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Report on Use of Excess M-Area Facilities

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DISCLAIMER

1.0 Purpose

The purpose of this report is to document the results of a study which investigated the feasibility of physically locating one or more functions that will be required to support the Accelerator Production of Tritium (APT) Project in M-Area facilities at the Savannah River Site (SRS).

2.0 Background

As the APT Project activities are being scoped and planned, it has become readily apparent that a number of tasks will have to be performed during the various project phases. This includes a variety of functional activities during plant design development, procurement and construction, start-up, and operation. The Conceptual Design Report, which is currently being developed, will define the concepts and locations for performing many of these activities.

In general, the APT Project will require the construction of many new facilities at SRS. It is recognized that SRS is a very large DOE site with many existing facilities and not all of these buildings are currently in use. Some of these existing facilities have been designated as surplus in several WSRC reports (ref. 1,2). Furthermore, the DOE-SR Office of Science, Technology and Business Development and the WSRC Community Outreach Division have been actively pursuing the privatization and commercial use of surplus facilities at SRS (ref. 3,4).

Utilization by the APT Project of some existing M-Area facilities that are presently considered surplus represents a potentially significant cost savings to the DOE. Furthermore, the M-Area facilities could be made ready for use much quicker than afforded by new construction. This suggests that they would be especially desirable for supporting hardware development activities prior to actual plant construction. In addition, the M-Area is near the site boundary and is therefore easily accessible by off-site personnel.

3.0 Scope

The feasibility of using some of the M-Area facilities in support of the APT Project depends on several factors. These include the following:

- APT Project Function Facility Requirements
- M-Area Facility Features
- M-Area Facility Integrity/Condition

The scope of the present study summarizes the facility requirements necessary to support a number of candidate functions. It also identifies existing M-Area facility features based on a review of several surplus facilities plus a few buildings that are currently in use. The integrity and condition of the existing facilities is summarized based on existing structural

evaluations together with preliminary assessments obtained through performed walkdowns.

The objectives of this study are as follows:

- Identify facility requirements necessary to support select APT Project functions.
- Identify available building features for existing select M-Area facilities.
- Compare facility requirements with existing features to screen candidate functions.
- Identify candidate functions that are most feasible.

4.0 Definitions/Acronyms

APT - Accelerator Production of Tritium
DOE - Department of Energy
HEBT - High Energy Beam Transport
HEPA - High-Efficiency Particulate Air
HVAC - Heating, Ventilation, and Air Conditioning
ICS - Integrated Control System
JCO - Justification for Continued Operation
LANL - Los Alamos National Laboratory
MCC - Motor Control Center
NPH - Natural Phenomena Hazards
PC - Performance Category - A classification using a graded approach in which structures, systems, and components in an assigned category are designed to assure a similar level of protection (performance goal) during Natural Phenomena Hazard events.
PDC - Program Development Center
RBA - Radiation Buffer Area
SAR - Safety Analysis Report
SRS - Savannah River Site
TVI - Technical Vocational Institute

5.0 Methodology

This feasibility study began with the selection and definition of various functions which will be required to support the APT Project. These functions collectively represent activities that will support all phases of the project from development through plant operation. For the purposes of this study, these functions are considered to be candidates for location in the SRS M-Area.

The facility requirements to enable the candidate functions are then determined. These are defined in terms of required facility size, utilities, special handling, environmental control, hazard generation, etc.

In parallel with the candidate function definition, a variety of the M-Area facilities are investigated. They represent a cross section of the largest buildings in M-Area. Several have been declared surplus and available for reuse, several are surplus buildings that are either currently shutdown or used as inactive storage areas, and one building is actively being used as a warehouse. These buildings are then characterized in terms of existing features, spatial capacity, available equipment, and integrity/condition.

The candidate functions are then screened by comparing the candidate function facility requirements with the existing features of the various M-Area facilities. Candidate functions which are not compatible with M-Area facilities are eliminated from further consideration. The remaining APT functions are identified as feasible candidates for incorporation in SRS M-Area. They are then prioritized according to the functions' requirements.

6.0 Discussion of Results

6.1 Identification of Candidate Functions and Facility Requirements

Based on several brainstorm sessions involving lead engineer personnel from both SRS and LANL, a list of 24 candidate functions to be considered for this study was developed. The functions were then grouped according to the initial phase of the project that each function is supportive of APT, i.e., pre-construction/development, construction, or start-up/operation.

As a result of this effort, the candidate functions were identified as follows:

Project Phase	Function No.	Function Description
Pre-Constr./ Development	1.	Program Development Center (computer hardware/ software development)
"	2.	Computer Maintenance
"	3.	Scaled Prototype Heat Transport Loop (Target/Blanket flow test development)
"	4.	Tritium Implantation Studies (Target/Blanket development)
"	5.	^{3}He/Tritium Gas Loop Fabrication and Testing

Construction	6.	Training Facility (technicians and operators)
"	7.	Control Room Simulator (operator training)
"	8.	Construction Modularization (fabrication of pipe, steel assemblies, HVAC, water treatment systems, etc.)
"	9.	Construction Staging
"	10.	Construction Instrumentation Calibration
"	11.	Receiving/Inspection of APT Equipment and Components
"	12.	Pre-Op. Test Verification of Electrical and Electronic Equipment
"	13.	Storage of Electrical and Electronic Equipment
"	14.	Pre-Op. Test Verification of Accelerator Targets
"	15.	Vacuum Valve Pre-Op. Test Verification
"	16.	H_2 Furnace and Welding
"	17.	Fabricate Target/Blanket Components
"	18.	Flow Testing of Target/Blanket Core Components
"	19.	Clean Room Equipment Fabrication/Repairs
"	20.	Magnet Equipment Maintenance
Start-Up/ Operation	21.	RF Equipment Support
"	22.	Hot Machine Shop Equipment Repairs
"	23.	Cold Machine Shop Equipment Repairs
"	24.	Waste Material Characterization

A brief description of these functions is given in the following subsections. The detailed facility requirements necessary to enable or support each candidate function are identified in table 1a & 1b.

6.1.1 Program Development Center

There is need to have a Program Development Center (PDC) during the pre-construction/ development phase of the project. The purpose of this function is to perform initial software development, receipt/inspection and pre-operational testing of new equipment, and integration testing of the Integrated Control System (ICS). Provision is to be included for interim storage of approximately 200 I/O cabinets (2'x2'x6' ea.), 70 workstations (4'x5'x4.5'), 60 printers/graphic copiers and a variety of other types of supporting equipment prior to installation in the APT plant.

A permanent PDC will be located at the APT site in proximity to the main control room. This facility will be used for commissioning, start-up, and long term operation of the APT plant.

The space requirements for the interim PDC will initially be about 1,000 ft^2 which increases to 8,500 ft^2 within 6 months due to temporary storage and equipment staging needs. A raised floor is required to accommodate electrical cabinet wiring. In addition to performing pre-op. testing of new equipment, some computer maintenance can also be performed here. Other facility features that are required to support this function are listed in table 1a & 1b.

6.1.2 Computer Maintenance

The computer maintenance function will provide a permanent work shop to support the storage, testing, maintenance, and installation of ICS computer equipment. Based on a review of the anticipated needs for computer operations support, this function must be located in close proximity to the Main Control Room and Program Development Center which will be located at the APT site. For this reason, the computer maintenance function should not be located in the SRS M-Area. It was therefore deleted from further M-Area consideration.

