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This TOP describes development test procedures required to determine whether general equipment is free from design, operational or maintenance hazards which could prevent accomplishment of their intended mission. Checklists and a hazard analysis format are provided to assist test personnel in the assessment of hazards.

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US ARMY TEST AND EVALUATION COMMAND
TEST OPERATIONS PROCEDURE

DRSTE-RP-702-100
*Test Operations Procedure 10-2-508 6 May 1980
AD No.

SAFETY AND HEALTH HAZARD EVALUATION - GENERAL EQUIPMENT

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1. SCOPE. This TOP provides general guidance for identifying and evaluating hazards associated with general supplies and equipment. Because of the variety of equipment which may be included in this category, all of the information contained in this document may not apply. Each test program must be designed to assure pertinent safety specifications and criteria are verified. When specific subtests are required to evaluate the safety characteristics, the TOP for the particular type of general equipment being evaluated will be consulted to determine which specific safety-related subtests are to be conducted.

2. FACILITIES AND INSTRUMENTATION.

2.1 Facilities. The facilities used for testing general equipment are diverse. The facilities are listed and described in the TOPs specific to the equipment being tested.

2.2 Instrumentation. Because of the wide variety of commodity items covered by this TOP, it is not feasible to include an exhaustive list of all necessary instrumentation. The actual instrumentation will be determined by the equipment under evaluation. The following listing indicates a number of more common items that may be used in the evaluation of various commodity items.

ITEM	MAXIMUM ERROR OF MEASUREMENT*
AC and DC voltmeters	±5% full scale
Wattmeters	±5% full scale

*This TOP supersedes MTP 10-2-508, 22 May 1970.

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ITEM (CONT)	MAXIMUM ERROR OF MEASUREMENT* (CONT)
Ohmmeters	±5% full scale
Ammeters	±5% full scale
Light meters	10% absolute
Sound intensity meter	See TOP 1-2-608 1/
Air contamination test sets	±5% full scale
Thermometers	±0.5°C (±1°F)
Pressure gages	±5% full scale

*Values may be assumed to represent ±2 standard deviations; thus the stated tolerances should not be exceeded in more than 1 measurement out of 20.

3. PREPARATION FOR TEST.

3.1 Preliminary Safety Review and Documentation Preparation. Ensure that a safety statement has been received from the developer as required by AR 70-10 2/. All developer- or contractor-identified safety and health hazards should be documented in the safety statement. Ensure that systems with radiation-producing components have been evaluated for health hazards in accordance with AR 40-5 3/ and DARCOM SUPPLEMENTS. All hazards identified must be taken into account in test planning.

Ensure that specific tests are included in the test plan to verify compliance with the safety and health criteria established for the system. These tests will differ for the different types of equipment being tested, and are usually described in the TOP for the specific item being tested.

Review the system support package, all instructional material, literature, and draft technical manuals.

Ensure that a suitable test site and test facilities are available for conducting the test.

Ensure required Standing Operating Procedures (SOPs) and Test Operations Procedures are available. The procedures for all hazardous operations will be documented in SOPs.

1/ TOP 1-2-608, Sound Level Measurements, 3 June 1977.
2/ AR 70-10, Test and Evaluation During Development and Acquisition of Materiel, 29 August 1975.
3/ AR 40-5, Health and Environment, 25 September 1974.

3.2 Operator Training and Familiarization. Ensure that the required new equipment operator training is conducted by the developer.

Conduct a preoperational briefing for all personnel prior to the start of the test. All personnel will review the hazards and precautions outlined in the safety statement and SOP.

3.3 Receipt Inspection. An initial safety inspection of the test item shall be performed by qualified test personnel with the assistance of a safety engineer, as required, prior to conducting all other tests of the item. The checklists in Appendix B provide a guide to the types of hazards which may be encountered. Satisfactory resolution concerning all potential hazards shall be obtained prior to conducting tests.

