PLAINTIFF'S
EXHIBIT
CHV-452

QUALIFICATION TEST FOR ALLOY LININGS USING STICK ELECTRODE

MATERIAL

The material to be used for the test is:

One piece of carbon steel plate 7 3/8" X 10 3/8" X 1/2", grit blasted on one side.

Three pieces of alloy sheet 3" X 6". Use 13 BWG unless otherwise specified to suite a special job.

1/8" welding electrodes conforming to the specifications shown below for the alloy to be welded.

Alloy Sheet	Weld Rod
Monel	Inconel 190
12% Cr	18-8 Cr Ni - AISI Type 309
18-8 Cr Ni	25-12 Cr Ni - AISI Type 309
18-8-3 Cr Ni Mo	16-13-3 Cr Ni Mo - AISI Type 316

CHEV B8 5999

WELDING PROCEDURE

All welding shall be done at a normal pace using 1/8" welding electrodes. All vertical fillet welds are to be made downhill. Weld over the tack welds unless they appear to be cracked. If they are cracked, grind them out before welding. No other grinding or chipping will be allowed except as specifically authorized by the person witnessing the test. Avoid striking the arc or hammering directly on the alloy sheets. Arc strikes and hammer dents promote cracking and corrosion in service installations. Tack weld strips to plate and proceed with welding as follows:

1. Place the sample plate in a vertical position with the alloy pieces oriented in the positions shown in the sketch.
2. Make a single fillet weld on all sides of pieces #2 and #3. Make the vertical welds downhill. When both fillets have been put into the center groove it should be completely filled with weld metal.
3. Place the sample plate in a horizontal position with the alloy pieces on the underside.
4. Make a single fillet weld in the overhead position on all sides of piece #1. If the groove between the three pieces is not completely filled, a third pass may be used to completely fill the groove.

INSPECTION AND TEST

Upon completion of the welding, the person witnessing the test shall inspect the finished welds and supervise the preparation and test of the strips as follows:

1. Lightly grit blast all the welds to remove all slag.
2. Inspect the finished welds to see that they are neat and workmanlike. The finished welds should be approximately flush with the surface of the alloy but not more than 1/32" above it.
3. Make a Dye Check or Zyglo Inspection of the welds. There shall be no cracks and not more than 2 pinholes in any single weld.

PIPE TEST QUALIFICATION OF METAL ARC WELDING

PREPARATION

Cut pieces from 6" Schedule 80 seamless pipe. Bevels for groove may be machined or torch cut. Tack the pieces together with four 3/4" long tack welds at locations A, B, C and D.

PROCEDURE

The method of depositing weld beads shall be consistent with regular practice. The welding speed, chipping of the weld beads, etc., shall also follow regular practice. The final reinforcing bead shall be approximately 1/16" above the parent metal.

WELDING POSITIONS

1. Position the pipe assembly with its axis fixed in the vertical position 2G. Make the root pass from A to B.
2. Position the pipe assembly with its axis fixed in the horizontal position 5G with the centerline vertical and point E at the bottom. Complete the horizontal weld.
3. Reposition the pipe assembly with its axis fixed in the vertical position 2G and complete the weld from A to B.

GENERAL INSTRUCTIONS

(1) After welds are completed, lay out the torch cuts and die stamp each specimen with number indicated in sketches. Cut out the specimens and prepare and test them as detailed in sketches and supplementing notes.

Face bend specimens 2, 4 and 6
Root bend specimens 1, 3 and 5

MATERIALS

For usual qualification, welds shall be made in seamless pipe conforming to ASTM Specs. A 106 or A 153 Grade B. Weld rods shall be Type E-6010 mild steel electrodes. Qualification for welding other than carbon steel, materials for test shall be the same as the materials to be used on the job. Refer to the following Engineering Instructions for the procedures.

811 Metal Arc Welding Chrome Moly Steels
812 Metal Arc Welding 18-8 Chrome Nickel Steels
819 Welding of Monel

Torch cut specimens and round off corners to approximately 1/8" radius. Grind top and bottom weld surfaces flat and smooth. Specimens shall be tested in a guided bend test jig.

FACE AND ROOT BEND SPECIMENS

(1) At the discretion of the Lead Equipment Inspector, position 6G and 2 ea. face and root bend specimens may be used in place of positions 2G and 5G. Pipe assemblies positioned for welding shall not be removed except for position change.

PLATE TEST FOR QUALIFICATION OF METAL ARC WELDERS

PREPARATION

Cut pieces from plate. Bevels for groove may be machined or torch cut and chipped or ground. Tack plates together with 3/4" long tack welds. Make these complete assemblies for positions indicated below. Strongbacks may be used to hold plates in alignment.

WELDING PROCEDURE

The method of depositing weld beads shall be consistent with regular practice. The welding speed, chipping of the weld beads, etc., shall also follow regular practice. The final reinforcing bead shall be approximately 1/16" above the parent metal.

WELDING POSITIONS

HORIZONTAL WELD - Plate vertical, groove horizontal. Mark face bend and root bend specimens 1H, 2H, 3H and 4H respectively.

