

METAL *Ballows* CORPORATION

NUCLEAR

IM 73989

INSTRUCTION MANUAL

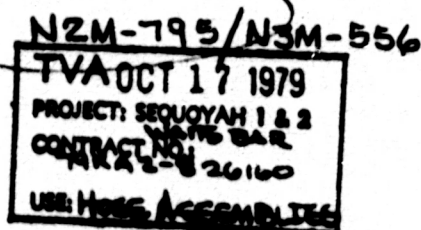
INSTALLATION, INSPECTION AND HANDLING

FOR

HOSE ASSEMBLY - FLEXIBLE METAL

PER ASME SECTION III, CLASS 2

MBC P/N 73989



No. of Pages: 12

July 28, 1978

Attachment I - CR 429

Revision C, October 10, 1979

INDEX OF REVISIONS

| Date and Rev. | Pages Affected | | | Remarks | Revised by |
|---------------|-------------------------|--------|---------|---|-------------------------------|
| | Revised | Added | Deleted | | |
| 11-21-78 A | Cover sheet & Page 3 | Page i | | Deleted Installation Configurations from Figure 1. | <i>RWB Hyslop</i> |
| 2-19-79 B | Cover, i, 1 | | | Revised Paragraph 4.0. Updated Figure 1 | <i>RWB Hyslop</i> |
| 10/10/79 C | All Pages | | | Completely revised | <i>RWB Hyslop</i> 10-11-79 |

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NOTICE

SINCE METAL BELLOWS CORP. IS NOT
SUPERVISING OR PERFORMING THE
INSTALLATION, METAL BELLOWS CORP.
CANNOT BE HELD RESPONSIBLE FOR
DAMAGE RESULTING FROM IMPROPER
HANDLING AND INSTALLATION.

1.0 SCOPE

This document presents the instructions and information for installation, inservice inspection, site storage and handling requirements for Flexible Metal Instrument Hose Assembly per ASME Section III, Class 2, hereinafter referred to as the "Hose Assembly", Metal Bellows Corporation (MBC) P/N 73989.

2.0 APPLICABLE DOCUMENTS

2.1 Metal Bellows Corporation

73989 Drawing, Hose Assembly - Flexible Metal Per ASME Section III, Class 2.

CR 429 Allowable Installation Configuration for Metal Bellows Corporation No. 73989 - Flexible Metal Hose Assembly.

3.0 DESCRIPTION

The hose assembly is an all metal constructed configuration with a flexible convoluted interior wall, a braided exterior and containing tube ends. The flexible section of the hose assembly is a nominal 0.44 inch inside diameter, 0.81 outside diameter and approximately 36.00 inches long. The ends are 0.500 outside diameter tubing of 0.095 inch wall thickness, approximately 2.38 inches long with a total free length of approximately 42.2 inches. The hose assembly is shown in Figure 1.

3.1 DO

- A. DO - READ INSTRUCTION MANUAL PRIOR TO INSTALLATION. For additional copies of manual call Metal Bellows Corporation at (213) 341-4900, or write 20960 Knapp Street, Chatsworth, CA 91311.
- B. DO - PROTECT HOSE ASSEMBLY FROM DIRT, WELD SPLATTER, ETC.
- C. DO - REPLACE HOSE ASSEMBLY IF BRAID APPEARS DAMAGED.
- D. DO - WELD ROOT VALVE TO PROCESS PIPE FIRST.
- E. DO - INSTALL HOSE AS THE LAST OPERATION.

3.2 DON'T

- A. DON'T - CRIMP OR BEND HOSE ASSEMBLY SHARPLY.
- B. DON'T - CRUSH HOSE ASSEMBLY.
- C. DON'T - INSTALL WITH END TO END TWIST (TORSION)
- D. DON'T - WELD ROOT VALVE TO HOSE FIRST.

4.0 INSTRUCTION FOR INSTALLATION

- A. The allowable installation configurations for MBC P/N 73989, shown in Figure 1, is presented in MBC report CR 429, enclosed herein as Attachment I.
- B. Hose ends must be in the same spatial plane.
- C. MBC recommends that root valve be installed upstream of hose (Not required by ASME Code except where hose attaches to class 1 piping or pressure vessel).
- D. The hose assembly should be installed as the final component in the pressure system to minimize possible damage.
- E. Any deviation from the recommended practice of this document should be addressed to Metal Bellows Corporation for approval and/or additional instructions.

