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बम निरोधक प्रणालियाँ — प्रदर्शन मूल्यांकन और आवश्यकताएँ

Draft Indian Standard

Bomb Disposal Systems — Performance Evaluation and Requirements

ICS 13.230

Arms and Ammunition for Civilian Use Sectional Committee, PGD 28	**Last date for Comment: 07 September 2025**

FOREWORD

The Indian Standard will be adopted by the Bureau of Indian Standards on the recommendation of the Arms and Ammunition for Civilian Use Sectional Committee and approval of the Production and General Engineering Division Council.

The Indian Armed Forces, paramilitary forces, and civilians are increasingly exposed to threats posed by unexploded bombs, improvised explosive devices (IEDs), and hand grenades, often encountered in war zones, cantonment areas, and public places. To ensure the safe handling and disposal of such hazardous items, three types of bomb disposal systems are commonly employed: Bomb Blanket, Bomb Basket, and Bomb Inhibitor.

At the time of publication of this standard, several public and private agencies across the country are engaged in the manufacturing of these systems. However, before deployment at actual disposal sites, it is essential that these systems are rigorously tested against their intended design parameters. Presently, international standards on such systems are either not publicly available or are not directly applicable to the types of threats and munitions encountered by Indian forces.

This standard has been developed to provide comprehensive guidelines for the evaluation of bomb disposal systems with respect to their performance against specified blast loads and splinter effects. It outlines the requirements for equipment, test range conditions, and procedures necessary to assess the effectiveness of these systems.

It serves as a reference for test sponsors in arranging appropriate samples for evaluation and for representatives of testing agencies conducting the assessments. The test methodology described herein

includes details on procedures, apparatus, test specimens, and other essential requirements to verify whether a bomb disposal system meets the defined performance criteria.

Specifically, the evaluation includes:

- Structural integrity, assessed through visual inspection post-testing;
- Blast mitigation capability, determined by measuring blast parameters in the surrounding area; and
- Fragment arresting efficiency, evaluated by analyzing the number of hits or perforations in the bomb disposal assembly and simulated targets such as wooden ply or MS sheets.

This standard on the subject may facilitate the following stakeholders:

a) *Manufacturer/supplier* – Design and develop the bomb disposal systems according to the requirements of the user.
b) *User* – Selection of the bomb disposal systems based on the threat perception. Evaluating effect of operating conditions on performance and evaluation of service life, positioning samples for testing etc.
c) *Testing agency* – Evaluation of minimum performance and lot certification for bomb disposal systems like bomb blanket, bomb basket and bomb inhibitor along with test methodologies and equipment to be used for evaluation.

In the formulation of this standard, considerable assistance has been derived from the following:

a) Revised Qualitative Requirements and Trial Directives for Bomb Blanket issued by National Security Guard, Ministry of Home Affairs dated 27 February 2025 vide Ref No. पी पी/604/24/389/E-135040/Bomb Blanket/संभरण (ऑर्डनेंस)/एनएसजी/1160.
b) Revised Qualitative Requirements and Trial Directives for Bomb Basket issued by National Security Guard, Ministry of Home Affairs dated 25 October 2024 vide Ref No. पी/604/23/389/ई0 124300 /बम्ब बास्केट/सम्भरण (आयुध)/मु0अ0सू0ना0/4507.
c) Trial Directives for Bomb Inhibitor, No. IV-17017/13/06-Prov.I-816, Prov. I Desk, Ministry of Home Affairs, Government of India, New Delhi dated 15.04.2014.
d) TBRL Standard Operating Procedures for Blast Evaluation of Bomb Disposal Systems. Doc. No. TBRL/BDS/SOP-1/2018.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revision*).’ The number of significant places retained in the rounded off value shall be the same as that of the specified value in this standard.

Draft Indian Standard

BOMB DISPOSAL SYSTEMS — PERFORMANCE EVALUATION AND REQUIREMENTS

1 SCOPE

1.1 This standard specifies the qualitative requirements and related test methods applicable for various types of bomb disposal systems, including bomb blanket, bomb basket and bomb inhibitor. It defines the standard procedures that are to be followed when utilizing an open-air explosion to evaluate the blast mitigation and fragment arresting capability of a bomb disposal system.

1.2 The standard is intended to be used to test complete bomb disposal systems assemblies (for example, a bomb blanket system includes the bomb blanket along with blast containment ring.) This standard and the resulting data is valid for bomb disposal systems mentioned in **1.1** and similar systems.

1.3 This standard is intended to test the blast mitigation and fragment arresting capacity of a bomb disposal system assembly. This standard pertains to the receipt of the bomb disposal system samples, selection of explosive charge and splinter types, readiness of field setup and the evaluation of bomb disposal systems against designed blast and splinter effect. It does not attempt to address all other tests required for bomb disposal systems assemblies.

1.4 Unless specified otherwise, the units specified in this standard are SI units.

1.5 The blast tests described in subsequent sections have inherent hazards, hence adequate safety norms for personnel and property must be employed while conducting the tests.

2 REFERENCES

The standards listed in Annex E contain provisions which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards listed in Annex E.

3 TERMINOLOGY

For the purpose of this standard, the following definitions shall apply:

3.1 Ambient Pressure — Pressure of air that surrounds the test specimen.

3.2 Bomb Disposal System — The bomb disposal devices are designed to withstand certain defined level of blast load, fragment and fireball effects and thus virtually reducing the risk to the surrounding areas. Bomb blanket, Bomb basket and Bomb inhibitor are various types of bomb disposal systems which have been designed for use by para-military forces when a suspected explosive device is found in public area. These are effective against shrapnel and fragments from hand grenade, small bombs, IEDs etc.

3.3 Bomb Blanket — Disposal system for emergency protection against blast & fragments in the event of an explosive device is detonated before it can be neutralized. It is quick & effective against most pipe bombs, hand grenades & fragments caused by IEDs. The bomb blanket is usually used in conjunction with a blast containment safety ring which is placed with its edge around the explosive device. The blanket is then placed over the containment safety ring and bomb. The safety ring directs the force of the blast upwards into the blanket which mitigates the blast effect and contains most of the fragments created by the explosion.

Generally, both bomb blanket and safety ring are folded into a compact and easily carried bag. A typical bomb blanket is shown in Fig. 1.

FIG 1. BOMB BLANKET

3.4 Bomb Basket — Disposal system intended to store the IED while transporting it to a safe disposal area. It provides safety to the bomb technician and public in case of accidental explosion. It is generally made of high grade composite material. It can be carried with the help of bomb transportation trailer to a safe disposal area. A typical bomb basket is shown in Fig. 2.

FIG 2. BOMB BASKET

3.5 Bomb Inhibitor — Improved alternative to the bomb blanket which does not have the ability to extinguish or reduce the fireball. The bomb inhibitor absorbs most of the effects of an explosion (given by the percentage of reduction) including blast pressure, fire effect and fragments, without causing any additional secondary fragments or secondary fire of its own body. A typical bomb inhibitor is shown in Fig. 3.

