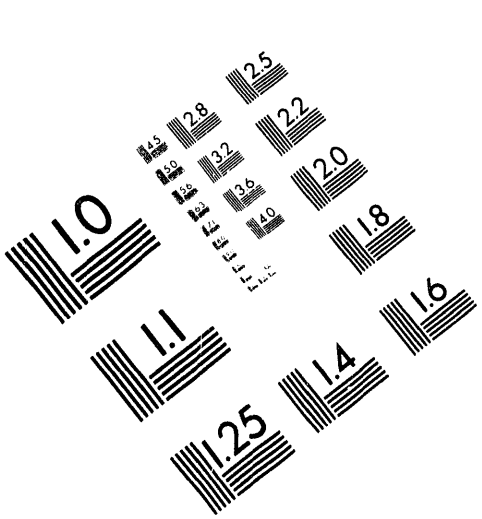

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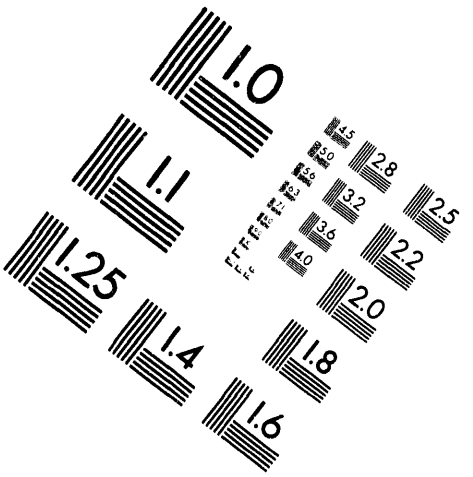

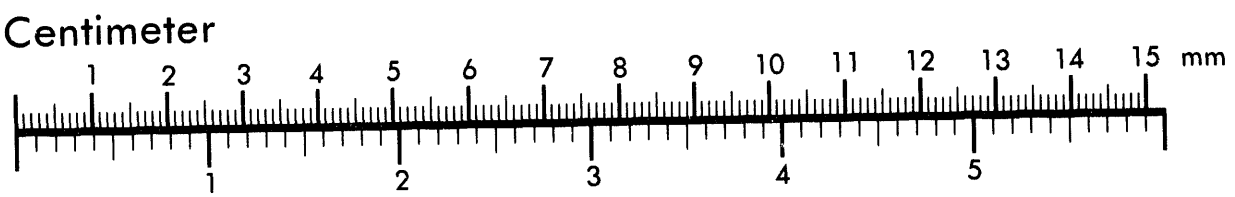

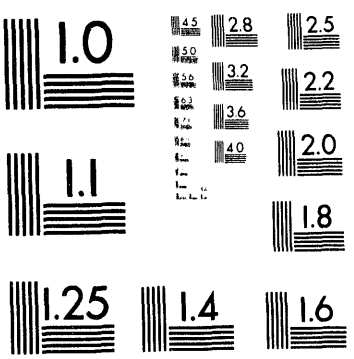

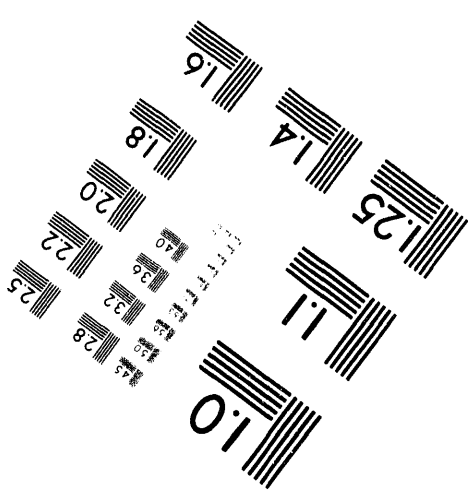

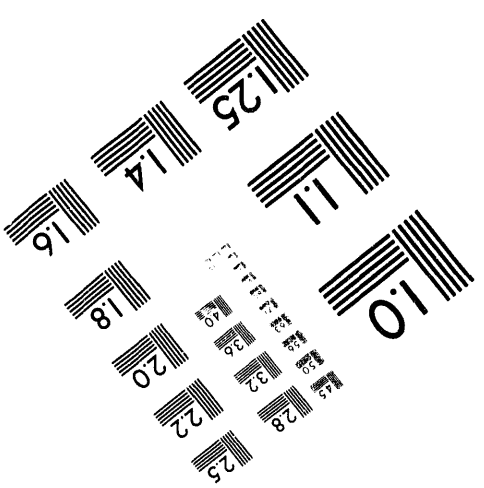

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OPERATIONAL READINESS REVIEW OF THE LOW-LEVEL WASTE VAULTS AT SRS–A CASE STUDY

by

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INTERNATIONAL NUCLEAR MATERIALS MANAGEMENT at Naples, Florida from 17 July 1994 - 20 July 1994.

