Commonwealth Edison
1400 Opus Place
Downers Grove, Illinois 60515

January 21, 1994

Dr. Thomas E. Murley, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Zion Nuclear Station Units 1and 2
Second Interval Inservice Inspection
Program Relief Requests
NRC Docket Nos. 50-295 and 50-304

Dear Dr. Murley:

By letter dated June 27, 1993, Commonwealth Edison Company, (CECo), submitted the Inservice Inspection for the Second Ten Year Interval for Zion Station. As required by 10 CFR 55(a)(g), the plan was prepared in compliance with ASME Section XI, 1980 Edition through Winter 1981 Addenda.

Pursuant to 10 CFR 50.55(a)(g)(5)(iii), CECo is submitting the following additional relief requests:

1. Relief Request IWB-14
2.. Relief Request IWC-6

Relief request IWB-14 proposes alternate examinations for the steam generator primary nozzles on 3 of the 4 steam generators on each unit.

Relief Request IWC-6 seeks relief from the performance of the alternate examination described in Relief Request IWC-5 for one weld on the regenerative heat exchanger. The basis for the requested reliefs, as well the proposed alternatives, are discussed in the Attachments to this letter.

If there are any questions or comments regarding this matter, please direct them to this office.

Sincerely,

Terrence W. Simpkin
T.W. Simpkin
Nuclear Licensing Administrator

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Attachments

cc: J. B. Martin, Regional Administrator - RIII
C. Y. Shiraki, Project Manager - NRR
J.D. Smith, Senior Resident Inspector - Zion

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ZION GENERATING STATION
UNITS 1 AND 2

RELIEF REQUEST IWB-14

COMPONENT IDENTIFICATION:	Steam Generator
CODE CLASS:	1
REFERENCES:	Table IWB-2500-1
EXAMINATION CATEGORY:	B-D
ITEM NUMBER:	B3.140
DESCRIPTION:	Steam Generator Primary Nozzle Inside Corner Radii.
COMPONENT NUMBER:	1RC100, 1RC200, 1RC300, 1RC400 2RC100, 2RC200, 2RC300, 2RC400
CODE REQUIREMENT:	Volumetric examinations are required by Table IWB-2500-1. Examinations are required on all nozzles.

BASIS FOR RELIEF:

Relief is requested from performing volumetric examinations on the steam generator primary nozzle inside corner radii of all four steam generators on the basis that compliance with the Code requirement would result in hardship or unusual difficulty without a compensating increase in the level of plant quality and safety.

Prior to the Fall of 1993, it was widely believed in the industry that it was not possible to perform examinations on PWR Steam Generator Primary Nozzle inside corner radii. The steam generator primary nozzles contain an inherent geometric constraint which made the performance of a meaningful volumetric examination using conventional ultrasonic techniques difficult. A lack of symmetry between the inner and outer radii of curvature and the large thickness of the vessel head made it difficult to determine the effective examination angle and to verify that the code required volume was achieved. In addition, the difficulty in interpreting the UT data due to clad role, the scattering effect of the cast material on ultrasonic beams, and rough surface finish would reduce the effectiveness of the exam.

The difficulty in performing this examination is well known in the industry. Relief from performing a volumetric exam was granted for Zion Station's first ten-year interval and was requested for the second ten-year interval. Relief was originally requested in relief request IWB-2 and was reviewed by the NRC in the Safety Evaluation Report (SER) dated February 11, 1986. This relief request was granted provided that a volumetric examination was performed to the extent practical.

RELIEF REQUEST IWB-14

BASIS FOR RELIEF: (continued)

In Fall 1993, Commonwealth Edison contracted Westinghouse to perform 3-Dimensional ultrasonic modeling of the steam generator primary nozzles. 3-Dimensional modeling of the nozzles provides understanding of sound beam behavior in the nozzles, assists in determination of the optimal sound beam angle, and provides input for the design of calibration blocks. A procedure was developed from the results of the 3-Dimensional modeling effort. In addition, a full scale mock-up with EDM notches the size of the code allowable flaw that were placed at the boundaries of the examination volume as well as the radii corner was fabricated to validate the procedure technique.

