

COMMONWEALTH EDISON CO.
CORPORATE QUALITY VERIFICATION
DEPARTMENT
AUDIT REPORT NO. G-94-80

Transco, Incorporated
55 East Jackson Blvd.
Chicago, Illinois 60604-4166

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AUDIT REPORT

VENDOR NAME/ADDRESS

Transco Incorporated
55 East Jackson Blvd.
Chicago, Illinois 60604-4166

AUDIT DATES

May 4-6 and May 11-13, 1994

AUDIT PURPOSE AND SCOPE:

During the period of 5/4/94 to 5/13/94, Corporate Quality Verification performed the subject audit of Transco Inc. at 55 East Jackson Blvd., Chicago, Illinois and Darchem/Faverdale, a Transco sub-vendor in Darlington, England. The audit verified implementation of the Transco Inc. Quality Program PSQA Manual Rev. 5, dated 8/14/89, as accepted by ComEd Company.

Six Unresolved Items were identified as a result of this audit and the items identified have been acceptably resolved for Corrective Action. It has been determined that there is no Action to Prevent Recurrence that needs to be addressed by Transco Inc. since these Unresolved Items have been identified early in the Project Concept Phase and prior to production to allow sufficient time for the Vendor to have been able to implement his program. Corrective Action has already been completed for the Unresolved Items.

A brief description is as follows:

G 94-80-01: Transco Inc. has not extended Technical and Quality requirements to Darchem/Faverdale, a sub-vendor, for the ComEd purchase order 353865.

G 94-80-02: Transco Inc. has not performed a Design Verification and Analysis of the Darmett KM-1 material for ComEd purchase order 353865.

G 94-80-03: Transco Inc. has not established an Internal/External Design Interface between ComEd, Transco and Darchem/Faverdale.

G 94-80-04: At the time of this audit, Transco Inc. has not completed an External Audit of Darchem/Faverdale for ComEd purchase order 353865. Darchem/Faverdale is a sub-vendor of Transco Inc. This item will also track closure of the NUPIC audit deficiency (WEPCo) AFR 93-122A.

G 94-80-05: Transco Inc. has not established a Packaging/Handling/Shipping, Security arrangement and a permanent identification and marking system for the Darmett KM-1 fire boards as committed in the ComEd letter to the NRC dated 4/6/94 for ComEd purchase order 353865.

G 94-80-06: Transco has not completed a formal review of the Darchem/Faverdale procedures, instructions and drawings for ComEd purchase order 353865.

EVALUATION AND ASSESSMENT

The purpose of this audit was to review a sub-vendor of Transco Inc., Darchem/Faverdale, for the replacement of fire barriers that had been installed at LaSalle Station. The fire barrier that is in place at this time was installed during the initial installation of NRC Generic Letter 86-10 requirements for fire protection of Safety related systems installed in cable spreading rooms, aux electric rooms and diesel generator rooms prior to 1985. It was found later that the present Thermolag did not meet the requirements of the NRC Generic Letter 86-10 as an effective fire barrier.

As a result, an alternative was found. This alternative is the Darmett KM-1 fire barrier boards that Darchem/Faverdale manufactures. Darchem/Faverdale is located in Darlington, England.

The results of this audit, six Unresolved Items, only indicates the incomplete items that had to be completed before full scale production of the fire boards could begin. There is no indication from this audit that the production of the fire boards should not begin since Corrective Action is in place at the time of this report. Darchem/Faverdale is the OEM of a quality fire board that can be used as a replacement for the Thermolag that is presently installed. The fire board is a commercial item of Darchem/Faverdale. ComEd contracted Transco to provide their expertise of fire protection systems coupled with a ComEd Engineering Qualification of this fire board. A product certification test was conducted in March 1994 with ComEd and Transco personnel present at Darchem/Faverdale. This one hour fire test met the requirements of the Generic letter 86-10. The results of this test was communicated back to the NRC.

ComEd has committed to the NRC that these fire boards will be installed at LaSalle, Byron and Braidwood.

Corporate Quality Verification has completed this audit and recommends that the replacement of the fire barriers be installed at these plants. The ComEd program requires that the fire boards be classified as Regulatory Related (Augmented Quality). However, ComEd Engineering has taken a more conservative approach and classified the fire boards as Safety Related.

This doesn't create any additional difficulties as the Program Requirements for the critical areas of fabrication, inspection/test, procedures, procurement, nonconformances, corrective action, organization, records and audits remain approximately the same.

Corporate Quality Verification recommends that Transco and Darchem/Faverdale remain as Vendor/Suppliers of the Darnett KM-1 fire board material.

AUDIT SUMMARY:

AREA: ORDER ENTRY/PROCUREMENT

Darchem/Faverdale is the OEM for the fire barriers used for ComEd purchase order 353865. Darchem/Faverdale are not 10 CFR 50 Appendix B program suppliers. Darchem/Faverdale is a European ISO 9000 supplier to Transco. For the ComEd purchase order 353865, Transco, is implementing their ComEd approved program with Darchem/Faverdale working to the ComEd approved Transco program. Darchem/Faverdale is approved by "NAMAS", a United Kingdom National approval organization. NAMAS is a Department of Trade and Industry Registrar for raw materials and commercial products. The Darnett KM-1 material is a commercial product. The Darnett KM-1 material used in the fabrication of the fire barriers, is a commercially available material with no unique characteristics to nuclear power plants.

A review of the Transco incoming orders on 5/4/94 for ComEd purchase order 353865 revealed that Transco translates Incoming Order requirements into the Transco 'Customer Design Implementation Checklist'. Transco documents this activity in accordance with procedure PSQAP 3.0 Rev.O dated 4/25/94. The system that Darchem/Faverdale uses to process incoming procurement documents is described in DEL procedure QP-13 and 14, dated 12/18/90 and 9/22/93 respectively. At the time of this audit, the only active ComEd purchase order that Transco had with ComEd was 353865 dated 4/12/94.

Darchem/Faverdale uses 'Order Abstracts' to translate incoming orders. At the time of this audit at Darchem/Faverdale 5/11/94, Transco has just recently placed two purchase orders, 5289 and 5290 dated 5/9/94, to Darchem/Faverdale, and as a result Darchem/Faverdale has not had an opportunity to generate the 'Order Abstracts' at the time of this audit for Transco purchase orders 5289 and 5290 for the Fire Resistant material and Testing respectively. However, at the time of this report, the order abstracts were faxed to ComEd. Darchem/Faverdale had prepared an 'Order Abstract' for Transco purchase order 5076 which was for the initiation of product certification test work at Darchem/Faverdale. The Darchem/Faverdale work order number is 310106, dated 4/19/94 issue A, for the One Hour Fire Test.

This is documented in accordance with the FTI Quality Manual QPD-35. The ComEd purchase order 353865, dated 4/12/94, had been classified as Safety Related even though the actual classification by the ComEd program, would only require a Regulatory Related

position. Discussion with ComEd Engineering, revealed that the classification was determined by ComEd as a conservative measure since the fire barrier material is protecting Safety Related equipment.

However, at the time of this audit at Transco, Transco had not imposed Safety Related requirements to Darchem/Faverdale for the Testing and Fabrication of the Darmett KM-1 material for ComEd at LaSalle. The procurement activity was originally documented on Transco Purchase Order 5076 as Non-Safety, however upon review of this document during the audit at Transco it was brought to the attention of the Transco QA Manager and requested that the document be revised. Discussion with the TPI QA Manager concluded that the procurement document would be revised by the time of the Darchem/Faverdale audit on 5/11/94. As indicated earlier, Transco purchase order 5289 and 5290 had already been issued to Transco.

Since the ComEd procurement activity is very recent to Transco and the details of the Fire Board Testing have only recently been agreed upon between the NRC and ComEd it was determined that this would be identified as an Unresolved Item. This Unresolved Item was completed for Corrective Action at the time of this report.

See Unresolved Item G 94-80-01 for details.

Further discussion with both Transco and Darchem/Faverdale revealed that in the event that purchase requirements could not be met, this would be directly communicated back to the originator telephonically or by fax and immediately followed up by correspondence for documentation purposes. Discussion with these vendors also revealed that there hasn't been a situation where this has occurred yet, however, through the conduct of this audit it was determined that if the situation would arise the notification would be made. This activity was found acceptable.

Other purchase orders reviewed during this audit were the Darchem/Faverdale purchase orders for the raw material used to fabricate the Darmett KM-1 fire barriers. The purchase orders were reviewed and found to be classified as a non-safety/commercial grade. The technical requirements imposed were for the DEL CMP-001 Darmett KM-1 material. There were no specific or additional quality program or requirements imposed. There were no specific requirements for documentation, nonconformances, records or 10 CFR Part 21. This is due to the fact that the material purchased is a commercially available material with no specific or unique characteristics for nuclear power plants. This procurement classification was found acceptable.

Upon receipt of the raw materials, Darchem/Faverdale mixes the raw materials together to produce an acceptable fire barrier slurry. When Darchem/Faverdale completes the batching and material pouring process, the blend and the completed fire barrier are treated as if they are Safety Related. It is during and after this process completion that the boards are Safety

Related. This activity was found acceptable for the Darchem/Faverdale facility and the fabrication of the Fire Boards.

Based upon the review of the procurements made by Transco and Darchem/Faverdale, both the Transco and Darchem/Faverdale subsuppliers were considered acceptably reviewed for procurement scope commensurate with the procurement activity. See Unresolved Item G 94-80 001 for procurement classification.

Corrective Action was complete for this Unresolved Item at the time of this report.

There is no ASME material to be supplied for the ComEd purchase order 353865 by Transco or Darchem/Faverdale. This activity was found not applicable to this audit.

AREA: DESIGN CONTROL/SOFTWARE QUALITY ASSURANCE

Transco is subcontracting this work activity to Darchem/Faverdale. Darchem is the OEM for the Darmett KM-1 Fire Barrier material. The original design is performed by Darchem/Faverdale and is documented in the Darchem/Faverdale design report CMP-001, issue B, dated 5/12/94. The reviews were completed by Darchem Engineering Limited (DEL), on 5/12/94. The original issue of this design report, issue A, was reviewed and approved by DEL on 3/17/94. Since Transco is purchasing this activity from Darchem/Faverdale, Transco will perform a design review of the material components and then have them approved by ComEd. ComEd is taking the responsibility for the Engineering Qualification testing. It is ComEd expertise in Fire Protection Engineering, assisted by Transco and Darchem/Faverdale to develop and approve a model to satisfy the NRC requirements of the Generic Letter GL 86-10.

Darchem is a sub-vendor to Transco for ComEd purchase order 353865. At the time of this of this audit, ComEd/Transco have prepared Fire Test procedure TR 213 rev.2 Dated 4/28/94. This procedure was prepared in accordance with NRC GL 86-10 requirements for fire barrier systems to be installed at LaSalle station. The Generic Letter identifies the base requirements for the fire barriers. They are General Design Criteria 3 from 10 CFR 50.48, ASTM E119, 10CFR 50 App.R, and NFPA 251.

ComEd/Transco have been in direct communication with the NRC in preparation of this test document. This test document will be a pilot demonstration for the Nuclear Utility Industry. Upon successful completion of this testing, the remaining Nuclear Utility Industry will most likely follow this path.

Darchem completed the initial test and test report for the fire barrier system demonstration. This is documented in the Faverdale Test Report F7 CR/94/0060, issue A, dated 4/8/94. This test report constitutes the design requirements necessary to implement the GL 86-10 requirements.

The test report identifies the material composition of the fire barriers and the qualification testing results. The final configuration testing will be completed approximately June 21, 1994. The configuration includes a demonstration arrangement of cable pan and cables to be tested for fire barrier protection. This configuration demonstration will also be in accordance with GL 86-10 requirements. The demonstration configuration is identified in the TR 213 rev. 2 Test document. The sketch configuration was prepared by ComEd and S&L Engineering at LaSalle station. Sketch #1 and #2 were both dated 3/31/94 and incorporated into the TR 213 rev.1 Procedure which was prepared, checked and approved by Transco personnel on 3/23/94. Tr 213 rev. 2 Was prepared, checked and approved on 4/28/94 by the same personnel who were in involved in rev.1. The rev.2 Of TR 213 test procedure was Transco approved in accordance with PSQAP 3.0, Rev.0, Dated 4/24/94.

The suitability of materials for the ComEd/Transco purchase order was documented in the demonstration/qualification test report completed by Darchem/Faverdale, a sub-vendor to Transco, in the 1-hour test report, Faverdale document FTCCR/94/0060, issue A, dated 4/8/94.

However, it was noted that a complete review/approval by Transco of the FTCCR/94/0060 Test Report had not yet been completed at the time of this audit. This activity is being identified as an Unresolved Item. See CAR G 94-80-02 for details. Corrective Action for this Unresolved Item has been completed at the time of this report.

The design reviews to prepare for the Engineering Qualification testing of the fire barriers involved for the ComEd/Transco purchase order 353865 are included in the TR 213 rev.1 & 2 Test documents. These were verified to be independently reviewed. It was also verified that the original fire barrier composition was Engineering evaluated by DEL prior to development of the qualification testing procedure.

Design analysis and qualification testing are the engineering methods employed for the design verification. The qualification test procedure TR 213 Rev. 1 was used for the 1 hour fire test conducted by Faverdale. The configuration testing to be conducted on June 21,1994 will be in accordance with Rev. 2 Of the TR 213 test document.

The only design changes identified and observed during this audit were involved in revision #2 to the TR 213 test document and the DEL design report for the base material KM-1, issue B, of CMP-001.

There have been no changes made to the original material composition since the original product testing was performed and witnessed by ComEd in the product certification testing which was conducted on 3/30/94. There were only minor editorial changes made to these two documents to satisfy ComEd purchase order requirements and NRC enhancements to the GL 86-10. This product certification was certified by Faverdale on 3/30/94. However, as previously identified in this audit, Transco has not yet approved the 1 hour test report FTCCR/94/0060. See Unresolved Item G-94-80-02

There have been no material substitutions for the ComEd/Transco purchase order 353865 of the Darmett KM-1 fire barrier material that were observed during the course of this audit. This activity was found acceptable.

There are no spare/replacement parts involved in ComEd purchase order 353865. To Transco. This project consists only of material qualification for fire barrier installation at LaSalle Station. This area was found not applicable to this audit.

There has been no dedication of material by Transco or Darchem/Faverdale used for fire barrier protection for the LaSalle project. The material is a commercial item of Darchem/Faverdale, but no dedication is required of the material, since an Engineering Qualification Test was performed. The critical characteristics for the material composition is documented in the DEL CMP-001 Design Report, issue A & B. There have been no changes to that material composition for ComEd purchase order 353865. This activity was found acceptable.

Due to the timing of this activity between ComEd/Transco and Darchem/Faverdale, a ComEd/Transco/Darchem Design Interface has not yet been established at the time of this audit.

Discussion with ComEd Engineering, Transco and Darchem/Faverdale revealed that a Design Interface was in the process of being developed during the course of this audit. This is being identified as Unresolved Item G 94-80-003. Corrective Action has already been completed at the time of this report.

Transco has not developed or procured software for their use in Design applications. There was no evidence of software application involved at Transco and no activity was observed during the course of this audit of any software applications for ComEd purchase order 353865. This activity was found not applicable for Transco for the purposes of this audit.

Discussion with the Faverdale QA Manager, revealed that there is a formula developed by DEL that is used in the determination of a fire barriers capability. Darchem/Faverdale has established procedure CQA 103-7 issue 2 dated 3/11/94, "Control Verification & Utilization of Computer Software within the Design Department." The formula used in the capability development of the Darmett KM-1 Fire Material, is stored in a controlled DEL computer directory, maintained on a Lotus 1-2-3 commercial software database. The program implements what DEL refers to as "Simpsons Rule". It is a basic engineering calculation which is run on the Lotus 1-2-3 software worksheets, wk-1 and graphics. The program determines flame resistance durability. The verification and validation of the program is completed by DEL. The computer code is installed on a 386 cpu based system. Each time the Lotus program is executed, the data is validated and verified by hand calculation to design input documents or fire standards, such as the NFPA or ASTM for the ComEd purchase order 353865.

Any revision or amendment made to the formula is documented in the same manner as the original formulae. This activity is controlled within DEL procedure CQA 103-7, issue 2 dated 3/11/94. This activity was found acceptable.

The software procured by DEL is commercial software, Lotus 1-2-3. Discussion with the DEL Quality Manager revealed that there were no other procurements that DEL has made for software for the development of fire barrier programs. There was no evidence observed of other software that has been in use for the fire barrier development for ComEd purchase order 353865. Since the software in use for DEL is commercial software, this area was found not applicable for the purposes of this audit.

DEL maintains procedure CQA 103-7 for the "Control Verification & Utilization of Computer Software". This procedure also provides controls for the corrective measures that would have to be taken for software problems. There were no software problems to date that have been identified by DEL for the Lotus 1-2-3 program. This activity was found acceptable.

The only users that have access to this software program are DEL personnel. The program (formulae) that they developed for use in the Lotus 1-2-3 program is not public domain or for sale purposes. It is proprietary to DEL only. Any problems identified would be internally identified and internally corrected by DEL. There was no evidence of problems that have been identified by DEL with the Lotus 1-2-3 program. This activity was found acceptable.

The formula was used to develop and qualify the "Certificate of Product Testing", which is the 1-hour fire test for the ComEd purchase order 353865. A review of the fire test results revealed that the program was used as intended. The test concluded that the Darmett KM-1 material was suitable for the 1-hour duration. This activity was found to be acceptable.

AREA: TESTS/INSPECTIONS and CALIBRATIONS

At the time of this audit there was no testing activity in progress. There is a test procedure developed for the configuration testing that is to be conducted on June 21, 1994. The test procedure is TR 213 rev.2, approved 4/28/94. The test procedure was found to identify the activity/configuration to be inspected. The procedure also identified the specification, acceptance criteria, special equipment, characteristics, prerequisites, and personnel to be involved. There were no inspection points identified in the procedure as the whole test is to be witnessed by ComEd. There are no sampling plans involved for this test, so this was found not applicable for this test procedure. At the time of this audit the test had not been conducted yet, so there were no test results to verify. However, the test results will be approved by ComEd personnel. There have been no deficiencies identified with this test procedure, since the test has not been conducted yet. Deficiencies, if identified, are to be processed in accordance with DEL procedure QP-5 rev.0 dated 5/5/92 and overviewed by Transco. This activity was found to be not applicable to both Transco and Darchem/Faverdale at the time of this audit.

Darchem/Faverdale was found to maintain calibrated working standards for their calibration inspection activities. It needs to be pointed out that there was no inspection activity to conduct during the course of this audit for ComEd purchase order 353865. This is because there have been no purchase orders released from Transco to Darchem/Faverdale for the production of fire barrier boards for the ComEd project prior to this audit. However, a sample review of their equipment was made during the course of this audit in order to verify implementation. This activity was found acceptable.

The area of calibration was found not applicable to Transco for this audit due to the fact that this activity was contracted to Darchem/Faverdale for ComEd purchase order 353865.

Darchem/Faverdale maintains procedure QP15 rev.3 dated 10/8/92. Darchem calibrates their equipment to BSI (British Standards Institute) standards. The items were found traceable to either a purchase order for external calibration and/or a BSI standard if they are a disposable type item (used once and thrown away, i.e. Wire thermocouples). Each of the items were found to contain a unique identifier, status indicator, calibration interval and an "as found/as left" condition. Additional records contain the location and/or person involved with the calibration, calibration procedure/instructions and the calibration history. This activity was found to be not applicable to both Transco and Darchem/Faverdale at the time of this audit since no activity for ComEd purchase order 353865 was in progress.

A review of the personnel performing the calibrations was not made during the course of this audit. However, an inspection of the area where internal calibrations are performed was made and found to be an environmentally suitable area for the calibrations. The Darchem shop is virtually a laboratory to begin with. Calibrations of the nature performed by Darchem for the ComEd project could be completed almost anywhere within the confines of the testing laboratory. This activity was found acceptable.

There were no Darchem discrepancies reviewed during this audit which involved M&TE since no production activity for ComEd purchase order 353865 was in process at the time of this audit. This activity was found to be not applicable to both Transco and Darchem/Faverdale for the purposes of this audit.

AREA: MATERIAL CONTROL/DEDICATION

Transco is not the OEM of the Darmett KM-1 Fire Barriers. Transco has subcontracted this manufacturing activity to Darchem/Faverdale. At the time of the ComEd audit visit at Darchem/Faverdale, production of the fire barriers had not begun. The tentative schedule is approximately 7/15/94. The only fire barriers that had been fabricated at the time of this audit are the test boards for the 6/21/94 ComEd test. These test boards were found to be traceable to the process traveler by means of marking the boards with a black marker with the Transco purchase order number. These boards were not affected by the markings placed on them and they will not be sent to LaSalle for installation. However, there are no production fire barrier

boards to inspect, identify and store, including packaging/handling/shipping and security arrangements, at Darchem/Faverdale at this time for the installation at LaSalle. As a result, this area is being identified as an Unresolved Item See CAR G 94-80-005 for details.

A review of the training records for the Darchem/Faverdale fabricators revealed that they have received sufficient training to perform the batching and fabricate the fire barrier boards for ComEd purchase order 353865. This activity was found to be acceptable. As indicated earlier, these fire boards are not being dedicated. They are Engineering Qualified by test. Dedication was found not applicable for the purposes of this audit.

AREA: DOCUMENT CONTROL/PROCEDURE ADEQUACY

A review of the work activities documented in this audit revealed that the work activity for both Transco and Darchem/Faverdale is conducted in accordance with procedures that have been found to be controlled, reviewed for accuracy and available at the individual work locations. The procedures were found to be approved for use by each individual organization and to contain sufficient quantitative and qualitative acceptance criteria. However, at the time of this audit, Transco had not completed a formal review of Darchem/Faverdale procedures for acceptance to ComEd purchase order 353865 and to the Transco program. See Unresolved Item G 94-80-006.

AREA: NONCONFORMANCES/CORRECTIVE ACTION/PART 21

A review of Transco nonconformances was made during the course of this audit. The nonconformances reviewed for this audit were documented through the year of 1993. Prior to that time there were no other documented NCR's to review. The NCR's were found to sufficiently document and identify quality problems, verify implementation, control any further processing and to initiate or provide solutions to the concerns. The NCR's were found to be dispositioned by the personnel involved, with acceptable corrective action identified and implemented. Each of the NCR's were found to be accepted and verified by the Transco organization. At the time of this audit there have been no Transco NCR's identified for the ComEd project purchase order 353865.

At the time of this audit there have been no production NCR's identified with the manufacture of the fire barrier boards by Darchem/Faverdale. This is due to the fact that the production of the fire barrier boards has not begun yet. Production of the fire barriers is tentatively scheduled to begin around July 15, 1994. The Darchem/Faverdale nonconformances that are identified during the course of manufacture of the fire barrier boards will be reviewed by Transco. This review is done in accordance with the Transco program. The NCR's are generated by Darchem/Faverdale and overviewed by Transco with documented concurrence or redocumented by Transco in accordance with the Transco program and the Transco procedure PSQAP 15 rev.A, dated 3/9/90.

There was one Darchem/Faverdale NCR, A-11211 dated 5/13/94, that was documented in the makeup of a fire test board at the time of this audit at Darchem. Darchem/Faverdale implements procedure QP-5 rev. 0, Dated 5/5/92 which has been accepted by Transco. The NCR was written for an imperfection on the fire test board. It contained a crack. Since these boards are similar in appearance to a drywall board, the imperfect end of the board was dispositioned as scrap and the good/salvageable part was dispositioned as acceptable. The board was tagged and marked accordingly. The NCR was concurred with by Transco in a TPI letter dated 6/15/94. This activity was found to be acceptable.

Transco implements procedure PSQAP 15.1 Rev.B, dated 7/11/90 for the posting and implementation of Section 206, 10 CFR part 21 requirements. The posting of 10 CFR part 21 is maintained in the Transco office area and the procedure is attached to the 10CFR Part 21 ERA Act of 1974.

Transco has the responsibility for the Darchem/Faverdale portion of the ComEd/Transco contract and 10CFR Part 21 reporting for their activities since Darchem/Faverdale is working to the Transco program. At the time of this audit Transco has not been involved with any 10 CFR Part 21 actions. This activity was found acceptable for both Transco and Darchem/Faverdale.

AREA: INTERNAL/EXTERNAL AUDITS

A review of the 1993 Transco Internal/External audits was made and it was found that the audits have been conducted according to schedule with the exception of Transco Internal Design Control. The area of Internal audits was NUPIC audited by WEPCo in December of 1993. There are some deficiencies still open as a result of that audit. ComEd has reviewed the WEPCo audit and will not duplicate the deficiencies in this audit that are already documented. This NUPIC audit will serve as the ComEd tri-ennial audit. The deficiencies are near closure by WEPCo with an implementation followup due by 7/9/94. ComEd will receive this followup and review it for applicability for the ComEd tri-ennial audit period. As a result no further review was made for this area. ComEd documented CAR G-94-102-01 for tracking purposes.

The External audits performed by Transco in 1993 did not include Darchem/Faverdale. Transco performed this audit, V 94-05-01, during the week of 5/8/94. No deficiencies were identified by Transco. The audit report was reviewed and found to be acceptable.

AREA: RECORDS

A review of the ComEd/Transco project records was made and it was found that at the time of this audit there have not been many records generated for the ComEd project. However, Transco has an established system described in Transco procedure PSQAP 17.0 Dated 7/11/90. The records generated so far, for the ComEd project, are purchase orders, training

records, audits, instructions/procedures and drawings and the test record TR 213 Rev. 1 and Rev. 2. Completed inspection and test records, material analysis, C of C's, and calibration records were not yet available at the time of this audit. Discussion with the Transco QA Manager revealed that duplicate record storage is implemented at the Bensenville and Streator, Illinois facilities. However, those duplicate record facilities are not going to be reviewed for this audit. The record storage implemented at the time of this audit was found to be acceptable.

A review of the DEL record system at the time of this audit revealed that there have not been many records generated at the time of this audit due to the timing of the project progress. However, it was verified that DEL has a system to implement record storage, procedure QP-9, rev. 0 Dated 8/28/91. DEL has procedures, purchase orders, receipt inspection records, and completed product certification tests available for review for the ComEd project. The DEL record system for the ComEd project becomes Transco's responsibility to be handled in accordance with their program requirements and contract specification. This activity was found to be acceptable.

A review of both Transco and DEL records generated so far and to have been reviewed during this audit were found to be credible and legible with no unacceptable document alterations. Changes to documents made by either organization are normally made by the same personnel who generated the original document. There were no indications found that documents had been altered or changed by personnel without proper authorization. This activity was found to be acceptable for both Transco and Darchem/Faverdale.

AREA: ORGANIZATION/PROGRAM

A review of the Transco organizational structure identified in Transco PSQAM -1 Exhibit I and the implementation of the activities of that organization was made for the ComEd purchase order 353865. It was found that Transco has established a policy statement dated 8/14/89 and designated an individual as the Transco Quality Manager. The Transco Quality Manager was found to be independent of production and was found to have direct access to the Transco President. The independence was verified in the conduct of Transco internal audits and the intervention of quality issues for Transco nonconformance reports. Also at the time of this audit Transco had prepared and submitted a revised quality program, TI-QAM-1, dated 3/31/94. This program was reviewed during this audit and found to be in agreement with ComEd requirements. The program was desk surveyed by ComEd CQV department and no reduction in commitments were identified. This activity was found acceptable for the Transco organization.

Darchem/Faverdale has identified an independent quality organization as documented in appendix I of the DEL Quality Program QPD-35 dated 5/12/94, for the ComEd/Transco project concerning ComEd purchase order 353865. It should be noted that DEL is an ISO 9000 program, and although there are similarities with ISO 9000 and 10 CFR 50 Appendix B,

there are functional differences which exist with ISO 9000 programs at different levels of implementation.

DEL does have a Quality System and Quality Manager, however, there was no separate policy statement for program implementation at the Corporate level. The Quality Manager was found to be independent of production with access to upper management. The DEL management structure was found to be very similar to a well organized and structured commercial manufacturer found in the United States. This organization is considered to be acceptable for the manufacture of the fire barrier boards for the ComEd project. Transco is the organization whose 10 CFR 50 Appendix B is accepting responsibility for the 10 CFR Appendix B implementation of the Transco program at Darchem/Faverdale. Transco has reviewed the DEL program and has established any additional requirements into the DEL QPD 35 program document where necessary and taken responsibility for the implementation of the Transco program by subvendor contract. As previously stated, Transco is imposing their 10 CFR 50 Appendix B program to Darchem/Faverdale. This activity was found to be acceptable for Darchem/Faverdale.

A review of Transco effectiveness reviews for the past 12 months was made. A NUPIC Audit was conducted last December 1993 and had reviewed the effectiveness reviews that were conducted prior to 1993. Those were not reviewed again during this audit. The Transco effectiveness reviews that were observed during this audit were conducted by the Transco Quality Manager on a quarterly basis. The reports were found acceptable and to report the activities to the Transco Inc. President. This activity was found acceptable for Transco.

As for the DEL quality system, as indicated earlier in this audit, there are similarities between ISO 9000 programs and 10 CFR 50 appendix B programs with functional differences existing at different levels of implementation. The area of regular reports to upper management is another of those differences. However, it is the Transco program that is being imposed to Darchem/Faverdale by subvendor contract. As a result there would be no additional requirement imposed by Transco to Darchem/Faverdale. It also needs to be pointed out that the fire barrier boards were Engineering Qualified by test for the ComEd project. This qualification was performed by ComEd/Transco/Darchem-Faverdale. This area was found to be not applicable for Darchem/Faverdale.

AREA: TRAINING/CERTIFICATION

A review of the Transco training records for the ComEd project was made. It was found that the Transco personnel involved with the ComEd project have been trained in accordance with the requirements of the Transco QA Manual PSQAM-1, rev. 5, the Transco PSQAP procedures, the NQAM-1 rev. 6 and the Transco SQAP's. The Darchem/Faverdale personnel reviewed during this audit revealed that the personnel were trained in accordance with the requirements of the DEL Quality System and the DEL procedure QP-8 rev. 1, Dated 5/8/92. This activity was found acceptable for both Transco and Darchem/Faverdale personnel.

AREA: HANDLING/SHIPPING/STORAGE

At the time of this audit report, production of the Fire Boards has not begun. The tentative schedule is approximately 7/15/94. The only fire barriers that had been fabricated at the time of this audit are the test boards for the 6/21/94 ComEd test. These test boards were found to be traceable to the process traveler by means of marking the boards with a black marker with the Transco purchase order number. These boards were not affected by the markings placed on them. However, there are no fire barrier boards to inspect, identify and store, including packaging/handling/shipping and security arrangements, as committed to the NRC in the ComEd letter dated 4/6/94, at Darchem/Faverdale at this time for the installation at LaSalle. As a result, this area is being identified as an Unresolved Item. See CAR G 94-80-05 for details.

AREA: PREVIOUSLY IDENTIFIED DEFICIENCIES

CAR AFR 93-122A: Internal Audits - Unresolved Item
CAR AFR 93-122B: Internal Audits - Unresolved Item
CAR AFR 93-122C: Dedication- Not Applicable for this audit
CAR AFR 93-122D: QA Program - Acceptable
CAR AFR 93-122E: Calibration - Not Applicable for this audit
CAR AFR 93-122F: External Audits - Acceptable

AUDIT TEAM: The audit team included the following personnel:

William R. Betourne

Audit Team Leader

AUDIT REFERENCES: The audit was conducted using an approved checklist containing selected questions from the following references:

10CFR 50 Appendix B, Criteria 1 through 18
NQA-1, ANSI N45.2
Transco PSQA Manual Rev. 5, dated 8/14/89
CECo Purchase Order 353865 dated 4/12/94

ENTRANCE/EXIT MEETING ATTENDEES AND PERSONNEL CONTACTED:

The following personnel attended the audit entrance meeting held on May 4,1994 (1), attended the audit exit meeting on May 13,1994 (2) and/or were contacted during the audit (3).

<u>NAME</u>	<u>TITLE</u>	
B.C. Machchhar	Quality Manager, Transco	1,2,3
G. Jarosz	Product Manager, Transco	1,3
K. Hawks	Project Manager, Transco	1,2,3
K. Murray	Senior Engineer, Darchem	1,2,3
W. McLean	Quality Manager, Darchem	1,2,3

ATTACHMENTS:

Corrective Action Records (CAR's)

QUALITY ASSURANCE BIDDERS LIST (QABL) STATUS:

Corporate Quality Verification recommends that Transco remain on the QABL including the supply of Fire Barrier Boards.

CAR Number: G-94-80-01

Type Code

URI

Severity Code

Vendor Name Transco Inc

Audit Coordinator PJZ

Contact Person W. R. Betoume

COG QA ENG/INSP: Zurawski, Paul J.

CAR Issue Date 7/22/94

Next F/U Date 9/6/94

Close Date 7/22/94

Description

Technical and Quality requirements have not been extended to Darchem/Faverdale Technologies by Transco, Inc. Darchem/Faverdale is a subvendor to Transco for ComEd purchase order 353865.

Discussion

Transco, Inc. has issued purchase orders 5289 and 5290 to Darchem/Faverdale for fire resistant material and testing respectively. However, Transco has mis-classified the purchase orders as non-safety related. ComEd has imposed safety related and Part 21 requirements to Transco in ComEd purchase order 353865. Transco has not imposed these requirements to Transco. Transco is required to revise its purchase orders 5289 and 5290 to Darchem/Faverdale as safety related, Part 21.

Commitment

Transco committed to revise its purchase orders 5289 and 5290 to Darchem/Faverdale as safety related, part 21 by June 1, 1994.

Car Status Report

Status as of

7/22/94

Purchase orders 5289 and 5290 were revised on 5/9/94 and hand carried by Transco to Darchem/Faverdale on 5/11/94. The purchase orders were reviewed by CQV and were found to be classified as safety-related part 21. This activity was found acceptable. No further action is required. No further follow-ups are required. This item is CLOSED.

CAR Distribution

Prepared By: WRS Date: _____
Approved By: W.R. Betoume Date: 7/22/94
mk

CAR Status

CAR Number: G-94-80-02

Type Code

URI

Severity Code

Vendor Name Transco Inc

Audit Coordinator PJZ

Contact Person W. R. Betourne

COG QA ENG/INSP: Zurawski, Paul J.

CAR Issue Date 7/22/94

Next F/U Date 9/6/94

Close Date 7/22/94

Description

Transco Inc. has not performed a design verification of the Darmett KM-1 fire board barrier material for ComEd purchase order 353865. Also, the Faverdale test report FT CR/94/0060 has not been accepted by Transco and submitted to ComEd for approval

Discussion

A review of the Transco project files for ComEd purchase order 353865 revealed that a design verification/analysis of the Darmett KM-1 material had not been performed by Transco. Transco has contracted Darchem/Faverdale to test and manufacture new fire barrier material to meet NRC Generic Letter 88-10 requirements. However, Transco has not performed a Design Verification/Analysis of the Darmett KM-1 material. This design analysis would also verify suitability of application of the commercial grade materials involved and provide a review of its critical characteristics.

Discussion with Transco during this audit also revealed that the one hour fire test report FT CR/94/0060 has not yet been accepted by Transco and submitted to ComEd for approval.

Commitment

Transco indicated at the Darchem/Faverdale exit meeting on 5/13/94 that this analysis would be performed by 7/1/94.

Car Status Report

Status as of

7/22/94

Transco responded to this Unresolved Item on 6/15/94, 6/27/94, and 7/20/94. The response was reviewed and found acceptable. The design reviews were found to be completed and accepted by Transco. The FT CR/94/0060 was reviewed and accepted by Transco on 6/27/94.

No further action is required. No further follow-ups are required. This Unresolved Item is CLOSED.

CAR Distribution

Prepared By: WRS

Date:

Approved By: W. R. Betourne

Date: 7/22/94

PH

CAR Status

CAR Number: G-94-80-03

Type Code

URI

Severity Code

Vendor Name Transco Inc

Audit Coordinator PJZ

Contact Person W. R. Betourne

COG QA ENG/INSP: Zurawski, Paul J.

CAR Issue Date 7/22/94

Next F/U Date 9/6/94

Close Date 7/22/94

Description

Transco has not established an internal and external design interface between ComEd, Transco, and Darchem/Faverdale.

Discussion

A review of the ComEd/Transco project files for ComEd purchase order 353865 during the Transco portion of this audit revealed that an internal/external design interface had not yet been established by Transco to describe responsibilities for ComEd, Transco, and Darchem/Faverdale.

Commitment

Transco agreed to complete this activity by 7/1/94.

Cer Status Report

Status as of

7/22/94

Transco responded to this Unresolved Item on 6/15/94. CQV has reviewed the response and found it acceptable. A review of the Design Interface revealed that the interface includes the design organizations from Transco, Darchem/Faverdale and ComEd for review, approval, release, revision and distribution of design documents for ComEd purchase order 353865. No further action is required. No further follow-ups are required. This Unresolved Item is CLOSED.

CAR Distribution

Prepared By: WRS Date: _____

Approved By: W.R. Betourne Date: 7/22/94
pk

CAR Status

CAR Number: G-94-80-04

Type Code

URI

Severity Code

Vendor Name: Transco Inc

Audit Coordinator: PJZ

Contact Person: W. R. Betourne

COG QA ENG/INSP: Zurawski, Paul J.

CAR Issue Date: 7/22/94

Next F/U Date: 9/6/94

Close Date: 7/22/94

Description

At the time of this audit, Transco has not completed an external audit of Darchem/Faverdale for ComEd purchase order 353865. Darchem/Faverdale is a sub-vendor of Transco. This item would also track closure of the NUPIC audit deficiency on internal audits.

Discussion

Transco has not completed an external audit of Darchem/Faverdale at the time of the audit. Darchem/Faverdale is a subvendor to Transco for ComEd purchase order 353865. Darchem/Faverdale is the OEM for the Darnett KM-1 fire barrier material.

Commitment

Transco committed to completing the sub-vendor audit of Darchem/Faverdale by June 1, 1994. The internal audit deficiency is scheduled for WEPCO follow-up by 7/9/94.

Car Status Report

Status as of

7/22/94

Transco responded to this Unresolved Item on 7/14/94. CQV has reviewed the response and finds it acceptable. Transco completed the Darchem/Faverdale audit on 5/13/94. Transco submitted a copy of the report. The audit addressed the 18 criteria of Transco's program PSQM-1, Revision 5 and the Darchem/Faverdale Quality Procedure QPD-35. No deficiencies were identified in the Transco audit V94-05-01.

The NUPIC audit deficiency AFR 93-122A was followed-up by WEPCO on 7/9/94 and found acceptable. No further action is required. No further follow-up is required. This Unresolved Item is CLOSED.

CAR Distribution

Prepared By: _____ Date: _____

Approved By: W. R. Betourne Date: 7/22/94

PH

CAR Status

CAR Number: G-94-80-05

Type Code

URI

Severity Code

Vendor Name Transco Inc

Audit Coordinator PJZ

Contact Person W.R. Betourne

COG QA ENG/INSP: Zurawski, Paul J.

CAR Issue Date 7/22/94

Next F/U Date 9/6/94

Close Date 7/22/94

Description

Transco has not established a packaging/shipping/handling, security arrangements and a permanent identification and marking system for the Darmett KM-1 fire barrier as identified in ComEd commitment letter from M. Vonk to NRC dated 4/6/94 for ComEd purchase order 353865.

Discussion

Through a review of the ComEd letter dated 4/6/94 from M. Vonk to the NRC, it was found that the packaging/shipping/handling, security arrangements and a permanent identification and marking system for the fire barrier boards has not been established.

Commitment

Transco agreed to establish the packaging/shipping/handling, security arrangements and a permanent markings and identification process for the Darmett KM-1 boards by 6/1/94.

Car Status Report

Status as of

7/22/94

Transco responded to this Unresolved Item on 6/15/94. CQV has reviewed the response and finds it acceptable. The packaging/shipping and handling is documented in CPP-1 dated 6/14/94. The identification/markings and security arrangements are documented in TI-001 and TI-002 dated 6/1/94 with ComEd approval by Engineering on 6/8/94. No further action is required. No further follow-up is required. This Unresolved Item is CLOSED.

CAR Distribution

Prepared By: [Signature] Date: _____
Approved By: [Signature] Date: 7/22/94

CAR Status

CAR Number: G-94-80-06
Vendor Name: Transco Inc
Contact Person: W. R. Betourne
CAR Issue Date: 7/22/94

Type Code: URI

Severity Code

Audit Coordinator: PJZ
COG QA ENG/INSP: Zurawski, Paul J.
Close Date: 7/22/94

Next F/U Date: 9/6/94

Description

Transco has not completed a formal review of Darchem/Faverdale procedures, instructions and drawings for comEd purchase order 353865.

