6. PROJECT EXECUTION STRATEGIES

Project execution will integrate the skills of various organizations to ensure that the project achieves success. The project manager will oversee this integration.

> Project execution strategies have been developed for:
>
> - Safety Analysis
> - Quality
> - Environment, Safety, and Health
> - Configuration Management
> - Safeguards and Security
> - Procurement
> - Construction
> - Project Schedule
> - Conceptual Cost Estimate.

6.1 Safety Analysis

The hazard classification and safety category for the AR Project are the result a preliminary hazard assessment and safety analysis documented in a draft Preliminary Safety Analysis Report (PSAR; SAR-215).

6.1.1 Hazard Classification

The PSAR evaluated and documented the following significant hazards (those that could initiate a release or exposure):

- **Fissile Material**: inadvertent criticality
- **Ionizing Radiation**: immediate worker exposure to high radiation fields during waste retrieval
- **Radioactive Materials and Hazardous Chemicals**: breached containers, breached retrieval enclosure, loss of power to the retrieval enclosure, immediate worker exposure during retrieval, incompatible materials, fires, and explosions
- **External Events**: vehicle collisions, aircraft collisions, range fires, and pit subsidence
- **Natural Phenomena**: earthquake, flooding, high winds, lightning, snow loads, and volcanic eruption.

The PSAR has classified this facility as a Hazard Category 2, nuclear facility. This classification was determined by comparing threshold quantities for radionuclides given in DOE-STD-1027-92 to bounding inventories of materials that may be encountered during waste retrieval.

6.1.2 Safety Category

Structures, systems and components (SSCs) were evaluated for designation of safety categories in the PSAR. This evaluation was performed based on criteria given in DOE Idaho Operations Office Order 420.D and in accordance with 10 CFR 830, Subpart B. No safety class or safety significant SSCs are identified in the PSAR.

6.2 Quality

Project activities will be performed in accordance with the established Quality Assurance (QA) program. The quality program is implemented by a graded approach based on risk and safety analyses. The level of rigor of analysis, documentation, verification, and other controls are applied commensurate with an item's risk and importance. Quality assurance program requirements are implemented for design, procurement, inspection and testing, construction, operations, work processes, items important to demonstrate compliance to environmental requirements, and radiological monitoring and control. This applies to activities performed by the contractor or its suppliers and/or subcontractors (such as designers, manufacturers or analytical laboratory services). Additional requirements beyond the standard QA program apply to collecting acceptable knowledge for TRU waste sampling and analysis activities that support waste characterization, certification, and shipment to WIPP for final disposal.

The AR Project contains no safety class or safety significant SSCs. However, an evaluation being performed to MCP-540, "Documenting the Safety Category of Structures, Systems and Components," may identify Low Safety Consequence SSCs. Designers must ensure a proper level of rigor is applied to meet the design requirements for SSCs listed on Form 414.70, "Safety Category List."

The QA program is implemented in a manner sufficient to achieve adequate protection of the workers, the public, and the environment, taking into account the work to be performed and the associated hazards. Specific quality program documents include:

- 10 CFR 830 Subpart A, "Quality Assurance Requirements"
- 10 CFR 835, "Occupational Radiation Protection"
- DOE O 414.1A, "Quality Assurance "
- ASME NQA-1-1997, "Quality Assurance Requirements for Nuclear Facility Applications"
- Companywide Manual 13A, *Quality and Requirements Management Program Documents*
- LST-200, "Implementing Document Reference List"
- *Quality Assurance Project Plan for WAGs 1, 2, 3, 4, 5, 6, 7, 10 and Inactive Sit*es (DOE-ID 2002c)
- PLN-852, "Quality Program Plan for Idaho Completion Project Transuranic Waste Management"
- PLN-920, "Project and Construction Management Quality Program Plan"
- MCP 2811, "Design Control."

6.3 Environment, Safety & Health

6.3.1 Environmental Protection Strategy

A NTCRA has been identified as the regulatory approach for implementation of the AR Project. The NTCRA will be implemented in accordance with the requirements of the NCP and CERCLA Section 104 regarding removal activities. The NTCRA is focused on the removal of TRU waste and soils from Area G and transfer of the materials to WIPP in New Mexico. The NTCRA is an initial step toward developing a method and process for safely and efficiently removing TRU contaminated materials from the SDA inventory.

The project design must consider and address ARARs that apply to the location, activity, or chemicals involved in the removal action. Project ARARs will be documented in the required engineering evaluation/cost analysis to be drafted prior to the final design. As part of implementing ARARs, air emissions estimation will be performed as early as possible in the design process to verify design compliance and assumptions. Waste containers with PCBs greater than or equal to 50 ppm will be stored within WMF-628. Using this approach, no risk based PCB storage approval will be required or sought.

Based on DOE policy, the CERCLA process will be relied on to address National Environmental Policy Act (42 USC § 4321 et seq.) values and public involvement procedures. Consequently, no separate implementation of the NEPA is required for CERCLA projects at the INEEL. An environmental checklist, prepared in accordance with MCP-3480, "Environmental Instructions for Facilities, Processes, Materials and Equipment," will reference project ARARs and define additional internal environmental requirements for the project. As a facility managing low-level and TRU mixed waste, DOE Order 435.1-1, "Radioactive Waste Management," and DOE Order 5400.5, "Radiation Protection of the Public and the Environment," require implementation.

