NFPA No.

415-T

File: 400 Series
Aviation

Tentative Standard on

AIRPORT RAMP DRAINAGE

May, 1960

May, 1960

NOTICE

This pamphlet circulates for review and comment the NFPA Tentative Standard on Airport Ramp Drainage adopted at the 1960 NFPA Annual Meeting. Developed by the NFPA Sectional Committee on Aircraft Hangars and Airport Facilities, this Tentative Standard was approved only with the understanding that the sponsoring committee would further review the text prior to requesting final adoption by the Association and that it would be published in this form for the widest possible circulation.

Readers are warned that this text does not present official recommendations of the National Fire Protection Association in its present form. There have been a number of criticisms of the existing text and these, as well as any others received, will be considered by the Sectional Committee at its future meetings.

Comments are solicited on this Tentative Standard from all those interested. Such comments should be forwarded to the NFPA prior to September 15, 1960 to receive full Committee consideration.

Price: 40 cents*

NATIONAL FIRE PROTECTION ASSOCIATION
International
60 Batterymarch Street, Boston 10, Massachusetts

1M-6-60-W.P. *Discount for quantities. Printed in U.S.A.

National Fire Protection Association

International

Executive Office: 60 Batterymarch St., Boston 10, Mass.

The National Fire Protection Association was organized in 1896 to promote the science and improve the methods of fire protection and prevention, to obtain and circulate information on these subjects and to secure the cooperation of its members in establishing proper safeguards against loss of life and property by fire. Its membership includes two hundred national and regional societies and associations (list on outside back cover) and nearly eighteen thousand individuals, corporations, and organizations. Anyone interested may become a member; membership information is available on request.

This is one of a large number of publications on fire safety issued by the Association; a complete list is available without charge on request. All NFPA standards adopted by the Association are published in the **National Fire Codes** which are re-issued annually. The standards, prepared by the technical committees of the NFPA and adopted in the annual meetings of the Association, are intended to prescribe reasonable measures for minimizing losses of life and property by fire. All interests concerned have opportunity through the Association to participate in the development of the standards and to secure impartial consideration of matters affecting them. Complete information on Committees will be found in the NFPA Year Book.

Official NFPA Definitions

SHALL is intended to indicate requirements.

SHOULD is intended to indicate recommendations, or that which is advised but not required.

APPROVED refers to approval by the authority having jurisdiction.

Units of measurements used here are U. S. standard. 1 U. S. gallon = 0.83 Imperial gallons = 3.785 liters. One foot = 0.3048 meters. One inch = 24.50 millimeters. One pound per square inch = 0.06805 atmospheres = 2.307 feet of water.

Approved Equipment

The National Fire Protection Association does not "approve" individual items of fire protection equipment, materials or services. The suitability of devices and materials for installation under these standards is indicated by the listings of nationally recognized testing laboratories, whose findings are customarily used as a guide to approval by agencies applying these standards. Underwriters' Laboratories, Inc., Underwriters' Laboratories of Canada, the Factory Mutual Laboratories and the American Gas Association (gas devices) test devices and materials for use in accordance with the appropriate standards, and publish lists which are available on request.

Committee on Aviation

EXECUTIVE DIVISION

Jerome Lederer,† Chairman,
Flight Safety Foundation, 468 Fourth Avenue, New York 16, N. Y.

Harvey L. Hansberry, Vice-Chairman,
Fenwal, Inc., Ashland, Mass.

George H. Tryon,† Secretary,
National Fire Protection Association, 60 Batterymarch St., Boston 10, Mass.

