Code Case N-504-1

Application to the Palisades Nuclear Plant
Control Rod Drive Upper Housings

ENCLOSURE 2

Background on the Issue

- CRD Upper Housing Description
- Leak Identification on CRD-21
- Examination Results to Date

Weld Overlay Repair Option

- Overlay In Accordance With Code Case N-504-1 For Stainless Piping
- CRD Housings Were Supplied As A Sub-component With Reactor Head
- CRD Housing Constructed Of Standard Austenitic Stainless Pipe & Components

Application Of Code Case N-504-1

Issues To Be Addressed

- Design Of The Overlay
- Beneficial Effects Of An Overlay
- Applicability To TGSCC

Palisades Standard Overlay Design

- Applicable To Both Axial And Circumferential Flaws
- Assumes Flaw Is 100% Through Wall, 360° Around
- Overlay Design Utilizes 309L Stainless Material

Beneficial Effects Of Overlay

- Replaces Base Material With SCC Resistant Material
- Compressive Stress Field Generated
- Over 1000 Overlays Performed With No Indication Of Crack Growth

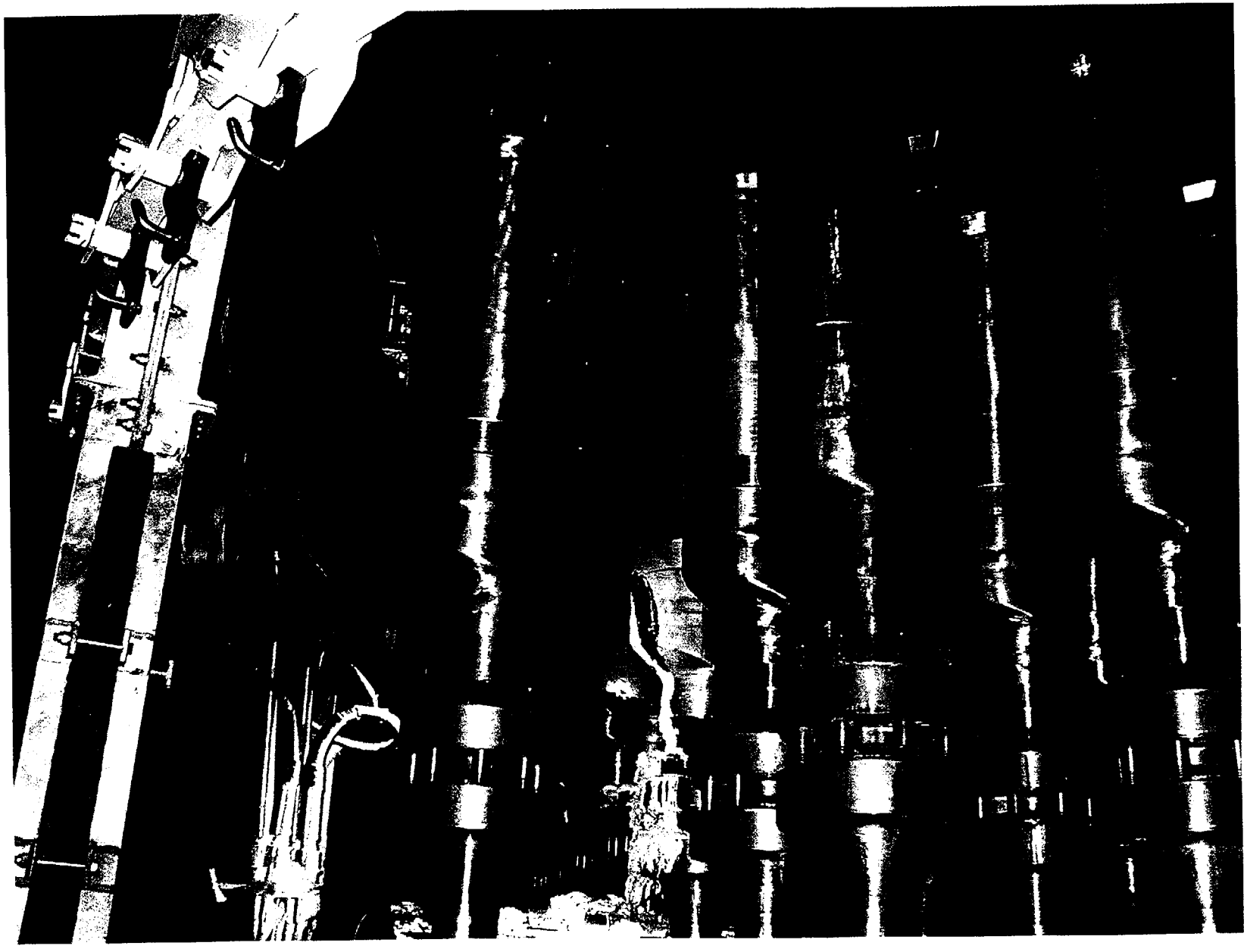
Applicability To TGSCC

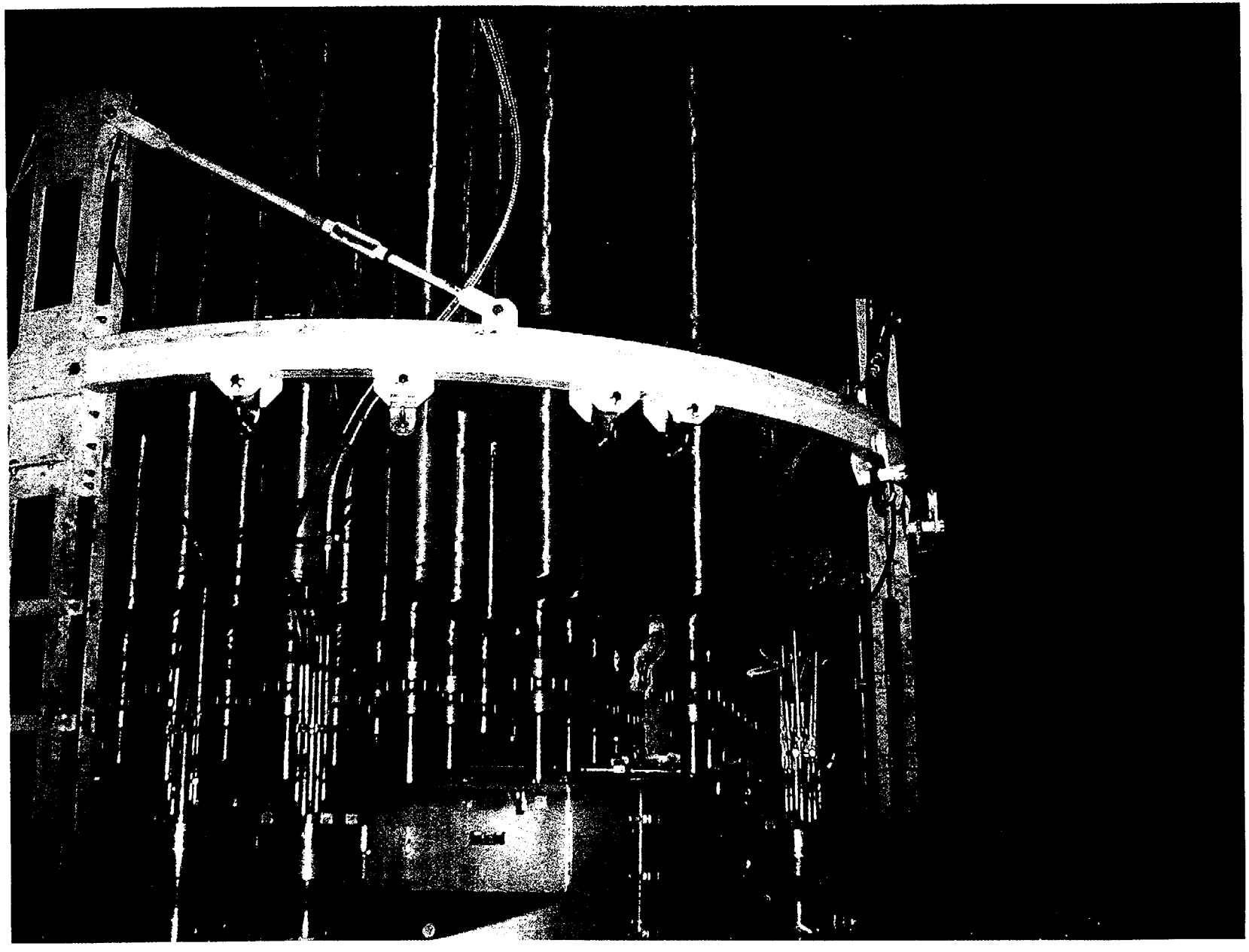
- Code Case Is Not Limited To Any Specific Degradation Mechanism
- Highly Resistant Overlay Material To Be Used (>10% Ferrite)
- Crack Growth Rate Consideration

