Category 4

Public Service Company of Colorado
P. O. Box 361, Platteville, CO 80651

May 10, 1976
Fort St. Vrain
Unit No. 1
P-76104

Mr. Richard P. Denise
Asst. Director for Advanced Reactors
U. S. Nuclear Regulatory Commission
Division of Reactor Licensing
7920 Norfolk Avenue
Bethesda, MD 20034

Docket No. 50-267

Dear Mr. Denise:

Subject: Attachment A & B to Replace P-76034 Transmittal

This letter and attachments A and B replace our transmittal, P-76034, dated April 6, 1976. Included in Attachment A is the additional information requested in your letter dated April 27, 1976.

Attachment A to this letter supplements and revises, as indicated, our transmittal P-75024 dated December 15, 1975, our letter dated September 17, 1975, and our letter dated August 28, 1975.

Attachment B to this letter is a computer printout of all cables in Categories 1, 3, 4, and 5, which replaces the computer printout submitted with our September 17, 1975 letter.

Very truly yours,

R. F. Walker, Vice President
Engineering and Planning
Electric Department

RFW:il

Attachments

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ATTACHMENT A

Information on Cable Non-Conformance

General - See Item X, Page 13.

Delete paragraph B-4, page 2 of 12-15-75 letter and replace with the following sentence:

Apply Flamemastic as described in Attachment 1 and in Attachment 3.

The following items are modifications of Attachment 1 to the 12-15-75 letter:

I. Revise Category 1, Corrective Action, Paragraph a, to read as follows:

a) For control and instrument cables install asbestos cloth or Flamemastic on the crossover portion of the cable extending it at least 12 inches into each tray/riser.

For power cables, install Flamemastic on the crossover portion of the cable extending it at least 12 inches into each tray/riser.

For cables where Flamemastic is used, the crossover portion of the cable will be covered with approximately 1/8 inch (dry) thickness of Flamemastic and it will extend 12 inches into each tray/riser. For crossovers into multi-cable conduit, the crossover protection will extend from the conduit opening along the crossover length and 12 inches into the tray/riser. The opening into the conduit will be plugged with inorganic material and/or Flamemastic.

II. Revise Category 1, Basis of Corrective Action, as follows:

a) Last paragraph on page 2. First word in fourth line reads "present"; it should read "prevent".

b) Item 1, at bottom of page 3 reads "Two non-interruptible---", should read "three non-interruptible."

c) The third paragraph on page 4 references figures 2, 3, and 4. Additional curves are attached to this letter and the reference should now read figures 2, 3, 4, 5, 6, 7, and 8.

d) The following new information should replace the table and first paragraph on page 6.

Comparison of Westinghouse Circuit Breaker, Bussman Type NON 250 Volt Fuse and Shawmut Amp-Trap Form 1 Tripping Characteristics

Time Seconds	Westinghouse % Current (Maximum)	Bussman %Current	Shawmut % Current
3600	135	135	
100	200	146	
10	375	210	200
1	1400	424	230
0.1	4400	735	260

Based on the Westinghouse maximum trip characteristic being the reference, the above comparison shows that the Bussman and Shawmut fuse trips significantly faster than the Westinghouse circuit breaker. Since testing was based on the Westinghouse circuit breaker characteristic curve, it is concluded that the Bussman and Shawmut fuse characteristics are on the conservative side, i.e., the fuses will trip faster than the Westinghouse circuit breaker.

e) The following new paragraph should be added after the first paragraph on page 6.

The cable ampacities for #10, #12, #14, #16, #18, #19, #20, and #22 AWG gauge wire are not available in the IPCEA standard tables. Therefore, we have developed and used the following ampacities based on the formula described in IPCEA P-46-426, 1962. The derating due to multi-conductors in a tray is based on IPCEA P-33-440, 1959. (Both these standards were in effect in August 1968).

AWG Size	Single Conductor Ampacity (amps)	Multi-conductor in a tray Ampacity (amps)
10	47	23
12	35	17
14	26	13
16	19	9.5
18	14	7.0
19	12.3	6.2
20	10.5	5.2
22	7.8	3.9

f) The following new paragraph should be added after the first paragraph on page 6, following the new paragraph in (e) above:

The following type of study will be performed to determine the need to derate Instrument and Control cables for the application of asbestos cloth and Flamemastic 71A on cables in the Auxiliary Equipment Room, 480 Volt Switchgear Room, Control Room, cable trays and risers, manholes, pullboxes, transition boxes to the underground duct system, and other areas where cable non-conformances exists:

1. A review of the general classes of instrument and control circuits will be made to develop categories of load and usage factors to establish limiting cable currents for each category.

2. The IPCEA ampacity tables and formulae will be used to develop allowable ampacities assuming a maximum derating for tray fill.

3. The limiting cable currents for each category will be compared with the allowable ampacities developed in item 2.

4. Where the currents estimated in item 1 are less than 60% of the ampacities developed in item 2, the application of Flamemastic and/or asbestos cloth will be acceptable without further derating of cables in those categories.

5. Where the loads estimated in item 1 are greater than 60% of the ampacities developed in item 2 the derating of cables will be established on an individual basis using 5% derating for Flamemastic and 30% for asbestos cloth.

The results of this work will be available for NRC review at the site.

The results of this work are required to be complete prior to exceeding 40% power.

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III. The following information supplements the Category 1 cable list (Submitted 17 September 1975 as an attachment to our letter). Cable reroutes or deletions, field rechecks of original data, cable or tray designation or tray boundary changes have resulted in 15 cables being deleted from the category 1 list of nonconforming cables. These cables are tabulated in Table III - 1 along with the reason for removal from category I and their current status. The basis for tray designation or tray boundary changes is covered in item XI d.

29 cables have been added to the category I list of non-conforming cables as a result of completion of the cable audit. These cables are as follows:

4853	17249	25590	28006	28040
9162	21175	27650	28007	28041
9882	21227	27653	28024	28046
9885	21241	27669	28025	28047
9888	22467	28004	28026	5855
9889	25337	28005	28027	

NRC letter of 4/27/76, item 3, requested the basis for not including cables 5855, 21247, 25053 and 25747 in the category 1 list of non-conforming cables. The status of these cables is as follows:

Cable 5855 is a non-conforming cable and has been added to the category 1 list.

Cable 21247 had a keypunch error in the routing (308M instead of 303) which when corrected eliminated the indicated non-conformance.

Cables 25053 and 25747 have been field-rechecked and found to be in conformance and therefore are not on the Category 1 list of non-conforming cables.

IV. Revise "ADDITIONAL INFORMATION" as follows:

Paragraph 1-h, Discussion, Page 9; Attachment 1, 12-15-75 letter.

The following cables are additions to Table #1:

3118	6006	7060	18263	26156	7063
3196	6040	7278	18267	26204	3362
3332	6700	7377	18270	26210	26894
3420	6701	7435	18287	26217	25650
3612	6702	7442	25001	26370	25651
4853	6703	7452	25062	26371	
5032	6708	9982	25118	26372	
5455	6983	17216	25593	26373	
5456	6986	17217	25654	26374	
5870	6987	17239	25656	26375	
5979	6991	18255	26152	26422	
5980	7007	18259	26153	26424	

Cable 3423 should be deleted from Table 1 since this cable was deleted from the bearing water makeup pump controls (see Item V.h of this letter.)

