CHAPTER 12.0

SPECIAL NOTE

Until the Unit 2 & 3 Radiological Effluent Technical Specifications have been approved by the Nuclear Regulatory Commission, the requirements of the Technical Specifications shall take precedence over this chapter, should any differences occur.

DRESDEN ANNEX INDEX

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12.0 RADIOLOGICAL EFFLUENT TECHNICAL STANDARDS

12.1 DEFINITIONS

1. Channel Functional Test (Radiation Monitor) - Shall be the injection of a simulated signal into the channel as close to the sensor as practicable to verify operability including alarm and/or trip functions.

2. Dose Equivalent I-131 - That concentration of I-131 (microcurie/gram) which alone would produce the same thyroid dose as the quantity and isotopic mixture of I-131, I-132, I-133, I-134, and I-135 actually present. The thyroid dose conversion factors used for this calculation shall be those listed in Table III of TID -14844, "Calculation of Distance Factors for Power and Test Reactor Sites".

3. Hot Standby - Hot standby means operation with the reactor critical, system pressure less than 600 psig, the main steam isolation valves closed.

4. Immediate - Immediate means that the required action will be initiated as soon as practicable considering the safe operation of the unit and the importance of the required action.

5. Instrument Calibration - An instrument calibration means the adjustment of an instrument signal output so that it corresponds, within acceptable range and accuracy, to a known value(s) of the parameter which the instrument monitors. Calibration shall encompass the entire instrument, including actuation, alarm, or trip.

6. Instrument Check - An instrument check is qualitative determination of acceptable operability by observation of instrument behavior during operation. This determination shall include, where possible, comparison of the instrument with other independent instruments measuring the same variable.

7. Instrument Functional Test - An instrument functional test means the injection of a simulated signal into the instrument primary sensor to verify the proper instrument response alarm and/or initiating action.

8. Member of the Public - an individual in a controlled or unrestricted area. However, an individual is not a member of the public during any period in which the individual receives an occupational dose.

9. Mode - The reactor mode is that which is established by the mode-selector-switch.

10. The Offsite Dose Calculation Manual (ODCM) shall contain the methodology and parameters used in the calculation of offsite doses regulating from radioactive gaseous and liquid effluents, in the calculation of gaseous and liquid effluent monitoring Alarm/Trip Setpoints, and in the conduct of the Environmental Radiological Monitoring Program. The ODCM

12.1 DEFINITIONS (Cont'd)

shall also contain (1) the Radioactive Effluent Controls and Radiological Environmental Monitoring Programs described in Section 12.5 and (2) descriptions of the information that should be included in the Annual Radiological Environmental Operating and Radioactive Effluent Release Reports required by Sections 12.6.2.2.1 and 12.6.2.1.

11. Operable - A system, subsystem, train, component or device shall be OPERABLE or have OPERABILITY when it is capable of performing its specified function(s). Implicit in this definition shall be the assumption that all necessary attendant instrumentation, controls, a normal and an emergency electrical power source, cooling or seal water, lubrication or other auxiliary equipment that are required for the system, subsystem, train, component or device to perform its function(s) are also capable of performing their related support function(s).

12. Operating - Operating means that a system, subsystem, train, component or device is performing its intended function in its required manner.

13. Operating Cycle - Interval between the end of one refueling outage and the end of the subsequent refueling outage.

14. The Process Control Program (PCP) shall contain the current formulas, sampling, analyses, test, and determinations to be made to ensure that processing and packaging of solid radioactive wastes based on demonstrated processing of actual or simulated wet solid wastes will be accomplished in such a way as to assure compliance with 10 CFR Parts 20, 61, and 71, State regulations, burial ground requirements, and other requirements governing the disposal of solid radioactive waste.

15. Rated Thermal Power - Rated thermal power means a steady-state power level of 2527 thermal megawatts.

16. Reactor Power Operation - Reactor power operation is any operation with the mode switch in the "Startup/Hot Standby" or "Run" position with the reactor critical and above 1% rated thermal power.

    1. Startup/Hot Standby Mode - In this mode, the reactor protection scram trips, initiated by condenser low vacuum and main steamline isolation valve closure, and by-passed when reactor pressure is less than 600 psig; the low pressure main steamline isolation valve closure trip is bypassed, the reactor protection system is energized with IRM neutron-monitoring system trips and control rod withdrawal interlocks in service.

    2. Run Mode - In this mode, the reactor protection is energized with APRM protection and RBM interlocks in service.

12.1 DEFINITIONS (Cont'd)

17. Reactor Vessel Pressure - Unless otherwise indicated, reactor vessel pressures listed in the RETS are those measured by the reactor vessel steam space detector.

18. Refueling Outage - Refueling outage is the period of time between the shutdown of the unit prior to a refueling and the startup of the plant subsequent to that refueling. For the purpose of designating frequency of testing and surveillance, a refueling outage shall mean a regularly scheduled refueling outage; however, where such outages occur within 8 months of the completion of the previous refueling outage, the required surveillance testing need not be performed until the next regularly scheduled outage.

19. Shutdown - The reactor is in a shutdown condition when the reactor mode switch is in the shutdown mode position and no core alterations are being performed. When the mode switch is placed in the shutdown position a reactor scram is initiated, power to the control rod drives is removed, and the reactor protection system trip systems are de-energized.

    1. Hot Shutdown means conditions as above with reactor coolant temperature greater than 212°F.

    2. Cold Shutdown means conditions as above with reactor coolant temperature equal to or less than 212° F.

20. Source Check - The qualitative assessment of instrument response when the sensor is exposed to a radioactive source.

21. Surveillance Interval - Each surveillance requirement shall be performed within the specified surveillance interval with a maximum allowable extension not to exceed 25% of the surveillance interval.

22. Definitions Related to Estimating Dose to the Public Using the ODCM Computer Program:

    1. Actual - Refers to using known release data to project the dose to the public for the previous month. These data are stored in the database and used to demonstrate compliance with the reporting requirements of Chapter 12.

    2. Projected - Refers to using known release data from the previous month or estimated release data to forecast a future dose to the public. These data are NOT incorporated into the database.

TABLE 12.1-1

SURVEILLANCE FREQUENCY NOTATION

NOTATION	FREQUENCY
S	At least once per 8 hours
D	At least once per 24 hours
T	At least once per 72 hours
W	At least once per 7 days
M	At least once per 31 days
Q	At least once per 92 days
SA	At least once per 184 days
A	At least once per 366 days
R	At least once per refuel outage
S/U	Prior to each reactor startup
N.A.	Not applicable
E	At least once per 550 days (Units 2 & 3) and 18 months for Unit 1

12.2 INSTRUMENTATION

A. Radioactive Liquid Effluent Instrumentation

1. Radioactive Liquid Effluent Instrumentation Operability

1. The effluent monitoring instrumentation shown in Table 12.2-1 shall be operable with alarm trip setpoints set to insure that the limits of Section 12.3.A are not exceeded. The alarm setpoints shall be determined in accordance with the ODCM.

2. With a radioactive liquid effluent monitoring instrument alarm/trip setpoint less conservative than required, without delay suspend the release of radioactive liquid effluents monitored by the affected instrument, or declare the instrument inoperable, or change the setpoint so it is acceptably conservative.

3. With one or more radioactive liquid effluent monitoring instruments inoperable, take the action shown in Table 12.2-1. Return the instrument to operable status within 30 days and, if unsuccessful, explain in the next Radioactive Effluent Release Report why the inoperability was not corrected in a timely manner. This is in lieu of an LER.

4. In the event operability requirements and associated action requirements cannot be satisfied because of circumstances in excess of those addressed in the specifications, provide a 30-day written report to the NRC and no changes are required in the operational condition of the plant, and this does not prevent the plant from entry into any operational mode.

2. Radioactive Liquid Effluent Instrumentation Surveillance

1. Each radioactive liquid effluent monitoring instrument shown in Table 12.2-2 shall be demonstrated operable by performance of the given source check, instrument check, calibration, and functional test operations at the frequencies shown in Table 12.2-2.

B. Radioactive Gaseous Effluent Instrumentation

1. Radioactive Gaseous Effluent Instrumentation Operability

1. The effluent monitoring instrumentation shown in Table 12.2-3 shall be operable with alarm/trip setpoints set to ensure that the limits of Section 12.4.A are not exceeded. The alarm/trip setpoints shall be determined in accordance with the ODCM.

2. With a radioactive gaseous effluent monitoring instruments alarm/trip set point less conservative than required, without delay suspend the release of radioactive gaseous effluents monitored by the affected instrument, or declare the instrument inoperable, or change the setpoint so it is acceptably conservative.

12.2.B.1 Radioactive Gaseous Effluent Instrumentation Operability (Cont'd)

3. With one or more radioactive gaseous effluent monitoring instruments inoperable, take the action shown in Table 12.2-3. Return the instrument to operable status within 30 days and, if unsuccessful, explain in the next Radioactive Effluent Release Report why the inoperability was not corrected in a timely manner. This is in lieu of an LER.

4. The unit 2/3 plant chimney gas sampling system may be out of service for 48 hours for the purpose of servicing the high range noble gas monitor as long as the following conditions are satisfied:

   1. Both units are at steady state conditions with the recombiners and charcoal absorbers in service for the operating unit(s).

   2. The dose rate in unrestricted areas must be shown by calculation to be less than the limits of 12.4.A assuming the charcoal absorbers are bypassed on both units.

   3. Both offgas monitors on Unit 2 and Unit 3 must be operational and the monitor reading correlated to the chimney release rate based on the conservative assumption of both units' charcoal absorbers being bypassed.

   4. If the provisions of 12.4.A.1.1, 12.4.A.1.2, or 12.4.A.1.3 cannot be met, an orderly load reduction of the unit(s) shall be initiated immediately.

5. In the event operability requirements and associated action requirements cannot be satisfied because of circumstances in excess of those addressed in this Section, provide a 30-day written report to the NRC and no changes are required in the operational condition of the plant, and this does not prevent the plant from entry into any operation mode.

2. Radioactive Gaseous Effluent Instrumentation Surveillance

Each radioactive gaseous radiation monitoring instrument in Table 12.2-4 shall be demonstrated operable by performance of the given source check, instrument check, calibration, and functional test operations at the frequency shown in Table 12.2-4.

TABLE 12.2-1

RADIOACTIVE LIQUID EFFLUENT MONITORING INSTRUMENTATION

UNIT 1

Instrument		Operable	Minimum Channels Channels	Total No. of Action
1.	Service Water Effluent Gross Activity Monitor	1	1	10
2.	Discharge Canal Sampler	1	1	12

ACTIONS

ACTION 10 - With less than the minimum number of operable channels, releases via this pathway may continue, provided that at least once per 24 hours grab samples are collected and analyzed for beta or gamma activity at an LLD of less than or equal to 10^{-7} µCi/ml.

ACTION 12 - Operability is verified prior to performing and once a day during planned discharge.

TABLE 12.2-1

RADIOACTIVE LIQUID EFFLUENT MONITORING INSTRUMENTATION

UNITS 2 & 3

	Instrument	Minimum Channels Operable	Total No. of Channels	Action
1.	Service Water Effluent Gross Activity Monitor	1	1	10
2.	Liquid Radwaste Effluent Gross Activity Monitor	1	1	11

ACTIONS

ACTION 10 - With less than the minimum number of operable channels, releases via this pathway may continue, provided that at least once per 12 hours grab samples are collected and analyzed for beta or gamma activity at an LLD of less than or equal to 10^{-7} uCi/ml.

ACTION 11 - With less than a minimum number of operable channels, effluent releases via this pathway may continue, provided that prior to initiating a release, at least 2 independent samples are analyzed, and at least 2 members of the facility staff independently verify the release calculation and discharge valving. Otherwise, suspend release of radioactive effluent via this pathway.

TABLE 12.2-2

RADIOACTIVE LIQUID EFFLUENT MONITORING
INSTRUMENTATION SURVEILLANCE REQUIREMENTS

UNIT 1

Instrument		Functional Test	Calibration (b)(f)	Instrument Check (f)	Source Check
1.	Service Water Effluent Gross Activity Monitor	Q (a,f,e)	E (c)	D	E
2.	Discharge Canal Sampler	(g)			

TABLE 12.2-2

RADIOACTIVE LIQUID EFFLUENT MONITORING
INSTRUMENTATION SURVEILLANCE REQUIREMENTS

UNITS 2 & 3

Instrument		Functional Test(a)(f)	Calibration (b)(f)	Instrument Check (f)	Source Check
1.	Liquid Radwaste Effluent Gross Activity Monitor	Q (e)	E (c)	D	E(d)
2.	Service Water Effluent Gross Activity Monitor	Q (e)	E (c)	D	E

TABLE 12.2-2 (Cont'd)

RADIOACTIVE LIQUID EFFLUENT MONITORING
INSTRUMENTATION SURVEILLANCE REQUIREMENTS

TABLE NOTATIONS

(a) The Instrument Functional Test shall also demonstrate that control room alarm annunciation occurs, if any of the following conditions exist, where applicable.

1. Instrument indicated levels above the alarm setpoint.
2. Circuit failure.
3. Instrument indicates a downscale failure.
4. Instrument controls not set in OPERATE mode.

(b) Calibration shall include performance of a functional test.

(c) Calibration shall include performance of a source check.

(d) Source check shall consist of observing instrument response during a discharge.

(e) Functional tests may be performed by using trip check and test circuitry associated with the monitor chassis.

(f) Functional tests, calibrations, and instrument checks are not required when these instruments are not required to be operable or are tripped. Calibration is not required to be performed more than once every 18 months.

(g) Operability is verified prior to performing discharge and once a day during planned discharge.

TABLE 12.2-3

RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION

UNIT 1

Instrument	Minimum Channels Operable	Total No. of Channels	Applicable Operational Modes	Action
1. Main Chimney SPING Noble Gas Monitors	1	3	*	28
2. Main Chimney Particulate Samplers	1	1	*	27
3. Main Chimney Iodine Samplers	1	1	*	27

TABLE 12.2-3

RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION

UNITS 2 & 3

Instrument	Minimum Channels Operable	Total No. of Channels	Applicable Operational Modes	Action
1. Main Chimney Noble Gas/SPING/ GE Low Range Activity Monitor	1	3	*	20
2. Main Chimney SPING Noble Gas Monitors Mid, Hi Range	1	1	*	26
3. Main Chimney Iodine Sampler	1	1	*	22
4. Main Chimney Particulate Sampler	1	1	*	22
5. Main Chimney Flow Rate Monitor	1	1	*	21
6. Main Chimney Sampler Flow Rate Monitor	1	1	*	21
7. Reactor Building Vent Exhaust Duct Radiation Monitor	1	2	*	24
8. Reactor Building Vent SPING Noble Gas Monitor Low, Mid, High Range	1	1	*	25
9. Reactor Building Vent Flow Rate Monitor	1	1	*	21
10. Reactor Building Vent Sampler Flow Rate Monitor	1	1	*	21
11. Reactor Building Vent Iodine Sampler	1	1	*	22
12. Reactor Building Vent Particulate Sampler	1	1	*	22

TABLE 12.2-3 (Cont'd)

RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION
ACTIONS AND TABLE NOTATIONS

ACTION 20 - With less than the minimum channels operable, effluent releases via this pathway may continue for up to 30 days provided grab samples are taken at least once every 8 hours and analyzed for noble gas within 24 hours. In addition, restore the inoperable equipment to operable status within 7 days, or prepare and submit a report to the commission within the next 30 days outlining the plans, actions taken and procedures to be used to provide for the loss of sampling capability.

ACTION 21 - With the number of operable channels less than the minimum required, effluent releases via this pathway may continue provided that the flow rate is estimated at least once per 4 hours.

ACTION 22 - With less than the minimum channels operable, effluent releases via this pathway may continue provided samples are continuously collected with auxiliary sampling equipment, as required in Table 12.4-1.

ACTION 24 - With less than the minimum channels operable, immediately suspend release of radioactive effluents via this pathway.

ACTION 25 - With less than the minimum channels operable, effluent releases via this pathway may continue provided that the minimum number of operable channels for the Reactor Building Vent Exhaust Duct Radiation Monitor are operable.

ACTION 26- With less than the minimum channels operable, effluent releases via this pathway may continue provided the low range monitor is operable and on scale. Restore the inoperable equipment to operable status within 21 days, or prepare and submit a report to the commission pursuant to Technical Specification 6.6.B (Section 6.6.A in Upgraded Technical Specifications) within the next 30 days outlining the plans, actions taken and procedures to be used to provide for the loss of sampling capability of the system.

ACTION 27- The main chimney SPING monitor may be out-of-service for calibration and maintenance provided that particulate and iodine samples are taken and analyzed. The samples shall be collected using alternate filter holders and pumps connected to the main chimney sample stream.

ACTION 28 - With less than the minimum channels operable, effluent releases via this pathway may continue provided daily noble gas samples are taken and analyzed daily. Restore the inoperable equipment to operable status within 30 days. If service can not be returned, document equipment availability difficulties within the Radioactive Effluent Release Report for the period including actions taken in response to the equipment and procedures used to provide for the loss of sampling capability of the system.

* At all times

TABLE 12.2-4

RADIOACTIVE GASEOUS EFFLUENT MONITORING
INSTRUMENTATION SURVEILLANCE REQUIREMENTS

UNIT 1

	Instrument	Functional Test(a)(e)	Calibration (b)	Instrument Check	Source Check	Applicable Operational Modes
1.	Main Chimney SPING Noble Gas Monitor Low Range	Q	E	D	M	*

TABLE 12.2-4

RADIOACTIVE GASEOUS EFFLUENT MONITORING
INSTRUMENTATION SURVEILLANCE REQUIREMENTS

UNITS 2 & 3

Instrument		Functional Test(a)(e)	Calibration (b)(e)	Instrument Check (e)	Source Check	Applicable Operational Modes
1.	Main Chimney Noble Gas Activity Monitor	Q	E	D	M	*
2.	Main Chimney SPING Noble Gas Monitor Lo, Mid, High Range	Q	E	D	M	*
3.	Main Chimney Particulate and Iodine Sampler	N.A.	N.A.	D(c)	N.A.	*
4.	Main Chimney Flow Rate Monitor	Q	E	D	N.A.	*
5.	Main Chimney Sampler Flow Rate Monitor	Q(d)	E	D	N.A.	*
6.	Reactor Bldg Vent Exhaust Duct Radiation Monitor	Q	E	D	Q	*
7.	Reactor Bldg Vent SPING Noble Gas Monitor Lo, Mid, High Range	Q	E	D	M	*
8.	Reactor Bldg Vent Flow Rate Monitor	Q	E	D	N.A.	*
9.	Reactor Bldg Sampler Flow Rate Monitor	Q(d)	E	D	N.A.	*
10.	Reactor Bldg Vent Particulate and Iodine Sampler	N.A.	N.A.	D(c)	N.A.	*

TABLE 12.2-4 (Cont'd)

RADIOACTIVE GASEOUS EFFLUENT MONITORING
INSTRUMENTATION SURVEILLANCE REQUIREMENTS

TABLE NOTATIONS

(a) The Instrument Functional Test shall also demonstrate that control room alarm annunciation occurs, if any of the following conditions exist, where applicable.

1. Instrument indicates levels above the alarm setpoint.

2. Circuit failure.

3. Instrument indicates a downscale failure.

4. Instrument controls not set in OPERATE mode.

(b) Calibration shall include performance of a functional test.

(c) Instrument check to verify operability of sampler; that the sampler is in place and functioning properly.

(d) Functional test shall be performed on local switches providing low flow alarm.

(e) Functional tests, calibrations, and instrument checks are not required when these instruments are not required to be operable or are tripped. Calibration is not required to be performed more than once every 18 months.

* At all times.

12.2.C Liquid And Gaseous Effluents Instrumentation Bases

1. The radioactive liquid and gaseous effluent instrumentation is provided to monitor the release of radioactive materials in liquid and gaseous effluents during releases. The alarm setpoints for the instruments are provided to ensure that the alarms will occur prior to exceeding the limits of RETS.

12.3 LIQUID EFFLUENTS

12.3.A Liquid Effluents Limits and Reporting Operability

1. Concentration in Unrestricted Areas

The concentration of radioactive material released from the site to unrestricted areas (at or beyond the site boundary, Dresden Station ODCM Annex, Appendix F, Figure F-1) shall be limited to the concentrations specified in Appendix B, Table 2, Column 2 to 10CFR20.1001-20.2402[1], with the Table 12.3-1 values for noble gases.