6.3.2 Radiation Protection Strategy

Area G waste inventories cannot be predicted with great certainty. The planning and design for the AR Project will provide effective radiation protection based on estimated inventory. Such an approach is in accordance with 10 CFR 835 and the ALARA philosophy.

The AR Project will present some unique health physics practices. The nuclides of concern are weapons grade plutonium, ^{241}Am, ^{137}Cs, and ^{3}H. The external radiological hazards are affiliated with the gamma, beta, and neutron components of waste that contain weapons grade plutonium, ^{241}Am and ^{137}Cs. Internal exposure would result from the inhalation, absorption, and/or injection of all the nuclides of concern. In addition, the ^{3}H also causes internal exposure via skin absorption. During excavation, unmitigated DAC values are estimated to range from 100 to 20,000,000 (mitigated DAC from 1 to 200,000). The ambient DAC values depend upon the type of waste being manipulated such as sludge, filters, graphite, etc. There will also be a stack monitor employed to monitor the enclosure structure HEPA exhaust point. Several CAMs, in doghouses, will be strategically placed outside of the enclosure structure. DAC levels from the Glovebox Excavator Method project will be recorded to acquire some initial airborne hazard data. It is anticipated that internal and external exposure to affected workers will be significant when compared to routine doses typical to ICP operations. As always, the ALARA philosophy will remain paramount relative to radiation protection.

Affected work areas will be adequately monitored for radiological hazards to provide the best possible protection. Such monitoring practices will include airborne, surface contamination, and radiation fields. Air sampling will be accomplished via CAMs, low volume air samplers, high volume air samplers, and lapel air samplers. Surface contamination will be controlled by vigilant surface scan and smear surveys. Radiation fields will be monitored through gamma, beta, and neutron surveys of the affected work areas. In addition, RAMs and electronic alarming dosimeters (EADs) will be deployed to keep personnel exposures ALARA. Area monitoring thermoluminescent dosimeters (AMTLD) will be used to provide a permanent and integrated dose in appropriate areas. The appropriate postings will be verified via radiological monitoring.

In accordance with 10 CFR 835 Sec. 1001, the hierarchy for radiation protection measurement implementation is (1) engineering controls, (2) administrative controls, and (3) PPE. Current federal regulations and site requirements mandate that engineering controls be established to protect employees, the public, and the environment from the adverse effects of ionizing radiation. The AR Project complies with this requirement. Engineering controls, administrative controls, and PPE are specifically described in the remainder of this section.

Engineering Controls. Engineering controls will be used as much as practical to keep dose equivalents ALARA. The excavator cab will be equipped with a blower/HEPA filter system that will provide over-pressurization of the cab. The excavator operator will typically be the individual receiving the most exposure, both external and internal. The operator will be from 10 to 47 ft from the digface. The inherent shielding and distance should significantly reduce the operator's external dose equivalent. The over-pressurization of the excavator cab should minimize the amount of airborne radioactive materials and surface contamination entering the cab. The interior of the cab will be routinely surveyed and undergo an "operational decon" to reduce levels as much as practical. Note that an operational decon is not a thorough decon and is not intended to reduce interior cab surface levels to below contamination area levels (e.g., alpha <20 dpm/100 cm^2). Regardless, every effort will be made to maintain interior cab surfaces below "high contamination area" levels as described in the *INEEL Radiological Control Manual*, Table 2.2 (Manual 15A). The removable contamination limits for a high contamination area are levels less than 200, 1.0E+05, and/or 1.0E+06 dpm/100 cm^2 for TRU, beta/gamma emitters, and ^3H respectively. Misting, sealing, and foaming will minimize airborne radioactivity. All waste surface areas that are not actively undergoing excavation will be sealed with surfactants such as Soiltac. Waste surfaces being actively excavated will be continuously misted with a dilute surfactant solution. The excavator boom will also be equipped with a misting device. The loading of waste materials into boxes will utilize a foaming agent to significantly reduce airborne generation. Other engineering controls include video camera use for remote viewing, viewing through windows, HEPA equipped ventilation of the enclosures, radio communication between workers inside and outside enclosures, and possibly dose rate meter results from the excavator boom via telemetry, and monitoring system results from the excavator via telemetry.

Administrative Controls. Administrative radiation protection practices and requirements will also maintain personnel and environmental exposures ALARA. No material or equipment will be removed from the controlled area without Health Physics authorization. All SWBs will be closed during non-operational times. Therefore, the work will be planned so that no boxes remain open when a shift ends. Diligent surveying of personnel, equipment, and waste boxes will prevent an inadvertent release of radioactive materials into uncontrolled areas. Survey meters, friskers, a personal contamination monitor, CAMs, and the stack monitoring system will be properly deployed to prevent and/or minimize such occurrences. Equipment and personnel doors will not be opened when the crawler excavator is actively retrieving waste. The number of personnel actively working in the enclosure structure will be kept to a minimum. It is anticipated that two workers will be the average number at the digface—an excavator operator and surfactant applicator. More personnel will be deployed as necessary to support nonroutine operations and maintenance requirements. All operations will be under full time Health Physics coverage. It is anticipated that a large portion of the health physics job coverage will be done via radio, video viewing, and window observations. Other coverage such as industrial hygiene, industrial safety, project engineering, waste certification, and worker supervision can also be accomplished mostly via remote communication and observation. An in-situ gamma spectroscopy may be used to characterize the waste surface and locate areas of high ^{241}Am, ^{137}Cs, or ^{60}Co activity. Therefore, additional work controls and direction can be employed to keep doses ALARA and to facilitate waste disposition. The in-situ characterization will be performed after the top 5 or 6 ft of overburden is removed from Area G.

