PI-83-0100

Jan 10, 1983

Mr. Kenneth J. Dooley
District Sales Manager
Ameron
Corrosion Resistant Piping Division
596 West Lambert Road
Brea, California 92621

Dear Mr. Dooley:

This refers to your letter of November 30, 1982, requesting our approval of Ameron RTR pipe for use in pipelines that are subject to 49 CFR Part 195.

The Part 195 safety standards for hazardous liquid pipelines do not prohibit the use of pipe made of materials other than steel. Thus, a special approval or waiver is not required for the use of such materials. However, as more fully stated in §195.8, the use of any material other than steel in a proposed pipeline is conditioned upon the operator of the proposed pipeline giving prior notice to this agency so that a determination can be made about the safety of the pipeline before transportation begins. A separate notice must be given for each pipeline that is to be constructed of a material other than steel.

The letter you have sent to us does not meet the notice requirements of §195.8; thus, we will not begin any action under that section until proper notice is received from the operator.

Sincerely,
Original signed by
Richard L. Beam
Associate Director for
Pipeline Safety Regulation
Materials Transportation Bureau

Ameron
595 West Lambert Road
Post Office Box 1010
Brea, California 92621

November 30, 1982

Mr. Richard Beam
Associate Director
Office of Pipeline Safety Regulations
Material Transportation Bureau
400 - 7th St. S.W.
Washington, D.C. 20590

Dear Mr. Beam:

Long Beach Oil Developers, Long Beach, California

Pipeline Safety Regulations - Hazardous Liquids, Section 195

The above subject covers the transporting of oily water. The water content as I understand it, is in excess of 95% and less than 5% oil.

The Long Beach Oil Developers are contemplating the replacement of steel mortar lined pipe because of continuing corrosion in the lines with resultant leaks. In addition to the corrosive leaks, there is a combination of corrosion and erosion causing a build up on the inside diameter and eventual clogging of the line.

I am enclosing literature on the Ameron Bondstrande® RTR Pipe which will be corrosion free on both the inside and outside diameter. Being corrosion free, you will have a product that will not leak or clog due to the effects of corrosion and erosion.

I am also attaching copies of:

A) Mil Spec P-22245A - Condensate and Jet Fuel
B) Mil Spec P-28584 - Condensate
C) Jet Fuel Case Histories
D) U.S. Government Users List

The conditions of the pipe line are 160°F with a 200 psi working pressure. We would furnish a 14 Bar (205 psi) piping system with a 4 to 1 safety factor. The pipe is buried in 3 to 4 feet of earth cover and is extremely strong and resistant to external loading. I am attaching a picture on 12" pipe where we have subjected the pipe to a tractor running over it.

I would appreciate your approval for Ameron RTR pipe in this type of service by your permitting a waiver at this time and eventually granting permission. It is a definite advantage over the steel pipe.

I thank you for your help and cooperation.

Very truly yours,
Kenneth J. Dool
District Sales Manager

MIL-P-22245A (DOCKS)
12 March 1963
Superseding
MIL-P-22245 (DOCKS)
13 November 1961

MILITARY SPECIFICATION
PIPE AND PIPE FITTINGS
GLASS FIBER REINFORCED PLASTIC

1 . SCOPE

1.1 Scope. This specification covers pipe and fittings made from epoxy resin and glass fiber reinforcement for the transport of liquid materials, together with epoxy adhesives necessary for joint assembly.

1.2 Classification. The reinforced plastic pipe and fittings shall be of the following types and classes, as specified (see 6.2).

Type I - 150 degrees F.

Class A - 150 psi
Class B - 500 psi

Type II - 200 degrees F.

Class A - 150 psi
Class B - 500 psi

Type III - 300 degrees F.

Class A - 150 psi
Class B - 500 psi

2 . APPLICABLE DOCUMENTS

2.1 The following specifications and standards, of the issue in effect on date of invitation for bids, form a part of this specification to the extent specified herein.

SPECIFICATIONS

FEDERAL

PPP-B-601 - Boxes, Wood, Cleated-Plywood.

PPP-B-621 - Boxes, Wood, Nailed and Lock-Corner.

MILITARY

MIL-C-132- Crates, Wood, Open; Maximum Capacity 2,500 Pounds.

STANDARDS

FEDERAL

FED. TEST METHOD STD. NO. 406 - Plastics: Methods of Testing.

MILITARY

MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.

MIL-STD-129 - Marking for Shipment and Storage.

(Copies of specifications and standards required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids shall apply.

NATIONAL BUREAU OF STANDARDS

Handbook H28 - Screw-Thread Standards for Federal Services.

(Application for copies should be addressed to the Superintendent of Documents, Government Printing Office, Washington 25, D.C.)

AMERICAN SOCIETY FOR TESTING AND MATERIALS

D1694-59T - Threads for Reinforced Thermosetting Plastic Pipe.

(Copies may be obtained from the American Society for Testing and Materials, 1916 Race Street, Philadelphia 3, Pennsylvania.)

3. REQUIREMENTS

3.1 General. All. plastic pipe and fittings shall be round and straight, of uniform quality and workmanship, and free from all defects including indentations, delaminations, bends, cracks, bubbles, pinholes, porosity, resin rich areas, and resin starved areas which due to their nature, degree, or extent, detrimentally affect the strength and serviceability of the pipe and fittings. Pipe lengths shall have uniform lineal density, resin content, and surface finish throughout the length of the pipe. All pipe ends shall be cut at right angles to the axis of the pipe and any sharp edges removed. The bore of the pipe shall contain a smooth, uniform liner to protect the glass fiber reinforcement. The liner shall be composed of an epoxy resin formulation and may contain a non-glass fiber reinforcement. The bore of the fittings shall have a smooth, uniform surface with no exposed fibers. Type I pipe and fittings shall be suitable for service up to 150 degrees F., Type II pipe and fittings for service up to 200 degrees F., and Type III pipe and fittings for service up to 300 degrees F. Class A pipe and fittings shall be suitable for service up to 150 psi and Class B pipe and fittings for service up to 500 psi. The use of "psi" throughout this specification shall be construed as meaning gauge pressure.

3.2 Preproduction qualification. The plastic pipe and fittings furnished under this specification shall be a product which has been tested and has passed the qualification inspection (examination and tests) specified herein. Awards will be made only for such products as have, prior to the time set for opening of bids, been tested and approved. Each manufacturer who desires to qualify plastic pipe and fittings under this specification shall have met the production experience requirements and shall furnish the personnel, facilities, and other data required prior to requesting qualification. Approval of the preproduction sample by the activity concerned shall not relieve the contractor of his obligation to supply pipe and fittings conforming to this specification. No changes or deviations from the preproduction sample will be acceptable without prior written approval from the Bureau of Yards and Docks.

3.2.1 Production experience. The manufacturer, at the time of request for qualification, shall have at least 6 months production experience in making plastic pipe or fittings of the type, class, size, process, and reinforcement for which qualification is desired. Production, as used in this specification is defined as the repetitive manufacture of glass fiber reinforced plastic laminated parts of the same design in accordance with a standard specification. A standard specification is the written document employed by the manufacturer listing details of manufacture of the plastic item and the performance required thereof.

3.2.2 Qualification procedure. The manufacturer shall request the Department of the Navy, Bureau of Yards and Docks, Washington 25, D. C., for authorization to conduct qualification inspection under the supervision of a Government inspector at the manufacturer's own laboratory or other laboratory satisfactory to the Bureau of Yards and Docks, with the cost of such inspection to be borne by the manufacturer. The request shall include three copies of the following information:

(a) A list showing the number of engineers, technicians, leadmen, and administrative personnel with the number of years of glass fiber reinforced plastic experience of each one; the size, quantity, and length of time in production of each unit proposed for qualification; and a complete list and description of all production and quality control facilities and equipment including a description of all fabricating processes, procedures, and equipment used.

(b) Types, classes, and sizes of pipe and fittings, and type of thread for which qualification is desired (see 1.2, 3.7, and 3.8), together with a list of all materials used in the fabrication including the number or brand designation of glass fiber reinforcement, resin, and curing agent, and the type of treatment or finish on the glass fibers and chemical name of the curing agent.

3.2.2.1 Authorization. Upon review of the information, the Bureau of Yards and Docks will advise the manufacturer concerning authorization to conduct qualification inspection. When authorization has been given, the manufacturer shall, upon completion of all qualification inspection requirements, submit to the Bureau of Yards and Docks, through the Government inspector, reports of the results of all examinations and tests including a complete description of adhesives used in making the joint tests. The report shall also include the information required under qualification tests which require testing to failure of the sample. In addition, the manufacturer shall forward to the Bureau of Yards and Docks for retention a sample of the pipe or fittings identical to those used for the qualification inspection. The pipe sample forwarded shall be 18 inches in length. Upon review of the inspection reports, the Bureau of Yards and Docks will advise the manufacturer of the qualification status of his products.