With the concentration of radioactive material released from the site to unrestricted areas exceeding the above limits, without delay decrease the release rate of radioactive materials and/or increase the dilution flow rate to restore the concentration to within the above limits.

2. Dose from Liquid Effluents

The dose or dose commitment above background to a member of the public from radioactive materials in liquid effluents released to unrestricted areas (at or beyond the site boundary) from the site shall be limited to the following:

1. During any Calendar Quarter:

   (1) Less than or equal to 3 mrem to the whole body.
   (2) Less than or equal to 10 mrem to any organ.

2. During any Calendar Year:

   (1) Less than or equal to 6 mrem to the whole body.
   (2) Less than or equal to 20 mrem to any organ.

3. With the calculated dose from the release of radioactive materials in liquid effluents exceeding any of the above limits, prepare and submit to the Commission within 30 days a Special Report which identifies the cause(s) and defines the corrective actions taken and the proposed actions to be taken to ensure that future releases are in compliance with Sections 12.3.A.2.1 and 12.3.A.2.2. This is in lieu of a Licensee Event Report.

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[1]Upon technical specification approval, ten (10) times the Appendix B value may be used to determine the maximum instantaneous liquid release.

12.3.A Liquid Effluents Limits and Reporting Operability
(Cont'd)

4. With the calculated dose from the release of radioactive materials in liquid effluents exceeding the limits of Sections 12.3.A.2.1 or 12.3.A.2.2., prepare and submit a Special Report to the Commission within 30 days and limit the subsequent releases such that the dose or dose commitment to a member of the public from all uranium fuel cycle sources is limited to less than or equal to 25 mrem to the total body or any organ (except thyroid, which is limited to less than or equal to 75 mrem) over 12 consecutive months. This Special Report shall include an analysis which demonstrates that radiation exposures to all real individuals from all uranium fuel cycle sources (including all effluent pathways and direct radiation) are less than the 40 CFR Part 190 Standard. Otherwise obtain a variance from the Commission to permit releases which exceed the 40 CFR Part 190 Standard. The radiation exposure analysis contained in the Special Report shall use methods prescribed in the ODCM. This report is in lieu of a Licensee Event Report.

5. When the projected annual whole body or any internal organ dose computed at the nearest downstream community water system is equal to or exceeds 2 mrem from all radioactive materials released in liquid effluents from the Station, prepare and submit a Special Report within 30 days to the operator of the community water system. The report is prepared to assist the operator in meeting the requirements of 40 CFR Part 141, EPA Primary Drinking Water Standards. A copy of this report will be sent to the NRC. This is in lieu of a Licensee Event Report.

3. Dose Projections

At all times during processing prior to discharge to the environs, process and control equipment provided to reduce the amount or concentration of radioactive materials shall be operated when the projected dose due to liquid effluent releases to unrestricted areas (Dresden Station ODCM Annex, Appendix F, Figure F-1), when averaged over 31 days, exceeds 0.13 mrem to the total body or 0.42 mrem to any organ.

12.3.A Liquid Effluents Limits and Reporting Operability (Cont'd)

4. Liquid Radioactive Waste Treatment System

If liquid waste has to be or is being discharged without treatment as required above, prepare and submit to the Commission with 30 days, a report which includes the following information.

1. Identification of the defective equipment.

2. Cause of the defect in the equipment.

3. Action(s) taken to restore the equipment to an operating status.

4. Length of time the above requirements were not satisfied.

5. Volume and curie content of the waste discharged which was not processed by the appropriate equipment but which required processing.

6. Action(s) taken to prevent a recurrence of equipment failures.

This is in lieu of a Licensee Event Report.

5. System Operability and Plant Operations

In the event a limit and/or associated action requirements identified in Sections 12.3.A and 12.3.B cannot be satisfied because of circumstances in excess of those addressed in this Section, no changes are required in the operational condition of the plant, and this does not prevent the plant from entry into any operational mode.

12.3.B Liquid Effluents Surveillance

1. Concentration in Unrestricted Areas

The concentration of radioactive material in unrestricted areas shall be determined to be within the prescribed limits by obtaining representative samples in accordance with the sampling and analysis program specified in Table 12.3-2. The sample analysis results will be used with the calculational methods in the ODCM to determine that the concentrations are within the limits of Section 12.3.A.1.

12.3.B Liquid Effluents Surveillance (Cont'd)

2. Dose from Liquid Effluents

The dose contribution from measured quantities of radioactive material shall be determined by calculation at least once per 31 days and cumulative summation of these total body and organ dosed shall be maintained for each calendar quarter.

Doses computed at the nearest community water system will consider only the drinking water pathway and shall be projected using the methods prescribed in ODCM, at least once per 92 days.

3. Dose Projections

Doses due to liquid releases to unrestricted areas (at or beyond the site boundary) shall be projected at least once per 31 days in accordance with the ODCM.

TABLE 12.3-1

ALLOWABLE CONCENTRATION OF DISSOLVED OR ENTRAINED NOBLE GASES RELEASED FROM THE SITE TO UNRESTRICTED AREAS IN LIQUID WASTE

NUCLIDE	AC(μCi/ml)*
Kr-85m	2×10^{-4}
Kr-85	5×10^{-4}
Kr-87	4×10^{-5}
Kr-88	9×10^{-5}
Ar-41	7×10^{-5}
Xe-131m	7×10^{-4}
Xe-133m	5×10^{-4}
Xe-133	6×10^{-4}
Xe-135m	2×10^{-4}
Xe-135	2×10^{-4}

* Computed from Equation 20 of ICRP Publication 2 (1959), adjusted for infinite cloud submersion in water, and R = 0.01 rem/week, density = 1.0 g/cc and Pw/Pt = 1.0.

TABLE 12.3-2

RADIOACTIVE LIQUID WASTE SAMPLING AND ANALYSIS PROGRAM

UNIT 1

LIQUID RELEASE TYPE	SAMPLING FREQUENCY(6)	MINIMUM ANALYSIS FREQUENCY(6)	TYPE OF ACTIVITY ANALYSIS	LOWER LIMIT OF DETECTION (LLD)[1] (μCi/ml)
A. Service Water Releases (4)	M	M	I-131	$1x10^{-6}$
	M (Grab Sample)	M	Principal Gamma Emitters[5]	$5x10^{-7}$
	M (Grab Sample)	M	Dissolved & Entrained Gases[6] Gamma Emmitters[5]	$1x10^{-5}$
	M (Grab Sample)	M (Composite)	H-3	$1x10^{-5}$
			Gross Alpha	$1x10^{-7}$
	Q (Grab Sample)	Q	Sr-89, Sr-90 Fe-55 (Gamma Emitters)	$5x10^{-8}$
				$1x10^{-6}$

LIQUID RELEASE TYPE	SAMPLING FREQUENCY(6)	MINIMUM ANALYSIS FREQUENCY(6)	TYPE OF ACTIVITY ANALYSIS	LOWER LIMIT OF DETECTION (LLD)[1] (μCi/ml)
B. Above Ground Liquid Storage Tanks (7)	T	T	Principal Gamma Emitters[5]	$5x10^{-7}$
			Dissolved & Entrained Gases[6] Gamma Emmitters[5]	$1x10^{-5}$

TABLE 12.3-2
RADIOACTIVE LIQUID WASTE SAMPLING AND ANALYSIS PROGRAM
UNITS 2 & 3

LIQUID RELEASE TYPE	SAMPLING FREQUENCY(6)	MINIMUM ANALYSIS FREQUENCY(6)	TYPE OF ACTIVITY ANALYSIS	LOWER LIMIT OF DETECTION (LLD)[1] (µCi/ml)
A. Batch Release Tanks	Prior to Each Batch	Prior to Each Batch	Principal Gamma Emitters[5] I-131	$5x10^{-7}$ $1x10^{-6}$
	Prior to Each Batch	M Composite[2]	Gross Alpha H-3	$1x10^{-7}$ $1x10^{-5}$
	Prior to Each Batch	Q Composite [2]	Fe-55 Sr-89, Sr-90	$1x10^{-6}$ $5x10^{-6}$
	Prior to One Batch/M	M	Dissolved Entrained Gases [6] (Gamma Emmitters)	$1x10^{-5}$
B. Plant Continuous Releases (4)	M[3] (Grab Sample)	M[3]	I-131	$1x10^{-6}$
	M[3] (Grab Sample)	M[3]	Principal Gamma Emitters [5]	$5x10^{-7}$
	M[3] (Grab Sample)	M[3]	Dissolved & Entrained Gases[6] Gamma Emmitters[5]	$1x10^{-5}$
	M[3] (Grab Sample)	M[3]	H-3	$1x10^{-5}$
			Gross Alpha	$1x10^{-7}$
	Q[3] (Grab Sample)	Q[3]	Sr-89, Sr-90	$5x10^{-6}$
			Fe-55 (Gamma Emitters)	$1x10^{-6}$

LIQUID RELEASE TYPE	SAMPLING FREQUENCY(6)	MINIMUM ANALYSIS FREQUENCY(6)	TYPE OF ACTIVITY ANALYSIS	LOWER LIMIT OF DETECTION (LLD)[1] (µCi/ml)
C. Above Ground Liquid Storage Tanks (7)	T	T	Principal Gamma Emitters [5]	$5x10^{-7}$
			Dissolved & Entrained Gases[6] Gamma Emmitters[5]	$1x10^{-5}$

TABLE 12.3-2 (Cont'd)
TABLE NOTATION

1. The LLD is defined in the ODCM.

2. A composite sample is one in which the quantity of liquid samples is proportional to the quantity of liquid waste discharged and in which the method of sampling employed results in a specimen which is representative of the liquids released.

3. If the alarm setpoint of the service water effluent monitor as determined in the ODCM is exceeded, the frequency of analysis shall be increased to daily until the condition no longer exists.

4. A batch release is the discharge of liquid wastes of a discrete volume. Prior to sampling for analyses, each batch shall be isolated and then thoroughly mixed to assure representative sampling. A continuous release is the discharge of liquid wastes of a nondiscrete volume; e.g., from a volume or system that has an input flow during the release.

5. The principal gamma emitters for which the LLD specification applies exclusively are the following radionuclides: Mn-54, Fe-59, Co-60, Zn-65, Co-58, Mo-99, Cs-134, Cs-137, Ce-141, and Ce-144. Other peaks which are measurable and identifiable by gamma ray spectrometry together with the above nuclides, shall be also identified and reported when the actual analysis is performed on a sample. Nuclides which are below the LLD for the analyses shall not be reported as being present at the LLD level for that nuclide.

6. The dissolved and entrained gases (gamma emitters) for which the LLD specification applies exclusively are the following radionuclides: Kr-87, Kr-88, Xe-133, Xe-133m, Xe-135, and Xe-138. Other dissolved and entrained gases (gamma emitters) which are measurable and identifiable by gamma ray spectrometry, together with the above nuclides, shall also be identified and reported when an actual analysis is performed on a sample. Nuclides which are below the LLD for the analyses shall not be reported as being present at the LLD level for that nuclide.

7. A sample(s) from:
   Unit 1: Each of the above-grade liquid waste tanks,
   Units 2 & 3: The Waste Sample Tanks, Floor Drain Sample Tanks and the Waste Surge Tanks, shall be taken, analyzed, and recorded every 72 hours. If no additions to a tank have been made since the last sample, the tank need not be sampled until the next addition.

12.3.C LIQUID EFFLUENTS BASES

1. Concentration

This specification is provided to ensure that the concentration of radioactive materials released in liquid waste effluents from the site to unrestricted areas will be less than the concentration levels specified in Appendix B, Table 2, Column 2 to 10CFR20.1001-20.2402.

2. Dose

This specification is provided to implement the requirements of Sections II.A, III.A and IV.A of Appendix I, 10 CFR Part 50. The operational requirements implements the guides set forth in Section II.A of Appendix I. The statements provide the required operating flexibility and at the same time implement the guides set forth in Section IV.A of Appendix I to assure that the releases of radioactive material in liquid effluents will be kept "as low as reasonably achievable". The dose calculations in the ODCM implement the requirements in Section III.A of Appendix I that conformance with the guides of Appendix I be shown by calculational procedures based on models and data such that the actual exposure of an individual through appropriate pathways is unlikely to be substantially underestimated. The equations specified in the ODCM for calculating the doses due to the actual release rates of radioactive materials in liquid effluents will be consistent with the methodology provided in Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I", Revision 1, October 1977 and Regulatory Guide 1.113, "Estimating Aquatic Dispersion of Effluents from Accidental and Routine Reactor Releases for the Purpose of Implementing Appendix I", April 1977. NUREG-0113 provides methods for dose calculations consistent with Reg Guide 1.109 and 1.113.

3. Liquid Waste Treatment

The operability of the liquid radwaste treatment system ensures that this system will be available for use whenever liquid effluents require treatment prior to release to the environment. The requirement that the appropriate portions of this system be used when specified provides assurance that the releases of radioactive materials in liquid effluents will be kept "as low as reasonably achievable". This specification implements the requirements of 10 CFR Part 50.36a, General Design Criterion 60 of Appendix A to 10 CFR Part 50 and design objective Section 11.D of Appendix I to 10 CFR Part 50.

12.3.C LIQUID EFFLUENTS BASES - (Continued)

4. Mechanical Vacuum Pump

The purpose of isolating the mechanical vacuum line is to limit release of activity from the main condensor. During an accident, fission products would be transported from the reactor through the main steam line to the main condenser. The fission product radioactivity would be sensed by the main steamline radioactivity monitors which initiate isolation.

12.4 GASEOUS EFFLUENTS

A. Gaseous Effluents Limits and Reporting Operability

1. Dose Rate

The dose rate in unrestricted areas at or beyond the site boundary (Dresden Station ODCM Annex, Appendix F, Figure F-1) due to radioactive materials released in gaseous effluents from the site shall be limited to the following.

1. For Noble Gases:

   (1) Less than a dose rate of 500 mrem/year to the whole body.
   (2) Less than a dose rate of 3000 mrem/year to the skin.

2. For iodine-131, for iodine-133, tritium and for all radionuclides in particulate form with half-lives greater than 8 days, less than a dose rate of 1500 mrem/year.

3. If the dose rates exceed the above limits, without delay decrease the release rates to bring the dose rates within the limits, and provide notification to the Commission (per 10 CFR Part 20.2203).

2. Noble Gas Dose

The air dose in unrestricted areas at or beyond the site boundary due to noble gases released in gaseous effluents from the unit shall be limited to the following:

1. For Gamma Radiation

   (1) Less than or equal to 5 mrad during any calendar quarter.
   (2) Less than or equal to 10 mrad during any calendar year.

2. For Beta Radiation

   (1) Less than or equal to 10 mrad during any calendar quarter.
   (2) Less than or equal to 20 mrad during any calendar year.

3. With the calculated air dose from radioactive noble gases in gaseous effluents exceeding any of the above limits, prepare and submit to the Commission within 30 days, a Special Report which identifies the cause(s) for exceeding the limit(s) and defines the corrective actions to be taken to ensure that future releases are in compliance with Sections 12.4.A.2.1 and 12.4.A.2.2. This is in lieu of a Licensee Event Report.

12.4.A Gaseous Effluents Limits and Reporting Operability (Cont'd)

4. With the calculated air dose from radioactive noble gases in gaseous effluents exceeding the limits of Sections 12.4.A.2.1 or 12.4.A.2.2, prepare and submit a Special Report to the Commission within 30 days and limit the subsequent releases such that the doses or dose commitment to a member of the public from all uranium fuel cycle sources is limited to less than or equal to 25 mrem to the total body or any organ (except thyroid, which is limited to less than or equal to 75 mrem) over 12 consecutive months. This Special Report shall include an analysis which demonstrates that radiation exposures to all members of the public from all uranium fuel cycle sources (including all effluent pathways and direct radiation) are less than 40 CFR Part 190 Standard. Otherwise, obtain a variance from the Commission to permit releases which exceed the 40CFR Part 190 Standard. The radiation exposure analysis contained in the Special Report shall use the methods prescribed in the ODCM. This report is in lieu of a Licensee Event Report.

3. Iodine-131, Iodine-133, Tritium, and Particulate Dose

The dose to a member of the public in unrestricted areas at or beyond the site boundary from iodine-131, iodine-133, tritium, and all radionuclides in particulate form with half-lives greater than 8 days in gaseous effluents released from the unit shall be limited to the following.

1. Less than or equal to 7.5 mrem to any organ during any calendar quarter.

2. Less than or equal to 15 mrem to any organ during any calendar year.

3. With the calculated dose from the release of iodine-131, iodine-133, tritium, and all radionuclides in particulate form with half-lives greater than 8 days in gaseous effluents exceeding any of the above limits, prepare and submit to the Commission within 30 days, a Special Report which identifies the cause(s) for exceeding the limit and defines the corrective actions taken to ensure that future releases are in compliance with Section 12.4.A.3.1 and 12.4.A.3.2. This is in lieu of a Licensee Event Report.

4. With the calculated dose from the release of iodine-131, iodine-133, tritium, and all radionuclides in particulate form with half-lives greater than 8 days in gaseous effluents exceeding the limits of Sections 12.4.A.3.1. or 12.4.A.3.2., prepare and submit a Special Report to the Commission within 30 days and limit subsequent releases such that the dose or dose commitment to a

12.4.A Gaseous Effluents Limits and Reporting Operability (Cont'd)

member of the public from all uranium fuel sources is limited to less than or equal to 25 mrem to the total body or organ (except the thyroid, which is limited to less than or equal to 75 mrem) over 12 consecutive months. This Special Report shall include an analysis which demonstrates that radiation exposures to all members of the public from all uranium fuel cycle sources (including all effluent pathways and direct radiation) are less than the 40 CFR Part 190 Standard. Otherwise, obtain a variance from the Commission to permit releases which exceed the 40 CFR Part 190 Standard. The radiation exposure analysis contained in the Special Report shall use the methods prescribed in the ODCM. This report is in lieu of a Licensee Event Report.

4. Off-Gas Treatment

1. At all times during processing for discharge to the environs, process and control equipment provided to reduce the amount of concentration of radioactive materials shall be operated.

2. The above specification shall not apply for the Off-Gas Charcoal Adsorber Beds below 30 percent of rated thermal power.

3. The recombiner shall be operable whenver the reactor is operating at a pressure greater than 900 psig.

4. The recombiner may be inoperable for 48 hours.

5. With either the recombiners inoperable, or all charcoal beds by-passed for more than 7 days in a calendar quarter while operating above 30 percent of the rated thermal power, prepare and submit to the Commission within 30 days a Special Report which includes the following information.

a. Identification of the defective equipment.

b. Cause of the defect in the equipment.

c. Action(s) taken to restore the equipment to an operating status.

d. Length of time the above requirements were not satisfied.

e. Volume and curie content of the waste discharged which was not processed by the inoperable equipment but which required processing.

12.4.A Gaseous Effluents Limits and Reporting Operability (Cont'd)

f. Action(s) taken to prevent a recurrence of equipment failures.

This is in lieu of a Licensee Event Report.

5. Main Condenser Air Ejector

The release rate of the sum of the activities from the noble gases measured at the main condenser air ejector shall be limited to 100 microcuries/sec per MWt (after 30 minutes decay) at all times. With the release rate of the sum of the activities from noble gases at the main condenser air ejector exceeding 100 microcuries/sec per MWt (after 30 minutes decay), restore the release rate to within its limits within 72 hours, or be in at least HOT STANDBY within the next 12 hours.

6. System Operability and Plant Operations

In the event a limit and/or associated action requirements identified in Sections 12.4.A and 12.4.B cannot be satisfied because of circumstances in excess of those addressed in this Section, no changes are required in the operational condition of the plant, and this does not prevent the plant from entry into any operational mode.

12.4.B Gaseous Effluents Surveillance

1. Dose Rate

The dose rates due to radioactive materials released in gaseous effluents from the site shall be determined to be within the prescribed limits by obtaining representative samples in accordance with the sampling and analysis program specified in Table 12.4-1. The dose rates are calculated using methods prescribed in the ODCM.

2. Noble Gas Dose

The air dose due to releases of radioactive noble gases in gaseous effluents shall be determined to be within the prescribed limits by obtaining representative samples in accordance with the sampling and analysis program specified in Sections A and B of Table 12.4-1. The allocation of effluents between units having shared effluent control system and the air doses are determined using methods prescribed in the ODCM at least once ever 31 days.