FIG 3. BOMB INHIBITOR

3.6 Peak Positive over Pressure (kPa) — Pressure jump in the blast wave front and is measured as excess pressure over the atmospheric pressure. This peak over pressure falls quasi-exponentially to atmospheric pressure. The instantaneous peak over pressure, $P(t)$ within the pressure-time curve is given by Friedlander equation:

$$P(t) = (P_{so} - P_o)\left(1 - \frac{t}{t_d}\right)e^{\frac{-kt}{t_d}}$$

Where, P_{so} is peak side-on pressure (kPa), P_o is the atmospheric pressure (kPa), k is dimensionless decay parameter, t_d (ms) is the duration of the positive phase of blast wave and t (ms) is the time measured at the instant the shock front arrives at a point of observation. At far off places from the point of explosion, the blast wave degenerates into sound wave and hence the over pressure approaches zero.

3.7 Positive Phase Duration (ms) — Duration, in milliseconds (ms) of an air blast pressure-time history, having a nearly instantaneous rise to the peak positive pressure and a quasi-exponential decay to ambient conditions. In certain conditions, a negative phase of the air blast pressure follows the positive phase.

3.8 Positive Phase Impulse (kPa-ms) — The integral of the measured positive phase peak over pressure-time history, expressed in kilopascal-millisecond (kPa-ms) gives the positive phase impulse. The pressure-time curve gives the specific impulse that is impulse per unit area and is given by the area under the pressure-time curve. Impulse depends upon peak over pressure, duration and the decay constant.

The three parameters, namely, peak over pressure, duration and specific impulse are shown in Fig. 4.

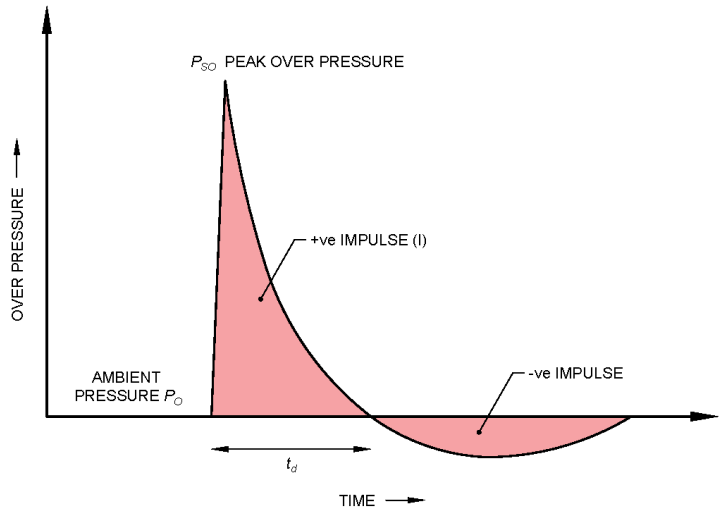


FIG 4. TYPICAL BLAST OVER PRESSURE VS. TIME PROFILE

3.9 Scaled Distance (m/kg$^{1/3}$) — Ratio of actual distance (m) to the cube root of TNT equivalent weight (kg) of the explosive considering ground reflections.

3.10 Test Agency — Party performing the testing and documenting the test results.

3.11 Test Director/Trial Officer — Individual identified by the test agency responsible to complete the specified tests as required and to document the results in accordance with this test method. The test director must sign all of the test reports.

3.12 Trial Safety Officer — Individual identified by the test agency nominated for each trial through the medium of Trial programme. The trial safety officer is responsible for all the safety aspects during the trial time and safe conduct of trials.

3.13 Test Specimen — A complete bomb disposal system assembly provided by Test sponsor for the test.

3.14 Test Sponsor — Party requesting and sponsoring the test. The test sponsor may be the end user of the bomb disposal system assembly or its manufacturer or a vendor.

3.15 Shelf Life — The minimum expected storage life, measured from the date of manufacture, during which the bomb disposal system is expected to comply with these specifications, if stored under defined conditions.

3.16 Naturally Available Earth — The naturally occurring, undisturbed ground surface at the test site, consisting of soil, sand, gravel, or other earthen materials in their native state, free from artificial coverings (such as concrete, asphalt, or synthetic mats) or significant human modification (such as leveling, compaction beyond natural settlement, or reinforcement).

3.17 TNT Relative Equivalence (TNT RE) — It is the ratio of the TNT mass to the explosive mass which generates same amount of energy under similar conditions. It is expressed as:

TNT RE = ____kg of TNT / ____ kg of explosive

4 QUALITATIVE REQUIREMENTS

4.1 Bomb Blanket

4.1.1 The Bomb Blanket shall be made with multiple layers of suitable aramid fabric or any other suitable fabric composite material and shall conform to the protection level required and then sewn into a fire retardant cover. The cover shall conform to the requirements of Category 1 fire-resistant fabric as given in IS 18931. The bomb blanket shall be water repellant up to spray rating AATCC 100 or ISO 5 when tested in accordance with IS 390.

4.1.2 The Bomb Blanket may offer protection against blast, thermal and fragmentation effect resulting from the detonation of explosives (Fragmentation test V50, min 665 m/sec or more).

4.1.3 The Bomb Blanket shall consist of an integral blast containment ring of minimum 431.8 mm or 17 inch height to deter side fragmentation discharge and to direct the force of the blast upwards. Ring shall be made of one piece without any joint.

4.1.4 The Bomb Blanket design and material used for manufacture shall permit taking X-ray of the suspected device, without being lifted.

4.1.5 The Bomb Blanket shall easily cover a suspected device of minimum size of 40cm × 30cm × 40cm without making any contact.

4.1.6 The Bomb Blanket shall provide sufficient sturdy arrangement for easy lifting and placement on suspected object. It shall have no filing or strapping of blanket while deployment. It may have an inbuilt anchor arrangement, if required.

4.1.7 Weight of Bomb Blanket shall not be more than 52 kg including blast containment ring (excluding carrying case).

4.1.8 The Bomb Blanket shall offer protection against blast, thermal and fragmentation effect resulting out of blast effect of minimum 300 gm TNT equivalent explosives along with minimum 10 percent by mass of nails/nuts as fragments for the first time use. It shall restrict the horizontal displacement of fragments. The fragment arresting capability shall be as given in Table 4b when tested as per **7.1** and **8.1.2**.

4.1.9 The shelf life of the Bomb Blanket shall be 07 years at ambient temperature from the date of manufacturing.

4.1.10 Miscellaneous: The firm shall be able to provide the following as applicable along with the equipment:

a) Cleaning kit;

b) Users hand book and technical manual giving full description of the item;
c) Literature on preservation technique; and
d) Suitable ruggedized carrying case.

