SEABROOK STATION
Engineering Office

PSNH

June 3, 1985

SBN- 809
T.F. B7.1.2, B7.1.3

Public Service of New Hampshire

NEW HAMPSHIRE YANKEE DIVISION

United States Nuclear Regualtory Commission
Washington, DC 20555

Attention: Mr. George W. Knighton
Licensing Branch No. 3
Division of Licensing

References: (a) Construction Permits CPPR-135 and CPPR-136, Docket Nos. 50-443 and 50-444

Subject: Cable Raceway System Damping

Dear Sir:

At our May 24, 1985, meeting we discussed the Seabrook Station's Cable Tray Support Re-Evaluation Program and, in detail, the implementation of up to 20 percent damping for cable tray/raceway systems. The conclusion of this meeting was that PSNH's proposal was technically acceptable. However, prior to issuance of NRC's formal acceptance of this proposal you requested that we submit a report of the presentation as well as any changes to the FSAR. Accordingly please find enclosed one copy each of the below listed Attachments. It should be noted that the annotated FSAR pages contained in Attachment A will be incorporated into the FSAR by means of a future amendment.

1. Attachment A - Annotated FSAR Pages
2. Attachment B - Report of Presentation - Part A

These Attachments, however, do not represent a complete response to your request because some of the information to be provided has been identified, by its Owner, to be confidential and proprietary. Since we are unable to provide this information to you at this time, we intend to make this document available for your use through our Bethesda Project Office.

After receipt of the affidavit required by 10CFR2.790 from the Owner of the information, PSNH will transmit this information to you.

Very truly yours,

John DeVincentis, Director
Engineering and Licensing

B001
1/1

Enclosure

cc: Atomic Safety and Licensing Board Service List -

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(ATTN: Herb Boynton)

ATTACHMENT A

ANNOTATED FSAR PAGES

SEABROOK STATION

(NON-PROPRIETARY)

This ratio corresponds to a period interval varying from 0.0006 seconds at a period of 0.03 seconds to a period interval of 0.01 seconds at a period of 0.50 seconds.

3.7(B).1.3 Critical Damping Values

The percentages of critical viscous damping used for the seismic analysis of Category I structures, systems, and components are based on recommendations presented in Regulatory Guide 1.61. These percentages, which account for stress level as well as type of construction or fabrication, are summarized in Table 3.7(B)-1.

For seismic piping analysis, an alternative to Regulatory Guide 1.61 may be used. These values are shown graphically in Figure 3.7(B)-39.

INSERT 3.7(B).1.3 ←

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3.7(B).1.4 Supporting Media for Category I Structures

All seismic Category I structures are founded on sound bedrock or on engineered backfill extending to sound bedrock. Engineered backfill was also placed around all seismic Category I structures.

The bedrock at the site is uniform, competent, and nonfragmented. Engineering properties of the bedrock measured in both the field and the laboratory are presented in Subsection 2.5.4.2.a.

The engineered backfill consists of either fill concrete, backfill concrete, offsite borrow, tunnel cuttings, or sand-cement. Properties of the engineered backfill materials are described in Subsection 2.5.4.5. The type of engineered backfill used beneath all seismic Category I structures was fill concrete, except for safety-related electrical duct banks, five electrical manholes, and the service water pipes, which were founded on offsite borrow or tunnel cuttings, as shown in Table 2.5-19.

Identification of the safety-related electrical manholes founded on offsite borrow or tunnel cuttings, the depths of offsite borrow or tunnel cuttings over the bedrock under these particular manholes, the widths of their structural foundations and the total structural height are summarized below:

45

Manhole Numbers	Depths of Soil over Bedrock (ft)	Widths of Structural Foundations (ft)	Total Structural Height (ft)	Supporting Material
W13/W14	6-12	18 x 18½	9½	Offsite Borrow
W15/W16	6-12	18 x 18½	9½	Offsite Borrow
W19/20	15	23½ x 23½	12	Tunnel Cuttings
W29/W30	14	19 x 22½	15	Offsite Borrow
W33/W34	18	18 x 18½	12	Offsite Borrow

45

Change Required for Increased Damping

Insert for
3.7(B).1.3

For the Cable Raceway System, an alternative to Regulatory Guide 1.61 may be used. Critical damping levels may be a maximum of 20 percent for input acceleration levels of .35g and greater for OBE and SSE conditions. In cases where input accelerations are between .1g and .35g, the critical damping valves maybe interpolated between 7 percent and 20 percent respectively.

Attachment A
SB 1 & 2
FSAR

TABLE 3.7(B)-23

CRITICAL DAMPING VALUES

Item, Equipment or Component	Damping Percent Critical	
	OBE	SSE
Piping Systems	1	2
Valves, Compact Pumps, Compressors, Instrumentation, Diesel Generators, Motors	1	2
Heat Exchangers, Tanks & Vessels, Control Cabinets, Deep Well Pumps, Fans, Electrical Conduits, Electrical Switchgear, Filters, Dampers	2	3
Cable Trays	4	7

DELETE

ATTACHMENT B

REPORT OF PRESENTATION - PART A

SEABROOK STATION

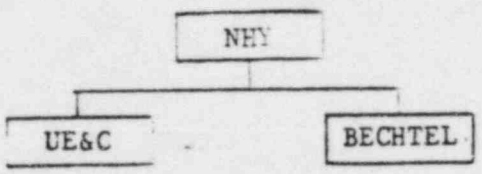
(NON-PROPRIETARY)

SEABROOK CABLE TRAY DAMPING
MEETING AGENDA

- INTRODUCTION (R. TUCKER / YAEC)
- CABLE TRAY TEST PROGRAM (B. LINDERMAN / BECHTEL)
- CABLE TRAY TEST MOVIE (OPTIONAL)
- OVERVIEW OF TEST PROGRAM RESULTS (B. LINDERMAN / BECHTEL)
- SEABROOK REVIEW (P. McMAHON / BECHTEL)
- DESIGN IMPLEMENTATION (A. DUFAULT / UE&C)
- CONCLUSIONS (R. TUCKER / YAEC)
- DISCUSSION

INTRODUCTION

- CURRENT CONSTRUCTION STATUS
  - OVERALL PLANT CONSTRUCTION IS 86% COMPLETE
  - 98% OF THE CABLE TRAY AND VERTICAL TRAY SUPPORT SYSTEM IS COMPLETE
  - LATERAL BRACING IS 75% COMPLETE
  - AXIAL BRACING IS 5% COMPLETE
- PURPOSE OF THE CABLE TRAY STUDY
- RESULTS OF THE STUDY
  - IMPLEMENTATION OF THE BECHTEL RACEWAY PROGRAM
- BENEFITS OF ADOPTING THE PROGRAM
  - REDUCE CHANGEOUT OF CONNECTION HARDWARE
  - REDUCE INSTALLATION PROBLEMS
  - REDUCE COMPLEXITY OF ANTICIPATED MODIFICATIONS FROM 100% QA REINSPECTION
  - IMPROVE CONSTRUCTION SCHEDULE
- ORGANIZATION



RACEWAY TEST PROGRAM

PURPOSE

- TO UNDERSTAND THE DYNAMIC BEHAVIOR OF RACEWAY SYSTEMS AND ESTABLISH REALISTIC DAMPING CHARACTERISTICS, FREQUENCY RESPONSES, AND THE ACTUAL ELASTIC AND INELASTIC BEHAVIOR OF THE SYSTEMS.
- FURNISH DATA FOR DEFINING BETTER METHODS OF ANALYSIS FOR BOTH PRESENT AND FUTURE FACILITIES.
- DEMONSTRATE CIRCUITS REMAIN FUNCTIONAL EVEN WITH PLASTIC DEFORMATION OF RACEWAY SYSTEMS.
- DETERMINE CAPABILITIES OF INSTALLED SYSTEMS IN EXISTING FACILITIES TO RESIST EARTHQUAKE MOTIONS.

RACEWAY TEST PROGRAM (CONT)

METHOD

- STARTING WITH THE SIMPLEST DESIGN SUCH AS ONE USED FOR A FOSSIL POWER PLANT, TO UPGRADE THE SYSTEMS BY TESTING, UNTIL AN ACCEPTABLE AND STABLE LEVEL OF BEHAVIOR OF THE SYSTEM IS ACHIEVED.
- TO EXTENSIVELY TEST THESE SELECTED SYSTEMS TO GENERATE STATISTICAL DATA BASES.
- USE DATA BASES TO ESTABLISH ADEQUATELY CONSERVATIVE DESIGN CRITERIA AND PROCEDURES.

