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Pacific Northwest Laboratory
Operated for the U.S. Department of Energy
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October 31, 1950

This document consists of

56 pages

To: File

From: F. A. Bowman, Chairman
P-10-X Working Committee

P-10-X DESIGN FEATURES

Purpose of Document

This document will be used to record the major equipment items and arrangements for purposes of:

1. Guidance of the design effort.
2. Information to be used in the preparation of the project proposal.

It reflects the thinking as of date of October 31, 1950.

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P-10-X DESIGN FEATURES

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DECLASSIFIED*Development Building*

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GENERAL SCOPE OF FACILITIES, P-10-X
Parts I & II

*What about
second half of
1951?*

Building

Supplement storage and processing equipment now being installed in 108-B for the P-10-D Project to increase production of P-10 to

] Included will be

handling and storage arrangements compatible with the shipping schedule and use of the product shipping container designed by Los Alamos. An additional metal extraction line will be installed so that available extraction facilities will include two metal lines with the glass lines left installed as back-up facilities.

*When is
the scope
committee letter*

] Processing auxiliaries also will be supplemented as required to handle the increased production schedule and provide more adequate health hazard control, for example, analytical equipment, clothing change facilities, process waste disposal facilities, etc.

2. Provide storage and supply auxiliaries for irradiated P-10 slugs to accommodate the following:

- a. Transferring slugs from 105 Areas to 212-N in regular cask car.
- b. Ageing slugs in 212-N.
- c. Transferring slugs from 212-N to 105-B in regular cask car.
- d. Transferring slugs from regular buckets to shielded casks in 105-B wash pad area.
- e. Transferring slugs in shielded casks from 105-B to 108-B on a truck.

3. Provide storage auxiliaries for ageing, and suitable slug buckets, casks, and cask-handling facilities for shipping E-10 and R-10 fuel slugs to Arco for processing. The actual purchase of auxiliaries for R-10 fuel slugs will be delayed until a decision is reached on the charging of DR.

*Added
in last*

ROUGH DRAFTGENERAL SCOPE OF FACILITIES, P-10-X(Continued)

4. In the case that it is decided to charge the DR pile with P-10 material, 105-DR will be equipped with suitable auxiliary pile control facilities and special devices to assure security and safety under the special conditions of the P-10 program.

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ROUGH DRAFTTARGET DATES

108-B Slug Storage, Can Opening, and Extraction

Lines - Ready for "Shakedown Operation"

(Construction of above facilities complete)

November 1, 1951

Process Equipment Ready for Production

December 31, 1951

Extraction Line to be Shipped

August 1, 1951 *Check this*

Stripping Lines (First) to be Shipped

Indefinite

Shipping Facilities for H-10 Slugs (Fuel)

May 1, 1951

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P-106X DESIGN FEATURES

PREPARED BY

DESIGN DIVISION

PROJECT ENGINEERING DIVISIONS

October 31, 1950

APPROVALS FOR PART I

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PART I

ROUGH DRAFT

CORRELATION OF PRODUCTION SCHEDULE
AND DEVELOPMENT OF PROCESS EQUIPMENT

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At the present time of scoping of the P-10-X installation, several processing phases are not sufficiently definite to allow rigid design. Since the production requirements necessitate continuation of the design effort during the period that the desired processing information is being developed, it is necessary that the design incorporate a considerable degree of flexibility. Examples of situations which are in a state of development are as follows:

1. The metal extraction line for P-10-D, which is basic to the P-10-X production effort, is the first of its kind. It is being fabricated with delivery scheduled for about the time of completion of the scoping of P-10-X. Due to the nature of the materials produced, there is no "semi-works" or "pilot plant" experience on metal production lines.

2. At the present time, the economics of stripping product from the by-product fraction is under study as well as other correlary uses of a stripping line e.g. clean-up of air-contaminated product. A stripping building will be provided with the expectation that it will first be used by the Technical Divisions for hot development.

3. The analytical features for P-10-X are not firm and probably will not be until early 1951. While it seems assured that spectrometers will be used for analysis, the particular type, number and type of companion facilities required is uncertain.

4. Procedures for product container outgassing are to be specified by Los Alamos. At present there is no definite processing guide.

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●
CORRELATION OF PRODUCTION SCHEDULE (Continued) ●

In view of the above situations, it is clear that the scheduling activities must include as high a degree of flexibility as is consistent with space and other design limitations. ● ●

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P-10-X DESIGN FEATURES - BUILDING 108-BPROCESS EQUIPMENT1. Extraction Lines

One additional metal extraction line will be installed in addition to the metal extraction line being installed under the P-10-D Project. Both of these extraction lines will have a design capacity of 20 P-10 slugs per run or approximately 4,000 cc's (S.T.P.) of ~~P-10 product~~ ^{Isotum} per run.

Material Balance Flow

Sheet, H-1-2571, shows additional details of the extraction line performance.

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Facilities to accommodate two product shipping containers and two by-product containers will be provided on each line. The product shipping

PROCESS EQUIPMENT (Continued)

container (12 liter capacity) is being developed by Los Alamos specifically for this service. This shipping container will hold the product from three runs at a pressure of approximately one atmosphere. Present planning is to use product shipping containers for by-product storage if it is decided economically sound to install stripping facilities. The basis for this proposal is that after use in by-product service, these containers may be outgassed and reused in product service whereas a special by-product container could not be used for any other known service. One run will produce approximately 9 liters (S.T.P.) of by-product. In the event stripping facilities are not installed but both by-product and outgassed fractions are vented to the stack, a small number of product shipping containers would be specifically marked for use in storing by-product and outgassed fractions during periods when meteorological conditions prevent venting to the stack. These fractions would then be vented to the stack when weather conditions were favorable. A separate small hood and exhaust pump will be provided in Extraction Cell #1 for this controlled venting. This cell contains the extraction line installed for the P-10-D Project.

