as amended; 16 U.S.C. 3), the Act of May 11, 1910 (36 Stat. 354; 16 U.S.C. 162), and the Act of August 22, 1914 (38 Stat. 700; 16 U.S.C. 170), 245 DMI (27 F.R. 6395) as amended, National Park Service Order No. 34 (31 F.R. 4255) as amended, Regional Director, Midwest Regional Order No. 4 (31 F.R. 5769) as amended, it is proposed to amend § 7.3 of Title 36 of the Code of Federal Regulations as set forth below.

The purpose of this amendment is to further insure the protection and preservation of populations of native fishes and natural aquatic environments, to retain quality angling for wild fish in natural environments as part of the visitors' total park experience, and to simplify the fishing season by establishing one opening and closing date for all but four park waters.

It is the policy of the Department of the Interior, whenever practicable, to afford the public an opportunity to participate in the rulemaking process. Accordingly, interested persons may submit written comments, suggestions, or objections regarding the proposed amendment to the Superintendent, Glacier National Park, West Glacier, Mont. 59936, within 30 days of the publication of this notice in the FEDERAL REGISTER.

Paragraphs (a), (b), and (c) of § 7.3 are amended, as follows:

§ 7.3 Glacier National Park.

(a) *Fishing; open season.* All waters in the park shall be open to fishing from 12:01 a.m. on June 5 and end at 12 midnight on October 15, except as otherwise provided by the following restrictions:

(1) That portion of Waterton Lake that is in the park shall be open to fishing in conformance with the seasons established by Canada for this lake.

(2) Kintla Creek between Kintla Lake and Upper Kintla Lake, Bowman Creek for its entire length above Bowman Lake, Logging Creek between Logging Lake and Grace Lake, and Ole Creek, Park Creek, Muir Creek, Coal Creek, and Nyack Creek for their entire length; Fish Creek for its entire length, Upper McDonald Creek from McDonald Falls to Lake McDonald, shall be closed to fishing.

(3) The North Fork of the Flathead River, except for its tributaries, and Lower McDonald Creek from the Quarter Circle Bridge to its confluence with the Middle Fork of the Flathead River, shall be open to fishing in conformance with the seasons and regulations established by the State of Montana for this river.

(4) That portion of Lower Two Medicine Lake that is in the park shall be open in conformance with the seasons established for the Blackfeet Indian Reservation for this lake.

(5) [Deleted]

(6) [Deleted]

(7) [Deleted]

(b) *Fishing; daily limit of catch and possession limit.* (1) Sport fish are herein defined as cutthroat trout, rainbow trout, brook trout, lake trout, Dolly Varden, Kokanee salmon, grayling, mountain whitefish, lake whitefish, northern pike, and burbot (ling). All other species are defined as nonsport fish and may not be kept or killed.

(2) A person must cease fishing immediately when he has in his possession or has taken into his possession a total of five (5) sport fish that day, except that a person shall cease fishing as soon as he has in his possession or has taken into his possession a total of three (3) of the following sport fish that day: Cutthroat trout, Dolly Varden trout, lake trout, grayling. However:

(i) The daily limit of catch and possession in the North Fork of the Flathead River, except for its tributaries, and Lower McDonald Creek from the Quarter Circle Bridge to its confluence with the Middle Fork of the Flathead River, shall be in conformance with the regulations established by the State of Montana for this river;

(ii) The daily limit of catch and possession in that portion of Waterton Lake, located within the park, shall be in conformance with the limits established by Canada for this lake;

(iii) The daily limit of catch and possession in that portion of Lower Two Medicine Lake, located within the park, shall be in conformance with the regulations established for the Blackfeet Indian Reservation for this lake;

(iv) Fish caught in Lower McDonald Creek from the Quarter Circle Bridge and upstream, extending into Lake McDonald for a radius of 300 feet, shall be handled carefully and released immediately to the stream. No fish of any size may be in possession at any time along this stream.

(c) *Fishing; restriction on use of bait and lures.* (1) Only artificial flies, with a single hook, may be used as lures in Rogers Lake, Trout Lake, Arrow Lake, Camas Lake, Lake Evangeline, Ruger Lake, and those sections of Camas Creek interconnecting these lakes.

(2) Only artificial flies and lures, with a single hook, may be used as lures in the catch and release fishing waters of Lower McDonald Creek from the Quarter Circle Bridge and upstream, extending into Lake McDonald for a radius of 300 feet.

* * * * *

Dated: February 18, 1971.

WILLIAM J. BRIGGLE,
Superintendent,
Glacier National Park.

[FR Doc.71-4326 Filed 3-29-71;8:46 am]

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Food and Drug Administration

[21 CFR Part 130]

DRUGS FOR HUMAN USE

New Drugs on the Market Without Approved New-Drug Applications; Extension of Time for Filing Comments

The notice published in the FEDERAL REGISTER of February 23, 1971 (36 F.R. 3372), proposing § 130.— *New drugs on the market without approved new-drug applications,* provided for comments to be filed within 30 days of said date.

The Commissioner of Food and Drugs has received a request to extend such time and, good reason therefor appearing, the time for filing comments on the proposal is extended to April 24, 1971.

This action is taken pursuant to provisions of the Federal Food, Drug, and Cosmetic Act (secs. 201(p), 505, 701(a), 52 Stat. 1041–42, as amended, 1052–53, as amended, 1055; 21 U.S.C. 321(p), 355, 371(a)) and under authority delegated to the Commissioner (21 CFR 2.120).

Dated: March 24, 1971.

SAM D. FINE,
Associate Commissioner for Compliance.

[FR Doc.71-4334 Filed 3-29-71;8:47 am]

Social and Rehabilitation Service

[45 CFR Part 250]

UTILIZATION REVIEW OF CARE AND SERVICES

Notice of Proposed Rule Making

Notice is hereby given that the regulations set forth in tentative form below are proposed by the Administrator, Social and Rehabilitation Service, with the approval of the Secretary of Health, Education, and Welfare. The proposed regulations relate to certification and recertification by physicians for inpatient hospital services in the medical assistance program under title XIX of the Social Security Act.

Prior to the adoption of the proposed regulations, consideration will be given to any comments, suggestions, or objections thereto which are submitted in writing to the Administrator, Social and Rehabilitation Service, Department of Health, Education, and Welfare, 330 Independence Avenue SW., Washington, DC 20201, within a period of 30 days from the date of publication of this notice in the FEDERAL REGISTER.

The proposed regulations are to be issued under section 1102, 49 Stat. 647, 42 U.S.C. 1302.

Dated: February 10, 1971.

JOHN D. TWINAME,
Administrator, Social and Rehabilitation Service.

Approved: March 17, 1971.

ELLIOT L. RICHARDSON,
Secretary.

Section 250.20(a) is amended by adding a new subparagraph (3) to read as follows:

§ 250.20 Utilization review of care and services.

(a) * * *

(3) Provide for procedures to assure that the principles and standards for certification and recertification by physicians for inpatient hospital services

described in 20 CFR 405.1625–405.1630 are applied for hospital inpatients under the medical assistance program.

* * * * *

[FR Doc.71-4095 Filed 3-29-71;8:45 am]

DEPARTMENT OF TRANSPORTATION

Coast Guard

[46 CFR Part 146]

[CGFR 71-17]

SULFURIC ACID CONTAINERS

Notice of Proposed Rule Making

Correction

In F.R. Doc. 71-3790 appearing at page 5296 in the issue of Friday, March 19, 1971, in the table in the first column of page 5297, the fourth entry under the heading "Wooden boxes" now reading "Fiberboard boxes (DOT-12)B WIC polyethylene not over 1 gal. cap. ea." should read "Fiberboard boxes (DOT-12B) WIC polyethylene not over 1 gal. cap. ea."

Federal Aviation Administration

[14 CFR Parts 37, 91, 121, 127, 135]

[Docket No. 10955; Notice 71-10]

AIRBORNE ATC TRANSPONDER EQUIPMENT

Notice of Proposed Rule Making

The Federal Aviation Administration is considering amending Parts, 37, 91, 121, 127, and 135 to provide new standards for airborne ATC transponder equipment and to require that transponders in aircraft meet TSO standards.

Interested persons are invited to participate in the making of the proposed rule by submitting such written data, views, or arguments as they may desire. Communications should identify the regulatory docket or notice number and be submitted in duplicate to the Federal Aviation Administration, Office of the General Counsel, Attention: Rules Docket, GC-24, 800 Independence Avenue SW., Washington, DC 20590. All communications received on or before June 30, 1971, will be considered by the Administrator before taking action on the proposed rule. The proposals contained in this notice may be changed in light of comments received. All comments submitted will be available, both before and after the closing date for comments, in the Rules Docket for examination by interested persons.

By Notice 69-9 published in the FEDERAL REGISTER (34 F.R. 5259) on March 14, 1969, the FAA proposed to further implement the National Airspace System (NAS) by requiring that all aircraft carry improved radar beacon transponders for all operations in controlled airspace at and above 10,000 feet MSL, in positive control airspace, or in terminal airspace within which transponders are required by appropriate FAR's.

The present TSO-C74b contains appropriate minimum performance standards for the improved radar beacon transponders specified in Notice 69-9. However, TSO-C74b was prepared with air carrier operations in mind and did not take into consideration the minimum performance standards that would be suitable for transponder equipment to be used in general aviation operations under Part 91. It is therefore proposed to update TSO-C74b to provide appropriate performance standards for ATC transponder equipment to be used in general aviation operations. The present performance standards of TSO-C74b would be incorporated into the new TSO with the exception that paragraph 2.7c of the Federal Aviation Administration Standard set forth in the TSO would be amended to limit the dead time of the transponder due to means other than normal interrogations. This would control transponder dead time occurring primarily from the use of proximity warning systems. In addition, the present classifications would be redesignated as Class 1A and Class 1B. A new class of equipment designated 2A and 2B would be incorporated in the TSO and the performance standards for such equipment would be set forth in Radio Technical Commission for Aeronautics Document No. DO-144 entitled "Minimum Operational Characteristics—Airborne ATC Transponder Systems," dated March 12, 1970, and Change No. 1 to DO-144, Paper 232-70/EC-643, dated November 5, 1970. The identification of equipment as Class 2A and 2B would depend upon whether the equipment was to be used in operations above 15,000 feet or below, the same as Class 1A and 1B equipment. It should be noted that while ATC transponder equipment approved prior to the effective date of the new TSO may continue to be manufactured, the proposed amendments to the operating rules would require the installation of equipment meeting this new TSO after January 1, 1972, on all aircraft not equipped with an ATC transponder and on all aircraft using ATC transponders after January 1, 1975.

The proposed new TSO would also require a manufacturer to furnish the FAA with an equipment data sheet specifying the actual performance capability of the equipment and the environmental conditions under which the performance capability can be achieved. Knowledge of the actual performance capability for transponder equipment would facilitate the approval of the equipment installation. Therefore, it is proposed to require manufacturers to also furnish a copy of this data sheet with each article.

Notice 69-9 identifies the required ATC transponder merely as one which has a Mode 3/A 4096 code capability, replying to Mode 3/A interrogations with the code specified by ATC. Both TSO-C74b and the proposed TSO provide this capability. However, there are numerous other design requirements, in addition to the number of codes, which a transponder must meet to insure that it will perform its function adequately and reliably and that it is compatible with other airborne transponders and with the ground interrogator facilities. Both TSO-C74b and the TSO proposed herein provide the necessary performance standards and they are both compatible with the U.S. National Standards for Radar Beacon Systems (ATCRBS). Therefore, in order to properly implement the Air Traffic Control Radar System portion of the National Airspace System it will be necessary that all transponders meet the requirements of TSO-C74b or the TSO proposed herein at the time that the requirements proposed in Notice 69-9 are incorporated into the Federal Aviation Regulations.

For the foregoing reasons, it is proposed to amend Parts 91, 121, 127, and 135 to require that ATC transponder equipment installed after January 1, 1972, in any aircraft not previously equipped with an ATC transponder must meet the requirements of TSO-C74b or the appropriate requirements of the TSO proposed herein. Moreover, it is proposed to require that all ATC transponder equipment used after January 1, 1975, meet the requirements of TSO-C74b or the appropriate requirements of the TSO proposed herein. This will insure that all transponder equipment being used in any operation, regardless of when that equipment was installed, eventually meets the necessary performance standards. Under this proposal, transponders currently installed may continued to be used, including the installation of replacement equipment, until January 1, 1975, without meeting the requirements of TSO-C74b or the TSO proposed herein. It should be noted that there is no need for a specific amendment to Part 123 in this proposal since the proposed amendment to § 121.345 would be applicable to Part 123 operators under the provisions of § 123.27(g).

