

PALO VERDE NUCLEAR GENERATING STATION

Plant Welders

Classroom Lesson



Plant Welders	Date: 2/3/2011 6:29:26 AM
LP Number: NMW34C000103	Rev Author: DAVID J. EVANS
Title: Pipe Supports and Hangers	Technical Review:
Duration : 4 HOURS	
	Teaching Approval:

INITIATING DOCUMENTS

Task Analysis of Welder Task List

REQUIRED TOPICS

None

CONTENT REFERENCES

13-PN-204: Fabrication and Installation of Nuclear Piping Systems for the Arizona Public Service Company, Palo Verde Nuclear Generating Station Units 1, 2, and 3

13-PN-205: Fabrication and Installation of Non-Nuclear Piping Systems for the Arizona Public Service Company, Palo Verde Nuclear Generating Station Units 1, 2, and 3

CRDR 91480 : (98Q167) Amendment "A" to WO 841404 ways planned without all the required work verifications being identified.

CRDR 75644 : (95Q276) During performance of Work Order #694051 (AF 103, Snubber Reduction) various pieces of ASME code class hanger material scribed with only the C&I #.

CRDR 79748 : (96Q228) During performance of PCWO 00706606 by Fluor Daniel's, Nuclear Assurance Maintenance found several unacceptable conditions.

CRDR 96530 : (990422) CRDR identifies a worker verification step that was signed in error.

CRDR 35653 Response to NRC Allegation RIV-1998-A-049, A Fluor Daniel Foreman & Pipefitter Signed As Acceptable Critical Attributes Verification Sheets When Verifications Had Not Been Performed.

Title: Pipe Supports and Hangers

**Lesson Plan
#:**

NMW34C000103

CRAI 35658 Develop And Implement Training For Appropriate Planners And Workers On Revised Specifications 13-PN-204 And 13-PN-205.

LESSON PLAN REVISION DATA

Feb 03,
2011

Dave Evans

Record created

Tasks and Topics Covered

The following tasks are covered in Pipe Supports and Hangers :

Task or Topic Number*	Task Statement
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Lesson: Pipe Supports and Hangers

PSHG001	Remove and Install piping system struts
PSHG002	Remove and Install pipe support and hanger restraints (threaded)
PSHG003	Remove and Install pipe support and hanger restraints (welded)
PSHG004	Fabricate or modify pipe supports or hangers
PSHG005	Rework pipe supports or hangers

Total task or topics: 5

TERMINAL OBJECTIVE:

- 1 Using 13-PN-205, participants will , identify requirements for the installation of pipe supports ,hangers and piping system struts. Participants are required to score 80% on a written exam.
 - 1.1 Identify pipe support installation tolerances and critical attributes
 - 1.2 Identify expectations for workers related to critical attributes for pipe supports and hangers.

- I. Introductions

Introduce yourself and present your background and experience. Have the participants introduce themselves.

- II. Classroom Guidelines

Identify the CLASS GUIDELINES posted in the classroom.

Discuss the schedule for the course, i.e. break frequency, length of breaks, etc.

 - A. Attendance Sheet

If using an attendance sheet, pass the sheet around and have students signed in black ink.

 - B. Questions and Participation

Discuss the importance of participation.

Encourage the participants to see each other and the instructors as resources available to them throughout the course.

- III. Course Introduction
 - A. Motivation

Focus student attention on "What's In It For Me."

 - B. Objectives

 - C. Questions and answers

Allow time for participants to ask questions prior to beginning lesson.

TO: 1 Using 13-PN-205, participants will , identify requirements for the installation of pipe supports ,hangers and piping system struts. Participants are required to score 80% on a written exam.

EO: 1.1 Identify pipe support installation tolerances and critical attributes**Main Idea****Content**

Pipe supports refer to all type of metal supports which are designed to transmit loads from the pressure retaining barrier of the piping to the load carrying building structure or supporting structure, whether concrete or structural steel.

The design and location of pipe supports shall be the responsibility of Engineering. All design details will be shown on drawings, including miscellaneous steel when required.

Installation of supports shall be in accordance with the design drawings, applicable codes and/or standards, as well as 13-PN-204 or 13-PN-205.

The pipe support location critical dimension is used to locate the support on the pipe system.

The pipe support location critical dimension shall be indicated on the location plan of the pipe support design drawing or on a sectional view of a vertical run of pipe; and will be from an elbow, tee, flange, etc., to the support's location.

If such a dimension is not provided, then the critical dimension shall be the reference dimensions from the building columns shown on the location plan of the pipe support design drawing, or for vertical run pipe, the centerline elevation of the component detail.

Permitted Deviations From Drawings

Deviations are permitted provided that the function of the support is not affected, and the required clearance for thermal growth is maintained. Deviations and tolerances for sizes, lengths, and position of miscellaneous steel angles, channels, I beams, tube steel, wide flanges, and plates shall be in accordance with 13-PN-204 or 13-PN-205.

Prevent Events: Use STAR to verify installation of hangers and supports is within acceptable limits of allowed deviations.

