Australasian Explosives Industry Safety Group Inc.

Code of Practice

SEGREGATION BARRIERS FOR TRANSPORTING MIXED LOADS OF DETONATORS AND HIGH EXPLOSIVES

Edition 3
May 2019

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About AEISG

The Australasian Explosives Industry Safety Group (AEISG) is an incorporated association of Australasian explosives manufacturers and suppliers originally formed in 1994.

Since then, AEISG membership has grown substantially to include most of the Australasian explosives industry. A full list of all current member organisations can be found on the AEISG website, www.aeisg.org.au

The goal of AEISG is to continuously improve the level of safety and security throughout our industry in the manufacture, transport, storage, handling and use of explosives and related materials across the region.

One of the strategies adopted by AEISG in this regard is to identify areas where improved and consistent standards of operational safety and security need to be applied, and then develop appropriate codes which reflect industry best practice in these areas.

AEISG codes of practice are adopted by members for the benefit of their employees, their customers and the general community. In the interest of promoting safety and security, the codes are freely available on the AEISG website.

To keep abreast of technological advancements, industry progress and regulatory changes, AEISG Codes of Practice are subject to regular review and updated through the issue of amendments or revised editions as necessary. It is important that users ensure they are in possession of the latest edition and aware of any amendments. References to superseded versions should be updated accordingly.

The goal of AEISG is to continuously improve the level of safety throughout our industry in the manufacture, transport, storage, handling and use of, precursors and explosives in commercial blasting throughout Australasia.

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ISBN 978-1-921308-24-6

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PREAMBLE

The safe and secure transport of explosives is covered by the Australian Code for the Transport of Explosives by Road and Rail, also known as the Australian Explosives Code (AEC).

Within the AEC there is allowance for the transport of mixed loads of incompatible explosives, such as detonators and other high explosives, provided the incompatible explosives are segregated by:

(a) an effective means of segregation demonstrated to prevent sympathetic detonation of the incompatible explosives; or

(b) other means specifically approved by a Competent Authority for that purpose (Refer Section 7.3.2(5) of the AEC).

These guidelines have been developed to document and detail a suitable segregation barrier demonstrated to be effective in preventing sympathetic detonation within defined explosives loads and in minimising the risk of any communication of explosion from the detonators being transported to other high explosives on the same vehicle.

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1. PURPOSE

The purpose of this Code is to provide guidance on the design and use of a suitable segregation barrier for the transportation of mixed loads of detonators and other high explosives in accordance with the Australian Code for the Transport of Explosives by Road and Rail (AEC).

Such mixed loads of explosives have been transported safely within Australia for over 25 years and are permitted by the AEC (Section 7.3.2(5)) provided the explosives are segregated by:

(a) an effective means of segregation demonstrated to prevent sympathetic detonation of the incompatible explosives; or

(b) other means specifically approved by a Competent Authority (i.e. explosives regulatory authority having duties and powers for the transport of explosives by road and/or rail) for that purpose.

To satisfy the requirements of the first edition of the AEC (1991), a substantial program of experiments, tests and computer modeling was undertaken to design and then demonstrate the effectiveness of a suitable segregation barrier for loads of detonators and other high explosives.

An historical summary of the developmental process is provided in Appendix 1, while a summary of tests, results and conclusions is included in Appendix 2.

In developing this Code, AEISG aims to enhance the safety of its members, customers, contractors and the general community by documenting a proven and effective method of segregating detonators from high explosive loads during transport to achieve a consistent standard of blast barrier design across the industry.

2. SCOPE

This Code covers the following areas:

- specifying the types and quantities of detonators to be transported within the detonator carry box for mixed explosives loads incorporating segregation barriers specified herein (the types and quantities of high explosives in the carry box are limited by the AEC);
- the minimum design requirements for a segregation barrier positioned between the detonator and high explosive carry boxes on a vehicle transporting up to and including Category 3 explosive loads;
- the design requirements for the detonator and high explosive carry boxes additional to those already specified in the AEC;
- the configuration and attachment of the segregation barrier and the explosive carry boxes for various vehicle types (including rigid vehicle, semi-trailer, B Double);
- the conformance checking of the segregation barrier to ensure compliance with this Code; and
- the process for seeking modifications or alterations to designs contained within this Code.

This Code does not cover matters already included in, or addressed by, the AEC such as placarding, vehicle design, security, transport documentation, stowage and/or transport procedures.

This Code maintains consistency with the AEC and provides additional guidance necessary to satisfy the segregation requirements outlined in Chapter 7 of the AEC in relation to transporting detonators and other high explosives on the same vehicle.

While the segregation barrier and vehicle configurations outlined in this Code are acceptable for Category 1, 2 and 3 loads of explosives, lesser requirements may also be acceptable for Category 1 and 2 loads. In such cases reference should be made to the AEC and the relevant explosives regulatory authority.

Nothing in this Code prevents all the vehicle compartments and vehicle configurations outlined being used for the transport of either detonators or other high explosives in line with the AEC.

3. DEFINITIONS

AEC: refers to the current edition of the Australian Code for the Transport of Explosives by Road and Rail, otherwise known as the Australian Explosives Code.

BASELINE: the lowest part of the container i.e. the notional plane surface formed by the bottoms of the container twist locks.

CATEGORY: a risk category quantity of explosives as specified in Table 2.1 of the AEC.

CODE: refers to this Code of Practice, Segregation Barriers for Transporting Mixed Loads of Detonators and High Explosives unless otherwise specified.

CONSIGNOR: means a person who:

a) is named or otherwise identified as the consignor of the goods in transport documentation for the transport of the goods by road or rail; or
b) engages a prime contractor, either directly or through an agent or other intermediary, to transport the goods; or
c) has possession of, or control over, the goods immediately before the goods are transported by road; or
d) loads a vehicle with the goods, for transport by road or rail, at a place:
    i. where dangerous goods in bulk are stored; and
    ii. that is unattended (except by the driver of the vehicle) during loading.

CRISSCROSS: fixed at right angles to the preceding layer. In practical terms this means that one layer has a horizontal axis while the other has a vertical axis.

DOWNSTREAM: closer to the rear

ELEMENTED CAPS: refers to the detonator components of electric, electronic or signal/shock tube detonators prior to assembly.

ENVELOPE: in this Code envelope is used to describe the sheet steel enclosure surrounding the barrier timbers.

HAZARD DIVISION: the division to which an explosive is assigned using the criteria outlined in Addendum 1 to Appendix 2 of the AEC.

HE: High Explosives

LIGHT METAL: materials permitted by AEC3 sub-clauses 6.2(2)(a) and (c) for containment of explosives on transport vehicles, provided any steel components do not exceed 2mm thickness.

NEQ: Net explosives quantity

UPSTREAM: closer to the front.

Note: *In all cases where the words "front" or "back" are used "front" refers to the forward driving direction and "back" to the trailing direction. To avoid confusion the container ends will be referred to as the "barrier end" and the "door end".*

4. EXPLOSIVE TYPES TRANSPORTED

When the segregation barriers were being designed and tested in 1991, there was a requirement to transport a significant quantity of plain detonators. These detonators represented the worst-case scenario in that they had a potential for mass detonation. The demand for plain detonators has decreased so significantly that their transport in mixed loads is no longer required.

4.1 Detonator Carry Box

This Code is restricted to the transport of electric detonators, signal/shock tube detonators and electronic detonators of any classification up to a maximum of 10,000 detonators within the detonator carry box.

Plain detonators, elemented caps and other detonator components are not to be transported in the detonator carry box of mixed loads unless they have been packaged and classified as Hazard Division 1.4.

Note: *In accordance with the AEC (7.3.2 (7)), where all the detonators being transported are of Certification Code 1.4B or 1.4S, they may be transported on the same vehicle as other high explosives provided they are in a separate carry box or compartment from the other explosives (i.e. without a segregation barrier).*

Multi-package loads of electric, electronic and/or signal/shock tube detonator assemblies will not mass detonate, with initiation of any load likely to be spread over a significant period of time with much reduced damage potential. The elimination of plain detonators offers a significant increase in the margin of safety provided by the segregation barrier design outlined in this Code.

4.2 High Explosives Compartment

There is no restriction on the types and quantities of explosives to be transported within the high explosives compartments, other than those outlined within the AEC.

5. SEGREGATION BARRIER DESIGN REQUIREMENTS

5.1 Design Principles

Three mechanisms that could transmit an explosion of the contents of the detonator compartment to the high explosive (HE) container were identified as follows:

- Direct shock initiation of the acceptor high explosive.
- Penetration of the barrier by shrapnel and initiation of the acceptor high explosive by impact.
- Movement of burning delay detonators from the donor to the acceptor high explosive load.

Consideration of these three mechanisms led to three accepted criteria (refer Appendix 1) by which the success of a segregation barrier design could be assessed following a “worst-case full-size demonstration blast”, namely:

(1) No shock initiation of the acceptor high explosive.

(2) No penetration of the acceptor HE container by shrapnel.

(3) No rupture compromising the structural integrity of the acceptor HE container.

The design principles identified to address each of the three criteria are tabulated below, together with a description of how the design elements have been implemented. In some cases, the same design element may address multiple criteria, albeit with different critical dimensions – for example, while an air gap of 370mm between the donor and the barrier was sufficient to meet Criterion 1, the gap had to be increased to 500mm to meet Criterion 3.

