
REVISED RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

APR1400 Design Certification

Korea Electric Power Corporation / Korea Hydro & Nuclear Power Co., LTD

Docket No. 52-046

RAI No.: 20-7912
SRP Section: 02.03.04 - Short Term Atmospheric Dispersion Estimates for Accident Releases
Application Section: 2.3
Date of RAI Issue: 06/01/2015

Question No. 02.03.04-1

As stated in SRP Section 2.3.4, 10CFR50 Appendix A, GDC 19 provides the requirements related to the meteorological considerations used to evaluate the personnel exposures inside the control room during radiological and airborne hazardous material accident conditions.

SRP Section 2.3.4 Acceptance Criteria 5 states, in part, that atmospheric dispersion factors used for the assessment of consequences related to atmospheric radioactive releases to the control room for design basis, other accidents, and for onsite and offsite releases of hazardous airborne materials should be provided.

So that the staff may independently conduct a confirmatory analysis to verify the technical acceptability per NRC Regulatory Guide 1.194, please provide the input and output files for all source/receptor pairs in the ARCON96 analysis. These files should be in native (ASCII) format so that the staff may conduct a confirmatory analysis.

Response – (Rev.2)

The onsite atmospheric dispersion factors used for control room habitability analysis are evaluated using APR1400 design-specific source-receptor design parameters and the meteorological data for Prairie Island during 1993 - 1997. These values are then adjusted to include a margin of 50% (or use a multiplication factor of 1.5) and the reduction factor based on the automatic selection of “clean” air intake stipulated by RG 1.194, as the APR1400 design is equipped with redundant ESF-grade radiation monitors within each intake, and an ESF-grade control logic and actuation circuitry provided for the automatic selection of a clean intake throughout the event.

Table 1 shows the names of ARCON96 input and output files used for the calculations and the relevant information such as source and receptor locations, margin, reduction factors and the

corresponding table numbers in the DCD. The input and output files for all source/receptor pairs in the ARCON96 analysis are provided in ASCII text format in Attachment 1.

Please note that NRC and KHNP had a clarification call dated February 3, 2016, KHNP has adjusted slightly some of the release-receptor locations; and re-analyzed the atmospheric dispersion factors for a complete set of 41 release-receptor pairs. The analysis yields a revised set of x/Q values for APR1400 that is, in some cases, lower than the original values. As a result, DCD Tier 2, Table 2.3-2 through Table 2.3-13 are updated and are attached to this response as Attachment 2. In addition, the NRC Staff provided the comment regarding update to include a short discussion on the use of "Effective Onsite x/Q" on May 20, 2016, therefore, KHNP will revise the Tables 2.3-3, 5, 8, 9, 10, 11, and 12 as indicated in Attachment 2.

Please also note that KHNP revised the response to RAI 174-8211-02.03.04-5, which discusses the release-receptor pairs and the site selection analysis using the Prairie Island meteorological data as a basis for the development of the bounding x/Q for APR1400 design.

Table 1. ARCON96 I/O Filenames and the Relevant Information

Case No.	ARCON96 I/O File Name	Release Points (Source)	Intake Points (Receptor)	Margin	Reduction Factor	Table No. in DCD
1	1-1 CBCNI	Containment Building (CB) Surface	MCR ¹⁾ North	1.5	8 ³⁾	2.3-2
	1-2 CBCSI		MCR South	1.5	8	
	1-3 CBMCRCL		MCR Roof Centerline	1.5	- ⁴⁾	
2	2-1 CBABNI		AB ²⁾ North	1.5	N/A ⁵⁾	2.3-3
	2-2 CBABSI		AB South	1.5	N/A	
3 (Prairie Island)	3-1 MSNCNIPI	Main Steam Valve Room North Vent	MCR North	1.5	8	2.3-4
	3-2 MSSCSIPI	Main Steam Valve Room South Vent	MCR South	1.5	8	
	3-3 MSNCSIPI	Main Steam Valve Room North Vent	MCR South	1.5	8	
	3-4 MSSCNIPI	Main Steam Valve Room South Vent	MCR North	1.5	8	
4	4-1 MSNABNI	Main Steam Valve Room North Vent	AB North	1.5	N/A	2.3-5
	4-2 MSSABSI	Main Steam Valve Room South Vent	AB South	1.5	N/A	
	4-3 MSNABSI	Main Steam Valve Room North Vent	AB South	1.5	N/A	
	4-4 MSSABNI	Main Steam Valve Room South Vent	AB North	1.5	N/A	
5	5-1 ADVNCNI	Atmospheric Dump Valve North Vent	MCR North	1.5	8	2.3-6
	5-2 ADVSCSI	Atmospheric Dump Valve South Vent	MCR South	1.5	8	
	5-3 ADVNCSI	Atmospheric Dump Valve North Vent	MCR South	1.5	8	

Case No.	ARCON96 I/O File Name	Release Points (Source)	Intake Points (Receptor)	Margin	Reduction Factor	Table No. in DCD
	5-4 ADVSCNI	Atmospheric Dump Valve South Vent	MCR North	1.5	8	
6	6-1 MSSNCNI	Main Steam Safety Valve North Vent	MCR North	1.5	8	2.3-7
	6-2 MSSSCSI	Main Steam Safety Valve South Vent	MCR South	1.5	8	
	6-3 MSSNCSI	Main Steam Safety Valve North Vent	MCR South	1.5	8	
	6-4 MSSSCNI	Main Steam Safety Valve South Vent	MCR North	1.5	8	
7	7-1 ADVNABNI	Atmospheric Dump Valve North Vent	AB North	1.5	N/A	2.3-8
	7-2 ADVSABSI	Atmospheric Dump Valve South Vent	AB South	1.5	N/A	
	7-3 ADVNABSI	Atmospheric Dump Valve North Vent	AB South	1.5	N/A	
	7-4 ADVSABNI	Atmospheric Dump Valve South Vent	AB North	1.5	N/A	
8	8-1MSSNABNI	Main Steam Safety Valve North Vent	AB North	1.5	N/A	2.3-9
	8-2MSSSABSI	Main Steam Safety Valve South Vent	AB South	1.5	N/A	
	8-3MSSNABSI	Main Steam Safety Valve North Vent	AB South	1.5	N/A	
	8-4MSSSABNI	Main Steam Safety Valve South Vent	AB North	1.5	N/A	
9	9-1 ABNVCNI	AB North Vent	MCR North	1.5	N/A	2.3-10
	9-2 ABSVCSI	AB South Vent	MCR South	1.5	N/A	
	9-3 ABNVCSI	AB North Vent	MCR South	1.5	N/A	
	9-4 ABSVCNI	AB South Vent	MCR North	1.5	N/A	
10	10-1 ABNVABNI	AB North Vent	AB North	1.5	N/A	2.3-11
	10-2 ABSVABSI	AB South Vent	AB South	1.5	N/A	
	10-3 ABNVABSI	AB North Vent	AB South	1.5	N/A	
	10-4 ABSVABNI	AB South Vent	AB North	1.5	N/A	
11	11-1 FHAVCNI	Fuel Handling Area Vent	MCR North	1.5	8	2.3-12
	11-2 FHAVCSI		MCR South	1.5	8	
	11-3 FHAVABNI		AB North	1.5	N/A	
	11-4 FHAVABSI		AB South	1.5	N/A	