Discussion

At the time of this audit, Transco had not completed a formal review of Darchem/Faverdale procedures, instructions, and drawings for ComEd purchase order 353865. This review will assure that sufficient qualitative/quantitative acceptance criteria exist for fabrication, test/inspections, and calibrations.

Commitment

Transco agreed to complete this review by 7/1/94, prior to fabrication, test/inspections and calibration for the production of fire barrier boards.

Car Status Report

Status as of

7/22/94

Transco completed audit V94-05-01 on 5/13/94 of Darchem/Faverdale. Transco submitted a copy of the audit report to ComEd on 7/14/94. The audit completed by Transco of Darchem/Faverdale revealed that Transco has completed a review of the Darchem/Faverdale procedures and instructions. Other drawings and design reviews were made by Transco and documented in CAR G-94-80-02 of this audit. No further action is required. No further follow-ups are required. This Unresolved Item is CLOSED.

CAR Distribution

Prepared By: WRB Date: _____
Approved By: W.R. Betourne Date: 7/22/94
DKF

Attachment 2

Faverdale Lab Fire Test Report

Faverdale
Technology
Centre Ltd.



Faverdale Centre, Faverdale Industrial Estate
Darlington, Co Durham DL3 0QL
England

Telephone 0325 381220
Facsimile 0325 381218

Order number 310106	Document number FTCR/94/0094
Client Transco Products Inc/ Commonwealth Edison 55 East Jackson Boulevard Illinois 60604-4166 Chicago, USA	

TEST REPORT

official issue

**FAVERDALE
TECHNOLOGY
CENTRE LTD**

**TEST REPORT FOR A 1 HOUR FIRE TEST ON
DARMATT KM1 FIRE PROTECTION SYSTEM
FOR SITE CONFIGURATIONS AT THE
LASALLE NUCLEAR POWER PLANT**

Issue	Date	Modification	Issued		Approved	
			by	date	by	date
A	30/8/94	ORIGINAL	S PALLISTER		M R GARDNER	
			S. Pallister	30/8/94	M Gardner	30/8/94



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Revision Sheet

Pages Affected	Section	Date	Revision Summary	Revised By

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SUMMARY

A one hour fire test and a five minute hose stream test, following the ASTM E119 fire curve and the performance requirements of GL 86-10 and Supplement 1, was carried out on the KM1 Darmatt fire protection system, which protected various electrical raceway assemblies.

The fire test was conducted at the Faverdale Technology Centre, Darlington (England - UK) using a prototype specimen which represented a composite of Commonwealth Edison's LaSalle County Station, Units 1 and 2 worst case conditions for where this material/design is intended to be installed. The test was conducted on the 16 June 1994 and was witnessed by:-

Mr R Vickers	Commonwealth Edison
Mr H Goss	Transco Products Inc
Mr G Jarosz	Transco Products Inc
Ms S M Bradford	Transco Products Inc

The pass/fail criteria was that the highest average temperature recorded by any set of thermocouples must not exceed 139°C (250°F) above the initial starting ambient and the maximum temperature recorded by any thermocouples must not exceed 181°C (325°F).

Also any of the insulated items must not be visibly exposed after the hose stream test.

The results were as follows:-

The Darmatt KM1 successfully complied with the criteria laid down in NRC generic letter 86-10 Supplement 1 and repeated in section 6.8 of this report.

**TEST REPORT FOR A 1 HOUR FIRE TEST ON
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1. INTRODUCTION

This document describes the performance of the Darmatt KM1 fire barrier system when subjected to fire test conditions. The electrical raceway assembly protected was representative of site configurations at the Lasalle Nuclear Power plant, and included items such as cable raceways, conduits, junction boxes, Unistrut hangers and supporting steelwork.

The Darmatt KM1 system was tested in accordance with Transco Products Inc Test Specification TR 213 Rev. 2 which has been approved by Commonwealth Edison Company as satisfying the criteria stated in NRC generic letter 86-10 Supplement 1 at the Faverrdale Technology Centre (FTC) in the United Kingdom.

The manufacture of the Darmatt KM1 base material was conducted in accordance with Darchem Engineering manufacturing procedure CMP001 for the board and CMP003 for the conduit and thermal filler material.

The manufacture of the board material was monitored by Mr W Betourne of Commonwealth Edison Company and Mr B C Machchhar of Transco Products Inc. The board material was locked and sealed in a secure containment until the fabrication and installation of the material when the material was released when required by Mr J Behn of Commonwealth Edison. These steps were performed to assure control of materials to be installed as part of the test specimen. The conduit and thermal filler material manufacture was witnessed by Ms S M Bradford of Transco Products Inc and Mr J Behn of Commonwealth Edison.

The fabrication, installation and the testing of the Darmatt KM1 system was monitored by Ms S M Bradford of Transco Products Inc, Mr G J Jarosz of Transco Products Inc and Mr R Vickers of Commonwealth Edison.

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2. DESCRIPTION OF THE TEST EQUIPMENT

2.1 Furnace

The fire test furnace used was approximately 12 feet long by 7 feet wide by 7 feet high (internal dimensions) and was constructed from a mild steel outer shell and structural steel members. The test furnace was built up in two sections of which one section which incorporated the test specimen was fixed in position. The other section was removable, and followed the outline of the fixed section to enable it to seal the two sections when fitted together. The furnace was fired by 8 gas burners which used a propane gas and forced air mixture. The burners were controlled individually from a central manifold system. The pressure within the furnace was monitored by an electronic manometer, and adjusted accordingly by two dampers.

Concrete sections formed parts of the roof and walls and were 150 mm thick. Where the furnace shell was not lined with concrete, 150 mm thickness of ceramic fibre was used to insulate the test furnace. The concrete sections were cured for 7 days prior to arrival at Faverdale Technology Centre on the 20 May 1994. The concrete slabs were then cured for 7 days in a warm air atmosphere of approximately 40°C. The slabs were finally air cured for the remainder of the time up until the test day. The concrete mix design Certificate is contained in Appendix B. The concrete sections were attached to the furnace roof and walls by M16 (5/8" diameter) fixing studs. These studs were subsequently secured to the steel sections on the outer faces of the furnace.

P1001 Unistrut hangers were used to support the cable raceways from the concrete roof.

The junction box, support steelwork and conduits were attached to the concrete using 3/8" Hilti Quick Bolt 2 anchors approved by Commonwealth Edison.

2.2 Protected Items

All items that were protected were supplied by Transco Products Inc. and complied with Commonwealth Edison specification requirements. The items consisted of:-

- (a) 30" wide x 4" deep galvanised steel raceway made from two/three straight sections and a 90° horizontal bend with 2" deep stiffening ribs on the bottom of the tray.
- (b) 4 3/4" diameter galvanised steel conduit.
- (c) 12" x 12" x 3" galvanised steel junction box.

The intervening structural steelwork comprised of a 3" x 3" mild steel column.

The geometry of these is shown in Figures 1a - 1e, in Appendix A.

3. SAMPLE DETAILS (Ref. Figure 1, Appendix A)

The Darmatt KM1 system is a semi-rigid endothermic reactive-insulating board of 16 mm nominal thickness with a surface density of 13 kg/m². The boards in accordance with fabricated panels were cut to size from the boards in accordance with a survey taken of the test configuration.

The 1 hour Darmatt KM1 system consisted of two layers of 16 mm nominal thickness board. The inner layer is not covered by any cloth or other covering.

The outer layer of the Darmatt KM1 system is covered with a silicone rubber coated glass cloth (with an inconel wire mesh reinforcement).

Adjacent panels were secured in positions via lacing hooks and wire which came as integral parts of the panels.

The gasket that was used along the joints between adjacent panels and between the panels and the concrete, was expanding paper gaskets.

Product information and letters of conformity which guarantee all these components of the protective system can be seen in Appendix B.

4. INSTRUMENTATION (Ref. Figures 2 and 3, Appendix C)

4.1 Data Recorder

The data recorder used was the S1 535 Scorpio. This is a multi-task data processing and recording device with an accuracy of 0.05°C.

4.2 Furnace Thermocouples

The furnace temperature was monitored and controlled by a total of 13 thermocouples 5.5mm diameter, metal sheathed type K, thermocouples which met the accuracy requirements as defined in GL 86-10 Supplement 1. Of these thirteen thermocouples eight were positioned in the roof, four in the wall of the fixed furnace section and one in the side wall of the removable furnace section.

4.3 Test Sample Thermocouples

The test sample temperatures were monitored by glass fibre covered 24 gauge C20 type T thermocouples.

The thermocouples were positioned as in the drawings in Appendix C.

- (i) 30" x 4" Cable raceway - The temperature rise was measured by thermocouples every 6" on the exterior surface of each tray side between the cable tray side and the fire barrier material. The internal raceway temperatures were measured by an AWG 8 bare copper conductor routed along the longitudinal centre of the cable tray with thermocouples installed every 6" along the length of the copper conductor.
- (ii) Conduits - The temperature rise was measured by placing thermocouples every 6" on the exterior conduit surface.
- (iii) Junction boxes - the temperature rise was measured by thermocouples placed at the geometric centre of each side of the box and one thermocouple placed within 1" of the air drop penetration.
- (iv) Airdrops - the internal temperature was measured by a bare copper conductor routed inside the entire length of the airdrop with three thermocouples installed approximately 6" apart.
- (v) Thermal shorts - these were attached to $\frac{3}{4}$ " long copper pieces which were placed at the end of the $\frac{3}{4}$ " conduit.

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4.5 Differential Pressure Measurement

The differential pressure was measured by an electrical manometer capable of reading pressure within an accuracy of 0.0004 inch (0.004 Pa) of water.

The pressure measuring probes were placed in the removable section of the furnace, separated by a vertical distance equal to half the height of the furnace. The probes were manufactured from stainless steel.

The readings were taken at 5 minute intervals.

5. CONTROL OF FIRE TESTS (Ref figures 4 and 5, Appendix D)

The furnace was controlled to follow the ASTM E119 standard fire curve.

A graph showing the ASTM E119 standard fire curve and the actual fire curve achieved during the tests is included in Figure 4 of Appendix D.

Tolerance

The tolerance of ASTM E119 is $\pm 10\%$ for 1 hour tests.

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6. TEST PROCEDURE

6.1 Installation of Test Assembly

The raceway, junction box and conduits were installed as integral parts of the test furnace to which the fire barrier system was installed in situ.

The components protected by the Darmatt KM1 fire barrier system were representative of the worst-case conditions experienced at the Lasalle County Nuclear Power Station for where this design is intended to be installed.

Penetrating/intervening items such as airdrops, conduits, structural steelwork and a junction box were included in the test assembly to portray the worst on site conditions and to provide a thorough examination of the fire barrier system capabilities and installation tolerance.

Penetrations through the concrete into the furnace were sealed using materials and techniques that provide an effective heat and smoke seal without influencing the performance of the Darmatt KM1 fire barrier system or the result of the test.

6.2 Installation of the Test Sample

The test sample was installed in accordance with the manufacturers approved method and the as-built condition recorded on drawings included in Appendix A.

Extra flange pieces were added at the interface of the two sided cable tray wrap where it butts up against the concrete ceiling and also where the far sided cable tray wrap butts up against the wall. These were added as an extra precautions just in case any gap would open up if the cable trays expanded at different rates. These flanges were secured into position using Hilti Quick Bolts.

At the end section to the entire assembly where the cable tray stiffener protruded down through the initial layer of Darmatt material an additional third layer of material was positioned over this area. None of the joints created by this additional layer were fitted with any type of gasket.

Any gaps in the fit up of the fire barrier system that were greater than $1/16$ " and penetrated through the entire Darmatt KM1 system were plugged using either short strips of the expanding paper gasket or the Darmatt KM1 "thermal filler". Local gaps or flaws that only penetrated the first layer of the Darmatt KM1 system were left untouched.

Such situations arose during the installation of the Darmatt KM1 system were deemed to show typical site installation condition. Some panel edges were not overlapped by the silicone glass cloth - on the cable tray some butt joints were not covered by the glass cloth leaving small regions, approximately $1/2$ ", of the Darmatt KM1 material exposed to

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direct flame conditions. Also on the cable tray wrap where one piece of glass cloth would not cover a single section of Darmatt material, two pieces were used. These two pieces overlapped each other by approximately 2" and were stapled into the Darmatt material, thus enabling the whole section of Darmatt material to be covered in cloth.

Situations occurred where the section ends were not covered in silicone glass cloth. the two round pre formed pieces that surrounded the 3/4" conduit, which extended out of the junction box and across the cable support, their ends were left uncovered. Also where some of the pre-formed pieces butt up against flat pieces, their ends were left exposed.

Situations arose where some panel corners were not covered by silicone glass cloth - which were a representative of a tear/rip in the cloth. The end piece to the entire assembly had 1/4" to 3/8" tares at the corners. Similar size tares were also on the corners of the outer layer surrounding the I beam and on the layer surrounding the junction box.

Some holes/gaps which were deemed to show typical site installation condition were left unplugged.

On a section of barrier that goes against the conduit that mounted to the ceiling approximately at the point where the cable tray hanger is there was a space approximately 1/2" wide which is not fitted with gasket or KMI Darmatt thermal filler material. This demonstrates a crack in the material which might occur on installation. This space penetrates down to the layer that precedes it.

A 1 1/2" - 2" gap was left between the concrete slab and the cable tray support hangers protection. The cable tray support hanger was protected for twelve inches (12") from the fire barrier.

The pre-formed pieces that surround the 3/4" conduit that extended out from the junction box and across the cable tray support, a space of approximately 1" was left unfilled. These pieces are held together using metal cable ties and can be rotated. Where the ends of the pre-formed sections butt up against flat section gaps have been left where perfect joints could not be achieved, these have been left opened.

Where the intervening non vital conduits butt up against the cable tray wrap the interfaces have been filled with the gasket material, however, spaces have been created where one piece butts up against another and the clips of one of the pieces prevents a tight fit being achieved. Some of the spaces were filled with the thermal filler material, some of the spaces were left open.

6.3 Installation of the furnace sections

The removable section of the furnace was fitted to the fixed half so that no gaps existed between any of the joints, which would be capable of enabling heat and smoke to leak from the furnace.

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6.4 Furnace Ignition and Temperature (Ref figure 4 Appendix D)

After all instrumentation had been checked for functionality the burners were ignited and the average furnace temperature was controlled to match ASTM E119 standard fire curve. A graph of the time/temperature curve is presented in Figure 4.

6.5 Test Readings

i) Temperatures

- a) The average conductor temperature as indicated by the thermocouples on the bare copper conductor for the insulated components were printed to paper at 2 minute intervals for the duration of the test.
- b) The average furnace temperature was continuously displayed on the data recorder and printed to paper at the frequencies stated above.
- c) All the individual thermocouple readings were stored to floppy disk and printed to paper at 2 minute intervals.

Note an initial print-out was taken before the ignition of the burners to establish ambient conditions.

ii) Observations

The test samples were continuously monitored and any significant behaviour noted together with the time of the occurrence (refer to Section 8 of this document).

6.6 Duration of the Test

The duration of the test is 60 minutes for all the items. The duration was extended by 10% to show that the highest mean temperature exceeded 250°F rise above the initial temperature.

6.7 Hose Stream Test

Immediately after the fire test the wall furnace surrounding the test specimen was removed and the test samples were subjected to a hose stream. The hose stream was directed at the centre of the raceway then slowly traversed over the whole area for a period of 5 minutes.

The hose stream was discharged from 2½" hose with a 1½" (30° angle divergent) spray discharge nozzle. The pressure at the base of the nozzle was 75 psi and the distance of the nozzle from the centre point of the test sample was 1.5m. (5 feet). This provided a flow rate of approximately 75 gallons per minute.

TEST REPORT FOR A 1 HOUR FIRE TEST ON DARMATT KM1 FIRE PROTECTION SYSTEM FOR SITE CONFIGURATIONS AT THE LASALLE NUCLEAR POWER PLANT	Document No. FTCR/94/0094	
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Calibration details are contained in section B. Spray angle, pressure and flow rate were verified by K Hawks and G Jarosz.

6.8 Pass/Failure Criteria

i) Temperature

The pass/failure criteria was that the highest average temperature recorded by any set of thermocouples must not exceed 139°C (250°F) above the initial starting ambient. Also the maximum temperature recorded by any thermocouples must not exceed 181°C (325°F).

ii) Hose Stream

Any of the insulated items must not be visibly exposed after the hose stream test.

7. TEST RESULTS

The individual thermocouple readings can be seen in Appendix E and the graphs for the 1 hour fire test results can be seen in Figure 6 of Appendix D.

Details of the thermocouple positions described can be see in Figures 2. and 3 of Appendix C.

TABLE OF RESULTS

Item	Average Temperature (°F)					
	0 (mins)	16 (mins)	30 (mins)	46 (mins)	60 (mins)	66 (mins)
Cable tray side X	56.8	58.1	76.5	118.2	137.5	147.2
Cable tray side Y	57.0	57.9	77.4	122.4	162.6	165.4
Conductor	57.2	58.3	71.63	108.3	135.9	148.6
Interface of cable tray and penetrating conduit	54.9	59.2	103.3	146.7	174.7	185.9
Junction box	58.3	64.8	103.3	161.8	189.2	204.3
Air drop cable	57.2	71.1	126.7	176.7	203.0	221.5
Conduit against concrete roof	57.7	64.0	84.9	130.1	158.9	172.2

Average values shown on the original data printouts at 16 minutes were incorrect due to a data logging error. This only occurred at 16 minutes., The average values were re-calculated using the data which was saved to disc throughout the duration of the test.

After the fire test was carried out on the test assembly the hose stream was carried out in compliance with the criteria of NRC generic letter 86-10 Supplement 1 as stated in Transco Specification TR213 and repeated in Section 6.7 of this document.

The Darmatt KM1 successfully complied with the criteria laid down in NRC generic letter 86-10 supplement 1 as stated in the Transco Specification TR 213 and repeated in Section 6.8 of this document.

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8. OBSERVATIONS

Photographs of stages of installation of the Darmatt KM1 also before, during and after the fire test can be seen in Appendix F.

The pressure differential in the furnace started at 7 Pa (0.7 mm H₂O) and increased to about 9 Pa (0.9 mm H₂O) by the end of the test.

Pressure readings were as follows:-

Time (minutes)	Pressure	Time (minutes)	Pressure
5	7.0 Pa	35	8.0 Pa
10	7.0 Pa	40	8.0 Pa
15	7.0 Pa	45	8.0 Pa
20	7.0 Pa	50	8.5 Pa
25	7.5 Pa	55	9.0 Pa
30	7.5 Pa	60	9.0 Pa

After six minutes into the test the silicone rubber coating from the cloth residue had been burned off leaving intact a residue between the weave of the cloth.

Small amounts of smoke were given off from the furnace joints (where the ceramic fibre lining had not sealed the joints perfectly) during the course of the test.

After the duration of the test (the test ran until 66 minutes ie 10% extra) the integrity of the Darmatt KM1 fire barrier system was unbreached.

After the hose stream test a full inspection of the test specimen was carried out. The main points that were noted were that the expanding paper gasket had charred in places and expanded to fill any voids as was its intention. The silicone glass cloth had sagged in areas along the horizontal run of the two sided cable raceway wrap. However, this did not affect the integrity of the system. It was also noted that the system was completely intact and there were no breaches of the fire barrier where the raceways or supports were visible through the Darmatt KM1 Fire Barrier System. The thermal filler which had been applied in certain areas and left uncovered was also still intact maintaining the integrity of the system.

APPENDIX A

- Fig 1a General arrangement of furnace and test specimen.
- Fig 1b General arrangement of insulated test specimen.
- Fig 1c Section details of insulated components.
- Fig 1d Section details of insulated components.
- Fig 1e Construction details.

Any errors on this drawing are to be reported to the drawing office immediately by a postcard

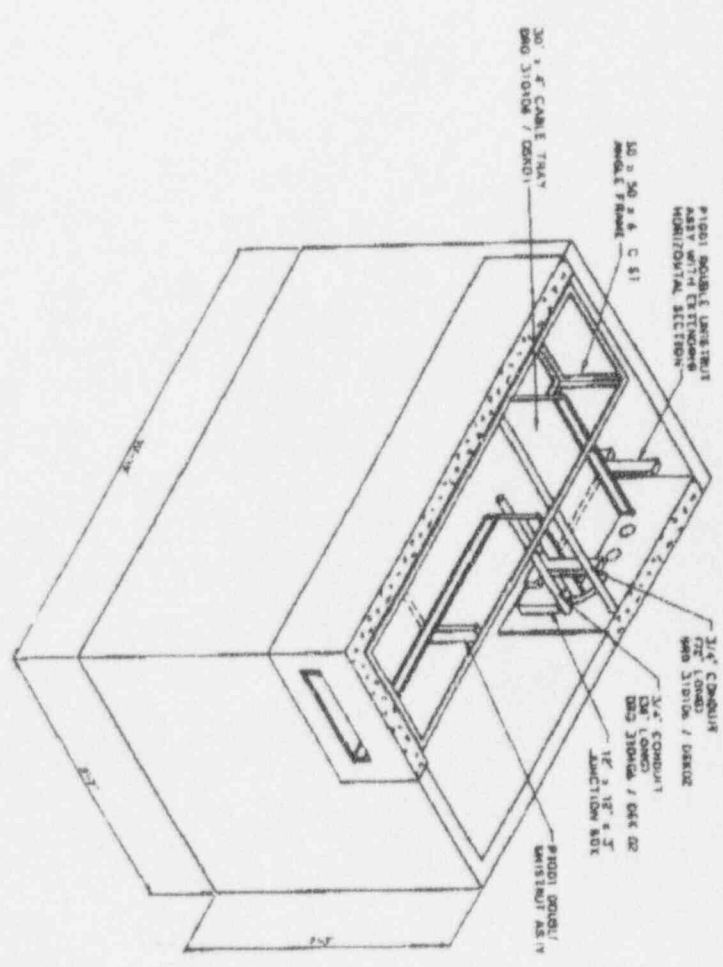
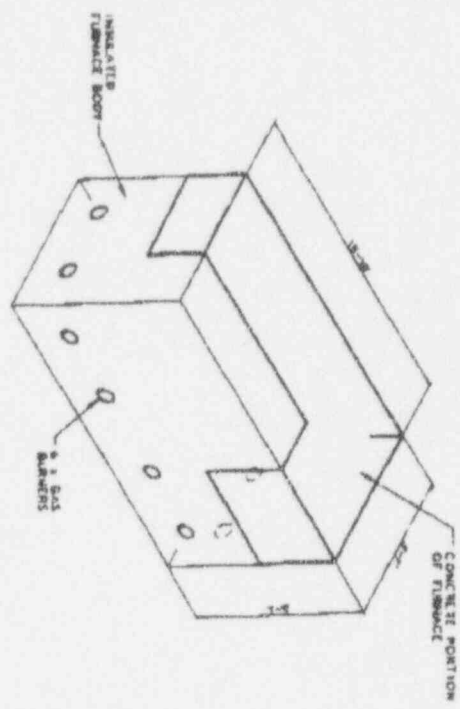


Figure 1a

REV	DATE	BY	CHKD	DESCRIPTION
A	08/09/94	...	...	...
B	08/09/94	...	...	...

The drawing is the property of the drawing office and shall not be used for any other purpose without the written consent of the drawing office.

PROJECT NO.	310106 / DSK 03
CLIENT	AIR
DATE	08/09/94
BY	...
CHKD	...

GENERAL ARRANGEMENT OF RACEWAYS

LAASALLE FIRE-TEST

INSULATED FURNACE BODY

CONCRETE PORTION OF FURNACE

3/4" GAS SAMPLES

20' x 4' CABLE TRAY BRIDGE / DUCT

10' x 50' x 6' C SI INSULATED FURNACE

P1001 DOUBLE LINED TRUST ASSEMBLY WITH EXTENSIVE HORIZONTAL SECTION

3/4" CONDUIT FOR CABLES / DUCTS

3/4" CONDUIT FOR CABLES / DUCTS

1/2" x 1/2" x 1/2" JUNCTION BOX

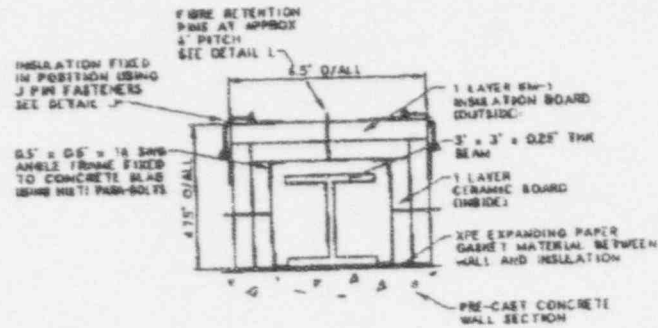
P1001 DOUBLE LINED TRUST ASSEMBLY

ISOMETRIC OF PRE-INSULATED FIRE TEST SAMPLES

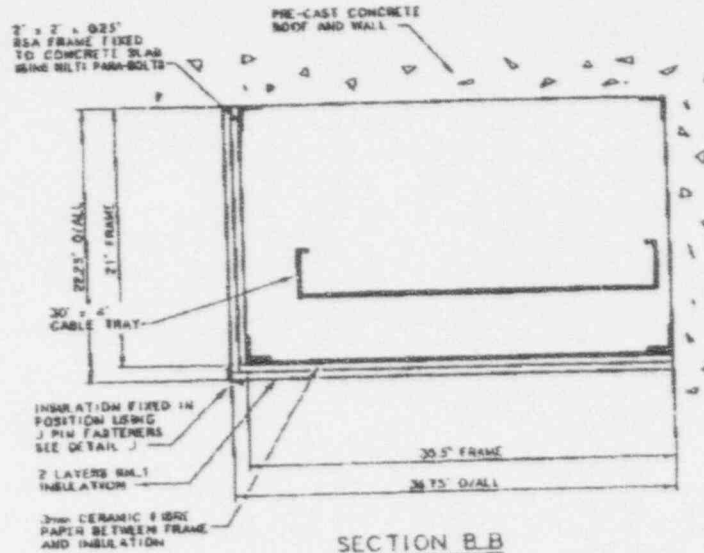
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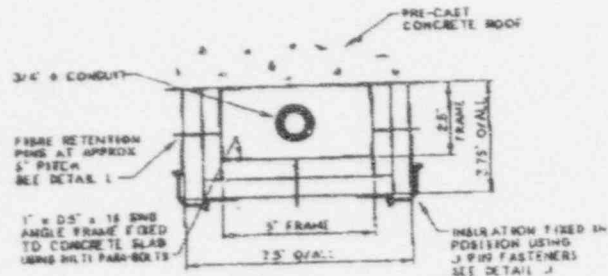
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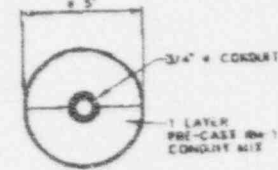
SECTION A-A



SECTION B-B



SECTION C-C



SECTION D-D

Figure 1c

FOR TYPICAL PANELS CONSTRUCTION SEE DETAIL M AND DETAIL N

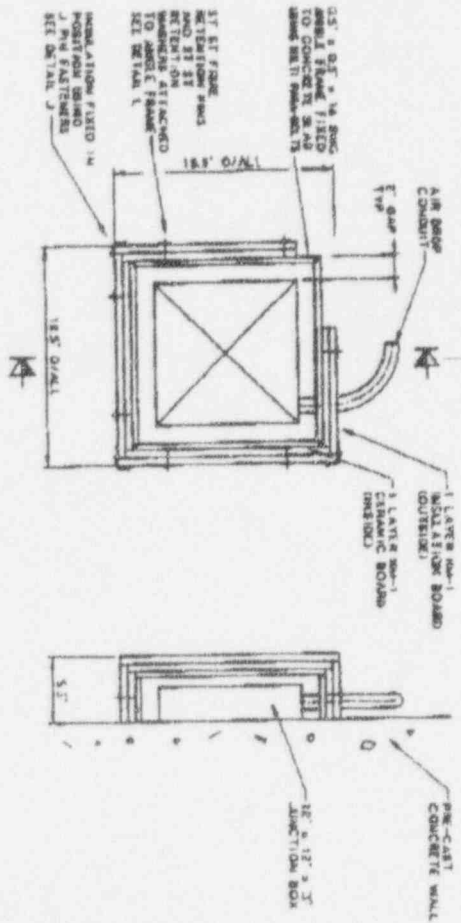
INITIALS	DATE	DESCRIPTION	APPROVED
A			
B			

This drawing is the property of Darshan Engineering Ltd and must not be disclosed to a third party without permission

original scale: NTS
 dimensions: mm
 do not scale from drawing
 third angle projection

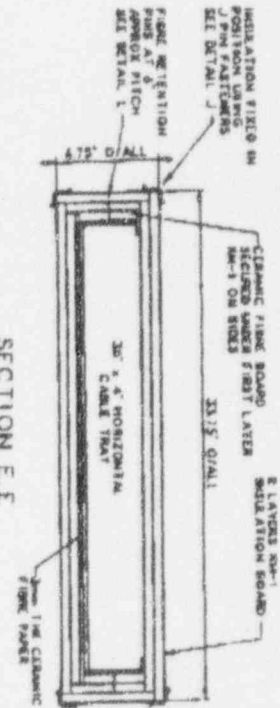
Darshan Engineering Ltd Bolognans Stockman-Loss Cleveland TS21 1LB England			
LASALLE FIRE-TEST			
SECTIONS THROUGH INSULATED RACEWAYS			
drawn	BW	date	27.6.94
checked	KJM	date	27.6.94
approved	KJM	date	27.6.94
order no	310106	customer's material sig	AB
drawing no	310106 / DSK 05		

Figure 1d

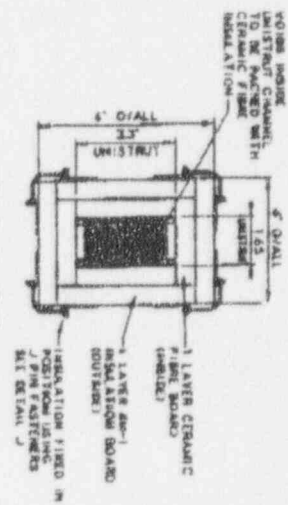


FOR TYPICAL PANELS CONSTRUCTION SEE DETAIL M AND DETAIL N

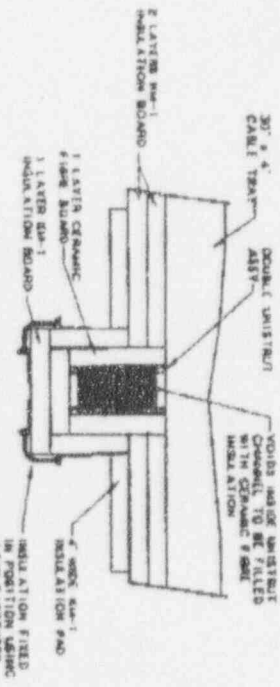
SECTION E.E.



SECTION F.F.



SECTION H.H.



INITIAL	DATE	REVISION	DESCRIPTION
A	08/09/94	1	ISSUED FOR CONSTRUCTION
B	08/09/94	2	REVISION TO DETAIL J

SECTION	DATE	BY	CHKD
SECTION G.G.	08/09/94	...	...
SECTION H.H.	08/09/94	...	...
SECTION E.E.	08/09/94	...	...
SECTION F.F.	08/09/94	...	...

LABALLE FIRE-TEST

SECTIONS THROUGH INSULATED RACEWAYS

310106 / DSK 06

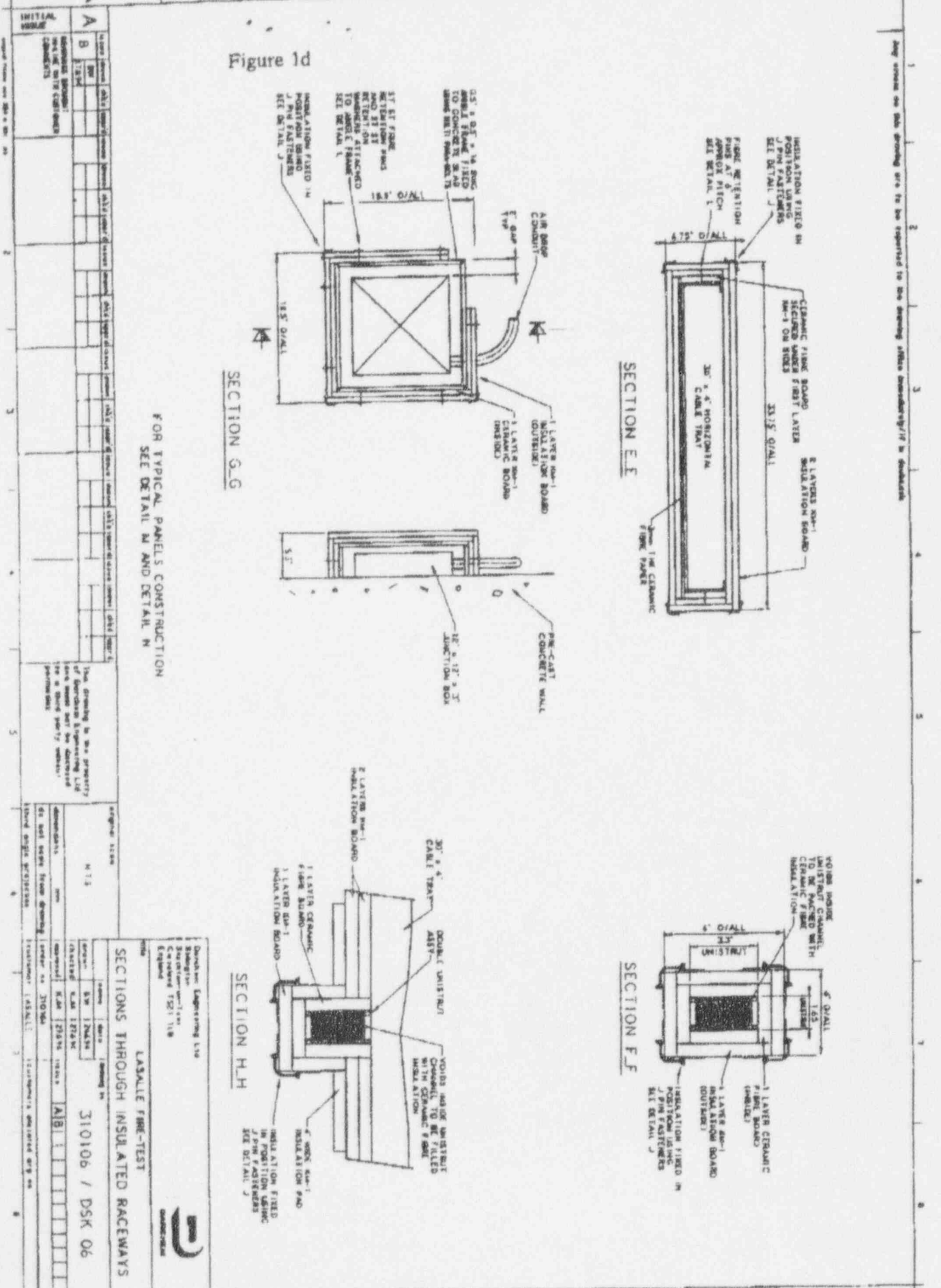
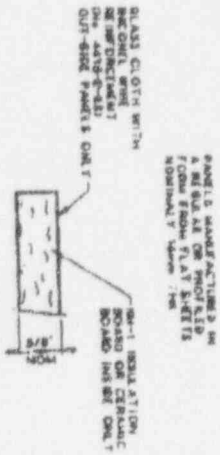
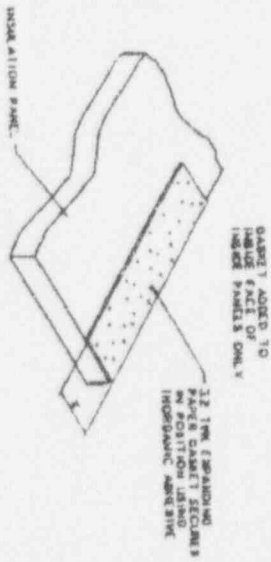


Figure 1e

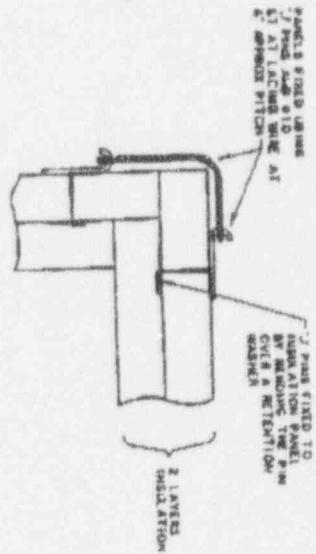
DETAIL M
SECTION THRU PANEL



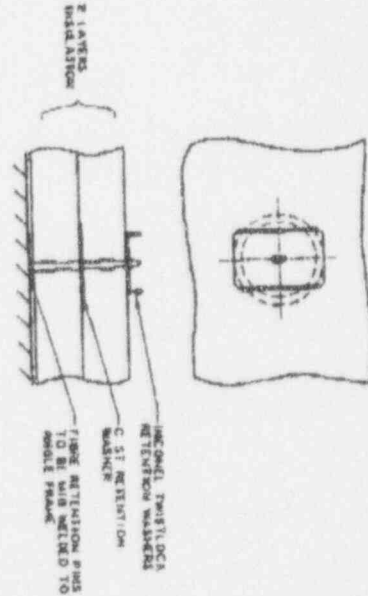
DETAIL N
DETAIL OF PANEL GASKET



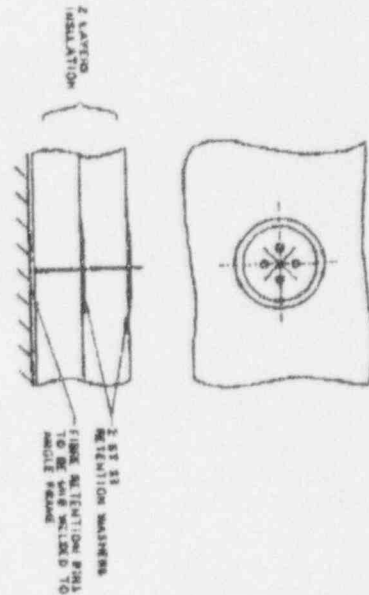
DETAIL J
TYPICAL CORNER FIXING ARRANGEMENT



DETAIL K
FIBRE RETENTION PIN - TWISTLOCK TYPE



DETAIL L
FIBRE RETENTION PIN



INITIAL ISSUE	NO	DATE	BY	REVISION
	A			ISSUE FOR CONSTRUCTION
	B			ISSUE FOR CONSTRUCTION

Approved by: [Signature]

Checked by: [Signature]

Drawn by: [Signature]

Project No: 310106 / DSK 07

Scale: 1:1

Sheet No: 13 of 13

Revision: A/B

DATE: 08.09.94

FAUVERDALE TECHNOLOGY

APPENDIX B

- 1 Product Data Sheets and Quality Certification of Test Sample Constituents - P24A, B and C
- 2 Hose Stream Calibration Details - P25A
- 3 Hose Pump Pressure Gauge Calibration - P25B and C.
- 4 Concrete Mix Design Certificate - P26.

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1 Product Data Sheets and Quality Certification of Test Sample Constituents

DARCHEM ENGINEERING LIMITED

KMI DARMATT
QUALITY CONTROL SHEET

Contract No. 5289
 Part No.

Customer TRANSCO.
 Description 16 mm

Qty Required ~~20~~ 20

Material	Weight	Material Batch No.
ULTRACARB HFD	25,000.0	C 0031
BULK FIBRE	10,000.0	C 0025
ACRYLIC RESIN	6,000.0	C 0029
SODIUM SILICATE	1,000.0	C 0002
ALUMINIUM SULFATE	800.0	C 0030
NACLAR 25	4.5	C 0004

Technical Specification No. : CMP-001
 Manufacturing Procedure No. :

Shift Serial No. 5

Quantity this shift : 8

(see over)

Accept 7

Reject 1

Date 11.5.1994

Q.C. Signature *Whelan*

DARCHEM ENGINEERING LIMITED

KMI DARMATT
QUALITY CONTROL SHEET

Contract No. 5289
 Part No.

Customer TRANSO
 Description 16mm

Qty Required 520

Material	Weight	Material Batch No.
ULTRACARB HFD	25,000 gm	C 0031
BULK FIBRE	10,000	C 0025
ACRYLIC RESIN	6,000	C 0029
SODIUM SILICATE	1,000	C 0002
ALUM. SULPHATE	800	C 0030
NUCLEAR 25	4.5	C 0004

Technical Specification No. :
 Manufacturing Procedure No. : CMP-001

Shift Serial No. 6

Quantity this shift : 9

(see over)

Accept 8
 Reject 1

Whitean

DARCHEM ENGINEERING LIMITED

KMI DARMATT
QUALITY CONTROL SHEET

Contract No. 5289
 Part No.