3. Iodine-131, Iodine-133, Tritium and Particulate Dose

The dose to a member of the public due to releases of iodine-131, iodine-133, tritium, and all radionuclides in particulate form with half-lives greater than 8 days shall be determined to be within the prescribed limits by obtaining representative samples in accordance with the sampling and analysis program specified in Table 12.4-1.

For radionuclides not determined in each batch or weekly composite, the dose contribution to the current calendar quarter cumulative summation may be estimated by assuming an average monthly concentration based on the previous monthly or quarterly composite analyses. However, for reporting purposes, the calculated dose contributions shall be based on the actual composite analyses when possible.

The allocation of effluents between units having shared effluent control systems and the doses are determined using the methods prescribed in the ODCM at least once every 31 days.

4. Off-Gas Treatment

Doses due to treated gases released to unrestricted areas at or beyond the site boundary shall be projected at least once per 31 days in accordance with the ODCM.

12.4.B Gaseous Effluents Surveillance - Continued

5. Noble Gases at the Main Condenser Air Ejector

The radioactivity release rate of noble gases at (near) the outlet of the main condenser air ejector shall be continuously monitored. The release rate of the sum of the activities from noble gases from the main condenser air ejector shall be determined to be within the limits of 12.4.A at the following frequencies by performing an isotopic analysis of a representative sample of gases taken at the recombiner outlet, or at the air ejector outlet if the recombiner is by-passed.

1. At least once per 31 days.

2. Within 4 hours following an increase, as indicated by the main condenser air ejector noble gas activity monitor, or greater than 50%, after factoring out increases due to changes in thermal power level and off-gas flow, in the nominal steady -state fission gas release from the primary coolant.

Table 12.4-1

RADIOACTIVE GASEOUS WASTE SAMPLING
AND ANALYSIS PROGRAM
UNIT 1

GASEOUS RELEASE TYPE	SAMPLING FREQUENCY	MINIMUM ANALYSIS FREQUENCY	TYPE OF ACTIVITY ANALYSIS	LOWER LIMIT OF DETECTION (LLD)[1] (µCi/ml)
A. Main Chimney	M (Grab Sample)	M	Principal Gamma Emitters [5] Tritium Noble Gases [7]	$1x10^{-4}$ $1x10^{-6}$ $1x10^{-6}$
	M[4,6] (Continuous)	M [3,7] Iodine Sample	I-131 I-133	$1x10^{-12}$ $1x10^{-10}$
	M[6] (Continuous)	M [3] Particulate Sample[7]	Principal Gamma Emitters [5]	$1x10^{-11}$
	Q (Continuous)	Q Composite Particulate Sample	Sr-89, Sr-90 Gross Alpha	$1x10^{-11}$

Table 12.4-1

RADIOACTIVE GASEOUS WASTE SAMPLING
AND ANALYSIS PROGRAM
UNITS 2 & 3

GASEOUS RELEASE TYPE	SAMPLING FREQUENCY	MINIMUM ANALYSIS FREQUENCY	TYPE OF ACTIVITY ANALYSIS	LOWER LIMIT OF DETECTION (LLD)[1] (μCi/ml)
A. Main Chimney Reactor Bldg. Vent Stack	M (Grab Sample)	M[2] M	Principal Gamma Emitters[5] Tritium	$1x10^{-4}$ $1x10^{-6}$
B. All Release Types as Listed in A above	Continuous[4]	W[3] Iodine Sample	I-131 I-133	$1x10^{-12}$ $1x10^{-10}$
	Continuous[4]	W[3] Particulate Sample	Principal Gamma Emitters [5] (I-131, others)	$1x10^{-11}$
	Continuous[4]	Q Composite Particulate Sample	Sr-89 Sr-90	$1x10^{-11}$ $1x10^{-11}$
	Continuous[4]	Q Composite Particulate Sample	Gross Alpha	$1x10^{-11}$
C. Main Chimney	Continuous[4]	Noble Gas Monitor	Noble Gases	$1x10^{-6}$
D. Reactor Bldg. Vent Stack	Continuous[4]	Noble Gas Monitor	Noble Gases	$1x10^{-4}$
E. MVRS Process Exhaust Sampler	Continuous[4]	W[6] Iodine Sample	I-131 I-133	$1x10^{-12}$ $1x10^{-10}$
	Continuous[4]	W[6] Particulate Sample	Principal Gamma Emitters [5] (I-131, others)	$1x10^{-11}$
F. MVRS HVAC Exhaust Sampler	Continuous[4]	W[6] Iodine Sample	I-131 I-133	$1x10^{-12}$ $1x10^{-10}$
	Continuous[4]	W[6] Particulate Sample	Principal Gamma Emitters [5] (I-131, others)	$1x10^{-11}$

TABLE 12.4-1 (Cont'd)

RADIOACTIVE GASEOUS WASTE SAMPLING
AND ANALYSIS PROGRAM

TABLE NOTATION

1. The lower limit of detection (LLD) is defined in the ODCM.

2. Sampling and analyses shall also be performed following shutdown, startup, or a thermal power change exceeding 20 percent of rated thermal power in 1 hour unless (1) analysis shows that the dose equivalent I-131 concentration in the primary coolant has not increased more than a factor of 5, and (2) the noble gas activity monitor shows that effluent activity has not increased by more than a factor of 3.

3. Samples shall be changed at least once per 7 days and the analyses completed within 48 hours after removal from the sampler. Sampling shall also be performed within 24 hours following each shutdown, startup, or thermal power level change exceeding 20% of rated thermal power in one hour. This requirement does not apply if 1) analysis shows that the dose equivalent I-131 concentration in the primary coolant has not increased more than a factor of 5, and 2) the noble gas activity monitor shows that effluent activity has not increased by more than a factor of 3. When samples collected for 24 hours are analyzed, the corresponding LLD's may be increased by a factor of 10.

4. The ratio of sample flow rate to the sampled stream flow rate shall be known.

5. The principal gamma emitters for which the LLD specification applies exclusively are the following radionuclides: Kr-87, Kr-88, Xe-133, Xe-133m, Xe-135, and Xe-138 for gaseous emissions, and Mn-54, Fe-59, Co-60, Zn-65, Co-58, Mo-99, Cs-134, Cs-137, Ce-141, and Ce-144 for particulate emissions. Other peaks which are measurable and identifiable by gamma ray spectrometry, together with the above nuclides, shall be also identified and reported when an actual analysis is performed on a sample. Nuclides which are below the LLD for the analyses shall not be reported as being present at the LLD level for the nuclide.

6. Analysis frequency shall be increased to 1/week if release rates exceed 1% of any applicable limit referenced in the ODCM, when added to Units 2 and 3 airborne effluents.

12.4.C Gaseous Effluents Bases

1. Gaseous Effluents - Dose

This Section is provided to ensure that the dose at the unrestricted area boundary from gaseous effluents from the units on site will be within the annual dose limits of 10CFR20 for unrestricted areas. These limits provide reasonable assurance that radioactive material discharged in gaseous effluents will not result in the exposure of an individual in an unrestricted area to annual average concentrations exceeding the limits specified in Appendix B, Table 2 of 10CFR20.1001-2402. The release rate limits restrict, at all times, the corresponding gamma and beta dose rates above background to an individual at or beyond the unrestricted area boundary to less than or equal to 500 mrem/year to the total body or to less than or equal to 3000 mrem/year to the skin. These release rate limits also restrict, at all times, the corresponding thyroid dose rate above background via the inhalation pathway to less than or equal to 1500 mrem/year. For purposes of calculation doses resulting from airborne releases, the main chimney is considered to be an elevated release point and the reactor building vent stack is considered to be a mixed mode release point.

2. Dose, Noble Gases

This Section is provided to implement the requirements of Sections II.B, III.A and IV.A of Appendix I, 10 CFR Part 50. The Operability Requirements implement the guides set forth in Section II.3 of Appendix I. The statements provide the required operating flexibility and at the same time implement the guides set forth in Section IV.A of Appendix I to assure that the releases of radioactive material in gaseous effluents will be kept "as low as is reasonably achievable." The surveillance requirements implement the requirements in Section III.A of Appendix I that conformance with the guides of Appendix I is to be shown by calculational procedures based on models and data such that the actual exposure of an individual through the appropriate pathways is unlikely to be substantially underestimated. The dose calculations established in the ODCM for calculating the doses due to the actual release rates of radioactive noble gases in gaseous effluents will be consistent with the methodology provided in Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I," Revision 1, October 1977 and Regulatory Guide 1.111, "Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases from Light-Water Cooled Reactors," Revision 1, July 1977. NUREG-0133 provides methods for dose calculations consistent with Regulatory Guides 1.109 and 1.111.

12.4.C Gaseous Effluents Bases (Cont'd)

3. Dose, Radioiodines, Radioactive Material in Particulate Form and Radionuclides Other than Noble Gases

This Section is provided to implement the requirements of Sections II.C, III.A and IV.A of Appendix I, 10 CFR Part 50. The Operability Requirements are the guides set forth in Section II.C of Appendix I. The statements provide the required operating flexibility and at the same time implement the guides set forth in Section IV.A of Appendix I to assure that the releases of radioactive materials in gaseous effluents will be kept "as low as reasonably achievable." The ODCM calculational methods specified in the surveillance requirements implement the requirements in Section III.A of Appendix I that conformance with the guides of Appendix I be shown by calculational procedures based on models and data such that the actual exposure of an individual through appropriate pathways is unlikely to be substantially underestimated. The ODCM calculational methods approved by NRC for calculating the doses due to the actual release rates of the subject materials are required to be consistent with the methodology provided in Regulatory Guide 1.109. "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I", Revision 1, October 1977 and Regulatory Guide 1.111, "Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases from Light-Water-Cooled Reactors," Revision 1, July 1977. These equations also provide for determining the actual doses based upon the historical average atmospheric conditions. The release rate limits for radioiodines, radioactive material in particulate form and radionuclides other than noble gases are dependent on the existing radionuclide pathways to man, in the unrestricted area. The pathways which were examined in the development of these limits were: 1) individual inhalation of airborne radionuclides, 2) deposition of radionuclides onto green leafy vegetation with subsequent consumption by man and 3) deposition onto grassy areas where milk animals graze with consumption of the milk by man.

4. Gaseous Waste Treatment

The operability of the gaseous waste treatment which reduces amounts or concentrations of radioactive materials ensures that the system will be available for use whenever gaseous effluents require treatment prior to release to the environment. The requirement that the appropriate portions of this system be operable when specified provides reasonable assurance that the releases of radioactive materials in gaseous effluents will be kept "as low as reasonably achievable". This specification implements the requirements of 10 CFR Part 50.36a, General Design Criterion 60 of Appendix A to 10 CFR Part 50, and design objective Section II.D of Appendix I to 10 CFR Part 50.

12.5 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

A. Radiological Environmental Monitoring Program

1. The Radiological Environmental Monitoring Program given in Table 12.5-1 shall be conducted except as specified below.

2. With the Radiological Environmental Monitoring Program not being conducted as specified in Table 12.5-1, prepare and submit to the Commission, in the Annual Radiological Environmental Operating Report, a description of the reasons for not conducting the program as required and the plans for preventing a recurrence. Deviations are permitted from the required sampling schedule if specimens are unobtainable due to hazardous conditions, seasonal unavailability, contractor omission which is corrected as soon as discovered, malfunction of sampling equipment, or if a person who participates in the program goes out of business. If the equipment malfunctions, corrective actions shall be completed as soon as practical. If a person supplying samples goes out of business, a replacement supplier will be found as soon as possible. All deviations from the sampling schedule shall be describe in the Annual Report.

3. When the level of radioactivity in an environmental sampling medium at one or more of the locations specified in the Table 12.5-1 exceeds the limits of the Table 12.5-2 when averaged over any calendar quarter, prepare and submit to the Commission within 30 days from the end of the affected calendar quarter, a Special Report which includes an evaluation of any release conditions, environmental factors or other aspects which caused the limits of the Table 12.5-2 to be exceeded. This report is not required if the measured level of radioactivity was not the result of plant effluents; however in such an event the condition shall be reported and described in the Annual Radiological Environmental Operating Report.

4. With milk samples unavailable from one or more of the sample locations required by Table 12.5-1, identify locations for obtaining replacement samples and add them to the Radiological Environmental Monitoring Program within 30 days. The locations from which samples were unavailable may then be deleted from the monitoring program. In lieu of Licensee Event Report, identify the cause of the unavailability of samples and identify the new location(s) for obtaining replacement samples in the Annual Radiological Environmental Operating Report and also include in the report a revised figure(s) and table reflecting the new location(s).

12.5.A Radiological Environmental Monitoring Program (Cont'd)

5. A census of nearest residences and of animals producing milk for human consumption shall be conducted annually (during the grazing season for animals) to determine their location and number with respect to the site. The nearest residence in each of the 16 meteorological sectors shall also be determined within a distance of five miles. The census shall be conducted under the following conditions:

   1. Within a 2-mile radius from the plant site, enumeration of animals and nearest residences by a door-to-door or equivalent counting technique.

   2. Within a 5-mile radius, enumeration of animals by using referenced information from country agricultural agents or other reliable sources.

6. With a land use census identifying location(s) of animals which yield(s) calculated dose or dose commitment greater than the values currently being calculated in Section 12.4.A.3, the new location(s) shall be added to the Radiological Environmental Monitoring Program within 30 days, if possible.

   The sampling location, having the lowest calculated dose or dose commitment (via the same exposure pathway) may be deleted from this monitoring program after October 31 of the year in which this land use census was conducted.

7. Radiological analyses shall be performed on samples representative of those in Table 12.5-1, supplied as a part of the Interlaboratory Comparison Program which has been approved by the NRC.

8. With analyses not being performed as required, report the corrective actions taken to prevent a recurrence to the Commission in the Annual Radiological Environmental Operating Report.

9. System Operability and Plant Operations

   In the event a limit and/or associated action requirements identified in Sections 12.5.A and 12.5.B cannot be satisfied because of circumstances in excess of those addressed in these Sections, no changes are required in the operational condition of the plant, and this does not prevent the plant from entry into any operational mode.

B. Radiological Environmental Monitoring Surveillance

1. The radiological environmental monitoring samples shall be collected pursuant to Table 12.5-1 from the locations specified in the ODCM and shall be analyzed pursuant to the requirements of Table 12.5-3.

12.5.B Radiological Environmental Monitoring Surveillance (Cont'd)

2. The results of analyses performed on radiological environmental monitoring samples shall be summarized in the Annual Radiological Environmental Operating Report.

3. The land use census shall be conducted at least once per twelve months between the dates of June 1 and October 1 by a door-to-door survey, aerial survey, road survey, or by consulting local agriculture authorities.

4. The results of the land use census shall be included in the Annual Radiological Environmental Operating Report.

5. The results of the analyses performed as part of the required Interlaboratory Comparison Program shall be included in the Annual Radiological Environmental Operating Report. The analyses shall be done in accordance with ODCM Table 11-1.

TABLE 12.5-1
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

EXPOSURE PATHWAY AND/OR SAMPLE	MINIMUM NUMBER OF SAMPLES AND SAMPLE LOCATIONS*	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY OF ANALYSIS
1. AIRBORNE A. Particulates	17 locations	Continuous operation of sampler for a week	Gross beta and gamma isotopic as specified in ODCM Table 11-1.
B. Radioiodine	17 locations	Continuous operation of sampler for two weeks	I-131 as specified in ODCM Table 11-1.
2. DIRECT RADIATION	42 locations (Minimum of two TLDs per packet)	Quarterly	
3. WATERBORNE A. Surface Water	2 locations	Monthly composite of weekly collected samples	Gamma Isotopic analysis of each composite sample
B. Sediment	1 downstream location in receiving body of water	Annually	Gamma Isotopic analysis of each sample
C. Plant Cooling Water	Intake, Discharge	Weekly Composite	Gross Beta analysis of each sample
4. INGESTION A. Milk	2 locations	At least once weekly when animals are on pasture; at least once per month at other times	I-131 analysis of each sample
B. Fish	1 location in receiving body of water	Semiannually	Gamma Isotopic analysis on edible portions

*Sample locations are described in ODCM Chapter 11.

Table 12.5-2

REPORTING LEVELS FOR RADIOACTIVITY
CONCENTRATIONS IN ENVIRONMENTAL SAMPLES

ANALYSIS	WATER (pCi/l)	AIRBORNE PARTICULATE OR GASES (pCi/m^3)	FISH (pCi/Kg, wet)	MILK (pCi/1)	FOOD PRODUCTS (pCi/Kg, wet)
H-3	2×10^4 (see Note 1)				
Mn-54	1×10^3		3×10^4		
Fe-59	4×10^2		1×10^4		
Co-58	1×10^3		3×10^4		
Co-60	3×10^3		2×10^4		
Zn-65	3×10^2		2×10^4		
Zr-Nb-95	4×10^2				
I-131	2	0.9		3	1×10^2
Cs-134	30	10	1×10^3	60	2×10^3
Cs-137	50	20	1×10^3	70	2×10^3
Ba-La-140	2×10^2			3×10^2	

Note: 1) For drinking water samples. This is 40 CFR Part 141 value.

Table 12.5-3
PRACTICAL LOWER LIMITS OF DETECTION (LLD) FOR STANDARD
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

SAMPLE MEDIA	ANALYSIS	(LLD)[D,E] (4.66σ)	UNITS
Airborne "Particulate"	Gross Beta[B]	0.01	pCi/m^3(C)
	Gamma Isotopic	0.01	pCi/m^3(C)
Airborne I-131	Iodine-131	0.10	pCi/m^3(C)
Milk/Public Water	I-131	5[A]	pCi/1
	Cs-134	10	pCi/1
	Cs-137	10(C)	pCi/l
	Tritium	200	pCi/1
	Gross Beta[B]	5	pCi/1
	Gamma Isotopic	20	pCi/1/nuclide
Sediment	Gross Beta[B]	2	pCi/g dry
	Gamma Isotopic	0.2	pCi/g dry
Fish Tissue	I-133-Thyroid	0.1	pCi/g wet
	Cs-134, 137	0.1	pCi/g wet
	Gross Beta[B]	1.0	pCi/g wet
	Gamma Isotopic	0.2	pCi/g wet

Note:
A. 0.5 pCi/l on milk samples collected during the pasture season.
B. Reference to Cs-137
C. 5.0 pCi/1 on milk samples

(Notes continued next two pages)

Table 12.5-3 (Cont'd)

PRACTICAL LOWER LIMITS OF DETECTION (LLD) FOR STANDARD
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

TABLE NOTATION

D. The LLD is the smallest concentration of radioactive material in a sample that will be detected with 95 percent probability with only 5% probability of falsely concluding that a blank observation represents a "real" signal.

For a particular measurement system (which may include radiochemical separation)

$$LLD = \frac{4.66 \cdot (S_b)}{(A) \cdot (E) \cdot (V) \cdot (2.22) \cdot (Y) \cdot (\exp(-\lambda \Delta t)) \cdot (t)}$$

Where:

LLD is the "A priori" lower limit of detection for a blank sample or background analysis as defined above (as pCi per unit mass or volume).

S_b is the square root of the background count or of a blank sample count; is the estimated standard error of a background count or a blank sample count as appropriate (in units of counts).

E is the counting efficiency (as counts per disintegration).

A is the number of gamma rays omitted per disintegration for gamma ray radionuclide analysis (A = 1.0 for gross alpha and tritium measurements).

V is the sample size (in units of mass or volume).

2.22 is the number of disintegrations per minute per picocurie.

Y is the fractional radiochemical yield when applicable (otherwise Y=1.0).

λ is the radioactive decay constant for the particular radionuclide (in units of reciprocal minutes).

Δt is the elapsed time between the midpoint of sample collection and the start time of counting. (t = 0.0 for environmental samples and for gross alpha measurements).

t is the duration of the count (in units of minutes).

The value of "S_b" used in the calculation of the LLD for a detection system shall be based on an actual observed background count or a blank sample count (as appropriate) rather than on an unverified theoretically predicted value. Typical values of "E", "V", "Y", "t" and "Δt" shall be used in the calculation.