PPE. The PPE will be selected to protect the affected workers. For radiological hazards, it is anticipated that water resistant anti-contamination clothing would be donned. Powered air purifying and negative pressure air purifying respirators should provide adequate protection. However, several self-contained breathing apparatus systems will be available for emergencies. It should be noted that the above PPE is discussed relative to radiological hazards. If hazardous materials exist, industrial hygiene personnel may require the use of other types and numbers of PPE.

Both personnel and the environment will be appropriately monitored for radiological hazards. All affected personnel will wear a TLD, an electronic alarming dosimeter, and a lapel air sampler equipped with a filter and bubbler arrangement. The EADs will also be capable of neutron detection. AMTLDs will record integrated doses affiliated with key areas. In addition, the AMTLDs will ensure that no unmonitored personnel will exceed 100 mrem/year. All personnel and environmental TLDs should be read on a monthly basis or as directed by health physics personnel. All affected personnel will also be required to participate in a bioassay program. The bioassay program will include a whole body count as a baseline, fecal sample, and urine sample. The fecal and urine samples for bioassay will be required on at least a monthly basis or as directed by health physics personnel. The TLD and bioassay results should be used for the assignment of "Official Record" personnel dose equivalent. However, the electronic alarming dosimeter results in conjunction with DAC-hour tracking will be continuously recorded to monitor dose equivalent during the operational period. The DAC hours will be assigned from lapel or breathing zone air sampler results.

6.3.3 Industrial Health and Safety Protection Strategy

The AR Project will use the five core functions and eight guiding principles of the Integrated Safety Management System to define the work scope, analyze the hazards, develop and implement controls, and provide feedback and continuous improvement throughout the design, construction, and operations phases.

The AR Project safety and health program and project requirements will be developed to implement the occupational safety and fire protection requirements (Manual 14A), and the occupational medical and industrial hygiene requirements (Manual 14B), and will be documented in an AR Project specific health and safety plan. The industrial safety and health factors that must be considered in the design phase are:

- Identifying the specific chemical hazards posed by the project
- Identifying the specific industrial hazards posed by the project
- Identifying required mitigating features for worker protection
- Identifying required mitigating features for co-located workers, the public, and the environment
- Verifying ES&H mitigating features of the design.

Identifying the specific chemical hazards posed by the project includes addressing the source and potential contamination levels of airborne chemical hazards, such as VOCs, heavy metals, dusts, and diesel exhaust fumes. Also, the engineering, administrative, and PPE controls for manned entry and confinement control of the hazards must be defined.

Identifying the specific industrial hazards posed by the project includes addressing the source of expected industrial hazards. Industrial hazards may include hazardous material handling and storage, machinery and equipment operation, high temperature and pressure systems (including compressed gas storage and handling), walking/working surface design, elevated surfaces (including stair and ladder access design), excavation, hoisting and rigging, electrical equipment, heat and cold stress, noise exposure, and flammable and combustible material handling.

Identifying required mitigating features for worker protection includes addressing performance requirements such as required air changes per hour, determining retrieval methods to prevent employee exposure, identifying applicable administrative controls, and determining necessary PPE requirements based on anticipated employee exposure levels. Material compatibility with anticipated chemical contaminants must be ensured for structural components, sealing materials, etc. Emergency equipment such as eyewash and safety shower facilities, fire protection equipment and systems, spill response equipment, and necessary first aid equipment will be defined based on anticipated hazards.

Identifying required mitigating features for co-located workers, the public, and the environment includes addressing the performance of the heating, ventilating, and air conditioning filtering and confinement systems to prevent hazardous emissions to the environment. Applicable time, distance, and shielding requirements will be determined and location isolation features will be defined to prevent co-located worker or public access.

Verifying mitigating environment safety and health features of the design include personnel and environmental monitoring and sampling, as well as task monitoring to ensure safe execution of work activities. Industrial hygiene will determine the need to monitor for VOCs, carbon monoxide, noise, diesel fumes, dust, heavy metals, asbestos, and other anticipated hazardous agents as appropriate.

6.4 Configuration Management

The AR Project will use the configuration management processes, procedures, and tools defined in PLN-1549, "Configuration Management Plan for the Accelerated Retrieval Project at Area G of Pit 4 on the Radioactive Waste Management Complex," currently being drafted. Changes to this Conceptual Design Report and associated drawings will be configuration controlled in accordance with that plan.

6.5 Safeguards and Security

Safeguards and security interests at the AR Project will be protected to preclude or minimize unauthorized access, unauthorized disclosure, loss, destruction, modifications, theft, compromise, or misuse. The project area will be protected as a property protection area in accordance with DOE requirements for the protection and control of safeguards and security interests. This includes the establishment of access controls to the facility.

