



NOT MEASUREMENT SENSITIVE

DOE-STD-1088-95 JUNE 1995

DOE STANDARD

FIRE PROTECTION FOR RELOCATABLE STRUCTURES



U.S. Department of Energy Washington, D.C. 20585

AREA GDRQ

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

This document has been reproduced directly from the best available copy.

Available to DOE and DOE contractors from the Office of Scientific and Technical Information, P.O. Box 62, Oak Ridge, TN 37831; (615) 576-8401.

Available to the public from the U.S. Department of Commerce, Technology Administration, National Technical Information Service, Springfield, VA 22161; (703) 487-4650.

Order No. DE95014751

TABLE OF CONTENTS

<u>PAR</u>	<u>AGRAPH</u> PA	AGE
FORE	EWORD	. V
1. S0	COPE	. 1
2. Pl	URPOSE	. 3
3. AF	PPLICABLE CRITERIA	. 5
4. DI	EFINITIONS	. 7
5. Sī	TRUCTURAL REQUIREMENTS 5.1 General 5.2 Compartmentation 5.3 Anchors and Supports 5.4 Interior Finish 5.5 Skirting 5.6 Identification 5.7 Heating and Air Conditioning 5.8 Surveillance	11 12 12 12 13 13
6. Pl	LACEMENT REQUIREMENTS 6.1 Separation Distances 6.2 Location Restrictions 6.3 Cargo Containers	15 16
7. 00	7.1 General	19 19 19 19 20 20 20
8. FI	IRE PROTECTION REQUIREMENTS 8.1 Automatic Sprinklers 8.2 Fire Extinguishers 8.3 Fire Hydrants 8.4 Emergency Egress	21 22 22
CON	ICLUDING MATERIAL	25
DOC	CUMENT IMPROVEMENT PROPOSAL FORM	. 27

FOREWORD

This Department of Energy Standard is approved for use by all DOE components and their contractors.

Beneficial comments (recommendations, additions, deletions) and any pertinent data that may improve this document should be sent to the name and address below by letter or by using the self-addressed Document Improvement Proposal (DOE F 1300.3) appearing at the end of this document.

Dennis Kubicki
Office of Environment, Safety and Health
Office of Occupational Health and Safety Policy
Bellemead Building
U.S. Department of Energy
19901 Germantown Road
Germantown, MD 20874-1290

1. SCOPE

This Standard provides fire protection criteria applicable to the design, construction, and location of relocatable structures as defined herein. It also addresses fire extinguishing methods and general safeguards. The provisions of this Standard apply to the following:

- a. All departmental elements as delineated in the scope of DOE 5480.7A, "Fire Protection."
- b. The purchase and lease, as well as the design and construction, of all relocatable structures acquired or initially installed after the effective date of this Standard.
- c. Other "temporary" or "non-permanent" structures that are not encompassed by other DOE criteria such as DOE 6430.1A, "General Design Criteria." This includes relocatable structures that are fixed or anchored to a permanent or temporary foundation constructed in accordance with the Uniform Building Code, applicable local building code, or industry standard as part of their siting.
- d. Existing relocatable structures (including structures repositioned from one site location to another) when a fire hazard analysis demonstrates conditions that represent a significant risk to the health and safety of the public or site personnel as determined by the DOE Authority Having Jurisdiction (AHJ).
- e. Existing relocatable structures which, if lost due to fire, would result in an unacceptable program impact.

This Standard does not apply to relocatable structures that will remain in place for no more than 180 days onsite and that do not contain significant fire hazards and have no programmatic importance or significant value, as determined by the cognizant fire protection engineer.

Modifications made to existing portable structures should be performed in accordance with this Standard. Site-specific interpretations of the provisions of this Standard should be the responsibility of the DOE AHJ.

Nothing in this standard is intended to limit the application of other fire protection methods when unique situations or hazards warrant an alternate approach. The alternate approach should provide an equivalent level of safety to that achieved by conformance with this Standard. Such alternate approaches must be approved by the DOE AHJ.

