ATTACHMENT 7

DECONTAMINATION PLAN
FOR
ROCKETDYNE FACILITIES
LICENSED UNDER
SPECIAL NUCLEAR MATERIAL LICENSE
SNM-21

Rockwell International

AI-78-10

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Prepared by the Staff
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I. INTRODUCTION

Included with the renewal by the U.S. Nuclear Regulatory Commission of Rocketdyne's Special Nuclear Materials License No. SNM-21 on September 15, 1977, is License Condition 45, which requires that "...the licensee shall submit a plan for the future decontamination of the places of use and sites authorized by this license so that they can be released for unrestricted use. This submittal shall identify and discuss the factors that were considered in the design of the plan in sufficient detail to enable an independent review..."

This report has been prepared to fulfill the preceding requirements. For each applicable Rocketdyne facility, a description of the building is given, followed by past and present operations in the building, latest known or suspected contamination levels, and recommended cleanup procedures prior to release for unrestricted use. The decontamination efforts proposed are based on current status, as of May 1988, and some modification may be necessary, depending on future facility use. Any such revisions or adjustments will be noted at the time of future license renewals.

The guidelines for decontamination presented in Annex B to the Special Nuclear Materials License have been followed in the development of this plan.

II. ROCKWELL INTERNATIONAL HOT LABORATORY (BUILDING 020), SANTA SUSANA FIELD LABORATORIES

Building 020, the Rockwell International Hot Laboratory (RIHL), was designed and constructed to provide for the examination of irradiated nuclear fuels and reactor components. Examinations have been conducted with Sodium Reactor Equipment (SRE) fuel assemblies and moderator cans; fuel elements from the Organic Moderated Reactor Experiment (OMRE) and Piqua reactors; and fuel test capsules irradiated at the Materials Testing Reactor (MTR), Engineering Test Reactor (ETR), General Electric Testing Reactor (GETR), Whiteshell Reactor No. 1 (WR-1), and Hanford reactors. Three intact compact reactor cores (under license-exempt operations), for the Systems for Nuclear Auxiliary Power (SNAP) 8 Experimental Reactor, SNAP 10FS-3, and the SNAP 8 Demonstration Reactors, have been disassembled and examined. The facility is adaptable for operations with irradiated plutonium-bearing fuels, by use of remotely operated enclosures within the cells. Facilities are also provided for work with radioisotopic heat sources.

Irradiated fuel declad programs (e.g., SRE, Hallam, EBR-I, Sefor, EBR-II, and Fermi) were conducted at the RIHL from 1974 through 1988.

A. FACILITY DESCRIPTION

The Rockwell International Hot Laboratory (RIHL) is located at the Santa Susana Field Laboratories in Area IV (Figure 1). Construction was completed in 1958. At that time, it was designated the Component Development Hot Cell (CDHC) and was unofficially referred to as the "hot cell." The designated name was subsequently changed to Atomics International Hot Laboratory (AIHL), and then to the current designation, RIHL. Historical information on the "hot cell" may be found under any one of three acronyms: CDHC, AIHL, or RIHL.

1. GENERAL LAYOUT

The RIHL contains 16,000 ft^2 of floor space and includes four large multimegacurie hot cells. The floor plan is shown in Figure 2. Behind each cell is a heavily shielded decontamination room. The cells are equipped with master-slave manipulators, electromechanical manipulators, and bridge cranes. Additional controlled areas within the facility provide space for laboratory operations, maintenance and testing of nuclear materials and equipment that do not require the heavy shielding of a cell or decontamination room. The RIHL is constructed of both reinforced concrete and dense concrete which supports a building structure surrounding the cells to provide office space, operating gallery, operations support, a mock-up area, and a service gallery.

In-cell equipment is remotely operated from the operating gallery using manipulators, analytical equipment, and controls for the various cell operations. Access to inside the cells is from the service gallery, located at the rear of the hot cells. The decontamination rooms are located between the cells and service gallery. These rooms are where equipment is decontaminated and packaged. The decontamination rooms also serve as contamination control areas between the cells and the service gallery. Connected with the service gallery is a hot manipulator repair room for servicing low-level, radioactively contaminated equipment. In addition, controlled environment glove boxes are available for use with radioisotopes and low-level radiation operations. Additional support areas are located throughout the facility as indicated in Figure 2.