Note)

1) MCR : Main Control Room

2) AB : Auxiliary Building

3) A factor of 10 is applied to account for the ability to automatically select a "clean" MCR intake per RG 1.194, Section 3.3.2.4, but a factor of 8 is used for the conservatism.

4) MCR Roof Centerline is assumed to be one imaginary intake point above the MCR Roof.

⁵⁾ The Effective x/Q value is calculated based on the two x/Q values in same time interval in the same wind direction window per RG 1.194, Section 3.3.2.1, Equation 5a.

Impact on DCD

Table 2.3-3,5,8,9,10,11 and 12 in the DCD will be updated as indicated in Attachment 2.

Impact on PRA

There is no impact on the PRA.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environment Report.

APR1400 DCD TIER 2

RAI 20-7912 -Question 02.03.04-1 _ Rev.1

RAI 174-8211-Question 02.03.04-04

RAI 20-7912 -Question 02.03.04-1 _ Rev.2

Table 2.3-2

Onsite χ/Q for Reactor Containment Building Release
to ~~MCR~~ North and South Intakes and MCR Roof Centerline

Time Interval (hr)	Onsite χ/Q (s/m ³)		
	Containment Building to		
	MCR North Intake	MCR South Intake	MCR Roof Centerline
0–2	3.73E-04	3.39E-04	3.92E-04
2–8	3.17E-04	1.91E-04	3.00E-04
8–24	1.38E-04	8.42E-05	1.29E-04
24–96	1.02E-04	5.59E-05	9.11E-05
96–720	7.84E-05	3.94E-05	7.05E-05

MCR and TSC

Replace this table with “A” of next new tables

APR1400 DCD TIER 2

RAI 20-7912 -Question 02.03.04-1 _ Rev.1

RAI 20-7912 -Question 02.03.04-1 _ Rev.2

Table 2.3-3

Onsite χ/Q for Reactor Containment Building Release
to Auxiliary Building North Intakes

Time Interval (hr)	Onsite χ/Q (s/m ³)
0-2	2.35E-03
2-8	1.91E-03
8-24	8.18E-04
24-96	6.15E-04
96-720	4.77E-04

Replace this table with “B” of next new tables

APR1400 DCD TIER 2

RAI 174-8211-Question 02.03.04-04

RAI 20-7912 -Question 02.03.04-1 _ Rev.1

RAI 20-7912 -Question 02.03.04-1 _ Rev.2

Table 2.3-4

Onsite χ/Q for North and South Main Steam Valve Room
Direct Releases to ~~MCR~~ North and South Intakes

Time Interval (hr)	Onsite χ/Q (s/m ³)	
	North Main Steam Valve Room to MCR North Intake	South Main Steam Valve Room to MCR South Intake
0-2	2.68E-03	5.63E-03
2-8	2.10E-03	4.43E-03
8-24	9.17E-04	1.93E-03
24-96	6.38E-04	1.29E-03
96-720	5.06E-04	1.01E-03

MCR and TSC

Replace this table with "C" of next new tables

APR1400 DCD TIER 2

RAI 174-8211-Question 02.03.04-04

RAI 20-7912 -Question 02.03.04-1 _ Rev.1

RAI 20-7912 -Question 02.03.04-1 _ Rev.2

Table 2.3-5

Onsite χ/Q for North and South Main Steam Valve Room
Cross Releases to ~~MCR~~ North and South Intakes

Time Interval (hr)	Onsite χ/Q (s/m ³)	
	North Main Steam Valve Room to MCR South Intake	South Main Steam Valve Room to MCR North Intake
0-2	2.33E-04	2.57E-04
2-8	1.32E-04	2.10E-04
8-24	5.48E-05	9.21E-05
24-96	3.58E-05	5.79E-05
96-720	2.72E-05	4.54E-05

MCR and TSC

Replace this table with "D" of next new tables

APR1400 DCD TIER 2

RAI 20-7912 -Question 02.03.04-1 _ Rev.1

RAI 20-7912 -Question 02.03.04-1 _ Rev.2

Table 2.3-6

Onsite χ/Q for South Main Steam Valve Room
Release to Auxiliary Building South Intakes

Time Interval (hr)	Onsite χ/Q (s/m ³)
0–2	7.80E-03
2–8	6.41E-03
8–24	2.81E-03
24–96	1.94E-03
96–720	1.53E-03

Replace this table with “E” of next new tables

APR1400 DCD TIER 2

RAI 174-8211-Question 02.03.04-04

RAI 20-7912 -Question 02.03.04-1 _ Rev.1

RAI 20-7912 -Question 02.03.04-1 _ Rev.2

Table 2.3-7

Onsite χ/Q for North and South Atmospheric
Dump Valve Releases to ~~MCR~~ North and South Intakes

Time Interval (hr)	Onsite χ/Q (s/m ³)	
	North ADV to MCR North Intake	South ADV to MCR South Intake
0-2	1.46E-03	2.61E-03
2-8	1.14E-03	2.01E-03
8-24	4.99E-04	8.79E-04
24-96	3.43E-04	5.76E-04
96-720	2.68E-04	4.63E-04

