



DEPARTMENT OF DEFENSE EXPLOSIVES SAFETY BOARD  
2461 EISENHOWER AVENUE  
ALEXANDRIA VIRGINIA A 22331-0600



18 APR 2004

DDESB-KT

MEMORANDUM FOR U.S. ARMY DEFENSE AMMUNITION CENTER, 1 C TREE ROAD,  
MCALESTER, OK 74501-9053

SUBJECT: Approval of Explosives Limits for NABCO SV-50 Explosive Storage Vessel

References: (a) U.S. Army Defense Ammunition Center, SJMAC-EST Memorandum, dated  
30 January 2004, Subject as above

- (b) Test Report by ABS Consulting for NABCO, Inc., dated 4 December 2003,  
Subject: 50-lb Proof Testing for the NABCO Urban Explosives Storage  
Magazine
- (c) DDESB Technical Paper 16, Revision 1, dated 1 December 2003, Subject:  
Methodologies for Calculating Primary Fragment Characteristics

The subject explosives safety submission forwarded by reference (a) has been reviewed with respect to explosives safety criteria. This submission requests approval for use of the NABCO SV-50 Explosives Storage Vessel with a reduced quantity distance (QD), based on successful testing that has been accomplished. Test results are documented in reference (b) and on test video clips provided on the compact disk forwarded with reference (b). Based on the information provided, approval is granted for use of the SV-50 for explosives storage, with a reduced QD.

The following conditions and restrictions apply to this approval:

a. Maximum Net Explosive Weight (NEW). The SV-50 is authorized for use for explosives storage up to a maximum of 50 pounds NEW of Hazard Division (HD) 1.1 or HD 1.3 or HD 1.4. Limitations apply to the storage of primary fragment generating munitions as discussed in paragraph b. below. The use of "NEW" vice "TNT or equivalent explosives" is intentional and is considered appropriate due to the successful full-scale testing of the SV-50 design at 125% over its rated 50-lb TNT capacity, with no impact on the structural integrity. In addition, the use of "NEW" vice "TNT or equivalent explosives" will simplify the management of explosives storage in the field.

b. Primary Fragment Producing Munitions Limitations. HD 1.1 or HD 1.2 munitions with diameters  $\leq$  1.6 inches (40 mm) can be stored in the SV-50 without restrictions, but subject to the NEW limitation in paragraph a. above. Munition items that have diameters greater than 1.6 inches (40 mm) are also authorized, provided only one is stored at a time and the

item's fragment properties (mass and initial velocity) have been determined and evaluated per reference (c) to insure their fragments will not penetrate the shell of the SV-50. The NEW limitation of paragraph a. above applies to these single items as well.

c. Shaped charges are not permitted to be stored within the SV-50.

d. The minimum inhabited building distance (IBD) required for the SV-50 is 20 feet measured from the front (door) of the vessel and 20 feet out to the sides (measured from the center of the door), which transitions to 5 feet directly behind the rear of the vessel. Refer to the attached figure for a pictorial of the approved IBD arc. It is recommended that DoD Components consider at their discretion a greater distance around the SV-50, in order to prevent encroachment around the magazine.

e. The only handling of explosives permitted at an SV-50 are the placement of explosives materials and items into the SV-50 or the removal of explosives material and items from the SV-50. This point cannot be emphasized enough. The required DoD explosives safety protection to surrounding areas and inhabited spaces is only provided when explosives are inside a closed and sealed SV-50. When the door to the SV-50 is opened for explosives transfer operations, there is great potential for injury and damage to surrounding areas and inhabited spaces were an accidental explosion to occur. To illustrate this point, consider that Table CT9.2 of DoD 6055.9-STD requires a 601-foot IBD arc for 50 lbs of HD 1.1 in the open. This is significantly greater than the 20-foot IBD being established around the SV-50 for explosives storage purposes. Other operations (e.g., unpackaging or packaging, breakdown, cutting, charge set-up) other than placing explosives into the SV-50 or the removal of explosives from the SV-50 shall be conducted at a location sited in accordance with DoD 6055.9-STD criteria for the material being handled.

f. A minimum 30-inch standoff distance shall be maintained between explosives materials and items stored inside the SV-50 and the nearest interior wall or door. The SV-50 must have positive design features installed to insure this minimum standoff is maintained.

g. As a potential explosion site (PES), there is no minimum required intermagazine (IM) distance from an SV-50. The door of the SV-50 shall be oriented away from entrances into other explosives storage locations, and away from surrounding occupied areas to the extent possible.

h. As an exposed site (ES), the SV-50 shall be separated from any other storage PES that does not totally contain explosives effects by K6, based on the explosives quantity in the PES. No IM separation distance is required from a storage PES that is capable of containing all effects and has been approved by the Department of Defense Explosives Safety Board (e.g., NABCO SV-23, GOLAN 10). Doors of such magazines shall not face each other.

i. The required intraline distance (ILD) is 15 feet measured from the front (door) of the vessel and 15 feet out to the sides (measured from the center of the door), which transitions to 5 feet directly behind the rear of the vessel. The door of the SV-50 shall be oriented away from nearby occupied spaces.

j. Utilities (e.g. internal lighting, IDS, security) are permitted within the vessel. A maximum of two 1/2-inch diameter utility penetrations are permitted in the SV-50, provided they are located through the bottom of the SV-50, inside the vessel's support skirt. The site submission package shall clearly describe any penetrations that are planned. Refer to reference (b) for the designer's guidance for installation of these utilities. Utilities shall comply with the requirements of Chapter 6 and 7 of DoD 6055.9-STD (e.g., hazard area classification, use of metallic piping, grounding, surge protection, 50-foot underground requirement).

