SEMI-ANNUAL REPORT

RADIOACTIVE EFFLUENT RELEASES

JUNE 28, 1989 THROUGH DECEMBER 27, 1989

TABLE OF CONTENTS

INTRODUCTION

This semi-annual radioactive effluent release report for Duane Arnold Energy Center (DAEC) is for the period from June 28, 1989, 0900, to December 27, 1989, 0800. These dates match as closely as possible the calendar semi-annual period with the actual sampling dates for radioactive effluents, and are bounded by the dates for quarterly analysis of Strontium 89 and 90.

The DAEC was shutdown four (4) times the last half of 1989. The first period was from August 26, 1989, to August 28, 1989, due to a turbine trip from the power load unbalance circuitry. The second was a scheduled outage from September 15, 1989, to October 23, 1989, for Main Steam Isolation Valves - Local Leak Rate Testing which was requested by the Nuclear Regulatory Commission (NRC) Region III. Environmental Qualification (EQ) on Drywell electrical splices and containment ventilation issues also were discovered and corrected during this outage. Outage number three occurred from November 9, 1989, to November 23, 1989, for Turbine Control Valve #2 and for the High Pressure Coolant Injection (HPCI) discharge check valve. The last outage was from November 26, 1989, to November 29, 1989, for Reactor Safety Relief Valve PSV-4402.

There were no radioactive liquid releases from DAEC during the reporting period.

There were no changes to the Offsite Dose Assessment Manual (ODAM).

There were two changes to the Process Control Plan (PRCP). See Page 12.

A spent fuel pool cleanup project was started in the second half of 1989 and one shipment of irradiated hardware made in that time period.

There were no abnormal occurrences during the semi-annual period that would have required special reporting per DAEC Technical Specifications.

SEMIANNUAL RADIOACTIVE MATERIAL RELEASE REPORT (1989)

LIQUID EFFLUENT *

Nuclides Released	Unit	3rd Quarter	4th Quarter
strontium-89	Ci	0.0E+00	0.0E+00
strontium-90	Ci	0.0E+00	0.0E+00
cesium-134	Ci	0.0E+00	0.0E+00
cesium-137	Ci	0.0E+00	0.0E+00
iodine-131	Ci	0.0E+00	0.0E+00

cobalt-58	Ci	0.0E+00	0.0E+00
cobalt-60	Ci	0.0E+00	0.0E+00
iron-55	Ci	0.0E+00	0.0E+00
iron-59	Ci	0.0E+00	0.0E+00
zinc-65	Ci	0.0E+00	0.0E+00
manganese-54	Ci	0.0E+00	0.0E+00
chromium-51	Ci	0.0E+00	0.0E+00

zirconium-niobium-95	Ci	0.0E+00	0.0E+00
molybdenum-99	Ci	0.0E+00	0.0E+00
technetium-99m	Ci	0.0E+00	0.0E+00
barium-lanthanum-140	Ci	0.0E+00	0.0E+00
cerium-141	Ci	0.0E+00	0.0E+00

Other (specify)	Ci	0.0E+00	0.0E+00
	Ci	0.0E+00	0.0E+00
	Ci	0.0E+00	0.0E+00
	Ci	0.0E+00	0.0E+00
	Ci	0.0E+00	0.0E+00
Total for period (above)	Ci	0.0E+00	0.0E+00

xenon-133	Ci	0.0E+00	0.0E+00
xenon-135	Ci	0.0E+00	0.0E+00

* No liquid release June 28, 1989, thru December 27, 1989.

SEMIANNUAL RADIOACTIVE MATERIAL RELEASE REPORT (1989)

GASEOUS EFFLUENTS *

Nuclides Released	Unit	3rd Quarter	4th Quarter
1. Fission gases			
krypton-85	Ci	4.2E-05	2.2E-03
krypton-85m	Ci	0.0E+00	0.0E+00
krypton-87	Ci	0.0E+00	0.0E+00
krypton-88	Ci	0.0E+00	0.0E+00
xenon-133	Ci	2.9E-06	3.4E-06
xenon-135	Ci	0.8E+00	1.9E+00
xenon-135m	Ci	4.4E+00	8.5E+00
xenon-138	Ci	0.0E+00	0.0E+00
nitrogen-13	Ci	8.2E-01	0.0E+00
tritium	Ci	4.3E+00	5.1E+00
Total for period	Ci	1.0E+01	1.6E+01
2. Iodines			
iodine-131	Ci	7.6E-05	2.2E-05
iodine-132	Ci	3.3E-06	0.0E+00
iodine-133	Ci	9.6E-05	4.2E-05
iodine-134	Ci	3.1E-05	0.0E+00
iodine-135	Ci	1.9E-05	1.6E-05
Total for period	Ci	2.3E-04	8.0E-05
3. Particulates			
strontium-89	Ci	7.8E-06	6.6E-06
strontium-90	Ci	3.4E-08	1.6E-07
cesium-134	Ci	0.0E+00	8.4E-06
cesium-137	Ci	0.0E+00	1.1E-05
barium-lanthanum-140	Ci	0.0E+00	0.0E+00
chromium-51	Ci	3.3E-04	1.6E-04
manganese-54	Ci	6.3E-05	2.6E-05
cobalt-58	Ci	1.2E-04	3.9E-05
cobalt-60	Ci	3.7E-04	2.3E-04
cerium-141	Ci	0.0E+00	0.0E+00
Total for period	Ci	8.9E-04	4.8E-04

* Release period is June 28, 1989, at 0900 hours through December 27, 1989, at 0800.

SUMMARY

(June 28, 1989 - December 27, 1989)

SHIPMENTS MADE TO BARNWELL, S.C.

WASTE	NO. OF SHIPMENTS	VOLUME (M^3)	ACTIVITY (Ci)
DEWATERED RESIN	4	2.21E+01	9.87E+01
IRRADIATED HARDWARE	1	1.63E+00	1.59E+04

SHIPMENTS MADE TO RICHLAND, WA.

WASTE	NO. OF SHIPMENTS	VOLUME (M^3)	ACTIVITY (Ci)
DRY ACTIVE WASTE	2	1.61E+01	4.33E+01

SHIPMENTS MADE TO SCIENTIFIC ECOLOGY GROUP

DRY ACTIVE WASTE	*	2.34E+01	1.58E+00
WET TRASH	*	2.61E+00	1.54E-01

* ONE (1) TOTAL SHIPMENTS.