Summary

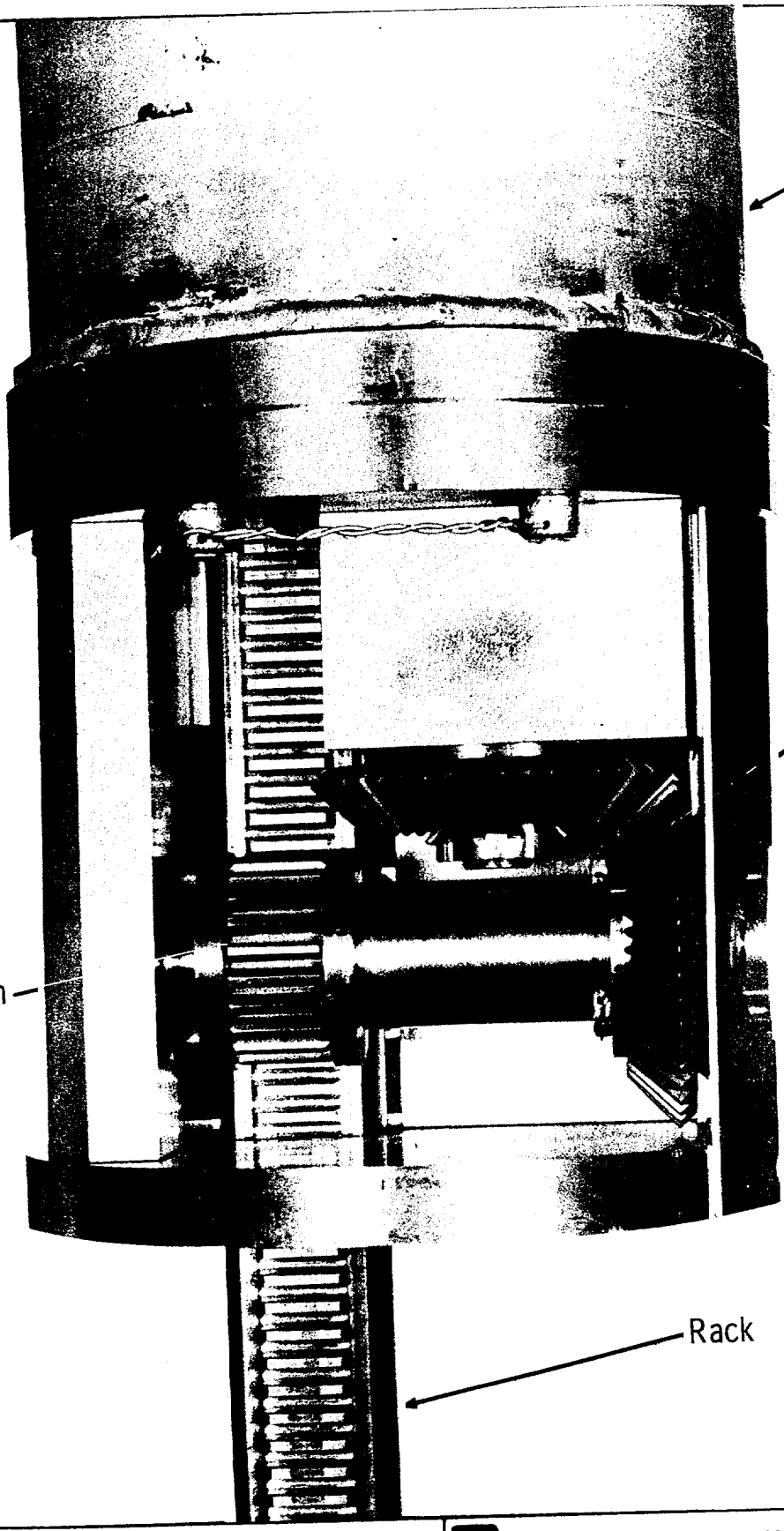
- 309L Material Is Resistant To SCC
- Overlay Mitigates Crack Growth
- Full Structural Overlay Design
- Future Inspections Will Provide Assurance Of Overlay Effectiveness

