

0374
FILE
CONNECTORS^A

FLEXIBLE GAS CONNECTORS
CHRONOLOGY OF COMMISSION INVOLVEMENT

PART I
(488 pages)

U.S. CONSUMER PRODUCT SAFETY COMMISSION
OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20207

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WASHINGTON, D.C. 20207

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Enclosure(s)

Flexible Gas Connectors

Chronology of Commission Involvement

- 2/75 Engineering Sciences, through NBS, analyzed the failure of a flexible brass gas appliance connector. Failure resulted from the ammoniacal leak testing fluid. (NBSIR 75-669 Failure of flexible Brass Gas Appliance Connector, 2/75). *TAB A*
- 9/21/76 J.R. Ambrose, Corrosion and Electrodeposition Section, NBS memorandum to J.P. Talentino, Bureau of Engineering Sciences, CPSC. NBS was asked if it was worthwhile to do anything in this area? NBS response included the acknowledgement that brass will crack in an ammonia atmosphere and it was questionable as to whether resources should be expended as to how fast and under what conditions. Further, NBS stated that new techniques could not predict service life on other materials possibly considered for replacement. *TAB B*
- 1/77 Gas Appliance Connector Survey (Phase I). 65 commercially available flexible gas connectors, representing 11 manufacturers, were examined for conformance with the American National Standard Institute (ANSI) standard Z21.24. Those dated 1976 and later were examined under ANSI Z21.24(a). *TAB C*
- 4/77 Gas Appliance Connector Survey (Phase II). (1) Five connectors were tested for resistance to flexure cracking by ANSI Z21.24 Section 4.3; all passed. (2) Four connectors were tested for resistance to season cracking by Section 4.6. The brass connector failed, the stainless steel connector passed and the two epoxy-coated brass connectors failed. (3) Six connectors were subjected to the test for resistance to ammonia atmospheres in Section 4.10. The two brass connectors and the damaged epoxy-coated brass connector failed. The stainless steel brass/aluminum connector and the undamaged epoxy-coated brass connector passed. *TAB C*
- 3/15/79 Public Service Company of Colorado reports to Denver Area Office a hazard pattern in leaking flexible metal gas tubing connectors manufactured by Cobra Metal Hose, Chicago, Illinois. Denver Area Office forwards information to Product Defect Identification Division (CEPD). *TAB D*
- 4/2/79 CEPD decides cannot take action since company was out of business. *TAB D*
- 4/30/79 Denver Area Office advises Public Service Company official to consider filing a petition since PSC was still concerned about the hazard and wanted CPSC to act. *TAB D*
- 7/19/79 The CEPD Hazard Assessment Committee determined that a component steel nut was manufactured out of specification on a flexible gas connector manufactured by Masco Corporation (RP 79-152) permitting a potential gas leak thus posing a fire hazard. *TAB E*

- 10/23/79 Public Service Company of Colorado provides further information to Denver Area Office about increasing number of defects discovered in gas connectors manufactured by Cobra. Denver Area Office forwards information to AED Field Operations with recommendation to contact AGA and jointly resolve the problem. *TAB D*
- 11/5/79 Information from Denver Area Office discussed at the Emerging Hazards Program Team Meeting. AGA to be contacted and asked whether they would want to cooperate with CPSC in addressing the problem. *TAB F*
- 11/19/79 Emerging Hazards Status Report. Chicago Area Office to attempt to obtain Cobra distribution records. AGA willing to cooperate with CPSC to work out a public notification of the problem in conjunction with local gas companies. *TAB F*
- 11/21/79 CEPD determines that Masco Corporation's corrective action plan adequately addresses the hazard presented by the product. The corrective action is accepted and will be monitored (ID 79-172). *TAB G*
- 12/7/79 Chicago Area Office determines that D.K. Manufacturing Company (manufacturer of Cobra) was liquidated in 1968. Distribution records were probably not available. *TAB H*
- 12/7/79 AGA details actions it would take: (1) Transmit to member companies recommendations made by CPSC; (2) Publish a similar notice in AGA's Directory of Certified Appliances and Accessories; (3) Recommend that member companies immediately consider whatever actions they would deem appropriate in order to comply with the recommendations; (4) Recommend that members distribute, by letter, bill inserts or other appropriate methods a notice concerning proper procedures to be followed by the customer should the customer smell gas in the home. *TAB I*
- 12/14/79 Commission staff (OEX) requests the assistance and cooperation of AGA. Commission staff developed a statement for use by AGA. *TAB J*
- 12/21/79 AGA details its actions including 12/19/79 Safety Bulletin to all delegates of AGA member companies. *TAB K*
- 1/2/80 Commission staff (OEX) letters to the National LP-Gas Association, American Public Gas Association (APGA), Department of Defense and Department of Housing and Urban Development. *TAB L*
- 1/30/80 National LP-Gas Association (NLPGA) Correspondence discussing 1/28/80 Safety Bulletin to marketeter members. *TAB M*
- 2/21/80 Public Service Company of Colorado press conference on flexible gas connectors. *TAB N*
- 2/21/80 Department of Housing and Urban Development informs Commission that HUD will issue an appropriate notice to Public Housing Agencies. *TAB O*

- 5/80 CPSC MEMO article on flexible gas connectors. *THE C*
- 8/1/80 CPSC Regional and District Office employee survey to determine who had seen a notice in their gas bill regarding Cobra gas connectors. A low number of people recalled seeing the notice. *THE D*
- 8/18/80 PM, Emerging Hazards memoranda to Director, CEPD on additional reports of potentially defective gas connectors for appliances. (From Public Service Company of Colorado). *THE N*
- 8/19/80
- 9/80 PM, Emerging Hazards informally contacts AGA, NLPGA and APGA to obtain reaction to request for issuance of new letters to marketers. AGA: Has sent out at least two subsequent notifications. Any new campaigns should include manufacturers also. NLPGA: willing to cooperate but would suggest recall of specific products. APGA: reserved making any commitments. *THE S*
- 9/26/80 AGA transmits to Commission 3/20/80 service Bulletin sent customer service department managers, customer activities committee and customer and utilization committee. Bulletin was expanded to assist in identifying those additional flexible gas connectors which have shown a potential for failure. AGA also expressed a willingness to assist the Commission in the distribution of further notifications. *THE T*
- 10/17/80 CEPD requests the AGA Laboratories to (1) identify all firms who were certified by AGA to manufacture the old style (pre-1967 ANSI standard revision) flexible gas appliance connectors; (2) provide information regarding the current status of the firms; and (3) indicate whether the nine firms identified by CEPD in the letter manufactured the old style gas appliance connector. *THE U*
- 10/31/80 CEPD closes the file on Masco Corporation (ID 79-172). *THE V*
- 12/25/80 AGA provides partial response to CEPD's request. AGA provided attachments identifying by name and last known address those firms that at one time or another between 1950 and 1968 had AGA Directory listings of flexible metal connectors. *THE W*
- 2/27/81 AGA provides additional information to CEPD received from their Pacific Coast Branch Laboratories. *THE W*
- 5/1/81 New Project Identification (NPI) Program discussion paper on gas-fired appliances prepared for the Executive Director. (Gas pipes, fittings, and distribution systems was a discussion item. Leaks in gas line connectors, both flexible and rigid, resulting in explosions was the major hazard pattern for this group.) *THE X*
- 7/2/81 PSA requested by CACA to review IDIs and samples with respect to CA 81-2664 (American Metal Products Corporation). *THE Y*
- 7/29/81 NPI Program memorandum to the Executive Director on specific issues which could be used for focusing future CPSC activities on gas-fired appliance hazards. (Flexible gas connectors was one of five issues discussed). *THE Z*

- 8/15/81 Product Safety Assessment (PSA) Program completes injury data base review for incidents involving flexible gas connectors for the Corrective Actions Division (CACA). Twelve incidents were found. *TAB AA*
- 10/6/81 PSA program completes engineering analyses of two American Metal Products Corporation flexible gas connectors for CACA (CA 81-2664). Both connectors failed by stress corrosion of the brass metal of which the connectors were made. Recommendation was that brass not be used as a material for this application. *TAB EE*
- 12/7/81 The Fire Prevention Bureau of the city of Saginaw, Michigan informed the Commission of an excessive number of fires due to the failure of flexible gas connectors. *TAB CC*
- 4/7/82 Program Manager for Emerging Hazards requests the PSA program prepare a discussion paper on flexible gas connectors. *TAB DD*
- 4/27/82 CACA preliminary determination not to proceed on CA 81-2664 (American Metal Products Corporation). *TAB EE*

