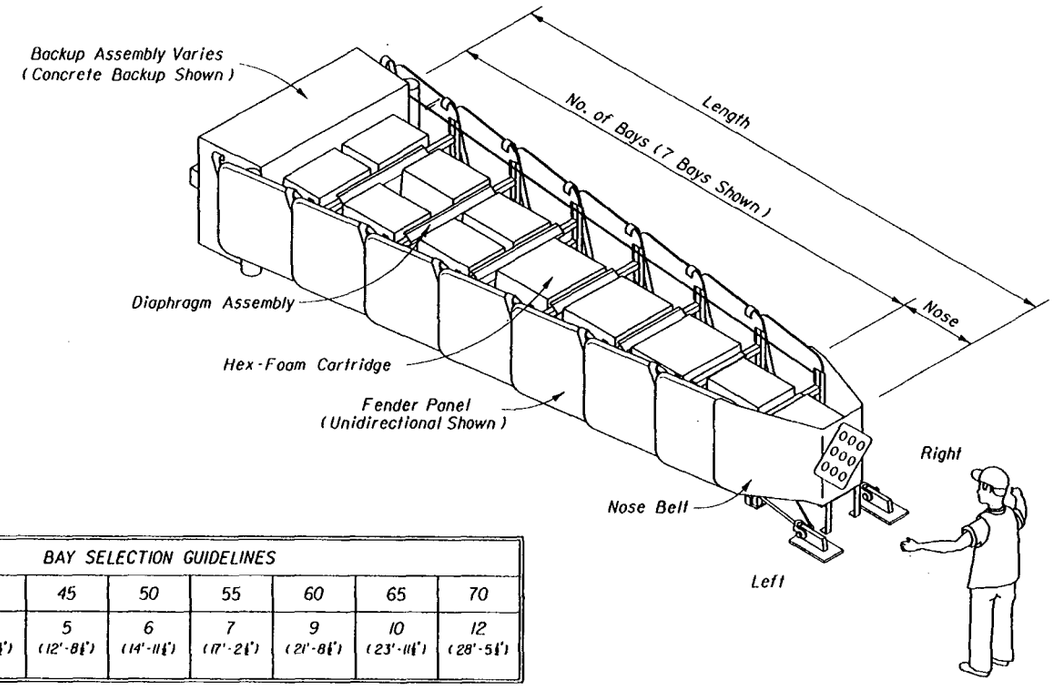

BAY SELECTION GUIDELINES							
DESIGN SPEED	40	45	50	55	60	65	70
NO. OF BAYS (Nominal Length)	4 (10'-5½")	5 (12'-8½")	6 (14'-11½")	7 (17'-2½")	9 (21'-8½")	10 (23'-11½")	12 (28'-5½")

HEX-FOAM CARTRIDGE SELECTION CHART												
Attenuator Type	Cartridge Type											
	Nose	Bay 1	Bay 2	Bay 3	Bay 4	Bay 5	Bay 6	Bay 7	Bay 8	Bay 9	Bay 10	Bay 11	Bay 12
4 Bay Narrow	80	80	80	80	81								
4 Bay Medium	80	80	82	(80)	(81)								
4 Bay Wide	80	80	82	(80)	(81)								
5 Bay Narrow	80	80	80	80	82	81							
5 Bay Medium	80	80	82	(80)	(80)	(81)							
5 Bay Wide	80	80	82	(80)	(80)	(81)							
6 Bay Narrow	80	80	80	80	80	82	81						
6 Bay Medium	80	80	82	82	(80)	(80)	(81)						
6 Bay Wide	80	80	82	82	(80)	(80)	(81)						
7 Bay Narrow	80	80	80	80	80	80	82	81					
7 Bay Medium	80	80	82	82	82	(80)	(80)	(81)					
7 Bay Wide	80	80	82	82	82	(80)	(80)	(81)					
9 Bay Narrow	80	80	80	80	80	80	80	80	82	81			
9 Bay Medium	80	80	82	82	82	82	(80)	(80)	(80)	(81)			
9 Bay Wide	80	80	82	82	82	82	(80)	(82)	(82)	(81)			
10 Bay Narrow	80	80	80	80	80	80	80	80	80	82	81		
10 Bay Medium	80	80	80	82	82	82	82	(80)	(80)	(80)	(81)		
10 Bay Wide	80	80	82	82	82	82	82	(80)	(80)	(82)	(81)		
12 Bay Narrow	80	80	80	80	80	80	80	80	80	82	82	82	81
12 Bay Medium	80	80	80	82	82	82	82	82	(80)	(80)	(80)	(80)	(81)
12 Bay Wide	80	80	82	82	82	82	82	82	(80)	(80)	(82)	(82)	(81)

1. Parentheses ( ) denote double cartridge bays.
2. Type 80 - 17" Wide x 24" Long (Part no. 350980I-0000)
   Type 81 - 24" Wide x 17" Long (Part no. 350981I-0000)
   Type 82 - 26" Wide x 24" Long (Part no. 350982I-0000)

INDEX OF SHEETS

GENERAL NOTES

1. The energy absorbing system represented on this standard drawing is a proprietary design by Energy Absorption Systems, Inc. and marketed under the trade name Hex-Foam™ Sandwich System. Any infringement on the rights of the designer shall be the sole responsibility of the user.
2. This standard drawing is produced by the Florida Department Of Transportation solely for use by the Department and its assignees. This standard drawing provides the general graphics and information necessary to field identify componet parts of the Hex-Foam Sandwich System and their incorporation into a whole system.
3. This standard drawing is sufficient for plan details for the Hex-Foam Sandwich System installed as a free standing system or installed in connection with concrete barrier walls and other fixed barrier systems, and precludes the requirement for shop drawing submittals unless the plans otherwise call for such submittals. For unusual situations such as cross slopes exceeding 20:1 (0.05), expansion joints, drainage, deck structures, or extra wide hazards, Energy Absorption Systems, Inc. provides a free application service to ensure proper use of the system.
4. The Hex-Foam Sandwich System shall be assembled and installed in accordance with the manufacturers detailed drawings, procedures and specifications.
5. The standard Hex-Foam Sandwich System is available in 3 standard widths protecting hazards up to 7' wide. Each of these widths can be matched to any of the four backup assemblies shown in this index. The four backup assemblies are to be utilized as follows:
   (a) Independent systems:
      (1) Concrete backup assemblies.
      (2) Diagonal braced backup assemblies.
      (3) Wide flange backup assemblies.
   (b) Dependent systems:
      (1) Horizontal braced backup assemblies.
   (c) Combination systems:
      (1) Concrete backup assemblies.