Under the terms of this notice, affected operators would be allowed to equip their aircraft with either above-15,000-feet transponders (TSO-C74b, Class I, or TSO-C74c, Classes 1A and 2A, as applicable) or below-15,000-feet transponders (TSO-C74b, Class II, or TSO-C74c, Classes 1B and 2B, as applicable). This would mean that aircraft capable of operating well above 15,000 feet could be equipped (under the proposed rules) with below-15,000-feet transponders. If the operator of such an aircraft were to climb above 15,000 feet, either voluntarily or in response to an ATC request, his transponder would not perform adequately and safety might be adversely affected. For this reason, it has been suggested that the agency eliminate the 15,000-foot altitude distinction and require all affected operators to equip their aircraft with above-15,000-feet transponders. The agency is aware that transponders meeting above-15,000-feet standards are more expensive than those that do not, but does not have reliable information on how much. To help resolve this issue, interested persons are hereby asked to comment on: (1) The need to eliminate the 15,000-foot altitude

distinction in the transponder TSO proposed in this notice and to require that all affected operators equip their aircraft with above-15,000-feet transponders; and (2) how much more expensive above-15,000-feet transponders would be in comparison to below-15,000-feet transponders. If, on the basis of comments received, the agency determines that there is insufficient justification to retain the proposed distinction between above-15,000-feet transponders and below-15,000-feet transponders, the final rule will permit the use of above-15,000-foot transponders only.

In consideration of the foregoing, it is proposed to amend Parts 37, 91, 121, 127, and 135 of the Federal Aviation Regulations as follows:

A. Part 37 would be amended by amending § 37.180 as follows:

1. Paragraphs (a), (b), (c), and (d) would be amended and a new paragraph (e) would be added, to read as follows:

§ 37.180 Airborne ATC transponder equipment—TSO–C74c.

(a) *Applicability.* This technical standard order prescribes the minimum performance standards which airborne ATC transponder equipment must meet in order to be identified with the applicable TSO marking. New models of such equipment that are to be so identified and that are manufactured on or after (the effective date of this section) must meet the following performance and environmental standards:

(1) *Performance standards.* (i) Equipment marked as Class 1A must be equipment intended for installation in aircraft that operate at altitudes above 15,000 feet and must meet the minimum performance requirements of "Federal Aviation Administration Standard Airborne ATC Transponder Equipment," set forth at the end of this section, as applicable.

(ii) Equipment marked as Class 1B must be equipment intended for installation in aircraft that operate at altitudes not exceeding 15,000 feet and must meet the minimum performance standards of "Federal Aviation Administration Standard, Airborne ATC Transponder Equipment," set forth at the end of this section, as applicable.

(iii) Equipment marked as Class 2A must be equipment intended for installation in aircraft that operate at altitudes above 15,000 feet and must meet the minimum performance standards set forth in Radio Technical Commission for Aeronautics Document No. DO–144 entitled "Minimum Operational Characteristics—Airborne ATC Transponder Systems," dated March 12, 1970, and Change No. 1 to DO–144, Paper 232–70/EC–643, dated November 5, 1970, as applicable.

(iv) Equipment marked as Class 2B must be equipment intended for installation in aircraft that operate at altitudes not exceeding 15,000 feet and must meet the minimum performance standards set forth in Radio Technical Commission for Aeronautics Document No. DO–144 entitled, "Minimum Operational Characteristics—Airborne ATC Transponder Systems," dated March 12, 1970, and Change No. 1 to DO–144, Paper 232–70/EC–643, dated November 5, 1970, as applicable.

(2) *Environmental standards.* RTCA Document No. DO–138 entitled "Environmental Conditions and Test Procedures for Airborne Electronic/Electrical Equipment and Instruments," dated June 27, 1968, must be used in determining the environmental conditions over which the equipment has been designed to operate. Class 2A and 2B equipment need only be tested for the environmental conditions of temperature and altitude, humidity, shock, vibration, and power input voltage set forth in paragraphs 4, 5, 6, 7, and 9 of DO–138.

(b) *Availability of documents.* RTCA Documents Nos. DO–138 and DO–144, as amended, are incorporated herein in accordance with 5 U.S.C. 552(a)(1) and § 37.23 of the Federal Aviation Regulations and are available as indicated in § 37.23. Additionally, RTCA Documents Nos. DO–138 and DO–144, as amended, may be examined at any FAA regional office of the Chief of Engineering and Manufacturing Branch (or in the case of the Western Region, the Chief, Aircraft Engineering Division) and may be obtained from the RTCA Secretariat, Suite 655, 1717 H Street NW., Washington, DC, 20006, at a cost of $8 per copy for Document No. DO–138 and $6 per copy for Document No. DO–144.

(c) *Marking.* In addition to the markings specified in § 37.7, the equipment must meet the following requirements:

(1) The environmental categories over which it has been designed to operate as set forth in Appendix B of RTCA Document No. DO–138 must be permanently and legibly marked on the equipment. Where an environmental test procedure is not applicable and the test is not conducted, and "X" should be placed in the space assigned for that category.

(2) The class which the equipment meets must be permanently and legibly marked on the equipment. Equipment which meets the requirements of more than one class need only be marked with the class which contains the more severe requirements. When listed in order of severity of requirements, highest first, the classes are: 1A, 1B, 2A, and 2B.

(3) Each separate component of equipment (antenna, receiver-transmitter, etc.) must be permanently and legibly marked with at least the name of the manufacturer, the TSO number, and the environmental categories over which it is designed to operate.

(d) *Data requirements.* (1) In accordance with § 37.5, the manufacturer must furnish to the Chief, Engineering and Manufacturing Branch, Flight Standards Division (or in the case of the Western Region, the Chief, Aircraft Engineering Division), Federal Aviation Administration, in the region in which the manufacturer is located, one copy of the following technical data:

(i) Manufacturer's operating instructions and equipment limitations.

(ii) Installation procedures with applicable schematic diagrams, wiring diagrams, and specifications. Indicate any limitations, restrictions, or other conditions pertinent to the installation.

(iii) Manufacturer's test report(s).

(iv) Equipment data sheet specifying the actual performance capability of the equipment and the environmental conditions under which the performance capability can be achieved. Performance data for abnormal environmental conditions may also be included.

(2) One copy of the technical data specified in subparagraphs (1) (ii) and (iv) of this paragraph must be furnished with each article.

(e) *Previously approved equipment.* Airborne ATC transponder equipment approved prior to the effective date of this section may continue to be manufactured under the provisions of its original approval.

2. Paragraph 2.7c of the "Federal Aviation Standard, Airborne ATC Transponder Equipment," would be amended to read as follows:

2.7 *Transponder discrimination and desensitization.*

* * * * *

c. *Dead time.* (1) After reception of a proper interrogation, the transponder must reply to no other interrogation for the duration of the reply pulse train. This dead time must end no later than 125 microseconds after the transmission of the last reply pulse of the group.

(2) The dead time of the transponder created by means other than normal interrogations shall not exceed a period of more than 2,500 microseconds duration at a maximum duty cycle of 4.5 percent.

3. Paragraphs 2.8 and 2.11 of the "Federal Aviation Standards, Airborne ATC Transponder Equipment" would be amended by deleting the parenthetical reference to "(Class I)" and to "(Class II)".

B. Part 91 would be amended by adding a new § 91.24 to read as follows:

§ 91.24 ATC transponder equipment.

(a) ATC transponder equipment installed after January 1, 1972, in U.S. registered civil aircraft not previously equipped with an ATC transponder and all ATC transponder equipment used in U.S. registered civil aircraft after January 1, 1975, must meet the requirements of any Class of TSO–C74b of any Class of TSO–C74c, as appropriate.

(b) This section does not apply to operations conducted under Part 121, 123, 127, or 135 of this chapter.

C. Part 121 would be amended by amending § 121.345 by adding a new paragraph (c) to read as follows:

§ 121.345 Radio equipment.

* * * * *

(c) ATC transponder equipment installed after January 1, 1972, in aircraft not previously equipped with an ATC transponder and all ATC transponder equipment used after January 1, 1975, must meet the requirements of any Class

of TSO–C74b, or Class 1A or Class 1B of TSO–C74c, as appropriate.

* * * * *

D. Part 127 would be amended by designating present § 127.123 as paragraph (a) and adding a new paragraph (b) as follows:

§ 127.123 **Radio equipment.**

* * * * *

(b) ATC transponder equipment installed after January 1, 1972, in helicopters not previously equipped with an ATC transponder and all ATC transponder equipment used after January 1, 1975, must meet the requirements of any Class of TSO–C74b, or Class 1A or 1B of TSO–C74c, as appropriate.

E. Part 135 would be amended by amending § 135.143 by adding a new paragraph (c) to read as follows:

§ 135.143 **General requirements.**

* * * * *

(c) ATC transponder equipment installed after January 1, 1972, in aircraft not previously equipped with an ATC transponder and all ATC transponder equipment used after January 1, 1975, must meet the requirements of any Class of TSO–C74b, or Class 1A or Class 1B of TSO–C74c, as appropriate.

These amendments are proposed under the authority of sections 313(a), 601, 603, and 604 of the Federal Aviation Act of 1958 (49 U.S.C. 1354(a), 1421, 1423, and 1424), and of section 6(c) of the Department of Transportation Act (49 U.S.C. 1655(c)).

Issued in Washington, D.C., on March 22, 1971.

R. S. SLIFF,
Acting Director,
Flight Standards Service.

[FR Doc.71–4352 Filed 3–29–71;8:48 am]

[14 CFR Part 71]

[Airspace Docket No. 71–SO–40]

TRANSITION AREA

Proposed Alteration

The Federal Aviation Administration is considering an amendment to Part 71 of the Federal Aviation Regulations that would alter the Vidalia, Ga., transition area.

Interested persons may submit such written data, views or arguments as they may desire. Communications should be submitted in triplicate to the Federal Aviation Administration, Southern Region, Air Traffic Division, Post Office Box 20636, Atlanta, GA 30320. All communications received within 30 days after publication of this notice in the FEDERAL REGISTER will be considered before action is taken on the proposed amendment. No hearing is contemplated at this time, but arrangements for informal conferences with Federal Aviation Administration officials may be made by contacting the Chief, Airspace and Procedures Branch. Any data, views or arguments presented during such conferences must also be submitted in writing in accordance with this notice in order to become part of the record for consideration. The proposal contained in this notice may be changed in light of comments received.

The official docket will be available for examination by interested persons at the Federal Aviation Administration, Southern Region, Room 724, 3400 Whipple Street, East Point, GA.

The Vidalia transition area described in § 71.181 (36 F.R. 2140) would be redesignated as:

That airspace extending upward from 700 feet above the surface within an 8.5-mile radius of Vidalia Municipal Airport (lat. 32°11'45" N., long. 82°22'15" W.).

The proposed alteration is required to provide controlled airspace protection for IFR operations in the Vidalia terminal in conformance with the application of Terminal Instrument Procedures (TERPs) and current airspace criteria.

This amendment is proposed under the authority of section 307(a) of the Federal Aviation Act of 1958 (49 U.S.C. 1348(a)) and of section 6(c) of the Department of Transportation Act (49 U.S.C. 1655(c)).

Issued in East Point, Ga., on March 19, 1971.

JAMES G. ROGERS,
Director, Southern Region.

[FR Doc.71–4353 Filed 3–29–71;8:48 am]

[14 CFR Part 71]

[Airspace Docket No. 71–EA–23]

CONTROL ZONE AND TRANSITION AREA

Proposed Alteration

Correction

In F.R. Doc. 71–4088 appearing at page 5620 in the issue of Thursday, March 25, 1971, in the description of the Utica, N.Y., transition area (§ 71.181), the phrase "9 miles southwest" in the 14th line should read "9 miles southeast".

National Highway Traffic Safety Administration

[49 CFR Part 571]

[Docket No. 1–5; Notice 7]

BRAKE HOSES AND BRAKE HOSE ASSEMBLIES

Proposed Motor Vehicle Safety Standard

A notice of proposed amendment to 49 CFR 571.21, Federal Motor Vehicle Safety Standard No. 106, Brake Hoses and Brake Hose Assemblies, was published on August 28, 1970 (35 F.R. 13728), corrected on November 5, 1970 (35 F.R. 17055), and revised in certain respects on November 6, 1970 (35 F.R. 17116). The purpose of this notice is to reissue the proposal incorporating the corrections, some of the earlier revisions, and additional revisions discussed herein.

Research, test results, and other data which have come to the attention of the Administration since the initial issuance of the proposal have shown the need for additional revisions of proposed requirements and test procedures, and for comment thereon. The proposed specifications for hydraulic brake hose braid are revised to eliminate cotton, viscose rayon, and polyester cord, and to leave the braid material unspecified. Thus, under the proposal, a hydraulic brake hose braid may be made from any material as long as the brake hose incorporating the braid can meet the performance requirements of the standard. Values for regular-expansion hoses are added to Table I that previously set forth only maximum expansion limits of a low-expansion hose under pressure. The additional values will permit the continued availability of cotton braid hoses. A substantial number of passenger cars use cotton braid hydraulic brake hoses as original equipment, and a cotton braid hose is deemed more suitable for replacement than a rayon braid hose, which would have been the alternative had the earlier proposal not been modified. The proposed requirement that hoses bear two white stripes is revised to allow use of at least two stripes of any color contrasting with that of the hose. Under the previous proposal, the date of manufacture was indicated by a hyphenated numeral representing the day of the year, and the year itself; comments indicated that a numeral combining month, day, and year would result in a more easily identifiable manufacturing date and the proposal is revised accordingly.

