



March 27, 2001
RC-01-0053

Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Gentlemen:

Subject: VIRGIL C. SUMMER NUCLEAR STATION (VCSNS)
DOCKET NO. 50/395
OPERATING LICENSE NO. NPF-12
REQUEST FOR REVISIONS TO PREVIOUSLY ACCEPTED
DEVIATIONS TO THE CRITERIA WITHIN SECTION III.G.2.c TO
APPENDIX R OF 10CFR50

South Carolina Electric & Gas (SCE&G) is submitting the attached requests for revisions to an existing plant licensing basis deviation that was granted in NUREG-0717, Supplement 3, and affirmed in Licensing Amendment 17. The revisions requested apply to the requirements of Section III.G.2 of Appendix R to 10CFR Part 50.

VCSNS commissioned fire-endurance testing to be performed on Kaowool triple wrap fire barriers on December 28, 1999. This testing was performed as a voluntary initiative by VCSNS, in response to the discussions of "industry testing" in SECY 99-204, "Kaowool and FP-60 Fire Barriers."

On December 29, 1999, engineering review of preliminary results indicated that some applications may not meet the current regulatory requirements for maintaining one train free of fire damage for a one hour duration (10 CFR 50 Appendix R, Section III.G.2.). Compensatory measures were established pending final resolution and a Licensee Event Report was submitted.

Provided in Attachment IV-A (Table 1) are the 13 Kaowool triple wraps which meet the present deviation criteria. These are included to assist in your understanding of the methodology utilized to determine the time ratings for the triple wraps in Attachment IV-B (Table 2) for which SCE&G is requesting the revisions to the existing deviation. This condition is not risk significant because either the revised rating is greater than the postulated exposure or because a PRA calculation shows the fire induced CDF is less than 1.0E-6.

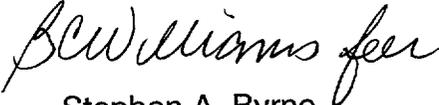
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VCSNS believes that the attached deviation revision requests provide sufficient detail to show that adequate protection is provided to ensure safe shutdown capability.

Should you have any questions, please call Mr. Andy Robosky at (803) 345-4765.

Very truly yours,


Stephen A. Byrne

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RTS (O-C-99-1520)
File (815.01)
DMS (RC-01-0053)

INDEX OF ATTACHMENTS

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Attachment IX	Design Calculation for Ampacity Considerations for cables in Air Drops and Routed through Junction / Pull Boxes *

* NOTE: Only the applicable portions of these Design Calculations are attached here.

**Triple Wrap Deviations
SUMMARY
2/28/2001**

**REQUEST FOR REVISIONS TO PREVIOUSLY ACCEPTED DEVIATIONS TO THE CRITERIA
WITHIN SECTION III.G.2.c TO APPENDIX R OF 10CFR50**

This document provides a generic description of separate revisions to an existing plant licensing basis deviation that was granted in SER Supplement 3 and affirmed in License Amendment 17 (to require only certain areas of the station to have the required suppression). The revisions requested apply to the requirements of Section III.G.2.c of Appendix R to 10CFR50. These revision deviations are requested as a part of the SCE&G effort to resolve concerns associated with the capability of Kaowool triple wrap. Table 1 (Attachment IV-A) discusses thirteen triple wraps (15-TW, 16-TW, 17-TW, 18-TW, 19-TW, 21-TW, 22-TW, 23-TW, 25-TW, 29-TW, 34-TW, 38-TW and 40-TW). Table 2 (Attachment IV-B) discusses seventeen triple wraps (3-TW, 5-TW, 6-TW, 7-TW, 8-TW, 9-TW, 10-TW, 11-TW, 12-TW, 13-TW, 41-TW, 42-TW, 44-TW, 45-TW, 47-TW, 50-TW and 51-TW).

Kaowool blanket is produced from kaolin, a naturally occurring alumina-silica fire clay. Kaowool has a melting point of 3200°F, a normal use limit of 2300°F, but can be used at even higher temperatures in certain applications. Kaowool is Non-Combustible as classified per UL-723/ASTM-E-84 for all densities. Its Flame Spread, Fuel Contribution and Smoke Developed all have a zero rating. The resultant high-quality blown alumina-silica fibers are air-laid into a continuous mat and mechanically needled for added tensile strength and surface integrity. Kaowool ceramic fiber blanket is a highly efficient insulator. Its low shot content gives more usable fiber, and its longer fibers give it the high tensile strength and resiliency to withstand vibration and physical abuse. Kaowool is self-supporting and will not separate, sag or settle. It has low thermal conductivity, low heat storage, and is extremely resistant to thermal shock.

V.C. Summer Nuclear Station (VCSNS) conducted a full-scale test at Omega Point Test Labs on December 28, 1999, to establish the actual fire-resistance performance of the installed three (1") Kaowool (8-pcf density). See Technical Report (TR07870-001, Revision 0 dated 5/24/2000), "Kaowool Triple Wrap Raceway Fire Barrier Test for Conduits and Cable Trays". As a result of this test, all surface mounted configurations, 4" and larger conduit, and 6" x 36" raceway suspended in open air passed the 1-hour fire rating. Some of the cables in 1" conduit, 6" x 6" raceway, and air drop cables suspended in open air did not pass the Generic Letter (GL) 86-10, Supplement 1 megger when subjected to an ASTM E-119 fire test. The 1" conduits and the 6" x 6" raceway cables passed a 47-48 minute fire rating. As a result of interpolation or extrapolation, the thirteen deviations listed in Table 1 will meet the 60-minute requirement noted in the original deviation. Additionally, through interpolation or extrapolation, the seventeen deviations listed in Table 2 will meet a 45-minute duration. SCE&G requests acceptance with the deviations noted in both Tables.

In four instances in the plant, there are air drop cables (11-TW, 41-TW, 42-TW and 45-TW) that required additional analysis and modifications to provide thermal masses above the tested configurations to protect these individual cables. Two of the air drop (11-TW and 45-TW) circuits involve 7.2kv power cables, and two (41-TW and 42-TW) involve 125vdc control circuits. VCSNS has developed an engineering change request (Modification ECR-50205) that provides Kaowool triple wrapping over exposed silicone foam barriers, exposed supports (potential thermal shorts), and an additional two layers of Kaowool over three additional dummy cables (thermal mass) that have been added to the air drop areas. Refer to Attachment VII regarding the computer program simulation for the 3-layer versus 5-layer arrangement on air drops. With the 5-layers of 1" Kaowool,

and the additional cables for thermal mass, the program simulation shows a maximum temperature of 233°F at 60 minutes. Design Calculation DC08500-024 (Attachment IX) documents cable sizing considerations for cable air drops associated with Kaowool fire barriers.

Power cables are sized and derated on the basis of IPCEA P-46-426 [4], supplemented by IPCEA-NEMA P54-440 [5]. The operating temperature for power cables accounts for the temperature rise due to cable I²R losses. The use of fire barriers (wraps) affect the qualified life of a cable by inhibiting the transfer of heat from the cable. Additional derating of power cables is considered when fire wraps are used. However, for the two air drops (11-TW and 45-TW) involving power cables, no derating was necessary since only 1% to 1-1/2% of the total length will have the additional two wraps added. Design Calculation DC08500-023 (Attachment VIII) documents cable sizing considerations for power cable trays associated with Kaowool fire barriers.

No ampacity derating factors are applied to control and instrument cables due to the type of service and low current levels. Due to the small or negligible currents, or their intermittent operation, there is no heat rise from I²R losses attributable to control or instrumentation cables. Therefore fire wraps around control or instrumentation cables do not affect their qualified lives.

Attached are sketches showing the location of the triple wrap and the major source of the combustible loads in the area (Attachment V). Additionally, we have added some data sheets from a computer program that compares 3-layer versus 5-layer insulation wrap on a 0.69" cable (no conduit) to simulate an air drop configuration. This is applicable to Triple Wrap number(s) 11-TW, 41-TW, 42-TW and 45-TW.

Some revision requests involve only the "C" Train and are noted as such on an individual basis. Train "C" is the "installed spare" Train and is NOT normally subject to the requirements of Appendix "R". The "C" Train components can be powered from either "A" or "B" Train power supplies with both power supply breakers normally racked down, when the components are not fully operational, or not being utilized as a replacement for either of the Train components (as per our response to Inspection Report 86-12 dated October 17, 1986).

VCSNS has conservatively applied Appendix "R" guidelines to the "C" Train components to enhance the margin of safety for the public, the plant, and the employees. To implement this enhancement, the "C" Train components are maintained to the standards of the "A" and "B" Train equipment. The equipment on "C" Train is operated on a rotating frequency during normal plant operations to allow the "C" Train components to spend approximately 50% of their running time on "A" Train and approximately 50% on "B" Train. Therefore, the probability that "C" Train components will be impacted by an Appendix "R" fire while being powered from either the "A" or "B" Train power supply is greatly reduced.

This philosophy ensures that maintenance activities on plant components that have an "installed spare" have minimal impact on the safe operation of the plant or the Core Damage Frequency (CDF). With the reduced operating time on either train, the reduced CDF, and the conservative application of Appendix "R" requirements to "C" Train components, VCSNS feels that the deviation revisions requested for "C" Train components are appropriate. In all instances, either the "A" or "B" Train circuits are wrapped for the areas where separation is less than 20 feet.

As an added conservatism, VCS will provide additional triple wrap around the supports and any silicone foam penetration seals to eliminate thermal shorts and protect the cables at the penetration seal. The cable(s) that are routed in, and supported by, triple wrap rigid steel conduits/raceways will be wrapped a minimum of 9" to ensure that they will retain adequate strength in the event of a fire.

Because the supports for these conduits/raceways are made from heavy structural shapes and are supported by passing through the rated fire barrier walls, the protected supports will remain structurally functional even in the event of a failure of the fire detection system.

All transient combustibles are strictly controlled by procedures and have been taken into consideration when the overall combustible load calculations (Btu/ft²) were completed.

An organized program with appropriate schedules is established to assure that appropriate personnel are properly trained to perform their functions as members of fire fighting teams. The Manager, Operations, is responsible for the establishment of training programs concerning fire protection.

In June 1995, in response to Generic Letter 88-20, Supplement 4, VCSNS completed an examination of potential fire-induced vulnerabilities at VCSNS using the EPRI FIVE methodology (EPRI TR-100370, April 1992). At the time, the industry recognized that due to the screening nature of FIVE, the analysis would provide very conservative results. SCE&G completed a supplementary evaluation of fire risk at VCSNS to reduce this conservatism as well as provide the quantitative details requested in the NRC's 1998 RAI. The supplementary evaluation is documented in the January 1999 Addendum (RC-99-0017 dated January 28, 1999). The Core Damage Frequency (CDF's) mentioned in the write-ups were calculated for normal power operations.

The deviation revision requests detailed on Attachment IV will show that adequate protection can be provided to ensure safe shutdown capability of the Kaowool triple wrap fire barriers fabricated by Thermal Ceramics [formerly Babcock and Wilcox (B&W)].

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 Attachment III
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SUBJECT CODE 031		SOUTH CAROLINA ELECTRIC AND GAS COMPANY CALCULATION RECORD		PAGE 1 OF 2	
CALCULATION TITLE V.C. Summer 1998 Five Addendum Multi-Compartment Analysis		CALCULATION NO. DC00310-010		REV 0	
PARENT DOCUMENT TR00310-002		SYSTEM NA		SAFETY CLASS <input type="checkbox"/> NN <input type="checkbox"/> QR <input checked="" type="checkbox"/> SR	
ORIGINATOR K. Bateman		DISC FP		DATE 01/30/99	
		ORGANIZATION SAIC		XREF. NO. NA	
A. CALCULATION INFORMATION					
CONTENT DESCRIPTION: Qualitative and quantitative evaluations of risk due to propagation of the effects of fire between two fire zones. This calculation supports the 1998 FIVE Addendum.					
AFFECTED COMPONENTS/CALCULATIONS/ANALYSES: TR00310-002 V.C. Summer Individual Plant Examination for External Events (IPEEE) Internal Fires Addendum Report					
CONTAINS PRELIMINARY DATA/ASSUMPTIONS: <input type="checkbox"/> Yes, Piping Reconciliation Completed per QA-CAR-0089-18					
<input checked="" type="checkbox"/> NO <input type="checkbox"/> YES, PAGES					
COMPUTER PROGRAM USED: <input type="checkbox"/> NO					
<input checked="" type="checkbox"/> YES, VALIDATION NOT REQ'D [REF. 3.5] <input type="checkbox"/> YES, VALIDATED [OTHERS]					
<input type="checkbox"/> YES, VALIDATED [ES-412] <input type="checkbox"/> PROGRAM VALIDATION CALCULATION					
<input type="checkbox"/> CONTINUED, ATTACHMENT					
B. VERIFICATION					
VERIFICATION SCOPE: Review attached calculation for completeness and accuracy					
VERIFIER/DATE <i>B. Najafi</i> 2/4/99		ASSIGNED BY: <i>Karen M. Bateman</i> 1/30/99 RESPONSIBLE ENGINEER (DESIGNEE)/DATE			
VERIFIER/DATE <i>[Signature]</i> 2/4/99		APPROVAL/DATE <i>[Signature]</i> 2/3/99			
C. RECORDS					
TO DMS: <i>hgo</i> 4-5-99 INIT/DATE					

DISTRIBUTION: CALC FILE (ORIGINAL)

general area on the 485'-0" elevation, AB-1.30) through large openings in the floor. One opening is in the northeast portion of the Auxiliary Building (at column line Q-6) and the other is in the southwest portion (at about column line L-10). The northeast opening is an open equipment hatch, 12 ft long by 5 ft wide; the southwest opening is a grated opening in the floor 26 ft long by 9 ft wide (approximate dimensions scaled from drawings).

The Auxiliary Building main supply system provides ventilation air to the general floor areas. Air is exhausted by the Auxiliary Building main exhaust system, Auxiliary Building charcoal exhaust system, and Auxiliary Building HEPA exhaust system.

A fire in one general area is not expected to result in damage to equipment and cables in other general areas for the following reasons:

- Detailed analysis performed for the general area of the Intermediate Building on the 412'-0" elevation is applicable to the general areas in the Auxiliary Building. The area analyzed in the Intermediate Building has a floor area of 11,301 square feet and ceilings 22 feet in height. A very large oil fire, a 20 square foot unconfined oil spill with an estimated heat release rate of 7425 Btu/s, was analyzed for the Intermediate Building space. The temperature rise predicted in the plume at an elevation 21 feet above the fire was 608 °F. Critical levels of radiant heat for the fire analyzed were predicted to occur within a radius of 15 feet. Therefore, even a very large floor-based exposure fire is not capable of directly affecting equipment and cables on the elevation above.
- The only other means of propagating the effects of a fire to other elevations is through migration of hot gases through unprotected openings, the largest of which are the northeast and southwest equipment hatches. However, the potential for hot gas layer buildup is limited because at each elevation the hatches open to the next elevation directly above one another. Buoyancy forces will cause hot air rising through a hatch at one elevation to continue to rise to succeeding elevations. The rising column of heated air will cool as it rises due to entrainment of cooler air at each elevation. A column of hot air rising through the northeast equipment hatches will terminate on the ventilation equipment level of the Auxiliary Building, the 485'-0" elevation. There are no safe shutdown cables or equipment on this elevation. A column of hot air rising through the southwest equipment hatches will terminate on the 463'-0" elevation (AB-1.21.2). At the uppermost elevation, the heated column of air will mix with a large volume of cool air. In addition, the Auxiliary Building ventilation system will draw out a portion of the heated air at the highest elevation, mixing it with cooler air throughout the Auxiliary Building. It is most likely that the combined effect of entrainment of cool air as the column rises and dilution by the ventilation system will limit hot gas layer buildup and keep temperatures at all elevations well below damage thresholds.

Based on the discussion above, the following Auxiliary Building compartment pairs were not subjected to further analysis.

- AB-1.4/AB-1.10
- AB-1.4/AB-1.18
- AB-1.4/AB-1.21

1.7. Screening

The 1998 Addendum reevaluated the screening performed for the 1995 FIVE analysis, incorporating updated P2 values developed for Phase 1 of the Addendum analysis. The updated P2 values are based in part on a rigorous and detailed HRA analysis described in Section 1.3, and an updated Fire IPE model described in Section 1.5.1. The Addendum requantified the screening core damage frequencies (CDFs), utilizing Equation 2 [Ref. 1, Sections 6.3.4 through 6.3.7], for those zones which were screened using Equation 2 in the 1995 Five analysis, as described in Section 2 of Reference 3.

$$F3 = F1 \times P2 \times [P_f + P_{fst} \times p \times u \times y/2 \times \ln (1/y)] \quad \text{Eq. 2}$$

where:	F1	is the zone fire ignition frequency taken from the 1995 FIVE analysis (except as noted above)
	P2	is the conditional core damage probability developed for the 1998 Addendum
	Pf	is the probability of suppression unavailability when exposed to a fixed combustible fire source
	Pfst	is the probability of suppression unavailability when exposed to a transient combustible fire source
	p	is the probability of transient combustibles being exposed
	u	is the probability that transient combustibles are located in the range of the target components (i.e., an area ratio).
	y/2 × ln (1/y)	represents the frequency of having the critical combustible loading present in the zone in violation of plant policy (not credited in this analysis, i.e., = 1.0)

The Addendum requantified all other zones utilizing Equation 3 as described in Section 3 of Reference 3.

$$\text{CDF} = \sum_i (F1_i \times P2_i \times Pas_i \times Pms_i \times p_i \times u_i \times SF_i) \quad \text{Eq. 3}$$

where:	F1	is the modified post-FIVE fire frequency
	P2	is the conditional core damage probability
	Pas	is the probability of automatic suppression unavailability (not credited in this analysis, i.e., =1.0)
	Pms	is the probability of manual suppression unavailability (credited for transient ignition sources only)
	p	is the probability of transient combustibles being exposed
	u	is the probability that transient combustibles are located in the range of the target components (i.e., an area ratio).
	SF	is a severity factor (credited for fixed ignition sources only and not credited in conjunction with suppression in the MCR or Relay Room)

Inputs other than P2 values used in updating the screening were taken from the 1995 FIVE analysis except as noted in the paragraphs that follow. The updated screening results are provided in Section 2.1.

Table 27 Phase 1 Requantification of Screening for Zones Using Equation 3

Fire Zone	Unscreened IS	F1	P2	Pas	Pms	u (Area Ratio)	SF	Scenario CDF	% Contrib.	Total Zone CDF
IB-23	Transients (welding)	2.480E-04	3.65E-02	1	0.15	5.50E-02	na	7.459E-08	5.2%	1.436E-06
IB-23	Transients (other)	4.160E-05	3.65E-02	1	0.65	5.50E-02	na	5.422E-08	3.8%	
IB-23	Pumps	1.792E-04	3.65E-02	1	1	na	0.20	1.307E-06	91.0%	

NOTE: This is selected data from page 69 of 104 from TR00310-002, and not the entire page.

Table 1
Triple Wrap Deviations
VC Summer Nuclear Station

SUMMARY:

	TW #	Conduit, (Tray), or Equipment	Size	Cable or Circuit Number(s)
A	15	XX-3413C XX3417C XX3574C PB-CC77 PB-CC78	(H/OA) 3.00" G (HV/OA) 3.00" G (HV/OA) 2.50" G	VLC18C (EK-B1L) CCE23C (EK-B1N) YY1421C (EK-B1N) N/A
B	16	PB-SG14 XX-419D XX-1680D	(HV/SM) 3.00" G (HV/SMOA) 3.00" G	CSU2D (EK-C1A) SIU3D (EK-C1A) RCU72D (EK-C1A) RCU74D (EK-C1A) RCU76D (EK-C1A) RCU78D (EK-C1A) RCU82D (EK-C1A) MSU82D (EK-C1A) MSU84D (EK-C1A) MSU86D (EK-C1A) MSU88D (EK-C1A) MSU101D (EK-C1A) MSU102D (EK-C1A) MSU103D (EK-C1A)
C	17	EDE23A EDE24A EDE28A DGE23A [Others - not App 'R' EDE27A YY1953 XX2942A XX2980A]	(H/OA) 2.00" G (H/OA) 2.00" G (H/OA) 2.50" G (H/OA) 1.50" G [(H/OA) 3.00" G (H/OA) 2.00" G (H/OA) 2.50" G (H/OA) 2.50" G]	EDE23A (EK-A2S) EDE24A (EK-A2S) EDE28A (EK-A2E) DGE23A (EK-A3B) [Others - not App 'R' EDE27A (EK-A2D) YY1953 (EK-A2S) XX2942A (7 ckts) XX2980A (3 ckts)]
D	18	PB-SG12 XX-417A XX-418A XX-897A XX-898A	(HV/SM) 3.00" G (HV/SM) 3.00" G (H/OA) 3.00" G (H/OA) 3.00" G	RCU393A;-396A;-399A (CFC61) YY1881A (EK-C1A) RCU22A;-24A;-26A;- 28A (EK-C1A) RCU48A (EK-C1A) YY918A (EK-C1A) RCU49A (EK-C1A) MSU42A;-44A;-46A;- 48A (EK-C1A)

Table 1
Triple Wrap Deviations
VC Summer Nuclear Station

	TW #	Conduit, (Tray), or Equipment	Size	Cable or Circuit Number(s)
E	19	PB-SG15 XX-423E XX-893E [Others - Not App 'R' XX-895E XX-893E XX421E XX422E	(V/SM) 2.00" G (HV/SMOA) 3.00" G [(HV/SMOA) 2.00" G (HV/SMOA) 2.00" G (V/SM) 3.00" G (V/SM) 2.00" G]	YY1378E (EK-C1A) RCU92E (EK-C1A) RCU94E (EK-C1A) [Others - Not App 'R' (EK-C1A) (5 ckts) (EK-C1C) (3 ckts) (EK-C1A) (8 ckts) (EK-C1A) (5 ckts)]
F	21	(4314A) (4284A) (5144A)	(HV/OA) 6" x 36" (40% fill) (HV/OA) 6" x 36" (30% fill) (HV/OA) 6" x 36" (13% fill)	VARIOUS VARIOUS VARIOUS
G	22	(4069A) (4284A)	(HV/OA) 6" x 24" (53% fill) (V/OA) 6" x 24" (30% fill)	VARIOUS VLC3A;16A;142A
H	23	(4284A)	(HV/OA) 6" x 36" (20% fill)	VARIOUS
I	25	TB-CS102 VLC17C ESM171B XX2271C PB-CS27	(HV/SMOA) 1.25" G (HV/OA) 4.00" G (HV/SM) 3.00" G	VLC17C (EK-B1L) ESM171B (EK-A1C) VLC12C (EK-B1L) CSC264XC (EK-B1L) YY36C (EK-B1G)(N/A)
J	29	PB-VU27 XX-3574C XX-3414C [Others - Not App 'R' XX3513C]	(V/SMOA) 2.50" G (H/OA) 3.00" G [(H/OA) 2.50" G]	VLC18C (EK-B1L) CCE23C (EK-B1N) VUJ137C (EK-B1H) YY1434C (B1H) YY1441C (B1G) YY1447C (B1N) [Others - Not App 'R' (EK-B1J) (N/A) (EK-B1H) (N/A)]

Table 1
Triple Wrap Deviations
VC Summer Nuclear Station

	TW #	Conduit, (Tray), or Equipment	Size	Cable or Circuit Number(s)
K	34	SWL11A PB-SW75;SW76;SW77 PB-SW106;SW107	(HV/SMOA) 3.50" G	SWL11A (EK-A2F)
L	38	CCM38C CCM39C PB-CC33 PB-CC61	(HV/OA) 4.00" G (HV/OA) 4.00" G	CCM38C (EK-A1E) CCM39C (EK-A1E)
M	40	SB-VU44 VUL34B VUL52C [Others - Not App 'R' VUL84B] PB-VU50	(HV/SM) 2.50" G (HV/SMOA) 2.50" G [(HV/SMOA) 2.50" G]	VUL34B (EK-A2L) VUL52C (EK-A3E) [Others - Not App 'R' VUL84B (EI-A3E)]

NOTES:

H = Horizontal
 V = Vertical
 G = Galvanized Conduit

SM = Surface Mounted
 OA = Open Air
 F = Flexible Conduit

PB = Pull Box
 SB = Service Box
 TB = Terminal Box

Table 1
Triple Wrap Deviations
VC Summer Nuclear Station

C. DEVIATION FOR CONTROL BUILDING FIRE AREAS/ZONES
(CB-1.1, CB-2, CB-10, AND CB-12):

<u>Fire Barrier Item Number 15-TW</u>	[E-215-042 (G-5) and E-215-175 (H-5Sh5)]
Appendix R Regulatory Requirement	Required for "C" Train
FPER Section	4.5.2.4.2
Kaowool Configuration	3.00"/3.00"/2.50" Conduits (XX-3413C, XX-3417C and XX-3574C)
	Pull Boxes (PB-CC77 and PB-CC78)
Circuit(s) Protected	VLC18C and CCE23C
Function(s) Protected	VLC18C provides power to Supply Fan for 'C' Charging/SI Pump Room 2 Cooling and CCE23C is 'C' Component Coolin 'C' speed switch
Physical Protection	None
Ceiling/Wall/Floor Pen Seal Material	[Barrier #1046 (ECB2400/TR-CB416)] Ceiling Foam [Barrier #557 (TR-CB1249)] West Wall Kaowool
Approximate length involved	32'
Building	Control Building
Elevation	412'
Room Number(s)	12-04
Fire Area/Zone	CB-2
Fire Loading in Btu/SqFt	184,033 (138 minutes)
Automatic Fire Detection	Yes
Automatic Fire Suppression	Yes
IPEEE (January 1999) CDF	6.41E-07

LICENSING BASIS FOR REQUEST:

For these cables in conduits, no revision to an existing deviation of 60 minutes is requested from the requirements of separation in the area for Section III.G.2.c of Appendix R to 10CFR50. The existing plant licensing basis in this area involved a deviation that was granted in SER Supplement 3. SCE&G is providing this information as an example of the methodology used to develop the time ratings.

Description of Fire Zone CB-2

Fire Area CB-2 is the B train east basement chase located at elevation 412'-0" and the eastern portion of the east cable pit located at elevation 400'-0". This cable chase is located in the east portion of the Control Building. Fire Area CB-2 (Room 12-04) is located adjacent to CB-5 (Room 12-04A) and is separated by walls providing a 3-hour fire rated barrier. Fire Area CB-2 contains mostly "B" train cabling with some "A" train cabling also present in several conduits and cable trays within the area. Fire Area CB-2 contains Fire Barrier Item Numbers 15-TW, 16-TW, 17-TW, 18-TW, 19-TW, and 21-TW. Fire Wrap provides a fire rated barrier for "Required for 'C'-Train Operability" in CB-5, while in CB-2, 15-TW and the other barriers provide a fire rated barrier for "Appendix R

Table 1
Triple Wrap Deviations
VC Summer Nuclear Station

Required Protection". Fire Barrier Item Numbers 15-TW protects conduits XX-3413C and XX-3574C in this area. XX-3413C is wrapped from PB-CC77 to and including PB-CC78; XX-3574C is wrapped from PB-78 to the ceiling (ECB-2400/TR-416) of Room 12-04.

Combustibles associated with permanent plant equipment located within Fire Area CB-2 consist of cable insulation. The total combustible content of Fire Area CB-2 results in a fire loading of 184,033 Btus/sq. ft. Fire detection equipment for Fire Areas CB-2 consists of a smoke detection system that actuates the preaction sprinkler system. Fire suppression equipment consists of a preaction sprinkler system, portable fire extinguishers, and interior manual hose stations.

TEST COMPARISON:

Kaowool Triple Wrap (15-TW) is 32' long and encloses two 3" conduits and one 2-1/2" conduit suspended in open air with a total thermal mass of 763.0 pounds (23.8 lbs/ft) in Fire Zone CB-2. This item is similar to the Omega Point Test Labs Item #1 (Open Air 4" Conduit) that had a thermal mass of 329.8 (16.5 lbs/ft) pounds (inside furnace) and reached a temperature of 308°F in 60 minutes. The GL 86-10, Supplement 1 allows a temperature of 250°F above ambient (67°F) for an allowable temperature of 317°F. The extrapolated available comparison would indicate that 15-TW would reach a temperature of 304°F in 60 minutes. This equates to an available margin of 13°F or 21 minutes.

JUSTIFICATION/MODIFICATION:

Evaluation of Fire Area CB-2

Fire Area CB-2 is the 'B' Train east basement chase of the Control Building located at elevations 412' and 425'. It also includes the east portion of the electrical pit at elevation 400'. At elevation 412', it is bounded on the north by the controlled access hallway, on the east by the Intermediate Building, on the south by the stair tower, and on the west by the laundry and laboratory area and the 'A' Train east basement cable chase. At elevation 425', it is bounded on the north by a pipe and cable chase, on the east by the Intermediate Building, on the south by the stair tower, and on the west by the 'A' Train cable chase and the relay room cable spreading area. The walls and ceiling form the boundary of this fire area have 3-hour ratings except for the stair tower wall that is rated at two hours. The floors are of reinforced concrete but are unrated since they are in contact with earth. Fire Area CB-2 mainly contains 'B' Train cabling and no equipment. Thus for a major fire in this area, shutdown will be controlled from the control room using 'A' Train equipment.

Fire Area CB-2 has a relatively high fire load equivalent to an estimated fire duration of approximately 2-1/2 hours. This overall fire loading is greater than the designed fire resistance rating of the subject barrier. The combustible content in this area is totally comprised of cable insulation. This area is a typical cable chase of a height and floor area that the calculated fire loading in Btus/sq. ft. is artificially high. There are no permanent combustibles located on the floor elevation, which would present an exposure fire to the subject barrier. Assuming a floor based exposure fire did occur, the temperatures developed in the overhead areas of the chase would not be expected to reach temperatures that would jeopardize the noted electrical raceway fire barrier

Table 1
Triple Wrap Deviations
VC Summer Nuclear Station

enclosure. In addition, this cable chase is protected by preaction sprinkler systems. The existing area wide fire detection system alarms in the control room would provide for early detection of a fire and allow for prompt suppression. The existing barrier therefore provides a level of protection consistent with the hazards identified and provides a high level of assurance that at least one train of safe shutdown equipment will remain free of fire damage. Also, a review of the IPEEE Internal Fire evaluation calculation indicates a core damage frequency (CDF) of $6.41E-07$ for this area. Based on the low CDF calculated during the screening phase of the IPEEE Internal Fire Evaluation, additional detailed analysis or fire modeling was not performed as part of the IPEEE.

Conduits XX3413C, XX3417C and XX3574C contain various cables that are "Required for 'C'-Train Operability". SCE&G performed a full scale fire test at Omega Point Test Labs in December 1999 and concluded that cable in larger conduit has been shown to remain functional when subjected to an ASTM E-119 fire test for at least 60 minutes. Because the cable does not meet the criteria of Section III.G.2.c, since it is not a "one hour rated fire barrier," VCS will provide additional triple wrap around the supports and silicone foam penetration seal to eliminate thermal shorts and protect the cable at ceiling. The cable is routed in, and supported by, triple wrap rigid steel conduits as discussed in the cover letter.

A walkdown of the area showed that one exposed cable tray is ~ 2' below the wrap with ~ 15 control cables. If we assume 'B1L' cables, we then have 10.6 pounds of insulation. This cable load could impact the area under the wrap (3' x 3') and would provide a fire severity of 10 minutes for this area under the wrap. This area has a sprinkler system installed.

SUMMARY:

The cables in these conduits are NOT 'A' or 'B' Train related and the fire loading is less than the tested configuration. Because VC Summer treats the swing train components as a backup of Appendix R, no revision to the deviation for 60 minutes is requested from the requirements of separation in the area for Section III.G.2.c of Appendix R to 10CFR50. The existing plant licensing basis in this area involved a deviation that is mentioned in the cover letter. SCE&G is providing this information as an example of the methodology used to develop the time ratings.

Thus the use of Kaowool triple wrap over the two 3" conduits and the one 2-1/2" conduit for the "Required for 'C'-Train Operability" cable in the fire zone CB-2; in conjunction with the existing fire protection features and additional triple wrap over the exposed thermal shorts and the ceiling silicone foam penetration seal, provide an equivalent 60 minutes level of protection to that required by Section III.G.2.c of Appendix R to 10CFR50.

Table 1
Triple Wrap Deviations
VC Summer Nuclear Station

<u>Fire Barrier Item Number 16-TW</u>	[E-215-041 (D-5) and E-215-175 (S-5Sh9)]
Appendix R Regulatory Requirement	Required for Appendix 'R'
FPER Section	4.5.2.2.2
Kaowool Configuration	3.00" Conduits (XX-419D and XX-1680D) Pull Box (PB-SG14)
Circuit(s) Protected	CSU2D, SIU3D, RCU and MCU's
Function(s) Protected	Cables associated with 'A' Train SG 'B' Press Transmitter
Physical Protection	None, Flamemastic & Zetex
Ceiling/Wall/Floor Pen Seal Material	[Barrier # 571 (TR-CB1384) West Wall Kaowool [(TR-CB16TW)] Floor Not Rated
Approximate length involved	56'
Building	Control Building
Elevation	412'
Room Number(s)	12-04
Fire Area/Zone	CB-2
Fire Loading in Btu/SqFt	184,033 (138 minutes)
Automatic Fire Detection	Yes
Automatic Fire Suppression	Yes
IPEEE (January 1999) CDF	6.41E-07
<u>Fire Barrier Item Number 17-TW</u>	[E-215-041 (F-5)]
Appendix R Regulatory Requirement	Required for Appendix 'R'
FPER Section	4.5.2.2.2
Kaowool Configuration	2.00"/2.50"/1.50" Conduits (EDE23A, EDE24A, EDE28A & DGE23A)
Circuit(s) Protected	EDE23A, EDE24A, EDE28A & DGE23A
Function(s) Protected	Cables associated with 'A' Train 125Vdc distribution panel and Diesel Generator Exciter Regulation
Physical Protection	Flamemastic
Ceiling/Wall/Floor Pen Seal Material	[Barrier #251 (ECB1129/TR-CB145)] East Wall Foam/PS [Barrier #557 (TR-CB1134)] West Wall Kaowool/Albi [Barrier #557 (TR-CB1132)] West Wall Kaowool/Albi
Approximate length involved	12'
Building	Control Building
Elevation	412'
Room Number(s)	12-04
Fire Area/Zone	CB-2
Fire Loading in Btu/SqFt	184,033 (138 minutes)
Automatic Fire Detection	Yes
Automatic Fire Suppression	Yes
IPEEE (January 1999) CDF	6.41E-07

Table 1
Triple Wrap Deviations
VC Summer Nuclear Station

<u>Fire Barrier Item Number 18-TW</u>	[E-215-041 (F-5)]
Appendix R Regulatory Requirement	Required for Appendix 'R'
FPER Section	4.5.2.2.2
Kaowool Configuration	3.00" Conduits (XX-417A, XX-418A, XX-897A & XX-898A)
Circuit(s) Protected	Pull Box (PB-SG12)
Function(s) Protected	RCU and MSU's Cables associated with 'A' Train Level Transmitters and Temperature Elements for 'B' SG Narrow Range DP, PZR Level DP and Loop 2 Hot Leg RTD
Physical Protection	Flamemastic
Ceiling/Wall/Floor Pen Seal Material	[Barrier #557 (TR-CB1244)] West Wall Kaowool [(TR-18TW)] Floor Not Rated
Approximate length involved	20'
Building	Control Building
Elevation	412'
Room Number(s)	12-04
Fire Area/Zone	CB-2
Fire Loading in Btu/SqFt	184,033 (138 minutes)
Automatic Fire Detection	Yes
Automatic Fire Suppression	Yes
IPEEE (January 1999) CDF	6.41E-07
<u>Fire Barrier Item Number 19-TW</u>	[E-215-041 (C-5) and E-215-175 (2-2Sh2)]
Appendix R Regulatory Requirement	Required for Appendix 'R'
FPER Section	4.5.2.2.2
Kaowool Configuration	2.00"/3.00" Conduits (XX-423E and XX-894E) Pull Box (PB-SG15)
Circuit(s) Protected	MSU, CSU, FWU and RCU's
Function(s) Protected	Cables associated with 'B' Train Loop 2 Cold Leg RTDs
Physical Protection	Flamemastic
Ceiling/Wall/Floor Pen Seal Material	[(TR-19TW)] Floor Not Rated [Barrier #571 (TR-CB1211)] West Wall Kaowool [Barrier #571 (TR-CB1356)] West Wall Kaowool [Barrier #571 (TR-CB1357)] West Wall Kaowool
Approximate length involved	16'
Building	Control Building
Elevation	412'
Room Number(s)	12-04
Fire Area/Zone	CB-2
Fire Loading in Btu/SqFt	184,033 (138 minutes)

Table 1
Triple Wrap Deviations
VC Summer Nuclear Station

Automatic Fire Detection	Yes
Automatic Fire Suppression	Yes
IPEEE (January 1999) CDF	6.41E-07
<u>Fire Barrier Item Number 21-TW</u>	[E-214-041 (G-8)]
Appendix R Regulatory Requirement	Required for Appendix 'R'
FPER Section	4.5.2.2.2 & 4.5.2.4.2
Kaowool Configuration	6" x 36" Trays (4314A, 4284A, and 5144A)
Circuit(s) Protected	Various
Function(s)	
Physical Protection	Flamemastic
Ceiling/Wall/Floor Pen Seal Material	[Barrier #571 (ECB1161/TR-CB1210)] West Wall Foam [Barrier #1046 (ECB2135/TR-CB404X)] Ceiling Foam
Approximate length involved	37'
Building	Control Building
Elevation	412'
Room Number(s)	12-04
Fire Area/Zone	CB-2
Fire Loading in Btu/SqFt	184,033 (138 minutes)
Automatic Fire Detection	Yes
Automatic Fire Suppression	Yes
IPEEE (January 1999) CDF	6.41E-07

Evaluation of Fire Area CB-2

Fire Area CB-2 has a relatively high fire load equivalent to an estimated fire duration of approximately 2-1/2 hours. This overall fire loading is greater than the designed fire resistance rating of the subject barrier. The combustible content in this area is totally comprised of cable insulation. This area is a typical cable chase of a height and floor area that the calculated fire loading in Btus/sq. ft. is artificially high. There are no permanent combustibles located on the floor elevation, which would present an exposure fire to the subject barrier. Assuming a floor based exposure fire did occur, the temperatures developed in the overhead area of the chase would not be expected to reach temperatures that would jeopardize the noted electrical raceway fire barrier enclosure. In addition, this cable chase is protected by a preaction sprinkler system. The existing fire detection system would provide for early detection of a fire and allow for prompt suppression. The existing barrier therefore provide a level of protection consistent with the hazards identified and provides a high level of assurance that at least one train of safe shutdown equipment will remain free of fire damage. Also, a review of the IPEEE Internal Fire evaluation core damage frequency (CDF) calculation indicates a CDF of 6.41E-07 for this area. Based on the low CDF calculated during the screening phase of the IPEEE Internal Fire Evaluation, additional detailed analysis or fire modeling was not performed as part of the IPEEE.

Table 1
Triple Wrap Deviations
VC Summer Nuclear Station

LICENSING BASIS FOR REQUEST:

For these cables in conduits, no revision to an existing deviation of 60 minutes is requested from the requirements of separation in the area for Section III.G.2.c of Appendix R to 10CFR50. The existing plant licensing basis in this area involved a deviation that was granted in SER Supplement 3. SCE&G is providing this information as an example of the methodology used to develop the time ratings.

Description of Fire Zone CB-2

Fire Area CB-2 is the B train east basement chase located at elevation 412'-0" and the eastern portion of the east cable pit located at elevation 400'-0". This cable chase is located in the east portion of the Control Building. Fire Area CB-2 is located adjacent to CB-5 and is separated by walls providing a 3-hour fire rated barrier. Fire Area CB-2 contains mostly "B" train cabling with some "A" train cabling also present in several conduits and cable trays within the area. Fire Area CB-2 contains Fire Barrier Item Numbers 16-TW, 17-TW, 18-TW, 19-TW, and 21-TW. These barriers provide a fire rated barrier for "Appendix R Required Protection".

Fire Barrier Item Numbers 16-TW protects conduits XX-419D and XX-1680D. XX-1680D is wrapped from the fire rated west wall (TR-CB1384) to and including PB-SG14. XX-419D is wrapped from PB-SG14 to the floor.

Fire Barrier Item Number 17-TW protects conduits EDE23A, EDE24A, EDE28A, and DGE23A and runs from the fire rated east wall (TR-145) to the fire rated west wall. Other conduits and cables are included in the wrap, but are not required for Appendix 'R'.

Fire Barrier Item Number 18-TW protects conduits XX-417A, XX-418A, XX-897A and XX-898A. XX-417A and XX-418A are wrapped from the floor to and including PB-SG12. XX-897A and XX-898A are wrapped from the PB-SG12 to the fire rated west wall (TR-1244). There are additional cables included in the wrap that are not Appendix 'R' required.

Fire Barrier Item Numbers 19-TW protects conduits XX-423E and XX-894E and runs from the floor to the fire rated west wall. XX-894E is wrapped from the west wall to and including PB-SG15; XX-423E is wrapped from PB-SG15 to the floor in Room 12-04. Other conduits and cables are included in the wrap, but are not required for Appendix 'R'.

Fire Barrier Item Number 21-TW protects cable trays 4314A, 4284A, and 5144A and runs from the fire rated ceiling to the fire rated west wall. These trays are 6" x 36" and do not need an exemption because they are similar to the passed item #5 of the Omega Point Test Labs completed on 12/29/99.

Combustibles associated with permanent plant equipment located within Fire Area CB-2 consist of cable insulation. The total combustible content of Fire Area CB-2 results in a fire loading of 184,033 Btus/sq. ft. Fire detection equipment for Fire Areas CB-2 consists of a smoke detection system that actuates the preaction sprinkler system. Additional fire suppression equipment consists of portable fire extinguishers, and interior manual hose stations.

Table 1
Triple Wrap Deviations
VC Summer Nuclear Station

TEST COMPARISON:

Kaowool Triple Wrap (16-TW) is 56' long and encloses two (2) 3" conduits with one surface mounted and the second being both surface mounted and suspended in open air (12') with a total thermal mass of 449.9 pounds (45.5 lbs/ft) in Fire Zone CB-2. Zetex has been added in some areas for physical protection. This item is similar to two Omega Point Test Labs; Item #2 (Wall/Ceiling mounted 1-1/4" and 4" Conduits) and Item #1 (Open Air 4" Conduit) which had thermal masses of 337.7 pounds (16.9 lbs/ft) (inside furnace) and 329.8 pounds (16.5 lbs/ft) (inside furnace) and reached temperatures of 198°F and 308°F, respectively, in 60 minutes. The GL 86-10, Supplement 1 allows a temperature of 250°F above ambient (67°F) for an allowable temperature of 317°F. The extrapolated available comparison would indicate that 16-TW would reach a temperature of 253°F in 60 minutes. This equates to an available margin of 64°F or 70 minutes.

Kaowool Triple Wrap (17-TW) is 12' long and encloses one 3" conduit, three (3) 2-1/2" conduits, three (3) 2" conduits, and one 1-1/2" conduit suspended in open air with a total thermal mass of 557.8 pounds (46.5 lbs/ft) in Fire Zone CB-2. This item is similar to the Omega Point Test Labs Item #1 (Open Air 4" Conduit) that had a thermal mass of 329.8 (16.5 lbs/ft) pounds (inside furnace) and reached a temperature of 308°F in 60 minutes. The GL 86-10, Supplement 1 allows a temperature of 250°F above ambient (67°F) for an allowable temperature of 317°F. The extrapolated available comparison would indicate that 17-TW would reach a temperature of 292°F in 60 minutes. This equates to an available margin of 25°F or 42 minutes.

Kaowool Triple Wrap (18-TW) is 20' long and encloses four 3" conduits, of which two are surface mounted and two are suspended in open air (5') with a total thermal mass of 316.1 pounds (31.7 lbs/ft) in Fire Zone CB-2. This item is larger than the similar Omega Point Test Labs: Item #2 (Wall/Ceiling mounted 1-1/4" and 4" Conduits) and Item #1 (Open Air 4" Conduit) which had thermal masses of 337.7 pounds (16.9 lbs/ft) (inside furnace) and 329.8 pounds (16.5 lbs/ft) (inside furnace), and reached temperatures of 198°F and 308°F, respectively, in 60-minutes. The GL 86-10, Supplement 1 allows a temperature of 250°F above ambient (67°F) for an allowable temperature of 317°F. The extrapolated available comparison would indicate that 18-TW would reach a temperature of 279°F in 60 minutes. This equates to an available margin of 38°F or 77 minutes.

Kaowool Triple Wrap (19-TW) is 16' long and encloses two 3" conduits and four 2" conduits. One 3" and two 2" are surface mounted, while one 3" and two 2" are both surface mounted and suspended in open air (9'), with a total thermal mass of 240.6 pounds (45.3 lbs/ft) in Fire Zone CB-2. This item is similar to the Omega Point Test Labs: Item #2 (Wall/Ceiling mounted 1-1/4" and 4" Conduits) and Item #1 (Open Air 4" Conduit) which had thermal masses of 337.7 pounds (16.9 lbs/ft) (inside furnace) and 329.8 pounds (16.5 lbs/ft) (inside furnace), and reached temperatures of 198°F and 308°F, respectively, in 60 minutes. The GL 86-10, Supplement 1 allows a temperature of 250°F above ambient (67°F) for an allowable temperature of 317°F. The interpolated available comparison would indicate that 19-TW would reach a temperature of 281°F in 60 minutes. This equates to an available margin of 36°F or 80 minutes.

Table 1
Triple Wrap Deviations
VC Summer Nuclear Station

Kaowool Triple Wrap (21-TW) is 37' long and encloses three 6" x 36" trays suspended in open air that have a thermal mass of 6430 pounds (173.8 lbs/ft) in Fire Zone CB-2. This item is similar to the Omega Point Test Labs Item #5 (Open Air 6" x 36" Tray) that had a thermal mass of 669.9 pounds (33.5 lbs/ft) (inside furnace) and reached a temperature of 316°F in 60 minutes. The GL 86-10, Supplement 1 allows a temperature of 250°F above ambient (67°F) for an allowable temperature of 317°F. The extrapolated available comparison would indicate that 21-TW would reach a temperature of 317°F in 62 minutes. This equates to an available margin of 2 minutes.

JUSTIFICATION/MODIFICATION:

Evaluation of Fire Area CB-2

Fire Area CB-2 is the 'B' Train east basement chase of the Control Building located at elevations 412' and 425'. It also includes the east portion of the electrical pit at elevation 400'. At elevation 412', it is bounded on the north by the controlled access hallway, on the east by the Intermediate Building, on the south by the stair tower, and on the west by the laundry and laboratory area and the 'A' Train east basement cable chase. At elevation 425', it is bounded on the north by a pipe and cable chase, on the east by the Intermediate Building, on the south by the stair tower, and on the west by the 'A' Train cable chase and the relay room cable spreading area. The walls and ceiling form the boundary of this fire area have three-hour ratings except for the stair tower wall that is rated at two hours. The floors are of reinforced concrete but are unrated since they are in contact with earth. Fire Area CB-2 mainly contains 'B' Train cabling and no equipment. Thus for a major fire in this area, shutdown will be controlled from the control room using 'A' Train equipment.

Fire Area CB-2 has a relatively high fire load equivalent to an estimated fire duration of approximately 2-1/2 hours. This overall fire loading is greater than the designed fire resistance rating of the subject barrier. The combustible content in this area is totally comprised of cable insulation. This area is a typical cable chase of a height and floor area that the calculated fire loading in Btus/sq. ft. is artificially high. There are no permanent combustibles located on the floor elevation, which would present an exposure fire to the subject barriers. Assuming a floor based exposure fire did occur, the temperatures developed in the overhead areas of the chase would not be expected to reach temperatures that would jeopardize the noted electrical raceway fire barrier enclosure. In addition, this cable chase is protected by a preaction sprinkler system. The existing area-wide fire detection system alarms in the control room and would provide for early detection of a fire and allow for prompt suppression. The existing barrier therefore provides a level of protection consistent with the hazards identified and provides a high level of assurance that at least one train of safe shutdown equipment will remain free of fire damage. Also, a review of the IPEEE Internal Fire calculation indicates an evaluation core damage frequency (CDF) of 6.41E-07 for this area. Based on the low CDF calculated during the screening phase of the IPEEE Internal Fire Evaluation, additional detailed analysis or fire modeling was not performed as part of the IPEEE.

Conduits XX419D, XX1680D, EDE23A, EDE24A, EDE28A, DGE23A, XX417A, XX418A, XX897A, XX898A, XX423E, XX894E that are "Required for Appendix 'R'" and others containing various cables that are NOT "Required for Appendix 'R'". SCE&G performed a full-scale fire test at Omega

Table 1
Triple Wrap Deviations
VC Summer Nuclear Station

Point Test Labs in December 1999. The conclusion reached is that all cable in surface mounted configurations, and cable in larger conduit and trays has been shown to remain functional when subjected to an ASTM E-119 fire test for at least 60 minutes. Trapped air, in spaces between the layers, act as an insulator. The consequences of a joint failure are also lessened because of the multiple joints and staggering. Because the cables do not meet the criteria of Section III.G.2.c, since it is not a "one hour rated fire barrier," VCS will provide additional triple wrap around the supports and silicone foam penetration seals to eliminate thermal shorts and protect the cable at the penetration seal. Flamemastic and/or Zetex have been added in some areas for physical protection. The cable is routed in, and supported by, triple wrap rigid steel conduits as discussed in the cover letter.

A walkdown of the 16-TW area showed there are NO exposed cable trays near this wrap. This area has a sprinkler system installed and the tray is, also, covered with Zetex.

A walkdown of the 17-TW area showed there are NO exposed cable trays beside or below this wrap. This area has a sprinkler system installed.

A walkdown of the 18-TW area showed that one exposed cable tray is ~ 2' below the wrap with ~ 15 control cables. If we assume 'B1L' cables, we then have 10.6 pounds of insulation. This cable load could impact the area under the wrap (3' x 3') and would provide a fire severity of 10 minutes for this area under the wrap. This area has a sprinkler system installed.

A walkdown of the 19-TW area showed there are NO exposed cable trays near this wrap. This area has a sprinkler system installed.

A walkdown of the 21-TW area showed there are NO exposed cable trays near this wrap. This area has a sprinkler system installed.

SUMMARY:

The 16-TW, 17-TW, 18-TW, 19-TW and 21-TW cables in these conduits and/or tray are "Required for Appendix R" and the fire loading is less than the tested configuration. No revision to the existing deviation for 60 minutes is necessary from the requirements of separation in the area for Section III.G.2.c of Appendix R to 10CFR50. The existing plant licensing basis in this area involved a deviation that is mentioned in the cover letter. SCE&G is providing this information as an example of the methodology used to develop the time ratings.

The use of Kaowool triple wrap over the various conduits associated with 16-TW, 17-TW, 18-TW, 19-TW and 21-TW that are "Required for Appendix R" cable in the fire area CB-2; in conjunction with the existing fire protection features, additional triple wrap over the exposed thermal shorts and the silicone foam penetration seals, and zetex on some areas, provide an equivalent 60 minutes level of protection to that required by Section III.G.2.c of Appendix R to 10CFR50.

Table 1
Triple Wrap Deviations
VC Summer Nuclear Station

<u>Fire Barrier Item Number 22-TW</u>	[E-214-041 (B-4)]
Appendix R Regulatory Requirement	Required for Appendix 'R'
FPER Section	4.5.1.2.2
Kaowool Configuration	6" x 24" Trays (4069A and 4284A)
Circuit(s) Protected	Various; VLC3A; VLC16A, and VLC142A
Function(s) Protected	Cables associated with 'A' Train RB RecircUnits; 'A' Charging Fan; 'A' RHR Fan; and AuxBldg SwgrRm Fan
Physical Protection	None
Ceiling/Wall/Floor Pen Seal Material	[Barrier #0085.2 (ECB1042/TR-CB236X)] North Wall Foam [Barrier #1036 (ECB2128/TR-CB249)] Ceiling Foam
Approximate length involved	15'
Building	Control Building
Elevation	412'
Room Number(s)	12-03
Fire Area/Zone	CB-1.1
Fire Loading in Btu/SqFt	42,556 (32 minutes)
Automatic Fire Detection	Yes
Automatic Fire Suppression	Yes
IPEEE (January 1999) CDF	6.09E-06

LICENSING BASIS FOR REQUEST:

For these cables in trays, no revision to an existing deviation of 60 minutes is necessary from the requirements of separation in the area for Section III.G.2.c of Appendix R to 10CFR50. The existing plant licensing basis in this area involved a deviation that was granted in SER Supplement 3. SCE&G is providing this information as an example of the methodology used to develop the time ratings.

Description of Fire Area CB-1

Fire Area CB-1 consists of 2 zones located at elevations 412'-0" (CB-1.1) and 425'-0" (CB-1.1, CB-1.2). Fire Zone CB-1.1 includes the personnel laboratory on elevation 412'-0" and cable chase area on elevation 425'-0". This fire area contains mostly 'B' train cabling. 'A' train cabling is present in cable trays 4069 and 4284 for the Auxiliary Building Ventilation and Reactor Building HVAC service water valves. Cables SWC155XA, SWC157XA, and SWC195A to XVG-3108A-SW, and cables SWC161XA, SWC165XA, SWC205A, and SWC207A to XVG-3108B-SW, the RB HVAC SW valves are located in Cable Trays 4069 and 4284. Cables VLC3A, VLC16A, and VLC142A to AB ventilation fans XFN-46A-VL, XFN-49A-VL, and XFN-132-VL are also located in Cable Trays 4069 and 4284. These trays are protected by Fire Barrier Item Number 22-TW provides a fire rated barrier for "Appendix R Required Protection" of the subject circuits. The barrier runs from the fire rated north wall to the rated ceiling within this fire area. Tray 4069(A) is wrapped from the north wall to tray 4284(A); Tray 4284(A) is wrapped from tray 4069(A) to the ceiling.

Table 1
Triple Wrap Deviations
VC Summer Nuclear Station

Combustibles associated with permanent plant equipment located within Fire Zone CB-1.1 consist of cable insulation and mechanical equipment. The total combustible content of Fire Zone CB-1.1 results in a fire loading of 42,556 Btus/sq. ft. Fire detection equipment for Fire Zone CB-1.1 consists of an ionization smoke detection system and a heat detection system, which actuates a pre-action sprinkler system that is located in the cable chase area above the suspended ceiling of the north corridor. In addition to the preaction sprinkler system provided above the suspended ceiling in the north corridor, fire suppression equipment consists of a wet pipe automatic sprinkler system which is located below the suspended ceiling in the north corridor. Manual fire suppression consists of fire extinguishers and interior manual hose stations.

TEST COMPARISON:

Kaowool Triple Wrap (22-TW) is 15' long and encloses two 6" x 24" trays suspended in open air that have a thermal mass of 1734.0 pounds (115.6 lbs/ft) in Fire Zone CB-1.1. This item is similar to the Omega Point Test Labs Item #5 (Open Air 6" x 36" Tray) that had a thermal mass of 669.9 pounds (33.5 lbs/ft) (inside furnace) and reached a temperature of 316°F in 60 minutes. The GL 86-10, Supplement 1 allows a temperature of 250°F above ambient (67°F) for an allowable temperature of 317°F. The extrapolated available comparison would indicate that 22-TW would reach a temperature of 317°F in 62 minutes. This equates to an available margin of 2 minutes.

JUSTIFICATION/MODIFICATION:

Evaluation of Fire Zone CB-1.1

Fire Zone CB-1.1 has a low fire load equivalent to an estimated fire duration of less than 35 minutes. This overall fire loading is less than the designed fire resistance rating of the subject barrier. A postulated fire in this area is not expected to develop to a magnitude or duration, which would jeopardize the noted electrical raceway fire barrier enclosure. In addition, this area is protected by a preaction sprinkler system. The existing fire detection system would provide for early detection of a fire and allow for prompt suppression. The existing barrier therefore provides a level of protection consistent with the hazards identified and provides a high level of assurance that at least one train of safe shutdown equipment will remain free of fire damage. Also, a review of the IPEEE Internal Fire evaluation calculation indicates a core damage frequency (CDF) of 6.09E-06 for this area. Based on the low CDF calculated during the screening phase of the IPEEE Internal Fire Evaluation, additional detailed analysis or fire modeling was not performed for this area as part of the IPEEE.

Trays 4069 and 4284 contain many cables that are "Required for Appendix 'R'". SCE&G performed a full scale fire test at Omega Point Test Labs in December 1999 and concluded that cable in 6" x 36" trays has been shown to remain functional when subjected to an ASTM E-119 fire test for at least 60 minutes. Trapped air, in spaces between the layers, act as an insulator. The consequences of a joint failure are also lessened because of the multiple joints and staggering. Because the cable does not meet the criteria of Section III.G.2.c, since it is not a "one hour rated fire barrier," VCS will provide additional triple wrap around the supports and the silicone foam penetrations to eliminate thermal shorts and protect the wall and ceiling silicone foam penetrations.

Table 1
Triple Wrap Deviations
VC Summer Nuclear Station

The cable is routed in, and supported by, a triple wrap rigid steel raceway as discussed in the cover letter.

A walkdown of the area showed that there are three exposed cable trays 2' below the wrap with ~ 116 control & 98 instrument cables. If we assume 'B1G' and 'C1A' cables, we then have 70 pounds of insulation. This cable load could impact the area under the wrap (3' x 10') and would provide a fire severity of 20 minutes for this area under the wrap. This area has a sprinkler system installed.

SUMMARY:

The cables in these trays are "Required for Appendix R" and the fire loading is less than the tested configuration. No revision to the existing deviation of 60 minutes is necessary from the requirements of separation in the area for Section III.G.2.c of Appendix R to 10CFR50. The existing plant licensing basis in this area involved a deviation that was granted in SER 9.5-1 to require the potential effects of a fire on safety related equipment have been reduced by encasing one redundant division in a one-hour rated barrier with automatic suppression. SCE&G is providing this information as an example of the methodology used to develop the time ratings.

Thus the use of Kaowool triple wrap over the two 6" x 24" trays, associated with 22-TW for the "Required for Appendix 'R'" cable in fire zone CB-1.1; in conjunction with the existing fire protection features, additional triple wrap over the exposed thermal shorts and silicone foam penetration seals, provides an equivalent 62-minute level of protection to that required by Section III.G.2.c of Appendix R to 10CFR50.

Table 1
Triple Wrap Deviations
VC Summer Nuclear Station

<u>Fire Barrier Item Number 23-TW</u>	[E-214-042 (C-4)]
Appendix R Regulatory Requirement	Required for Appendix 'R'
FPER Section	4.5.12.2.2
Kaowool Configuration	6" x 36" Tray (4284A)
Circuit(s) Protected	Various
Function(s)	Cables associated with 'A' Train RB RecircUnits; 'A' Charging Fan; 'A" RHR Fan; and AuxBldg SwgrRm Fan
Physical Protection	Zetex
Ceiling/Wall/Floor Pen Seal Material	[Barrier #596 (ECB2332/TR-CB1302)] South Wall Foam/Flamemastic/Zetex [Barrier #1036 (ECB2128/TR-CB249)] Floor Foam
Approximate length involved	24'
Building	Control Building
Elevation	436'
Room Number(s)	36-03
Fire Area/Zone	CB-12
Fire Loading in Btu/SqFt	227,111 (170 minutes)
Automatic Fire Detection	Yes
Automatic Fire Suppression	Yes
IPEEE (January 1999) CDF	4.38E-08

LICENSING BASIS FOR REQUEST:

For these cables in trays, no revision to an existing deviation of 60 minutes is necessary from the requirements of separation in the area for Section III.G.2.c of Appendix R to 10CFR50. The existing plant licensing basis in this area involved a deviation that was granted in SER Supplement 3. SCE&G is providing this information as an example of the methodology used to develop the time ratings.

Description of Fire Area CB-12

Fire Area CB-12 is the northeast intermediate chase and is also located at elevations 436'-0" adjacent to Fire Area CB-10. Fire Area CB-12 contains mostly 'B' train cabling including valve control cables for pressurizer power operated relief, main steam line isolation, main steam line bypass isolation, main steam power operated relief, and emergency feedwater flow control. 'A' train cabling is also present in cable tray 4284 within the area. Fire Area CB-12, also, contains Fire Barrier Item Number 23-TW that protects cable tray 4284A containing 'A' train cables to valves XVG-3108A&B-SW and XVG-3109A&B-SW as well as fans XFN-0046A-VL, XFN-0049A-VL, and XFN-0132-VL. This barrier provides a fire rated barrier for Appendix R required protection and runs from the east to south fire rated walls (TR-1302) to the rated floor (TR-249).

Combustibles associated with permanent plant equipment located within Fire Area CB-12 consist of cable insulation. The total combustible content of Fire Area CB-12 results in a fire loading of 227,111 Btus/sq. ft.

Table 1
Triple Wrap Deviations
VC Summer Nuclear Station

Fire detection equipment for Fire Area CB-12 consists of a smoke detection system that actuates the preaction sprinkler system. Fire suppression equipment, also, consists of portable fire extinguishers, and interior manual hose stations.

TEST COMPARISON:

Kaowool Triple Wrap (23-TW) is 24' long and encloses one 6" x 36" tray suspended in open air that has a thermal mass of 1418 pounds (59.1 lbs/ft) in Fire Zone CB-12. This item is similar to the Omega Point Test Labs Item #5 (Open Air 6" x 36" Tray) that had a thermal mass of 669.9 pounds (33.5 lbs/ft) (inside furnace) and reached a temperature of 316°F in 60 minutes. The GL 86-10, Supplement 1 allows a temperature of 250°F above ambient (67°F) for an allowable temperature of 317°F. The extrapolated available comparison would indicate that 23-TW would reach a temperature of 317°F in 64 minutes. This equates to an available margin of 4 minutes.