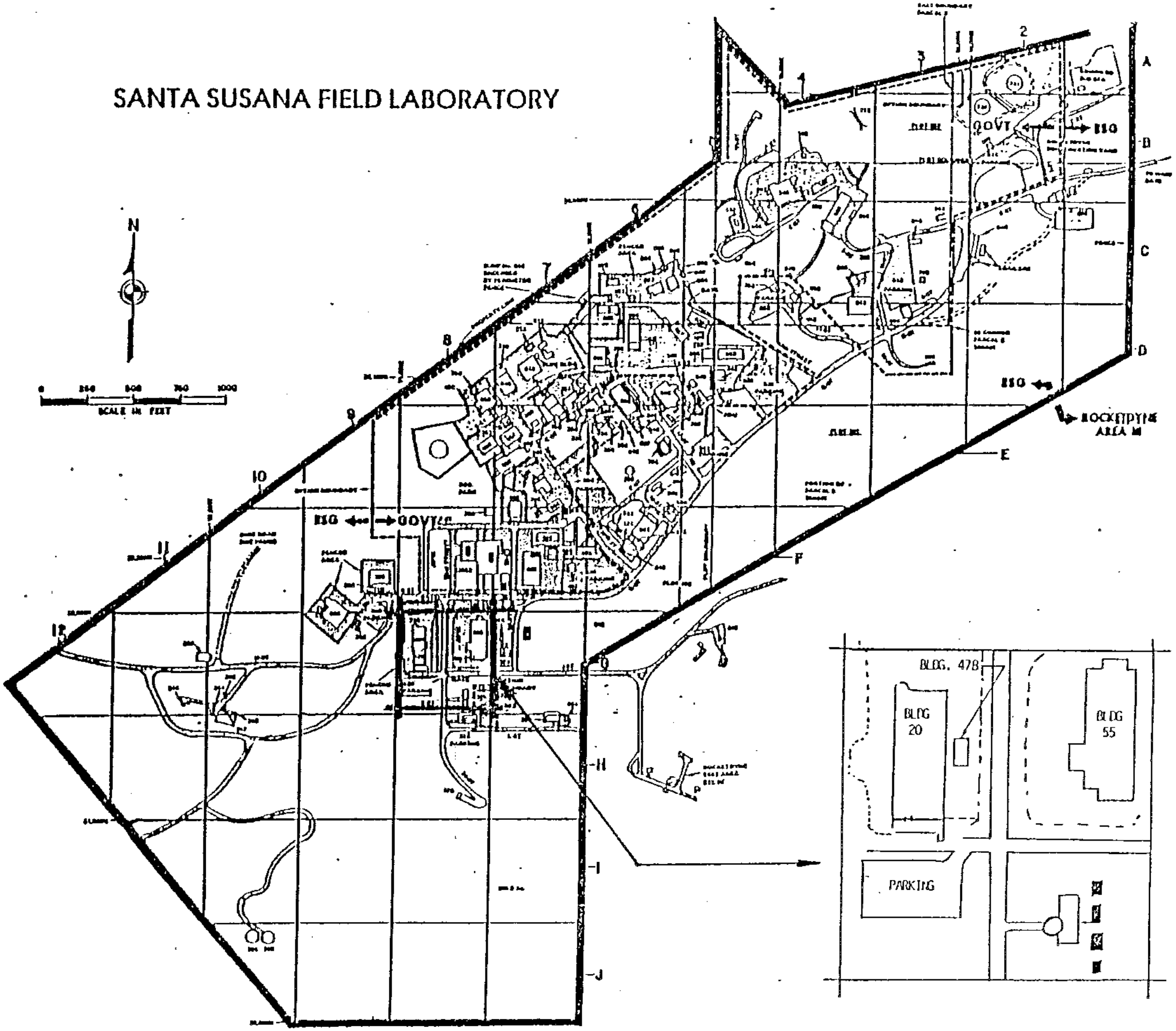

Figure 1. Santa Susana Field Laboratory

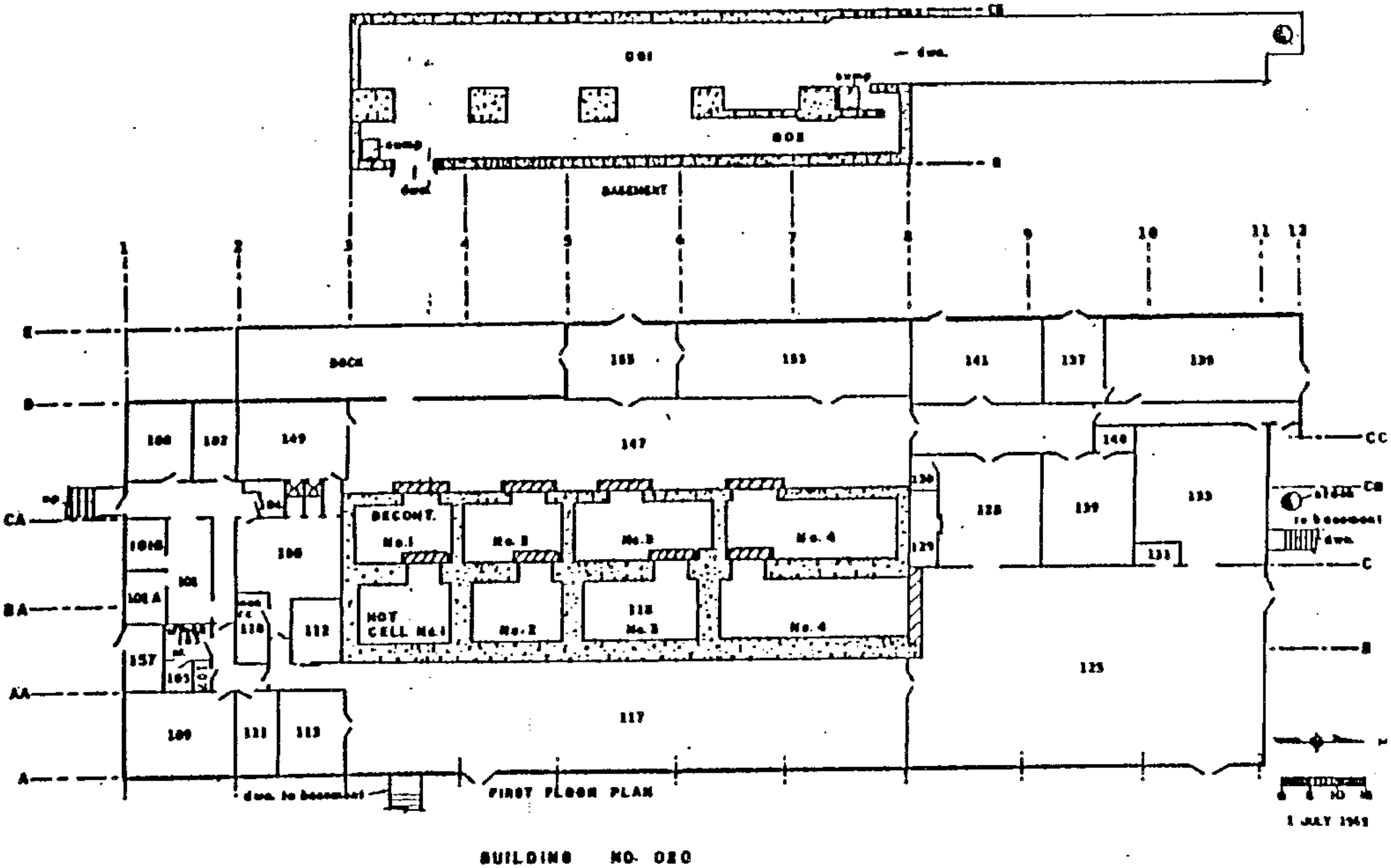

Figure 2. Structural Layout of RIHL, Showing Basement Under Hot Cells

The facility ventilation system forces air to flow from the radioactively cold areas toward the areas of highest contamination potential, through roughing filters and high-efficiency particulate filters, and finally out a 54-in.-dia 73-ft-high stack (above grade). The ventilation ducts are installed in the basement directly below the hot cells.

The building is provided with air conditioning, gaseous and liquid effluent controls, alarms, fire control, electrical power distribution, emergency power, compressed breathing air, compressed shop air, and an air sampling system.

2. HOT CELLS

The hot cell walls are 42-in.-thick, high-density (4.4-g/cm^3), magnetite concrete. The ceilings of the cells are 29-in.-thick magnetite concrete. Cell dimensions are given in Table 1. Viewing window parameters are shown in Table 2.

