U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No. 85-21

Docket No. 50-410

Licensee No. CPPR-112 Priority -- Category A

Licensee: Niagara Mohawk Power Corporation
300 Erie Boulevard
Syracuse, New York 13202

Facility Name: Nine Mile Point, Unit 2

Inspection At: Scriba, New York

Inspection Conducted: June 17, 1985

Approved by: J. C. Linville 7/11/85
J.C. Linville, Chief, Reactor Projects Section 2C, DRP date

Meeting Summary: Management Conference on June 17, 1985
(Report No. 50-410/85-21)

Summary: Special management conference convened at the request of Region I to discuss the results of the Large Bore Pipe Support reinspection effort conducted by Niagara Mohawk Power Corporation. The identified nonconforming conditions were presented in conjunction with the associated engineering analysis which demonstrated that the weld conditions would satisfy the design intent. Enhanced system walkdowns are scheduled to detect and rectify mechanical deficiencies. The basic philosophy used by Niagara Mohawk to demonstrate the acceptability of previously inspected pipe supports was acknowledged by Region I. A further meeting was requested by Region I to discuss three additional commodity reinspection results along with information pertaining to Reactor Controls, Inc. and electrical separation problems. The meeting of June 17 was approximately two hours in duration.

DETAILS

1. Attendees

Niagara Mohawk Power Corporation (NMPC)

C.G. Beckham, Quality Assurance Manager, NMPC (MAC)
W.J. Donlon, President, NMPC
C.V. Mangan, Vice President Nuclear Engineering, NMPC
J.A. Perry, Director of Quality Assurance, NMPC (MAC)
D.L. Quamme, Project Director, NMPC (MAC)

U.S. Nuclear Regulatory Commission (NRC)

S.J. Collins, Chief, Reactor Projects Branch 2, DRP
J.P. Durr, Chief, Engineering Branch, DRS
S.D. Ebneter, Director, Division of Reactor Safety (DRS)
R.A. Gramm, Senior Resident Inspector NMP-2
J. Linville, Chief, Reactor Projects Section 2C, DRP
K. Manoly, Lead Reactor Engineer, DRS
T. Murley, Regional Administrator
R.W. Starostecki, Director, Division of Reactor Projects (DRP)
J. Wiggins, Chief, Materials and Processes (DRS)
H.J. Wong, Senior Reactor Construction Engineer, IE

Stone and Webster Engineering Corporation

S.C. Chow, Assistant Division Manager - Engineering Mechanics, Stone and Webster Engineering Corp. (SWEC)
C.E. Crocker, Superintendent of Engineering (SWEC)

2. Background Information

The NRC Construction Appraisal Team inspection (50-410/83-18) was performed in late 1983. That inspection effort identified numerous inconsistencies between inspected hardware installations and the associated design documents. Those results prompted Niagara Mohawk Quality Assurance to perform a number of reinspection efforts to ascertain the conformance of hardware installations to the design requirements. The reinspection efforts were conducted by Quality Assurance personnel of the following commodities:

Commodity	Responsible Contractor	Quantity
Pipe Supports	ITT-Grinnell	175
Pipe Supports	SWEC	14
Instrument Tubing Supports	Johnson Controls, Inc.	150
HVAC Supports	SWEC	56
Mechanical Equipment	SWEC	6

Piping - Mechanical	ITT-Grinnell	3 isometrics
Piping - Welds	ITT-Grinnell	18 isometrics
Concrete Surface	SWEC	6600 ft
Structural Steel	SWEC	80 members/ 120 connections
Concrete Expansion Anchors	Various	40
Nuclear Coatings	SWEC	2000 ft
Electrical Equipment	SWEC	43
Conduit	SWEC	189
Cable Tray	SWEC	106
Raceway Supports	SWEC	319
Cables	SWEC	771

Niagara Mohawk QA compiled a summary of the deficiencies identified during the course of the reinspection efforts. A determination was made as to the timeframe in which the deficient item had originally been accepted by the associated contractor quality control organization. SWEC engineering analyzed the consequences of the noted deficiencies with respect to the ability of the component to perform the design function. A meeting was scheduled between Region I and Niagara Mohawk to discuss the results of the ITT-Grinnell pipe support reinspection as a considerable number of deficiencies were documented during the reinspection for that commodity.