Conclusion





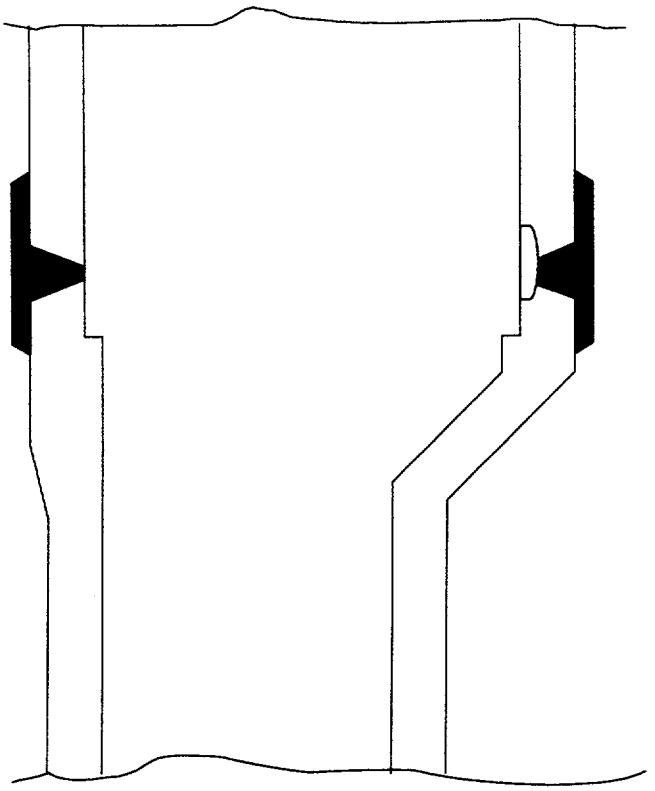
UPPER HOUSING

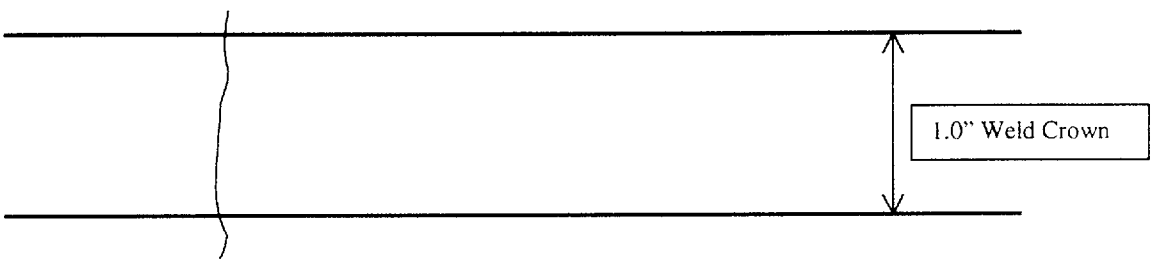


Pinion Housing and Rack Assembly

COMBUSTION ENGINEERING, INC.
WINDSOR, CONNECTICUT

Figure 3




1.0" Weld Crown

Cycle No: End of Cycle 15 (01 Refout beginning)
Date Revised: April 8, 2001
System Engineer: RJ Slakes

