May 15, 1980

CORRECTION NOTICE

TO ALL COPY HOLDERS OF

SECY-80-132C - TMI-2 CONTAINMENT BUILDING PURGE
(INFORMATION REPORT)

THE ATTACHED TABLE WAS OMITTED FROM THE ORIGINAL PAPER. THE EXECUTIVE DIRECTOR FOR OPERATIONS REQUESTS THAT THE ATTACHED TWO PAGES BE ATTACHED TO THE PAPER AS THE LAST TWO PAGES.

Attachment:
As stated

SECRETARIAT

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Table 1

Components Presently Being Used

I.D.#	Description
RC-2-TE-1,2	Pressurizer Temperature; RCS Pressure Control
AHV103,104, 106,107	R.B. Air Sample suction and discharge valves
MU-V1A,B	Letdown Cooler Isolation Valves; RCS Pressure Control
MU-V2A,B	Letdown Cooler Isolation Valves; RCS Pressure Control
MU-V33A,B,C,D	RC Pump Seal Leakoff Valves; RCP's must be maintained operable - Tech Specs
MU-V25	Containment Isolation Valves on RCP Seal Return; RC Pump Operation
IC-V1A,B	Isolation Valves for Letdown Coolers; Makeup & Purif. System Operation
MS-TE 103,104 109,110	Main Steam Temperature; Natural Circulation Data
NI-1	Source Range Nuclear Instrumentation; Indication of Reactor Status
NI-4	Intermediate Range Nuclear Instrumentation; Indication of Reactor Status
CA-V1	Pressurizer Isolation of RCS Line; RCS Samples
CA-V3	Pressurizer Isolation of RCS Isolation Line; RCS Samples
CA-V6	Pressurizer Isolation of RCS Letdown; RCS Samples
RC-V117	Pressurizer Sample Valve (steam side); RCS Samples
RC-V122	Pressurizer Sample Valve (water side); RCS Samples
RC-4A,B	T_h (with temperature transmitters); Natural circulation Data - Tech Specs
RC-5A,B	T_c (with temperature transmitters); Natural Circulation Data - Tech Specs
CA-V4A,B	OTSG Sample Containment Isolation; OTSG Samples
SV-V10A,B	OTSG Sample Valve; OTSG Samples
SV-V11A,B	OTSG Sample Valve; OTSG Samples
AH-E11A-E	Reactor Building Cooling Fans; Maintain RB at Negative Pressure
AH-TE5019,5020, 5021,5022,5023, 5024	Reactor Building Ambient Temperature; Tech Specs
AH-013A-E	Normal RB Cooler Valves; RB Pressure Control
AH-014A-E	Normal RB Cooler Valves; RB Pressure Control
RR-FT 1025,1026 1027, 1028, 1029	RB Cooler Cooling Flow Transmitters; Presently not operable
CF-2-LT-1,2,3,4	Core Flood Tank Level Transmitter; Tech Specs
CF-1-PT-1,2,3,4	Core Flood Tank Pressure Transmitter; Tech Specs
CF-V2A,B	Core Flood Tank Sample Valves
SP-6A-PT-I2	OTSG Pressure; Tech Specs
SP-6B-PT-I2	OTSG Pressure; Tech Specs

Emergency Use

AH-V80	RB Depressurization Valve
DH-R1	Decay Heat System Drop Line Relief Valve
AH-V6	RB ΔP Isolation Valve; Needed During Purge
RR-V26A-E	RB Emergency Cooler Outlet Valves
CF-V115	Core Flood Tank Isolation Valve
CF-V3A,B	Core Flood Tank Vent Valves