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V. a. Revise Category 3, page 7, Corrective Action, 2nd paragraph, should read:

As a result of discussions with the Staff, 96 non-essential instrument and control cables were identified in this category which would not require rerouting. The following list identifies the individual instrument and control cables (Category 3) which were discussed with the Staff and mutually found acceptable as not degrading plant safety:

1528	2753	2867	16064	22340
1555	2765	2868	16066	22342
1784	2766	2869	16067	22407
1786	2767	2989	16069	22409
1791	2768	3004	16165	25018
2600	2770	3012	16167	25456
2627	2786	3533	16187	25604
2705	2787	4038	16188	26015
2708	2796	5028	16206	26054
2715	2797	7010	16367	26064
2718	2798	7169	17039	26096
2719	2814	7293	17354	26613
2720	2817	7503	17395	26751
2725	2818	7894	17512	27026
2728	2819	7980	17610	27460
2735	2829	9176	17824	27819
2738	2843	16000	18290	
2745	2864	16001	18291	
2746	2865	16003	18299	
2747	2866	16063	18300	

During this review certain cables were removed from the above list because of reroutes which eliminated the nonconformance, because of field rechecks, or because of cable or tray redesignations which showed the cables to not be in this category. These cables are as follows:

a) Reroutes: 1528, 1555, 1784, 1786, 7293, 22340, 22342, 25018, 25604

b) Field Rechecks or Cable or Tray Redesignations: 3012, 4038, 1791, 25456, 26015, 26054, 26064, 26096, 27026

Of the cables given in the above list, 8 are spare or abandoned cables. These are cables 2818, 2819, 2867, 9176, 17512, 17610, 22407, 22409. Of the remaining cables in the above list, all will have flamemastic or zipper tube applied at some point in the route as a result of Category 4 corrective action or general control complex flamemastic application with the exception of the following cables in the turbine building: 2600, 2765, 2770, 2817, 2864, 2865, 2866, 2989, 3533, 7503, 7980. These cables have been discussed with the

Staff and mutually determined to not require application of flamemastic as these eleven cables do not violate bus or loop routing in the turbine building.

b. Category 3, Page 8 - Delete the second paragraph of the Basis for Corrective Action and add the following section immediately before the Basis for Corrective Action:

Clarification of Criteria

As a result of discussions with the NRC Staff, we wish to clarify the criteria for routing of control cables. As stated in the criteria essential and non-essential control cables may be installed in either control or control/power trays/risers. These cables may be routed from control trays/risers to control/power tray/risers or from control power trays/risers to control trays/risers and are not in Category 3. If these cables also cross bus or loop designation, they have been placed in Category 1 or 4, as appropriate. All control cables which are routed in control/power trays/risers have been reviewed to assure that they have a 600V insulation rating and are therefore compatible with other cables in such trays/risers. The results of this review will be available at the site for NRC audit. The cables which are routed in this manner can be identified in the routing of these cables in the cable tabulation.

Table V-1 contains the Cable Tabulation for the control cables which, based on Issue B of the cable tabulation dated April 21, 1976, are routed in control/power tray/risers at any point.

c. Category 3, Page 8 - the following is an additional paragraph to the Basis for Corrective Action:

"Instrument cables installed in control designated routings, control cables installed in instrument designated routings, and control cables installed in instrument designated routings and additionally installed in control/power designated routings have been reviewed with the Staff and it was mutually concluded that they will not incur or cause other cables to incur interactions which would affect plant operations."

Allowing control and instrument cables to be installed as described in the preceding paragraph does not degrade the redundancy requirements of the design, and therefore the Health and Safety of the Public.

d. Category 4, Page 8 - Add the following section after the section on Basis for Corrective Action:

Clarification of Criteria

As a result of discussions with the NRC Staff, we wish to clarify our criteria for routing of control cables. As stated above, non-essential control cables which jump from trays/risers of one bus/loop designation to trays/

risers of another bus/loop designation will be corrected as indicated. Non-essential control cables which cross from control/power trays/risers to control trays/risers or from control trays/risers to control/power trays/risers of the same bus and/or loop designation are not in violation of the criteria for Category 4. They have not violated bus and/or loop designation and they do not provide a path for propagation of fire from one bus and/or loop to another as a result of an external fire source or an internal fire source resulting from a fault. Since they do not violate the criteria for this category, the corrective action for this section will not be implemented.

e. Paragraph 1-i, Discussion, Page 10:

Cable number 27528 was incorrect; it should read 25728. Cable number 7442 was rerouted.

f. Paragraph 1-j, Discussion, Page 10:

Cables numbered 1784, 1786, and 7293 were also rerouted.

g. Paragraph 1-k, Discussion, Page 10:

Cable 4787 was added in conjunction with cables 4785 and 4788.

h. Paragraph 1-l, Page 10:

Delete the following additional cables from the Bearing Water Make-up Controls:

3288, 3289, 3297, 3299, 3423, 3424, 3452, 3621, and 3625.

Discussion:

Cables 7278 and 7279 were rerouted and reused and cable 26298 was reused.

i. Paragraph 1-p, Page 11:

Also delete cable 4798.

j. Paragraph 1-s, Page 11:

Equipment number P-4204 should read P-4202.

k. Paragraph 2, E, Page 12:

No other items have been assigned a bus change.

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1. Paragraph 3, Discussion, Page 12 - Replace existing Discussion paragraph with the following:

A Class 1E battery charger, Class 1E inverter, and Class 1E battery have been installed which will provide a separate Class 1E power source for the plant protective system equipment presently being supplied by interruptible 120V AC, Bus 3. A separate seismic Class I Battery Room has been provided to house the new Class 1E battery.

The new non-interruptible 120V AC bus has been designated:

120V AC, Bus 4

Equipment installed:

Battery 1C

Battery Charger - Inverter 1C

Non-Interruptible Bus 4

New essential cables installed:

3319, 3467

Cables 509, 510, 511 and 538 associated with the PPS are being reconnected from 120V Instrument Bus 3 to 120V Instrument Bus 4.

The above battery (1C) shall be "acceptance tested" in accordance with the PSC published procedure. The basis for the PSC procedure is paragraphs 5.1, 5.2, 5.4.1, 5.5.1 and 5.7 of IEEE Std. 450-1975.

Figure 1, attached, indicates the electrical configuration of this new equipment.

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VII. The following changes have been made to the area radiation monitors, per discussions with NRC Staff.

a. Gas Waste Compressor Cooling Activity Monitor (RT-46212)

Reroute cable 9234 from a Bus 2 to a Bus 1 routing.

b. Reactor Plant Vent Exhaust Monitors (RT-7324-1)

Rework so electrical source is from Bus 2 rather than Bus 1.

c. Gas Waste Exhaust Monitor (RT-6314-2)

Reroute cable 9266 from a Bus 2 to a Bus 1 routing.

d. Cables associated with and required for operation of area radiation monitors RT-6212, RT-6213, RT-46211, RT-46212, RT-6314-1, RT-6314-2, RT-7324-1, RT-7324-2, RT-7325-1, RT-7325-2, RT-31193, RT-93250-12, RT-93251-12 and RT-93252-12 will be classified as "Non-essential Separated". This classification of Non-essential separated will require and assure that the separation, independence and redundancy will be maintained between redundant equipment.

e. The following table indicates the area radiation monitors by name, number, redundancy, cable numbers associated with each and the source electrical bus.

Source Bus	1	2	3
Cable Routing (Bus)	1	2	1
Liquid Waste Discharge One of two required		RT-6213 9224	RT-6212 9206
Gas Waste Compressor Cooling Activity One of two		RT-46212 9241, 9242 9243	RT-46211 9234, 9235 9237
Gas Waste Exhaust One only (backup by RT-7324-1, 7324-2)	RT-6314-1 9301		RT-6314-2 9266, 9303
Reactor Plant Vent Exhaust Gas Radiation Monitors One of two		RT-7324-1 9246, 9252	RT-7324-2 9251, 9248
Fixed Filter, Particulate & Iodine		RT-7325-1 9291, 9292 9294	RT-7325-2 9295, 9298
Air Ejector Exhaust One only (backup by RT-6314-1, RT-6314-2)			RT-31193 9256
PCRV Relief Valve Piping One Only (backup by RT-7325-1, RT-7325-2)		RT-93252-12 9166	
Steam Water Dump Tank	RT-93250-12 9152, 9153		RT-93251-12 9156

VIII. Two additional areas have been identified where we will apply Flamemastic 71A. They are:

a) For manholes 3, 4, 5, 6, 7 and 8 the exposed surfaces of all cables will be coated with approximately 1/8" (dry) thickness of Flamemastic 71A due to routing non-conformance.