k. The SV-50 has two 1/2-inch diameter openings in its roof to vent internal pressure and detonation by-products from an internal explosion. Lightweight plastic or rubber plugs are used to keep out the elements, but in the event of an internal explosion these plugs will be immediately ejected. The two roof openings provide controlled venting of internal detonation pressure. When the SV-50 is located out in the open, the venting pressure and by-products do not present a risk to personnel. This is not necessarily the case when the SV-50 is placed within a facility (e.g., pressure build-up, hazardous by-products). If an SV-50 is placed within a facility, the two roof vents shall be connected to vent pipes that lead to the exterior of the facility where the pressure and by-products can be safely vented. Refer to reference (b) for installation guidance of such a system. The vent piping shall be capable of withstanding the pressure loads that it will experience.

l. The two small openings discussed in paragraph k. above could provide potential paths for lightning current to enter the SV-50. Consequently, lightning protection in the form of an air terminal on the roof and grounding of the SV-50 shall be provided in accordance with Chapter 7 of Department of Defense (DoD) 6055.9-STD and National Fire Protection Association (NFPA) Standard 780.

m. No additional penetrations or holes, other than the two vent holes in the roof and the two utility holes in the bottom, are authorized. SV-50 users shall not attach anything to the exterior of the vessel because in the event of a detonation, these may become projectiles due to translation of internal energy from the explosion to the SV-50 wall and then on to the attached item. If required, equipment (electrical junction box, light, etc.) can be mounted internally via small tabs that are welded to the inside of the vessel wall.

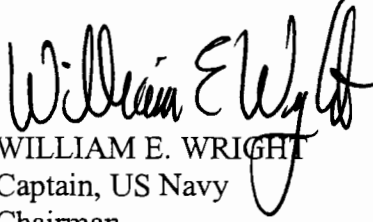
n. Each siting of an SV-50 will require DDESB review and approval prior to use.

o. Any modification to design drawings for the SV-50, without prior review/coordination/approval through this office will negate the site approval for the modified design.

p. Each SV-50 shall be labeled on its exterior, near the entrance, with the following markings "USE FOR NON-FRAGMENTING EXPLOSIVES AND DDESB APPROVED FRAGMENTING MUNITIONS ONLY" to clearly identify the type of ammunition and explosives that are permitted to be stored within the SV-50.

q. Reuse of an SV-50 following an internal explosion is not permitted.

My point of contact is Mr. Eric Deschambault, commercial phone: 703-325-1369, DSN: 221-1369; Fax: 703-325-6227; E-mail: Eric.Deschambault@ddesb.osd.mil.



WILLIAM E. WRIGHT  
Captain, US Navy  
Chairman

Attachment  
As stated

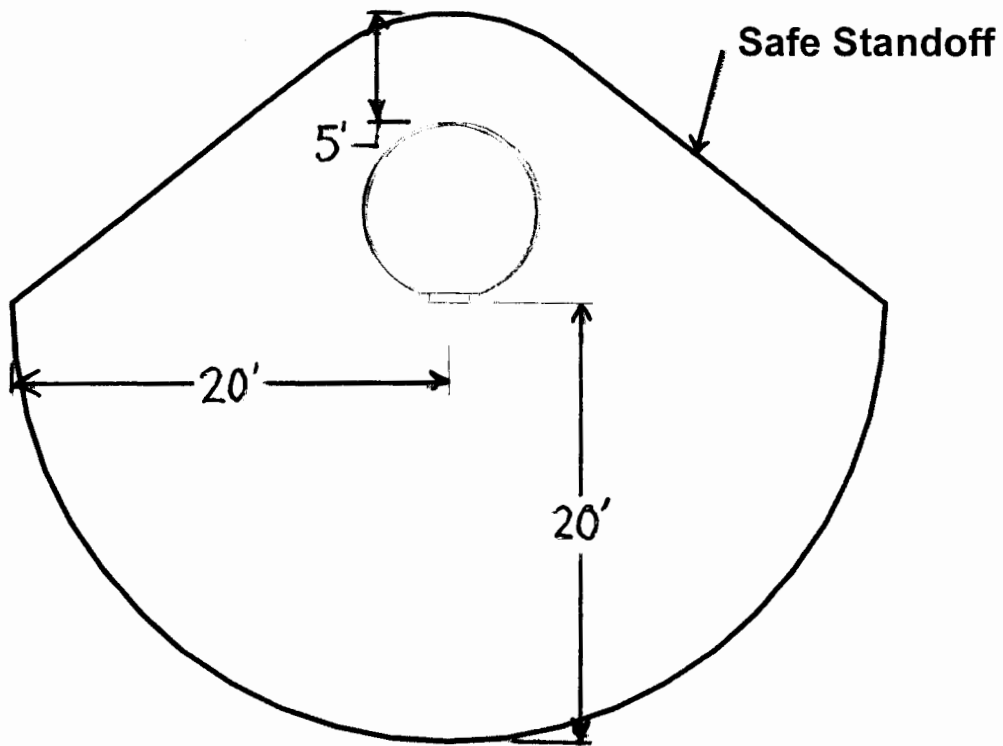
cc:

AFSC/SEW (Ms. Lea Ann Cotton)

NOSSA (N711, Mr. Gary Hogue)

MARCORSYSCOM (AM-EES, Mr. George Morrison)

NABCO, Inc., (Mr. Randy Markey), 101 Corporate Drive, Suite 205, Canonsburg, PA 15317



SV-50 Inhabited Building Distance (IBD) arc.