



2600SEG108

SAFETY STANDARD FOR MANAGING, TRANSPORTING, STORING AND USING EXPLOSIVES AND AMMUNITIONS

1.0 PURPOSE

Establishing uniform safety requirements for controlling, the transporting, storing, using, preserving and disposing of explosives and ammunitions.

2.0 BACKGROUND INFORMATION

2.1 This standard became necessary due to the increase in activities involving explosives in the area of the Panama Canal, and with the lack of regulations in Spanish to include technical aspects.

2.2 The Safety and Occupational Health Manual of the Panama Canal Authority (ACP), section 14.10, issued and revised by the Safety Division (ESS) in January 2000.

2.2 Publications No.1 through 25 by the IME (Institute of Manufacturers of Explosives), for the storage, transportation, and use of explosive and pyrotechnical materials.

2.3 Executive Decree # 104 of October 16, 1930, Chapter V. Safety Bureau of the Firefighting Department of Panama, Ministry of Government and Justice. Version of May 29, 2006.

2.4 Blasting Regulations by the Safety Bureau, March 10, 1994, Firefighting Department of Panama.

2.5 IMO standards.

2.6 Section 2.316 Drilling and Blasting (for contract bid documents).

2.7 Section 1.15 Project requisites (portion related to explosives and blasts for the bid documents of works contracts: Explosives storage and use, radio transmitters, blasting operations.

3.0 SCOPE

This standard applies to all employees, contractors and third parties carrying out explosives storage, transportation, handling, use and disposition activities within the physical boundaries and under the direction of the ACP.

4.0 LEGAL FOUNDATION

This Standard is established pursuant to Agreement No. 12 of the Board of Directors of the Panama Canal Authority (ACP), Safety and Health Regulations, Chapter 1, Article 8.

5.0 DEFINITIONS

5.1 The definitions found in the glossary of publication No.12 (Glossary of Commercial Explosives Industry Terms) of IME (Institute of Manufacturers of Explosives), shall be adopted for the purposes of this standard,

6.0 GENERAL

6.1 The ACP, contractors and third parties shall provide maximum possible protection to all individuals and property while carrying out explosives storage, transportation, handling, use and



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disposition activities within the areas under the responsibility of the ACP, due to the potential effects of accidents involving the handling of explosives and ammunitions.

6.2 Exposures to explosives and ammunitions must be limited to experienced personnel only, according to the explosives storage and operational procedures.

6.3 All Explosive procedures must be up to date with Standards, Regulations, and Manufacturing specifications, and shall be enforced by experienced personnel.

6.4 Reporting Accidents

6.4.1 All incidents or accidents involving explosives or ammunitions must be communicated immediately to the responsible unit, Safety and Industrial Hygiene Unit (RHSH) and Protection and Emergency Response Division (OPP), as soon as possible.

6.4.2 A formal investigation must be initiated on accidents involving explosives or ammunitions. The investigating team shall include representatives from the Safety and Industrial Hygiene Unit (RHSH) and Protection and Emergency Response Division (OPP), and a representative from the unit and/or contractor involved, accordingly. The investigation shall be performed according to the standards established by ACP.

6.5 Physical safety

6.5.1 All explosives, ammunitions, components and other accessories shall be safely secured following procedures controlled by the Safety and Industrial Hygiene Unit (RHSH) and Protection and Emergency Response Division (OPP),

6.5.2 Their storage shall be verified and accepted accordingly with documentation.

6.5.3 Operational units and contractors shall store explosives in magazines according to IME regulations and according to the type of explosive. The Safety and Industrial Hygiene Unit (RHSH) and Protection and Emergency Response Division (OPP), shall make sure that the rules and regulations are complied with.

6.5.4 Explosives magazines shall have signs (labels) according to the type of facility, and kept in acceptable conditions with specifications provided by IME'S Publication # 1.

6.5.4.1 There shall be written emergency response procedures and inventory control procedures.

6.5.4.2 Constant surveillance by the Protection and Emergency Response Division (OPP) and/or the National Police Force.

6.5.3.3 Storage limited to daily or short-term requirements.

6.5.3.5 Procedure shall be in place to immediately notify the Safety and Industrial Hygiene Unit (RHSH) and the Protection and Emergency Response Division (OPP) in the event of loss or thefts of explosive material.

