



**DEPARTMENT OF THE AIR FORCE**  
HEADQUARTERS AIR FORCE CIVIL ENGINEER SUPPORT AGENCY

FROM: HQ AFCESA/ENC  
139 Barnes Drive  
Tyndall AFB FL 32403-5319

SUBJECT: **Engineering Technical Letter (ETL) 94-8: Design in Metric**

**1. Purpose.** This ETL establishes requirements for use of metric measurements in criteria, design, and specification documents for facility projects.

**2. Application:** All entities engaged in production of facility project documents.

**2.1. Authority:** Executive Order (EO) 12770, *Metric Usage in Federal Government Programs*, 25 July 1991.

**2.2. Effective Date:** Immediately. Expires five years from date of issue.

**3. Reference Publications.**

**3.1.** Metric Conversion Act of 1975, Public Law 94-168 (15 U.S.C. 205a et seq.), as amended by section 5164 of the Omnibus Trade and Competitiveness Act of 1988, Public Law 100-418, implemented by Federal Acquisition Regulation paragraph 10.002(c).

**3.2.** Executive Order 12770, *Metric Usage in Federal Government Programs*, July 25, 1991 (Federal Register/Vol. 56, No. 145/pp. 35801-35803).

**3.3.** *The Metric Guide for Federal Construction*, 1st ed., The Construction Subcommittee of the Metrication Operating Committee of the Interagency Council on Metric Policy; National Institute of Building Sciences, 1201 L Street N.W., Washington, DC 20005.

**3.4.** *Metric Design Guide*, 3rd ed., General Services Administration, Office of Design and Construction, October 1993.

**3.5.** *Metric Guide Specification* (GSA (AIA-based) Master Specs on WordPerfect 5.1 disks), General Services Administration, Office of Design and Construction.

**3.6.** Federal Standard 376B, *Preferred Metric Units for General Use by the Federal Government*, National Institute of Standards and Technology, March 12, 1993.

**APPROVED FOR PUBLIC RELEASE: DISTRIBUTION UNLIMITED**

**3.7.** ASTM Standard Manual E 380-92, *Standard Practice for Use of the International System of Units (SI) (the Modernized Metric System)*.

**3.8.** ASTM E 621-84 (reapproved 1991), *Standard Practice for the Use of Metric (SI) Units in Building Design and Construction*.

#### **4. Definitions.**

**4.1. Hard Metric:** Applies to products manufactured to industry-established metric modules and standards, and to metric measurements mathematically converted from corresponding inch-pound (IP) values and logically rounded to whole metric numbers; for example, 600 mm by 1200 mm.

**4.2. Soft Metric:** Applies to products and measurements that conform to IP modules, standards, or other controlling factors and are expressed in metric values which are exact mathematical conversions of the corresponding IP values. Converted measurements will be expressed to the minimum number of significant digits that will maintain the required accuracy IAW ASTM Standard Manual E 380-92.

**4.3. Neutral (Designations):** Identifiers that have no expressed relation either to metric or IP values. For example, American Wire Gage (AWG) designates thickness or diameter, but in itself is neither metric nor IP.

**5. Specific Requirements.** Requirements in this ETL are mandatory unless otherwise stated.

**5.1.** Use the International System of Units (SI) in all new or revised publication media to disseminate technical criteria. Use SI units for facility project drawings and specifications starting with the FY 96 programs.

**5.2.** Use hard metric units when there is no conflict with codes and standards and available products are economically feasible and will effectively interface with non-metric construction components.

**5.3.** When measurements governed by IP values are critical, use soft metric conversions of corresponding IP measurements, or conservatively rounded (in the correct direction) conversions.

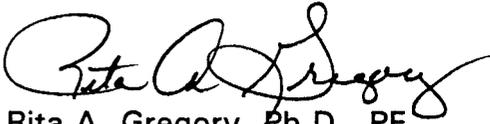
**5.4.** Where dual units are needed, present SI designations first, followed by the IP designation in parentheses.

**5.5.** Do not display unit designations on metric drawings. Dimensions are understood to be in millimeters (except large scale civil drawings, which are dimensioned in meters).

5.6. MILCON programming documents (such as DD Form 1391) and real property records will remain in IP units.

**6. Points of Contact.**

- Policy issues: Mr. Jim Enloe, HQ USAF/CECM, DSN 225-8176.
- Technical issues: Mr Larry Spangler, HQ AFCESA/ENC, DSN 523-6180.