Table 12.5-3 (Cont'd)

PRACTICAL LOWER LIMITS OF DETECTION (LLD) FOR STANDARD
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

TABLE NOTATIONS

For gamma ray radionuclide analyses the background counts are determined from the total counts in the channels which are within plus or minus one FWHM (Full Width at Half Maximum) of the gamma ray photopeak energy normally used for the quantitative analysis for that radionuclide. Typical values of the FWHM shall be used in the calculation.

The LLD for all measurements is defined as an "A priori" (before the fact) limit representing the capability of a measurement system and not as an "a posteriori" (after the fact) limit for a particular sample measurement.

E. Other radionuclides which are measurable and identifiable by gamma ray spectrometry, together with the nuclides indicated in Table 12.5-3, shall also be identified and reported when an actual analysis is performed on a sample. Nuclides which are below the LLD for the analyses shall not be reported as being present at the LLD level for that nuclide.

12.5.C Radiological Environmental Monitoring Program Bases

1. Monitoring Program

The radiological environmental monitoring program required by this Section provides measurements of radiation and of radioactive materials in those exposure pathways and for those radionuclides, which lead to the highest potential radiation exposures of individuals resulting from the station operation. This monitoring program thereby supplements the radiological effluent monitoring program by verifying that the measurable concentrations of radioactive materials and levels of radiation are not higher than expected on the basis of the effluent measurements and modeling of the environmental exposure pathways. Program changes may be initiated based on operational experience.

The detection capabilities required by Table 12.5-3 are state-of-the-art for routine environmental measurements in industrial laboratories. The specified lower limits of detection for I-131 in water, milk and other food products correspond to approximately one-quarter of the Appendix I to 10 CFR Part 50 design objective dose-equivalent of 15 mrem/year for atmospheric releases and 10 mrem/year for liquid releases to the most sensitive organ and individual. They are based on the assumptions given in Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I", October 1977, except the change for an infant consuming 330 liter/year of drinking water instead of 510 liters/year.

2. Land Use Census

This Section is provided to ensure that changes in the use of unrestricted areas are identified and that modifications to the monitoring program are made if required by the results of this census. This census satisfies the requirements of Section IV.B.3 of Appendix I to 10 CFR Part 50.

3. Interlaboratory Comparison Program

The requirement for participation in the Interlaboratory Comparison Program is provided to ensure that independent checks on the precision and accuracy of the measurements of radioactive material in environmental sample matrices are performed as part of the quality assurance program for environmental monitoring in order to demonstrate that the results are reasonably valid.

12.6 RECORDKEEPING AND REPORTING

1. Station Operating Records

   1. Records and/or logs relative to the following items shall be kept in a manner convenient for review and shall be retained for at least five years.

      1. Records and periodic checks, inspection and/or calibrations performed to verify the surveillance requirements (See the applicable surveillance in the Instrumentation, Liquid Effluents, Gaseous Effluents, and Radiological Environmental Monitoring Sections) are being met. All equipment failing to meet surveillance requirements and the corrective action taken shall be recorded.

      2. Records of radioactive shipments.

   2. Records and/or logs relative to the following items shall be recorded in a manner convenient for review and shall be retained for the life of the plant.

      1. Records of off-site environmental monitoring surveys.

      2. Records of radioactivity in liquid and gaseous wastes released to the environment.

      3. Records of reviews performed for changes made to the ODCM.

2. Reports

   1. Radioactive Effluent Release Report

      The Radioactive Effluent Release Report covering the operation of the unit during the previous 12 months of operation shall be submitted to the Commission according to the Technical Specifications. The report shall include a summary of the quantities of radioactive liquid and gaseous effluents and solid waste released from the unit. The material provided shall be (1) consistent with the objectives outlined in the ODCM and PCP and (2) in conformance with 10 CFR Part 50.36a and Section IV.B.1 of Appendix I to 10 CFR Part 50.

   2. Annual Radiological Environmental Operating Report

      The Annual Radiological Environmental Operating Report covering the operation of the unit during the previous calendar year shall be submitted according to Technical Specifications. The report shall include summaries, interpretations, and analysis of trends of the results of the Radiological Environmental Monitoring Program for the reporting period. The material provided shall be consistent with the objectives in (1) the ODCM and (2) Sections IV.B.2., IV.B.3, and IV.C of Appendix I to 10 CFR Part 50. A detailed listing of the requirement of the report is given below:

12.6.2 Reports - Continued

(a) Results of environmental sampling summarized on a quarterly basis following the format of Regulatory Guide 4.8 Table 1 (December 1975); (individual sample results will be retained at the station);

In the event that some results are not available for inclusion with the report, the report shall be submitted noting and explaining the reasons for the missing results. Summaries, interpretations, and analysis of trends of the results are to be provided.

(b) An assessment of the monitoring results and radiation dose via the principal pathways of exposure resulting from plant emissions of radioactivity including the maximum noble gas gamma and beta air doses in the unrestricted area. The assessment of radiation doses shall be performed in accordance with the ODCM.

(c) Results of the census to determine the locations of animals producing milk for human consumption, and the pasture season feeding practices at dairies in the monitoring program.

(d) The reason for the omission if the nearest dairy to the station is not in the monitoring program.

(e) An annual summary of meteorological conditions concurrent with the releases of gaseous effluents in the form of joint frequency distributions of wind speed, wind direction, and atmospheric stability.

(f) The results of the interlaboratory comparison program described in Section 12.5.A.7.

(g) The results of the 40 CFR Part 190 uranium fuel cycle dose analysis for each calendar year.

(h) A summary of the monitoring program, including maps showing sampling locations and tables giving distance and direction of sampling locations from the station.

3. Non-Routine Environmental Report

(a) If a confirmed measured radionuclide concentration in an environmental sampling medium averaged over any calendar quarter sampling period exceeds the reporting level given in Table 12.5-2 and if the radioactivity is attributable to plant operation, a written report shall be submitted to the Regional Administrator of NRC Regional Office, with a copy of the Director, Office of Nuclear Reactor Regulation, within 30 days from the end of the quarter. When more than one of the radionuclides in Table 12.5-2 are detected in the medium, the reporting level shall have been exceeded if $SC_i/(RL)_i$ is equal to or greater than 1 where C is the concentration of the i^{th} radionuclide in the medium and RL is the reporting level of radionuclide i.

12.6.2 Reports - Continued

(b) If radionuclides other than those in Table 12.5-2 are detected and are due to plant effluents, a reporting level is exceeded if the potential annual dose to an individual is equal to or greater than the design objective doses of 10 CFR Part 50, Appendix I.

(c) This report shall include an evaluation of any release conditions, environmental factors, or other aspects necessary to explain the anomalous affect.

12.6.3. Offsite Dose Calculation Manual (ODCM)

1. The ODCM shall contain the methodology and parameters used in the calculation of offsite doses due to radioactive gaseous and liquid effluents and in the calculation of gaseous and liquid effluent monitoring Alarm/Trip setpoints and in the conduct of the Radiological Environmental Monitoring Program. The ODCM shall also contain (1) the Radioactive Effluent Controls and Radiological Environmental Monitoring Programs required by Technical Specification Sections 3.2.F, 3.2.G, 3.8.A, 3.8.B and 3.8.E and (2) descriptions of the information that should be included in the Annual Radiological Environmental Operating and Radioactive Effluent Release Reports required by Technical Specifications Sections 6.6.C.1 and 6.6.C.2 (Upgraded Technical Specifications 6.9.A.3 and 6.9.A.4). Methodologies and calculational procedures acceptable to the Commission are contained in NUREG-0133.

   The ODCM shall be subject to review and approval by the Commission prior to initial implementation.

2. Changes to the ODCM:

   (1) Shall be documented and records of reviews performed shall be retained as required by Specification 6.5.B (Upgraded Technical Specification 6.10.B). This documentation shall contain:

      (a) Sufficient information to support the change together with appropriate analyses or evaluations justifying the change(s); and

      (b) A determination that the change will maintain the level of radioactive effluent control required by 10 CFR Part 20.1302, 40 CFR Part 190, 10 CFR Part 50.36a, and Appendix I to 10 CFR Part 50 and not adversely impact the accuracy or reliability of effluent, dose or set point calculations.

   (2) Shall be effective after review and acceptance by the Onsite Review & Investigative Function and the approval of the Station Manager, on the date specified by the Onsite Review and Investigative Function.

12.6.3 Offsite Dose Calculation Manual (ODCM)-(Cont'd)

(3) Shall be submitted to the Commission in the form of a complete, legible copy of the entire ODCM as a part of or concurrent with the Semiannual Radioactive Effluent Release Report for the period of the report in which any change to the ODCM was made effective. Each change shall be identified by markings in the margin of the affected pages, clearly indicating the area of the page that was changed, and shall indicate the date (e.g., month/year) the change was implemented.

12.6.4. Major Changes to Radioactive Waste Treatment Systems (Liquid and Gaseous)

NOTE: This information may be submitted as part of the annual FSAR update.

1. Licensee initiated major changes to the radioactive waste systems may be made provided:

The change is reported in the Monthly Operating Report for the period in which the evaluation was reviewed by the On-Site Review and Investigative Function. The discussion of each change shall contain:

(1) A summary of the evaluation that led to the determination that the change could be made in accordance with 10 CFR Part 50.59;

(2) Sufficient detailed information to support the reason for the change;

(3) A detailed description of the equipment, components, and process involved and the interfaces with other plant systems;

(4) An evaluation of the change which shows the predicted releases of radioactive materials in liquid and gaseous effluents that differ from those previously predicted in the license application and amendments;

(5) A comparison of the predicted releases of radioactive materials in liquid and gaseous effluents to the actual releases for the period in which the changes were made;

(6) An estimate of the exposure to plant operating personnel as a result of the change; and

(7) Documentation of the fact that the change was reviewed and found acceptable by the On-Site Review and Investigative Function.

2. The change shall become effective upon review and acceptance by the On-Site Review and Investigative Function.

DRESDEN NUCLEAR POWER STATION PROCESS CONTROL PROGRAM

Requirements:

Technical Specifications, Section 6.9, Process Control Program
TECH SPECS 6.13, Process Control Program

Special Controls/Reviews:

1. Revisions to this procedure must be Onsite reviewed.

2. Revisions to this procedure must be reviewed by the Radwaste Coordinator.

L. Ferrell
Originator

J. Shelian
Department Procedure Writer

M. Mikota/R. Papach
Technical Reviewer/Verifier

T. Nauman
Authorization

Effective Date

DRESDEN NUCLEAR POWER STATION PROCESS CONTROL PROGRAM

A. SCOPE:

The purpose of the Dresden Nuclear Power Station (DNPS) Process Control Program (PCP) is to establish the process parameters which will provide a reasonable assurance that all Low-Level Radioactive Waste (LLRW) processed at Dresden Station will meet or exceed any and all acceptance criteria for processing, packaging, onsite storage, and shipment of LLRW to Licensed Burial Facilities.

These criteria include all Department of Transportation (DOT), Nuclear Regulatory Commission (NRC), State, and Licensed Burial Facilities' rules and regulations for the processing, packaging, on-site storage, and shipping of LLRW.

Although a Stock Equipment Company Cement Solidification System was installed during 1979, DNPS currently uses Commercial, Vendor - Supplied Processing Systems for the processing of the primary liquid LLRW streams generated by the Station.

Commonwealth Edison requires that all Vendors used to process liquid LLRW at DNPS must meet all applicable Commonwealth Edison Co. quality standards and shall have submitted a Process System Topical Report to the NRC. Furthermore, the vendor solidification/stabilization media must be approved by the Licensed Burial Sites.

B. USER REFERENCES:

1. Technical Specifications, Units 1, 2, & 3.

   a. Section 1.0 Definition of Process Control/Program. *TECH SPECS 1.0, Definition of Process Control Program*

   b. Section 6.9, Process Control Program. *TECH SPECS 6.13, Process Control Program*

2. Procedures.

   a. DAP 02-27, Integrated Reporting Process IRP.

   b. DAP 10-01, Onsite Review and Investigative Function/Plant Operations Review Committee (PORC).

   c. DAP 10-02, 10CFR50.59 Review Screenings and Safety Evaluations.

   d. DOP 2000 Series, Radwaste Operating Procedures.

   e. Vendor Procedures.

B. 3. Commonwealth Edison Program for Implementation of 10 CFR Part 61 and 10 CFR Part 20.311 Dated December 22, 1983.

4. Commonwealth Edison Quality Assurance Manual.

5. 10 CFR Part 20.311, Transfer for Disposal and Manifests.

6. 10 CFR Part 61, Licensing Requirements for the Land Disposal of Radioactive Waste.

7. 10 CFR Part 71, Packaging and Transportation of Radioactive Material.

8. 49 CFR Part 173, General Requirements for Shipments and Packaging.

C. KEY DEFINITIONS:

NOTE

The following definition of the PCP is from Tech Specs 1.0 Definition of Process Control/Program. *TECH SPECS 1.0, Definition of Process Control Program*

1. **PROCESS CONTROL PROGRAM (PCP)** - shall contain the current formulas, sampling, analysis, test and determination to be made to ensure that processing and packaging of actual or simulated wet solid wastes will be accomplished in such a way to assure compliance with 10 CFR Parts 20, 61, and 71, State Regulations, burial ground requirements, and other requirements governing the disposal of solid radioactive waste.

2. **SOLIDIFICATION** - Liquid Waste processed to either a stable or unstable free standing monolith.

D. SUPPLEMENTS:

NONE.

E. POLICY:

1. Records of license reviews performed for changes made to the PCP program shall be maintained for the life of the plant.

2. The PCP shall be approved by the Commission prior to implementation.

3. All waste streams shall be classified per 10 CFR 61.55 and meet the waste characteristics per 10 CFR part 61.56.

4. Station and Vendor Procedures shall be followed to comply with this PCP.

NOTE

Steps E.5 and E.6 are required by Tech Specs 6.9, Process Control Program. *TECH SPECS 6.13, Process Control Program*

E. 5. Changes to the PCP shall be documented. This documentation shall contain:

a. Sufficient information to support the change together with the appropriate analyses of evaluations justifying the change(s), and

b. A determination that the change will maintain the overall conformance of the solidified waste product to existing requirements of Federal, State, or other applicable regulations.

6. Changes shall become effective after review and acceptance by the On-site Review Function, and the approval of the Station Manager per DAP 10-01, Onsite Review and Investigative Function/Plant Operations Review Committee (PORC).

7. Because all solidification is performed by Vendors, the Vendor Process Control Procedures contain the formulas, sampling, analysis, test and determination required to be made to ensure that processing and packaging of waste is accomplished to assure compliance with the required regulations.

8. If any of the PCP criteria are not satisfied, resulting in a defective product, then the shipment of the defective product shall be suspended until a root cause determination has been identified per DAP 02-27, Integrated Reporting Process IRP.

9. Major Changes to Radioactive Waste Treatment Systems may be made provided that the change is reported in the Monthly Operating Report for the period in which the evaluation was reviewed by the On-site Review Function.

a. The discussion of each change shall contain:

(1) A summary of the evaluation that led to the determination that the change could be made in accordance with 10 CFR 50.59, per DAP 10-02, 10CFR50.59 Review Screenings and Safety Evaluations;

(2) Sufficient detailed information to support the reason for the change;

E. 9. a. (3) A detailed description of the equipment, components, and process involved and the interfaces with other plant systems;

(4) An evaluation of the change which shows the predicted quantity of solid waste that differ from those previously predicted in the license application and amendments;

(5) A comparison of the predicted quantity of radioactive materials in solid waste to the actual quantity for the period in which the changes were made;

(6) An estimate of the exposure to plant operating personnel as a result of the change; and

(7) Documentation of the fact that the change was reviewed and found acceptable by the On-Site Review Function.

b. The change shall become effective upon review and acceptance by the On-Site Review Function.

c. The changes may be made by submitting this information as part of the annual RUPSAR update.

d. All references to the Stock Solidification System have been deleted from the PCP, as Dresden presently uses a Vendor Solidification Process only. The Stock Solidification System never functioned as intended and because of changing regulations on the solidification PCP, the use of Contract Vendor Services proved to be more cost effective over using the Stock System.

F. PROCEDURE:

1. VENDOR PROCESS SYSTEM(S):

a. DNPS currently uses Commercial, Vendor supplied, processing systems for the processing of the primary liquid LLRW streams generated by the Station.

b. Commonwealth Edison requires that all Vendors used to process liquid LLRW at DNPS must meet all applicable Commonwealth Edison Co. quality standards and shall have submitted a Process System Topical Report to the NRC. Furthermore, the vendor solidification/stabilization media must be approved by the Licensed Burial Sites.

F. 2. LIQUID WASTE PROCESSING SYSTEM:

a. Liquid radwaste processing consists of dewatering, solidification, Vendor supplied filter/process system, or an evaporative process to treat the following waste streams: spent resin, concentrated liquids, sludges, filter media, filter cartridges and oil.

b. Spent ion-exchange resin is collected in the Spent Resin Tank prior to processing for disposal.

(1) Spent resin may originate from any one of the following systems:

- Condensate.
- Fuel Pool.
- Reactor Water Clean Up.
- Floor Drain Processing System.
- Radwaste Equipment Drain Processing Systems.

(2) Resins are allowed to settle in the Spent Resin Tank and then are discharged to the Vendor Processing System via a resin water slurry.

(3) Vendor resin beds are also used for decontamination of plant systems such as the Spent Fuel Pool, RWCU, and SDC. These resins are then handled by the Vendor Processing System.

c. CONCENTRATED WASTES: In general, various drains and sump discharges are collected in Floor Drain Collector Tank and/or Waste Collector Tank for waste treatment.

(1) Water from these tanks can be sent through a filter or demineralizer prior to being sent to the Max Recycle System where it is concentrated utilizing the Max Recycle Concentrator or Vendor supplied processing systems.

(2) The Max Recycle Concentrator boils off the water into a distillate and a concentrate. The distillate is sent to waste Systems for filtration, demineralization and plant re-use OR discharged to the river. The concentrates are periodically discharged to the vendor processing system for waste treatment.

F. 2. d. FILTER SLUDGES: Filtering devices using precoat media are used at DNPS in a variety of process streams.

(1) These devices are used primarily for the removal of suspended solids from the liquid waste streams.

(2) The precoat material from these devices are routinely removed from the filter vessel and discharged to a Filter Sludge Tank.

(3) Periodically, the filter sludge is discharged to the Vendor Processing System for waste treatment.

e. LUBRICANTS AND/OR OILS: Various lubricants and oils become contaminated as a consequence of normal operating and maintenance activities. These contaminated lubricants/oils are processed for treatment on an as needed basis using a Vendor.

f. FILTER CARTRIDGES: Various filter cartridges are dried and placed into a High Integrity Container(s) (HIC) for disposal or are encapsulated in an In-Situ Liner for waste processing.

g. ACTIVATED HARDWARE: Activated Hardware is stored in the Spent Fuel Pools.

(1) The waste includes items such as: Control Rods, Fuel Channels, and Nuclear Instrumentation.

(2) These items are processed periodically using remote underwater handling equipment provided by a Vendor.

(3) The waste is then put into a liner for shipment and/or storage.

3. DRY ACTIVE WASTE (DAW):

Dry Active Waste such as paper, wood, plastic, cardboard, hoses, cloth and metals, etc. become contaminated as a consequence of normal operating and maintenance activities.

a. DAW is collected, surveyed and sorted for compatible and non-compatible wastes.

b. Contaminated compatible waste is packaged in containers to facilitate on-site pre-compaction and/or off-site super-compaction or incineration.

c. Contaminated Non-compatible DAW is sorted to provide an efficient handling method for waste treatment.

F. 3. d. In addition, DAW items are surveyed for release when applicable.

4. SECONDARY WASTE STREAMS: Periodically, wastes are generated from such sources as decontaminations, tank cleanings, sump cleanings, dried Sewage Treatment Plant Waste, waste oil and other waste from cleanup of inadvertent contaminations.

a. Wastes generated in this manner are sampled on a batch basis.

b. Appropriate formulas for rationing solidification agent to waste are developed on small bench samples, or if the consistency of the waste is known, from established formulas.

c. Secondary waste streams such as DAW (Dry Active Waste) and activated hardware are packaged and handled as a case by case bases. Samples of the above waste streams are obtained and analyzed by DNPS personnel per approved procedures.

5. INSPECTION: All shipping containers are inspected for compliance with DOT, Station, On-site Storage, and/or burial site requirements prior to use.

a. When applicable, containers of Concentrated Waste, Spent Resin and Sludges, are inspected for quality of solidification and/or dewatering requirements.

b. Dewatering requirements for the Station/Burial Site is <1% free standing water.