6.6 Acquisitions through Purchases and Contracts (works contractors shall follow the indications of their bid documents):



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6.6.1 Each division performing purchases or dealing with contractors, or involved in the acquisition of explosive materials shall be responsible for developing safety procedures, and record keeping for transportation, storage and use of explosives.

6.6.2 The respective users shall develop the technical specs for purchasing and controlling explosive materials. All technical characteristics shall be reviewed by Safety and Industrial Hygiene Unit (RSHS).

6.6.3 The Safety and Industrial Hygiene Unit (RSHS) shall make comments on the safety standards, which must be included in the specifications of purchases or services related to explosives, before signing the contract.

6.6.4 All units involved in the purchase of explosives shall develop a shipping advise protocol for purchasers, including the following information on the explosives:

6.6.4.1 Shipping date

6.6.4.2 Arrival date

6.6.4.3 Contractor's name

6.6.4.4 Type and name of the transportation

6.6.4.5 Classification according to the recommendations developed by the United Nations Committee (UNC) regarding the classification and transportation of explosive materials.

6.6.5 Besides keeping close communication with the Transportation and Storage Division and the Contracting Division, units dealing with the acquisition of explosives shall abide by the Laws of Panama and the Regulations of the Ministry of Government and Justice.

6.6.6 The supplier shall provide the material safety data sheets (MSDS), which will be reviewed and approved by the Safety and Industrial Hygiene Unit (RSHS) prior to executing the purchase of any explosive material whatsoever.

6.6.7 Acquired or used explosives and their accessories shall be manufactured under internationally-recognized safety and quality standards.

6.6.8 Quality standards shall be included in each contract.

6.6.9 Explosive materials and their accessories shall:

6.6.9.1 Be visually inspected (each lot).

6.6.9.2 Present manufacturer quality proof regarding retardation precision, density, sensitivity, water resistance, chemical stability, gas characteristics, detonation speed, effective energy, absolute strength on weight, and relative strength.

6.6.9.3 Comply with United Nations regulations regarding the transportation, packaging, forwarding, sign posting, and labeling of the cargo.



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6.6.10 And the revision of any changes in their purchasing or contracts specs shall be coordinated Safety and Industrial Hygiene Unit (RHSB) so that safety levels adjust to the product or service required in the previously revised specs.

6.7 Delivery of Explosives: (Work contractors shall follow the indications on the bid document)

6.7.1 Explosive materials deliveries shall be planned to reduce the handling of excessive amounts. There shall always be a blasting plan indicating the amounts in pounds or kilograms of explosives utilized by delay systems, boosters and their location in the plant.

6.7.2 Deliveries shall be carried out during such hours when there is daylight, to qualified personnel, supervised by a technician with verified license and experience.

6.7.3 Explosives deliveries by ground transportation to Cerro Pelado shall be limited to a maximum of 10 tons GVW (total vehicle weight including the cargo), due to limitations present at the Gamboa bridge.

6.7.4 All contractor vehicles shall be in perfect mechanic conditions, and must be inspected and approved to be used, by ACP.

6.7.5 Vehicles transporting explosives shall not be taken to repair shops while loaded.

6.7.6 Material Safety Data Sheets (MSDS) shall be included outside each box containing explosives.

6.7.7 All documents related to the cargo sent shall include detailed identification of the cargo and its contents.

6.7.8 Every explosives shipment shall comply with the regulations in force in the Republic of Panama.

6.7.9 Air-carried explosives or initiation devices (detonators, accelerators, etc.), shall be ruled by United Nations standards.

6.7.10 Explosives arriving into Tocumen air terminal shall be transported by ground to the respective approved explosives magazine.

6.7.11 Water-carried explosives deliveries shall arrive into Gatun Lake (explosives mooring area), from there, to Gamboa, to then be carried by ground to the Cerro Pelado magazine or other designated and approved deposits.

6.7.12 Explosives weight, including their containers' weight, shall be limited to the available crane and towboat capacity.

