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July 1, 2002

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555
Attn: Mr. Robert Clark (Mail Stop O-8-E9)
Project Directorate I-1

Subject: Revision to Emergency Plan Implementing Procedures
R.E. Ginna Nuclear Power Plant
Docket No. 50-244

Gentlemen:

In accordance with 10 CFR 50.4(b)(5), enclosed are revisions to Ginna Station Emergency Plan Implementing Procedures (EPIP).

We have determined, per the requirements of 10 CFR 50.54(q), that these procedure changes do not decrease the effectiveness of our Nuclear Emergency Response Plan.

Very truly yours,

Richard J Watts

Richard J. Watts
Manager, Nuclear Training Department

Enclosures

xc: USNRC Region 1 (2 copies of letter and 2 copies of each procedure)
Resident Inspector, Ginna Station (1 copy of letter and 1 copy of each procedure)
RG&E Nuclear Safety and Licensing (1 copy of letter)
Dr. Robert C. Mecredy (2 copies of letter only)

PSP/jtw

A045

PROCEDURE	REVISION NUMBER
EPIP 2-2	12
EPIP 2-3	15
EPIP 2-16	12
EPIP 4-3	10
EPIP 5-1	25
EPIP 5-5	14

GINNA NUCLEAR POWER PLANT
PROCEDURES INDEX
EMERGENCY PLAN IMPLEMENTING PROCEDURE

PARAMETERS: DOC TYPES - PREPIP STATUS: EF 5 YEARS ONLY:

PROCEDURE NUMBER	PROCEDURE TITLE	REV	EFFECT DATE	LAST REVIEW	NEXT REVIEW	ST
EPIP-1-0	GINNA STATION EVENT EVALUATION AND CLASSIFICATION	028	05/15/02	05/15/02	05/15/07	EF
EPIP-1-1	UNUSUAL EVENT	003	11/02/01	11/02/01	11/02/06	EF
EPIP-1-2	ALERT	004	11/02/01	11/02/01	11/02/06	EF
EPIP-1-3	SITE AREA EMERGENCY	005	12/09/96	01/23/98	01/20/03	EF
EPIP-1-4	GENERAL EMERGENCY	005	11/02/01	11/02/01	11/02/06	EF
EPIP-1-5	NOTIFICATIONS	049	04/10/02	04/10/02	04/10/07	EF
EPIP-1-6	SITE EVACUATION	013	12/20/01	12/20/01	12/20/06	EF
EPIP-1-7	ACCOUNTABILITY OF PERSONNEL	009	11/02/01	11/02/01	11/02/06	EF
EPIP-1-8	SEARCH AND RESCUE OPERATION	005	12/20/01	12/20/01	12/20/06	EF
EPIP-1-9	TECHNICAL SUPPORT CENTER ACTIVATION	021	12/20/01	12/20/01	12/20/06	EF
EPIP-1-10	OPERATIONAL SUPPORT CENTER (OSC) ACTIVATION	010	07/25/00	07/25/00	07/25/05	EF
EPIP-1-11	SURVEY CENTER ACTIVATION	026	05/15/02	05/15/02	05/15/07	EF
EPIP-1-12	REPAIR AND CORRECTIVE ACTION GUIDELINES DURING EMERGENCY SITUATIONS	009	12/20/01	12/20/01	12/20/06	EF
EPIP-1-13	LOCAL RADIATION EMERGENCY	003	08/04/95	01/23/98	01/23/03	EF
EPIP-1-15	USE OF THE HEALTH PHYSICS NETWORK HPN	005	04/24/96	03/03/99	03/03/04	EF
EPIP-1-16	RADIOACTIVE LIQUID RELEASE TO LAKE ONTARIO OR DEER CREEK	004	02/13/98	02/13/98	02/13/03	EF
EPIP-1-17	PLANNING FOR ADVERSE WEATHER	002	06/21/00	06/21/00	06/21/05	EF
EPIP-1-18	DISCRETIONARY ACTIONS FOR EMERGENCY CONDITIONS	003	06/11/02	06/11/02	06/11/07	EF
EPIP-2-1	PROTECTIVE ACTION RECOMMENDATIONS	019	06/04/01	06/04/01	06/04/06	EF
EPIP-2-2	OBTAINING METEOROLOGICAL DATA AND FORECASTS AND THEIR USE IN EMERGENCY DOSE ASSESSMENT	012	07/01/02	07/01/02	07/01/07	EF
EPIP-2-3	EMERGENCY RELEASE RATE DETERMINATION	015	07/01/02	07/01/02	07/01/07	EF
EPIP-2-4	EMERGENCY DOSE PROJECTIONS - MANUAL METHOD	013	07/20/01	07/20/01	07/20/06	EF
EPIP-2-5	EMERGENCY DOSE PROJECTIONS PERSONAL COMPUTER METHOD	014	05/15/02	05/15/02	05/15/07	EF
EPIP-2-6	EMERGENCY DOSE PROJECTIONS - MIDAS PROGRAM	011	06/21/00	06/21/00	06/21/05	EF

PARAMETERS: DOC TYPES - PREPIP STATUS: EF 5 YEARS ONLY:

PROCEDURE NUMBER	PROCEDURE TITLE	REV	EFFECT DATE	LAST REVIEW	NEXT REVIEW	ST
EPIP-2-7	MANAGEMENT OF EMERGENCY SURVEY TEAMS	010	10/23/00	10/23/00	10/23/05	EF
EPIP-2-8	VOLUNTARY ACCEPTANCE OF EMERGENCY RADIATION EXPOSURE	005	05/16/00	05/16/00	05/16/05	EF
EPIP-2-9	ADMINISTRATION OF POTASSIUM IODIDE (KI)	005	05/15/02	05/15/02	05/15/07	EF
EPIP-2-10	INPLANT RADIATION SURVEYS	003	01/16/97	01/16/97	01/16/02	EF
EPIP-2-11	ONSITE SURVEYS	019	05/15/02	05/15/02	05/15/07	EF
EPIP-2-12	OFFSITE SURVEYS	022	05/15/02	05/15/02	05/15/07	EF
EPIP-2-13	IODINE AND PARTICULATE ACTIVITY DETERMINATION FROM AIR SAMPLES	008	07/27/99	07/27/99	07/27/04	EF
EPIP-2-14	POST PLUME ENVIRONMENTAL SAMPLING	014	12/04/00	12/04/00	12/04/05	EF
EPIP-2-15	POST PLUME EVALUATION OF OFFSITE DOSES DUE TO DEPOSITION	005	02/06/02	02/06/02	02/06/07	EF
EPIP-2-16	CORE DAMAGE ESTIMATION	012	07/01/02	07/01/02	07/01/07	EF
EPIP-2-17	HYPOTHETICAL (PRE-RELEASE) DOSE ESTIMATES	007	03/01/02	03/01/02	03/01/07	EF
EPIP-2-18	CONTROL ROOM DOSE ASSESSMENT	014	05/15/02	05/15/02	05/15/07	EF
EPIP-3-1	EMERGENCY OPERATIONS FACILITY (EOF) ACTIVATION AND OPERATIONS	017	08/31/01	08/31/01	08/31/06	EF
EPIP-3-2	ENGINEERING SUPPORT CENTER (ESC)	009	03/12/01	03/12/01	03/12/06	EF
EPIP-3-3	IMMEDIATE ENTRY	008	12/20/01	12/20/01	12/20/06	EF
EPIP-3-4	EMERGENCY TERMINATION AND RECOVERY	008	03/12/01	03/12/01	03/12/06	EF
EPIP-3-7	SECURITY DURING EMERGENCIES	009	11/16/99	11/16/99	11/16/04	EF
EPIP-4-1	PUBLIC INFORMATION RESPONSE TO AN UNUSUAL EVENT	006	02/13/98	02/13/98	02/13/03	EF
EPIP-4-3	ACCIDENTAL ACTIVATION OF GINNA EMERGENCY NOTIFICATION SYSTEM SIRENS	010	07/01/02	07/01/02	07/01/07	EF
EPIP-4-6	JOINT EMERGENCY NEWS CENTER ACTIVATION	009	08/31/01	08/31/01	08/31/06	EF
EPIP-4-7	PUBLIC INFORMATION ORGANIZATION STAFFING	020	06/11/02	06/11/02	06/11/07	EF
EPIP-5-1	OFFSITE EMERGENCY RESPONSE FACILITIES AND EQUIPMENT PERIODIC INVENTORY CHECKS AND TESTS	025	07/01/02	07/01/02	07/01/07	EF
EPIP-5-2	ONSITE EMERGENCY RESPONSE FACILITIES AND EQUIPMENT PERIODIC INVENTORY CHECKS AND TESTS	027	04/24/02	04/24/02	04/24/07	EF

PARAMETERS: DOC TYPES - PREPIP STATUS: EF 5 YEARS ONLY:

PROCEDURE NUMBER	PROCEDURE TITLE	REV	EFFECT DATE	LAST REVIEW	NEXT REVIEW	ST
EPIP-5-5	CONDUCT OF DRILLS AND EXERCISES	014	07/01/02	07/01/02	07/01/07	EF
EPIP-5-6	ANNUAL REVIEW OF NUCLEAR EMERGENCY RESPONSE PLAN (NERP)	004	05/28/99	05/28/99	05/28/04	EF
EPIP-5-7	EMERGENCY ORGANIZATION	036	06/11/02	06/11/02	06/11/07	EF
EPIP-5-9	TESTING THE OFF HOURS CALL-IN PROCEDURE AND QUARTERLY TELEPHONE NUMBER CHECK	006	05/28/99	05/28/99	05/28/04	EF
EPIP-5-10	EMERGENCY RESPONSE DATA SYSTEM (ERDS)	006	03/28/02	03/28/02	03/28/07	EF
NERP	GINNA STATION NUCLEAR EMERGENCY RESPONSE PLAN	020	03/21/01	03/21/01	12/09/04	EF

TOTAL FOR PREPIP 53

ROCHESTER GAS AND ELECTRIC CORPORATION

GINNA STATION

CONTROLLED COPY NUMBER 23

PROCEDURE NO. EPIP 2-2

REV. NO. 12

OBTAINING METEOROLOGICAL DATA AND FORECASTS AND THEIR USE IN EMERGENCY DOSE ASSESSMENT

RESPONSIBLE MANAGER

07/01/02

EFFECTIVE DATE

CATEGORY 1.0

THIS PROCEDURE CONTAINS 5 PAGES

EPIP 2-2

OBTAINING METEOROLOGICAL DATA AND FORECASTS AND THEIR USE IN EMERGENCY DOSE ASSESSMENT

1.0 PURPOSE:

The purpose of this procedure is to provide guidance on obtaining meteorological data and forecast information from various sources for use in emergency dose assessment. Such information is useful in assessing the extent of plume dispersion expected, in defining the current and future downwind affected areas, and in estimating radiological levels in the affected areas.

2.0 RESPONSIBILITY:

The TSC or EOF Dose Assessment Manager is responsible for implementing this procedure.

3.0 REFERENCES:

3.1 Developmental References

3.1.1 Nuclear Emergency Response Plan

3.1.2 EPA 400-R-92-001, Manual of Protective Action Guides and Protective Actions For Nuclear Incidents (1991)

3.2 Implementing References

3.2.1 EPIP 2-1, Protective Action Recommendations

3.2.2 EPIP 2-4, Emergency Dose Projections-Manual Method

3.2.3 EPIP 2-5, Emergency Dose Projections - Personal Computer Method

3.2.4 EPIP 2-6, Emergency Dose Projections - MIDAS Program

4.0 PRECAUTIONS:

None.

5.0 PREREQUISITES:

5.1 An emergency has been declared in accordance with EPIP 1-0, Ginna Station Event Evaluation and Classification.

6.0 ACTIONS

6.1 Obtaining Weather Forecasts

6.1.1 Request the current forecast and the forecast for the next 6 hours by contacting the National Weather Service in Buffalo at (800) 462-7751 or 565-0013 or 565-0014. If unable to contact Buffalo NWS, contact Binghamton at (607) 798-6625 or (607) 729-7629.

6.1.2 For follow-up forecast information, you may also check the Internet for forecast information at the following sites:

A. National Weather Service - Buffalo @ www.wbuf.noaa.gov

B. www.weather.com
(In the local forecast section, type Rochester, NY)

C. Channel 13 @ www.Rochestertoday.com

D. www.nysemo.state.ny.us
(Go to "links"; scroll down to "weather"; and obtain data from any of the listed sources.)

6.2 Obtaining Current Ginna Weather Conditions

6.2.1 Use of the Plant Process Computer System (PPCS) (Preferred Method)

6.2.1.1 From the top menu, select "Emergency Plan Menu". Select "Radiation Monitors". At the bottom are the instantaneous and 15 minute averages for the Ginna primary weather tower.

6.2.2 Access of Main Weather Tower Meteorological Data

NOTE: TIMES INDICATED FOR WEATHER TOWER DATA ARE EASTERN DAYLIGHT.

6.2.2.1 Turn on Dose Assessment PC Terminal, monitor and printer.

NOTE: ENSURE "CAPS LOCK" IS ON TO ASSURE APPROPRIATE DATA CODE IS DISPLAYED.

6.2.2.2 Select the "Met Tower" icon from the Dose Assessment menu.

6.2.2.3 The program will automatically load and dial the Primary Tower computer.

6.2.2.4 Select Print Capture (printer icon) from Tool bar.

6.2.2.5 Type "AV"; depress RETURN; data will be displayed.

6.2.2.6 Deselect Print Capture (printer icon) from Tool Bar to print information.

6.2.2.7 To exit, select Disconnect (telephone) icon; select File; select Exit.

6.2.3 Access of Backup Tower Meteorological Data

6.2.3.1 Turn on Dose Assessment PC terminal, monitor and printer.

6.2.3.2 Select the "Station 13A (BU Weather Tower)" icon from the Dose Assessment desktop window.

6.2.3.3 The program will automatically load and dial the backup weather tower computer.

6.2.3.4 Select Print Capture (printer icon) from Tool Bar.

6.2.3.5 Type "G" (to obtain 5 minute values) or "H" (to obtain hourly data); press Return.

6.2.3.6 Deselect Print Capture (printer icon) to print information.

6.2.3.7 To determine atmospheric stability from wind fluctuation recorded by the backup tower, use the following tables:

6.2.3.8 Initial Estimate of Atmospheric Stability

Wind Fluctuation (SD3)	Stability
< 22.5	A - Extremely Unstable
< 22.5 and > 17.5	B - Moderately Unstable
< 17.5 and > 12.5	C - Slightly Unstable
< 12.5 and > 7.5	D - Neutral
< 7.5 and > 3.8	E - Slightly Stable
< 3.8	F - Moderately Stable

Go to either step 6.2.3.9 for day time and 6.2.3.10 for nighttime.

6.2.3.9 Daytime

Stability from Step 6.2.3.10	Wind Speed (MPH)	Final Stability
A	< 6.5	A
	> 6.5 and < 8.6	B
	> 8.6 and < 13.0	C
	> 13.0	D
B	< 8.6	B
	> 8.6 and < 13.0	C
	> 13.0	D
C	< 13.0	C
	> 13.0	D
D, E or F	ANY	D

6.2.3.10 Nighttime

Stability from Step 6.2.3.10	Wind Speed (MPH)	Final Stability
A	< 6.3	F
	> 6.3 and < 7.8	E
	> 7.8	D

Stability from Step 6.2.3.10	Wind Speed (MPH)	Final Stability
B	< 5.2	F
	> 5.2 and < 6.5	E
	> 6.5	D
C	< 5.2	E
	> 5.2	D
D	ANY	D
E	< 10.8	E
	> 10.8	D
F	< 6.5	F
	> 6.5 and < 10.8	E
	> 10.8	D

6.2.3.11 To exit, select Disconnect (telephone) icon; select File; select Exit.

6.2.4 Other Meteorological Sources

In the event that the PPCS and both primary and backup towers are unavailable, use the following sources:

a. Primary Meteorological Tower - Control Room Readout
b. Substation 13A Backup Meteorological Tower - Local chart recorder printout
c. WOKR Staff Meteorologists: 334-8460 or 334-8700 (9 am - 5:30 pm) 334-8743 (nights and weekends)
d. Energy Control Center: 8944

e. The following chart can be used to determine stability class when only wind speed is available:

A = Extremely unstable conditions
B = Moderately unstable conditions
C = Slightly unstable conditions
D = Neutral conditions[a]
E = Slightly stable conditions
F = Moderately stable conditions

	Daytime Insolation			Nighttime Conditions	
Surface Wind Speed (m/sec)	Strong[b]	Moderate	Slight	Thin overcast or > 4/8 Cloudiness[c]	<3/8 Cloudiness
<2	A	A-B	B		
2	A-B	B	C	E	F
4	B	B-C	C	D	E
6	C	C-D	D	D	D
>6	D	D	D	D	D

a = Applicable to heavy overcast, day or night.

b = Incoming solar radiation

c = The degree of cloudiness is defined as that fraction of the sky above the horizon which is covered by clouds.

NOTE: (METERS PER SECOND) ÷ (0.45) = MPH.

ROCHESTER GAS AND ELECTRIC CORPORATION

GINNA STATION

CONTROLLED COPY NUMBER 23

PROCEDURE NO. EPIP 2-3

REV. NO. 15

EMERGENCY RELEASE RATE DETERMINATION

RESPONSIBLE MANAGER

07/01/02

EFFECTIVE DATE

CATEGORY 1.0

THIS PROCEDURE CONTAINS 23 PAGES

EPIP 2-3

EMERGENCY RELEASE RATE DETERMINATION

1.0 PURPOSE

1.1 The purpose of this procedure is to provide method of determining the release rates of radioactive material from the plant vent, containment vent, air ejector, and Atmosphere Relief Valve, ARV, and code safety valves during accident conditions.

2.0 RESPONSIBILITY

2.1 The TSC Dose Assessment Manager or EOF Dose Assessment Manager is responsible for implementing this procedure.

3.0 REFERENCES

3.1 Developmental References

3.1.1 Eberline System Server Operation Manual

3.1.2 CH-RETS-SPING High Range Effluent Monitors (SPING-4) RM-12A, RM-14A, RM-15A, R-31 and R-32 Operation.

3.1.3 Technology for Energy Corporation Report No. R-81-020, Calculation of Dose to Activity Conversion Curves for Determination of Activity Concentrations Within Steam Lines A & B of Ginna Nuclear Station, August 1981.

3.1.4 Knoll, W.K., "Dose Rate to Activity Concentration Algorithm", internal memorandum, May 25, 1989.

3.1.5 EPA-400, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents. (1991).

3.1.6 I&E Information Notice 86-30 Design Limitation of Gaseous Effluent Monitoring System.

3.1.7 40CFR302.4 EPA reporting criteria for radioactive effluents.

4.0 PRECAUTIONS

4.1 The assumed initial average gamma energy for noble gas, as measured by the SPING middle and upper ranges, is 0.5 MEV (from t=0 to 4.5 hours after shutdown, based on References 3.1.4 and 3.1.5). The technical basis behind this is found in Attachment 5.

Attachment 2 provides an average energy vs time after shutdown for help in interpreting the SPING readings.

4.2 See Attachment 1 of this procedure for alarm set points.

4.3 The alert alarm will clear when the level falls below 80% of the set point.

NOTE: TWO SEPARATE CHANNELS CAN BE USED FOR BACKGROUND SUBTRACTION. NORMALLY CH. 4 IS USED, BUT THE CPM CAN BE BACK CALCULATED FROM CH. 8 IF CH. 4 IS OFF SCALE.

4.4 There have been two generic problems identified with SPING units and listed in I&E information Notice 86-30.

a. In extremely high dose fields, the electronics can fail. At Ginna Station, the projected doses even in a complete core release should not cause this failure based on a letter from George Daniels to the NRC addressing this concern. (Reference 3.1.6)

b. When the low range gas detector is exposed to increases of ~ 2 decades, it may absorb some noble gas on the inner and outer mylar windows and when the release rates decrease, they may not return to the correct concentration indications immediately. This should not be a serious problem since the normal plant monitoring systems will be reading correctly.

NOTE: HIGH ALARM IS A NORMAL STATUS CONDITION.

4.5 "Normal" indicated by the channel status means that the data for that time period has been normalized. In other words, any portion of data accumulated for that time period when the unit was another status is dropped.

4.6 It will usually take 10 min for a status change such as failed to clear (this is the time period of the next data update).

5.0 PREREQUISITES:

None.

6.0 ACTIONS:

6.1 The following sample points are available on the Eberline SS-1:

See Attachment 1. The concentration value of the noble gas calculated is dependent upon the average gamma energy per disintegration of the gas mixture. Concentration values should be corrected for actual isotopic mixture. The correction factor programmed in the Eberline SS-1 is for 0.5 MEV as indicated in Reference 3.1.4 and 3.1.5 .

6.1.1 Containment Vent RM-12A Unit

Channel #	Type	Units	Range	Bkgnd Subtract Fixed + chan 2
1	Particulate - Beta	μCi	1E-6 to 1E+0	None
2	Particulate - Alpha	CPM	1E+0 to 1E+6	Chan 4
3	Iodine - 131	μCi	1E-5 to 1E+6	None
4	Background Iodine	CPM	1E+0 to 1E+6	None
5	Noble Gas - Low	μCi/cc	1E-8 to 1E-2	Fixed
6	Area Monitor	mR/h	1E-3 to 1E+3	Fixed
*7	Noble Gas-Mid	μCi/cc	1E-5 to 1E+1	Fixed
8	Gamma Background	CPM	1E+0 to 1E+6	Fixed
*9	Noble Gas-High	μCi/cc	1E-3 to 1E +3	Fixed

* Precaution 4.1

6.1.2 Plant Vent RM-14A Unit

Channel #	Type	Units	Range	Bkgnd Subtract Fixed + chan 2
1	Particulate - Beta	μCi	1E-6 to 1E+0	None
2	Particulate - Alpha	CPM	1E+0 to 1E+6	Chan 4
3	Iodine - 131	μCi	1E-5 to 1E+6	None
4	Background Iodine	CPM	1E+0 to1E+6	None
5	Noble Gas - Low	μCi/cc	1E-8 to 1E-2	Fixed
6	Area Monitor	mR/h	1E-3 to 1E+3	Fixed
*7	Noble Gas-Mid	μCi/cc	1E-5 to 1E+1	Fixed
8	Gamma Background	CPM	1E+0 to 1E+6	Fixed
*9	Noble Gas-High	μCi/cc	1E-3 to 1E+3	Fixed

* Precaution 4.1

6.1.3 Air Ejector RM-15A Unit

Channel #	Type	Units	Range	Bkgnd Subtract Fixed + chan 2
5	Noble Gas - Low	μCi/cc	1E-8 to 1E-2	Fixed
6	Area Monitor	mR/h	1E-3 to 1E+3	Fixed
*7	Noble Gas-Mid	μCi/cc	1E-5 to 1E+1	Fixed
8	Gamma Background	CPM	1E+0 to 1E+6	Fixed
*9	Noble Gas-High	μCi/cc	1E-3 to 1E+3	Fixed

* Precaution 4.1

6.1.4 Steam Line Monitors Unit

Channel #	Type	Units	Range	Bkgnd Subtract
1 R-31 "A" Steam	Gamma	mR/h	1E-2 to 1E+4	Fixed
2 R-32 "B" Steam	Gamma	mR/h	1E-2 to 1E+4	Fixed

6.2 To display the Eberline SS-1 System Server Screen from Windows, select the Eberline SPING-SS-1 icon. The program automatically boots to SS-1 screen.

