NAVSEAINST 8020.5C: QUALIFICATION AND FINAL (TYPE) QUALIFICATION PROCEDURES FOR NAVY EXPLOSIVES

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ABSTRACT

Due to the increased emphasis of explosive safety, the Navy explosive qualification document, NAVSEAINST 8020.5, is being updated to reflect a thorough safety characterization of candidate explosives for use in weapon systems. New requirements in the instruction include an explosive aging protocol, formal explosive selection committees for new weapon systems, and insensitive munitions evaluation on generic test hardware. With increases in joint weapon systems, explosive qualification will involve several domestic and international documents: NAVSEAINST 8020.5, MIL-STD-1751A, STANAG 4170, and other related STANAGs.

INTRODUCTION

The purpose of NAVSEAINST 8020.5C, which is expected to be approved late FY 96, is to establish policy and provide procedures for approving explosives for Navy use and to establish the Insensitive Munitions Explosive Selection Working Group (IMESWG). The Naval Sea Systems Command is assigned the Navy-wide responsibility for energetic materials, explosives safety and insensitive munitions in accordance with references (1) and (2).

Lead SYSCOM responsibilities include the approval authority for Qualification and Final (Type) Qualification of explosives. The term “explosives” specifically includes high explosives, propellants, pyrotechnics and blasting agents. NAVSEAINST 8020.5C is the Navy implementing document for reference (3) and related STANAGS. Qualification test procedures are in accordance with reference (4).

This qualification instruction applies to explosives at Navy installations and aboard Navy ships or aircraft, whether designed and built by the Navy or developed by other Services, private industry, or foreign sources and whether intended for operational use, training, testing, or

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transport. Fleet ballistic missile strategic weapons and nuclear weapons are excluded.

Policy

Guided by weapon systems operational requirements and following reference (5), the least sensitive explosive material shall be used in all Navy munitions which meets the performance/operational requirements of that munition. Emphasis on the explosives selection shall consider susceptibility to violent reaction as a result of cook-off, bullet and fragment impact and to sympathetic detonation in transportation, storage and use.

High explosives shall be qualified prior to use in a munitions development or product improvement program. Qualified explosives approved for weapon development are listed in reference (6) table 3. Approval to use any finalized or developmental explosive not listed in reference (6) table 3 must be requested in writing from PEO-CLA. Any explosive qualified between revisions of reference (6) shall be considered included in reference (6).

Test data on propellants and pyrotechnics shall be reviewed by SEA 91M within 45 days of receipt prior to initiating testing of the next higher assembly (e.g. propulsion systems, cartridges, pyrotechnic devices, etc.). Qualification shall be obtained after the formulation has been finalized which occurs after testing of the next higher assembly.

For previously qualified explosives, changes in materials or processing which result in changes to explosive safety, performance, and mechanical properties, or the process by which the energetic ingredients are made shall be reviewed by SEA 91M to determine whether requalification is required. A review will be based on sensitivity and other data requested by SEA 91M from the explosive formulator. Changes must be duly recorded by the sponsor in the appropriate documents, e.g. Specifications or Naval Munitions Data Documents (reference (7)). Explosives previously approved by the Navy and listed in reference (6) table 3 need only go through the Final (Type) Qualification procedures.

Only Final (Type) Qualified explosives shall be employed in munitions and explosive devices introduced for operational or training use. The fact that an explosive has been Final (Type) Qualified for a specific munition does not imply that it is acceptable for other uses. Each new application must be reviewed by the Weapon System Explosives Safety Review Board (WSESRB) and approved by PEO-CLA.

Production prior to receiving Final (Type) Qualification will be allowed only if the items are placed in ammunition condition code "D" as defined in reference (8). The condition code may be subsequently changed to "A" when Final (Type) Qualification is approved.

A Qualified or Final (Type) Qualified booster explosive may be considered as a Qualified main charge explosive if a safety analysis of the proposed weapon or application has been made, reviewed by the WSESRB and approved for Final (Type) Qualification by PEO-CLA.