TEST PROGRAM TASKS

TASK A - FIXTURE DESIGN AND CONSTRUCTION

TASK B INITIAL - PRELIMINARY TESTING

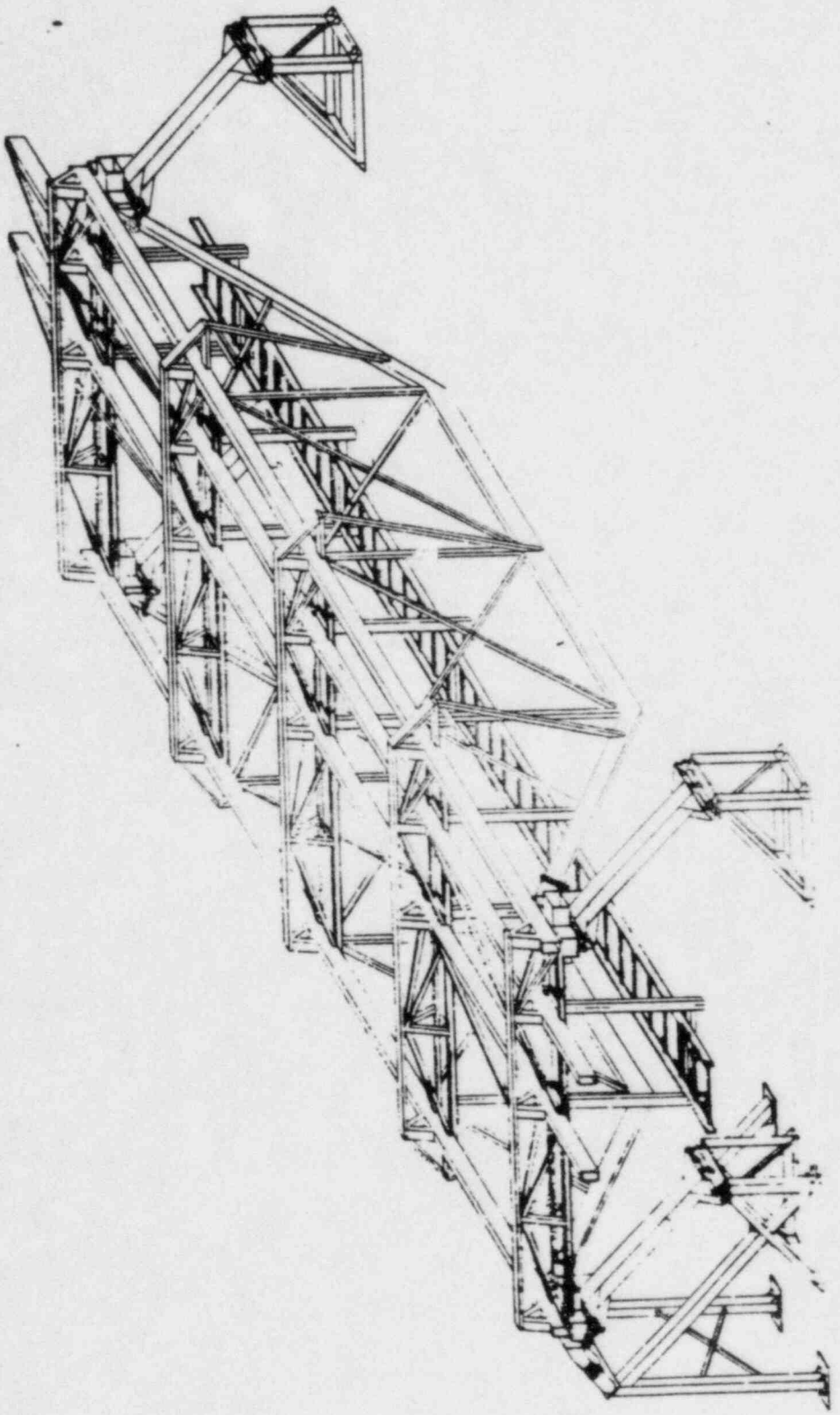
TASK B - CABLE TRAY RACEWAY SYSTEMS

TASK C - CONDUIT RACEWAY SYSTEMS

TASK D - COMBINED RACEWAY SYSTEMS

TASK E - FATIGUE LIFE OF CONNECTIONS

TASK F - CAPACITY OF CLAMPS



TASK B
CABLE TRAY RACEWAY SYSTEMS

PHASE I - TEST VARIOUS TRAY TYPES ON RIGID SUPPORTS

PHASE II - NON-DESTRUCTIVE TESTING OF VARIOUS UNBRACED TRAY SYSTEMS

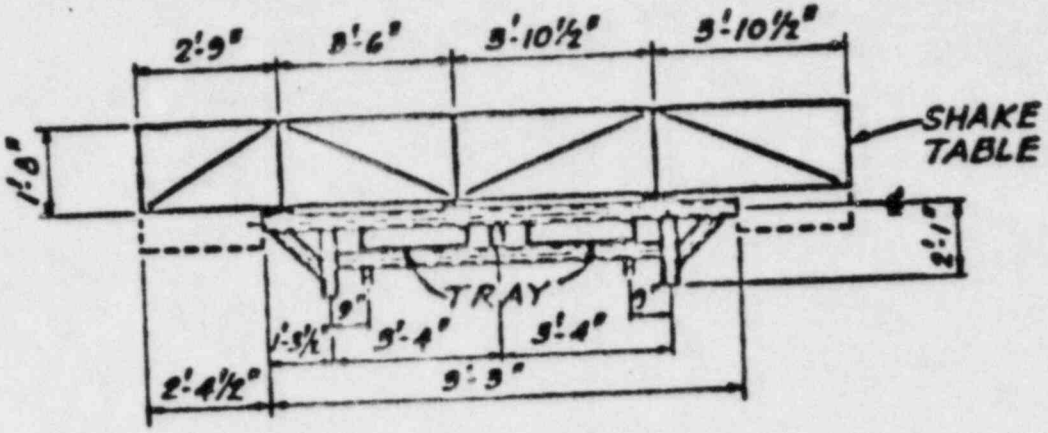
PHASE III - TEST EFFECTS OF TRAY TYPE AND MANUFACTURER ON A SELECTED UNBRACED TRAY SYSTEM

PHASE IV - TEST EFFECTS OF STRUT CONNECTIONS ON A SELECTED UNBRACED TRAY SYSTEM

PHASE V - DESTRUCTIVE TESTING ON SELECTED UNBRACED AND BRACED TRAY SYSTEMS

PHASE VI - DESTRUCTIVE TESTING ON OPTIMIZED UNBRACED AND BRACED SYSTEMS

Attachment B



TEST SET-UP FOR RIGIDLY SUPPORTED TRAYS

(PHASE I)