Criterion 1: No shock initiation of the acceptor high explosive

Design Principle	Implementation / Design Element
1.1 Limit the strength of blast wave impinging on the segregation barrier.	1.1.1 Limit the types and quantity of detonators carried in the detonator carry box: - no plain detonators, elemented caps or other explosive detonator components unless classified as Division 1.4; - 10,000 detonators max.(electric, electronic, signal/shock tube of any classification) 1.1.2 Air gap of at least 370mm between donor and segregation barrier. **Note:** *An increased gap of 500 mm is proposed*
1.2 Attenuate the strength of the blast wave transmitted through the segregation barrier onto the barrier end of the HE container/ compartment.	1.2.1 A segregation barrier envelope comprising of a 3mm mild steel plate / two crisscross layers of dressed hardwood, each of at least 45mm thickness/a second 3mm mild steel plate. **Note:** *Two crisscross layers of hardwood of grade F8 or better, at least 68 mm thickness each are proposed in the segregation barrier envelope to satisfy Criterion 3.* 1.2.2 Ensure the segregation barrier envelope sits on strengthened corners and frame of HE container barrier end wall.

Criterion 2: No penetration of the acceptor HE container by shrapnel

Design Principle	Implementation / Design Element
2.1 Limit the generation of primary shrapnel during the donor explosion.	2.1.1 Limit the types and quantity of detonators carried in the detonator carry box: - no plain detonators, elemented caps or other explosive detonator components unless classified as Division 1.4; - 10,000 detonators max.(electric, electronic, signal/shock tube of any classification) 2.1.2 Light construction of the particular wall of the detonator compartment that is in potential contact with the donor and that directly faces the segregation barrier. ***Note:*** *For test convenience plywood was originally used; for weather resistance and transport durability light metals as approved in AEC are preferred and do not compromise this design principle.*
2.2 Capture of the primary shrapnel.	2.2 A segregation barrier envelope comprising: - 3mm mild steel plate / two criss-cross layers of dressed hardwood, each of at least 45mm thickness/ 3 mm mild steel plate. ***Note:*** *Two criss-cross layers of dressed hardwood of grade F8 or better, each of at least 68 mm thickness are proposed to satisfy Criterion 3.*

Criterion 3: No rupture compromising the structural integrity of the HE container

Design Principle	Implementation / Design Element
3.1 Limit the strength of the blast wave impinging on the segregation barrier	3.1.1 Limit the types and quantity of detonators carried in the detonator carry box to minimise potential for mass explosion: - no plain detonators, elemented caps or other explosive detonator components unless classified as Division 1.4; - 10,000 detonators max. (electric, electronic, signal/shock tube of any classification). 3.1.2 Air gap of at least 500mm between donor explosives (detonators) and segregation barrier. 3.1.3 Light construction of detonator box to minimise internal blast reflections.
3.2 Reduce the peak horizontal velocity and the ultimate peak relative horizontal displacement of the segregation barrier imparted by the impulsive load.	3.2.1 Increase mass and rigidity of barrier by incorporating two crisscross layers each of at least 68mm dressed thickness hardwood of grade F8 or better into segregation barrier envelope. 3.2.2 Limit the types and quantity of detonators carried in the detonator carry box: - no plain detonators, elemented caps or other explosive detonator components unless classified as Division 1.4; - 10,000 detonators max. (electric, electronic, signal/shock tube of any classification)

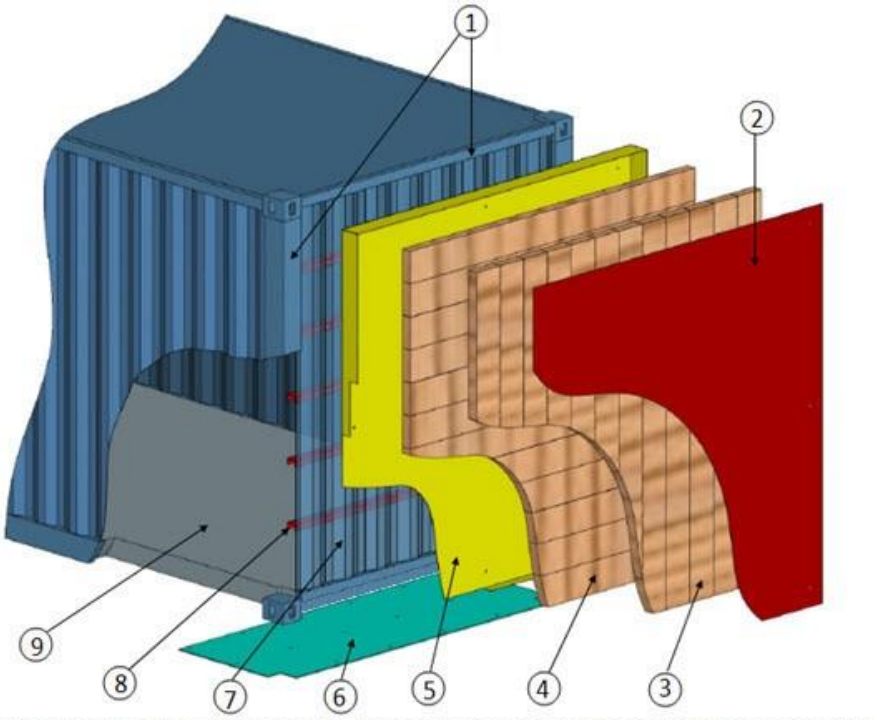
3.3 Reduce the peak horizontal velocity and the ultimate peak relative horizontal displacement of the barrier end of the HE container during energy transfer from the segregation barrier by transferring the impulsive load to the frame of the HE container.	3.3.1 Ensure the barrier extends to, and is secured to, the strengthened corner supports and frame of the barrier end wall of HE container. The steel plates of the barrier must be the full width and height of the container end wall, extending below floor level as far as practicable (i.e. to immediately above container anchor points). 3.3.2 Weld continuously the edges of the (downstream) 3mm steel plate of the segregation barrier envelope to the frame of HE container. The 3mm steel plate must be the full width and height of the container barrier end wall, extending below floor level as far as practicable (i.e. to immediately above container anchor points). 3.3.3 Attach at least five (5) horizontal 75x40 mm MS PFC channels, evenly spaced, to the inside surface of the barrier end wall of the HE container. Weld to any wall corrugations and to vertical corner supports of container frame. Channels are to be evenly spaced over the full height of the container.

3.4 Reduce the inward and upward deformation of the bottom end rail of HE container, thereby reducing access of the donor explosion products to underfloor cavity.	3.4.1 Limit the types and quantity of detonators carried in the detonator carry box to minimise potential for mass explosion: - no plain detonators, elemented caps or other explosive detonator components unless classified as Division 1.4; - 10,000 detonators max. (electric, electronic, signal/shock tube of any classification). 3.4.2 Raise centre of action of impulsive load on barrier end wall via false floor in detonator compartment at least 300mm higher than baseline. 3.4.3 Continuously weld full width 6mm thick x 900mm long mild steel plate, from the middle of the bottom structural member back at least 900mm towards the door end of the HE container. 3.4.4 Ensure bottom cover panel of HE container facing the detonator carry box is complete, e.g. any cut outs for fork lift tynes must be closed over.

5.2 Design Details

The segregation barrier arrangement effectively consists of three components, a segregation barrier, a modified HE container and an appropriately designed and/or positioned detonator carry box.

The details of a segregation barrier arrangement to meet the critical requirements described in Section 5.1 are shown in Figure 1.



VIEW FROM DETONATOR CARRY BOX SIDE - LAYERED BARRIER CONSTRUCTION SHOWN

1. - Container framing strength members.
2. - Barrier outer skin (3mm 250 grade steel plate).
3. - Vertical secondary layer of Grade 8≥ dressed hardwood (68mm x 2400mm).
4. - Horizontal primary layer of Grade 8≥ dressed hardwood (68mm x 2400mm).

Note: Vertical and horizontal layers to span between the Container framing strength members.

5. - Barrier inner skin (3mm 250 grade steel plate).
6. - Floor plate (6mm 250 grade steel plate).
7. - External metal skin of container.
8. - Five (5) 75x40mm MS PFC channels
9. - Container floor.

FIGURE 1

This design incorporates some improvements in detail over the arrangements used in the test to demonstrate that the segregation barrier would meet the requirements outlined in Section 5.1.

The differences between the design in this Code and the test barrier arrangement are discussed in Appendix 3.

The key points of the design of the segregation barrier arrangement are described in the following sections.

Note:

GENERAL: ALL WORKMANSHIP AND MATERIALS TO BE TO AUSTRALIAN STANDARDS. REMOVE ALL SLAG, SHARP EDGES AND BURRS PRIOR TO PAINTING. FLAME CUT SURFACES TO BE UNIFORM AND CLEAN BEFORE WELDING.

WELDING: TO BE IN ACCORDANCE WITH AS1554. UNSPECIFIED BUTT WELDS TO BE FULL PENETRATION, FILLET WELDS TO BE CONTINUOUS WITH SIZE EQUAL TO COMPONENT THICKNESS - 6mm MAXIMUM.

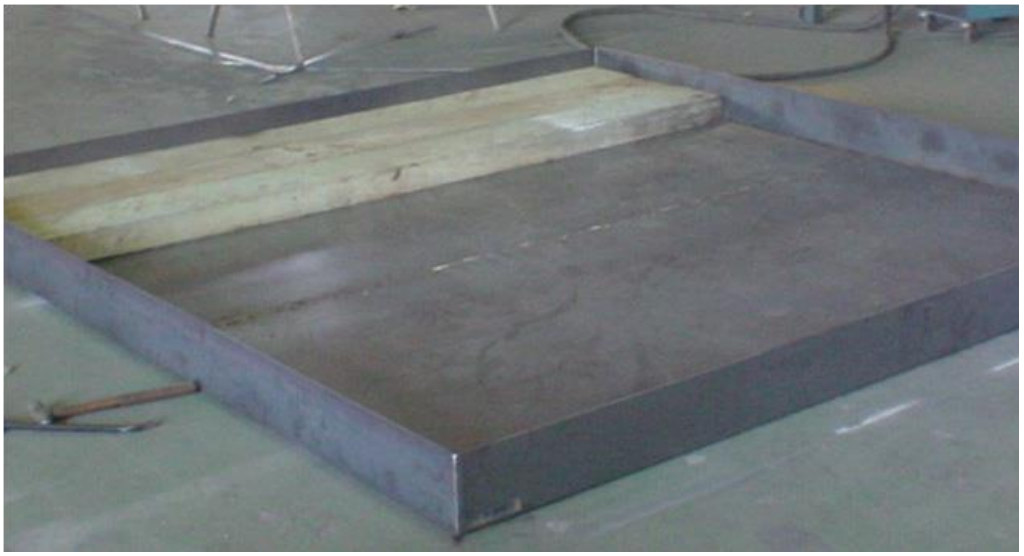
PAINTING: SURFACE PREPARATION AND TREATMENT TO BE IN ACCORDANCE WITH AS2312.