2. PURPOSE

This Standard supersedes DOE/EV-0043, "Standard on Fire Protection for Portable Structures," dated August, 1979. It was revised to address the numerous types of relocatable structures, such as trailers, tension supported structures, and tents that are being used by DOE and its contractors. This Standard was developed because other industry criteria do not comprehensively or clearly address all fire safety issues associated with the use of such structures by DOE.

This Standard is part of the DOE directives system and is issued to provide supplemental information regarding the Department's expectations for fulfilling its fire safety requirements as contained in rules, Orders, notices, and regulatory standards. This Standard provides acceptable methods for implementing these requirements for relocatable structures.

3. APPLICABLE CRITERIA

Relocatable structures and their associated fire protection features should comply with the applicable sections of the current editions of the criteria listed in the following table.

Federal Directives and Standards

- a. DOE 5480.7A, "Fire Protection"
- b. DOE 6430.1A, "General Design Criteria"
- c. OSHA General Industry Standards
 - 1. 29 CFR Part 1910, "Occupational Safety & Health Standards"
 - 2. 29 CFR Part 1926, "Safety & Health Regulations for Construction"
- d. DOE/EP-0108, "Fire Protection of AEC Electronic Computer Data Processing Systems"
- e. Americans with Disabilities Act Accessibility Guidelines (ADAAG)

National Fire Protection Association (NFPA) Codes and Standards^{1/}

- a. NFPA 10, "Portable Fire Extinguishers"
- b. NFPA 30, "Flammable and Combustible Liquids Code"
- c. NFPA 45, "Fire Protection for Laboratories Using Chemicals"
- d. NFPA 54, "National Fuel Gas Code"
- e. NFPA 70, "National Electrical Code"
- f. NFPA 75, "Protection of Electronic Computer/Data Processing Equipment"
- g. NFPA 80A, "Protection of Buildings from Exterior Fire Exposures"
- h. NFPA 90A, "Installation of Air Conditioning and Ventilation Systems"
- i. NFPA 101, "Life Safety Code"
- j. NFPA 102, "Grandstands, Folding and Telescopic Seating, Tents and Membrane Structures"
- k. NFPA 241, "Construction, Alteration, Demolition Operations"
- NFPA 501A, "Fire Safety Criteria for Manufactured Home Installation, Sites and Communities"
- m. NFPA 701, "Methods of Fire Tests for Flame-Resistant Textiles and Films"
- n. NFPA 1141, "Fire Protection in Planned Building Groups"

Other Codes and Standards

- a. Applicable State and local building and fire codes
- b. Applicable industry standards governing the construction of mobile structures

^{1/} A relocatable structure's fire protection features should be designed, installed, tested, and maintained in accordance with the applicable NFPA Codes or Standards, as amended by DOE.

4. **DEFINITIONS**

<u>Authority Having Jurisdiction</u> - The decision making authority in matters concerning fire protection. The DOE Head of Field Organization or designee is the AHJ unless otherwise directed by the Cognizant Secretarial Officer.

<u>Cognizant Fire Protection Engineer</u> - The fire protection engineer that is responsible for implementing this Standard for a given issue. This would normally be a representative of the management and operating (M&O) contractor, but would be the DOE fire protection engineer if no contractor was involved.

<u>Fire Area</u> - A location bounded by construction having a minimum fire resistance rating of 2 hours with openings protected by appropriately fire-rated doors, dampers, or penetration seals. The boundaries of exterior fire areas (yard areas) should be as determined by the cognizant fire protection engineer (contractor or DOE). When relocatable structures are grouped and are not separated as directed in this Standard, they should be considered as being part of the same fire area.

<u>Fire Loss</u> - The dollar cost of restoring damaged property to its pre-fire condition (see DOE 5484.1). When determining loss, the estimated damage to the facility and contents should include replacement cost, less salvage value. Losses will exclude the costs for:

- a. Property scheduled for demolition
- b. Decommissioned property not carried on books as a value

Include the cost of decontamination and cleanup, the loss of production or program continuity, the indirect costs of fire extinguishment (such as damaged fire department equipment), and the effects on related areas in all property loss amounts.