6.7.13 Bulk explosives delivery site shall be specified in the contract's requirements. Delivery and storage of materials in bulk shall be coordinated, which materials must be approved by the Safety Office of the Firefighting Department of Panama. The Safety and Industrial Hygiene Unit (RHSB) shall recommend solutions to situations that may not comply with the standards in force so that a temporary deposit site may be approved.



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6.8 Operational Procedures

6.8.1 All units involved with explosives shall develop and implement the required procedures for the storage, use, handling, control and disposition of explosives, using ACP explosives standards and IME (Institute of Makers of Explosives) publications as reference. These procedures shall be revised periodically by Safety and Industrial Hygiene Unit (RSHS).

6.8.2 All work contractors whose work scope include using, handling, controlling and disposing of explosives, shall restrict to the indications on their respective contract bid documents, in sections 2.316 (Drilling and Blasting) and 1.15 Project requirement (the part relative to drilling and blasting). Work inspectors shall follow the procedure for inspecting and coordinating blasting events.

6.9 Additional Requirements:

6.9.1 Only qualified, specialized, personnel, familiar with and authorized for the use and handling of explosive materials shall be allowed. Only supervisor in charge, and personnel with blaster's license shall be in charge of initiating explosives or blasts.

6.9.2 Supervisor in charge and licenses Blasters shall be familiar with the last publication of the safety standard related to explosives, as well as with IME standards, those of the Firefighting Department of Panama and the regulations of the Ministry of Government and Justice.

6.9.3 Supervisor in charge and licenses Blasters shall hold a valid license issued by the Ministry of Government and Justice through the Firefighting Department of Panama.

6.9.4 Ignition sources such as: Smoking, fire arms, matches, lighters, open flames, sparks, sparking tools, or other sources, are forbidden in areas where explosives are manipulated, transported, or stored. Particular consideration must be given to the risk existing due to the stimulation produced by static electricity, electromagnetic energy, impact-friction-crushing (involving metallic parts or jewelry), heat from radiators-bombs, etc. direct sunlight, chemical decomposition of the explosives, etc.

6.9.5 Alcohol and drug abuse: It is forbidden to participate in explosive storage, handling, and use or transportation operations while under the influence of intoxicating beverages, narcotics or other drugs. All personnel participating in operations involving handling explosives may be submitted to drug testing before being hired, after being hired (annually), or whenever there may be reasonable doubt, which includes, but is not limited to: violence in the workplace, and serious accidents or incidents.

6.9.6 Electrical storms: During explosives storage, handling, transportation or use operations, the supervisor in charge shall have an functional device to detect the presence of electrical storms within a 10-mile radio; and know how to operate such device, as well as how to apply standard 2600SEG106.



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6.10 Blasting:

6.10.1 Blasting operations shall only be carried out while there is sunlight. All exceptions shall be coordinated with Safety and Industrial Hygiene Unit (RHSH).

6.10.2 Warning signs shall be posted at all access ways to blasting areas

6.10.3 Whenever it may be necessary to coordinate with Government agencies such as the State Security, the Security Council, or the Ministry of Government and Justice, such coordination shall be carried out through the Protection and Emergency Respond Division (OPP) by contacting [OPP](#) and OPP@pancanal.com.

6.10.4 Each Unit or Division conducting blasting operations shall prepare a plan with the following information: the date, time, type of blasting, location, blasting block off set, maximum charge per delay, vibration forecast, and distance from the seismograph; and alerting about warning codes. This information shall be sent to concerned unit by e-mail at least 24 hours prior to blasting, except as provided in paragraph 7.2.5.4 for underwater blasts. Work contractors who need to perform blasting operations shall comply with the requirements indicated in Section 1.15 (use of explosives) of their respective contract bid document: shall check with the firefighting department's official inspector, the deposit custodian (firefighters) and the National Police.

6.10.5 The use of electrical detonators is forbidden.

6.10.6 A unit of the National Police must be present during the entire blasting process in order to verify the use of the material and that surplus material is returned.