TOTAL SOLID WASTE DISPOSITION

NO. OF SHIPMENTS:	8
MODE OF TRANSPORTATION:	TRUCK (EXCLUSIVE USE)
DESTINATION:	BARNWELL, SC (5)
	RICHLAND, WA (2)
	OAK RIDGE, TN (1)
VOLUME:	65.84 CUBIC METERS
ACTIVITY:	1.69E+04 CURIES
WASTE CLASSIFICATION:	"A" STABLE (4)
	"C" STABLE (1)
	"A" UNSTABLE (3)

SUMMARY

(June 28, 1989, - December 27, 1989)

MAJOR NUCLIDE COMPOSITION

DEWATERED RESIN

NUCLIDE	3rd QTR (Ci)	4th QTR (Ci)	TOTAL (Ci)	PERCENT ABUNDANCE
PRINCIPLE NUCLIDES				
Fe-55	2.03E+01	1.91E+01	3.94E+01	3.99E+01
Co-60	2.07E+01	1.96E+01	4.03E+01	4.08E+01
Cr-51	7.55E-01	4.50E-01	1.21E+00	1.22E+00
Mn-54	2.02E+00	3.46E+00	5.48E+00	5.55E+00
Ni-63	1.00E+00	9.61E-01	1.96E+00	1.99E+00
Co-58	7.14E-01	1.78E+00	2.49E+00	2.53E+00
H-3	1.31E-02	1.35E-02	2.66E-02	2.70E-02
C-14	4.49E-02	4.32E-02	8.81E-02	8.93E-02
Cs-134	1.28E+00	1.56E+00	2.84E+00	2.89E+00
Cs-137	2.23E+00	1.90E+00	4.13E+00	4.18E+00
NUCLIDES WITH Z>92				
TRUs*	3.18E-04	2.60E-04	5.78E-04	5.86E-04
Pu-241	6.60E-06	0.00E+00	6.60E-06	6.69E-06
ALL OTHERS **	7.85E-02	7.32E-01	8.10E-01	8.21E-01
TOTALS	4.91E+01	4.96E+01	9.87E+01	1.00E+02

* ALPHA EMITTING TRANSURANICS WITH HALF-LIFE GREATER THAN FIVE (5) YEARS

** Ag-110m, I-134, Nb-94, Rh-105, Sb-125, Sr-90, AND Zn-65

SUMMARY

(June 28, 1989, - December 27, 1989)

MAJOR NUCLIDE COMPOSITION

IRRADIATED HARDWARE

NUCLIDE	3rd QTR (Ci)	4th QTR (Ci)	TOTAL (Ci)	PERCENT ABUNDANCE
PRINCIPLE NUCLIDES				
Fe-55	0.00E+00	7.75E+03	7.75E+03	4.87E+01
Co-60	0.00E+00	6.81E+03	6.81E+03	4.28E+01
Ni-63	0.00E+00	5.72E+02	5.72E+02	3.59E+00
Mn-54	0.00E+00	7.70E+02	7.70E+02	4.84E+00
C-14	0.00E+00	2.02E-01	2.02E-01	1.27E-03
Tc-99	0.00E+00	8.13E-04	8.13E-04	5.11E-06
I-129	0.00E+00	7.33E-09	7.33E-09	4.60E-11
H-3	0.00E+00	2.76E+00	2.76E+00	1.73E-02
NUCLIDES WITH Z>92				
TRUs*	0.00E+00	1.41E-04	1.41E-04	8.86E-07
Pu-241	0.00E+00	1.11E-04	1.11E-04	6.98E-07
Cm-242	0.00E+00	1.38E-05	1.38E-05	8.67E-08
ALL OTHERS **	0.00E+00	8.49E+00	8.49E+00	5.34E-02
TOTALS	0.00E+00	1.59E+04	1.59E+04	1.00E+02

* ALPHA EMITTING TRANSURANICS WITH HALF-LIFE GREATER THAN FIVE (5) YEARS

** Cs-137, Nb-94, Ni-59, AND Sr-90

SUMMARY

(June 28, 1989, - December 27, 1989)

MAJOR NUCLIDE COMPOSITION

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NUCLIDE	3rd QTR (Ci)	4th QTR (Ci)	TOTAL (Ci)	PERCENT ABUNDANCE
PRINCIPLE NUCLIDES				
Fe-55	0.00E+00	3.17E+01	3.17E+01	7.07E+01
Co-60	0.00E+00	1.03E+01	1.03E+01	2.30E+01
Mn-54	0.00E+00	1.74E+00	1.74E+00	3.88E+00
Ni-63	0.00E+00	5.97E-01	5.97E-01	1.33E+00
C-14	0.00E+00	3.54E-01	3.54E-01	7.89E-01
Tc-99	0.00E+00	8.27E-06	8.27E-06	1.84E-05
I-129	0.00E+00	2.96E-06	2.96E-06	6.60E-06
NUCLIDES WITH Z>92				
TRUs*	0.00E+00	3.18E-05	3.18E-05	7.09E-05
Pu-241	0.00E+00	9.47E-04	9.47E-04	2.11E-03
Cm-242	0.00E+00	6.10E-05	6.10E-05	1.36E-04
ALL OTHERS **	0.00E+00	1.69E-01	1.69E-01	3.77E-01
TOTALS	0.00E+00	4.49E+01	4.49E+01	1.00E+02

* ALPHA EMITTING TRANSURANICS WITH HALF-LIFE GREATER THAN FIVE (5) YEARS

** Ce-144, Cr-51, Co-58, Cs-137, Cs-134, Fe-59, Ni-59, Sr-90, and Zn-65

SUMMARY

(June 28, 1989, - December 27, 1989)

MAJOR NUCLIDE COMPOSITION

WET TRASH

NUCLIDE	3rd QTR (Ci)	4th QTR (Ci)	TOTAL (Ci)	PERCENT ABUNDANCE
PRINCIPLE NUCLIDES				
Fe-55	0.00E+00	9.14E-02	9.14E-02	5.94E+01
Co-60	0.00E+00	2.70E-02	2.70E-02	1.76E+01
Mn-54	0.00E+00	7.90E-03	7.90E-03	5.14E+00
Ni-63	0.00E+00	2.08E-02	2.08E-02	1.35E+01
Co-58	0.00E+00	2.45E-03	2.45E-03	1.59E+00
Fe-59	0.00E+00	2.99E-03	2.99E-03	1.94E+00
NUCLIDES WITH Z>92				
TRUs*	0.00E+00	1.65E-06	1.65E-06	1.07E-03
Pu-241	0.00E+00	5.40E-05	5.40E-05	3.51E-02
Cm-242	0.00E+00	5.80E-06	5.80E-06	3.77E-03
ALL OTHERS **	0.00E+00	1.23E-03	1.23E-03	8.00E-01
TOTALS	0.00E+00	1.54E-01	1.54E-01	1.00E+02

* ALPHA EMITTING TRANSURANICS WITH HALF-LIFE GREATER THAN FIVE (5) YEARS

** Ce-144, Cs-134, Cs-137, Cr-51, AND Zn-65

SUMMARY OF CHANGES TO

THE OFFSITE DOSE ASSESSMENT MANUAL (ODAM)

For the period of June 28, 1989, through December 27, 1989, no changes were made to the Offsite Dose Assessment Manual.

SUMMARY OF CHANGES

TO THE PROCESS CONTROL PLAN (PRCP)

During the period of June 28, 1989, through December 27, 1989, the following changes were made to the existing PRCP's:

PRCP-A "Wet Radioactive Solid Waste" was revised. The purpose of the revision was to incorporate stability requirements for High Integrity Containers. The revision includes an update of the rapid dewatering process and also allows for the optional use of a dewatering manifold assembly. A copy of this PRCP is attached.

PRCP-C "Irradiated Components in Carbon Steel Liners" This PRCP was created for the cleanup of the Spent Fuel Pool and Cask Pool. Revision 1 clarifies stability and free standing liquid requirements. A copy of this PRCP is attached.

