



REQUESTING A WEAPON SYSTEMS OCCUPATIONAL HEALTH HAZARD ASSESSMENT (HHA) FROM THE NAVY AND MARINE CORPS FORCE HEALTH PROTECTION COMMAND (NMCFHPC)

October 2024

Background: BUMEDINST 6270.8D, Occupational Health Hazard Assessments, defines the Navy and Marine Corps HHA program. The HHA program supports defense acquisition programs via an integrated effort with a focus to reduce occupational health hazard risks throughout the life cycle of materiel. HHAs are evaluations to inform acquisition program managers of potential health effects associated with the use of a product, chemical, or the operation of equipment. Assessments may be requested to evaluate new products or processes, consider changes to previously evaluated products and processes, or address reformulations of products. Navy Medicine provides this service for submarines, surface vessels, aircraft, and shore activities to assist with maintaining operational readiness, capabilities, and performance.

To Request an HHA:

Send all requests, test results and documents to the NMCFHPC Industrial Hygiene Department. Request letters and supporting technical documentation are accepted in electronic and paper formats.

Electronic. Signed request letters from the Navy or Marine Corp sponsor and all supporting technical documents can be emailed to Head, Acquisition Technical Support Division at: usn.hampton-roads.navmcpubhlthcenpors.list.nmcphc-HHA@health.mil

Paper. Mail the information to:

Commander
Navy and Marine Corps Force Health Protection Command
Industrial Hygiene – HHA
620 John Paul Jones Circle, Suite 1100
Portsmouth, VA 23708-2103

Fax. Fax the request or documentation to 757-953-0689. The fax cover sheet should be marked as Health Hazard Assessment (HHA) or Submarine Materials Review HHA.



Request Letters

The weapon HHA request letter must come from the Navy or Marine Corps sponsoring organization. We do not perform independent product reviews or endorsements and will not accept information directly from a supplier or manufacturer until we have the official request.

The request letter should provide specific weapon information, including purpose of weapon, percentage of chemical composition, test data results for all potential physical and chemical exposures to be assessed, and the intended use of the weapon. Each area of information is critical to the risk assessment within the HHA, and is evaluated per the DoD System Safety Standard, MIL-STD-882E. Insufficient information may cause uncertainty in the risk assessment leading to an elevated risk assessment code (RAC). The following specific information is required, if applicable:

Type of weapon.

Type of weapon system associated with the weapon.

If the weapon HHA request is to be applied to multiple weapon systems the test data should be collected on each weapon system to account for any potential differences in risk due to weapon system design. Where what conditions the weapon will be used.

The anticipated number of rounds to be fired to meet objectives.

Rounds fired in testing should strongly correlate with the number of rounds anticipated to be fired during fielding. Consult with NMCFHPC when constraints to available rounds exist.

The rate of fire for the weapon in testing should reflect the rate of fire for anticipated use during fielding. If the weapon is to be fired as single shots, burst firing, or fully automatic, the testing should measure any of these conditions that apply.

The frequency of weapon use (e.g. The 40 mm MK 0 will require a one-time 64 initial rounds for familiarization and 128 rounds annually for qualification).

The operational layout for weapon (e.g. sitting position, tripod mount, free field, standing position on a gun mount for firing from enclosure).

If posture, mount, or platform vary for the weapon the test conditions should be collected in a manner that reflects these different conditions to account for the potential change in exposure.



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Comprehensive description of weapon composition. This description should detail the chemical composition and percentage, or weight of components throughout the weapon, including in the propellant, primer, casing, projectile, delay, igniter, tracer, fuze, explosive module, etc.

Indicating the chemical composition with generic descriptions or manufacturer labels alone will not provide enough granularity for NMCFHPC to assess the potential exposure. Manufacturer safety data sheets should accompany any indication of energetic mixtures when the chemical composition of components cannot be fully described.

Test results addressing the various potential exposures to personnel while using the weapon. Testing would typically include a minimum of chemical and impulse noise measurements. Additional hazards may be necessary to test for if the potential for exposure exists (e.g. blast overpressure (BOP), continuous noise, electromagnetic radiation, vibration, etc.).

All testing should adhere to specific Test Operating Procedures (TOP) and, or Military Standards. If gaps exist in the TOPs or Military Standards, the NMCFHPC Industrial Hygiene Field Operators Manual can be utilized or consult with NMCFHPC directly.

If it is unclear whether the hazard exists or how extensive the testing should be, consult with NMCFHPC prior to testing.

TEST RESULTS

All test results collected by DoD commands, centers, and labs must have the appropriate references and security markings. Having this information on the documentation is necessary for NMCFHPC to officially reference per BUMEDINST. Documentation provided through non-DoD sources should also contain the organization name, document title, and date. SDSs are required to meet information formatting per the Hazard Communication Standard, 29 CFR 1910.1200. E-mails, phone cons, and letters from weapon program managers, engineers, scientists, and specialists providing information or answers are considered expert opinion and can be referenced by NMCFHPC in the HHA

Exposure criteria and risk evaluation methods can differ across the DoD. Because of this, limitations may exist with some data sharing from other military departments. Although the following list is not comprehensive, and exceptions may apply the TOPs, MIL-SPECs, and other documents cited below should be considered as standard guidance for test procedure and risk characterization within the HHA.

Ideal test results to be submitted with the HHA request:



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Toxic Contaminants. 'Toxic contaminants' is a broad term often cited in TOPs referring to the chemical products and by-products that enter the atmosphere as a result of firing the weapon. Toxic contaminants can be separated into the following areas:

Combustion Products.