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A resistance furnace will be provided for the extraction line and will be separately hooded and exhausted.

PROCESS EQUIPMENT (Continued) *check this*DECLASSIFIED
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MS/afford
Forced cooling may be necessary to effect such a schedule. The relation between furnace cycle and extraction line cycle is shown on H-1-2573 (Engineering Flow Diagram). The furnace will be designed by General Electric, Hanford.

The extraction line and furnace will be located in Extraction Cell #2 which will be a duplicate of Extraction Cell #1. This provides working space around the line hood as well as space for a decontamination hood since this cell will not contain the controlled venting hood located in Cell #1.

Each extraction cell will be equipped with a leak detector.

2. Stripping Lines *BELL*

The specific method and equipment for stripping or extracting P-10 from the by-product fraction has not been selected at this time.

The building allotted for the installation of stripping lines should it be found desirable, has been sized to accommodate hot semi-work studies by the Technical Divisions.

PROCESS EQUIPMENT (Continued)

As mentioned previously, it may be desirable to provide stripping lines for the purification of any product which becomes contaminated with air. Pending a decision on the installation of stripping facilities, no storage space is planned for the storage of any appreciable number of containers filled with the by-product fraction.

DECLASSIFIED3. Process Control Room

Individual controls for each extraction line (P-10-X and P-10-B) will be located in a main control room separate from the extraction cells. For the most part, the extraction process will be remotely controlled. Most of the valves will be either solenoid or hydraulically operated, but a few control valves must be operated manually. Connecting and disconnecting product and by-product containers and furnace charging and discharging must be performed manually. The control and instrument panels will be supplied as packaged units along with the extraction lines by the General Engineering and Consulting Laboratory.

Controls for the extraction furnace are separate and will be designed by General Electric, Hanford. They will be located in the control room adjacent to the controls for the extraction lines. Instruments for the air monitoring systems, including individual recorders and Beckman instruments, will also be located in the main control room and will be supplied by Hanford. These will be patterned, in general, after the units already existing in Building 103-B. A test rack and work bench to be used in

PROCESS EQUIPMENT (Continued)

servicing the monitoring equipment and other instruments will be provided in the control room.

4. Analytical Room

Space will be provided to accommodate sufficient analytical instruments as may be decided are necessary based on the present thinking of the use of spectrometers, ion gauges, density balances, analytical glass lines, etc. Flexibility will be provided to accommodate final selection of analytical equipment in early 1951.

At present it seems that 3 spectrometers will be needed for product analysis and control. A sample of product from each extraction run will be analyzed before it is pumped into the shipping container.

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In view of the uncertainty of analytical requirements, future changes may require more space which may necessitate rearrangement of other existing space. The existing spectrometer and analytical rooms now on the third floor will be left in their present location. They are to be included in the over-all analytical facilities.

5. Decontamination Hood

A stainless steel hood installed as part of the P-10-D program will be adequate for the P-10-D program for the purpose of repairing or cleaning any component parts of the process equipment.

PROCESS EQUIPMENT (Continued)

Degreasing agents or dilute acids may be used in this hood to decontaminate parts which might be reused. A minimum air velocity of 200 feet per minute is provided at the hood opening. The exhaust air will be discharged into the stack duct.

6. Furnace Pot Outgassing

On the first floor of Building 108-B, three furnaces, a vacuum system, and a helium leak detector are already provided for under the P-10-D Project. These will be sufficient for use in the P-10-X program for outgassing and vacuum testing the furnace pots.

One furnace will outgas and allow the testing of one furnace pot per shift. In order to meet this time cycle, it may be necessary to force cool the furnace pots or to lift them from the furnace before completely cooled so as to allow another furnace pot to be loaded at the beginning of the next shift. This is desirable so that two furnaces will be capable of supplying furnace pots for each extraction line and allowing the third furnace to be kept as a stand-by unit.

*furnace
cycles
1 m/h
2 m/h*

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PROCESS EQUIPMENT (Continued)7. Shipping Container Outgassing

At the present time, a definite procedure has not been established for the outgassing of shipping containers. There is a possibility that the vendor may be required to hydrogen fire and outgas the shipping containers prior to delivery on the project, however, the "P" Division is investigating whether or not this would eliminate the necessity of outgassing the shipping containers just prior to use since there is a possibility of air leakage into the containers during the time the vendor would outgas and they would be used on the project.

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It will be necessary to erect a small building near Building 10E-3 if on site outgassing of shipping containers is necessary. This building might be in the form of an addition to the stripping building.

8. Slug Drying

Slugs must be thoroughly dried before they are decanned and loaded into the furnace pot because the presence of moisture in the pot would be detrimental to the process. The slugs will be dropped out of the shielded transfer cask one or two at a time depending on whether a 20 or 40 slug capacity supply cask is used. They will be manually loaded into the dryer which will dry the slugs by use of heated forced air introduced through high velocity jets. Air will be exhausted from the drier at a sufficient rate to maintain a negative pressure inside the drier with respect to the surrounding atmosphere. The exhaust air will be discharged into the duct leading to the 300 foot stack. The drier will be mounted in the existing can opening hood.

PROCESS EQUIPMENT (Continued)

9. Can Opening

The roller type can opener already available for Project P-10-D will be sufficient for the P-10-X program. This is also true of the facilities available for the disposal of the can opening waste and facilities for trucking to the burial ground.

10. Furnace Pot Loading

Facilities already available for the loading of furnace pots for the P-10-D Project will be sufficient for the P-10-X program.

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PROCESS HANDLING FACILITIES1. P-10 Slug Supply Cask

Casks with either 20 slug capacity (slug supply for one charge) or 40 slug capacity will be provided for transferring aged irradiated P-10 slugs from the Building 105-B to the Building 108-B. Due to the present state of knowledge as to the radiation level of individual slugs, it is not yet possible to complete the design of the casks nor to make a definite decision between the 20 and 40 slug capacity. A sufficient number of casks will be constructed to provide storage in Building 108-B for a half of a week's production requirement plus a sufficient number to be in 105-B to allow loading of casks during off-peak periods.

