

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR FORCE CIVIL ENGINEERING SUPPORT AGENCY
TYNDALL AIR FORCE BASE FL 32403-6001

FROM: HQ AFCESA/EN
139 Barnes Drive, Suite 1
Tyndall AFB, FL 32403-5319

SUBJ: Engineering Technical Letter (ETL) 93-4:
Fire Protection Engineering Criteria - Automatic Sprinkler
Systems in Military Family Housing (MFH)

TO: See Distribution

1. PURPOSE. This letter provides criteria for automatic sprinkler systems in MFH. These systems enhance the level of life safety for Air Force personnel and their dependents because they activate in fires before room temperature and smoke/toxic gas production reach levels intolerable for human life. HQ USAF/CE requires the installation of these systems in certain types of MFH.

2. APPLICATION. This ETL complies with Public Law (PL) 102-522, Fire Administration Authorization Act of 1992, and applies to all commands with MFH. It is effective immediately. It does not specify the conditions when automatic sprinkler systems are required in MFH. Policy guidance from HQ USAF/CE specifies those conditions. This ETL was coordinated with HQ USAF/CEH.

3. SPECIFIC REQUIREMENTS. Atch 3 provides criteria and technical guidance for automatic sprinkler systems in MFH.

4. WAIVERS. HQ AFCESA/DF is responsible for the management and currency of this criteria and for approval/disapproval of permanent waivers. The MAJCOM evaluates waiver requests prior to submittal to HQ AFCESA/DF.

5. POINT OF CONTACT. Mr Raymond N. Hansen, P. E., HQ AFCESA/DFE, telephone DSN 523-6317, commercial (904) 283-6317, or FAX 523-6499.

WILLIAM V. CORSETTI, PE
Acting Director of Systems
Engineering

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3. Criteria and
Technical Guidance

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ENGINEERING TECHNICAL LETTERS (ETL)

SECTION A - CURRENT ETLs

| ETL Number | Title | Date Issued |
|------------|---|-----------------------|
| 82-2 | Energy Efficient Equipment | 10 Nov 82 |
| 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 |
| 83-3 | Interior wiring Systems, AFM 88-15 Para 7-3 | 22 Jul 87 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 |
| 84-2 | Computer Energy Analysis Change 1 Ref: HQ USAF/LEEEU Msg 031600Z MAY 84 1 Jun 84 | 27 Mar 84 |
| 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 | Anti terrorism 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 |
| 87-4 | Energy Budget Figures (EBFs) for Facilities in the Military Construction Program | 13 Mar 87 |
| 87-5 | Utility Meters in New and Renovated Facilities | 13 Jul 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 |

ENGINEERING TECHNICAL LETTERS (ETL)

SECTION A - CURRENT ETLs

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| 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 |
| 89-3 | Facility Fire Protection Criteria for Electronic Equipment Installations | 9 Jun 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 |
| 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 | 20 Apr 90 |
| 90-4 | 1990 Energy Prices and Discount Factors for Life-Cycle Cost Analysis | 24 May 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 |
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| 91-2 | High Altitude Electromagnetic Pulse (HEMP) Hardening in Facilities | 4 Mar 91 |
| 91-3 | Water Supply for Fire Protection | 14 Jun 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 |

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| 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) | 18 Aug 93 |

SECTION B - OBSOLETE ETLs

| No. | Date | Status |
|-------|------------|--|
| 82-1 | 10 Nov 82 | Superseded by ETL 83-10, 86-1, 87-4 |
| 82-3 | 10 Nov 82 | Superseded by ETL 83-5, 84-2 |
| 82-4 | 10 Nov 82 | Superseded by ETL 84-7 |
| 82-5 | 10 Nov 82 | Superseded by ETL 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 |
| 84-3 | 21 Mar 84 | Cancelled |
| 84-4 | 10 Apr 84 | Superseded by ETL 86-7, 86-15, 87-5 |
| 84-5 | 7 May 84 | Superseded by ETL 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 ETL 86-11, 86-18, 88-6 |
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| 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 | 15 Dec 86 | Superseded by ETL 88-6 |
| 87-3 | 12 Mar 87 | Superseded by ETL 87-6, ETL 88-5 |
| 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 |
| 88-7 | 24 Aug 88 | Superseded by ETL 90-3, ETL 91-2 |