None of the changes submitted will affect product waste forms and all product waste forms will still conform to the requirements of 10CFR61.56.

PROCESS CONTROL PROGRAM FOR DEWATERING

WET RADIOACTIVE SOLID WASTE

PRCP-A

Revision 7

July 7, 1989

Duane Arnold Energy Center

Iowa Electric Light and Power Company

Approved by: Lisa Henderson — 7-14-89
Radwaste Supervisor — Date

Approved by: [signature] — 7-20-89
Radiation Protection Supervisor — Date

Reviewed by: R J Salmon — 7/26/89
Chairman, Operations Committee — Date

Approved by: David L Wilson for RLH — 7-27-89
Plant Superintendent-Nuclear — Date

Introduction

This Process Control Program describes the dewatering of wet radioactive waste solids from liquid systems at the Duane Arnold Energy Center and packaging the waste in high integrity containers (HIC) or steel containers (also referred to as liners).

Wet wastes are those wastes produced from the liquid radwaste treatment system. These wastes may typically be described as resins (bead and powdered), filter material, waste sludges, and filter precoat media. The dewatering process removes liquid from the waste in a HIC or steel liner to meet the criterion in 10 CFR Sections 61.56 (a)(3) and 61.56 (b)(2) and burial site requirements for free-standing liquid. Stability for Class A waste is provided by the high integrity container as authorized by Section 61.56 (b)(1), where required. For Class B and C waste materials stability will be provided at the Barnwell site by use of concrete structural overpacks.

Vendor

Westinghouse RS Inc, Formerly Westinghouse Hittman Nuclear and Development Corporation of Moorestown, New Jersey, is the vendor of the dewatering and packaging services as well as the RADLOK™ high integrity containers and steel liners used at the DAEC. Hittman personnel perform the dewatering and packaging operations described herein.

Dewatering System Description

The Hittman dewatering system employs dewatering equipment to dewater the wet radioactive waste solids in a HIC or steel liner. The Hittman system consists of an overflow drum, container level indicators, and interconnecting piping and valves. Attachment 1 is a diagram of the dewatering system as it is typically configured. A waste-filled HIC or steel liner is dewatered in the radwaste processing area using dewatering equipment which is located in the radwaste building. The dewatering system uses service air supplied by the DAEC and exhausts air into the DAEC Radwaste Ventilation System. Water removed from the HIC or steel liner, during dewatering, is returned to the DAEC radwaste system and is treated as liquid radwaste.

The Hittman dewatering system is equipped with instruments to provide information about the dewatering process. These include mechanical and electrical liquid level indicators with sensors in the HIC or steel liner, vacuum receiver tank, and dewatering manifold assembly. Drainable liquid tests are performed using a vacuum pump and vacuum bottle to verify liquid content of the HIC or steel liner prior to shipment.

Operation

The radioactive wastes that are dewatered and packaged in a HIC or steel liner for disposal are normally, but not limited to, wastes from the condensate phase separators, reactor water cleanup phase separators, waste sludge tanks, or the spent resin tank.

Wastes from any of the above mentioned systems are piped to a waste holding tank which is piped directly to the vendor's equipment. The wastes are transferred to the HIC or steel liner using the vendor's equipment as shown in Attachment 1. A conductivity probe near the top of the HIC or steel liner interior that actuates an audible alarm and light provides an indication of the waste level during the HIC or steel liner filling and after dewatering.

After a HIC or steel liner is filled with waste, dewatering is performed by pulling a suction on the filter assemblies in the HIC or steel liner until loss of suction occurs. Loss of suction for the rapid dewatering underdrain is defined as, (1) a vacuum drop of several inches of Hg from one steady vacuum to another and (2) a loss of continuous water flow in the dewatering hose. Pump down by suction on the bottom underdrain manifold is continued for a specified time with the dewatering pump and the vacuum pump.

A drainable liquid test is performed by allowing the HIC or steel liner to rest for a stated time, then siphoning from the bottom underdrain manifold for a specified time to remove any liquid that has drained into it. The drainable liquid test is passed if the volume of water removed is less than a volume demonstrated by the vendor to indicate less than 1% free-standing liquid in the waste for the HIC being tested, or less than 0.5 percent drainable liquid for any container being sent to the Nevada burial site.

In the event the waste in the HIC or steel liner does not pass the drainable liquid test, a cycle of waiting a specified time, operating the dewatering and vacuum pumps, waiting a specified time, and then performing a drainable liquid test is repeated until the free-standing liquid criterion is met. Specific times appropriate for the HIC or steel liner and waste being dewatered have been determined by the vendor and are stated in the dewatering procedure.

Essential Waste Characteristics and Verification

The requisite characteristics of the radioactive waste addressed by this Process Control Program are stated in 10 CFR Section 61.56, State of Nevada, State of Washington, and State of South Carolina License conditions, as appropriate.

The wastes subject to the process control plan are from sources within the DAEC that are well characterized and generally recognized as meeting the essential qualities of Section 61.56 (a), and burial site requirements. By knowing the source and kind of each of the subject wastes, IELP is able to ensure that the qualities of the wastes continue to meet the requirements of Section 61.56 (a), and are compatible with the HIC or steel liner itself. In addition, the DAEC's chemical control program helps prevent listed substances from being admitted into the waste streams that are deposited into the HIC or steel liner.

10 CFR Section 61.56 (b) includes provisions for stability of radioactive waste after its disposal. For the wastes covered by this PRCP, Iowa Electric intends to provide stability when required by burial site licensing condition and Part

61 by placing the waste in a high integrity container that will be stable after disposal as authorized in Section 61.56 (b)(1).

Both 10 CFR Sections 61.56 (a)(3) and 61.56 (b)(2) require as little free-standing and noncorrosive liquid as is reasonably achievable and no more than 1% of the volume of the waste when the waste is in a disposal container designed to ensure stability, except for the Nevada site which stipulates less than 0.5 percent in any container. Iowa Electric intends to accomplish this by dewatering as described herein and to perform surveillance to assure that it has been done. For a given type of waste, the operating procedure requires the vacuum pump and dewatering pump be operated for stated time interval(s). Dewatering is considered complete when the volume of liquid that can be suctioned from the HIC or steel liner during a defined time is no greater than an amount stated in the operating procedure pertaining to that kind of waste. The conditions stated in the procedure will have been demonstrated by the vendor of the dewatering service to achieve less than 1% or 0.5 percent free-standing water in the waste, appropriate to the burial site being sent to.

High Integrity Container

Wastes covered by this PRCP will be packaged in RADLOK™ high integrity containers or steel liners. The RADLOK™ containers have been certified by the South Carolina Bureau of Radiological Health for the intended use. Steel liners will qualify as strong, tight containers as per 49CFR.

Each container will be visually inspected before use for acceptable condition of:

1. Sealing components,
2. Exterior surface,
3. Dewatering filter elements, and
4. Dewatering verification tube.

After filling and dewatering has been completed, the fill port opening in the container is closed in accordance with written procedures. The procedure requires verification that the closure gasket is in place and that the threaded fill port lid is tightened to a specified torque value when required by procedure.

