

NOTICE OF  
CHANGE

METRIC

MIL-STD-1472D  
NOTICE 1  
20 March 1991

MILITARY STANDARD  
HUMAN ENGINEERING DESIGN CRITERIA FOR MILITARY  
SYSTEMS, EQUIPMENT, AND FACILITIES

TO ALL HOLDERS OF MIL-STD-1472D:

1. THE FOLLOWING PAGES OF MIL-STD-1472D HAVE BEEN REVISED AND SUPERSEDE THE PAGES LISTED:

NEW PAGE	DATE	SUPERSEDED PAGE	DATE
Cover	14 March 1989	Cover	14 March 1989
ii	14 March 1989	ii	REPRINTED WITHOUT CHANGE
7	20 March 1991	7	14 March 1989
8	14 March 1989	8	REPRINTED WITHOUT CHANGE
16 A	20 March 1991	NEW PAGE	
16 B	20 March 1991	NEW PAGE	
43	14 March 1989		REPRINTED WITHOUT CHANGE
44	20 March 1991	44	14 March 1989
91	14 March 1989		REPRINTED WITHOUT CHANGE
92	20 March 1991	92	14 March 1989
145	20 March 1991	120	14 March 1989
146	14 March 1989		REPRINTED WITHOUT CHANGE
169	20 March 1991	169	14 March 1989
170	14 March 1989		REPRINTED WITHOUT CHANGE
249	20 March 1991	249	14 March 1989
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278 A	20 March 1991	NEW PAGE	
278 B	20 March 1991	NEW PAGE	
281	20 March 1991	281	14 March 1989
282	20 March 1991	282	14 March 1989
285	14 March 89	285	REPRINTED WITHOUT CHANGE
286	20 March 1991	286	14 March 1989

2. MAKE THE FOLLOWING PEN AND INK CHANGES

- a. Page 13, para 3.45, second line: Change "4" to "6."
- b. Page 23, para 5.1.2.3.8, third line: After "sight," add "(see Fig 1)."
- c. Page 25. Add: "5.1.4.9 Visual Display Terminals (VDTs). See 5.16."
- d. Page 34, para 5.2.2.1.12, second and fifth lines: Change "3.17" to "3.39."
- e. Page 41, para 5.2.3.1.8, first line: Change "3.17" to "3.39."
- f. Page 48, para 5.2.6.4.3, first line: Change "3.17" to "3.39."

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- g. Page 49, para 5.2.6.5.4, first line: Change "3.17" to "3.39."
- h. Page 51, para 5.2.6.6.4.3.1, second line: Change "3.18" to "3.40."
- i. Page 75, para 5.4.2.1.1.5, second line: Change "3.17" to "3.39."
- j. Page 75: para 5.4.2.1.1.6, third line: Change "opertor's" to "operator's."
- k. Page 123, para 5.5.5.8, title: Change to "Stroke width, normal."
- l. Page 240, para 5.14.2.1, fifth line: Delete "MIL-L-87240."
- m. Page 287, para 70.3, sixth line: Delete "(1985)."
- n. Page 388, Review Activities, first line: Delete "MR."
- o. Page 388, Review Activities, second line: Delete "MS."
- p. Page 388, Review Activities, third line: Delete "26."
- q. Page 388, Civilian Agencies, Change "RDS" to "FAA."

3. RETAIN THIS NOTICE AND INSERT BEFORE TABLE OF CONTENTS.

4. Holders of MIL-STD-1472D will verify that page changes and additions indicated above have been entered. The notice pages will be retained as a check sheet. This issuance, together with appended pages, is a separate publication. Each notice is to be retained by stocking points until the Military Standard is completely revised or cancelled.

Custodians

Army - MI  
 Navy - AS  
 Air Force - 11

Preparing activity:  
 Army - MI

(Project HFAC-0050)

Review activities:

Army - AR, AT, AV, CR, ER, GL, ME, MD, TE, TM, EA  
 Navy - EC, MD, OS, PE, SH, TD  
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User activities:

Army - AL  
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Civilian agencies:

NASA - MSFC  
 DOT - FAA

MIL-STD-1472D  
NOTICE 1

METRIC

MIL-STD-1472D  
14 MARCH 1989  
SUPERSEDING  
MIL-STD-1472C  
2 May 1981

MILITARY STANDARD

HUMAN ENGINEERING DESIGN CRITERIA FOR MILITARY  
SYSTEMS, EQUIPMENT, AND FACILITIES



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Supersedes cover of 14 March 1989

FOREWORD

1. This Military Standard has been approved for use by all Departments and Agencies of the Department of Defense.

2. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, US Army Missile Command, ATTN: AMSMI-RD-SE-TD-ST, Redstone Arsenal, AL 35898-5270, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

3. This standard establishes general human engineering criteria for design and development of Military systems, equipment and facilities. Its purpose is to present human engineering design criteria, principles and practices to be applied in the design of systems, equipment and facilities so as to:

- a. Achieve required performance by operator, control and maintenance personnel.
- b. Minimize skill and personnel requirements and training time.
- c. Achieve required reliability of personnel-equipment combinations.
- d. Foster design standardization within and among systems.