Customer TRANSCO
 Description 16mm

Qty Required 20

Material	Weight	Material Batch No.
ULTRACARB HD	25,000 gm	C0031
BULK FIBRE	10,000	C0025
ACRYLIC RESIN	6,000	C0029
SODIUM SILICATE	1,000	C0002.
ALUM. SULPHATE	800	C0030
NACL AC 25'	4.5	C0004.

Technical Specification No. :
 Manufacturing Procedure No. : CMP - 001

Shift Serial No. 7

Quantity this shift : 3

(see over)

Accept 3

Reject -

Date 13/5/94

Q.C. Signature 

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Document No.
FTCR/94/0094

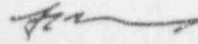
Issue A

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- 2 Hose Stream Calibration Details
- 3 Hose Pump Pressure Gauge Calibration

DARCHEM ENGINEERING
 CALIBRATION CERTIFICATE

DATE..23.2.94.....

Customer	
FAVERDALE TECHNOLOGY CENTRE	
Item Description	
100 PSI PRESSURE GAUGE	
Type	
WIKA	
Serial No.	
0029 FAV	
Result of Test	
SATISFACTORY	
Comments/Disposal	
SEE ATTACHED SHEET FOR CALIBRATION RESULTS	
Uncertainty of measurement +/- 0.5 PSI For a confidence probability of not less than 95%	
Master Equipment and Certificate No.s	
BUDENBURG TESTER NO. 283 CERT NO. BR9460	
Relevant British Standards:	
BS 1780 : 1985	
All master equipment used to calibrate the above item have been calibrated by a BCS approved laboratory and certificates issued are traceable to NPL standards	
Darchem Calibration Control Procedure refers	
Circulation:	Signature:
MR K KNOX  DENISE HEYWOOD (FTC) FILE	

Gauge No : 1029 FAV Method : DCF BEST DICE
 Type : PRESSURE GAUGE Procedure: DCF-15 Issues : Act 0 Max 0
 Description : 0-100 PSI WITH PRESSURE GAUGE Equipment: 9280 Usage : Act 0 Max 0 WKS
 Home Location : FAV TECH CENTRE Standard : SS.1780:1985 Calibration freq: 52 wks
 Status : IN SERVICE Last Cal : 21/02/94 Next Cal : 20/02/95

Dimension	±1%	±1%	±1%	±1%	±1%	±1%	±1%	±1%	±1%	±1%	±1.5%
Nominal	10.0	20.0	30.0	40.0	50.0	60.0	70.0	80.0	90.0	100.0	
Upper Tol	11.0	21.0	31.0	41.0	51.0	61.0	71.0	81.0	91.0	101.5	
Lower Tol	9.0	19.0	29.0	39.0	49.0	59.0	69.0	79.0	89.0	98.5	
Dimension	±1.5%	±1%	±1%	±1%	±1%	±1%	±1%	±1%	±1%	±1%	±1%
Nominal	100.0	90.0	80.0	70.0	60.0	50.0	40.0	30.0	20.0	10.0	
Upper Tol	101.5	91.0	81.0	71.0	61.0	51.0	41.0	31.0	21.0	11.0	
Lower Tol	98.5	88.5	79.0	69.0	59.0	49.0	39.0	29.0	19.0	9.0	

Date Adj Comments

21/02/94 SATISFACTORY CERTIFICATE 22/94 REFERS

	±1%	±1%	±1%	±1%	±1%	±1%	±1%	±1%	±1%	±1%	±1.5%
Actual	10.5	20.0	30.0	40.0	50.0	60.0	70.0	80.0	90.0	99.5	
Wear	-0.5	0	0	0	0	0	0	0	0	0	0.5
	±1.5%	±1%	±1%	±1%	±1%	±1%	±1%	±1%	±1%	±1%	±1%
Actual	99.5	90.0	80.0	70.0	60.0	50.0	40.0	30.0	20.0	10.0	
Wear	0.5	0	0	0	0	0	0	0	0	0	0

** END-OF-REPORT **

Engineering Ltd

Division Engineering Ltd
 18 Kingsway
 Stockport - Cheshire
 Cheshire SK11 1LB
 England

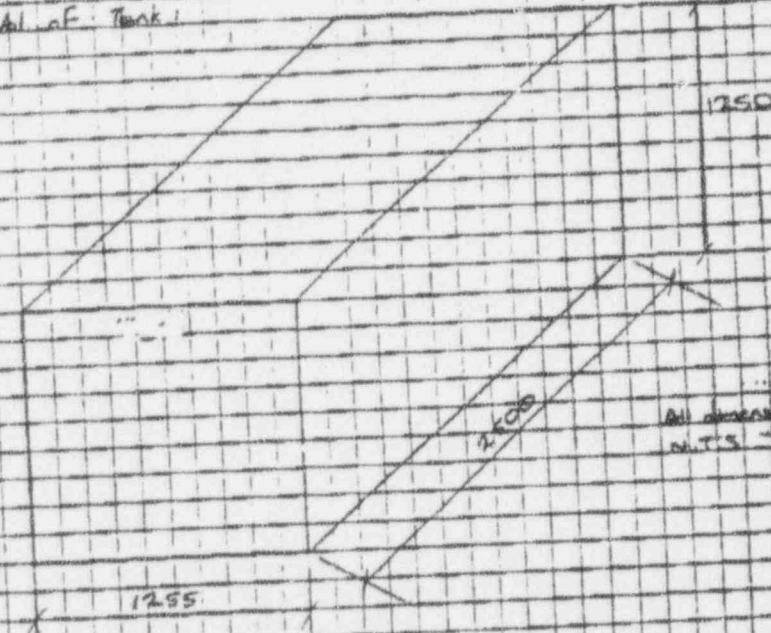
31-0106

Telephone: 0740 20061
 Facsimile: 0740 20029
 Telex: 88544

Customer	Equipment No
FIRE HOSE CALIBRATION TO 284 l/min	
Date 3-3-94	Approved

REQUIRE A FLOW OF 284 l/min MEASURED AS REDUCTION OF WATER HELD IN THE WATER TANK

Vol of Tank



All dimensions in mm
 N.T.S.

$$Vol = (1255 \times 2500 \times 1250) m^3 = 3.922 m^3$$

$$Vol = 3922 \text{ litres}$$

$$\text{Surface Area} = (1255 \times 2500) m^2 = 31375 m^2$$

$$284 l = 0.284 m^3$$

$$\therefore \text{Depth for } 284 l = \frac{0.284 m^3}{31375 m^2} = 0.009 m \quad (90 \mu m)$$

Verified 30 Angle / 59s for 75gpm with a pressure of 80psi at the base of the nozzle.

The hose stream was directed onto the test specimen for a 5 minute period at the following rate.

$$\text{From above - depth of water used in 5 minutes} = 90 \times 5 \times \left(\frac{60}{100}\right) = 458 mm$$

$$\therefore \text{Volume of water used} = (1255 \times 25 \times 0.458) = 1.437 m^3 = 1437 \text{ litres}$$

$$\therefore \text{litres used in 1 minute} = \frac{1437}{5} = 287.4 l = 75.9 gpm$$

TEST REPORT FOR A 1 HOUR FIRE TEST ON
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4 Concrete Mix Design Certificate

Concrete Mix Design
 Clifford House, Wetherby Business Park,
 York Road, Wetherby, West Yorkshire.
 Tel: Wetherby (0937) 581977 Fax: (0937) 581610

Northern

Date 2/2/92 Job Ref. WA748 Main Supplying Plant Washington
 Contractor Deecrete
 Site Freest Works, Washington

INFORMATION PROVIDED BY CONTRACTOR

Grade	<u>035</u>
Specified Characteristic Strength N/mm ²	<u>35</u>
Mix Type	<u>Design</u>
Min Cement Content kg/m ³	<u>-</u>
Max. W/C Ratio	<u>-</u>
Max. Aggregate Size	<u>10mm</u>
Cement Type	<u>OPC</u>
Workability - Slump	<u>75mm</u>
Special Requirements	<u>-</u>

SATURATED SURFACE DRY BATCH WEIGHTS FOR ONE CUBIC METRE OF CONCRETE

Cement Cont (kg)	<u>340</u>
Fine Agg 1 (kg)	<u>744</u>
Fine Agg 2 (kg)	<u>-</u>
20mm Agg./20-5mm (kg)	<u>-</u>
40mm Agg./40-10mm (kg)	<u>1104</u>
Free Water (Litres)	<u>193</u>
Admixture WRA	<u>0.884</u>
Agg./Cement Ratio by Wt.	<u>5.44</u>
Free W/C Ratio by Wt.	<u>0.568</u>

Any changes in mix composition will comply with BS 5328 : Part 3 : 1990.
 Specified cement contents and water : cement ratios would not be infringed.

MATERIALS

Cement	OPC	<u>Blue Circle, Weardale</u>
	S.R.C.	<u>-</u>
	GGBFS	<u>-</u>
	P.F.A.	<u>-</u>
	P.N.F.	<u>-</u>
	P.P.F.A.	<u>-</u>
Coarse Agg.		<u>10mm Single Size North Tyne Roadstone Carboniferous Limestone</u>
Fine Agg. 1		<u>Chilton Sand (Tarmac) Natural Grade 'M' Concreting Sand</u>
Fine Agg. 2		<u>-</u>
Admixture		<u>MBT 300N Water Reducing Agent</u>

The above material types and sources may change subject to quality and availability, please inform us if you require notification of such changes

Notes

1 1 1

APPENDIX C

- Fig 2 Thermocouple positions on 30" x 4" Cable Tray
- Fig 3 Thermocouple positions on 12" x 12" Junction Box, $\frac{3}{4}$ " Conduit and $\frac{3}{4}$ " Airdrop

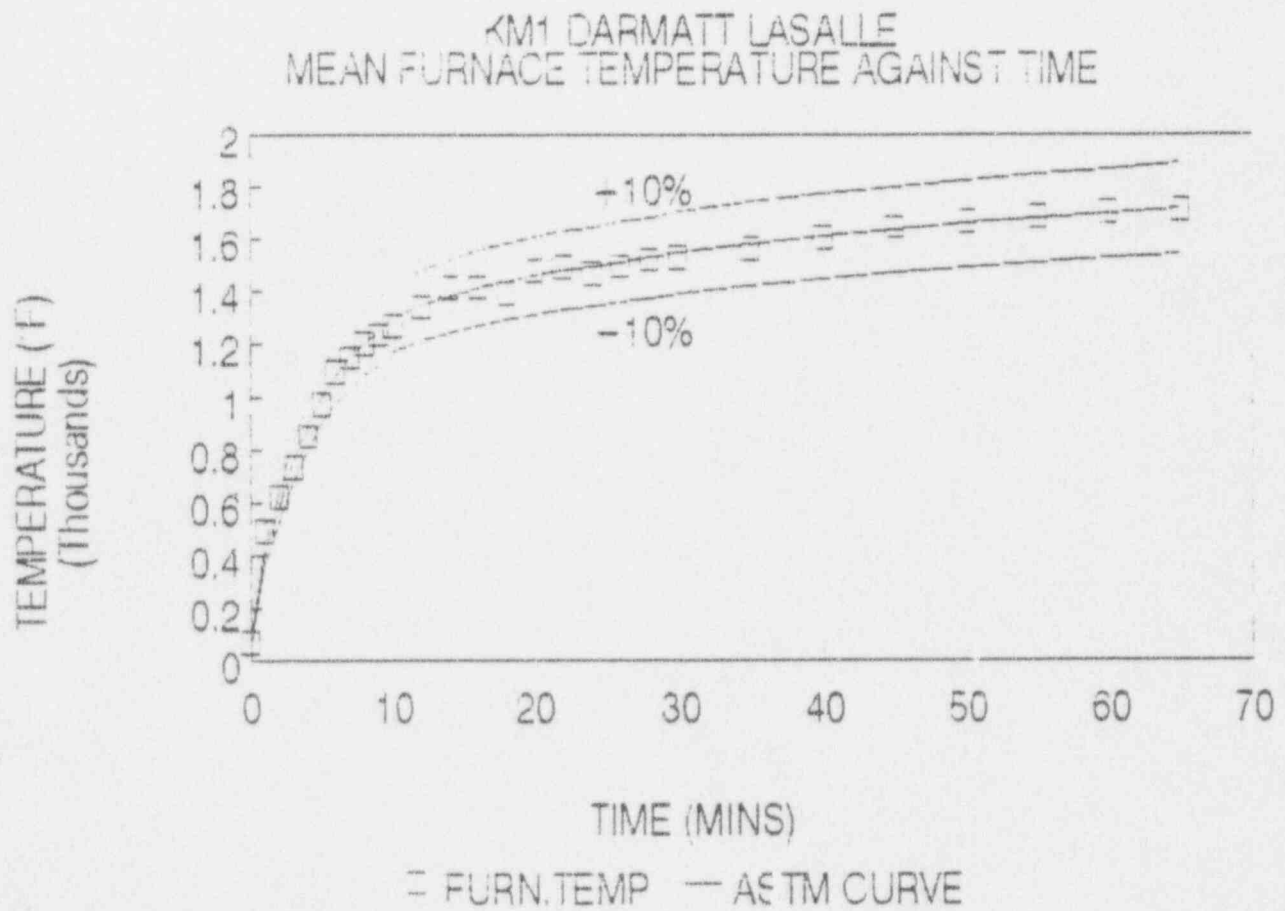
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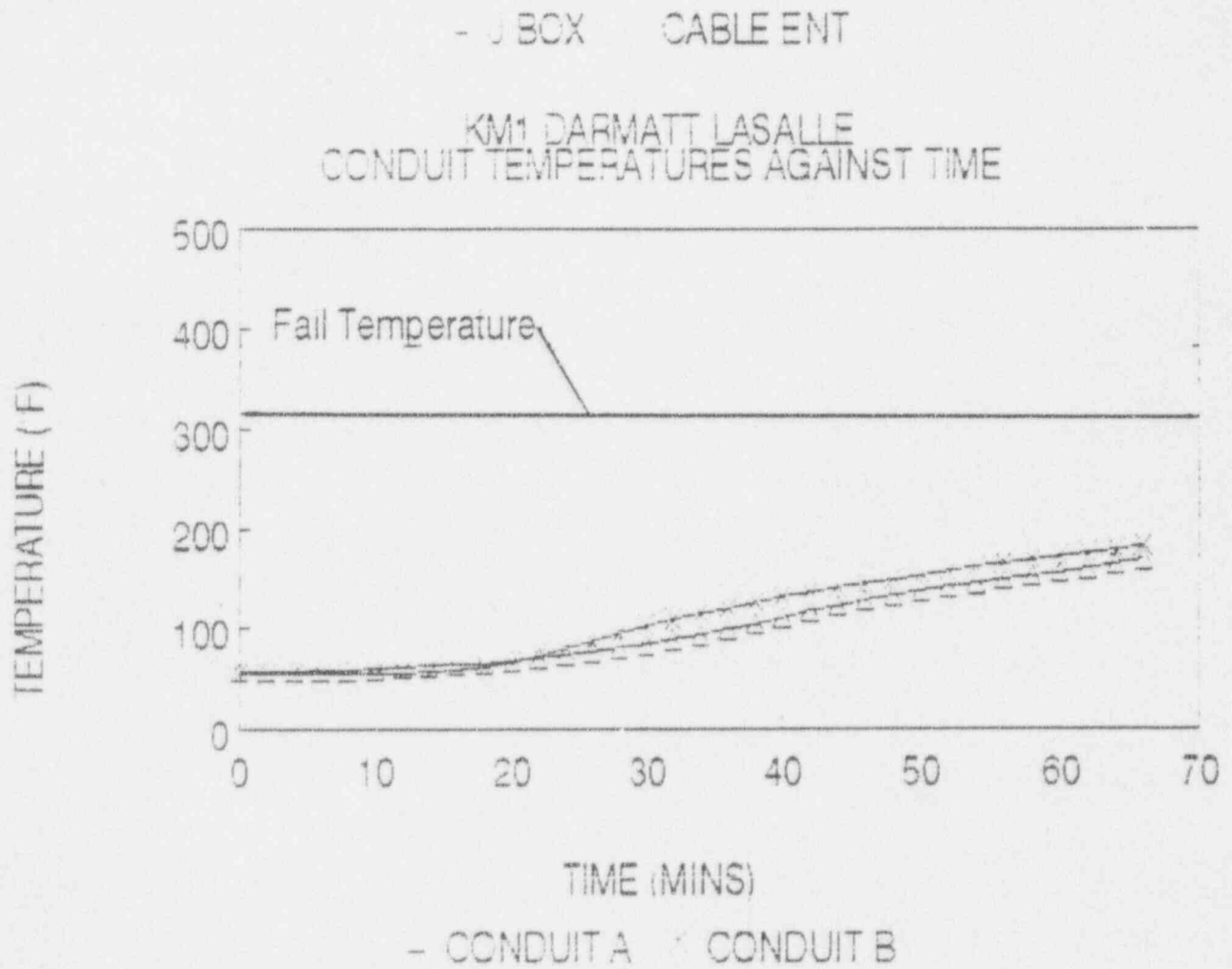
CONDUIT JUNCTION BOX

TC No	DATA RECORDER CHANNEL No	TC No	DATA RECORDER CHANNEL No
74	75	87	97
75	76	88	98
76	77	89	99
77	78	90	100
78	79	91	101
79	80	92	102
80	81	93	103
81	82	94	104
82	83	95	105
83	84	96	106
84	85	97	107
85	86	98	108
86	87	99	109
87	88	100	110
88	89	101	111
89	90	102	112
90	91	103	113
91	92	104	114
92	93	105	115
93	94	106	116
94	95	107	117
95	96	108	118
96	97	109	119
97	98	110	120
98	99	111	121
99	100	112	122
100	101	113	123
101	102	114	124
102	103	115	125
103	104	116	126
104	105	117	127
105	106	118	128
106	107	119	129
107	108	120	130
108	109	121	131
109	110	122	132
110	111	123	133
111	112	124	134
112	113	125	135
113	114	126	136
114	115	127	137
115	116	128	138
116	117	129	139
117	118	130	140
118	119	131	141
119	120	132	142
120	121	133	143
121	122	134	144
122	123	135	145
123	124	136	146
124	125	137	147
125	126	138	148
126	127	139	149
127	128	140	150
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147	148	160	170
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149	150	162	172
150	151	163	173
151	152	164	174
152	153	165	175
153	154	166	176
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155	156	168	178
156	157	169	179
157	158	170	180
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160	161	173	183
161	162	174	184
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APPENDIX D

- Fig 4 Graph of the ASTM E119 Standard Fire Curve and Achieved Furnace Fire Test Temperatures
- Fig 5, 6, 7, 8 Graph of Mean unexposed Face Temperatures against Time for 1 Hour Fire Tests





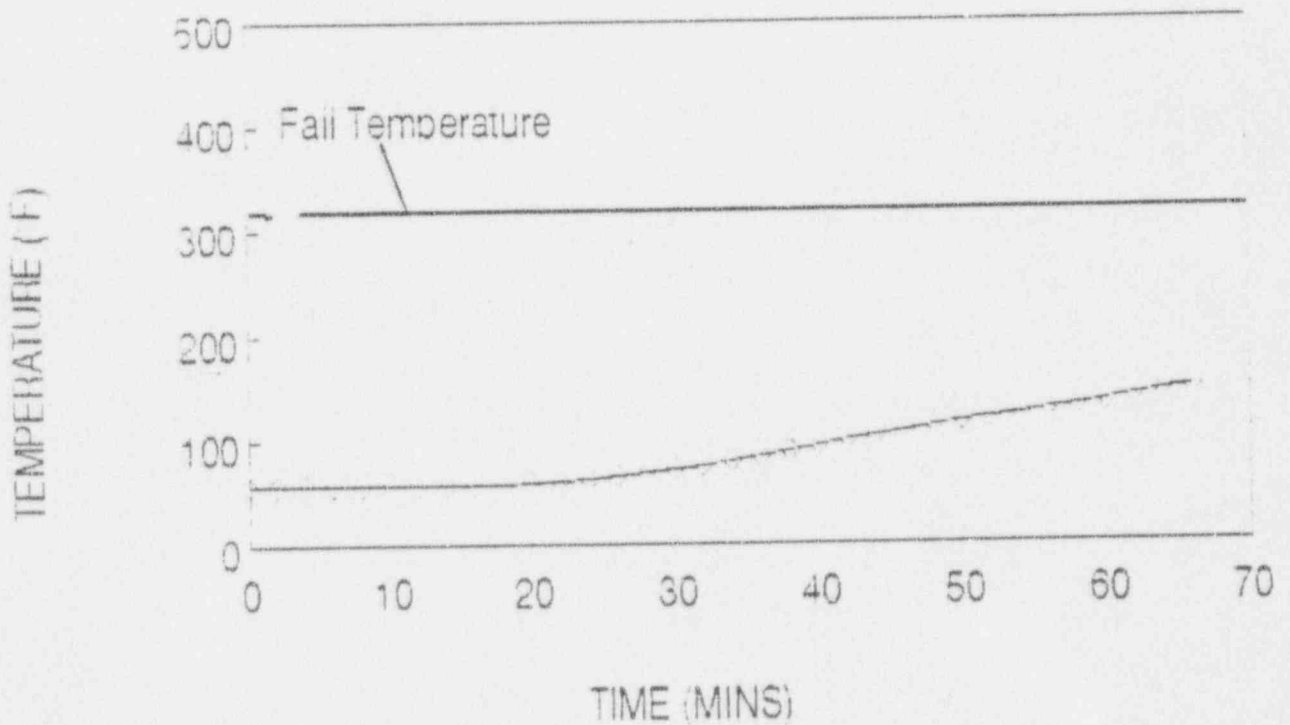
TEST REPORT FOR A 1 HOUR FIRE TEST ON
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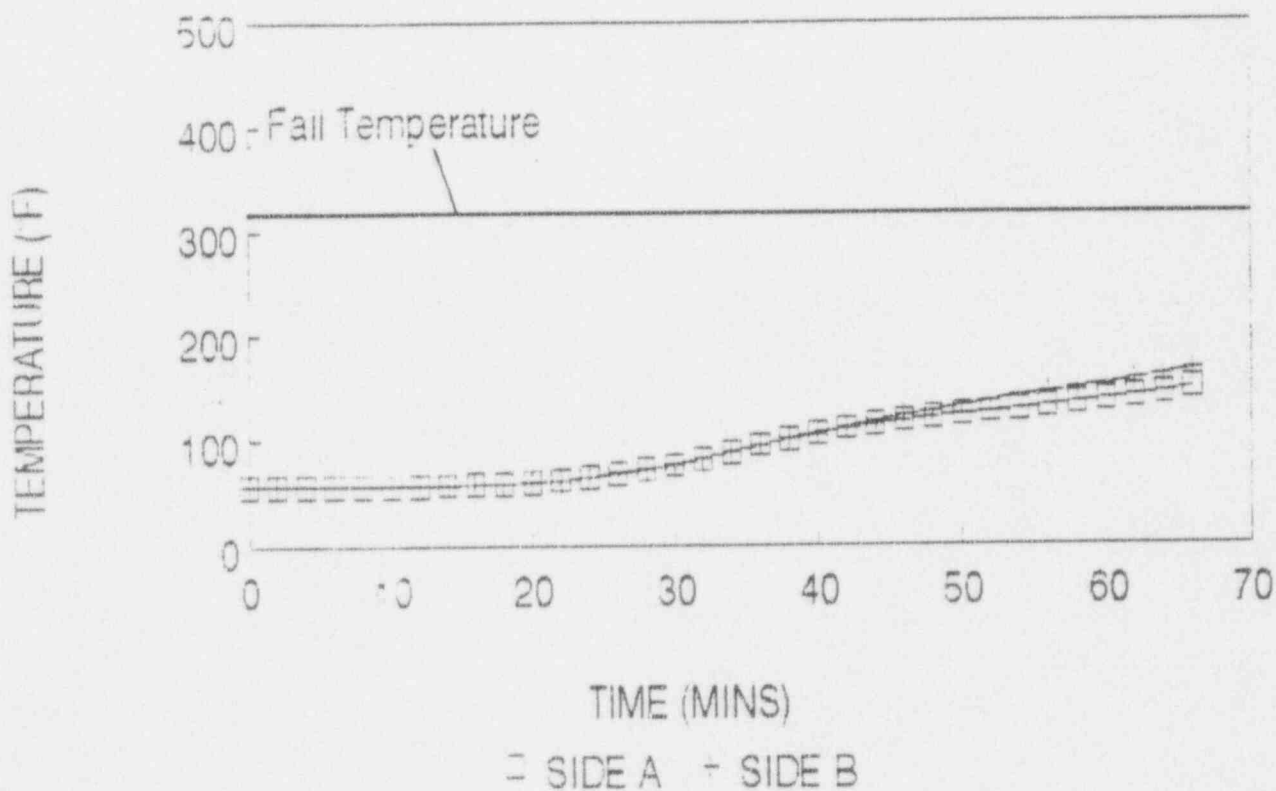
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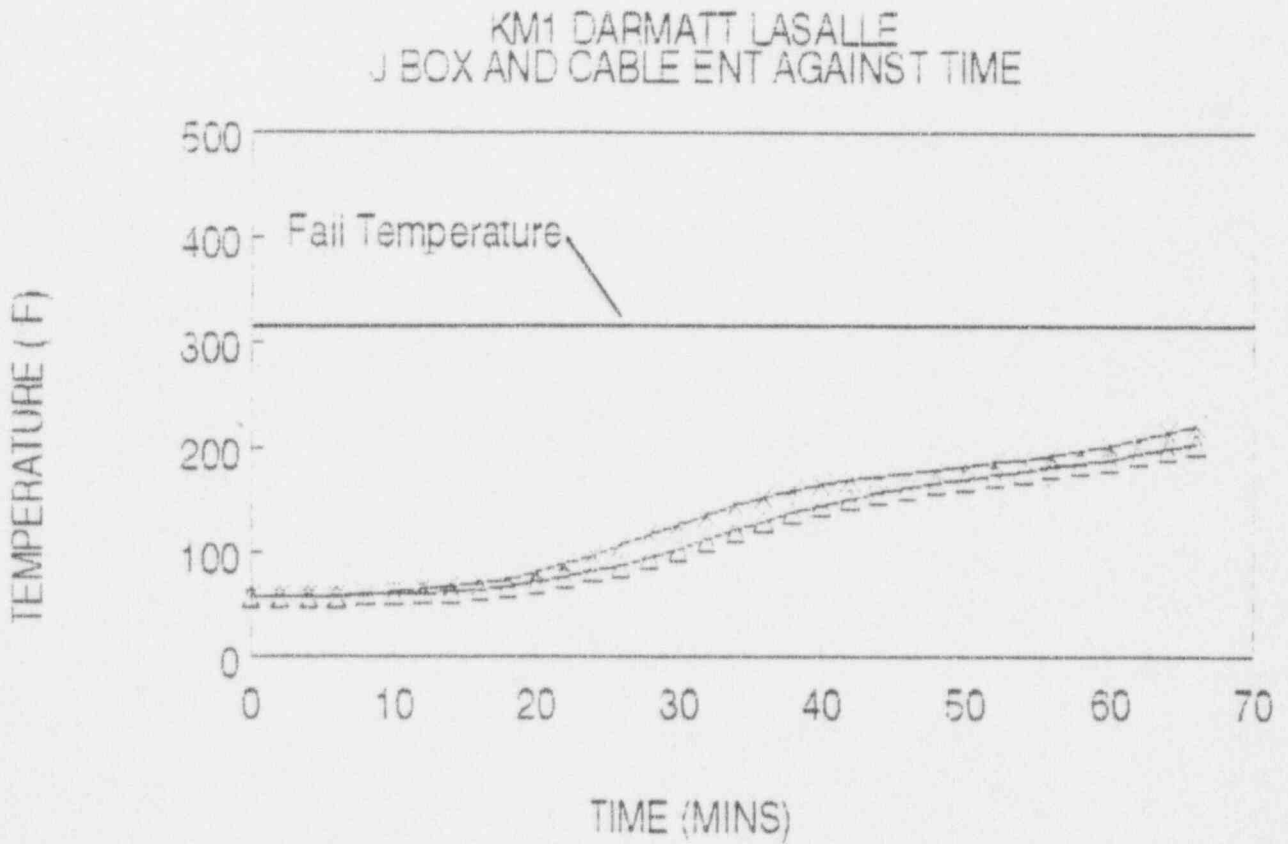
KM1 DARMATT LASALLE
CONDUCTOR TEMPERATURE AGAINST TIME



CONDUCTOR

KM1 DARMATT LASALLE
TRAY SIDES AGAINST TIME





APPENDIX E

- 1 Complete Set of Thermocouple Readings in Degrees Fahrenheit
- 2 Average Thermocouple Readings in Degrees Fahrenheit
- 3 The original data printouts in Degrees Centigrade

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1, 2 Thermocouple readings and Averages in Degrees Fahrenheit

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0	49.007	49.2279	49.0766	49.088	49.2474	49.8956	47.9248	48.4214	48.2072	48.4214	48.1046	47.0084	47.9102	49.2209
2	57.074	57.122	57.128	57.8126	56.93	57.325	56.922	57.272	56.714	57.055	56.84	57.038	56.84	56.984
4	56.948	57.573	56.93	57.7022	56.822	57.194	56.722	57.146	56.624	57.038	56.788	56.804	56.75	56.93
6	56.912	57.524	56.93	57.708	56.822	57.146	56.75	57.182	56.66	57.038	56.876	56.876	56.714	57.002
8	56.948	57.542	56.984	57.8018	56.922	57.146	56.75	57.182	56.624	56.966	56.822	56.894	56.822	58.046
10	56.912	57.488	56.966	57.758	56.786	57.11	56.732	57.164	56.642	57.056	56.876	57.002	57.164	59.828
12	56.93	57.488	57.02	57.8302	56.84	57.154	56.758	57.218	56.696	57.056	56.966	57.056	57.578	60.3476
14	57.146	57.614	57.0	57.8194	57.002	57.29	56.93	57.326	56.84	57.218	57.11	57.164	58.136	62.384
16	57.2	57.64	57.47	57.8076	57.272	57.488	57.122	57.614	57.02	57.542	57.506	57.596	58.766	63.9608
18	57.47	57.92	58.01	57.8102	57.938	58.046	57.758	58.172	57.488	57.974	58.028	58.046	59.792	65.7626
20	58.064	58.352	58.82	57.8084	58.964	59.018	58.532	58.964	58.28	58.874	59	58.874	51.214	69.5156
22	58.55	58.802	59.558	57.754	59.972	59.864	59.324	60.08	59.648	60.548	60.9278	60.476	63.6098	73.6934
24	59.432	59.54	60.764	57.8212	61.8422	61.4588	60.9098	62.3022	62.0654	63.3524	64.1444	63.059	67.0424	78.332
26	60.242	60.368	62.3516	51.7622	63.7718	63.2704	62.9708	64.7726	65.0642	66.6374	67.5266	65.831	70.2842	83.138
28	61.6748	61.8224	64.8356	61.0602	66.5636	66.056	65.7032	67.3316	68.7452	70.484	71.1482	69.1204	74.0804	88.61
30	63.3002	63.4658	67.361	60.5256	69.4868	68.8586	68.306	71.0402	72.2534	74.1632	74.8184	72.5774	77.828	94.046
32	65.6366	65.75	70.3238	60.0828	72.4982	71.816	71.1518	74.327	75.9956	77.936	78.692	76.676	81.59	99.5702
34	68.9378	68.6408	73.7024	49.9262	76.3772	75.4916	74.1452	76.9316	79.016	81.284	81.95	80.15	85.91	107.6684
36	74.2082	72.9374	78.35	49.4708	80.906	80.114	78.538	80.906	82.724	85.37	96.108	83.966	90.6134	115.979
38	79.232	77.792	83.21	48.9002	85.442	85.064	83.606	85.658	86.846	89.294	90.1634	88.07	95.1116	124.232
40	83.894	82.49	87.818	48.8102	89.9456	89.6972	88.268	90.1958	90.9842	93.2828	94.3106	92.6582	100.1336	132.116
42	88.484	87.404	92.1596	48.7652	94.3142	94.2476	92.9246	94.6022	95.3258	97.412	98.5244	96.8612	105.3176	139.568
44	92.4764	91.7654	95.9972	49.1	97.9358	98.0276	96.764	98.5406	99.365	101.525	102.7112	101.2244	109.715	146.048
46	96.0548	95.6192	99.4298	49.0982	101.4476	101.624	100.5242	102.4394	103.2422	105.5282	106.673	105.521	114.359	150.7298
48	99.1238	98.9564	102.434	49.8164	104.5724	104.6318	103.7246	105.809	106.6064	108.7538	109.8644	109.0418	118.8554	154.8896
50	102.254	102.1604	105.602	60.5958	107.9078	107.6378	106.8268	108.8474	109.6124	111.8174	112.91	112.622	122.882	158.4788
52	104.9252	104.909	108.9536	60.8676	111.6068	110.9084	109.3812	111.533	112.5752	114.5102	115.8224	115.4606	126.878	161.33
54	107.429	107.4866	112.8038	61.0214	115.7936	114.665	112.8182	114.8702	115.6262	117.8708	119.3306	118.4396	130.532	163.8464
56	109.7726	109.9076	117.0176	51.44	120.3314	118.9472	117.1202	118.517	119.2478	121.7102	123.008	121.5464	134.528	166.0856
58	112.3466	112.5922	121.4114	61.5066	125.222	123.692	121.712	122.81	123.368	126.032	127.22	126.104	138.614	168.7298
60	115.4138	115.9916	125.888	62.2502	130.118	128.642	126.68	127.418	127.778	130.55	131.918	130.838	142.88	171.2714
62	118.8914	120.1352	130.586	61.6578	135.194	133.772	131.684	132.224	132.458	135.266	136.778	135.626	147.5906	173.7482
64	122.666	124.448	135.194	62.4786	140.324	138.902	136.904	137.174	137.174	140.108	141.762	140.522	152.7008	176.6282
66	126.374	128.84	139.928	62.3538	145.544	144.122	141.998	142.124	142.106	145.166	146.768	145.67	158	179.222

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SCAN MINS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	44.2144	47.5466	49.0174	48.2494	48.1077	48.4266	48.1092	48.1072	48.1133	47.7214	47.778	47.5538	47.2282	47.2392	
2	48.7114	48.9866	48.8442	47.0292	47.174	47.814	48.072	47.0566	48.519	48.78	48.738	47.038	48.66	48.402	
4	48.606	48.912	48.842	48.074	47.11	47.62	48.072	47.038	48.438	48.714	48.722	47.002	48.624	48.758	
6	48.679	47.074	48.624	47.132	47.092	47.61	48.42	47.074	48.532	48.786	48.696	48.948	48.424	48.702	
8	48.624	48.748	48.662	47.11	47.11	48.172	48.012	47.002	48.462	48.624	48.696	48.384	48.242	48.702	
10	48.604	48.694	48.606	47.124	47.072	48.144	48.072	47.038	48.468	48.75	48.696	47.002	48.66	48.75	
12	47.218	48.676	48.789	47.416	47.652	48.612	48.02	47.002	48.67	48.786	48.702	47.02	48.66	48.768	
14	47.974	47.8398	48.966	47.62	48.244	48.03	48.462	47.074	48.558	48.858	48.702	47.038	48.66	48.768	
16	48.189	48.6026	47.244	48.622	48.142	48.612	48.48	47.074	48.536	48.804	48.804	47.032	48.768	48.694	
18	48.9476	48.2016	47.266	48.708	48.566	48.0916	48.408	47.002	48.642	48.876	48.84	47.132	48.858	48.966	
20	48.2752	48.1902	48.13	48.254	48.4424	48.6702	48.642	47.154	48.866	47.226	47.254	47.524	47.146	47.308	
22	48.0702	48.134	48.9296	48.6886	47.721	48.284	48.966	47.424	47.416	47.83	47.722	48.064	47.722	48.082	
24	48.2914	48.686	48.7736	47.4978	48.2478	48.6994	47.596	47.038	48.19	48.586	48.676	48.054	48.784	48.45	
26	48.6	48.6944	47.2548	48.386	48.58	48.5134	48.442	48.658	48.234	48.666	48.864	48.368	48.278	48.3274	
28	48.808	48.2184	48.6332	48.844	48.5772	48.988	48.862	48.9	48.9296	48.4804	48.7648	48.42	48.5046	48.806	
30	47.628	48.836	48.998	48.076	48.5128	47.652	48.7702	48.4984	48.207	48.671	48.1174	48.9994	48.2784	48.7454	
32	107.4164	116.1626	86.832	115.2436	119.2318	86.1088	84.2208	83.6098	85.2352	86.5294	87.01	88.2412	88.6516	70.1672	
34	124.556	132.854	92.4578	141.044	138.452	105.2625	87.6724	86.4412	88.6624	70.0124	70.538	72.032	72.6188	74.2406	
36	142.142	141.242	114.6532	151.81	147.139	126.032	72.8842	70.466	73.22	74.5358	75.1946	76.4456	77.09	78.71	
38	156.4466	147.038	133.716	158.5184	151.502	140.51	78.901	74.9246	77.846	79.214	79.916	81.086	81.626	83.254	
40	166.2106	151.4948	146.636	163.0562	157.451	149.0224	81.066	70.34	82.246	83.822	84.308	85.514	85.82	87.494	
42	172.2966	155.5538	156.407	165.0254	159.791	156.0218	84.82	83.534	86.36	87.854	88.808	90.1472	90.257	92.0606	
44	178.7648	160.2986	154.093	168.9962	165.7238	158.6228	88.258	87.548	90.194	91.6592	92.7644	94.1288	94.253	96.0188	
46	180.896	163.6358	168.5678	171.95	169.0294	166.424	91.5452	91.3136	93.7148	95.135	96.4112	97.9916	98.0906	99.6926	
48	182.192	166.3322	171.7106	173.2514	171.922	170.3502	94.208	94.4258	96.5858	97.9538	99.2606	100.832	101.1686	103.0406	
50	182.489	168.5426	174.2278	175.5464	174.0164	172.4206	96.6614	97.1906	99.2948	100.6214	102.092	103.559	104.2142	106.0286	
52	182.8814	170.96	176.5134	174.329	174.1794	175.3538	99.798	99.5954	101.4198	102.7706	104.1836	105.6542	106.7396	108.7592	
54	182.4862	172.4828	178.2752	177.2214	176.5376	177.5264	100.8256	101.8688	103.5698	104.9396	105.8882	107.3768	108.7412	111.0866	
56	181.6286	175.631	180.8042	178.7054	178.2932	177.7632	102.6336	103.7714	105.2752	106.5524	107.51	109.1678	108.68	112.9748	
58	181.9518	178.2716	182.7986	179.725	179.51	178.6532	104.7812	105.8738	107.51	108.6656	109.5476	110.9696	111.8012	114.9278	
60	182.0516	181.0228	184.4546	181.04	180.222	180.6278	107.0042	107.9402	110.057	111.083	111.65	113.1134	113.7956	117.2966	
62	182.8076	184.3178	186.404	182.9336	182.6094	182.3342	109.3784	110.1884	112.8578	113.9864	114.0674	115.1258	116.0546	119.4764	
64	183.785	188.5576	189.7196	185.581	184.7282	183.749	111.713	112.3304	115.709	116.5334	116.9492	118.256	117.9896	121.8614	
66	182.5868	192.7552	192.848	190.0688	187.0448	185.234	114.4796	114.728	118.7312	119.4314	120.227	121.5536	120.488	124.664	