A

NBSIR 75-669

Failure of Flexible Brass Gas- Appliance Connectors

J. R. Ambrose and J. Kruger

Corrosion and Electrodeposition Section
Metallurgy Division
Institute for Materials Research
National Bureau of Standards
Washington, D. C. 20234

February 1975

Failure Analysis Report

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 Mrs Notified _____
 Comments Processed _____

Prepared for
Office of Consumer Product Safety
Walter G. Leight, Chief
National Bureau of Standards
Washington, D. C. 20234

5-A

NBSIR 75-669

**FAILURE OF FLEXIBLE BRASS GAS
APPLIANCE CONNECTORS**

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U. S. DEPARTMENT OF COMMERCE, Frederick B. Dent, Secretary
NATIONAL BUREAU OF STANDARDS, Richard W. Roberts, Director

5-B

Failure of Flexible Brass Gas Appliance Connectors

BACKGROUND

A written request was received from the U. S. Consumer Product Safety Commission (CPSC) by the Office of Consumer Product Safety at the National Bureau of Standards to analyze the failure of two flexible brass tubing samples provided by Bureau of Engineering Sciences under the 15 (b) Project (Fig. 1). According to the CPSC report which accompanied the request, the brass tubing was used as a flexible gas appliance connector and had failed within 3 to 6 weeks following installation. At the time of installation, proper sealing of the tubing couplings was verified by application of a blue liquid leak detector to the couplings and flexible tubing at either end of the connector. The report continued on to state that severe corrosion and rupture of the tubing connectors by cracks penetrating the tubing walls occurred at those extremities of the connectors, where the leak detector would presumably have been applied. An independent analysis of the leak detector solution using gas chromatographic analysis was obtained by CPSC which reported the solution to contain a significant concentration of free ammonia.

A one gallon plastic container approximately three-fourth full of a clear blue liquid accompanied the two sections of tubing, and it was further requested that an opinion be given as to whether this solution could have been responsible for the reported corrosion of the brass tubing.

VISUAL EXAMINATION

Visual examination of the specimens revealed discoloration and blue and white residue in the area located near the extremities of the tubing sections, where couplings were attached (Fig. 2a). In addition to this,

a large number of cracks had penetrated the tubing, and, since the CPSC report had pointed out the presence of ammonia in the leak detector solution, it was suspected that subsequent failure resulted from what is commonly called stress corrosion cracking (Fig. 2b). The residue appeared bluish-green with rather large amounts of a crystalline white material as well (Fig. 3).

INVESTIGATION AND RESULTS

Analysis of Metal Composition

A 10 cm section of tubing was forwarded to the Chicago Spectro Service Laboratory for the metal composition analysis. Their results show the brass to be within the specifications of what is commonly called Admiralty Metal (see Table I). The specifications and compositional maxima and minima for Admiralty Metal are given in Table II (1). The Laboratory report is reproduced in Appendix A.

Metallographic Examination

Optical micrographs were made of a specimen which was sectioned from the flexible tubing in an area near one of the major fracture sites. Cracks can be observed throughout the body of the material and are highly branched (Fig. 4). When the specimen surface was chemically etched two important observations can be made: (1) the metal microstructure is of rather large grain size, and (2) the cracks are largely transgranular in nature, propagating through grains rather than through grain boundaries (Fig. 5).

Residue Identification

X-ray diffraction patterns were obtained from samples of the two types of residue, and attempts were made to determine their chemical composition.

The blue material gave diffraction patterns which could not be unambiguously identified. However, a large number of the diffraction lines characteristic of tetramine cupric sulfate ($\text{Cu}(\text{NH}_3)_4\text{SO}_4$) were found. This particular compound would be expected to be present as a corrosion product when copper reacts with ammonia.

The white product also gave a large number of diffraction lines which could not be completely resolved. Certain similarities were observed between these patterns and certain organic compounds (e.g. stearates) to indicate the presence of an organic compound. The white product on the tubing foamed when distilled water was sprayed on the surface and gave an indication of alkaline pH when tested with pH indicator paper. Although not absolutely conclusive, these tests point to the probability that the white material may be some type of detergent.

Leak Detector Solution Analysis

The seal was broken on the plastic bottle containing the blue leak detector solution; a strong odor characteristic of ammonia was immediately noticed upon opening the bottle. Two 100 ml aliquots were withdrawn. One was reserved for our use in an exposure test and in a pH measurement. The pH was measured with a conventional glass electrode which gave a reading of 10.0. The other aliquot was sent to the Sadtler Research Laboratories for a total nitrogen and an ammonia nitrogen analysis. Results are given in Table III and show a high total nitrogen content as well as a significant concentration of ammonia nitrogen. The laboratory report is reproduced in Appendix B.

The analytical technique used here gave approximately a 10 time higher concentration of ammonia than did the CPSC gas chromatography analysis. The Sadtler Laboratory procedure as given in Appendix B would give an estimate of the total available nitrogen as ammonia in the solution. As the pH of the solution is increased (by MgO addition), the equilibrium between NH_4^+ and NH_3 would be shifted to the right (favoring NH_3 liberation):



DISCUSSION

Most brasses, and this includes Admiralty Metal, are susceptible to stress corrosion cracking in the presence of as little as trace amounts of ammonia in the atmosphere, providing four ingredients are present (2):

- (a) ammonia or an ammonia derivative,
- (b) water or water vapor,
- (c) oxygen and
- (d) stress.

The analysis of the leak detector solution reveals the presence of ammonia; water vapor and oxygen are always present in the atmosphere. The presence of residual stress, probably arising from fabrication of the tubing or from flexing during its installation, was verified through the mercurous nitrate test (3) (see Fig. 6).

A comparison of the optical micrographs taken of cracks in this material (Fig. 5) with those observed for stress corrosion cracking of 70-30 brass in non-tarnishing aqueous ammonia solution show the morphology of cracking to be quite similar (Fig. 7, from (4)). Furthermore, the particular heat treatment of this brass which resulted in the large grain size (Fig. 5)

would be expected to cause an increase in susceptibility to stress corrosion cracking (5).

Finally, a test specimen was cut from a section of the brass tubing, bent once to simulate treatment during installation of the coupling unit, dipped into a sample of the leak detector solution, then placed into a sealed glass container. The test exposure was allowed to proceed for two weeks, after which the specimen was removed, sectioned, and mounted for metallographic examination. Although the extent of crack propagation is less than that in the failed specimens, the initial stages of cracking are evident in Fig. 8. It should be remembered that service failures were reported to have taken from 3 to 6 weeks to occur, while the short term laboratory test was all that was possible, within the time limitations set to prepare this report.

CONCLUSIONS

From the results of the failure analysis performed on the brass tubing supplied, from the chemical analysis of the leak detector solution, and from the simulated exposure test in this laboratory, it is concluded that failure resulted from the stress corrosion cracking of flexible Admiralty Metal tubing due to the combined effects of residual stress and ammonia, oxygen and water vapor.

BIBLIOGRAPHY

1. Metals Handbook, T. Lyman, Editor, p. 920 (American Society for Metals, Novelty, Ohio, 1960).
2. D. H. Thompson, Stress Corrosion Cracking of Metals - A State of the Art, STP 518, p. 39 (American Society for Testing and Materials, Philadelphia, 1972).
3. 1974 Annual Book of ASTM Standards, Part 6, Designation B 154-73, p. 278 (American Society for Testing and Materials, Philadelphia, 1974).
4. E. N. Pugh, J. V. Craig, and A. J. Sedriks, Proc. of Conf. on Fund. Aspects of Stress Corr. Cracking, OSU, Columbus, Ohio, p. 135 (National Assoc. of Corr. Engineers, Houston, 1969).
5. G. Edmunds, Symposium on Stress Corr. Cracking of Metals, p. 67 (ASTM-AIME, 1945).