4. This standard does not alter requirements for system development participation of human engineering specialists to interpret and implement these practices and to provide solutions to human engineering problems which arise and which are not specifically covered herein.

5. The use of the words "shall," "should," "may," and "will" in this standard is in accordance with MIL-STD-962, wherein "shall" expresses a provision that is binding, "should" and "may" express nonmandatory provisions, and "will" expresses a declaration of purpose or simple futurity.

6. Requirements herein are expressed in the International System of units (SI). As a convenience, the metric units are accompanied by their approximate customary system equivalents (in parentheses). Angular measure is expressed in radians or milliradians, except for 45°, 90°, 180°, 360°, etc., which are shown as multiples or divisions of  $\pi$  radians.

MIL-STD-1472D  
NOTICE 1

ANSI S3.5                      Articulation Index, Methods for the Calculation of

(Application for copies should be addressed to the American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018.)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM E 380                      Metric Practice, Standard for

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

HUMAN FACTORS SOCIETY (HFS)

ANSI/HFS 100                    American National Standard for Human Factors  
Engineering of Visual Display Terminal  
Workstations

(Applications for copies should be addressed to the Human Factors Society, Inc., P.O. Box 1369, Santa Monica, CA 90406

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

ISO DIS 2631                    Guide to the Evaluation of Human Exposure to Whole  
Body Vibration

(Application for copies should be addressed to the American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018.)

SOCIETY OF AUTOMOTIVE ENGINEERS (SAE)

SAE J925                        Minimum Access Dimensions for Construction and  
Industrial Machinery

(Application for copies should be addressed to the Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, PA 15096-0001.)

(Non-Government standards and other publications are normally available from the organizations that prepare or distribute the documents. These documents also may be available in or through libraries or other informational services.)

2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

MIL-STD-1472D

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MIL-STD-1472D  
NOTICE 1

In the absence of a radiant heat source (e.g., solar, engine, furnace), a modified Wet-Dry (WD85) index should be used where:

$$WD85 = 0.85T_{WBnp} + 0.15T_A$$

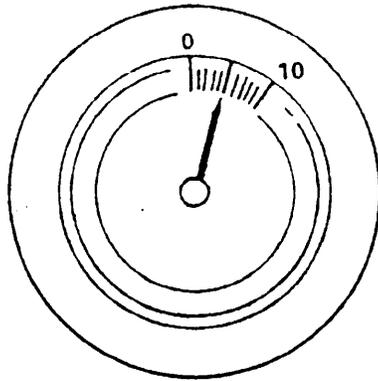
NOTE: Unless otherwise indicated, terms of equipment divisions are defined in accordance with MIL-STD-280.

MIL-STD-1472D  
NOTICE 1

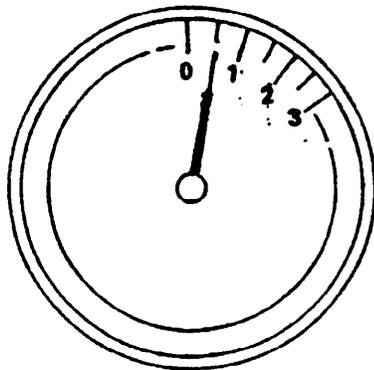
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16B

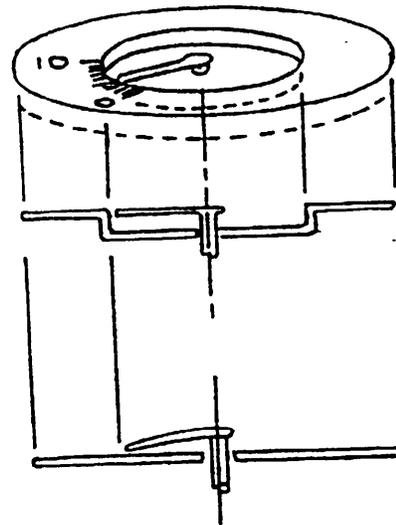
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FOR MAXIMUM READING ACCURACY  
(THE POINTER IS AN EQUAL DISTANCE -  
NOMINAL 0.8-1.6 mm (0.031-0.061 in.) -  
FROM ALL SCALE MARKS, NEVER  
OVERLAPPING ANY MARK OR NUMERAL.)



ALTERNATE FORMAT FOR GROSS  
READING OF NUMBERS



TO PREVENT OR MINIMIZE VISUAL  
PARALLAX

FIGURE 3. RELATIVE POSITION OF SCALE MARKS, NUMERALS,  
AND POINTERS ON CIRCULAR DIALS

MIL-STD-1472D  
NOTICE 1

in rows so that all pointers line up horizontally (for vertical scales) or in columns so that all pointers line up vertically (for horizontal scales).