3.2.3 Qualification combinations. Each specific type, class, and size of pipe and fitting, and when applicable, type of thread shall pass the qualification inspection requirements in order to be qualified for that particular combination, except as limited by the provisions stated in 4.3.

3.2.4 Qualification sample. Sample pipe and fittings required for preproduction qualification inspection shall be fittings or pieces of pipe selected at random by the Government inspector out of normal production. Pipe shall be a minimum length of 15 feet.

3.2.5 Qualification tests. Samples must pass all qualification tests. If any sample fails a qualification test, an additional three samples shall be tested. Failure of any of the additional samples to pass the test shall reject from qualification the specific pipe or fitting represented by the sample. Requests for qualification of products which have previously failed to pass the tests shall be accepted only after it has been shown to the satisfaction of the Bureau of Yards and Docks that changes have been made to correct the deficiencies.

3.3 Material. Material shall be as specified herein. Material not definitely specified shall be of the quality regularly used by the manufacturer in the product he sells on the commercial market. All material

shall be new and unused and shall be free from all deleterious defects and imperfections.

3.4 Standard product. Except where modified herein, it is intended that the product and its component parts shall be a regular commercial product of the manufacturer or his suppliers.

3.5 Design. The design of the pipe and fittings shall be in accordance with the best engineering practice. The pipe, fittings, and adhesives shall permit assembly, maintenance, and servicing in the field. The design shall be such as to prevent conditions which may be hazardous to personnel or deleterious to associated environments.

3.6 Potable service. To be acceptable for potable service, the pipe, fittings, and adhesives shall be non-toxic as evidenced by the data required in 4.3.2.1 (see 6.2).

3.7 Dimensions.

3.7.1 Pipe. Dimensions of pipe shall be in accordance with Table I (see 6.2). All pipe of the same Type, Class, size and manufacturer shall have the same wall thickness subject to the O.D. tolerance limits of Table I.

Table I

Dimensions of Pipe

Nominal Pipe Size, Inches	Outside Diameter, Inches	O.D. Tolerance, Inches
2	2.375	± 0.012
2-1/2	2.875	.012
3	3.500	0.12
3-1/2	4.000	0.12
4	4.500	0.15
5	5.563	0.15
6	6.625	0.25
8	8.625	0.25
10	10.750	0.25
12	12.750	0.25

3.7.1.1 The length of the pipe shall be from 15 to 22 feet unless otherwise specified (see 6.2).

3.7.2 Fittings. Fittings shall be of the same nominal sizes indicated in Table 1(see 6.2).

3.8 Threads. Thread connections shall be 60 degree stub threads conforming to ASTM Designation D1694-591 or shall be iron pipe threads conforming to the National Bureau of Standards Handbook H28, as specified (see 6.2).

3.9 Resins.

3.9.1 Laminating resins shall be thermosetting epoxy resins of commercial first quality.

3.9.2 Adhesives for joint assembly shall be epoxy resin base materials. When specified (see 6.2) a sufficient quantity of adhesive shall be provided for joint assembly, and shall be the same adhesive used by the manufacturer in the qualification of his product. Instructions for use shall be marked on the container.

3.10 Glass fiber reinforcement used in the manufacture of the pipe and fittings shall be glass of commercial first quality.

3.11 Beam deflection. The calculated value of E shall be a minimum of 1,000,000 when tested in

accordance with 4.3.2.2. The manufacturer shall recommend the spacings of hangers such that a concentrated load in midspan of the hangers in an installation produces deflections not exceeding 0.1 inch and 0.5 inch at the test temperature. The concentrated loads used to determine the hanger spacing shall be in accordance with the average pipe insulation weights shown in Table II.

Table II
Insulation Weights

Nominal Pipe Size, Inches	Insulation Weights, Pounds per Linear Foot
2	1.5
2 ½	2.0
3	2.0
3 ½	2.5
4	2.5
5	3.0
6	3.5
8	5.0
10	6.0
12	7.0

3.12 Expansion and creep. When tested in accordance with 4.3.2.3 and 4.3.2.3.1, the circumferential expansion and creep shall be not greater than 0.3 percent, the axial expansion and creep shall be not greater than 0.2 percent, and there shall be no porosity, distortion, or structural failure of the pipe and fittings. All recorded readings shall be submitted to the Bureau of Yards and Docks.

3.13 Cycling. Pipe and fittings shall show no porosity or structural failure when tested in accordance with 4.3.2.4.

3.14 Impact resistance. Pipe and fittings shall show no porosity when tested in accordance with 4.3.2.5.1 and 4.3.2.5.2.

3.15 Delamination resistance. Pipe shall show no evidence of delamination or porosity when tested in accordance with 43.2.6.

3.16 Boil resistance. Samples of Type III pipe and fittings shall show no evidence of delamination or other impairment and shall have a weight gain no greater than 1.0% when tested in accordance with 4.3.2.7.

3.17 Joint strength. Bonded or threaded joints and pipe and coupling shall show no porosity or other evidence of failure after 168 hours when tested in accordance with 4.3.2.8. In addition a report of the type of failure and pressure at which failure occurs in the short-time burst test shall be submitted to the Bureau of Yards and Docks.

3.18 Short-time burst. After testing the pipe in accordance with 4.3.2.9, a report of the results shall be submitted to the Bureau of Yards and Docks.

3.19 Specific gravity. When tested in accordance with 4.3.2.10, the specific gravity of preproduction sample pipe and fittings shall be within the range of plus or minus 5 percent of the average of the five preproduction samples. The specific gravity of production samples shall not vary more than plus or minus 5 percent from the average of the preproduction results.

3.20 Resin content. When tested in accordance with 4.3.2.11, the resin content of preproduction sample pipe and fittings shall be within the range of plus or minus 5 percent of the average of the five preproduction samples. The specific gravity of production samples shall not vary more than plus or minus 5

percent from the average of the preproduction results.

3.21 Hardness. When tested in accordance with 4.3.2.12, the Rockwell hardness number for the preproduction sample pipe and fittings shall be within the range of plus or minus 5 percent of the average for the five preproduction samples. The Rockwell hardness number for the production samples shall not vary more than plus or minus 5 percent from the average of the preproduction results.

3.22 Burning rate. The burning rate of the pipe shall not exceed 0.5 inch per minute when tested in accordance with 4.3.2.13.

3.23 Hydrostatic proof test. Pipe and fittings shall withstand 1-1/2 times the psi for the top bracket of its class without any indication of porosity when tested in accordance with 4.4.5.1.1.

3.24 Identification marking. Each pipe shall have permanent identification marking at intervals no more than 3 feet apart between markings along the length of the pipe. Each length of pipe and each fitting shall be marked and identified as follows:

1. Specification number.
2. Type and Class.
3. Pressure rating (degrees F. and psi).
4. Manufacturer's name.
5. Date of manufacture.
6. Suitable for potable service (when applicable).

3.25 Quality control facilities. The manufacturer shall have the necessary quality control facilities and equipment by which the quality of raw materials and end use products can be determined and controlled.

4. QUALITY ASSURANCE PROVISIONS

4.1 Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Ekcept as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.2 Inspection. Inspection (examination and tests) shall consist of the following:

a. Preproduction qualification inspection.
b. Production inspection.

4.3 Preproduction qualification inspection. Preproduction qualification inspection shall consist of all the examinations specified in 4.3.1 and all the tests specified in 4.3.2. When two or more sizes of the same type and class of pipe and fittings are offered for preproduction qualification inspection, the expansion and creep, cycling, delamination resistance, boil resistance, and burning rate tests specified in 4.3.2.3, 4.3.2.4, 4.3.2.6, 4.3.2.7, and 4.3.2.13 shall be performed on only one size. Selection of the size for these tests shall be made by the Bureau of Yards and Docks.

4.3.1 Examination. The sample pipe and fittings shall be examined for the following defects: Incorrect dimensions, threads not in accordance with requirements, out of roundness, lengths not straight, indentations, delaminations, bends, cracks, bubbles, pinholes, porosity, resin rich areas, resin starved areas, pipe not cut at right angles and sharp edges not removed, inside surfaces not smooth and uniform, and

identification marking incorrect or missing.

4.3.1.1 Dimensions. Compliance with dimensional requirements shall be determined by the following methods of measuring.

4.3.1.1.1 Wall thickness. The wall thickness shall be measured with a spring-loaded dial caliper or screw micrometer equipped with an inner anvil with a radius substantially smaller than the radius of the inside of the pipe. Four measurements shall be made at the open end of each sample and four measurements on each of six sections cut
along its length to show consistency of wall thickness throughout the length.