5.2.1 Segregation Blast Barrier

The segregation blast barrier consists of:

- A *3mm 250 grade* steel plate (barrier inner skin). The plate must extend from immediately above the container anchor points [twist lock blocks], as a minimum, to the top of the carry box and to the outer extremities.

  N*ote: The plate may be constructed of smaller plates welded together using a continuous weld and may contain cut-out sections for access to the lifting points on the container.*



PHOTOGRAPH 1

- Two (2) crisscross layers of dressed hardwood of grade F8 or better, extending the full height and width of the carry box, with each layer having a final dressed thickness of at least 68mm which are positioned in the barrier inner skin. Refer to Photograph 1.

  Note: *The thickness of the hardwood in the direction of any blast is the critical dimension. Normally but not essentially the width would be wider than the depth.*

- A second *3mm 250 grade* steel plate (barrier outer skin), of similar dimensions to the first. This plate is positioned immediately in front of the two layers of hardwood and welded to the barrier inner skin using a continuous weld. The two layers of hardwood are sandwiched firmly together between the inner and outer barrier skins (plates) forming a steel box like construction (envelope).

  Note: *This will provide additional rigidity to the barrier and the container, weather proofing the timber and minimising any fire contact with the timber. The timber must be in close contact with the steel plates to prevent the formation of shrapnel.*

The manufactured blast barrier is then positioned in front of the container wall and welded to the container frame strength members around all four sides using a continuous weld. The barrier is then additionally secured to the container using a minimum of nine (9) M12 bolts (refer to Figure 2).

5.2.2 High Explosives Container Modifications

The strengthening of the container to withstand a potential blast in the detonator carry box, in addition to the attached segregation barrier, is to be carried out as follows (refer to Figure 2):

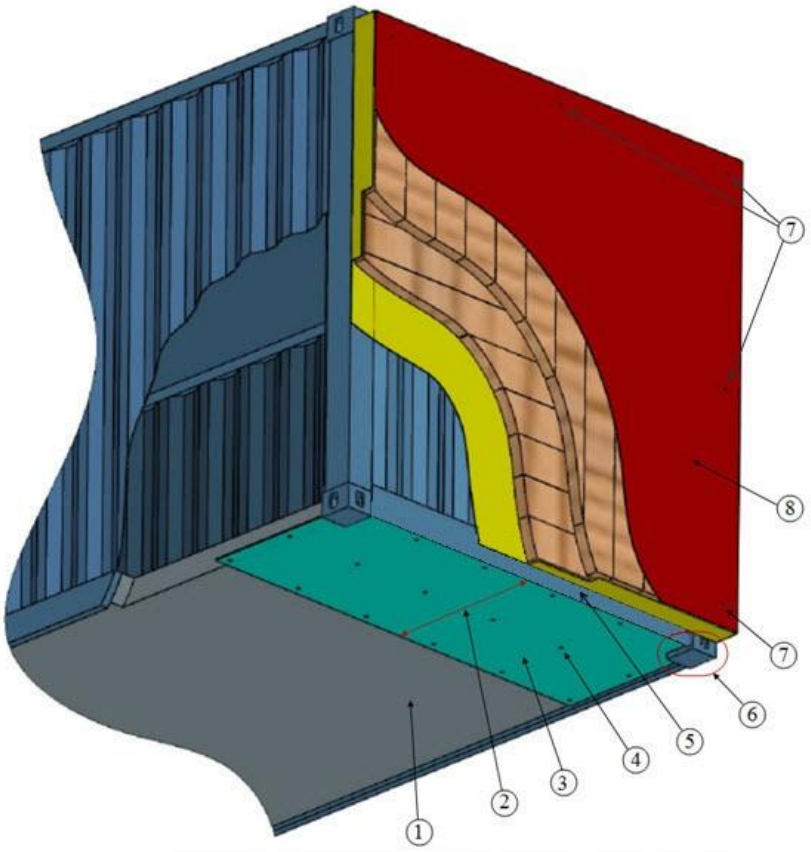
- A *6mm 250 grade* steel floor plate, secured to the underside of the container floor. The plate is to extend back from the middle of the bottom container frame strength member a minimum of 900mm from the segregation barrier. Floor plate is to be continuously welded along all sides and plug welded to the container floor support beams.

  Note: *Cut-outs in the floor plate to provide access to the container anchor points is acceptable.*

- A minimum of five (5) *75x40mm 250 grade* mild steel *PFC* channels welded horizontally across the inside of any wall corrugations and to vertical corner supports of container frame. Channels to be spaced over the full height of the container.

- Any cut outs, e.g. for fork lift tynes, above the steel plate must be closed over.

The length of the container may be modified to suit the length of the vehicle.
The container may be constructed from alternative materials of construction, provided the design complies with load strength testing requirements for restraint (longitudinal) and rigidity (longitudinal) and end loading as outlined in Australian Standard AS3711.4 - General Purpose Containers.



1. Container floor
2. Floor plate width – minimum 900mm
3. Floor plate (6mm 250 grade steel plate)
4. Floor plate to container floor support beams – plug weld locations
5. Container bottom frame strength member
6. Floor plate cut-out for container anchor points
7. Nine (9) fastener locations (M12 bolts)
8. Barrier outer skin

FIGURE 2

5.2.3 Detonator Carry Box

The critical features and construction of the detonator carry box are as follows (refer Figure 3):

- A *500mm* air-gap must be provided between the detonator load and the front of the segregation barrier.

  This may be achieved by constructing the detonator carry box separately from the segregation barrier and positioned at least 500mm from the front steel plate of the barrier. In this configuration, the detonator carry box wall facing the barrier should preferably be constructed of light metal to AEC requirements to minimise the potential for penetrating shrapnel.

  Alternatively, this may be incorporated inside the detonator compartment, by constructing an internal false wall at least 500mm from the outside wall of the detonator carry box.

  Note: *Where the 500mm air-gap is incorporated within the detonator carry box the resultant air-gap must be enclosed in such a way that it cannot be used for a storage compartment (e.g. for materials handling equipment such as rollers or pallet jacks).*

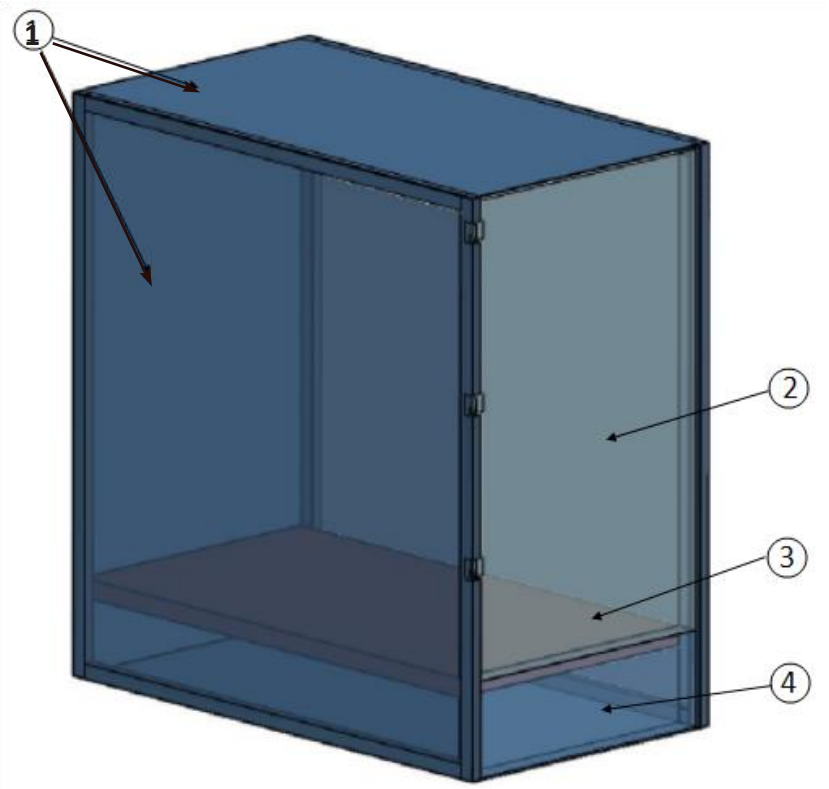
  In this configuration, the detonator carry box may be positioned right up against the segregation barrier, or indeed the front steel plate of the barrier may act as the external wall of the detonator carry box.

- The floor of the detonator compartment must be raised at least 300mm higher than the baseline of the vehicle.

  This may be done by incorporating a false floor in the detonator compartment. Alternatively, this may be achieved by positioning the detonator carry box so that its base sits at least 300mm above the baseline of the HE container.