2. Wet Storage, Building 212-N

Existing facilities at 212-N will be used for the storage during ageing of P-10 slugs. They will be transported in regular buckets using existing cask cars for transfer from the 105 Areas to the Building 212-N and also for the return of aged slugs to the Building 105-B for subsequent loading to the transfer casks prior to shipment to the Building 108-B. Transfer of the slugs from the buckets to shielded transfer casks will be done at the wash pad area in the 105-B Building.

3. Truck Transfer Building 105-B to Building 108-B

A flat bed truck with tarpaulin will be used for transferring in groups of 5 or 6 casks between the Buildings 105-B and 108-B. Two transfers a week are contemplated.

4. Loading Dock, Building 108-B

A new loading dock will be constructed on the west side of the Building 108-B, with entrance into the building into what is now the metal storage

PROCESS HANDLING FACILITIES (Continued)

area. This entrance will be just south of the existing north wall of this room.

DECLASSIFIED5. Monorail, Building 108-B

A monorail with a $1\frac{1}{2}$ ton motor driven electric hoist will be provided to move the supply cask from the 108-B loading dock to the cask storage space and also from the cask storage space to the can opening hood. It will also be used to load the furnace pot and cask into the loading fixture. A study is being made as to whether or not the filters now in the can opening hood are necessary. If not, they will be removed to allow the extension of the monorail for the complete length of the hood. This would allow a complete rearrangement of the can opening facilities into a more orderly flow.

6. Dry Storage, Building 108-B

Space will be provided for the storage of a half of a week's supply of P-10 slugs in supply casks immediately adjacent to the 108-B loading dock. This will be done by constructing a new wall 12 feet south of the north wall of the room now used for metal storage. A hydraulic lift truck will be provided for handling casks in this room.

7. Pot Cask

The furnace pots will be placed in lead-lined casks and loaded with decanned slugs. These casks will contain the pot during transfer until the pot is placed in the extraction furnace. They will also be used for holding the furnace pot when the latter is being removed after processing. Lead shielding will be used in the cask sufficient to reduce the radiation reading to less than 10 MR/hr. One furnace pot cask will be available

PROCESS HANDLING FACILITIES (Continued)

from the P-10-D Project, however, in order to insure adequate supply of furnace pots for the extraction lines, 5 additional casks will be built for the P-10-X Project so that a supply of loaded pots will be on hand in case for any reason the can opening facilities would have to be shut down for any length of time.

DECLASSIFIED8. Pot Cask Handling

The monorail beginning at the new loading dock will terminate in the hood in the can opening room over the pot cask loading fixture. The cask, after the pot has been loaded, will be lowered into a special dolly which will be used to move the cask into the elevator for transfer to and from the third floor. This dolly has already been supplied by the P-10-D Project.

9. Elevator

A 2,500 pound capacity freight elevator will be provided for handling the transportation of the pot cask dolly from the first to the third floor of Building 108-B. The elevator will also be used for carrying miscellaneous freight such as shipping containers, essential materials, sampler, leak detectors, laundry, etc. It will have a 4' x 6' platform and have a maximum lift of 25 feet per minute.

The elevator shaft will be fully enclosed and the elevator will conform to all code requirements for elevator construction. It will be of the self-supporting type so that the building except for the foundation under the elevator will not have to bear any of the load.

10. Extraction Furnace Monorail

A one ton monorail hoist installed above the extraction line furnace

PROCESS HANDLING FACILITIES (Continued)

will be used for transferring the pot cask from the dolly to the furnace at which point the pot will be lowered into the furnace. This procedure will be reversed for unloading the furnace.

- Furnace and Can Opening Waste Removal*
11. The discharged furnace pot and contents will be moved in the pot cask (Item 7) from the extraction line cells to the dock by dolly and elevator. The waste material will then be transferred to the burial ground by suitable truck or burial cart.

The dolly and shielded cask designed for the P-10-D Project will be used for transferring scrap cans from the can opening room to the loading dock.

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CONTAMINATION CONTROL ©

The existing zoning system in Building 108-B consists of "hot" zones wherein processing of irradiated materials takes place, such as the Glass Line hood room, and "cold" zones, such as the third floor control room, which include the remainder of the building. However, these "cold" zones are not entirely regulated with respect to personnel traffic nor the ventilation systems; and since contamination has been encountered in certain locations of this "cold" zone, it is proposed that a more extensive zoning system be established where economically practical to insure firm control of radiation hazards.

The proposed building arrangement is such that traffic to a hazard zone must originate in the lowest category (least hazard) and proceed through control points to successively higher rated zones. Except for emergency exits, return traffic must follow the entry sequence in reverse order. Since it is essential that traffic to the higher rated zones be reduced to a minimum, the various building services, process equipment, operations, etc. are located in the minimum zone category compatible with their potential hazard wherever possible. However, the location of some existing facilities is such that it would be impossible to follow this ideal arrangement 100% without involving considerable expense. ©

Every effort will be made to provide physical separation of zones through use of solid walls, partitions, floors, and ceilings except at the necessary control point openings for personnel or material traffic. © The ventilation system will constitute an important phase of zone control and will be used to safeguard against cross-contamination of zones. Minor changes to existing ventilation systems will be necessary to insure this.

A breakdown of the hazardous areas and operations results in five principal categories. The zones are given numerical designations which decrease with decreasing hazard.