MCR and TSC

Replace this table with "F" of next new tables

APR1400 DCD TIER 2

Table 2.3-8

RAI 174-8211-Question 02.03.04-04

RAI 20-7912 -Question 02.03.04-1 _ Rev.1

RAI 20-7912 -Question 02.03.04-1 _ Rev.2

Onsite χ/Q for North and South Main Steam
Safety Valve Releases to ~~MCR~~ North and South Intakes

Time Interval (hr)	Onsite χ/Q (s/m ³)	
	North Main Steam Safety Valves to MCR North Intake	South Main Steam Safety Valves to MCR South Intake
0–2	1.18E-03	1.88E-03
2–8	9.08E-04	1.52E-03
8–24	3.99E-04	6.60E-04
24–96	2.72E-04	4.29E-04
96–720	2.12E-04	3.45E-04

MCR and TSC

Replace this table with “G” of next new tables

APR1400 DCD TIER 2

RAI 174-8211-Question 02.03.04-04

RAI 20-7912 -Question 02.03.04-1 _ Rev.1

RAI 20-7912 -Question 02.03.04-1 _ Rev.2

Table 2.3-9

Onsite χ/Q Values for Auxiliary Building
North Exhaust Release to ~~MCR~~ North and South Intakes

Time Interval (hr)	Onsite χ/Q (s/m ³)	
	Auxiliary Building North Exhaust To	
	MCR North Intake	MCR South Intake
0-2	6.88E-04	1.79E-04
2-8	5.16E-04	9.04E-05
8-24	2.27E-04	4.01E-05
24-96	1.58E-04	2.91E-05
96-720	1.25E-04	2.14E-05

MCR and TSC

Replace this table with "H" of next new tables

APR1400 DCD TIER 2

RAI 174-8211-Question 02.03.04-04

RAI 20-7912 -Question 02.03.04-1 _ Rev.1

RAI 20-7912 -Question 02.03.04-1 _ Rev.2

Table 2.3-10

Onsite χ/Q for Auxiliary Building South Exhaust Release
to ~~MCR~~ North and South Intakes

Time Interval (hr)	Onsite χ/Q (s/m ³)	
	Auxiliary Building South Exhaust To	
	MCR North Intake	MCR South Intake
0-2	1.05E-04	2.12E-04
2-8	8.79E-05	1.68E-04
8-24	3.96E-05	7.37E-05
24-96	2.76E-05	5.04E-05
96-720	2.14E-05	3.92E-05

MCR and TSC

Replace this table with "I" of next new tables

APR1400 DCD TIER 2

RAI 174-8211 -Question 02.03.04-5

RAI 20-7912 -Question 02.03.04-1 _ Rev.1

RAI 20-7912 -Question 02.03.04-1 _ Rev.2

Table 2.3-11

Onsite χ/Q for Auxiliary Building South Exhaust Release
to Auxiliary Building South Intake

North and South

Time Interval (hr)	Onsite χ/Q (s/m ³)
0-2	6.78E-04
2-8	5.54E-04
8-24	2.40E-04
24-96	1.70E-04
96-720	1.32E-04

Replace this table with
"A" in next page

Replace this table with "J" of next new tables

APR1400 DCD TIER 2

RAI 20-7912 -Question 02.03.04-1 _ Rev.1

RAI 174-8211-Question 02.03.04-04

RAI 174-8211 -Question 02.03.04-5

RAI 20-7912 -Question 02.03.04-1 _ Rev.2

Table 2.3-12

and Auxiliary Building South Intake

Onsite χ/Q for Fuel Handling Area Exhaust Release
to ~~MCR~~ North and South Intakes

Time Interval (hr)	Onsite χ/Q (s/m ³)	
	Fuel Handling Area To	
	MCR North Intake	MCR South Intake
0-2	1.52E-04	2.59E-04
2-8	1.31E-04	2.04E-04
8-24	6.02E-05	8.98E-05
24-96	4.01E-05	5.93E-05
96-720	3.19E-05	4.58E-05

MCR and TSC

AB South Intake
1.04E-03
8.18E-04
3.59E-04
2.37E-04
1.83E-04

Replace this table with "K" of next new tables

APR1400 DCD TIER 2

RAI 20-7912 -Question 02.03.04-1 _ Rev.1

RAI 174-8211-Question 02.03.04-04

RAI 20-7912 -Question 02.03.04-1 _ Rev.2

Table 2.3-13 (1 of 6)

Design Input for ARCON96 Calculation

Parameter		Value
Meteorological Data		Prairie Island (1993–1997)
Source Release Category		
< From >	< To >	< Source Type >
Reactor Containment Building	MCR Intakes MCR Roof Centerline Auxiliary Building Intakes	Diffuse area source Diffuse area source Diffuse area source
North and South Main Steam Valve Room	MCR Intakes Auxiliary Building Intakes	Ground level point sources Ground level point sources
North and South Atmospheric Dump Valves	MCR Intakes	Ground level point sources
North and South Main Steam Valves	MCR Intakes	Ground level point sources
North Auxiliary Building South Auxiliary Building South Auxiliary Building	MCR Intakes MCR Intakes Auxiliary Building Intakes	Ground level point sources Ground level point sources Ground level point sources
Fuel Handling Area	MCR Intakes	Ground level point sources
MCR Intake (Receptor)		
Characteristics MCR intakes MCR roof Auxiliary building intakes (infiltration path way)		Dual MCR intakes Single point at roof center Dual AB intakes
Reduction of χ/Q_s MCR intakes Auxiliary building intakes (infiltration path way)		Factor of 8 Factor of 2

“MCR” in Table 2.3-13 should be replaced with “MCR and TSC”

Replace this table with “L” of next new tables

APR1400 DCD TIER 2 RAI 20-7912 -Question 02.03.04-1 _ Rev.1

RAI 174-8211-Question 02.03.04-04

RAI 20-7912 -Question 02.03.04-1 _ Rev.2

Table 2.3-13 (2 of 6)