The products of combustion are the result of an exothermic reaction between a fuel and an oxidant to yield oxidized products usually in the form of gases. The following chemicals are considered a high priority for combustion products testing:

- Ammonia (NH₃)
- Carbon Dioxide (CO₂)
- Hydrogen Cyanide (HCN)
- Nitric Oxide (NO)
- Nitrogen Dioxide (NO₂)
- Sulfur Dioxide (SO₂)
- Carbon Monoxide (CO)

Volatile Organic Compounds (VOCs).

VOCs represent carbon containing compounds that easily evaporate under standard temperature and pressure. There is a large list of potential VOCs that can be emitted during weapons firing. Measuring for all VOCs is not typically necessary for the purpose of the HHA, and the list can be narrowed with development of a sample plan. Common VOCs for consideration in the testing include:

- Benzene (C₆H₆)
- Acrolein (CH₂CHCHO)
- Toluene (C₆H₅CH₃)
- Xylene ((CH₃)₂C₆H₄)
- Formaldehyde (CH₂O)

Metals.

Metals and metallic compounds are integral to many components of the weapon energetics, casings, and body composition. Weapons identified as 'lead-free', 'green ammo', 'enhanced performance rounds', etc., do not eliminate the presence of toxic metals being detected in the air during firing. These labels are primarily addressed at reducing environmental impact during the manufacturing process and on the range. Metals yielded during firing is dependent upon what is in the initial composition, however the amount measured is influenced by the reaction and air disbursement. Lead is a priority metal for testing as its presence in weapons is common. Other metals measured during testing include, when applicable:

- Copper (Cu)
- Nickel (Ni)
- Tungsten (W)



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Aluminum (Al)
Chromium (Cr)
Strontium (Sr)
Manganese (Mn)

All toxic contaminant measurements should be tested in a manner to account for the most representative potential exposure to personnel while operating the weapon and in a standard procedure-based format to ensure reproducibility of the testing and validity of the samples. The following documents can be referenced for procedure and sampling plan information:

- 1) TOP 02-2-622 Toxic Hazards Testing for Military Equipment and Materiel of 14 May 2020
- 2) TOP 03-2-504A Safety Evaluation of Small Arms and Medium Caliber Weapons of 29 May 2013
- 3) Industrial Hygiene Field Operators Manual (IHFOM), Technical Manual NMCPHC-TM6290.91-2 of 24 AUG 2022
- 4) Industrial Hygiene Sampling Guide for Comprehensive Industrial Hygiene Laboratories (CIHLs), NMCPHC of 15 Dec 2021

Physical Hazards. The physical hazards typically encountered during weapons firing are impulse noise and blast overpressure. These areas are further defined as follows:

Continuous Noise.

Continuous noise, also referred to as steady state noise, or intermittent noise testing is only necessary when a weapon or weapon system produces a sustained hazardous noise level that will cause prolonged exposure beyond the actual firing period. Continuous noise is typically associated with mechanical parts, engines, motor assemblies, or low-pressure changes within an air movement chamber, and not the rapid pressure changes due to chemical explosions occurring with weapons.

Impulse Noise.

Weapons are anticipated to exceed the exposure criteria of 140 decibels Peak (dBP) in nearly every situation and therefore testing is required to determine the potential impulse noise exposure to personnel. Risk assessment of impulse noise is evaluated different across the DoD, which places limitations on data sharing. To obtain risk mitigation acceptance under the DON umbrella all impulse noise testing should be in accordance with the most current DoD Noise Limit Design Criteria Standard. NMCFHPC can evaluate impulse noise test results per earlier DoD design standards and TOPs but will not be able to adjust the RAC. The following reference should be utilized for impulse noise testing:

MIL-STD-1474E Department of Defense Design Criteria Standard Noise Limits of 15 Apr 2015



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Hazardous Noise Contour.

The hazardous noise contour refers to the distance from the weapon at which the noise criteria level is no longer exceeded. This value is calculated by NMCFHPC for single hearing protection and double hearing protection based on the impulse noise test results.

Blast Overpressure (BOP).

BOP refers to the sudden onset of a pressure wave, above normal atmospheric pressure, which occurs from a blast (e.g., explosions and weapons firing events). The pressure wave is caused by the energy released during explosions and weapons firing. All weapons generate some level of BOP; however, the potential exposure is highly dependent upon the size of the weapon, design of the weapon, area of use, and position of personnel in relation to the blast source. It is highly recommended that BOP testing be conducted with any weapon HHA requests at this time. The following documents should be utilized for BOP procedure and consideration:

- 1) International Test Operations Procedure (ITOP) 4-2-822 Electronic Measurement of Airblast Overpressure and Impulse Noise of 25 Sep 2000
- 2) Department of Defense, Memorandum: Department of Defense Requirements for Managing Brain Health Risks from Blast Overpressure of 8 Aug 2024

Handling of Proprietary or Business Sensitive Information

When performing HHAs for the Navy and Marine Corps, NMCFHPC strictly adheres to the Department of Defense and Department of Navy requirements for handling information that is proprietary, competition sensitive or business sensitive. This information is treated as Controlled Unclassified Information (CUI) and is handled as such. More information regarding CUI can be found here: www.dodcui.mil.

The proprietary formulation will not be distributed to any other command or agency. The proprietary formulation is reviewed only to assess the potential health impacts of the chemical components. NMCFHPC does not sign confidentiality agreements or similar documents with manufacturers.

Contact the HHA Team

If you have any questions, contact the Navy and Marine Corps Force Health Protection Command, Industrial Hygiene Department, Acquisition Technical Support Division. Please direct all communications to Head, Acquisition Technical Support Division:

Head, Acquisition Technical Support Division

(757) 953-0725; DSN 377-0725

usn.hampton-roads.navmcpubhlthcenpors.list.nmcpnc-HHA@health.mil