CONTAMINATION CONTROL (Continued)Zone 5

Zone 5 includes all points within enclosures where radio-active materials are processed. The enclosures shall be ventilated by suction only and shall be equipped to maintain a static pressure always below that of the surroundings. The suction ventilation openings to the enclosures shall have a minimum face velocity of 200 feet per minute for the entering air. Each Zone 5 enclosure should be provided with suitable by-pass openings to insure adequate enclosure ventilation when access doors are closed. Gaseous contaminants will be discharged direct to the house exhaust for transfer to the main 300 foot exhaust stack. All Zone 5 enclosure openings shall be made to either a Zone 5 enclosure of similar hazard or a Zone 4 serving the Zone 5 in question.

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All Zone 5 enclosures shall be constructed of smooth, nonporous material suitable for surface decontamination.

A typical Zone 5 area is within the extraction line and furnace hoods.

Zone 4

This zone serves the primary purpose of providing safety areas about Zone 5 enclosures wherein maintenance, loading, unloading, inspection, and incidental operations on the Zone 5 equipment may be conducted. Safety features will include controlled room air pressure, controlled access through Zone 4-A area, fresh air masks where necessary, and the necessary air sampling and air monitoring equipment. The wall surfaces of Zone 4 areas will be coated with a suitable strippable coating to facilitate decontamination.

CONTAMINATION CONTROL (Continued)

A secondary purpose of the Zone 4 areas will be short term transfer storage of radio-active materials in sealed containers.

Those tools used in Zone 5 work which cannot be stored in the Zone 5 enclosures shall be stored in Zone 4 areas.

Typical Zone 4 areas are the cell room which houses the extraction line hood and the can opening room.

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Zone 4-A

Zone 4-A includes all areas wherein personnel proceed from Zone 3 areas to zones of greater hazards and the transfer and storage of radio-active material occurs with additional 4-A classification of spaces such as pipeways and equipment rooms where radio-active material in air might be expected to infiltrate.

A secondary purpose for Zone 4-A areas will be to serve as plenum chambers from which Zone 4 areas draw fresh air by means of suction through the Zone 5 enclosures.

The most practical building arrangement utilizing existing facilities requires that certain areas which would normally be Zone 1 be classified Zone 4-A since they can be reached only by passing through a Zone 4-A area. Every effort will be made to minimize the occurrence of such areas.

A typical Zone 4-A area is the control room on the third floor.

Zone 3

The Zone 3 category is confined to areas used as "hot" change rooms.

CONTAMINATION CONTROL (Continued)

Such areas are the lowest category wherein radio-active materials might be normally encountered, and then as contaminants carried on protective clothing only. Zone 3 change rooms will contain the principal personnel monitoring instrument and protective equipment used in the higher rated zones.

Zone 2

Zone 2 includes all "cold" change rooms serving Zone 3 areas. Zone 2 spaces may be considered as safety zones to prevent the accidental spread of radiation contamination from Zone 3 areas.

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Zone 1

The Zone 1 category consists of all spaces within the building which might be considered as reasonably free and safe from radio-active contamination. There should be no transfer, irrespective of kind or means, of radio-active material or contaminated equipment through Zone 1 areas.

A typical Zone 1 area is the P-10 alloy room.

The Zone breakdown presented herein is confined to consideration of the personnel hazards involved in the handling of radio-active materials. The zoning classifications are not necessarily based on the quantity or radiation intensity of the material handled, but rather upon the likelihood of release of such material in the personnel environment. Storage casks and the various process lines may contain potential hazards greater than would be found in some Zone 5 areas; however, when casks and lines are securely sealed and shielded, they may be considered as within Zone 4 or 4-A category for transfer or storage. In no case should operations upon radio-active materials, including transfer and storage, be conducted in areas of lower classification than Zone 4-A

CONTAMINATION CONTROL (Continued) **DECLASSIFIED**

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VENTILATION1. GENERAL

The present ventilation system in Building 108-B has the principal function of: (1) general building ventilation and temperature control; (2) hood enclosure (Zone 5) ventilation; and (3) general building air flow zoning. The capacity of this system is to be increased to provide for additional hoods and equipment. The system must also be altered to some extent to provide necessary air flow control consistent with the proposed contamination control zoning system (See Section III).

Auxiliary ventilation systems will be required for the product storage building and the stripping and shipping container outgassing building. *DW*

The systems described herein include all supply and exhaust facilities required except the fresh air make supply. The facilities required for building heating also are included here because of their vital relation to ventilation functions of temperature control.

GENERAL DESIGN CRITERIAA. Design Conditions for Temperature Control

(1) Summer:

Outside Air: 104°F. Dry Bulb and 69°F. Wet Bulb

Inside Air: 85°F. Dry Bulb (Max.)

78°F. Dry Bulb (Control setting)

(2) Winter:

Outside Air: 0°F. (For building heating)

-10°F. (For ventilation unit design)

Inside Air: 75°F. Dry Bulb and 62°F. Wet Bulb

(3) Ventilation Rate - Minimum

Zone 1 areas: 10 air changes/hr

All Other Zones: 15 air changes/hr

VENTILATION (Continued)

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B. Hood Enclosure Ventilation

- (1) Supply to Zone 5 enclosures must be by suction only from adjacent Zone 4 areas.
- (2) The minimum face velocity of ventilation air through normal working openings of Zone 5 enclosures shall be 200 feet per minute. Face velocities at other enclosures shall conform with current best practice.
- (3) The exhaust of Zone 5 enclosures shall be through main exhaust ducts to an exhaust fan, thence to the stack.
- (4) All contaminated or potentially contaminated exhaust air shall be discharged to atmosphere through the existing 300 foot waste gas stack. The necessity for this is set forth in Document HW-18467 (Basic Health Standards - P-10, by H. M. Parker.)

C. Building Zone Control

- (1) The direction of air flow within the building must be maintained in the direction of increasing numerical zone category. Static pressure or velocity regulation will be used where necessary.
- (2) All exhaust fan motors and supply fan motors are to be on emergency power to insure continuous ventilation of the building. If it becomes necessary to reduce the emergency power requirements of the building, steam turbine driven stand-by fans will be installed on the ~~Primary and Secondary~~ systems.

