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UNITED STATES GOVERNMENT

# *Memorandum*

TO : A. J. Rizzo, Chief
Operational Safety Branch

DATE: September 30, 1966

FROM : Harold Glauberman,
Operational Safety Branch

SUBJECT: REMOVAL OF CONTAMINATED EQUIPMENT AT THE CANEL FACILITY
MIDDLETOWN, CONNECTICUT

## INTRODUCTION

The decision to terminate AEC contract activities at the CANEL facility introduced the need to dispose of radioactively contaminated equipment and materials so as to permit release of the facilities. As a result, the Operational Safety Branch, NY, was requested to perform the necessary Health Physics surveillance and monitoring functions during the disassembly, removal and packaging of the contaminated equipment. The actual removal and handling of contaminated equipment was performed by the AEC contractor, Dunbar Transfer Company, Newington, Connecticut. The Health Physics activities under the supervision of H. Glauberman with assistance by J. Haskins and S. Garafalo were initiated on 11/15/65 and completed on 7/8/66. The Operational Safety Branch supervision on site during this time span covered only those periods when work was scheduled on contaminated equipment. The total effort for the project was 150 man-days. This report covers a description of the procedures used and presents the results of the various measurements obtained throughout the project.

## PROCEDURES

### Survey of Contaminated Equipment and Areas

Prior to disassembly and removal, the radioactively contaminated equipment listed by Pratt & Whitney(1) was checked with survey meters and verified. In addition, air samples and smears were taken in areas where radioactive materials had been used to establish the existing background concentrations. All contaminated equipment listed on AEC, CANEL "Work Description Task Orders"(2) was resurveyed during the scheduled removal operations.

Direct measurements of fixed surface contamination levels were made using an Eberline PAC 1SA and Ludlum Model 11-A alpha survey meters while a Nuclear Chicago Model 2612 end window GM meter was used for beta-gamma measurements. The instruments were checked repeatedly for response to

(1) Letter w/attached list D.M. Dawson (P&W) to J. T. Consiglio AEC, CANEL, d/9/16/65
(2) Filed in Operational Safety Branch, NY

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alpha and beta-gamma sources and zero settings. Calibrations were checked periodically at the Health & Safety Laboratory. Surface smear samples of floors, walls and equipment (covering an area of one sq. ft.) were taken using whatman #41 - 1-1/8 inch filter paper to determine the levels of transferable contamination. Air dust samples were collected by drawing air through the same type filter paper at approximately one cubic foot per minute. The above type of measurements were taken throughout the removal operations to assure personnel protection as well as to determine the extent of packaging and labeling requirements and to identify any necessary decontamination. A final survey of the fixed and removable surface contamination was performed on May 25, 26, 1966 in all rooms and corridors after the contractor had completed the removal of the designated contaminated equipment.

Sample Analysis

Filter samples were analyzed at the CANEL site (by the OSB) and at the HASL utilizing either scintillation or gas flow proportional counting techniques. The filters were counted for alpha and/or beta-gamma concentrations depending on the use history of the sample collection area.

Personnel Protection

During operations involving contaminated equipment, contractor personnel were provided with respirators, gloves, paper smocks or coveralls and shoe covers for personnel protection. Tools and equipment used during the disassembly, hands, clothing and shoes were monitored when necessary or specifically requested by contractor personnel.

Contamination Criteria for Disposal of Equipment and Facilities

The criteria outlined in AECMC Appendix 5170 "Utilization of Excess and Disposal of Surplus Personal Property" - Part X were used to determine the classification and type of packaging requirements for the equipment removed.

In areas where equipment had been removed, the values listed in Table I below were used to permit unconditional release of the facilities contaminated with normal, enriched or depleted uranium.

Table I - Permissible Surface Contamination Levels

| Fixed Activity | Removable Activity |
|---|---|
| Alpha $<$ 2000 d/m/100 $cm^2$ | $<$ 100 d/m/100 $cm^2$ |
| Beta-gamma $<$ 0.1 mr/hr | $<$ 100 d/m/$ft^2$ |

Disposal of Contaminated Metal Scrap

Metal scrap generated during the disassembly operations was monitored to assure that the disposal criteria set forth in AECMC 5182 - "Disposal of Surface-Uranium Contaminated Metal Scrap" were satisfied. Measurements obtained from outside surfaces of pipes and/or tubing indicated no detectable activity. Inside surfaces were surveyed and evaluated by randomly cutting small sections out of the total lengths.

