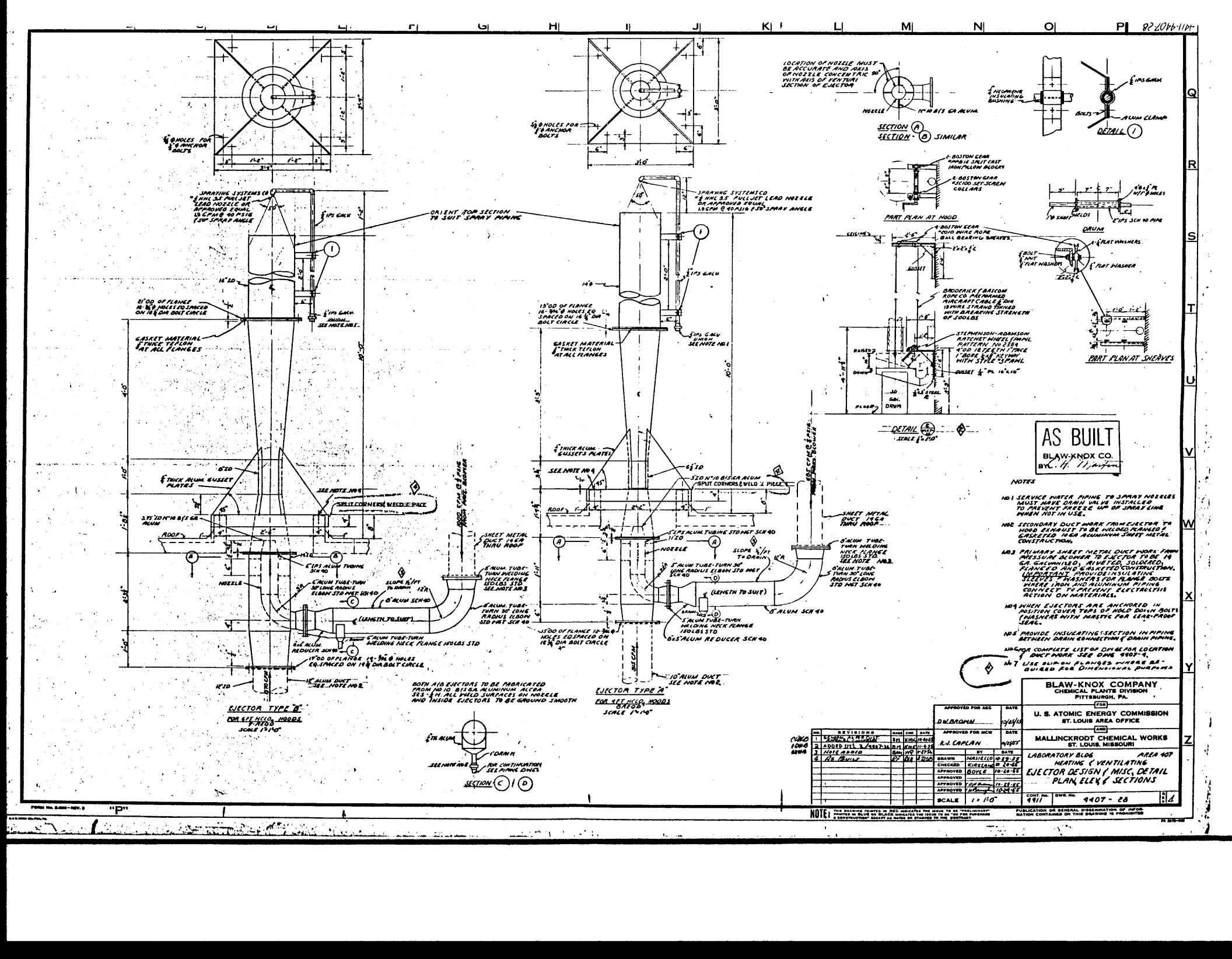
FORM No. E-300-REV. 8 "P"


EJECTOR TYPE "B"
FOR 6 FT HCLO HOODS
EJECTOR TYPE "A"
FOR 4 FT HCLO HOODS
SECTION (C) (D)
PART PLAN AT HOOD
PART PLAN AT SHEAVES
DETAIL (2)
SECTION (A) (B) SIMILAR
DETAIL (1)
AS BUILT
BLAW-KNOX CO.
NOTES
NO 1 SERVICE WATER PIPING TO SPRAY NOZZLES MUST HAVE DRAIN VALVE INSTALLED TO PREVENT FREEZE UP OF SPRAY LINE WHEN NOT IN USE.
NO 2 SECONDARY DUCT WORK FROM EJECTOR TO HOOD EXHAUST TO BE WELDED, FLANGED & GASKETED 16 GA ALUMINUM SHEET METAL CONSTRUCTION.
NO 3 PRIMARY SHEET METAL DUCT WORK FROM PRESSURE BLOWER TO EJECTOR TO BE 14 GA. CALVANIZED, RIVETED, SOLDERED, FLANGED AND GASKETED CONSTRUCTION. IMPORTANT: PROVIDE INSULATING SLEEVES & WASHERS FOR FLANGE BOLTS WHERE IRON AND ALUMINUM PIPING CONNECT TO PREVENT ELECTROLYSIS ACTION ON MATERIALS.
NO 4 WHEN EJECTORS ARE ANCHORED IN POSITION COVER TOPS OF HOLD DOWN BOLTS WASHERS WITH MASTIC FOR LEAK-PROOF SEAL.
NO 5 PROVIDE INSULATING SECTION IN PIPING BETWEEN DRAIN CONNECTION & DRAIN PIPING.
NO 6 FOR COMPLETE LIST OF DWGS FOR LOCATION OF DUCT WORK SEE DWG 4907-1.
NO 7 USE SLIP-ON FLANGES WHERE REQUIRED FOR DIMENSIONAL PURPOSES
BLAW-KNOX COMPANY
CHEMICAL PLANTS DIVISION
PITTSBURGH, PA.
FOR
U. S. ATOMIC ENERGY COMMISSION
ST. LOUIS AREA OFFICE
AND
MALLINCKRODT CHEMICAL WORKS
ST. LOUIS, MISSOURI
LABORATORY BLDG AREA 407
HEATING & VENTILATING
EJECTOR DESIGN & MISC. DETAIL PLAN, ELEV & SECTIONS
CONT. No. 4911
DWG. No. 4907-28
SCALE 1" = 1'-0"
NOTE: THIS DRAWING PRINTED IN RED INDICATES THE ISSUE TO BE "PRELIMINARY" PRINTED IN BLUE OR BLACK INDICATES THE ISSUE TO BE "NOT FOR PURCHASE & CONSTRUCTION" EXCEPT AS NOTED OR STAMPED TO THE CONTRACT.
PUBLICATION OR GENERAL DISSEMINATION OF INFORMATION CONTAINED ON THIS DRAWING IS PROHIBITED

SUPPORTING DOCUMENTS: See the following drawings.

3.5 Building/Area: Maintenance and Storage - Building 408

DESCRIPTION: Building 408 housed various maintenance shops, including an automotive maintenance shop, maintenance equipment, and storage for supplies such as spare parts.

CHEMICAL SYSTEMS: This building does not contain process related equipment or piping. Numerous pieces of equipment contain oily residues.

OBSERVATIONS/ANALYSIS: Several areas are designated for PCB cleanup. No other chemical concerns were noted. Essentially all miscellaneous items which posed a chemical hazard were removed during chemical consolidation projects conducted under the WSSRAP.

SUPPORTING DOCUMENTS: See the following drawings.