JUSTIFICATION/MODIFICATION:

Evaluation of Fire Areas CB-12

Fire Area CB-12 has a relatively high fire load of over 2-1/2 hours. The combustible content in this area is comprised totally of cable insulation. This area is a typical cable chase where the calculated fire loading in Btus/sq. ft. is artificially high. There are no permanent combustibles located on the floor elevations, which would present an exposure fire to the subject barrier. Assuming a floor based exposure fire did occur, the temperatures developed in the overhead area of the chase would not be expected to reach temperatures that would jeopardize the noted electrical raceway fire barrier enclosure. In addition, this cable chase is protected by a preaction sprinkler system. The existing fire detection system would provide for early detection of a fire and allow for prompt suppression. The existing barrier therefore provides a level of protection consistent with the hazards identified and provides a high level of assurance that at least one train of safe shutdown equipment will remain free of fire damage. Also, a review of the IPEEE Internal Fire evaluation core damage frequency (CDF) calculation indicates a CDF of 4.38E-08 for this area. Based on the low CDF calculated during the screening phase of the IPEEE Internal Fire Evaluation, additional detailed analysis or fire modeling was not performed as part of the IPEEE.

A walkdown of the area showed that all trays are covered, except one. This exposed cable tray (4234) cuts diagonally and is ~ 1' below and (1' -to- 7') to the west of the wrap with ~ 122 control cables. If we assume 'B1G' cables, we then have 129 pounds of insulation. This cable load may impact the area under the wrap (7' x 10') and would provide a localized fire severity of 16 minutes. This area has a sprinkler system installed and the entire wrapped tray is, also, covered with Zetex.

SUMMARY:

The cables in this tray, associated with 23-TW, are "Required for Appendix R" and the fire loading is less than the tested configuration. No revision of 60 minutes, to the existing deviation, is necessary from the requirements of separation in the area for Section III.G.2.c of Appendix R to 10CFR50. The existing plant licensing basis in this area involved a deviation that was granted in SER 9.5-1 to

Table 1
Triple Wrap Deviations
VC Summer Nuclear Station

require the potential effects of a fire on safety related equipment to be reduced by encasing one redundant division in a one-hour rated barrier with automatic suppression. SCE&G is providing this information as an example of the methodology used to develop the time ratings.

Thus the use of Kaowool triple wrap over the 6" x 36" tray for the "Required for Appendix 'R'" cable in Fire Zone CB-12, in conjunction with the existing fire protection features, additional triple wrap over the exposed thermal shorts and silicone foam penetration seals, provides an equivalent 64 minutes level of protection to that required by Section III.G.2.c of Appendix R to 10CFR50.

Table 1
Triple Wrap Deviations
VC Summer Nuclear Station

Fire Area/Zone	CB-10
Fire Loading in Btu/SqFt	432,140 (324 minutes)
Automatic Fire Detection	Yes
Automatic Fire Suppression	Yes
IPEEE (January 1999) CDF	3.02E-07

LICENSING BASIS FOR REQUEST:

For these cables in conduits, no revision to an existing deviation of 60 minutes is requested from the requirements of separation in the area for Section III.G.2.c of Appendix R to 10CFR50. The existing plant licensing basis in this area involved a deviation that was granted in SER Supplement 3. SCE&G is providing this information as an example of the methodology used to develop the time ratings.

Description of Fire Area CB-10

Fire Area CB-10 is the east intermediate chase and is located at elevation 436'-0". Fire Area CB-10 contains mostly "A" train cabling; however, "B" train cabling is also present, including conduit ESM171B for switchgear unit XSW-1DB-ES, U7. This area contains train "C" control cables for XFN-47-VL for alignment to both "A" and "B" train systems. Fire Area CB-10 contains Fire Barrier Item Numbers 25-TW and 29-TW.

Fire Barrier Item Numbers 25-TW protects conduits ESM171B and XX2271C containing cables VLC17C and VLC12C. This barrier provides a fire rated barrier for Appendix R required protection as well as for 'C' Train Operability. This barrier runs from the east (TR-478) to west (TR-892) fire rated walls and from the east wall to the rated ceiling. XX-2271C is wrapped from the east wall to and including TB-CS102; VLC17C is wrapped from TB-CS102 to the west wall; ESM171B is wrapped from the east wall (TR-478) to the north wall (TR-1355). There are additional cables included in the wrap that are not Appendix 'R' required.

Fire Barrier Item Number 29-TW protects conduits XX-3574C and XX-3414C containing cable VLC18C and provides a fire rated barrier for 'C' Train Operability only. The barrier runs from the west fire rated wall to the rated floor. XX-3574C is wrapped from the floor (TR-416) to and including PB-VU27; XX-3414C is wrapped from PB-VU27 to within 24" of the west wall. There are other conduits and cables included in the wrap that are not Appendix 'R'.

Combustibles associated with permanent plant equipment located within Fire Area CB-10 consist of cable insulation. The total combustible content of Fire Area CB-10 results in a fire loading of 432,140 Btus/sq. ft. Fire detection equipment for Fire Area CB-10 consists of a smoke detection system that actuates the preaction sprinkler system. Fire suppression equipment, also, consists of portable fire extinguishers, and interior manual hose stations.

Table 1
Triple Wrap Deviations
VC Summer Nuclear Station

TEST COMPARISON:

Kaowool Triple Wrap (25-TW) is 28' long and encloses three conduits (4", 3" and 1-1/4"). One (3") is surface mounted, one (4") is suspended in open air (10'), and the (1-1/4") is both surface mounted and suspended in open air (4') with a total open air thermal mass of 193.1 pounds (28.7 lbs/ft) in Fire Zone CB-10. Zetex has been added in some areas for physical protection. These items are similar to the Omega Point Test Labs: Items #1 (Open Air 4" Conduit) and Item #2 (Wall/Ceiling Mounted 1-1/4" and 4" Conduit) which had thermal masses of 329.8 pounds (16.5 lbs/ft) (inside furnace) and 337.7 pounds (16.9 lbs/ft) (inside furnace), and reached a temperature of 308°F and 198°F, respectively, in 60 minutes. The GL 86-10, Supplement 1 allows a temperature of 250°F above ambient (67°F) for an allowable temperature of 317°F. The extrapolated available comparison would indicate that 25-TW would reach a temperature of 253°F in 60 minutes. This equates to an available margin of 64°F or 70 minutes.

Kaowool Triple Wrap (29-TW) is 29' long and also encloses three conduits. The 2-1/2" and 3" conduits are suspended in open air (5' and 5'), while the other conduit (2-1/2") is both surface mounted and suspended in open air (12') with a total thermal mass of 198.5 pounds (26.3 lbs/ft) in Fire Zone CB-10. These items are similar to the Omega Point Test Labs: Item #1 (Open Air 4" Conduit) and Item #2 (Wall/Ceiling Mounted 1-1/4" and 4" Conduit) that had thermal masses of 329.8 pounds (16.5 lbs/ft) (inside furnace) and 337.7 pounds (16.9 lbs/ft) (inside furnace), and reached temperatures of 308°F and 198°F, respectively in 60 minutes. The GL 86-10, Supplement 1 allows a temperature of 250°F above ambient (67°F) for an allowable temperature of 317°F. The extrapolated available comparison would indicate that 29-TW would reach a temperature of 223°F in 60 minutes. This equates to an available margin of 94°F or 66 minutes.

JUSTIFICATION/MODIFICATION:

Evaluation of Fire Area CB-10

Fire Area CB-10 has a relatively high fire load equivalent to an estimated fire duration of over 3 hours. This overall fire loading is greater than the designed fire resistance rating of the subject barrier because the area is totally comprised of cable insulation. This area is a typical cable chase of a height and floor area that the calculated fire loading in Btus/sq. ft. is artificially high. There are no permanent combustibles located on the floor elevations in this cable chase, which would present an exposure fire to the subject barrier. Assuming a floor based exposure fire did occur the temperatures developed in the overhead area of the chase would not be expected to reach temperatures that would jeopardize the noted electrical raceway fire barrier enclosure. In addition, this cable chase is protected by a preaction sprinkler system.

The existing fire detection system would provide for early detection of a fire and allow for prompt suppression. The existing barrier therefore provides a level of protection consistent with the hazards identified and provides a high level of assurance that at least one train of safe shutdown equipment will remain free of fire damage. Also, a review of the IPEEE Internal Fire evaluation calculation indicates a core damage frequency (CDF) of 3.02E-07 for this area. Based on the low

Table 1
Triple Wrap Deviations
VC Summer Nuclear Station

CDF calculated during the screening phase of the IPEEE Internal Fire Evaluation, additional detailed analysis or fire modeling was not performed as part of the IPEEE.

Conduits VLC17C, ESM171B, XX2271C, XX3574C, XX3414C are "Required for Appendix 'R'" and "Required for 'C'-Train Operability". There are other cables in this conduit that are "NOT Required for Appendix 'R'". SCE&G performed a full-scale fire test at Omega Point Test Labs in December 1999. The conclusion reached is that all cable in surface mounted configurations, and cable in larger conduit has been shown to remain functional when subjected to an ASTM E-119 fire test for at least 60 minutes.

Because the cables do not meet the criteria of Section III.G.2.c, since it is not a "one hour rated fire barrier," VCS will provide additional triple wrap around the supports and silicone foam penetration seals to eliminate thermal shorts and protect the cable at the penetration seals. Flamemastic and/or Zetex have been added in some areas for physical protection. The cable is routed in, and supported by, triple wrap rigid steel conduits as discussed in the cover letter.

A walkdown of the 25-TW area showed that one tray is covered, and two (4158 & 4159) are exposed beneath the wrap. This exposed cable trays are ~ 4' below the wrap with ~ 343 control cables. If we assume 'B1G' cables, we then have 155 pounds of insulation. This cable load could impact the area under the wrap (3' x 11') and would provide a fire severity of 40 minutes for this area under the wrap. This area has a sprinkler system installed and the entire tray is, also, covered with Zetex.

A walkdown of the 29-TW area showed there are NO exposed cable trays near this wrap. One covered tray crosses underneath (~ 4'). The nearest tray is to the North (~ 5-1/2') and does not present a combustible hazard because it is at or above the elevation. This area has a sprinkler system installed.

SUMMARY:

Some of the cables in 25-TW conduits are "Required for Appendix R" and some, NOT 'A' or 'B' Train related, have a fire loading less than the tested configuration. Because VC Summer treats the swing train components as a backup of Appendix R, no revision to the deviation for 60 minutes is requested from the requirements of separation in the area for Section III.G.2.c of Appendix R to 10CFR50. The existing plant licensing basis in this area involved a deviation that is mentioned in the cover letter. SCE&G is providing this information as an example of the methodology used to develop the time ratings.

The cables in 29-TW conduits are NOT 'A' or 'B' Train related and the fire loading is less than the tested configuration. Because VC Summer treats the swing train components as a backup of Appendix R, no revision to the deviation for 60 minutes is requested from the requirements of separation in the area for Section III.G.2.c of Appendix R to 10CFR50. The existing plant licensing basis in this area involved a deviation that is mentioned in the cover letter. SCE&G requests acceptance of the deviation noted.

Table 1
Triple Wrap Deviations
VC Summer Nuclear Station

The use of Kaowool triple wrap over the various conduits associated with 25-TW and 29-TW that are "Required for Appendix 'R'" and "Required for 'C'-Train Operability" cables in the fire zone CB-10; in conjunction with the existing fire protection features and the proposed additional triple wrap over the exposed thermal shorts and the silicone foam penetration seals, and zetex on some areas, provide an equivalent 60 minute level of protection to that required by Section III.G.2.c of Appendix R to 10CFR50.

Table 1
Triple Wrap Deviations
VC Summer Nuclear Station

D. DEVIATION FOR INTERMEDIATE BUILDING FIRE AREAS/ZONES
(IB-7.1, IB-7.2, IB-7.3, IB-11, IB-14, IB-16, IB-23.2, IB-25.1 AND IB-25.6):

<u>Fire Barrier Item Number 34-TW</u>	[E-215-131 (D-12)]
Appendix R Regulatory Requirement	Required for Appendix 'R'
FPER Section	4.5.25.2.2
Kaowool Configuration	3.50" Conduit (SWL11A) Pull Boxes (PB-SW75, -SW76, -SW77,-SW106,-SW107)
Circuit(s) Protected	SWL11A
Function(s) Protected	SWL11A is the Power cable to 'A' SW Booster Pump
Physical Protection	None & Flamemastic
Ceiling/Wall/Floor Pen Seal Material	[Barrier #971 (EIB2209/TR-IB2109)] South Wall Foam
Approximate length involved	106'
Building	Intermediate Building
Elevation	412'
Room Number(s)	12-02W
Fire Area/Zone	IB-25.1
Fire Loading in Btu/SqFt	29,454 (22 minutes)
Automatic Fire Detection	Yes
Automatic Fire Suppression	Yes
IPEEE (January 1999) CDF	8.49E-07

LICENSING BASIS FOR REQUEST:

For this cable in conduit, no revision to an existing deviation of 60 minutes is requested from the requirements of separation in the area for Section III.G.2.c of Appendix R to 10CFR50. The existing plant licensing basis in this area involved a deviation that was granted in SER Supplement 3. SCE&G is providing this information as an example of the methodology used to develop the time ratings.

Description of Fire Zone IB-25.1

Fire Zone IB-25.1 is the general floor area of the Intermediate Building basement. The western portion of Fire Zone IB-25.1 is designated as Fire Subzone IB-25.1.2 and contains mainly "B" train equipment and cabling for safe shutdown and other equipment and cabling used when "B" train is chosen for shutdown. This includes the "B" train service water booster pump (XPP-45B-SW), the "B" train component cooling water pump (XPP-1B-CC), and their associated cabling. "A"-train equipment and cables and other equipment and cables used for "A" train shutdown are also present in this subzone.

Separation between "B" train cabling within Fire Subzone IB-25.1.2 and the "A" train cabling also located in that subzone consists of protective enclosures or fire resistant cables. Power cable SWL11A to XPP-45A-SW, the "A" train service water booster pump, is located in two conduits and is protected by Fire Barrier Item Number 34-TW. This barrier provides a fire rated barrier for

Table 1
Triple Wrap Deviations
VC Summer Nuclear Station

"Appendix R Required Protection" and runs from the "A" train service water booster pump motor to the fire rated south wall (TR-2109) in Room 12-02W of Fire Zone IB-25.1.

Combustibles associated with permanent plant equipment, located within Fire Zone IB-25.1 consists of cable insulation and mechanical equipment. The total combustible content of Fire Zone IB-25.1 results in a fire loading of 29,454 Btus/sq. ft. Fire detection equipment for this zone consists of a smoke detection system, which actuates the preaction sprinkler system. Fire suppression equipment consists of a preaction system, portable fire extinguishers, and interior manual hose stations.

TEST COMPARISON:

Kaowool Triple Wrap (34-TW) is 106' long and encloses one 3-1/2" conduit that is both surface mounted and suspended in open air (52') with a total thermal mass of 1551.2 pounds (29.8 lbs/ft) in Fire Zone IB-25.1. This item is larger than the Omega Point Test Labs: Item #1 (Open Air 4" Conduit) and Item #2 (Wall/Ceiling Mounted 1-1/4" and 4" Conduit) which had thermal masses of 329.8 and 337.7 pounds (16.5 and 16.9 lbs/ft) (inside furnace), and reached temperatures of 308°F and 198°F, respectively, in 60 minutes. The GL 86-10, Supplement 1 allows a temperature of 250°F above ambient (67°F) for an allowable temperature of 317°F. The extrapolated available comparison would indicate that 34-TW would reach a temperature of 253°F in 60 minutes. This equates to an available margin of 64°F or 70 minutes.

JUSTIFICATION/MODIFICATION:

Evaluation of Fire Zone IB-25.1

A fire in one general area is not expected to result in damage to equipment and cables in other general areas for the following reasons:

- Detailed analysis was performed for this general area of the Intermediate Building (IB) on the 412' elevation. The area analyzed (IB-25.1) has a floor area of 11,301 square feet and ceilings 22 feet in height. A very large oil fire (a 20 square foot unconfined oil spill with an estimated heat release rate of 7,425 Btu's) was analyzed for the IB space. The temperature rise, predicted in the plume at an elevation 21' above the fire, was 608°F. Critical levels of radiant heat for the fire analyzed were predicted to occur within a radius of 15'. Therefore, even a very large floor-based exposure fire is not capable of directly affecting equipment and cables on the elevation above.
- The only other means of propagating the effects of a fire to other elevations is migration of hot gases through unprotected openings, the largest of which is the southwest equipment hatch. There are also two unprotected ladder openings. However, the potential for hot gas layer buildup is limited because at the 436' floor elevation, the ladder openings and the hatch opens to the 436' elevation directly above. Buoyancy forces will cause hot air rising through the hatch at 412' elevation to continue to rise to the 436' elevation. The rising column of heated air will cool as it rises due to entrainment of cooler air at 436' elevation. A column of hot air rising through

Table 1
Triple Wrap Deviations
VC Summer Nuclear Station

the southwest equipment hatch and ladder openings will terminate on the 436' elevation (IB-25.6.2). At this uppermost elevation, the heated column of air will mix with a large volume of cool air. In addition, the IB ventilation system will draw out a portion of the heated air at the highest elevation, mixing it with cooler air throughout the IB. It is most likely that the combined effect of entrainment of cool air as the column rises and dilution by the ventilation system will limit hot gas layer buildup and keep temperatures at the 412' and 436' elevations well below damage thresholds.

Fire Zone IB-25.1 has a low fire load equivalent to an estimated fire duration of less than 30 minutes. This overall fire loading is less than the designed fire resistance rating of the subject barrier. A postulated fire in this area is not expected to develop to a magnitude or duration, which would jeopardize the noted electrical raceway fire barrier enclosure. In addition, the existing area-wide fire detection system that alarms in the control room would provide for early detection of a fire and allow for prompt suppression. The existing barrier therefore provides a level of protection consistent with the hazards identified and provides a high level of assurance that at least one train of safe shutdown equipment will remain free of fire damage. Also, a review of the IPEEE Internal Fire evaluation calculation indicates a core damage frequency (CDF) of 8.558E-05 in this zone. Based on the CDF obtained during the screening phase of the IPEEE Internal Fire Evaluation, additional detailed analysis including fire modeling was performed for this area. This detailed analysis resulted in a reduction of the CDF for Fire Zone IB-25.1.2 to 8.489E-07.

This fire analysis supports the conclusion that a fire in this area would not be of a magnitude or duration, which would jeopardize the noted electrical raceway fire barrier enclosure. The hazards in Fire Zone IB-25.1 consist of the CCW and SW Booster pumps. Oil inventories for these pumps are not large, consisting of 1 gallon for each of the CCW pumps and 2 pints for each SW Booster pump. The chilled water pumps contain only small amounts of oil (about 1 quart each). The pump pedestals are provided with berms around the perimeter, which will effectively contain the contents of an oil spill. Power cable SWL11A to XPP-45A-SW, the "A" train service water booster pump, is protected by Fire Barrier Item Number 34-TW. This barrier is located adjacent to and above the "B" train service water booster pump. Fire modeling indicates that the temperature at the lowest tray above the "B" train service water booster pump is predicted to be 546°F, well below the damage threshold (700°F) for the cable. The cable is also located outside of the estimated critical radial distance. No damage would be expected to occur even without the presence of the subject fire barrier. The predicted temperatures are also well below the maximum temperature of 1700°F used for the design and testing of a 1-hour fire rated barrier per ASTM E-119.

As described in the V. C. Summer Nuclear Station Fire Protection Evaluation Report (FPER), the floor/ceiling at elevation 436' would satisfy the requirements for a three hour rated fire barrier except for an open equipment hatch, unprotected pipe penetrations, and a personnel access hatch. The pipe penetrations are located to the north of the nearest 'A' Train conduits by approximately 20 feet. These openings are of a size and location that would NOT present a significant pathway for propagation of a fire, originating in fire zone IB-25.1.2, to the 'A' Train cables in fire zone IB-25.6.2. The personnel access hatch cover is constructed of steel and is located approximately 10 feet from the nearest 'A' Train cables; the hatch cover is sufficient to prevent fire propagation. The equipment hatch is located against the East wall side of the two zones and is 15 feet from the nearest 'A' Train

Table 1
Triple Wrap Deviations
VC Summer Nuclear Station

conduits. In addition to the 15 foot distance, these conduits are shielded from direct fire exposure from the hatch by the northeast corner of the switchgear room adjacent to fire zone IB-25.6.2.

Conversely, there are no Train 'B' cables within fire zone IB-25.1.2 that are sufficiently close to the unprotected openings to be of concern. Thus a major fire within fire zone IB-25.6.2 will not damage the Train 'B' cables needed for safe shutdown that are located within fire zone IB-25.1.2. The relationship of fire zones IB-25.1.2 and IB-25.6.2 to other fire zones within fire area IB-25 are described in the Fire Protection Evaluation report and do not impact this exemption request.

Automatic preaction suppression systems are throughout zone IB-25.1.2 and in the vicinity of the equipment hatch within zone IB-25.6.2. Hose stream protection and portable fire extinguishers are available for manual fire suppression in both zones. The fire detection system in conjunction with the suppression system assures rapid extinguishment of a fire in its early stages. Should the automatic suppression system fail to fully extinguish the fire, the detection system assures early response by the plant fire brigade to extinguish the fire manually prior to significant propagation.

Conduit SWL11A contains the cable that is "Required for Appendix 'R'". SCE&G performed a full-scale fire test at Omega Point Test Labs in December 1999. The conclusion reached is that all cable in surface mounted configurations, and cable in 4" open air conduit has been shown to remain functional when subjected to an ASTM E-119 fire test for at least 60 minutes. Because the cables do not meet the criteria of Section III.G.2.c, since it is not a "one hour rated fire barrier," VCS will provide additional triple wrap around the supports and silicone foam penetration seal to eliminate thermal shorts and protect the cable at the penetration seal. Flamemastic has been added in some areas for physical protection. The cable is routed in, and supported by a triple wrap rigid steel conduit as discussed in the cover letter.

A walkdown of the 34-TW area showed that three trays (3092, 4154 & 4157) are exposed beneath the wrap. These exposed power and control cable trays are below the wrap with ~ 424 cables. If we assume 'B1G' cables for control and 'A3J' for power, we then have 191 pounds of insulation. This cable load could impact the area under the wrap (3' x 23.75') and would provide a fire severity of 23 minutes for this area under the wrap. This area has a sprinkler system installed above and below the trays.

SUMMARY:

The cable in this conduit is "Required for Appendix R" and the fire loading is less than the tested configuration. No revision to the deviation for 60 minutes is requested from the requirements of separation in the area for Section III.G.2.c of Appendix R to 10CFR50. The existing plant licensing basis in this area involved a deviation that is mentioned in the cover letter. SCE&G is providing this information as an example of the methodology used to develop the time ratings.

The use of Kaowool triple wrap over the SWL11A conduit, associated with 34-TW that is "Required for Appendix 'R'" cable in the fire zone IB-25.1; in conjunction with the existing fire protection features, additional triple wrap over the exposed thermal shorts and the silicone foam penetration seal, provides an equivalent 60-minutes level of protection to that required by Section III.G.2.c of Appendix R to 10CFR50.

Table 1
Triple Wrap Deviations
VC Summer Nuclear Station

<u>Fire Barrier Item Number 38-TW</u>	[E-215-131 (F, G-9)]
Appendix R Regulatory Requirement	Required for "C" Train
FPER Section	4.5.25.4.2
Kaowool Configuration	4.00" Conduits (CCM38C and CCM39C) Pull Boxes (PB-CC33 and PB-CC61)
Circuit(s) Protected	CCM38C and CCM39C
Physical Protection	Zetex & Flamemastic
Ceiling/Wall/Floor Pen Seal Material	[Barrier #291 (EIB1138/TR-IB282)] South Wall Foam
Approximate length involved	52'
Building	Intermediate Building
Elevation	412'
Room Number(s)	12-02
Fire Area/Zone	IB-25.1
Fire Loading in Btu/SqFt	29,454 (22 minutes)
Automatic Fire Detection	Yes
Automatic Fire Suppression	Yes
IPEEE (January 1999) CDF	8.49E-07

LICENSING BASIS FOR REQUEST:

For these cables in conduit, no revision to an existing deviation of 60 minutes is requested from the requirements of separation in the area for Section III.G.2.c of Appendix R to 10CFR50. The existing plant licensing basis in this area involved a deviation that was granted in SER Supplement 3. SCE&G is providing this information as an example of the methodology used to develop the time ratings.

Description of Fire Zone IB-25.1

Fire Zone IB-25.1 is the general floor area of the Intermediate Building basement. The western portion of Fire Zone IB-25.1 is designated as Fire Subzone IB-25.1.2 and contains mainly "B" train equipment and cabling for safe shutdown and other equipment and cabling used when "B" train is chosen for shutdown. This includes the "B" train service water booster pump (XPP-45B-SW), the "B" train component cooling water pump (XPP-1B-CC), and their associated cabling. "A" train equipment and cables and other equipment and cables used for "A" train shutdown are also present in this subzone.

Separation between "B" train cabling within Fire Subzone IB-25.1.2 and the "A" train cabling also located in that subzone consists of protective enclosures or fire resistant cables. Subzone 25.1.2 also contains "C" train power and control cables and equipment for alignment to "A" and "B" train systems including the power and control cables for component cooling water pump XPP-1C-CC. Cables CCM38C and CCM39C to XPP-1C-CC are located in conduits and are protected by Fire Barrier Item Number 38-TW. This barrier provides a fire rated barrier for protection of "C" Train Operability" for these circuits. The barrier runs from the "C" Component cooling water pump motor

Table 1
Triple Wrap Deviations
VC Summer Nuclear Station

to the fire rated south wall (TR-282) at elevation 426'-0". This cable run continues as Fire Barrier Item Number 45-TW in Fire Zone IB-23.2.

Combustibles associated with permanent plant equipment, located within Fire Zone IB-25.1 consists of cable insulation and mechanical equipment. The total combustible content of Fire Zone IB-25.1 results in a fire loading of 29,454 Btus/sq. ft. Fire detection equipment for this zone consists of a smoke detection system, which actuates the preaction sprinkler system. Fire suppression equipment consists of a preaction system, portable fire extinguishers, and interior manual hose stations.

TEST COMPARISON:

Kaowool Triple Wrap (38-TW) is 52' long and encloses two 4" conduits that are both suspended in open air (52') with a total thermal mass of 1496.9 pounds (28.8 lbs/ft) in Fire Zone IB-25.1.5. This item is larger than the Omega Point Test Labs: Item #1 (Open Air 4" Conduit) which had a thermal mass of 329.8 pounds (16.5 lbs/ft) (inside furnace), and reached a temperature of 308°F in 60 minutes. The GL 86-10, Supplement 1 allows a temperature of 250°F above ambient (67°F) for an allowable temperature of 317°F. The extrapolated available comparison would indicate that 38-TW would reach a temperature of 270°F in 60 minutes. This equates to an available margin of 47°F or 7 minutes.

JUSTIFICATION/MODIFICATION:

Evaluation of Fire Zone IB-25.1

A fire in one general area is not expected to result in damage to equipment and cables in other general areas for the following reasons:

- Detailed analysis was performed for this general area of the Intermediate Building (IB) on the 412' elevation. The area analyzed (IB-25.1) has a floor area of 11,301 square feet and ceilings 22 feet in height. A very large oil fire (a 20 square foot unconfined oil spill with an estimated heat release rate of 7,425 Btu's) was analyzed for the IB space. The temperature rise, predicted in the plume at an elevation 21' above the fire, was 608°F. Critical levels of radiant heat for the fire analyzed were predicted to occur within a radius of 15'. Therefore, even a very large floor-based exposure fire is not capable of directly affecting equipment and cables on the elevation above.
- The only other means of propagating the effects of a fire to other elevations is migration of hot gases through unprotected openings, the largest of which is the southwest equipment hatch. There are also two unprotected ladder openings. However, the potential for hot gas layer buildup is limited because at the 436' floor elevation, the ladder openings and the hatch opens to the 436' elevation directly above. Buoyancy forces will cause hot air rising through the hatch at 412' elevation to continue to rise to the 436' elevation. The rising column of heated air will cool as it rises due to entrainment of cooler air at 436' elevation. A column of hot air rising through the southwest equipment hatch and ladder openings will terminate on the 436' elevation (IB-

Table 1
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25.6.2). At this uppermost elevation, the heated column of air will mix with a large volume of cool air. In addition, the IB ventilation system will draw out a portion of the heated air at the highest elevation, mixing it with cooler air throughout the IB. It is most likely that the combined effect of entrainment of cool air as the column rises and dilution by the ventilation system will limit hot gas layer buildup and keep temperatures at the 412' and 436' elevations well below damage thresholds.

Fire Zone IB-25.1 has a low fire load equivalent to an estimated fire duration of less than 30 minutes. This overall fire loading is less than the designed fire resistance rating of the subject barrier. A postulated fire in this area is not expected to develop to a magnitude or duration, which would jeopardize the noted electrical raceway fire barrier enclosure. In addition, the existing fire detection system would provide for early detection of a fire and allow for prompt suppression. The existing barrier therefore provides a level of protection consistent with the hazards identified and provides a high level of assurance that at least one train of safe shutdown equipment will remain free of fire damage. Also, a review of the IPEEE Internal Fire evaluation core damage frequency (CDF) calculation indicates a CDF of 8.558E-05 in this zone. Based on the CDF obtained during the screening phase of the IPEEE Internal Fire Evaluation, additional detailed analysis including fire modeling was performed for this area. This detailed analysis resulted in a reduction of the CDF for Fire Zone IB-25.1.2 to 8.489E-07.

This fire analysis supports the conclusion that a fire in this area would not be of a magnitude or duration, which would jeopardize the noted electrical raceway fire barrier enclosures. The hazards in Fire Zone IB-25.1 consist of the CCW and SW Booster pumps. Oil inventories for these pumps are not large, consisting of 1 gallon for each of the CCW pumps and 2 pints for each SW Booster pump. The chilled water pumps contain only small amounts of oil (about 1 quart each). The pump pedestals are provided with berms around the perimeter, which will effectively contain the contents of an oil spill. Cables CCM38C and CCM39C to XPP-1C-CC are protected by Fire Barrier Item Number 38-TW. This barrier is located adjacent to and above the "B" train CCW pump. Fire modeling indicates a critical radial distance of 7'-6" where the temperature is expected to reach or exceed damage threshold for the cable (700°F). Fire Barrier Item Number 38-TW is located significantly outside of this critical distance. No damage would be expected to occur even without the presence of the subject fire barrier. The predicted temperatures are also well below the maximum temperature of 1700°F used for the design and testing of a 1 hour fire rated barrier per ASTM E-119.

As described in the V. C. Summer Nuclear Station Fire Protection Evaluation Report (FPER), the floor/ceiling at elevation 436' would satisfy the requirements for a three hour rated fire barrier except for an open equipment hatch, unprotected pipe penetrations, and a personnel access hatch. The pipe penetrations are located to the north of the nearest 'A' Train conduits by approximately 20 feet. These openings are of a size and location that would NOT present a significant pathway for propagation of a fire, originating in fire zone IB-25.1.5, to the 'A' Train cables in fire zone IB-25.6.2. The personnel access hatch cover is constructed of steel and is located approximately 10 feet from the nearest 'A' Train cables; the hatch cover is sufficient to prevent fire propagation. The equipment hatch is located against the East wall side of the two zones and is 15 feet from the nearest 'A' Train

Table 1
Triple Wrap Deviations
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conduits. In addition to the 15 foot distance, these conduits are shielded from direct fire exposure from the hatch by the northeast corner of the switchgear room adjacent to fire zone IB-25.6.2.

Conversely, there are no Train 'B' cables within fire zone IB-25.1.5 that are sufficiently close to the unprotected openings to be of concern. Thus a major fire within fire zone IB-25.6.2 will not damage the Train 'B' cables needed for safe shutdown that are located within fire zone IB-25.1.5. The relationship of fire zones IB-25.1.5 and IB-25.6.2 to other fire zones within fire area IB-25 are described in the Fire Protection Evaluation report and do not impact this exemption request.

Automatic preaction suppression systems are throughout zone IB-25.1.5 and in the vicinity of the equipment hatch within zone IB-25.6.2. Hose stream protection and portable fire extinguishers are available for manual fire suppression in both zones. The fire detection system in conjunction with the suppression system assures rapid extinguishment of a fire in its early stages. Should the automatic suppression system fail to fully extinguish the fire, the detection system assures early response by the plant fire brigade to extinguish the fire manually prior to significant propagation.

Conduits CCM38C and CCM39C contains the cables that are "Required for 'C'-Train Operability". SCE&G performed a full-scale fire test at Omega Point Test Labs in December 1999. The conclusion reached is that all cable in surface mounted configurations, and cable in 4" open air conduit has been shown to remain functional when subjected to an ASTM E-119 fire test for at least 60 minutes. These cables meet the criteria of Section III.G.2.c. for a "one hour rated fire barrier." VCS provided additional triple wrap around the supports and silicone foam penetration seal to eliminate thermal shorts and protect the cable at the penetration seal. Flamemastic has been added in some areas for physical protection. The cable is routed in, and supported by a triple wrap rigid steel conduit as discussed in the cover letter.

A walkdown of the 38-TW area showed that one power tray (1078) is exposed and running parallel beneath the wrap. This exposed cable tray has two power cables. If we assume 'A1E' cables, we then have 15.7 pounds of insulation. This cable load could impact the area under the wrap (3' x 3') and would provide a fire severity of 15 minutes for this area under the wrap. This area has a sprinkler system installed.

SUMMARY:

These cables in conduits are "Required for 'C'-Train Operability" and the fire loading is less than the tested configuration. No revision to the existing deviation for 60 minutes is required from the requirements of separation in the area for Section III.G.2.c of Appendix R to 10CFR50. The existing plant licensing basis in this area involved a deviation that is mentioned in the cover letter. SCE&G is providing this information as an example of the methodology used to develop the time ratings.

The use of Kaowool triple wrap over the CCM38C and CCM39C conduits, associated with 38-TW that are "Required for 'C'-Train Operability" cable in the fire zone IB-25.1, in conjunction with the existing fire protection features, additional triple wrap over the exposed thermal shorts and the silicone foam penetration seal, provides the required 60-minutes level of protection required by Section III.G.2.c of Appendix R to 10CFR50.

Table 1
Triple Wrap Deviations
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<u>Fire Barrier Item Number 40-TW</u>	[E-215-136 (H-13)]		
Appendix R Regulatory Requirement	Req'd for Appendix 'R' Req'd for "C" Train		
FPER Section	4.4.7.4.2		
Kaowool Configuration	2.50" Conduits (VUL34B and VUL52C) Splice Box (SB-VU44); Pull Box (PB-VU50)		
Circuit(s) Protected	VUL34B and VUL52C		
Function(s) Protected	VUL34B and VUL52C are Power cables to 'B' and 'C' Chilled Water Pumps		
Physical Protection	Zetex & Flamemastic		
Ceiling/Wall/Floor Pen Seal Material	[Barrier #240 (EIB1187/TR-IB209)] West Wall Foam [Barrier #968 (EIB1144/TR-IB99)] Ceiling Grout		
Approximate length involved	58'		
Building	Intermediate Building		
Elevation	412'		
Room Number(s)	12-13A	12-13B	12-13C
Fire Area/Zone	IB-7.3	IB-7.2	IB-7.1
Fire Loading in Btu/SqFt	Negligible	Negligible	Negligible
Automatic Fire Detection	Yes		
Automatic Fire Suppression	Yes		
IPEEE (January 1999) CDF	4.644E-07	4.339E-08	5.248E-07

LICENSING BASIS FOR REQUEST:

For these cables in conduits, no revision to an existing deviation of 60 minutes is requested from the requirements of separation in the area for Section III.G.2.c of Appendix R to 10CFR50. The existing plant licensing basis in this area involved a deviation that was granted in SER Supplement 3. SCE&G is providing this information as an example of the methodology used to develop the time ratings.

Description of Fire Area IB-7

Fire Area IB-7 is the HVAC chilled water pump area located at elevation 412'-0" of the Intermediate Building. All three chilled water pumps are located in this fire area and are separated into 3 fire zones by two reinforced concrete walls that contain partial height drywall radiant energy shield walls with fire doors. Chilled water pump room "A" is designated as Fire Zone IB-7.1; Pump Room "B" (Fire Zone IB-7.3); Pump Room "C" (Fire Zone IB-7.2).

Fire Zone 7.1 is the southern portion of Fire Area IB-7 containing the "A" chilled water pump (XPP-48A-VU) and its power cable VUL37A. This zone also contains power cable VUL52C for the "C" chilled water pump (XPP-48C-VU). Power cable VUL52C, for the "C" chilled water pump in Fire Zone IB-7.1, is also separated from the "A" train equipment and cabling in this zone by a kaowool fire barrier (40-TW), that runs from the "C" pump motor in Fire Zone IB-7.2 to the fire rated west wall (TR-209) in Room 12-13C of Fire Zone IB-7.1. The "A" train equipment and cabling in Fire Zone IB-7.1 is separated from the redundant "B" train equipment and cabling in Fire Zone IB-7.3 by the 2

Table 1
Triple Wrap Deviations
VC Summer Nuclear Station

radiant energy shield walls, more than 20 feet distance, and negligible combustible loading. There are additional conduits and cables included in the wrap that are NOT Appendix 'R' required.

Fire Zone 7.2 is the central portion of Fire Area IB-7 containing the "C" chilled water pump (XPP-48C-VU) and its power cable VUL52C. This zone also contains power cable VUL34B for the "B" chilled water pump (XPP-48B-VU). Power cable VUL34B for the "B" chilled water pump is enclosed in a rated kaowool fire barrier (40-TW). VUL34B is wrapped from SB-VU44 to the opening in the ceiling of Room 12-13B. This barrier runs from the "B" chilled water pump motor in Fire Zone IB-7.3 to the fire rated ceiling of Room 12-13B in Fire Zone IB-7.2. Power cable VUL52C for the "C" chilled water pump in Fire Zone IB-7.1 is also separated from the "A" train equipment and cabling in this zone by a kaowool fire barrier (40-TW). This barrier runs from the "C" chilled water pump motor in Fire Zone IB-7.2 to the fire rated west wall in Fire Zone IB-7.1. There are other cables included within the wrap that are NOT Appendix 'R'.

Fire Zone 7.3 is the northern portion of Fire Area IB-7 containing the "B" chilled water pump (XPP-48B-VU) and its power cable VUL34B that is enclosed in a rated kaowool fire barrier (40-TW). This barrier runs from the "B" chilled water pump motor in Fire Zone IB-7.3 to the fire rated ceiling in Fire Zone IB-7.2.

Fire Barrier Item Number 40-TW encloses the conduits containing the noted power cables and provides a fire rated barrier for "Appendix R Required Protection" for circuit VUL34B, and is also required for protection of " 'C' Train Operability" for circuit VUL52C. There are no significant amounts of permanent combustibles located within Fire Zone IB-7. The chilled water pumps contain only small amounts of oil (about 1 quart each). The fire loading in IB-7 is considered to be negligible. Fire detection equipment for this fire area consists of an ionization smoke detection system, which actuate the IB preaction sprinkler system. Fire suppression equipment consists, also, of portable fire extinguishers, and interior manual hose stations.

TEST COMPARISON:

Kaowool Triple Wrap (40-TW) is 58' long and encloses three 2-1/2" conduits. One conduit is surface mounted and the other conduits are both surface mounted and suspended in open air (16') with a total thermal mass of 731.0 pounds (69.3 lbs/ft) in Fire Zone IB-7. Zetex has been added in some areas for physical protection. These items are similar to the Omega Point Test Labs Item #2 (Wall/Ceiling Mounted 1-1/4" and 4" Conduit) which had a thermal mass of 337.7 pounds (16.9 lbs/ft) (inside furnace) and reached a temperature of 198°F in 60 minutes. The GL 86-10, Supplement 1 allows a temperature of 250°F above ambient (67°F) for an allowable temperature of 317°F. The extrapolated available comparison would indicate that 40-TW would reach a temperature of 143°F in 60 minutes. This equates to an available margin of 174°F or 190 minutes.

Table 1
Triple Wrap Deviations
VC Summer Nuclear Station

JUSTIFICATION/MODIFICATION:

Evaluation of Fire Area IB-7

Fire Area IB-7 has a negligible fire load equivalent to an estimated duration of less than 5 minutes. This overall fire loading is significantly less than the designed fire resistance rating of the subject barrier. A postulated fire in this area is not expected to develop to a magnitude or duration, which would jeopardize the noted electrical raceway fire barrier enclosure. In addition, the existing fire detection system would provide for early detection of a fire and allow for prompt suppression. The existing barrier therefore provides a level of protection consistent with the hazards identified and provides a high level of assurance that at least one train of safe shutdown equipment will remain free of fire damage. Also, a review of the IPEEE Internal Fire evaluation calculation indicates core damage frequency (CDFs) of 5.248E-07 in Fire Zone IB-7.1, 1.006E-06 in Fire Zone IB-7.2, and 4.644E-07 in Fire Zone IB-7.3. Based on the CDF in Fire Zone IB-7.2 obtained during the screening phase of the IPEEE Internal Fire Evaluation, additional detailed analysis including fire modeling was performed for this zone. This detailed analysis resulted in a reduction of the CDF for Fire Zone IB-7.2 to 4.339E-08. Based on the low CDF calculated during the screening phase of the IPEEE Internal Fire Evaluation, additional detailed analysis or fire modeling was not performed for Fire Zones IB-7.1 and IB-7.3 as part of the IPEEE.

This fire analysis supports the conclusion that a fire in this area would not be of a magnitude or duration, which would jeopardize the noted electrical raceway fire barrier enclosure. The chilled water pumps contain only small amounts of oil (about 1 quart each). The pump pedestals are provided with troughs around the perimeter, which are capable of containing the entire contents of a spill. The most severe oil spill from the pumps is expected to result in a thin film of oil over the surface of the pedestal with most of the oil collecting in the trough. Such a spill could produce an initial high heat release rate, but the fire would be of a short duration because of the limited supply of fuel. The walls between the pumps effectively shield the floor-based equipment in adjacent enclosures from the effects of radiant heat in the event of a fire. Fire modeling indicates that the predicted hot gas layer temperatures outside the plume in the adjacent fire zones are less than 700°F. The critical ceiling jet radius does not extend beyond the limits of a single pump enclosure. The damage zone is therefore limited to the cables/conduits located directly above the fire source within the same zone. The predicted ceiling temperature at the centerline of the plume is calculated to be 913°F. This temperature is below the ignition temperature (932°F) for the subject targets. This predicted temperature is also well below the maximum temperature of 1700°F used for the design and testing of a 1-hour fire rated barrier per ASTM E-119.

Conduits VUL34B, VUL52C and another (VUL84B not required for Appendix R) contain cables that are "Required for Appendix 'R'" and "Required for 'C'-Train Operability". SCE&G performed a full-scale fire test at Omega Point Test Labs in December 1999. The conclusion reached is that all cable in surface mounted configurations, and cable in larger conduit has been shown to remain functional when subjected to an ASTM E-119 fire test for at least 60 minutes. Because the cables do not meet the criteria of Section III.G.2.c, since it is not a "one hour rated fire barrier," VCS will provide additional triple wrap around the supports and ceiling silicone foam/pressure penetration seals to eliminate thermal shorts and protect the cable at the penetration seal. Flamemastic and/or

Table 1
Triple Wrap Deviations
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Zetex have been added in some areas for physical protection. The cable is routed in, and supported by triple wrap rigid steel conduits as discussed in the cover letter.

A walkdown of the 40-TW area showed there are NO exposed cable trays near this wrap. This area has a sprinkler system installed, and the fire severity is negligible.

SUMMARY:

Some of the cables in 40-TW conduits are "Required for Appendix R" and some, NOT 'A' or 'B' Train related, have a fire loading less than the tested configuration. Because VC Summer treats the swing train components as a backup of Appendix R, no revision to the deviation for 60 minutes is requested from the requirements of separation in the area for Section III.G.2.c of Appendix R to 10CFR50. The existing plant licensing basis in this area involved a deviation that is mentioned in the cover letter. SCE&G is providing this information as an example of the methodology used to develop the time ratings.

The use of Kaowool triple wrap over the various conduits associated with 40-TW that are "Required for Appendix 'R'" and "Required for 'C'-Train Operability" in fire zone IB-7; in conjunction with the existing fire protection features and additional triple wrap over the exposed thermal shorts and the silicone foam/pressure penetration seal, and zetex on some areas, provide an equivalent 60 minutes level of protection to that required by Section III.G.2.c of Appendix R to 10CFR50.

Table 2
Triple Wrap Deviations
VC Summer Nuclear Station

SUMMARY:

	TW #	Conduit, (Tray), or Equipment	Size	Cable or Circuit Number(s)
1	3	SWC87C	(HV/OA) 2.00" G	SWC87C (EK-B1N)
2	5	(4065B) (4066B)	(V/OA) 6" x 6" (63% fill) (HV/OA) 6" x 6" (67% fill)	VARIOUS VARIOUS
3	6	CSM11B PB-CS93	(HV/OA) 4.00" G	CSM11B (EK-A1E)
4	7	CSM1A PB-CS10	(V/SM) 4.00" G & F	CSM1A (EK-A1E)
5	8	VLC4B (4064B) (4065B) XFN-46B-VL	(HV/SMOA) 1.25" G (H/OA) 6" x 6" (37% fill) (H/OA) 6" x 6" (35% fill) 75Lx43Wx40H (FAN) 72Lx42Wx30H (DUCT)	VLC4B (EK-A3J) VARIOUS VARIOUS
6	9	CSM11B	(HV/SM) 4.00" G & F	CSM11B (EK-A1E)
7	10	VLC1A XFN-46A-VL	(HV/SMOA) 1.25" G 75Lx43Wx40H (FAN) 72Lx42Wx30H (DUCT)	VLC1A (EK-A3J) N/A
8	11 Air Drop	CSM11B (1012B) PB-VU27 [Others - Not App 'R' CSM42B] PB-CS92	(H/SM) 4.00" G (H/SM) 4"x12" (40% fill) [(H/SM) 4.00" G]	CSM11B (EK-A1E) [Others - Not App 'R' CSM42B (EK-A1E)]
9	12	PB-CS117 XX-2048C XX-2511C	(HV/SM) 2.00" G (HV/SM) 2.00" G	VLC12C (EK-B1L) CSC264XC (EK-B1L) YY36C (EK-B1G) N/A
10	13	PB-CS112 PB-CS118 XX-2511C XX-3153C XX-2512C	(HV/SMOA) 2.00" G (V/SM) 2.00" G (V/SM) 2.00" G	CSC264XC (EK-B1L) VLC12C (EK-B1L) YY36C (EK-B1G) N/A

Table 2
Triple Wrap Deviations
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	TW #	Conduit, (Tray), or Equipment	Size	Cable or Circuit Number(s)
11	41 Air Drop	XX-3116A [Others - Not App 'R' CCE21A]	(H/SM) 1.50" G [(H/SM) 1.25" G]	CCM16A (EK-B1G) BIJ46XA (EK-B1G) [Others - Not App 'R' CCE21A (EK-A3B)]
12	42 Air Drop	XX-3115B CCM44B	(HV/OA) 1.50" G (HV/OA) 1.00" G	CCM26B (EK-B1G) BIJ56XB (EK-B1G) CCM44B (EK-B1K)
13	44	VUL34B	(V/SM) 2.50" G	VUL34B (EK-A2L)
14	45 Air Drop	(1034C)	(HV/OA) 4" x 6" (81% fill)	CCM38C (EK-A1E) CCM39C (EK-A1E)
15	47	XX-3702B PB-CR9	(HV/SMOA) 2.00" G	VLC124B (EK-A3H) CRE3B (EK-A3B)
16	50	ESM171B	(HV/OA) 4.00" G	ESM171B (EK-A1C)
17	51	VLC44B PB-VL30 PB-VL31	(HV/SMOA) 1.50" G	VLC44B (EK-A3G)

NOTES:

H = Horizontal
V = Vertical
G = Galvanized Conduit

SM = Surface Mounted
OA = Open Air
F = Flexible Conduit

PB = Pull Box
SB = Service Box
TB = Terminal Box

Table 2
Triple Wrap Deviations
VC Summer Nuclear Station

A. DEVIATION FOR SERVICE WATER PUMP HOUSE BUILDING FIRE AREA/ZONE (SWPH-1 AND SWPH-5.1):

<u>Fire Barrier Item Number 3-TW</u>	[(E-226-055 (J-13))]	
Appendix R Regulatory Requirement	Required for "C" Train	
FPER Section	4.7.1.4.2	
Kaowool Configuration	2.00" Conduit (SWC87C)	
Circuit(s) Protected	SWC87C	
Function(s) Protected	Control cable for 'C' Service Water Pump Discharge Valve	
Physical Protection	None	
Ceiling/Wall/Floor Pen Seal Material	[Barrier #1121 (ESW1003/TR-SW61)] North Wall Foam [Barrier #1138 (TR-SW119)] West Wall Kaowool	
Approximate length involved	39'	
Building	Service Water Pump House	
Elevation	425'	
Room Number(s)	25-05	25-03
Fire Area/Zone	SWPH-1	SWPH-5.1
Fire Loading in Btu/SqFt	30,843 (23 minutes)	654 (< 1 minute)
Automatic Fire Detection	Yes	
Automatic Fire Suppression	NO	
IPEEE (January 1999) CDF	5.408E-07	4.166E-07

LICENSING BASIS FOR REQUEST:

For these cables in conduits, a revision to an existing deviation for 45 minutes is requested from the requirements of separation and no suppression in the area for Section III.G.2.c of Appendix R to 10CFR50. The existing plant licensing basis in this area involved a deviation that was granted in SER Supplement 3 and affirmed in License Amendment 17 to require only certain areas of the station to have the required suppression. The deviation was granted with the stipulation that "in the remaining areas, the potential effects of a fire on safety related equipment have been reduced by encasing one redundant division in a 1-1/2 hour rated fire barrier." SCE&G requests acceptance of the deviation noted.

Description of Fire Area SWPH-1

Fire Area SWPH-1 is the electrical equipment room "A" located in the southern corner of the Service Water Pump House at elevation 425'-0". This area (830 ft²) is labeled Room 25-05 with the combustible load in cable insulation and electrical equipment located mainly above the wrap with the equipment in the center of the room (~ 9-1/2' away from the wrap).

This area contains Fire Barrier Item Number 3-TW that contains 'A' train equipment and cabling. Since this area does contain redundant 'B' train equipment and cabling, shutdown can be achieved from the control room utilizing 'B' train systems for a fire in this area. This area also contains 'C'

Table 2
Triple Wrap Deviations
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train power and control cables and equipment for alignment to 'A' train systems, including the control cable for service water pump XPP-39C-SW discharge valve XVB-3116C-SW. The 'A' train equipment and cabling in this fire area are separated from the "C" train control cable located in conduit SWC87C by Fire Barrier Item Number 3-TW. This barrier provides a fire rated barrier for 'C' Train Operability only. SWC87C is wrapped from the west wall of Room 25-03 to the east wall of the room. The barrier runs from the fire rated north wall (TR-61) of Room 25-05 to the fire rated east wall in this fire area. This barrier continues in Fire Zone SWPH-5.1 as described below.

Combustibles associated with permanent plant equipment located within this Fire Area SWPH-1 consist of cable insulation and electrical equipment (480V and 7200V switchgear, speed switch, MCC). The total combustible content of Fire Area SWPH-1 results in a fire loading of 30,834 Btus/sq.ft. Fire detection equipment for this fire area includes a smoke detection system, while the fire suppression equipment consists of fire extinguishers.

Description of Fire Zone SWPH-5.1

Fire Zone SWPH-5.1 is the valve pit rooms associated with the service water pumps and is located at elevation 425'-0" in the eastern portion of the service water pump house. Access to this zone is through 3 unprotected manholes, one for each pit, from the operating floor at elevation 436'-0". The 3 pits are separated from each other by interior walls of reinforced concrete and, except for unprotected openings, would satisfy the requirements for 3-hour fire resistance ratings. Fire Barrier Item Number 3-TW is located in Fire Subzone SWPH-5.1.1 or valve pit room 'A'.

Fire Subzone SWPH-5.1.1 is the western portion of Fire Zone SWPH-5.1 and contains the 'A' train service water pump discharge valve XVB-3116A-SW, its control panel XPN-5416-SW, and related cabling. This Subzone also contains the control cable for XPP-39C-SW discharge valve XVB-3116C-SW. This area (348 ft²) is labeled Room 25-03 with the low combustible load in cable insulation located mainly above the wrap at the ceiling of the room. There are no other combustibles normally present in the pit and access is very limited.

The 'A' train equipment and cabling in this fire zone are separated from the 'C' train control cable located in conduit SWC87C by Fire Barrier Item Number 3-TW. This barrier provides a fire rated barrier for 'C' Train Operability only and runs from the fire rated south wall to the north wall separating this subzone from the adjacent valve pit room 'C' east wall in this fire area. This barrier continues in Fire Area SWPH-1 as described above.

Combustibles associated with permanent plant equipment located within Fire Zone SWPH-5.1 consist of cable insulation. The total combustible content of Fire Zone SWPH-5.1 results in a fire loading of 654 Btus/sq. ft. Fire detection equipment for this fire zone consists of a smoke detection system located in valve room 'A', while the fire suppression equipment for this zone consists of fire extinguishers.

TEST COMPARISON:

Kaowool Triple Wrap (3-TW) is 39' long and encloses a 2" conduit suspended in open air, and has a thermal mass of 158.7 pounds (4.1 lbs/ft) in Fire Areas SWPH-1 and SWPH-5.1. This item more

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closely resembles the Omega Point Test Labs Item #1 (Open Air 4" Conduit) that had a thermal mass of 329.8 pounds (16.5 lbs/ft) (inside furnace) and reached a temperature of 308°F in 60 minutes. The GL 86-10, Supplement 1 allows a temperature of 250°F above ambient (67°F) for an allowable temperature of 317°F. The interpolated available comparison would indicate that 3-TW would reach a temperature of 301°F in 49 minutes. This equates to an available margin of 16°F or 26 minutes.

JUSTIFICATION/MODIFICATION:

Evaluation of Fire Area SWPH-1

Fire Area SWPH-1 has a low fire load equivalent to an estimated fire duration of less than 30 minutes. The overall fire loading is less than the designed fire resistance rating of the subject barrier. A postulated fire in this area (~ 32' x 26') is not expected to develop to a magnitude or duration, which would jeopardize the noted electrical raceway fire barrier enclosure. In addition, the existing fire detection system would provide for early detection of a fire and allow for prompt suppression. The existing barrier therefore provides a level of protection consistent with the hazards identified and provides a high level of assurance that at least one train of safe shutdown equipment will remain free of fire damage. Also, a review of the IPEEE Internal Fire evaluation calculation indicates a core damage frequency (CDF) of 5.408E-07 for this area. Based on the low CDF calculated during the screening phase of the IPEEE Internal Fire Evaluation, additional detailed analysis or fire modeling was not necessary as part of the IPEEE.

Evaluation of Fire Zone SWPH-5.1

Fire Zone SWPH-5.1 also has a negligible fire load equivalent to an estimated fire duration of less than 1 minute. This overall fire loading is significantly less than the designed fire resistance rating of the subject barrier. A postulated fire in this area (~ 12' x 29') is not expected to develop to a magnitude or duration, which would jeopardize the noted electrical raceway fire barrier enclosure. In addition, the existing fire detection system would provide for early detection of a fire and allow for prompt suppression. The existing barrier therefore provides a level of protection consistent with the hazards identified and provides a high level of assurance that at least one train of safe shutdown equipment will remain free of fire damage. Also, a review of the IPEEE Internal Fire evaluation calculation indicates a core damage frequency (CDF) of 4.166E-07 for this area. Based on the low CDF calculated during the screening phase of the IPEEE Internal Fire Evaluation, additional detailed analysis or fire modeling was not performed as part of the IPEEE.

Conduit SWC87C contains 1 cable that is "Required for 'C'-Train Operability". SCE&G performed a full scale fire test at Omega Point Test Labs in December 1999 and concluded that cable in larger conduit has been shown to remain functional when subjected to an ASTM E-119 fire test for at least 60 minutes. Because the cable does not meet the criteria of Section III.G.2.c, since it is not a "one hour rated fire barrier" with suppression, VCS will provide additional triple wrap around the supports and the silicone foam penetration seal to eliminate thermal shorts and protect the cable at the penetration seal. The cable is routed in, and supported by, a triple wrap rigid steel conduit as discussed in the cover letter.

Table 2
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There are two ladder trays (1061 & 4613) located above the wrap and will not cause damage downward. The only other combustibles in the area are associated with electrical components located within cabinets to the south and downward ~ 9-1/2 feet. This fire area has a 23-minute fire severity.

SUMMARY:

The cable in this conduit is NOT 'A' or 'B' Train related and the fire loading is less than the tested configuration. Because VC Summer treats the swing train components as a backup for Appendix R, a revision to the existing deviation for 45 minutes is requested from the requirements of separation and lack of an automatic fire suppression system in the area for Section III.G.2.c of Appendix R to 10CFR50. The existing plant licensing basis in this area involved a deviation that is mentioned in the cover letter. SCE&G requests acceptance of the deviation noted.

Thus the use of Kaowool triple wrap over the 2" conduit for the "Required for 'C'-Train Operability" cable in conduit SWC87C, in the fire area/zone SWPH-1 and SWPH-5.1, in conjunction with the existing fire protection features and additional triple wrap over the exposed thermal shorts and silicone foam penetration seal(s), provides an equivalent 49 minute level of protection to that required by Section III.G.2.c of Appendix R to 10CFR50.

Table 2
Triple Wrap Deviations
VC Summer Nuclear Station

B. DEVIATION FOR AUXILIARY BUILDING FIRE AREAS/ZONES
(AB-1.4, AB-1.9, AB-1.10 AND AB-1.18):

<u>Fire Barrier Item Number 5-TW</u>	[E-214-073 (G-5)]	
Appendix R Regulatory Requirement	Required for "C" Train	
FPER Section	4.2.1.4.2	
Kaowool Configuration	6" x 6" Trays (4065B and 4066B)	
Circuit(s) Protected	Various	
Function(s) Protected	VLC4B - power cable for 'B' Charging pump room cooling	
Physical Protection	Flamemastic	
Ceiling/Wall/Floor Pen Seal Material	[Barrier #722 (EAB2056)] West Wall Not Rated [Barrier #794 (EAB4073/TR-AB15X)] Ceiling Leaded Elastomer	
Approximate length involved	24'	
Building	Auxiliary Building	
Elevation	400'	388'
Room Number(s)	00-02E	88-13NE
Fire Area/Zone	AB-1.9	AB-1.4
Fire Loading in Btu/SqFt	3,879 (3 minutes)	5,995 (4 minutes)
Automatic Fire Detection	Yes	
Automatic Fire Suppression	NO	
IPEEE (January 1999) CDF	7.52E-08	1.97E-07

LICENSING BASIS FOR REQUEST:

For these cables in trays, a revision to an existing deviation for 60 minutes is requested from the requirements of separation and no suppression in the area for Section III.G.2.c of Appendix R to 10CFR50. The existing plant licensing basis in this area involved a deviation that was granted in SER Supplement 3 and affirmed in License Amendment 17 to require only certain areas of the station to have the required suppression. The deviation was granted with the stipulation that "in the remaining areas, the potential effects of a fire on safety related equipment have been reduced by encasing one redundant division in a 1-1/2 hour rated fire barrier." SCE&G requests acceptance of the deviation noted.

Description of Fire Zone AB-1.9

Fire Zone AB-1.9 is the charging pump cooling units room and is located on the partial shield slab above the charging pumps at elevation 400'-0", in the north portion of the Auxiliary Building. This zone contains both 'A' and 'B' train equipment and cabling. This includes 'A' train fan XFN-46A-VL (for charging/SI pump room cooling) and its power cable VLC1A, and "B" train fan XFN-46B-VL and its power cable VLC4B. Power cables CSM1A and CSM11B for the 'A' and 'B' train charging/SI pumps (XPP-43A-CS and XPP-43B-CS) are also located in this zone. This zone includes 'C' train cables and equipment (for alignment to both 'A' and 'B' train systems), including XFN-47-VL (safety injection charging pump room No. 2 fan).

Table 2
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Power cable VLC4B to XFN-46B-VL is located in conduit and cable trays 4065 and 4066 and is protected by Fire Barrier Item Numbers 5-TW and 8-TW. These barriers provide a fire rated barrier for "C" Train Operability" as well as for "Appendix R Protection", respectively. The trays (4064B and 4065B) are wrapped from the west wall of Room 00-02E of Fire Zone 1.4 above the charging/SI pump rooms through Fire Zone AB-1.9 to the east wall of Room 00-02E. VLC4B is wrapped from 4065(B) to XFN-46B-VL.

Combustibles associated with permanent plant equipment located within Fire Zone AB-1.9 consist of cable insulation. The total combustible content of Fire Zone AB-1.9 results in a fire loading of 3,879 Btus/sq. ft. Fire Zone AB-1.9 is provided with a smoke detection system, while the fire suppression equipment serving this zone consists of portable fire extinguishers and interior manual hose stations.