Removal and Packaging of Contaminated Equipment

Contaminated equipment was identified with radioactive contamination labels affixed to a visible front surface. The degree and type of contamination were clearly marked on the labels. Controls were set up to prevent possible spread of contamination during removal. The equipment was subsequently completely wrapped in heavy gauge plastic, sealed with tape, steel strapped to skids or enclosed in wooden boxes and labeled according to ICC regulations.

All contaminated equipment shipped to government contractor facilities was recorded on Pratt & Whitney Form 67[3] and included descriptions of the items along with information relative to radioactivity levels. Statements for exemption from labeling and packaging requirements when applicable (as described in Par. 73.392 a(1) (2) (3) of the ICC regulations) were also contained on the form.

Disposal of Contaminated Precious Metals

Boxes and drums[4] containing unprocessed precious metals contaminated with plutonium and mixed fission products were monitored. The drums were repacked in 55 gallon outer drums and surrounded with vermiculite in such manner so as to assure that a substantial layer of vermiculite was present at both ends of the inner drum. The wooden boxes were placed in large outer boxes (2) and locked in place by nailed wooden braces. Bureau of Explosives permit numbers 2334 and 2335 were obtained for the boxes and drums, respectively, and radioactive materials labels were placed on the containers in accordance with ICC regulations.

Disposal of Alkali Metals

Approximately 32 various types of drums and 4 tanks containing sodium, potassium, NaK, lithium, lithium hydride etc., were stored on site.

(3) Filed in OSB, NY
(4) Memo D.E. McCarthy to J.A. Maffucci, NYOO
Precious Metals in Storage at CANEL, d/7/6/65

Since the contents were non-radioactive the major concern in removal was the potential hazards of fire and explosion. As a precautionary measure the Pratt & Whitney Fire Department was present throughout the entire packaging and moving of the alkali metals. Specification ICC-15 A type wooden boxes were constructed for over packaging the drums which ranged from 10 to 55 gallons in size. The drums were chocked, centered on the bottom of the boxes and wood braced across the top rim of the drums. The drums were cushioned by filling the voids with vermiculite. The large horizontal and vertical tanks were similarly overpackaged in large wooden crates. The ICC special permit number 1599 obtained for shipping the alkali metals was stenciled on all boxes along with the appropriate ICC labels.

Decontamination Activities

The general decontamination procedure was to first survey and then to either dry vacuum or wipe the area with denatured alcohol until the levels were in accordance with the established criteria. The levels of removable surface contamination were for the most part quite low and only small areas or isolated parts of equipment required decontamination.

RESULTS OF PROJECT

Fixed and Removable Surface Contamination

Approximately 850 smear samples were taken on floor, wall and equipment surfaces during the pre, intermediate, and post removal operations. The data sheets which contain the results of all sample analyses are filed in the OSB, NY. The results of the final instrument and smear survey performed on May 25, 26, 1966 indicated that the highest removable surface concentration in a specific area was 7.7 alpha d/m/100 $cm^2$ while the maximum fixed contamination level was 600 alpha d/m/100 $cm^2$. The individual smear measurements obtained in the various areas during the final survey are shown in Figures 1 through 6 in the Appendix. Fixed radiation levels were for the most part 0 - 50 c/m which is equivalent to the instrument background. Locations exhibiting higher levels (but less than the established criteria limits) are indicated on the figures by the shaded areas.

Air Concentrations

Air samples obtained during the disassembly and removal of contaminated equipment at various locations and times are listed in Table II of the Appendix. Air sample concentrations in the Fuel Element Laboratory rooms and Machine Shop ranged from no detectable activity to 10.7 alpha d/m/$m^3$ (disintegrations per minute per cubic meter) and had a composite average of approximately 2.2 d/m/$m^3$. This concentration is but 1% of the Maximum Permissible Concentration (220 d/m/$m^3$), listed in NBS Handbook 69, for enriched uranium. The highest air sample concentrations were obtained during the removal of two fume hoods in Room 81 of the Nuclear Materials

Research and Development Labs. and resulted in an average air concentration of 84 d/m/m$^3$. Air samples taken 24 hours after the hood removal had been completed indicated a decrease in the average air concentration to 4.8 d/m/m$^3$. All contractor personnel assigned to this task wore respirators which provided protection against these concentrations.

