Horizon Package Testing Service Inc. is a current DOT UN Third Party Certification Agency under §107.403
Project ID: #1995                      Certificate Number: +CA0940

Certifying Party:                Ms. Marie O. Mills
                                  Jet Research Center, a Division of Halliburton
                                  8432 South I-35W
                                  Alvarado, TX 7609

Packaging Description

NOTE: Packagings submitted are for Design Qualification Testing and require preconditioning per 49 CFR 178.602 (d).
Designated Packaging Code: 4G    Packing Group II (Y)

A Combination Package (4 x 4 x 9) comprising one (1) steel cylinder product stimulant inner packaging completely wrapped in absorbent kim-pack wadding. Inner packagings are placed into a double wall Kraft/Kraft Center Special Slotted Container (CSSC) outer packaging. Outer closure method tested with two (2) 15mm metal staples top flap seam and bottom flap seam. The use of other packaging methods or components may render this report invalid.

Packaging Performance Tests

<table>
<thead>
<tr>
<th>TEST</th>
<th>SPEC</th>
<th>TEST LEVEL</th>
<th>RESULT</th>
</tr>
</thead>
<tbody>
<tr>
<td>COBB TEST</td>
<td>UN Para 6.1.4.12.1</td>
<td>96.0 g/m²</td>
<td>Pass</td>
</tr>
<tr>
<td>DROP TEST</td>
<td>UN Para 6.1.5.3</td>
<td>1.2 meter</td>
<td>Pass</td>
</tr>
<tr>
<td>STACKING TEST</td>
<td>UN Para 6.1.5.6</td>
<td>43.0 kg</td>
<td>Pass</td>
</tr>
<tr>
<td>VIBRATION STANDARD</td>
<td>49CFR 178.608</td>
<td>1 hour</td>
<td>Pass</td>
</tr>
</tbody>
</table>

UN/DOT Package Marking

In accordance with the US Code of Federal Regulations Volume 49 Section 178.601, I certify that the samples of the Package, prepared as for transport, described herein and tested in the manner summarized above, successfully pass the tests according to the criteria specified in paragraphs 6.1.4.12.1, 6.1.5.3, and 6.1.5.6 as set forth in the UN Recommendations of the Committee of Experts on the Transportation of Dangerous Goods, Chapter 6, and US 49CFR Section 178.608, and that the packages may bear the marking:

4G / Y 4 / S / *  USA/+CA0940

* Year of Manufacture

By____________________________________________  Date: December 5, 2014
JAMES A. STEVENS
HORIZON PACKAGE TESTING SERVICE, INC. CERTIFICATION OFFICER

5002 E. 119th St.  Grandview, MO  64030        816-767-8400        816-767-8966
December 5, 2014
Page 2 of 15

Ms. Marie O. Mills
Jet Research Center, a Division of Halliburton
8432 South I-35W
Alvarado, TX 76009
817-761-2201

Gentlemen/Mesdames:

RE: Summary of Packaging Performance for UN/IACO/IMDG Transport of Dangerous Goods, Detonators, Packing Group II Certification: +CA0940
Project ID: #1995
ID: 4 x 4 x 9

Tests performed to certify compliance with the UN Recommendations of the Committee of Experts on the Transport of Dangerous Goods, Chapter 6, Twelfth Revised Edition and US 49CFR Section 178.608, as follows:

<table>
<thead>
<tr>
<th>TEST</th>
<th>SPEC</th>
<th>TEST LEVEL</th>
<th>RESULT</th>
</tr>
</thead>
<tbody>
<tr>
<td>COBB TEST</td>
<td>UN Para 6.1.4.12.1</td>
<td>96.0 g/m²</td>
<td>Pass</td>
</tr>
<tr>
<td>DROP TEST</td>
<td>UN Para 6.1.5.3</td>
<td>1.2 meter</td>
<td>Pass</td>
</tr>
<tr>
<td>STACKING TEST</td>
<td>UN Para 6.1.5.6</td>
<td>43.0 kg</td>
<td>Pass</td>
</tr>
<tr>
<td>VIBRATION STANDARD</td>
<td>49CFR 178.608</td>
<td>1 hour</td>
<td>Pass</td>
</tr>
</tbody>
</table>

The packages satisfy the requirements for a fiberboard box (4G) outer packaging tested to Packing Group II specifications for a Type Y certificate. The use of other packaging methods or components may render this report invalid.