Though the specifications allow for deviations, for consistency on these deviations a team leader or the planner shall be contacted

Methods & Activities

13-PN-205, 7.1.1.1

for the proper interpretation/application of the specifications.

90° reorientation of beam attachments with load pins of 1-1/8 inches or less is acceptable. Beam attachments with load pins of 1-1/4 inches and above shall be oriented and welded per the pipe support drawing.

Stiffener plates shown on only one side of a beam web may actually be installed on either side of the web, unless the stiffener has been provided due to an eccentric loading condition.

Angles reversed 90°, channels reversed 180°, or any component (except snubbers) or structure placed on the opposite side of the pipe is acceptable provided all the following criteria are met:

- a. There is no resulting reduction in section properties of the structure in the loaded direction.
- b. Point loading does not result.
- c. The change is free of obstruction.
- d. Specified clearances, pipe movements, or design intentions are not impacted.

Pipe Support Installation Tolerances

13-PN-205, 7.2.3

Runs of Pipe 2-1/2 Inches and Larger

7.2.3.1 (See ATTACHMENT 22, Page 22-6).

Free of Obstructions

Support location (as shown by the support's critical dimension) may deviate:

±2 inches transversally

(IMPORTANT)

±12 inches axially

Miscellaneous steel members with field welded end connections may be repositioned up to:

7.2.3.3

±2 inches vertically

±2 inches horizontally

Prevent Events: Use STAR to verify installation of

hangers and supports is within acceptable limits of allowed deviations.

**Runs of Pipe 2 Inches and Under
Free of Obstructions**

7.2.3.2 (See ATTACHMENT 22, Page 22-6)
(IMPORTANT)

Support location (as shown by the support's critical dimension) may deviate:

±4 inches transversally

±9 inches axially (except when the support location is within ±12" of valves, flanges, or any other concentrated load)

Use sketches/PVC piping to reinforce proper application

Prevent Events: Self check, Peer check and use STAR

Miscellaneous steel members with field welded end connections may be repositioned up to:

7.2.3.3

±4 inches vertically

±4 inches horizontally

Prevent Events: Self check, Peer check and use STAR

Sway Struts

7.2.3.4

Shall be installed such that they are within ±five degrees (5°) of the design angle when the pipe is at its design operating temperature and pressure.

Spring Hangers

7.2.3.5

May deviate a maximum of five percent (5%) from the design setting.

Variable Spring Or Constant Spring Supports

7.2.3.6

May have an allowable deviation from the vertical of ±4° between the beam attachment load bolt/pin and the load stud of the pipe clamp when the pipe is at its design operating temperature and pressure.

Pipe Strap, Restraint and U-Bolt Substitutions

For pipe 1" diameter or less, when the pipe support drawing calls for an anchor restraint or a 2-directional restraint strap with axial shear lugs, the field may substitute two standard U-bolts with 4-hex nuts, maintaining 0" clearance between the pipe and U-bolts.

7.4.1

(i.e., load nuts shall be

U-Bolt Spacing Criteria

U-bolts substituted for anchor restraints, the U-bolts shall be spaced

- 2" minimum center to center
- 4" maximum center to center

U-bolts substituted for a 2-directional restraint strap with axial shear lugs, the U-bolts shall be spaced

- 2" minimum center to center
- 4" maximum center to center

U-bolts are substituted for 3-way restraints, the U-bolts shall be spaced

- 1-1/2" maximum center to center

Formed plate restraints (pipe support item numbers 70, 72, or 85) may be substituted for anchor straps/restraints as illustrated by ATTACHMENT 13.

When a pipe support drawing calls for a 2-directional formed plate restraint to be installed with 1" diameter pipe and smaller, the field may substitute one standard U-bolt with 6 hex nuts, maintaining 1/16" clearance or free to slide.

Field may substitute Standard U-bolts with Non-Standard U-bolts provided rod size is the same or larger and other clearances/requirements are still met. If hanger drawings call for inside surface jam nuts, these nuts may be half height jam nuts. Refer to ATTACHMENT 21 for caustic and hypochlorite piping.

Pipe Strap, Restraint and U-Bolt Clearances

Clearance between pipe wall (or pipe attachment) and structures (except U-bolts) shall be as follows:

- a. Where 1/16 inch clearance is specified at one side and no clearance (i.e., 0 inch) is specified at the opposite side in the pipe restrained directions, the 1/16 inch clearance may be inspected from 0 inch (free to slide) to

snug tight plus approximately 1/2 turn, tightly fastened, not free to slide)

Contact team leaders/planners when making substitutions.

7.4.2,

See 13-PN-205, Attachment 13 for an illustration of a typical anchor restraint.

13-PN-205, 7.4.3

Contact team leaders/planners when making substitutions.

13-PN-205, 7.4.4

Contact team leaders/planners when making substitutions.

13-PN-205, 7.4.5

Contact team leaders/planners when making substitutions.

13-PN-205, 7.5.1

Use sketches/PVC piping to reinforce proper application.

(IMPORTANT)

1/8 inch maximum clearance.