4.3.1.1.2 Outside diameter. The outside diameter shall be measured with a flat anvil micrometer or vernier caliper capable of reading in 0.001 inch increments. The same number of measurements as required for the wall thickness measurements shall be made using the same wall thickness samples.

4.3.1.1.3 Out-of-roundness. The out-of-roundness shall be determined by the fit of a "go-no go" gage.

4.3.1.1.4 Other dimensions. Dimensions other than those above shall be measured in accordance with standard practices.

4.3.2 Tests. Tests which are specified at "roan temperature" are to be accomplished under normal roam conditions with the temperature not to be below 65 degrees F. This will allow testing to be done in areas which do not have close roam temperature control. Tests shall not be accomplished in areas of abnormally high or low humidities.

4.3.2.1 Potable service data. To qualify pipe, fittings, and adhesives for potable service, the manufacturer shall submit to the Bureau of Yards and Docks for approval all pertinent data supporting potable service acceptability, including extraction study details and results, and a list of the materials, with their chemical and trade names, used in the manufacturing process.

4.3.2.2 Beam deflection. A minimum 6 foot length of pipe shall be capped and filled completely with water but not pressurized. The pipe shall be suspended by laying the end caps on appropriate supports, allowing the pipe to hang free between the supports, and supporting the end caps at their centers of gravity. Type I and Type II pipe shall be tested with water at 120 degrees F. Type III pipe shall be tested with water at 200 degrees F. The sag in the pipe shall be measured and recorded every 168 hours for a period of 1008 hours plus or minus 8 hours. The sag at. the end of the test shall be used to calculate the value of E in the formula:

$$Y = \frac{22.5\ W\ L^4}{EI}$$

Where $I = \frac{\pi}{64}(D^4 - D_1{}^{4).}$

W	=	weight per foot of pipe, including water	Sag is measured from the
L	=	Length of span, feet	horizontal plane of the
Y	=	deflection or sag, inches	pipe supports to the
D	=	outside diameter of pie, inches	lower surface of the
D_1	=	inside diameter of pipe, inches	loaded pipe

4.3.2.3 Expansion and creep. A minimum 6 foot length of pipe shall be capped or plugged and filled completely with fresh water containing a soluble fluorescent dye. The pipe shall be laid on lightly greased, 1/2 inch wide steel bars spaced every 2 feet, with the top of the bars on one horizontal, plane. The ends of the pipe shall be unrestrained. The pipe shall be equipped with gages for measuring circumferential and axial expansion and creep of the pipe. Micrometer gages, strain gages (SR-4 type), or equivalent extensometer having an accuracy of 0.000] inch shall be applied in three locations. Two of these gages shall be mounted so as to indicate circumferential expansion, the other to indicate axial expansion. The circumference and length of the pipe shall be recorded before, during, and after pressurization. Hydrostatic pressure at 1-1/2 times the psi for the top bracket of its class shall be maintained at room temperature for a minim= of 2000 hours. Readings shall be recorded to the nearest 0.001 inch. Sufficient readings (maximum 96 hour intervals) shall be taken during the test to provide a significant data plot. At the end of the 2000 hour period, while the sample is still under pressure, it shall be examined for porosity, distortion, and structural failure. In this and other tests where examination for porosity is made, the detection of small amounts of weeping shall be accomplished by viewing the samples in a darkened area with a suitable ultra-violet lamp such that a droplet of water containing the fluorescent dye will glow brightly and be easily detectable. After completion of the examinations, the pressure shall be released and readings recorded until they show no further change in pipe dimensions.

4.3.2.3.1 The above procedure shall be repeated on separate samples with the internal water temperature at 150 degrees F for Type II and Type III pipes and at 1-1/2 times the psi pressure for the top bracket of its class.

4.3.2.4 Cycling. At the termination of the expansion and creep test (4.3.2.3 and 4.3.2.3.1), the samples shall be held at room temperature and cycled between 0 and 1-1/2 times the psi for the top bracket of its class for 10,000 cycles. Approximately 7 seconds time shall be used to amply the pressure followed by a 30 second dwell at full pressure, and then immediate removal of the pressure followed by 30 second dwell at zero pressure. At the end of this cycling test, the samples shall be allowed to remain pressurized at 1-1/2 times the psi for the top bracket of its class for 2 hours, at the end of which time the samples shall be examined for porosity with an ultra-violet lamp and for structural failure.

4.3.2.5 Impact resistance.

4.3.2.5.1 Pipe. A steel ball 2 inches in diameter and weighing approximately 1-1/4 pounds shall be dropped squarely onto the surface of the pipe with a free fall (which may be guided) for a distance of 1 foot. The ball may be caught or deflected after the hit so that the rebound does not hit the pipe. The pipe shall be full of water containing a soluble fluorescent dye but not pressurized. The test shall be made at room temperature and the pipe shall be supported on its bottom axis on a solid flat support. Four drops shall be made on randomly selected areas which are a minimum of 12 inches and 90 degrees clockwise from each other. The test shall be repeated on the same pipe but with the pipe pressurized at the maximum service pressure. Four drops shall be made on different areas from those previously used. The pipe shall then be pressurized to 1-1/2 times the psi for the top bracket of its class and shall remain at this pressure for 168 hours at the end of which time the pipe shall be examined for porosity with an ultraviolet lamp.

4.3.2.5.2 Fittings. Fittings shall be tested following the above procedure except that the drops shall be reduced from four to one in each test.

4.3.2.6 Delamination resistance. A 2-1/2 inch long sample shall be cut at least 4 inches from the end of a length of pipe and tested in the fixture shown in Figure 1. The sample shall be tested at room temperature Under 500 psi hydrostatic pressure for 168 hours. No oil or other foreign material shall be on the sample or in the water. At the end of the test period, the sample shall be examined for indications of delamination or porosity (through outside wall, inside wall, or the non-exposed edge).

4.3.2.7 Boil resistance. Three test samples, 1-1/2 inches in length, shall be cut from a length of Type Ill pipe. The samples shall be taken from sections at least 6 feet apart along the length of the pipe. Type III fittings shall be tested using either the whole fitting as the test sample or three 1-1/2 inch lengths cut from the fitting. The samples shall be conditioned for 8 hours at 300 degrees F., desiccated, and an initial weighing made. The samples shall then be suspended in a boiling distilled water bath for 3 hours. The samples shall then be removed one at a time, blotted dry of excess water, and weighed. This weighing shall be made within 1 ± 0.5 minute after removal from the bath. After weighing, the samples shall be visually examined for delamination or other evidence of impairment and the percentage weight gain of the samples shall be calculated as follows:

$$\% \text{ weight gain} = \frac{B - A}{A} \times 100$$

Where A = initial weight
B = weight after immersion

43.2.8 Joint strength. Two pieces of pipe shall be cut so that when they are joined together with a compatible coupling, the overall length shall be 18 inches or 7 times the outside diameter, whichever is greater. The pipe shall be cut so that the coupling is within 1 inch of the center of the completed test section. Unthreaded joint assemblies shall be made with an adhesive as recommended by the manufacturer and shall be applied and cured as under field conditions in accordance with his printed instructions. The test section shall be subjected to a hydrostatic pressure of 1-1/2 times the psi for the top bracket of its class for 168 hours at 150 degrees F. for Type I, 200 degrees F. for Type II, and 300 degrees F. for Type Ill pipe and coupling. The liquid medium shall contain a soluble fluorescent dye and may be oil or water. Observations shall be made each 24 hours for porosity (using an ultra-violet lamp) or other evidence of failure of the pipe, coupling, or joint. If the test section is not defective at the conclusion of the 168 hours, it shall be tested to failure by subjecting it to the short-time burst test (43.2.9) at the maximum service temperature for the Type. The test report shall include the time to failure, type of failure, and the psi at which failure occurs.

4.3.2.9 Short-time burst. Three samples shall be cut from a length of pipe. The length of each sample shall be 18 inches or 7 times the outside diameter, whichever is the greater. The test shall be made using an appropriate sealing plug in each end which are restrained by a holding frame or rod so that loading is pat on the pipe. The pipe sample shall be pressurized at an approximate rate of 1000 psig per minute. If the pipe circumference expands beyond the capacity of the sealing mechanism to hold pressure, collett-like holding bands may be used over the outside of the pipe over the sealing area to prevent excessive expansion. The pipe failures must occur away from these bands and in the central area of the pipe to be valid. The test shall be run at roan temperature, and the sample shall be tested to failure. A failure is defined as porosity, horizontal splits, delaminations, bursts, or other defects which permit the transmission of the test fluid to the outside surface of the pipe. The test report shall include the time to failure, type and location of failure, and the psig at which failure occurs for each of the three samples.