A physical security plan for the AR Project (yet to be written) will outline the physical protection requirements, access controls, and information protection requirements. A contingency plan will address immediate security actions and requirements if classified material is excavated. The project manager or his designated security liaison will coordinate with the physical security officer to develop these plans and ensure the requirements therein are implemented.

Accountable special nuclear material (SNM) will not be stored at the AR Project. RWMC Operation's SNM used by the AR Project will be handled in accordance with INEEL Safeguards requirements.

Some of the excavated material has the potential to be classified. The INEEL Classification Office participates in design reviews for the construction and operation of the AR Project to ensure the design doesn't present an opportunity for compromise of classified material and so they can implement procedures to identify the classification level of excavated material. If classified material is excavated, operations will be temporarily suspended and additional physical protection measures will be implemented immediately. The Classification Office and Physical Security will initiate a review of the project and possibly a damage assessment. A determination on how to proceed with the project will be made after these activities are completed.

6.6 Design

The AR Project philosophy is based on the Large Area Containment as described in MCP-198. The AR retrieval enclosure provides the features of the large area containments to control the spread of radioactive contamination as described in MCP-198, to the extent practical. The design goal of the AR Project is to provide structures and facilities that are designed and constructed so as to assure adequate protection for the public, workers, and environment from project hazards. This is achieved through code compliance and hazards analysis. Nuclear safety, criticality safety, fire protection, and natural phenomena hazards mitigation are all addressed in the design and based on the safety analysis, fire hazards analysis, and criticality safety evaluations.

Detailed application of nuclear safety requirements were guided by the safety analyses. SAR-215 evaluated the hazards associated with the facility and established that technical safety requirement administrative controls adequately protect the worker and reduce the risk to acceptable levels. Additional barriers in the form of safety-related SSCs are not required. Engineered features will be relied upon to provide defense-in-depth protection for the appropriate hazards, but will not necessarily be designated safety significant. For example, operations will be conducted in a weather enclosure with a HEPA filtered ventilation system and an excavator that is equipped with dust suppression systems to provide defense-in-depth protection from nuclear hazards.

Criticality safety hazards are identified in EDF-4494. Measures such as the Fissile Material Assay system and absorption of free liquids at the digface are in place to apply double contingency protection against criticality.

Fire protection hazards are addressed in HAD-266. The AR Project provides minimal fire protection features to protect against anticipated, potential, and unlikely fire emergencies. This is in response to management direction to accept additional risk in return for lower cost of operations. Administrative controls, preventive maintenance procedures, training, and management support for fire protection issues are required for successful fire-related performance of the AR Project. Increased reliance is placed on manual means for the suppression of both incipient and large fires.

Numerous deviations from current codes and standards are identified in the HAD-266. Approval from NE-ID, as the AHJ will be required before the project can operate with the proposed limited fire protection program. Deviations are listed below:

1. DOE O 420.1A, "Facility Safety"

    a. A reliable water supply is required. A reliable water supply cannot be provided to the project location is economically due to the buried waste containing nature of the site. The fire hazards analysis demonstrates that equivalent protection can be provided through other means.

b. No automatic fixed fire suppression system despite maximum possible fire loss in excess of established limits will be provided. Fire department response will be relied upon for fire protection. The fire hazards analysis demonstrates that equivalent protection can be provided through other means.

c. The use of telephones and radios for fire department and occupant notification will be used of lieu of the required fire alarm and notification system. The fire hazards analysis demonstrates that equivalent protection is provided by the use of telephones and radios.

2. NFPA 801, "Fire Protection for Facilities Handling Radioactive Materials"

a. A reliable water supply is required. A reliable water supply cannot be provided to the project location economically due to the buried waste containing nature of the site. The fire hazards analysis demonstrates that equivalent protection can be provided through other means.

b. The use of telephones and radios for fire department and occupant notification will be used of lieu of the required fire alarm and notification system. The fire hazards analysis demonstrates that equivalent protection is provided by the use of telephones and radios.

The DOE-ID AE Standards implement the model building codes applicable to the INEEL. Due to the unique and temporary nature of both the retrieval and storage enclosures, several deviations from the AE Standards will require approval from NE-ID. Many of the requirements that must be waived represent requirements that should be imposed on permanent facilities and should not necessarily apply to short life-cycle, relocatable structures. They are summarized below:

1. AES 0110-3.9, "Building Materials"

New permanent structures shall meet the IBC requirements for construction materials or better. New permanent structures in excess of 5,000 square feet floor area should be of noncombustible or fire resistive construction.

Limited combustible construction is used. The retrieval enclosure and storage enclosure are relocatable and temporary structures to accommodate operational needs. Noncombustible construction is not feasible for the type of function that the facility must provide. The building fabric will comply with NFPA 701 and have a flame spread rating under 25 and smoke developed rating under 450.

2. AES 0112-7, "Insulation"

In designing heated buildings, the heat transmission coefficient ("U" value) shall not exceed .064 (R=15.6) for walls nor .045 (R =22.2) for roofs or roof/ceiling combinations unless economically justified. The use of any asbestos-containing product is prohibited.

Wall and roof insulation of R=8 and R=10 respectively will be provided. The retrieval enclosure and storage enclosure are not permanent, fully occupied facilities. Heat and insulation are provided only to supplement operational productivity and facilitate year-round operation to support the project schedule.