4.1 Installation

4.1.1 Non-Welded End

MBC recommends the utilization of a three degree restraint tubing clamp, J. C. White Company or equivalent, on the tube end between the flexible section and the tube connection on all non-welded installation, as shown in Figure 2. (MBC has not performed any qualification testing on a swage type coupling)

4.1.2 Welded End

MBC recommends a maximum length of " L " inches of unsupported tubing to the first clamp for all welded installation, as shown in Figures 3 & 4. This length is provided to ensure that the tube bending stresses at the first anchor caused by the hose imposed loads will meet the requirements of ASME Section III Paragraph NC3650 and that the natural frequency of the system (hose and unsupported tubing) will be above 33 Hz.

4.1.3 Procedure

4.1.3.1 Semi-Welded Installation (Figure 2)

- A. Select the desired installation configuration that best meets motion and envelope requirements from those listed in CR 429. These configurations may be in any spatial plane and if possible, should be one of the configurations that has an asterick (*) along the left hand column.
- B. Install root valve (if used) to process pipe or pressure vessel.

5.3 Physical

The hose assembly shall be physically examined for any permanent damage to the outer braid from improper handling and/or excessive bending. MBC recommends replacement of the hose assembly if there is any evidence of broken or cut wires, bent or creased wire, braid bulging, or braid strand separation. Typical braid damage as caused by bending the hose very sharply (Centerline bend radius less than 3.0 in.) then bending back straight, is shown in Figure 5.

ANY HOSE ASSEMBLY IN QUESTION, SHOULD BE RETURNED TO MBC FOR EVALUATION AND/OR REFURNISHMENT.

5.4 Testing

After installation, the hose pipe system shall be hydrostatic tested to 1.5 times design operating pressure and examined per the requirements of NC 6000. During this test the hose and braid shall be observed to see if any water will leak, seep or flow thru the pervious braid cover if a leak occurs.

The inspector shall be within 3 feet of hose, or equivalent with optical amplification, to verify no moisture is on braid due to leakage.

5.5 Inservice Inspection

In addition to the inservice inspection program required by the applicable ASME Code, and at the same time, each hose shall be visually inspected for any evidence of braid damage as noted in Paragraph 5.3. Inspector performing the examination shall be within 3 feet of the hose, or equivalent distance with optical amplification. Any hose in question shall be replaced.

6.0 SITE STORAGE AND HANDLING

6.1 Site Storage

The hose assembly ends are closed with suitable covers or plugs, sealed with pressure sensitive tape, sealed in a single 6 mil polyethylene bag and shipped in a normal fiberboard box of a maximum of ten (10) per box. The hose assemblies shall be kept in their shipping condition until ready for installation. The hose assembly is not effected by the storage environment; therefore, no additional precaution is required.

6.2 Handling

The hose assembly weighs approximately two (2) pounds; therefore, it can easily be handled by one person. No special equipment, lifting mechanisms and/or restraints are required. The hose assembly shall be supported at both ends when in the horizontal axis. Handling of the hose assembly in the horizontal axis at one end only with additional motion and/or whipping action could cause permant deformation and result in reduced life.

6.2 Handling, Con't

The hose assembly is a stainless steel welded configuration; therefore, no calibration, replacement of parts, lubrication, or any type of maintenance is required except noted inservice inspection.

1. Do not scale drawing.
2. Part to be free of burrs per
ES1018-5.
3. Design conditions:
Design Press: 2500 Psig max.
Design Temp: 70°F
Proof Press: 3300 Psig

4. Deleted.
5. Liquid Penetrant inspect welds & approve per AWS B1.1, C1.0.
6. Post heat treat. not required
7. Hose shall be capable of being bent to 90° Grad.
8. Mat'l traceability per ABC

Deleted. 10. Deleted.