NOTE: PRESS THE ESCAPE KEY TO RETURN TO THE MAIN MENU.

6.3 To obtain the current data from a unit, perform the following:

6.3.1 Highlight "display status" using the arrow keys.

6.3.2 Press enter.

6.3.3 Highlight "data" then "group display".

6.3.4 Select the group number of interest and press enter.

- RM12A for containment vent
- RM14A for plant vent
- RM15A for air ejector
- DAM for the steam line monitor

6.3.5 Observe data.

6.3.6 If a print out of the data is desired, highlight "print" using the arrow keys and press enter.

6.4 To obtain a history of the data from a unit, perform the following:

6.4.1 Highlight "data" using the arrow keys.

6.4.2 Press enter.

6.4.3 Select one of the following:

- 10 minute history
- 1 hour history
- 1 day history

6.4.4 Select the unit of interest:

- RM12A for containment vent
- RM14A for plant vent
- RM15A for air ejector
- DAM for the steam line monitor.

6.4.5 Select the channel of interest:

RM-12A or RM-14A	RM-15A	DAM
1 - Beta particulate 2 - Alpha particulate 3 - Iodine 4 - Iodine background 5 - Low range noble gas 6 - Gamma area 7 - Mid-range noble gas 8 - Gamma background 9 - High range noble gas	4 - Iodine background 5 - Low range noble gas 6 - Gamma area 7 - Mid-range noble gas 8 - Gamma background 9 - High range noble gas	1- R-31 - A steam line 2- R-32 - B steam line

6.4.6 Observe data.

6.4.7 With "Toggle"highlighted, press "enter" to toggle until "time" is displayed along the left hand side of the chart.

6.4.8 If a print out of the data is desired, highlight "PRINT" using the arrow keys and press enter.

6.4.9 To obtain the release rate, enter the flow rate then press enter.

6.4.10 If a print out of the data is desired, highlight "PRINT" using the arrow keys and press enter.

6.4.11 Release rates can be converted to Ci/sec by multiplying 1E-6 to convert μCi to curies and dividing by 60. Dose Assessment can make offsite dose projections entering this release rate into the dose assessment computer programs.

6.4.12 Release rates can be refined by lab analysis of grab samples which can be obtained from the appropriate SPING field unit.

6.5 Radioactivity release from steam line code safety valves and ARV's.

6.5.1 Primary to secondary leakage is indicated by an increased reading of Air Ejector Monitor or Steam Generator Blowdown Monitor, or an unexpected rise in water level of one steam generator. Air ejector release rates are determined by steps described in section 6.5 through 6.6. The first steam line monitor to alarm should be the leaking steam generator.

6.5.2 If steam is released by the safety valves or PORV's determine the time elapsed since the shutdown of the reactor and select the dose rate vs concentration conversion factor on Attachment 3 corresponding to the nearest elapsed time since reactor shutdown. Conversion factors were calculated for various times after shutdown to reflect radioactive decay of the isotopic mix.

6.5.3 Determine, using the data calculation sheet, (Attachment 4) the equivalent μCi/cc of the radioactivity released by multiplying the appropriate conversion factor (μCi/cc per mR/hr) by the steam line dose rate (mR/hr) from Attachment 3 or activity from the steam generator blowdown if the S/G is water solid.

6.6 From the PPCS or by observation, determine the period of time and number of the ARV and steam relief valves which were open. Were they open coincidently? Was the turbine driven auxiliary feedwater pump being driven from the faulted steam generator.

6.7 Determine the maximum flow rate through steam valves relieving simultaneously to atmosphere by adding the flow rates from each valve on the data sheet. Ensure the ARV and safeties are those from the faulted steam generator.

ARV	= 153,900 cu. ft/hr = 1.33 E6 cc.sec
Each Safety	= 333,000 cu. ft/hr = 2.65 E6 cc/sec
Turbine Driven Auxiliary Feedwater	= 7,106 cu. ft/hr = 5.59 E4 cc/sec

For water solid steam generator*

Each Safety	= 2000 gal/min = 1.3 E5 cc/sec
ARV	= 1000 gal/min = 6.5 E4 cc/sec

*These values are based on vendor information provided for the 1982 steam generator tube rupture report.

6.8 Determine on the data sheet the Ci/sec release rate of radioactivity by multiplying the μCi/cc released (determined in 6.7.5) by 1E-6 Ci/μCi. (1E-6 converts μCi to Ci) that answer multiplied by the total release rate of steam (determined in 6.9) will yield a release rate in Ci/sec. See attached data calculation sheet Attachment 4.

6.9 A release through the S/G Safety and ARV's can be calculated using EPIP 2-5. Information on S/G release rates and total curies released can be obtained by using the PPCS monitors and calling up the SPING data, Page 2 of 2 from the Event printouts.

6.10 Waterborne or Surface Spill

6.10.1 To calculate volume released, try to obtain the initial and final levels and calculate difference. If the initial level is unknown, assume the container was full. If the final level is unknown, assume container is empty. Attachment 6 has volumes for some of the plant tanks.

6.10.2 To calculate activity, obtain a sample from the tank and perform an isotopic identification. If unable to perform an isotopic analysis, perform a gross beta/gamma analysis. If the container is empty and no sample can be obtained, correlate the effluent release monitor reading to a radioactive concentration. If release was unmonitored, look at the historical data from past analysis and if it is believed that the activity in the container did not deviate from the historical data, use the historical data activity.

6.10.3 Using the appropriate conversation factors, calculate the total activity released.

6.10.4 Using isotopic analysis or historical data, indicate the isotopic mix of the release in μCi/ml.

6.11 Notification of EPA (40 CFR302.6)

6.11.1 Using Attachment 7, determine if the release has exceed the EPA RQ curie values for any 24 hour period.

6.11.2 If the RQ curie values have been exceed for any 24 hour period, then inform the EPA.

EPA National Response Center
9-1-800-424-8802
or
9-1-202-426-2675

6.11.3 If you call the EPA, within 4 hours inform the NRC that you have notified the EPA I.A.W. 40CFR302.6 per 10CFR 50.72 (b) (2) (vi).

7.0 ATTACHMENTS:

1. SPING Alarm Setpoints
2. Noble Gas Mixture
3. Factors to convert steam line monitor dose rates to activity concentration.
4. Radioactivity release through steam vents data calculation sheet.
5. Calculation of the Gamma Becquerel MeV/μCi constant for ^{133}Xe and ^{85}Kr for determination of activity released.
6. Determination of Release from waterborne or surface spill .
7. 40CFR302.4, Appendix B, ch. 1

Attachment 1

RM-12A Containment Vent High Range
Effluent Monitor

SPING Alarm Setpoints

CHANNEL	TREND ALARM	RELEASE RATE LIMIT	HIGH ALARM SETPOINT	WARNING ALARM SETPOINT
01-Beta Particulate	100%/minute	2.57E-07μCi/cc	1.90E-01 μCi	9.00E-02 μCi/cc
02-Alpha Particulate	N/A	2.57E-07 μCi/cc	3.00E+02 cpm	2.00E+02 cpm
03-Iodine - 131	100%/minute	1.10E-08 μCi/cc	2.00E-02 μCi	1.00E-02 μCi
05-Low Range Gas	40%/minute	2.00E-01 μCi/cc	4.00E-02 μCi/cc	2.00E-02 μCi
06-Area Gamma	N/A	N/A	1.00E+02 mRad/hr	5.00+00 mRad/hr
07-Mid Range Gas	N/A	2.00E-01 μCi/cc	2.00E-01μCi/cc	8.00-02 μCi/cc
09-High Range Gas	N/A	2.00E-01 μCi/cc	2.00E+00 μCi/cc	2.00E μCi/cc

* The alarm values for these fixed filters represent the number of microcuries collected in one hour of sampling to give the specified fraction of the release rate limit. The containment flow rate was assumed to be 11,000 cfm using either the A and B fans or 3.1 E+8 cc/min.

** Trend alarms indicate the percent per minute increase over the last channel reading.

Attachment 1
SPING Alarm Setpoints

RM-14A Plant Vent High Range Effluent Monitor

CHANNEL	TREND ALARM**	RELEASE RATE LIMIT	HIGH ALARM SET POINT	WARNING ALARM SETPOINT
01Beta-Particulate	100%/minute	2.90E-08 μCi/cc	4.12E-02 μCi	2.00E-02 μCi
02-Alpha Particulate	N/A	2.90E-08 μCi/cc	3.00E+02 cpm	2.00+02 cpm
03-Iodine - 131	100%/minute	1.75E-09 μCi/cc	1.79-03 μCi	8.95E-04 μCi
05-Low Range Gas	40%/minute	1.80E-02 μCi/cc	6.92E-03 μCi/cc	3.46E-03 μCi/cc
06-Area Gamma	N/A	N/A	1.00E+02 mRad/hr	5.00E+00 mRad/hr
07-Mid Range Gas	N/A	1.80E-02 μCi/cc	3.46E-02 μCi/cc	1.73E-02 μCi/cc
09-High Range Gas	N/A	1.80E-02 μCi/cc	1.73E-01 μCi/cc	8.65E-02 μCi/cc

* The alarm values for these fixed filters represent the number of microcuries collected in one hour of sampling to give the specified fraction of the release rate limit. The plant vent flow rate was assumed to be 76,000 cfm or 2.15 E+9 cc/min.

** Trend alarms indicate the percent per minute increase over the last channel reading.

Attachment 1

SPRING Alarm Setpoint

RM-15A Ejector High Performance Effluent Monitor

DIRECT Alignment

CHANNEL	TREND ALARM	RELEASE RATE LIMIT	HIGH ALARM SETPOINTS	WARNING ALARM SETPOINTS
05-Low Range Gas	N/A	3.14E0 μCi/cc	3.14E-02 μCi/cc	3.14E-02 μCi/cc
06-Area Gamma	N/A	N/A	1.00E+02 mRad/hr	5.00E+00 mRad/hr
07-Mid Range Gas	N/A	3.14E0 μCi/cc	1.26E0 μCi/cc	6.3E-01 μCi/cc
09-High Range Gas	N/A	3.14E0 μCi/cc	1.26E+01 μCi/cc	6.28E 0 μCi/cc

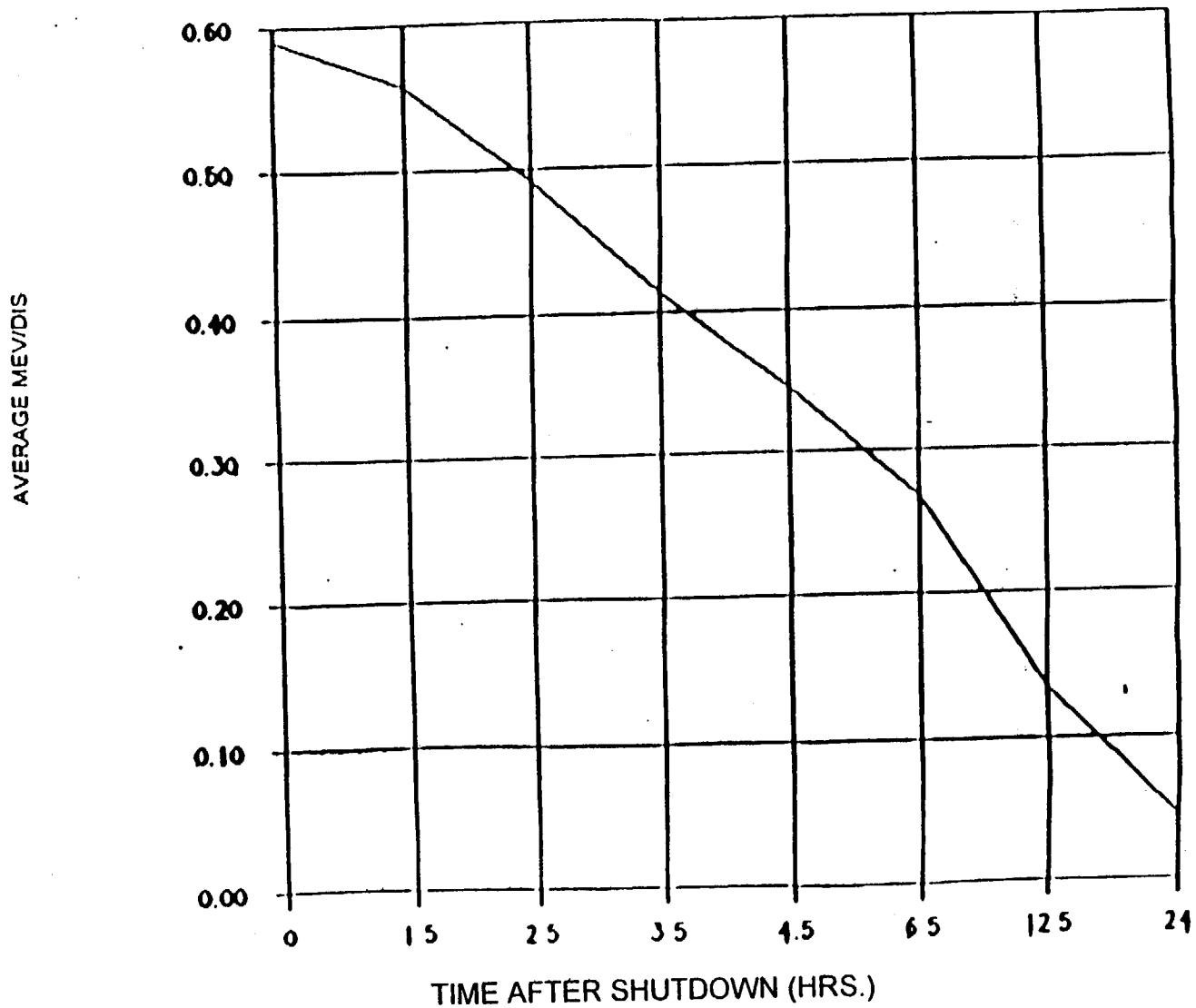
DILUTED Alignment

CHANNEL	TREND ALARM	RELEASE RATE LIMIT	HIGH ALARM SETPOINTS	WARNING ALARM SETPOINTS
05-Low Range Gas	N/A	1.56E-02 μCi/cc	6.24E-03 μCi/cc	3.12E-03 μCi/cc
06-Area Gamma	N/A	N/A	1.00E+02 mRad/hr	5.00E+00 mRad/hr
07-Mid Range Gas	N/A	1.56E-02 μCi/cc	6.24E-02 μCi/cc	3.12E-02 μCi/cc
09-High Range Gas	N/A	1.56-02 μCi/cc	1.56E-01 μCi/cc	7.8E -02 μCi/cc

** Trend alarms indicate the percent per minute increase over the last channel reading.

NOBLE GAS MIXTURE

AVG. GAMMA ENERGY



FACTORS TO CONVERT STEAM LINE MONITOR DOSE RATE TO ACTIVITY CONCENTRATION

μCi/cc per mr/hr

Time After Shutdown	"A" or "B" Steam Line
0.00	0.1295
0.25	0.1345
0.50	0.1397
0.75	0.1451
1.00	0.1507
1.25	0.1565
1.50	0.1626
1.75	0.1689
2.00	0.1754
2.25	0.1822
2.50	0.1892
2.75	0.1966
3.00	0.2042
3.5	0.2203
4.0	0.2376
4.5	0.2564
5.0	0.2766
5.5	0.2984
6.0	0.3219
6.5	0.3473
7.0	0.3747
7.5	0.4042
8.0	0.4361
12.0	0.8004
24.0	4.9477

Multiply appropriate steam line monitor (R-31 or R-32) reading in Mr/hr, by above to obtain μCi/cc in steam.
Above factors do not apply to water solid steam line case.

RADIOACTIVITY RELEASE THROUGH STEAM VENTS DATA CALCULATION SHEET

1. Time of reactor shutdown: _____Hours _____Date

2. Time of this reading: _____Hours _____Date

3. Elapsed time: _____Hours
(2) - (1)

4. Steam line location and mR/hr: A_____mR/hr B_____mR/hr

5. Conversion factor (μCi/cc per mR/hr) used (from Attachment 3):_____

6. Equivalent μCi/cc (Step 4 multiplied by Step 5):_____ μCi/cc

(NOTE: FOR WATER SOLID STEAM GENERATOR, USE μCi/cc FROM STEAM GENERATOR BLOWDOWN ACTIVITY.)

FLOW DATA THROUGH RELIEF VALVES TO ATMOSPHERE

		OPERATING	FLOW cc/sec	DURATION SECONDS	VOLUME cc
Atmospheric Relief Valve (ARV)		_____	1.33E6 (6.5E4)	_____	_____
Safety Valve	1	_____	2.65E6 (1.3E5)	_____	_____
Safety Valve	2	_____	2.65E6 (1.3E5)	_____	_____
Safety Valve	3	_____	2.65E6 (1.3E5)	_____	_____
Safety Valve	4	_____ (1.3E5)	2.65E6	_____	_____
Turbine Driven Aux. Feedwater Pump		_____	5.59E4	_____	_____

NOTE 1: ( ) INDICATES FLOW RATE FOR WATER SOLID STEAM GENERATOR.

7. Total Volume through relief valves to atmosphere. Total Volume _____

8. ARV flow duration _____ seconds

9. Total Steam Release Rate _____ cc/sec
(7) / (8)

10. Curies per second release of radioactivity determined from calculation below:

$$\underset{(6)}{_____}\ \frac{uCi}{cc} \times 1E\text{-}6\ \frac{Ci}{\mu Ci} \times \underset{(9)}{_____}\ \frac{cc}{Sec} = \underset{(10)}{_____}\ \frac{Ci}{Sec} \quad \text{(Noble Gas)}$$

11. Use a default ratio of 1E-4 to determine iodine release rate.

$$\underset{(10)}{_____}\ \frac{Ci}{Sec} \times 1E\text{-}4 = _____\ \frac{Ci}{Sec} \quad \text{(Iodine)}$$

Signature:_____
Date/Time:_____

Checked by:_____
Date/Time: _____

Calculation of the Gamma Becquerel
MeV/uCi Constant for ^{133}Xe and ^{85}Kr for determination
of Activity Released

I. Calculation of the · Bq · MeV/μCi constant for ^{133}Xe·

- MIRD Pamphlet No. 10 lists the following photons (x and gamma rays) originating from the decay of ^{133}Xe·

RADIATION	PHOTONS/DISINTEGRATION	MEAN ENERGY/PHOTON (MeV)
Gamma	0.0061	0.0796
Gamma	0.3603	0.0809
Gamma	0.0002	0.3839
K Alpha - 1 X-Ray	0.2552	0.0309
K Alpha - 2 X-Ray	0.1321	0.0306
K Beta - 1 X-Ray	0.0712	0.0349
K Beta - 2 X-Ray	0.0150	0.0359
L X-Rays	0.0823	0.0043

NOTE: **ALL THE PHOTONS EMITTED IN LESS THAN 0.01 PERCENT OF THE DISINTEGRATIONS WERE OMITTED.**

- The mean photon energy emitted per disintegration is determined by:

$$\sum_{i=1}^{n} (i/^{d)} MeV_i)$$

This value is 0.0450 · MeV based on the MIRD photon listing.

- Since a Becquerel (Bq) is one disintegration per second and there are 3.7×10^4 disintegrations per second/μCi, the · Bq · MeV/μCi constant for ^{133}Xe is:

$$(0.0450 \cdot MeV)\ 3.7 \times 10^4\ /\ \cdot Bq/\mu Ci) = 1.67 \times 10^3\ \cdot Bq \cdot MeV/\mu Ci$$

II. Calculation of the · Bq · MeV/μCi constant for ^{85}Kr.

- MIRD Pamphlet No. 10 lists the following photons (x and gamma rays) originating from the decay of ^{85}Kr.

RADIATION	PHOTONS/DISINTEGRATION	MEAN ENERGY/PHOTON (MeV)
Gamma	0.0042	0.5140

NOTE: **ALL THE PHOTONS EMITTED IN LESS THAN 0.01 PERCENT OF THE DISINTEGRATIONS WERE OMITTED.**

- The mean photon energy emitted per disintegration is determined by:

$$\sum_{i=1}^{n} (i/^{d)} MeV_i)$$

This value is 0.0022 · MeV based on the MIRD photon listing.

- Since a Becquerel (Bq) is one disintegration per second and there are 3.7×10^4 disintegrations per second/μCi, the · Bq · MeV/μCi constant for ^{85}Kr is:

$(0.0022 \cdot MeV)\ (3.7 \times 10^4\ Bq/\mu Ci) = 8.14 \times 10^1 \cdot Bq \cdot MeV/\mu Ci$

III. Conversion from · Bq · MeV/cm^3 for ^{133}Xe or ^{85}Kr.

- The intermediate and high range noble gas channels on the SPING monitor present data in terms of · Bq · MeV/cm^3. To convert this data to units μCi/cm^3 the conversion factors (· Bq · MeV/μCi) calculated above must be known as well as the composition of the sample gas.