3. AES 0185-5.5, "Improved Risk Concept for Fire Protection"

Improved Risk Concept for Fire Protection Systems Fire protection design for facilities shall incorporate an "improved risk" level of fire protection as directed in DOE O 420.1.

a. A reliable water supply is required. A reliable water supply cannot be provided to the project location is economically due to the buried waste containing nature of the site. The fire hazards analysis demonstrates that equivalent protection can be provided through other means.

b. No automatic fixed fire suppression system despite maximum possible fire loss in excess of established limits will be provided. Fire department response will be relied upon for fire protection. The fire hazards analysis demonstrates that equivalent protection can be provided through other means.

c. The use of telephones and radios for fire department and occupant notification will be used of lieu of the required fire alarm and notification system. The fire hazards analysis demonstrates that equivalent protection is provided by the use of telephones and radios.

See HAD-266 for a full discussion of fire protection issues and equivalencies.

4. AES 0185-5.6, "NFPA and DOE O 420.1A"

DOE Fire Protection systems shall meet or exceed the minimum requirements established by the National Fire Protection Association and DOE O 420.1. DOE O 420.1 also contains additional requirements for unique DOE fire hazards. For areas subject to significant life safety risks, serious property damage, program interruption, or loss of safety class equipment as defined in the relevant facility SAR, additional protection measures may be deemed necessary as determined by the AHJ.

See fire hazards analysis equivalencies listed above. See HAD-266 for a full discussion of fire protection issues and equivalencies.

5. AES 0200-2.8, "Surface Drainage"

Unpaved areas shall be 2% minimum. Concrete slabs, door stoops, truck ramps, etc., shall be sloped at least 2%, where feasible.

A minimum 2% slope on unpaved areas will not be provided. Due to the contaminated nature of the site, cut and fill to accommodate sloping the site will be minimized. The site will be adequately sloped to drain away from the building and prevent ponding in operating and vehicular traffic areas.

6. AES 1390-3.1, "Automatic Fire Suppression Systems"

Built-in automatic fire suppression systems shall be provided in all new construction over 5,000 sq. ft, unless otherwise approved by the OC Facility FPE, with concurrence by the DOE-ID AHJ. Special hazards may require special suppression systems (e.g., gaseous or dry chemical systems), *which shall be designed and installed in accordance with the applicable NFPA or "Improved Risk" Standards.*

No automatic fire suppression system will be provided. Fire department response will be relied upon for fire protection. The fire hazards analysis demonstrates that equivalent protection can be provided through other means. See HAD-266 for a full discussion of fire protection issues and equivalencies.

7. AES 1390-7.1, "Standpipes and Hose Systems"

Standpipe and hose systems shall be required for higher hazard occupancies, based upon the building type, occupancy rating, applicable codes and standards, and the Improved Risk Criteria.

No standpipe or hose system is needed Fire department response will be relied upon for fire protection. The fire hazards analysis demonstrates that equivalent protection can be provided through other means. See HAD-266 for a full discussion of fire protection issues and equivalencies.

8. AES 1550-3.3, "Fuel Supply Tanks"

Fuel supply tanks shall be sized for 30-day supply.

A 30-day supply will not be provided. NFPA 58 has additional requirements (e.g., fire safety assessment, remote fire shut-off, fire protection) for aggregate tank capacities over 4,000 gallons. The AR Project will have four 1,000-gallon tanks. This provides the needed service for one week during poor conditions. This has been considered by the project as acceptable.

9. AES 1550-3.5, "Fans for Contamination Control"

Exhaust fans for controlling contamination in contaminated areas should be designed in accordance with the following:

a. Alarms with readout at a central, manned location shall be provided to indicate fan shutdown and high temperatures, excessive vibration, and other malfunctions as required by the design criteria.

b. Installed spare fans and isolation dampers shall normally be provided for the supply and exhaust air systems. When any fan is inoperative in a system, a backflow damper should automatically isolate the idle fan from the system. Where this is economically unfeasible, consideration shall be given to fan pairs sharing the load such that if one fan fails, the other can maintain partial air movement.

Alarms for ventilation malfunction will not be provided. Systems that can malfunction or breach are the fan and filters, respectively. The only other item associated with the exhaust flow (excluding sampling) is the ductwork, which is located after the HEPA filter banks and under negative pressure. Monitoring of the HEPA and pre-filters differential pressures and fan operation will be provided. A 100% capacity redundant fan will be provided in case of failure. Fans and filters can be fully isolated and independently operated.

