US Army Corps
of Engineers
Portland District

Status of HSS Inspections in The Portland District

2005 Infrastructures Conference

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Status of HSS Inspections in NWP

Fiscal Year	No. HSS Inspected
2002	73
2003	97
2004	257
2005 (So Far)	331
Total	**785**

Breakdown of HSS Inspections by Project

Project	Total Number of HSS	Total Number of HSS Inspected
Bonneville	540	359
John Day	127	86
The Dalles	471	221
The Willamette Valley (13 Projects Total)	171	77
Willow Creek	2	0
The Rogue Basin (2 Projects)	42	42
Total for 19 Projects	**1353**	**785**

Total of 58% of HSS Completed To Date.

HSS by the Numbers

- Currently have 785 HSS completed, 58% of total
- 25% of HSS inspected this year – over 300 structures. A majority of HSS is being done “At the last possible minute”
- Currently have more than 80 HSS removed from service
- More than $1,000,000 in repair contracts in the works. Major maintenance being delayed because of HSS

HSS Findings/Issues in FY05

- Tagging out of Fracture Critical Structures
  - This FY several structures have been removed from service due to flaws in Fracture Critical Welds or Tension Splices
  - Examples:
    - Bonneville Second Powerhouse Taillogs – 12 Taillogs with extensive Class A flaws in vertical skin plate splices in tension
    - The Dalles Spillway Stoplogs – 20 Stoplogs with extensive Class A flaws in Tension Splices in the Truss Chords
    - Dexter Spillway Stoplog Lifting Beam – Latticework Lifting Beam damaged and repaired numerous times

HSS Findings/Issues in FY05 Cont…

Bonneville Main Unit Taillogs: fabricated in the 1980's– UT flaws in fracture critical CJP tension splices in skin plate – 12 stoplogs removed from service.

HSS Findings/Issues in FY05 Cont…

The Dalles Spillway Stoplogs – fabricated in the 1960's. Fracture critical truss structure with 24 CJP tension splices. 323 failed connections out of 481 tested. 67% failure rate

HSS Findings/Issues in FY05 Cont…

Brazed Splice

Dexter Spillway Stoplog Lifting Beam - missing hooks, failed UT, brazed splices, etc.

Ultrasonic Testing Lessons Learned

- Ultrasonic Testing of CJP welds provides a method of finding weld flaws including slag, voids, and lack of penetration in the joint
- AWS D1.1 requires welds tested with UT to be clean, free of weld splatter, paint, etc.
- AWS D1.1 requires visual exam prior to UT – for assurance of fit-up etc. Connections not passing visual should not be UT'd
- As a result – our inspections do not truly meet AWS requirements (paint, joint configuration, access, etc.)

Ultrasonic Testing Lessons Learned

- Rule Number 1 – **ALWAYS** Bring a UT Technician.
  - The UT Tech/CWI is not only a great source of information, but he/she may be just the person to help explain and justify why the $13 Million rewind contract is NOT going to start tomorrow
  - You never know what you are going to find
    - Splices, torch cut holes and patches
    - A 60 foot tall bulkhead that was dropped on an intake deck and then welded back together

Ultrasonic Testing Lessons Learned Cont…

The Dalles Intake Bulkhead – Spliced back together after being dropped in the 1980's.

Splice Through One Side of Bulkhead

Girder Cut Out Directly Below Splice

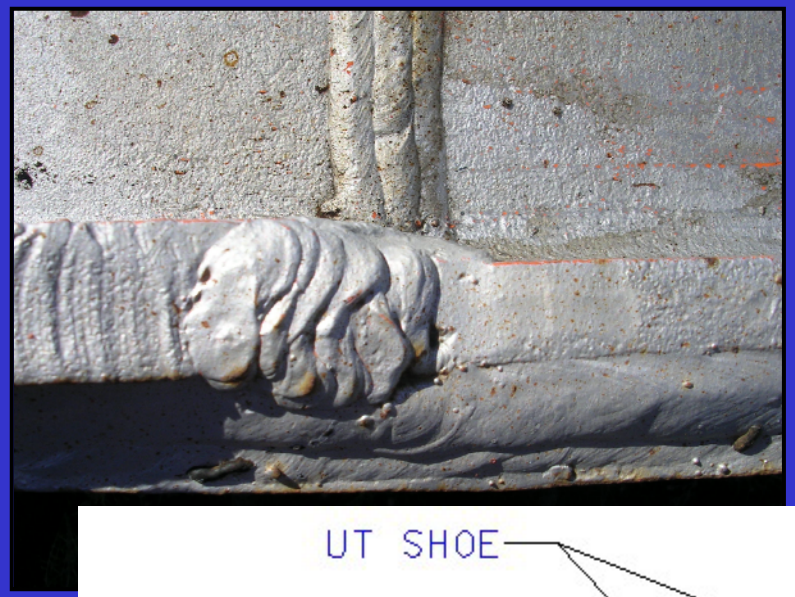
Ultrasonic Testing Lessons Learned Cont…

The Dalles Intake Bulkhead – Repaired.