Table 1. Hot Cell Internal Dimensions

Cell	Length	Depth	Height
1	16 ft	10 ft	16 ft 9 in.
2	16 ft	10 ft	16 ft 9 in.
3	20 ft	10 ft	16 ft 9 in.
4	33 ft 6 in.	10 ft	16 ft 9 in.

Transfer drawers are provided inside tunnels in the walls between the cells. Steel-encased lead shielding doors are at each end of the transfer drawer tunnels. Shielded storage caves are provided in the walls between the main cells and the decontamination rooms. A small transfer tunnel connects Cell 1 to the metallograph room.

Table 2. Viewing Window Parameters

Plate Number	Location	Material*	Density (g/cm^3)	Thickness (in.)
1	Outside	Tempered plate	2.5	1
2	↓	Lead glass	6.2	4
3	↓	Lead glass	6.2	4
4	to	Lead glass	6.2	4
5	↓	Lead glass	3.27	8
6	↓	Lead glass	3.27	8
7	↓	Lead glass	3.27	8
8	Cell side	Nonbrowning tempered plate	2.7	1

*Optically coupled with white oil.

Large doors are provided in each of the decontamination rooms and main cells. The cell doors, located between the cells and the decontamination rooms, are 21-in.-thick Meehanite. The decontamination room doors separating the service gallery from the decon rooms are 16-in. dense concrete. A second 21-in.-thick Meehanite door is provided at the north end of Cell 4, adjacent to the mock-up area. It contains an 18-in.-dia port with a sliding lead door, 12 3/4-in. thick. All doors are provided with inflatable seals.

Handling equipment is provided for in-cell movement of materials and operation of test apparatus. One pair of master-slave manipulators is located at each main window. In addition, each cell is equipped with a 3-ton bridge crane. Cells 2, 3, and 4 also have track-mounted General Mills electromechanical manipulators.

Generally, a raised false floor is used in all the cells. These floors are made from 1/4-in.-thick plywood, completely covered with a 1/32-in. stainless steel plate. The floor is supported by an aluminum angle and channel structure, bolted together.

In-cell cooling units are provided to reduce and control the temperature of the cell atmosphere. These units have explosion-proof electrical connections, and use a standard refrigerant for cooling purposes. Each unit has a drain line which goes to the cell floor. This drains to a weir box and then to the Radioactive Liquid Waste Holdup Tank.

3. VENTILATION SYSTEMS

The building ventilation systems direct the flow of air from the outside of the building into the main cells. The air flow is always from an area of lower contamination to an area of potentially higher contamination within the building.

3.1 HIGH-VOLUME CELL VENTILATION

Ventilation of the four hot cells and associated decontamination rooms is provided by a 12,540-cfm constant-volume blower. A second identical blower is located in parallel and is automatically actuated in the event of a failure of the primary blower.

The cell exhaust passes through in-cell prefilters and then through high-efficiency particulate air (HEPA) filters in the basement. When necessary to provide additional filtration, HEPA filters are installed in-cell, downstream of the prefilters. Cell ventilation is controlled by pressure instruments located in the operating gallery.

Sufficient ventilation system capacity is provided to create large flow rates into the cells when any cell door or other opening is made. When a cell door is opened, about 4,000 cfm are exhausted from the cell. This corresponds to a flow rate of >100 linear ft/min through the opening into the cell. This flow rate is adequate to prevent the release of contamination from the cell into the adjacent decontamination room.

3.2 LOW-VOLUME CELL VENTILATION

A low-volume ventilation system provides an inert (nitrogen) atmosphere in the cells for fire prevention and the protection of pyrophoric materials. The nitrogen supply is automatically controlled by photohelics to prevent the cell pressure differential from dropping below 0.05 in. of water negative with respect to adjacent areas.

3.3 ALPHA ENCLOSURE VENTILATION AND FILTRATION

Room 139 is set up for work with unencapsulated unirradiated plutonium and similar materials. Two alpha glove boxes are installed, with three stages of HEPA filtration before release of the exhaust air. The room has HEPA filters installed to provide two stages of filtration before discharge. An alpha glove box is also installed in Decon 4, with the same filtration provisions.

4. ATMOSPHERIC AND LIQUID EFFLUENT CONTRDL SYSTEM

4.1 ATMOSPHERIC EFFLUENT CONTROL SYSTEM

Radioactivity in the atmospheric effluent is measured continuously with a stack gas monitoring system using beta scintillator, for both particulate and gaseous contamination. The particulate is trapped on a filter that is continuously monitored with a beta scintillator. The filter is changed weekly and counted for radioactivity in a laboratory counting system to quantify and permanently record the airborne concentration. After filtering, the gaseous effluent is measured volumetrically in a gas chamber, also with a beta scintillator.

4.2 RADIOACTIVE LIQUID EFFLUENT HOLDUP SYSTEM

Liquid wastes from all radiologically controlled area drains are collected in one 3000-gal holdup tank. The Holdup Tank Building (Building 478) is located to the east of the RIHL at the perimeter fence line. Most of the tank contents are generated during decontamination of the cells when liquids are used. A weir box is used to catch large solid particles prior to their entering the holdup tank.

4.3 SANITARY SEWER SYSTEM

The sanitary sewer system drains to the Rocketdyne sewage treatment plant. Discharge from this plant is monitored for radiation and is released to a 3,000,000-gal retention pond. Laboratory analysis of the retention pond water is performed as part of the environmental monitoring program.

5. ELECTRICAL POWER DISTRIBUTION

5.1 NORMAL POWER

The facility is supplied from the SSFL 4160-V power distribution system. Transformers in the facility convert the power to 480/277/208/120 V, as needed.

5.2 EMERGENCY POWER

A 480-V, 200-kW diesel-powered generator provides emergency power for the facility in the event normal power is lost. Emergency power is supplied to:

1) Operating gallery alarm panel
2) Emergency lighting
3) Liquid/gaseous nitrogen system
4) Exhaust system
5) Beta-gamma stack monitor
6) Alpha stack monitor

7) Operating gallery air monitor
8) Fire detection system
9) Air compressor.

Power for starting the diesel is supplied by batteries which are charged with normal source current. Battery power is provided to the emergency lighting system, the paging system, and to the exhaust stack radioactivity monitor, in the event the emergency generator fails.

