#### **EVALUATION RESEARCH CORPORATION**

#### COMANCHE PEAK RESPONSE TEAM

QUALITY INSTRUCTION FOR ISSUE SPECIFIC ACTION PLAN VII.c

CONTROLLED COPY OF INSTRUCTION NO.:

EFFECTIVE DATE: 07/26/85

REINSPECTION OF CONDUIT/I-E-CDUT

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Date: 7.25-85

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### Reinspection of Conduit/I-E-CDUT

### 1.0 PURPOSE

To provide methods to be used and the accept/reject criteria to be applied when performing reinspection of conduit.

### 2.0 APPLICABILITY

This procedure applies to reinspection of samples selected from the conduit population. The population is described in the Population Description for Conduit.

### 3.0 REFERENCES

- 3.1 CPP-009, Performance of Reinspection and Documentation Reviews
- 3.2 2323-E1(E2)-1700, Cable and Raceway Schedule
- 3.3 2323-E1(E2)-1800, Material List
- 3.4 2323-S-0910, Conduit Support Package

### 4.0 GENERAL

Reinspection reviews are performed and documented in accordance with established project procedures and instructions. This instruction establishes the attributes and accept/reject criteria for reinspections of conduit. Reference 3.1 addresses the method to perform reinspections, document and process the results.

### 5.0 PROCEDURE

5.1 Using the information in Reference 3.1 and below, perform the reinspections on the items in this population and document the results of the reinspection on the checklist (Attachment 6.9).

## 1. Size and Material

a. Verify that installed conduit size agrees with size as called for on the conduit layout drawings. Conduit of the next larger size in accordance with the following size range is not considered a deviation from the designed size: conduit size range (1/2, 3/4, 1, 1-1/2, 2, 3, 4, 5).

b. Verify that conduit material used is rigid steel, zinc coated unless otherwise noted on drawings.

## 2. Identification

- a. Verify that the exposed conduit, except lighting conduit, has permanent identification markings (alphanumeric code designation) and that the identification agrees with the cable and raceway schedule report. Report Section No. 70, 2323-E1-1700 and 2323-E2-1700 including outstanding DCA's. Markings may be any of the following:
  - Freehand markings with black ink marker or paint
     Adhesive markers factory pre-printed (except reactor containment, and manholes)
     Metal or plastic tags

Metal tags used inside the Reactor Containment must be attached to the conduit with either wire, Tefzel ty-raps, or engineered approved fastenings.

- b. Verify, except for lighting conduit, that permanent identification markings have been applied at the following locations:
  - ° At both ends of each run
  - ° Entering or leaving a junction/pull box each side
  - ° Entering or leaving a tray
  - ° On each side of a floor or wall

NOTE: Conduit 10 feet in length or less need only be identified at a single point in the run.

A single conduit entering and leaving a pull box is not required to be identified on either side of the box.

c. Verify that color code markings have been applied at intervals not to exceed 15 feet.

For conduit identification and color code explanations see Attachment 6.1.

NOTE: For cable tray identification explanation see Attachment 6.2.

## 3. Origin and Destination

Verify that the conduit origin and destination agree with the initial point and ending point designation per the Cable and Raceway Schedule Report No. 70 (conduit list), 2323-El-1700, and 2323-E2-1700, including all approved outstanding design change authorization (DCAs).

## 4. Fittings

- a. Verify that either an insulated bushing or sleeve insert has been installed on all conduit ends including conduit terminating at equipment/cabinets, junction/ pull boxes, except for conduit connections to equipment with hubs.
- b. Verify that conduit terminating at either a junction/pull box or cabinet is fastened with a locknut or bushing to the enclosure.
- c. Verify that couplings are secure (i.e., couplings are not loose).
- d. Conduit connections at outdoor enclosures containing terminations, or indoors where exposed to continuous wetting shall be made with liquid tight hub fittings. Fitting type shall be as specified on the Material list. Gasketed locknuts are an acceptable substitute. Conduits entering the top of equipment subject to water spray from fire protection sprinkler activation should be sealed according to details provided on the drawings.

## 5. Expansion Fittings

Verify that either expansion fitting or flexible conduit has been used in long straight runs of conduit. Long straight runs (bends less than 15° are considered straight for this application only) of continuous conduit shall be provided with either an expansion fitting or flexible conduit at 75-foot intervals.