The result of these efforts was successful since it was demonstrated that the examination procedure was able to detect all of the notches in the mockup. The examination was performed on the 1C Steam Generator hot and cold leg nozzles and essentially full examination coverage was achieved and no flaw induced indications were found.

Relief is requested from performing exams on the remaining three steam generator primary inlet and outlet nozzles due to the high radiation exposure that will be received by plant personnel. The total radiation exposure to personnel to prepare and examine the primary nozzles of one steam generator was approximately 2R. It was also estimated that an additional 1R of exposure was received to shield and decontaminate the area to facilitate preparation and inspection. It is estimated that a total of 9R of radiation exposure would be expended to decontaminate, shield, build scaffold, remove insulation, prepare the surface, and inspect the remaining nozzles of the other three steam generators. Similar dose rates are expected for Unit 2.

The Steam Generator primary hot leg and cold leg nozzles do not experience thermal stratification or a high thermal gradient during operation and therefore are not highly susceptible to thermally induced fatigue cracking.

PROPOSED ALTERNATE EXAMINATION:

For Unit 1 Steam Generators: Ultrasonic examinations were performed on one hot leg and one cold leg primary nozzles and no ultrasonic indications were found. In addition, visual examinations (VT-3) were performed on the inner radii surfaces from the inside of all four steam generators and no visual indications were found.

For Unit 2 Steam Generators: Ultrasonic examinations will be performed on one hot leg and one cold leg primary nozzles. Visual examinations (VT-3) will be performed on the inner radii surfaces from the inside of all four steam generators.

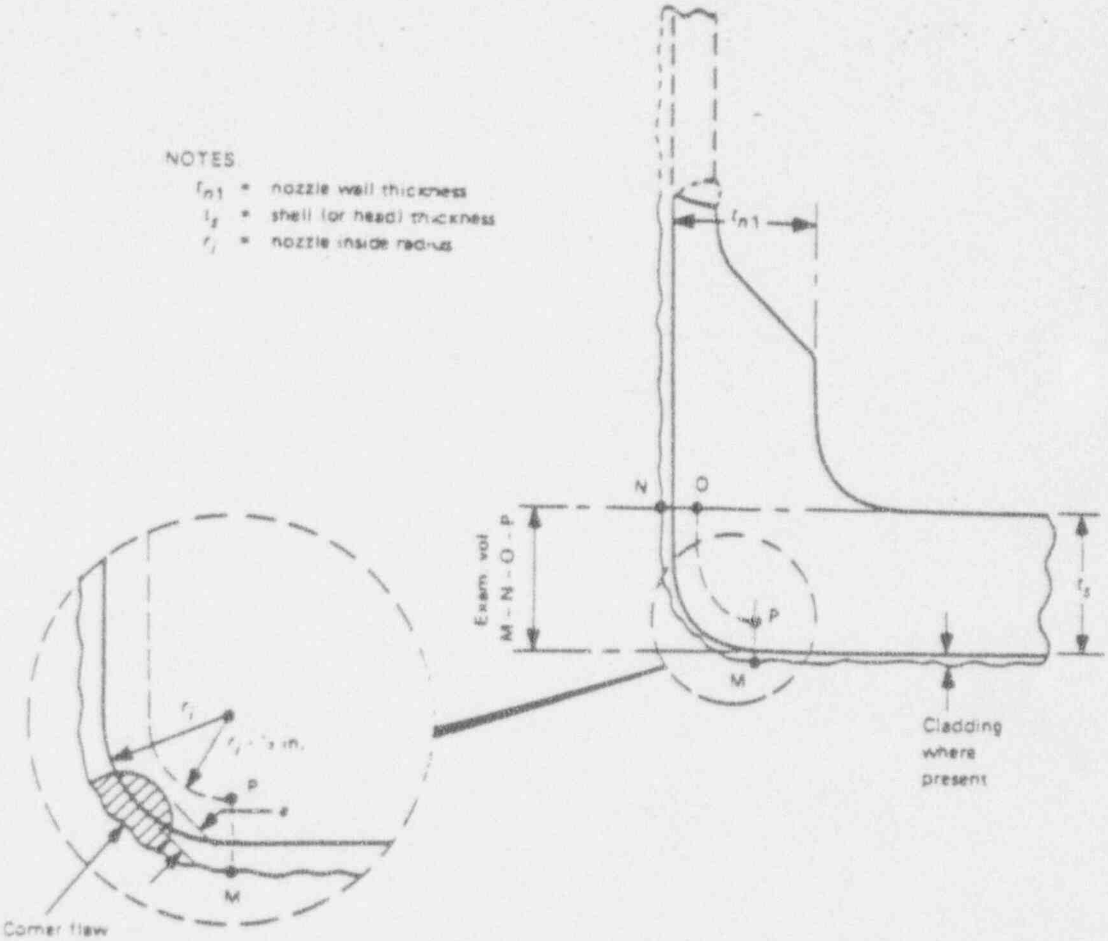
PROPOSED ALTERNATE EXAMINATION: (continued)