NOTE: 49CFR 178.601 (e) For combination packaging, periodic retests must be conducted at least once every 24-months. Periodic retest is due by December 5, 2016

Respectfully submitted,
Horizon Package Testing Service, Inc.

James A. Stevens
Certification Officer
JS

Encl.
Packages Tested
One (1) steel cylinder product stimulant inner packaging completely wrapped in absorbent kim-pack wadding. Inner packagings are placed into a double wall Kraft/Kraft Center Special Slotted Container (CSSC) outer packaging. Outer closure method tested with two (2) 15mm metal staples top flap seam and bottom flap seam.

<table>
<thead>
<tr>
<th>TEST</th>
<th>SPEC</th>
<th>Test Weight</th>
<th>Sample Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>DROP TEST</td>
<td>UN Para 6.1.5.3</td>
<td>4.0 kg</td>
<td>1,2,3,4 and 5</td>
</tr>
<tr>
<td>STACKING TEST</td>
<td>UN Para 6.1.5.6</td>
<td>4.0 kg</td>
<td>6,7,and 8</td>
</tr>
<tr>
<td>VIBRATION STANDARD</td>
<td>49CFR 178.608</td>
<td>4.0 kg</td>
<td>9, 10, and 11</td>
</tr>
</tbody>
</table>

4G Combination Package

View of Shipper and Inner Packagings
4 x 4 x 9 Packing Overview

**Photo 1:** Assemble the #995.44009 CSSC by installing two (2) 15mm metal staples 19mm (0.75 inch) from both side panels along the **bottom** flap seam.

**Photo 2:** Insert one (1) #101215415 kim-pack cellulose wadding pad in the bottom of the CSSC box.

**Photo 3:** Insert one (1) #100005437 steel cylinder completely wrapped in kim-pack cellulose wadding into the CSSC box.

**Photo 4:** Complete assembly by installing two (2) 15mm metal staples 19mm (0.75 inch) from both side panels along the **top** flap seam.
1. **Identify Faces** according to the diagram below:

![Diagram of a cube with labeled faces and edges]

2. **Identify Edges** using the numbers of the two faces forming that edge.
   
   **Example:** Edge 1-2 is the edge formed by face 1 and face 2 of the package.

3. **Identify Corners** using the numbers of the three faces that meet to form that corner.
   
   **Example:** corner 2-3-5 is the corner formed by face 2, face 3 and face 5 of the package.

**FACES TESTED**

- **Drop:**
  - #1 3
  - #2 1
  - #3 6
  - #4
  - #5 1-2-5

- **Stack:**
  - #6 1&3
  - #7 1&3
  - #8 1&3

- **Vibration:**
  - #9 3
  - #10 3
  - #11 3
Cobb Test


Methods: The absorption of water over a 30-minute period must not be greater than 155 g/m². Average the results from five (5) test specimens. Weigh each specimen before testing and place under the test apparatus consisting of a metal ring (cross-sectional area of 25 square cm) clamped to a flat base plate. Pour 25 ml of water into the ring and let stand for the 30-minute period. Pour the water from the ring 15 seconds before the expiration of the test period, blot the surface with blotting paper and roller, and immediately weigh. The difference between the original and final weight, multiplied by 400, is the weight of water absorbed, in grams per square meter. Samples were conditioned at +23°C and 50% RH for 24 hours prior to testing.

Results: Pass (*top photo, **bottom photo)

<table>
<thead>
<tr>
<th>Sample</th>
<th>Original Weight, gr</th>
<th>Final Weight, gr</th>
<th>Difference, g/m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>*9.21</td>
<td>**9.44</td>
<td>92</td>
</tr>
<tr>
<td>2</td>
<td>9.39</td>
<td>9.63</td>
<td>96</td>
</tr>
<tr>
<td>3</td>
<td>9.34</td>
<td>9.59</td>
<td>100</td>
</tr>
<tr>
<td>4</td>
<td>9.19</td>
<td>9.40</td>
<td>84</td>
</tr>
<tr>
<td>5</td>
<td>8.86</td>
<td>9.13</td>
<td>108</td>
</tr>
</tbody>
</table>

* Five (5) samples reveal an average Cobb of 96.0 g/m²
Drop Test

**Guidelines:** Code of Federal Regulations 49, Section 178.603; UN Para 6.1.5.3; ASTM D4919 (7.1)

**Methods:** Five samples, one for each drop, are required for testing. First drop: Flat on bottom (using 1st sample). Second drop: Flat on top (using 2nd sample). Third drop: Flat on the long side (using 3rd sample). Fourth drop: Flat on short side (using 4th sample). Fifth drop: On a corner (using 5th sample). Testing of 4G combination packagings with other than plastic inner receptacles containing solids is performed when the packagings have been filled to 95% of capacity and the completed packagings have been conditioned at +23°C and 50% RH for 24 hours prior to testing.