Parameter		Value
Source – Receptor Horizontal Distance		
< From >	< To >	< Distance (m) >
Reactor Containment Building	MCR North Intakes	36.72
	MCR South Intakes	33.92
	MCR Roof Centerline	33.76
	Auxiliary Building North Intakes	26.80
	Auxiliary Building South Intakes	26.80
North Main Steam Valve Room	MCR North Intakes	19.80
South Main Steam Valve Room	MCR South Intakes	12.56
North Main Steam Valve Room	MCR South Intakes	64.43
South Main Steam Valve Room	MCR North Intakes	66.20
North Main Steam Valve Room	Auxiliary Building North Intakes	22.30
South Main Steam Valve Room	Auxiliary Building South Intakes	22.30
North Atmospheric Dump Valves	MCR North Intakes	26.65
South Atmospheric Dump Valves	MCR South Intakes	19.36
North Main Steam Valves	MCR North Intakes	29.86
South Main Steam Valves	MCR South Intakes	22.56
North Auxiliary Building	MCR North Intakes	39.10
North Auxiliary Building	MCR South Intakes	73.35
South Auxiliary Building	MCR South Intakes	109.24
South Auxiliary Building	MCR North Intakes	73.53
South Auxiliary Building	Auxiliary Building North Intakes	101.26
South Auxiliary Building	Auxiliary Building South Intakes	84.42
Fuel Handling Area	MCR North Intakes	88.21
Fuel Handling Area	MCR South Intakes	64.04

“MCR” in Table 2.3-13 should be replaced with “MCR and TSC”

Replace this table with “M” of next new tables

APR1400 DCD TIER 2

RAI 20-7912 -Question 02.03.04-1 _ Rev.1

RAI 174-8211-Question 02.03.04-04

RAI 20-7912 -Question 02.03.04-1 _ Rev.2

Table 2.3-13 (3 of 6)

Parameter		Value
Source – Receptor Direction		
< From >	< To >	< Degree (°) >
Reactor Containment Building	MCR North Intakes	137.57
	MCR South Intakes	35.26
	MCR Roof Centerline	90.00
	Auxiliary Building North Intakes	120.00
	Auxiliary Building South Intakes	60.00
North Main Steam Valve Room	MCR North Intakes	99.75
South Main Steam Valve Room	MCR South Intakes	74.62
North Main Steam Valve Room	MCR South Intakes	10.92
South Main Steam Valve Room	MCR North Intakes	162.86
North Main Steam Valve Room	Auxiliary Building North Intakes	73.20
South Main Steam Valve Room	Auxiliary Building South Intakes	106.80
North Atmospheric Dump Valves	MCR North Intakes	93.60
South Atmospheric Dump Valves	MCR South Intakes	85.03
North Main Steam Valves	MCR North Intakes	93.49
South Main Steam Valves	MCR South Intakes	85.37
North Auxiliary Building	MCR North Intakes	93.80
North Auxiliary Building	MCR South Intakes	26.60
South Auxiliary Building	MCR South Intakes	132.80
South Auxiliary Building	MCR North Intakes	92.52
South Auxiliary Building	Auxiliary Building North Intakes	125.34
South Auxiliary Building	Auxiliary Building South Intakes	101.92
Fuel Handling Area	MCR North Intakes	127.85
Fuel Handling Area	MCR South Intakes	76.79

“MCR” in Table 2.3-13 should be replaced with “MCR and TSC”

Replace this table with “N” of next new tables

APR1400 DCD TIER 2

RAI 20-7912 -Question 02.03.04-1 _ Rev.1

RAI 174-8211-Question 02.03.04-04

RAI 20-7912 -Question 02.03.04-1 _ Rev.2

Table 2.3-13 (4 of 6)

Parameter		Value
Building Wake Area		
< From >	< To >	< Area (m ²) >
Reactor Containment Building	MCR North Intakes	3,167
	MCR South Intakes	3,167
	MCR Roof Centerline	3,167
	Auxiliary Building North Intakes	3,167
	Auxiliary Building South Intakes	3,167
North Main Steam Valve Room	MCR North Intakes	880
South Main Steam Valve Room	MCR South Intakes	406
North Main Steam Valve Room	MCR South Intakes	3,167
South Main Steam Valve Room	MCR North Intakes	3,167
North Main Steam Valve Room	Auxiliary Building North Intakes	1,878
South Main Steam Valve Room	Auxiliary Building South Intakes	1,241
North Atmospheric Dump Valves	MCR North Intakes	880
South Atmospheric Dump Valves	MCR South Intakes	406
North Main Steam Valves	MCR North Intakes	880
South Main Steam Valves	MCR South Intakes	406
North Auxiliary Building	MCR North Intakes	880
North Auxiliary Building	MCR South Intakes	3,167
South Auxiliary Building	MCR South Intakes	3,167
South Auxiliary Building	MCR North Intakes	406
South Auxiliary Building	Auxiliary Building North Intakes	3,167
South Auxiliary Building	Auxiliary Building South Intakes	406
Fuel Handling Area	MCR North Intakes	3,167
Fuel Handling Area	MCR South Intakes	406

"MCR" in Table 2.3-13 should be replaced with "MCR and TSC"

Replace this table with "O" of next new tables

APR1400 DCD TIER 2

RAI 20-7912 -Question 02.03.04-1 _ Rev.1

RAI 174-8211-Question 02.03.04-04

RAI 20-7912 -Question 02.03.04-1 _ Rev.2

Table 2.3-13 (5 of 6)

Parameter		Value
Release Height		
< From >	< To >	< Height (m) >
Reactor Containment Building	MCR North Intakes	54.0
	MCR South Intakes	54.0
	MCR Roof Centerline	54.0
	Auxiliary Building North Intakes	54.0
	Auxiliary Building South Intakes	54.0
North Main Steam Valve Room	MCR North Intakes	25.3
South Main Steam Valve Room	MCR South Intakes	25.3
North Main Steam Valve Room	MCR South Intakes	25.3
South Main Steam Valve Room	MCR North Intakes	25.3
North Main Steam Valve Room	Auxiliary Building North Intakes	25.3
South Main Steam Valve Room	Auxiliary Building South Intakes	25.3
North Atmospheric Dump Valves	MCR North Intakes	24.0
South Atmospheric Dump Valves	MCR South Intakes	24.0
North Main Steam Valves	MCR North Intakes	24.0
South Main Steam Valves	MCR South Intakes	24.0
North Auxiliary Building	MCR North Intakes	34.8
North Auxiliary Building	MCR South Intakes	34.8
South Auxiliary Building	MCR South Intakes	24.4
South Auxiliary Building	MCR North Intakes	24.4
South Auxiliary Building	Auxiliary Building North Intakes	24.4
South Auxiliary Building	Auxiliary Building South Intakes	24.4
Fuel Handling Area	MCR North Intakes	17.0
Fuel Handling Area	MCR South Intakes	17.0