Attachment B

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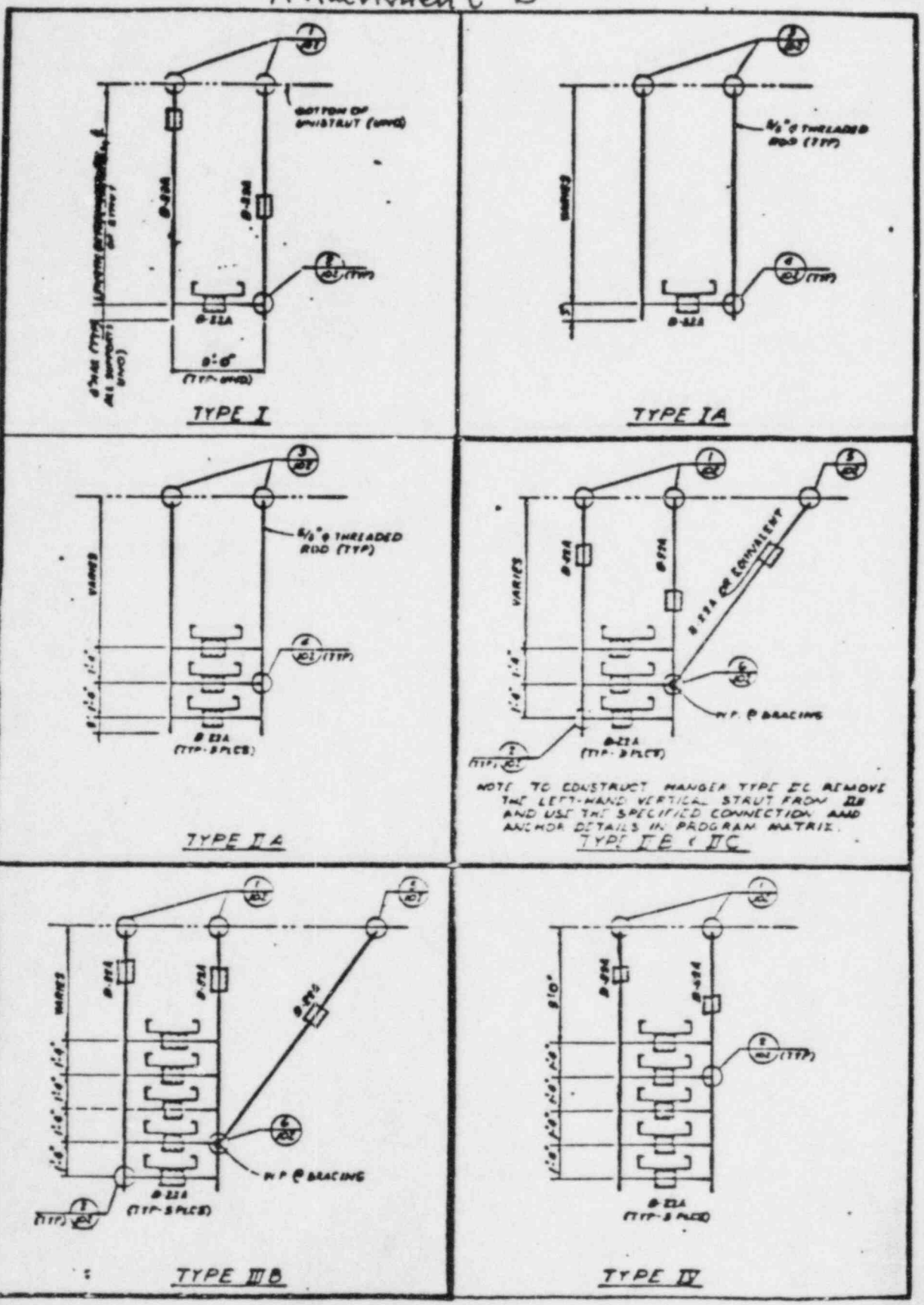
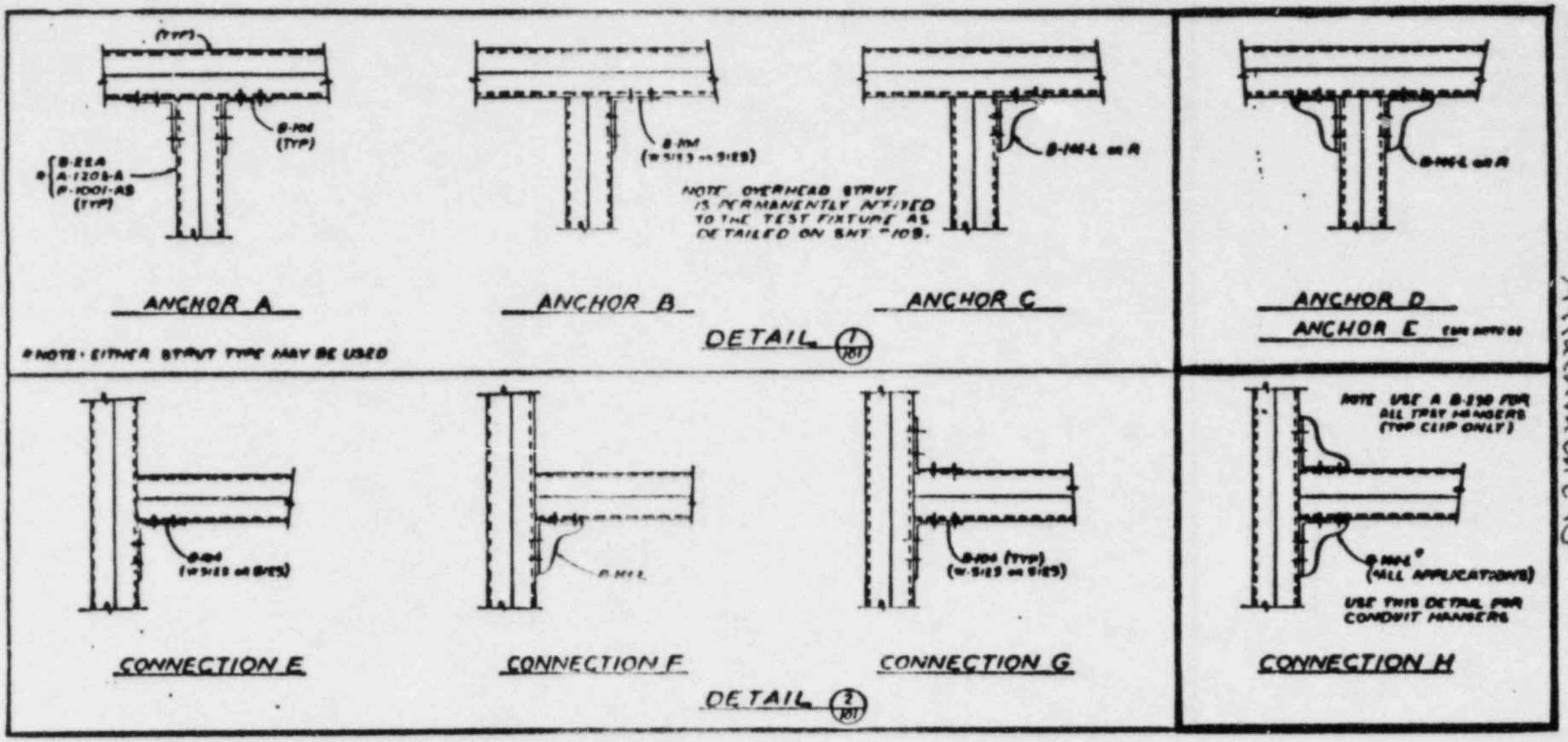


