

NPAEN-DB-M

28 August 1969

SUBJECT: Recondition, Maintain, Replace Pipe, Haines to Fairbanks Pipeline, Alaska - Solicitation No. DACA85-70-B-0001

Division Engineer, North Pacific
ATTN NPDEN-TE

1. Reference is made to the DD Form 95 note from O. Brunstad dated 30 July 1969 to Emmett Herrle, NPDEN-DB-AR, with attached review comments by O. Brunstad dated 29 July 1969 pertinent to subject project.

2. The following comments, bearing like identifications to items listed on review comments referred to in paragraph 1 above, are submitted as action taken by this office:

a. Drawing No. 78-15-81, sh P-19, Items No. 1 and No. 2:

(1) The original pipeline, installed in 1954, was given a hydrostatic field test at 1734 psig. This was at a hoop stress of 90 percent of 30,000 psi minimum yield strength.

(2) API Std 5L, lists for 0.277-inch wall, schedule 30, Grade A pipe, the standard mill test of 1160 psig and alternate test at 1450 psig. For 0.322-inch schedule 40, the standard mill test is 1340 psig and the alternate is 1680 psig.

(3) The project specification requires that a mill hydrostatic test pressure be applied at 1650 psig to 0.277-inch wall and 1700 psig for 0.322-inch wall pipe.

(4) The API Std 5L allows a minus 12.5 percent wall tolerance. A minus 12.5 percent wall tolerance would make 0.277-inch nominal wall thickness allowable at 0.2424-inch wall thickness. Using the 30,000 psi minimum yield strength and a wall thickness of 0.2427 inches, the hoop stress is computed to be 1686 psig at 100 percent of minimum. This office elected to specify 1650 psig as mill test to be applied to 0.277-inch nominal wall thickness pipe. As will be seen from the attached

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United States Steel Corporation's certified test reports, a hydrostatic test pressure of 1690 psig was applied to the 0.277-inch wall and 1960 psig to the 0.322-inch wall pipe.

(5) The applicable Code for Pressure Piping, Liquid Petroleum Transportation Piping Systems, USASI B31.4-1966, has increased hydrostatic test pressure from 1.1 times the internal design pressure and not to exceed 90 percent of yield strength to 1.25 times the internal design pressure with provision to allow for a hoop stress that exceeds the 90 percent of yield strength.

(6) The design is predicated upon the requirement that the pipeline, after reconditioning and replacement, shall qualify under the latest edition of the Code for Pressure Piping. This requirement is met, for a line designed for maximum operating pressure of 1440 psig, with the 1800 psig hydrostatic pressure test specified on page 15D-32, in subparagraph 42.7, Amendment No. 6 to subject solicitation.

(7) The protection for field welded girth pipe joints is specified on page 15C-8, paragraph 9, Amendment No. 6. The joints, following the welding, will be wrapped on tape-wrapped pipe, or thermofit sleeves will be applied on extruded polyethylene sheath coated pipe. The requirement for a pneumatic air pressure test has been stripped from the specifications. As soon as joints are covered, the pipeline may be covered or be left exposed. Due to soft ground and cave-in, the pipe will probably be covered, and ditch backfilled, prior to application of the hydrostatic test pressures.

(8) The frequency of inspection and of testing of girth welds is specified on page 15P-2, paragraph 4, in Amendment No. 5. It is specified that all girth welds shall be examined by the X-ray method. The 100 percent X-ray requirement would detect weld porosity defects that would permit leaks. Consequently, any attempt to keep a 12-mile ditch open in soft ground, much of it in swamp area, to keep welded joints exposed until after the hydrostatic pressure test is applied did not appear to this office to be a reasonable, practicable, or tenable condition. Such an approach would be extremely costly, and with 100 percent X-ray of girth welds, a contract requirement to keep the pipeline exposed would have been an exercise without any benefits accruing to the work. With pipe to be tested at over 90 percent of hoop stress based upon the API 5L minimum yield strength (less hoop stress will exist in the pipe actually being installed), placing the pipe in the ditch prior to applying the hydrostatic test pressure will provide desirable confinement. If a piece of pipe welded into the pipeline is not structurally adequate, it will split open at 1800 psig test pressure. And this type

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of failure is what is being sought in the hydrostatic pressure test. Defective and structurally unsound pipe must be removed before the pipeline is transferred to the Petroleum Distribution Office, United States Army, Alaska Support Command. The likelihood of a split is very remote.

b. Drawing No. 78-15-81, sh P-1, Item No. 3:

Match line "C," 2041+23 occurs between aerial marker 125 and 126. The drawing with Amendment No. 1, dated 25 July 1969, shows match line "C" marked at two places on bottom strip at extreme right side, and on second strip from the bottom at the extreme left side. It appears that now the presently shown match line "C" 2041+23, which is shown in two places, is clear.

c. Drawing No. 78-15-81, sh P-20, Item No. 4:

Note C(2)(e) provides for a test pressure of 1800 psi (refer to narrative Amendment No. 6). Duration of test pressure is specified to be not less than 24 hours (refer to spec page 15D-33A, subparagraph 42.9, Amendment No. 5).

d. Drawing No. 78-15-81, sh P-1, Item 5:

Revision No. A4 shows a special note. The note coordinates the basic, Additive Item No. 1A, and Additive Item No. 2A shown on the bid form with Priorities No. I, II, and III shown on the drawings.

3. Inclosed are the certified test reports prepared by United States Steel Corporation at their National works on 1 August 1969 covering API Std 5L, Grade A steel pipe on customer's order No. AVP-753, U.S. Steel order No. AS49937. The physical data, mill minimum hydrostatic test pressures, mechanical properties, and chemical analysis, both check and ladle, are shown. This information is incorporated into the specifications on page 15D-33A, subparagraph 42.8, Amendment No. 5. It provides the specifications with information on the mechanical properties of the pipe to show the physical properties of the material actually being incorporated into the pipeline. This data is available to use to compute actual hoop stress that will exist in the pipe when the hydrostatic test pressure is applied at 1800 psi. The actual hoop stress will be far less, and therefore the margin of safety is far greater, as the yield strength of the pipe material exceeds the minimum yield strength given in the Code for Pressure Piping. Using the actual sample test data for the sample having the lowest yield strength of 40790 psi, it is computed that the new pipe, when being tested at 1800 psig hydrostatic test pressure, will be tested at a hoop stress of only 68.7 percent

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of yield. The maximum operating pressure of 1440 psig will cause an actual hoop stress of only 55 percent of yield strength in the new pipe being installed in the subject project.

4. A reply was not made to the review comments referred to in paragraph 1 above until this date for the reason that cut-off for preparation of contract documents did not occur until the last amendment was issued. The review comments by NPD were incorporated into the final documents, insofar as applicable, in the orderly sequence of the progress on the work.

FOR THE DISTRICT ENGINEER:

1 Incl
USS Corp Certified Test Rept
1 Aug 69 in 3 shts

Copies furnished:
PEAR
POL Unit

M
WARREN GEORGE
Chief, Engineering Division

28 Aug 69
ENGR
~~Tackes~~
~~Balhis~~
~~George~~

EJK 29 Aug 69 - Mr. Kreitlow/bgh/753-4110
OREC: Engr Div