For Future Use

DH-V1,171	Decay Heat System Valves Needed For MDHR Operation
AH-V61, 63	Air Supply Valves to RB Purge Valve
RC-V137	Pressurizer Vent Valve; May Be Needed in Primary System Pressure Reduction Prior to MDHR Operation
RC-V149	Alternate Pressurization Spray; Pressurizer Cooldown when on DH
D5127A,B	Reactor Building Dome Dampers; Recirculate RB Atmosphere
AH-V2A,B	Reactor Building Purge Supply Valves; Maintain RB at Negative Pressure
AH-V3A,B	Reactor Building Purge Exhaust Valves; Maintain RB at Negative Pressure
IC-V2	ICCW RB Isolation; RCP Operation
NS-V100	NS Return From RCP's Bldg. Isolation; RCP Operation

Additional

Air Lock Door Inner Seal - will need maintenance if seal leaks develop.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

May 8, 1980

INFORMATION REPORT

SECY-80-132C

For: The Commissioners

From: Harold R. Denton, Director
Office of Nuclear Reactor Regulation

Thru: Executive Director for Operations

Subject: TMI-2 CONTAINMENT BUILDING PURGE

Purpose: To provide response to questions relating to the staff's proposed purging of the TMI-2 Containment Building Atmosphere.

Discussion: Staff responses to a number of questions raised by Chairman Ahearne are given in the attachments.

These questions were:

1. What are the most, and least, favorable months if a decision were made to purge the krypton from the TMI-2 containment building - Response given in Attachment 1. (Prepared by NRC staff meteorologist and TMI-2 Program Office).

2. What work is planned to be done in the containment building if the krypton were purged and what necessary work, if any, can be accomplished without purging? What are the radiation levels with and without purging? - Responses given in Attachment 2. (Prepared by TMI-2 Program Office).

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Harold Denton 5/6/80

Harold R. Denton, Director
Office of Nuclear Reactor Regulation

Enclosures:
1. Assessment of Atmospheric Dispersion Conditions Needed for TMI-2 Kr-85 Purge.
2. Assessment of Capability to do Work Within TMI-2 Containment Building.

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Attachment 1

ASSESSMENT OF ATMOSPHERIC DISPERSION CONDITIONS NEEDED FOR TMI-2 Kr-85 PURGE

SUMMARY AND CONCLUSIONS

Two methods of purging the Kr-85 from the containment have been proposed by the staff in NUREG-0662: (1) a fast purge with an actual release duration of about five days and (2) a slow purge with a release duration of approximately 30 days. In order to assure that radioactive doses to the public will be within the requirements of the regulations, the atmosphere must disperse the effluent adequately during the period of release. We have made an assessment of the atmospheric dispersal capability as a function of time of the year for the fast purge method. Based on an assessment of historical data (which has wide variation from year-to-year) we conclude that:

(1) For the fast purge during the spring season (March-May) there is a fair likelihood of being able to expeditiously release and maintain sufficiently low doses to the public. We estimate that favorable meteorology during these months may permit the fast purge option to be accomplished within a 2 calendar week period.

(2) For the fast purge during the summer and fall months (June-October), we estimate, based on historical data which show a small probability of favorable meteorological conditions, that this alternative may require as much as 2 calendar months to complete. (Given the June thru October meteorological conditions, the time frames necessary for both the fast purge and the slow purge are roughly equivalent.)

(3) At the present time the fast purge is not, in our opinion, a desirable alternative for the following reasons:

a. the fast purge could probably not be initiated within the spring season (even if the Commission were to approve it) because of required modifications and testing on the existing high volume purge system,

b. the advantage of the fast purge, namely a lessening of potential psychological stress for area residents, will be lost during the summer months when total elapsed time required for both fast and slow purge alternatives are essentially the same.

c. reactor building purging should not be delayed past the summer and fall months for better winter meteorological conditions for those reasons elaborated on in Section 4.0 of NUREG-0662.

(4) For the slow purge there is a high likelihood, during any month, of being able to release and maintain sufficiently low doses to the public during the purge.

DISCUSSION OF REVIEW

Meteorological conditions vary widely from year-to-year. Therefore, in order to provide an assessment of the probability of achieving atmospheric diffusion conditions during which effluent releases can take place, long term meteorological records are needed. We have based our assessment on approximately 3½ years of data from the on-site meteorological tower at TMI as well as 10 years of data from the Harrisburg airport. While this volume of historical meteorology does not represent an ideal data base, it does provide an estimate of meteorological conditions that might occur near TMI (see Table 1).