TRAY SUPPORT TYPES TESTED



TRAY SUPPORT CONNECTIONS

Attachment B

p.10

TASK C
CONDUIT RACEWAY SYSTEMS

PHASE VII - TEST VARIOUS SIZED RIGID CONDUITS ON RIGID SUPPORTS

PHASE VIII - NON-DESTRUCTIVE TESTING OF RIGID CONDUITS SUPPORTED ON VARIOUS UNBRACED SUPPORT SYSTEMS

PHASE IX - DELETED

PHASE X - DESTRUCTIVE TESTS ON RIGID CONDUIT SUPPORT SYSTEMS WITH VARIOUS TYPES OF STRUT CONNECTIONS

PHASE XI - DELETED

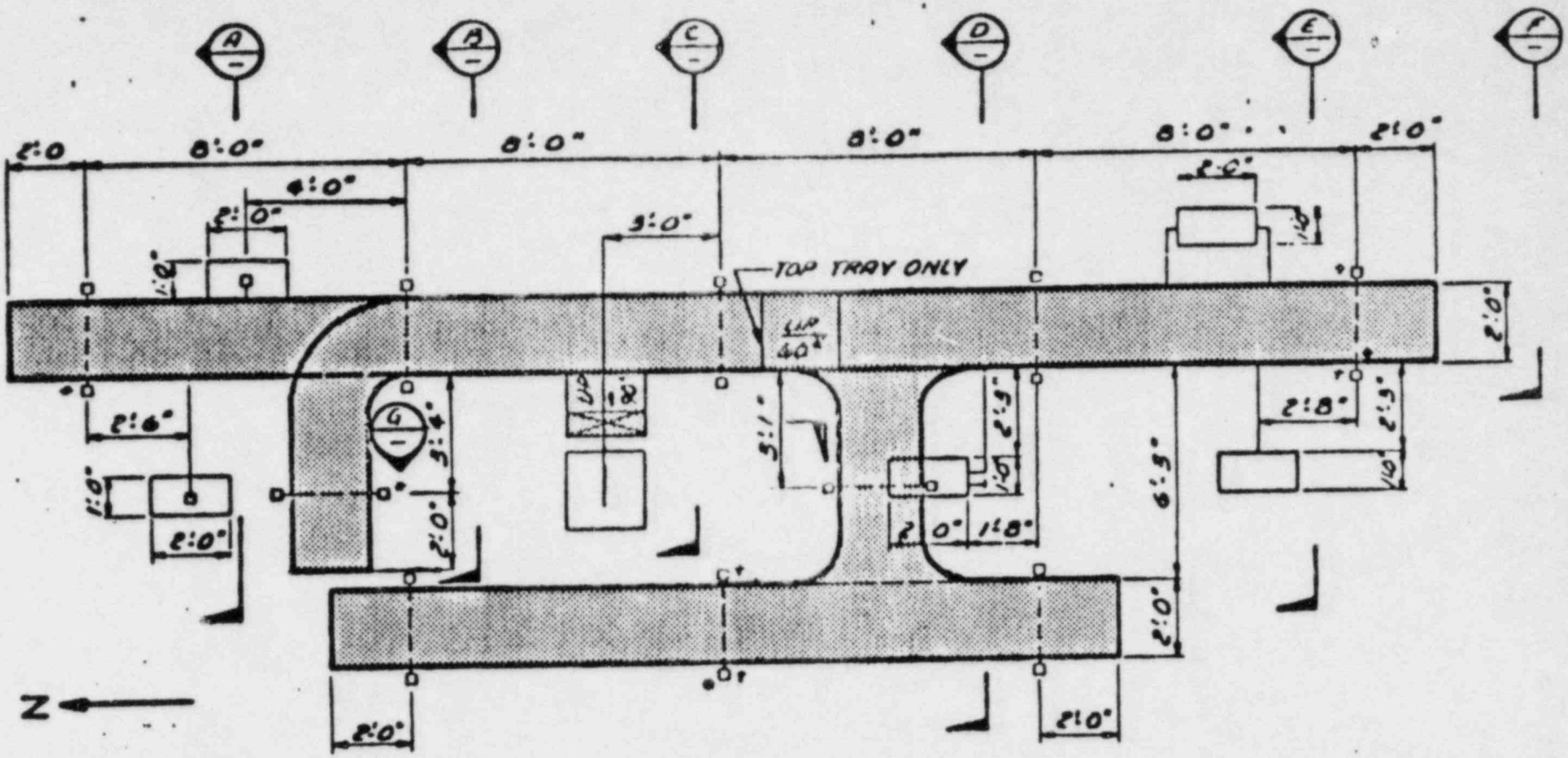
TASK D
COMBINED RACEWAY SYSTEMS

PHASE XII - COMBINED TRAY-CONDUIT RACEWAY SYSTEMS WITH STRUT-TYPE HANGERS

PHASE XIII - DELETED

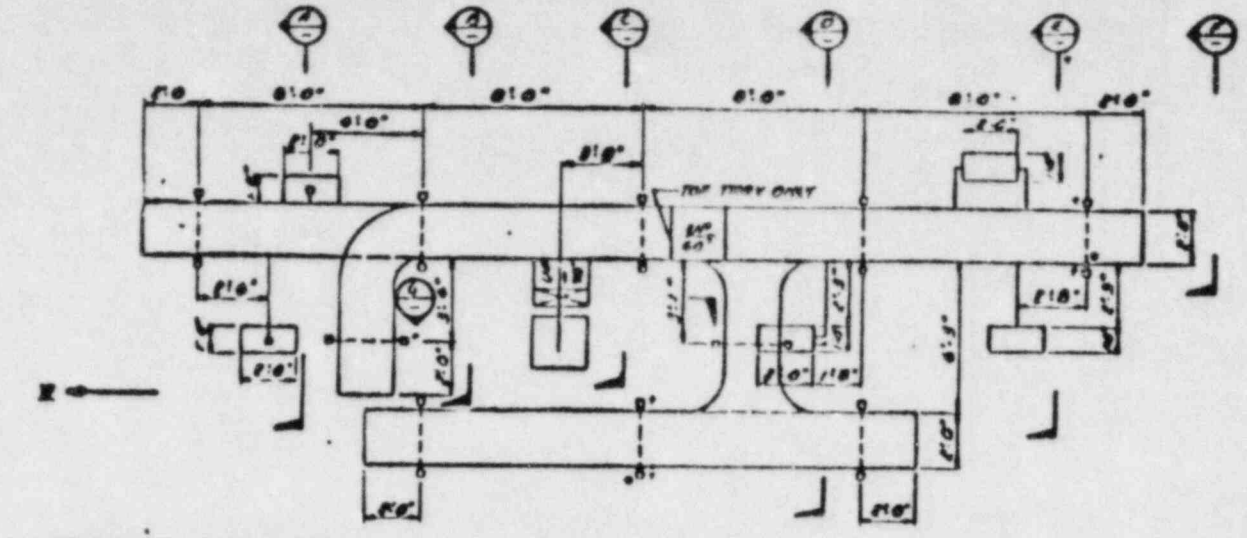
p. 13

Attachment B

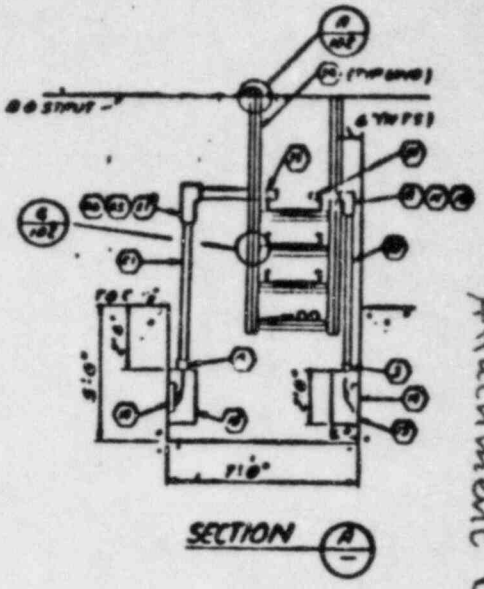


* LOCATION OF TRANSVERSE BRACE
† LOCATION OF LONGITUDINAL BRACE

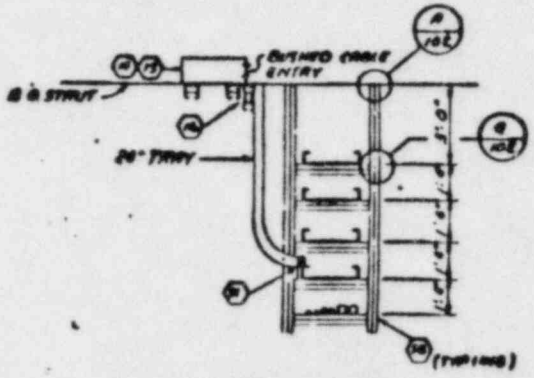
TESTED COMPOSITE RACEWAY LAYOUT — PLAN (PHASE XII)



COMPOSITE RACEWAY SYSTEM



SECTION A



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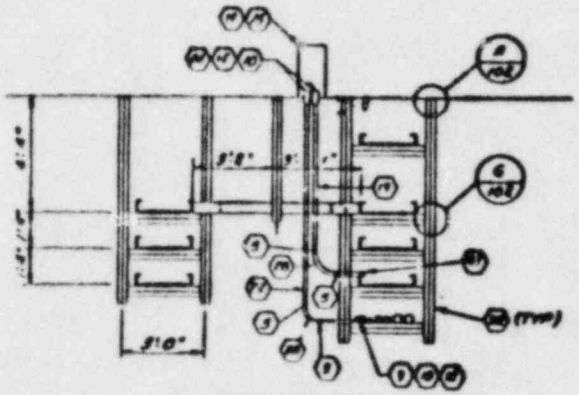
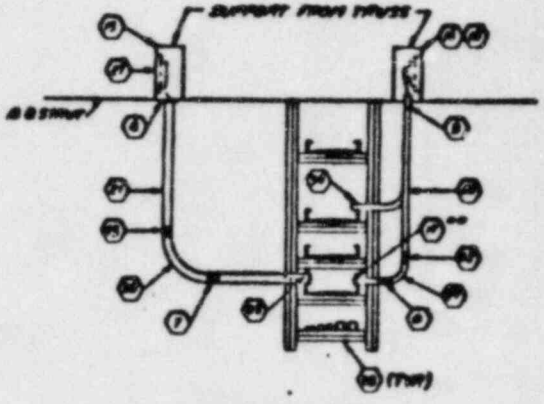


SECTION D



SECTION E

** PART AS USED IN UNGROUTED TESTS

Attachment B

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TESTED COMPOSITE RACEWAY LAYOUT — SECTIONS (PHASE XII)

TEST VARIABLES

- TRAY AND CONDUIT TYPES
- TRAY AND CONDUIT LOADING
- HANGER TYPES
- HANGER LENGTH
- HANGER CONNECTIONS
- NUMBER OF TRAYS
- NUMBER OF CONDUITS
- CONDUIT SIZES
- CONDUIT CLAMPS
- FITTINGS
- BRACING
- INPUT MOTION DIRECTION

CABLE TRAY

FIVE DIFFERENT TYPES OF CABLE TRAYS WERE SELECTED TO BE TESTED:

- LADDER TYPE MANUFACTURED BY B-LINE SYSTEMS INC.
- LADDER TYPE MANUFACTURED BY METAL PRODUCTS CORPORATION.
- PUNCH BOTTOM TYPE MANUFACTURED BY B-LINE SYSTEMS INC.
- TROUGH TYPE MANUFACTURED BY HUSKY-BURNDY
- ALUMINUM LADDER TYPE MANUFACTURED BY P-W INDUSTRIES

ALUMINUM GUTTER WIREWAY WITH COVER MANUFACTURED BY SUN METAL PRODUCT WAS ALSO TESTED.

Attachment B

TEST MOTION

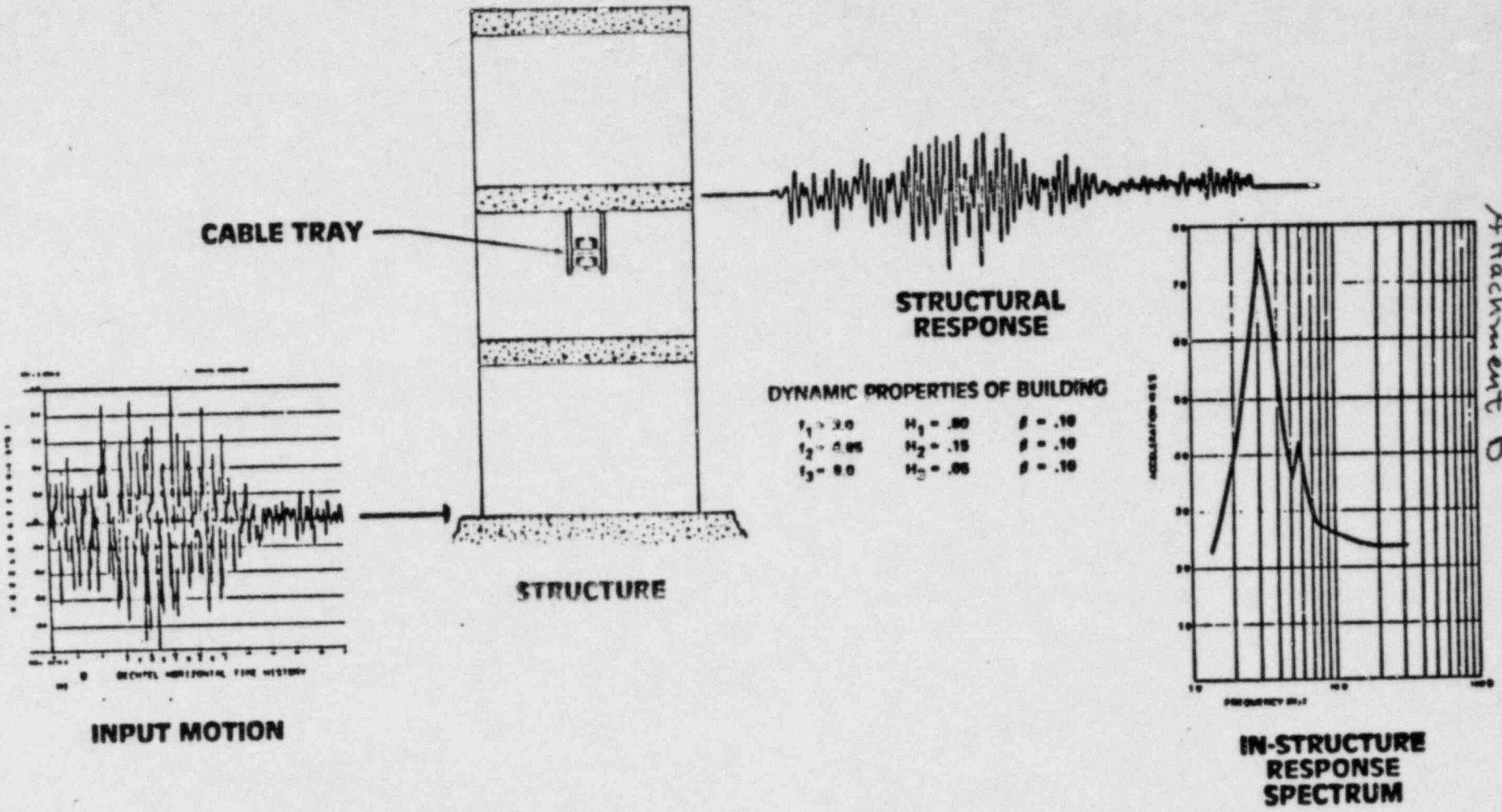
SNAP BACK - FIXED SUPPORTS

HARMONIC MOTION

EARTHQUAKE MOTION

Attachment B

#17



Attachment B

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CABLE TRAY
TEST PROGRAM
MOVIE