Explosives which have not been Qualified are permitted at Navy Research and Development (R&D) and pilot plant processing facilities for research or development, including synthesis, formulation, processing, characterization studies up to testing of the next higher assembly, only. Testing aboard Navy aircraft and ships is specifically prohibited. Only Qualified high explosives shall be recommended to other government activities, private industry or allied countries for weapon development.

For the use of an unqualified explosive in munitions and explosive devices introduced for operational or training use, a written request must be submitted to SEA 91, documenting the need to use an unqualified explosive and describing special precautions that will be taken to offset the higher hazard associated with its use. If justified and after WSESRB review, PEO-CLA will grant Final (Type) Qualification for use in the particular application. The explosive will retain its unqualified status. In addition TNT-based explosives are considered not suitable for service use.

To ensure production safety for contractor developed munitions, contact SEA 91M for a determination if Navy in-house explosive loading validation is required.

Responsibilities

Naval Sea Systems Command

In the capacity of Lead SYSCOM, the Program Executive Office for Carriers, Littoral Warfare and Auxiliary Ships (PEO-CLA) is the approval authority for Qualification and Final (Type) Qualification. The Director, Insensitive Munitions Office (SEA 91M) will:

(1) Review Qualification Data Packages submitted on high explosives and blasting agents and either prepare NAVSEA documentation granting Qualification for PEO-CLA signature or provide a written response discussing reasons for denial of Qualification or requesting additional information within 45 days of receipt.

(2) Review Qualification Data Packages submitted on Propellants and Pyrotechnics. Written comments to the Program Manager (PM) will be provided within 30 days of receipt, which will allow the PM to proceed at their discretion with testing at the next higher assembly. Formal qualification of the propellant or pyrotechnic will either be granted by PEO-CLA within 60 days or may be postponed until the propellant or pyrotechnic composition is finalized and/or additionally requested test data are submitted by the developing activity or PM.

(3) Review Final (Type) Qualification requests and provide a written response to the requesting activity after receiving WSESRB recommendations. A response shall be provided within 60 days of receipt of WSESRB recommendations.

(4) Issue designations (nomenclature) for Qualified and Final (Type) Qualified explosives as part of NAVSEA document granting Qualification or Final (Type) Qualification.

(5) Serve as chairman for the IMESWG.

(6) Respond to requests to use an explosive in a new application which is not included in table (3) of reference (6).

The IMESWG will make recommendations to the program managers for selecting the least sensitive explosive available which will meet the operational requirements of the weapon system.

Naval Air Systems Command

Support and assist NAVSEA as required to implement this instruction. Assign a NAVAIR code the responsibility for assuring that explosives used in NAVAIR applications meet the requirements of this directive. Provide a representative to the IMESWG.

US Marine Corps Systems Command

Support and assist NAVSEA as required to implement this instruction. Assign a point of contact the responsibility for assuring that explosives used in USMC applications meet the requirements of NAVSEAINST 8020.5C. Act as a Requesting Organization for all Marine Corps explosives which may be transported in Navy ships.

Naval Ordnance Center (NOC)

WSESRB will review Qualification and Final (Type) Qualification requests, concurrently with the weapon system review, and shall provide a written recommendation to

approve or disapprove the requests. A response to SEA 91M shall be provided within 60 days of receipt. Upon the request of SEA 91M, review Qualification requests and provide concurrence or nonconcurrence within 15 days of receipt. Provide service life history on in-service explosives if available to the IMESWG for consideration during the selection process.

Naval Surface Warfare Center, Dahlgren Division (NSWC/DD)

Support and provide technical assistance to NAVSEA and other Commands or activities, as required, to implement the qualification instruction. Assist in the preparation of disclosures to SEA 91M on Final (Type) Qualification data for explosives and support project offices as required.