10. AES 1550-3.8, "Controls"

Manual controls or automatic controls equipped with manual override shall be provided for ventilation systems or components, as required for proper operation and safety. In general, selection of control systems should favor automatic controls in larger and more complex (multizone sensitive duty) systems. In general, every effort should be made to simplify the design and operation of control systems.

a. *The preferred method for zone pressure control, is to provide constant exhaust flow and vary supply air volume to maintain the pressure setpoint. Exhaust air volume may be temporarily increased to accommodate breaches in physical containment barriers such as doors opened or hatches removed.*

b. *All flows and pressures requiring either automatic or manual adjustment to maintain and verify confinement zone pressures must be continuously monitored. Local gauges shall always be provided in addition to any monitoring capabilities associated with automatic controls.*

c. *Adjustable damping shall be provided for all automatic flow and pressure control systems as required for stable operation.*

d. *Reference pressure systems used for building zone pressure control and monitoring systems shall have demonstrated acceptable performance in similar applications or field tests prior to incorporation into INEEL designs. Electronic instrumentation and controls shall be given preference to pneumatic equivalents unless cost prohibitive.*

e. *Atmospheric reference headers shall be installed as required to mitigate wind disruption and provide adequate dampened response time; these shall be provided with leak test fittings.*

f. *Control systems shall not be susceptible to radio interference.*

g. *A redundant source of control air should be provided, such as a redundant compressor. A dedicated circuit should be provided for the control electrical service.*

h. *Multiple pitot tube manifolded racks with upstream flow straighteners or other certified apparatus shall be used for flow elements.*

As stated in this section, "In general, every effort should be made to simplify the design and operation of control systems." The retrieval enclosure will have manual dampers, backdraft dampers, monitoring of the HEPA and prefilter filters' differential pressures and fan operation. Normal operations will utilize anterior spaces physically separated by doors or curtains (air lock) for traffic between the enclosure and the outside.

11. AES 1551-2, "General Information"

2.1 *Ventilation systems shall be designed to confine radioactive materials under normal and DBA conditions and to limit radioactive discharges to ALARA levels. The HVAC system shall provide the design pressure differentials, volume changes, temperature, air cleaning, and humidity* *control of building atmosphere, while addressing and minimizing the potential of crossflow between the HVAC, utility, and waste systems. Specific design guidance and requirements for nuclear and sensitive duty HVAC systems will be provided in the project design criteria.*

2.2 *A ventilation system shall serve all enclosure systems (such as reactor compartments or process cells) to maintain a negative pressure inside the enclosure with respect to the operating area. Consideration shall be given to the removal of heat, explosive and corrosive gases, toxic and particulate gases, and other contaminants. Air or inert gas from glove boxes or other process enclosures where wet chemical operations take place shall be treated if necessary to protect the ventilation ductwork, final filters, and filter plenums from exposure to wetting or deleterious chemical attack.*

2.3 *The system shall be designed to automatically ensure an inflow of air of 125 linear feet per minute through a credible breach (as defined in the design criteria) in the enclosure system. Design consideration shall be given to the effects of normal maintenance enclosure breaches and their effect on pressure gradients between the breached enclosure system and adjacent operating areas. The design of the enclosure ventilation flow pattern shall act to minimize the spread of fire. Small enclosure systems shall be provided with positive pressure-relief valves (connected into the exhaust system) to prevent pressurization of the system. Consideration shall be given to provisions for all necessary cleanup and detection equipment for noxious chemicals. Use of downdraft ventilation within enclosures shall be considered as a means of reducing fire and contamination spread potential.*

This subsection of the AE Standards provides general guidance for ventilation systems that are used to maintain confinement in permanent facilities with occupants in limited PPE. The intent is to maintain control of spread of contamination from areas of higher contamination potential to areas of lower contamination potential (operating areas) by means of pressure differentials and air flow. This approach is not applicable to the retrieval enclosure for the AR Project. The AR Project involves direct contact with the contaminated retrieved material and there is no concept of an operating area as implied by this section. The ventilation system in the AR Project retrieval enclosure will provide flows such that contamination levels within the enclosure and spread of contamination to the external environment will be reduced, but the system will not maintain pressure differentials or insure air flow rates through breaches.

12. AES 1551-3, "Ventilation Confinement"

3.1 *Ventilation systems serve as one of the principal secondary confinement barriers in a confinement barrier system guarding against the release of radioactive or other potentially dangerous materials during normal or abnormal design conditions. Ventilation systems are subject to variations in operating temperatures and pressures and to environmental conditions associated with normal operation, maintenance, plant shutdown, and testing. They may also be subject to and designed for the effects of natural phenomena such as seismic motion, floods, missiles, tornadoes, fires, explosion, and other accidents.*

3.2 *Ventilation systems shall be designed to withstand any credible fire or explosion and continue to act as a confinement barrier. Fire protection features of ventilation systems shall include fire-resistant materials of construction, fire-resistant filers, heat and smoke detectors, alarms, heat removal devices, fire-suppression equipment, and fire doors and dampers or other* *proven devices to restrict the spread of fires. Design of the system shall include an analysis to ensure that the ventilation system is capable of operating under design basis fire conditions as specified in the design criteria. It shall be designed to the maximum extent possible to withdraw the heat and smoke safely through appropriate ventilation channels so that products of combustion are not spread beyond the room of origin.*

3.2 *Failure of a single component or control function shall not compromise minimum adequate ventilation. (sic)*

The AR Project ventilation system will not comply with this requirement. The draft PSAR indicates that the design basis accident and other accident scenarios will not result in exposures to the co-located workers or the offsite public above evaluation guidelines and the risk is deemed to be acceptable.

The system provides fully redundant fans but only single stage HEPA filters. No fire protection in the ventilation system is provided, and the AR Project relies on the fire department response.