COMMENTS AND CONCLUSIONS

A small number of "contaminated" items remained in buildings 150 and 140 when Pratt & Whitney purchased the CANEL facility from GSA. This equipment was identified and listed for P&W personnel. A copy of the list is filed in OSB, NY. The levels of contamination are slight and using the limits specified in AECMC, Appendix 5170, most of the items can be considered to be uncontaminated.

Pratt & Whitney officials agreed to take responsibility for the removal of the remaining exhaust system ductwork at their convenience. Since all ductwork was sealed off and generally contained above ceiling level it does not presently constitute a health hazard. However, care should be exercised when and if these ducts are removed since loose radioactive material may be trapped inside. Pratt & Whitney also agreed to dispose of the small amount of radioactive waste generated during the entire removal operations.

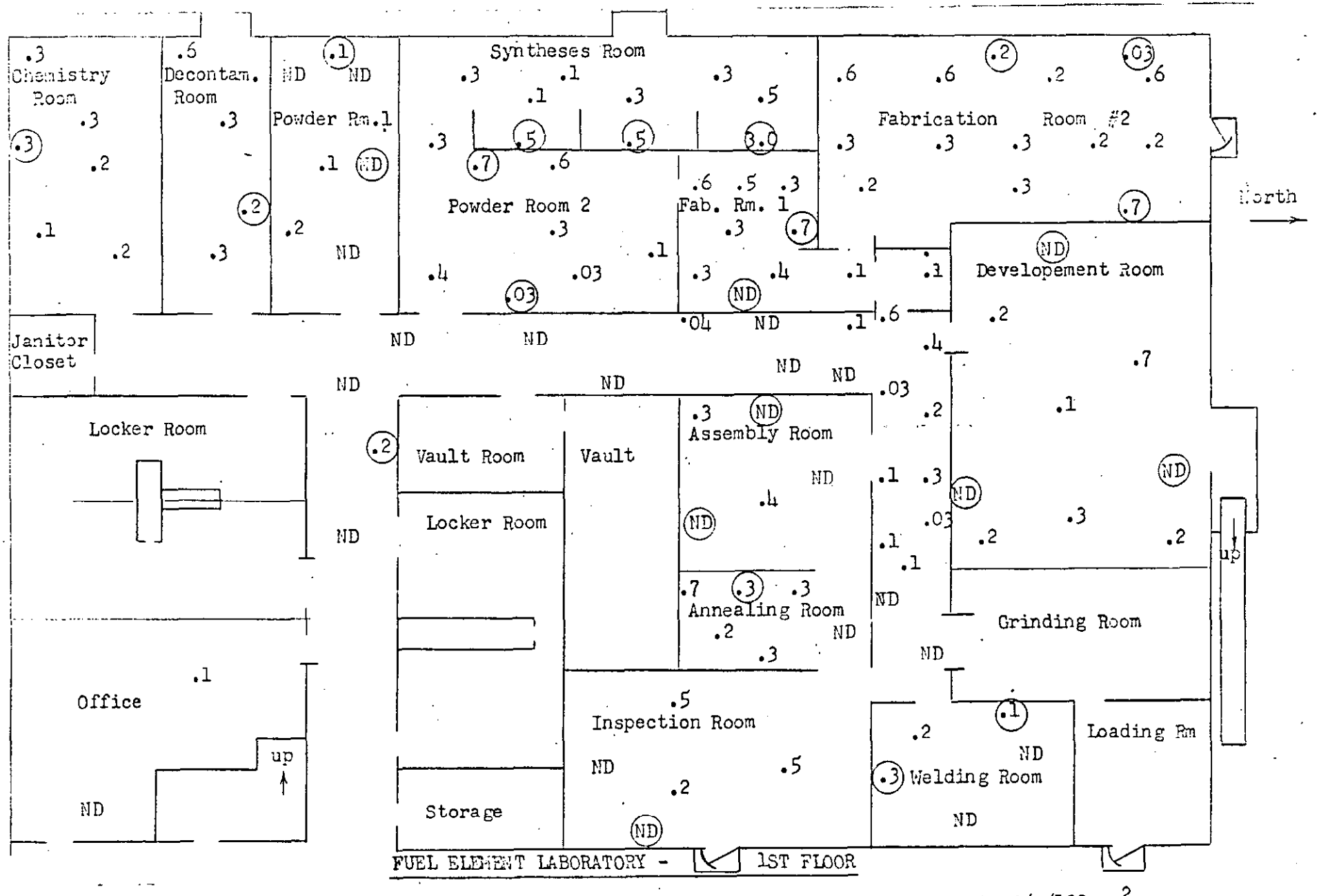
A number of items were removed from the Hot Laboratory (Building 450) and the Nuclear Physics Laboratory (Building 440). Routine Health Physics monitoring was provided by the OSB during the removal operations. However, no attempts were made to reduce radiation levels at these buildings since it was understood that they would eventually be reactivated for similar type operations.(5) It should be noted that these buildings were surveyed by P&W personnel during shutdown and decontaminated so as to reduce health hazards to an absolute minimum. Radiation levels in the Hot Cells (Building 450) are posted on the cell walls and floors and can be read through the viewing windows. Wall smears covering a one square meter area were generally less than 25 mr/hr beta-gamma. The maximum in-cell radiation levels measured at one meter from a floor surface, were 75 mr/hr gamma and 1250 mr/hr beta-gamma. Complete instrument and smear surveys made in other areas of these buildings indicated no detectable radioactive contamination. A description of the contamination remaining in these buildings is contained in the P&W report CNLM 6353, Volume II, dated October 15, 1965.