Ultrasonic examinations on one steam generator will serve to provide a reasonable sample from which to assess the integrity of the steam generator primary nozzles. The visual exams will ensure that gross flaws are not present in the remaining nozzle inner radii. Cracking of PWR steam generator primary nozzle inner radii have not been a problem in the industry.

This relief request will apply to Zion Station's Second Ten-Year Interval Program only. For the Third Ten-Year Interval, Zion Station will inspect the Steam Generator Primary Nozzles at the Code required frequency.

RELIEF REQUEST STATUS:

Relief is requested for the Second Ten-year ISI Interval. Zion has attempted to comply with the terms of the original relief request reviewed as IWB-2 and granted in the SER dated February 11, 1986. However, due to the high radiation exposure to plant personnel that would be received by performing exams on all of the steam generator primary nozzles, we request relief from performing volumetric examination on all of the steam generator primary nozzle inner radii as required by code.



EXAMINATION REGION[1]
Nozzle inside corner region

EXAMINATION VOLUME[2]
M-N-O-P

NOTES:
(1) Examination regions are identified for the purpose of differentiating the acceptance standards in IWB-3512.
(2) Examination volumes may be determined either by direct measurements on the component or by measurements based on design drawings.

W80

FIG. IWB-2500-7(d) NOZZLE IN SHELL OR HEAD
(Examination Zone in Nozzles Integrally Cast or Formed in Shell or Head)

ZION GENERATING STATION
UNITS 1 AND 2

RELIEF REQUEST IWC-6

COMPONENT IDENTIFICATION: Regenerative Heat Exchanger

CODE CLASS: 2

REFERENCES: Table IWC-2500-1

EXAMINATION CATEGORY: C-A

ITEM NUMBER: C1.20

DESCRIPTION: Regenerative Heat Exchanger Head to Shell Weld

COMPONENT NUMBER: 1VC001, 2VC001

CODE REQUIREMENT: Volumetric examinations are required by Table IWB-2500-1. Examinations may be limited to one vessel or distributed among the vessels.

BASIS FOR RELIEF:

Relief is requested from performing examinations on one head to shell weld (welds 2, 4, and 6 as shown in Figure CWE-2-1150) of the Regenerative Heat Exchanger on the basis that compliance with the Code requirement would result in hardship or unusual difficulty without a compensating increase in the level of plant quality and safety.

The Regenerative Heat exchanger is located in a small cubicle beneath removable blocks inside Containment. The Regenerative Heat Exchanger consists of three vessels connected by 3" NPS piping as shown in Figure CWE-2-1150. The shell side of the heat exchanger contains letdown flow and the tube side of the heat exchanger contains charging flow. The purpose of the heat exchanger is to transfer heat from letdown flow (as an initial measure of cooling prior to demineralization) to charging flow in order to heat up charging flow prior to injection into the Reactor Coolant Loops.

