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December 23, 1947

D. D. Streid
Design Engineering Department

234-5 PROJECT

SPECIFICATION LETTER 235-41

CHEMICAL DEVELOPMENT LABORATORY

INTRODUCTION

Chemical development work on the 234-5 Project has been divided into two parts, work started before 7/1/49*, and work started after 7/1/49. The former will be conducted in temporary facilities and will not be discussed herein. The latter will be conducted in the 234-5 Building in four different types of apparatus:

(1) Small scale experiments using radioactive materials will be performed in ventilated dryboxes or "incubators."

(2) Large scale tests using either non-radioactive materials or radioactive stand-ins will be performed in an experimental line described in other correspondence as a "stand-in" or as a "cold" line.

(3) Plant scale tests will be conducted in production equipment using procedures known as production tests at Hanford.

(4) Tests involving large quantities of radioactive materials, where the equipment is too large to be placed in ventilated dryboxes, where similar equipment is not available in the production lines, and where only one portion of the process will be under test, will be conducted in semi-works equipment.

*Scheduled completion date for the 234-5 chemical development laboratory.

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At the present time the procedures and equipment to be used for any one development problem are not known. Hence, it is highly desirable to install development facilities which incorporate as much flexibility as possible.

To assist the Design Engineering Department in arriving at a suitable development layout, the functions and facilities of the various rooms are described below. To clarify the text, a layout (figure 1) is attached: in this figure, room locations and dimensions are specified only for preliminary estimation. More efficient room layout and room dimensions would be desirable, still retaining the various functions. At a later date details of equipment in the various rooms will be submitted.

The discussion which follows is divided into the topics listed below:

1. General location
2. Contamination control
3. Experimental line
4. Equipment assembly facilities
5. Ventilated drybox room
6. Semi-works
7. Laboratories
8. Offices
9. Monitoring and decontamination locations
10. Vault
11. Emergency exits and safety showers
12. Ventilation
13. Utilities

GENERAL LOCATION

The development section of the 234-5 Project should be located in the "top secret" portion of the building with access from a corridor with health classification of a "section 3" and with direct access from the men's locker room between "section 2" and section 3 as outlined in Specification Letter 234-4, 235-4 (Building Layout).

CONTAMINATION CONTROL

A definite system of hazard control has been outlined for the 234-5 Project in previous specification letters. The nature and solution of the anticipated development program problems require that parts of the laboratory must have a health classification comparable to sections 3 and 4. Consequently, the laboratory will have openings directly to the locker room (between section 2 and section 3) and to the section 3 corridor. Although this establishes the entire laboratory as section 3 (except for section 4 hoods), it is desirable to establish a workable zoning system within the laboratory which segregates the work of high risk of contamination spread from that of low risk. To accomplish this the laboratory should be divided as follows:

Section 3, Area A -- similar to section 1 of Specification Letter 234-4, 235-4 except that infrequently an opening will exist between this section and a potentially contaminated section.

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Section 3, Area B -- similar to section 2 of Specification Letter 234-4, 235-4 except that rubber glove manipulation will replace remote manipulation.

Section 3, Area C -- similar to section 3 of Specification Letter 234-4, 235-4 except that plutonium transfers in surveyed containers will occur more frequently.

Section 4 -- identical to section 4 of Specification Letter 234-4, 235-4.

This contamination control will be achieved by monitoring closely and by using strict operating procedures, but may be simplified somewhat by the manner in which the rooms are laid out.

EXPERIMENTAL LINE

An exact duplicate of a production line through and including metal button production, but including only one of each unit operation equipment piece, should be provided adjacent to the other facilities outlined below. This line should be accessible from section 3, Area B, and from the section 3, Area C corridor through tight sealing lockable doors. A tight sealing panel should be provided in the barrier between the operating side and the equipment such that the entire space can be operated as a section 3, Area B.

EQUIPMENT ASSEMBLY FACILITIES

Approximately 1000 square feet of floor space should be allocated for equipment assembly facilities. Here various pieces of development equipment may be fabricated and assembled in an atmosphere free of radioactive contamination by employing close monitoring techniques and strict rule enforcement at the entrances and exits. Since chemicals and equipment must be moved from these facilities through section 3, Area B and 3, Area C corridors to the point of consumption in section 4, it must be possible to accomplish transfers from the equipment assembly section.

Personnel working in this laboratory should be provided with space for the following purposes:

1. Glass storage
2. Glass blowing
3. Chemical storage
4. Chemical make-up
5. Chemical solution standardization
6. Work benches and facilities for setting up apparatus.