Rita A. Gregory, Ph.D., PE  
Director of Systems Engineering

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  2. Technical Details

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# ENGINEERING TECHNICAL LETTERS (ETL)

## SECTION A - CURRENT ETLs

ETL Number	Title	Date Issued
83-1	Design of Control Systems for HVAC Change No. 1 to ETL 83-1, U.S. Air Force Standardized Heating, Ventilating & Air Conditioning (HVAC) Control Systems	16 Feb 83 22 Jul 87
83-3	Interior Wiring Systems, AFM 88-15, Para 7-3	2 Mar 83
83-4	EMCS Data Transmission Media (DTM) Considerations	3 Apr 83
83-7	Plumbing, AFM 88-8, Chapter 4	30 Aug 83
83-8	Use of Air-to-Air Unitary Heat Pumps	15 Sep 83
83-9	Insulation	14 Nov 83
84-7	MCP Energy Conservation Investment Program (ECIP)	13 Jun 84
84-10	Air Force Building Construction and the Use of Termiticides	1 Aug 84
86-2	Energy Management and Control Systems (EMCS)	5 Feb 86
86-4	Paints and Protective Coatings	12 May 86
86-5	Fuels Use Criteria for Air Force Construction	22 May 86
86-8	Aqueous Film Forming Foam Waste Discharge Retention and Disposal	4 Jun 86
86-9	Lodging Facility Design Guide	4 Jun 86
86-10	Antiterrorism Planning and Design Guidance	13 Jun 86
86-14	Solar Applications	15 Oct 86
86-16	Direct Digital Control Heating, Ventilation, and Air Conditioning Systems	9 Dec 86
87-1	Lead Ban Requirements of Drinking Water	15 Jan 87
87-2	Volatile Organic Compounds	4 Mar 87
87-9	Prewiring	21 Oct 87
88-2	Photovoltaic Applications	21 Jan 88
88-3	Design Standards for Critical Facilities	15 Jun 88
88-4	Reliability & Maintainability (R&M) Design Checklist	24 Jun 88
88-6	Heat Distribution Systems Outside of Buildings	1 Aug 88
88-9	Radon Reduction in New Facility Construction	7 Oct 88
88-10	Prewired Workstations Guide Specification	29 Dec 88
89-2	Standard Guidelines for Submission of Facility Operating and Maintenance Manuals	23 May 89
89-4	Systems Furniture Guide Specification	6 Jul 89
89-6	Power Conditioning and Continuation Interfacing Equipment (PCCIE) in the Military Construction Program (MCP)	7 Sep 89

ENGINEERING TECHNICAL LETTERS (ETL)

SECTION A - CURRENT ETLs

ETL Number	Title	Date Issued
89-7	Design of Air Force Courtrooms	29 Sep 89
90-1	Built-Up Roof (BUR) Repair/Replacement Guide Specification	23 Jan 90
90-2	General Policy for Prewired Workstations and Systems Furniture	26 Jan 90
90-3	TEMPEST Protection for Facilities Change 1 Ref: HQ USAF/LEEDE Ltr dated 20 April 90, Same Subject	23 Mar 90
90-5	Fuel and Lube Oil Bulk Storage Capacity for Emergency Generators	26 Jul 90
90-6	Electrical System Grounding, Static Grounding and Lightning Protection	3 Oct 90
90-7	Air Force Interior Design Policy	12 Oct 90
90-8	Guide Specifications for Ethylene Propylene Diene Monomer (EPDM) Roofing	17 Oct 90
90-9	Fire Protection Engineering Criteria for Aircraft Maintenance, Servicing, and Storage Facilities	2 Nov 90
90-10	Commissioning of Heating, Ventilating, and Air Conditioning (HVAC) Systems Guide Specification	17 Oct 90
91-1	Fire Protection Engineering Criteria Testing Halon Fire Suppression Systems	2 Jan 91
91-2	High Altitude Electromagnetic Pulse (HEMP) Hardening in Facilities	4 Mar 91
91-4	Site Selection Criteria for Fire Protection Training Areas	14 Jun 91
91-5	Fire Protection Engineering Criteria - Emergency Lighting and Marking of Exits	18 Jun 91
91-6	Cathodic Protection	3 Jul 91
91-7	Chlorofluorocarbon (CFC) Limitation in Heating, Ventilating and Air-Conditioning (HVAC) Systems	21 Aug 91
93-1	Construction Signs	11 Mar 93
93-2	Dormitory Criteria for Humid Areas	13 Jul 93
93-3	Inventory, Screening, Prioritization, and Evaluation of Existing Buildings for Seismic Risk	18 Aug 93
93-4	Fire Protection Engineering Criteria - Automatic Sprinkler Systems in Military Family Housing (MFH)	11 Aug 93