Description of Fire Zone AB-1.4

Fire Zone AB-1.4 is the general floor area of the sub-basement (Elev. 374'-0") of the Auxiliary Building and the partial shield slab located directly above at elevation 400'-0". This area has a large open volume (14,031 square feet with a ceiling height of more than 20 feet). The general areas of the Auxiliary Building [388' (AB-1.4), 412' (AB-1.10), 436' (AB-1.18) and the 463' (AB-1.21)] communicate with one another [and with the general area on the 485' (AB-1.30)] through large openings in the floor. One opening is in the northeast portion of the Auxiliary Building (column line Q-6) and the other is in the southwest portion (column line L-10). The northeast opening is an open equipment hatch (12' long by 5' wide); the southwest opening is a grated opening in the floor (26' long by 9' wide). Room 88-13NE covers approximately 945 square feet of the total 14,031 square feet, with the combustible load mainly in transient combustibles going to the charging/safety injection pump rooms located to the southwest corner of the room. The ceiling of this room contains the northeast opening described above. This zone contains Fire Barrier Item Numbers 5-TW and 6-TW. The fire barriers are located above elevation 388'-0" outside of the "B" and "C" train charging/SI pump rooms and are "Required for 'C' Train Operability". These barriers are a continuation of Fire Barrier Item Numbers 8-TW and 11-TW located in adjacent Fire Zone AB-1.9. Tray 4065(B) is wrapped from the west wall (EAB-2056) of Room 00-02E to tray end, including end of tray 4066(B) to ceiling blackout (EAB-4073).

Combustibles associated with permanent plant equipment located within Fire Zone AB-1.4 consist of cable insulation. The total combustible content of Fire Zone AB-1.4 results in a fire loading of 5,995 Btus/sq. ft. Fire Zone AB-1.4 is provided with a smoke detection system while the fire suppression equipment serving this zone consists of portable fire extinguishers and interior manual hose stations.

TEST COMPARISON:

Kaowool Triple Wrap (5-TW) is 24' long and encloses two (2) 6" x 6" trays suspended in open air, and has a thermal mass of 981.0 pounds (41.2 lbs/ft) in Fire Zones AB-1.9 and AB-1.4. This item has an equivalent thermal mass to the Omega Point Test Labs Item #3 (Open Air 6" x 6" Tray) that had a thermal mass of 324.4 pounds (16.2 lbs/ft) (inside furnace) and reached a temperature of 311°F in 48 minutes. The GL 86-10, Supplement 1 allows a temperature of 250°F above ambient

Table 2
Triple Wrap Deviations
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(67°F) for an allowable temperature of 317°F. The extrapolated available comparison would indicate that 5-TW would reach a temperature of 317°F in 62 minutes. This equates to an available margin of 2 minutes.

JUSTIFICATION/MODIFICATION:

Evaluation of Fire Zone AB-1.9 and AB-1.4

A fire in one general area is not expected to result in damage to equipment and cables in other general areas for the following reasons:

- Detailed analysis performed for the general area of the Intermediate Building (IB) on the 412' elevation is applicable to the general areas of the Auxiliary Building (AB). The area analyzed in the IB has a floor area of 11,301 square feet and ceilings 22 feet in height. A very large oil fire (a 20 square foot unconfined oil spill with an estimated heat release rate of 7,425 Btu's) was analyzed for the IB space. The temperature rise, predicted in the plume at an elevation 21' above the fire, was 608°F. Critical levels of radiant heat for the fire analyzed were predicted to occur within a radius of 15'. Therefore, even a very large floor-based exposure fire is not capable of directly affecting equipment and cables on the elevation above.
- The only other means of propagating the effects of a fire to other elevations is through migration of hot gases through unprotected openings, the largest of which are the northeast and southwest equipment hatches. However, the potential for hot gas layer buildup is limited because at each elevation the hatches open to the next elevation directly above one another. Buoyancy forces will cause hot air rising through a hatch at one elevation to continue to rise to succeeding elevations. The rising column of heated air will cool as it rises due to entrainment of cooler air at each elevation. A column of hot air rising through the northeast equipment hatches will terminate on the ventilation equipment level of the AB (485' elevation). There are no safe shutdown cables of equipment on this elevation. A column of hot air rising through the southwest equipment hatches will terminate on the 463' elevation (AB-1.21.2). At the uppermost elevation, the heated column of air will mix with a large volume of cool air. In addition, The AB ventilation system will draw out a portion of the heated air at the highest elevation, mixing it with cooler air throughout the AB. It is most likely that the combined effect of entrainment of cool air as the column rises and dilution by the ventilation system will limit hot gas layer buildup and keep temperatures at all elevations well below damage thresholds.

Fire Zones AB-1.9 and AB-1.4 have a negligible fire load equivalent to an estimated fire duration of less than 5 minutes each. These overall fire loadings are significantly less than the designed fire resistance rating of the subject barrier. A postulated fire in these zones is not expected to develop to a magnitude or duration, which would jeopardize the noted electrical raceway fire barrier enclosure. In addition, the existing fire detection system would provide for early detection of a fire and allow for prompt suppression. The existing barrier therefore provides a level of protection consistent with the hazards identified and provides a high level of assurance that at least one train of safe shutdown equipment will remain free of fire damage. Also a review of the IPEEE Internal

Table 2
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Fire evaluation calculation indicates a core damage frequency (CDFs) of 7.52E-08 for AB-1.9 and 1.97E-07 for AB-1.4. Based on the low CDFs calculated during the screening phase of the IPEEE Internal Fire Evaluation, additional detailed analysis or fire modeling was not performed as part of the IPEEE.

Trays 4065 and 4066 contain cables that are "Required for 'C'-Train Operability". SCE&G performed a full scale fire test at Omega Point Test Labs in December 1999 and concluded that cable in 6" x 6" trays has been shown to remain functional when subjected to an ASTM E-119 fire test for at least 45 minutes. Because the cable does not meet the criteria of Section III.G.2.c, since it is not a "one hour rated fire barrier" with suppression, VCS will provide additional triple wrap around the supports and the silicone foam penetrations to eliminate thermal shorts and protect the point of entry/exit. Flamemastic has been added in some areas for physical protection. The cable is routed in, and supported by, triple wrap rigid steel raceways as discussed in the cover letter.

A walkdown of the area showed all cabling in conduits and no exposed combustibles near the wrap. This area has a fire severity of 4 minutes.

SUMMARY:

The cables in these trays are NOT 'A' or 'B' Train related and the fire loading is less than the tested configuration. Because VC Summer treats the swing train components as a backup for Appendix R, a revision to the existing deviation for 60 minutes is requested from the requirements of separation and lack of an automatic fire suppression system in the area for Section III.G.2.c of Appendix R to 10CFR50. The existing plant licensing basis in this area involved a deviation that is mentioned in the cover letter. SCE&G requests acceptance of the deviation noted.

Thus the use of Kaowool triple wrap over the two (2) 6" x 6" trays for the "Required for 'C'-Train Operability" cable in fire zones AB-1.9 and AB-1.4: in conjunction with the existing fire protection features and additional triple wrap over the exposed thermal shorts and silicone foam penetration seals, provides an equivalent 62 minute level of protection to that required by Section III.G.2.c of Appendix R to 10CFR50.

Table 2
Triple Wrap Deviations
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<u>Fire Barrier Item Number 6-TW</u>	[E-215-073 (G-5)]
Appendix R Regulatory Requirement	Required for "C" Train
FPER Section	4.2.1.4.2
Kaowool Configuration	4.00" Conduit (CSM11B) Pull Box (PB-CS93)
Circuit(s) Protected	CSM11B
Function(s) Protected	Power to 'B' Charging Pump
Physical Protection	Flamemastic
Ceiling/Wall/Floor Pen Seal Material	[Barrier #722 (EAB2078)]West Wall Not Rated & [Barrier #723 (EPAB2007/TR-AB1853)] South Wall Foam
Approximate length involved	58'
Building	Auxiliary Building
Elevation	388'
Room Number(s)	88-13NE
Fire Area/Zone	AB-1.4
Fire Loading in Btu/SqFt	5,995 (4 minutes)
Automatic Fire Detection	Yes
Automatic Fire Suppression	NO
IPEEE (January 1999) CDF	1.97E-07

LICENSING BASIS FOR REQUEST:

For these cables in conduits, a revision to an existing deviation for 45 minutes is requested from the requirements of separation and no suppression in the area for Section III.G.2.c of Appendix R to 10CFR50. The existing plant licensing basis in this area involved a deviation that was granted in SER Supplement 3 and affirmed in License Amendment 17 to require only certain areas of the station to have the required suppression. The deviation was granted with the stipulation that "in the remaining areas, the potential effects of a fire on safety related equipment have been reduced by encasing one redundant division in a 1-1/2 hour rated fire barrier." SCE&G requests acceptance of the deviation noted.

Description of Fire Zone AB-1.4

Fire Zone AB-1.4 is the general floor area of the sub-basement (Elev. 374'-0") of the Auxiliary Building and the partial shield slab located directly above at elevation 400'-0". This area has a large open volume (14,031 square feet with a ceiling height of more than 20 feet). The general areas of the Auxiliary Building [388' (AB-1.4), 412' (AB-1.10), 436' (AB-1.18) and the 463' (AB-1.21)] communicate with one another [and with the general area on the 485' (AB-1.30)] through large openings in the floor. One opening is in the northeast portion of the Auxiliary Building (column line Q-6) and the other is in the southwest portion (column line L-10). The northeast opening is an open equipment hatch (12' long by 5' wide); the southwest opening is a grated opening in the floor (26' long by 9' wide). Room 88-13NE covers approximately 945 square feet of the total 14,031 square feet, with the combustible load mainly in transient combustibles going to the charging/safety injection pump rooms located to the southwest corner of the room. The ceiling of this room contains

Table 2
Triple Wrap Deviations
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the northeast opening described above. This zone contains Fire Barrier Item Numbers 5-TW and 6-TW. The fire barriers are located above elevation 388'-0" outside of the "B" and "C" train charging/SI pump rooms and are "Required for 'C' Train Operability". These barriers are a continuation of Fire Barrier Item Numbers 8-TW and 11-TW located in adjacent Fire Zone AB-1.9. CSM11B is wrapped from the west wall (EAB-2078) of Room 88-13NE above the Charging/SI pump rooms to the south wall (TR-1853) of Room 00-02E.

TEST COMPARISON:

Kaowool Triple Wrap (6-TW) is 58' long and encloses a 4" conduit suspended in open air, and has a thermal mass of 834.8 pounds (14.4 lbs/ft) in Fire Zone AB-1.4. This item is similar to the Omega Point Test Labs Item #1 (Open Air 4" Conduit) that had a thermal mass of 329.8 pounds (16.5 lbs/ft) (inside furnace) and reached a temperature of 308°F in 60 minutes. The GL 86-10, Supplement 1 allows a temperature of 250°F above ambient (67°F) for an allowable temperature of 317°F. The interpolated available comparison would indicate that 6-TW would reach a temperature of 307°F in 58 minutes. This equates to an available margin of 10°F or 16 minutes.

JUSTIFICATION/MODIFICATION:

Evaluation of Fire Zone AB-1.4

A fire in one general area is not expected to result in damage to equipment and cables in other general areas for the following reasons:

- Detailed analysis performed for the general area of the Intermediate Building (IB) on the 412' elevation is applicable to the general areas of the Auxiliary Building (AB). The area analyzed in the IB has a floor area of 11,301 square feet and ceilings 22 feet in height. A very large oil fire (a 20 square foot unconfined oil spill with an estimated heat release rate of 7,425 Btu's) was analyzed for the IB space. The temperature rise, predicted in the plume at an elevation 21' above the fire, was 608°F. Critical levels of radiant heat for the fire analyzed were predicted to occur within a radius of 15'. Therefore, even a very large floor-based exposure fire is not capable of directly affecting equipment and cables on the elevation above.
- The only other means of propagating the effects of a fire to other elevations is through migration of hot gases through unprotected openings, the largest of which are the northeast and southwest equipment hatches. However, the potential for hot gas layer buildup is limited because at each elevation the hatches open to the next elevation directly above one another. Buoyancy forces will cause hot air rising through a hatch at one elevation to continue to rise to succeeding elevations. The rising column of heated air will cool as it rises due to entrainment of cooler air at each elevation. A column of hot air rising through the northeast equipment hatches will terminate on the ventilation equipment level of the AB (485' elevation). There are no safe shutdown cables of equipment on this elevation. A column of hot air rising through the southwest equipment hatches will terminate on the 463' elevation (AB-1.21.2). At the uppermost elevation, the heated column of air will mix with a large volume of cool air. In addition, The AB ventilation system will draw out a portion of the heated air at the highest elevation, mixing it with

Table 2
Triple Wrap Deviations
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cooler air throughout the AB. It is most likely that the combined effect of entrainment of cool air as the column rises and dilution by the ventilation system will limit hot gas layer buildup and keep temperatures at all elevations well below damage thresholds.

Fire Zone AB-1.4 has a negligible fire load equivalent to an estimated fire duration of less than 5 minutes. This overall fire loading is significantly less than the designed fire resistance rating of the subject barrier. A postulated fire in this zone is not expected to develop to a magnitude or duration, which would jeopardize the noted electrical raceway fire barrier enclosure. In addition, the existing fire detection system would provide for early detection of a fire and allow for prompt suppression. The existing barrier therefore provides a level of protection consistent with the hazards identified and provides a high level of assurance that at least one train of safe shutdown equipment will remain free of fire damage. Also a review of the IPEEE Internal Fire evaluation calculation indicates a core damage frequency (CDF) of $1.97E-07$ for this area. Based on the low CDF calculated during the screening phase of the IPEEE Internal Fire Evaluation, additional detailed analysis or fire modeling was not performed as part of the IPEEE.

Conduit CSM11B contains one cable that is "Required for 'C'-Train Operability". SCE&G performed a full scale fire test at Omega Point Test Labs in December 1999 and concluded that cable in 4" conduit has been shown to remain functional when subjected to an ASTM E-119 fire test for at least 60 minutes. Because the cable does not meet the criteria of Section III.G.2.c, since it is not a "one hour rated fire barrier" with suppression, VCS will provide additional triple wrap around the supports and silicone foam penetration seals to eliminate thermal shorts and protect the cable at point of entry/exit. Flamemastic has been added in some areas for physical protection. The cable is routed in, and supported by, a triple wrap rigid steel conduit as discussed in the cover letter.

A walkdown of the area showed all cabling in conduits and no exposed combustibles near the wrap. This area has a fire severity of 4 minutes.

SUMMARY:

The cable in this conduit is NOT 'A' or 'B' Train related and the fire loading is less than the tested configuration. Because VC Summer treats the swing train components as a backup for Appendix R, a revision to the existing deviation for 45 minutes is requested from the requirements of separation and lack of an automatic fire suppression system in the area for Section III.G.2.c of Appendix R to 10CFR50. The existing plant licensing basis in this area involved a deviation that is mentioned in the cover letter. SCE&G requests acceptance of the deviation noted.

Thus the use of Kaowool triple wrap over the 4" conduit for the "Required for 'C'-Train Operability" cable in the fire zone AB-1.4: in conjunction with the existing fire protection features and additional triple wrap over the exposed thermal shorts and the silicone foam penetration seals, provides an equivalent 58 minute level of protection to that required by Section III.G.2.c of Appendix R to 10CFR50.

Table 2
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<u>Fire Barrier Item Number 7-TW</u>	[E-215-074 (B-6);-091 (G-7); and -181,Sh2 (G-13)]
Appendix R Regulatory Requirement	Required for "C" Train
FPER Section	4.2.1.4.2
Kaowool Configuration	4.00" Conduit (CSM1A) Pull Box (PB-CS10)
Circuit(s) Protected	CSM1A
Function(s) Protected	Power to 'A' Charging Pump
Physical Protection	None
Ceiling/Wall/Floor Pen Seal Material	[Barrier #1196 (EAB2046)] Floor Not Rated & [Barrier # 783 (EAB4071/TR-AB2342)] Ceiling Leaded Elastomer
Approximate length involved	9'
Building	Auxiliary Building
Elevation	400'
Room Number(s)	00-02E
Fire Area/Zone	AB-1.9
Fire Loading in Btu/SqFt	3,879 (3 minutes)
Automatic Fire Detection	Yes
Automatic Fire Suppression	NO
IPEEE (January 1999) CDF	7.52E-08

<u>Fire Barrier Item Number 8-TW</u>	[E-214-073 (F-7) and E-215-073 (G-6)]
Appendix R Regulatory Requirement	Required for Appendix 'R'
FPER Section	4.2.1.2.2
Kaowool Configuration	6" x 6" Trays (4064B and 4065B) 1.25" Conduit (VLC4B) Fan (XFN-46B-VL)
Circuit(s) Protected	VLC4B and Various others
Function(s) Protected	VLC4B - power cable for 'B' Charging pump room cooling
Physical Protection	None None Zetex
Ceiling/Wall/Floor Pen Seal Material	[Barrier #717 (EAB2064)] West Wall Not Rated [Barrier #722 (EAB2056)] East Wall Not Rated
Approximate length involved	40'
Building	Auxiliary Building
Elevation	400'
Room Number(s)	00-02E
Fire Area/Zone	AB-1.9
Fire Loading in Btu/SqFt	3,879 (3 minutes)
Automatic Fire Detection	Yes
Automatic Fire Suppression	NO
IPEEE (January 1999) CDF	7.52E-08

Table 2
Triple Wrap Deviations
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Fire Barrier Item Number 9-TW

[E-215-073 (F-5)]

Appendix R Regulatory Requirement	Required for Appendix 'R'
FPER Section	4.2.1.4.2
Kaowool Configuration	4.00" Conduit (CSM11B)
Circuit(s) Protected	CSM11B
Function(s) Protected	Power to 'B' Charging Pump
Physical Protection	None
Ceiling/Wall/Floor Pen Seal Material	[Barrier #722 (TR-9TW)] Floor Not Rated & [Barrier #722 (EAB2078)] East Wall Not Rated
Approximate length involved	4'
Building	Auxiliary Building
Elevation	400'
Room Number(s)	00-02E
Fire Area/Zone	AB-1.9
Fire Loading in Btu/SqFt	3,879 (3 minutes)
Automatic Fire Detection	Yes
Automatic Fire Suppression	NO
IPEEE (January 1999) CDF	7.52E-08

Fire Barrier Item Number 10-TW

[E-215-073 (J-6) and E-215-074 (B-6)]

Appendix R Regulatory Requirement	Required for "C" Train
FPER Section	4.2.1.4.2
Kaowool Configuration	1.25" Conduit (VCL1A) Fan (XFN-46A-VL)
Circuit(s) Protected	VLC1A
Function(s) Protected	Power cable for 'A' Charging Pump Room Cooling Fan
Physical Protection	None Zetex
Ceiling/Wall/Floor Pen Seal Material	[Barrier #783 (EAB4071/TR-AB2342)] Ceiling Leaded Elastomer
Approximate length involved	18'
Building	Auxiliary Building
Elevation	400'
Room Number(s)	00-02E
Fire Area/Zone	AB-1.9
Fire Loading in Btu/SqFt	3,879 (3 minutes)
Automatic Fire Detection	Yes
Automatic Fire Suppression	NO
IPEEE (January 1999) CDF	7.52E-08

Table 2
Triple Wrap Deviations
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<u>Fire Barrier Item Number 11-TW</u>	[E-215-073 (J-4) and E-215-074 (B-5)]
Appendix R Regulatory Requirement	Required for Appendix 'R'
FPER Section	4.2.1.2.2
Kaowool Configuration (Air Drop)	4" x 12" Tray (1012B) 4.00" Conduit (CSM11B) Pull Boxes (PB-VU27 and PB-CS92)
Circuit(s) Protected	CSM11B
Function(s) Protected	Power to 'B' Charging Pump
Physical Protection	None
Ceiling/Wall/Floor Pen Seal Material	[Barrier #723 (EPAB2007/TR-AB1853)] South Wall Foam
Approximate length involved	61'
Building	Auxiliary Building
Elevation	400'
Room Number(s)	00-02E
Fire Area/Zone	AB-1.9
Fire Loading in Btu/SqFt	3,879 (3 minutes)
Automatic Fire Detection	Yes
Automatic Fire Suppression	NO
IPEEE (January 1999) CDF	7.52E-08

LICENSING BASIS FOR REQUEST:

For these cables in conduits and/or trays, a revision to an existing deviation for 45 minutes is requested from the requirements of separation and no suppression in the area for Section III.G.2.c of Appendix R to 10CFR50. The existing plant licensing basis in this area involved a deviation that was granted in SER Supplement 3 and affirmed in License Amendment 17 to require only certain areas of the station to have the required suppression. The deviation was granted with the stipulation that "in the remaining areas, the potential effects of a fire on safety related equipment have been reduced by encasing one redundant division in a 1-1/2 hour rated fire barrier." SCE&G requests acceptance of the deviations noted.

Description of Fire Zone AB-1.9

Fire Zone AB-1.9 is the charging pump cooling units room and is located on the partial shield slab above the charging pumps at elevation 400'-0", in the north portion of the Auxiliary Building. This zone contains Fire Barrier Item Numbers 7-TW, 8-TW, 9-TW, 10-TW, and 11-TW. These barriers are required for "Appendix R Protection" as well as "Required for 'C' Train Operability". This zone contains both "A" and "B" train equipment and cabling. This includes 'A' train fan XFN-46A-VL (for charging/SI pump room cooling) and its power cable VLC1A; and 'B' train fan XFN-46B-VL and its power cable VLC4B. Power cables CSM1A and CSM11B for the 'A' and 'B' train charging/SI pumps (XPP-43A-CS and XPP-43B-CS) are also located in this zone. This zone includes 'C' train cables and equipment (for alignment to both 'A' and 'B' train systems), including XFN-47-VL (safety injection charging pump room No. 2 fan).

Table 2
Triple Wrap Deviations
VC Summer Nuclear Station

Power cable CSM1A to XPP-43A-CS is located in conduit and is protected by Fire Barrier Item Number 7-TW. This barrier provides a fire rated barrier for 'C' Train Operability only. CSM1A is wrapped from blockout in floor (EAB-2046) to blockout in ceiling. In addition to the noted power cables, both the 'A' and 'B' train charging/SI pump room cooling units (XFN-46A-VL and XFN-46B-VL) are enclosed in kaowool fire rated enclosures (8-TW and 10-TW).

Power cable VLC4B to XFN-46B-VL is located in conduit and cable trays 4065 and 4066 and is protected by Fire Barrier Item Numbers 5-TW and 8-TW. These barriers provide a fire rated barrier for 'C' Train Operability" as well as for "Appendix R Protection", respectively. The trays (4064B and 4065B) are wrapped from the west wall of Room 00-02E of Fire Zone 1.4 above the charging/SI pump rooms through Fire Zone AB-1.9 to the east wall of Room 00-02E. VLC4B is wrapped from 4065(B) to XFN-46B-VL. In addition to the noted power cables, the 'B' train charging/SI pump room cooling unit (XFN-46B-VL) is enclosed in this kaowool fire rated enclosure (8-TW) and has a Zetex covering.

Power cable CSM11B is wrapped in 9-TW from the floor to the east wall of Room 00-02 and is the "B" train charging/SI pump (XPP-43B-CS). This zone includes 'C' train cables and equipment (for alignment to both 'A' and 'B' train systems), including XFN-47-VL (safety injection charging pump room No. 2 fan).

Power cable VLC1A to XFN-46A-VL is located in conduit and is protected by Fire Barrier Item Number 10-TW. This barrier provides a fire rated barrier for 'C' Train Operability. The VLC1A cable is wrapped from the ceiling (EAB-4071) of the south wall to XFN-46A-VL of this fire zone. In addition to the noted power cables, the 'A' train charging/SI pump room cooling unit (XFN-46A-VL) is enclosed in this kaowool fire rated enclosure (10-TW) and has a Zetex covering.

Power cable CSM11B to XPP-43B-CS is located in conduit and cable tray 1012(B) and is protected by Fire Barrier Item Numbers 6-TW and 11-TW. These barriers provide a fire rated barrier for 'C' Train Operability" as well as for "Appendix R Protection", respectively. The barriers run from the west wall of Fire Zone 1.4 above the charging/SI pump rooms to the south wall (EPAB-2007) of Fire Zone AB-1.9. CSM11B is wrapped 40 feet north from tray 1012(B). There is an additional conduit (CSM42B) and cable included in the wrap that is not Appendix 'R' required. Additionally, there is a 1-1/2' air gap between the two 4" conduits (CCM11B and CSM42B) and tray (1012).

Combustibles associated with permanent plant equipment located within Fire Zone AB-1.9 consist of cable insulation. The total combustible content of Fire Zone AB-1.9 results in a fire loading of 3,879 Btus/sq. ft. Fire Zone AB-1.9 is provided with a smoke detection system. Fire suppression equipment serving this zone consists of portable fire extinguishers and interior manual hose stations.

Table 2
Triple Wrap Deviations
VC Summer Nuclear Station

TEST COMPARISON:

Kaowool Triple Wrap (7-TW) is 9' long and encloses a 4" surface mounted conduit in Fire Zone AB-1.9 with a thermal mass of 14.4 lbs/ft. This item is similar to the Omega Point Test Labs Item #2 (Wall/Ceiling Mounted 1-1/4" and 4" Conduit) that had a thermal mass of 337.7 pounds (16.9 lbs/ft) (inside furnace) and reached a temperature of 198°F in 60 minutes. The GL 86-10, Supplement 1 allows a temperature of 250°F above ambient (67°F) for an allowable temperature of 317°F. The interpolated available comparison would indicate that 7-TW would reach a temperature of 215°F in 58 minutes. This equates to an available margin of 102°F or 13 minutes.

Kaowool Triple Wrap (8-TW) is 40' long and encloses a number of items. Included are a 1-1/4" conduit that is both surface mounted and suspended in open air (5-1/2') and two (2) 6" x 6" trays that are suspended in open air (28") and have a total thermal mass of 950.4 pounds (47.1 lbs/ft) in Fire Zone AB-1.9. The wrap also includes a fan/duct assembly (Thermal mass of 2752 pounds) mounted to the floor that has zetex as physical protection. This item is similar to a combination of Omega Point Test Labs Items #2 (Wall/Ceiling Mounted 1-1/4" and 4" Conduit) that had a thermal mass of 337.7 pounds (16.9 lbs/ft) (inside furnace) and reached a temperature of 198°F in 60 minutes; Item #3 (6" x 6" Open Air Tray) that had a thermal mass of 324.4 pounds (16.2 lbs/ft) (inside furnace) and reached a temperature of 311°F in 48 minutes; and Item #4 (Open Air 1" Conduit) that had a thermal mass of 30.3 pounds (1.9 lbs/ft) (inside furnace) and reached a temperature of 300°F in 47 minutes. The GL 86-10, Supplement 1 allows a temperature of 250°F above ambient (67°F) for an allowable temperature of 317°F. The extrapolated available comparison would indicate that 8-TW would reach a temperature of 317°F in 50 minutes. This equates to no available margin.

Kaowool Triple Wrap (9-TW) is 4' long and encloses a 4" surface mounted conduit in Fire Zone AB-1.9 with a thermal mass of 14.4 lbs/ft. This item is similar to the Omega Point Test Labs Item #2 (Wall/Ceiling Mounted 1-1/4" and 4" Conduit) that had a thermal mass of 337.7 pounds (16.9 lbs/ft) (inside furnace) and reached a temperature of 198°F in 60 minutes. The GL 86-10, Supplement 1 allows a temperature of 250°F above ambient (67°F) for an allowable temperature of 317°F. The interpolated available comparison would indicate that 9-TW would reach a temperature of 215°F in 58 minutes. This equates to an available margin of 102°F or 13 minutes.

Kaowool Triple Wrap (10-TW) is 18' long and encloses a number of items, including a 1-1/4" conduit that is both surface mounted (12') and suspended in open air (6') and has a total thermal mass of 40.5 pounds (6.8 lbs/ft) in Fire Zone AB-1.9. The wrap also includes a fan/duct assembly (Thermal mass of 2752 pounds) mounted to the floor that has zetex as physical protection. This item is similar to a combination of Omega Point Test Labs Items: #2 (Wall/Ceiling Mounted 1-1/4" and 4" Conduit) and Item #4 (Open Air 1" Conduit) that had thermal masses of 337.7 pounds (16.9 lbs/ft) (inside furnace) and 30.3 pounds (1.9 lbs/ft) (inside furnace), and reached temperatures of 198°F in 60 minutes and 300°F in 47 minutes, respectively. The GL 86-10, Supplement 1 allows a temperature of 250°F above ambient (67°F) for an allowable temperature of 317°F. The interpolated available comparison would indicate that 10-TW would reach a temperature of 267°F in 51 minutes. This equates to an available margin of 50°F or 6 minutes.

Table 2
Triple Wrap Deviations
VC Summer Nuclear Station

Kaowool Triple Wrap (11-TW) is 61' long and encloses a number of items, including a 4" conduit that is surface mounted; one (1) 4" x 12" tray that is surface mounted; and a second 4" conduit that is, also, surface mounted, with a total thermal mass of 2743.4 pounds (55.0 lbs/ft) in Fire Zone AB-1.9. This item is similar to the Omega Point Test Labs Item #2 (Wall/Ceiling Mounted 1-1/4" and 4" Conduit) that had a thermal mass of 337.7 pounds (16.9 lbs/ft) (inside furnace) and reached a temperature of 198°F in 60 minutes. There is a 1-1/2' cable air gap associated with triple wrap (11-TW), and was protected by enclosing the cables (CSM11B and CSM42B) with three spare cables (EK-A1E), (for thermal mass only), inside an additional two layers of 1" Kaowool for the 1-1/2' distance between the ends of the conduits and the beginning of the cable tray. This cable air gap now has a thermal mass of 68.6 pounds (22.9 lbs/ft), which is larger than the Omega Point Test Labs Item #10 (Air Drop of Single Cable) which had a thermal mass of 5.4 pounds (0.3 lbs/ft) (inside furnace) and reached a temperature of 312°F in 34 minutes. The GL 86-10, Supplement 1 allows a temperature of 250°F above ambient (67°F) for an allowable temperature of 317°F. Program simulation with Thermal Ceramics of a five layer wrap of 1" Kaowool, under an ASTM E-119 test curve, shows a maximum temperature of 233°F in 60 minutes. This equates to an available air drop margin of 79°F or 60 minutes. The extrapolated available comparison would indicate that 11-TW trays would reach a temperature of 317°F in 117 minutes. This equates to an available margin of 57 minutes.

JUSTIFICATION/MODIFICATION:

Evaluation of Fire Zone AB-1.9

Fire Zone AB-1.9 has a negligible fire load equivalent to an estimated fire duration of less than 5 minutes. This overall fire loading is significantly less than the designed fire resistance rating of the subject barrier. A postulated fire in this zone is not expected to develop to a magnitude or duration, which would jeopardize the noted electrical raceway fire barrier enclosure. In addition, the existing fire detection system would provide for early detection of a fire and allow for prompt suppression. The existing barrier therefore provides a level of protection consistent with the hazards identified and provides a high level of assurance that at least one train of safe shutdown equipment will remain free of fire damage. Also a review of the IPEEE Internal Fire evaluation calculation indicates a core damage frequency (CDF) of 7.52E-08 for this area. Based on the low CDF calculated during the screening phase of the IPEEE Internal Fire Evaluation, additional detailed analysis or fire modeling was not performed as part of the IPEEE.

For 7-TW, Conduit CSM1A contains 1 cable that is "Required for 'C'-Train Operability". For this cable in conduit, a revision to an existing deviation is requested from the requirements of separation and lack of an automatic fire suppression system in the area for Section III.G.2.c of Appendix R to 10CFR50. SCE&G performed a full scale fire test at Omega Point Test Labs in December 1999 and concluded that cable in surface mounted conduit has been shown to remain functional when subjected to an ASTM E-119 fire test for at least 58 minutes. Because the cable does not meet the criteria of Section III.G.2.c, since it is not a "one hour rated fire barrier" with suppression, VCS will provide additional triple wrap around the supports and the leaded elastomer penetration seal to

Table 2
Triple Wrap Deviations
VC Summer Nuclear Station

eliminate thermal shorts and protect the cable at the penetration seal. The cable is routed in, and supported by, a triple wrap rigid steel raceway as discussed in the cover letter.

A walkdown of the area showed that all cabling is enclosed in conduits with no exposed combustibles near the wrap. This area has a fire severity of 3 minutes.

For 8-TW, Conduit VLC4B contains 1 cable; trays 4064 and 4065 contain numerous cables that are "Required for Appendix 'R'". For these cables in conduit and trays, and the fan assembly, a revision to an existing deviation is requested from the requirements of separation and lack of an automatic fire suppression system in the area for Section III.G.2.c of Appendix R to 10CFR50. SCE&G performed a full scale fire test at Omega Point Test Labs in December 1999 and concluded that cable in surface mounted conduit and conduit/tray in open air has been shown to remain functional when subjected to an ASTM E-119 fire test for at least 50 minutes. Because the cable does not meet the criteria of Section III.G.2.c, since it is not a "one hour rated fire barrier" with suppression, VCS will provide additional triple wrap around the supports to eliminate thermal shorts. The cable is routed in, and supported by, triple wrap rigid steel raceways as discussed in the cover letter.

A walkdown of the area showed that all cabling is enclosed in conduits with no exposed combustibles near the wrap. This area has a fire severity of 3 minutes.

For 9-TW, Conduit CSM11B contains 1 cable that is "Required for Appendix 'R'". For this cable in conduit, a revision to an existing deviation is requested from the requirements of separation and lack of an automatic fire suppression system in the area for Section III.G.2.c of Appendix R to 10CFR50. SCE&G performed a full scale fire test at Omega Point Test Labs in December 1999 and concluded that cable in surface mounted conduit has been shown to remain functional when subjected to an ASTM E-119 fire test for at least 58 minutes. Because the cable does not meet the criteria of Section III.G.2.c, since it is not a "one hour rated fire barrier" with suppression, VCS is requesting this revision to an existing deviation. The cable is routed in, and supported by, a triple wrap rigid steel conduit as discussed in the cover letter.

A walkdown of the area showed that all cabling is enclosed in conduits with no exposed combustibles near the wrap. This area has a fire severity of 3 minutes.

For 10-TW, Conduit VLC1A contains one cable that is "Required for 'C'-Train Operability". For this cable in conduit, and the fan assembly, a revision to an existing deviation is requested from the requirements of separation and lack of an automatic fire suppression system in the area for Section III.G.2.c of Appendix R to 10CFR50. SCE&G performed a full scale fire test at Omega Point Test Labs in December 1999 and concluded that cable in surface mounted and open air conduit has been shown to remain functional when subjected to an ASTM E-119 fire test for at least 51 minutes. Because the cable does not meet the criteria of Section III.G.2.c, since it is not a "one hour rated fire barrier" with suppression, VCS will provide additional triple wrap around the supports to eliminate thermal shorts. The cable is routed in, and supported by, a triple wrap rigid steel conduit as discussed in the cover letter.

A walkdown of the area showed that all cabling is enclosed in conduits with no exposed combustibles near the wrap. This area has a fire severity of 3 minutes.

Table 2
Triple Wrap Deviations
VC Summer Nuclear Station

For 11-TW, Conduit CSM11B contains one cable; tray 1012B contain numerous cables that are "Required for Appendix 'R'". For these cables in conduit and tray, a revision to an existing deviation is requested from the requirements of separation and lack of an automatic fire suppression system in the area for Section III.G.2.c of Appendix R to 10CFR50. SCE&G performed a full scale fire test at Omega Point Test Labs in December 1999 and concluded that cable in surface mounted conduit and tray has been shown to remain functional when subjected to an ASTM E-119 fire test for at least 60 minutes. The 1-1/2' cable air gap associated with triple wrap (11-TW) was protected by surrounding the cables (CSM11B and CSM42B) with three spare cables (EK-A1E), for thermal mass only, inside an additional two layers of 1" Kaowool for the 1-1/2' distance between the ends of the conduits and the beginning of the cable tray. This cable air gap now has a thermal mass of 68.6 pounds (22.9 lbs/ft), which is larger than the Omega Point Test Labs Item #10 (Air Drop of Single Cable) which had a thermal mass of 5.4 pounds (0.3 lbs/ft) (inside furnace) and reached a temperature of 312°F in 34 minutes. Trapped air, in spaces between the layers, act as an insulator. The consequences of a joint failure are also lessened because of the multiple joints and staggering. Because the cable does not meet the criteria of Section III.G.2.c, since it does not have suppression, VCS will provide additional triple wrap around the supports and over the silicone foam penetration seal to eliminate thermal shorts and protect the cables from a fire at the silicone foam penetration seal. The cable is routed in, and supported by, a triple wrap rigid steel raceway as discussed in the cover letter.

A walkdown of the area showed that all cabling is enclosed in conduits with no exposed combustibles near the wrap. This area has a fire severity of 3 minutes.

SUMMARY:

The cable in 7-TW conduit is NOT 'A' or 'B' Train related and the fire loading is less than the tested configuration. Because VC Summer treats the swing train components as a backup for Appendix R, a revision to the existing deviation for 45 minutes is requested from the requirements of separation and lack of an automatic fire suppression system in the area for Section III.G.2.c of Appendix R to 10CFR50. The existing plant licensing basis in this area involved a deviation that is mentioned in the cover letter. SCE&G requests acceptance of the deviation noted.

The cables in 8-TW trays/conduit and fan assembly are "Required for Appendix R" and the fire loading is less than the tested configuration. A revision to the existing deviation for 45 minutes is requested from the requirements of separation and lack of an automatic fire suppression system in the area for Section III.G.2.c of Appendix R to 10CFR50. The existing plant licensing basis in this area involved a deviation that is mentioned in the cover letter. SCE&G requests acceptance of the deviation noted.

The cable in 9-TW conduit is "Required for Appendix R" and the fire loading is less than the tested configuration. A revision to the existing deviation for 45 minutes is requested from the requirements of separation and lack of an automatic fire suppression system in the area for Section III.G.2.c of Appendix R to 10CFR50. The existing plant licensing basis in this area involved a deviation that is mentioned in the cover letter. SCE&G requests acceptance of the deviation noted.

Table 2
Triple Wrap Deviations
VC Summer Nuclear Station

The cable in 10-TW conduit and fan assembly are NOT 'A' or 'B' Train related and the fire loading is less than the tested configuration. Because VC Summer treats the swing train components as a backup for Appendix R, a revision to the existing deviation for 45 minutes is requested from the requirements of separation and lack of an automatic fire suppression system in the area for Section III.G.2.c of Appendix R to 10CFR50. The existing plant licensing basis in this area involved a deviation that is mentioned in the cover letter. SCE&G requests acceptance of the deviation noted.

The cables in 11-TW conduit/trays are "Required for Appendix R" and the fire loading is less than the tested configuration. A revision to the existing deviation for 45 minutes is requested from the requirements of separation and lack of an automatic fire suppression system in the area for Section III.G.2.c of Appendix R to 10CFR50. The existing plant licensing basis in this area involved a deviation that is mentioned in the cover letter. SCE&G requests acceptance of the deviation noted.

Thus the use of Kaowool triple wrap over the conduits and trays for the "Required for 'C'-Train Operability" and/or "Required for Appendix R" cable in raceways in the fire zone AB-1.9: in conjunction with the existing fire protection features and the proposed additional triple wrap over the exposed thermal shorts and leaded elastomer penetration seal, zetex on some areas, provides an equivalent 50-to-58 minute level of protection to that required by Section III.G.2.c of Appendix R to 10CFR50 for 7-TW, 8-TW, 9-TW, 10-TW and 11-TW, **and** an equivalent 60-minute level of protection with the additional two wraps over the air drop cable for 11-TW.

Table 2
Triple Wrap Deviations
VC Summer Nuclear Station

<u>Fire Barrier Item Number 12-TW</u>	[E-215-077 (B-6)]
Appendix R Regulatory Requirement	Required for "C" Train
FPER Section	4.2.1.4.2
Kaowool Configuration	2.00" Conduits (XX-2048C and XX-2511C) Pull Box (PB-CS117)
Circuit(s) Protected	VLC12C and CSC264XC
Function(s) Protected	VLC12C provides 120V Control for 'C' Charging/SI Pump Room 2 Cooling & CSC264XC is a spare circuit
Physical Protection	None
Ceiling/Wall/Floor Pen Seal Material	[Barrier #783 (EAB4071/TR-AB2342)] Floor Leaded Elastomer and [Barrier #864 (EAB5206)] Ceiling Not Rated
Approximate length involved	44'
Building	Auxiliary Building
Elevation	412'
Room Number(s)	12-28
Fire Area/Zone	AB-1.10
Fire Loading in Btu/SqFt	56,240 (42 minutes)
Automatic Fire Detection	Yes
Automatic Fire Suppression	NO
IPEEE (January 1999) CDF	1.55E-08

LICENSING BASIS FOR REQUEST:

For these cables in conduits, a revision to an existing deviation for 60 minutes is requested from the requirements of separation and no suppression in the area for Section III.G.2.c of Appendix R to 10CFR50. The existing plant licensing basis in this area involved a deviation that was granted in SER Supplement 3 and affirmed in License Amendment 17 to require only certain areas of the station to have the required suppression. The deviation was granted with the stipulation that "in the remaining areas, the potential effects of a fire on safety related equipment have been reduced by encasing one redundant division in a 1-1/2 hour rated fire barrier." SCE&G requests acceptance of the deviation noted.

Description of Fire Zone AB-1.10

Fire Zone AB-1.10 is the general floor area in the basement of the Auxiliary Building and the partial shield slab located directly above it. This area has a large open volume (16,730 square feet with a ceiling height of more than 20 feet). The general areas of the Auxiliary Building [388' (AB-1.4), 412' (AB-1.10), 436' (AB-1.18) and the 463' (AB-1.21)] communicate with one another [and with the general area on the 485' (AB-1.30)] through large openings in the floor. One opening is in the northeast portion of the Auxiliary Building (column line Q-6) and the other is in the southwest portion (column line L-10). The northeast opening is an open equipment hatch (12' long by 5' wide); the southwest opening is a grated opening in the floor (26' long by 9' wide). This fire zone is located on elevations 412'-0" and 426'-0", respectively, of the Auxiliary Building and contains Fire Barrier Item

Table 2
Triple Wrap Deviations
VC Summer Nuclear Station

Number 12-TW. Room 12-28 covers approximately 700 square feet of the total 16,730 square feet, with the combustibile load in cable insulation located mainly at the southwest ceiling of the room. This zone mainly contains 'A' Train equipment and cabling. This zone also contains the 'C' train power cable for alignment to both 'A' and 'B' train systems for the 'C' charging/SI pump room cooling fan XFN-0047-VL. Power cable VLC12C to XFN-47-VL is located in conduits XX-2048C and XX-2511C. Both conduits are protected by Fire Barrier Item Number 12-TW. This barrier provides a fire rated barrier for 'C' Train Operability only. The barrier runs from the concrete floor (EAB-4071) to the concrete ceiling (EAB-5206) within this fire zone. XX-2048C is wrapped from the floor at elevation 412'-0" to and including PB-CS117. XX-2511C is wrapped from PB-CS117 to ceiling. There are additional cables included in the wrap that are NOT Appendix 'R' required.

Combustibles associated with permanent plant equipment located within Fire Zone AB-1.10 consist of cable insulation and internal wiring in motor control centers. The total combustibile content of Fire Zone AB-1.10 results in a fire loading of 56,240 Btus/sq. ft. Fire Zone AB-1.10 is provided with a smoke detection system while the fire suppression equipment serving this zone consists of portable fire extinguishers and interior manual hose stations.

TEST COMPARISON:

Kaowool Triple Wrap (12-TW) is 44' long and encloses two 2" surface mounted conduits in Fire Zone AB-1.10 with a thermal mass of 10.3 lbs/ft. This item is similar to the Omega Point Test Labs Item #2 (Wall/Ceiling Mounted 1-1/4" and 4" Conduit) that had a thermal mass of 337.7 pounds (16.9 lbs/ft) (inside furnace) and reached a temperature of 198°F in 60 minutes. The GL 86-10, Supplement 1 allows a temperature of 250°F above ambient (67°F) for an allowable temperature of 317°F. The interpolated available comparison would indicate that 12-TW would reach a temperature of 238°F in 60 minutes. This equates to an available margin of 79°F or 119 minutes.

JUSTIFICATION/MODIFICATION:

Evaluation of Fire Zone AB-1.10

A fire in one general area is not expected to result in damage to equipment and cables in other general areas for the following reasons:

- Detailed analysis performed for the general area of the Intermediate Building (IB) on the 412' elevation is applicable to the general areas of the Auxiliary Building (AB). The area analyzed in the IB has a floor area of 11,301 square feet and ceilings 22 feet in height. A very large oil fire (a 20 square foot unconfined oil spill with an estimated heat release rate of 7,425 Btu's) was analyzed for the IB space. The temperature rise predicted in the plume at an elevation 21' above the fire was 608°F. Critical levels of radiant heat for the fire analyzed were predicted to occur within a radius of 15'. Therefore, even a very large floor-based exposure fire is not capable of directly affecting equipment and cables on the elevation above.
- The only other means of propagating the effects of a fire to other elevations is through migration of hot gases through unprotected openings, the largest of which are the northeast and

Table 2
Triple Wrap Deviations
VC Summer Nuclear Station

southwest equipment hatches. However, the potential for hot gas layer buildup is limited because at each elevation the hatches open to the next elevation directly above one another. Buoyancy forces will cause hot air rising through a hatch at one elevation to continue to rise to succeeding elevations. The rising column of heated air will cool as it rises due to entrainment of cooler air at each elevation. A column of hot air rising through the northeast equipment hatches will terminate on the ventilation equipment level of the AB (485' elevation). There are no safe shutdown cables of equipment on this elevation. A column of hot air rising through the southwest equipment hatches will terminate on the 463' elevation (AB-1.21.2). At the uppermost elevation, the heated column of air will mix with a large volume of cool air. In addition, The AB ventilation system will draw out a portion of the heated air at the highest elevation, mixing it with cooler air throughout the AB. It is most likely that the combined effect of entrainment of cool air as the column rises and dilution by the ventilation system will limit hot gas layer buildup and keep temperatures at all elevations well below damage thresholds.

Fire Zone AB-1.10 has a low fire load equivalent to an estimated fire duration of less than 45-minutes. This overall fire loading is less than the designed fire resistance rating of the subject barrier. A postulated fire in this area is not expected to develop to a magnitude or duration, which would jeopardize the noted electrical raceway fire barrier enclosure. In addition, the existing fire detection system would provide for early detection of a fire and allow for prompt suppression. The existing barrier therefore provides a level of protection consistent with the hazards identified and provides a high level of assurance that at least one train of safe shutdown equipment will remain free of fire damage. Also, a review of the IPEEE Internal Fire evaluation calculation indicates a core damage frequency (CDF) of 1.55E-08 for this area. Based on the low CDF calculated during the screening phase of the IPEEE Internal Fire Evaluation, additional detailed analysis or fire modeling was not performed as part of the IPEEE.

For 12-TW, Conduits XX-2048C and XX-2511C contain various cables that are "Required for 'C'-Train Operability". SCE&G performed a full scale fire test at Omega Point Test Labs in December 1999 and concluded that cable in surface mounted conduit has been shown to remain functional when subjected to an ASTM E-119 fire test for at least 60 minutes. Because the cables do not meet the criteria of Section III.G.2.c, since it is not a "one hour rated fire barrier" with suppression, VCS will provide additional triple wrap around the supports and the leaded elastomer penetration seal to eliminate thermal shorts and protect the cables at the penetration seal. The cable is routed in, and supported by, triple wrap rigid steel conduits as discussed in the cover letter.

A walkdown of the area showed that there are no exposed combustibles near the wrap. This area has a fire severity of 42 minutes.

SUMMARY:

The cables in these conduits are NOT 'A' or 'B' Train related and the fire loading is less than the tested configuration. Because VC Summer treats the swing train components as a backup of Appendix R, a revision to the deviation for 60 minutes is requested from the requirements of separation and lack of an automatic fire suppression system in the area for Section III.G.2.c of Appendix R to 10CFR50. The existing plant licensing basis in this area involved a deviation that is mentioned in the cover letter. SCE&G requests acceptance of the deviation noted.

Table 2
Triple Wrap Deviations
VC Summer Nuclear Station

Thus the use of Kaowool triple wrap over the 2" conduits for the "Required for 'C'-Train Operability" cable in conduits in the fire zone AB-1.9: in conjunction with the existing fire protection features and additional triple wrap over the exposed thermal shorts and leaded elastomer penetration seal, provides an equivalent 60 minutes level of protection to that required by Section III.G.2.c of Appendix R to 10CFR50.

**Table 2
Triple Wrap Deviations
VC Summer Nuclear Station**

<u>Fire Barrier Item Number 13-TW</u>	[E-215-079 (H-6)]
Appendix R Regulatory Requirement FPER Section Kaowool Configuration	Required for "C" Train 4.2.1.4.2 2.00" Conduits (XX-3153C, XX-2511C and XX-2512C) Pull Boxes (PB-CS112 and PB-CS118)
Circuit(s) Protected Function(s) Protected	VLC12C and CSC264XC VLC12C provides 120V Control for 'C' Charging/SI Pump Room 2 Cooling & CSC264XC is a spare circuit
Physical Protection Ceiling/Wall/Floor Pen Seal Material	None & Flamemastic [Barrier #864 (EAB5206)] Floor Not Rated & [Barrier #297 (EAB5061)] South Wall Foam/Pressure Seal
Approximate length involved Building Elevation Room Number(s) Fire Area/Zone Fire Loading in Btu/SqFt . Automatic Fire Detection Automatic Fire Suppression IPEEE (January 1999) CDF	39' Auxiliary Building 436' 36-18 AB-1.18 113,532 (85 minutes) Yes NO 2.68E-08

LICENSING BASIS FOR REQUEST:

For these cables in conduits, a revision to an existing deviation for 60 minutes is requested from the requirements of separation and no suppression in the area for Section III.G.2.c of Appendix R to 10CFR50. The existing plant licensing basis in this area involved a deviation that was granted in SER Supplement 3 and affirmed in License Amendment 17 to require only certain areas of the station to have the required suppression. The deviation was granted with the stipulation that "in the remaining areas, the potential effects of a fire on safety related equipment have been reduced by encasing one redundant division in a 1-1/2 hour rated fire barrier." SCE&G requests acceptance of the deviation noted.

Description of Fire Zone AB-1.18

Fire Zone AB-1.18 is the general floor area located at elevations 436'-0" of the Auxiliary Building. This area has a large open volume (16,434 square feet with a ceiling height of more than 20 feet). The general areas of the Auxiliary Building [388' (AB-1.4), 412' (AB-1.10), 436' (AB-1.18) and the 463' (AB-1.21)] communicate with one another [and with the general area on the 485' (AB-1.30)] through large openings in the floor. One opening is in the northeast portion of the Auxiliary Building (column line Q-6) and the other is in the southwest portion (column line L-10). The northeast opening is an open equipment hatch (12' long by 5' wide); the southwest opening is a grated opening in the floor (26' long by 9' wide). Room 36-18 covers approximately 3,415 square feet of

Table 2
Triple Wrap Deviations
VC Summer Nuclear Station

the total 16,434 square feet, with the combustible load in cable insulation located throughout the ceiling of the room. This area contains Fire Barrier Item Number 13-TW which is located in Fire Sub-Zone AB-1.18.1 in the central portion of this elevation. This zone also contains 'C' train control cables for alignment to both 'A' and 'B' train systems for the 'C' charging/SI pump (XPP-43C-CS) and its room cooling fan XFN-47-VL. Power cable VLC12C to XFN-47-VL is located in conduits XX-3153C and XX-2512C. Both conduits are protected by Fire Barrier Item Number 13-TW. This barrier provides a fire rated barrier for 'C' Train Operability only. The barrier runs from the concrete floor (EAB-5206) to the fire rated south concrete wall (EAB-5061) in this fire zone. XX-3153C is wrapped from the south wall to and including PB-CS112; XX-2512C is wrapped from PB-CS112 to and including PB-CS118; XX-2511C is wrapped from PB-CS118 to the floor elevation 436'-0". There are additional cables included in the wrap that are not Appendix 'R' required.

Combustibles associated with permanent plant equipment located within Fire Zone AB-1.18 consist of cable insulation and mechanical equipment. The total combustible content of Fire Zone AB-1.18 results in a fire loading of 113,532 Btus/sq. ft. Fire detection equipment for Fire Zone AB-1.18 consists of a smoke detection system. Fire suppression equipment within this zone consists of portable fire extinguishers and interior manual hose stations.

TEST COMPARISON:

Kaowool Triple Wrap (13-TW) is 39' long and encloses three 2" conduits (two are surface mounted and one is both surface mounted and in open air (3') and has a thermal mass of 167.2 pounds (65.8 lbs/ft) in Fire Zone AB-1.18. This item is similar to two Omega Point Test Labs Items: #2 (Wall/Ceiling Mounted 1-1/4" and 4" Conduit) and Item #1 (Open Air 4" Conduit) that had thermal masses of 337.7 pounds (16.9 lbs/ft) (inside furnace) and 329.8 pounds (16.5 lbs/ft) (inside furnace) and reached a temperature of 198°F and 308°F, respectively in 60 minutes. The GL 86-10, Supplement 1 allows a temperature of 250°F above ambient (67°F) for an allowable temperature of 317°F. The extrapolated available comparison would indicate that 13-TW would reach a temperature of 238°F in 60 minutes. This equates to an available margin of 79°F or 119 minutes.

JUSTIFICATION/MODIFICATION:

Evaluation of Fire Zone AB-1.18

A fire in one general area is not expected to result in damage to equipment and cables in other general areas for the following reasons:

- Detailed analysis performed for the general area of the Intermediate Building (IB) on the 412' elevation is applicable to the general areas of the Auxiliary Building (AB). The area analyzed in the IB has a floor area of 11,301 square feet and ceilings 22 feet in height. A very large oil fire (a 20 square foot unconfined oil spill with an estimated heat release rate of 7,425 Btu's) was analyzed for the IB space. The temperature rise predicted in the plume at an elevation 21' above the fire was 608°F. Critical levels of radiant heat for the fire analyzed were predicted to

Table 2
Triple Wrap Deviations
VC Summer Nuclear Station

occur within a radius of 15'. Therefore, even a very large floor-based exposure fire is not capable of directly affecting equipment and cables on the elevation above.

- The only other means of propagating the effects of a fire to other elevations is through migration of hot gases through unprotected openings, the largest of which are the northeast and southwest equipment hatches. However, the potential for hot gas layer buildup is limited because at each elevation the hatches open to the next elevation directly above one another. Buoyancy forces will cause hot air rising through a hatch at one elevation to continue to rise to succeeding elevations. The rising column of heated air will cool as it rises due to entrainment of cooler air at each elevation. A column of hot air rising through the northeast equipment hatches will terminate on the ventilation equipment level of the AB (485' elevation). There are no safe shutdown cables of equipment on this elevation. A column of hot air rising through the southwest equipment hatches will terminate on the 463' elevation (AB-1.21.2). At the uppermost elevation, the heated column of air will mix with a large volume of cool air. In addition, The AB ventilation system will draw out a portion of the heated air at the highest elevation, mixing it with cooler air throughout the AB. It is most likely that the combined effect of entrainment of cool air as the column rises and dilution by the ventilation system will limit hot gas layer buildup and keep temperatures at all elevations well below damage thresholds.

Fire Zone AB-1.18 has a moderate fire load equivalent to an estimated fire duration of less than 90 minutes. A postulated fire in this area is not expected to develop to a magnitude or duration, which would jeopardize the noted electrical raceway fire barrier enclosure. In addition, the existing fire detection system would provide for early detection of a fire and allow for prompt suppression. A review of the IPEEE Internal Fire evaluation calculation indicates a core damage frequency (CDF) of 2.68E-08 for this area. Based on the low CDF calculated during the screening phase of the IPEEE Internal Fire Evaluation, additional detailed analysis or fire modeling was not performed as part of the IPEEE. The existing barrier provides a level of protection consistent with the hazards identified and provides a high level of assurance that at least one train of safe shutdown equipment will remain free of fire damage.

For 13-TW, Conduits XX-2512C, XX-3153C and XX-2511C contain various cables that are "Required for 'C'-Train Operability." SCE&G performed a full scale fire test at Omega Point Test Labs in December 1999 and concluded that cable in surface mounted conduit and larger conduit in open air remains functional when subjected to an ASTM E-119 fire test for at least 60 minutes. Because the cables do not meet the criteria of Section III.G.2.c, not a "one hour rated fire barrier" with suppression, VCS will provide additional triple wrap around the supports and the silicone foam/pressure penetration seal to eliminate thermal shorts and protect the cables at the penetration seal. Flamemastic has been added in some areas for physical protection. The cable is routed in, and supported by, triple wrap rigid steel conduits as discussed in the cover letter.

A walkdown of the area showed that there are ten exposed cable trays below the wrap with ~ 50% of the total cable load. If we assume that 30% of the cable load would impact the area under the wrap (13' x 118'), then we would have a fire severity of 44 minutes for this area under the wrap.

Table 2
Triple Wrap Deviations
VC Summer Nuclear Station

SUMMARY:

The cables in these conduits are NOT 'A' or 'B' Train related and the fire loading is less than the tested configuration. Because VC Summer treats the swing train components as a backup of Appendix R, a revision to the deviation for 60 minutes is requested from the requirements of separation and lack of an automatic fire suppression system in the area for Section III.G.2.c of Appendix R to 10CFR50. The existing plant licensing basis in this area involved a deviation that is mentioned in the cover letter. SCE&G requests acceptance of the deviation noted.

The use of Kaowool triple wrap over the three 2" conduits "Required for 'C'-Train Operability" in Fire Zone AB-1.18: in conjunction with the existing fire protection features and additional triple wrap over the exposed thermal shorts and silicone foam/pressure penetration seal, provides an equivalent 60 minutes level of protection to that required by Section III.G.2.c of Appendix R to 10CFR50.

Table 2
Triple Wrap Deviations
VC Summer Nuclear Station

D. DEVIATION FOR INTERMEDIATE BUILDING FIRE AREAS/ZONES
(IB-11, IB-14, IB-16, IB-23.2, AND IB-25.6):

<u>Fire Barrier Item Number 41-TW</u>	[E-215-131 (J-10)]
Appendix R Regulatory Requirement	Required for Appendix 'R'
FPER Section	4.4.11.2.2
Kaowool Configuration (Air Drop)	1.50" Conduit (XX-3116A); 1.25" Conduit (CCE21A)
Circuit(s) Protected	CCM16A and BIJ46XA
Function(s) Protected	CCM16A is the power cable to 'A' CC Water Pump BIJ46XA is the control cable to 'A' CC Water Pump
Physical Protection	Flamemastic
Ceiling/Wall/Floor Pen Seal Material	[Barrier #293 (EIB1158/TR-IB277)] East Wall Grout [Barrier #981 (EIB2148/TR-IB584)] Ceiling Foam/Pressure Seal
Approximate length involved	4'
Building	Intermediate Building
Elevation	426'
Room Number(s)	26-01
Fire Area/Zone	IB-11
Fire Loading in Btu/SqFt	19,963 (15 minutes)
Automatic Fire Detection	Yes
Automatic Fire Suppression	NO
IPEEE (January 1999) CDF	3.73E-08

LICENSING BASIS FOR REQUEST:

For these cables in conduits, a revision to an existing deviation for 45 minutes is requested from the requirements of separation and no suppression in the area for Section III.G.2.c of Appendix R to 10CFR50. The existing plant licensing basis in this area involved a deviation that was granted in SER Supplement 3 and affirmed in License Amendment 17 to require only certain areas of the station to have the required suppression. The deviation was granted with the stipulation that "in the remaining areas, the potential effects of a fire on safety related equipment have been reduced by encasing one redundant division in a 1-1/2 hour rated fire barrier." SCE&G requests acceptance of the deviation noted.

Description of Fire Area IB-11

Fire Area IB-11 is the service water booster pump area cooling unit room 'B'. This fire area is located on a partial floor at elevation 426'-0" in the south central portion of the Intermediate Building, above the HVAC water chiller equipment rooms 'B' and 'C'. This fire area contains mostly 'B' train equipment and cabling which includes cabling for the emergency feedwater flow control valve IFV-3541-EF and the pressurizer power operated relief valve (PORV) IPV-0444B-RC. 'A' train power cable for component cooling pump XPP-1A-CC is also located in this area. Separation between the 'B' train cabling in this fire area and the 'A' train cabling needed for safe shutdown consists of a fire rated protective enclosure. This cable is located in conduit XX-3116A and is protected by Fire

Table 2
Triple Wrap Deviations
VC Summer Nuclear Station

Barrier Item Number 41-TW which provides a fire rated barrier for "Appendix R Required Protection" for circuit CCM16A and runs from the fire rated east wall (TR-277) to the fire rated ceiling in this fire area. There are other conduits and cables included within the wrap that are NOT Appendix 'R'

Combustibles associated with permanent plant equipment located within Fire Area IB-11 consist of cable insulation. The total combustible content of Fire Area IB-11 results in a fire loading of 19,963 Btus/sq. ft. Fire detection equipment for this fire area consists of a smoke detection system, while the fire suppression equipment consists of portable fire extinguishers and interior manual hose stations.