- For example:

If the mid-range noble gas channel on a SPING was reporting a sample stream concentration of 1.00×10^2 · Bq · MeV/cm^3 and it was known that the noble gas content was purely ^{133}Xe; the concentration of ^{133}Xe (μCi/cm^3) based on the previously determined conversion factor of 1.67×10^3 · Bq · MeV/μCi is:

$$^{133}Xe\ Concentration = \frac{1.00 \times 10^2 \cdot Bq \cdot MeV/cm^3}{1.67 \times 10^3 \cdot Bq \cdot MeV/\mu Ci}$$

$$= 5.99 \times 10^{-2}\ \mu Ci/cm^3$$

DETERMINATION OF RELEASE

FROM WATERBORNE OR SURFACE SPILL

Initial Volume		Final Volume		Release Volume
_____	-	_____	=	_____

Volume Released	x	Total Activity	x	Conversion Factors	=	Total Curies Released
_____	x	_____	x	_____	=	_____

CONVERSION FACTORS

1 curie = 10^3 millicuries

1 curie = 10^6 microcuries

1 curie = 2.22E12 dis/min

1 dis/min = 4.505E-10 millicuries

1 dis/min = 4.505E-7 microcuries

1 gallon = 0.13368 ft^3

1 ft^3 = 28.32 liters

1 liter = 0.26418 gallons

TANK VOLUMES

Waste Condensate Tank = 600 gallons

Monitor Tank = 7,500 gallons

Retention Tank = 25,699 gallons

Standby Retention Tank = 30,000 gallons

High Conductivity Waste Tank = 30,000 gallons

Spent Fuel Pit = 500 gallon/inch

Resin Cask Liner = 100 ft^3 (8-120-B)

ISOTOPIC MIX (IN μCi/m1)

NOTES

Cr-51	_____
Co-58	_____
Fe-59	_____
Co-60	_____
Kr-85	_____
Kr-88	_____
Nb-95	_____
Zr-95	_____
Sb-124	_____
I-131	_____
Xe-131M	_____
Xe-133	_____
Cs-137	_____
Ba-140	_____
Ce-144	_____
_____	_____
_____	_____
_____	_____
_____	_____
Total Act	_____ *

* Use gross beta/gamma activity if isotopic analysis information is not available.

APPENDIX B TO § 302.4—RADIONUCLIDES—Continued

Radionuclide	Atomic Number	Final RQ Ci (Bq)
Californium-249	98	0.01 (3.7E 8)
Californium-250	98	0.01 (3.7E 8)
Californium-251	98	0.01 (3.7E 8)
Californium-252	98	0.1 (3.7E 9)
Californium-253	98	10 (3.7E 11)
Californium-254	98	0.1 (3.7E 9)
Carbon-11	6	1000 (3.7E 13)
Carbon-14	6	10 (3.7E 11)
Cerium-134	58	10 (3.7E 11)
Cerium-135	58	10 (3.7E 11)
Cerium-137m	58	100 (3.7E 12)
Cerium-137	58	1000 (3.7E 13)
Cerium-139	58	100 (3.7E 12)
Cerium-141	58	10 (3.7E 11)
Cerium-143	58	100 (3.7E 12)
Cerium-144	58	1 (3.7E 10)
Cesium-125	55	1000 (3.7E 13)
Cesium-127	55	100 (3.7E 12)
Cesium-129	55	100 (3.7E 12)
Cesium-130	55	1000 (3.7E 13)
Cesium-131	55	1000 (3.7E 13)
Cesium-132	55	10 (3.7E 11)
Cesium-134m	55	1000 (3.7E 13)
Cesium-134	55	1 (3.7E 10)
Cesium-135m	55	100 (3.7E 12)
Cesium-135	55	10 (3.7E 11)
Cesium-136	55	10 (3.7E 11)
Cesium-137	55	1 (3.7E 10)
Cesium-138	55	100 (3.7E 12)
Chlorine-36	17	10 (3.7E 11)
Chlorine-38	17	100 (3.7E 12)
Chlorine-39	17	100 (3.7E 12)
Chromium-48	24	100 (3.7E 12)
Chromium-49	24	1000 (3 7E 13)
Chromium-51	24	1000 (3.7E 13)
Cobalt-55	27	10 (3.7E 11)
Cobalt-56	27	10 (3.7E 11)
Cobalt-57	27	100 (3.7E 12)
Cobalt-58m	27	1000 (3.7E 13)
Cobalt-58	27	10 (3.7E 11)
Cobalt-60m	27	1000 (3 7E 13)
Cobalt-60	27	10 (3.7E 11)
Cobalt-61	27	1000 (3 7E 13)
Cobalt-62m	27	1000 (3.7E 13)
Copper-60	29	100 (3 7E 12)
Copper-61	29	100 (3.7E 12)
Copper-64	29	1000 (3.7E 13)
Copper-67	29	100 (3.7E 12)
Curium-238	96	1000 (3.7E 13)
Curium-240	96	1 (3 7E 10)
Curium-241	96	10 (3 7E 11)
Curium-242	96	1 (3 7E 10)
Curium-243	96	0 01 (3.7E 8)
Curium-244	96	0 01 (3 7E 8)
Curium-245	96	0 01 (3 7E 8)
Curium-246	96	0 01 (3 7E 8)
Curium-247	96	0 01 (3 7E 8)
Curium-248	96	0 001 (3 7E 7)
Curium-249	96	1000 (3 7E 13)
Dysprosium-155	66	100 (3 7E 12)
Dysprosium-157	66	100 (3.7E 12)
Dysprosium-159	66	100 (3 7E 12)
Dysprosium-165	66	1000 (3.7E 13)
Dysprosium-166	66	10 (3.7E 11)
Einsteinium-250	99	10 (3.7E 11)
Einsteinium-251	99	1000 (3.7E 13)
Einsteinium-253	99	10 (3.7E 11)
Einsteinium-254m	99	1 (3.7E 10)
Einsteinium-254	99	0.1 (3.7E 9)
Erbium-161	68	100 (3.7E 12)

APPENDIX B TO § 302.4—RADIONUCLIDES—Continued

Radionuclide	Atomic Number	Final RQ Ci (Bq)
Erbium-165	68	1000 (3.7E 13)
Erbium-169	68	100 (3.7E 12)
Erbium-171	68	100 (3.7E 12)
Erbium-172	68	10 (3.7E 11)
Europium-145	63	10 (3.7E 11)
Europium-146	63	10 (3.7E 11)
Europium-147	63	10 (3.7E 11)
Europium-148	63	10 (3.7E 11)
Europium-149	63	100 (3.7E 12)
Europium-150 (12.6 hr)	63	1000 (3.7E 13)
Europium-150 (34.2 yr)	63	10 (3.7E 11)
Europium-152m	63	100 (3.7E 12)
Europium-152	63	10 (3.7E 11)
Europium-154	63	10 (3.7E 11)
Europium-155	63	10 (3.7E 11)
Europium-156	63	10 (3.7E 11)
Europium-157	63	10 (3.7E 11)
Europium-158	63	1000 (3.7E 13)
Fermium-252	100	10 (3.7E 11)
Fermium-253	100	10 (3.7E 11)
Fermium-254	100	100 (3.7E 12)
Fermium-255	100	100 (3.7E 12)
Fermium-257	100	1 (3.7E 10)
Fluorine-18	9	1000 (3.7E 13)
Francium-222	87	100 (3.7E 12)
Francium-223	87	100 (3.7E 12)
Gadolinium-145	64	100 (3.7E 12)
Gadolinium-146	64	10 (3.7E 11)
Gadolinium-147	64	10 (3.7E 11)
Gadolinium-148	64	0.001 (3.7E7)
Gadolinium-149	64	100 (3.7E 12)
Gadolinium-151	64	100 (3.7E 12)
Gadolinium-152	64	0.001 (3.7E 7)
Gadolinium-153	64	10 (3.7E 11)
Gadolinium-159	64	1000 (3.7E 13)
Gallium-65	31	1000 (3.7E 13)
Gallium-66	31	10 (3.7E 11)
Gallium-67	31	100 (3.7E 12)
Gallium-68	31	1000 (3.7E 13)
Gallium-70	31	1000 (3.7E 13)
Gallium-72	31	10 (3.7E 11)
Gallium-73	31	100 (3.7E 12)
Germanium-66	32	100 (3.7E 12)
Germanium-67	32	1000 (3.7E 13)
Germanium-68	32	10 (3.7E 11)
Germanium-69	32	10 (3.7E 11)
Germanium-71	32	1000 (3.7E 13)
Germanium-75	32	1000 (3.7E 13)
Germanium-77	32	10 (3.7E 11)
Germanium-78	32	1000 (3.7E 13)
Gold-193	79	100 (3.7E 12)
Gold-194	79	10 (3.7E 11)
Gold-195	79	100 (3.7E 12)
Gold-198m	79	10 (3.7E 11)
Gold-198	79	100 (3.7E 12)
Gold-199	79	100 (3.7E 12)
Gold-200m	79	10 (3.7E 11)
Gold-200	79	1000 (3.7E 13)
Gold-201	79	1000 (3.7E 13)
Hafnium-170	72	100 (3.7E 12)
Hafnium-172	72	1 (3.7E 10)
Hafnium-173	72	100 (3.7E 12)
Hafnium-175	72	100 (3.7E 12)
Hafnium-177m	72	1000 (3.7E 13)
Hafnium-178m	72	0.1 (3.7E 9)
Hafnium-179m	72	100 (3.7E 12)
Hafnium-180m	72	100 (3.7E 12)
Hafnium-181	72	10 (3.7E 11)
Hafnium-182m	72	100 (3.7E 12)
Hafnium-182	72	0.1 (3.7E 9)

APPENDIX B TO § 302.4—RADIONUCLIDES—Continued

Radionuclide	Atomic Number	Final RQ Ci (Bq)
Hafnium-183	72	100 (3.7E 12)
Hafnium-184	72	100 (3.7E 12)
Holmium-155	67	1000 (3.7E 13)
Holmium-157	67	1000 (3.7E 13)
Holmium-159	67	1000 (3.7E 13)
Holmium-161	67	1000 (3.7E 13)
Holmium-162m	67	1000 (3.7E 13)
Holmium-162	67	1000 (3.7E 13)
Holmium-164m	67	1000 (3.7E 13)
Holmium-164	67	1000 (3.7E 13)
Holmium-166m	67	1 (3.7E 10)
Holmium-166	67	100 (3.7E 12)
Holmium-167	67	100 (3.7E 12)
Hydrogen-3	1	100 (3.7E 12)
Indium-109	49	100 (3.7E 12)
Indium-110 (69.1 min)	49	100 (3.7E 12)
Indium-110 (4.9 hr)	49	10 (3.7E 11)
Indium-111	49	100 (3.7E 12)
Indium-112	49	1000 (3.7E 13)
Indium-113m	49	1000 (3.7E 13)
Indium-114m	49	10 (3.7E 11)
Indium-115m	49	100 (3.7E 12)
Indium-115	49	0.1 (3.7E 9)
Indium-116m	49	100 (3.7E 12)
Indium-117m	49	100 (3.7E 12)
Indium-117	49	1000 (3.7E 13)
Indium-119m	49	1000 (3.7E 13)
Iodine-120m	53	100 (3.7E 12)
Iodine-120	53	10 (3.7E 11)
Iodine-121	53	100 (3.7E 12)
Iodine-123	53	10 (3.7E 11)
Iodine-124	53	0.1 (3.7E 9)
Iodine-125	53	0.01 (3.7E 8)
Iodine-126	53	0.01 (3.7E 8)
Iodine-128	53	1000 (3.7E 13)
Iodine-129	53	0 001 (3.7E 7)
Iodine-130	53	1 (3.7E 10)
Iodine-131	53	0.01 (3.7E 8)
Iodine-132m	53	10 (3.7E 11)
Iodine-132	53	10 (3.7E 11)
Iodine-133	53	0.1 (3.7E 9)
Iodine-134	53	100 (3.7E 12)
Iodine-135	53	10 (3.7E 11)
Indium-182	77	1000 (3.7E 13)
Indium-184	77	100 (3.7E 12)
Indium-185	77	100 (3.7E 12)
Indium-186	77	10 (3.7E 11)
Indium-187	77	100 (3.7E 12)
Indium-188	77	10 (3 7E 11)
Indium-189	77	100 (3 7E 12)
Indium-190m	77	1000 (3 7E 13)
Indium-190	77	10 (3 7E 11)
Indium-192m	77	100 (3 7E 12)
Indium-192	77	10 (3 7E 11)
Indium-194m	77	10 (3 7E 11)
Indium-194	77	100 (3 7E 12)
Indium-195m	77	100 (3 7E 12)
Indium-195	77	1000 (3.7E 13)
Iron-52	26	100 (3 7E 12)
Iron-55	26	100 (3 7E 12)
Iron-59	26	10 (3 7E 11)
Iron-60	26	0 1 (3.7E 9)
Krypton-74	36	10 (3.7E 11)
Krypton-76	36	10 (3.7E 11)
Krypton-77	36	10 (3.7E 11)
Krypton-79	36	100 (3.7E 12)
Krypton-81	36	1000 (3.7E 13)
Krypton-83m	36	1000 (3.7E 13)
Krypton-85m	36	100 (3.7E 12)
Krypton-85	36	1000 (3.7E 13)

APPENDIX B TO § 302.4—RADIONUCLIDES—Continued

Radionuclide	Atomic Number	Final RQ Ci (Bq)
Krypton-87	36	10 (3.7E 11)
Krypton-88	36	10 (3.7E 11)
Lanthanum-131	57	1000 (3.7E 13)
Lanthanum-132	57	100 (3.7E 12)
Lanthanum-135	57	1000 (3.7E 13)
Lanthanum-137	57	10 (3.7E 11)
Lanthanum-138	57	1 (3.7E 10)
Lanthanum-140	57	10 (3.7E 11)
Lanthanum-141	57	1000 (3.7E 13)
Lanthanum-142	57	100 (3.7E 12)
Lanthanum-143	57	1000 (3.7E 13)
Lead-195m	82	1000 (3.7E 13)
Lead-198	82	100 (3.7E 12)
Lead-199	82	100 (3.7E 12)
Lead-200	82	100 (3.7E 12)
Lead-201	82	100 (3.7E 12)
Lead-202m	82	10 (3.7E 11)
Lead-202	82	1 (3.7E 10)
Lead-203	82	100 (3.7E 12)
Lead-205	82	100 (3.7E 12)
Lead-209	82	1000 (3.7E 13)
Lead-210	82	0.01 (3.7E 8)
Lead-211	82	100 (3.7E 12)
Lead-212	82	10 (3.7E 11)
Lead-214	82	100 (3.7E 12)
Lutetium-169	71	10 (3.7E 11)
Lutetium-170	71	10 (3.7E 11)
Lutetium-171	71	10 (3.7E 11)
Lutetium-172	71	10 (3.7E 11)
Lutetium-173	71	100 (3.7E 12)
Lutetium-174m	71	10 (3.7E 11)
Lutetium-174	71	10 (3.7E 11)
Lutetium-176m	71	1000 (3.7E 13)
Lutetium-176	71	1 (3.7E 10)
Lutetium-177m	71	10 (3.7E 11)
Lutetium-177	71	100 (3.7E 12)
Lutetium-178m	71	1000 (3.7E 13)
Lutetium-178	71	1000 (3.7E 13)
Lutetium-179	71	1000 (3.7E 13)
Magnesium-28	12	10 (3.7E 11)
Manganese-51	25	1000 (3.7E 13)
Manganese-52m	25	1000 (3.7E 13)
Manganese-52	25	10 (3.7E 11)
Manganese-53	25	1000 (3.7E 13)
Manganese-54	25	10 (3.7E 11)
Manganese-56	25	100 (3.7E 12)
Mendelevium-257	101	100 (3.7E 12)
Mendelevium-258	101	1 (3.7E 10)
Mercury-193m	80	10 (3.7E 11)
Mercury-193	80	100 (3.7E 12)
Mercury-194	80	0.1 (3.7E 9)
Mercury-195m	80	100 (3.7E 12)
Mercury-195	80	100 (3.7E 12)
Mercury-197m	80	1000 (3.7E 13)
Mercury-197	80	1000 (3.7E 13)
Mercury-199m	80	1000 (3.7E 13)
Mercury-203	80	10 (3.7E 11)
Molybdenum-90	42	100 (3.7E 12)
Molybdenum-93m	42	10 (3.7E 11)
Molybdenum-93	42	100 (3.7E 12)
Molybdenum-99	42	100 (3.7E 12)
Molybdenum-101	42	1000 (3.7E 13)
Neodymium-136	60	1000 (3.7E 13)
Neodymium-138	60	1000 (3.7E 13)
Neodymium-139m	60	100 (3.7E 12)
Neodymium-139	60	1000 (3.7E 13)
Neodymium-141	60	1000 (3.7E 13)
Neodymium-147	60	10 (3.7E 11)
Neodymium-149	60	100 (3.7E 12)
Neodymium-151	60	1000 (3.7E 13)

APPENDIX B TO § 302.4—RADIONUCLIDES—Continued

Radionuclide	Atomic Number	Final RQ Ci (Bq)
Neptunium-232	93	1000 (3.7E 13)
Neptunium-233	93	1000 (3.7E 13)
Neptunium-234	93	10 (3.7E 11)
Neptunium-235	93	1000 (3.7E 13)
Neptunium-236 (1.2 E 5 yr)	93	0.1 (3.7E 9)
Neptunium-236 (22.5 hr)	93	100 (3.7E 12)
Neptunium-237	93	0.01 (3.7E 8)
Neptunium-238	93	10 (3.7E 11)
Neptunium-239	93	100 (3.7E 12)
Neptunium-240	93	100 (3.7E 12)
Nickel-56	28	10 (3.7E 11)
Nickel-57	28	10 (3.7E 11)
Nickel-59	28	100 (3.7E 12)
Nickel-63	28	100 (3.7E 12)
Nickel-65	28	100 (3.7E 12)
Nickel-66	28	10 (3.7E 11)
Niobium-88	41	100 (3.7E 12)
Niobium-89 (66 min)	41	100 (3.7E 12)
Niobium-89 (122 min)	41	100 (3.7E 12)
Niobium-90	41	10 (3.7E 11)
Niobium-93m	41	100 (3.7E 12)
Niobium-94	41	10 (3.7E 11)
Niobium-95m	41	100 (3.7E 12)
Niobium-95	41	10 (3.7E 11)
Niobium-96	41	10 (3.7E 11)
Niobium-97	41	100 (3.7E 12)
Niobium-98	41	1000 (3.7E 13)
Osmium-180	76	1000 (3.7E 13)
Osmium-181	76	100 (3.7E 12)
Osmium-182	76	100 (3.7E 12)
Osmium-185	76	10 (3.7E 11)
Osmium-189m	76	1000 (3.7E 13)
Osmium-191m	76	1000 (3 7E 13)
Osmium-191	76	100 (3.7E 12)
Osmium-193	76	100 (3 7E 12)
Osmium-194	76	1 (3.7E 10)
Palladium-100	46	100 (3.7E 12)
Palladium-101	46	100 (3 7E 12)
Palladium-103	46	100 (3.7E 12)
Palladium-107	46	100 (3.7E 12)
Palladium-109	46	1000 (3.7E 13)
Phosphorus-32	15	0 1 (3.7E 9)
Phosphorus-33	15	1 (3.7E 10)
Platinum-186	78	100 (3 7E 12)
Platinum-188	78	100 (3 7E 12)
Platinum-189	78	100 (3 7E 12)
Platinum-191	78	100 (3 7E 12)
Platinum-193m	78	100 (3 7E 12)
Platinum-193	78	1000 (3 7E 13)
Platinum-195m	78	100 (3 7E 12)
Platinum-197m	78	1000 (3 7E 13)
Platinum-197	78	1000 (3 7E 13)
Platinum-199	78	1000 (3.7E 13)
Platinum-200	78	100 (3 7E 12)
Plutonium-234	94	1000 (3 7E 13)
Plutonium-235	94	1000 (3 7E 13)
Plutonium-236	94	0 1 (3 7E 9)
Plutonium-237	94	1000 (3 7E 13)
Plutonium-238	94	0 01 (3 7E 8)
Plutonium-239	94	0 01 (3 7E 8)
Plutonium-240	94	0 01 (3 7E 8)
Plutonium-241	94	1 (3 7E 10)
Plutonium-242	94	0 01 (3.7E 8)
Plutonium-243	94	1000 (3 7E 13)
Plutonium-244	94	0 01 (3.7E 8)
Plutonium-245	94	100 (3.7E 12)
Polonium-203	84	100 (3.7E 12)
Polonium-205	84	100 (3.7E 12)
Polonium-207	84	10 (3.7E 11)
Polonium-210	84	0.01 (3.7E 8)

APPENDIX B TO § 302.4—RADIONUCLIDES—Continued

Radionuclide	Atomic Number	Final RQ Ci (Bq)
Potassium-40	19	1 (3.7E 10)
Potassium-42	19	100 (3.7E 12)
Potassium-43	19	10 (3.7E 11)
Potassium-44	19	100 (3.7E 12)
Potassium-45	19	1000 (3.7E 13)
Praseodymium-136	59	1000 (3.7E 13)
Praseodymium-137	59	1000 (3.7E 13)
Praseodymium-138m	59	100 (3.7E 12)
Praseodymium-139	59	1000 (3.7E 13)
Praseodymium-142m	59	1000 (3.7E 13)
Praseodymium-142	59	100 (3.7E 12)
Praseodymium-143	59	10 (3.7E 11)
Praseodymium-144	59	1000 (3.7E 13)
Praseodymium-145	59	1000 (3.7E 13)
Praseodymium-147	59	1000 (3.7E 13)
Promethium-141	61	1000 (3.7E 13)
Promethium-143	61	100 (3.7E 12)
Promethium-144	61	10 (3.7E 11)
Promethium-145	61	100 (3.7E 12)
Promethium-146	61	10 (3.7E 11)
Promethium-147	61	10 (3.7E 11)
Promethium-148m	61	10 (3.7E 11)
Promethium-148	61	10 (3.7E 11)
Promethium-149	61	100 (3.7E 12)
Promethium-150	61	100 (3.7E 12)
Promethium-151	61	100 (3.7E 12)
Protactinium-227	91	100 (3.7E 12)
Protactinium-228	91	10 (3.7E 11)
Protactinium-230	91	10 (3.7E 11)
Protactinium-231	91	0.01 (3.7E 8)
Protactinium-232	91	10 (3.7E 11)
Protactinium-233	91	100 (3.7E 12)
Protactinium-234	91	10 (3.7E 11)
Radium-223	88	1 (3.7E 10)
Radium-224	88	10 (3.7E 11)
Radium-225	88	1 (3.7E 10)
Radium-226Φ	88	0.1 (3.7E 9)
Radium-227	88	1000 (3.7E 13)
Radium-228	88	0.1 (3.7E 9)
Radon-220	86	0.1 (3.7E 9)
Radon-222	86	0.1 (3.7E 9)
Rhenium-177	75	1000 (3.7E 13)
Rhenium-178	75	1000 (3.7E 13)
Rhenium-181	75	100 (3.7E 12)
Rhenium-182 (12.7 hr)	75	10 (3.7E 11)
Rhenium-182 (64.0 hr)	75	10 (3.7E 11)
Rhenium-184m	75	10 (3.7E 11)
Rhenium-184	75	10 (3.7E 11)
Rhenium-186m	75	10 (3.7E 11)
Rhenium-186	75	100 (3.7E 12)
Rhenium-187	75	1000 (3.7E 13)
Rhenium-188m	75	1000 (3.7E 13)
Rhenium-188	75	1000 (3.7E 13)
Rhenium-189	75	1000 (3.7E 13)
Rhodium-99m	45	100 (3.7E 12)
Rhodium-99	45	10 (3.7E 11)
Rhodium-100	45	10 (3.7E 11)
Rhodium-101m	45	100 (3.7E 12)
Rhodium-101	45	10 (3.7E 11)
Rhodium-102m	45	10 (3.7E 11)
Rhodium-102	45	10 (3.7E 11)
Rhodium-103m	45	1000 (3.7E 13)
Rhodium-105	45	100 (3.7E 12)
Rhodium-106m	45	10 (3.7E 11)
Rhodium-107	45	1000 (3.7E 13)
Rubidium-79	37	1000 (3.7E 13)
Rubidium-81m	37	1000 (3.7E 13)
Rubidium-81	37	100 (3.7E 12)
Rubidium-82m	37	10 (3.7E 11)
Rubidium-83	37	10 (3.7E 11)

