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Log # TXX-3599
File # 10014

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VICE PRESIDENT

December 9, 1982

Mr. Harold R. Denton
Director
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

SUBJECT: COMANCHE PEAK STEAM ELECTRIC STATION
DOCKET NOS. 50-445 AND 50-446
SUBMITTAL OF PROPOSED PROCESS CONTROL PROGRAM

Dear Mr. Denton:

By letter dated October 28, 1982 we submitted to the Commission the proposed Radiological Effluent Technical Specifications for Comanche Peak Unit 1. As a follow-up to that submittal, enclosed are six copies of the proposed Comanche Peak Process Control Program.

If you have any questions about this matter, please call Richard Werner at (214) 653-4869.

Respectfully submitted,

Billy R Clements

BRC:tls
Enclosures

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PROCESS CONTROL PROGRAM

PROCESS CONTROL PROGRAM

1.0 Scope

1.1 Purpose

The process control program establishes boundary conditions for the operation of the ATCOR Radioactive Waste Solidification System which provides reasonable assurance of complete solidification of radioactive wastes. Successful operation of the solidification system within the boundary conditions ensures the product will be a monolithic structure with no free liquid.

1.2 Applicability

This process control program shall be used by all personnel operating the ATCOR Radioactive Waste Solidification System. The system shall be demonstrated operable at least once per 92 days by operation in accordance with this process control program. In addition to this, verification of solidification shall be made from at least every tenth batch of each type of waste to be solidified.

2.0 Definitions

2.1 Suitable Container - A strong, tight container (55-gal. drum, 50 ft^3 or 100 ft^3 liner) approved for use by the Nuclear Regulatory Commission.

2.2 Set Time - The time required for the cement paste to harden into a stable product.

2.3 Cement - A generic term applied to a number of substances which, when mixed with water, produce a stable product.

2.4 Batch - The volume of wastes solidified from a full Waste Conditioning Tank.

2.5 Free Liquid - Liquid (primarily water) which has not been chemically bonded into the cement/waste mixture in the containers.

2.6 Stable Product - Refers to solidified radioactive waste product which, if the holding container were removed, remains monolithic and free standing.

3.0 System Description

3.1 Design Bases

The ATCOR Radioactive Waste Solidification System is specifically designed to optimize solidification of wastes such as spent powdex (radioactive) and bead resins, spent filter cartridges, evaporator concentrates, reverse osmosis wastes, and chemical drain wastes. The radioactivity in these wastes require their immobilization. The ATCOR system provides immobilization by solidification of the waste in suitable containers using cement as the solidifying agent.

3.2 Location

The entire radwaste solidification system is located in the southeast corner of the Fuel Building on floor elevations 810'-6", 822'-4" and 841'-0". Components which contain radioactive waste material (Waste Conditioning Tank, Waste Feeder, and Mixer/Feeder Assembly) are located within shielded cubicles on the elevations listed. Cement for the solidification process is stored in bulk in a silo outside the south wall of the waste solidification complex. System controls are located on the Waste Solidification Panel which is in a low radiation area near the Mixer/Feeder Assembly.

3.3 Process and Equipment Description

3.3.1 Cement loading and Metering

Dry bulk cement is pneumatically conveyed to the 600 cubic foot storage silo from the bulk cement truck. An alarm sounds when a high level is reached to prevent overfilling of the silo. A dessicant filter prevents moisture in the air from causing the cement to set up in the bin. The quality control program for cement is discussed in Section 4.6.

During cement metering, the bin vent is operating which insures dust-free operation of this portion of the system. The cement silo is equipped with a vibrating bin bottom which prevents bridging and promotes flow to the cement feeder/conveyor. The cement feeder/conveyor feeds dry cement to the Mixer/Feeder Assembly for mixing with liquid waste and is interlocked to prevent feeding without proper conditions.

3.3.2 Waste Conditioning and Metering Phase

The waste conditioning subsystem receives radioactive wastes from various sources within the plant. For bead resin processing, dewatering begins after input to the tank and continues until Waste Conditioning Tank level ceases to drop. Water is then metered in to achieve the proper moisture content of 75% (by weight) water. The waste is now ready for mixing with dry cement. For powdex resin processing, the resin is allowed to settle in the Waste Conditioning Tank and a decanting/refilling cycle continued until the tank is full and the mixture is 75% (by weight) water.

