7.2 Reactor Protection System

In the Supplemental Safety Evaluation Report we stated that the applicant's separation criteria did not include separation requirements between Class 1E and non-Class 1E wiring inside the Class 1E logic cabinets and in various control panels (identified in S ·tion 7.9.3 of the SER). As a result, the applicant was requested to verify that faults (i.e., grounding, shorting, application of high voltage, or electromagnetic interference (noise)) on non-Class 1E circuits would not propogate to the safety grade circuits and degrade them below an acceptable level. The applicant agreed to submit test procedures and test results which would demonstrate that such faults would not degrade the safety systems below an acceptable level.

In response to this concern the applicant submitted type tests which describe various qualification procedures conducted by the Class 1E safety systems suppliers (i.e. Reactor Protection System supplier and the Engineered Safe y Features Actuation System supplier). Although these qualification procedures describe the methodology used (via analysis and/or test) to qualify several isolation devices, and demonstrate that certain selected pieces of equipment on a component or subchannel level are immune to simulated electromagnetic interference (noise), the information and tests presented do not adequately demonstrate that faults (such as described above) would not degrade the safety systems (as implemented and wired at the plant site) below an acceptable level.

We therefore conclude that the applicants response to the staff's concerns regarding the adequacy of their implemented design (i.e., non-separation

of Class 1E and non-Class 1E wiring inside the Class 1E logic cabinets and associated panels) is incomplete at this time and therefore is unacceptable. We require that the applicant reevaluate their design and provide the information requested as identified in Paragraph 1 above.

In addition, the staff requires that an acceptable demonstration of the applicant's design should be provided and include, but not be limited to, the following:

1. Provide definition of the maximum credible voltage, current and electromagnetic disturbance that could be imposed in these circuits,
2. Define fault duration and a description of the fault detection or fault termination devices used to limit faulted conditions (include primary and back up devices, if any),
3. A description of the adequacy of the cable wiring and or connectors required to sustain the above faulted conditions without degradation which could lead to degradation or faulted conditions in the safety channels, and
4. Provide test proceedures and test results which demonstrate that faults identified in the previous three items would not degrade the installed safety systems below acceptable levels.

We will review the applicants response when submitted and report our evaluation in the next supplement to the safety evaluation report.

In addition, in the Safety Evaluation Report we identified that all four redundant reactor coolant flow transmitters measuring flow in each loop to the steam generators, share common process sensing lines, and as such the implemented design does not satisfy the single failure criterion. The applicant was required to modify the design to satisfy the single failure criterion, submit the modified design for our review and provide a schedule for completion of modified installation.

We have not yet received the applicants response, and therefore this item remains unresolved. We will review this item when submitted and report our evaluation in the next supplement to the safety evaluation report.

7.3.2 Engineered Safety Features Actuation/Basic Logic

In the Supplemental Safety Evaluation Report (SSER) we required the applicant to document in the FSAR and in the final design schematics their design modification which deletes the automatic test system from their Engineered Safety Features Actuation System (ESFAS). We have reviewed the proposed method of disconnecting the automatic test system which includes 1) disconnecting the power supply circuits, 2) disconnecting the interconnecting wiring to the redundant protection channels, and 3) removing the auto test module from the circuit. In addition, we have reviewed the final design schematics which reflect this change. We conclude that the design satisfies the staffs requirements and is acceptable.

7.7 Environmental Qualification

In the Safety Evaluation Report Supplement we stated that the applicant was requested and agreed to supplement the information in the FSAR and describe the qualification tests performed on the steam generator level transmitters and the containment pressure transmitters and submit the test results and procedures used to qualify this equipment. The applicant amended the FSAR and submitted the information requested. We have reviewed the equipment qualification procedures for the steam generator level transmitters and conclude that the qualification environments that the equipment was submitted to during the test was substantially in excess of the required environmental envelope as stated in the FSAR and is acceptable. Although the applicant has not yet submitted the qualification tests for the containment pressure transmitters, the applicant has documented that these transmitters will be located outside containment and subjected only to a worst case environment of 120°F/100% relative humidity. Based on the relatively low ambient requirements imposed on these sensors we have reasonable assurance that this equipment will perform their required function in these environments and are therefore acceptable. We will however review these qualification documents when submitted and identify our concerns, if any, in the next supplement to the safety evaluation report.