   Variations from the uses described above shall be constructed as detailed in the plans and/or as required by shop drawings.
6. Only the Hex-Foam cartridges shall be used in all bays and the nose section.
7. Concrete foundations and backup blocks shall be constructed with 4000 psi min. compressive strength concrete.
8. The Hex-Foam Sandwich System can be constructed on cross slopes 20:1 or flatter without compensating alterations.
9. All metallic components shall meet the galvanizing requirements for guardrail, Index No. 400.
10. Fittings, hardware, anchorages and accessories not labled or described in these details are items furnished by the manufacturer/supplier and are to be installed in accordance to the manufacturers instructional drawings and specifications.
11. The Hex-Foam Sandwich System will be paid for under the contract unit price for Impact Attenuator Vehicular (Hex-Foam Sandwich), Each.

DESIGN NOTES AND GUIDELINES

1. The Hex-Foam Sandwich System is designed to cushion automobile end-on hits and to redirect automobiles from side hits. The standard width Hex-Foam Sandwich System is designed to shield fixed hazards (up to 7' wide) or the ends of other fixed barrier systems. The number of bays to be used in a specific unit will be determined by the design speed, except where the Engineer determines that another speed is more applicable. The unit width will be determined by the width of the object to be shielded or by the connecting barrier system. The backup assembly for a specific unit will be determined by either (a) the unit standing free of the object to be shielded or (b) the hazard or barrier system(s) to which it is connected. The order of priority for backup assembly selection is as follows:
   (a) Free standing:
      (1) Concrete backup assemblies.
      (2) Diagonal braced backup assemblies.
      (3) Wide flange backup assemblies.
   (b) Connections to concrete barrier systems:
      (1) Concrete backup assemblies.
      (2) Horizontal braced backup assemblies.
   (c) Connections to guardrail systems:
      (1) Concrete backup assemblies.
      (2) Diagonal braced backup assemblies.
      (3) Wide flange backup assemblies.
2. The Hex-Foam Sandwich System is a restorable system that is particularly suited to shielding wide (≥ 3') hazards subject to high speed traffic, high volume traffic, and/or traffic with a history of frequent errant vehicle departures from the roadway or the potential exists for such departures. The Hex-Foam Sandwich System is particularly suited to shielding hazards where the approach space is limited; and, is particularly suited to conditions where the terminal must be located close to the traffic lane. For unusual situations see General Note No. 3.
3. The Hex-Foam G-R-E-A-T System has Department established priority over the narrow Hex-Foam Sandwich System, and the G-R-E-A-T System is to be used unless the plans specifically call for the Hex-Foam Sandwich System. Currently the Department does not recognize other proprietary items as being equally suitable alternatives to the medium and wide Hex-Foam Sandwich Systems, and until such alternatives are available, the medium and wide Hex-Foam Sandwich Systems need not be bid against other proprietary items.

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION
ROAD DESIGN

HEX-FOAM SANDWICH SYSTEM

	Names	Dates
Designed By	MFG/MG	2/93
Drawn By	HKH	2/93
Checked By	MG	2/93
F.H.W.A. Approved:		

Approved By: Freddie Simmons
State Roadway Design Engineer

Revision No.	Sheet No.	Index No.
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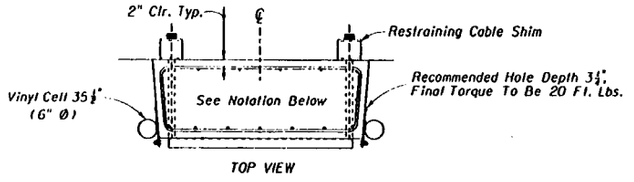
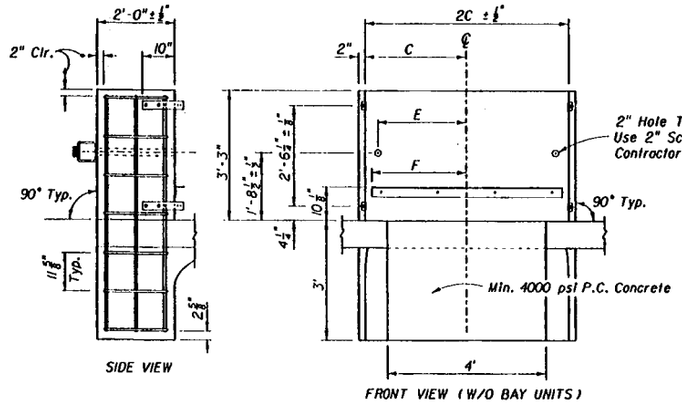
GENERAL SYSTEM FEATURES AND BAY SELECTION GUIDELINES



TOP VIEW

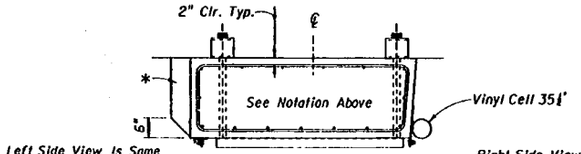


SIDE VIEW

FRONT VIEW (W/O BAY UNITS)

All concrete backup walls will be constructed with 7 No. 6 vertical reinforcing bars equally spaced across front face of the wall. All other backup wall reinforcing will be No. 5 bars. Narrow, medium and wide units will be constructed with 5, 6 and 9 equally spaced verticle bars along the back face of the wall respectively. All other reinforcing bars shall be constructed as shown.
Field bend vertical reinforcing steel to clear Schedule 40 pipe.
All exposid backup block edges shall be chamfered ¾".

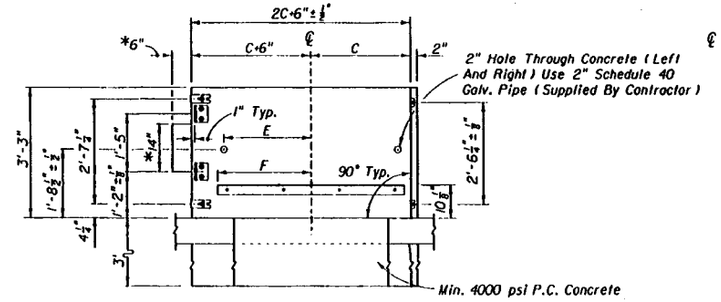
BACKUP ASSEMBLY - UNIDIRECTIONAL



TOP VIEW

Left Side View Is Same As SIDE VIEW Above With Bracket Alteration

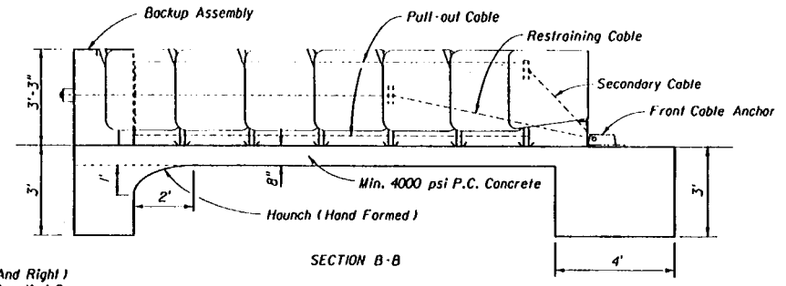
Right Side View Is Mirror Image Of SIDE VIEW Above



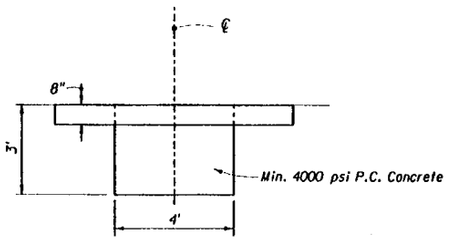
FRONT VIEW (W/O BAY UNITS)

For reinforcement and chamfers see notation above.