5.2.3.3 Fixed-pointer, moving-scale indicators.

5.2.3.3.1 Numerical progression. On fixed-pointer, moving scale indicators, numbers shall progress in magnitude in clockwise direction around the faces of circular dials (counter-clockwise dial movement for numerical increase). On vertical or horizontal straight moving scales, numbers shall increase from bottom-to-top or from left-to-right.

5.2.3.3.2 Orientation. Numerals on moving scales shall be upright when in the reading position.

5.2.3.3.3 Alignment of pointer or fixed reference line. For circular scales, alignment of the pointer or fixed reference line shall be in the 12 o'clock position for right-left directional information and in the 9 o'clock position for up-down information. For purely quantitative information, either position may be used.

5.2.3.3.4 Setting. If the display will be used for setting in a value (e.g., tuning in a desired wavelength), the unused portion of the dial face shall be covered, and the open window shall be large enough to permit at least one numbered graduation to appear at each side of any setting.

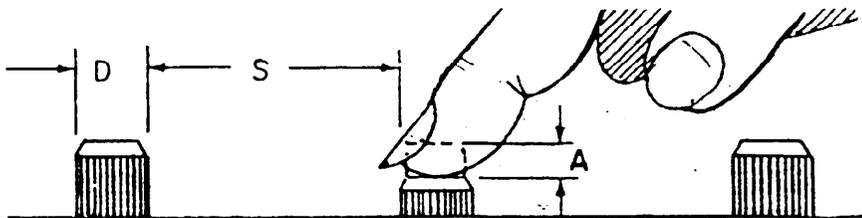
5.2.3.3.5 Tracking. If the display will be used for tracking, as in the case of a directional indicator, the whole face of the dial shall be exposed.

5.2.3.3.6 Moving tape displays. When the scale length required for acceptable readout accuracy exceeds the limits of the display package capacity (i.e., compaction of scale marking would make the display illegible or subject to readout error), moving tape scale format may be used.

5.2.3.3.7 Composite scalar/pictorial displays. Combinations of scales, pointers, and pictorial symbols may be used to combine functionally-related information into a single instrument or display (e.g., artificial horizon, command heading, true/relative bearing). Design of significant reference features (e.g., aircraft or ship symbols, horizon, altitude or pitch scales) shall conform to the general criteria herein for direction-of-motion, scale-pointer relationships, and legibility.

5.2.4 Cathode ray tube (CRT) displays. CRTs shall conform to the provisions below; however, where a CRT is part of a visual display terminal used for text processing, data entry, or data inquiry applications in an office environment or equivalent, see 5.16.

5.2.4.1 Signal size. When a target of complex shape is to be distinguished from a non-target shape that is also complex, the target signal should subtend not less than 6 mrad (20 minutes) of visual angle and should subtend not less than 10 lines or resolution elements. Image quality shall be consistent with the operator's needs.



	DIMENSIONS		RESISTANCE		
	DIAMETER D		Single Finger	Different Fingers	Thumb or Palm
	Fingertip	Thumb or Palm			
Minimum	9.5 mm (3/8 in.)	19 mm (3/4 in.)	2.8 N (10 oz.)	1.4 N (5 oz.)	2.8 N (10 oz.)
Maximum	25 mm (1 in.)		11 N (40 oz.)	5.6 N (20 oz.)	23 N (80 oz.)
DISPLACEMENT					
A					
	Fingertip		Thumb or Palm		
Minimum	2 mm (5/64 in.)		3 mm (1/8 in.)		
Maximum	6 mm (1/4 in.)		38 mm (1-1/2 in.)		
SEPARATION					
S					
	Single Finger	Single Finger Sequential	Different Fingers	Thumb or Palm	
Minimum	13 mm (1/2 in.)	6 mm (1/4 in.)	6 mm (1/4 in.)	25 mm (1 in.)	
Preferred	50 mm (2 in.)	13 mm (1/2 in.)	13 mm (1/2 in.)	150 mm (6 in.)	

Note: Above data for barehand application. For gloved hand operation, minima should be suitably adjusted.

FIGURE 11. PUSHBUTTONS (FINGER OR HAND OPERATED)

MIL-STD-1472D  
NOTICE 1

required, or when load sharing among limbs is desirable. Because foot-operated switches are susceptible to accidental actuation, their uses should be limited to non-critical or infrequent operations such as press-to-talk communication or vehicle headlight dimming.

5.4.3.1.2.2 Operation. Foot switches shall be positioned for operation by the toe and the ball of the foot rather than by the heel. They shall not be located so near an obstruction that the operator cannot center the ball of the foot on the switch button. A pedal may be used over the button to aid in locating and operating the switch. When the switch may become wet and slippery, the switch cap surface should possess a frictional surface to minimize the possibility of the foot slipping off the switch.

5.4.3.1.2.3 Dimensions, resistance, and displacement. Dimensions, resistance, and displacement of foot-operated switches shall conform to the criteria in Figure 12. Although not recommended (i.e., only one switch per foot is preferred), when one foot is required to operate more than one switch, such switches shall be at least 75 mm (3 in.) apart (horizontal); 200 mm (8 in.) apart (vertical).