In addition, it should be pointed out that the concerns identified in Section 7.2 of the SER regarding the drift problem in the reactor coolant pressure transmitters has been adequately resolved. The applicant's technical specifications include requirements for periodic testing of this equipment every 4 months.

We therefore conclude that the environmental qualification of safety related equipment is acceptable conditioned only on the satisfactory resolution of the item identified in Section 6.2.1 of the Safety Evaluation Report.

7.9.2 Separation Criteria Between Redundant Class 1E Circuits Routed in Wireways and Metal Conduits

A. Conduits

In the Safety Evaluation Report we identified areas where the separation between redundant circuit routed in metalic conduit was inadequate and the information was insufficient to complete our review.

The applicant has amended the information in the FSAR describing the separation criteria for routing Class 1E circuits in conduit and documented their separation criteria for these circuits when crossing open tray type raceways. In addition to the separation distances provided, the applicant documented that all open trays (with certain justified exceptions, i.e., trays inside containment) will be covered with flame retardant insulating blankets to minimize flame propagation or ignition. The adequacy of using the specific type of thermal blankets is being reviewed independently in conjunction with the applicant's overall fire protection system and will be discussed in that portion of a supplementary report to the Davis Besse Unit 1 Safety Evaluation Report.

Based on our review of the separation criteria for circuits routed in metal conduit we conclude that the design is acceptable with the following exception.

The applicants recently amended minimum separation criteria for redundant Class 1E circuits routed in metalic conduits allows less than 1" of free air space between redundant conduits with no provisions for barriers other than the conduit itself. In order to justify the adequacy of this amended design, the applicant committed to demonstrate

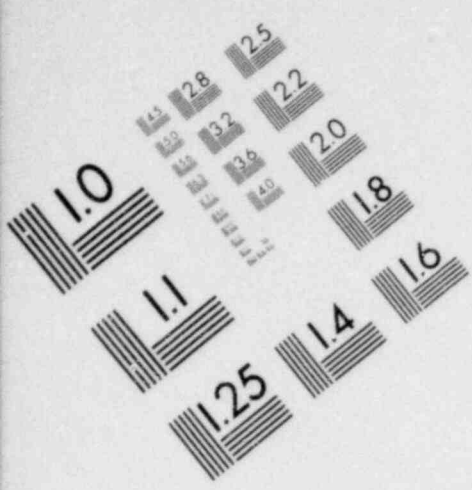
by test that a single failure such as fault (i.e., noise, voltage surge, short circuit or ground) imposed in one Class 1E circuit routed in these conduits, would not degrade the redundant Class 1E circuitry routed in the redundant conduits below an acceptable level.

An interim test report with clarification to the separation of these circuits to support the adequacy of their design was submitted to the staff for review.

Based on the information presented we can not conclude at this time that the applicants justification for allowing various redundant conduit to be routed is such close proximity is adequate. The applicant was requested and agreed to submit the final test procedures, analysis and test data results which clearly demonstrate that the test results envelope their implemented design and substantiate their proposed criteria. We will review these results when submitted and report our evaluation in the next supplement to the Safety Evaluation Report.

