

**Committee of Experts on the Transport of Dangerous Goods
and on the Globally Harmonized System of Classification
and Labelling of Chemicals**

13 November 2018

**Sub-Committee of Experts on the
Transport of Dangerous Goods**

Fifty-fourth session

Geneva, 26 November-5 December 2018

Item 2 (b) of the provisional agenda

**Recommendations made by the Sub-Committee on
its fifty-first, fifty-second and fifty-third sessions
and pending issues: explosives and related matters**

**Sub-Committee of Experts on the Globally Harmonized
System of Classification and Labelling of Chemicals**

Thirty-sixth session

Geneva, 5-7 December 2018

Item 3 (b) of the provisional agenda

**Classification criteria and related hazard
communication:
review of Chapter 2.1**

**Examples of application of proposed technical explosives classification
and detailed criteria flowchart for sub-category 2 of explosives in the
GHS Chapter 2.1**

**Transmitted by the United States of America, the Institute of Makers of
Explosives (IME) and the Sporting Arms and Ammunition
Manufacturer's Institute (SAAMI)**

Background

1. During the joint session of the Sub-Committees TDG and GHS on 3 July 2018 there was an explicit wish from the GHS that examples be provided to illustrate what the amended system would mean in practice, in particular regarding which kinds of explosives would end up in the various sub-categories within Category 2¹.
2. The intent of such examples would be to demonstrate how the proposed amended classification system for explosives in the GHS² and the associated Category 2 Sub-category criteria³ would be applied to various explosives commonly found on the market.
3. The USA provides examples to support the collaborative efforts of the ICG under the leadership of the expert from Sweden, as evidenced by the body of work prepared for the fifty-fourth and thirty-sixth sessions of the Sub-Committees of Experts on the Transport of Dangerous Goods and Globally Harmonized System of Classification and Labelling of Chemicals, respectively.

Summary

4. This paper provides numerous examples in the Annex of how the proposed amended classification system for explosives in the GHS² and the associated Category 2 Sub-category criteria³ would be applied to various explosives commonly found on the market. It is anticipated that these examples and the associated pattern will facilitate the necessary extrapolation to the wide variety of products that are currently offered, or may be offered in the future, by the explosives industry.

¹ See the report from the Sub-Committee GHS (ST/SG/AC.10/C.4/70), paragraphs 24-27

² ST/SG/AC.10/C.3/2018/85 - ST/SG/AC.10/C.4/2018/20

³ Informal documents INF.10 (36th session, GHS) - INF.13 (54th session, TDG).

Annex

Examples of Application of Proposed Technical Explosives Classification and Detailed Criteria Flowchart for Sub- category 2 of Explosives in the GHS Chapter 2.1

(Following Pages)

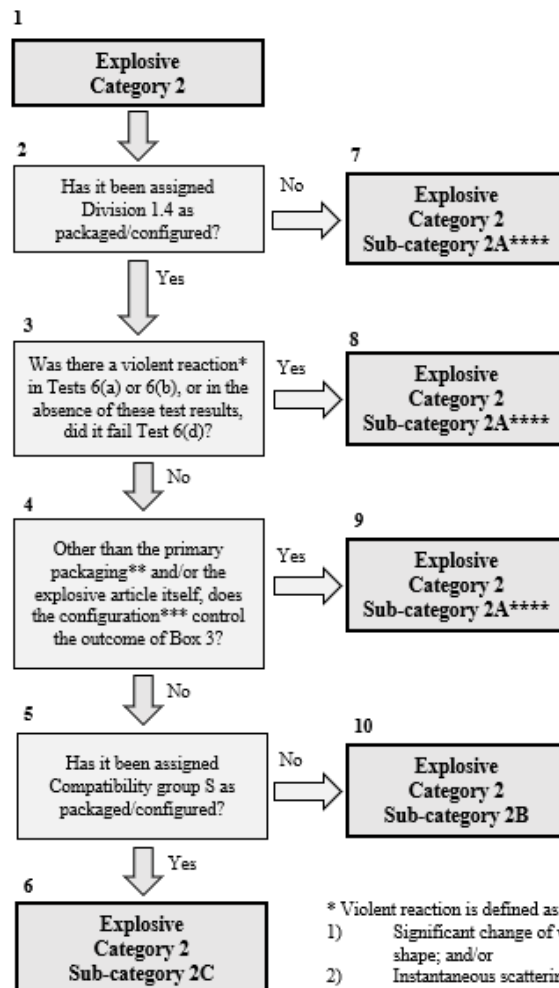
DRAFT

GHS 2.1 Revision

**Examples of the Applying
Category 2 Sub-category Criteria
to Various Explosives**

ANNEX 1

Flow Chart for Category 2 Sub-categories



* Violent reaction is defined as:

- 1) Significant change of witness plate shape; and/or
- 2) Instantaneous scattering of most of the confining material.

** The "primary packaging" is the minimum level of packaging that a) is responsible for preventing a violent reaction, and b) is required to be retained until use of the explosive.

*** Configuration means the complete package and explosive as tested according to the UNMTC, including special orientation for cancellation of explosive effects.

**** The classifier may assign as High Hazard (2A) based on other data or considerations.

UN Manual Definitions

Transport Hazard Division (HD)	Definition
HD 1.1	Substances and articles which have a mass explosion hazard
HD 1.2	Substances and articles which have a projection hazard but not a mass explosion hazard
HD 1.3	Substances and articles which have a fire hazard and either a minor blast hazard or a minor projection hazard or both, but not a mass explosion hazard
HD 1.4	Substances and articles which present no significant hazard
HD 1.4S	Substances and articles...so packaged or designed that any hazardous effects arising from accidental functioning are confined within the package unless the package has been degraded by fire, in which case all blast or projection effects are limited to the extent that they do not significantly hinder fire-fighting or other emergency response efforts in the immediate vicinity of the package
HD 1.5	Very insensitive substances which have a mass explosion hazard
HD 1.6	Extremely insensitive articles which do not have a mass explosion hazard

UN Manual Definitions



HD 1.1: mass explosion



HD 1.2: projection hazard



HD 1.3: fire hazard



HD 1.4: no significant hazard
(medium hazard, not high hazard)

UN Series 6 Tests

Test 6(a) Single Package Test



Redacted Sign

Test 6(b) Stack Test

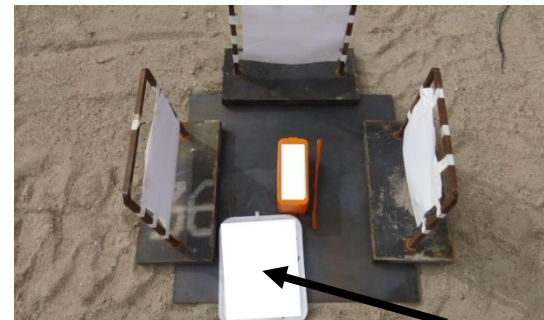


Redacted Sign

Test 6(c) External Fire Test



Test 6(d) Unconfined Package Test



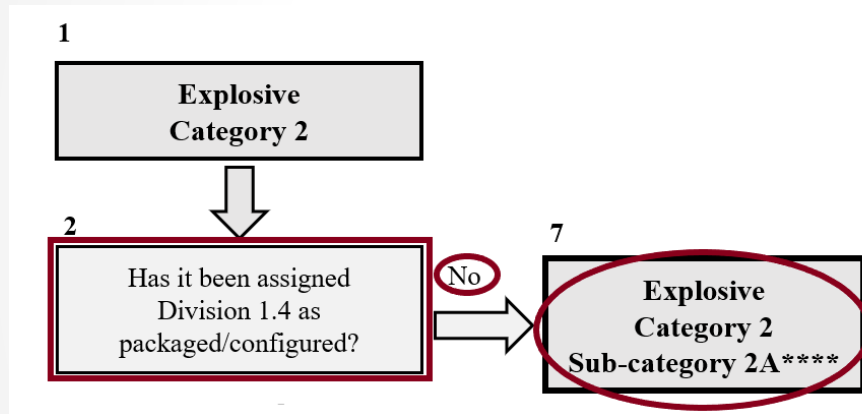
Redacted Sign and Image

For additional information such as pictures, videos, test specifications, etc. refer to

www.etusersgroup.org/test-methods-matrix

3-Inch Chained Salutes

Transport Division: 1.1G



3-Inch Chained Salutes

Transport Division: 1.1G

UN Test Results

6(a) Test Results:

- Complete disruption of confining material
- Small crater formed
- No hole in witness plate but damaged
- Mass reaction



6(a) Test setup



6(a) Test Result: Initial Reaction Stage



6(a) Test Result (Cont.)

Note: Instantaneous scattering of most of the confining material.

3-Inch Chained Salutes

Transport Division: 1.1G

PATH TO DETERMINING GHS CATEGORY 2 SUB-CATEGORY:

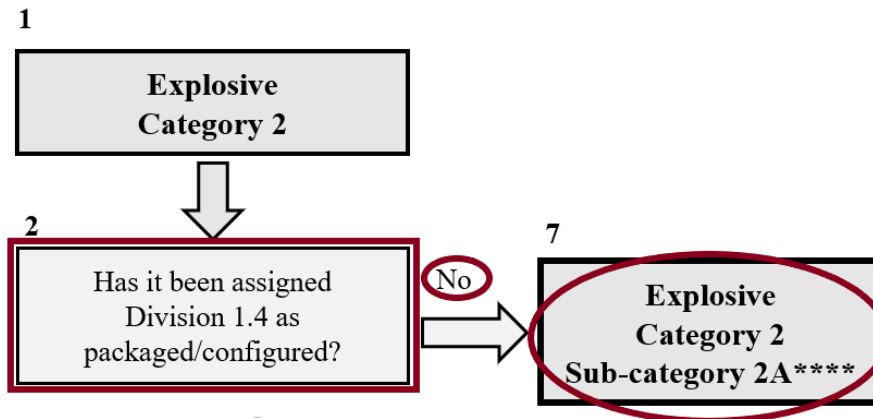
Assigned:

Transport Classification: **1.1G**

UN #: **UN0333**

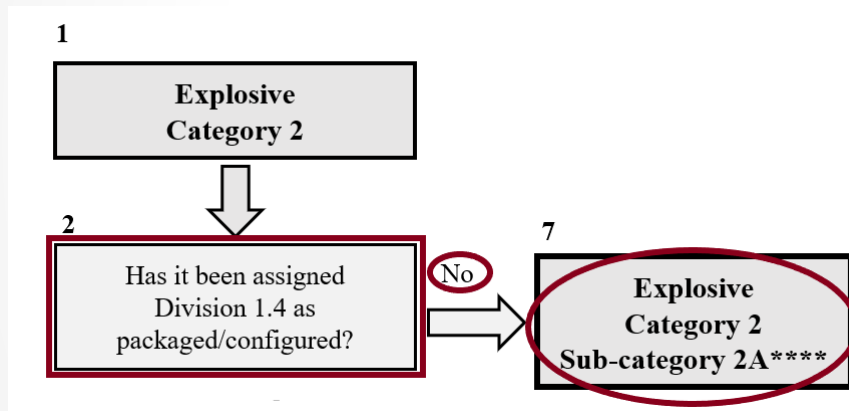
6(a) Test: Mass Reaction

Assigned GHS Sub-category: **2A**



M6 Propellant

Transport Division: 1.3C



M6 Propellant

Transport Division: 1.3C

UN Test Results

6(a) Test Results:

- No mass reaction (not 1.1)
- No damage to the witness plates
- No instantaneous scattering of confining material



6(a) Pre-Test



6(a) Test



6(a) Post-Test

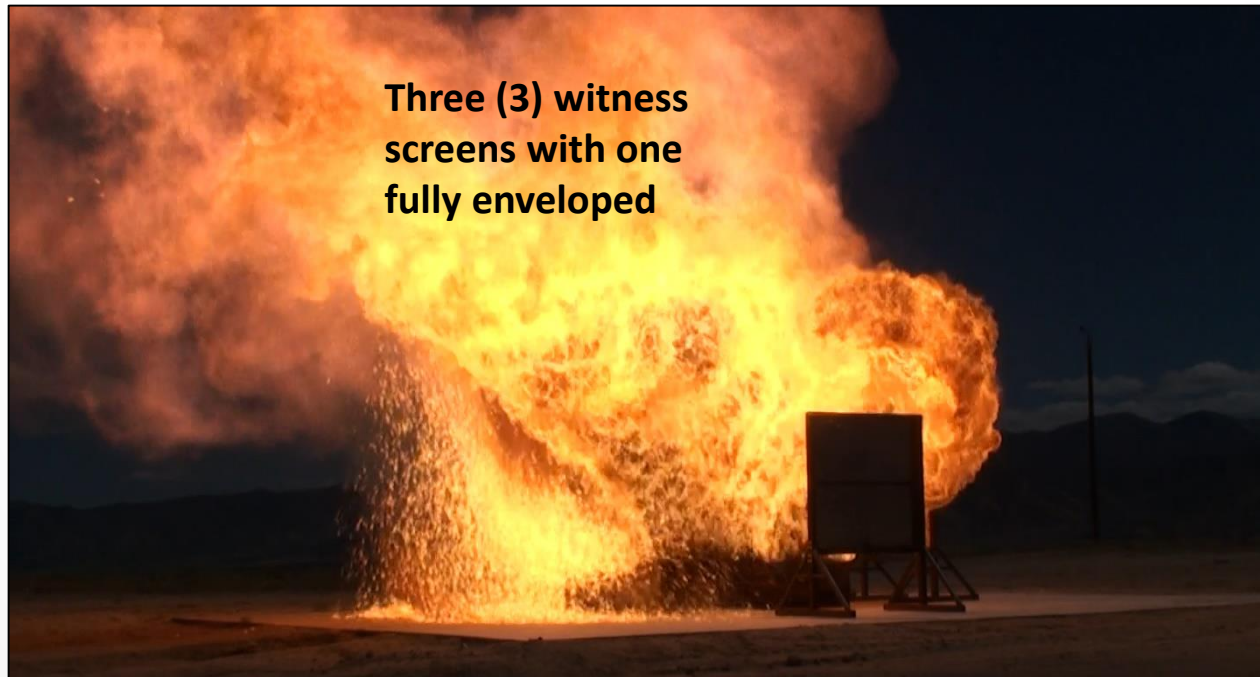
M6 Propellant

Transport Division: 1.3C

UN Test Results

6(c) Test Results evidenced 1.3 reaction:

- Large fireball extended beyond the witness screen
- Burn time was less than 24 seconds for 365 kg of material



6(c) Test

M6 Propellant

Transport Division: 1.3C

PATH TO DETERMINING GHS CATEGORY 2 SUB-CATEGORY:

Assigned:

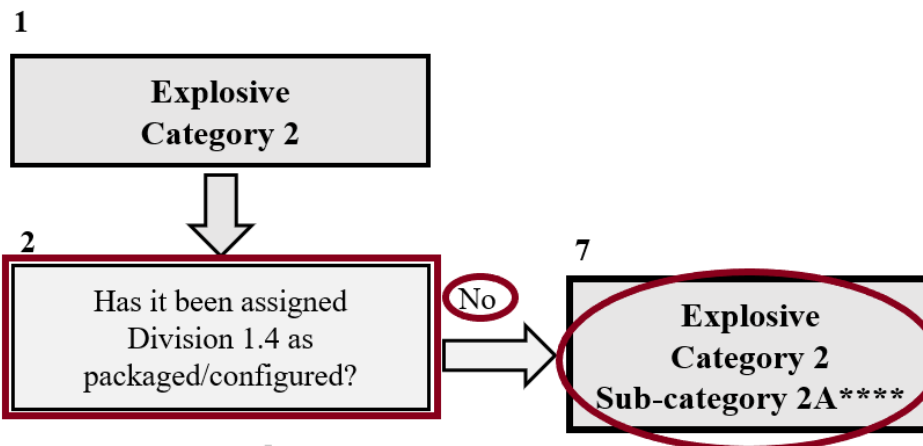
Transport Classification: **1.3C**

UN #: **UN0161**

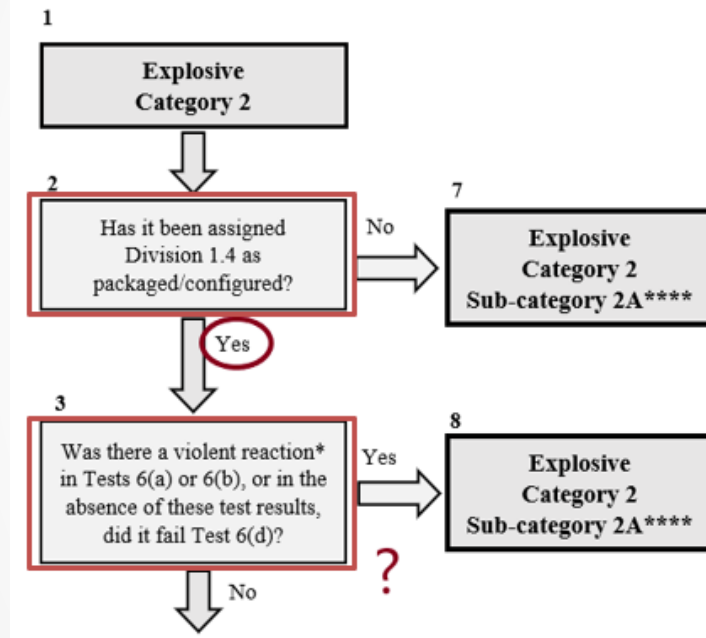
6(a) Test: No Mass Reaction

6(c) Test: Mass Fire

Assigned GHS Sub-category: **2A**



Gas Generant Transport Division: 1.4C



Gas Generant

UN 6(a) Test Results

6(a) Test Criteria	Results
Mass Explosion as evidenced by:	<ul style="list-style-type: none"> No mass explosion
<ul style="list-style-type: none"> Crater at test site; 	<ul style="list-style-type: none"> No crater
<ul style="list-style-type: none"> Damage to the witness plate beneath the package; 	<ul style="list-style-type: none"> No significant change of witness plate shape
<ul style="list-style-type: none"> Measurement of a blast; and 	<ul style="list-style-type: none"> No measurement of blast
<ul style="list-style-type: none"> Disruption and scattering of the confining material 	<ul style="list-style-type: none"> No instantaneous scattering of most of the confining material <ul style="list-style-type: none"> Volcano effect

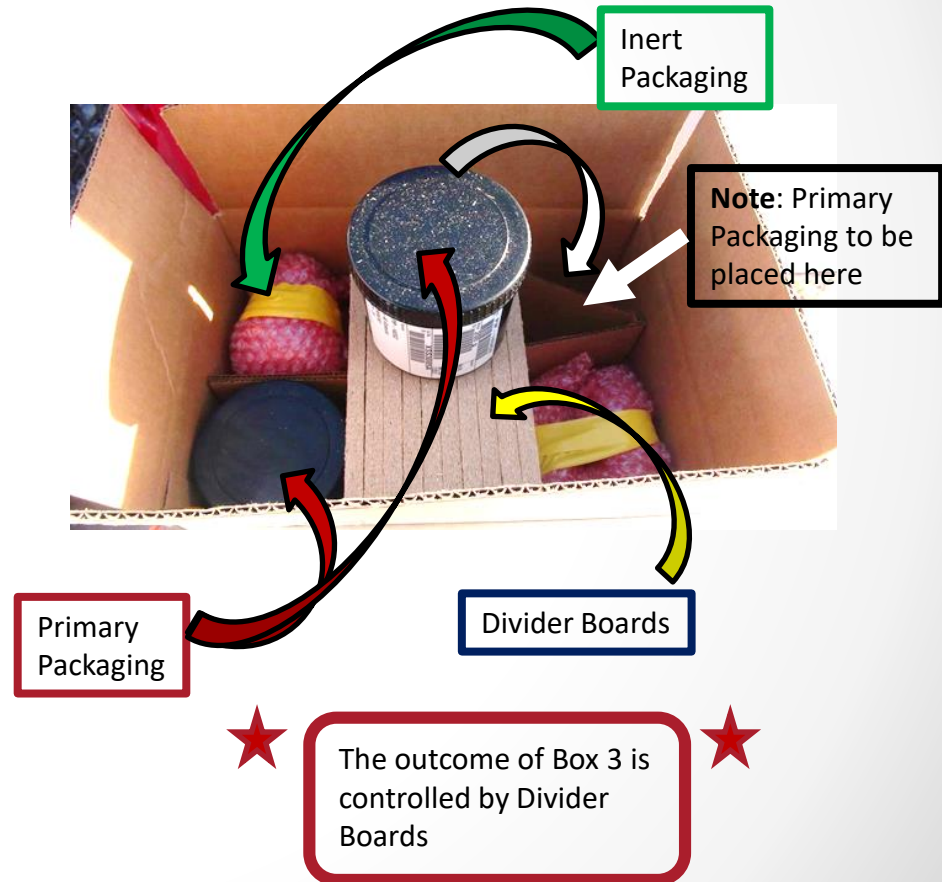
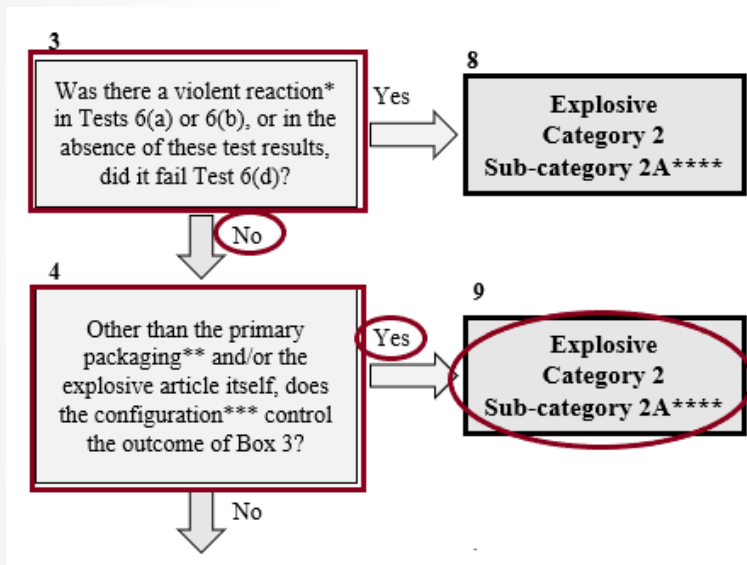


6(a) Test Setup



6(a) Post-Test

Gas Generant



Gas Generant

PATH TO DETERMINING GHS CATEGORY 2 SUB-CATEGORY:

Assigned:

Transport Classification: **1.4C**

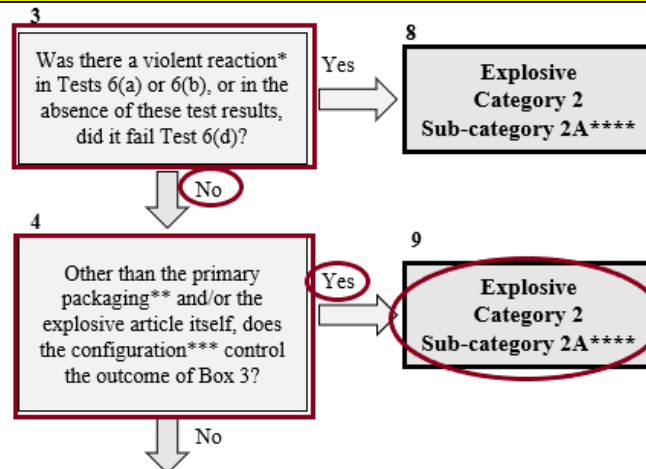
UN #: **UN0501**

Meets 1.4 Criteria

Does Not Meet 1.4S Criteria

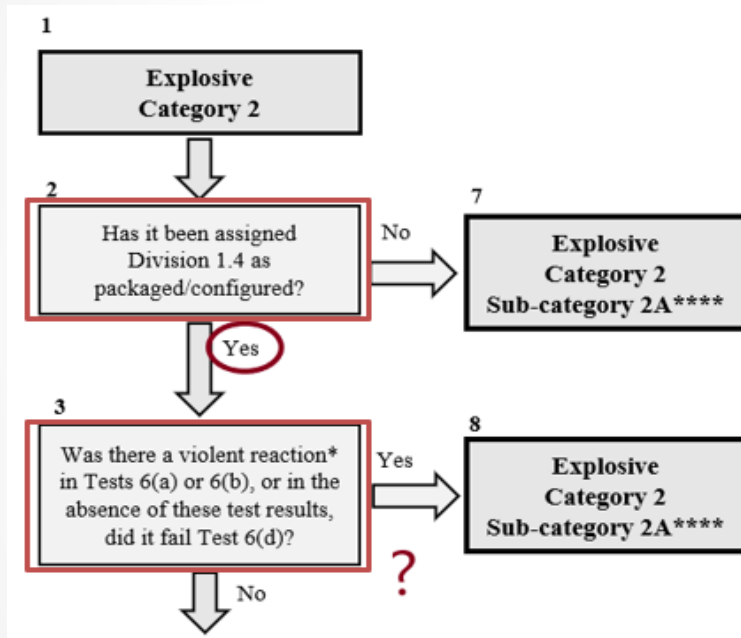
★ Classification relies on Divider Boards ★

Assigned GHS Sub-category: **2A**



Example 4

Large Cup Cartridges Transport Division: 1.4S

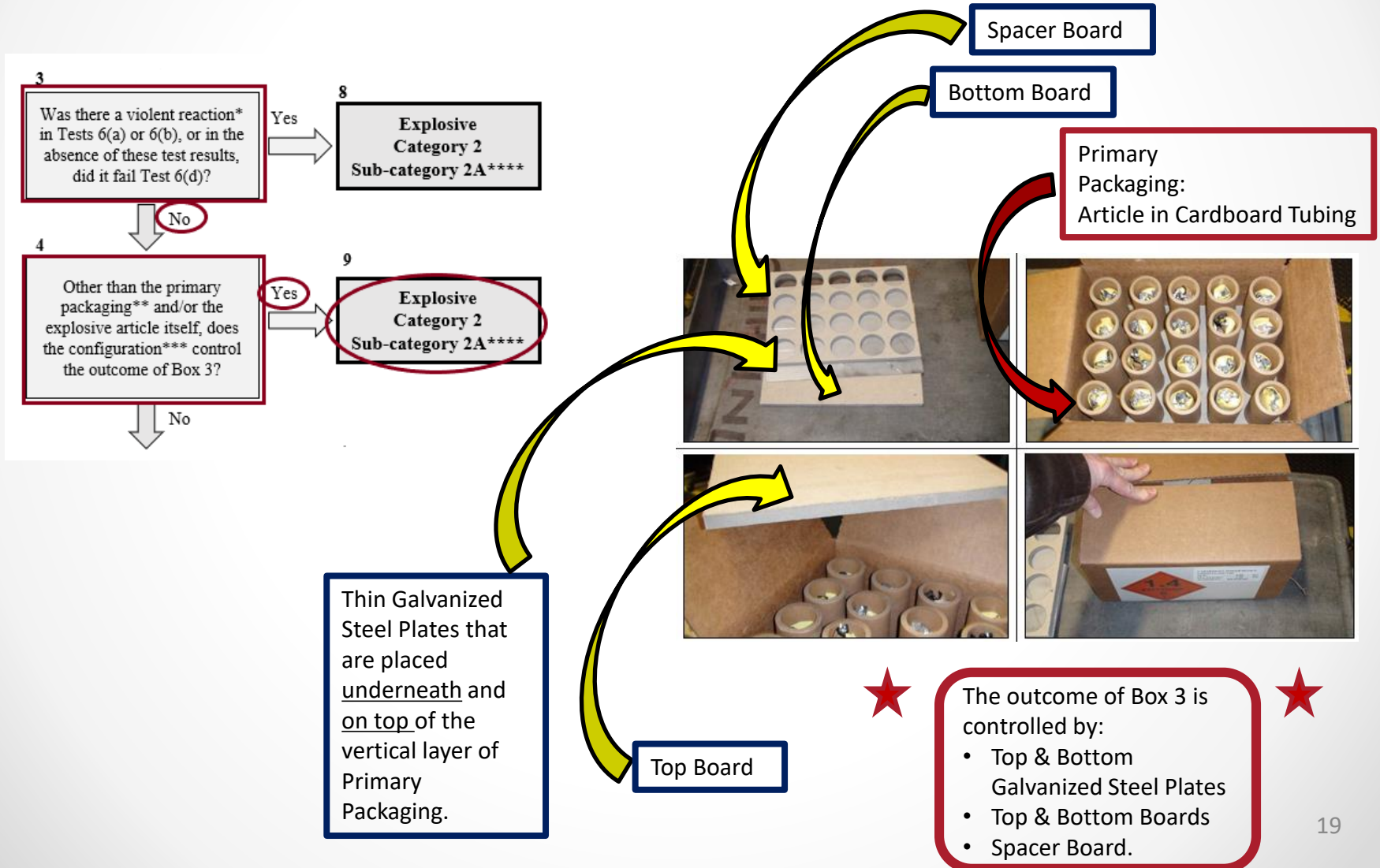


Large Cup Cartridges

UN 6(d) Test Results

6(d) Test Criteria	Results
Hazardous effect outside the package as evidenced by:	Hazardous effect outside package
<ul style="list-style-type: none"> Denting or perforation of the witness plate beneath the package; 	<ul style="list-style-type: none"> No denting or perforation of the witness plate
<ul style="list-style-type: none"> A flash or flame that ignites an adjacent material such as a sheet of 80 ± 10 g/m² paper at a distance of 25 cm from the package; 	<ul style="list-style-type: none"> No flash or flame ignited the adjacent material (paper)
<ul style="list-style-type: none"> Disruption of the package causing projection of the explosives contents; or 	<ul style="list-style-type: none"> No mass propagation
<ul style="list-style-type: none"> A projection which passes completely through the packaging (a projection or fragment retained or stuck in the wall of the packaging is considered as non hazardous) 	<ul style="list-style-type: none"> No projectiles passing through the package

Large Cup Cartridges



Large Cup Cartridges

PATH TO DETERMINING GHS CATEGORY

2 SUB-CATEGORY:

Assigned:

Transport Classification: **1.4S**

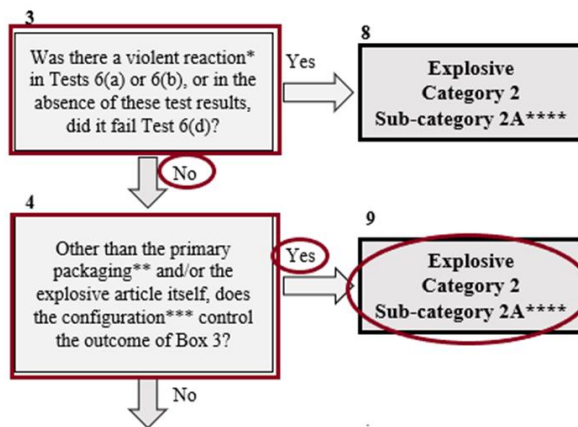
UN #: **UN0323**

Meets 1.4 Criteria

Meets 1.4S Criteria

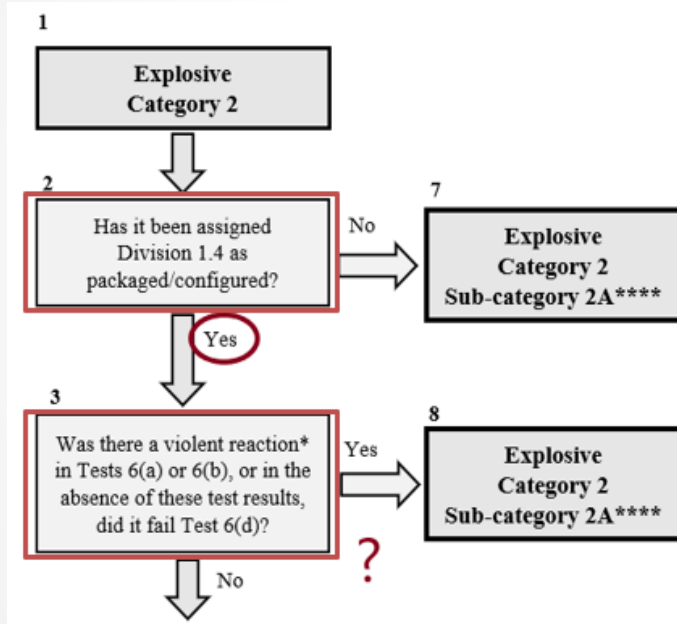
★ Classification relies on 1) Spacer Board, 2) Top & Bottom Metal plates, and 3) Top & Bottom Boards ★

Assigned GHS Sub-category: **2A**



Detonator

Transport Division: 1.4B



Redacted Image



Detonator

UN 6(a) Test Results

6(a) Test Criteria	Results
Mass Explosion as evidenced by:	<ul style="list-style-type: none"> No mass explosion
<ul style="list-style-type: none"> Crater at test site; 	<ul style="list-style-type: none"> No crater
<ul style="list-style-type: none"> Damage to the witness plate beneath the package; 	<ul style="list-style-type: none"> No significant change of witness plate shape
<ul style="list-style-type: none"> Measurement of a blast; and 	<ul style="list-style-type: none"> No measurement of blast
<ul style="list-style-type: none"> Disruption and scattering of the confining material 	<ul style="list-style-type: none"> No instantaneous scattering of most of the confining material <ul style="list-style-type: none"> Volcano effect

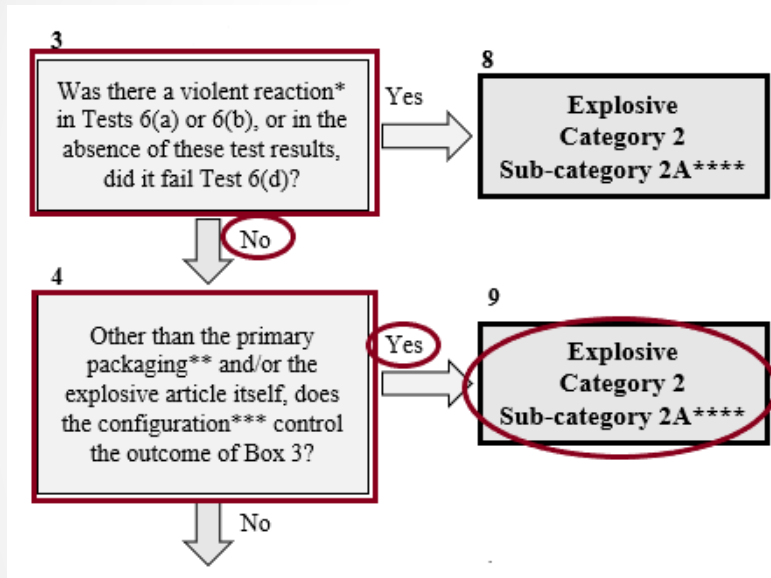
Redacted Image



6(a) Post-Test

Example 5

Detonator



Redacted Image



Primary Packaging

Divider Boards

★ The outcome of Box 3 is controlled by Divider Boards ★

Detonator

PATH TO DETERMINING GHS CATEGORY 2 SUB-CATEGORY:

Assigned:

Transport Classification: **1.4B**

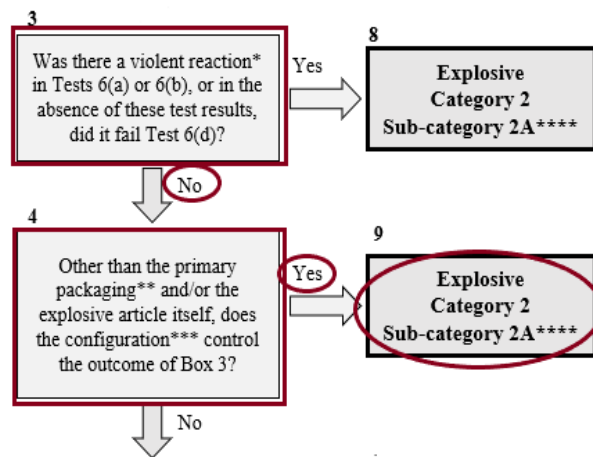
UN #: **UN0361**

Meets 1.4 Criteria

Does Not Meet 1.4S Criteria

★ Classification relies on Divider Boards ★

Assigned GHS Sub-category: **2A**

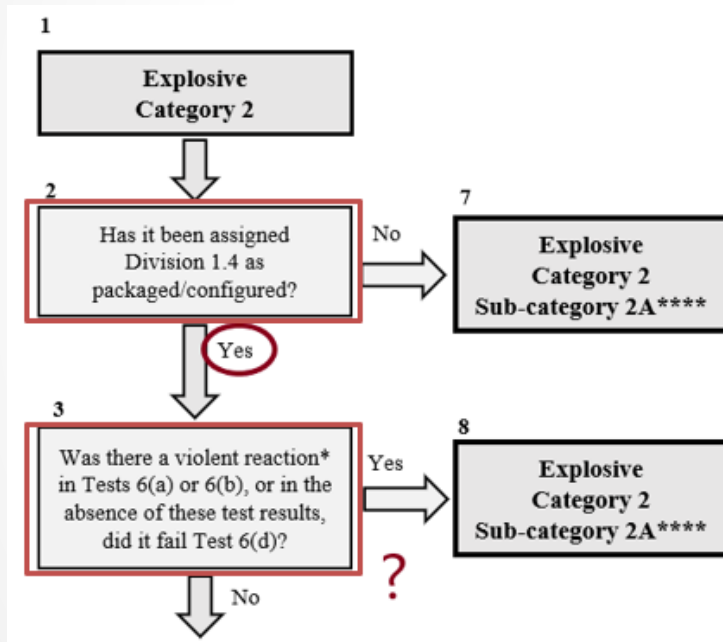


Example 6

Noise Maker Cartridge (2-Stage)

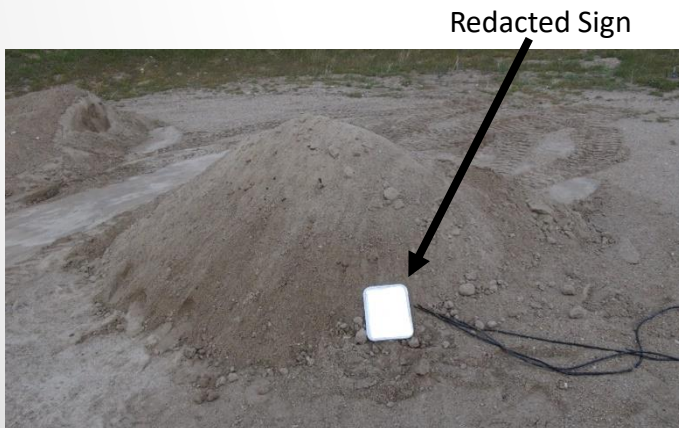
Transport Division: 1.4G

Redacted Image



Noise Maker Cartridge (2-Stage) UN 6(a) Test Results

6(a) Test Criteria	Results
Mass Explosion as evidenced by:	<ul style="list-style-type: none"> No mass explosion
<ul style="list-style-type: none"> Crater at test site; 	<ul style="list-style-type: none"> No crater
<ul style="list-style-type: none"> Damage to the witness plate beneath the package; 	<ul style="list-style-type: none"> No significant change of witness plate shape
<ul style="list-style-type: none"> Measurement of a blast; and 	<ul style="list-style-type: none"> No measurement of blast
<ul style="list-style-type: none"> Disruption and scattering of the confining material 	<ul style="list-style-type: none"> No instantaneous scattering of most of the confining material <ul style="list-style-type: none"> Volcano effect



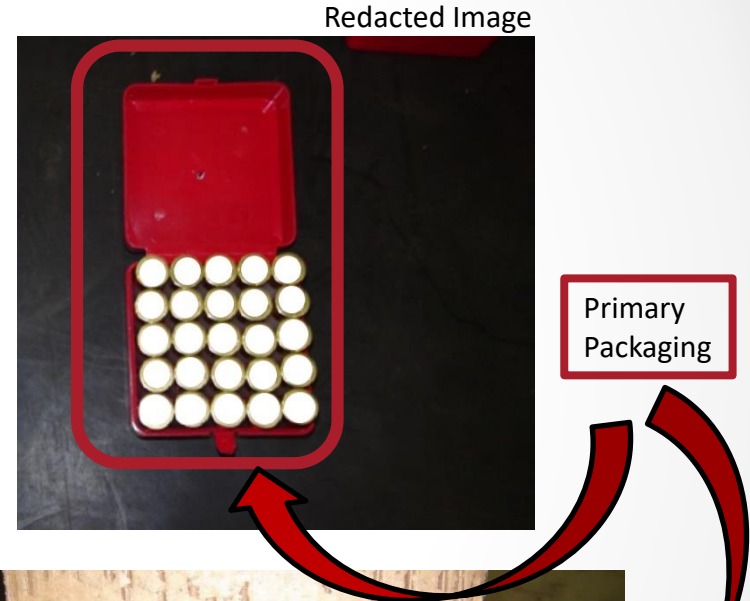
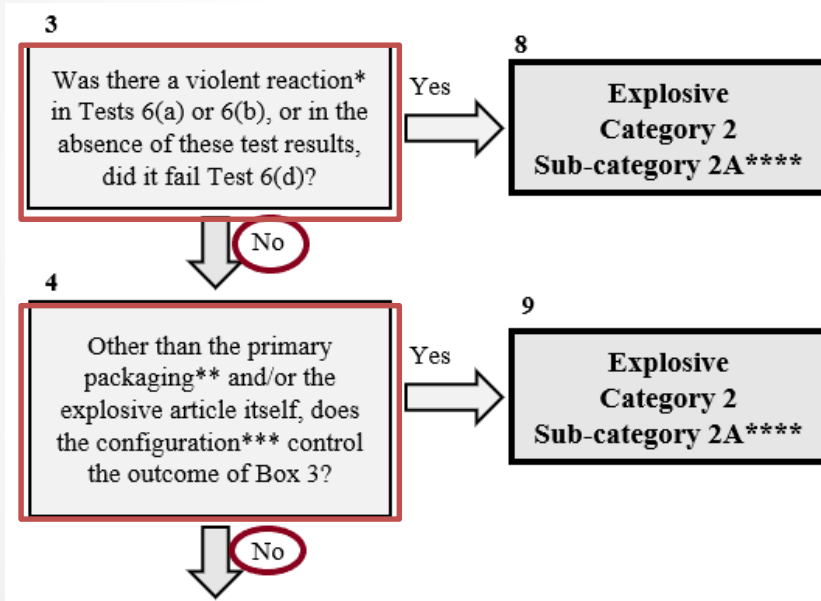
6(a) Test Setup



6(a) Post-Test

Example 6

Noise Maker Cartridge (2-Stage)



The "configuration" does not control outcome of Box 3

Noise Maker Cartridge (2-Stage)

PATH TO DETERMINING GHS CATEGORY 2 SUB-CATEGORY:

Assigned:

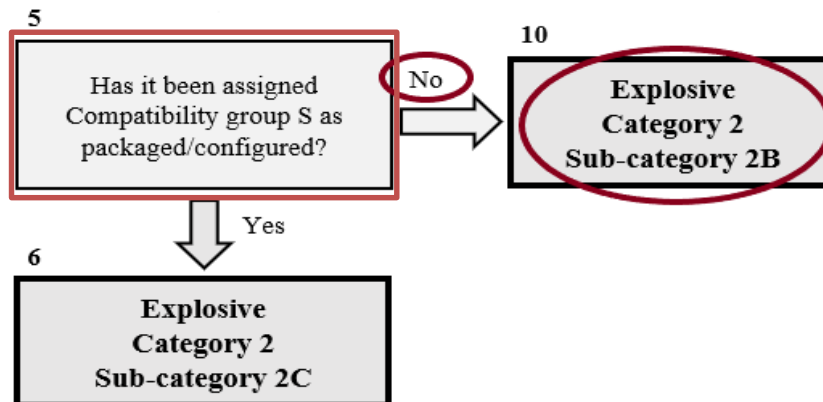
Transport Classification: 1.4G

UN #: UN0431

Meets 1.4 Criteria

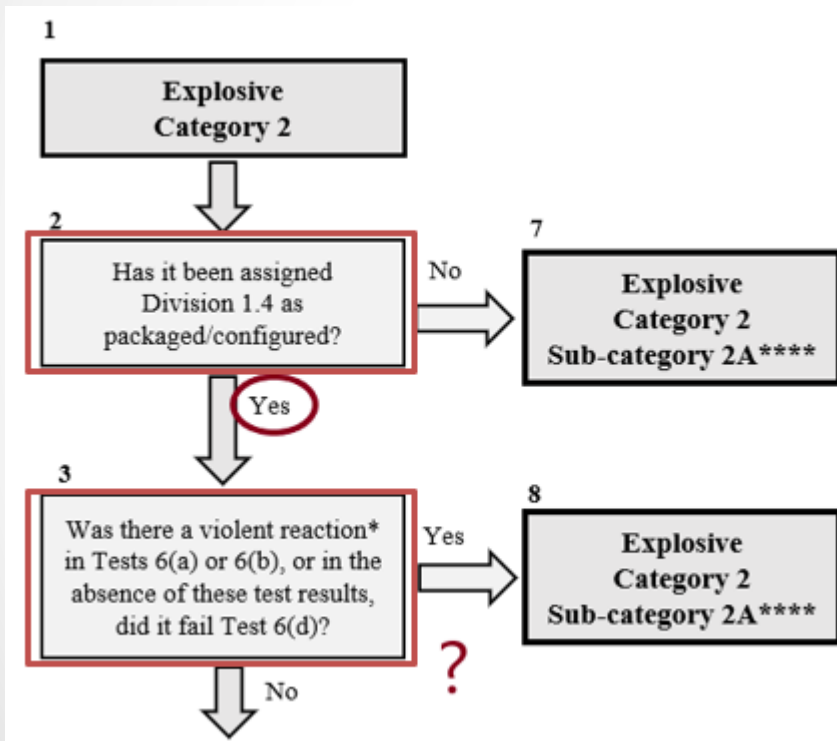
Does Not Meet 1.4S Criteria

Assigned GHS Sub-category: 2B



Primers

Transport Division: 1.4B



Redacted Image



Primers

UN 6(a) Test Results

6(a) Test Criteria	Results
Mass Explosion as evidenced by:	<ul style="list-style-type: none"> No mass explosion
<ul style="list-style-type: none"> Crater at test site; 	<ul style="list-style-type: none"> No crater
<ul style="list-style-type: none"> Damage to the witness plate beneath the package; 	<ul style="list-style-type: none"> No significant change of witness plate shape
<ul style="list-style-type: none"> Measurement of a blast; and 	<ul style="list-style-type: none"> No measurement of blast
<ul style="list-style-type: none"> Disruption and scattering of the confining material 	<ul style="list-style-type: none"> No instantaneous scattering of most of the confining material <ul style="list-style-type: none"> Limited propagation between intermediate packaging Volcano effect