(5) Letter - W. H. Pennington, AEC, NY to R. W. Jones, GSA, Boston, d/1/18/66.

In conclusion it is apparent from the results of the various measurements obtained during the final survey that the levels of contamination remaining in the buildings, excluding Buildings 440 and 450, are well below the established criteria for unconditional release of the facility.

cc: W. H. Pennington, Deputy Manager
J. A. Maffucci, Security & Property Mgmt. Div.

# APPENDIX

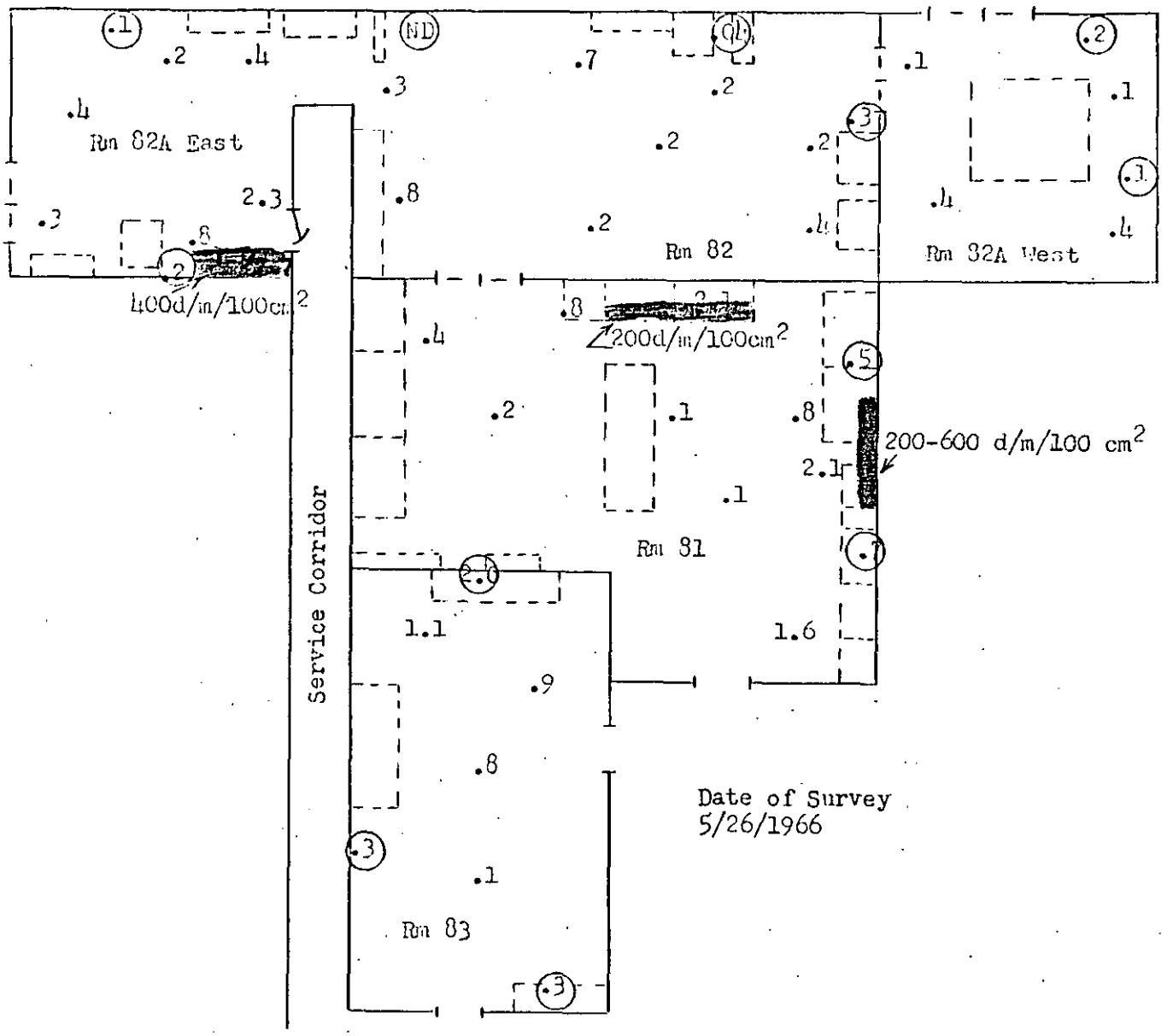



Date of Survey
5/25/1966

Final Surface Contamination Survey - Concentrations shown are in d/m/100 $cm^2$
ND indicates no detectable activity above counting background
Circled values indicate wall smears
Note: Direct instrument readings in all locations indicated no detectable activity above instrument background - 0-50 c/m