J. C. Abbott, British Overseas Airways Corp. (Personal)
Ben W. Ashmead, Civil Aeronautics Board.
H. F. Blumel, Jr., American Airlines. Chairman of Sectional Committee.
Henry G. Bone, Jr., Boeing Airplane Co. (Personal)
J. A. Bono, Underwriters' Laboratories, Inc.
John W. Bridges, Federal Aviation Agency.
J. A. Brooker, United Kingdom Ministry of Aviation.
E. Thomas Burnard, Airport Operators Council.
R. C. Byrus, University of Maryland. Chairman of Sectional Committee.
J. M. Chase, Flight Safety Foundation. Chairman of Sectional Committee.
N. L. Christoffel, United Air Lines. (Personal)
William L. Collier, Air Line Pilots Association.
G. T. Cook, Department of the Air Force.
Carl Dreesen, Bureau of Naval Weapons, Department of the Navy.
Charles Froesch, Society of Automotive Engineers.
J. J. Jackson, III, American Petroleum Institute.
R. Dan Mahaney,† Federal Aviation Agency.
C. M. Middlesworth,† Federal Aviation Agency.
Gerard J. Miller, Eastern Air Lines. (Personal)
Willard Northrop, Association of Casualty & Surety Companies.
J. A. O'Donnell, American Airlines. (Personal)
F. E. Parker, Australian Dept. of Civil Aviation.
Clarence C. Pell, Jr., Associated Aviation Underwriters.
R. C. Petersen, Port of New York Authority. (Personal)
H. B. Peterson, U. S. Naval Research Laboratory.
S/L B. C. Quinn, Canadian Department of National Defence.
William H. Rodda, Transportation Insurance Rating Bureau.
George Schrank, Fire Equipment Manufacturers Association.
John T. Stephan, American Association of Airport Executives.
E. F. Tabisz, Underwriters' Laboratories of Canada.
R. H. Tolson, American Petroleum Institute.
W. L. Walls, Factory Mutual Engineering Division.
Lawrence Wilkinson, United States Aviation Underwriters.
Douglas C. Wolfe, American Association of Airport Executives.

†Non-voting member.

Alternates.

Alternate to Mr. Burnard
Hervey F. Law (Airport Operators Council)

Alternate to Mr. Cook
Roscoe L. Bell (Dept. of the Air Force)

Alternate to Messrs. Jackson and Tolson
C. F. Reinhardt (American Petroleum Institute)

Alternate to Mr. Northrop
Charles S. Rust (Association of Casualty and Surety Companies)

Alternates to Messrs. Stephan and Wolfe (American Association of Airport Executives)
George J. Bean (New Castle County Airport)
Wallace J. Bennon (Wood County Airport)
Ronald C. Bird (St. Joseph County Airport)
James F. Byrne (Logan International Airport)
Robt. J. Casteline (Broome County Airport)
Arthur K. Muchmore (Lambert-St. Louis Municipal Airport)
William Neilson (Maui County Airports)
Donald G. Shay (Seattle-Tacoma International Airport)
Wm. J. Ralston (Sky Harbor Airport)

Alternate to Mr. Tabisz
G. L. Toppin (Underwriters' Laboratories of Canada)

Liaison Representatives.

Col. Edwin E. Aldrin, Institute of Aeronautical Sciences
C. E. A. Brown, National Association of State Aviation Officials
Allen W. Dallas, Air Transport Association
J. B. Hartranft, Jr., Aircraft Owners & Pilots Association
W. E. Koneczny, Civil Aeronautics Board
S. Krzyczkowski, International Air Transport Association
Dr. L. G. Lederer, Airlines Medical Directors Association
Carl Ljungburg, International Civil Aviation Organization
Boyd C. Myers, National Aeronautics and Space Administration
Dr. A. F. Robertson, National Bureau of Standards
E. J. C. Williams, Air Ministry, United Kingdom

Sectional Committee on Aircraft Hangars and Airport Facilities

H. F. Blumel, Jr., Chairman,
American Airlines, 100 Park Ave., New York 17, N. Y.

J. W. Bridges, Vice-Chairman.
Federal Aviation Agency, Airport Operations Branch FM-463, 16th and Constitution Ave., Washington 25, D.C.