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TCAN	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86
1	57.272	57.5074	58.2774	57.733	57.827	57.7884	57.278	58.0104	57.518	57.7558	58.223	57.194	57.71	57.224			
2	57.246	57.1	56.444	56.87	56.203	56.455	56.415	56.216	56.03	56.594	56.322	57.128	57.055	57.122			
3	57.022	57.028	56.418	56.324	56.112	56.354	56.4	56.3	56.272	56.34	56.75	57.074	57.12	57.318			
4	57.194	57.122	56.418	56.506	56.51	56.48	56.4	56.218	56.39	56.84	56.822	57.11	57.039	57.362			
5	57.182	57.192	56.11	56.504	56.112	56.354	56.4	56.218	56.272	56.858	56.736	57.038	57.074	57.325			
10	57.338	57.208	56.432	56.542	56.11	56.612	56.415	56.282	56.426	56.894	56.54	57.154	57.146	57.47			
12	58.084	57.668	56.824	56.538	56.426	56.57	56.43	56.372	56.516	56.966	56.656	57.254	57.308	57.459			
14	59.018	58.37	56.644	57.228	56.736	56.768	56.328	56.462	56.824	57.092	57.032	57.326	57.344	57.578			
16	60.17	59.294	57.578	58.122	57.823	57.33	56.655	56.824	56.804	57.308	57.29	57.524	57.534	57.774			
18	61.304	61.2238	58.514	59.182	58.745	58.313	58.35	56.75	56.912	57.488	57.458	57.704	57.74	57.992			
20	62.4568	64.3636	60.428	60.8112	61.3322	60.186	56.773	57.056	57.382	58.064	58.244	58.288	58.388	58.496			
22	65.9714	68.6876	63.1224	66.6446	66.1254	63.2804	56.138	57.704	58.082	58.892	59.198	59.306	59.27	59.324			
24	68.9406	74.2802	67.3222	70.5108	70.313	67.4254	55.462	56.352	58.874	59.936	60.35	60.35	60.35	60.256			
26	73.076	80.834	73.6484	79.628	78.91	72.822	56.876	59.162	59.9	61.1042	61.8044	61.8404	61.7646	61.7756			
28	80.24	90.0122	81.608	93.024	95.426	93.078	57.542	60.35	61.3454	62.9484	62.7052	63.7826	63.8096	63.7826			
30	87.332	98.3858	89.7546	99.8126	99.5286	97.13	58.208	61.5542	62.6738	64.4324	66.732	66.011	66.074	66.8382			
32	92.8814	106.8542	99.8212	110.3	109.382	95.8216	59.522	63.4046	64.6232	66.5024	67.9892	68.576	68.8226	69.4824			
34	100.6052	118.5484	107.35	131.206	127.5702	127.1464	61.1672	65.6438	66.9308	68.9576	70.8602	71.2254	71.4308	71.0636			
36	109.409	130.1	117.2842	144.35	129.12	135.9448	63.3686	68.8136	70.2374	72.4388	74.5384	74.849	74.8976	74.408			
38	118.562	140.504	129.3	158.1204	148.372	155.618	65.8202	72.5252	74.2874	76.7254	78.908	79.034	78.926	78.404			
40	126.572	149.2412	140.324	161.1256	147.7304	157.876	68.4526	76.019	78.116	80.636	83.21	83.408	83.192	82.562			
42	134.402	156.6842	151.7054	168.7828	153.7718	149.9072	71.1256	79.528	82.094	84.776	87.476	87.8	87.628	86.9			
44	142.034	164.1992	162.4154	175.1414	161.5082	161.0708	73.922	83.318	86.09	88.79	91.3208	91.7924	91.7402	90.9698			
46	150.656	170.0132	170.5034	177.611	168.4596	169.331	76.5392	86.72	89.9348	92.7122	95.0666	95.5544	95.6804	94.9154			
48	159.773	174.8156	181.23	182.5188	175.8966	179.0276	79.034	89.8952	93.3206	95.954	96.24	98.9798	99.2156	98.4128			
50	167.7848	180.9878	188.3066	186.755	179.868	188.0528	81.574	92.5988	96.1268	98.8286	101.0858	101.8832	102.3386	101.5736			
52	176.0848	187.5596	194.1918	190.7456	183.2414	192.1756	83.624	95.126	98.6846	101.3558	103.5256	104.504	105.1682	104.6048			
54	183.1748	193.109	200.2748	197.225	189.8372	195.9494	85.504	97.3382	100.8716	103.6706	106.1114	107.069	107.7944	107.6414			
56	189.3236	197.645	205.715	205.187	195.044	204.026	87.674	99.7952	103.5518	106.6892	109.2902	110.1812	110.768	110.4314			
58	195.0746	202.6004	211.3026	210.532	200.8914	207.8132	89.7494	102.262	106.3994	109.8644	112.6508	113.495	113.9576	113.4212			
60	200.3108	207.5	216.508	222.278	205.34	210.2432	91.7456	105.0656	109.5404	113.2646	116.1896	117.0806	117.5504	116.834			
62	205.0556	212.504	221.774	231.17	213.285	213.342	93.693	107.8736	112.9092	116.8826	120.9416	120.9488	121.3862	120.6356			
64	209.7442	218.266	226.536	240.656	217.416	214.97	95.1448	110.8562	116.33	120.7166	124.106	125.06	125.636	124.88			
66	210.746	223.208	232.7	250.718	225.124	221.414	96.126	113.6606	119.9246	124.682	128.282	129.38	130.118	129.434			

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0	55.208	59.8008	59.4720	59.8700	59.859	59.1790	59.809	59.2674	59.1622	59.4186	59.154	58.299	57.8004	57.2702
2	57.260	57.868	57.814	57.922	57.849	58.104	57.404	57.794	57.808	57.38	58.375	57.29	56.516	56.33
4	57.806	57.896	57.814	57.866	57.876	58.108	57.416	57.758	57.184	57.344	58.258	57.272	56.48	56.948
6	57.298	57.704	57.704	58.082	57.812	58.118	57.416	57.758	57.2	57.398	56.93	57.344	56.516	56.984
8	57.362	57.832	57.704	58.01	57.32	58.244	57.842	57.248	57.434	57.632	57.02	57.344	56.516	56.984
10	57.542	57.812	57.884	58.225	58.064	58.07	57.856	58.064	57.704	57.866	57.254	57.524	56.696	57.128
12	57.578	57.83	57.922	58.38	58.208	58.486	57.812	58.172	57.776	57.938	57.326	57.704	56.912	57.38
14	57.668	57.938	58.01	58.352	58.316	58.64	57.874	58.352	58.028	58.19	57.896	57.992	57.434	57.758
16	57.866	58.118	58.32	58.632	58.668	58.992	58.352	58.802	58.64	58.892	58.244	58.694	58.28	58.478
18	58.028	58.352	58.532	58.81	58.748	58.208	58.748	58.396	58.216	58.396	58.678	58.35	58.306	58.414
20	58.694	59.09	59.342	59.702	59.558	60.188	59.708	60.674	60.656	60.656	59.702	60.728	61.2392	61.2212
22	59.558	60.206	60.584	61.079	60.8558	61.8244	61.2306	62.4704	62.4326	62.4416	61.2086	62.501	62.6008	62.5486
24	60.782	61.5704	62.1238	62.5578	62.609	63.5702	63.4946	64.9004	64.8572	64.9706	63.5792	65.1812	67.0694	66.938
26	62.3408	63.4154	64.157	64.814	64.5838	65.2726	65.2556	67.4996	67.4906	67.6652	66.2342	68.1566	70.9646	70.9826
28	64.4846	65.9336	66.8296	67.6904	67.4384	68.7758	69.0134	71.1158	71.1266	71.3966	69.7928	71.1554	74.7446	75.9506
30	66.6248	68.3114	69.44	70.3796	70.3922	71.9114	72.3794	74.768	75.0254	75.515	72.5476	74.1686	78.17	80.348
32	69.3572	71.3102	72.7988	74.039	73.778	75.5474	76.2584	79.052	79.952	81.05	78.458	78.494	82.318	86.414
34	71.8492	74.1614	75.8714	77.352	77.09	78.674	79.574	82.724	84.722	86.864	85.91	84.2	89.366	93.434
36	75.2504	77.648	78.362	80.122	80.402	81.86	82.778	85.09	86.72	88.106	87.386	88.502	95.2934	100.4144
38	79.258	81.77	82.932	83.92	84.128	85.804	86.342	89.248	89.564	90.1616	90.221	93.29	101.8598	108.8168
40	83.39	86.026	87.332	88.376	88.448	89.8924	90.203	93.2432	93.5978	93.9884	94.1558	97.5604	107.7854	115.2022
42	87.692	90.3488	91.7366	92.7986	92.9822	94.3178	94.4618	97.6028	98.1086	98.4704	98.7782	102.8372	114.4292	123.782
44	91.706	94.361	95.8046	96.9818	97.187	98.4398	98.6594	101.8742	102.8534	103.307	103.469	108.1706	121.208	131.108
46	95.6642	98.285	99.7772	100.9616	101.3342	102.5186	102.74	105.8954	107.0654	107.6468	107.8178	113.3276	127.742	138.092
48	99.2236	102.0038	103.6094	104.9504	105.2186	106.285	106.574	109.5188	110.9048	111.7868	112.1936	118.8158	134.456	145.364
50	102.4574	105.2582	106.9736	108.3092	108.58	109.8958	110.0786	112.9982	114.3572	115.7324	116.2292	123.854	140.774	152.1482
52	105.2806	108.2102	110.0228	111.3782	111.722	113.0324	113.4446	116.5172	117.8222	119.7464	120.5978	129.002	147.2558	159.0512
54	108.356	111.0182	112.965	114.3014	114.7658	116.4128	117.167	120.3008	121.6634	124.052	125.186	134.168	153.0104	165.4556
56	111.2306	113.9126	115.8494	117.4478	117.8672	120.2432	121.1954	124.448	125.979	128.678	130.154	139.858	159.0602	171.9482
58	114.3536	117.302	119.417	121.0136	121.4132	124.628	125.798	129.02	130.622	133.592	135.374	145.58	165.461	178.7522
60	117.8816	121.1144	123.314	124.952	125.42	129.434	130.802	134.024	135.698	138.866	140.684	151.2986	171.5198	184.8578
62	121.7642	125.042	127.328	128.796	129.632	134.33	136.022	139.064	140.864	144.212	146.066	156.7004	177.242	190.3172
64	125.888	129.254	131.54	132.908	134.078	139.514	141.258	144.446	146.136	149.5724	151.4282	162.2192	182.5808	194.6192
66	130.388	133.718	135.95	137.246	138.686	144.704	146.758	149.7398	151.142	153.6548	156.7868	157.549	187.295	197.9978

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2	49.8704	49.8044	49.771	49.7217	49.724	49.7534	49.8004	49.8454	49.7718	49.7519	49.7036	49.7504	49.782	49.8242
4	56.408	56.324	56.3446	56.328	56.334	56.384	56.36	56.406	56.005	56.622	56.622	56.298	56.858	56.858
6	56.372	56.324	56.3484	56.322	56.328	56.362	56.336	56.424	59.144	58.712	57.812	56.288	56.376	56.47
8	56.462	57.392	57.32	57.338	57.322	57.356	57.378	58.532	59.324	58.874	58.154	58.298	56.68	57.009
10	56.426	57.2	57.3254	57.348	57.322	57.392	57.312	58.514	59.432	59.36	59.99	58.442	56.758	57.416
12	56.65	57.398	57.3212	57.322	57.35	57.328	57.348	58.496	59.522	62.1266	63.4172	58.532	56.408	57.2
14	56.876	57.56	57.492	57.47	57.522	57.522	57.52	58.568	59.9	56.371	57.8778	59	56.21	57.416
16	57.032	57.902	58.0888	57.928	57.9	57.928	57.74	59.206	60.404	71.2058	72.3464	59.864	56.408	57.974
18	57.614	58.514	58.6958	57.488	57.47	58.028	57.848	59.576	61.5704	75.9438	78.332	61.5866	57.154	59.018
20	58.016	59.414	58.6186	57.824	57.828	58.244	58.046	60.062	62.7026	78.296	81.536	64.4252	58.118	60.116
22	58.756	61.2572	57.8254	58.84	58.82	59.242	58.846	62.4794	64.6358	81.482	85.46	69.1244	59.936	62.4182
24	62.0114	64.012	71.187	60.9008	61.7018	61.9214	62.1074	64.076	67.6418	84.182	89.42	73.2308	62.3596	65.3
26	65.0012	67.6742	74.7242	63.206	64.7526	64.8518	65.0516	66.7994	70.6316	86.504	93.5024	77.378	65.6078	69.3086
28	68.8442	72.0554	79.592	66.7364	68.1224	67.9298	67.8544	69.9656	73.9652	88.556	97.1042	89.086	69.0584	74.3756
30	73.8662	77.504	84.328	68.4794	71.3268	71.2076	70.7252	73.4594	77.324	91.031	100.7708	85.154	73.2344	80.6
32	79.196	83.516	91.0222	71.8812	74.4212	74.2576	73.228	77.018	80.618	93.569	104.0918	88.97	77.774	87.026
34	86	91.7252	99.7014	74.5726	77.72	77.918	77.152	80.852	84.236	96.8378	107.4848	92.7176	83.254	93.2864
36	94.2476	104.8928	110.1292	78.296	82.31	82.886	82.634	84.578	88.304	100.751	110.1686	94.5212	89.6738	101.579
38	104.2574	116.8466	123.43	82.12	86.972	88.124	88.142	88.97	92.8562	105.7298	113.4734	97.1114	96.386	110.9876
40	114.412	124.142	131.9	86.224	91.7258	92.5826	92.4314	94.4996	99.0014	112.0154	118.2758	101.4458	103.9856	119.2784
42	123.296	134.258	140.288	90.2066	95.7578	96.0894	97.4552	100.436	105.7748	117.8078	124.61	107.8088	111.5852	127.058
44	130.928	142.178	149.7262	93.0162	99.2866	100.1264	102.8516	106.8386	113.126	124.412	132.026	116.015	119.849	134.834
46	138.02	148.856	157.28	95.6138	101.5636	104.4248	108.5504	112.7354	118.6304	130.496	138.614	123.818	128.318	141.998
48	144.752	154.5674	163.904	98.2554	105.3572	109.571	113.0594	118.553	123.656	136.598	144.914	131.414	135.23	148.0442
50	150.728	159.682	169.9952	105.125	109.6718	114.7208	118.1372	123.746	128.3	142.628	151.0952	139.874	142.052	151.5208
52	156.8498	164.2586	175.3934	109.9822	114.4238	118.9652	122.702	128.354	132.062	147.9578	156.398	147.4862	149.6678	157.9136
54	162.3614	168.899	180.5278	113.5148	117.4566	122.45	126.698	132.268	135.86	152.3264	160.8296	154.1858	156.4124	162.8528
56	167.5004	173.272	185.2474	116.4992	120.5636	125.312	129.208	136.004	139.424	156.5834	164.2334	160.6388	161.6144	167.4284
58	172.7582	177.7982	190.2956	118.9004	122.612	127.616	131.228	139.298	143.186	160.1168	167.2142	166.3574	165.0596	171.104
60	177.8594	182.3306	194.7866	120.4808	124.772	129.614	134.122	142.222	146.84	163.5836	169.8908	171.041	171.2308	174.3638
62	182.579	186.638	199.0112	122.558	127.418	131.864	136.736	145.814	151.0178	166.9154	172.499	175.5464	176.162	177.8486
64	186.5596	190.4702	202.3042	124.262	130.136	134.258	139.244	149.864	155.624	170.0294	175.324	180.1534	180.7412	184.0154
66	189.806	193.9838	208.1048	127.274	132.746	136.922	141.836	154.3478	160.6676	173.0588	179.159	186.1988	186.3824	189.5972
68	192.1946	197.3084	214.376	129.812	135.386	139.292	144.428	159.3284	166.1954	176.0504	183.6392	192.0092	191.9714	196.7414

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1	78.88	79.00	77.312	80.0753	80.7768	81.2558	82.4676	80.451	82.102	82.3108	83.93	82.768	81.735	81.3754						
2	80.93	80.32	78.444	80.75	80.44	81.22	84.77	84.244	82.009	82.974	83.676	82.155	81.274	81.208						
4	87.182	89.646	86.448	83.051	86.462	88.442	84.77	82.118	88.104	87.848	89.496	88.118	87.008	87.014						
6	87.128	81.1554	86.229	88.232	86.272	89.109	84.77	88.352	88.208	87.92	88.748	88.172	87.956	87.704						
8	89.188	85.7562	88.12	88.634	88.588	80.478	84.906	89.7954	88.08	88.082	89.252	88.154	88.406	80.44						
10	88.73	78.314	88.108	88.002	87.362	83.9716	85.11	72.0432	88.002	88.208	89.648	88.406	89.648	84.5453						
12	88.792	80.708	88.01	88.052	88.404	70.3394	85.94	71.7242	89.708	88.338	80.116	88.676	81.4336	87.0388						
14	83.1056	81.158	85.408	87.036	89.972	76.4006	89.866	70.049	81.142	88.856	80.9232	88.946	84.1132	82.9746						
16	84.7042	82.868	86.84	88.208	82.0906	80.114	89.182	75.0604	80.2228	89.846	82.907	89.324	87.3358	70.2488						
18	86.7814	84.668	87.404	88.102	84.004	82.358	81.5578	70.214	85.3334	81.25	85.3414	89.702	71.0204	78.7516						
20	70.3292	88.338	88.154	88.08	87.045	85.514	86.6842	84.11	85.197	80.9906	70.4606	80.674	78.17	83.462						
22	70.2884	91.7294	81.7732	82.4354	89.808	88.466	70.3472	80.5198	70.2184	87.7732	75.3484	82.1464	86.144	81.292						
24	76.9064	84.9586	85.1272	85.0372	73.1568	81.8086	80.546	87.3202	80.024	72.7574	82.778	83.9986	84.8992	100.2488						
26	80.726	88.4002	88.4554	89.4922	76.4438	84.9586	88.016	102.8038	86.954	77.29	89.7954	86.1406	104.02	109.6088						
28	85.01	101.6564	82.2462	74.6544	80.636	88.438	85.9864	109.7186	86.2708	85.1	88.6198	88.927	114.7838	119.5862						
30	89.6594	104.1746	75.9668	80.854	84.922	101.3828	103.1306	115.403	106.137	83.2036	107.3634	71.8898	124.79	128.139						
32	95.3196	108.005	80.69	87.746	80.347	104.6138	109.7186	122.918	116.6828	102.4412	116.5492	75.7274	134.636	136.202						
34	104.0342	112.2178	86.278	85.2208	87.736	109.8644	115.934	134.69	125.698	111.119	127.58	80.402	144.374	144.392						
36	112.5904	116.375	81.222	102.6086	106.1852	116.5172	121.2502	144.104	126.778	120.8732	128.092	86.252	153.4838	152.3174						
38	119.786	120.4466	88.1482	109.8518	114.7346	122.612	127.472	152.2814	145.148	131.45	147.7706	82.7158	161.1212	159.2888						
40	127.544	126.05	103.7848	116.447	121.6254	128.282	132.674	159.2042	152.4956	129.982	155.3288	89.1922	166.9532	164.8904						
42	136.058	135.788	109.9238	122.584	127.594	133.266	137.498	164.9858	159.5444	148.244	162.1778	105.1646	170.9294	169.6156						
44	146.336	144.266	116.15	128.462	133.412	138.092	142.106	169.034	165.119	154.9004	167.5688	110.527	173.2838	173.642						
46	154.8266	147.092	122.054	133.232	138.128	142.646	146.48	172.5548	170.3426	160.8296	172.3028	115.3688	177.6506	177.1682						
48	160.682	151.043	127.454	137.736	141.71	145.094	151.0574	175.3646	174.2972	165.9362	176.2574	120.65	184.5248	180.4982						
50	165.2702	146.696	132.124	141.422	145.112	148.694	155.4224	177.3662	177.7406	169.8422	179.33	125.33	191.4278	183.479						
52	170.0888	156.8036	126.67	145.112	148.6436	152.1428	159.4634	179.2058	179.7818	173.3432	181.9364	129.452	199.256	187.1222						
54	175.766	156.7454	140.954	148.4636	152.897	156.2774	163.5026	181.4702	182.7734	176.5994	184.1414	134.006	209.1434	190.1408						
56	179.411	161.0672	145.374	151.8818	156.8788	159.5156	167.0432	183.2602	185.1098	178.349	186.5696	138.74	217.526	194.4212						
58	180.1058	168.359	149.2226	155.8432	160.9934	163.823	170.96	184.649	186.8054	181.2758	190.193	143.204	224.924	198.7268						
60	187.088	176.2222	153.104	159.3598	165.5378	168.5408	174.4934	185.6822	184.0928	183.3728	194.7704	147.164	237.056	204.0926						
62	195.9944	181.4918	157.0478	163.7275	170.8718	175.2584	178.2032	187.3004	190.7258	186.2564	200.9588	151.4768	247.658	209.3936						
64	201.9398	187.394	161.4612	168.7172	177.1592	180.8294	181.5214	189.221	197.5154	188.1572	206.726	157.0172	257.882	215.582						
66	207.1778	191.8274	166.1594	174.0196	182.0228	187.169	185.6272	191.7788	203.6694	188.3204	212	159.944	268.4408	222.972						

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TIME	T/C	T/C	T/C	T/C	T/C	T/C	T/C	T/C	T/C	T/C	T/C	T/C	T/C	T/C	T/C	T/C
MIN	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119
12	320.201	42.5531	14.4442	15.1344	13.1122	112.1578	107.8918	118.1113	120.23	142.179	132.5504	117.204	178.4869	149.888	175.2229	
14	37.419	17.112	435.748	609.2582	127.1772	821.1282	601.1274	113.5822	578.795	681.5248	571.3282	527.1288	592.4172	661.2278	670.5129	
16	57.722	57.128	463.473	101.121	494.124	448.72	153.122	131.121	503.866	486.532	470.121	138.204	1003.178	873.3046	355.7284	
18	58.389	58.229	1479.026	1065.741	1225.021	1120.426	1137.872	1228.025	1097.097	1077.816	1072.583	1090.22	1029.085	1146.2	1154.170	
20	59.324	59.304	1298.828	1187.352	1211.123	1129.825	1205.446	1205.324	1189.268	1208.264	1195.245	1235.202	1176.782	1197.914	1131.022	
22	63.9114	61.121	1282.8	1282.924	1272.222	1269.194	1252.826	1225.818	1269.638	1261.49	1274.72	1298.524	1345.406	1383.17	1346.864	
24	65.7112	62.816	1254.454	1249.124	1245.249	1241.254	1227.122	1242.12	1212.574	1245.388	1249.156	1277.446	1423.12	1470.776	1434.12	
26	65.8868	64.8644	1409.578	1239.259	1235.212	1230.822	1225.12	1229.246	1221	1458.88	1421.156	1478.768	1486.57	1403.815	1441.224	
28	70.225	67.4275	1404.824	1412.228	1416.225	1415.12	1410.098	1423.85	1427.828	1425.11	1453.046	1496.786	1495.514	1408.54	1429.212	
30	75.129	70.8664	1231.024	1284.38	1280.124	1285.12	1282.328	1286.088	1352.452	1282.918	1415.516	1434.524	1408.298	1287.436	1298.524	
32	80.444	75.188	1480.142	1474.844	1472.244	1477.364	1475.206	1477.25	1447.16	1491.812	1490.8	1513.852	1496.804	1474.79	1490.784	
34	81.7048	81.86	1498.406	1487.122	1485.124	1490.702	1490.524	1492.448	1465.72	1517.36	1498.208	1525.388	1533.758	1505.425	1516.406	
36	101.8204	102.222	1474.555	1468.814	1474.124	1470.542	1470.184	1470.29	1447.97	1486.49	1504.058	1536.89	1509.89	1483.412	1499.128	
38	111.9128	99.2955	1525.712	1500.062	1505.122	1501.934	1499.144	1499.828	1475.834	1499.99	1519.358	1536.188	1512.36	1490.918	1500.478	
40	122.72	109.9976	1522.4	1518.872	1524.416	1520.006	1519.926	1519.61	1501.232	1546.016	1539.806	1573.61	1557.826	1532.228	1548.716	
42	131.228	119.5268	1556.878	1550.795	1559.714	1553.72	1553.395	1555.898	1535.63	1569.092	1560.29	1588.136	1547.042	1527.026	1535.558	
44	140.792	129.32	1501.592	1501.052	1509.22	1511.69	1514.12	1528.208	1495.868	1485.122	1514.156	1525.72	1516.676	1508.612	1555.828	
46	149.1512	141.222	1560.56	1563.378	1567.668	1573.754	1586.658	1593.05	1568.228	1550.552	1552.414	1571.964	1574.834	1570.928	1625.022	
48	156.2084	149.7902	1561.568	1562.682	1567.14	1569.11	1569.398	1573.334	1555.934	1534.388	1555.502	1557.932	1548.284	1548.428	1598.27	
50	163.2568	156.4142	1597.154	1598.54	1599.278	1605.362	1604.408	1617.26	1591.466	1580.774	1592.752	1609.196	1608.116	1601.906	1653.116	
52	168.3268	161.6144	1596.992	1598.334	1604.158	1609.632	1615.12	1626.296	1600.826	1589.558	1596.092	1609.448	1615.406	1612.454	1664.72	
54	173.7078	166.0604	1624.118	1625.008	1629.826	1637.432	1640.678	1647.428	1622.588	1601.096	1613.336	1629.698	1628.96	1626.854	1673.122	
56	176.2808	169.7144	1647.95	1647.738	1652.326	1654.358	1653.962	1667.192	1642.522	1624.31	1641.202	1655.798	1651.766	1648.886	1697.72	
58	179.6666	173.122	1644.494	1644.764	1644.812	1650.902	1646.006	1657.112	1636.988	1619.708	1633.838	1646.204	1642.496	1637.24	1692.56	
60	182.759	176.2216	1638.896	1638.824	1638.932	1641.74	1638.104	1641.974	1625.558	1604.426	1627.646	1625.738	1605.704	1579.712	1625.326	
62	185.8028	179.5424	1665.698	1662.524	1669.749	1675.12	1676.084	1683.22	1658.66	1648.12	1652.26	1664.402	1656.58	1654.574	1701.724	
64	189.1472	182.5124	1680.242	1684.56	1685.346	1690.556	1693.634	1703.966	1678.676	1654.952	1667.696	1677.326	1669.514	1666.49	1714.852	
66	192.9884	185.3294	1675.714	1679.156	1680.206	1685.948	1685.122	1699.52	1669.64	1662.25	1659.398	1670.828	1662.29	1656.284	1713.038	
68	197.4218	188.3122	1694.75	1697.918	1697.24	1706.27	1707.226	1715.09	1689.314	1661.054	1673.042	1679.216	1667.384	1659.74	1707.404	
70	202.3088	191.7878	1704.074	1704.884	1705.15	1712.066	1709.474	1719.824	1696.028	1678.244	1684.346	1696.118	1687.802	1687.37	1732.125	
72	207.752	195.34	1703.984	1702.85	1707.124	1708.268	1721.408	1726.222	1698.476	1678.262	1688.252	1699.664	1690.142	1684.472	1740.82	
74	213.188	202.0478	1706.072	1712.156	1713.008	1718.564	1720.796	1731.146	1706.72	1686.38	1692.274	1701.878	1692.428	1689.296	1741.082	
76	219.272	208.3568	1707.17	1711.816	1712.57	1719.518	1723.184	1728.266	1705.46	1686.47	1691.312	1699.61	1689.44	1686.812	1738.724	
78	225.166	214.97	1711.374	1710.322	1711.55	1715.738	1723.568	1726.558	1705.73	1697.72	1693.148	1700.6	1690.502	1685.822	1734.71	

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AVERAGE THERMOCOUPLE READINGS

SCAN (MINS)	FURNACE	SIDE A	SIDE B	CONDUCTOR	CONDUIT A	CONDUIT B	JB BOX	CABLE ENT
0	68.48672	56.85656	57.08066	57.31934	57.55676	54.85244	58.25498	57.15518
2	623.2298	56.81264	57.03602	57.27218	57.64532	54.80114	58.21808	57.20468
4	850.7246	56.67944	57.01406	57.24284	57.69932	54.70124	58.11746	57.49646
6	1095.935	56.84594	57.04412	57.30422	57.93098	54.6908	58.25498	58.16714
8	1200.965	56.9183	57.03494	57.3575	58.67276	54.86018	60.3824	59.99414
10	1271.073	57.11594	57.1973	57.51158	59.92214	55.34924	61.18736	62.816
12	1342.236	57.32996	57.34544	57.62624	61.2041	55.95818	61.71314	65.35706
14	1412.124	57.72092	57.49628	57.81722	62.5433	57.01442	62.90582	67.91648
16	1416.497	58.11854	57.92522	58.22528	64.09904	59.24408	64.83326	71.09564
18	1394.043	58.7777	58.40726	58.65746	65.33258	61.41074	66.87968	74.17004
20	1477.734	60.31454	59.95184	59.76302	67.982	66.83144	71.23424	80.84786
22	1494.433	62.28788	62.19338	61.27772	70.80224	73.27364	76.28108	88.36016
24	1468.997	64.78178	65.0624	63.20876	73.97762	80.7395	82.13306	97.55186
26	1499.473	68.0792	68.648	65.62562	77.41094	88.35764	86.76626	107.3107
28	1521.95	72.25664	73.04684	68.68454	81.27338	96.48356	95.81234	117.7478
30	1534.906	76.4429	77.39438	71.71538	84.8894	103.2575	103.3392	126.6009
32	1501.975	81.80366	82.319	75.64352	89.16512	109.8591	111.8111	135.635
34	1569.772	88.40984	88.46384	80.28824	94.55054	116.0178	121.0847	145.0772
36	1557.896	94.89488	94.31726	84.69932	100.1829	121.4882	130.2191	153.2328
38	1602.201	101.0521	100.1510	89.25854	106.0541	127.6500	138.6620	159.8570
40	1608.44	106.1535	105.8671	94.21664	112.1536	132.7157	145.7771	165.1245
42	1630.126	110.6096	111.4777	99.25556	118.4795	137.6364	151.9899	169.5673
44	1649.03	114.4824	117.0946	103.8543	124.4528	142.2006	156.7553	173.3336
46	1647.667	118.2925	122.3339	108.3813	130.0474	146.6276	161.7035	176.7302
48	1614.524	121.2355	127.5281	112.5762	135.0572	151.1603	166.2832	179.9358
50	1671.454	123.8268	132.0152	116.3201	139.4904	155.5050	170.3121	183.0093
52	1684.047	126.1342	136.2659	119.9568	144.0417	159.5588	174.0396	186.3435
54	1679.887	128.6173	140.2977	123.4700	147.6566	163.5612	178.0698	189.4285
56	1692.676	131.2973	144.5055	127.4097	151.2001	167.1211	181.7393	193.4947
58	1704.729	134.2409	148.1970	131.5203	154.5166	171.0464	185.2847	197.7173
60	1704.938	137.4416	152.492	135.7782	158.6814	174.5789	188.7456	202.8675
62	1711.428	140.6948	156.3627	140.0255	163.0697	178.2813	194.1908	208.3643
64	1711.050	144.4391	160.4845	144.4323	167.6166	181.7702	199.5092	214.592
66	1712.332	148.2508	165.3117	148.6398	172.2873	185.8217	204.2137	221.5274

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3 Original Data Printouts of thermocouple Results in Degrees Centigrade

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PNV 11 18 20 10-94

31-0106
LASALLE

SCRM (PMS) 0
FURNACE 0
SIDE A 0
SIDE B 0
CONDUCTOR 0
CONDUIT A 0
CONDUIT B 0
J BOX 0
CABLE ENT 0

T 7 25:14:43.3
C 001 0013.89 oac C 002 0014.25 oac C 003 0013.91 oac C 004 012.814 oac
C 005 0013.84 oac C 006 0014.05 oac C 007 0013.88 oac C 008 0014.02 oac
C 009 0013.74 oac C 010 0013.96 oac C 011 0013.81 oac C 012 0013.87 oac
C 013 0013.79 oac C 014 0013.87 oac C 015 0013.74 oac C 016 0013.85 oac
C 017 0013.69 oac C 018 0013.94 oac C 019 0013.94 oac C 020 0014.27 oac
C 021 0013.54 oac C 022 0013.92 oac C 023 0013.62 oac C 024 0013.74 oac
C 025 0013.77 oac C 026 0013.93 oac C 027 0013.73 oac C 028 0013.81 oac
C 029 0013.75 oac C 030 0013.91 oac C 031 0013.79 oac C 032 0013.92 oac
C 033 0013.87 oac C 034 0013.99 oac C 035 0013.94 oac C 036 0013.90 oac
C 037 0014.13 oac C 038 0014.23 oac C 039 0014.29 oac C 040 0014.40 oac
C 041 0014.15 oac C 042 0014.33 oac C 043 0013.90 oac C 044 0014.01 oac
C 045 0013.68 oac C 046 0013.67 oac C 047 0013.46 oac C 048 0013.68 oac
C 049 0013.85 oac C 050 0013.54 oac C 051 0013.57 oac C 052 0013.84 oac
C 053 0013.80 oac C 054 0013.98 oac C 055 0013.93 oac C 056 0014.12 oac
C 057 0014.10 oac C 058 0014.26 oac C 059 0014.26 oac C 060 0014.47 oac
C 061 0014.30 oac C 062 0014.53 oac C 063 0014.17 oac C 064 0014.33 oac
C 065 0014.02 oac C 066 0014.12 oac C 067 0013.80 oac C 068 0014.09 oac
C 069 0013.62 oac C 070 0013.87 oac C 071 0013.59 oac C 072 0013.90 oac
C 073 0015.90 oac C 074 0014.09 oac C 075 0014.09 oac C 076 0014.30 oac
C 077 0014.21 oac C 078 0014.69 oac C 079 0014.97 oac C 080 0014.75 oac
C 081 0014.16 oac C 082 0014.57 oac C 083 0013.80 oac C 084 0014.09 oac
C 085 0013.75 oac C 086 0014.23 oac C 087 E2 Overid oac C 088 E2 Overid oac
C 089 0013.59 oac C 090 0013.71 oac C 091 0013.50 oac C 092 0014.25 oac
C 093 0013.46 oac C 097 0014.68 oac C 098 0014.63 oac C 099 0014.44 oac
C 100 0014.43 oac C 101 0014.40 oac C 102 0014.41 oac C 103 0014.00 oac
C 104 0014.87 oac C 105 0013.81 oac C 106 0013.57 oac C 107 0014.44 oac
C 108 0013.19 oac C 109 0013.78 oac C 110 0013.80 oac C 111 0014.77 oac
C 112 0014.47 oac C 113 0013.77 oac C 114 0013.99 oac C 115 0014.77 oac
C 116 0014.77 oac C 117 0013.74 oac C 118 0013.74 oac C 119 0013.74 oac

SCRM (PMS) 2.00000
FURNACE 338.140
SIDE A 13.7696
SIDE B 13.9849
CONDUCTOR 14.8296
CONDUIT A 14.2543
CONDUIT B 12.6678
J BOX 14.5680
CABLE ENT 14.0963

T 7 25:18:34.3
C 001 0013.89 oac C 002 0014.25 oac C 003 0013.91 oac C 004 012.809 oac
C 005 0013.82 oac C 006 0014.03 oac C 007 0013.78 oac C 008 0014.03 oac
C 009 0013.72 oac C 010 0013.93 oac C 011 0013.76 oac C 012 0013.74 oac
C 013 0013.77 oac C 014 0013.85 oac C 015 0013.72 oac C 016 0013.87 oac
C 017 0013.67 oac C 018 0013.96 oac C 019 0013.94 oac C 020 0014.24 oac
C 021 0013.52 oac C 022 0013.91 oac C 023 0013.59 oac C 024 0013.68 oac
C 025 0013.74 oac C 026 0013.88 oac C 027 0013.81 oac C 028 0013.54 oac
C 029 0013.55 oac C 030 0013.46 oac C 031 0013.63 oac C 032 0013.53 oac
C 033 0013.42 oac C 034 0013.49 oac C 035 0013.78 oac C 036 0013.92 oac
C 037 0014.11 oac C 038 0014.19 oac C 039 0014.24 oac C 040 0014.57 oac
C 041 0014.13 oac C 042 0014.32 oac C 043 0013.95 oac C 044 0013.96 oac
C 045 0013.55 oac C 046 0013.63 oac C 047 0013.39 oac C 048 0013.52 oac
C 049 0013.55 oac C 050 0013.49 oac C 051 0013.59 oac C 052 0013.84 oac
C 053 0013.80 oac C 054 0013.94 oac C 055 0013.91 oac C 056 0014.07 oac
C 057 0014.03 oac C 058 0014.24 oac C 059 0014.24 oac C 060 0014.40 oac
C 061 0014.36 oac C 062 0014.51 oac C 063 0014.13 oac C 064 0014.32 oac
C 065 0014.00 oac C 066 0014.11 oac C 067 0013.86 oac C 068 0014.07 oac
C 069 0013.67 oac C 070 0013.87 oac C 071 0013.56 oac C 072 0013.86 oac
C 073 016.015 oac C 074 0014.09 oac C 075 0014.11 oac C 076 0014.38 oac
C 077 0014.22 oac C 078 0014.60 oac C 079 0015.02 oac C 080 0014.77 oac
C 081 0014.25 oac C 082 0014.62 oac C 083 0013.82 oac C 084 0014.13 oac
C 085 0013.82 oac C 086 0014.77 oac C 087 E2 Overid oac C 088 E2 Overid oac
C 089 0013.54 oac C 090 0013.71 oac C 091 0013.56 oac C 092 0014.25 oac
C 093 0013.63 oac C 097 0014.59 oac C 098 0014.62 oac C 099 0014.44 oac
C 100 0014.79 oac C 101 0014.49 oac C 102 0014.42 oac C 103 0014.00 oac
C 104 0014.09 oac C 105 0013.80 oac C 106 0013.173 oac C 107 0014.07 oac
C 108 0014.09 oac C 109 0013.78 oac C 110 0013.411 oac C 111 0013.971 oac
C 112 0013.87 oac C 113 0013.235 oac C 114 0013.247 oac C 115 0014.122 oac
C 116 0013.316 oac C 117 0013.487 oac C 118 0013.794 oac C 119 0013.794 oac

FAVERDALE TECHNOLOGY

TEST RECORD FAVERDALE TECHNOLOGY

ABSTRACT No: 31-0106 CEMHELD

REGULATED LASALLE

TEST CONFIGURATION: ASTM E119 FIRE CURVE

DATE: 10/6/94

ISSUE: 1

Prepared by: Anthony Verboon 10/6/94

TEST REPORT FOR A 1 HOUR FIRE TEST ON
 DARMATT KM1 FIRE PROTECTION SYSTEM FOR
 SITE CONFIGURATIONS AT THE LASALLE
 NUCLEAR POWER PLANT

Document No.
 FTCTR/94/0094

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SCRM (MINS) 4 40000
FURNACE 400.420
SIDE A 1.120
SIDE B 1.1361
CONDUCTOR 4 4400
CONDUIT A 4 2650
CONDUIT B 11 1520
SIDE 4 2170
TABLE ENT 4 1223
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001 0013.00 o/c C 002 0014.21 o/c C 003 0013.84 o/c C 004 012.006 o/c
002 0013.79 o/c C 006 0013.98 o/c C 007 0013.75 o/c C 008 0013.96 o/c
009 0013.64 o/c C 010 0013.91 o/c C 011 0013.76 o/c C 012 0013.83 o/c
013 0013.75 o/c C 014 0013.84 o/c C 015 0013.68 o/c C 016 0013.84 o/c
017 0013.67 o/c C 018 0013.91 o/c C 019 0013.93 o/c C 020 0014.74 o/c
021 0013.53 o/c C 022 0013.92 o/c C 023 0013.62 o/c C 024 0013.73 o/c
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029 0013.73 o/c C 030 0013.89 o/c C 031 0013.75 o/c C 032 0013.87 o/c
033 0013.83 o/c C 034 0013.92 o/c C 035 0013.92 o/c C 036 0013.95 o/c
037 0014.87 o/c C 038 0014.16 o/c C 039 0014.25 o/c C 040 0014.36 o/c
041 0014.17 o/c C 042 0014.32 o/c C 043 0013.95 o/c C 044 0013.97 o/c
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049 0013.81 o/c C 050 0013.48 o/c C 051 0013.54 o/c C 052 0013.81 o/c
053 0013.77 o/c C 054 0013.94 o/c C 055 0013.93 o/c C 056 0014.88 o/c
057 0014.89 o/c C 058 0014.25 o/c C 059 0014.25 o/c C 060 0014.43 o/c
061 0014.25 o/c C 062 0014.49 o/c C 063 0014.13 o/c C 064 0014.31 o/c
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085 0013.84 o/c C 086 0015.23 o/c C 087 E2 Overid o/c C 088 E2 Overid o/c
089 0013.55 o/c C 090 0013.67 o/c C 091 0013.56 o/c C 092 0014.54 o/c
093 0012.18 o/c C 094 0014.51 o/c C 095 0014.52 o/c C 096 0014.34 o/c
100 0014.74 o/c C 101 0014.58 o/c C 102 0014.48 o/c C 103 0014.85 o/c
104 0014.22 o/c C 105 0014.87 o/c C 113 0462.95 o/c C 114 0454.83 o/c
115 0472.79 o/c C 116 0464.37 o/c C 117 0472.57 o/c C 118 0473.88 o/c
119 0441.81 o/c C 120 0488.46 o/c C 121 0479.58 o/c C 122 0497.52 o/c
123 056.927 o/c C 124 051.247 o/c C 126 537.388 o/c
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FURNACE 389.877
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SIDE B 1.15118
CONDUCTOR 4 4520
CONDUIT A 4 2990
CONDUIT B 11 1481
SIDE 4 2775
TABLE ENT 4 5418
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085 0014.43 o/c C 086 016.344 o/c C 087 E2 Overid o/c C 088 E2 Overid o/c
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093 0012.89 o/c C 094 0014.57 o/c C 095 0014.52 o/c C 096 0014.35 o/c
097 0014.31 o/c C 098 0014.52 o/c C 099 0014.25 o/c C 100 0014.31 o/c
101 0014.54 o/c C 102 0014.52 o/c C 103 0014.42 o/c C 104 0014.71 o/c
105 0014.54 o/c C 106 0014.46 o/c C 113 596.451 o/c C 114 579.883 o/c
115 521.258 o/c C 116 593.296 o/c C 117 488.583 o/c C 118 487.247 o/c
119 580.845 o/c C 120 581.488 o/c C 121 578.449 o/c C 122 588.546 o/c
123 0586.76 o/c C 124 0672.79 o/c C 126 0672.83 o/c
S T 2

