REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

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AUTH.NAME	AUTHOR AFFILIATION
ROOT,L.D.	Iowa Electric Light & Power Co.
RECIP.NAME	RECIPIENT AFFILIATION
IPPOLITO,T.A.	Operating Reactors Branch 3

SUBJECT: Forwards addl mechanical info re containment purge & vent sys in response to NRC 800107 request.All purge sys isolation valves meet ASME Category I code requirements, including valves CV4309 & CV4310.

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Iowa Electric Light and Power Company

February 15, 1980
NG-80-54

LARRY D. ROOT
ASSISTANT VICE PRESIDENT
NUCLEAR GENERATION

Mr. Thomas A. Ippolito
Nuclear Regulatory Commission
7920 Norfolk Avenue
Bethesda, MD 20034

Dear Mr. Ippolito:

This letter is in response to your letter of January 7, 1980 concerning containment purging or venting during normal plant operations. Your request for information in the mechanical area is contained in the enclosure.

The differences between our plant design and your Branch Technical Position CSB 6-4 are being evaluated to determine if modifications are necessary. Our letter of August 31, 1979, identified the following points which are still applicable. 1) The vent and purge valves and valve controls at the DAEC satisfy the criteria stated in your letter of November 29, 1978. 2) Negating the ability for operational hydros and the ability to investigate leakage in the drywell is not in the best interest of public health and safety. 3) A mechanism for degradation of ECCS equipment due to purging has not been identified. 4) The radiological consequences of a design basis accident requiring containment isolation during venting operations are insignificant.

Our commitment to minimize purging in the interest of safety without unduly limiting plant flexibility remains unchanged.

Very truly yours,

Larry D. Root

Larry D. Root
Assistant Vice President
Nuclear Generation

LDR/RFS/mz
Attachment (1)
cc: R. Salmon File: A-107a
D. Arnold
L. Liu
S. Tuthill
K. Meyer
D. Mineck
D. Wilson
T. Kevern (NRC)

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S,1/1

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ADDITIONAL INFORMATION (MECHANICAL)
FOR
THE CONTAINMENT PURGE AND VENT SYSTEM
FOR
THE DUANE ARNOLD ENERGY CENTER
DOCKET 50-331

The Duane Arnold Energy Center (DAEC) was designed, contructed, and licensed for operation prior to formalization and issuance of the NRC Standard Review Plans (and Branch Technical Positions) in late 1975. Consequently, all areas addressed by the Standard Review Plans are not necessarily applicable to the DAEC. These particular areas are identified and discussed below.

The primary containment purge system provides the means to introduce to and exhaust air from the drywell and pressure suppression chamber (refer to the attached sketch). A common fan supplies air to two ducts leading to each area. The exhaust from each area is routed to a common header which exhausts via the standby gas treatment system to the offgas stack.

Clean reactor building air is supplied to the drywell for purge purposes during the reactor shutdown and refueling periods to permit personnel access and occupancy. The lines supplying air to the primary containment are provided with two, fast-acting, pneumatic, cylinder-operated butterfly valves in series for isolation purposes. These valves are normally closed during plant operation.

The containment is vented during reactor heatup as necessary to eliminate a pressure buildup. It can be periodically vented thereafter to maintain pressure within operating limits during planned operations. The exhaust lines are provided with two, fast-acting, pneumatic, cylinder-operated butterfly valves in series for isolation purposes. The drywell and suppression pool chamber can be vented separately. The valves are normally closed during plant operation.

In addition, the purge system may be used as a backup to the CAD (containment air dilution) system for controlling post-LOCA hydrogen concentrations.

Itemized Discussion of Branch Technical Position CSB 6-4

Valves CV4300, 4301, 4302, 4303, 4306, 4307 and 4308 have been modified by installing a stop bolt in the valve piston operator spring cams to mechanically prevent the valves from opening more than 30 degrees, to ensure operability against design basis accident (DBA) pressure. The same valves are used in different configurations to purge the drywell and suppression pool during operation, startup, hot standby, hot shutdown, cold shutdown, or refueling. The system is interlocked so the drywell and suppression pool cannot both be purged simultaneously when a containment isolation signal is present.