| | | | |
|------|--------|----|------------------------|
| 88-8 | 4 Oct | 88 | Superseded by ETL 91-7 |
| 89-1 | 6 Feb | 89 | Superseded by ETL 90-4 |
| 89-5 | | | Issued as ETL 90-7 |
| 91-8 | 24 Sep | 91 | Cancel led |

Atch 2
(3 of 3)

CRITERIA AND TECHNICAL GUIDANCE
FOR
AUTOMATIC SPRINKLER SYSTEMS IN MFH

1.0 INTRODUCTION. Automatic sprinkler systems in MFH provide an enhanced level of life safety to Air Force personnel and their dependents. Historically, sprinklers were designed to control fire growth before too much property was destroyed. Technological advances have led to the development of residential sprinkler systems which activate much earlier in the fire growth process. These systems will activate before room temperature and smoke/toxic gas production reach levels intolerable for human life. This document provides criteria and technical guidance for the systems.

2.0 REFERENCED PUBLICATIONS.

2.1 MIL-HDBK-1008, Fire Protection for Facilities Engineering, Design and Construction.

2.2 National Fire Protection Association (NFPA) Standard 13, Installation of Sprinkler Systems.

2.3 NFPA Standard 13D, Installation of Sprinkler Systems in One- and Two-Family Dwellings and Mobile Homes.

2.4 NFPA Standard 13R, Installation of Sprinkler Systems in Residential Occupancies up to and Including Four Stories in Height.

2.5 AFM 91-37, Maintenance of Fire Protection Systems. NOTE: This manual is scheduled for reissue for Air Force use. It is currently distributed as Army TM 5-695 and Navy MO-117.

3.0 CRITERIA/TECHNICAL GUIDANCE.

3.1 Design Standards. Automatic sprinkler systems in MFH shall be designed in accordance with MIL-HDBK-1008, NFPA 13, NFPA 13D and NFPA 13R, as appropriate.

3.2 Definition of Residential Sprinkler System. Automatic sprinkler systems in MFH buildings up to and including four stories designed per NFPA 13D and NFPA 13R are hereafter referred to as "residential sprinkler systems."

3.3 Materials Selection.

3.3.1 All materials in automatic sprinkler systems shall be designed for maximum reliability and minimum maintenance.

3.3.2 NOTE: Because of the long service life of MFH units, higher initial costs for better quality materials will usually be amortized by savings in maintenance costs.

3.4 Hydraulic Calculations.

3.4.1 Automatic sprinkler systems in MFH shall be hydraulically calculated.

3.4.2 NOTE: Residential sprinkler systems are characterized by low volumes of water and low pressures. There is relatively little margin for error in system design. Piping schedules used in earlier editions of some NFPA standards are not suitable for residential sprinkler systems.

3.5 Common Supply Main.

3.5.1 Residential sprinkler systems should be connected to the water supply via a common supply main serving both the sprinklers and domestic uses. Separate supply mains should not be used except in existing construction when separate supply mains are more cost effective than replacement of the existing domestic supply main.

3.5.2 The common supply main in new construction and replacement projects shall be a minimum of 1-inch diameter. It shall provide a minimum of 26 gpm. Water meters, if provided, shall be at least 1-inch in size.

3.5.3 The common supply main in existing MFH shall be a minimum of 3/4-inch diameter. A water meter, if provided, shall be at least 1-inch in size. Existing water meters less than 1-inch in size may not be used because they cause excessive friction loss and prevent proper system operation.

3.6 Valves for Use with Common Supply Mains.

3.6.1 Each system using a common supply main shall have a single control valve to shut off both the domestic and sprinkler water supplies. This control valve shall be readily available to the tenants of the MFH.