REFERENCE ONLY

CRDM HEAD MAP

NORTH — ||| GATE |||

	A 01 2966-95 93/06 142 1/4 41 3/8	1 21 2966-84 95/06 143 3/8 33 3/8	3 33 2966-80 00/02 103 5/8 28 3/8	1 22 2966-87 93/06 104 1/4 34 3/8	A 02 2966-16 98/12 105 7/16 42 1/4	
A 03 2966-107 95/06 106 5/16 40 3/8	4 38 2966-90 93/06 107 1/4 23 3/8	B 13 2966-85 93/06 108 1/4 17 3/8	P 42 2966-70 92/02 205 1/4 12 3/8	B 14 2966-104 95/06 109 5/16 18 3/8	4 39 2966-73 92/02 144 5/16 24 3/8	A 04 2966-62 99/11 111 5/16 43 3/8
1 23 2966-69 92/02 112 1/4 32 3/8	B 15 2966-81 92/02 113 1/2 16 3/8	2 29 2966-89 00/02 114 5/16 07 3/8	A 05 2966-79 92/02 115 ___ 04 3/8	2 30 2966-26 99/11 116 1/4 08 1/4	B 16 2966-97 93/06 117 1/2 19 3/8	1 24 2966-86 00/02 118 9/16 35 3/8
3 34 2966-68 92/02 119 1/2 27 3/8	P 43 2966-100 95/06 202 5/16 11 3/8	A 06 2966-66 00/02 120 5/16 03 3/8	3 35 2966-71 92/02 121 3/4 01 3/8	A 07 2966-01 99/11 122 1/2 05 1/4	P 44 2966-108 99/11 203 5/16 13 3/8	3 36 2966-32 99/11 123 5/16 29 1/4
1 25 2966-93 93/06 124 9/16 31 3/8	B 17 2966-76 93/05 125 5/16 15 3/8	2 31 2966-94 95/06 126 5/16 06 3/8	A 08 2966-65 95/06 127 5/16 02 3/8	2 32 2966-64 00/02 128 5/16 09 3/8	B 18 2966-63 00/02 129 5/16 20 3/8	1 26 2966-110 99/11 130 5/16 36 3/8
A 09 2966-60 96/12 131 1/4 39 3/8	4 40 2966-96 93/06 132 3/8 22 3/8	B * 19 2966-105 00/02 110* 5/16 14 3/8	P 45 2966-92 98/05 204 5/16 10 3/8	B 20 2966-34 99/11 134 1/2 21 1/4	4 41 2966-98 93/06 135 5/16 25 3/8	A 10 2966-109 99/11 136 7/16 44 3/8
	A 11 2966-61 96/12 137 5/8 38 3/8	1 27 2966-67 95/06 138 5/16 30 3/8	3 37 2966-106 00/09 139 5/16 26 3/8	1 28 2966-91 00/02 140 5/16 37 3/8	A 12 2966-99 00/02 141 3/8 45 3/8	

||| GATE ||| — SOUTH

Rod Group — **Location CRD-##**
Seal Housing Serial Number
Last Rebuild — Control Rod Serial Number
Collar Hght — Rx Head Bore # — **CCW NPT**

Rod Groups: { A-B shutdown } { 1-4 regulating } { P part-length }

Housing Serial Numbers: <2966-60 are 304 stainless steel with 1/4 NPT CCW ports;
≥ 2966-60 are 347 stainless steel with 3/8 NPT CCW ports.
2966-2xx are Inconel Housings with 3/8 or 1/2 NPT CCW ports.

Broad horizontal lines represent CCW and leakoff piping headers servicing adjacent CRDM rows.
North headers service only the north outer row.
Headers are stacked: Top is CCW in; Middle CCW out; Bottom seal leakoff.

* Location 19 has: Pitted autoclave seating surface and special coupler for Control Rod 110 (ref.SFC-81-092)

ENCLOSURE 3