6.1.3 Scaled Prototype Heat Transport Loop

The purpose of this function is to perform integral flow and heat removal studies of prototype target modules. A primary objective of these studies is to identify any unexpected phenomena related to single and two phase flow in the heat transport loop prior to target fabrication for the APT plant. In addition, this test facility can also be used to generate thermal hydraulic data for benchmarking any system analysis code (such as TRAC) which will be used as the primary design and safety analysis tool. Furthermore, this test loop could also be used for further studies after plant start-up.

The space requirements for this heat transport loop will be about 1,000 ft^2 with a room height of about 20 ft. Other facility features that are required to support this function are listed in table 1a & 1b.

Based on a review, it was determined that the SRS Thermal Fluids Laboratory (786-A) already has the capabilities to perform this function. No major structural modifications would be needed to accommodate the Prototype Heat Transport Loop in the 786-A Laboratory. The Prototype Heat Transport Loop itself would have to be constructed, however. Because of the current facility capabilities in the Thermal Fluids Laboratory, this function was deleted from further M-Area consideration.

6.1.4 Tritium Implantation Studies

This purpose of this function will be to perform beam injection experiments using a small tritium accelerator to determine the effects of impingement on aluminum targets. This function is considered to be a target materials development effort and would be performed during the pre-construction phase of the APT Project.

The tritium accelerator which would be employed for this function is currently located at LANL and would need to be transported to a SRS test facility. The floor space required is about 200 ft^2. The material specimens used in the experiments would become somewhat contaminated in the process of generating about [TBD] curies of tritium. This would require a hood recovery HVAC system for hazardous material confinement. Other facility features that are required to support this function are listed in table 1a & 1b.

6.1.5 ^{3}He/Tritium Gas Loop Fabrication and Testing

The purpose of this function is to demonstrate startup, operational and maintenance functionality of the gas flow loop that will be used to circulate the ^{3}He/Tritium mixture between the Target/Blanket (T/B) and the Tritium Separation Facility (TSF). Each T/B will consist of multiple tube bundles (estimated as high as 50) manifolded together. Initial indications are that the tubes will have to be operated and maintained remotely due to radiation from spallation products. This demonstration will provide data for use in obtaining the optimum design to help ensure the highest probability of a successful operating plant design. Possible tasks include:

- Mock up to determine the best layout arrangement and connection(s) to help ensure ease of installation and removal
- Determination of best approach for secondary confinement of the primary tubes (e.g., coaxial design or vessel confinement)
- Demonstration of the feasibility of remotely cutting, handling and welding tubes
- Development of techniques for the initial pump downs, high vacuum clean up, purging, and leak testing of the system prior to initial ^{3}He filling
- Best equipment, techniques and procedures to be used to leak-test assemblies both before installation and in an "operating" T/B
- Filtering for spallation products
- Shut-down operations and how best to reduce system pressure and recover both ^{3}He and tritium during an operating "excursion"
- Pre-operational testing for spare T/B assemblies.

The space requirements for this ^{3}He/Tritium Gas Loop function will be about 10,000 ft^2. The need for remote handling equipment to demonstrate cutting and welding of gas flow tube bundles is [TBD]. Other facility features that are required are listed in table 1a & 1b.

6.1.6 Training Facility

It is anticipated that there will be a need for some training of technicians and operators to familiarize these SRS personnel with some of the specialized equipment that will be required for the APT plant. Radio Frequency (RF) components, beam diagnostic hardware, instrument racks and chassis, and other accelerator specific equipment and components will require some degree of hands-on familiarization. It is assumed that the technical personnel who receive this type of training will be Technical Vocational Institute (TVI) graduates who already have experience in electronics. Consequently, the required APT related training will be provided through a combination of classroom lectures/ assignments, field assignments at existing accelerator plants (e.g., LANL), and on-the-job learning exercises.

Many of the RF components require large quantities of electrical power and/or cooling to operate and are not well suited for training exercises in a classroom. Training in all aspects of their installation, operation, and maintenance will require interface and support from the RF equipment suppliers and experienced accelerator engineers and TVI technicians.

The SRS training facility at 766-H is equipped to administer primarily classroom training and radiation worker exercises. The classroom format for APT training may include hands-on familiarization with some of the APT components. In that event, it would be advantageous to have a designated training laboratory that is available for APT hands-on training exercises using prototypes or mock-ups of actual hardware and hazardous sources in a simulated setting. The estimated floor space required is 1,000 ft^2. Other facility features that are required to support this function are listed in table 1a & 1b. It should be noted, however, that most required training will probably occur either off-site (provided by vendor or LANL personnel), in 766-H, or on-the-job at the APT site.

6.1.7 Control Room Simulator

The Control Room Simulator will be a full-scale training simulator that replicates the Main Control Room including the overhead video displays. It will be used to provide operator training and process system analysis. Its simulation capabilities will provide the full range of operating and Design Basis Accident conditions. It will also be used to analyze various operating scenarios.

The floor space required to support the Control Room Simulator is about 8,850 ft^2 which is divided between two rooms with a ceiling height of at least 16 ft. A raised floor is required to accommodate computer console wiring. Any required computer maintenance can be performed in either the interim Program Development Center (section 6.1.1) or Computer Maintenance workshop (section 6.1.2). Other facility features that are required to support this function are listed in table 1a & 1b.

6.1.8 Construction Modularization

This function pertains to the fabrication of pipe, steel subassemblies, HVAC hardware, water treatment equipment assemblies, etc. during APT plant construction. Under existing SRS site agreements, these activities must be performed by the construction contractor in their own facilities. Until the construction contractor's scope is clearly defined, it is unknown whether any APT construction activities will be performed by WSRC/BSRI personnel who could utilize on-site facilities such as at M-Area. Assuming all construction activities are subcontracted, then the use of SRS site facilities would not be feasible. In any case, the SRS Central Shops Area currently has extensive shop fabrication capabilities. As a consequence, this function was therefore deleted from further M-Area consideration at the present time.

6.1.9 Construction Staging

The purpose of this function is to provide a staging area of materials for construction activities. Items requiring some protection from the environment via Level C storage include instrument cable, pumps, valves, fans, compressors, ducting, dampers, etc. Some electrical equipment may require Level B (conditioned) storage to preclude moisture condensation.

Normally, the construction contractor is required to provide their own staging facilities. Assuming the APT construction contract permits the use of on-site facilities at SRS, then it is estimated that a minimum of 100,000 ft^2 of floor space may be required. Other facility features that are required to support this function are listed in table 1a & 1b. It should be noted that the actual storage requirements are highly dependent on the coordination of established component delivery schedules with construction activities.

6.1.10 Construction Instrumentation Calibration

This function pertains to the regular calibration of field instrumentation used to support construction activities. Depending on the scope definition of the construction contract, the contractor may be obligated to provide their own capability. If the subcontract permits the use of SRS on-site facilities, then the existing field instrument calibration laboratory in SRS Central Shops will be sufficient. As a consequence, this function was therefore deleted from further M-Area consideration.