SUMMARY OF CABLE TRAY TEST RESULTS

STRUT SUPPORTED TRAY SYSTEMS

- HIGH DAMPING WITH VALUES RANGING TO 50% OF CRITICAL FOR TRAYS WITH CABLE LOADING FROM 25 TO 50 LBS/FT. DAMPING REDUCES TO 7% OF CRITICAL WITH NO CABLE LOADING.
- DAMPING INCREASES WITH INCREASING FLOOR RESPONSE LEVEL.
- BRACING/RIGIDITY IS DESIRABLE BECAUSE IT INCREASES THE RESONANT FREQUENCY, DECREASES DEFLECTIONS AND INCREASES THE DAMPING IN THE SYSTEM.
- CABLES DO NOT APPEAR TO INFLUENCE OVERALL SYSTEM RESPONSE EXCEPT FOR DAMPING AND THEIR MASS.
- ALL STRUT SUPPORTED CABLE TRAYS TESTED SURVIVED WITHOUT DAMAGE. THESE SYSTEMS WERE TESTED AT INPUT LEVELS (ZPA VALUE) OF 1 TO 3 G'S TO THE SHAKE TABLE.

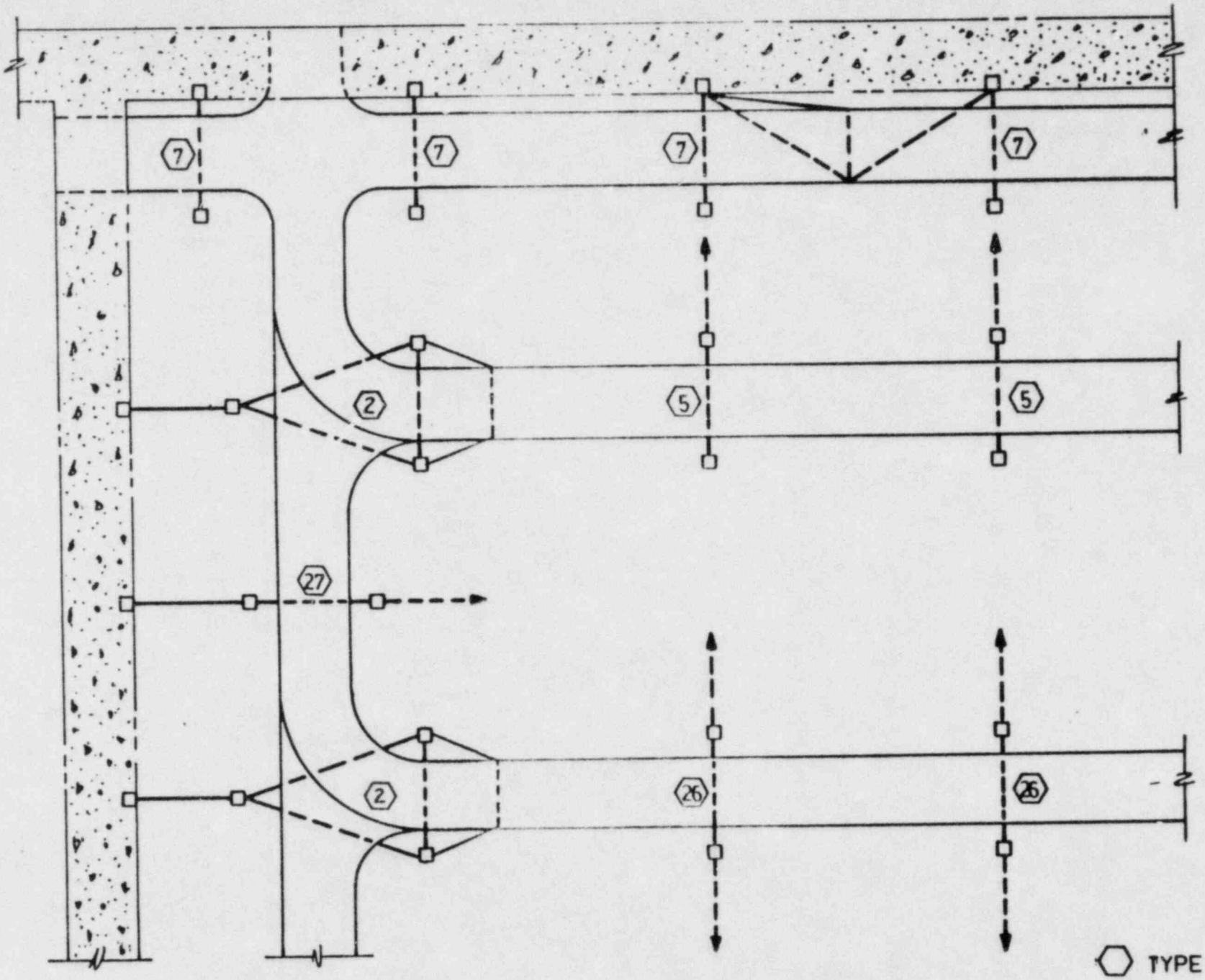
SEABROOK REVIEW:

- DOCUMENTATION REVIEW
- CRITERIA REVIEW
- STANDARD DETAILS REVIEW
- PLANT WALKDOWN
- SYSTEM COMPATIBILITY WITH THE TEST PROGRAM