Naval Air Warfare Center, Weapons Division, China Lake (NAWCWPNDIV/CL)

Support and provide technical assistance to NAVSEA and other commands or activities to implement this instruction. Prepare and submit Qualification data packages for high explosives and propellants. Assist in the preparation of disclosures to SEA 91M on Final (Type) Qualification data for high explosives and propellants to support project offices as required.

Provide advisory statements on the processing and safe-handling characteristics of propellants and high explosives for Final (Type) Qualification. Support Naval Surface Warfare Center, Indian Head Division (NSWC/IHD) as required, in the preparation of advisory statements on the processability and safe-handling characteristics of primary, booster and main-charge high explosives and propellants. Provide a representative to the IMESWG as specified by SEA 91M. Identify to SEA 91M a Code with signature authority responsible for recommending Qualification of explosives.

Naval Surface Warfare Center, Indian Head Division (NSWC/IHD)

Support and provide technical assistance to NAVSEA and other commands or activities to implement this instruction. Prepare and submit Qualification data packages for propellants, high explosives, cartridges, cartridge actuated devices (CADS), propellant actuated devices (PADS), and aircrew escape systems (APES) in accordance with this instruction. Provide advisory statements on the processing and safe-handling characteristics of propellants and high explosives for Final (Type) Qualification.

Assist in the preparation of disclosures to SEA 91M on Final (Type) Qualification data for propellants, high explosives and explosives for cartridges, (CADS), and (PADS) and support program offices as required. Provide a

representative to the IMESWG as specified by SEA 91M. Update and maintain reference (6). Support NAWCWPNDIV/CL, as required, in the preparation of advisory statements on the processability and safe-handling characteristics of primary, booster and main-charge high explosives and propellants.

Maintain repository of all explosive Qualification and Final (Type) Qualification data. Identify to SEA 91M a Code with signature authority responsible for recommending Qualification of explosives. Perform high explosive loading process validations for contractor developed munitions. Load and assemble explosive charges as required by development centers or program offices for test and evaluation data leading to Final (Type) Qualification for Navy in-house development programs.

Naval Surface Warfare Center, Crane Division (NSWC/Crane)

Support NAVSEA and other commands or activities to implement this instruction. Prepare and submit Qualification packages for pyrotechnics and blasting agents in accordance with NAVSEAINST 8020.5C. Assist Program Managers in the preparation of requests for Final (Type) Qualification for pyrotechnic devices. Provide advisory statements on the processing and safe-handling characteristics of pyrotechnics and blasting agents for Final (Type) Qualification. Identify to SEA 91M a Code with signature authority responsible for recommending Qualification of pyrotechnics and blasting agents.

Qualification Procedures

Qualification data packages for high explosives and propellants shall be prepared and submitted to NSWC/IHD or NAWCWPNDIV/CL. The Program Manager may also prepare and submit Qualification data packages with written concurrence from the Commanding Officer or authorized representative of NSWC/IHD or NAWCWPNDIV/CL.

Qualification data packages for pyrotechnics shall be prepared and submitted by NSWC/IHD or NSWC/Crane. The Program manager may also prepare and submit Qualification data packages with written concurrence from the Commanding Officer or authorized representative of NSWC/Crane or NSWC/IHD.

Qualification data packages for blasting agents shall be prepared and submitted by NSWC/Crane or the Program Manager with written concurrence from the Commander or authorized representative of NSWC/Crane.

Qualification Procedures for Explosives

Requests for Final (Type) Qualification shall be submitted to SEA 91 by the Program Manager. The qualification data package for an explosive shall contain sufficient supporting data to show that it is judged to be safe and suitable for consideration in development, product improvement, or other programs leading to eventual service applications. Results of tests conducted in accordance with United States ratified NATO STANAGS are recognized as sufficient proof of sensitivity when compared to a recognized comparison explosive. Blasting agents will be considered to be an end item munition and qualification will include Final (Type) Qualification.