Figure 1

A-1

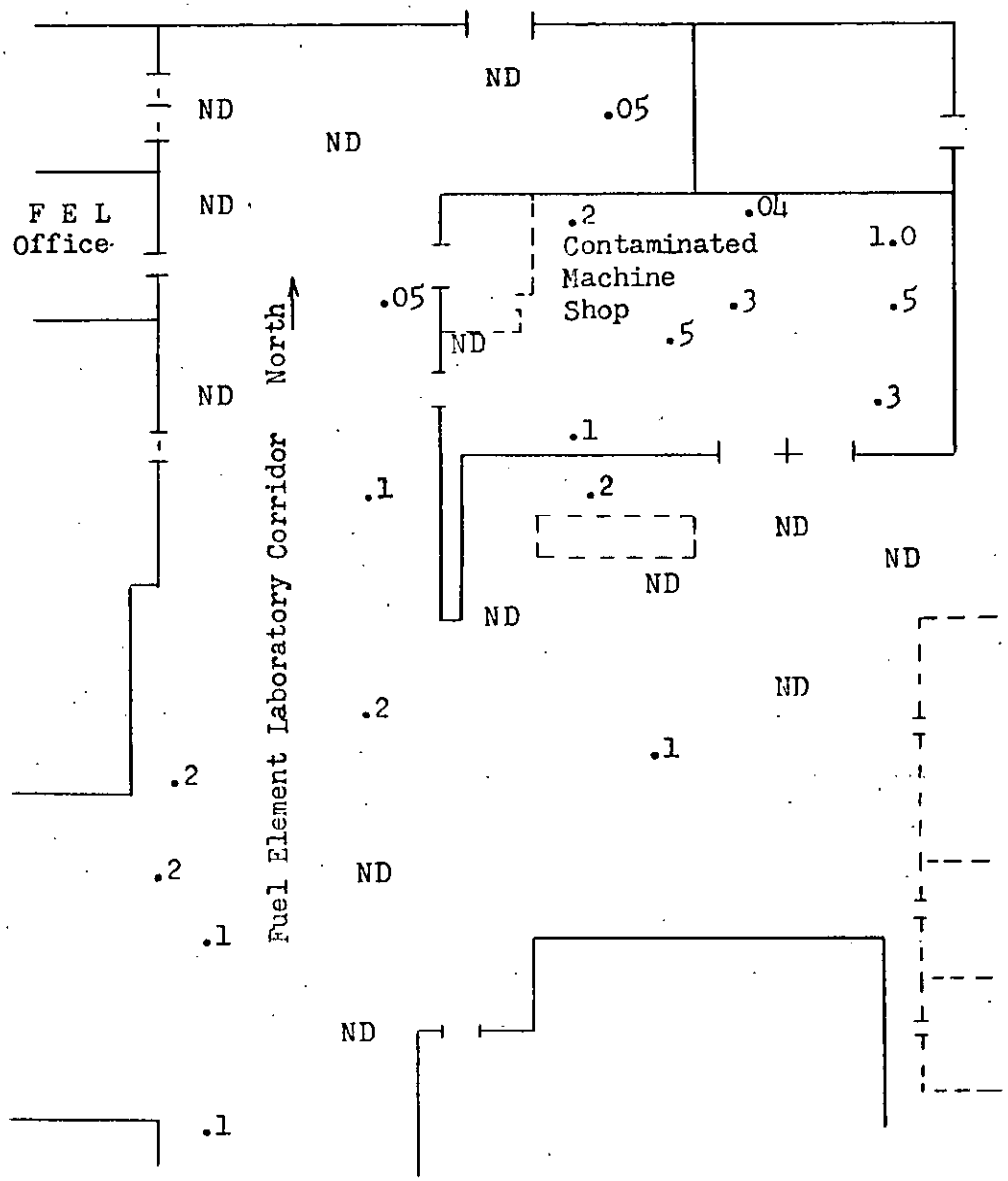



NUCLEAR MATERIALS RESEARCH AND DEVELOPMENT LAB. BUILDING 140

Final Surface Contamination Survey - Concentrations shown are in d/m/100 $cm^2$
ND indicates no detectable smear activity above counting background
Circled values indicate wall smears
Shaded areas indicate levels of fixed contamination above instrument background

