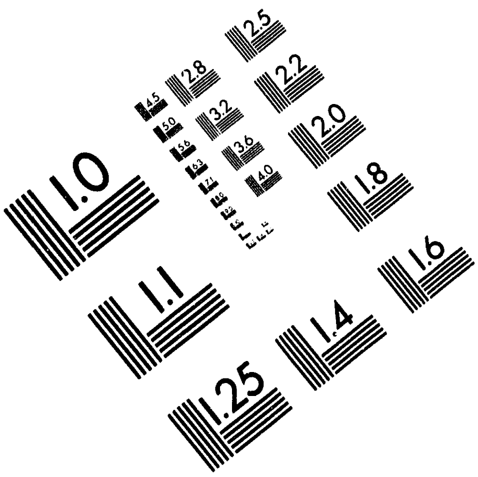

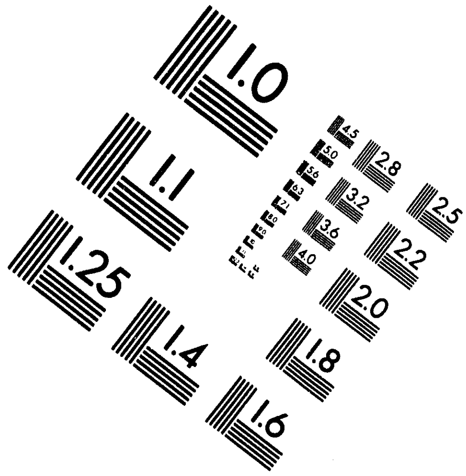

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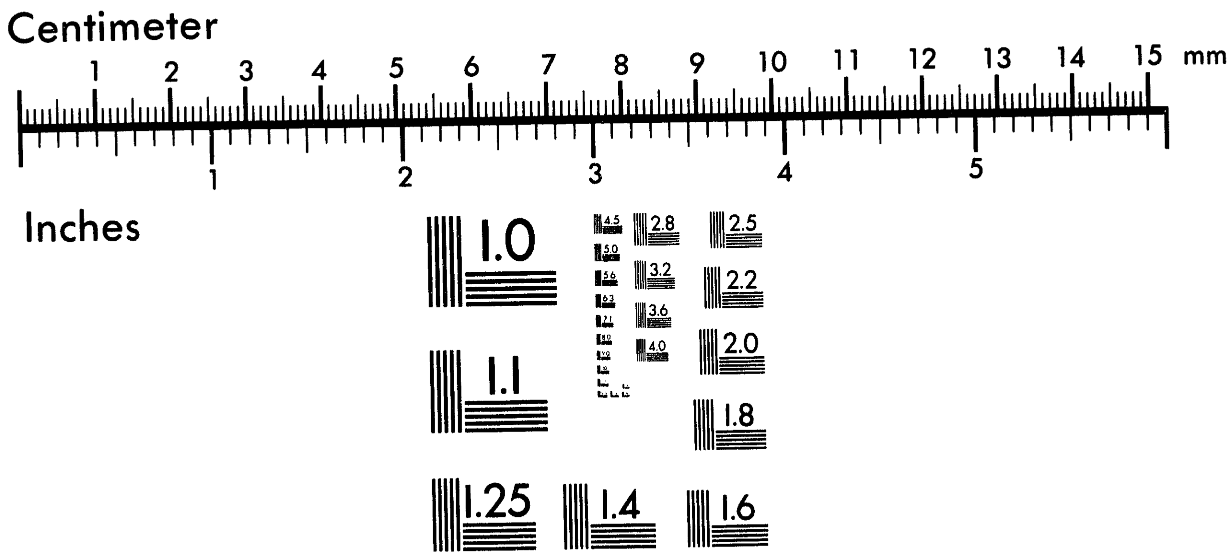