6(a) Test setup

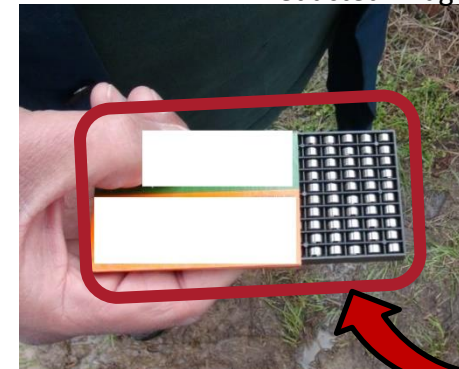
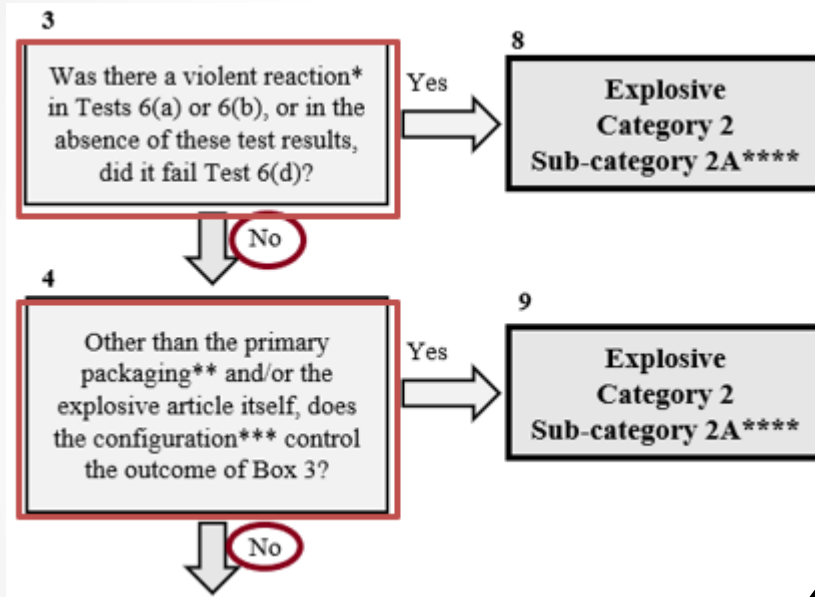


Redacted Image

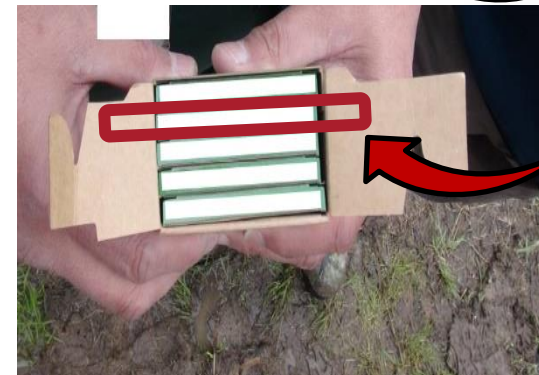
6(a) Post-Test

Primers

Redacted Images



Primary Packaging



The "configuration" does not control outcome of Box 3

Primers

PATH TO DETERMINING GHS CATEGORY 2 SUB-CATEGORY:

Assigned:

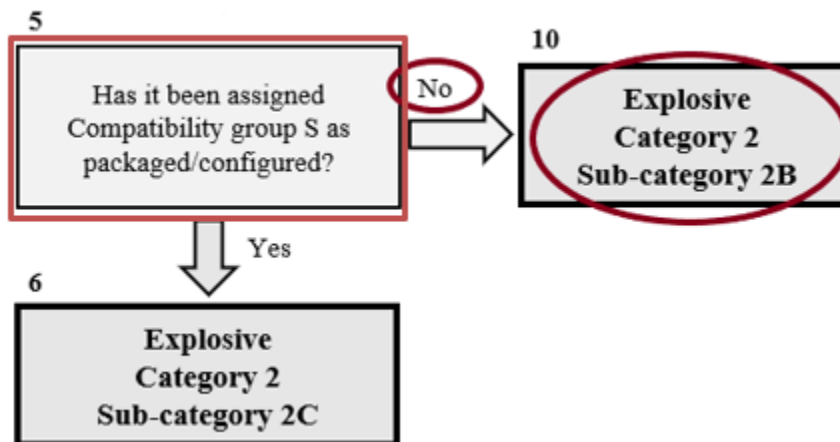
Transport Classification: 1.4B

UN #: UN0378

Meets 1.4 Criteria

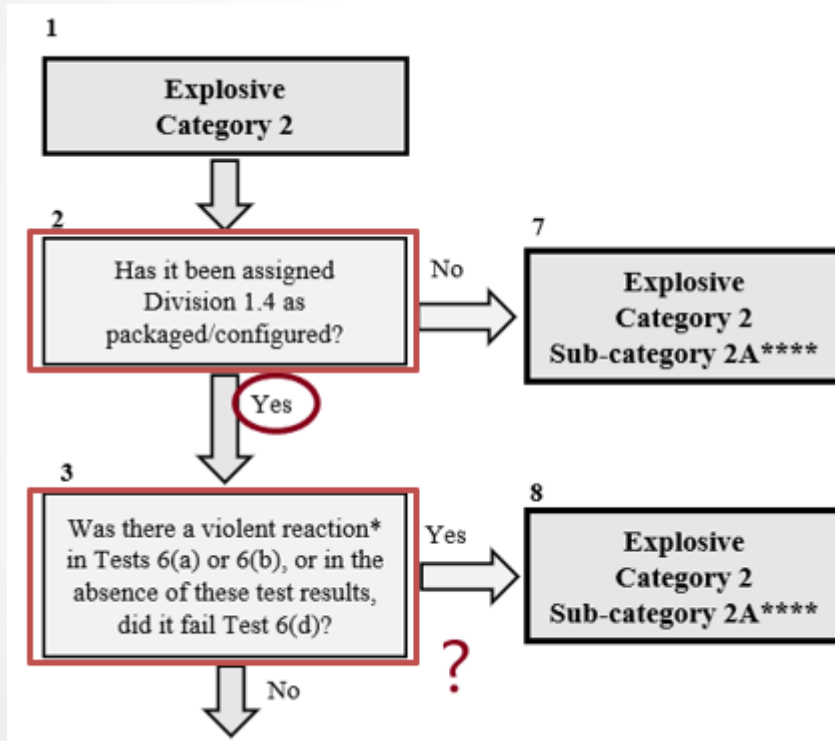
Does Not Meet 1.4S Criteria

Assigned GHS Sub-category: 2B

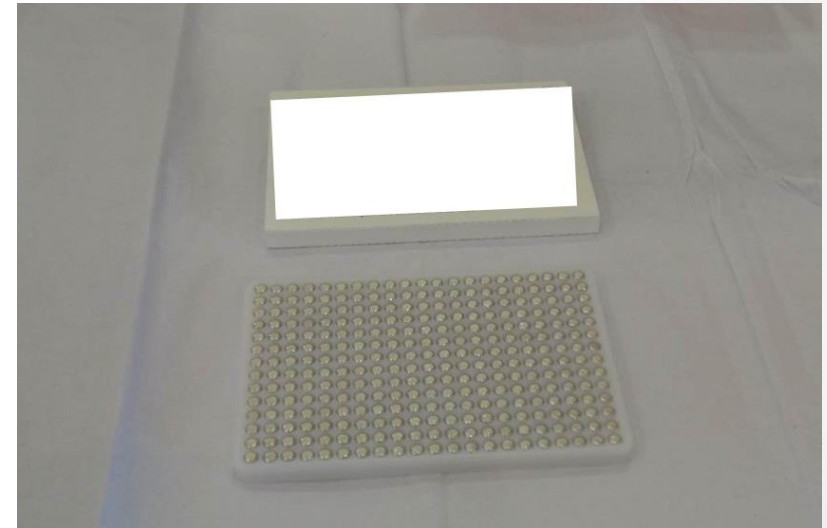


Small Rifle Primers

Transport Division: 1.4S



Redacted Image



Small Rifle Primers

UN 6(a) Test Results

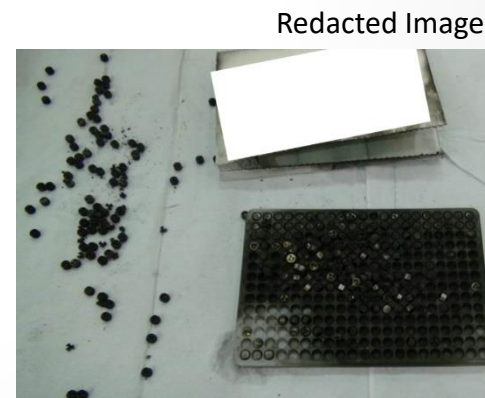
6(a) Test Criteria	Results
Mass Explosion as evidenced by:	No mass explosion
<ul style="list-style-type: none"> Crater at test site; 	<ul style="list-style-type: none"> No crater
<ul style="list-style-type: none"> Damage to the witness plate beneath the package; 	<ul style="list-style-type: none"> No significant change of witness plate shape
<ul style="list-style-type: none"> Measurement of a blast; and 	<ul style="list-style-type: none"> No measurement of blast
<ul style="list-style-type: none"> Disruption and scattering of the confining material 	<ul style="list-style-type: none"> No instantaneous scattering of most of the confining material <ul style="list-style-type: none"> Minor damage to outer packaging



6(a) Test setup



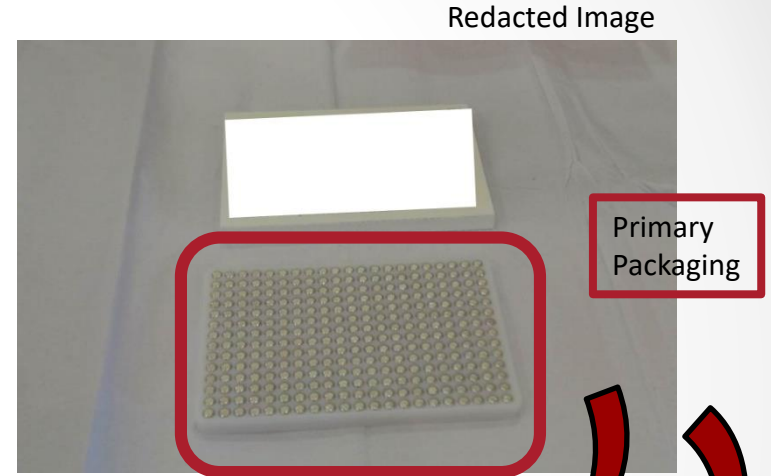
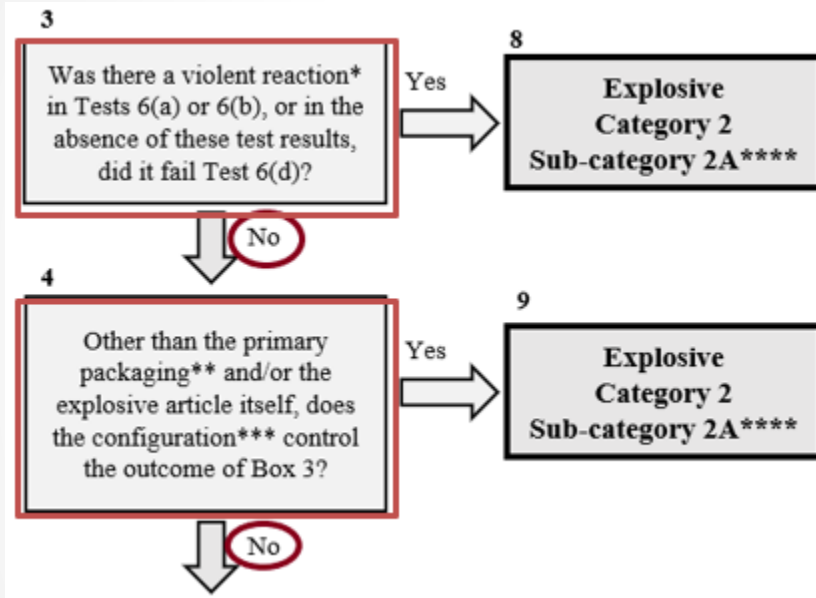
6(a) Post-Test



6(a) Post-Test

Example 8

Small Rifle Primers



The "configuration" does not control outcome of Box 3

Small Rifle Primers

PATH TO DETERMINING GHS CATEGORY 2 SUB-CATEGORY:

Assigned:

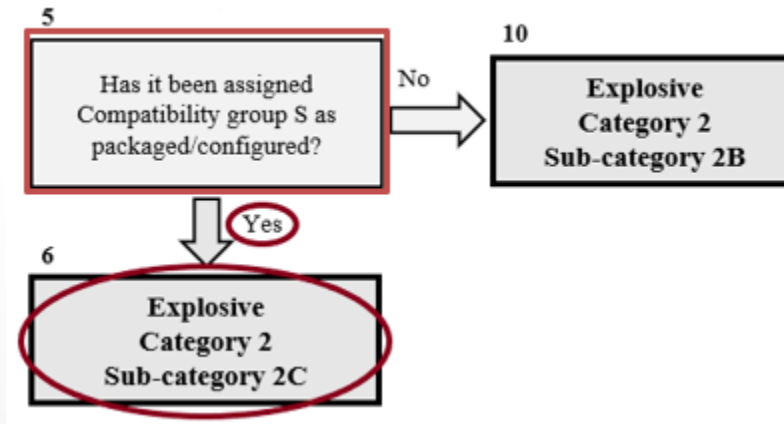
Transport Classification: **1.4S**

UN #: **UN0044**

Meets 1.4 Criteria

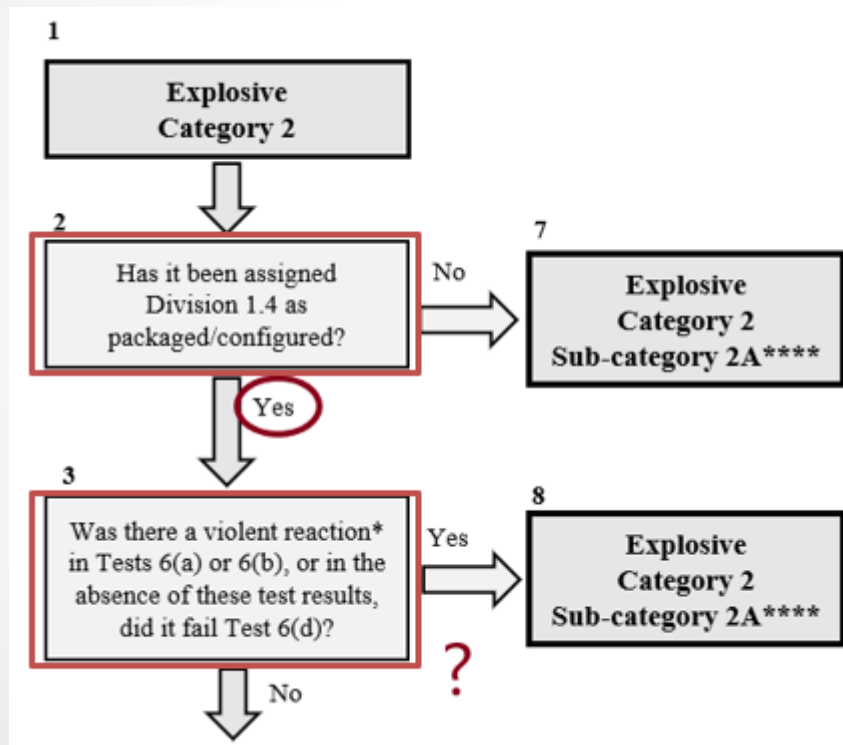
Meets 1.4S Criteria

Assigned GHS Sub-category: **2C**



Shaped Charge (Config. 1)

Transport Division: 1.4D



Representation of shaped charge.
 Figure adapted from "Shape Charges" by Mexis, 2015.
 Retrieved from mexis.co.id

Redacted Image



Shaped Charge (Config. 1)

UN 6(a) Test Results

6(a) Test Criteria	Results
Mass Explosion as evidenced by:	<ul style="list-style-type: none"> No mass explosion
<ul style="list-style-type: none"> Crater at test site; 	<ul style="list-style-type: none"> No crater
<ul style="list-style-type: none"> Damage to the witness plate beneath the package; 	<ul style="list-style-type: none"> Significant change of witness plate shape <ul style="list-style-type: none"> Minor damage
<ul style="list-style-type: none"> Measurement of a blast; and 	<ul style="list-style-type: none"> No measurement of blast
<ul style="list-style-type: none"> Disruption and scattering of the confining material 	<ul style="list-style-type: none"> No instantaneous scattering of most of the confining material <ul style="list-style-type: none"> Volcano effect Minor propagation was observed

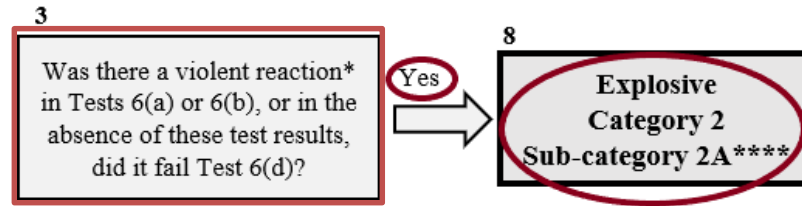


6(a) Test setup



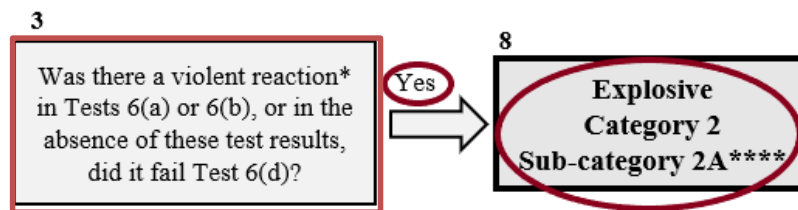
6(a) Post-Test

Shaped Charge (Config. 1)



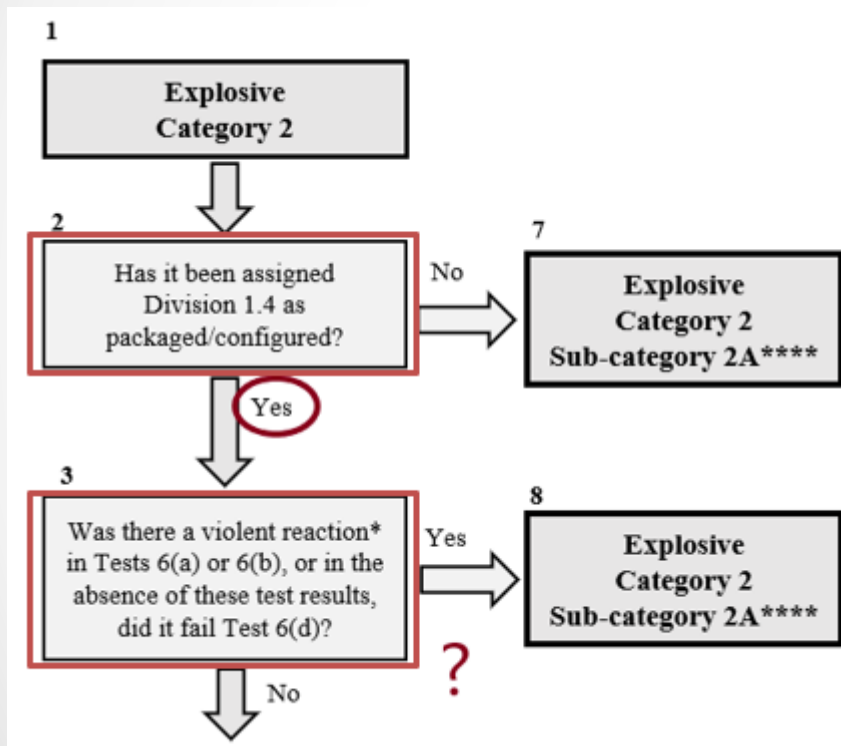
Shaped Charge (Config. 1)

PATH TO DETERMINING GHS CATEGORY 2 SUB-CATEGORY:
Assigned:
Transport Classification: 1.4D
UN #: UN0440
Meets 1.4 Criteria Does Not Meet 1.4S Criteria
Assigned GHS Sub-category: 2A
Violent Reaction in Test 6(a)



Example 10

Shaped Charge (Config. 2) Transport Division: 1.4D



Representation of shaped charge.

