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Released 1995

**Prepared for the U.S. Department of Energy
under Contract DE-AC06-76RLO 1830**

**Pacific Northwest Laboratory
Operated for the U.S. Department of Energy
by Battelle Memorial Institute**

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D. D. Streid
Design Engineering Department

HW-8323
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December 17, 1947

234-5 PROJECT

SPECIFICATION LETTER 234-10, 235-10

VENTILATION

INTRODUCTION

Specification Letter 234-4, 235-4 presents the principles to be used for the arrangement of the 234-5 Building. The building should be divided into zones classed as "regulated" and "non-regulated." A regulated zone is an area in which plutonium is handled or processed and which may contain items that are either contaminated or potentially contaminated with radioactive materials. A non-regulated zone is one in which radioactive materials are not handled and in which the possibility of contamination is practically non-existent. These zones, regulated and non-regulated, should be broken down further into sections as follows:

- Section 1 - A non-regulated zone where radioactive materials are not processed either directly or by remote mechanical methods.
- Section 2 - A regulated zone where radioactive materials are not processed directly but are processed by remote mechanical methods.
- Section 3 - A regulated zone where personnel must perform operations of both a routine and a non-routine nature directly upon radioactive material or contaminated equipment.
- Section 4 - A regulated zone inside an equipment enclosure where it is known that surface and air contamination may be above tolerance values.

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The sections discussed in this letter correspond to the above sections. No distinction will be made between the various rooms and corridors within a section.

This letter will include an outline of the general ventilation requirements of the 234-5 Building and will present the necessary details for air supply, air exhaust, and air conditioning throughout the building.

GENERAL

The 234-5 Building is to be dustproof. A positive pressure with respect to atmospheric is to be maintained in all parts of the building which connect to the outside by regular entrances, emergency exits, or windows. Section 4 is to be under negative pressure with respect to atmospheric. Suitable vacuum breakers should be installed to prevent collapsing the process hoods and equipment.

The pressures in the sections are to be regulated to provide progressively decreasing pressures from Section 1 to Section 2 to Section 3 to Section 4. Air is to move from Section 1 to Section 2 to Section 3 to Section 4 only by casual leakage through the barriers between the sections, except in cases such as laboratory installations where it may be necessary to deliberately place openings for air passage from one section to another. If it is necessary to use air locks to maintain the desired pressure gradient or to regulate air leakage these may be installed. No movement of air from Section 4 to Section 3 to Section 2 to Section 1 is permissible.

AIR SUPPLY

An air supply system which will provide clean temperature-regulated air to all parts of the building should be installed. The air intake shaft should be accessible through doors which can be locked. This shaft should contain suitable dry air filters for removing dust from the air. The dry air filters and the area surrounding them is to be regulated in a manner similar to Section 3.

The air supply system should consist of more than one unit so that it will not be necessary to suspend operations completely during routine maintenance work. Each unit should be equipped with a wet cell washer for purifying the air. All air entering the various sections should pass through distributors which will prevent swift air currents or drafts which carry dust or lint. Sufficient air should be brought into the 234-5 Building to provide the following conditions in the individual sections.

- a) A change of air consistent with good ventilation in Section 1.
- b) A change of air every two minutes in Section 2.
- c) A change of air every two minutes in Section 3.
- d) A change of air in Section 4 which will provide good ventilation without spreading product dust. Equipment should provide for varying the rate of air change from nearly zero to one change every two minutes throughout Section 4.

- e) An air velocity of 150 to 200 linear feet per minute through openings into Section 4 from Section 3 during maintenance work or routine processing.

AIR EXHAUST

All air exhausted from Sections 2, 3, and 4 must be filtered through filter units containing Chemical Warfare Service Type 6 paper meeting C.W.S. Specification 197-54-303C and discharged to the atmosphere via a 200 foot stack. The filters are to be located as close to the source of contamination as possible. All ducts on the contaminated side of the filters are to be fabricated from stainless steel. The ducts on the exhaust side of the filters should be constructed from acid resistant material. The ducts on the inlet and exhaust side of each filter are to be equipped with a sampling ports. A sampling port immediately preceding the exhaust fan should also be installed. Each filter should be equipped with a device which will indicate the pressure drop across the filter.

The maximum permissible product concentration in the air emitted from the 200 foot stack is 5×10^{-10} $\mu\text{g/cc}$ with a discharge rate of 40,000 c.f.m. If it is necessary to use a higher discharge rate a proportionately lower product concentration is necessary.

Duplicate exhausting fans should be installed for the regulated (includes Sections 2, 3, and 4) ventilation system. Electrically powered exhausting equipment is to be provided for normal usage with steam powered emergency equipment available during periods of electrical failure. Suitable control devices must be installed to activate the steam operated system as soon as an electrical failure occurs. An alarm system which will warn personnel when inadequate ventilation is being maintained must be installed.

Air removed from Section 1 may be dispersed directly to the atmosphere through roof vents. Suitable static pressure regulators should be provided to maintain a positive pressure in this section.

Independent exhaust ventilation fans could be installed for all locker rooms, toilets, shower rooms, and other service quarters regardless of the section housing the facilities.

AIR CONDITIONING

All rooms in which electronic standard counters are to be used should be completely air conditioned. The maximum permissible relative humidity is 35% with a temperature of 75°F. A 10% fresh air make-up should be employed.

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JBW
J. B. Work
Technical Department

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