6. FIRE PREVENTION AND SUPPRESSION

The entire building is under a fire protection system. Except for the hot cells and decontamination room, the system is a fully supervised, ordinary hazard, preaction sprinkler system with thermopneumatic devices to sound an alarm, indicate the fire zone, and open a valve filling the pipes to the sprinkler heads (standard pendulum 165°F heads). Fires in the hot cells or decontamination rooms would be detected by the same type of sensing device providing both visual and audible alarms; a fire in these two areas would be controlled by means of a manual nitrogen purge system, which essentially floods only the desired area with nitrogen and reduces the oxygen content to the extent that combustion cannot continue. The final HEPA filters are protected from any potential fire by distance and by dilution air.

7 ALARM SYSTEM

Visual and/or audible alarms are provided for the following functions:

7.1 VENTILATION

The ventilation indication and control system is mounted on two control Panels in the Operating Gallery. The instruments of the main control panel actuate alarms for each cell. Each cell has a separately controlled atmosphere.

7.2 FACILITY SERVICES

Significant facility services are provided with visual and/or audible alarms. All alarms are in the RMDF area except as noted in Item 1) below:

1) The level of liquid in the 3000-gal tanks reaches 60% (local alarm) and 80% (Protective Services Control Center)
2) The hot drain sump level reaches 18 to 22 in. from the top of the sump
3) The purge and/or the exhaust fan fails with standby take-over
4) The diesel equipment fails
5) The rectifier malfunctions
6) The instrument air pressure is below 80 psi
8) Battery-charging system malfunctions
9) Cell differential pressure less negative than -0.1 in. water.

7.3 RADIATION ALARM SYSTEM (RAS)

There are four RAS detectors in the hot cell complex--two located on the east wall of the operating gallery, one on the roof over the service gallery, and a fourth located in the radioactive liquid waste facility. The RAS detectors are set for 20 mR/h above background and trigger the emergency evacuation alarm, which consists of flashing red lights and sirens. This alarm system is connected to the Protective Services Control Center (PSCC) to initiate the emergency response system.

7.4 FIRE ALARM

Other alarms that notify the PSCC are on the fire panel. These alarms indicate fire in a cell or decontamination room (from detectors located near the floor, ceiling, and in air ducts). They also indicate fire in the main duct (south end, center, or north end) or basement. An alarm sounds for low or high pressure at the vaporizer for the nitrogen system.

B. OPERATIONS DESCRIPTIONS

1. RESEARCH AND DEVELOPMENT OPERATIONS

The specific operations that can be performed in the cells vary, depending upon current needs and changing program requirements; the work has been principally research and development. Thus, only general techniques and types of operations typical to hot cell operation are listed. The various capabilities for the cell block area are:

1) Cell 1
    a) Preparation of samples or irradiated material for metallography
    b) Microhardness testing
    c) Microscopic measurements
    d) Preparation and replication of samples for electron microscopy
    e) Autoradiography on mounted samples
2) Cell 2
    a) Materials testing
        (1) Tensile testing
        (2) Stress-rupture and creep
        (3) Testing
        (4) Fatigue testing
    b) NaK and sodium distillation
    c) Visual examination
    d) Density measurements
    e) Dimensional measurements
    f) Minor component disassembly
    g) Fission gas collection
    h) Isotope encapsulation
3) Cell 3
    a) Disassembly cell for irradiated materials
    b) Sample preparation
    c) Elox equipment
    d) Cutoff wheel

    - e) Waste packaging
    - f) Visual examination
    - g) Stereomicroscopic examination
    - h) Dimensional measurements
    - i) Cask unloading
- 4) Cell 4
    - a) Hydrogen analysis
    - b) Profilometer measurements
    - c) Annealing studies
    - d) Permeation testing
    - e) Major component disassembly and repair
    - f) Visual examination
    - g) Stereomicroscopic examination
    - h) Fuel canning
    - i) Dimensional measurements
    - j) Waste packaging
    - k) Cask unloading and loading
    - l) Density measurements
    - m) Gamma spectrometry
    - n) Autoradiography on capsule assemblies

2. PROCEDURES AND EQUIPMENT

A flow diagram for a typical hot cell examination is shown in Figure 3.

a. Materials

Post-irradiation examinations are conducted on irradiation experiments containing such solid reactor fuel materials as U-Mo, UO_2, U-ZrH, etc. Also, cladding materials examined include aluminum, SAP, stainless steel, zirconium, and Hastelloy alloys. Sodiumand NaK-bonded capsules are also examined. Irradiation experiments are received for examination from sodium, organic, and water-cooled reactor systems and tests.