6.1.11 Receiving/Inspection of APT Equipment and Components

The purpose of this function is to provide a designated location for determining the received condition of procured equipment items, performing QA verification for purchase order compliance, and providing a central location for temporary storage and subsequent routing. Construction materials are not be included in this function description; they would be routed directly to the construction site for processing.

The SRS Central Shops has an existing facility for receiving and inspection of equipment. For purposes of this study, it was assumed that the APT Project will require a separate facility to process a large quantity of sophisticated APT equipment that requires special handling and inspection.

There are several factors which determine the space requirements for receiving/inspection. Utilization of just-in-time delivery, the rate of material processing (through-put), construction schedule coordination, and the timing of APT system availability will all influence the actual storage requirements. For purposes of this study, it will be assumed that the floor space required will be in the range of 10,000 ft^2 - 100,000 ft^2. A portion of this space will require HVAC for human comfort and Level B storage for electrical equipment. A fire protection system will be required based on anticipated fire hazards associated with equipment storage. Other facility features that are required to support this function are listed in table 1a & 1b.

6.1.12 Pre-Op. Test Verification of Electrical and Electronic Equipment

The purpose of this function is to perform pre-operational test verification of various electrical and electronic equipment prior to installation. This includes the following as a minimum:

- 400 vacuum circuit breakers (4.16kv)
- 3,000 instrument racks/w 20,000 chassis
- 1,000 beam diagnostic devices

All circuit breakers will be tested and adjusted for proper electrical and mechanical operation. Tests to be performed include insulation resistance, contact resistance with breaker closed, and vacuum interrupter integrity. Approximately 1,500 ft^2 of floor space is required for performing this pre-operational test function.

The instrument racks will require some assembly in a clean, environmentally controlled, dust free area. Upon receipt, the chassis will be subjected to electrical function verification prior to installation in the racks. Rack/chassis assembly includes some inner rack wiring. Approximately 4,000 ft^2 of floor space is required for performing this pre-operational test function.

The beam diagnostic devices include 400+ microstrips, 400+ beam loss monitors, 100+ beam monitors with actuators. The devices require some assembly in a clean, environmentally controlled, dust free area. In addition, this function includes an operability check and a vacuum leak check and involves the use of a small radioactive calibration source and cleaning fluids. Approximately 5,000 ft^2 of floor space is required for performing this pre-operational test function. During plant operation, it is anticipated that this function will be needed to provide diagnostic repairs and upgrades as required.

A fire protection system will be required for these pre-op. test areas based on anticipated fire hazards associated with equipment assembly and operational checks. Other facility features that are required to support this function are listed in table 1a & 1b.

6.1.13 Storage of Electrical and Electronic Equipment

This purpose of this function is to provide temporary lag storage of various electrical and electronic equipment while awaiting installation. This includes the following as a minimum:

- 60 motor control centers (480v)
- 400 vacuum circuit breakers (4.16kv)
- 3,000 instrument racks/w 20,000 chassis
- 1,000 beam diagnostic devices

Each motor control center (MCC) section is 20" x 20" x 90" (h) and weighs 600 lbs. Approximately 2,000 ft^2 of floor space is required for the lag storage of MCC sections. The storage area must be conditioned (heated) to preclude moisture condensation.

Each circuit breaker cabinet is 4' x4' x'4' and weighs approximately 1,000 lbs. Assuming that storage racks are used to stack the breaker cabinets three high, then 2,500 ft^2 of floor space is required for the lag storage. The storage area must be conditioned (heated) to preclude moisture condensation.

The instrument racks can be stored in clusters of four. Each of the 750 clusters will require about 40 ft^2 of floor space that is clean, dust free, and conditioned (heated) to preclude moisture condensation. The total lag storage floor space requirement for the instrument rack clusters is therefore about 30,000 ft^2.

The beam diagnostic devices can be stored on shelf racks that are six high. On average, each device is expected to need about 1 ft^3 of volume for storage. This results in a total lag storage requirement for the beam diagnostic equipment of about 500 ft^2. The storage environment must be clean, dust free, and conditioned (heated) to preclude moisture condensation.

A fire protection system will be required for these storage areas based on anticipated fire hazards associated with equipment storage. Other facility features that are required to support this function are listed in table 1a & 1b.

6.1.14 Pre-Op. Test Verification of Accelerator Targets

The purpose of this function is to perform hydraulic performance verification tests of the target modules prior to their installation in the APT plant. To ensure heat removal from the targets under normal and off-normal operating conditions, the flow rate and pressure drop characteristic of the target modules must be verified at an SRS staging area. This will identify any deficiencies that may affect the module flow system.

This function is primarily applicable during the construction phase of the APT plant. During plant operation, the continuing need will depend upon the replacement frequency of these components.

Since the target modules are large, massive components that will be approximately 9'(l)x2'(w)x23'(h) and weigh up to 52½ tons each, it may be required that the pumping loop needs to be fabricated around them. The technical staff at the SRS Thermal Fluids Laboratory can provide all the testing capabilities such as the pumping loop, instrumentation and data acquisition system which can be transported to the staging area. The total floor space needed to perform this function in the staging area is about 1000 ft^2. Other facility features that are required are listed in table 1a & 1b.

This function can probably be co-located with the Flow Testing of Target/Blanket Core Components which is described in section 6.1.18.

6.1.15 Vacuum Valve Pre-Op. Test Verification

The purpose of this function is to perform inspection and pre-operational testing of vacuum valves prior to installation in the APT plant. The valves will be inspected for damage and evaluated for sealability and function. These inspections must be performed in a clean, dust free environment with humidity and temperature control. The valve inspection and test area is estimated to require about 1,000 ft^2 of floor space. Other facility features that are required to support this function are listed in table 1a & 1b.

6.1.16 H_2 Furnace and Welding

This function provides the capability to perform high temperature hydrogen brazing of OFHC copper components. Based on a review of the LANL H_2 furnace facility, it is apparent that considerable infrastructure is required to support this function. It is believed that such a capability will only be needed by the APT plant on a very limited basis. Routine use is not expected. Furthermore, the accelerator component contractor will also have this furnace capability. For these reasons, this function was therefore deleted from further M-Area consideration.

6.1.17 Fabricate Target/Blanket Components

The purpose of this function is to assemble Target/Blanket modules from individual component bundles. This is a multi-step process that involves some welding of aluminum bundle components, metal machining, and handling of heavy modules. The bundles each weigh about 1½ tons and the assembled target modules weigh up to 10 tons each. A balcony or working platform will be required at a height of about 7 ft. to enable work access to the top of a bundle. Approximately 4,000 ft^2 of floor space plus 250 ft^2 of balcony floor is required to perform this function. Other facility features that are required are listed in table 1a & 1b.

6.1.18 Flow Testing of Target/Blanket Core Components

The purpose of this function is to perform hydraulic performance verification tests of various Target/Blanket components prior to their installation in the APT plant. To ensure heat removal from these components under normal and off-normal operating conditions, the flow rate and pressure drop characteristic of the target modules must be verified at an SRS staging area. This will identify any deficiencies that may affect the module flow system.

This function is primarily applicable during the construction phase of the APT plant. During plant operation, the continuing need will depend upon the replacement frequency of these components.