J. C. Abbott, British Overseas Airways Corp. (Personal)
Andrew T. Boggs, III, American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (Pro tem)
J. J. Brenneman, United Air Lines. (Personal)
Martin P. Casey, Hdqrs. Air Research & Development Command.
Joseph M. Chase, Flight Safety Foundation.
Gifford T. Cook, Dept of the Air Force.
Donald L. Drumm, National Board of Fire Underwriters.
L. A. Eggleston, U. S. Fire Protection Engineering Service, Inc. (Personal)
Stuart C. Hand, J. S. Frelinghuysen Corp. (Personal)
Harvey L. Hansberry (ex officio), Fenwal, Inc.
R. E. Hitchcock, Eastern Air Lines. (Personal)
R. M. Huber, Ammann & Whitney. (Personal)
J. J. Jackson, III, American Petroleum Institute.
Jerome Lederer,† (ex-officio), Flight Safety Foundation.
L. D. McKenna, Canadian Department of National Defence.
E. J. R. Moulton, Chubb & Son. (Personal)
R. C. Petersen, Airport Operators Council.
E. B. Rumble, National Automatic Sprinkler & Fire Control Association.
R. M. L. Russell, Factory Insurance Association.
George Schrank, Fire Equipment Manufacturers Association.
J. H. Sellers, North America Companies. (Personal)
C. J. Setzer, Ohio Inspection Bureau. (Personal)
John T. Stephan, American Association of Airport Executives.
R. H. Tolson, American Petroleum Institute.
W. L. Walls, Factory Mutual Engineering Division.
C. V. Whalin, Department of the Navy.
Douglas C. Wolfe, American Association of Airport Executives.

†Non-voting member.

Alternates.

Alternate to Mr. Cook
Roscoe L. Bell (Dept. of the Air Force)
Alternate to Mr. Hitchcock
Glenn E. Roof (Eastern Air Lines)
Alternate to Messrs. Jackson and Tolson
C. F. Reinhardt (American Petroleum Institute)
Alternate to Mr. Rumble
T. S. Duke (National Automatic Sprinkler and Fire Control Association)
Alternates to Messrs. Stephan and Wolfe (American Association of Airport Executives)
George J. Bean (New Castle County Airport)
Wallace J. Bennon (Wood County Airport)
Ronald C. Bird (St. Joseph County Airport)
James F. Byrne (Logan International Airport)
Robt. J. Casteline (Broome County Airport)
Arthur K. Muehmore (Lambert-St. Louis Municipal Airport)
William Neilson (Maui County Airports)
Donald G. Shay (Seattle-Tacoma International Airport)
Wm. J. Ralston (Sky Harbor Airport)

Liaison Representatives.

Daniel Farb, American Institute of Steel Construction (Alternate to T. R. Higgins)
Frank J. Hanrahan, American Institute of Timber Construction
T. R. Higgins, American Institute of Steel Construction
John J. Hogan, Portland Cement Association
Robert Schempf, Tippetts-Abbett-McCarthy-Stratton
John G. Shope, National Lumber Manufacturers Association
Spencer T. Stack, Committees on Automatic Sprinklers and Signaling Systems and Thermostats

Tentative Standard on
AIRPORT RAMP DRAINAGE

NFPA No. 415-T

10. Definitions.

11. An AIRPORT RAMP, as used herein, shall mean any outdoor area at an airport, including aprons and hardstands, on which aircraft are fueled, defueled, serviced or maintained. It may also include those areas on which parking and storage of fueled aircraft frequently occurs.

12. A FLAMMABLE LIQUID, as used herein, shall mean any liquid having a flash point below 200°F. and having a vapor pressure not exceeding 40 pounds per square inch (absolute) at 100°F.

13. A COMBUSTIBLE LIQUID, as used herein, shall mean any liquid having a flash point above 200°F.

14. For simplicity purposes, the word FUEL as used herein shall mean all flammable liquids and all combustible liquids (falling within the definitions given above) used in aircraft operations, servicing, and maintenance.

20. Purpose.

21. The drainage recommendations herein shall be included in the design of the water drainage system of an airport ramp to control the flow of fuel which may be spilled on a ramp and to minimize the resultant possible danger therefrom. Such a drainage system is intended:

a. To prevent spread of the fuel spill to structures, passenger loading fingers or concourses which might result in the liquid or vapors therefrom reaching a source of ignition or might result in the release of dangerous or toxic vapors therein.