TEST COMPARISON:

Kaowool Triple Wrap (41-TW) is 4' long and encloses two conduits. The 1-1/2" and 1-1/4" conduits are both surface mounted in Fire Zone IB-11 with a thermal mass of 7.8 lbs/ft. These items are similar to the Omega Point Test Labs Item #2 (Wall/Ceiling Mounted 1-1/4" and 4" Conduit) which had a thermal mass of 337.7 pounds (16.9 lbs/ft) (inside furnace) and reached a temperature of 198°F in 60 minutes. There was a 1-1/2' cable air drop, associated with triple wrap (41-TW), that was protected by surrounding the existing cables (CCM16A and BIJ46XA) with three spare cables (EK-A1E), for thermal mass only, inside an additional two layers of 1" Kaowool triple wrap for the 1-1/2' distance between the end of the conduit and the penetration. This cable air drop now has a thermal mass of 21.9 pounds (14.6 lbs/ft), which is larger than the Omega Point Test Labs Item #10 (Air Drop of Single Cable) that had a thermal mass of 5.4 pounds (0.3 lbs/ft) (inside furnace) and reached a temperature of 312°F in 34 minutes. The GL 86-10, Supplement 1 allows a temperature of 250°F above ambient (67°F) for an allowable temperature of 317°F. Program simulation with Thermal Ceramics of a five layer wrap of 1" Kaowool, under an ASTM E-119 test curve, shows a maximum temperature of 233°F in 60 minutes. Therefore, this equates to an available air drop margin of 84°F or 60 minutes. The interpolated available comparison would indicate that 41-TW would reach a temperature of 260°F in 52 minutes. This equates to an available margin of 57°F or 7 minutes.

JUSTIFICATION/MODIFICATION:

Evaluation of Fire Area IB-11

Fire Area IB-11 has a low fire load equivalent to an estimated fire duration of less than 20 minutes. This overall fire loading is significantly less than the designed fire resistance rating of the subject barrier. A postulated fire in this area is not expected to develop to a magnitude or duration, which would jeopardize the noted electrical raceway fire barrier enclosure. In addition, the existing fire detection system would provide for early detection of a fire and allow for prompt suppression. The existing barrier therefore provides a level of protection consistent with the hazards identified and provides a high level of assurance that at least one train of safe shutdown equipment will remain free of fire damage. Also, a review of the IPEEE Internal Fire evaluation calculation indicates a core damage frequency (CDF) of 3.73E-08 for this area. Based on the low CDF calculated during the screening phase of the IPEEE Internal Fire Evaluation, additional detailed analysis or fire modeling was not performed as part of the IPEEE.

Table 2
Triple Wrap Deviations
VC Summer Nuclear Station

Conduits XX3116A and another (CCE21A not required for Appendix R) contain cables that are "Required for Appendix 'R'". SCE&G performed a full-scale fire test at Omega Point Test Labs in December 1999. The conclusion reached is that all cable in surface mounted configurations has been shown to remain functional when subjected to an ASTM E-119 fire test for at least 60 minutes. The 1-1/2' cable air drop associated with triple wrap (41-TW) was protected by surrounding the existing cables (CCM16A and BIJ46XA) with three spare cables (EK-A1E), for thermal mass only, inside an additional two layers of 1" Kaowool triple wrap for the 1-1/2' distance between the end of the conduit and the penetration. This cable air drop now has a thermal mass of 21.9 pounds (14.6 lbs/ft), which is larger than the Omega Point Test Labs Item #10 (Air Drop of Single Cable) that had a thermal mass of 5.4 pounds (0.3 lbs/ft) (inside furnace) and reached a temperature of 312°F in 34 minutes. Trapped air, in spaces between the layers, act as an insulator. The consequences of a joint failure are also lessened because of the multiple joints and staggering. Because the cables do not meet the criteria of Section III.G.2.c, not a "one hour rated fire barrier," and no automatic fire suppression system in the vicinity, VCS will provide additional triple wrap around the supports and ceiling silicone foam/pressure penetration seals to eliminate thermal shorts and protect the cable at the penetration seal. Flamemastic has been added in some areas for physical protection. The cable is routed in, and supported by triple wrap rigid steel conduits as discussed in the cover letter.

A walkdown of the area showed that there are three exposed cable trays (1025, 2058 and 3128) at the ceiling and running westward. If we assume the trays have twenty-five 'A3J' power cables, we then have 10.8 pounds of insulation. This cable load could impact the area under the wrap (3' x 3') and would provide a fire severity of 10 minutes for this area under the wrap. All cabling near the wrap are in conduits. The total room fire severity is 15 minutes.

SUMMARY:

The cables in 41-TW conduits are "Required for Appendix R" and have a fire loading less than the tested configuration. A revision to the deviation for 45 minutes is requested from the requirements of separation and no suppression in the area for Section III.G.2.c of Appendix R to 10CFR50. The existing plant licensing basis in this area involved a deviation that is mentioned in the cover letter. SCE&G requests acceptance of the deviation noted.

The Kaowool triple wrap over the conduits associated with 41-TW that are "Required for Appendix 'R'" cables in fire zone IB-11; in conjunction with the existing fire protection features, additional triple wrap over the exposed thermal shorts and the silicone foam/pressure penetration seal, provide an equivalent 52 minutes level of protection to that required by Section III.G.2.c of Appendix R to 10CFR50, and an equivalent 60-minute level of protection with the additional two wraps over the air drop cable for 41-TW.

Table 2
Triple Wrap Deviations
VC Summer Nuclear Station

<u>Fire Barrier Item Number 42-TW</u>	[E-215-131 (J-10)]	
Appendix R Regulatory Requirement	Req'd for Appendix 'R'	Req'd for "C" Train
FPER Section	4.4.23.2.2	4.4.23.4.2
Kaowool Configuration (Air Drop)	1.50"/1.00" Conduits (XX-3115B and CCM44B)	
Circuit(s) Protected	CCM26B, BIJ56XB and CCM44B	
Function(s) Protected	CCM26B and BIJ56XB are the power and control cables for the 'B' Component Cooling Pump CCM44B is the control cable for the RB Spray Pump	
Physical Protection	Flamemastic	
Ceiling/Wall/Floor Pen Seal Material	[Barrier #293 (EIB1157/TR-IB276)] West Wall Grout [Barrier #982 (EIB2129/TR-IB511)] Ceiling Foam/Pressure Seal	
Approximate length involved	6'	
Building	Intermediate Building	
Elevation	426'	
Room Number(s)	26-02	
Fire Area/Zone	IB-23.2	
Fire Loading in Btu/SqFt	11,924 (9 minutes)	
Automatic Fire Detection	Yes	
Automatic Fire Suppression	NO	
IPEEE (January 1999) CDF	1.44E-06	
<u>Fire Barrier Item Number 44-TW</u>	[E-215-131 (J-10)]	
Appendix R Regulatory Requirement	Required for Appendix 'R'	
FPER Section	4.4.23.2.2	
Kaowool Configuration	2.50" Conduit (VUL34B)	
Circuit(s) Protected	VUL34B	
Function(s) Protected	VUL34B is the power cable for the 'B' Chilled Water Pump	
Physical Protection	Flamemastic	
Ceiling/Wall/Floor Pen Seal Material	[Barrier #968 (EIB1144/TR-IB99)] Floor Grout [Barrier #293 (EIB1143/TR-IB274)] West Wall Grout	
Approximate length involved	5'	
Building	Intermediate Building	
Elevation	426'	
Room Number(s)	26-02	
Fire Area/Zone	IB-23.2	
Fire Loading in Btu/SqFt	11,924 (9 minutes)	
Automatic Fire Detection	Yes	
Automatic Fire Suppression	NO	
IPEEE (January 1999) CDF	1.44E-06	

Table 2
Triple Wrap Deviations
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<u>Fire Barrier Item Number 45-TW</u>	[E-215-131 (J-10)]
Appendix R Regulatory Requirement	Required for "C" Train
FPER Section	4.4.23.4.2
Kaowool Configuration (Air Drop)	4" x 6" Tray (1034C)
Circuit(s) Protected	CCM38C and CCM39C
Function(s) Protected	CCM38C & 39C are the power cables for 'C' CC pump Speed (High/Low) Control for 'C'-Comp Cool Pump
Physical Protection	Flamemastic
Ceiling/Wall/Floor Pen Seal Material	[Barrier #291 (EIB1138/TR-IB282)] North Wall Foam
Approximate length involved	28'
Building	Intermediate Building
Elevation	426'
Room Number(s)	26-02
Fire Area/Zone	IB-23.2
Fire Loading in Btu/SqFt	11,924 (9 minutes)
Automatic Fire Detection	Yes
Automatic Fire Suppression	NO
IPEEE (January 1999) CDF	1.44E-06

LICENSING BASIS FOR REQUEST:

For these cables in conduits and/or trays, a revision to an existing deviation for 45 minutes is requested from the requirements of separation and no suppression in the area for Section III.G.2.c of Appendix R to 10CFR50. The existing plant licensing basis in this area involved a deviation that was granted in SER Supplement 3 and affirmed in License Amendment 17 to require only certain areas of the station to have the required suppression. The deviation was granted with the stipulation that "in the remaining areas, the potential effects of a fire on safety related equipment have been reduced by encasing one redundant division in a 1-1/2 hour rated fire barrier." SCE&G requests acceptance of the deviations noted.

Description of Fire Area IB-23

Fire Area IB-23 consists of 3 fire zones located at elevations 412'-0" (IB-23.1), 426'-0" (IB-23.2), and 436'-0" (IB-23.3). Fire Zone IB-23.2 is the service water booster pump area cooling unit room 'A'. This fire area is located on a partial floor at elevation 426'-0" in the south central portion of the Intermediate Building, above HVAC water chiller equipment room "A" and chilled water pump rooms.

The IB-23.2 zone has a floor area of 726 square feet and has a ceiling height of 8 feet. Walls surrounding this fire zone are of reinforced concrete and provide a 3-hour rated fire barrier. The floor and ceiling are of reinforced concrete and are penetrated by a ladder opening with a non-rated steam tight hatch located in the southeast corner. The bulk of combustibles (86%) come from cable tray fire loading, with the remaining 15% attributed to transient combustibles. The 45-TW runs north

Table 2
Triple Wrap Deviations
VC Summer Nuclear Station

to south near the west wall ceiling. The exposed cable combustibles (~1 minute fire severity) are located on the opposite end of the room at the east wall running north to south.

This fire area contains mostly 'A' train systems. 'B' train cables CCM26B (for component cooling pump XPP-1B-CC) and VUL34B (for chilled water pump XPP-48B-VU) are also located in Fire Zone IB-23.2. Separation between the 'B' train cabling in this fire area and the 'A' train cabling needed for safe shutdown consists of a fire rated protective enclosure. Cable CCM26B is located in conduit XX-3115B and is protected by Fire Barrier Item Number 42-TW that provides a fire rated barrier for "Appendix R Required Protection". Cable CCM44B is required for " 'C' Train Operability" and is located in conduit and is also protected by Fire Barrier Item Number 42-TW which runs from the fire rated west wall (TR-276) of Room 26-02 to the ceiling.

Cable VUL34B is located in conduit and protected by Fire Barrier Item Number 44-TW which provides a fire rated barrier for "Appendix R Required Protection". Cable VUL34B is wrapped by Item 44-TW and runs from the fire rated floor (TR-99) to the fire rated west wall in this fire zone. Fire Zone IB-23.2 contains 'C' train and optional equipment power and control cables for alignment to 'A' train systems. Fire Zone IB-23.2 also contains 'C' train and optional equipment power and control cables for alignment to 'A' train systems. Cables CCM38C and CCM39C to XPP-1C-CC, Component cooling water pump 'C' are located in Cable Tray 1034C and are protected by Fire Barrier Item Number 45-TW. This barrier provides a fire rated barrier for protection of " 'C' Train Operability" for these circuits and runs the entire length of tray 1034C.

Combustibles associated with permanent plant equipment located within Fire Zone IB-23.2 consist of cable insulation and electrical equipment. The total combustible content of Fire Zone IB-23.2 results in a fire loading of 11,924 Btus/sq. ft. Fire detection equipment for this fire area consists of a smoke detection system while the fire suppression equipment consists of portable fire extinguishers and interior manual hose stations.

TEST COMPARISON:

Kaowool Triple Wrap (42-TW) is 6' long and encloses two conduits. The 1-1/2" (XX3115B) and 1" (CCM44B) conduits are both suspended in open air with a total thermal mass of 28.3 pounds (5.4 lbs/ft) in Fire Zone IB-23.2. These items have twice the thermal mass than the Omega Point Test Labs Item #4 (Open Air 1" Conduit) which had a thermal mass of 30.3pounds (1.9 lbs/ft) (inside furnace) and reached a temperature of 300°F in 47 minutes. However, this item had a smaller thermal mass than the Omega Point Test Labs Item #1 (Open Air 4" Conduit) which had a thermal mass of 329.8 pounds (16.5 lbs/ft) (inside furnace) and reached a temperature of 198°F in 60 minutes. There is a 1-1/2' cable air drop associated with triple wrap (42-TW), and was protected by surrounded the existing cables (CCM26B, BIJ46XB, and CCM44B) with three spare cables (EK-A1E), for thermal mass only, inside an additional two layers of 1" Kaowool for the 1-1/2' distance between the ends of the conduits and the penetration. This cable air drop now has a thermal mass of 21.6 pounds (14.4 lbs/ft), that is larger than the Omega Point Test Labs Item #10 (Air Drop of Single Cable) which had a thermal mass of 5.4 pounds (0.3 lbs/ft) (inside furnace) and reached a temperature of 312°F in 34 minutes. The GL 86-10, Supplement 1 allows a temperature of 250°F above ambient (67°F) for an allowable temperature of 317°F. Program simulation with Thermal

Table 2
Triple Wrap Deviations
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Ceramics of a five layer wrap of 1" Kaowool, under an ASTM E-119 test curve, shows a maximum temperature of 233°F in 60 minutes. Therefore, this equates to an available air drop margin of 84°F or 60 minutes. The interpolated available comparison would indicate that 42-TW would reach a temperature of 276°F in 50 minutes. This equates to an available margin of 41°F or 5 minutes.

Kaowool Triple Wrap (44-TW) is 5' long and encloses one 2-1/2" (VUL34B) conduit that is surface mounted in Fire Zone IB-23.2 with a thermal mass of 7.3 lbs/ft. This item is similar to the Omega Point Test Labs Item #2 (Wall/Ceiling Mounted 1-1/4" and 4" Conduit) which had a thermal mass of 337.7 pounds (16.9 lbs/ft) (inside furnace) and reached a temperature of 198°F in 60 minutes. The GL 86-10, Supplement 1 allows a temperature of 250°F above ambient (67°F) for an allowable temperature of 317°F. The interpolated available comparison would indicate that 44-TW would reach a temperature of 265°F in 52 minutes. This equates to an available margin of 52°F or 7 minutes.

Kaowool Triple Wrap (45-TW) is 28' long and encloses one 4" x 6" tray (1034C) that is suspended in open air and has a total thermal mass of 452.1 pounds (16.1 lbs/ft) in Fire Zone IB-23.2. This item has a slightly smaller thermal mass than the Omega Point Test Labs Item #3 (6" x 6" Open Air Tray) which had a thermal mass of 324.4 pounds (16.2 lbs/ft) (inside furnace) and reached a temperature of 311°F in 48 minutes. However, this item had a smaller thermal mass than the Omega Point Test Labs Item #5 (6" x 36" Open Air tray) which had a thermal mass of 669.9 pounds (33.5 lbs/ft) (inside furnace) and reached a temperature of 316°F in 60 minutes. There is a 1-1/2' cable air drop associated with triple wrap (45-TW) and was protected by surrounding the existing cables (CCM38C and CCM39C) with three spare cables (EK-A1E), for thermal mass only, inside an additional two layers of 1" Kaowool for the 1-1/2' distance between the end of the tray and the penetration. This cable air drop now has a thermal mass of 34.3 pounds (22.9 lbs/ft), which is 76 times larger than the Omega Point Test Labs Item #10 (Air Drop of Single Cable) which had a thermal mass of 5.4 pounds (0.3 lbs/ft) (inside furnace) and reached a temperature of 312°F in 34 minutes. The GL 86-10, Supplement 1 allows a temperature of 250°F above ambient (67°F) for an allowable temperature of 317°F. Program simulation with Thermal Ceramics of a five layer wrap of 1" Kaowool, under an ASTM E-119 test curve, shows a maximum temperature of 233°F in 60 minutes.

The interpolated available comparison would indicate that the tray inside 45-TW would reach a temperature of 314°F in 54 minutes. This equates to an available margin of 3°F or 6 minutes, and the air drop cable(s), with the additional two 1" layers of Kaowool, would reach a temperature of 233°F in 60 minutes. This equates to an available air drop margin of 84°F or 60 minutes.

Table 2
Triple Wrap Deviations
VC Summer Nuclear Station

JUSTIFICATION/MODIFICATION:

Evaluation of Fire Area IB-23

Fire Zone IB-23.2 has a negligible fire load equivalent to an estimated fire duration of less than 10 minutes. This overall fire loading is significantly less than the designed fire resistance rating of the subject barrier. A postulated fire in this area is not expected to develop to a magnitude or duration, which would jeopardize the noted electrical raceway fire barrier enclosures.

During the FIVE analysis, this zone looked at a possible 5 gallon lube oil spill with an estimated heat release rate of 29,700 Btu's covering a 2 foot wide x 10 foot long area. The temperature rise predicted in the plume at an elevation 4 feet above the fire was 1600°F. The critical temperature rise at the protected covered tray was 580°F. The radiant heat flux was 9 Btu/ft², while the convective heat flux was 23 Btu/ft². As a result, this zone screened out and no further fire modeling was done.

In addition, the existing fire detection system would provide for early detection of a fire and allow for prompt suppression. The existing barrier therefore provide a level of protection consistent with the hazards identified and provides a high level of assurance that at least one train of safe shutdown equipment will remain free of fire damage. Also, a review of the IPEEE Internal Fire evaluation calculation indicates a core damage frequency (CDF) of 1.44E-06 for this zone. Based on the low CDF calculated during the screening phase of the IPEEE Internal Fire Evaluation, additional detailed analysis or fire modeling was not performed as part of the IPEEE.

Conduits XX3115B and CCM44B contain cables that are "Required for Appendix 'R'" and "Required for 'C'-Train Operability". Conduit VUL34B contains a cable that is "Required for Appendix 'R'". Tray 1034C contains cables that are "Required for 'C'-Train Operability".

SCE&G performed a full-scale fire test at Omega Point Test Labs in December 1999. The conclusion reached is that all cable in surface mounted configurations, larger conduit in open air, and larger thermal mass trays in open air has been shown to remain functional when subjected to an ASTM E-119 fire test for at least 60 minutes.

The 1-1/2' cable air drops associated with triple wraps [(42-TW) and (45-TW)] are now protected by enclosing the cables [(CCM26B, BIJ46XB, and CCM44B) and (CCM38C and CCM39C)] inside an additional two layers of 1" Kaowool for the approximate 1-1/2' distance between the ends of the conduits, tray and the penetrations.

The 42-TW enclosure cable air drop has three spare cables (EK-A1E), for thermal mass only, surrounding the existing cables for a total thermal mass of 21.6 pounds (14.4 lbs/ft), which is larger than the Omega Point Test Labs Item #10 (Air Drop of Single Cable). A walkdown of the area showed this wrap to be surrounded by other triple wraps. Exposed cabling is located near the east wall ~ 22' away. Most of the cabling is in conduit. This room has a fire severity of 9 minutes.

Table 2
Triple Wrap Deviations
VC Summer Nuclear Station

The 44-TW enclosure is ~ 5' long, encloses one 2-1/2" conduit, and is surface mounted to the west wall. A walkdown of the area showed that exposed cabling is located near the opposite east wall ~ 28' away. Most of the cabling is in conduit. This room has a fire severity of 9 minutes.

The 45-TW enclosure air drop, also, has three spare cables (EK-A1E), for thermal mass only, surrounding the existing cables for a thermal mass of 34.3 pounds (22.9 lbs/ft), which is seventeen times larger than the Omega Point Test Labs Item #10 (Air Drop of Single Cable) that had a thermal mass of 5.4 pounds (0.3 lbs/ft) (inside furnace) and reached a temperature of 312°F in 34 minutes. Trapped air, in spaces between the layers, act as an insulator. The consequences of a joint failure are also lessened because of the multiple joints and staggering. A walkdown of the area showed this wrap to be surrounded by other triple wraps. Exposed cabling is located near the east wall ~ 22' away. Most of the cabling is in conduit. This room has a fire severity of 9 minutes.

Because the cables do not meet the criteria of Section III.G.2.c, no "one hour rated fire barrier" and no automatic fire suppression system in the vicinity, VCS will provide additional triple wrap around the supports and silicone foam/pressure penetration seals to eliminate thermal shorts and protect the cable at the penetration seal. Flamemastic has been added in some areas for physical protection. The cable is routed in, and supported by triple wrap rigid steel conduits and a tray as discussed in the cover letter.

SUMMARY:

Some of the cables in 42-TW conduits are "Required for Appendix R" and some, NOT 'A' or 'B' Train related, have a fire loading less than the tested configuration. Because VC Summer treats the swing train components as a backup of Appendix R, a revision to the deviation for 45 minutes is requested from the requirements of separation in the area for Section III.G.2.c of Appendix R to 10CFR50. The existing plant licensing basis in this area involved a deviation that is mentioned in the cover letter. SCE&G requests acceptance of the deviation noted.

The cable in 44-TW conduit is "Required for Appendix R" and has a fire loading less than the tested configuration. A revision to the deviation for 45 minutes is requested from the requirements of separation in the area for Section III.G.2.c of Appendix R to 10CFR50. The existing plant licensing basis in this area involved a deviation that is mentioned in the cover letter. SCE&G requests acceptance of the deviation noted.

Tray 1034C in 45-TW contains cables that are "Required for 'C'-Train Operability". The cables in this tray are NOT 'A' or 'B' Train related and the fire loading is less than the tested configuration. Because VC Summer treats the swing train components as a backup of Appendix R, a revision to the existing deviation for 45 minutes is requested from the requirements of separation and no suppression in the area for Section III.G.2.c of Appendix R to 10CFR50. The existing plant licensing basis in this area involved a deviation that is mentioned in the cover letter. SCE&G requests acceptance of the deviation noted.

The use of Kaowool triple wrap over the conduits associated with 42-TW that are "Required for Appendix 'R'" and/or "Required for 'C'-Train Operability" cables in Fire Zone IB-23.2; in conjunction with the existing fire protection features, additional triple wrap over the exposed thermal shorts and

Table 2
Triple Wrap Deviations
VC Summer Nuclear Station

silicone foam/pressure penetration seal, provides an equivalent 50 minutes level of protection to that required by Section III.G.2.c of Appendix R to 10CFR50, **and** an equivalent 60-minute level of protection with the additional two wraps over the air drop cable for 42-TW.

The use of Kaowool triple wrap over the conduit associated with 44-TW that is "Required for 'C'-Train Operability" cables in Fire Zone IB-23.2; in conjunction with the existing fire protection features, additional triple wrap over the exposed thermal shorts and silicone foam/pressure penetration seal, provides an equivalent 52 minutes level of protection to that required by Section III.G.2.c of Appendix R to 10CFR50.

Additionally, the use of Kaowool triple wrap over the tray associated with 45-TW that is "Required for 'C'-Train Operability" in Fire Zone IB-23.2; in conjunction with the existing fire protection features, additional triple wrap over the exposed thermal shorts and silicone foam penetration seal, provide an equivalent 54 minutes level of protection to that required by Section III.G.2.c of Appendix R to 10CFR50, **and** an equivalent 60-minute level of protection with the additional two wraps over the air drop cable for 45-TW.

Table 2
Triple Wrap Deviations
VC Summer Nuclear Station

<u>Fire Barrier Item Number 47-TW</u>	[E-215-133 (G-11) and E-215-137 (C-14)]
Appendix R Regulatory Requirement	Required for Appendix 'R'
FPER Section	4.4.14.2.2
Kaowool Configuration	2.00" Conduit (XX-3702B) Pull Box (PB-CR9)
Circuit(s) Protected	VLC124B and CRE3B
Function(s) Protected	VLC124B is the power cable for 'B' Switchgear Room Cooling Fan Speed Switch CRE3B Reactor Trip Switchgear
Physical Protection	Flamemastic
Ceiling/Wall/Floor Pen Seal Material	[Barrier #976 (EIB2274/TR-IB482)] Floor Foam/Pressure Seal (EIB3112/TR-IB826)
Approximate length involved	54'
Building	Intermediate Building
Elevation	436'
Room Number(s)	36-03A
Fire Area/Zone	IB-14
Fire Loading in Btu/SqFt	67,819 (51 minutes)
Automatic Fire Detection	Yes
Automatic Fire Suppression	NO
IPEEE (January 1999) CDF	1.60E-07

LICENSING BASIS FOR REQUEST:

For these cables in conduits, a revision to an existing deviation for 60 minutes is requested from the requirements of separation and no suppression in the area for Section III.G.2.c of Appendix R to 10CFR50. The existing plant licensing basis in this area involved a deviation that was granted in SER Supplement 3 and affirmed in License Amendment 17 to require only certain areas of the station to have the required suppression. The deviation was granted with the stipulation that "in the remaining areas, the potential effects of a fire on safety related equipment have been reduced by encasing one redundant division in a 1-1/2 hour rated fire barrier." SCE&G requests acceptance of the deviation noted.

Description of Fire Area IB-14

Fire Area IB-14 is the control room evacuation panel room 'A' and is located at elevation 436'-0" in the south central portion of the Intermediate Building. This fire area contains mostly 'A' train systems including cabling for the pressurizer PORV (IPV-0445A-RC) and letdown line isolation valves ILV-0459-CS and ILV-0460-CS. "B" train power cable VLC124B to XFN-106B-VL, CREP "B" speed switch switchgear room cooling fan is also located in this area. Separation between the 'A' train cabling, in this fire area, and the 'B' train cabling needed for safe shutdown consists of a fire rated protective enclosure. Cable VLC124B is located in conduit XX-3702B and is protected by Fire Barrier Item Number 47-TW which provides a fire rated barrier for "Appendix R Required Protection" for this circuit. This barrier runs from the fire rated floor (TR-482) up the north wall to the fire rated

Table 2
Triple Wrap Deviations
VC Summer Nuclear Station

east wall of Room 36-03A above the partial floor slab at elevation 451'-0" in this fire area, through trace (IB826) above HVAC duct.

Combustibles associated with permanent plant equipment located within Fire Area IB-14 consist of cable insulation and electrical equipment located in panels and cabinets. The total combustible content of Fire Area IB-14 results in a fire loading of 67,819 Btus/sq. ft. Fire detection equipment in Fire Area IB-14 consists of a smoke detection system, while the fire suppression equipment consists of portable fire extinguishers and interior manual hose stations.

TEST COMPARISON:

Kaowool Triple Wrap (47-TW) is 54' long and encloses one 2" conduit that is both surface mounted and suspended in open air (11') with a total thermal mass of 236.2 pounds (21.5 lbs/ft) in Fire Zone IB-14. This item is similar to the Omega Point Test Labs: Item #1 (Open Air 4" Conduit) and Item #2 (Wall/Ceiling Mounted 1-1/4" and 4" Conduit) which had thermal masses of 329.8 pounds (16.5 lbs/ft) (inside furnace) and 337.7 pounds (16.9 lbs/ft) (inside furnace), and reached temperatures of 308°F and 198°F, respectively, in 60 minutes. The GL 86-10, Supplement 1 allows a temperature of 250°F above ambient (67°F) for an allowable temperature of 317°F. The extrapolated available comparison would indicate that 47-TW would reach a temperature of 253°F in 60 minutes. This equates to an available margin of 64°F or 70 minutes.

JUSTIFICATION/MODIFICATION:

Evaluation of Fire Area IB-14

Fire Area IB-14 has a low fire load equivalent to an estimated fire duration of less than 52 minutes. This overall fire loading is slightly more than the designed fire resistance rating of the subject barrier. A postulated fire in this area is not expected to develop to a magnitude or duration, which would jeopardize the noted electrical raceway fire barrier enclosure. In addition, the existing fire detection system would provide for early detection of a fire and allow for prompt suppression. The existing barrier therefore provides a level of protection consistent with the hazards identified and provides a high level of assurance that at least one train of safe shutdown equipment will remain free of fire damage. Also, a review of the IPEEE Internal Fire evaluation calculation indicates a core damage frequency (CDF) of 1.60E-07 for this area. Based on the low CDF calculated during the screening phase of the IPEEE Internal Fire Evaluation, additional detailed analysis or fire modeling was not performed for this area as part of the IPEEE.

Conduit XX3702B contains cables that are "Required for Appendix 'R'". SCE&G performed a full-scale fire test at Omega Point Test Labs in December 1999. The conclusion reached is that all cable in surface mounted configurations and larger thermal mass conduits in open air has been shown to remain functional when subjected to an ASTM E-119 fire test for at least 60 minutes. Because the cables do not meet the criteria of Section III.G.2.c, no "one hour rated fire barrier" and no automatic fire suppression system in the vicinity, VCS will provide additional triple wrap around the supports and silicone foam/pressure penetration seals to eliminate thermal shorts and protect the cable at the penetration seal. Flamemastic has been added in some areas for physical

Table 2
Triple Wrap Deviations
VC Summer Nuclear Station

protection. The cable is routed in, and supported by, a triple wrap rigid steel conduit as discussed in the cover letter.

A walkdown of the area showed that there are three exposed cable trays (3093, 3094 and 4213) located ~ 8' below the wrap that intersect at right angles. Two trays have power cables and one tray has control cables. If we assume the trays have 38 'A3J' power cables, and 37 'B1G' control cables, we then have 33 pounds of insulation. This cable load could impact the area under the wrap (3' x 3') and would provide a fire severity of 15 minutes for this area under the wrap. There is also a bundle of 15 cables running out of the control tray towards the ceiling next to the wrap. This amounts to 18 pounds of insulation and would provide a fire severity is 17 minutes.

SUMMARY:

The cables in 47-TW conduit is "Required for Appendix R" and has a fire loading less than the tested configuration. A revision to the deviation for 60 minutes is requested from the requirements of separation and no suppression in the area for Section III.G.2.c of Appendix R to 10CFR50. The existing plant licensing in this area involved a deviation that is mentioned in the cover letter. SCE&G requests acceptance of the deviation noted.

The use of Kaowool triple wrap over the conduit associated with 47-TW that is "Required for Appendix 'R'" in fire zone IB-14; in conjunction with the existing fire protection features, additional triple wrap over the exposed thermal shorts and the silicone foam/pressure penetration seal, provides an equivalent 60 minutes level of protection to that required by Section III.G.2.c of Appendix R to 10CFR50.

**Table 2
Triple Wrap Deviations
VC Summer Nuclear Station**

<u>Fire Barrier Item Number 50-TW</u>	(E-215-133 (D-15))
Appendix R Regulatory Requirement	Required for Appendix 'R'
FPER Section	4.4.25.2.2
Kaowool Configuration	4.00" Conduit (ESM171B)
Circuit(s) Protected	ESM171B
Function(s) Protected	ESM171B is associated with Unit Sub Feeder Breaker
Physical Protection	Flamemastic
Ceiling/Wall/Floor Pen Seal Material	[Barrier #380 (EIB2214/TR-IB205)] North Wall Foam/Pressure Seal [Barrier #377 (EIB2034/TR-IB478)] West Wall Foam
Approximate length involved	33'
Building	Intermediate Building
Elevation	436'
Room Number(s)	36-01 and 36-02W
Fire Area/Zone	IB-25.6
Fire Loading in Btu/SqFt	25,344 (19 minutes)
Automatic Fire Detection	Yes
Automatic Fire Suppression	NO
IPEEE (January 1999) CDF	5.62E-08

LICENSING BASIS FOR REQUEST:

For these cables in conduits, a revision to an existing deviation for 60 minutes is requested from the requirements of separation and no suppression in the area for Section III.G.2.c of Appendix R to 10CFR50. The existing plant licensing basis in this area involved a deviation that was granted in SER Supplement 3 and affirmed in License Amendment 17 to require only certain areas of the station to have the required suppression. The deviation was granted with the stipulation that "in the remaining areas, the potential effects of a fire on safety related equipment have been reduced by encasing one redundant division in a 1-1/2 hour rated fire barrier." SCE&G requests acceptance of the deviation noted.

Description of Fire Zone IB-25.6

The general floor area in the north central portion of the Intermediate Building is designated as Fire Zone IB-25.6 at elevation 436'-0" and mainly contains 'A' train equipment and cabling, and other equipment and cabling to be used for "A" train shutdown. A protective enclosure is provided around "B" train cabling needed for safe shutdown in this zone. Cable ESM171B from XSW-1DB-ES is located in conduit and is protected by Fire Barrier Item Number 50-TW which provides for "Appendix R Required Protection" and runs from the fire rated south wall of Room 36-02W to the fire rated east wall of this area.

Combustibles associated with permanent plant equipment within Fire Zone IB-25.6 consist of cable insulation and mechanical equipment that results in a fire loading of 25,344 Btus/sq. ft. with fire detection equipment consisting of a smoke detection system that actuates a preaction sprinkler

Table 2
Triple Wrap Deviations
VC Summer Nuclear Station

system for the corridor in the southwest portion of the zone. Additional fire suppression equipment consists of portable fire extinguishers and interior manual hose stations.

TEST COMPARISON:

Kaowool Triple Wrap (50-TW) is 33' long and encloses one 4" conduit that is suspended in open air with a total thermal mass of 542.5 pounds (16.4 lbs/ft) in Fire Zone IB-25.6. This item is similar to the Omega Point Test Labs Item #1 (Open Air 4" Conduit) which had a thermal mass of 329.8 pounds (16.5 lbs/ft) (inside furnace) and reached a temperature of 308°F in 60 minutes. The GL 86-10, Supplement 1 allows a temperature of 250°F above ambient (67°F) for an allowable temperature of 317°F. The interpolated available comparison would indicate that 50-TW would reach a temperature of 308°F in 60 minutes. This equates to an available margin of 9°F.

JUSTIFICATION/MODIFICATION:

Evaluation of Fire Zone IB-25.6

A fire in one general area is not expected to result in damage to equipment and cables in other general areas for the following reasons:

- Detailed analysis was performed for the general area of the Intermediate Building (IB) on the 412' elevation. The area analyzed (IB-25.1) has a floor area of 11,301 square feet and ceilings 22 feet in height. A very large oil fire (a 20 square foot unconfined oil spill with an estimated heat release rate of 7,425 Btu's) was analyzed for the IB space. The temperature rise predicted in the plume at an elevation 21' above the fire was 608°F. Critical levels of radiant heat for the fire analyzed were predicted to occur within a radius of 15'. Therefore, even a very large floor-based exposure fire is not capable of directly affecting equipment and cables on this elevation, since the layout is similar to the 412' elevation. Additionally, the (436' elevation) ceiling to the east and south of the equipment hatch is covered by a preaction sprinkler system.
- The only other means of propagating the effects of a fire to higher elevations is migration of hot gases through unprotected openings. However, the potential for hot gas layer buildup is limited because the ceiling of the 436' elevation is a roof that contains an ~2,040 square foot pressure relief area directly to the east of the equipment hatch. Buoyancy forces will cause hot air to continue to rise throughout the 436' elevation. The rising column of heated air will cool as it rises due to entrainment of cooler air at 436' elevation (IB-25.6.2). At this elevation, the heated column of air will mix with a large volume of cool air. In addition, the IB ventilation system will draw out a portion of the heated air at this elevation, mixing it with cooler air throughout the IB. It is most likely that the combined effect of entrainment of cool air as the column rises and dilution by the ventilation system will limit hot gas layer buildup and keep temperatures at the 436' elevation well below damage thresholds.

Fire Zone IB-25.6 has a low fire load equivalent to an estimated duration of less than 20 minutes. This overall fire loading is significantly less than the designed fire resistance rating of the subject

Table 2
Triple Wrap Deviations
VC Summer Nuclear Station

barrier. A postulated fire in this area is not expected to develop to a magnitude or duration, which would jeopardize the noted electrical raceway fire barrier enclosure.

In addition, the existing area wide fire detection system would provide for early detection and allow for prompt suppression. The existing barrier therefore provides a level of protection consistent with the hazards identified and provides a high level of assurance that at least one train of safe shutdown equipment will remain free of fire damage.

Also a review of the IPEEE Internal Fire evaluation calculation indicates a core damage frequency (CDF) of $5.62E-08$ for this area. Based on the low CDF calculated during the screening phase of the IPEEE Internal Fire Evaluation, additional detailed analysis or fire modeling was not performed as part of the IPEEE.

An automatic preaction suppression system is provided in the vicinity of the equipment hatch within zone IB-25.6.2. Hose stream protection and portable fire extinguishers are available for manual fire suppression in this zone. The fire detection system in conjunction with the suppression system assures rapid extinguishment of a fire in its early stages. Should the automatic suppression system fail to fully extinguish the fire, the detection system assures early response by the plant fire brigade to extinguish the fire manually prior to significant propagation.

Conduit ESM171B contains a cable that is "Required for Appendix 'R'". SCE&G performed a full-scale fire test at Omega Point Test Labs in December 1999. The conclusion reached is that all cable in 4" conduits in open air has been shown to remain functional when subjected to an ASTM E-119 fire test for at least 60 minutes.

Because the cables do not meet the criteria of Section III.G.2.c, not "one hour rated fire barrier" and no automatic fire suppression system in the vicinity, VCS will provide additional triple wrap around the supports and silicone foam/pressure penetration seals to eliminate thermal shorts and protect the cable at the penetration seals. Flamemastic has been added in some areas for physical protection. The cable is routed in, and supported by, a triple wrap rigid steel conduit as discussed in the cover letter.

A walkdown of the area showed that there are two exposed cable trays (4158 & 4159) running vertically (~ 3') next to the wrap. The remainder of the wrap is under conduit. If we assume the trays have 306 'B1G' control cables, we then have 138 pounds of insulation. This cable load could impact the area next to the wrap (3' x 3') and would provide a fire severity of 132 minutes for this area next to the wrap. All other cabling near the wrap are in conduits. The total room fire severity is 19 minutes.

Table 2
Triple Wrap Deviations
VC Summer Nuclear Station

SUMMARY:

The cable in 50-TW conduit is "Required for Appendix R" and has a fire loading less than the tested configuration. A revision to the deviation for 60 minutes is requested from the requirements of separation and no suppression in the area for Section III.G.2.c of Appendix R to 10CFR50. The existing plant licensing in this area involved a deviation that is mentioned in the cover letter. SCE&G requests acceptance of the deviation noted.

The use of Kaowool triple wrap over the conduit associated with 50-TW that is "Required for Appendix 'R'" in fire zone IB-25.6; in conjunction with the existing fire protection features, additional triple wrap over the exposed thermal shorts and the silicone foam/pressure penetration seals, provide an equivalent 60 minutes level of protection to that required by Section III.G.2.c of Appendix R to 10CFR50.

**Table 2
Triple Wrap Deviations
VC Summer Nuclear Station**

<u>Fire Barrier Item Number 51-TW</u>	[E-215-133 (H-16)]
Appendix R Regulatory Requirement	Required for Appendix 'R'
FPER Section	4.4.16.2.2
Kaowool Configuration	1.50" Conduit (VLC44B) Pull Boxes (PB-VL30 and PB-VL31)
Circuit(s) Protected	VLC44B
Function(s) Protected	VLC44B is the power cable for the ESF Switchgear 1DB Cooling Fan
Physical Protection	Flamemastic
Ceiling/Wall/Floor Pen Seal Material	[Barrier #407 (TR-IB681)] North Wall Foam [Barrier #992 (EIB2276/TR-IB298)] Floor Foam
Approximate length involved	64' (Includes Room 51-02 that is not required)
Building	Intermediate Building
Elevation	451'
Room Number(s)	51-01
Fire Area/Zone	IB-16
Fire Loading in Btu/SqFt	11,013 (8 minutes)
Automatic Fire Detection	Yes
Automatic Fire Suppression	NO
IPEEE (January 1999) CDF	4.90E-08

LICENSING BASIS FOR REQUEST:

For these cables in conduits, a revision to an existing deviation for 60 minutes is requested from the requirements of separation and no suppression in the area for Section III.G.2.c of Appendix R to 10CFR50. The existing plant licensing basis in this area involved a deviation that was granted in SER Supplement 3 and affirmed in License Amendment 17 to require only certain areas of the station to have the required suppression. The deviation was granted with the stipulation that "in the remaining areas, the potential effects of a fire on safety related equipment have been reduced by encasing one redundant division in a 1-1/2 hour rated fire barrier." SCE&G requests acceptance of the deviation noted.

Description of Fire Area IB-16

Fire Area IB-16 is the ESF switchgear cooling unit room A located in the southwest corner of the Intermediate Building on a partial floor at elevation 451'-0" below ESF switchgear room 'A' and above ESF switchgear room 'B'. This fire area contains mostly 'A'-train systems. 'B' train power cable VLC44B (for XFN-76-VL, ESF switchgear 1DB cooling fan) is also located in Fire Area IB-16. Separation between the 'A' train equipment and cabling and the 'B' train cabling needed for safe shutdown consists of a fire rated protective enclosure. This cable (VLC44B) is located in conduit and is protected by Fire Barrier Item Number 51-TW which provides a rated barrier for "Appendix R Required Protection" for this circuit and runs from XFN-76-VL, ESF switchgear 1DB cooling fan to the fire rated floor opening (TR-298) in Room 51-01. Combustibles associated with permanent plant equipment located within Fire Area IB-16 consist of cable insulation that results in a fire loading of 11,013 Btus/sq. ft. Fire detection equipment in Fire Area IB-16 consists of a smoke detection

Table 2
Triple Wrap Deviations
VC Summer Nuclear Station

system, while the fire suppression equipment consists of portable fire extinguishers and interior manual hose stations.

TEST COMPARISON:

Kaowool Triple Wrap (51-TW) is 64' long and encloses one 1-1/2" conduit that is both surface mounted and suspended in open air (6') with a total thermal mass of 200.0 pounds (33.3 lbs/ft) in Fire Zone IB-16. This item is similar to the Omega Point Test Labs: Item #1 (Open Air 4" Conduit) and Item #2 (Wall/Ceiling Mounted 1-1/4" and 4" Conduit) which had thermal masses of 329.8 pounds (16.5 lbs/ft) (inside furnace) and 337.7 pounds (16.9 lbs/ft) (inside furnace), and reached temperatures of 308°F and 198°F, respectively, in 60 minutes. The GL 86-10, Supplement 1 allows a temperature of 250°F above ambient (67°F) for an allowable temperature of 317°F. The extrapolated available comparison would indicate that 51-TW would reach a temperature of 183°F in 60 minutes. This equates to an available margin of 134°F or 536 minutes.

JUSTIFICATION/MODIFICATION:

Evaluation of Fire Area IB-16

Fire Area IB-16 has a negligible fire load equivalent to an estimated fire duration of less than 10 minutes. This overall fire loading is significantly less than the designed fire resistance rating of the subject barrier. A postulated fire in this area is not expected to develop to a magnitude or duration, which would jeopardize the noted electrical raceway fire barrier enclosure. In addition, the existing fire detection system would provide for early detection of a fire and allow for prompt suppression. The existing barrier therefore provides a level of protection consistent with the hazards identified and provides a high level of assurance that at least one train of safe shutdown equipment will remain free of fire damage. Also, a review of the IPEEE Internal Fire evaluation calculation indicates a core damage frequency (CDF) of 4.90E-08 for this area. Based on the low CDF calculated during the screening phase of the IPEEE Internal Fire Evaluation, additional detailed analysis or fire modeling was not performed as part of the IPEEE.

Conduit VLC44B contains a cable that is "Required for Appendix 'R'". SCE&G performed a full-scale fire test at Omega Point Test Labs in December 1999. The conclusion reached is that all cable in surface mounted configurations and larger thermal mass conduits in open air has been shown to remain functional when subjected to an ASTM E-119 fire test for at least 60 minutes. Because the cables do not meet the criteria of Section III.G.2.c, no "one hour rated fire barrier" and no automatic fire suppression system in the vicinity, VCS will provide additional triple wrap around the supports and silicone foam penetration seal to eliminate thermal shorts and protect the cable at the penetration seal. Flamemastic has been added in some areas for physical protection. The cable is routed in, and supported by, a triple wrap rigid steel conduit as discussed in the cover letter.

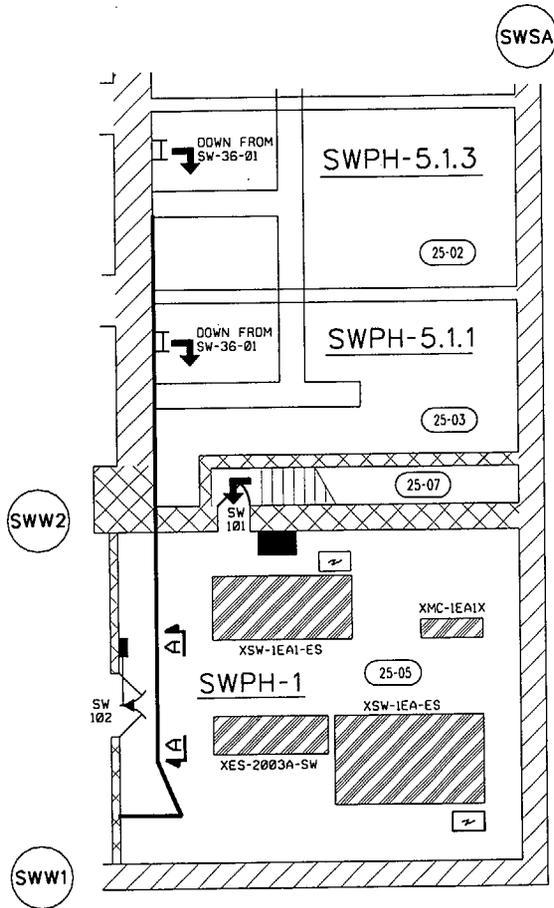
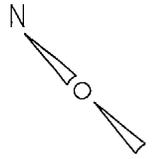
Ninety percent of this wrap is surface mounted with no exposed combustibles near the wrap. The total room fire severity is 8 minutes and is associated with the cabling that is wrapped.

Table 2
Triple Wrap Deviations
VC Summer Nuclear Station

SUMMARY:

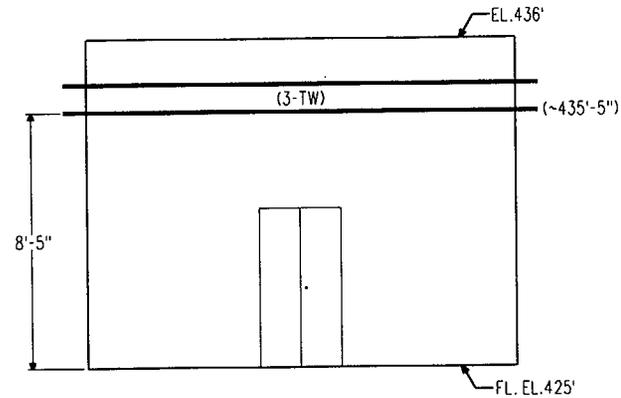
The cable in 51-TW conduit is "Required for Appendix R" and has a fire loading less than the tested configuration. A revision to the deviation for 60 minutes is requested from the requirements of separation and no suppression in the area for Section III.G.2.c of Appendix R to 10CFR50. The existing plant licensing in this area involved a deviation that is mentioned in the cover letter. SCE&G requests acceptance of the deviation noted.

The use of Kaowool triple wrap over the conduit associated with 51-TW that is "Required for Appendix 'R'" in fire zone IB-16, in conjunction with the existing fire protection features; additional triple wrap over the exposed thermal shorts and the silicone foam penetration seal, provides an equivalent 60 minutes level of protection to that required by Section III.G.2.c of Appendix R to 10CFR50.



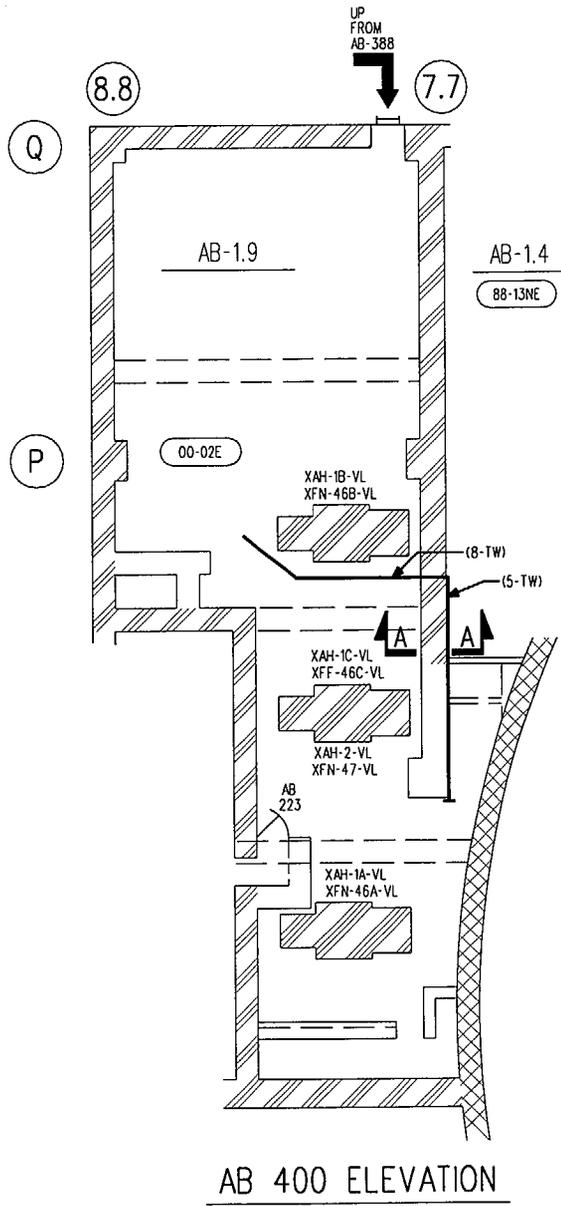
SWPH-425 ELEVATION

- THERE ARE TWO LADDER TRAYS (1061,4613) LOCATED ABOVE THE WRAP IN SWPH-1 & WILL NOT CAUSE DAMAGE DOWNWARD. THE ONLY OTHER COMBUSTIBLES IN THE AREA ARE ASSOCIATED WITH ELECTRICAL COMPONENTS LOCATED WITHIN CABINETS TO THE SOUTH ~9' AND DOWN/OVER ~9½'
- THIS ROOM (SWPH-1) HAS A 23MIN. FIRE SEVERITY

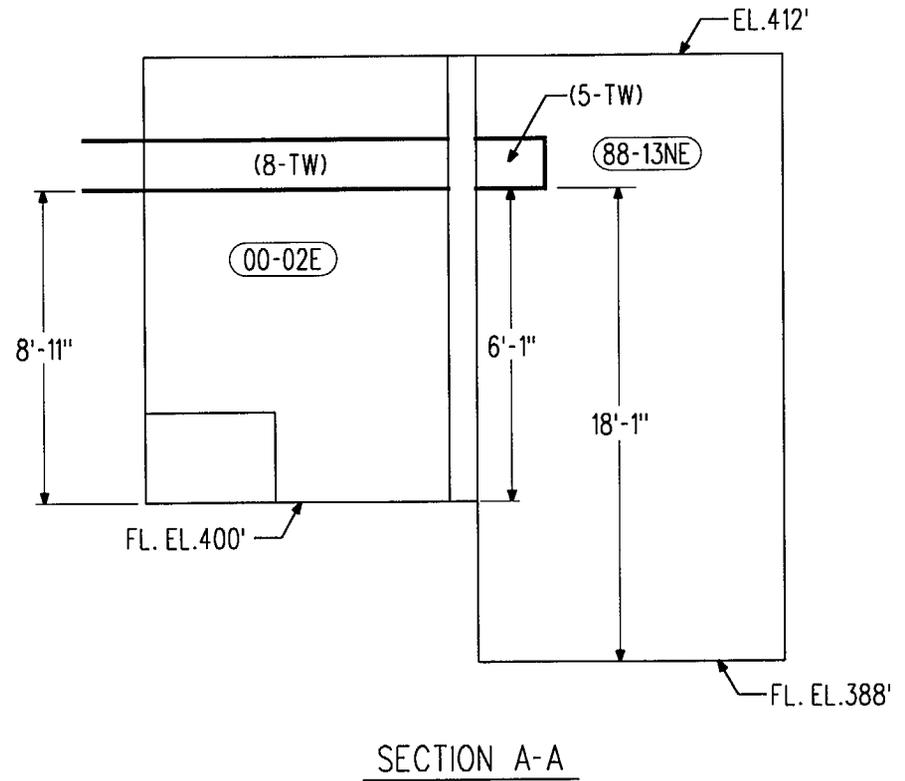


SECTION A-A

V.C. SUMMER NUCLEAR STATION
 TRIPLE WRAP-3
 SWPH 425 ELEVATION
 NO SCALE FPP00076-1

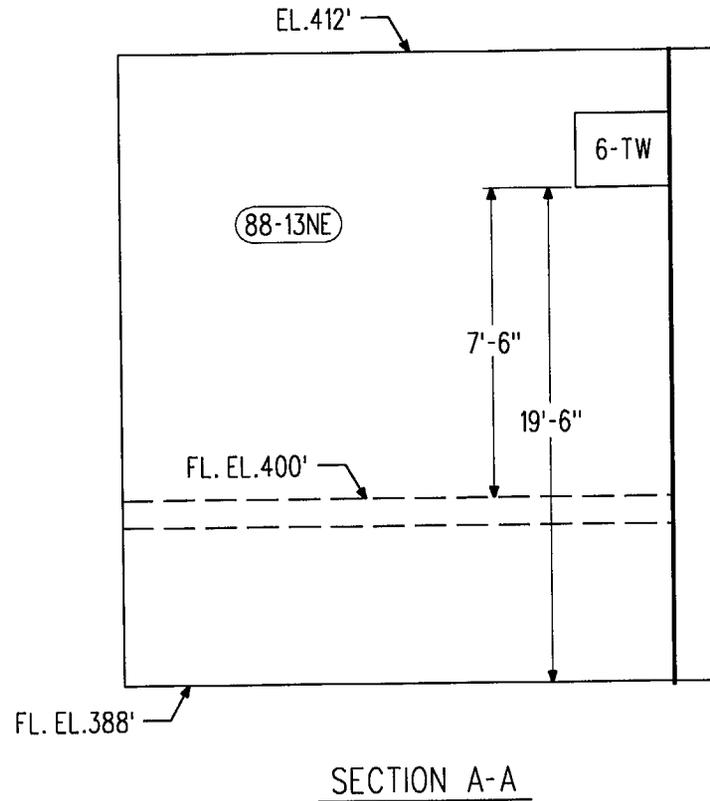
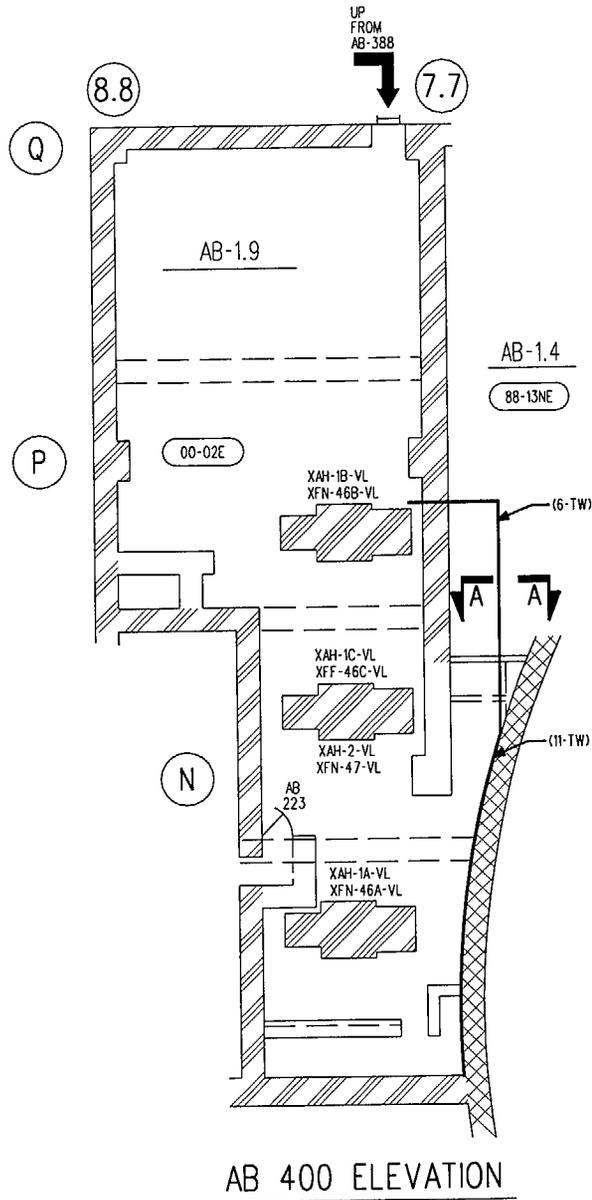


- ALL CABLING IN CONDUITS.
- NO EXPOSED COMBUSTIBLES NEAR THE WRAP.
- THIS AREA HAS A FIRE SEVERITY OF 4 MINUTES.

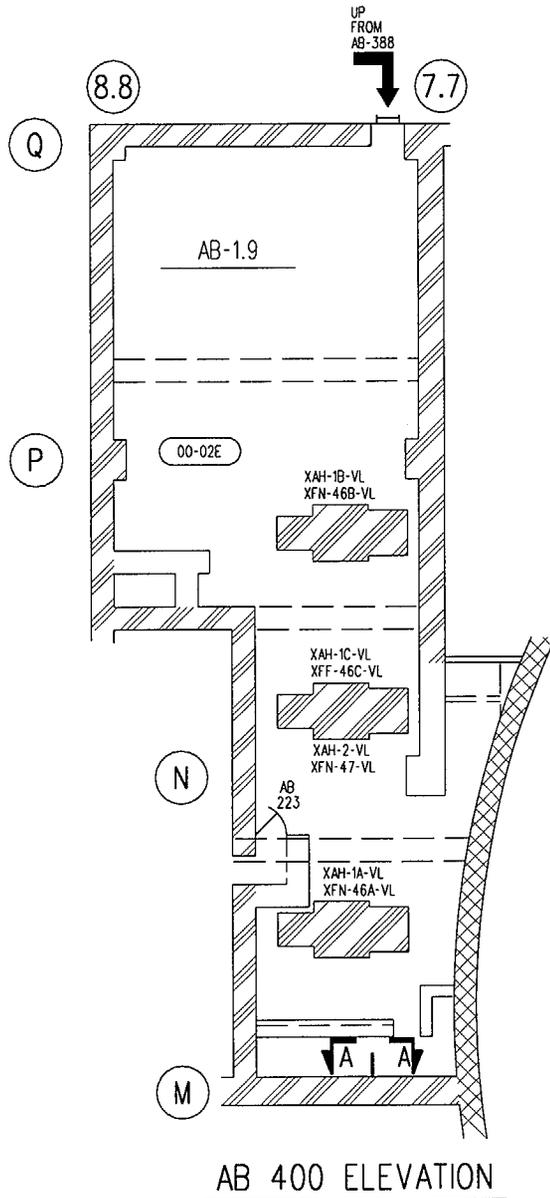


V.C. SUMMER NUCLEAR STATION
 TRIPLE WRAP-5
 AB 400 ELEVATION
 NO SCALE FPP00012-1

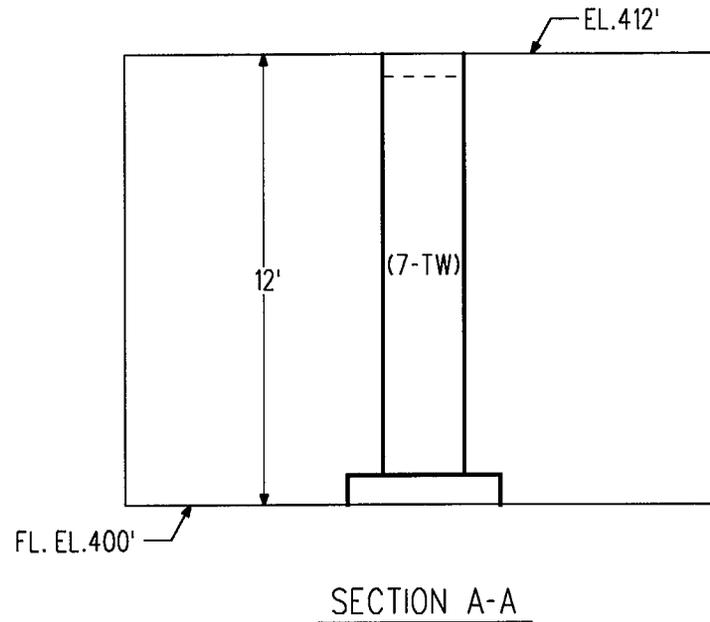
- ALL CABLING IN CONDUITS.
- NO EXPOSED COMBUSTIBLES NEAR THE WRAP.
- THIS AREA HAS A FIRE SEVERITY OF 4 MINUTES.



