Quality Assurance
Procedure QAP 5957

Method of Test For

Ultrasonic Inspection Procedure for Bridge Pins

1. Scope

1.1 This written procedure conforms to ASNT SNTC-TC-1A and the Written Practice of Personnel Qualification for Ultrasonic (UT) testing, evaluation, and interpretation procedures for bridge pins (In Situ) are detailed.

1.2 This procedure shall be used to detect, locate, evaluate, and interpret in service fatigue cracks (typically propagating from the In Situ Pin outer surface) caused primarily from torsional stress aggravated by corrosion at the In Situ Pin to Hangar Strap interface location (see Figure 1). Additionally, the Hangar Straps shall be visually inspected for cracks.

2. Personnel

2.1 Personnel performing Ultrasonic
Test and Evaluations shall be certified as ASNT Level II or III ultrasonic operators.

2.2 An ASNT Board Examined Level III shall interpret the test reports and determine their disposition. The Level III shall report test interpretations to the Engineer.

3. Apparatus

3.1 Ultrasonic equipment shall meet the requirements of AASHTO/AWS D1.5M/D1.5 current edition, Bridge Welding Code, except:

3.1.1 Transducers shall be 0.5 inch diameter, 3.5-5.0 MHz.

3.1.2 Search units shall not exceed one and one half inches in length nor width.

3.1.3 Test angles shall be:

3.1.3.1 15 degree longitudinal wave.

3.1.3.2 25 degree longitudinal wave.

3.1.3.3 35 degree longitudinal wave.

3.1.3. 45 degree longitudinal or transverse wave.

4. Reference Standard

4.1 The Reference Standard shall be a steel pin with saw cut notches one eighth inch deep (greatest depth dimension at the center of the cut) at the center of in the cylindrical surface of the pin. The locations along the axis of the pin shall vary in length from the test surface of the pin (Test Face). The distance of

the saw cuts shall represent the distance from the Test face to the edges (or corners) of the Hangar Strap one inch on the In Situ Pins to be tested (see Figure 2). This distance or the sound path distance can be measured based upon a diagram of the actual bridge pin (In Situ Pin Diagram).

5. Procedure

5.1 Determine the Optimum Test Angle

5.1.1 The ASNT Level III shall determine the optimum test angle to be used on each In Situ Pin (angles listed in 3.1.3.1-3.1.3.4). The optimum angle shall be that angle that centers the theoretical center of the sound beam at corners of the Hangar Strap - In Situ Pin interface such that the pin geometry (pin shoulder or threaded holes at the end to fasten pin caps) does not interfere with the sound beam (more than a 6 dB reduction).

5.1.2 An In Situ Pin Diagram for each Pin type to be tested shall be drawn to scale and include the following:

5.1.2.1 The dimension of the In Situ Pin.

5.1.2.2 Including the pin diameter, pin length, threaded end diameter and length (if applicable), hangar strap thickness and location.

5.1.2.3 The optimum test angle to be used.

5.1.2.4 The sound entry position of the search unit shall be shown on the end of the pin (Test Face).

5.1.2.5 The sound path distance from the Test Face to the Hangar Strap Corners (both Hangar Straps) interface on the In Situ Pin.

5.2 Establish Test Reference Level

5.2.1 Daily and prior to testing, the dB Reference Level shall be established using the same test angle and transducer to be used on the In Situ Pin.

5.2.2 The dB reference level shall be measured on the one eighth inch deep saw cut notch of the Reference Standard (Figure 2) that represents the sound path distance of that shown on the In Situ

Pin Diagram.

5.2.3 The test dB Reference Level is that level of the eighth inch deep notch in the Reference Standard (Figure 2) that measures the maximized signal at 50% Full Screen Height.

5.3 In Situ Pin Test Face Preparation

5.3.1 The test surface (Face A and/or B, as required to test all corner-pin interfaces) of the In Situ Pin shall be clean of soil, oil, organic matter, and any roughness 0.0315 deep, or any waviness that would allow a 0.1 inch diameter wire to enter under the search unit (between the search unit and pin test face). Surfaces that are not flat and free from roughness or waviness as described shall be ground to provide a depression free 125 micro- inch finish.

5.4 Test Scanning Sensitivity

5.4.1 Scanning sensitivity shall be set a minimum of 20 dB above Reference Level and no higher than that producing noise above 50% Full Screen Height in the area of the Sound Path established on the In

Situ Pin Diagram (Sound Path length from the Test Face to the corners of the Hangar Strap - In Situ Pin on the In Situ Pin Diagram).