6.10.7 Effects such as vibrations and sound pressure, produced during all blasts, must be monitored by the Topography section, by means of a seismograph with a valid calibration. Copy of seismic records shall be forwarded to concerned units or sections as well as to contractors who apply through the Purchasing, warehouse and inventory Division (FAA), in order to verify that the standard included in IME publication No.17 is complied with.

6.11 Warning Signs:

6.11.1 All units conducting blasting operations within the ACP shall abide by the warning signs included in the procedures.

6.11.2 Prior to firing, the supervisor in charge, or leader blaster shall be responsible for complying with the warning signs.

6.11.3 The device or equipment to be used to announce warning signs shall have an alarm that may be heard over the level of surrounding noises. Sirens are recommended instead of blow horns.

6.11.4 Types of signs:

6.11.4.1 Warning sign: a series of one-minute long whistles, five minutes prior to the blast.

6.11.4.2 Blasts: a series of short whistles, one minute prior to firing.

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6.11.4.3 Clear the area: a 30-second long sign.

6.12 Transportation of Explosives:

6.12.1 Explosives shall only be transported while there is day light, guarded by units from the National Police. Each unit or section that coordinates their transportation shall notify the Protection and Emergency Respond Division (OPP) of the Panama Canal Authority (ACP), so that they are aware of a potential event, but for practical reasons it shall not be necessary for the OPPB SECTION to join the ground escort.

6.12.2 Explosives shall only be transported while there is daylight.

6.12.3 All vehicles utilized for explosives transportation shall comply at least with IME standards.

6.12.4 Water transportation of explosives shall only be carried out while there is daylight and pursuant to the provisions of the Maritime Regulations for Canal Operations, Chapter IX, Hazardous Materials.

6.13 Storage of Explosives:

6.13.1 Explosive materials shall be stored in sites approved by the Safety and Industrial Hygiene Unit (RSHS), and per type of explosive.

6.13.2 All explosives shall be stored pursuant to the criterion established by IME regarding distances and other safety requisites.

6.13.3 Priority shall be given to rotate the use of explosives according to the order of arrival. The oldest explosives must be used first and after those the newest explosives, provided that they are not deteriorated.

6.13.4 Explosives magazines shall be inventoried on a weekly basis. Copies of this log shall be forwarded to the following divisions: Warehousing Section (FAAL), FAA, Dredging Division (OPD); should there be exceptions or should they be requested, they shall be referred to the Protection and Emergency Response Division (OPP), for their due custody.

6.13.5 A monthly inventory shall be forwarded to the Ministry of Government and Justice through the Warehousing Section (FAAL).

6.14 Use of Explosives

6.14.1 The highest safety standards must be established and maintained while handling, storing, transporting and disposing of explosive materials.

6.14.2 All personnel involved with explosives must be trained to comply with all procedures, understand the process steps, and the consequences of any errors.

6.14.3 The area where it is planned to drill blasting holes shall be prepared in order to prevent rain water accumulation.



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6.14.4 The blaster shall place a warning sign and establish a safety perimeter around the blasting area in a continuous manner.

6.14.5 The safety perimeter shall bear legible signs, speed restrictions, barricades and warning cones at least 24 inches high; there must be berms or soil mounds at least equally high or higher than the diameter of the largest tire that might circulate close to the area.

6.14.6 Wherever simultaneous drilling or explosives manipulation operations are carried out together with unrelated heavy-duty equipment operations, a safe distance of over 50 feet from the safety perimeter where explosives are manipulated must be established, as well as the considerations of the paragraph above.

6.14.7 All blasting operations shall be safe if we familiarize with IME and ACP standards, as well as with the regulations of the Republic of Panama.

6.14.8 All supervisors in charge, blasters, or competent persons in charge of operations involving explosives, are responsible for making all efforts to enforce and comply with the different safety procedures, precautions and requirements.

6.14.9 All supervisors in charge, blasters, or competent persons in charge of operations involving explosives shall abide by the rules of blasting design and optimization obtained by way of experimenting and empiricism by manufacturers, in matters related to: Blast-hole verticality, Over-drilling, Burden, Spacing; relations-restrictions between blast-hole height and diameter; timing of considered delays, and the properties of the explosives.