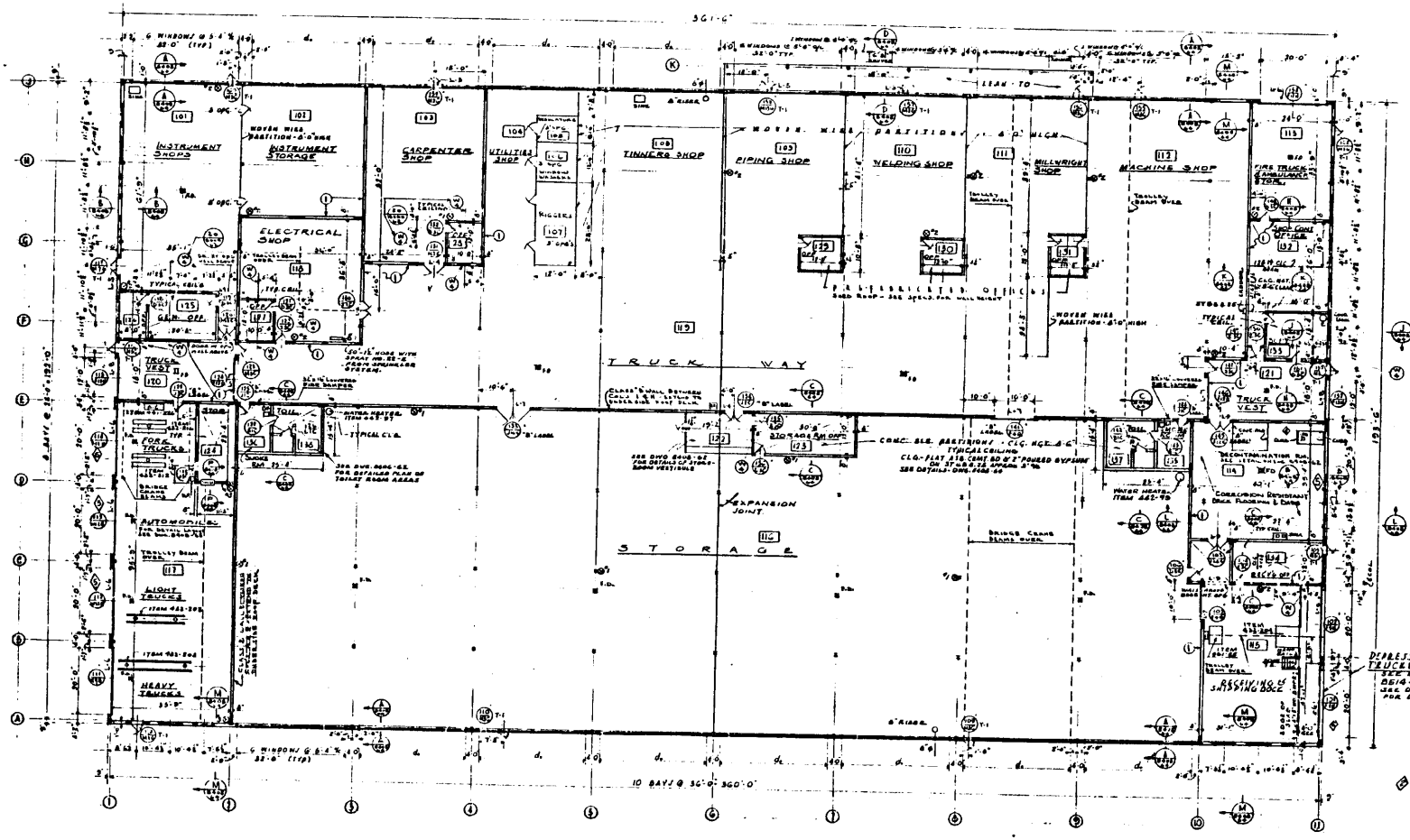
3.6 Building/Area: Services Building - Building 410

DESCRIPTION: The services building housed the following facilities: cafeteria, health department, guard house, gate house, men's change rooms, shower and laundry facilities.

CHEMICAL SYSTEMS: This building does not contain process related equipment or piping. Some oily medical laboratory equipment is present, such as the x-ray machine. A perchloric acid hood is present in the north west corner of the building in the medical services area.

OBSERVATIONS/ANALYSIS: One wall in the x-ray room contains a lead shield to protect the x-ray technician from exposure to x-rays. All PCB data is below the 100 $\mu g/100\ cm^2$ cleanup criteria. No other chemical concerns were noted. Essentially all miscellaneous items which posed a chemical hazard were removed during chemical consolidation projects conducted under the Weldon Spring Site Remedial Action Project (WSSRAP).

SUPPORTING DOCUMENTS: See the following drawings.



PLAN

H.P. FIN. FLOOR ELEV. 637'-0"
SCALE 1/16" = 1'-0"

FIRE PROTECTION SCHEDULE

- 1 = SODA ACID - 2½ GAL.
- 2 = CO_2 - 15#
- 3 = DRY POWDER #20

LIVE LOAD SCHEDULE

FLOOR 1000 PSF IN STORAGE AREA
" " 500 PSF ALL OTHER OR 10,000# STATIC EQUIVALENT WHEEL LOAD
ROOF - 20 PSF
WIND - 20 PSF

NOTES:
FIRE WALLS & WALLS MARKED (1) EXTEND TO UNDERSIDE OF ROOF DECK.
FOR WINDOWS W-4 IN MASONRY PARTITIONS SEE DETAIL 20 ON DWG. 8408-62.
FOR FL. ELEV. AND FL. DRAIN LOCATIONS SEE DWG. NO. 7408-1
FOR LINTEL SCHEDULE SEE DWG. 8408-62
ALL WATER CLOSETS ARE TO BE FLOOR MOUNTED SEE SPEC. 4411-P-1
FOR DESIGN, MATERIALS, ERECTION, FABRICATION & GENERAL NOTES, SEE SPECS.
ALL MASONRY PARTITIONS, UNLESS NOTED, TO BE TYPE 2 UNRETED PARTITIONS

AS BUILT
BLAW-KNOX CO.

NO	REVISIONS	MADE	CHK	DATE
1	ADDED CUSTOMERS CHANGES	FCB	BRB	6-3-55
2	[illegible]	[illegible]	[illegible]	7-15-55
3	GENERAL REVISION	[illegible]	[illegible]	7-15-55
4	ADDED CUSTOMERS CHANGES [illegible]	MJK	RJS	11-3-55
5	CHANGED DIMENSIONS & CORRECTED DOOR SIZES	[illegible]	[illegible]	10-19-55
6	[illegible]	[illegible]	[illegible]	[illegible]

	BY	DATE
APPROVED FOR AEC	G.H. HILTON	6-1-55
APPROVED FOR MCW	G.E. BROWN	6-1-55
DRAWN	[illegible]	[illegible]
CHECKED	[illegible]	[illegible]
APPROVED	[illegible]	[illegible]
APPROVED	[illegible]	[illegible]
APPROVED		
APPROVED		
SCALE	AS NOTED	

BLAW-KNOX COMPANY
CHEMICAL PLANTS DIVISION
PITTSBURGH, PA.