**Criteria for passing the test:** For combination packagings, there is no damage to the outer packaging likely to adversely affect safety during transport, and there is no leakage of the filling substance from the inner packaging. The package/product is dropped from 1.2 meter.

**Results:**

<table>
<thead>
<tr>
<th>TEST with Photo</th>
<th>RESULT</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Sample #1 is impacted flat on the #3 face.</td>
<td>No breakage/leakage</td>
</tr>
<tr>
<td>• Sample #2 is impacted flat on the #1 face.</td>
<td>No breakage/leakage</td>
</tr>
<tr>
<td>• Sample #3 is impacted flat on the #6 face.</td>
<td>No breakage/leakage</td>
</tr>
<tr>
<td>• Sample #4 is impacted flat on the #4 face.</td>
<td>No breakage/leakage</td>
</tr>
<tr>
<td>• Sample #5 is impacted diagonally on the #1-2-5 corner. (top mfr’s joint corner sustained minor deformation)</td>
<td>No breakage/leakage</td>
</tr>
</tbody>
</table>

Samples #1 thru #4 sustained no damage, see Sample #5 for result. In all cases, there is no damage liable to affect safety during transport and there is no leakage of the filling substance from the inner packagings.
Stacking Test

**Guidelines**: Code of Federal Regulations 49, Section 178.606, UN 6.1.5.6; ASTM 4919 (10.1)

**Methods**: Three test containers are subjected to a force applied to the top surface equal to the total weight of identical packages stacked on it in transit. The minimum height of the stack is 3-meters. Three (3) filled containers are closed as for shipment and subjected to a free standing compression load of 43.0 kg, equivalent to a 3-meter high stack of identical packages, continuously for 24 hours. The completed packagings have been conditioned to +23°C and 50% RH for 24 hours prior to testing.

Free Standing  X  
Guided Load  

**Criteria for passing the test**: No test sample may leak. No sample may show any deterioration, which would adversely affect transportation safety or any distortion likely to reduce its strength or cause instability in stacks of packages. The following details the compressive load applied in the stacking test:

\[
\text{Stacking height} = SH = (3 \text{ meter} = 3000 \text{ mm}) \\
\text{Height of Package} = PH (\text{mm}) \\
\text{Number of Packages} = n \\
\text{Maximum gross weight of the package} = \text{MGW} (\text{kg}) \\

\text{Stacking Load} = \left( \frac{SH}{PH} \right) - 1 \times \text{MGW} \\

\left( \frac{3000 \text{ mm}}{255 \text{ mm}} \right) = 11.76 - 1 \times 4.0 \text{ kg} = 43.0 \text{ kg (97.7 lbs)}
\]

**TEST**: Samples #6 - #8 are subjected to an actual top load of 45.3 kg

**RESULTS**: No damage/leakage, each sample was subjected to the stack load individually and sustained no damage. Each sample, after completion has shown 5mm ±2 compression after 24 hours.

NOTE: Stacking stability was not assessed since a guided load test was not performed

Stack Test(sample photo #8)

![Stack Test](sample photo #8)

Actual top load of 45.3 kg (100.0 lbs)
**Vibration Standard**

**Guidelines:** Code of Federal Regulations 49, Section 178.608.  ASTM D4919 (11.1)

**Methods:** Three packages are filled and closed as for shipment. Testing is performed for 1 hour at a frequency that causes the package to be raised from the vibrating platform 1.6 mm. The packages are left free to move vertically, bounce and rotate in their normal shipping orientation. The completed packagings have been conditioned to +23°C and 50% RH for 24 hours prior to testing.

Rotary Vibration Table  X  
Vertical Linier Vibration Table  

Immediately following the test, each package must be removed from the platform, turned on its side and observed for any evidence of leakage.