13. AES 1551-4, "Pressure Zones"

4.1 *A building or facility shall be divided into hazard class confinement zones as outlined in ERDA 76-21, Nuclear Air Cleaning Handbook; except, at INEL, Zone I refers to low hazard, Zone III is high hazard, and "clean area" equates to Zone IV in that handbook. In addition, protective clothing requirements may differ. Not all of the zones listed below would be required in all buildings, and an entire building could quite possibly be designated as a single zone. However, there shall be a minimum of two negative pressure zones within hazardous process and reactor buildings at the INEEL.*

a. *Zone III classification applies to the interior of hot cells, process cells, glove boxes, or other containments for handling highly radioactive materials. Containment features must prevent the spread of radioactive or hazardous material within and release from the building under both normal operating and upset conditions up to and including the DBA for the facility. Complete isolation (physical separation) from neighboring facilities, laboratories, shop area, and operating areas is necessary. A high efficiency filter, preferably HEPA type, is required in the air inlet.*

b. *Zone II classification applies to glove box operating areas, hot cell service or maintenance areas, or other building spaces where high levels of radioactive contamination could be present. Particularly hazardous operations are generally conducted in glove boxes. Sufficient air supply to produce inward airflow into glove box ports (with one glove removed) of at least 125 linear fpm is required.*

c. *Fume hood performance is affected by the hoods location, sash arrangement, room air currents, and hood construction. New installations or relocation's of fume hood shall consider the requirements of NFPA 45, OSHA 1910.1450, ANSI/AIHA Z9.5, and the ASHRAE Applications handbook. After installation, and on a yearly basis, hoods shall be tested for performance using ANSI/ASHRAE 110. The results will then be evaluated to minimize worker exposure.*

d. *Zone I classification is assigned to hot cell or process cell operating areas and other potentially contaminated areas that are adjacent to Zone II and III process or maintenance areas. Also included are general chemical laboratories, maintenance areas, and other general working areas which are usually nonradioactive but which may be subject to low levels of radiation in the air. Chemical fume hoods are required for operations, which could produce greater than CG for radioactive material or TLV for toxic or noxious material as defined in ERDA 76-21, Nuclear Air Cleaning Handbook.*

e. *"Clean Area" classification is assigned to areas that are normally free of contamination, such as control rooms, offices, and nonradioactive shop and storage areas. No specific protective clothing is required. Radiation monitoring may be required at exit points.*

4.2 *There shall be a negative differential pressure of at least 0.1 in. wg maintained between the building and outside atmosphere and between zones, except for the Zone III and II confinements, which shall be a minimum of 0.5 in. wg negative with respect to adjacent areas or spaces. However, consideration shall be given to designing office areas and control rooms at atmospheric or slightly positive pressure levels based on economic, safety, and evacuation personnel flow considerations.*

As noted previously, this retrieval activity is a different application than a permanent facility and pressure zones will not be provided. As in other applications in which simple enclosures are erected over contaminated areas for specific operations, the retrieval enclosure is a single enclosure around the retrieval area, and a pressure differential, per se, will not be maintained. Rather, the ventilation system will provide air flow through the enclosure to minimize the potential for contamination spread to the environment and will filter that air before exhausting it to the environment.

While not providing pressure zones, airlocks are used to minimize contamination spread from the retrieval area to the external environment.

14. AES 1551-5, "Air Supply System"

5.1 *Air supplied to the facility should be filtered to minimize loading of exhaust filters with atmospheric dirt and dust. During normal operation, ventilation supply air must flow from nonradioactive zones to moderately radioactive zones to highly radioactive zones.*

5.2 *A portion of the air may be recirculated within each zone, thus lessening the load on heating, cooling, and humidifying equipment; however, recirculation in Zone I, II, or III will require specific approval by the OC. Recirculation systems serving potentially contaminated zones shall be equipped with air cleaning equipment and continuous radioactive monitors to assist in maintaining air quality. An important operating principle with respect to air recirculation is that air may not under any circumstance be allowed to enter a zone of lower potential contamination than that from which it was withdrawn.*

5.3 *Outdoor makeup air supply units shall be protected form the weather. Air intakes shall be arranged to minimize the effects of tornadoes, high winds, rain, snow, ice, debris, and adjacent building effluents (such as steam vents) on the operation of the system. Screens shall be provided in air intake louvers for 100% outdoor air systems. The consequences of frost plugging of these* *screens shall be evaluated and methods to mitigate plugging included as appropriate. Preheat systems may be necessary in areas where icing can cause significant supply filter damage.*

Inlet filtration to reduce the load on exhaust filters is clearly not applicable in a waste retrieval action. Furthermore, no recirculation of the air will be considered. Air intakes will be arranged to minimize impacts on the system to the extent possible in a fabric structure.

15. AES 1551-6, "Air Flow"

    6.1 *An air flow pattern shall be used that ensures that air flow is from the atmosphere into the building and from noncontaminated areas to potentially contaminated areas and then to those areas normally containing contamination (series air flow pattern).*

    6.2 *These patterns of air flow shall be effected by maintaining pressure differentials between the different building confinement zones and between the building and the environment and by controlling interzone venting in accordance with the design criteria.*

    6.3 *Supply air shall be properly conditioned and where possible should be distributed at or near the ceiling of potentially contaminated areas of the facility.*

    6.4 *As much as practicable, airborne contamination released from process equipment or hot cells should be directed by air flow patterns for capture by an exhaust point in the immediate vicinity of the release. Air from each Zone 1, II, or Zone III area shall be removed near the area of highest contamination potential through area grills or registers equipped with fire-resistant, medium-efficiency filters. The filters should have an atmospheric dust spot efficiency rating of 90% of better.*

    As noted previously, air flow within the enclosure is used to reduce the contamination levels and, to the extent practical, provide air flow from less contaminated areas (e.g., airlock area) to more contaminated areas (e.g., dig face). However, the pressure zones (Zones I, II, and III) will not be maintained within this enclosure.