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SCAN (MKS) 8.0000
FURNACE 153.815
SIDE A 13.8510
SIDE B 13.9106
CONDUCTOR 14.1847
CONDUIT A 14.8444
CONDUIT B 11.7819
J BOX 15.8267
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889 0013.66 o/c C 890 0013.88 o/c C 891 0013.77 o/c C 892 0013.81 o/c
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897 0013.67 o/c C 898 0013.93 o/c C 899 0013.95 o/c C 900 0014.34 o/c
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909 0013.71 o/c C 910 0013.85 o/c C 911 0013.77 o/c C 912 0013.86 o/c
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941 0014.37 o/c C 942 0014.54 o/c C 943 0014.15 o/c C 944 0014.25 o/c
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989 0049.83 o/c C 990 0013.88 o/c C 991 058.857 o/c C 992 058.427 o/c
993 0048.91 o/c C 994 0014.58 o/c C 995 0014.29 o/c
S T 2
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SIDE A 13.9414
SIDE B 13.9913
CONDUCTOR 14.1711
CONDUIT A 15.5384
CONDUIT B 12.9718
J BOX 16.2198
TABLE ENT 17.1855
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893 0013.93 o/c C 894 0015.38 o/c C 895 0013.71 o/c C 896 0014.87 o/c
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921 0014.23 o/c C 922 0015.78 o/c C 923 0014.88 o/c C 924 0013.57 o/c
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965 0014.56 o/c C 966 024.819 o/c C 967 E2 Derrid o/c C 968 E2 Derrid o/c
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981 017.238 o/c C 982 016.171 o/c C 983 0785.86 o/c C 984 0016.79 o/c
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989 0013.81 o/c C 990 0013.11 o/c C 991 0014.83 o/c C 992 0785.58 o/c
993 0738.81 o/c C 994 0761.69 o/c C 995 0014.72 o/c
S T 2
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TEST REPORT FOR A 1 HOUR FIRE TEST ON
 DARMATT KM1 FIRE PROTECTION SYSTEM FOR
 SITE CONFIGURATIONS AT THE LASALLE
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SCRM (MINS) 14.2894
 FURNACE 17.989
 SIDE A 14.8722
 SIDE B 14.8888
 CONDUCTOR 14.1268
 CONDUIT A 15.2245
 CONDUIT B 17.2181
 BOX 18.2873
 CABLE EXT 18.5227

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 817 0013.78 o/c C 818 0014.14 o/c C 819 0014.22 o/c C 820 0015.11 o/c
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 916 0723.93 o/c

SCRM (MINS) 14.8888
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 SIDE A 14.2864
 SIDE B 14.1878
 CONDUCTOR 14.1485
 CONDUIT A 17.8183
 CONDUIT B 13.8999
 BOX 17.1965
 CABLE EXT 78.8864

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 916 0013.29 o/c

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ICR# (MINS) 16.0000
TURNACE 74.919
SIDE A 14.5671
SIDE B 14.5683
CONDUCTOR 14.7049
CONDUIT A 14.5823
CONDUIT B 14.5823
J BOX 19.3099
CABLE ENT 23.2555
S T 2 15:28:14.8
C 001 0013.55 o/c C 002 0014.23 o/c C 003 0014.80 o/c C 004 011.785 o/c
C 005 0013.97 o/c C 006 0014.12 o/c C 007 0013.92 o/c C 008 0014.16 o/c
C 009 0013.54 o/c C 010 0014.89 o/c C 011 0014.87 o/c C 012 0014.10 o/c
C 013 0014.74 o/c C 014 017.595 o/c C 015 0014.92 o/c C 016 017.250 o/c
C 017 0014.80 o/c C 018 0014.60 o/c C 019 0014.97 o/c C 020 0015.77 o/c
C 021 0013.57 o/c C 022 0013.90 o/c C 023 0013.64 o/c C 024 0013.75 o/c
C 025 0013.75 o/c C 026 0013.90 o/c C 027 0013.72 o/c C 028 0013.79 o/c
C 029 0013.74 o/c C 030 0013.80 o/c C 031 0013.81 o/c C 032 0013.85 o/c
C 033 0013.98 o/c C 034 0013.56 o/c C 035 0014.84 o/c C 036 0014.15 o/c
C 037 0014.29 o/c C 038 0014.48 o/c C 039 0014.66 o/c C 040 0014.80 o/c
C 041 0014.87 o/c C 042 016.562 o/c C 043 0015.50 o/c C 044 0015.15 o/c
C 045 0014.15 o/c C 046 0014.40 o/c C 047 0014.87 o/c C 048 0014.81 o/c
C 049 0013.84 o/c C 050 0013.64 o/c C 051 0013.73 o/c C 052 0014.81 o/c
C 053 0014.80 o/c C 054 0014.13 o/c C 055 0014.14 o/c C 056 0014.27 o/c
C 057 0014.24 o/c C 058 0014.50 o/c C 059 0014.55 o/c C 060 0014.77 o/c
C 061 0014.64 o/c C 062 0014.91 o/c C 063 0014.60 o/c C 064 0014.83 o/c
C 065 0014.73 o/c C 066 0014.87 o/c C 067 0014.51 o/c C 068 0014.75 o/c
C 069 0014.48 o/c C 070 0014.60 o/c C 071 0014.13 o/c C 072 0014.64 o/c
C 073 017.720 o/c C 074 0014.86 o/c C 075 0014.15 o/c C 076 0014.45 o/c
C 077 0014.25 o/c C 078 0015.31 o/c C 079 016.280 o/c C 080 023.740 o/c
C 081 0025.34 o/c C 082 016.234 o/c C 083 0013.92 o/c C 084 0014.93 o/c
C 085 017.804 o/c C 086 0020.80 o/c C 087 E2 Overid o/c C 088 E2 Overid o/c
C 089 0013.71 o/c C 090 0014.57 o/c C 091 016.490 o/c C 092 0026.29 o/c
C 093 0014.75 o/c C 094 023.570 o/c C 095 017.870 o/c C 096 0015.32 o/c
C 100 016.840 o/c C 101 0015.13 o/c C 102 019.199 o/c C 103 022.506 o/c
C 104 021.285 o/c C 105 019.430 o/c C 106 0770.50 o/c C 107 0768.87 o/c
C 108 0769.30 o/c C 109 0769.49 o/c C 110 0765.87 o/c C 111 0774.51 o/c
C 112 0776.87 o/c C 113 0774.86 o/c C 114 0777.30 o/c C 115 0791.81 o/c
C 116 0784.12 o/c C 117 0759.60 o/c C 118 0765.10 o/c
D T 2
*****
ICR# (MINS) 17.0000
TURNACE 74.622
SIDE A 14.8695
SIDE B 14.6349
CONDUCTOR 14.7056
CONDUIT A 14.5823
CONDUIT B 14.5823
J BOX 19.3099
CABLE ENT 23.2555
S T 2 15:32:13.2
C 001 0014.12 o/c C 002 0014.25 o/c C 003 0014.27 o/c C 004 011.802 o/c
C 005 0014.20 o/c C 006 0014.29 o/c C 007 0014.23 o/c C 008 0014.44 o/c
C 009 0014.96 o/c C 010 0014.25 o/c C 011 0014.30 o/c C 012 0014.41 o/c
C 013 0015.31 o/c C 014 010.432 o/c C 015 0015.82 o/c C 016 019.515 o/c
C 017 0014.32 o/c C 018 0015.22 o/c C 019 0015.70 o/c C 020 016.879 o/c
C 021 0013.25 o/c C 022 0013.87 o/c C 023 0013.66 o/c C 024 0013.79 o/c
C 025 0013.81 o/c C 026 0013.96 o/c C 027 0013.70 o/c C 028 0013.85 o/c
C 029 0013.90 o/c C 030 0013.93 o/c C 031 0013.87 o/c C 032 0013.80 o/c
C 033 0014.80 o/c C 034 0014.86 o/c C 035 0014.24 o/c C 036 0014.24 o/c
C 037 0014.54 o/c C 038 0014.69 o/c C 039 0015.80 o/c C 040 0015.21 o/c
C 041 0015.20 o/c C 042 017.810 o/c C 043 016.101 o/c C 044 016.879 o/c
C 045 0014.64 o/c C 046 0015.10 o/c C 047 0014.70 o/c C 048 0014.49 o/c
C 049 0013.11 o/c C 050 0013.71 o/c C 051 0013.83 o/c C 052 0014.14 o/c
C 053 0014.14 o/c C 054 0014.25 o/c C 055 0014.29 o/c C 056 0014.35 o/c
C 057 0014.44 o/c C 058 0014.60 o/c C 059 0014.49 o/c C 060 0014.90 o/c
C 061 0014.73 o/c C 062 0015.12 o/c C 063 0014.83 o/c C 064 0015.15 o/c
C 065 0015.80 o/c C 066 0015.23 o/c C 067 0014.80 o/c C 068 0015.13 o/c
C 069 0015.80 o/c C 070 0013.12 o/c C 071 0014.54 o/c C 072 0015.14 o/c
C 073 010.581 o/c C 074 0014.23 o/c C 075 0014.25 o/c C 076 0014.42 o/c
C 077 0014.50 o/c C 078 0015.64 o/c C 079 017.840 o/c C 080 0025.66 o/c
C 081 0027.43 o/c C 082 017.370 o/c C 083 0014.50 o/c C 084 0015.50 o/c
C 085 019.229 o/c C 086 0029.86 o/c C 087 E2 Overid o/c C 088 E2 Overid o/c
C 089 0014.85 o/c C 090 0015.84 o/c C 091 017.650 o/c C 092 0027.82 o/c
C 093 016.207 o/c C 094 0026.84 o/c C 095 016.324 o/c C 096 016.187 o/c
C 100 010.302 o/c C 101 0015.29 o/c C 102 021.449 o/c C 103 024.743 o/c
C 104 024.254 o/c C 105 021.845 o/c C 106 0768.44 o/c C 107 0764.52 o/c
C 108 0764.53 o/c C 109 0765.85 o/c C 110 0764.47 o/c C 111 0765.87 o/c
C 112 0743.23 o/c C 113 0765.80 o/c C 114 0777.94 o/c C 115 0790.50 o/c
C 116 0778.49 o/c C 117 0766.20 o/c C 118 0771.80 o/c
D T 2
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TEST REPORT FOR A 1 HOUR FIRE TEST ON
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SCAN (MINS) 20.0000
FURNACE 799.223
SIDE A 15.7473
SIDE B 15.5667
CONDUCTOR 15.4443
CONDUIT A 18.4396
CONDUIT B 19.4842
J BOX 21.3996
CABLE ENT 22.2753
T 2 15.3413.9
881 8814.44 o/c 787 8814.65 o/c 880 8814.81 o/c 884 8811.769 o/c
885 8814.89 o/c 886 8814.93 o/c 887 8814.98 o/c 888 8814.78 o/c
889 8814.53 o/c 814 878.344 o/c 811 8814.85 o/c 812 8814.78 o/c
813 814.898 o/c 814 878.344 o/c 815 817.238 o/c 816 873.458 o/c
817 8814.36 o/c 818 816.493 o/c 819 817.887 o/c 820 816.838 o/c
821 8813.64 o/c 822 8813.96 o/c 823 8813.84 o/c 824 8813.59 o/c
825 8814.82 o/c 826 8814.18 o/c 827 8813.95 o/c 828 8814.82 o/c
829 8813.99 o/c 830 8814.14 o/c 831 8814.13 o/c 832 8814.89 o/c
833 8814.38 o/c 834 8814.65 o/c 835 8814.99 o/c 836 8815.81 o/c
837 8815.84 o/c 838 8815.18 o/c 839 8815.68 o/c 840 8815.93 o/c
841 816.262 o/c 842 816.228 o/c 843 817.222 o/c 844 817.659 o/c
845 8815.84 o/c 846 816.653 o/c 847 816.865 o/c 848 8815.58 o/c
849 8813.76 o/c 850 8813.92 o/c 851 8814.86 o/c 852 8814.43 o/c
853 8814.51 o/c 854 8814.61 o/c 855 8814.63 o/c 856 8814.49 o/c
857 8814.78 o/c 858 8815.82 o/c 859 8815.14 o/c 860 8815.48 o/c
861 8815.76 o/c 862 8815.68 o/c 863 8815.33 o/c 864 8815.83 o/c
865 8815.71 o/c 866 8815.79 o/c 867 8815.28 o/c 868 8815.81 o/c
869 816.845 o/c 870 816.821 o/c 871 8815.25 o/c 872 816.864 o/c
873 819.675 o/c 874 8814.59 o/c 875 8814.63 o/c 876 8814.92 o/c
877 8814.94 o/c 878 816.475 o/c 879 817.871 o/c 880 8827.19 o/c
881 8829.34 o/c 882 828.239 o/c 883 8815.37 o/c 884 816.721 o/c
885 821.814 o/c 886 8831.17 o/c 887 E2 Derrid o/c 888 E2 Derrid o/c
889 8814.85 o/c 890 8815.68 o/c 891 819.123 o/c 892 8829.34 o/c
893 818.747 o/c 894 8828.40 o/c 895 828.239 o/c 896 817.467 o/c
897 828.776 o/c 898 8815.79 o/c 899 824.584 o/c 900 8828.75 o/c
901 8828.59 o/c 902 824.158 o/c 903 8882.16 o/c 904 8888.17 o/c
905 8793.22 o/c 906 8798.27 o/c 907 8798.74 o/c 908 8789.79 o/c
909 8793.55 o/c 910 8798.83 o/c 911 8882.49 o/c 912 8813.48 o/c
913 8797.75 o/c 914 8786.74 o/c 915 8792.85 o/c
S T 2
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SCAN (MINS) 22.0000
FURNACE 799.328
SIDE A 16.8214
SIDE B 16.7923
CONDUCTOR 16.2792
CONDUIT A 21.5963
CONDUIT B 23.8698
J BOX 24.6835
CABLE ENT 31.4534
T 2 15.3413.9
881 8815.67 o/c 882 8815.88 o/c 883 8815.28 o/c 884 811.514 o/c
885 8815.39 o/c 886 8815.77 o/c 887 8815.86 o/c 888 8815.42 o/c
889 8815.12 o/c 890 8815.53 o/c 891 8815.72 o/c 892 812.885.52 o/c
893 817.196 o/c 894 872.637 o/c 895 819.568 o/c 896 816.8825.49 o/c
897 8815.83 o/c 898 818.349 o/c 899 819.222 o/c 900 878.817.984 o/c
901 8813.79 o/c 902 8814.87 o/c 903 8814.84 o/c 904 874.8814.24 o/c
905 8814.22 o/c 906 826.8814.39 o/c 907 8814.17 o/c 908 829.8814.35 o/c
909 8814.33 o/c 910 8814.57 o/c 911 8814.63 o/c 912 832.8814.51 o/c
913 8815.31 o/c 914 8815.79 o/c 915 816.189 o/c 916 836.816.184 o/c
917 816.148 o/c 918 816.222 o/c 919 816.788 o/c 920 848.817.129 o/c
921 817.391 o/c 922 819.247 o/c 923 818.538 o/c 924 819.795 o/c
925 817.857 o/c 926 818.621 o/c 927 817.885 o/c 928 848.816.873 o/c
929 8813.31 o/c 930 8814.14 o/c 931 8814.35 o/c 932 8814.79 o/c
933 8814.94 o/c 934 8815.87 o/c 935 8815.84 o/c 936 8815.85 o/c
937 8815.17 o/c 938 8815.49 o/c 939 8815.68 o/c 940 8815.95 o/c
941 8815.88 o/c 942 816.284 o/c 943 816.862 o/c 944 816.673 o/c
945 816.648 o/c 946 816.642 o/c 947 816.811 o/c 948 868.816.671 o/c
949 817.223 o/c 950 878.817.213 o/c 951 816.291 o/c 952 872.817.485 o/c
953 821.228 o/c 954 8815.71 o/c 955 816.158 o/c 956 874.816.338 o/c
957 816.479 o/c 958 878.817.547 o/c 959 819.411 o/c 960 888.8828.68 o/c
961 8831.45 o/c 962 822.481 o/c 963 816.465 o/c 964 884.818.873 o/c
965 822.598 o/c 966 832.764 o/c 967 E2 Derrid o/c 968 E2 Derrid o/c
969 816.122 o/c 970 816.622 o/c 971 828.677 o/c 972 892.8821.82 o/c
973 821.988 o/c 974 8831.78 o/c 975 822.651 o/c 976 899.819.213 o/c
977 823.866 o/c 978 816.528 o/c 979 8829.84 o/c 980 8831.88 o/c
981 8831.91 o/c 982 8826.63 o/c 983 8792.35 o/c 984 8789.98 o/c
985 8785.28 o/c 986 8889.74 o/c 987 8889.67 o/c 988 8794.63 o/c
989 8784.34 o/c 990 8884.68 o/c 991 8885.42 o/c 992 8817.23 o/c
993 8812.72 o/c 994 8799.48 o/c 995 8885.84 o/c
S T 2
    
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TEST REPORT FOR A 1 HOUR FIRE TEST ON
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 SITE CONFIGURATIONS AT THE LASALLE
 NUCLEAR POWER PLANT

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*****
SCAN (MINS) 24.0000
FURNACE 118.729
SIDE A 18.2403
SIDE B 19.4646
CONDUCTOR 27.2925
CONDUIT A 21.2036
CONDUIT B 27.2412
T BOX 27.9721
CABLE ENT 26.6195
S T 2 15:30:15.1
C 001 0015.10 oac C 002 0015.19 oac C 003 0015.01 oac C 004 011.210 oac
C 005 016.322 oac C 006 016.120 oac C 007 0015.02 oac C 008 016.493 oac
C 009 016.366 oac C 010 017.023 oac C 011 017.297 oac C 012 016.716 oac
C 013 019.051 oac C 014 0025.16 oac C 015 022.514 oac C 016 0020.05 oac
C 017 017.213 oac C 018 021.070 oac C 019 022.494 oac C 020 019.022 oac
C 021 0014.10 oac C 022 0014.22 oac C 023 0014.43 oac C 024 0014.62 oac
C 025 0014.60 oac C 026 0014.00 oac C 027 0014.72 oac C 028 0015.05 oac
C 029 0015.23 oac C 030 0015.66 oac C 031 0015.06 oac C 032 0015.50 oac
C 033 016.940 oac C 034 017.517 oac C 035 017.053 oac C 036 017.664 oac
C 037 017.645 oac C 038 017.003 oac C 039 010.261 oac C 040 010.781 oac
C 041 010.079 oac C 042 020.140 oac C 043 020.072 oac C 044 022.457 oac
C 045 019.270 oac C 046 021.581 oac C 047 020.493 oac C 048 019.123 oac
C 049 0013.59 oac C 050 0014.56 oac C 051 0014.02 oac C 052 0015.37 oac
C 053 0015.59 oac C 054 0015.61 oac C 055 0015.60 oac C 056 0015.63 oac
C 057 0015.01 oac C 058 016.245 oac C 059 016.530 oac C 060 016.029 oac
C 061 016.776 oac C 062 017.267 oac C 063 017.126 oac C 064 017.917 oac
C 065 017.070 oac C 066 010.001 oac C 067 017.271 oac C 068 010.132 oac
C 069 019.070 oac C 070 010.974 oac C 071 017.911 oac C 072 019.334 oac
C 073 023.263 oac C 074 017.296 oac C 075 017.010 oac C 076 017.910 oac
C 077 010.045 oac C 078 019.171 oac C 079 021.071 oac C 080 0029.99 oac
C 081 023.640 oac C 082 024.607 oac C 083 010.245 oac C 084 020.230 oac
C 085 024.453 oac C 086 024.525 oac C 087 E2 Overid oac C 088 E2 Overid oac
C 089 017.062 oac C 090 010.090 oac C 091 022.409 oac C 092 022.774 oac
C 093 0025.97 oac C 094 025.260 oac C 095 0025.04 oac C 096 022.025 oac
C 100 0027.37 oac C 101 017.510 oac C 102 023.071 oac C 103 026.700 oac
C 104 027.350 oac C 105 0031.22 oac C 110 0002.11 oac C 114 0790.00 oac
C 115 0001.77 oac C 116 0799.73 oac C 117 0799.55 oac C 118 0010.50 oac
C 119 0799.76 oac C 120 0030.59 oac C 121 0025.17 oac C 122 0046.02 oac
C 123 0040.01 oac C 124 0025.27 oac C 106 0025.00 oac
S T 2
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SCAN (MINS) 26.0000
FURNACE 010.119
SIDE A 20.1137
SIDE B 20.4215
CONDUCTOR 10.7319
CONDUIT A 25.2027
CONDUIT B 21.2966
T BOX 21.4424
CABLE ENT 42.0459
S T 2 15:40:13.7
C 001 0015.59 oac C 002 0015.67 oac C 003 016.639 oac C 004 011.004 oac
C 005 017.429 oac C 006 017.175 oac C 007 016.954 oac C 008 017.092 oac
C 009 017.096 oac C 010 010.035 oac C 011 019.266 oac C 012 010.200 oac
C 013 020.090 oac C 014 0027.02 oac C 015 0026.15 oac C 016 0021.94 oac
C 017 019.111 oac C 018 0025.03 oac C 019 0027.12 oac C 020 022.305 oac
C 021 0014.57 oac C 022 0014.78 oac C 023 0014.99 oac C 024 0015.19 oac
C 025 0015.23 oac C 026 0015.50 oac C 027 0015.49 oac C 028 016.051 oac
C 029 016.454 oac C 030 017.061 oac C 031 017.326 oac C 032 016.963 oac
C 033 010.557 oac C 034 019.040 oac C 035 019.369 oac C 036 019.302 oac
C 037 019.204 oac C 038 019.527 oac C 039 020.009 oac C 040 020.370 oac
C 041 020.697 oac C 042 021.626 oac C 043 022.173 oac C 044 0026.20 oac
C 045 022.317 oac C 046 0025.46 oac C 047 024.016 oac C 048 021.092 oac
C 049 0013.75 oac C 050 0014.90 oac C 051 0015.23 oac C 052 0015.99 oac
C 053 016.321 oac C 054 016.316 oac C 055 016.295 oac C 056 016.305 oac
C 057 016.451 oac C 058 017.209 oac C 059 017.505 oac C 060 017.901 oac
C 061 017.702 oac C 062 010.405 oac C 063 010.395 oac C 064 019.346 oac
C 065 019.331 oac C 066 019.429 oac C 067 010.632 oac C 068 019.623 oac
C 069 021.057 oac C 070 021.010 oac C 071 019.069 oac C 072 021.665 oac
C 073 0025.77 oac C 074 010.332 oac C 075 019.644 oac C 076 019.527 oac
C 077 019.452 oac C 078 020.734 oac C 079 022.070 oac C 080 0031.00 oac
C 081 025.681 oac C 082 0026.70 oac C 083 020.044 oac C 084 022.741 oac
C 085 0026.45 oac C 086 016.354 oac C 087 E2 Overid oac C 088 E2 Overid oac
C 089 019.000 oac C 090 020.232 oac C 091 024.214 oac C 092 024.616 oac
C 093 0030.17 oac C 094 020.150 oac C 095 0029.64 oac C 096 024.906 oac
C 100 0031.20 oac C 101 010.491 oac C 102 020.296 oac C 103 041.964 oac
C 104 043.145 oac C 105 024.276 oac C 110 0017.67 oac C 114 0012.94 oac
C 115 0026.07 oac C 116 0016.21 oac C 117 0014.50 oac C 118 0014.92 oac
C 119 0001.90 oac C 120 0015.34 oac C 121 0031.57 oac C 122 0051.06 oac
C 123 0030.74 oac C 124 0022.13 oac C 106 0020.10 oac
S T 2

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 SCRN (PKNS) 20 8900
 FURNACE 134 125
 SIDE A 11 4452
 SIDE B 11 1668
 CONDUCTOR 29 4172
 CONDUIT A 27 4126
 CONDUIT B 22 3935
 J BOX 22 5536
 CABLE ENT 47 5993
 S T 2 15:42:15 B

C 001 816.257	oac	C 002 816.274	oac	C 003 817.992	oac	C 004 818.678	oac
C 005 818.022	oac	C 006 818.578	oac	C 007 818.368	oac	C 008 819.583	oac
C 009 8084.99	oac	C 010 828.981	oac	C 011 821.269	oac	C 012 828.368	oac
C 013 822.969	oac	C 014 8038.79	oac	C 015 8038.53	oac	C 016 826.882	oac
C 017 821.880	oac	C 018 8038.38	oac	C 019 823.266	oac	C 020 825.82	oac
C 021 8015.31	oac	C 022 8015.22	oac	C 023 8015.89	oac	C 024 816.198	oac
C 025 816.327	oac	C 026 816.652	oac	C 027 816.683	oac	C 028 817.352	oac
C 029 817.957	oac	C 030 818.739	oac	C 031 819.884	oac	C 032 818.632	oac
C 033 828.348	oac	C 034 821.816	oac	C 035 821.186	oac	C 036 821.877	oac
C 037 821.184	oac	C 038 821.337	oac	C 039 821.797	oac	C 040 822.164	oac
C 043 822.550	oac	C 042 823.728	oac	C 043 8025.72	oac	C 044 8038.94	oac
C 045 8026.45	oac	C 046 8038.27	oac	C 047 8028.47	oac	C 048 8025.81	oac
C 049 8014.13	oac	C 050 8015.61	oac	C 051 816.189	oac	C 052 816.324	oac
C 053 817.366	oac	C 054 817.488	oac	C 055 817.414	oac	C 056 817.378	oac
C 057 817.724	oac	C 058 818.473	oac	C 059 818.967	oac	C 060 819.356	oac
C 061 819.387	oac	C 062 819.992	oac	C 063 828.184	oac	C 064 821.248	oac
C 065 821.249	oac	C 066 821.438	oac	C 067 828.578	oac	C 068 821.292	oac
C 069 823.372	oac	C 070 823.944	oac	C 071 822.625	oac	C 072 824.601	oac
C 073 8028.71	oac	C 074 828.418	oac	C 075 821.586	oac	C 076 821.328	oac
C 077 821.852	oac	C 078 822.547	oac	C 079 824.728	oac	C 080 822.475	oac
C 081 827.889	oac	C 082 8029.86	oac	C 083 822.414	oac	C 084 8024.38	oac
C 085 8028.92	oac	C 086 828.358	oac	C 087 E2 Durril	oac	C 088 E2 Durril	oac
C 089 821.204	oac	C 090 823.119	oac	C 091 8026.49	oac	C 092 826.538	oac
C 093 834.662	oac	C 097 842.538	oac	C 098 834.481	oac	C 099 8028.49	oac
C 100 825.768	oac	C 101 828.187	oac	C 102 844.778	oac	C 103 848.878	oac
C 104 8058.61	oac	C 105 842.528	oac	C 107 8029.59	oac	C 108 8025.64	oac
C 115 8029.79	oac	C 116 8027.87	oac	C 117 8026.89	oac	C 118 8026.97	oac
C 119 8028.24	oac	C 120 8042.55	oac	C 121 8038.43	oac	C 122 8050.18	oac
C 123 8048.93	oac	C 124 8045.69	oac	C 126 8061.21	oac		

 SCRN (PKNS) 20 8900
 FURNACE 134 948
 SIDE A 24 6985
 SIDE B 25 1251
 CONDUCTOR 22 8641
 CONDUIT A 29 3838
 CONDUIT B 29 5875
 J BOX 29 6329
 CABLE ENT 51 5561
 S T 2 15:44:15 B

C 001 817.178	oac	C 002 817.263	oac	C 003 819.328	oac	C 004 818.744	oac
C 005 828.423	oac	C 006 828.885	oac	C 007 819.822	oac	C 008 821.266	oac
C 009 821.881	oac	C 010 822.918	oac	C 011 823.267	oac	C 012 823.817	oac
C 013 824.963	oac	C 014 823.776	oac	C 015 825.218	oac	C 016 848.189	oac
C 017 8025.12	oac	C 018 826.636	oac	C 019 829.867	oac	C 020 8029.98	oac
C 021 816.249	oac	C 022 816.148	oac	C 023 816.841	oac	C 024 817.316	oac
C 025 817.240	oac	C 026 817.986	oac	C 027 818.111	oac	C 028 818.954	oac
C 029 819.585	oac	C 030 828.378	oac	C 031 828.668	oac	C 032 828.168	oac
C 033 821.062	oac	C 034 821.468	oac	C 035 822.748	oac	C 036 822.848	oac
C 037 822.827	oac	C 038 823.875	oac	C 039 823.685	oac	C 040 824.581	oac
C 041 824.297	oac	C 042 8026.92	oac	C 043 8029.84	oac	C 044 825.784	oac
C 045 8038.97	oac	C 046 825.663	oac	C 047 833.189	oac	C 048 8029.77	oac
C 049 8014.44	oac	C 050 816.232	oac	C 051 816.898	oac	C 052 817.848	oac
C 053 818.487	oac	C 054 818.599	oac	C 055 818.614	oac	C 056 818.457	oac
C 057 818.928	oac	C 058 819.828	oac	C 059 828.435	oac	C 060 828.891	oac
C 061 828.961	oac	C 062 821.781	oac	C 063 821.992	oac	C 064 823.273	oac
C 065 823.377	oac	C 066 823.988	oac	C 067 822.568	oac	C 068 823.888	oac
C 069 8025.12	oac	C 070 8026.22	oac	C 071 8025.49	oac	C 072 8027.88	oac
C 073 822.862	oac	C 074 821.768	oac	C 075 823.148	oac	C 076 823.894	oac
C 077 822.688	oac	C 078 824.518	oac	C 079 8026.59	oac	C 080 823.864	oac
C 081 829.637	oac	C 082 8031.15	oac	C 083 824.811	oac	C 084 8029.69	oac
C 085 8031.41	oac	C 086 829.987	oac	C 087 E2 Durril	oac	C 088 E2 Durril	oac
C 089 823.945	oac	C 090 8026.38	oac	C 091 8028.86	oac	C 092 828.188	oac
C 093 828.648	oac	C 097 845.612	oac	C 098 829.895	oac	C 099 822.936	oac
C 100 848.861	oac	C 101 821.743	oac	C 102 8030.24	oac	C 103 8052.34	oac
C 104 8054.34	oac	C 105 847.489	oac	C 113 8053.64	oac	C 114 8048.57	oac
C 115 8054.44	oac	C 116 8058.82	oac	C 117 8051.52	oac	C 118 8049.99	oac
C 119 8048.14	oac	C 120 8062.44	oac	C 121 8043.36	oac	C 122 8053.42	oac
C 123 8041.44	oac	C 124 8029.92	oac	C 126 8025.88	oac		

TEST REPORT FOR A 1 HOUR FIRE TEST ON
 DARMATT KMI FIRE PROTECTION SYSTEM FOR
 SITE CONFIGURATIONS AT THE LASALLE
 NUCLEAR POWER PLANT

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DARMATT 000 000
SITE A 31.4518
SITE B 31.4885
CONDUCTOR 24.3288
CONDUIT A 31.8718
CONDUIT B 43.4195
BOX 44.5255
CABLE EXT 57.7754
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085 822.122 o/c C 086 821.748 o/c C 087 821.451 o/c C 088 823.167 o/c
089 824.828 o/c C 089 825.111 o/c C 090 825.523 o/c C 091 824.419 o/c
092 827.87 o/c C 093 836.949 o/c C 094 846.628 o/c C 095 844.728 o/c
096 829.24 o/c C 097 848.396 o/c C 098 846.952 o/c C 099 834.525 o/c
100 817.611 o/c C 101 817.299 o/c C 102 818.174 o/c C 103 818.878 o/c
104 819.863 o/c C 105 819.223 o/c C 106 819.922 o/c C 107 828.880 o/c
108 821.468 o/c C 109 822.186 o/c C 110 822.587 o/c C 111 821.992 o/c
112 823.648 o/c C 113 824.318 o/c C 114 824.657 o/c C 115 825.14 o/c
116 824.813 o/c C 117 825.84 o/c C 118 825.68 o/c C 119 826.17 o/c
120 826.66 o/c C 121 829.14 o/c C 122 833.127 o/c C 123 844.188 o/c
124 826.879 o/c C 125 841.517 o/c C 126 847.838.648 o/c C 127 848.835.896 o/c
128 826.12 o/c C 129 828.17.217 o/c C 130 851.817.913 o/c C 131 852.818.518 o/c
132 829.724 o/c C 133 828.848 o/c C 134 825.828.177 o/c C 135 856.819.958 o/c
136 828.438 o/c C 137 821.525 o/c C 138 859.822.269 o/c C 139 868.823.816 o/c
140 822.774 o/c C 141 823.783 o/c C 142 863.824.868 o/c C 143 864.825.55 o/c
144 825.96 o/c C 145 866.826.51 o/c C 146 867.825.19 o/c C 147 868.825.21 o/c
148 827.88 o/c C 149 829.47 o/c C 150 871.829.17 o/c C 151 872.822.189 o/c
152 826.859 o/c C 153 823.279 o/c C 154 875.824.943 o/c C 155 876.824.999 o/c
156 824.884 o/c C 157 826.68 o/c C 158 828.57 o/c C 159 888.825.541 o/c
160 841.589 o/c C 161 833.338 o/c C 162 883.827.67 o/c C 163 884.823.598 o/c
164 834.268 o/c C 165 841.565 o/c C 166 E2 Overid o/c C 167 E2 Overid o/c
168 826.44 o/c C 169 888.87 o/c C 170 891.8831.75 o/c C 171 892.829.988 o/c
172 842.484 o/c C 173 849.127 o/c C 174 898.845.788 o/c C 175 899.837.917 o/c
176 845.922 o/c C 177 823.775 o/c C 178 882.8855.77 o/c C 179 882.8856.94 o/c
180 8859.28 o/c C 181 8853.84 o/c C 182 8817.67 o/c C 183 8817.52 o/c
184 8827.89 o/c C 185 8823.78 o/c C 186 8826.63 o/c C 187 8845.82 o/c
188 8825.95 o/c C 189 8817.84 o/c C 190 8821.74 o/c C 191 8822.89 o/c
192 8841.77 o/c C 193 8837.26 o/c C 194 8862.23 o/c
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SITE B 31.4885
CONDUCTOR 24.3119
CONDUIT A 34.8728
CONDUIT B 44.7728
BOX 49.6771
CABLE EXT 63.8873
S T 2 15:48:13 J
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089 825.76 o/c C 090 826.89 o/c C 091 827.28 o/c C 092 826.88 o/c
093 829.47 o/c C 094 841.828 o/c C 095 849.516 o/c C 096 8854.87 o/c
097 825.221 o/c C 098 8858.92 o/c C 099 8857.47 o/c C 100 826.848.586 o/c
101 819.225 o/c C 102 818.681 o/c C 103 819.823 o/c C 104 824.828.478 o/c
105 828.938 o/c C 106 821.734 o/c C 107 822.821 o/c C 108 828.822.948 o/c
109 823.587 o/c C 110 824.315 o/c C 111 824.843 o/c C 112 822.829 o/c
113 825.88 o/c C 114 826.37 o/c C 115 826.71 o/c C 116 826.96 o/c
117 826.82 o/c C 118 827.82 o/c C 119 827.65 o/c C 120 848.828.28 o/c
121 828.88 o/c C 122 8831.91 o/c C 123 843.826.987 o/c C 124 844.846.647 o/c
125 848.681 o/c C 126 846.8853.88 o/c C 127 847.845.858 o/c C 128 848.848.252 o/c
129 849.815.94 o/c C 130 858.818.378 o/c C 131 851.819.132 o/c C 132 852.828.229 o/c
133 821.198 o/c C 134 821.432 o/c C 135 821.512 o/c C 136 821.222 o/c
137 821.829 o/c C 138 823.843 o/c C 139 823.984 o/c C 140 849.824.788 o/c
141 824.687 o/c C 142 825.49 o/c C 143 862.826.82 o/c C 144 864.827.77 o/c
145 828.84 o/c C 146 866.829.56 o/c C 147 867.829.57 o/c C 148 868.828.16 o/c
149 8831.87 o/c C 150 878.823.255 o/c C 151 871.823.466 o/c C 152 872.828.844 o/c
153 841.843 o/c C 154 825.22 o/c C 155 827.32 o/c C 156 827.68 o/c
157 827.48 o/c C 158 828.72 o/c C 159 8838.73 o/c C 160 888.827.619 o/c
161 842.896 o/c C 162 824.461 o/c C 163 8831.28 o/c C 164 828.827 o/c
165 829.149 o/c C 166 844.693 o/c C 167 E2 Overid o/c C 168 E2 Overid o/c
169 829.51 o/c C 170 824.258 o/c C 171 825.548 o/c C 172 842.522 o/c
173 846.877 o/c C 174 8855.85 o/c C 175 8851.42 o/c C 176 899.842.987 o/c
177 8851.82 o/c C 178 8826.27 o/c C 179 8861.36 o/c C 180 8862.63 o/c
181 885.744 o/c C 182 8868.71 o/c C 183 8851.11 o/c C 184 8858.18 o/c
185 8853.94 o/c C 186 8855.88 o/c C 187 8864.48 o/c C 188 8867.76 o/c
189 8852.23 o/c C 190 8847.71 o/c C 191 8848.72 o/c C 192 8858.78 o/c
193 8861.82 o/c C 194 8857.95 o/c C 195 8891.88 o/c
S T 2
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TEST REPORT FOR A 1 HOUR FIRE TEST ON
 DARMATT KM1 FIRE PROTECTION SYSTEM FOR
 SITE CONFIGURATIONS AT THE LASALLE
 NUCLEAR POWER PLANT

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SCAN (MEMS) 36.8888
SURFACE 35.8884
SIDE A 35.8884
SIDE B 34.7553
CONDUCTOR 29.3782
CONDUIT A 12.8846
CONDUIT B 49.8483
DOX 54.7437
TABLE ENT 67.4676
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C 893 822.838 oac C 894 845.783 oac C 895 859.59 oac C 896 868.11 oac
C 897 842.785 oac C 898 865.143 oac C 899 866.19 oac C 900 849.473 oac
C 901 821.819 oac C 902 828.862 oac C 903 822.348 oac C 904 823.858 oac
C 905 823.451 oac C 906 824.145 oac C 907 824.613 oac C 908 825.47 oac
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C 913 828.25 oac C 914 828.53 oac C 915 829.88 oac C 916 829.89 oac
C 917 828.83 oac C 918 829.88 oac C 919 829.77 oac C 920 828.35 oac
C 921 821.23 oac C 922 824.938 oac C 923 842.814 oac C 924 853.36 oac
C 925 846.265 oac C 926 866.112 oac C 927 8852.88 oac C 928 845.678 oac
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SCAN (MEMS) 38.8888
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SIDE B 37.8617
CONDUCTOR 31.8183
CONDUIT A 41.1412
CONDUIT B 53.1289
J. BC 59.2567
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C 893 824.585 oac C 894 8858.89 oac C 895 867.533 oac C 896 8863.28 oac
C 897 8854.43 oac C 898 869.497 oac C 899 865.941 oac C 900 8868.11 oac
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C 913 8838.68 oac C 914 8838.89 oac C 915 8831.48 oac C 916 8831.61 oac
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C 965 847.942 oac C 966 848.988 oac C 967 E2 Durid oac C 968 E2 Durid oac
C 969 826.826 oac C 970 842.336 oac C 971 845.899 oac C 972 849.742 oac
C 973 8852.36 oac C 974 865.855 oac C 975 8861.78 oac C 976 8854.12 oac
C 977 8863.19 oac C 978 822.948 oac C 979 828.845 oac C 980 869.521 oac
C 981 872.285 oac C 982 868.375 oac C 983 8861.83 oac C 984 8862.18 oac
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C 993 8871.89 oac C 994 8872.44 oac C 995 8888.97 oac
S T 2