In the case where multiple vessels exist, Section XI allows the examination scope to be limited to one vessel or distributed among the vessels. Liquid penetrant and visual (VT-1) exams were performed on Unit 1 Welds 1, 7, and 8 (as shown in Figure CWE-2-1150) in accordance with relief request IWC-5 which was improved by the NRC in the SER dated February 11, 1986. No recordable indications were found.

Welds 2, 4, and 6 are similar with respect to material composition, thermal gradient, and flow rates. Welds 1, 3, and 5 are similar to welds 2, 4, and 6 with respect to material composition bt differ from welds 2, 4, and 6 with respect to thermal gradients and flow rates.

RELIEF REQUEST IWC-6

BASIS FOR RELIEF (cont'd):

Relief is requested from performing examinations on welds 2, 4, or 6 due to the high radiation fields in the area (reference HP survey dated December 17, 1993). In addition, access to weld 2 is limited by the concrete ceiling above that portion of the vessel and is not exposed when the removable blocks are removed. The close and tight proximity of the components in the area prohibit the rotation of personnel and will result in high radiation exposures to a few individuals. Welds 4 and 6, which are similar to weld 2 with respect to vessel configuration and material composition, are in even higher radiation fields. No indications were found in Unit 1 Weld 1 which is similar to weld 2 with respect to material composition and experiences a higher thermal gradient but lower flow rate than Weld 2 (reference figure 5a-3 for temperature and flow estimates for each shall and accompanying attachments for assumption and calculations).

In general, the temperature gradients and flow rates across the Regenerative Heat Exchanger nozzles are not extreme. Therefore, the Regenerative Heat Exchanger is not highly susceptible to thermal fatigue. The vessel materials used in the Regenerative Heat Exchanger have good operating histories in PWR water enviroments.

Shielding is not practical since the high radiation fields would result in high radiation exposure to the shielders resulting in no net savings in radiation exposure. The tight proximity of the vessels and related piping make it difficult to install shielding which adds to the time spent in the area and to the total radiation exposure. In addition, there are no connections available that would enable the station to chemically flush the best exchanger in an effort to lower the dose rates.

The total radiation exposure estimate to build scaffold, remove insulation, prepare welds and perform examinations on any of the affected welds is 4.5R . Due to the restricted access in the cubicle, this exposure will be distributed among very few individuals. Due to the nature of the activities, the potential exists that one or more individuals would receive a dose greater than 1R. Similar doses are expected for Unit 2 based on current radiation surveys.

The normal daily radiation exposure allowed to site personnel is 300 mR/day. Extensions greater than 300 mR/day may be granted as necessary in unusual circumstances.

Any through wall leak of the heat exchanger will be detected by the RCS leak rate monitors. In the event that leakage is detected, the Regenerative Heat Exchanger could be easily isolated and alternate paths of letdown and charging could easily be established with minimal effect on plant safety.

The data obtained from this inspection does not provide a compensatory increase in quality and safety to justify the hazards of personnel radiation exposure received to obtain the data.

ZION GENERATING STATION
UNITS 1 AND 2

RELIEF REQUEST IWC-6

PROPOSED ALTERNATE EXAMINATION:

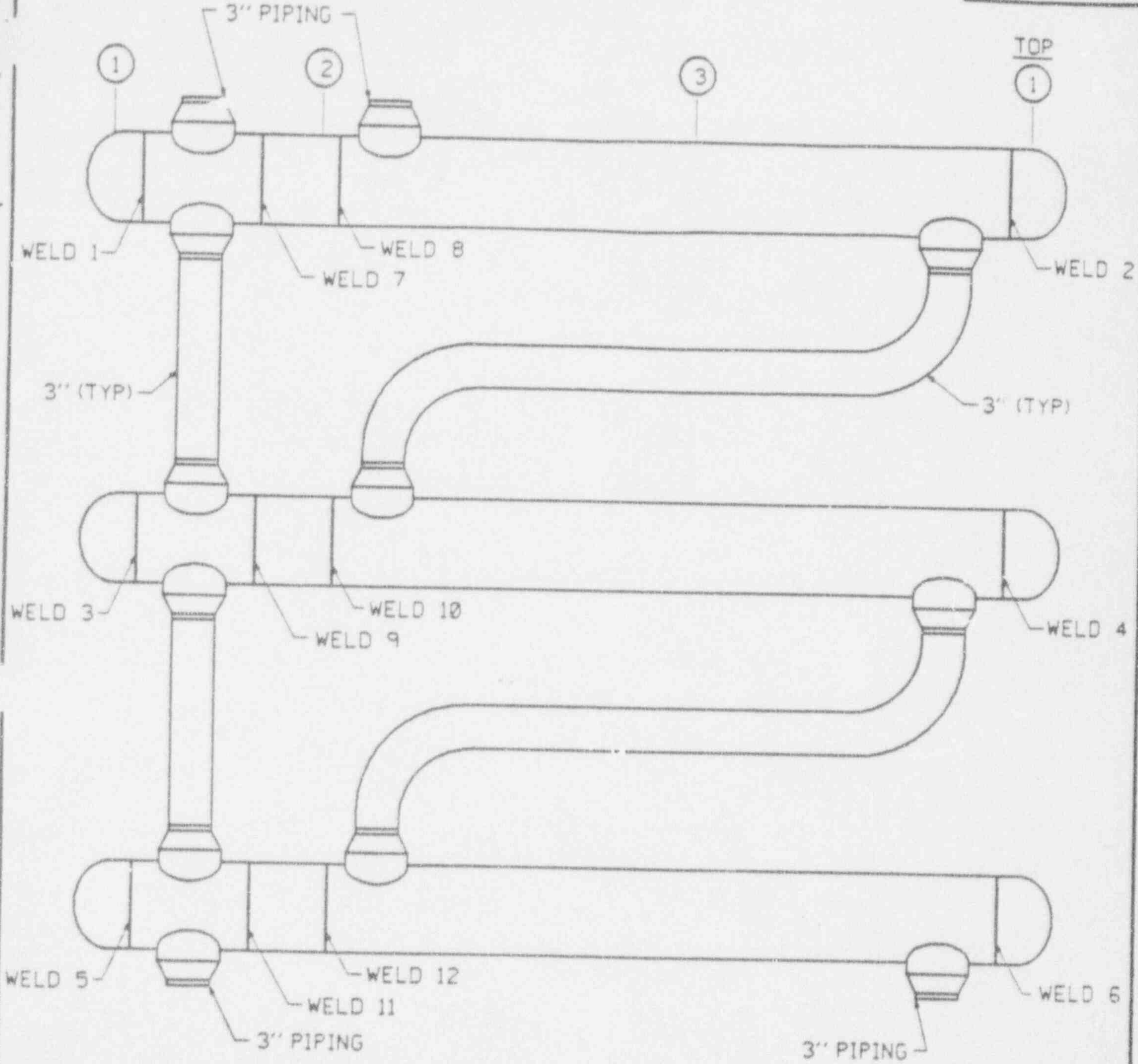
Unit 1 welds 1, 7, and 8 were examined in accordance with relief request IWC-5 (VT-1 and PT). Unit 2 welds 1, 7, and 8 will be examined in accordance with relief request IWC-5 (VT-1 and PT). Liquid Penetrant and Visual exams will assure the detection of any surface flaw. VT-2 examinations will be conducted on the Regenerative Heat Exchanger. Regenerative Heat Exchanger cracking has not been a problem in the industry.

APPLICABLE TIME PERIOD FOR RELIEF:

This relief request is for the Second Ten-Year Interval for Zion Station Units 1 and 2.