“MCR” in Table 2.3-13 should be replaced with “MCR and TSC”

Replace this table with “P” of next new tables

APR1400 DCD TIER

RAI 20-7912 -Question 02.03.04-1 _ Rev.1

RAI 174-8211-Question 02.03.04-04

RAI 20-7912 -Question 02.03.04-1 _ Rev.2

Table 2.3-13 (6 of 6)

Parameter	Value
Intake Height from Ground Level	
MCR intakes	25.8 m
MCR roof centerline	24.4 m
Auxiliary building intakes (infiltration path way)	32.0 m
Surface Roughness Length	0.2 m
Minimum Wind Speed	0.5 m/s
Average Sector Width Constant	4.3
Lower Measurement Height for Meteorological Data	10.0 m
Intermediate Measurement Height for Meteorological Data	60.0 m
Wind Speed Units for Meteorological Data	Miles per hour (mph)
Vertical Diffusion Area Coefficient (σ_{z0})	
Reactor containment building – MCR intakes	0.0 m
Reactor containment building – MCR roof centerline	0.0 m
Reactor containment building – auxiliary building intakes	0.0 m
Horizontal Diffusion Area Coefficient ⁽¹⁾ (σ_{y0})	
Reactor containment building – MCR intakes	8.0 m
Reactor containment building – MCR roof centerline	8.0 m
Reactor containment building – auxiliary building intakes	8.0 m

(1) Width of Diffuse Area $\times \frac{1}{6}$: Horizontal diffusion area coefficients are calculated by this equation described in Reference 6.

“MCR” in Table 2.3-13 should be replaced with “MCR and TSC”

Replace this table with “Q” of next new tables

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A

Table 2.3-2

Onsite χ/Q for Reactor Containment Building Release
to MCR and TSC North and South Intakes, and Roof Centerline

Time Interval (hr)	Onsite χ/Q (s/m ³)		
	Containment Building to		
	MCR and TSC North Intake	MCR and TSC South Intake	MCR Roof Centerline
0–2	1.78E-04	1.53E-04	3.60E-03
2–8	1.42E-04	9.28E-05	2.79E-03
8–24	6.19E-05	4.16E-05	1.19E-03
24–96	4.73E-05	2.96E-05	8.48E-04
96–720	3.77E-05	1.97E-05	6.48E-04

B

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Table 2.3-3

Effective Onsite χ/Q for Reactor Containment Building Release
to Auxiliary Building Intakes

Time Interval (hr)	Effective Onsite χ/Q (s/m ³)
0–2	4.73E-03
2–8	3.58E-03
8–24	1.56E-03
24–96	1.12E-03
96–720	8.29E-04

1)

¹⁾ The Effective χ/Q value is calculated based on the two χ/Q values in same time interval in the same wind direction window per RG 1.194, Section 3.3.2.1, Equation 5a.

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C

Table 2.3-4

Onsite χ/Q for North and South Main Steam Valve Room
Direct and Cross Releases to MCR and TSC North and South Intakes

Time Interval (hr)	Onsite χ/Q (s/m ³)			
	North Main Steam Valve Room to		South Main Steam Valve Room to	
	MCR and TSC North Intake	MCR and TSC South Intake	MCR and TSC North Intake	MCR and TSC South Intake
0–2	1.26E-03	1.88E-04	2.27E-04	1.18E-03
2–8	9.81E-04	9.71E-05	1.85E-04	9.21E-04
8–24	4.29E-04	4.24E-05	8.31E-05	4.05E-04
24–96	2.98E-04	2.98E-05	5.34E-05	2.68E-04
96–720	2.31E-04	2.21E-05	4.16E-05	2.12E-04

D

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Table 2.3-5

Effective Onsite χ/Q for North and South Main Steam Valve Room
Releases to Auxiliary Building Intakes

1)

Time Interval (hr)	Effective Onsite χ/Q ($\$/m^3$)	
	North Main Steam Valve Room to to Auxiliary Building Intake	South Main Steam Valve Room to to Auxiliary Building Intake
0-2	6.26E-03	7.39E-03
2-8	3.89E-03	6.10E-03
8-24	1.73E-03	2.76E-03
24-96	1.18E-03	1.86E-03
96-720	8.87E-04	1.46E-03

1) The Effective χ/Q value is calculated based on the two χ/Q values in same time interval in the same wind direction window per RG 1.194, Section 3.3.2.1, Equation 5a.

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E

Table 2.3-6

Onsite χ/Q for North and South Atmospheric Dump Valve
Direct and Cross Releases to MCR and TSC North and South Intakes

Time Interval (hr)	Onsite χ/Q (s/m ³)			
	North Atmospheric Dump Valve to		South Atmospheric Dump Valve to	
	MCR and TSC North Intake	MCR and TSC South Intake	MCR and TSC North Intake	MCR and TSC South Intake
0–2	6.83E-04	1.62E-04	1.95E-04	6.17E-04
2–8	5.48E-04	8.40E-05	1.66E-04	4.99E-04
8–24	2.36E-04	3.81E-05	7.35E-05	2.18E-04
24–96	1.66E-04	2.72E-05	4.84E-05	1.43E-04
96–720	1.30E-04	1.95E-05	3.75E-05	1.13E-04

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F

Table 2.3-7

Onsite χ/Q for North and South Main Steam Safety Valve
Direct and Cross Releases to MCR and TSC North and South Intakes

Time Interval (hr)	Onsite χ/Q (s/m ³)			
	North Main Steam Safety Valve to		South Main Steam Safety Valve to	
	MCR and TSC North Intake	MCR and TSC South Intake	MCR and TSC North Intake	MCR and TSC South Intake
0–2	6.30E-04	1.57E-04	1.89E-04	6.00E-04
2–8	5.06E-04	8.16E-05	1.59E-04	4.59E-04
8–24	2.19E-04	3.69E-05	7.16E-05	2.03E-04
24–96	1.54E-04	2.63E-05	4.71E-05	1.34E-04
96–720	1.20E-04	1.89E-05	3.62E-05	1.06E-04

G

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Table 2.3-8

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Effective Onsite χ/Q for North and South Atmospheric
Dump Valve Releases to Auxiliary Building Intakes

1)

Time Interval (hr)	Effective Onsite χ/Q (s/m ³)	
	North Atmospheric Dump Valve to Auxiliary Building Intake	South Atmospheric Dump Valve to to Auxiliary Building Intake
0–2	4.02E-03	4.67E-03
2–8	2.74E-03	3.90E-03
8–24	1.21E-03	1.75E-03
24–96	8.15E-04	1.20E-03
96–720	6.24E-04	9.32E-04

1) The Effective χ/Q value is calculated based on the two χ/Q values in same time interval in the same wind direction window per RG 1.194, Section 3.3.2.1, Equation 5a.