Figure adapted from "Shape Charges" by Mexis, 2015.
Retrieved from mexis.co.id

Redacted Image



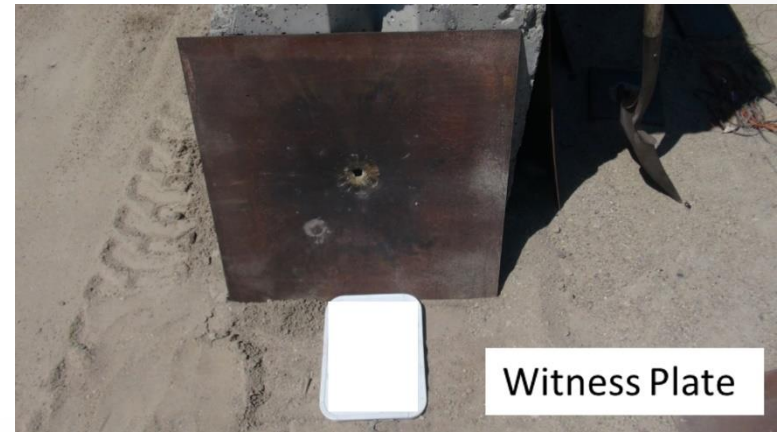
Shaped Charge (Config. 2)

UN 6(a) Test Results

6(a) Test Criteria	Results
Mass Explosion as evidenced by:	<ul style="list-style-type: none"> No mass explosion
<ul style="list-style-type: none"> Crater at test site; 	<ul style="list-style-type: none"> No crater
<ul style="list-style-type: none"> Damage to the witness plate beneath the package; 	<ul style="list-style-type: none"> Change of witness plate shape <ul style="list-style-type: none"> Damaged and cut through witness plate
<ul style="list-style-type: none"> Measurement of a blast; and 	<ul style="list-style-type: none"> No measurement of blast
<ul style="list-style-type: none"> Disruption and scattering of the confining material 	<ul style="list-style-type: none"> No instantaneous scattering of most of the confining material <ul style="list-style-type: none"> Volcano effect Minor propagation was observed

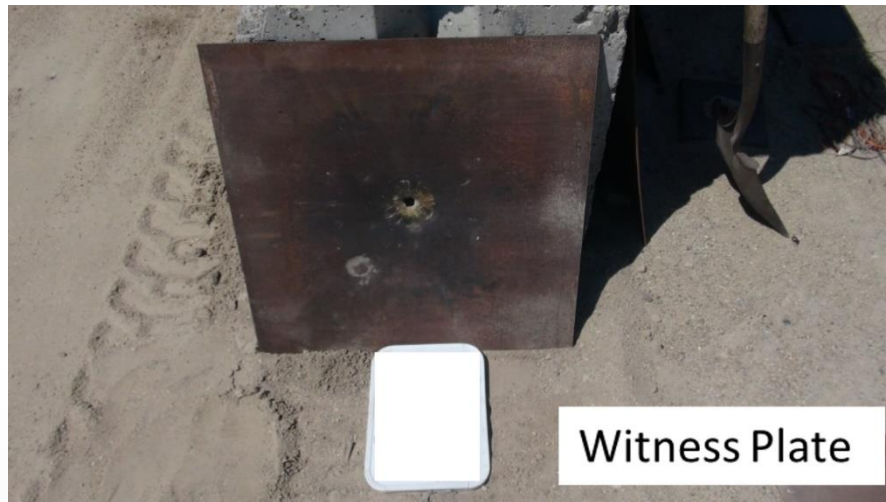
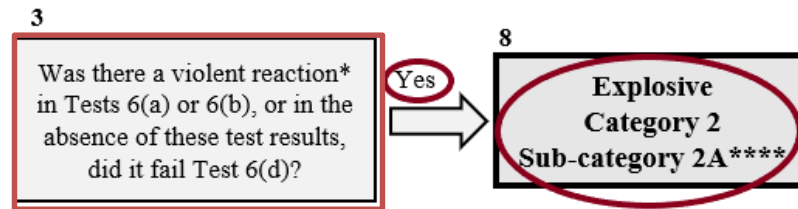


6(a) Test setup



6(a) Post-Test

Shaped Charge (Config. 2)



Shaped Charge (Config. 2)

PATH TO DETERMINING GHS CATEGORY 2 SUB-CATEGORY:

Assigned:

Transport Classification: 1.4D

UN #: UN0440

Meets 1.4 Criteria
Does Not Meet 1.4S Criteria

Assigned GHS Sub-category: 2A

Violent Reaction in Test 6(a)

3

Was there a violent reaction*
in Tests 6(a) or 6(b), or in the
absence of these test results,
did it fail Test 6(d)?

Yes

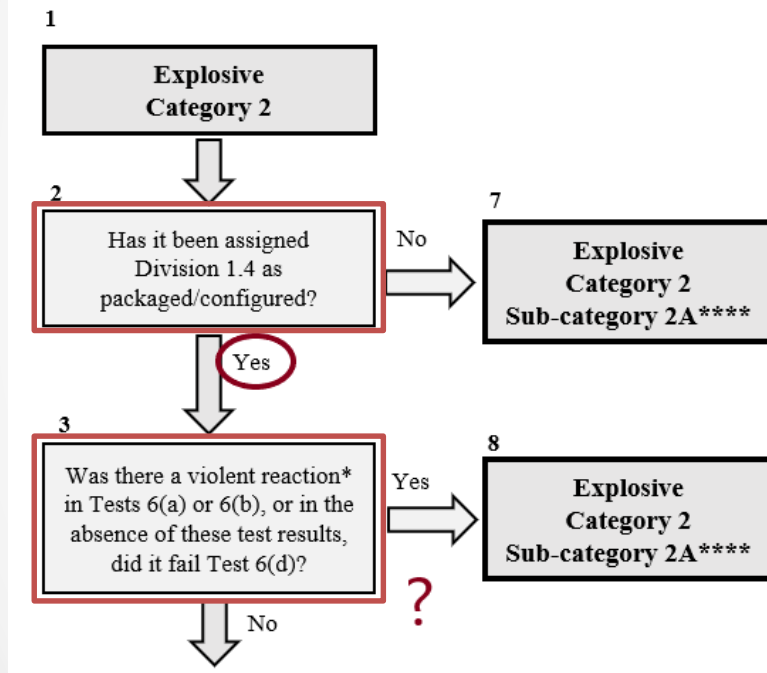
8

**Explosive
Category 2
Sub-category 2A******

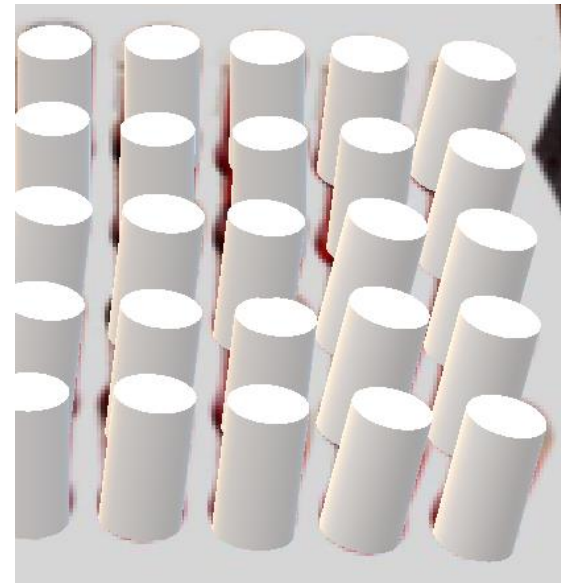
Example 11

Noise Maker Cartridges

Scenario 1: Test 6(d) Only Performed Transport Division: 1.4G



Redacted Image



Noise Maker Cartridges

Scenario 1: Test 6(d) Only Performed

UN 6(d) Test Results (Not Required per SP 347)

6(d) Test Criteria	Results
Hazardous effect outside the package as evidenced by:	Hazardous effect outside package
<ul style="list-style-type: none"> Denting or perforation of the witness plate beneath the package; 	<ul style="list-style-type: none"> No significant change of witness plate shape
<ul style="list-style-type: none"> A flash or flame that ignites an adjacent material such as a sheet of $80 \pm 10 \text{ g/m}^2$ paper at a distance of 25 cm from the package; 	<ul style="list-style-type: none"> No adjacent material (paper) used
<ul style="list-style-type: none"> Disruption of the package causing projection of the explosives contents; or 	<ul style="list-style-type: none"> No mass propagation Package severely damaged Unreacted articles scattered
<ul style="list-style-type: none"> A projection which passes completely through the packaging (a projection or fragment retained or stuck in the wall of the packaging is considered as non hazardous) 	<ul style="list-style-type: none"> No fragmentations produced



6(d) Test setup



6(d) Post-Test

Noise Maker Cartridges

Scenario 1: Test 6(d) Only Performed

PATH TO DETERMINING GHS CATEGORY 2 SUB-CATEGORY:

Assigned:

Transport Classification: 1.4G

UN #: UN0431

Meets 1.4 Criteria
Does Not Meet 1.4S Criteria
Failed 6(d) Test Criteria

Assigned GHS Sub-category: 2A

Failed 6(d) Test Criteria

3

Was there a violent reaction*
in Tests 6(a) or 6(b), or in the
absence of these test results,
did it fail Test 6(d)?



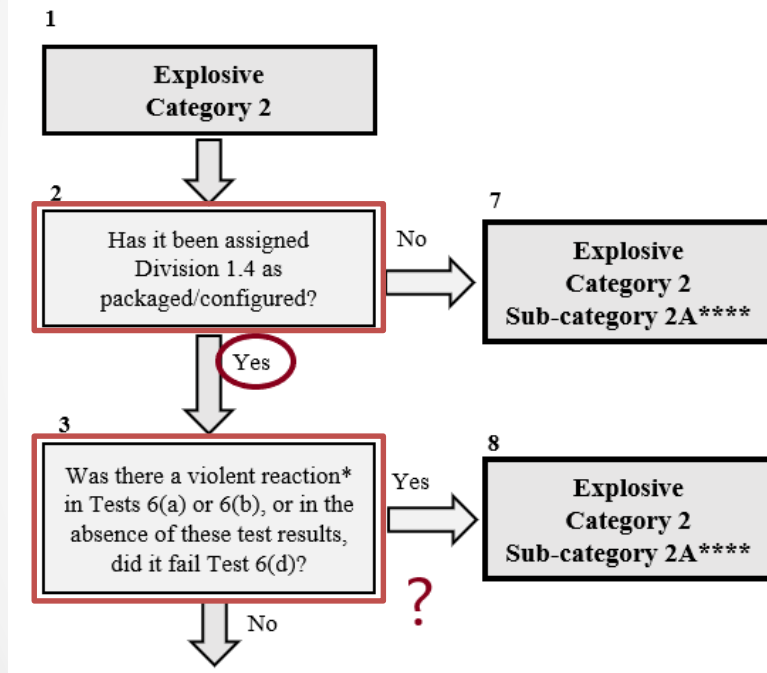
8

**Explosive
Category 2
Sub-category 2A******

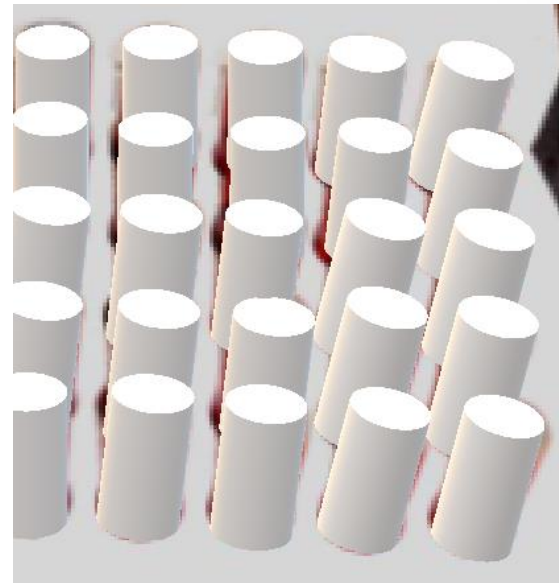
Example 12

Noise Maker Cartridges

Scenario 2: 6(d) Test and 6(a) Test Performed Transport Division: 1.4G



Redacted Image



Noise Maker Cartridges

Scenario 2: 6(d) Test and 6(a) Test Performed UN 6(d) Test Results (Not Required per SP 347)

6(d) Test Criteria	Results
Hazardous effect outside the package as evidenced by:	Hazardous effect outside package
<ul style="list-style-type: none"> Denting or perforation of the witness plate beneath the package; 	<ul style="list-style-type: none"> No significant change of witness plate shape
<ul style="list-style-type: none"> A flash or flame that ignites an adjacent material such as a sheet of 80 ± 10 g/m² paper at a distance of 25 cm from the package; 	<ul style="list-style-type: none"> No adjacent material (paper) used
<ul style="list-style-type: none"> Disruption of the package causing projection of the explosives contents; or 	<ul style="list-style-type: none"> No mass propagation Package severely damaged Unreacted articles scattered
<ul style="list-style-type: none"> A projection which passes completely through the packaging (a projection or fragment retained or stuck in the wall of the packaging is considered as non hazardous) 	<ul style="list-style-type: none"> No fragmentations produced



6(d) Test setup



6(d) Post-Test

Noise Maker Cartridges

Scenario 2: 6(d) Test and 6(a) Test Performed

UN 6(a) Test Results

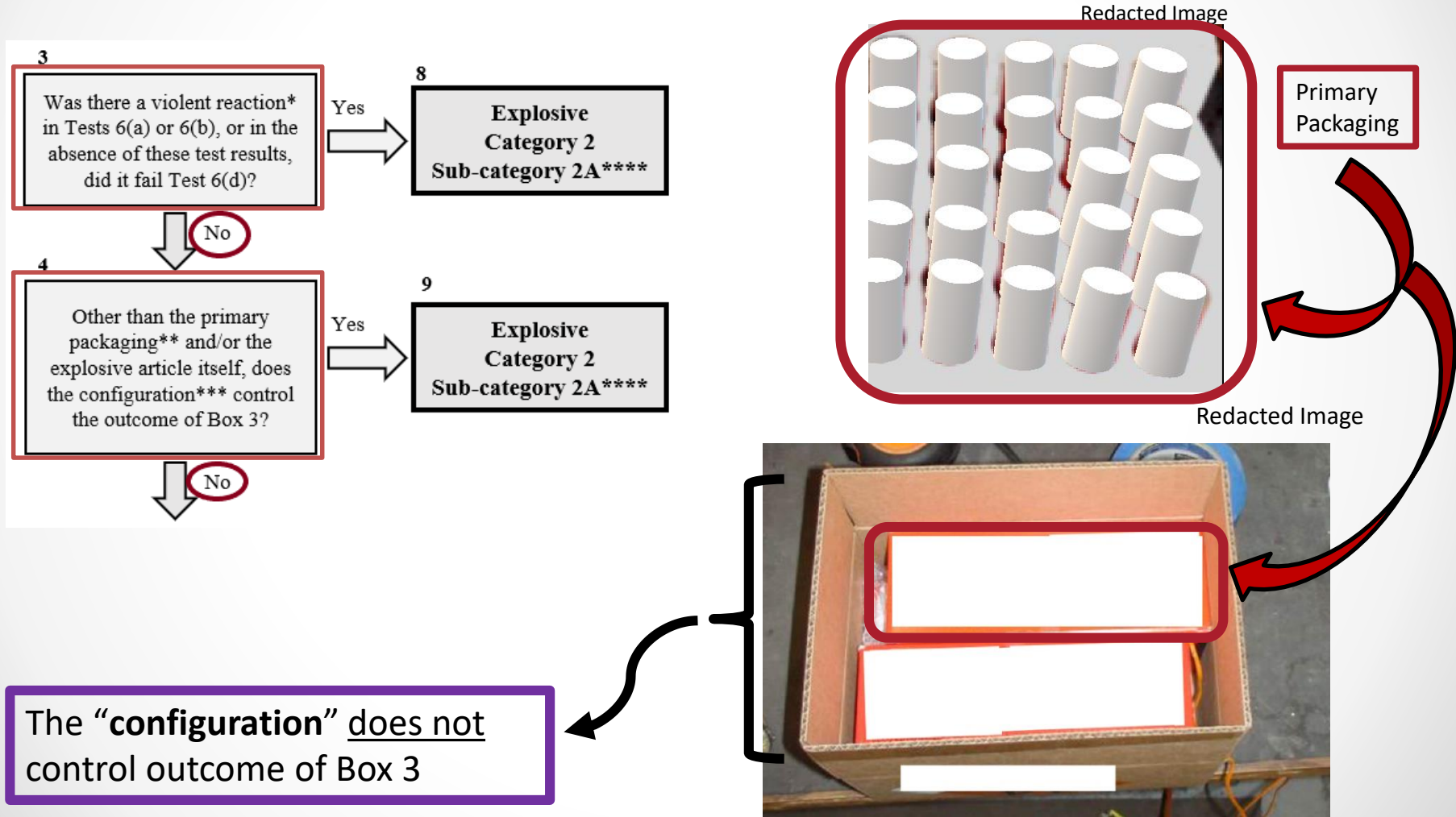
6(a) Test Criteria	Results
Mass Explosion as evidenced by:	No mass explosion
Crater at test site;	No crater
Damage to the witness plate beneath the package;	No significant change of witness plate shape
Measurement of a blast; and	No measurement of blast
Disruption and scattering of the confining material	<p>No instantaneous scattering of most of the confining material</p> <ul style="list-style-type: none"> • Volcano effect • Outer packaging broken open and torn apart • Propagation through donor package was by flame spread and was not instantaneous • Some cartridges ejected from sand and burst close to test setup



6(a) Post-Test

Noise Maker Cartridges

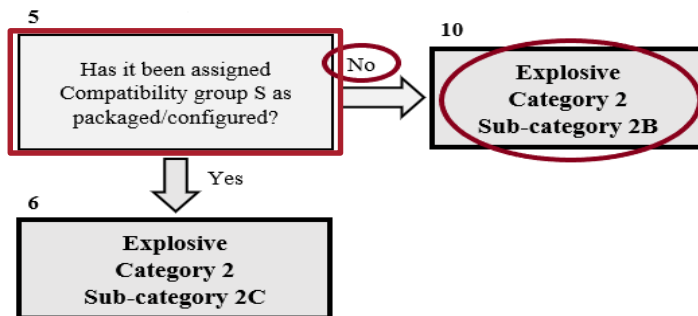
Scenario 2: 6(d) Test and 6(a) Test Performed



Noise Maker Cartridges

Scenario 2: 6(d) Test and 6(a) Test Performed

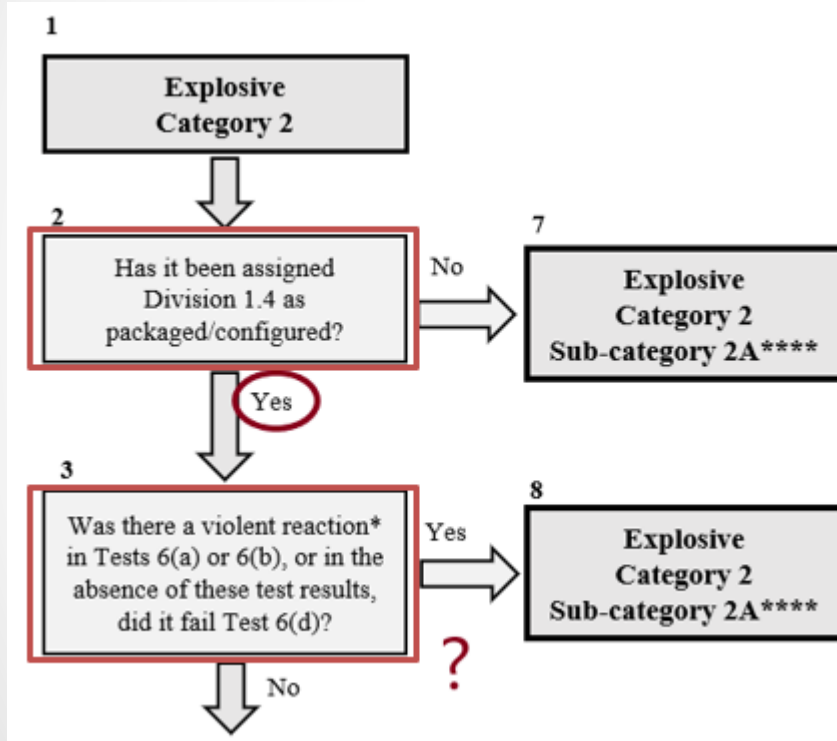
PATH TO DETERMINING GHS CATEGORY 2 SUB-CATEGORY:
Assigned:
Transport Classification: 1.4G
UN #: UN0431
Meets 1.4 Criteria Does Not Meet 1.4S Criteria Failed 6(d) Test Criteria
Assigned GHS Sub-category: 2B
Failed 6(d) Test Criteria
No Violent 6(a) Test Results



Example 13

Micro Gas Generator Assembly

Transport Division: 1.4S



Redacted Image



Example 13

Micro Gas Generator Assembly

UN 6(d) Test Results (Not Required per SP 347)

6(d) Test Criteria	Results
Hazardous effect outside the package as evidenced by:	No hazardous effect outside package
<ul style="list-style-type: none">Denting or perforation of the witness plate beneath the package;	<ul style="list-style-type: none">No significant change of witness plate shape
<ul style="list-style-type: none">A flash or flame that ignites an adjacent material such as a sheet of $80 \pm 10 \text{ g/m}^2$ paper at a distance of 25 cm from the package;	<ul style="list-style-type: none">No adjacent material (paper) used
<ul style="list-style-type: none">Disruption of the package causing projection of the explosives contents; or	<ul style="list-style-type: none">No mass propagationEvent completely contained within the outer package
<ul style="list-style-type: none">A projection which passes completely through the packaging (a projection or fragment retained or stuck in the wall of the packaging is considered as non hazardous)	<ul style="list-style-type: none">No fragmentations produced



6(d) Test setup

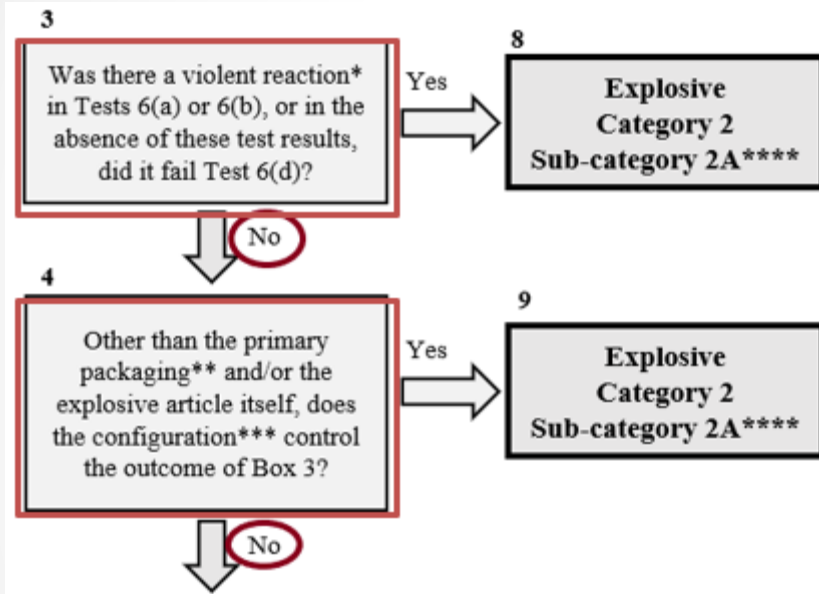
Redacted Image



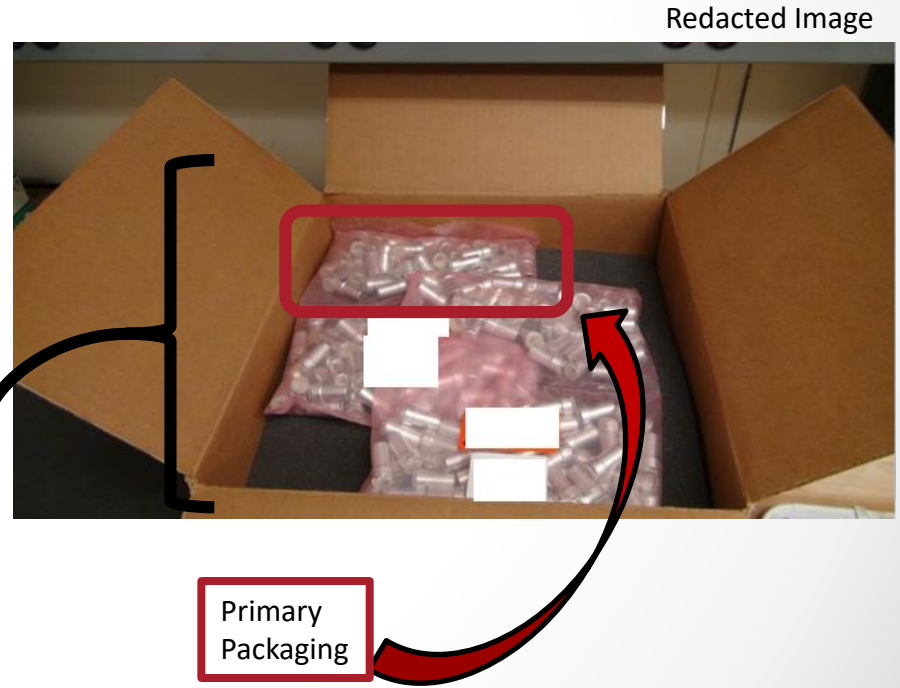
Post-Test

Example 13

Micro Gas Generator Assembly



The “**configuration**” does not control outcome of Box 3



Micro Gas Generator Assembly

PATH TO DETERMINING GHS CATEGORY 2 SUB-CATEGORY:

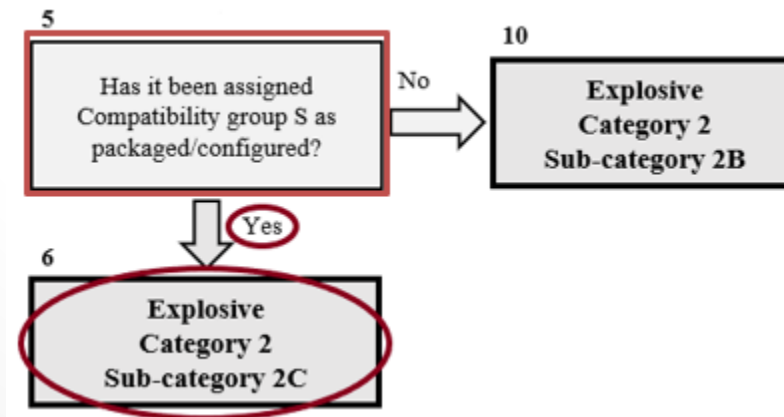
Assigned:

Transport Classification: **1.4S**

UN #: **UN0432**

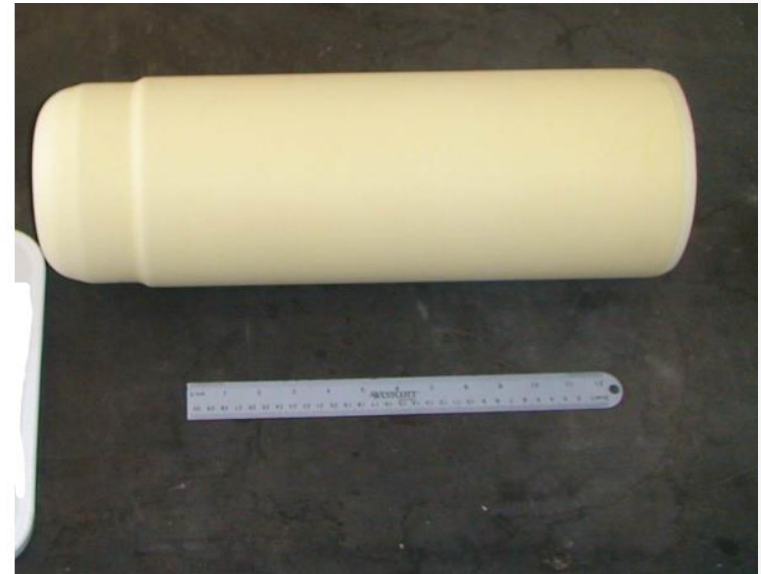
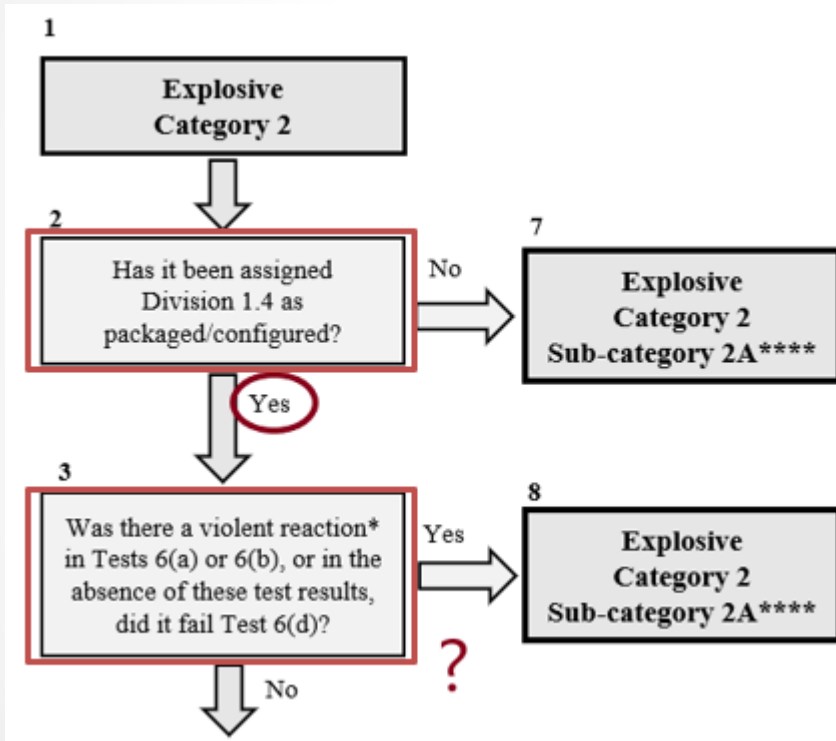
Meets 1.4 Criteria
Meets 1.4S Criteria

Assigned GHS Sub-category: **2C**



Combustible Case

Transport Division: 1.4S



Combustible Case

UN 6(a) Test Results

6(a) Test Criteria	Results
Mass Explosion as evidenced by:	No mass explosion
Crater at test site;	No crater
Damage to the witness plate beneath the package;	No significant change of witness plate shape
Measurement of a blast; and	No measurement of blast
Disruption and scattering of the confining material	<p>No instantaneous scattering of most of the confining material</p> <ul style="list-style-type: none"> • Volcano effect • Propagation to all articles occurred over a 2 minute period



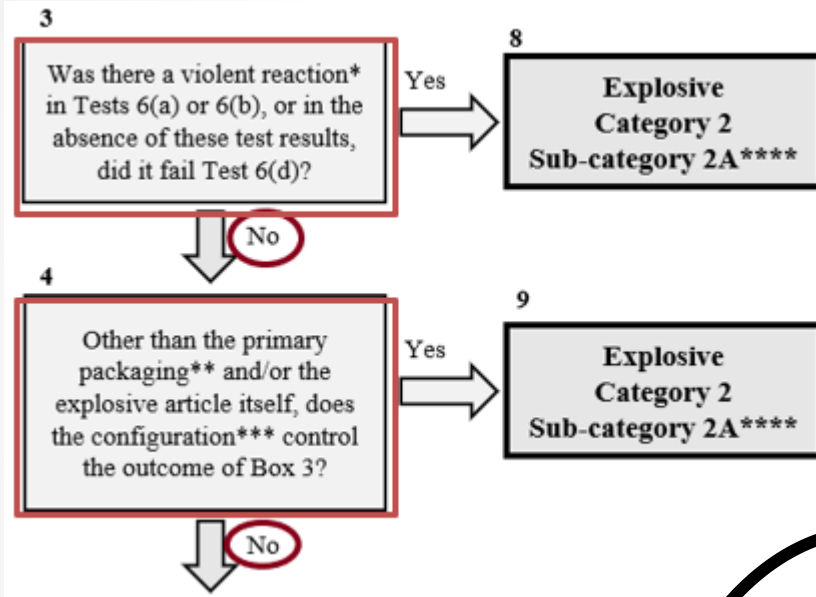
6(a) Test setup



Redacted Sign

6(a) Post-Test

Combustible Case



Primary Packaging

Redacted Image



The "configuration" does not control outcome of Box 3

Combustible Case

PATH TO DETERMINING GHS CATEGORY 2 SUB-CATEGORY:

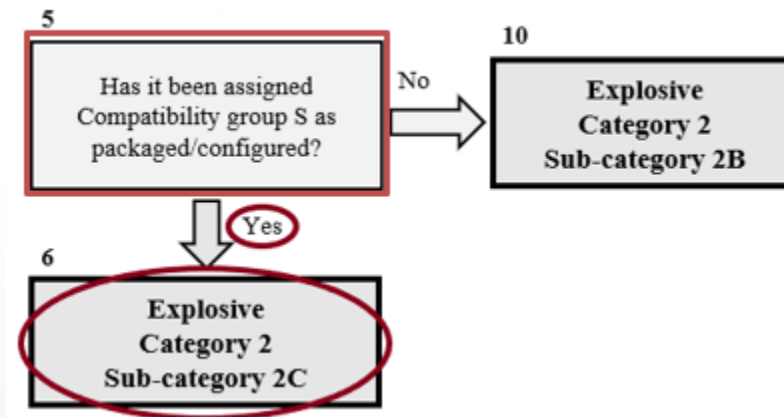
Assigned:

Transport Classification: **1.4S**

UN #: **UN0349**

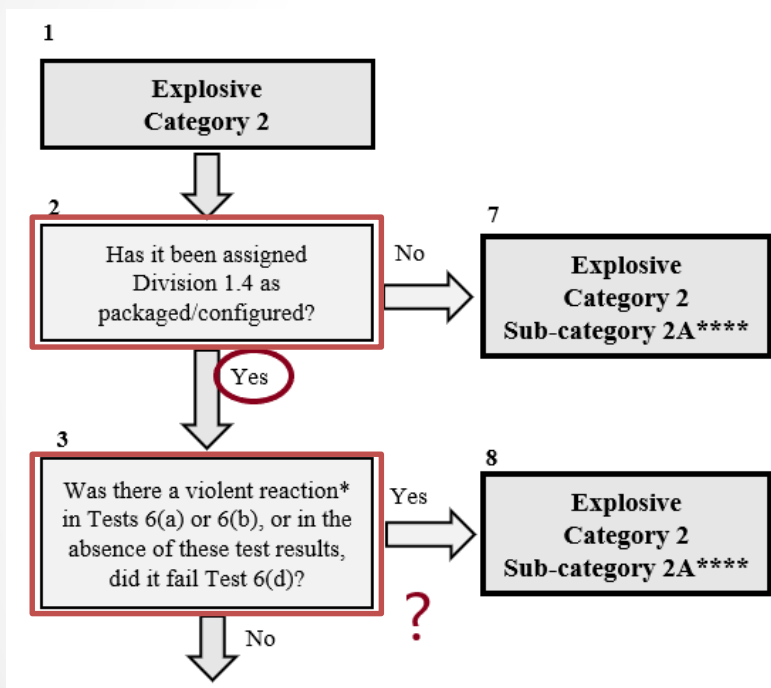
Meets 1.4 Criteria
Meets 1.4S Criteria

Assigned GHS Sub-category: **2C**



Energetic Paper

Transport Division: 1.4C



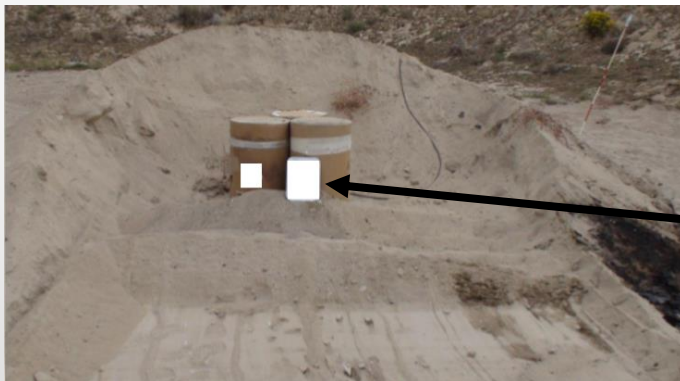
Redacted Image



Energetic Paper

UN 6(b) Test Results

6(b) Test Criteria	Results
Mass Explosion as evidenced by:	No mass explosion
<ul style="list-style-type: none"> Crater at test site appreciably larger than that given by a single package or unpackaged article; 	<ul style="list-style-type: none"> No crater
<ul style="list-style-type: none"> Damage to the witness plate beneath the stack which is appreciably greater than that from a single package or unpackaged article; 	<ul style="list-style-type: none"> No significant change of witness plate shape
<ul style="list-style-type: none"> Measurement of blast which significantly exceeds that from a single package or unpackaged article; and 	<ul style="list-style-type: none"> No measurement of blast
<ul style="list-style-type: none"> Violent disruption and scattering of most of the confining material 	<ul style="list-style-type: none"> No instantaneous scattering of most of the confining material <ul style="list-style-type: none"> Volcano effect as hot gases escaped In one trial, the energetic paper roll was launched approx. 2 meters from pile of confining material and burned with an initial 4-meter fireball



6(b) Test setup prior to adding confining material

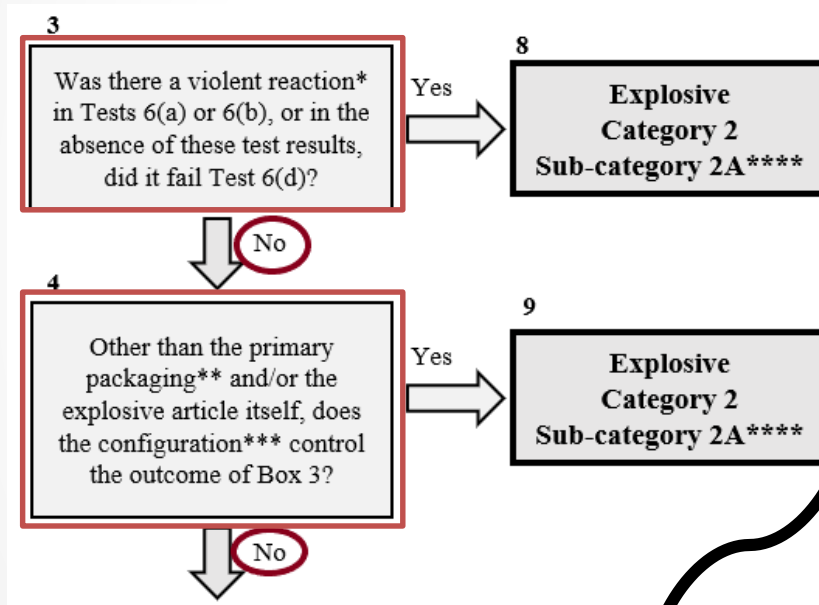


6(b) Post-Test

Redacted Signs

Energetic Paper

Redacted Image



Primary
Packaging

The **“configuration”** does not control outcome of Box 3

Energetic Paper

PATH TO DETERMINING GHS CATEGORY 2 SUB-CATEGORY:

Assigned:

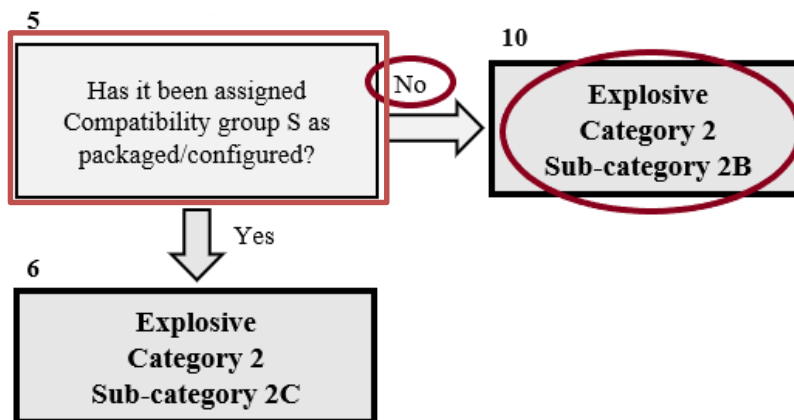
Transport Classification: 1.4C

UN #: UN0446

Meets 1.4 Criteria

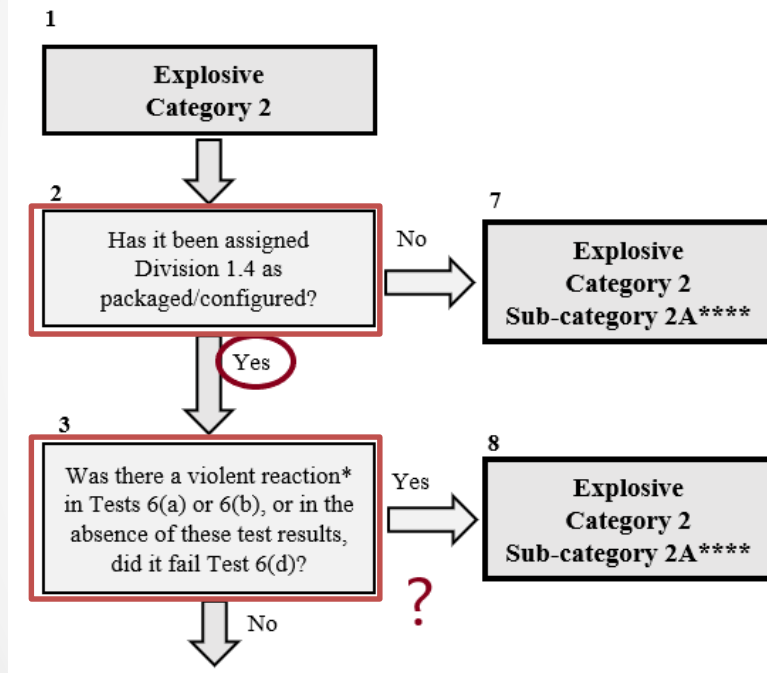
Does Not Meet 1.4S Criteria

Assigned GHS Sub-category: 2B



Mortar Increment

Transport Division: 1.4C



Redacted Image



Mortar Increment UN 6(a) Test Results

6(a) Test Criteria	Results
Mass Explosion as evidenced by:	No mass explosion
Crater at test site;	No crater
Damage to the witness plate beneath the package;	No significant change of witness plate shape
Measurement of a blast; and	No measurement of blast
Disruption and scattering of the confining material	No instantaneous scattering of most of the confining material <ul style="list-style-type: none"> • Volcano effect • Propagation to most articles occurred over a 27-second period



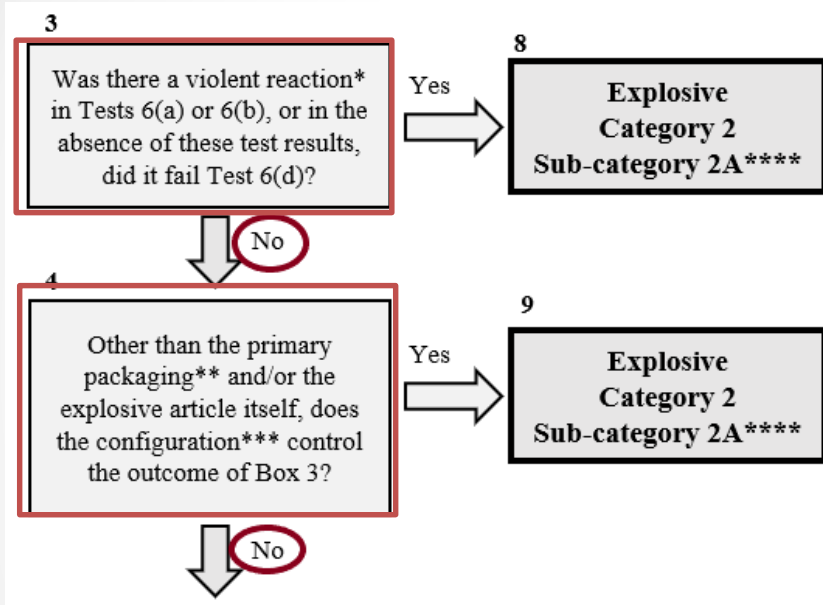
6(a) Test setup

Redacted Sign



6(a) Test

Mortar Increment



The "configuration" does not control outcome of Box 3

Mortar Increment

PATH TO DETERMINING GHS CATEGORY 2 SUB-CATEGORY:

Assigned:

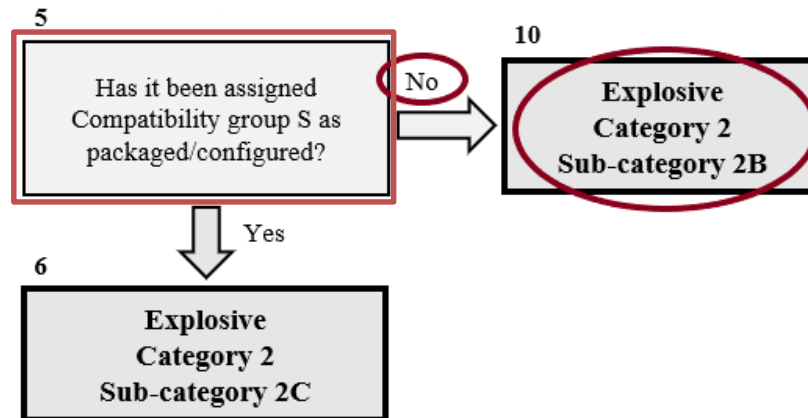
Transport Classification: **1.4C**

UN #: **UN0446**

Meets 1.4 Criteria

Does Not Meet 1.4S Criteria

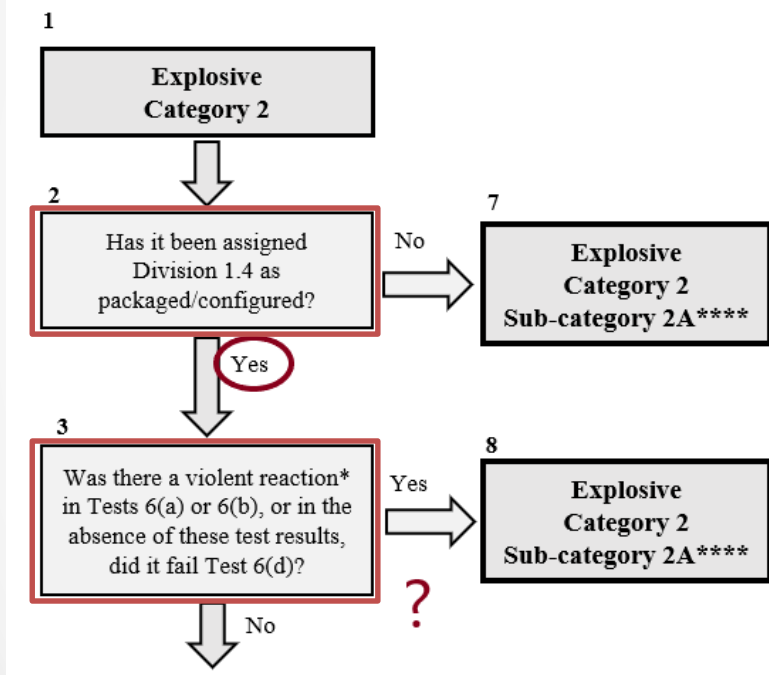
Assigned GHS Sub-category: **2B**



Linear Shaped Charge

Scenario 1: Test 6(d) Only Performed

Transport Division: 1.4D



Redacted Image



Linear Shaped Charge

Scenario 1: Test 6(d) Only Performed

UN 6(d) Test Results (Required per SP 347)