Quality Assurance

Control of the dewatering and packaging processes is maintained by conducting these operations according to written procedures addressing container inspection before filling, dewatering, container closure, and cask loading. The vendor verifies and documents that key steps have been performed.

Iowa Electric maintains assurance that dewatering and packaging is performed as intended by separately verifying and documenting that the key steps were performed.

Iowa Electric's quality assurance program is subject to 10 CFR Part 50, Appendix B, as applied to dewatering and packaging of radioactive waste.

Administration

The Radiation Protection Department maintains or requires the vendor to maintain procedures which will ensure that all applicable requirements are met prior to shipment of radioactive waste. Iowa Electric Light and Power will review applicable vendor's operating procedures before authorizing the vendor to dewater radioactive waste. Site specific procedures developed by the vendor for the DAEC will be reviewed by the Radiation Protection Supervision. Most recent revisions will be stamped as approved on both working and controlled vendor procedure copies. Processing procedures internal to the vendor will be reviewed and approved by the vendor. The Radwaste Group of the Radiation Protection Department is responsible for ensuring compliance with the PRCP, for vendor verifications, and for recordkeeping.

At least once every 24 months, IELP will audit the radwaste Process Control Program and operating procedures that implement it (in accordance with Technical Specification 6.5.2.8.j.) Any change to the Process Control Program will be made in accordance with Technical Specification 6.15, approved by the Plant Superintendent-Nuclear, reviewed by the Operations Committee, and submitted to the NRC in the next Semi-Annual Radioactive Material Release Report after the change is made.

Training

Before a vendor employee performs a dewatering or packaging procedure that is subject to this PRCP, they must have received relevant training, and Iowa Electric must have received documented confirmation of their training along with a statement of their qualifications.

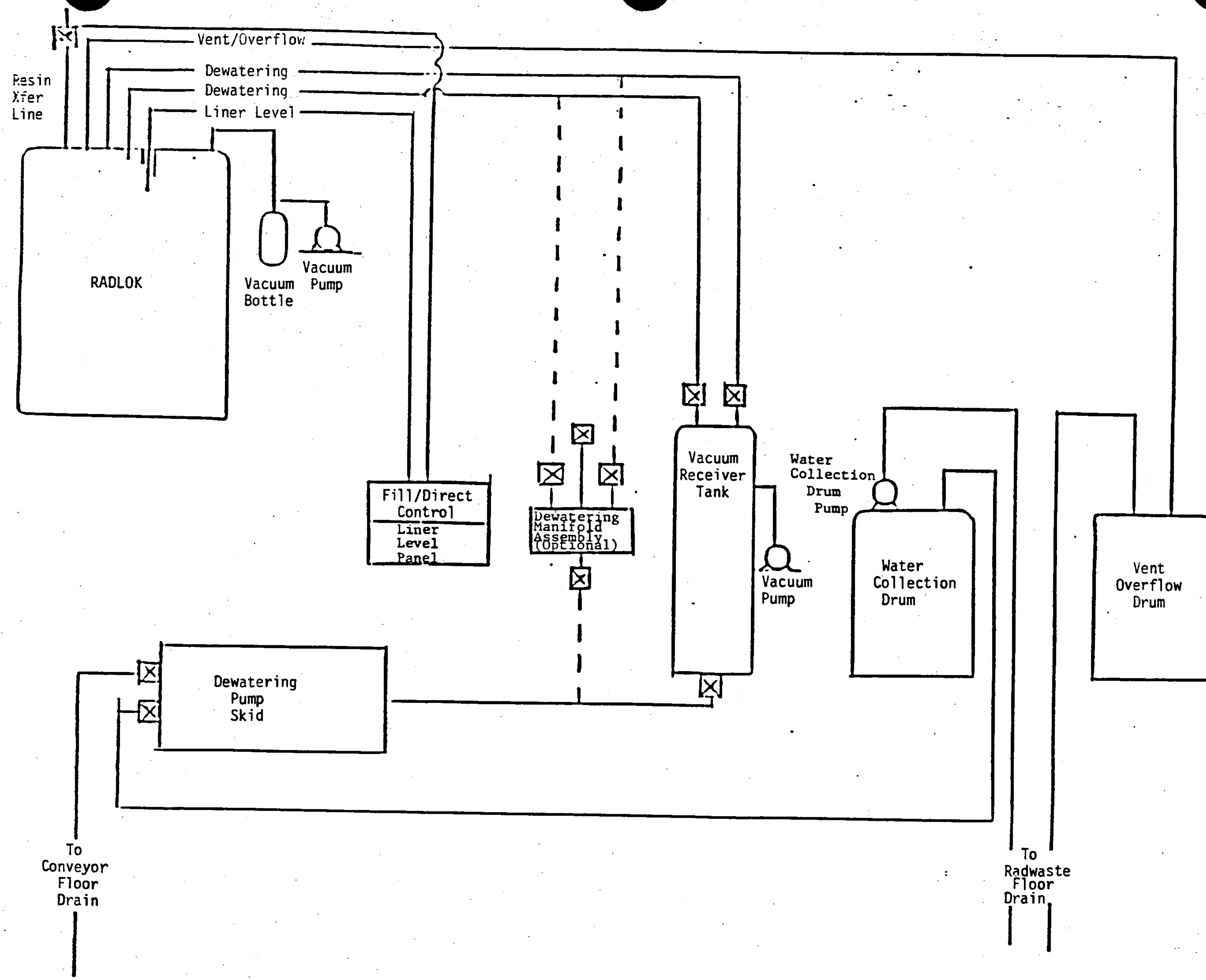
References

1. DAEC Radwaste Handling Procedures

2. Westinghouse Hittman Nuclear Incorporated procedure STD-P-03-010, "Transfer and Dewatering Bead Resin in Hittman RADLOK High Integrity Containers with Single Layer Underdrain Assembly to Less Than 1% Drainable Liquid".

3. Westinghouse Hittman Nuclear Incorporated Procedure STD-PCP-03-040, "Powdered Resin Transfer and Dewatering procedure using steel containers".

4. Westinghouse Hittman Nuclear Incorporated Procedure STD-P-03-046, Transfer and Dewatering Ion Exchange Resin and/or Activated Charcoal Filter Media using the Hittman Rapid Dewatering System.


Vent/Overflow
Dewatering
Dewatering
Liner Level
Resin
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RADLOK
Vacuum
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Liner
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Receiver
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Water
Collection
Drum
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Skid
To
Conveyor
Floor
Drain
To
Radwaste
Floor
Drain

PROCESS CONTROL PROGRAM FOR PROCESSING

IRRADIATED COMPONENTS IN CARBON STEEL LINERS

PRCP-C

Revision 1

November 7, 1989

Duane Arnold Energy Center

Iowa Electric Light and Power Company

Approved by: Lisa Henderson	11-15-89
Radwaste Supervisor	Date
Approved by: [illegible]	11-15-89
Radiation Protection Supervisor	Date
Reviewed by: R [illegible] Holman	11/21/89
Chairman, Operations Committee	Date
Approved by: [illegible]	11-22-89
Plant Superintendent-Nuclear	Date

INTRODUCTION

This Process Control Program describes the packing and dewatering of irradiated components into waste liners from storage in the Spent Fuel and Cask Pools here at the Duane Arnold Energy Center.