(1) If free standing water or poor solidification is observed, then samples of the particular series of batches is taken for root cause determination.

(2) Additional samples may be taken, as warranted, to ensure free standing water and solidification requirements are maintained.

c. Process parameters in use during the production of these containers will be investigated and corrective actions taken as warranted.

6. SHIPMENT: All wastes shipped off site are packaged in DOT approved shipping containers.

a. All transport vehicles must meet the appropriate DOT and NRC requirements prior to loading.

b. Packages are inspected and shipments (vehicles) are inspected for compliance with DOT, NRC and Burial Site criterion prior to leaving the site.

G. DISCUSSION:

NONE.

W. WRITER'S REFERENCES:

1. NRC Branch Technical Position on Waste Form.

2. NUREG 0133, Preparation of Radiological Effluent Technical Specifications for Nuclear Power Plants - October 1978.

3. Dresden Final Safety Analysis Report, 11.4, Solid Waste Management System.

6.9 PROCESS CONTROL PROGRAM (PCP)

A. The PCP shall contain the sampling, analysis, and formulation determination by which solidification of radioactive wastes from liquid systems is assured.

B. The PCP shall be approved by the Commission prior to implementation.

C. Licensee initiated changes may be made to the PCP provided the change:

1. Shall be submitted to the Commission in the Semi-Annual Radioactive Effluent Release Report for the period in which the change was made and shall contain:

   a. Sufficiently detailed information to support the change;

   b. A determination that the change did not reduce the overall conformance of the solidified waste product to existing criteria for solid wastes; and

   c. Documentation that the change has been reviewed and found acceptable by the onsite review function.

2. Shall become effective upon review and acceptance by the onsite review function.

FOR INFORMATION ONLY

This page reserved for GENERIC QUAD CITIES ANNEX INDEX

CHAPTER 12.0

All pages in Chapter 12.0 are designated REVISION 1.0

SPECIAL NOTE

Until removal of the Radiological Effluent Technical Specifications has been approved by the Nuclear Regulatory Commission, the requirements of the Technical Specifications shall take precedence over this chapter, should any differences occur.

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12 - 1	1.0	12 - 50	1.0
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CHAPTER 12

RADIOACTIVE EFFLUENT TECHNICAL STANDARDS
(RETS)
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CHAPTER 12

RADIOACTIVE EFFLUENT TECHNICAL STANDARDS (RETS)
LIST OF TABLES

* At present, there is no Table 12.3-2 in this chapter.

12.1 Definitions

12.1.1 Channel Calibration - A Channel Calibration shall be the adjustment, as necessary, of the Channel output such that it responds with the necessary range and accuracy to known values of the parameter which the Channel monitors. The Channel Calibration shall encompass the entire Channel including the sensor and alarm and/or trip functions, and shall include the Channel Functional Test. The Channel Calibration may be perfomed by any series of sequential, overlapping or total Channel steps such that the entire Channel is calibrated.

12.1.2 Channel Check - A Channel Check shall be the qualitative assessment of Channel behavior during operation by observation. This determination shall include, where possible, comparison of the Channel indication and/or status with other indications and/or status derived from independent instrument Channels measuring the same parameter.

12.1.3 Channel Function Test - A Channel Functional Test shall be:

a. Analog Channels - the injection of a simulated signal into the Channel as close to the sensor as practicable to verify Operability including alarm and/or trip functions and Channel failure trips.

b. Bistable Channels - the injection of a simulated signal into the sensor to verify Operability including alarm and/or trip functions.

The Channel Functional Test may be performed by any series of sequential, overlapping or total Channel steps such that the entire Channel is tested.

12.1.4 Dose Equivalent I-131 - Dose Equivalent I-131 is that concentration of I-131 (microcurie/ gram) which alone would produce the same thyroid dose as the quantity and isotopic mixture of I-131, I-132, I-133, I-134, and I-135 actually present. The thyroid dose conversion factors used for this calculation shall be those listed in Table III of TID-14844, "Calculation of Distance Factors For Power and Test Reactor Sites."

12.1.5 Hot Standby - Hot standby means operation with the reactor critical, system pressure less than 1060 psig, the main steam isolation valves closed, and thermal power not exceeding 15%.

12.1.6 Immediate - Immediate means that the required action will be initiated as soon as practicable considering the safe operation of the unit and the importance of the required action.

12.1.7 Member(s) of the Public - Members of the Public means an individual in a controlled or unrestricted area. However, an individual is not a member of the public during any period in which the individual receives an occupational dose.

12.1.8 Modes Switch Interlock - A reactor mode switch selects the proper interlocking for the operating or shutdown condition of the plant. Following are the reactor mode switch positions and interlocks provided:

1. Shutdown - In this position, a reactor scram is initiated, power to the control rod drives is removed, and the reactor protection trip systems have been deenergized for 10 seconds prior to permissive for manual reset.

2. Refuel - In this position, interlocks are established so that one control rod only may be withdrawn when flux amplifiers are set at the proper sensitivity level and the refueling crane is not over the reactor. Also the trips from the turbine control valves, turbine stop valves, main steam isolation valves, and condenser vacuum are bypassed. If the refueling crane is over the reactor, all rods must be fully inserted and none can be withdrawn.

3. Startup/Hot Standby - In this position, the reactor protection scram trips, initiated by condenser low vacuum and main steamline isolation valve closure, are bypassed, the low pressure main steamline isolation valve closure trip is bypassed, and the reactor protection system is energized, with IRM and APRM neutron monitoring system trips and control rod withdrawal interlocks in service.

4. Run - In this position, the reactor system pressure is at or above 825 psig and the reactor protection system is energized with the APRM protection and RBM interlocks in service (excluding the 15% high flux scram).

12.1.9 Offsite Dose Calculation Manual (ODCM) - The Offsite Dose Calculation Manual shall contain the methodology and parameters used in the calculation of offsite doses resulting from radioactive gaseous and liquid effluents, in the calculation of gaseous and liquid effluent monitoring Alarm/Trip Setpoints, and in the conduct of the Radiological Environmental Monitoring Program. The ODCM shall also contain (1) the Radioactive Effluent Controls and Radiological Environmental Monitoring Programs required by Sections 12-5 and (2) descriptions of the information that should be included in the Radioactive Effluent Release Reports and in the Annual Radiological Environmental Operating Reports required by Sections 12.6.2.1 and 12.6.2.2.

12.1.10 Operable - Operability - A system, subsystem, train, component, or device shall be Operable or have Operability when it is capable of performing its specified function(s). Implicit in this definition shall be the assumption that is necessary attendant instrumentation, controls, normal and energency electrical power sources, cooling or seal water, lubrication or other auxiliary equipment that are required for the system, subsystem, train, component or device to perform its function(s) are also capable of performing their related support function(s).

12.1.11 Operating - Operating means that a system, subsystem, train, component or device is performing its intended functions in its required manner.

12.1.12 Operating Cycle - Operating Cycle is the interval between the end of one Refueling Outage for a particular unit and the end of the next subsequent Refueling Outage for the same unit.

12.1.13 Process Control Program (PCP) - The Process Control Program shall contain the current formulas, sampling, analyses, test, and determinations to be made to ensure that processing and packaging of solid radioactive wastes based on demonstrated processing of actual or simulated wet solid wastes will be accomplished in such a way as to assure compliance with 10CFR Parts 20, 61, and 71, State regulations, burial ground requirements, and other requirements governing the disposal of solid radioactive waste.

12.1.14 Protective Instrumentation Definitions - Protective instrumentation definitions are as follows:

a. Channel - A Channel is an arrangement of a sensor and associated components used to evaluate plant variables and produce discrete outputs used in logic. A Channel terminates and loses its identity where individual Channel outputs are combined in a logic.

b. Trip System - A Trip System means an arrangement of instrument Channel trip signals and auxiliary equipment required to initiate action to accomplish a protective trip function. A Trip System may require one or more instrument Channel trip signals related to one or more plant parameters in order to initiate Trip System action. Initiation of Protective Action may require the tripping of a single Trip System or the coincident tripping of two Trip Systems.

c. Protective Action - An action initiated by the protection system when a limit is reached. A Protective Action can be at the Channel or system level.

d. Protective Function - A system protective action which results form the Protective Action of the Channels monitoring a particular plant condition.

12.1.15 Rated Thermal Power - Rated Thermal Power means a steady- state power level of 2511 thermal megawatts.

12.1.16 Reactor Power Operation - Reactor Power Operation is any operation with the mode switch in the Startup/Hot Standby or Run position with the reactor critical and above 1% Rated Thermal Power.

12.1.17 Reactor Vessel Pressure - Reactor Vessel Pressures listed in the Technical Specifications, unless otherwise indicated, are those measured by the reactor vessel steam space detector.

12.1.18 Refueling Outage - Refueling Outage is the period of time between the shutdown of the unit prior to a refueling and startup of the plant subsequent to that refueling. For the purpose of designating frequency of testing and surveillance, a Refueling Outage shall mean a regularly scheduled Refueling Outage; however, where such outages occur within 8 months of the completion of the previous Refueling Outage, the required surveillance testing need not be performed until the next regularly scheduled outage.

12.1.19 Source Check - Source Check is the qualitative assessment of instrument response when the sensor is exposed to a radioactive source.

12.1.20 Definitions Related to Estimating Dose to the Public Using the Appendix I Computer Program:

a. Actual - Refers to using known release data to project the dose to the public for the previous month. This data is stored in the database and used to demonstrate compliance with the reporting requirements of Chapter 12.

b. Projected - Refers to using known release data from the previous month or estimated release data to forecast a future dose to the public. This data is NOT incorporated into the database.

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12.2 INSTRUMENTATION

12.2.1.A Radioactive Liquid Effluent Instrumentation Operability

Applicability: Applies to radioactive effluents from the plant.

The effluent monitoring instrumentation shown in Table 12.2.1 shall be operable with alarm setpoints set to ensure that the limits of Section 12.3 are not exceeded. The alarm setpoints shall be determined in accordance with Section 10.2.

1. With a radioactive liquid effluent monitoring instrument alarm/trip setpoint less conservative than required, without delay suspend the release of radioactive liquid effluents monitored by the affected instrument, or declare the instrument inoperable, or change the setpoint so it is acceptably conservative.

2. With one or more radioactive liquid effluent monitoring instruments inoperable, take the action shown in Table 12.2-1. Exert best efforts to return the instrument to operable status within 30 days and, if unsuccessful, explain in the next Semi-Annual Radioactive Effluent Release Report why the inoperability was not corrected in a timely manner.

12.2.1.B Radioactive Liquid Effluent Instrumentation Surveillance

Applicability: Applies to the periodic measurements of radioactive effluents.

Each radioactive liquid effluent monitoring instrument shown in Table 12.2-2 shall be demonstrated operable by performance of the given source check, instrument check, calibration, and functional test operations at the frequencies shown in Table 12.2-2.

12.2.1.A Radioactive Liquid Effluent Instrumentation Operability

3. In the event a limiting condition for operation and associated action requirements cannot be satisfied because of circumstances in excess of those addressed in the specifications, provide a 30-day written report to the NRC and no changes are required in the operational condition of the plant, and this does not prevent the plant from entry into an operational mode.

12.2.1.B Radioactive Liquid Effluent Instrumentation Surveillance

12.2 2.A Radioactive Gaseous Effluent Instrumentation Operability

The effluent monitoring instrumentation shown in Table 12.2-3 shall be operable with alarm/trip setpoints set to ensure that the limits of Section 12.4 are not exceeded. The alarm/trip setpoints shall be determined in accordance with the Section 10.1.

1. With a radioactive gaseous effluent monitoring instrument alarm/trip set point less conservative than required, without delay suspend the release of radioactive gaseous effluents monitored by the affected instrument, or declare the instrument inoperable, or change the setpoint so it is acceptably conservative.

2. With one or more radioactive gaseous effluent monitoring instruments inoperable, take the action shown in Table 12.2-3. Exert best efforts to return the instrument to operable status within 30 days and, if unsuccessful, explain in the next Semi-Annual Radioactive Effluent Release Report why the inoperability was not corrected in a timely manner. This is in lieu of an LER.

3. In the event a limiting condition for operation and associated action requirements cannot be satisfied because of circumstances in excess of those addressed in the specifications, provide a 30-day written report to the NRC and no changes are required in the operational condition of the plant, and this does not prevent the plant from entry into an operational mode.

12.2.2.B Radioactive Gaseous Effluent Instrumentation Surveillance

Each radioactive gaseous radiation monitoring instrument in Table 12.2-4 shall be demonstrated operable by performance of the given source check, instrument check, calibration, and functional test operations at the frequency shown in Table 12.2-4.

TABLE 12.2-2

RADIOACTIVE LIQUID EFFLUENT MONITORING
INSTRUMENTATION SURVEILLANCE REQUIREMENTS

Instrument	Instrument Check(1)	Calibration(1)(3)	Functional Test(1)(2)	Source Check(1)
Liquid Radwaste Effluent Gross Activity Monitor	D	R	Q (7)	(6)
Service Water Effluent Gross Activity Monitor	D	R	Q (7)	R
Liquid Radwaste Effluent Flow Rate Monitor	(4)	R	NA	NA

Notes

(1) D = once per 24 hours
M = once per 31 days
Q = once per 92 days
R = once per 18 months
S = once per 6 months

(2) The Instrument Functional Test shall also demonstrate that control room alarm annunciation occurs, if any of the following conditions exist, where applicable.

a. Instrument indicates levels above the alarm setpoints.
b. Circuit failure.
c. Instrument indicates a downscale failure.
d. Instrument controls not set in OPERATE mode.

(3) Calibration shall include performance of a functional test.

(4) Instrument Check to verify flow during periods of release.

(5) Calibration shall include performance of a source check.

(6) Source check shall consist of observing instrument response during a discharge.

(7) Functional test may be performed by using trip check and test circuitry associated with the monitor chassis.

TABLE 12.2-1

RADIOACTIVE LIQUID EFFLUENT MONITORING INSTRUMENTATION

Minimum No. of Operable Channels	Total No. of Channels	Parameter	Action[1]
1	1	Service Water Effluent Gross Activity Monitor	A
1	1	Liquid Radwaste Effluent Flow Rate Monitor	C
1	1	Liquid Radwaste Effluent Gross Activity Monitor	B

Notes

Action A: With less than the minimum number of operable channels, releases via this pathway may continue, provided that at least once per 12 hours grab samples are collected and analyzed for beta or gamma activity at an LLD of less than or equal to 10^{-7} uCi/ml.

Action B: With less than the minimum number of operable channels, effluent releases via this pathway may continue, provided that prior to initiating a release, at least 2 independent samples are analyzed in accordance with Section 12.3.A.1, and at least 2 members of the facility staff independently verify the release calculation and discharge valving. Otherwise, suspend release of radioactive effluents via this pathway.

Action C: With less than the minimum number of operable channels, releases via this pathway may continue, provided the flow rate is estimated at least once per 4 hours during actual releases. Pump curves may be utilized to estimate flow.

TABLE 12.2-3

RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION

Minimum No. of Operable Channels[1]	Total No. of Channels	Parameter	Action [2]
1	2	SJAE Radiation Monitors	D
1	2	Main Chimney Noble Gas Activity Monitor	A
1	1	Main Chimney Iodine Sampler	C
1	1	Main Chimney Particulate Sampler	C
1	1	Reactor Bldg. Vent Sampler Flow Rate Monitor	B
1	1	Reactor Bldg. Vent Iodine Sampler	C
1	1	Reactor Bldg. Vent Particulate Sampler	C
1	1	Main Chimney Sampler Flow Rate Monitor	B
1	1	Main Chimney Flow Rate Monitor	B
1	2	Reactor Bldg. Vent Noble Gas Monitor	E
1	1	Main Chimney High Range Noble Gas Monitor	F

Notes

(1) For SJAE monitors, applicable during SJAE operation. For other instrumentation, applicable at all times.

(2) Action A: With the number of operable channels less than the minimum requirement, effluent releases via this pathway may continue, provided grab samples are taken at least once per 8 hour shift and these samples are analyzed within 24 hours.

TABLE 12.2-3 (Con't)

RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION

Action B: With the number of operable channels less than the minimum required, effluent releases via this pathway may continue provided that the flow rate is estimated at least once per 4 hours.

Action C: With less than the minimum channels operable, effluent releases via this pathway may continue provided samples are continuously collected with auxiliary sampling equipment, as required in Table 12.4-1.

Action D: With less than the minimum channels operable, gases from the main condenser off gas system may be released to the environment for up to 72 hours provided at least one chimney monitor is operable; otherwise, be in hot stand-by in 12 hours.

Action E: With less than the minimum channels operable, immediately suspend release of radioactive effluents via this pathway.

Action F: With less than the minimum channels operable, initiate the preplanned alternate method of monitoring the appropriate parameter(s) within 72 hours, and:

(1) either restore the inoperable channel(s) to operable status within 7 days of the event, or

(2) prepare and submit a Special Report to the Commission within 30 days following the event outlining the action taken, the cause of the inoperability and the plans and schedule for restoring the system to operable status.

TABLE 12.2-4

RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION SURVEILLANCE REQUIREMENTS

Instrument	Mode(2)	Instrument Check(1)	Calibration(1)(4)	Functional Test(1)(3)	Source Check(1)
Main Chimney Noble Gas Activity Monitor	B	D	R	Q	M
Main Chimney Sampler Flow Rate Monitor	B	D	R	Q[6]	NA
Reactor Bldg. Vent Sampler Flow Rate Monitor	B	D	R	Q[6]	NA
Main Chimney Flow Rate Monitor	B	D	R	Q	NA
Reactor Bldg Vent Activity Monitor	B	D	R	Q	Q
SJAE	A	D	R	Q	R
Main Chimney Iodine and Particulate Sampler	B	D[5]	NA	NA	NA
Reactor Bldg. Vent Iodine and Particulate Sampler	B	D[5]	NA	NA	NA
Main Chimney High Range Noble Gas Monitor	B	D[5]	R	Q	M

Notes

(1) D = once per 24 hours
M = once per 31 days
Q = once per 92 days
R = once per 18 months

(2) A = during SJAE operation
B = at all times

(3) The Instrument Functional Test shall also demonstrate that control room alarm annunciation occurs, if any of the following conditions exist, where applicable:

a. Instrument indicates levels above the alarm setpoint
b. Circuit failure
c. Instrument indicates a downscale failure
d. Instrument controls not set in OPERATE mode

TABLE 12.2-4 (cont'd)

RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION SURVEILLANCE REQUIREMENTS

(4) Calibration shall include performance of a functional test.

(5) Instrument check to verify operability of the instrument; that the instrument is in place and functioning properly.

(6) Functional test shall be performed on local switches providing low flow alarm.

12.2.C LIQUID AND GASEOUS EFFLUENTS INSTRUMENTATION BASES

1. The radioactive liquid and gaseous effluent instrumentation is provided to monitor the release of radioactive materials in liquid and gaseous effluents during releases. The alarm setpoints for the instruments are provided to ensure that the alarms will occur prior to exceeding the limits of RETS and 10 CFR 20.

12.3.A Liquid Effluents Limits and Reporting

1. The concentration of radioactive material released form the site to unrestricted areas (at or beyond the site boundary, see Quad Cities Station ODCM Annex, Appendix F, Figure F-1) shall be limited to the concentrations specified in 10 CFR Part 20, Appendix B, Table 11, Column 2 with the Table 12.3-1 values representing the MPC's for noble gases.

   With the concentration of radioactive material released from the site to unrestricted areas exceeding the above limits, without delay decrease the release rate of radioactive materials and/or increase the dilution flow rate to restore the concentration to within the above limits.

2. The dose or dose commitment above background to a member of the public from radioactive materials in liquid effluents released to unrestricted areas (at or beyond the site boundary) from the site shall be limited to the following:

   a. During any calendar quarter:

      (1) Less than or equal to 3 mrem to the whole body.

      (2) Less than or equal to 10 mrem to any organ.

12.3.B Liquid Effluents Surveillance

1. The concentration of radioactive material in unrestricted areas shall be determined to be within the prescribed limits by obtaining the representative samples in accordance with the sampling and analysis program specified in Table 12.3-3. The sample analysis results will be used with the calculational methods in the ODCM to determine that the concentrations are within the limits of Specification 12.3.A.1.