With the application of Flamemastic 71A to these cables, consideration for the possible need to derate the cables will be included. The study will be completed and available for review on site prior to application of the Flamemastic.

b) For cables routed through pull boxes and transition boxes to the underground duct system, bus and loop separation is achieved by the use of barriers, conduits or the application of Flamemastic.

With the application of Flamemastic 71A to these cables, consideration for the possible need to derate the cables will be included. The study will be completed and available for review on site prior to application of the Flamemastic.

With the application of Flamemastic 71A to these cables. an overcurrent protection study shall be performed. This study will be completed and available for review on site prior to application of the Flamemastic.

IX. With the application of Flamemastic 71A to portions of cables and cable tray/riser system, consideration for the possible need to derate the cables, considering tray fill, Flamemastic application, and service, must be included.

The derating for control and instrument cables is outlined in section II f. Power cables which will receive Flamemastic will be derated 5%.

X. Public Service Company has reviewed the documentation referenced under general in your letter of April 27, 1976. Public Service Company agrees with the Staff's understanding except for the statement in Enclosure 1 of R. P. Denise's (NRC) letter to R. F. Walker (PSCo) dated November 21, 1975, referenced in Item No. 5.

Discussions with the Staff has resolved the disagreement and has resulted in the following mutually agreed upon revision to the statement in Enclosure 1 of the November 21, 1975 letter:

> "The Staff considers that a) all electrical components of inputs to the Plant Protective System, b) the Plant Protective System, c) all electrical components of outputs of the Plant Protective System, except those not required for safety that are acceptably isolated, d) those electrical portions of the auxiliary supporting systems of the previous three items required for safety, and e) redundant systems identified in FSAR Table 1.4-2, "Lists of Structures, Systems and Components Required for a Safe Shutdown of the Plant", are essential.
>
> Therefore, cabling associated with the previous five categories is considered essential. The Staff understands that these criteria (a through e above) were used as a basis for the 1971-1972 audit of the electrical system."

The electric cable installation at the Fort St. Vrain station shall conform to the criteria outlined in the FSAR for the facility as modified by the documentation supplied to the NRC in letters dated August 28, 1975, August 29, 1975, September 17, 1975, and December 15, 1975, and as a part of this letter.

Documentation of the cable system is contained in an updated cable tabulation, Issue B, dated April 21, 1976. This cable tabulation is based on the Design Cable Tabulation as of July 1975 and updated by the information developed in our audit procedures used during the past year. All the information related to compliance with bus and/or loop and service separation criteria of the FSAR throughout the facility has been audited. The information not related to this has not been audited since the purpose of this audit was to determine the routing information required to judge conformance with the routing criteria of the FSAR.

The procedures used during the past year to audit the cable system required to insure compliance with these criteria included:

a) The review of the identification of essential cables.

b) The routing of the cables was reviewed for conformance to the bus and/or loop and service separation criteria of the FSAR.

c) The collection of the following field data used to update the cable tabulation;

1) The cables at each wall penetration into the auxiliary electric equipment room or the 480V switchgear room were identified and their routing through the wall penetration and into the first or second tray section on each side was identified.

The cables in a tray which penetrate a wall into the auxiliary electric equipment room or the 480V switchgear room were identified and their routing through the tray which penetrates the wall and into the first tray section on each side was identified.

A second tray section was not identified in some cases; however, all tray sections were audited for jumpers.

2) The termination points of each non-essential cable which enters the tray/riser system were identified and the associated cable routing into the first or second tray section identified. The termination points in the Auxiliary Electrical and 480V Switchgear Room were excluded. (These termination points and associated cable routings are covered under c.7 below.)

3) Each essential cable was identified at each end and its routing into the first or second tray/riser section identified.

4) The cable tray/riser system was checked for cables that physically jump from a tray/riser of one bus and/or loop designation to a tray/riser of another bus and/or loop designation.

Cables which make this jump are called jumpers and were identified. The locations in the tray/riser system where these jumps occur were identified.

5) The cable tray/riser system was checked for cables that physically cross from a tray/riser of one service designation to a tray/riser of another service designation, contrary to the FSAR criteria. All cables which cross in this fashion were identified.

6) Cables were identified at manhole entries and exits and their routing through the manhole identified.

7) A color code audit was conducted in the auxiliary electric equipment and 480V rooms.

8) Conduits with more than one cable were identified and the contained cables identified. Specific use conduits were excluded.

The two types of specific use conduit are defined as follows:

a) Conduits containing cables from a pullbox/ junction box to a specific piece of equipment. These conduits are associated with access into the radiation detectors, the hot service facility, the turbine generator, the PCRV, helium storage area, local equipment panels and motors, valves and compressors.

b) Conduits which contain only lighting or communication cable.

Essential cables in such conduit were field audited. These specific use conduits do not contain redundant essential circuits and therefore, excluding them from specific identification does not degrade the plant safety.

9) Power trays were inspected for asbestos cloth covered power cables. Any asbestos cloth found was removed.

All non-conformances identified were corrected (except for application of Flamemastic) and the corrections audited. Therefore, this cable tabulation will contain the as-built information required to verify that the cable installation meets the FSAR criteria as modified by the corrective action identified in our letters. This document was formally issued on April 21, 1976. Changes to this document will be made in accordance with design document control procedures.

XI. The following additional information was requested in your letter of April 27, 1976.

a) Table XI-1 is an update of Table 1 in our letter dated August 28, 1975.

b) Table XI-2 is an update of Table 6 in our letter dated September 17, 1975.

c) Table XI-3 contains the cable numbers of all spared or abandoned cables identified in Issue B of the Cable Tabulation.

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d) Basis for changing tray designation or boundaries.

During the cable audit and implementation of the cable routing corrective actions, it became necessary to change the designation of certain tray sections to minimize the number of cable non-conformances. When these sections were identified the designation of bus, loop and/or service was changed.

Similarly, it was necessary to change the boundaries between tray/riser sections. When these locations were identified, the boundaries were changed.

These changes were implemented by FCN's, per design document control procedures. These procedures include an evaluation to ascertain compliance with criteria established in the FSAR. All affected cables were checked and non-conforming cables were identified and placed in Categories 1, 2, 3, 4, or 5, as appropriate. Therefore, these changes have no adverse effect on the health and safety of the public.

e) Control cables with 300V insulation

Some cables have been installed as control cables which are insulated for 300 volts. These cables were purchased for specific use, or were furnished as a part of vendor's equipment for installation within the plant. There are no control cables with this insulation rating that are routed in control/power tray/risers. These cables are energized at various voltage levels; however, in no case does this exceed the voltage classification of the cable. Other control cables which may be routed in the same tray or conduit are energized at less than 300 volts.

Installation of these cables has been reviewed and their application is consistent with the design basis of the circuits in which they are installed and therefore does not affect the safety of the plant. This information is available at the site for NRC review.

f) Use of conductors less than #12 AWG in Control Cable

Conductor size less than 12 AWG has been used in certain cable. The adequacy of the specific conductor size used has been reviewed and found to be consistent with the design bases of the circuits involved. The load requirements for each cable is consistent with the IPCEA allowable ampacities. The results of this review will be available at the site for NRC review.