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TEST REPORT FOR A 1 HOUR FIRE TEST ON
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 SITE CONFIGURATIONS AT THE LASALLE
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SCRN (NIMS) 40 8000
FURNACE 175.380
SIDE A 41.1954
SIDE B 41.4373
CONDUCTOR 34.5444
CONDUIT R 44.5298
CONDUIT B 55.9522
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CABLE EXT 75.9581
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C 809 832.748 o/c C 810 833.519 o/c C 811 834.181 o/c C 812 833.825 o/c
C 813 837.285 o/c C 814 8054.62 o/c C 815 873.685 o/c C 816 865.847 o/c
C 817 8063.81 o/c C 818 871.555 o/c C 819 868.985 o/c C 820 865.922 o/c
C 821 8026.74 o/c C 822 8025.73 o/c C 823 8027.43 o/c C 824 8028.19 o/c
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C 837 833.165 o/c C 838 833.246 o/c C 839 833.969 o/c C 840 834.413 o/c
C 841 835.647 o/c C 842 841.687 o/c C 843 8051.56 o/c C 844 864.180 o/c
C 845 8059.80 o/c C 846 871.155 o/c C 847 8063.56 o/c C 848 8057.92 o/c
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C 861 8030.79 o/c C 862 8031.62 o/c C 863 8031.81 o/c C 864 833.516 o/c
C 865 833.692 o/c C 866 834.811 o/c C 867 834.180 o/c C 868 835.979 o/c
C 869 841.458 o/c C 870 845.975 o/c C 871 849.658 o/c C 872 8055.69 o/c
C 873 8059.80 o/c C 874 8031.84 o/c C 875 834.973 o/c C 876 835.225 o/c
C 877 835.639 o/c C 878 837.268 o/c C 879 840.144 o/c C 880 846.983 o/c
C 881 8050.62 o/c C 882 841.228 o/c C 883 843.224 o/c C 884 8052.88 o/c
C 885 8052.17 o/c C 886 8051.86 o/c C 887 E2 Over16 o/c C 888 E2 Over16 o/c
C 889 839.283 o/c C 890 846.258 o/c C 891 849.211 o/c C 892 8052.74 o/c
C 893 8055.28 o/c C 894 849.961 o/c C 895 866.844 o/c C 896 8058.92 o/c
C 100 867.654 o/c C 101 836.547 o/c C 102 874.268 o/c C 103 873.186 o/c
C 104 875.183 o/c C 105 871.541 o/c C 106 872.15 o/c C 107 873.86 o/c
C 108 876.42 o/c C 109 8078.45 o/c C 110 8083.58 o/c C 111 8078.83 o/c
C 112 8075.52 o/c C 113 8066.75 o/c C 114 8071.57 o/c C 115 8079.34 o/c
C 116 8078.89 o/c C 117 8077.53 o/c C 118 8087.38 o/c
D T 2
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SCRN (NIMS) 42 8000
FURNACE 167.848
SIDE A 43.6728
SIDE B 44.1543
CONDUCTOR 27.3642
CONDUIT R 48.8042
CONDUIT B 58.6069
T ROD 66.6411
CABLE EXT 76.4242
S T 15.56-15.5
C 881 8030.84 o/c C 882 8030.28 o/c C 883 832.948 o/c C 884 809.271 o/c
C 885 834.116 o/c C 886 834.874 o/c C 887 833.321 o/c C 888 834.275 o/c
C 889 834.677 o/c C 890 835.857 o/c C 891 836.437 o/c C 892 835.264 o/c
C 893 840.144 o/c C 894 8058.92 o/c C 895 879.348 o/c C 896 868.228 o/c
C 897 868.898 o/c C 898 873.728 o/c C 899 871.378 o/c C 900 868.268 o/c
C 901 8028.92 o/c C 902 8028.15 o/c C 903 8029.73 o/c C 904 8030.56 o/c
C 905 8031.88 o/c C 906 8031.74 o/c C 907 8031.83 o/c C 908 833.824 o/c
C 909 833.956 o/c C 910 834.386 o/c C 911 835.381 o/c C 912 834.263 o/c
C 913 835.475 o/c C 914 835.512 o/c C 915 836.239 o/c C 916 836.121 o/c
C 917 835.481 o/c C 918 835.836 o/c C 919 836.486 o/c C 920 836.896 o/c
C 921 838.589 o/c C 922 845.743 o/c C 923 8053.96 o/c C 924 868.365 o/c
C 925 845.148 o/c C 926 874.981 o/c C 927 866.358 o/c C 928 864.485 o/c
C 929 871.496 o/c C 930 8026.13 o/c C 931 8027.45 o/c C 932 8028.53 o/c
C 933 8030.29 o/c C 934 8030.44 o/c C 935 8030.37 o/c C 936 8029.89 o/c
C 937 8030.42 o/c C 938 8031.92 o/c C 939 832.699 o/c C 940 833.289 o/c
C 941 833.357 o/c C 942 834.187 o/c C 943 834.286 o/c C 944 835.922 o/c
C 945 836.179 o/c C 946 836.375 o/c C 947 836.521 o/c C 948 838.783 o/c
C 949 845.146 o/c C 950 8058.28 o/c C 951 8054.22 o/c C 952 8060.51 o/c
C 953 864.426 o/c C 954 833.638 o/c C 955 837.889 o/c C 956 837.345 o/c
C 957 838.743 o/c C 958 840.841 o/c C 959 844.228 o/c C 960 8050.55 o/c
C 961 8054.04 o/c C 962 845.780 o/c C 963 847.775 o/c C 964 8056.21 o/c
C 965 8056.89 o/c C 966 8056.28 o/c C 967 E2 Over16 o/c C 968 E2 Over16 o/c
C 969 842.548 o/c C 970 849.768 o/c C 971 8052.71 o/c C 972 8055.68 o/c
C 973 8058.12 o/c C 974 873.186 o/c C 975 878.835 o/c C 976 8063.73 o/c
C 100 871.523 o/c C 101 848.112 o/c C 102 876.852 o/c C 103 875.980 o/c
C 104 877.665 o/c C 105 873.964 o/c C 106 8057.39 o/c C 107 8059.81 o/c
C 108 8059.26 o/c C 109 8063.47 o/c C 110 8063.21 o/c C 111 8077.18 o/c
C 112 8083.29 o/c C 113 8076.89 o/c C 114 8078.83 o/c C 115 8080.55 o/c
C 116 8087.48 o/c C 117 8085.99 o/c C 118 8092.37 o/c
D T 2
    
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TEST REPORT FOR A 1 HOUR FIRE TEST ON
 DARMATT KM1 FIRE PROTECTION SYSTEM FOR
 SITE CONFIGURATIONS AT THE LASALLE
 NUCLEAR POWER PLANT

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*****
SCAN (MKS) 44 4090
FURNACE 197.355
SIDE A 45.9829
SIDE B 47.4099
CONDUCTOR 48.8139
CONDUIT A 51.5111
CONDUIT B 51.2374
T BOX 51.4868
CABLE ENT 51.5786
S T 2 15:58:13.3
C 801 833.948 oac C 802 832.941 oac C 803 835.858 oac C 804 809.499 oac
C 805 836.166 oac C 806 836.288 oac C 807 835.476 oac C 808 836.451 oac
C 809 836.894 oac C 810 838.897 oac C 811 838.719 oac C 812 837.819 oac
C 813 842.681 oac C 814 862.58 oac C 815 881.188 oac C 816 878.771 oac
C 817 872.525 oac C 818 875.618 oac C 819 873.275 oac C 820 869.595 oac
C 821 8838.88 oac C 822 8838.38 oac C 823 8831.86 oac C 824 832.665 oac
C 825 832.264 oac C 826 834.867 oac C 827 834.871 oac C 828 835.844 oac
C 829 836.187 oac C 830 837.241 oac C 831 837.658 oac C 832 836.672 oac
C 833 837.767 oac C 834 837.693 oac C 835 838.944 oac C 836 838.484 oac
C 837 838.868 oac C 838 838.789 oac C 839 839.125 oac C 840 839.699 oac
C 841 841.592 oac C 842 8858.19 oac C 843 8868.18 oac C 844 872.527 oac
C 845 871.285 oac C 846 878.898 oac C 847 878.452 oac C 848 878.386 oac
C 849 872.929 oac C 850 8828.85 oac C 851 8829.57 oac C 852 8831.85 oac
C 853 832.479 oac C 854 832.746 oac C 855 832.717 oac C 856 832.246 oac
C 857 832.674 oac C 858 834.156 oac C 859 834.978 oac C 860 835.685 oac
C 861 835.687 oac C 862 836.428 oac C 863 836.518 oac C 864 838.294 oac
C 865 838.687 oac C 866 839.834 oac C 867 839.165 oac C 868 841.688 oac
C 869 848.778 oac C 870 8854.23 oac C 871 8858.18 oac C 872 864.229 oac
C 873 868.823 oac C 874 835.886 oac C 875 838.573 oac C 876 829.628 oac
C 877 841.943 oac C 878 844.223 oac C 879 847.531 oac C 880 8854.81 oac
C 881 8858.44 oac C 882 8858.84 oac C 883 8852.42 oac C 884 8866.49 oac
C 885 8862.38 oac C 886 8861.34 oac C 887 E2 Over18 oac C 888 E2 Over18 oac
C 889 886.882 oac C 890 8852.97 oac C 891 8855.72 oac C 892 8858.36 oac
C 893 8868.61 oac C 894 875.713 oac C 895 872.346 oac C 896 867.452 oac
C 897 874.764 oac C 898 872.829 oac C 899 878.348 oac C 900 878.253 oac
C 901 879.723 oac C 902 876.168 oac C 903 898.85 oac C 904 8897.31 oac
C 905 8988.18 oac C 906 8981.88 oac C 907 8981.59 oac C 908 8988.56 oac
C 909 8994.94 oac C 910 8984.44 oac C 911 8994.86 oac C 912 8982.54 oac
C 913 8998.98 oac C 914 8998.16 oac C 915 8925.85 oac
S T 2
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SCAN (MKS) 46 4080
FURNACE 197.593
SIDE A 47.9483
SIDE B 58.1855
CONDUCTOR 47.4341
CONDUIT A 54.4788
CONDUIT B 62.6828
T BOX 72.8575
CABLE ENT 88.4857
S T 2 15:00:14.4
C 801 835.158 oac C 802 834.868 oac C 803 837.833 oac C 804 809.526 oac
C 805 838.126 oac C 806 838.224 oac C 807 837.585 oac C 808 838.654 oac
C 809 839.883 oac C 810 848.355 oac C 811 848.991 oac C 812 848.179 oac
C 813 845.161 oac C 814 865.285 oac C 815 882.541 oac C 816 872.719 oac
C 817 875.419 oac C 818 877.229 oac C 819 875.687 oac C 820 873.661 oac
C 821 832.788 oac C 822 832.513 oac C 823 833.982 oac C 824 834.684 oac
C 825 835.328 oac C 826 836.184 oac C 827 836.272 oac C 828 837.194 oac
C 829 838.864 oac C 830 839.381 oac C 831 839.927 oac C 832 838.991 oac
C 833 839.818 oac C 834 839.865 oac C 835 841.791 oac C 836 848.891 oac
C 837 848.918 oac C 838 841.956 oac C 839 842.284 oac C 840 842.841 oac
C 841 845.838 oac C 842 8854.81 oac C 843 864.886 oac C 844 876.891 oac
C 845 877.167 oac C 846 888.127 oac C 847 875.371 oac C 848 875.488 oac
C 849 874.435 oac C 850 8829.99 oac C 851 8831.74 oac C 852 833.282 oac
C 853 834.554 oac C 854 834.876 oac C 855 834.928 oac C 856 834.522 oac
C 857 834.918 oac C 858 836.487 oac C 859 837.212 oac C 860 837.973 oac
C 861 838.883 oac C 862 838.679 oac C 863 838.789 oac C 864 848.593 oac
C 865 841.173 oac C 866 841.684 oac C 867 841.784 oac C 868 844.653 oac
C 869 8852.54 oac C 870 8858.24 oac C 871 8861.86 oac C 872 867.458 oac
C 873 872.543 oac C 874 837.833 oac C 875 848.277 oac C 876 842.543 oac
C 877 844.588 oac C 878 847.414 oac C 879 8828.35 oac C 880 8857.42 oac
C 881 8862.88 oac C 882 8854.32 oac C 883 8856.83 oac C 884 8863.86 oac
C 885 847.585 oac C 886 864.474 oac C 887 E2 Over18 oac C 888 E2 Over18 oac
C 889 849.434 oac C 890 8855.88 oac C 891 8858.54 oac C 892 8861.84 oac
C 893 8863.18 oac C 894 877.762 oac C 895 876.227 oac C 896 878.914 oac
C 897 877.486 oac C 898 845.699 oac C 899 888.254 oac C 900 888.232 oac
C 901 881.648 oac C 902 878.861 oac C 903 8896.87 oac C 904 8896.36 oac
C 905 8897.82 oac C 906 8988.48 oac C 907 8985.81 oac C 908 8989.49 oac
C 909 8994.88 oac C 910 8885.79 oac C 911 8998.88 oac C 912 8998.81 oac
C 913 8994.88 oac C 914 8892.11 oac C 915 8823.74 oac
S T 2

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TEST REPORT FOR A 1 HOUR FIRE TEST ON
 DARMATT KMI FIRE PROTECTION SYSTEM FOR
 SITE CONFIGURATIONS AT THE LASALLE
 NUCLEAR POWER PLANT

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*****
SCAN (MINS) 48.8888
FURNACE 479.188
SIDE R 49.5752
SIDE O 53.8712
CONDUCTOR 44.7646
CONDUIT R 27.2548
CONDUIT O 66.2882
J BOX 74.6818
CRBLE EXT 87.1866
S T 2 16:02:16.2
C 801 837.812 o/c C 802 836.881 o/c C 803 838.828 o/c C 804 839.786 o/c
C 805 840.887 o/c C 806 840.821 o/c C 807 839.484 o/c C 808 840.451 o/c
C 809 841.876 o/c C 810 842.386 o/c C 811 842.989 o/c C 812 842.447 o/c
C 813 847.788 o/c C 814 847.815 o/c C 815 803.323 o/c C 816 874.396 o/c
C 817 877.329 o/c C 818 878.311 o/c C 819 877.452 o/c C 820 876.868 o/c
C 821 834.241 o/c C 822 834.228 o/c C 823 825.566 o/c C 824 836.351 o/c
C 825 837.158 o/c C 826 837.978 o/c C 827 838.118 o/c C 828 839.137 o/c
C 829 839.848 o/c C 830 841.328 o/c C 831 841.877 o/c C 832 841.888 o/c
C 833 841.939 o/c C 834 841.888 o/c C 835 844.215 o/c C 836 843.528 o/c
C 837 843.516 o/c C 838 845.372 o/c C 839 845.428 o/c C 840 846.873 o/c
C 841 849.419 o/c C 842 8059.64 o/c C 843 869.847 o/c C 844 878.664 o/c
C 845 881.861 o/c C 846 883.258 o/c C 847 879.343 o/c C 848 879.759 o/c
C 849 8825.80 o/c C 850 8931.85 o/c C 851 833.748 o/c C 852 835.249 o/c
C 853 836.472 o/c C 854 836.798 o/c C 855 836.925 o/c C 856 836.491 o/c
C 857 836.949 o/c C 858 838.454 o/c C 859 839.323 o/c C 860 848.811 o/c
C 861 848.228 o/c C 862 848.863 o/c C 863 848.991 o/c C 864 842.455 o/c
C 865 842.488 o/c C 866 842.845 o/c C 867 844.828 o/c C 868 847.578 o/c
C 869 8856.29 o/c C 870 8862.26 o/c C 871 865.361 o/c C 872 878.382 o/c
C 873 876.828 o/c C 874 835.912 o/c C 875 842.811 o/c C 876 845.349 o/c
C 877 847.285 o/c C 878 8858.23 o/c C 879 8852.98 o/c C 880 8868.80 o/c
C 881 865.489 o/c C 882 8858.97 o/c C 883 8868.15 o/c C 884 866.825 o/c
C 885 878.833 o/c C 886 865.428 o/c C 887 E2 Overid o/c C 888 E2 Overid o/c
C 889 8852.51 o/c C 890 8858.37 o/c C 891 8868.62 o/c C 892 8862.63 o/c
C 893 865.689 o/c C 894 879.354 o/c C 895 878.399 o/c C 896 873.817 o/c
C 897 879.634 o/c C 898 848.686 o/c C 899 883.726 o/c C 900 882.111 o/c
C 901 883.481 o/c C 902 888.281 o/c C 903 8878.23 o/c C 904 8879.88 o/c
C 905 8879.23 o/c C 906 8879.29 o/c C 907 8879.89 o/c C 908 8888.36 o/c
C 909 8872.41 o/c C 910 8863.29 o/c C 911 8875.88 o/c C 912 8872.49 o/c
C 913 8856.49 o/c C 914 8855.88 o/c C 915 8882.38 o/c
D T 2

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SCAN (MINS) 58.8888
FURNACE 918.888
SIDE R 51.8149
SIDE O 55.5648
CONDUCTOR 46.8445
CONDUIT R 59.7169
CONDUIT O 68.6129
J BOX 76.8481
CRBLE EXT 83.8941
S T 2 16:04:10.8
C 881 838.649 o/c C 882 838.687 o/c C 883 848.518 o/c C 884 818.285 o/c
C 885 841.761 o/c C 886 841.616 o/c C 887 841.196 o/c C 888 842.327 o/c
C 889 842.748 o/c C 890 843.571 o/c C 891 844.581 o/c C 892 844.444 o/c
C 893 8858.88 o/c C 894 869.882 o/c C 895 882.588 o/c C 896 875.698 o/c
C 897 878.725 o/c C 898 879.519 o/c C 899 878.853 o/c C 900 878.256 o/c
C 901 825.648 o/c C 902 825.986 o/c C 903 837.873 o/c C 904 837.848 o/c
C 905 828.642 o/c C 906 829.465 o/c C 907 829.818 o/c C 908 848.797 o/c
C 909 841.469 o/c C 910 842.974 o/c C 911 843.426 o/c C 912 842.878 o/c
C 913 843.749 o/c C 914 843.813 o/c C 915 846.338 o/c C 916 845.894 o/c
C 917 845.264 o/c C 918 848.492 o/c C 919 848.476 o/c C 920 849.199 o/c
C 921 8853.77 o/c C 922 864.111 o/c C 923 874.581 o/c C 924 881.828 o/c
C 925 886.156 o/c C 926 884.742 o/c C 927 881.382 o/c C 928 885.741 o/c
C 929 8827.28 o/c C 930 833.384 o/c C 931 825.322 o/c C 932 836.838 o/c
C 933 838.847 o/c C 934 838.462 o/c C 935 838.686 o/c C 936 838.238 o/c
C 937 838.771 o/c C 938 848.299 o/c C 939 841.266 o/c C 940 841.994 o/c
C 941 842.183 o/c C 942 842.844 o/c C 943 842.948 o/c C 944 844.545 o/c
C 945 845.329 o/c C 946 846.116 o/c C 947 846.288 o/c C 948 8858.51 o/c
C 949 8859.79 o/c C 950 866.838 o/c C 951 868.612 o/c C 952 872.879 o/c
C 953 879.811 o/c C 954 842.821 o/c C 955 845.482 o/c C 956 847.823 o/c
C 957 849.883 o/c C 958 8853.88 o/c C 959 8855.15 o/c C 960 8863.88 o/c
C 961 868.562 o/c C 962 8863.26 o/c C 963 864.583 o/c C 964 869.379 o/c
C 965 873.461 o/c C 966 864.553 o/c C 967 E2 Overid o/c C 968 E2 Overid o/c
C 969 8855.18 o/c C 970 8868.41 o/c C 971 8862.54 o/c C 972 864.329 o/c
C 973 867.964 o/c C 974 888.497 o/c C 975 888.597 o/c C 976 875.965 o/c
C 977 881.485 o/c C 978 8831.29 o/c C 979 887.397 o/c C 980 883.761 o/c
C 981 885.847 o/c C 982 881.672 o/c C 983 8988.78 o/c C 984 8918.88 o/c
C 985 8911.43 o/c C 986 8914.55 o/c C 987 8913.74 o/c C 988 8919.85 o/c
C 989 8995.46 o/c C 990 8997.85 o/c C 991 8998.43 o/c C 992 8987.89 o/c
C 993 8982.33 o/c C 994 8981.43 o/c C 995 8927.55 o/c
D T 2

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TEST REPORT FOR A 1 HOUR FIRE TEST ON
 DARMATT KMI FIRE PROTECTION SYSTEM FOR
 SITE CONFIGURATIONS AT THE LASALLE
 NUCLEAR POWER PLANT

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SCRN (MINS) 52.0000
FURNACE 917.124
SIDE A 52.2510
SIDE B 58.0169
CONDUCTOR 48.9471
CONDUIT A 62.2366
CONDUIT B 78.9342
J BOX 78.9817
ANGLE ENT 85.8180
S T 2 16:06:16.3
C 001 046.281 o/c C 002 048.263 o/c C 003 042.417 o/c C 004 018.438 o/c
C 005 043.792 o/c C 006 043.489 o/c C 007 042.596 o/c C 008 043.874 o/c
C 009 044.488 o/c C 010 045.518 o/c C 011 046.282 o/c C 012 045.964 o/c
C 013 0052.27 o/c C 014 071.561 o/c C 015 003.794 o/c C 016 074.373 o/c
C 017 009.187 o/c C 018 078.922 o/c C 019 077.894 o/c C 020 079.329 o/c
C 021 034.069 o/c C 022 037.283 o/c C 023 030.225 o/c C 024 029.858 o/c
C 025 029.985 o/c C 026 048.759 o/c C 027 041.381 o/c C 028 042.346 o/c
C 029 043.044 o/c C 030 044.467 o/c C 031 044.922 o/c C 032 044.581 o/c
C 033 045.465 o/c C 034 045.877 o/c C 035 048.284 o/c C 036 048.137 o/c
C 037 047.728 o/c C 038 0051.68 o/c C 039 0051.77 o/c C 040 0052.51 o/c
C 041 0057.87 o/c C 042 068.194 o/c C 043 079.253 o/c C 044 085.814 o/c
C 045 089.774 o/c C 046 087.495 o/c C 047 083.445 o/c C 048 089.445 o/c
C 049 088.43 o/c C 050 034.792 o/c C 051 034.821 o/c C 052 038.293 o/c
C 053 029.545 o/c C 054 040.823 o/c C 055 040.378 o/c C 056 040.814 o/c
C 057 040.477 o/c C 058 042.836 o/c C 059 043.833 o/c C 060 042.778 o/c
C 061 044.004 o/c C 062 044.731 o/c C 063 044.912 o/c C 064 044.588 o/c
C 065 047.318 o/c C 066 048.346 o/c C 067 048.796 o/c C 068 0053.25 o/c
C 069 0063.26 o/c C 070 069.753 o/c C 071 071.742 o/c C 072 075.599 o/c
C 073 082.122 o/c C 074 044.909 o/c C 075 047.228 o/c C 076 045.864 o/c
C 077 0052.18 o/c C 078 0055.48 o/c C 079 0057.24 o/c C 080 064.361 o/c
C 081 071.151 o/c C 082 067.156 o/c C 083 068.481 o/c C 084 072.271 o/c
C 085 074.186 o/c C 086 067.454 o/c C 087 E2 Overid o/c C 088 E2 Overid o/c
C 089 0057.75 o/c C 090 0062.45 o/c C 091 064.467 o/c C 092 066.438 o/c
C 093 078.421 o/c C 094 001.656 o/c C 095 001.976 o/c C 096 078.256 o/c
C 100 003.121 o/c C 101 0053.73 o/c C 102 003.313 o/c C 103 006.268 o/c
C 104 007.344 o/c C 105 003.475 o/c C 110 0015.96 o/c C 114 0017.38 o/c
C 115 0018.28 o/c C 116 0022.27 o/c C 117 0024.38 o/c C 118 0029.06 o/c
C 119 0015.38 o/c C 120 0002.33 o/c C 121 0009.87 o/c C 122 0015.14 o/c
C 123 0011.58 o/c C 124 0009.26 o/c C 106 0036.49 o/c
S T 2
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SCRN (MINS) 54.0000
FURNACE 916.676
SIDE A 53.0060
SIDE B 49.3481
CONDUCTOR 58.9781
CONDUIT A 64.4467
CONDUIT B 73.1794
J BOX 81.2744
ANGLE ENT 87.5851
S T 2 16:00:16.4
C 001 041.688 o/c C 002 041.684 o/c C 003 044.491 o/c C 004 018.044 o/c
C 005 046.099 o/c C 006 045.580 o/c C 007 044.584 o/c C 008 045.673 o/c
C 009 046.183 o/c C 010 047.328 o/c C 011 048.129 o/c C 012 047.689 o/c
C 013 0054.37 o/c C 014 072.988 o/c C 015 003.736 o/c C 016 077.712 o/c
C 017 006.229 o/c C 018 038.644 o/c C 019 000.091 o/c C 020 000.693 o/c
C 021 038.839 o/c C 022 038.574 o/c C 023 039.568 o/c C 024 040.395 o/c
C 025 040.895 o/c C 026 041.764 o/c C 027 042.454 o/c C 028 043.712 o/c
C 029 044.426 o/c C 030 045.008 o/c C 031 046.249 o/c C 032 046.825 o/c
C 033 047.137 o/c C 034 047.792 o/c C 035 0050.16 o/c C 036 0050.57 o/c
C 037 0050.80 o/c C 038 0054.77 o/c C 039 0055.88 o/c C 040 0055.78 o/c
C 041 0060.76 o/c C 042 072.388 o/c C 043 003.368 o/c C 044 009.083 o/c
C 045 093.887 o/c C 046 091.849 o/c C 047 006.422 o/c C 048 009.629 o/c
C 049 0029.54 o/c C 050 036.876 o/c C 051 038.111 o/c C 052 039.658 o/c
C 053 040.982 o/c C 054 041.486 o/c C 055 041.911 o/c C 056 041.711 o/c
C 057 042.118 o/c C 058 043.687 o/c C 059 044.642 o/c C 060 045.488 o/c
C 061 045.659 o/c C 062 046.521 o/c C 063 046.918 o/c C 064 048.658 o/c
C 065 049.289 o/c C 066 0058.69 o/c C 067 0051.38 o/c C 068 0056.23 o/c
C 069 046.626 o/c C 070 073.464 o/c C 071 074.735 o/c C 072 078.137 o/c
C 073 004.834 o/c C 074 046.771 o/c C 075 049.097 o/c C 076 0051.68 o/c
C 077 0053.91 o/c C 078 0057.35 o/c C 079 0059.28 o/c C 080 068.798 o/c
C 081 073.188 o/c C 082 078.825 o/c C 083 071.742 o/c C 084 074.775 o/c
C 085 079.193 o/c C 086 078.981 o/c C 087 E2 Overid o/c C 088 E2 Overid o/c
C 089 0060.12 o/c C 090 064.475 o/c C 091 067.235 o/c C 092 069.229 o/c
C 093 073.169 o/c C 094 003.115 o/c C 095 003.853 o/c C 096 000.475 o/c
C 100 004.594 o/c C 101 0056.72 o/c C 102 000.598 o/c C 103 007.945 o/c
C 104 009.518 o/c C 105 005.175 o/c C 110 0015.26 o/c C 114 0017.81 o/c
C 115 0017.46 o/c C 116 0028.18 o/c C 117 0028.27 o/c C 118 0027.89 o/c
C 119 0017.97 o/c C 120 0002.18 o/c C 121 0009.92 o/c C 122 0011.98 o/c
C 123 0000.42 o/c C 124 0005.71 o/c C 106 0035.15 o/c
S T 2

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SCAN (MKS) 56.0000
FURNACE 186.865
SIDE A 55.1848
SIDE B 61.6857
CONDUCTOR 51.1762
CONDUIT A 64.7182
CONDUIT B 72.9371
J BOX 38.8856
CABLE ENT 57.8365
S T 2 16.18.16.6
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C 885 848.568 oac C 886 847.854 oac C 887 846.838 oac C 888 847.684 oac
C 889 848.843 oac C 818 849.484 oac C 811 8858.15 oac C 812 849.431 oac
C 813 8856.58 oac C 814 874.267 oac C 815 883.143 oac C 816 879.591 oac
C 817 882.452 oac C 818 881.411 oac C 819 881.159 oac C 820 881.898 oac
C 821 879.861 oac C 822 839.678 oac C 823 848.594 oac C 824 841.276 oac
C 825 841.779 oac C 826 842.736 oac C 827 841.819 oac C 828 844.797 oac
C 829 845.558 oac C 830 847.841 oac C 831 847.255 oac C 832 847.241 oac
C 833 848.425 oac C 834 849.469 oac C 835 8951.52 oac C 836 8852.71 oac
C 837 8851.92 oac C 838 8857.44 oac C 839 8858.74 oac C 840 8858.93 oac
C 841 864.295 oac C 842 875.882 oac C 843 886.785 oac C 844 891.658 oac
C 845 895.563 oac C 846 895.325 oac C 847 889.975 oac C 848 894.725 oac
C 849 8828.69 oac C 850 837.338 oac C 851 839.472 oac C 852 841.197 oac
C 853 842.614 oac C 854 843.189 oac C 855 843.469 oac C 856 843.282 oac
C 857 843.712 oac C 858 845.197 oac C 859 844.278 oac C 860 847.152 oac
C 861 847.368 oac C 862 848.615 oac C 863 849.139 oac C 864 8958.98 oac
C 865 8851.73 oac C 866 8853.21 oac C 867 8854.83 oac C 868 8859.25 oac
C 869 849.975 oac C 870 877.842 oac C 871 877.573 oac C 872 888.556 oac
C 873 887.532 oac C 874 848.878 oac C 875 8858.11 oac C 876 8852.91 oac
C 877 8835.19 oac C 878 8859.37 oac C 879 8861.42 oac C 880 878.861 oac
C 881 874.787 oac C 882 874.896 oac C 883 873.326 oac C 884 876.784 oac
C 885 881.823 oac C 886 878.673 oac C 887 E2 Dvr14 oac C 888 E2 Dvr14 oac
C 889 8862.51 oac C 890 866.226 oac C 891 849.445 oac C 892 878.881 oac
C 893 875.859 oac C 894 884.111 oac C 895 885.185 oac C 896 881.282 oac
C 897 885.936 oac C 898 889.38 oac C 899 883.28 oac C 900 898.317 oac
C 901 891.963 oac C 902 885.788 oac C 903 887.82 oac C 904 898.55 oac
C 905 898.49 oac C 906 8918.18 oac C 907 8987.82 oac C 908 8912.48 oac
C 909 892.73 oac C 910 8891.73 oac C 911 8981.58 oac C 912 8981.88 oac
C 913 8898.37 oac C 914 8889.36 oac C 915 8914.13 oac
D T 2
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SCAN (MKS) 58.0000
FURNACE 128.467
SIDE A 56.8639
SIDE B 64.6257
CONDUCTOR 55.2728
CONDUIT A 68.1483
CONDUIT B 77.3825
J BOX 45.2353
CABLE ENT 92.1757
S T 2 16.12.13.2
C 881 844.411 oac C 882 844.544 oac C 883 849.169 oac C 884 818.859 oac
C 885 8851.24 oac C 886 8858.41 oac C 887 849.322 oac C 888 849.981 oac
C 889 8858.35 oac C 818 8851.75 oac C 811 8852.43 oac C 812 8851.86 oac
C 813 8858.88 oac C 814 875.658 oac C 815 883.268 oac C 816 881.822 oac
C 817 882.512 oac C 818 881.972 oac C 819 881.838 oac C 820 881.832 oac
C 821 848.211 oac C 822 848.822 oac C 823 841.751 oac C 824 842.476 oac
C 825 842.957 oac C 826 843.758 oac C 827 844.198 oac C 828 845.926 oac
C 829 844.767 oac C 830 848.335 oac C 831 848.374 oac C 832 848.466 oac
C 833 849.833 oac C 834 8851.21 oac C 835 8852.96 oac C 836 8854.88 oac
C 837 8854.51 oac C 838 8868.48 oac C 839 8861.44 oac C 840 8861.84 oac
C 841 847.583 oac C 842 879.212 oac C 843 889.946 oac C 844 894.152 oac
C 845 899.867 oac C 846 8189.88 oac C 847 893.235 oac C 848 897.318 oac
C 849 8821.98 oac C 850 838.783 oac C 851 841.883 oac C 852 842.895 oac
C 853 844.381 oac C 854 844.889 oac C 855 845.185 oac C 856 844.876 oac
C 857 845.278 oac C 858 846.988 oac C 859 848.135 oac C 860 849.823 oac
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C 865 8854.33 oac C 866 8855.95 oac C 867 8856.98 oac C 868 8862.38 oac
C 869 873.417 oac C 870 886.742 oac C 871 888.438 oac C 872 882.966 oac
C 873 889.954 oac C 874 849.821 oac C 875 8851.29 oac C 876 8854.82 oac
C 877 8856.59 oac C 878 8868.88 oac C 879 8863.34 oac C 880 872.646 oac
C 881 876.248 oac C 882 876.625 oac C 883 876.595 oac C 884 879.829 oac
C 885 883.815 oac C 886 874.821 oac C 887 E2 Dvr14 oac C 888 E2 Dvr14 oac
C 889 844.758 oac C 890 848.258 oac C 891 871.282 oac C 892 872.683 oac
C 893 876.783 oac C 894 884.681 oac C 895 885.814 oac C 896 882.632 oac
C 897 876.817 oac C 898 884.125 oac C 899 8186.71 oac C 900 892.854 oac
C 901 887.417 oac C 902 888.318 oac C 903 8924.75 oac C 904 8928.84 oac
C 905 894.829 oac C 906 8832.84 oac C 907 8931.85 oac C 908 8937.44 oac
C 909 8927.98 oac C 910 8932.84 oac C 911 8918.89 oac C 912 8924.67 oac
C 913 8924.34 oac C 914 8913.71 oac C 915 8918.34 oac
C 916 8928.13 oac C 917 8928.44 oac C 918 8948.34 oac
D T 2

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 SCRN (NEWS) 68.8888
 FURNACE 331.259
 SIDE A 58.6411
 SIDE B 67.8278
 CONDUCTOR 77.7486
 CONDUIT A 78.4855
 CONDUIT B 79.2829
 J.805 87.1754
 CHABLE ENT 95.8761

S T 2 16:14:13.2
 C 801 845.957 oac : 882 846.198 oac C 883 8851.57 oac C 894 811.875 oac
 C 885 8853.89 oac : 886 8853.11 oac C 887 8852.82 oac C 888 8852.48 oac
 C 889 8852.67 oac : 818 8854.18 oac C 811 8854.93 oac C 812 8854.39 oac
 C 813 8861.18 oac : 814 877.811 oac C 815 883.385 oac C 816 882.448 oac
 C 817 884.526 oac : 818 882.653 oac C 819 882.575 oac C 820 882.441 oac
 C 821 841.336 oac : 822 841.915 oac C 823 842.988 oac C 824 843.677 oac
 C 825 842.929 oac : 826 844.887 oac C 827 845.177 oac C 828 847.115 oac
 C 829 847.984 oac : 830 849.552 oac C 831 849.468 oac C 832 849.577 oac
 C 833 8851.13 oac : 834 8852.96 oac C 835 8854.48 oac C 836 8857.18 oac
 C 837 8856.99 oac : 838 8863.44 oac C 839 884.898 oac C 840 884.625 oac
 C 841 878.314 oac : 842 882.286 oac C 843 892.987 oac C 844 896.911 oac
 C 845 8182.84 oac : 846 8184.78 oac C 847 895.448 oac C 848 898.458 oac
 C 849 832.991 oac : 850 848.215 oac C 851 842.649 oac C 852 844.787 oac
 C 853 846.382 oac : 854 846.794 oac C 855 847.876 oac C 856 846.696 oac
 C 857 847.741 oac : 858 849.881 oac C 859 8858.22 oac C 860 8851.18 oac
 C 861 8851.38 oac : 862 8853.54 oac C 863 8854.39 oac C 864 8856.16 oac
 C 865 8857.89 oac : 866 8858.88 oac C 867 8859.83 oac C 868 8854.543 oac
 C 869 876.753 oac : 870 884.177 oac C 871 883.849 oac C 872 885.282 oac
 C 873 892.328 oac : 874 8858.82 oac C 875 8852.78 oac C 876 8855.86 oac
 C 877 8857.78 oac : 878 8862.78 oac C 879 865.637 oac C 880 874.588 oac
 C 881 877.846 oac : 882 879.288 oac C 883 879.449 oac C 884 888.373 oac
 C 885 884.936 oac : 886 879.883 oac C 887 E2 Over14 oac C 888 E2 Over14 oac
 C 889 866.799 oac : 890 878.382 oac C 891 873.587 oac C 892 875.877 oac
 C 893 878.682 oac : 894 885.235 oac C 895 882.276 oac C 896 883.726 oac
 C 897 889.837 oac : 898 8863.48 oac C 899 8112.52 oac C 900 894.994 oac
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 C 905 8921.79 oac : 906 8932.24 oac C 907 8928.77 oac C 908 8941.43 oac
 C 909 8925.66 oac : 910 8914.59 oac C 911 8928.87 oac C 912 8926.85 oac
 C 913 8928.72 oac : 914 8917.61 oac C 915 8942.82 oac

 SCRN (NEWS) 67.8888
 FURNACE 923.844
 SIDE A 68.6483
 SIDE B 69.2814
 CONDUCTOR 68.1288
 CONDUIT A 71.9267
 CONDUIT B 81.3278
 J.805 98.2353
 CHABLE ENT 98.1817

S T 2 16:14:13.4
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 C 889 8855.23 oac : 818 8856.82 oac C 811 8857.68 oac C 812 8856.97 oac
 C 813 8863.63 oac : 814 878.397 oac C 815 883.782 oac C 816 884.194 oac
 C 817 885.518 oac : 818 883.611 oac C 819 883.564 oac C 820 883.378 oac
 C 821 847.685 oac : 822 843.175 oac C 823 844.617 oac C 824 845.228 oac
 C 825 845.287 oac : 826 845.923 oac C 827 846.517 oac C 828 848.364 oac
 C 829 849.287 oac : 830 8858.82 oac C 831 8858.71 oac C 832 8858.78 oac
 C 833 8852.58 oac : 834 8854.61 oac C 835 8856.83 oac C 836 8859.86 oac
 C 837 8859.32 oac : 838 8866.328 oac C 839 868.135 oac C 840 867.756 oac
 C 841 873.596 oac : 842 885.425 oac C 843 895.572 oac C 844 899.534 oac
 C 845 8184.97 oac : 846 8188.23 oac C 847 899.629 oac C 848 899.837 oac
 C 849 834.212 oac : 850 841.797 oac C 851 844.581 oac C 852 846.698 oac
 C 853 848.436 oac : 854 848.931 oac C 855 849.187 oac C 856 848.757 oac
 C 857 849.388 oac : 858 8851.22 oac C 859 8852.48 oac C 860 8853.35 oac
 C 861 8853.73 oac : 862 8856.25 oac C 863 8857.28 oac C 864 8858.99 oac
 C 865 8859.98 oac : 866 8861.79 oac C 867 8862.82 oac C 868 8866.625 oac
 C 869 888.814 oac : 870 887.332 oac C 871 885.465 oac C 872 887.624 oac
 C 873 894.352 oac : 874 8851.29 oac C 875 8854.28 oac C 876 8856.47 oac
 C 877 8859.25 oac : 878 884.955 oac C 879 888.876 oac C 880 876.259 oac
 C 881 879.255 oac : 882 881.594 oac C 883 881.571 oac C 884 883.736 oac
 C 885 898.283 oac : 886 882.816 oac C 887 E2 Over14 oac C 888 E2 Over14 oac
 C 889 865.841 oac : 890 873.612 oac C 891 876.586 oac C 892 878.876 oac
 C 893 888.762 oac : 894 886.198 oac C 895 887.334 oac C 896 883.446 oac
 C 897 893.189 oac : 898 865.947 oac C 899 887.988 oac C 900 897.988 oac
 C 901 894.988 oac : 902 893.739 oac C 903 8118.68 oac C 904 897.988 oac
 C 905 8932.61 oac : 906 8937.19 oac C 907 8928.34 oac C 908 8931.48 oac
 C 909 8938.36 oac : 910 8915.82 oac C 911 8922.21 oac C 912 8927.67 oac
 C 913 8922.85 oac : 914 8919.58 oac C 915 8947.78 oac