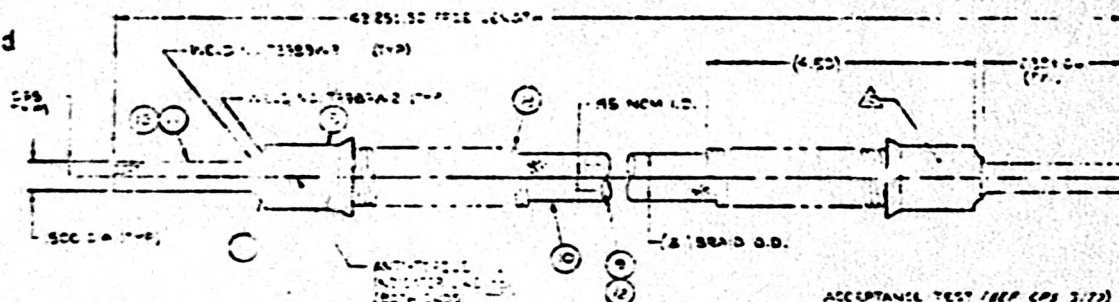
1. Hose design & manuf. shall meet the requirements of ASME Sec. III, C-2.

2. After Accep. Test. identify as shown with the following information:

Metal Bellows Co.
 2500 psig at 700°F max.
 PN 16519/03989-XXX
 Serial No. _____
 Year Built _____
 Code Case N-198 & N-192.

13. Deleted.
14. With one end fixed, the other end shall be capable of being offset 5 ins. in any direction as qual. by CR 364.
15. With one end fixed, the other end shall be capable of being offset up to 1" for infinite life.
16. With one end fixed, the other end shall be capable of an infinite life with a max. of 6g's imposed vibration.
17. With one end fixed, the other end shall be capable of $\pm 1"$ seismic motion in any direction, 100 cycles max.
18. Hose assy. shall be capable of 1500 psig operation at 1000°F for a max. of 50 hrs total.
19. Indicator lines to provide a visual indication that excess twist has not been imposed on hose after installation.
(See Instruction Manual IX-73939).

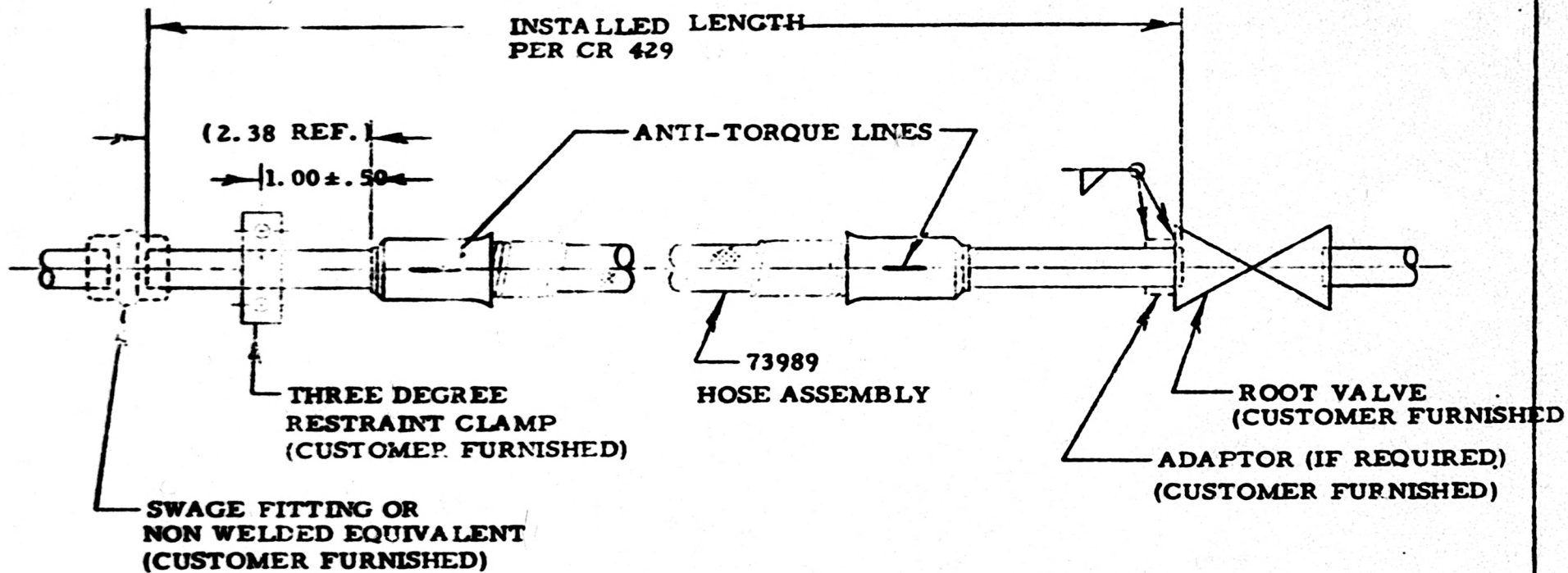
Weld per CPS 3043. Welding rod as requ'd per SFA 5.14 Type
A6.7.3. (Inconel 25) AWS Classif. ER-Ni-CR-MO-3.
See WBS Record for details of installation configurations.



