ABSTRACT

Thinking Outside the Metal Box

In the late 1980’s, major industry in North America had to really get serious and look at the economics of managing their waste streams. As for containers, metal drums were the norm. Introducing the use of other types of containers required a paradigm shift. Innovative companies reviewed industry needs and developed IBC’s that were much lighter and held DOT exemptions for Flammable Solids, Class B poisons, Oxidizers etc. These containers were certainly more than just strong, tight containers. When HM-181 came into effect with the POP standards, the testing criteria were set for the testing for Packaging Groups I, II & III. Presently, tens of thousands of non-metal packaging containers are being used throughout the world for the shipment of dangerous goods. Most of these packages hold the contents of 4 to 6 drums worth of material but may weigh less than even one drum. Replacing metals whenever possible offers savings on both the purchase of the containers and the cost of transporting the container both incoming and outgoing. Over the past decade, this style of IBC has been buried or burned at almost all commercial disposal properties. Many facilities have realized the overall cost and time savings of using non-metal containers. The US Government seems to be the last of the large metal container users. The use of steel drums and bins is ingrained in the system. For the government to consider the use of non-metal containers will require a big paradigm shift.

Recently, some of the DOE national labs have reviewed the economics of using metal containers and have begun researching alternatives. This has led to the development of a recent test for a Type A container. A new type of container, The Stagecoach, has been developed and tested to these criteria. It is approved for many types of low level, mixed and hazardous materials in packing groups I, II & III. It can be used as strong, tight or IP 1, IP 2, or IP 3.

THE STAGECOACH, A BREAKTHROUGH IN 7A TYPE A PACKAGING

U.F. Strainrite Inc. (now known as Lapoint Industries) has over 25 years of manufacturing experience with over 15 years experience in the Hazardous Waste industry. U.F. Strainrite operates with an ISO 9001 Quality Assurance Program and consistently strives to produce innovative products for industry. The Stagecoach was developed in keeping with Type A requirements to fill a gap in the current industry product offering. Under DOE auspices, the Stagecoach was extensively tested by Waste Management Technical Services. It is designed for and intended to ship Type A solid, radioactive materials, normal form, Material Form Numbers 1, 2, and 3. The tested and approved gross weight of the packaging, as filled with contents, is 1360.77kg (3,000 lb.). Type A packaging testing included the water spray, penetration bar drop, 1.0 m (3.3ft), stack, and 1.2m (4ft) drop tests with no release of contents.

The packaging configuration tested was designed, manufactured, and constructed in the United States by U.F. Strainrite Inc., Lewiston, Maine. The report documents the tests and evaluations
conducted by WMTS in 1999 under Docket 99-49-7A. The testing and evaluation
documentation demonstrates that the materials of construction and design of the Stagecoach meet
all DOT-7A Type A packaging requirements of 49 CFR 178 “Specifications for Packagings”
178.350 (1). The approved Type A packaging designed documentation discussed in the report
may also be used to support the use of the packaging as an Industrial Packaging or as a Strong-
Tight Packaging. A design verification procedure (2) was used to ensure that the packaging
would meet the design requirements of 49 CFR 173, “Shippers –General Requirements for
Shipments and Packagings” (3).

Container Design

The Stagecoach design is as follows: It is a freestanding semi-rigid plastic container that includes
a 6-mil low-density polyethylene liner. Two plastic ties are provided to assist in securing the
liner. In addition, the container incorporates multiple closures, including a tamper proof security
device. The 4 sidewalls of the Stagecoach each consists of 2 sheets of triple-wall natural kraft
corrugated fiberboard in “pockets” of woven, coated polypropylene. The cover consists of 1
sheet of triple-wall natural kraft corrugated fiberboard. The fiberboard is encapsulated between
an inner and outer layer of ultraviolet-resistant, weather-resistant, woven, coated polypropylene
fabric. VELCRO® is used to secure the “pocket” for the fiberboard encapsulation for the
sidewalls. The bottom of the Stagecoach consists of the polypropylene fabric and does not
contain any fiberboard material. The cover of the Stagecoach overhangs three of the sidewalls
approximately 15.24 cm (6”) and incorporates 6 grommets (2 left, 2 center, and 2 right). Three
corresponding tabs are located on one sidewall of the container, each containing 1 grommet.
Ties are provided and are inserted through the grommets for closure and tamperproof purposes.
The remaining side of the cover is stitched to a sidewall. The seams of the container are chain-
stitched. There are three rows of stitching. The Stagecoach does not contain any valves or
filters. See Fig.1 for Assembly Instructions that demonstrate how to open, set-up, fill, and secure
the Stagecoach. All materials that accompany a Stagecoach container are also represented.
The Stagecoach is a freestanding container. When opened, exterior dimensions are approximately 44'' x 44'' x 44''. Interior dimensions are 42'' x 42'' x 42''. Capacity is 3,000 lbs.
by weight. The container will hold 1.6 cubic yards (43 cu ft), approximately the same volume capacity as six 55 gallon containers. Before opening, the Stagecoach is flat, with dimensions of approximately 44” x 44” x 6”. Weight when empty is about 39 lbs. A 6-mil yellow liner, ties, security device, and directions are included with each container. When empty and flattened before opening, up to 15 pieces can be banded on a pallet and shipped by motor freight. Although a pallet is not included, one is required for use.