VENTILATION (continued)

2. COMPONENTS OF SYSTEM:

A. Supply

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Two factors contribute to the arrangement and capacity of the supply system. First, the various ventilated enclosures must be supplied with conditioned air to insure dependable year-around operation. Second, the high summer temperatures encountered at the site necessitate provision for summer cooling. Generally, the enclosure ventilation requirements dictate the supply system capacity, but local cooling load considerations within the building set the minimum supply allowable, particularly in Zone 1 areas.

(1) Supply for 108-B Building

The general supply system in Building 108-B consists of four separate integral units. In order to meet the increased demands, each of the units must be stepped-up to its maximum capacity as listed:

<u>Unit</u>	<u>Capacity, c.f.m.</u>
Primary (Installed for original building)	24,000
Secondary (Installed for P-10-D Project)	33,000
P-10-A Supply Unit	11,000
P-10-B Supply Unit	7,000
Total	75,000

The indicated capacities can be obtained with a minimum of alterations. Each unit will require a new motor and drive, and it will be necessary to increase the filtering area of the Secondary unit. The air washers installed in the Primary and Secondary units will necessarily have a lesser humidifying efficiency at the increased capacities, but preliminary investigations indicate that this reduction will not be serious. For space saving reasons and the fact that air in the P-10 alloy room must contain no more moisture than is necessary, cooling coils were used in place of evaporative coolers for the P-10-B and

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VENTILATION (Continued)

the P-10-A supply units. These units will meet the increased cooling demands.

P-10-A and P-10-B supply units shall serve the fixed air requirements of the Zone 1 areas. The air quantities shall be constant to insure relative pressurizing of Zone 1 areas regardless of higher Zone ventilation demand.

The Primary and Secondary air supply systems shall serve Zone 4-A areas directly with a variable air supply governed by changing enclosure ventilation demand.

The metallic ductwork of the existing distribution systems will be used wherever possible. Alterations and additions to the systems will be of similar construction.

(2) Product Storage Building Supply

A separate supply unit of approximately 2,500 c.f.m. capacity will be installed at the product storage building to temper and condition the storage ventilation air. Particular attention will be directed at the design features contributing to fire hazard and dependable operation.

(3) Stripping and Shipping Container Outgassing Building Supply

This building will be provided with a variable air supply system with a maximum capacity of approximately 15,000 c.f.m. The system will temper and humidify the ventilation air and provide general air flow zoning similar to that in the 108-B Building.

VENTILATION (Continued)

DECLASSIFIED

B. Exhaust

The contaminated or potentially contaminated exhaust system constitutes the principle exhaust of the Building 108-B and the complete exhaust of the product storage and the stripping and shipping container outgassing buildings. The size of the exhaust system is determined by the estimated quantities listed below for enclosure ventilation.

ROUGH DRAFT

VENTILATION (Continued)(1) Building 108-B Exhaust(a) Contaminated or Potentially Contaminated ExhaustThird Floor

<u>Enclosure</u>	<u>Maximum Permissible Operating Rate, c.f.m.</u>	<u>Minimum Rate, c.f.m.</u>	<u>50% Use Factor Rate, c.f.m.</u>
5 Glass Extraction Lines	Based on existing operating condi- tions 21,000	21,000	21,000
Metal Extraction Unit-- 8 doors total	4 doors open-- 7,600	All doors closed-- Air through by-pass 3,700	7,600
Furnace Unit-- 3 doors / 6" x 5'-0" slot	1 door open-- 4,650	All doors closed-- Air through slot 3,650	4,650
Metal Extraction Unit-- 8 doors total	4 doors open-- 7,600	All doors closed-- Air through by-pass 3,700	3,700
Furnace Unit-- 3 doors / 6" x 5'-0" slot	1 door open-- 4,650	All doors closed-- Air through slot 3,650	3,650
Helium Hood-- 4 doors total	2 doors open-- 4,000	All doors closed-- Air through by-pass 2,300	4,000
Helium Hood-- 4 doors total	2 doors open-- 4,000	All doors closed-- Air through by-pass 2,300	2,300
Decontamination Hood-- 1 door	door open-- 2,000	Doors closed-- Air through 3" slot 500	2,000
Decontamination Hood-- 1 door	door open-- 2,000	Door closed-- Air through 3" slot 500	500

DECLASSIFIED

ROUGH DRAFT

VENTILATION (Continued)

Third Floor (Continued)

Enclosure

By-product disposal
Hood-- 1 door

Analytical Glass Line
Hood--4 doors total

Analytical Balance
Hood--1 door

Spectrometer Hood--
1 door and filter

	<u>Maximum Permissible Operating Rate, c.f.m.</u>	<u>Minimum Rate, c.f.m.</u>	<u>50% Design Factor Rate, c.f.m.</u>
door open--	1,500	Door closed-- Air through 3" slot 300	300
2 doors open--	4,000	All doors closed-- Air through by-pass 2,300	4,000
door open--	200	Door closed-- Air through 3" slot 200	200
door open--	400	Door closed-- Air through filter 300	400
	63,600	44,300	54,300

DECLASSIFIED

VENTILATION (Continued)

Second Floor

<u>Enclosure</u>	<u>Maximum Permissible Operating Rate, c.f.m.</u>	<u>Minimum Rate, c.f.m.</u>	<u>50% Use Factor Rate, c.f.m. *</u>
Spectrometer Hood-- 1 door and filter	Door open-- 400	Door closed-- Air through filter 300	400
Spectrometer Hood-- 1 door and filter	Door open-- 400	Door closed-- Air through filter 300	300
Analytical Hood-- 1 door	Door open-- 2,000	Door closed-- Air through 3" slot 500	2,000
H. I. Hood-- 1 door	Door open-- 2,000	Door closed-- Air through 3" slot 500	500
Maintenance Shop Hood--1 door	Door open-- 2,000	Door closed-- Air through 3" slot 500	500
	6,800	2,100	5,200

First Floor

Can Opening Hood-- 9" slot all around	3,000	3,000	3,000
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*The 50% Use Factor Rate is used as a design basis for Exhaust System. The following indicate the method used in determining this rate:

1. Rate of flow through all hoods requiring continuous flow. Example Can Opening-- 3,000 c.f.m.
2. Maximum rate of flow through one-half of all similar hoods used in more than one place on a given floor, and the minimum rate of flow through the remaining one-half of these hoods. Extraction Unit--7,600 c.f.m.
Extraction Unit--3,700 c.f.m.