4. TEST CONTROLS.

4.1 Procedures for Accumulating Data. The results of initial safety inspection, hazard analysis of all test results, interviews, and operator reports of unsafe conditions will be used as methods of accumulating data.

4.2 Personnel. When specified in the Independent Evaluation Plan/Test Design Plan or at the request of the test director, an occupationally qualified safety professional will participate in the accumulation of data and analysis of the data using hazard-analysis and risk-assessment procedures.

4.3 Risk Assessment. Hazard-analysis and risk-assessment procedures will be used to establish the degree of hazard. The probability that the mishap will occur and the severity of potential consequences will be considered in this evaluation. Risk-assessment procedures are described in Appendix A.

5. PERFORMANCE TESTS.

5.1 Safety and Health Evaluation Subtests. Specific safety and health-evaluation subtests will be designed to evaluate all safety and health criteria established for an item or to otherwise identify hazards. The subtests are usually described in the TOP for the specific commodity type being tested.

5.2 Equipment-Operation Hazard Analysis. The equipment-operation hazard analysis is based upon the results of all subtests that may contain information concerning the safety or health characteristics of the test item. Based upon the results of the preliminary safety inspection, test results, comments from operating and maintenance personnel, and a review of the draft technical manuals, the following hazards should be evaluated using the techniques described in Appendix A:

a. Mechanical hazards.

b. Electrical hazards.

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c. Chemical hazards.

d. Health hazards.

e. Fire and explosion hazards.

f. Procedural hazards (operating and maintenance).

5.2.1 Mechanical Hazards. Carefully examine all instructional material to determine potential mechanical hazards.

Accomplish a thorough test item safety inspection and observe the item throughout all testing and evaluation phases. Solicit the comments and observations of equipment operators.

The following potential mechanical hazard sources should be considered when performing this evaluation:

a. Rotating, reciprocating and transverse motions.

b. Cam action.

c. Cutting actions - motion.

d. Cutting exposure - sharpness.

e. Punching, shearing, and bending actions

f. Rate of speed.

g. Instability (center of gravity).

h. Entrapment.

i. Lack of clearance.

j. Misleading appearance of quality.

k. Stored energy - physical.

ℓ. Improper rigidity.

m. Impact.

A sample checklist upon which a safety evaluation of mechanical hazards can be performed is included in Appendix B.

5.2.2 Electrical Hazards. Examine all instructional material; determine the location of all potential electrical hazards and ensure that these hazards are clearly indicated and that appropriate precautionary notices and instructions are provided 4/.

The test item shall be thoroughly inspected for safety during the initial safety inspection and during all phases of testing and evaluation. Comments and observations from equipment operators should be obtained.

The following electrical hazard sources should be considered when performing this evaluation:

a. Shock.

b. Short circuit.

c. Stored electrical charge (batteries and stray voltage).

d. Improper and/or inadequate ground.

e. Fire.

f. Overheating.

g. Ventilation.

h. Insulation failure.

i. Sparks.

j. Arcing.

k. Explosion.

A sample checklist upon which a safety evaluation of electrical hazards can be performed is included in Appendix B.

5.2.3 Chemical Hazards. Determine each chemical contained in or used with this equipment.

When exposure of personnel to chemicals will occur during operation of the system, ensure that the health hazards for each chemical have been considered 5/ and that controls are employed to assure maximum allowable

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4/ MIL-STD-454F, Standard General Requirements for Electronic Equipment, 15 March 1978.

5/ TECOM Regulation 385-7, Potential Health Hazards to Humans Participating in Testing, 15 November 1978.

exposure limits are not exceeded. If protective devices are used to eliminate or control the exposure their adequacy must be evaluated.

In addition, each chemical should be reviewed for the following properties and their effects on the system:

a. Corrosion.

b. Toxicity.

(1) By inhalation.

(2) By skin absorption.

(3) By ingestion.

c. Flammability.

d. Explosive limits.

e. Shock sensitivity.

f. Oxidation.

g. Photosensitivity.

h. Reactivity with water, air, fuels and lubricants, materials of construction.

i. Carcinogenicity.

j. Susceptibility to decomposition.