#### 6. Bends

N.I.S. conduit raceway, function 6R, 6W, 6B and 6Y (for third and fourth character respectively in the conduit identification number) field bends shall comply with the following dimensions:

Size of Conduit

3" diameter conduit - Hinimum Bend Radius
4" diameter conduit - 20" min. bend radius

# 7. Total Conduit Length and Bends Between Pull Points

N.I.S. conduit raceway functions 6R, 6W, 6B and 6Y are to be installed to the dimension provided on the drawings with a maximum tolerance of ±6 inches from the design dimension. The distance between junction boxes/pull points and the length of conduit between boxes/pull points shall be in accordance with the dimensions provided on the drawings.

Where design dimensions are not provided on drawings, verify the installation of N.I.S. conduit in accordance with the following requirements:

Pull boxes are to be located at intervals defined by A + B = 100, where "A" is the total number of degrees of conduit bends between pull points and "B" is the total number of running feet between pull points.

## 8. Flexible Conduit

- a. Verify that conduit connections made to motors and free standing equipment is made with flexible conduit. Conduit connections to wall mounted equipment, where the equipment is supported on the same surface as the conduit, may be either rigid or flexible.
- b. Verify length of flexible conduit in accordance with the following:

Motors and other freestanding equipment

Size of Conduit

1/2" to 3" conduit - Maximum Length
4" to 5" conduit - 60" maximum length

Unless otherwise specified in S-0910, the minimum flexible conduit length is 18 inches for flexible conduit greater than 2 inches in diameter. For flexible conduit 2 inches in diameter or smaller, the minimum length is that which allows a minimum of 1 inch slack movement of the flexible conduit.

Flexible lengths shall be in accordance with the above, unless otherwise shown on the drawings.

- c. Verify that flexible conduit has been used for continuous runs of conduit across shake spaces between adjacent buildings. Verify l' movement (slack has been provided. Shake space requirements are applicable for continuous runs of conduit between the safeguard building or fuel building and auxiliary building.
- d. Verify that stainless steel flexible conduit is used in containment.

# 9. Conduit and Cable Tray Interface

a. Where conduit attaches to a cable tray verify that the connection is made with flexible conduit. b. Where conduit interfaces with a cable tray verify that the conduit terminates at the tray in accordance with Attachment 6.3 detail 23.

### 10. Clearance

a. Conduit shall not be installed closer than 6 inches from the insulation of high temperature Class I and II piping except as necessary for pipe-mounted instrumentation such as thermocouples. Where this distance has not been maintained verify that heat reflective shielding has been installed as shown on the drawings.

In no case shall any part of the conduit or the conduit support system come in direct contact with uninsulated equipment in the piping system or with pipe restraints or anchors.

- NOTE: 1. Class I or Class II piping can be identified by the mechanical I.D. Tags. Typical spool piece tag number: 3"-SB-1-63-301-5 (Last numeral is Class.) If tag cannot be seen, go to pipe support typical tag number: SFX-022-700-A55D (Last numeral is Class.) Support will be the same Class as pipe it supports.
  - High temperature pipe is pipe that has an operating temperature of 200°F or more.
     For temperature ratings of piping reference the Pipe Line Designation Table.
- b. Minimum clearance between conduits containing power cables (raceway function 10, 20, 1G, 2G, 1K, 2K and 5K) shall not be less than outside diameter of larger conduit except as defined below:
  - 1. At such points where exposed conduits enter or exit any equipment or box to a point of 4'-0" from such equipment or box, but not less than 1-inch between different train conduit.
  - 2. In general plant areas where conduits have a minimum clearance of 1/4 0.D. of the larger conduit, but not less than 1" between different train conduits, for conduit runs not exceeding 10 feet in length.

## 11. Fire Stops and Seals

- a. Conduit connections to floor mounted equipment and conduit penetrating a floor or fire rated wall.
  - 1. Verify that where a conduit penetrates a fire wall or floor either a "C" condulet, EYS fitting, or junction/pull box has been installed between the equipment and the fire wall. Verify by visual inspection that sealing material has been installed. Where the conduit penetrates a floor or fire rate wall without connection to equipment, verify that a sealing material has been installed.
  - Verify by visual inspection at equipment with stub-ups(stove pipes) sealing material has been installed.
- Conduit connections to other nonfloor mounted totally enclosed equipment.
  - 1. Where a conduit penetrates either a fire wall or floor and the distance from the wall to the equipment is less than 10 feet on either side of the wall or floor, verify the installation of condulet, EYS or pull/junction box including visual verification for the installation of sealing material per a.l above.
  - 2. Where a conduit penetrates either a fire wall or floor and the length of conduit from the wall to the equipment is 10 feet or greater in length on both sides of the wall or floor the installation of C condulet, EYS fitting, or pull/junction box is not required between the fire wall/floor and the equipment.