Irradiated components in general describe any item that has been exposed to a neutron flux. Components typical of this waste stream at DAEC include expended control rod blades, fission chamber detectors (SRM and IRM) and their associated dry tubes, local power range monitors (LPRMS) and other irradiated parts. Depleted neutron sources may also be disposed of using this Process Control Program provided that they qualify for disposal under the waste classification requirements of 10CFR61.

The packaging process describes how irradiated components are to be handled and packaged in accordance with the applicable burial site criteria and/or requirements.

The dewatering process removes liquid from the waste in the disposal liner to meet the criteria set forth in 10CFR61.56 (a) (3), 10CFR61.56 (b) (2) and applicable burial site requirements for free standing liquid. Irradiated components are considered inheritently stable.

VENDOR

WasteChem Corporation of Mahwah, NJ is the vendor for the packaging and dewatering of irradiated components in carbon steel liners. WasteChem personnel, assisted by DAEC personnel as required, perform the dewatering and packaging operation described herein. The cask for transport of the irradiated components is to be provided by Transnuclear, Incorporated of Hawthorne, NY.

DEWATERING SYSTEM DESCRIPTION

The cask has a drain system used for draining water from the cask after loading of the waste liner. Cask cavity water is removed by opening the vent port for venting and installing the drain connector and a hose for draining. Water drained from the cask will be directed to the liquid radwaste system for processing.

After the cask is drained, the vacuum drying system (VDS) is utilized to perform cavity drying. The VDS is utilized to remove residual moisture from the cask cavity by vacuum drying. After a loaded cask is removed from the cask pool and thoroughly drained, it is connected to the VDS and placed under a vacuum. Any water which has not drained from the cavity evaporates from the cavity surface or surface of the irradiated hardware.

The water vapor in the cavity is then condensed by braking the vacuum. The resulting condensate is drained into a tank which is connected to the cask drain. Any remaining water vapor is then removed by continuing the vacuum pumping until a dryness test is successfully completed. Upon completion of drying, the VDS is used for cask leakage and tightness testing.

The VDS system consists of a 70 CFM vacuum pump, an in-line filter, vacuum gages, a drain bottle (one gallon capacity) and associated piping, hoses and valves. The total VDS system is skid mounted to facilitate easy access and mobility. Dewatering of the liner containing the irradiated waste will be in accordance with a WasteChem procedure specific to the irradiated component waste stream.

OPERATION

The irradiated component wastes that are dewatered and packaged in a stainless steel liner for disposal are normally, but not limited to, wastes removed from inside the reactor pressure vessel or associated components. Wastes from the above activities are changed out periodically and stored normally in the spent fuel and/or cask storage pool. When a quantity sufficient to fill a steel liner is accumulated they will be packaged and dewatered using vendor equipment and procedures.

After a steel liner is filled with waste, dewatering is performed by pulling a suction on the cask cavity and the surface of the irradiated components until no significant amount of water is collected in the drain bottle. Dryness is then verified by measuring an increase in the internal pressure of the cavity.

ESSENTIAL WASTE CHARACTERISTICS AND VERIFICATION

The requisite characteristics of the radioactive waste addressed by this Process Control Program are stated in 10 CFR Section 61.56 and State license conditions, as appropriate.

The wastes subject to the process control plan are from sources within the DAEC that are well characterized and generally recognized as meeting the essential qualities of 10 CFR Section 61.56 (a), and burial site requirements. By knowing the source and kind of each of the subject wastes, IEL&P is able to ensure that the qualities of the waste continue to meet the requirements of 10 CFR Section 61.56 (a), and are compatible with the steel liner. In addition, the DAEC's Chemical Control Program helps prevent listed hazardous substances from being admitted into the waste streams that are deposited into the steel liner.

10 CFR Section 61.56 (b) includes provisions for stability for radioactive waste after its disposal. The structural stability for irradiated components is provided by the waste form itself since it is a solid monolith.

Both 10 CFR 61.56 (a)(3) and 61.56 (b)(2) requires as little free-standing and noncorrosive liquid as is reasonably achievable and no more than 1% of the volume of the waste in a disposal container designed to ensure stability. Iowa Electric intends to accomplish this by dewatering and drying of the steel liner and cask as described herein and to perform surveillance to assure that it has been done. For a given type of waste, the operating procedure requires the vacuum pump be operated for stated time interval(s) as long as additional water enters the drain bottle. Once no significan amount of water is collected in the drain bottle, a vacuum is pulled three additional times. Finally to test for dryness a pressure reading test is performed. If the pressure increase does not exceed an amount stated in the operating procedures the cask and liner is considered to be dry and to meet free-standing liquid requirements.

PACKAGINGS

Wastes covered by this PRCP will be packaged in carbon steel liners. Containers will be inspected prior to use to ensure that they are acceptable for use.

QUALITY ASSURANCE

Control of the dewatering and packaging is maintained by conducting these operations according to written procedures addressing container inspection before filling, dewatering, container closure, and cask loading. The vendor verifies and documents that key steps have been performed.

Iowa Electric maintains assurance that dewatering and packaging is performed as intended by separately verifying and documenting that the key steps were performed.

Iowa Electric's quality assurance program is subject to 10 CFR Part 50, Appendix B, as applied to dewatering and packaging of radioactive waste.

ADMINISTRATION

The Radiation Protection Department maintains or requires the vendor to maintain procedures which will ensure that all applicable requirements are met prior to shipment of radioactive waste. Iowa Electric Light and Power will review applicable vendor's operating procedures before authorizing the vendor to package and to dewater radioactive waste. Site specific procedures developed by the vendor for the DAEC will be reviewed by Radiation Protection Supervision. Most recent revisions will be stamped as approved on both working and controlled vendor procedure copies. Processing procedures internal to the vendor will be reviewed and approved by the vendor. The Radwaste Group of the Radiation

Protection Department is responsible for ensuring compliance with the PRCP, for vendor verification, and for recordkeeping.

At least once every 24 months, IEL&P will audit the Radwaste Process Control Program and Operating Procedures that implement it (in accordance with Technical Specification 6.5.2.8.j). Any change to the Process Control Program will be made in accordance with Technical Specification 6.15, approved by the Plant Superintendent-Nuclear, reviewed by the Operations Committee, and submitted to the NRC in the next Semi-Annual Radioactive Material Release Report after the change is made.

TRAINING

Before a vendor employee performs a dewatering or packaging procedure that is subject to this PRCP, they must have received relevant training, and Iowa Electric must have received documented confirmation of their training along with a statement of their qualifications.

REFERENCES

1.0 DAEC Radwaste Handling Procedures.

2.0 Wastechem Procedure No. 0013G, "Procedure for calculating the Radionuclide contents, concentration and waste classification of liners containing activated metal components."

3.0 WasteChem Procedure No. 0021F, "Procedure for Processing of Irradiated Hardware using the WasteChem Underwater Shear/Compactor (USC)".