H

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Table 2.3-9

Effective Onsite χ/Q for North and South Main Steam
Safety Valve Releases to Auxiliary Building Intakes

1)

Time Interval (hr)	Effective Onsite χ/Q (s/m^3)	
	North Main Steam Safety Valve to Auxiliary Building Intake	South Main Steam Safety Valve to Auxiliary Building Intake
0–2	3.74E-03	4.36E-03
2–8	2.58E-03	3.62E-03
8–24	1.13E-03	1.63E-03
24–96	7.67E-04	1.11E-03
96–720	5.84E-04	8.69E-04

1) The Effective χ/Q value is calculated based on the two χ/Q values in same time interval in the same wind direction window per RG 1.194, Section 3.3.2.1, Equation 5a.

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I

Table 2.3-10

Effective Onsite χ/Q for Auxiliary Building North and South Exhaust Release to MCR and TSC Intakes

Time Interval (hr)	Effective Onsite χ/Q (s/m^3)	
	North Auxiliary Building Exhaust to MCR and TSC Intake	South Auxiliary Building Exhaust to MCR and TSC Intake
0–2	7.39E-04	7.88E-04
2–8	5.74E-04	6.71E-04
8–24	2.51E-04	2.99E-04
24–96	1.66E-04	1.95E-04
96–720	1.29E-04	1.54E-04

¹⁾ The Effective χ/Q value is calculated based on the two χ/Q values in same time interval in the same wind direction window per RG 1.194, Section 3.3.2.1, Equation 5a.

J

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Table 2.3-11

Effective Onsite χ/Q for Auxiliary Building North and South Exhaust Release to Auxiliary Building Intakes¹⁾

Time Interval (hr)	Effective Onsite χ/Q (s/m ³)	
	North Auxiliary Building Exhaust to Auxiliary Building Intakes	South Auxiliary Building Exhaust to Auxiliary Building Intakes
0–2	8.45E-04	9.30E-04
2–8	6.78E-04	8.31E-04
8–24	2.90E-04	3.70E-04
24–96	1.93E-04	2.44E-04
96–720	1.50E-04	1.90E-04

¹⁾ The Effective χ/Q value is calculated based on the two χ/Q values in same time interval in the same wind direction window per RG 1.194, Section 3.3.2.1, Equation 5a.

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K

Table 2.3-12

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(Effective) Onsite χ/Q for Fuel Handling Area Exhaust Release to MCR and TSC North and South Intakes, and Auxiliary Building Intakes

Time Interval (hr)	Onsite χ/Q (s/m ³)		Effective Onsite χ/Q (s/m ³)
	Fuel Handling Area Exhaust to		
	MCR and TSC North Intake	MCR and TSC South Intake	Auxiliary Building Intakes
0–2	1.26E-04	1.63E-04	1.51E-03
2–8	1.09E-04	1.28E-04	1.16E-03
8–24	5.01E-05	5.63E-05	5.09E-04
24–96	3.36E-05	3.73E-05	3.44E-04
96–720	2.64E-05	2.87E-05	2.66E-04

¹⁾ The Effective χ/Q value is calculated based on the two χ/Q values in same time interval in the same wind direction window per RG 1.194, Section 3.3.2.1, Equation 5a.

L

Table 2.3-13 (1 of 6)

Design Input for ARCON96 Calculation

Parameter		Value
Meteorological Data		Prairie Island (1993–1997)
Source Release Category		
< From >	< To >	< Source Type >
Reactor Containment Building	MCR and TSC Intakes MCR Roof Centerline Auxiliary Building Intakes	Diffuse area source Diffuse area source Diffuse area source
North and South Main Steam Valve Room	MCR and TSC Intakes Auxiliary Building Intakes	Ground level point sources Ground level point sources
North and South Atmospheric Dump Valves	MCR and TSC Intakes Auxiliary Building Intakes	Ground level point sources Ground level point sources
North and South Main Steam Valves	MCR and TSC Intakes Auxiliary Building Intakes	Ground level point sources Ground level point sources
North and South Auxiliary Building Exhaust	MCR and TSC Intakes Auxiliary Building Intakes	Ground level point sources Ground level point sources
Fuel Handling Area	MCR and TSC Intakes Auxiliary Building Intakes	Ground level point sources Ground level point source
MCR and TSC Intake (Receptor)		
Characteristics MCR and TSC intakes MCR and TSC roof Auxiliary building intakes (infiltration path way)		Dual MCR and TSC intakes Single point at roof center Dual AB intakes
Reduction of χ/Q_s MCR and TSC intakes		Factor of 8*
* Except for the case of north and south auxiliary building exhaust release to MCR and TSC intakes		

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M

Table 2.3-13 (2 of 6)