3. Meeting Summary

The meeting of June 17, 1985 was scheduled specifically to discuss the reinspection results and engineering analysis for the ITT-Grinnell large bore pipe supports. Niagara Mohawk QA reinspected 50 supports and found 24 that were not in full compliance with the design criteria, while SWEC reinspected 125 and found 64 that were not in full compliance. The supports had originally been accepted during 1982, 1983 and 1984. The support deficiencies included improperly installed bolted connections, clearance violations, improper piping gaps, arc strikes, and other miscellaneous attributes. A licensee assessment found that ITT Quality Control procedures were generally adequate to address the engineering requirements and that the inspector qualification program was satisfactory. The root cause of the problem was that Quality Control inspectors had independently made judgements regarding the hardware acceptability where either the inspection tolerances were lacking or the engineering specifications were subject to interpretation. SWEC engineering evaluated all of the noted weld deficiencies and found that adequate design conservatism was available such that the installed supports and the adjacent piping system components, would still perform the design function. Engineering has since established criteria for weld size and length tolerances based upon NRC approval of ASME code case 413 and SWEC design conservatism.

Quality Assurance implemented the following actions to preclude further ITT support problems and to identify additional deficient supports:

- Enhanced the ITT-Grinnell N-5 walkdown program to specifically examine pipe support bolting hardware, support to pipe gaps, support clearances, support damage from adjacent work activities, and proper anchor bolt identification.

- Initiated ITT-Grinnell construction/engineering pre-examination prior to the support release to Quality Control.

- Enhanced the post inspection rework control program.

- Incorporated engineering tolerance criteria into the ITT inspection procedures.

- Directed ITT-Grinnell to completely reinspect supports accepted after December 1, 1984.

- Directed SWEC to maintain a surveillance of support adequacy accepted by ITT-Grinnell Quality Control after December 1, 1984.

- Eight ITT-Grinnell Quality Control inspectors identified as having accepted nonconforming installations, were decertified and retrained.

The licensee has concluded that based upon the reinspections performed, the associated engineering analysis, and the enhanced Quality Control walkdown attributes, the acceptability of the pipe supports installed by ITT-Grinnell will be ensured.

4. Summary

Region I indicated that the basic philosophy that was utilized by Niagara Mohawk to evaluate the acceptability of the pipe support commodity was satisfactory. Further review of the engineering criteria is discussed within Inspection Reports 50-410/85-06 and 85-19. Region I further requested that additional worst case commodity results be presented by the licensee in addition to an overview of the quality of Reactor Controls Inc. work and the site resolution of numerous electrical separation problems. A meeting date of July 23, 1985 has been scheduled.

NMP2 PIPE SUPPORTS

NRC MEETING AGENDA

INTRODUCTION	D. Quamme
PROBLEM DESCRIPTION	C. Beckham
QUALITY ASSURANCE ASSESSMENT	C. Beckham
ENGINEERING EVALUATION	C. Crocker
QUALITY ASSURANCE EVALUATION	C. Beckham
CONCLUSION	D. Quamme

CMBS 935

PROBLEM DESCRIPTION

CMBS 938

NMP2 PIPE SUPPORTS

PROBLEM IDENTIFICATION

PROBLEMS IDENTIFIED ON PREVIOUSLY ITT GRINNELL FIELD QUALITY CONTROL (FQC) ACCEPTED LARGE BORE SUPPORTS

- NRC CONSTRUCTION APPRAISAL TEAM INSPECTION
- NRC RESIDENT INSPECTOR INSPECTION ACTIVITIES
- NMPC SURVEILLANCE AND AUDIT ACTIVITIES

CM85 090

NMP2 PIPE SUPPORTS

PROBLEM IDENTIFICATION (CONTD)

NMPC CONDUCTED AN OVERVIEW INSPECTION OF 50 LARGE BORE SUPPORTS PREVIOUSLY INSPECTED AND ACCEPTED BY ITT GRINNELL FQC

- OVERVIEW INSPECTION IDENTIFIED 24 LARGE BORE SUPPORTS THAT DID NOT COMPLY COMPLETELY WITH THE LATEST ENGINEERING REQUIREMENTS