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DISCLAIMER

OPERATIONAL READINESS REVIEW OF THE LOW LEVEL WASTE VAULTS AT SAVANNAH RIVER SITE - A CASE STUDY

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ABSTRACT

Low Level radioactive Waste (LLW) at the Savannah River Site (SRS) at Aiken, South Carolina, has traditionally been disposed of using engineered trenches in accordance with the guidelines and technology existing at the time. Recently, sub-grade concrete vaults known as E-Area Vaults (EAV) have been constructed at SRS. The EAV project is a comprehensive effort for upgrading LLW disposal at SRS based on meeting the requirements of current Department of Energy (DOE) Orders, and addressing more stringent federal and state regulations. The EAV is a first of its kind state-of-the-art facility designed and built in the United States to receive LLW. Westinghouse Savannah River Company (WSRC) conducted an Operational Readiness Review (ORR) of the vaults prior to startup. The objective of the EAV ORR was to perform a comprehensive review of the operational readiness of the facilities per DOE guidelines including Defense Nuclear Facilities Safety Board (DNFSB) recommendations. This review included assessing construction of the vaults as per design, adequate approved procedures, and training of all the personnel associated with the facility operations. EAV ORR incorporated the lessons learned from other DOE ORRs, included DNFSB recommendations, used a graded approach, and utilized subject matter experts for each functional area of assessment.

INTRODUCTION

The EAV Project is an enhanced form for disposal of Low Level radioactive Waste (LLW). DOE Order 5820.2A defines LLW as "waste that contains radioactivity and is not classified as high level waste, transuranic waste, or spent nuclear fuel." SRS operations further classify the LLW handled by the EAV Project as low activity, intermediate activity, and long lived wastes. The EAV facilities will not handle disposal or storage of liquid waste, TRU waste, and mixed (hazardous and radioactive) waste.

A methodical, phased approach in the execution of startup activities leading to radioactive operations is utilized. The program is based on the premise of defining

specific objectives to be achieved in each phase of the startup. Specific emphasis is placed on the demonstrable evidence of personnel safety, environmental protection, equipment reliability, configuration control, personnel training, emergency preparedness, and conduct of operations.

DESCRIPTION OF THE FACILITIES

The EAV facilities to be used for disposal or storage have been categorized based on the type of waste received, as follows.

Low Activity Waste (LAW) Vaults will be used to dispose of LLW waste that radiates less than or equal to 200 mrem/hr from an unshielded container at 5 cm. LAW will typically be contained in B-25 boxes (metal boxes measuring approximately 4' x 4' x 6') which in turn will be stacked in a below-grade, concrete structure comprised of 12 compartments or cells. Each cell measures approximately 56' wide, 24' high, and 145' long. Each cell is closed at the top with roof beam panels and a poured-in-place concrete slab to form a roof. Handling/stacking of the B-25 boxes will be accomplished using a motorized fork lift, or similar equipment, with access to the cells being provided through an opening at the front of each cell.

Intermediate Level Non-Tritium (ILNT) Vault will receive LLW that radiates greater than 200 mrem/hr at 5 cm from the outer disposal container and contains no more than a trace amount of tritium. ILNT waste will typically be in containers of various sizes, which in turn will be placed in a below-grade, concrete structure comprised of seven cells. Each cell measures approximately 27' wide, 29' deep, and 48' long. Each completed layer or level of containers will be covered with grout for radiation shielding and to form a flat surface for placement of the next layer. The allowable number of layers or levels is determined by configuration of the containers.

Intermediate Level Tritium (ILT) Vault will receive LLW that radiates greater than 200 mrem/hr at 5 cm from the outer disposal container, and contains significant quantities of tritium. ILT waste will be deposited in a below-grade, concrete structure comprised of two cells which are specifically designed for tritium waste. One cell is open, allowing for various size containers, and measures approximately 28' wide, 28' deep, and 48' long. Layers of tritium waste in this cell will be grouted as in the ILNT cells. The second cell also measures approximately 28' wide, 28' deep, and 48' long, but is arranged with 142 cylindrical silos for disposal of tritium crucibles. The space between the silos is filled with grout. Shield Plugs are installed in the top of each silo tube after each crucible is loaded.

The ILNT and ILT Vaults are located adjacent to each other, share a similar design, and are closed as a single unit. Handling of both ILNT and ILT waste will be accomplished

using a mobile gantry crane, with access to the cells being provided via the openings at the top of each cell.

Long Lived Waste Storage Building (LLWSB) will be used to store LLW waste that exceeds the Waste Acceptance Criteria limits for allowable disposal quantities of long-lived mobile isotopes (such as spent deionizers) that have major environmental impacts. This waste will be stored above grade on a concrete pad located inside a metal building and will primarily be housed in 7' diameter concrete culverts.