4.0 WasteChem Procedure No. 0024F, "Procedure for Processing of Incore Instrumentation".

5.0 Transnuclear Manual OM-7, "TN-RAM Cask Operations Manual".

6.0 Title 10 of Code of Federal Regulations - Energy.

7.0 Title 49 of Code of Federal Regulations - Transportation

8.0 Iowa Electric's Quality Assurance Program.

9.0 DAEC Technical Specifications

SUMMARY OF METEOROLOGICAL DATA

The following pages are a summation of meteorological data accumulated during the calender year 1989 by the MIDAS System at the Duane Arnold Energy Center (DAEC). Each table is by wind speed, wind direction, and stability class at the specified sensor height (33' or 156'). A summary table of all stability classes at each height is also included.

8901010189123124

SITE: DUANE ARNOLD 02/12/90 08:43

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD = 89010101-89123124

STABILITY CLASS: A DT/DZ

ELEVATION: SPEED:WS33 DIRECTION:WD33 LAPSE:DEL T

WIND SPEED(MPH)

WIND DIRECTION	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	1	7	1	0	0	9
NNE	0	14	13	0	0	0	27
NE	0	13	8	0	0	0	21
ENE	1	19	6	0	0	0	26
E	2	28	4	0	0	0	34
ESE	4	29	11	0	0	0	44
SE	4	30	14	0	0	0	48
SSE	1	39	33	0	0	0	73
S	2	43	62	16	1	0	124
SSW	2	25	29	25	0	0	81
SW	4	18	23	15	1	0	61
WSW	1	15	9	6	0	0	31
W	0	5	8	5	0	1	19
WNW	0	10	11	10	3	0	34
NW	0	9	14	11	8	0	42
NNW	1	11	17	14	3	0	46
TOTAL	22	309	269	103	16	1	720

PERIODS OF CALM(HOURS): 184

VARIABLE DIRECTION 0

HOURS OF MISSING DATA: 807

ENTER: [RETURN] CONTINUE, [SO] START OVER, [EX] TO EXIT

SITE: DUANE ARNOLD 02/12/90 08:44

HOURS AT EACH WIND SPEED AND DIRECTION

OD OF RECORD = 89010101-89123124

ILITY CLASS: B DT/DZ

ELEVATION: SPEED:WS33 DIRECTION:WD33 LAPSE:DEL T

WIND SPEED(MPH)

WIND DIRECTION	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	1	3	0	0	0	4
NNE	0	4	7	1	0	0	12
NE	0	5	5	1	0	0	11
ENE	0	4	3	0	0	0	7
E	2	3	3	0	0	0	8
ESE	0	2	5	0	0	0	7
SE	3	4	5	0	0	0	12
SSE	0	5	6	1	0	0	12
S	1	8	6	6	0	0	21
SSW	2	4	3	7	0	0	16
SW	0	2	5	2	1	0	10
WSW	1	5	3	1	0	0	10
W	0	3	2	2	2	1	10
WNW	1	2	8	6	1	0	18
NW	0	3	7	10	1	0	21
NNW	0	1	10	8	0	0	19
TOTAL	10	56	81	45	5	1	198

IODS OF CALM(HOURS): 184

VARIABLE DIRECTION 0

HOURS OF MISSING DATA: 807

ENTER: [RETURN] CONTINUE, [SO] START OVER, [EX] TO EXIT

SITE: DUANE ARNOLD 02/12/90 08:44

HOURS AT EACH WIND SPEED AND DIRECTION

OD OF RECORD = 89010101-89123124

ILITY CLASS: C DT/DZ

ELEVATION: SPEED:WS33 DIRECTION:WD33 LAPSE:DEL T

WIND SPEED(MPH)

WIND DIRECTION	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	1	1	3	0	0	5
NNE	1	7	3	4	0	0	15
NE	1	8	5	4	0	0	18
ENE	1	7	3	0	0	0	11
E	0	13	3	0	0	0	16
ESE	0	7	10	0	0	0	17
SE	3	8	5	0	0	0	16
SSE	2	6	11	0	0	0	19
S	3	5	15	1	1	0	25
SSW	3	4	6	3	1	0	17
SW	1	7	6	3	0	0	17
WSW	0	4	4	1	0	0	9
W	0	5	4	4	3	0	16
WNW	0	3	9	3	2	1	18
NW	1	6	10	8	2	0	28
NNW	0	1	16	9	1	0	28
TOTAL	16	92	111	43	10	1	275

IODS OF CALM(HOURS): 184

VARIABLE DIRECTION 0

HOURS OF MISSING DATA: 807

ENTER: [RETURN] CONTINUE, [SO] START OVER, [EX] TO EXIT

SITE: DUANE ARNOLD 02/12/90 08:44

HOURS AT EACH WIND SPEED AND DIRECTION

OD OF RECORD = 89010101-89123124

ILITY CLASS: D DT/DZ

ELEVATION: SPEED:WS33 DIRECTION:WD33 LAPSE:DEL T

WIND SPEED(MPH)

WIND DIRECTION	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	2	23	52	24	0	0	106
NNE	1	26	49	28	3	0	109
NE	7	68	55	12	0	0	142
ENE	7	61	39	5	0	0	112
E	13	86	36	0	0	0	136
ESE	17	80	28	3	0	0	128
SE	16	77	42	0	0	0	135
SSE	18	77	69	1	0	0	165
S	15	68	100	45	5	0	233
SSW	7	40	47	27	4	0	125
SW	12	32	41	16	2	0	103
WSW	4	29	31	6	1	0	71
W	0	38	41	20	5	13	118
WNW	4	33	51	42	10	3	144
NW	3	54	109	79	23	1	282
NNW	0	32	136	128	8	1	312
TAL	126	824	926	436	61	18	2421

IODS OF CALM(HOURS): 184

VARIABLE DIRECTION 0

HOURS OF MISSING DATA: 807

ENTER: [RETURN] CONTINUE, [SO] START OVER, [EX] TO EXIT

SITE: DUANE ARNOLD 02/12/90 08:45

HOURS AT EACH WIND SPEED AND DIRECTION

OD OF RECORD = 89010101-89123124

ILITY CLASS: E DT/DZ

ELEVATION: SPEED:WS33 DIRECTION:WD33 LAPSE:DEL T

WIND SPEED(MPH)

WIND DIRECTION	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	18	34	31	15	1	0	99
NNE	20	80	43	9	0	0	156
NE	22	85	30	7	0	0	144
ENE	23	48	14	4	0	0	89
E	40	46	14	1	0	0	102
ESE	50	116	24	2	0	0	192
SE	55	137	15	1	0	0	209
SSE	64	163	72	1	0	0	300
S	59	209	161	22	1	0	454
SSW	35	85	56	19	2	0	197
SW	21	51	36	7	0	0	115
WSW	17	43	16	4	1	0	81
W	18	60	40	11	1	1	131
WNW	12	71	69	38	7	1	198
NW	7	94	136	60	12	2	312
NNW	5	69	138	35	8	0	255
TAL	466	1391	895	236	33	4	3034

IODS OF CALM(HOURS): 184

VARIABLE DIRECTION 0

HOURS OF MISSING DATA: 807

ENTER: [RETURN] CONTINUE, [SO] START OVER, [EX] TO EXIT

SITE: DUANE ARNOLD 02/12/90 08:45

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD = 89010101-89123124

STABILITY CLASS: F DT/DZ

ELEVATION: SPEED:WS33 DIRECTION:WD33 LAPSE:DEL T

WIND SPEED(MPH)