Prevent Events: Self check, Peer check and use STAR

- a. Where 1/16 inch clearance is specified at each opposite side, the inspection may be from 0 inch (free to slide) on one side to 1/16 inch minimum and 1/8 inch maximum total for both sides.
- b. For all other cases, specified clearance on pipe hanger drawing/EDC in the pipe unrestrained directions shall be the minimum. The minimum inspection clearance shall not be less than the design pipe movement in the direction of the minimum clearance as indicated on the drawing plus additional clearance for pipe thermal radial growth in accordance with ATTACHMENT 3.

Prevent Events: Self check, Peer check and use STAR

U-bolt clearances for guides may be from 0 inch (free to slide) to 1/8 inch maximum (lateral, total for both sides per ATTACHMENT 22, Page 22-7). Clearances for 1 inch diameter plastic coated U-bolt may be from 0 inch (free to slide) to 1/4 inch maximum.

13-PN-205, 7.5.2

Prevent Events: Self check, Peer check and use STAR

For the inspection and verification that a space exists for 0 inch (free to slide) clearance between pipe wall (or welded pipe attachments) and miscellaneous steel supports, standard restraint straps, welded pipe attachments, or U-bolts, the method of inspection may be any one of the following:

13-PN-205, 7.5.3

Use sketches, photos, video clips, or PVC piping to reinforce proper application.

(IMPORTANT)

- a. The ability to insert a standard feeler gauge between the pipe wall and the supporting structure or the restraint strap.
- b. The ability to physically measure a space between the pipe wall and the supporting structure or the restraint strap.

(IMPORTANT)

- c. The ability to physically move the pipe by hand within the restraint or miscellaneous steel support.

- d. The ability to see visible light between the pipe wall and the supporting structure or the restraint strap.

Prevent Events: Self check, Peer check and use STAR

EO: 1.2 Identify expectations for workers related to critical attributes for pipe supports and hangers.

Main Idea

Pipe Support and Hanger Installation Critical Attributes

The following attributes shall be utilized when fabricating and installing pipe supports and hangers

13-PN-205, 8.3.8.1

1# Support identification

Verify that the hanger/support is identified. The ID should be placed to allow maximum visibility to personnel and be permanent. ID markings should be made by stamping or be legibly marked with a vibrating etching tool, ink pen, or paint stick.

Prevent Events: Use Peer Checking and three-legged communications to verify proper ID is assigned to each hanger/ support.

2# Configuration and location, including clearances

Verify that the hanger/support is installed at the correct location, elevation, is leveled, has the proper alignment, and all clearances are as required by the design drawings and specifications. Interferences should be checked which could prevent the anticipated thermal movement of the pipe, such as: conduits, cable trays, platforms, grating, insufficient penetration sleeve clearance, and insufficient clearances to adjacent piping.

Prevent Events: Use Peer Checking and three-legged communications to verify proper ID is assigned to each hanger/ support.

3# Material per design

Verify that the material used for the fabrication and installation is the correct material as listed on the design documents.

Prevent Events: Perform verifications prior to going to the field.

4# Concrete anchors installed

Verify that the correct quantity of concrete anchors were properly installed and the documentation is complete.

Anchors are installed by another specification. This can be done on the hanger installation work order with a signoff for completion that would include the appropriate paper work supporting the other spec.

5# Grout Complete

Verify that the grout was installed properly and the documentation is

Grout is installed by another specification.

complete.

This can be done on the hanger installation work order with a signoff for completion that would include the appropriate paper work supporting the other spec.

6# Fasteners torqued

Verify that bolt tightening on the hanger/support is per design. Record the following in the work order: torque wrench calibration due date, M&TE number, and the final torque value. If the Turn-of-the-Nut method was used, provide a notation in the work order. Specifically excluded from this attribute are the tightening of nuts on U-bolts and the installation of jam nuts, when no torque value is specified.

Prevent Events: Have torque wrench pre-tested if the wrench is to be used in a hard to access area to verify that it is functioning properly and to reduce the risk of having to reperform the torquing.

7# Welding complete

Verify that all weld data sheets (WDS) are complete and acceptable. The actual inspection/acceptance of a weld is documented and recorded on the WDS as required by the Welding and Brazing Control Procedure.

Objective Review

Review major points.

Questions and Answers

Clarify any areas where there is a lack of understanding.

SUMMARY OF MAIN PRINCIPLES

The following items are things to consider in your lesson summary. They are not mandatory. You should develop your own summary.,

Objectives Review

Review the Lesson Objectives

Topic Review

Restate the main principles or ideas covered in the lesson. Relate key points to the objectives. Use a question and answer session with the objectives.

Questions and Answers

Oral questioning

Ask questions that implement the objectives. Discuss students answers as needed to ensure the objectives are being met.

Problem Areas

Review any problem areas discovered during the oral questioning, quiz, or previous tests, if applicable. Use this opportunity to solicit final questions from the students (last chance).

Concluding Statement

If not done in the previous step, review the motivational points that apply this lesson to students needs. If applicable, end with a statement leading to the next lesson.

You may also use this opportunity to address an impending exam or practical exercise.

Should be used as a transitional function to tie the relationship of this lesson to the next lesson. Should provide a note of finality.