VENTILATION (Continued)(b) Exhaust Air Free and Safe from Radio-Active Contamination

P-10 Alley Room 8,500 c.f.m.

P-10-B Cold Laboratory 4,100

12,600 c.f.m.

(2) Product Storage and Stripping and Shipping Container Outgassing Buildings ExhaustProduct Storage Building

<u>Enclosure</u>	<u>Maximum Permissible Operating Rate, c.f.m.</u>	<u>Minimum Rate, c.f.m.</u>	<u>50% Use Factor Rate, c.f.m.</u>
Shipping Container Storage Cells	500	500	500
Storage Room	<u>2,000</u>	<u>2,000</u>	<u>2,000</u>
	2,500	2,500	2,500

Stripping and Shipping Container Outgassing Building

Stripping Unit— 10 doors (Estimated)	5 doors open— 9,600	All doors closed— Air through by-pass , 3,700	9,600
Helium Hood— 4 doors total	2 doors open— 4,000	All doors closed— Air through by-pass 2,300	4,000
Cryostat Hood— 4 doors (Estimated)	2 doors open— 2,400	All doors closed— Air through by-pass 800	800
Outgassing Room	<u>1,500</u>	<u>1,500</u>	<u>1,500</u>
	17,500	8,300	15,900

DECLASSIFIED

VENTILATION (continued)**DECLASSIFIED**Total Contaminated Air Exhaust - Discharge to Stack

	<u>Maximum Rate, c.f.m.</u>	<u>Minimum Rate, c.f.m.</u>	<u>50% UF Rate, c.f.m.</u>
Building 108-B			
Third Floor	63,600	44,300	54,300
Second Floor	6,800	2,100	5,200
First Floor	<u>3,000</u>	<u>3,000</u>	<u>3,000</u>
	73,400	49,400	62,500
Product Strg. Bldg.	2,500	2,500	2,500
Stripping & Shipping Container Outgassing Building	<u>17,500</u>	<u>8,300</u>	<u>15,900</u>
	93,400	60,200	80,900

- © The general contaminated air exhaust system shall consist of three separate and integral systems: (1) 108-B Building general exhaust; (2) can opening room exhaust; and (3) product storage and stripping and shipping container outgassing buildings exhaust. Each system discharges to the stack; and all systems shall be on emergency power and shall be electrically inter-connected so that should any motor cease operating for any reason, the remaining motors will also shutdown. © This precaution is necessary to prevent the possibility of backing air through a Zone 5 enclosure into a Zone 4 area ©

3. BUILDING AIR FLOW ZONING

The P-10-A and P-10-B supply units shall supply air to Zone 1 areas.

A portion of this air shall exhaust direct to Zone 4-A areas, thence to Zone 4 areas.

DECLASSIFIED

VENTILATION (Continued)

The Primary and Secondary supply units shall supply air to Zone 4-A areas with exhaust to Zone 4 areas.

In addition to the above, the Primary supply unit shall supply air to the Zone 2 change area with exhaust to the Zone 3 change area.

Zone 4 areas will be supplied by suction (Zone 5 enclosure) only through inlets from Zone 4-A areas. Air supply to the Zone 4-A areas shall be controlled by throttling louver dampers. These dampers shall be controlled by static pressure instruments set to maintain a safe pressure differential between Zone 4-A and Zone 4 areas. The instruments shall include limit attachments to sound an alarm should zoning control failure occur through equalization or reversal of Zone 4-A - 4 pressure difference. The Zone 5 enclosure exhausting Zone 4 areas shall be directly connected to the exhaust system.

4. BUILDING HEATING SYSTEM

Low pressure steam heating facilities shall be provided for all spaces where temperature control is essential or where ventilation supply is insufficient to maintain comfortable temperatures.

AIR MONITORING AND AIR SAMPLING

DECLASSIFIED

1. Air Monitoring

The sensitivity of all the present air monitoring systems in the Building 108-B, except the furnace sweep and vacuum pump exhaust, will be increased by replacing the small Kanne Chamber with a larger, more sensitive one. The small Kanne Chamber has proved to be adequate for monitoring air that contains a relatively large amount of P-10 but not sensitive enough to monitor air containing low amounts of P-10. A larger Kanne Chamber with increased sensitivity will be used for all systems except the furnace sweep and vacuum pump exhaust.

Additional air monitoring systems will be added in the Building 103-B, the stripper and shipping container outgassing building and the product storage building. Present indications are that the following list outlines the total Kanne Chamber needs:

(a) Extraction Cell #1			
Cell Room	1		
Furnace Sweep Combined with Vacuum Pump Exhaust	1		
Extraction Hood, Furnace Hood, and Helium Recycle Hood	1		
Total	3	-	3
(b) Extraction Cell #2			
Cell Room	1		
Furnace Sweep Combined with Vacuum Pump Exhaust	1		
Extraction Hood, Furnace Hood and Decontamination Hood	1		
Total	3	-	3
(c) Glass Lines			
Same as Extraction Cell #2			3
(d) Analytical Rooms (Two on Second Floor and one on Third Floor)			
			3
(e) Control Room			
			1
(f) Exhaust Stack (One Spare Unit)			
			2

DECLASSIFIED

AIR MONITORING AND AIR SAMPLING (continued)

(g) Can Opening Room	
(h) Ventilation Air Supply (Primary and Secondary)	1
(i) New Building	
Stripping Cell (Same as Extraction Cell #2)	3
Analytical Room	1
Shipping Container Outgassing	1
	<hr/>
Total	5 - 5
(j) Product Storage Building	
	<hr/>
	1
TOTAL	23

The air monitoring systems will be similar in principle to the present facilities. Each system will consist of a piping arrangement connecting a Kanne Chamber, draft gage and blower. An electrical signal from the Kanne Chamber is amplified by a Beckman micro-microammeter and recorded by a continuous strip recorder. Each system will have a controller to sound an alarm to warn of exceeding pre-determined P-10 amounts. Wherever possible, the piping will be arranged such that one blower will serve several systems thereby reducing cost.