Ultrasonic Testing Lessons Learned Cont…

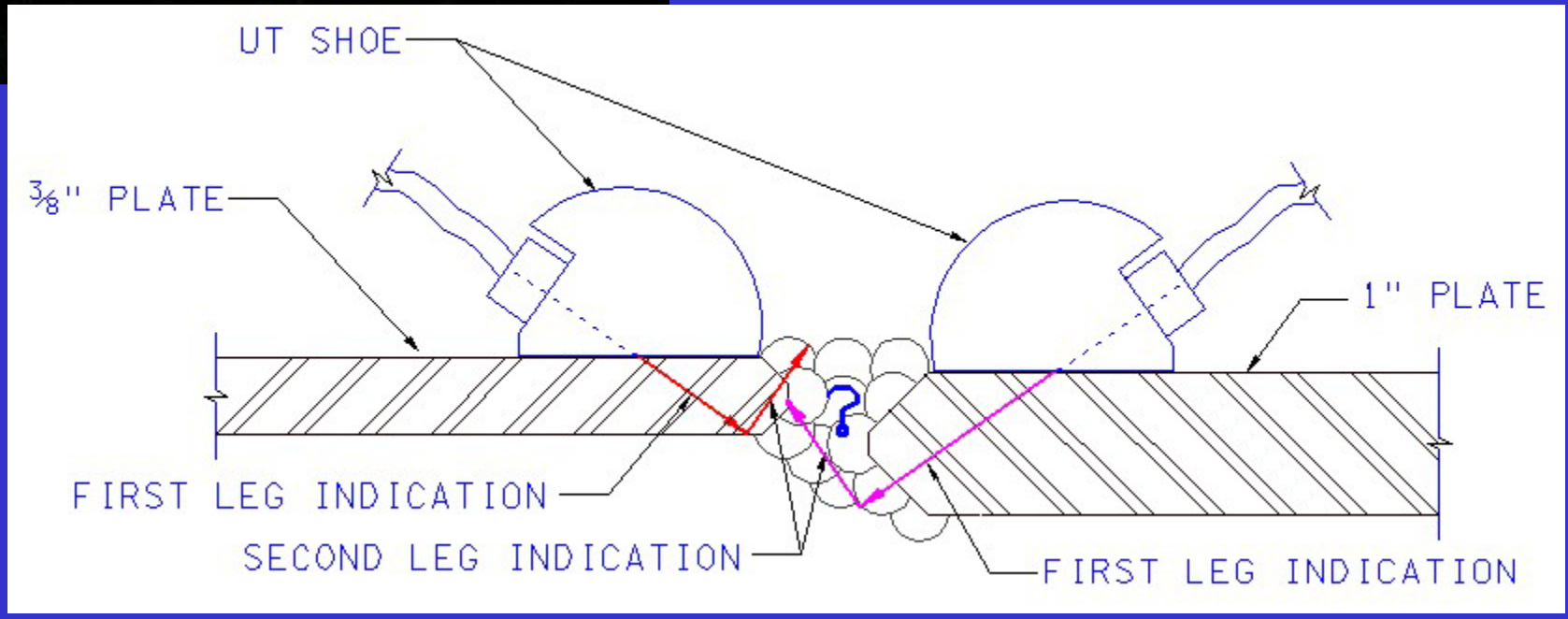
- Rule Number 2 – **Understand the Limits of UT**
  - Testing through paint, joint configuration, weld profile, etc
  - Understand first leg/second leg indications
  - Need to know what the weld looks like in order to UT it

Ultrasonic Testing Lessons Learned Cont…



The Dalles Spillway Stoplogs – Fracture critical connections that can not be fully UT'd due to joint configuration.