TABLE I

Copper	71.03%
Tin	0.90
Zinc	28.00
Iron	0.01
Others Total	0.10

TABLE II

	<u>Maximum</u> <u>Minimum</u>	<u>Minimum</u>
Copper	70.00%	73.00%
Tin	0.75	1.20
Iron		0.06
Lead		0.075
Others Total		0.10
Zinc	remainder	

TABLE III

Ammonia N	1.175% by weight
Total N	7.26% by weight

Appendix A



Sadtler

Research Laboratories, Inc.
Subsidiary of Block Engineering, Inc.

3316 Spring Garden Street
Philadelphia, Pa. 19104
Area Code: 215/382-7800
TWX 710-670-1186 Cable SADTLABS

February 18, 1975

REPORT OF ANALYSIS

SAMPLE: One (1) FROM: U. S. Department of Commerce
National Bureau of Standards
RECEIVED: February 3, 1975 Washington, D.C. 20234
LABORATORY NO: 80792 ATTN: Dr. J. R. Ambrose
B243 Bldg. 223

SUBJECT: One (1) sample of "Leak Test Solution"

REQUEST: Determination of ammonia and total nitrogen content

RESULTS: Ammonia nitrogen as N, % by wt. 1.19 (1.16)
Total nitrogen as N, % by wt. 7.31 (7.21)

COMMENT: The above reported results were corrected for reagent blank determinations. The analyses were conducted in duplicate.

Ammonia nitrogen was determined by distillation of weighed portions of sample in the presence of magnesium oxide. The distillates were recovered in boric acid and titrated to methyl red end point with standardized hydrochloric acid.

Total nitrogen was determined by the Kjeldahl digestion method using the distillation procedure described above.

Guenter Niessen
Research Chemist

GN:bs

5-K



CHICAGO SPECTRO SERVICE LABORATORY, INC.
Spectrographic and Chemical Analysts
Metallurgists

4848 S. KEDZIE AVE. • CHICAGO, ILL. 60632

ANALYSIS REPORT FOR:

AREA CODE 312 - 523-7088

- U.S. Department of Commerce
National Bureau of Standards
Washington, D. C. 20234

PURCHASE ORDER NO.

- Attention: Mr. John R. Ambrose, Corrosion and
Electrodeposition Section

DATE

Feb. 5, 1975

Report No. 6363

Sample: Flexible Brass Tubing

Copper	71.03%
Tin	0.90
Zinc	28.00
Iron	0.01
Others Total	<.10

5-L

CHICAGO SPECTRO SERVICE LABORATORY, INC.

BY

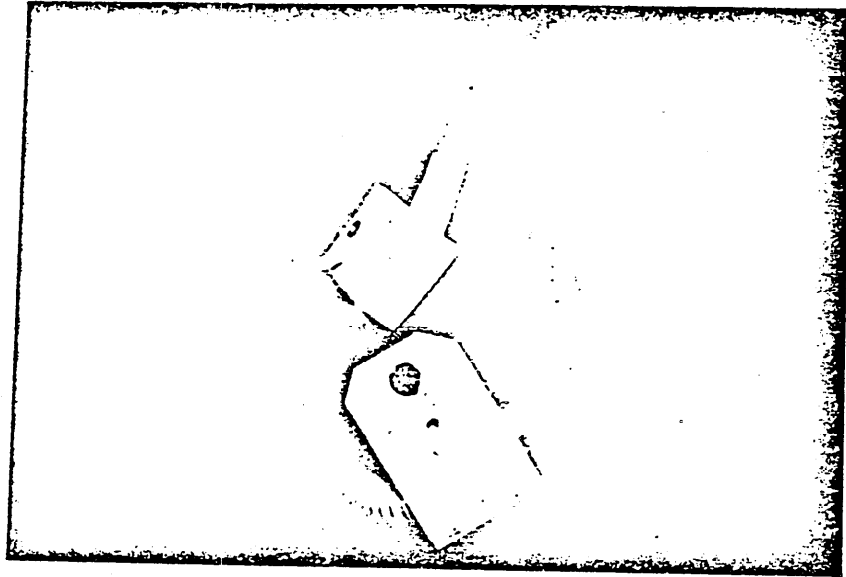


Fig. 1 Photograph of the two flexible brass samples.

5-M

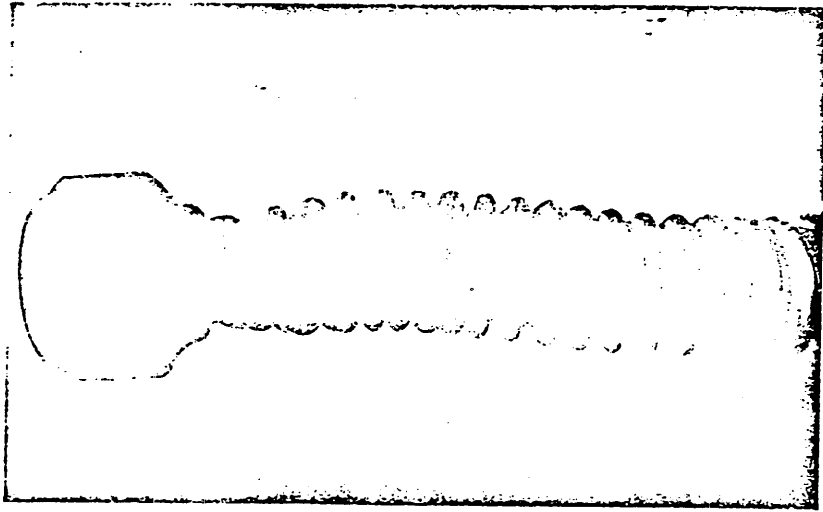


Fig. 2a Close-up view of an end of one tubing, showing where the corrosion attack was located.

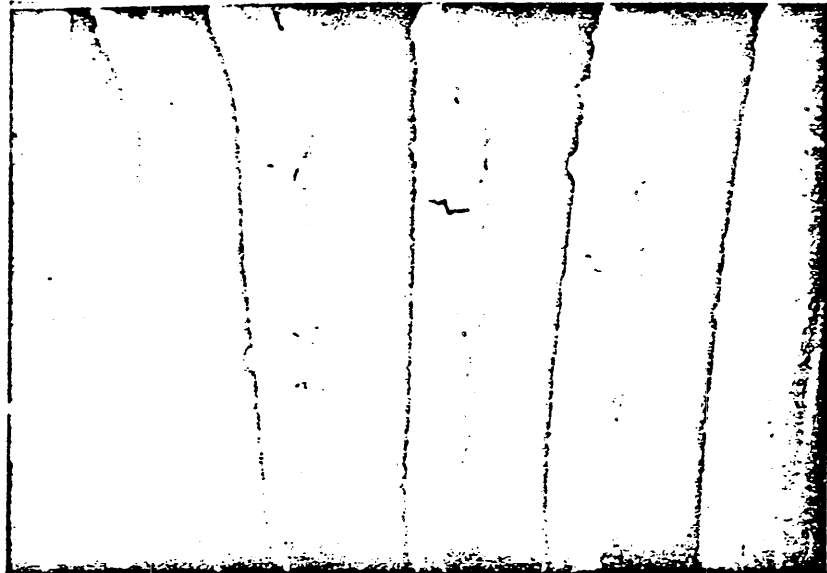


Fig. 2b Close-up photograph of an end of a tubing sample, showing the severe cracking of the brass.

5-N



Fig. 3 Close-up photograph of the corrosion product on the brass tubing, showing both the white and the bluish-green materials.



Fig. 4 Optical Micrograph (x200) of a cross section of the flexible brass tubing, showing the branched nature of the cracks.