2. Air Sampling System

An air sampling system will be installed that will provide a means of collecting for measurement the P-10 oxide present in a measured amount of air. The air sampled will be drawn through a bed of calcium chloride absorbent.

The sampling system will consist of a vacuum pump and a piping arrangement with valved outlets at designated places throughout the building. The system will be designed for a use factor of 50%.

Sixteen outlets will be located in the building as follows:

Third Floor: One in each cell room; two in the control room; one in spectrometer room; one in analytical room.

AIR MONITORING AND AIR SAMPLING (continued)

Second Floor: One in each analytical room: one in the H. I. Laboratory; one in the hot locker room; one in maintenance shop; one in instrument shop.

First Floor: One in the can opening room; one in furnace pot outgassing room; one in soiled laundry area.

©

A similar sampling system will be installed in the stripping and shipping container outgassing building.

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AIR MASK SUPPLY

The present air mask supply piping will be extended to include ten additional outlets. The outlets will be located as follows:

First Floor: Three in can opening room.

Second Floor: Five in the analytical rooms: two in the maintenance shop.

The system designed with a 75% use factor will be supplied from the present D. C. motor driven air blower. The two standby A. C. motor driven blowers have capacity to supply 16 of the total (44) outlets.

An air mask supply system similar to the present 108-B installation will be installed in the stripping and shipping container outgassing building.

The air blower will have an A. C. motor drive. Installation of a vital power source will not be considered necessary until the stripping line is installed. Air mask requirements in the product storage building will be met through the use of portable Chemox breathing apparatus.

DECLASSIFIED

FURNACE VENTILATION

The space between the furnace pot and the interior wall of the extraction furnace will be flushed with an air flow of approximately 25 c.f.m. to remove any P-10 which diffuses through furnace pot wall during furnace operation. Present indications (See Material Balance Flow Sheet, H-1-2571) are that the amount of P-10 liberated to the atmosphere during this phase of the process will not require special treatment.

In order to avoid hood contamination through eddy currents, an auxiliary air suction system is planned for use when the furnace top is open. This will be designed for a 300 c.f.m. air flow and will operate during charging and discharging of the furnace.

DECLASSIFIED

METEOROLOGICAL EQUIPMENT

Instruments and necessary mounting structure (either on the 300 foot stack or a separate tower) will be supplied to obtain wind velocity and direction and air temperature at the 75, 150 and 290 foot levels. In addition, air temperature will be measured at the 4 foot level. Auxiliary equipment will be provided for recording these data at a remote station inside Building 108-B.

Instrument booms on the mounting structure will be constructed to allow the equipment to be lowered for servicing.

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ELECTRICAL**DECLASSIFIED**1. Controls and Instrumentation

Controls and instrumentation for the metal extraction line (and stripping line, if installed) will be furnished by the General Engineering and Consulting Laboratory, Schenectady. Hanford will provide all other controls and instrumentation.

2. Lighting, Normal and Emergency

The present normal and emergency lighting installed for the P-10-D Project will be sufficient. Any changes will only be because of rearrangement of the rooms.

3. Power, Normal

Additional normal power requirements (approximately 100 KVA) will be supplied through the existing Building 108-B substation.

4. Power, Emergency

Facilities already existing for the P-10-D Project will be modified for the P-10-X Project.

5. Power, Vital

Facilities already existing for the P-10-D Project will be sufficient for the P-10-X Project.

6. Furnaces

The furnace used in the extraction line operation required 13 KW at low voltage for heating elements. Throttle control of the electronic saturable reactor type will be used.

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ELECTRICAL (Continued)7. Outside Lines

The only work necessary on outside lines will be possible relocation due to construction of other buildings such as the storage and stripping buildings.

8. Telephone Facilities

Existing telephone service to Building 108-B is adequate. Changes will be only interior rearrangement.

9. Inter-Communication System

Inter-communication facilities between major operational centers within the building will be provided.

10. Air Monitoring

Power will be provided for the air monitoring systems described in the Air Monitoring section of this document.

11. Fire Alarms

A standard fire alarm system for Building 108-B is being installed under the P-10-D Project.

12. Evacuation Alarms

Evacuation alarms will be provided with audible signal on each floor and in each building.

DECLASSIFIED

ARCHITECTURAL

1. Building 108-B

Any new partitions that are required in Building 108-B will be constructed of concrete or pumice blocks to match existing partitions. Ceilings and walls in Zone 4 areas may be covered with a strippable coating to facilitate decontamination.

Floors that are subject to contamination will be investigated to determine whether or not any treatment is necessary to provide a smooth, nonporous surface.

Alterations to the fourth floor Machinery Level platform will be necessary in way of the new Air Monitoring installation.

2. Product Storage Building

A reinforced concrete building will be built adjacent to Building 108-B to house two months' production of product. This building will have a floor space of approximately 375 square feet.

The product containers will be stored in individual compartments in the concrete floor. Each compartment will be covered with an aluminum grating so that maximum protection will be afforded the containers and still allow ventilation air to circulate around the containers.

Containers will be handled manually within the storage building.

The ventilation air will be tempered but not conditioned. Monitoring of the storage room exhaust air will be necessary for personnel protection. The exhaust air will be discharged to the stack.