Ft. St. Vrain Unit No. 1

One Line Diagram Non-Interruptible Instrument Bus No. 4

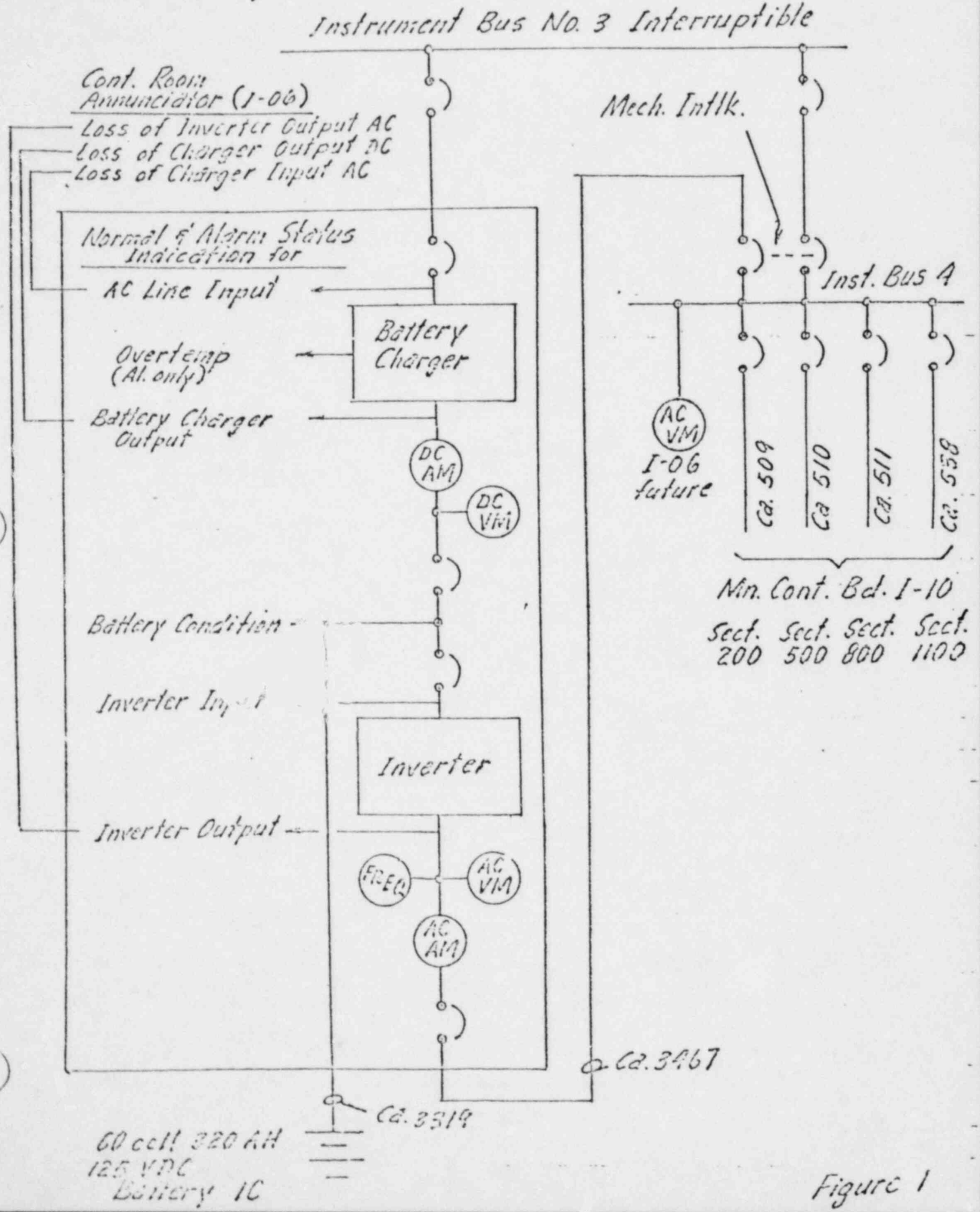

Figure 1

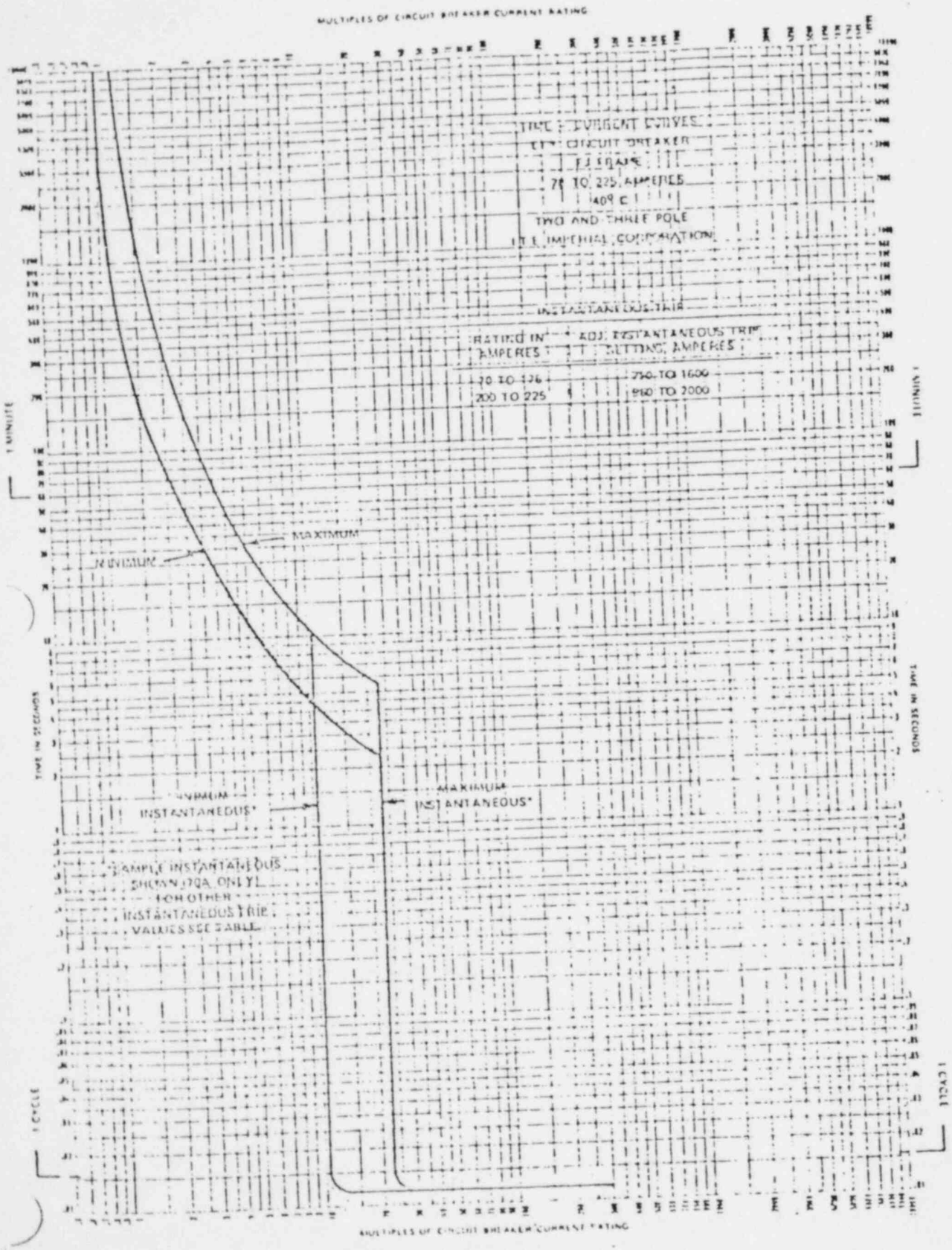
MULTIPLES OF CIRCUIT BREAKER CURRENT RATING
TIME - CURRENT CURVES
FOR CIRCUIT BREAKER
FRAME
70 TO 225 AMPERES
TWO AND THREE POLE
I.T.E. IMPERIAL CORPORATION
INSTANTANEOUS TRIP
RATING IN AMPERES
ADJ. INSTANTANEOUS TRIP SETTING, AMPERES
70 TO 175
200 TO 225
750 TO 1600
960 TO 2000
1 MINUTE
MAXIMUM
MINIMUM
TIME IN SECONDS
MAXIMUM INSTANTANEOUS*
MINIMUM INSTANTANEOUS*
*SAMPLE INSTANTANEOUS SHOWN FOR ONLY ONE OTHER INSTANTANEOUS TRIP VALUES SEE TABLE
1 CYCLE
MULTIPLES OF CIRCUIT BREAKER CURRENT RATING