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SCAN (MKS) 64.8000
FURNACE 131.193
SIDE A 62.5294
SIDE B 71.4664
CONDUCTOR 63.2523
CONDUIT A 75.4434
CONDUIT B 83.2755
J BOX 93.1643
CABLE ENT 181.573
S T 2 16.28.13.5
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C 889 887.84 o/c C 810 879.44 o/c C 811 886.36 o/c C 812 885.78 o/c
C 813 886.391 o/c C 814 879.938 o/c C 815 884.184 o/c C 816 886.399 o/c
C 817 887.272 o/c C 818 885.114 o/c C 819 884.587 o/c C 820 884.150 o/c
C 821 843.993 o/c C 822 844.354 o/c C 823 846.131 o/c C 824 846.648 o/c
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C 833 8854.15 o/c C 834 8856.22 o/c C 835 8858.25 o/c C 836 8863.11 o/c
C 837 8861.61 o/c C 838 869.122 o/c C 839 871.282 o/c C 840 878.581 o/c
C 841 876.486 o/c C 842 888.896 o/c C 843 898.234 o/c C 844 8182.77 o/c
C 845 8187.35 o/c C 846 8114.98 o/c C 847 8182.58 o/c C 848 8188.98 o/c
C 849 825.481 o/c C 850 843.417 o/c C 851 846.688 o/c C 852 848.818 o/c
C 853 8856.65 o/c C 854 8851.19 o/c C 855 8851.58 o/c C 856 8851.88 o/c
C 857 8851.84 o/c C 858 8853.51 o/c C 859 8854.77 o/c C 860 8855.55 o/c
C 861 8856.13 o/c C 862 8859.88 o/c C 863 8868.24 o/c C 864 8861.92 o/c
C 865 8862.53 o/c C 866 864.791 o/c C 867 863.764 o/c C 868 871.631 o/c
C 869 883.816 o/c C 870 889.877 o/c C 871 887.381 o/c C 872 889.515 o/c
C 873 897.318 o/c C 874 8852.57 o/c C 875 8855.65 o/c C 876 8857.98 o/c
C 877 8868.84 o/c C 878 867.378 o/c C 879 878.997 o/c C 880 877.968 o/c
C 881 881.259 o/c C 882 884.981 o/c C 883 885.821 o/c C 884 887.187 o/c
C 885 893.743 o/c C 886 885.755 o/c C 887 E2 Overid o/c C 888 E2 Overid o/c
C 889 871.391 o/c C 890 875.328 o/c C 891 879.729 o/c C 892 881.677 o/c
C 893 882.679 o/c C 894 886.926 o/c C 895 891.171 o/c C 896 886.538 o/c
C 180 896.482 o/c C 181 868.681 o/c C 182 8124.38 o/c C 183 8181.24 o/c
C 184 8183.25 o/c C 185 897.231 o/c C 113 8929.66 o/c C 114 8938.56 o/c
C 115 8933.73 o/c C 116 8937.19 o/c C 117 8937.68 o/c C 118 8941.85 o/c
C 119 8929.51 o/c C 120 8919.19 o/c C 121 8921.88 o/c C 122 8926.45 o/c
C 123 8928.72 o/c C 124 8922.61 o/c C 186 8949.58 o/c
S T 2
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SCAN (MKS) 64.8000
FURNACE 133.518
SIDE A 64.5738
SIDE B 74.8421
CONDUCTOR 64.7999
CONDUIT A 77.9374
CONDUIT B 85.4565
J BOX 95.6743
CABLE ENT 185.293
S T 2 16.28.13.6
C 881 8852.82 o/c C 882 8853.38 o/c C 883 8859.45 o/c C 884 811.133 o/c
C 885 8862.49 o/c C 886 8861.66 o/c C 887 8868.51 o/c C 888 8868.63 o/c
C 889 8868.61 o/c C 810 8862.29 o/c C 811 8863.31 o/c C 812 8862.54 o/c
C 813 889.364 o/c C 814 881.428 o/c C 815 885.885 o/c C 816 889.856 o/c
C 817 889.884 o/c C 818 887.295 o/c C 819 885.857 o/c C 820 884.978 o/c
C 821 845.529 o/c C 822 845.689 o/c C 823 847.883 o/c C 824 847.874 o/c
C 825 848.487 o/c C 826 849.341 o/c C 827 848.292 o/c C 828 8851.14 o/c
C 829 8851.83 o/c C 830 8853.47 o/c C 831 8853.52 o/c C 832 8853.23 o/c
C 833 8855.64 o/c C 834 8858.81 o/c C 835 8861.37 o/c C 836 866.282 o/c
C 837 8863.91 o/c C 838 871.758 o/c C 839 874.236 o/c C 840 873.178 o/c
C 841 879.899 o/c C 842 871.133 o/c C 843 8188.45 o/c C 844 8185.74 o/c
C 845 8189.99 o/c C 846 8128.29 o/c C 847 8185.73 o/c C 848 8184.43 o/c
C 849 836.521 o/c C 850 844.962 o/c C 851 848.426 o/c C 852 8851.88 o/c
C 853 8852.99 o/c C 854 8853.58 o/c C 855 8853.96 o/c C 856 8853.58 o/c
C 857 8854.11 o/c C 858 8855.57 o/c C 859 8857.21 o/c C 860 8857.97 o/c
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C 865 865.925 o/c C 866 867.747 o/c C 867 868.688 o/c C 868 874.497 o/c
C 869 885.721 o/c C 870 891.853 o/c C 871 888.888 o/c C 872 891.432 o/c
C 873 8188.48 o/c C 874 8854.85 o/c C 875 8857.34 o/c C 876 8859.52 o/c
C 877 8862.23 o/c C 878 869.874 o/c C 879 873.851 o/c C 880 879.689 o/c
C 881 883.789 o/c C 882 888.222 o/c C 883 888.835 o/c C 884 898.517 o/c
C 885 896.755 o/c C 886 887.742 o/c C 887 E2 Overid o/c C 888 E2 Overid o/c
C 889 873.982 o/c C 890 878.288 o/c C 891 882.745 o/c C 892 885.588 o/c
C 893 884.879 o/c C 894 888.439 o/c C 895 894.586 o/c C 896 887.885 o/c
C 180 899.566 o/c C 181 878.751 o/c C 182 138.853 o/c C 183 8185.13 o/c
C 184 8187.88 o/c C 185 8188.79 o/c C 113 8933.83 o/c C 114 8936.51 o/c
C 115 8936.61 o/c C 116 8948.58 o/c C 117 8941.83 o/c C 118 8945.78 o/c
C 119 8938.85 o/c C 120 8921.79 o/c C 121 8923.73 o/c C 122 8926.92 o/c
C 123 8921.29 o/c C 124 8918.71 o/c C 186 8945.75 o/c
S T 2
*****

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TEST RECORD FAVERDALE TECHNOLOGY
 A STRUCTURE 31-0106 CENTRE ID
 LASALLE LASALLE
 TEST CONFIGURATION ASTM E119 FIRE CORNER
 ISSUE 1
 16/6/94
 Rodney Vallis 6/10/94

APPENDIX F

Photographic Record

- | | |
|----------|----------------------------------------------------------------------------|
| Frame 1 | Removable section of the furnace assembly |
| Frame 2 | Fixed section of the furnace assembly containing cable tray, conduits etc. |
| Frame 3 | Pre test build up of initial layers |
| Frame 4 | Pre test build up of initial layers |
| Frame 5 | Pre test build up of initial layers |
| Frame 6 | Pre test build up of initial layers |
| Frame 7 | Pre test build up of initial layers |
| Frame 8 | Pre test build up of initial layers |
| Frame 9 | Pre test build up of final layer |
| Frame 10 | Pre test build up of final layer |
| Frame 11 | Pre test build up of final layer |
| Frame 12 | Pre test build up of final layer |
| Frame 13 | Pre test build up of final layer |
| Frame 14 | Pre test build up of final layer |
| Frame 15 | Hose stream test |
| Frame 16 | Post test |
| Frame 17 | Post test |
| Frame 18 | Post Test |

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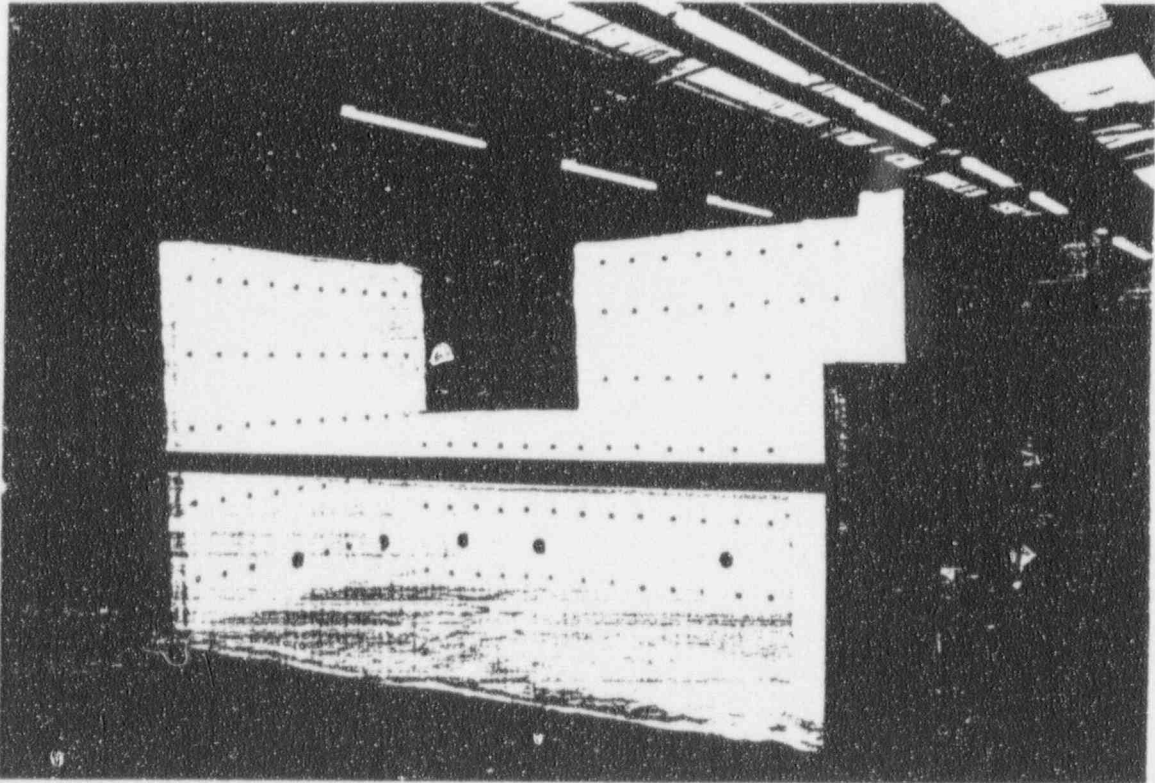
Frame 19 Post Test
Frame 20 Post Test
Frame 21 Post Test
Frame 22 Post Test
Frame 23 Post Test
Frame 24 Post Test
Frame 25 Post Test

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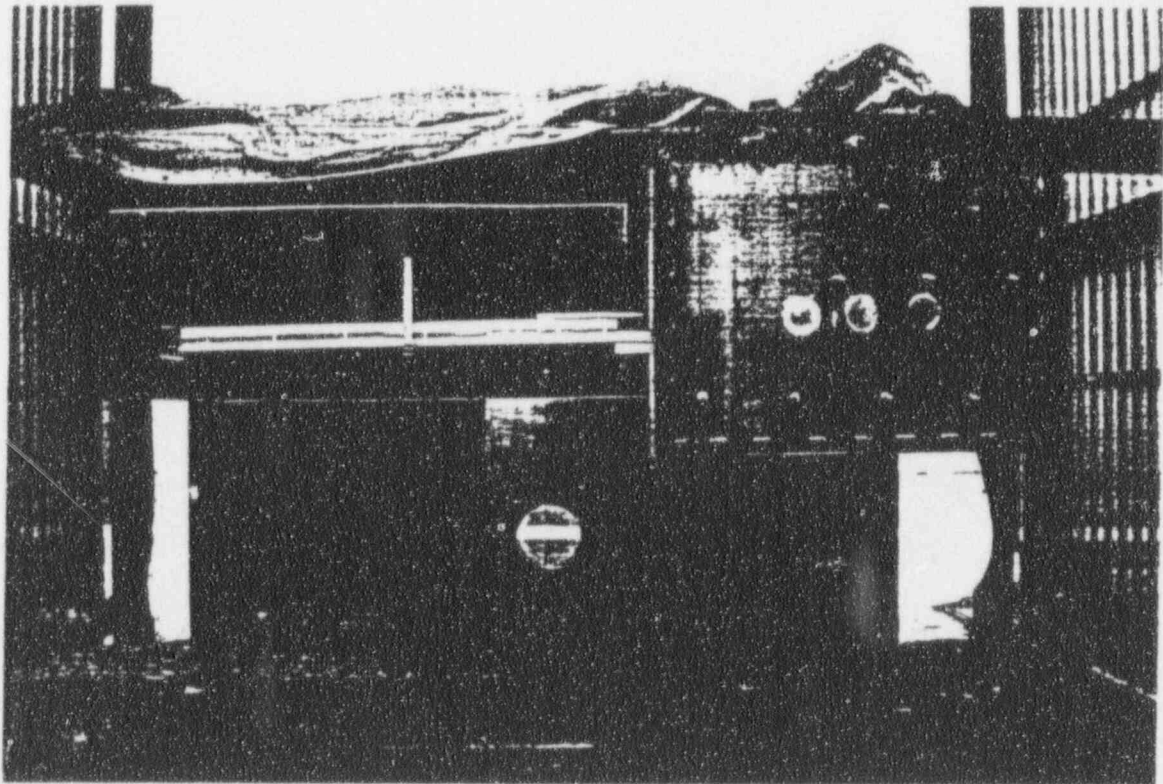
Frame 1 Removable Section of the Furnace Assembly

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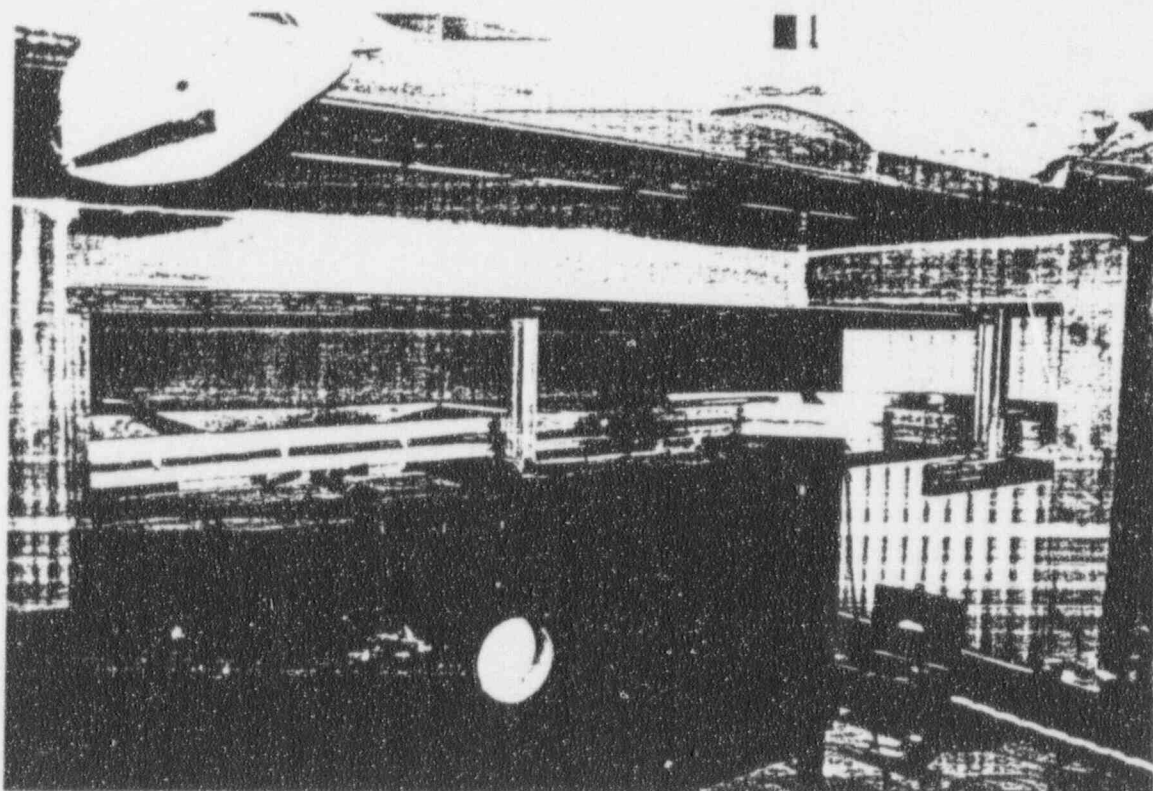
Frame 2 Fixed Section of the Furnace Assembly containing Cable Tray, Conduits etc.

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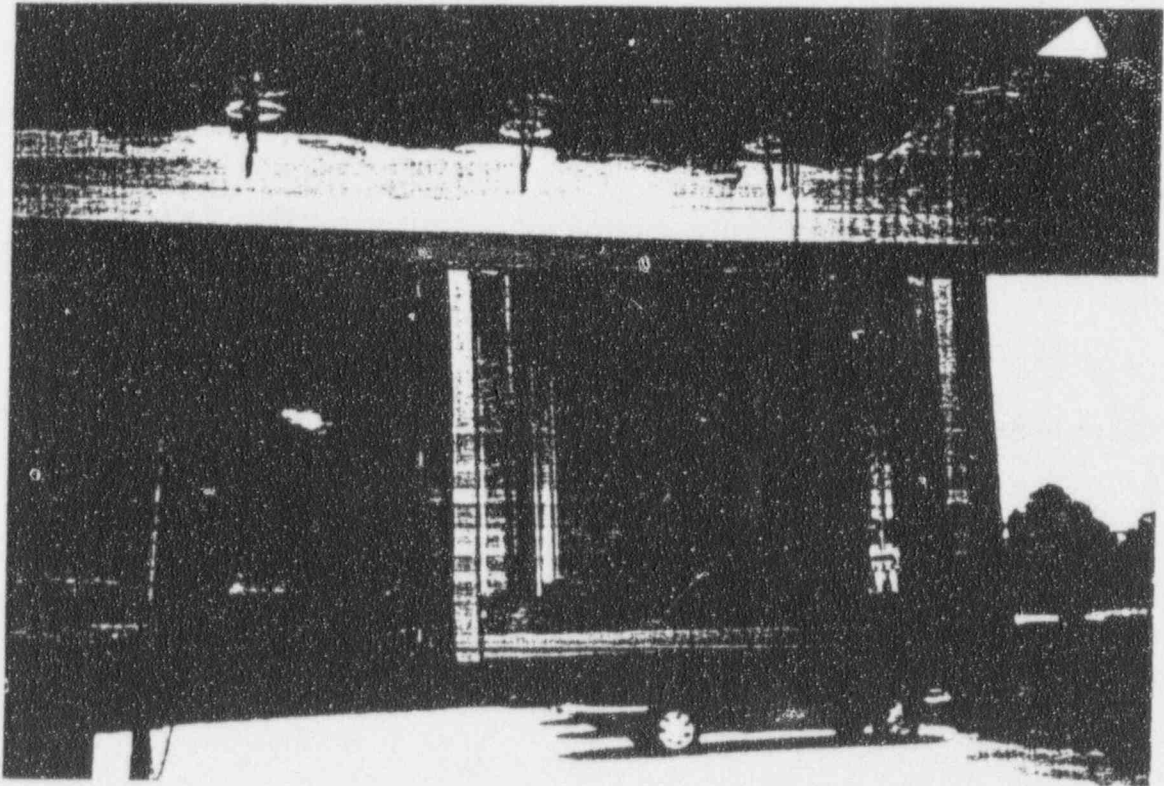
Frame 3 Pre Test build up of initial layers

TEST REPORT FOR A 1 HOUR FIRE TEST ON
DARMATT KM1 FIRE PROTECTION SYSTEM FOR
SITE CONFIGURATIONS AT THE LASALLE
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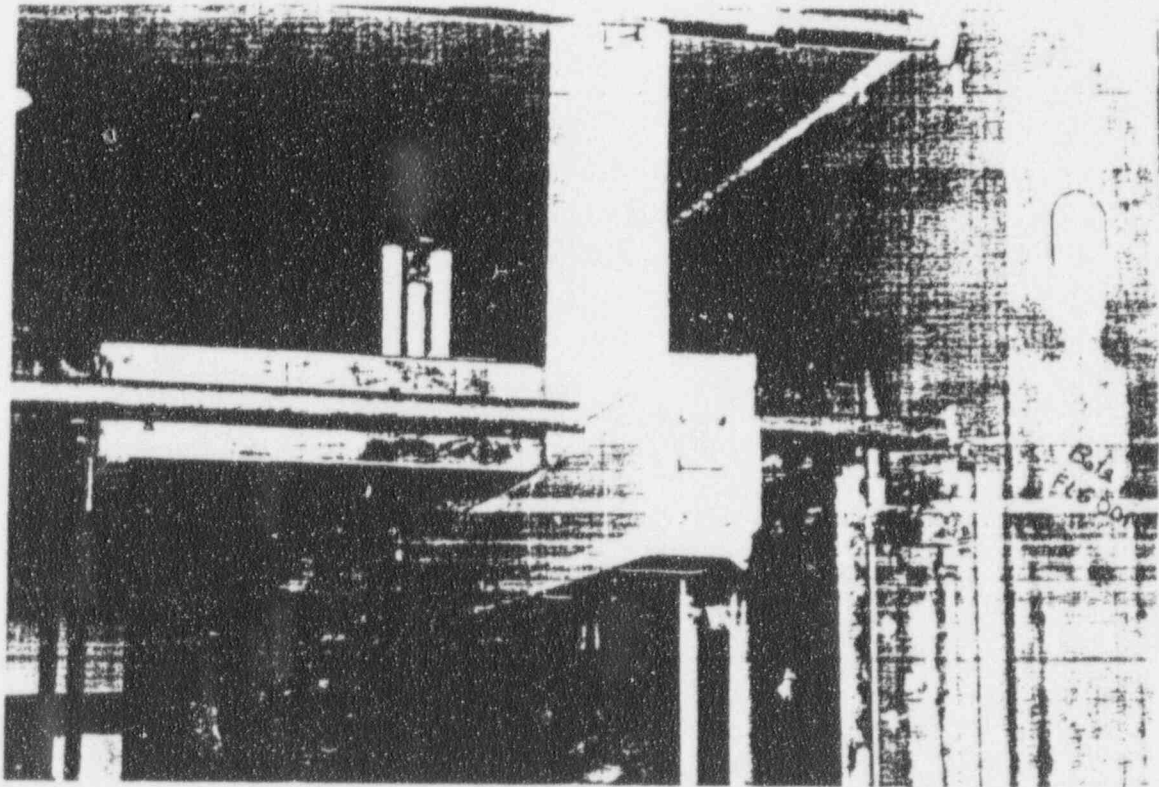
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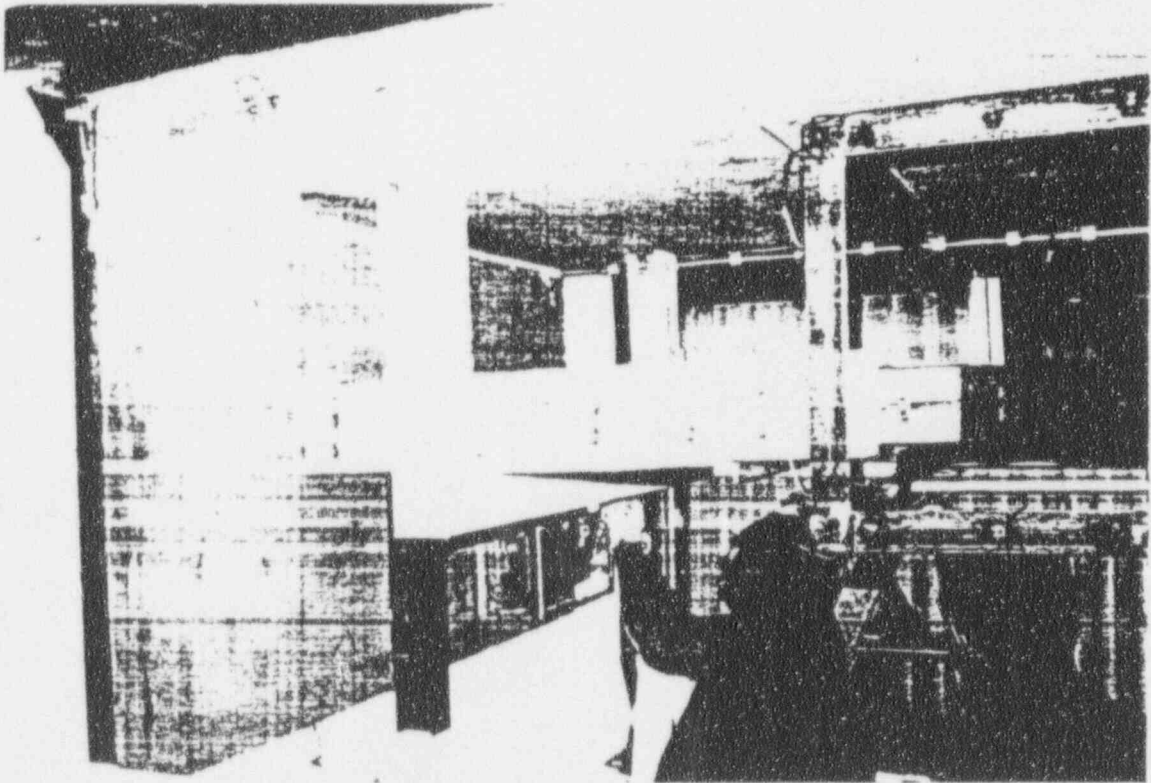


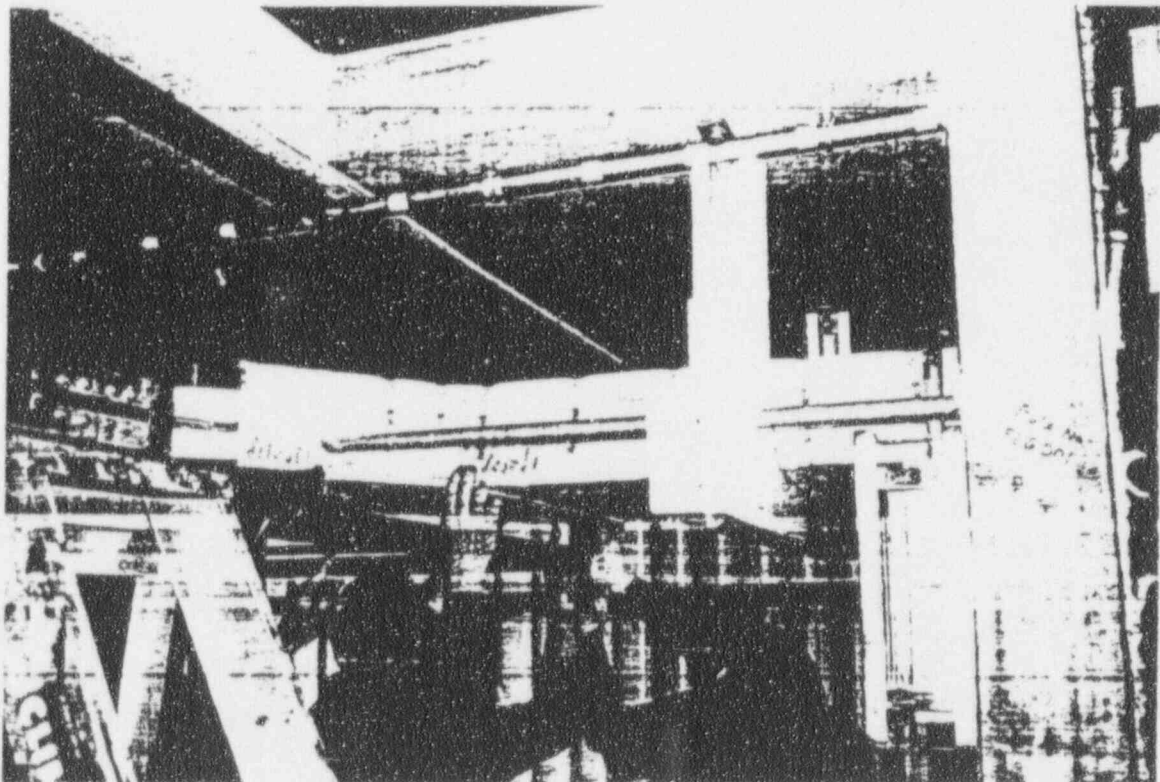
Frame 4 Pre Test build up of initial layers



Frame 5 Pre Test build up of initial layers

Frame 6 Pre Test build up of initial layers





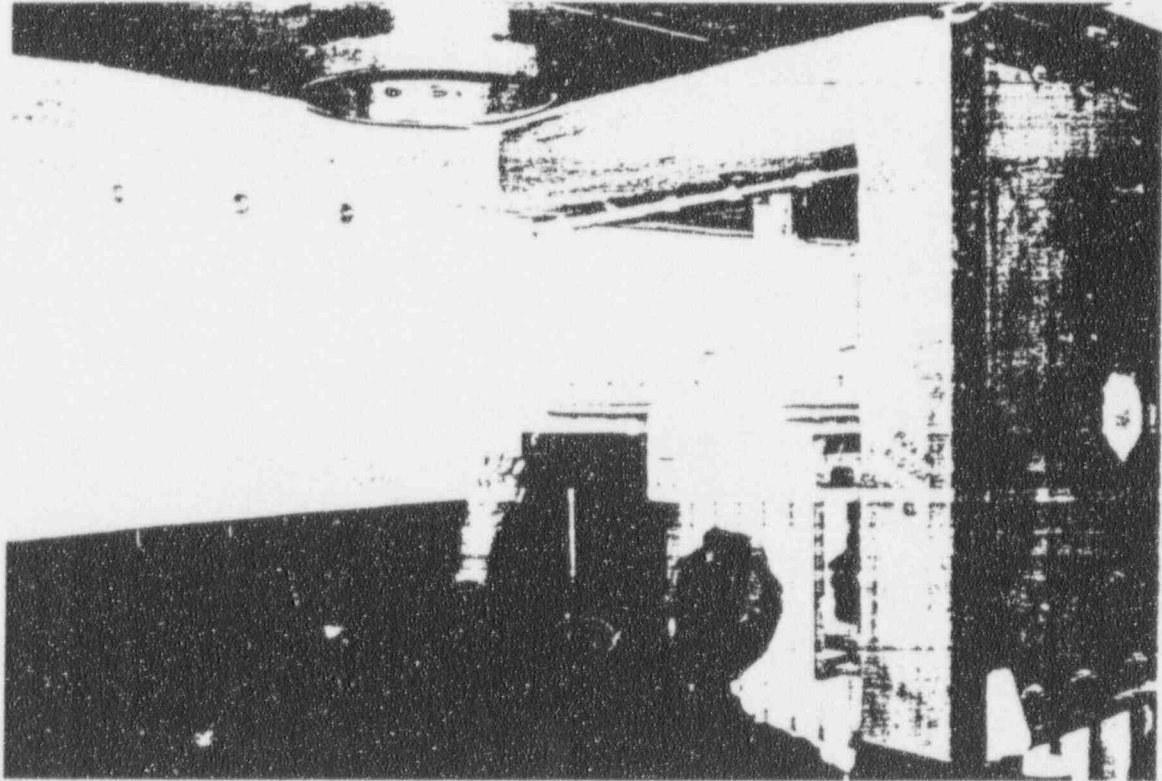
Frame 7 Pre Test build up of initial layers

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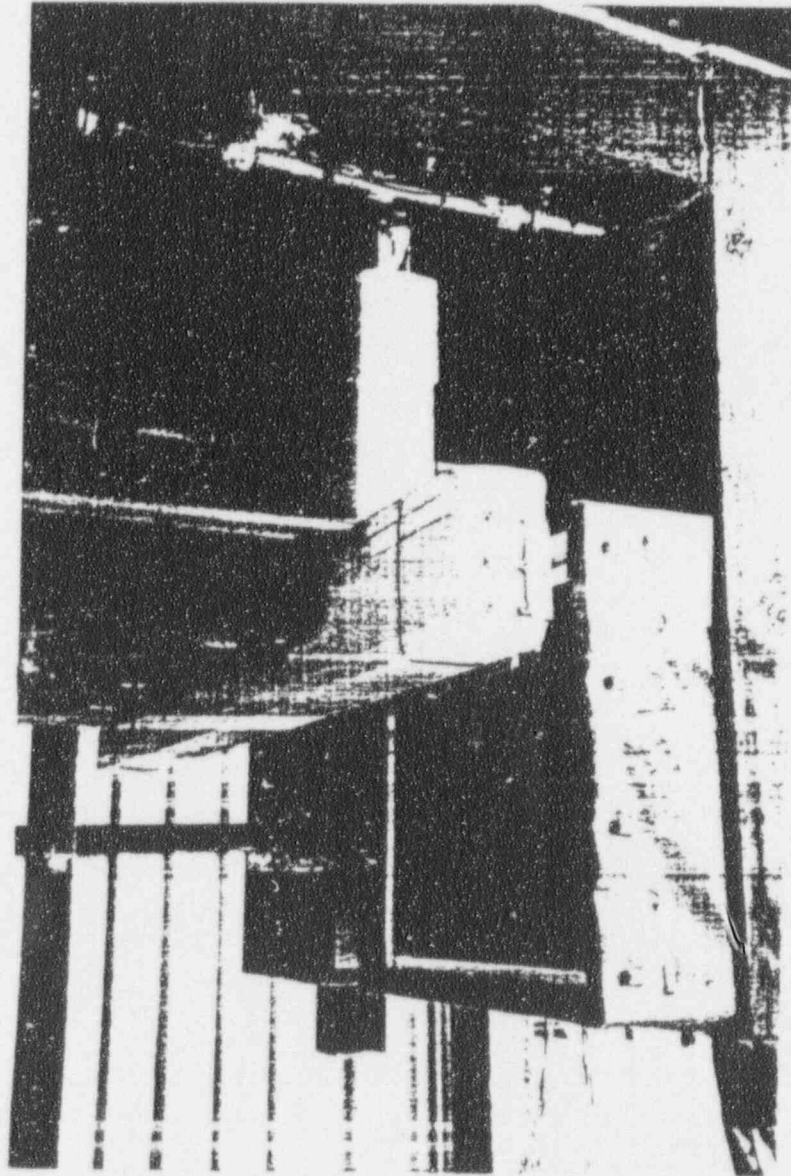
Frame 8 Pre Test build up of initial layers

TEST REPORT FOR A 1 HOUR FIRE TEST ON
DARMATT KMI FIRE PROTECTION SYSTEM FOR
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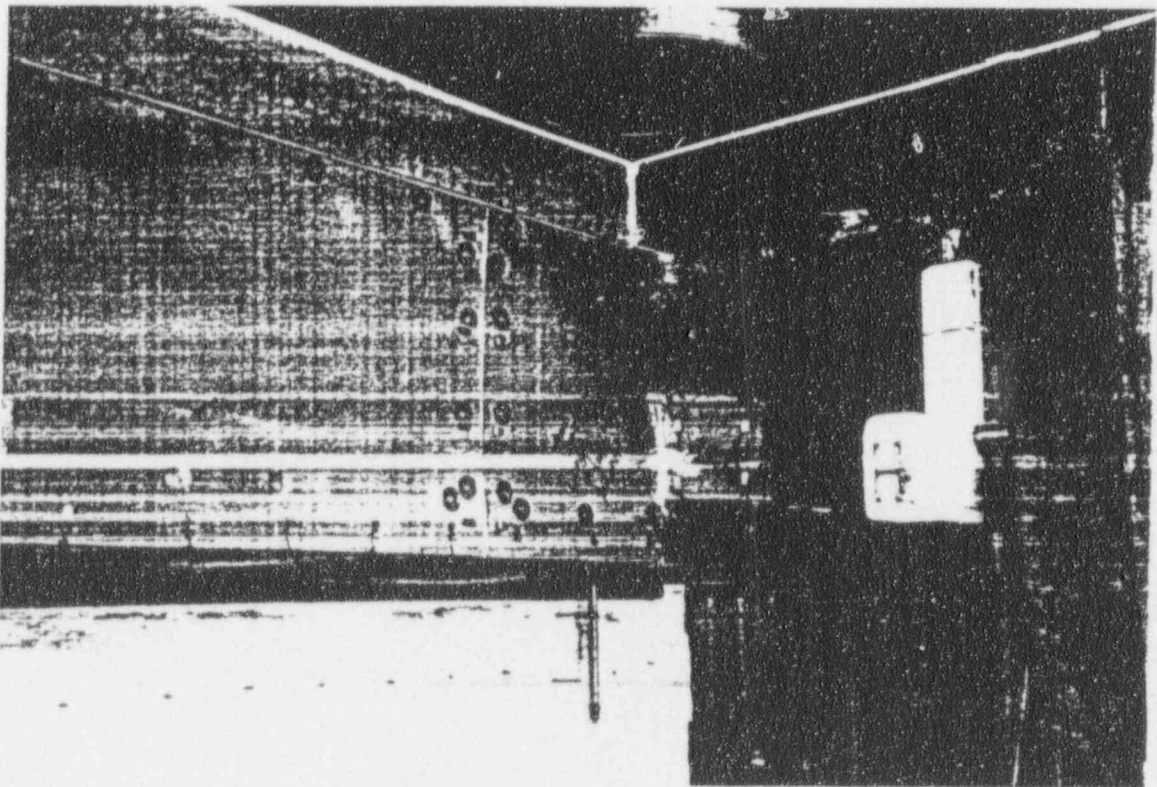
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Frame 9 Pre Test build up of final layer



Frame 10 Pre Test build up of final layer

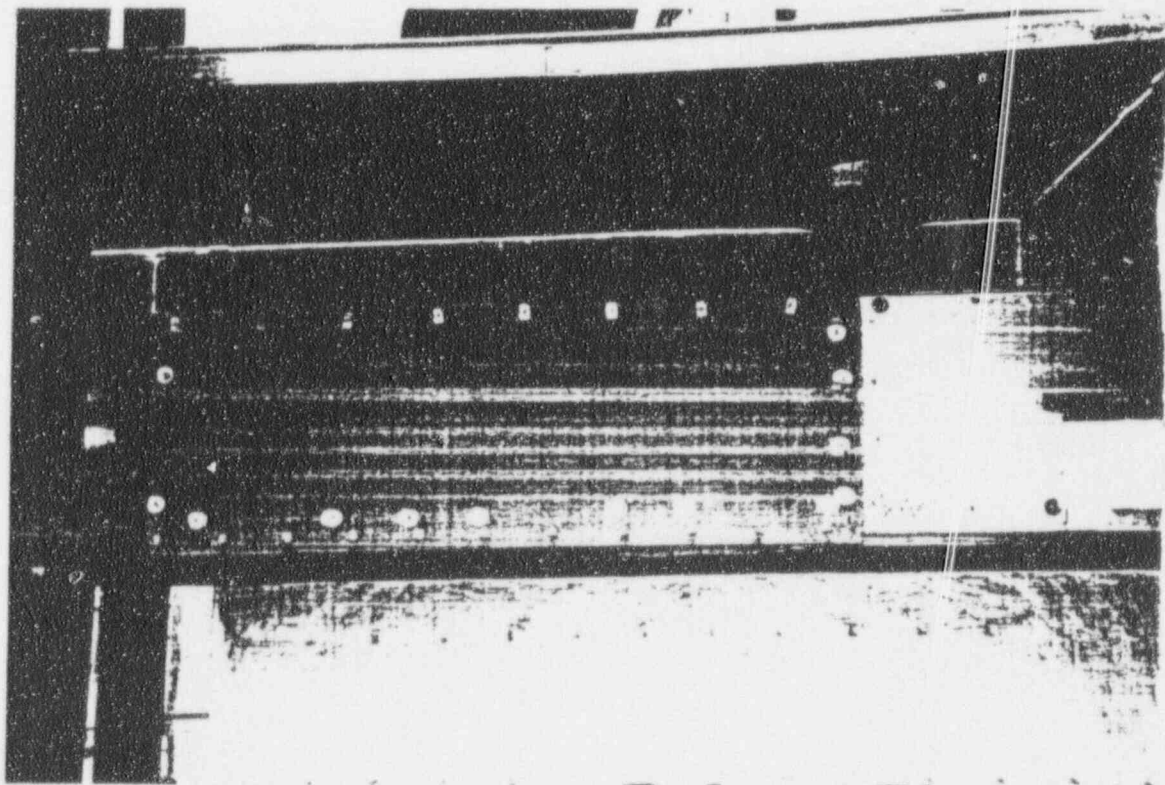
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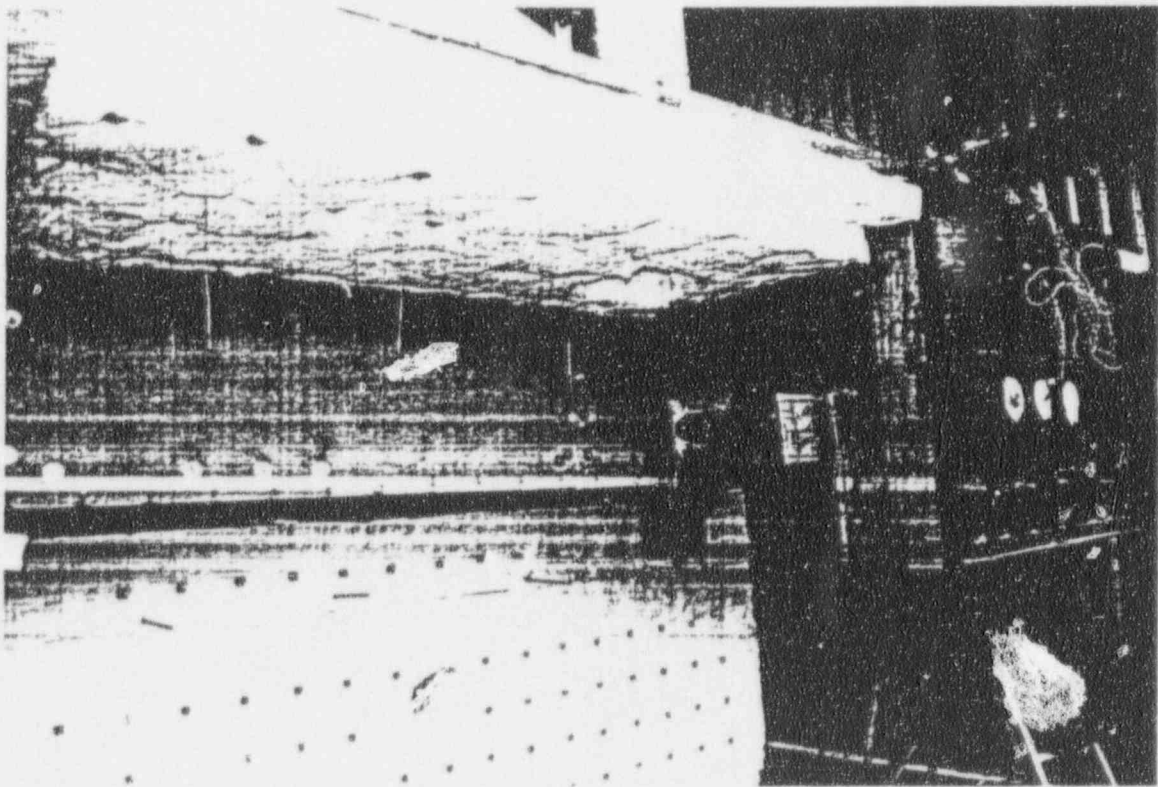
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Frame 11 Pre Test build up of final layer