  Note: *The height of the detonator carry box on the vehicle cannot exceed the height of the barrier.*

  The dimensions and materials of construction are otherwise non-critical, subject to satisfying Section 6.2 of the Australian Explosives Code. The construction within the air-gap should use lighter weight materials such as wood, aluminium or 2mm steel forms or sections to minimise potential for penetrating shrapnel.



DETONATOR CARRY BOX

1. External Cladding to be made from light metal.
2. Lockable access door.
3. Detonator compartment storage shelf (false or raised floor).
4. 300mm air gap under storage shelf.

FIGURE 3

6. VEHICLE CONFIGURATIONS USING SEGREGATION BARRIER

The segregation barrier may be used for carrying mixed loads of detonators and other high explosives on various vehicle types. The following guidelines outline where the detonator carry box, the segregation barrier and the HE container should be positioned on different vehicle types.

With any vehicle configuration carrying mixed loads of detonators and other high explosives, the placement of other high explosives in the detonator compartment and detonators in the high explosives compartment(s) is only permitted when all the detonators being transported have been packaged and classified as Classification Code 1.4B and/or 1.4S. In such cases a segregation barrier is not required and hence becomes irrelevant.

6.1 Rigid Vehicle

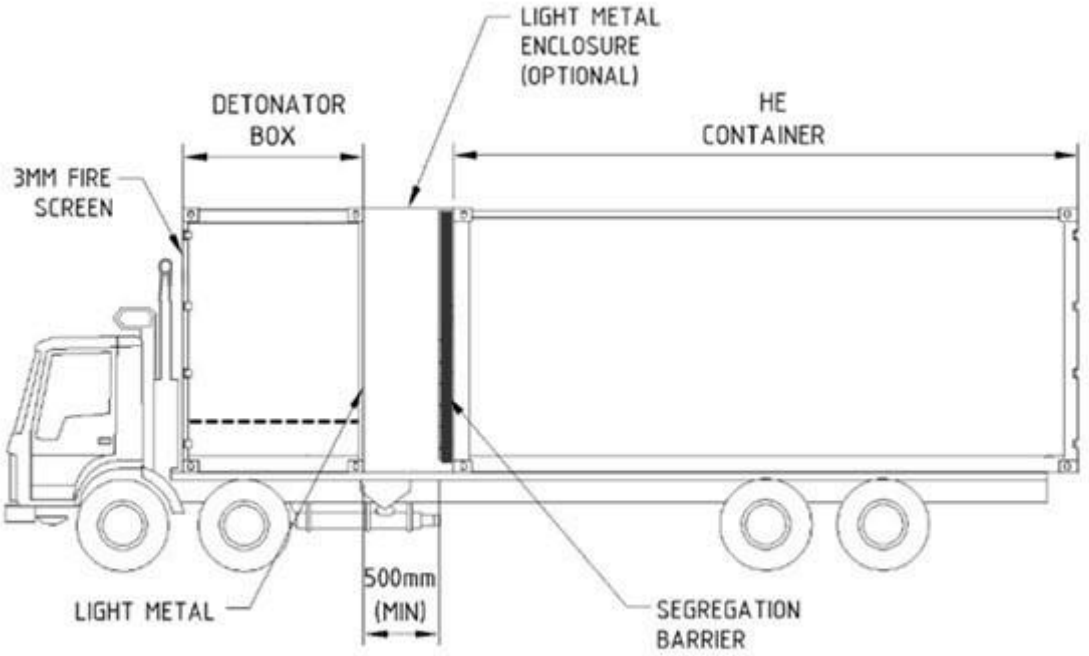
When transporting mixed loads of explosives on a rigid type vehicle, the detonator carry box is placed forward of the HE container. The HE container is placed with its barrier end facing forward towards the detonator carry box and its door end facing the rear as indicated in Figure 4.

In this arrangement, the detonator carry box may be positioned against the barrier where the 500mm spacing between the detonator load and the barrier is contained within that box. If not, the spacing between the detonator box and the barrier is 500mm minimum.

Any spacing between the detonator carry box and the barrier may be shielded or enclosed to minimise air resistance. This spacing may not be used as a storage compartment (e.g. for materials handling equipment such as rollers or pallet jacks).

However, any available spacing under the detonator carry box or under the HE container may be used for storage of handling or other equipment. Under no circumstances should the space in front of or behind the detonator box be used for storage of handling or other equipment.

For occupational health and safety reasons a retractable work platform may be fitted under the carrying compartments to reduce risks of falling from a height when loading or unloading the vehicle.



RIGID VEHICLE MIXED LOAD CONFIGURATION

FIGURE 4

6.2 Semi-Trailer Vehicle

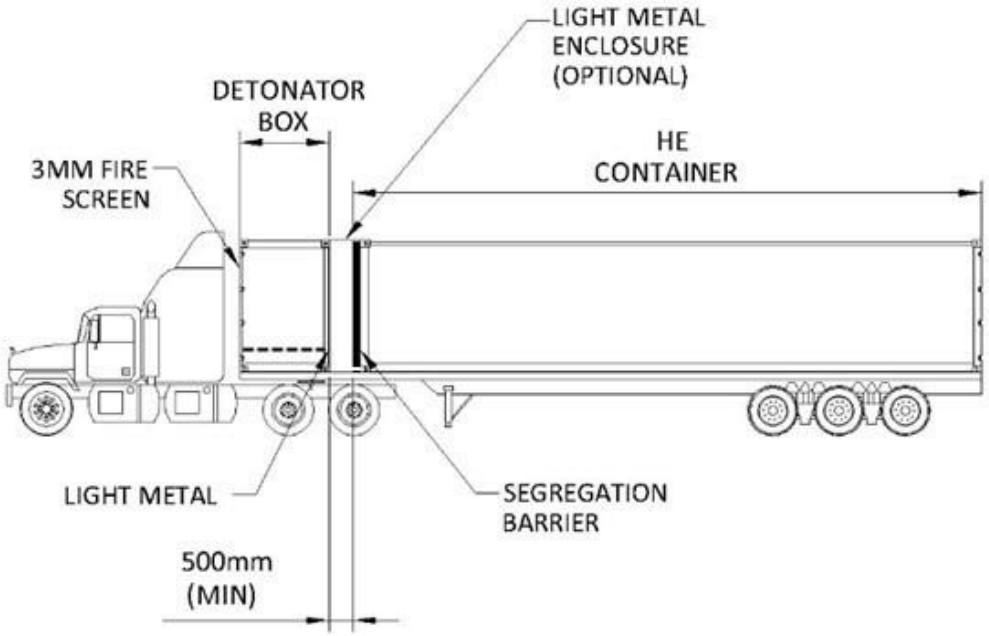
When transporting mixed loads of explosives on a semi-trailer type vehicle, the detonator carry box is placed on the trailer forward of the HE container. The HE container is placed with its barrier end facing forward towards the detonator carry box and its door end facing the rear as indicated in Figure 5.

In this arrangement, the detonator carry box may be positioned against the barrier where the 500mm spacing between the detonator load and the barrier is contained within that box. If not, the spacing between the detonator box and the barrier is 500mm minimum.

Any spacing between the detonator carry box and the barrier may be shielded or enclosed to minimise air resistance. This spacing may not be used for a storage compartment (e.g. for materials handling equipment such as rollers or pallet jacks).

However any available spacing under, the detonator carry box or under the HE container may be used for storage of handling or other equipment. Under no circumstances should the space in front of or behind the detonator box be used for storage of handling or other equipment.

For occupational health and safety a retractable work platform may be fitted under the carrying compartments to reduce risks of falling from a height when loading or unloading the vehicle.



SEMI-TRAILER MIXED LOAD CONFIGURATION

FIGURE 5

6.3 B Double Type Vehicles

When transporting mixed loads of detonators and other high explosives using a B Double type vehicle, where explosives may be located on different articulated trailers, it is important that there remains a segregation barrier in line between the detonator carry box and the HE containers.

One HE container (A) is normally positioned on the forward trailer with its barrier end facing to the rear. The detonator carry box (B) is positioned at the front of the second trailer, directly over the turntable. The second HE container (C) is positioned to the rear of the second trailer with its barrier end facing forward. The configuration is shown in Figure 6.

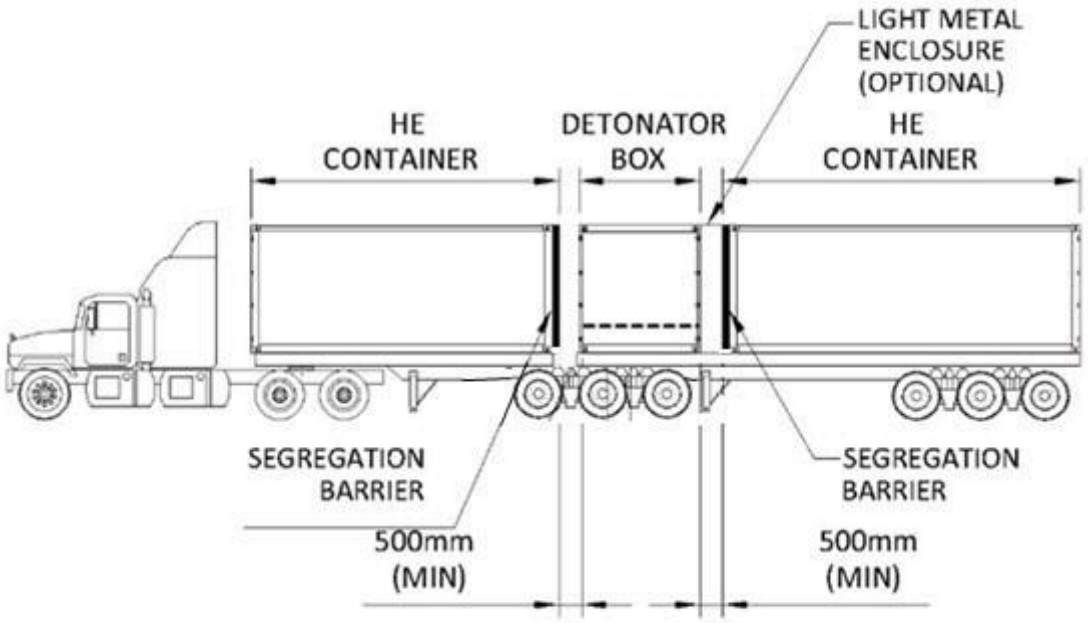
In this arrangement, the detonator carry box may be positioned against the barrier of the HE container on the second trailer where the 500mm spacing between the detonator load and the barrier is contained within that box. If not, the spacing between the detonator box and that barrier is 500mm minimum.