5.4.3.1.2.4 Feedback. A positive indication of control actuation shall be provided (e.g., snap feel, audible click, associated visual or audio display change).

5.4.3.1.3 Keyboards. Keyboards shall conform to the provisions below; however, where a keyboard is part of a visual display terminal used for text processing, data entry, or data inquiry applications in an office environment or equivalent, see 5.16.

5.4.3.1.3.1 Use. Arrangements of push buttons in the form of keyboards should be used when alphabetic, numeric, or special function information is to be entered into a system.

5.4.3.1.3.2 Layout and configuration. The key configuration and the number of keys are dependent upon the predominant type of information to be entered into the system. The major forms that keyboards can take, which aid in the entry of such information, are given below:

a. Numeric keyboard. The configuration of a keyboard used to enter solely numeric information should be a 3 X 3 + 1 matrix with the zero digit centered on the bottom row.

b. Alpha-numeric keyboard. Keyboard configurations for entry of alphabetic and some numeric information shall conform to MIL-STD-1280. For some applications the entry of data varies from primarily alphabetic to primarily numeric. For these applications, two alternatives are preferred: Provide a keyboard of the type shown in Figure 2 of MIL-STD-1280 (where there is no separation between alphabetic and numeric characters) or provide a separation to emphasize the two separate functions, with the numeric keyboard located to the right of the standard keyboard.

5.4.3.1.3.3 Dimensions, resistance, displacement, and separation. The control dimensions, resistance, displacement, and separation between adjacent

5.7 Workspace design.

5.7.1 General. Unless otherwise noted, the following criteria apply to ground installations and, as practical, to airborne and shipboard installations; however, where a visual display terminal is used for text processing, data entry, or data inquiry applications in an office environment or equivalent, see 5.16.

5.7.1.1 Kick space. All cabinets, consoles, and work surfaces that require an operator to stand or sit close to their front surfaces shall contain a kick space at the base at least 100 mm (4 inches) deep and 100 mm (4 inches) high to allow for protective or specialized apparel.

5.7.1.2 Handles. Handles on cabinets and consoles shall be recessed whenever practicable, to eliminate projections on the surface. If handles cannot be recessed, they shall be designed such that they shall neither injure personnel nor entangle clothing or equipment.

5.7.1.3 Work space. Whenever feasible, free floor space of at least 1.220 m (4 feet) shall be provided in front of each console. For equipment racks that require maintenance, free floor space shall be provided in accordance with the following criteria.

5.7.1.3.1 Depth of work area. Clearance from the front of the rack to the nearest facing surface or obstacle shall be not less than 1.070 m (42 inches). The minimum space between rows of cabinets shall be 200 mm (8 inches) greater than the depth of the deepest drawer (equipment).

5.7.1.3.2 Lateral work space. The minimum lateral workspace for racks having drawers or removable equipment shall be as follows (measured from the drawers or equipment in the extended position):

a. for racks having drawers or removable items weighing less than 20 kg (44 pounds): 460 mm (18 inches) on one side and 100 mm (4 inches) on the other,

b. for racks having drawers or removable items weighing over 20 kg (44 pounds): 460 mm (18 inches) on each side.

5.7.1.3.3 Space between rows of cabinets. The minimum space between rows of cabinets shall be 200 mm (8 inches) greater than the depth of the deepest drawer or cabinet.

5.7.1.3.4 Storage space. Adequate and suitable space shall be provided on consoles or immediate work space for the storage of manuals, worksheets, and other materials that area required for use by the operational or maintenance personnel.

5.7.2 Standing operations

5.7.2.1 Work surface. Unless otherwise specified, work surfaces to support documents such as job instruction manuals or worksheets shall be 915  $\pm$ 15 mm (36  $\pm$ 0.6 inches) above the floor.

5.7.2.2 Display placement, normal. Visual displays mounted on vertical panels and used in normal equipment operation shall be placed between 1.040 m (41 inches) and 1.780 m (70 inches) above the standing surface.

5.7.2.3 Display placement, special. Displays requiring precise and frequent reading shall be placed between 1.270 m (50 inches) and 1.650 m (65 inches) above the standing surface.

5.7.2.4 Control placement, normal. All controls mounted on a vertical surface and used in normal equipment operation shall be located between 860 mm and 1.780 m (34 and 70 inches) above the standing surface.

5.7.2.5 Control placement, special. Controls requiring precise or frequent operation and emergency controls shall be mounted between 860 mm and 1.350 m (34 and 53 inches) above the standing surface and no farther than 530 mm (21 inches) laterally from the centerline.

### 5.7.3 Seated operations.

5.7.3.1 Work surface width and depth. A lateral workspace of at least 760 mm (30 inches) wide and 400 mm (16 inches) deep shall be provided whenever practicable.

5.7.3.2 Work surface height. Desk tops and writing tables shall be 740 to 790 mm (29 to 31 inches) above the floor, unless otherwise specified.

5.7.3.3 Writing surfaces. Where a writing surface is required on equipment consoles, it shall be at least 400 mm (16 inches) deep and should be 610 mm (24 inches) wide, when consistent with operator reach requirements.