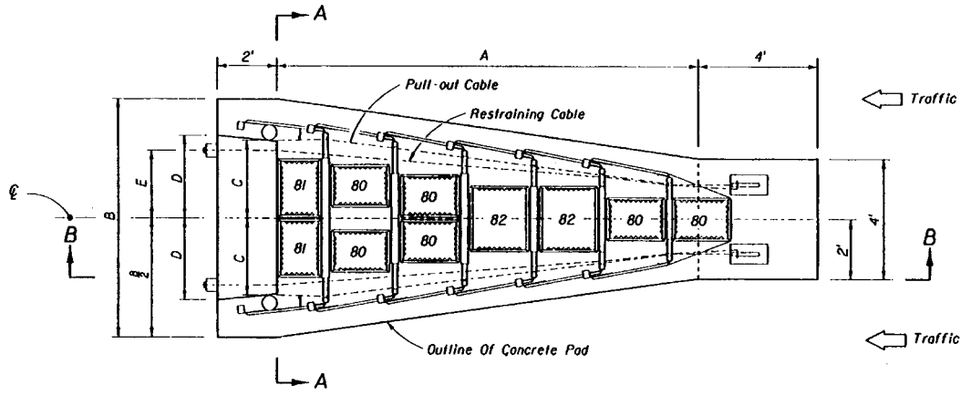
BACKUP ASSEMBLY - BIDIRECTIONAL



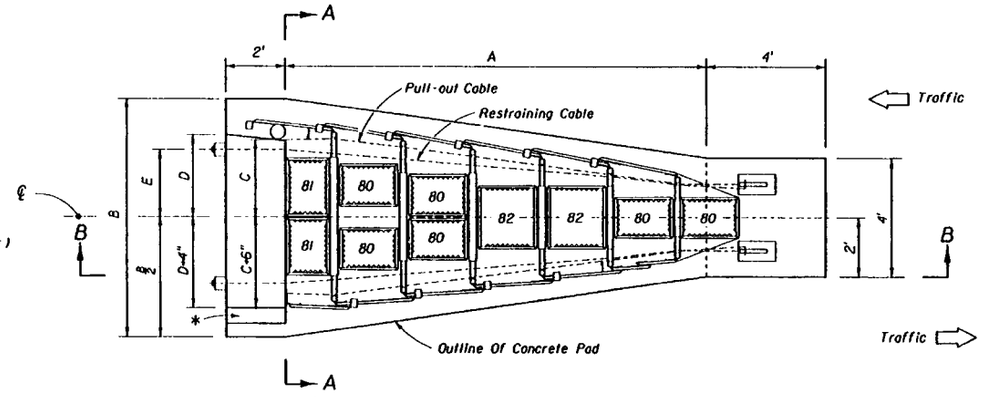
SECTION B-B



SECTION A-A



PLAN - UNIDIRECTIONAL UNIT (6 BAY UNIT SHOWN)



* Concrete guardrail offset lug to be cast with backup assembly when trailing end guardrail attachment is called for in the plans.

PLAN - BIDIRECTIONAL UNIT (6 BAY UNIT SHOWN)

SUPPLEMENTAL DIMENSIONS						
NO. OF BAYS	A	B	C	D	E	F
4 Bays	9'-8"	6'	1'-8"	1'-10"	1'-4"	1'-2"
		8'	2'-7"	2'-9"	2'-3"	2'-5"
		10'	3'-9"	3'-11"	2'-1½"	3'-6"
5 Bays	11'-11"	6'	1'-8"	1'-10"	1'-4"	1'-2"
		8'	2'-7"	2'-9"	2'-3"	2'-5"
		10'	3'-9"	3'-11"	2'-1½"	3'-6"
6 Bays	14'-2"	6'	1'-8"	1'-10"	1'-4"	1'-2"
		8'	2'-7"	2'-9"	2'-3"	2'-5"
		10'	3'-9"	3'-11"	2'-3½"	3'-6"
7 Bays	16'-5"	6'	1'-8"	1'-10"	1'-4"	1'-2"
		8'	2'-7"	2'-9"	2'-3"	2'-5"
		10'	3'-9"	3'-11"	2'-6"	3'-6"
9 Bays	20'-11"	6'	1'-8"	1'-10"	1'-4"	1'-2"
		8'	2'-7"	2'-9"	2'-3"	2'-5"
		10'	3'-9"	3'-11"	2'-8½"	3'-6"
10 Bays	23'-2"	6'	1'-8"	1'-10"	1'-4"	1'-2"
		8'	2'-7"	2'-9"	2'-3"	2'-5"
		10'	3'-9"	3'-11"	2'-8½"	3'-6"
12 Bays	27'-8"	6'	1'-8"	1'-10"	1'-4"	1'-2"
		8'	2'-7"	2'-9"	2'-3"	2'-5"
		10'	3'-9"	3'-11"	2'-8½"	3'-6"

CONCRETE BACKUP ASSEMBLY

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION
ROAD DESIGN

HEX-FOAM SANDWICH SYSTEM

	Names	Dates
Designed By	MFG/HKH	2/93
Drawn By	HKH	2/93
Checked By	JVG	2/93
F.H.W.A. Approved:		

Approved By Freddie Simmons
State Roadway Design Engineer

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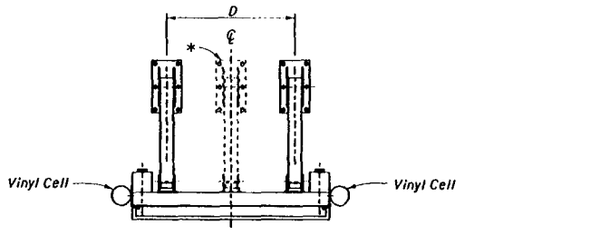
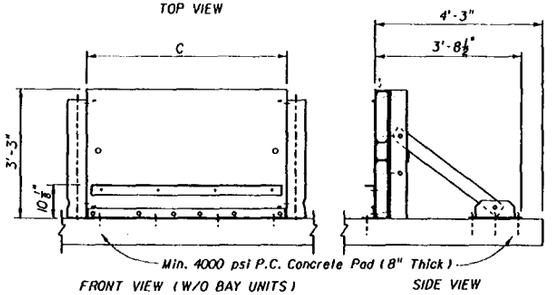
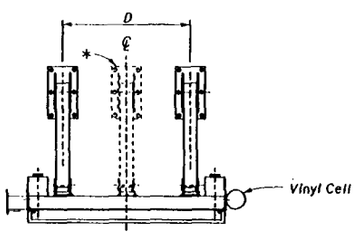