V.C. SUMMER NUCLEAR STATION
 TRIPLE WRAP-6
 AB 400 ELEVATION
 NO SCALE FPP00012-1

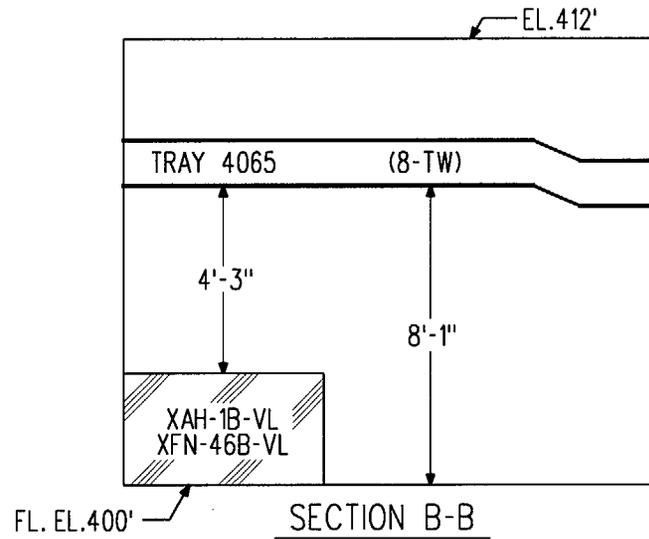
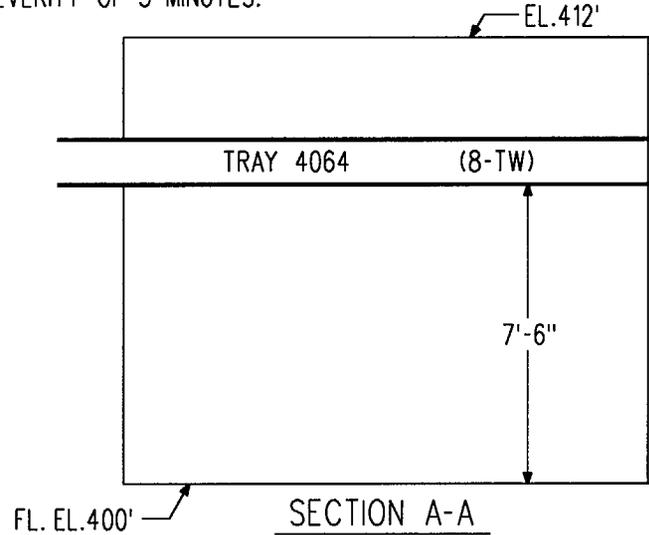
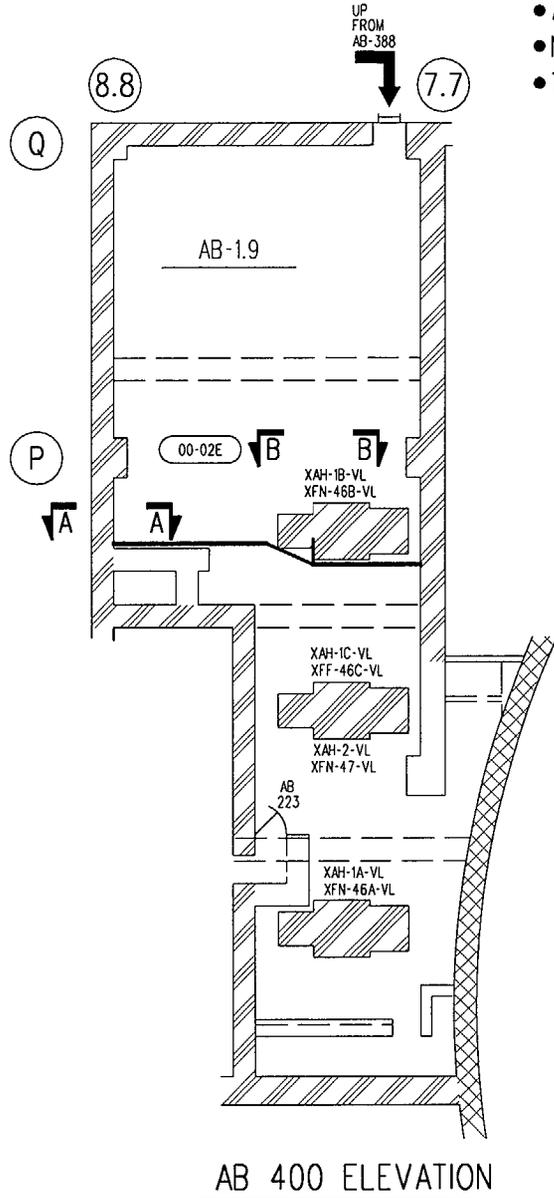


- ALL CABLING IN CONDUITS.
- NO EXPOSED COMBUSTIBLES NEAR THE WRAP.
- THIS AREA HAS A FIRE SEVERITY OF 3 MINUTES.

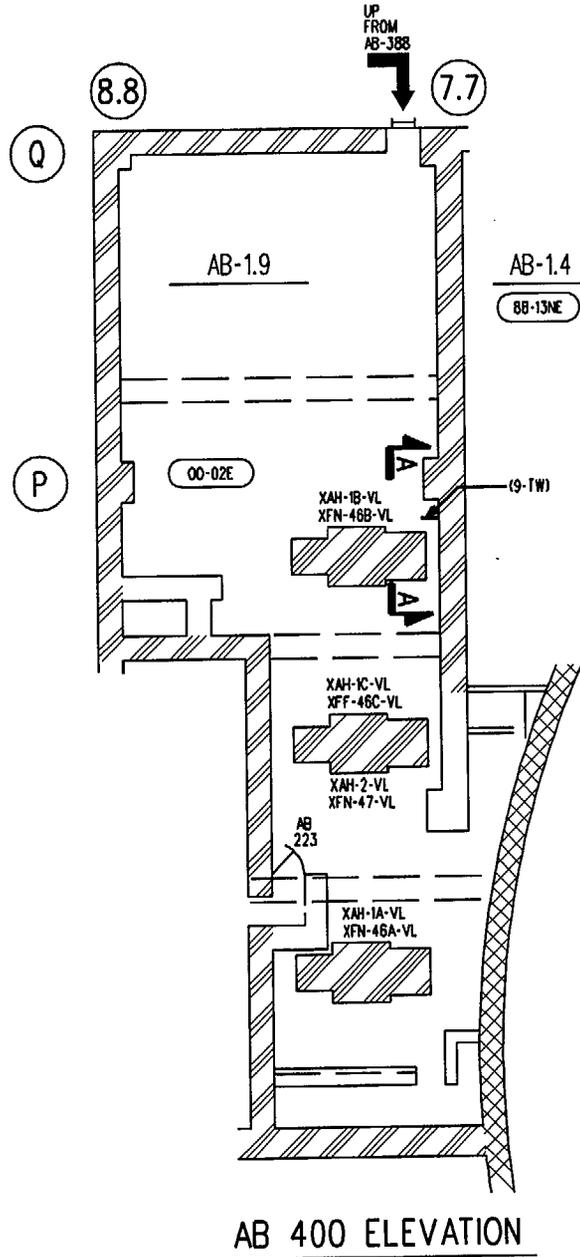


V.C. SUMMER NUCLEAR STATION
 TRIPLE WRAP-7
 AB 400 ELEVATION
 NO SCALE FPP00012-1

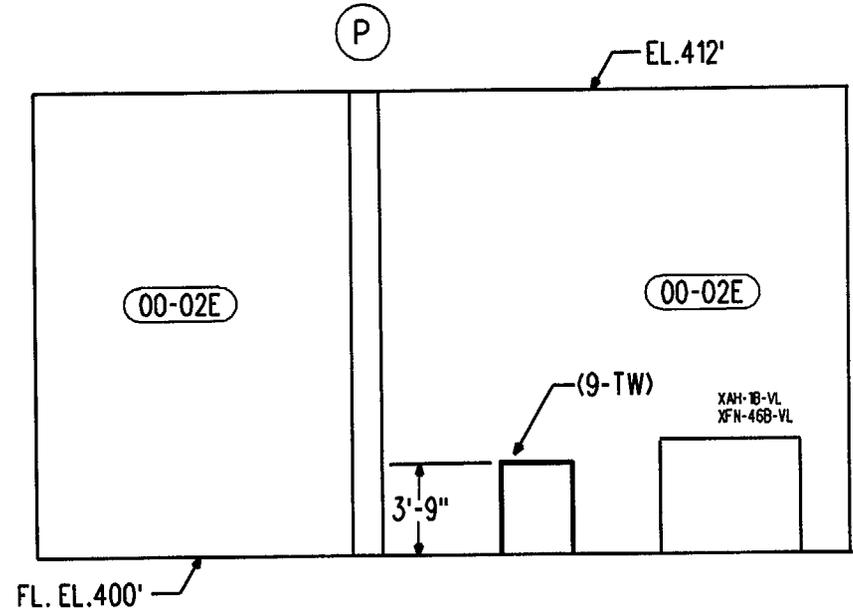
- ALL CABLING IN CONDUITS.
- NO EXPOSED COMBUSTIBLES NEAR THE WRAP.
- THIS AREA HAS A FIRE SEVERITY OF 3 MINUTES.



V.C. SUMMER NUCLEAR STATION
 TRIPLE WRAP-8
 AB 400 ELEVATION
 NO SCALE
 FPP00012-1

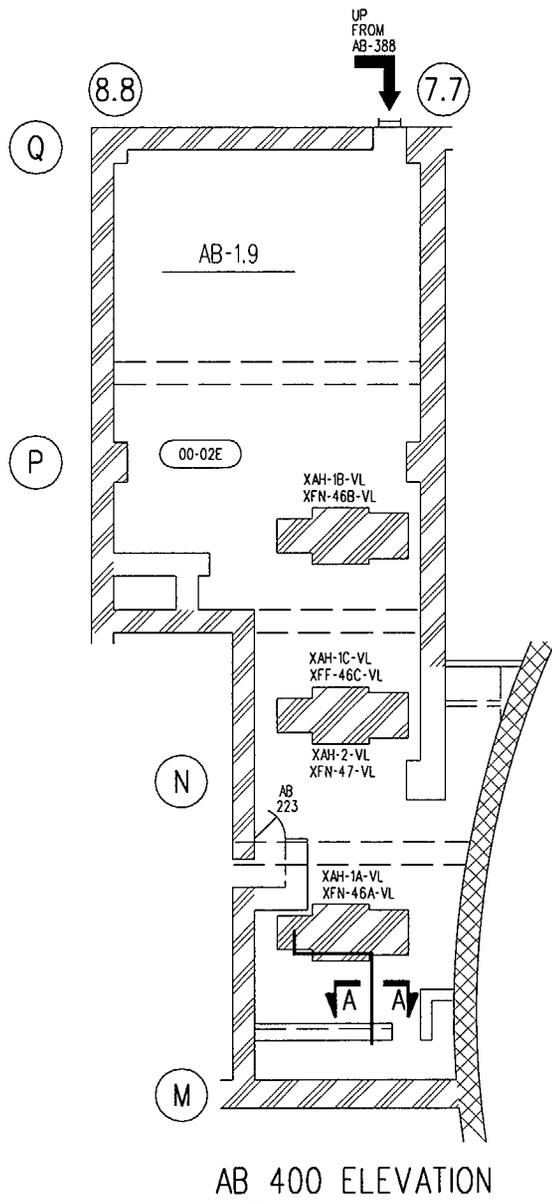


- ALL CABLING IN CONDUITS.
- NO EXPOSED COMBUSTIBLES NEAR THE WRAP.
- THIS AREA HAS A FIRE SEVERITY OF 4 MINUTES.

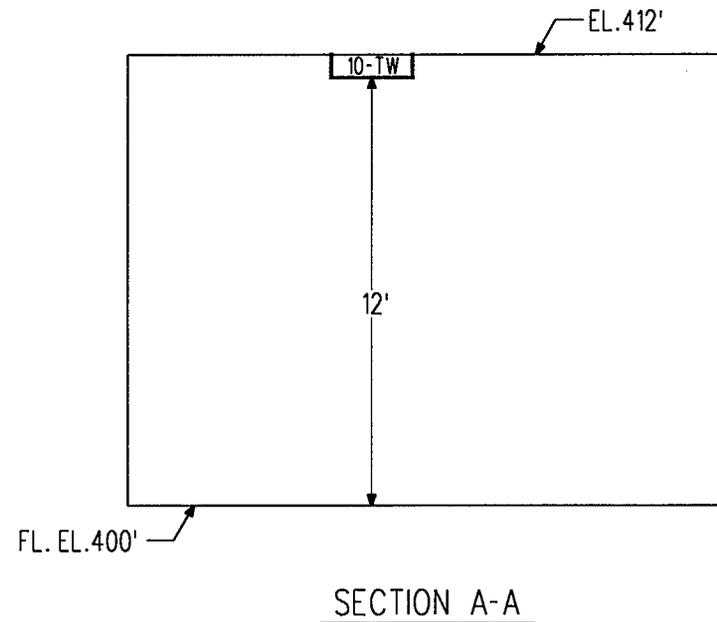


SECTION A-A

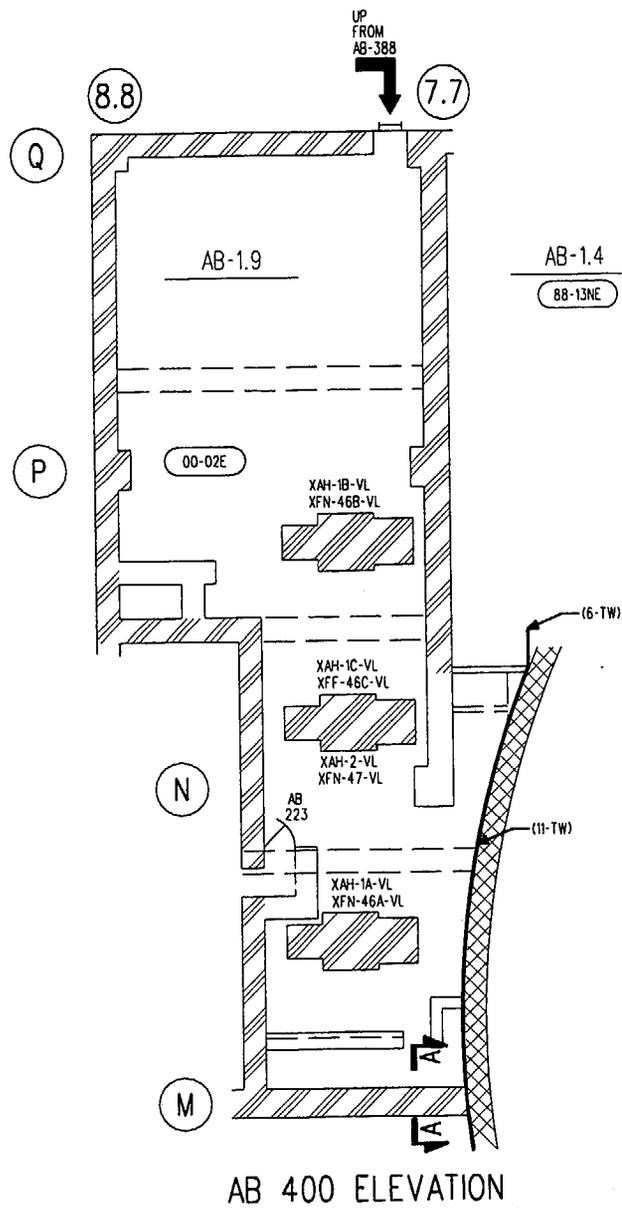
V.C. SUMNER NUCLEAR STATION
 TRIPLE WRAP-9
 AB 400 ELEVATION
 NO SCALE FPP00012-1



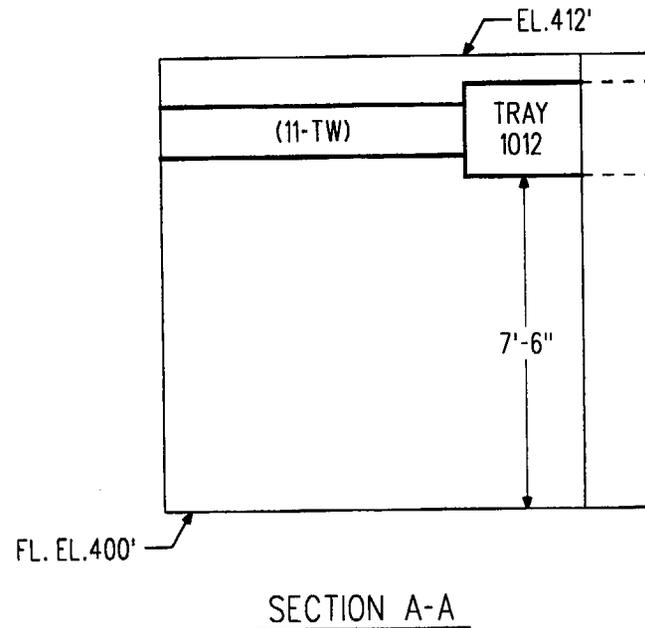
- ALL CABLING IN CONDUITS.
- NO EXPOSED COMBUSTIBLES NEAR THE WRAP.
- THIS AREA HAS A FIRE SEVERITY OF 3 MINUTES.



V.C. SUMMER NUCLEAR STATION
 TRIPLE WRAP-10
 AB 400 ELEVATION
 NO SCALE FPP00012-1

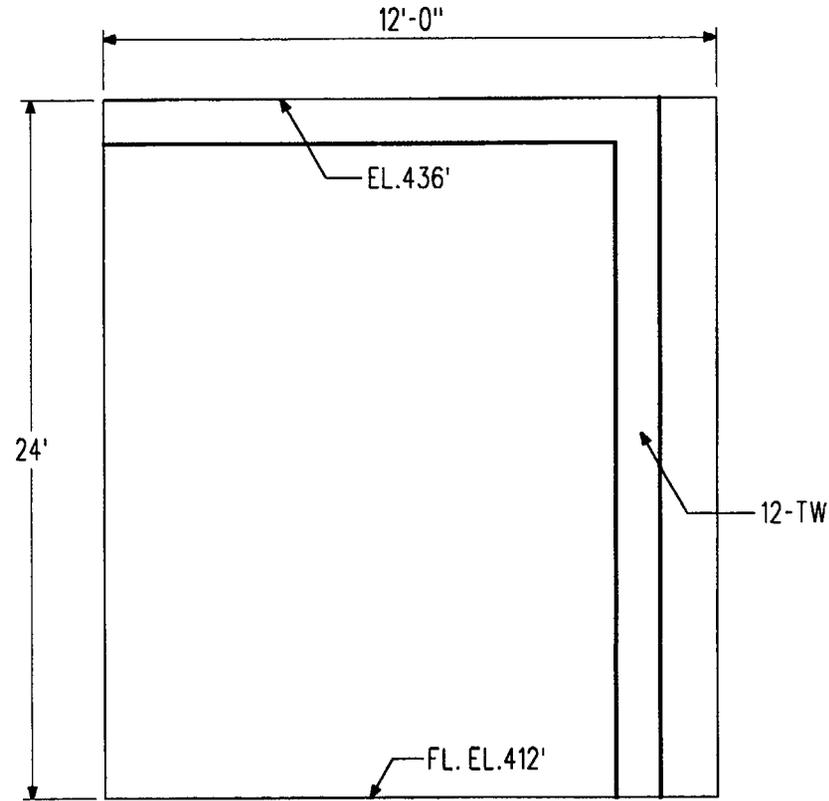
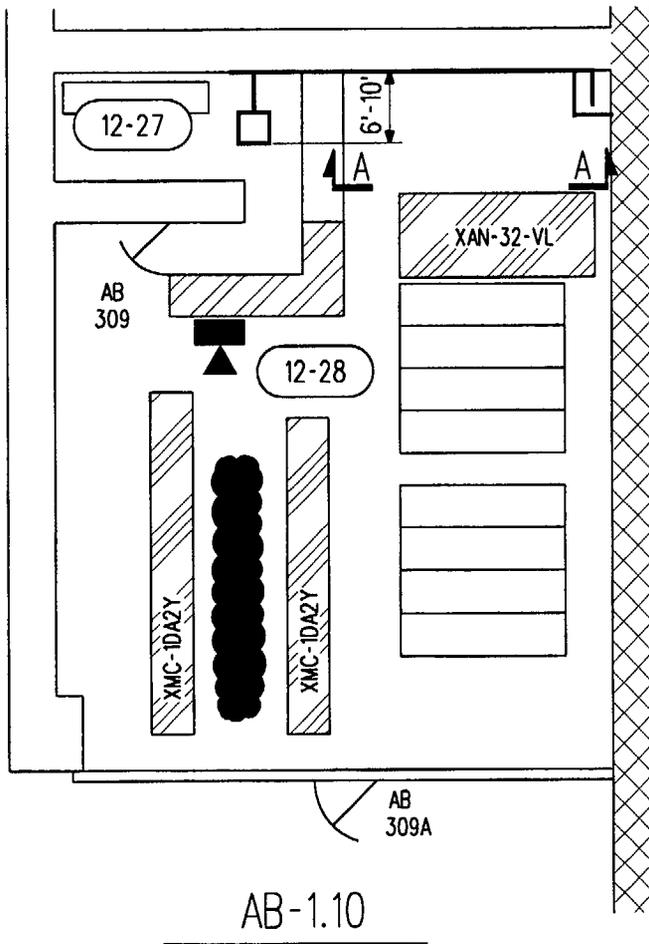


- ALL CABLING IN CONDUITS.
- NO EXPOSED COMBUSTIBLES NEAR THE WRAP.
- THIS AREA HAS A FIRE SEVERITY OF 3 MINUTES.



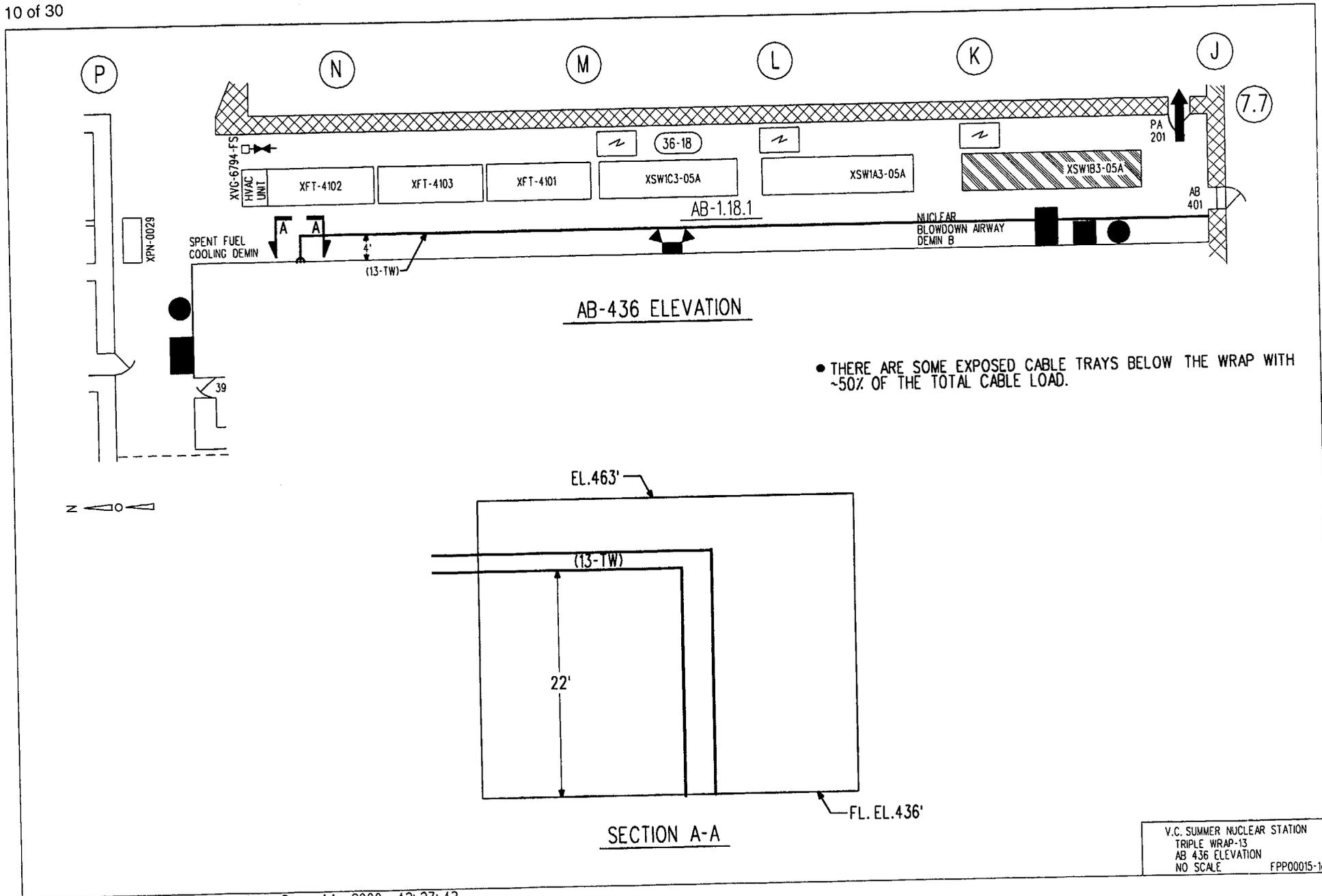
V.C. SUMMER NUCLEAR STATION
 TRIPLE WRAP-11
 AB 400 ELEVATION
 NO SCALE FPP00012-1

- THERE ARE NO EXPOSED COMBUSTIBLES NEAR THE WRAP.
- THIS ROOM HAS A FIRE SEVERITY OF 42 MINUTES.

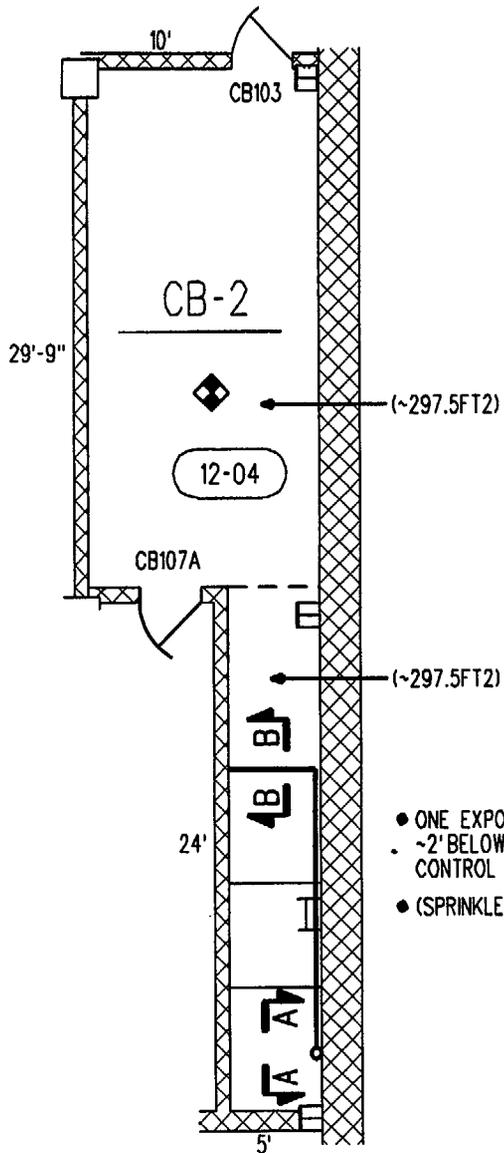


SECTION A-A

V.C. SUMMER NUCLEAR STATION
TRIPLE WRAP-12
AB 412 ELEVATION
NO SCALE FPP00013-1

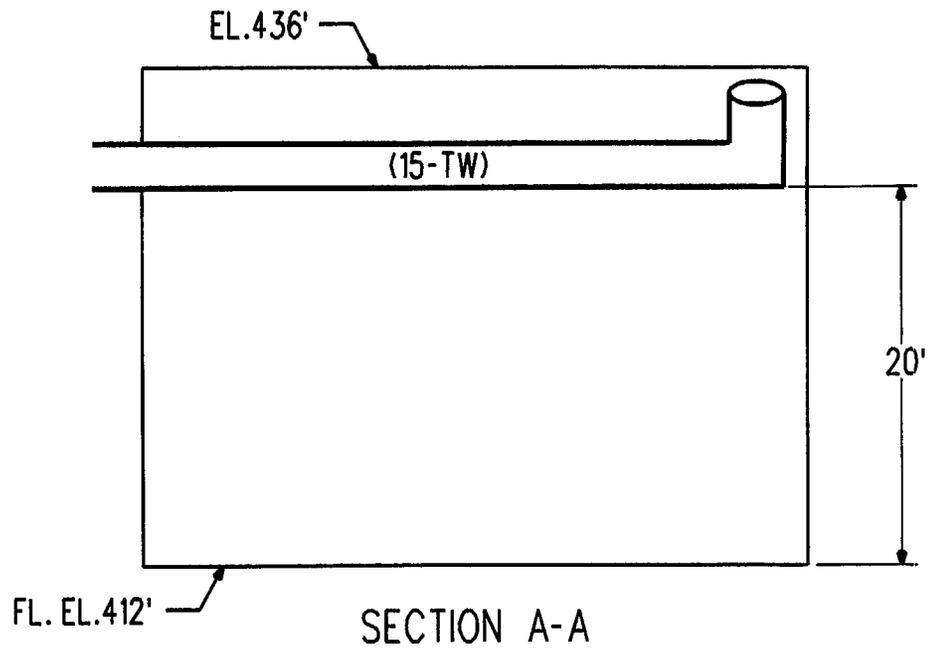


V.C. SUMMER NUCLEAR STATION
 TRIPLE WRAP-13
 AB 436 ELEVATION
 NO SCALE FPP00015-1a

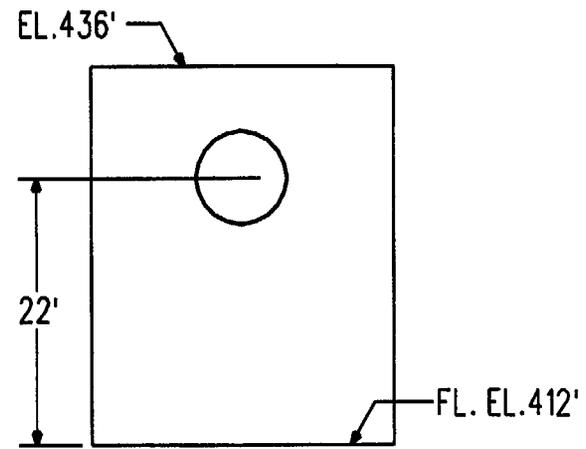


CB 412 ELEVATION

- ONE EXPOSED CABLE TRAY
- ~2' BELOW WRAP WITH SOME CONTROL CABLES.
- (SPRINKLER SYSTEM INSTALLED)

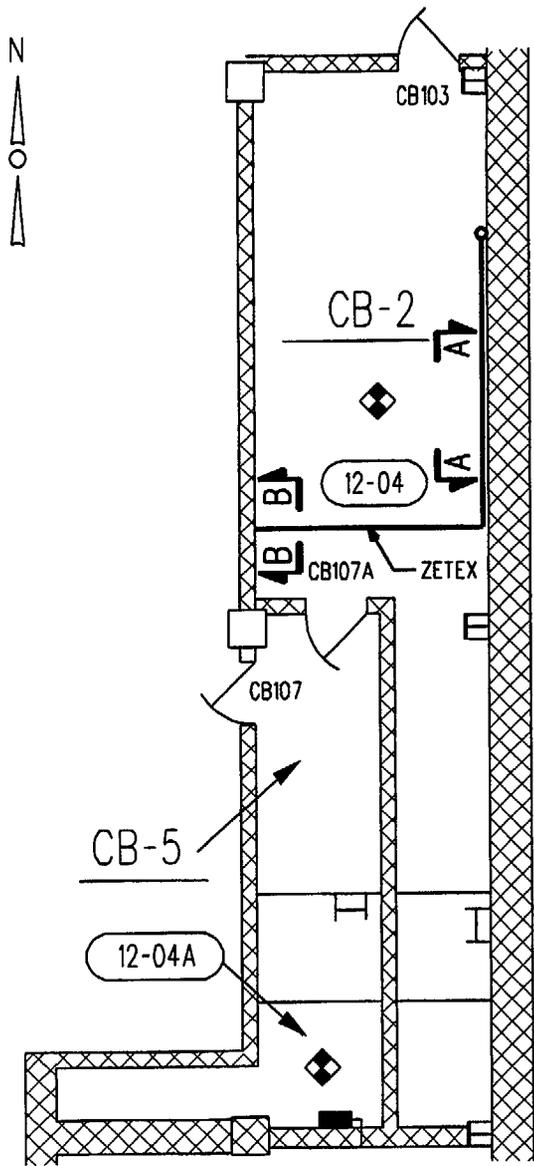


SECTION A-A



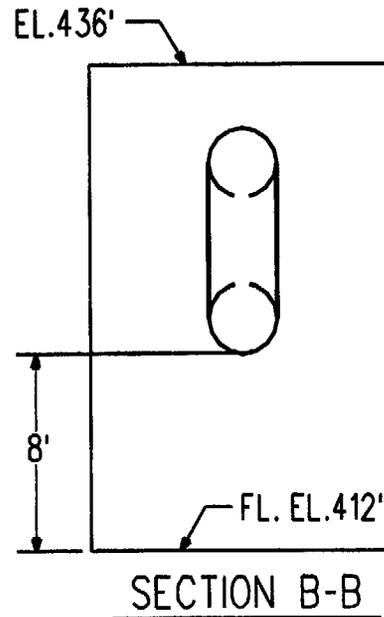
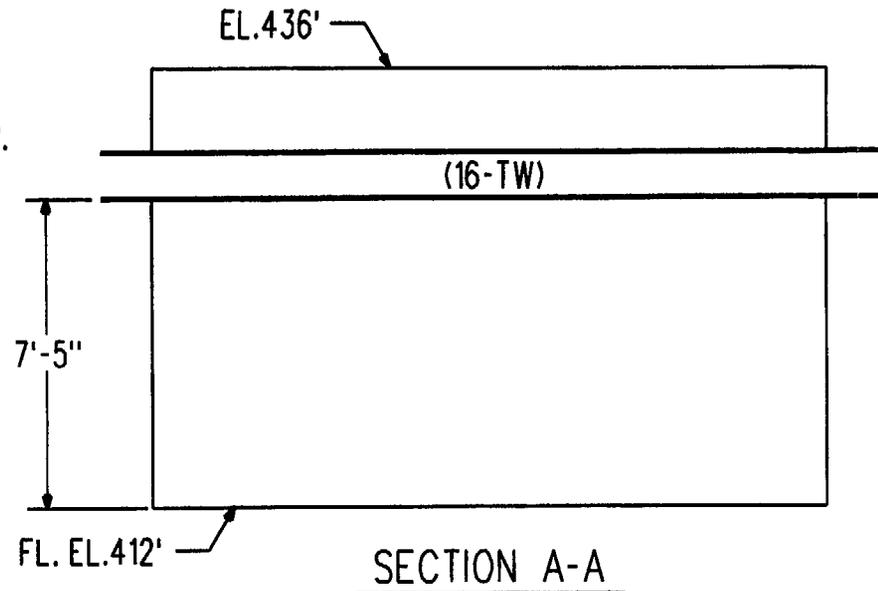
SECTION B-B

V.C. SUMNER NUCLEAR STATION
 TRIPLE WRAP-15
 CB 412 ELEVATION
 NO SCALE FPP00003-20

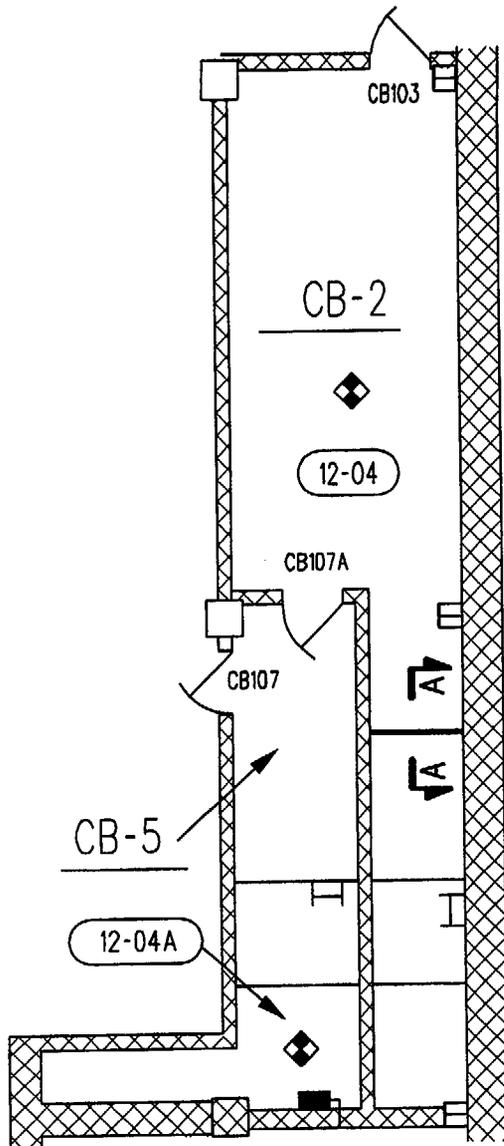


CB 412 ELEVATION

- THERE ARE NO EXPOSED CABLES NEAR THIS WRAP.
- (SPRINKLER SYSTEM INSTALLED)

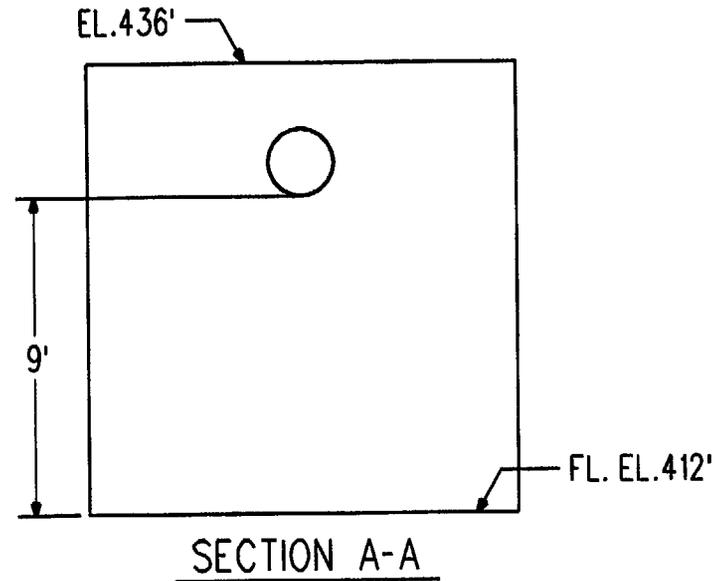


SECTION B-B

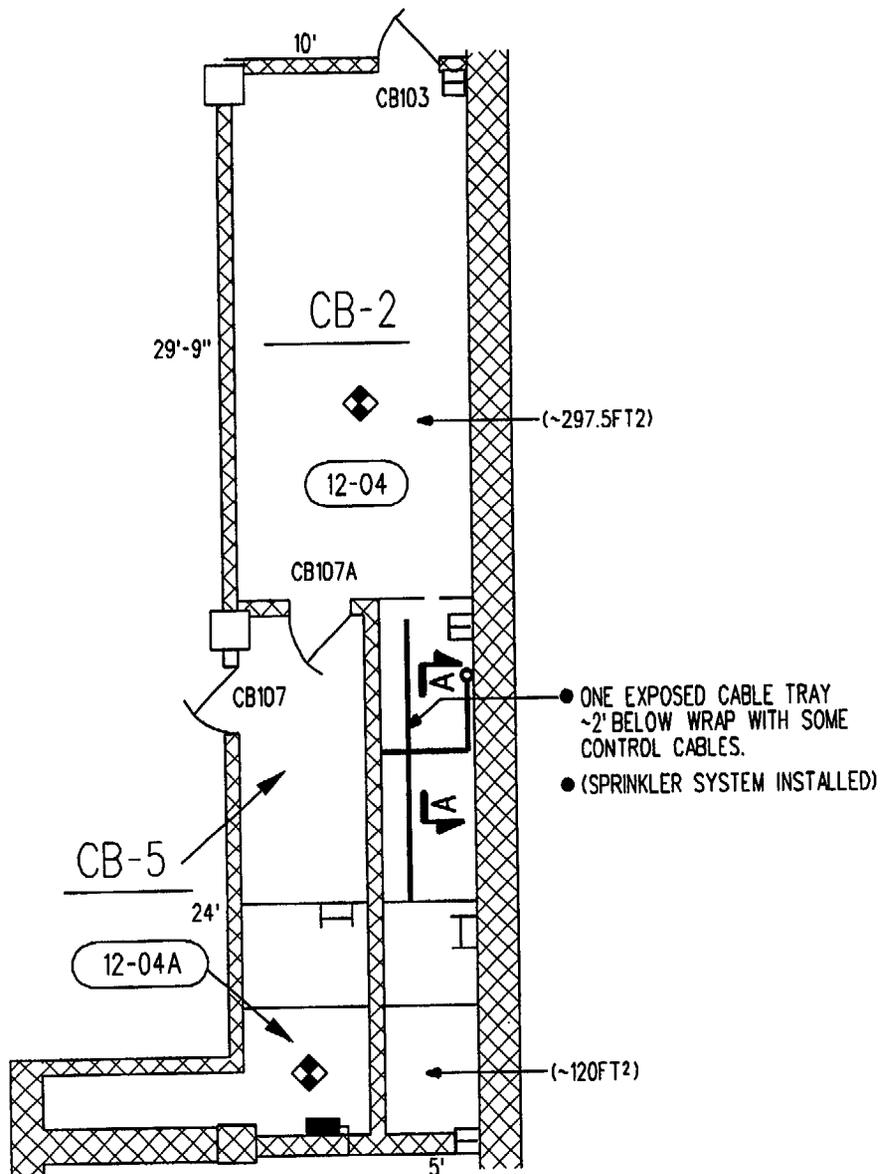
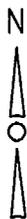


CB 412 ELEVATION

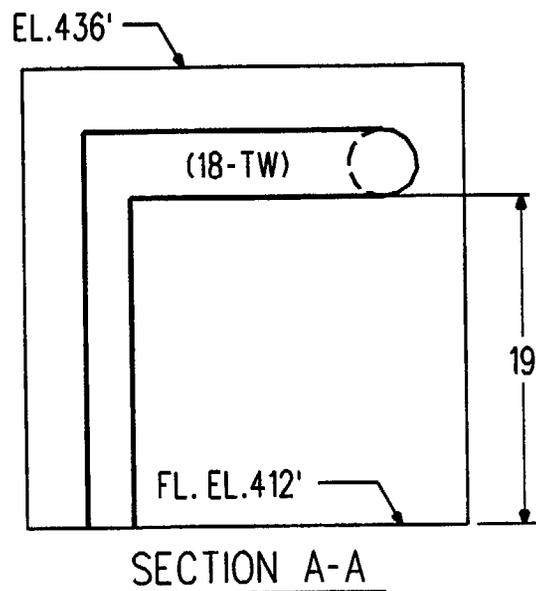
- THERE ARE NO EXPOSED CABLES BESIDE OR BELOW THIS WRAP.
- (SPRINKLER SYSTEM INSTALLED)



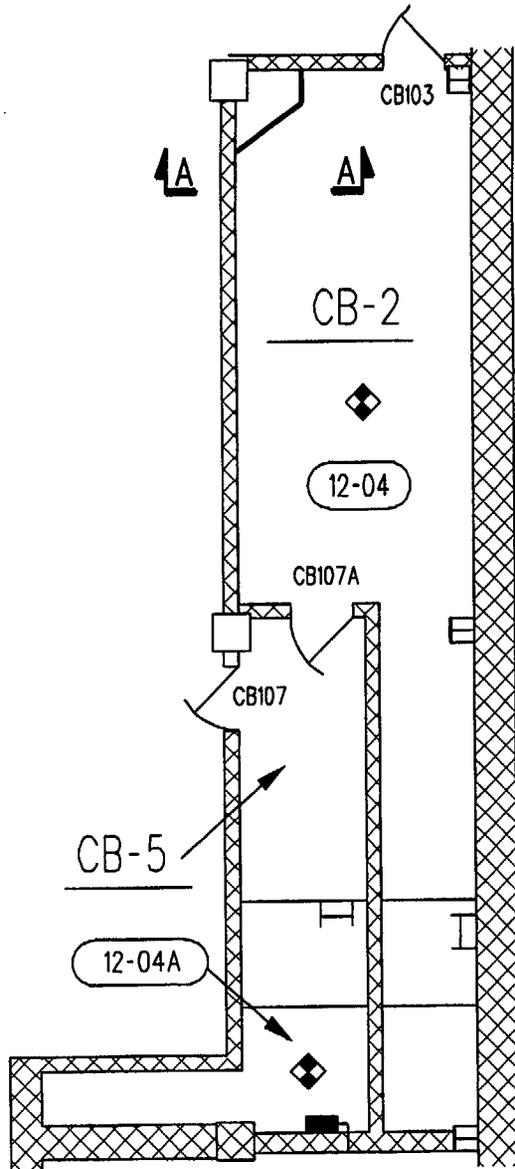
SECTION A-A



CB 412 ELEVATION

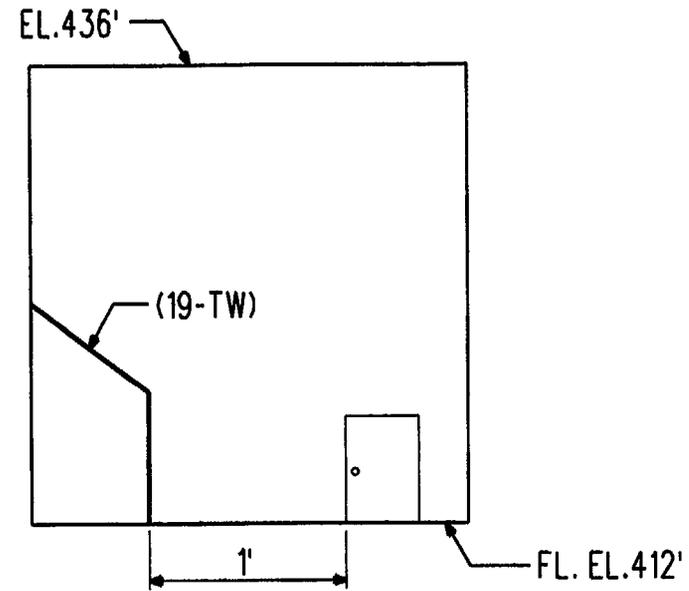


V.C. SUMNER NUCLEAR STATION
 TRIPLE WRAP-18
 CB 412 ELEVATION
 NO SCALE FPP00003-3c

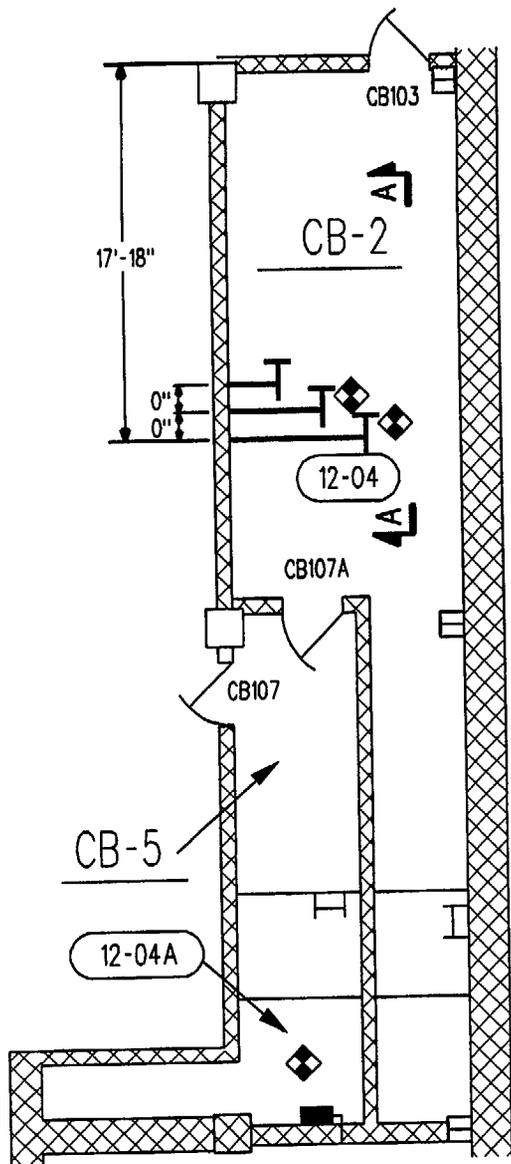


CB 412 ELEVATION

- THERE ARE NO EXPOSED CABLES NEAR THIS WRAP.
- (SPRINKLER SYSTEM INSTALLED)

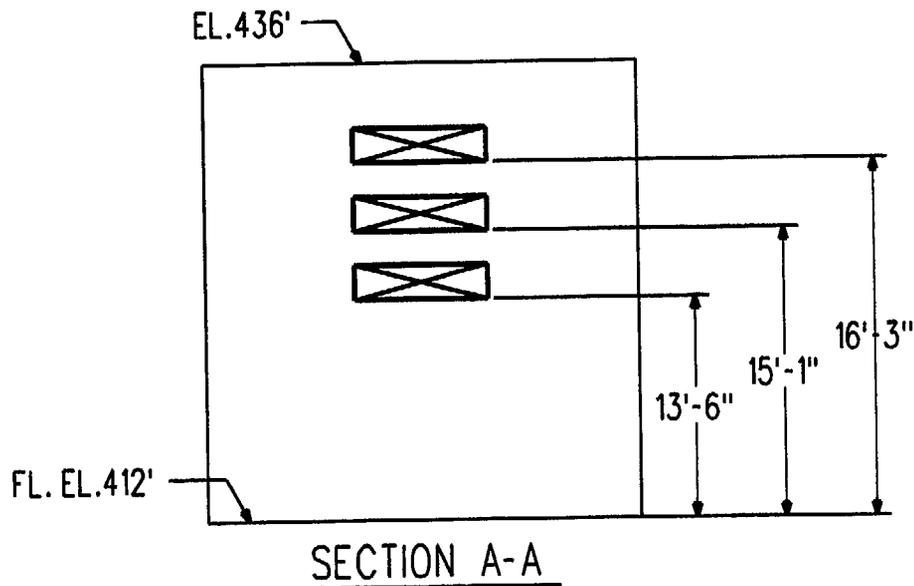


SECTION A-A

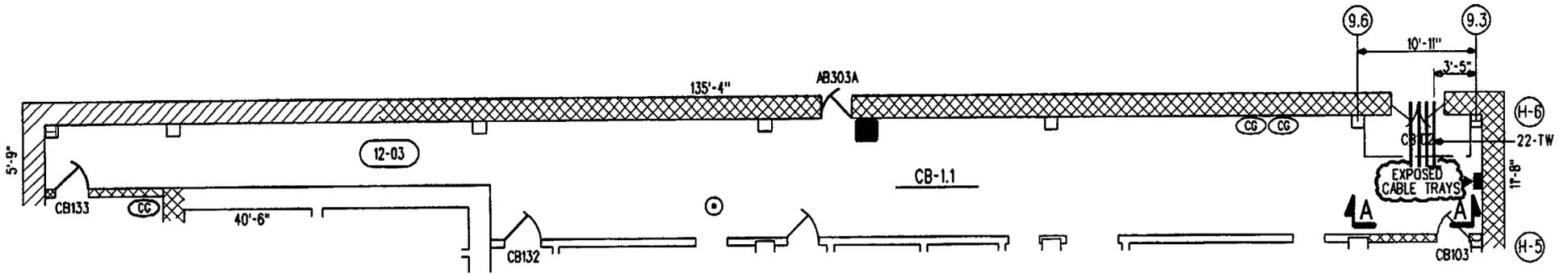


CB 412 ELEVATION

- THERE ARE NO EXPOSED CABLES BESIDE OR BELOW THIS WRAP.
- (SPRINKLER SYSTEM INSTALLED)

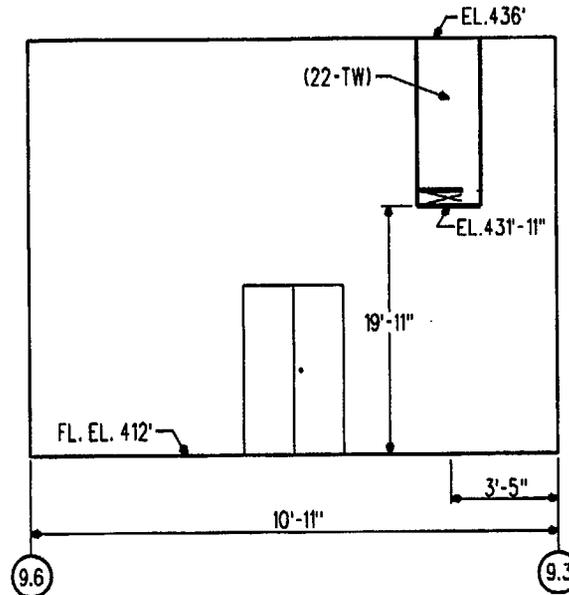


V.C. SUMMER NUCLEAR STATION
TRIPLE WRAP-21
CB 412 ELEVATION
NO SCALE FPP00003-3



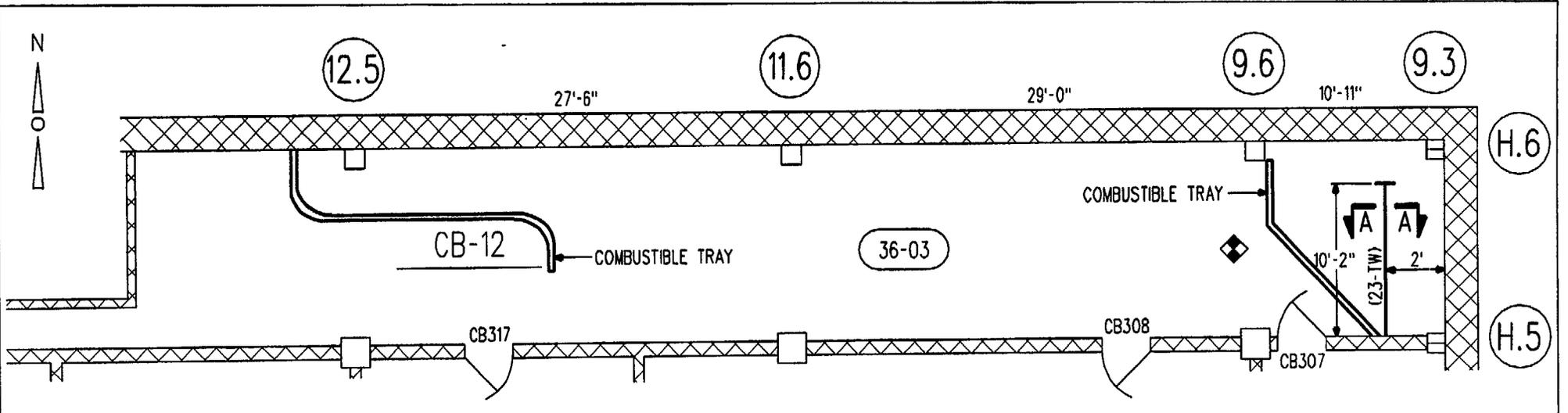
CB 412 ELEVATION

- THERE ARE SOME EXPOSED CONTROL CABLE TRAYS ~2' BELOW WRAP.
- SPRINKLER SYSTEM INSTALLED.



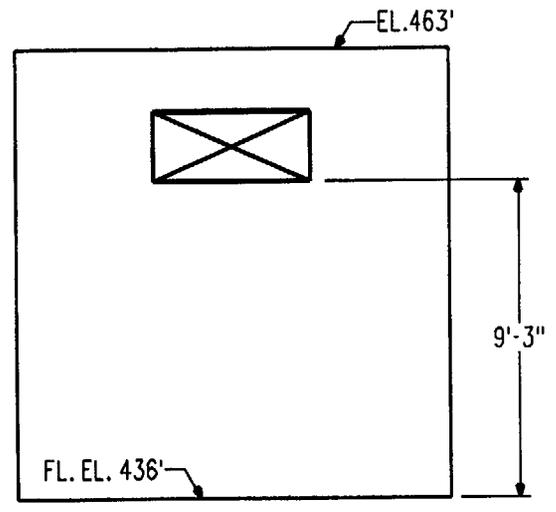
SECTION A-A

V.C. SUMNER NUCLEAR STATION
 TRIPLE WRAP-22
 CB 412 ELEVATION
 NO SCALE FPP00003-1a



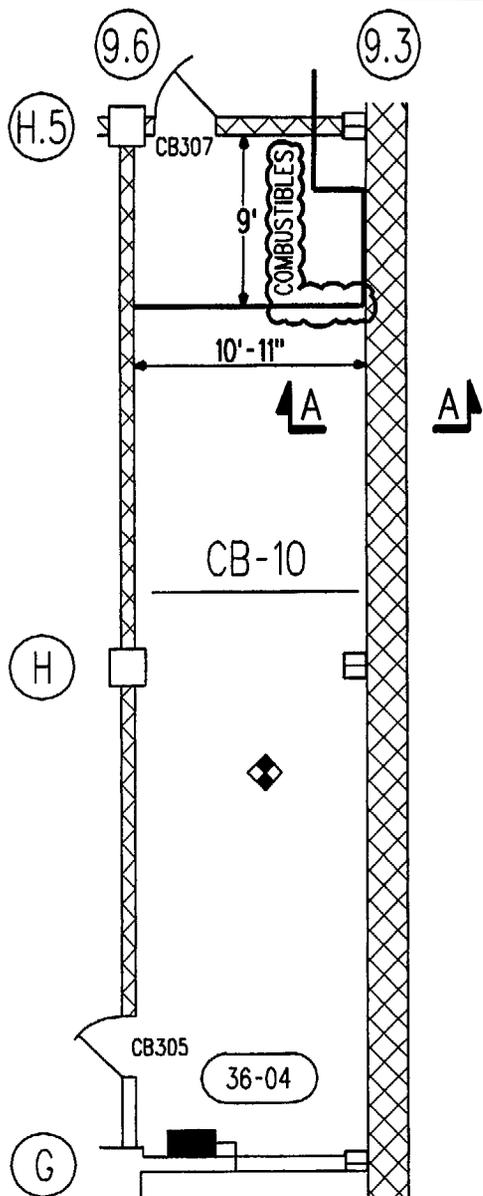
CB 436 ELEVATION

- SPRINKLER SYSTEM INSTALLED.
- 23-TW HAS A ZETEX COVERING AS ADDED PROTECTION.
- TRAYS BELOW ARE COVERED. THE NEAREST UNCOVERED TRAY (4234) WITH CONTROL CABLES CUTS DIAGONLLY & IS ~1' BELOW AND (1'-7') TO THE WEST.



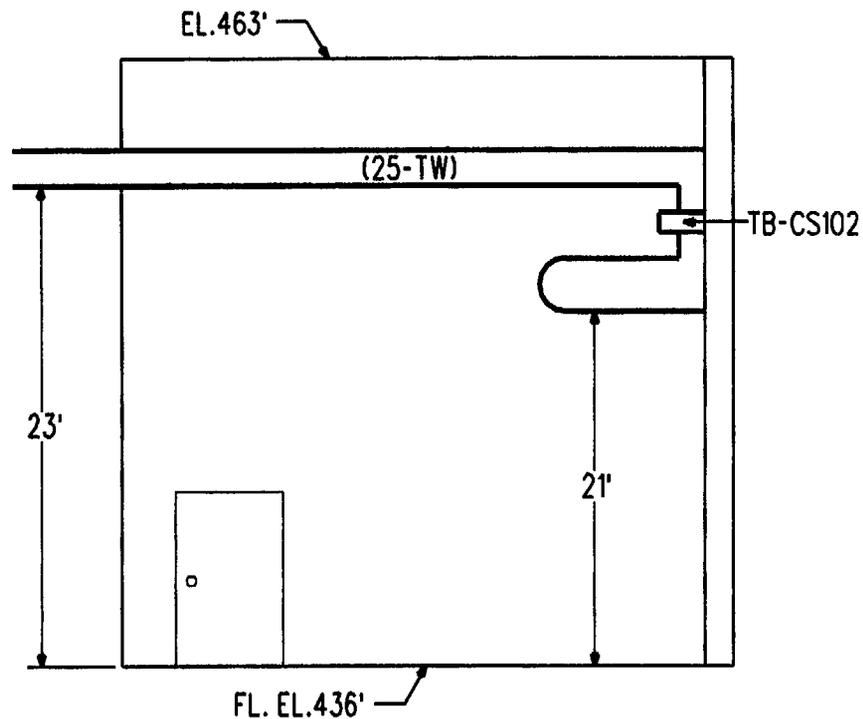
SECTION A-A

V.C. SUMMER NUCLEAR STATION
 TRIPLE WRAP-23
 CB 436 ELEVATION
 NO SCALE FPP00005-2a



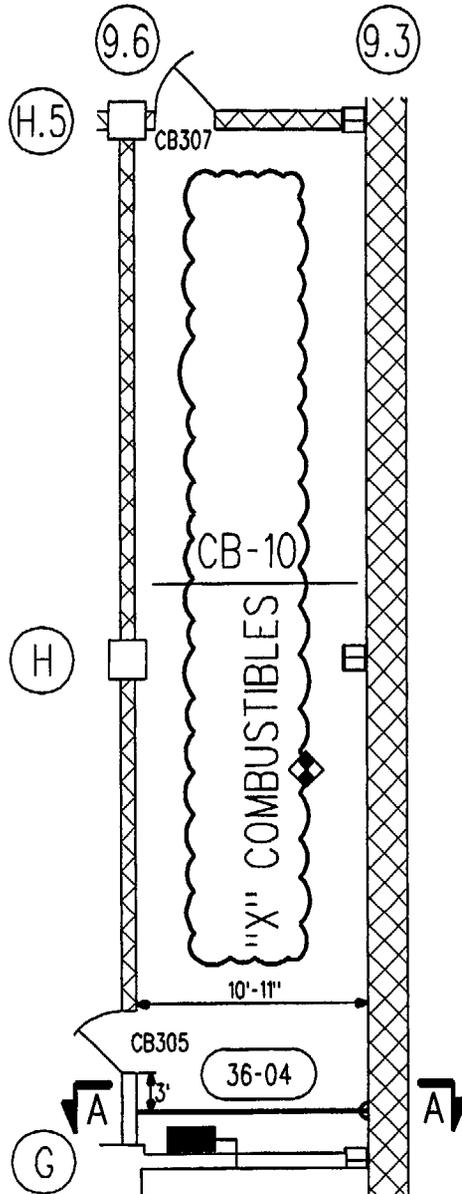
CB 436 ELEVATION

- SPRINKLER SYSTEM INSTALLED.
- 25-TW HAS A ZETEX COVERING AS AN ADDED PROTECTION.
- THREE TRAYS [ONE COVERED AND TWO (4158/4159)] CONTAINING CONTROL CABLES ARE LOCATED BENEATH (~4') THE WRAP.