### 5.7.3.4 Seating.

5.7.3.4.1 Compatibility. Work seating shall provide an adequate supporting framework for the body relative to the activities that must be carried out. Chairs to be used with sit-down consoles shall be designed to be operationally compatible with the console configuration.

5.7.3.4.2 Vertical adjustment. Provision shall be made for vertical seat adjustment from 380 to 535 mm (15 to 21 inches) in increments of no more than 25 mm (1 inch) each.

5.7.3.4.3 Backrest. A supporting backrest that reclines between 1745 and 2005 mrad (100 and 115 degrees) shall be provided. The backrest shall engage the lumbar and thoracic regions of the back, and shall support the torso in such a position that the operator's eyes can be brought to the "Eye Line" with no more than 75 mm (3 inches) of forward body movement.

5.7.3.4.4 Cushioning. Where applicable, both the backrest and seat shall be cushioned with at least 25 mm (1 inch) of compressible material and provided with a smooth surface.

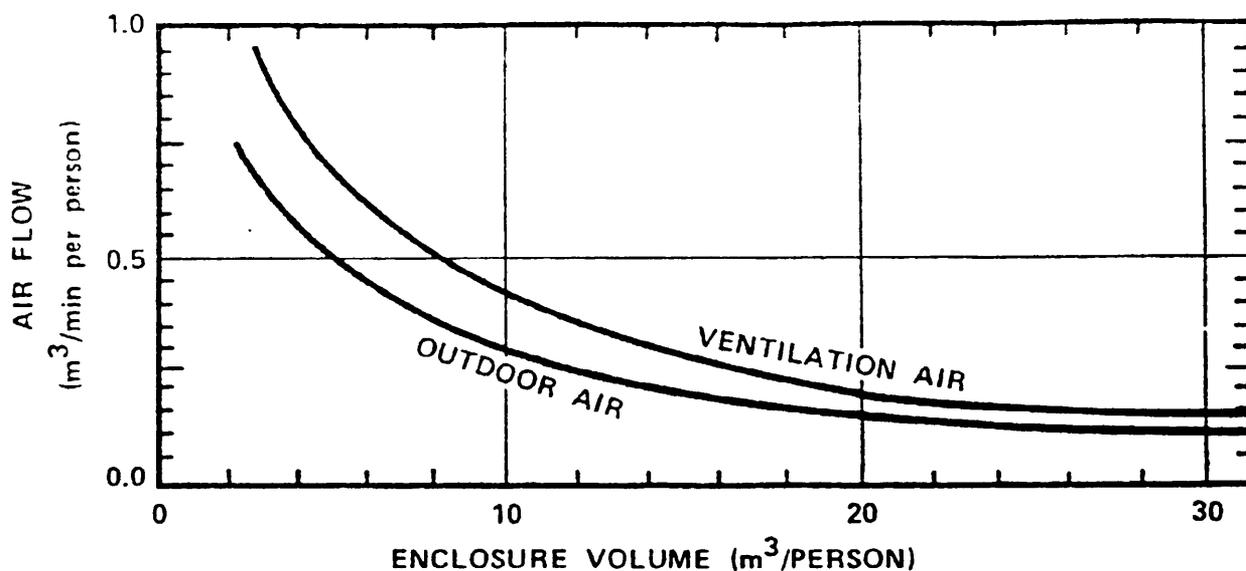


FIGURE 39. VENTILATION REQUIREMENTS

fuel handler suits, body armor, arctic clothing, and temperature regulated clothing are required and worn, a comfort micro-climate between 20°C (68°F), 14 mm Hg ambient water vapor pressure and 35°C (95°F), 3 mm Hg ambient water vapor pressure is desirable and, where possible, shall be maintained by heat transfer systems.

5.8.1.7 Thermal tolerance and comfort zones. Temperature and humidity exposure should not exceed the effective temperature limits given in Figure 40 when corrected for air velocity (Figure 39).

5.8.1.8 Limited thermal tolerance zones. Where hard physical work is to be required for more than two hours, an environment not exceeding WBGT or WD index of 25° C (77°F) shall be provided. Where the wearing of protective clothing systems (which reduce evaporation of sweat from the skin) is required, this index shall be decreased 5°C (10°F) for complete protective uniforms, 4°C (7°F) for intermediate clothing systems, and 3°C (5°F) for body armor.

5.8.2 Illuminance. Where equipment is to be used in enclosures and is not subject to blackout or special low-level lighting requirements, illumination levels shall be as specified by table XXI and shall be distributed so as to reduce glare and specular reflection. Capability for dimming shall be provided. Adequate illumination shall be provided for maintenance tasks. General and supplementary lighting shall be used as appropriate to ensure that illumination is compatible with each task situation. Portable lights should be provided for personnel performing visual tasks in areas where fixed illumination is not provided. For display lighting, see Table XXII. For illumination characteristics (illuminance, glare, balance, and specular reflectance) of VDTs, see 5.16.