Major revisions have been made in the airbrake hose portion of the proposal by eliminating the six types previously specified. Thus an airbrake hose under the proposal may be manufactured from any material as long as the hose can meet the performance requirements of the standard. Specification of a multilayer construction has been deleted to allow the industry more freedom for innovation in meeting the proposed requirements. Similarly, multilayer construction has been deleted from proposed hydraulic brake hose specifications. Comments are especially solicited on this specific area of the proposal. In recognition of the contemplated manufacture of certain brake hoses from synthetic materials, hoses of ⅛-inch inside diameter are included. The proposed minimum radii of the forms are also increased, as the previously specified radii are considered unduly restrictive.

Comments have apprised the NHTSA of the hazards involved in coupling differing sizes of air brake hoses and end fittings. While the coupling appears proper to the eye, the hose may be separated from the fitting as early as the first brake application. Specifying the outside diameter of airbrake hoses would insure a

greater likelihood of proper inservice replacement of airbrake hose assemblies. The NHTSA has not specified outside diameter dimensions for airbrake hoses in this rulemaking action but will prescribe values that will require the use of Standard SAE 100R5 fittings. It is requested that interested persons comment to the docket in order that these dimensions may be prescribed in the eventual amendment of Standard No. 106.

Test requirements are proposed for airbrake hoses to demonstrate resistance to ozone, water, ultraviolet light, and zinc chloride. Following exposure to each, a brake hose would have to demonstrate compliance with one of the following requirements: length change, adhesion, air pressure, strength, or tensile strength.

Physical tolerances in test conditions and procedures have been removed, since they are generally inappropriate for regulatory purposes, and likely to cause confusion as to their significance. Where a range within test conditions or procedures is specified, it is important for enforcement purposes that the vehicle or equipment be required to meet the specified requirements at all points within the range. If it is only required to meet the requirements at one point within a range, a nonconforming result in an NHTSA compliance test would be inconclusive, and repeated retesting would be required. Thus, if tolerances are used they should represent options for Government testing, not for manufacturers' test. But since safety standards should in all cases be considered as performance levels that each vehicle or item of equipment must meet, and not as instructions for manufacturer testing, it is usually clearer and more useful to express a test condition as a single figure without tolerances. Manufacturers have the responsibility of insuring, by any methods that constitute due care, that their products meet the requirements at the stated level. Normally this is done by setting their own test conditions slightly on the "adverse side" of the stated level.

The proposed effective date is extended from October 1, 1971, to March 1, 1972.

Interested persons are invited to submit data, views, and arguments on the proposed amendments. Comments are particularly invited on the leadtime and costs directly related to compliance with the proposed standard. Comments should refer to the docket number and be submitted to: Docket Section, National Highway Traffic Safety Administration, Room 4223, 400 Seventh Street SW., Washington, DC 20591. It is requested, but not required, that 10 copies be submitted. All comments received before the close of business May 24, 1971, will be considered, and will be available in the docket for examination both before and after the closing date. To the extent possible, comments filed after the closing date will also be considered. However, the rulemaking action may proceed at any time after that date, and comments received after the closing date and too late for consideration will be treated as suggestions for future rulemaking. Relevant material will continue to be filed as it becomes available in the docket after the closing date, and it is recommended that interested persons continue to examine the docket for new materials.

Proposed effective date: March 1, 1972.

In consideration of the foregoing it is proposed that 49 CFR 571.21, Motor Vehicle Safety Standard No. 106, Brake Hoses and Brake Hose Assemblies, be amended as set forth below. This notice of proposed rulemaking is issued under the authority of sections 103 and 119 of the National Traffic and Motor Vehicle Safety Act of 1966 (15 U.S.C. 1392, 1407) and the delegations of authority at 49 CFR 1.51 (35 F.R. 4955) and 49 CFR 501.8 (35 F.R. 11126).

Issued on March 19, 1971.

RODOLFO A. DIAZ,
Acting Associate Administrator,
Motor Vehicle Programs.

§ 571.21 Federal Motor Vehicle Safety Standards.

* * * * *

MOTOR VEHICLE SAFETY STANDARD NO. 106

S1. *Scope.* This standard specifies requirements for motor vehicle brake hoses and hose assemblies.

S2. *Purpose.* The purpose of this standard is to reduce deaths and injuries occurring as a result of brake failure from pressure loss due to hose leakage or rupture.

S3. *Application.* This standard applies to passenger cars, multipurpose passenger vehicles, trucks, buses, trailers, and motorcycles, and to brake hoses and brake hose assemblies for use in passenger cars, multipurpose passenger vehicles, trucks, buses, trailers, and motorcycles.

S4. *Definitions.*

"Braid" means two or more strands of intertwined threads forming a diagonal pattern the length of a brake hose.

"Hydraulic brake hose" means a flexible hose for use in a hydraulic brake system of a motor vehicle.

"Hydraulic brake hose assembly" means a hydraulic brake hose with or without armor equipped with permanently attached end fittings.

"Airbrake hose" means a flexible hose for use in an airbrake system of a motor vehicle.

"Airbrake hose assembly" means an airbrake hose with or without armor equipped with couplings or end fittings.

"Vacuum brake hose" means a flexible hose for use in a vacuum brake system of a motor vehicle.

"Vacuum brake hose assembly" means a vacuum brake hose with or without armor equipped with couplings or end fittings.

"Heavy-duty vacuum brake hose" means a vacuum brake hose intended for use in the braking systems of single vehicles or as connecting or transmission lines in combinations of vehicles and systems thereof.

"Oil-resisting heavy-duty vacuum brake hose" means a heavy-duty vacuum brake hose intended for specific use as a manifold connection.

"Light-duty vacuum brake hose" means a vacuum brake hose intended for service in conjunction with the power-braking system on passenger cars, multipurpose passenger vehicles and trucks.

"Rupture" means any failure which results in leakage or a separation of a brake hose from its couplings or end fittings.

"P.s.i." means gage pressure in pounds per square inch as differentiated from absolute pressure.

S5 *Requirements.*

S5.1 *Hydraulic brake hoses and hose assemblies.*

S5.1.1 *Manufacture.* Each hydraulic brake hose shall consist of a rubber inner tube of ⅛-inch, 5/16-inch, or ¼-inch inside diameter, braid imbedded in and bonded to the rubber, and a rubber outer cover. The cover shall be free from sulfur bloom. The inner tube of each hose shall be of a nonblooming stock.

S5.1.2 *Labeling.*

S5.1.2.1 Each hydraulic brake hose shall have at least two solid stripes of a color contrasting to that of the hose, at least one-eighth of an inch in width, placed on opposite sides of the hose parallel to its longitudinal axis. The stripes may be interrupted by the information required by S5.1.2.2.

S5.1.2.2 Each hydraulic brake hose shall be permanently labeled at 6-inch intervals, in block capital letters and numerals at least five thirty-seconds of an inch high, with the following information in the order listed:

(a) A six-digit number indicating the month, day, and year of manufacture. For example, "010773" means January 7, 1973.

(b) The symbol DOT, constituting a certification by the hose manufacturer that the hose conforms to all applicable motor vehicle safety standards.

(c) The hose manufacturer's code number, assigned by the National Highway Traffic Safety Administration.

(d) One of the following three symbols, as applicable:

(1) H2, for hydraulic brake hose of ⅛-inch diameter;

(2) H3, for hydraulic brake hose of 5/16-inch diameter; or

(3) H4, for hydraulic brake hose of ¼-inch diameter.

S5.1.2.3 At least one end fitting of a hydraulic brake hose assembly shall be permanently etched, embossed, or stamped, in block capital letters and numerals at least three thirty-seconds of an inch high, with the date on which the fitting was assembled to the hose, the symbol DOT, and the assembler's code number, as specified in S5.1.2.2 (a), (b), and (c).

S5.1.3 *Test requirements.* Each hydraulic brake hose assembly shall be capable of meeting any of the requirements set forth under this heading, when tested under the conditions of S6 and the applicable procedures of S7. However, a particular hose assembly need not meet further requirements after hav-

ing been subjected to, and having met the requirements of, any one of the following test groups:

(a) Expansion test (S7.1.2) and strength test (S7.1.3);

(b) Fatigue life test (S7.1.4.) and pressure test (S7.1.5);

(c) Tensile test (S7.1.6) and pressure test (S7.1.5);

(d) Water absorption procedure (S7.1.7), strength test (S7.1.3), tensile test (S7.1.6), and fatigue life (S7.1.4);

(e) Cold test (S7.1.8);

(f) Brake fluid compatibility test (S7.1.9); constriction test (S7.1.1), and strength test (S7.1.3);

(g) Ozone resistance test (S7.1.10); or

(h) Salt spray test (S7.1.11).

S5.1.3.1 *Constriction.* The time required for the gage plug to drop of its own weight a distance of 3 inches into the hydraulic brake hose assembly shall not exceed 5 seconds (S7.1.1(a)). However, if the configuration of the assembly precludes testing by the gage plug method, the above requirement shall not apply, and instead, when tested according to S7.1.1(b), a steel ball with a diameter equal to that of the applicable gage plug under 25 p.s.i. air pressure shall pass completely through the hose assembly at a rate not less than 1 inch per second.

S5.1.3.2 *Expansion and strength.* The maximum expansion of a hydraulic brake hose assembly at 1,000 p.s.i. and 1,500 p.s.i. shall not exceed the values specified in Table I (S7.1.2). After being subjected to the expansion test, the hydraulic brake hose shall then withstand 4,000 p.s.i. water pressure for 2 minutes without rupture, and shall not rupture at less than 5,000 p.s.i. (S7.1.3).

TABLE I—MAXIMUM EXPANSION OF FREE LENGTH BRAKE HOSE, cc/ft.

Hydraulic brake hose, inside diameter	Test pressure			
	1000 p.s.i.		1500 p.s.i.	
	Reg. Exp. hose	Low Exp. hose	Reg. Exp. hose	Low Exp. hose
¼ inch	0.66	0.33	0.79	0.42
5/16 inch	0.86	0.55	1.02	0.72
⅜ inch	1.04	0.82	1.30	1.10

S5.1.3.3 *Fatique life and pressure resistance.* A hydraulic brake hose assembly shall not rupture when run continuously on the flexing machine for 35 hours (S7.1.4), and shall then withstand 1,500 p.s.i. air pressure for 30 seconds without rupture (S7.1.5).

S5.1.3.4 *Tensile strength and pressure resistance.* A hydraulic brake hose assembly shall withstand a pull of 325 pounds without rupture (S7.1.6), and shall then withstand 1,500 p.s.i. air pressure for 30 seconds without rupture (S7.1.5).

S5.1.3.5 *Water absorption, strength, tensile strength, and fatigue life.* Each hydraulic brake hose assembly, after immersion in water for 70 hours (S7.1.7), shall withstand 4,000 p.s.i. water pressure for 2 minutes without rupture, and shall then not rupture at less than 5,000 p.s.i. (S7.1.3). It shall then withstand a pull of 325 pounds without rupture (S7.1.6), and shall not rupture when run continuously on a flexing machine for 35 hours (S7.1.4).

S5.1.3.6 *Low-temperature compatibility.* The outer cover of a hydraulic brake hose conditioned at minus 65° F. for 70 hours shall show no signs of cracking when bent around a cylinder (S7.1.8).

S5.1.3.7 *Brake fluid compatibility, construction, and strength.* After having been subjected to a temperature of 250° F. for 70 hours while filled with brake fluid conforming to Standard No. 116, as in effect on the date of manufacture of the hose (S7.1.9), each hydraulic brake hose assembly shall meet the constriction requirements of S5.1.3.1. It shall then withstand 4,000 p.s.i. water pressure for 2 minutes without rupture, and shall not rupture at less than 5,000 p.s.i. (S.7.1.3).

S5.1.3.8 *Ozone resistance.* The outer cover of a hydraulic brake hose shall show no cracking after exposure to ozone, when examined under 7-power magnification (S71.10).

S5.1.3.9 *End fitting corrosion resistance.* After 24 hours of exposure to salt spray, hydraulic brake hose assembly end fittings shall show no pitting, or base metal rust on the end fitting surface (S7.1.11).

S5.2 *Airbrake hoses and hose assemblies.*

S5.2.1 *Manufacture.*

(a) Each airbrake hose and hose assembly shall be provided with reusable metal end fittings.

(b) Each reusable end fitting shall consist of a nipple inserted into the bore of the hose and an outer sleeve (socket, body, or shell) engaging the nipple. The wall of the hose shall be compressed between the nipple and sleeve. Zinc-plated end fittings, if any, shall be dichromate dipped.