5-P

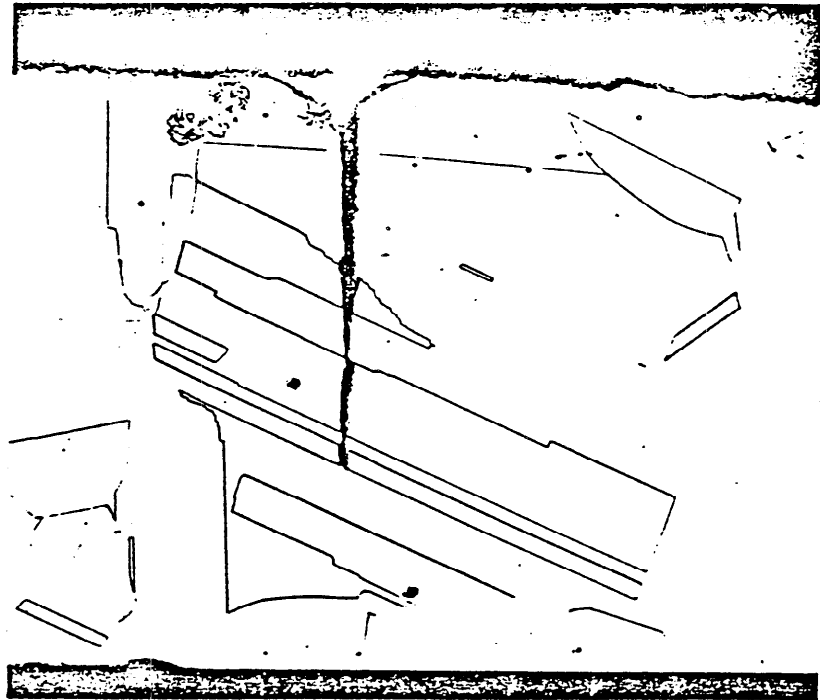


Fig. 5 Optical Micrograph (x200) of a cross section of the flexible brass tubing, etched in 1 part water (H_2O), 1 part hydrogen peroxide (H_2O_2), and 1 part concentrated ammonium hydroxide (NH_4OH), showing the metal microstructure. Cracks are predominantly transgranular.

5-Q

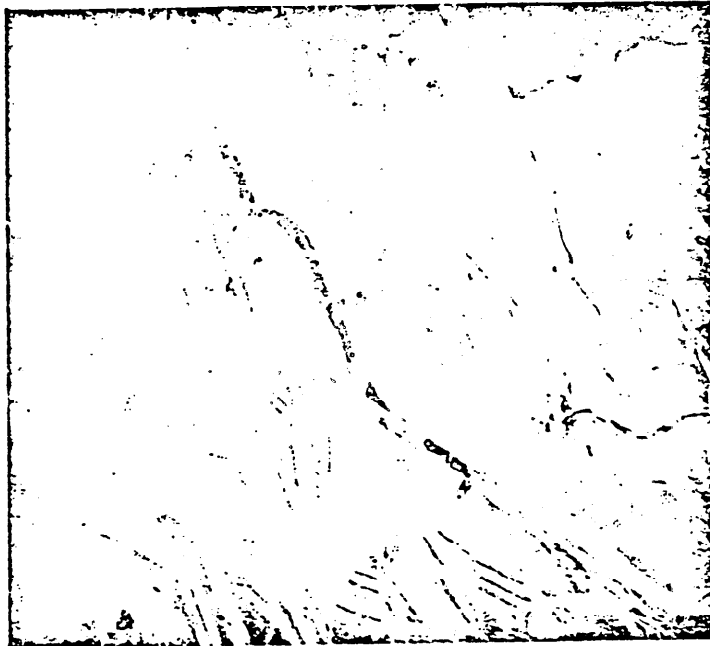


Fig. 6 Scanning Electron Micrograph ($\times 90$) showing cracks in a flexible brass tubing specimen after exposure in the mercurous nitrate test. Cracks indicate presence of residual stress.

5-R

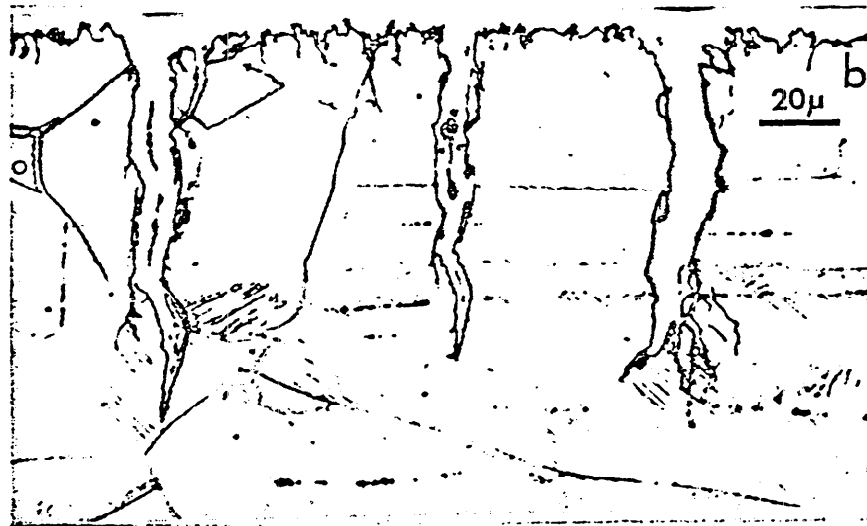


Fig. 7 Optical Micrograph showing stress corrosion cracks in 70-30 brass exposed to aqueous ammonia solution (from (3)).

5-5

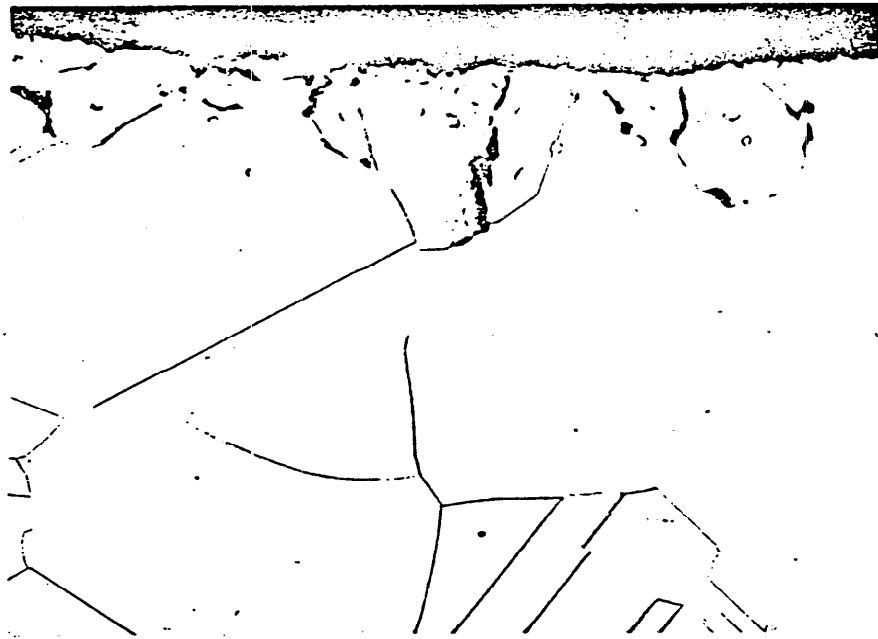


Fig. 8 Optical Micrograph (x500) of the cross section of a 5 cm specimen of brass tubing exposed for two weeks to the leak detector solution, then etched as in Fig. 5, showing initiation of cracking at the metal surface.

5-T

B

September 21, 1976

MEMORANDUM TO: Mr. James P. Talentino, BES, CPSC

Through: Walter G. Leight, Chief
Office of Consumer Product Safety

From: Dr. J. R. Ambrose
Corrosion and Electro-
deposition Section

Subject: Analysis of Data on Brass Appliance Connectors

I have gone through the material contained in 3 file folders assembled by J. P. Talentino, Bureau of Engineering Sciences for CPSC, and have come up with the following comments:

- 1) I agree with the suggestion that Test 4.6 for Season Cracking is intended for detection of high level induced stresses in metal. To perform the test on annealed material which has never been flexed is senseless.
- 2) The entire connector — tubing and coupling — should be exposed to the ammonia environment. As a much more representative test, however, I suggest that the entire apparatus be dipped into the 14% ammonia solution before introducing into the 18 hour vapor exposure test.
- 3) Elevated temperature testing should be considered as a part of the standard. Generally, stress corrosion cracking susceptibility does increase with increasing temperature.
- 4) Coating integrity is extremely important. Standards should reflect this.
- 5) Introduction of trace contaminants into the gas system opens an entire new area of possibilities for corrosive attack. Performance of materials should be evaluated carefully.
- 6) Finally, it seems to me that the flex and torsion tests are supposed to represent mechanical abuse sustained by the connector over its lifetime. This standard probably should remain intact. But to lump all materials into the same mechanical properties category as copper based alloys is really not fair. If a thinner walled material can meet the mechanical property standards of abuse, then it probably should be allowed.

