Position Paper for High Moisture Content Waste

Revision 0, November 3, 1998

Prepared by:
Nevada Test Site Generator Work Group
High Moisture Content Waste Subgroup

EXECUTIVE SUMMARY

During the 1995 Annual Waste Generator Workshop, discussions were held regarding several areas of concern to waste generators currently shipping Low Level Waste to the Nevada Test Site. A goal to resolving these areas of concern was the establishment of an NVO-325 Work Group. In January of 1996 the NVO-325 Work Group was formalized and a Charter was adopted. The Work Group has since changed its name to the Nevada Test Site Generator Work Group (NTSGWG). The Work Group's membership includes two voting members from each Nevada Test Site waste generator site; one of the two voting members from each generator site is that site's Waste Certification Official. The NTSGWG is chartered to assist generators and DOE/NV in establishing a technical resource for the resolution of issues common to generating sites and to promote consistent and streamlined documentation packages for common waste streams.

In June of 1998, DOE/NV formally requested that the Work Group develop a sub Work Group that would provide uniform guidance for high-moisture content waste streams. This position paper provides a uniform approach for generator sites to comply with the Nevada Test Site Waste Acceptance Criteria free liquid requirement when managing waste with high-moisture content. It also functions to streamline the DOE/NV Radioactive Waste Acceptance Program's review and approval process by promoting more consistent characterization packages.

Position Paper for High Moisture Content Waste

Introduction

High moisture content waste streams (HMCW) are common throughout the DOE complex, and disposal of such waste is inevitable at the Nevada Test Site (NTS). The proper characterization and disposal of HMCW has been recognized as an item that should be standardized among sites designated to ship low-level radioactive waste (LLW) to the NTS for disposal. The purpose for this position paper is to present a common basis for the proper characterization and disposal of HMCW that will be utilized both by generators disposing of waste at the NTS and by DOE/NV's Radioactive Waste Acceptance Program (RWAP) when reviewing HMCW waste profiles for approval. This position paper was developed by the HMCW Work Group that was comprised of representatives from the sites designated to dispose of radioactive waste at the NTS with technical support from the RWAP representatives. This guidance (see attached flowchart) allows for flexibility and innovation in meeting the NTS Waste Acceptance Criteria (WAC) when characterizing, packaging, and shipping LLW. Each generator's waste stream is unique; not all waste streams will be subject to this guidance.

Definition of HMCW

High moisture content waste is defined as "waste that has the potential to release moisture from it's final waste form in excess of the Nevada Test Site Waste Acceptance Criteria."

Decision Block - Is it a dry waste?

All waste streams will not fall under the guidance of this position paper; therefore, it first must be determined that the waste to be generated is or is not innately a dry waste. This determination can be based upon process knowledge. Defensible process knowledge will be acceptable to the RWAP. The concept of this decision block is to identify and disposition those LLW streams that obviously do not need to be examined for moisture content. These types of waste would normally meet the definition of debris or construction waste. Typical examples include, but are not limited to, dry soil, manufactured items, metal sheeting, demolished buildings, contaminated equipment with fluids removed, air filters, rocks, gravel, concrete, piping, personal protective equipment, Plexiglas, glass, etc. Similar waste types meeting the description above can be considered "dry waste" and need not be addressed for moisture content. If the waste can be determined to be a dry waste, then the generator can proceed to package and ship the waste for disposal.

If sufficient knowledge of the waste stream is not obtainable, then the waste generator should perform adequate testing of the waste to determine that the waste will not release moisture from its final waste form. There are a number of tests that the waste generator may utilize to determine if the waste will release moisture. These include, but are not limited to, an oven drying test, proctor test, vibration test, paint filter test (SW-846 test method 9095), shake test, freeze/thaw test, and liquid release test (SW-846 test method 9096).

One uniform approach toward obtaining testing knowledge is to perform a combination of tests on the waste. One combination includes an oven drying test and a shaker test. The oven-drying test should be performed at a relatively low temperature (i.e., 50° C) over a relatively short period of time (i.e., two hours). Sample weights must be taken before and after the oven-drying test. If the moisture is truly bound,

it will not release during these conditions. A higher oven temperature over a longer drying time may eventually evaporate the moisture that is bound by the waste. If it is determined that a significant release of moisture has occurred during the oven-drying test, then it is not a dry waste.

If a release of moisture did not occur during the oven-drying test, it should then be determined if transporting the waste from the generating facility to the NTS will cause a release. One method for determining this release is the shaker test which consists of rotating waste samples at determined cycles per minute for a specified time period. Utilizing this method, it is recommended to test the waste at a frequency of 180 to 300 cycles per minute for no less than 24 hours. This frequency is similar to that experienced in transit. If a release is observed, then the waste is not a dry waste.