S5.2.2 *Labeling.*

S5.2.2.1 Each airbrake hose shall be labeled as specified in S5.1.2.2 (a), (b), (c), and with the letter "A" indicating that the hose is an airbrake hose. In addition each airbrake hose shall bear a number designating hose diameter in sixteenths of an inch. For example, "7" designates a hose diameter of seven-sixteenths of an inch; "6.5" designates a hose diameter of thirteen thirty-seconds of an inch.

S5.2.2.2 Each airbrake hose assembly shall be permanently labeled as specified in S5.1.2.3.

S5.2.3 *Test requirements.*

(a) Each airbrake hose assembly shall be capable of meeting any of the requirements set forth under this heading, when tested under the conditions of S6 and the applicable procedures of S7.

(b) A particular hose assembly need not meet further requirements after having been subjected to and having met the requirements of any of the following tests:

(1) Salt spray test (S7.2.2).

(2) High temperature resistance test (S7.2.3).

(3) Low temperature compatibility test (S7.2.4).

(4) Oil resistance test (S7.2.5).

(c) Each airbrake hose assembly shall meet the applicable requirements when subjected to any one of the tests in group (1), below, followed by any one of the tests in group (2). A particular hose assembly need not meet further requirements after having been subjected to and having met the requirements of any such combination of tests.

(1) Ozone resistance test (S7.2.6); water resistance test (S7.2.12); ultraviolet light resistance test (S7.2.13); or zinc chloride resistance test (S7.2.14).

(2) Length change test (S7.2.7); adhesion test (S7.2.8); air pressure test (S7.2.9); strength test (S7.2.10); or tensile strength test (S7.2.11).

S5.2.4 *Constriction.* A steel ball (of diameter as specified in Table II) under 25 p.s.i. air pressure shall pass completely through the hose assembly at a rate not less than 1 inch per second (S7.2.1).

TABLE II—AIRBRAKE HOSE CONSTRICTION REQUIREMENTS

Inside diameter of hose (inches):	*Minimum ball diameter (inches)*
⅛	0.0940
5/16	.1405
¼	.1880
5/16	.2340
⅜	.2820
13/32	.2980
7/16	.3280
½	.3750
⅝	.4700

S5.2.5 *Airbrake hose assembly end connectoins.* After 24 hours exposure to salt spray airbrakes hose assembly couplings or end fittings shall show no pitting, or base metal rust of the couplings or end fittings surfaces (S7.2.2).

S5.2.6 *High temperature resistance.* An airbrake hose shall show no cracks, charring or disintegration externally or internally when straightened after being bent over a form having the minimum bend radius specified in Table III (S7.2.3) and then impacted with a 10-pound weight (see Figure 1).

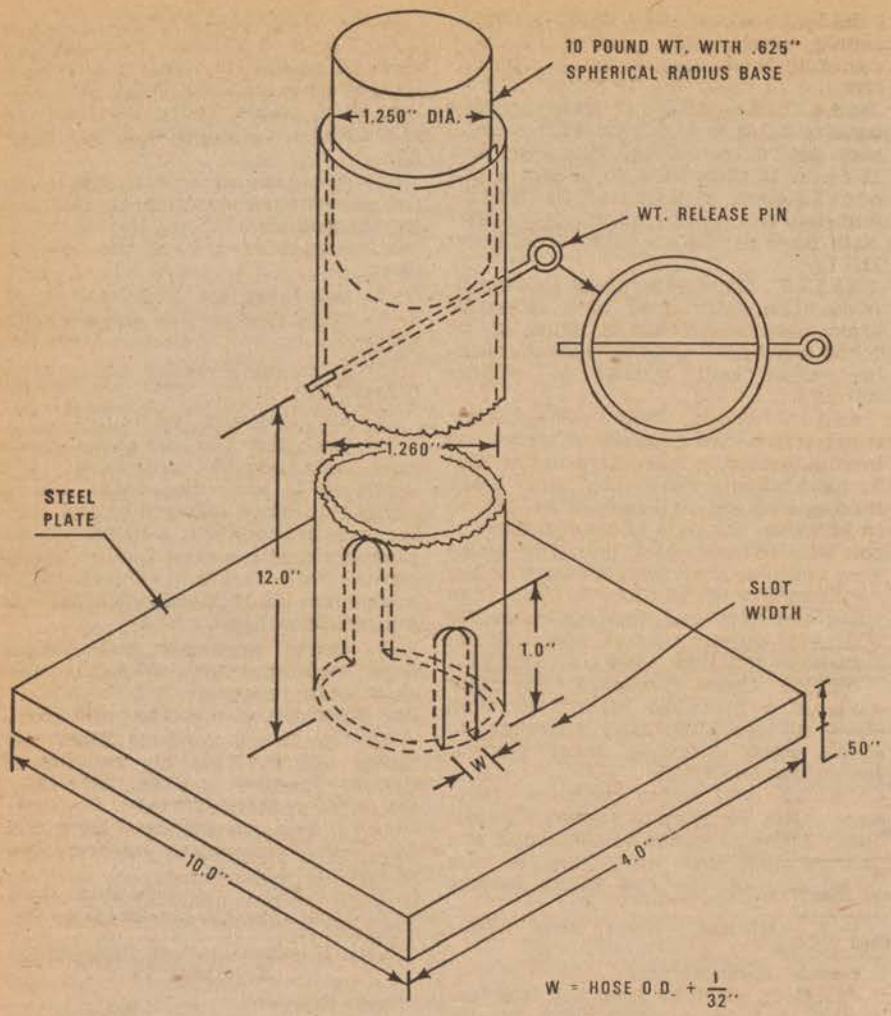


FIGURE 1

TABLE III—AIR BRAKE HOSE DIAMETERS AND MINIMUM BEND RADII

Hose, inside diameter in inches	⅛	3/16	¼	5/16	⅜	13/32	7/16	½	5/8
Minimum bend radius to inside of bend, in inches	1½	2	2½	3	3½	3½	4	4	4½

S5.2.7 *Sizes.* The hose shall conform to the dimensional requirements given in Table III.

S5.2.8 *Low temperature compatibility.* The outer cover of an airbrake hose shall show no signs of cracking after conditioning at minus 40° F. for 70 hours, when bent around a cylinder having the minimum bend radius specified in Table III, and shall not rupture when tested under 300 p.s.i. air pressure for 30 seconds (S.7.2.4).

S5.2.9 *Oil resistance.* After immersion in ASTM No. 3 oil for 70 hours at 212° F. the volume of a specimen prepared from the inner tube and from the cover of an airbrake hose shall not increase more than 100 percent (S7.2.5).

S5.2.10 *Ozone resistance.* After exposure to ozone for 70 hours at 104° F. the outer cover of an airbrake hose shall show no cracking when examined under 7-power magnification (S7.2.6), and:

(a) *Length change.* The hose shall not contract in length more than 7 percent nor elongate more than 5 percent when tested under a pressure of 150 p.s.i. (S7.2.7).

(b) *Adhesion.* The hose shall not require a force less than 8 pounds (machine method) to separate adjacent layers (S7.2.8).

(c) *Air pressure.* The hose assembly shall show no leakage when tested under air pressure of 300 p.s.i. for 30 seconds (S7.2.9).

(d) *Strength.* The hose shall not rupture when tested under hydrostatic pressure at 900 p.s.i. (S7.2.10).

(e) *Tensile strength.* The hose assembly shall withstand a pull of 250 pounds if it is ⅛-inch, 3/16-inch, or ¼-inch hose, or of 325 pounds, if it is any other hose, without separation from the end fittings or couplings and without rupture of the hose (S7.2.11).

S5.2.11 *Water resistance.* After immersion in distilled water for 168 hours, each airbrake hose and hose assembly shall be capable of meeting the requirements of S5.2.10(a)–(e).

S5.2.12 *Ultraviolet light resistance.* After exposure to ultraviolet light for 1,200 hours, and impact with a 10-pound weight (see Figure 1), the outer cover of each airbrake hose shall show no cracks under 7-power magnification (S7.2.13). The hose assembly shall then be capable of meeting the requirements of S5.2.10(a)–(e).

S5.2.13 *Zinc chloride resistance.* After immersion in a 50-percent zinc chloride aqueous solution for 200 hours, the outer cover of each airbrake hose shall show no cracks under 7-power magnification (S7.2.14). The hose assembly shall then be capable of meeting the requirements of S5.2.10(a)–(e).

S5.3 *Vacuum brake hoses and hose assemblies.*

S5.3.1 *Manufacture.* Vacuum brake hose shall have the dimensional requirements as specified in Table IV and Table V and shall be manufactured with a smoothbore tube of flexible material, reinforced with cord or duck plies, or a combination of both, together with an abrasive, weather, and sunlight resistant cover. Covers for light-duty vacuum and for oil-resisting heavy-duty vacuum brake hose shall be oil resistant. Zinc plated end connections shall be dichromate dipped.

TABLE IV—HEAVY-DUTY VACUUM BRAKE HOSE DIAMETERS

Heavy-duty vacuum brake hose size						
	Inside diameter, inch					
	¼	3/8	½	5/8	¾	1
Tolerance (inch):						
Plus	0.008	0.008	0.008	0.008	0.008	0.010
Minus	0.020	0.020	0.020	0.020	0.020	0.022
	Outside diameter, inch					
	9/16	13/16	15/16	1 1/16	1 3/16	1 5/16
Tolerance (inch):						
Plus	1/32	1/32	1/32	1/32	1/32	1/32
Minus	3/32	3/32	3/32	3/32	3/32	3/32

TABLE V—LIGHT-DUTY VACUUM BRAKE HOSE DIAMETERS

Light-duty vacuum brake hose size			
	Inside diameter, inch		
	7/32	1 3/32	1 5/32
Tolerance (inch):			
Plus	0.028	0.028	0.028
Minus	0.032	0.032	0.032
	Outside diameter, inch		
	7/16	1 1/16	1 3/16
Tolerance (inch):			
Plus	0.032	0.032	0.032
Minus	0.032	0.032	0.032

S5.3.2 *Labeling.*

S5.3.2.1 Each vacuum brake hose shall be labeled as specified in S5.1.2.2 (a), (b), and (c). In addition each hose shall also bear the following information in the order listed:

(a) A digit indicating intended service. The digit "1" designates a light-duty vacuum brake hose, "2" designates a heavy-duty vacuum brake hose, and "3" designates an oil-resisting heavy-duty vacuum brake hose.

(b) The letter "V" indicating that the hose is a vacuum brake hose.

(c) A number designating hose diameter in sixteenths of an inch. For example, "7" designates a hose diameter of seven-sixteenths of an inch; "6.5" designates a hose diameter of thirteen thirty-seconds of an inch.

S5.3.2.2 Each vacuum brake hose assembly shall be permanently labeled as specified in S5.1.2.3.

S5.3.3 Each vacuum brake hose assembly shall be capable of meeting any of the requirements set forth under this heading, when tested under the conditions of S6 and the applicable procedures of S7.

S5.3.4 *Constriction.* A steel ball of diameter as specified in Table VI for heavy-duty vacuum brake hose or Table VII for light-duty vacuum brake hose, under 25 p.s.i. air pressure shall pass completely through the hose assembly at a rate not less than 1 inch per second (S7.3.1).

S5.3.5 *Vacuum brake hose assembly end connections.* After 24 hours exposure to salt spray vacuum brake hose assembly end connections shall show no pitting or base metal rust of the connection surface (S7.3.2).

S5.3.6 *High temperature resistance.* A vacuum brake hose shall show no cracks, charring, or disintegration externally or internally when straightened after being bent over a form having the radius specified in Table VI for heavy-duty type or Table VII for light-duty type (S7.3.3).

TABLE VI—HEAVY-DUTY VACUUM BRAKE HOSE TEST REQUIREMENTS

Hose—Inside diameter, inches	High temperature resistance		Bend		Deformation—Collapsed ID (dimension D), inches	Strength—p.s.i.	Swell—diameter of ball, inches
	Specimen length, inches	Radius of form, inches	Specimen length, inches	Maximum collapse of OD, inches			
¼	9	1½	8	3/32	1/16	1200	3/16
5/16	10	1¾	12	5/32	3/32	1200	5/16
⅜	11	2	16	7/32	1/8	1000	13/32
7/16	12	2¼	22	7/32	5/32	1000	17/32
½	14	2½	28	7/32	3/16	800	5/8
1.0	16	3¼	36	9/32	¼	800	¾

TABLE VII—LIGHT-DUTY VACUUM BRAKE HOSE TEST REQUIREMENTS

Hose—Inside diameter, inches	High temperature resistance		Bend		Deformation—Collapsed ID (dimension D), inches	Strength—p.s.i.	Swell—ball diameter factor
	Specimen length, inches	Radius of form, inches	Specimen length, inches	Maximum collapse of OD, inches			
3/32	8	1½	7	1/64	3/64	350	1/16
1/16	9	1¾	11	1/64	3/64	350	3/32
1/32	11	2	14	1/64	3/64	350	3/32

S5.3.7 *Low temperature compatability.* The outer cover of a vacuum brake hose shall show no signs of cracking after conditioning at minus 40° F. for 70 hours when bent around a cylinder (S7.3.4).