TOP VIEW

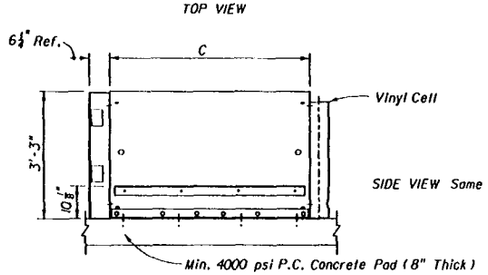


FRONT VIEW (W/O BAY UNITS) SIDE VIEW

BACKUP ASSEMBLY - UNIDIRECTIONAL



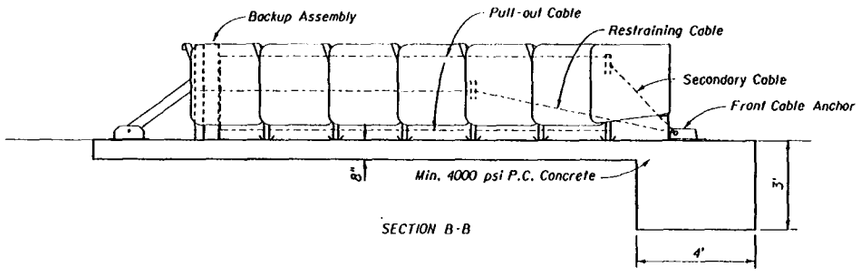
TOP VIEW



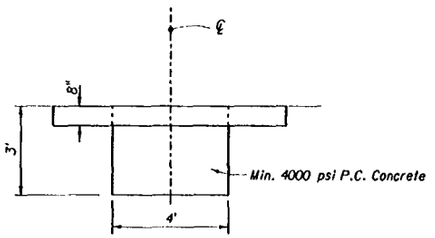
SIDE VIEW Same As Above

FRONT VIEW (W/O BAY UNITS)

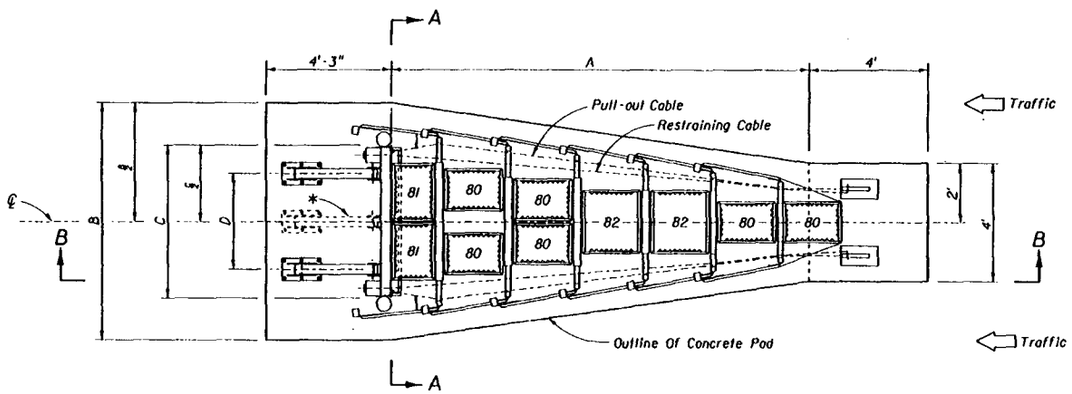
BACKUP ASSEMBLY - BIDIRECTIONAL



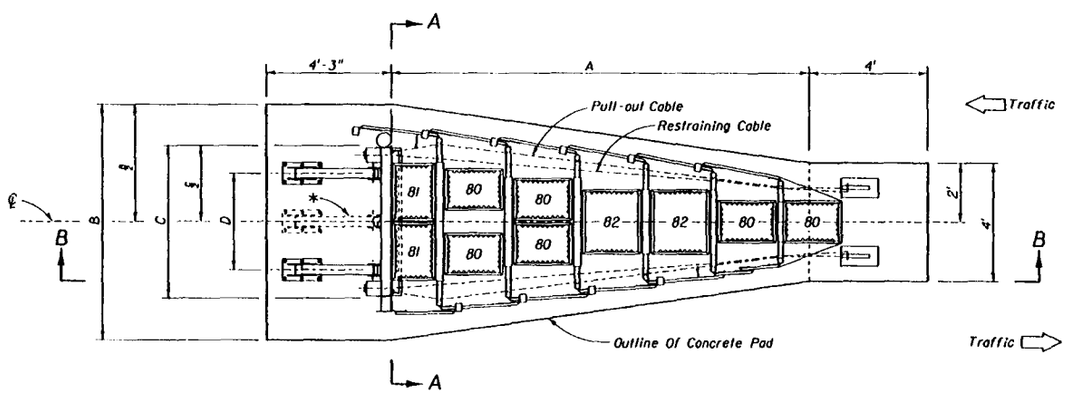
SECTION B-B



SECTION A-A



PLAN - UNIDIRECTIONAL UNIT (6 BAY UNIT SHOWN)



PLAN - BIDIRECTIONAL UNIT (6 BAY UNIT SHOWN)

* 2 diagonal support braces are required on narrow and medium width systems, 3 diagonal support braces are required on wide systems (C = 7'-6").

SUPPLEMENTAL DIMENSIONS				
NO. OF BAYS	A	B	C	D
4 Bays	9'-8"	6'	2'-11"	1'-11"
		8'	5'-1"	3'-3½"
		10'	7'-6"	6'-10½"
5 Bays	11'-11"	6'	2'-11"	1'-11"
		8'	5'-1"	3'-3½"
		10'	7'-6"	6'-10½"
6 Bays	14'-2"	6'	2'-11"	1'-11"
		8'	5'-1"	3'-3½"
		10'	7'-6"	6'-10½"
7 Bays	16'-5"	6'	2'-11"	1'-11"
		8'	5'-1"	3'-3½"
		10'	7'-6"	6'-10½"
9 Bays	20'-11"	6'	2'-11"	1'-11"
		8'	5'-1"	3'-3½"
		10'	7'-6"	6'-10½"
10 Bays	23'-2"	6'	2'-11"	1'-11"
		8'	5'-1"	3'-3½"
		10'	7'-6"	6'-10½"
12 Bays	27'-8"	6'	2'-11"	1'-11"
		8'	5'-1"	3'-3½"
		10'	7'-6"	6'-10½"

DIAGONAL BRACED BACKUP ASSEMBLY

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION
ROAD DESIGN

HEX-FOAM SANDWICH SYSTEM

	Names	Dates
Designed By	MFG/HKH	2/93
Drawn By	HKH	2/93
Checked By	JVG	2/93

Approved By: Freddie Simmons
State Roadway Design Engineer

F.H.W.A. Approved:

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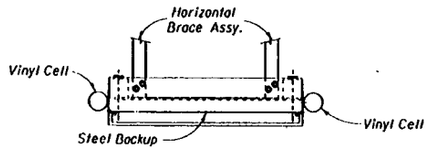
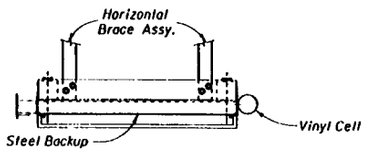
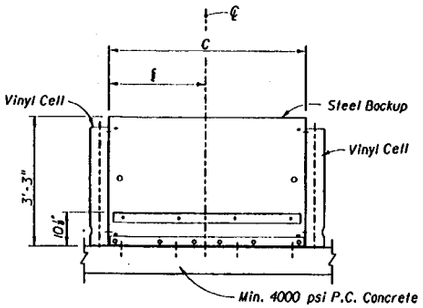


TOP VIEW (UNIDIRECTIONAL)

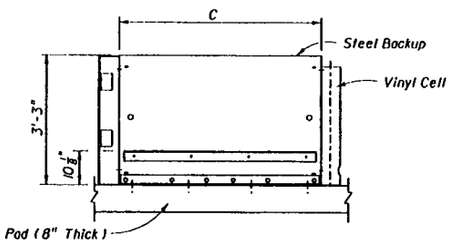


TOP VIEW (BIDIRECTIONAL)



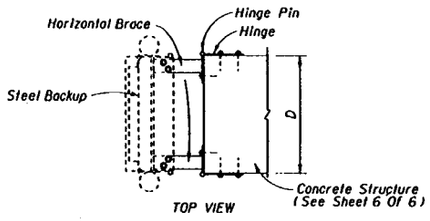
FRONT VIEW (W/O BAY UNITS)

STEEL BACKUP - UNIDIRECTIONAL

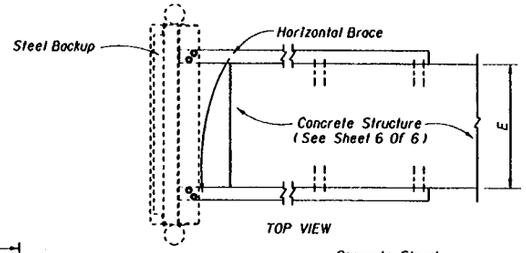


FRONT VIEW (W/O BAY UNITS)

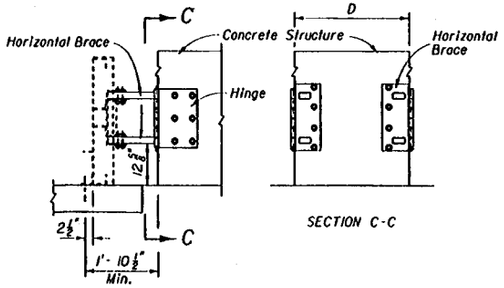
STEEL BACKUP - BIDIRECTIONAL



TOP VIEW



TOP VIEW

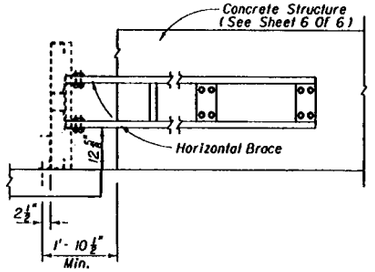


SECTION C-C

SIDE VIEW

Concrete Structure Widths (D)
Narrow Units - 2' Min., 2'-11" Max.
Medium Units - 3' Min., 5'-1" Max.
Wide Units - 5' Min., 7'-6" Max.

CORNER MOUNT



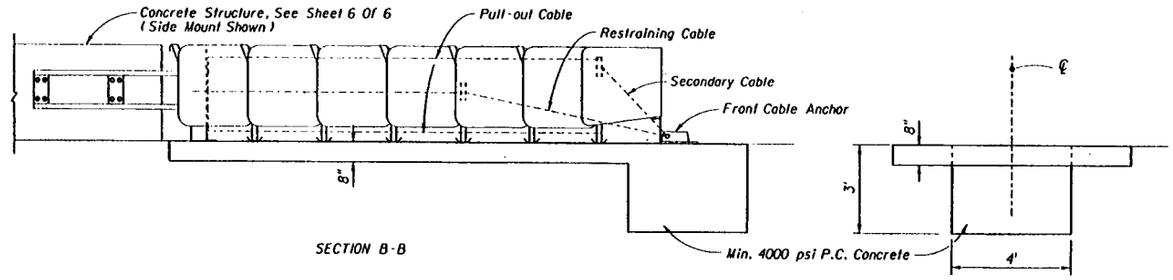
SIDE VIEW

Concrete Structure Widths (E)
Narrow Units - 1'-4" Min., 2'-2" Max.
Medium Units - 2'-4" Min., 4'-4" Max.
Wide Units - 4'-4" Min., 6'-9" Max.

SIDE MOUNT

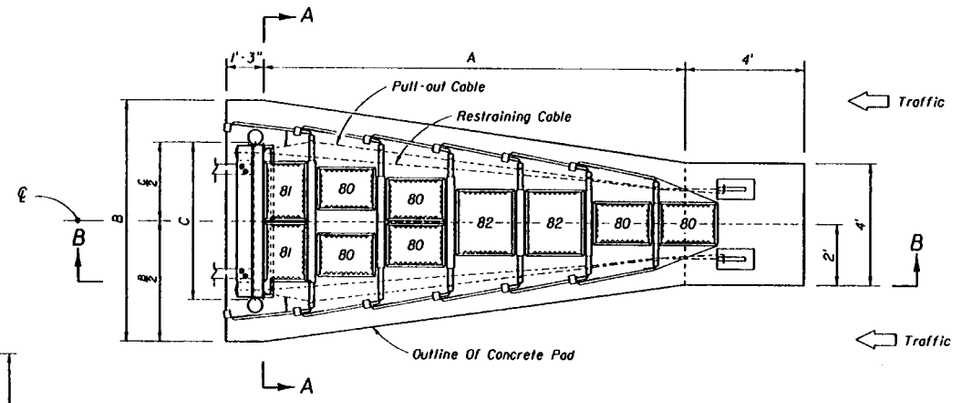
Note: Horizontal braces are custom accessory items. Actual designs vary depending on the concrete backup structure.