<u>Fire Protection System</u> - Any system designed to detect, extinguish, and limit the extent of fire damage or enhance life safety. Where redundant fire protection systems are required, any two of the following will satisfy that requirement. These include:

- a. Automatic suppression systems, such as fire sprinklers, foam, gaseous, explosion suppression, or other specialized extinguishing systems plus appropriate alarms. An adequate supply, storage, and distribution system is an essential element.
- Automatic fire detection, occupant warning, manual fire alarm, and fire alarm reporting systems combined with properly equipped and adequately trained fire departments or brigades.
- c. Fire barrier systems or combinations of physical separation and barriers for outdoor locations.
- d. Other systems, such as alternate process control systems, as approved by the AHJ.

<u>Limited Supply Suppression System</u> - A system installed in accordance with the applicable NFPA Standards and having a limited quantity of suppression agent. These systems typically include carbon dioxide, dry chemical, other gaseous agent, or water.

<u>Maximum Possible Fire Loss (MPFL)</u> - The value of property, excluding land value, within a fire area, unless a fire hazards analysis demonstrates a lesser (or greater) loss potential. This assumes the failure of both automatic fire suppression systems and manual fire fighting efforts.

Noncombustible - A material that in the form in which it is used and under the conditions anticipated will not ignite, burn, support combustion, or release flammable vapors when subjected to fire or heat, as defined by fire protection industry standards on the basis of large scale fire tests performed by a nationally recognized independent fire test authority.

<u>Occupancy</u> - Occupancy classification, construction, and area limitations of relocatable structures as determined under the provisions of the applicable local building code or the Uniform Building Code unless otherwise specified by the DOE AHJ.

Relocatable Structure - Manufactured structures, mobile homes, trailers, semi-trailers, modular type structures, factory assembled structures, cargo containers, hazardous materials or flammable liquid storage containers, air supported/inflated structures, tent/membrane and cloth/rib structures. This term does not apply to trailers and cargo containers that are being used in the transportation mode

for conveying materials while onsite, or to prefabricated buildings that are permanently located, such as "Butler" or "Strand Steel" buildings. Structures not specifically identified herein should be referred to the AHJ for categorization.

5. STRUCTURAL REQUIREMENTS

5.1 General

Relocatable structures should be constructed to conform with the applicable requirements of the Uniform Building Code, as amended by DOE 6430.1A, "General Design Criteria" (or the local building code, if the local code is enforced onsite).

- Exception 1: Corridors should meet the requirements of the current edition of the Life Safety Code, NFPA Standard 101.
- Exception 2: Tents or other membrane-type structures should be constructed of tentage material that has been tested and approved by a nationally recognized independent fire test authority for the anticipated end use. Approval should be based on the performance of large scale tests.

Exception 3: This criteria does not apply to semi-trailers and cargo containers.

5.2 Compartmentation

Relocatable structures should be separated such that the largest fire area does not exceed the limits imposed by the Uniform Building Code.

Exception: Relocatable structures over 16,000 square feet (1,487 square meters) in floor area that are protected by an automatic fire suppression system should be divided into separate fire areas by 2-hour fire-rated barriers so that no single area exceeds 16,000 square feet (1,487 square meters) in floor area. Such barriers should extend throughout the entire height and breadth of the structure, so designed as to prevent fire propagation through and around the barrier.

No fire area in a relocatable structure should have a MPFL exceeding limits imposed by the DOE AHJ.

5.3 Anchors and Supports

Each relocatable structure should have support and anchoring systems properly designed and installed that will resist overturning and lateral movement of the structure.

5.4 Interior Finish

The interior finish of all relocatable structures should comply with NFPA 101, as amended below.

Relocatable structures used for any of the following occupancies should have an interior finish with a flame spread rating ≤25 and a smoke development rating ≤50 per ASTM E84:

- a. Dedicated to housing electronic data processing equipment or other computer equipment.
- b. Structures used for sleeping quarters.
- c. Structures used for storing, processing, or involving radiological materials.
- d. Structures used for storing or operating lasers and related equipment.

The above delineated interior finish requirements should also apply to the shell covering material of tension supported structures.

If fire retardant pressure impregnated wood is used as interior finish it should be the non-leachable type that meets Underwriter's Laboratories (UL) "Standard Rain Test" and should be installed with corrosion resistant fasteners that will withstand the chemicals impregnated in the wood. It should be rated as FR-S material as currently listed in the (UL) Building Materials Directory or equivalent.