S5.3.8 *Ozone resistance.* The outer cover shall show no cracking when examined under 7-power magnification after exposure to ozone (S7.3.5).

S5.3.9 *Strength.* A vacuum brake hose shall not rupture at the hydrostatic pressure specified in Table VI for heavy-duty type and Table VII for light-duty type (S7.3.6).

S5.3.10 *Vacuum.* The collapse of the outside diameter of a vacuum brake hose under internal vacuum of 26 inches of Hg. for 5 minutes shall not exceed 1/16 inch S7.3.7).

S5.3.11 *Bend.* The collapse of the outside diameter of a vacuum brake hose at the middle point of the test length when bent until the ends touch shall not exceed the values given in Table VI for heavy-duty type and Table VII for light-duty type (S7.3.8).

S5.3.12 *Swell.* A vacuum brake hose shall show no leakage in vacuum test under 26 inches of Hg. for 10 minutes, after which there shall be no separation of the inner tube from the fabric reinforcement of the hose. The steel ball shall pass freely through the hose (S7.3.10).

S5.3.13 *Adhesion.* The load required to separate adjacent layers shall be not less than 8 pounds (S7.3.11).

S5.3.14 *Additional requirements for heavy-duty vacuum brake hose.* In addition to meeting the requirements of S5.3.4 through S5.3.13, each heavy-duty vacuum brake hose shall also meet the following requirements:

(a) *Deformation.* A heavy-duty vacuum brake hose shall immediately return to at least 90 percent of the original outside diameter. The collasped inside diameter (dimension D) shall be that specified in Table VI. The load required in the first compression shall be less than 70 pounds, and in the fifth compression it shall be greater than 40 pounds (S7.3.9).

(b) *Cover tensile.* The cover shall have a tensile strength not less than 1,200 p.s.i. (S7.3.12).

(c) *Cover elongation.* The cover stock shall have an elongation at break not less than 200 percent (not less than 2 inches or more than 6 inches) (S7.3.12).

(d) *Tube tensile.* The tube stock shall have a tensile strength not less than 1,000 p.s.i. (S7.3.12).

(e) *Tube elongation.* The tube shall have an elongation at break not less than 175 percent (S7.3.12).

S5.3.15 *Additional requirements for light-duty vacuum brake hose.* In addition to meeting the requirements of S5.3.4 through S5.3.13, each light-duty vacuum brake hose shall also meet the following requirements:

(a) *Deformation.* Each light-duty vacuum brake hose shall immediately return to at least 90 percent of the original outside diameter. The collapsed inside diameter (dimension D) shall be that specified in Table VII. The load required in the first compression shall be less than 50 pounds, and in the fifth compression it shall be greater than 20 pounds (S7.3.9).

(b) *Swell.* Each hose shall meet the requirements of S5.3.12 (S7.3.10).

(c) *Cover tensile.* The cover stock shall have a tensile strength not less than 800 p.s.i. (S7.3.12).

(d) *Cover elongation.* The cover stock shall have an elongation at break not less than 200 percent (not less than 2 inches or more than 6 inches) (S7.3.12).

(e) *Cover volume increase.* The volume of a specimen prepared from the cover of the hose shall not increase more than 50 percent (S7.2.5).

(f) *Tube tensile.* The tube stock shall have a tensile strength not less than 700 p.s.i. (S7.3.12).

(g) *Tube elongation.* The tube stock shall have an elongation at break not less than 175 percent (S7.3.12).

S5.3.16 *Special requirements for oil-resisting heavy-duty vacuum brake hose.* The tube volume of a specimen of oil-resisting heavy-duty vacuum brake hose prepared from the inner tube of the hose shall not increase more than 100 percent. (S7.2.5). The brake hose itself shall meet each requirement of S5.3.4 through S5.3.14.

S6. *Test conditions.* The requirements of S5 shall be met under the following conditions.

S6.1 The temperature of the testing room is 75° F.

S6.2 Except for S7.1.8, S7.2.4, and S7.3.4 the test samples are stabilized at room temperature prior to testing.

S6.3 The brake hose assemblies are at least 24 hours old, and unused.

S7. *Test procedures.*

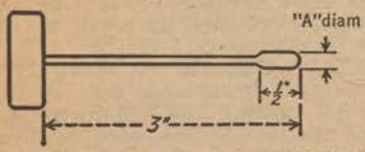
S7.1 *Hydraulic brake hoses and hose assemblies.*

S7.1.1 *Constriction test.*

(a) Measure the constriction of the brake hose assembly with gage plugs as shown in Figure 2. Diameter "A" shall be 0.080 inch for ⅛-inch hose, 0.120 inch for 3/16-inch hose, and 0.165 inch for ¼-inch hose. Gage plugs shall weigh 2 ounces. Hold the hose assembly vertically, and insert the "A" diameter portion of the plug one-half inch into the end of the fitting, then permit the gage plug to drop of its own weight the remaining

2½ inches into the hose assembly. Test both ends.

(b) Hold the brake hose assembly in a straight and vertical position. Pass a steel ball of diameter equal to diameter "A" of the applicable gage plug through the hose under 25 p.s.i. air pressure.



GAGE PLUG SHALL WEIGH 2-OUNCES. DIMENSION "A" OF THE GAGE PLUG SHALL BE AS PRESCRIBED IN THE SPECIFICATIONS FOR THE HOSE.

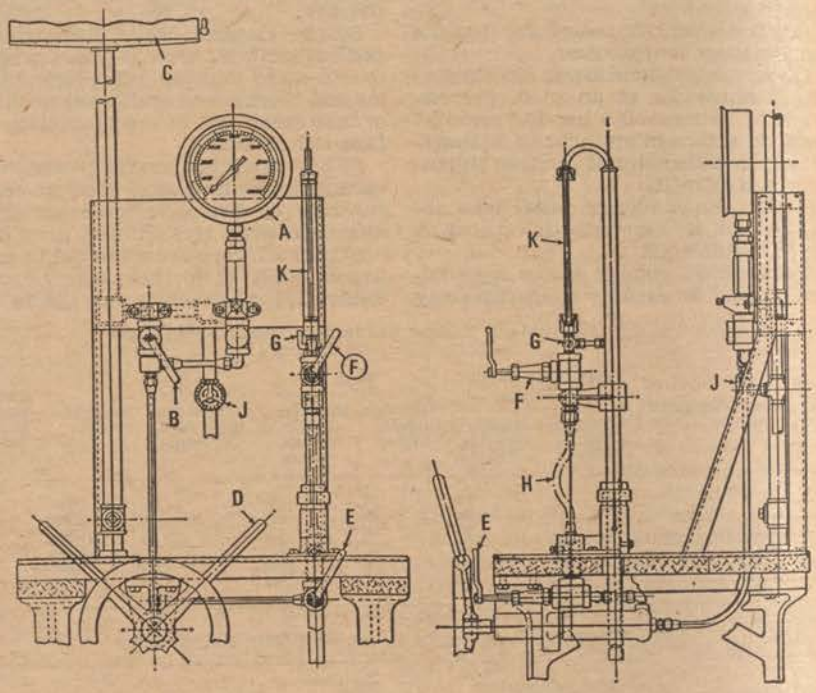
FIGURE 2.—Gage Plug for Testing Construction of Bore of Hose.

S7.1.2 *Test apparatus.*

(a) The test apparatus shall consist essentially of the following, as shown in Figure 3: Source for required fluid pressures, pressure gages, piping, valves, fittings in which the hose assembly may be mounted vertically for application of pressure under controlled conditions, and a graduated buret for measuring the volume of liquid corresponding to the expansion of the hose under pressure. All piping and connections shall be smooth bore without recesses or offsets, so that all air may be freely removed from the system before running each test. Valves shall be capable of withstanding pressures involved without leakage. The apparatus shall be capable of applying pressure at a rate of increase of 15,000 p.s.i. per minute.

(b) Establish the calibration correction factor for the test device at pressures of 1,000 and 1,500 p.s.i. using doublewalled, copper-brazed steel tubing with a small diameter, in place of the hose assembly. Subtract these calibration correction factors from expansion readings obtained on test specimens. The maximum permissible calibration correction factor shall be 0.08 cubic centimeters at 1,500 p.s.i.

(c) Thread the test specimen into position on apparatus so as to provide a leakproof seal. Do not twist. Maintain the hose in a vertical, straight position without tension while under pressure. Fill tank C with distilled water, so that when it is filled it is free of air and dissolved gases. Open valve B and turn crank D to left to allow the maximum amount of water to flow into the master cylinder. Next open valves, E, F, and G allowing water to run from tank C through buret K until no air bubbles are seen in the buret. Removal of air bubbles may be facilitated by moving the hose back and forth. Close valves B and F and raise pressure in hose to 1,500 p.s.i., at a rate of 15,000 p.s.i. per minute, for not more than 10 seconds. After inspecting for leaks at the connections, release the pressure in the hose completely by opening valve F. Close valve F. Adjust water level in buret K to zero by means of valve G. Turn crank D to the right, raising the pressure in the hose to 1,000 p.s.i., at a rate of 15,000 p.s.i. per minute. Seal this pressure in hose by closing valve E, after which measure the expansion immediately by opening valve F and allowing water in the expanded hose to rise in the buret. As soon as the liquid level is constant, close valve F and take reading on buret K. Repeat this operation so that the final reading taken on buret K will be the total of three expansions. This reading, divided by 3, minus the calibration factor, is the final volumetric expansion of the hose at 1,000 p.s.i. Readjust the water level in buret to zero as above and repeat procedure to obtain expansion at 1,500 p.s.i. If pressure in the hose should inadvertently be raised just prior to the expansion reading to a value above that specified, do not take a reading but release pressure and repeat procedure.



A—PRESSURE GAGE OF 10,000-PSI CAPACITY.
B—CONTROL VALVE FROM TANK C.
C—PRESSURE-MEDIUM TANK (VENTED ON TOP).
D—SCREW OPERATED MASTER CYLINDER.
E—VALVE CONTROLLING LINE FROM MASTER CYLINDER TO HOSE.
F—VALVE ABOVE HOSE.
G—VALVE CONTROLLING FLOW INTO BURET.
H—HOSE IN SLACK POSITION.
J—FLUID LINE VALVE.
K—BURET GRADUATED IN 0.1 CU CM.

FIGURE 3.—Apparatus for Expansion and Bursting Strength Tests.

S7.1.3 *Strength test.*

(a) The test apparatus shall consist of a pressure system in which the brake hose is so connected that controlled and measured fluid pressure may be applied internally. The pressure shall be obtained by pump or accumulator system and shall be measured with a calibrated gage. Provision shall be made for filling the hose with distilled water and allowing all air to escape through a relief valve prior to application of pressure. Pressure shall be applied at a rate of increase of 15,000 p.s.i. per minute. The apparatus described in S7.1.2(a) may be used when it conforms to these requirements and the components are adapted to high-pressure work.

(b) Connect the brake hose assembly to pressure system and fill completely with water, allowing all air to escape. Close relief valve and apply pressure at 15,000 p.s.i. per minute until it reaches 4,000 p.s.i. Hold for 2 minutes. Then increase pressure to 5,000 p.s.i.

S7.1.4 *Fatigue life (whip test).* Test shall be conducted with free length as specified in Table VIII and with protective armor removed.

TABLE IX.—HOSE LENGTHS

Straight length (free length between end fittings), in.	Slack, in.	
	1/8-in. hose	5/16-in. and 1/4-in. hose
8 to 15½, inclusive	1.750 ±0.015	1.000 ±0.015
Over 15½ to 19, inclusive	1.250 ±0.015	
Over 19 to 24, inclusive	0.750 ±0.015	

(a) Test apparatus shall provide the same motion to the specimens as the following: A movable header consisting of a horizontal bar mounted at each end on vertically rotating disks through ball bearings with centers placed 4 inches from disk centers, and an adjustable stationary header parallel to the movable header in the same horizontal plane as the centers of the disks. The headers are each provided with four standard end connections equally spaced, approximately 3½ inches on centers in which the hose assemblies are mounted in parallel. The disks are revolved at a speed of 800 r.p.m., whereby the hose ends fastened to the moving header are rotated at this speed through a circle 8 inches in diameter while the opposite hose ends remain stationary. The end connections on the movable header are tightly capped, while those on the stationary header are open to a manifold through which water pressure is supplied by means of a weight-operated plunger in a pressure cylinder. The hose assemblies are thereby subjected during test to a constant water pressure which shall be maintained between 225 and 235 p.s.i. as shown by a gage installed so as to read pressure in the manifold. A limit switch operated by the plunger weight must be used to stop the machine when the water pressure drops as in the case of rupture of the hose, since it is essential that the machine stop if the pressure drops or a hose assembly fails. A revolution counter and elapsed time indicator shall be provided.