1. HYDROSTATIC PROOF TEST AT 850 PSI FOR 30 MINUTES. THERE SHALL BE NO PERMANENT DEFORMATION.
2. MASS SPECTROMETER LEAK TEST PER EP-101. LEAKAGE SHALL NOT EXCEED 1×10^{-6} SEC/SIC MILLIAM AT ONE ATMOSPHERE Δ PRESSURE.
3. WELD PENETRANT INSPECT HELIOS (1995-12-14) PER NOTE 8 AFTER LEAK TESTING.

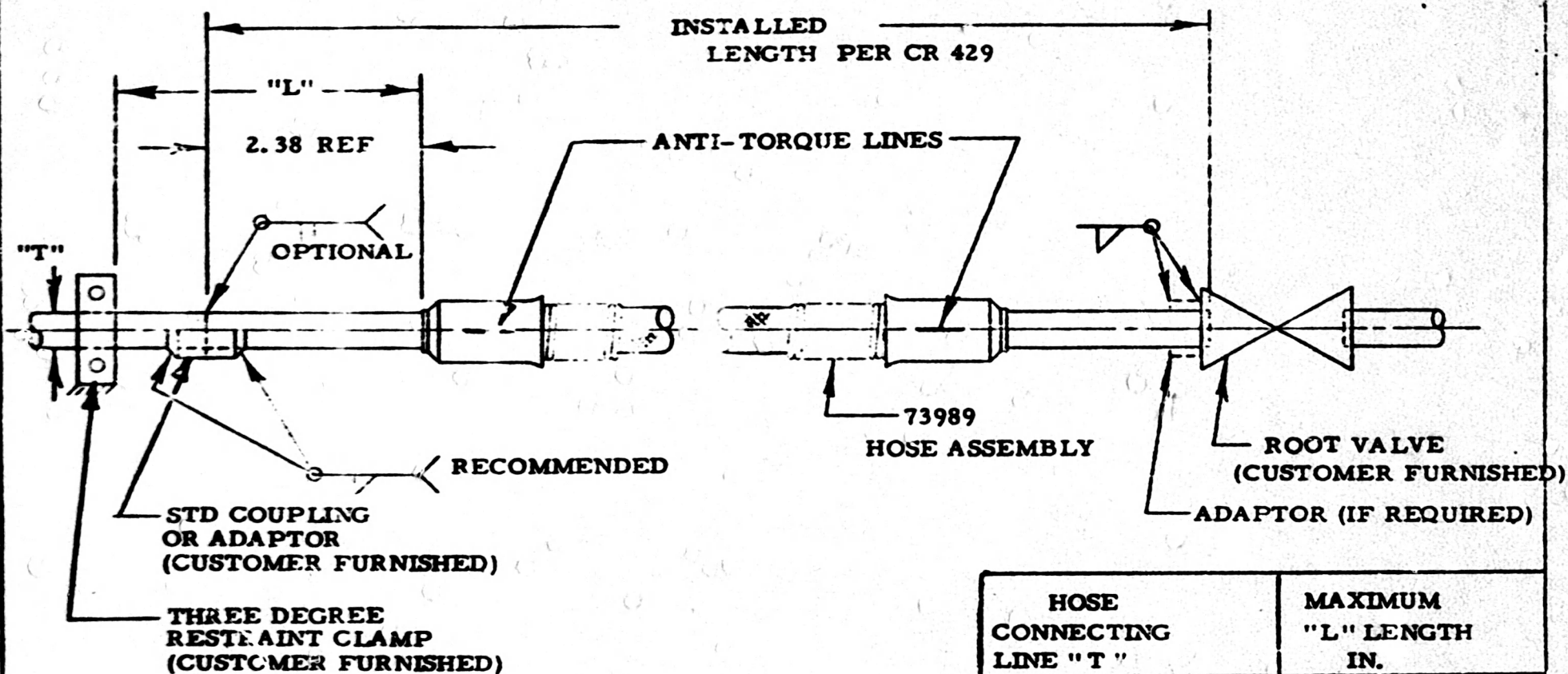
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Figure 1