WIND DIRECTION	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	4	2	0	0	0	0	6
NNE	11	21	2	0	0	0	34
NE	7	27	0	0	0	0	34
ENE	7	9	0	0	0	0	16
E	9	6	0	0	0	0	15
ESE	26	12	0	0	0	0	38
SE	29	10	0	0	0	0	41
SSE	63	17	1	0	0	0	88
S	54	21	1	0	0	0	76
SSW	30	18	2	0	0	0	50
SW	16	16	8	0	0	0	40
WSW	12	19	3	0	0	0	34
W	15	16	3	0	0	0	34
WNW	4	19	7	0	0	0	30
NW	0	13	2	0	0	0	15
NNW	2	1	0	0	0	0	3
TOTAL	289	227	29	0	0	0	554

PERIODS OF CALM(HOURS): 184

VARIABLE DIRECTION 0

HOURS OF MISSING DATA: 807

ENTER: [RETURN] CONTINUE, [SO] START OVER, [EX] TO EXIT

SITE: DUANE ARNOLD 02/12/90 08:45

HOURS AT EACH WIND SPEED AND DIRECTION

OD OF RECORD = 89010101-89123124

ILITY CLASS: G DT/DZ

ELEVATION: SPEED:WS33 DIRECTION:WD33 LAPSE:DEL T

WIND SPEED(MPH)

WIND DIRECTION	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	5	0	0	0	0	0	5
NNE	12	12	0	0	0	0	26
NE	35	30	0	0	0	0	68
ENE	37	7	0	0	0	0	47
E	35	3	1	0	0	0	43
ESE	31	1	0	0	0	0	40
SE	46	3	0	0	0	0	71
SSE	80	1	0	0	0	0	126
S	109	3	0	0	0	0	124
SSW	63	6	0	0	0	0	74
SW	54	10	0	0	0	0	68
WSW	16	8	0	0	0	0	26
W	14	4	0	0	0	0	18
WNW	6	2	0	0	0	0	8
NW	3	0	0	0	0	0	3
NNW	1	0	1	1	1	0	4
TOTAL	547	90	2	1	1	0	751

IODS OF CALM(HOURS): 184

VARIABLE DIRECTION 0

HOURS OF MISSING DATA: 807

ENTER: [RETURN] CONTINUE, [SO] START OVER, [EX] TO EXIT

SITE: DUANE ARNOLD 02/12/90 08:46

HOURS AT EACH WIND SPEED AND DIRECTION

…OD OF RECORD = 89010101-89123124

…ILITY CLASS: ALL DT/DZ

ELEVATION: SPEED:WS33 DIRECTION:WD33 LAPSE:DEL T

WIND SPEED(MPH)

WIND DIRECTION	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	29	62	94	43	1	0	234
NNE	45	164	117	42	3	0	379
NE	72	236	103	24	0	0	438
ENE	76	155	65	9	0	0	308
E	101	185	61	1	0	0	354
ESE	128	247	78	5	0	0	466
SE	156	269	81	1	0	0	532
SSE	228	308	192	3	0	0	783
S	243	357	345	90	8	0	1057
SSW	142	182	143	81	7	0	560
SW	108	136	119	43	4	0	414
WSW	51	123	66	18	2	0	262
W	47	131	98	42	11	16	346
WNW	27	140	155	99	23	5	450
NW	14	179	278	168	46	3	703
NNW	9	115	318	195	21	1	667
TOTAL	1476	2989	2313	864	126	25	7953

…IODS OF CALM(HOURS): 184

VARIABLE DIRECTION 0

HOURS OF MISSING DATA: 807

ENTER: [RETURN] CONTINUE, [SO] START OVER, [EX] TO EXIT

8901010189123124
SITE: DUANE ARNOLD 02/12/90 08:49

HOURS AT EACH WIND SPEED AND DIRECTION
[illegible]OD OF RECORD = 89010101-89123124
[illegible]ILITY CLASS: A DT/DZ
E[illegible]VATION: SPEED:WS156 DIRECTION:WD156 LAPSE:DEL T

WIND SPEED(MPH)

WIND DIRECTION	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	1	3	6	0	0	0	10
NNE	0	9	15	7	0	0	31
NE	1	9	11	3	0	0	24
ENE	0	20	10	1	0	0	31
E	2	22	13	1	0	0	38
ESE	0	21	11	5	0	0	37
SE	2	17	20	3	0	0	42
SSE	0	19	51	21	0	0	91
S	2	20	54	30	6	1	113
SSW	1	9	26	29	5	0	70
SW	3	12	21	16	6	1	59
WSW	1	6	12	3	2	0	24
W	1	8	5	4	4	0	22
WNW	1	7	14	10	5	0	37
NW	0	7	8	18	10	0	43
NNW	0	8	12	20	5	1	46
TOTAL	15	197	289	171	43	3	718

[illegible]IODS OF CALM(HOURS): 4
VARIABLE DIRECTION 0
HOURS OF MISSING DATA: 779
ENTER: [RETURN] CONTINUE, [SO] START OVER, [EX] TO EXIT

SITE: DUANE ARNOLD 02/12/90 08:50

HOURS AT EACH WIND SPEED AND DIRECTION

[illegible]OD OF RECORD = 89010101-89123124

[illegible]ILITY CLASS: B DT/DZ

ELEVATION: SPEED:WS156 DIRECTION:WD156 LAPSE:DEL T

WIND SPEED(MPH)

WIND DIRECTION	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	2	1	3	0	0	6
NNE	0	2	8	2	0	0	12
NE	1	4	6	1	0	0	12
ENE	1	3	3	0	0	0	7
E	0	2	5	0	0	0	7
ESE	0	1	3	1	0	0	5
SE	0	3	5	3	0	0	11
SSE	2	1	13	3	0	0	19
S	0	4	4	6	2	0	16
SSW	1	4	5	5	3	0	18
SW	1	1	4	2	0	1	9
WSW	0	3	2	2	0	0	7
W	2	1	1	5	0	3	12
WNW	1	2	7	5	6	0	21
NW	0	1	7	8	4	0	20
NNW	0	1	6	9	0	0	16
TOTAL	9	35	80	55	15	4	198

[illegible]IODS OF CALM(HOURS): 4

VARIABLE DIRECTION 0

HOURS OF MISSING DATA: 779

ENTER: [RETURN] CONTINUE, [SO] START OVER, [EX] TO EXIT

SITE: DUANE ARNOLD   02/12/90 08:50

```
                  HOURS AT EACH WIND SPEED AND DIRECTION
   OD OF RECORD =     89010101-89123124
   ILITY CLASS:      C    DT/DZ
ELEVATION:      SPEED:WS156   DIRECTION:WD156   LAPSE:DEL T
```

WIND SPEED(MPH)