This flow test configuration will require a pumping loop and an instrumentation and data acquisition system. Technical staff at the SRS Thermal Fluids Laboratory (TFL) can provide all the testing capabilities either at TFL (for smaller components) or after being transported to the staging area as required. The Target/Blanket core components to be tested weigh up to 10 tons each. The total floor space needed to perform this function is about 500 ft^2. Other facility features that are required are listed in table 1a & 1b.

This function can probably be co-located with the Pre-Op. Test Verification of Accelerator Targets which is described in section 6.1.14.

6.1.19 Clean Room Equipment Fabrication/Repairs

The purpose of this function is to assemble and repair superconducting cavity components. These operations must be performed in a super-clean room environment (Class 10,000) by workers who wear protective clothing and respirator hoods. This function will be required for the APT project. However, it is known that superconducting equipment assemblies should not be subjected to unnecessary travel if it can be avoided. The distance between M-Area and the potential APT sites being considered is over 5 miles. As a consequence, this function should be located closer to the APT site than that which is afforded by the SRS M-Area. For this reason, this function was deleted from further M-Area consideration.

6.1.20 Magnet Equipment Maintenance

This function provides the capability to map the magnetic field of each magnet prior to installation in the ATP plant. Once the magnetic center is located and recorded, it enables proper alignment of the magnet during installation. Tests on the magnets include field strength, uniformity, harmonic content, and cooling system parameters. In addition, the temperature switches (e.g., Klixon) are installed by soldering.

This function is primarily applicable during the construction phase. During plant operation, the continuing need is anticipated to be quite small and can probably be accomplished in the klystron rebuild area.

Performing magnet maintenance requires access to a 5 ton crane, cooling water capacity for 50 kw of heat removal, and up to 480v electrical service. The floor space required is estimated to be 5,000 ft^2. A soldering trunk (hood) branch of the HVAC system will be required to install the temperature switches. Other facility features that are required to support this function are listed in table 1a & 1b.

6.1.21 RF Equipment Support

This function provides the capability to perform pre-operational test verification and rebuild/repairs for a variety of RF equipment. Included in this scope are anticipated needs for the following items:

klystrons	switches
circulators	phase shifters
resistive loads	directional couplers & pick-up loops
windows	Linac & klystron cooling system

Approximately one-half of the estimated 25,000 ft^2 of floor space that is required for this RF support facility must be devoted to test stand operation. It is estimated that 10 full power RF test stations will be required to test and condition the large quantity of RF components for the APT project. This will require a large amount of electrical power since the power required for the full power test of ten klystrons is 20MW. Due to the significant infrastructure requirements of this test stand configuration (equipment for electrical power, cooling, etc.), it is preferable to co-locate this function capability near the APT Klystron Gallery. For this reason, this function was deleted from further M-Area consideration.

6.1.22 Hot Machine Shop Equipment Repairs

This function enables the modification or maintenance of certain components which have become activated during APT plant operation. One example might be some of the HEBT instrumentation which requires modification to improve performance.

At this early stage of the APT Project, it is impossible to characterize the need for this function. Fortunately, SRS has several areas with existing hot shops (e.g., Reactors, Fuel Separations). For purposes of the present study, it is assumed that the existing SRS hot machine shop capabilities can accommodate any associated needs for the APT Project. For this reason, this function was deleted from further M-Area consideration.

6.1.23 Cold Machine Shop Equipment Repairs

This function enables the modification or repair of certain APT components such as pumps, motors, and magnets. One example might be to support the development of a design modification through confirmatory testing of a fabricated prototype.

At this early stage of the APT Project, it is difficult to quantify the requirements for this function. It would be desirable to have provisions for a drill press, band saw, lathe, mill, welding equipment with exhaust hood, furnace, and a separate paint room. The suggested floor space required to perform these operations and provide for supply storage is about 9,800 ft^2. Fortunately, SRS has several areas with existing cold machine shops (e.g., Central Shops, A-Area Labs.). For purposes of the present study, it is assumed that the existing SRS cold machine shop capabilities can accommodate any associated needs for the APT Project. For this reason, this function was deleted from further M-Area consideration.

6.1.24 Waste Material Characterization

Analytical laboratory services will be required to characterize waste material prior to disposal. One example application is the characterization of the water treatment resin. Other potential applications are presently being discussed with LANL personnel. At this early stage of the APT Project, it is difficult to quantify the requirements for this function. As a consequence, this function was therefore deleted from further M-Area consideration at the present time. It is recommended that it be investigated further once the potential scope is defined.

6.2 M-Area Building Features and Conditions

A total of eight M-Area facilities were investigated. This evaluation scope represents a cross section of the largest buildings in M-Area. Four of these buildings (313-M, 320-M, 321-M, 322-M) are shutdown and have been declared surplus. Three other buildings (305-1M, 330-M, 331-M) are used as inactive storage buildings. One building (315-M) is actively being used as a warehouse in support of several SRS projects.

The M-Area facility investigation included a review of available architectural drawings, discussions with M-Area facility cognizant engineers, a field walkdown of the buildings, and a preliminary structural assessment for Natural Phenomena Hazard (NPH) event conditions such as earthquake and wind. The drawings consulted include the following:

320-M	321-M	322-M
S4-3-413	W166475	S5-3-2273
W155575	W166438	S5-3-2218
W155597	W166437	W803731
W164124	W166546	W162891
W155593	W166605	W719815
W155579	W166296	S5-3-526
W155578	W166545	W162932
W155595		
W155594	315-M	330-M
W155574	S5-3-4815	W734377
W166440	S5-3-5873	W734382
W166414	S5-3-4812	W734051
	S5-3-5874	
313-M		331-M
W155419	313-M(cont.)	W734052
W741733	W155411	W734051
W155406	W155410	W726476
W155405	W155412	
W155407	W155425	305-1M
W155093	W155454	NA
W736202	W232081	
W155408	W155420	

The in-scope M-Area buildings were characterized in terms of existing features, spatial capacity, available equipment, and integrity/condition. In the process of acquiring this M-Area facility data, the following generic observations/assumptions were established:

- All M-Area buildings have indirect access to a functioning rail spur.
- All in-scope M-Area buildings have waste water detection and treatment capability for Uranium and heavy metals, but not for tritium.
- All in-scope buildings and the candidate functions were assumed to have a Performance Category designation of PC-1.

The results of the building characterization are summarized in table 2a & 2b.

The only M-Area building which has an existing formal structural evaluation for NPH event conditions is 321-M. As documented in the corresponding structural evaluation report (ref. 5), building 321-M currently requires a roof upgrade which should consist of membrane seal replacement and added structural bracing along the roof edges. Furthermore, the building custodian indicated that the 321-M roof does have a number of water leaks.

Based on a preliminary assessment of the 305-1M, 313-M, 315-M, 320-M, 322-M, 330-M and 331-M, buildings, it is believed that they will be structurally acceptable for PC-1 NPH loads. This corresponds to low occupancy (<300 persons) and supports the functional classification designation of General Service for structures, systems, and components.