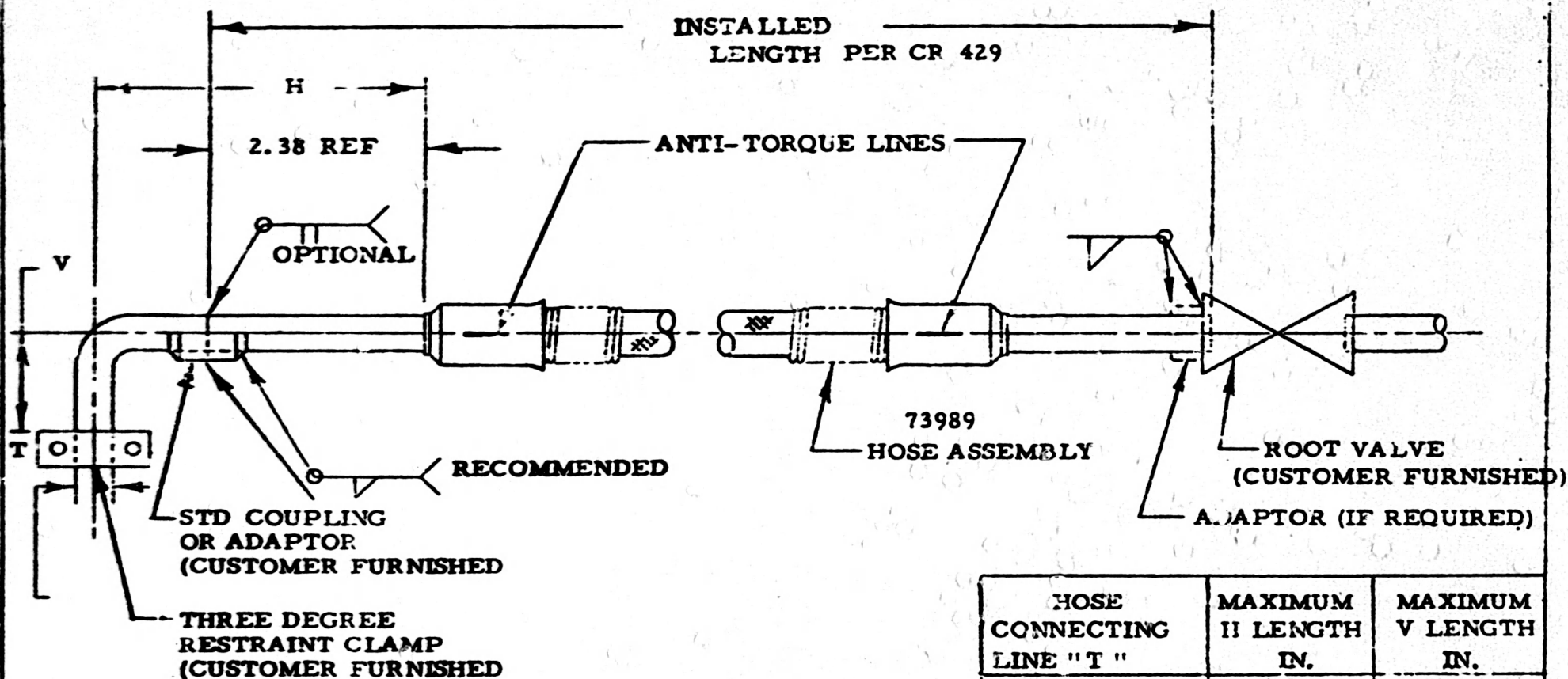
SEMI-WELDED INSTALLATION

FIGURE 2



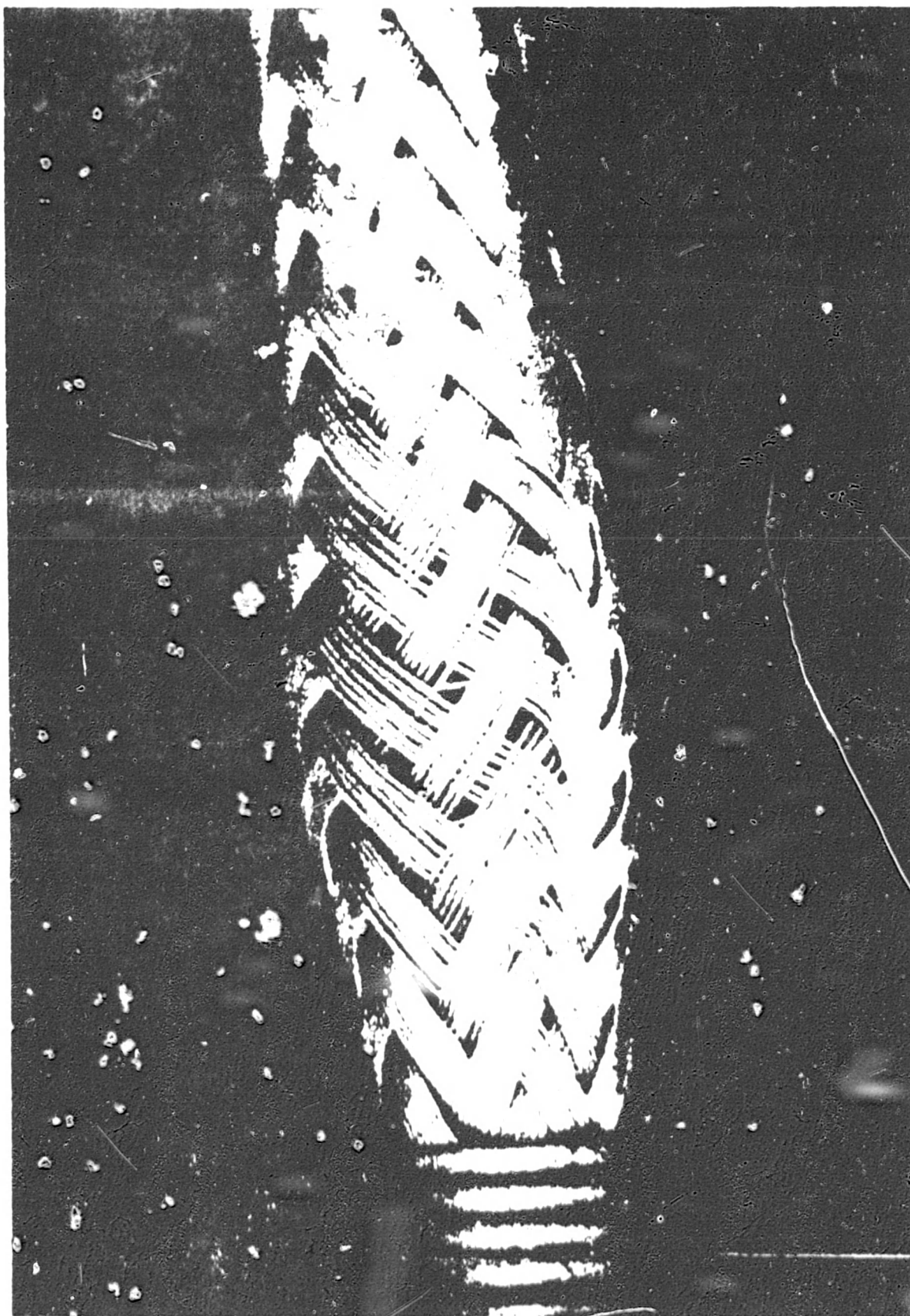
WELDED INSTALLATION
FIGURE 3

| HOSE CONNECTING LINE "T" | MAXIMUM "L" LENGTH IN. |
|--------------------------------|------------------------------|
| 3/8 DIA X .050 | 4 |
| 1/2 DIA X .093 | 6 |
| 3/4 DIA X .125 | 12 |
| 1/2 IPS SCH 40 | 12 |
| 3/4 IPS SCH 40 | 24 |
| 1 IPS SCH 40 | 36 |