ILLUSTRATIVE ONLY

CWE-2-1150



MATERIALS: (1) .900"T SA-240 TP 304
(TYPICAL) (2) .938"T SA-182 TP 304
(3) .938"T SA-351-CF8

DIAMETER: 9.55" O.D.
CIRCUMFERENCE: 30.0"
CAL BLK: CWE-09
COMPONENT SUPPORT: CS1
LOCATION: 617' CONTAINMENT
ZERO REFERENCE: TOP CENTERLINE OF WELD

ZION UNIT 1				PACIFIC NUCLEAR	REGENERATIVE HEAT EXCHANGER	
REV	DESCRIPTION:					
	DATE:	DRN:	CK:	APPR:		
REV	DESCRIPTION:				JOB NO: COE-265-2001	DRAWING NO: CWE-2-1150	REV 0
	DATE:	DRN:	CK:	APPR:	FILE NO: CWE21150.DGN		

DATE: 12/17/93 TIME: 1230	DRESS CLASSIFICATION —	SURVEY # 4532	RAD POSTING: < R/HR HS Areas	EPN # N/A	RT SUPS INITIAL

NAME: Harry Buse JA

RWP # 93 -- 1559 --

RWP # NA -- --

DOSIMETRY PLACEMENT:
CHEST X HEAD __ ANKLE __
OTHER ____
COMMENTS: mR/HR TO R/HR

LOCATION: Level U-1 Ctmt

Area: Regen Heat Ex. Pit

Air Sample Taken? YES __ NO X

INST MODEL	SERIAL #
Teletector	14493
RO2A	947
RAm 10	3692-065

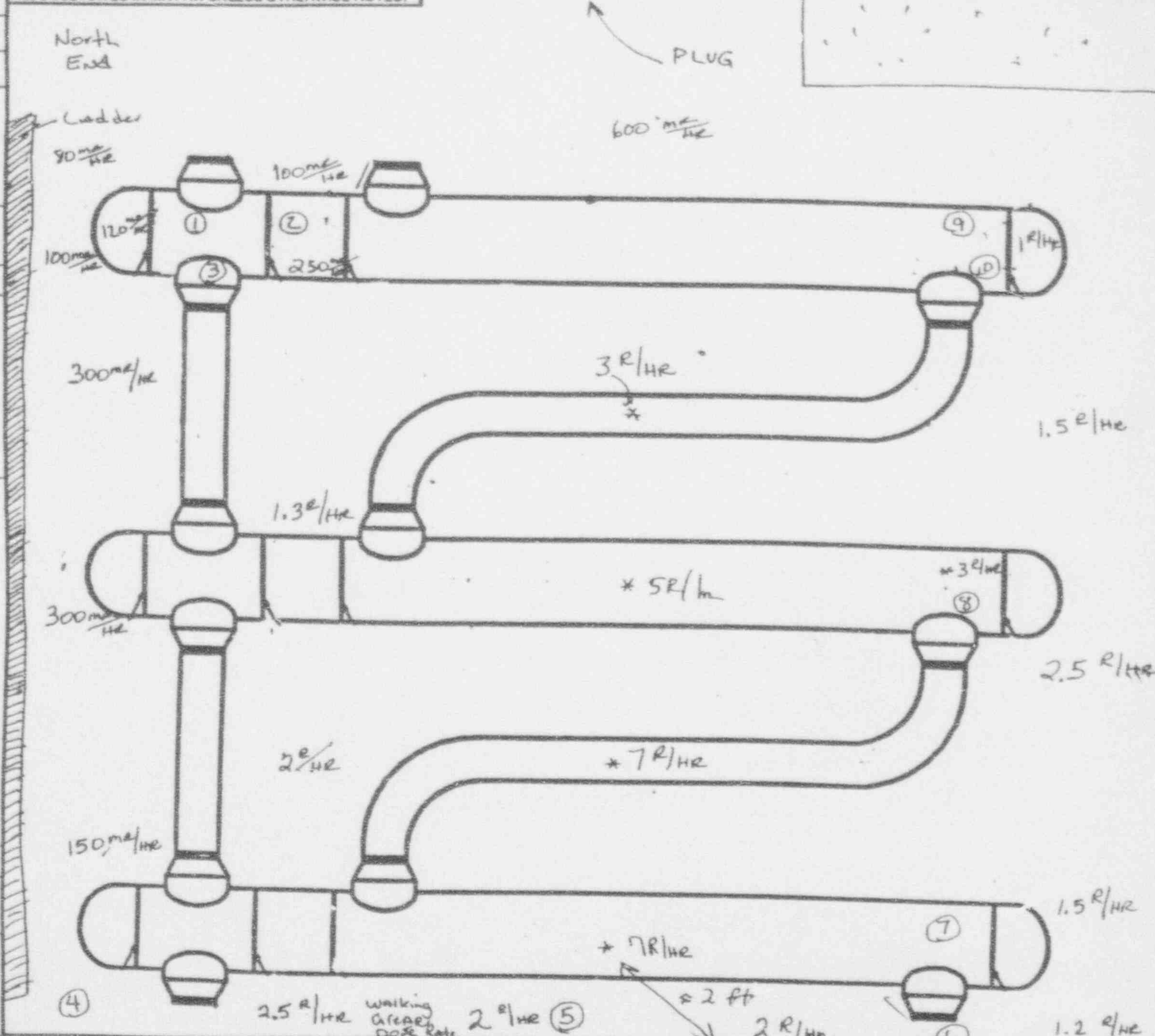
ALL SMEARS <1000 dpm/100cm2
UNLESS NOTED BELOW:
SMEAR NUMBERS