NMP2 PIPE SUPPORTS

PROBLEM IDENTIFICATION(CONTD)

BASED ON THE RESULTS OF THIS OVERVIEW INSPECTION NMPC DIRECTED SWEC TO PERFORM ADDITIONAL REINSPECTION OF PREVIOUSLY ACCEPTED ITT GRINNELL LARGE BORE SUPPORTS

- SWEC REINSPECTED 125 LARGE BORE SUPPORTS
- THIS INSPECTION IDENTIFIED 64 LARGE BORE SUPPORTS THAT DID NOT COMPLY WITH THE LATEST ENGINEERING REQUIREMENTS

NMP2 PIPE SUPPORTS

ATTRIBUTES REINSPECTED

EACH LARGE BORE SUPPORT WAS REINSPECTED FOR WELDING AND MECHANICAL ATTRIBUTES

INSPECTION ATTRIBUTES IDENTIFIED AS UNSATISFACTORY

- LOCATION
- CONFIGURATION
- COMPONENT MATERIAL IDENTIFICATION
- BOLTED CONNECTION THREAD ENGAGEMENT
- PLATE GAP
- TUBE STEEL VENT HOLES FOR SEAL-WELDED PRODUCTS
- BOLTED CONNECTIONS TIGHT & HAVE LOCKING DEVICES WHERE REQUIRED
- OFFSET OF SUPPORT RODS
- SWAY STRUT & SHOCK SUPPRESSION DIMENSIONS
- CLEARANCES
- LOCATED OVER CIRCUMFERENTIAL PIPE WELDS
- ANCHOR BOLT LENGTH IDENTIFICATION
- ARC STRIKES, DAMAGE, DENTS, GOUGES & EXCESSIVE GRINDING
- WELDING

BASED ON THE RE-INSPECTION RESULTS, A PROBLEM REPORT [POTENTIAL 50.55 (E)] WAS INITIATED BY QUALITY ASSURANCE ON 12-4-84. THIS PROBLEM REPORT WAS SUBSEQUENTLY EVALUATED BY ENGINEERING ON 1-10-85 AND WAS DETERMINED NOT TO BE REPORTABLE PER THE REQUIREMENTS OF 50.55(E)

NMP2 PIPE SUPPORTS

TIME FRAME OF PROBLEM

ALL SUPPORTS ACCEPTED BY ITT-G QUALITY CONTROL PRIOR TO 11/1/84 (2846)

YEAR	SUPPORTS REINSPECTED	SUPPORTS REJECTED
1982	3	2
1983	85	41
1984	87	45
TOTAL	175	88

CMBS 892

QUALITY ASSURANCE ASSESSMENT

CMBS 939

NMP2 PIPE SUPPORTS

QUALITY PROGRAM ASSESSMENT

PROCEDURES

— FQC PROCEDURES AND INSPECTION CHECKLISTS ADEQUATELY ADDRESS SPECIFICATION REQUIREMENTS

INSPECTOR QUALIFICATION

— QUALIFICATION PROGRAM IS SATISFACTORY

— TECHNICAL TRAINING IS SATISFACTORY

— INSPECTORS TRYING TO ASSESS ACCEPTABILITY

ROOT CAUSE

— LACK OF INSPECTION TOLERANCE IN SPECIFICATION /CODE

— SPECIFICATION/CODE SUBJECT TO INTERPRETATION

— INSPECTORS MAKING ACCEPTABILITY ASSESSMENT

NMP2 PIPE SUPPORTS

WELD CONCERNS

	SUPPORTS	LINEAR INCHES
REINSPECTED	175	30,000
REJECTED	42	180
PERCENT	24	0.6

ATTRIBUTES CAUSING REJECTION

- UNDERSIZE WELD
- SHORT
- UNDERCUT
- OVERLAP

NMP2 PIPE SUPPORTS

MECHANICAL CONCERNS

	SUPPORTS	ATTRIBUTES
REINSPECTED	175	2250+
REJECTED	46	75
PERCENT	26.3	3.3

ATTRIBUTES CAUSING REJECTION

• BOLTED CONNECTIONS TIGHT & HAVE LOCKING DEVICES WHERE REQUIRED	36*
• SUPPORT GAPS	10*
• SUPPORT CLEARANCES	6*
• SUPPORT FREE OF ARC STRIKES, DAMAGE, DENTS, GOUGES AND EXCESSIVE GRINDING	5*
• ANCHOR BOLT LENGTH IDENTIFICATION	4*
• MISCELLANEOUS ATTRIBUTES	14
	75 (61*)

*PROBABILITY OF CHANGE AFTER INSPECTION SIGNOFF.
TO ASSURE THAT QUALITY IS MAINTAINED THESE ATTRIBUTES WILL BE REVERIFIED AT FINAL INSPECTION DURING WALKDOWN PRIOR TO N-5.

