SARGENT & LUNDY ENGINEERS

DESIGN CONTROL SUMMARY
DESIGN VERIFICATION

PAGE 1

PROJECT NAME: Zion Station
PROJECT NO.: 8986-10
CLIENT: Commonwealth Edison Company
CALC. NO.: ATD-0206
TITLE: Organic Iodine Recirculation Spray Removal Rate

UNIT NO.: 1&2
FILE NO.: 4.6, 13.1
SYSTEM: CS
DIVISION: ATD

[X] SAFETY RELATED [ ] NON SAFETY RELATED

REV. 0 DATE 11/30/92

PREPARER: R. S. Hubner 11/17/92

REVIEWER: W. J. Johnson 11/2/92

APPROVER: G. P. Lahti 11/30/92

Pages 1 through 81, all new calculation.

REVIEW METHOD: See page 81.

STATUS: Verified Data

REV. 1 DATE 2/17/93

PREPARER: A.G. Klazura 2/15/93

REVIEWER: W.J. Johnson 2/16/93

APPROVER: G.P. Lahti 17 Feb. 1993

Revised Page 1, Design Control Summary Sheet, to add Revision 1 information.

Added Pages 82 thru 86 (Revision 1).

REVIEW METHOD
See Page 86

STATUS
Verified

REV. 2 DATE 3-31-94

PREPARER: B. C. Schwartz 3/21/94

REVIEWER: W. E. DeLise 3/22/94

APPROVER: W. J. Johnson 3-31-94

Revised Page 1, Design Control Summary Sheet, to add Revision 2 information

Added Pages 87 through 91 (Revision 2)

REVIEW METHOD
See Page 91

STATUS
Verified

REV. ___ DATE ___

PREPARER:

REVIEWER:

APPROVER:

REVIEW METHOD

STATUS

IDENTIFICATION OF PAGES ADDED/REVISED/SUPERSEDED/VOIDED & REVIEW METHOD

SARGENT & LUNDY ENGINEERS	Calc. For Organic Iodine Recirculation Spray Removal Rate		Calc. No. ATD-0206	
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Client Commonwealth Edison Company	Prepared by	Date
Project Zion Station - Units 1 & 2	Reviewed by	Date
Proj. No. 9140-98 Equip. No.	Approved by	Date
System Code Subsystem	Division	File No.

1. PURPOSE

The purpose of this calculation is to determine the removal rate of organic iodine from containment atmosphere due to containment spray operation during the recirculation mode. This revision will use a calculated value for the containment recirculation flowrate from a single RHR pump.

2. DESIGN INPUT

All design input parameters are the same as those provided in Revision 0 and 1 of this calculation except as follows:

1) The Post-LOCA recirculation flowrate through the CS header is (Page 6 of Reference 1): 1450 gpm

2) The Nozzle Pressure Drop 12.06 psi

3) Geometric Mean Water Drop
   Diameter Case 1 524.5 microns

   Standard Deviation of Geometric Mean
   Diameter Case 1 1.884

   Geometric Mean Water Drop
   Diameter Case 2 393.8 microns

   Standard Deviation
   of Geometric Mean, Case 2 1.970

3. ASSUMPTIONS

The assumptions and engineering judgement used in this revision are the same as those presented in Revisions 0 and 1 to this calculation.

As an additional assumption in Revision 2, drop size and standard deviation Equations of Revision 0 can be extrapolated to the average nozzle pressure drop associated with 1450 gpm for 171 nozzles, i.e., Q=8.48 gpm/nozzle.

4. APPROACH

All information presented in the Approach Section of Revisions 0 and 1 to this calculation is applicable to this revision. The computer code, SPRIT-PC, (Reference 2) will be used to calculate the organic iodine removal rate due to the containment spray. SPIRT-PC was also used in Revisions 0 and 1.

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5.   CALCULATION

All information presented in the Calculation Section of Revisions 0 and 1 to this calculation is applicable to this revision except as follows:

- The ΔP parameter which is the pressure drop of a nozzle is determined using Equation 7 from Page 11 of Revision 0. SPIRT-PC input parameters DMEANG and SIGMAG which pertains to the geometric mean diameter and the standard deviation of the geometric mean, respectively, are determined using the Equations 8a, 8b, 9a and 9b from Page 42 of Revision 0. The changes are noted as follows:

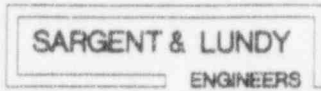|	Revision 0 & 1 DMEANG	SIGMAG	Revision 2 DMEANG	SIGMAG
Case 1	.0328 cm	1.993	.05245 cm	1.884
Case 2	.03032 cm	2.009	.03938 cm	1.970
Bulk				
Flow gpm	2460		1450	
ΔP psi	34.7		12.06	

The value for all other SPIRT-PC parameters are as described in Revisions 0 and 1.

As was done in Revisions 0 and 1, two (2) SPIRT-PC computer program runs were made (Case 1 and Case 2). The cases are defined in Revisions 0 and 1 and differ only in CS header flow, the geometric mean, the standard deviation of the geometric mean, and the case title.

6.0   RESULTS

SPIRT-PC calculated iodine recirculation spray removal rates follow.

SPIRT-PC Input for ΔP = 12.06psi			SPIRT-PC Output
SPIRT-PC Case - 1450 gpm	Geometric Mean Diameter (Microns)	Standard Deviation of Geometric Mean Diameter	Organic Iodine Removal Rate (Per Hour)
1	524.5	1.884	.01704
2	393.8	1.970	.01794

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As was done with the previous revision, the smaller organic removal rate will be selected since the smaller removal rate will result in conservative radiological evaluations where the post-accident containment atmosphere is concerned. Thus the organic iodine removal rate for the recirculation phase is .01704 per hour.

7.   REFERENCES

1.   Calculation Number ATD-0377, Rev. 0, RHR Pump Recirculation Flow.

2.   Sargent & Lundy (S&L) validated computer program "SPIRT-PC, a computer program for calculating spray iodine removal constraints" S&L Program No. 03.7.366-1.0, Rev.0, 01-31-91.

anacomp

REVIEW METHOD SHEET

Calc. No. ATD-0206
Revision 2
Page 91 fo Final
Proj. No. 9140-98
SAFETY RELATED

This calculation has been reviewed by me according to the method(s) checked below.

1. Computer Aided Calculations

a	Review to determine that the computer program(s) has been validated and documented, is suitable to the problem being analyzed, and that the calculation contains all necessary information for reconstruction at a later date.
b	Review to determine that the input data as specific for program execution is consistent with the design input, correctly defines the problem for the computer algorithm and is sufficiently accurate to produce results within any numerical limitations of the program.
c	Review to verify that the results obtained from the program are correct and within stated assumptions and limitations of the program and are consistent with the input.
d	Review validation documentation for temporary changes to listed, or developmental, or unique single application programs, to assure that methods used adequately validate the program for the intended application.
e X	Review of code input only, since the computer program has sufficient history of use at Sargent & Lundy in similar calculations.
f X	Review arithmetic necessary to prepare code input data.
g	Other:

2. Hand Prepared Calculations

a	Detailed review of the original calculation.
b	Review by an alternate, simplified, or approximate method of calculation.
c	Review of a representative sample of repetitive calculations.
d	Review of the calculation against a similar calculation previously performed.

3. Revisions

a	Editorial changes only.
b	Elimination of unapproved input data without altering calculation results.
c	Other:

4. Other

Reviewer: *W. E. De Lisle* Date: 3/22/94