TYPICAL HORIZONTAL BRACE ASSEMBLIES

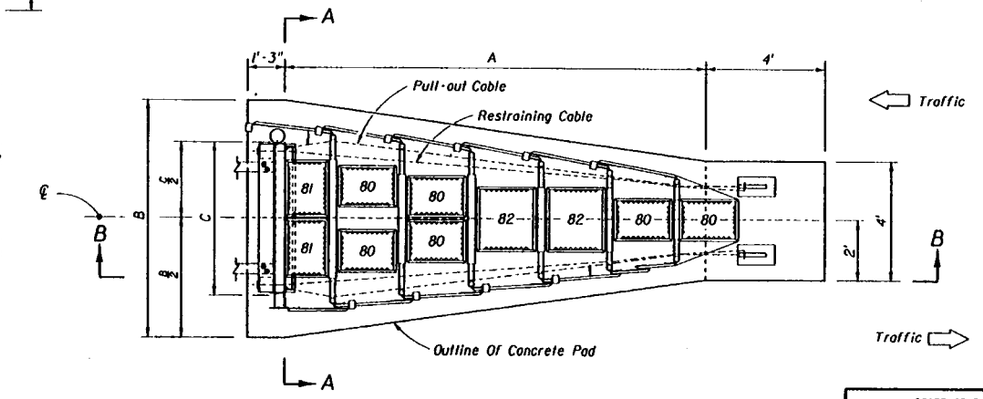


SECTION B-B

SECTION A-A



PLAN - UNIDIRECTIONAL UNIT (6 BAY UNIT SHOWN)



PLAN - BIDIRECTIONAL UNIT (6 BAY UNIT SHOWN)

SUPPLEMENTAL DIMENSIONS			
NO. OF BAYS	A	B	C
4 Bays	9'-8"	6'	2'-11"
		8'	5'-1"
		10'	7'-6"
5 Bays	11'-11"	6'	2'-11"
		8'	5'-1"
		10'	7'-6"
6 Bays	14'-2"	6'	2'-11"
		8'	5'-1"
		10'	7'-6"
7 Bays	16'-5"	6'	2'-11"
		8'	5'-1"
		10'	7'-6"
9 Bays	20'-11"	6'	2'-11"
		8'	5'-1"
		10'	7'-6"
10 Bays	23'-2"	6'	2'-11"
		8'	5'-1"
		10'	7'-6"
12 Bays	27'-8"	6'	2'-11"
		8'	5'-1"
		10'	7'-6"

Note: See Sheet 6 of 6 for minimum concrete structure reinforcement.

HORIZONTAL BRACED BACKUP ASSEMBLY

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION
ROAD DESIGN

HEX-FOAM SANDWICH SYSTEM

	Names	Dates
Designed By	WFG/HKH	2/93
Drawn By	HKH	2/93
Checked By	JVG	2/93
F.H.W.A. Approved:		

Approved By: Freddie Simmons
State Roadway Design Engineer

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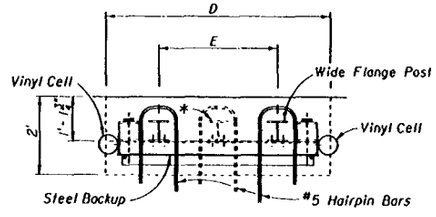
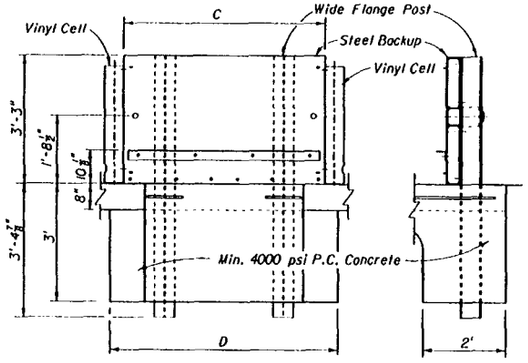
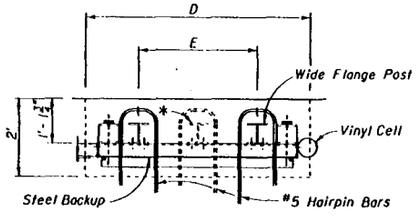


TOP VIEW

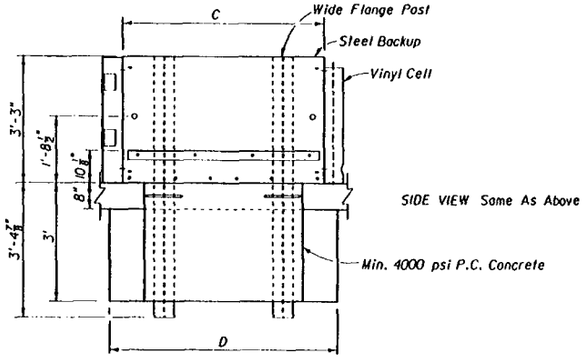


FRONT VIEW (W/O BAY UNITS) SIDE VIEW

BACKUP ASSEMBLY - UNIDIRECTIONAL



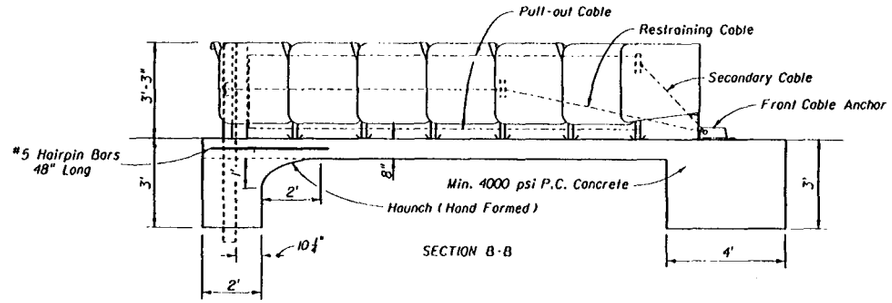
TOP VIEW

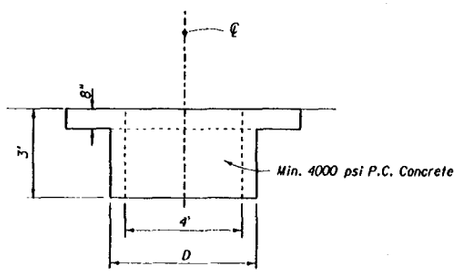


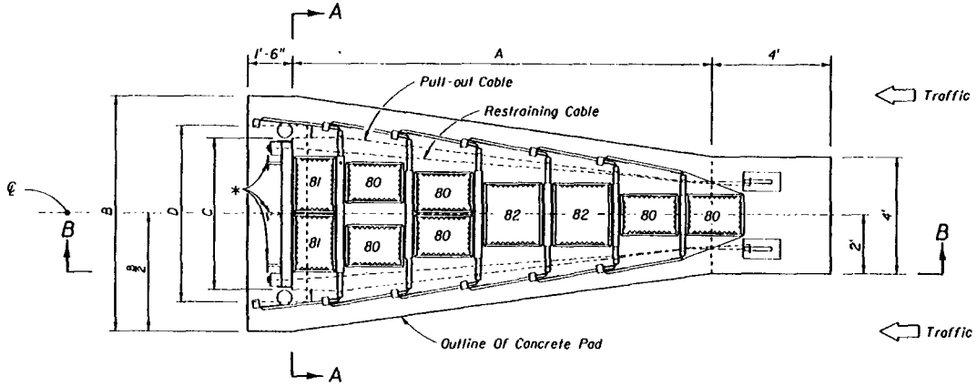
SIDE VIEW Same As Above

FRONT VIEW (W/O BAY UNITS)