FOR
U. S. ATOMIC ENERGY COMMISSION
ST. LOUIS AREA OFFICE
AND
MALLINCKRODT CHEMICAL WORKS
ST. LOUIS, MISSOURI

MAINTENANCE & STORES AREA
ARCHITECTURAL
FLOOR PLAN

CONT. No. 4411 | DWG. No. 8408-61 | REV. 6

NOTE: THIS DRAWING PRINTED IN RED INDICATES THE ISSUE TO BE "PRELIMINARY" PRINTED IN BLUE OR BLACK INDICATES THE ISSUE TO BE "FOR PURCHASE & CONSTRUCTION" EXCEPT AS NOTED OR STAMPED TO THE CONTRACT

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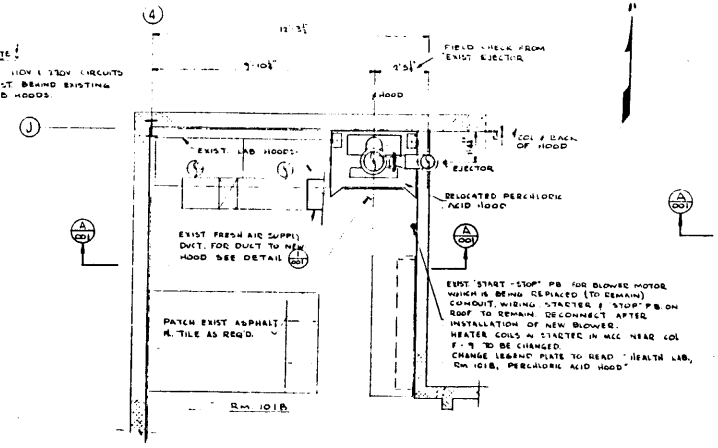
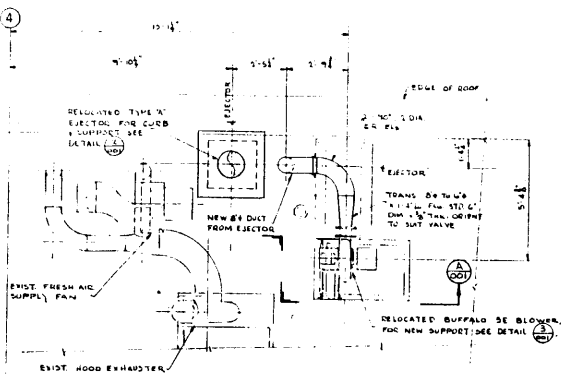
FORM No. E-300-REV. 3 "P"



PLAN

EQUIPMENT LOCATION IN ROOM 1018

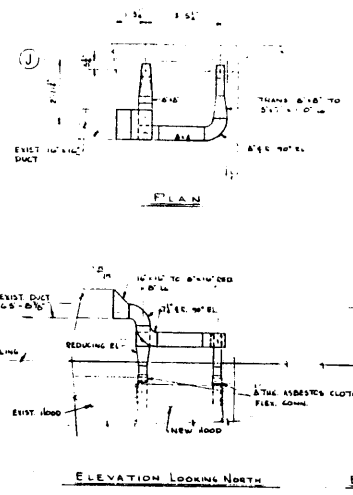
SCALE - 1/4"=1'-0"



PLAN

EQUIPMENT LOCATION ON ROOF

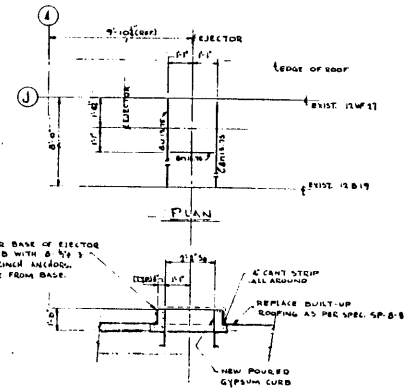
SCALE - 1/4"=1'-0"



DETAIL (1/001)

FRESH AIR DUCTWORK

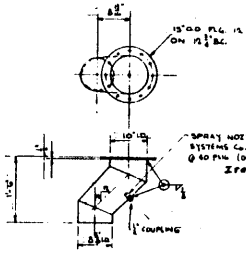
SCALE - 1/4"=1'-0"



DETAIL (2/001)

EJECTOR SUPPORT

SCALE - 1/2"=1'-0"

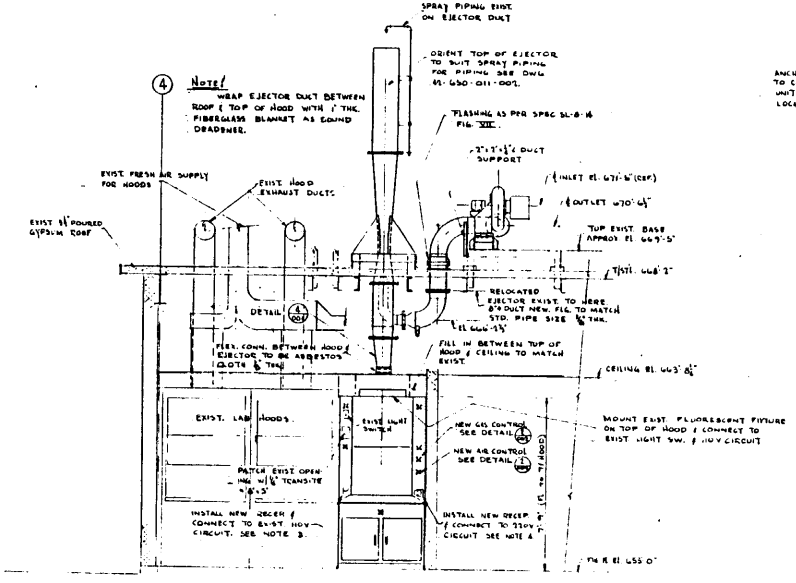


DETAIL (4/001)

EJECTOR TO HOOD CONN

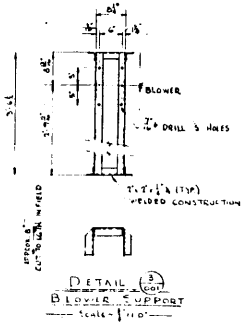
MATL - ALUM. 10ga

SCALE - 1/2"=1'-0"



ELEVATION

SCALE - 1/4"=1'-0"



DETAIL (3/001)

BLOWER SUPPORT

SCALE - 1/2"=1'-0"

General Notes

1) Exhaust Ductwork to be As Per MCW Spec. SL-8-6 (Except as Noted) Supply Ductwork to be As Per MCW Spec SL-8-11 (Except as Noted)
2) Provide Insulating Sleeves & Washers For F/G Bolts Where Iron & Aluminum Duct Connect to Prevent Electrolysis Action on Materials.
3) Recaulk All Transite Joints in Hood with; Sauereisen Cements Co Acid Proof Cement, 75% No. 31 Filler 25% No 31 Binder, Mix & Apply Above 50°F ONLY.
Note: Cement Has Short Pot Life 45 min. 60° to 70° F 30 Min. 70° to 80° F
4) Paint All Interior Surfaces of Hood With Carboline Epoxy Paint No. B15, 2 Coats. Caution: Do Not Use a Vinyl Primmer.

Electrical Notes

1) Where a Conduit Enters a Box or Other Fitting, an Insulated Bushing Shall Be Provided to Protect the Wire From Being Damaged.
2) All Cut Ends of Conduit Shall Be Reamed to Remove Rough Edges
3) Receptacle to be Single, Twist Lock, Polarized, 1Ø, 115V, 10A, 3 Wire, Hubbell 7596G, or Approved Equal With Flush Brass Plate.
4) Receptacle to be 220V, 20A, 1Ø, 3 Wire, Appleton No. AE332, Style 2, Form 8 or Approved Equal

SL-8-6	EXHAUST DUCT SPEC
SL-8-11	SUPPLY DUCT SPEC
SW 4-1	ELECTRICAL SPECS
SP-8-8	MIXED GYPSUM ROOF SPECS
47-650-011-003	AREA PREPARATION
47-650-011-005	PIPING
DWG. NO.	TITLE

REFERENCE DRAWINGS

SL-8-8	PAINTING SPEC
SL-8-14	FLASHING FIG VIII

MALLINCKRODT CHEMICAL WORKS
ST. LOUIS, MO — URANIUM DIVISION — WILSON SPRING, MO
ATOMIC ENERGY COMMISSION CONTRACT NO W-14-108-ENG-6

NO.	REVISIONS	BY	CHKD	DATE

	BY	DATE
DRAWN	JGL/LES/CH	3-30-56
CHECKED	[illegible]	[illegible]
PROJ. ENGR.	[illegible]	4-16-56
APPROVED	[illegible]	4-16-56
APPROVED	[illegible]	[illegible]
APPROVED		
SCALE:	NOTED	

2-6-0-9 AREA 610

HEALTH DEPT PERCHLORIC ACID HOOD

LOCATION & INSTALLATION

DETAILS & ELECTRICAL

DWG. NO. 47-650-011-001

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3.7 Building/Area: Paint Shop - Building 417

DESCRIPTION: The paint shop supported plant maintenance functions, which included applying coatings to various pieces of equipment, containers, fixtures, etc. The building is divided into a general storage section, and work space. The work section is equipped with a spray booth and spray equipment.