NOTE: DBD-SY1 FHA drawings show location of fire rated floors and walls.

# 12. Separation

- a. For all conduits except N.I.S. conduit raceway function 6R, 6W, 6B, and 6Y, verify separation as follows:
  - Minimum separation between conduits having different trains and/or channels including Train A & B lighting conduit shall be one inch.

Attachment 6.4 lists the trains and channels and their associated raceway functions (third and fourth characters of conduit ID number).

 A minimum separation of 2'-0" must be maintained between parallel runs of conduit raceway Systems 20, 2G, and 2K; 30, 3G, and 3K; 5R, 5W, 5B and 5Y; 5K and NIS conduit raceway functions 6R, 6W, 6B and 6Y except as noted.

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- b. Separation between N.I.S. conduit and other conduit to be as follows:
  - A minimum separation of 2'-0" must be maintained between parallel runs of "NIS" conduit systems (Raceway functions 6R, 6W, 6B and 6Y) and different channel "NIS" Conduit.
  - 2. A minimum separation of 2'-0" must be maintained between parallel runs of "N.I.S." conduit raceway functions 6R, 6W, 6B, 6Y and raceway systems 20, 2G & 2K; 30, 3G & 3K; 5R, 5W, 5B & 5Y; 5K; & 6K.

NOTE: Minimum separation of non-parallel runs of "NIS" conduit and the above mentioned systems (i.e., crossing each other at an angle greater than 15 degrees) is 1-inch.

- c. Verify separation between conduit (including lighting Train A or B conduit) and cable tray except N.I.S. system per the following:
  - Minimum vertical separation between a Train A, B, non N.I.S. channels I, II, III, & IV conduit and the top of an open tray having different train or channel shall be 2'-0" in the cable spreading room and 3'-0" in general plant areas. The minimum separation is 1-inch where a solid cover is provided. See Attachment 6.5.
  - Minimum separation between a Train A, B, non N.I.S. channels I, II, III, & IV conduit and either the bottom or side of a cable tray having different train or channel shall be 1". See Attachment 6.6.
  - 3. Minimum separation between a Train C conduit and either the bottom, top or side of a tray having different train or channel designation shall be 1". See Attachment 6.6, detail 49.
    - NOTE: 1. All bus duct shall be treated the same as non-safety (Train "C") ladder tray.
      - All non-scheduled raceway (security, fire detection, non train lighting, communications, etc.) shall be treated as nonsafety (Train "C").

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- Verify separation for all conduit except N.I.S. system conduit passing a vertical tray per Attachment 6.8.
- d. Verify N.I.S. conduit to cable tray separation as follows:
  - A minimum separation of 6'-0" must be maintained between "NIS" conduit systems (Raceway functions 6R, 6W, 6B & 6Y) & 6.9Kv raceway functions 10, 1G & 1K including cable bus duct. See Attachment 6.7.
  - 2. A minimum separation of 2'-0" must be maintained between parallel runs "NIS" conduit (Raceway functions 6R, 6W, 6B & 6Y) and cable tray raceway system 20, 2G & 2K; 30, 3G & 3K; 5R, 5W, 5B & 5Y; 5K; & 6K. Minimum separation of non-parallel runs of "NIS" conduit and the above mentioned systems (i.e., crossing each other at an angle greater than 15 degrees) reduce such separation to 1" with the addition of tray covers. (Top only required for N.I.S. conduit passing over the top, and bottom only required for N.I.S. conduit passing on the bottom. Solid bottom tray constitutes as a cover.)
- e. Verify separation between conduit and exposed cable (i.e., cable not enclosed in a raceway) per the following:
  - Separation between train or channel conduit except N.I.S. system and other exposed train or channel cable shall be as follows:
    - ° 3'-0" in general plant areas ° 1'-0" in cable spreading area

The 1 foot - 3 foot dimension may be reduced provided either conduit or cable has a separation barrier material (SBM) blanket applied for a distance to provide required separation for the area. See Attachment 6.7, detail 57.