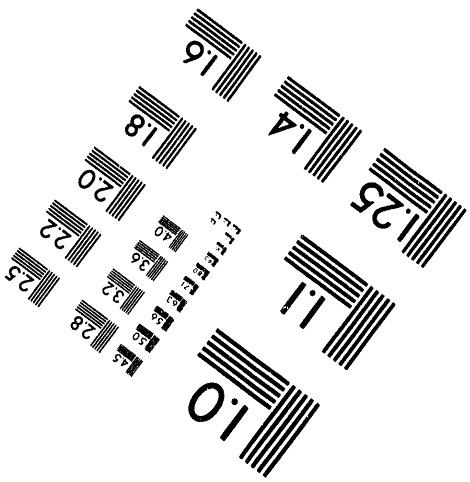

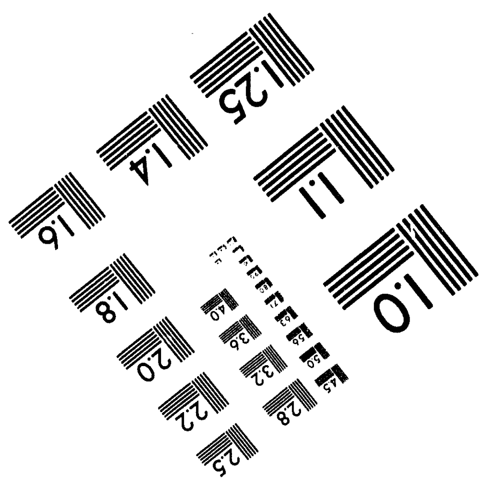

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AN INNOVATIVE APPROACH TO SOLID LOW LEVEL RADIOACTIVE WASTE PROCESSING AND DISPOSAL

Daniel C. Pancake, Jr.
Argonne National Laboratory - East
9700 S. Cass Ave. - Building 340
Argonne, Illinois 60439
(708) 252 - 7389

Michael A. Sodaro
Argonne National Laboratory - East
9700 S. Cass Ave. - Building 340
Argonne, Illinois 60439
(708) 252 - 6868

ABSTRACT

This paper will focus on a new system of Low Level Radioactive Waste (LLW) accumulation, processing and packaging, as well as the implementation of a Laboratory-wide training program used to introduce new waste accumulation containers to all of the on-site radioactive waste generators, and to train them on the requirements of this innovative waste characterization and documentation program.

I. INTRODUCTION

The need to develop this new system was driven by changing conditions in the Department of Energy's radioactive waste disposal policy, with special regard to the identification, and the corresponding Waste Acceptance Criteria to be met, of the primary LLW disposal facility. Argonne's problem began with 5 years accumulation of LLW (approx. 30,000 cu.ft.) packaged to Idaho National Engineering Laboratory waste acceptance criteria (WAC), which then could not be shipped to INEL per the Department of Energy's (DOE) direction. Poor characterization data for the historic material, and new Low Level Waste being generated every day, further contributed to the problem. The challenge was to establish and implement a program for certification and characterization of all LLW, including both historic and newly generated, which would be in compliance with the Hanford, Washington Site's new Waste Acceptance Criteria.

II. IMPLEMENTATION

The new LLW management system developed in response to this problem can be broken down into five major areas, consisting of: (1) Defining the role of the laboratory waste generator, (2) the development and introduction of new radioactive waste accumulation containers, (3) implementation of new waste disposal forms, (4) implementation of a new LLW "Sorting Process", and (5) a training class, which is video based, for all Laboratory employees that will be generating or handling radioactive waste.

Argonne National Laboratory - Argonne, Illinois 60439
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A. Waste Generator Definition

Pertaining to the discussions set forth in this paper, the "waste generator" refers to on-site personnel that produce or create radioactive and/or mixed wastes as a direct result of the work being performed by them. This definition includes the scientific research community, environmental remediation projects, and decontamination and decommissioning (D&D) projects. The role of these on-site waste generators has recently been redefined, as part of the new LLW processing system at Argonne. Waste generators are no longer expected to have full knowledge of the disposal site's WAC, only those criteria which must be met for the ANL WM organization to pick-up their waste. The responsibility for ensuring that the final waste package being shipped meets all of the disposal site's acceptance criteria has been shifted to the WM organization. The on-site waste generator is simply asked to accumulate waste safely, and to characterize and document the material according to instructions provided by WM. The method that the WM Department has developed for meeting those disposal site requirements is referred to as the "sorting process", and is discussed below.