43.2.10 Specific gravity. Five samples selected from various sections of the pipe or fitting shall be tested in accordance with Method 5011 of Federal Test Method Standard No. 406.

4.3.2.11 Resin content. Five samples selected from various sections of the pipe or fitting shall be tested in accordance with Method T061 of Federal Test Method Standard No. 406.

4.3.2.12 Hardness. The hardness of pipe and fittings shall be determined with a Rockwell Hardness Tester in accordance with Method 1081 of Federal Test Method Standard No. 406. A V-notch anvil shall be used for cylindrical specimens.

4.3.2.13 Burning rate. The burning rate of the pipe shall be determined in accordance with Method 2021

of Federal Test Method Standard No. 406.

4.4 Production inspection. Production inspection shall be performed as part of the manufacturer's production quality control procedure and shall include the following inspection.

4.4.1 Lot.

4.4.1.1 Pipe. All pipe of the same Type, Class, and size produced in any one 24 hour period and to be offered for delivery under a contract or order shall be considered a lot for purposes of inspection.

4.4.1.2 Fittings. All fittings of the same Type, Class, and size produced in any one 24 hour period and to be offered for delivery under a contract or order shall be considered a lot for purposes of inspection.

4.4.2 Sampling for examination. A random sample of pipe and fittings shall be selected from each lot in accordance with Standard MIL-STD-105, using an AQL of 4.0 percent defective.

4.4.3 Sampling for tests (except hydrostatic proof test for pipe).

4.4.3.1 Pipe. A random sample of pipe shall be selected from each lot in accordance with Standard MIL-STD-105 using inspection level L-4, and an AQL of 4.0 percent defective.

4.4.3.2 Fittings. A random sample of fittings shall be selected from each lot in accordance with Standard MIL-STD-105 using, inspection level L-4, and an AQL of 6.5 percent defective.

4.4.4 Examination. Sample pipe and fittings selected in accordance with 4.4.2 shall be examined as specified in 4.3.1. Any sample pipe or fitting having one or more of the defects listed shall be considered a defective unit.

4.43 Tests.

4.4.5.1 Pipe. Each length of pipe to be furnished under a contract or order shall be subjected to the hydrostatic proof test specified in 4.4.5.1.1. Any length of pipe failing to pass the hydrostatic proof test shall be rejected. Sample pipe selected in accordance with 4.4.3.1 shall be subjected to the specific gravity, resin content, and hardness tests specified in 4.3.2.10, 4.3.2.11, and 4.3.2.12. Any sample failing to pass any of these tests shall be considered a defective unit.

4.4.5.1.1 Hydrostatic proof test. The pipe shall be filled completely with fresh utter and pressurized at 1-1/2 times the psi for the top bracket of its class. Threaded end connectors shall be used on threaded pipe. The test shall be made at room temperature and after the internal pressurizing water has had time to reach the room temperature. The pipe shall remain under pressure for not less than 5 minutes and at the end of that time the pipe shall be examined for porosity.

4.4.5.2 Fittings. Sample fittings selected in accordance with 4.4.3.2 shall be subjected to the specific gravity, resin content, and hardness tests specified in 4.3.2.10, 4.3.2.11, and 4.3.2.32. Any sample failing to pass any of these tests shall be considered a defective unit.

4.5 Inspection of preparation for delivery. The packaging, packing, and marking of the pipe and fittings, and adhesive when furnished, shall be examined to determine conformance with the requirements of Section 5 of this specification.

5. PREPARATION FOR DELIVERY

5.1 Packaging. Packaging shall be level A or C, as specified (see 6.2).

5.1.1 Level A. All threaded pipe shall have the threads completely covered with thread protectors. All non- threaded pipe shall have the open ends sealed with suitable caps or plugs.

5.1.2 Level C. The pipe and fittings shall be packaged in accordance with the suppliers standard practice.

When adhesive is furnished it shall be packaged in the standard commercial containers and quantities normally specified by the pipe manufacturer for this product.

5.2 Packing. Neking shall be level A, B, or C, as specified (see 6.2).

5.2.1 Level A.

5.2.1.1 Pipe. The pipe shall he packed in open wood crates conforming to Specification MIL C-132.

5.2.1.2 Fittings. The fittings shall be packed in close-fitting cleated-plywood boxes conforming to Specification PPP-B-601 (overseas type) or nailed wood boxes conforming to Specification PPP-B-621 (class 2).

When the gross weight of a box exceeds 250 pounds, the box shall be modified by the addition of skids in accordance with the applicable box specification.

5.2.1.3 Adhesive. Adhesive, when furnished, shall be packed as specified for fittings.

5.2.2 Level B. The pipe and fittings, and adhesive when furnished, shall be packed as specified for level A except that boxes shall be the domestic type or class, as applicable.

5.2.3 Level C. The pipe and fittings, and adhesive when furnished, shall be packed in a manner which will insure arrival at destination in satisfactory condition and which will be acceptable to the carrier at lowest rates.

5.3 Marking. Shipping containers shall be marked in accordance with Standard MIL-STD-129.

6. NOTES

6.1 Intended use. Pipe and fittings covered by this specification are suitable for handling hot and cold liquids, including dilute acids, and steam within the temperature and pressure limitations specified for the particular types and classes, and for other uses if found to be suitable.

6.2 Ordering data. Procurement documents should specify the following:

(a) Title, number, and date of this specification.

(b) Type and Class of pipe and fittings required (see 1.2).

(c) Quantity, size, and length of pipe required (see 3.7 and Table I).

(d) Quantity and size of fittings required (see 3.7)-

(e) Type of thread when required (see 3.8).

(f) Whether adhesive is to be provided (see 3.9.2 and 6.3)

(g) Whether pipe, fittings, and adhesives for potable service are required (see 3.6).

(h) Level of packaging and level of packing required (see 5.1 and 5.2)

6.3Adhesives. When pipe and fittings are being procured for stock or will be stored for more than one year before use, the adhesive should not be specified, since it may have a limited shelf life.

6.4 Jointing. Only pipe, fittings, and recommended adhesives from the same manufacturer should be used together.

6.5 Qualification. With respect to products requiring qualification, awards will be made only for such

products as have, prior to the time set for opening of bids, been tested and approved for inclusion in the applicable Qualified Products List whether or not such products have actually been so listed by that date. The attention of the suppliers is called to this requirement, and the manufacturers are urged to arrange to have the products that they proposed to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. Information pertaining to qualification of products is contained in paragraph 3.2 of this specification.

Notice. When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

Custodian:

Navy - Bureau of Yards and Docks

Preparing Activity:

Navy - Bureau of Yards and Pocks

MILITARY SPECIFICATION
PIPE AND PIPE FITTINGS,
GLASS FIBER REINFORCED PLASTIC

This amendment forms a part of Military Specification MIL-P-22245A(DOCKS), dated 12 March 1963.

PAGE 2

2.2 Under "American Society for Testing and Materials" change: "D1694-59T - Threads ...." to "D1694-67 - Standard Specification for Threads....".

PAGE 3

3.1, Line 2. Delete "non-glass fiber".

3.2, Last line. Change "Bureau of Yards and Docks" to "Naval Facilities Engineering Command". Make similar changes throughout the specification.

3.2.2, Line 2. Change "Washington 25, D.C." to "Washington, D.C. 20390."

PAGE 4

3.2.2(b), line 3. After "used" add "in the adhesive and in the fabrication of the pipe and fittings".

Add new paragraph 3.2.6:

"3.2.6 Qualification certification. The manufacturer of products which have been listed on the Qualified Products List shall, when requested by the Naval Facilities Engineering Command, submit certification signed by a responsible official of management, attesting that the listed products are still available from the listed plant, are being produced under the same conditions as originally qualified, i.e., same process, materials, construction, design, manufacturer's part number or designation and meet the requirements of the current issue of the specification. Failure to provide the certification will be cause for removal from the Qualified Products List."

PAGE 5

3.6. Delete paragraph.

3.7.1. Delete second sentence and substitute: "The outside diameter (O.D.) of pipe made by processes which provide a fixed 0.D. and an uncontrolled O.D. shall be in accordance with the tolerance limits of Table I."

Table I. In heading of third column, before "O.D." add "Fixed".

Table I. Add a fourth column reading:

"Uncontrolled O.D. tolerance, Inches
±0.025
±.030
±.035
+.040 -.035
+.045 -.035
+.055 -.040
+.066 -.050
+.086 -.065
+.107 -.080
+.127 -.095

Add new paragraph:

"3.7.1.2 Wall thickness. Each length of pipe shall have a consistent wall thickness subject to the O.D. tolerance limits of table I."

PAGES 6 and 7

3.12, line 5. Delete "and fittings".

PAGE 8

3.23, line 1. Delete "and fittings".