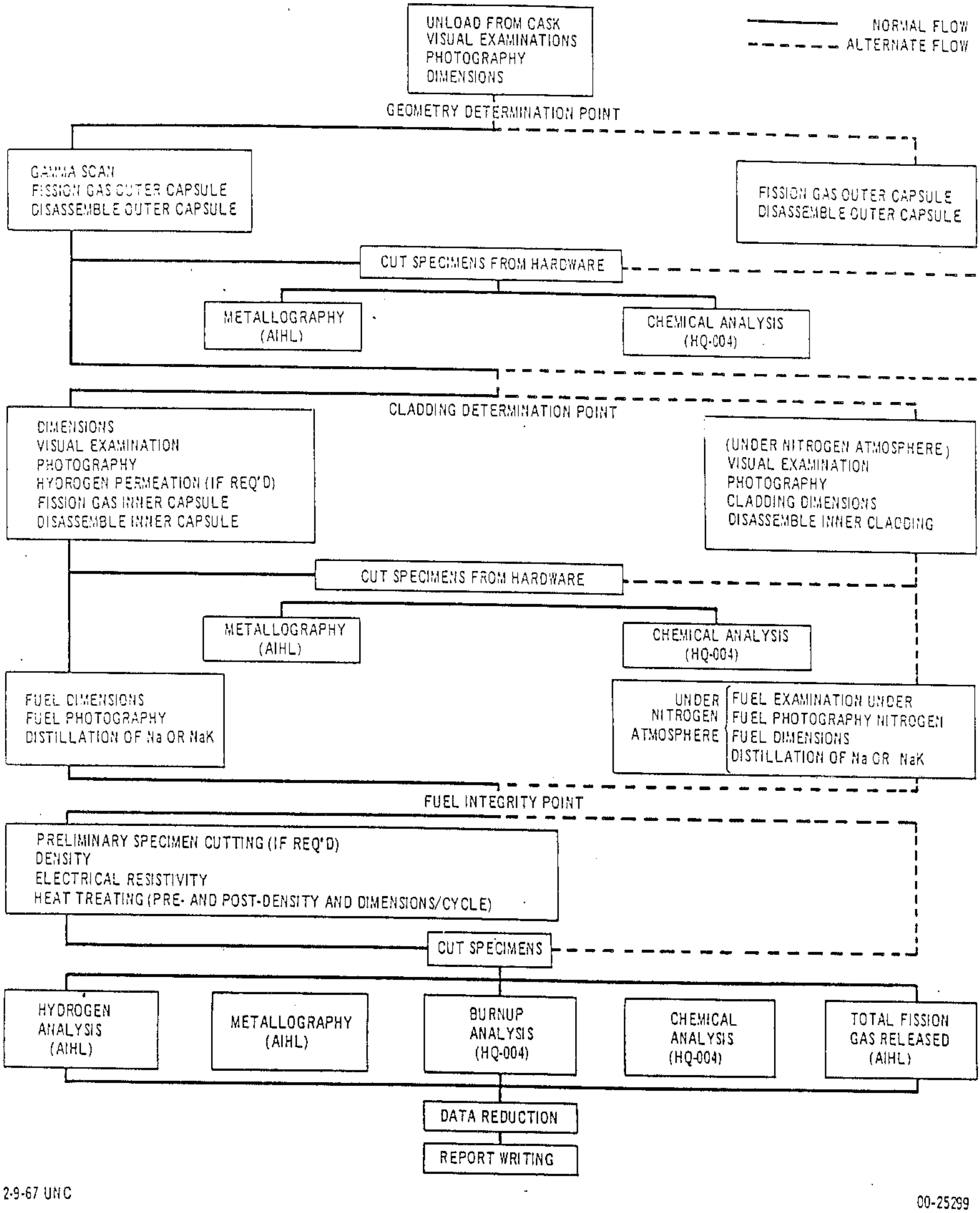

Figure 3. RIHL Process Description

b. Disassembly

Many different types of equipment are used for remote disassembly of fuel capsules and reactor components, including, for example, a remotely operated pipe-cutter used to make tubular cuts on irradiation test capsules. Several hacksaws are used for disassembly operations and for cutting radioactive scrap into lengths suitable for processing. An abrasive cutoff wheel is used for sectioning of fuel and cladding. Disassembly of a variety of reactor hardware and components is done by a remote milling machine. An electrical discharge machine (Elox) is used extensively for precision disassembly and sectioning of fuel and cladding. With this machine, all types of cuts can be made, such as plug cut, coring, and longitudinal cuts for slitting fuel assembly cladding. Many specialized jigs and fixtures for the remote operation and disassembly of components, such as an electric arc cutting device, have been designed and fabricated.

c. Analytical

Nondestructive testing equipment includes a gamma activity scanning spectrometer equipped with a movable stage, used to record the relative activity profile of fuel assemblies. An eddy current device can be used nondestructively to detect fuel cracks and cladding defects in irradiated fuel rods. Permeation apparatus can readily detect and record the helium or hydrogen diffusion rates through metal cladding materials. A pinhole camera is used to take autoradiographs of fuel assemblies, to determine fuel integrity before disassembly operations are initiated.

Equipment used in destructive testing includes such items as a Fission Gas Apparatus, for collecting fission gases produced in irradiated fuel assemblies.

A special annealing apparatus is used for the post-irradiation testing of fuel samples at various temperatures and conditions, to determine irradiation damage effects. A remote glass-blowing operation is used, in conjunction with this apparatus, for sealing samples in quartz capsules.

The Vacuum Extraction Hydrogen Analyzer collects and measures the volume of hydrogen gas evolved from a fuel sample at elevated temperatures. The Hydrogen Analyzer is used primarily on hydride fuel experiments.

Radiochemistry and mass spectrometry analyses are conducted on fuel samples to determine fuel burnup. Density measurements are obtained, using the Archimedes liquid displacement method. Two types of density systems - an Ainsworth remote readout balance, and a direct reading Mettler analytical balance - are employed. Operation of micrometers, tri-mikes, calipers, pitapes, and dial indicators remotely can provide accuracies to ±0.001 in. Two remotized profilometer systems, utilizing pressure transducers, are used to accommodate a wide variety of experiments. This equipment is primarily used to determine length and diameter changes after irradiation. All measuring equipment is designed for continuous calibration while in service.

d. Materials Testing and Metallography

Remote tensile testing is performed on an Instrom Model TT-C universal machine, capable of subjecting test specimens to 20,000-lb force in tension or compression. An extensometer attachment allows strain determinations to be made to an accuracy of ±0.0002 in.

In addition, equipment is available for the performance of stress-rupture testing of hollow cladding tubes by internal pressurization, and fatigue testing of strip specimens by alternate bending.

Metallographic samples can be mounted in epoxy resins or thermosetting plastics. Vacuum impregnation mounting is employed for porous or fragile materials. Two automated grinding and polishing stations allow simultaneous processing of several specimens. Vibratory polishing equipment is also available. A microscope is used to check the quality of the metal surface before examination. A standard Bausch and Lombe Model A-1001 metallograph is shielded, in order that radioactive specimens emitting up to 50,000 R/h can be examined. Examinations can be made at magnifications from 50 to 1000X, using bright-field, dark-field, or polarized light. Photomicrographs are routinely prepared in color, as well as in black and white. With a Unitron Model TM Measuring Microscope, precise measurements can be made in three dimensions, to an accuracy of ±0.0001 in., over a 1 by 1 in. range.

Microhardness measurements can be taken with 100- to 1000-g loads on a Wilson "Tukon" Hardness Tester. Electron microscopy of irradiated materials is performed by taking Faxfilm replicas of the sample, and decontaminating the resulting replicas to an extent that allows examination in a noncontrolled area.

A log of all material movements and material in storage is maintained at each cell. In addition, a master log is maintained by the materials balance accountability custodian. Explicit records of size, weight, description of fuel material, and descriptions of all work and storage stations are contained in the master log. Prior to movement of fuel material within the cell or between cells, approval has to be obtained from the Lead Operator. The approval of this move is based on the records at both cells, in addition to the master log.

Prior to adding or removing material from this cell or the sample storage drawer, the final station location has to be recorded, and approval obtained. (Most of the work performed falls into this category. Allowing movement within a cell eliminates a large number of unnecessary approvals, and makes the necessity of approval more meaningful.)