NMP2 PIPE SUPPORTS

PROBLEM ANALYSIS

- INSPECTION PROCESS DID NOT CHANGE THROUGHOUT THE PERIOD
- CONDITIONS IDENTIFIED BY REINSPECTION PERFORMED BY SWEC/ NMPC ARE REPRESENTATIVE OF ENTIRE SUPPORT POPULATION
- HIGH CONFIDENCE THAT MORE SIGNIFICANT PROBLEMS DO NOT EXIST

ENGINEERING EVALUATION

CH85-838

NMP2 PIPE SUPPORTS

INSPECTION RESULTS

- 175 SUPPORTS INSPECTED
- 42 SUPPORTS WITH WELDING DISCREPANCIES
- 30,000 INCHES INSPECTED
- 180 INCHES WITH MINOR DISCREPANCIES

CH85 039

NMP2 PIPE SUPPORTS

SUMMARY OF WELD DISCREPANCIES

• WELD UNDERSIZE	32
• WELD UNDERLENGTH	6
• UNDERCUT	2
• OVERLAP	2
TOTAL SUPPORTS	42

NMP2 PIPE SUPPORTS

ENGINEERING EVALUATION

- ENGINEERING INSPECTION OF HARDWARE
- REVIEW DESIGN CALCULATIONS
- ALL SUPPORTS ARE ACCEPTABLE
- LARGE SAFETY FACTORS DUE TO DESIGN CONSERVATISM
- NO SAFETY CONCERNS