PAGE 9

4.3.2. After last sentence add "Unless the test method specifies otherwise, at least three samples shall be tested."

4.3.2.1. Delete paragraph.

PAGE 13

4.4.1.1, Lines 1 and 2. Delete "produced in any one 24 hour period and to be" and after "delivery" add "at the same time".

4.4.1.2, Line 2. Delete "produced in any one 24 hour period and to be" and after "delivery" add "at the same time".

PAGE 15

6.2. Delete sub-element "(g)".

PAGE 16

Add new paragraph:

"6.6 Potable service. The Bureau of Medicine and Surgery should be contacted for advice regarding the suitability of particular glass fiber reinforced plastic pipe and fittings intended for use in potable service applications."

Preparing activity:

Navy - YD

(Project No. 4710-NO250)

MILITARY SPECIFICATION
PIPE AND PIPE FITTINGS,
GLASS FIBER REINFORCED PLASTIC, FOR CONDENSATE RETURN LINES

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers plastic pipe and fittings made from epoxy resin and glass fiber reinforcement, together with epoxy adhesive necessary for joint assembly, for service up to 300 degrees F and 125 prig in condensate return lines.

1.2 Classification.

1.2.1 Pipe. The reinforced plastic pipe shall be of the following types, as specified (see 6.2): Type I - Filament wound.
Type II - Centrifugally cast.

1.2.2 Fittings. The reinforced plastic fittings shall be of the following types, as specified (see 6.2): Type I - Filament wound. Type II - Molded.

2. APPLICABLE DOCUMENTS

2.1 The following documents, of the issue in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

Federal Specifications:

PPP-B-601 - Boxes, Wood, Cleated-Plywood.
PPP-B-621 -Boxes, Wood, Nailed and Lock-Corner
PPP-B-636 - Boxes, Shipping, Fiberboard.
PPP-C-650 - Crates, Wood, Open and Covered.

Military Standards:

MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.

MIL-STD-129 - Marking for Shipment and Storage.

(Copies of specifications and standards required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

American Society for Testing and Materials (ASTM):

D2122 - Method of Determining Dimensions of Thermoplastic Pipe and Fittings. D2310 - Classification for Machine-Made Reinforced Thermosetting Resin Pipe.

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

National Motor Freight Traffic Association, Inc., Agent:

National Motor Freight Classification.

(Application for copies should be addressed to the American Trucking Association, Inc., Attn: Tariff Order Section, 1616 P Street, N.W., Washington, D.C. 20036.)

Uniform Classification Committee, Agent:

Uniform Freight Classification.

(Application for copies should be addressed to the Uniform Classification Committee, Room 1106, 222 S. Riverside Plaza, Chicago, Illinois 60606.)

(Technical society and technical association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.)

3. REQUIREMENTS

3.1 General. The plastic pipe and fittings shall be round and straingt, and of uniform density, resin content and surface finish. All pipe ends shall be cut at right angles to the axis of the pipe and any sharp edges removed. The bore of the pipe shall contain a smooth, uniform liner to protect the glass fiber reinforcement. The liner shall be composed of an epoxy resin formulation and may contain a reinforcement. The bore of the fittings shall have a smooth, uniform surface with no exposed fibers.

3.2 Material. The pipe and fittings shall be made from epoxy resins and glass fiber reinforcement of commercial first quality. Fillers, colorants, and other materials may be added, provided the pipe and fittings produced meet all the requirements of this specification.

3.3. Dimensions.

3.3.1 Pipe. The pipe shall be 2, 3, 4, or 6-inch nominal size, as specified (see 6.2), and shall have the dimensions shown in Table I.

Table I
Dimensions of Pipe

Nominal Pipe Size, Inches	Outside Diameter, Inches	Tolerance Inches	
		Type I	Type II
2	3.375	+0.060 -0.018	±0.012
3	3.500	+0.060 -0.018	±0.012
4	4.500	+0.060 -0.018	±0.015
6	6.625	+0.066 -0.028	±0.025

3.3.1.1 Length. Unless other lengths are specified (see 6.2 and 6.5), the length of the pipe shall be 20 feet, with a plus tolerance of two feet and a minus tolerance of five feet.

3.3.1.2 Wall thickness. The minimum wall thickness of the pipe shall be not less than 87.5 percent of the nominal wall thickness published in the manufacturer's literature current at the time of purchase.

3.3.2 Fittings. Fittings shall be 2, 3, 4, or 6-inch nominal size, as specified (see 6.2), and shall have

dimensions suitable to enable the pipe and fittings to be joined.

3.4 Adhesive. Adhesive for joint assembly shall be an epoxy resin base material suitable for providing a permanent seal between the pipe and fittings throughout the temperature and pressure range of the condensate service application. The adhesive shall be supplied as a kit which includes containers of all components in the amounts needed for each adhesive mixture. Instructions for use shall be marked on each container or listed on an instruction sheet included in each adhesive kit. When specified (see 6.2), adhesive kits shall be furnished in a sufficient quantity, as recommended by the supplier, for the particular procurement of pipe and fittings.

3.5 Joint strength, Pipe, fittings, and joints shall show no porosity or other evidence of failure when tested in accordance with 4.4.2.

3.6 Impact resistance. Pipe and fittings shall show no porosity when tested in accordance with 4.4.3.

3.7 Boil resistance. Pipe and fittings shall show no evidence of delamination or other impairment and shall have a weight gain no greater than 1.0 percent when tested in accordance with 4.4.4.

3.8 Beam strength. The elastic modulus of the pipe shall be a minimum of 1,000,000 psi when tested in accordance with 4.4.5.

3.9 Cycling resistance. The pipe and fittings assembly shall not show evidence of leakage or other visible signs of damage after being subjected to a series of (a) initial deflection cycles, (b) pressure cycles, (c) temperature cycles, (d) water hammer cycles, and (e) final deflection cycles when tested in accordance with 4.4.6.

3.10 Hydrostatic strength. The pipe shall withstand 1-1/2 times the manufacturer's rated pressure without any indication of porosity when tested in accordance with 4.4.7.

3.11 Identification marking.

3.11.1 Pipe. Each length of pipe shall be marked at intervals of not more than 15 feet. Each marking shall include at least the manufacturer's name or trademark, the nominal pipe size, and the type of reinforced plastic pipe. The type of reinforced plastic pipe may be designated in accordance with ASTM D2310 or some other easily identifiable system. The marking shall be of a contrasting color and a type that remains legible under normal handling and installation procedures.

3.11.2 Fittings. Each fitting shall be marked on the body or hub with at least the manufacturer's name or trademark and the nominal size. The marking shall be of a contrasting color and a type that remains legible under normal handling and installation procedures.

3.11.3 Adhesive. Each container shall be marked with at least the manufacturer's name or trademark, adhesive component type, date of manufacture, special storage conditions, and instructions for use (if a separate instruction sheet is not included in the adhesive kit).

3.12 Workmanship. The pipe and fittings shall be free from all defects including delaminations, cracks, indentations, bubbles, pinholes, porosity, resin rich areas, and resin starved areas which due to their nature, degree, or extent, detrimentally affect the strength and serviceability of the pipe and fittings. The pipe liner shall be free of cracks, chips, or other damage.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the supplier may use his own or any other facilities suitable for

the performance of the inspection requirements specified herein (see 4.2.1), unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.2 Quality conformance inspection. Quality conformance inspection shall include all the examinations and tests of this specification and shall be performed on every lot of pipe and fittings offered for delivery and on every lot of adhesive, when furnished.

4.2.1 Destructive tests. The destructive tests specified in 4.4.2 to 4.4.6 shall be performed by an independent commercial laboratory acceptable to the Government or in the supplier's own facilities under the observation of a factory inspection agency acceptable to the Government.

4.2.2 Lot. When a certificate of compliance is not acceptable, each lot shall contain sufficient pipe and fittings to perform all the destructive tests specified herein (see 4.2.4, 4.4 and 4.5).

4.2.2.1 Pipe. All pipe of the same type and nominal size offered for delivery at the same time under a contract or order shall be considered a lot for purposes of inspection.

4.2.2.2 Fittings. All fittings of the same type, kind, and nominal size offered for delivery at the same time under a contract or order shall be considered a lot for purposes of inspection.

4.2.2.3 Adhesive. All adhesive kits offered for delivery at the same time under a contract or order shall be considered a lot for purposes of inspection.

4.2.3 Sampling for examination. A random sample of pipe, fittings, and adhesive kits shall be selected from each lot in accordance with NIL-STD-105, using inspection level II and an AQL of 4.0 percent defective.