**Criteria for Passing the Test:** A packaging passes the Vibration Standard if there is no rupture or leakage from any of the packages. No test sample should show any deterioration, which could adversely affect transportation safety, or any distortion liable to reduce packaging strength.

**TEST:** Samples #9 - #11 are vibrated for 1 hour at 200 CPM (cycles per minute)

**RESULTS:** No damage/leakage, each sample was opened and inspected after completion, inner packagings were intact, outer packaging did show minor scuffing on the bottom panel, inner packagings sustained no damage, outer packaging closure was intact.
Conclusions

The packages were tested according to Paragraphs 6.1.5.3, 6.1.5.6 and 6.1.4.12.1 of the Recommendations of the United Nations Committee of Experts on the Transport of Dangerous Goods, Chapter 6, 12th Revision and 49CFR Section 178.608 for Group II products.

The package met the test requirements and it is recommended that a UN certificate be issued with the mark Y, to wit:

\[
\begin{array}{c}
\text{UN} \\
4G / Y 4 / S / * \\
USA/+CA0940
\end{array}
\]

where: 4G is the packaging type code
Y is the packing group
4 is the gross mass in kg
S is for combination packaging
* year of manufacture
USA is the country of testing
+CA0940 is test number of certifying agency

The use of other packaging methods or components may render this report invalid.

Equipment List:

Conditioning Chamber#1
DeLonghi PAC N100EL Air Conditioner
Zenith Dehumidifier 850A
Omega HH314A Temperature/RH Meter
Omega Digital Thermometer HH66U
Scout Pro Scale
CAS SW 20 lb Capacity Bench Top Scale
CAS PB 300 lb Capacity Shipping Scale
Fowler 54-100-444 Digital Caliper
Toolsmith #800316 5M Tape Measure
Container Stapler #58 Pneumatic Stapler
Wall-Board 48” ‘T’ Square
Johnson Metric Ruler M391/40-0560
Gurly Cobb Seizer
Lansmont Drop Tower PDT56ED
Free Weights
Gaynes Transport Simulator

NOTE: calibration data on file
APPENDIX A

**Inner Packaging**

One (1) steel cylinder product stimulant inner packaging completely wrapped in absorbent kim-pack wadding.

**Product Information:** Packing Group II Solid

**INNER PACKAGING:**

<table>
<thead>
<tr>
<th><strong>Steel Cylinder</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Supplier</strong></td>
<td>Jet Research Center, a Division of Halliburton (817-761-2201)</td>
</tr>
<tr>
<td></td>
<td>8432 South I-35W</td>
</tr>
<tr>
<td></td>
<td>Alvarado, TX 7609</td>
</tr>
<tr>
<td><strong>Item</strong></td>
<td>100005437</td>
</tr>
<tr>
<td><strong>Specification</strong></td>
<td>Halo Cylindrical Steel</td>
</tr>
<tr>
<td><strong>Tare Weight</strong></td>
<td>3.9 kg (8.59 lbs)</td>
</tr>
<tr>
<td><strong>Size (mm, OD)</strong></td>
<td>85.0 X 219 (D x L)</td>
</tr>
<tr>
<td><strong>Size (in, OD)</strong></td>
<td>3.34 X 8.62 (D x L)</td>
</tr>
<tr>
<td><strong>Material</strong></td>
<td>Steel</td>
</tr>
<tr>
<td><strong>Material Caliper</strong></td>
<td>9.78mm (0.385 inch)</td>
</tr>
<tr>
<td><strong>Count</strong></td>
<td>One (1) per CSSC shipper</td>
</tr>
</tbody>
</table>

a) **Kim-Pack Wadding**

<table>
<thead>
<tr>
<th><strong>Manufacturer</strong></th>
<th>Sealed Air (800-648-9093)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Item</strong></td>
<td>101215415</td>
</tr>
<tr>
<td><strong>Tare Weight</strong></td>
<td>60 grams</td>
</tr>
<tr>
<td><strong>Material</strong></td>
<td>Constructed of multiple layers of tissue</td>
</tr>
</tbody>
</table>
APPENDIX B

Outer Packaging

Inner packagings are placed into a double wall Kraft/Kraft Center Special Slotted Container (CSSC) outer packaging. Outer closure method tested with two (2) 15mm metal staples top flap seam and bottom flap seam.