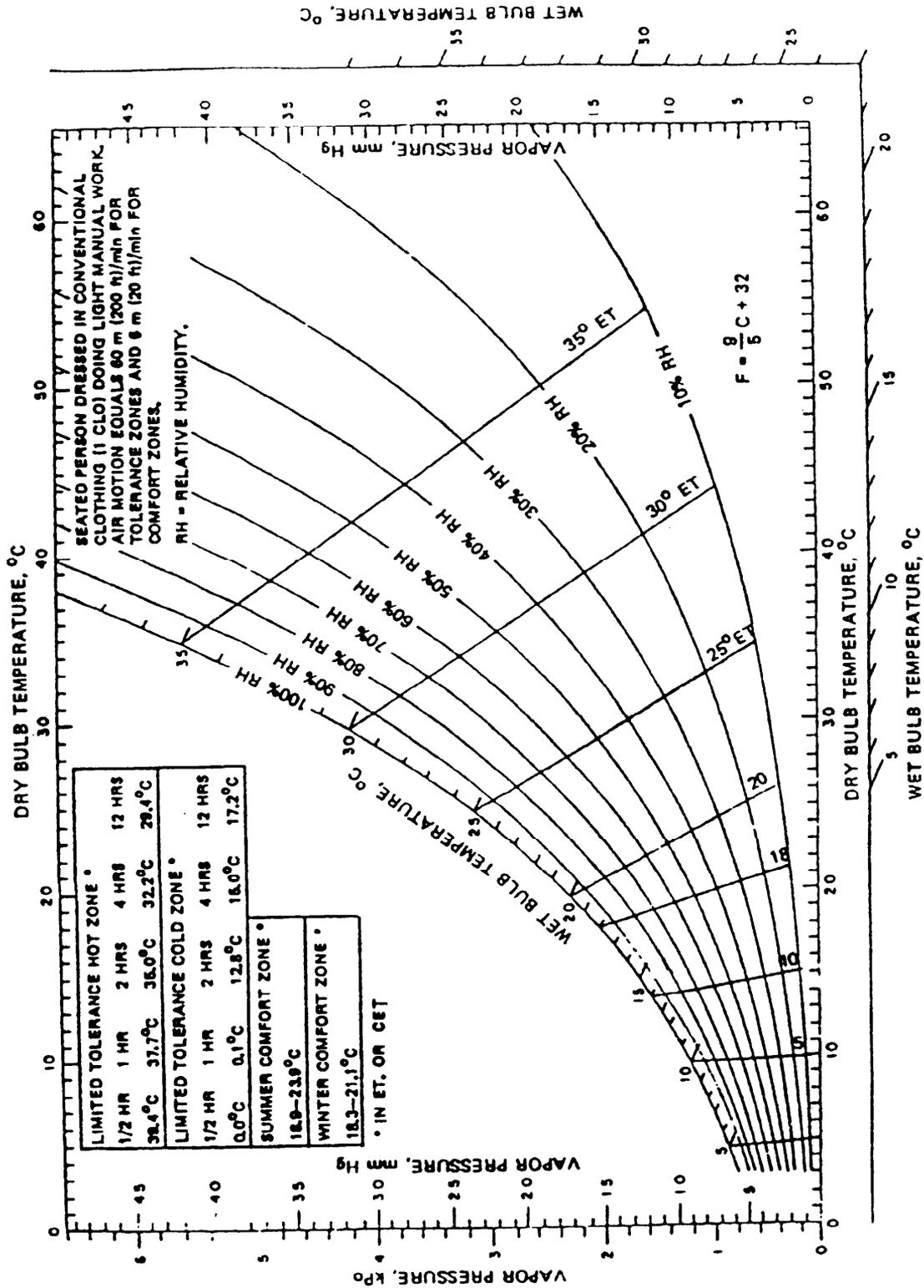


FIGURE 40. SUMMER AND WINTER COMFORT ZONES AND THERMAL TOLERANCE FOR INHABITED COMPARTMENTS

MIL-STD-1472D  
NOTICE 1

not move beyond the display boundaries and disappear from sight. If the cursor is moved by depressing a key, releasing the key shall cause the cursor to stop moving.

5.15.2.1.8.3 Home position. The home position for the cursor should be consistent across similar types of displays.

5.15.2.1.8.4 Explicit actuation. A separate, explicit action, distinct from cursor position, shall be required for the actual entry (e.g., enabling, actuation) of a designation position.

5.15.2.1.8.5 Consistent positioning. Where cursor positioning is incremental by discrete steps, the step size of cursor movement shall be consistent horizontally (i.e. in both right and left directions), and vertically (in both up and down directions).

5.15.2.1.8.6 Keyboard cursor control. When position designation is required in a task emphasizing keyed data entry, cursor control should be by some device integral to the keyboard. If cursor movement is accomplished by depressing keys, the keys shall be located on the main keyboard.