4.2.4 Sampling for tests.

4.2.4.1 Joint strength, impact resistance, boil resistance and beam strength tests.

4.2.4.1.1 Pipe. A random sample of pipe shall be selected from each lot in accordance, with NIL-STD-105, using inspection level S-2 and an AQL of 4.0 percent defective.

4.2.4.1.2 Fittings. A random sample of fittings shall be selected from each lot in accordance with NIL-STD-105, using inspection level S-2 and an AQL of 6.5 percent defective.

4.2.4.2 Cycling resistance test. Five samples of pipe and fittings shall be selected from each lot and shall be required to pass the cycling resistance test. If more than one sample fails to pass the test, the lot shall not be acceptable. If one sample fails, five additional samples shall be tested, and the lot shall be acceptable only if none of the additional samples fails the test.

4.2.4.3 Hydrostatic strength test. A random sample of pipe shall be selected from each lot in accordance with MIL-STD-105, using inspection level II and an AQL of 1.0 percent defective.

4.3 Examination.

4.3.1 Pipe. Sample pipe selected in accordance with 4.2.3 shall be examined for the following defects: incorrect dimensions; ends of pipe not cut at right angles to the axis; liner missing, cracked, or Chipped; bubbles; pinholes; delamination; cracks; indentations; resin rich or resin starved areas in the outer pipe wall; and incorrect or missing identification marking. Any sample pipe having one or more of the defects listed shall be considered a defective unit.

4.3.1.1 Dimensions. The outside diameter, wall thickness, and length of the pipe shall be determined in accordance with the applicable sections of ASTM D2122.

4.3.2 Fittings. Sample fittings selected in accordance with 4.2.3 shall be examined for the following defects: delamination; cracks; indentations; resin rich or resin starved areas; bubbles; pinholes; exposed fibers or non-uniform surface on bore of fitting; and incorrect or missing identification marking. Any sample fitting having one or more of the defects listed shall be considered a defective unit.

4.3.3 Adhesive. Sample kits of adhesive selected in accordance with 4.2.3 shall be examined for missing adhesive components, missing instructions for use, and missing or incorrect identification marking. Any sample adhesive kit having one or more of the defects listed shall be considered a defective unit.

4.4 Tests. Sample pipe and fittings selected in accordance with 4.2.4.1.1, 4.2.4.1.2, 4.2.4.2, and 4.2.4.3 shall be subjected to the tests specified in 4.4.2 through 4.4.7. Any sample failing to pass any of these tests shall be considered a defective unit.

4.4.1 Test conditions. Unless otherwise specified in the test method, samples shall be conditioned for not less than 48 hours at 23 degrees C (73.4 degrees F) plus or minus 2.0 degrees C (3.6 degrees F) and 50 plus or minus 5 percent relative humidity, and tested at the same temperature and humidity. Test temperatures and pressures specified in the individual test methods shall have tolerances of plus or minus 2.0 degrees C (3.6 degrees F) and plus 5, minus 0 psig, respectively.

4.4.2 Joint strength. Joint assemblies containing the pipe, fittings, and adhesive shall be fabricated, with the adhesive applied and cured as under field conditions in accordance with the manufacturer's printed instructions. The completed test section may be an assembly containing each kind of fitting to be furnished under a contract or order, or may be simply one fitting joined between two pieces of pipe. When a test section containing just one fitting is used, then similar test sections containing the other kinds of fittings to be furnished must also be tested. If the test section containing the one fitting is used, the overall length of the test section shall be 18 inches or 7 times the outside diameter of the pipe, whichever is greater. If the test section containing all the fittings is used, the pipe length between fittings shall he 6 inches or 3 times the outside diameter of the pipe, whichever is greater. The test section shall be subjected to a hydrostatic pressure of 200 psig or 1-1/2 times the manufacturer's rated pressure, whichever is greater, at 300 degrees F for 168 hours. The liquid medium used shall be an oil selected by the testing laboratory and shall contain a soluble fluorescent dye. Observations with an ultra-violet lamp shall be made each 24 hours for porosity or other evidence of failure of the pipe, fittings, or joints.

4.4.3 Impact resistance.

4.4.3.1 Pipe. A steel ball two inches in diameter and weighing approximately 1-1/4 pounds shall be dropped squarely onto the surface of the pipe wth a free fall (which may be guided) for a distance of 1 foot. The ball may be caught or deflected after the hit so that the rebound does not hit the pipe. The pipe shall be full of water containing a soluble fluorescent dye but not pressurized. The test shall be made at room temperature and the pipe shall be supported on its bottom axis on a solid flat support. Four drops shall be made on randomly selected areas which are a minimum of 12 inches and 90 degrees clockwise from each other, The test shall be repeated on the same pipe but with the pipe pressurized to the manufacturer's rated pressure. Four drops shall be made on different areas from those previously used. The pipe shall then be pressurized to 200 psig or 1-1/2 times the rated pressure, whichever is greater, and shall remain at this pressure for 168 hours at the end of which time the pipe shall be examined for porosity with an ultra-violet lamp.

4.4.3.2 Fittings. Fittings shall be tested following the above procedure except that the drops shall be reduced from four to one in each test.

4.4.4 Boil resistance. Three tests samples, 1-1/2 inches in length, shall be cut from a length of pipe. The samples shall be taken from sections at least 3 feet apart along the length of the pipe. Fittings shall be tested using either the whole fitting as the test sample or three 1-1/2 inch lengths cut from the fitting. The samples

shall be conditioned for 8 hours at 300 degrees F, desiccated, and an initial weighing made. The samples shall then be suspended in a boiling distilled water bath for 3 hours. The samples shall then be removed one at a time, blotted dry of excess water, and weighed. This weighing shall be made within 10.5 minute after removal from the bath. After weighing, the samples shall be visually examined for delamination or other evidence of impairment and the percentage weight gain of the samples shall be calculated as follows:

$$\%\text{weight gain} = \frac{B-A}{A} \times 100$$

Where A = initial weight
B = weight after immersion

4.4.5 Beam strength. A minimum 6 foot length of pipe shall be capped and filled and maintained completely with water at 200 degrees F, but not pressurized. The pipe shall be suspended by laying the end caps on appropriate supports, allowing the pipe to hang free between the supports, and supporting the end caps at their centers of gravity. The sag in the pipe shall be measured and recorded every 168 hours for a period of 1008 hours plus or minus 8 hours. The sag at the end of the test shall be used to calculate the value of E in the formula:

$$Y = \frac{22.5\ WL^4}{EI}$$

Where $I = \frac{\pi}{64}(D^4 - D_1^{4)}$.

W	=	weight per foot of pipe, including water	Sag is measured from the
L	=	Length of span, feet	horizontal plane of the
Y	=	deflection or sag, inches	pipe supports to the
D	=	outside diameter of pie, inches	lower surface of the
D_1	=	inside diameter of pipe, inches	loaded pipe

4.4.6 Cycling resistance.

4.4.6.1 Test equipment. A test rack having a structural steel frame shall be used to test various assemblies of piping system components. The test rack shall provide a means of firmly securing a one- foot reinforced plastic pipe nipple comprising the supply side of the assembly being tested to the supply side of the rack, and a means of continuously deflecting the outlet side of the assembly not less than 1/2-inch in both directions at a rate of not less than 8 cycles per minute. The deflection pressure shall be applied not more than 46 inches from the center line of the pipe nipple. Inlet and outlet headers shall be provided with traps, heat exchangers, pressure reducing valves, shut-off valves and other equipment necessary to provide the specified test conditions. The outlet side of each assembly shall consist of a reinforced plastic flange bolted to a steel flange connected to a flexible outlet pipe having a diameter not larger than half the diameter of the test pipe. The flexible pipe shall be connected to the outlet header. The test rack shall be so constructed that the assembly being tested is not restrained from blowing apart if a joint or connection fails under test.

4.4.6.2 Test assembly. The test assembly shall consist of (1) a one-foot nipple secured to the test rack, (2) a 90- degree elbow, (3) a one-foot nipple, (4) a coupling, (5) a three-foot length of pipe, and (6) a reinforced plastic flange bolted to the steel outlet flange. The entire assembly shall be wrapped with 3/4-inch fiber glass insulation to simulate ground cover. All change of direction-type fittings, such as 45-degree elbows, tees, crosses, laterals, and saddles, shall be tested by substituting them for the 90-degree elbow in the above assembly. All other types of joints, such as bell-end pipe, reinforced plastic pipe to steel pipe adapters, flanges and gaskets, and reducers, shall be tested by substituting them for the coupling in the above assembly. Open ends shall be blanked off as necessary, and the inlet nipple shall be realigned as necessary to accommodate changes in direction other than 90- degrees.