5.5 Scanning Pattern

5.5.1 Position the search unit on the Face of the In Situ Pin oriented in the correct direction (front of search unit with respect to the cylindrical pin surface) at the location as shown on the In Situ Pin Diagram. Move the search unit forward and backward (forward toward the cylindrical pin surface being interrogated; backward, away from this surface- see AASHTO/AWS D1.5M/D1.5 current edition, Figure 6.6, Movement B- while concurrently rotating the search unit side- to-side approximately 15 degrees- see AASHTO/AWS D1.5M/D1.5 current edition, Figure 6.6, Movement A.

5.6 Flaw Size Evaluation Procedures

5.6.1 Signals (other than those that are indicated as reflectors of the pin shoulder or back wall) shall be adjusted to 50% Full Screen Height when the signal amplitude has been maximized. Without moving the search unit, increase the amplitude 6 dB (screen saturation). The length and depth of such signals shall be measured on the test surface (In Situ Pin Face) from the center of the search unit. The movement of the search unit, including front-to-back and side-to-side, shall be measured to the points at which a 6dB drop in amplitude is measured (i.e., where the signal decays to 50% Full Screen Height).

5.6.2 Signals indicated from the In Situ Pin Face tested in 5.6.1 shall also be evaluated from the opposite pin face (side). Perform the same evaluation as in

6. Test Result Records

6.1 The test record shall show:

6.1.1 Test Date
6.1.2 UT Operator
6.1.3 Bridge, Location, and Mile Post
6.1.4 Instrument
6.1.5 Transducer #, diameter, and frequency
6.1.6 Search Unit # and angle
6.1.7 Reference Level
6.1.8 Scanning Sensitivity
6.1.9 Pin # tested, Faces tested
6.1.10 Test Result indicating : either no relevant signals, or in case of relevant signals, the sound path and dB rating at 50% Full Screen Height.
6.1.11 Interpretation, if applicable

6.2 In Situ Pins with indications at 50% Full Screen Height at Scanning Level Sensitivity or less shall be recorded on the In Situ Pin Diagram.

6.2.1 The In Situ Pin Diagram shall include: the amplitude, location, and area of the signals. Dimensions shall be shown in elevation from the side and from the Test Face.

6.2.2 Indications meeting the criteria of 6.2 shall be reported to the Engineer within thirty days.

7. Interpretation

7.1 The ASNT Board Examined Level III shall interpret indications recorded in 6.2 and 6.2.1. The Level III shall determine the source of the reflector and make his recommendation for remediation to the Engineer.

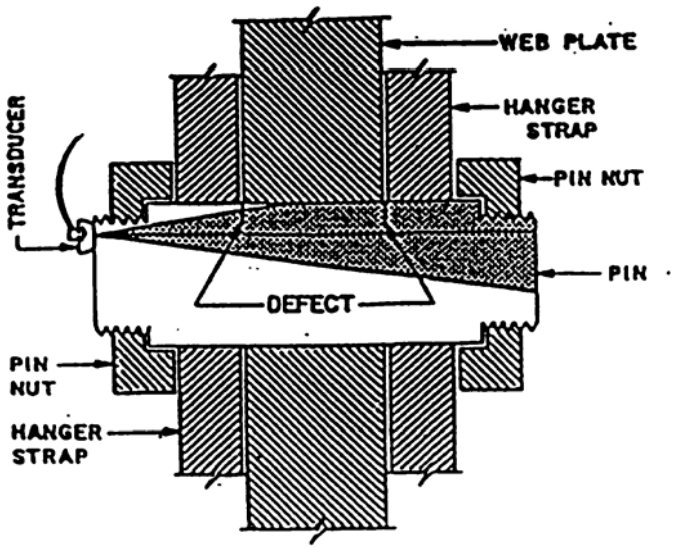

FIGURE 1. Section of pin and hanger strap connection.

Figure 1

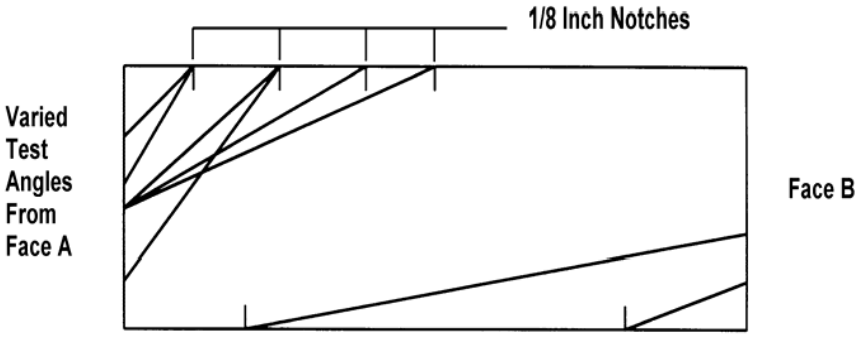

Figure 2
Reference Standard