Design and general information
The shipping case (packaging) container is designed to secure the Troxler RoofReader Model 3216 Moisture Gauge and protect it from incidents during normal transportation and shipping. It provides cavities to secure the gauge and accessories.

Construction
The Troxler Model 123299.0001 Shipping Case is a single-wall case manufactured of ultraviolet (UV)-stabilized, rotomolded high-impact polyethylene intended for rugged industrial use in material handling and shipping cases. It has medium-density foam inserts for padding and component separation.

Hardware attachment inserts are placed in the mold prior to molding to provide reinforced mounting locations for post-installed hardware.

Other items included in the package are components such as a gasket for weather resistance, plated steel hinges and draw latches for opening and securing the lid, a steel stay lid, and other components for construction.

Dimensions and weight
- The dimensions of the case are 23.3 in. (L) x 20.2 in. (W) x 14.8 in. (H).
- The weight of an empty case is 19.9 lb.
- The weight of a fully loaded case (i.e., a case that contains a gauge and its accessories) is approximately 30 lb.

Closures and closure system
Packing of the case and placement of materials should be done following the closure instructions for the Model 3216 gauge. The case incorporates a silicon gasket in the lid to provide weather protection. The container closure is accomplished with hinges and “butterfly” hook-and-clasp latches constructed of heavy-duty, corrosion-protected steel. Closures are attached to the case walls with blind rivets installed into molded-in inserts. Integral security features are incorporated within the latch construction to permit the use of padlocks or security devices.

Shielding
The case itself does not provide any shielding. The gauge has internal shielding constructed of polyethylene.

Packing material
The case is packed in accordance with the closure instructions for the Model 3216 gauge. The items packed in the case include a Model 3216 gauge, other accessories, and a documentation packet. Finally, the case is sealed with a security seal or a padlock.
Troxler Electronic Laboratories, Inc.
Type A Certification
Model 123299.0001 Case and Model 3216 Gauge

This is to certify that the shipping container described on the previous page was tested in accordance with US Department of Transportation (USDOT) requirements and complies with the requirements and specifications set forth in the following sections in “Title 49 - Transportation” of the Code of Federal Regulations (2017):

- 49 CFR 173.410 - General design requirements
- 49 CFR 173.412 - Additional design requirements for Type A packages
- 49 CFR 173.461 - Demonstration of compliance with tests
- 49 CFR 173.465 - Type A packaging tests

Authorized by:  
Reviewed by:  

Date: 5-1-2018
Troxler Electronic Laboratories, Inc.
Engineering Evaluation
Model 123299.0001 Case and Model 3216 Gauge

NOTE: This section describes the evaluation of the case with foam inserts to accommodate the Model 3216 gauge, which was based on Type A packaging tests for the case with foam inserts to accommodate the Troxler Moisture Measurement System (MMS) (Model 3630) neutron source box.

The case used to ship the Model 3216 gauge is the same case that Troxler uses to ship the MMS source boxes. The package configuration for the source boxes was tested using the performance tests described in § 173.465.

NOTE: Per § 173.461(a)(2) and (a)(4), this evaluation demonstrates compliance with these tests.

The outer case is structurally equivalent regardless of its contents—it is made of rotomolded high-impact polyethylene and has steel latches and molded-in, tongue-and-groove gasketed seals. The primary difference between the Model 3216 gauge case and the MMS source box case is the polyethylene foam inserts on the inside.

Foam inserts
The foam inserts are constructed to securely house the Model 3216 gauge in the case. The foam used in the MMS source box case is 2.2 pcf polyethylene, while the foam used in the Model 3216 gauge case is a combination of 2 pcf polyethylene and 1.3 pcf polyurethane.

Shielding
The MMS neutron source box variant of the MMS source box case includes cadmium sheets to provide shielding for the californium-252 (Cf-252) source. (This shielding provides no structural integrity to the package.) The Model 3216 gauge uses an americium-241/beryllium (Am-241/Be) source that does not require shielding, so the cadmium is not included in its case.

Weight
The Model 3216 gauge is substantially lighter than the MMS neutron source box. The Model 3216 gauge weighs approximately 9 lb., and its fully loaded case weighs approximately 30 lb. The MMS neutron source box weighs approximately 63.1 lb., and its fully loaded case weighs approximately 83 lb.

Testing
No permanent damage was observed while testing the MMS source box case. (During the free drop test, only minor scuffing was noted on the exterior of the case where it impacted the concrete floor. There was no loss or dispersal of the radioactive contents, nor was there any significant increase in the radiation levels recorded at the external surfaces for the condition before the test.)