Cell 1 is normally used for preparing irradiated fuel and cladding samples for metallographic examination. Temporary storage for fissile material samples is provided in 2-in. diameter stainless steel tubes placed in a rack in the storage drawer located at the back of the cell. The incoming material to the cell is primarily irradiated fuel samples in the form of slug sections. Although the average weight of these sample is ~3 g, no material is accepted without approval of the MBA custodian, who checks the master log prior to the move, and changes the master log after the move. The criticality control limit for Cell 1 is 350 g of U^{235}, exclusive of the storage station at the back of the cell, which is also limited to 350 g, except as provided by special analysis.

The samples in temporary storage are regulated, so that the total weight of the U^{235} is not more than 350 g, based on their acceptable weight as received. The 350-g limit also includes that portion of the fuel which has been abraded into fine particles and is in storage in a shielded sump. The removal of the contents of this sump is made when the radiation level exceeds 10 R/h at contact. The radiation level is measured approximately once a month. The limit of fuel samples in process is computed according to their full received weight. A log of these weights and sump removals is maintained in the Cell 1 logbook. All fuel material movements in and out of the cell are recorded in the master log. Also, a master log is maintained of the fuel specimens in the storage drawer.

C. SUMMARY OF EXISTING RADIOACTIVE CONTAMINATION

Some degree of radioactive contamination exists in much of the functional areas of Building 020. The general extent is as follows:

1) Cells 1, 2, 3, and 4 and connected decontamination areas - high to moderately high ($\geq$5000 dpm contamination known to exist).
2) Most of the cell service gallery has some degree of low-level contamination (<3000 dpm). Also, the hot shop, the hot storage area, and the loading dock.
3) The remainder of the cell service area, the operating gallery, the hot shop, and the passageway between the operating gallery and the hot shop, are possible areas of contamination, but at a lower level (<1000 dpm).

The radiation levels in the cells averages ~50 mR/h, with drains reading 1 R/h. Most equipment in the cells has contamination of 5000 dpm/100 cm^2, and dose rates up to 500 mR/h (near contact). The decontamination area ranges between 0.01 and 0.10 rad/h. Service gallery, hot slave shop, hot storage area, 3000 to 5000 dpm (in spots), up to 20 mR/h in cracks, etc. Basement area, in general, 1000 dpm, tank alcove, 100 mrem/h. Pipes, pumps, and filter banks generally contaminated.

Radioactive contamination consists primarily of old mixed fission products (Cs-137, Sr-90, Pm-147) with Co-60 and small amounts of uranium and plutonium.

D. DECOMMISSIONING

1. TECHNICAL APPROACH

Radioactive decontamination is defined as the removal of radioactive material by chemical or physical methods, with the primary objective being the reduction in radiation exposure to the work force and ultimately to the general Public. Decontamination can be accomplished by different means depending on how the contaminate adheres to the surface and the level of decontamination desired. For loosely bonded material, vacuum cleaning may be adequate to remove it from the surface and shallow crevices. For tightly bonded material or material trapped in deep, convoluted crevices, removal of a portion of the surface by chemical or physical methods may be necessary. In many cases, decontamination can be accomplished by treatment such as water rinsing or scrubbing with soap and water; however, these simple techniques can be complicated due to limited access because of excessive radiation fields and by limited control or containment of the process.

Much of the RIHL can be decontaminated using techniques proven effective on other D&D programs performed by Nuclear Operations, Department 635-123. However, the RIHL facility structure provides a number of unique problems not usually encountered with contamination removal. Where it might normally be most cost effective to remove a contaminated pipe or penetration and package the entire part as radioactive waste, the massive amount of structural steel tie-ins, welds, and dense reinforced concrete surrounding the contaminated Pipes and penetrations dictate an alternate approach. This alternate approach includes the development and test of in situ decontamination techniques for wall penetrations, floor drains, storage tubes, and cell liners located in Cell 1. Decontamination in-place would eliminate the requirement to remove large amounts of concrete and steel to remove contaminated penetrations and drain pipes. This would leave the hot cell virtually intact for reuse and greatly reduce R/A waste volume. The total planning process includes development and demonstration of the in situ cleaning techniques through the implementation of test plans, trade-off studies, and equipment design activities.

Once the techniques and equipment have been demonstrated to be effective in Cell 1, detailed work procedures for these RIHL specific activities will be written and/or revised as will the facilities dismantling plan. Other already existing procedures of a generic nature will be reviewed, reformatted, and revised as necessary for the RIHL D&D project. Figure 3 represents the RIHL decontamination and decommissioning (D&D) planning process through project completion.

Detailed work procedures (DWPs) will be written to describe the operations to be followed for significant specific activities. The DWPs will follow the general guidelines and format of 173TI000004, "Detailed Work Procedure Writing Guidelines." As indicated in Figure 4, some of the procedures are general operating procedures, some are generic in nature for repetitive operations and some are specific to activities or areas.

Since structure and radioactive conditions and/or situations encountered during the decon activities will, on occasion, vary from those anticipated and planned for, the detail DWP work instructions may not be applicable or practical. Except for operations designated as a "critical sequence," or as a "critical operation" as stated in the DWP, the planned order of work and the described operations are to be utilized as guidance instructions. Therefore, operations may be altered or deviated at the discretion of the operator as necessary to accommodate the prevailing work environment.

If needed, instructions designated as "critical" may be changed as stated in 173QFP000001, Paragraph 10, "REDLINING - PROCEDURE CHANGES."

In the application of D&D techniques to the RIHL, decontamination (decon) will be the primary focus. Figure 5 is a flow diagram of the activities required to release the facility to unrestricted use. The objective being to decon those areas of highest radioactivity first in order to minimize personnel exposure and to comply with ALARA principles.