4.4.6.3 Test procedure. The test shall be performed with the assembly being continuously deflected

from 1/2- inch on the right of the unrestrained position to 1/2-inch on the left and back to 1/2-inch on the right of the unrestrained position. The deflection rate shall be not less than 8 cycles per minute. Overnight shutdowns are permissable. The cycling shall be conducted in the following sequence.

4.4.6.3.1 Initial deflection cycles. The assembly shall be subjected to 1000 deflection cycles with water inside the assembly maintained at 115 psig and 250 degrees F.

4.4.6.3.2 Pressure cycles. With deflection cycles continuing, the test pressure shall be rapidly lowered to 30 psig and then immediately allowed to build back to 115 psig by opening and closing an outlet valve. This shall be repeated for 20 pressure cycles at a rate of not more than
5 minutes per cycle.

4.4.6.3.3 Temperature cycles. With deflection cycles continuing, the temperature of the water inside the assembly shall be increased to 300 degrees F, lowered to 60 degrees F, and then increased to 300 degrees F for 20 complete cycles. The pressure shall be allowed to vary during the temperature cycling, but shall be not less than 115 psig when the temperature is 300 degrees F. The cycles may be as rapid as desired, but shall not be more than 30 minutes per cycle.

4.4.6.3.4 Water hammer cycles. With deflection cycles continuing, water hammer shall be produced by pressurizing the assembly with 15 psig steam from the supply header and then introducing water at 50 psig and 80 degrees F from the outlet header until the pressure steadies at 50 psig. The water shall then be drained until the assembly contains only steam, and the process shall be repeated for 20 cycles. The maximum time per cycle shall not exceed 15 minutes.

4.4.6.3.5 Final deflection cycles. Following the water hammer cycles, the pressure and temperature shall be steadied at 115 psig and 250 degrees F, and the deflection cycles continued for 1000 cycles.

4.4.6.4 Inspection. Following the final deflection cycles, and while still deflecting, the fiber glass insulation shall be removed and the assembly shall be visually inspected for leaks and other signs of damage. The deflection shall then be stopped and the assembly pressurized to 1-1/2 times the manufacturer's rated pressure and reinspected for leaks and damage.

4.4.7 Hydrostatic strength. The pipe shall be filled completely with fresh water and pressurized to 200 psig or 1 ½ times the manufacturer's rated pressure, whichever is greater. The test shall be made at room temperature and after the water in the pipe has had time to reach room temperature. The pipe shall remain under pressure for not less than 5 minutes, and then shall be examined for porosity while still under pressure.

4.5 Certificate of compliance. Unless otherwise specified (see 6.2), a certificate of compliance from an independent commercial laboratory or factory inspection agency acceptable to the Government will be accepted as proof that the requirements in 3.5 to 3.9 for the destructive tests specified in 4.4.2 to 4.4.6 (joint strength, impact resistance, boil resistance, beam strength, and cycling resistance) have been met. The certificate of compliance shall be accompanied by a certification from the manufacturer that the pipe and fittings being furnished are manufactured with the same materials and by the same procedures as those used for the pipe and fittings that were tested.

4.6 Inspection of preparation for delivery. The packaging, packing, and marking of the pipe and fittings, and adhesive when furnished, shall be examined to determine conformance with the requirements of Section 5 of this specification.

5. PREPARATION FOR DELIVERY

5.1 Packaging. Packaging shall be level A or C, as specified (see 6.2).

5.1.1 Level A. Pipe shall have the open ends sealed with suitable caps or plugs. When kits of adhesive are furnished (see 3.4 and 6.2), they shall be packaged in one or more fiberboard boxes conforming to PPP-B-636, weather- resistant class. Contents of boxes shall be cushioned and braced to prevent movement within

the boxes.

5.1.2 Level C. The pipe and fittings, and kits of adhesive when furnished (see 3.4 and 6.2), shall be packaged in accordance with the supplier's standard practice.

5.2 Packing. Packing shall be level A, B, or C, as specified (see 6.2).

5.2.1 Level A.

5.2.1.1 Pipe. The pipe shall be packed in open wood crates conforming to PPP-C-650, style B, Type III.

5.2.1.2 Fittings. The fittings shall be packed in close-fitting cleated-plywood boxes conforming to PPP-B-601 (overseas type) or nailed wood boxes conforming to PPP-B-621 (class 2). The fittings shall be arranged in the boxes to provide minimum cube and best protection. Contents of boxes shall be cushioned, blocked, and braced to prevent movement of and damage to contents. When the gross weight of a box exceeds 250 pounds, the box shall be modified by the addition of skids in accordance with the applicable box specification.

5.2.1.3 Adhesive. Kits of adhesive when furnished (see 3.4 and 6.2), shall be packed as specified for fittings.

5.2.2 Level B. The pipe and fittings, and kits of adhesive when furnished (see 3.4 and 6.2), shall be packed as specified for level A except that boxes shall be the domestic type or class, as applicable.

5.2.3 Level C. The pipe and fittings, and adhesive when furnished (see 3.4 and 6.2), shall be packed in a manner which will insure arrival at destination in satisfactory condition and which will be acceptable to the carrier at lowest rates. Containers and packing shall comply with Uniform Freight Classification rules, or National Motor Freight Classification rules.

5.3 Marking. Interior packages and shipping containers shall be marked in accordance with MIL-STD-129, and marking shall include size, quantity, and kind of items, as applicable.

5. NOTES

6.1 Intended use. The pipe and fittings covered by this specification are intended for service up to 300 degrees F and 125 psig in condensate return lines. The pressure rating of these products is usually higher for the smaller nominal sizes and at lower service temperatures. The pipe and fittings may be suitable for other applications, but consideration should be given to the necessity of evaluating these products for the specific requirements of those applications and the possibility that lower cost reinforced plastic pipe and fittings (such as unlined pipe) might also be suitable for those applications.

6.2 Ordering data.

6.2.1 Procurement requirements. Purchasers should exercise any desired options offered herein, and procurement documents should specify the following:

a) Title, number, and date of this specification.

b) Type of pipe and fittings required (see 1.2.1 and 1.2.2).

c) Size of pie required and length, if other than 20 feet (see 3.3.1, 3.3.1.1, and 6.5).

d) Kind and size of fittings required (see 3.3.2).

e) Whether adhesive kits are to be provided (see 3.4 and 6.3).

f) If a certificate of compliance for the destructive tests is not acceptable (see 4.5).

g) Level of packaging and level of packing required (see 5.1 and 5.2)/

6.2.2 Contract data requirements. When this specification is used in a procurement which incorporates a DD Form 1423 and invokes the provisions of paragraph 7-104.9 (n) of the Armed Services Procurement Regulation, the data requirements identified below will be developed as specified by an approved Data Item Description (DD Form 1664) and delivered in accordance with the Contract Data Requirements List (DD Form 1423) incorporated into the contract. When the provisions of ASPR 7-104.9 (n) are not invoked, the data specified below shall be delivered in accordance with the contract requirements. Deliverable data required by this specification is cited in the following paragraph:

Paragraph	Data Requirement	Applicable DD 1664
4.5	Certificate of Compliance	DI-E-2121

(Copies of Data Item Descriptions required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

6.3 Adhesive. When pipe and fittings are being procured for stock and will be stored for more than one year before use, the adhesive should not be ordered since it might have a limited shelf life.

6.4 Jointing. In order to insure that the pipe and fittings have suitable dimensions for jointing, only pipe, fittings, and adhesive furnished by the same manufacturer should be used together.

6.5 Pipe lengths. In addition to the standard length (see 3.3.1.1), pipe may be available from some manufacturers in random or exact lengths up to 40 feet. Exact lengths are more expensive per foot than random lengths.

User Activities:
Army — CE
Air Force — 11

Preparing Activity:
Navy — YD

(Project No. 4710-N341)

AMERON Corrosion Resistance Piping Division
BONDSTRAND Fiberglass Pipe Fittings Flanges
Western Area

June 11, 1979
Jet Fuel Case Histories
Miltary

Project	Engineer	Lineal		Installation date
Eniwetok Atol Pacific	USAF (underwater)	2490	6”	8/71
Hickam Air Force base Hawaii	USAF DEE Hickam	9580 3340 9680	10” 8” 6”	9/74
U.S. Coast Guard Sitka, Alaska	Corps Engineers U.S. Coast Guard	600	4”	5/75
Kadena Air Force Base Okinawa	Corps Engineers DEE USAF	2400 1260	8” 6”	3/76
Arizona Air National Guard Phoenix, Arixzona	USAF	2600 1750	10”* 8”*	1/78
Utah Air National Guard Salt Lake City, Utah	USAF P M Engineering SLC Keller & Gannon SFO	440 40	10” 6”	4/78
Kusan Air Force Base Korea	Corps Engineers	740 360 20 60 1000 80	10” 8” 6” 4” 3” 2”	5/78
U.S. Navy Subic Bay, Philippines	Corps Engineers	40 120 180 900	3” 8” 10” 12”	12/78
U.S. Navy Lemoore Naval Air Station Lemoore, California	NAVFAC WESTDIV	10,200 31,800	2” 3”	5/79

Base specification:Bondstrand Series 2000 pipe, Series 4000 filament wound fittings & Flanges. Military Specification MIL-P_22245-A.