6(d) Test Criteria	Results
Hazardous effect outside the package as evidenced by:	Hazardous effect outside package
<ul style="list-style-type: none"> Denting or perforation of the witness plate beneath the package; 	<ul style="list-style-type: none"> No significant change of witness plate shape
<ul style="list-style-type: none"> A flash or flame that ignites an adjacent material such as a sheet of $80 \pm 10 \text{ g/m}^2$ paper at a distance of 25 cm from the package; 	<ul style="list-style-type: none"> No adjacent material (paper) used
<ul style="list-style-type: none"> Disruption of the package causing projection of the explosives contents; or 	<ul style="list-style-type: none"> Metallic material propelled external to package Entire packaging destroyed
<ul style="list-style-type: none"> A projection which passes completely through the packaging (a projection or fragment retained or stuck in the wall of the packaging is considered as non hazardous) 	<ul style="list-style-type: none"> No fragmentations produced



6(d) Test

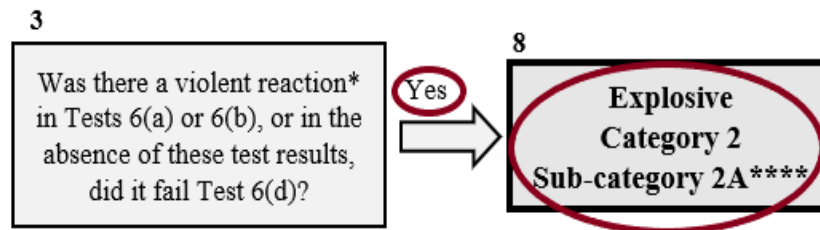


6(d) Test

Linear Shaped Charge

Scenario 1: Test 6(d) Only Performed

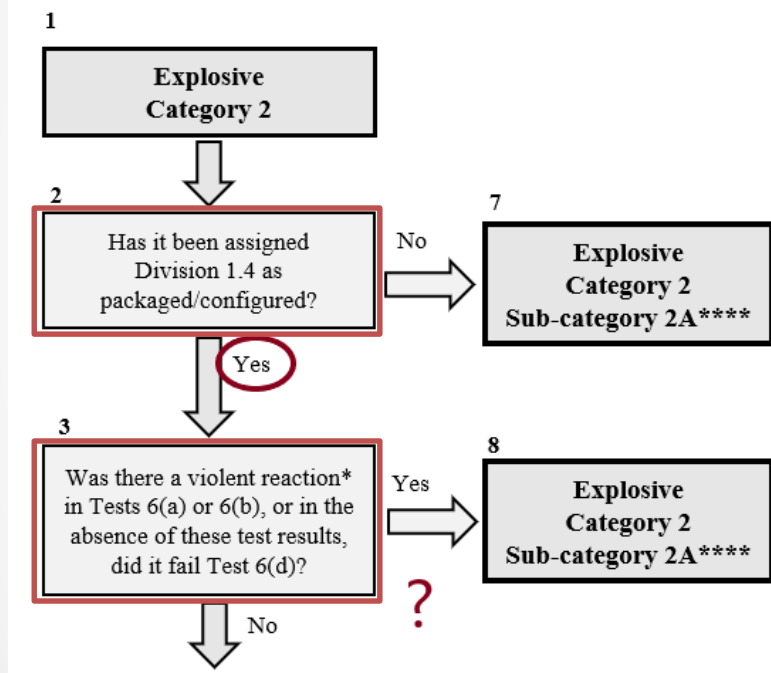
PATH TO DETERMINING GHS CATEGORY 2 SUB-CATEGORY:
Assigned:
Transport Classification: 1.4D
UN #: UN0237
Meets 1.4 Criteria Does Not Meet 1.4S Criteria Failed 6(d) Test Criteria
Assigned GHS Sub-category: 2A
Failed 6(d) Test Criteria



Example 18

Linear Shaped Charge

Scenario 2: Test 6(d) and Test 6(b) Performed Transport Division: 1.4D



Redacted Image



Linear Shaped Charge

Scenario 2: Test 6(d) and Test 6(b) Performed

UN 6(d) Test Results (Required per SP 347)

6(d) Test Criteria	Results
Hazardous effect outside the package as evidenced by:	Hazardous effect outside package
<ul style="list-style-type: none"> Denting or perforation of the witness plate beneath the package; 	<ul style="list-style-type: none"> No significant change of witness plate shape
<ul style="list-style-type: none"> A flash or flame that ignites an adjacent material such as a sheet of $80 \pm 10 \text{ g/m}^2$ paper at a distance of 25 cm from the package; 	<ul style="list-style-type: none"> No adjacent material (paper) used
<ul style="list-style-type: none"> Disruption of the package causing projection of the explosives contents; or 	<ul style="list-style-type: none"> Metallic material propelled external to package Entire packaging destroyed
<ul style="list-style-type: none"> A projection which passes completely through the packaging (a projection or fragment retained or stuck in the wall of the packaging is considered as non hazardous) 	<ul style="list-style-type: none"> No fragmentations produced



6(d) Test



6(d) Test

Linear Shaped Charge

Scenario 2: **Test 6(d) and Test 6(b) Performed** UN 6(b) Test Results

6(b) Test Criteria	Results
Mass Explosion as evidenced by:	No mass explosion
<ul style="list-style-type: none"> Crater at test site appreciably larger than that given by a single package or unpackaged article; 	<ul style="list-style-type: none"> No crater
<ul style="list-style-type: none"> Damage to the witness plate beneath the stack which is appreciably greater than that from a single package or unpackaged article; 	<ul style="list-style-type: none"> No significant change of witness plate shape
<ul style="list-style-type: none"> Measurement of blast which significantly exceeds that from a single package or unpackaged article; and 	<ul style="list-style-type: none"> No measurement of blast
<ul style="list-style-type: none"> Violent disruption and scattering of most of the confining material 	<ul style="list-style-type: none"> No instantaneous scattering of most of the confining material <ul style="list-style-type: none"> Volcano effect as hot gases escaped No propagation



6(b) Test setup

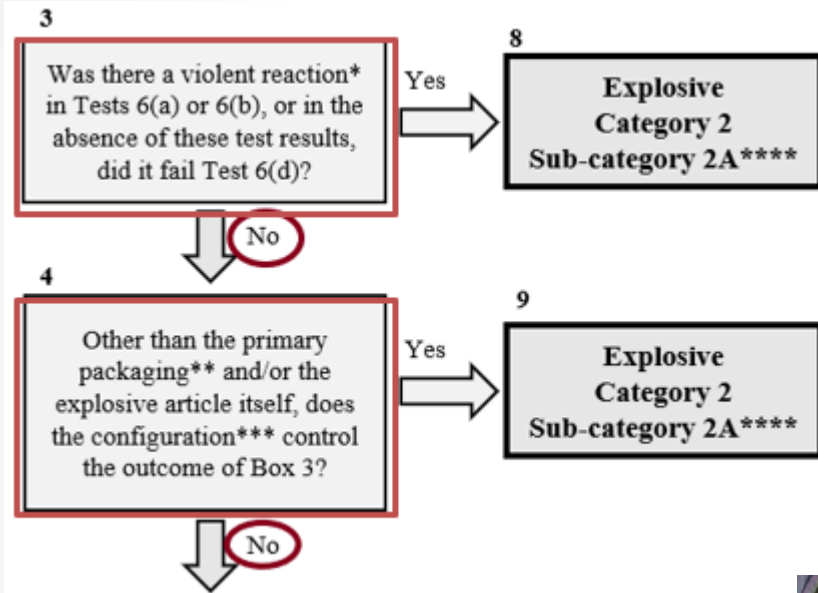


6(b) Post-Test

Redacted Signs

Linear Shaped Charge

Scenario 2: Test 6(d) and Test 6(b) Performed



Redacted Image



Redacted Image



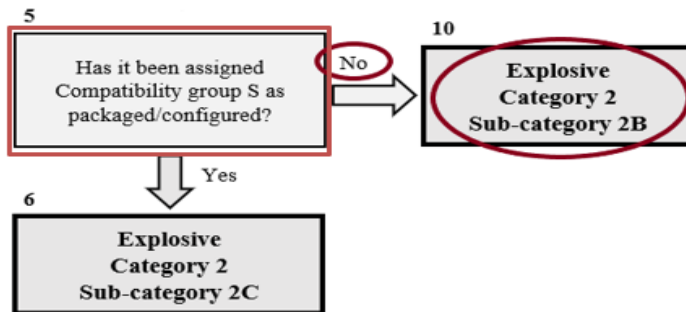
Primary Packaging

The "configuration" does not control outcome of Box 3

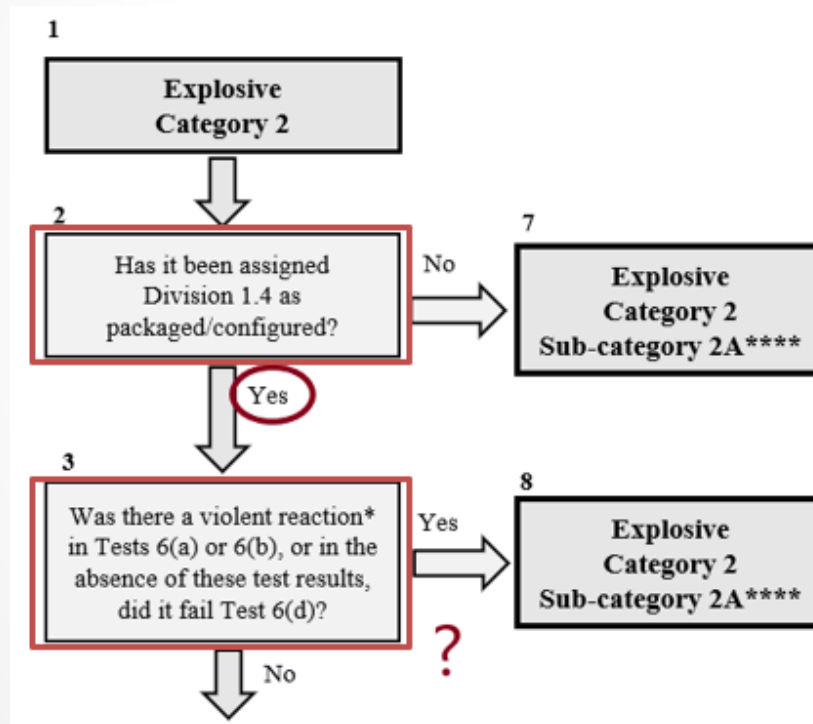
Linear Shaped Charge

Scenario 2: Test 6(d) and Test 6(b) Performed

PATH TO DETERMINING GHS CATEGORY 2 SUB-CATEGORY:
Assigned:
Transport Classification: 1.4D
UN #: UN0237
Meets 1.4 Criteria Does Not Meet 1.4S Criteria Failed 6(d) Test Criteria
Assigned GHS Sub-category: 2B
Failed 6(d) Test Criteria
No Violent 6(b) Test Results



Gas Generant Transport Division: 1.4C



Gas Generant

UN 6(a) Test Results

6(a) Test Criteria	Results
Mass Explosion as evidenced by:	No mass explosion
Crater at test site;	No crater
Damage to the witness plate beneath the package;	No significant change of witness plate shape
Measurement of a blast; and	No measurement of blast
Disruption and scattering of the confining material	No instantaneous scattering of most of the confining material <ul style="list-style-type: none"> • Volcano effect

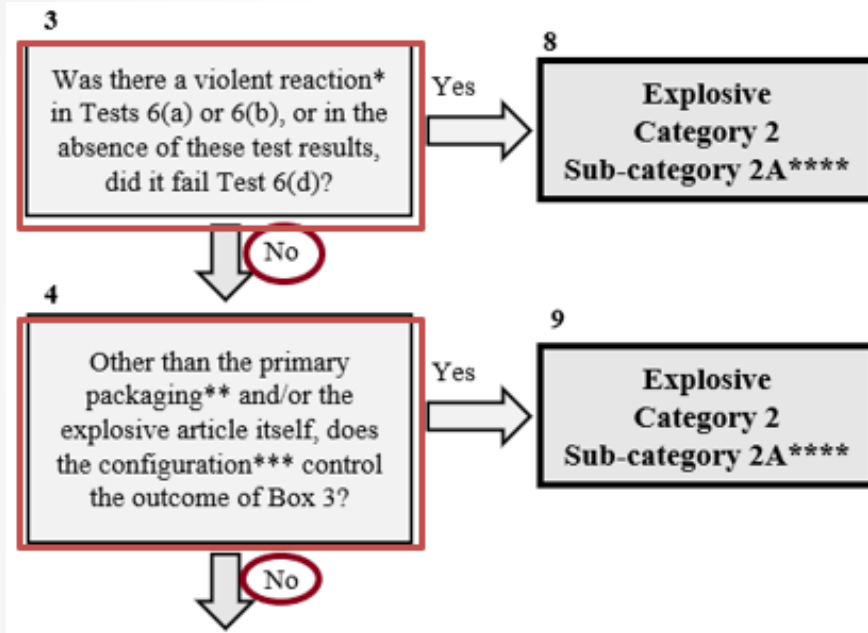


6(a) Test setup



6(a) Test

Gas Generant



The "configuration" does not control outcome of Box 3

Primary Packaging

Gas Generant

PATH TO DETERMINING GHS CATEGORY 2 SUB-CATEGORY:

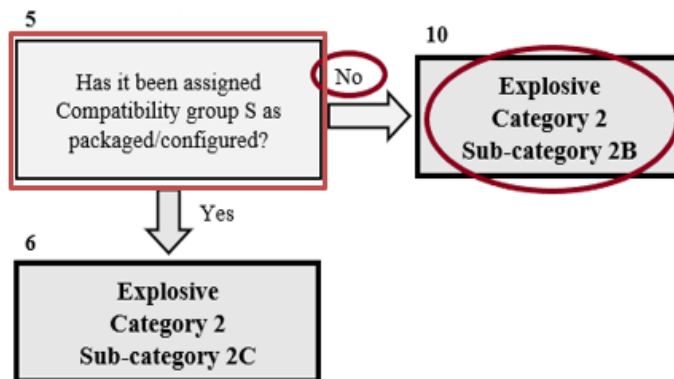
Assigned:

Transport Classification: **1.4C**

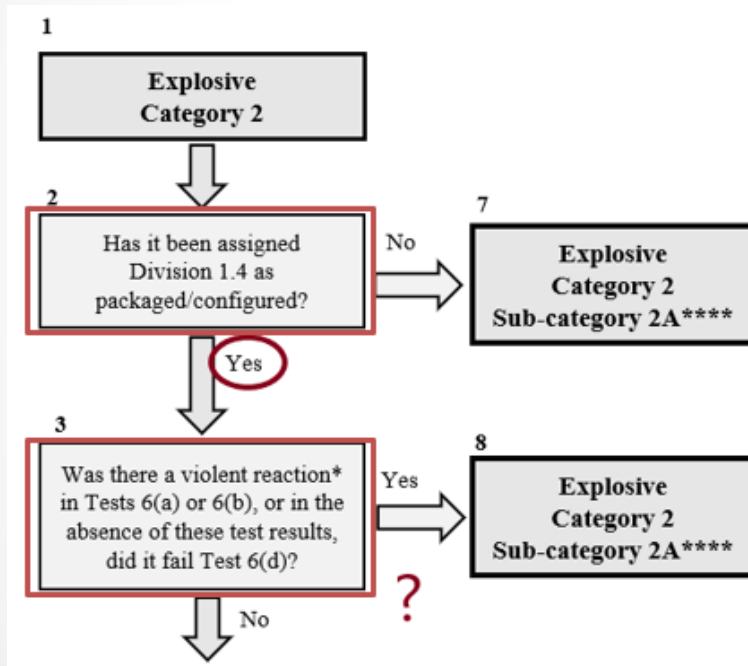
UN #: **UN0501**

Meets 1.4 Criteria
Does Not Meet 1.4S Criteria

Assigned GHS Sub-category: **2B**



Desensitized Propellant Transport Division: 1.4C



Desensitized Propellant

UN 6(a) Test Results

6(a) Test Criteria	Results
Mass Explosion as evidenced by:	No mass explosion
Crater at test site;	No crater
Damage to the witness plate beneath the package;	No significant change of witness plate shape
Measurement of a blast; and	No measurement of blast
Disruption and scattering of the confining material	<p>No instantaneous scattering of most of the confining material</p> <ul style="list-style-type: none"> • Volcano effect • A flame jet was produced reaching a diameter of approx. 2 meters wide and 7 meters high • Burned for approx. 23 seconds



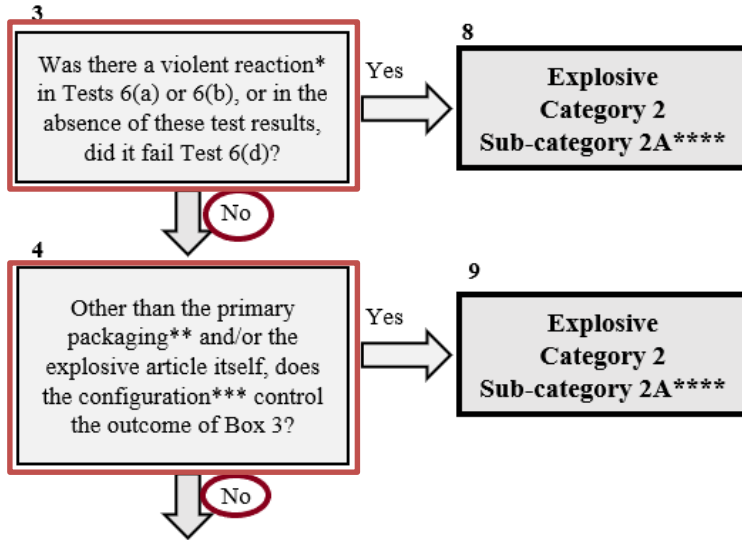
6(a) Test setup



6(a) Post-Test

Example 20

Desensitized Propellant



Redacted Image



Primary Packaging

The “configuration” does not control outcome of Box 3

Desensitized Propellant

PATH TO DETERMINING GHS CATEGORY 2 SUB-CATEGORY:

Assigned:

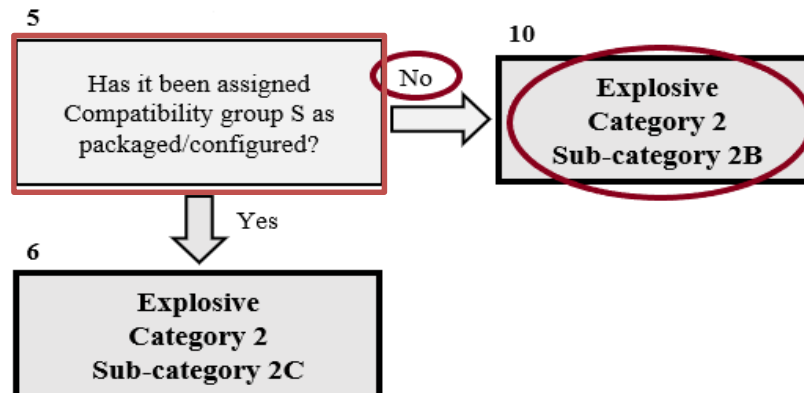
Transport Classification: 1.4C

UN #: UN0501

Meets 1.4 Criteria

Does Not Meet 1.4S Criteria

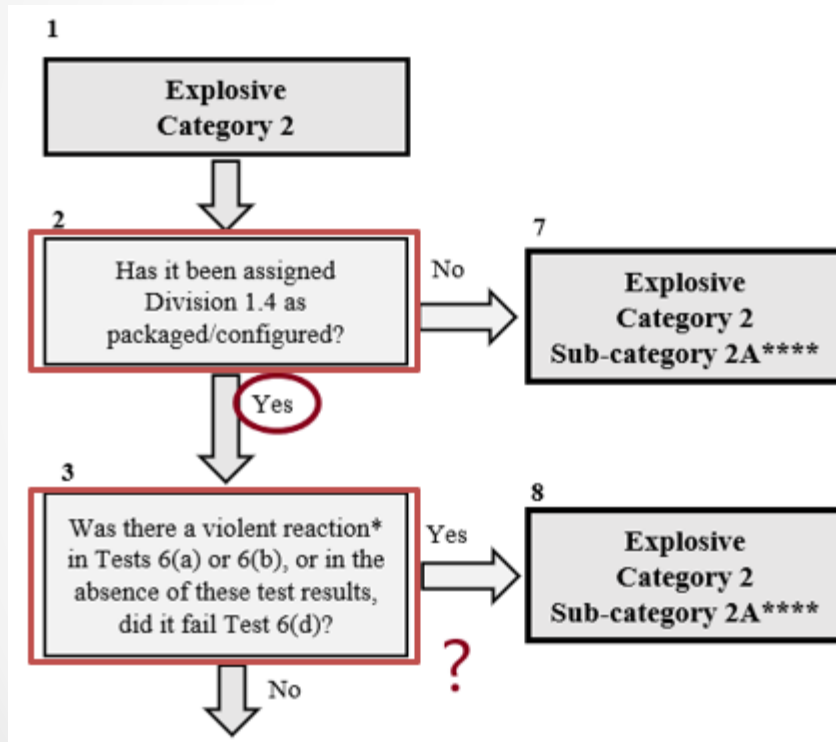
Assigned GHS Sub-category: 2B



Example 21

Smokeless Powder (5 lb. Container)

Transport Division: 1.4C



Redacted Image



Smokeless Powder (5 lb. Container)

UN 6(a) Test Results

6(a) Test Criteria	Results
Mass Explosion as evidenced by:	No mass explosion
<ul style="list-style-type: none"> Crater at test site; 	<ul style="list-style-type: none"> No crater
<ul style="list-style-type: none"> Damage to the witness plate beneath the package; 	<ul style="list-style-type: none"> No significant change of witness plate shape
<ul style="list-style-type: none"> Measurement of a blast; and 	<ul style="list-style-type: none"> No measurement of blast
<ul style="list-style-type: none"> Disruption and scattering of the confining material 	<ul style="list-style-type: none"> No instantaneous scattering of most of the confining material <ul style="list-style-type: none"> Volcano effect Outer packaging damaged