B. Wireways

In a supplement to the Safety Evaluation Report we stated that the applicant's criteria for cable routed in wireways was under review. The applicant documented their separation criteria for wireways routed in close proximity with other redundant Class 1E raceways (i.e., ladder type trays, wireways and conduit) and with non-Class 1E raceways (i.e., channel A, B, and C). In addition to providing thermal insulating blankets on all open type trays previously described, the applicant identified that certain cable routed in these wireways was different from the cable



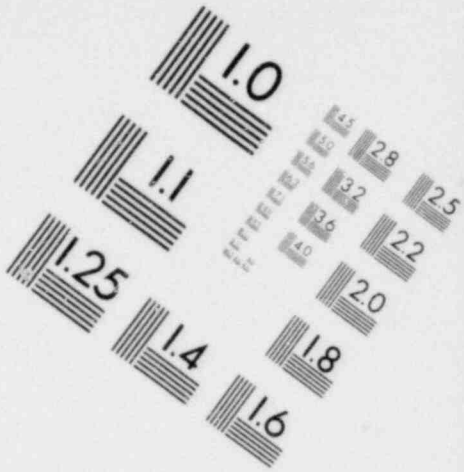
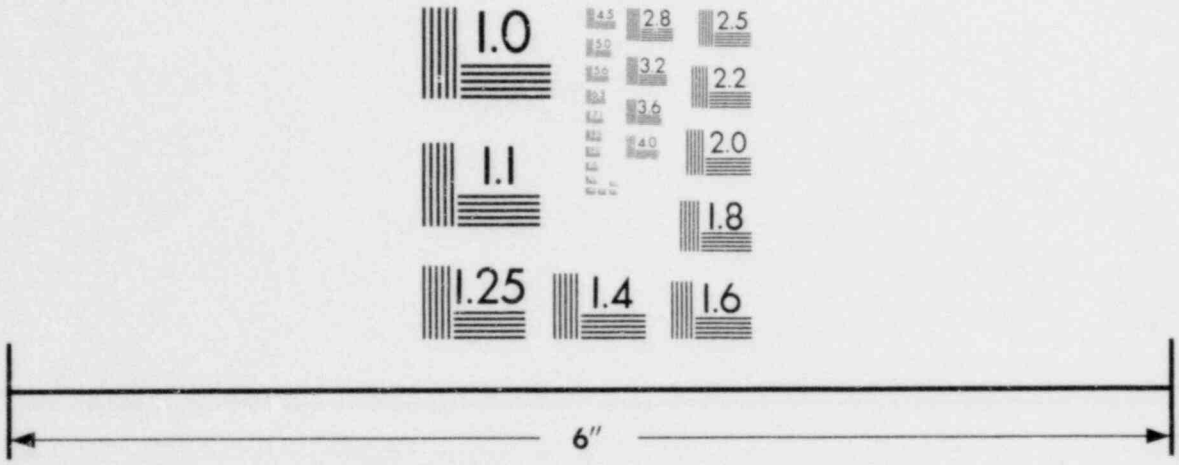
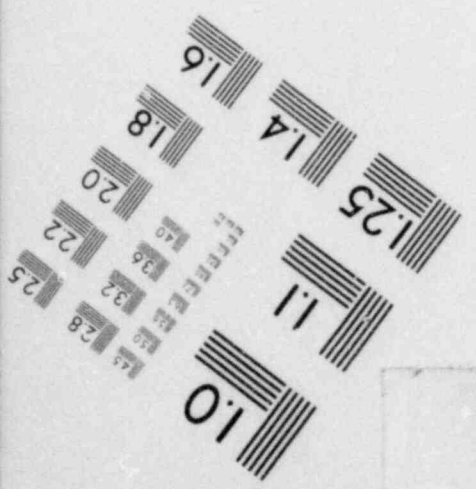
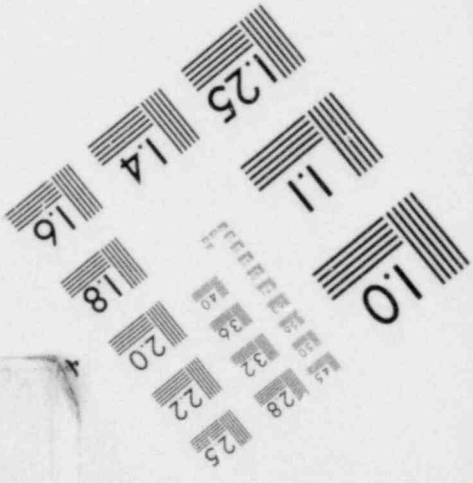