(b) Equip the nonrotating header to permit attachment of each hose assembly with individual adjustment for length. When mounted in the whip test machine, the projected length of the hose assembly shall be less than the straight length by the amount indicated as slack in Table VIII. The reduction from straight length to projected length on the machine shall be within the limits specified. Take the projected length parallel to the axis of the rotating head. Install brake hose assemblies in the apparatus without any twist. Apply water pressure and bleed all hose and passages to eliminate air pockets or bubbles. Start the motor rotating the movable head and note the duration of the test. Failure of the brake hose by water leakage through a rupture, and consequent loss of pressure, constitutes a failure of the test. Run the machine continuously for 35 hours.

S7.1.5 *Pressure test.* Attach one end of the hose assembly to a source of air pressure and cap the open end. Submerge the hose assembly in water, using a suitable container for visual observation. Before applying pressure, wipe the hose assembly free of any surface bubbles formed during submersion. Apply an internal air pressure of 1,500 p.s.i. to the hose assembly and maintain for 30 seconds.

S7.1.6 *Tensile test.*

(a) Use a tension testing machine conforming to the requirements of the Methods of Verification of Testing Machines (ASTM Designation: E4) and provided with a recording device to give the total pull in pounds. The hose assembly shall be so held that the hose and fittings shall have a straight centerline corresponding to the direction of the machine pull.

(b) Assemble hose assembly in the fixture and mount in the testing machine. Apply a steady tension load at a speed such that the moving head of the testing machine travels at 1 inch per minute until the total load reaches 325 pounds.

S7.1.7 *Water absorption procedure.* Remove cover of a hose assembly one-half inch to five-eighths inch from either side of the center (total 1 inch to 1¼ inches of the cover removed), in such a manner that the outer braid is exposed, but the outer yarn is not injured and the hose is not elongated. Immerse the assembly in distilled water at room tempreature for 70 hours. Within 10 minutes after removal from the water, begin tests S7.1.3, and S7.1.6, as appropriate. Begin whip test (S7.1.4) not sooner than 10 minutes, and not later than 30 minutes, after removal from the water.

S7.1.8 *Low temperature compatability test.* After removal of chafing sleeves or extra appendages, condition the hose, in a straight position, and a cylinder of the diameter specified below, in air at minus 65° F. for 70 hours. Then, still at that temperature, bend the hose 180 degrees around the cylinder at a steady rate in a period of 3 to 5 seconds. The cylinder diameter shall be 3 inches for 1/8-inch hose, and 3½ inches for 3/16-inch and ¼-inch hose.

S7.1.9 *Brake fluid compatibility procedure.* Fill a hose assembly with brake fluid conforming to Federal Motor Vehicle Safety Standard No. 116, as effective at the time of manufacture of the hose, and cap both ends. Condition the assembly in an oven at 250° F. for 70 hours. Within 10 minutes after removal from the oven, drain the brake hose assembly of brake fluid and immediately begin test S7.1.1 or S7.1.3 as appropriate.

S7.1.10 *Ozone resistance test.* Bend a brake hose 10 inches longer than the circumference of the required cylinder around the cylinder, the diameter of which shall be eight times the nominal outside diameter of the brake hose, and bind where the ends cross. If the hose collapses when bent around the cylinder, provide for internal support of the hose. Condition hose for 24 hours in air at room temperature, and then place the hose on the cylinder in an exposure chamber containing air mixed with ozone in the proportion of 50 parts of ozone per 100 million parts of air by volume, for 70 hours. Ambient air temperature in chamber during test shall be 104° F. Then examine cover of hose under 7-power magnification, ignoring areas immediately adjacent to or within area covered by binding.

S7.1.11 *Salt spray test.*

(a) *Apparatus.* The apparatus for this test shall be that described in the appendix.

(b) *Material.* The material of construction of the salt spray chamber shall be such that it will not affect the corrosiveness of the fog. Drops of solution which accumulate on the ceiling or cover of the chamber shal not be permitted to fall on the brake hose. Drops of solution which fall from the brake hose shall not be returned to the solution reservoir for respraying.

(c) *Position of hose during test.* The position of the hose assembly in the chamber during the test shall be such that the following conditions are met:

(i) A hose assembly is supported or suspended 30° from the vertical and parallel to the principal direction of horizontal flow of fog through the chamber, based upon the dominant surface being tested.

(ii) Each hose is so placed as to permit free settling of fog on all assemblies.

(iii) Salt solution from one hose assembly does not drip on any other hose assembly.

(d) *Salt solution.* Solution shall be 5 parts by weight of sodium chloride in 95 parts of distilled water or water containing not more than 200 p.p.m. of total solids. The sodium chloride shall be substantially free of nickel and copper and shall contain on a dry basis not more than 0.1 percent of sodium iodide and not more than 0.3 percent of total impurities. The pH of the salt solution shall be such that when atomized at 95° F. the collected solution shall be in the pH range of 6.5 to 7.2. Before the solution is atomized it shall be free of suspended solids. The pH measurement shall be made electrometrically at 77° F. using a glass electrode with a saturated potassium chloride brideg, or colorimetrically using Bromthymol blue as indicator.

(e) *Air supply.* Compressed air supply to nozzle or nozzles for atomizing salt solution shall be free of oil and dirt and maintained between 10 and 25 p.s.i.

(f) *Condition in salt supply chamber.* (i) Exposure zone of salt spray chamber shall be maintained at 95° F. Temperature within the exposure zone of the closed cabinet shall be recorded at least twice a day at least 7 hours apart.

(ii) Place at least two clean fog collectors within the exposure zone so that no drops of solution from the hoses or other sources are collected. Collectors shall be placed in the proximity of hoses, one nearest to any nozzle and the other farthest from all nozzles. Fog shall be such that for each 80 square centimeters of horizontal collecting area there will be collected in each collector from 1 to 2 milliliters of a solution per hour based on an average run of at least 16 hours. The sodium chloride concentration of the collected solution shall be 5 percent by weight. The pH of the collected solution shall be 6.5 to 7.2 and shall be made

electrometrically or colorimetrically using Bromthymol blue as the indicator.

(iii) The nozzle or nozzles shall be so directed or baffled that none of the spray can impinge directly on the hose assemblies.

(g) *Continuity and cleaning.* (i) The test shall be continuous for a period of 24 hours.

(ii) Remove salt deposit from surface of hoses by washing gently or dipping in clean running water not warmer than 100° F. and then immediately dry.

S7.2 *Airbrake hoses and hose assemblies.*

S7.2.1 *Constriction test.* Hold the hose assembly in a straight and vertical position. Pass a steel ball (of diameter as specified in Table II) through the hose while under 25 p.s.i. air pressure.

S7.2.2 *Salt spray test.* Conduct S7.1.11 using an airbrake hose.

S7.2.3 *High temperature resistance test.* Bend a specimen of brake hose over a form having the minimum bend radius specified in Table III and hold in place by a band or cord. Condition the assembly for 70 hours in an air oven at 212° F. After removal from oven allow hose to cool to room temperature and then remove from the form. Open hose out to a straight length, and impact at once, one time, with a 10-pound weight with a device as illustrated in Figure 1. Examine externally for cracks, charring, or disintegration. Cut specimen lengthwise and examine inner tube for signs of cracking.

S7.2.4 *Low temperature compatibility test.* Condition a hose, in a straight position, and a cylinder in a cold box at minus 40° F. for 70 hours. Without removing the hose, bend it around the cylinder 180° in not less than 3 seconds and not more than 5 seconds. The cylinder shall have a diameter of the minimum bend radius specified in Table III. Conduct S7.1.5 maintaining an internal air pressure of 300 p.s.i. for 30 seconds.

S7.2.5 *Oil resistance (volume increase).*

(a) Each test specimen shall be a rectangular rubber block 2 inches long and 1 inch wide, having a thickness not over one-sixteenth inch. It shall be cut from the brake hose and buffed on both faces only to extent necessary to insure smoothly buffed faces, except when the material is too thick, in which case the buffing shall be sufficient to reduce specimens to one-sixteenth inch. Three specimens shall be used for each test and the results averaged.

(b) Measure the volume of each test specimen by a water displacement method in which the specimen is accurately weighed to nearest milligram in air (W_1) and in distilled water (W_2) at room temperature. When weighing in water take care that specimen is free from adhering air bubbles. If necessary it may first be wetted by being dipped in acetone and thoroughly rinsed with distilled water. After weighing, blot specimen dry with filter paper, completely immerse in ASTM No. 3 oil, and allow to stand for 70 hours at 100° C. Cool specimen to room temperature by transferring to a clean, cool portion of test liquid for 30 to 60 minutes. Dip specimen quickly into acetone, blot lightly with filter paper, and place in a tared weighing bottle and weigh (W_3). Then remove it from bottle and weigh (W_4) in distilled water in immediate consecutive procedure to determine water displacement after test. Final weighing shall be completed within 5 minutes after removal of test specimen from test liquid.

(c) Calculate percentage increase in volume as follows:

$$\text{Percentage of increase} = \frac{(W_3 - W_4) - (W_1 - W_2)}{(W_1 - W_2)} \times 100$$

S7.2.6 *Ozone test.* Conduct S7.1.10 using air brake hose. Then conduct one of the following tests: Length change (S7.2.7), adhesion (S7.2.8, air pressure (S7.2.9), strength (S7.2.10), or tensile strength (S7.2.11).

S7.2.7 *Length change.* Lay out the hose in a straight, horizontal position and apply a pressure of 10 p.s.i. Measure the original length at this pressure. Then increase the pressure to 200 p.s.i. without releasing the original pressure of 10 p.s.i. and make a final length measurement within 1 minute. An increase in the final length from the original length is an elongation. A decrease in the final length from the original length is a contraction.

S7.2.8 *Adhesion test.* The test shall be conducted only on original unaged specimens using a power-driven apparatus of the inclination balance or pendulum type which fulfills the following requirements:

(i) The applied tension as measured and recorded is accurate within ±1 percent.

(ii) The recording head of the machine has a freely rotating form with an outside diameter substantially the same as the inside diameter of the hose specimen that is placed on it. The form shall be mounted in such a way that its axis of rotation will be in the plane of the ply being separated from the ring and that the applied force will be perpendicular to the tangent of the ring circumference at the line of separation.

(iii) The rate of travel of the power-actuated grip is a uniform 1 inch per minute.

(iv) The machine is to be operated without any device for maintaining maximum load indication. In a pendulum type machine, the weight lever swings as a free pendulum without engagement of pawls.

(v) The machine is autographic, giving a chart having the inches of separation as one axis and applied tension as the other axis of coordinates.

(vi) The machine is of such capacity that the maximum applied tension during the test is not more than 85 percent or less than 15 percent of the rated capacity. Separate from the specimen by hand that layer of the specimen of which the adhesion is to be tested, sufficient to permit attaching the power-actuated clamp of the machine. Place the specimen snugly on the cylinder. With the cylinder attached to the recording head of the machine and the separated layer gripped symmetrically and firmly without twisting in the power-actuated lamp, adjust the autographic mechanism and chart to zero and start the machine. Strip the separating layer from the specimen approximately at an angle of 90° to the tangent of the specimen surface, and continue the separation for a sufficient distance to indicate the adhesion value. The adhesion value shall be the minimum load over the portion of the chart corresponding to actual separation of the part being tested, or the minimum load recorded during actual separation of the part being tested. The load shall be expressed in pounds per inch of width for separation at 1 inch. During test the cylinder shall rotate freely so as to maintain the line of separation at all times approximately in the same position.

S7.2.9 *Air pressure test.* Assemble a specimen of hose 18 inches in length, with end fittings as for service, and connect to a source of air pressure. Then submerge the hose assembly entirely in water, using any suitable container for the water such that visual observation of the assembly is permitted. Then apply internal air pressure of 200 p.s.i. and maintain for 30 seconds.

S7.2.10 *Strength test.*

(a) Apply hydrostatic pressure by means of a hydraulic pump or an accumulator system. Connect hose to waterline or pump and fill with water before applying pressure, allowing all air in hose to escape through a petcock. Then close petcock and apply pressure at a uniform rate of increase of approximately 1,000 p.s.i. per minute until hose ruptures.

(b) The brake hose test specimen shall be at least 18 inches in length for hose 3 inches or less in inside diameter, and at least 24 inches in length for larger hose, but in no case shall the length exceed 36 inches.

S7.2.11 *Tensile test.* Use machine as in S7.1.6. The machine shall be operated at a speed of approximately 1 inch per minute. The specimen of airbrake hose, approximately 18 inches in length, shall be so held in the testing machine that the hose and fittings have a straight center line corresponding to the direction of the machine pull. The hose assembly shall be subjected to an increasing tension load until failure occurs either by separation of the specimen from the end fittings or by rupture of the hose structure.

S7.2.12 *Water resistance.* Bend air brake hose assembly around a cylinder having the minimum bend radius specified in Table III, then immerse in distilled water at room temperature for 168 hours. After removal from distilled water, conduct one of the following tests: length change (S7.2.7), adhesion (S7.2.8), air pressure (S7.2.9), strength (S7.2.10), or tensile strength (S7.2.11).