4.2 Bomb Basket

4.2.1 The bomb basket shall be able to sustain blast effect of explosives for single use as mentioned below:

a) 2 kg TNT equivalent
b) 3 kg TNT equivalent
c) 4 kg TNT equivalent
d) 5 kg TNT equivalent

The user department may opt for above mentioned options of explosive quantity as per their requirement at the time of tender. Certificate/ Trial report from a national accredited lab for Bomb basket shall be provided by the OEM/Firm.

4.2.2 The weight of the bomb basket in proportion to the explosive shall be as under:

a) 2 kg TNT equivalent - Not more than 300 kg
b) 3 kg TNT equivalent - Not more than 400 kg
c) 4 kg TNT equivalent - Not more than 500 kg
d) 5 kg TNT equivalent - Not more than 600 kg

4.2.3 The volume of the Bomb Basket shall be minimum 80 liters.

4.2.4 The diameter of the opening of the Bomb Basket shall be minimum 20 inch or 508 mm.

4.2.5 The height of the Bomb Basket shall be minimum 30 inch or 762 mm.

4.2.6 The bomb basket shall have bottom end closed & shall direct primary fragments surrounding the explosive upward through the top opening only. The bomb basket shall prevent any horizontal movement of fragments. The bomb basket shall not topple during blast test and no perforations is allowed on the walls and bottom of the Bomb Basket.

4.2.7 The Bomb Basket shall not be made of any material which may act as secondary fragments.

4.2.8 The bomb basket shall not displace by more than 300 mm from its initial position when measured from its perimeter.

4.2.9 The bomb basket shall have a cart/ trolley with following specifications:

a) The trolley shall be designed for safe transportation of suspected device in bomb basket.
b) It shall have a detachable canopy to protect the basket from rain & sun.
c) The construction of the trolley should be more advantageous for operations in hill area & off road conditions and it should easily be towed with a smaller vehicle like a jeep or any SUVs.

d) It shall consist of 04 wheels for giving it a better center of gravity and ease of parking. Ground clearance of trolley shall be 200 mm minimum.
e) Each trolley shall have a tool box with towing accessories.
f) It shall consist of breaking system. It shall have a suspension system to take the payload of up to 800 kg.
g) It shall have inbuilt mechanism for easy loading and unloading of bomb basket.

4.2.10 Miscellaneous: The firm shall be able to provide the following as applicable along with the equipment:

a) Technical manual with full description of all the items.
b) Users Hand Book.
c) Literature on care and preservation technique/ methods.
d) Specification for packing, handling/ transportation /storage.
e) Details regarding periodical checks to be carried out by the user of serviceability of the equipment.
f) Spare Support: Spares availability shall be for min five years or as defined by the user.
g) Training: Minimum 01 days training to be provided by firm at user premises without any cost or as defined by the user.
h) Warranty: Warranty shall be minimum two years to be provided by firm or as defined by the user.

4.3 Bomb Inhibitor

4.3.1 The bomb inhibitor shall be constructed either as a single-piece unit or in a modular assembly configuration.

4.3.2 The weight of the bomb inhibitor shall be less than 90kg and it should be portable and easy to install.

4.3.3 It shall have strong and comfortable handles for lifting.

4.3.4 It shall be able to reduce blast damage by 80% minimum.

4.3.5 It shall be able to reduce fragmentation damage by 80% minimum.

4.3.6 It shall be capable of eliminating fire risk by 80% minimum.

4.3.7 It shall be able to contain blast effect of minimum 1.5 kg of explosive (TNT equivalent).

4.3.8 It shall be able to retain shrapnel for investigation.

4.3.9 It shall be able to retain forensic evidence.

4.3.10 It shall permit taking X-Ray of device even through the inhibitor.

4.3.11 It shall permit effective firing of disruptor through the inhibitor.

4.3.12 It shall allow snifter dogs to sniff.

4.3.13 The internal cavity of the bomb inhibitor shall have minimum dimensions of 16 inches (length) × 16 inches (width) × 16 inches (depth) for a rectangular profile. For a circular profile, the cavity shall have a minimum diameter of 16 inches (406.4 mm) and a depth of 16 inches.

5 REQUISITION FOR BLAST EVALUATION OF SAMPLES

5.1 The Test sponsor shall provide the complete trial directive with specifications along with the samples (tender/ R&D/ Lot proofing/ demonstration samples) to be tested.

5.2 The test sponsor shall provide the details in the format as given in Table 1. Any sample submitted without the required details as given in Table 1 shall not be accepted. If some details are not applicable, then test sponsor should fill those details as non-applicable.

Table 1 Details of Sample

(*Clauses* 5.2)

S.No.	Sample Parameters	Details
1.	Name of Test sponsor	
2.	Test sponsor Address with Fax No. and Contact No.	
3.	Amount deposited with cheque No./ Draft No.	
4.	Test item nomenclature and make	
5.	Test item dimensions and weight	
6.	Test item construction material	
7.	Test item identification/ Sr. No.	
8.	Type and quantity(weight) of explosive to be used	
9.	Quantity (weight) of splinters or ratio of weight of splinters to weight of explosive (if any, other than mentioned in the standard)	
10.	Type & size of splinters with % weight with respect to total weight of splinters (if any, other than mentioned in the standard)	
11.	Standoff distance of explosive charge from test item/position of explosive charge	
12.	Parameters to be recorded (if any, other than mentioned in the	

	standard)	
13.	Distances of measurement (if any, other than mentioned in the standard)	
14.	Acceptance criteria with respect to distance for safe blast pressure and with respect to fragment arresting capability against splinters (if any, other than mentioned in the standard)	
15.	Photography/Videography requirements	
16.	Other requirements of Test sponsor, if any	

5.3 An official nominated by the Test sponsor shall be responsible for selecting samples for evaluation, overseeing the trial methodologies and test results and take back the samples.

5.4 In case of tender samples, only blast evaluation shall be undertaken at the test agency. Physical verification related to the size, weight, dimensions, construction material, etc. shall not be the responsibility of the test agency. The test agency shall not be responsible for sampling and clearance of any lots. However, a separate test certificate/report for physical verification may be provided (if required by the purchaser) from a government laboratory or from a national accredited laboratory.

5.5 The type of blast load and splinter specifications against which the test specimen is to be tested, and acceptance criteria shall clearly be defined by the Test sponsor. If no special directive or test procedure is issued by the Test sponsor, the tests shall be carried out as per this standard. The Test sponsor representative, if required, may contact test agency for assistance in finalizing the trial directive prior to the tender of the bomb disposal system(s).

5.6 The test director shall assign an identification number to each test specimen and permanently mark each test specimen accordingly.

5.7 Each test specimen shall be inspected physically in sufficient details to ensure compliance with the vendor's/manufacturer's specifications provided by test sponsor. In case, a major discrepancy is found, it shall be informed to test sponsor before the conduct of trial.

5.8 The test sponsor shall fill a Trial Directive & Setup Consent Declaration; pre-trial and a post-trial declaration form, a typical format for which is as per Annex A , Annex B and Annex C.