Page 2

The letter from D. Blankinship of U.S. Brass Corporation deserves special consideration. The analysis by W. H. Clingman which he cites in the letter is a most speculative and misleading use of the published literature and statistical data. True, overall corrosion rates of brasses are proportional to ammonia concentration, but stress corrosion cracks (which, by the way, are not the same thing) propagate in atmospheres which contain fairly small amounts of ammonia — J. M. Popplewell and T. V. Gearing, Corrosion, 31, 279 (1975). Furthermore, the inference that failure rate (presumably by propagation of stress corrosion cracks) is proportional to ammonia concentration is not well founded, at least insofar as I could determine from the literature. In fact, based on the Popplewell paper, failures occurred in 70-30 Brass in 0-23 days (Brooklyn), which is a considerably shorter interval than the 3 years (25,200 hour) projected in Dr. Clingman's analysis.

The question of whether I consider it worthwhile to do any work in this area is a difficult one. We know brass will crack in ammonia atmosphere. To determine how fast and under what limiting conditions (stress level, ammonia concentrations, other corrosive environments) can be a major research effort not capable of being funded, let alone manned. New techniques are available to characterize materials as far as susceptibility of stress corrosion cracking, but these techniques, at least in their present stage of development, do not permit prediction of service life.

8

C

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C/10/R

UNITED STATES GOVERNMENT

U.S. CONSUMER PRODUCT
SAFETY COMMISSION
WASHINGTON, D.C. 20207

Memorandum

TO : Pat Thomas, BESS
THRU: A. B. Castle, Jr., Director, BESL
FROM : Rory S. Fausett, Chief Chemist, BESL
SUBJECT: Gas Appliance Connector Survey: Phase I

DATE: January 4, 1977

Sixty-five commercially available gas appliance connectors, representative of eleven such manufacturing firms, were examined for compliance to ANSI Standard Z21.24, "Metal Connectors for Gas Appliances." The results are itemized on the attached data sheets.

All samples were constructed of segmented, flexible metal tubing of various lengths and diameters, terminated at each end with a fitting provided with tapered pipe threads for connection to a gas appliance and to house piping. Thirty-four of the connectors had been provided with a protective polymer coating.

All connectors and attached fittings with a 1976 date of manufacture were examined per the superseding sections of the February 1976 Addenda rather than the original corresponding sections of the standard. All other connectors and fittings were examined per the original standard.

Attachments: 65
540334:77:RSF:ABC:amj

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1
#10

GAS APPLIANCE CONNECTOR SURVEY

MANUFACTURER: [REDACTED]
SAMPLE NUMBER: [REDACTED]
DATE OF MANUFACTURE: 1975

MATERIALS

COMMENTS

Tubing Composition	Brass
Permanent Fitting Composition	Ferrous alloy
Removable Fitting Composition	Ferrous alloy
Protective Polymer Coating	Yes

CONNECTOR DIMENSIONS

Length	33 1/2"
Nominal Tubing Diameter	1/2"

FITTING DESIGN AND DIMENSIONS

Dimension Across Flats	1"
Flat Length	13/16"
Shoulder Length/Male	
Shoulder Length/Female	.767"

INSTRUCTIONS

Compliant

MARKING

Permanent Labeling	Compliant
Removable Fittings Marked	Compliant

//

GAS APPLIANCE CONNECTOR SURVEY

MANUFACTURER: [REDACTED]
SAMPLE NUMBER: [REDACTED]
DATE OF MANUFACTURE: 1975

MATERIALS	COMMENTS
Tubing Composition	Brass
Permanent Fitting Composition	Ferrous alloy
Removable Fitting Composition	Ferrous alloy
Protective Polymer Coating	None

CONNECTOR DIMENSIONS	
Length	45 3/4"
Nominal Tubing Diameter	1/2"

FITTING DESIGN AND DIMENSIONS	
Dimension Across Flats	31/32"
Flat Length	13/16"
Shoulder Length/Male	
Shoulder Length/Female	.527"/.596"

INSTRUCTIONS	
	Compliant

MARKING	
Permanent Labeling	Compliant
Removable Fittings Marked	Compliant

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GAS APPLIANCE CONNECTOR SURVEY

MANUFACTURER: [REDACTED]
SAMPLE NUMBER: [REDACTED]
DATE OF MANUFACTURE: 1971

MATERIALS

COMMENTS

Tubing Composition	Brass
Permanent Fitting Composition	Ferrous alloy
Removable Fitting Composition	Brass
Protective Polymer Coating	None

CONNECTOR DIMENSIONS

Length	27 1/4"
Nominal Tubing Diameter	1/2"

FITTING DESIGN AND DIMENSIONS

Dimension Across Flats	1"
Flat Length	13/16"
Shoulder Length/Male	
Shoulder Length/Female	.691"

INSTRUCTIONS

Compliant

MARKING

Permanent Labeling	Compliant
Removable Fittings Marked	Compliant

13

4

74

GAS APPLIANCE CONNECTOR SURVEY

MANUFACTURER: [REDACTED]
SAMPLE NUMBER: [REDACTED]
DATE OF MANUFACTURE: 1974

MATERIALS

COMMENTS

Tubing Composition	Brass
Permanent Fitting Composition	Ferrous alloy
Removable Fitting Composition	Ferrous alloy
Protective Polymer Coating	None

CONNECTOR DIMENSIONS

Length	22"
Nominal Tubing Diameter	1/2"

FITTING DESIGN AND DIMENSIONS

Dimension Across Flats	1"
Flat Length	13/16"
Shoulder Length/Male	.760"/.676"
Shoulder Length/Female	

INSTRUCTIONS

Compliant

MARKING

Permanent Labeling	Compliant
Removable Fittings Marked	Compliant

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5
6

GAS APPLIANCE CONNECTOR SURVEY

MANUFACTURER: [REDACTED]
SAMPLE NUMBER: [REDACTED]
DATE OF MANUFACTURE: 1976

MATERIALS

COMMENTS

Tubing Composition	Brass
Permanent Fitting Composition	Ferrous alloy
Removable Fitting Composition	Ferrous alloy
Protective Polymer Coating	Yes

CONNECTOR DIMENSIONS

Length	47 1/4"
Nominal Tubing Diameter	1/2"

FITTING DESIGN AND DIMENSIONS

Dimension Across Flats	1"
Flat Length	13/16"
Shoulder Length/Male	
Shoulder Length/Female	.503"/.698"

INSTRUCTIONS

Non-compliant: psi caution not present

MARKING

Permanent Labeling	Compliant
Removable Fittings Marked	Compliant

15

6
4-3

GAS APPLIANCE CONNECTOR SURVEY

MANUFACTURER: [REDACTED]
SAMPLE NUMBER: [REDACTED]
DATE OF MANUFACTURE: 1976

MATERIALS

COMMENTS

Tubing Composition	Brass
Permanent Fitting Composition	Ferrous alloy
Removable Fitting Composition	Ferrous alloy
Protective Polymer Coating	Yes

CONNECTOR DIMENSIONS

Length	34 1/8"
Nominal Tubing Diameter	3/8"

FITTING DESIGN AND DIMENSIONS

Dimension Across Flats	7/8"
Flat Length	3/8"
Shoulder Length/Male	.769"
Shoulder Length/Female	.685"