Attachment B

p. 21

SEABROOK CABLE TRAY SUPPORT TYPES

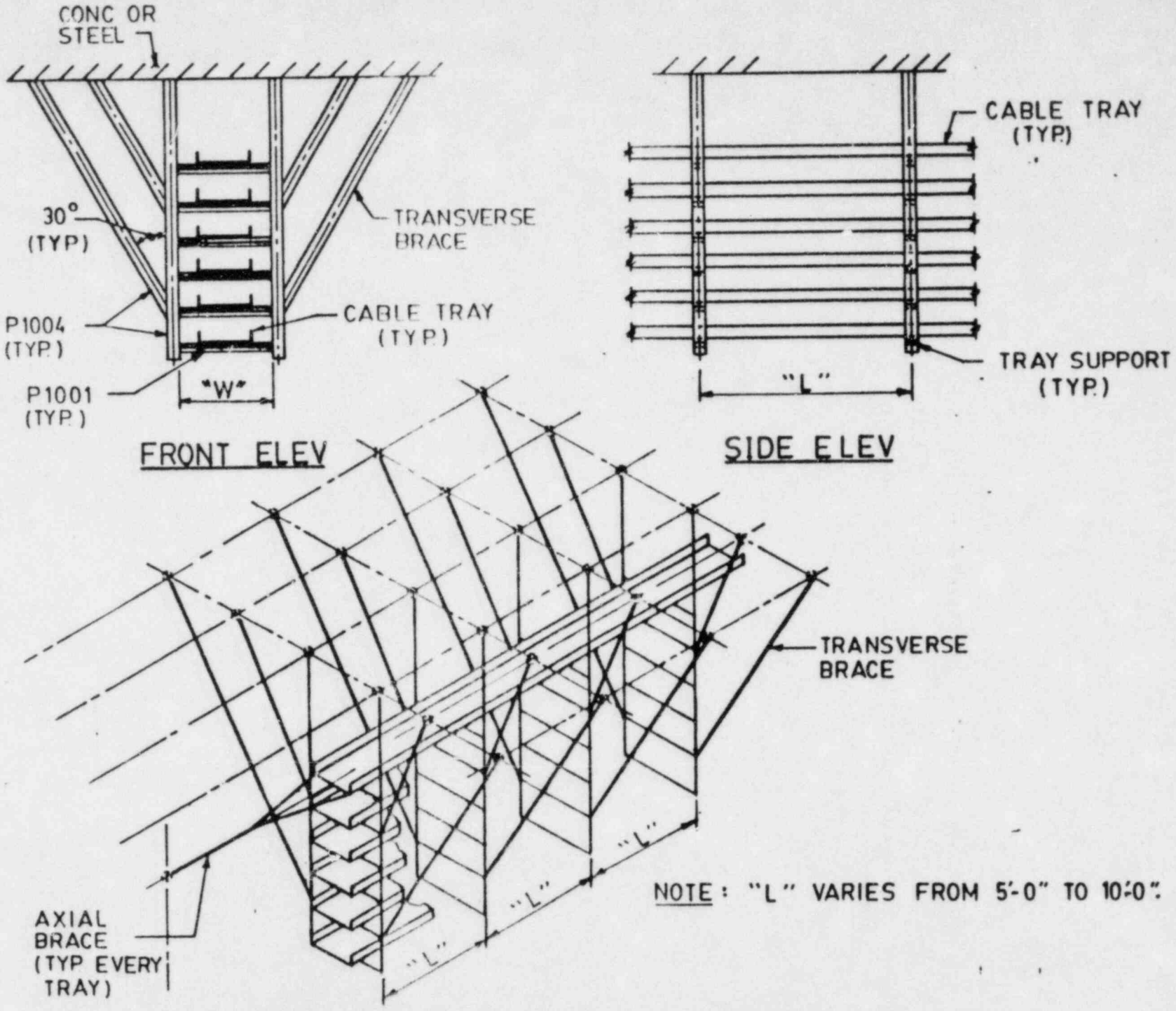


PLAN

Attachment B

p.22

SEABROOK CABLE TRAY SUPPORT TYPES

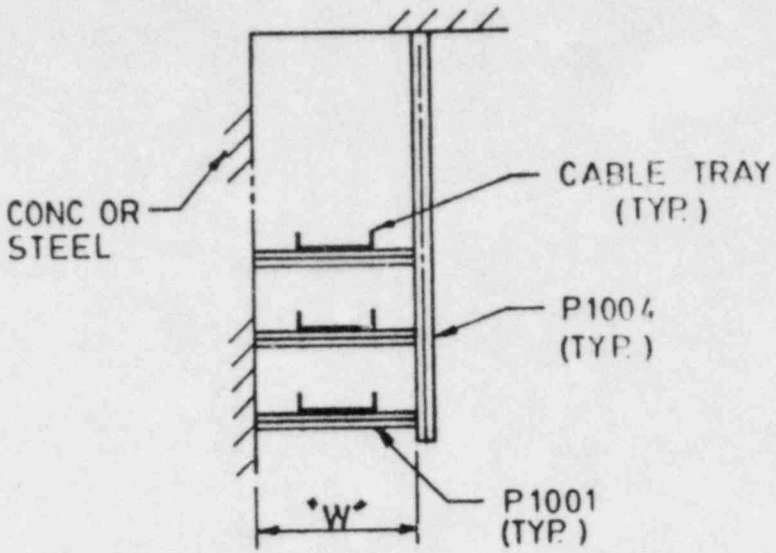


TYPICAL TRAPEZE-TYPE TRAY SUPPORT TYPE ⟨26⟩

Attachment B

P. 23

SEABROOK CABLE TRAY SUPPORT TYPES



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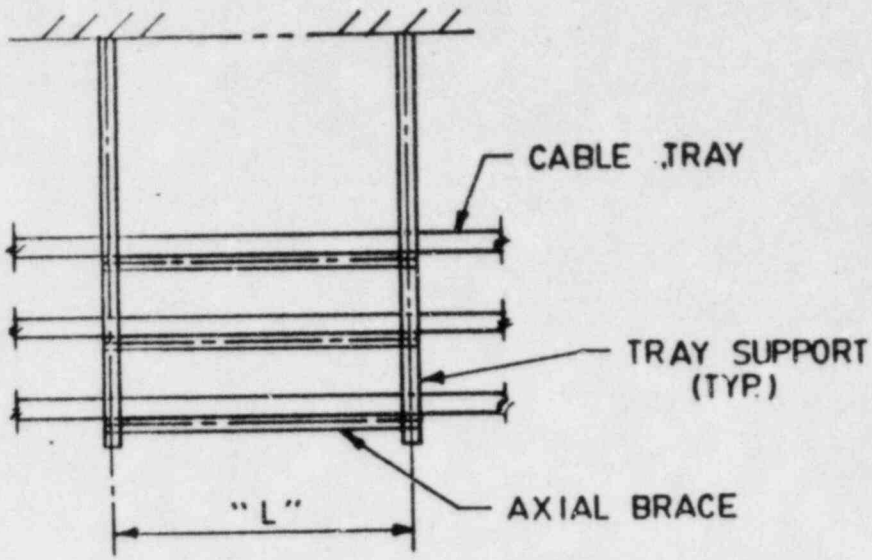

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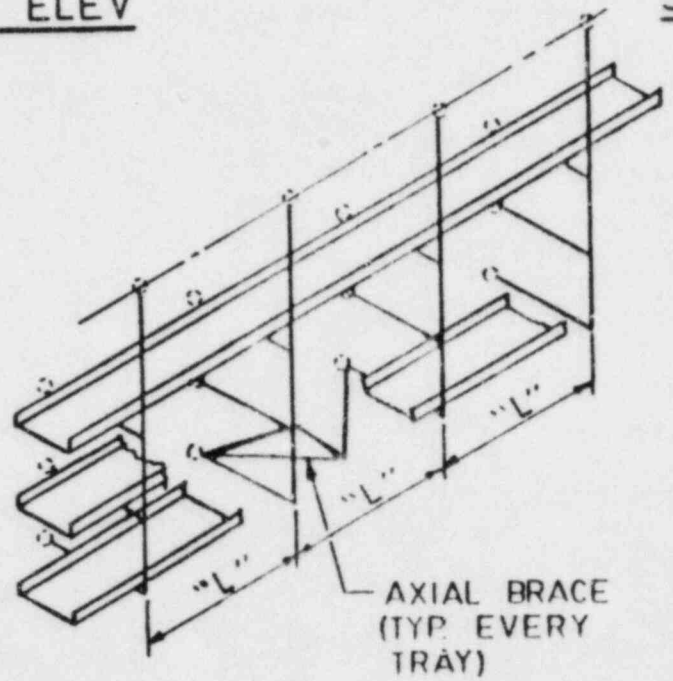


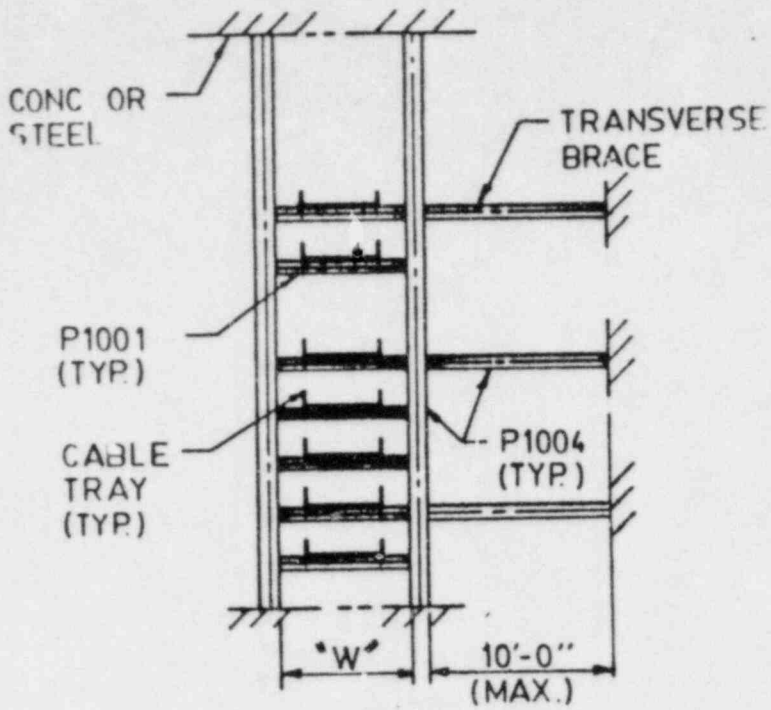
NOTE: "L" VARIES FROM 5'-0" TO 10'-0

TYPICAL WALL BRACED TYPE TRAY SUPPORT TYPE

Attachment B

P. 24

SEABROOK CABLE TRAY SUPPORT TYPES



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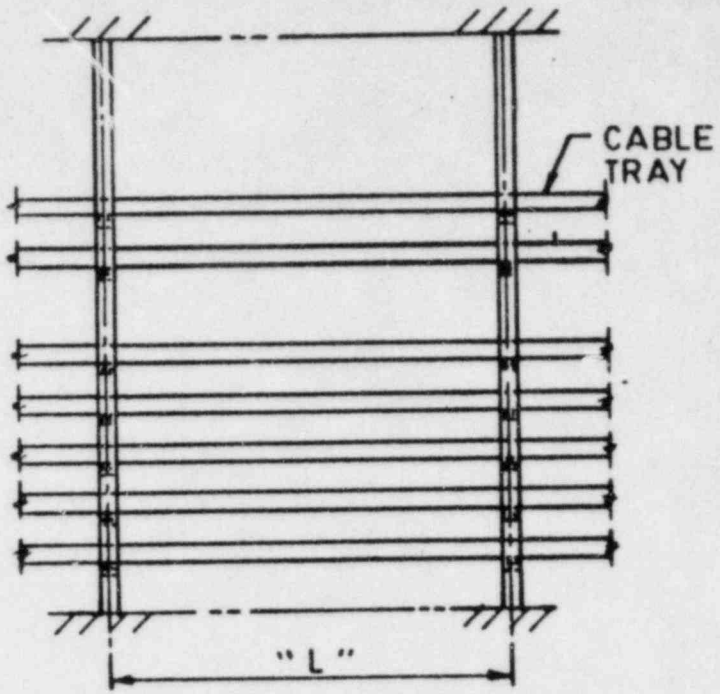