Fire retardant paint is not acceptable for flame spread reduction for interior finish.

5.5 Skirting

Relocatable structures with open under-floor areas should be provided with skirting to prevent the accumulation of combustibles and debris beneath the structures.

5.6 Identification

All relocatable structures should be marked with the number, symbol, or name for identification purposes. The marking system used should be permanent and consistent with the system currently used at the site.

5.7 Heating and Air Conditioning

Heating and air conditioning equipment should be listed or approved by a nationally recognized independent fire testing authority and installed in accordance with its approved design and applicable industry standards.

Portable heating appliances should not be permitted unless they are approved by the cognizant fire protection engineer and are a listed or approved type.

5.8 Surveillance

Exterior structural features of relocatable structures should be inspected in conjunction with the site fire protection assessment program to monitor potential physical deterioration due to atmospheric conditions. If such deterioration has resulted in a significant increase in fire risk, structural repairs or other appropriate mitigating measures should be implemented.

6. PLACEMENT REQUIREMENTS

6.1 Separation Distances

Relocatable structures should comply with the following separation distances:

Exposing Wall Length ft (m)	Minimum Separation Distance ft (m)
10 (3)	20 (6)
20 (6)	30 (9)
30 (9)	35 (11)
40 (12)	40 (12)
50 (15)	45 (12)
60 (18)	50 (15)
More than 60 (18)	60 (18)

The following adjustments of the separation distances specified above are cumulative, but the minimum distance should not be less than 10 feet (3 meters):

- a. 50 percent reduction for light fire loading, e.g., 8,000 BTU/sq. ft. or less.
- b. 50 percent increase for heavy fire loading, e.g., 160,000 BTU/sq. ft. or higher.
- c. 50 percent reduction for limited supply suppression system in the exposing relocatable structure which completely protects the structure.
- d. 75 percent reduction for an automatic sprinkler system in the exposing relocatable structure.
- e. 75 percent reduction for exposure deluge system.

Exception 1: This separation distances requirement does not apply if the MPFL of the relocatable structure combined with all exposed structures is less than \$1 million.

Exception 2: Tents and other fabric-type structures should comply with the separation distances and exposure protection requirements of NFPA Standard 80A.

In all cases, the required separation distance should be based on the "worst case" between the structures, such as when structures are positioned on an angle. Required distances to separate permanent buildings or facilities from relocatable structures should be determined in a similar manner. Due to the many factors that must be considered for permanent buildings, NFPA 80A should be used to establish their separation distance.

Exposures presented by exterior canopies, connecting walkways, etc. should also be considered when determining separation distances and protection features.

There should be no storage of combustible or hazardous materials between the relocatable structure and the exposed building(s).

6.2 Location Restrictions

- a. Relocatable structures should be placed so emergency vehicles can operate within 100 feet (30 meters) of the structure. The space between the structure and the road should be free of natural obstructions that would prevent or severely restrict access by emergency responders. Security barriers should be designed in a manner that permits emergency access. Landscaping and similar non-essential obstructions should not restrict emergency access.
- b. Relocatable structures should not be located where they impede or otherwise hinder personnel egress or ingress to, or within, other facilities or structures.
- c. Relocatable structures should not be located where they impede or otherwise hinder the access of emergency response vehicles to other facilities or structures.
- d. Relocatable structures should not be placed inside permanent facilities that do not have sprinklers unless a fire hazards analysis demonstrates that there is no significant increase in fire risk to the facility. Structures that are placed inside permanent facilities should be protected with the same level of fire protection as provided for the permanent facility.

e. Relocatable structures should not be placed over control valves, access ways to underground utilities, utility corridors, gas mains, or water mains.

Exception: Relocatable structures may be placed above those utility lines that service the structure itself.