INSTRUCTIONS

Non-compliant: psi caution not included

MARKING

Permanent Labeling	Compliant
Removable Fittings Marked	Compliant

91

GAS APPLIANCE CONNECTOR SURVEY

MANUFACTURER: [REDACTED]
SAMPLE NUMBER: [REDACTED]
DATE OF MANUFACTURE: 1975

MATERIALS

COMMENTS

Tubing Composition	Brass
Permanent Fitting Composition	Ferrous alloy
Removable Fitting Composition	Ferrous alloy
Protective Polymer Coating	Yes

CONNECTOR DIMENSIONS

Length	34 3/8"
Nominal Tubing Diameter	1/2"

FITTING DESIGN AND DIMENSIONS

Dimension Across Flats	31/32"
Flat Length	13/16"
Shoulder Length/Male	.597"/.516"
Shoulder Length/Female	

INSTRUCTIONS

Compliant

MARKING

Permanent Labeling	Compliant
Removable Fittings Marked	Compliant

17

GAS APPLIANCE CONNECTOR SURVEY

MANUFACTURER: *For* [REDACTED]
SAMPLE NUMBER: [REDACTED]
DATE OF MANUFACTURE: 1975

MATERIALS

COMMENTS

Tubing Composition	Aluminum <i>SS</i>
Permanent Fitting Composition	Ferrous alloy
Removable Fitting Composition	Ferrous alloy
Protective Polymer Coating	None

CONNECTOR DIMENSIONS

Length	10 3/8"
Nominal Tubing Diameter	1/2"

Rusty Nuts

FITTING DESIGN AND DIMENSIONS

Dimension Across Flats	1"
Flat Length	21/32"
Shoulder Length/Male	
Shoulder Length/Female	.708"

INSTRUCTIONS

Compliant

MARKING

Permanent Labeling	Compliant
Removable Fittings Marked	Compliant — <i>No Mfg</i>

81

GAS APPLIANCE CONNECTOR SURVEY

MANUFACTURER: [REDACTED]
SAMPLE NUMBER: [REDACTED]
DATE OF MANUFACTURE: 1976

MATERIALS

COMMENTS

Tubing Composition	Brass
Permanent Fitting Composition	Ferrous alloy
Removable Fitting Composition	Ferrous alloy
Protective Polymer Coating	Yes

CONNECTOR DIMENSIONS

Length	45"
Nominal Tubing Diameter	1/2"

FITTING DESIGN AND DIMENSIONS

Dimension Across Flats	1"
Flat Length	3/4"
Shoulder Length/Male	
Shoulder Length/Female	.759"/.575"

INSTRUCTIONS

Non-compliant: psi caution and connector illustration not included

MARKING

Permanent Labeling	Compliant
Removable Fittings Marked	Compliant

61

GAS APPLIANCE CONNECTOR SURVEY

MANUFACTURER: [REDACTED]
SAMPLE NUMBER: [REDACTED]
DATE OF MANUFACTURE: 1973

MATERIALS	COMMENTS
Tubing Composition	Brass
Permanent Fitting Composition	Brass
Removable Fitting Composition	Brass
Protective Polymer Coating	None

CONNECTOR DIMENSIONS	
Length	57 5/8"
Nominal Tubing Diameter	1/4"

FITTING DESIGN AND DIMENSIONS	
Dimension Across Flats	3/4"
Flat Length	1/2"
Shoulder Length/Male	
Shoulder Length/Female	.787"

INSTRUCTIONS	
	Compliant

MARKING	
Permanent Labeling	Compliant
Removable Fittings Marked	Compliant

20

GAS APPLIANCE CONNECTOR SURVEY

MANUFACTURER: [REDACTED]
SAMPLE NUMBER: [REDACTED]
DATE OF MANUFACTURE: 1976

MATERIALS

Tubing Composition	Brass
Permanent Fitting Composition	Brass
Removable Fitting Composition	
Protective Polymer Coating	Yes

COMMENTS

CONNECTOR DIMENSIONS

Length	33 5/8"
Nominal Tubing Diameter	1/4"

FITTING DESIGN AND DIMENSIONS

Dimension Across Flats	3/4"
Flat Length	1/2"
Shoulder Length/Male	
Shoulder Length/Female	

INSTRUCTIONS

Non-compliant: psi caution and connector illustration not included

MARKING

Permanent Labeling	Compliant
Removable Fittings Marked	Compliant

12
41

GAS APPLIANCE CONNECTOR SURVEY

MANUFACTURER: [REDACTED]
SAMPLE NUMBER: [REDACTED]
DATE OF MANUFACTURE: 1976

MATERIALS

Tubing Composition	Brass
Permanent Fitting Composition	Ferrous alloy
Removable Fitting Composition	Brass
Protective Polymer Coating	Yes

COMMENTS

CONNECTOR DIMENSIONS

Length	35 1/8"
Nominal Tubing Diameter	1/2"

FITTING DESIGN AND DIMENSIONS

Dimension Across Flats	29/32"
Flat Length	3/4"
Shoulder Length/Male	
Shoulder Length/Female	.685"

INSTRUCTIONS

Non-compliant: psi caution and connector illustration not included

MARKING

Permanent Labeling	Compliant
Removable Fittings Marked	Compliant

22

13
* 52

GAS APPLIANCE CONNECTOR SURVEY

MANUFACTURER: [REDACTED]
SAMPLE NUMBER: [REDACTED]
DATE OF MANUFACTURE: 1975

MATERIALS

Tubing Composition	Brass
Permanent Fitting Composition	Brass
Removable Fitting Composition	Brass
Protective Polymer Coating	None

COMMENTS

CONNECTOR DIMENSIONS

Length	40"
Nominal Tubing Diameter	1/2"

FITTING DESIGN AND DIMENSIONS

Dimension Across Flats	1"
Flat Length	5/8"
Shoulder Length/Male	
Shoulder Length/Female	.671"

INSTRUCTIONS

Compliant

MARKING

Permanent Labeling	Compliant
Removable Fittings Marked	Compliant

63

* $\frac{14}{13}$

GAS APPLIANCE CONNECTOR SURVEY

MANUFACTURER: [REDACTED]
SAMPLE NUMBER: [REDACTED]
DATE OF MANUFACTURE: 1974

MATERIALS COMMENTS

Tubing Composition	Brass
Permanent Fitting Composition	Ferrous alloy
Removable Fitting Composition	Brass
Protective Polymer Coating	None

CONNECTOR DIMENSIONS

Length	21 1/2"
Nominal Tubing Diameter	1/2"

FITTING DESIGN AND DIMENSIONS

Dimension Across Flats	1"
Flat Length	3/4"
Shoulder Length/Male	
Shoulder Length/Female	.641"

INSTRUCTIONS Compliant

MARKING

Permanent Labeling	Compliant
Removable Fittings Marked	Compliant

24

15
5

GAS APPLIANCE CONNECTOR SURVEY

MANUFACTURER: [REDACTED]
SAMPLE NUMBER: [REDACTED]
DATE OF MANUFACTURE: None listed

MATERIALS

Tubing Composition	Brass
Permanent Fitting Composition	Brass
Removable Fitting Composition	Brass
Protective Polymer Coating	None

COMMENTS

CONNECTOR DIMENSIONS

Length	15 5/8"
Nominal Tubing Diameter	1/4"

FITTING DESIGN AND DIMENSIONS

Dimension Across Flats	5/8"
Flat Length	9/32"
Shoulder Length/Male	.564"
Shoulder Length/Female	.517"

INSTRUCTIONS

Non-compliant: none

MARKING

Permanent Labeling
Removable Fittings Marked

Non-compliant: date of manu not present
Non-compliant: manufacturer's symbol on surface
subject to tool usage

25

16
14

GAS APPLIANCE CONNECTOR SURVEY

MANUFACTURER: [REDACTED]
SAMPLE NUMBER: [REDACTED]
DATE OF MANUFACTURE: 1974

MATERIALS

COMMENTS

Tubing Composition	Brass
Permanent Fitting Composition	Ferrous alloy
Removable Fitting Composition	Ferrous alloy
Protective Polymer Coating	None

CONNECTOR DIMENSIONS

Length	56 1/4"
Nominal Tubing Diameter	1/2"

FITTING DESIGN AND DIMENSIONS

Dimension Across Flats	1"
Flat Length	25/32"
Shoulder Length/Male	
Shoulder Length/Female	.779"