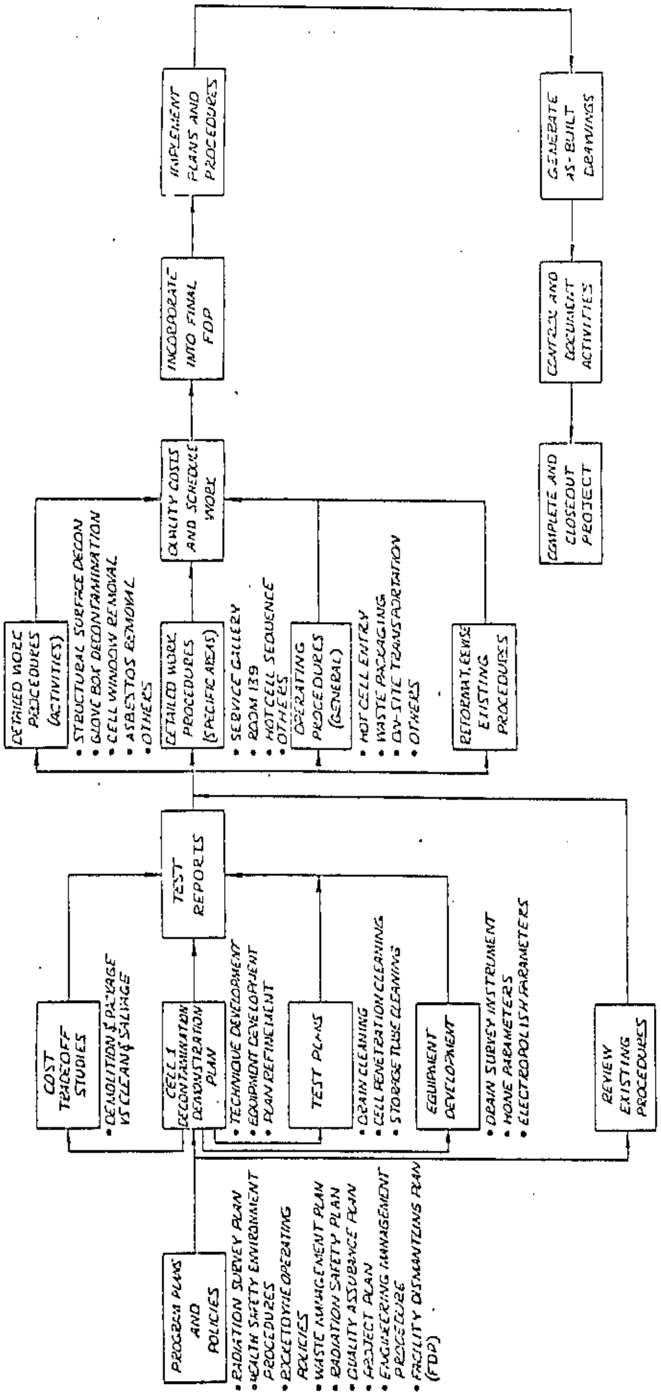

Figure 4. RIHL D&D Plans, Equipment, Procedures Development Flow Diagram

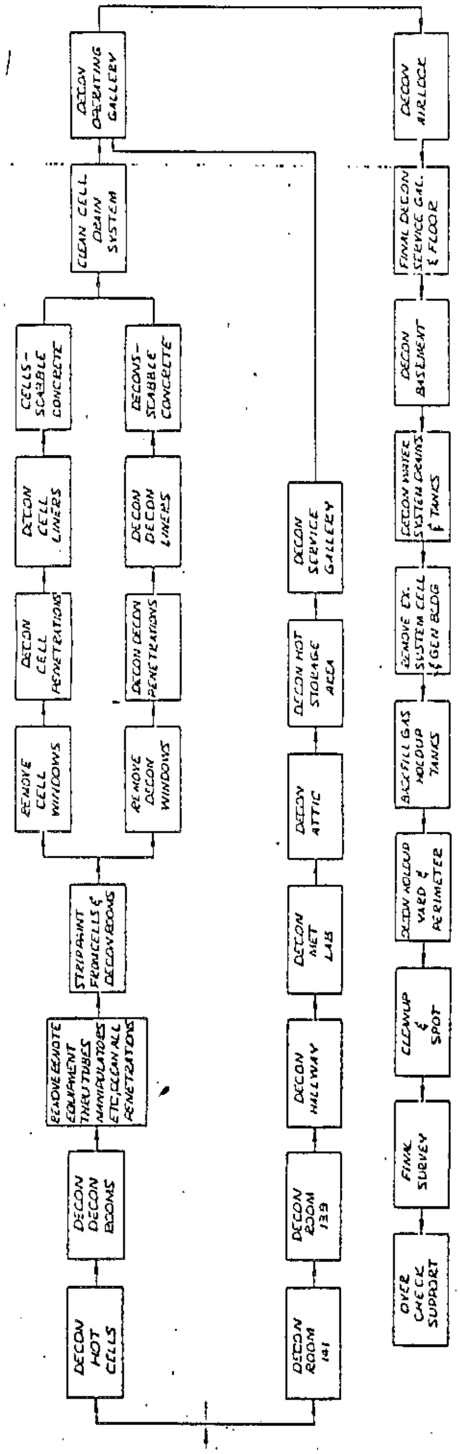

Figure 5. Building 020 D&D Flow Diagram

1.1 BASIC APPROACH TO DECOMMISSIONING THE RIHL

The basic approach to the D&D of RIHL is that the facility will be cleared of all by-product, source, and special nuclear materials (SNM) presently on inventory. The hot cells will be cleared of all materials that required remote handling. Transfer drawers, storage drawers, and storage tubes will be cleared of material, remotely decontaminated, and surveyed to assure they are free of high radiation sources. Other equipment and materials will be cleared from the cells and decon rooms. The remote handling equipment will be removed and wall penetrations cleaned. The cells will be decontaminated and the windows removed. Where necessary, metal cell liners will be removed and concrete scabbled. Cell and decon room drains will be decontaminated, surveyed, and, if clean, abandoned in place. All other radiologically controlled areas will be cleared of contaminated equipment and material. Any material or equipment that cannot be released as clean will be removed, packaged as radioactive waste, and shipped to the Radioactive Materials Disposal Facility (RMDF) for final disposition. The R/A material will then be shipped from there to an approved burial site. No waste material with detectable radioactivity will be disposed of as conventional waste. When all hazardous materials have been removed and the facility decontamination is complete, the ventilation systems will be removed. A final survey, spot cleanup, and an overcheck survey will complete the D&D activities. Building structures will be repaired only to ensure that the facility is left in a safe condition.

1.2 ELEMENTS OF DECOMMISSIONING THE RIHL

Trade studies and tests will be performed to provide decision making information or to establish direction for conducting the RIHL D&D project. Areas of concern that may warrant further study or testing includes, but need not be limited to, paint removal in the hot cell and decon rooms, cell liner removal, radioactive drain system decontamination and/or removal; cell penetrations decontamination and/or removal; storage tube decontamination and/or removal; and sampling areas with limited physical access in order that those areas can be released to unrestricted use.