WELDED INSTALLATION
FIGURE 4

| HOSE CONNECTING LINE "T" | MAXIMUM H LENGTH IN. | MAXIMUM V LENGTH IN. |
|--------------------------------|----------------------------|----------------------------|
| 3/8 DIA X .090 | 4 | 1 1/2 |
| 1/2 DIA X .093 | 6 | 3 |
| 3/4 DIA X .125 | 12 | 4 |
| 1/2 IPS SCH 40 | 12 | 6 |
| 3/4 IPS SCH 40 | 24 | 6 |
| 1 IPS SCH 40 | 36 | 12 |



PERMANENTLY DAMAGED HOSE ASSEMBLY

FIGURE 5

METAL *Bellows* CORPORATION
CHATSWORTH, CALIFORNIA

IM 73989

ATTACHMENT I

CR 429

**ALLOWABLE INSTALLATION CONFIGURATION
FOR
METAL BELLOWS CORPORATION PART NO. 73989
FLEXIBLE METAL HOSE ASSEMBLY**

4.1.3.1 Semi-Welded Installation (Figure 2) Con't

- C. Install balance of piping or tubing system on opposite side of hose.
- D. Prior to welding, inspect the installation to verify that the end points are within a tolerance of ± 0.50 of the selected configuration listed in CR 429 (See Figure 2 of where to measure). Hose end centerlines must lie in the same plane.
- E. After the installation configuration has been verified, insert one end of the hose assembly into the root valve connection (or mating connection). Rotate hose, if necessary so that when completely installed, both alignment lines are visible to check alignment per Paragraph 5.1. Secure this end in position by a (minimum) of four approximately equally spaced tack welds.
- F. Install the opposite end loosely in the three degree restraint clamp, with no twist in the hose assembly.
- G. Weld the end of the hose assembly in place at the root valve (or mating connection).
- H. With the end of the hose loosely in the three degree restraint clamp, hold the hose assembly in the center of the flex. hose and rapidly shake the hose several times, allowing the hose assembly to relax to eliminate any twist. If necessary, hold the hose in the installed position with one finger and tighten the clamp, securing this end in position.
- I. Install the swaged fitting (or connection) over the end of the hose assembly, while torquing the fitting, observe the end of the flexible hose, in particular the anti-torque line, to assure that no twist has been transmitted to the hose assembly.

4.1.3.2 Welded Installation (Figure 3)

- A. Select the desired installation configuration that best meets motion and envelope requirements from those listed in CR 429. These configurations may be in any spatial plane and if possible, should be one of the configurations that has an asterick (*) along the left hand column.
- B. Install root valve (if used) to process pipe or pressure vessel.
- C. Install balance of piping or tubing system on opposite side of hose.
- D. Prior to welding, inspect the installation to verify that the end points are within a tolerance of ± 0.50 of the selected configuration listed in CR 429 (See Figure 3 or 4 of where to measure). Hose end centerlines must lie in the same plane.

4.1.3.2 Welded Installation (Figure 3) Con't

- E. After the installation configuration has been verified, insert one end of the hose assembly into the root valve connection (or mating connection) rotate hose, if necessary so that when completely installed, both alignment lines are visible to check alignment per Paragraph 5.1. Secure this end in position by a (minimum) of four approximately equally spaced tack welds.
- F. Place opposite end of hose in its mating coupling with one hand and with the other hand rapidly shake the hose several inches several times to relax hose and eliminate any twist.
- G. Hold the hose assembly in the installed position with one finger allowing the hose assembly to remain relaxed to eliminate any twist, then secure this end in position with (minimum) four approximately equally spaced tack welds.
- H. Weld both ends of the hose assembly in position, welding shall proceed around the tube in the same direction on both ends of the hose assembly.

5.0 INSPECTION

5.1 Installation

Reverify the hose meets one of the installation configuration listed in CR 429.

The hose assembly contains anti-torque indicator lines at each end on the ferrule. After installation, sight along indicator lines to verify that no excessive twist has been imposed.

If the torque lines can be visually observed to be misaligned, this is considered excessive twist. Remove one end and reweld in accordance with applicable paragraph of Paragraph 4.1.3.2 or loosen fitting and clamp and retighten per Paragraph 4.1.3.1.

5.2 Examination

All welding performed shall be examined per the applicable requirements of NC 5000.