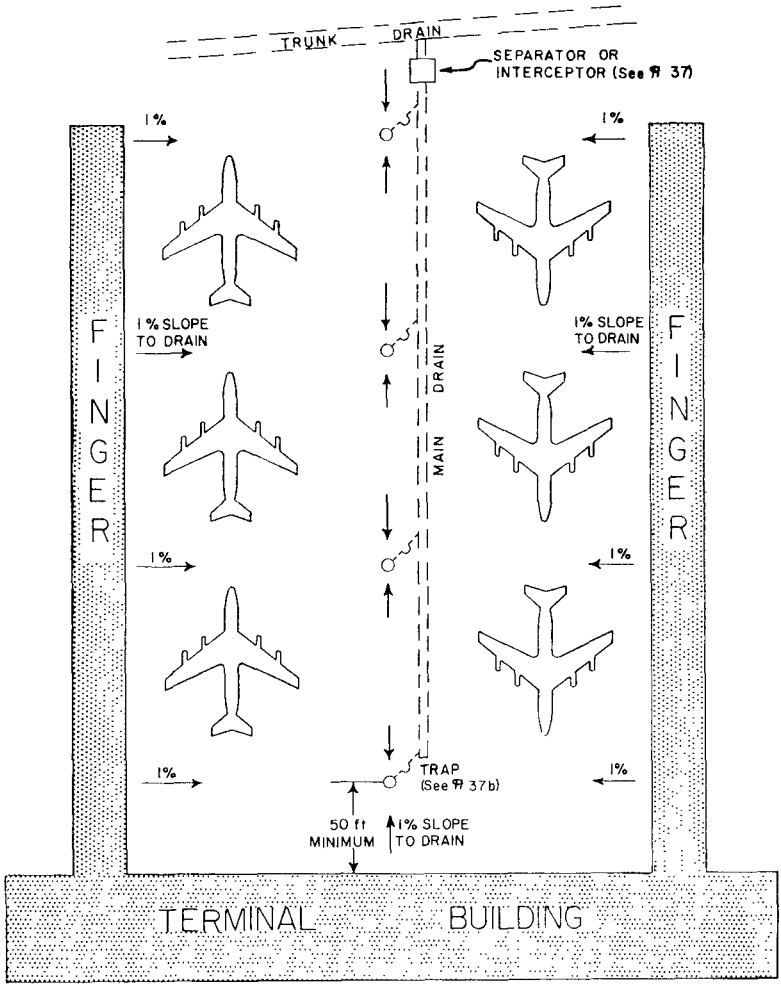

Figure 1. Airport Ramp Drainage Arrangements

Aircraft are superimposed to indicate the intent of the ramp drainage recommendations given herein. Aircraft of other types will necessitate revision of the parking arrangements.

b. To prevent spread of the fuel spill over large areas of the ramp surface and the transmission of vapors by the drainage system which may expose a number of aircraft or other equipment parked or operating on the ramp.