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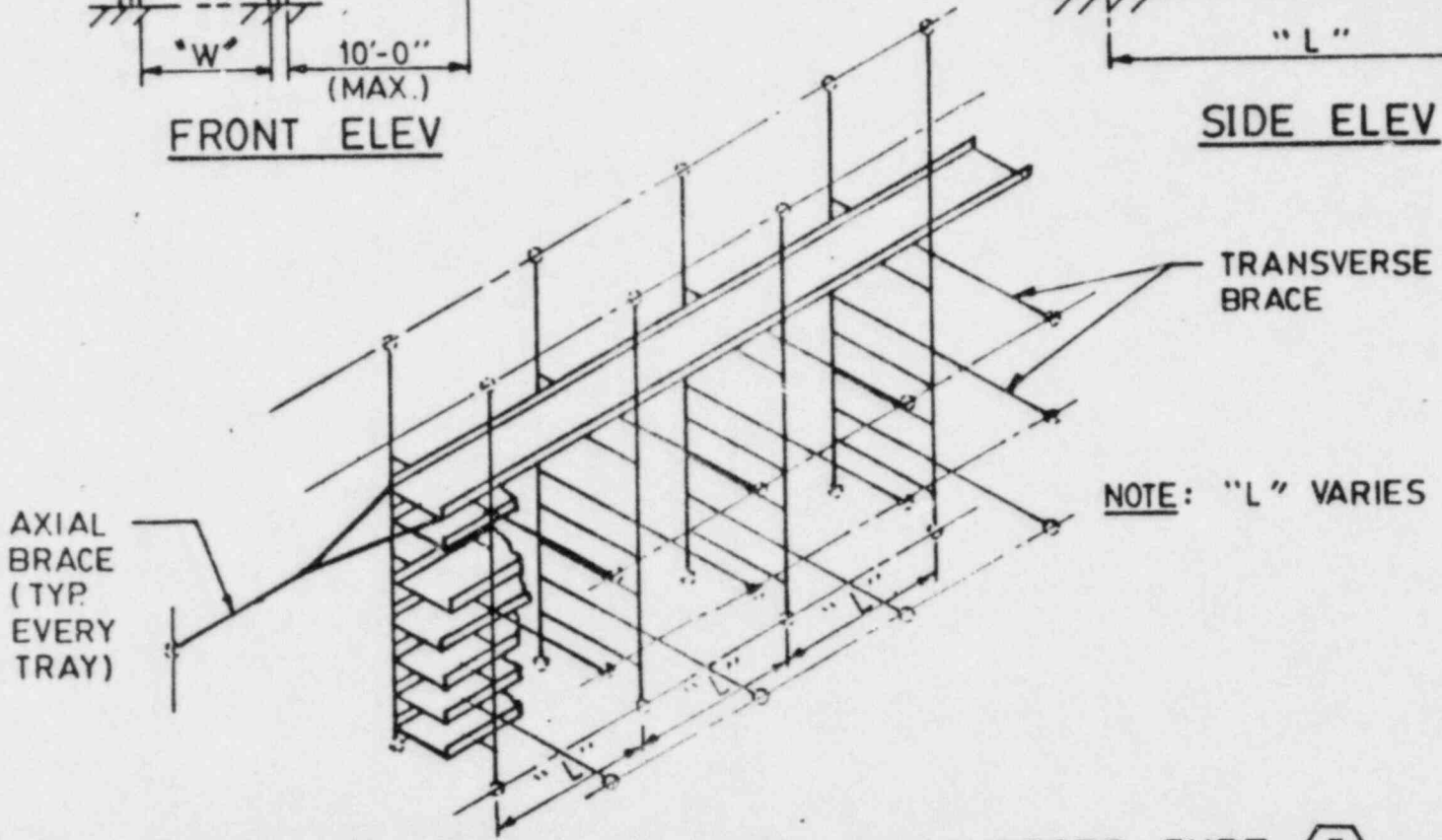


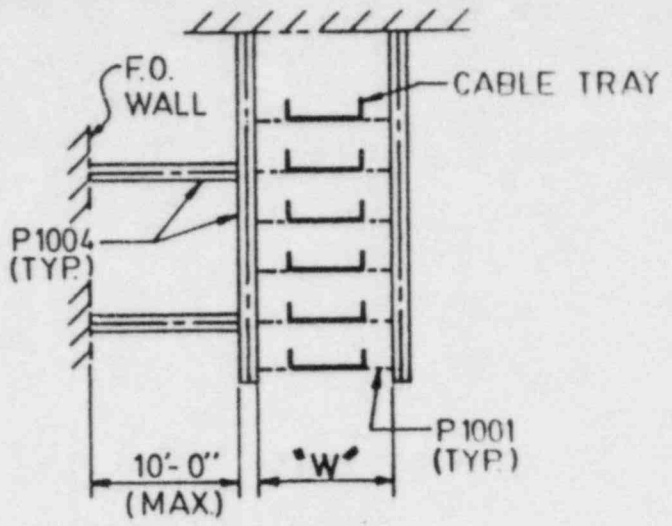
NOTE: "L" VARIES FROM 5'-0" TO 10'-0".

TYPICAL FLOOR TO CEILING TYPE TRAY SUPPORT TYPE (5)

Attachment B

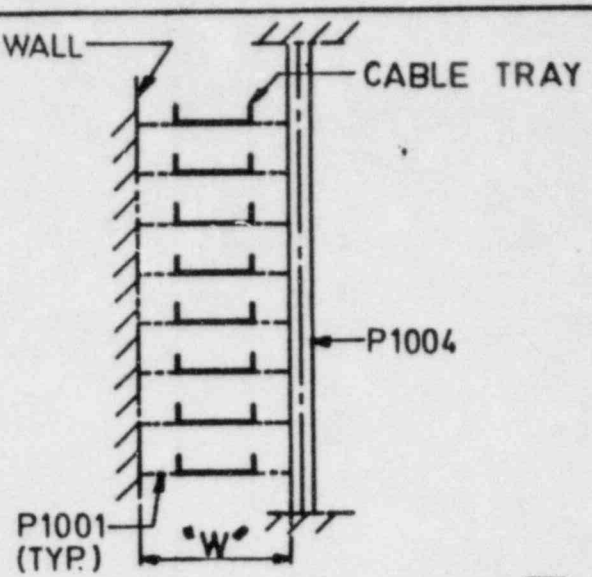
p. 25

SEABROOK CABLE TRAY SUPPORT TYPES



ELEV

TYPE 4



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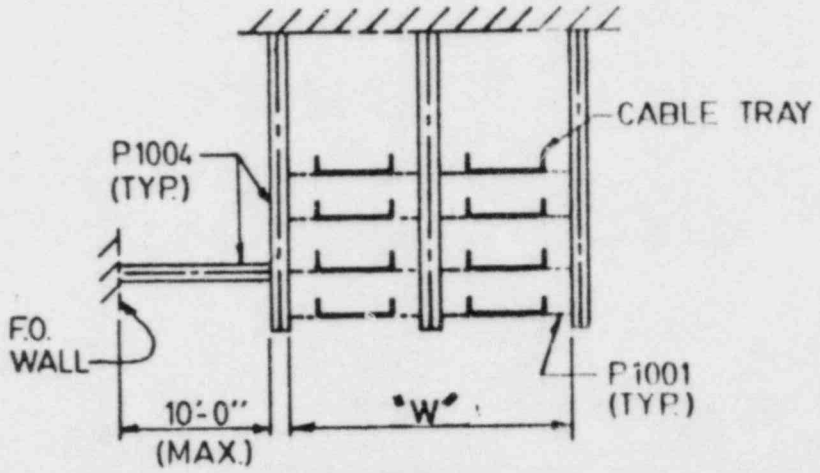
TYPE 6 14



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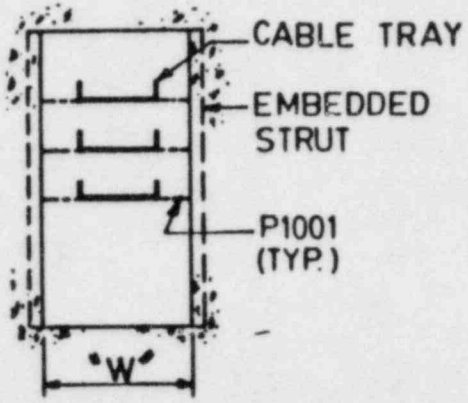