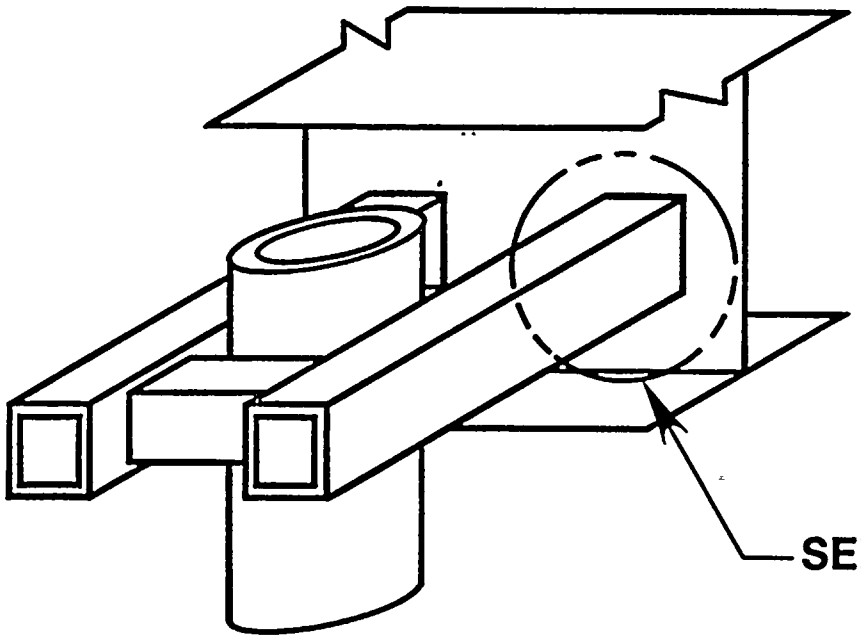
CH05 041

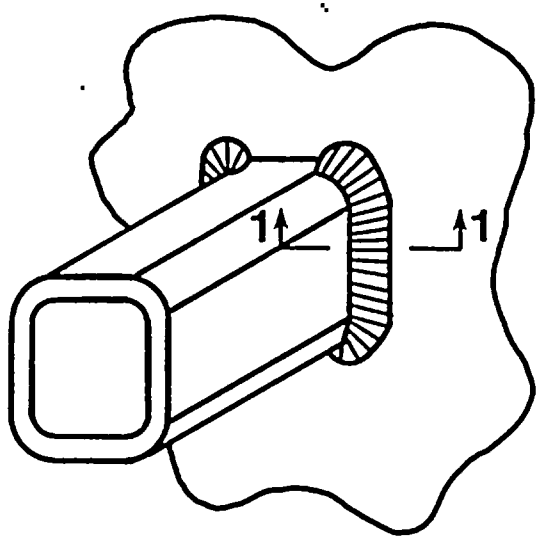
NMP2 PIPE SUPPORTS

INHERENT CONSERVATISM IN ENGINEERING METHODOLOGY

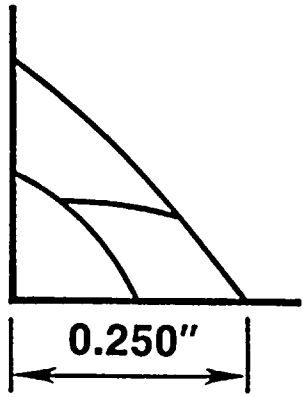
- DESIGN LOAD DEFINITION
- ENVELOPED AMPLIFIED RESPONSE SPECTRA AT ALL ELEVATIONS
- AMPLIFIED RESPONSE SPECTRA PEAK SPREADING
- PIPING DAMPING VALUES
- ASME III CODE
- METHOD OF ANALYSIS

NMP2 PIPE SUPPORTS





DETAIL A

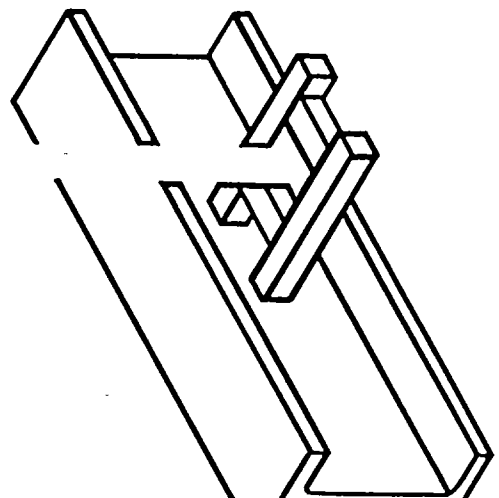


SECTION 1—1

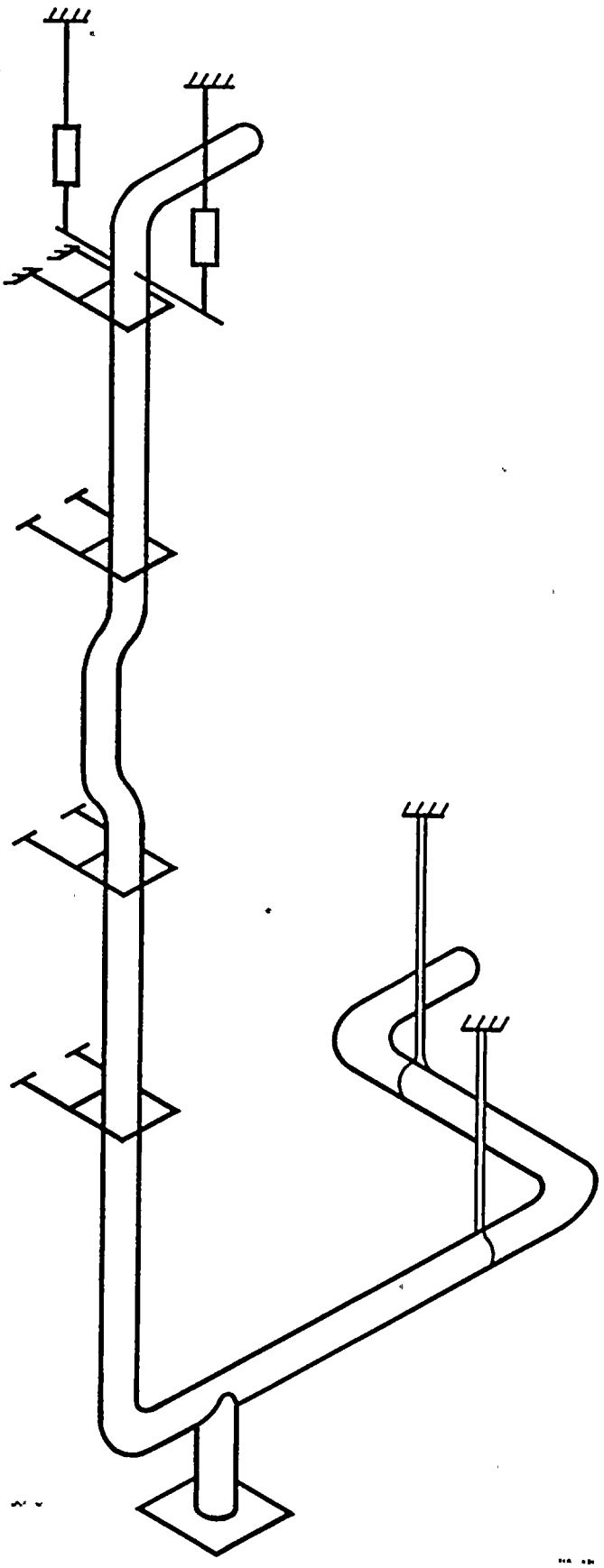
WELD SIZE SPECIFIED ON DRAWING	0.25"
ACTUAL WELD SIZE	0.19"
WELD SIZE NEEDED	0.08"