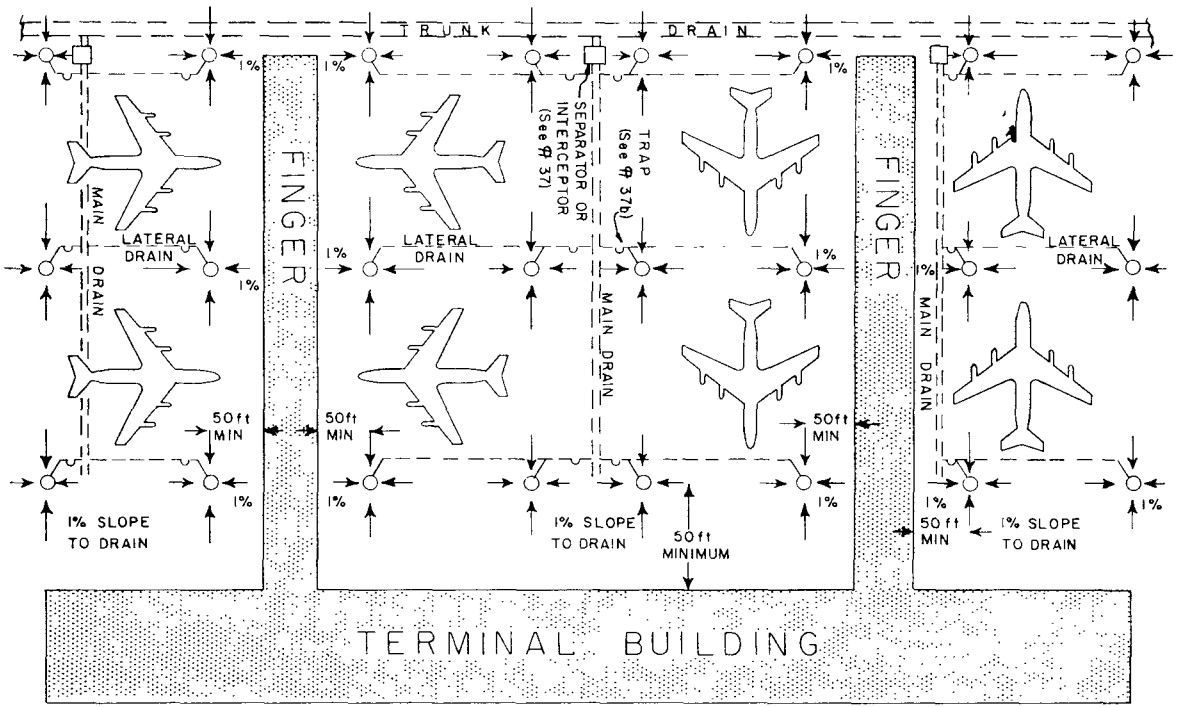

Figure 2. Airport Ramp Drainage Arrangements

Aircraft are superimposed to indicate the intent of the ramp drainage recommendations given herein. Aircraft of other types will necessitate revision of the parking arrangements.

c. To prevent continued exposure of the spilled liquids to the air and the uncontrolled vaporization of the fuel on ramp surfaces which might result in the creation of serious fire hazard exposure conditions or the release of uncontrolled quantities of vapors creating potential hazards to life and property.

d. To provide for the safe disposal of fuel spillage (see also Paragraphs 34 and 35).

30. Airport Ramp Slope and Drain Design.

31. Airport ramps shall slope away from terminal buildings, fingers, aircraft hangars or other structures with a recommended grade of one percent (1%). Drainage inlets, where provided, shall be a minimum of 50 feet from such structures.

32. For the purpose of fuel spill drainage, airport ramps shall be divided into "drainage areas" of not over 40,000 square feet of ramp surface (which may encompass one or more aircraft positions). The square foot area limitation provisions of this paragraph need not be applied where the drainage slopes and inlets are so designed or located that fuel cannot be transmitted by the drainage system to another aircraft position or group of positions. Drainage from any one "drainage area" shall be arranged so that it does not create a hazard of the fuel or its vapors travelling or passing through the drainage system to any adjoining or separate "drainage area." (See figures for examples.)

33. Effective ramp drainage as specified herein may be accomplished by any one or a combination of the following methods:

a. Use of drain inlets with connected piping;

b. Use of open grate trenches as a collection means with connected piping; or

c. Sloping of the ramp alone.

NOTE: The use of slopes alone on ramps is the least desirable method but may be accepted where the hazards indicated in Paragraph 21 are not present. The use of slopes and open grate trenches as a collection means with connected piping to dispose of fuel spills is preferable to the use of slopes alone but is not as desirable for major airports as the use of slopes and drain inlets with connected piping.