B. Waste Accumulation Containers

The development and introduction of new solid LLW accumulation containers was done to minimize the volume of waste generated, facilitate safer and more timely processing of the contents, and to make waste segregation easier and more straightforward for the generators. The containers are color coded to a waste type, yellow for solid nonhazardous LLW, blue for Mixed Waste, and white for Transuranic waste. The containers themselves are plastic "buckets", with a foot pedal for opening and closing them, an 11 liter clear, rigid plastic insert, a polyethylene liner bag, and specially designed sphincter-style opening which keeps waste in the bag. Each clear poly bag liner has a yellow, blue, or white colored stripe printed on it, designating its use in only one type of container and providing a means of waste type identification later in the processing of the waste material.

The small polyethylene bag replaces a rigid fiberboard liner used in the "old" waste accumulation containers, and decreases the total disposal volume of waste processed by Waste Management Operations (WMO). The use of larger fiberboard accumulation containers has also been minimized, by the introduction of a container which utilizes a large (30 Gal.) poly bag, affixed to a frame and fitted with a special lid, which, similar to the smaller container's sphincter-style lid, is designed to keep waste and radioactive contamination in the bag.

C. Radioactive Waste Disposal Requisitions

The on-site waste generator initiates the waste disposal process by submitting a Radioactive Waste Disposal Requisition to the WM Department. The generator completes one form, the EWM-190, for Solid Nonhazardous Low Level Radioactive Waste, another, EWM-195, for Radioactive Mixed Waste (RMW), Transuranic Waste, liquid waste, or gaseous waste. These two new forms replace one "all-purpose" form, which has proved to be overly cumbersome for the generator to complete, and, in many cases, requires the waste generator to provide information that may not be applicable to the type of material being disposed of.

The new waste disposal forms used by the on-site waste generators to document their waste to Waste Management Operations have been simplified and streamlined according to the Department's belief that if the generator is asked only for truly relevant and pertinent information regarding the waste, then that information will be of a high quality. The waste generator is not asked to provide information about a "final shipping container", nor be obliged to satisfy the TSD WAC, because he or she is not packaging the waste for ultimate disposal. This puts the responsibility of final waste certification, packaging, documentation, and shipping where it belongs - with the professionals in the Waste Management Department.

D. LLW Sorting Process

Once the Waste Disposal Requisition has been reviewed and approved for processing, WMO mechanics pick up the waste from the generator's location and transport the material back to the waste processing facility. The waste is segregated by type of Waste Disposal Requisition it is documented on. All material documented on the EWM-190 Solid Nonhazardous Low Level Radioactive Waste Disposal Requisition will be prepared for the "sorting process". All other waste, which only comprises about 10% of the radioactive waste generated on-site, documented on the EWM-195 Radioactive and Mixed Waste Disposal Requisition, falls under other treatment methods and is not processed initially in this manner. All waste containers to be sorted are staged in an area immediately outside of the sorting facility, until there is enough material to warrant a full shift of waste processing activity.

The waste sorting facility consists of a room equipped with a stainless steel sorting table surrounded by a containment tent, with adjacent waste staging areas. The sorting table has five openings, fitted with drum rings and sleeves, on the work surface, which are attached to receiving drums, under the work surface, for compactible and non-compactible waste. There is a plexiglass window on the front of the table, hinged at the top for adding and removing waste containers, which covers approximately 75% of the hood opening. This allows personnel access to the waste being processed. The hood section of the table is connected to the room ventilation system, which is equipped with pre-filters and High Efficiency Particulate Air (HEPA) filters. The tent surrounding the table is constructed of 10 mil nylon reinforced polyethylene sheeting and unistrut steel supports, and is divided into two sections. The first section is where waste containers are staged to obtain initial organic content readings using a photoionization detector, and is divided from the actual work area. The second section, the work area, has two doors, which allow for personnel egress separate from material movement from the tent.