- f. Relocatable structures should not be placed beneath vital power lines or lines over 600 volts such that a fire in the structure could damage the lines. Such structures should also not be placed under other vital utilities, such as communication cables and inerting gas lines, unless the relocatable structure is protected by an automatic fire suppression system. Service conductor clearances and disconnects should be in accordance with NFPA 70.
- g. Site location(s) for relocatable structures should be evaluated for wildland fire exposures. Where a significant fire risk exists, appropriate fire resistive building materials and/or other methods of protection should be utilized as determined by the cognizant fire protection engineer.
- h. Relocatable structures should not be placed closer than 50 feet (15 meters) to a fire hydrant. (See also, paragraph 8.3.)

6.3 Cargo Containers

Cargo containers should be limited to stacks 2-high unless otherwise approved by the cognizant fire protection engineer. The arrangement of cargo containers, which may not meet other industry fire safety standards, should reflect the fire hazard of contents, the risk to personnel, value, and access for emergency responders.

7. OCCUPANCY CONSIDERATIONS

7.1 General

Unless a graded fire hazards analysis demonstrates that a particular occupancy represents an unacceptable fire risk to the health and safety of the public, site personnel, or to program continuity, there are no restrictions on the occupancy of portable structures except as delineated below and in the Uniform Building Code or applicable local building code.

Relocatable structures should be governed by site or facility-specific procedures for the use and storage of combustible, flammable, radioactive, and hazardous materials so as to minimize the risk from fire. Such procedures should also exist for activities, such as smoking limitations, isolation of hot work, and other fire prevention measures that contribute to a reduction in fire risk.

7.2 Computer/Automated Information Systems Equipment

Relocatable structures used to house automated information systems or other computer equipment should comply with NFPA 75, "Protection of Electronic Computer/Data Processing Equipment," and supplementary guidance provided by DOE (DOE/EP-0108, "Standard for Fire Protection of DOE Electronic Computer/Data Processing Systems," and other interpretations by the DOE AHJ).

7.3 Laboratories

Relocatable structures may be used to house laboratories provided they were designed for this purpose and comply with this Standard and the applicable NFPA Standards.

7.4 Hazardous Material Storage

Relocatable structures may be used for the storage of hazardous materials if the structures comply with this Standard, the applicable NFPA Standards, and all applicable hazardous waste storage requirements.

7.5 Provisions for Individuals with Disabilities

Relocatable structures that may be used by individuals with disabilities should be designed in accordance with the criteria contained in the Americans with Disabilities Act Accessibility Guidelines (ADAAG).

7.6 Sleeping Facilities

Sleeping areas should not be permitted in relocatable structures unless they are specifically designed for this purpose. Such facilities should conform with the provisions of NFPA 101, including the requirements for two remote means of egress and for a smoke detection system that alarms in the facility and is interconnected with the site fire alarm/signalling system.

7.7 Remote Facilities

Where fire protection criteria of this Standard cannot be feasibly met because the relocatable structure is in a remote location, alternate fire protection features may be provided as determined by the AHJ.

7.8 Portable Heat Producing Devices

Coffee pots, hot plates, ovens, and similar items producing heat or capable of overheating should be listed by a nationally recognized independent testing agency. All such devices or the receptacles into which they are plugged should feature a light or other equivalent means to indicate when the appliance is energized.

8. FIRE PROTECTION REQUIREMENTS

8.1 Automatic Sprinklers

Complete automatic sprinkler protection designed per the applicable NFPA Standards should be provided for relocatable structures as follows:

- a. In all new structures over 5,000 square feet (465 square meters).
- b. In all structures having an MPFL in excess of \$1 million.
- c. In all structures where the MPFL will affect a vital program for a period longer than that specified as acceptable by the Program Senior Official.
- d. In all structures where quantities of hazardous materials are used or stored in excess of the limits delineated in the Uniform Fire Code, or alternate model fire code as determined by the AHJ.
- e. In all structures used for sleeping quarters, including day care centers. (For such structures, "quick-response" sprinklers should be utilized.)
- Exception 1: Limited supply suppression systems may be used where a reliable water supply is not available, or where the application of water would increase the overall hazard in the event of a fire.
- Exception 2: Automatic sprinkler systems are not required in fabric or membrane type structures where alternate means of fire protection will provide an acceptable level of protection. Such means include, but are not limited to, fire detection systems combined with foam fire extinguishing systems and other special fire suppression systems.

8.2 Fire Extinguishers

Portable fire extinguishers, listed by a nationally recognized independent testing agency, should be provided for portable structures in accordance with NFPA 10.