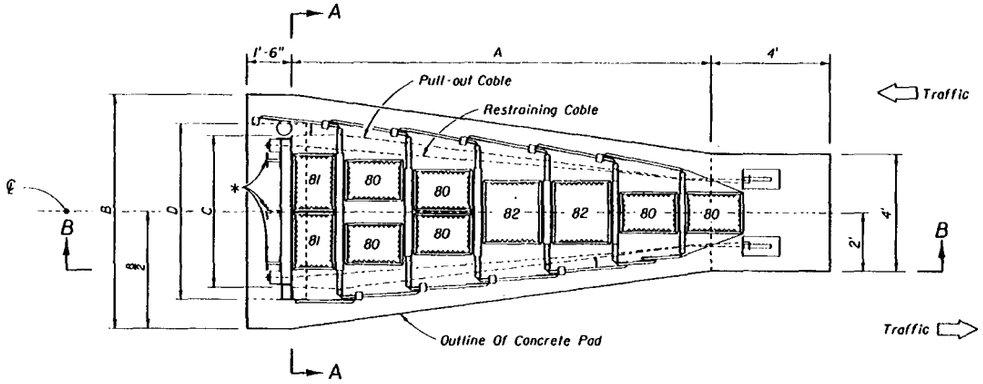
BACKUP ASSEMBLY - BIDIRECTIONAL







PLAN - UNIDIRECTIONAL UNIT (6 BAY UNIT SHOWN)



PLAN - BIDIRECTIONAL UNIT (6 BAY UNIT SHOWN)

* 2 WF posts are required on narrow and medium width systems,
3 WF posts are required on wide systems (C = 7'-6").

SUPPLEMENTAL DIMENSIONS					
NO. OF BAYS	A	B	C	D	E
4 Bays	9'-8"	6'	2'-11"	3'-7½"	1'-7½"
		8'	5'-1"	5'-0"	3'-0"
		10'	7'-6"	8'-6"	6'-8"
5 Bays	11'-11"	6'	2'-11"	3'-7½"	1'-7½"
		8'	5'-1"	5'-0"	3'-0"
		10'	7'-6"	8'-6"	6'-8"
6 Bays	14'-2"	6'	2'-11"	3'-7½"	1'-7½"
		8'	5'-1"	5'-0"	3'-0"
		10'	7'-6"	8'-6"	6'-8"
7 Bays	16'-5"	6'	2'-11"	3'-7½"	1'-7½"
		8'	5'-1"	5'-0"	3'-0"
		10'	7'-6"	8'-6"	6'-8"
9 Bays	20'-11"	6'	2'-11"	3'-7½"	1'-7½"
		8'	5'-1"	5'-0"	3'-0"
		10'	7'-6"	8'-6"	6'-8"
10 Bays	23'-2"	6'	2'-11"	3'-7½"	1'-7½"
		8'	5'-1"	5'-0"	3'-0"
		10'	7'-6"	8'-6"	6'-8"
12 Bays	27'-8"	6'	2'-11"	3'-7½"	1'-7½"
		8'	5'-1"	5'-0"	3'-0"
		10'	7'-6"	8'-6"	6'-8"

WIDE FLANGE BACKUP ASSEMBLY

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION
ROAD DESIGN

HEX-FOAM SANDWICH SYSTEM

	Names	Dates
Designed By	MFG/HKH	2/93
Drawn By	HKH	2/93
Checked By	JVG	2/93
F.H.W.A. Approved:		

Approved By: Freddie Simmons, State Highway Design Engineer

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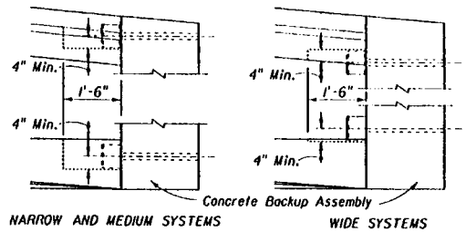
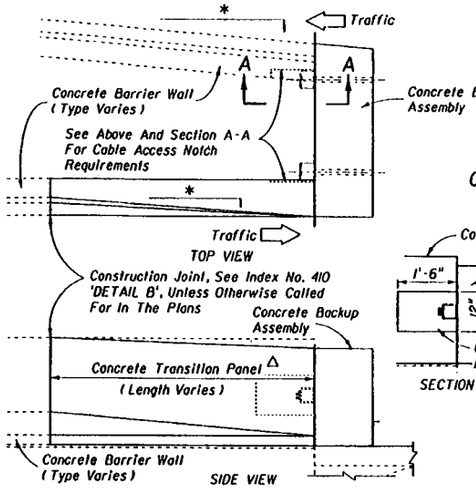
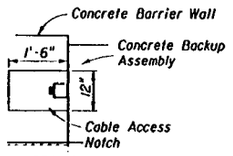


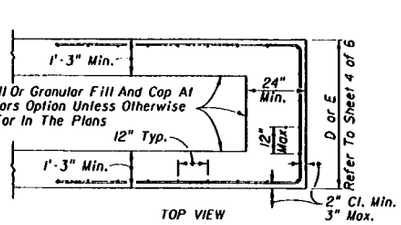
NARROW AND MEDIUM SYSTEMS WIDE SYSTEMS

RESTRAINING CABLE ACCESS NOTCH LOCATIONS WHEN CONNECTING TO CONCRETE BARRIER WALL (SHOULDER)



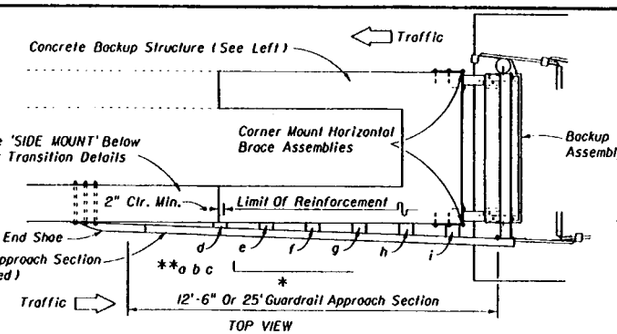


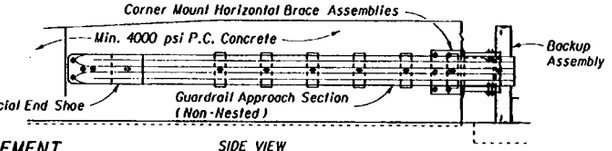
BARRIER WALL CONNECTION



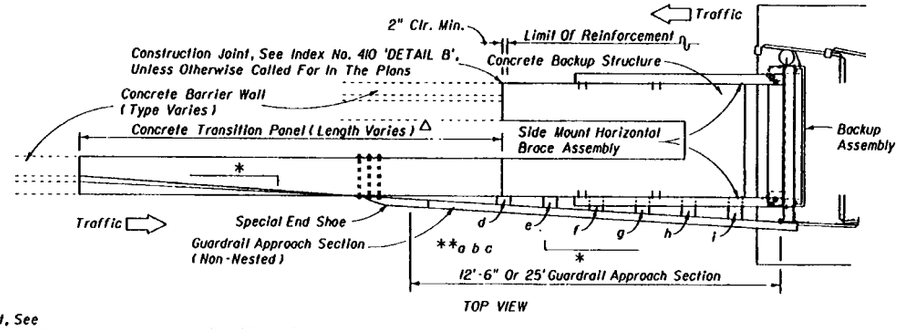
Note: All Reinforcement To Be No. 5 Bars