CHEMICAL SYSTEMS: This building does not contain process related equipment or piping. Some oily residues and dried/hardened paint spills are present on the floors.

OBSERVATIONS/ANALYSIS: Several areas are designated for PCB cleanup. The spray painting booth requires cleaning, to remove filters and over-spray dust, prior to placement in the MSA. No other chemical concerns were noted. Essentially all miscellaneous items which posed a chemical hazard were removed during chemical consolidation projects conducted under the WSSRAP.

SUPPORTING DOCUMENTS: None.

3.8 Building/Area: Ambulance Garage - Building 430

DESCRIPTION: This is a cinder block building designated as a garage for the chemical plant's ambulance service. It could house two ambulances.

CHEMICAL SYSTEMS: No chemical systems are present.

OBSERVATIONS/ANALYSIS: No PCB contamination areas were detected. No other chemical impacts affecting demolition were observed.

SUPPORTING DOCUMENTS: None.

3.9 Building/Area: Proof Samplers - Buildings 431 and 432

DESCRIPTION: The proof samplers housed automated sampling equipment for taking periodic samples of process sewer and sanitary sewer water, prior to discharge from the site. Laboratory personnel analyzed the waste water for uranium content to ensure that the

concentration of uranium in the waste stream did not exceed 1 g/l. Traces of other process chemicals were also measured periodically, primarily to monitor process efficiencies. There are three proof samplers serving different areas and systems on the chemical plant site. Building 431 proof sampler sampled the laboratory waste water and sewer lines serving Building 407. The Building 432 proof sampler sampled the sanitary sewer system tied to the Imhoff sewage treatment facility.

CHEMICAL SYSTEMS: The proof sampler stations consist of a reinforced concrete structure, flume, flow orifices, pumps, and auxiliary instrumentation below ground, covered by a small prefabricated steel housing. The above ground structures house a proof sampler enclosed in a cabinet, a storage tank (s.s. vat), and instrumentation.

ANALYSIS/OBSERVATIONS: The tanks in Buildings 431 and 432 were empty and no visible residue was present. During plant operation the tank in Building 431 would have contained highly dilute solutions of process chemicals, laboratory reagents, thorium, and uranium compounds. The tank in Building 432 would have contained composites of the sanitary sewer discharge water. The sanitary sewer system was isolated from the process waste streams. These two stainless steel vats will be cleaned to pass a radiological survey as part of the demolition.

SUPPORTING DOCUMENTS: None

3.10 Building/Area: Storage - Building 433

DESCRIPTION: Building 433 was used to store maintenance vehicles and smaller mechanical components.

CHEMICAL SYSTEMS: No chemical systems are present. Several oily spill areas were noted during previous investigations.

OBSERVATIONS/ANALYSIS: All of the areas tested for surface PCB contamination had no detectable PCB.

SUPPORTING DOCUMENTS: None.

4 DEMOLITION PACKAGE 3 BUILDINGS

4.1 Building/Area: Green Salt Plant - Building 201

DESCRIPTION: The green salt plant was designed for conversion of orange oxide (UO_3), from the denitration process in Building 103, to brown oxide (UO_2), and brown oxide to green salt (UF_4).

CHEMICAL SYSTEMS:

Level 1 - Green salt systems: hoppers, weighing hoppers, screw conveyors, and drum filling station,

Hydraulic system: oil reservoirs, piping and filters.
Freon 22 system: pump, condenser and compressor.
Water softener system.
Lime slurry mixing tanks and sump slurry neutralization tanks.
Anhydrous hydrofluoric acid superheaters and vaporizer system.
Anhydrous ammonia dissociation system.
HF rundown tanks from azeotrope distillation system.
Sumps.

Level 2

Hydrofluorination reactors and AHF piping.
UF_4 to UO_2 reverter (R-10) and electric superheater for steam.
Dryers and weighing hoppers.
Hydraulic powered screw conveyors.
Vacuum pumps.
Vacuum cleaning system, dust collectors and piping.
Lime slurry make-up tank.

Level 3

HF reactors and AHF piping.
HF azeotrope distillation system .
Feed hoppers.
HF holding tanks (rubber lined).
Hydrogen distribution system, valves and piping.
Dust collection system.
AHF and nitrogen flow controls.

Level 4

Screw-type UO_3 reduction reactors.
Dust collection cyclone.
Weighing hopper.
Feed hoppers (UO_3).
Screw conveyors.
Fluidized bed reduction reactors - five banks.
HF off-gas piping.
Duct work for dust control system.

Level 5

HF off-gas filters.
Hydrogen burners, propane supply for pilot lights.
Orange oxide hopper unloading platforms.
Duct work.
Exhaust stacks.

ROOFTOPS

Bag houses and other dust control systems.
Refrigeration system for HF azeotrope annex.
Exhaust stacks.

LIST OF CHEMICALS USED IN BUILDING 201:

Lime (calcium hydroxide).
Anhydrous ammonia.
Hydrogen.
Nitrogen.
Freon 22.
Anhydrous hydrofluoric acid.
Hydrofluoric acid, various concentrations.
Uranium oxides.
Uranium tetrafluoride.
Potassium hydroxide.
Hydraulic oil.
Propane.

OBSERVATIONS/ANALYSIS: Uranium oxides and green salt residues are present throughout. Uranium compounds have been deposited on many exposed surfaces as off-gases condensed out on pipe insulation, I-beams, ceilings, handrails, etc. This contamination is highly mobile, and should be removed prior to demolition. Oxides of uranium and green salt are insoluble in water.

The HF, AHF, and azeotrope systems have been ventilated, with several low points found open to the environment. Spot tests conducted on the internals of these systems (at accessible points) were determined pH neutral. Some pipe ends have deposits of green salt. Radioactive residue on all process piping and equipment in this building should be removed prior to placement in the MSA.

All radioactive residuals in this building can be easily detected by a field geiger counter.

Unreacted HF liquid is not expected to be present anywhere in this building, due to its characteristics. It appears that most of the systems have been open to the atmosphere, therefore it is not likely that unreacted HF exists. However, the demolition subcontractor shall approach the HF systems with due caution, especially when disassembling heat exchangers, distillation columns, and horizontal sections of piping. HF protective gear should be specified for disassembling these critical areas, if remote demolition methods are

not used. Hydrogen gas is a by-product when HF reacts with iron, so explosion potential must be monitored before any cutting takes place.

Graphite items (HF azeotrope distillery, condensers, etc.) may contain radioactive residues in unknown quantity. A silver lining 1/8 in. thick is indicated in several as-built drawings, but not discovered during building investigation. There were numerous modifications to the systems in Building 201, so it is possible that the silver-lined equipment was replaced prior to shutdown.

Sump pump-out lines are suspect for radioactive contamination only. Sump water results will reflect contamination levels in the pipe rinse water.

Banks of HF reactors and reduction reactors will need surface cleaning.

The outside nitrogen tank west of Building 201 is empty.

Five banks of fluidized bed reduction reactors are present; they are coated with asbestos and inaccessible for sampling. UO_2 and UO_3 may be present.