Closure Plan: The interim closure plan for the ILNT and ILT waste vaults consists of a poured-in-place concrete slab over each facility. The interim closure plan for the LAW vaults consists of sealing the access opening to each cell with concrete. The final closure plan allows for covering the entire vault system with layers of crushed stone, clay, and earth in an environmentally responsible and engineered manner to minimize moisture infiltration and to mitigate inadvertent intrusion. The disposal vaults and storage buildings are intended to meet the performance requirements of applicable DOE Orders.

DESCRIPTION OF THE ORR

An ORR is a well structured method to assess the readiness of the plant, procedures, and people. The satisfactory completion of an ORR and any identified deficiencies gives assurance to the management that the facility is ready to startup, and is in compliance with the federal and state regulations. The unique and effective methodology adopted for this successful EAV ORR are listed below.

Phased Approach: The EAV ORR was designed to be conducted in three phases (as listed below) to be consistent with the construction and startup schedule. While this arrangement required the preparation of separate EAV ORR final reports, performance of the ORR in this manner enabled each facility to receive separate authorization to commence normal operations as that facility was completed.

Phase A conducted the majority of the EAV ORR assessments, including those areas which were common to operation or support of all of the EAV facilities and LLWSB. Phases B and C were conducted to assess issues which are unique and exclusive to the ILT/ILNT waste vaults and LAW vault respectively.

Phase A:	All programmatic issues. EAV site preparation and LLWSB.
Phase B:	ILT and ILNT waste vaults.
Phase C:	LAW vault.

Readiness Tree: The EAV ORR Readiness Tree (Figure 1) was developed to provide a pictorial representation of the areas to be assessed, along with the structure

and organization of the assessment checklist. The EAV ORR Readiness Tree was structured to support the intent of a phased startup. The first layer of the tree represents the three facilities that will receive waste (LLWSB, ILT/ILNT and LAW VAULTS). The second layer divides each of these three facilities into Hardware, Programs (procedures), and Personnel. In order for any one of these three facilities to be placed in operation, the Site Preparation and the Programmatic issues must be completed. Therefore, these were placed in the tree in the second layer under the facility that was expected to be ready to start first (LLWSB).

Assessment Methodology: The EAV ORR was based on assessment of operational readiness by a method often referred to as a "Graded Approach". This method took a "Horizontal Slice" of selected areas or subjects of applicable federal, state, and local regulations (e.g., DOE Orders). The horizontal slice addressed the three principal areas covered by the ORR, which were: personnel, procedures/ documents, and plant/equipment. Then a "Vertical Slice" was made to further select from the many requirements within each area or subject, providing the detail necessary to determine whether or not each principal area is ready to start operations. The assessment requirements were derived from the DOE Orders and WSRC manuals related to EAV. Each checklist item requirement was assessed using a methodology appropriate to the subject and character of the item, which included: Personnel Interviews; Document/Records Reviews; Field Walkdowns; Observations of drills, exercises, meetings, training sessions, operations, and maintenance activities; and Review of assessment activities performed for other facilities which could be directly related to the EAV.

Organization: The EAV ORR Organization was established to ensure appropriate development, approval, and execution of the ORR, and attainment of the ORR objectives. Readiness Review Board (RRB) was independent of the Facility Management, and consisted of members who were expert in their area of specialization. Three non-voting members, one each from DOE, Facility Management, and ESH&QA, an oversight organization, provided on-time input regarding any future procedural changes which could have an impact on EAV ORR.

Qualification of the ORR Team was established consistent with the WSRC procedures. All ORR team members possessed the experience and qualification to perform their assigned duties, and in addition, they were given facility specific training. The ORR team members were "Subject Matter Experts" in their functional areas. This structure of the ORR organization and selection of the participants improved significantly the conduct and quality of this ORR.

Records: Development and maintenance of comprehensive and audible records is a key for the success of future DOE ORRs, and

review by DNFSB. One should expect that as a minimum the following documents will be generated during the performance of an ORR: ORR Plan; ORR Report including assessment activities associated with individual checklist items, and actual assessment method used; Team member Qualification and Training Records; Action Item documents describing the non-conformances identified, determination of resolution acceptability, and verification upon resolution completion. The RRB provided independent oversight of the ORR, and reviewed and approved all of the above mentioned documents for EAV.

RESULTS

EAV ORR incorporated the lessons learned from other DOE ORRs, used a graded approach, and utilized subject matter experts for each functional area of assessment. The EAV ORR Plan checklist focused on the DOE Order compliance, and each requirement provided a reference to the DOE Order along with the relevant portion of the verbatim statement. In addition to the review of documents, the ORR Team conducted numerous field walkdowns, interviewed managers and operators, witnessed emergency drills, and observed performance-based training of the operators. WSRC oversight organizations and DOE recognized this compliance and performance-based ORR.