The spacing between the detonator carry box and the barrier of the front HE container is normally larger than required, however it too must be at least 500mm.

Any spacing between the detonator carry box and the barrier may be shielded or enclosed to minimise air resistance. This spacing may not be used as a storage compartment (e.g. for materials handling equipment such as rollers or pallet jacks).

However, any available spacing under the detonator carry box or the HE container may be used for storage of handling or other equipment. Under no circumstances should the space in front of or behind the detonator box be used for storage of handling or other equipment.

For occupational health and safety, a retractable work platform may be fitted under the carrying compartments to reduce risks of falling from a height when loading or unloading the vehicle.



B DOUBLE MIXED LOAD CONFIGURATION

FIGURE 6

When using this B Double load configuration, the following load arrangements are considered satisfactory:

FRONT HE CONTAINER	DETONATOR CARRY BOX	REAR HE CONTAINER
High Explosives	Detonators	High Explosives
Detonators	Detonators	High Explosives
High Explosives	Detonators	Detonators

7. APPLICATION OF FIRESCREENS

To satisfy AEC requirements, there must be a vertical firescreen of equivalent heat resistance to 3mm steel between the vehicle cabin and the explosives load for vehicles transporting explosives in Category 3 loads. There must also be a horizontal firescreen of not less than 3mm steel under all of the detonator carry box or enclosed vehicle body.

In most cases the horizontal firescreen is provided by the deck of the transport vehicles. If not, a horizontal firescreen must be provided to AEC requirements.

In the case of the rigid vehicle and semi-trailer configurations outlined above, the front wall of the detonator carry box may be used as the firescreen provided that it meets the requirements of the AEC. Where this is not the case, a firescreen must be fitted in accordance with the AEC.

In the case of the B Double configuration (refer Figure 6), note that the front HE container has its doors facing forward. The AEC allows this configuration only on bonneted prime movers i.e. cab-over prime movers cannot be used without a vertical firescreen.

8. CONFORMANCE ASSURANCE

8.1 General Requirements

Each segregation barrier and modified HE container assembly must:

- be individually identified;
- be checked by an independent engineer to confirm conformance with the requirements of this code;
- be covered by documentation from such engineer assuring compliance of the identified assembly with this code, as outlined in 8.3; and, such documentation shall be kept securely by the owner and passed on to any future owner as part of the sale process,
- carry a securely attached Compliance Plate, meeting the requirements outlined in 8.4.

Note 1: The objective of these requirements is to enable ready identification of the segregation barrier and HE container assembly and its compliance with this code to any relevant enquirer, including an explosives regulatory authority, an explosives consignor or a potential purchaser of the barrier assembly.

Note 2: For previously constructed segregation barriers and modified HE container assemblies, owners will need to provide satisfactory evidence of construction acceptable to the relevant regulatory authority.

8.2 Engineering Inspection Details

The engineering inspection will be required to confirm that an identified segregation barrier and HE container assembly conforms to the details prescribed in this Code and issue, and record, documentation details of such inspection. The documentation must link with the Compliance Plate attached to the segregation barrier and HE container assembly (refer 8.4).

The inspection will also require the completion of the check list in Appendix 4. It should be noted that some items will require inspection during construction. These are itemised in Appendix 4.

Example: The timber component of the barrier which will be totally enclosed in a steel envelope the grade and dimensions of the timber will need to be verified before enclosure. Also, the construction of the envelope must ensure that the timber component of the barrier is a neat fit between the steel sheets.

The completed check list must form part of the documentation maintained by the owner of the segregation barrier and HE container assembly and be available on request by any relevant party.

8.3 Documentation

Conformance documentation (including photographs, engineering report, completed checklist) must be prepared to a level of detail that enables the owner or future owners of the segregation barrier and HE container assembly to demonstrate that this code is met or exceeded. If a segregation barrier and HE container assembly changes ownership at any time the conformance documentation must form part of the ownership transfer.

8.4 Compliance Plate

Each segregation barrier and HE container assembly must be fitted with a Compliance Plate (refer Figure 7) containing at least the following information:

- the name of the manufacturer and the client;
- the date of construction;
- the unique identifying/serial number details;
- the statement of conformation with this code;
- the name, or identifying details, of the inspecting engineer or company; and,
- the date of inspection.

Compliance plates should be fitted to the front near side of any segregation barrier and HE container assembly.

HE CONTAINER WITH SEGREGATION BARRIER

MANUFACTURE:	**DGEX CONTRUCTION CO. PTY. LTD.**
DATE OF MANUFACTURE:	**MARCH 2014**
MANUFACTURED FOR:	**EXPLO TRANSPORT PTY. LTD.**
IDENTIFICATION:	**ETB106-14**
INSPECTED BY:	**ABC ENGINEERING PTY. LTD.**
DATE OF FINAL INSPECTION:	**28 MARCH 2014**
COMPLIES WITH CURRENT AEISG CODE OF PRACTICE FOR SEGREGATION BARRIERS	

Example of Compliance Plate for Segregation Barrier/HE Container Assembly

FIGURE 7

8.5 Segregation Barrier/HE Container Assemblies with Current Compliance Plates

This Code has been drawn up to ensure that design techniques utilised in currently complying and licensed mixed load vehicles are adequately documented and publicly available for reference by current and future transporters when using, designing, building and modifying vehicles intended for the transport of defined types of detonators and high explosives on the same vehicle.

9. INSPECTION OF SEGREGATION BARRIER

To ensure that the transport of explosives and detonators in the vehicle configurations described earlier remain safe and secure, a maintenance program should be implemented.

Carry boxes and other receptacles used in the transport of explosives and detonators including the segregation barriers should be visually inspected prior to each use.

In addition, these units should be inspected by a competent person as part of the organisation's preventative maintenance program on a regular basis. These inspections should be based on a defined checklist and adequate records shall be kept. An example of such a checklist is provided at Appendix 5.

Further, to satisfy obligations under the AEC (Section 8.3.2(1)), consignors of explosives should also ensure the vehicle complies with the AEC and this Code. An example of a relevant checklist which could be occasionally used by a consignor, or person loading a vehicle on behalf of a consignor, is provided at Appendix 6.

Where any deficiencies are identified, they should be rectified prior to further use.

10. MODIFICATION OF SEGREGATION BLAST BARRIER

A segregation barrier arrangement design must not differ, or be amended, in any manner from that outlined in this code.

Any new or amended segregation barrier design proposal must go through a design change approval process involving a change to this Code. A segregation barrier and explosives carry box assembly which has been modified or altered in any way will require a re-inspection and must have its compliance plate and conformance documentation updated accordingly.

APPENDIX 1 – HISTORICAL BACKGROUND

By the late 1980s most states and territories had authorised the transport of up to 10,000 detonators with other high explosives to be carried on the same vehicle in separate compartments. At this time explosives transport was controlled under individual state/territory explosives regulations as there was no national explosives transport code (the first AEC was issued in 1991).

As a consequence, across the jurisdictions there was broad variation in transport requirements as well as truck and carry box designs authorised to transport explosives by road. This included differences in the separation requirements in place at the time to enable transport of detonators and other high explosives on the same vehicle. While well intentioned, these arrangements were generally not supported by any evidentiary testing to demonstrate effectiveness and resulted in a growing level of concern within explosives regulators charged with ensuring safety for the community from the adverse effects of explosives.

The issue of incompatible explosives loads (in particular, detonators and other high explosives) and their safety was raised and discussed at an Australasian Conference of Chief Inspectors of Explosives (ACIE Conference) in Adelaide in 1988. The decision was made that, for the safety of the community, the effectiveness of the means of separation of incompatible explosives needed to be demonstrated.

Accordingly, relevant explosives industries in Australia were advised in writing as follows:

> *Decision Agenda Item 7(a) 22nd Conference llth-14th October 1988.*
>
> *After 31st December 1991, detonators shall not be carried on any vehicle containing 1000kg or more of explosive of another hazard division or compatibility group UNLESS the separation or protective mechanism has been demonstrated to effectively prevent the communication of fire or explosion from detonators to the other explosives.*

It also suggested that “an industry wide approach may be more efficient”.

A 3 year grace period was granted to provide the explosives industry sufficient time to produce the required evidence of effective separation/segregation.

At the time there was no industry wide body or association to conduct or co-ordinate such a project. ICI (now Orica) and Dyno Wesfarmers Ltd (now Dyno Nobel Asia Pacific Ltd) worked together to carry out a series of experiments and computer modelling exercises to assess the effectiveness of various segregation barrier configurations (refer Appendix 2). These experiments were designed not only to determine an effective barrier but also to get an understanding of any critical issues involved and the margin of safety that would be incorporated in a final test barrier.

The ACIE Conference subsequently agreed, in Canberra in November 1991, to success criteria for demonstrating the effectiveness of any segregation barrier in preventing fire or explosion communicating directly from the detonators to the other high explosives, namely:

- none of the receptor charges in the high explosives compartment are to be initiated;
- the high explosive container/compartment is not to be penetrated by shrapnel; and
- the integrity of the high explosive container/compartment is to be maintained so that a flying detonator could not enter the container.