Position 2G

VERTICAL WELD - Plate vertical, groove vertical. Mark face bend and root bend specimens 1V, 2V, 3V and 4V respectively.

Position 3G

OVERHEAD WELD - Plate horizontal, weld groove overhead. Mark face bend and root bend specimens 1-O, 2-O, 3-O and 4-O respectively.

Position 4G

GENERAL INSTRUCTIONS

After completing welds, straighten plates. Lay out cuts and die stamp each specimen as indicated. Machine or torch cut specimens. Finish side bend specimens to 3/8" thickness. Test specimens as detailed in sketches and supplementing notes.

MATERIALS

For usual qualification, welds shall be made in firebox steel plate conforming to ASTM Spec. 285. Weld rods shall be type E-6010 mild steel electrodes.

For qualification for welding other than carbon steel, materials for test shall be the same as the materials to be used on the job. Refer to the following engineering instructions for the procedures to be followed regarding welding, preheating, heat treating, etc.

CHEV B8 6001

PIPE TEST FOR QUALIFICATION OF GAS TIG OR MIG WELDERS

PREPARATION

Cut pieces from 3" Schedule 40 seamless pipe for gas welds. Bevels for groove may be machined or torch cut and chipped or ground. Tack the pieces together with four 3/8" long tack welds at locations A, B, C and D.

PROCEDURE

The method of depositing weld beads shall be consistent with regular practice. The welding speed, chipping of the weld beads, etc., shall also follow regular practice. The final reinforcing bead shall be approximately 1/16" above the parent metal.

WELDING POSITIONS

1. Position the pipe assembly with its axis fixed in the vertical position 2G. Make the root pass from A to B.

2. Position the pipe assembly with its axis fixed in the horizontal position 5G with the centerline vertical and point E at the bottom. Complete the horizontal weld.

3. Reposition the pipe assembly with its axis fixed in the vertical position 2G. Complete the weld A to B.

GENERAL INSTRUCTIONS

At the discretion of the Lead Equipment Inspector, position 6G and 2 ea. face and root bend specimens may be used in place of positions 2G and 5G. Pipe assemblies positioned for welding shall not be removed except for position change.

After welds are completed, lay out the torch cuts and die stamp each specimen with number indicated in sketches. Cut out the specimens and prepare and test them as detailed in sketches and supplementing notes.

Face bend specimens 1 and 4
Root bend specimens 2 and 5

MATERIALS

For usual qualification, welds shall be made in carbon steel seamless pipe conforming to ASTM Specs. A 106 or A 53 or API Spec. 5L. Weld rods shall be Type GA or GB gas rods for Oxy-acetylene or TIG. Weld rod shall be Linde-65 or equivalent for MIG.

Torch cut specimens and round off corners to approximately 1/8" radius. Grind top and bottom weld surfaces flat and smooth. Specimens shall be tested in a guided bend test jig.

FACE AND ROOT BEND SPECIMENS

QUALIFICATION TEST FOR ALLOY LININGS USING MIG WELDING

MATERIAL

The material to be used for the test is:

One piece of carbon steel plate 7 3/8" X 10 3/8" X 1/2", grit blasted on one side.

Three pieces of alloy sheet 3" X 6". Use 13 BWG unless otherwise specified to suit a special job.

0.030" or 0.035" welding wire conforming to the specifications shown below for the alloy to be welded.

Alloy Sheet	Welding Wire	Inert Gas
Monel	Inco Monel 60	30 CFH Argon
11-13% Cr	25-12 Cr Ni - AISI Type 309	30 CFH 75% Argon 25% CO_2
18-8 Cr Ni	25-12 Cr Ni - AISI Type 309	30 CFH 75% Argon 25% CO_2
18-8-3 Cr Ni Mo	16-13-3 Cr Ni Mo - AISI Type 316	30 CFH 75% Argon 25% CO_2

CHEV B8 6003

WELDING PROCEDURE

All welding shall be done at a normal pace. No grinding or chipping of the weld will be allowed except as specifically authorized by the person witnessing the test. Avoid striking the arc or hammering directly on the alloy. This promotes cracking in service installations. Assemble and weld the test sample as follows:

1. Lay out and tack the alloy samples to the steel plate as shown on the sketch. Use small tacks at the corners only.
2. Place the sample plate in a vertical position with the alloy pieces oriented as shown on the sketch and then weld as follows:
   - 2.1 Fill the center gap between pieces 2 and 3 in one pass welding downhill.
   - 2.2 Weld the horizontal gap between pieces 1 and 2 and 3 using two stringer beads.
   - 2.3 Weld a single fillet all around the outside of the alloy pieces. Make the vertical welds downhill.

INSPECTION AND TEST

Upon completion of welding the person witnessing the test shall:

1. Inspect the finished welds to see that they are neat and workmanlike. The surface of the weld shall be approximately flush with the surface of the sheet but not more than 1/32" above.
2. Make a Dye Check or Zyglo inspection of the welds. There shall be no cracks and not more than 2 pinholes in any single weld.