VENTILATED DRYBOX ROOM

Approximately 1700 square feet of floor space should be allocated to house ventilated dryboxes or incubators. An arrangement should be made such that 24 such boxes can be eventually operated but only 12 should be ordered initially. The layout for 24 boxes should consist of three banks of eight each so that modifications to one set can proceed while another set is operating. Each set of eight boxes should be split into two lines of four boxes each with a service corridor between the lines. The location of the first dryboxes to be installed

will be covered in a subsequent specification letter. One end of each service corridor should be closed by a tight sealing, lockable door opening to the section 3, Area C corridor and the other end, opening to the incubator room proper, should be closed by a tight sealing panel. In operation, the rear of the drybox will be serviced from the section 3, Area C corridor while the panel to the incubator room proper will be sealed in place. When installing equipment in one set (8) of contamination-free dryboxes the door to the section 3, Area C corridor will be sealed and locked and personnel will enter from the room proper after removing the panel.

In this room, technical personnel will manipulate equipment remotely in the experimental line and directly in the ventilated dryboxes using rubber gloves sealed to the face of the boxes.

Contamination control and segregation will be achieved by using the sealed rubber gloves, by remote operation, and by close monitoring of all personnel entering and leaving.

SEMI-WORKS

Approximately 800 square feet of floor space should be provided to house semi-works development equipment.

Apparatus may be constructed in section 3, Area A and assembled and mounted in an assembly bay. The apparatus will be mounted on a moveable cart of floor dimensions 4 by 6 feet and enclosed by a shell of steel frame work and glass panels. The shell will be about 6 feet tall and will taper to supply and exhaust ventilation ductwork easily connected and disconnected. Apparatus will be operated either remotely or by using rubber gloves whichever is the more feasible.

When assembled the equipment will be mechanically tested on non-radioactive materials in the bay and then disconnected from the ventilation system and rolled into one of three semi-works rooms through large tight sealing panels.

In the semi-works room the panel to the equipment assembly facilities will be closed and sealed and the apparatus will be connected to the ventilation system. Here, the equipment will be operated by personnel entering from the section 3, Area C Corridor.

Since the equipment mentioned above is large and moveable, a design of doors and corridors is desired that will permit easy passage.

LABORATORIES

Laboratory #1 is part of the equipment assembly section and has been mentioned above.

Laboratory #2 is approximately 168 square feet in floor area and will be equipped with open hoods for direct work upon radioactive material. Personnel will enter from a section 3, Area C corridor. Hoods will be a modification of the research type hoods presently installed in rooms 38-45 of the Isolation Building.

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OFFICES

Office space for six people should be provided in section 1, Area A. In figure 1, two offices 9' by 14' and one office 12' by 16' are shown. These offices will contain standard equipment - desks, tables, chairs, files, etc.

MONITORING AND DECONTAMINATION LOCATIONS

It is desirable to install at least two monitoring and decontamination stations in the development section. Facilities will be required for monitoring personnel and equipment and decontaminating various objects. It has proved desirable to dispense shoe covers here and to collect soiled ones. The stations should serve as airlocks and the pressure should be regulated accordingly.

Station #1 should control traffic of personnel and equipment from the locker room, the section 3 corridor, and from areas 3A, 3B, and 3C.

Station #2 should be located between the section 3, area C corridor and the rear of the experimental line. Since it is probable that radioactive standards will be used here, the station should be so constructed that contaminated waste can be separately collected.

VAULT

A vault should be provided in the section 3, Area C corridor for storage of plutonium.

EMERGENCY EXITS AND SAFETY SHOWERS

Emergency exits and safety showers are designed to protect personnel in certain rooms of the development laboratory and are marked on figure 1.

VENTILATION

It is desirable to ventilate all sections of the development laboratory and to attempt to control air contamination by pressure regulation of the various sections. A decreasing air pressure system from Areas 3A, 3B, and 3C to 4 similar to the system of decreasing air pressure from sections 1, 2, and 3 to 4 as outlined in Specification Letter 234-10, 235-10 on ventilation would be desirable.