SAFETY FACTOR = 0.19 / 0.08 = 2.4

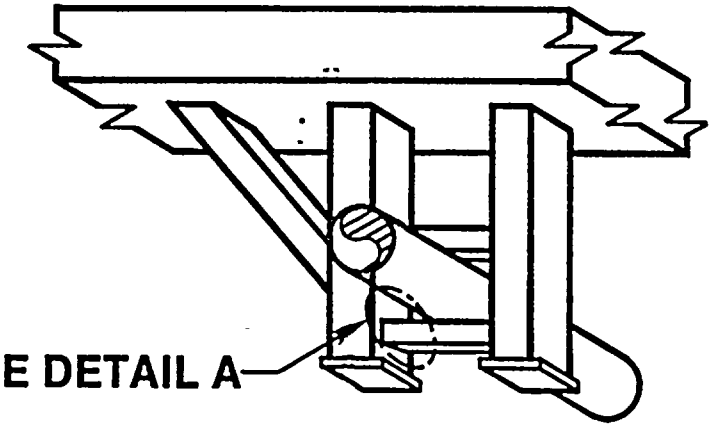
CH05 844

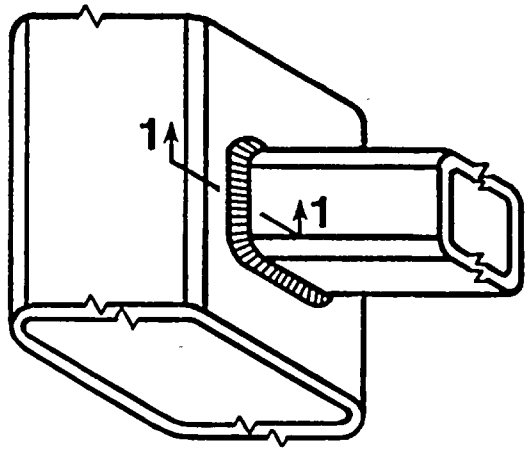


NMP2 PIPE SUPPORTS

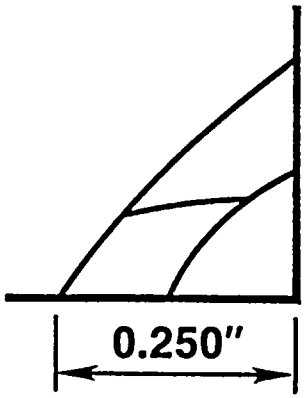


NMP2 PIPE SUPPORTS





DETAIL A



SECTION 1—1

WELD SIZE SPECIFIED ON DRAWING	0.25"
ACTUAL WELD SIZE	0.19"
WELD SIZE NEEDED	0.07"