The Qualification Data Package shall include:

(1) Mandatory data according to this document. Additional data may be required or mandatory data waived by SEA 91M on a case-by-case basis. To establish any additional requirements, a review of the generated data with SEA 91M prior to beginning testing and submission of the Qualification Data Package is recommended.

(2) Data for inclusion into reference (6).

(3) A justification for qualification of explosive compositions stating significant improvement in safety, performance, processability, environmental characteristics and/or cost over currently qualified explosives. In order to control the proliferation of these compounds, qualification will be denied without data showing a significant advantage over an existing explosive.

(4) A draft of a comprehensive technical report on the qualification testing of the explosive (methods and results).

(5) A draft of the material specification or NATO STANAG.

(6) A draft Material Safety Data Sheet in accordance with reference (9).

(7) Recommendation for Qualification by the Commanding Officer of the submitting activity or by an authorized representative.

(8) A preliminary environmental analysis statement shall be included in the request for qualification package. The analysis shall include a review of the environmental issues associated with the life-cycle management of the explosive within existing DOD and Navy requirements.

(9) A Final Hazard Classification.

The requesting organization will publish within six months of Qualification a comprehensive technical report on the qualification testing of the explosive.

Qualification Test Data

Mandatory data and assessments for high explosives, solid propellants, pyrotechnics, and blasting agents are listed in table I. The test procedures and equipment are defined in reference (4). Test apparatus other than those required by reference (4) may be used to perform tests for shock, friction, impact, and electrostatic discharge sensitivity. If alternate apparatus or procedures are used, testing must be conducted on a comparison explosive (e.g. an explosive qualified for use in that particular role and listed in reference (6)). Qualification tests shall be performed on fully cured samples. In addition, technical personnel at NSWC/Crane, NSWC/IHD, NAWCWPNDIV/CL or NAVSEA must concur that the test procedure and apparatus are adequate to use for qualification purposes.

TABLE I. MANDATORY QUALIFICATION TESTS/ASSESSMENTS

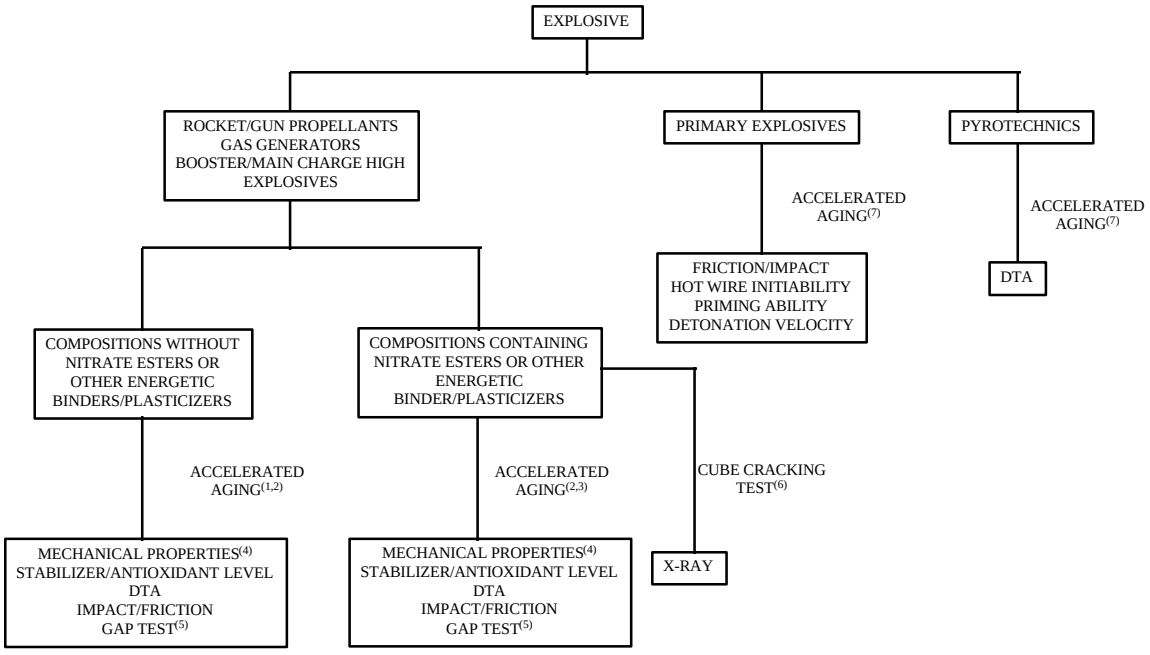
TESTS	HIGH EXPLOSIVES			PROPELLANTS	PYROTECHNICS	BLASTING AGENTS
	PRIMARY	BOOSTER	MAIN CHARGE	SOLID ROCKET, GAS GENERATOR & SOLID GUN		
IMPACT SENSITIVITY	X	X	X	X	X	X
CAP TEST(1)	-	X	X	X	X	X
GAP TEST	-	X	X	X	-	-
THERMAL STABILITY(2)	-	X	X	X	X	X
IGNITION AND UNCONFINED BURNING(3)	-	X	X	X	-	X
VACUUM STABILITY	X	X	X	X	X	-
SELF HEATING (DSC/DTA)(4)	X	X	X	X	X	X
FRICTION SENSITIVITY	X	X	X	X	X	X
ELECTROSTATIC SENSITIVITY	X	X	X	X	X	X
DETONATION VELOCITY	-	X	X	-	-	-
AGING CHARACTERISTICS (5)	X	X	X	X	X	-
CRITICAL DIAMETER	-	X	X	X	-	-
TOXICITY(6)	X	X	X	X	X	X
BULK SELF-HEATING PROPERTIES(7)	-	-	-	-	-	X
COMPATIBILITY DATA(8)	-	-	-	-	-	X