6 APPARATUS

6.1 Test Specimen

The test specimen shall be provided as a complete assembly by Test sponsor. It may include bomb blanket along with blast containment ring, bomb basket and bomb inhibitor, etc.

6.2 High Explosive

The high explosive charge as mentioned by the Test sponsor may be used to generate the desired peak over pressure, positive pulse duration and positive phase impulse on the test specimen.

6.3 Instrumentation

The instrumentation system used for measuring blast pressure may comprise a pressure sensor with high resolution, high frequency response, and short rise time, along with data acquisition equipment, which may be either integrated with the sensor or provided externally. The recommended specifications are as follows:

6.3.1 *Blast Probes*

Blast probes are utilized to record the pressure–time history of blast waves. The general specifications for blast probes shall be as follows:

a) Measurement range: ≥ 50 psi

b) Rise time: < 5 μs

c) Sensitivity: ≤ 20 mV/psi

d) Resonant frequency: > 400 kHz

e) Non-linearity: < 1 %

6.3.2 *Signal Conditioners*

Signal conditioners may be required for certain models of blast probes. Where applicable, signal conditioners shall be compatible with the specific probe or sensor model in use. The general specifications for signal conditioners shall be as follows:

a) Frequency range (± 5 %) (gain <100): 0.05 Hz to 100 kHz, or as appropriate to meet the time resolution and rise time requirements specified in **6.3.1**;
b) Excitation voltage to sensor: +24 VDC or as applicable to the specific model of the blast probe; and
c) Excitation voltage and constant current excitation to sensor: As required by the specific sensor model.

6.3.3 *Low Noise Cables*

A special low-noise, anti-microphonic cables for transmitting signals from the sensor to the recording system should be used. Such cables should offer immunity from triboelectric effects and electromagnetic interference, ensuring signal fidelity during high-vibration environments.

6.3.4 *Data Acquisition System (DAS)*

The Data Acquisition System (DAS) shall include an analog or digital recording unit with a sufficient number of data channels to accommodate blast probes and any additional electronic measurement devices. The DAS shall operate with a bandwidth of at least 500 MHz to accurately capture the positive pressure phase and its duration. Triggering of the recording system shall be synchronized with the blast event using a Transistor-Transistor Logic (TTL) system.

6.4 Photographic Equipment

Each test should be documented using still photography. Additionally, video or high-speed photography may be employed where required.

7 PERFORMANCE TEST PROCEDURES

7.1 Bomb Blanket

7.1.1 The parameters (shape, color, weight, height, dimensions, identification number, etc.) are verified before trial.

7.1.2 Photographic records of details of the blanket and the test configuration is taken prior to the test. If a video photographic record of the response of bomb blanket during the test is desired, video cameras are deployed.

7.1.3 The explosive charge is prepared as defined by the Test sponsor. Unless otherwise stated by the Test sponsor, the splinters consisting of assorted nails, ball bearings, nuts & bolts are embedded within the charge as per Table 2 and ratio of weight of splinters to weight of explosive is 0.10.

7.1.4 Wooden ply of thickness 6 mm or MS sheet of thickness 1.5 mm and height 8 feet from the ground are deployed in a half circle around explosive charge as per Table 3. Only half circumference of explosive charge is embedded with assorted splinters facing the wooden ply or MS sheet deployed.

7.1.5 The safety ring is placed on the naturally available earth surface.

7.1.6 The explosive charge mixed with assorted splinters is positioned at the center of ring on naturally available earth surface. The ring is covered with bomb blanket.

7.1.7 The explosive charge kept inside the safety ring is initiated using suitable detonator or initiator.

7.1.8 The trial site location and range safety distance is decided as per the safety regulations of the testing agency.

7.1.9 In case of misfire, the second attempt is done as per as per the safety norms of the testing agency.

7.1.10 After tests, the visual inspection of bomb blanket is done as per test criteria given at **8.1** to evaluate its structural integrity and fragment arresting capability. Adequate photography is taken after each test.

7.2 Bomb Basket

7.2.1 The parameters (shape, color, weight, height, dimensions, identification number, etc.) are verified before trial.

7.2.2 Photographic records of details of the bomb basket and the test configuration is taken prior to the test. If a video photographic record of the response of bomb basket during the test is desired, video cameras are deployed.

7.2.3 The explosive charge is prepared as defined by the Test sponsor. Unless otherwise stated by the Test sponsor, the splinters consisting of assorted nails, ball bearings, nuts & bolts are embedded within the charge as per Table 2 and ratio of weight of splinters to weight of explosive is 0.10.

7.2.4 Wooden ply of thickness 6 mm or MS sheet of thickness 1.5 mm and height 8 feet from the ground are deployed in a half circle around explosive charge as per Table 3. Only half circumference of explosive charge is embedded with assorted splinters facing the wooden ply or MS sheet deployed.

7.2.5 The bomb basket is kept on naturally available earth surface in vertical orientation with its open end in upward direction.

7.2.6 The explosive charge is placed inside the bomb basket at the base in the center.

7.2.7 The explosive charge kept inside the bomb basket is initiated by suitable detonator or initiator.

7.2.8 The trial site location and range safety distance is decided as per safety regulations of the testing agency.

7.2.9 In case of misfire, the second attempt is done as per the safety norms of the testing agency.

7.2.10 After test, the visual inspection of bomb basket is done as per test criteria given at **8.2** to evaluate its structural integrity and fragment arresting capability. Adequate photography is taken after each test.

7.3 Bomb Inhibitor

7.3.1 The parameters (shape, color, weight, height, dimensions, identification number, etc.) are verified before trial.

7.3.2 Photographic records of details of the bomb inhibitor and the test configuration is taken prior to the test. If a video photographic record of the response of bomb inhibitor during the test is desired, video cameras are deployed.

7.3.3 The explosive charge is prepared as defined by the Test sponsor. Unless otherwise stated by the Test sponsor, the splinters consisting of assorted nails, ball bearings, nuts & bolts are embedded within the charge as per Table 2 and ratio of weight of splinters to weight of explosive is 0.10.

7.3.4 Wooden ply of thickness 6 mm or MS sheet of thickness 1.5 mm and height 8 feet from the ground are deployed in a half circle around explosive charge as per Table 3. Only half circumference of explosive charge is embedded with assorted splinters facing the wooden ply or MS sheet deployed.

7.3.5 The blast probes are deployed at scaled distances of 3.0, 6.0 and 10.0 $m/kg^{1/3}$ to record the blast pressure. The blast probes are deployed in such a way that their sensing element is at a height of 1 ± 0.02 m from the ground and are directed towards the explosive charge. The blast probes are then connected to the data acquisition systems and tested to verify proper operation.

7.3.6 The explosive charge is kept on the naturally available earth surface such that the embedded splinters face 6 mm thick wooden ply or 1.5 mm thick MS sheet targets.

7.3.7 The explosive charge placed on naturally available earth surface is covered with the open end of the Bomb Inhibitor.