SAFETY FACTOR = 0.19 / 0.07 = 2.7

NMP2 PIPE SUPPORTS

WORST CASE EVALUATIONS

- LARGE SAFETY FACTOR EXISTS BASED ON AS-BUILT WELD SIZES
- LARGE DESIGN MARGIN REMAINS
- SUPPORTS ACCEPTABLE WITH THE SMALLEST OBTAINABLE WELD (1/8")
- PIPING ACCEPTABLE IF A SUPPORT WITH WELDING DISCREPANCIES WAS NOT INSTALLED

CMBS 843

NMP2 PIPE SUPPORTS

INSPECTION CRITERIA

- REVIEWED EXISTING CRITERIA
- SUBJECT TO INTERPRETATION
- NO TOLERANCE PROVIDED
- UNNECESSARY AND POTENTIALLY DAMAGING REPAIRS
- INDUSTRY PROBLEM
  - OTHER PROJECTS
  - VISUAL WELD ACCEPTANCE CRITERIA (NUCLEAR CONSTRUCTION ISSUES GROUP)
  - CODE CASES/ASME

CM05 848

NMP2 PIPE SUPPORTS

REVISED INSPECTION CRITERIA

- TO PROVIDE REALISTIC, PRACTICAL MEASUREMENT TOLERANCE
- JUSTIFICATION
  - ASME CODE CASE N-413 (ACCEPTED BY NRC)
  - DESIGN CONSERVATISM

CH05 049

NMP2 PIPE SUPPORTS

WELD QUALITY
REVISED INSPECTION CRITERIA

ATTRIBUTE	OLD CRITERIA	REVISED CRITERIA	IMPLEMENTING DOCUMENT SWEC E & DCR	JUSTIFICATION
FILLET WELD SIZE	NO(-)TOLERANCE	-1/16" FOR WELDS $\geq$ 1/4" -1/32" FOR WELDS $<$ 1/4"	F02099B	N413 & DESIGN CONSERVATISM
WELD LENGTH	NO(-)TOLERANCE	12 PERCENT UNDERLENGTH	F02174A	N413 & DESIGN CONSERVATISM
OVERLAP	NO TOLERANCE	3/8" LONG FOR WELDS $>$ 2"	P02585A	N413 & DESIGN CONSERVATISM
UNDERCUT	<1/32"	UNDERCUT SHALL NOT ENCROACH ON THE REQUIRED SECTION THICKNESS	P02585A	ASME III-NF 4424(b)
PAD WELD SIZE	.707 t_{PAD}	.5 t_{PAD}	F02174A	DESIGN CONSERVATISM

NMP2 PIPE SUPPORTS

CONCLUSION — ENGINEERING EVALUATION

- ALL SUPPORTS ARE ACCEPTABLE
- LARGE SAFETY FACTOR BASED ON AS-BUILT WELD SIZES
- CONSISTENT WITH PAST CONSTRUCTION EXPERIENCE
- SIMILAR CONDITIONS EXIST ON OTHER PROJECTS
- MORE PRACTICAL INSPECTION CRITERIA
- NO SAFETY CONCERNS
- NO FURTHER REINSPECTION REQUIRED

QUALITY ASSURANCE EVALUATION

CMBS 940

NMP2 PIPE SUPPORTS

QPMP ACTION

- IDENTIFIED HIGH ITT-G QUALITY CONTROL REJECT RATE
- IDENTIFIED SPECIFIC ATTRIBUTES CAUSING REJECTS AND INITIATED CORRECTIVE ACTION
- INITIATED ITT-G CONSTRUCTION / ENGINEERING PRE-INSPECTION PRIOR TO RELEASE TO QUALITY CONTROL
- REMOVED ITT-G QUALITY CONTROL FROM PRE-INSPECTION STATUSING
- INITIATED POST ACCEPTANCE REWORK AWARENESS PROGRAM

NMP2 PIPE SUPPORTS

QUALITY PROGRAM ENHANCEMENT

- ENGINEERS PROVIDED INSPECTION TOLERANCE
- MEETINGS HELD WITH CONSTRUCTION PERSONNEL AND QUALITY CONTROL INSPECTORS TO REITERATE THEIR ROLE IN QUALITY PROGRAM
- IDENTIFIED SPECIFIC ATTRIBUTES FOR REINSPECTION AT FINAL WALKDOWN