Figure 5

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RATIO OF ACTUAL CURRENT TO LONG-TIME PICKUP POINT *

GENERAL-PURPOSE DIRECT-ACTING TRIP DEVICES

I-T-E Type CD-3 for K-225 through K-2000, CD-300 for K-2000 and K-4000

Breaker Frame Type	Maximum Continuous Coil Rating	Long-Time Adjustable Pickup Points						Instantaneous Adjustable Pickup Points			
		1	2	3	4	5	6	1	2	3	4
K-225	70	-	12	15	18	20	25	75	125	200	300
K-225 & K-600	40	20	25	30	-	40	50	150	250	400	600
K-225 & K-600	70	40	-	50	60	70	90	250	500	750	1100
K-225 & K-600	125	70	-	90	100	125	180	450	800	1200	1900
K-225, K-600 & K-1600	225	120	150	175	200	225	255	750	1500	2400	3400
K-600, K-1600 & K-2000	400	-	250	300	350	400*	500	1250	2000	4000	6000
K-600	600	-	400	-	500	600	750	2000	4000	6000	9000
K-1600&K2000	800	400	500	600	-	800	1000	2500	5000	8000	12000
K-1600&K2000	1600	800	1000	1200	-	1600	2000	5000	10000	16000	24000
K-2000	2000	-	1250	1600	1800	2000	2500	10000	15000	20000	30000
K-3000	3000	1600	2000	-	2500	3000	3750	15000	20000	28000	36000
K-4000	4000	2000	-	3000	3500	4000	5000	20000	30000	40000	48000

Note 1: The upper limit of the band represents the time from the start of the overcurrent until interruption by the circuit breaker. The actual tripping time will be equal to or less than the upper limit of the band. Reset time of device after operation is 5 sec. maximum.

Note 2: The lower limit of the band represents the time for which the overcurrent may persist at the given value and then drop to 85% of the long-time pickup without tripping the circuit breaker. The actual minimum tripping time will always be in excess of the lower limit of the band. Reset time of device after operation is 4 sec. minimum.

Note 3: Instantaneous pickup points are a varying multiple of the long-time pickup point selected. Use proper multiple to determine time-delay curve cut off. Allow ± 20% variation.

Note 4: Factory settings (unless otherwise specified): Long-time pickup-maximum continuous coil rating. Instantaneous pickup-values listed in column 3 of instantaneous section of above table.

Note 5: Apply coil rating within the short-circuit current rating of the applicable circuit breaker.

LONG-TIME BAND UPPER LIMIT SEE NOTE 1.

LONG-TIME BAND LOWER LIMIT SEE NOTE 2.

INSTANTANEOUS PICKUP ADJUSTABLE IN ACCORDANCE WITH TABLE ABOVE (SHOWN SET AT 900% & 1500% FOR A TYPICAL LONG-TIME PICKUP POINT* SEE NOTE 3.)

MAXIMUM CIRCUIT-BREAKER CLEARING TIME WITH INSTANTANEOUS TRIP

TIME IN SECONDS

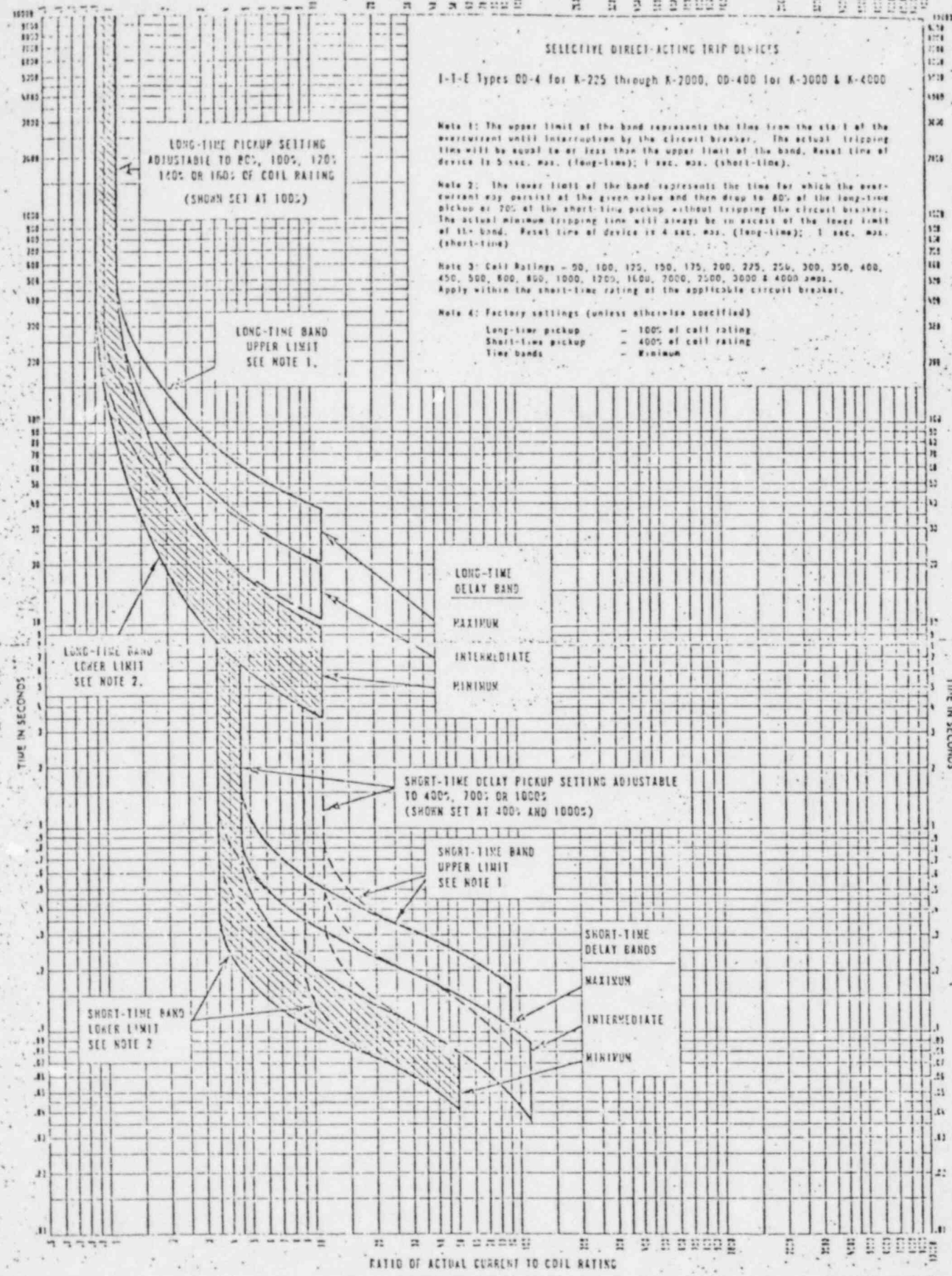
RATIO OF ACTUAL CURRENT TO LONG-TIME PICKUP POINT