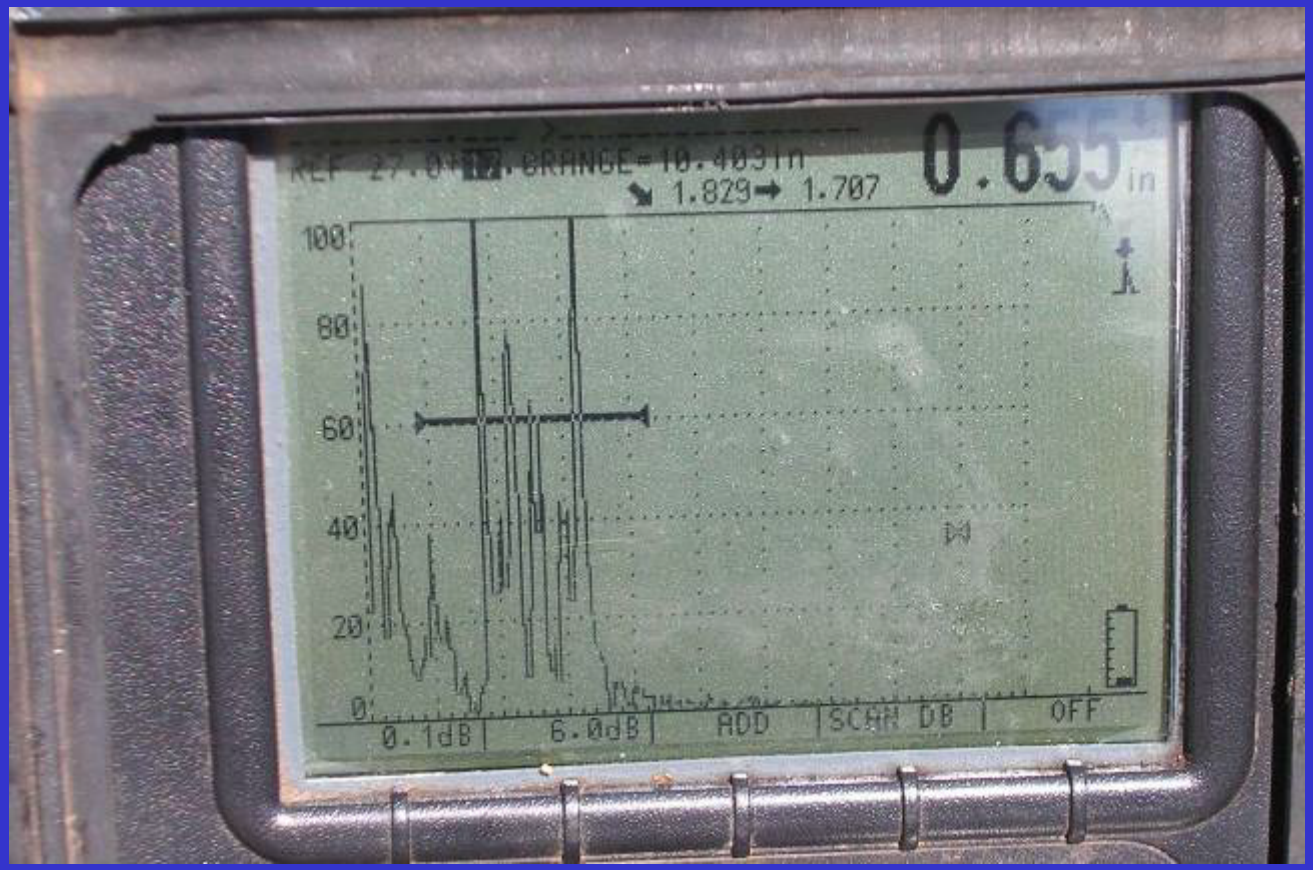
First leg indications can not be found without grinding the welds flush.



Ultrasonic Testing Lessons Learned Cont…

The Dalles Spillway Stoplogs – UT Screen Shot.

First leg indications cannot be found without grinding the welds flush.



CJP double bevel groove weld In tension – subjected to a 4 dB penalty – rejection at +2 dB or less – so each of these signals at +6 dB is rejectable.

Ultrasonic Testing Lessons Learned Cont…

- Rule Number 3 – **Write a Procedure**
  - A lesson we are still learning
  - AWS D1.1 requires
    - Clean, paint free welds with minimum reinforcement
    - Proper fit-up and joint configuration
    - Visual acceptance prior to UT
  - Need to know what the weld looks like to find the location of the flaw
  - Write an acceptance/rejection criteria for your inspector for in-service equipment

Ultrasonic Testing Lessons Learned Cont…

- Rule Number 3 – **Continued…**
  - Recognizing that the joint being inspected does not meet AWS D1.1 for inspection purposes (joint configuration, offset, etc.) – Now you need to fix it
  - AWS D1.1 requires
    - Visual acceptance prior to UT
  - If the weld did not meet visual requirements in the field due to fit up and offset, you will have the same problem in the shop when you perform the repairs.

Ultrasonic Testing Lessons Learned Cont…

- Rule Number 3 – **Continued…**
  - So write your own acceptance procedure for in the field and in the shop
  - Ensure your specifications ask for:
    - A complete record of the weld, recording what failed UT prior to repairs. AWS does not require this
    - Require a third party inspection or use a contracting services contract to do the spot checking yourself.

Inspection Tips

- Ways to make the inspection work for you:
  - Do the calculations before you go – know what weld you are looking for instead of what weld is on the drawing
  - Assume a vertical splice in large gates and check the tension load/weld required
  - By doing both of these calculations, safety decisions can be made BEFORE you go behind the gate to do additional inspections
  - Most importantly – Bring Donuts

Inspection Tips Continued…

- What to look for:
  - ALWAYS Inspect the lifting beam first!
  - Project Modification - Nothing a torch can't fix
  - Partial penetration welds where complete joint penetration welds are supposed to be
  - Welds that are difficult today (CJP from one side in a closed shape) did not happen in 1953 – so do not assume the weld is CJP
  - If the weld is hard to see, it isn't welded
  - Bulkheads that work either direction

Inspection Tips Continued…

Project Modification

Inspection Tips Continued…

Air lines for cleaning the sill

Project Modification Continued…

The fastest way to get a narrower gate

Where are we going from here?

- HSS Inspection Planning
  - Attempting to avoid last minute inspections
  - Developing better working relationships with not just project management and engineering staff, but also the staff that relies on these structures for life safety
  - Getting project welders qualified
  - Thinking ahead as much as possible to ensure contract work stays on schedule
  - Ensuring that all new HSS meet HSS criteria