NMP2 PIPE SUPPORTS

FQC-4.2-26-2
FINAL SYSTEM WALKDOWN CHECKLIST ATTRIBUTES

- THREAD FASTENER LOCKING DEVICES
- JAM NUTS ON HILTI BOLTS
- SUPPORTS NOT ON CIRCUMFERENTIAL WELDS
- THREAD ENGAGEMENT
- COLD SETTINGS
- ISI CLEARANCES
- ARC STRIKES, GOUGES, DAMAGE
- GAPS
- SUPPORT CLEARANCES
- MISSING, LOOSE OR DAMAGED HARDWARE

NMP2 PIPE SUPPORTS

REINSPECTION PROGRAM

- FINAL WALKDOWN INSPECTION ASSURES REINSPECTION OF SPECIFIC MECHANICAL ATTRIBUTES
- ITT-G TO COMPLETELY REINSPECT SUPPORTS ACCEPTED AFTER 12/1/84
- SWEC SURVEILLANCE OF SUPPORTS ACCEPTED AFTER 12/1/84

CMS 900

NMP2 PIPE SUPPORTS

SURVEILLANCE/AUDIT RESULTS SUPPORTS ACCEPTED AFTER 12/1/84

	SUPPORTS RESINSPECTED	REJECTED WELDING	REJECTED MECHANICAL
NMPC/SWEC SURVEILLANCE	150	5 (3.3%)	24 (16%)
EA/QA AUDIT	20	0	1 (5%)

REJECTED ATTRIBUTES WERE SIMILAR TO THOSE IDENTIFIED IN FIRST REINSPECTION. ENGINEERING HAS EVALUATED THESE RESULTS AND THE SUPPORTS ARE ACCEPTABLE AS IS.

NMP2 PIPE SUPPORTS

WELD CONCERNS

ATTRIBUTE	CONCERNS
UNDERSIZE	2
LENGTH	4
UNDERCUT	2
PROFILE	1
	9

TOTAL WELDS INSPECTED	2250
TOTAL WELDS REJECTED	9
% REJECTED	0.4%

	81	82	83	84	85
INITIAL WELD ACCEPTANCE	1	0	6	0	2

NMP2 PIPE SUPPORTS

MECHANICAL CONCERNS

ATTRIBUTE	CONCERNS
HARDWARE INSTALLATION	9 *
MATERIAL TRACEABILITY	4 **
CLEARANCES/GAPS	4 *
DIMENSIONS	5 *
ORIENTATION	4 ***
POST WELD HEAT TREATMENT	1 **
	27
TOTAL ATTRIBUTES INSPECTED	2000
TOTAL ATTRIBUTES REJECTED	27
% REJECTED	1.35%

* FINAL WALKDOWN INSPECTION ATTRIBUTE
** DOCUMENTATION REVIEW
*** FINAL WALKDOWN AND ENGINEERING AS-BUILT WALKDOWN

NMP2 PIPE SUPPORTS

SURVEILLANCE EVALUATION

- TWENTY THREE INSPECTORS — SUPPORTS ACCEPTABLE
- NINE INSPECTORS — ONE SUPPORT REJECTED
- EIGHT INSPECTORS — TWO OR MORE SUPPORTS REJECTED
- SUPPORTS STILL BEING REWORKED WITHOUT PROPER CONTROL

CH85 904

NMP2 PIPE SUPPORTS

CORRECTIVE ACTION

- DE-CERTIFIED EIGHT (8) INSPECTORS — RE-TRAIN AND RE-CERTIFY PRIOR TO FURTHER INSPECTION

- STRENGTHENED THE REWORK CONTROL FOR LARGE BORE SUPPORTS

CH85 905

CONCLUSION

CMBS 936

NMP2 PIPE SUPPORTS

CONCLUSIONS

- ORIGINAL PROBLEM CAUSED BY INSPECTORS ASSESSING ADEQUACY
- REITERATION OF INSPECTORS' ROLE
- PROVIDED ACCEPTANCE TOLERANCE TO INSPECTORS
- SURVEILLANCE INDICATES QUALITY PROGRAM IS SATISFACTORY
- LARGE BORE SUPPORT PROGRAM IS SATISFACTORY

CMBS 934