- Separation between N.I.S. system conduit and exposed cable shall be as follows:
  - a. A minimum separation of 6'-0" must be maintained between N.I.S. conduit and exposed power cables (raceway functions 10, 1G & 1K).

- b. A minimum separation of 2'-0" must be maintained between parallel runs of N.I.S. conduit and exposed cable (raceway functions 20, 2G, 2K; 30, 3G & 3K; 5R, 5W, 5B & 5Y; & 6K).
- 5.2 Document the results of the reinspection on the attributed checklist (Attachment 6.9). Forms are available in Records Management.

## 6.0 ATTACHMENTS

- 6.1 Conduit Identification
- 6.2 Cable Tray Identification
- 6.3 Conduit/Cable Tray Interfaces
- 6.4 Trains and Channels and Associated Raceways
- 6.5 Separation Requirements
- 6.6 Separation Requirements
- 6.7 Separation Requirements
- 6.8 Separation Requirements
- 6.9 Checklist

TABLE 2 (Racovey Function)

16. 1G. 1K - 6.9 NV A.C.

29. 2G. 2K - 480 Vac. 120, 208 Vac - 125V-250V

D.C. power

36. 3G. 3K - Control AC & DC & Small Power Feeders

Under 480V

46. 4G. 4E - Low Livel Signals

4E. 4W, 4S, 4T - Reactor Protection Instrumentation

Liw Level Signals

36. 3G. 3K - 480W all & Beary Fower Feeders Under 480V

(Local Control)

3R. 5W, 5S, 5T - Reactor Protection Instrumentation

121W Signal

46. 4G. 6E - Control & C & DC & Small Power Feeders

Under 180V (Local Control)

4R. 6W, 6S, 6T - Huclear Instrumentation System

76. 7G. 7E - Low Level Signals (Local Control)

4R. 6W, 6S, 6T - Huclear Instrumentation System

76. 7G. 7E - Low Level Signals (Local Control)

4R. Telephone & Communications

TABLE 1 (Baic Busher)

### TABLE ) (Safety Related Train)

"A" Train - Orange - # -

"B" Train - Green - G - Associated "B" Train - Green with white stripes

"C" Train - Black - E - (Nos-Q)

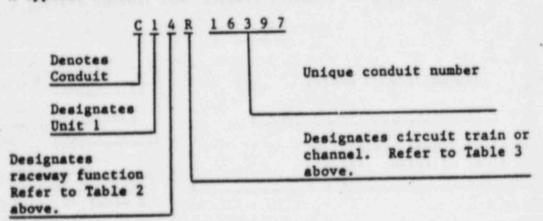
Inst. Channel ! - Red - R -

Inst. Channel II - White - W -

Inst. Channel III - Blue - B

Inst. Channel IV - Yellow - Y -

A typical conduit identification number is depicted as follows:



### TRAY NUMBER EXPLANATION

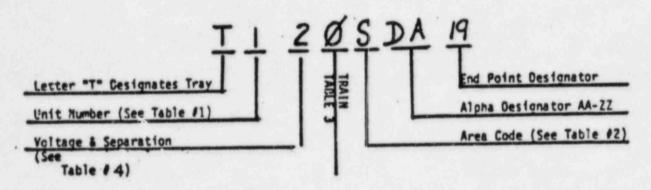


TABLE 1	TABLE 2	TABLE 3			
0 - Common 1 - Unit 1 2 - Unit 2	A - Auxiliary C - Electrical & Control D - Diesel E - Electrical Equipment Area (in Safeguard) F - Fuel M - Miscellaneous Buildings R - Reactor S - Safeguard T - Turbine & Switchgear	8 - Orange - A Train G - Green - B Train K - Black - C Train R - Red - Channel I W - White - Channel II B - Blue - Channel III V - Yellow - Channel IV			

## TABLE 4 (Recewey Function)

16. 1G, 1K - 6.9 KV A.C.