APPENDIX B TO § 302.4—RADIONUCLIDES—Continued

Radionuclide	Atomic Number	Final RQ Ci (Bq)
Rubidium-84	37	10 (3.7E 11)
Rubidium-86	37	10 (3.7E 11)
Rubidium-88	37	1000 (3.7E 13)
Rubidium-89	37	1000 (3.7E 13)
Rubidium-87	37	10 (3.7E 11)
Ruthenium-94	44	1000 (3.7E 13)
Ruthenium-97	44	100 (3.7E 12)
Ruthenium-103	44	10 (3.7E 11)
Ruthenium-105	44	100 (3.7E 12)
Ruthenium-106	44	1 (3.7E 10)
Samarium-141m	62	1000 (3.7E 13)
Samarium-141	62	1000 (3.7E 13)
Samarium-142	62	1000 (3.7E 13)
Samarium-145	62	.100 (3.7E 12)
Samarium-146	62	0.01 (3.7E 8)
Samarium-147	62	0.01 (3.7E 8)
Samarium-151	62	10 (3.7E 11)
Samarium-153	62	100 (3.7E 12)
Samarium-155	62	1000 (3.7E 13)
Samarium-156	62	100 (3.7E 12)
Scandium-43	21	1000 (3.7E 13)
Scandium-44m	21	10 (3.7E 11)
Scandium-44	21	100 (3.7E 12)
Scandium-46	21	10 (3.7E 11)
Scandium-47	21	100 (3.7E 12)
Scandium-48	21	10 (3.7E 11)
Scandium-49	21	1000 (3.7E 13)
Selenium-70	34	1000 (3.7E 13)
Selenium-73m	34	100 (3.7E 12)
Selenium-73	34	10 (3.7E 11)
Selenium-75	34	10 (3.7E 11)
Selenium-79	34	10 (3.7E 11)
Selenium-81m	34	1000 (3.7E 13)
Selenium-81	34	1000 (3.7E 13)
Selenium-83	34	1000 (3 7E 13)
Silicon-31	14	1000 (3 7E 13)
Silicon-32	14	1 (3.7E 10)
Silver-102	47	100 (3.7E 12)
Silver-103	47	1000 (3 7E 13)
Silver-104m	47	1000 (3 7E 13)
Silver-104	47	1000 (3 7E 13)
Silver-105	47	10 (3.7E 11)
Silver-106m	47	10 (3.7E 11)
Silver-106	47	1000 (3.7E 13)
Silver-108m	47	10 (3.7E 11)
Silver-110m	47	10 (3.7E 11)
Silver-111	47	10 (3.7E 11)
Silver-112	47	100 (3 7E 12)
Silver-115	47	1000 (3 7E 13)
Sodium-22	11	10 (3 7E 11)
Sodium-24	11	10 (3 7E 11)
Strontium-80	38	100 (3 7E 12)
Strontium-81	38	1000 (3 7E 13)
Strontium-83	38	100 (3 7E 12)
Strontium-85m	38	1000 (3 7E 13)
Strontium-85	38	10 (3 7E 11)
Strontium-87m	38	100 (3 7E 12)
Strontium-89	38	10 (3 7E 11)
Strontium-90	38	0 1 (3 7E 9)
Strontium-91	38	10 (3 7E 11)
Strontium-92	38	100 (3 7E 12)
Sulfur-35	16	1 (3 7E 10)
Tantalum-172	73	100 (3.7E 12)
Tantalum-173	73	100 (3 7E 12)
Tantalum-174	73	100 (3.7E 12)
Tantalum-175	73	100 (3.7E 12)
Tantalum-176	73	10 (3.7E 11)
Tantalum-177	73	1000 (3.7E 13)
Tantalum-178	73	1000 (3.7E 13)
Tantalum-179	73	1000 (3.7E 13)

APPENDIX B TO § 302.4—RADIONUCLIDES—Continued

Radionuclide	Atomic Number	Final RQ Ci (Bq)
Tantalum-180m	73	1000 (3.7E 13)
Tantalum-180	73	100 (3.7E 12)
Tantalum-182m	73	1000 (3.7E 13)
Tantalum-182	73	10 (3.7E 11)
Tantalum-183	73	100 (3.7E 12)
Tantalum-184	73	10 (3.7E 11)
Tantalum-185	73	1000 (3.7E 13)
Tantalum-186	73	1000 (3.7E 13)
Technetium-93m	43	1000 (3.7E 13)
Technetium-93	43	100 (3.7E 12)
Technetium-94m	43	100 (3.7E 12)
Technetium-94	43	10 (3.7E 11)
Technetium-96m	43	1000 (3.7E 13)
Technetium-96	43	10 (3.7E 11)
Technetium-97m	43	100 (3.7E 12)
Technetium-97	43	100 (3.7E 12)
Technetium-98	43	10 (3.7E 11)
Technetium-99m	43	100 (3.7E 12)
Technetium-99	43	10 (3.7E 11)
Technetium-101	43	1000 (3.7E 13)
Technetium-104	43	1000 (3.7E 13)
Tellurium-118	52	1000 (3.7E 13)
Tellurium-121m	52	10 (3.7E 11)
Tellurium-121	52	10 (3.7E 11)
Tellurium-123m	52	10 (3.7E 11)
Tellurium-123	52	10 (3.7E 11)
Tellurium-125m	52	10 (3.7E 11)
Tellurium-127m	52	10 (3.7E 11)
Tellurium-127	52	1000 (3.7E 13)
Tellurium-129m	52	10 (3.7E 11)
Tellurium-129	52	1000 (3.7E 13)
Tellurium-131m	52	10 (3.7E 11)
Tellurium-131	52	1000 (3.7E 13)
Tellurium-132	52	10 (3.7E 11)
Tellurium-133m	52	1000 (3.7E 13)
Tellurium-133	52	1000 (3.7E 13)
Tellurium-134	52	1000 (3.7E 13)
Terbium-147	65	100 (3.7E 12)
Terbium-149	65	100 (3.7E 12)
Terbium-150	65	100 (3.7E 12)
Terbium-151	65	10 (3.7E 11)
Terbium-153	65	100 (3.7E 12)
Terbium-154	65	10 (3.7E 11)
Terbium-155	65	100 (3.7E 12)
Terbium-156m (5.0 hr)	65	1000 (3.7E 13)
Terbium-156m (24.4 hr)	65	1000 (3.7E 13)
Terbium-156	65	10 (3.7E 11)
Terbium-157	65	100 (3.7E 12)
Terbium-158	65	10 (3.7E 11)
Terbium-160	65	10 (3.7E 11)
Terbium-161	65	100 (3.7E 12)
Thallium-194m	81	100 (3.7E 12)
Thallium-194	81	1000 (3.7E 13)
Thallium-195	81	100 (3.7E 12)
Thallium-197	81	100 (3.7E 12)
Thallium-198m	81	100 (3.7E 12)
Thallium-198	81	10 (3.7E 11)
Thallium-199	81	100 (3.7E 12)
Thallium-200	81	10 (3.7E 11)
Thallium-201	81	1000 (3.7E 13)
Thallium-202	81	10 (3.7E 11)
Thallium-204	81	10 (3.7E 11)
Thorium-226	90	100 (3.7E 12)
Thorium-227	90	1 (3.7E 10)
Thorium-228	90	0.01 (3.7E 8)
Thorium-229	90	0.001 (3.7E 7)
Thorium-230	90	0.01 (3.7E 8)
Thorium-231	90	100 (3.7E 12)
Thorium-232Φ	90	0.001 (3.7E 7)
Thorium-234	90	100 (3.7E 12)

APPENDIX B TO § 302.4—RADIONUCLIDES—Continued

Radionuclide	Atomic Number	Final RQ Ci (Bq)
Thulium-162	69	1000 (3.7E 13)
Thulium-166	69	10 (3.7E 11)
Thulium-167	69	100 (3.7E 12)
Thulium-170	69	10 (3.7E 11)
Thulium-171	69	100 (3.7E 12)
Thulium-172	69	100 (3.7E 12)
Thulium-173	69	100 (3.7E 12)
Thulium-175	69	1000 (3.7E 13)
Tin-110	50	100 (3.7E 12)
Tin-111	50	1000 (3.7E 13)
Tin-113	50	10 (3.7E 11)
Tin-117m	50	100 (3.7E 12)
Tin-119m	50	10 (3.7E 11)
Tin-121m	50	10 (3.7E 11)
Tin-121	50	1000 (3.7E 13)
Tin-123m	50	1000 (3.7E 13)
Tin-123	50	10 (3.7E 11)
Tin-125	50	10 (3.7E 11)
Tin-126	50	1 (3.7E 10)
Tin-127	50	100 (3.7E 12)
Tin-128	50	1000 (3.7E 13)
Titanium-44	22	1 (3.7E 10)
Titanium-45	22	1000 (3.7E 13)
Tungsten-176	74	1000 (3.7E 13)
Tungsten-177	74	100 (3.7E 12)
Tungsten-178	74	100 (3.7E 12)
Tungsten-179	74	1000 (3.7E 13)
Tungsten-181	74	100 (3.7E 12)
Tungsten-185	74	10 (3.7E 11)
Tungsten-187	74	100 (3.7E 12)
Tungsten-188	74	10 (3.7E 11)
Uranium-230	92	1 (3.7E 10)
Uranium-231	92	1000 (3.7E 13)
Uranium-232	92	0.01 (3.7E 8)
Uranium-233	92	0.1 (3.7E 9)
Uranium-234♦	92	0.1 (3.7E 9)
Uranium-235♦	92	0.1 (3.7E 9)
Uranium-236	92	0.1 (3.7E 9)
Uranium-237	92	100 (3.7E 12)
Uranium-238♦	92	0.1 (3.7E 9)
Uranium-239	92	1000 (3.7E 13)
Uranium-240	92	1000 (3.7E 13)
Vanadium-47	23	1000 (3.7E 13)
Vanadium-48	23	10 (3.7E 11)
Vanadium-49	23	1000 (3.7E 13)
Xenon-120	54	100 (3.7E 12)
Xenon-121	54	10 (3.7E 11)
Xenon-122	54	100 (3.7E 12)
Xenon-123	54	10 (3.7E 11)
Xenon-125	54	100 (3.7E 12)
Xenon-127	54	100 (3.7E 12)
Xenon-129m	54	1000 (3.7E 13)
Xenon-131m	54	1000 (3.7E 13)
Xenon-133m	54	1000 (3.7E 13)
Xenon-133	54	1000 (3.7E 13)
Xenon-135m	54	10 (3.7E 11)
Xenon-135	54	100 (3.7E 12)
Xenon-138	54	10 (3.7E 11)
Ytterbium-162	70	1000 (3.7E 13)
Ytterbium-166	70	10 (3.7E 11)
Ytterbium-167	70	1000 (3.7E 13)
Ytterbium-169	70	10 (3.7E 11)
Ytterbium-175	70	100 (3.7E 12)
Ytterbium-177	70	1000 (3.7E 13)
Ytterbium-178	70	1000 (3.7E 13)
Yttrium-86m	39	1000 (3.7E 13)
Yttrium-86	39	10 (3.7E 11)
Yttrium-87	39	10 (3.7E 11)
Yttrium-88	39	10 (3.7E 11)
Yttrium-90m	39	100 (3.7E 12)

APPENDIX B TO § 302.4—RADIONUCLIDES—Continued

Radionuclide	Atomic Number	Final RQ Ci (Bq)
Yttrium-90	39	10 (3.7E 11)
Yttrium-91m	39	1000 (3.7E 13)
Yttrium-91	39	10 (3.7E 11)
Yttrium-92	39	100 (3.7E 12)
Yttrium-93	39	100 (3.7E 12)
Yttrium-94	39	1000 (3.7E 13)
Yttrium-95	39	1000 (3.7E 13)
Zinc-62	30	100 (3.7E 12)
Zinc-63	30	1000 (3.7E 13)
Zinc-65	30	10 (3.7E 11)
Zinc-69m	30	100 (3.7E 12)
Zinc-69	30	1000 (3.7E 13)
Zinc-71m	30	100 (3.7E 12)
Zinc-72	30	100 (3.7E 12)
Zirconium-86	40	100 (3.7E 12)
Zirconium-88	40	10 (3.7E 11)
Zirconium-89	40	100 (3.7E 12)
Zirconium-93	40	1 (3.7E 10)
Zirconium-95	40	10 (3.7E 11)
Zirconium-97	40	10 (3.7E 11)

Ci—Curie. The curie represents a rate of radioactive decay. One curie is the quantity of any radioactive nuclide which undergoes 3.7E 10 disintegrations per second.

Bq—Becquerel. The becquerel represents a rate of radioactive decay. One becquerel is the quantity of any radioactive nuclide which undergoes one disintegration per second. One curie is equal to 3.7E 10 becquerel.

♦—Final RQs for all radionuclides apply to chemical compounds containing the radionuclides and elemental forms regardless of the diameter of pieces of solid material.

&—The adjusted RQ of one curie applies to all radionuclides not otherwise listed. Whenever the RQs in table 302.4 and this appendix to the table are in conflict, the lowest RQ shall apply. For example, uranyl acetate and uranyl nitrate have adjusted RQs shown in table 302.4 of 100 pounds, equivalent to about one-tenth the RQ level for uranium-238 listed in this appendix.

E—Exponent to the base 10. For example, 1.3E 2 is equal to 130 while 1.3E 3 is equal to 1300.

m—Signifies a nuclear isomer which is a radionuclide in a higher energy metastable state relative to the parent isotope.

♦—Notification requirements for releases of mixtures or solutions of radionuclides can be found in § 302.6(b) of this rule. Final RQs for the following four common radionuclide mixtures are provided: radium-226 in secular equilibrium with its daughters (0.053 curie); natural uranium (0.1 curie); natural uranium in secular equilibrium with its daughters (0.052 curie); and natural thorium in secular equilibrium with its daughters (0.011 curie).

[54 FR 33449, Aug. 14, 1989]

EDITORIAL NOTE: For FEDERAL REGISTER citations affecting § 302.4, see the List of CFR Sections Affected in the Finding Aids section of this volume.

§ 302.5 Determination of reportable quantities.

(a) *Listed hazardous substances.* The quantity listed in the column "Final RQ" for each substance in table 302.4, or in appendix B to table 302.4, is the reportable quantity (RQ) for that substance. The RQs in table 302.4 are in units of pounds based on chemical toxicity, while the RQs in appendix B to table 302.4 are in units of curies based on radiation hazard. Whenever the RQs

ROCHESTER GAS & ELECTRIC CORPORATION

GINNA STATION

CONTROLLED COPY NUMBER 23

PROCEDURE NO. EPIP 2-16

REV. NO. 12

CORE DAMAGE ESTIMATION

RESPONSIBLE MANAGER

07/01/02

EFFECTIVE DATE

CATEGORY 1.0

THIS PROCEDURE CONTAINS 28 PAGES

EPIP 2-16

CORE DAMAGE ESTIMATION

1.0 PURPOSE

To provide an estimate of the degree of core damage based on fission product concentrations and other indications under accident conditions.

2.0 RESPONSIBILITY

2.1 The Chemistry Manager is responsible for obtaining post-accident sampling and analysis information.

2.2 The Engineering Support Manager is responsible for implementing this procedure to obtain estimates of core damage.

3.0 REFERENCES

3.1 Developmental References

3.1.1 NUREG-0737, II.B.3

3.1.2 Westinghouse Mitigating Core Damage Training Manual.

3.1.3 Rogovin Report, Part 2, Volume II, pp 524 - 527.

3.1.4 WASH-1400 Appendix VII.

3.1.5 Westinghouse Owner's Group Post Accident Core Damage Assessment Methodology, Rev. 2, November, 1984.

3.1.6 NUREG 1210, NRC Severe Reactor Accident Incident Response Training Manual

3.1.7 Technology for Energy Report No. R-81-012

3.1.8 Westinghouse Owner's Group (WOG) Severe Accident Management Guidelines, June 1994

3.2 Implementing References

3.2.1 CH-EPIP-LIQUID, Alternate Emergency Sampling of Primary Coolant

3.2.2 CH-EPIP-CV-AIR, Containment Atmosphere Sampling and Analysis During Containment Isolation

3.2.3 CH-PASS-ACCIDENT, Post Accident Sampling at the PASS - Accident Conditions

3.2.4 CH-PASS-SAMP-ANAL, Analysis of Samples Taken at the PASS for Isotopic Analysis

3.2.5 P-9, Radiation Monitoring System

3.2.6 S-14.3, Operation of Containment High Range Area Monitors R-29, R-30.

3.2.7 EPIP 1-0, Ginna Station Event Evaluation and Classification

3.2.8 CH-EPIP-CVH2, Containment Atmosphere Hydrogen Monitoring

4.0 PRECAUTIONS

4.1 Care should be taken to avoid defining too precisely the extent of core damage based upon initial sampling results. Other plant indicators will also be available (such as incore temperature indication, containment hydrogen monitors, etc.) which should also be considered in arriving at a more refined estimate.

4.2 The time of sampling relative to the suspected transient or core degradation sequence must be considered. The effects of isotope decay, sampling equilibrium and progressing core degradation may tend to complicate sample interpretation.

4.3 Reactor power history is to be considered in determining whether certain key radionuclides have reached equilibrium.

4.4 Measured concentration of radioactivity may need to be adjusted to account for system dilution (e.g. accumulators, safety injection water) prior to estimating fuel damage.

4.5 When providing guidance on plant operations, use the setpoints and instructions found in the Emergency Operating Procedures (EOP's) or Severe Accident Management Guidelines (SAMGs) as appropriate.

5.0 PREREQUISITES

5.1 Isotopic analysis of primary liquids.

5.2 Data from plant radiation monitors.

5.3 Plant operational status including pertinent core data.

5.4 Isotopic analysis of containment atmosphere

5.5 Hydrogen analysis of containment atmosphere.

5.6 Data from core exit thermocouples.

6.0 ACTIONS

6.1 Initial Assessment of Core Damage

6.1.1 Core damage will be initially classified into one of the following categories:

- No damage
- Gap activity released
- Fuel activity released

6.1.2 Check the following plant indications to assess initial core damage:

Indicator	No Damage or Small Amount Possible	Gap Activity	Fuel Activity
R-9 (if not isolated)	<2000 mR/hr.	2000 mR/hr = 1% 5000 mR/hr = 5%	N/A
R-29/30	<100 R/hr (approx. 10 R/hr for a LOCA)	>100 R/hr	>1000 R/hr
Core Exit Thermocouples	<750 F	750 F - 1650 F	>1650 F
Containment Hydrogen	None detectable	None detectable	>1%

6.1.3 Other indications that core damage may be taking place:

a. Nuclear instrumentation does not follow normal decay curve following reactor trip.

If there is voiding in the core, excore nuclear instrumentation can read high. This is due to a loss of the water shielding and increased amount of gamma and neutron radiation reaching the detectors.

b. Reactor Vessel Level Indicating System (RVLIS)

RVLIS indication can determine if the core has remained covered. The top of the core, using RVLIS indication, is 78%. If the core has remained covered, core damage should be limited to gap released from cladding defects. However, if the core was uncovered, it becomes more probable that extensive cladding oxidation could have occurred lading to cladding and fuel pellet fragmentation. Refer to drawing 03021-687 for help in determining if the core has been uncovered.

c. Core Exit Thermocouples (CETs)

Attachment 1 shows possible core damage states as core temperature increases.

d. Containment Radiation Monitors

Attachment 2 provides a series of curves showing a monitor dose rate versus time after shutdown. The curves have been calculated for various amounts of core damage. These curves are representative of core damage if there has been a loss of coolant accident (LOCA). The curves will not be representative of core damage from increased radiation or normal leakage into containment.

e. Containment Air Activity

Attachments 3, 4, 5 and 6 have containment air activity for various states of core damage. These activities can be used to estimate the activity in samples drawn from the containment atmosphere or to estimate the amount of curies/second that will released from containment using the design leak rate of 2% a day. The calculated activities are for the following states of core damage:

- 100% release of coolant into containment
- 100% release of the gap activity into containment (using Reg. Guide 1.25 methodology)
- 100% release of the gap activity into containment (using Westinghouse WCAP 7828 methodology)
- 1% release of fuel into containment.

6.2 Detailed Assessment of Core Damage

6.2.1 A detailed assessment of core damage will be performed when isotopic data is available from Radiation Protection and Chemistry.

6.2.2 Use isotopic information and the following table to assess core damage:

Category of Damage	Isotopes Released
No Damage	Normal levels of I-131, I-133, Cs-137, Kr-88, and Xe-133
Gap Activity Released	Increased levels of Kr-88, Xe-133 I-131 and I-133
Fuel Overheating	Te-129, Te-132, Sr-90, Ba-140, La-140, La-142 and Pr-144
Fuel Melting	Ru-103, Ru-106, Rh-105, Mo-99, U, Pu

6.2.3 Use isotopic information and the following ratios to assess core damage:

Isotopic Ratios	Calculated Ratio	Gap Activity Ratio	Fuel Pellet Ratio
Kr-87/Xe-133	_____	0.022	0.22
I-132/I-131	_____	0.17	1.5
I-133/I-131	_____	0.71	2.1
I-135/I-131	_____	0.39	1.9

6.3 Calculation of Released Activity

****

CAUTION

REVIEW DATA NEEDED TO PERFORM CORE DAMAGE (CR) (ATTACHMENT 7) PRIOR TO CALCULATION.