INSTRUCTIONS

Compliant

MARKING

Permanent Labeling	Compliant
Removable Fittings Marked	Compliant

26

17
61

GAS APPLIANCE CONNECTOR SURVEY

MANUFACTURER: [REDACTED]
SAMPLE NUMBER: [REDACTED]
DATE OF MANUFACTURE: 1972

MATERIALS

Tubing Composition	Brass
Permanent Fitting Composition	Brass
Removable Fitting Composition	Brass
Protective Polymer Coating	None

COMMENTS

CONNECTOR DIMENSIONS

Length	9 1/8"
Nominal Tubing Diameter	1/2"

FITTING DESIGN AND DIMENSIONS

Dimension Across Flats	1"
Flat Length	19/32"
Shoulder Length/Male	.788"
Shoulder Length/Female	.748"

INSTRUCTIONS

Compliant

MARKING

Permanent Labeling	Compliant
Removable Fittings Marked	Compliant

67

18
49

GAS APPLIANCE CONNECTOR SURVEY

MANUFACTURER: [REDACTED]
SAMPLE NUMBER: [REDACTED]
DATE OF MANUFACTURE: 1976

MATERIALS

COMMENTS

Tubing Composition	Brass
Permanent Fitting Composition	Brass
Removable Fitting Composition	Brass
Protective Polymer Coating	Yes

CONNECTOR DIMENSIONS

Length	35 5/8"
Nominal Tubing Diameter	3/8"

FITTING DESIGN AND DIMENSIONS

Dimension Across Flats	7/8"
Flat Length	1/2"
Shoulder Length/Male	
Shoulder Length/Female	.678"/.652"

INSTRUCTIONS

Non-compliant: psi caution and connector illustration not present

MARKING

Permanent Labeling	Compliant
Removable Fittings Marked	Compliant

28

19
57

GAS APPLIANCE CONNECTOR SURVEY

MANUFACTURER: [REDACTED]
SAMPLE NUMBER: [REDACTED]
DATE OF MANUFACTURE: 1976

MATERIALS

Tubing Composition	Brass
Permanent Fitting Composition	Brass
Removable Fitting Composition	Brass
Protective Polymer Coating	Yes

COMMENTS

CONNECTOR DIMENSIONS

Length	22 1/4"
Nominal Tubing Diameter	1/4"

FITTING DESIGN AND DIMENSIONS

Dimension Across Flats	3/4"
Flat Length	1/2"
Shoulder Length/Male	.788"
Shoulder Length/Female	.540"

INSTRUCTIONS

Non-compliant: psi caution and connector illustration not included

MARKING

Permanent Labeling	Compliant
Removable Fittings Marked	Compliant

62

GAS APPLIANCE CONNECTOR SURVEY

MANUFACTURER: [REDACTED]
SAMPLE NUMBER: [REDACTED]
DATE OF MANUFACTURE: 1975

MATERIALS

Tubing Composition
Permanent Fitting Composition
Removable Fitting Composition
Protective Polymer Coating

Brass
Ferrous alloy
Ferrous alloy
Yes

CONNECTOR DIMENSIONS

Length
Nominal Tubing Diameter

69 3/4"
1/2"

FITTING DESIGN AND DIMENSIONS

Dimension Across Flats
Flat Length
Shoulder Length/Male
Shoulder Length/Female

31/32"
3/4"
.795"/.737"

INSTRUCTIONS

Compliant

MARKING

Permanent Labeling
Removable Fittings Marked

Compliant
Compliant

21
2

GAS APPLIANCE CONNECTOR SURVEY

MANUFACTURER: [REDACTED]
SAMPLE NUMBER: [REDACTED]
DATE OF MANUFACTURE: 1976

MATERIALS

COMMENTS

Tubing Composition	Brass
Permanent Fitting Composition	Ferrous alloy
Removable Fitting Composition	Ferrous alloy
Protective Polymer Coating	Yes

CONNECTOR DIMENSIONS

Length	27 3/8"
Nominal Tubing Diameter	1/2"

FITTING DESIGN AND DIMENSIONS

Dimension Across Flats	1"
Flat Length	23/32"
Shoulder Length/Male	
Shoulder Length/Female	.729"

INSTRUCTIONS

Non-compliant: psi caution and connector illustration not included

MARKING

Permanent Labeling	Compliant
Removable Fittings Marked	Compliant

1/6

22
28

GAS APPLIANCE CONNECTOR SURVEY

MANUFACTURER: [REDACTED]
SAMPLE NUMBER: [REDACTED]
DATE OF MANUFACTURE: 1972

MATERIALS	COMMENTS
Tubing Composition	Brass
Permanent Fitting Composition	Brass
Removable Fitting Composition	Brass
Protective Polymer Coating	Yes
CONNECTOR DIMENSIONS	
Length	21 3/4"
Nominal Tubing Diameter	1/2"
FITTING DESIGN AND DIMENSIONS	
Dimension Across Flats	1"
Flat Length	5/8"
Shoulder Length/Male	
Shoulder Length/Female	.753"/.641"
INSTRUCTIONS	Compliant
MARKING	
Permanent Labeling	Compliant
Removable Fittings Marked	Compliant

22

23
34

GAS APPLIANCE CONNECTOR SURVEY

MANUFACTURER: [REDACTED]
SAMPLE NUMBER: [REDACTED]
DATE OF MANUFACTURE: 1976

MATERIALS

COMMENTS

Tubing Composition	Brass
Permanent Fitting Composition	Ferrous alloy
Removable Fitting Composition	Ferrous alloy
Protective Polymer Coating	Yes

CONNECTOR DIMENSIONS

Length	33 1/8"
Nominal Tubing Diameter	1/2"

FITTING DESIGN AND DIMENSIONS

Dimension Across Flats	1"
Flat Length	3/4"
Shoulder Length/Male	
Shoulder Length/Female	.770"/.572"

INSTRUCTIONS

Non-compliant: psi caution and connector illustration not provided

MARKING

Permanent Labeling	Compliant
Removable Fittings Marked	Compliant

33

* 24
52

GAS APPLIANCE CONNECTOR SURVEY

MANUFACTURER: [REDACTED]
SAMPLE NUMBER: [REDACTED]
DATE OF MANUFACTURE: 1975

MATERIALS

COMMENTS

Tubing Composition	Brass
Permanent Fitting Composition	Ferrous alloy
Removable Fitting Composition	Brass
Protective Polymer Coating	None

CONNECTOR DIMENSIONS

Length	21 7/8"
Nominal Tubing Diameter	1/2"

FITTING DESIGN AND DIMENSIONS

Dimension Across Flats	31/32"
Flat Length	25/32"
Shoulder Length/Male	
Shoulder Length/Female	.727"

INSTRUCTIONS

Compliant

MARKING

Permanent Labeling	Compliant
Removable Fittings Marked	Compliant

34

25
46

GAS APPLIANCE CONNECTOR SURVEY

MANUFACTURER: [REDACTED]
SAMPLE NUMBER: [REDACTED]
DATE OF MANUFACTURE: 1976

MATERIALS

COMMENTS

Tubing Composition	Aluminum SS
Permanent Fitting Composition	Ferrous alloy
Removable Fitting Composition	Ferrous alloy
Protective Polymer Coating	None

CONNECTOR DIMENSIONS

Length	22 1/8"
Nominal Tubing Diameter	1/2"

FITTING DESIGN AND DIMENSIONS

Dimension Across Flats	1"
Flat Length	11/16"
Shoulder Length/Male	.821"
Shoulder Length/Female	.708"

INSTRUCTIONS

Non-compliant: PSI caution and connector illustration not included

MARKING

Permanent Labeling	Compliant
Removable Fittings Marked	Compliant

35

26

X

55

GAS APPLIANCE CONNECTOR SURVEY

MANUFACTURER: [REDACTED]
SAMPLE NUMBER: [REDACTED]
DATE OF MANUFACTURE: 1976

MATERIALS

COMMENTS

Tubing Composition	Aluminum
Permanent Fitting Composition	SS
Removable Fitting Composition	Ferrous alloy
Protective Polymer Coating	Ferrous alloy
	None