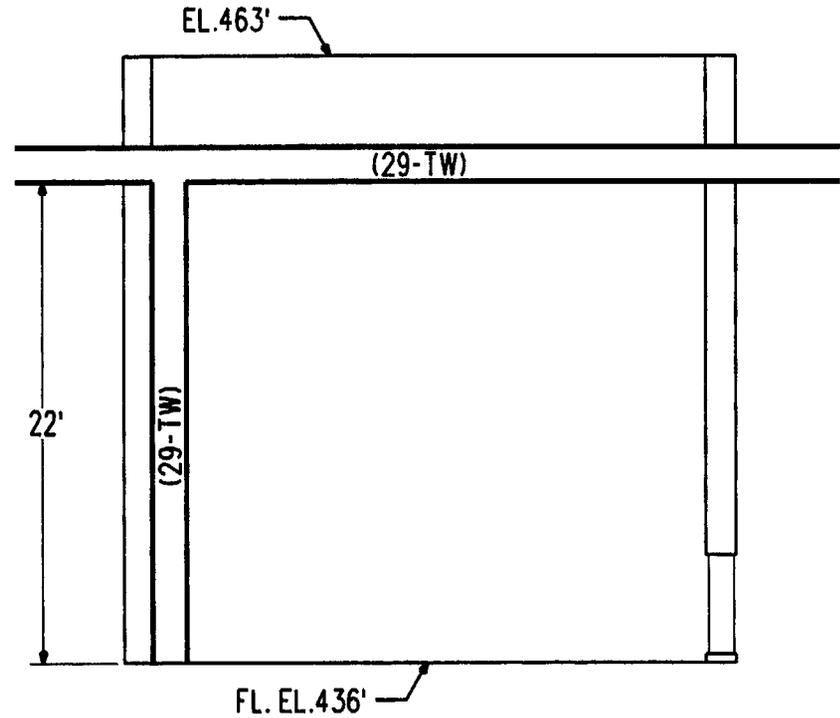
SECTION A-A

V.C. SUMMER NUCLEAR STATION
TRIPLE WRAP-25
CB 436 ELEVATION
NO SCALE FPP00005-1a



CB 436 ELEVATION

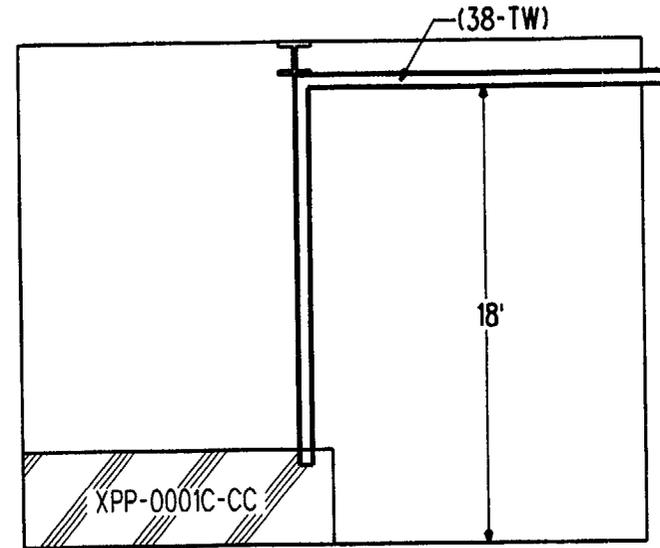
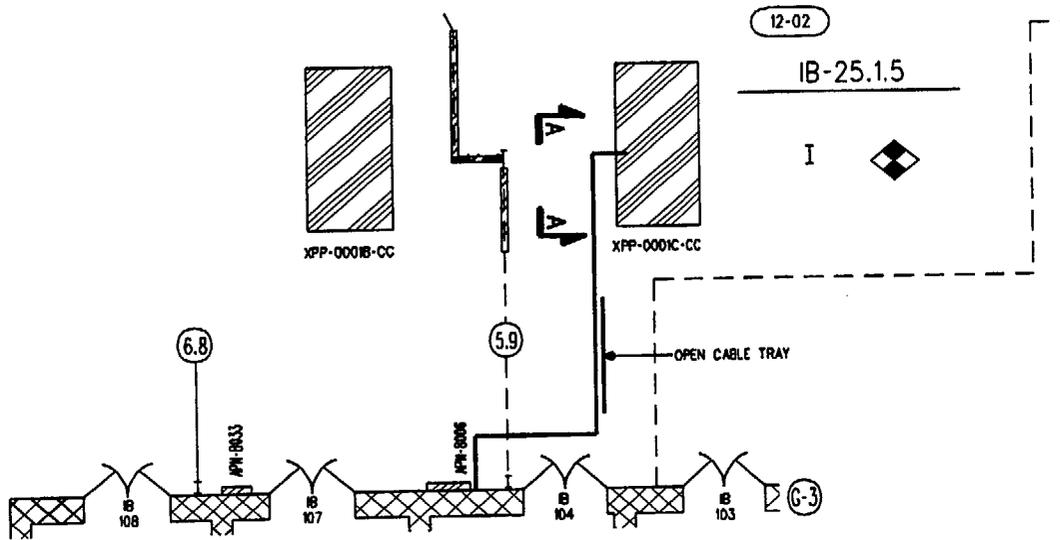
- SPRINKLER SYSTEM INSTALLED.
- ONE TRAY CROSSES UNDERNEATH (~4') AND IS COVERED.
- NEAREST TRAYS (CONTROL) ARE TO THE NORTH (~5½') AND DO NOT PRESENT A COMBUSTIBLE HAZARD BECAUSE THEY ARE AT OR NEAR THE SAME ELEVATION.



SECTION A-A

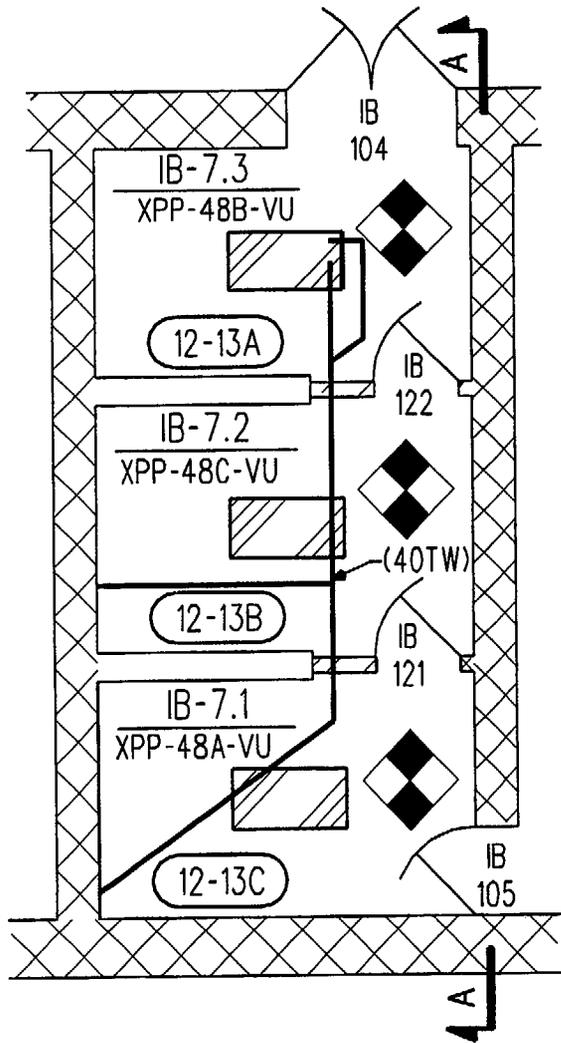
V.C. SUMMER NUCLEAR STATION
 TRIPLE WRAP-29
 CB 436 ELEVATION
 NO SCALE FPP0005-1

- (SPRINKLER SYSTEM INSTALLED)
- THERE IS ONE POWER CABLE TRAY (1070) RUNNING PARALLEL (9'-6") TO WRAP AND WITHIN 3'.

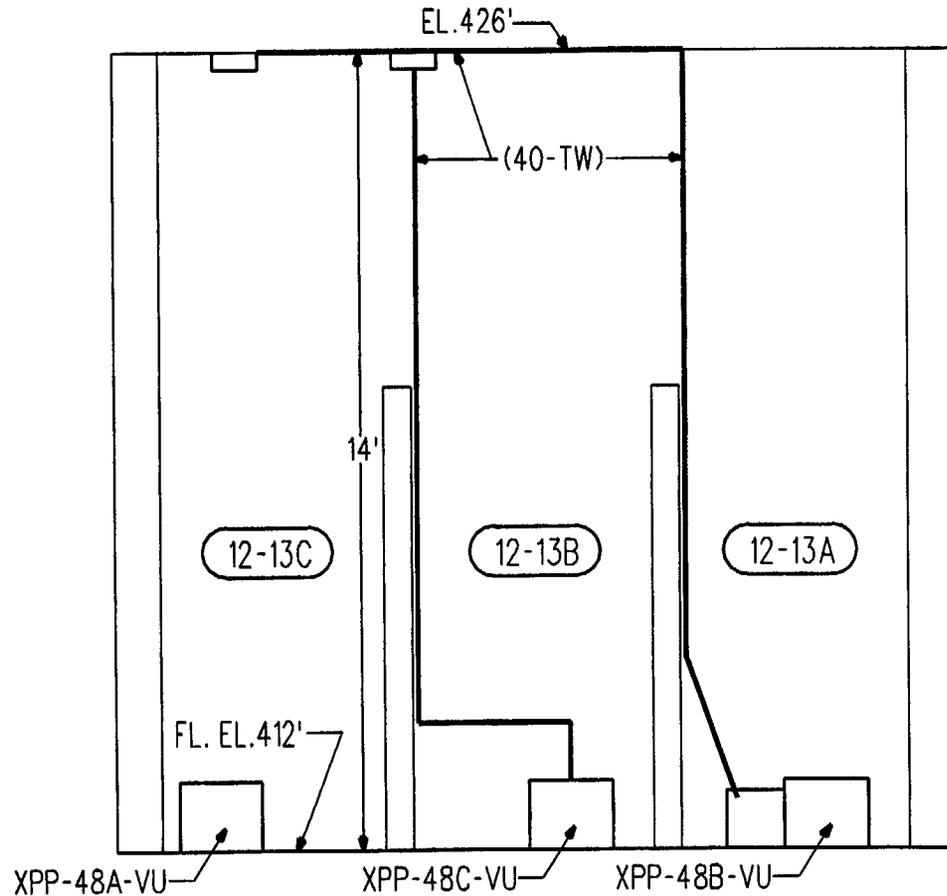


SECTION A-A

V.C. SUMMER NUCLEAR STATION
TRIPLE WRAP-3B
IB 412,423,423-6,426 ELEVATION
NO SCALE FPP00033-3a



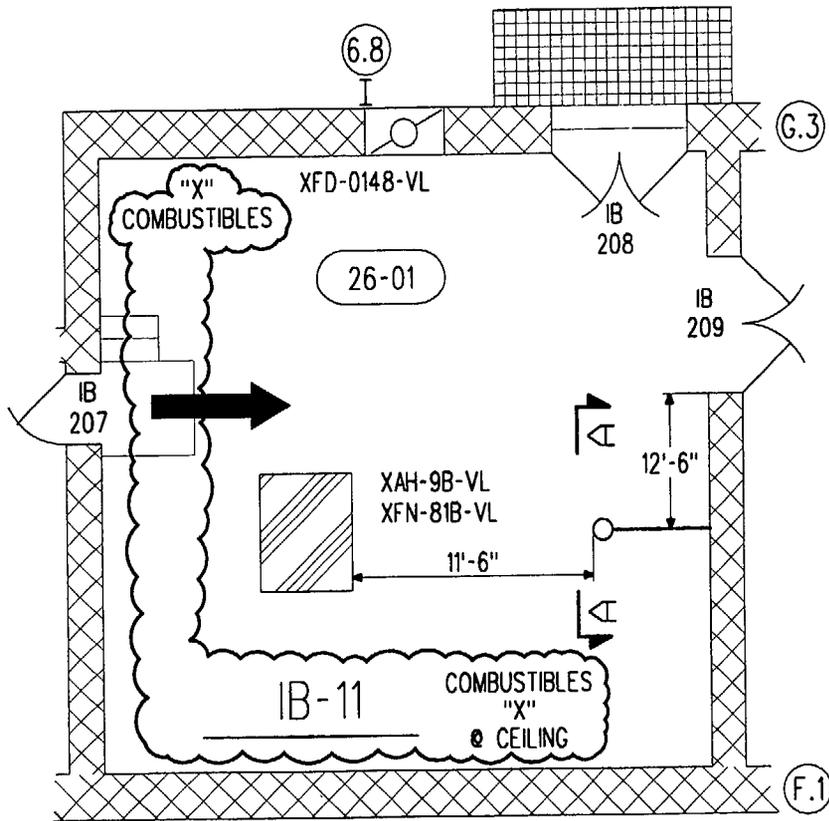
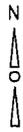
- (SPRINKLER SYSTEM INSTALLED)
- THERE ARE NO EXPOSED CABLES NEAR THIS WRAP
- FIRE SEVERITY IS NEGLIGIBLE



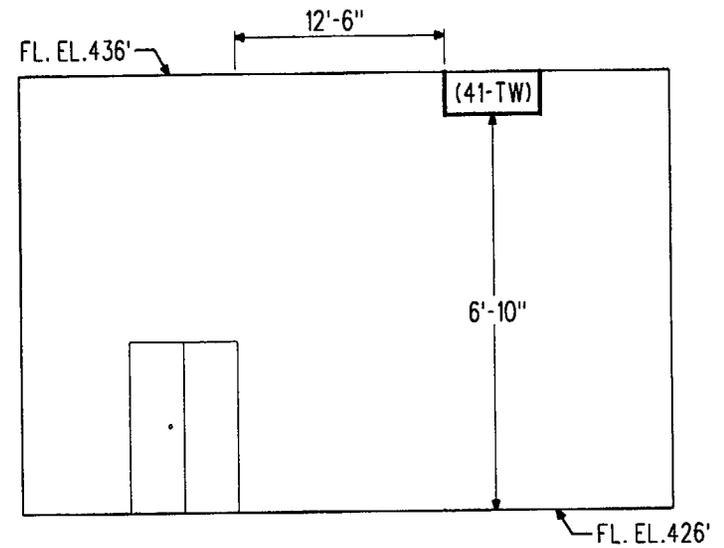
SECTION A-A

V.C. SUMNER NUCLEAR STATION
TRIPLE WRAP-40
IB 412,423,423-6,426 ELEVATION
NO SCALE FPP00033-5

- ALL CABLING NEAR WRAP IN CONDUITS.
- EXPOSED TRAYS (1025,2058 & 3128) POWER CABLING LOCATED WITHIN 3' OF WRAP AT THE CEILING AND RUNNING WESTWARD.

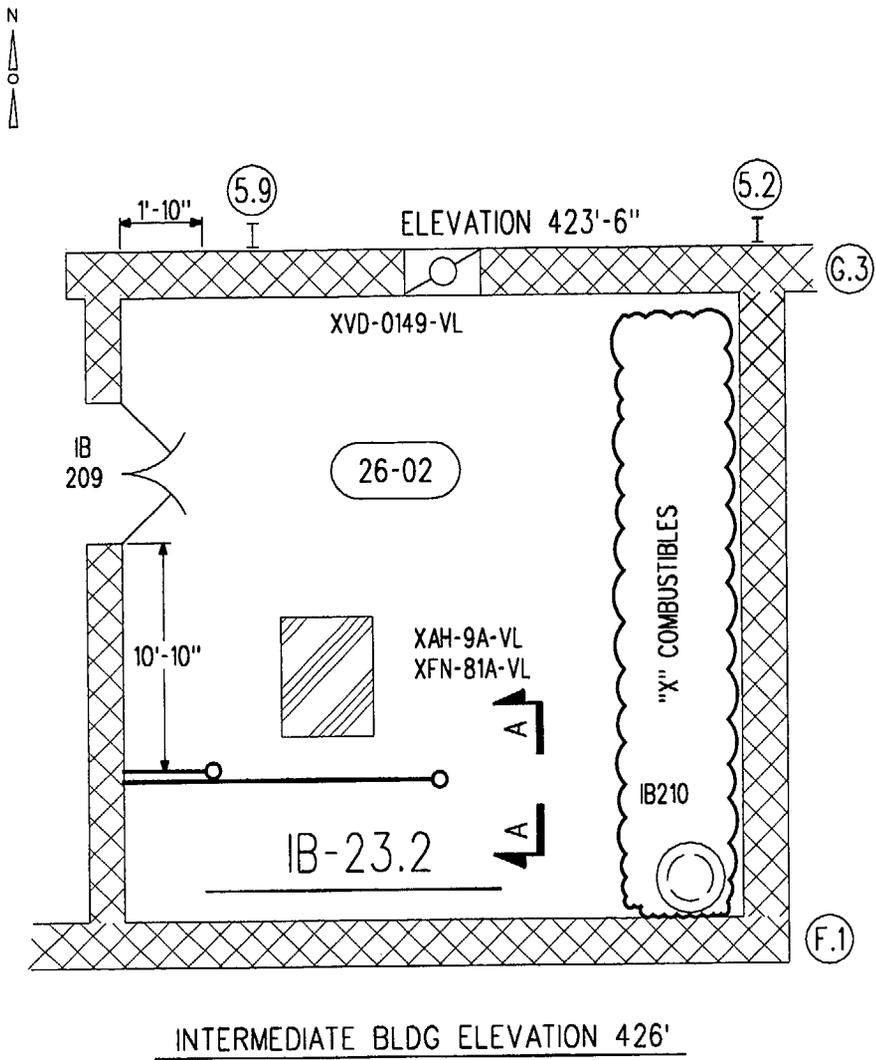


INTERMEDIATE BLDG ELEVATION 426'

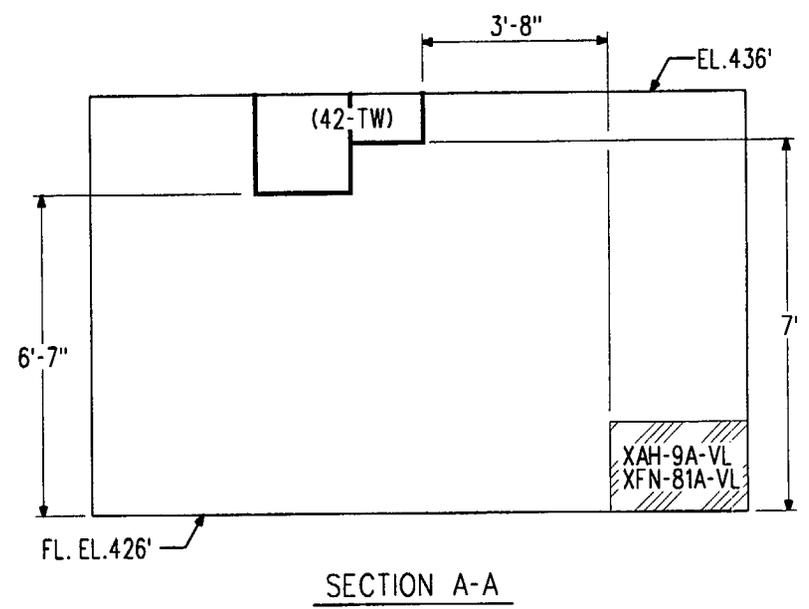


SECTION A-A

V.C. SUMMER NUCLEAR STATION
 TRIPLE WRAP-41
 IB 412,423,423-6,426 ELEVATION
 NO SCALE FPP00033-2a

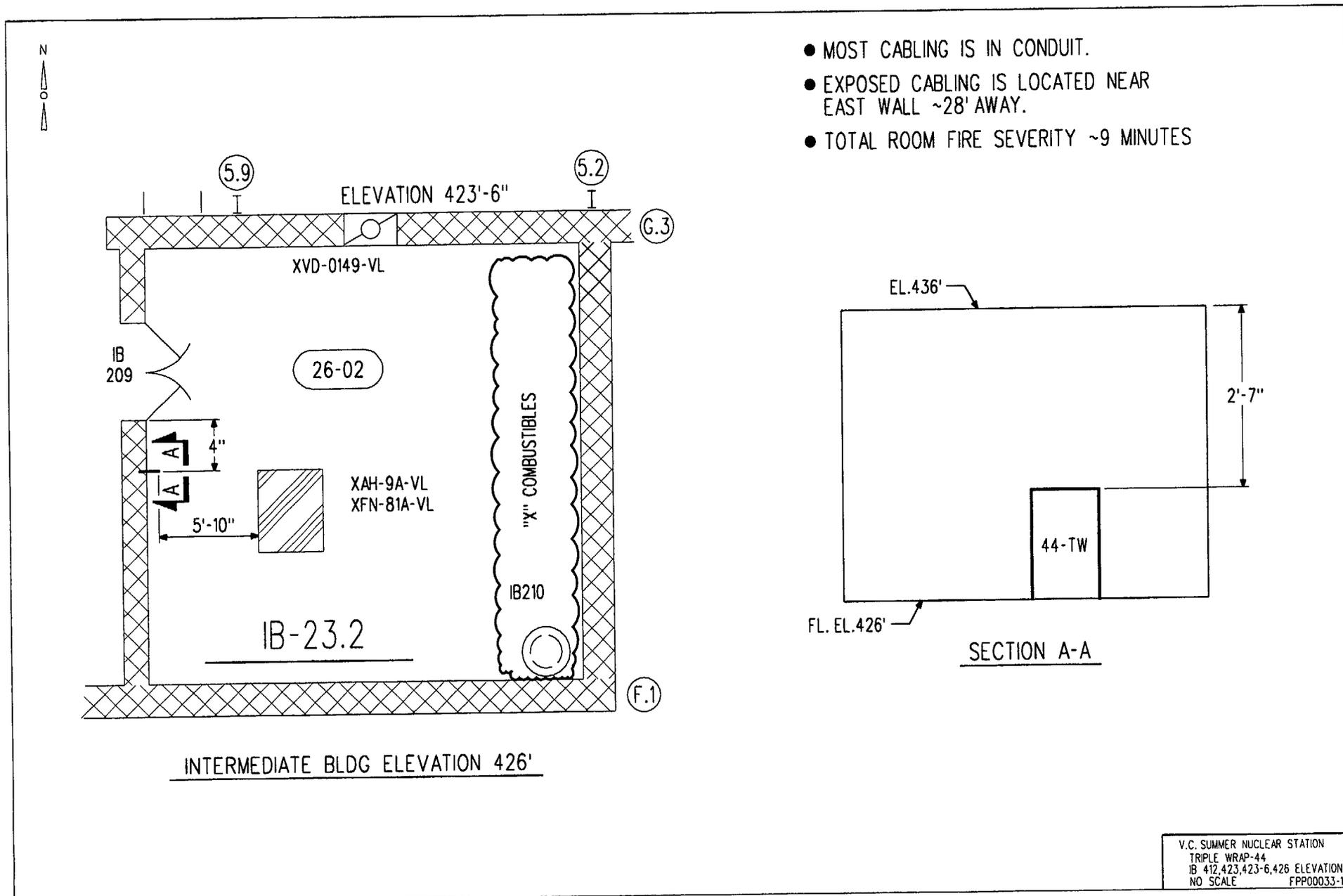


- THIS WRAP IS SURROUNDED BY OTHER WRAPS
- EXPOSED CABLE IS LOCATED NEAR EAST WALL ~22' AWAY. MOST CABLING IS IN CONDUIT.
- TOTAL ROOM FIRE SEVERITY ~9 MINUTES

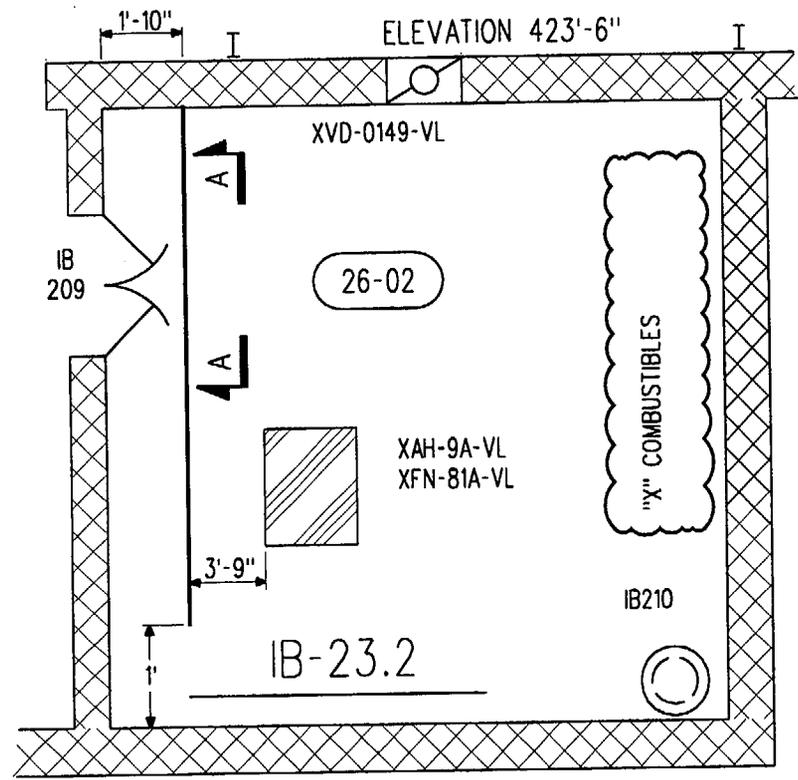


V.C. SUMMER NUCLEAR STATION
 TRIPLE WRAP-42
 IB 412,423,423-6,426 ELEVATION
 NO SCALE FPP00033-1

- MOST CABLING IS IN CONDUIT.
- EXPOSED CABLING IS LOCATED NEAR EAST WALL ~28' AWAY.
- TOTAL ROOM FIRE SEVERITY ~9 MINUTES

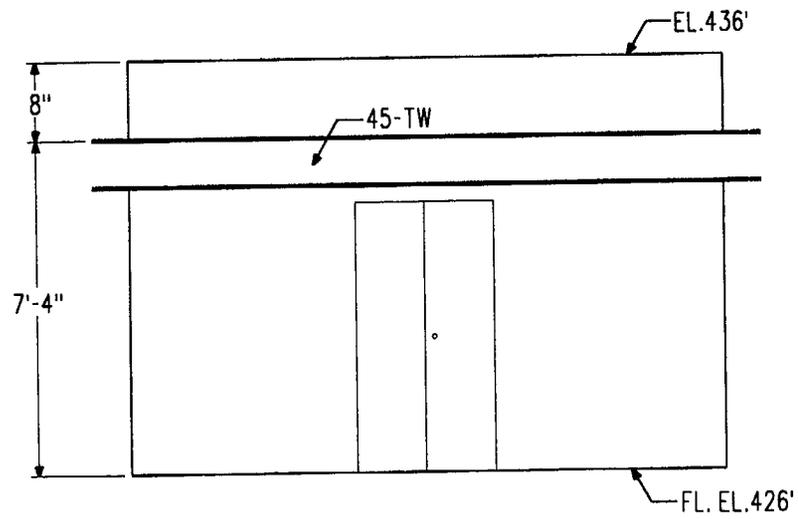


V.C. SUMMER NUCLEAR STATION
 TRIPLE WRAP-44
 IB 412,423,423-6,426 ELEVATION
 NO SCALE FPP00033-1



INTERMEDIATE BLDG ELEVATION 426'

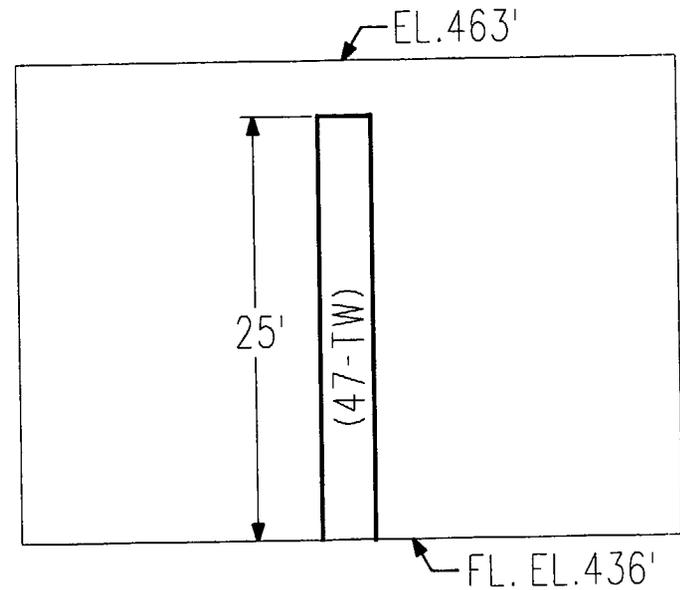
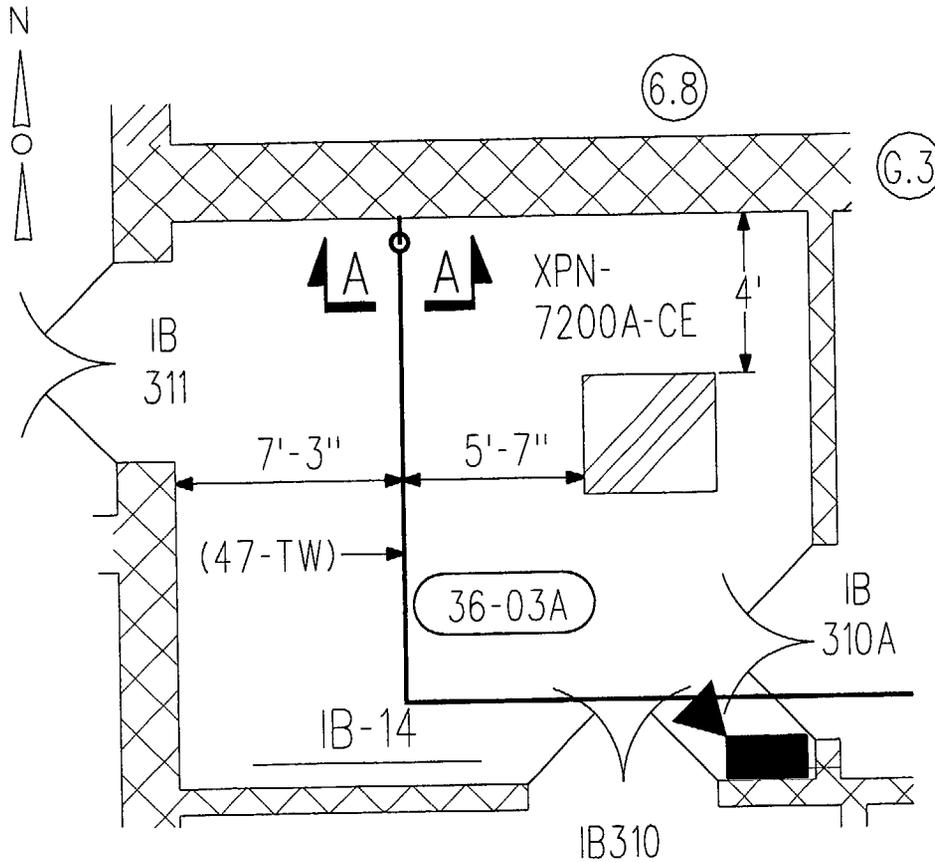
- THIS WRAP IS SURROUNDED BY OTHER WRAPS
- EXPOSED CABLE IS LOCATED NEAR EAST WALL ~22' AWAY
- OTHER CABLING IN CONDUIT.
- TOTAL ROOM FIRE SEVERITY ~9 MINUTES.



SECTION A-A

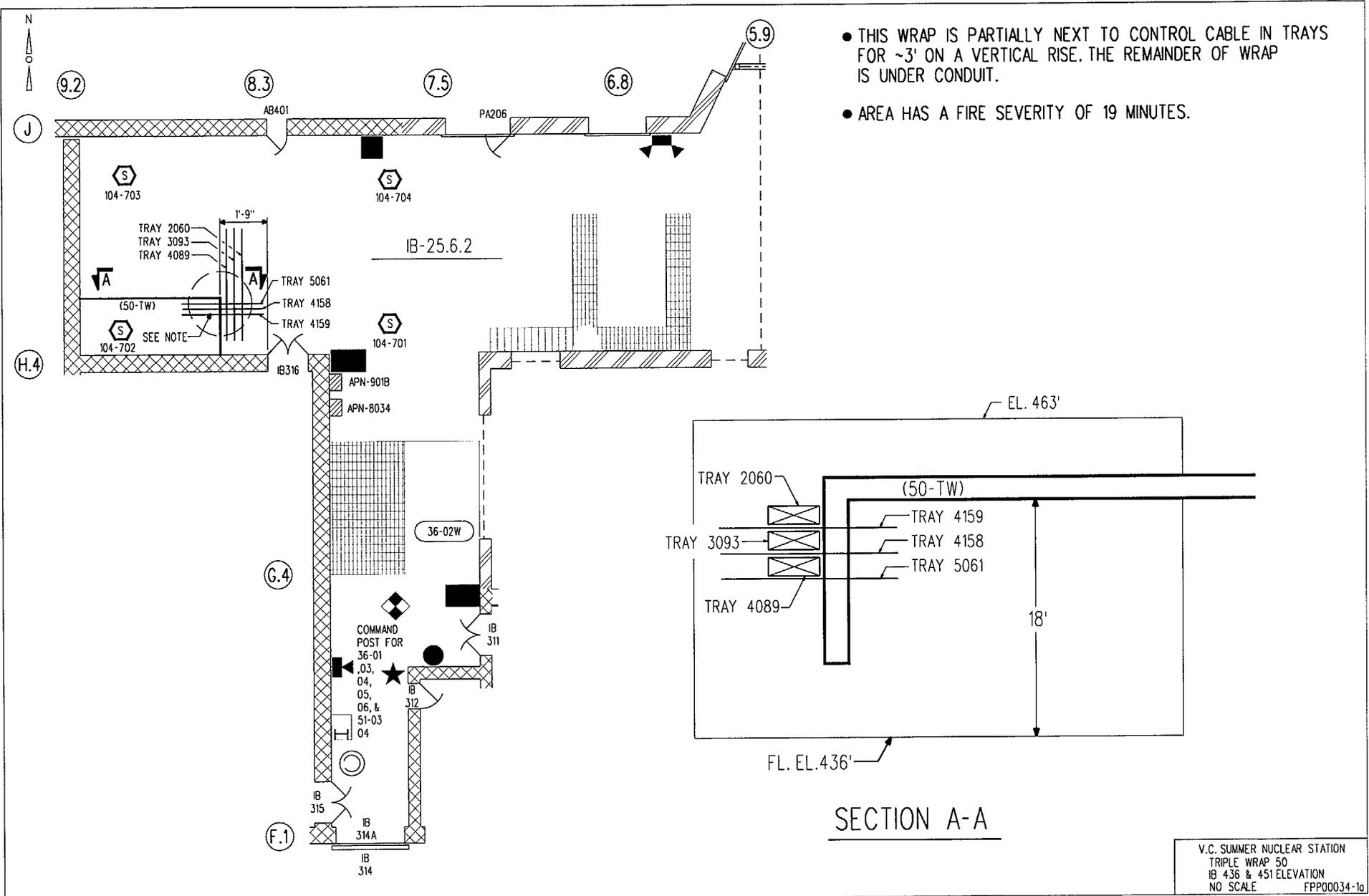
V.C. SUMMER NUCLEAR STATION
 TRIPLE WRAP-45
 IB 412,423,423-6,426 ELEVATION
 NO SCALE FPP00033-1

- TRAYS LOCATED ~8' BELOW WRAP THAT INTERSECT AT RIGHT ANGLES. TWO TRAYS HAVE POWER CABLES & ONE CONTROL CABLES WITH SOME CABLES RISING OUT OF CONTROL TRAY IN A BUNDLE PAST 47-TW TO THE CEILING.

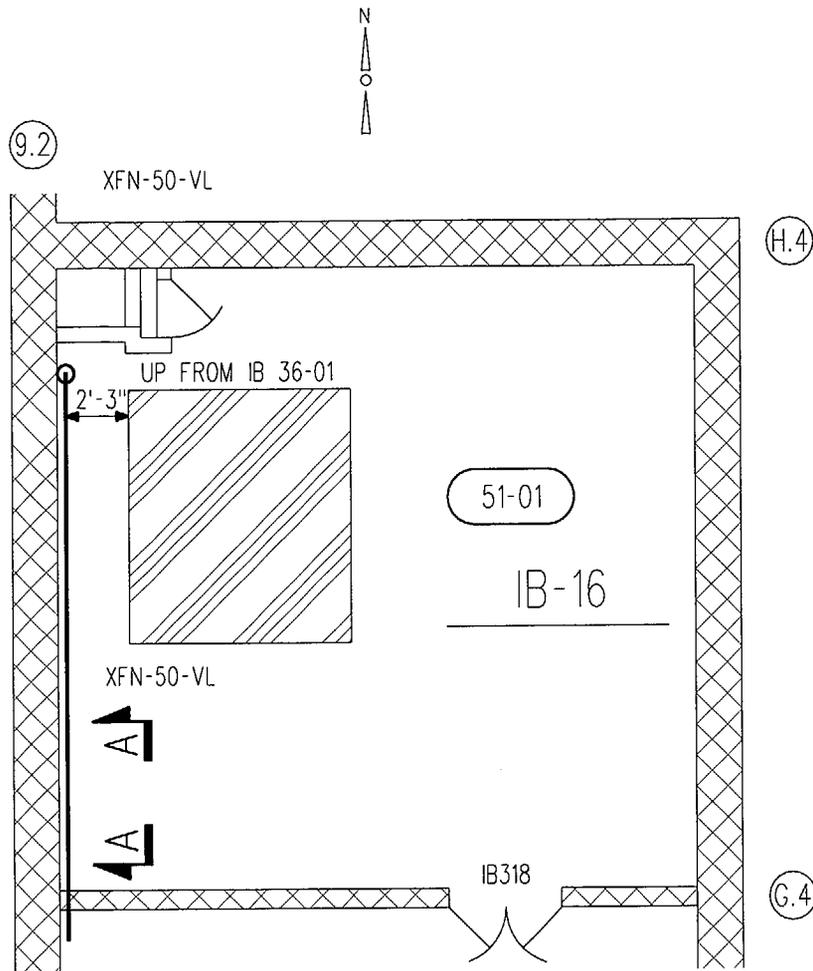


SECTION A-A

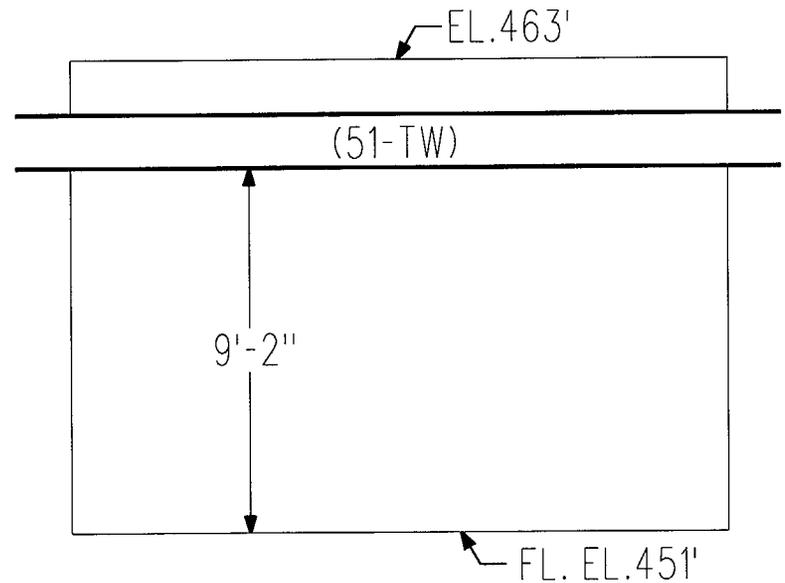
V.C. SUMMER NUCLEAR STATION
 TRIPLE WRAP 47
 IB 436 & 451 ELEVATION
 NO SCALE FPP00034-2a



V.C. SUMMER NUCLEAR STATION
 TRIPLE WRAP 50
 IB 436 & 451 ELEVATION
 NO SCALE FPP00034-1a



- 90% OF THIS WRAP IS SURFACE MOUNTED WITH NO EXPOSED COMBUSTIBLES NEAR THE WRAP.
- TOTAL ROOM FIRE SEVERITY ~ 8 MINUTES & IS ASSOCIATED WITH THE CABLING THAT IS WRAPPED.

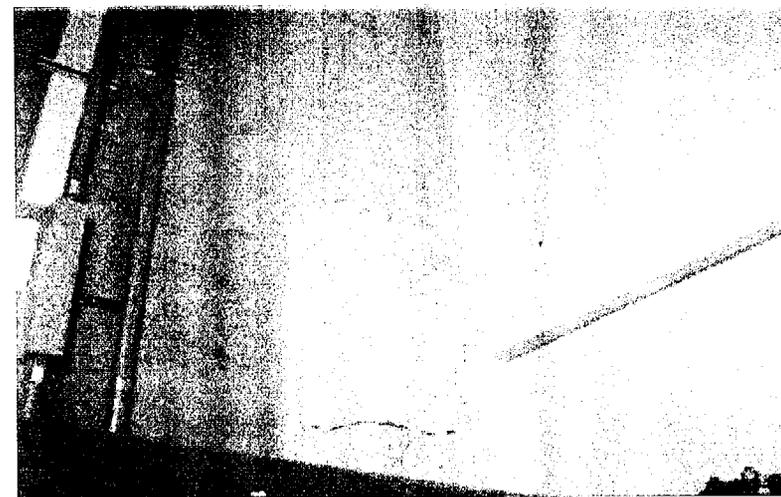
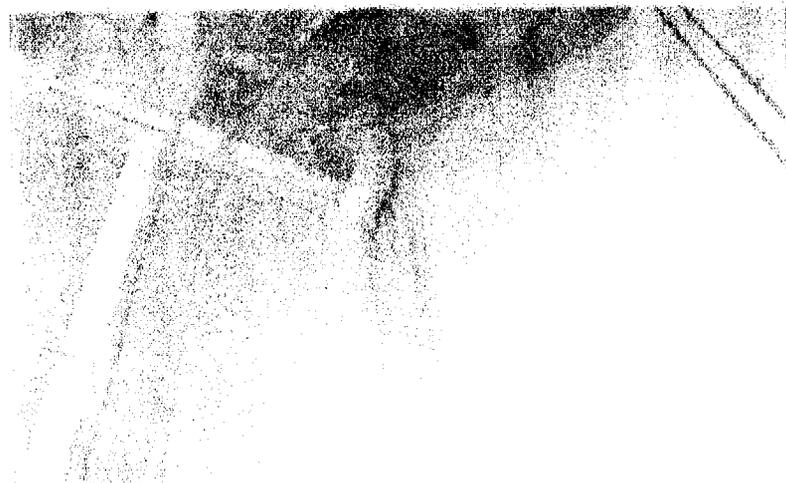


SECTION A-A

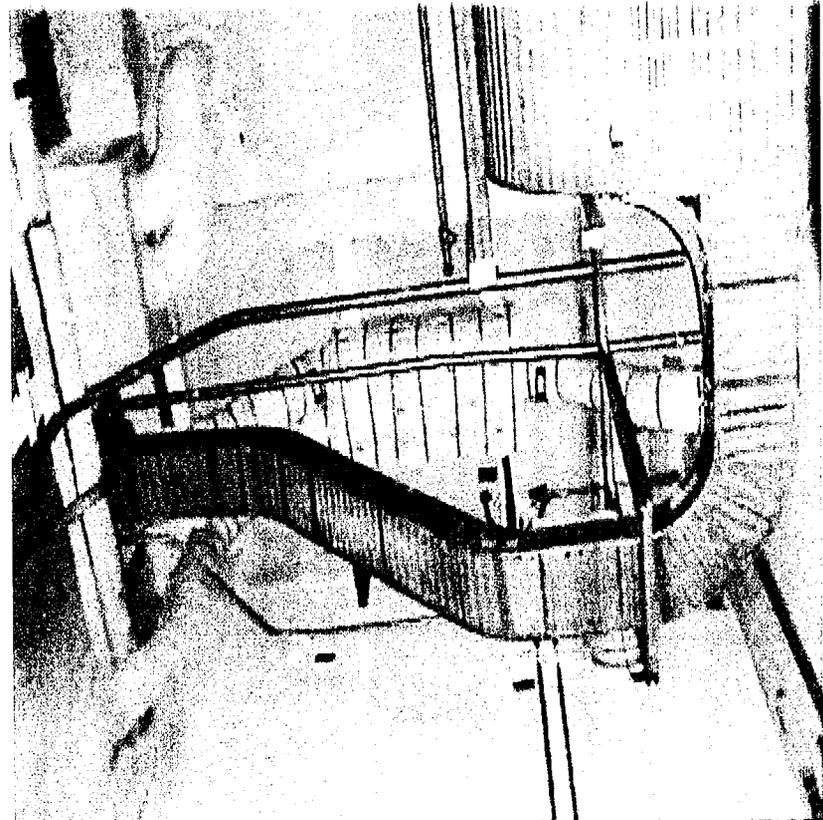
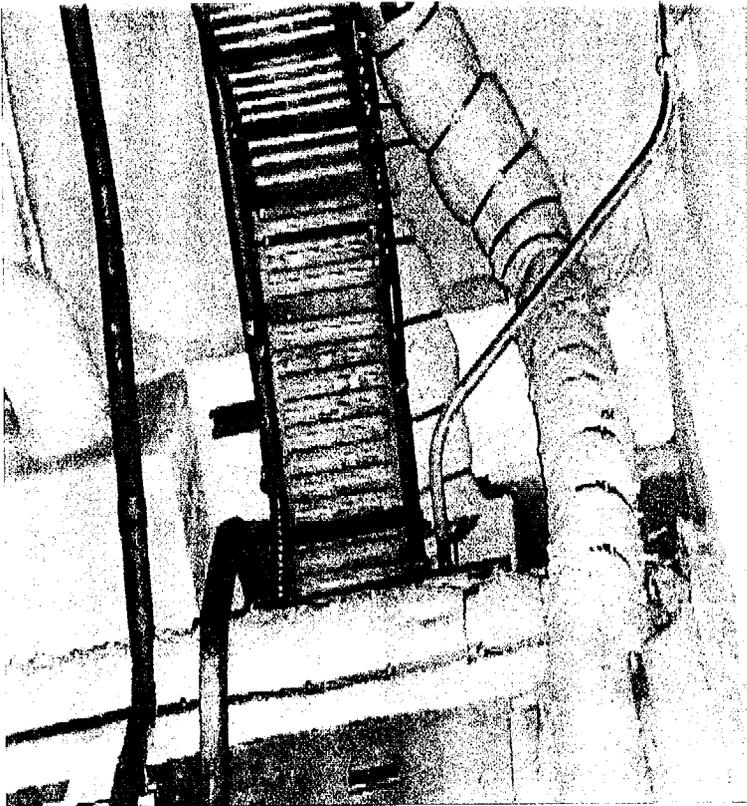
INTERMEDIATE BLDG ELEVATION 451'

V.C. SUMMER NUCLEAR STATION
 TRIPLE WRAP 51
 IB 436 & 451 ELEVATION
 NO SCALE FPP00034-3

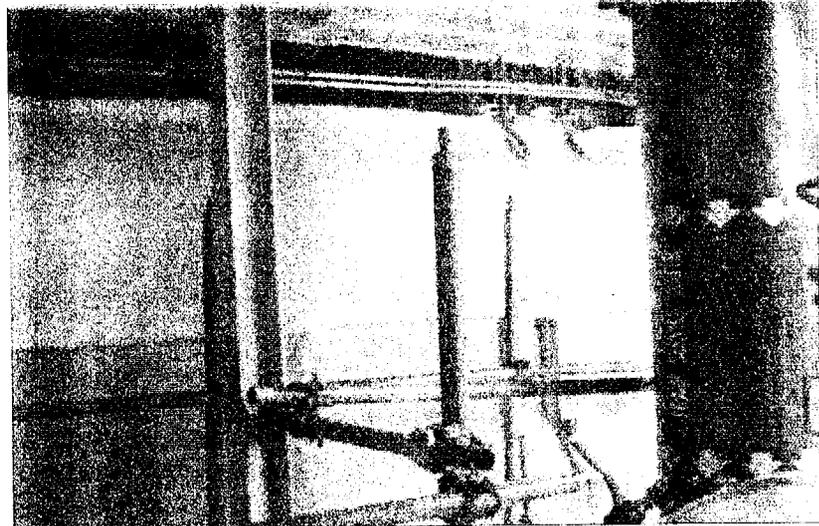
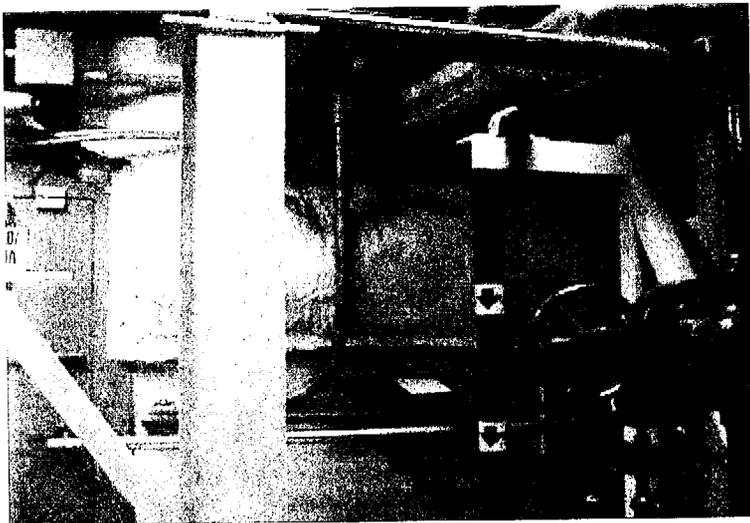
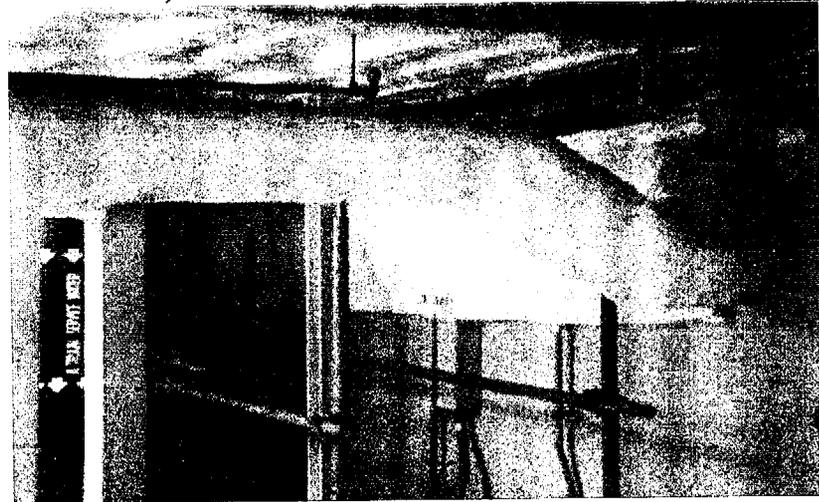
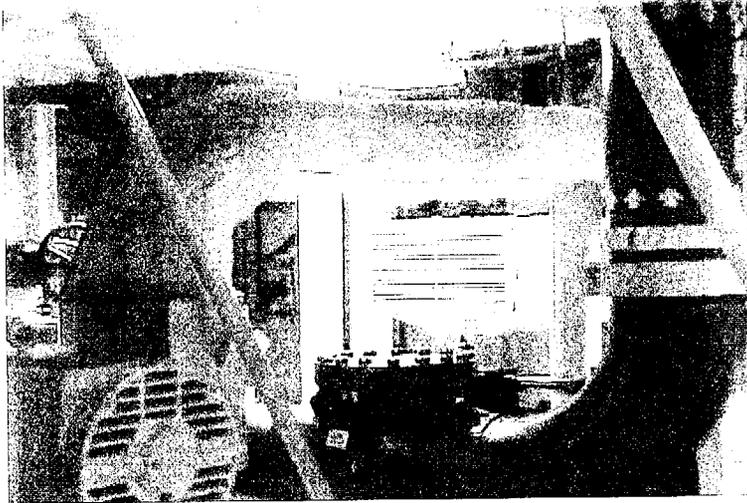
29-TW (Floor - Ceiling in rm. CB36-04, view clockwise starting at upper left corner)



29-TW (E. Wall - W. Wall in rm. CB36-04, view from left - right)



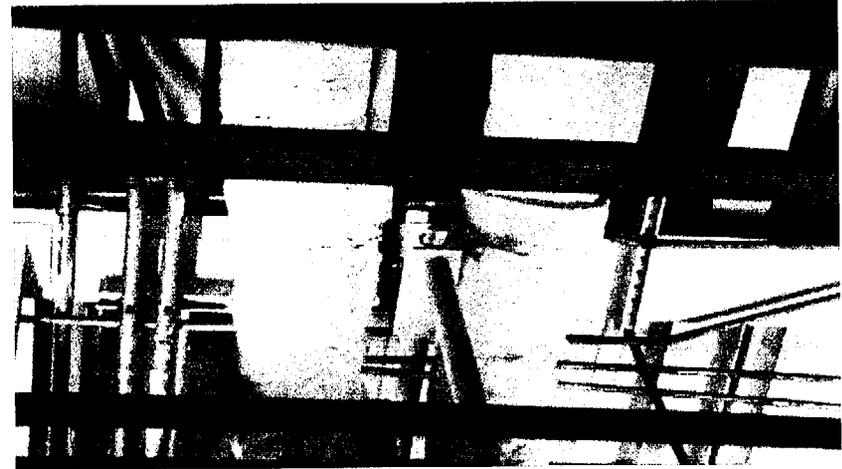
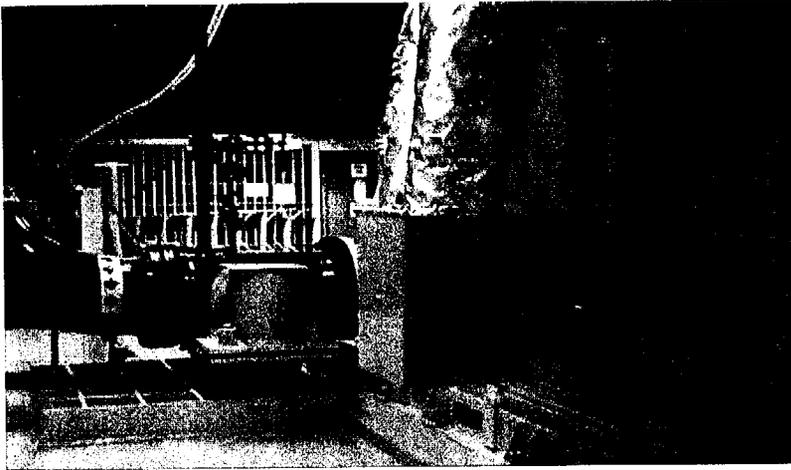
34-TW (XPP45A-SW - N. Wall in rm. IB12-02W, view clockwise starting at upper left corner)



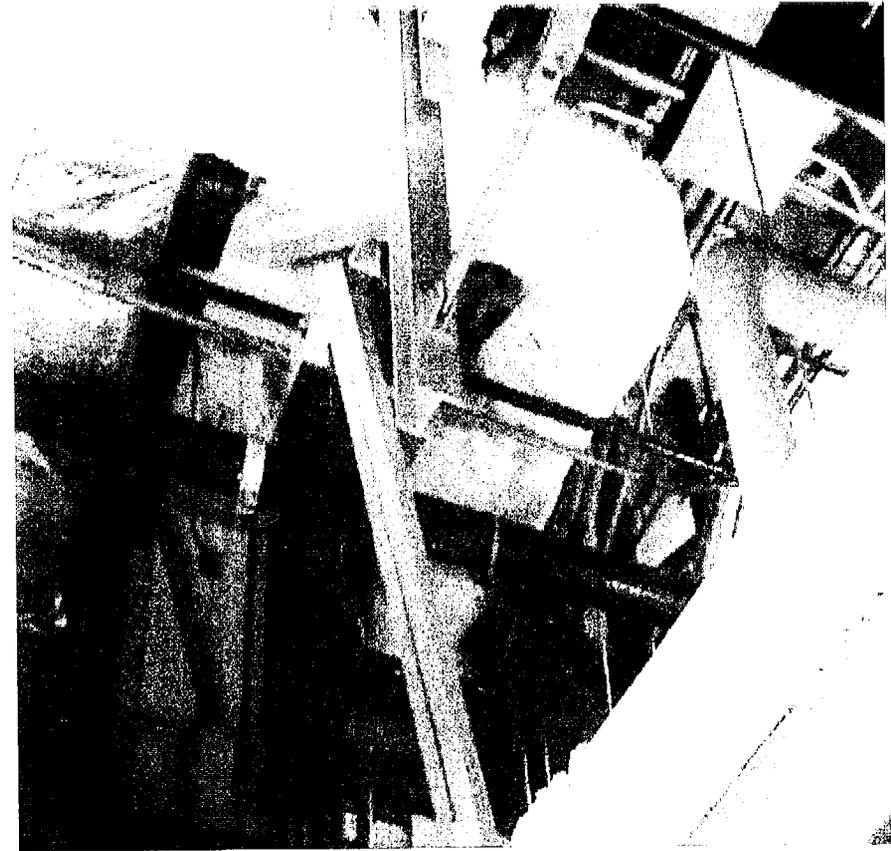
34-TW (W. Wall - S. Wall in rm. IB12-02W, view left - right)



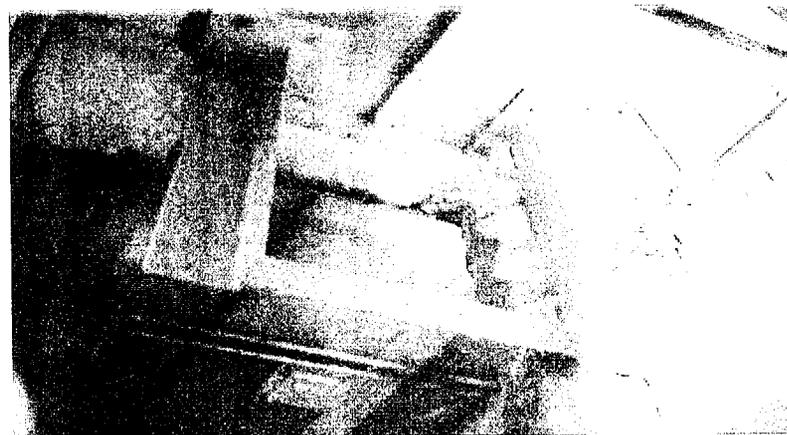
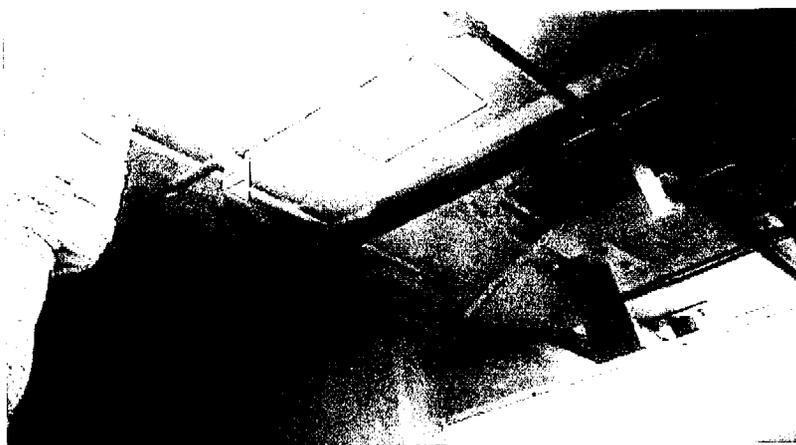
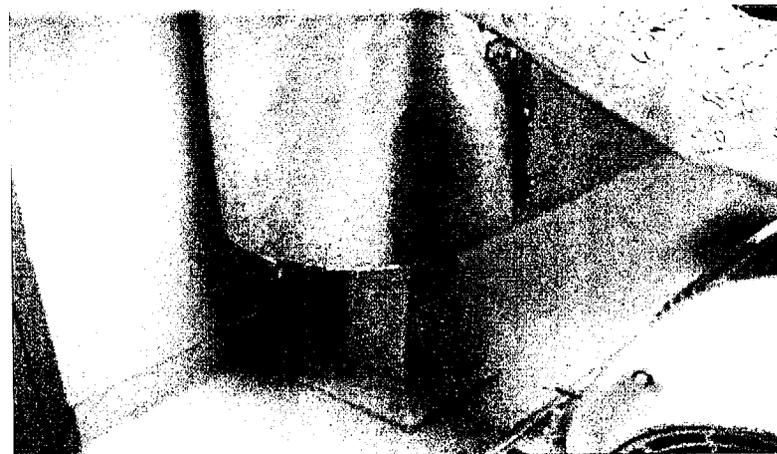
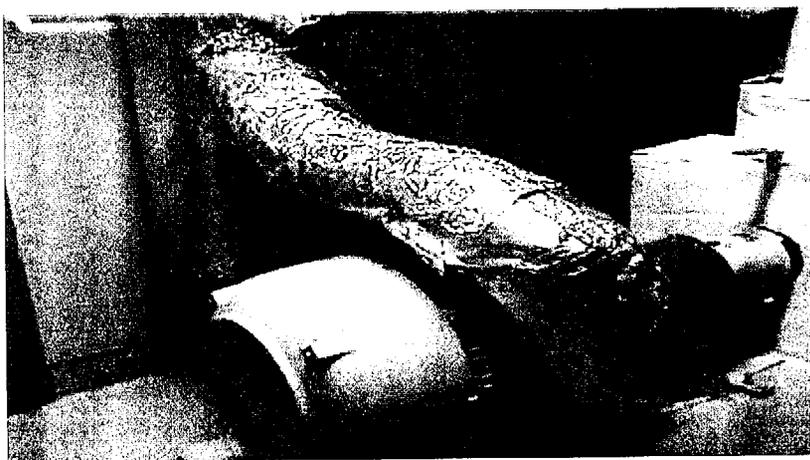
38-TW (XPP1C-CC - Ceiling of rm. IB12-02, view clockwise starting at upper left corner)