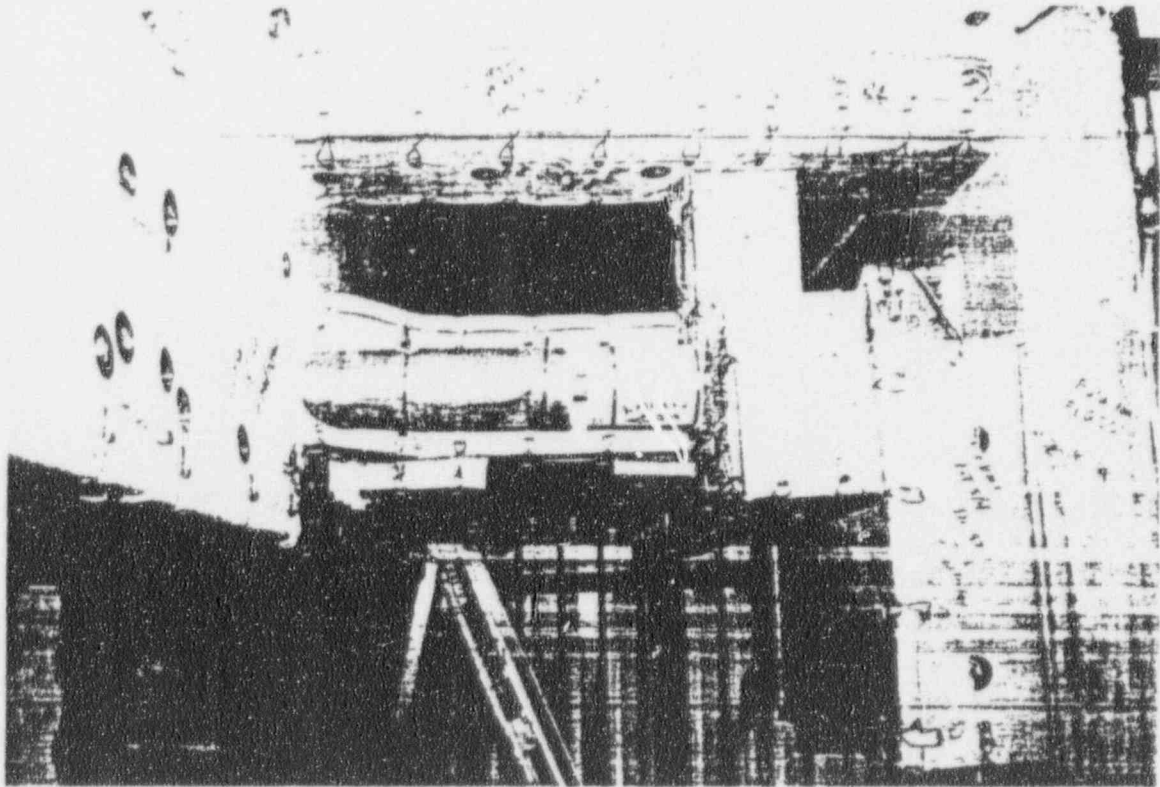
Frame 12 Pre Test build up of final layer

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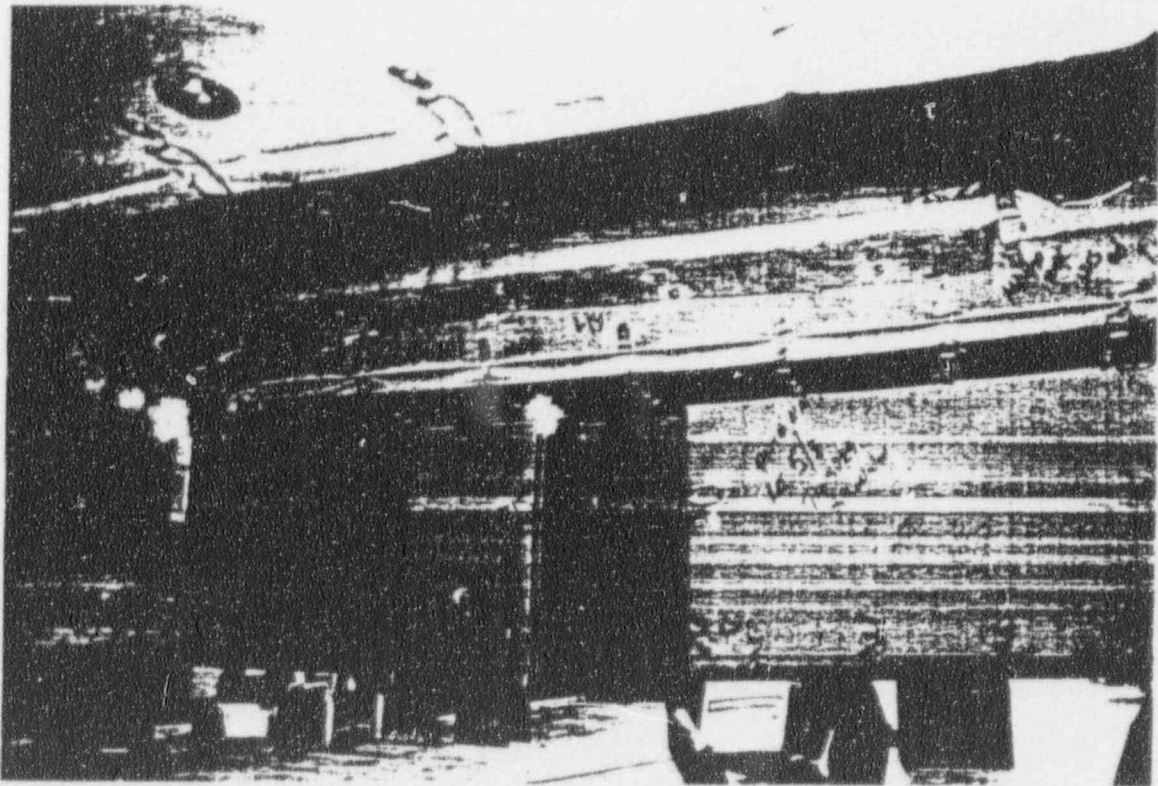
Frame 13 Pre Test build up of final layer

TEST REPORT FOR A 1 HOUR FIRE TEST ON
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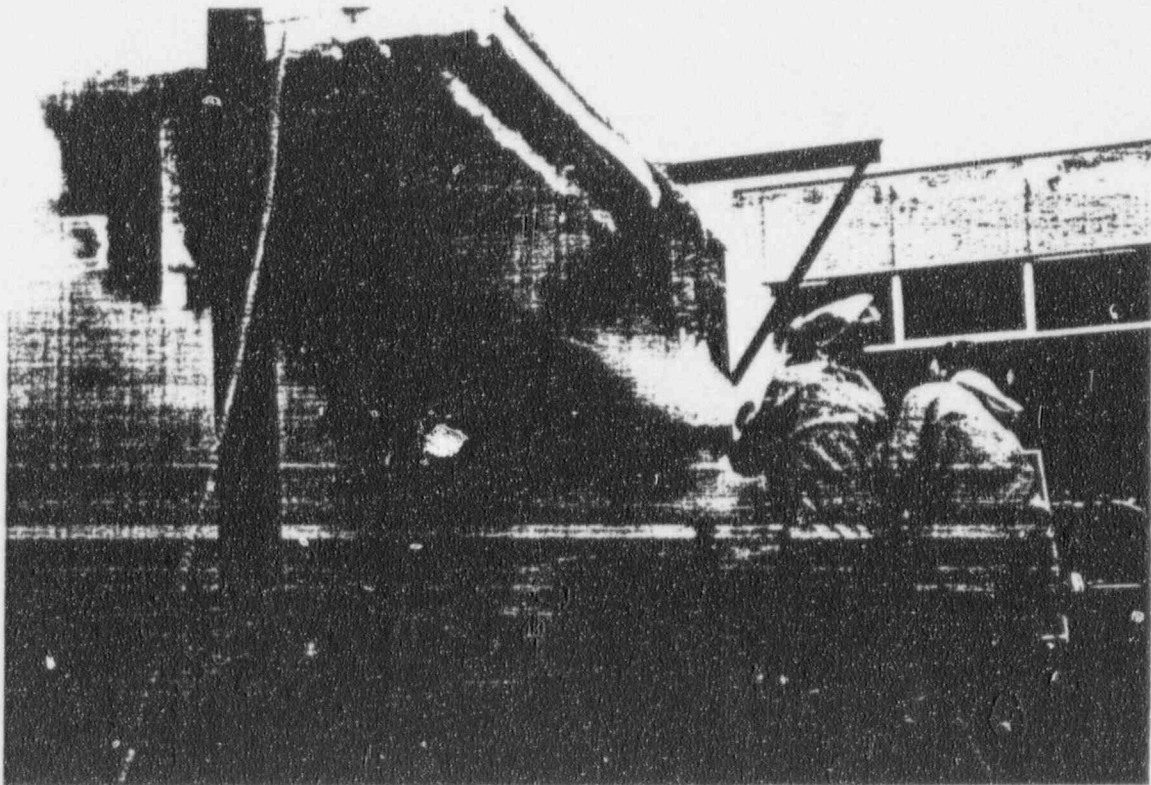
Frame 14 Pre Test build up of final layer

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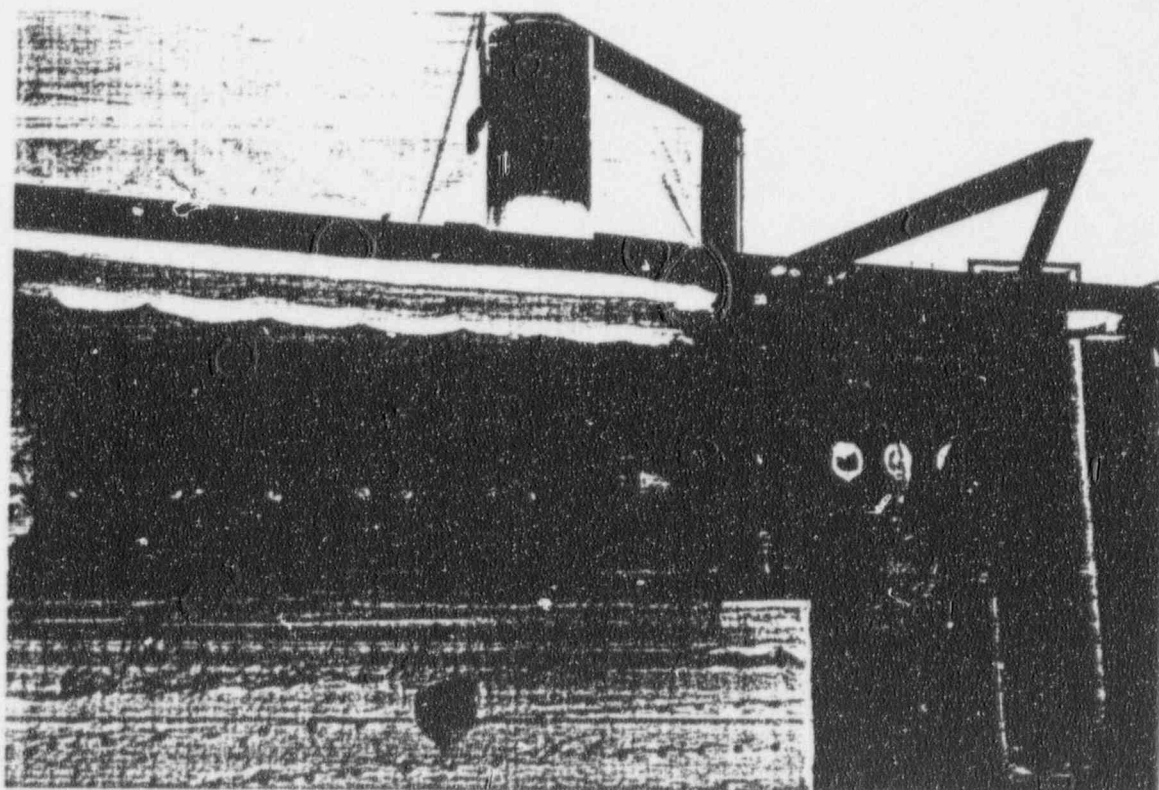
Frame 15 Hose Stream Test

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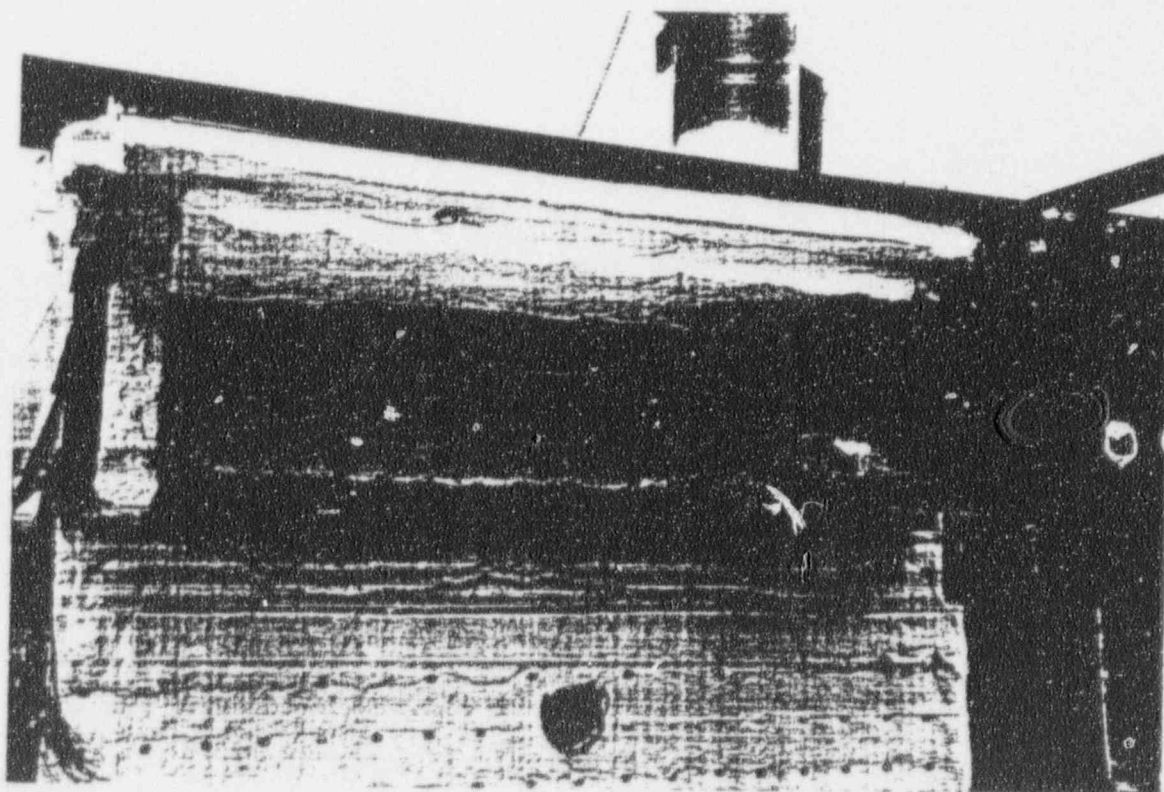
Frame 16 Post Test

TEST REPORT FOR A 1 HOUR FIRE TEST ON
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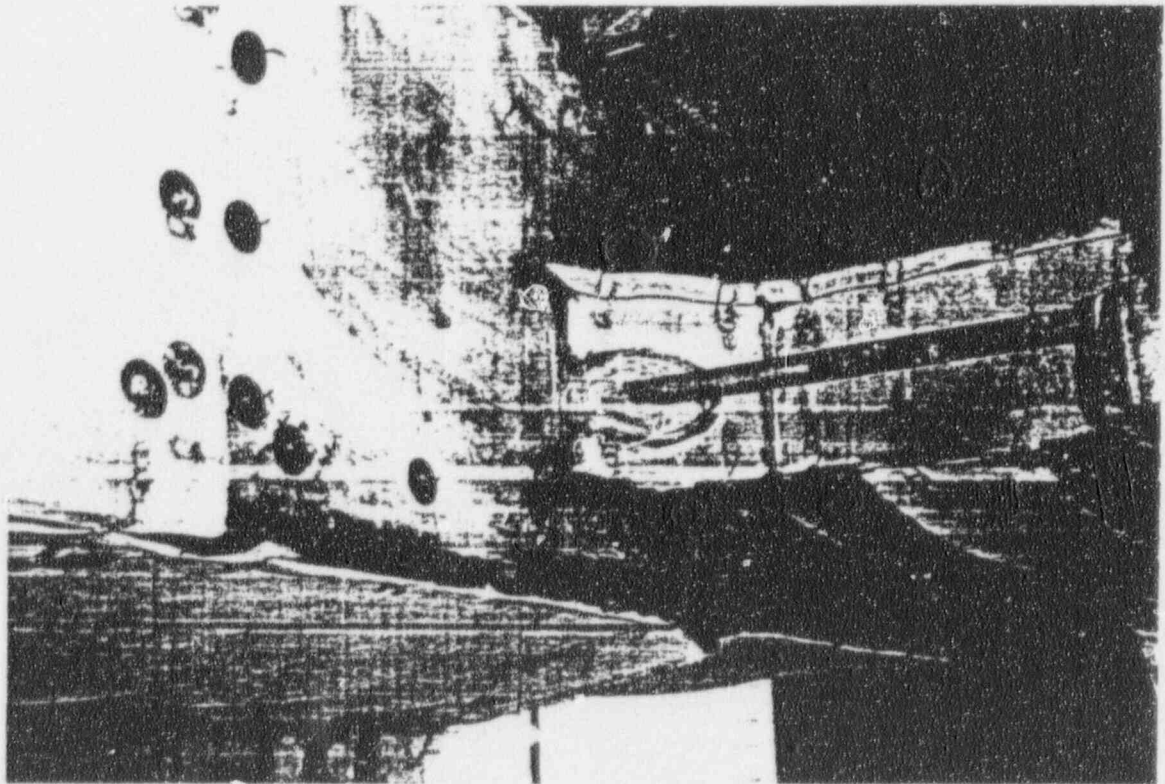
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TEST REPORT FOR A 1 HOUR FIRE TEST ON
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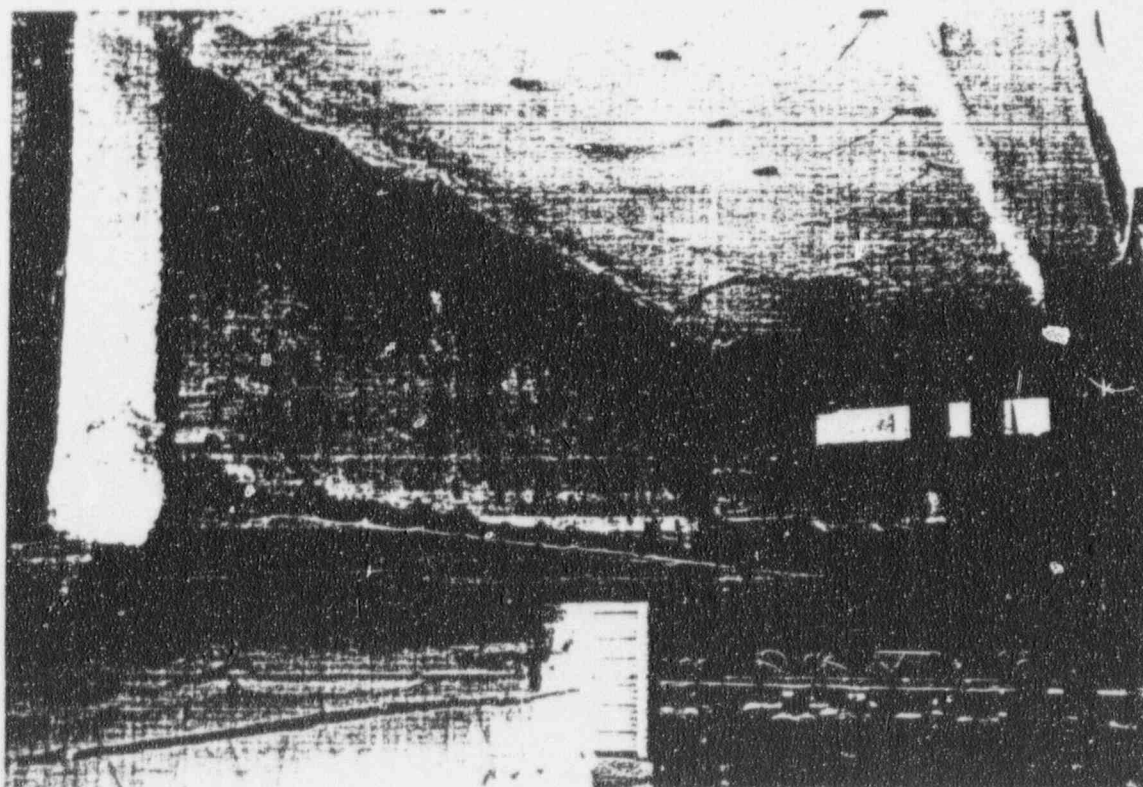
Frame 18 Post Test

TEST REPORT FOR A 1 HOUR FIRE TEST ON
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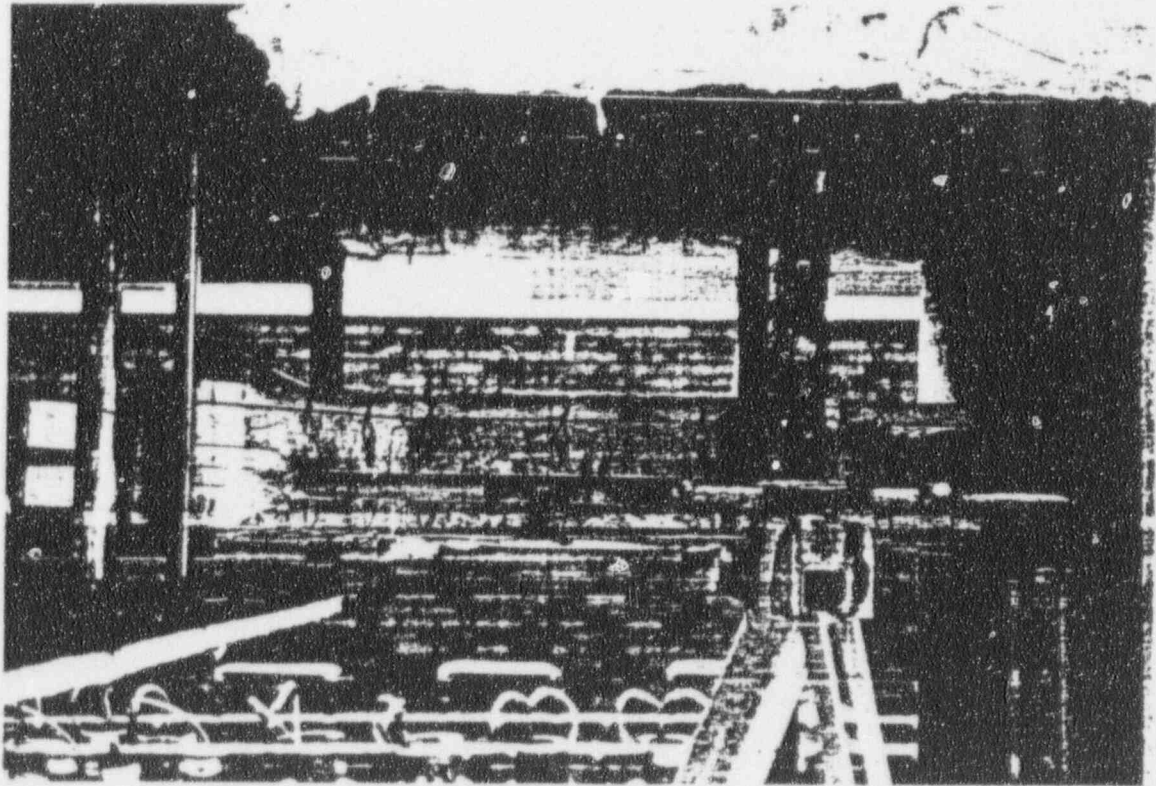
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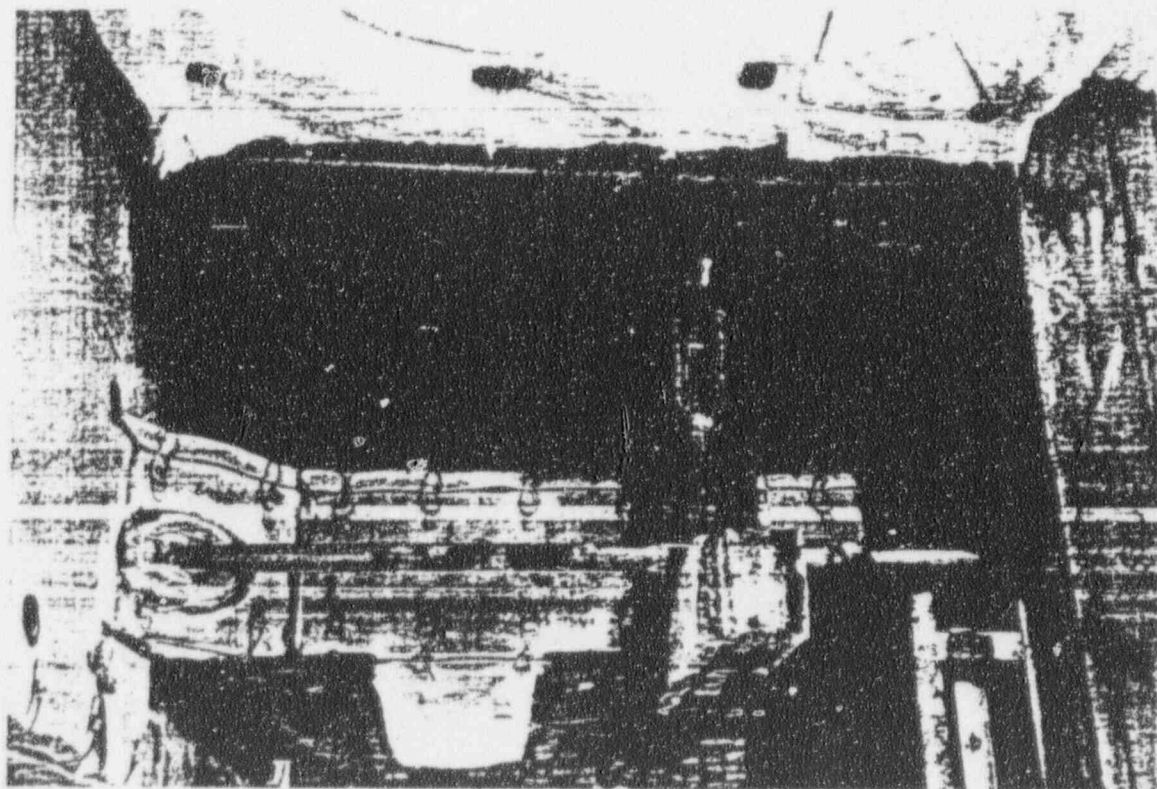
Frame 20 Post Test

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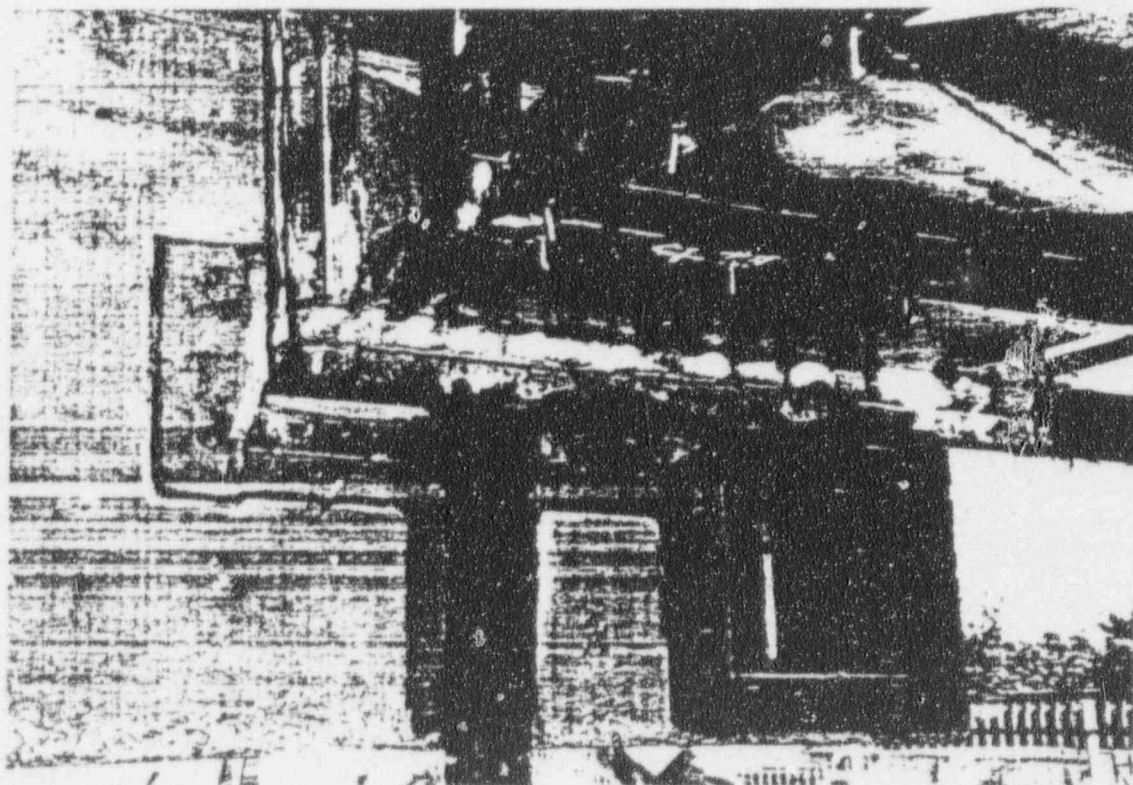
Frame 21 Post Test

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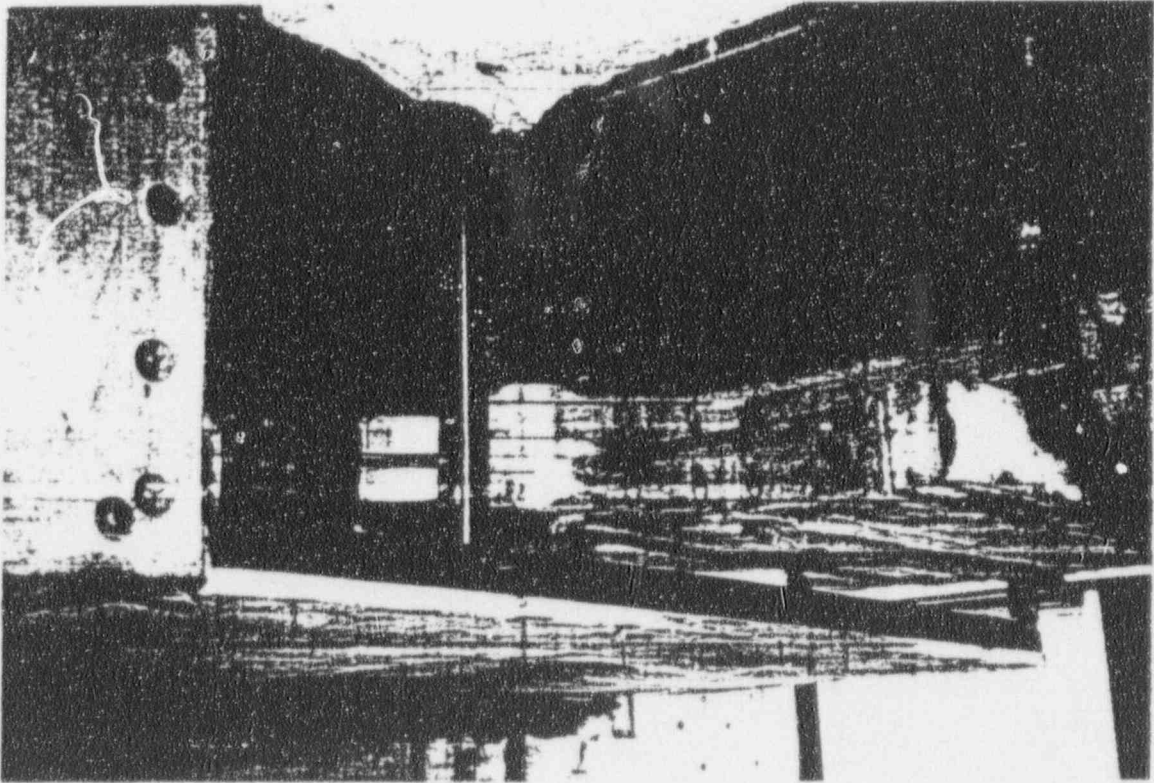
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TEST REPORT FOR A 1 HOUR FIRE TEST ON
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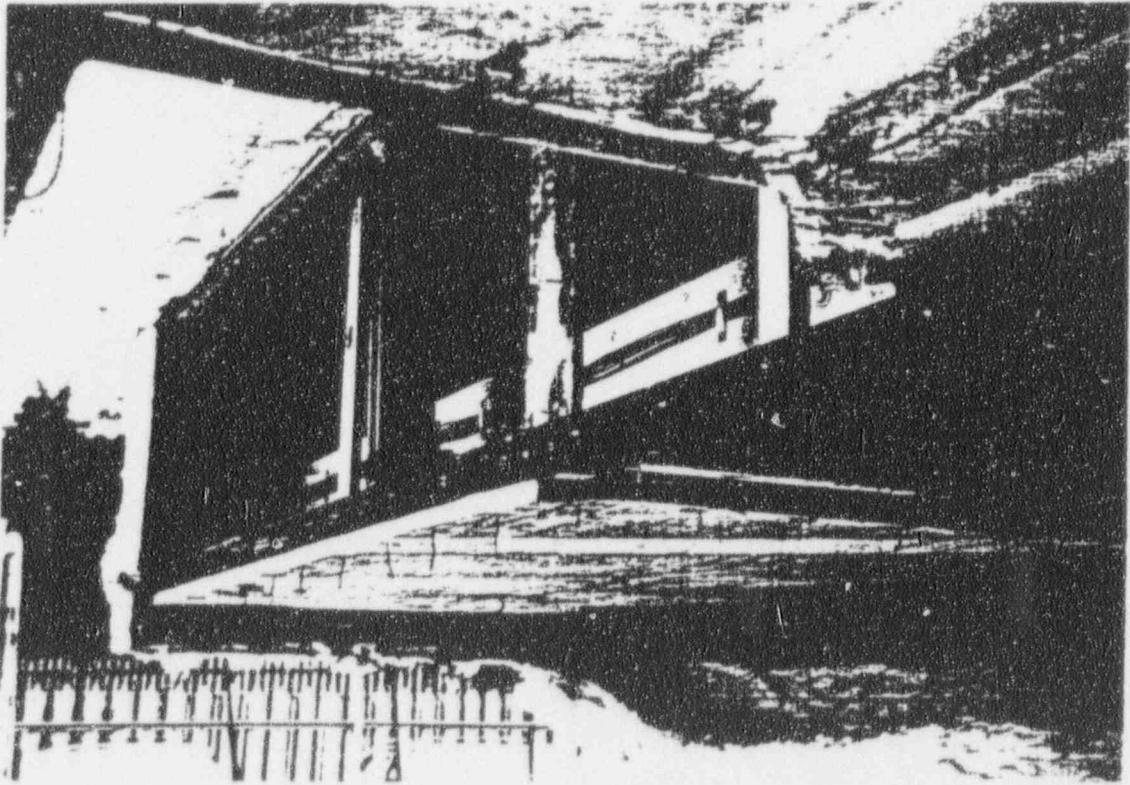
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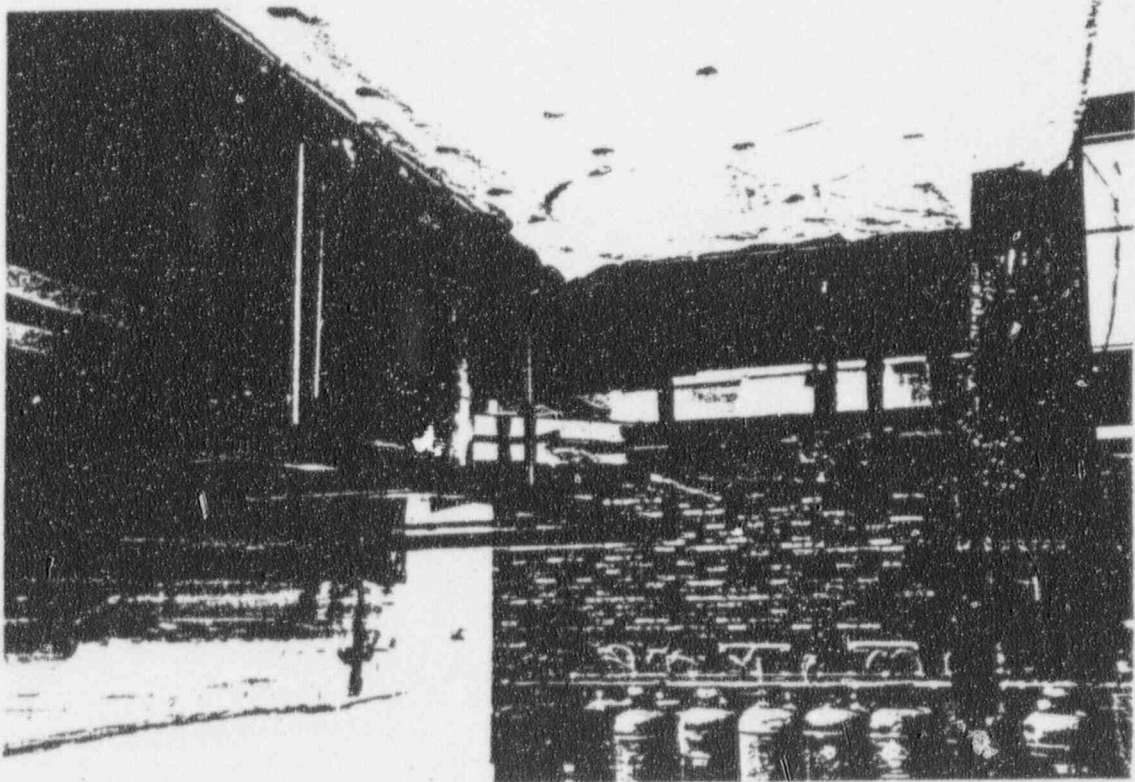
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Frame 25 Post Test