6.3 Feasibility Evaluation Summary

In the process of performing this evaluation, it was determined that several of the candidate functions should preferably not be located in any of the M-Area facilities. This was due to the fact that either an existing capability exists elsewhere at SRS or that the function should be performed at the APT site. As a result, the following functions were eliminated from consideration in M-Area:

Computer Maintenance
Scaled Prototype Heat Transport Loop
Construction Modularization
Construction Instrumentation Calibration
H_2 Furnace & Welding
Clean Room Equipment Fabrication/Repairs
RF Equipment Support
Hot Machine Shop
Cold Machine Shop

The balance of the feasibility evaluation is performed by screening the candidate functions based on a comparison of the table 1a/1b facility requirements with the table 2a/2b M-Area building features.

In general, the most limiting function requirement is that of floor space combined with room height. Approximately half of the candidate functions require a room height of at least 15 ft (see table 1a); however, only building 320-M and 321-M can accommodate this in their high bay areas (see table 2a).

Based on the screening process, buildings 315-M, 330-M, and 331-M would represent feasible storage locations for the MCCs, Circuit Breakers, Instrument Racks, and Beam Diagnostic Devices (section 6.1.13) if these buildings are converted to Type B storage facilities by incorporating temperature and humidity control and air filtration. They are uninsulated, pre-engineered metal warehouse buildings and presently have no HVAC. Building 330-M and 331-M are presently used for storage of reactor slugs. Building 315-M is presently being actively used for received material lag storage supporting various SRS site projects. Other M-Area facilities that can be used for these electrical equipment storage functions are 320-M and portions of 313-M or 321-M. Note that 313-M is located immediately adjacent to 330-M and 331-M which would become feasible locations with the HVAC additions described above.

Building 305-1M is also an uninsulated, pre-engineered metal warehouse building and was judged to be acceptable for use as a Training Facility (6.1.6) if the HVAC system is upgraded. Presently, only the ductwork remains since the heat pumps have been removed. The building is currently used to store excess office furniture and it has no fire detection/suppression system.

If the Circuit Breaker, Instrument Rack Assy., and Beam Diagnostic Device Pre-Op. Test functions (6.1.12) are to be co-located together, they are compatible with 313-M, 320-M or 321-M. If these pre-operational test verifications can be performed at different locations, then 322-M is compatible with the Circuit Breaker Testing but some building interior room walls would have to be removed to create a larger work area.

Building 313-M is fairly large and appears to have good structural integrity. It does possess a number of structural discontinuities such as pits and trenches (under floor grating) and interior non-load bearing walls. It also contains an appreciable amount of existing equipment in the center sections. These features complicate any building modification considerations so its potential use may be limited to functions that don't require much floor space or room height, e.g., Vacuum Valve Testing (6.1.15), Training (6.1.6), or Tritium Implantation (6.1.4). In addition, the 5 ton bridge crane and much of the floor space is in an RBA zone due to existing contamination. Furthermore, the building exterior and interior wall construction consists of transite with asbestos composition. This implies that asbestos mitigation efforts would be required for any building modifications.

The Control Room Simulator (6.1.7) requires 8,850 ft^2 of floor space combined with a room height of 16 ft. to accommodate video displays. The only M-Area building that is compatible with this requirement is the high bay in 321-M. Note that a raised floor would have to be added.

The Pre-Op. Test Verification of Accelerator Targets (6.1.14) will involve the transportation and handling of target modules that are 9'(l) x 2'(w) x 23'(h) and weigh up to 52½ tons. None of the M-Area buildings has a height under roof that can accommodate this size structure (23' height). Consequently, this function was deleted from further consideration for an existing M-Area building. Although the Flow Testing of Target/Blanket Core Components (6.1.18) is compatible with building 320-M, it may be preferable to co-locate this function with the accelerator target test function which is not compatible with M-Area buildings.

The ^{3}He/Tritium Gas Loop Fabrication and Testing function (6.1.5) may only be compatible with the 321-M high bay due to the combined floor space (10,000 ft^2) and room height (20 ft) requirements.

All of the other remaining candidate functions are compatible with building 320-M and 321-M. Both of these buildings have overhead 10 ton bridge cranes and high bay areas. Both have diesel generator standby power and some fire detection capability. In addition, building 321-M has a partial wet pipe distribution system for fire protection. Building 320-M affords the greatest potential for supporting APT candidate functions with the least preparation/conversion costs since it is the largest building in terms of floor space, has the least amount of hazardous contamination (radiation and chemical), and appears to have a high degree of structural integrity.

Building 321-M is the second largest building of those investigated but it has some structural deficiencies and hazardous contamination in a RBA zone. Its exterior and interior wall construction consists of transite with asbestos composition. This implies that asbestos mitigation efforts would be required for any building modifications. The roof of 321-M requires structural modification to eliminate leaks and reinforce the edges with added bracing.

The Construction Staging function (6.1.9) imposes perhaps the most flexible facility requirements among the functions investigated. Although the floor space required is estimated to be up to 100,000 ft^2 and the room height up to 20 ft, the size variety and amount of equipment suggests that it can be distributed throughout any of the in-scope M-Area buildings.

At this early stage of the APT Project, the specific building utility requirements that are needed to support the various candidate functions have not been determined. This suggests that certain M-Area building equipment upgrades may be required depending on the function(s) to be implemented. Further investigation is needed to assess the feasibility (and cost) associated with possible upgrades to electrical power, process cooling, domestic/service water, instrument air, process/sanitary sewer, fire protection, and HVAC.

7.0 Conclusions/Recommendations

7.1 Conclusions

As a result of this feasibility study, various APT Project supporting functions have been identified through a screening process as feasible candidates for location in one or more M-Area facilities. The candidate functions are listed below in the order of descending impact based on floor space requirements. The compatible M-Area buildings are also identified.

Function	Floor Space Req'd	Possible Locations
Construction Staging	up to 100,000 ft^2	All M-Area Bldgs.(1)
Receipt/Inspection of Equip.	10,000-100,000 ft^2	320-M, 321-M(2) 315-M (if heated)
MCC, Circuit Breaker, Instr. Rack, Beam Diag.Storage	35,000 ft^2	320-M, 321-M (partial), 313-M (partial), (315-M, 330-M, 331-M)/w HVAC additions
Circuit Breaker, Instr. Rack, Beam Diag. Device Testing	10,500 ft^2	320-M, 321-M, 313-M (if co-located), or 322-M
^{3}He/Tritium Gas Loop Fab./Test	10,000 ft^2	321-M
Control Room Simulator	8,850 ft^2	321-M
Program Development Center	8,500 ft^2	320-M, 321-M
Magnet Equipment Maint.	5,000 ft^2	320-M, 321-M
T/B Component Fabrication	4,000 ft^2	320-M, 321-M
Vacuum Valve Testing	1,000 ft^2	313-M, 320-M, 321-M
Training Facility	1,000 ft^2	313-M, 320-M, 321-M, (305-1M/w HVAC & fire prot.)
T/B Component Flow Testing	500 ft^2	320-M(3)
Tritium Implantation Studies	200 ft^2	313-M, 320-M, 321-M, 322-M

Notes - (1) Depends upon construction contract. Not all of this function can be located in any single M-Area building due to space limitations.
(2) It's possible that not all of this function may be located in any single M-Area building due to space limitations.
(3) T/B Component Flow Testing may be co-located with the Accelerator Target Flow Testing (which will not be in M-Area).