These criteria were considered to address all the conceivable mechanisms by which a detonation in the detonator compartment could be communicated to the high explosive.

Following their series of trials, experiments and tests, ICI and Dyno Wesfarmers Ltd carried out full scale tests of a barrier in the presence of representatives of the Victorian, South Australian and Northern Territory explosives regulators in December 1991.

Owing to environmental and other practical difficulties with using detonators as donors the explosive donor load was supplied by 9.6Kg of cast primers configured to provide a concentrated load focused on the centre line of the detonator box. This is significantly more intense than a mass blast of the same NEQ distributed over the full height of the detonator box and vastly more intense than the same NEQ of the detonator assemblies defined in this Code.

The results of the tests easily met the above success criteria. The tests incorporated a large margin of safety and the successful outcome, combined with the experience obtained from the earlier series of trials clearly demonstrated that the proposed segregation barrier can prevent the communication of an explosion from the detonator compartment to the high explosive compartment.

It was subsequently agreed by the various state/territory Chief Inspectors of Explosives (i.e. explosives regulatory authorities) that the tested segregation barrier would meet the requirements for loads up to and including 10,000 plain detonators (close packed, high density packaging with potential for mass explosion).

Further full-scale simulated tests were also conducted by ERT [now Maxam Explosives (Australia) Pty Ltd] in October 1992 adding further to the knowledge base surrounding the effectiveness of the proposed segregation barrier design.

In 1996 the national explosives regulators agreed to the use of the segregation barrier on B Double vehicles in the configuration shown in Figure 6 of this Code (Refer 10th Explosives Competent Authority Subcommittee meeting, November 1996).

APPENDIX 2 – SEGREGATION BARRIER TESTING AND RESULTS

As mentioned earlier, up to the late 1980s there existed many different truck designs and configurations for transporting mixed loads of detonators and other high explosives. Those companies involved with the initial testing decided, sensibly, to focus on the minimum requirements for safe segregation rather than assessing the performance of the many existing and varied arrangements.

The minimum requirements for an effective segregation barrier were established as:

an explosion of the detonators within the detonator compartment should not result in:

- shock initiation of high explosives in the high explosives compartment; or
- any breach of the high explosives compartment, potentially enabling initiation of the high explosives either directly by shrapnel or by entrance of detonators into that compartment.

Essentially these same criteria were ratified by the ACIE Conference in November 1991.

To prevent the scattering of unexploded detonators during testing, an equivalent charge of boosters (PETN/TNT) was used as the donor charge in testing possible barrier arrangements. The following table indicates equivalent reaction energy levels and gas volumes produced for similar net explosives quantities (NEQ) of boosters and detonators.

Explosive	Energy (Mj)	Gas Volume (moles)
10,000 #8* Detonators	48.1	274
10 kg Anzomex Boosters	52.2	268

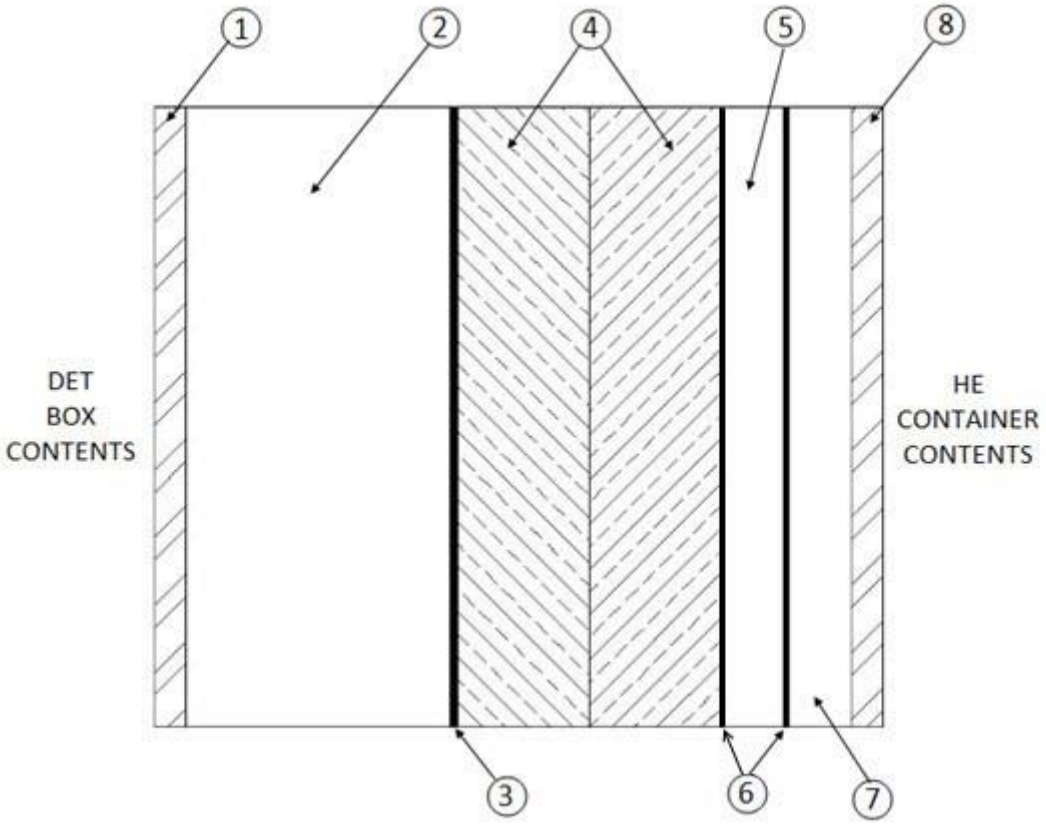
An initial series of trials was undertaken to identify a suitable barrier to prevent a mass explosion of plain detonators on one side of the barrier communicating to high explosives on the other side of the barrier.

These trials indicated that:

- a barrier of steel plates required substantial filling material between the plates to minimise penetration;
- an internal filling of hardwood between the plates, preferably in two crisscrossed layers, was more effective in providing additional support, mechanical strength and preventing shrapnel penetration;
- shrapnel production was minimised significantly by de-coupling the donor charge from the initial steel plate of the barrier;
- the initial steel plate should be in close contact with the wood filling to prevent shrapnel production and penetration;
- direct shock initiation of receptor charges through a segregation barrier of hardwood enclosed by steel plates was highly unlikely (even with donor charges up to *19.6 kg*); and,
- prevention of communication of a mass explosion of plain detonators to other high explosives using a segregation barrier was achievable.

Simulated full scale tests were also conducted in October 1991 involving the following arrangements (Figure 8):

(a) the segregation barrier consisted of two steel plates (1x3mm, 1x2mm) interspaced with two crisscross layers of hardwood (each 150mm x 50mm, i.e. total thickness 100mm);



1. 12.5mm plywood
2. 105mm air gap
3. 3mm 250 grade steel plate
4. 100mm crisscross wood layers
5. Air gap (created by corrugated container wall)
6. 2mm steel (corrugated container wall)
7. Minimum air gap 25mm
8. 12.5mm plywood.

FIGURE 8

(b) donor charge of 19.6 kg boosters, representing approximately 30,000 plain detonators or 20,000 No.8 Star detonators;

(c) donor charge had a stand-off distance of 105mm from the first steel plate of the barrier;

(d) arranged as shown;

FIGURE 9

The results of this test were significant in that an almost instantaneous detonation of approximately 19.5kg within the detonator compartment:

- did not cause shock initiation of receptor high explosives charges in the high explosives container;
- did not breach the barrier, the front steel plate of which remained intact, i.e. was not holed;
- did not enable shrapnel penetration into the high explosives container.

The intense shock of the detonation did however cause distortion of the barrier, particularly at the bottom of the barrier where the charge was focused. Further there was damage to the high explosives container, with distortion and subsequent rupturing of the inner plywood walls and wood flooring. Neither of these factors represented a failure of the established success criteria, however it was concluded that the donor charge should be reduced (representing more accurately the 10,000 detonators normally carried) and/or the high explosives container should be strengthened for future tests.

Two further simulated full scale tests were conducted in December 1991, the second of which was witnessed by observers from three explosives regulatory authorities, Victoria, South Australia and Northern Territory.