Portable air masks will be provided for the use of personnel entering the building during an emergency.

ARCHITECTURAL (Continued)

DECLASSIFIED

3. Change Room Facilities

As mentioned under Contamination Control, a hot and cold locker room with attendant showers and toilets will be provided on the second floor for the protection of personnel. The above cold locker room will not be used for over-night storage of clothing. Over-night storage is available in the area change houses. The number of personnel to be provided for on the above basis is twenty-five per shift.

Personnel that are working in the P-10 Alloy rooms on the first floor and the Cold Laboratory and Mechanical Development Laboratory on the second floor will not use the hot-cold locker rooms but will use the existing locker and toilet facility at the north end of the first floor.

4. Office Space

Adequate office space will be available in Building 1703-B, Technical Service Building, which is adjacent to Building 108-B.

5. Miscellaneous Storage Space

Storage space will not be available in Building 108-B for long term storage of shipping containers or furnace pots. Warehouse space within an area enclosure will have to be provided for such items.

6. Stripping and Shipping Container Outgassing Building

A prefabricated steel building of approximately 3000 square feet may be necessary adjacent to Building 108-B to provide space for a stripping line and shipping container outgassing. The need for both of the above items is not definite yet. Development work on stripping and

ARCHITECTURAL (Continued)

container outgassing is being carried on at Hanford and other sites and conclusions will not be available until early 1951.

However, it is becoming apparent that the Technical Divisions will need space for additional facilities at Building 108-B so that in the event that either stripping or container outgassing or both are not necessary, a new building will probably still be required for Technical Divisions' needs.

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PIPING, SERVICE AND DRAINAGE1. Required Services, Building 108-B

The service and waste piping tabulated below constitute all house piping systems required in Building 108-B with the exception of fresh air mask supply lines, air monitoring piping, air sampling piping, and the steam and condensate piping for the building heating system.

a. Sanitary water

- (1) Cold water
- (2) Protected cold water (See Item 2.a)
- (3) Hot water
- (4) Protected hot water (See Item 2.a)

b. Process water

c. Fire protection and safety showers

d. Compressed air (30 c.f.m. compressor is installed)

e. Propane gas

11" water

f. Helium gas

5 psi

g. Argon gas

5 psi

h. Oxygen gas

8 psi

i. Hydrogen gas

8 psi

j. Sanitary waste

k. Waste to Process Sewer

l. Waste to Crib

2. Service Systems Description, Building 108-B

a. Sanitary Water

The existing sanitary water system is supplied by a 4 inch line from

DECLASSIFIEDPIPING, SERVICE AND DRAINAGE (continued)

the area sanitary system. The distribution system inside Building 108-B will be altered to serve new rooms. Any outlets on this system that are not already on the low pressure side of the pressure reducing station will have the piping leading to them revised so that they are on the low pressure side.

As a special precaution against backflow, hot and cold water branch lines serving laboratory outlet connections and the change rooms will be "protected" by the equivalent to a lift loop with vacuum breaker and check valve. This protection is not installed in the existing system at Building 108-B.

The existing hot water heater in Building 108-B is adequate for future needs.

b. Process Water

The existing Building 108-B process water system, which is supplied from the area filtered water system, will be modified to serve new rooms.

Backflow protection is contemplated to prevent any P-10 process water from backing into any non-regulated zone such as the P-10 Alloy installation.

Past experience has indicated that a pressure reducing station should be installed on the Building 108-B Process Water system.

PIPING, SERVICE AND DRAINAGE (continued)**DECLASSIFIED**c. Fire Protection and Safety Shower Water

A review will be made of existing Building 108-B hose reel stations and safety showers and, if necessary, more will be added.

The fire protection standpipe system should provide a hose reel station within 50-foot hose and 25-foot fire stream distance of any point in the building, with the exception of the area on the third floor that is served by a sprinkler system.

Safety showers shall be provided at any points where acids may be used such as at decontamination hoods.

d. Compressed Air

The existing Building 106-B compressed air system will be modified to serve new rooms. The system shall supply line pressure air to points of use on all four floors.

Outlets of sufficient size and capacity shall be provided in Zone 4 areas to serve strippable coating spray-guns.

e. Gases

The existing Building 108-B gas bottle houses (propane, hydrogen, oxygen, helium, and argon) are adequate for P-10-X needs. However, the main lines leading from the bottle houses, as installed in the first P-10 Project, are 3/4". If, upon investigation, the main lines appear too small, the two stage regulators at the bottle houses will be replaced with single stage regulators and further single stage regulators will be installed on branch lines. In this way,

DECLASSIFIEDPIPING, SERVICE AND DRAINAGE (continued)

the existing 3/4" mains would have a greater capacity, as the gases would be carried at higher pressures.

Gas facilities for the proposed Stripping and Outgassing Building will be provided by the installation of gas bottle houses adjacent to that building.

f. Sanitary Waste

The existing Building 108-B sanitary waste system will be modified to serve the new change rooms and toilets.

g. Waste to Process Sewer

The existing process waste system serves all clear water flows from process and operating equipment where radiation hazard is not a problem. The building process sewer connects to the area process sewer outside of Building 108-B.

h. Waste to Crib

An existing crib serves as a discharge point for all waste water from Zone 5 equipment and other locations such as the product storage building. The crib has adequate capacity for many times the existing flow.

A sampling station will need to be installed on the 4" line leading to the crib.

3. Services to Auxiliary Buildings

a. Product Storage Building

The product storage building will require a fire water line for the

PIPING, SERVICE AND DRAINAGE (continued)

sprinkler system. The waste water from this building will be discharged into the Waste Crib system.

b. Stripping and Shipping Container Outgassing Building

Probably all of the services that are required for Building 10F-B itself will be required for the Stripping and Shipping Container Outgassing Building.

DECLASSIFIED