S7.2.13 *Ultraviolet light resistance.* Bend air brake hose assembly into a circle having the minimum bend radius specified in Table III and place on a turntable with an RS4 sunlamp centered 9 inches above. Rotate the turntable at 33⅓ r.p.m. for 1,200 hours. Remove hose assembly and impact at once, one time,

with a 10-pound weight (see Figure 1). Examine under 7-power magnification for cracks. Then conduct one of the following tests: Length change (S7.2.7), adhesion (S7.2.8), air pressure (S7.2.9), strength (S7.2.10), or tensile strength (S7.2.11).

S7.2.14 *Zinc choloride resistance.* Bend air brake hose assembly around a form having the minimum bend radius specified in Table III, then immerse in a 50 percent zinc chloride aqueous solution at room temperature for 200 hours. After removal from solution, examine under 7-power magnification for cracks, then conduct one of the following tests: Length change (S7.2.7), adhesion (S7.2.8), air pressure (S7.2.9), strength (S7.2.10), or tensile strength (S7.2.11).

S7.3 *Vacuum brake hoses and hose assemblies.*

S7.3.1 *Constriction test.* Conduct S7.2.1 using vacuum brake hose.

S7.3.2 *Salt spray test.* Conduct S7.1.11 using vacuum brake hose.

S7.3.3 *High temperature resistance test.* Conduct S7.2.3 using vacuum brake hose with dimension of form (Figure 4) as specified in Table IX.

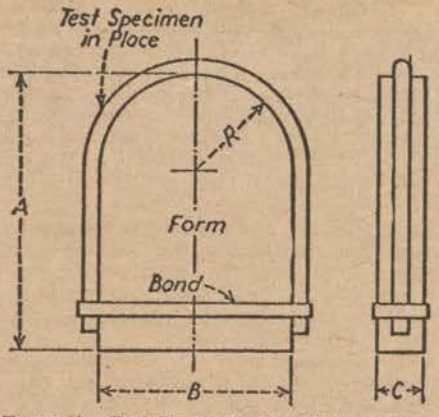


FIGURE 4.—Test Specimen on Form for Aging Test.

TABLE IX—DIMENSIONS OF VACUUM BRAKE HOSE TEST SPECIMEN AND FORM FOR HIGH TEMPERATURE RESISTANCE TEST

Inside diameter of hose (inch)	Duty type	Length of specimen (inch)	Dimensions of form (see Fig. 4) (inches)			
			A	B	R	C (min.)
VACUUM BRAKE HOSE						
5/16	Light	8	4 1/2	3	1 1/2	1/2
1/4	Heavy	9	4 1/2	3	1 1/2	1/2
11/32	Light	9	4 3/4	3 1/2	1 3/4	3/4
3/8	Heavy	10	4 3/4	3 1/2	1 3/4	3/4
15/32	Light	11	5	4	2	3/4
1/2	Heavy	11	5	4	2	3/4
5/8	do	12	5 1/2	4 1/2	2 1/4	3/8
3/4	do	14	6	5	2 1/2	1
1	do	16	7	6 1/2	3 1/4	1 3/8

S7.3.4 *Low temperature compatibility test.* Conduct S7.2.4 using vacuum brake hose.

S7.3.5 *Ozone test.* Conduct S7.1.10 using vacuum brake hose.

S7.3.6 *Strength test.* Conduct S7.2.10 using vacuum brake hose.

S7.3.7 *Vacuum test.* Assemble a specimen of vacuum brake hose 12 inches long with end fittings so that one end may be completely closed against air leakage and the other end connected to a vacuum pump. Measure the outside diameter of the test specimen and subject it to a vacuum of 26 inches of Hg. for 5 minutes. Connect a manometer or vacuum gage in the system to indicate the degree of vacuum actually maintained. At the end of the 5-minute period, while the hose is still under vacuum, again measure the outside diameter of the specimen so as to determine the minimum diameter at any cross section. Make the measurement with outside spring calipers and a steel scale graduated to one sixty-fourth inch. The difference between this measurement and the original outside diameter shall be the collapse of the hose outside diameter under vacuum.

S7.2.12 *Water resistance.* Bend air-vacuum brake hose, of the length prescribed in Table VI or Table VII, in the direction of its normal curvature until its ends just touch as shown in Figure 5. Measure the outside diameter of the specimen at the middle section A in the plane of the centerline before and after bending, using outside spring calipers and a steel scale graduated to one sixty-fourth inch. The difference between the two measurements shall be considered the collapse of the hose outside diameter on bending.

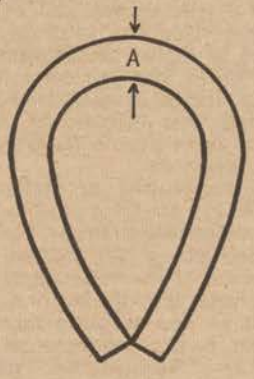


FIGURE 5.—Bend Test of Vacuum Brake Hose.

S7.3.9 *Deformation test.*

(a) *Apparatus.* The test apparatus shall consist of a No. 3 arbor press or other suitable compression device for collapsing the diameter of hose specimens, a platform scale or other suitable means for weighing the load required to collapse the hose, and feeler gages for measuring the free distances between the inner tube faces of the collapsed hose. The weighing device shall have a capacity of at least 100 pounds and shall indicate the applied loads on a dial or scale with an accuracy within ±1 percent. The feeler gages shall be of sufficient length to be passed completely through the test specimens of hose, which shall be a section cut to a length of 1 inch and shall be of rectangular cross section with dimensions as prescribed in Table X.

(b) *Procedure.* Place test specimen longitudinally in the arbor press with the fabric laps, if any, on either side and not in the line of the applied pressure. Insert the weighing device in the press and place the specimen on it so that the load applied may be measured. Compress test specimen to the form shown in Figure 6 with dimension D as prescribed in Table X. Record the observed load required to compress specimen to specified dimension D. Then compress test specimen 4 additional consecutive times to the form shown in Figure 6 with dimension D as prescribed in Table X. Hold the specimen under load each time for 5 seconds and allow it to recover for approximately 10 seconds which shall elapse between load applications. While under each application of the load, measure dimension D by means of the proper feeler gage for the size of hose being tested. Record the observed load required in the fifth application to compress the specimen to the specified dimension D. The specimen shall fail the test unless the load is less than that specified on the first application and unless the load is greater than that specified on the fifth application.

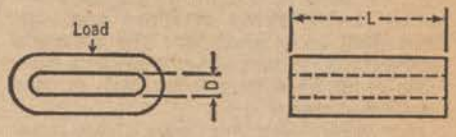


FIGURE 6.—Deformed Specimen of Vacuum Brake Hose.

TABLE X—DIMENSIONS OF TEST SPECIMEN AND FEELER GAGE FOR DEFORMATION TEST OF VACUUM BRAKE HOSE

Inside diameter of hose (inch)	Duty type	Specimen dimensions (see Fig. 6)		Feeler gage dimensions	
		D (inch)	L (inch)	Width (inch)	Thickness (inch)
7/32	Light	5/64	1	1/8	3/64
1/4	Heavy	1/16	1	1/8	1/16
11/32	Light	3/64	1	3/16	3/64
3/8	Heavy	3/32	1	3/16	3/32
15/32	Light	3/64	1	1/4	3/64
1/2	Heavy	1/8	1	1/4	1/8
5/8	do	3/32	1	1/4	3/32
3/4	do	3/16	1	1/4	3/16
1	do	1/4	1	1/4	1/4

S7.3.10 *Swell test.*

(a) Cut a speciment of vacuum brake hose 12 inches long. Measure the inside diameter and then fill the specimen with Reference Fuel A as described in the Method of Test for Change in Properties of Elastomeric Vulcanizates Resulting From Immersion in Liquids (ASTM Designation D471), enclosed by means of suitable cork stoppers to prevent loss by evaporation or leakage. Avoid putting Fuel A under greater than atmospheric pressure. Allow the filled hose to stand at room temperature for 48 hours, then remove the fuel and immediately test the hose specimen, in sequence, as described in paragraphs (b) to (d) of this section.

(b) Drop a steel ball through the specimen. If the ball does not pass freely, the specimen fails the test. Diameter of steel ball shall be that specified in Table VI for Heavy-Duty hose, and equal to the actual inside diameter measurement minus ball diameter factor in Table VII for Light-Duty hose.

(c) Next subject the specimen to a vacuum of 26 inches of Hg. as prescribed in S7.3.7, except that no measurements of diameter are required and the vacuum shall be maintained for at least 10 minutes. If the hose leaks, the specimen fails the test.

(d) Cut the specimen lengthwise in two sections and examine for any signs of separation of the inner tube from the fabric. If there is separation, the specimen fails the test.

S7.3.11 *Adhesion test.* Conduct S7.2.8 using vacuum brake hose.

S7.3.12 *Tensile strength and elongation of tube and cover.*

(a) *Apparatus.* Test apparatus shall consist of the following:

(i) *Bench marker.* The bench marker shall have two parallel straight marking surfaces ground smooth in the same plane. The surfaces shall be between 0.002 and 0.003 inch in width and at least 0.6 inch in length. The angles between the marking surfaces and the sides shall be at least 75°. The distance between the centers of the markings surfaces shall be within 0.003 inch of the required distance.

(ii) *Stamp pad.* The stamp pad shall have a plane unyielding surface (for example, hardwood, plate glass, or plastic). The ink shall have no deteriorating effect on the specimen and shall be of contrasting color to that of the specimen.

(iii) *Micrometers.* The dial micrometer used to measure the thickness of flat specimens shall be capable of exerting a pressure of 3.6 p.s.i. on the specimens and measuring the thickness to within 0.001 inch. The anvil of the micrometer shall be at least 1.4 inches in diameter and shall be parallel to the face of the contact foot.

(iv) *Testing machine.* Tension tests shall be made on a power-driven machine equipped with a suitable dynamometer and indicating or recording device for measuring the applied force within ±2 percent. If the capacity range cannot be changed during a test, as in the case of the pendulum dynamometer, the applied force at break shall be measured within ±2 percent, and the smallest tensile force measured shall be accurate to within 10 percent. If the dynamometer is of the compensating type for measuring tensile stress directly, means shall be provided to adjust for the cross sectional area of the specimen. The response of either an indicator or recorder shall be sufficiently rapid that the applied force is measured with the requisite accuracy during the extension of the specimen to rupture. If the tester is not equipped with a recorder, a device shall be provided that indicates after rupture the maximum force applied during extension. Testers equipped with a device to measure elongation automatically shall be capable of determining extensions within 5 percent of the original length. If elongation is measured manually, a scale capable of measuring each 10 percent elongation shall be provided.

(v) *Grips.* The tester shall have two grips, one of which shall be connected to the dynamometer, and a mechanism for separating the grips at a uniform rate of 20 inches per minute for a distance of at least 30 inches. Grips for testing specimens shall be either wedge or toggle type designed to transmit the applied force over a large surface area of the specimen.

(vi) *Calibration of testing machine.* The testing machine shall be calibrated in accordance with Procedure A of ASTM E4, Methods of Verification of Testing Machines.[1] If the dynamometer is of the strain-gage type the tester shall be calibrated at one or more loads daily, in addition to the requirements in sections 7 and 18 of Methods E4. Testers having pendulum dynamometers may be calibrated as follows: Place one end of a specimen in the upper grip of the testing machine. Remove the lower grip from the machine and attach it to the specimen. Attach to the lower grip a hook suitable for holding weights. Suspend a weight from the hook on the specimen to permit the weight assembly to rest on the machine grip holder. If the machine has a dynamometer head of the compensating type calibrate it at two or more settings of the compensator. Start the motor and run as in normal testing until the weight assembly is freely suspended by the specimen. If the dial or scale (whichever is normally used in testing) does not indicate the weight applied (or its equivalent in stress for compensating tester) within the specified tolerance, check the machine for excess friction in the bearings and all other moving parts. After eliminating as nearly as possible all the excess friction, recalibrate the machine as described in this paragraph. Calibrate the machine at a minimum of three points, using accurately known weight assemblies of approximately 10, 20, and 50 percent of capacity. Include the weight of the lower grip and hook as part of the calibration weight. If pawls and ratchet are used during the test, use them during the calibration. Friction in the head may be checked by calibrating with the pawls up.

(b) *Test specimens.* Test specimens shall be of sufficient length to permit their installation in the wedge or toggle grip used in the test. Bench marks shall be placed on the specimens. To determine the cross sectional area of specimens in the form of tubes, the weight, length, and density of the specimen shall be determined. The cross sectional area shall then be calculated from these measurements as follows:

$$A = \frac{W}{DL}$$

where:

A = Cross sectional area, cm.²,
W = Weight in air, g.,
D = Density, g./cm.³, and
L = Length, cm.

To determine the cross sectional area in square inches, the area A in square centimeters shall be multiplied by 0.155.