The Waste Material Characterization function is considered to be a candidate for further study at a later time since its needs are not yet quantified due to the lack of defined scope.

To fully support some of the above functions, it may be necessary to upgrade the building utilities. Specific utility requirements need to be determined for electrical power, process cooling, domestic/service water, instrument air, process/sanitary sewer, fire protection, and HVAC. This will enable an accurate evaluation of existing building utility capabilities and perhaps affect the M-Area building usage feasibility.

The feasibility and cost effectiveness associated with any required building or utility upgrades is beyond the scope of the present study. This data should be obtained so as to form the basis for prioritizing the selection of functions for implementation in the M-Area facilities.

7.2 Recommendations

As a result of the performed feasibility study, several issues were identified which need to be investigated further to determine the impact, if any, on the feasibility conclusions stated in section 7.1. The issues are as follows:

- Define the Performance Category for all selected candidate functions. (It was assumed to be PC-1 for the present study.)
- Perform a NPH structural integrity evaluation for the M-Area building(s) of interest. This has already been completed for 321-M (ref. 5).
- The proximity of the M-Area to the SRS site boundary will be a factor affecting location feasibility for those candidate functions that generate radioactive material.
- A Process Hazards Review should be performed for the new mission(s).
- An environmental baseline survey should be conducted to characterize and establish the location of existing hazardous contamination in the M-Area buildings of interest. This has already been completed for 320-M (ref. 6).
- Perform a Fire Hazards Analysis to determine the fire protection requirements.
- Determine the impact to the current safety analysis baseline of the affected M-Area buildings. (SAR for 321-M, JCO for other buildings)
- A cost/benefit trade study should be performed to investigate the consequences associated with required building structural upgrades (321-M), hazardous material remediation (313-M, 320-M, 321-M, 322-M), and building configuration conversion (all). The building configuration conversion study should include possible modification (as required) of the utilities (electrical, water, sewer), fire protection, and HVAC as well as the removal of existing abandoned equipment.
- Ensure the continued availability of
    1. Site rail service to M-Area
    2. SRS Central Shops fabrication for construction modularization and/or cold machine shop APT equipment maintenance
    3. SRS Thermal Fluids Laboratory (786-A).
- Characterize the capability, condition, and long term availability of the hot machine shops at SRS.
- Define the potential scope of the Waste Material Characterization function.

8.0 References

(1) "Savannah River Site Surplus Facilities Available for Reuse," EFR-TDD-950060, August 25, 1995.

(2) "Savannah River Site (SRS) Surplus Facility Inventory and Assessment Database FY 1996 Update (U)", March 21, 1996.

(3) Savannah River Operation Office Policy Statement SRP 96-06, SRIP 500, Chapter 580.2 SR Privatization Program Procedure.

(4) WSRC 1B Manual, MRP5.21, Rev.0, "Reuse of Surplus Facilities", January 18, 1995.

(5) EPD-SE-93-0308:65, "Building 321-M Structural Evaluation of the Borated Concrete Storage Racks and Enclosure-(U)", IOM from M.E. Maryak to G.F. Couture, October 7, 1993.

(6) WSRC-RP-95-661, "320-M Environmental Survey Report".

Table 1a. Facility Requirements to Support Function

Function	Floor Space (ft^2)	Room Height (ft)	Building Ingress (ft x ft)	Crane Capacity (tons)	Raised Floors (ft^2)	Hot Cell/ Remote Handling
Program Development Center	1,000ft^2 - 8,500ft^2 (Note 1)	10 ft	10'(w) x 7'(h) double-wide door	NA	All	NA
Computer Maintenance	NA	NA	NA	NA	NA	NA
T/B Heat Transport Loop	1000 ft^2	20ft	NA	1 ton	NA	NA
Tritium Implantation Studies	200 ft^2	10 ft	4'(w)x6'(h)	1 ton	NA	TBD
^{3}He/Tritium Gas Loop Fab. and Testing	10,000 ft^2	20 ft	10'(w)x12'(h) roll-up door	10 ton	NA	TBD
Training Facility	1,000 ft^2	10 ft	10'(w) x 10'(h)	NA	NA	NA
Control Room Simulator	8,850 ft^2	16 ft	10'(w) x 10'(h)	NA	All	NA
Construction Modularization	NA	NA	NA	NA	NA	NA
Construction Staging	100,000 ft^2	20 ft	10'(w) x 10'(h) roll-up door	NA	NA	NA
Construction Instrumentation Calibration	NA	NA	NA	NA	NA	NA
Receipt/Inspection of APT Equipment	10,000 ft^2 - 100,000 ft^2	20 ft	10'(w) x 10'(h) roll-up door	10 ton	NA	NA
Circuit Breaker Pre-Op. Testing	1,500 ft^2	8 ft	7'(w) x 7'(h) double-wide door	NA	NA	NA
Instrument Rack Assy. & Testing	4,000 ft^2	20 ft (/w crane) 12 ft (w/o crane)	10'(w) x 10'(h) roll-up door	½ ton (if available)	NA	NA
Beam Diagnostic Device Pre-Op. Testing	5,000 ft^2	8 ft	7'(w) x 7'(h) double-wide door	NA	NA	NA
MCC Storage	2,000 ft^2	12 ft	10'(w) x 10'(h) roll-up door	NA	NA	NA

Table 1a. Facility Requirements to Support Function (continued)

Function	Floor Space (ft^2)	Room Height (ft)	Building Ingress (ft x ft)	Crane Capacity (tons)	Raised Floors (ft^2)	Hot Cell/ Remote Handling
Circuit Breaker Storage	2,500 ft^2 (if stacked)	15 ft	10'(w) x 10'(h) roll-up door	NA	NA	NA
Instrument Rack Storage	30,000 ft^2	20 ft (/w crane) 12 ft (w/o crane)	10'(w) x 10'(h) roll-up door	½ ton (if available)	NA	NA
Beam Diagnostic Device Storage	500 ft^2 (if stacked)	10 ft	10'(w) x 7'(h) double-wide door	NA	NA	NA
Accelerator Target Pre-Op. Testing	1000 ft^2	25 ft	12'(w) x12'(h)	52½ ton	NA	NA
Vacuum Valve Pre-Op. Testing	1000 ft^2	8 ft	10'(w) x 7'(h) double-wide door	NA	NA	NA
H_2 Furnace & Welding	NA	NA	NA	NA	NA	NA
T/B Component Fabrication	4,000ft^2	20 ft (high bay), 12 ft elsewhere	roll-up door 14' (w)	10 ton crane (high bay area)	No, but 250 ft^2 balcony required.	NA
T/B Component Testing	500 ft^2	20 ft	10' (w) x10'(h)	10 ton	NA	NA
Clean Room Equipment Fabrication	NA	NA	NA	NA	NA	NA
Magnet Equipment Maintenance	5,000 ft^2	15 ft	10'(w) x 10'(h)	5 ton	NA	NA
RF Equipment Support	25,000 ft^2	20 ft	10'(w) x 10'(h)	6 ton	NA	NA
Hot Machine Shop	NA	NA	NA	NA	NA	NA
Cold Machine Shop	9,800 ft^2	20 ft	10'(w) x 10'(h)	5 ton	NA	NA
Waste Material Characterization	TBD	TBD	TBD	TBD	TBD	TBD

Notes: (1) The interim PDC initially requires an area of 1,000 ft^2 but increases to 8,500 ft^2 within six months to enable lag storage and staging of equipment.