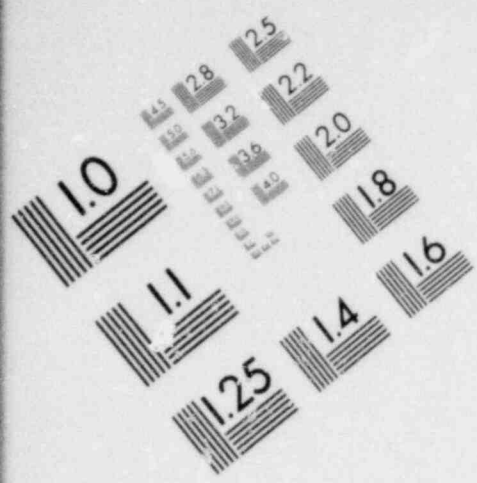
IMAGE EVALUATION
TEST TARGET (MT-3)



MICROCOPY RESOLUTION TEST CHART







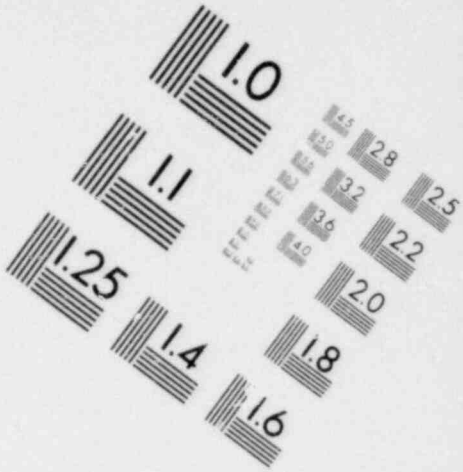
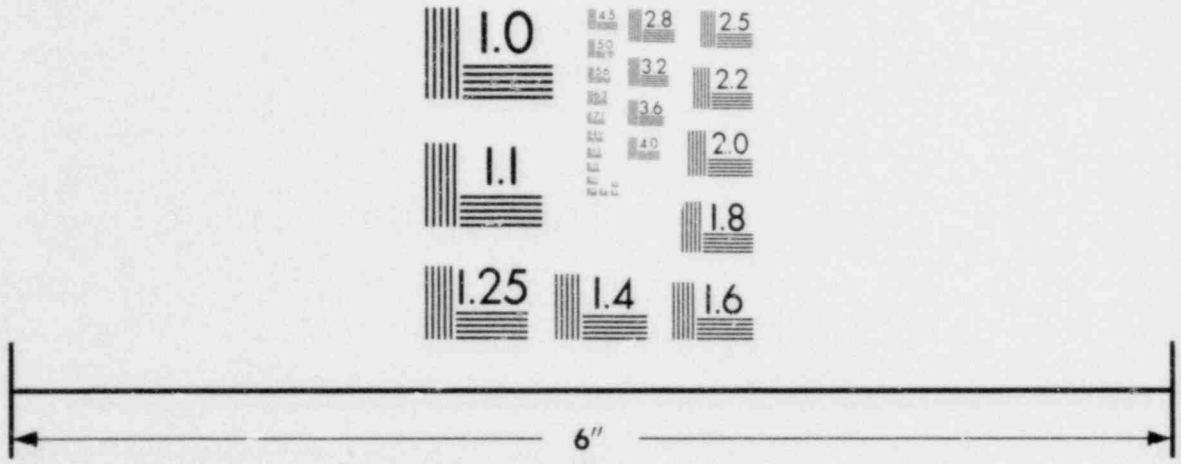


IMAGE EVALUATION
TEST TARGET (MT-3)