1. Design Criteria

a. Position:

The performance and reliability of the purge system isolation valves should be consistent with the operability assurance program outlined in MEB Branch Technical Position MEB-2, Pump and Valve Operability Assurance Program. (Also see SRP Section 3.9.3) The design basis for the valves and actuators should include the buildup of containment pressure for the LOCA break spectrum, and the purge line and vent line flows as a function of time up to and during valve closure.

Response:

All the purge system isolation valves are Seismic Category I, ASME Section III, Subsection NE, Class MC, including valves CV4309 and CV4310. As modified, all are capable of closing under the DBA pressure.

The operability assurance program described in SRP 3.9.3 was reviewed and the DAEC containment purge and vent valves meet the acceptance criteria of the SRP except as noted below:

Section II.2.a, pumps and valves whose operability is required during an accident or event

- Containmnet purge and vent valves were qualified by analysis rather than by a combination of test and analysis as discussed in the SRP. Analyses included those identified in Section II.2.a.(2)(b).

- Pipe support design for Seismic Category I piping, including the purge and vent valves and pipe supports, were designed in accordance with B31.7 rather than ASME Section III, Subsection NG.

Section II.2.c, design specifications

External flange end loads are not included as part of the design specification. Seismic loads are provided, as well as required operating conditions, and the vendors stress report and seismic analyses demonstrate that the valve assemblies are capable of withstanding these seismic loadings acting simultaneously with normal operating loadings.

b. Position:

The number of purge and vent lines that may be used should be limited to one purge line and one vent line.

Response:

The DAEC design allows for more than one purge and one vent line to be open simultaneously. This is an essential BWR design feature that permits more effective and efficient purging of the system.

c. Position:

The size of the purge and vent lines should not exceed about eight inches in diameter unless detailed justification for larger line sizes is provided.

Response:

The purge lines are 18 inches. The inboard bypass lines are 2 inches, with 1.455-inch flow orifices. The bypass lines are used almost exclusively for purging during operation, startup, and hot standby, except inerting and deinerting.

d. Position:

The containment isolation provisions for the purge system lines should meet the standards appropriate to engineered safety features; i.e., quality, redundancy, testability and appropriate criteria.

Response:

The purge system lines meet the standards appropriate to engineered safety features. The inboard and bypass air supply solenoid valves are powered from reactor protective bus A. The outboard air supply solenoid valves are powered from reactor protective bus B. The inboard and outboard valves are redundant. The valves and piping are Seismic Category I and are designed in accordance with ASME Section III, Subsection NE, Class MC. The air supply for the inboard and outboard T-ring seals is furnished independently by the heating and ventilating instrument air compressor system which is Seismic Category I. The purge system isolation valves are tested for leakage by utilizing the installed 3/4-inch test connections.

e. Position:

Instrumentation and control systems provided to isolate the purge system lines should be independent and actuated by diverse parameters; e.g., containment pressure, safety injection actuation, and containment radiation level. If energy is required to close the valves, at least two diverse sources of energy shall be provided, either of which can affect the isolation function.

Response:

Actuator spring (stored) energy is used to close the purge valves. Diverse closure is initiated by high fuel pool exhaust radiation, high reactor building exhaust radiation, high drywell pressure, and low reactor water level.

f. Position:

Purge system isolation valve closure times, including instrumentation delays should not exceed five seconds.

Response:

All the purge system isolation valves close in less than 5 seconds, including instrumentation delays.

g. Position:

Provisions should be made to ensure that isolation valve closure will not be prevented by debris which could potentially become entrained in the escaping air and steam.

Response:

A visual inspection of the purge and vent connections in the drywell and suppression pool has been conducted. The connections on the torus are vertical takeoffs near the top of the torus. The drywell vent connection is a horizontal takeoff from an elevated location on the side of the drywell. The drywell purge connection is a slightly inclined connection near the bottom of the drywell. Our visual inspection has indicated that further evaluation is necessary.

2. Position:

The purge system should not be relied on for temperature and humidity control within the containment.