26. 2G, 2K - 480 Vac, 120, 208 Vac - 125V-250V
D.C. power

36. 3G, 3K - Control AC & DC & Small Power Feeders
Under 480V

46. 4G, 4K - Low Level Signals

56. 5G, 5K - 480V AC & Beavy Power Feeders Under 480V
(Local Control)

5R, 5W, 5B, 5Y - Reactor Protection Instrumentation
120V Signals

66. 6G, 6K - Control AC & DC & Small Power Feeders
Under 480V (Local Control)

68. 6W, 68. 6Y - Muclear Instrumentation System

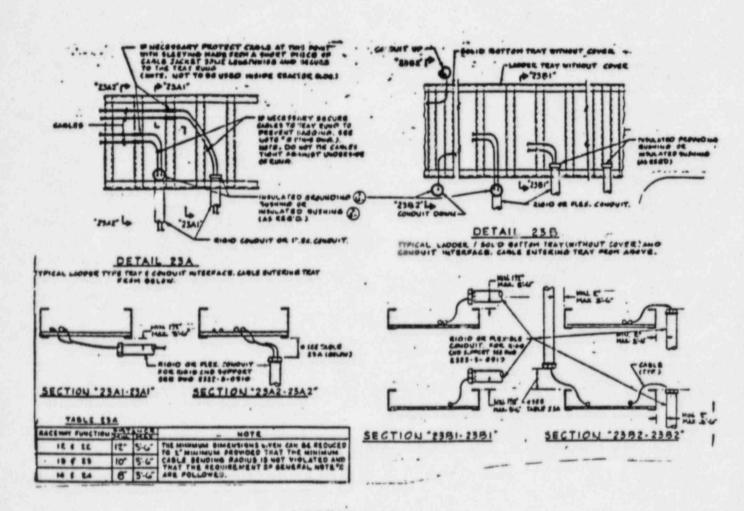
76. 7G, 7K - Low Level Signals (Local Control)

68. 6W, 68. 6Y - Muclear Instrumentation System

76. 7G, 7K - Low Level Signals (Local Control)

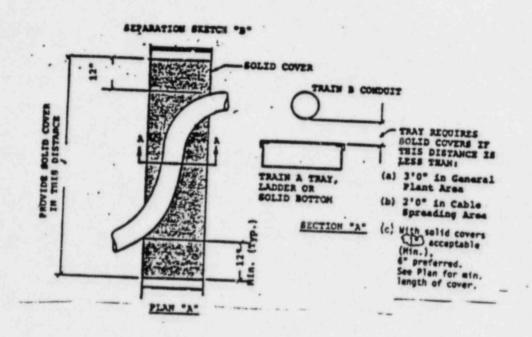
68. 6W, 68. 6Y - Ruclear Instrumentation System

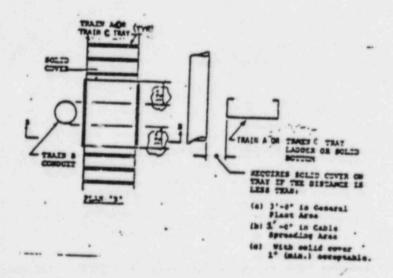
76. 7G, 7K - Low Level Signals (Local Control)