1	3k	Insulation
2	2k	↓
3	4k	↓
4	3k	floor
5	4k	↓
6	7k	↓
7	3k	Insulation
8	2k	↓
9	3k	↓
10	1k	↓

PURPOSE of SURVEY
__ RWP
__ ROUTINE
__ INVESTIGATIONAL
__ RELEASE
__ OTHER (SPECIFY)

COMMENTS:
__ Decon Recommended
__ Shielding Recommended
__ Release Recommended
__ None
__ Other (specify)

ALL DOSE RATES IN MR / HR UNLESS OTHERWISE NOTED.



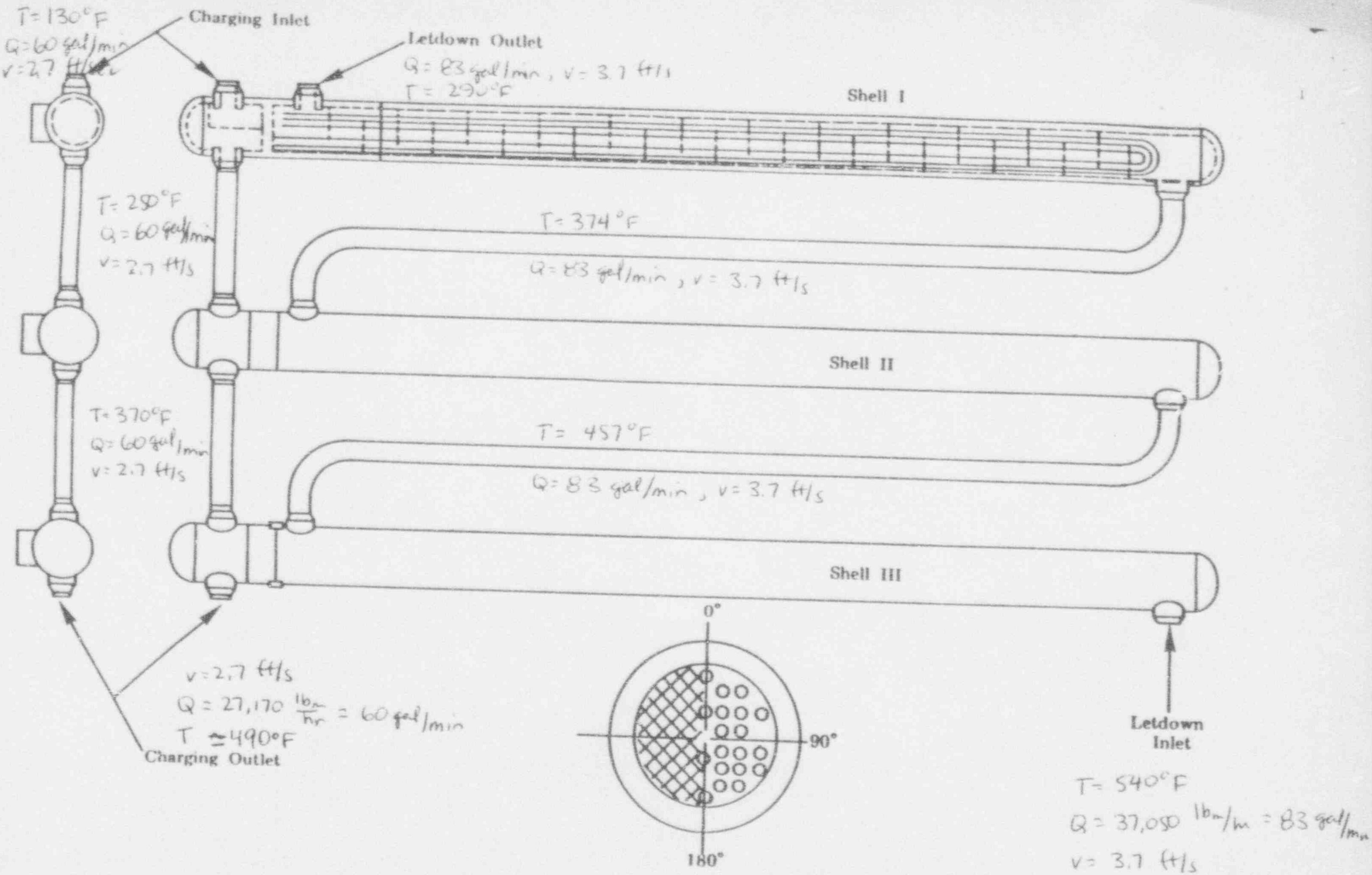


Figure 5a-3 (Rev. 0)
Regenerative Heat Exchanger

ZION GENERATING STATION UNIT 1

RELIEF REQUEST IWC-6

FLOW RATE AND HEAT TRANSFER ESTIMATES

From the vendor manual:

For Charging (tube side)

Inlet temperature:	130 degrees F
Outlet temperature:	490 degrees F
Flow rate:	27,170 lb-m/hr

For Letdown (shell side)

Inlet temperature:	540 degrees F
Outlet temperature:	290 degrees F
Flow rate:	37,050 lb-m/hr

From Piping and Design Spec X-3646 'E'

Design pressure: 2485 psig

From Zion P&ID M-54 and Figure CWE-2-1150

All inlet, outlet and interconnecting piping are 3" NPS.

HEAT TRANSFER ESTIMATE:

Since the Regenerative Heat exchanger is a counter flow heat exchanger it was assumed that the heat transfer is the same for all three shells. Therefore, the change in temperature across each shell is the same. Heat transfer from the interconnecting piping is assumed to be negligible.