1. Fast Purge (5 days)

   The spring season (March-May) affords the highest probability of achieving the favorable meteorological conditions required for initiating the purge while the summer and fall seasons (June-October) afford the lowest probability.

We have estimated that during spring months the reactor building could be purged within a two week period. In this case, two weeks represents the calendar time frame likely to provide sufficient favorable meteorology to allow for the five days of actual (if intermittent) releases required during the fast purge. However, during summer and fall months, the fast purge calendar time frame approaches that time period necessary for the slow rate purge. During the summer/fall the five days of actual releases required for the fast purge would necessitate about two calendar months to accomplish due to less favorable meteorological conditions. The probabilities of experiencing favorable meteorology in other months lie between these spring and summer/fall values.

Therefore, during the summer and fall, the likelihood of being able to expeditiously purge the containment building atmosphere is extremely small. Even though our best estimates of the calendar time frames associated with favorable meteorology during spring and summer/fall are provided above, it should be noted that unusual meteorological occurrences (e.g., passage of a frontal system) during any season could provide ideal conditions for the fast purge. However, the ability to provide adequate advance notice to the public may be limited under these circumstances.

As noted in Table 2, a X/Q of 4.1×10^{-5} sec./m^3 is the maximum allowable for initiation of the fast purge method. Although the maximum permissible X/Q's vary during the purge scenario, as a function of both reactor building Kr-85 concentration and purge rate, they all involve atmospheric conditions with moderate to strong winds. The highest probability of achieving unstable, windy conditions is usually associated with the passage of strong cold frontal systems which tend to occur most frequently in the spring. On the other hand, releases could not be made during stagnant weather conditions in which effluents linger in the local area for several days and are not diffused rapidly. The frequency of stagnant conditions is high during the summer (June-August) and peaks during the fall (September-October).

2. Slow Purge (30 days)

The slow purge is based upon controlling the release rate (Ci/sec.) of Kr-85 to ensure conformance with the limiting discharge conditions of the plant radiological effluent technical specifications. In addition, releases will be made only during favorable meteorological conditions to ensure conformance with the dose design objectives of Appendix I to 10 CFR Part 50. Concerning the required meteorology for the slow purge scenario, the probabilities are high (greater than 50 percent) of having acceptable hourly atmospheric diffusion conditons during any season due to the aformentioned limiting conditions imposed on the purge.

This evaluation is based on historical consideration of local meteorological conditions. However, large variations from year-to-year may be expected. Therefore, once a scenario (fast or slow purge) is selected as the approach, long period (30-day) forecast outlooks and short period (five-day) forecasts will be needed to select an optimum period. Releases, however, would be terminated whenever meteorological conditions are unacceptable and resumed when conditions permit.

TABLE 1

ESTIMATED AVERAGE MONTHLY PROBABILITIES OF OBTAINING AN HOURLY X/Q 4.1 X 10^{-5} sec./m^3*

January	.12	July	.02
February	.13	August	.01
March	.16	September	.03
April	.13	October	.04
May	.08	November	.11
June	.06	December	.10

*These are the probabilities associated with achieving the onset meteorological condition for the fast purge scenario described in Addendum 2 to NUREG-0662 and Table 2 which follows. It should be noted that alternate scenarios, employing flow rates different from those listed in Table 2, have been evaluated by the Meteorology Section Staff. These alternate scenarios could result in purge duration and calendar time frames which vary somewhat from those associated with the fast purge scenario described in Addendum 2. However, these alternative scenarios do not alter our conclusions regarding the potential for using a fast purge scenario in the summer/fall.