Figure 2

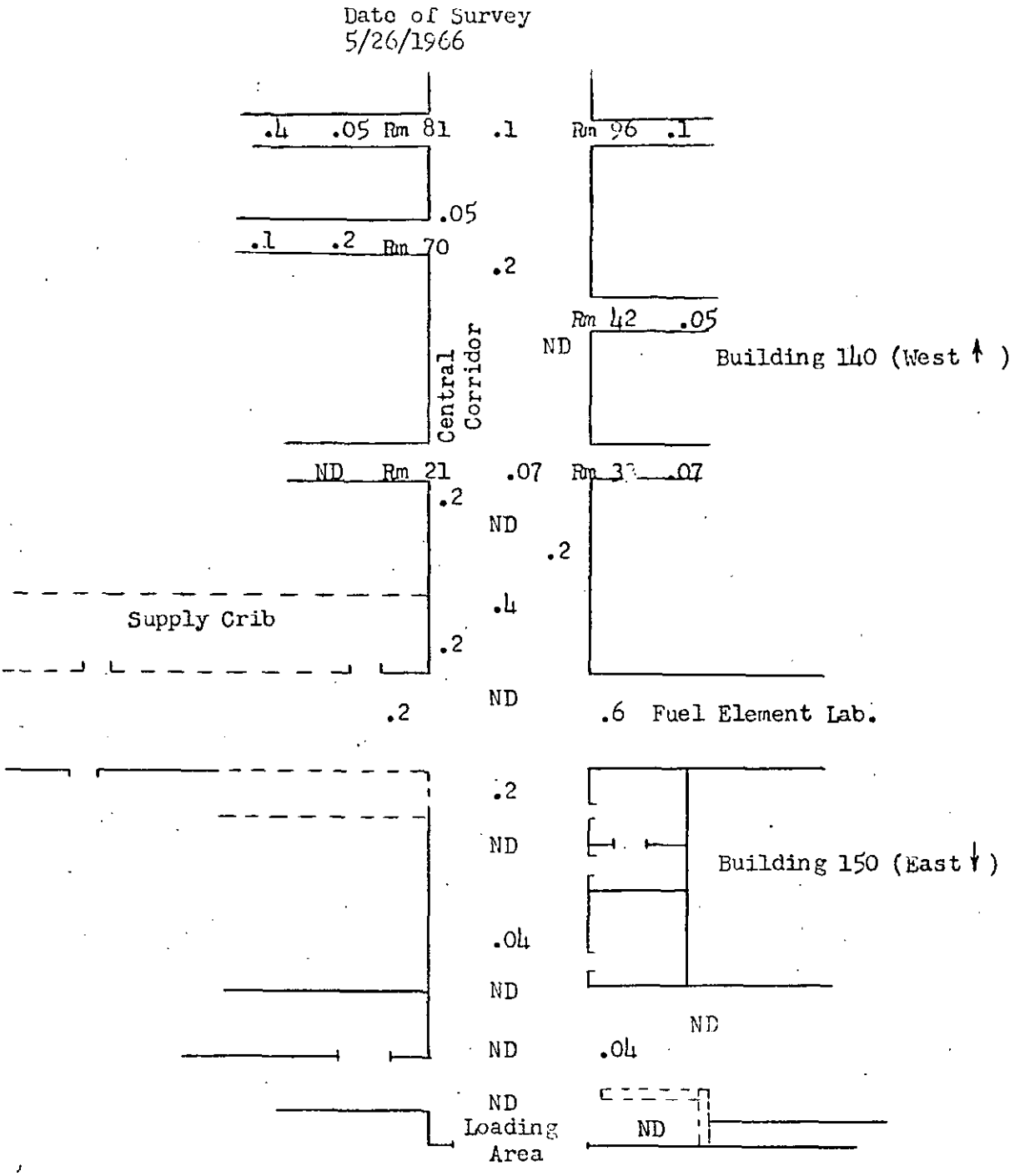
Date of Survey
5/26/1966




BUILDING 150

Final Surface Contamination Survey - Concentrations shown are in d/m/100 $cm^2$
ND indicates no detectable smear activity above counting background
Circled values indicate wall smears
Note: Direct instrument readings in all locations indicated no detectable activity above instrument background - 0- 50 c/m