6(a) Test setup

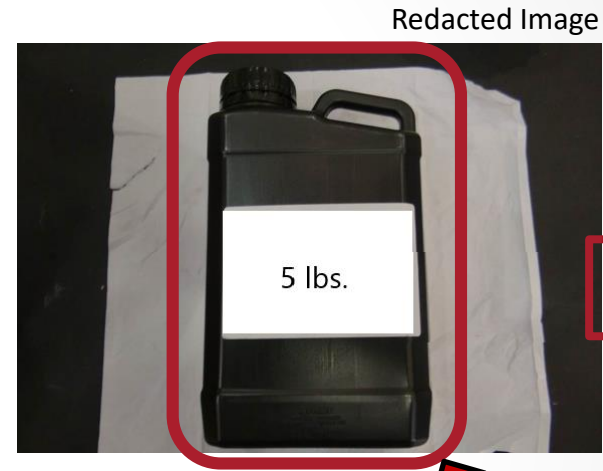
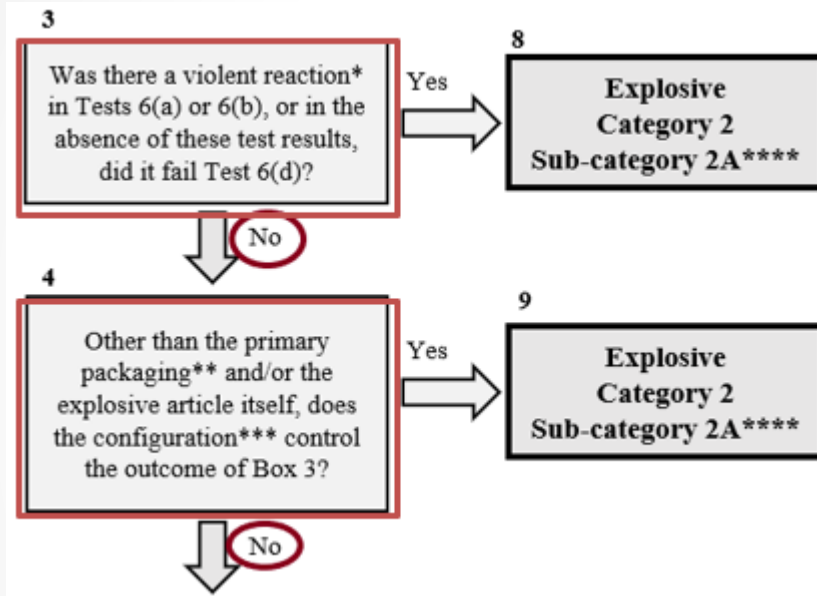
Redacted Sign



6(a) Test

Example 21

Smokeless Powder (5 lb. Container)



The "configuration" does not control outcome of Box 3

Smokeless Powder (5 lb. Container)

PATH TO DETERMINING GHS CATEGORY 2 SUB-CATEGORY:

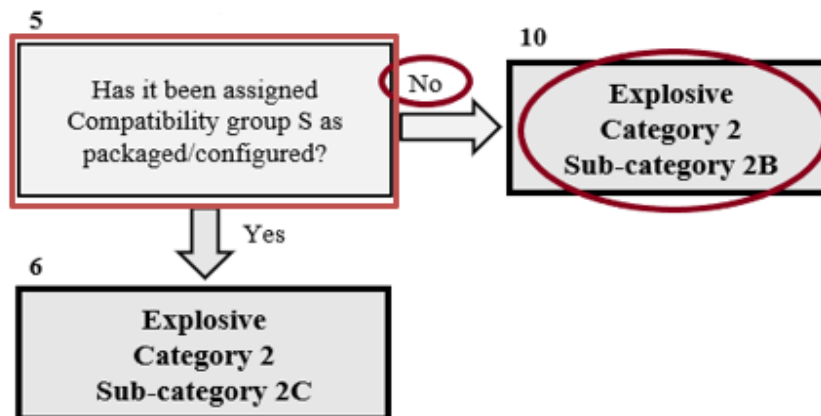
Assigned:

Transport Classification: 1.4C

UN #: UN0509

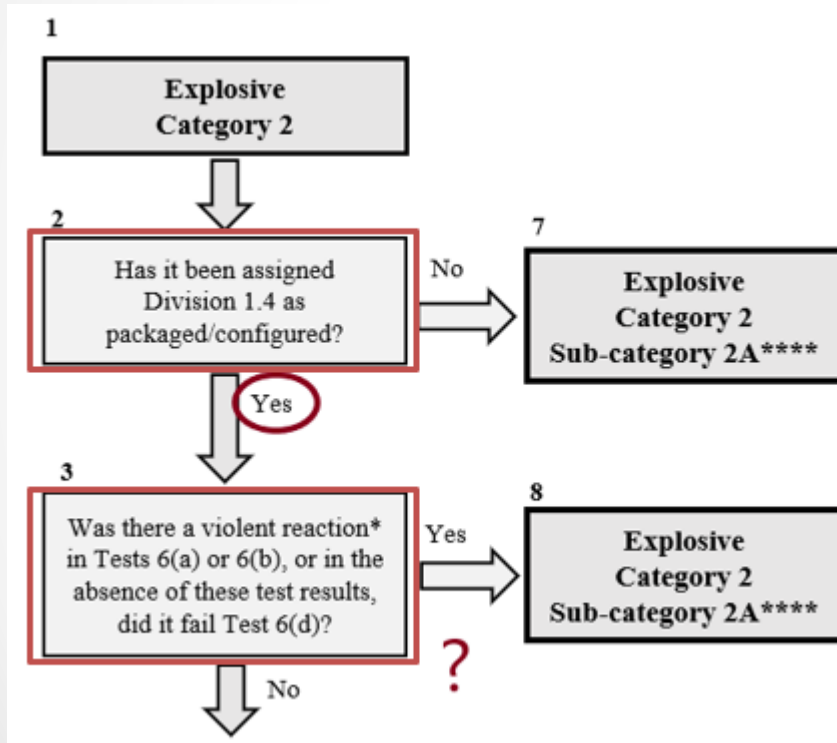
Meets 1.4 Criteria
Does Not Meet 1.4S Criteria

Assigned GHS Sub-category: 2B



Deflagrating Pellet

Transport Division: 1.4S



Redacted Image



Deflagrating Pellet

UN 6(d) Test Results (Required per SP 347)

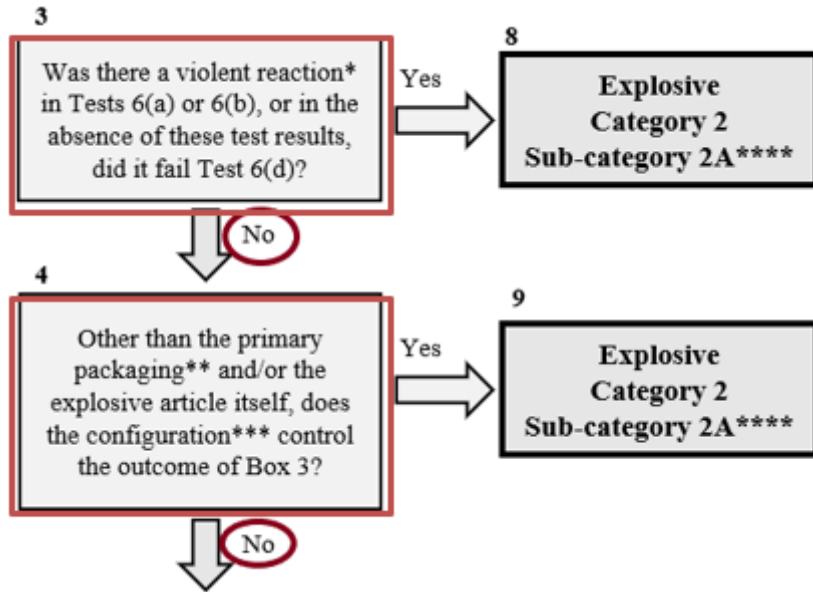
6(d) Test Criteria	Results
Hazardous effect outside the package as evidenced by:	No hazardous effect outside package
<ul style="list-style-type: none"> Denting or perforation of the witness plate beneath the package; 	<ul style="list-style-type: none"> No significant change of witness plate shape
<ul style="list-style-type: none"> A flash or flame that ignites an adjacent material such as a sheet of $80 \pm 10 \text{ g/m}^2$ paper at a distance of 25 cm from the package; 	<ul style="list-style-type: none"> No flash or flame ignited adjacent material (paper)
<ul style="list-style-type: none"> Disruption of the package causing projection of the explosives contents; or 	<ul style="list-style-type: none"> No mass propagation
<ul style="list-style-type: none"> A projection which passes completely through the packaging (a projection or fragment retained or stuck in the wall of the packaging is considered as non hazardous) 	<ul style="list-style-type: none"> No fragmentations produced



6(d) Test setup

Redacted Image

Deflagrating Pellet



Primary Packaging

The "configuration" does not control outcome of Box 3



Deflagrating Pellet

PATH TO DETERMINING GHS CATEGORY 2 SUB-CATEGORY:

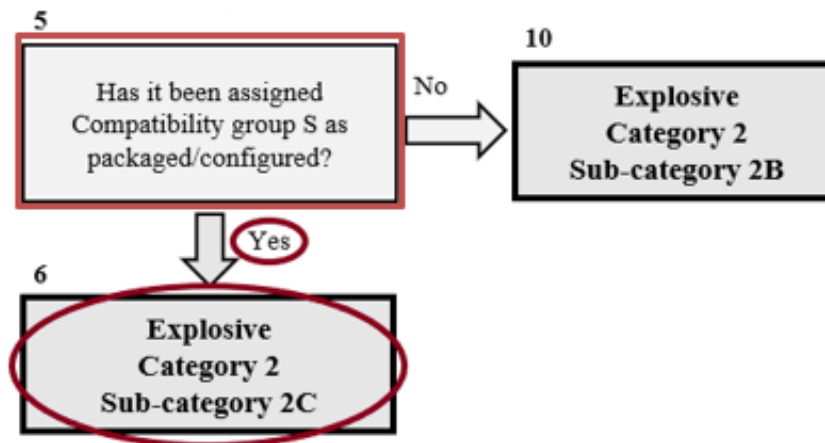
Assigned:

Transport Classification: **1.4S**

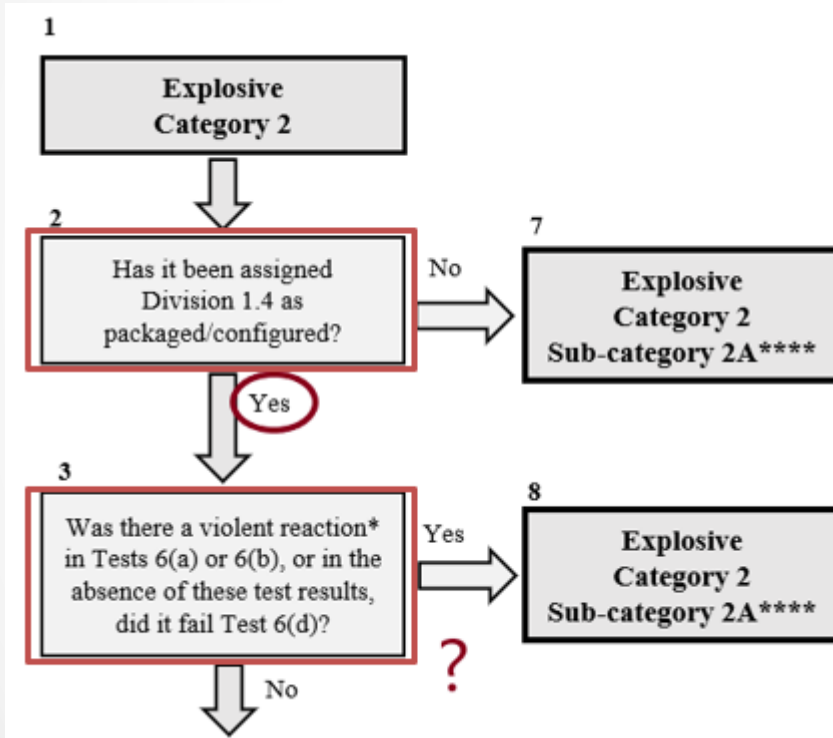
UN #: **UN00349**

Meets 1.4 Criteria
Meets 1.4S Criteria

Assigned GHS Sub-category: **2C**



Safe & Arm Module for Artillery Transport Division: 1.4S



Redacted Image



Safe & Arm Module for Artillery

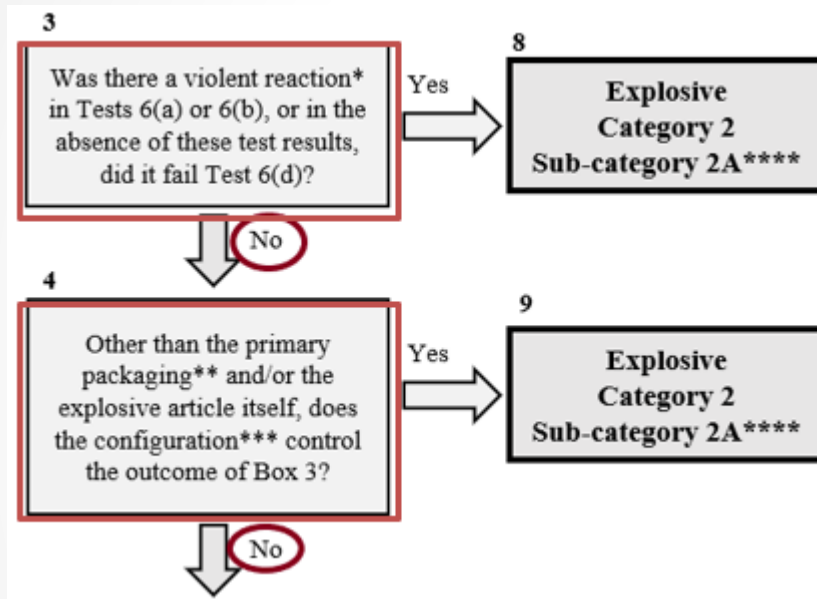
UN 6(a) Test Results

6(a) Test Criteria	Results
Mass Explosion as evidenced by:	No mass explosion
<ul style="list-style-type: none"> Crater at test site; 	<ul style="list-style-type: none"> No crater
<ul style="list-style-type: none"> Damage to the witness plate beneath the package; 	<ul style="list-style-type: none"> No significant change of witness plate shape
<ul style="list-style-type: none"> Measurement of a blast; and 	<ul style="list-style-type: none"> No measurement of blast
<ul style="list-style-type: none"> Disruption and scattering of the confining material 	<ul style="list-style-type: none"> No instantaneous scattering of most of the confining material <ul style="list-style-type: none"> Volcano effect Outer packaging damaged

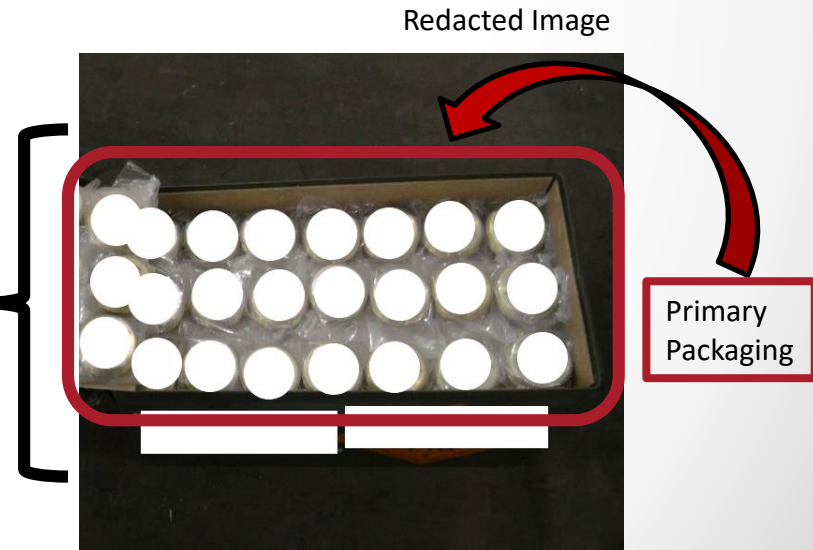


6(a) Test setup

Safe & Arm Module for Artillery



The "configuration" does not control outcome of Box 3



Safe & Arm Module for Artillery

PATH TO DETERMINING GHS CATEGORY 2 SUB-CATEGORY:

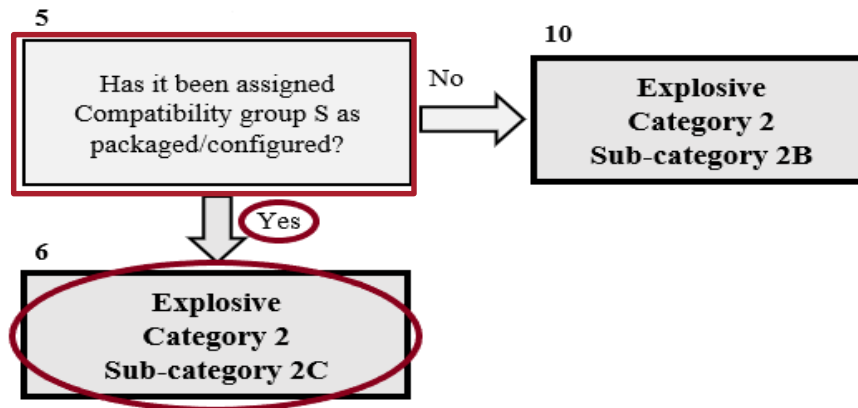
Assigned:

Transport Classification: 1.4S

UN #: UN0367

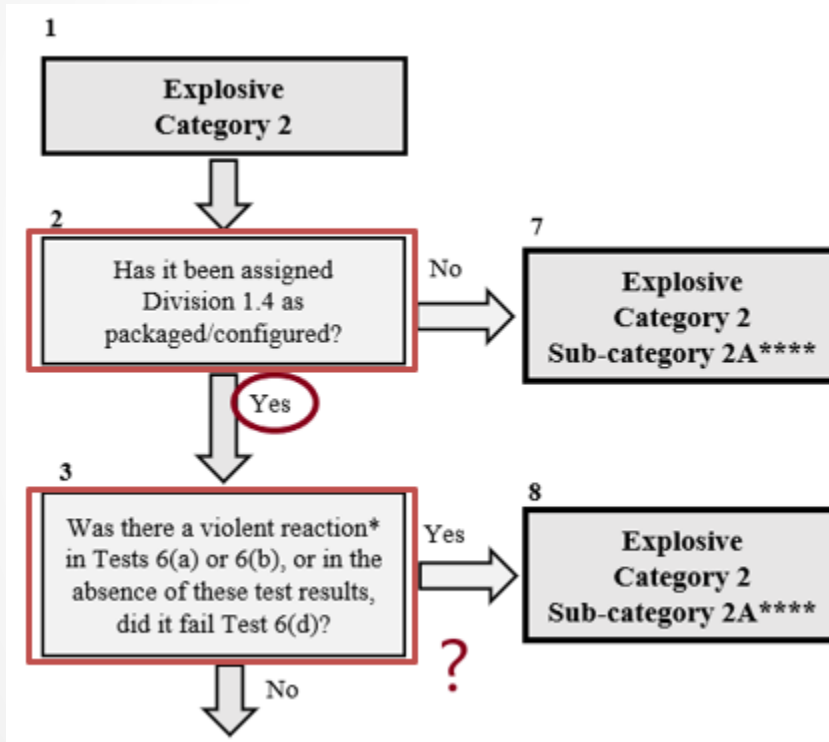
Meets 1.4 Criteria
Meets 1.4S Criteria

Assigned GHS Sub-category: 2C



Explosive Bolt

Scenario 1: Test 6(d) Only Performed Transport Division: 1.4B



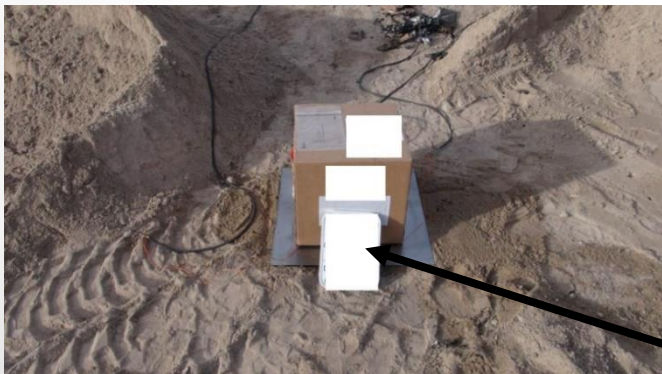
No photo provided.