7.3.8 The explosive charge kept inside the bomb inhibitor is initiated by suitable detonator or initiator.

7.3.9 For each trial, two numbers of tests are conducted. The first trial is conducted with bomb inhibitor and second is conducted without bomb inhibitor.

7.3.10 The trial site location and range safety distance is decided as per safety regulations of the testing agency.

7.3.11 In case of misfire, the second attempt is done as per Misfire Drill of the testing agency.

7.3.12 After tests, the visual inspection of the Bomb inhibitor and the target plates (wooden ply or MS sheet) is done as per test criteria given at **8.3** for counting hits and perforations through them.

Table 2 Splinters' Specifications

(*Clauses* 7.1, 7.2, 7.3, 8.1, 8.2 and 8.3.2)

S. No.	Total Splinters Weight	Parameters	Type of Splinters			
			Hexagonal Nuts	Hexagonal Bolts	Steel Balls (Ball bearings' balls)	Nails
1	≤ 200 gm	% Weight	-	-	-	100
		Size of shrapnel	-	-	-	14 gauge shank; 1 inch long and 8 gauge shank; 1.5 inch long (equal % weight)
		Property class/ Material	-	-	-	Steel
2	>200 gm & ≤ 500 gm	% Weight	25	25	25	25
		Size of shrapnel	M6	M6 ; 1 inch long	6 mm diameter	14 gauge shank; 1 inch long
		Property class/ Material	Steel; Black coated; Grade 8.8	Steel; Black coated; Grade 8.8	62-67 HRC; Corrosion resistant steel or Chrome plated	Steel

3	>500 gm	% Weight	25	25	25	25
		Size of shrapnel	M6 and M8 (equal % weight)	M6 and M8; 1 inch long (equal % weight)	6 mm and 8 mm diameter (equal % weight)	14 gauge shank; 1 inch long and 8 gauge shank; 1.5 inch long (equal % weight)
		Property class/ Material	Steel; Black coated; Grade 8.8	Steel; Black coated; Grade 8.8	62-67 HRC; Corrosion resistant steel or Chrome plated	Steel

NOTE:

1. The nominated Board of Officers (BOO) or personnel from the test sponsor can specify their own splinters' specifications as applicable. The details of splinters with its specifications will be recorded in Trial Directive & Setup Consent Declaration as per Annex 'A' and shall be signed by nominated BOO or reps of test sponsor, as applicable.
2. 1 inch = 25.4 mm; 14 gauge shank = 2.1 mm shank diameter; 8 gauge shank = 4.2 mm shank diameter.
3. If decided by the user, splinter specifications/ property may be as per the following Indian standards:
   a) Hexagonal Nuts M6 & M 8 Class 10 [as IS 1364 (Part 6)]
   b) Nails 2 mm shank dia; 25 mm long [as per IS 723] and 4 mm shank dia; 38 mm long (equal % weight) [as per IS 18741]
   c) Steel Balls (Ball bearings' balls) 4 mm, 6 mm and 8 mm diameter (equal % weight) [as per IS 2898 (Part 1)]
   d) Hexagonal Bolts M6; 1 inch long; Class 10.9 [equivalent to grade C of IS 1363 (Part 1)]

8 TEST CRITERA

8.1 Bomb Blanket

The Bomb Blanket may undergo two types of tests:

a) Mandatory Test: Fragment Arresting Capability Test
b) Optional Test: Blast Parameters Evaluation Test

8.1.1 If required by the consumer, the blast mitigation capability of bomb blanket may be evaluated by comparing the air blast pressure in surrounding region with and without the use of bomb blanket. Piezoelectric type blast probes are deployed at scaled distances of 3.0, 6.0 and 10.0 m/kg$^{1/3}$ to record the blast pressure. The bomb blanket is kept over naturally available earth surface to provide identical ground conditions for all tests.

a) The quantity of explosive as defined by the Test sponsor is used to generate the blast effect. The blast probes are deployed in such a way that their sensing element is at a height of 1 m ± 0.02 m from the ground and is directed towards the explosive charge.

b) The comparison of blast data acquired in trials with and without the use of bomb blanket is then used to calculate the percentage reduction in the peak over pressure for various scaled distances. This percentage reduction in peak over pressure at a given scaled distance is the percentage by which the peak over pressure measured (at considered scaled distance) in trial with bomb blanket

is reduced with that of trial without bomb blanket. Unless otherwise stated by the Test sponsor, the acceptance criteria with respect to safety distance with respect to blast pressure is given at Table 4a.

8.1.2 The fragment arresting capability of bomb blanket is determined by counting the number of perforation and hits of shrapnel on plywood or MS sheet. Unless specified otherwise by Test sponsor, the details of shrapnel shall be as given in Table 2. Unless otherwise stated by the Test sponsor, the acceptance criteria with respect to fragment arresting capability shall be as given at Table 4b.

8.1.3 The structural integrity of bomb blanket and blast containment ring after the trial is evaluated by visual inspection and diameter of fireball, measured using videograph.

8.1.4 The schematic representation for blast evaluation of bomb blanket is as shown in Fig. 5.

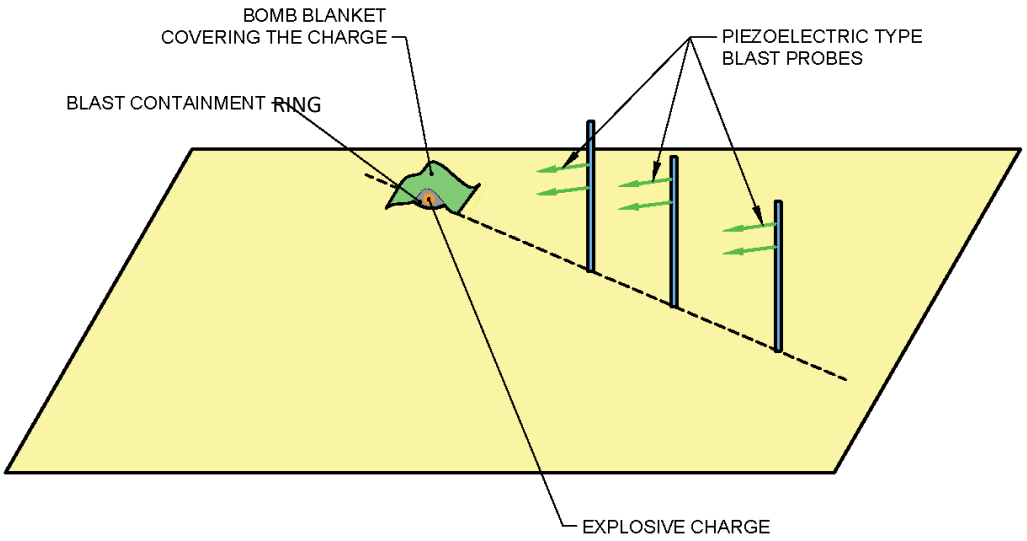


FIG. 5 SCHEMATIC REPRESENTATION OF FIELD SET UP FOR BLAST EVALUATION OF BOMB BLANKET

8.2 Bomb Basket

The Bomb Basket may undergo two types of tests:

a) Mandatory Test: Fragment Arresting Capability Test
b) Optional Test: Blast Parameters Evaluation Test