Parameter		Value
Source – Receptor Horizontal (or Slant) Distance		
< From >	< To >	< Distance (m) >
Reactor Containment Building	MCR and TSC North Intake	41.9
	MCR and TSC South Intake	41.9
	MCR Roof Centerline	31.4
	Auxiliary Building North Intake	25.2
	Auxiliary Building South Intake	25.2
North Main Steam Valve Room	MCR and TSC North Intakes	29.1
South Main Steam Valve Room	MCR and TSC South Intakes	29.1
North Main Steam Valve Room	MCR and TSC South Intakes	71.5
South Main Steam Valve Room	MCR and TSC North Intakes	71.5
North Main Steam Valve Room	Auxiliary Building North Intakes	28.1
South Main Steam Valve Room	Auxiliary Building South Intakes	28.1
North Main Steam Valve Room	Auxiliary Building South Intakes	44.9
South Main Steam Valve Room	Auxiliary Building North Intakes	44.9
North Atmospheric Dump Valves	MCR and TSC North Intakes	40.1
South Atmospheric Dump Valves	MCR and TSC South Intakes	40.1
North Atmospheric Dump Valves	MCR and TSC South Intakes	77.0
South Atmospheric Dump Valves	MCR and TSC North Intakes	77.0
North Main Steam Safety Valves	MCR and TSC North Intakes	41.7
South Main Steam Safety Valves	MCR and TSC South Intakes	41.7
North Main Steam Safety Valves	MCR and TSC South Intakes	78.4
South Main Steam Safety Valves	MCR and TSC North Intakes	78.4
North Atmospheric Dump Valves	Auxiliary Building North Intakes	37.5
South Atmospheric Dump Valves	Auxiliary Building South Intakes	37.5
North Atmospheric Dump Valves	Auxiliary Building South Intakes	51.7
South Atmospheric Dump Valves	Auxiliary Building North Intakes	51.7
North Main Steam Safety Valves	Auxiliary Building North Intakes	39.2
South Main Steam Safety Valves	Auxiliary Building South Intakes	39.2
North Main Steam Safety Valves	Auxiliary Building South Intakes	53.2
South Main Steam Safety Valves	Auxiliary Building North Intakes	53.2
North Auxiliary Building	MCR and TSC North Intakes	97.6
South Auxiliary Building	MCR and TSC South Intakes	97.8
North Auxiliary Building	MCR and TSC South Intakes	120.7
South Auxiliary Building	MCR and TSC North Intakes	117.7
North Auxiliary Building	Auxiliary Building North Intakes	94.0
South Auxiliary Building	Auxiliary Building South Intakes	92.9
North Auxiliary Building	Auxiliary Building South Intakes	101.6
South Auxiliary Building	Auxiliary Building North Intakes	99.3
Fuel Handling Area	MCR and TSC North Intakes	97.2
Fuel Handling Area	MCR and TSC South Intakes	82.2
Fuel Handling Area	Auxiliary Building North Intakes	79.1
Fuel Handling Area	Auxiliary Building South Intakes	74.3

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Table 2.3-13 (3 of 6)

Parameter		Value
Source – Receptor Direction		
< From >	< To >	< Degree (°) >
Reactor Containment Building	MCR and TSC North Intake	131
	MCR and TSC South Intake	49
	MCR Roof Centerline	90
	Auxiliary Building North Intake	106
	Auxiliary Building South Intake	74
North Main Steam Valve Room	MCR and TSC North Intakes	96
South Main Steam Valve Room	MCR and TSC South Intakes	84
North Main Steam Valve Room	MCR and TSC South Intakes	24
South Main Steam Valve Room	MCR and TSC North Intakes	156
North Main Steam Valve Room	Auxiliary Building North Intakes	53
South Main Steam Valve Room	Auxiliary Building South Intakes	127
North Main Steam Valve Room	Auxiliary Building South Intakes	30
South Main Steam Valve Room	Auxiliary Building North Intakes	150
North Atmospheric Dump Valves	MCR and TSC North Intakes	101
South Atmospheric Dump Valves	MCR and TSC South Intakes	80
North Atmospheric Dump Valves	MCR and TSC South Intakes	31
South Atmospheric Dump Valves	MCR and TSC North Intakes	149
North Main Steam Safety Valves	MCR and TSC North Intakes	99
South Main Steam Safety Valves	MCR and TSC South Intakes	81
North Main Steam Safety Valves	MCR and TSC South Intakes	32
South Main Steam Safety Valves	MCR and TSC North Intakes	148
North Atmospheric Dump Valves	Auxiliary Building North Intakes	62
South Atmospheric Dump Valves	Auxiliary Building South Intakes	118
North Atmospheric Dump Valves	Auxiliary Building South Intakes	40
South Atmospheric Dump Valves	Auxiliary Building North Intakes	140
North Main Steam Safety Valves	Auxiliary Building North Intakes	63
South Main Steam Safety Valves	Auxiliary Building South Intakes	117
North Main Steam Safety Valves	Auxiliary Building South Intakes	41
South Main Steam Safety Valves	Auxiliary Building North Intakes	139
North Auxiliary Building	MCR and TSC North Intakes	91
South Auxiliary Building	MCR and TSC South Intakes	86
North Auxiliary Building	MCR and TSC South Intakes	54
South Auxiliary Building	MCR and TSC North Intakes	124
North Auxiliary Building	Auxiliary Building North Intakes	76
South Auxiliary Building	Auxiliary Building South Intakes	101
North Auxiliary Building	Auxiliary Building South Intakes	64
South Auxiliary Building	Auxiliary Building North Intakes	113
Fuel Handling Area	MCR and TSC North Intakes	124
Fuel Handling Area	MCR and TSC South Intakes	77
Fuel Handling Area	Auxiliary Building North Intakes	111
Fuel Handling Area	Auxiliary Building South Intakes	97

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Table 2.3-13 (4 of 6)