1.2.1 Hot Cells and Decontamination Rooms

Initial decon may be performed remotely if radiation levels in cell are deemed too high. The storage and transfer drawers will be emptied, decontaminated, and surveyed remotely to assure that all high radiation sources are removed. Contaminated equipment will be cleaned in place (if practical) and then moved from the cells to the decon rooms. The false floors will be cleaned and removed. Remote handling equipment will be removed from the cells. Final decon and disposition of the items will be performed in the decon room or service gallery, as conditions permit. Master-slave manipulators, periscopes, and other items penetrating the front wall will be removed and dispositioned. The wall penetrations will be decontaminated and sealed to prevent recontamination during cell cleaning.

When all of the materials and equipment have been removed, the paint will be completely stripped from the cells and decon rooms. Radiation surveys will be performed to determine if any contamination remains. Selected areas of the cell and decon liners will be removed to permit concrete sampling of the underlying area. Further work in the "hot cells" and decon rooms will be based on the results of this sampling.

1.2.2 Other Posted Radiological Support Areas

The hot cells and decon rooms are surrounded by other radiologically controlled areas used to support the activities in the RIHL. These include the service gallery, hot storage room, air lock, hot laboratory (Room 141), hot machine shop (Room 139), hot metallograph, manipulator repair room, basement, generator room, cask storage yard, and liquid waste system. This section discusses all of the above areas except the liquid waste system and the ventilation system for those areas which are discussed in sections 1.2.3 and 1.2.4, respectively.

These radiologically posted areas, outside the hot cells and decon rooms, are controlled due to the presence (or suspected presence) of either surface contamination, airborne contamination), ionizing radiation, or a combination thereof.

The approach to decontaminating these areas will be to disposition ionizing radiation sources, remove the surface contamination, and any other sources of airborne contamination to the extent required to release these areas for unrestricted use. The final disposition of the service gallery and air lock will follow the decontamination of the hot cells and decon rooms.

1.2.3 Liquid Waste System

The liquid waste system consists of a 3000-gal collection/holding tank fed from floor drains, sumps, and sinks located in radiologically controlled areas of the "hot cell." The R/A drain piping system, for the most part, is embedded in heavily steel-reinforced concrete which creates a significant barrier to its removal. Trade studies and perhaps experimental testing will be necessary to establish the most cost-effective way to release these drains/areas for unrestricted use. If they are to be abandoned in place, they will not only need to be decontaminated but they must also be proven releasable to the Annex B limits. This must be done to the satisfaction and concurrence of NRC and the State of California.

R/A drain piping located in standard flooring shall be removed using conventional techniques for disposal. All other liquid waste system components such as sinks or sumps shall be surveyed, decontaminated and, if possible, released for unrestricted use. The 3000-gal collection/holding tank shall be desludged, the contents solidified and the tank, pumps, valves, gauges, etc., disposed as R/A waste. If feasible, the tank may be size reduced at the RMDF.

The building which houses the 3000-gal tank will be decontaminated using conventional techniques and released for unrestricted use.

The sequence for removal of the liquid waste system shall (generally) proceed from the areas of lowest potential contamination toward those with higher potential contamination. Also from higher elevation toward lower elevations. The 3000-gal tank and associated piping will be last.

1.2.4 Ventilation System

The hot cell ventilation system shall be the last R/A system removed from a radiologically controlled area. The ducting removal shall proceed from the farthest point of departure from the blower or from each main duct trunk line. The ducts, filter housing, control system, etc., will be completely removed, decontaminated, and dispositioned. Where ducting is embedded in heavy concrete, every attempt shall be made to decontaminate that portion of the duct so that it may be abandoned in place. When all of the ducting system and blowers have been removed (or determined suitable for release for unrestricted use), the stack shall be surveyed and abandoned in place or demolished.

1.2.5 Unposted Support Areas

Unposted support areas at the hot cell are listed below:

1) Office areas
2) Operating gallery
3) Restrooms
4) Mockup room
5) Heating and ventilation room
6) Battery room
7) Metallograph room
8) Manipulator repair room (cold side)
9) Health physics room
10) Cold change room
11) South section of service gallery
12) Hot change room (Room 149)
13) Office lab (Room 113)
14) Cold lab (Room 111)
15) Health physics trailer
16) Engineering storage room.

These areas are not expected to be contaminated nor should they contain contaminated items. They will be surveyed along with all their contents to verify they meet the requirements of Table 1 of Annex B prior to request for license termination for release for unrestricted use. Areas which are found to exceed the acceptance limits will be decontaminated.

2. HAZARDOUS WASTE PACKAGING

Disposal site and transportation requirements must be complied with when packaging hazardous waste. Material, form, concentration level, toxicity, quantity, etc., are some of the considerations that determine the type of packaging as well as the type of disposal site. For the purpose of planning the D&D of Building 20, only radioactive and asbestos wastes will be addressed. Any other hazardous waste, such as chemicals, will be disposed through normal interplant channels.

2.1 RADIOACTIVE WASTE

Radioactive waste packaging has been an ongoing, routine function of the "hot cell" and Radioactive Materials Disposal Facility (RMDF). Procedures and guidelines are established and in place; these shall be used "as is" for the final packaging and disposition of radioactive waste during the D&D program. If unique conditions arise that are not covered by existing procedures, they shall be addressed by exception in the individual detailed work procedure under which the work is being performed.

2.2 ASBESTOS WASTE

Asbestos waste must be handled under special procedures and by specially trained personnel even if not radiologically contaminated. Existing procedures will be used where applicable. If unique conditions exist that are not covered by established procedures they shall be addressed, by exception, in the detailed working procedure under which the work is being performed.

2.3 MIXED (RADIOACTIVE AND HAZARDOUS MATERIAL) WASTE

A "mixed waste" can be defined as a hazardous waste material from the EPA list that is also radioactively contaminated. Every effort will be made to avoid generating this type of waste because disposal is currently very difficult. If "mixed waste" material is unavoidable and cannot be decontaminated, it will be necessary to work directly with the disposal site on a case-by-case basis to resolve the disposition.

3. D&D OPERATIONS AND RECORD CONTROL

RIHL D&D operations will be controlled using Detailed Working Procedures (DWP) and appropriate Radiation & Nuclear Safety Radiation Survey data sheets.

III. OTHER AUTHORIZED FACILITIES

Other facilities may be authorized for the use of special nuclear material, following internal review and approval. Operations at these facilities will be so limited, by the License Conditions and the authorized use, that only minor contamination is likely to occur. Decontamination of these facilities will consist of removal or decontamination of equipment, ventilation systems, liquid waste systems, and structural surfaces, to comply with the limits and requirements of Annex B. This decontamination effort will be included in the project planning and, as appropriate, will be performed at the end of the project or at the end of SNM at the facility.

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