A sample checklist upon which a safety and health evaluation of chemical hazards can be performed is included in Appendix B.

5.2.4 Health Hazards. Throughout the conduct of the test, note any conditions that might be physiologically hazardous to the operation or maintenance personnel. Specific industrial hygiene measurements should be made to verify suspected hazards.

The following sources of health hazards should be considered:

a. Noise (pressure).

(1) High intensity.

(2) High frequency.

(3) Impulsive.

b. Vibration.

c. Radiation, ionizing.

d. Radiation, nonionizing.

(1) Ultraviolet emission.

(2) Visible-light emission.

(3) Infrared emission.

(4) Microwave emission.

(5) Radiowave emission.

e. Physical stress

f. Temperature - variation and extremes.

g. Oxygen depletion.

h. Lifting and carrying.

i. Toxic gases and particulates.

A sample checklist upon which an evaluation of health hazards can be performed is included in Appendix B.

5.2.5 Fire and Explosion Hazards. Accomplish a thorough test-item inspection and observe the item throughout all testing and evaluations for fire and explosion hazards. The following fire- and explosion-related hazards should be considered:

a. Fuel source.

b. Rate of flammability.

c. Ignition source.

(1) Heat (chemical).

(2) Heat (spontaneous).

(3) Heat (mechanical).

(4) Heat (electrical).

(5) Spark (mechanical).

(6) Lasers.

(6) Spark (electrical-static).

(7) Open flame.

A sample checklist upon which to base an evaluation of fire and explosion hazards is included in Appendix B.

5.2.6 Procedural Hazards. The primary variables to be considered are the operating or maintenace personnel, their surrounding environment, and the tasks which they must perform. Each task must be examined to determine the danger to personnel and equipment. The procedure and considerations described in TOP 10-2-507 6/ and TOP 1-2-610 7/ are most useful in this phase of the safety evaluation.

6. DATA REDUCTION AND PRESENTATION.

6.1 Data Presentation. The format shown in Figure 1, Appendix A will be used to present all conditions which are hazardous to personnel, equipment, and property.

6.2 Narrative Description of Test Results. Sufficient narrative comments will be included on each condition to provide background information to be used in the analysis of test results.

6.3 Analysis. Each hazardous condition will be analyzed as outlined in Appendix A to determine the category (severity) and probability of the hazard. The classification guide in TOP 1-1-012 8/ will be used to classify deficiencies, shortcomings, and suggested improvements 9/.

Recommended changes to this publication should be forwarded tc Commander, US Army Test and Evaluation Command, ATTN: DRSTE-AD-M, Aberdeen Proving Ground, MD 21005. Technical information may be obtained from the preparing activity: Commander: US Army Aberdeen Proving Ground, ATTN: STEAP-MT-M, Aberdeen Proving Ground, MD 21005. Additional copies are available from the Defense Technical Information Center, Cameron Station, Alexandria, VA 22314. This document is identified by the accession number (AD No.) printed on the first page.

6/ TOP 10-2-507, Maintenance Evaluation, 15 September 1971.
7/ TOP 1-2-610, Human Factors Engineering, 20 December 1977.
8/ TOP 1-1-012, Classification of Deficiencies and Shortcomings, 1 April 1979.
9/ DARCOM Regulation 385-12, Life Cycle Verification of Materiel Safety, 29 June 1972.

APPENDIX A
EQUIPMENT-OPERATION HAZARD ANALYSIS

Operating-hazard analysis may be performed during development testing to identify hazards associated with equipment, procedures, and personnel. Data from all development subtests can be used to prepare the Equipment Operation Hazard Analysis.