When filled, the Stagecoach can most easily be handled on a pallet. In transport, it may be banded to a pallet. During testing, two of four carbon steel bands (1.91 cm, .75 in) held the packaging on a wooden pallet. Although 2 bands can be used, four bands are recommended due to the flexibility of the container.

Testing Results

The polypropylene fabric used in the Stagecoach underwent several American Society for Testing and Materials (ASTM) test procedures to determine its strength and associated ratings. This fabric will function effectively over the –40 to 70 degree C (~-40 to 158 degree F) temperature range. In addition, the corrugated fiberboard used in the Stagecoach underwent several strength tests for industry ratings. The liner is made of low-density polyethylene, which will perform adequately at 2.5 Mrad.

Vibration testing was not conducted on the Stagecoach under Docket 99-49-7A. An independent test facility conducted a vibration test on a similar package design manufactured by U.F. Strainrite (4). The design passed vibration testing with no release of contents. Based on the similar designs and method of construction used for the two packagings, one can readily conclude that the packaging configuration tested under Docket 99-49-7A meets this performance requirement. In addition, this type of packaging has been used and produced for about a decade without any incidents during transportation!

The Stagecoach is considered a bulk package. It is not a combination packaging, and it is not authorized for transporting liquid materials. The Stagecoach is neither evaluated nor recommended for air transport.

The test report concludes that when loaded as described in the report, the evaluation and testing indicates that the Stagecoach packaging configuration meets applicable DOT-7A Type A design and compliance test requirements. The approved packaging configurations are authorized for shipment of radioactive solids, Material Form Numbers 1, 2, and 3 (5). Deviations from the approved, as-tested packaging configuration will require re-testing or approval by the U.S. Department of Energy.

How The Stagecoach Represents a Paradigm Shift in Container Type

As compared to the more familiar types of metal (or wooden) containers, the Stagecoach is considerably more “user friendly” and in many instances, more “environmentally friendly”. They are lighter, and take up about 90% less space before opening. A pallet of Stagecoaches would have approximately the same capacity as (90) 55-gallon steel drums, but would weigh less
than one fourth as much. The container can be double stacked when filled. The Stagecoach is very secure in landfills; it will compact like soft-sided containers, but not “split or burst” like more rigid containers. In addition it will not rust like steel nor deteriorate like wooden or tri-wall boxes. Incineration is very clean, as the container burns hot and produces carbon dioxide and H20. Upon comparison with building plywood boxes or buying steel boxes/drums, several cost-saving factors are evident. Less time is spent setting up and moving this type of container – an empty container can be moved and set up by one person. The collapsibility of the container and light weight also save on incoming freight costs and on-site storage. The light weight of the container also avoids unnecessary added weight and transportation cost for outgoing shipments.

In addition to being approved as a Type A container, the Stagecoach also has UN approval for Packaging Groups I, II and III. Suggested applications include soil, debris, sludge, filter cake, rags, and bags. A compactor is also available for use with this type of container to maximize container capacity and reduce landfill volume. The WMTS report also shows that the container crushed somewhat when stacked but there were no loss of contents. Reduced volume in this respect is a good thing as is allows for maximum use of disposal space.

U.F. Strainrite/Lapoint Industries has had over 15 years of involvement in the Hazardous Waste Industry working with disposal facilities and transportation companies. Tens of thousands of similar containers for hazardous materials have been used for disposal since 1985. WAC requirements at the Nevada Test Site and at Hanford, WA, each allow this type of container to be buried in one of their two pits, depending on the type of waste. The container is also acceptable at Envirocare of Utah and other similar sites.

Packaging innovations for low level rad waste are practically non-existent. Steel drums and metal boxes have been the norm for many years, and still have their place. However for various types of low level rad waste, for various applications, and for various disposal sites, The Stagecoach package may be more economical and save money for the stakeholders. The challenge is sometimes just thinking outside the metal box.

The Final Evaluation Report can be viewed at several web sites including
www.wranglerzone.com
www.rampac.com

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REFERENCES

1. 49 CFR 178 “Specifications for Packagings” 178.350
5. RL (1998)