For charging:

delta T (total) = 490 - 130 = 360 degrees F
delta T/shell = delta T(total)/3 = 120 degrees F

For letdown:

delta T (total)= 540 - 290 = 250 degrees F
delta T/shell = delta T (total)/3 = 83 degrees F

ZION GENERATING STATION UNIT 1

RELIEF REQUEST IWC-6

FLOW RATE AND HEAT TRANSFER ESTIMATES

FLOW RATE ESTIMATE:

From ASME Steam Tables:

Specific Volume, v = 0.018 cubic feet/lb-m

Note: An average value for v was used (averaging values at T = 130 degrees and T = 540 degrees at 2500 psia).

It is assumed that the flows and velocities remain constant and that friction losses are negligible. Pipe size remains constant.

Area of 3" NPS piping = 0.049 sq. ft.

For charging:

Q = 27,170 lb-m/hr x 0.018 cu. ft./lb-m x 1hr/60 minutes = 8.1 cu. ft./min
Q is approximately 60 gallons/minute

Inlet/outlet velocity = Q/A = 8.1 cu. ft./min x 1 min/60 sec x 1/0.049 sq. ft. = 2.7 ft/s

For letdown:

Q = 37,050 lb-m/hr x 0.018 cu. ft./lb-m x 1 hr/60 sec = 11.1 cu. ft./min
Q is approximately 80 gallons per minute

Inlet/outlet velocity = Q/A = 11.1 cu. ft./min x 1 min/60 sec x 1/0.049 sq. ft. = 3.7 ft/s