CONNECTOR DIMENSIONS

Length	34 3/4"
Nominal Tubing Diameter	1/2"

FITTING DESIGN AND DIMENSIONS

Dimension Across Flats	1 1/8"
Flat Length	27/32"
Shoulder Length/Male	
Shoulder Length/Female	.650"

INSTRUCTIONS

Compliant

MARKING

Permanent Labeling	Compliant
Removable Fittings Marked	Non-compliant

36

27
17

GAS APPLIANCE CONNECTOR SURVEY

MANUFACTURER:
SAMPLE NUMBER:
DATE OF MANUFACTURE: 1976

MATERIALS

Tubing Composition
Permanent Fitting Composition
Removable Fitting Composition
Protective Polymer Coating

Brass
Brass
Ferrous alloy
Yes

COMMENTS

CONNECTOR DIMENSIONS

Length
Nominal Tubing Diameter

32 3/4"
1/2"

FITTING DESIGN AND DIMENSIONS

Dimension Across Flats
Flat Length
Shoulder Length/Male
Shoulder Length/Female

1"
21/32"
.775"

INSTRUCTIONS

Non-compliant: psi caution and connector
illustration not included

MARKING

Permanent Labeling
Removable Fittings Marked

Compliant
Compliant

67

28
23

GAS APPLIANCE CONNECTOR SURVEY

MANUFACTURER: [REDACTED]
SAMPLE NUMBER: [REDACTED]
DATE OF MANUFACTURE: 1976

MATERIALS

COMMENTS

Tubing Composition	Brass
Permanent Fitting Composition	Ferrous alloy
Removable Fitting Composition	Ferrous alloy
Protective Polymer Coating	Yes

CONNECTOR DIMENSIONS

Length	22 3/8"
Nominal Tubing Diameter	1/4"

FITTING DESIGN AND DIMENSIONS

Dimension Across Flats	25/32"
Flat Length	13/32"
Shoulder Length/Male	.774"
Shoulder Length/Female	.628"

INSTRUCTIONS

Non-compliant: psi caution and connector illustration not included

MARKING

Permanent Labeling	Compliant
Removable Fittings Marked	Compliant

38

29
32

GAS APPLIANCE CONNECTOR SURVEY

MANUFACTURER: [REDACTED]
SAMPLE NUMBER: [REDACTED]
DATE OF MANUFACTURE: 1976

MATERIALS

Tubing Composition	Brass
Permanent Fitting Composition	Brass
Removable Fitting Composition	Brass
Protective Polymer Coating	Yes

COMMENTS

CONNECTOR DIMENSIONS

Length	33 1/8"
Nominal Tubing Diameter	3/8"

FITTING DESIGN AND DIMENSIONS

Dimension Across Flats	29/32"
Flat Length	1/2"
Shoulder Length/Male	.785"
Shoulder Length/Female	.605"

INSTRUCTIONS

Non-compliant: psi caution and connector illustration not included

MARKING

Permanent Labeling	Compliant
Removable Fittings Marked	Compliant

39

X

GAS APPLIANCE CONNECTOR SURVEY

MANUFACTURER: [REDACTED]
SAMPLE NUMBER: [REDACTED]
DATE OF MANUFACTURE: 1976

MATERIALS

COMMENTS

Tubing Composition	Brass
Permanent Fitting Composition	Brass
Removable Fitting Composition	Ferrous alloy
Protective Polymer Coating	Yes

CONNECTOR DIMENSIONS

Length	15 1/2"
Nominal Tubing Diameter	1/2"

FITTING DESIGN AND DIMENSIONS

Dimension Across Flats	1"
Flat Length	5/8"
Shoulder Length/Male	
Shoulder Length/Female	.615"/.732"

INSTRUCTIONS

Non-compliant: psi caution and connector illustration not included

MARKING

Permanent Labeling	Compliant
Removable Fittings Marked	Compliant

42

30
57

GAS APPLIANCE CONNECTOR SURVEY

MANUFACTURER: [REDACTED]
SAMPLE NUMBER: [REDACTED]
DATE OF MANUFACTURE: 1976

MATERIALS

COMMENTS

Tubing Composition	Brass
Permanent Fitting Composition	Ferrous alloy
Removable Fitting Composition	Ferrous alloy
Protective Polymer Coating	Yes

CONNECTOR DIMENSIONS

Length	34 1/2"
Nominal Tubing Diameter	3/8"

FITTING DESIGN AND DIMENSIONS

Dimension Across Flats	7/8"
Flat Length	1/2"
Shoulder Length/Male	.770"
Shoulder Length/Female	.510"

INSTRUCTIONS

Non-compliant: psi caution and connector illustration not included

MARKING

Permanent Labeling	Compliant
Removable Fittings Marked	Compliant

07

31
45

GAS APPLIANCE CONNECTOR SURVEY

MANUFACTURER: [REDACTED]
SAMPLE NUMBER: [REDACTED]
DATE OF MANUFACTURE: 1975

MATERIALS

COMMENTS

Tubing Composition	Brass
Permanent Fitting Composition	Ferrous alloy
Removable Fitting Composition	Ferrous alloy
Protective Polymer Coating	Yes

CONNECTOR DIMENSIONS

Length	10 1/8"
Nominal Tubing Diameter	3/8"

FITTING DESIGN AND DIMENSIONS

Dimension Across Flats	7/8"
Flat Length	23/32"
Shoulder Length/Male	.775"
Shoulder Length/Female	.622"

INSTRUCTIONS

Compliant

MARKING

Permanent Labeling	Compliant
Removable Fittings Marked	Compliant

17

33
19

GAS APPLIANCE CONNECTOR SURVEY

MANUFACTURER: [REDACTED]
SAMPLE NUMBER: [REDACTED]
DATE OF MANUFACTURE: 1975

MATERIALS

COMMENTS

Tubing Composition	Brass
Permanent Fitting Composition	Ferrous alloy
Removable Fitting Composition	Ferrous alloy
Protective Polymer Coating	Yes

CONNECTOR DIMENSIONS

Length	11 1/4"
Nominal Tubing Diameter	3/8"

FITTING DESIGN AND DIMENSIONS

Dimension Across Flats	7/8"
Flat Length	1/2"
Shoulder Length/Male	
Shoulder Length/Female	.607"

INSTRUCTIONS

Compliant

MARKING

Permanent Labeling	Compliant
Removable Fittings Marked	Compliant

43

34
8

GAS APPLIANCE CONNECTOR SURVEY

MANUFACTURER: [REDACTED]
SAMPLE NUMBER: [REDACTED]
DATE OF MANUFACTURE: None listed

MATERIALS

COMMENTS

Tubing Composition	Brass
Permanent Fitting Composition	Ferrous alloy
Removable Fitting Composition	Ferrous alloy
Protective Polymer Coating	None

CONNECTOR DIMENSIONS

Length	21 3/8"
Nominal Tubing Diameter	1/2"

FITTING DESIGN AND DIMENSIONS

Dimension Across Flats	1"
Flat Length	11/16"
Shoulder Length/Male	
Shoulder Length/Female	.776"

INSTRUCTIONS

Compliant

MARKING

Permanent Labeling
Removable Fittings Marked

Non-compliant: metal ring blank; no manu/date
Non-compliant

44

35
58

GAS APPLIANCE CONNECTOR SURVEY

MANUFACTURER: [REDACTED]
SAMPLE NUMBER: [REDACTED]
DATE OF MANUFACTURE: 1974

MATERIALS

COMMENTS

Tubing Composition	Brass
Permanent Fitting Composition	Ferrous alloy
Removable Fitting Composition	Ferrous alloy
Protective Polymer Coating	None

CONNECTOR DIMENSIONS

Length	33 1/2"
Nominal Tubing Diameter	1/4"

FITTING DESIGN AND DIMENSIONS

Dimension Across Flats	3/4"
Flat Length	3/8"
Shoulder Length/Male	.800"
Shoulder Length/Female	

INSTRUCTIONS

Compliant

MARKING

Permanent Labeling	Compliant
Removable Fittings Marked	Compliant

45