2. a. The dose contributions from measured quantities of radioactive material shall be determined by calculation at least once per 31 days and a cumulative summation of these total body and organ doses shall be maintained for each calendar quarter.

12.3.A Liquid Effluents Limits and Reporting	12.3.B Liquid Effluents Surveillance
3 b. During any calendar year: (1) Less than or equal to 6 mrem to the whole body. (2) Less than or equal to 20 mrem to any organ.	b. Doses computed at the nearest community water system will consider only the drinking water pathway and shall be projected using the methods prescribed in the ODCM at least once per 92 days.
c. With the calculated dose from the release of radioactive materials in liquid effluents exceeding any of the above limits, prepare and submit to the Commission within 30 days a Special Report which identifies the cause(s) for exceeding the limit(s) and defines the corrective actions taken and the proposed actions to be taken to ensure that future releases are in compliance with 12.3.A.2.a & b. This is in lieu of a Licensee Event Report.	
d. With the calculated dose from the release of radioactive materials in liquid effluents exceeding the limits of Specification 12.3.A.2.a. or 12.3.A.2.b., prepare and submit a Special Report to the Commission within 30 days and limit the subsequent releases such that the dose or dose commitment to a member of the public from	

12.3.A Liquid Effluents Limits and Reporting	12.3.B Liquid Effluents Surveillance
all uranium fuel cycle sources is limited to less than or equal to 25 mrem to the total body or any organ (except thyroid, which is limited to less than or equal to 75 mrem) over 12 consecutive months. This Special Report shall include an analysis which demonstrates that radiation exposures to all members of the public from all uranium fuel cycle sources (including all effluent pathways and direct radiation) are less than the 40 CFR Part 190 Standard. Otherwise obtain a variance from the Commission to permit releases which exceed the 40 CFR Part 190 Standard. The radiation exposure analysis contained in the Special Report shall use methods prescribed in the ODCM. This report is in lieu of a Licensee Event Report.	
3 e. With the projected annual whole body or any internal organ dose computed at the nearest downstream community water system is equal to or exceeds 2 mrem from all radioactive materials released in liquid effluents from the Station, prepare and submit a Special Report within 30 days to the operator of the community water system.	

12.3.A Liquid Effluents Limits and Reporting

The report is prepared to assist the operator in meeting the requirements of 40 CFR 141: EPA Primary Drinking Water Standards. A copy of this report will be sent to the NRC. This is in lieu of a Licensee Event Report.

3. At all times during processing prior to discharge to the environs, process and control equipment provided to reduce the amount or concentration of radioactive materials shall be operated when the projected dose due to liquid effluent releases to unrestricted areas (see Figure 12.5-1), when averaged over 31 days, exceeds 0.13 mrem to the total body or 0.42 mrem to any organ.

4. If liquid waste has to be or is being discharged without treatment as required above, prepare and submit to the Commission within 30 days, a report which includes the following information:

   a. Identification of the defective equipment.

   b. Cause of the defective equipment.

   c. Action(s) taken to restore the equipment to an operating status.

   d. Length of time the above requirements were not satisfied.

12.3.B Liquid Effluents Surveillance

3. Liquid Waste Treatment

   a. Doses due to liquid releases to unrestricted areas (at or beyond the site boundary) shall be projected at least once per 31 days in accordance with ODCM.

12.3.A Liquid Effluents Limits and Reporting

5. In the event a limited and/or associated action requirements identified in Sections 12.3.A and 12.3.B cannot be satisfied because of circumstances in excess of those addressed in this Section, no changes are required in the operational condition of the plant, and this does not prevent the plant from entry into an operational mode.

TABLE 12.3-1

ALLOWABLE CONCENTRATION OF DISSOLVED OR ENTRAINED NOBLE GASES RELEASED FROM THE SITE TO UNRESTRICTED AREAS IN LIQUID WASTE

NUCLIDE	AC(uCi/ml)*
Kr-85m	2×10^{-4}
Kr-85	5×10^{-4}
Kr-87	4×10^{-5}
Kr-88	9×10^{-5}
Ar-41	7×10^{-5}
Xe-131m	7×10^{-4}
Xe-133m	5×10^{-4}
Xe-133	6×10^{-4}
Xe-135m	2×10^{-4}
Xe-135	2×10^{-4}

* Computed from Equation 20 of ICRP Publication 2 (1959), adjusted for infinite cloud submersion in water, and R = 0.01 rem/week, density = 1.0 g/cc abd Pw/Pt = 1.0.

TABLE 12.3-3
RADIOACTIVE LIQUID WASTE SAMPLING
AND ANALYSIS PROGRAM

LIQUID RELEASE TYPE	SAMPLING FREQUENCY	MINIMUM ANALYSIS FREQUENCY	TYPE OF ACTIVITY ANALYSIS	LOWER LIMIT OF DETECTION (LLD) (uci/ml)
A. Batch Waster Release Tanks	Prior to Each Batch	Prior to Each Batch	Principal Gamma Emitters[a]	$5x10^{-7}$
			I-131	$1x10^{-6}$
	Prior to Each Batch	M Composite[b]	Gross Alpha	$1x10^{-7}$
			H-3	$1x10^{-5}$
	Prior to Each Batch	Q Composite[b]	Fe-55	$1x10^{-6}$
			Sr-89, Sr-90	$5x10^{-8}$
	Prior to One Batch/M	M	Dissolved & Entrained Gases[f] (Gamma Emitters)	$1x10^{-5}$
B. Plant Continuous Releases	M[c] (Grab Sample)	M[c]	I-131	$1x10^{-6}$
			Principle Gamma Emitters[a]	$5x10^{-7}$
			Dissolved and Entrained Gases[f] (Gamma Emitters)	$1x10^{-5}$
			H-3	$1x10^{-5}$
			Gross Alpha	$1x10^{-7}$
	Q[c] (Grab Sample)	Q[c]	Sr-89, Sr-90	$5x10^{-8}$
			Fe-55	$1x10^{-6}$

TABLE 12-3-3 (Continued)

RADIOACTIVE LIQUID WASTE SAMPLING
AND ANALYSIS PROGRAM

TABLE NOTATION

a. The LLD is defined in Notation A of Table 11-3.

b. A composite sample is one in which the quantity of liquid samples is proportional to the quantity of liquid waste discharged and in which the method of sampling employed results in a specimen which is representative of the liquids released.

c. If the alarm setpoint of the service water effluent monitor as determined in the ODCM is exceeded, the frequency of analysis shall be increased to daily until the condition no longer exists.

d. A batch release is the discharge of liquid wastes of a discrete volume. Prior to sampling for analyses, each batch shall be isolated then thoroughly mixed to assure representative sampling. A continuous release is the discharge of liquid wastes of a nondiscrete volume; e.g., from a volume or system that has an input flow during the release.

e. The principal gamma emitters for which the LLD specification applies exclusively are the following radionuclides: Mn-54, Fe-59, Co-60, Zn-65, Co-58, Mo-99, Cs-134, Cs137, Ce-141, and Ce-144. Other peaks which are measurable and identifiable by gamma ray spectrometry together with the above nuclides, shall be also identified and reported when the actual analysis is performed on a sample. Nuclides which are below the LLD for the analyses shall not be reported as being present at the LLD level for that nuclide.

f. The dissolved and entrained gases (gamma emitters) for which the LLD specification applies exclusively are the following radionuclides: Kr-87, Kr-88, Xe-133, Xe-133m, Xe-135, and Xe-138. Other dissolved and entrained gases (gamma emitters) which are measurable and identifiable by gamma-ray spectrometry, together with the above nuclides, shall also be identified and reported when an actual analysis is performed on a sample. Nuclides which are below the LLD for the analyses shall not be reported as being present at the LLD level for that nuclide.

12.3.C LIQUID EFFLUENTS BASES

1. Concentration

This specification is provided to ensure that the concentration of radioactive materials released in liquid waste effluents from the site to unrestricted areas will be less than the concentration levels specified in Appendix B, Table 2, Column 2 to 10CFR20.1001 - 20.2402. The concentration limit for noble gases was converted to an equivalent concentration in water using the International Commission on Radiological Protection (ICRP) Publication 2.

2. Dose

This specification is provided to implement the requirements of Sections II.A, III.A and IV.A of Appendix I, 10 CFR Part 50. The Limiting Condition for Operation implements the guides set forth in Section II.A of Appendix I. The statements provide the required operating flexibility and at the same time implement the guides set forth in Section IV.A of Appendix I to assure that the releases of radioactive material in liquid effluents will be kept "as low as is reasonably achievable". The dose calculations in the ODCM implement the requirements in Section III.A of Appendix I that conformance with the guides of Appendix I be shown by calculational procedures based on models and data such that the actual exposure of an individual through appropriate pathways is unlikely to be substantially underestimated. The equations specified in the ODCM for calculating the doses due to the actual release rates of radioactive materials in liquid effluents will be consistent with the methodology provided in Regulatory Guide 1.109, "Calculation of Annual doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I", Revision 1, October 1977 and Regulatory Guide 1.113, "Estimating Aquatic Dispersion of Effluents from Accidental and Routine Reactor Releases for the Purpose of Implementing Appendix I", April 1977. NUREG-0113 provides methods for dose calculations consistent with Reg Guide 1.109 and 1.113.

12.3.C LIQUID EFFLUENTS BASES (CONT.)

3. Liquid Waste Treatment

The operability of the liquid radwaste treatment system ensures that this system will be available for use whenever liquid effluents require treatment prior to release to the environment. The requirement that the appropriate portions of this system be used when specified provides assurance that the releases of radioactive materials in liquid effluents will be kept "as low as is reasonably achievable". This specification implements the requirements of 10 CFR Part 50.36a, General Design Criterion 60 of Appendix A to 10 CFR Part 50 and design objective Section 11.D of Appendix I to 10 CFR Part 50.

12.4 Gaseous Effluents

12.4.A. Gaseous Effluents Limits and Reporting

1. The dose rate in unrestricted areas (at or beyond the site boundary, see Quad Cities Station ODCM Annex, Appendix F, Figure F-1) due to radioactive materials released in gaseous effluents from the site shall be limited to the following:

   a. For Noble Gases:

      (1) Less than 500 mrem/ year to the whole body.

      (2) Less than 3000 mrem/ year to the skin.

   b. For iodine-131, for iodine 133, and for all radionuclides in particulate form with half-lives greater than 8 days less than 1500 mrem/year.

12.4.B Gaseous Effluents Surveillance

1. The dose rates due to radioactive materials released in gaseous effluents from the site shall be determined to be within the prescribed limits by obtaining representative samples in accordance with the sampling and analysis program specified in Table 12.4-1. The dose rates are calculated using methods prescribed in the Off-Site Dose Calculation Manual (ODCM).

12.4.A. Gaseous Effluents Limits and Reporting	12.4.B Gaseous Effluents Surveillance
c. If the dose rates exceed the above limits, without delay decrease the release rates to bring the dose rates within the limits, and to provide prompt notification to the Commission (12.6.2.1)	
2. The air dose in unrestricted areas (at or beyond the site boundary) due to Noble Gases released in gaseous effluents from the unit shall be limited to the following:	2. The air dose due to releases of radioactive noble gases in gaseous effluents shall be determined to be within the prescribed limits by obtaining representative samples in accordance with the sampling and analysis program specified in sections A and B of Table 12.4-1. The allocation of effluents between units having shared effluent control systems and the air doses are determined using methods prescribed in the ODCM at least once every 31 days.
a. For gamma radiation:	
(1) Less than or equal to 5 mrad during any calendar quarter.	
(2) Less than or equal to 10 mrad during any calendar year.	
b. For Beta radiation:	
(1) Less than or equal to 10 mrad during any calendar quarter.	
(2) Less than or equal to 20 mrad during any calendar year.	

12.4.A.	Gaseous Effluents Limits and Reporting	12.4.B	Gaseous Effluents Surveillance

2 c. With the calculated air dose from radioactive noble gases in gaseous effluents exceeding any of the above limits, prepare and submit to the Commission within 30 days, a Special Report which identifies the cause(s) for exceeding the limit(s) and defines the corrective actions to be taken to ensure that future releases are in compliance with 12.4.A.2.a & b. This is in lieu of a Licensee Event Report.

d. With the calculated air dose from radioactive noble gases in gaseous effluents exceeding the limits of Specification 12.4.A.2.a. or 12.4.A.2.b., prepare and submit a Special Report to the Commission within 30 days and limit the subsequent releases such that the doses or dose committment to a member of the public from all uranium fuel cycle sources is limited to less than or equal to 25 mrem to the total body or any organ (except thyroid, which is limited to less than or equal to 75 mrem) over 12 consecutive months. This Special Report shall include an analysis which demonstrates that radiation exposure to all members of the public from all uranium fuel cycle sources (including all effluent pathways and direct

12.4.A. Gaseous Effluents Limits and Reporting	12.4.B Gaseous Effluents Surveillance
radiation) are less than the 40 CFR Part 90 Standard. Otherwise, obtain a variance from the Commission to permit releases which exceed the 40 CFR Part 190 Standard. The radiation exposure analysis contained in the Special Report shall use the methods prescribed in the ODCM. This report is in lieu of a Licensee Event Report.	
3. The dose to a member of the public in unrestricted areas (at or beyond the site boundary) from iodine-131, iodine-133, tritium, and all radionuclides in particulate form with half-lives greater than 8 days in gaseous effluents released from the unit shall be limited to the following:	3. The dose to a member of the public due to releases of iodine-131, iodine-133, tritium, and all radionuclides in particulate form with half-lives greater than 8 days shall be determined to be within the prescribed limits by obtaining representative samples in accordance with the sampling and analysis program specified in Table 12.4-1. For radionuclides not determined in each batch or weekly composite, the dose contribution to the current calendar quarter cumulative summation may be estimated by assuming an average monthly concentration based on the previous monthly or quarterly composite analyses. However, for reporting purposes, the calculated dose contributions shall be based on the actual composite analyses when possible. The allocation of effluents between units having shared effluent control systems and the doses are determined using the methods prescribed in the ODCM at least once every 31 days.

12.4.A.	Gaseous Effluents Limits and Reporting	12.4.B	Gaseous Effluents Surveillance

3 a. Less than or equal to 7.5 mrem to any organ during any calendar quarter.

b. Less than or equal to 15 mrem to any organ during any calendar year.

c. With the calculated dose from the release of iodine131, iodine-133, tritium, and all radionuclides in particulate form with halflives greater than 8 days in gaseous effluents exceeding any of the above limits, prepare and submit to the Commission within 30 days, a Special Report which identifies the cause(s) for exceeding the limit and defines the corrective actions taken and the proposed actions to be taken to ensure that future releases are in compliance with 12.4.A.3.a & 12.4.A.3.b. This is in lieu of a Licensee Event Report.

d. With the calculated dose from the release of iodine131, iodine-133, tritium, and all radionuclides in particulate form with half-lives greater than 8 days in gaseous effluents exceeding the limits of Section 12.4.A.3a. or 12.4.A.3b., prepare and submit a Special Report to the Commission within 30 days and limit subsequent releases such that the dose or dose commitment to a member of the public from

12.4 A. Gaseous Effluents Limits and Reporting	12.4.B Gaseous Effluents Surveillance
all uranium fuel cycle sources is limited to less than or equal to 25 mrem to the total body or organ (except the thyroid, which is limited to less than or equal to 75 mrem) over 12 consecutive months. This Special Report shall include an analysis which demonstrates that radiation exposures to all members of the public from all uranium fuel cycle sources 'including all effluent pathways and direct radiation) are less than the 40 CFR Part 190 Standard. Otherwise, obtain a variance from the Commission to permit releases which exceed the 40 CFR Part 190 Standard. The radiation exposure analysis contained in the Special Report shall use the methods prescribed in the ODCM. This report is in lieu of a Licensee Event Report.	
4. Off-gas System	4. Off-gas System
a. At all times during processing for discharge to the environs, process and control equipment provided to reduce the amount or concentration of radioative materials shall be operated.	Doses due to treated gases released to unrestricted areas at or beyond the site boundary shall be projected at least once per 31 days in accordance with the ODCM.
b. The above specification shall not apply for the Off-Gas Charcoal Adsorber Beds below 30 percent of rated thermal power.	

12.4.A. Gaseous Effluents Limits and Reporting

5.	The release rate of the sum of the activities from the noble gases measured at the main condenser air ejector shall be limited to less than or equal to 100 microcuries/sec per MWt (after 30 minutes decay) at all times. With the release rate of the sum of the activities from noble gases at the main condenser air ejector exceeding 100 microcuries/sec per MWt (after 30 minutes decay), restore, the release rate to within its limits within 72 hours, or be in at least HOT STANDBY within the next 12 hours.	5.	The radioactivity rate of noble gases at (near) the outlet of the main condenser air ejector shall be continuously monitored in accordance with Specification 12.2.2.A. The release rate of the sum of the activities from nolble gases from the main condenser air ejector shall be determined to be within the limits of Specification 12.4.A.5 at the following frequencies by performing an isotope analysis of a representative sample of gases taken at the recombiner outlet, or at the air ejector outlet if the recombiner is bypassed.
		a.	At least once per 31 days.
		b.	Within 4 hours following an increase, as indicated by the main condenser air ejector noble gas activity monitor, of greater than 50%, after factoring out increases due to changes in thermal power level and off-gas flow, in the nominal steady-state fission gas release from the primary coolant.
6.	In the event a limit and/or associated action requirement identified in Sections 12.4.A and 12.4.B cannot be satisfied because of circumstances in excess of those addressed in this Section, no changes are required in the operational condition of the plant, and this does not prevent the plant from entry into an operational mode.		

TABLE 12.4-1

RADIOACTIVE GASEOUS WASTE SAMPLING AND ANALYSIS PROGRAM

GASEOUS RELEASE TYPE	SAMPLING FREQUENCY	MINIMUM ANALYSIS FREQUENCY	TYPE OF ACTIVITY ANALYSIS	LOWER LIMIT OF DETECTION (LLD) (uCi/ml)
A. Main Chimney Reactor Bldg. Vent Stack	M Grab Sample	M[b]	Principal Gamma Emitters[a]	$1x10^{-4}$
		M	Tritium	$1x10^{-6}$
B. All Release Types as Listed in A Above	Continuous (d)	W[c] Charcoal Sample	I-131	$1x10^{-12}$
			I-133	$1x10^{-10}$
	Continuous (d)	W[c] Particulate Sample	Principal Gamma Emitters[a] (I-131, others)	$1x10^{-11}$
	Continuous (d)	Q Composite Particulate Sample	SR-89	$1x10^{-11}$
			SR-90	$1x10^{-11}$
	Continuous (d)	M Composite Particulate Sample	Gross Alpha	$1x10^{-11}$
C. Main Chimney	Continuous (d)	Noble Gas Monitor	Noble Gases	$1x10^{-6}$
D. Reactor Bldg. Vent Stack	Continuous (d)	Noble Gas Monitor	Noble Gases	$1x10^{-4}$

TABLE 12.4-1 (Continued)
TABLE NOTATION

a. The lower limit of detection (LLD) is defined in table notation A. of Table 12.5-3.

b. Sampling and analyses shall also be performed following shutdown, startup, or a thermal power change exceeding 20 percent of rated thermal power in 1 hour unless (1) analysis shows that the DOSE EQUIVALENT I-131 concentration in the primary coolant has not increased more than a factor of 5, and (2) the noble gas activity monitor shows that effluent activity has not increased by more than a factor of 3.

c. Samples shall be changed at least once per 7 days and the analyses completed within 48 hours after removal from the sampler. Sampling shall also be performed within 24 hours following each shutdown, startup, or thermal power level change exceeding 20% of rated thermal power in one hour. This requirement does not apply if (1) analysis shows that the DOSE EQUIVALENT I-131 concentration in the primary coolant has not increased more than a factor of 5, and (2) the noble gas activity monitor shows that effluent activity has not increased by more than a factor of 3. When samples collected for 24 hours are analyzed, the corresponding LLD's may be increased by a factor of 10.

d. The ratio of sample flow rate to the sampled stream flow rate shall be known.

e. The principal gamma emitters for which the LLD specification applies exclusively are the following radionuclides: Kr-87, Kr-88, Xe-133, Xe-133m, Xe-135, and Xe-138 for gaseous emissions, and Mn-54, Fe-59, Co-60, Zn-65, Co-58, Mo-99, Cs-134, Cs-137, Ce141, and Ce-144 for particulate emissions. Other peaks which are measurable and identifiable by gamma ray spectrometry, together with the above nuclides, shall be also identified and reported when an actual analysis is performed on a sample. Nuclides which are below the LLD for the analyses shall not be reported as being present at the LLD level for that nuclide.