6.14.10 Only essential and authorized personnel will be allowed within the area during operations with explosives.

6.14.11 Detonators must only be introduced in boosters immediately after introducing the ensemble in the blast-hole.

6.14.12 Measures must be taken to prevent detonator cables to get inside the blast-holes after the detonator has been introduced into the initiating system and placed at the bottom of the blast-hole.

6.14.13 When using detonators, the end opposing the cables must be kept opposite to the body of the user or any other person.

6.14.14 The interconnection of the detonators superficial cabling must only be performed when the location has been cleared of any personnel that is not required for this process immediately before placing the surface connectors and the lead in line.

6.14.15 For interconnecting detonators or surface connectors, perform a double link.

6.14.16 Verification that there are no obstructions must be performed in each blast-hole in order to correct the deficiency to the extent possible prior to charging the blast-hole.

6.14.17 Permanent control must be exercised regarding the measuring of explosive products contents poured in the blast-holes, as well as the specifications regarding the granulometry and thickness of the stemming, as related to the blast-hole's diameter, in order to obtain the best energy distribution, flying rocks elimination, and lessening of unsafe vibrations.



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6.14.18 Verification must be made upon finishing the interconnection between detonators and surface connectors, (double check) must be verified, in order to confirm that everything is set up correctly.

6.14.19 For the purposes of explosives transportation and storage, always verify the compatibility table indicated on IME Publication # 1, among the compatibility groups of the United Nations Committee and in the explosives MSDS.

6.14.20 Explosives shall be kept separated from detonators, and transported to the operations site in their original containers and wrappings. Boosters may be transported in the same vehicle as emulsions, but at least 24 inches apart, in the packages offered by the manufacturer.

6.14.21 ANFO may not be stored or transported with boosters.

6.14.22 Precautions shall be taken when conducting detonations to prevent injuries, and damages, and minimize ground vibrations. Potential risks due to loose rocks shall be evaluated after the explosions.

6.14.23 Strict adherence to the misfire procedure is mandatory. Contractors shall adopt the provisions in the bid documents with regard to the revision of misfires and procedures to handle misfires.

6.14.24 Unsafe, surplus and deteriorated explosives shall be eliminated according to the manufacturer's instructions. A safety at the work place analysis shall be performed for the purposes of the disposal or elimination process.

6.15 Emergency Procedures:

6.15.1 All units involved in operations with explosives shall have a contingency plan for immediately responding in cases of fire or accidental detonations. The plan shall be prepared in consultation with the following divisions: Safety and Industrial Hygiene Unit(RHSH), Protection and Emergency Response Division (OPP) and Warehousing Section (FAAL). All work contractors shall fulfill the requisites (safety requisites, safety plan) contained in their respective bid documents for the contract, in which they shall include the emergencies and contingencies plan with regard to blasts.

6.15.2 The contingency plan shall include evacuation simulations at least once a year, and all recordkeeping must be retained for a three-years.

7.0 RESPONSIBILITIES

7.1 Training Requirements:

7.1.1 All personnel with access or involved in the handling, storage, use or transportation of explosives or ammunitions shall receive annual training, preferably through the explosive material supplier; such training might be subject to the initial purchasing specifications and conditions, prior coordination with the Safety and Industrial Training (RHSI). Additionally, it shall be documented and include a written, practical knowledge verification. The results of this test shall be retained for three years. Contractor shall provide training for their own employees.



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7.1.2 All units involved in operations with explosives shall have a continuous supplementary educational program.

7.2 Additional Responsibilities

7.2.1 The Managers of the Branches involved: Training (RHSC), Warehousing (FAAL), and Procurement, Warehousing and Inventory (FAA), shall keep copies of the Licenses and Permits required by the Ministry of Government and Justice or the variations applicable to these licenses.

7.2.2 All individuals involved in the purchase, transportation, shipping, storage and use of explosive materials must contact the Specialist in Safety with Explosives for consultations on the specific licenses or permits that operational units require from the suppliers of these services.

7.2.3 The users and individuals in charge of explosive materials storage or transportation are responsible for knowing the relevant national and international regulations and making sure that their personnel and the explosive magazines comply with the Laws, Standards and procedures.