Qualification tests for liquid, slurry, gel, and fuel-air explosives will be proposed in a test plan by the Office of Primary Responsibility (OPR) to SEA 91M for comment 30 days prior to the commencement of qualification testing.

Accelerated aging studies shall be conducted prior to qualification of new explosives. Figure 1 shows the aging protocol proposed for solid propellants, high explosives and pyrotechnic compositions. Upon submission of Qualification test plans for liquid, slurry, gel and fuel-air explosives to SEA 91M, the possible need and extent of an aging protocol will be established in cooperation between the Program Manager and SEA 91M. Deviations from the aging and test matrix in Figure 1 or assessments in lieu of testing must be approved by SEA 91M prior to the start of the aging program. Test procedures and data evaluation shall be

conducted as described in reference (4) and data as well as safe- and service-life predictions based on changes in the explosive properties will be with the Qualification package. Pass-fail criteria for the mechanical integrity of high explosives differ substantially from those of rocket propellant depending on projected applications (i.e., penetrator warhead, directional warhead, shaped charge, projectile fill). In predicting the expected service-life, several scenarios may have to be considered. Based on the nature of primaries and pyrotechnics, acceptance criteria for aged explosives are largely based on thermal stability parameters. A low temperature aging study with humidity control shall be started with the qualification testing with final results reported in the Final (Type) Qualification package. Interim results shall be reported in the Qualification package.

FIGURE 1. AGING PROTOCOL FOR SOLID EXPLOSIVES



(1)60°C - 1,2,4,6,8 MONTHS, SEALED CONTAINERS
70°C - 1,2,4,6 MONTHS, SEALED CONTAINERS
25°C, 30%RH - UNTIL FINAL (TYPE) QUAL

(2)COMPOSITIONS BASED ON POLYESTER BINDERS WILL BE AGED UNDER CONTROLLED HUMIDITY (30%RH)

(3)50°C - 1,3,6,9,12 MONTHS, SEALED CONTAINERS
60°C - 1,2,4,6,8 MONTHS, SEALED CONTAINERS
25°C, 30%RH - UNTIL FINAL (TYPE) QUAL

(4)HIGH RATE COMPRESSIVE STRENGTH FOR GUN PROPELLANTS. ALL OTHERS UNIAXIAL AT THREE TEMPERATURES.