8.2.1 If required by the consumer, the blast mitigation capability of bomb basket may be evaluated by comparing the air blast pressure in surrounding region with and without the use of bomb basket. Piezoelectric type blast probes are deployed at scaled distances of 3.0, 6.0 and 10.0 m/kg$^{1/3}$ to record the blast pressure. The bomb basket is kept over naturally available earth surface to provide identical ground conditions for all tests.

a) The quantity of explosive as defined by the Test sponsor is used to generate the blast effect. The blast probes are deployed in such a way that their sensing element is at a height of 1 m ± 0.02 m from the ground and directed towards the explosive charge.

b) The comparison of blast data acquired in trials with and without the use of bomb basket is then used to calculate the % reduction in the peak over pressure for various scaled distances. This % reduction in peak over pressure at a given scaled distance is the percentage by which the peak over pressure measured (at considered scaled distance) in trial with bomb basket is reduced with that of trial without bomb basket. Unless otherwise stated by the Test sponsor, the acceptance criteria with respect to safety distance with respect to blast pressure shall be as given at Table 4a.

8.2.2 The fragment arresting capability of bomb basket is determined by counting the number of perforation of shrapnel through it. Unless specified otherwise by Test sponsor, the details of shrapnel shall be as mentioned in Table 2. Unless otherwise stated by the Test sponsor, the acceptance criteria with respect to fragment arresting capability shall be as given in Table 4b.

8.2.3 The structural integrity of bomb basket after the trial is evaluated by visual inspection only.

8.2.4 The schematic representation for blast evaluation of bomb basket is as shown in Fig. 6.

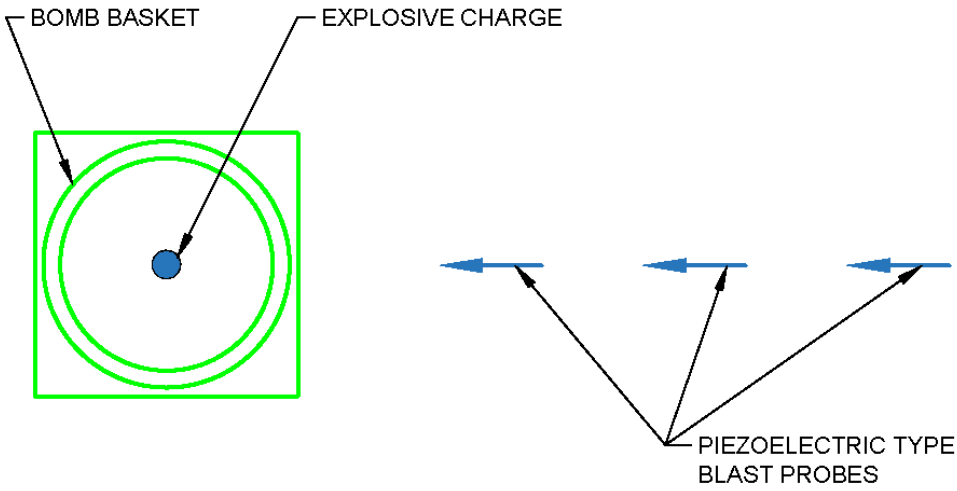


FIG. 6 SCHEMATIC REPRESENTATION OF FIELD SET UP FOR BLAST EVALUATION OF BOMB BASKET

8.3 Bomb Inhibitor

8.3.1 If required by the consumer, the blast mitigation capability of bomb inhibitor may be evaluated by comparing the air blast pressure in surrounding region with and without its use. Piezoelectric type blast probes are deployed at scaled distances of 3.0, 6.0 and 10.0 m/kg$^{1/3}$ to record the blast pressure. The bomb inhibitor is kept over naturally available earth surface to provide identical ground conditions for all tests.

a) The quantity of explosive as defined by Test sponsor is used to generate the blast effect. The blast probes are deployed in such a way that their sensing element is at a height of 1 m ± 0.02 m from the ground and is directed towards the explosive charge.
b) The comparison of blast data acquired in trials with bomb inhibitor and without the bomb inhibitor (bare charge test) is then used to calculate % reduction in the peak over pressure for various scaled distances. This % reduction in peak over pressure at a given scaled distance is the percentage by which the peak over pressure measured (at considered scaled distance) in trial with bomb inhibitor is reduced with that of trial without bomb inhibitor. Location of explosive in both the trials is kept same. Unless otherwise stated by the Test sponsor, the acceptance criteria with respect to safety distance with respect to blast pressure is given at Table 4a.

8.3.2 The fragment arresting capability of bomb inhibitor is determined by counting and comparing the number of hits and perforations of splinters in 6 mm wooden ply or 1.5 mm MS sheet deployed vertically in half circle at scaled distances as per Table 3, from the point of explosion with and without bomb inhibitor. Unless specified otherwise by Test sponsor, the details of shrapnel is mentioned in Table 2. Unless otherwise stated by the Test sponsor, the acceptance criteria with respect to fragment hits and perforations is given in Table 4c.

8.3.3 The bomb inhibitor shall be able to eliminate the fire risk. The diameter of the fireball is measured using High Speed Videography. The acceptance criteria for eliminating the fire risk shall be as per Table 4d.

8.3.4 Blast pressure reduction, fragment hits and perforations are checked from Wooden Ply of thickness 6 mm or MS sheet of thickness 1.5 mm. The diameter of the fireball is measured by using videography.