8.3 Fire Hydrants

At least one fire hydrant supplied by an adequate and reliable water distribution system should be located so that it does not require more than 300 feet (91 meters) of fire hose to reach any exterior portion of a relocatable structure or a group of structures to be protected.

- Exception 1: This requirement does not apply to those structures that are required to be mobile and are moved on a regular basis to support an operation, such as field monitoring and sampling trailers.
- Exception 2: This requirement does not apply to structures under 5,000 square feet (465 square meters) in floor area, or when the MPFL is less than \$1 million.
- Exception 3: This requirement does not apply to remote structures as determined by the DOE AHJ.

8.4 Emergency Egress

All relocatable structures that are occupied by people should have access to a means to summon emergency assistance. Where a fire alarm or signalling system is not otherwise provided or required, this may take the form of a telephone, radio, or equivalent means.

Relocatable structures should be provided with fire alarm and notification systems as required by NFPA 101 and 29 CFR 1910.165 for the specific occupancy.

Relocatable structures equipped with an automatic fire suppression or detection system shall also be equipped with local alarm(s) that transmit separate and distinct signals for fire, trouble, and supervisory to:

- a. the site fire department/emergency response center, or
- b. to a continuously occupied station for the purpose of initiating emergency response if a site fire department does not exist.

Provisions for emergency egress, including exits, emergency lighting, and exit signage should be in accordance with NFPA 101.

CONCLUDING MATERIAL

Review Activity:	Preparing Activity:

DOE Field Offices DOE-EH-51

DP AL

EH CH Project Number:
EM ID GDRQ-0006

NE NV NN OR ER RL

SF SR

Fernald

National Laboratories

BNL

LLNL

LANL

PNL

Sandia

Area Offices

Amarillo Area Office

Kirtland Area Office

Princeton Area Office

Rocky Flats Area Office

DOE F 1300.3 (01-94)	DOCUMENT IM	partment of Energy PROVEMENT PROPOSAL tions on Reverse)	OMB Control No. 1910-0900 OMB Burden Disclosure Statement on Reverse						
1. Document Number	2. Document Title								
3. Name of Submitting Organ	ization		4. Type of Organization (Mark one) User Manufacturer Other (Specify)						
5. Problem Areas (Attach exti	5. Problem Areas (Attach extra sheets as needed.)								
a. Paragraph Number and Wording									
b. Recommended Wording									
c. Reason/Rationale for Recommendation									
6. Remarks									
7a. Name of Submitter (Last,	First, Mi)	7b. Work Telephone Number (Include Area Code)							
7c. Mailing Address (Street, 0	City, Zip Code)	8. Date of Submission							

DOE F 1300.3 OMB Control No. (01-94) 1910-0900

INSTRUCTIONS: In a continuing effort to improve the U.S. Department of Energy (DOE) Technical Standards, this form is provided for use in submitting comments and suggestions for improvements. All users of DOE Technical Standards are invited to provide suggestions. This form may be detached, folded along the lines indicated, taped along the loose edge (DO NOT STAPLE) mailed to the address indicated or faxed to (615) 574-0382.

- 1. The submitter of this form must complete blocks 1 through 8.
- 2. The Technical Standards Program Office (TSPO) will forward this form to the Preparing Activity. The Preparing Activity will reply to the submitter within 30 calendar days of receipt from the TSPO.

NOTE: This form may not be used to request copies of documents, nor to request waivers, deviations, or clarification of specification requirements on current contractors. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

OMB Burden Disclosure Statement

Public reporting burden for this collection of information is estimated to average 30 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Office of Information Resources Management Policy, Plans and Oversight, Records Management Division, HR-422 - GTN, Paperwork Reduction Project (1910-0900), U.S. Department of Energy, 1000 Independence Avenue, S.W., Washington DC 20585; and to the Office of Management and Budget (OMB) Paperwork Reduction Project (1910-0900), Washington, DC 20503.

U.S. Department of Energy Technical Standards Program Office c/o Performance Assurance Project Office P.O. Box 2009, Bldg. 9201-3 Oak Ridge, Tennessee 37831-8065