Figure 3

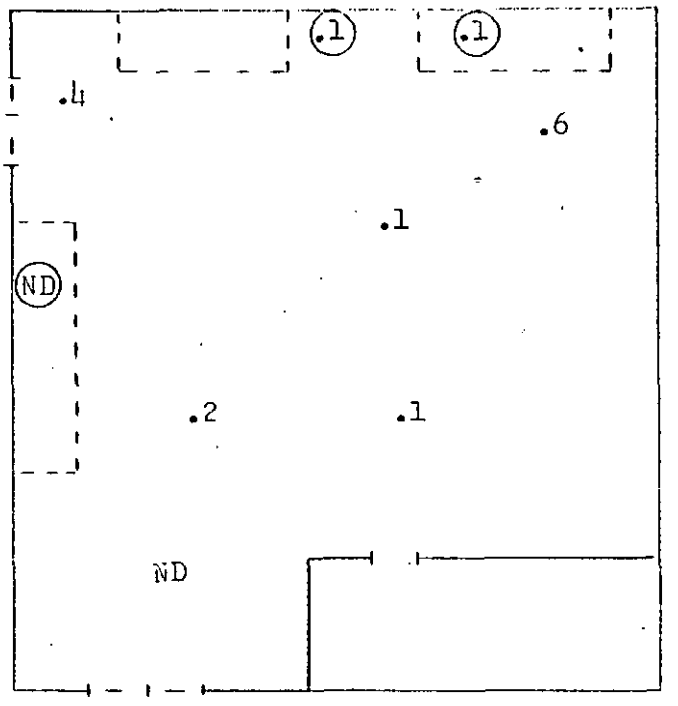



BUILDINGS 140 AND 150

Final Surface Contamination Survey - Concentrations shown are in d/m/100 $cm^2$
ND indicates no detectable activity above counting background
Note: Direct instrument readings in all locations indicated no detectable activity above instrument background - 0- 50 c/m