(5)50°C - 12 MONTHS
60°C - 8 MONTHS
70°C - 6 MONTHS
25°C, 30%RH - UNTIL FINAL (TYPE) QUAL
GUN PROPELLANTS EXCLUDED

(6)70°C
3" CUBE FOR BOOSTER COMPOSITION
6" CUBE FOR OTHERS
GUN PROPELLANTS EXCLUDED

(7)70°C - 6,12 MONTHS, SEALED CONTAINERS
25°C, 30%RH - UNTIL FINAL (TYPE) QUAL

NOTE: UNLESS OTHERWISE STATED, NO HUMIDITY CONTROL

Insensitive munition testing in accordance with reference (10) conducted in generic test hardware is required for Qualification. A review of the test plan by SEA 91M is required.

Additional tests, listed in references (4), (11), and (12), provide desirable background information and may be requested by SEA 91M on a case-by-case basis for use in assessing safety and suitability for service use.

High Explosives

Primary and booster explosives shall be tested in accordance with reference (4). SEA 91M may waive some of these requirements on a case-by-case basis. Failure to pass one or more of these requirements will generally disqualify a booster explosive. The request for approval submission of booster explosives shall contain a comparison of the results of the mandatory tests with those obtained from at least two approved booster explosives listed in reference (6).

Qualification testing of main charge explosives shall be as described in reference (4). SEA 91M may waive some of these requirements on a case-by-case basis. Failure to pass one or more of these requirements will generally disqualify a main charge explosive. A comparison of the data from the above tests shall be made with results obtained from at least two approved main charge explosives and one booster explosive listed as permissible in reference (6).

Test data which will be submitted to SEA 91M in the Qualification package must be generated on explosive samples taken from a batch made using representative production techniques.

Propellants (Solid Rocket, Gas Generator, and Gun)

Solid propellants shall be tested in accordance with procedures listed in references (4), (11), (12), (13) and (14). The data will be compared with those generated on at least two similar solid propellants that have shown to be safe and suitable for service use. Test data which will be submitted to SEA 91M in the Qualification package must be generated on propellant samples taken from a batch made using representative production techniques.

Pyrotechnics

Tests on pyrotechnics shall be performed according to procedures listed in references (4) and (13). Test data which will be submitted to SEA 91M in the Qualification package must be generated on pyrotechnic samples taken from a batch made using representative production techniques.

Depending on the rate of energy release at application, explosives for Cartridges, CADS, PADS, and shall be tested as a high explosive, propellant, or pyrotechnic.

A statement shall be made on the producibility of the explosive based on availability of material, properties, mix

histories, production batch size, and overall production risk assessment.

Liquid, Gel, and Slurry Explosives

Mandatory tests for qualification are determined on a case-by-case basis. For novel applications, new tests may be developed and employed when approved in advance by SEA 91M. Tests listed below and conducted according to procedures listed in references (4) and (13) are generally required to evaluate the overall safety characteristics of a liquid explosive.

(1) Impact sensitivity.

(2) Shock sensitivity.

(3) Thermal stability (75°C/48 Hrs).

(4) External fire.

(5) Self heating ((Differential Scanning Calorimetry (DSC)) or autoignition temperature.

(6) Detonation velocity.

(7) Minimum pressure for vapor phase ignition.

(8) Flash point.

(9) Toxicity statement based on assessments of ingredients, combustion products and by-products of processing.

Depending on the composition of the explosive, additional test data, e.g., vacuum stability, density, melting/boiling point, vapor pressure, flammability/detonability limits, friction sensitivity, electrostatic sensitivity, thin film properties, compatibility with various materials may be required.

Upon submission of Qualification test plans for liquid, gel, and slurry explosives to SEA 91M, the possible need and extent of an aging protocol will be established in cooperation between the Program Manager and SEA 91M.