Figure 1 is a typical Equipment Operation Hazard Analysis Worksheet. This worksheet is designed to assure a complete analysis and classification of hazards that have been identified. The following instructions apply to the worksheet:

a. Hazard Description - Describe the personnel error, environmental condition, design inadequacy, procedural deficiency, system or component malfunction that presents a hazard to personnel, equipment, or property.

b. Hazard Effect - Describe the worst potential consequences to operating or maintenance personnel, equipment or property should the hazard continue to exist.

c. Hazard Category - Categorize the hazard in accordance with the provisions of MIL-STD-882A 10/. This is accomplished in two parts. First, consider the hazard effect described in the second column of the worksheet. Based on this description, assign one of four possible hazard categories shown below:

(1) CATEGORY I - CATASTROPHIC: May cause death or system loss.

(2) CATEGORY II - CRITICAL: May cause severe injury, severe occupational illness, or major system damage.

(3) CATEGORY III - MARGINAL: May cause minor injury, minor occupational illness, or minor system damage.

(4) CATEGORY IV - NEGLIGIBLE: Will not result in injury, occupational illness, or system damage.

10/ MIL-STD-882A, System Safety Program Requirements, 28 June 1977.

HAZARD DESCRIPTION	HAZARD EFFECT	HAZARD CATEGORY	HAZARD CONTROLS AND REMARKS

Figure 1. Typical Equipment-Operation Hazard-Analysis Worksheet

After assigning the hazard category, then the qualitative probability that the hazard effect will occur in a specific individual item or in the Army inventory must be assigned. One of six possible hazard probability levels must be assigned from those listed below:

Hazard Probability

Descriptive Word	Level	Specific Individual Item	Inventory
Frequent	A	Likely to occur frequently	Continuously experienced
Reasonably Probable	B	Will occur several times in life cycle of an item	Will occur frequently
Occasional	C	Likely to occur sometime in life cycle of an item	Will occur several times
Remote	D	So unlikely it can be assumed that this hazard will not be experienced	Unlikely to occur but possible
Extremely Improbable	E	Probability of occurrence cannot be distinguished from zero	So unlikely it can be assumed it will not be experienced
Impossible	F	Physically impossible to occur	Physically impossible to occur

Together, the hazard category (severity) and the hazard probability completely classify the hazard in accordance with MIL-STD-882A. For example, a critical hazard that occurs occasionally is a Category II-C hazard. This designation should be entered in the third column of the worksheet.

To classify the hazard as a deficiency, shortcoming, or suggested improvement, the Hazard Classification Guidelines provided as Figure 2 may be used. This classification may be entered in the third column of the worksheet.

d. Hazard Controls and Remarks - Comments relative to what should be done to prevent the hazard or protect against the consequences should be included in the fourth column of the worksheet.

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HAZARD SEVERITY			HAZARD PROBABILITY					
			FREQUENT	REASONABLY PROBABLE	OCCASIONAL	REMOTE	EXTREMELY IMPROBABLE	IMPOSSIBLE
	SPECIFIC INDIVIDUAL ITEM		Likely to occur frequently	Will occur several times in life of item	Likely to occur sometime in the life of item	So unlikely, can be assumed that this hazard will not be experienced	Probability of occurrence cannot be distinguished from zero	Physically impossible to occur
	FLEET OR INVENTORY		Continuously experienced	Will occur frequently	Will occur several times	Unlikely to occur, but possible	So unlikely, can be assumed that this hazard will not be experienced	Physically impossible to occur
			A	B	C	D	E	F
HAZARD SEVERITY	CATASTROPHIC - May cause death or system loss	I	DEFICIENCY	DEFICIENCY	DEFICIENCY	DEFICIENCY	SUGGESTED IMPROVEMENT OR ACCEPTABLE	ACCEPTABLE
	CRITICAL - May cause severe injury or illness, or major system damage	II	DEFICIENCY	DEFICIENCY	DEFICIENCY	SHORTCOMING	SUGGESTED IMPROVEMENT OR ACCEPTABLE	ACCEPTABLE
	MARGINAL - May cause minor injury or illness, or minor system damage	III	DEFICIENCY	SHORTCOMING	SHORTCOMING	SUGGESTED IMPROVEMENT	SUGGESTED IMPROVEMENT OR ACCEPTABLE	ACCEPTABLE
	NEGLIGIBLE - Will not result in injury or illness, or system damage	IV	SHORTCOMING	SUGGESTED IMPROVEMENT	SUGGESTED IMPROVEMENT	SUGGESTED IMPROVEMENT OR ACCEPTABLE	SUGGESTED IMPROVEMENT OR ACCEPTABLE	ACCEPTABLE

Figure 2. Hazard Classification Guidelines.