7.2.4 The users and individuals in charge of explosive materials transportation or storage must furnish the Specialist in Safety with Explosives with:

7.2.4.1 According to IME'S definitions, the type and exact location of the explosive magazines (location, coordinates, and tying points on a topographic map)

7.2.4.2 A sketch or map at an adequate scale, of the configuration of the magazines, as well as the distribution of each of the products in store within the space, identifying their classification according to their compatibility and based on the criteria in force at IME and the UNO.

7.2.4.3 Distances to public roads, electrical lines, water tanks, aqueducts, highways, streets, railways, and the axis of the Canal's navigational channel.

7.2.4.4 Distances to occupied buildings and the business site.

7.2.4.5 Distance to other hazardous materials storages.

7.2.4.6 The maximum amount of explosive material in net explosive weight to be stored in each magazine.

7.2.5 The users and individuals in charge of the storage or transportation of explosive materials must furnish the Protection and Emergency Response Division (OPP) with:

7.2.5.1 A formal request expressing the intention of opening a new facility in their existing facilities, and the amount and type of explosives to be stored, as well as the design.

7.2.5.2 Documentation of the amounts in the magazine's inventory. Magazine inventory records must include the manufacturer, part number, date code, amount received, amount removed, and the total available remaining amount. The available amount must be updated at the end of each activity day.



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7.2.5.3 A consensus established with all affected parties, provided that it is safe, practical and possible; a range of fixed schedules, so that all blast firings are performed preferably at the same time interval (window).

7.2.5.4 For underwater blasts, the window might be between 0600 and 0700, making it possible to perform it at any moment while there is natural light. For the vessel where the blasting is performed, in addition to the red-BRAVO flag (which represents Dangerous Cargo), a Red-White-UNIFORM flag must be hoisted (which represents Standing Into Danger), two (2) hours before the blast.

7.2.5.5 It shall be the responsibility of the supervisor in charge, and Blaster to enforce, Blasting operation that all the Laws, Regulations, and Standards related to the activity be fully complied with; additionally he is responsible for the dosage of the explosive charge used; adopted delays; required safety distances; coordination of all events with the parties that might be affected; and monitoring and control of effects such as: damages, vibrations, noise and fly rock.

7.3 Procedures to handle explosives that did not detonate when they were set off (contractors shall follow the instructions on their bid documents)

7.3.1 Non-electrical initiation systems: wait at least 30 minutes before checking for an ignition failure.

7.3.2 Examine the area in front of the blast if there was piling up examine the cables in search for accidental disconnections, incompatible design configurations.

7.3.3 Only qualified personnel who are critically necessary for evaluating the failure.

7.3.4 Should it not be possible to identify the ignition failure properly, warning signs must be installed and the entire personnel in near areas must be notified; immediately notify the Safety and Industrial Hygiene Unit(RHSH)and Protection and Emergency Respond Division (OPP)..

8.0 INQUIRIES

Any information or clarification of the content or application of this Standard must be requested in writing to the Safety and Industrial Hygiene Unit (RHSH).

9.0 EXCEPTIONS

Any requests for changes or temporary exceptions to this Standard must be made in writing to the Safety and Industrial Hygiene Unit (RHSH).

10.0 TERM

This Standard shall remain in force until amended or revised.

11.0 REFERENCES

11.1 Safety and Occupational Health Manual. Panama Canal Authority. January 2000 revision.



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11.2 Information Standard on Hazardous Materials, 2600SEG201, of February 21, 2002. Panama Canal Authority.

11.3 IME (Institute of Manufacturers of Explosives) – Publications No. 1 to 25

11.4 Executive Decree # 104 of October 16, 1930. Chapter V. Safety Division, Firefighting Department of Panama, Ministry of Government and Justice. Version of May 29, 2006.

11.5 Chargeman Rules of March 10, 1994, Safety Office, Firefighting Department of Panama, Ministry of Government and Justice.

11.6 DOD Ammunition and Explosives Safety Standards, 6055.9-ST

11.7 NFPA 495, Explosives Material Code.