12.4.C. GASEOUS EFFLUENTS BASES

1. Gaseous Effluents Dose

This specification is provided to ensure that the dose at the unrestricted area boundary from gaseous effluents from the units on the site will be within the annual dose limits of 10CFR20. These limits provide reasonable assurance that radioactive material discharged in gaseous effluents will not result in the exposure of an individual in an unrestricted area to annual average concentrations exceeding the limits specified in Appendix B, Table 2 of 10CFR20. The specified release rate limits restrict, at all times, the corresponding gamma and beta dose rates above background to an individual at or beyond the unrestricted area boundary to less than or equal to 500 mrem/year to the total body or to not less than or equal to 3000 mrem/year to the skin. These release rate limits also restrict, at all times, the corresponding thyroid dose rate above background via the inhalation pathway to not less than or equal to 1500 mrem/year. For purposes of calculating doses resulting from airborne releases the main chimney is considered to be an elevated release point, and the reactor vent stack is considered to be a mixed mode release point.

2. Dose, Noble Gases

This specification is provided to implement the requirements of Sections II.B, III.A and IV.A of Appendix I, 10 CFR Part 50. The Limiting Condition for Operation implements the guides set forth in Section II.B of Appendix I. The statements provide the required operating flexibility and at the same time implement the guides set forth in Section IV.A of Appendix I to assure that the releases of radioactive material in gaseous effluents will be kept "as low as is reasonably achievable." The Surveillance Requirements implement the requirements in Section III.A of Appendix I that conformance with the guides of Appendix I is to be shown by calculational procedures based on models and data such that the actual exposure of an individual through the appropriate pathways is unlikely to be substantially underestimated. The dose calculations established in the ODCM for calculating the doses due to the actual release rates of radioactive noble gases in gaseous effluents will be consistent with the methodology provided in Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I," Revision 1, October 1977 and Regulatory Guide 1.111, "Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases from Light-Water Cooled Reactors", Revision 1, July 1977. The ODCM equations provide for determining the air doses at the unrestricted boundary based upon the historical average atmospheric conditions. NUREG-0133 provides methods for dose calculations consistent with Regulatory Guides 1.109 and 1.111.

12.4.C GASEOUS EFFLUENTS BASES (CONT.)

3. Dose, Radioiodines, Radioactive Material in Particulate Form and Radionuclides other than Noble Gases

This specification is provided to implement the requirements of Sections II.C, III.A and IV.A of Appendix I, 10 CFR Part 50. The Limiting Conditions for Operation are the guides set forth in Section II.C of Appendix I. The statements provide the required operating flexibility and at the same time implement the guides set forth in Section Iv.A of Appendix I to assure that the releases of radioactive materials in gaseous effluents will be kept "as low as is reasonable achievable." The ODCM calculational methods specified in the surveillance requirements implements the requirements in Section III.A of Appendix I that conformance with the guides of Appendix I be shown by calculational procedures based on models and data such that the actual exposure of an individual through appropriate pathways is unlikely to be substantially underestimated. The ODCM calculational methods approved by NRC for calculating the doses due to the actual release rates of the subject materials are required to be consistent with the methodology provided in Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I", Revision 1, October 1977 and Regulatory Guide 1.111, "Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases from Light-Water-Cooled Reactors," Revision 1, July 1977. These equations also provide for determining the actual doses based upon the historical average atmospheric conditions. The release rate specifications for radioiodines, radioactive material in particulate form and radionuclides other than noble gases are dependent on the existing radionuclide pathways to man, in the unrestricted area. The pathways which were examined in the development of these specifications were: 1) individual inhalation of airborne radionuclides, 2) deposition of radionuclides onto green leafy vegetation with subsequent consumption by man and 3) deposition onto grassy areas where milk animals graze with consumption of the milk by man.

12.5 ENVIRONMENTAL MONITORING

12.5.A Environmental Monitoring Program

1. The environmental monitoring program given in Table 12.5-1 shall be conducted except as specified below.

2. With the radiological environmental monitoring program not being conducted as specified in Table 12.5-1, prepare and submit to the Commission, in the Annual Radiological Operating Report, a description of the reasons for not conducting the program as required and the plans for preventing a recurrence. Deviations are permitted from the required sampling schedule if specimens are unobtainable due to hazardous conditions, seasonal unavailability, contractor omission which is corrected as soon as discovered, malfunction of sampling equipment, or if a person who participates in the program goes out of business. If the equipment malfunctions, corrective actions shall be completed as soon as practical. If a person supplying samples goes out of business, a replacement will be found as soon as possible. All deviations from the sampling schedule shall be described in the annual report.

12.5.B. Environmental Monitoring Surveillance

1. The radiological environmental monitoring samples shall be collected pursuant to Table 12.5-1 from the locations specified in the ODCM, and shall be analyzed pursuant to the requirements of Table 12.5-3.

2. The results of analyses performed on radiological environmental monitoring samples shall be summarized in the Annual Radiological Environmental Operating Report.

12.5.A Environmental Monitoring Program

3. With the level of radioactivity in an environmental sampling medium at one or more of the

locations specified in the ODCM exceeding the limits of Table 12.5-2 when averaged over any calendar quarter, prepare and submit to the Commission within 30 days from the end of the affected calendar quarter, a Special Report which includes an evaluation of any release conditions, environmental factors or other aspects which caused the limits of Table 12.5-2 to be exceeded. This report is not required if the measured level of radioactivity was not the result of plant effluents; however, in such an event the condition shall be reported and described in the Annual Radiological Environmental Operating Report.

12.5 B. Environmental Monitoring Surveillance

3. The land use census shall be conducted at least once per twelve months between the dates of June 1 and October 1 by a door-to-door survey, aerial survey, road survey, or by consulting local agriculture authorities.

12..A Environmental Monitoring Program	12.5.B. Environmental Monitoring Surveillance
4. With milk samples unavailable from one or more of the sample locations required by Table 12.5-1, identify locations for obtaining replacement samples and add them to the radiological environmental monitoring program within 30 days. The locations from which samples were unavailable may then be deleted from the monitoring program. In lieu of a Licensee Event Report, identify the cause of the inavailability of samples and identify the new location(s) for obtaining replacement samples in the Annual Radiological Environmental Operating report and also include in the report a revised figure(s) and table for the ODCM reflecting the new location(s).	4. The results of the land use census shall be included in the Annual Radiological Environmental Operating Report.
5. A census of nearest residences of animals producing milk for human consumption shall be conducted annually (during the grazing season for animals) to determine their location and number with respect to the site. The nearest residence in each of the 16 meteorological sectors shall also be determined within a distance of five miles. The census shall be conducted under the following conditions: a. Within a 2-mile radius from the plant site, enumeration of animals and nearest residences by a door-to-door or equivalent counting technique.	5. The results of the analyses performed as part of the required crosscheck program shall be included in the Annual Radiological Environmental Operating Report. The analyses shall be done in accordance with Section 5.3.1 and Chapter 11.

12.5.A Environmental Monitoring Program	12.5.B. Environmental Monitoring Surveillance
b. Within a 5-mile radius, enumeration of animals by using referenced information from county agricultural agents or other reliable sources.	
6. With a land use census identifying location(s) of animals which	

yield(s)an ODCM calculated dose or dose commitment greater than the values currently being calculated in Specification 12.4.A.3, the new location(s) shall be added to the radiological environmental monitoring program with 30 days, if possible.

The sampling location, having the lowest calculated dose or dose commitment (via the same exposure pathway) may be deleted from this monitoring program after October 31 of the year in which this land use census was conducted.

7. Radiological analyses shall be performed on samples representative of those in Table 12.5-1, supplied as a part of the Interlaboratory Comparison Program which has been approved by the NRC.

8. With analyses not being performed as required, report the corrective actions taken to prevent a recurrence to the Commission in the Annual Radiological Environmental Operating Report.

9. In the event a limit and/or associated actions requirements identified in Sections 12.5.A and 12.5.B cannot be satisified because of circumstances in exess of those addressed in these Sections, no changes are required in the operational condition of the plant, and

this does not prevent the plant from entry into an operational mode.

TABLE 12.5-1

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Exposure Pathway and/or Sample	Minimum Number of Samples and Sample Locations*	Sampling and Collection Frequency	Type and Frequency of Analysis
1. AIRBORNE			
a. Particulates	16 locations	Continuous operation of sampler for a week	Gross beta and gamma Isotopic as specified in ODCM.
b. Radioiodine	16 locations	Continuous operation of sampler for two weeks	I-131 as specified in ODCM.
2. DIRECT RADIATION	Forty Locations (Minimum of two TLDs per packet)	Quarterly	
3. WATERBORNE			
a. Public Water	2 Locations	Monthly composite of weekly collected samples	Gamma Isotopic analysis of each composite sample
b. Sediment	1 downstream location in receiving body of water	Annually	Gamma Isotopic analysis of each sample
c. Plant Cooling Water	Intake, Discharge	Weekly composite	Gross Beta analysis of each sample
4. INGESTION			
a. Milk	2 Locations	At least once weekly when ani-animals are on pasture; at least once per month at other times.	I-131 analysis of each sample
b. Fish	1 location in receiving body of water	Semi-annually	Gamma Isotopic analysis on edible portions

*Sample locations are described in the ODCM

TABLE 12.5-2

REPORTING LEVELS FOR RADIOACTIVITY
CONCENTRATIONS IN ENVIRONMENTAL SAMPLES

Reporting Levels

Analys.	Water	Airborne Particulate or Gases (pCi/m^3)	Fish (pCi/Kg, wet)	Milk (PCi/1)	Food Products (PCi/Kg, wet)
H-3	2×10^4(a)				
Mn-54	1×10^3		3×10^4		
Fe-59	4×10^2		1×10^4		
Co-58	1×10^3		3×10^4		
Co-60	3×10^2		1×10^4		
Zn-65	3×10^2		2×10^4		
Zr-Nb-95	4×10^2				
I-131	2	0.9		3	1×10^2
Cs-134	30	10	1×10^3	60	1×10^3
Cs-137	50	20	1×10^3	70	2×10^3
Ba-La-140	2×10^2			3×10^2	

a) for drinking water samples. This is 40 CFR Part 141 value.

TABLE 12.5-3

PRACTICAL LOWER LIMITS OF DETECTION (LLD)
FOR STANDARD ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM

Sample Media	Analysis	LLD[A,B] (4.66 σ)	Units
Airborne "Particulate"	Gross Beta +	0.01	pCi/m^3
	Gamma Isotopic	0.01	pCi/m^3
Airborne I-131	Iodine 131	0.10	pCi/m^3
Milk/Public Water	I-131	5°	pCi/l
	Cs-134	10	pCi/l
	Cs-137	10 ▲	pCi/l
	Tritium	200	pCi/l
	Gross Beta +	5	pCi/l
	Gamma Isotopic	20	pCi/l/nuclide
Sediment	Gross Beta +	2	pCi/g dry
	Gamma Isotopic	0.2	pCi/g dry
Fish Tissue	I-131 Thyroid	0.1	pCi/g wet
	Cs-134, 137	0.1	pCi/g wet
	Gross Beta +	1.0	pCi/g wet
	Gamma Isotopic	0.2	pCi/g wet

° 0.5 pCi/l on milk samples collected during the pasture season.

\+ Referenced to Cs-137

▲ 5.0 pCi/l on milk samples

TABLE 12.5-3 (Continued)

PRACTICAL LOWER LIMITS OF DETECTION (LLD)
FOR STANDARD ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM

TABLE NOTATION

A. The LLD is the smallest concentration of radioactive material in the sample that will be detected with 95 percent probability with only 5% probability of falsely concluding that a blank observation represents a "real" sequal.

For a particular measurement system (which may include radiochemical separation)

$$LLD = \frac{4.66 \cdot s_b}{A \cdot E \cdot V \cdot 2.22 \cdot Y \cdot \exp(-\lambda \Delta t) \cdot t}$$

Where:

LLD is the "a priori" lower limit of detection for a blank sample or background analysis as defined above (as pCi per unit mass or volume).

s_b is the square root of the background count or of a blank sample count; is the estimated standard error of a background count or a blank sample count as appropriate (in units of counts).

E is the counting efficiency (as counts per disintegration).

A is the number of gamma rays emitted per disintegration for gamma ray radionuclide analysis (A=1.0 for gross alpha and tritium measurements).

V is the sample size (in units of mass or volume).

2.22 is the number of disintegrations per minute per picocurie.

Y is the fractional radio-chemical yield when applicable (otherwise Y = 1.0).

λ is the radioactive decay constant for the particular radionuclide (in units of reciprocal minutes).

Δt is the elapsed time between the midpoint of sample collection and the start time of counting. (Δt = 0.0 for environmental samples and for gross alpha measurements).

t is the duration of the count (in units of minutes).

TABLE 12.5-3 (Continued)

PRACTICAL LOWER LIMITS OF DETECTION (LLD)
FOR STANDARD ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM

TABLE NOTATION

The value of "s_b" used in the calculation of the LLD for a detection system shall be based on an actual observed background count or a blank sample count (as appropriate) rather than on an unverified theoretically predicted value. Typical values of "E", "V", "Y", "t", and "Δt" shall be used in the calculation.

For gamma ray radionuclide analyses the background counts are determined from the total counts in the channels which are within plus or minus one FWHM (Full Width at Half Maximum) of the gamma ray photopeak energy normally used for the quantitative analysis for that radionuclide. Typical values of the FWHM shall be used in the calculation.

The LLD for all measurements is defined as an "A priori" (before the fact) limit representing the capability of a measurement system and not as an "a posteriori" (after the fact) limit for a particular sample measurement.

B. Other radionuclides which are measureable and identifiable by gamma-ray spectrometry, together with the nuclides indicated in Table 12.5-2, shall also be identified and reported when an actual analysis is performed on a sample. Nuclides which are below the LLD for the analyses shall not be reported as being present at the LLD level for that nuclide.

12.5.C RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

1. Monitoring Program

The radiological monitoring program required by this specification provides measurements of radiation and of radioactive materials in those exposure pathways and for those radionuclides, which lead to the highest potential radiation exposures of individuals resulting from the station operation. This monitoring program thereby supplements the radiological effluent monitoring program by verifying that the measurable concentrations of radioactive materials and levels of radiation are not higher than expected on the basis of the effluent measurements and modeling of the environmental exposure pathways. Program changes may be initiated based on operational experience.

The detection capabilities required by Table 12.5-3 are state-of-the-art for routine environmental measurements in industrial laboratories. The specified lower limits of detection for I-131 in water, milk and other food products correspond to approximately one-quarter of the Appendix I to 10 CFR Part 50 design objective dose-equivalent of 15 mrem/year for atmospheric releases and 10 mrem/year for liquid releases to the most sensitive organ and individual. They are based on the assumptions given in Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I", October 1977, except the change for an infant consuming 330 liter/year of drinking water instead of 510 liters/year.

2. Land Use Census

This specification is provided to ensure that changes in the use of unrestricted areas are identified and that modifications to the monitoring program are made if required by the results of this census. This census satisfies the requirements of Section IV.B.3 of Appendix I to 10 CFR Part 50.

3. Interlaboratory Comparison Program

The requirement for participation in the interlaboratory comparison crosscheck program is provided to ensure that independent checks on the precision and accuracy of the measurements of radioactive material in environmental sample matrices are performed as part of the quality assurance program for environmental monitoring in order to demonstrate that the results are reasonably valid.

a. Results of all environmental measurements summarized in the format of the Regulatory Guide 4.8 Table 1 (December 1975). (Individual sample results will be retained at the Station). In the event that some results are not available for inclusion with the report, the report shall be submitted noting and explaining the reasons for missing results. Summaries, interpretations, and analysis of trends of the results are to be provided.

b. An assessment of the monitoring results and radiation dose via the principal pathways of exposure resulting from plant emissions of radioactivity including the maximum noble gas gamma and beta air doses in the unrestricted area. The assessment of radiation doses shall be performed in accordance with the Offsite Dose Calculation Manual (ODCM).

c. Results of the census to determine the locations of nearest residences and of nearby animals producing milk for human consumption (Table 12.5-1).

d. The reason for the emission if the nearest dairy to the station is not in the monitoring program (Table 12.5-1).

e. An annual summary of meteorological conditions concurrent with the releases of gaseous effluents in the form of joint frequency distributions of wind speed, wind direction, and atmospheric stability.

f. The results of the Interlaboratory Comparison Program described in Section 12.5.C.3.

g. The results of the 40 CFR 190 uranium fuel cycle dose analysis for each calendar year.

h. A summary of the monitoring program, including maps showing sampling locations and tables giving distance and direction of sampling locations from the Station.

3. If a confirmed measured radionuclide concentration in an environmental sampling medium averaged over any calendar quarter sampling period exceeds the reporting level given in Table 12.5-2 and if the radioactivity is attributable to plant operation, a written report shall be submitted to the Administrator of the NRC Regional Office, with a copy to the Director, Office of Nuclear Reactor Regulation, within 30 days from the end of the quarter.

12.6 RECORD KEEPING AND REPORTING

12.6.1 Plant Operating Records

A. Records and/or logs relative tc the following items shall be kept in a manner convenient for review and shall be retained for at least 5 years:

1. Records and periodic checks, inspection and/or calibrations performed to verify that the surveillance requirements (see Section 6.4 of the Technical Specifications) are being met (all equipment failing to meet surveillance requirements and the corrective action taken shall be recorded);

2. Records of radioactive shipments;

B. Records and/or logs relative to the following items shall be recorded in a manner convenient for review and shall be retained for the life of the plant:

1. Records of offsite environmental monitoring surveys;

2. Records of radioactivity in liquid and gaseous wastes released to the environment;

4. Records of reviews performed for changes made to the Offsite Dose Calculation Manual.

12.6.2 Reports

1. Radioactive Effluent Release Report

The Radioactive Effluent Release Report covering the operation of the unit during the previous 12 months of operation shall be submitted prior to April 1 of each year. The report shall include a summary of the quantities of radioactive liquid and gaseous effluents and solid waste released from the unit. The material provided shall be (1) consistent with the objectives outlined in the ODCM and PCP and (2) in conformance with 10 CFR 50.36a and Section IV.B.1 of Appendix I to 10 CFR Part 50.

2. Annual Radiological Environmental Operating Report

An annual report containing the data taken in the standard radiological monitoring program (Table 12.5-1) shall be submitted prior to May 1 of each year. The content of the report shall include:

b. A determination that the change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR Part 50 and not adversely impact the accuracy or reliability of effluent, dose, or setpoint calculations.

2. Shall become effective after review and acceptance by the Onsite Review and Investigative Function and the approval of the Plant Manager on the date specified by the Onsite Review and Investigative Function.

3. Shall be submitted to the Commission in the form of a complete, legible copy of the entire ODCM as a part of or concurrent with the Radioactive Effluent Release Report for the period of the report in which any change to the ODCM was made effective. Each change shall be identified by markings in the margin of the affected pages, clearly indicating the area of the page that was changed, and shall indicate the date (e.g., month/year) the change was implemented.

12.6.2.4 MAJOR CHANGES TO RADIOACTIVE WASTE TREATMENT SYSTEMS (LIQUID AND GASEOUS)

A. Licensee initiated major changes to the radioactive waste systems may be made provided:

1. The change is reported in the Monthly Operating Report for the period in which the evaluation was reviewed by the onsite review function. The discussion of each change shall contain:

a. A summary of the evaluation that led to the determination that the change could be made in accordance with 10 CFR 50.59;

b. Sufficient detailed information to support the reason for the change;

c. A detailed description of the equipment, components, and process involved and the interfaces with other plant systems;

d. An evaluation of the change which shows the predicted releases of radioactive materials in liquid and gaseous effluents and (or quantity of solid waste that differ from those previously predicted in the license application and amendments);

a. When more than one of the radionuclides in Table 12.5-2 are detected in the medium, the reporting level shall have been exceeded if

$$\frac{C_i}{R.L._i} \geq 1$$

where C_i is the average quarterly concentration of the i^{th} radionuclide in the medium and RL is the reporting level of radionuclide i.

b. If radionuclides other than those in Table 12.5-2 are detected and are due to plant effluents, a reporting level is exceeded if the potential annual dose to an individual is equal to or greater than the design objective doses of 10 CFR 50, Appendix 1.

c. This report shall include an evaluation of any release conditions, environmental factors, or other aspects necessary to explain the anomalous effect.