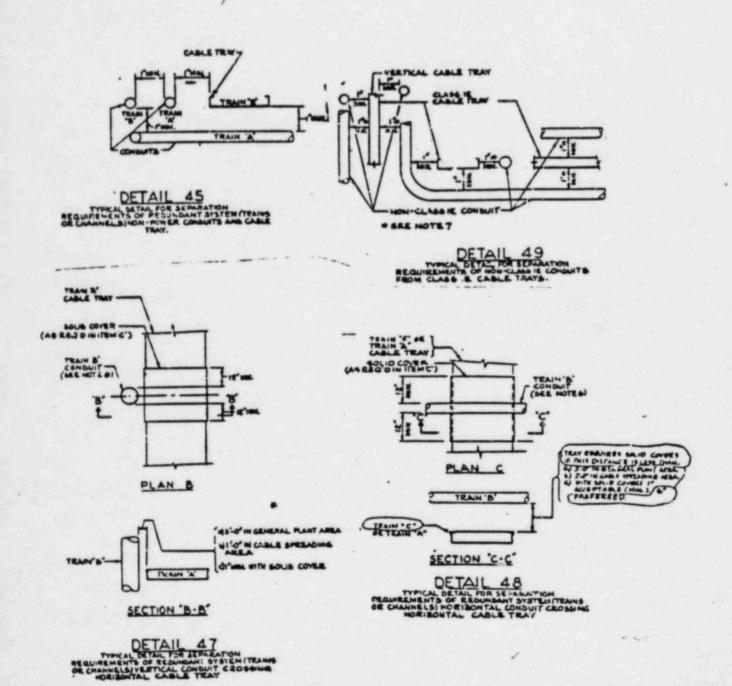


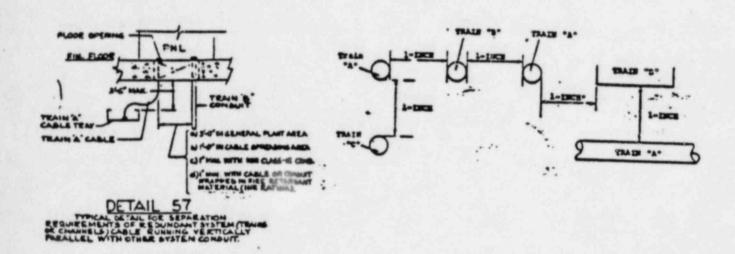
TYPICAL CABLE TRAY & CONDUIT WITERFACE DETAIL

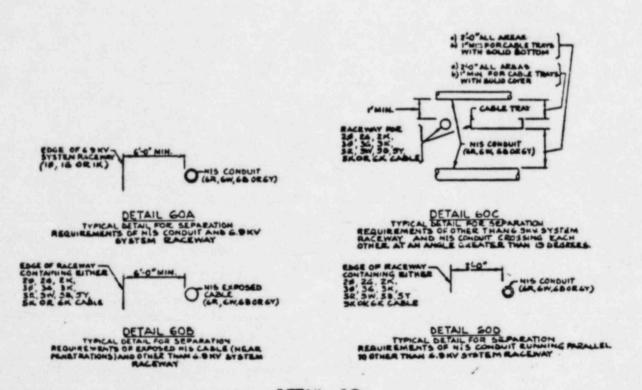
Class	DWG Symbol	Train or Channel	Raceway Function
1E" 1E Associated"	A	Trein "A"	10, 20, 30, 40
1E" 1E Associated"		Train "B"	1G, 2G, 3G, 4G
Non "1E"	NONE	Train "C"	1K, 2K, 3K, 4K, 5K, 6K
1E"	0	Channel I	4R, 5R
1E"	$\bigcirc$	Channel II	4W, 5W
1E"	$\otimes$	Channel III	4B, 5B
1E"		Channel IV	4Y, 5Y

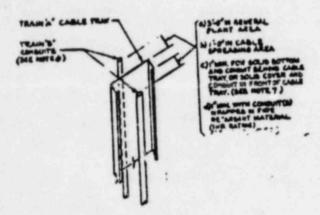




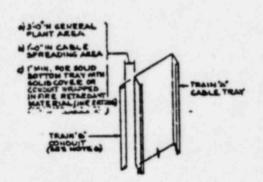








DETAIL 52
TYPICAL DETAIL FOR SEMERATION
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OF (MAINS ELS) VERTICAL CONDUITS ROUTED IN

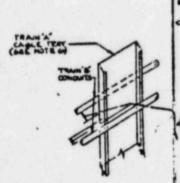


PETAIL 53

TYPICAL DETAIL FOR SEMEATICH

REQUIREMENTS OF REDUNDANT SYSTEM TRANS
OR CHAN ILS YERTICAL COIDUT RUNNING ALONSHOE

OF VERTICAL CABLE TRAI



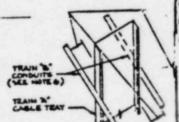
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) 1" MIN WITH CONQUITES) WEAPPED ON PIRE ROTOR DANFRATERIOL (INC EDITING) EXTENDING FROM TRAY NOT WOO THAN 5"0" WI ANGEL PLANF AREA OR 2"0" IN COLUM APPEADING AREA

TYPICAL DETAIL FOR SEMERATION
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FED NT & ERAC OF VERTICAL CABLE TEA!



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PARE

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			6		
3) Origin and Destination		2	13		
4) Fittings	-	1	10		
5) Expansion Fittings 6) Bends		a			
7) Length end Pull Points					
PREPARED BY DAT	E APP	ROVED BY	DATE	APPROVED BY	DATE
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9) Cable Tray Interface	b			3	10	}
(0) Clearance	<u>a</u>		~	19	D	
il) Fire Stope and Scale	a1 a2 b1 b2	5		3		
2) Separation	e1 b1 b2 c1 c2 c3 c4 d1 d2 e1					

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