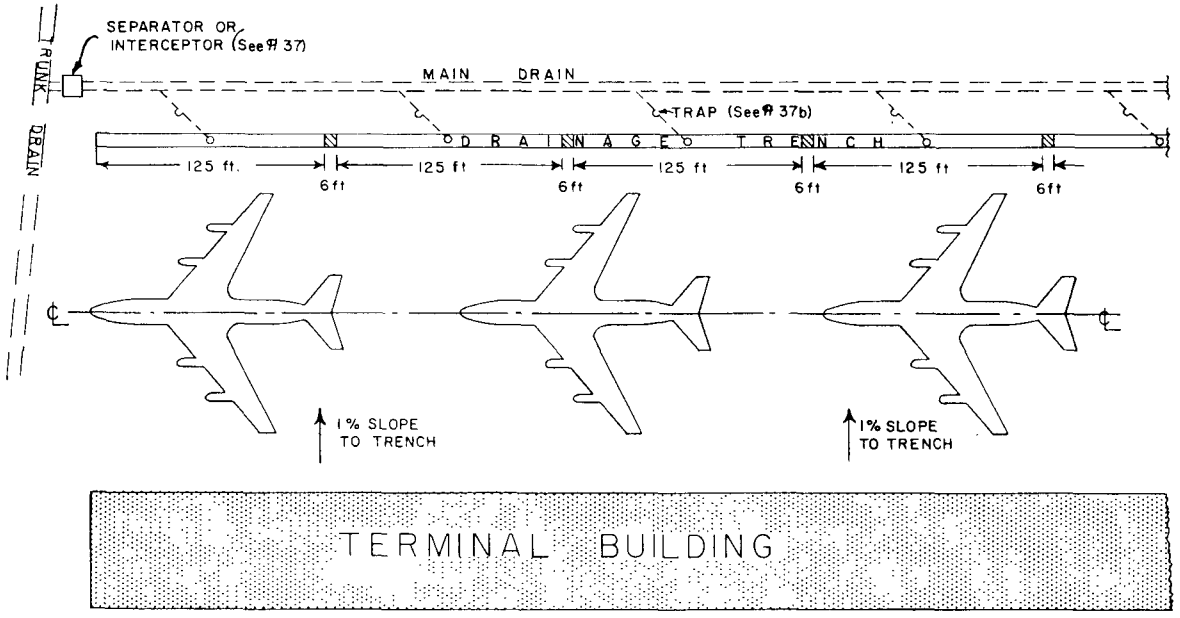

Figure 3. Airport Ramp Drainage Arrangements

Aircraft are superimposed to indicate the intent of the ramp drainage recommendations given herein. Aircraft of other types will necessitate revision of the parking arrangements.

34. The drainage system of any airport ramp or the "drainage area" on a ramp as described in Paragraphs 31 or 32 shall be so arranged that the fuel or its vapor cannot enter into the drainage systems of buildings, areas utilized for automobile parking, public or private streets or on the public side of airport terminal or aircraft hangar structures.

35. In no case shall the fuel be allowed to collect on the ramp or adjacent ground surfaces where it may constitute a fire hazard, become part of the ground water table, or result in a hazardous subsurface accumulation of such fuel. In no case shall drainage systems be arranged to allow disposal of the fuel onto adjoining properties or waterways.

36. The effectiveness of the "drainage areas" specified in Paragraph 32 depends on the proper parking of aircraft using the ramp. It is accordingly recommended that ramp personnel be fully instructed and informed on the purposes of the drainage system used and the importance of properly locating aircraft with respect to the drainage inlets provided. Aircraft should not be parked over any drainage system inlet.

37. Isolation of drainage system components is essential to prevent transmission of flame or vapor through the underground piping system.

a. Sections of drainage systems shall be isolated from trunk mains by interceptors, separators, or specially designed approved devices.

b. Water seal traps are recommended to isolate sections of the drainage system between "drainage areas" or at individual drainage inlets.

NOTE: Where climatic conditions would render traps unserviceable for extended periods of time because of freezing or drying out of the water seals, reliance cannot be placed on these devices.

c. When interceptors or separators are used, they shall be located where readily accessible for inspection and maintenance and vents shall be run to a safe location. Fuel discharged from separators shall drain to a safely located tank, cistern or sump. Accumulated fuels shall be removed from interceptors periodically and disposed of in a safe location.

NOTE: Interceptors or separators can be expected to perform their function for the maximum rated flow for which they were designed if properly maintained. Determination of the maximum flow capacity of the equipment selected shall be decided for each installation based on the nature of the exposure. Normally, it will not be possible to plan on a catastrophic spill of fuel, as might occur following total discharge of a full load of fuel from the largest aircraft in service at the airport. It is recommended that the minimum retention capacity of the interceptor or separator be based on 25 per cent of the total fuel capacity of the largest aircraft likely to be serviced on the airport ramp.

38. If open grate drainage trenches are used as a collection means such open trenches, including branches, shall not be over 125 feet in length with a minimum interval of 6 feet between open trench sections to act as fire stops. Each 125 foot section shall be individually drained through underground piping. Open trenches shall not be used where they are in line of pedestrian or passenger traffic.

39. Grates and drain covers shall be removable to facilitate cleaning and flushing.

40. Drain and Separator Maintenance.

41. Periodic maintenance checks (not less than monthly and more often if climatic conditions dictate) and flushing with large volume water streams shall be conducted through all drains, separators and interceptors to assure that they are clear of obstructions and function properly.

42. Large volume flushing with water shall be conducted through appropriate drainage elements after any large fuel spill on the airport apron enters the drainage system.