Explosive Bolt

Scenario 1: Test 6(d) Only Performed

UN 6(d) Test Results (Required per SP 347)

6(d) Test Criteria	Results
Hazardous effect outside the package as evidenced by:	Hazardous effect outside package
<ul style="list-style-type: none"> • Denting or perforation of the witness plate beneath the package; 	<ul style="list-style-type: none"> • No significant change of witness plate shape
<ul style="list-style-type: none"> • A flash or flame that ignites an adjacent material such as a sheet of 80 ± 10 g/m² paper at a distance of 25 cm from the package; 	<ul style="list-style-type: none"> • No adjacent material (paper) used
<ul style="list-style-type: none"> • Disruption of the package causing projection of the explosives contents; or 	<ul style="list-style-type: none"> • No mass propagation
<ul style="list-style-type: none"> • A projection which passes completely through the packaging (a projection or fragment retained or stuck in the wall of the packaging is considered as non hazardous) 	<ul style="list-style-type: none"> • Event was not contained within the outer packaging <ul style="list-style-type: none"> • Bolt expelled from outer packaging • Bolt component logged in outer packaging



6(d) Test setup

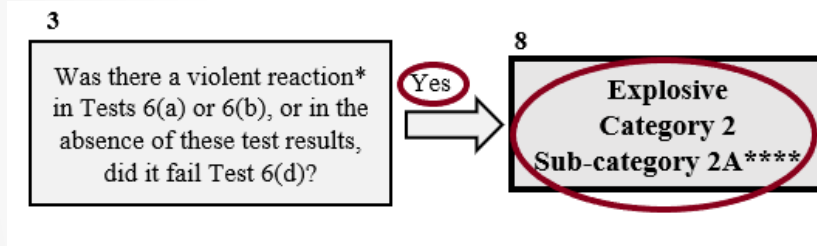
Redacted Image and Sign



6(d) Post-Test

Explosive Bolt

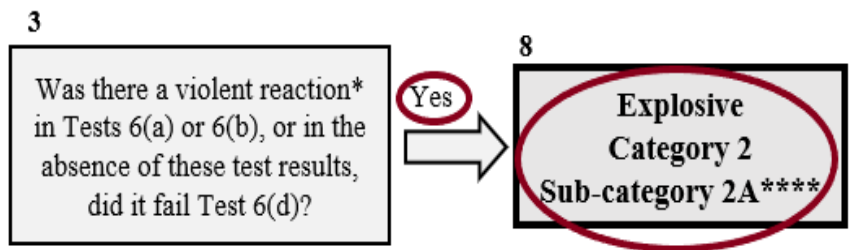
Scenario 1: Test 6(d) Only Performed



Explosive Bolt

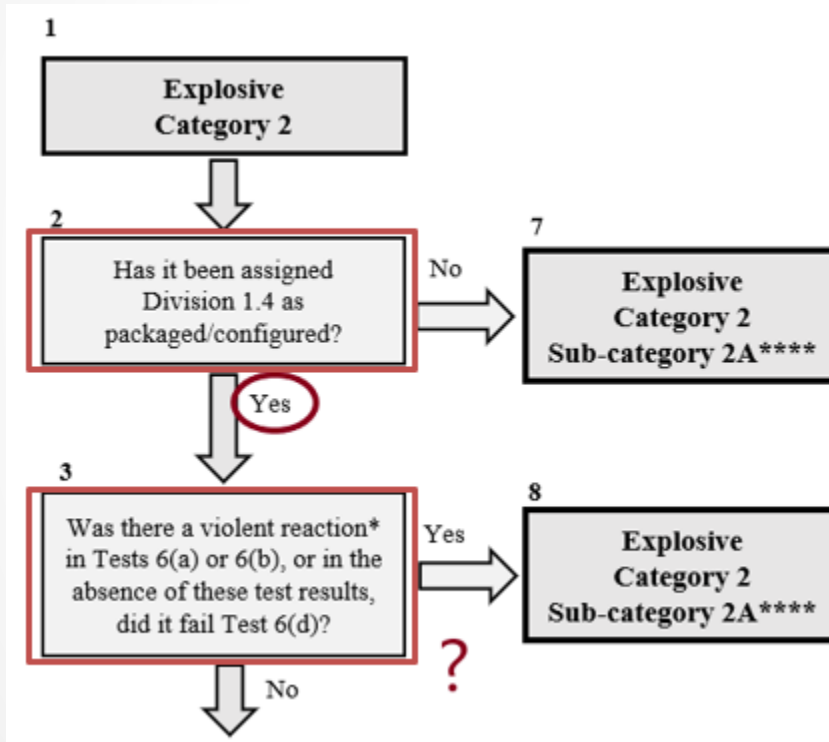
Scenario 1: Test 6(d) Only Performed

PATH TO DETERMINING GHS CATEGORY 2 SUB-CATEGORY:
Assigned:
Transport Classification: 1.4B
UN #: UN0255
Meets 1.4 Criteria Does Not Meet 1.4S Criteria Failed 6(d) Test Criteria
Assigned GHS Sub-category: 2A
Failed 6(d) Test Criteria



Explosive Bolt

Scenario 2: Test 6(d) and Test 6(a) performed Transport Division: 1.4B

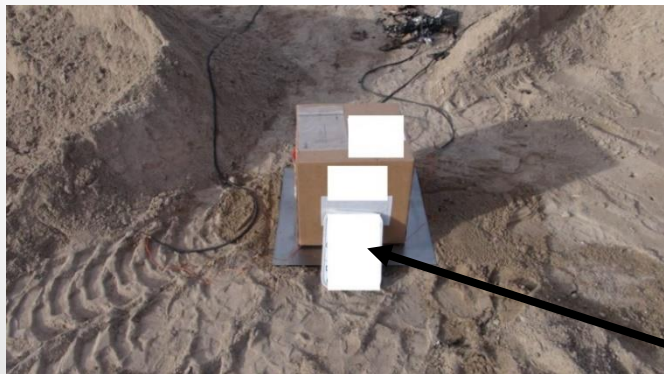


No photo provided.

Explosive Bolt

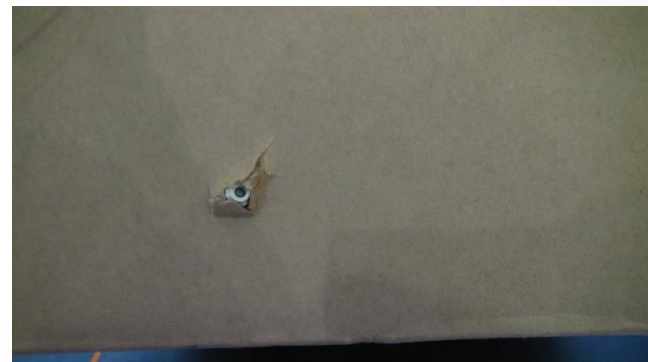
Scenario 2: Test 6(d) and Test 6(a) performed UN 6(d) Test Results (Required per SP 347)

6(d) Test Criteria	Results
Hazardous effect outside the package as evidenced by:	Hazardous effect outside package
<ul style="list-style-type: none"> • Denting or perforation of the witness plate beneath the package; 	<ul style="list-style-type: none"> • No significant change of witness plate shape
<ul style="list-style-type: none"> • A flash or flame that ignites an adjacent material such as a sheet of 80 ± 10 g/m² paper at a distance of 25 cm from the package; 	<ul style="list-style-type: none"> • No adjacent material (paper) used
<ul style="list-style-type: none"> • Disruption of the package causing projection of the explosives contents; or 	<ul style="list-style-type: none"> • No mass propagation
<ul style="list-style-type: none"> • A projection which passes completely through the packaging (a projection or fragment retained or stuck in the wall of the packaging is considered as non hazardous) 	<ul style="list-style-type: none"> • Event was not contained within the outer packaging <ul style="list-style-type: none"> • Bolt expelled from outer packaging • Bolt component logged in outer packaging



6(d) Test setup

Redacted Image and Sign



6(d) Post-Test

Explosive Bolt

Scenario 2: Test 6(d) and Test 6(a) performed UN 6(a) Test Results

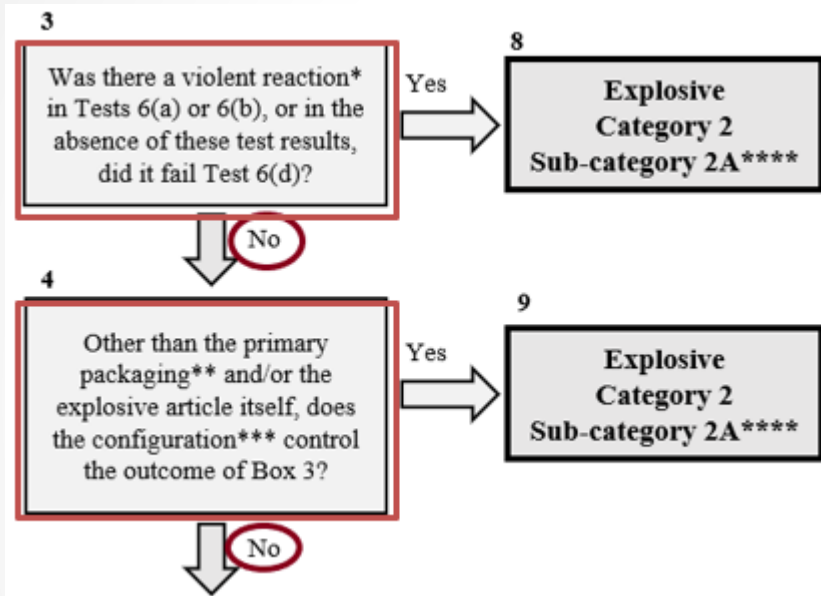
6(a) Test Criteria	Results
Mass Explosion as evidenced by:	No mass explosion
<ul style="list-style-type: none"> Crater at test site; 	<ul style="list-style-type: none"> No crater
<ul style="list-style-type: none"> Damage to the witness plate beneath the package; 	<ul style="list-style-type: none"> No significant change of witness plate shape
<ul style="list-style-type: none"> Measurement of a blast; and 	<ul style="list-style-type: none"> No measurement of blast
<ul style="list-style-type: none"> Disruption and scattering of the confining material 	<ul style="list-style-type: none"> No instantaneous scattering of most of the confining material



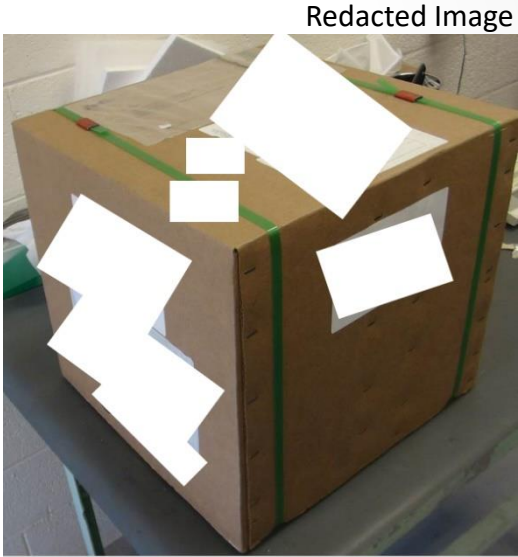
6(a) Test setup

Explosive Bolt

Scenario 2: Test 6(d) and Test 6(a) performed



The "configuration" does not control outcome of Box 3

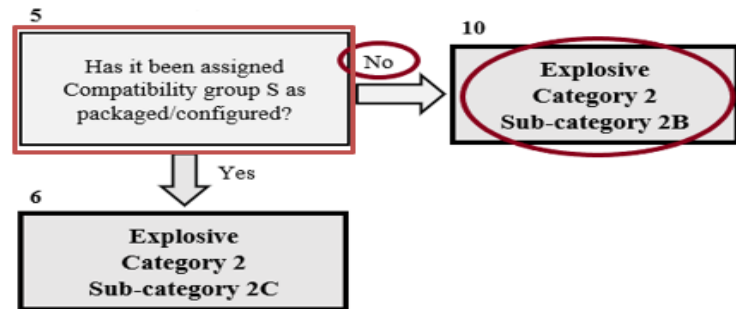


Articles are individually wrapped in plastic and are in box with no separation.

Explosive Bolt

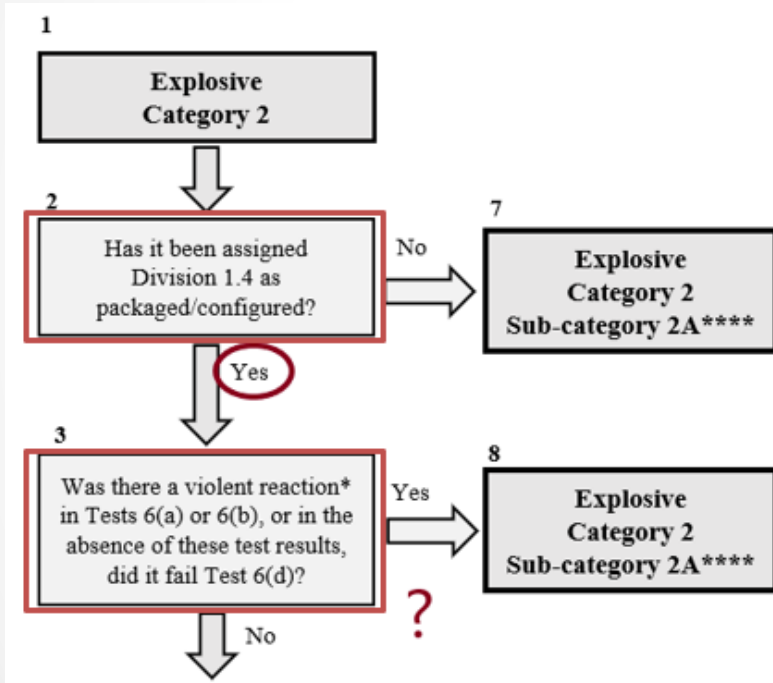
Scenario 2: Test 6(d) and Test 6(a) performed

PATH TO DETERMINING GHS CATEGORY 2 SUB-CATEGORY:
Assigned:
Transport Classification: 1.4B
UN #: UN0288
Meets 1.4 Criteria Does Not Meet 1.4S Criteria Failed 6(d) Test Criteria
Assigned GHS Sub-category: 2B
Failed 6(d) Test Criteria
No Violent 6(a) Test Results



Desensitized Flare Composition

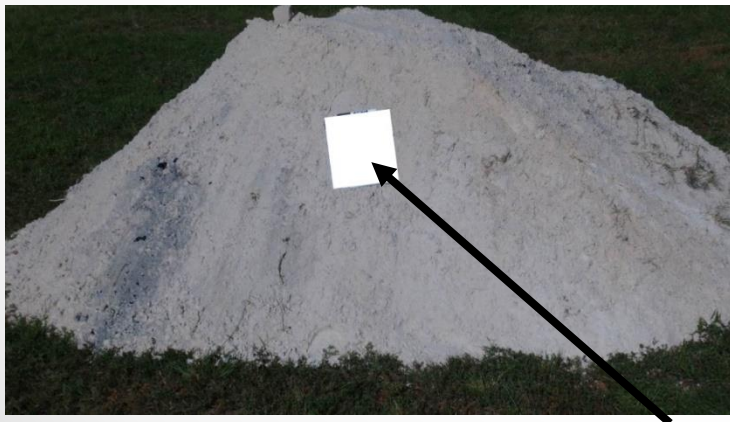
Transport Division: 1.4G



Desensitized Flare Composition

UN 6(a) Test Results

6(a) Test Criteria	Results
Mass Explosion as evidenced by:	No mass explosion
<ul style="list-style-type: none"> Crater at test site; 	<ul style="list-style-type: none"> No crater
<ul style="list-style-type: none"> Damage to the witness plate beneath the package; 	<ul style="list-style-type: none"> No significant change of witness plate shape
<ul style="list-style-type: none"> Measurement of a blast; and 	<ul style="list-style-type: none"> No measurement of blast
<ul style="list-style-type: none"> Disruption and scattering of the confining material 	<ul style="list-style-type: none"> No instantaneous scattering of most of the confining material <ul style="list-style-type: none"> Volcano effect Outer packaging slightly damaged Samples ignited and burned for 3.5 minutes



6(a) Test setup

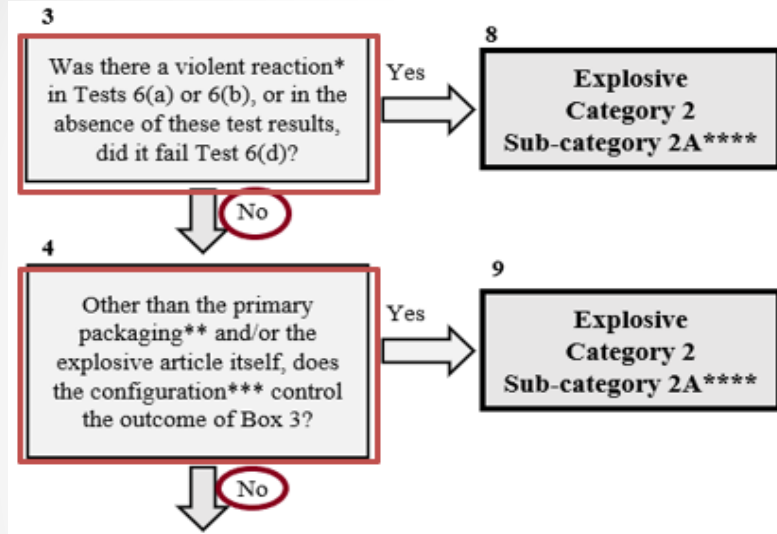
Redacted Sign



6(a) Test

Example 26

Desensitized Flare Composition



The “configuration” does not control outcome of Box 3

Primary Packaging

Desensitized Flare Composition

PATH TO DETERMINING GHS CATEGORY 2 SUB-CATEGORY:

Assigned:

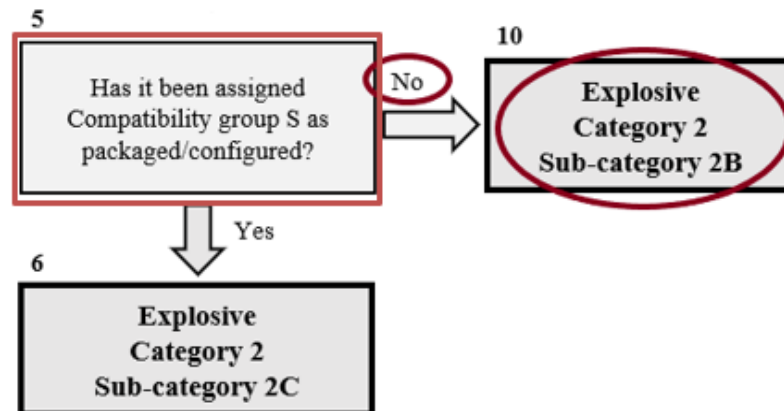
Transport Classification: **1.4G**

UN #: **UN0485**

Meets 1.4 Criteria

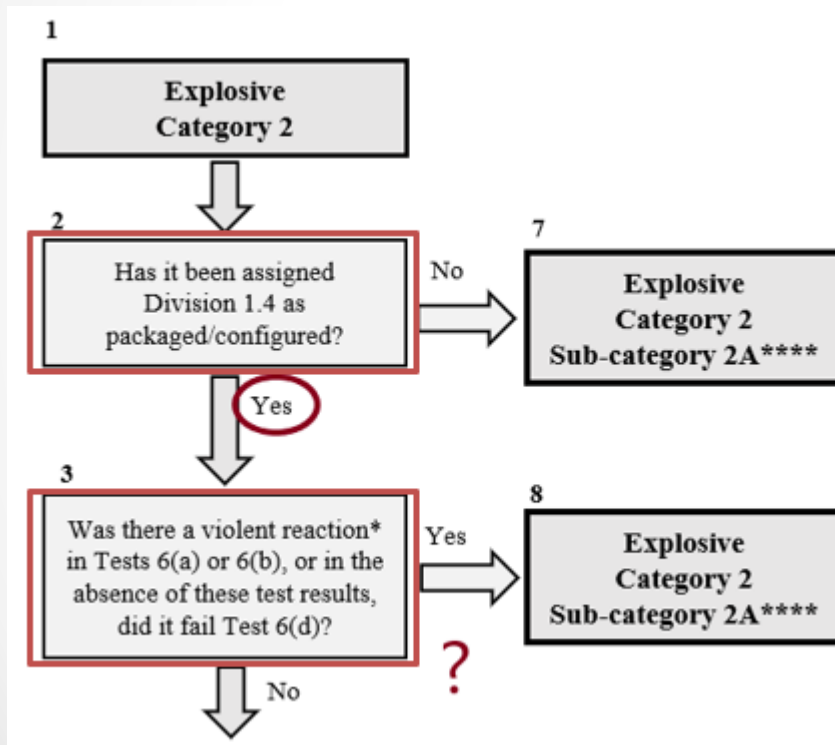
Does Not Meet 1.4S Criteria

Assigned GHS Sub-category: **2B**



Detonator

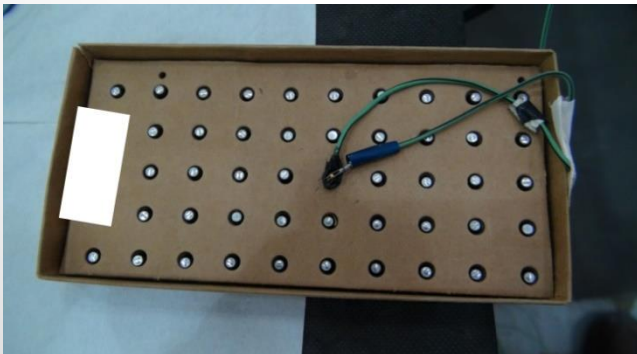
Transport Division: 1.4B



Detonator

UN 6(d) Test Results (Required per SP 347)

6(d) Test Criteria	Results
Hazardous effect outside the package as evidenced by:	No hazardous effect outside package
<ul style="list-style-type: none"> Denting or perforation of the witness plate beneath the package; 	<ul style="list-style-type: none"> No significant change of witness plate shape
<ul style="list-style-type: none"> A flash or flame that ignites an adjacent material such as a sheet of $80 \pm 10 \text{ g/m}^2$ paper at a distance of 25 cm from the package; 	<ul style="list-style-type: none"> No flash or flame ignited adjacent material (paper)
<ul style="list-style-type: none"> Disruption of the package causing projection of the explosives contents; or 	<ul style="list-style-type: none"> No mass propagation No damage to outer package Slight blackening of inner package
<ul style="list-style-type: none"> A projection which passes completely through the packaging (a projection or fragment retained or stuck in the wall of the packaging is considered as non hazardous) 	<ul style="list-style-type: none"> No fragmentations produced Even was completely contained in the outer package



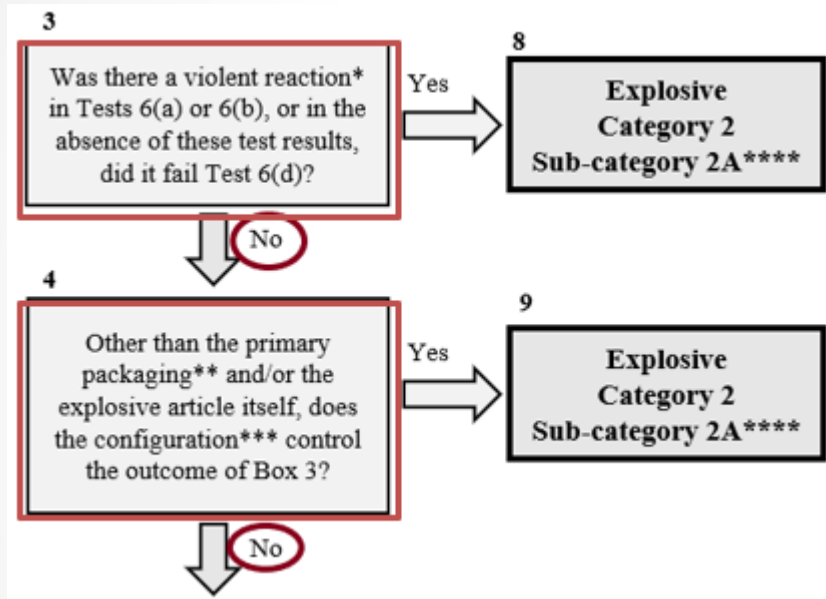
6(d) Test setup

Redacted Images



6(d) Post-Test

Detonator



The “**configuration**” does not control outcome of Box 3



Detonator

PATH TO DETERMINING GHS CATEGORY 2 SUB-CATEGORY:

Assigned:

Transport Classification: 1.4B

UN #: UN0365

Meets 1.4 Criteria

Does Not Meet 1.4S Criteria

Assigned GHS Sub-category: 2B

Must be maintained in primary packaging to maintain sub-category 2B

Manufacturer may assign high hazard sub-category 2A based on other data or considerations