Decision Block - Is moisture sufficiently bound?

This decision block applies to those wastes which have obvious moisture content. Some of these wastes may have even technically passed the EPA's Paint Filter Test. This decision block identifies which waste streams will require processing prior to packaging and shipment.

This waste, which typically is liquid or has been in direct contact with liquids and is approaching the saturation point, includes, but is not limited to, wastewater, mud, tanks heels, sludges, filtercakes, etc.

The purpose of this block is to assure that an evaluation is made to determine if the waste, once packaged, will retain liquids throughout storage and shipment to the NTS. This evaluation includes, but is not limited to, package configuration, storage environment, effort to extract liquids from the waste form, impact of freezing and thawing of the waste form, etc.

One uniform approach for determining if the moisture is sufficiently bound is discussed in the first decision block *Is it a dry waste?* If the waste passes the tests as described in the first decision block and is shipped immediately after packaging, it would be safe to assume that a release of moisture will not occur. Sorbents should be added only to collect moisture attributed to condensation. However, if the waste is not shipped immediately and may be subject to extreme temperature fluctuations, the waste should undergo freeze/thaw testing. Moisture may be released under these conditions. The freeze/thaw testing consists of running a waste sample through a number of freeze/thaw cycles. One method is to cycle the sample down to -6° C for a minimum of six hours and then back to room temperature for a period of time sufficient for thaw. Observation should be made at each cycle for water release during thaw. A minimum of ten cycles should be performed. This test simulates storage and transportation conditions during the winter periods.

If moisture is released, then the moisture is not sufficiently bound. Waste forms that are considered to be liquid or capable of releasing moisture either in storage or during transport will require treatment to control moisture.

Decision Block - Determination of appropriate sorbent.

If it has been determined that the waste material has sufficient releasable moisture to exceed the WAC, then the addition of sorbent prior to shipping is necessary.

The selected sorbent should be capable of withstanding conditions similar to those experienced in transit and storage. These conditions include vibration and freeze/thaw cycles. The sorbent should be designed to be stable and bind moisture permanently.

There are two types of sorbent--bulk and polish. The bulk sorbent is used when the waste has a very large amount of water present and requires blending. Polish sorbents are used to collect minor water releases through vibration, freeze/thaw or condensation.

Sufficient sorbent should be added to bind with 200 percent of the releasable moisture present within the container. In the event that the anticipated releasable moisture exceeds one percent of the volume of the container, the waste material may require treatment to reduce the moisture content. Example: A 100-cubic foot shipping container has a releasable moisture content of one cubic foot. Polish sorbent with sufficient capacity to collect two cubic feet of moisture should be used. Example: A 100-cubic foot container is to be filled with a waste that is 60-percent moisture; testing indicates that 15 percent of the moisture is releasable. The waste should be dried or blended with a sorbent to reduce the releasable moisture content to below one percent of the volume of the container.

Decision Block - Sufficient knowledge/testing of sorbent with the waste matrix

Sorbents should be tested with the waste matrix to determine their behavior under conditions similar to those experienced in transit and storage. The roads between a generator site and the disposal site will induce vibration. It is recommended to utilize the shaker test as prescribed earlier. Sorbents should also be tested in multiple freeze/thaw cycles as discussed previously.

All testing of sorbents should be done at saturation since this is the worst case the material will experience.

Decision Block - Determine appropriate packaging

The shipping container is specified under separate DOE procedures and DOT regulations. It is recommended that the shipping container be lined with pre-formed polyvinyl chloride, polyethylene, or polypropylene liner in the container.

Dry waste or very low moisture content wastes could be packaged with a sorbent pad prior to the placement of wastes. For boxes it is recommended that two pads be placed four inches up all side walls and cover the bottom. One pad will not cover the bottom of the box completely. If only one pad is used, the sorbent pad will pull away from the container's seams when waste is added. The seams may leak if moisture develops. Drum sorbent pads may also be used, but keep in mind that the pads need to be layered to line the sidewall approximately four inches up.

High moisture content wastes may be blended with a sorbent material, for example, agricultural lime or Portland cement. CAUTION: Portland cement may cause a thermal reaction when added to the waste.

Decision Block – Will the waste undergo immediate shipment once packaged?

If the packaged waste will be shipped immediately to the disposal site or will be stored under a relatively constant storage temperature, then it will be safe to assume that the moisture will stay sufficiently bound and will not release from the waste matrix.