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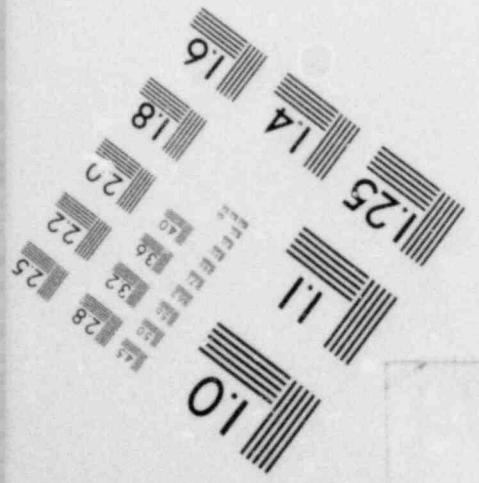

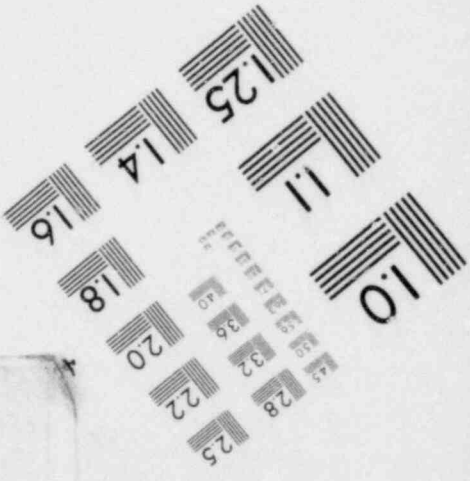

tested for flame retardancey as described in SER Section 7.9.1. For these wireways the applicant will inject silica gel in to the wireway in order to encase these cables with a flame retardant material. Based on our review of the criteria established for safety circuits routed in wireways, and the additional protective measures incorporated by the applicant we conclude that this design is acceptable.

7.10 Electrical Penetrations

Replace the information provided in the SER supplement (dated December 28, 1976) with the following:

In our Safety Evaluation Report we stated that the applicant was requested to supplement the information in the FSAR and provide their justification and basis to assure that the design of the electrical penetrations satisfies the requirements stated in General Design Criterion 50, i.e., "Containment Design Basis." In response, the applicant documented short circuit test results which were conducted on their medium and low voltage penetrations that demonstrate that these penetration assemblies can withstand, without loss of mechanical integrity, the maximum possible fault current versus time conditions. In addition, the applicant submitted analysis which demonstrate that the primary and back-up protective relaying used in these circuits are designed to interrrupt power in sufficient time to preclude electrical penetration damage in the event of faults in these circuits. Also, during our review the applicant was requested to verify that the operation of the primary and back-up protective relaying used in these circuits would not be negated assuming a single failure in the supply power to these breakers. In response to our concern the applicant identified that only the 13.8 KV breakers require power (i.e., dc power) to isolate the reactor coolant pumps from their motor control centers, and committed to modify their design by providing independent dc power sources to the respective protective breakers. The modified design will supply dc power to the primary breakers from dc distribution panels "DAP" and "DBP" and will supply dc power to the back-up breakers from dc distribution panels "DAN" and "DBN." Each distribution panel is supplied by an independent battery and battery charger.

Based on our review of the test results, analysis design modifications and various final design schematics, we conclude that the design of the electrical penetration protection provides an equivilent or improved design as compared to the designs recently licensed and is therefore acceptable.

8.2 Offsite Power Systems

In the Safety Evaluation Report we requested the applicant to evaluate their design for the Class 1E electrical distribution system to determine whether the operability of safety related equipment, including associated circuitry and instrumentation, can be adversely affected by short term or long term degradation in the offsite power system, as those experienced recently on the Millstone Unit 2 Plant.

In response to our request the applicant submitted a partial response. Additional information requested by the staff is scheduled to be submitted by March 4, 1977. We therefore conclude that this item is still under review. We will report the results of our evaluation of this item in the next supplement to the Safety Evaluation Report.