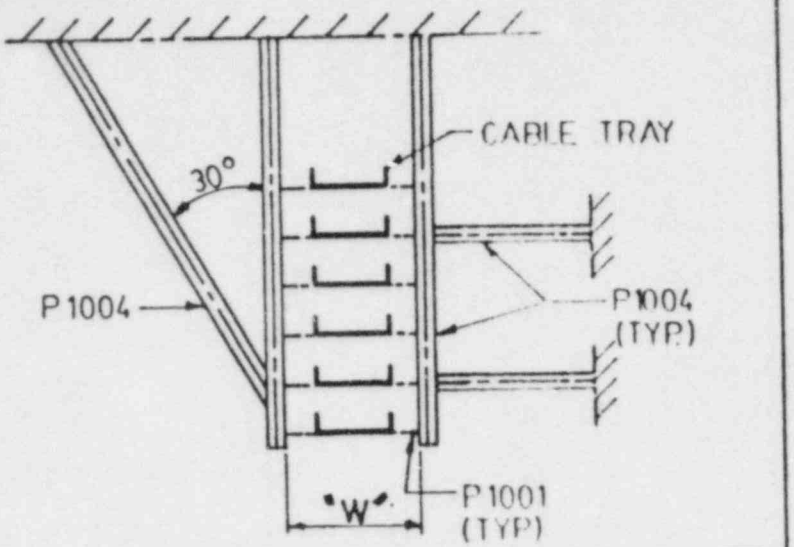
ELEV

TYPE 15

Attachment B

P 26

SEABROOK CABLE TRAY SUPPORT TYPES



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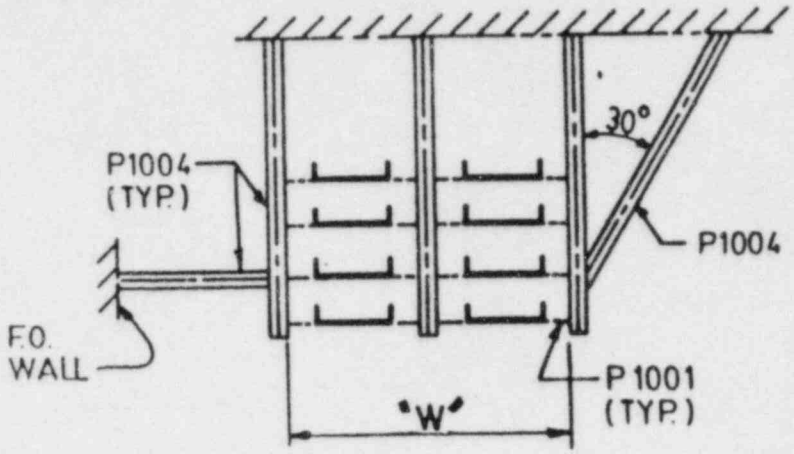

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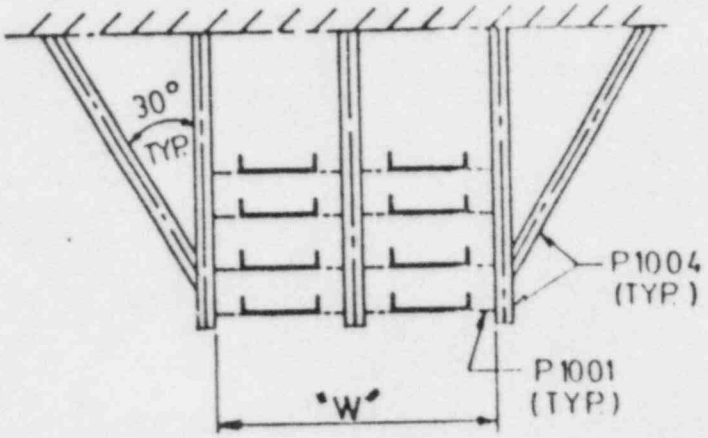

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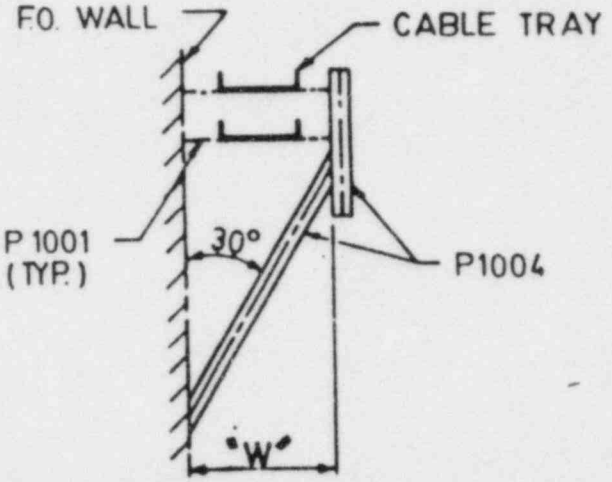

ELEV TYPE 31

Attachment B

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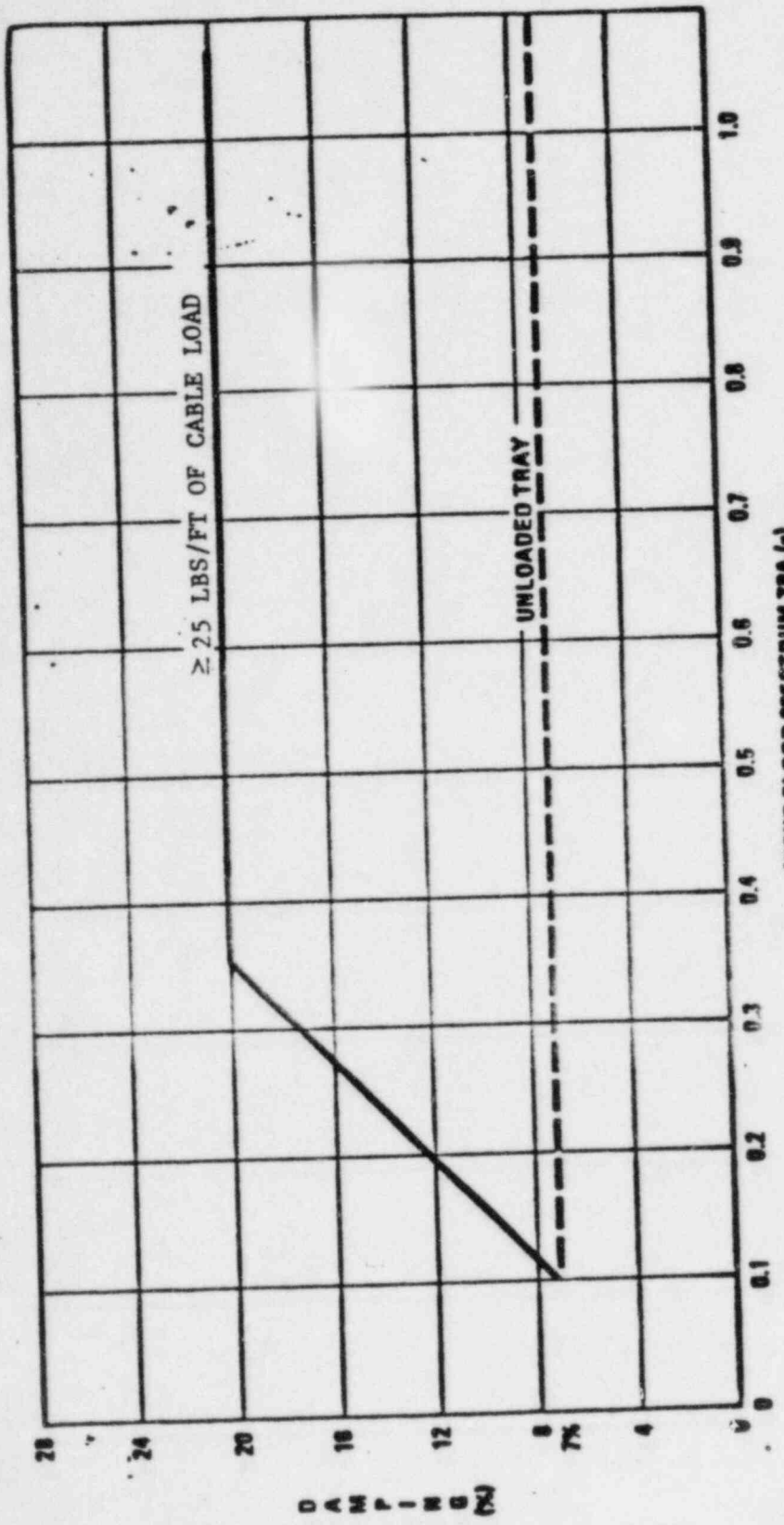

DAMPING AS A FUNCTION OF INPUT ZPA

Attachment B

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IMPLEMENTATION OF 20% DAMPING AT THE SEABROOK STATION

DESIGN

- GUIDELINES HAVE BEEN DEVELOPED TO ESTABLISH THE SIGNIFICANT CONTROLLING PARAMETERS SUCH AS CONFIGURATION, TRAY MATERIALS, STRUT MATERIALS AND CONNECTION HARDWARE.

INSTALLATION

- DETAILED SUPPORT DRAWINGS FOR EACH SUPPORT WILL BE ISSUED TO CONSTRUCTION.
- ALL SUPPORTS WILL BE REINSPECTED TO THE DETAILED SUPPORT DRAWINGS.

APPLICATION

- USE OF THE 20% DAMPING WILL BE ON A CASE-BY-CASE BASIS.
- APPLICATION EXAMPLES:
  - RESOLUTION OF CONSTRUCTION FABRICATION PROBLEMS
  - SIMPLIFIED RESOLUTION OF INTERFERENCES WITH FIELD RUN COMPONENTS
  - OPTIMIZATION OF CONNECTION SIZES
  - OPTIMIZATION OF CONNECTION CHANGES

Attachment B

CONCLUSIONS

- DAMPING IS DEVELOPED BY CABLE MOTION.
- SEABROOK CABLE TRAY SUPPORTS ARE ESSENTIALLY RIGID.
- 20% DAMPING OPTIMIZES DESIGN.
- ENGINEERING/CONSTRUCTION SAVINGS CAN BE REALIZED WITHOUT DECREASING THE QUALITY AND SAFETY OF THE SYSTEM.
- IMMEDIATE IMPLEMENTATION IS REQUIRED TO REALIZE OPTIMAL BENEFIT.