The freon system has been vented. It was used in the refrigeration system to control the temperature of Building 202 (AHF Storage) to less than 60°F, and supplied refrigerant to the condensers in the HF azeotrope distillation system. Freon was not an integral part of the chemical processes in Building 201.

Five mixing tanks; No's 0079, 0080, 0081, 0085, 0086 have lime residues inside, and the filter screen between Tanks 0085 and 0086 contains 1/2 lb of yellow cake.

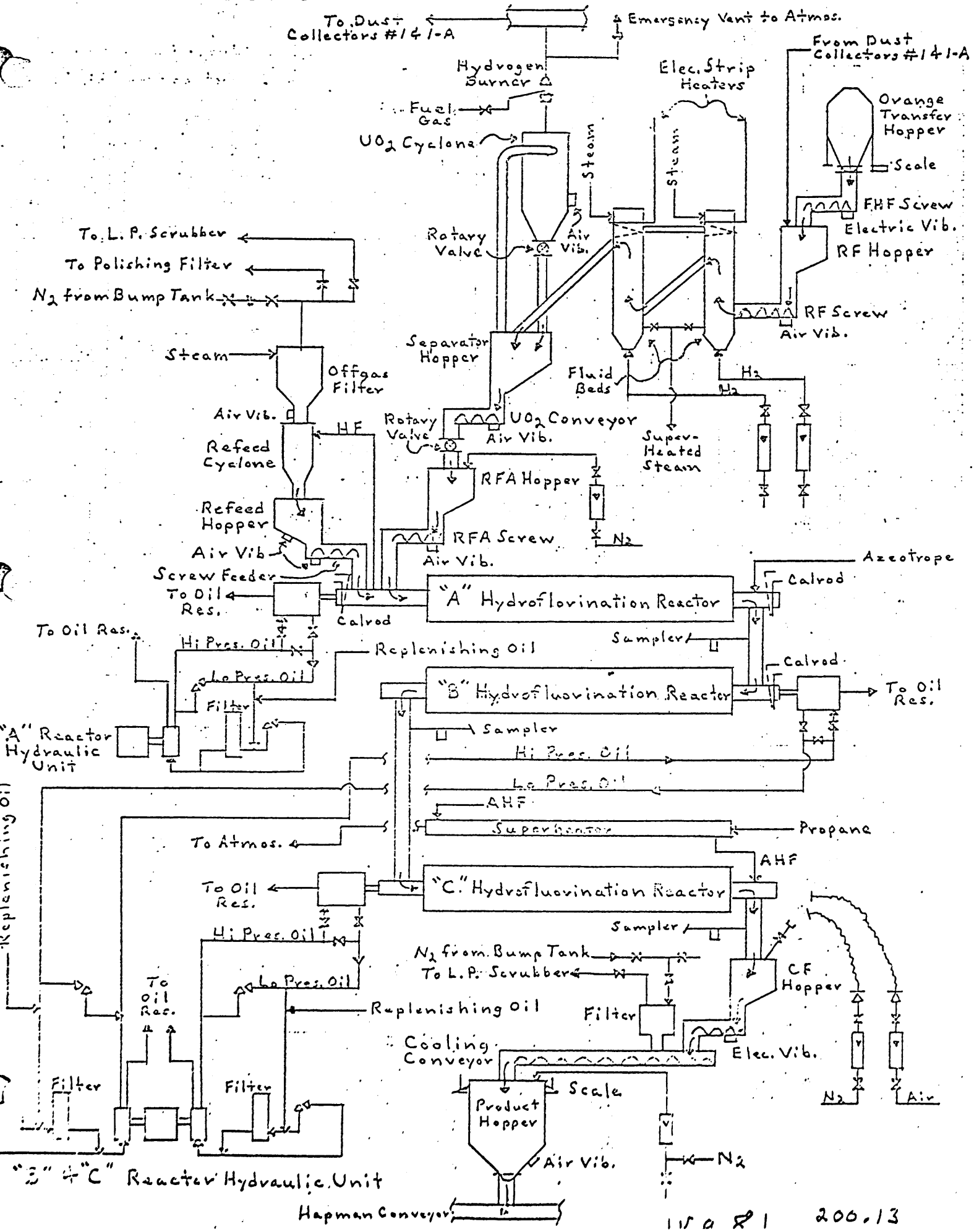
A water softener located on the ground floor is empty.

Utility piping consists of cooling water, steam, air, hydrogen, nitrogen, city water and gas. Much of this piping has been severed during overhead piping removal. Valves are open on these lines.

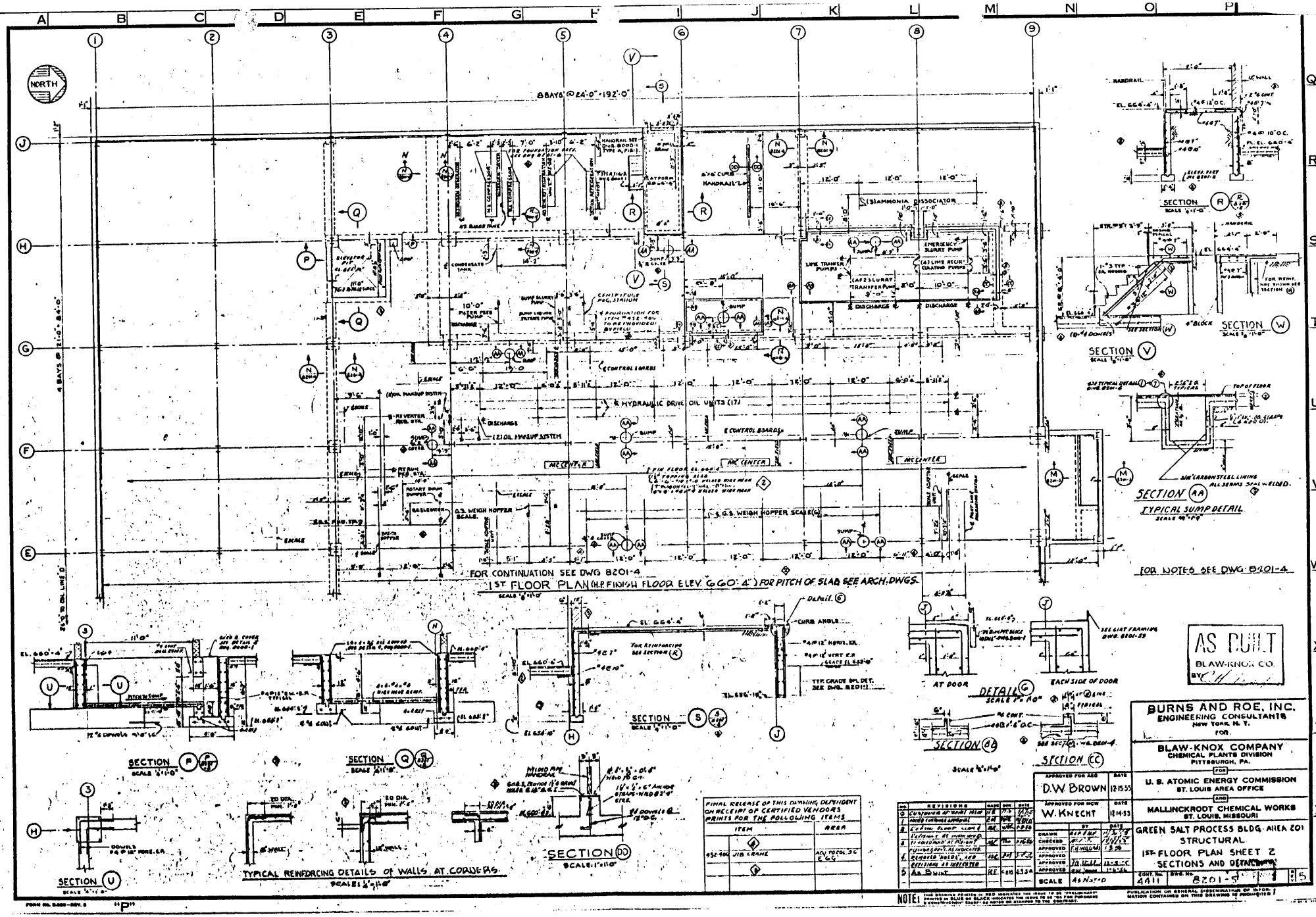
Process piping consisted of hydrofluoric acid lines, lime/acidic waste water neutralization lines, cracked ammonia lines, off-gas lines.