12.6.2.3 OFFSITE DOSE CALCULATION MANUAL (ODCM)

12.6.2.3.A. The OFFSITE DOSE CALCULATION MANUAL (ODCM) shall contain the methodology and parameters used in the calculation of offsite doses resulting from radioactive gaseous and liquid effluents, in the calculation of gaseous and liquid effluent monitoring Alarm/Trip Setpoints, and in the conduct of the Radiological Environmental Monitoring Program. The ODCM shall also contain (1) the Radioactive Effluent Controls and Radiological Environmental Monitoring Programs described in section 12.5 and (2) descriptions of the information that should be included in the Semi-annual Radioactive Effluent Release Reports and in the Annual Radiological Environmental Operating Reports required by sections 12.6.2.1 and 12.6.2.2.

The ODCM shall be subject to review and approval by the Commission prior to implementation.

12.6.2.3.B. Changes to the ODCM

1. Shall be documented and records of reviews performed shall be retained as required by Specification 6.5.B.14. This documentation shall contain:

   a. Sufficient information to support the change together with the appropriate analyses or evaluations justifying the change(s) and

e. A comparison of the predicted releases of radioactive materials in liquid and gaseous effluents and in solid waste to the actual releases for the perird in which the changes were made;

f. An estimate of the exposure to plant operating personnel as a result of the change; and

g. Documentation of the fact that the change was reviewed and found acceptable by the onsite review function.

2. The change shall become effective upon review and acceptance by onsite review function.

FOR INFORMATION ONLY

QUAD-CITIES STATION

PROCESS CONTROL PROGRAM

FOR

PROCESSING OF RADIOACTIVE WET WASTE

REVISION 11

SEPTEMBER 1993

01530/0229Z

I. PURPOSE

The purpose of this Process Control Program (PCP) is to insure that the Radwaste System is used as applicable to process all low level radioactive wet wastes solidified or dewatered at Quad-Cities Nuclear Power Station. The Process Control Program shall contain the current formulas, sampling, analyses, test, and determinations to be made to ensure that processing and packaging of solid radioactive waste based on demonstrated processing of actual or simulated wet solid wastes will be accomplished in such a way as to assure compliance with 10 CFR Parts 20, 61, and 71, State regulations, burial ground requirements, and other requirements governing the disposal and shipping of solid radioactive waste. If the provisions of this Process Control Program are not satisfied the station will suspend shipments of the defectively processed or defectively packaged waste. This program covers the in-plant cement, vendor cement, vendor dewatering and vendor encapsulating systems. Wet wastes at Quad-Cities Station consist of filter media (powdered resin and fiber), bead resin, sump sludges, tank residues, and higher activity cartridge filters. When expended, these wastes are transferred to various storage tanks or storage containers and in some cases these wastes are transferred directly into a burial container for processing. Vendor processing of the waste is normally done with the waste container in either a transportation cask or a process shield which offers the advantage of reduced radiation exposure to personnel involved in performing the necessary package handling operations. In some cases where radiation exposure would be minimal, processing of the waste is done with the container placed on an unshielded flatbed trailer.

II. IN-PLANT CEMENT SOLID WASTE SYSTEM

A. Description

(In-plant cement solid waste system is limited to use for Class A unstable waste forms only)

The resin slurry is transferred to one of two centrifuges for dewatering. The centrifuges have a capacity of 25 gpm. The solids are separated from the water and drop into a hopper associated with each centrifuge. The water is routed back to a storage tank.

Each hopper has a 40 cubic foot capacity. At the bottom of the hopper there is a hopper discharge valve. This is a remotely operated, air operated, fail closed valve. Connected to the hopper discharge valve is the sludge chute and the drum feed valve. The sludge chute is 8 inches in diameter and 6 feet 5 inches long, with a capacity of 2.2 cubic feet. The drum feed valve is also remotely operated, air operated, and fail-closed. The hopper discharge valve and the drum feed valve are interlocked to prevent both valves from being open simultaneously.

Cement is added to a drum from the cement silo. The cement silo has a capacity of 620 cubic feet. Cement is fed through a rotary feeder down a transfer tube through the mixer head, into the drum. The mixer goes into the drum and forms a seal to prevent dispersion of cement dust or spillage during mixing. The mixer has two speeds, 100 rpm and 200 rpm, that are programmed into the mix cycle.

Drums are capped at the load-out conveyor area before loading into a shipping vehicle. A cap is set in place and a seal ring is snapped over it. A threaded bolt is used to tighten the seal ring.

Drum storage consists of three conveyor lines, with room for 25 drums on each line. Drums stored on the storage lines are removed and either shipped, stored in storage bins located in the radwaste facility, or stored in the Interim Radwaste Storage facility.

B. Operation of the In-Plant Cement Solid Waste System

In order to insure solidification of spent resins with no free water, tests were conducted at Quad-Cities Station using unspent resin. Fresh resins were mixed up in the proportions that would be expected to be normally processed. These resins were then put into a drum and the drum was processed through the cement system. The drum was capped as normal and allowed to set in storage for 24 hours. After 24 hours, the drum was cut open lengthwise and inspected. The results of the inspection resulted in a change of the proportions of water and cement until the final product was solid and free of water. A series of drums were processed using spent resins, and the drums were visually inspected for no free water prior to shipping. No free water was observed. Based on these tests, specific station procedures were written to assure that solidified barrels produced by the in-plant cement system fall within the test results. Since all of the barrels made on the in-plant system are classified as Class A unstable, per 10 CFR 61, no additional testing outside of the initial station tests are required.

The general procedure that is followed to process spent resins is described below. Specific plant operating procedures are followed by the operator.

1. The empty drum is covered with a plastic bag and taped in place to prevent external contamination.
2. A half of a bag of dry cement is added to the empty drum.
3. The empty drums are loaded on a conveyor.
4. One empty drum from the conveyor is loaded on a transfer cart (remote operation).
5. The transfer cart is advanced to the selected hopper station (remote operation).

6. The drum is filled with resins to a prescribed level (remote operation). The resin is transferred from the hopper to the drum through the sludge chute. The discharge valve on the sludge chute is a manually operated remote valve. The operator views the drum through a mirror and fills the drum to between the first and second roll hoop from the top of the drum. Although this method of adding resin to the drum is not precise, it can be controlled to a high degree. If an operator determines that the quantity of resins varies from the prescribed level, he can compensate with water and/or cement.
7. Water is added (remote operation). Normally 16-20 gallons of water are added to each drum. This amount can be varied if necessary for complete solidification. The amount of water required is selected, and a flow integrator gives the inlet valve a closed signal when that amount is delivered.
8. The drum is transferred to the mixing station (remote operation).
9. The cement timer is set.
10. The mixer cycle (remote operation) is started. The mixer lowers into the drum and forms a tight seal. The mixer will begin to rotate at slow speed. The air slide blower and dust collector are started. The cement feeder and vibrators start and cement is metered to the drum. The mixer increases to fast speed. The cement feeder stops and the air slide blower and dust collector stop. When the mixer completes the cycle, the RPM meter will start to decrease. At this point, the mixer control switch is moved from AUTO to FAST and the mixer is given an additional 5 minutes on fast speed. The switch is then returned to AUTO, and the mixer cycle is complete.

11. The drum is transferred to the inspection station (remote operation).

12. The mixed drum contact radiation reading are logged and the contents of the drum are observed. If it is determined that more cement is required, the drum is returned to the mixer and additional cement is added. When the mix is satisfactory, the drum is transferred to the drum storage lines.

C. Verification of In-Plant Cement System Solidification

Each solidified drum is verified to be void of free water prior to shipping or storage. The drum is transferred from the storage lines to the load-out conveyor. At this point, each drum is visually inspected to verify it is void of free water and the contents solidified. The protective plastic bag is removed, and the drum is capped. The drum is then surveyed for smearable contamination and dose rate. The drum is then loaded into the shipping vehicle or placed in storage.

If a drum is found to contain free water, dry cement will be added to solidify the free water or the drum will be recycled through the mixing line as required. The drum will not be shipped with more than 0.5 percent freestanding water.

III. VENDOR SUPPLIED SOLIDIFICATION SYSTEM

A. Description

Contractor solidification services are utilized at the Station for wastes which are required to be classified as stable waste per 10 CFR 61 and/or burial site licenses. Additionally, in certain circumstances, contractor services may also be used to process wastes which are not required to be stable per 10CFR61 and/or burial site licenses. The contractor must have procedures or other support documents as necessary to produce a waste form which meets all the requirements of 10CFR61 and applicable burial site criteria. A copy of the vendor's procedures (which states station interface requirements), and other support documents are submitted to an on-site review prior to use to assure compatability with Station Systems, procedures, and Technical Specifications. Specific station procedures are then developed from this vendor information and approved prior to use.

Normally, a batching tank is utilized to collect the radwaste to be solidified. The tank can be filled from any of the following:

1. Condensate Phase Separators.
2. Cleanup Phase Separators.
3. Spent Resin Tanks.
4. Waste Sludge Tank.

After the tank is filled with radwaste, a decant pump is used to remove water from the top of the settled sludge. When the decanting operation is completed, the tank contains about 1,900 gallons of sludge.

The mixing tank can be operated on recirculation to allow a tank sample to be taken for analysis and sample solidification tests as required.

In certain cases, for example, wastes resulting from chemical decontaminations, the waste is sent directly to a liner in which the solidification will take place. In this case a sample is taken out of the liner after it has been properly mixed prior to adding solidification chemicals. The recipe for solidification will be determined based on a successful solidification demonstration using the sample taken from the liner.

A temperature monitor in the liner is used to note the maximum temperature during the exotherm. After sufficient cooling the liner is prepared for shipment or storage.

B. Operation of the Vendor Solidification System

A liner is prepared for use by installing a thermocouple and tubing for level indication. The fill head is placed over the liner and locked in-place.

The radwaste is added to the liner. The mixing tank, if used, is first mixed for about 10 minutes. The proper amount of radwaste is delivered by a radwaste pump or slurried from portable processing equipment. Waste flow to the liner is monitored by a TV camera. The radwaste pipe lines and waste transfer hose to the fill head are then flushed.

After the radwaste has been put into the liner the process is completed by the contractor. The contractor adds cement and additives in accordance with their approved PCP. After final mixing the temperature is monitored and the maximum temperature is noted. When the solidified liner has sufficiently cooled, the contractor and Station personnel visually inspect the product and verify that it is an acceptable product. The liner is then covered with a lid, secured, surveyed and shipped or stored in the Interim Radwaste Storage Facility.

C. Verification of Vendor Supplied Solidification System

Verification of solidification first involves sampling the radwaste prior to solidification in order to determine the proper proportions of the ingredients that will produce an acceptable product. A representative laboratory sample of waste is taken. In accordance with the vendor's PCP program, small, scaled-down amounts of cement and additives are added in the proper quantities. Based on an acceptable lab sample solidification, scale-up factors are developed for the full scale solidification. The full scale solidification will not be done until a satisfactory lab sample solidification has been verified.

A visual inspection of each liner is performed by both the vendor and station personnel prior to installing the lid. The visual inspection further verifies that the product is acceptable per the contractors PCP. If the visual inspection does not verify solidification, the contractor will be required to provide the station an acceptable resolution.

IV. VENDOR SUPPLIED DEWATERING SYSTEM

A. Description

Contractor dewatering services may be utilized at the Station in lieu of solidification for stable waste forms as directed by station operating personnel. Additionally, in certain circumstances, contractor dewatering may also be used to process wastes which are not required to be stable per 10CFR61 and/or burial site licenses. The contractor must have procedures or other support documents to produce a waste form which meets all the requirements of 10CFR61 and the applicable burial site criteria. A copy of the vendor's

procedures (which states station interface requirements) and other support documents are submitted to an on-site review prior to use to assure compatability with Station Systems, procedures, and Technical Specifications. Specific station procedures are then developed from this vendor information and approved prior to use.

Normally a mixing tank is utilized to collect the radwaste to be dewatered. The tank can be filled from any of the following:

1. Condensate Phase Separators
2. Cleanup Phase Separators
3. Spent Resin Tanks
4. Waste Sludge Tank

After the tank is filled with radwaste, a decant pump is used to remove water from the top of the settled sludge. When the decanting operation is completed, the tank contains about 1,900 gallons of sludge.

The mixing tank can be operated on recirculation in order to allow a tank sample to be taken for analysis if required. In certain cases when it is not possible or desirable to use the mixing tank, for example, wastes resulting from chemical decontaminations, waste from spent Resin tanks, waste from sump cleaning or waste from portable process equipment. This waste is sent directly to a High Integrity Container (HIC) or steel liner, as required, in which the dewatering will take place.

B. Operation of the Vendor Dewatering System

A High Integrity Container (HIC) or steel liners, as required, is prepared for use by installing a thermocouple, if not already installed, and inspecting dewatering elements and thermocouple leads, if installed. The fill head is placed over the HIC or steel liner, as required, and secured in-place.

The mixing tank, if utilized, is first mixed for approximately 10 minutes. The proper amount of radwaste is delivered to the HIC or steel liner using the installed radwaste pump, portable waste pumps or with air pressure for decontamination system equipment and portable processing equipment. Waste flow to the HIC is monitored by a TV camera. The radwaste pipe lines and waste transfer hose used for the waste transfer to the fill head are flushed after each transfer. .

After the radwaste has been put into the HIC or steel liner, the balance of the dewatering process is completed by the contractor. The contractor dewaters in accordance with their approved procedures or other support documents until the acceptance criteria is met. When the process is complete, the contractor and Station personnel verify that each HIC is an acceptable product and samples are taken from the HIC. The HIC is then covered with a lid, secured, surveyed and shipped or stored in the Interim Radwaste Storage Facility.

C. Verification of Vendor Supplied Dewatering System

Verification of an acceptable dewatered product is delineated in the contractors procedures. The acceptance criteria is dependent upon the type of dewatering system used and the material dewatered.

V. VENDOR ENCAPSULATION OF WASTE

A. Description

Contractor encapsulation services may be utilized by the Station for cartridge filters and other wastes which are required to be classified as stable waste per 10CFR61 and/or burial site licenses. The contractor must have procedures or other support documents as necessary to produce a waste form which meets all the requirements of 10CFR61 and the applicable burial site criteria. Vendor procedures

used to prepare specific Station procedures which are submitted to an on-site review prior to use to assure compatibility with station systems procedures and Technical Specifications.

B. Vendor Encapsulation Method

A liner is prepared by the vendor which has a prepoured bottom and partial sides. The item to be encapsulated is placed inside the prepour and the remaining portion of the liner is filled with a stable formula of cement.

When the encapsulation has sufficiently cooled, the contractor and Station personnel visually inspect the product and verify that it is an acceptable product. The liner is then covered with a lid, secured, surveyed and shipped or stored in the Interim Radwaste Storage Facility.

C. Verification of Vendor Encapsulation

To verify encapsulation, a visual inspection of each liner is performed prior to installing the lid. The visual inspection verifies that the product meets to acceptance criteria of the contractors procedures. If the liner is not an acceptable product, the vendor will be required by the station to provide an acceptable resolution.

VI. HIGH INTEGRITY CONTAINER USAGE

High Integrity container (HIC's) are used at the Station for packaging higher activity cartridge filters and other various approved waste packaging. The vendor which supplies the HIC must provide the Station with a copy of the Certificate of Compliance for the HIC which details specific limitations on use of the HIC.

VII. WASTE CLASSIFICATION

Station wastes will be classified as Class A, Class B, or Class C to determine the acceptability for near-surface disposal and for the purpose of segregation at the disposal site. The waste class will be based on the concentration of certain radionuclides in the waste as outlined in 10CFR61.55.

Radionuclide concentrations will be determined based on the volume or weight of the final waste form as discussed in Section C.2 of the Branch Technical Position Paper on Waste Classification.

Of the four suggested methods for determining radionuclide concentration, the one most commonly used is the direct measurement of individual radionuclides (gamma emitters) and the use of scaling factors to determine the radionuclide concentration of difficult to measure radionuclides (normally non-gamma emitters). The use of the other suggested methods; material accountability, classification by source or gross radioactivity measurements may occur if the situation best fits the use of that methodology.

Approved Station procedures are used in the determination of radionuclide concentration for difficult to measure nuclides (normally non-gamma emitters) and for the classification of radioactive waste for near-surface burial.

VII. SHIPMENT MANIFEST

Each shipment of radioactive waste to a licensed land disposal facility will be accompanied by a shipment manifest as required by 10CFR20.311(b) and 10CFR20.311(c). The manifest will contain the name, address, and telephone number of the waste generator. The manifest will also include the name, address, and telephone number or the name and EPA hazardous waste identification number of the person transporting the waste to the land disposal facility.

The manifest will also indicate to the extent practicable: a physical description of the waste; the volume; radionuclide identity and quantity; the total radioactivity; and the principal chemical form. The solidification agent, if applicable, will be identified.

Waste containing more than 0.1% chelating agents by weight will be identified and the weight percentage of the chelating agent estimated. Waste classification, Class A, B, or C, will be clearly indicated on the manifest. The total quantity of the radionuclides H-3, C-14, Tc-99, and I-129 will be shown on the manifest.

Each manifest will include a certification by the waste generator that the transported materials are properly classified, described, packaged, marked, and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation and the NRC. A representative of the Station will sign and date the manifest. Approved Station procedures are used for the preparation of burial site radioactive shipping manifests.

The Station will maintain a manifest recordkeeping and tracking system that meets the requirements of 10CFR20.311(d).

IX. ADMINISTRATIVE CONTROLS

A. Training

A training program will exist to ensure that waste processing will be performed according to Station procedures and in accordance with the requirements of the Station PCP. An individual's training record will be maintained for audit and inspection. The processing and shipment of radioactive material will be performed by qualified and trained personnel.

B. Record Retention

Records of processing data, test and analysis results, documents, results of training, inspections and audits will be retained in accordance with company quality verification requirements for record retention. Records of reviews performed for changes made to the PCP shall be retained for the duration of the Unit Operating License.

C. Documentation Control

Licensee initiated changes may be made to the PCP provided that the change:

1. Is documented and records of reviews performed shall be retained for the duration of the Unit Operating License. This documentation shall contain:
   a. Sufficient information to support the change together with the appropriate analyses or evaluations justifying the change(s) and
   b. A determination that the change will maintain the overall conformance of the solidified waste product to existing requirements of Federal, State, or other applicable regulations.

Changes to the PCP shall become effective after review and acceptance by the Onsite Review Function and the approval of the Plant Manager. Changes to the PCP shall be submitted to the Commission in the Semi-Annual Radioactive Effluent Release Report for the period in which the changes were made.

Radioactive waste that does not fall within previous waste processing experience will be evaluated and, if necessary, included in the PCP prior to final processing and disposal.

D. Quality Control

Licensee procedures ensure that a vendor processing radioactive waste, for burial, adhere to their procedures and that an acceptable product that meets regulatory requirements and burial site criteria results. This procedure addresses the requirement to assess the impact of changes in a vendor's PCP or the Station's PCP and requires a 10CFR50.59 safety evaluation for any changes in the vendor's PCP.

E. Major Changes to Radioactive Waste Treatment Systems

Major changes to the Solid Radioactive Waste Treatment Systems may be made provided:

1. The change is reported in the Monthly Operating Report for the period in which the evaluation was reviewed by the On-site Review Function. The discussion of each change shall contain:
   a. A summary of the evaluation that led to the determination that the change could be made in accordance with 10 CFR 50.59.
   b. Sufficient detailed information to support the reason for the change.
   c. A detailed description of the equipment, components, and process involved and the interfaces with other plant systems.
   d. An evaluation of the change which shows the predicted quantity of solid waste that differs from that previously predicted in the license application and amendments.

e. A comparison of the predicted volume of radioactive solid waste to the actual volume for the period in which the changes were made.

f. An estimate of the exposure to plant operating personnel as a result of the change.

g. Documentation of the fact that the change was reviewed and found acceptable by the On-site Review Function.

2. The change shall become effective upon review and acceptance by the On-Site Review Function.