For evaporator concentrates, chemical drains and other liquid wastes, dewatering is not required. In order to prevent crystallization, the tank is heated to approximately the temperature of hot evaporator concentrates prior to their receipt.

The Waste Conditioning Tank is equipped with: an agitator to homogenize spent resin wastes and facilitate their flow from the tank; a water spray nozzle for rinsing the tank after processing; a radiation level detector to alarm for excessive levels of radiation in various waste streams; and ultrasonic and fixed level detectors for waste tank level monitoring and alarms. The various types of wastes are fed to the Mixer/Feeder Assembly by the Waste Feeder Assembly located directly below the Waste Conditioning Tank. The Waste Feeder Assembly speed is automatically set by the process selector switch from the Waste Solidification Panel for the various waste feed streams. Tachometers mounted on the Waste Solidification Panel provide indication of waste flow rates.

3.3.3 Mixing Phase

The conditioned waste stream and the dry cement stream are introduced simultaneously into the Mixer/Feeder Assembly. Cement flow is constant at 0.8 cubic feet per minute while waste flow rate is dependent on the type of waste being processed. The screw flight arrangement within the Mixer/Feeder Assembly ensures a thorough

mixing action. Process stream parameters are verified by a comprehensive testing program discussed in Section 4.3. After mixing, the cement paste flows into a container. A splatter shield eliminates the spreading of radioactive material in the filling area. Overfilling of the waste container is prevented by the use of an ultrasonic level detector. The level detector controls the two-stage filling process using two setpoints. At the first stage fill level setpoint, 90% of capacity, the flows of dry cement, waste, and cement paste as well as Mixer/Feeder operation are terminated. The amount of cement paste remaining in the Mixer/Feeder is just sufficient to complete the filling of the container to the second fill level setpoint of 100% capacity. In this way, overfilling of the container will not occur.

3.3.4 Flush Phase

The flush phase has been designed to remove all residues of cement and radioactive waste from the solidification system after the Waste Conditioning Tank is emptied of waste. Separate flush cycles are provided for flushing of waste from the Waste Conditioning Tank and cement residue from the Mixer/Feeder Assembly. Flush water from the Mixer/Feeder Assembly is directed into an empty container where it is decanted by the siphon station and routed to the Waste Conditioning Tank. Flush water from the Waste Conditioning Tank is transferred to the Spent Resin Storage Tank or the Chemical Drain Tank.

3.3.5 Capping Phase

After the container is filled with cement, it is transferred to the capping area to be capped. Capping is done by operation of the capper system from the Waste Solidification Panel. The container is then moved to the storage area to allow the cement to solidify.

3.3.6 Container Transfer

A Container Transfer Cart mounted on rails is provided in the waste processing area. This cart is capable of accepting empty containers from the overhead bridge crane and then transporting them to the fill station for filling, the siphon station for decanting, and the capping station for capping. The cart then returns to the point where it picked up the container from the bridge crane. The bridge crane then transfers the container to the storage area. The Transfer Cart operation is by remote control from the Waste Solidification Panel. Photocells are used to position the cart at the various stations along the Transfer Cart pathway.

3.4 Control Functions

All control functions for the solidification process operations are actuated from the Waste Solidification Panel. Visual inspection of the system in operation is made possible by the inspection windows in the shield walls and by the bridge crane television monitoring system. In the event of a power failure or equipment malfunction during waste processing, a manual handwheel can be operated to empty the Mixer/Feeder Assembly of wet cement. This handwheel bypasses the drive motor and turns the mixer shaft through a gear arrangement. Flushing of the Mixer/Feeder Assembly can also be performed manually, thus preventing the remaining wet cement from solidifying in the system machinery.

3.5 Service Supplies

Service supplies to the solidification system include compressed air, demineralized water, and electrical power. Compressed air is supplied from the service air header. Demineralized water is supplied from the reactor make-up water distribution system. Electrical power is supplied from 480v Motor Control Center XEB4-1A.

4.0 Program Controls

4.1 Process Parameters

4.1.1 Moisture Content

The amounts of liquid in the waste streams are controlled by the liquid waste processing equipment. The conditioned waste streams are blended with cement in the Mixer/Feeder Assembly to produce a homogeneous cement paste. Operation of the ATCOR Radioactive Waste Solidification System within the process control setpoints allows conversion of the waste streams into a form that reasonably ensures a stable product with free liquid at less than 1.0% of the volume of the waste.