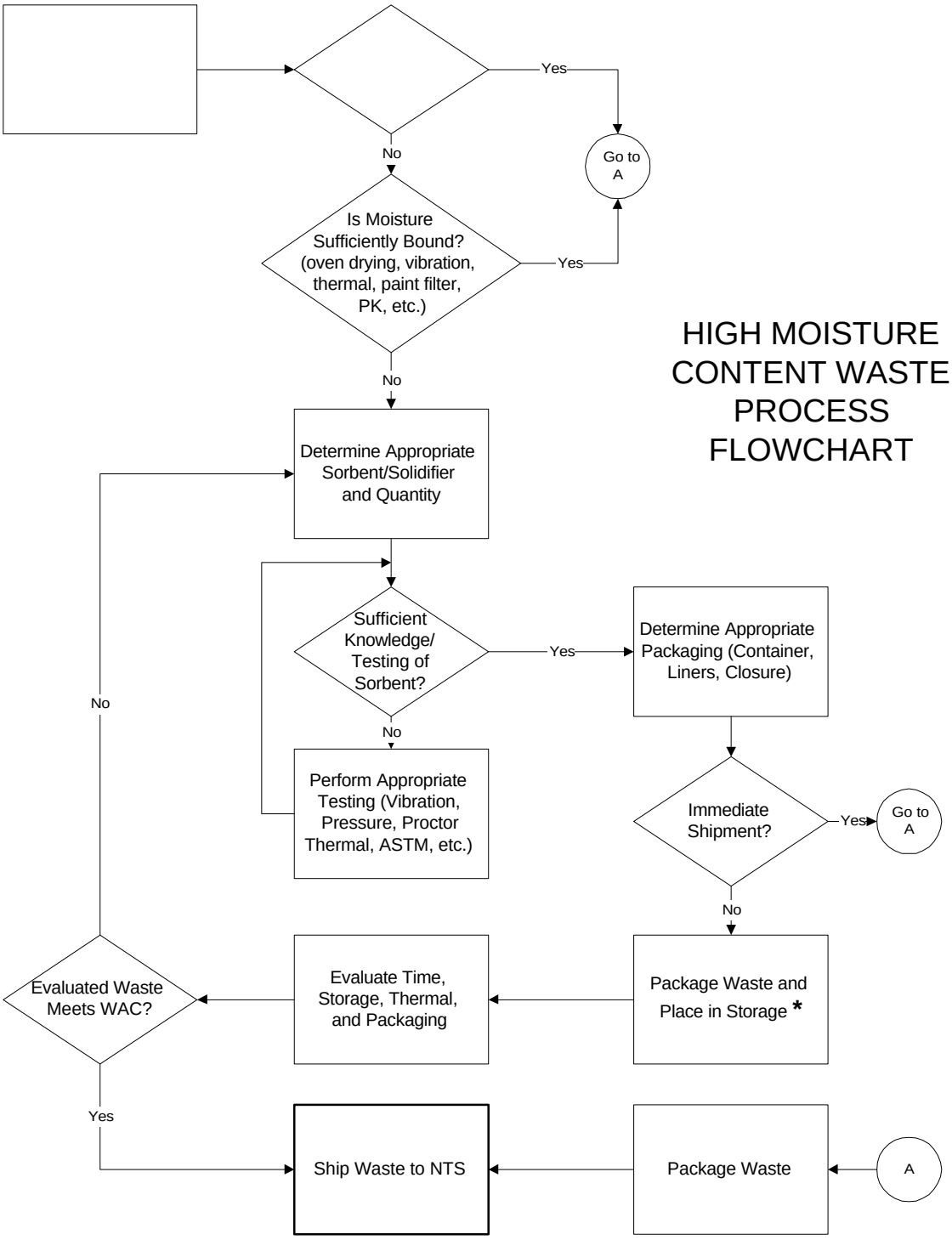
If the waste will remain at the generator's site for a period of time, the waste should be evaluated with regard to the time elapsed from packaging to shipment and storage temperatures. The packaging and sorbent should also be evaluated to ensure that their integrity is maintained for the required storage period.

Backlog waste that has been packaged and stored at the generating facility prior to the development of this position paper should also be evaluated.

Decision Block – Waste evaluated and meets NTSWAC

If it is determined through the evaluation that the moisture has remained sufficiently bound, then it will be safe to assume that moisture will not release from the waste matrix in excess of the NTSWAC requirements.

If it is evident that the moisture has not remained sufficiently bound, the generator should retrace the steps shown on the flowchart to determine the appropriate sorbent and quantity.



* Backlog waste that has been packaged and stored at the generating facility prior to the development of this position paper should be evaluated.