(c) *Determination of tensile stress, tensile strength, and ultimate elongation.* Place specimens in the grips of the testing machine, using care to adjust it symmetrically in order that the tension will be distributed uniformly over the cross section. If tension is greater on one side of the specimen than on the other, the bench marks will not remain parallel and maximum strength of the rubber will not be developed. Start the machine and note continually the distance between the center of the two bench marks, taking care to avoid parallax. Record the stress at the elongation specified for the materials under test and at the time of rupture, preferably by means of an autographic or spark recorder. At rupture measure and record the elongation to the nearest 10 percent on the scale. If the stress and strain are not autographically recorded, predetermine the distance between the centers of the rollers for the elongation specified for the material under test by the following equation:

[1] ASTM Standards Part 30 (1967).

$$D=\frac{1}{2}\left[\frac{EM}{100}+C-G\right]$$

where:

D=Distance between the roller centers of two grips,
E=Specified elongation, percent,
C=Inside circumference of the specimen,
M=Mean circumference of the specimen, and
G=Circumference of one grip roller (if each grip has two rollers, add twice the distance between the centers of the rollers on one grip).

Record the stress at the predetermined distance between the centers of the rollers and at the time of rupture, preferably by means of an autographic or spark recorder. At rupture measure the distance between the centers of rollers to within 0.1 inch and record.

(d) *Calculation.* Specimen: Calculate the tensile stress as follows:

$$\text{Tensile stress}=F/A$$

where:

F=Observed force, and
A=Cross-sectional area of the unstretched specimen.

Calculate the tensile strength by letting F in the above equation for tensile stress be equal to the force required to break the specimen.

Calculate the elongation as follows:

$$\text{Elongation, percent}=\frac{L-L_o}{L_o}\times 100$$

where:

L=Observed distance between the benchmarks on the stretched specimen, and
L_o=Original distance between the benchmarks.

Calculate the maximum elongation by letting L in the above equation for elongation be equal to the distance between the bench marks at the time of rupture. Calculate the tension set by substituting for L in the above equation, the distance between the bench marks after the 10-minute retraction period.

Appendix

Construction of Apparatus

1. *Cabinets.* (a) The salt spray cabinet consists of the basic chamber, an air saturator tower, a salt solution reservior, atomizing nozzles, specimen supports, provisions for heating the chamber, and suitable controls for maintaining the desired temperature.

(b) Accessories such as a suitable adjustable baffle or central fog tower, automatic level control for the salt reservoir, and automatic level control for the air saturator tower are pertinent parts of the apparatus.

(c) The cabinet is of sufficient size to test adequately the desired number of parts without overcrowding (i.e. no less than 15 cubic feet capacity).

(d) The chamber may be made of inert materials such as plastic, glass, or stone, but most preferably is constructed of metal and lined with impervious plastics, rubber, or epoxy type materials or equivalent.

2. *Temperature control.* (a) The maintenance of temperature within the salt chamber can be accomplished by several methods. It is desirable to control the temperature of the surroundings of the salt spray chamber and to maintain it as stable as possible. This may be accomplished by placing the apparatus in a constant temperature room, or by surrounding the basic chamber by a jacket containing water or air at a controlled temperature.

(b) The use of immersion heaters in an internal salt solution reservoir or of heaters within the chamber is detrimental where heat losses are appreciable, because of solution evaporation and radiant heat on the specimens.

(c) All piping which contacts the salt solution or spray must be of inert materials such as plastic. Vent piping should be of sufficient size so that a minimum of back pressure exists and should be installed so that no solution is trapped. The exposed end of the vent pipe should be shielded from extreme air currents that may cause fluctuation of pressure or vacuum in the cabinet.

3. *Spray nozzles.* (a) Satisfactory nozzles may be made of hard rubber, plastic, or other inert materials. The most commonly used type is made of plastic. Nozzles calibrated for air consumption and solution atomized are available. The operating characteristics of a typical nozzle are given in Table A.

Table A.—Operating Characteristics of Typical Spray Nozzle

Siphon height, in.	Air flow, liters per min.				Solution consumption, ml per hr.			
	Air pressure, p.s.i.				Air pressure, p.s.i.			
	5	10	15	20	5	10	15	20
4	19	26.5	31.5	36	2100	3840	4584	5256
8	19	26.5	31.5	36	636	2760	3720	4320
12	19	26.5	31.5	36	0	1380	3000	3710
16	19	26.5	31.5	36	0	780	2124	2904

(b) Air consumption is relatively stable at the pressures normally used, but a marked reduction in solution sprayed occurs if the level of the solution is allowed to drop appreciably during the test. Thus, the level of the solution in the salt reservoir must be maintained automatically to insure uniform fog delivery during the test.

(c) If the nozzle selected does not atomize the salt solution into uniform droplets, direct the spray at a baffle or wall to pick up the larger drops and prevent them from impinging on the test specimens. The nozzle selected shall produce the desired condition when operated at the air pressure selected. Nozzles are not necessarily located at one end, but may be placed in the center and can also be directed vertically up through a suitable tower.

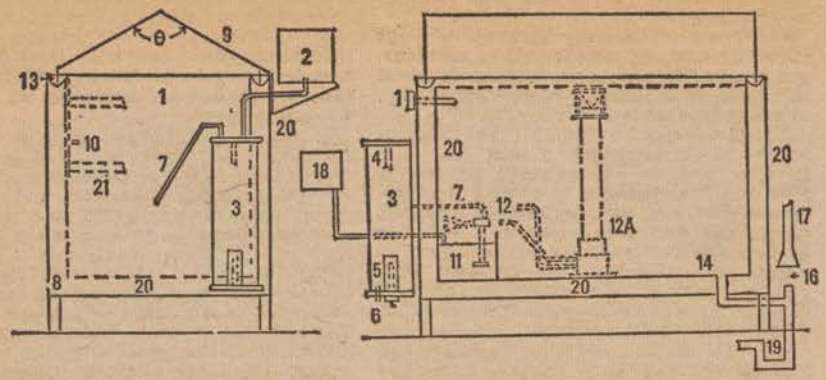
4. *Air for atomization.* (a) The air used for atomization must be free of grease, oil, and dirt before use by passing through well-maintained filters. Room air may be compressed, heated, humidified, and washed in a water sealed rotary pump, if the temperature of the water is suitably controlled. Otherwise cleaned air may be introduced into the bottom of a tower filled with water, through a porous stone or multiple nozzles. The level of the water must be maintained automatically to insure adequate humidification. A chamber operated according to this method will have a relative humidity between 95 and 98 percent. Since salt solutions from 2 to 6 percent will give the same results (though for uniformity the limits are set at 4 to 6 percent), it is preferable to saturate the air at a temperature well above the chamber temperature as insurance of a wet fog. Table B shows the temperature, at different pressures, that are required to offset the cooling effect of expansion to atmospheric pressure.

Table B.—Temperature and Pressure Requirements for Operation of Test at 95° F.

	Air pressure, p.s.i.			
	12	14	16	18
Temperature, degree fahrenheit	114	117	119	121

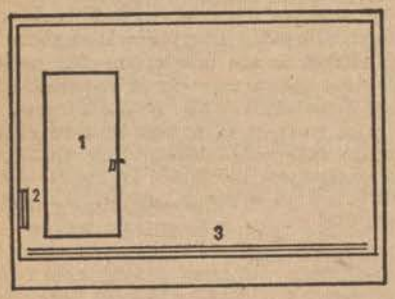
(b) Experience has shown that most uniform spray chamber atmospheres are obtained by increasing the atomizing air temperature sufficiently to offset heat losses, except those that can be replaced otherwise at very low temperature gradients.

5. *Types of construction.* A modern laboratory cabinet is shown in Fig. 1. Walk-in chambers are not usually constructed with a sloping ceiling due to their size and location. Suitably located and directed spray nozzles avoid ceiling accumulation and drip. Nozzles may be located at the ceiling, or 3 feet from the floor directed upward at 30° to 60° over a passageway. The number of nozzles depends on type and capacity and is related to the area of the test space. A 3- to 5-gallon reservoir is required within the chamber, with the level controlled. The major features of a walk-in type cabinet, which differs significantly from the laboratory type, are illustrated in Figure 2. Construction of a plastic nozzle, is shown in Figure 3.



0 - Angle of lid, 90 to 125 deg
1 - Thermometer and thermostat for controlling heater (Item No. 8) in base
2 - Automatic water leveling device
3 - Humidifying tower
4 - Automatic temperature regulator for controlling heater (Item No. 5)
5 - Immersion heater, non-rusting
6 - Air inlet, mulitple openings
7 - Air tube to spray nozzle
8 - Strip heater in base
9 - Hinged top, hydraulically operated, or counterbalanced
10 - Brackets for rods supporting specimens, or test table
11 - Internal reservoir
12 - Spray nozzle above reservoir, suitably, located anf baffled
12A - Spray nozzle housed in idspersion tower located preferably in center of cabinet
13 - Water Seal
14 - Combination drain and exhaust. Exhaust at oppsite side of test space from spray nozzle (Item 12), but preferably in combination with drain, waste trap, and force draft waste pipe (Items 16, 17, and 19).
16 - Complete separation between forced draft waste pipe (Item 17) and combination drain and exhaust (Items 14 and 19) to avoid undersirable suction or back pressure.
17 - Forced draft waste pipe.
18 - Automatic levelling device for reservoir
19 - Waste trap
20 - Air space or water jacket
21 - Test table or rack, well below roof area

Fig. 1.-Typical Salt Spray Cabinet



NOTE.-The controls are the same, in general, as for the laboratory cabinet (Fig1), but are sized to care for the larger cube. The chamber has the following features:
(1) Heavy insulation,
(2) Regrigeration door with drip rail, or pressure door with drip rail, inward sloping sill,
(3) Low temperature auxilliary heater, and
(4) Duck boards on floorm with floor sloped to combination drain and air exhaust.

Fig. 2.-Walk-in Chamber, 5 by 8 ft and Upward in Overall Size

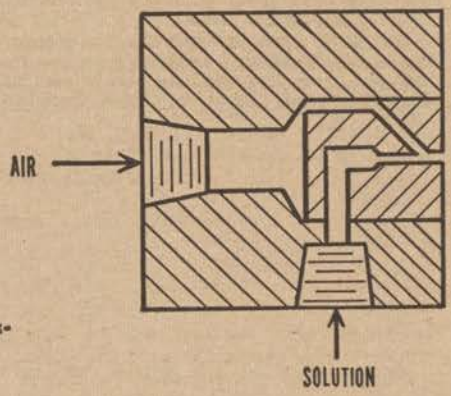


FIG. 3.—TYPICAL SPRAY NOZZLE.

[FR Doc.71-4181 Filed 3-29-71; 8:45 am]

Office of Pipeline Safety

[49 CFR Part 192]

[Notice 71-15; Docket No. OPS-3]

MINIMUM FEDERAL SAFETY STANDARDS FOR GAS PIPELINES

Initial Determination of Class Location and Confirmation or Revision of Maximum Allowable Operating Pressure; Notice of Public Hearing

The Minimum Federal Safety Standards for the Transportation of Natural and Other Gas by Pipeline were issued on August 11, 1970 (35 F.R. 13248). At that time, it was stated in the preamble that—

* * * a new § 192.607 contains requirements for the initial determination of class location and confirmation or establishment of maximum allowable operating pressure. Each operator is required to complete before April 15, 1971, a study to determine (for pipelines operated at more than 40 percent of SMYS) the present class location of all of the pipeline in its system, and whether the maximum allowable operating pressure for each segment of pipeline is commensurate with the present class location. The operator is then required to confirm or revise, in accordance with § 192.611, the maximum allowable operating pressure of the affected segment of pipeline so that at least 50 percent of the affected pipeline is confirmed or revised before January 1, 1972, and the remainder before January 1, 1973.

In view of * * * the diversity of views as to how much time is needed for confirmation or revision of pressures after a change has been discovered, * * * the impact of § 192.607 will not be known until April 1971, when the required studies are completed. These studies may show that the existing pipelines are, for the most part, already in compliance with the new class locations, so that there will be little difficulty in meeting the schedule for adjusting operating pressure. On the other hand, the studies may reveal a problem of such magnitude as to raise serious question as the practicality of the schedule.

The Office of Pipeline Safety plans to hold a public hearing in late April 1971 to get the results of the required studies and to give all interested parties an opportunity to present their recommendations on any adjustment which may be required in the schedule for adjusting operating pressures.

In order to afford ample time to prepare the data resulting from the studies for presentation at the hearing, the Office of Pipeline Safety will not hold the hearing referred to above until the middle of May. As a result of the hearing, the Office of Pipeline Safety hopes to develop a comprehensive picture of the situation of the industry as a whole in this regard, as well as detailed information concerning each individual company faced with special problems in complying with § 192.607. The information desired should cover such specifics as the contemplated methods of scheduling tests (including the length of time for required shutdown); the effects of testing and of revision of maximum allowable operating pressures on throughput (including