WIND DIRECTION	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	2	3	1	3	1	0	10
NNE	1	3	5	6	0	0	15
NE	1	6	8	3	0	0	18
ENE	0	4	5	0	0	0	9
E	1	11	4	0	0	0	16
ESE	0	3	7	3	0	0	13
SE	1	8	6	2	0	0	17
SSE	1	4	9	8	0	0	22
S	1	4	10	6	0	1	22
SSW	2	2	4	5	1	1	15
SW	1	7	3	4	1	0	16
WSW	3	3	5	2	0	0	13
W	0	3	3	5	2	2	15
WNW	0	3	4	9	3	1	20
NW	0	2	7	8	10	0	27
NNW	1	2	11	11	2	1	28
TOTAL	15	68	92	75	20	6	276

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  RIODS OF CALM(HOURS):      4
 VARIABLE DIRECTION     0
 HOURS OF MISSING DATA:    779
ENTER: [RETURN] CONTINUE, [SO] START OVER, [EX] TO EXIT
```

SITE: DUANE ARNOLD 02/12/90 08:50

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD = 89010101-89123124

STABILITY CLASS: D DT/DZ

ELEVATION: SPEED:WS156 DIRECTION:WD156 LAPSE:DEL T

WIND SPEED(MPH)

WIND DIRECTION	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	3	18	47	63	5	0	136
NNE	4	23	37	48	8	0	120
NE	6	50	58	23	2	0	139
ENE	6	34	51	18	0	0	109
E	7	57	57	12	0	0	133
ESE	10	47	51	19	2	0	129
SE	7	32	75	23	0	0	137
SSE	6	36	68	54	0	0	164
S	4	38	74	73	21	2	212
SSW	4	26	44	40	13	3	130
SW	5	24	36	25	7	1	98
WSW	3	24	29	11	2	1	70
W	7	24	40	27	8	17	123
WNW	6	21	36	38	32	10	143
NW	1	30	81	81	68	17	278
NNW	1	27	81	145	37	5	296
TOTAL	80	511	865	700	205	56	2417

PERIODS OF CALM(HOURS): 4

VARIABLE DIRECTION 0

HOURS OF MISSING DATA: 779

ENTER: [RETURN] CONTINUE, [SO] START OVER, [EX] TO EXIT

SITE: DUANE ARNOLD 02/12/90 08:51

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD = 89010101-89123124

STABILITY CLASS: E DT/DZ

ELEVATION: SPEED:WS156 DIRECTION:WD156 LAPSE:DEL T

WIND SPEED(MPH)

WIND DIRECTION	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	10	27	50	17	3	0	107
NNE	6	40	73	45	6	0	170
NE	9	51	50	12	1	0	123
ENE	8	33	45	8	1	0	95
E	11	47	39	3	1	0	101
ESE	10	52	99	17	1	0	179
SE	7	51	152	17	2	0	229
SSE	10	39	167	88	3	0	307
S	9	52	152	137	3	2	355
SSW	11	36	67	56	8	1	179
SW	13	39	61	34	1	0	148
WSW	9	44	29	12	5	1	100
W	6	35	53	30	8	3	135
WNW	5	22	72	57	32	8	196
NW	6	33	137	136	35	13	360
NNW	4	34	122	87	13	1	261
TOTAL	134	635	1368	756	123	29	3045

PERIODS OF CALM(HOURS): 4

VARIABLE DIRECTION 0

HOURS OF MISSING DATA: 779

ENTER: [RETURN] CONTINUE, [SO] START OVER, [EX] TO EXIT

SITE: DUANE ARNOLD 02/12/90 08:51

HOURS AT EACH WIND SPEED AND DIRECTION

OD OF RECORD = 89010101-89123124

ILITY CLASS: F DT/DZ

ELEVATION: SPEED:WS156 DIRECTION:WD156 LAPSE:DEL T

WIND SPEED(MPH)

WIND DIRECTION	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	4	7	14	0	0	0	25
NNE	0	5	18	3	0	0	26
NE	1	13	7	0	0	0	21
ENE	1	12	9	0	0	0	22
E	5	11	3	0	0	0	19
ESE	1	14	18	1	0	0	34
SE	2	12	25	0	0	0	39
SSE	3	29	31	0	0	0	63
S	6	12	23	1	1	0	43
SSW	2	14	9	4	0	0	29
SW	3	16	7	5	1	0	32
WSW	5	27	21	7	0	0	60
W	7	21	12	4	0	0	44
WNW	5	14	30	10	0	0	59
NW	1	7	15	1	0	0	24
NNW	4	9	5	2	0	0	20
TOTAL	50	223	247	38	2	0	560

IODS OF CALM(HOURS): 4

VARIABLE DIRECTION 0

HOURS OF MISSING DATA: 779

ENTER: [RETURN] CONTINUE, [SO] START OVER, [EX] TO EXIT

SITE: DUANE ARNOLD 02/12/90 08:51

HOURS AT EACH WIND SPEED AND DIRECTION

OD OF RECORD = 89010101-89123124

ILITY CLASS: G DT/DZ

E .FVATION: SPEED:WS156 DIRECTION:WD156 LAPSE:DEL T

WIND SPEED(MPH)

WIND DIRECTION	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	5	9	5	1	0	0	20
NNE	14	3	12	4	0	0	33
NE	11	18	8	0	0	0	37
ENE	4	11	3	1	0	0	19
E	16	18	6	1	0	0	41
ESE	12	17	13	1	0	0	43
SE	18	59	27	0	0	0	104
SSE	9	61	38	0	0	0	108
S	12	40	16	0	0	0	69
SSW	18	21	2	0	0	0	41
SW	15	16	4	2	0	0	38
WSW	17	21	8	0	0	0	46
W	16	23	10	0	0	0	49
WNW	16	22	14	0	0	0	52
NW	9	23	5	1	0	0	38
NNW	7	16	5	0	1	0	29
TOTAL	199	378	176	11	1	0	767

IODS OF CALM(HOURS): 4

VARIABLE DIRECTION 0

HOURS OF MISSING DATA: 779

ENTER: [RETURN] CONTINUE, [SO] START OVER, [EX] TO EXIT

SITE: DUANE-ARNOLD 02/12/90 08:51

HOURS AT EACH WIND SPEED AND DIRECTION

OD OF RECORD = 89010101-89123124

ILITY CLASS: ALL DT/DZ

ELEVATION: SPEED:WS156 DIRECTION:WD156 LAPSE:DEL T

WIND SPEED(MPH)

WIND DIRECTION	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	25	69	124	87	9	0	314
NNE	25	85	168	115	14	0	407
NE	30	151	148	42	3	0	374
ENE	20	117	126	28	1	0	292
E	42	168	127	17	1	0	355
ESE	33	155	202	47	3	0	440
SE	37	182	310	48	2	0	579
SSE	31	189	377	174	3	0	774
S	34	170	333	253	33	6	830
SSW	39	112	157	139	30	5	482
SW	41	115	136	88	16	3	400
WSW	38	128	106	37	9	2	320
W	39	115	124	75	22	25	400
WNW	34	91	177	129	78	19	528
NW	17	103	260	253	127	30	790
NNW	17	97	242	274	58	8	696
TOTAL	502	2047	3117	1806	409	98	7981

IODS OF CALM(HOURS): 4

VARIABLE DIRECTION 0

HOURS OF MISSING DATA: 779

ENTER: [RETURN] CONTINUE, [SO] START OVER, [EX] TO EXIT