****

6.3.1 Record the following plant indications. The values should be recorded as close as possible to the time at which the samples are taken.

Reactor Coolant System:

Pressure	_____ PSIG
Temperature	_____ °F
Reactor Vessel level	_____ %
Pressurizer level	_____ %

Containment Building:

Atmosphere Pressure	_____ PSIG
Atmosphere Temperature	_____ °F
A. Sump level	_____ Feet
B. Sump level	_____ Inches

6.3.2 Obtain and analyze selected samples using approved procedures. Use reactor shutdown as time zero for all decay calculations.

6.3.3 Correct samples for decay. Correct containment atmosphere samples for temperature and pressure using the following:

$$\text{Act. (atm)} = \text{Act. (Sample)} \times \frac{P_2 \times (T_1 + 460)}{P_1 \quad (T_2 + 460)}$$

where:

Act.	=	Decay-corrected sample activity (uCi/cc)
T_1, P_1	=	measured sample temp. (°F) and pressure (psia)
T_2, P_2	=	CV atmos. temp. (°F) and pressure (psia)

6.3.4 Record decay corrected liquid sample data on the Liquid Sample Worksheet (Attachment 7). Record decay corrected, pressure corrected, temperature corrected containment atmosphere samples on the Containment Atmosphere Worksheet (Attachment 8).

6.3.5 Calculate the sum of the total quantity of each fission product available for release from sampled sources.

****

CAUTION

IT IS ASSUMED FOR THIS DISCUSSION THAT THE RCS IS AT NORMAL MASS AND A LOCA HAS NOT OCCURRED. IF A LOCA HAS OCCURRED, THE DETERMINATION OF THE MASS IN THE RCS MUST BE ESTIMATED BY INDICATIONS AVAILABLE TO OPERATIONS. THE MAJOR ACTIVITY WOULD PROBABLY BE IN THE CONTAINMENT SUMP "A".

****

a. Calculate the quantity of activity in the reactor coolant using:

RCS Mass = (6236 ft^3) x (2.83E4) x (Ratio correction factor)

Curies activity = Act_o(uCi/gm) x RCS Mass x 1E-6

where: RCS Mass calculated from data in step 6.3.1 and Ratio Correction Factor from Figure 1 of Attachment 13.

Record total curies in the appropriate column of Summation Record of Release Quantity (Attachment 9).

b. Calculate total quantity of activity in the sump using:

Curies activity = Act_o (uCi/cc) x Sump Volume x 1E-6

where: Sump volume is determined from Figure 2 of Attachment 13. As an approximate temperature for the liquid in the sump, use the air temperature of containment.

Activity in sump is calculated on Attachment 7.

Record total curies in the appropriate column of Summation Record Release Quantity (Attachment 9).

c. Calculate the total quantity of fission products in the containment building atmosphere by completing Attachment 8 using:

Curies activity = Act.(uCi/cc) x 2.75E10 x 1E-6

where: Act. is the pressure and temperature corrected activity from Attachment 8. Containment Volume at STP is 9.7E5 cubic feet or 2.75E1Occ.

Record total curies in the appropriate column of Summation Record of Release Quantity (Attachment 9).

d. Sum total activity (D) obtained in items A, B and C on Attachment 9.

6.4 Power Correction Factor (PCF): To be applied to calculation of released activity if requested by Emergency Coordinator or EOF/Recovery Manager.

****

CAUTION

STEADY STATE POWER IS ASSUMED PRIOR TO SHUTDOWN. STEADY STATE POWER CONDITION IS ASSUMED WHERE THE POWER DOES NOT VARY BY MORE THAN ± 10 % OF RATED POWER LEVEL FROM TIME AVERAGED VALUE.

****

6.4.1 For half-life of nuclides approximately <1 day:

$$PCF = \frac{\text{Average Power Level (Mwt) for prior 4 days}}{\text{Rated Power Level (Mwt)}}$$

6.4.2 For half-life of nuclide approximately >1 day and < 10 days:

$$PCF = \frac{\text{Average Power Level (Mwt) for prior 30 days}}{\text{Rated Power Level (Mwt)}}$$

6.4.3 For half-life Nuclides <1 year and > 10 days:

$$PCF = \frac{\text{Average Power Level (Mwt) for prior year}}{\text{Rated Power Level (Mwt)}}$$

6.4.4 For half-life of nuclides> 1 year:

$$PCF = \frac{\text{Actual operating EFPD of equilibrium cycle}}{\text{Total expected EFPD of equilibrium cycle operation}}$$

****

CAUTION

FOR THE MAJORITY OF THE SELECTED NUCLIDES, THE 30-DAY POWER HISTORY PRIOR TO SHUTDOWN IS SUFFICIENT TO CALCULATE A POWER CORRECTION FACTOR.

****

6.4.5 Record power correction factor and calculate corrected source inventory on the Corrected Source Inventory (Attachment 10).

6.4.6 Determine the fraction of release by completing the Record of Fractional Release (Attachment 11 for the source of the release (either gap or fuel pellet).

6.5 Containment Hydrogen Concentration

****

CAUTION

THE USE OF THIS SECTION ASSUMES A LOCA RELEASING H_2 INTO CONTAINMENT FORMED BY A ZIRCONIUM-WATER REACTION IN THE CORE. IF VESSEL FAILURE HAS OCCURRED FOLLOWING CORE DAMAGE, ADDITIONAL H_2 MAY BE GENERATED DUE TO CORE CONCRETE INTERACTION. THIS ADDITIONAL H_2 IS NOT ACCOUNTED FOR IN THE CALCULATIONS WITHIN THIS SECTION.

****

****

CAUTION

THE MAXIMUM VALUE THAT % H_2 APPROACHES DUE TO ZIRCONIUM WATER REACTION IS 13.8% @ STP.

****

6.5.1 Obtain a measurement of containment atmosphere hydrogen concentration.

Assuming that all hydrogen formed by a zirconium-water reaction is released to the containment atmosphere, either use Figure 3 of Attachment 13 or calculate the fraction of zirconium-water reaction with the equation:

$$FZWR = \frac{(\%\ H_2)\ (V)\ (\text{correction factor for STP})}{(ZM)\ (H)\ (100-\ \%H_2)}$$

where:

FZWR	=	Fraction of Zirconium-Water Reaction
V	=	Containment volume, SCF, approx. 9.7E5 ft^3
ZM	=	Total zirconium mass, approx. 23,900 lbs.
H	=	Conversion factor, 7.92 SCF of H_2 per pound of zirconium reacted

the above equation becomes:

$$FZWR = \frac{(\%\ H_2)\ (5.12)\ (\text{Corr Factor for STP})}{(100-\%H_2)}$$

7.0 ATTACHMENTS

1. Possible Core Damage States as Core Temperature Increases
2. R-29 and R-30 Dose Rate Versus Time After Shutdown
3. Containment Activity (uCi/cc) for a 100% Release of the Coolant Activity
4. Containment Activity (uCi/cc) for a 100% Release of the Gap Activity (RG 1.25)
5. Containment Activity (uCi/cc) for a 100% Release of the Gap Activity (WCAP 7828)
6. Containment Activity (uCi/cc) for a 1% Release of the Fuel Inventory
7. Liquid Sample Worksheet
8. Containment Atmosphere Worksheet
9. Summation Record of Release Quantity
10. Corrected Source Inventory
11. Record of Fractional Release

7.0 ATTACHMENTS (Continued)

12. Guideline to Obtain Data Needed for Core Damage Assessment Estimation

13. Figures

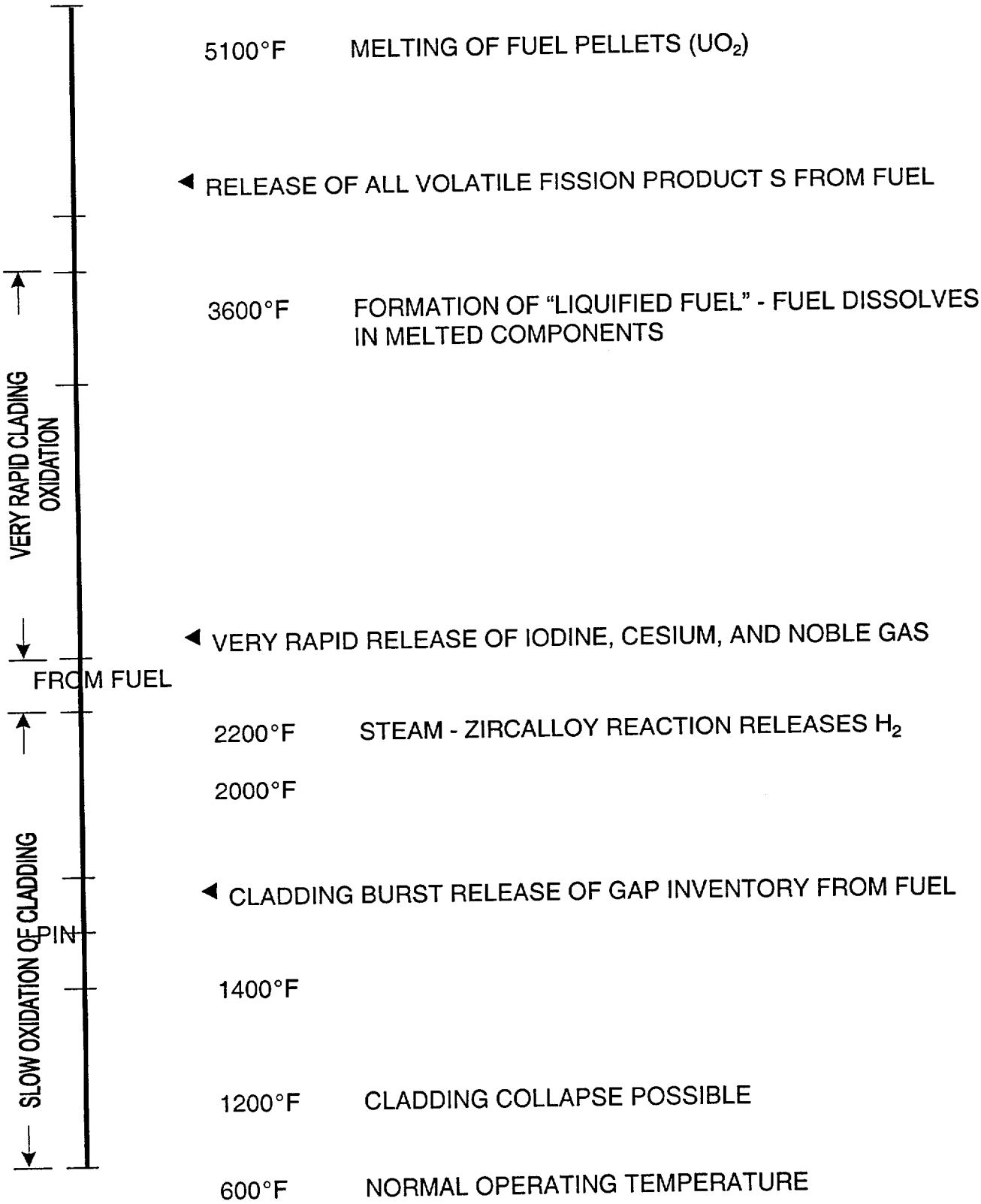
    #1 Ratio of H_20 Density to STP Density as a function of Temperature.

    #2a Containment Sump A Level vs. Volume

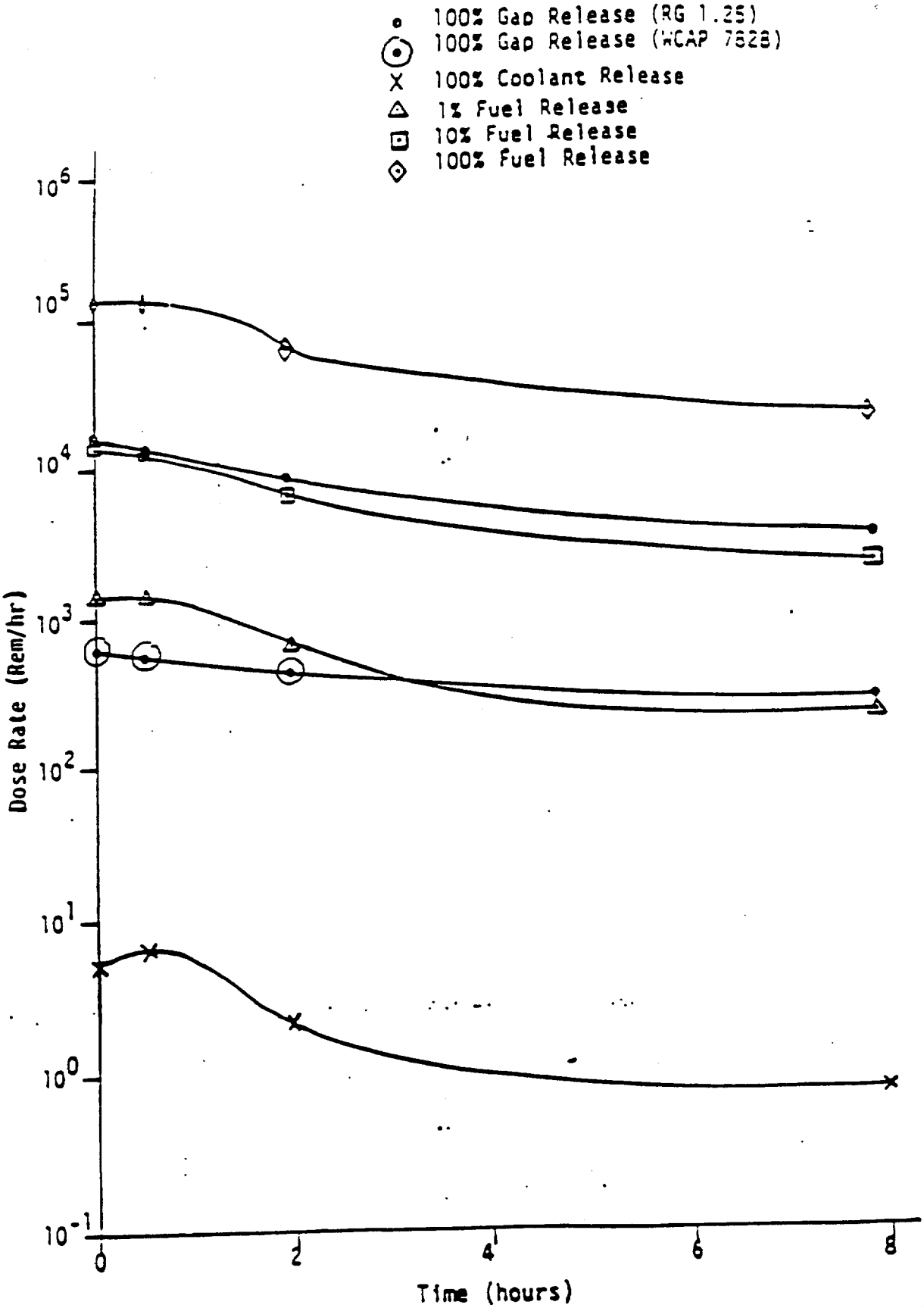
    #2b Containment Sump B Level vs. Volume

    #3 Containment Hydrogen Concentration vs. Zirconium Water Reaction

POSSIBLE CORE DAMAGE STATES AS CORE TEMPERATURE INCREASES

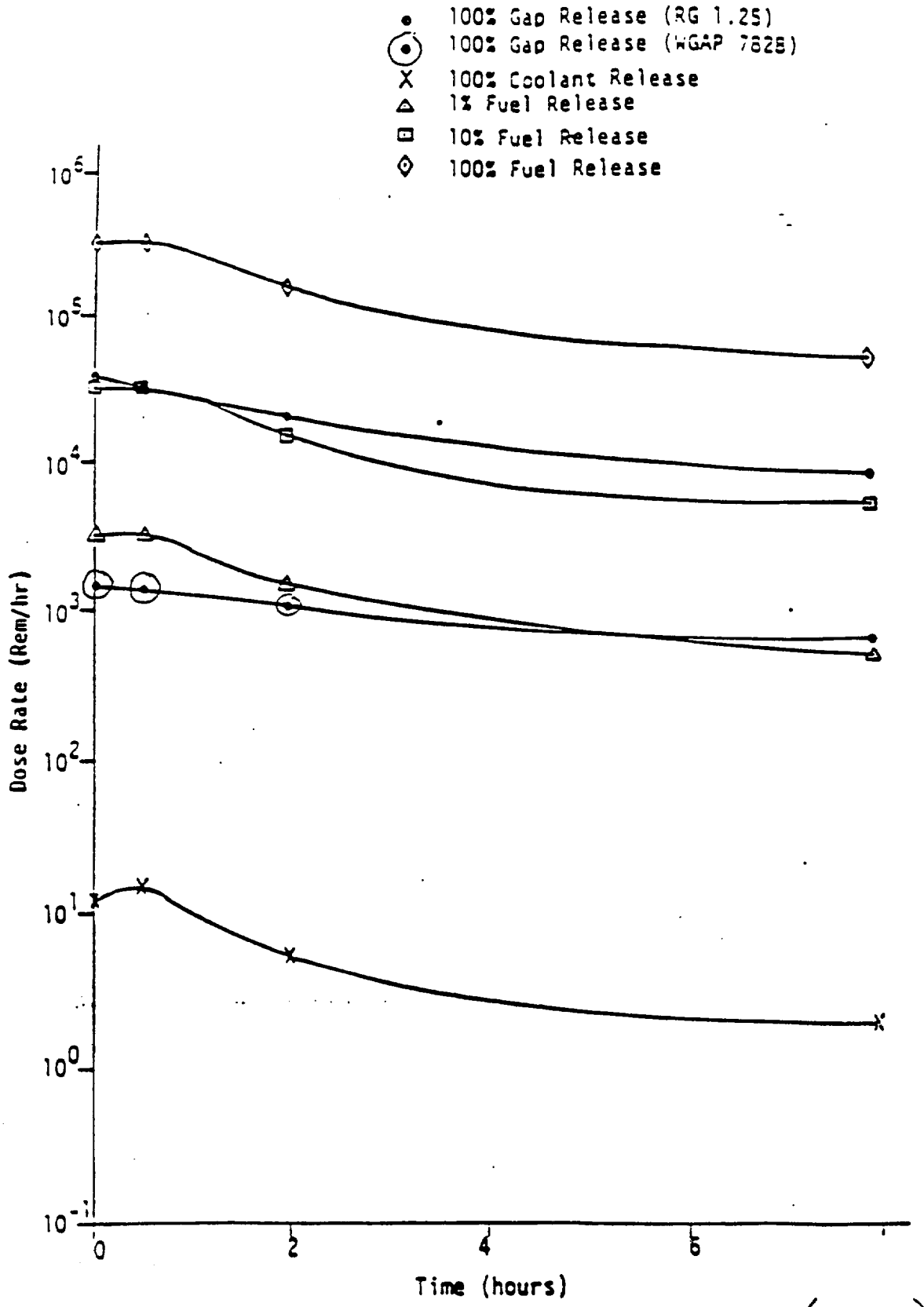


R-29 DOSE RATE VERSUS TIME AFTER SHUTDOWN



Containment High Range Detector 1 Dose Rates. (R-29)

R-30 DOSE RATE VERSUS TIME AFTER SHUTDOWN



Containment High Range Detector 2 Dose Rates. (R-30)

Containment Activity (uCi/cc) for a 100% Release
of the Coolant Activity

ISOTOPE	SUBCRITICAL TIME (hours)			
	0.0	0.5	2.0	8.0
Kr-85m	1.31E-2	1.21E-2	9.54E-3	3.69E-3
Kr-85	1.75E-2	1.77E-2	1.82E-2	1.95E-2
Kr-87	7.59E-3	5.79E-3	2.58E-3	1.01E-4
Kr-88	2.03E-2	2.03E-2	1.40E-2	3.15E-3
Xe-131m	0.00E+0	6.51E-8	2.59E-7	1.02E-6
Xe-133m	0.00E+0	3.14E-6	1.21E-5	4.23E-5
Xe-133	1.54E+0	1.54E+0	1.52E+0	1.48E+0
Xe-135m	0.00E+0	4.60E-5	5.42E-5	2.91E-5
Xe-135	5.13E-2	4.97E-2	4.51E-2	3.05E-2
Xe-138	2.92E-1	6.79E-2	8.56E-4	2.16E-11
Br-84	1.22E-4	6.38E-5	9.13E-6	3.83E-9
I-131	6.10E-3	6.09E-3	6.06E-3	5.93E-3
I-132	2.69E-3	2.31E-3	1.47E-3	2.39E-4
I-133	7.90E-3	7.77E-3	7.39E-3	6.04E-3
I-134	1.59E-3	1.07E-3	3.26E-4	2.82E-6
I-135	6.10E-3	5.79E-3	4.95E-3	2.65E-3
Rb-88	0.00E+0	1.56E-3	1.64E-3	3.74E-4
Cs-138	0.00E+0	1.53E-1	3.78E-2	1.65E-5
TOTAL	1.97E+0	1.89E+0	1.67E+0	1.55E+0

Containment Activity (uCi/cc) for a 100% Release
of the Gap Activity (RG 1.25)

ISOTOPE	SUBCRITICAL TIME (hours)			
	0.0	0.5	2.0	8.0
Kr-85m	3.64E+2	3.36E+2	2.65E+2	1.03E+2
Kr-85	4.26E+0	1.01E+1	2.50E+1	5.92E+1
Kr-87	6.92E+1	5.28E+1	2.35E+1	9.20E-1
Kr-88	1.06E+2	9.36E+1	6.45E+1	1.45E+1
Xe-131m	0.00E+0	8.54E-4	3.40E-3	1.34E-2
Xe-133m	7.28E+0	7.29E+0	7.32E+0	7.36E+0
Xe-133	2.88E+2	2.90E+2	2.94E+2	3.09E+2
Xe-135m	0.00E+0	9.88E-1	1.16E+0	6.26E-1
Xe-135	5.46E+1	5.81E+1	6.88E+1	8.30E+1
I-131	8.00E+1	7.99E+1	7.94E+1	7.78E+1
I-132	1.09E+2	9.37E+1	5.95E+1	9.70E+0
I-133	1.46E+2	1.44E+2	1.37E+2	1.12E+2
I-134	1.68E+2	1.13E+2	3.45E+1	2.98E-1
I-135	1.31E+2	1.24E+2	1.06E+2	5.68E+1
Rb-88	0.00E+0	7.21E+0	7.54E+0	1.73E+0
TOTAL	1.53E+3	1.41E+3	1.17E+3	8.35E+2