TIME-CURRENT CHARACTERISTIC CURVES I-T-E TYPES CD-3 AND CD-300, LONG-TIME AND INSTANTANEOUS GENERAL-PURPOSE DIRECT-ACTING TRIP DEVICE	ORDER NO. TEST NO. _____ FILE NO. _____ DWN. BY E. H. F. DATE 9/15/65 NO. TD-6093 REV. A

FIGURE 6

F-16134

RATIO OF ACTUAL CURRENT TO COIL RATING



TIME-CURRENT CHARACTERISTIC CURVES I-T-E TYPES CO-4 AND CO-400 - LONG-TIME AND SHORT-TIME DIRECT-ACTING TRIP DEVICES, FOR SELECTIVE TRIPPING APPLICATIONS.	ORDER NO. TEST NO. FILE NO. DWN. BY DATE NO. TD-0004 REV. 4

Figure 7

OUTLINE DIMENSIONS

250 VOLT FORM 101 AMP-TRAP

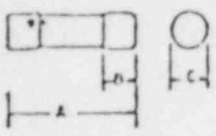


FIG. 1 - TYPE 1

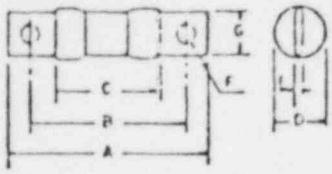
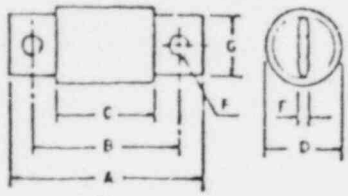


FIG. 2 — TYPE 4 — FIG. 3



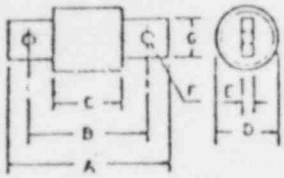


FIG. 4 - TYPE 4

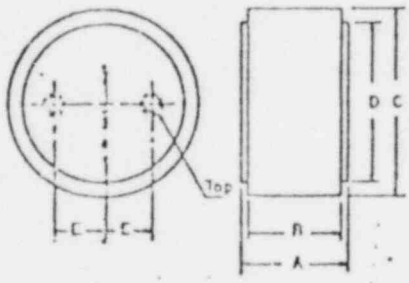
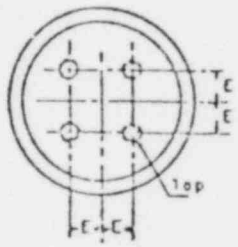


FIG. 5 — TYPE 128 — FIG. 6



D I M E N S I O N S

FIG.	CATALOG NO.	TYPE	A	B	C	D	E	F	G	TAP
1	A25X1-30	1	2	1/2	9/16					
2	A25X40-60	4	3 3/16	2 7/16	1 5/8	15/16	1/2	11/32	23/32	
3	A25X 70-200	4	3 1/2	2 3/8	1 5/8	1 7/32	3/16	5/16	1	
4	A25X 250-600	4	3 23/32	2 23/32	1 15/32	1 1/2	1/4	13/32	1	
4	A25X 700- 800	4	3 27/32	2 25/32	1 9/32	2	1/4	13/32	1 1/2	
5	A25X 800-1200	128	2 15/32	2 11/32	3	2 1/2	3/4			3/8-24 1/2 Deep
6	A25X 1600-2500	128	2 15/32	2 11/32	3 1/2	3	3/4			3/8-24 1/2 Deep
6	A25X 3000-5000	128	2 15/32	2 11/32	4 1/2	3 3/4	3/4			1/2-20 1/2 Deep

AT 250 VOLTS OR LESS

A25X thru A25Z	MELTING TIME	CLEARING TIME (100V CIRCUIT)	CLEARING TIME (250V CIRCUIT)
1	18	18	27
2	22	22	33
4	23	46	69
6	39	58	87
8	33	66	96
10	42	84	13
15	75	150	24
20	33	76	39
25	18	36	54
30	30	60	90
35	36	72	110
40	55	110	170
50	81	160	240
60	190	380	540
70	230	460	690
80	320	640	960
90	480	960	1400
100	530	1100	1600
125	690	1400	2100
150	1000	2000	3000
175	2500	5000	7500
200	4200	8400	13,000
250	6400	13,000	19
300	10,000	20	30
350	12	24	36
400	18	36	54
600	40	80	12
800	10	20	30
1000	14	28	42
1200	20	40	60
1600	36	72	110
1800	—	—	—
1500	—	—	—
2000	66	130	190
2500	100	200	300
3000	230	460	690
3500	310	620	930
4000	400	800	1200
4500	510	1000	1500
5000	630	1300	1900

MELTING TIME-CURRENT CHARACTERISTICS (A25X)