8.3.5 The schematic representation of the field set up for blast evaluation of bomb inhibitor is as shown in Fig. 7.

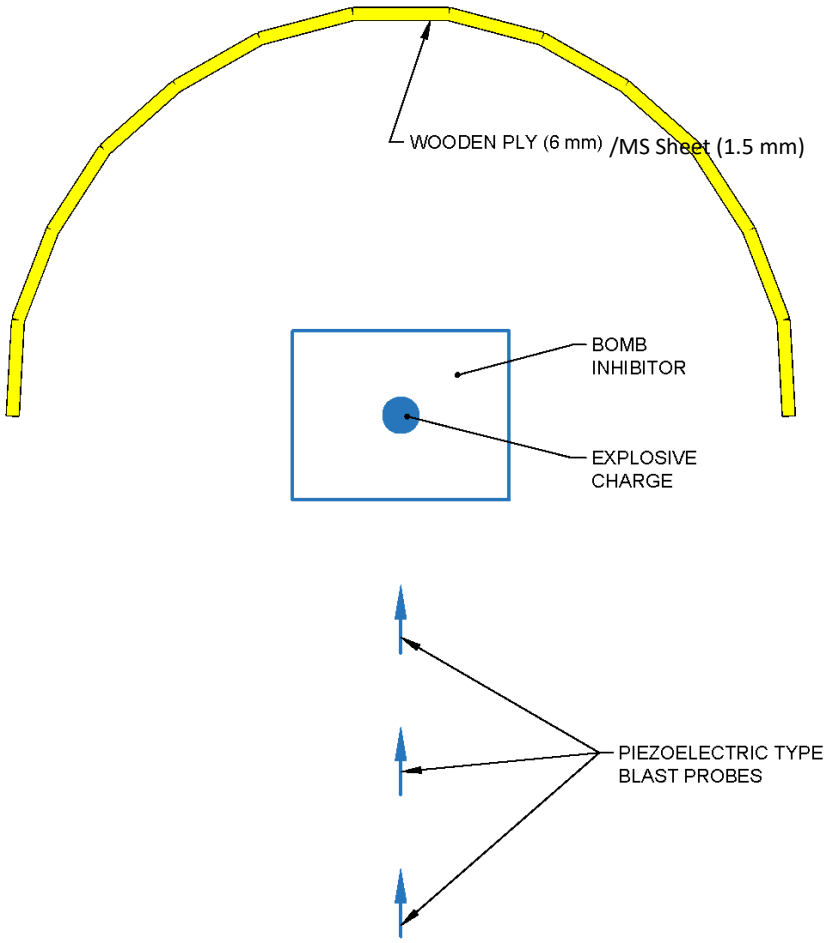


FIG. 7 SCHEMATIC REPRESENTATION OF FIELD SET UP FOR BLAST EVALUATION OF BOMB INHIBITOR

Table 3 Distance of 6 mm Plywood Sheet or 1.5 mm MS Sheet in Testing Against Blast Load in Bomb Basket, Bomb Blanket and Bomb Inhibitor

(*Clauses* 7.1.4, 7.2.4, 7.3.4 and 8.3.2)

S.No.	Amount of explosive charge	Distance of plywood or MS sheet (m)
1)	2)	3)
i)	up to 200 g	3
ii)	>200 g up to 1.5 kg	4
iii)	>1.5 kg up to 3 kg	7
iv)	>3 kg up to 5 kg	9

Table 4a Acceptance Criteria with Respect to Safety Distance for Blast Pressure
(*Clauses* 8.1.1(b), 8.2.1(b) and 8.3.1(b))

S.No.	Bomb Disposal System	Safety Scaled Distance ($m/kg^{1/3}$)	Minimum % Reduction in Peak over pressure
1)	2)	3)	4)
1.	Bomb Blanket (optional)	at 3.0, 6.0 and 10.0	80
2.	Bomb Basket (optional)	at 3.0, 6.0 and 10.0	80
3.	Bomb Inhibitor	at 3.0, 6.0 and 10.0	80

NOTE: The test sponsor may propose their own acceptance criteria, if different from those specified in this table. If applicable, the proposed acceptance criteria shall be submitted along with the sample details as outlined in Table 1.

Table 4b Acceptance Criteria with Respect to Fragment Arresting Capability
(*Clauses* 4.1.9, 8.1.2 and 8.2.2)

S.No.	Bomb Disposal System	Face	No. of perforations allowed
1)	2)	3)	4)
i)	Bomb Blanket and Blast Containment Ring	Side face	0
ii)	Bomb Basket	Side face and bottom	0

NOTE: The test sponsor may propose their own acceptance criteria, if different from those specified in this table. If applicable, the proposed acceptance criteria shall be submitted along with the sample details as outlined in Table 1.

Table 4c Acceptance Criteria with Respect to fragment Hits and Perforations
(*Clause* 8.3.2)

S.No.	Bomb Disposal System	% Reduction in no. of Perforations on Wooden Ply or MS Sheet Due to Bomb Disposal System
1)	2)	3)
i)	Bomb Inhibitor	80

NOTE: The test sponsor may propose their own acceptance criteria, if different from those specified in this table. If applicable, the proposed acceptance criteria shall be submitted along with the sample details as outlined in Table 1.

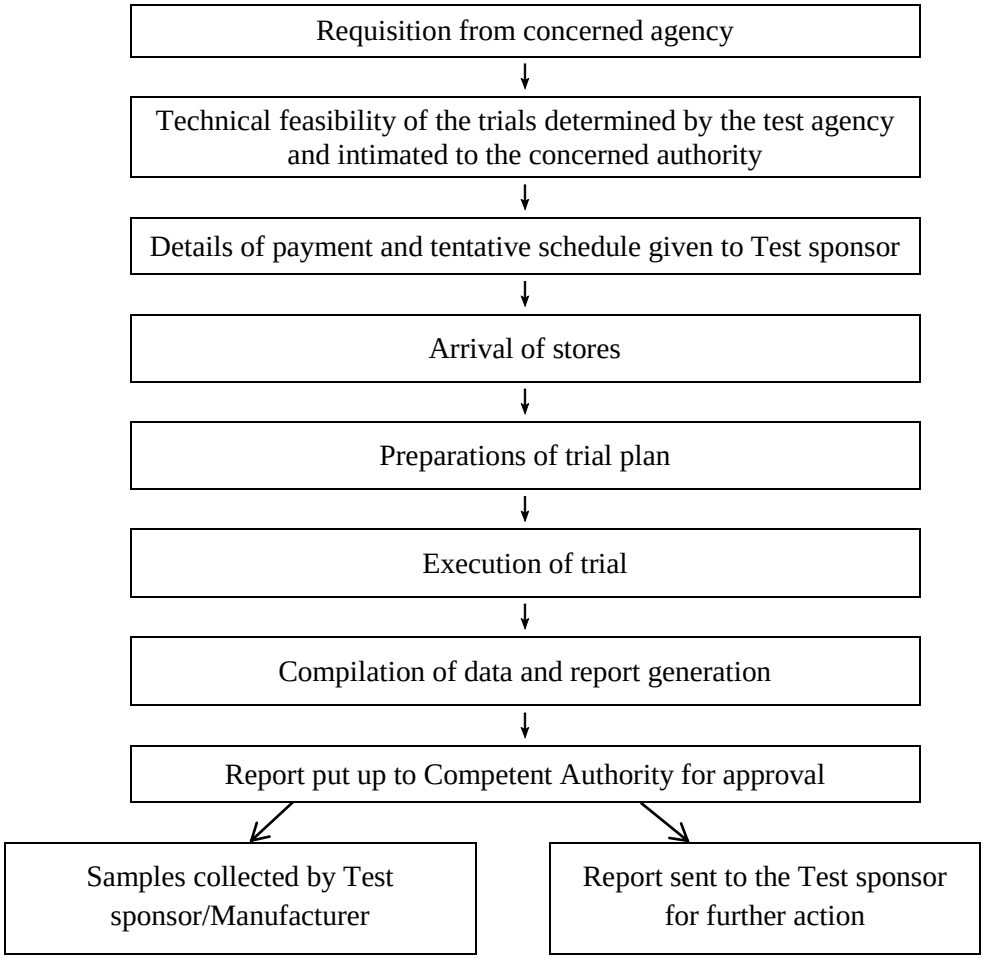
Table 4d Acceptance Criteria of with Respect to Risk against Fireball
(*Clause* 8.3.3)

S.No.	Bomb Disposal System	% Reduction in the Capability of Eliminating the Fire Ball Diameter
1)	2)	3)
i)	Bomb Inhibitor	80

NOTE: The test sponsor may propose their own acceptance criteria, if different from those specified in this table. If applicable, the proposed acceptance criteria shall be submitted along with the sample details as outlined in Table 1.