DOP 10-2-508
6 May 1980

APPENDIX B
CHECKLISTS

I. MECHANICAL HAZARD CHECKLIST

This checklist may be used as a guide for evaluating mechanical hazards when testing general equipment.

YES	NO	NA	
			1. Is the equipment designed so that the center of gravity, configuration or location of legs and supports make the equipment unlikely to tip over from unbalance effects or strong wind?
			2. Are expandable and collapsible structures such as shelters, jacks, supports, masts, tripods, etc., free from projections, sharp edges or design features which might be hazardous to personnel or associated equipment?
			3. Are lifting rings or slings provided for equipment which is normally moved or lifted by machine?
			4. Are ladders, climbing rings, handholds, rails, walkways, etc., provided where needed?
			5. Are steps and ladders and methods of supporting them safely made?
			6. Are entrances to equipment shelters free of hazardous obstructions?
			7. Do floor surfaces provide adequate nonslip characteristics?
			8. Are fasteners and methods of securing equipment to walls and racks sufficiently strong to prevent breakaway and falling?
			9. Can equipment shelters mounted on vehicles be entered without encountering a hazard?
			10. Does the installation of equipment on vehicles provide sufficient mechanical strength to minimize potential safety hazards?
			11. Are provisions made in vehicular and shelter installations for securing equipment, tools and accessories during movement?
			12. Are safety measures provided in the event the trailer becomes detached from the towing vehicle?

YES	NO	NA	
			13. When semi-trailers are detached from towing vehicles do dolly wheels or landing gear provide adequate support?
			14. If a standard military vehicle has been modified to accommodate the equipment, is the vehicle still capable of satisfactory and safe operation?
			15. Do doors and hinged covers have positive-action hold-open devices?
			16. Are locking mechanisms for doors and drawers designed to prevent injury to the operator when the lock is released?
			17. Are limit stops provided on roll-out racks and drawers?
			18. Are there provisions for easily overriding limit stops on roll-out racks and drawers?
			19. Is the method of opening a cover evident from the construction of the cover? If not, is an instruction plate permanently attached to the outside of the cover?
			20. Is it evident when a cover is in place but not secured?
			21. Is the equipment provided with suitable carrying handles?
			22. Are handles recessed rather than extended where they might be hazardous?
			23. Are handles positioned so they cannot catch on other units, wiring, or protrusions?
			24. Are handles located over center of gravity whenever possible?
			25. Are doors and other openings free of hazards from improperly designed catches, hinges, supports, fasteners and stops?
			26. Are components placed to allow sufficient space for use of test equipment and tools?
			27. Are heavy parts located as close as possible to load-bearing structures and as low as possible?
			28. Is the weight distribution such that the equipment is easy to handle, move or position?

YES	NO	NA

29. Are tasks of operation and maintenance such that they do not require excessive physical strength?

30. When the equipment is to be manpacked are the weight and configuration such that the combat effectiveness of the test soldier is not jeopardized?

31. Is the equipment free of sharp or overhanging edges and corners that might cause injury to personnel?

32. When glass is used is it glareproof and shatterproof?

33. Do exposed gears, cams, levers, fans, belts or other reciprocating, rotating or moving parts have adequate safety covers?

34. Is the equipment provided with sufficient caution plates to warn maintenance personnel of potential safety hazards?

35. Are warning signs coded and colored in accordance with Army regulations?

36. When required are provisions made for protection against eye hazards from flying particles?

37. Are safety valves, relief valves or other safety devices adjusted to their proper setting?

38. Are potential mechanical hazards adequately treated in the instructional manual?

II. ELECTRICAL HAZARD CHECKLIST

This checklist may be used as a guide for evaluating electrical or electronic hazards when testing general equipment.