16. AES 1551-9, "Building Sealing"

    9.1 *See 0270, Insulation, Sealing, and Joints.*

    As noted elsewhere, the retrieval facility is a fabric structure and the requirements of Section 0720 are not applicable.

6.7 Procurement

The AR Project presents several procurement challenges including abbreviated procurement cycle times and innovative methods to minimize costs. Accordingly, long-lead items will be procured before final design is complete. This standard method of staged design is accomplished by carefully defining structure, equipment, and all system interfaces. These design definitions are fixed when the long-lead subcontracts are initiated. Long-lead procurement items are:

- Retrieval/airlock enclosure

- Gradall XL-5200
- Fissile material assay system trailer
- Monitoring equipment
- SWBs.

To maintain schedule, long-lead procurement actions will include the early involvement of candidate suppliers for input to specifications and solicitation documents prior to the release of a formal request for proposal. As determined appropriate, the project will procure near-new equipment when fabrication durations exceed acceptable delivery dates. Rental and purchase options will be entertained when deemed advantageous. Other cost and schedule enhancing measures will be considered on a case-by-case basis.

As a risk mitigation approach, certain long lead items that might be purchased as commercial grade items will be purchased as Quality Level III, instead. When the items are received, they will be checked against the (then final) safety basis to verify that they meet the applicable requirements.

The project PSAR will be approved before major procurement subcontracts are awarded, reducing the risk of introducing late design changes.

6.8 Construction

All construction activities will be provided by BBWI force account personnel with construction management provided by the AR Project construction manager and field engineers.

The construction phase of this project will start with the site preparation activities. Field construction is expected to begin as early as seasonal conditions allow, starting with existing road improvements, new road access, laydown area development, enclosure and trailer pad preparation and installation of temporary power.

The major enclosures associated with the project are the retrieval and airlock enclosures and the interim storage enclosure(s). Upon delivery of the GFE retrieval and airlock enclosures, erection activities will begin. As part of the enclosure procurement, installation support will be provided from the enclosure manufacturer.

Erection activities will continue upon arrival of the GFE interim storage enclosure (anticipated 4 weeks after arrival of retrieval/airlock enclosure). During erection of the interim storage enclosure, full use of resources will be implemented to begin mechanical/electrical installations within the retrieval/airlock enclosure.

When they arrive, the mobile assay unit and Operations support trailer will be setup to house monitors and provide minimal lab capabilities.

Throughout all construction activities, punchlist items will be identified and worked as issues arise. Upon completion of installations, construction component and operational testing will be performed as specified. During this time frame, punchlist items and the project transfer to Operations will be completed.

The construction schedule timeline (see Appendix D) is based on the anticipated start date of April 1, 2004. This start date is determined by favorable seasonal conditions as well as completion of final design. Enclosure erection start dates are driven by arrival of procured GFE and materials. Retrieval and airlock structures are scheduled for installation April 1, 2004; the interim storage enclosure is scheduled for installation June 1, 2004. The remaining construction time will be used to erect the enclosures, install mechanical and electrical equipment, test and turnover systems. Turnover will continue throughout the month of May, and transfer to Operations is scheduled for June 1, 2004. Mechanical and electrical installation, testing, and turnover of storage structures will occur through June and July.

6.9 Project Schedule

A master schedule for the AR Project will be prepared based on the following six primary phases, with consideration given to fiscal-funding limitations, weather, and the construction season (time of year):

1. Environmental documentation, which includes the NTCRA documents (engineering evaluation cost analysis, and waste management plan).
2. Preliminary design, which includes PSAR, fire hazards analysis, preliminary criticality safety evaluation, and project plan development.
3. Final design and long-lead procurement of the excavator, retrieval and storage enclosures, fissile material assay system trailer, and other miscellaneous equipment.
4. Construction, which covers construction activities relative to access improvements; earthwork, pad, and electrical service; procured item installation; and installation of retrieval and storage enclosures to include ventilation, power, and lighting.
5. Operations, which covers startup and retrieval, interim storage, treatment for TRU containing VOCs, and return-to-pit activities.
6. WIPP disposition, which includes certification strategy, acceptable knowledge development, plans and procedures, and CCP deployment and startup.

A conceptual summary schedule for the AR Project is included in Appendix D. The project milestones in the schedule are based on ICP management's understanding of DOE preliminary agreements with EPA and IDEQ.

6.10 Conceptual Cost Estimate

During conceptual design, the project team developed a estimate of the life-cycle baseline (LCB) for the AR project. Using the project work breakdown structure (WBS), see Appendix E, the activities, materials, and other sources of expenditure were estimated to arrive at a LCB cost that includes design, construction, operations (including certification for WIPP), and deactivation, decontamination, and decommissioning. The estimated cost of the project is approximately $308 million including contingency.

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