4.1.2 Waste-to-Cement Ratios

The waste-to-cement ratios have been generated through laboratory testing for each type of waste to be solidified. These ratios ensure both product strength and absence of free liquid. Since the flow rate of cement to the Mixer/Feeder Assembly is fixed during processing, the flow rates of the various waste streams are adjusted to provide the proper waste-to-cement ratios. Table 4.1.2 shows the waste-to-cement ratios as well as the waste and cement feed rates that are recommended by the equipment manufacturer.

4.1.3 Bulk Oil

Bulk oil shall not be solidified using the ATCOR Radioactive Waste Solidification System. Any bulk amounts of oil will be placed in containers and stored at the plant site.

4.1.4 Set Time

Set Times vary with chemical content, pH, and water content of the waste stream to be solidified. Because these parameters differ from one waste stream to another, the set time allowed for every container filled shall be a minimum of 24 hours. This requires that all testing or shipping for burial of solidified waste shall occur no sooner than 24 hours after the filling of the container.

4.1.5 pH Concentration

Because set time varies greatly as waste stream pH varies, and in order to solidify the waste in a reasonable amount of time, insurance of proper waste pH is necessary. The pH values for pressurized water reactors such as Comanche Peak Steam Electric Station are generally acidic with an average pH of 4 to 6. The pH of conditioned waste streams shall be in the range of 2 to 7 before undergoing solidification. Waste streams with a pH outside the range of 2 to 7 shall undergo further conditioning by the addition of appropriate chemical solutions before being solidified.

4.1.6 Isotopic Concentrations

A radiation monitor, mounted on the Waste Conditioning Tank, sounds an alarm if the radiation level of the waste exceeds the assigned setpoint. The radiation monitor will be calibrated against a test source and the alarm setpoint established to detect excessive levels of radiation in the various batches being processed in the Waste Conditioning Tank. Actual batch isotopic concentrations will be determined by the sampling program discussed in Section 4.2.

Table 4.1.2 WASTE TO CEMENT RATIOS (W/C)*

MASONRY CEMENT

Waste Type	Waste to Cement Ratio (W/C)*		Flow Rate (Ft^3/Min.)					
			Dry Cement		Waste Stream		Cement Paste	
	Target	Range	Target	Range	Target	Range	Target	Range
Resins	1.25	1.36-1.16	0.8	0.72-0.88	1.0	0.98-1.02	1.27	1.22-1.31
Evaporator Concentrates**	0.8	0.88-0.74	0.8	0.72-0.88	0.64	0.63-0.65	0.91	0.87-0.94
Reverse Osmosis Wastes	1.25	1.36-1.16	0.8	0.72-0.88	1.0	0.98-1.02	1.27	1.22-1.31
Chemical Drain Content	1.25	1.36-1.16	0.8	0.72-0.88	1.0	0.98-1.02	1.27	1.22-1.31

GYPSUM CEMENT

Waste Type	Waste to Cement Radio (W/C)*		Flow Rate (Ft^3/Min.)					
			Dry Cement		Waste Stream		Cement Paste	
	Target	Range	Target	Range	Target	Range	Target	Range
Resins	1.62	1.76-1.51	0.8	0.72-0.88	1.30	1.27-1.33	1.57	1.51-1.62
Evaporator Concentrates**	1.15	1.25-1.07	0.8	0.72-0.88	0.92	0.9- 0.94	1.19	1.14-1.23
Reverse Osmosis Wastes	1.62	1.76-1.51	0.8	0.72-0.88	1.30	1.27-1.33	1.57	1.51-1.62
Chemical Drain Content	1.62	1.76-1.51	0.8	0.72-0.88	1.30	1.27-1.33	1.57	1.51-1.62

* Volume Percentage

** Up to 12% H_3BO_3 (Weight Percentage)

4.2 Waste Stream Sampling

Prior to solidification, the liquid waste streams shall be sampled by the Chemistry and Environmental Section. These samples shall be analyzed for pH, boric acid concentration, and isotopic identification and concentration in accordance with approved procedures.

4.2.1 Recording and Adjusting pH Levels

The measured pH values of the samples analyzed will be recorded on procedure data sheets and maintained as station records. If the pH is less than 2 or greater than 7, adjustment is required. For a too acidic waste stream, dilute with a less acidic stream or partially neutralize by the addition of a basic solution. For a too basic stream, dilute with a more acidic stream or add an acidic solution. Record any pH adjustments, the chemical added, and the resultant final pH along with the measured data.