YES	NO	NA

1. Is the path to ground from the equipment continuous and permament?

2. Does the grounding system have sufficient mechanical strength to minimize the possibility of accidental ground disconnection?

YES	NO	NA	
			3. Is the ground connection to the chassis or frame mechanically secured by one of the following methods? a. Secured to a spot-welded terminal lug. b. Secured to a portion of the chassis or frame that has been formed into a soldering lug. c. Secured by a screw or nut and a lockwasher to a terminal on the ground wire.
			4. Is the grounding system of sufficient gauge size to conduct safely any currents that may be imposed upon it?
			5. Is the impedance of the ground system sufficiently low to limit the potential above ground and to facilitate the operation of the overcurrent devices in the circuits?
			6. Are ground connections to shields and other mechanical parts, except the chassis and frame, made independently of the electrical circuits?
			7. Do plugs and convenience outlets for use with portable tools and equipment have provisions for automatic grounding?
			8. Are all external metal parts, control shafts, bushings and shields at ground potential at all times?
			9. Are voltages properly marked?
			10. Are guards, safety covers and warning plates provided for items handling 70 to 500 volts rms or dc?
			11. Are built-in test points provided where measurements of potentials greater than or equal to 300 volts peak?
			12. Can high-voltage circuits and capacitors be discharged to 30 volts within 2 seconds or less by automatic protective devices?
			13. When equipment is designed to operate on more than one type input power, are adequate precautions taken to prevent connection of improper power?
			14. Are dc power connections clearly marked for polarity?
			15. Are adjustment screws or other commonly worked-on parts located away from unprotected high voltages?

YES	NO	NA	
			16. Are tools to be used near high voltages adequately insulated?
			17. Do meters have protection against high voltage or current at the terminals?
			18. Are compartments operating at potentials in excess of 500 volts rms or dc where access is required for adjustment purposes equipped with interlocks with by-pass devices which remove all potentials in excess of 30 volts rms or dc?
			19. In compartments where access into the interior is required for adjustment purposes and no interlocks are used, are voltages in excess of 70 volts rms or dc isolated with barriers or guards?
			20. Is the grounding conductor of the equipment electrically insulated from the ac power return (neutral) within the system and/or equipment?
			21. Are mechanical and electrical interlocks designed to prevent energizing by movement when men are in positions where it could be dangerous?
			22. Are internal controls located at safe distances from dangerous voltages?
			23. Are physically similar but electrically noninterchangeable components keyed so that it is impossible to insert a wrong unit?
			24. Where design considerations require plugs and receptacles of similar configuration, are mating plugs and receptacles suitably coded and marked?
			25. Is shielding sufficiently separated from exposed conductors to prevent shorting or arcing?
			26. Are wires and cables adequately supported and terminated to prevent shock and fire hazard?
			27. Are wires and cables properly protected at points where they pass through metal partitions?
			28. Can maintenance be accomplished with shielding in place?
			29. Do floor surfaces provide adequate insulating characteristics?
			30. Are emergency controls placed in readily accessible positions?
			31. Is the main power breaker in an easily accessible location?

YES	NO	NA	
			31. Does the main power breaker cut off all power to the complete equipment or system?
			32. Can the power be cut off while installing, replacing or interchanging a complete equipment, assembly or part thereof?
			33. Are safety switches provided which will deactivate associated mechanical drive units without disconnecting other parts of the equipment?
			34. Are remotely located assemblies provided with safety switches to allow independent disconnection of the equipment?
			35. Are potential electrical hazards adequately treated in the instruction manual?
			36. Are disconnect devices (circuit breakers) properly labeled?

III. CHEMICAL HAZARD CHECKLIST

This checklist may be used as a guide when testing general equipment which uses chemicals.