CONCLUSIONS

The end of cold war period not only changed the DOE future mission, but also brought along public awareness, and more scrutiny by the oversight groups. New stringent regulations were passed for the startup/restart of DOE nuclear facilities. Any foreseeable effect which the facility operations may have on the environment, workers, or the public must be evaluated prior to startup. ORR is a tool to assess the readiness of the facility hardware, procedure, and personnel through a well structured method. ORR is no longer a quick review of the construction turn-over documents and procedures.

Careful planning of the ORR, along with the proper selection of the subject matter experts to form Readiness Review Board and ORR Team, will produce visible results which will be recognized by reviewers from the oversight agencies. The ORR must address all the federal (including DOE), state, and local regulations using a graded approach based on the hazard classification of the facility.

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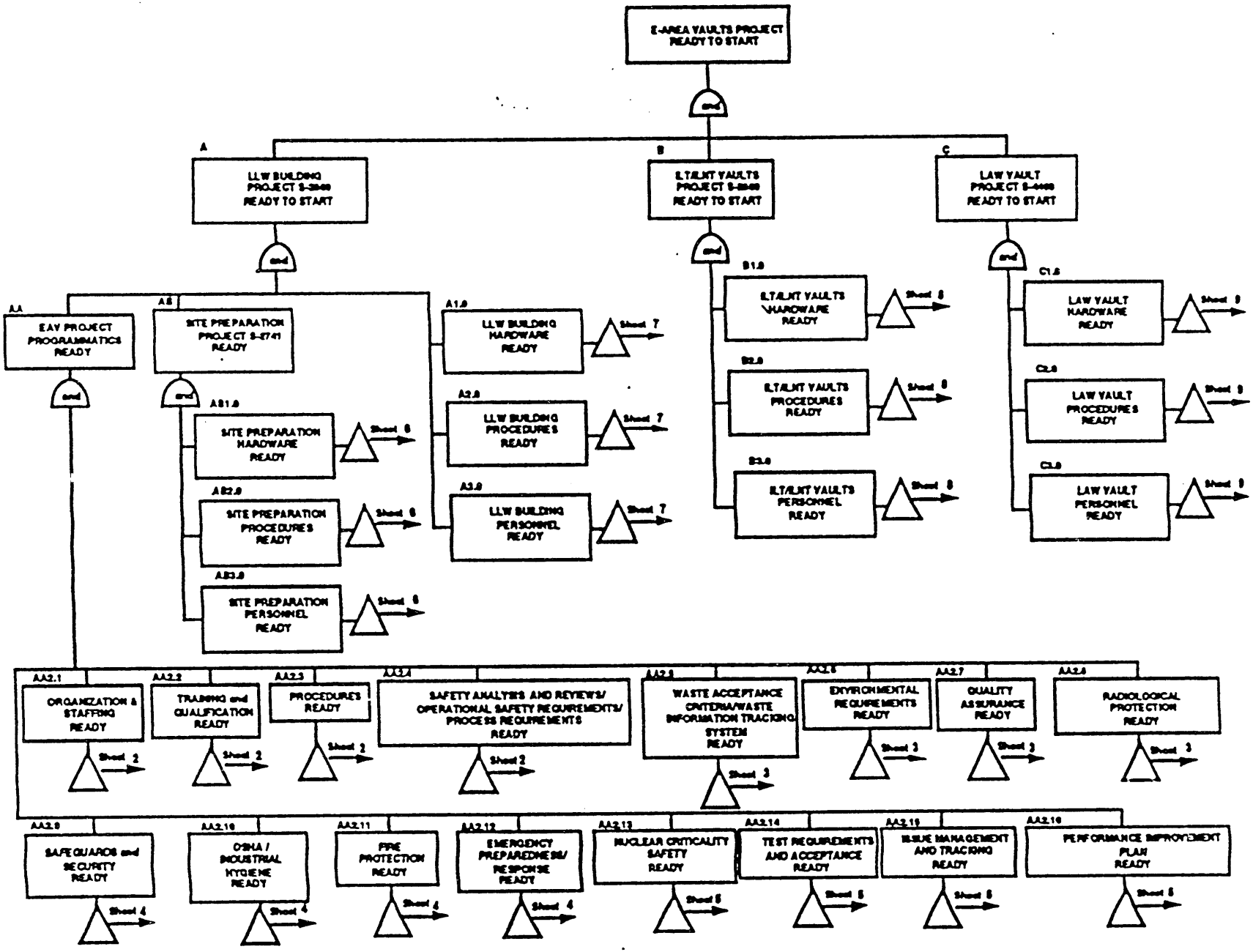

Figure 1. READINESS TREE

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