REDUCTION AND HYDROFLUORINATION REACTORS
LEVELS 1 - 5

JOB NO.



200.13



APPROVED FOR AEC	D.W. BROWN	12-15-55
APPROVED FOR BKW	W. KNECHT	12-14-55

	BY	DATE
DRAWN	[illegible]	11-7-55
CHECKED	[illegible]	11-7-55
APPROVED	[illegible]	11-30
APPROVED		
APPROVED	[illegible]	12-8-55
APPROVED	[illegible]	12-14-55
SCALE	AS NOTED	

NO.	REVISIONS	MADE BY	CHK'D BY	DATE
0	CUSTOMER'S REVIEW PRINT	[illegible]	[illegible]	11-7-55
1	ADDED FURNACE APPROVAL	[illegible]	[illegible]	11-30-55
2	ELEVATION FLOOR SLAB	[illegible]	[illegible]	12-8-55
3	ELEVATION AT MAIN DOOR & ELEVATOR PIT HOLD DOWN AT ROOF	[illegible]	[illegible]	12-14-55
4	REVISED "INITIAL AEC REVISIONAL AS INDICATED	[illegible]	[illegible]	12-15-55
5	AS BUILT	[illegible]	[illegible]	4-13-56

FINAL RELEASE OF THIS DRAWING DEPENDENT ON RECEIPT OF CERTIFIED VENDORS PRINTS FOR THE FOLLOWING ITEMS

ITEM	AREA
452-400 JIB CRANE	ADV. PROJ. SEC. E 66

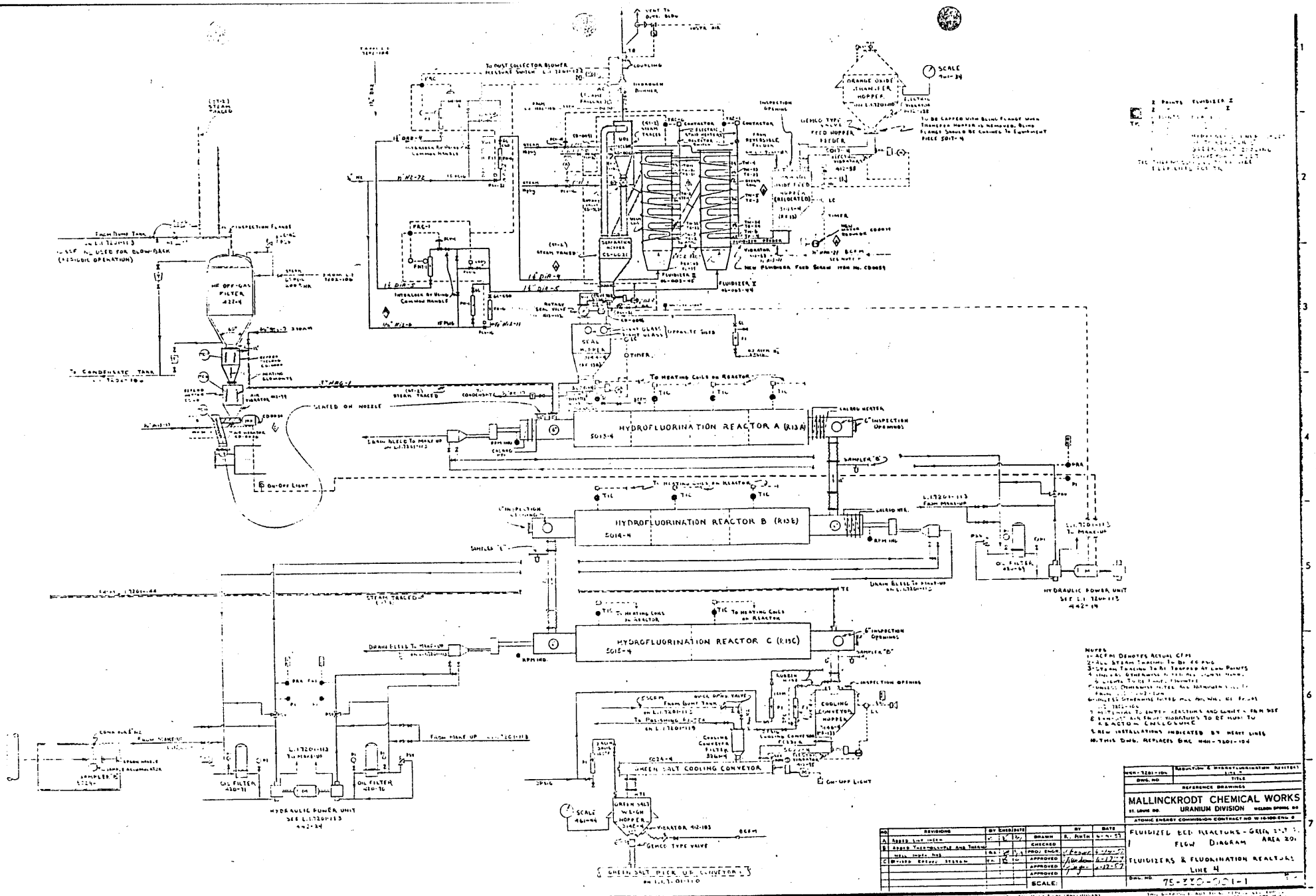
BURNS AND ROE, INC.
ENGINEERING CONSULTANTS
NEW YORK, N. Y.
FOR
BLAW-KNOX COMPANY
CHEMICAL PLANTS DIVISION
PITTSBURGH, PA.
FOR
U. S. ATOMIC ENERGY COMMISSION
ST. LOUIS AREA OFFICE
AND
MALLINCKRODT CHEMICAL WORKS
ST. LOUIS, MISSOURI

GREEN SALT PROCESS BLDG. AREA 201
STRUCTURAL
1ST FLOOR PLAN SHEET 2
SECTIONS AND DETAILS

CONT. No. 4411 DWG. No. 8201-5 SH. 5

NOTE: THIS DRAWING PRINTED IN RED INDICATES THE ISSUE TO BE "PRELIMINARY" PRINTED IN BLUE OR BLACK INDICATES THE ISSUE TO BE "FOR PURCHASE & CONSTRUCTION" STAMPS AS NOTED ARE STAMPED TO THE CONTRACT.