9 FLOWCHART OF TESTING

The process for test requisition, handling of the samples testing and issue of reports should be as given in the flow chart below.



10 HANDLING OF DATA AND REPORT GENERATION

10.1 Upon completion of the testing, the test director assigns a test number and records the test measurement and observations obtained from all test specimens for preparation of test report. The test report includes the following information:

a) Manufacturer/ Test sponsor/ Vendor's name and address.
b) Date of the test & test no.
c) The number of specimens tested.
d) Weight, dimensions and color of the bomb disposal system assembly.
e) Description of the internal construction used to construct bomb disposal system assembly if provided.
f) The recorded air blast history from blast probe(s) in graphical form.
g) Damage to the bomb disposal system assembly as determined by visual examination and post-test photographs.
h) Conclusion about structural integrity, blast mitigation and fragment arresting capability of bomb disposal system assembly.

10.2 The test director signs the test report and gets it approved from competent authority.

10.3 The format of report should be as given in Annex D.

11 BIS CERTIFICATION MARKING

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations framed thereunder, and the products may be marked with the standard mark.

ANNEX A

(*Clauses* 5.8)

TRIAL DIRECTIVE & SETUP CONSENT DECLARATION

1. Firm/ Manufacturer:

2. Trial Store description:

3. Trial Date(s):

4. Place:

5. Trial Directive & Setup for Blast Testing of Bomb Disposal System

6. Parameters to be measured:

7. Declaration:

   a) The trial directives & setup shown above is final and has consent of test sponsor. There will be no deviation to above details. In future also, the test sponsor will not raise any complaint or issue regarding the trial directives and setup to any court/ forum/ agency.
   b) Trial store(s) will be taken back by User Agency/ Firm (strike off whichever is not applicable) within 15 days of conduction of last trial.
   c) Test agency will not be responsible for trial store(s) health degradation after conduction of trial.
   d) Test agency will not entertain any request for trial store retrieval after 15 days of conduction of last trial.
   e) Trial report will be issued to user agency/firm in hard copy format at the address provided by them.
   f) This is R & D sample/ Tender sample/ user/ no user is involved (Strike off whichever is not applicable).

Signature of the representative(s) from the test sponsor

ANNEX B

(*Clause* 5.8)

PRE-TRIAL DECLARATION

S. No.	Trial Parameters and Details	User Requirement
1.	Trial Objective	
2.	Trial Date	
3.	Name of Test Agency, User & Firm	1. Test Agency – 2. User 3. Firm
4.	Explosive TNT Quantity / Equivalent	
5.	Fragment Details a. Weight. b. Type c. Material	
6.	Detailed Location of Charge	
7.	Parameters to be measured	
8.	Sensor Deployment locations	
9.	Other Observations to be recorded	
10.	Remarks, if any	

Declaration:

a) We have seen the trial site and understood the trial. We have no objection for conduction of the trial as per requirement agreed above. We agree to the trial directive as mentioned above. In future also, we will not raise any complaint/issue to any agency/court/forum.

b) The following representatives from the firm/manufacturer/user are present for witnessing the trial:

- Names & Designations of representatives from manufacturer/user

To be authenticated by authorized signatories, that is, representatives present for trial witnessing

ANNEX C

(*Clause* 5.8)

POST-TRIAL DECLARATION

S. No.	Trial Parameters and Details	User Requirement
1.	Trial Objective	
2.	Trial Date	
3.	Name of Test Agency, User & Firm	1. Test Agency – 2. User 3. Firm
4	Explosive TNT Quantity / Equivalent	
5.	Fragment Details a.Weight b.Type c.Material	
6.	Detailed Location of Charge	
7.	Observations recorded from visual inspection	

Declaration:

a) The trial has been conducted to the full satisfaction, fairness & as per information provided to us. We have no objection regarding the conduct of trial as per requirement agreed above. In future also, we will not raise any complaint/issue to any agency/court/forum.
b) The following representatives from the firm/manufacturer/user witnessed the trial:

- Name & Designation of reps from manufacturer/user

To be authenticated by Authorized signatories, that is, representatives present for trial witnessing

ANNEX D
(*Clause* 10.3)

EXECUTIVE SUMMARY

1 Title of the Report
2 General Introduction

I.	TRIAL TEAM	:
II.	DATE OF TRIAL	:
III.	PLACE OF TRIAL	:
IV.	TRIAL OFFICERS	:
V.	EXECUTIVE TRIAL OFFICER	:
VI.	EXECUTIVE AUTHORITY	:

3 Detailed Report

I. INTRODUCTION :
II. BLAST TESTING OF SAMPLE :
   a. SAMPLE DETAILS
   b. CHARGE DETAILS
   c. TRIAL SET UP
III. TRIAL DATA :
IV. POST-TRIAL OBSERVATIONS :
V. SUMMARY & CONCLUSION :

NOTE: The following documents must be attached in this report:

a) Trial Requisition Letter
b) Trial Directive and Setup Consent
c) Declaration should be as per ANNEX A.
d) Pre – Trial Declaration as per ANNEX B.
e) Post – Trial Declaration as per ANNEX C.

ANNEX E
(*Clause* 2)

REFERENCES

IS No./ Other publication	*Title*
IS 390 : 2024 / ISO 4920 : 2012	Textile Fabrics — Determination of resistance to surface wetting (spray test) (*second revision*)
IS 723 : 2023	Steel countersunk head wire nails — Specification (*second revision*)
IS 1363 (Part 1) : 2023/ ISO 4016 : 2022	Hexagon head bolts, screws and nuts of product grade 'C' Part 1 Hexagon head bolts (size range M5 to M64) (*sixth revision*)
IS 1364 (Part 6) : 2025/ ISO 4033 : 2023	Hexagon head bolts, screws and nuts of product grades A and B: Part 6 Hexagon nuts, style 2 (size range M5 to M39) (*second revision*)
IS 2898 (Part 1) : 2019/ ISO 3290-1 : 2014	Rolling bearings — Balls: Part 1 Steel balls (s*econd revision*)
IS 18741 : 2024	Concrete Nails — Specification
IS 18931 : 2024	Textiles — Fire resistant fabric made of Cotton Man-made fibres/filaments and their blends — General and Performance Requirements