Table 2

Limiting Meteorological Dispersion Factors
Associated with the Fast Purge Scenario
Described in Addendum 2 to NUREG-0662a

Purge Rate (cfm)	Reactor Building Concentration[b] (μCi/cc)	Maximum Release Rate[c] (KCi/hr)	Maximum Allowable Hourly X/Q[d] (sec/m^3)
1000	1.0	1.7	4.1×10^{-5}
1000	0.46	0.8	9.0×10^{-5}
1000	0.22	0.4	1.9×10^{-4}
5000	0.22	1.9	3.8×10^{-5}
5000	0.10	0.9	8.3×10^{-5}

a A maximum dose rate of 3 mrem/hr (skin) was assumed.

b The reactor building concentration is calculated with the following equation:

$C = C_o e^{-\lambda t}$ where $\lambda = 0.03$ hr^{-1} for a purge rate of 1,000 cfm, $\lambda = 0.15$ hr^{-1} for a purge rate of 5,000 cfm, and it is in hours.

c The maximum release rate is equal to the produce of the purge rate times the containment concentration times a conversion factor.

d The maximum X/Q = $\dfrac{3 \text{ mrem} \times 8760 \text{ hours/yr}}{1.34 \times 10^{-3} \text{ mrem - m}^3\text{/piCi-yr} \times Q}$

where Q is in pCi/sec.

ATTACHMENT 2

ASSESSMENT OF CAPABILITY TO DO WORK WITH TMI-2 CONTAINMENT BUILDING PRIOR TO AND AFTER PURGING

SUMMARY AND CONCLUSIONS

The staff concludes that prior to purging, the conduct of operations (e.g., decontamination activities, detailed radiation mapping, equipment maintenance and repair) in the TMI-2 containment building would be severely hampered and restricted. Required respiratory protective equipment and anticipated radiation exposure would limit "stay time" in the building to 15-20 minutes. With the krypton-85 cloud in the building the only work that can be accomplished would be minimal radiological surveillance and equipment inspections. Recent data indicates that the building is oxygen deficient (approximately 13%). The malfunction of respiratory equipment could, therefore, be hazardous.

In areas unshielded by the concrete floor at the 305' level, (e.g., the stairwell to 347' level high radiation fields exist as a result of proximity to the contaminated sump water). The whole body dose rate in these areas is in the range of 10 rem/hr. To gain access to the upper levels of the containment building some prtable shielding will be required. Purging of the krypton from the containment would facilitate the placement of portable shielding, as required, to cover "hot spots," areas exposed to sump radiation and plate out sources.

Purging of the containment building would have three major benefits. These benefits are removal of the krypton contribution to the whole body dose, restoration of building oxygen to normal levels and continuation of the recovery effort in a timely fashion. Increasing the oxygen content of the building would remove the potentially hazardous conditions that currently exist in the continment building. Removal of krypton from the building will allow more extensive maintenance and cleanup work to be carried out in containment.

In the staff's opinion, after a purge it would be possible to carry out detailed radiation surveys, perform limited decontamination and perform needed surveillance and maintenance functions. Most importantly progress toward ultimate cleanup at Three Mile Island Unit 2 is dependent upon removal of krypton-85 from the containment building environment.

DISCUSSION OF REVIEW

1. Anticipated Activities Without Purging

Metropolitan Edison is planning an entry in May. This entry will be limited to radiation surveys, inspections, photographs, and placement of measuring devices on the 305' elevation. Movement to elevations other than the 305' elevation will require additional shielding. In areas unshielded by the concrete floor at the 305' level, high radiation fields exist. For example, the exposed stairwell leading to the 347' level is in an exposure field of approximately 10 rem/hr. If the initial entry demonstrates that future entries can be safely accomplished, subsequent activities in the containment will include the placement of portable shielding, as required, to permit access to the 347' level for radiation mapping and inspection activities. The radiation mapping will also include a survey of the reactor head area. Without purging the containment, the primary activities will be limited to only gaining additional knowledge of the radiological conditions inside the building. More extensive work is not contemplated in the containment building prior to purging for the following reasons:

- The maximum stay time in the building would be limited to only 15-20 minutes because of the limited air supply (30 minutes) and the administrative control on worker exposure of 1 rem.