4.2.2 Recording Isotopic Identity and Concentration

A sample taken from the Waste Conditioning Tank prior to solidification shall be analyzed for radioisotope content. The radioisotopes found present will be identified and their concentrations measured in accordance with approved procedures. The radioisotopes detected and their concentrations will be recorded and correlated on a container basis utilizing a container identification and tracking system. This data will be forwarded to the Radiation Protection Section for transportation and burial purposes.

4.3 Verification of Process Parameters

The parameters in the process control program will be verified by the Engineering Department during the preoperational testing phase by a series of extensive tests both in-situ and in the laboratory using simulated (non-radioactive) waste streams to establish the ranges on each process stream parameter which will provide reasonable assurance of complete solidification. In addition, the test program will also define the minimum and maximum parameter boundaries that still produce a solidified product with no free liquid. The solidified waste containers will be sectioned; the contents examined for homogeneity and the absence of free liquid; and documented with photographs. The laboratory results and

preoperational test results will be compared. At that time, the Process Control Program parameters will be modified to reflect the acceptable test results.

The laboratory testing program may be maintained to allow for the testing of unanticipated feed streams which are generated on an occasional basis such as detergents and decontamination solutions. The process parameters for these feed streams will be determined on a case-by-case basis using a laboratory program as mentioned above.

4.4 Solidification of Spent Filter Cartridges

Highly radioactive spent filter cartridges shall be handled as follows. Filter cartridges shall be placed near the center of a waste container. The container shall then be filled with cement paste which will solidify around the filter cartridges. Filter cartridges which are not "highly" radioactive may be handled as dry active waste. The criteria to determine the difference between radioactive and "highly" radioactive shall be developed and implemented by the Radiation Protection Section.

4.5 Verification of Solidification

In order to verify that waste streams are being solidified into a stable, liquid-free product, periodic inspections and audits shall be conducted. Stability and lack of free liquid are requirements which must be met in order to transport and bury solidified waste.

When the results are unacceptable, the parameters in the Process Control Program shall be reviewed and evaluated to determine whether they continue to support the solidification requirements. These parameters shall be revised, after extensive testing, if it is determined they no longer insure that a stable, liquid-free product will be formed.

4.5.1 Free Liquid

The maximum permissible amount of free liquid contained in the solidified waste product shall not exceed 1.0 percent of the total volume of the waste product. Verification that this limit is not exceeded will be performed through a combination of periodic audits and routine operations surveillance. The Operating

records will be reviewed to ensure that the system is being operated within the process parameter ranges specified and verified for each process feed stream. The Operations Quality Assurance department will conduct these audits. The results of the periodic audits and surveillances shall be recorded and maintained as station records.

4.5.2 Stability

Stability of the product shall be verified as follows. Every tenth batch of the cement/waste mixture will be sampled and allowed to solidify. These samples will be visually inspected to ensure solidification. Results of these tests shall be recorded and maintained as station records.

4.6 Quality Assurance

4.6.1 Quality of Cement

The quality of the cement in the storage silo shall be established through a program of sampling of the new cement at the time of receipt. The results of the sampling program shall be recorded and maintained in station records.

4.6.2 Instrument Calibration

The plant I&C Engineer will establish a calibration program for the radwaste solidification system process instrumentation. This will ensure that the process parameters are accurately measured for the verification program.

4.7 Training

All plant personnel responsible for the operation and maintenance of the radwaste processing and solidification equipment will receive thorough training to ensure safe and efficient equipment operation utilizing approved procedures. Records of qualification shall be maintained.

5.0 References

5.1 NRC Topical Report ATC-132A, ATCOR Radioactive Waste Solidification System.

5.2 NRC Regulatory Guide 1.143, Design Guides for Radioactive Waste Management Systems, Structures, and Components Installed in Light-Water-Cooled Nuclear Power Plants.

5.3 Nureg 0475 Rev. 2, Standard Radiological Effluent Technical Specifications.

5.4 49CFR Part 173, General Requirements for Shipments and Packaging.

5.5 10CFR Part 61, Licensing Requirements for Land Disposal of Radioactive Waste.

5.6 ANSI/ANS 55.1 - 1979, Solid Radioactive Waste Processing System for Light-Water-Cooled Reactor Plants.

5.7 Branch Technical Position ETSB 11.3, Design Guidance for Solid Radioactive Waste Management Systems Installed in Light-Water-Cooled Nuclear Power Reactor Plants.