5.15.2.1.8.7 Movement relationships. The response of a cursor to control movements shall be consistent; predictable, and compatible with the user's expectation. For cursor control by key action a key labeled with a left-pointing arrow should move the cursor leftward on the display; for cursor control by joystick, leftward movement of the control should result in leftward movement of the cursor.

5.15.2.1.9 Abbreviations, mnemonics, and codes. When abbreviations, mnemonics, or codes are used to shorten data entry, they shall be distinctive and have a relationship or association to normal language or specific job-related terminology. Abbreviations should be the same length, the shortest possible that will ensure unique abbreviations.

5.15.2.1.10 Explicit delete action. Data deletion or cancellation shall require an explicit action, such as the depression of a DELETE key.

5.15.2.1.11 Change of data. Where a user requests change (or deletion) of a data item that is not currently being displayed, the option of displaying the old value before confirming the change should be presented.

5.15.2.1.12 Single method of data entry. Data entry methods and data displays should not require the user to shift between entry methods.

5.15.2.1.13 Data entry display. Where data entry on an electronic display is permitted only in prescribed areas, a clear visual definition of the entry fields shall be provided.

5.15.2.2 Keyboard. Keyboards shall conform to the provisions below; however, where a keyboard is part of a visual display terminal used for text processing, data entry, or data inquiry applications in an office environment or equivalent, see 5.16.

5.15.2.2.1 Use. A keyboard should be used to enter alphabetic, numeric and other special characters into the system.

5.15.2.2.2 Configuration. Keyboards shall conform to MIL-STD-1280, unless otherwise specified or approved by the procuring activity.

5.15.2.2.3 Timely display. Keyed inputs, except security items such as passwords, shall be shown on the display in accordance with the values in Table XXVIII.

5.15.2.2.4 Length. Except for extended text, the length of individual data items shall be minimized.

5.15.2.2.5 Justification. When entering tabular data, the user shall not be required to right- or left-justify tabular data entries. The system shall automatically justify columnar data with respect to decimal systems point, left margin or right item margin, depending on the type of data.

5.15.2.2.6 Numeric keypads. Keyboards used in systems requiring substantial numeric input shall be equipped with a numeric keypad.

5.15.2.2.7 Minimization of keying. The amount of keying required should be minimized.

5.15.2.2.8 Minimization of shift keying. The use of key shifting functions should be minimized during data entry transactions.

5.15.2.2.9 Data change. In keyed data entry, means shall be provided to allow users to change previous entries, if necessary, by DELETE and INSERT actions.

### 5.15.2.3 Fixed function (dedicated) keys.

5.15.2.3.1 Use. Fixed function keys (for example, ENTER) should be used for time-critical, error-critical, or frequently used control inputs.

5.15.2.3.2 Standardization. Fixed function keys should be common throughout the system.

5.15.2.3.3 Functional consistency. Once a key has been assigned a given function, it should not be reassigned to a different function for a given user.

5.15.2.3.4 Availability. Fixed function keys should be selected to control functions that are continuously available; i.e., lockout of fixed function keys shall be minimized. At any step in a transaction sequence, however, function keys which are not used for current inputs should be temporarily disabled under computer control. Mechanical overlays should not be used for this purpose.

5.15.2.3.5 Non-active keys. Non-active fixed function keys should be replaced by a blank key on the keyboard.

MIL-STD-1472D  
NOTICE 1

5.16 Visual Display Terminals (VDTs). Where a VDT is used only for text processing, data entry, and data inquiry applications in an office environment or equivalent, the VDT, associated furniture, and environments in which the VDT is placed shall conform to ANSI/HFS 100; however, where such criteria are not specified by ANSI/HFS 100, the VDT, associated furniture, and environments shall conform to applicable provisions herein.

MIL-STD-1472D  
NOTICE 1

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278B

NEW PAGE

MIL-STD-1472D  
NOTICE 1

10 SCOPE

The documents listed in this appendix provide supplementary information, criteria, and guidance that may be used, as applicable, to assist the designer in complying with the requirements of this standard. Their application is not to be regarded as mandatory, unless so specified by the procuring activity.

20 TRI-SERVICE PUBLICATIONS

MIL-HDBK-761	Human Engineering Guidelines for Management Information Systems
DOD-HDBK-763	Human Engineering Procedures Guide
MIL-H-46855	Human Engineering Requirements for Military Systems, Equipment, and Facilities
MIL-HDBK-141	Optical Design
TB MED 81 NAVMED P-5052-29 AFR 161-11	Cold Injury
CSC-STD-002-85	Department of Defense Password Management Guide (Fort George G. Meade, MD: Department of Defense Security Center.)