Containment Activity (uCi/cc) for a 100% Release
of the Gap Activity (WCAP 7828)

ISOTOPE	SUBCRITICAL TIME (hours)			
	0.0	0.5	2.0	8.0
Kr-85m	1.06E+0	9.79E-1	7.72E-1	2.99E-1
Kr-85	3.63E+0	3.65E+0	3.69E+0	3.79E+0
Kr-87	1.52E+0	1.16E+0	5.16E-1	2.02E-2
Kr-88	3.06E+0	2.70E+0	1.86E+0	4.19E-1
Xe-131m	0.00E+0	2.11E-4	8.42E-4	3.31E-3
Xe-133m	1.00E+0	9.99E-1	9.94E-1	9.69E-1
Xe-133	5.81E+1	5.81E+1	5.83E+1	5.85E+1
Xe-135m	0.00E+0	4.84E-2	5.70E-2	3.07E-2
Xe-135	3.44E+0	3.59E+0	4.03E+0	4.48E+0
I-131	1.98E+1	1.98E+1	1.97E+1	1.92E+1
I-132	3.17E+0	2.73E+0	1.73E+0	2.82E-1
I-133	1.22E+1	1.20E+1	1.14E+1	9.33E+0
I-134	3.01E+0	2.03E+0	6.18E-1	5.33E-3
I-135	6.42E+0	6.09E+0	5.21E+0	2.78E+0
Rb-88	0.00E+0	2.08E-1	2.18E-1	4.98E-2
TOTAL	1.16E+2	1.14E+2	1.09E+2	1.00E+2

Containment Activity (uCi/cc) for a 1% release
of the Fuel Inventory

ISOTOPE	SUBCRITICAL TIME (hours)			
	0.0	0.5	2.0	8.0
Kr-83m	1.20E+0	1.01E+0	5.93E-1	7.26E-2
Kr-85m	3.60E+0	3.33E+0	2.62E+0	1.01E+0
Kr-85	1.40E-1	1.98E-1	3.45E-1	6.83E-1
Kr-87	7.00E+1	5.34E+0	2.38E+0	9.31E-2
Kr-88	1.00E+1	8.83E+0	6.08E+0	1.37E+0
Xe-131m	1.20E-1	1.20E-1	1.20E-1	1.18E-1
Xe-133m	1.80E+1	1.79E+1	1.76E+1	1.63E+1
Xe-133	2.90E+1	2.92E+1	2.96E+1	3.11E+1
Xe135m	8.00E+0	2.16E+0	9.75E-2	3.15E-2
Xe-135	5.50E+0	1.13E+1	1.29E+1	1.02E+1
Xe-138	2.90E+1	6.75E+0	8.50E-2	2.14E-9
Br-83	3.00E-2	2.60E-2	1.69E-2	3.00E-3
Br-84	7.20E-2	3.77E-2	5.39E-3	2.26E-6
I-131	3.90E+0	3.89E+0	3.87E+0	3.79E+0
I-132	5.60E+0	4.81E+0	3.06E+0	4.98E-1
I-133	7.40E+0	7.28E+0	6.92E+0	5.66E+0
I-134	8.50E+0	5.72E+0	1.74E+0	1.51E-2
I-135	6.60E+0	6.26E+0	5.36E+0	2.86E+0
Rb-88	0.00E+0	6.80E-1	7.12E-1	1.63E-1
Cs-138	0.00E+0	1.52E+1	3.76E+0	1.64E-3
TOTAL	1.44E+2	1.30E+2	9.78E+1	7.40E+1

For 100% release multiply values x 100

LIQUID SAMPLE WORKSHEET

Sample Number:

Sample Location:

Time of Analysis:

Temperature, °F:

Pressure, PSIG:

	*Sample Activity uCi/gm at time of reactor shut-down	Mass of x liquid sampled (gm)	x 1E-6 Ci/uCi	= Corrected total Activity Released (Ci)
Kr 87	_____	_____	1E-6	_____
Xe 131m	_____	_____	1E-6	_____
Xe 133	_____	_____	1E-6	_____
I 131	_____	_____	1E-6	_____
I 132	_____	_____	1E-6	_____
I 133	_____	_____	1E-6	_____
I 135	_____	_____	1E-6	_____
Cs 134	_____	_____	1E-6	_____
Rb 88	_____	_____	1E-6	_____
Te 129	_____	_____	1E-6	_____
Te 132	_____	_____	1E-6	_____
Ba 140	_____	_____	1E-6	_____
La 140	_____	_____	1E-6	_____
La 142	_____	_____	1E-6	_____
Pr 144	_____	_____	1E-6	_____
Cs 137	_____	_____	1E-6	_____

* Use reactor shutdown as T_o

CONTAINMENT ATMOSPHERE WORKSHEET

Sample Number:

Sample Location:

Time of Analysis:

Temperature, °F:

Pressure, PSIG:

Isotope Activity	Total Act_o Atmosphere, Atmos., uCi/cc*	x	CV Volume 2.75E10 cc	x	CV 1E-6 Ci/uCi	=	Ci
Kr 87	_____		2.75E10		1E-6		_____
Xe 131m	_____		2.75E10		1E-6		_____
Xe 133	_____		2.75E10		1E-6		_____
I 131	_____		2.75E10		1E-6		_____
I 132	_____		2.75E10		1E-6		_____
I 133	_____		2.75E10		1E-6		_____
I 135	_____		2.75E10		1E-6		_____
Cs 134	_____		2.75E10		1E-6		_____
Rb 88	_____		2.75E10		1E-6		_____
Te 129	_____		2.75E10		1E-6		_____
Te 132	_____		2.75E10		1E-6		_____
Ba 140	_____		2.75E10		1E-6		_____
La 140	_____		2.75E10		1E-6		_____
La 142	_____		2.75E10		1E-6		_____
Pr 144	_____		2.75E10		1E-6		_____
Cs 137	_____		2.75E10		1E-6		_____

$$* \text{ Act.(atm)} = \frac{\text{Act. (Sample)}}{P_1} \times \frac{P_2 \times (T_1 + 460)}{(T_2 + 460)}$$

T_1, P_1 = sample temp (°F), sample pressure (psia)

T_2, P_2 = CV temp (°F), CV pressure (psia)

Sample activity has been decay corrected back to time of reactor shutdown.

SUMMATION RECORD OF RELEASE QUANTITY

Isotope	Reactor Coolant Sample Number ___ Act. x RCS Mass Ci	+ Containment Sump Sample Number___ Act. x Sump Mass Ci	+ Containment Atmosphere Sample Act. x C.V. Vol. Number _____, Ci	= Total Quantity Ci
Kr 87				
Xe 131m				
Xe 133				
I 131				
I 132				
I 133				
I 135				
Cs 134				
Rb 88				
Te 129				
Te 132				
Ba 140				
La 140				
La 142				
Pr 144				
Cs 137				

A + B + C = D

CORRECTED SOURCE INVENTORY

Isotope	Equilibrium Source Inventory Ci	Power Correction Fraction	Corrected Source Inventory Ci
Gap Inventory			
Kr 87	1.6 x 1E3	_____	_____
Xe 131m	3.8 x 1E2	_____	_____
Xe 133	7.6 x 1E4	_____	_____
I 131	1.2 x 1E5	_____	_____
I 132	2.0 x 1E4	_____	_____
I 133	8.3 x 1E4	_____	_____
I 135	4.2 x 1E4	_____	_____
Fuel Pellet Inventory			
Kr 87	1.7 x 1E7	_____	_____
Xe 131m	2.7 x 1E5	_____	_____
Xe 133	8.5 x 1E7	_____	_____
I 131	4.2 x 1E7	_____	_____
I 132	6.1 x 1E7	_____	_____
I 133	8.5 x 1E7	_____	_____
I 135	7.7 x 1E7	_____	_____
Cs 134	1.0 x 1E7	_____	_____
Rb 88	2.5 x 1E7	_____	_____
Te 129	1.4 x 1E7	_____	_____
Te 132	6.1 x 1E7	_____	_____
Sr 89	3.4 x 1E7	_____	_____
Ba 140	7.3 x 1E7	_____	_____
La 140	7.7 x 1E7	_____	_____
La 142	6.5 x 1E7	_____	_____
Pr 144	5.3 x 1E7	_____	_____
Cs 137	4.6 x 1E6	_____	_____

Additional information is available from Westinghouse Core Damage Assessment Methodology tables 2-2; 2-3; 2-3-1.

RECORD OF FRACTIONAL RELEASE

Isotope	From Attachment 9 Total Quantity Available For Release Ci	From Attachment 10 Corrected Source Fraction Inventory Ci	(#9/#10) Released
Gap Inventory			
Kr 87			
Xe 131m			
Xe 133			
I 131			
I 132			
I 133			
I 135			
Fuel Pellet Inventory			
Kr 87			
Xe 131m			
Xe 133			
I 131			
I 132			
I 133			
I 135			
Cs 134			
Rb 88			
Te 129			
Te 132			
Ba 140			
La 140			
La 142			
Pr 144			
Cs 137			