FINAL (TYPE) QUALIFICATION PROCEDURES FOR EXPLOSIVES

Data required for Final (Type) Qualification of an explosive shall be submitted to SEA 91M by the OPR and shall contain sufficient supporting data to show that the explosive is judged, by the submitting activity, to be safe and suitable in the intended application and a statement regarding compliance with reference (5). Requests for Final (Type) Qualification shall also contain an advisory

statement on processing and safe handling characteristics from one of the following:

(a) Commanding Officer, NSWC/IHD, for high explosives, propellants and pyrotechnics.

(b) Commanding Officer, NAWCWPNDIV/CL, for high explosives and propellants.

(c) Commander, NSWC/Crane, for pyrotechnics and blasting agents.

Required Documentation

Data package presented to or to be presented to the WSESRB in accordance with reference (15) which shall include:

(1) A statement of completion of a System Safety Program per reference (15) and (16).

(2) Supporting test and analysis results per table II plus additional test data requested by the WSESRB at reviews prior to Engineering and Manufacturing Development (E&MD).

TABLE II. MANDATORY FINAL (TYPE) QUALIFICATION TESTS

TESTS	HIGH EXPLOSIVES				PROPELLANTS	PYROTECHNICS	CARTRIDGE	CAD, PAD EXPLOSIVE
	PRIMARY		BOOSTER	MAIN CHARGE	SOLID ROCKET, GAS GENERATOR & SOLID GUN			
	SYSTEM LEVEL (1)	COMPONENT LEVEL (2)						
TEMPERATURE AND HUMIDITY (3)	X	X	X	X	X	X	X	X
VIBRATION	X	-	X	X	X	X	X	X
40 FOOT DROP	X	X (4)	X	X	X	X	X	X
5 FOOT DROP (5)	-	X (4)	-	-	-	-	-	-
FAST COOK-OFF	X (6)	-	X (7)	X	X	X	X (7)	X (7)
SLOW COOK-OFF(3)	-	X (8)	X (7)	X	X	X	X (8)	X (8)
BULLET IMPACT (3)	-	-	X (7)	X	X	X	-	-
JOLT	X	X (4)	X	-	-	X	X	X
JUMBLE (9)	X	-	X	-	-	X	X	X
FRAGMENT IMPACT (11)	-	-	X	X	X	-	X	X
SYMPATHETIC DETONATION (11)	X (10)	-	X	X	X	-	X	X
SPALL IMPACT (9,11)	-	-	X	X	X	-	X	X
SHAPED CHARGE JET IMPACT (9,11)	-	-	X	X	X	-	X	X
CHEMICAL AND PHYSICAL COMPATIBILITY	X	X	X	X	X	X	X	X
LOW TEMP/HUMIDITY AGING (12)	-	X	X	X	X	X	X	X

(3) A statement of the degree of compliance with references (5) and (10) with supporting data.

(4) Approved finalized materials documentation or description, such as materials specification, STANAG, etc.

(5) Data for inclusion in reference (6).

(6) Approved finalized Navy Munitions Document for booster and main-fill high explosives in accordance with reference (12).

(7) Advisory statements on the processing and safe-handling of explosives.

(8) A Final Hazard Classification.

(9) A Threat Hazard Assessment if the mandatory tests listed in table II are modified or deleted from the data package.

(10) Final draft of a comprehensive technical report on (1)-(9) above.

Recommendation for Final (Type) Qualification signed by the Commanding Officer of the submitting activity or by an authorized representative is required. The requesting organization will publish within six months a comprehensive technical report which documents the above required data.

Mandatory Test Data

Compliance matrix for system specific requirements, e.g., MIL-STD-1316 for safe-arm devices is required. Mandatory data and assessments listed in table II apply to explosives in all-up surface, air and underwater launched non-nuclear ordnance, and explosive devices. As indicated in reference (10), some tests may be performed on storage configuration ordnance or on subsystems, as long as extrapolation of vulnerability characteristics to all-up ordnance can be justified. Test plans, including deviations from mandatory requirements and required additional tests, shall be approved by SEA 91M prior to the E&MD phase.