Parameter		Value
Building Wake Area		
< From >	< To >	< Area (m ²) >
Reactor Containment Building	MCR and TSC North Intake	3192
	MCR and TSC South Intake	3192
	MCR Roof Centerline	3192
	Auxiliary Building North Intake	3192
	Auxiliary Building South Intake	3192
North Main Steam Valve Room	MCR and TSC North Intakes	869.9
South Main Steam Valve Room	MCR and TSC South Intakes	582.5
North Main Steam Valve Room	MCR and TSC South Intakes	3192
South Main Steam Valve Room	MCR and TSC North Intakes	3192
North Main Steam Valve Room	Auxiliary Building North Intakes	1903
South Main Steam Valve Room	Auxiliary Building South Intakes	1257
North Main Steam Valve Room	Auxiliary Building South Intakes	1903
South Main Steam Valve Room	Auxiliary Building North Intakes	1257
North Atmospheric Dump Valves	MCR and TSC North Intakes	869.9
South Atmospheric Dump Valves	MCR and TSC South Intakes	582.5
North Atmospheric Dump Valves	MCR and TSC South Intakes	3192
South Atmospheric Dump Valves	MCR and TSC North Intakes	3192
North Main Steam Safety Valves	MCR and TSC North Intakes	869.9
South Main Steam Safety Valves	MCR and TSC South Intakes	582.5
North Main Steam Safety Valves	MCR and TSC South Intakes	3192
South Main Steam Safety Valves	MCR and TSC North Intakes	3192
North Atmospheric Dump Valves	Auxiliary Building North Intakes	869.9
South Atmospheric Dump Valves	Auxiliary Building South Intakes	582.5
North Atmospheric Dump Valves	Auxiliary Building South Intakes	3192
South Atmospheric Dump Valves	Auxiliary Building North Intakes	3192
North Main Steam Safety Valves	Auxiliary Building North Intakes	869.9
South Main Steam Safety Valves	Auxiliary Building South Intakes	582.5
North Main Steam Safety Valves	Auxiliary Building South Intakes	3192
South Main Steam Safety Valves	Auxiliary Building North Intakes	3192
North Auxiliary Building	MCR and TSC North Intakes	869.9
South Auxiliary Building	MCR and TSC South Intakes	582.5
North Auxiliary Building	MCR and TSC South Intakes	3192
South Auxiliary Building	MCR and TSC North Intakes	3192
North Auxiliary Building	Auxiliary Building North Intakes	869.9
South Auxiliary Building	Auxiliary Building South Intakes	582.5
North Auxiliary Building	Auxiliary Building South Intakes	3192
South Auxiliary Building	Auxiliary Building North Intakes	3192
Fuel Handling Area	MCR and TSC North Intakes	3192
Fuel Handling Area	MCR and TSC South Intakes	582.5
Fuel Handling Area	Auxiliary Building North Intakes	3192
Fuel Handling Area	Auxiliary Building South Intakes	3192

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Table 2.3-13 (5 of 6)

Parameter		Value
Release Height		
< From >	< To >	< Height (m) >
Reactor Containment Building	MCR and TSC North Intake	54.9
	MCR and TSC South Intake	54.9
	MCR Roof Centerline	54.9
	Auxiliary Building North Intake	54.9
	Auxiliary Building South Intake	54.9
North Main Steam Valve Room	MCR and TSC North Intakes	25.9
South Main Steam Valve Room	MCR and TSC South Intakes	25.9
North Main Steam Valve Room	MCR and TSC South Intakes	25.9
South Main Steam Valve Room	MCR and TSC North Intakes	25.9
North Main Steam Valve Room	Auxiliary Building North Intakes	25.9
South Main Steam Valve Room	Auxiliary Building South Intakes	25.9
North Main Steam Valve Room	Auxiliary Building South Intakes	25.9
South Main Steam Valve Room	Auxiliary Building North Intakes	25.9
North Atmospheric Dump Valves	MCR and TSC North Intakes	24.0
South Atmospheric Dump Valves	MCR and TSC South Intakes	24.0
North Atmospheric Dump Valves	MCR and TSC South Intakes	24.0
South Atmospheric Dump Valves	MCR and TSC North Intakes	24.0
North Main Steam Safety Valves	MCR and TSC North Intakes	24.0
South Main Steam Safety Valves	MCR and TSC South Intakes	24.0
North Main Steam Safety Valves	MCR and TSC South Intakes	24.0
South Main Steam Safety Valves	MCR and TSC North Intakes	24.0
North Atmospheric Dump Valves	Auxiliary Building North Intakes	24.0
South Atmospheric Dump Valves	Auxiliary Building South Intakes	24.0
North Atmospheric Dump Valves	Auxiliary Building South Intakes	24.0
South Atmospheric Dump Valves	Auxiliary Building North Intakes	24.0
North Main Steam Safety Valves	Auxiliary Building North Intakes	24.0
South Main Steam Safety Valves	Auxiliary Building South Intakes	24.0
North Main Steam Safety Valves	Auxiliary Building South Intakes	24.0
South Main Steam Safety Valves	Auxiliary Building North Intakes	24.0
North Auxiliary Building	MCR and TSC North Intakes	5.0
South Auxiliary Building	MCR and TSC South Intakes	5.0
North Auxiliary Building	MCR and TSC South Intakes	5.0
South Auxiliary Building	MCR and TSC North Intakes	5.0
North Auxiliary Building	Auxiliary Building North Intakes	5.0
South Auxiliary Building	Auxiliary Building South Intakes	5.0
North Auxiliary Building	Auxiliary Building South Intakes	5.0
South Auxiliary Building	Auxiliary Building North Intakes	5.0
Fuel Handling Area	MCR and TSC North Intakes	17.0
Fuel Handling Area	MCR and TSC South Intakes	17.0
Fuel Handling Area	Auxiliary Building North Intakes	17.0
Fuel Handling Area	Auxiliary Building South Intakes	17.0

Q

Table 2.3-13 (6 of 6)

Parameter	Value
Intake Height from Ground Level	
MCR and TSC intakes	27.7 m
MCR roof centerline	29.0 m
Auxiliary building intakes (infiltration path way)	33.0 m
Surface Roughness Length	0.2 m
Minimum Wind Speed	0.5 m/s
Average Sector Width Constant	4.3
Lower Measurement Height for Meteorological Data	10.0 m
Intermediate Measurement Height for Meteorological Data	60.0 m
Wind Speed Units for Meteorological Data	Miles per hour (mph)
Vertical Diffusion Area Coefficient ⁽¹⁾ (σ_{z0})	
Reactor containment building – MCR and TSC intakes	5.44 m
Reactor containment building – MCR roof centerline	0.0 m
Reactor containment building – auxiliary building intakes	0.0 m
Horizontal Diffusion Area Coefficient ⁽²⁾ (σ_{y0})	
Reactor containment building – MCR and TSC intakes	8.08 m
Reactor containment building – MCR roof centerline	8.08 m
Reactor containment building – auxiliary building intakes	8.08 m

(1) Height of Diffuse Area $\times \frac{1}{6}$: Vertical diffusion area coefficient is calculated based on Reference 6.

(2) Width of Diffuse Area $\times \frac{1}{6}$: Horizontal diffusion area coefficient is calculated based on Reference 6.