

## EXPANSION CRITERIA UTILIZING PLANT SPECIFIC MOCK-UPS

By: Carl Latiolais  
Project Manager Piping and Bolting  
Performance Demonstration  
EPRI NDE Center

### Why do we need site specific mock-ups?

- Numerous variations of dissimilar metal welds exist in the industry and many are not included in test sets
  - Geometry varies from one weld to another
    - Search unit angle and focal depth may need to be changed in order to properly exam weld and cover examination volume
  - As-built contours vary from plant to plant and may be different than design
  - Scanning obstructions may force modifications to configurations

### Why do we need site specific mock-ups?

- Repairs may result unique configurations that need to be accounted for during examination
- Site specific mock-ups allows examiner to become familiar with unique examination requirements and provides provisions to assure adequate examination
  - Search unit selection
    - Proper angle
    - Correct size
  - Adjustments in scan pattern
  - Familiarization with signals associated with weld geometric profile

### Present Code Requirements

- The specimen set shall include examples of the following fabrication conditions:
- (1) geometric and material conditions that normally require discrimination from flaws (e.g., counterbore or weld root conditions, cladding, weld buttering, remnants of previous welds, adjacent welds in close proximity, and weld repair areas),

### Present Code Requirements

- (2) typical limited scanning surface conditions (e.g., weld crowns, diametrical shrink, single-side access due to nozzle and safe end external tapers for outside surface examinations; and internal tapers, exposed weld roots, and cladding conditions for inside surface examinations) Qualification requirements shall be satisfied separately for each examination surface.

### Present Code Requirements

- PDI test sets include all of the above conditions but,
  - PDI realized that more criteria was needed to address unique configurations and included site specific mock-ups part of their technical basis

### Criteria

- Plant specific mock-ups may be required to expand qualified procedures. These mock-ups may be used when plant specific configurations are not included in the Supplement 10 qualification test set. Mock-ups may not otherwise be used to qualify personnel or equipment or to expand other essential variables. No additional plant specific personnel qualification is required. A plant specific mock-up that matches the actual configuration of the weld to be examined shall be required if one of the following conditions exist and an example of it was not included in the qualification test set.

### Criteria

- (a) The actual configuration has internal tapers, for inside surface examinations, or external tapers, for outside surface examinations, that preclude coverage of the examination volume with the qualified inspection angle(s).

### Criteria

- (b) The actual configuration contains an adjacent weld or weld build-up that requires the beam to initiate wholly in austenitic weld material (excluding normal nozzle clad and circumferential scans).

### Criteria

- **5.2 Mock-up Requirements.**
- (a) The mock-up shall meet the requirements of 2.1(b) and (c)
- (b) The mock-up shall be fabricated from the same material type and product form as the component being examined
- (c) The welding type and direction shall be similar to that what was used to fabricate the actual component (e.g. automated TIG welding applied in downhill direction).

### Criteria

- (d) When the actual configuration requires scanning from internal or external tapers the mock-up shall contain that geometry
- (e) The mock-up shall contain the number of flaws determined in 5.3(c).
- (f) Notches, alternative flaws, cracks or a combination of the three may be used.
  - *(Procedures and Personnel have already been qualified on real cracks thus the reflectors simply provide assurance that the techniques are capable of covering the required examination volume )*

### Criteria

- (g) The flaws shall be placed in the examination volumes that are known to be susceptible to cracking (e.g., weld, nozzle or pipe butter and the heat affected zone of the safe-end base material).
- (h) The flaw size shall be dictated by either IWB-3500 or by IWB-3600 criteria.

### Criteria

- **5.3 Demonstration Requirements.**
- (a) Plant specific demonstrations may be conducted in a Non-Blind format.
- (b) The Inspector and an individual representing the licensee shall witness the demonstration.

### Criteria

- (c) A demonstration report shall be generated to include the same procedurally defined detail as required for an actual examination (e.g. essential parameters utilized and results of examination). It shall also provide a technical basis to identify the number and location of flaws.

### Criteria

- (d) Changes required to the essential parameters defined in the qualified procedure must be documented and included in the procedure for the examination of that specific configuration.
- (e) The licensee shall ensure that the examination personnel are familiar with the data collection and analysis processes established during the plant specific demonstration

### Criteria

- **5.4 Acceptance Criteria.**
- (a) The procedure is considered qualified if it can be demonstrated that the flaw(s) is discernible by specific criteria identified in the procedure (e.g., that a signal to noise ratio  $\geq 2$  to 1 can be obtained from the reflectors).
- (b) Areas within the examination volume that cannot be examined reliably shall be documented as a limitation.

## Summary

- The use of site specific mock-ups builds on the qualification and will assure adequate examinations are being performed
- Site specific mock-ups aid the examiners in doing a good job