GUIDANCE TO DATA NEEDED FOR CORE DAMAGE ASSESSMENT ESTIMATION

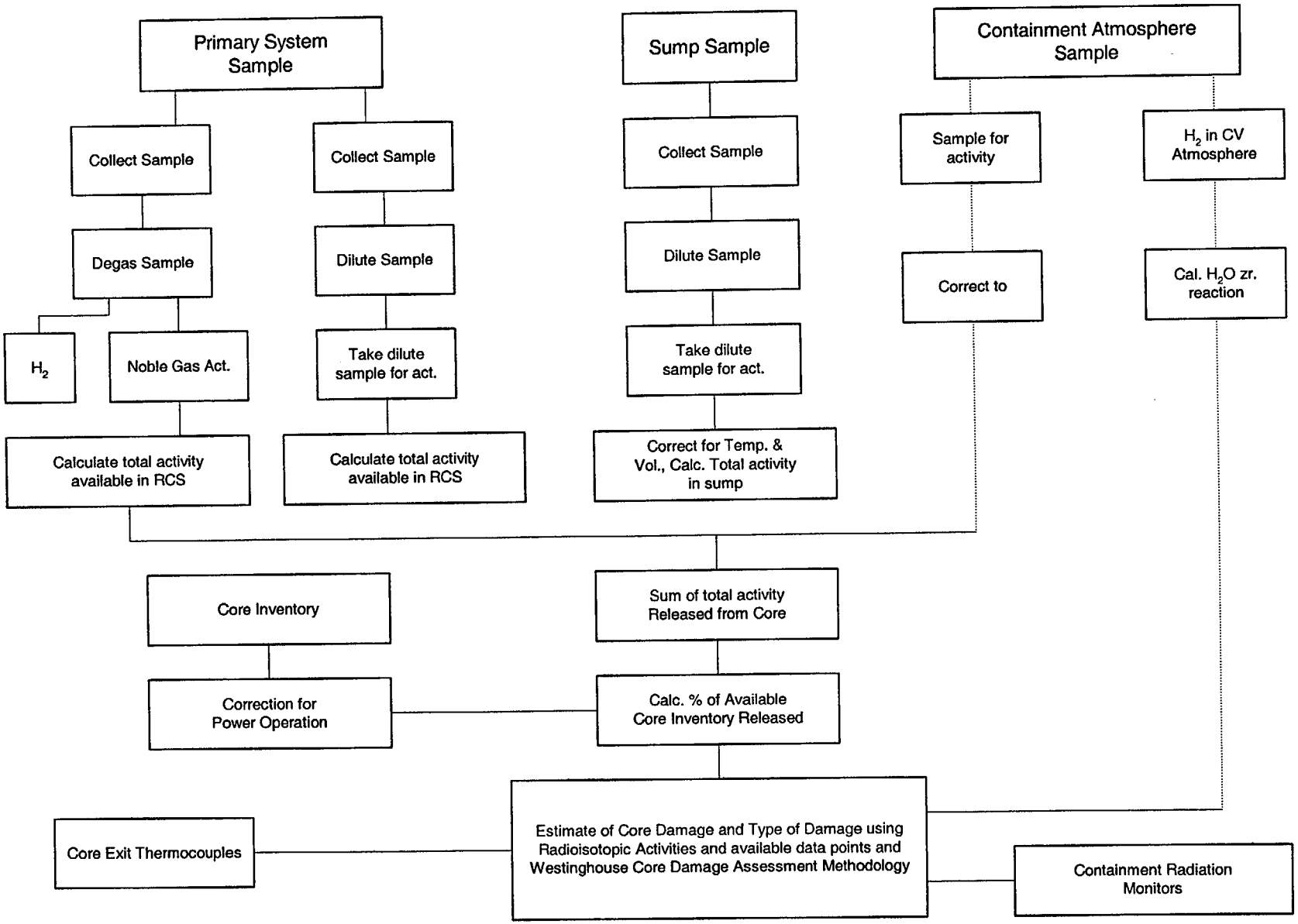


Figure I

Ratio of H_2O Density to STP Density as a function of temperature

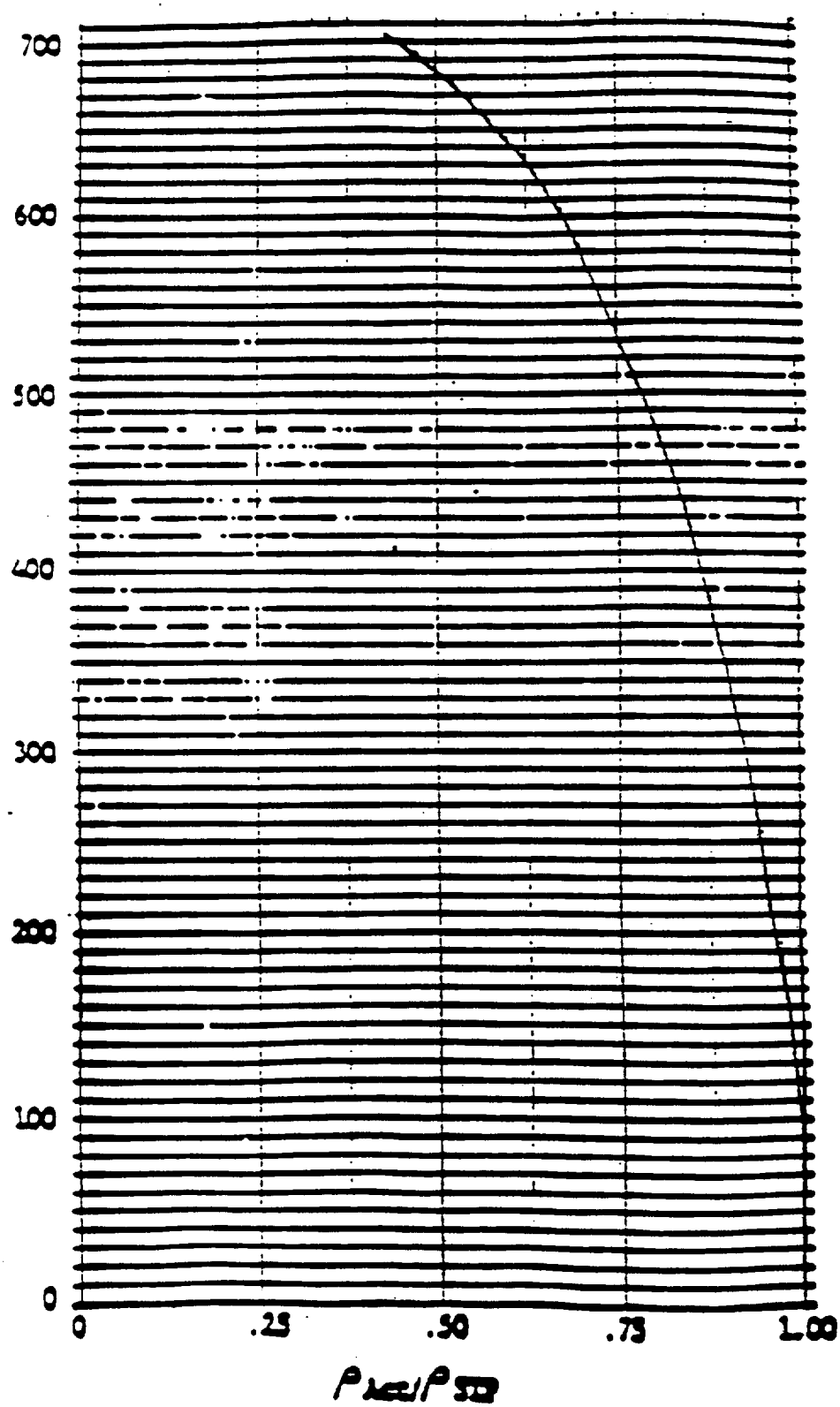


Figure 2a - Containment Sump A Level vs. Volume

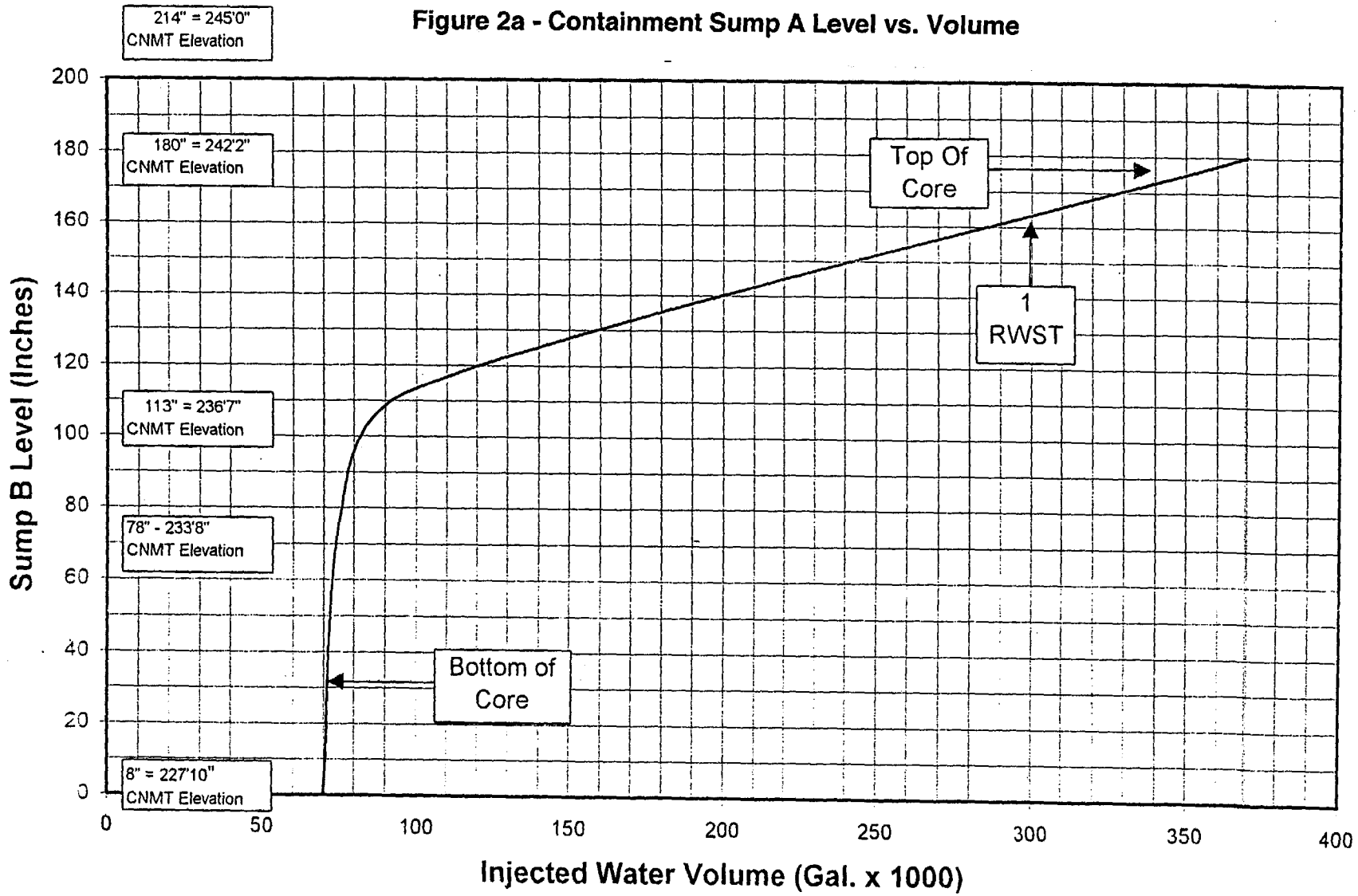


Figure 2b - Containment Sump B Level vs. Volume

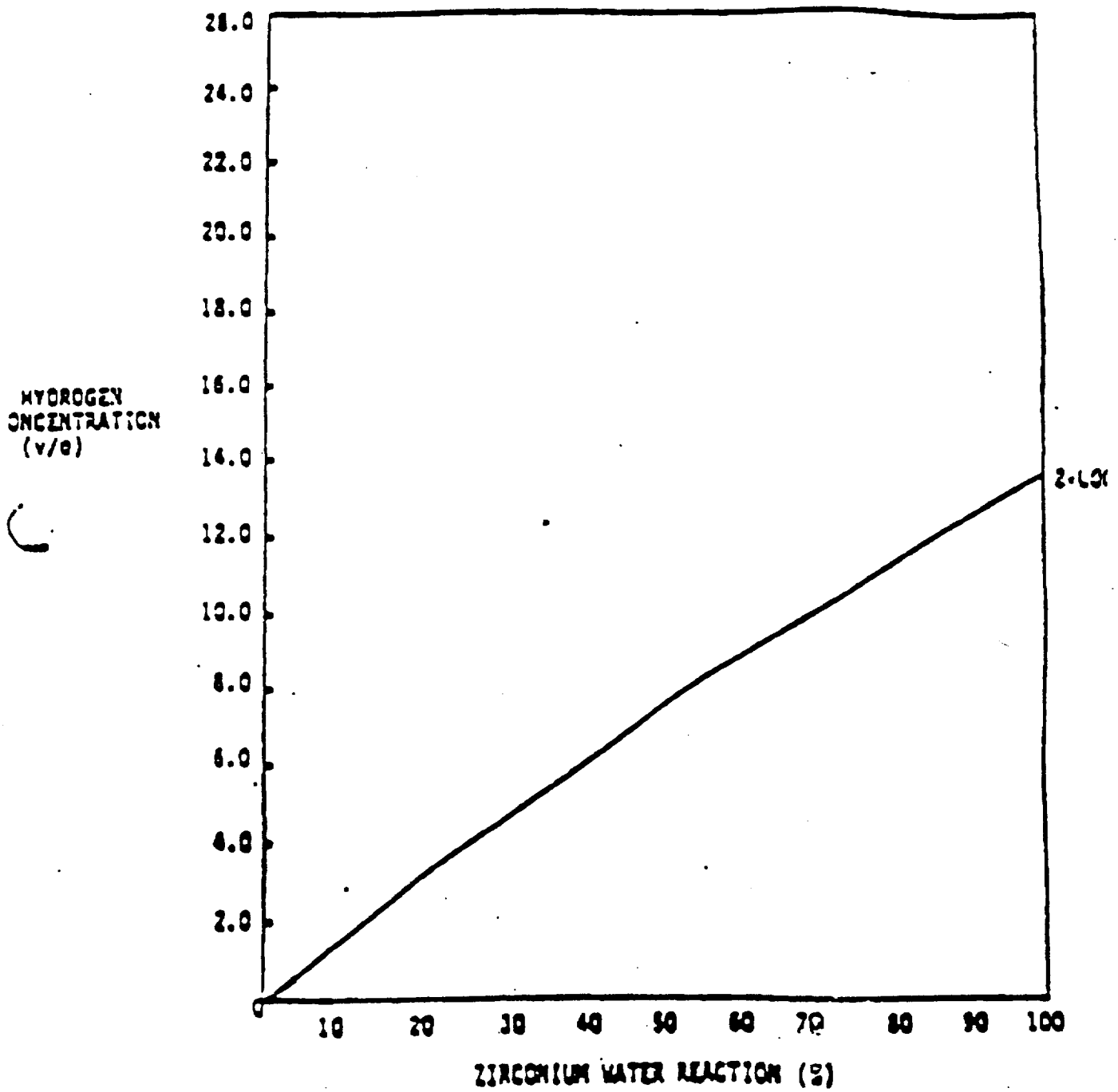
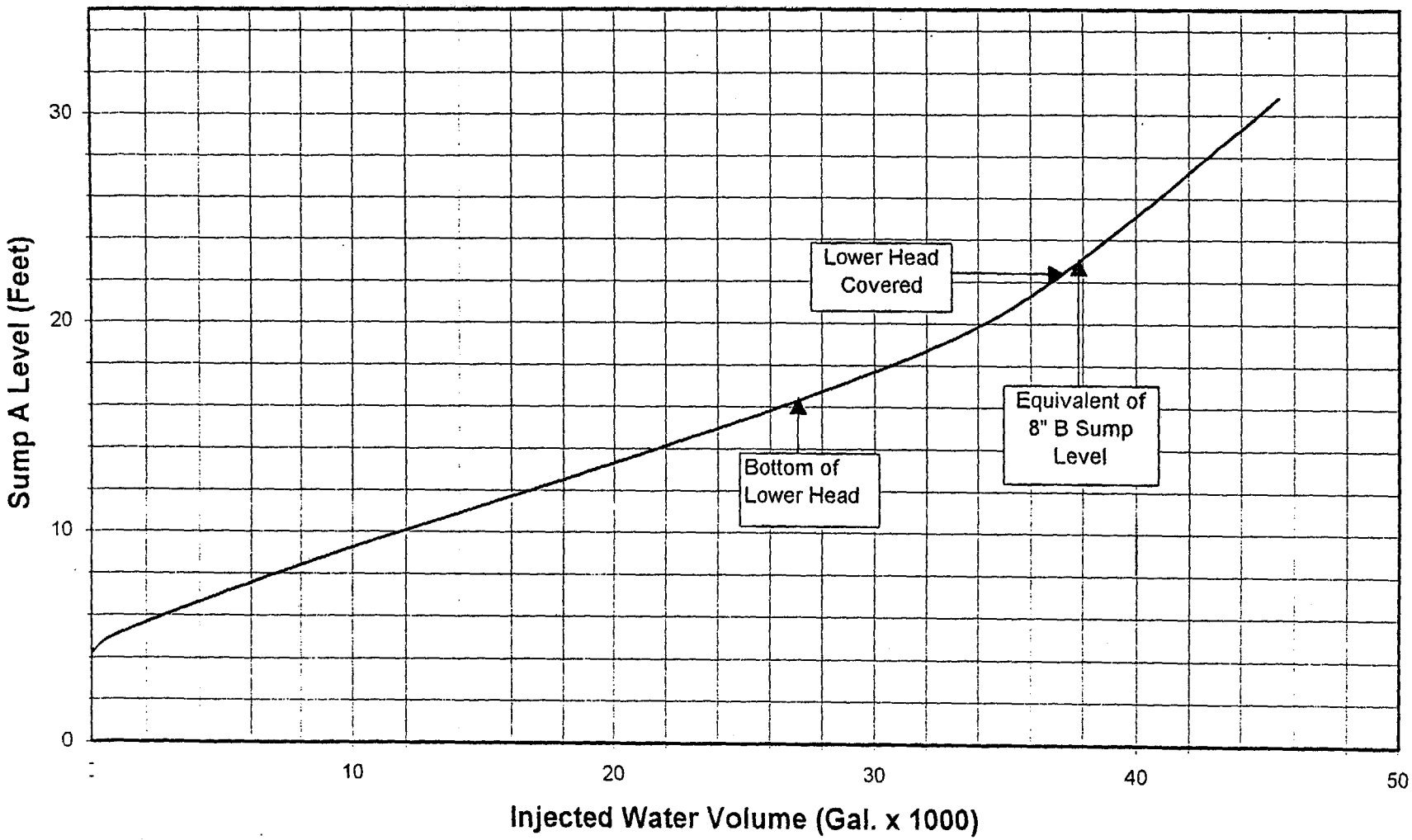


Figure 3
Containment Hydrogen Concentration
vs. Zirconium Water Reaction



ROCHESTER GAS AND ELECTRIC CORPORATION

GINNA STATION

CONTROLLED COPY NUMBER 23

PROCEDURE NO. EPIP 4-3

REV. NO. 10

ACCIDENTAL ACTIVATION OF GINNA EMERGENCY NOTIFICATION SYSTEM SIRENS

RESPONSIBLE MANAGER

07/01/02

EFFECTIVE DATE

Category 1.0

This procedure contains 3 pages

EPIP 4-3

ACCIDENTAL ACTIVATION OF GINNA EMERGENCY NOTIFICATION SYSTEM SIRENS

1.0 **PURPOSE:**

1.1 To specify the means by which notifications are to be made in the event of an accidental activation of Ginna Emergency Notification System Sirens.

2.0 **RESPONSIBILITY:**

2.1 The Ginna Control Room is responsible for initiating this procedure.

3.0 **REFERENCES:**

3.1 Developmental References

3.1.1 IEN 81-34 Accidental Activation of Prompt Public Notification System

3.2 Implementing References

None.

4.0 **PRECAUTIONS:**

None.

5.0 **PREREQUISITES:**

5.1 RG&E has been notified that a prompt public notification siren has sounded.

6.0 **ACTIONS:**

NOTE: **IF THERE IS AN ACTUAL GINNA EMERGENCY, INSTRUCT THE CALLER TO REFER TO THEIR EMERGENCY PLANNING CALENDAR AND/OR TUNE IN TO THEIR EMERGENCY ALERT SYSTEM STATION (WHAM) 1180AM, (WVOR) 100.5FM OR (WHEC) TV10 FOR ADDITIONAL INFORMATION.**

6.1 Obtain the following information from the caller:

a. Name
b. Address
c. Telephone number

6.2 Verify if a siren has activated by checking the Ginna Siren Feedback Computer at the 911 Center or the RG&E Energy Control Center. (A red siren means that the siren is activated). If all the sirens are green (Okay), then check the computer's printer to see if a siren was recently activated. Relay this information back to the caller.

6.3 If the siren computer indicates no sirens activated, go to 6.3.1. If the siren computer indicates a siren is activated, go to 6.3.2

6.3.1 If no sirens are activated, ask the caller if there may be a possible source other than a Ginna siren that may be sounding. If there are more than three calls about a siren activation within ten minutes, notify the Duty Public Information Officer at 771-2133 to inform them of the situation. The duty public information officer will determine if there is a need to notify the media. Go to step 6.4.

6.3.2 If a siren is activated:

a. Thank the caller for their help.
b. Reset the siren.
c. Notify Nuclear Emergency Preparedness per Step 6.4.

6.4 Call one of the following Nuclear Emergency Preparedness personnel and inform them of the situation. Have Emergency Preparedness make contact with the affected county, contact the Duty PIO, and ensure I&C Special Projects is made aware of the problem.

Peter Polfleit

Work:	716-7711-6772
Pager:	716-527-2207
Home:	315-524-7101
Cellular:	716-315-1201

Frank Cordaro

Work:	716-771-3108
Pager:	716-527-3650
Home:	315-524-2924
Cellular:	716-315-1277

Rick Watts

Work:	716-724-8706
Pager:	716-527-3749
Home:	716-425-2644
Cellular:	716-315-1204

Jill Willoughby

Work:	716-771-4033
Pager:	716-528-3295
Home:	716-787-9075
Cellular:	716-315-1205

7.0 ATTACHMENTS:

None.

ROCHESTER GAS AND ELECTRIC CORPORATION

GINNA STATION

CONTROLLED COPY NUMBER 23

PROCEDURE NO. EPIP 5-1 REV. NO. 25

OFFSITE EMERGENCY RESPONSE FACILITIES AND EQUIPMENT PERIODIC INVENTORY CHECKS AND TESTS

RESPONSIBLE MANAGER

07/01/02
EFFECTIVE DATE

Category 1.0

Reviewed by: _____

This procedure contains 17 pages

EPIP 5-1

OFFSITE EMERGENCY RESPONSE FACILITIES AND EQUIPMENT

PERIODIC INVENTORY CHECKS AND TESTS

1.0 PURPOSE

The equipment required by the Nuclear Emergency Response Plan and the means of assuring it is available are outlined in this procedure. Inspections will be made quarterly, monthly, or, as required by Technical Specifications and after each drill or use.

2.0 RESPONSIBILITY

The Corporate Nuclear Emergency Planner (CNEP) or designee is responsible for ensuring the periodic inspections, inventory and operational checking of emergency preparedness equipment.

3.0 REFERENCES

3.1 Developmental References

3.1.1 Nuclear Emergency Response Plan

3.1.2 Tech. Specs, Table 4.1-1 Minimum frequencies for checks, calibrations and test of instrument channels

3.2 Implementing References

3.2.1 RP-JC-DAILY-SRC-CHKS, Daily Instrument Source Checks.

3.2.2 EPIP 2-12, Offsite Surveys

3.2.3 EPIP 2-2, Obtaining Meteorological Data and Forecasts and Their Use in Emergency Dose Assessment

3.2.4 RP-JC_AIRSAMPLE, Attachment 1, Air Sample Job Coverage Record

3.2.5 RP-RES-M-RESP, Decontamination, Packing and Storage of Respirators

3.2.6 RP-RES-M-RESP, Maintenance, Inspection and Repair of Scottoramic Respirators

4.0 PRECAUTIONS

This procedure may be performed in any order, and attachments may be removed and submitted individually.

5.0 PREREQUISITES

Obtain current copies of applicable procedures of RP-JC-DAILY-SRC-CHKS

6.0 ACTIONS

6.1 Inspection and/or testing of Equipment

6.1.1 Inspect and/or test each location using Attachments 1 through 4.

6.1.2 Send completed attachments to the CNEP for review.

6.1.3 Inspection of EOF main area, Administrative area, Communications Room and Offsite Dose Assessment Area.

a. Check Center for general equipment and communications, Attachment 1.
b. Checks will be done monthly.

6.1.4 Inspection of Joint Emergency News Center

a. Check Joint Emergency News Center for general equipment and communications, Attachment 2.
b. All equipment shall be tested quarterly.

6.2 Reporting Discrepancies

6.2.1 If any discrepancies are found, the CNEP or designee will make a note on the emergency equipment monthly inspection log, Attachment 5. If there are no discrepancies, enter none for each location.

6.2.2 Discrepancies are to be corrected as soon as possible and so noted on the Log sheet.

7.0 ATTACHMENTS

1. General Equipment in EOF
2. Joint Emergency News Center Equipment Check List
3. Nuclear Emergency Offsite Response Radio Operation Procedure
4. Mobile Cellular Telephone Equipment Check
5. Emergency Equipment Monthly Inspection Log

GENERAL EQUIPMENT IN EOF

Main Room

1. Clocks (operating and set to present time; min. 1 unit) _____

2. RTC, Wayne and NOG E-Plan Telephone Directories (current revision) at each manager position. _____

3. Wayne, Monroe and New York State positions have a copy of their Emergency Plans at their position. _____

4. Computer and printer for news announcements (turn on, launch any new corporate software upgrades and print a press release). _____

5. Observe operation of SAS/PPCS by checking clock time. _____

6. PPCS Projector - check "status" light on projector. Change bulb if status light is on. _____

7. Check that there are a minimum of 5 copies of each EPIP in the drawer. _____

Offsite Dose Assessment Room

1. Clock (operating and set to present time; min. 1 unit) _____

2. Sufficient RTC, Wayne and NOG E-Plan Telephone Directories _____

3. Personal Computers (min. 2 units); check operability by contacting primary met tower, back-up met tower and MIDAS _____

4. Observe operation of SAS/PPCS by checking clock time. _____

5. Verify radio operation (Attachment 3, step 1.1) _____

6. Technical Support Center (Dose Assessment) Direct Line - Monthly Test. (Contact TSC to assist in answering phone.)

   a. Verify operation by ringing TSC and performing a callback to the EOF. _____

GENERAL EQUIPMENT IN EOF
(Continued)

89 East Avenue Lobby-Security Desk/Frisking Station

1. Ensure RM-14 Frisker with pancake probe or equivalent is set up and ready for use. Perform battery check, calibration check, response check and document using RP-JC-DAILY-SRC-CHKS. _____
Serial No. _____ Exp. _____

Communications Room

1. RECs Line - Monthly Test

   a. Pick up handset and depress "A" then "*" for all call. _____

   b. After ten seconds, depress "Push to talk" base on handset and state that "THIS IS A TEST. THIS IS THE GINNA STATION EMERGENCY OPERATIONS FACILITY CALLING THE STATE AND COUNTY WARNING POINTS. PLEASE STAND BY FOR ROLL CALL." _____

NOTE: RELEASE "PUSH TO TALK" BAR WHEN NOT SPEAKING.

   c. Then announce the following roll call:

      Wayne County Warning Point

      Monroe County Warning Point

      New York State Warning Point

   d. Recall warning points, if necessary, until they answer roll call. _____

   e. At completion of test, state "THIS IS THE END OF THE TEST. GINNA EMERGENCY OPERATIONS FACILITY OUT ", depress "A" then "#". _____

   f. Report any problems to the New York State Warning Point at (518) 457-2200.

GENERAL EQUIPMENT IN EOF
(Continued)

2. NRC ENS and Commercial Telephone System - Monthly Test

   a. (ENS) Call 301-816-5100 - state to operator, "This is a communications check". Request a call back to ensure operation. _____

   b. From the ENS phone call the other FTS2000 extensions. _____

Reactor Safety Counterpart Link	585-724-8423
Management Safety Counterpart Link	585-771-6126
Protective Measures Counterpart Link	585-771-6127
Local Area Network	585-724-8424
Emergency Notification System	585-771-6128
Health Physics Network	585-724-8422

Information Cabinet

1. Ginna procedures needed for EOF/Recovery Center _____

2. Ginna UFSAR _____

3. Ginna Technical Specifications _____

Administrative Area

1. Test Fax Machines by faxing a test message to New York State, Wayne County, Monroe County, TSC and Survey Center _____

2. Clock (operating and set to present time; min. 1 unit) _____

3. RTC, Wayne and NOG E-Plan Telephone Directory (current revision) (min. 1) _____

GENERAL EQUIPMENT IN EOF
(Continued)

Survey Team Storage

1. Survey team boxes - EOF-1, EOF-2. If seal is unbroken, assume equipment is intact. Inventory boxes and change batteries in January and July. _____

2. Survey meters. Battery check, check calibration date, response check and document using RP-JC-DAILY-SRC-CHKS. _____

   Low range,
   RM-14 with pancake probe or equivalent (min. 2 units) _____
   Serial #_____ Exp._____
   Serial #_____ Exp._____

   Bicron Micro-R or equivalent (min. 2 units) _____
   Serial #_____ Exp._____
   Serial #_____ Exp._____

   High range, Eberline RO-20 or equivalent (min. 2 units) _____
   Serial #_____ Exp._____
   Serial #_____ Exp._____

3. Dosimeter charger, battery operated - check operation (min. 1 unit) _____

4. Self-reading Pocket Dosimeters - check check calibration _____

   0-1500 mr (min. 4 units) Exp._____
   0-10R (min. 4 units) Exp. _____ _____

5. Thermoluminescent dosimeters (TLDs)
   (min 6-units*) Exp._____ _____

   * Four TLDs are assigned to personnel; two are for background purposes.

GENERAL EQUIPMENT IN EOF
(Continued)

Survey Team Storage (Con't)

6. Air samplers. Check calibration. Run samplers for several minutes to check operation. Ensure filters ARE NOT left in holders. _____

   Low volume, Gilian or equivalent. Ensure units are plugged into charger after test (min. 2 units)

   Serial #_____ Exp._____
   Serial #_____ Exp._____ _____
   RADECO H 809 C. Run for 1 minute (min. 2 units)

   Serial #_____ Exp. _____
   Serial #_____ Exp. _____ _____

NOTE: PRECEDE ALL COMMUNICATIONS WITH "THIS IS A TEST"

7. Motorola GM300 Mobile Portable Radios

   Turn on each radio (2) and conduct operability test with Security portable radio. See Attachment 3 for Radio Operation Instructions. _____

8. Antenna, magnetic car mount (min. 2 units) _____

9. Cellular phones. Check operation of each unit by performing Attachment 4. (min. 2 units). _____

10. Full Face Respirators (min. 4 units) _____

GENERAL EQUIPMENT IN EOF
(Continued)

11. Inspect and label per RP-RES-M-RESP. _____

12. Respiratory Charcoal Filters (min. 4 units) _____
    Expiration date: _____

13. Air Sample Job Coverage Record for SCOTT A Respirators per RP-JC AIRSAMPLE, ATT.1 (min. 10 copies) _____

14. Mask Qualification List - check for current copy (min. 1 copy) _____

Performed by _____ Date _____

EMERGENCY EQUIPMENT FOR SURVEY TEAM BOXES - EOF

TEAM BOX _____

NOTE: USE ONE ATTACHMENT FOR EACH TEAM BOX INVENTORY. IF BOX IS SEALED, INVENTORY IS NOT REQUIRED. BOXES SHALL BE OPENED IN JANUARY AND JULY FOR BATTERY CHANGE AND INVENTORY.

1. Protective Clothing (min. 2 units each) _____
   - Coveralls, disposable _____
   - Hood, disposable _____
   - Gloves, disposable (min. 12 units) _____
   - Booties, disposable _____
   - Hood, rain _____
   - Coat, rain _____
   - Boots, rain _____
   - Orange Safety Vest (min. 1 unit) _____
2. Flashlight with batteries. Change batteries in January (min. 1 unit) _____
3. Plastic bags (min. 2 units) _____
4. Tape, masking. Replace in January (min. 2 units) _____
5. Stationary supplies
   - Pencils/pens (min. 2 units) _____
   - Pencil sharpener (min. 1 unit) _____
   - Tablet, writing (min. 1 unit) _____
   - Clipboard (min. 1 unit) _____
   - Ruler, scale in inches (min. 1 unit) _____
   - Scissors (min. 1 unit) _____
6. Survey route maps (min. 2 units) _____

EMERGENCY EQUIPMENT FOR SURVEY TEAM BOXES - EOF

TEAM BOX _____ (Con't)

7. Air sampler filters

   Particulate (min. 5 units) _____

   Silver Zeolite (min. 5 units) Expiration: _____ _____

8. Air Sample Envelopes (min. 10 units) _____

9. Smears (min. 1-box) _____

10. Thyroid block tablets. Check expiration date
    (min. 3 units) Exp._____ _____

11. Tools

    Hammer (min. 1 unit) _____

    Nails (min. 10 units) _____

    Trowel, garden (min. 1 unit) _____

12. Tags with wire ties (min. 10 units) _____

13. Quarters for phone calls (min. 10) _____

14. 250 ml Poly bottles for liquid samples (min 2-units) _____

15. Tweezers _____

16. 12 volt yellow beacon _____

Performed by _____ Date _____

JOINT EMERGENCY NEWS CENTER
EQUIPMENT CHECK LIST

NOTE: CODE = 2-4-1 FOR JENC ACCESS.

County/State Room

1. Clock (operating and set to the present time) _____

2. RTC, Wayne and NOG E-Plan Telephone Directories (current revision) at each manager's position. _____

3. Fax Machines (Min. 3) - correct date and time
   Test operability by sending a test fax to both fax machines. _____

RG&E Room

1. Clocks (Min. 2) _____

2. RTC, Wayne and NOG E-Plan (currrent revision) Telephone Directories (1 each) _____

3. Computer Terminals (Min. 2 terminals) - Turn on, launch any new corporate software upgrades and Test Print Page verified. _____

JOINT EMERGENCY NEWS CENTER
EQUIPMENT CHECK LIST
(Continued)

Public Inquiry Room

1. Clock - set to present time _____

2. RTC, Wayne and NOG E-Plan (current revision) Telephone Directories at each position _____

Media Monitoring Room

1. Computer Terminals (Min 2 terminals) - Turn on, launch any new corporate software upgrades and Test Print Page verified _____

Performed by _____ Date _____

RADIO OPERATION PROCEDURE

1.0 INSTRUCTIONS

1.1 EOF Dose Assessment Desk Set Radio

1.1.1 Check that radio power converter is plugged into a 110 volt AC power source and that miniature red light is on Channel F1.

1.1.2 Check that frequency switch on right side of desk set is in the desired position as follows:

a. Position 1 General Maintenance Frequency, 153.53 MHz

b. Position 2 Rad Monitor, 153.59 MHz

c. Position 3 for Fire Brigade Frequency, 153.50 MHz

1.1.3 Turn radio volume knob clockwise for proper volume.

NOTE: WHEN HANDSET IS PICKED UP FROM THE DESK SET, SPEAKER IS CUT OUT AND INCOMING VOICE COMMUNICATION IS THROUGH THE HANDSET ONLY.