*Series 6000 filament wound fittings and flanges —Series 2000 pipe MIL-P-22245-A.

Ameron Corrosion Resistant Piping Division

BONDSTRAND

U.S. GOVERNMENT USERS LIST

MILITARY INSTALLATIONS	SERVICE	YEAR INSTALLED
U.S. Marine Installations		
El Toro, Santa Ana, California	Air	1969
Parris Island, Parris Island, So. Carolina	Condensate	1975-76
Camp Pendleton, California	Natural Gas	1973
U.S. Navy Installations		
China Lake Naval Weapons Center, China Lake, California	Condensate	1969-75
Naval Ammunition Facility, Hawthorne, California	Water-Acid	1976-77
Pearl Harbor, Oahu, Hawaii	POL	1976-77
Great Lake Naval Base, Chicago, Illinois	Water	1976
U.S. Naval Training Center, San Diego, California	Condensate	1972-73
U.S. Naval Supply School, Athens, Georgia	Hot Water	1972
Naval Air Station, Treasure Island, California	Condensate	1961
U.S. Navy	SWOB Barges	1975-76
U.S. Navy	YON Barges	1974-76
Alameda NAS, Alameda, California	Condensate	1969
San Diego Submarine Station	Sewage	1974
U.S. Army Installations		
Aberdeen Proving Ground, Maryland	Hot Water	1975
Fort Detrick, Frederick, Maryland	Condensate	1974
Fort Lewis, Lacey, Washington	Condensate	1976-77
Fort McClelland, Anniston, Alabama	Condensate	1969
Military Ocean Terminal, Bayonne, New Jersey	Condensate	1974
Redstone Arsenal, Huntsville, Alabama	Condensate	1976
Fort Rucker, Daleville, Alabama	Condensate	1975-76
Sierra Army Depot, Herlong, California	Condensate	1974-75
West Point Academy, West Point, New York	Condensate	1975
U.S. Air Force		
Amarillo, Texas (Auxiliary AFB)	Jet Fuel	1972
Andrews AFB, Maryland	Condensate	1970
" "	"	1974
Arnold AFB, Tennessee	Condensate	1970
" " "	Condensate	1976
Air Force Academy	Conduit Jacket	1973
Barksdale AFB, Louisiana	Acid	1968
Bolling AFB, Washington, D.C.	Condensate	1971
Chanute AFB, III.	Condensate	1973
Charleston AFB, South Carolina	Condensate	1976
Power AFB, Delaware	Water	1971
Edwards AFB, California	Condensate &Fuel	1968

Elgin AFB, Florida	Condensate & Fuel	1972
Ellsworth AFB, South Dakota	Condensate	1975
Elmendorf AFB, Alaska	Condensate	1973
Galena AFB, Alaska	Condensate	1973
George AFB, California	Fuel	1972
Griffis AFB, New York	Condensate	1974
Grissom AFB, Indiana	Condensate	1977
Hanscom AFB, Massachussets	Condensate	1974
" " "	"	1976
Hickam AFB, Hawaii	Jet Fuel	1973
Hill AFB, Utah	Condensate	1963
" " "	"	1968
" " "	"	1969
" " "	"	1970
" " "	"	1971
" " "	"	1972
" " "	"	1973
" " "	"	1974
" " "	"	1975
" " "	"	1976
Homestead AFB, Florida	Condensate	1971
Kadena Air Base, Okinawa, Japan	Hot Water	1976
" " "	Chilled Water	
" " "	JP-7 Fuel -	1976
" " "	Underwater	
Keesler AFB	Condensate	1976
Kincheve AFB, Michigan	Condensate	1974
Kirtland AFB, New Mexico	Condensate	1973
" " "	"	1974
" " "	"	1976
Langley AFB, Virginia	Condensate	1976
Lowry AFB, Colorado	Condensate	1975
Luke AFB, Arizona	Fuel	1971
Mac Dill AFB, Florida	Condensate	1972
McClellan AFB, California	Condensate	1972
" " "	Compressed Air	1972
" " "	Condensate	1975
" " "	"	1976
McCoy AFB, Florida	Condensate	1973
McGuire AFB, New Jersey	Hot Water	1973
Osan AFB, Korea	POL	1972
Patrick AFB, Florida	Condensate	1964
" " "	"	1975
Pope AFB, North Carolina	Condensate	1972
Reese AFB, Texas	Condensate	1976
Robins AFB, Georgia	Condensate	1973
Seymour Johnson AFB, North Carolina	Condensate	1972
" " " " "	"	1976
Shaw AFB, South Carolina	Condensate	1976
Sheppard AFB, Texas	Condensate	1974
" " "	Jet Fuel	1973
Scott AFB, Illinois	Condensate	1976
" " "	"	1977

Tinker AFB, Oklahoma	Acid	1969
Westover AFB, Massachussets	Condensate	1976
Whiteman AFB, Missouri	Condensate	1975
Wright-Patterson AFB, Ohio	Condensate	1976

FEDERAL INSTALLATIONS

Veterans Administration Hospitals

Perrypoint, Maryland	Condensate	1973
Indiana	"	1970
Sawtelle Veterans Hospital	Condensate	1976
Lawton, Youth Center	Hot Water	1975

Tennessee Valley Authority

Widows Creek, Alabama	Demin H_2O	1964

General Service Administration

Government Center, Denver, Colorado	Condensate	1968
Elipse (Whitehouse) Washington, D.C.	Condensate	1972
Point Barrow, Alaska	Condensate	1965
St. Elizabeth's Hospital, Washington, D.C.	Condensate	1964
California Institute of Technology Pasadena, California (First Bondstrand installation)	Condensate	1958

Paul Biancardi

2nd para.
Need to emphasize that approval can only be obtained by the operator for a specific pipeline. This supplier is attempting to get a blanket authorization to use his product. The inappropriateness of that is not clear in the proposed letter.

3rd para.

Also advise him of the Calif. FM jurisdiction.

Jack Overly is not available until January 3, but as I recall Long Beach Oil Developers is the company that Jack and I talked about. The discussion was over the phone and apparently Jack's contact with Long Beach was also via telephone:

It appears the operator may be trying to put the burden on the supplier to get approval for use of the pipe.

I have attached a copy of the only interpretation I'm aware of on 195.8. OPSR has no interpretations of 195.8 in their file.

January 17, 1974

Mr. Larry D. Wheaton
Marathon Oil Company
539 S. Main Street
Findlay, OH 45840

Jan 17, 1974

Dear Mr. Wheaton:

This refers to your letter of December 7, 1973, furnishing this Office additional information concerning "slug" used in your Maraflood TM process.

Based on the information provided in your letter, the Office of Pipeline Safety (OPS) has determined that the subject slug would not be classified as a hazardous material, petroleum, or petroleum product and therefore its pipeline transportation would not be subject to the requirements of 49 CFR, Part 195, Transportation of Liquids by Pipeline.

Your letter also requested clarification in two additional areas.

Question
"Does section 195.8 concerning notification of the use of plastic pipe apply if the material transported is not a hazardous material?"

Answer
If the material being transported by pipeline is not classified as a hazardous material, then it would not be required to comply with 49 CFR, Part 195.

Question
"If so" (answer to preceding question) "does it" (Section 195.4) "apply if the material is not being transported by a common carrier?"

Answer
If a material is classified as a hazardous material, petroleum, or petroleum product transported by pipeline, the carrier would have to comply with Part 155 if it is determined that the carrier is subject to Federal safety regulatory jurisdiction in accordance with the following:

> The liquid pipeline safety regulations are issued by the OPS under the authority of Title 18, United States Code, Sections 831-835. This safety authority is applicable to all common, private, and contract pipeline carriers in interstate and foreign commerce, who transport petroleum, petroleum products, and other liquid hazardous materials. Title 18, U.S.C., Section 834 provides that the regulations issued by the Department under this section are "...binding upon all carriers engaged in interstate or foreign commerce which transport explosives and other dangerous articles via any carrier engaged in interstate and foreign commerce by land or water" (emphasis added). Therefore, OPS regulations apply to carriers engaged in interstate operations, and to all pipelines operated by such carriers, regardless of whether the particular pipeline is interstate or intrastate.

We appreciate your efforts in supplying the requested information and if we can be of any further help, please contact this office.

Sincerely,
Joseph C. Caldwell
Director
Office of Pipeline Safety