Chemical compatibility testing of the explosive being considered for Final (Type) Qualification shall be conducted between the explosive and all materials (both energetic and inert) with which it may come in contact in production and in the end item configuration. This test program shall be submitted to SEA 91M for review and approval at least 60 days prior to start of the compatibility test.

Assessments may be used to satisfy testing requirements in some instances with prior concurrence from SEA 91M. Justification for the assessment with supporting data shall be included in the Final (Type) Qualification data package. Any information requested on an assessment basis may be changed to a requirement of actual testing of the all-up round if deemed necessary by the SEA 91M.

Final results from low temperature with humidity aging studies as shown in figure 1 shall be reported. Batch analysis data for the explosives/propellants used in the mandatory Final (Type) Qualification Tests (Table II) shall be reported.

Procedures for Obtaining Mandatory Data and Additional Data Requirements

For high explosives Final (Type) Qualification consists of two sets of tests. (1) Component level: to characterize the handling safety and functioning sensitivity of the component, e.g., primers, detonators, and squibs. Requirements specific to these devices, e.g., MIL-I-23659 for electric initiators, shall be met and proof of compliance submitted. (2) System level: those in the end-item usage, e.g., in arm-fire devices, exploders, and safety-and-arming devices. Requirements specific to these devices, e.g., MIL-STD-1316 for safety-and-arming devices, shall be met and a compliance matrix submitted. In addition, testing requirements listed in table II shall be met or assessed as applicable.

Booster explosives shall be tested in ordnance in accordance with reference (10) in the same configuration as will be used in the intended application. The Final (Type) Qualification of main charge explosives shall be performed in the same configuration as will be used in the service application. Procedures for mandatory tests are specified in references (5) and (10).

All units in Final (Type) Qualification must be manufactured to the requirements of the approved finalized Navy Munitions Document (NMD). Allowance will be made for circumstances requiring Final (Type) Qualification data for generation of the NMD.

For Rocket/Gas Generator/Gun Propellants Final (Type) Qualification shall be performed in the same configuration as will be used in the intended application and in accordance with reference (10). The propellant batch size that is used to fill the test hardware must represent the planned propellant batch size that is planned to be used in production. All production-level mixing and loading procedures must be followed when manufacturing test units for Final (Type) Qualification tests.

For Pyrotechnics Final (Type) Qualification shall be performed in the same configuration as will be used in the intended application and in accordance with reference (10). The pyrotechnics batch size that is used to fill the test hardware must represent the pyrotechnic batch size that is planned to be used in production. All production level mixing and loading procedures must be followed when manufacturing test units for Final (Type) Qualification tests.

For Explosives for Cartridges, CADs and PADs Final (Type) Qualification shall be performed in the same configuration as will be used in the intended role and in accordance with procedures listed in references (10), (17), and (18).

Summary

The implementation of NAVSEAINST 8020.5C in conjunction with MIL-STD-1751A and STANAG 4170 will ensure that new explosive formulations will be safe and suitable for use for Navy weapons.

References

1. OPNAVINST 8023.2
2. OPNAVINST 8010.13
3. NATO STANAG 4170
4. MIL-STD-1751
5. NAVSEAINST 8010.5
6. NAVSEA SW010-AG-ORD-010
7. NAVSEAINST 8020.11
8. SPCC 8010.12
9. CODE OF FEDERAL REGULATIONS, VOL 29, PART 1910
10. MIL-STD 2105
11. JANNAF SOLID PROPELLANT MECHANICAL BEHAVIOR MANUAL, CPIA PUB 21
12. MIL-STD-286
13. NAVSEAINST 8020.8
14. MIL-STD-2100(OS)
15. NAVSEAINST 8020.6
16. MIL-STD-882
17. MIL-D-21625(AS)
18. MIL-D-21615(AS)