1.1.4 Call ext. 3108 and ask for a test from the TSC on the Radiation Monitor channel. If there is no answer at ext. 3108, call ext. 3267 to test with SAS.

1.1.5 Pick-up and depress switch on handset to transmit. Release switch to receive.

1.1.6 Make communications check with another station using time and date.

1.2 Motorola GM300 Mobile Radios

1.2.1 Check that frequency switch on unit is in the desired position as follows:

a. Position 1 General Maintenance

b. Position 2 for Rad Monitor Teams

c. Position 3 for Fire Brigade

1.2.2 Place selector on Channel 1.

NUCLEAR EMERGENCY OFF-SITE RESPONSE
RADIO OPERATION PROCEDURE
(Cont'd)

1.2.3 Plug unit into transformer

1.2.3.1 Test radio with EOF Security portable radio.

1.2.3.2 Turn radio and transformer off and unplug radio from transformer.

CELLULAR TELEPHONE EQUIPMENT CHECK

NOTE: **IT MAY BE NECESSARY TO MOVE TO THE ELEVATOR AREA OR EXIT THE BUILDING IN ORDER TO USE THE CELLULAR PHONE EFFECTIVELY.**

1. Disconnect telephone from charging unit, if on charger.
2. Turn the unit on by pressing the PWR button on the handset.
3. To place a call, press the appropriate number buttons and verify the number displayed is correct.
4. Press the SND button to activate the call.
5. Press END button to end the test call.
6. To turn unit off, press PWR button. Ensure display is blank.
7. Return the unit to storage and ensure unit is plugged into the battery charger, if necessary.

EMERGENCY EQUIPMENT MONTHLY INSPECTION LOG

	DISCREPANCIES NOTED		DISCREPANCIES CORRECTED	
EOF Main Room	Date_____	Initials_____	Date_____	Initials_____
Survey Team Equipment	Date_____	Initials_____	Date_____	Initials_____
Offsite Dose Assessment Area	Date_____	Initials_____	Date_____	Initials_____
Communications Room	Date_____	Initials_____	Date_____	Initials_____
Administrative Area	Date_____	Initials_____	Date_____	Initials_____
Joint Emergency New Center	Date_____	Initials_____	Date_____	Initials_____

One copy of the completed Attachment 8 Emergency Equipment Monthly Inspection Log provided to Corporate Nuclear Emergency Planner (Ginna Training Center)

SUBMITTED BY: _____ DATE: _____

CNEP REVIEW: _____ DATE: _____

ROCHESTER GAS & ELECTRIC CORPORATION

GINNA STATION

CONTROLLED COPY NUMBER 23

PROCEDURE NO. EPIP 5-5 REV. NO. 14

CONDUCT OF DRILLS AND EXERCISES

Cordaro

RESPONSIBLE MANAGER

07/01/02

EFFECTIVE DATE

Category 1.0

This procedure contains 18 pages

EPIP 5-5

CONDUCT OF DRILLS AND EXERCISES

1.0 PURPOSE:

This procedure provides guidance for the preparation and conduct of emergency preparedness drills and exercises. It also describes the process for correcting deficiencies identified during drills and exercises.

2.0 RESPONSIBILITY:

2.1 The Corporate Nuclear Emergency Planner is responsible for ensuring drills, exercises and scenarios satisfy regulatory requirements and that deficiencies identified in previous drills and exercises are corrected.

2.2 The Corporate Nuclear Emergency Planner is responsible for resolving all deficiencies identified during Drills/Exercises.

3.0 REFERENCES:

3.1 Developmental References

3.1.1 NUREG-0654, FEMA REP-1, Revision 1 "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants".

3.1.2 10 CFR 50 Appendix E-Emergency Plans for Production and Utilization Facilities.

3.1.3 Nuclear Emergency Response Plan

3.2 Implementing References

3.2.1 NRC Inspection Manual Procedure

4.0 PRECAUTIONS:

4.1 During a simulated accident, any action to alter actual plant operating conditions shall be simulated.

4.2 An exercise or drill may be terminated by the Shift Supervisor any time conditions warrant such action.

4.3 Any announcement or notification associated with an exercise or drill must be preceded and followed by the words: "THIS IS AN EXERCISE " or "THIS IS A DRILL". If the drill is to be an unannounced drill, the Shift Supervisor and Control Room foreman shall be notified prior to any plant announcements.

4.4 The scenario is the source document for control of drills and exercises.

5.0 **PREREQUISITES:**

None.

6.0 **ACTIONS:**

6.1 Preparation of Drill and Exercises

6.1.1 Appropriate offsite agencies should be contacted to confirm their level of participation if they are to be involved. If offsite agencies do not wish to participate, other personnel may be assigned to simulate the agencies' response.

6.1.2 Drill/Exercise participants will be provided with appropriate evaluation forms.

6.1.3 Unannounced or off-hours emergency drills may be conducted to test and evaluate the plant's readiness in an emergency situation. These drills shall be planned in cooperation with appropriate management and staff.

6.1.4 Use of Simulator data via Plant Process Computer System (PPCS)

NOTE: IT IS NOT POSSIBLE TO DISPLAY GINNA SIMULATOR DATA ON THE CONTROL ROOM TERMINALS.

NOTE: THIS PORTION OF THE PROCEDURE WILL BE IMPLEMENTED VIA CONTROLLER MESSAGES AT THE BEGINNING AND END OF THE SCENARIO.

6.1.4.1 If the use of simulated plant conditions from the Ginna Simulator is to be displayed on selected PPCS terminal, perform the following:

6.1.4.2 Have the Ginna Computer System Group transfer the selected PPCS terminal to Simulator data.

6.1.4.3 Check the selected PPCS terminal to ensure that "Simulator" is displayed on the screen and that "R.E. Ginna Simulator" is printed on any hard copy report headers.

6.1.5 The Corporate Nuclear Emergency Planner, with the assistance of the Scenario Development Committee and other cognizant individuals, shall prepare a simulated accident scenario.

6.1.6 Plans for the simulated accident shall be sufficiently detailed such that locations and extent of damage are described fully enough to enable simulated corrective actions to be taken and evaluated. Ensure that when measurements are made that the scenario contains numbers for the measurement (i.e., radiation, gas, chemicals).

6.1.7 Attachment 3 will be reviewed by the Milestone committee annually to ensure all elements are performed.

6.1.8 The scenario should discuss the use of "time outs" by controllers to reinforce the correct response behaviors. The scenario should also consider pre-planned "time outs" where the scenario timeline is halted after major events to discuss the events. A convenient place is when contingency messages are in the scenario to interject a message if the responders do not perform adequately.

6.1.9 Observers/Controllers

6.1.9.1 The Corporate Nuclear Emergency Planner, with the assistance of the Ginna Training Manager, shall assure that during the conduct of the exercise an adequate number of knowledgeable controllers/observers are stationed at strategic locations to provide information as necessary to participants and to evaluate individual and group performance. The controllers/observers will be selected from various areas of expertise throughout RG&E, knowledgeable members of other utilities, or knowledgeable consultants.

6.1.9.2 Controllers and observers will be provided with appropriate evaluation materials such as Attachments 1 or 2 or use of the Team Dimensional Training model.

6.1.9.3 Prior to commencement of the annual exercise, the Corporate Nuclear Emergency Planner or cognizant individuals will train controllers/observers on the scenario and their duties.

6.2 Conduct of Drills/Exercises

6.2.1 Refer to EPG-1 for additional drill and exercise performance guidance.

6.2.2 Emergency Plan exercises are required annually. They can be supplemented with training drills. Both are designed to evaluate training effectiveness or to evaluate individual response during simulated conditions.

6.2.3 At the completion of the drill or exercise, the Lead Exercise Controller, with the assistance of the Corporate Nuclear Emergency Planner, should verify that all

participating offsite agencies have been notified of drill or exercise completion.

6.2.4 Medical emergency drills involving onsite personnel and offsite organizations shall be conducted annually.

6.2.5 Following completion of the drill or, at the request of the Shift Supervisor, have the Ginna Computer Systems Group return the selected PPCS terminals to actual plant conditions.

6.2.6 Inform the Shift Supervisor that the drill is complete.

6.3 Correcting Deficiencies

6.3.1 At the completion of the drill/exercise, the Corporate Nuclear Emergency Planner shall review the combined emergency exercise critique comments.

6.3.2 C/AIs may be developed from the critique comments per the following instructions by the Corporate Nuclear Emergency Planner.

6.3.2.1 Evaluate the combined emergency exercise critique comments as to applicability, requirements and need.

6.3.2.2 If the critique comment is applicable and there is a requirement or need for its implementation. This information will be incorporated into an ACTION Report.

6.3.2.3 A record of all appropriate Nuclear Emergency Response Plan ACTION Reports will be kept by the Corporate Nuclear Emergency Planner so that actions taken are tracked and recorded.

6.3.3 An Annual Drill and Exercise Report consisting of the performance of all drills and exercises in the previous year shall be submitted by the Corporate Nuclear Emergency Planner to PORC emphasizing areas of strength and weakness and outlining corrective actions.

7.0 **ATTACHMENTS**

1. Emergency Drill or Exercise Comment Sheet
2. Team Dimensional Training Evaluation Form
3. Elements exercised each year
4. Elements exercised over a 5 year period

SAMPLE OF EMERGENCY DRILL OR EXERCISE COMMENT SHEET

Observer: _____ **Date:** _____

Location of Observer: _____

Drill/Exercise information at your location:

Time Drill/Exercise started: _____

Time Drill/Exercise terminated: _____

Observation: (Proper use of equipment, correct procedures, effectiveness of individual and group action, etc.)

_____
_____
_____
_____
_____

Specific comments and recommendations:

_____
_____
_____
_____
_____

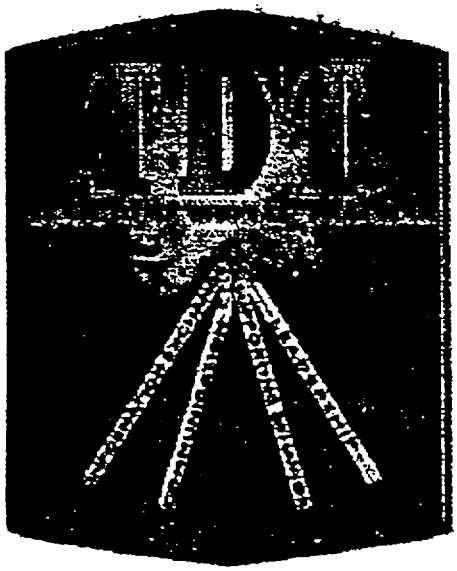
(Use additional pages as required)

_____
Signature

Return completed sheet to Corporate Nuclear Emergency Planner.

Team Dimensional Training

Prebriefing / Debriefing Guide



Team Dimensional Training was developed as a part of the Tactical Decision Making Under Stress (TADMUS) project. Any questions, comments, or requests for materials associated with Team Dimensional Training can be directed to Dr. Kim Jentsch, Naval Air Warfare Center Training Systems Division, Orlando, FL (407) 380-4645, Kim_Jentsch@ntsc.navy.mil.

Team Dimensional Training
Prebriefing - Performance - Debriefing Cycle

PREBRIEF

- Clarify mission
- Focus team's attention on the four teamwork dimensions
- Remind team of specific goals from previous TDT

PERFORM / OBSERVE

- Time on task; real or simulated
- Instructors record positive and negative examples under the four teamwork dimensions

DIAGNOSE PERFORMANCE

- After performance has ended, instructors come to consensus on categorization and prioritization of selected examples
- Instructors transfer 1-2 examples of each teamwork component within the appropriate box in the debriefing guide
- Strengths and goals for improvement are identified for each dimension

DEBRIEF

- TDT facilitator(s) sets the stage and recaps key exercise events
- TDT facilitator(s) guides team critique of the four teamwork dimensions
- Lessons learned are summarized and goals for improvement are set

TEAM DIMENSIONAL TRAINING PREBRIEF

This exercise will give you the opportunity to work on improving the processes your team uses to accomplish its objectives. In particular, I'd like you to focus on four dimensions of teamwork; information exchange, communication delivery, supporting behavior, and team initiative & leadership. Before we start the exercise, let's go over the specific components of these four dimensions.

INFORMATION EXCHANGE

The first dimension is information exchange. Effective information exchange allows the team to develop and maintain a shared situation awareness.

The components of information exchange are:

- Utilizing all available sources of information
- Passing information to the appropriate persons without having to be asked
- Providing periodic situation updates which summarize the big picture

COMMUNICATION

The second dimension is communication. While information exchange deals with what is passed to whom, this dimension involves how that information is delivered.

The components of communication delivery are:

- Proper phraseology
- Completeness of standard reports
- Brevity/ Avoiding excess chatter
- Clarity/ Avoiding inaudible comms

SUPPORTING BEHAVIOR

The third dimension is supporting behavior. This involves compensating for one another in order to achieve team objectives.

The components of supporting behavior are:

- Monitoring and correcting team errors
- Providing and requesting backup or assistance to balance workload

INITIATIVE/LEADERSHIP

The fourth dimension is initiative/ leadership. Anyone on the team can demonstrate initiative/leadership.

The components of initiative/leadership are:

- Providing guidance or suggestions to team members
- Stating clear and appropriate priorities

After the exercise, you will be asked to critique your own performance on these four dimensions. I will facilitate this process of team self-correction using a strategy called Team Dimensional Training, or TDT.

For TDT to be effective, all team members need to contribute to the process of identifying problems and coming up with solutions to those problems. I encourage everyone to take advantage of this opportunity to ask questions, state concerns, clarify issues, and offer suggestions on how your team can improve.

Guidelines for TDT Facilitators

- Position low ranking team members in the center of the group prior to debriefing
- Always let the team provide examples before offering your own input
- Pause and make eye contact with all team members after asking a question
- Encourage and reward participation - especially self-critique
- Keep discussion focused by staying with the outline
- Make sure feedback is
  - specific
  - solution-oriented
  - non-personal

TEAM DIMENSIONAL TRAINING DEBRIEF

Setting the Stage

TDT Facilitator (SAY):

- The exercise you just performed gave you an opportunity to practice working on four teamwork dimensions: information exchange, communication, supporting behavior, and initiative/ leadership.
- First, let's briefly recap the key exercise events. And then, we'll discuss the four teamwork dimensions and how they influenced the team's performance.
- (Recap key exercise events).
- Now that we've reviewed <u>what happened</u> at the key exercise events, let's talk about the <u>processes</u> that were used by your team. The way this works is that I'm going to ask you for examples of specific components within the four dimensions. Everyone on the team is expected to participate in this critique. Feel free to make comments, ask questions, and offer suggestions on how you can improve on subsequent exercises.

INFORMATION EXCHANGE

- First, let's talk about the team's INFORMATION EXCHANGE. One component of information exchange is utilizing information from all available sources. This means proactively going out and asking for information in order to establish an accurate picture of what's going on.
  - What sources of information were sought or used by the team to develop and maintain situation awareness?
  - What additional sources of information were available but not utilized, or not fully utilized?
    - How could these sources have improved team situation awareness?

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- Another component of information exchange is passing information before having to be asked. This means anticipating information needs both internal and external to your team.
  - Describe for me a time when a team member anticipated someone's need for information and provided it to him/her before having to be asked.
  - Give me an example of a time when a relevant piece of information was not passed to the appropriate person (at all or in a timely manner).
  - How did or could this have hurt the team's performance?

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- The last component of information exchange is providing situation updates. A situation update is an overall summary of the big picture that is passed to the entire team, a subset of the team, or someone external to the team.
  - Give me an example of when someone on the team shared an overall summary of their big picture through an internal or external situation update.
  - How did this help the team?
  - Describe a time when an internal or external situation update was not provided but would have been helpful in clearing up the big picture.
  - How might this have improved the team's performance?

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COMMUNICATION

- Now let's talk about the second teamwork dimension which is COMMUNICATION. While information exchange deals with <u>what</u> is passed to <u>whom</u>, this dimension involves <u>how</u> information is <u>delivered</u>. The first component of effective communication is the use of standard <u>phraseology</u>.
  - Give me an example of when nonstandard phraseology was used.
    - How could this have led to confusion?
    - What would have been the appropriate phraseology?

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- The second component of effective communication is <u>completeness of reports</u>. When internal and external reports contain all the standard pieces of information and in the correct order, communication flows more efficiently
  - Give me an instance when incomplete reports were used.
    - How might this have caused problems or slowed the team's response to the key events in the exercise?
    - What should have been included in these reports?

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- The next component of effective communication is avoiding <u>excess chatter</u>. This includes unnecessary communications, stammering, and long-winded reports which tie up communication lines.
  - Give me an example of excess chatter on the nets.
    - How could this have caused the team problems or made the team less efficient?
    - If excess chatter caused problems, could this have been avoided? How?

+/-

- The fourth component of effective communication is <u>clarity</u>. In other words, reports sent should be loud enough to hear, ungarbled, and paced so that the receiver catches it the first time.
  - Give me an example of a report that was garbled or inaudible.
    - How might this have affected the team's performance on any of the events?
    - What could have been done to avoid this?

+/-

SUPPORTING BEHAVIOR

- The third teamwork dimension is SUPPORTING BEHAVIOR. One component of supporting behavior is error correction. This involves monitoring for team errors, bringing an error to the team's attention, and seeing that it is corrected.

  - Give me an example of an error that your team caught and corrected.
    - How was it corrected?

  - In retrospect, what errors were not caught and corrected that could have been?
    - How could these errors have been caught and corrected, and by whom?

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- The second component of supporting behavior is providing backup/assistance. This involves noticing that another team member is overloaded or having difficulty performing a task and providing assistance to them by actually taking on some of their workload.

  - Give me an example of when assistance or "backup" was provided to reduce another team member's workload.
    - How did this improve the team's ability to deal with key events in the exercise?

  - Describe for me an instance when someone on the team could have benefited from backup that was not provided.
    - What kind of backup could have been given, and by whom?

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INITIATIVE / LEADERSHIP

- The last teamwork dimension is INITIATIVE/LEADERSHIP. It is important to remember that anyone on the team can demonstrate initiative/leadership. The first component of team initiative/leadership is providing guidance. This means directing a team member or another team to take particular action or instructing them on how to perform a task.

  - Describe a time when constructive guidance or suggestions were offered.
    - How did this help the team?
  - Describe a time when guidance was needed but not provided.
    - What guidance was needed, and who could have provided it?
    - Were there any cases when the guidance or suggestion given was not specific enough or was stated in a hostile or sarcastic way?
    - How could this have been stated more constructively?

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- The second component of team initiative/leadership is stating priorities. This means specifying, either to the team as a whole or to an individual team member, the priority ordering of multiple tasks.

  - Give me an instance when a priority was clearly stated. Was this priority appropriate?
    - How did this help team members to focus their efforts?
  - Looking back, can you recall an instance when it would have been helpful to have priorities stated more explicitly?
    - How did or could this have led to errors or confusion?
    - What was the intended priority, and who could have made this more clear?

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TEAMWORK SUMMARY

INFORMATION EXCHANGE	
STRENGTH	
GOAL FOR IMPROVEMENT	

SUPPORTING BEHAVIOR	
STRENGTH	
GOAL FOR IMPROVEMENT	

COMMUNICATION	
STRENGTH	
GOAL FOR IMPROVEMENT	

INITIATIVE / LEADERSHIP	
STRENGTH	
GOAL FOR IMPROVEMENT	

ELEMENTS THAT ARE EXERCISED EACH YEAR

ELEMENTS	LAST DEMONSTRATED	2001	2002	2003	2004	2005	2006
Accident Detection and Assessment	06/06/01	√	√	√	√	√	√
Emergency Classification	06/06/01	√	√	√	√	√	√
Notifications:							
Corporate Responders	06/06/01	√	√	√	√	√	√
Offsite Responders	06/06/01	√	√	√	√	√	√
Communications:							
RECs	06/06/01	√	√	√	√	√	√
NRC ENS Phone	06/-6/01	√	√	√	√	√	√
Radiological Exposure Control:							
Inplant air/liquid samples	06/06/01	√	√	√	√	√	√
Offsite air/liquid samples (field teams)	06/06/01	√	√	√	√	√	√
Personnel exposure control	06/06/01	√	√	√	√	√	√
Protective Action Recommendations	06/06/01	√	√	√	√	√	√
Staffing of Facilities							
Full facility activation	06/06/01	√	√	√	√	√	√
Shift change (simulated/actual)	(Actual - 1999)	√	√	√	√	√	√
Use of First Aid Team							
Onsite Responders	07/18/01	√	√	√	√	√	√
Ontario Vol. Emerg. Squad (OVES)	07/18/01	√	√	√	√	√	√
Hospital Participation							
Rochester General Hospital	07/18/01	√			√		
Newark-Wayne Comm. Hospital	06/21/00		√	√		√	√

ELEMENTS EXERCISED OVER A FIVE YEAR PERIOD

ELEMENTS	LAST DEMONSTRATED	2001	2002	2003	2004	2005	2006
Off-hours staffing (6pm - 4am)	12/08/97		√				
Activation of JENC News release prepared Media briefing conducted Prompt notification system/EAS Rumor Control	06/06/01 06/06/01 06/06/01 06/06/01 06/06/01	√ √ √ √ √	√ √ √ √ √	√ √ √ √ √	√ √ √ √ √	√ √ √ √ √	√ √ √ √ √
Use of Fire Brigade Onsite Responders Offsite Responders	05/02/01 05/17/00 2000	 √ √					 √ √
Use of Security personnel to provide quick access for emergency equipment and support	06/06/01	√	√	√	√	√	√
Use of Search and Rescue Team	1998			√			
Use of Backup Communications	05/17/00					√	
Use of facility emergency power	05/17/00					√	
Evacuation of response facilities and relocation	06/06/01	√		√		√	
Ingestion Pathway Exercise (NYS requirement)	1999				√		
Field Monitoring Collection of environmental media Sampling station collections/TLDs	06/06/01 06/06/01	√ √	√ √	√ √	√ √	√ √	√ √
Capability for determining the magnitude and impact of the particular release components	06/06/01	√	√	√	√	√	√
Capability for post accident sampling	05/17/00		√	√	√	√	√
Use of KI	06/06/01	√	√	√	√	√	√
Plant Evacuation	06/06/01	√	√	√	√	√	√
Assembly and accountability	06/06/01	√	√	√	√	√	√
Recovery and Re-entry	2000				√		
Federal Participation (Simulated/Actual)	A-12/06/95 S-05/06/98		√		√ A		