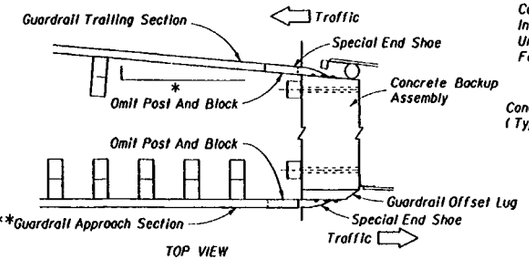
CONCRETE BACKUP STRUCTURE AND MINIMUM REINFORCEMENT FOR USE WITH HORIZONTAL BRACED BACKUP ASSEMBLIES

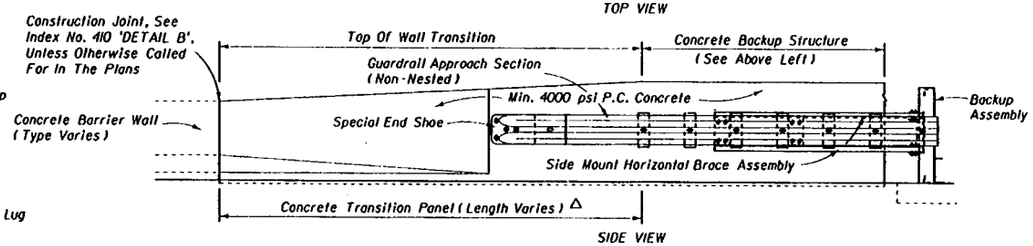




CORNER MOUNT

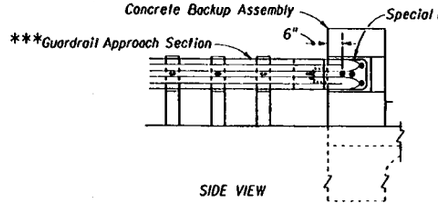




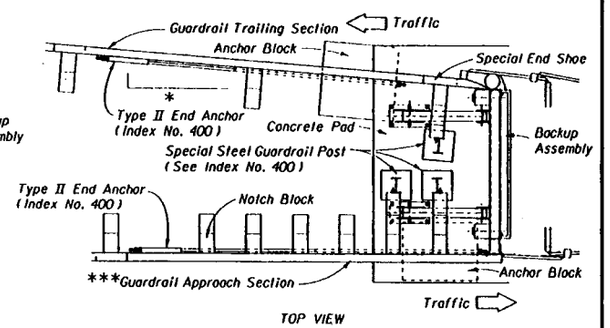


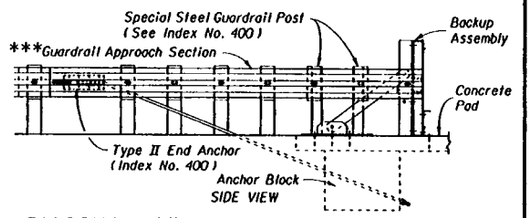
SIDE MOUNT

HORIZONTAL BRACED BACKUP ASSEMBLIES

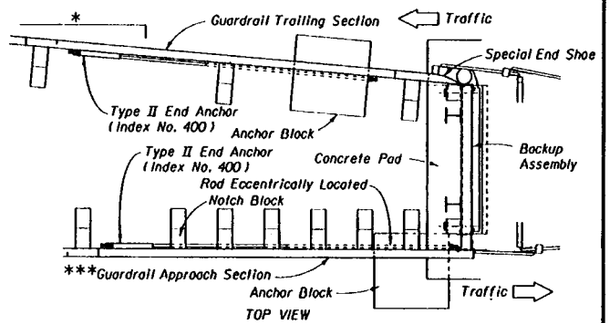


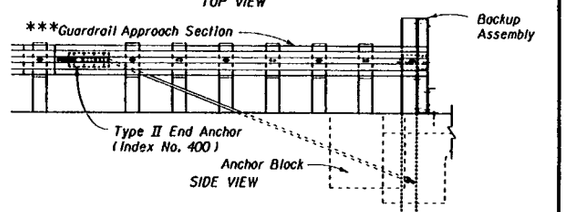
GUARDRAIL CONNECTION CONCRETE BACKUP ASSEMBLY





DIAGONAL BRACED BACKUP ASSEMBLY





WIDE FLANGE BACKUP ASSEMBLY

△ In absence of core fill or fill and cap, construct footing in accordance with Index No. 410 'PLAIN CONCRETE BARRIER WALL (SHOULDER)'.

* 10:1 Or Flatter For Design Speeds Under 50 mph
15:1 Or Flatter For Design Speeds 50 mph And Greater

** Blocks a, b and c will be used on 25' guardrail approaches only. When 25' guardrail approaches are constructed, block a shall be spaced at 6'-3" and blocks b, c and d shall be spaced at 3'-1½". All other blocks shall be spaced 1'-6¼". Blocks a, c, d, f and h shall be anchored to the concrete structure with ⅝" dia. anchor bolts with 5" embedment, hex nuts and standard washers, all other blocks shall be bolted to the rail only. On 12'-6" guardrail approaches all blocks shall be spaced 1'-6¼". Blocks d, f, and h shall be anchored to the concrete structure, with ⅝" dia. anchor bolts with 5" embedment, hex nuts and standard washers, all other blocks shall be bolted to the rail only. All offset blocks are to be field trimmed.

*** For Approach Guardrail Information Including Post Spacing And Nested Beams See Index No. 400 'DETAIL J'.

When the use of thru bolts are impractical for the installation of guardrail, approved chemical anchors may be used when installed in accordance with the anchor manufacturers specifications. Diameters shall be in accordance with Index No. 400. Minimum embedment shall be 6¾" for ⅝" dia. anchors and 5" for ¾" dia. anchors.

Cost of furnishing and installing guardrail items, including guardrail panels, special end shoes, standard posts and offset blocks, and all guardrail attachment hardware, shall be included in the contract unit price for Guardrail (Roadway), L.F.

Cost of furnishing and installing special steel guardrail posts shall be included in the contract unit price for Guardrail Post Special, Each.

Cost of furnishing and installing concrete and reinforcing steel for concrete backup structures and concrete transition panels shall be included in the contract unit price for Impact Attenuator Vehicular (Hex-Foam Sandwich), Each.

TRANSITION SECTIONS

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION
ROAD DESIGN

HEX-FOAM SANDWICH SYSTEM

	Names	Dates
Designed By	MFG/HKH	2/93
Drawn By	HKH	2/93
Checked By	JVG	2/93

Approved By Jaddie Summers
State Roadway Design Engineer

F.H.W.A. Approved:

Revision No.	Sheet No.	Index No.
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