PUBLICATION OR GENERAL DISSEMINATION OF INFORMATION CONTAINED ON THIS DRAWING IS PROHIBITED


HYDROFLUORINATION REACTOR A (R13A)
5013-4
HYDROFLUORINATION REACTOR B (R13B)
5014-4
HYDROFLUORINATION REACTOR C (R13C)
5015-4
HF OFF-GAS FILTER
422-4
SEPARATION HOPPER
CD-0031
FLUIDIZER II
FLUIDIZER I
ORANGE OXIDE TRANSFER HOPPER
FEED HOPPER
GEMCO TYPE VALVE
SEAL HOPPER
TO HEATING COILS ON REACTOR
TO CONDENSATE TANK
SEATED ON NOZZLE
ON-OFF LIGHT
STEAM TRACED
HYDRAULIC POWER UNIT
SEE L.1.7201-113
442-14
OIL FILTER
COOLING CONVEYOR HOPPER
GREEN SALT COOLING CONVEYOR
GREEN SALT WEIGH HOPPER
GREEN SALT PICK UP CONVEYOR
SCALE
NOTES
1- ACFM DENOTES ACTUAL CFM
2- ALL STEAM TRACING TO BE 40 PSIG
3- STEAM TRACING TO BE TRAPPED AT LOW POINTS
4- UNLESS OTHERWISE NOTED ALL ANGLE NOZZLE
5- UNLESS OTHERWISE NOTED ALL NOZZLES
6- UNLESS OTHERWISE NOTED ALL ANGLE NOZZLE
7- MATERIAL TO ENTER REACTORS AND CONVEYORS FROM DEF
8- EXHAUST AIR FROM VIBRATORS TO BE HUMT TO REACTOR ENCLOSURE
9- NEW INSTALLATIONS INDICATED BY HEAVY LINES
10- THIS DWG. REPLACES BMC HHH-7201-104
REDUCTION & HYDROFLUORINATION REACTORS
REFERENCE DRAWINGS
MALLINCKRODT CHEMICAL WORKS
URANIUM DIVISION
ST. LOUIS, MO.
WELDON SPRING, MO.
ATOMIC ENERGY COMMISSION CONTRACT NO. W-16-100-ENG-8
FLUIDIZED BED REACTORS - GREEN SALT FLOW DIAGRAM AREA 201
FLUIDIZERS & FLUORINATION REACTORS
LINE 4
DWG. NO. 75-330-001-1
SCALE:
DRAWN
CHECKED
PROJ. ENGR.
APPROVED
APPROVED
APPROVED
REVISIONS
A ADDED SAFE INDEX
B ADDED THERMOCOUPLE AND THERMO WELL INDEX NOS.
C REVISED EXHAUST SYSTEM
THIS DRAWING PRINTED IN BLUE ON BLACK AND LATER THE ISSUE TO BE "PRELIMINARY" PRINTED IN BLUE ON BLACK AND LATER THE ISSUE TO BE "OK FOR PURCHASE & CONSTRUCTION" UNLESS STAMPED TO THE CONTRARY
THIS DRAWING IS NOT TO BE REPRODUCED, COPIED OR LOANED FOR ANY PURPOSE EXCEPT AS SPECIFICALLY BY THE MALLINCKRODT CHEMICAL WORKS

Potential Resource Conservation Recovery Act/Toxic Substance Control Act (RCRA/TSCA) Wastes: hydrofluoric acid contaminated residues, ammonia residues, and accumulated waste water and sediment in sumps. Lubricants tainted with PCBs are present at several locations identified during sampling. No sources for reactive, toxic or ignitable wastes were identified. HF, ammonia and freon are highly volatile compounds which dissipate rapidly when vented to the atmosphere, and leave no residuals. The sumps are being analyzed for toxic metals. Data is due shortly.

Eleven off-gas condensers and filters are located on the 5th level. These units are coated with asbestos and were inaccessible for sampling. Radioactive solids are expected to be present, no liquids are anticipated due to openings at low points in these items.

Ammonia dissociation systems - level 1 NW corner, Tanks 0247, 0248, 0249 are lined with asbestos insulation. The ammonia dissociators also contain a catalyst consisting of balls made of iron oxide. No free liquids are present.

Dust collection, air handling, and ductwork systems are likely to have large amounts of radioactive dust and uranium compounds. In-house vacuum systems and baghouses are also radiologically contaminated. Baghouses on the roofs were inaccessible for internal inspection; the amount of radioactive dust in these systems is unknown.

SUPPORTING DOCUMENTS: See the following drawings.

4.2 Building/Area: Metals Plant - Building 301

DESCRIPTION: The metals plant was designed to convert green salt to pure uranium metal. The metal was shaped and processed to meet geometric and metallurgical specifications, and prepared for shipment to other off-site facilities.

CHEMICAL SYSTEMS:

uf_4/magnesium blender and reaction vessel loading station.

MgF_2 liner formation (jolter area and MgF_2 loading hoppers).

Thermite reduction furnaces - mixture of UF_4/magnesium.

Slag handling system, dingot cleaning and reactor lid cleaning - MgF_2, uranium and uranium compounds.

Two molten salt baths with water quench baths and oil separator tank (located outside, north of bldg.).

Container washing station.

Turret lathes, boring, rod straightening and sawing machines with cutting/lube/hydraulic oil.

Rotary kiln - oxidized uranium chips and slag for reprocessing.

Crucible formation.

Trichloroethylene vapor degreaser, bulk storage tank and rinse baths.

Sump water treatment system - caustic soda (NaOH) mix tank
settling tank
leaf-type filter tank
filtered water collection tank

Vacuum pumps/hydraulic systems - some used PCB oil.

OBSERVATIONS/ANALYSIS:

According to site archives and field investigations, the chemicals used in this building were UF_4, MgF_2, metallic uranium, metallic magnesium, NaOH, salt bath chemicals (i.e., a mixture of lithium carbonate and potassium carbonate), and trichloroethylene (TCE).
The vacuum cleaning system and duct work are radiologically contaminated. Loose radioactive contamination is everywhere.

The slag processing area in Building 301-south is contaminated with radioactive solids.

The metal shaping/grinding/drilling/milling equipment is oily in most locations.

The container washing system in the NW corner of Building 301 contains high pH radioactive residue, which will be removed as part of demolition of the building.

The caustic tank and three caustic lines are pH neutral; valves may have accumulated rainwater and/or oil inside.

The bulk TCE tank is empty, no TCE was detected by photoionization detector (PID). The lines are free of TCE based on PID measurements. The vapor degreaser and rinse tanks were also negative for TCE vapors, and no sludge or bottom residue was observed. These items are radiologically contaminanted and cleaning is needed.

Although the majority of oil-containing machinery has been drained in-place, selected pieces of inaccessible mechanical equipment throughout the building will have to be drained of oil, decontaminated or containerized as the s/c makes these units accessible.

The salt bath, quench tank, and water storage tank at NE corner of Building 301 were inaccessible for characterization, but are expected to be highly contaminated with radioactivity. The salt bath used molten salt, which the literature indicates was a mixture of lithium carbonate and potassium carbonate as a means of heat-treating the uranium bars. Heat treating was used to randomize the crystalline structure of the metal product, and thus improve its metallurgical properties.

Another salt bath is present in the extrusion press and billet heater area. The salt bath in the extrusion press area was used as a receptacle for miscellaneous debris during plant shutdown. No chemical residues were observed.

MgF_2 residues are present in the liner formation area.

PCB contamination is likely to be present in the capacitor cabinets in the billet heater area. Visible leaks were noted on many of the capacitors taken out of these cabinets.

Utility piping consists of air, steam, water, electrical conduit, and gas.