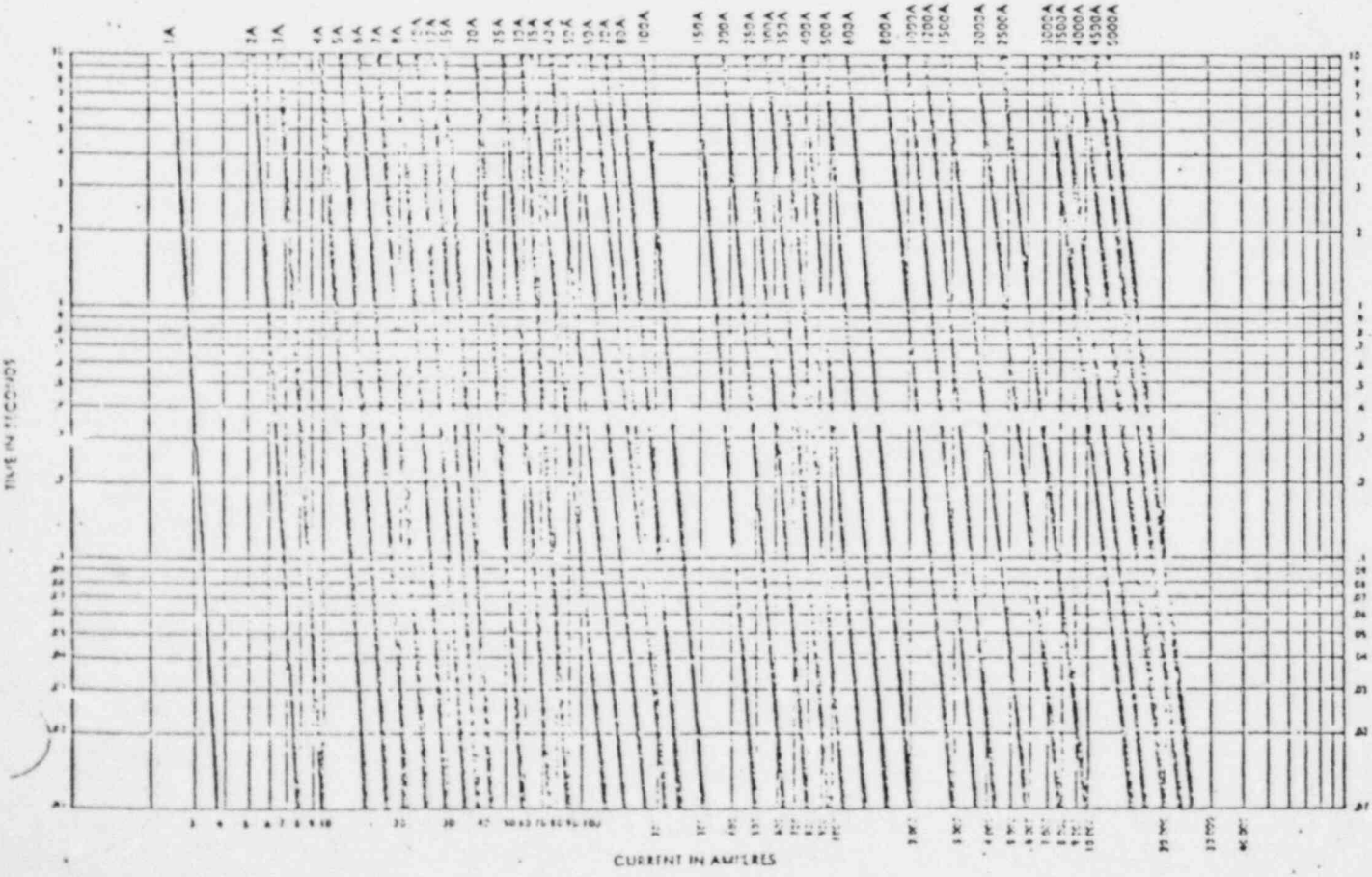


Figure 3

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TABLE III - 1

CABLE LIST RECONCILIATION

List deleted from: Title Category 1

Location PSC Letter

Date September 19, 1976

Reasons for removal:

A) Cable was rerouted or deleted from plant

B) Field recheck of original data indicated an error in the original data. The field recheck data did not indicate the cable belonged in this category.

C) Cable or tray designation or tray boundary change resulted in cable no longer belonging in this category.

D) Keypunch errors in September 17, 1975 listings

Current status of cable:

0 - Cable routing meets FSAR criteria

1 - Cable is now in Category 1

3 - Cable is now in Category 3

4 - Cable is now in Category 4

5 - Cable is now in Category 5

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CATEGORY 1 JUSTIFICATION OF DELETIONS

CABLE NO.	REASON	STATUS
3195	A	0
3196	A	0
3198	A	0
3325	A	0
3332	A	0
3334	A	0
3570	A	0
3594	A	0
3701	B	0
3756	A	0
22414	B	0
25050	A	0
25738	A	0
26853	A	0
26865	A	0

TABLE VI-1

CABLE LIST RECONCILIATION

List deleted from: Title Categories 4 & 5

Location PSC Letter

Date September 17, 1975

Reasons for removal:

A) Cable was rerouted or deleted from plant

B) Field recheck of original data indicated an error in the original data. The field recheck data did not indicate the cable belonged in this category.

C) Cable or tray designation or tray boundary change resulted in cable no longer belonging in this category.

D) Keypunch errors in September 17, 1975 listings

Current status of cable:

0 - Cable routing meets FSAR criteria

1 - Cable is now in Category 1

3 - Cable is now in Category 3

4 - Cable is now in Category 4

5 - Cable is now in Category 5

CATEGORY 4 AND 5 JUSTIFICATION OF DELETIONS

BLE NO.	REASON	STATUS
370	C	0
425	B	0
467	C	0
549	A	0
558	C	0
679	B	0
1072	A	0
1551	A	0
1799	A	0
2402	A	0
2421	A	0
2491	C	0
2492	C	0
2493	C	0
2501	B	0
2502	A	0
2503	A	0
2965	A	0
2979	A	0
3343	B	0
3344	B	0
3450	A	0
3617	A	0
4853	C	0
5571	A	0
5911	C	0
6036	C	0
6057	C	0
6058	C	0
6059	C	0
6060	C	0
6062	C	0
6070	C	0
6071	C	0
6073	C	0
6077	C	0
6080	C	0
6081	C	0
6083	C	0
6088	C	0
6089	C	0
6091	C	0
6093	C	0
6094	C	0
6106	C	0
6110	C	0
6111	C	0
6120	C	0
6124	C	0
6130	C	0
6131	C	0

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CATEGORY 4 AND 5 JUSTIFICATION OF DELETIONS

ABLE NO.	REASON	STATUS
6135	C	0
6136	C	0
6137	C	0
6156	C	0
6157	C	0
6160	C	0
6165	C	0
6166	C	0
6173	C	0
6178	C	0
6183	C	0
6188	C	0
6191	C	0
6196	C	0
6254	A	0
6276	A	0
6615	B	0
6750	A	0
7014	B	0
7053	C	0
7442	A	0
7448	C	0
7486	A	0
7488	A	0
8145	A	0
8163	D	0
8324	A	0
9227	A	0
9251	A	0
9291	A	0
9902	A	0
9908	A	0
9914	A	0
16425	C	0
16895	C	0
16907	C	0
17031	B	0
17710	C	0
17711	D	0
17712	D	0
17713	D	0
17714	D	0
17715	D	0
17716	D	0
17717	D	0
17718	D	0
17719	D	0
17852	C	0
17980	D	0
17981	D	0

CATEGORY 4 AND 5 JUSTIFICATION OF DELETIONS

TABLE NO.	REASON	STATUS
18000	C	0
18002	C	0
18167	B	0
20316	C	0
20319	C	0
20322	C	0
20325	C	0
20328	C	0
20331	C	0
20334	C	0
20363	C	0
20365	C	0
20367	C	0
20369	C	0
20371	C	0
20373	C	0
20376	C	0
20379	C	0
20382	C	0
20385	C	0
20388	C	0
20473	C	0
20474	C	0
20479	C	0
20482	B	0
20485	C	0
20488	C	0
20491	C	0
20494	C	0
20497	C	0
20523	C	0
20524	C	0
20527	C	0
20530	C	0
20533	C	0
20536	C	0
20539	C	0
20542	C	0
20545	C	0
20548	C	0
20551	C	0
20893	B	0
20894	B	0
20895	B	0
20896	B	0
20897	B	0
20898	B	0
20899	B	0
20900	B	0
20901	B	0
20902	B	0
20907	B	0

CATEGORY 4 AND 5 JUSTIFICATION OF DELETIONS

TABLE NO.	REASON	STATUS
20910	B	0
21175	C	1
21191	A	0
21206	A	0
21247	C,D	0
21335	B	0
21248	A	0
21822	B	0
22366	D	0
22367	D	0
22368	D	0
22369	D	0
22428	C	0
22445	B	0
22446	B	0
22447	B	0
22448	B	0
22467	C	1
25297	B	0
25434	B	0
25903	B	0
26012	D	0
26052	B	0
26283	D	0
26303	A	0
26315	B	0
26326	B	0
26340	B	0
26443	D	0
26471	A	0
26497	C	0
26498	C	0
26503	A	0
26504	A	0
26881	C	0
26886	C	0
26940	D	0
26950	D	0
27624	B	0
27759	D	0
27861	C	0
27896	D	0
27899	B	0
28007	C	1
28027	C	1
28043	C	0
28063	C	0
28066	A	0
28067	A	0
28210	C	0
28211	C	0

CATEGORY 4 AND 5 JUSTIFICATION OF DELETIONS

TABLE NO.	REASON	STATUS
28212	C	0
28213	C	0
28214	C	0
28215	C	0
28216	C	0
28217	C	0
28218	C	0
28247	C	0

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TABLE VI-2 CATEGORY 4 AND 5 CABLES ADDED SINCE SEPTEMBER 17, 1975

CABLE NUMBERS:

26	37	150	155	156	157	190	191
201	203	205	220	224	277	480	489
512	539	663	664	683	684	700	752
772	1004	1009	1017	1618	1056	1059	1060
1900	1901	1903	2060	2473	2474	2476	2477
2481	2482	2483	2489	2496	2497	2498	2507
2627	2714	2720	2786	2787	2789	2795	2799
2843	2868	2869	3011	3023	3034	3081	3086
3132	3133	3134	3135	3145	3144	3154	3156
3181	3182	3183	3380	3383	3384	3385	3389
3392	3393	3445	3676	3735	3747	3773	3783
3784	3785	3786	3790	3791	3792	3793	3794
3795	3797	3811	3812	3813	3816	3817	3820
3821	3822	3823	3824	3825	3826	3827	3828
3840	3841	3842	3843	3845	3851	3852	3853
3863	3895	3896	4103	4112	4114	4124	4125
4308	4804	4886	4889	4890	4891	4892	4938
4944	4960	4961	4968	5028	5204	5254	5264
5291	5326	5349	5500	5695	5696	5697	5761
5762	5768	5865	5910	5915	5916	5925	5930
5934	5940	5941	5945	5950	5951	5952	5955
5956	5957	5960	5961	5962	5963	5965	5966
5967	5970	5971	5972	5973	5975	5977	5978
6007	6008	6011	6016	6030	6035	6045	6053
6079	6085	6210	6230	6250	6253	6335	6366
6470	6471	6472	6473	6495	6500	6541	6543
6544	6590	6860	6862	6864	6910	7015	7112
7114	7292	7293	7299	7313	7326	7477	7506
7583	7588	7650	7879	8220	8400	8401	8402
8403	8404	8405	8409	8413	8416	8420	8422
8425	8426	8427	8428	8429	8430	8431	8432
8433	8434	8436	9620	9952	9953	9954	9958
9991	13000	13001	13007	13008	13009	13012	13013
13014	13015	13019	13024	13025	13026	13027	13031
13032	13033	13034	13035	13040	13041	13042	13046
13047	13048	13050	13051	13052	13053	13054	13055
13059	13060	13062	13064	13065	13066	13067	13068
13069	16187	16188	16367	16377	16447	16470	16510
16646	16654	16656	16667	16671	16672	16673	16674
16753	16757	16758	16789	17080	17183	17184	17185
17265	17279	17280	17286	17287	17288	17661	18135
18136	18137	18138	18299	18300	20210	20285	20396
20500	20520	20521	20522	20892	20903	20904	20905
20906	20908	20909	20911	20912	20913	21265	21283
21430	21431	21432	21850	24986	24986	25070	25075
25110	25186	25187	25232	25238	25239	25299	25397
25405	25417	25431	25432	25436	25456	25483	25556
25557	25796	25797	25823	25825	25826	25827	25828
25913	25914	25958	25965	25969	25970	25985	25986
25995	26077	26096	26123	26290	26297	26324	26376
26460	26478	26558	26564	26585	26653	26640	26724
26829	26845	26855	26874	26892	26993	27003	27026
27086	27087	27088	27257	27258	27259	27260	27261
27285	27295	27296	27440	27442	27460	27462	27611
27631	27661	27665	27666	27685	27764	27765	27766
27767	27814	27837	27851	27870	27871	27872	27876

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TABLE VI-2 CATEGORY 4 AND 5 CABLES ADDED SINCE SEPTEMBER 17, 1975

2R140	2R141	2R142	2R143	2R144	2R145	2R146	2R147
2R148	2R149	2R150	2R151	2R152	2R153	2R154	2R155
2R156	2R157	2R158	2R159				

THERE ARE 468 CABLE NUMBERS PRINTED

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TABLE VI-3

CABLE LIST RECONCILIATION

Title: Categories 4 & 5

Location: NRC Letter Item 12

Date: April 27, 1976

Reasons for removal:

A) Cable was rerouted or deleted from plant.

B) Field recheck of original data indicated an error in the original data. The field recheck data did not indicate the cable belonged in this category.

C) Cable or tray designation or tray boundary change resulted in cable no longer belonging in this category.

D) Keypunch errors in September 17, 1975 listings.

Current status of cable:

0 - Cable routing meets FSAR criteria

1 - Cable is now in Category 1

3 - Cable is now in Category 3

4 - Cable is now in Category 4

5 - Cable is now in Category 5

TABLE XI - 1

SUMMARY OF NON-CONFORMANCE CABLES AND CORRECTIVE ACTION

Non-Conformance Category	Number of Non-Conforming Cables	CORRECTIVE ACTION - NUMBER OF CABLES				
		Reroute	Review Protection	Asbestos Cloth	Fire Stop	Flamemastic
1. Essential Bus only	77	1	76	1	0	75
2. Essential Bus/Loop	357	357	-	-	-	-
3. Essential/Non-Essential Service Errors						
Instrument	101	58*	-	-	-	-
Control	62	27*	-	-	-	-
Power	22	22	-	-	-	-
4. Non-Essential	Totals					
Instrument	369	6	363	9	0	356**
Control	1390	23	1367	58	0	1336**
5. Non-Essential Power	198	2	196	-	0	196
TOTAL	2576	496	2002	68	0	1963

* The remaining 78 non-conforming cables have been reviewed with the Staff and found to not require reroute (See Section V of this letter).

** 29 non-essential control or instrument cables have both asbestos cloth and Flamemastic for corrective action.

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TABLE XI - 2

CABLE SUMMARY - NUMBER OF CABLES

	Non-Conforming	Corrected	Correct	Not Evaluated	TOTAL
Essential Cables	75*	401	1571	0	2047
Non-Essential Cables	1966**	134	7556	0	9656
TOTAL	2041	535	9127	0	11,703

* These cables are Category 1 cables for which Flamemastic will be applied before exceeding 40% power.

** These cables include 78 Category 3 cables reviewed by the Staff and found acceptable without reroute plus Category 4 and 5 cables for which Flamemastic will be applied before exceeding 40% power.

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TABLE XI-3 SPARED AND ABANDONED CABLES IDENTIFIED IN ISSUE B OF TAB

LE NUMBERS:

155	156	157	171	190	191	200	458
534	718	719	751	771	1788	2497	2498
2507	2508	2626	2818	2819	2853	2867	2883
2884	2946	3231	3232	3352	3356	3360	3361
3367	3375	3377	3466	3469	3731	3824	4125
4126	4127	4130	4131	4216	4218	4316	4859
4919	4995	4996	4998	5000	5011	5146	5158
5170	5171	5349	5538	5539	5540	5740	5779
5780	5825	5908	6005	6008	6011	6015	6120
6220	6227	6257	6366	6400	6402	6484	6603
6704	6710	6866	6876	6912	6921	6922	6925
6926	6927	6928	6931	7047	7147	7165	7166
7179	7267	7270	7276	7308	7325	7376	7392
7396	7410	7413	7470	7472	7474	7476	7480
7593	7607	7687	7689	7690	7741	7817	7887
7888	7902	7954	7970	8035	8068	8086	8307
8312	8348	8359	9172	9176	9231	9661	9662
9663	9664	9665	9666	9667	9668	9669	9670
9671	9961	13008	13009	16068	16166	16219	16229
16394	16656	16657	16671	16672	16673	16674	16864
16870	16903	16924	17031	17193	17207	17230	17231
17275	17276	17277	17278	17282	17283	17284	17285
17413	17471	17512	17513	17610	17701	17702	17794
17799	17800	17801	17804	17805	18288	18289	22206
208	22209	22212	22222	22223	22231	22240	22247
253	22255	22256	22258	22266	22267	22268	22269
22326	22351	22407	22409	22411	22419	22534	22535
22542	22558	25002	25004	25008	25009	25011	25029
25078	25079	25100	25103	25110	25119	25120	25133
25136	25152	25165	25295	25396	25407	25446	25461
25463	25464	25470	25471	25472	25605	25797	26076
26077	26278	26458	26460	26470	26578	26579	26659
26691	26692	26698	26701	26744	26753	26850	27501
27710	27864						

THERE ARE 266 CABLE NUMBERS PRINTED

Cable Tabulations A & B and Table V-1 not included.

Copy in Engineering and QA if needed.