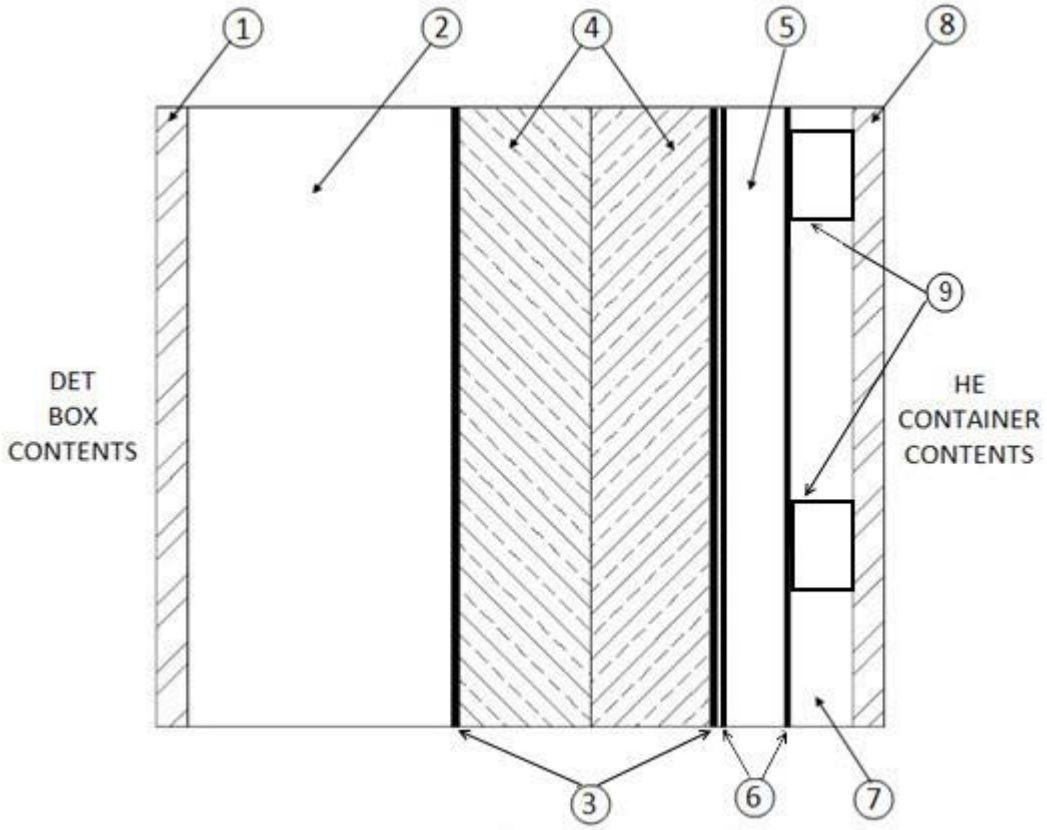
For these tests the following arrangements were included (Figure 10):

(a) the segregation barrier consisted of one steel plate (3mm) affixed to the face of the container with two crisscross layers of hardwood (each 150mm x 68mm i.e. total thickness of 136mm);

(b) the donor charge was reduced to 9.6kg to more closely represent the 10,000 detonators normally transported (Note: 10,000 plain detonators have NEQ of approximately 6.6kg, 10,000 #8 star detonators have NEQ of approximately 8.8kg);

(c) the donor charge had a stand-off distance of 500mm from the initial steel plate of the barrier (this was to further attenuate the shock wave as it travels through the air and prevent it coupling closely with the barrier);

(d) arranged as shown;



1. 12.5mm plywood
2. 500mm air gap
3. 3mm 250 grade steel plate x 2
4. 136mm crisscross wood layers
5. Air gap (created by corrugated container wall)
6. 2mm steel (corrugated container wall)
7. Minimum air gap 25mm
8. 12.5mm plywood.
9. Horizontal 75 x 45mm MS PFC

FIGURE 10

(e) The high explosives container was strengthened for these tests by:

- increasing the second steel plate to 3mm attached directly to the full face of the container;
- welding horizontal U-channels to the inside wall of the high explosives container extending to the strengthened corner steel sections;
- welding 6mm steel plate across the underneath of the barrier end of the high explosives container (across the first three floor joists, approximately 900mm).

This strengthening was to distribute the load from the detonation of the donor charge to the strong points at the edges of the container.

The results of these tests easily met the established success criteria, agreed by the ACIE Conference in November 1991, in that:

- there was no shock initiation of the high explosives receptor charges (including NG based explosives) placed in close contact with the barrier end wall of the high explosives container;
- there was no breach or penetration of the segregation barrier;
- the integrity of the high explosives container was maintained such that a flying detonator could not potentially enter that container.

The test incorporated a large margin for safety and its success, combined with the experience obtained from an earlier series of trials, clearly demonstrated that the proposed barrier can prevent the communication of a detonation from the detonator carry box to the high explosives compartment.

It was agreed by all the national explosives regulators for road transport that the tested barrier would meet the segregation requirements for loads in the detonator compartment of up to 10,000 plain detonators.

APPENDIX 3 - COMPARISON BETWEEN THE SEGREGATION BARRIER DESIGNS OUTLINED IN THIS CODE AND THE TESTED BARRIERS

The design arrangements of the segregation barrier successfully tested in 1991 are shown in Appendix 2.

There are a number of differences between the segregation barrier as tested and the barrier arrangements as outlined in this code. The differences represent improvements in the details of construction for added integrity of the barrier and improved serviceability, but do not in any way diminish the critical design elements of the barrier. They are consistent with the design principles detailed in Section 5.1.

3.1 Material of construction of detonator carry box

The tested detonator compartment was constructed as a 3mm external mild steel shell with 12mm internal plywood lining. The external mild steel shell acted as the outermost steel plate of the segregation barrier. While the outermost steel plate of the barrier remains in place, the detonator carry box is positioned at least 500mm from the barrier with the external wall, facing the barrier now constructed of a light metal sheet.

This provides two benefits:

- It reduces the potential to form penetrating shrapnel (refer to Section 5.1 Design Principles – Criterion 2).
- It reduces slightly the overall mass of the detonator compartment walls, helping to optimise Design Element 5.1.2. (refer to Section 5.1 Design Principles – Criterion 3)

3.2 Re-arrangement of barrier components

In the tested segregation barrier, the mandated 500mm air gap between the detonator load and the blast barrier was incorporated inside the detonator carry box via a false (12.5mm plywood) wall.

This required the detonator carry box to be positioned hard up against the timber layers of the barrier, such that the external 3mm steel wall of the carry box would represent the outermost steel plate of the barrier envelope (Refer to Section 5.2.1 Segregation Barrier).

It was essential for the external steel wall of the detonator carry box to be in as intimate contact as possible with the timber layers in order to minimise its possible fragmentation into high velocity shrapnel directed preferentially into the timber.

Whilst suitable for demonstration testing on the ground at Puckapunyal, such a configuration would not be expected to survive long during actual road transport, where normal flexure of the supporting truck tray would cause intermittent banging and scraping between the adjoining detonator carry box and the HE container.

This has required two allied modifications to be allowed to the segregation barrier as tested:

- The original external 3mm steel wall of the detonator carry box may be moved to become an integral part of the segregation barrier (this may also incorporate steel envelope surrounding the timber layers for added rigidity, weather proofing and minimising fire contact with the timber).
- An additional light metal sheet as per AEC, the outside of the detonator carry box, may be placed between the detonator load and the barrier. This is additional to the tested barrier. However, this sheet would be of light metal and would be at a 500mm, minimum, standoff distance from the segregation barrier. Thus, it would not form highly penetrative shrapnel.

3.3 Enclosure of wooden barrier planks by mild steel envelope.

In the original test report the method of weather proofing the blast barrier was seen as non-critical to the performance of the blast barrier. No attempt was made to weatherproof either barriers constructed for the purpose of the two full-scale trials.

This Code permits the timber layers of the segregation barrier to be totally enclosed within a 3 mm mild steel envelope, which is then welded continuously along all four edges to the frame at the barrier end wall of the HE container. This has been made possible by reassigning the upstream 3 mm steel plate from its original role as the external wall of the detonator compartment to becoming the exposed external steel wall of the segregation barrier box or envelope.

In addition to the obvious improvements in operability this is viewed as being a major improvement on the original design for three reasons. These are:

- The steel envelope of the segregation barrier provides increased overall rigidity of the barrier and, in particular, additional reinforcement of the HE container frame, thereby adding substantially to the attainment of Criterion 3 Section 5.1 Design Principles.
- The steel envelope increases the robustness of the join between all components of the blast barrier and the HE container, with the whole box (and its timber layer contents) being both continuously welded along all four edges, and being bolted, with nine (9) M12 bolts, into place against the barrier end wall of the HE container. Originally, only the downstream 3mm steel plate was welded to the HE container, with the timber layers being attached only by the six bolts, and the upstream 3mm steel plate being held in place only by the placement of the detonator carry box on the truck tray.
- The steel enveloping of the segregation barrier has enclosed the wooden planks against external fire. Originally, the wooden planks were totally exposed, and could have represented a major source of fuel fixed in close proximity to the HE container.

3.4 Nailing together of wooden planks in blast barrier.

The tested segregation barrier consisted of vertical timber planks nailed to horizontal timber planks at each crossing with one 3mm nail. In the original design, these nails provided the only means of holding the majority of the planks in place during transport (as only three horizontal and two vertical timber planks were affixed by the M12 bolts).

These nails were observed to function poorly under explosion loading, with many of the vertical planks pulling several centimetres away from the horizontal planks, and some falling off completely, during the two full-scale demonstration trials at Puckapunyal.

In this code the nails may be dispensed with and the planks held together within the steel envelope of the segregation barrier and by the M12 bolts.

This steel cladding has the added advantage of severely restricting air access to the segregation barrier timber layers in the event of a truck fire. In such cases the timber tends to “charcoal” rather than burn.

This modification is therefore viewed as being both functionally and operationally superior to the original design.

3.5 Location of restraining bolts through blast barrier.

In the previously approved segregation barrier, the six M12 steel bolts holding the timber layers in place should attach to the vertical corners of the HE container. Since these bolts were the sole means of attachment of these timber layers to the HE container, it was appropriate that they be attached to the strongest part of the HE container frame.

However, since the timber layers may now be held in place instead by the envelope, the bolts (now 9) take on two new and desirable roles. These are:

- they hold the two enclosing 3mm steel plates together in compression, acting to increase the overall rigidity of the blast barrier in accordance with Design Principle 3.2. (See Section 5.1 Design Principles Criterion 3.2); and
- they hold the barrier end wall of the HE container against the blast barrier in accordance with Design Principle 3.3. (See Section 5.1 Design Principles Criterion 3.3).

APPENDIX 4 - CONFORMANCE INSPECTION AND DOCUMENTATION

The details of a segregation barrier arrangement including the segregation barrier, modifications to the HE container and detonator carry box construction are outlined within this Code.

Any segregation barrier and HE container assembly constructed for the use of transporting mixed loads of detonators and other high explosives must be inspected by a qualified engineer to confirm conformance with this Code.