3.6.2 An additional shutoff valve for the domestic water (only) is permitted. A separate shutoff valve for fire-line piping is not permitted.

3.6.3 A double check valve shall be provided at the connection of the Fire-line piping to the common supply main.

3.7 Water Pressure Considerations for Residential Sprinkler Systems.

3.7.1 Pressure regulators may be required in some areas to protect domestic plumbing devices from excessive system pressure. Pressure regulators, if required, should be installed in the domestic water line only.

3.7.2 In areas where system pressure is too low for sprinkler operation, an engineering analysis shall be conducted to determine the most effective corrective action.

3.8 Water Hammer.

3.8.1 Automatic sprinkler systems in MFH shall be designed to prevent damage caused by water hammer.

3.8.2 Residential sprinkler systems may provide this protection by a pipe stub and cap that extends above one of the vertical sprinkler lines. The pipe stub will trap air in the systems to absorb some of the shock from a water hammer.

3.9 Water Flow Detection.

3.9.1 Waterflow alarms shall be provided and connected to the building fire alarm.

3.9.1.1 Waterflow alarms shall be provided for each story in buildings of more than 3 stories in height.

3.9.1.2 Waterflow alarms should be provided to detect sprinkler activation among a small group of MFH units

3.9.2 If the building is not provided with a fire alarm system, a waterflow warning or bell shall be placed on the exterior of the building, preferably adjacent to sleeping quarters of the residence.

3.10 Drain and Inspector Test Valve.

3.10.1 Drain and inspector test valve(s) shall be installed at the most remote point(s) of the automatic sprinkler system.

3.10.2 Residential sprinkler systems may use a keyless hose bib to accomplish this function. If used, the keyless hose bib shall be installed at eye level or higher so that it will not be mistaken for a domestic garden hose bib.

3.11 Piping Materials. Any piping materials may be used for automatic sprinkler systems in MFH if they are listed or approved by a nationally recognized testing laboratory for the application.

3.12 Piping Layout.

3.12.1 All piping will be concealed. Pipe shall not be visible within occupied spaces.

3.12.2 Install piping inside walls and attic spaces. If this is not possible (e.g., buildings with concrete walls), install cornice box along the top of the walls and use sidewall sprinklers instead of pendent sprinklers. Decorative hollow wooden beams to conceal the sprinkler piping are also acceptable.

3.12.3 Horizontal runs of piping within walls shall be installed at the lowest or highest points in a wall. This will minimize inadvertent damage by the occupant. Alternatively, a steel plate extending at least 1-inch above and below the piping may be installed to prevent the occupant from putting nails into the sprinkler system.

3.12.4 All sprinkler piping shall be restrained against improper movement.

3.13 Type of System. Automatic sprinkler systems in MFH shall be wet pipe systems.

3.14 Freeze Protection. Automatic sprinkler systems in MFH shall be protected from damage due to freezing as appropriate for the local climate.

3.15 Sprinkler Heads.

3.15.1 Quick response, residential-type sprinkler heads shall be used in all occupied living spaces. Quick response, commercial-or industrial-type sprinkler heads are not acceptable as substitutes.

3.15.2 Concealed sprinkler heads shall not be used. Recessed sprinkler heads with an exposed heat-sensing element are permitted.

3.16 Hydrostatic Test.

3.16.1 A hydrostatic test shall be performed for acceptance of all automatic sprinkler systems in MFH.

3.16.2 Residential sprinkler systems shall be tested per NFPA 13R. In existing buildings, a newly installed residential sprinkler system need only be tested from the point where the fire-line attaches to the common supply main.

3.17 Periodic Inspection, Testing and Maintenance.

3.17.1 Automatic sprinkler systems shall be periodically inspected, tested and maintained in accordance with AFM 91-37.

3.17.2 Periodic inspection and testing of sprinklers, piping, valves, hangars, seismic braces and alarm devices within a MFH unit may be delayed until change of tenants of the MFH unit.