Response:

The purge system is not relied on for temperature and humidity control.

3. Position:

Provisions should be made to minimize the need for purging of the containment by providing containment atmosphere cleanup systems within the containment.

Response:

As described in our letter of August 31, 1979, each shutdown and subsequent startup under conditions requiring a containment entry requires approximately 18 hours of purging. Deinerting and atmosphere cooling require approximately 6 hours and inerting requires approximately 12 hours. Iowa Electric does not consider it prudent to send personnel into the containment inerted except in extreme emergencies. The capability to detect unidentified leakage into the drywell is significantly enhanced by the capability to enter the drywell while the plant is still at operating pressure and temperature. Verification of successful pressure boundary repairs and operational hydrostatic tests are also enhanced by the capability

3. Response - Continued

to enter the drywell at operating pressure and temperature. Iowa Electric believes it is of the utmost importance to conduct the above inspections at operating pressure and temperature in the interest of minimizing any hazards to the public.

The drywell and suppression pool purge exhaust is processed by the standby gas treatment system outside the containment. No additional cleanup system is provided inside the containment.

4. Position:

Provisions should be made for testing the availability of the isolation function and the leakage rate of the isolation valves, individually, during reactor operation.

Response:

The purge isolation valves can be individually tested for operability and isolation during reactor operation. The total leak rate for drywell/suppression pool purge, drywell vent, and suppression pool vent valve groups, as shown on the attached sketch, can be measured during reactor operation because they are all located outside the containment. The leak rate for each purge and vent line valve group represents the maximum leak rate that any single valve in that group might have.

5. Analyses Performed

a. Position:

An analysis of the radiological consequences of a loss-of-coolant accident. The analysis should be done for a spectrum of break sizes, and the instrumentation and setpoints that will actuate the vent and purge valves closed should be identified. The source term used in the radiological calculations should be based on a calculation under the terms of Appendix K to determine the extent of fuel failure and the concomitant release of fission products, and the fission product activity in the primary coolant. A pre-existing idodine spike should be considered in determining primary coolant activity. The volume of containment in which fission products are mixed should be justified, and the fission products from the above sources should be assumed to be released through the open purge valves during the maximum interval required for valve closure. The radiological consequences should be within 10 CFR 100 guideline values.

5. Analyses Performed

Response:

Section 14 of the Duane Arnold FSAR contains an analysis of the consequences of the loss-of-coolant accident. The radiological consequences are within the 10 CFR 100 guideline values without purge. If a purge were in progress at the time of a DBA, the pressure in the containment would rise to the isolation setpoint within one-tenth of a second and fuel perforation would not occur until about 40 seconds into the accident. The purge valves' technical specifications require that the purge valves close in 5 seconds or less upon receipt of an isolation signal. The purge ventilation discharge path is via the standby gas treatment system (SGTS). Therefore, although a detailed analysis has not been performed for the radiological consequences of a DBA occurring at the DAEC during the time purging is actually in progress, analyses performed for similar plants indicate that the radiological consequences during the first few seconds prior to isolation will be an insignificant addition to the calculated radiological releases and below 10 CFR 100 guidelines.

b. Position:

An analysis which demonstrates the acceptability of the provisions made to protect structures and safety-related equipment; e.g., fans, filters and ductwork, located beyond the purge system isolation valves against loss of function from the environment created by the escaping air and steam.

Response:

The analysis to investigate the effect of escaping air and steam on safety-related requipment located beyond purge system isolation valves has not been completed. Based on the results of this analysis, modifications to the plant may be considered.

c. Position:

An analysis of the reduction in the containment pressure resulting from the partial loss of containment atmosphere during the accident for ECCS backpressure determination.