UTILITIES

	Ventilated Drying Room	Semi-works Rooms	Equipment Assembly Facilities	Laboratory No. 2
Electrical				
110 V power receptacle	x	x	x	x
220 V power receptacle	x	x	x	
Steam				
50 psi		x	x	
15 psi	x	x	x	x

[redacted]

Utilities (Continued)

	Ventilated Drying Room	Self-Work Rooms	Equipment Assembly Facilities	Laboratory No. 2
Chemical pipes				
Conc. HNO_3	x	x	x	x
Water				
Refrigerated	x	x	x	x
Distilled	x	x	x	x
Hot	x	x	x	x
Drinking	x		x	
Air				
40 psi g	x	x	x	x
Vacuum 25 in. Hg	x	x	x	x
Sewage				
Floor drains	x	x	x	x
Potable water	x	x		x
Industrial	x	x	x	x
Gases				
$Ra(NO_3)_4$	x	x		
A	x	x		
O_2	x	x	x	x
N_2	x	x	x	x
H_2	x	x		
He	x	x		
Kr	x	x		
SO_2	x	x		
Compressed Air	x	x	x	x

Approved:

J. G. Work
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Schematic Layout
Development Laboratory
234-5 Project

Figure 1

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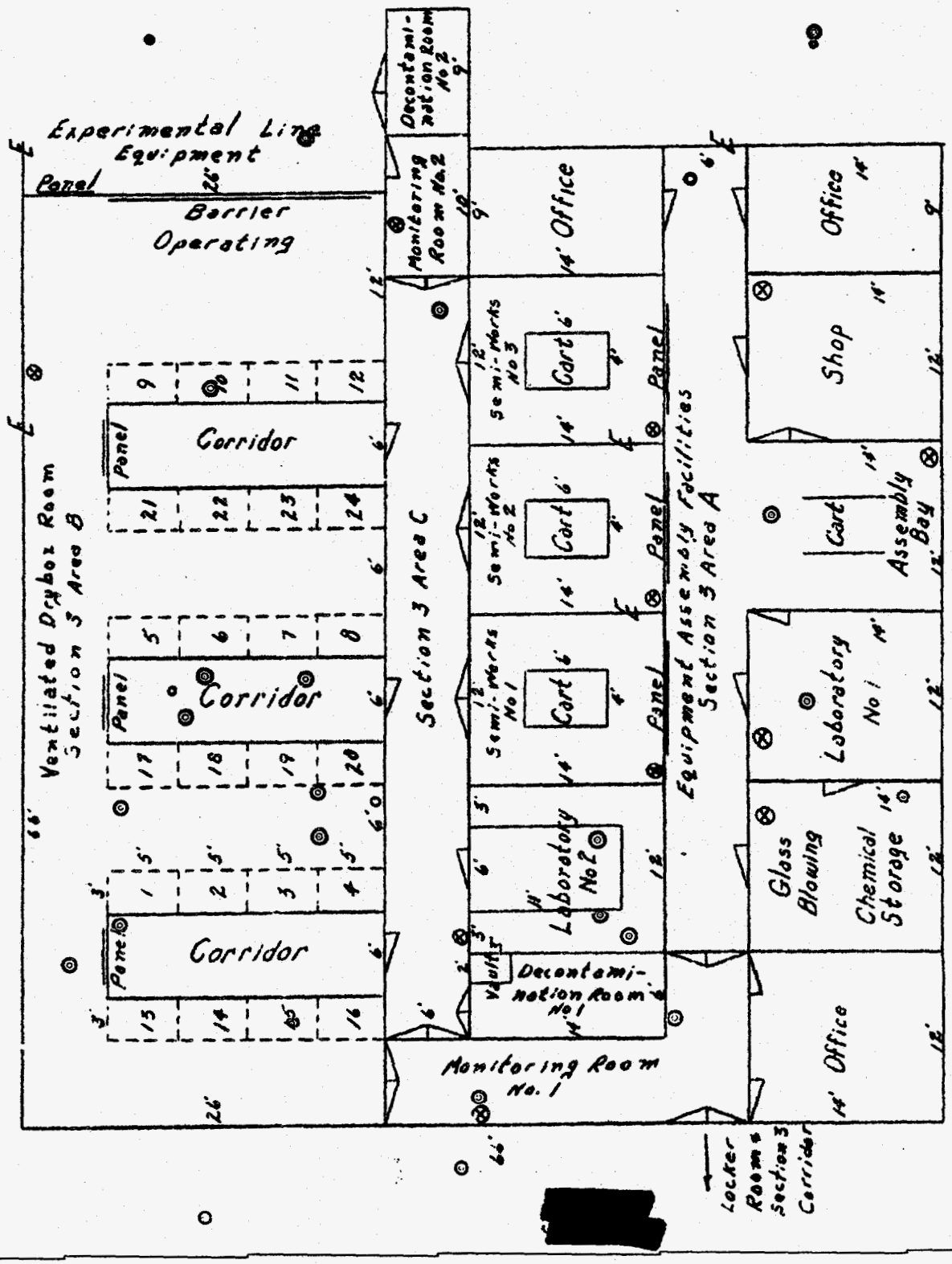

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