## ENGINEERING TECHNICAL LETTERS (ETL)

### SECTION A - CURRENT ETLs

ETL Number	Title	Date Issued
93-5	Fire Protection Engineering Criteria - Electronic Equipment Installations	22 Dec 93
94-1	Standard Airfield Pavement Marking Schemes	5 Apr 94
94-2	Utility Meters in New and Renovated Facilities	10 Jun 94
94-3	Air Force Carpet Standard	10 Jun 94
94-4	Energy Usage Criteria for Facilities in the Military Construction Program	19 Aug 94
94-5	Fire Protection Engineering Criteria and Technical Guidance - Emergency Lighting and Marking of Exits	8 Nov 94
94-6	Fire Protection Engineering Criteria and Technical Guidance - Removal of Halogenated Agent Fire Suppression Systems	5 Dec 94
94-7	Affirmative Procurement Requirements for Construction and Other Civil Engineering Specifications	14 Dec 94
94-8	Design in Metric	14 Dec 94

# ENGINEERING TECHNICAL LETTERS (ETL)

## SECTION B - OBSOLETE ETLs

ETL Number	Date	Status
82-1	10 Nov 82	Superseded by ETLs 83-10, 86-1, 87-4
82-2	10 Nov 82	Superseded by AFEPPM 88-10
82-3	10 Nov 82	Superseded by ETLs 83-5, 84-2
82-4	10 Nov 82	Superseded by ETL 84-7
82-5	10 Nov 82	Superseded by ETLs 84-1, 86-13, 86-14
82-6	30 Dec 82	Cancelled
82-7	30 Nov 82	Cancelled
83-2	16 Feb 83	Superseded by ETL 84-3
83-5	5 May 83	Superseded by ETL 84-2
83-6	24 May 83	Cancelled
83-10	28 Nov 83	Superseded by ETL 86-1
84-1	18 Jan 84	Superseded by ETL 86-14
84-2	27 Mar 84	Superseded by ETL 94-4
84-3	21 Mar 84	Cancelled
84-4	10 Apr 84	Superseded by ETLs 86-7, 86-15, 87-5
84-5	7 May 84	Superseded by ETLs 84-8, 86-11, 86-18, 88-6
84-6	Not Issued	Cancelled/Not Used
84-8	19 Jun 84	Superseded by ETL 86-11
84-9	5 Jul 84	Superseded by ETL 88-7
88-5	2 Aug 88	Superseded by ETL 91-6
86-1	3 Feb 86	Superseded by ETL 87-7
86-3	21 Feb 86	Superseded by ETL 86-4
86-6	3 Jun 86	Superseded by ETLs 86-11, 86-18, 88-6
86-7	3 Jun 86	Superseded by ETL 86-15
86-11	3 Jul 86	Superseded by ETL 88-6
86-12	3 Jul 86	Superseded by ETL 90-2
86-13	18 Aug 86	Superseded by ETL 86-14
86-15	13 Nov 86	Superseded by ETL 87-5
86-17	17 Dec 86	Superseded by ETL 89-6
86-18	18 Dec 86	Superseded by ETL 88-6
87-3	12 Mar 87	Superseded by ETLs 87-6, ETL 88-5
87-4	13 Mar 87	Superseded by ETL 94-4
87-5	13 July 87	Superseded by ETL 94-2
87-6	21 Aug 87	Superseded by ETL 88-5
87-7	14 Oct 87	Superseded by ETL 89-1
87-8	19 Oct 87	Superseded by ETL 90-1
88-1	5 Jan 88	Superseded by ETL 89-2
88-5	2 Aug 88	Superseded by ETL 91-6
88-7	24 Aug 88	Superseded by ETLs 90-3, 91-2
88-8	4 Oct 88	Superseded by ETL 91-7
89-1	6 Feb 89	Superseded by ETL 90-4
89-3	9 Jun 89	Superseded by ETL 93-5
89-5		Issued as ETL 90-7
90-4	24 May 90	Cancelled
91-8	24 Sep 91	Cancelled
91-3	14 Jun 91	Superseded by MIL HDBK 1008B, Jan 94

## CONSTRUCTION TECHNICAL LETTERS (CTL)

### SECTION C - CURRENT CTLs

CTL Number	Title	Date Issued
88-2	DD Form 1354 Checklist	6 Jan 88
88-7	Constructibility Review Checklist	1 Nov 88
89-1	Thirty-Percent Design Submittal	10 Apr 89
89-2	MAJCOM Construction Management	30 May 89
89-3	Warranty and Guarantee Program	22 Sep 89
90-1	Management of the MILCON Planning and Execution Process	6 Mar 90
90-2	Definitions for Design Milestones	13 Mar 90

### SECTION D - OBSOLETE CTLs

CTL Number	Status
87-1	Superseded by CTL 88-3
88-1	Superseded by CTL 90-1
88-3	Superseded by ETL
88-4	Replaced by Electronic Data File and Documentation in PDC/WIMS
88-5	Superseded by CTL 90-2
88-6	Issuance Cancelled