38-TW (Ceiling - S. Wall of rm. IB12-02, view from left - right)

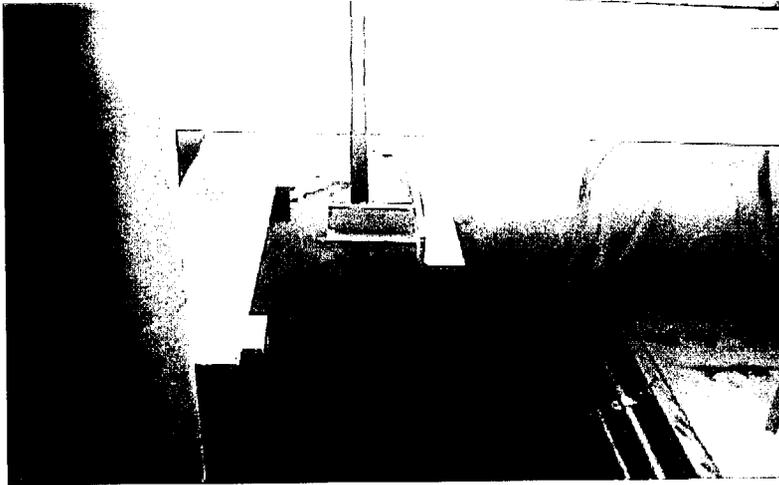
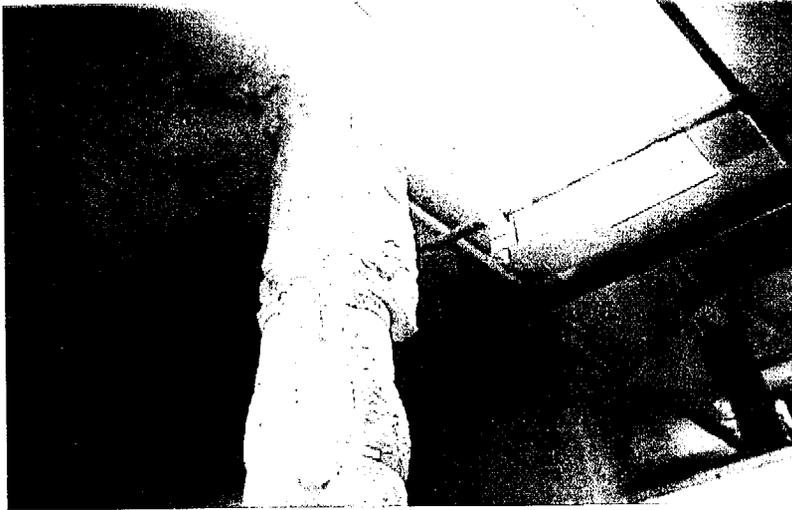


40-TW (XPP48B-VU - Ceiling in rm. IB12-13, view clockwise starting at upper left corner)



40-TW

(VUL34B is wrapped from Ceiling in rm IB12-13 -
Ceiling in rm. IB12- 13B,view clockwise starting at
upper left corner)



40-TW (VUL52C is wrapped from ceiling - W.Wall in rm. IB12-13C)



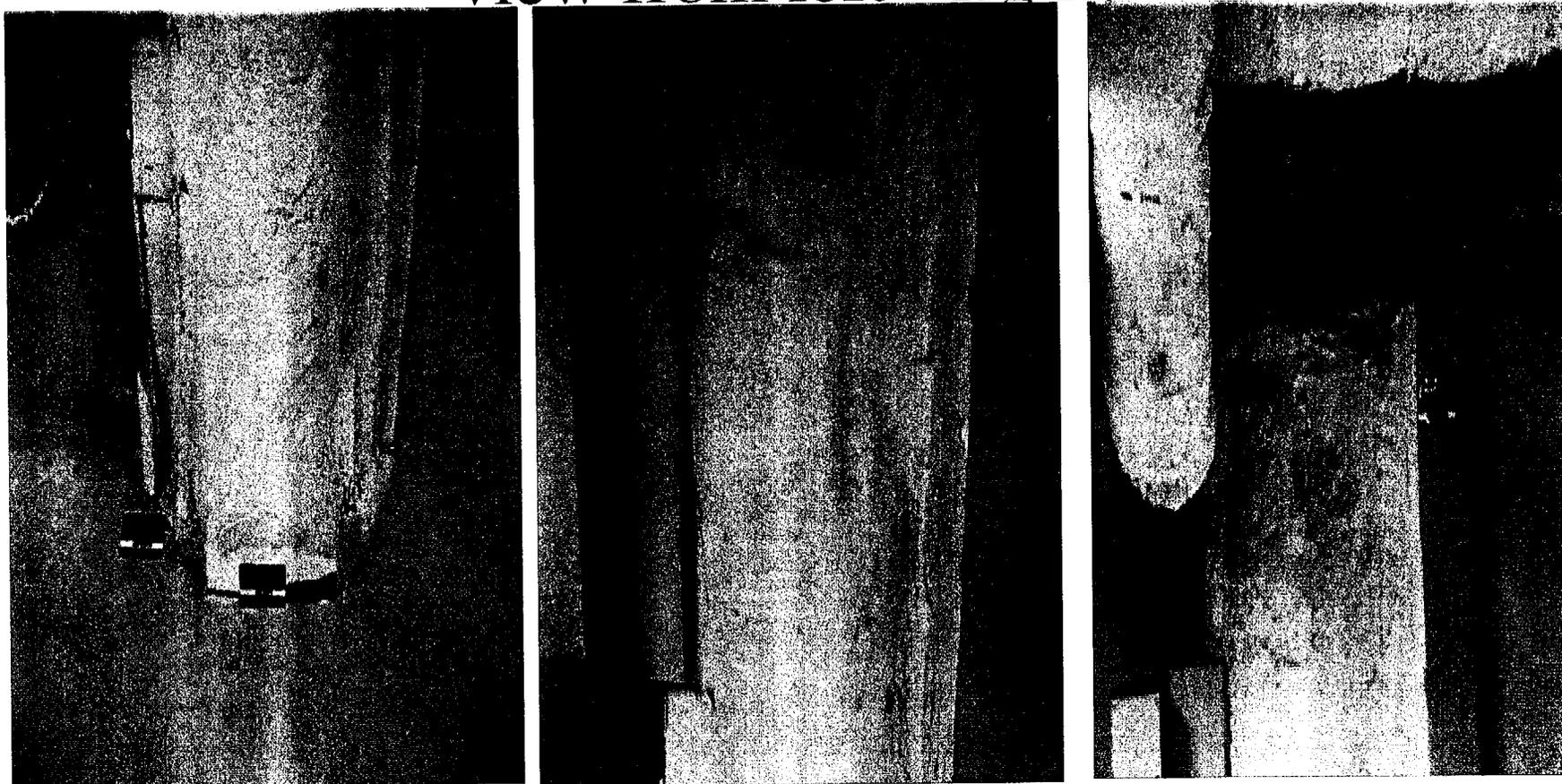
41-TW (E. Wall - Ceiling in rm. IB26-01, view from left - right)



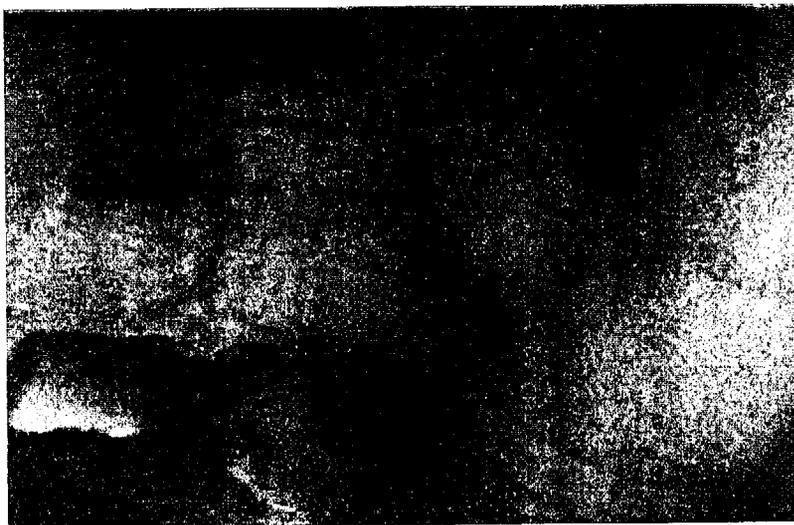
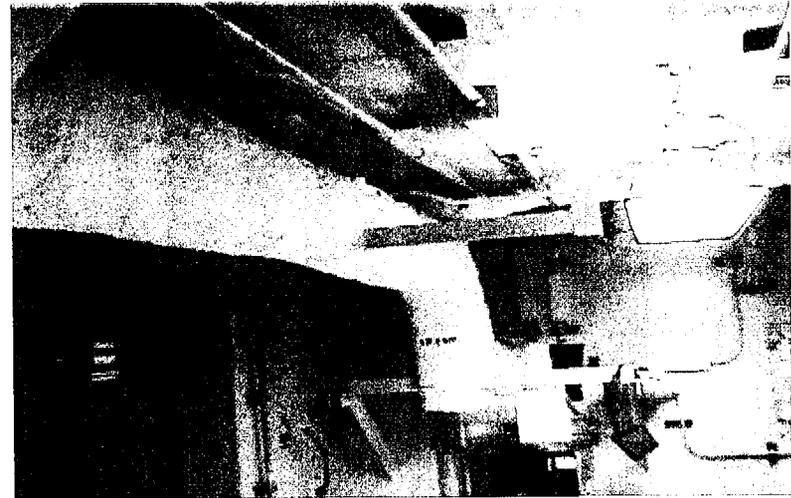
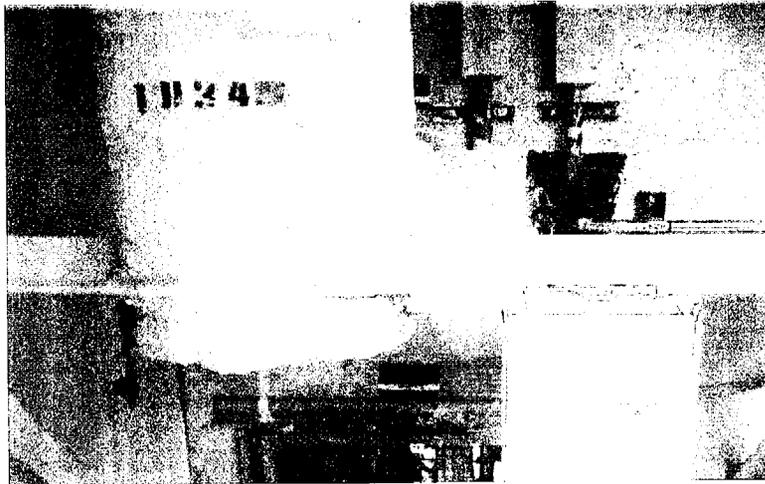
42-TW (W.Wall - Ceiling in rm. IB26-02)



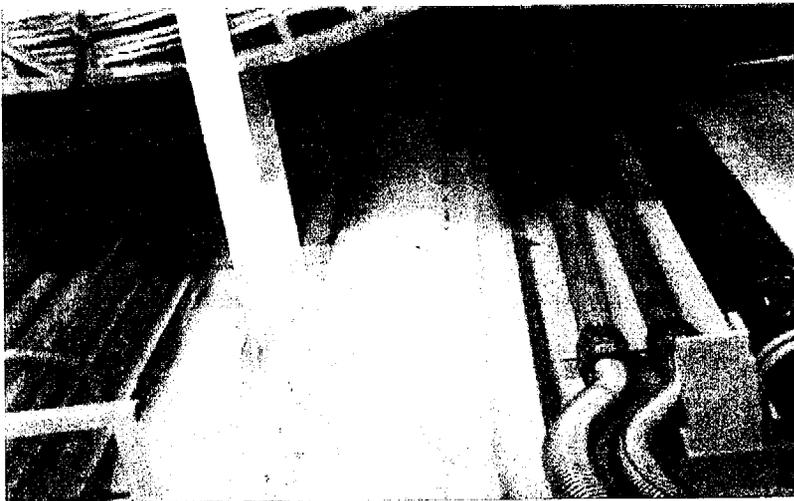
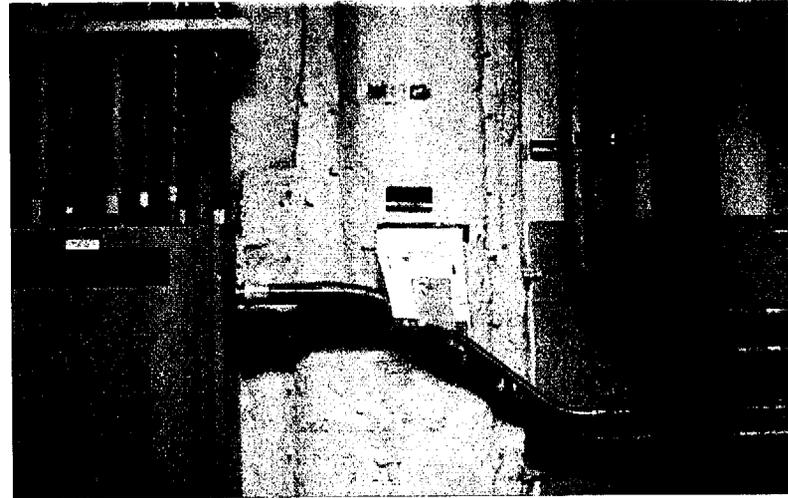
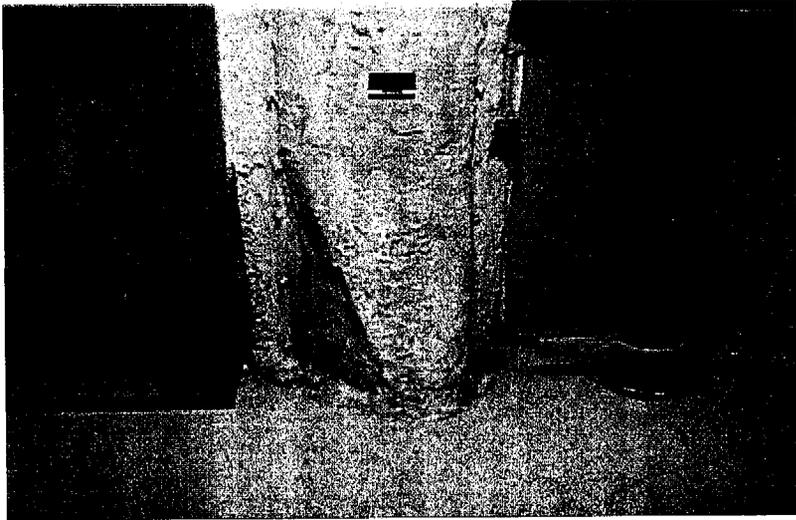
44-TW (Floor - W. Wall in rm. IB26-02, view from left - right)



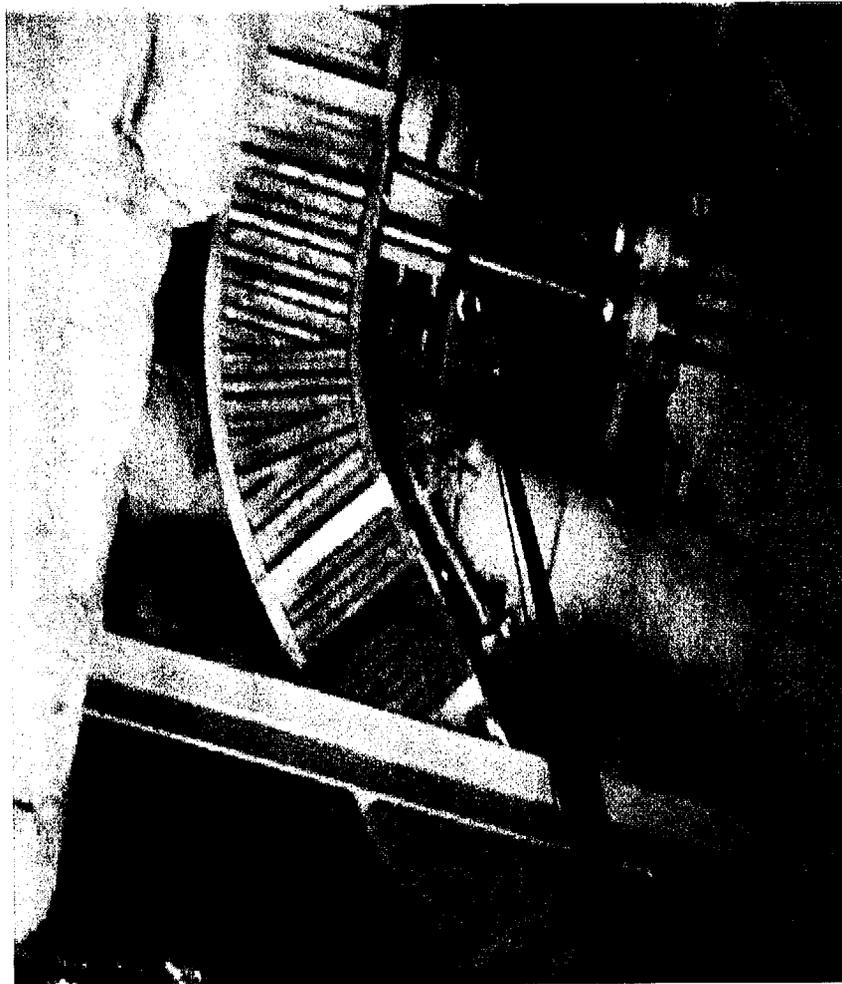
45-TW (N. Wall in rm. IB23-02, view clockwise starting at upper left corner)



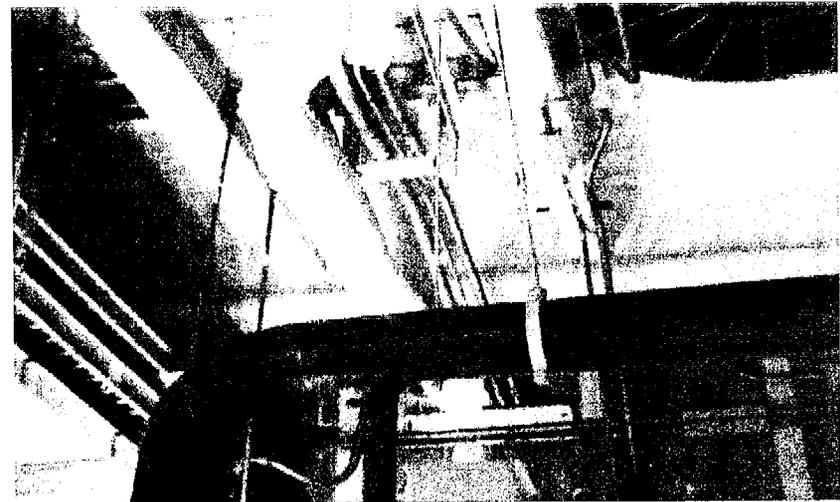
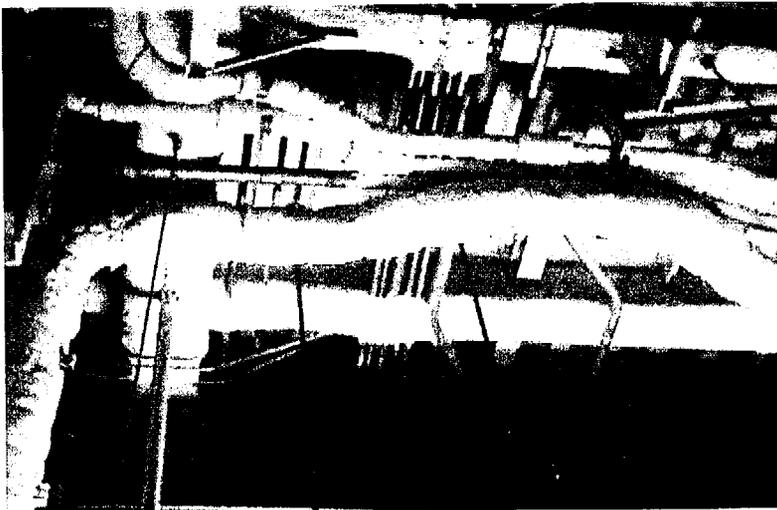
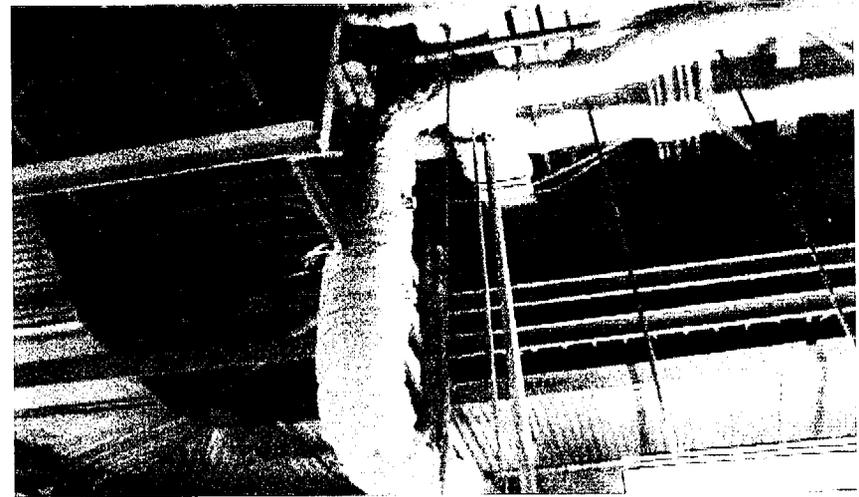
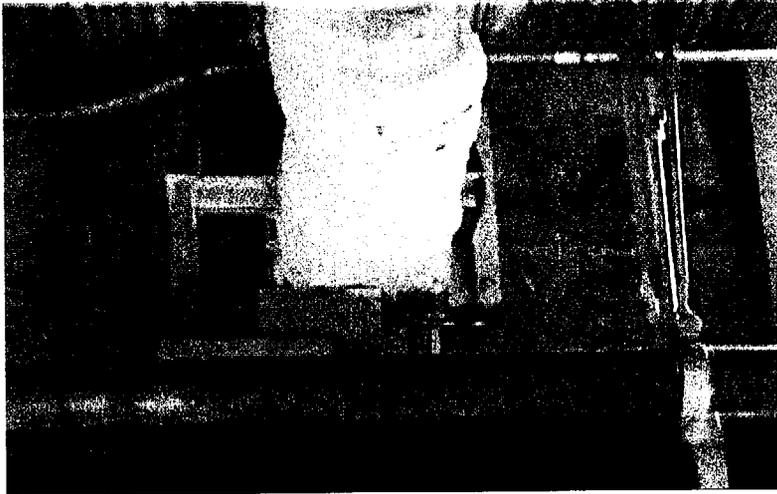
47-TW (Floor - Ceiling in rm. IB36-03A, view clockwise starting at upper left corner)



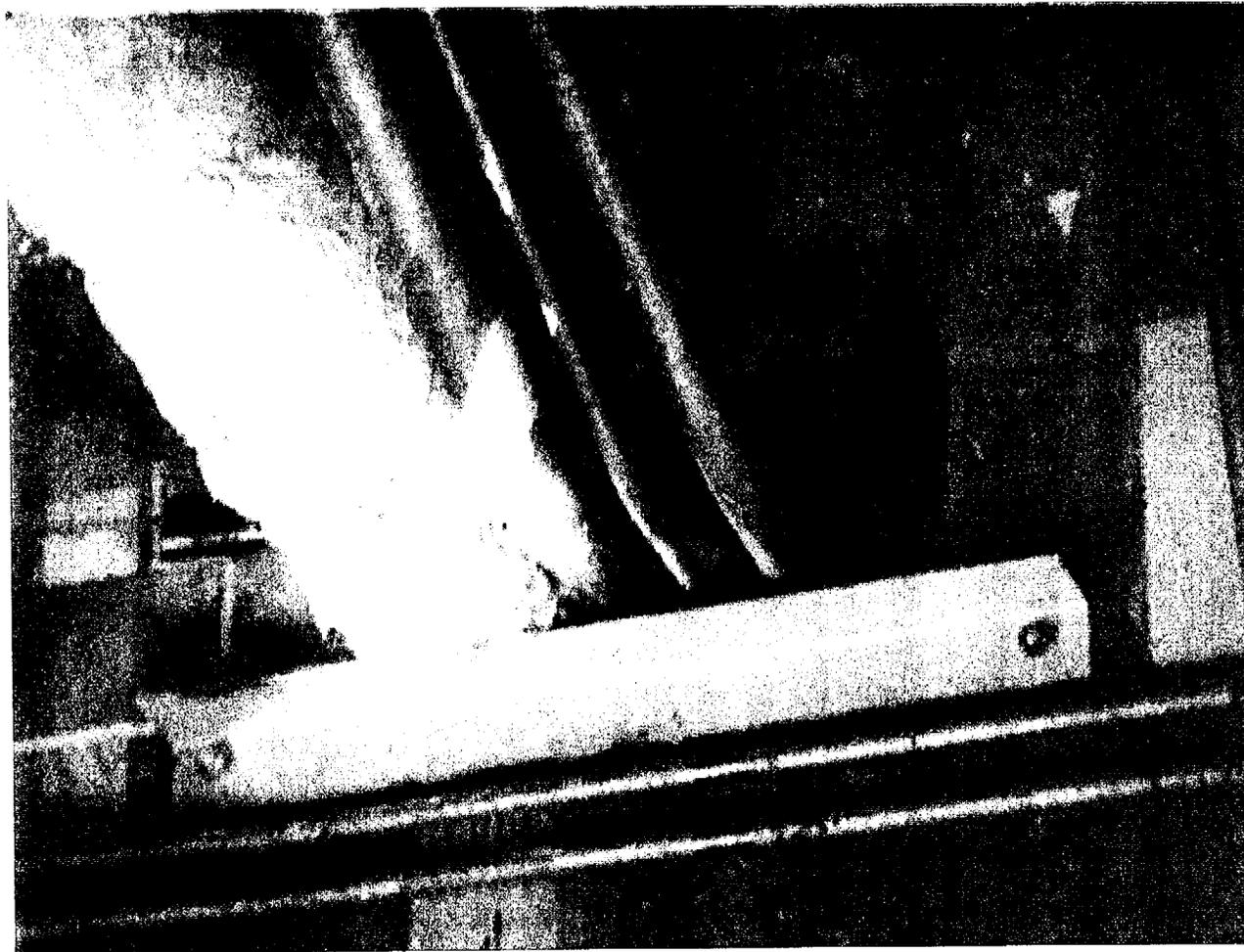
47-TW (Ceiling in rm. IB36-03A, view left - right)



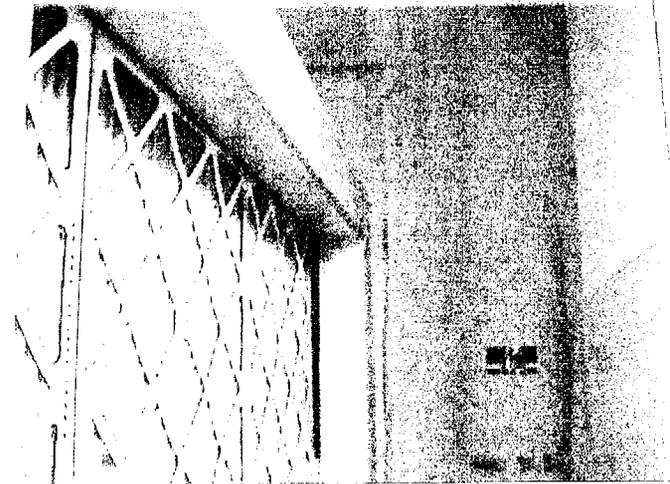
50-TW (N. Wall - W. Wall in rm. IB36-02S, view clockwise starting at upper left corner)



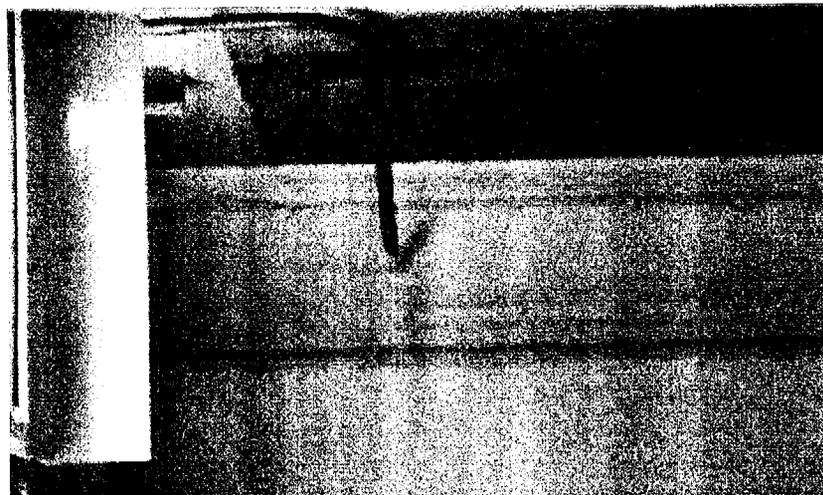
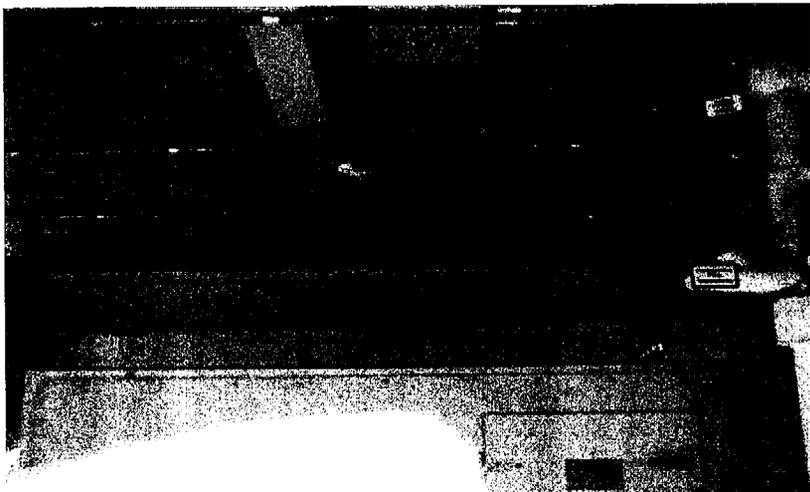
50-TW (W. Wall in rm. IB36-02S)



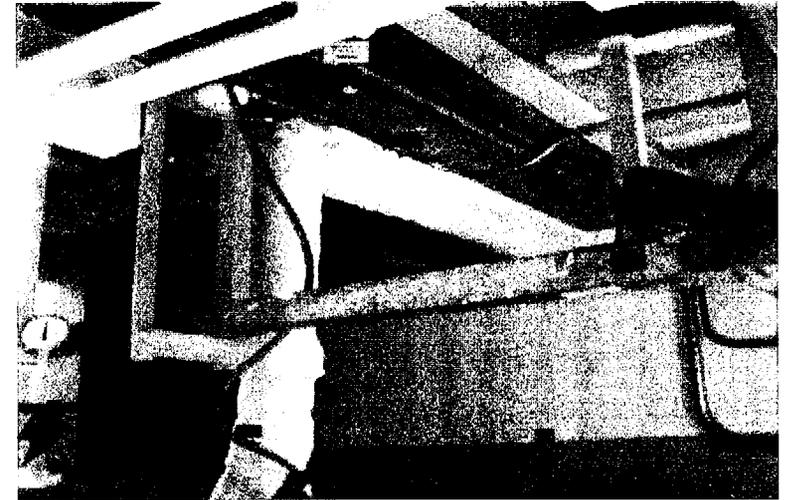
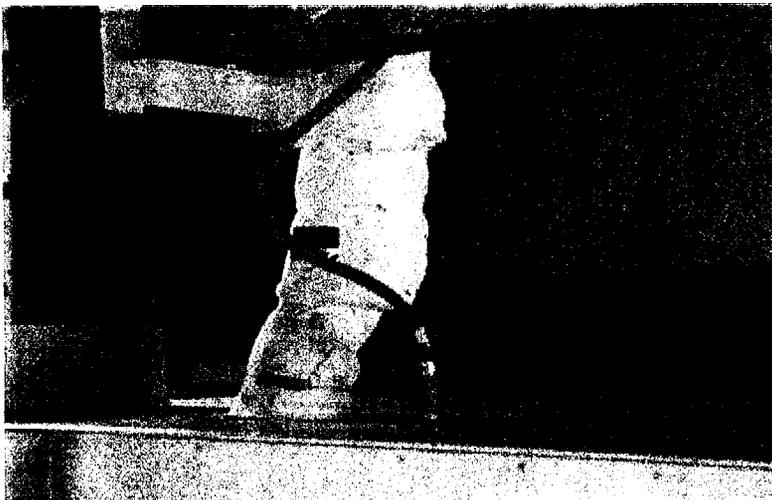
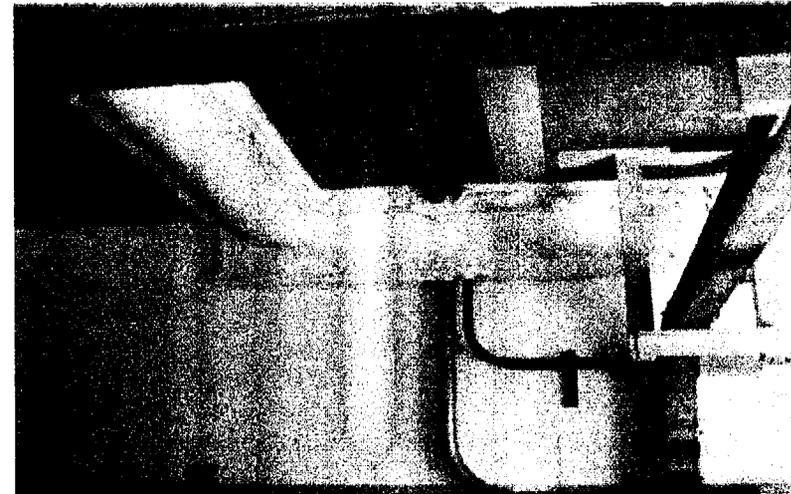
51-TW (Floor -W. Wall in rm. IB51-01, view clockwise starting at upper left corner)



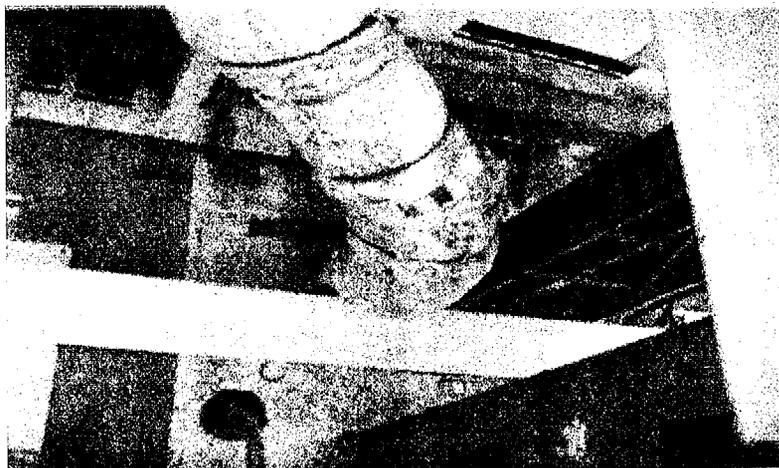
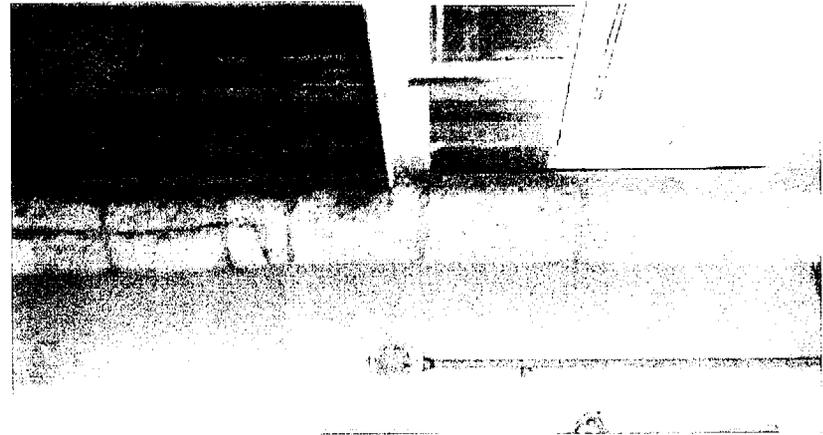
51-TW (W.Wall -N.Wall in rm. IB51-01 & IB51-02, view clockwise starting at upper left corner)



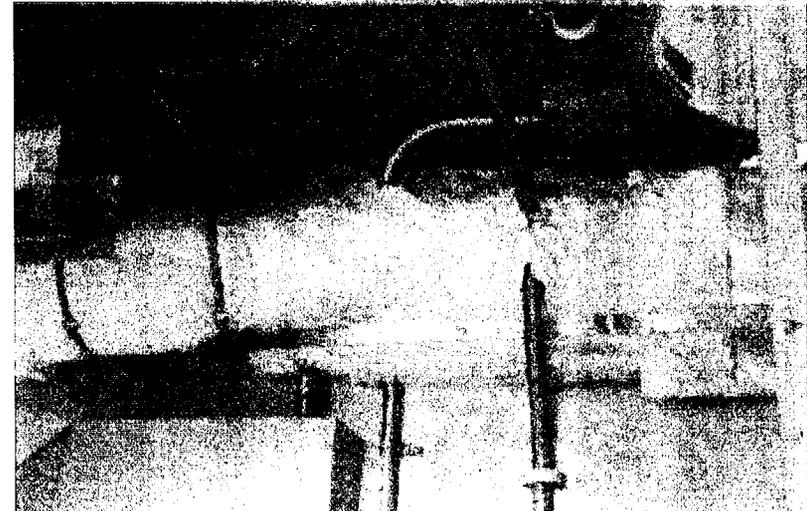
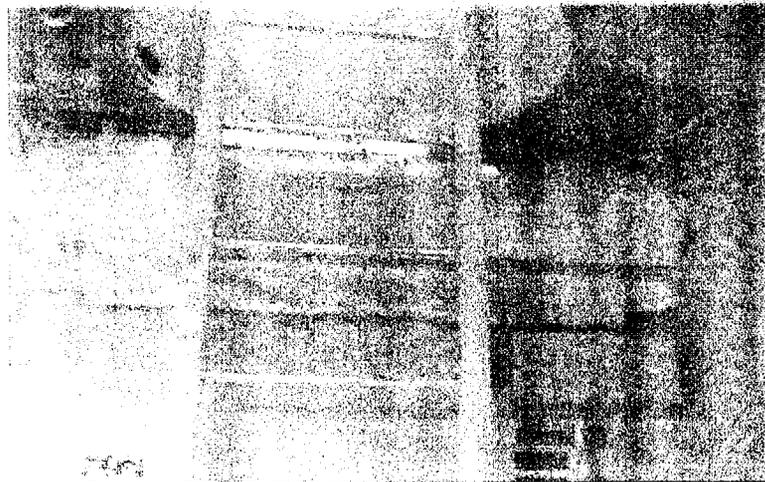
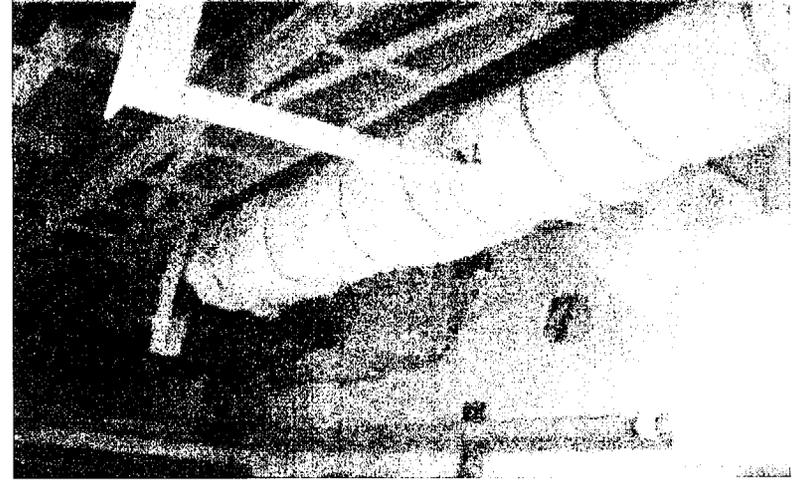
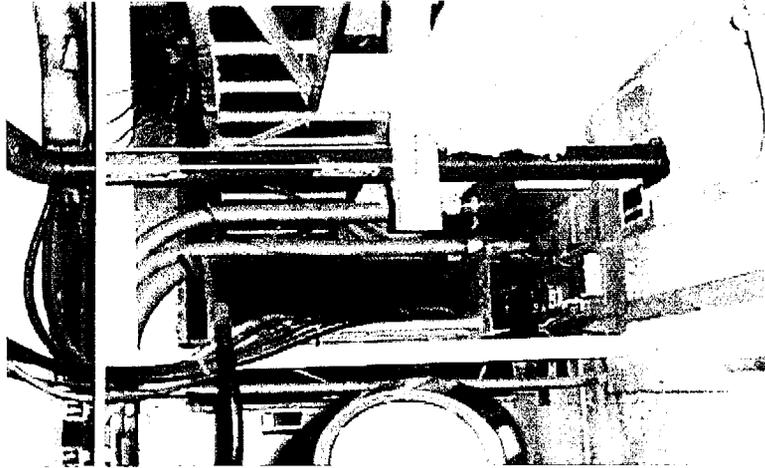
51-TW (N.Wall - XFN76-VL in rm. IB51-02, view clockwise starting at upper left corner)



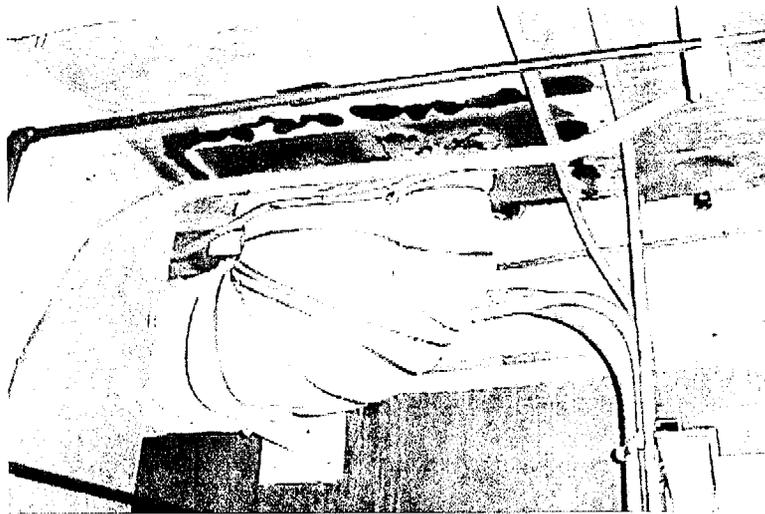
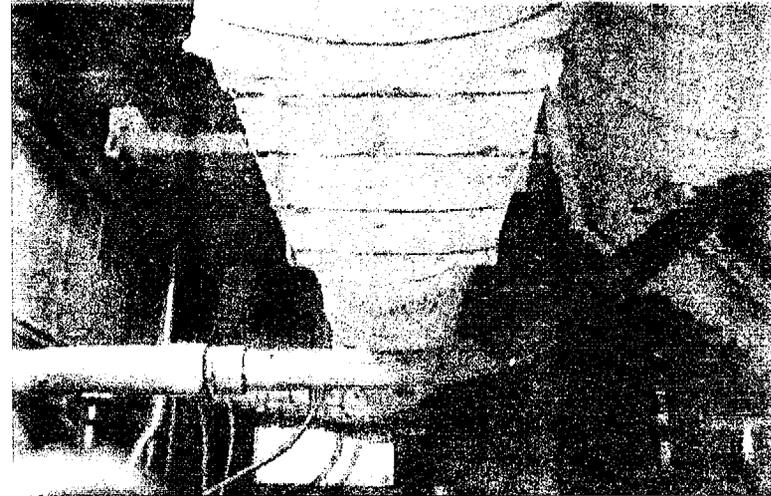
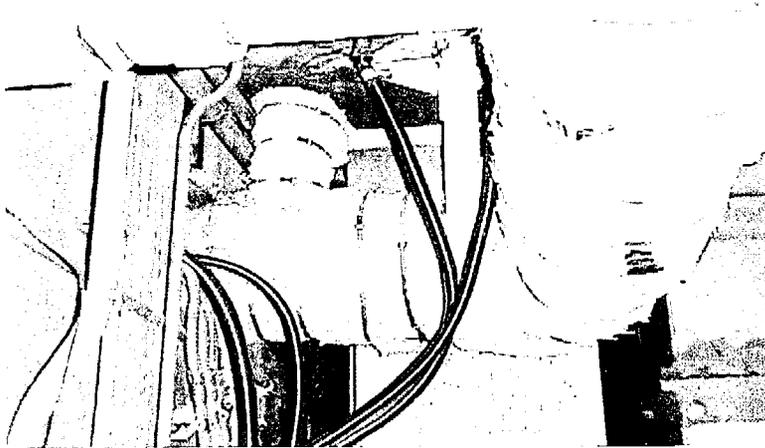
3-TW (W. Wall of SWPH 25-05 to N. Wall of SWPH 25-05 , view clockwise starting at upper left corner)



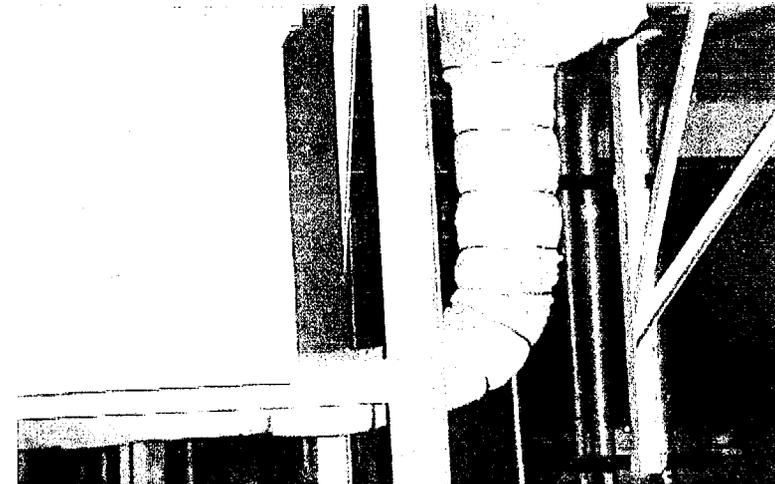
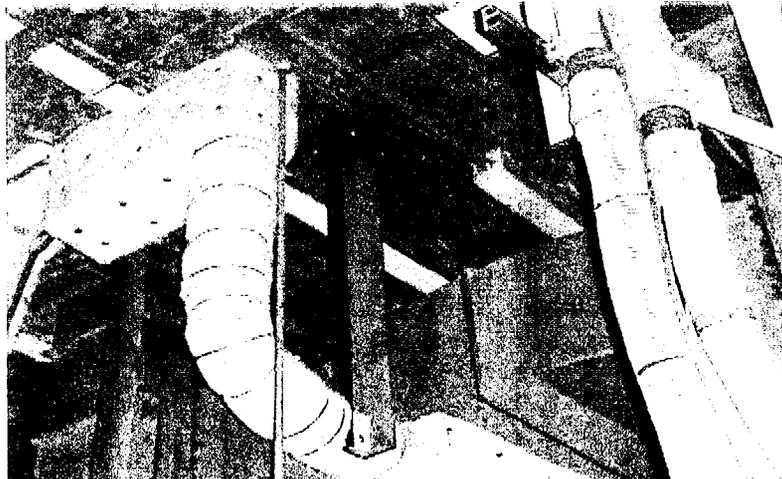
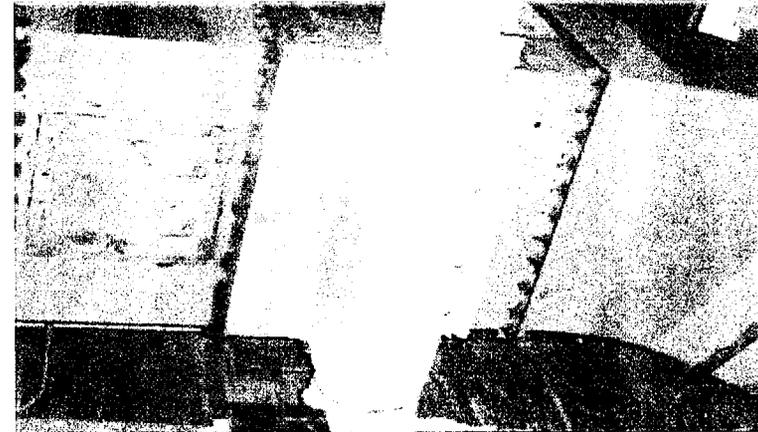
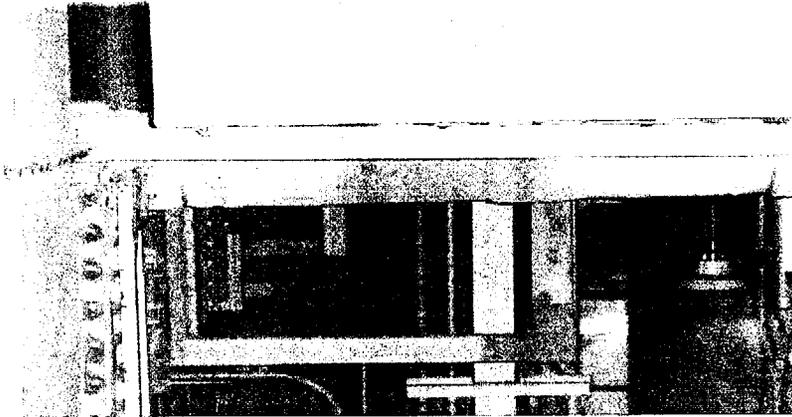
3-TW (W. Wall to E. Wall of SWPH 25-03, view clockwise starting at upper left corner)



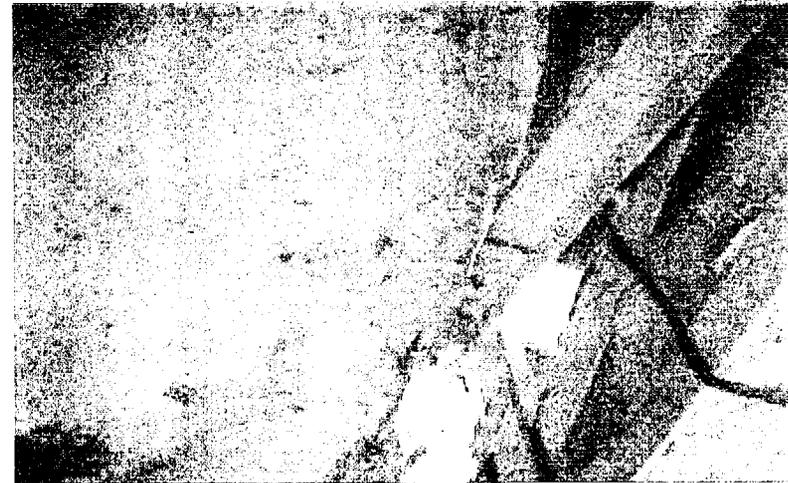
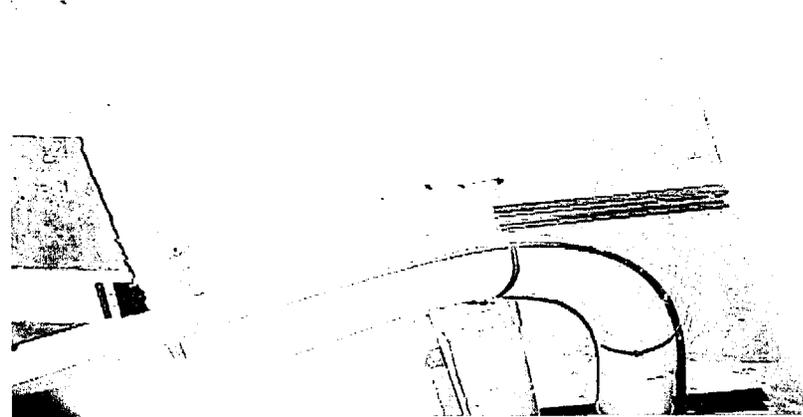
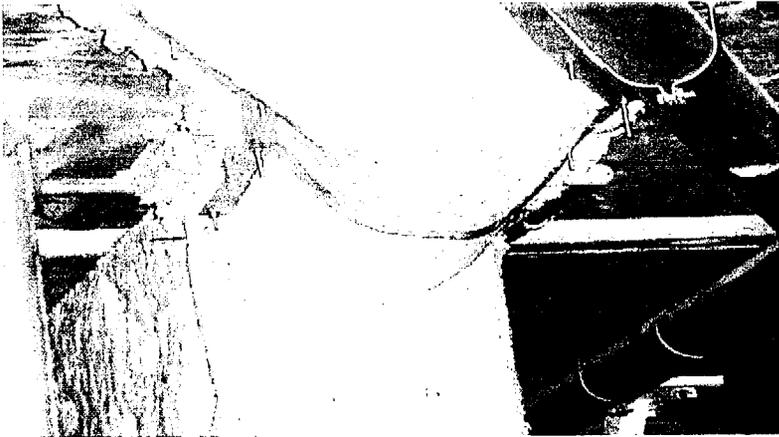
5-TW (W. Wall of rm. AB88-13 - Ceiling of rm. AB00-02, view clockwise, starting at upper left corner)



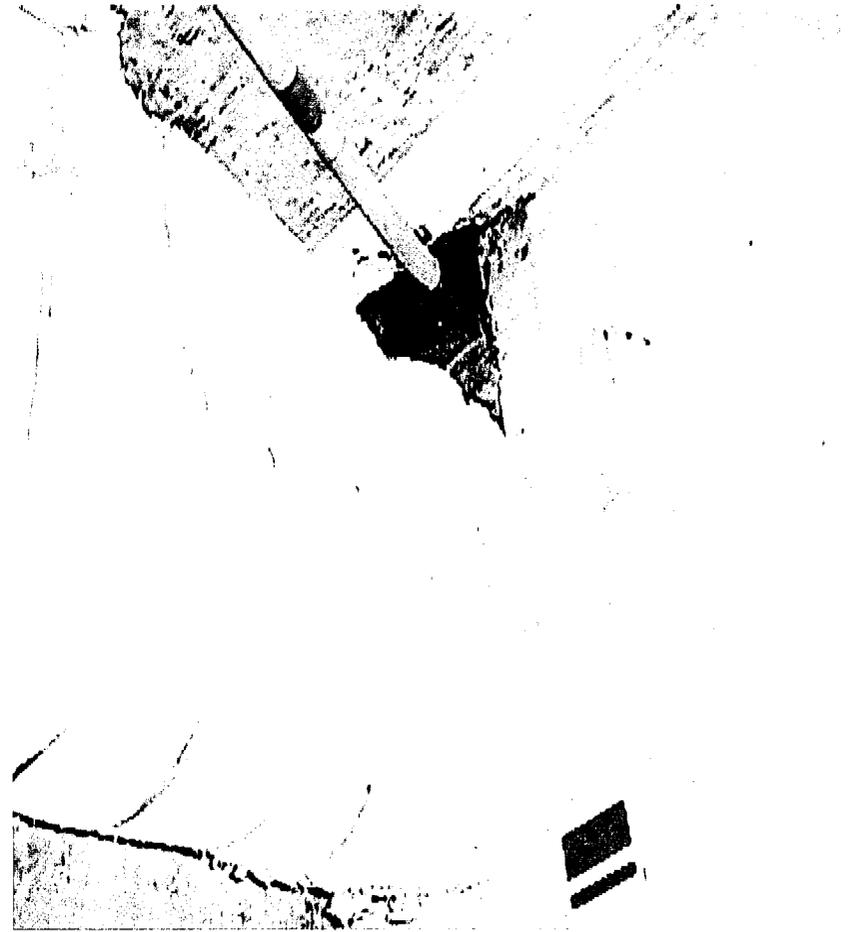
6-TW (W.Wall - Pull Box of rm. AB88-13, view clockwise starting at upper left corner)



6-TW (Pull Box in AB88-13 - Metal Pipe in AB00-02, view clockwise starting at the upper left corner)



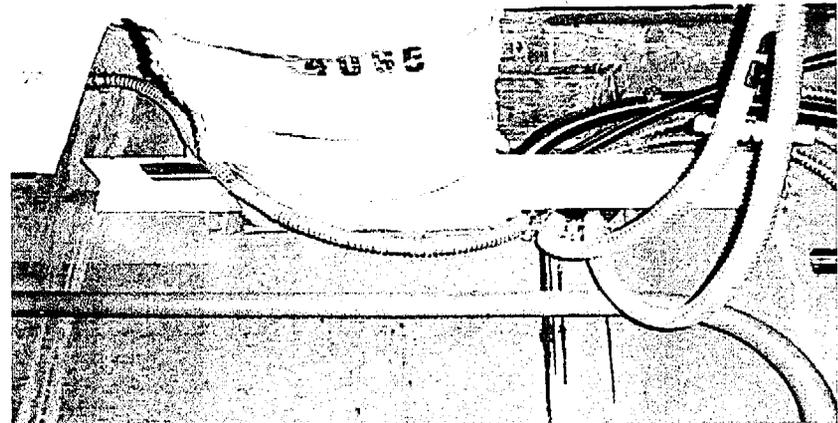
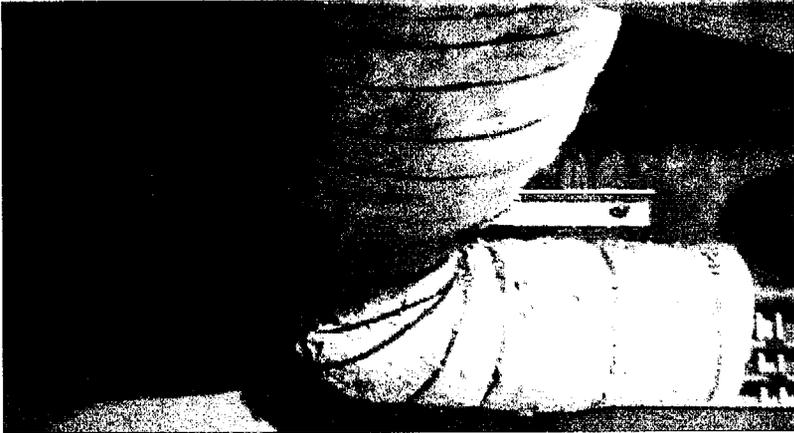
6-TW (Conduits -Tray-S. Wall in rm. AB00-02E, view from left - right)