30 ARMY PUBLICATIONS

30.1 Regulations

AR 40-10	Health Hazard Assessment Program in Support of the Army Materiel Acquisition Decision Process.
AR 40-14	Control and Recording Procedures, Occupational Exposure to Ionizing Radiation
AR 385-16	Safety for Systems, Associated Subsystems and Equipment
AR 700-52	Licensing and Control of Sources of Ionizing Radiation

MIL-STD-1472D  
NOTICE 1

30.2 Pamphlets & Bulletins

AMCP 706-134	Maintainability Guide for Design (AD 823 539)
DA PAM 40-501	Hearing Conservation
TB MED 521	Diagnostic X-Ray, Therapeutic X-Ray, and Gamma Beam Protection for Energies up to 10 Million Electron Volts
TB MED 270	Control of Hazards to Health from Microwave Radiation
TB MED 279	Control of Hazards to Health from Laser Radiation
TB MED 288	Medical Problems of Man at High Terrestrial Elevations
TB MED 508	Cold Injury

30.3 Design Criteria Handbook

MIL-HDBK-759	Human Factors Engineering Design for Army Materiel
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30.4 Reports

AVSCOM Report 75-47	Study to Determine the Impact of Aircrew Anthropometry on Airframe Configuration.
Natick Laboratories TR EPT-2	Reference Anthropometry of the Arctic Equipped Soldier (AD 449 4831)
Natick Laboratories TR 73-51-CE	The Carrying of Loads Within an Infantry Company (AD 762 559)
Natick RDEC TR 89/827	Anthropometric Survey of U.S. Army Personnel
USAAMRDL TR 71-22	Crash Survival Design Guide (Revised 1971)
USAHEL TM 4-77	A Human Factors Evaluation of a Vertical Scale Instrument Display System for the OV-1D Aircraft (AD A03 6050)

40 NAVY PUBLICATIONS

40.1 Manual

NAVAIR 00-807-99	U.S. Naval Aerospace Physiologist's Manual, 1972.
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MIL-STD-1472D

WADC TR 52-204	Handbook of Acoustic Noise Control (AD 18 260)
WADC TR 54-520	The Anthropometry of Work Positions (AD 110 573)
WADC TR 55-159	Space Requirements of the Seated Operator (AD 87 892)
WADC TR 56-218	Guide to the Design of Electronic Equipment for Maintainability (AD 101 729)
WADC TN 57-248	Acoustical Criteria for Work Spaces, Living Quarters, and Other Areas on Air Bases (AD 130 839)
WADD TR 58-474	The Effect of Team Size and Intermember Communication on decision-Making Performance (AD 215 621)
WADD TR 60-814	Audio Warning Signals for Air Force Weapon Systems (AD 258 477)

### 50.3 Air Force Systems Command Design Handbooks

Copies of Air Force Systems Command design criteria handbooks may be obtained by nongovernmental organizations when compliance therewith is required by a Government contract, or when possession of the handbook will otherwise benefit the Government. Requests for the following handbooks should be directed to 4950/TZHM, Wright-Patterson AFB, OH 45433:

AFSC DH 1-1	General Index and Reference
AFSC DH 1-3	Human Factors Engineering
AFSC DH 1-6	System Safety
AFSC DH 2-1	Airframe
AFSC DH 2-2	Crew Stations and Passenger Accommodations
AFSC DH 2-3	Propulsion and Power
AFSC DH 2-6	Ground Equipment and Facilities

## 60 NATIONAL AERONAUTICS AND SPACE ADMINISTRATION PUBLICATIONS

### 60.1 Standards

(Copies of the following documents can be obtained by qualified requesters from MSIS Custodian/SP34, NASA-Johnson Space Center, Houston, TX 77058)

MIL-STD-1472D  
NOTICE 1

NASA-STD-3000, Volume I Man-Systems Integration Standards

NASA -STD-3000, Volume II Man-Systems Integration Standards-Appendices

60.2 Book

Copies of the following document can be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402

NASA SP-3006 Bioastronautics Data Book, Second Edition,  
J.F. Parker and V. R. West, eds.

70 VOLUNTARY STANDARDS AND GUIDES

70.1 American National Standards Institute (ANSI)

Copies of the following standards can be obtained at a nominal cost from the ANSI, 1430 Broadway, New York, NY 10018

ANSI A12.1 Floor and Wall Openings, Railings, and Toeboards,  
Safety Requirements for

ANSI A14.3 Ladders-Fixed-Safety Requirements

ANSI C2 National Electrical Safety Code (NBS H30)

ANSI S1.11 Specification for Octave-Band and Fractional-Octave-  
Band Analog and Digital Filters (ASA 65)

ANSI Z136.1 Safe Use of Lasers

70.2 American Society for Testing and Materials. Copies of the following document can be obtained at a nominal cost from the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM F 1166-88 Standard Practice for Human Engineering Design  
Criteria for Marine Systems, Equipment, and  
Facilities

70.3 American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Copies of the following documents can be obtained at a nominal cost from the ASHRAE, 1791 Tullie Circle, NE, Atlanta, GA 30329

ASHRAE 55-81 Thermal Environmental Conditions for Human Occupancy

ASHRAE 61-81 Ventilation for Acceptable Indoor Air Quality Guide  
and Data Book (latest edition)

70.4 Illuminating Engineering Society (IES) of North America. Copies of the following document can be obtained at a nominal cost from the IES, 345 East 47th Street, New York, NY 10017

IES Lighting HDRK SEC 9 Application-87, Industrial Lighting