The length of the HE container is not critical and may be modified to suit the length of the vehicle.

The 500mm air gap between the detonator load and the segregation barrier may be enclosed, however it must not be used as a storage compartment (e.g. for materials handling equipment such as rollers or pallet jacks).

The key items of the segregation barrier design are detailed in the following inspection checklist. These do not include the linings or other matters which are required to meet the requirements of the Australian Explosives Code.

Depending on the precise details of construction some of the inspections will need to be carried out prior to and/or during the construction phase. These include:

4.1 Timber component

The crisscross layers of timber may be completely enclosed in a 3mm steel envelope. This has the advantages of providing additional rigidity, weather proofing the timber, keeping the barrier as a single unit and minimising fire contact to the timber components. The method of ensuring the timber is a neat fit in the envelope is illustrated in Figure 1.

An inspection must be carried out prior to sealing the steel envelope. This is to ensure that the timber is of the correct grade and dimensions, that it is a neat fit in the envelope and that the correct grade of steel is used in the barrier.

4.2 Internal bracing of the HE container

An inspection must be carried out prior to lining the container to meet the requirements of the Australian Explosives Code. This is to ensure the correct type and number of steel channels are used, they are evenly spaced and are welded to the vertical corner supports and corrugations of the barrier end wall of the HE container.

4.3 Detonator carry box air-gap (where attached to the HE container)

Construction details of the 500mm air-gap between the detonator load and the outermost steel plate of the segregation barrier must be checked to ensure there is no steel of greater than 2 mm thickness in between.

Where appropriate, photographs should be provided to verify code requirements have been met during construction.

The following checklist must be completed by the engineer conducting the conformance inspection as part of the conformance verification process.

MANUFACTURING CONFORMANCE CHECKLISTS

FOR THE DETONATOR CARRY BOX, AND THE SEGREGATION BARRIER AND THE HIGH EXPLOSIVES CONTAINER ASSEMBLY FOR TRANSPORTING MIXED LOADS OF DETONATORS AND OTHER HIGH EXPLOSIVES

DETONATOR CARRY BOX	ITEM	YES/NO
Flooring	Floor to be a minimum of 300mm above the HE container	
Air-gap	A minimum gap of 500 mm between the detonator load and the front of the segregation barrier.	
Construction material	No heavy gauge steel sections used on detonator carry box wall facing the segregation barrier.	

NAME OF PERSON INSPECTING (PRINT)…….

SIGNATURE OF PERSON INSPECTING……

DATE……..

CONFORMS WITH CODE REQUIREMENTS? YES/NO

COMMENTS: (Attach additional sheets if required)

SEGREGATION BARRIER/HIGH EXPLOSIVES CONTAINER ASSEMBLY

	ITEM	YES/NO
1. Segregation Barrier	1.1 A 3mm 250 grade steel plate welded across the barrier end of the HE container. (The plate must be welded to the strength members of the container around the four edges using a continuous weld. The plate may be constructed of smaller plates welded together using a continuous weld and may contain cut-out sections for access to the lifting points on the container.) – refer to 5.2.1.	
	1.2 Two crisscross layers of dressed hardwood of grade F8 or better with each layer having a final dressed thickness of at least 68 mm and length of 2400mm minimum. It is recommended that the full steel envelope be used to weatherproof the timber, hold it in position and minimise fire contact with the timber.	
	1.3 A second 3mm 250 grade steel plate, of similar dimensions, covering the front of the crisscross layers of hardwood timber.	
	1.4 The segregation barrier is permanently affixed (continuously welded) to the container and also bolted using nine M12 bolts, as shown in Figure 2 of this Code.	
	1.5 The segregation barrier may include cut-outs to access the container lifting points. Refer to 5.2.1	
2. HE Container	2.1 Container free of rust, splits, cracks and/or other structural defects.	
	2.2 Internal bracing on barrier end wall – 75 X 40mm MS PFC (minimum of 5) evenly spaced as in Figure 1 of this code, with welding to vertical corner supports and any corrugations.	
	2.3 A 6mm 250 grade steel plate welded to the bottom of the container from the middle of the bottom strength member of the barrier end of the HE container back at least 900mm continuously welded at the edges and with plug welds to the floor support beams. The plate can contain cut-outs to access the HE container anchor points.	

	2.4 If present, cutouts to the bottom rail of the barrier end of the HE container, for dual forklift pockets and / or for a central gooseneck, must be filled in or covered over in such a way as to restore the original strength and integrity of the bottom end rail.	

SEGREGATION BARRIER AND HIGH EXPLOSIVES CONTAINER ASSEMBLY IDENTIFICATION.....

MANUFACTURER.....

DATE OF MANUFACTURE.....

MANUFACTURED FOR.....

INSPECTING ENGINEER NAME (PRINT).....

INSPECTING ENGINEER SIGNATURE.....

DATE.....

CONFORMS WITH CODE REQUIREMENTS? YES/NO

COMMENTS: (Attach additional sheets if required)

APPENDIX 5 - MAINTENANCE CHECKLISTS

DETONATOR CARRY BOX		Date:	
ITEM		**Checked**	**COMMENTS**
1.	Floor of carry box is sealed, there are no cracks in seams and floor screws are secure and within the floor screw recess.		
2.	Internal floor is a minimum of 300mm above baseline of associated HE Container.		
3.	Doors are free from excessive rust and general wear and tear.		
4.	Door hinges show no excessive signs of fatigue or wear.		
5.	All seals on door are in good order and condition.		
6.	Check all internal walls and roof for damage, holes or exposed rivets or screws, cracks in seams.		
7.	Any placarding is in good condition and legible.		
8.	The position of detonator box on vehicle ensures a minimum air-gap of 500mm from front of associated segregation barrier.		
9.	Check any carry box lock down blocks/vehicle attachments for fatigue and weld cracks.		
10.	All external walls and roof are free from excessive rust or damage.		
11.	Check any lifting points on top of carry box for structural fatigue and weld cracks.		

Checked by: _____(Print Name)

_____(Signature)

SEGREGATION BARRIER/HE CONTAINER ASSEMBLY No……	Date:	
ITEM	**Checked**	**COMMENTS**
1. Check that floor of carry box is sealed and that there are no cracks in seams and that all floor screws are secure and within the floor screw recess.		
2. Check cross members under container for excessive rust/damage/weld fatigue.		
3. Check all internal walls and roof for damage, holes or exposed rivets or screws, cracks in seams.		
4. Check that doors are free from excessive rust and general wear and tear.		
5. Check for fatigue and wear on all door hinges.		
6. Check that all seals on door are in good order and condition.		
7. Check that EIP signs are correctly affixed to the walls and the signage is free from wear & tear and are legible.		
8. Check that placarding is in good condition and legible.		
9. Check for cracks under doors in main frame.		
10. Check that ladders are in good condition and working order.		
11. Check Blast wall for weld fatigue/rust or damage of any other kind, as well as general wear and tear.		
12. Check all lifting points on top of container for structural fatigue and weld cracks.		
13. Check all container pin lock down blocks for fatigue and weld cracks.		
14. Check compliance plate is affixed (front near side) and legible.		
15. Check that all external walls and roof are free from excessive rust or damage.		

Checked by: _____(Print Name)

_____(Signature)

APPENDIX 6 – CONSIGNOR CHECKLIST

DETONATOR CARRY BOX	**Date:**	
ITEM	**Checked**	COMMENTS
1. Carry box in general good condition, both externally and internally.		
2. Internal floor is a minimum of 300mm above baseline of associated HE Container.		
3. Any placarding is in good condition and legible.		
4. Check that position of detonator box on vehicle ensures a minimum air-gap of 500mm from front of associated segregation barrier.		
5. No equipment stored between detonator box and barrier.		
6. The location of the detonator box is appropriate for the vehicle configuration (Section 6).		
7. Detonator types being transported are appropriate (Section 4).		
8. Detonator quantities are appropriate (10,000 max.).		
SEGREGATION BARRIER/HE CONTAINER ASSEMBLY NO.		
ITEM	**Checked**	**COMMENTS**
1. Compliance plate is attached (front near side) and legible.		
2. Barrier/HE Container assembly number is supported by design/inspection documentation.		
3. Segregation barrier appears in good condition.		
4. HE Container appears in good condition, both externally and internally.		
5. EIP signs are correctly affixed to the walls or vehicle, the signage is free from wear and tear and legible.		
6. All placarding is in good condition and legible.		
GENERAL TRANSPORT CONFIGURATION		
1. Vehicular configuration is in line with Code (Section 6).		
2. Firescreen in place where necessary (Section 7).		

Checked by: _____(Print Name)

_____(Signature)

About AEISG

The Australasian Explosives Industry Safety Group (AEISG) is an incorporated association of Australasian explosives manufacturers and suppliers originally formed in 1994.

Since then, AEISG membership has grown substantially to include most of the Australasian explosives industry.

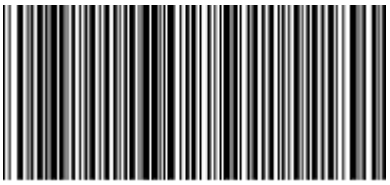
A full list of all current member organisations can be found on the AEISG website: www.aeisg.org.au.

The goal of AEISG is to continuously improve the level of safety and security throughout our industry in the manufacture, transport, storage, handling and use of explosives and related materials across the region.

One of the strategies adopted by AEISG in this regard is to identify areas where improved and consistent standards of operational safety and security need to be applied, and then develop appropriate codes which reflect industry best practice in these areas.

AEISG codes of practice are adopted by members for the benefit of their employees, their customers and the general community. In the interest of promoting safety and security, the codes are freely available on the AEISG website.

AEISG COP Segregation Barriers Ed 3



978-1-921308-24-6