Response:

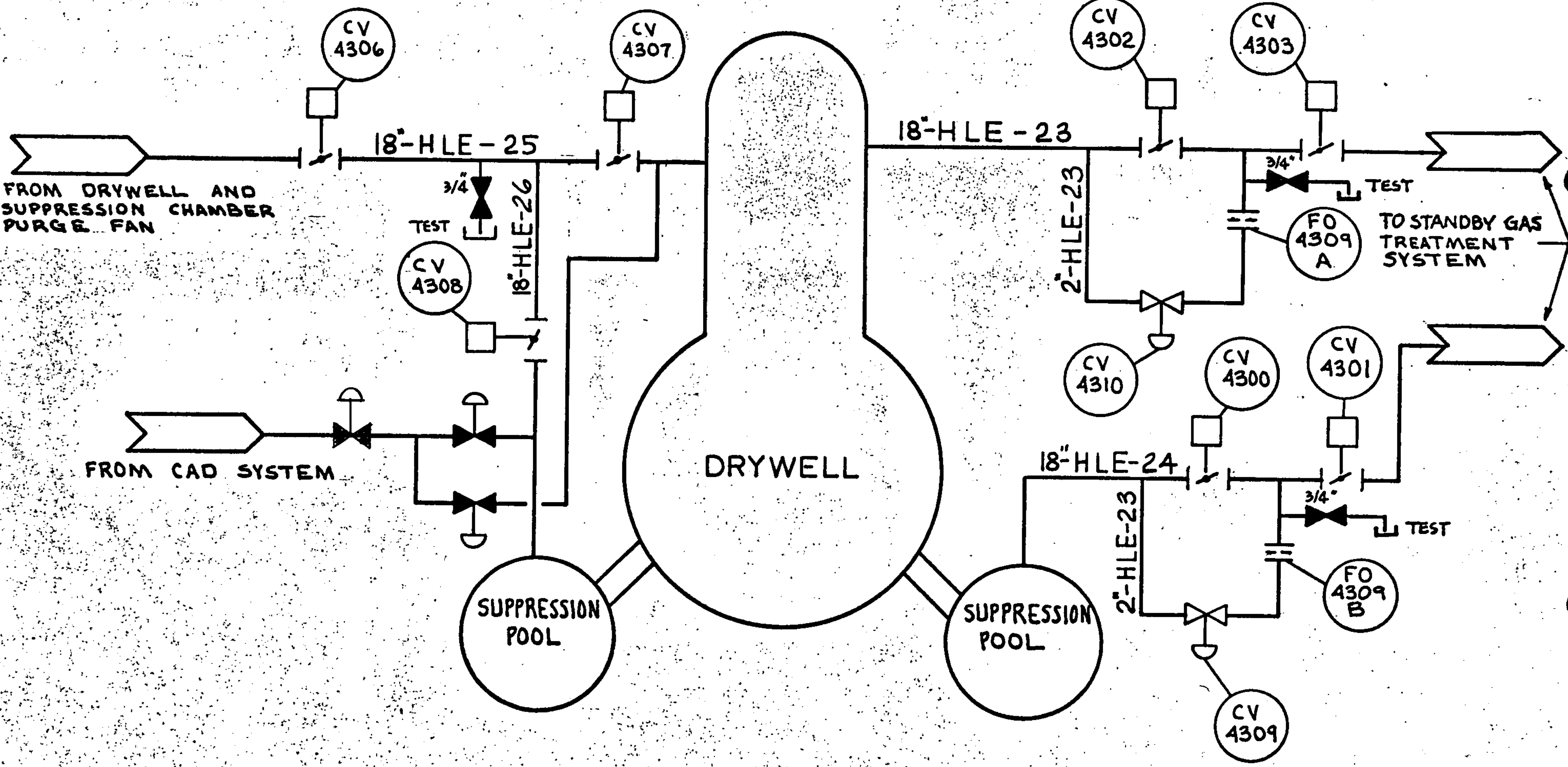
Not applicable for a boiling water reactor.

d. Position:

The allowable leak rates of the purge and vent isolation valves should be specified for the spectrum of design basis pressures and flows against which the valves must close.

d. Response:

Based on a telephone conversation with NRC personnel, it is our understanding that an analysis is not required for this item and that actual leak rates over a spectrum of design basis pressures are requested. This data has not yet been assembled but will be provided in our continuing investigations.



CONTAINMENT PURGE
ISOLATION SYSTEM