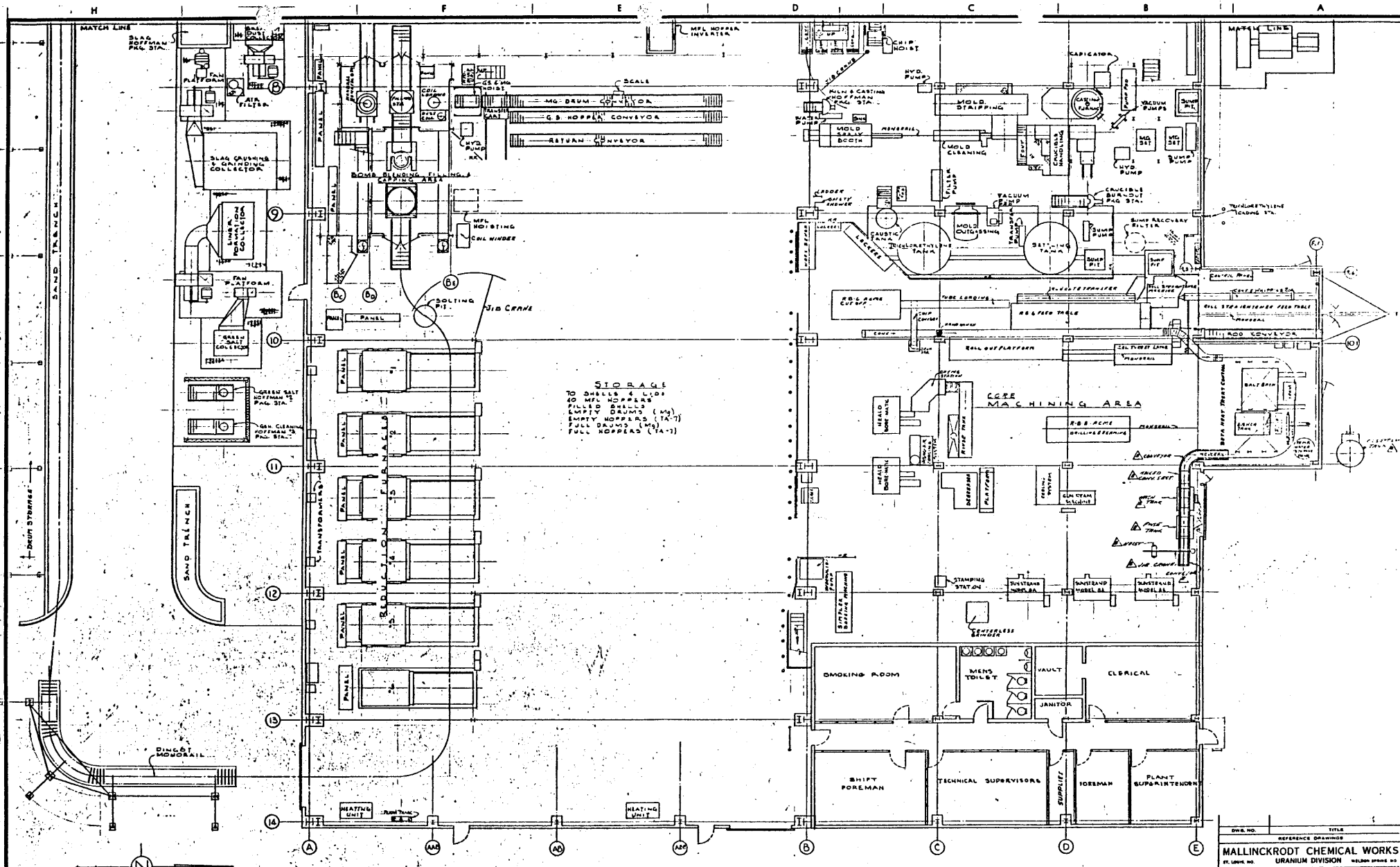
Chemical-carrying piping consisted of TCE and caustic soda solutions.

The oil settling tank outside the north wall of Building 301 was PCB wipe tested, and is not contaminated.

The bar shearing/washing/bundling area in the SW corner of Building 301 was not accessible for sampling.

There are two small out buildings south of Building 301 which need to be accounted for in the statement of work.

SUPPORTING DOCUMENTS: See the following drawings.



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B	[illegible]	RLP	RLP	

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PROJ. ENGR		
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APPROVED		
SCALE:	1/8" = 1'-0"	

DWG. NO. | TITLE

REFERENCE DRAWINGS

MALLINCKRODT CHEMICAL WORKS
ST. LOUIS, MO. URANIUM DIVISION NEWDON SPRING, MO

ATOMIC ENERGY COMMISSION CONTRACT NO W-14-100 ENG-9

AECA 301

METAL PLANT LAYOUT
SHEET 1 OF 2

DWG. NO. 02-360-702-1

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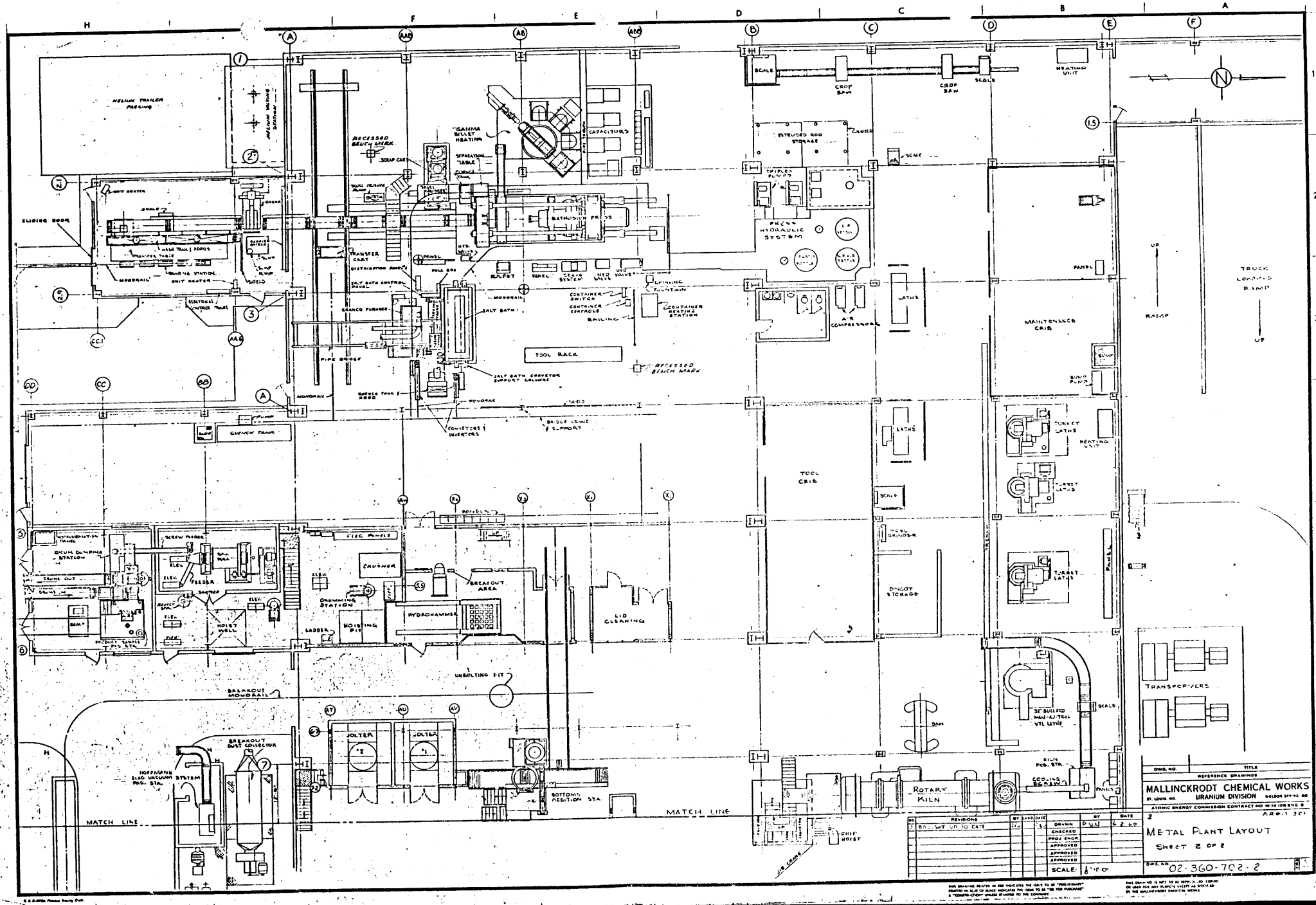

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ARG-7 301

METAL PLANT LAYOUT

SHEET 2 OF 2

DWG. NO. 02-360-702-2

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