- The bulk of respiratory equipment, dosimetry, communications gear, radiation detectors, and protective clothing would have a total weight of approximately 85 lbs and would hamper the easy movement necessary to perform demanding work tasks such as manual decontamination or equipment maintenance.

- Loss of respiratory protective equipment would be hazardous due to the oxygen deficient environment in the containment building.

2. Anticipated Activities Following Purging

The removal of the krypton-85 would facilitate or provide for the following:

- The performance of work, i.e., radiation mapping, limited decontamination, possible repair or replacement of core instrumentation, and perhaps maintenance on the fan coolers.

- Improve oxygen levels to normal levels.

- Increase stay time in the building during maintenance and other activities (especially if cannister masks are adequate for work inside the building).

- Significantly reduce whole body doses to personnel in the building. (e.g., 30 percent reduction at the 305' level and 75% at the 347' level).

a. Radiation Surveys

  - In order to determine the extent of the decontamination effort and prior to any additional acitivies, detailed radiation surveys must be performed.

- Accurate levels of contamination for specific equipment are needed to assess the magnitude of the cleanup effort.

- These surveys will aid in determining the preferred methods and the preferred decontamination solution(s) to be used.

b. Initial Decontamination

Prior to the start of a major cleanup effort there will be a need to decontaminate key areas and equipment. Area decontamination will be necessary to establish health physics check points and equipment laydown and staging points. Key equipment, in particular the containment building fans and coolers, needed to be decontaminated and maintained on a priority basis. As ambient temperatures increase due to solar shine on the containment building, the heat loading on the building fans and coolers will increase. These fans and coolers have been in operation since the accident although they were originally qualified for only 3 to 4 hours of continuous operation in a high humidity environment. The reactor building fan/coolers are vital to provide a reasonable working environment.

c. Valves and Instrumentation

To assure that the status of the reactor and containment building equipment is known at all times, it is important that data gathering capabilities be restored. Presenlty, the licensee cannot confirm the accuracy or operability of many key instruments and valves in the containment building. As an example, only one source range neutron detector is operable. Based on currently available information, it is expected that if the krypton is purged, and adequate local shielding is provided, it may be possible to repair or replace the other source range neutron monitor. A detailed study of this is underway. As a first step, the licensee has established a list of components (see Table 1) inside the contaiment building that will require maintenance, calibration or inspection. These components are viewed by the licensee as being important for verification of plant status and conditions.

3. Comparison of Occupational Exposure Rates Before and After Purging

The exposure rates provided in the Table below are for an individual in self-contained breathing apparatus and protective clothing with a thickness of 250 mg/cm² (i.e., a thickness sufficient to attenuate the Kr-85 beta emissions). The Kr-85 concentration is 1.0 μCi/cc and no krypton is assumed to diffuse through the protective clothing.

DOSE RATE, REM/HOUR

Elevation 305'	Before Purging	After Purging
Whole body	2.3	1.6
beta skin	0.8	0.8
Elevation 347'	Before Purging	After Purging
whole body	1.3	0.3
beta skin	1.2	1.2

An analysis of the above data indicates that the purging of the containment will remove approximately 30 percent of the whole body dose contributor at the 305' elevation and approximately 75 percent of the whole body dose contributor at the 347' elevation (the operating floor). The impact of the purge on the whole body dose at the 305' elevation is not as significant as the corresponding impact on the 347' elevation because approximately 60 percent of the dose contribution at 305' is due to the proximity of the sump water (290' level). Assuming that there is no infiltration of Kr-85 through the protective clothing and breathing apparatus, purging the containment will have no impact on the beta skin dose because the primary source is due to plateout of high energy beta emitters, Sr-89 and Y-90, on the concrete floors. Measures could be taken to significantly reduce the high energy beta source strength by using layers of portable shielding or initiating preliminary decontamination activities.