Given the minor differences between the two case assemblies—and the drastically lower weight of the Model 3216 gauge itself—it is reasonable to assume that all testing performed on the MMS source box case would generate similar results for the Model 3216 gauge case.
Troxler Electronic Laboratories, Inc.
Engineering Evaluation
Model 123299.0001 Case and Model 3216 Gauge

Matthew Marchese/Michael Veihl
Mechanical Engineer
Troxler Electronic Laboratories, Inc.

Signature ..........................
Date ..............................

Signature ..........................
Date ..............................
Troxler Electronic Laboratories, Inc.
Package Closure Instructions
Model 123299.0001 Case and Model 3216 Gauge

49 CFR 178.2 - Applicability and responsibility (c) requires that closure instructions be provided “to effectively assemble and close the packaging for the purpose of preventing leakage in transportation. Closure Instructions must provide for a consistent and repeatable means of closure that is sufficient to ensure the packaging is closed in the same manner as it was tested.”

Troxler has prepared the following closure instructions in accordance with this guidance.

1. Visually inspect the transport case and contents. Per § 173.461, look for divergence from the specifications or drawings, defects in construction, corrosion or other deterioration, and/or distortion of features. The package and its contents must be evaluated against the guidance of 49 CFR 173.475 - Quality control requirements prior to each shipment of Class 7 (radioactive) materials. (Please see the information regarding this evaluation at the end of the closure instructions.)
2. Lower the handle to its lowest (shortest) position.
3. Tighten the screw on the back of the handle to lock it in place.
4. Load the following items into the case in any order:
   a. **Model 3216 gauge**—Place the gauge in the case with the gauge body to the left of the case.
   b. **Other accessories**—Place other accessories in the cavity in the center of the case. (Other accessories include battery chargers, cables, etc.)
   c. **Documentation**—Documentation associated with the gauge may be stored in the pocket in the back of the case.
5. Once all the items in the package are loaded, close the case lid.
6. To secure the lid, raise the bottom part of the draw (butterfly) catch so that the hook connects with the catch located on the lid. If necessary, extend the hook by rotating the butterfly handle anticlockwise.
7. Rotate the butterfly handles clockwise until the lid is pulled down.
8. Fold the butterfly handles down so that they do not extend from the case.
9. Repeat steps 6 through 8 with all catches.
10. Secure the gauge case with a padlock or a security seal.
Troxler Electronic Laboratories, Inc.
Package Closure Instructions
Model 123299.0001 Case and Model 3216 Gauge

(a) Model 3216 gauge
(b) Other accessories
(c) Documentation

Figure 1. Empty case (open) and items

Figure 2. Fully loaded case (open)
Figure 3. Fully loaded case (closed and locked) (front)

Figure 4. Fully loaded case (closed and locked) (back)
§ 173.475
Before each shipment of any Class 7 (radioactive) materials package, the offeror must ensure, by examination or appropriate tests, that the requirements below are met.

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Action Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) The packaging is proper for the contents to be shipped;</td>
<td>Evaluate the radioactive material being shipped in the package.</td>
</tr>
<tr>
<td>(b) The packaging is in unimpaired physical condition, except for superficial marks;</td>
<td>Evaluate the packaging.</td>
</tr>
<tr>
<td>(c) Each closure device of the packaging, including any required gasket, is properly installed, secured, and free of defects;</td>
<td>Ensure that each closure device is properly installed, secured, and free of defects.</td>
</tr>
<tr>
<td>(d) For fissile material, each moderator and neutron absorber, if required, is present and in proper condition;</td>
<td>*</td>
</tr>
<tr>
<td>(e) Each special instruction for filling, closing, and preparation of the packaging for shipment has been followed;</td>
<td>*</td>
</tr>
<tr>
<td>(f) Each closure, valve, or other opening of the containment system through which the radioactive content might escape is properly closed and sealed;</td>
<td>*</td>
</tr>
<tr>
<td>(g) Each packaging containing liquid in excess of an A₂ quantity and intended for air shipment has been tested to show that it will not leak under an ambient atmospheric pressure of not more than 25 kPa, absolute (3.6 psia). The test must be conducted on the entire containment system, or on any receptacle or vessel within the containment system, to determine compliance with this requirement;</td>
<td>*</td>
</tr>
<tr>
<td>(h) The internal pressure of the containment system will not exceed the design pressure during transportation; and</td>
<td>*</td>
</tr>
<tr>
<td>(i) External radiation and contamination levels are within the allowable limits specified in this subchapter.</td>
<td>Evaluate external radiation and contamination levels.</td>
</tr>
</tbody>
</table>

* No action is required for this package.