Table 1b. Facility Requirements to Support Function

Function	Electrical Power	Cooling Water	HVAC	Multiple HVAC/w HEPA	Process Steam	Comments
Program Development Center	120v distn.	NA	Yes	NA	NA	• Office space for 10 people required. • Dry pipe fire protection for comp. equip.
Computer Maintenance	NA	NA	NA	NA	NA	Delete function from further consideration for M-Area. This function should be located at the APT site.
T/B Heat Transport Loop	120v (3MW)	Yes (500 gpm)	NA	NA	NA	Delete function from further consideration for M-Area. The SRS Thermal Fluids Lab. (A-Area) has existing capability for testing.
Tritium Implantation Studies	208v, 3Φ	Yes	Yes	Yes	NA	Tritium recovery hoods will be required.
^{3}He/Tritium Gas Loop Fab. and Testing	480v, 3Φ	NA	Yes	NA	NA	Possible need to demonstrate cutting & welding of gas flow tube bundles using remote handling equipment [TBD].
Training Facility	120v distn.	NA	Yes	NA	NA	
Control Room Simulator	120v distn.	NA	Yes	NA	NA	Dry pipe fire protection for comp. equip.
Construction Modularization	NA	NA	NA	NA	NA	Delete from further consideration for M-Area. Requirements will depend on construction contract scope.
Construction Staging	120v distn.	NA	Yes (Note 2)	NA	NA	Fire protection system req'd based on fire hazards analysis.
Construction Instrumentation Calibration	NA	NA	NA	NA	NA	Delete function from further consideration. Construction contractor to use existing facility.
Receipt/Inspection of APT Equipment	480v, 3Φ (for crane)	NA	Yes (Note 2)	NA	NA	• Fork lift to perform much of the unloading via pallets. • Temp. storage space req'd depends on delivery timing and through-put process rate. • Fire protection system req'd based on fire hazards analysis.
Circuit Breaker Pre-Op. Testing	480v, 3Φ 100 kva	NA	Yes	NA	NA	Fire protection system req'd based on fire hazards analysis.
Instrument Rack Assy. & Testing	480v, 3Φ 240/120v, 1Φ 10 kw	NA	Yes	NA	NA	• Needs to be a conditioned, fairly clean, dust free area. • Fire protection system req'd based on fire hazards analysis.
Beam Diagnostic Device Pre-Op. Testing	480v, 3Φ 240/120v, 1Φ 10 kw	NA	Yes	NA	NA	• Function req'd. during plant construction and operation. • Needs to be a conditioned, fairly clean, dust free area. • Small rad. calibration source and cleaning fluids are req'd. • Fire protection system req'd based on fire hazards analysis.
MCC Storage	NA	NA	Yes (Note 3)	NA	NA	• Fire protection system req'd based on fire hazards analysis. • Requires conditioned storage to preclude moisture condens.

Table 1b. Facility Requirements to Support Function (continued)

Function	Electrical Power	Cooling Water	HVAC	Multiple HVAC/w HEPA	Process Steam	Comments
Circuit Breaker Storage	NA	NA	Yes (Note 3)	NA	NA	• Storage racks req'd for stacking breakers@3 high. • Fire protection system req'd based on fire hazards analysis. • Requires conditioned storage to preclude moisture condens.
Instrument Rack Storage	NA	NA	Yes (Note 3)	NA	NA	• Needs to be a conditioned, fairly clean, dust free area. • Fire protection system req'd based on fire hazards analysis.
Beam Diagnostic Device Storage	NA	NA	Yes (Note 3)	NA	NA	• Storage racks req'd for stacking @6 high. • Needs to be a conditioned, fairly clean, dust free area. • Fire protection system req'd based on fire hazards analysis.
Accelerator Target Pre-Op. Testing	480v, 3Φ	Yes (8,000 gpm)	NA	NA	NA	• Delete function from further consideration for M-Area. The target modules are too large for the M-Area buildings. • Requires rail service to transport target modules. • Function may be co-located with T/B Component Testing.
Vacuum Valve Pre-Op. Testing	480v, 3Φ 240/120v, 1Φ	NA	Yes (Note 3)	NA	NA	Needs to be a fairly clean, dust free area with humidity control.
H_2 Furnace & Welding	NA	NA	NA	NA	NA	Delete function from further consideration. Capability exists at accelerator component vendor and at LANL; limited need exists.
T/B Component Fabrication	480v, 3Φ 120v distn.	NA	Yes	NA	NA	Each target bundle weighs 1½ ton. Each target module assy. weighs 8-10 ton.
T/B Component Testing	480v, 3Φ	Yes (1,000 gpm)	NA	NA	NA	Function may be co-located with Accelerator Target Pre.Op. Testing (which will not be in M-Area).
Clean Room Equipment Fabrication	NA	NA	NA	NA	NA	Delete function from further consideration for M-Area. Superconducting cavities should not be transported between sites.
Magnet Equipment Maintenance	480v, 3Φ (50 kw)	Yes, 50kw removal	Yes	NA	NA	Soldering trunk (hood) will be required during solder operations.
RF Equipment Support	20 MW	NA	NA	NA	NA	Delete function from further consideration for M-Area. Some tasks must be performed at the APT site due to power req'd.
Hot Machine Shop	NA	NA	NA	NA	NA	Delete function from further consideration for M-Area. The SRS has several areas with existing capability for hot machining.
Cold Machine Shop	480v, 3Φ	NA	Yes	NA	NA	Delete function from further consideration for M-Area. The SRS has several areas with existing capability for machining.
Waste Material Characterization	TBD	TBD	TBD	TBD	TBD	Define potential scope. Defer decision pending further review.

Notes: (2) Normal room HVAC is sufficient for electrical component storage (Level B) while other items could be Level C stored (warehouse w/o HVAC).
(3) Requires heated space to preclude condensation.