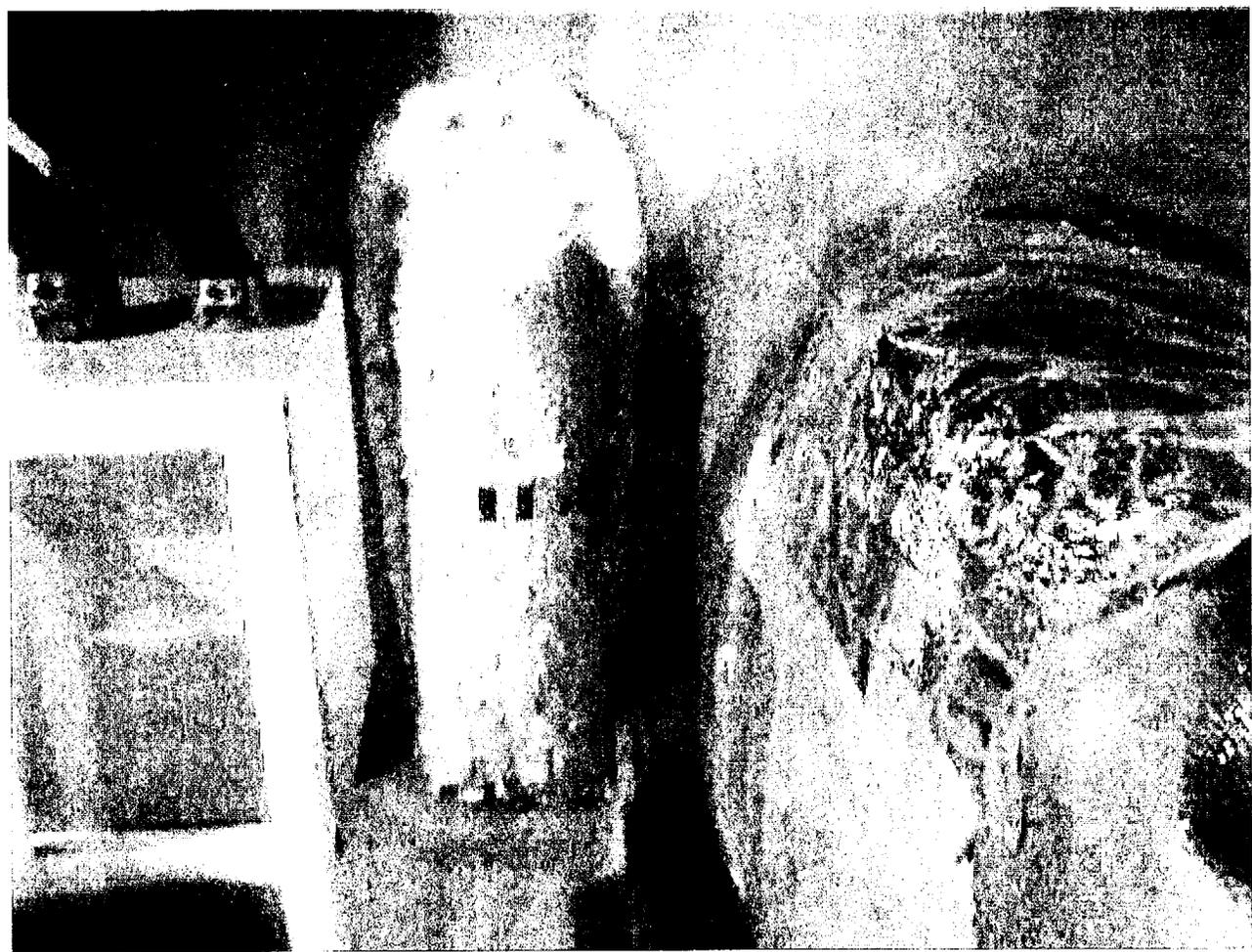
7-TW (Block-out in floor - Block-out in ceiling in rm. AB00-02E, view from left - right)



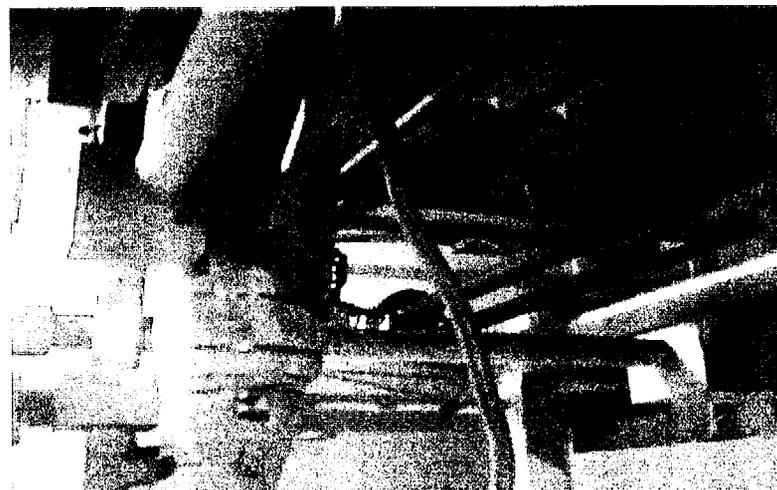
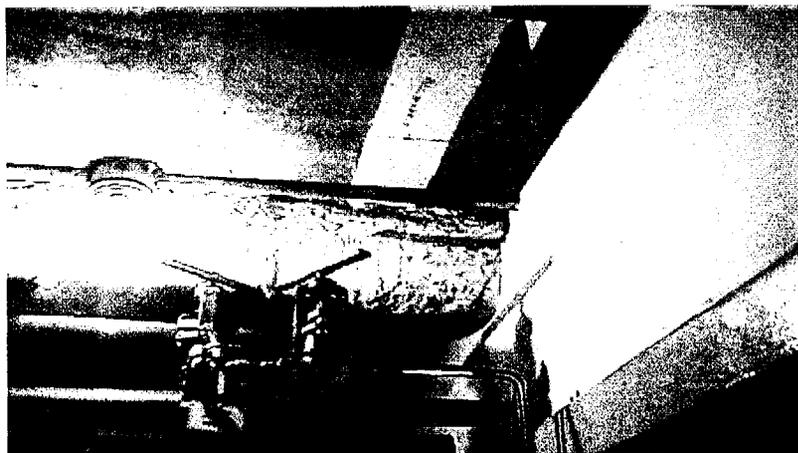
8-TW (W. Wall-E. Wall-Fan in rm. AB00-02E, view clockwise starting at upper left corner)



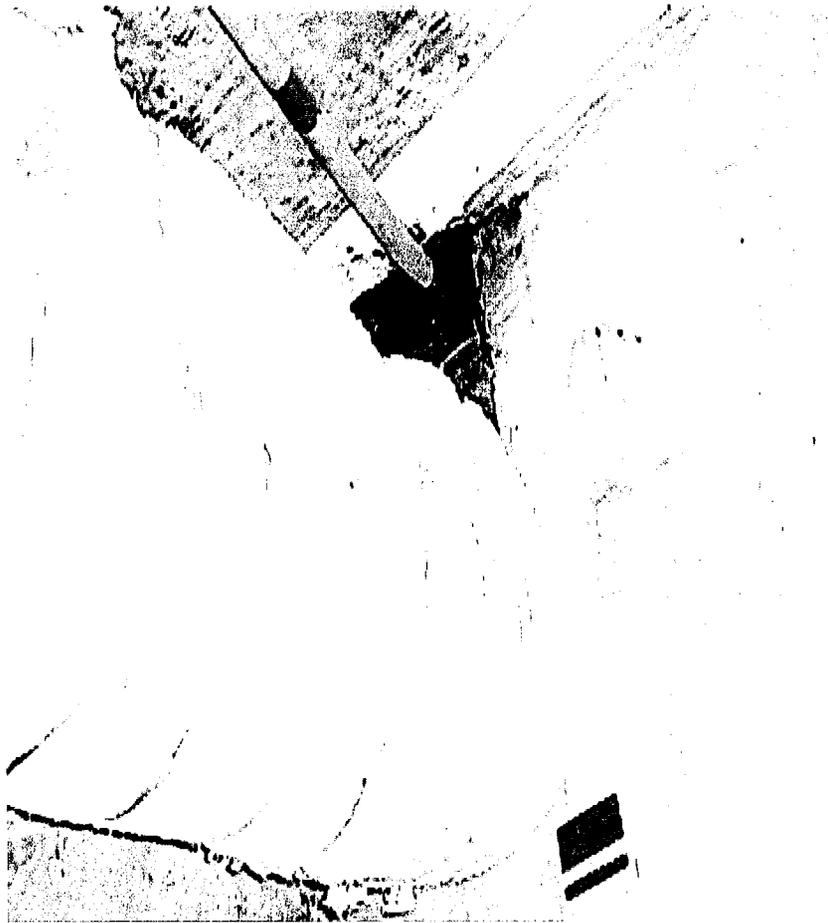
9-TW (Floor - E. Wall in rm. AB00-02E)



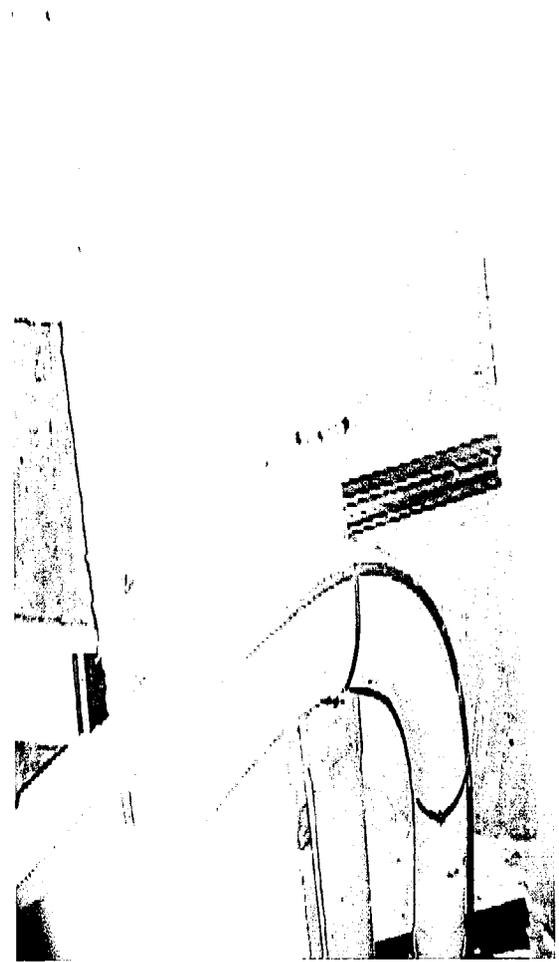
10-TW (S. Wall - Fan in rm. AB00-02E, view clockwise starting at upper left corner)



11-TW (S. Wall -Tray- Conduits in rm. AB00-02E, view from left - right)

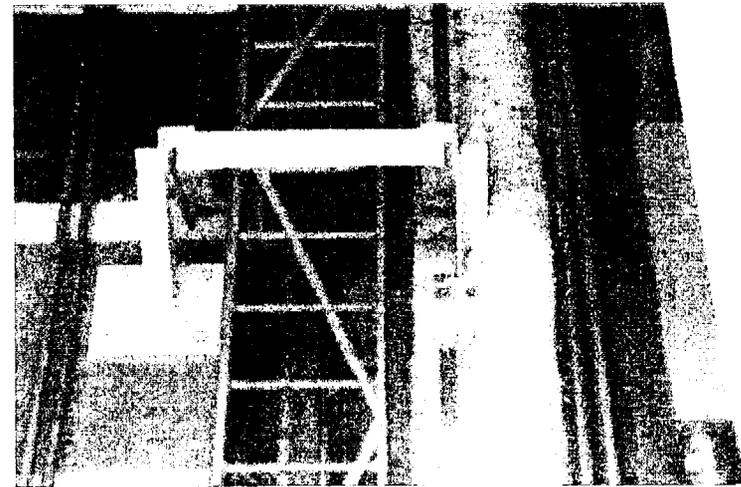
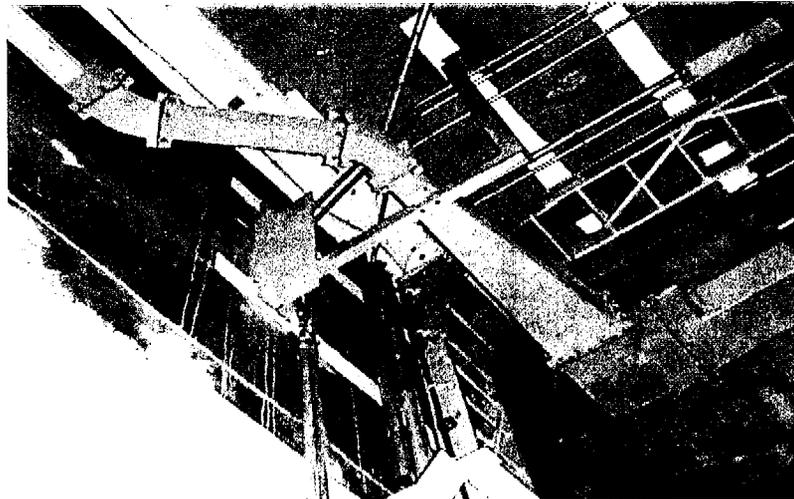
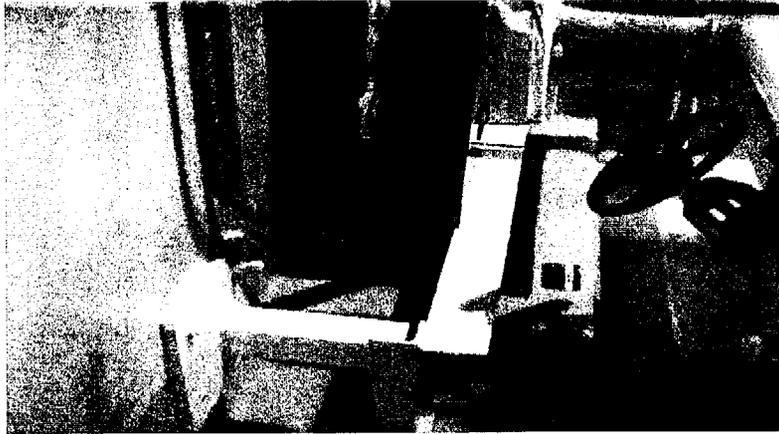


11-TW (Metal Pipe - Pull Box in rm. AB00-02E, view from left - right)

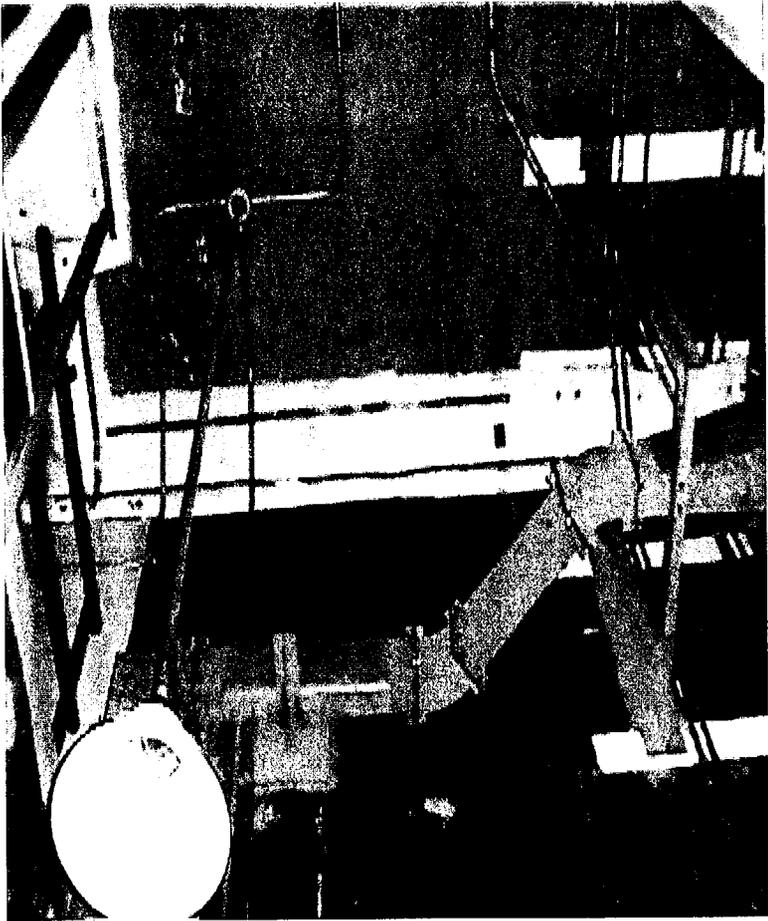


12-TW

(Block out in the floor - Ceiling in rm. AB12-28 N.
WALL, View clockwise starting at Upper Left Corner)

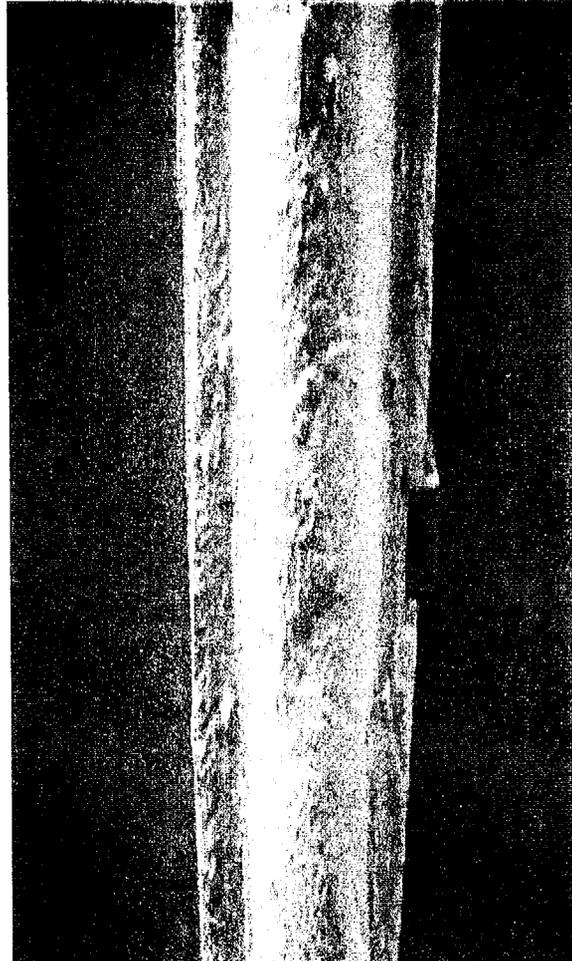
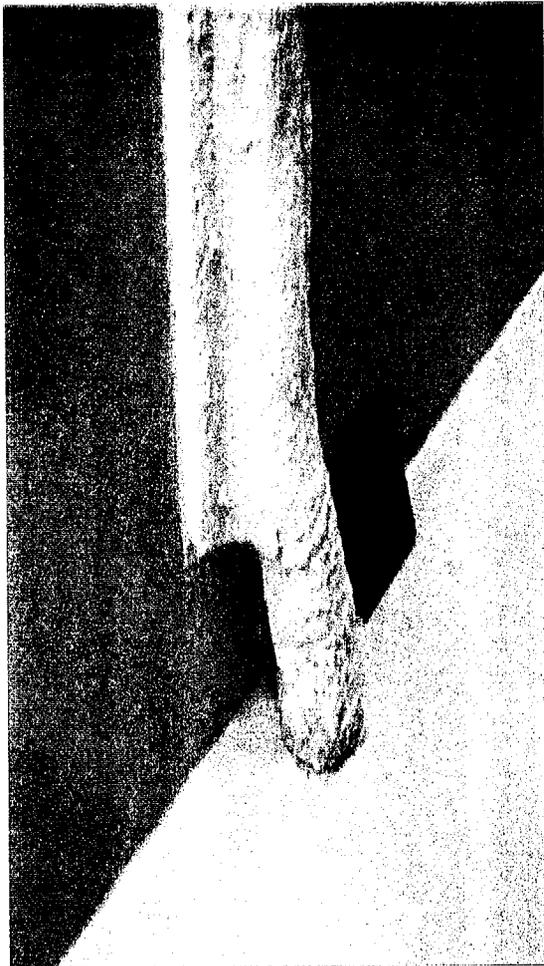


12-TW (Ceiling - block out in the ceiling in rm. AB12-28 N. WALL, View Left - Right clockwise starting at Left Corner)

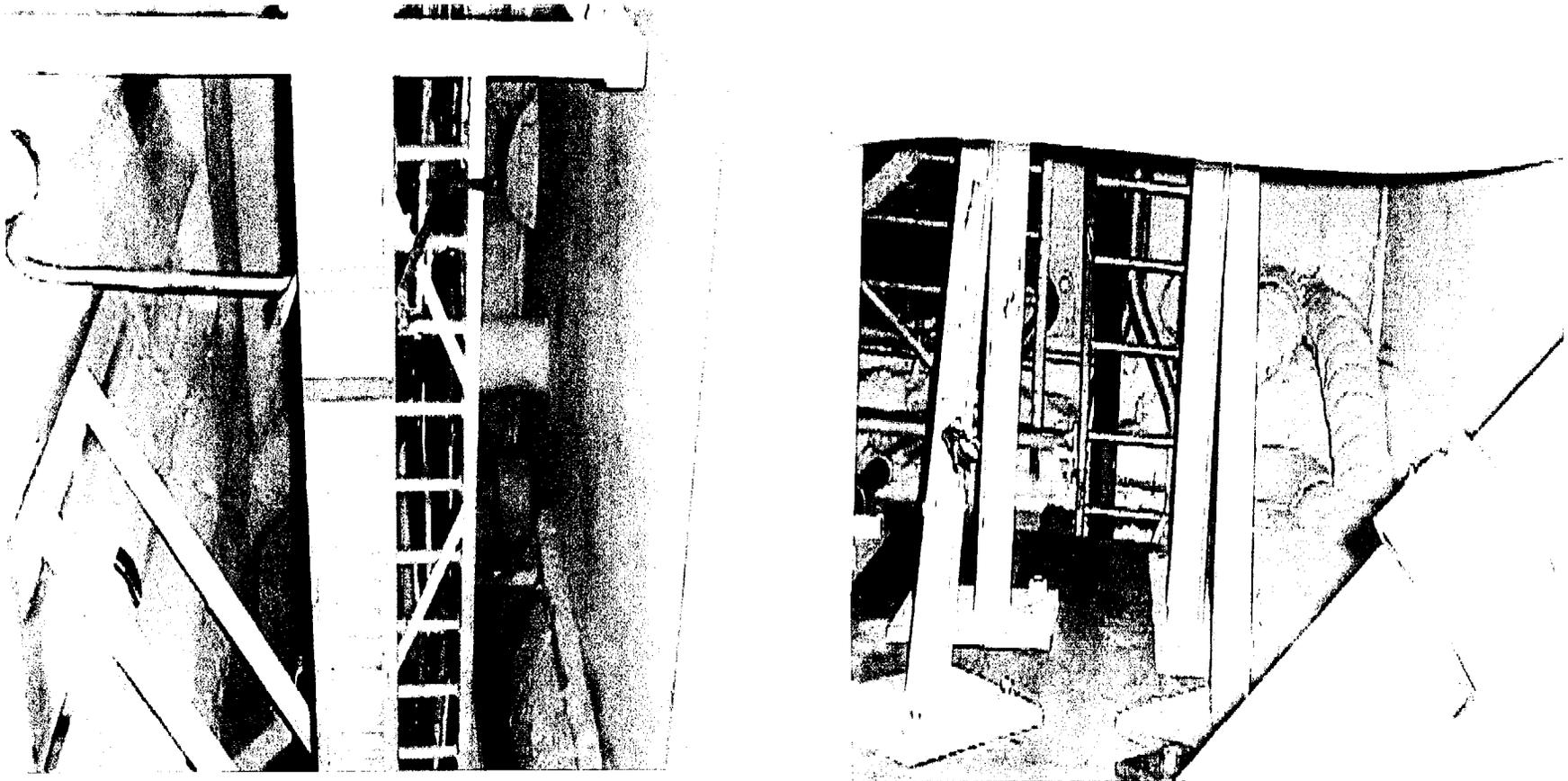


13-TW

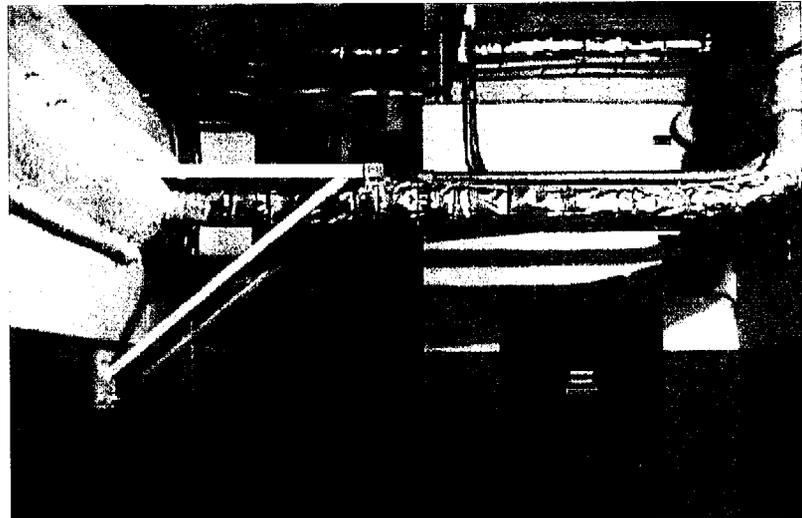
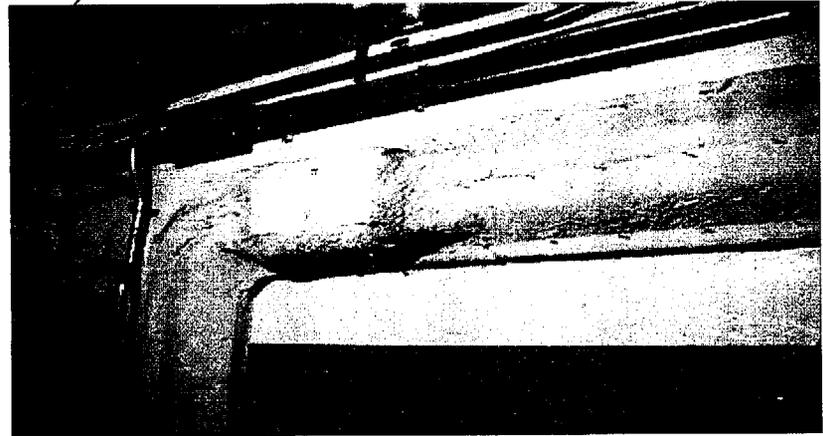
(The floor to the unidentified portion of the conduit in
rm. AB36-18 W. WALL, View from Left-Right,)



15-TW (Fire wall - Ceiling, in rm. CB12-04, view from Left - Right)



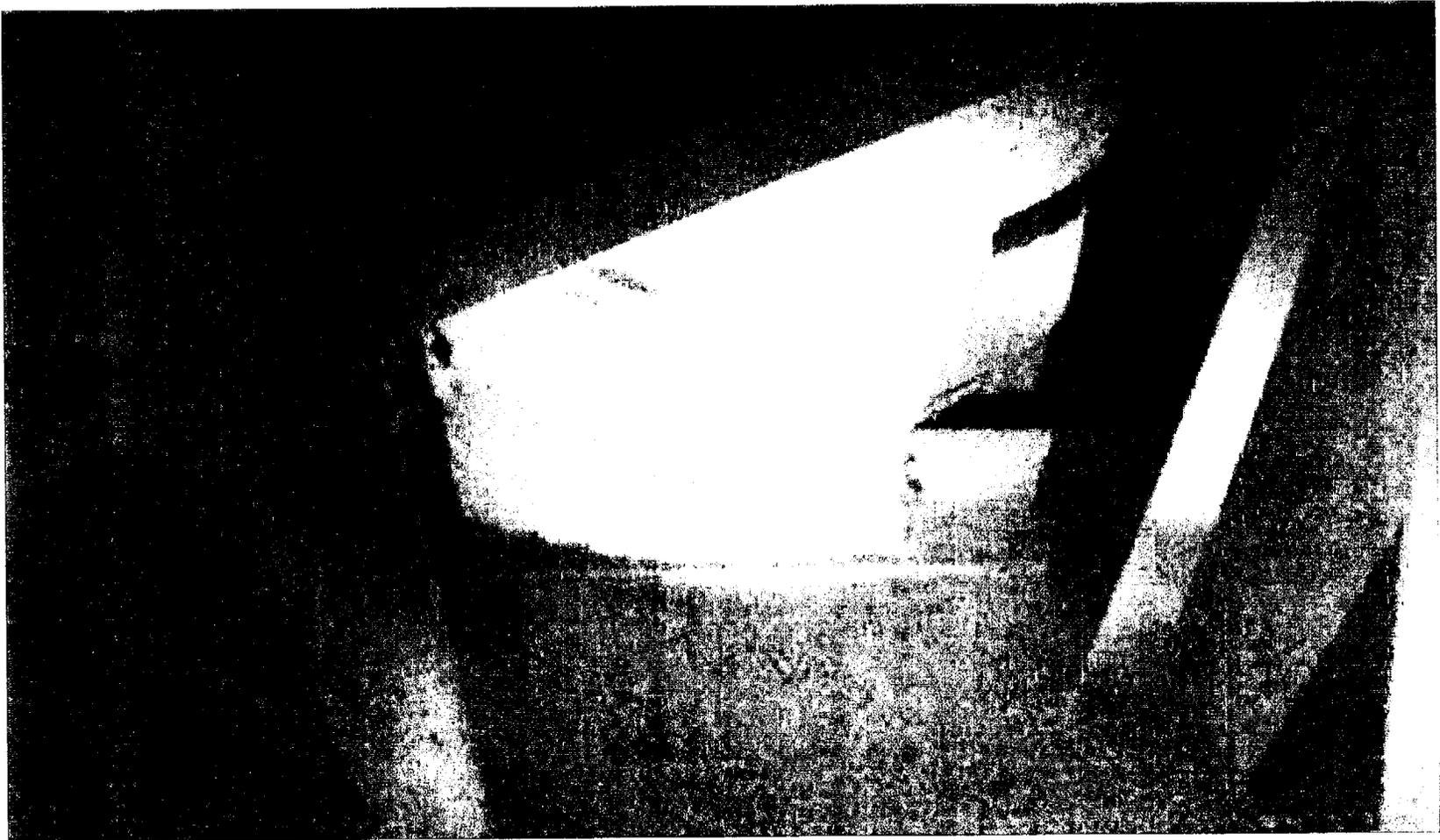
16-TW (The floor - W. Wall in rm. CB12-04, view clockwise starting at Upper Left Corner)



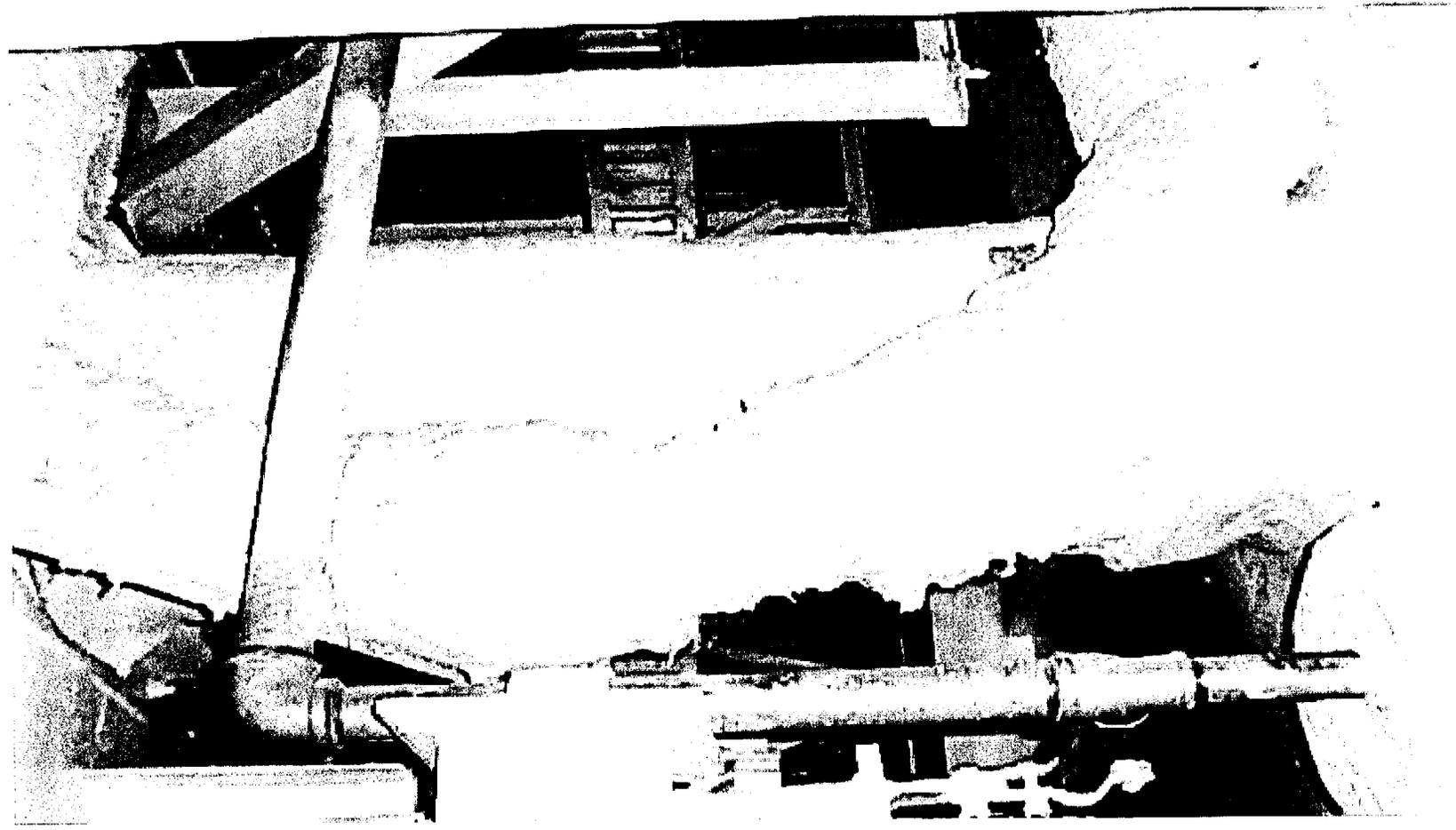
16-TW (Conduit entering the Block out at W. Wall in rm. CB12-04)



17-TW (East wall)



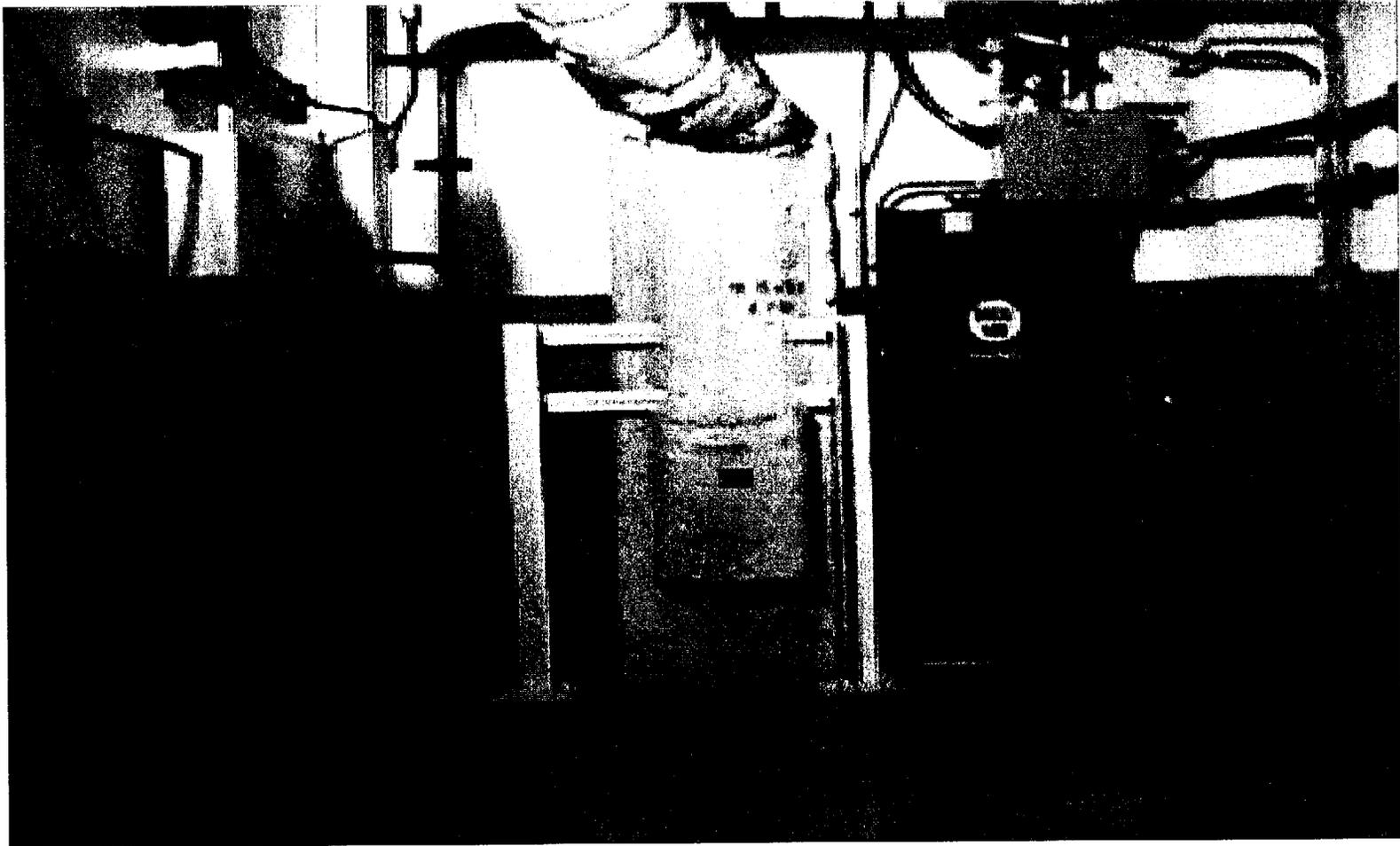
17-TW (Fire wall)



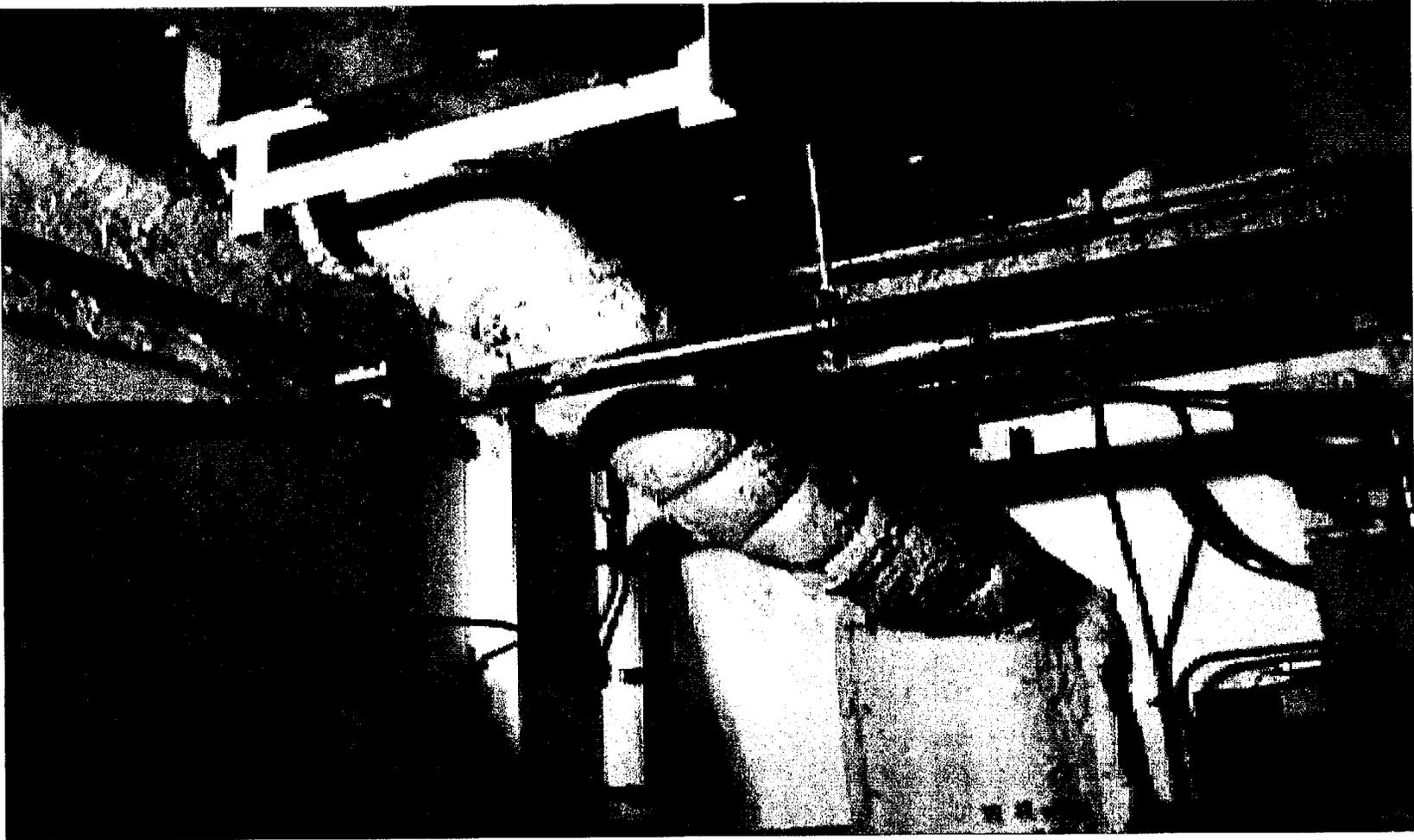
18-TW (Floor - Fire wall in rm. CB12-04, view from left - right)



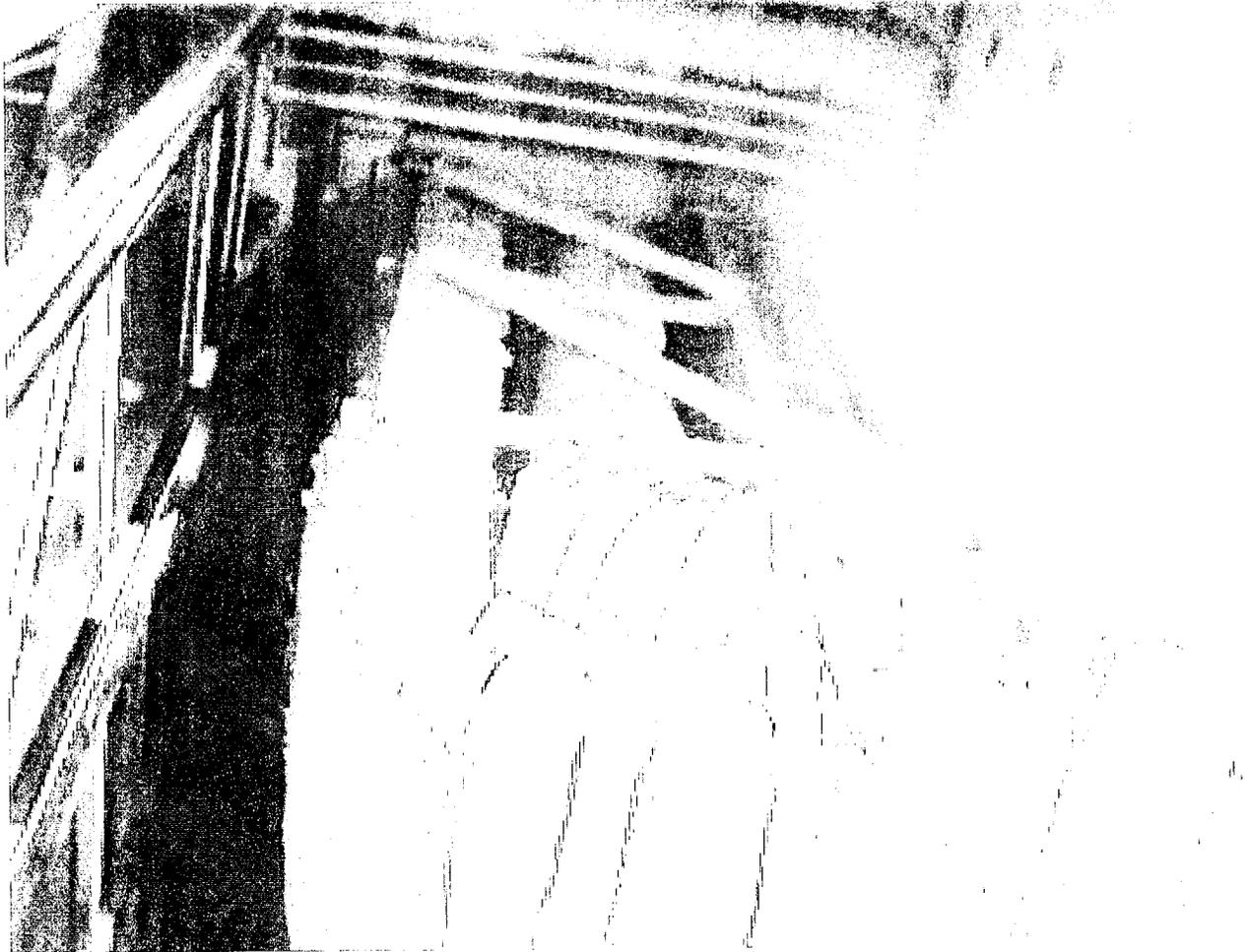
19-TW (Floor penetration in rm. CB12-04)



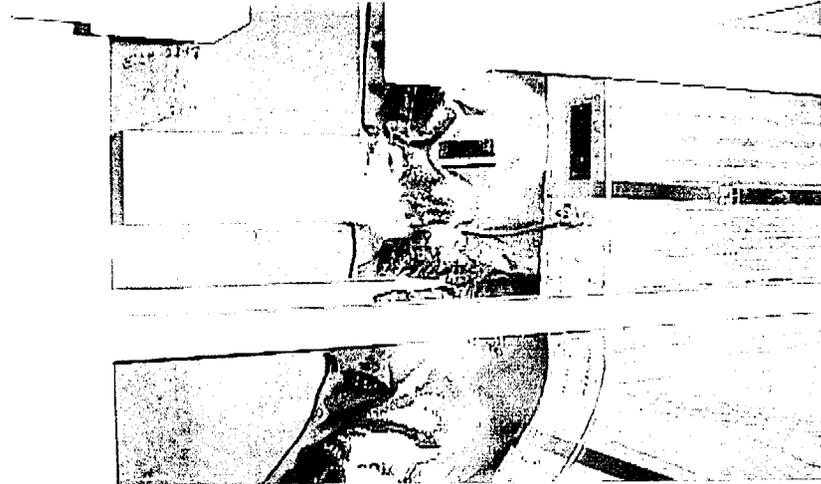
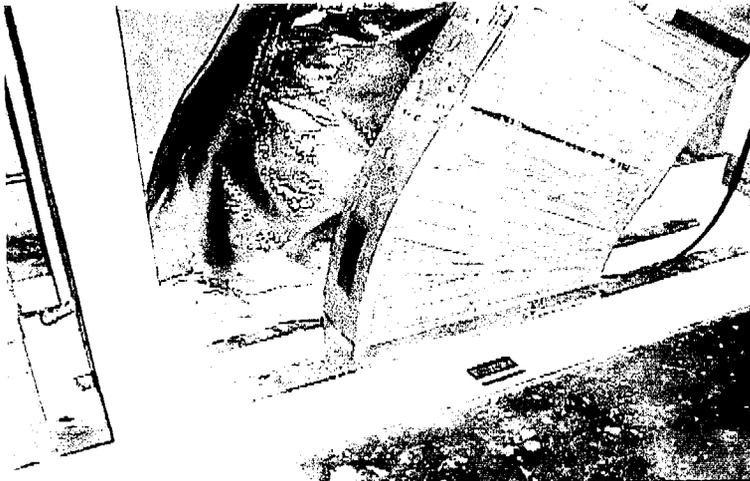
19-TW (W. wall penetration in rm. CB12-04)



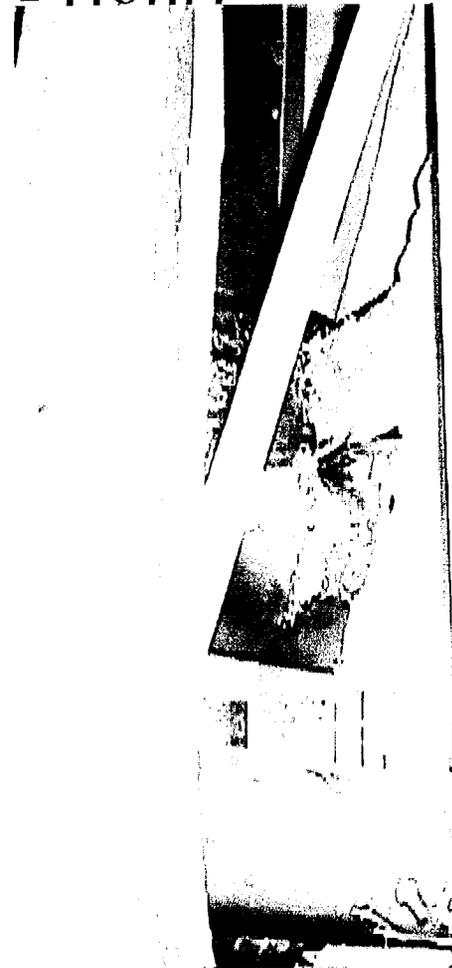
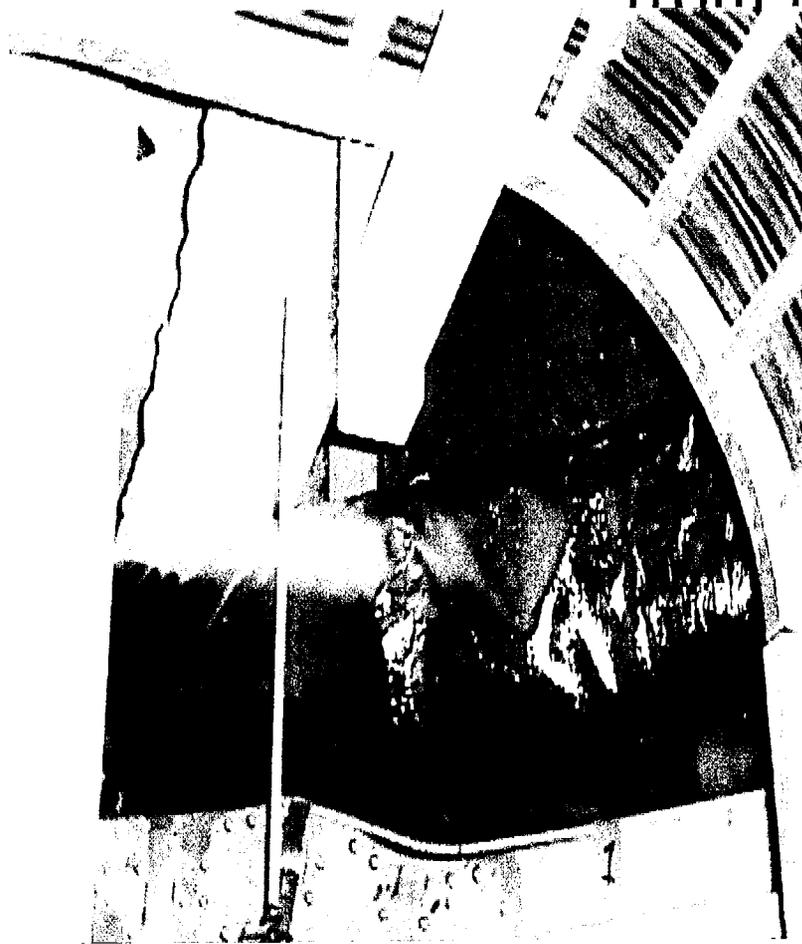
21-TW (W. Wall - Ceiling in rm. CB12-04)



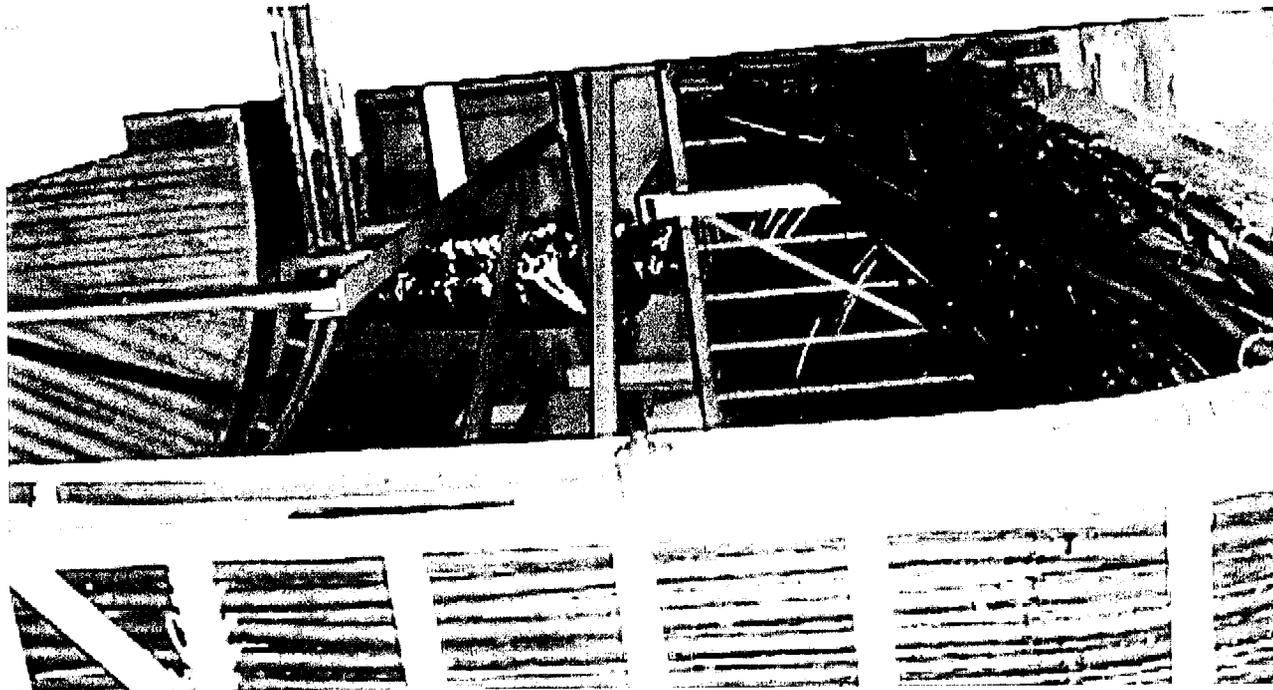
23-TW (Floor - Support in rm. CB36-03, view clockwise starting at upper left corner)



23-TW (Support - S. Wall in rm. CB36-03, view from left - right)

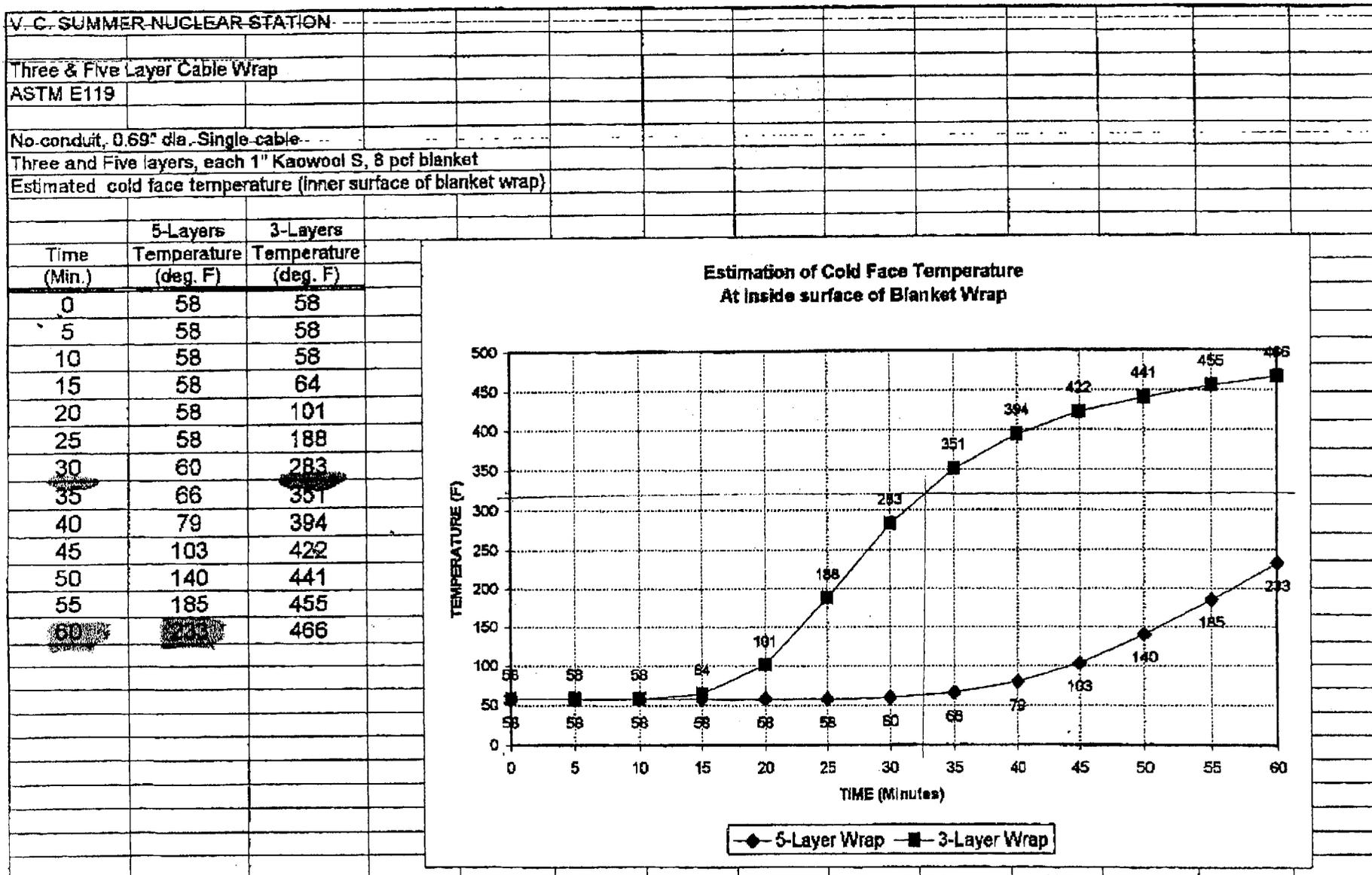


25-TW (VLC17C wrapped from TB-CS102 -
W. Wall in rm. CB36-04, other conduits
were not visible)



SINGLE 0.69" CABLE

TEMPERATURE ESTIMATION AT INSIDE OF BLANKET WRAP
 ASTM E119 SCHEDULE

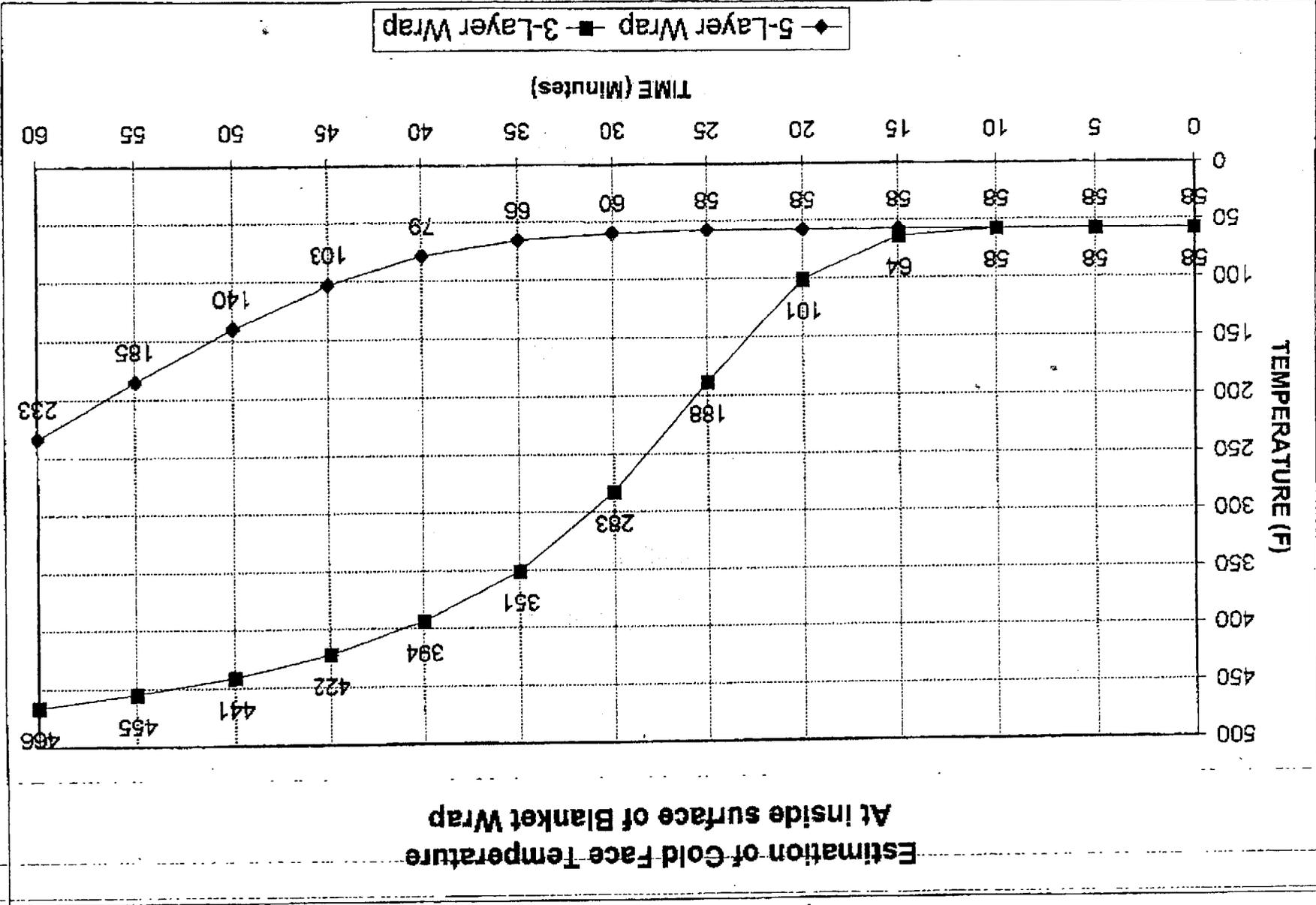


M. T. Johnson
 May 9, 2000

FOR COMPARISON PURPOSES ONLY,
 NOT FOR DESIGN SPECIFICATIONS

V. C. SUMMER NUCLEAR STATION
 3 and 5 layers of Kaowool S Blanket
 Each layer 1" of 8 pct blanket over .069" dia. cable

**Estimation of Gold Face Temperature
 At Inside Surface of Blanket Wrap**



FOR COMPARISON PURPOSES ONLY, NOT FOR DESIGN SPECIFICATIONS