The waste sorting process itself is how Argonne, as the waste generator shipping to the final TSD, verifies that all information provided by the on-site waste generator is complete and accurate, prior to shipping the waste to the Hanford Site. The entire process is conducted with constant coverage and assistance from the Health Physics technicians that work with the WM Department.

Staged in the first section of the tent area, the waste material is analyzed with the photoionization detector, to ensure that no organic materials, currently prohibited in LLW packages, have accidentally been placed into the waste container. Common sources of prohibited organic material found in LLW packages are rags and wipes contaminated with solvents, such as acetone. These prohibited items, if sent to the Hanford Site as LLW, could result in a nonconforming item requiring actions from correction of the deficiency by the generator, to restricting some or all waste shipments from the site.

The waste container is then transferred into the sorting table, via the hinged plexiglass door on the hood, and opened. The contents of the container are removed, and spread out over the surface of the table so that smears of the items can be taken. The smears reveal the levels of loose radioactive contamination on the material, and those levels are compared, if applicable, with the radionuclide characterization information supplied by the waste generator. If the results of the comparison show a significant difference between the two values, the waste is repackaged into the original container and set aside as a nonconforming item.

A nonconforming item found during LLW processing is documented by the Waste Management Quality Assurance Engineer (WMQAE), and corrective actions to be performed by the original waste generator, if any, are communicated to them in writing. Nonconforming items include material found in the container which was not documented on the disposal requisition, prohibited items, as specified in the ANL-E Waste Handling Procedures Manual, found in the waste container, and/or liquids found in solid waste containers.

The contents of the waste container are then inspected, to ensure that the actual physical waste form(s) is consistent with the information provided by the generator. As the waste is sorted, it is segregated and identified as either compactible or non-compactible. Each type of waste has a corresponding receiving drum, attached to an opening in the work surface of the sorting table via drum rings and sleeves, within which the waste items are deposited. The disposition of the contents of each container is documented by a WM mechanic working in the tent, so that the information can be used to complete all final shipping container burial records and shipping papers.

The compactible waste is volume reduced by compacting the waste material into a 55 gallon drum. The compaction process involves the use of a 30-ton compactor, which produces a drum which will be the final shipping container for the compactible waste. The non-compactible waste is placed directly into the 55 gallon drum reserved for such, and, when full, the drum is closed and prepared for disposal as the final shipping container.

Each container is then subject to assay by gamma spectroscopy, which confirms the radioisotope information provided by the generator. The assay system consists of a computer controlled segmented gamma scanner, utilizing a high purity germanium crystal detector. If there is a discrepancy between the type and/or quantities of radionuclides reported by the generator and those provided by the assay results, the more conservative numbers are reported to the burial site.

100% of the solid LLW is inspected, processed, and verified in this manner, which enables Waste Management personnel to certify every waste package leaving the site. Prohibited items discovered during the inspection process may be returned to the waste generator, under provisions of the aforementioned WM Nonconformance Reporting Procedure.

E. Radioactive Waste Generator Training

All on-site radioactive waste generators are trained on the elements of a high-quality waste generation process. The training covers proper waste accumulation practices, appropriate accumulation containers, waste inventories, accurate completion of the waste disposal requisitions, and characterization requirements for all types of radioactive waste. The training class is structured around a video program, produced and developed at Argonne National Laboratory, which takes the waste generator through the proper waste generation process, from accumulation to disposal. The class is a prerequisite for any Laboratory employee who will complete and sign a waste disposal requisition, and request that their waste be picked up from their lab by WM Department personnel for ultimate disposal. The training class itself was developed, and is presented currently, in conjunction with ANL's Environment, Safety, and Health Division's Training Section.

III. SUMMARY

Periodic audits by Westinghouse Hanford Company's disposal site personnel have affirmed that the program established at ANL provides a high level of confidence that the LLW offered for disposal meets the requirements set forth in the Hanford Site WAC. The improved LLW disposal process at ANL has also reduced the amount of time required for both generators and WM personnel to completely and accurately perform their respective functions in the process.

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