Table 2a. M-Area Building Features and Conditions

Building No.	Floor Space (ft^2)	Room Height (ft)	Building Ingress (ft x ft)[1]	Crane Capacity	Raised Floors (ft^2)[2]	Hot Cell/ Remote Handling	Comments
305-1M (Office Building)	7,500 ft^2 (total)	12 ft.	20'(w) x12'(h) 1 roll-up door	NA	NA	NA	• Pre-engineered metal building with a storage area and offices of wood construction.
313-M (Target Slug Fabrication Facility)	54,000 ft^2 (total) 2,000 ft^2 (autoclave pit) 1,600 ft^2 (maint. shop) 1,000 ft^2 (E&I shop)	14'(crane ht), 11'-22' elsewhere	5 roll-up doors 10'(w)x12'(h), 1 loading dock	4,500# brdg. crane (over autoclave pit) ½, ¾ ton brdg. crane	23'x18' (one room)	NA	• Bldg. has a lot of equipment-some heavy (inertia welder, plating line tanks, several 10" lathes, hydr. press, furnaces, drying oven). • Bldg. has various pits and trenches; most have floor grate or steel plate covers.
315-M (Essential Materials. Warehouse)	26,000 ft^2 (total) 1,000 ft^2 (offices)	12 ft.	2 sliding doors 12'(w)x10'(h)	NA	NA	NA	• Pre-engineered metal building with storage area, an inspection room, and several offices
320-M (Alloy Fabrication & Laboratory Facility)	63,000 ft^2 (total) 6,000 ft^2 @10 tn crane 3,600 ft^2 @5 tn crane 6,000 ft^2 (2nd floor) 8,000 ft^2 (basement) 1,600 ft^2 (E&M shops)	19' and 16' (crane ht in high bays), 11' elsewhere	several roll-up doors 12'(w)x10'(h)	10 ton brdg. crane 5 ton brdg. crane ½ ton crane (in 40'x20' maint. shop)	NA	NA	• Hardened shelter/storage area in basement (8000 ft^2). • Laboratory/office wing/w 25 rooms (7000 ft^2). • 2 ton elevator to second floor.
321-M (Fuel Fabrication Facility)	54,800 ft^2 (total) 9,600 ft^2 (high bay) 7,200 ft^2 @10 tn crane 1,600 ft^2 (E&M shops) 1,200 ft^2 (3 vaults)	20' high bay 14' @crane 13' elsewhere	4 roll-up doors- 22'x11', 20'x16', 10'x10'(2), 3 loading docks (2 are floating)	10 ton brdg. crane, 1 ton crane@ld. dock 600 lb stacker/ retriever	12'x17' (one room)	NA	• 16 offices, E&I shop, Maint. shop • Acid vats and storage tanks (degreaser, freon distillation /w refrigeration.) • 550°C ovens (6 @ 1.5'x4'x4') • 2 lathes in contaminated storage vault-one has computer controls • Double fenced security perimeter.
322-M (Met. Laboratory Facility)	11,400 ft^2 (total) 7,700 ft^2 (support areas) 3,400 ft^2 (confinement area)	8½ ft. (suspended ceiling)	3'x7' single door access, 5'x7' double door access	¼ ton brdg. crane (in hot cell)	NA	4'x6'x7'(h) hot cell (room 125)	• 23 rooms in support areas (offices, shops, labs, storage). Largest is 38'x22' (metal prep. room 109). • 14 rooms in confinement area/w airlocks. Largest is 39'x18'. • Most rooms have substantial lab. furniture & equip.
330-M (Product Warehouse)	8,000 ft^2	12 ft.	2 sliding doors- 10'x10', 1 loading dock	NA	NA	NA	• Pre-engineered metal building with storage area. • Direct access to 313-M via 10' x 10' sliding door.
331-M (Bare Core Storage Facility)	8,000 ft^2	12 ft.	2 sliding doors- 10'x10', 2 hydraulic loading docks	NA	NA	NA	• Pre-engineered metal building with storage area. • Direct access to 313-M via 10' x 10' sliding door.

Notes: (1) Special access features, e.g., loading docks and doors (ft x ft).
(2) Raised floor room size (ft^2).

Table 2b. M-Area Building Features and Conditions

Building No.	Electrical Power (kv)	Cooling Water	HVAC	Multiple HVAC/w HEPA[3]	Process Steam	Building Condition	Comments
305-1M (Office Building)	13.8 kv sply., 208/120v distribution.	Domestic	Yes, but only ductwork[4]	NA	NA	• Light duty metal construction suitable for storage and low occupancy (PC-1).	• Surplus facility being used as a warehouse to store excess furniture. Level C storage. • No fire detection system nor distribution.
313-M (Target Slug Fabrication Facility)	13.8 kv sply., 480v, 3Φ 208/120v, 1Φ distribution.	Domestic, and hot/cold process H_2O	Yes	Yes[5]	325, 50, 10 psig	• Autoclave area (2,000 ft^2) and crane have rad. contam. Much of the bldg. is considered an RBA. • Interior and exterior walls are transite/w asbestos composition. • Some roof and fire detection system repairs needed.	• 2 electrical substations provide bldg. pwr. • Diesel generator provides standby power. • Separate process and storage drain system. • Fire protection detection system. • Surplus facility available for reuse.
315-M (Essential Materials. Warehouse)	13.8 kv sply., 208/120v distribution.	1178 gpm @100 psig	NA	NA	NA	• Light duty metal construction suitable for storage and low occupancy (PC-1).	• Fire detection system /w wet pipe distribution. • Bldg. being used as a warehouse. Level C storage.
320-M (Alloy Fab. & Lab. Facility)	13.8 kv sply., 480v, 3Φ 208/120v, 1Φ distribution.	Domestic, chilled, and process H_2O	Yes	NA	325 psig	• Good structural integrity. • Minimum localized residual contamination by depleted uranium and chemicals. Asbestos insulation.	• 2 electrical substations provide bldg. pwr. • 200kw diesel generator (standby pwr). • Fire protection detection system. • Surplus facility available for reuse.
321-M (Fuel Fabrication Facility)	13.8 kv sply., 480v, 3Φ 208/120v, 1Φ distribution.	Domestic, chilled, and process H_2O. 4" pipe sply.	Yes, but repairs are needed.[6]	Yes[7]	325, 150, 15 psig	• Vaults/storage area (5,000 ft^2) have rad. contam. • Interior walls and some ceiling tiles are transite/w asbestos composition. • Roof construction is structurally deficient for required seismic and wind loads. Roof leaks. Membrane needs replacement. Additional roof bracing req'd.	• 3 electrical substations provide bldg. pwr. • Diesel generator provides standby power. • Fire detection sys./w partial wet pipe distn. • Particulate monitoring capability on one ventilation exhaust stack. • Facility is shutdown.
322-M (Met. Laboratory Facility)	13.8 kv sply., 480v, 3Φ 208/120v, 1Φ distribution.	Domestic, chilled, and process hot/ cold H_2O. 4" pipe sply.	Yes, but some repairs are needed.	Yes[8]	325, 150, 15 psig	• Light frame structure suitable for low occupancy (PC-1). • Some residual contamination by depleted uranium and chemicals. • Some interior walls are transite (possibly asbestos).	• 1 electrical substation provides bldg. pwr. • A diesel generator provides standby power. • Fire detection system/w wet pipe and some halon distn. • Surplus facility available for reuse.
330-M (Product Warehouse)	13.8 kv sply., 208/120v distribution.	Domestic	NA	NA	NA	• Light duty metal construction suitable for storage and low occupancy (PC-1).	• Bldg. currently being used as a warehouse to store reactor slugs. Level C storage. • Fire detection system /w wet pipe distn.
331-M (Bare Core Storage Facility)	13.8 kv sply., 208/120v distribution.	Domestic	NA	NA	NA	• Light duty metal construction suitable for storage and low occupancy (PC-1).	• Bldg. currently being used as a warehouse to store reactor slugs. Level C storage. • Fire detection system /w wet pipe distn.

Notes (3) Has separate HVAC zones with HEPA filtration.
(4) The HVAC heat pumps have been removed. Only the ducting remains.
(5) Building has a separate ventilation system/w HEPA filters for autoclave pit area.
(6) HVAC heat exchangers are not functional. New coils are needed.
(7) Building has a separate ventilation system /w HEPA filters for 3 storage vaults.
(8) Building has a separate ventilation system /w HEPA filters for lab. exhaust hoods.