OUTER PACKAGING:

- UN code: 4G
- Manufacturer: All Star Corrugated (817-551-5580)  
  1425 Forum Way S  
  Fort Worth, TX 76140
- Drawing No: 995.44009
- Tare Weight: 145 grams
- Style: Center Special Slotted Container (CSSC)
- Size (mm, OD): 112 X 112 X 255 (L x W x H)
- Size (in, ID): 3+7/8 X 3+7/8 X 9.0 (L x W x H)
- Board Grade: BMC: 275# Burst Strength
  
  Tests to: 110 (41/24/27/26/42) lb./1000 ft²
- Combined Weight of Facings
- Corrugations: Vertical "B-C" flute
- Facings: Kraft/Kraft
- Material Caliper: 6.12mm (0.241 inch)
- Flaps: Minor = meets, top and bottom panel
  Major = meets, top and bottom panel
- Mfr’s Joint: Stapled outside corner, 38mm tab (1+1/2 inch)
- Printing: None as tested
- Closure: Metal Staples
- Supplier: Uline (800-958-5463)  
  8900 N. 55th Street  
  Milwaukee, WI 53223
- Part No: 5/8-inch A58 Stick Staples, 5/8-inch RR1-58 Roll Staples
- Application: Two (2) 15mm metal staples installed 19mm (0.75 inch) from both side panels along the top flap seam and bottom flap seam.
- Method: Staples were applied by customer
Packaging Instructions

<table>
<thead>
<tr>
<th>Material #</th>
<th>Drawing #</th>
<th>Description</th>
<th>Qty per Box</th>
</tr>
</thead>
<tbody>
<tr>
<td>+AQ1810</td>
<td>995.44009</td>
<td>UN CERTIFIED BOX 4X4X9 INCHES</td>
<td>1 - 1</td>
</tr>
<tr>
<td>101215415</td>
<td>D00007976</td>
<td>KIM PACK, CELLULOSE WADDING</td>
<td>AS NEEDED TO INSURE NO MOVEMENT</td>
</tr>
</tbody>
</table>

PACKAGE WEIGHTS:

GROSS WTS. 8.8 LB 4 KG

Combination packaging, comprising of one (1) 3.9 kg steel cylinder solid product simulant, inner packaging, inserted into a fibreboard box. Cylinder is completely covered with absorbant kim pack wadding. Two staples are used to close both sides of the flaps.
Uline stocks a complete inventory of carton staples.

- Compatible with International Staple, Duofast, Salco, Beck and BEA.
- **FREE OFFER** - Order $200 worth of staples and receive a FREE H-289 Staple Remover.

### 5/6" A58 Stick Staples

<table>
<thead>
<tr>
<th>MODEL NO.</th>
<th>SIMILAR TO</th>
<th>CROWN WIDTH</th>
<th>LEG LENGTH</th>
<th>QTY./UNIT</th>
<th>QTY./CTN.</th>
<th>LBS./CTN.</th>
<th>PRICE/CARTON</th>
<th>ADD TO CART</th>
</tr>
</thead>
<tbody>
<tr>
<td>S-1397</td>
<td>A58</td>
<td>5/6&quot;</td>
<td>5/8&quot;</td>
<td>62 lbs</td>
<td>25,000</td>
<td>52</td>
<td>$67</td>
<td>$82</td>
</tr>
</tbody>
</table>

### 5/6" RR1-58 Roll Staples

Uline stocks a complete inventory of carton staples.

- Compatible with International Staple, Duofast, Salco, Beck and BEA.
- This staple is similar to RR1-58 (roll)
- **FREE OFFER** - Order $200 worth of staples and receive a FREE H-289 Staple Remover.

<table>
<thead>
<tr>
<th>MODEL NO.</th>
<th>SIMILAR TO</th>
<th>CROWN WIDTH</th>
<th>LEG LENGTH</th>
<th>QTY./UNIT</th>
<th>QTY./CTN.</th>
<th>LBS./CTN.</th>
<th>PRICE/CARTON</th>
<th>ADD TO CART</th>
</tr>
</thead>
<tbody>
<tr>
<td>S-580</td>
<td>RR1-58</td>
<td>1 1/4&quot;</td>
<td>5/8&quot;</td>
<td>1,000</td>
<td>24,000</td>
<td>40</td>
<td>$98</td>
<td>$90</td>
</tr>
</tbody>
</table>