YES	NO	NA	
			1. Has each chemical used in or with the system been identified in the safety statement?
			2. Have approved time-concentration exposure limits been established for each chemical used? If not, are toxicity tests being performed and interim safety precautions provided by the Surgeon General?
			3. Has each condition necessary for exposure to personnel or release to atmosphere or water been evaluated?
			4. Are the time-concentration exposure limits to personnel exceeded during operation of the item?
			5. Are precautions made to prevent exposure to respiratory hazards adequate? Skin absorption? Ingestion?

YES	NO	NA

6. Have all possible chemical reactions between the materials involved been analyzed including those with materials used in conjunction with the item being tested?

7. Are operator means of detecting a hazardous condition adequate?

8. Are all harmful chemicals properly identified with appropriate caution notices?

9. Are adequate safety devices and safety instructions provided for handling and use of gases stored under high pressure and/or extremely low temperature?

10. Has the effect of decontamination procedures on the equipment surface been studied? Is chemical or biological material retained in the paint or material? What is the desorption rate?

11. Did any personnel suffer irritation dermatitis as a result of contact with the chemical materials?

12. Are air intakes isolated from the exhaust?

13. Are adequate oxygen levels maintained inside shelters, etc.?

14. Is the collective efficiency of material collection equipment (scrubbers, filters, incinerators) adequate to prevent hazardous conditions?

15. Are the safeguards in event of power outage adequate?

16. Are adequate disposal procedures provided for all chemicals used as a part of or with the item?

IV. PHYSIOLOGICAL HAZARDS CHECKLIST

YES	NO	NA

1. Is the ambient noise level acceptable for personnel safety and efficiency?

2. Have all physical operator stresses such as repetitive motions, awkward working conditions, and vibration been evaluated?

3. Have all mental demands on operators been evaluated?

YES	NO	NA

4. Have all lifting and carrying requirements been evaluated?

5. When necessary, have all ear- and eye-protection devices been provided?

6. Are adequate controls and warning signs included to prevent exposure in excess of standards to ionizing radiation?

7. Are adequate controls and warning signs included to prevent exposure in excess of standards to nonionizing radiation, including UV, IR, laser, and microwave?

8. Are adequate illumination levels available for the tasks required?

9. Has heat stress to personnel as the result of exposure to high temperature or wearing protective equipment been evaluated?

10. Does the ventilating system provide for operator safety by ducting excess heat liberated by equipment to the outside of the shelter?

11. Is equipment-cooling air for shelter-mounted equipment completely separated from the personnel space to prevent contamination of the surrounding air?

12. Are adequate precautions made to prevent exposure of personnel to respiratory hazards from toxic gases, ducts, fumes and mists?

13. Is the air intake isolated from the exhaust?

14. Is the shelter heating and ventilating system designed to safeguard against depletion of oxygen in the personnel area?

15. Are all air-flow paths free of obstruction?

16. Is shelter-mounted equipment furnished with test kits for checking air contamination and oxygen depletion?

17. Are acids or other harmful liquids properly identified with appropriate caution notices?

18. Do instructions specify type of cleaning fluid and precautions to be taken when cleaning equipment?

YES	NO	NA

19. Are adequate safety devices and safety instructions provided for handling and use of gases stored under high pressure and/or extreme temperatures, e.g., hydrogen, helium, oxygen, nitrogen?

20. Is protection provided against hot surfaces which might be dangerous to personnel?

V. FIRE AND EXPLOSION HAZARD CHECKLIST

YES	NO	NA

1. Have all possible ignition sources been evaluated to determine potential hazard?

2. Has the flammability of the materials been taken into account in planning for use of the item?

3. Are fire extinguishers of the proper type for the equipment provided and mounted in easily accessible locations?

4. Are properly marked fire exits provided in shelters when required?

5. Have precautions been taken to assure that the storage and distribution of flammable material are done safely?

6. Is a self-closing metal can provided for oily rags and waste where required?

7. Have fire-extinguishing methods been included in technical publications?