Figure 4

Date of Survey
5/26/1966

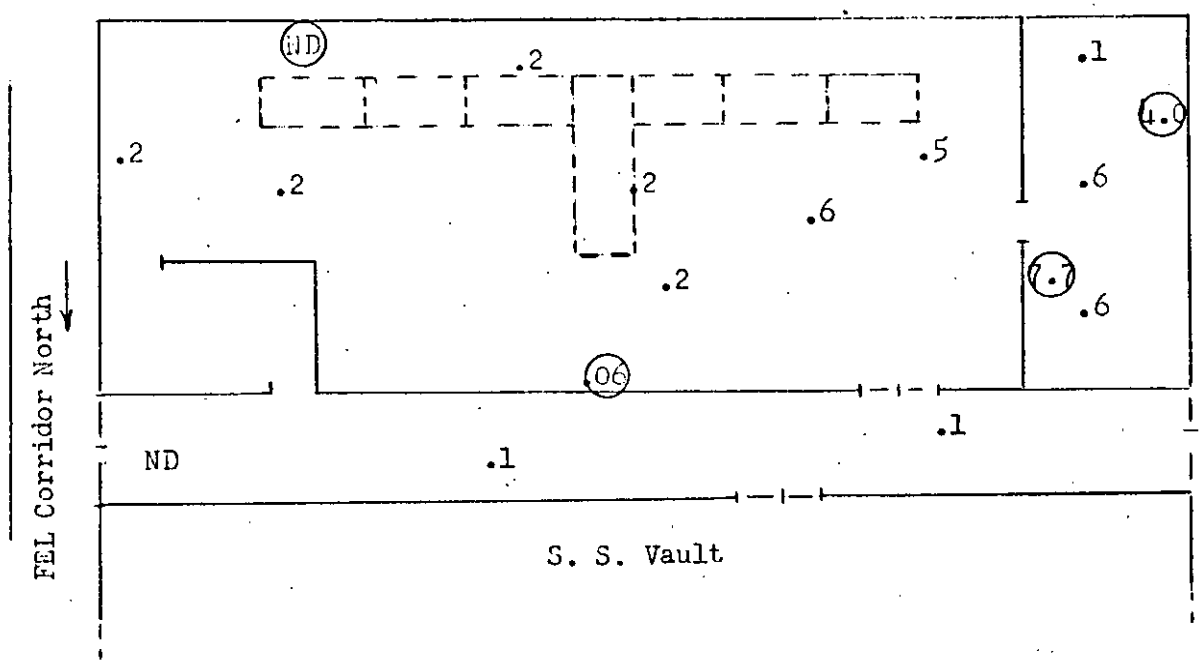



HIGH TEMPERATURE RESEARCH ROOM 21

Final Surface Contamination Survey - Concentrations shown are in d/m/100 $cm^2$
ND indicates no detectable smear activity above counting background
Circled values indicate wall smears
Note: Direct instrument readings in all locations indicated no detectable activity above instrument background - 0-50 c/m

Figure 5

Date of Survey
5/26/1966




BLICKMAN DRY BOX ROOM BUILDING 150

Final Surface Contamination Survey - Concentrations shown are in d/m/100 $cm^2$
ND indicates no detectable smear activity above counting background
Circled values indicate wall smears
Note: Direct instrument readings in all locations indicated no detectable activity above instrument background - 0 - 50 c/m

Figure 6

TABLE II

GENERAL AIR CONCENTRATIONS

| Location | | No. of Samples | Concentration alpha d/m/m$^3$ Low | High | Average |
|---|---|---|---|---|---|
| Fabrication 2 | During disconnection of electrical lines | 6 | 0.1 | 0.4 | 0.16 |
| Fabrication 2 | During disassembly, removal & cleanup of glove boxes | 10 | 0.1 | 7.3 | 3.6 |
| Fabrication 2 | During disassembly & removal of Stokes Press | 10 | 0.1 | 10.7 | 2.1 |
| Fabrication 2 | During floor sweeping | 1 | | | 0.6 |
| Fabrication 1 | During disconnection of electrical lines | 2 | | | ND* |
| Fabrication 1 | During floor sweeping | 1 | | | 0.2 |
| Powder 2 | During disconnection of electrical lines | 1 | | | ND |
| Powder 2 | During disassembly of equipment | 3 | 0.8 | 1.5 | 0.8 |
| Powder 2 | During floor sweeping | 1 | | | 0.5 |
| Development | During equipment removal | 2 | 0.8 | 3.4 | 2.2 |
| Blickman Glove Box Room | During glove box disassembly & removal | 6 | ND | 0.8 | 0.3 |
| Cont. Machine Shop | During equipment removal | 2 | | | ND |
| Room 37 | During fume hood removal | 2 | ND | 3.8 | 1.9 |
| Room 81 | During graphite rig disassembly | 2 | 0.1 | 0.2 | 0.15 |
| Room 82A West | During Plasma Spheroidizing Fce, disassembly & removal | 3 | 0.2 | 1.1 | 0.7 |
| Room 81 | During removal of fume hoods | 4 | 57 | 106 | 84 |
| | 1-1/2 hrs. after removal | 4 | 3 | 64 | 21 |
| | 24 hrs. after removal | 3 | 3 | 7 | 4.8 |
| Hot Lab. Rm. 26 | During X-ray diffractometer disassembly | 3 | ND | ND | ND** |

*ND indicates no detectable activity above counting background.
**Beta-gamma concentration.